



**WASTE DISCHARGE LICENCE 180-09
MONITORING REPORT
1 JUNE 2024 to 31 MAY 2025
COSMO HOWLEY PROJECT AREA**



AGNICO EAGLE

Version	Prepared by	Submission Date	Licence Expiry Date
1	NT Mining Operations	30 June 2025	21 February 2033
2	NT Mining Operations	29 August 2025	21 February 2033

CERTIFICATION DETAILS

I Sam Yang, Senior Environmental Advisor, have reviewed this report and I confirm that to the best of my knowledge and ability all the information provided in the report is true and accurate.

Signature:	
Date:	29/08/2025

EXECUTIVE SUMMARY

This report presents the findings of the environmental monitoring program for Cosmo Howley Project Area, operated by Northern Territory Mining Operations Pty Ltd. This program is conducted under the conditions of Waste discharge license 180-09, which regulates the discharge of treated mine water and requires ongoing environmental monitoring and reporting. The licence commenced on 22 February 2023 and remains in effect until 21 February 2033. The reporting period covered in this document spans from 1 June 2023 to 31 May 2024.

The 2024-2025 monitoring results for the Howley Creek Catchment present a comprehensive overview of water discharge, treatment efforts, rainfall patterns, water balance, and surface water quality. A total of 1,682.7 ML of treated water was discharged from AD1/RM2 into Howley Creek across eight authorised events, all conducted in accordance with regulatory requirements. Approximately 1,743 tonnes of quicklime were used in water treatment processes, reflecting a strong commitment to mitigating environmental impacts.

Rainfall during the period totalled 1,907.4 mm, consistent with the region's monsoonal climate, and played a key role in influencing creek flow and water storage. Water balance analysis showed an increase in total water inventory from June 2024 to 10,713 ML by May 2025. Notably, pH levels improved over the reporting period, shifting from more acidic conditions to near-neutral, indicating positive trends in water chemistry and treatment effectiveness.

Significant progress was observed at key monitoring sites. The installation of rock drains at CHCK03 and CHCK05 has begun to yield measurable improvements in water quality, particularly in reducing metal concentrations and stabilizing pH levels. While some exceedances of trigger values persist, the overall trend suggests that these interventions are effectively intercepting contaminated seepage and supporting site rehabilitation.

Ecotoxicology results at CHCK06, although still indicating potential toxicity, showed improved biological responses, with increased survival and reproduction rates in test organisms. The 2024–2025 macroinvertebrate and sediment assessment report is currently pending due to unseasonal heavy rainfall in late May, which disrupted stream conditions and delayed scheduled sampling. The report will be included as an appendix to this document once analysis is complete.

Macroinvertebrate and sediment monitoring conducted indicate aquatic ecosystem health in Howley Creek remains stable, with signs of improvement downstream of CHPA. At CHCK06, macroinvertebrate metrics were comparable to upstream reference sites, and sediment metal concentrations were below long-term medians, suggesting reduced cumulative impacts from mine water. Overall, active discharge from the CHPA did not result in significant impacts, and a trend of improving aquatic health is emerging, though continued monitoring is needed to confirm long-term outcomes.

The removal of CHCK04A from the compliance monitoring requirements under WDL180-09 is both scientifically and operationally justified. There is no longer any active discharge to this location, and all historical sources of contamination have been either rehabilitated or redirected. These flows are now either incorporated into other monitored systems or effectively isolated from environmental contact, eliminating the need for continued oversight at CHCK04A. Long-term monitoring data show no signs of environmental degradation or emerging risks, making the continued resource investment in this site disproportionate to its regulatory value. Sediment and macroinvertebrate results at CHCK04A showed arsenic concentrations exceeded guideline values and the macroinvertebrate community was dominated by pollution-tolerant taxa, likely influenced by limited habitat complexity. Additionally, CHCK04A has become redundant within the broader monitoring framework, as CHCK03 and CHCK05 provide more direct and representative data on pollution pathways and cumulative environmental impacts.

The report concludes that continued monitoring remains essential to support ecological health, assess the persistence of any residual toxicity, and guide water management during the site's care and maintenance phase. These efforts are aligned with long-term goals to enhance overall water quality, prevent uncontrolled discharges, and ensure sustainable environmental outcomes. The data collected during this period provides a strong foundation for informed decision-making and reinforces the commitment to responsible environmental management.

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Appendix 1: Ecotoxicology Report 2025

Appendix 2: Performance Improvement Report 2025

Appendix 3: Biological and Sediment Monitoring Report 2025

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Attachment A: NTMO WDL180-09 Biological Monitoring Plan 2022-2025

Attachment B: CHPA Contamination Loading 2025

Attachment C: CHPA Raw Data 2025

Attachment D: Annual Return 2025

Glossary

Definition	Abbreviation
Cosmo Howley Project Area	CHPA
Mine Water Dam	MWD
NT Mining Operations Pty Ltd	NTMO
Trigger Value	TV
Waste Discharge License	WDL
Waste Rock Dumps	WRD

1. INTRODUCTION

1.1 General

NT Mining Operations Pty Ltd (NTMO) are responsible for the management of the Cosmo Howley Project Area (CHPA). Mining at the PCPA ceased in 2020, and Agnico Eagle Mines Pty Ltd, the parent company of NT Mining Operations, assumed ownership of the site via merger with Kirkland Lake Gold in 2022. There is currently no mining occurring at CHPA, with the site under care and maintenance according to NTMO's CHPA Mining Management Plan. To regulate water levels and maintain the safe operation of critical infrastructure at the site (e.g. Tailings Storage Facilities, Waste Rock Dumps, Process Water Storage Dams), NTMO hold Waste Discharge Licence WDL 180-09, permitting discharge at two locations, AD1 and AD2, with compliance monitoring undertaken at sites CHCK06 and CHCK04A.

1.2 Monitoring Report

The monitoring report has been submitted in accordance with Schedule 1 Item 13 (condition 39) of WDL180-09. Table 1 shows requirements of this monitoring report.

TABLE 1 MONITORING REPORT REQUIREMENTS

Requirement	Section
Condition 37. The Licensee must keep records of all contraventions with this licence. These records must be adequate to enable the Licensee to comply with the notification and reporting conditions of this licence.	Refer to Monitoring Results Section 3.10
Condition 38. The Annual Return is due on 30 June each year for the period 1 June to 31 May during the term (or part thereof).	Refer to Attachment D: Annual Return 2025
Condition 39. The Licensee must complete and provide to the Administering Agency a report of data and information obtained through the implementation and performance of the Monitoring Program (the Monitoring Report).	Monitoring Report Due on 30 June 2025
Condition 40.1. The Monitoring Report is prepared in accordance with the requirements of the Administering Agency 'Guideline for Reporting on Environmental Monitoring' (or any other guideline as adopted by the Administering Agency from time to time).	Monitoring Report is prepared in accordance with the requirements of the Administering Agency 'Guideline for Reporting on Environmental Monitoring'.
Condition 40.2. The Monitoring Report includes a tabulation, in Microsoft® Excel® format or another format requested by the Administering Agency, of all monitoring data required to be collected in accordance with this licence for the preceding 12-month period.	Refer to Attachment C: CHPA Raw Data 2025
Condition 40.3. The Monitoring Report includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge points for the preceding 12-month period. Contaminant loads must be calculated for metals, metalloids, nutrients and other parameters (excluding field parameters) listed in the monitoring program. The calculations must be based on the daily discharge volume and the concentration of contaminant present in the discharge on that day. On the days when a sample was not taken then the concentration of the contaminant must be estimated using Linear Interpolation methodology.	Refer to Attachment B: CHPA Contamination Loading 2025
Condition 40.4. The Monitoring Report includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the Licensed Action over a minimum period of three years (or part thereof);	Refer to section 3. Monitoring Results
Condition 40.5. The Monitoring Report includes a summary of any investigations undertaken by the Licensee in accordance with this licence for the preceding 12-month period; and	Refer to Monitoring Results Section 3.10
Condition 40.6. The Monitoring Report includes an assessment of environmental impact from the Licensed Action.	Refer to Appendix 1: Ecotoxicology Report 2025 Refer to Appendix 3: Biological and Sediment Monitoring 2025
Condition 43. The Licensee must: (a) In the annual monitoring report, for total phosphorus results from CHCK01: i. Present a table of monthly averages from wet season samples analysed using a detection limit of 10 µg/L and; Calculate and provide the 80th percentile of the monthly averages.	Refer to Monitoring Results Section 3 Table 11

2.MONITORING OBJECTIVES AND METHOD

2.1 Surface Water Monitoring Points

The authorised discharge, compliance and monitoring points during the reporting period (as detailed in WDL180-09) are shown in Table 2 and Figure 1. Schedule 1, Item 4 and Attachment 1 describe the Biological Monitoring Plan. Schedule 1, Item 5 outlines the authorised discharge points, while Schedule 1, Item 6 identifies the source waters. Additionally, Schedule 1, Item 8 specifies the compliance points.

TABLE 2 AUTHORISED DISCHARGE AND MONITORING POINTS

Point	Description	Location	
		Latitude	Longitude
<u>Authorised Discharge Points</u>			
Authorised Discharge Point 1 (AD1/RM2)	Captures Dam 3 siphon discharge before other inputs	-13.498003	131.367991
Authorised Discharge Point 2 (AD2/RM1)	Creek 5 Discharge Outlet (tap on side of pipe) treated water from Howley West Pit.	-13.520264	131.364443
<u>Compliance Monitoring Points</u>			
Cosmo Howley Creek 6 (CHCK06)	Howley Creek, downstream of CHPA discharges	-13.468583	131.352699
Cosmo Howley Creek 4A (CHCK04A)	Creek 4 at Dorat Rd Crossing	-13.544365	131.378386
<u>Environmental Monitoring Point</u>			
Cosmo Howley Creek 1 (CHCK01)	Howley Creek upstream of mine influence reference site)	-13.493594	131.457174
Cosmo Howley Creek 2 (CHCK02)	Creek 2 downstream Stuart Highway crossing	-13.506025	131.381524
Cosmo Howley Creek 3 (CHCK03)	Creek 3 downstream Stuart Highway crossing	-13.524688	131.399919
Cosmo Howley Creek 5 (CHCK05)	Creek 5 downstream Stuart Highway crossing	-13.493822	131.371625
Monitoring Tributary Surface Water 2 (MTSW02)	Unnamed creek downstream Stuart Highway crossing	-13.477405	131.358122
<u>On-site Monitoring Point</u>			
Regulatory Monitoring Point 3 (RM3)	Captures seepage from old MWD area and capped Tailings Dam	-13.527895	131.369041
Regulatory Monitoring Point 4 (RM4)	Captures seepage from old MWD area	-13.525184	131.371657
Regulatory Monitoring Point 5 (RM5)	Captures surface water runoff from Cosmo WRD	-13.525749	131.378135
Regulatory Monitoring Point 6 (RM6)	Captures seepage from Acid Pond 4	-13.532003	131.387997
Regulatory Monitoring Point 7 (RM7)	Captures seepage from Acid Pond 1	-13.536006	131.388000
Regulatory Monitoring Point 8 (RM8)	On Mining Lease boundary between CHCK04A and CHCK04C	-13.547007	131.377997
DAM 3	Storage Dam	-13.499686	131.365921

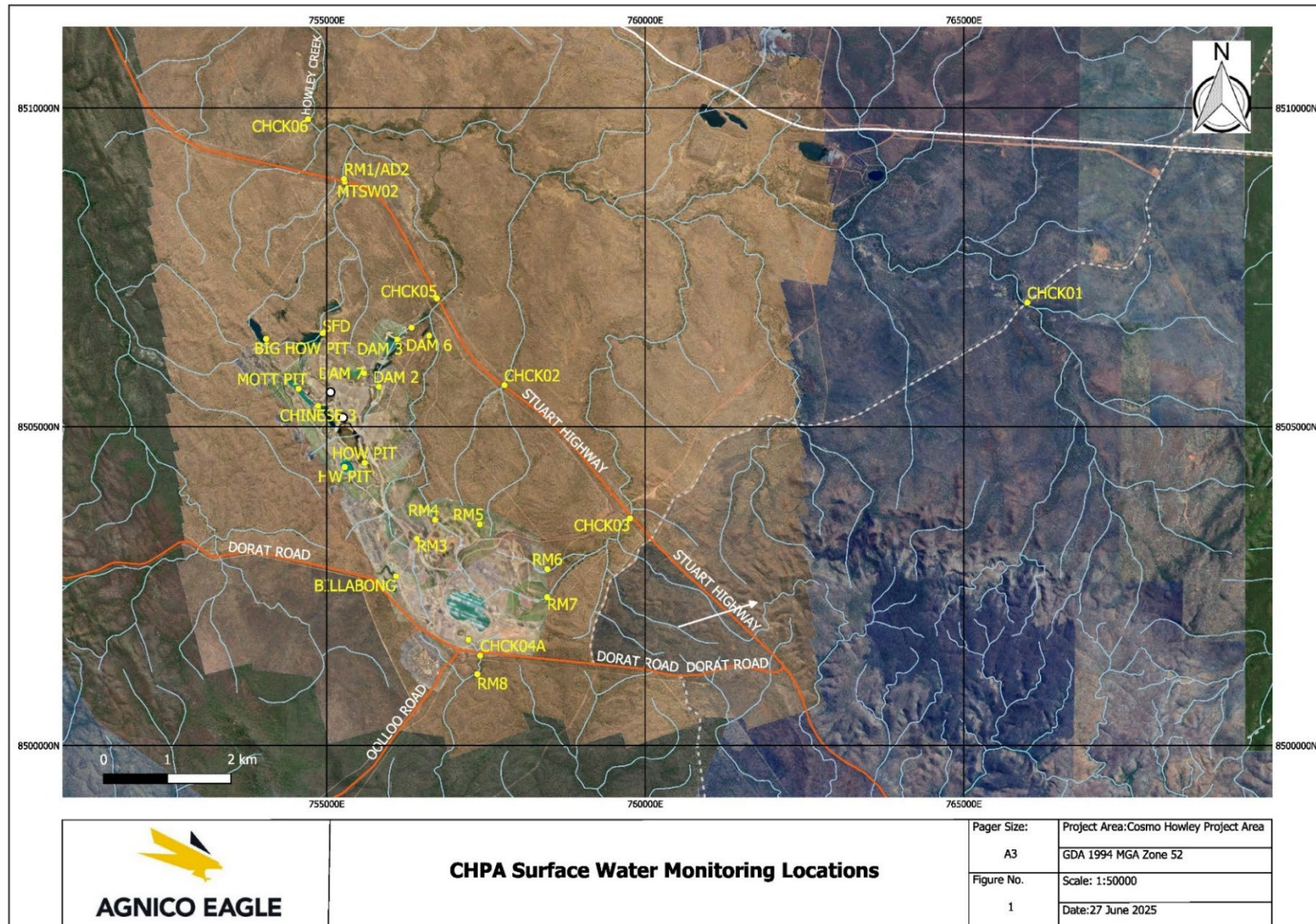


FIGURE 1 COSMO HOWLEY PROJECT AREA SAMPLING LOCATIONS

2.2 Compliance Points and Trigger Values

WDL 180-09 and Table 3 detail trigger values for compliance points CHCK06 and CHCK04A. Trigger value compliance is assessed against schedule 1 Item 10 below:

Item 10 relating to notifiable incidents (conditions 25 and 26):

- a) An exceedance of a trigger value of a limit specified in item 7 (trigger values) at the compliance point on three consecutive sampling occasions;*
- b) A measurement outside the range for pH and DO specified in Item 7 (trigger values) at the compliance point on three consecutive sampling occasions;*
- c) An exceedance of three or more times a trigger value specified in Item 7(trigger values) at the compliance point;*
- d) A discharge at a point not specified in Item 5;*
- e) A discharge from a source not specified in Item 6; or*
- f) A failure to comply with condition 23.*

TABLE 3 COMPLIANCE POINTS AND SSTVS

				Hayes Creek	Howley Creek
Site Code				CHCK04A	CHCK06
Parameter	Abbreviation	Units	Analysis	Trigger value	
Field Measurements					
Flow	–	kL/day	In situ	ND	ND
Water Level	–	m		ND	ND
pH	–	pH units		6.0 – 8.0 ¹	6.0 – 8.0 ¹
Electrical Conductivity	EC	µS/cm		250 ¹	700 ⁴
Dissolved Oxygen	DO	% saturation		90 – 120 ¹	45 – 120 ⁴
Temperature	–	°C		ND	ND
Total Dissolved Solids	TDS	mg/L		ND	ND
Dissolved Metals					
Aluminium	Al	µg/L	Filtered 0.45 µm	150 ³	196 ⁴
Arsenic	As			140 ³	42 ²
Cadmium	Cd			0.8 ³	0.4 ²
Chromium	Cr			40 ³	6 ²
Cobalt	Co			13 ³	13 ²
Copper	Cu			2.5 ³	1.8 ²
Iron	Fe			300 ²	428 ⁴
Lead	Pb			9.4 ³	5.6 ²
Manganese	Mn			3600 ³	2500 ²
Nickel	Ni			17 ³	13 ²
Selenium	Se			34 ³	18 ²
Uranium	U			ND	ND
Zinc	Zn	31 ³	15 ²		
General Chemistry					
Turbidity	–	NTU	Unfiltered	15 ¹	32 ⁴
Total Suspended Solids	TSS	mg/L		ND	28 ⁴
Hardness	–	as CaCO ₃		ND	ND
Carbonate	CO ₃	mg/L		ND	ND
Bicarbonate	HCO ₃			ND	ND
Unfiltered Alkalinity	CaCO ₃			ND	ND
Calcium	Ca			ND	ND
Magnesium	Mg			ND	ND
Potassium	K			ND	ND
Sodium	Na			ND	ND
Chloride	Cl ⁻			13	6 ⁴
Sulphate	SO ₄			ND	408 ⁴
Nutrients					
Total Nitrogen	TN	µg/L	Unfiltered	350 ¹	350 ¹
Total Phosphorus	TP			10 ¹	30 ⁵
Total Organic Carbon	TOC	mg/L		ND	ND

µS/cm = microSiemens per centimetre, µg/L = micrograms per litre, mg/L = milligrams per litre

¹Default ANZECC Trigger Values for Freshwater Upland and Lowland Rivers
²Default ANZG trigger value for 90% species protection
³Default ANZG trigger value for 80% species protection
⁴Site Specific Trigger Values as provided in the Cosmo Howley and Brocks Creek WDL-04 Report 2017
⁵Technical Memorandum. Total Phosphorus SSTV Derivation. SLR Consulting Australia, 21 June 2024
*Canadian Guideline adopted by ANZECC (2000)
ND – Not Determined

2.3 Monitoring Program

Water quality results of these monitoring programs are used to understand the influence of treated mine water discharge from the project area to the receiving environment in the Howley Creek system and the Daley River catchment. The results of the monitoring programs assist in identifying trends and assess the success of the various surface water management measures implemented by NTMO.

Schedule 1 Item 11 of WDL180-09 outlines NTMO's monitoring requirements which can be found below.

Schedule 1 Item 11. Monitoring Program

The Monitoring Program includes:

- (a) Surface water monitoring in accordance with Appendix 2 in WDL180-09; and*
- (b) Macroinvertebrate, sediment and ecotoxicological monitoring in accordance with NTMO CHPA Biological Monitoring Plan 2022 at Item 4.*

2.4 Mine Affected Water Sources

The sources of mine affected waters from the CHPA originate from the legacy infrastructure associated with historical mining activity including Dams, waste rock dumps (WRDs), tailings dam, mine water dam (MWD), ROM pads and other mining infrastructure (Table 4). Figure 2 shows the flow of water onsite from mine infrastructure to watercourses.

TABLE 4 COSMO HOWLEY PROJECT AREA WASTEWATER SOURCES

Site	Source	Receiving Sites
Howley Creek	Cosmo WRD via RM6 and RM7	CHCK03
	Howley WRD surface runoff and seepage via mine water dam creek	CHCK05
	Mine water dam seepage via RM4 and RM3	
	Active discharge via AD2 and AD1	
	Historic Big Howley Pit and WRD, Alluvial Stockpile and Mottrams WRD via Squashed Frog Dam and unnamed wetland	MTSW02
	RM5	CHCK02
Douglas Tributary	Fuel bay, maintenance workshop and offices Cosmo ROM	CHCK04A
	Historical heap leach pads and old mill	

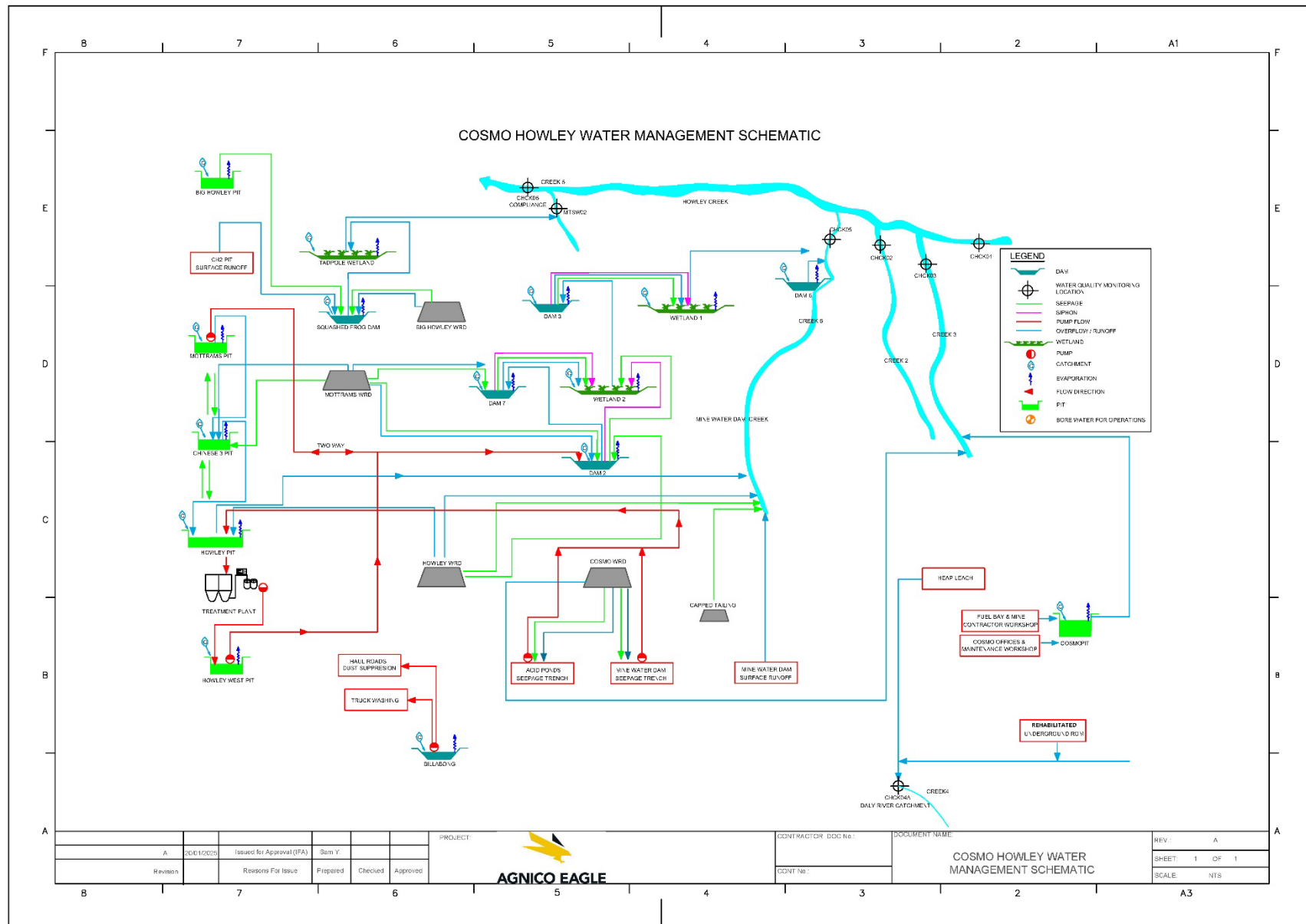


FIGURE 2 COSMO HOWLEY PROJECT AREA WATER MANAGEMENT SCHEMATIC

3. MONITORING RESULTS

3.1 Authorised Discharge Summary

Table 5 details the authorised discharges from AD1 into the receiving waters at Howley Creek for the reporting period. During this time, approximately 1,682.7 ML of water was discharged into Howley Creek. Authorised discharge point AD2 was not utilised during this reporting period. Authorised discharge of treated water was favoured through AD1 as it uses a multi-dam storage and release strategy whilst AD2 uses a direct release strategy from Howley West Pit.

TABLE 5 AUTHORIZED DISCHARGE SUMMARY

Release ID	Location	Release start	Release End	Total Release (ML)
1	AD1/RM2	23/12/24 9:00 AM	08/01/25 8:00 AM	138.9
2	AD1/RM2	25/01/25 10:00 AM	29/01/25 7:00 AM	146.2
3	AD1/RM2	04/02/25 8:00 AM	15/02/25 8:00 AM	536.2
4	AD1/RM2	17/02/25 4:00 PM	20/02/25 1:00 PM	109.9
5	AD1/RM2	22/02/25 10:00 AM	24/02/25 5:00 PM	53.2
6	AD1/RM2	17/03/25 8:00 AM	30/03/25 1:00 PM	548.7
7	AD1/RM2	01/04/25 11:00 AM	03/04/25 7:00 AM	41.3
8	AD1/RM2	07/04/25 1:00 PM	12/04/25 10:00 AM	108.3

3.2 Water Treatment

During the reporting period, water generated on-site was treated with quicklime in Howley West Pit. A total of approx. 1,743 tonnes of quicklime was used. The treated water was then transferred to Dams 2 and 7 for storage before being moved to Dam 3 for potential release under WDL180-09 conditions.

3.3 Rainfall

The Howley Creek catchment is characterised by a monsoonal climate regime, with clearly defined wet and dry seasons. These climatic conditions significantly influence the natural environment in the vicinity around the Mine. During the dry season months, the CHCK06 compliance point in Howley Creek began to flow in mid to late December 2024. A total of 1,907.4 mm of rainfall was recorded onsite at the CHPA rain gauge during the reporting period. Figure 3 presents cumulative rainfall for 2024-25 reporting period, 2023-24 reporting period and wet season scenario, dry season scenario and average rainfall at the Cosmo Site office.

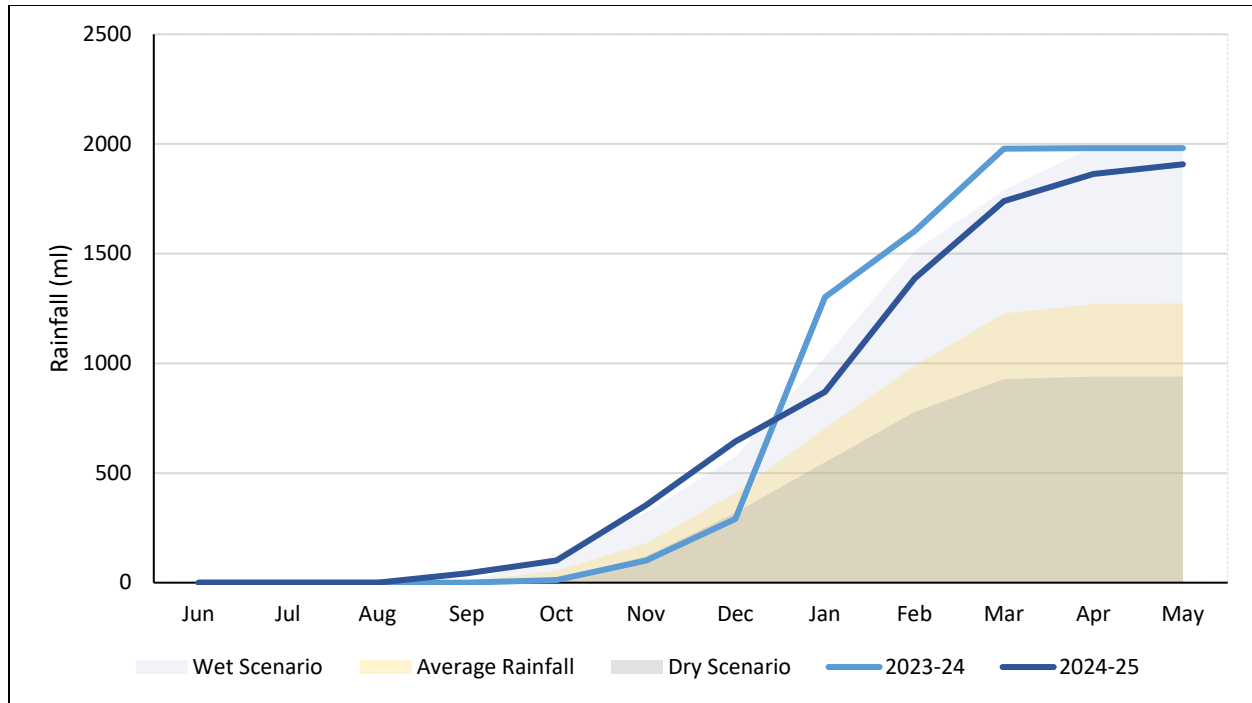


FIGURE 3 COSMO HOWLEY PROJECT AREA CUMULATIVE RAINFALL

3.4 Water Balance

The changes in total water storage from June 2024 to May 2025 at CHPA are shown in Table 6 and Figure 4. By the end of May 2025, the total inventory was 10,713.0 ML. Figure 5 and Figure 6 display the volume (ML) of water and pH levels in each of the pits and dams on site. pH readings, taken during Cosmo Howley water balance monitoring, indicated that the water sources were generally more acidic in June 2024 compared to May 2025.

TABLE 6 WATER BALANCES FROM JUNE 2024 AND MAY 2025

Site	Overflow Volume	June 2024			May 2025		
		Actual Volume		Freeboard to Overflow	Actual Volume		Freeboard to Overflow
		ML	%		ML	%	
Howley West	507.06	371.24	73.2%	135.82	390.42	77.0%	116.64
Dam 2	190.68	44.48	23.3%	146.20	178.12	93.4%	12.56
Dam 3	199.48	88.53	44.4%	110.95	149.23	74.8%	50.25
Dam 7	191.78	104.77	54.6%	87.01	191.78	100.0%	0.00
Howley Pit	4,226.88	3,773.73	89.3%	453.15	3,881.91	91.8%	344.97
Mottram Pit	1,417.49	1,106.74	78.1%	310.75	1,176.10	83.0%	241.39
Chinese 3	439.72	333.24	75.8%	106.48	341.35	77.6%	98.37
Cosmo Pit	6,801.51	4,172.20	61.3%	2,629.31	4,404.08	64.8%	2397.43
Total	13,974.60	9,994.93	71.5%	3,979.67	10,713.0	76.7%	3261.60

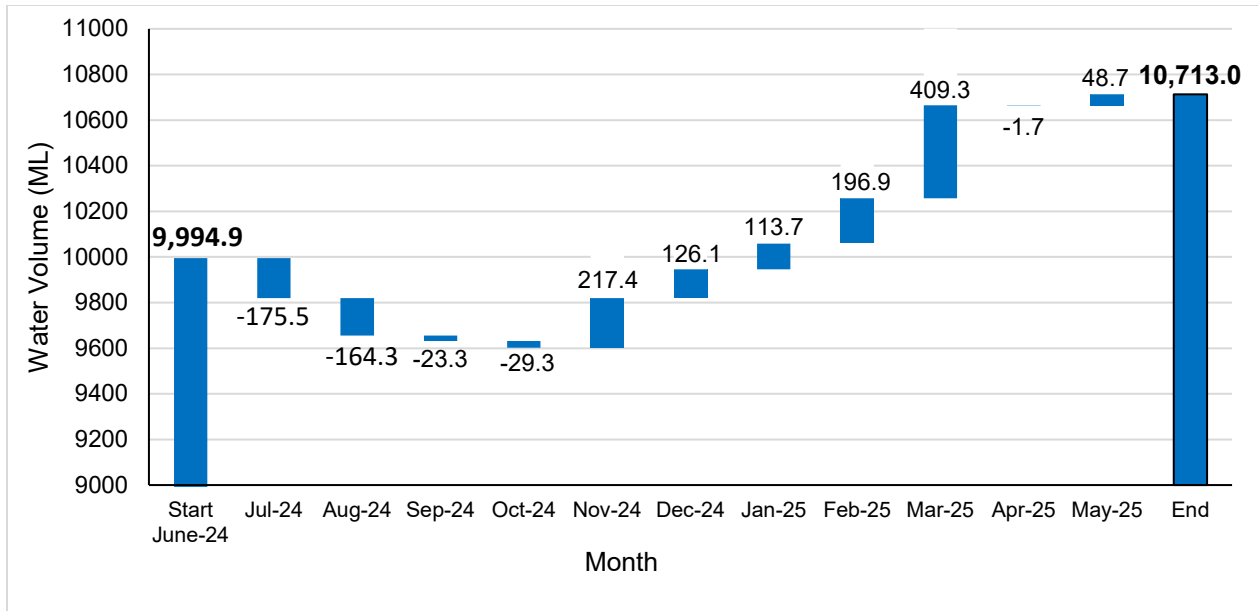


FIGURE 4 COSMO HOWLEY PROJECT AREA TOTAL WATER STORAGE

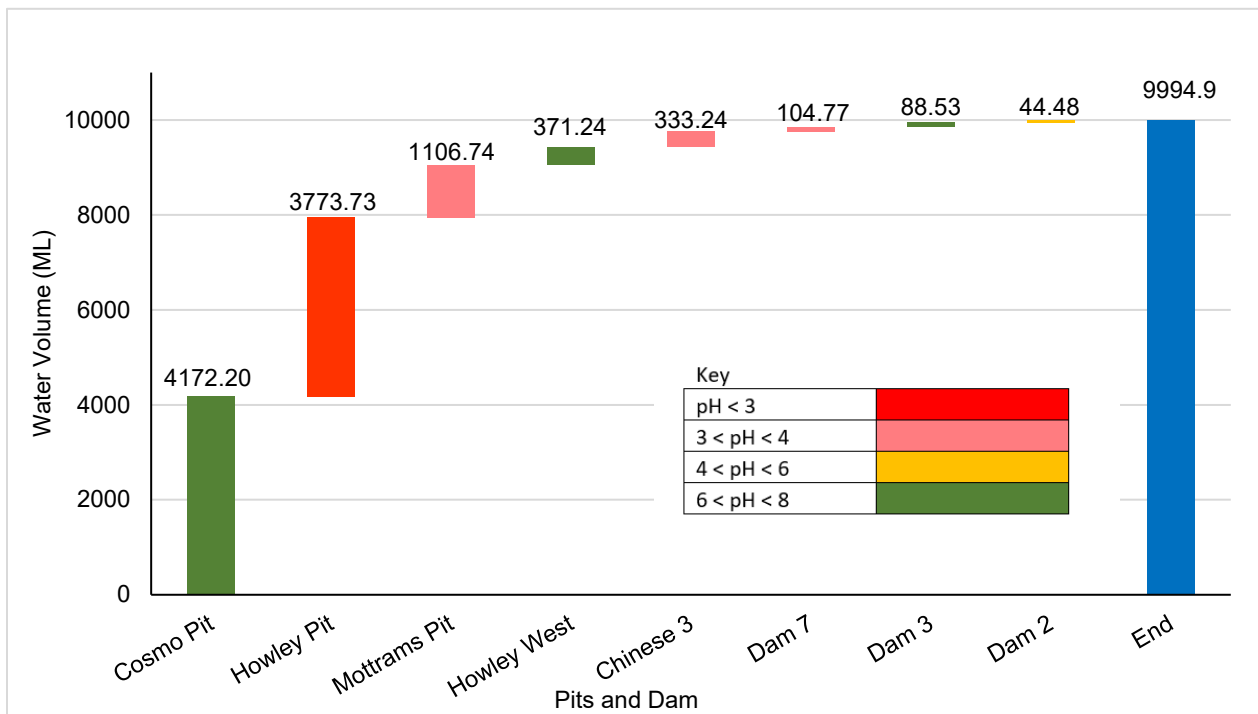


FIGURE 5 COSMO HOWLEY PROJECT AREA PITS AND DAMS VOLUME AND PH AT THE START OF JUNE 2024

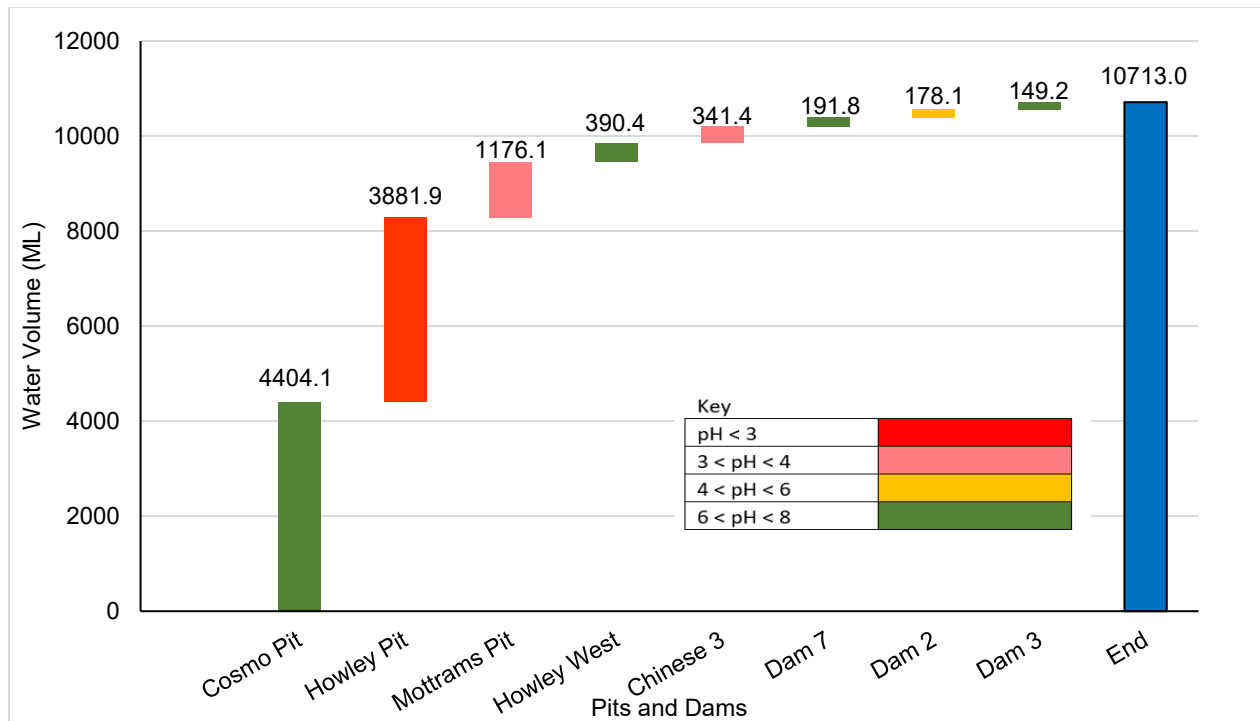


FIGURE 6 COSMO HOWLEY PROJECT AREA PITS AND DAMS VOLUME AND PH AT THE END OF MAY 2025

3.5 Creek Flow

Table 7 presents the water levels at CHCK06, CHCK03, CHCK05, CHCK02, CHCK01 and MTSW02 in Howley Creek. Table 8 provides the flow rates at these locations. Figure 7 presents flow rate (m^3/s) at CHCK06 during the reporting period. The gauge is designed to cap the flow rate at $17.5 \text{ m}^3/\text{s}$ to ensure that, in case of any reading inaccuracies, we do not discharge more than necessary. Accurately measuring creek flow is essential for water resource management and environmental monitoring. However, several factors can impact measurement accuracy:

- **Flow Variability:** Creek flows can change rapidly, making it difficult to obtain consistent measurements. The actual flow rate at any given gauge height can vary widely depending on whether the creek is rising or falling and the amount of water from previous runoff events.
- **Instrumentation Limitations:** Measurement instruments can be affected by sensor sensitivity, calibration issues, and maintenance needs. Factors like fouling, air bubbles, or debris can lead to inaccuracies. Different instruments may be required to measure various aspects of flow, adding complexity.
- **Timing Limitations:** Flow measurements can vary significantly over short periods. Peak flows from storm events can be much higher than average flow rates, affecting measurement accuracy.

TABLE 7 CREEK FLOW HEIGHT

Date	CHCK06	CHCK03	CHCK05	CHCK02	CHCK01	MTSW02
	m					
07-Jan-25	1.58	1.00	0.60	0.30	1.30	0.20
20-Jan-25	0.64	0.60	0.20	0.40	1.10	0.30
28-Jan-25	3.46	0.40	0.70	1.00	1.20	0.30
04-Feb-25	2.98	0.40	1.40	0.50	1.50	0.30
10-Feb-25	4.20	1.20	0.80	0.50	1.60	0.30
17-Feb-25	4.20	1.40	1.30	0.60	2.20	0.30
12-Mar-25	0.89	0.70	0.20	0.50	1.20	0.15
17-Mar-25	1.55	1.10	0.60	0.50	1.30	0.30
25-Mar-25	3.08	0.60	0.60	0.20	1.60	0.15

TABLE 8 CREEK FLOW RATE

Date	CHCK06	CHCK03	CHCK05	CHCK02	CHCK01	MTSW02
	m^3/s					
07-Jan-25	3.50	0.46	0.25	0.21	2.45	0.14
20-Jan-25	0.28	0.04	0.02	0.02	0.20	0.01
28-Jan-25	8.90	1.16	0.62	0.53	6.23	0.36
04-Feb-25	6.90	0.90	0.48	0.41	4.83	0.28
10-Feb-25	17.5	2.28	1.23	1.04	12.25	0.70
17-Feb-25	17.5	2.28	1.23	1.04	12.25	0.70
12-Mar-25	0.75	0.10	0.05	0.04	0.53	0.03
17-Mar-25	3.40	0.44	0.24	0.20	2.38	0.14
25-Mar-25	7.20	0.94	0.50	0.43	5.04	0.29

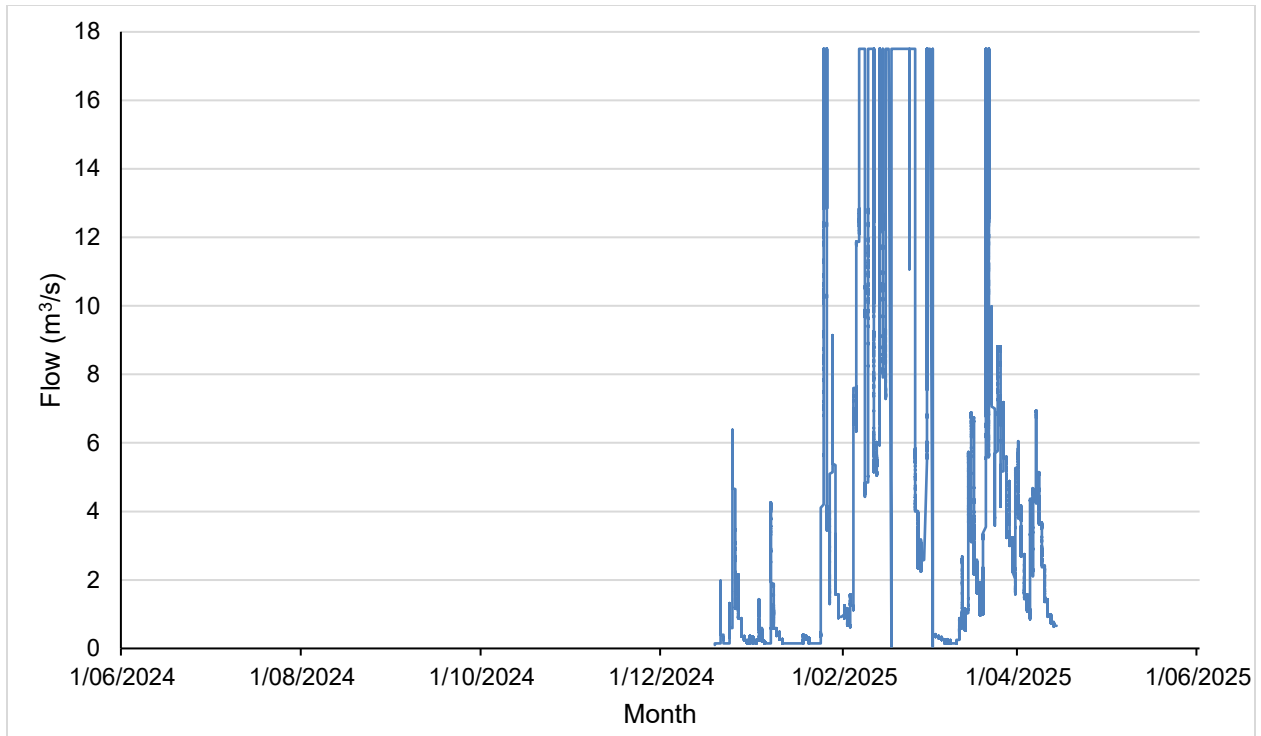


FIGURE 7 CHCK06 FLOW RATE

3.6 Contaminant Loads

The contaminant loading estimates presented in Table 9 include annual data from authorised discharge point AD1/RM2 for the reporting period. The contaminant loads have been calculated based on daily discharge volumes and concentrations of contaminants present in the discharge. For days when samples were not taken, concentrations were estimated using linear interpolation methodology. This approach ensures a comprehensive assessment of the contaminant loads, accounting for natural variability and measurement limitations. The detailed calculations and supporting data are presented in Attachment B.

TABLE 9 ESTIMATED CONTAMINANT LOADS FROM AD1

Parameter	Unit	AD1/RM2
Authorised Discharge Volumes	ML	1682.65
Dissolved Al	kg	1856.96
Dissolved As	kg	3.21
Dissolved Cd	kg	1.30
Dissolved Cr	kg	0.84
Dissolved Co	kg	272.19
Dissolved Cu	kg	11.72
Dissolved Fe	kg	70.61
Dissolved Pb	kg	0.84
Dissolved Mg	kg	8211.20
Dissolved Ni	kg	352.79
Dissolved Se	kg	0.84
Dissolved U	kg	2.43
Dissolved Zn	kg	228.59
TSS	tonnes	30.22
Carbonate	kg	4206.62
Bicarbonate	tonnes	19.50
Unfiltered Alkalinity	tonnes	19.50
Ca	tonnes	401.16
Mg	tonnes	304.91
K	tonnes	6.64
Na	tonnes	81.03
Cl	tonnes	6.33
SO4	tonnes	2391.07
TN	kg	192.52
TP	kg	17.12
TOC	kg	4617.94

3.7 Tabulation of Monitoring Data

The CHPA raw data can be found in Attachment C.

3.8 Howley Creek Catchment Surface Water Quality

Surface water quality data was collected from authorised discharge point AD1, environmental monitoring points CHCK01, CHCK05, CHCK03, CHCK02, MTSW02, compliance points CHCK06 and CHCK04A, and on-site monitoring point Dam 3. During this reporting period, only authorised discharge point AD1 was utilised.

Water quality results are included in the tables and figures below. Water quality data has been separated by catchment and monitoring site. Trigger values were assessed for each monitoring event at the compliance points, with median exceedances primarily highlighted. Using medians was chosen to avoid data outliers which would otherwise skew average values. All other data has been included for comparison purposes.

Monitoring Location CHCK01

The results for CHCK01 are shown in Table 10. It showed there were no median metals and general chemistry results exceeding the CHCK06 TV. Additionally, the minimum dissolved oxygen concentration fell below the CHCK06 TV range. Figure 8 highlighted that the maximum concentrations for zinc (21 µg/L) and iron (450 µg/L), which exceeded the CHCK06 TV (15 µg/L and 428 µg/L, respectively) are outliers. Figure 9 showed the maximum concentration of total nitrogen (0.4 mg/L) was an outlier. A summary table of monthly average concentrations from wet season samples, analysed using a detection limit of 10 µg/L, is presented in Table 11. The 80th percentile of these monthly averages has also been calculated and is provided in the same table.

TABLE 10 CHCK01 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0 – 8.0	15	6.32	6.67	7.18
EC	µS/cm	700 ⁴	15	14.3	39.1	87.5
DO	% saturation	45 – 120 ⁴	15	27.4	86.1	94.6
Dissolved Metals						
Al	µg/L	196 ⁴	13	5	40	170
As		42 ²	13	0.5	0.5	0.5
Cd		0.4 ²	13	0.05	0.05	0.05
Cr		6 ²	13	0.5	0.5	0.5
Co		13 ²	13	0.5	0.5	1
Cu		1.8 ²	13	0.5	0.5	0.5
Fe		428 ⁴	13	120	150	450
Pb		5.6 ²	13	0.5	0.5	0.5
Mn		2,500 ²	13	2.5	2.5	35
Ni		13 ²	13	0.5	0.5	0.5
Se		18 ²	13	0.5	0.5	0.5
Zn		15 ²	13	0.5	2	21
General Chemistry						
Turbidity	NTU	32 ⁴	14	4.4	8.9	46
TSS	mg/L	28 ⁴	14	5	5	38
Cl ⁻		6 ⁴	14	0.5	1	2
SO ₄		408 ⁴	14	0.5	1	14
Nutrients						
TN	mg/L	0.35 ¹	14	0.1	0.2	0.4
TP		0.03 ⁵	14	0.005	0.020	0.030

TABLE 11 CHCK01 TOTAL PHOSPHORUS CONCENTRATIONS

Date	Total Phosphorus	Monthly Average
	µg/L	
30/12/2024	20	20
07/01/2025	20	15
28/01/2025	10	
04/02/2025	10	7.5
10/02/2025	10	
17/02/2025	5	
24/02/2025	5	
04/03/2025	30	20
12/03/2025	20	
17/03/2025	10	
25/03/2025	20	
01/04/2025	20	20
07/04/2025	20	
14/04/2025	20	
80th percentile	20	

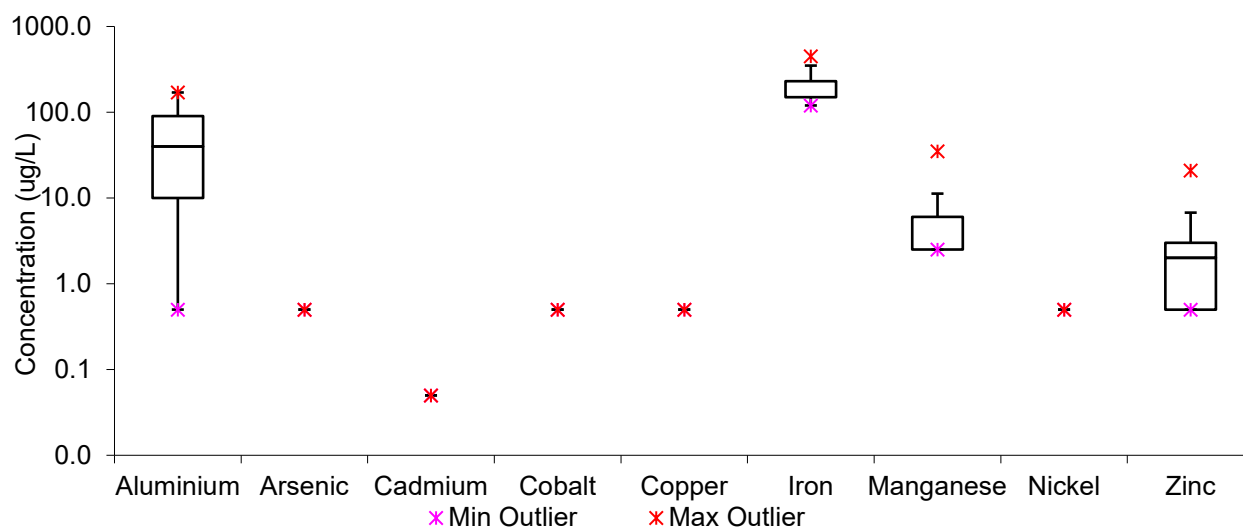


FIGURE 8 CHCK01 DISSOLVED METAL RESULTS

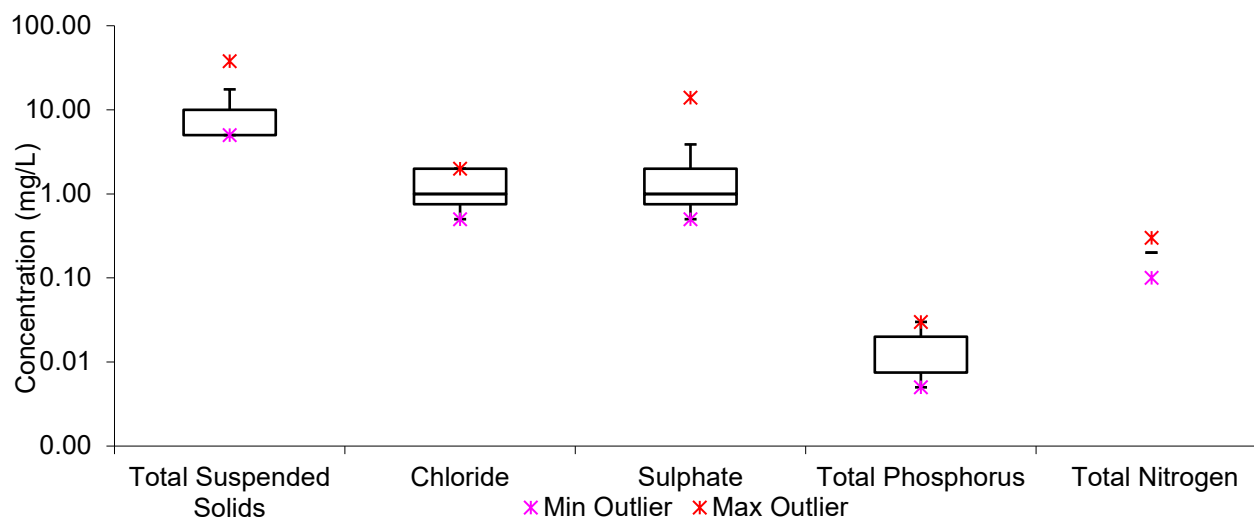


FIGURE 9 CHCK01 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Monitoring Location CHCK02

The results for CHCK02, as presented in Table 2, indicate there were no exceedances of CHCK06 TVs for median concentrations of metals or general chemistry parameters. The maximum concentration of copper slightly exceeded the CHCK06 TV (1.8 µg/L). The maximum iron concentration (640 µg/L) also exceeded the CHCK06 TV (428 µg/L). The maximum concentrations of total suspended solids (30 mg/L) and turbidity (44 NTU) slightly exceeded the CHCK06 TV (28 mg/L and 32 NTU). Additionally, the minimum dissolved oxygen concentration fell below the CHCK06 TV range. Figure 11 showed all concentrations for total nitrogen were below the CHCK06 TV (0.35 mg/L), except for the maximum concentration 0.9 mg/L which is an outlier.

TABLE 12 CHCK02 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0–8.0	18	6.40	6.82	7.35
EC	µS/cm	700 ⁴	18	59.9	176.7	285
DO	% saturation	45 – 120 ⁴	18	20.7	69	85.4
Dissolved Metals						
Al	µg/L	196 ⁴	12	5	50	190
As		42 ²	12	0.5	1	4
Cd		0.4 ²	12	0.05	0.05	0.05
Cr		6 ²	12	0.5	0.5	0.5
Co		13 ²	12	0.5	0.5	1
Cu		1.8 ²	12	0.5	0.5	2
Fe		428 ⁴	12	130	220	640
Pb		5.6 ²	12	0.5	0.5	0.5
Mn		2,500 ²	12	2.5	59	390
Ni		13 ²	12	0.5	0.5	2
Se		18 ²	12	0.5	0.5	0.5
Zn		15 ²	12	0.5	2	8
General Chemistry						
Turbidity	NTU	32 ⁴	12	3.8	8.05	44
TSS	mg/L	28 ⁴	12	5	11.5	30
Cl ⁻		6 ⁴	12	0.5	2	5
SO ₄		408 ⁴	12	6	17	40
Nutrients						
TN	mg/L	0.35 ¹	12	0.20	0.35	0.90

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
TP		0.03 ⁵	12	0.005	0.02	0.03

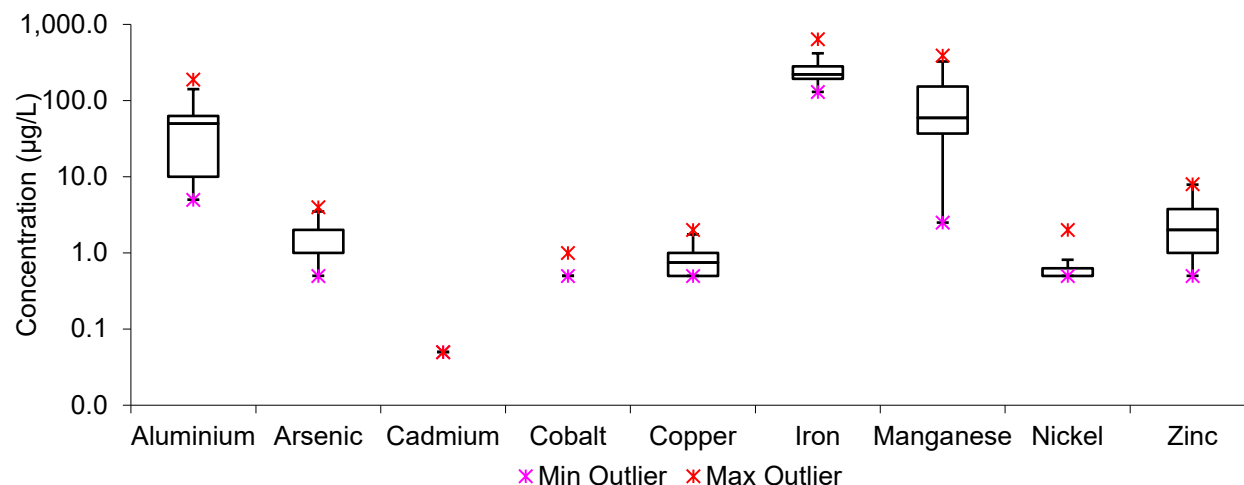


FIGURE 10 CHCK02 DISSOLVED METAL RESULTS

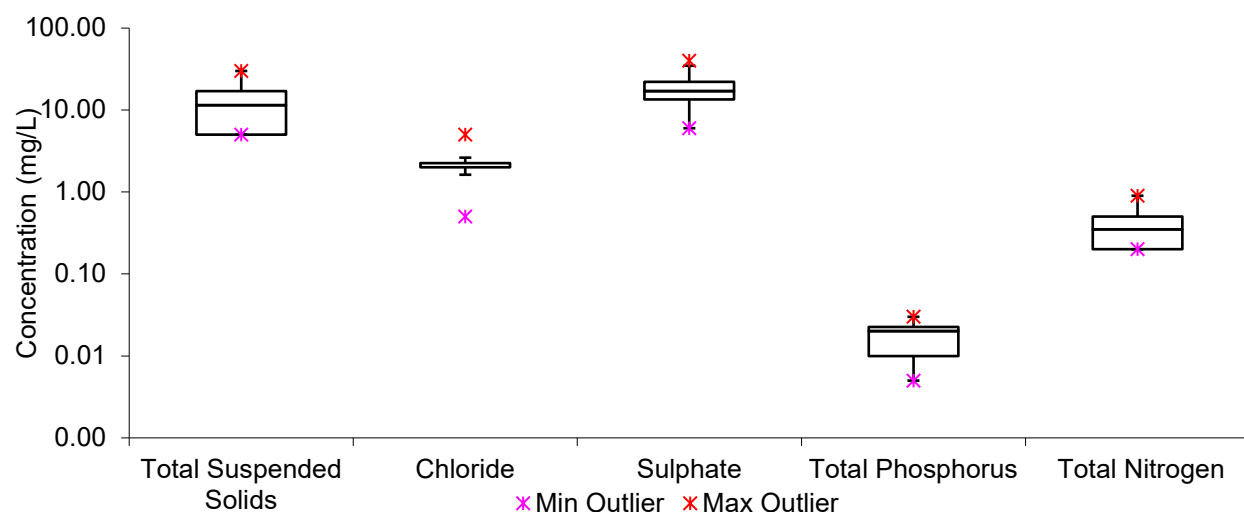


FIGURE 11 CHCK02 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Monitoring Location CHCK03

The data for CHCK03 is presented in

Table 13, which showed the median electrical conductivity (594 µS/cm) was below the CHCK06 TV. The minimum concentrations for both cobalt (15 µg/L) and nickel (18 µg/L) exceeded the CHCK06 TVs (13µg/L and 15µg/L, respectively). Additionally, the minimum dissolved oxygen concentration fell below the CHCK06 TV range. The median concentrations for zinc (26 µg/L) and copper (13 µg/L) exceeded the CHCK06 TV (15 µg/L and 1.8 µg/L, respectively). The maximum aluminium concentration (13,000 µg/L) substantially exceeded the CHCK06 TV (196 µg/L). Additionally, maximum concentrations for cadmium (0.5 µg/L) and manganese (4,700 µg/L) exceeded the CHCK06 TVs (0.4 µg/L and 2,500 µg/L). Figure 13 highlights the total suspended solids maximum concentration (37 mg/L) is an outlier. Similarly, the maximum sulphate concentration (730 mg/L) is also notably elevated and considered an outlier.

TABLE 13 CHCK03 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0–8.0	17	3.68	4.74	6.51
EC	µS/cm	700 ⁴	17	113.3	565	2,214
DO	% saturation	45 – 120 ⁴	17	39.3	87.3	95.8
Dissolved Metals						
Al	µg/L	196 ⁴	14	5	135	13,000
As		42 ²	14	0.5	1	2
Cd		0.4 ²	14	0.05	0.2	0.5
Cr		6 ²	14	0.5	0.5	3
Co		13 ²	14	15	53	200
Cu		1.8 ²	14	0.5	13	130
Fe		428 ⁴	14	10	275	1,100
Pb		5.6 ²	14	0.5	0.5	0.5
Mn		2,500 ²	14	400	1,250	4,700
Ni		13 ²	14	18	52.5	260
Se		18 ²	14	0.5	0.5	0.5
Zn		15 ²	14	8	26	110
General Chemistry						
Turbidity	NTU	32 ⁴	14	0.6	4.8	31
TSS	mg/L	28 ⁴	14	5	11	37
Cl ⁻		6 ⁴	14	0.5	2	3
SO ₄		408 ⁴	14	63	255	730
Nutrients						
TN	mg/L	0.35 ¹	14	0.05	0.10	0.20
TP		0.03 ⁵	14	0.005	0.01	0.02

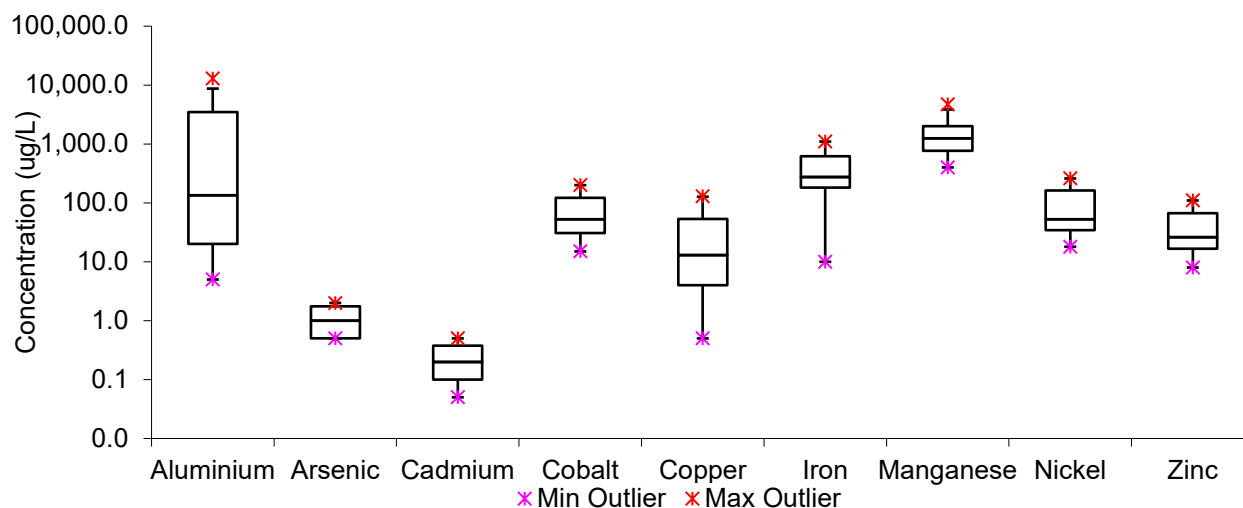


FIGURE 12 CHCK03 DISSOLVED METAL RESULTS

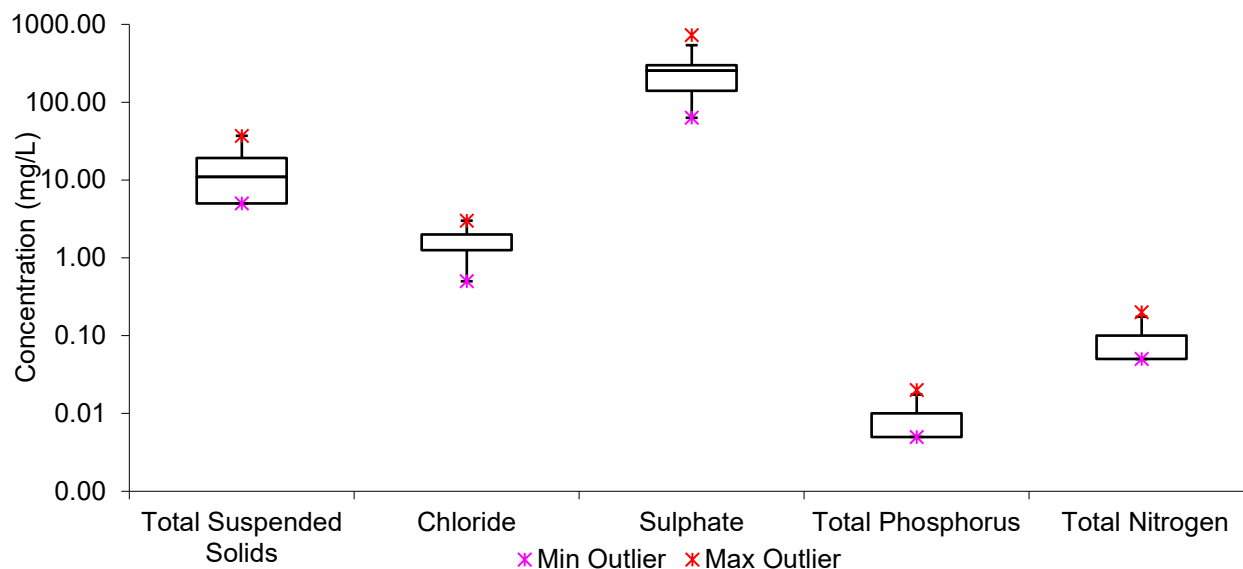


FIGURE 13 CHCK03 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Monitoring Location MTSW02

Table 14 displays the results for MTSW02. The maximum concentration of cobalt (18 µg/L) exceeded the CHCK06 TV (13 µg/L). Copper, manganese, nickel and zinc had maximum concentrations that exceeded the CHCK06 TVs. Additionally, the minimum dissolved oxygen concentration fell below the CHCK06 TV range. The maximum concentration of the total suspended solids (37 mg/L) was identified as an outlier and is highlighted in Figure 15. Turbidity's maximum concentration (67 NTU) is twice the CHCK06 TV (32 NTU). The maximum concentration of total nitrogen (0.4 mg/L) slightly exceeded the CHCK06 TV (0.35 mg/L).

TABLE 14 MTSW02 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0 – 8.0	17	6.28	6.62	7.19
EC	µS/cm	700 ⁴	17	78.4	260	487.7
DO	% saturation	45 – 120 ⁴	17	8.5	75.5	89.3
Dissolved Metals						
Al	µg/L	196 ⁴	12	5	8	60
As		42 ²	12	1	2	4
Cd		0.4 ²	12	0.05	0.05	0.3
Cr		6 ²	12	0.5	0.5	0.5
Co		13 ²	12	0.5	8	18
Cu		1.8 ²	12	0.5	1	2
Fe		428 ⁴	12	40	90	410
Pb		5.6 ²	12	0.5	0.5	0.5
Mn		2,500 ²	12	53	1,550	2,700
Ni		13 ²	12	0.5	2.5	29
Se		18 ²	12	0.5	0.5	0.5
Zn		15 ²	12	1	5.5	67
General Chemistry						
Turbidity	NTU	32 ⁴	12	1.3	10.2	67
TSS	mg/L	28 ⁴	12	5	9.5	37
Cl ⁻		6 ⁴	12	1	2.5	5
SO ₄		408 ⁴	12	11	73.5	190

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Nutrients						
TN	mg/L	0.35 ¹	12	0.2	0.3	0.4
TP		0.03 ⁵	12	0.05	0.02	0.02

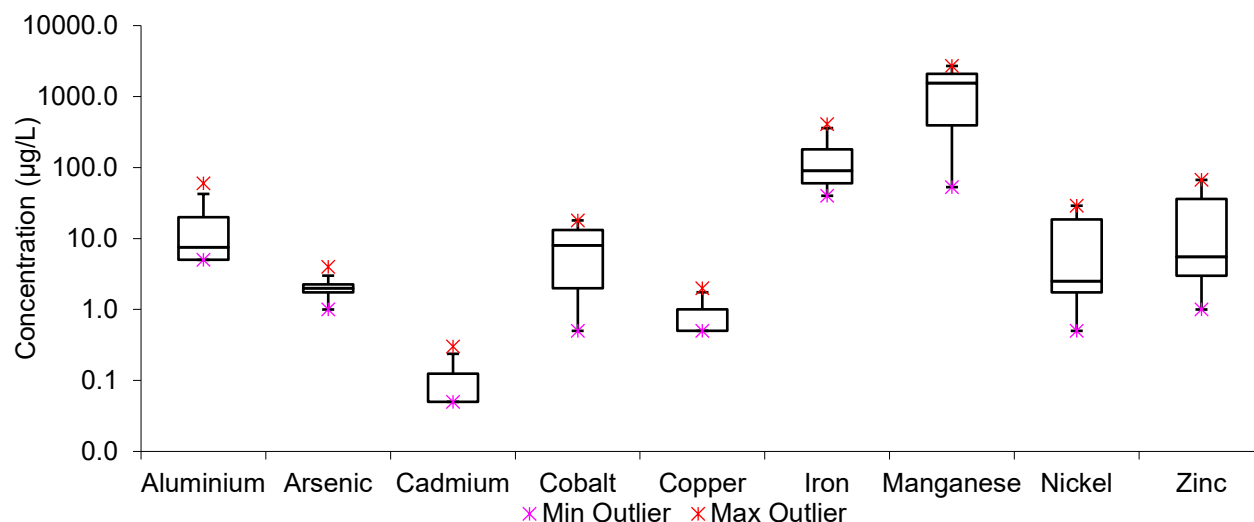


FIGURE 14 MTSW02 DISSOLVED METAL RESULTS

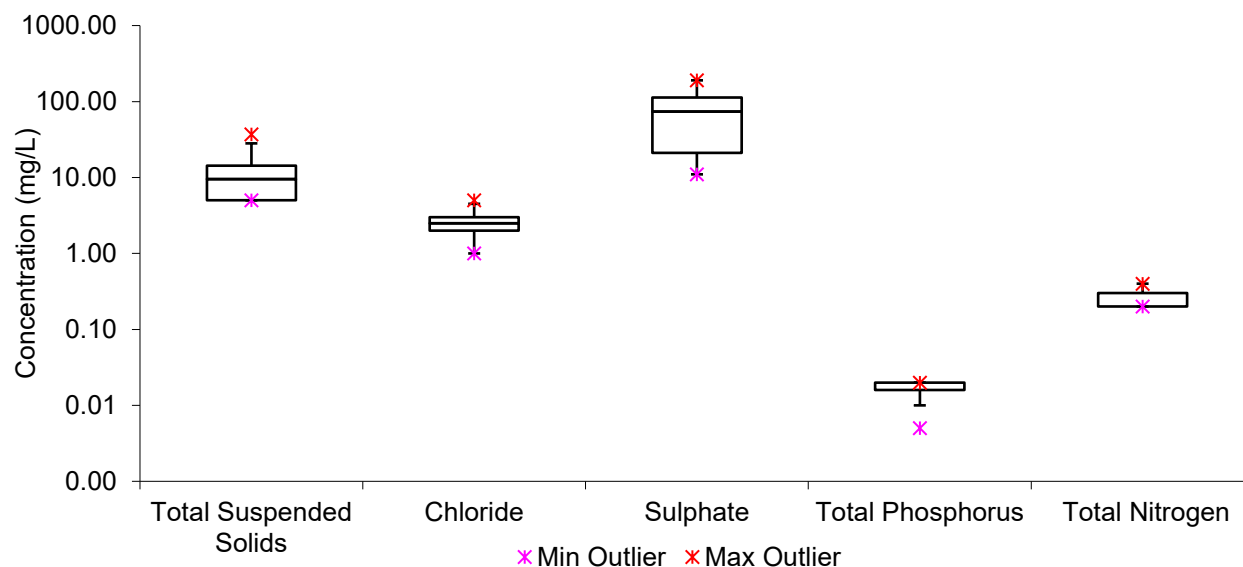


FIGURE 15 MTSW02 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Monitoring Location CHCK05 and Dam 3

Table 15 presents the results for CHCK05 and Dam 3. CHCK05 pH concentrations are at or below 6.16 pH units. Additionally, the minimum electrical conductivity concentration (838 µS/cm) was above the CHCK06 TV (700 µS/cm). All concentrations of cobalt, copper, nickel and zinc exceeded the CHCK06 TVs. The median concentration of aluminium (1,300 µg/L) significantly exceeds the CHCK06 TV (196 µg/L). The median concentrations of cadmium (0.7 µg/L) and manganese (3,200 µg/L) exceeds the CHCK06 TV (0.4 µg/L and 2,500 µg/L, respectively). The minimum concentration of sulphate (420 mg/L) exceeded the CHCK06 TV (408 mg/L). The median concentration of pH in Dam 3 (5.93 pH units) decreased to 4.75 pH units at CHCK05, becoming more acidic. The median electrical conductivity concentration was also lower

at CHCK05 (1,833 µg/L) when compared to Dam 3 (2,792 µg/L). Median concentrations of metals such as aluminium, copper, and zinc were higher at CHCK05 compared to Dam 3.

TABLE 15 CHCK05 AND DAM 3 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	CHCK05				Dam 3	
			Count	Minimum	Median	Maximum	Count	Median
Field Measurements								
pH	pH units	6.0 – 8.0	15	3.56	4.75	6.16	26	5.93
EC	µS/cm	700 ⁴	15	838	1,833	2,709	26	2,792
DO	% saturation	45 – 120 ⁴	15	77.3	90.6	94.6	26	97.5
Dissolved Metals								
Al	µg/L	196 ⁴	13	80	1,300	14,000	21	70
As		42 ²	13	0.5	3	5	21	2
Cd		0.4 ²	13	0.2	0.7	1.5	21	0.5
Cr		6 ²	13	0.5	0.5	2	21	0.5
Co		13 ²	13	81	150	330	21	110
Cu		1.8 ²	13	2	50	270	21	12
Fe		428 ⁴	13	90	420	1,000	21	10
Pb		5.6 ²	13	0.5	0.5	2	21	0.5
Mn		2,500 ²	13	2,200	5,200	7,500	21	3,200
Ni		13 ²	13	93	180	410	21	120
Se		18 ²	13	0.5	0.5	0.5	21	0.05
Zn		15 ²	13	48	100	210	21	73
General Chemistry								
Turbidity	NTU	32 ⁴	13	1.1	4.4	30	21	1.3
TSS	mg/L	28 ⁴	13	5	5	33	21	5
Cl ⁻		6 ⁴	13	2	5	6	21	5
SO ₄		408 ⁴	13	420	990	1,700	21	1,800
Nutrients								
TN	mg/L	0.35 ¹	13	0.01	0.2	0.3	21	0.2
TP		0.03 ⁵	13	0.005	0.01	0.02	21	0.005

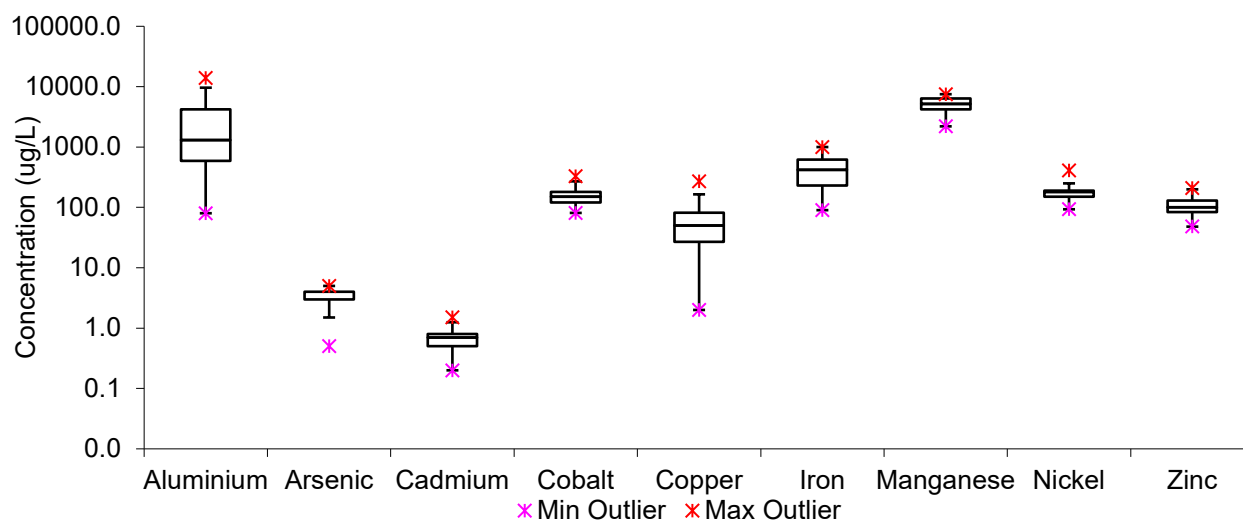


FIGURE 16 CHCK05 DISSOLVED METAL RESULTS

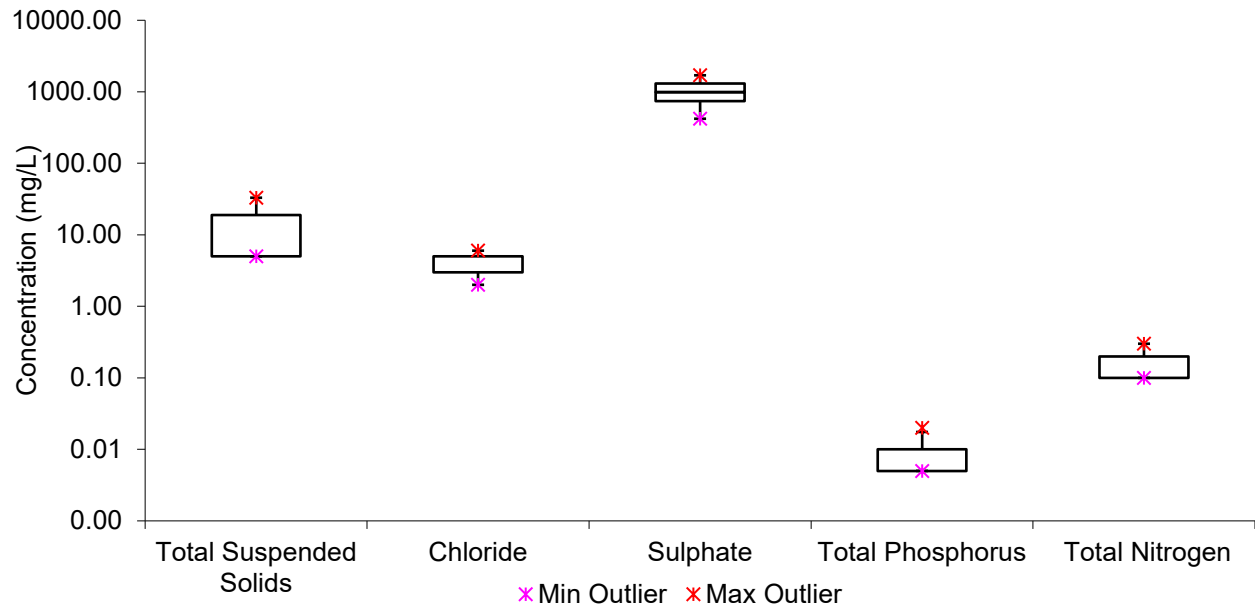


FIGURE 17 CHCK05 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Compliance Location CHCK06

The CHCK06 results are shown in Table 16. Median metal concentrations that exceeded TVs were observed for copper (2.0 µg/L; TV: 1.8 µg/L) and nickel (14 µg/L; TV: 13 µg/L). Maximum concentrations for cobalt (22 µg/L) and zinc (21 µg/L) exceeded the TVs (13 µg/L) and 15 µg/L, respectively) with outliers illustrated in Figure 18. Maximum concentrations for total suspended solids (48 mg/L) exceeded the TV (32 NTU). The maximum concentration of total nitrogen (0.4 mg/L) was an outlier as shown in Figure 19.

TABLE 16 CHCK06 WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK06 TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0 – 8.0	14	6.00	6.64	7.49
EC	µS/cm	700 ⁴	14	37.9	289.8	475.2
DO	% saturation	45 – 120 ⁴	14	75.6	86.6	90.7
Dissolved Metals						
Al	µg/L	196 ⁴	13	20	40	80
As		42 ²	13	0.5	1.0	2.0
Cd		0.4 ²	13	0.05	0.05	0.10
Cr		6 ²	13	0.5	0.5	0.5
Co		13 ²	13	0.5	9.0	22.0
Cu		1.8 ²	13	0.5	2.0	6.0
Fe		428 ⁴	13	20	60	150
Pb		5.6 ²	13	0.5	0.5	0.5
Mn		2,500 ²	13	13	380	1,100
Ni		13 ²	13	0.5	14.0	27.0
Se		18 ²	13	0.5	0.5	0.5
Zn		15 ²	13	1.0	8.5	21.0
General Chemistry						
Turbidity	NTU	32 ⁴	13	5.6	18.0	32.0
TSS	mg/L	28 ⁴	13	5.0	17.0	48.0
Cl ⁻		6 ⁴	13	0.5	2.0	3.0
SO ₄		408 ⁴	13	7	90	200
Nutrients						
TN	mg/L	0.35 ¹	13	0.1	0.2	0.4
TP		0.03 ⁵	13	0.005	0.01	0.02

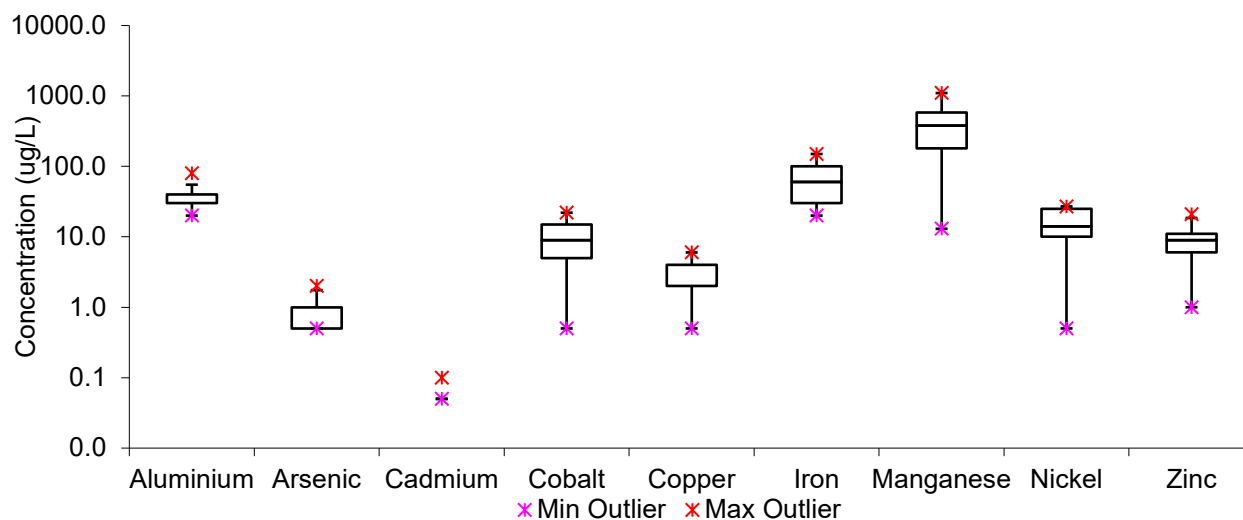


FIGURE 18 CHCK06 DISSOLVED METAL RESULTS

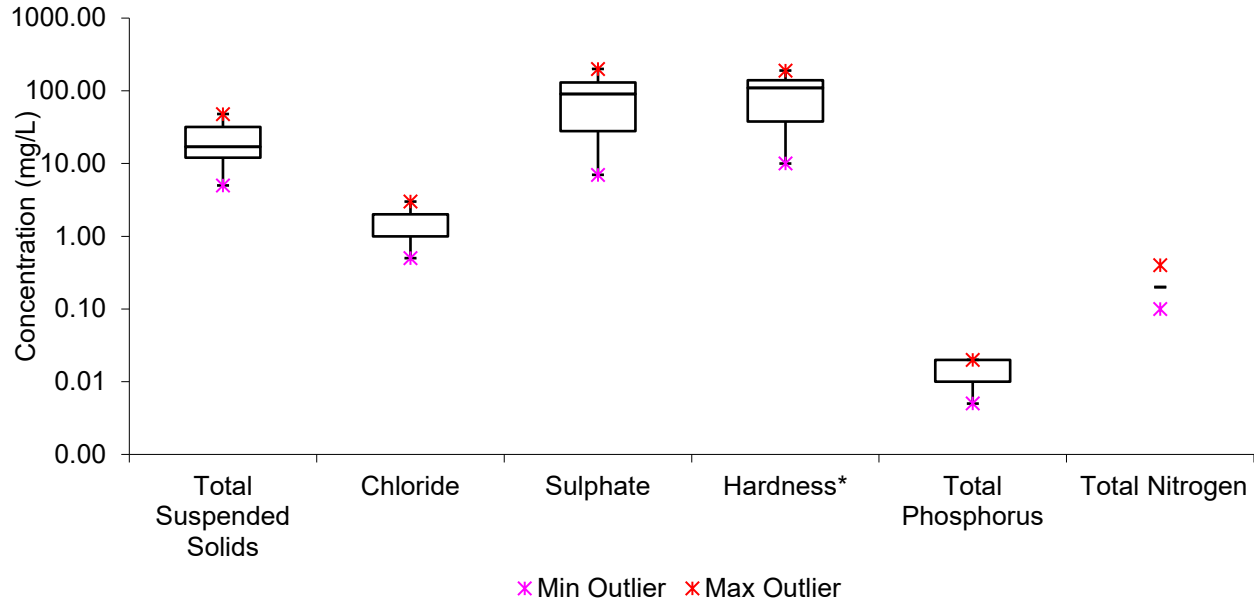


FIGURE 19 CHCK06 GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Howley Creek Electrical Conductivity and pH

Figure 20 illustrates the pH variability for all the creek catchments over the reporting period. The results show low pH and high variability at CHCK03 and CHCK05, with pH levels ranging from approximately 3.50 and 6.00 pH units. CHCK01, CHCK02, MTSW02 and CHCK06 exhibit pH levels between approximately 6.00 and 7.50 pH units.

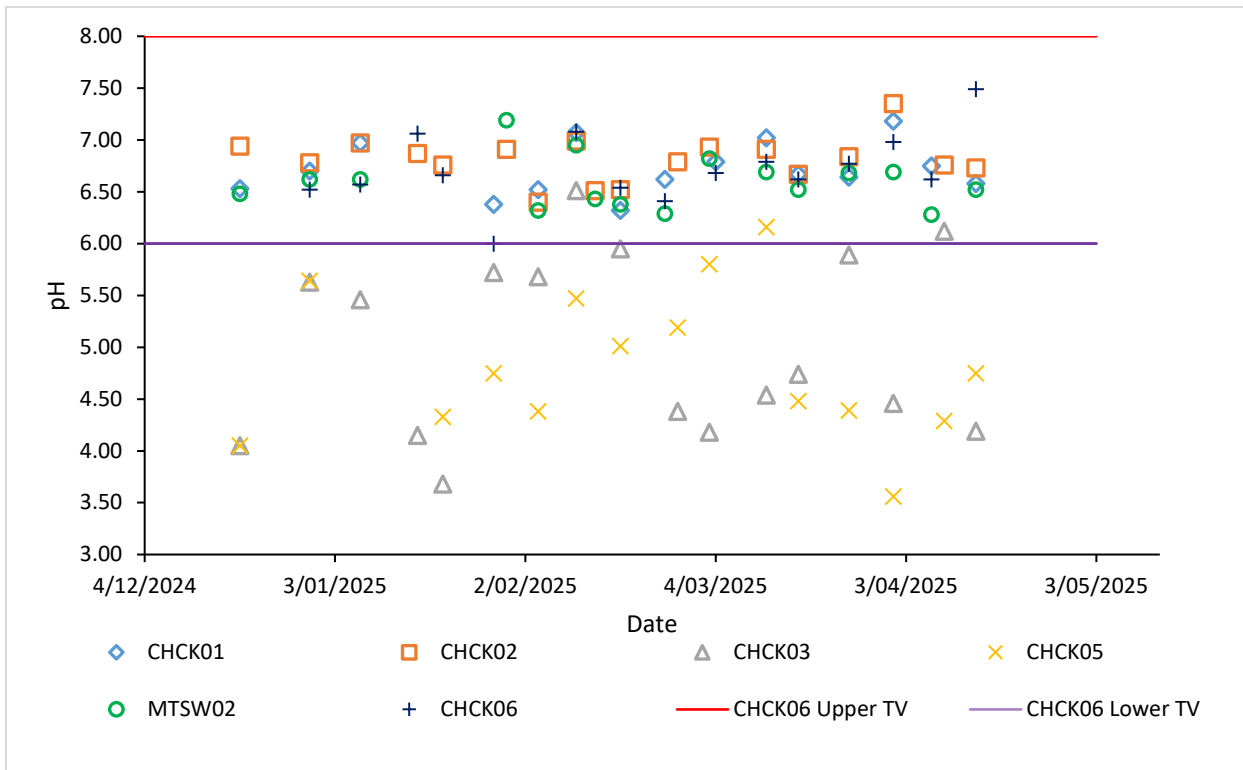


FIGURE 20 COSMO HOWLEY PROJECT AREA CREEK PH FOR 2024-25

Figure 21 illustrates the variability for EC across all creek catchments during the reporting period. CHCK05 show high EC levels and variability, ranging from approximately 800 to 2,750 $\mu\text{S}/\text{cm}$. CHCK03 also shows high EC levels and variability, ranging from approximately 100 to 2,000 $\mu\text{S}/\text{cm}$. CHCK01, CHCK02, MTSW02, and CHCK06 maintain EC levels below 700 $\mu\text{S}/\text{cm}$.

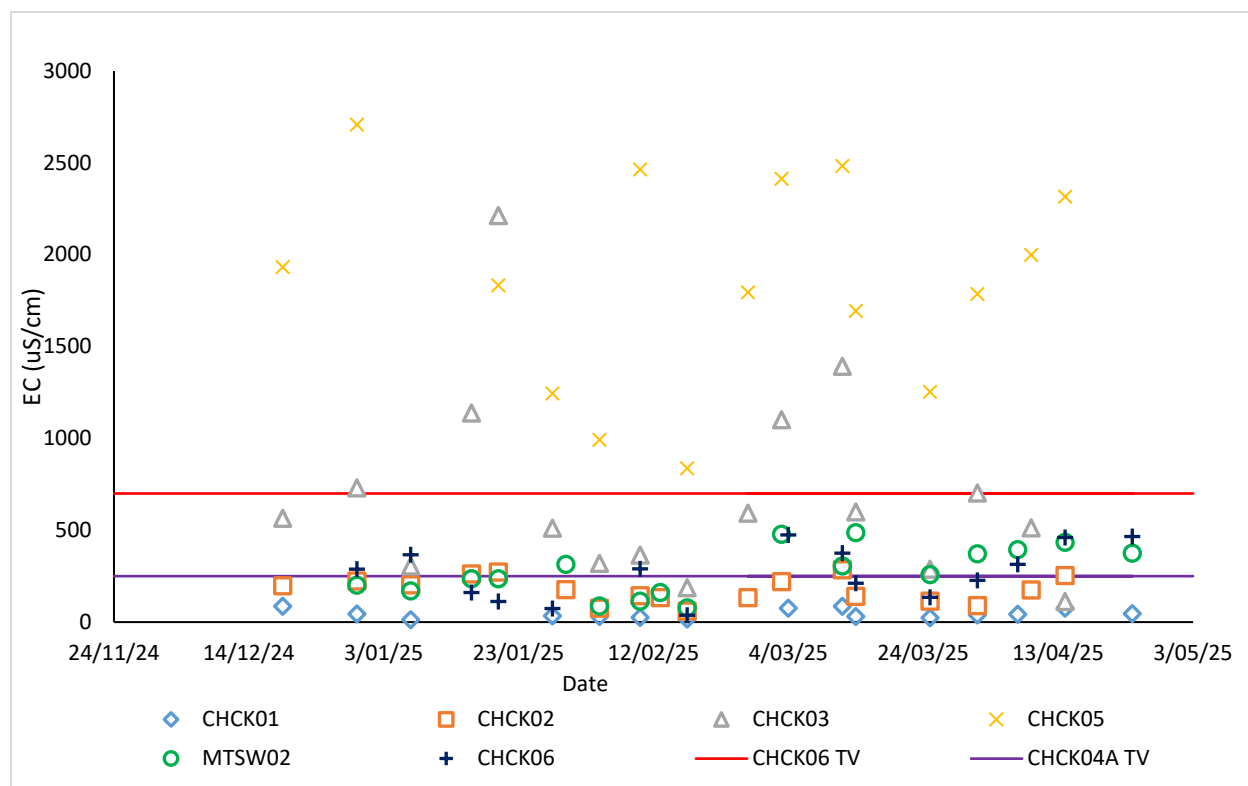


FIGURE 21 COSMO HOWLEY PROJECT AREA CREEK ELECTRICAL CONDUCTIVITY FOR 2024-25

Regulatory Monitoring Locations

During the 2023-24 and 2024-25 monitoring periods, notable changes were observed across the RM sites as shown in Table 17. At RM2, electrical conductivity increased significantly from 1,332 $\mu\text{S}/\text{cm}$ to 2,718 $\mu\text{S}/\text{cm}$, accompanied by a general rise in metal concentrations and a decline in nutrient levels. RM3 showed stability in both field measurements and metal concentrations, with a slight increase in nutrients. At RM4, dissolved oxygen levels dropped from 81.6% to 38.35%. Although general chemistry and nutrient levels remained steady, all metals decreased, with aluminium falling from 250,000 $\mu\text{g}/\text{L}$ to 49,000 $\mu\text{g}/\text{L}$ and iron from 175,000 $\mu\text{g}/\text{L}$ to 25,000 $\mu\text{g}/\text{L}$. RM5 showed slight increases in metal concentrations and a minor decrease in total phosphorus, which declined from 0.05 mg/L to 0.01 mg/L, while field measurements remained consistent. At RM6, increases were observed across metals, total phosphorus and most general chemistry parameters, with a rise in EC from 1,457 $\mu\text{S}/\text{cm}$ to 2,626 $\mu\text{S}/\text{cm}$. Finally, RM7 maintained stable field measurements, saw a decrease in metal concentrations, in particular, aluminium creased from 83,000 $\mu\text{g}/\text{L}$ to 23,000 $\mu\text{g}/\text{L}$, and experienced no major changes in general chemistry.

TABLE 17 HOWLEY CREEK REGULATORY MONITORING MEDIAN WATER QUALITY SUMMARY

Analyte	Units	CHCk06 TV	RM2		RM3		RM4		RM5		RM6		RM7	
			2023-24	2024-25	2023-24	2024-25	2023-24	2024-25	2023-24	2024-25	2023-24	2024-25	2023-24	2024-25
Field Measurements														
pH	pH units	6.0 – 8.0	5.94	5.49	3.01	3.26	2.78	3.09	4.08	4.47	3.19	2.91	3.16	3.91
EC	µS/cm	700 ⁴	1,332	2,718	1,064	1,332	5,517	6,256	166.0	231.4	1,457	2,626	2,263	2,036
DO	% saturation	45 – 120 ⁴	92.1	83.20	100.35	96.9	81.6	38.35	90.25	84.1	92.5	84.55	93.4	90.7
Dissolved Metals														
Al	µg/L	196 ⁴	420	60	18,000	16,000	250,000	49,000	760	800	90,000	96,000	83,000	23,000
As		42 ²	1	1.0	5	4	31	9	2	1	8	5	3	3
Cd		0.4 ²	0.3	0.5	2.6	3	12.15	7.1	0.1	0.2	3.2	4.1	2.5	1.1
Cr		6 ²	0.5	0.5	2	2	51	7	0.5	0.5	23	34	27	4.5
Co		13 ²	15	65	280	320	2,650	1,900	54	73	940	1,300	490	290
Cu		1.8 ²	8	12	270	290	3,900	1,600	22	14	670	830	1,200	410
Fe		428 ⁴	10	30	4,800	1,200	175,000	25,000	210	320	36,000	51,000	4,100	1,900
Pb		5.6 ²	0.5	0.5	0.5	2	7	9	0.5	0.5	4	3.00	8	6.00
Mn		2,500 ²	1,200	3,400	4,700	5,600	44,500	41,000	1,000	1,500	10,000	13,000	10,000	6,250
Ni		13 ²	40	120	350	370	4,000	2,200	67	68	1,200	1,700	820	395
Se		18 ²	0.5	0.50	0.5	0.5	2.5	3	0.5	0.5	0.5	2	0.5	0.75
Zn		15 ²	33	65	340	450	1,425	750	31	40	500	710	400	185
General Chemistry														
Turbidity	NTU	32 ⁴	5.3	0.3	0.6	0.4	2.7	0.7	2.7	0.8	2.6	4.5	3.5	4.3
TSS	mg/L	28 ⁴	5	5	5	5	5	5	5	5	5	10	12	5
Cl ⁻		6 ⁴	2	4	3	5	6	7	1	1	2	2	3	3
SO ₄		408 ⁴	660	1,600	480	710	4,700	4,300	71	72	1,300	2,200	1,400	1,400
Nutrients														
TN	mg/L	0.35 ¹	0.2	0.05	0.5	0.6	1.5	1.70	0.1	0.1	0.2	0.20	0.3	0.15
TP		0.01 ⁵	0.02	0.005	0.005	0.01	0.0275	0.05	0.05	0.01	0.005	0.05	0.005	0.05

CHCK06 Long Term Monitoring Data

The long-term water quality for CHCK06, based on median values from the 2016-17 to 2024-25 reporting periods, is summarized in Table 18. The electrical conductivity significantly dropped in 2020-21, followed by a gradual increase. Aluminium levels continue to show varied values, however decreasing its concentrations in 2024-25 (35 µg/L) in comparison to last year's reporting period 2023-24 (50 µg/L). From 2016 to 2024 the median concentration of arsenic has remained well below the CHCK06 trigger value 42 µg/L. Both cadmium, chromium, lead and selenium concentrations from 2016 to 2025 remain consistent to previous years and below the trigger value. Cobalt levels show significant fluctuations, peaking at 33 µg/L in 2017-18 and dropping to a low of 3 µg/L in 2018-19, followed by a gradual increase from 2020-21 to 2023-24, and beginning to decrease to a level of 8.5 µg/L in 2024-2025. Copper concentrations show to peak at 4 µg/L from 2016-17 to 2017-18 then decrease to a level of 1 µg/L at 2020-2021, then continuing to slowly fluctuate. Manganese concentrations peaked at 2017-18 at a value of 1,100 µg/L, with continued varied results over the years, whilst remaining below the trigger value. Zinc concentrations have remained the same from 2023 to 2025 recorded at a level of 8.5 µg/L. Lastly, total phosphorus levels have consistently been above the trigger value.

TABLE 18 CHCK06 LONG TERM WATER QUALITY RESULTS

Analyte	Units	CHCK06 TV	Median Result							
			2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Field Measurements										
pH	pH units	6.0 – 8.0	6.70	7.40	6.76	6.48	6.79	6.68	6.39	6.64
EC	µS/cm	700 ⁴	495	538	657	115	274	227	182	256
DO	% saturation	45 – 120 ⁴	76.0	73.0	59.5	71.8	87.2	87.4	83.0	86.3
Dissolved Metals										
Al	µg/L	196 ⁴	40	20	20	35	25	40	50	35
As		42 ²	1	1	1	2	1.5	2	1	1
Cd		0.4 ²	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.05	0.05
Cr		6 ²	<1	<1	<1	<1	0.5	3	0.5	0.5
Co		13 ²	33	3	10	5	8	12	14	8.5
Cu		1.8 ²	4	2	2	1	2	2	3.5	2.5
Fe		428 ⁴	47	48	42	76	50	50	55	65
Pb		5.6 ²	<1	<1	<1	<1	<1	<1	0.5	0.5
Mn		2,500 ²	1,100	295	690	275	455	530	490	375
Ni		13 ²	39	11	18	10	11	13	16	13.5
Se		18 ²	<1	<1	<1	<1	<1	<1	0.5	0.5
Zn		15 ²	35	8	7.5	5.5	9	13	8.5	8.5
General Chemistry										
Turbidity	NTU	32 ⁴	13	15	30	25	12	11	18.5	22.5
TSS	mg/L	28 ⁴	22	5	31.5	15	18	17	21	17.5
Cl ⁻		6 ⁴	2	3.0	3.0	2.0	2.0	3.0	1.5	2.0
SO ₄		408 ⁴	-	140	230	88	88	120	63	89.5
Nutrients										
TN	mg/L	0.35 ¹	-	0.4	0.2	0.2	0.3	0.1	0.2	0.2
TP		0.03 ⁵	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	0.01

3.9 Hayes Creek Catchment Surface Water Quality

Compliance Location CHCK04A

Table 19 shows the results for CHCK04A. The median electrical conductivity (367.9 $\mu\text{S}/\text{cm}$) exceeded the CHCK04A TV (250 $\mu\text{S}/\text{cm}$). Figure 22 showed maximum iron concentration (540 $\mu\text{g}/\text{L}$) was an outlier. All other metal concentrations did not exceed the CHCK04A TV. Figure 23 showed max concentration of total phosphorus was an outlier.

TABLE 19 CHCK04A WATER QUALITY RESULTS 2024-25

Analyte	Units	CHCK04A TV	Count	Minimum	Median	Maximum
Field Measurements						
pH	pH units	6.0 – 8.0 ¹	10	5.96	6.41	6.70
EC	µS/cm	250 ¹	10	226.2	359.0	557.0
DO	% saturation	90 – 120 ¹	10	63.1	76.3	86.2
Dissolved Metals						
Al	µg/L	150 ³	10	5	5	5
As		140 ³	10	5.0	8.5	25.0
Cd		0.8 ³	10	0.05	0.05	0.05
Cr		40 ³	10	0.5	0.5	0.5
Co		13 ³	10	3	4	8
Cu		2.5 ³	10	0.5	0.5	2.0
Fe		300 ²	10	10.	30	540
Pb		9.4 ³	10	0.5	0.5	0.5
Mn		3,600 ³	10	34	114	740
Ni		17 ³	10	1	3	4
Se		34 ³	10	0.5	0.5	0.5
Zn		31 ³	10	0.5	2.0	4.0
General Chemistry						
Turbidity	NTU	15 ¹	10	0.5	3.5	33.0
Cl ⁻	mg/L	13	10	1	2	3
Nutrients						
TN	mg/L	0.35 ¹	10	0.05	0.15	0.30
TP		0.01 ¹	10	0.005	0.015	0.02

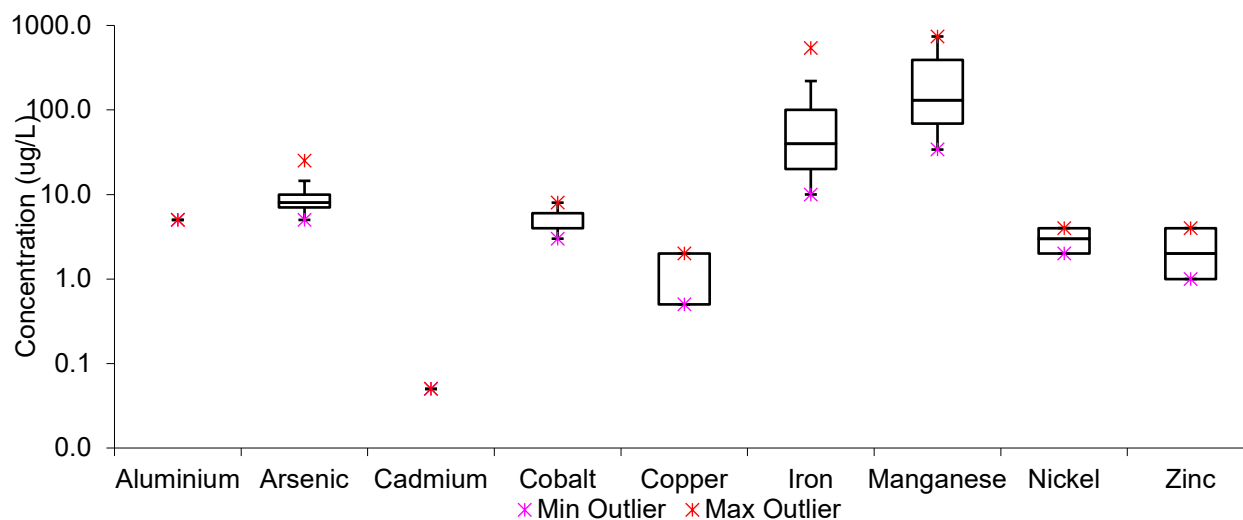


FIGURE 22 CHCK04A DISSOLVED METAL RESULTS

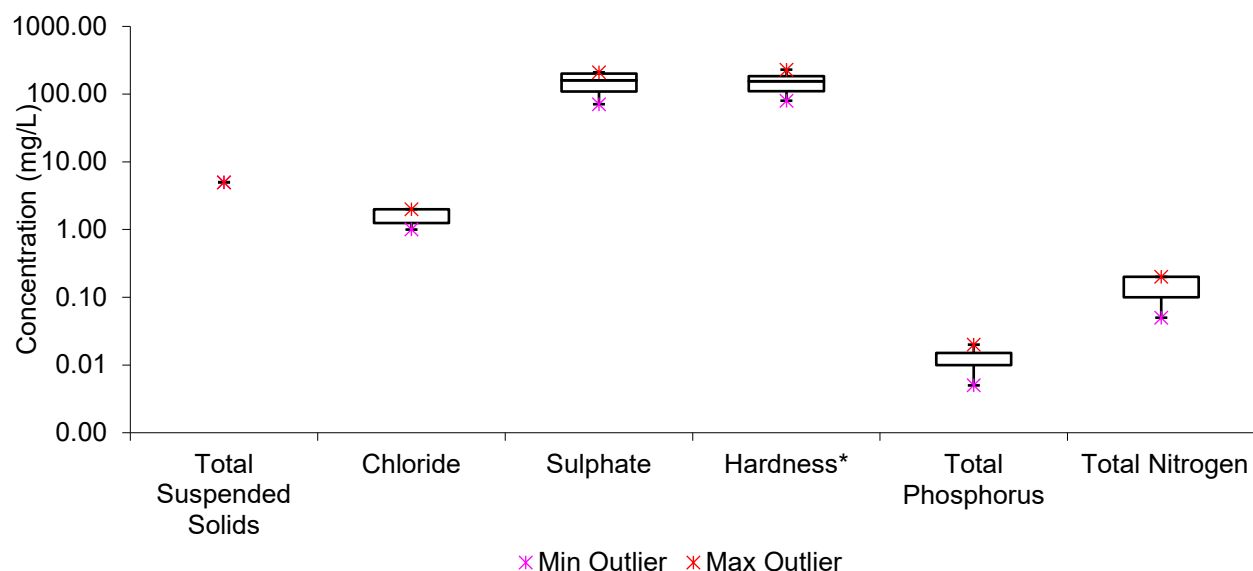


FIGURE 23 CHCK04A GENERAL CHEMISTRY AND NUTRIENTS RESULTS

Regulatory Monitoring Location (RM8)

Table 20 presents the median RM8 results from 2023-24 and 2024-25. The electrical conductivity has increased from 259.15 $\mu\text{S}/\text{cm}$ to 399.8 $\mu\text{S}/\text{cm}$. The level of aluminium dropped substantially, whilst the other dissolved metals remained similar to last periods results. Concentrations of both total nitrogen and total phosphorus showed a decline over the reporting period, with total nitrogen decreasing from 0.20 mg/L to 0.10 mg/L, and total phosphorus decreasing from 0.02 mg/L to 0.015 mg/L.

TABLE 20 HAYES CREEK REGULATORY MONITORING MEDIAN WATER QUALITY SUMMARY

Analyte	Units	CHCK04A TV	RM8	
			2023-24	2024-25
Field Measurements				
pH	pH units	6.0 – 8.0 ¹	6.67	6.53
EC	μS/cm	250 ¹	259.15	399.8
DO	% saturation	90 – 120 ¹	92.4	89.90
Dissolved Metals				
Al	μg/L	150 ³	140	5
As		140 ³	9	7
Cd		0.8 ³	0.05	0.05
Cr		40 ³	0.5	0.50
Co		13 ³	4	3.50
Cu		2.5 ³	1	0.50
Fe		300 ²	20	20
Pb		9.4 ³	0.5	0.5
Mn		3,600 ³	130	86
Ni		17 ³	2	2
Se		34 ³	0.5	0.50
Zn		31 ³	3	3
General Chemistry				
Turbidity	NTU	15 ¹	4.6	2.75
Cl ⁻	mg/L	13	2	5
Nutrients				
TN	mg/L	0.35 ¹	0.2	0.10
TP		0.01 ¹	0.02	0.015

CHCK04A Long Term Monitoring Data

Table 21 shows the median water quality from 2019 to 2025. The electrical conductivity has been consistently over the TV, however the concentration has decreased in 2024-25 from 2023-24 (359.0 $\mu\text{S}/\text{cm}$ to 469.6 $\mu\text{S}/\text{cm}$). The dissolved oxygen level has been consistently outside the TV over the years. Median metal concentrations consistently did not exceed the TV. The turbidity concentration has fluctuated from 2019 to 2025, decreasing in this reporting period (2024-25) in comparison to levels recorded in 2021-22, from 33 NTU vs 3.5 NTU. Similarly, the total nitrogen levels have remained at or below 0.2 mg/L since 2022-23 and now. Finally total phosphorus levels have continued to exceed the trigger value every year.

TABLE 21 CHCK04A LONG TERM WATER QUALITY RESULTS

Analyte	Units	CHCK04A TV	Median Result					
			2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Field Measurements								
pH	pH units	6.0 – 8.0 ¹	6.53	6.58	6.01	7.28	6.73	6.41
EC	µS/cm	250 ¹	399.0	403.4	657.0	379.5	469.6	359.0
DO	% saturation	90 – 120 ¹	69.3	68.0	82.9	85.4	90.1	76.3
Dissolved Metals								
Al	µg/L	150 ³	5	-	7.5	5	5	5
As		140 ³	9.5	15.5	7.0	17.0	13.0	8.5
Cd		0.8 ³	0.05	-	0.05	0.05	0.05	0.05
Cr		40 ³	0.5	-	0.5	0.5	0.5	0.5
Co		13 ³	8	7.5	8.5	5.5	4	4.5
Cu		2.5 ³	2	3	2	1.75	2	0.5
Fe		300 ²	35.5	30.5	40	40	25	35
Pb		9.4 ³	0.5	-	0.5	0.5	0.5	0.5
Mn		3,600 ³	180	160	200	76	101.5	114
Ni		17 ³	3.5	4.5	3.5	3.0	2.5	3
Se		34 ³	0.5	-	0.5	0.5	0.5	0.5
Zn		31 ³	3	3	8.5	5.0	2	2.0
General Chemistry								
Turbidity	NTU	15 ¹	18.7	5.5	33	7.15	2.2	3.5
Cl ⁻	mg/L	13	3	3	3.5	3.5	0.5	2
Nutrients								
TN	mg/L	0.35 ¹	0.30	0.25	0.30	0.20	0.20	0.20
TP		0.01 ¹	0.025	-	0.025	0.03	0.0275	0.015

3.10 Exceedances

During the reporting period, all water quality results collected at CHCK06 and CHCK04A were compared to the relevant trigger values in WDL180-09. Any results beyond the trigger values at these compliance locations were investigated to determine the contributing factors and potential environmental risk. Factors investigated included:

- Whether authorised discharge was occurring at the time;
- Other potential contributions
- Comparison to water quality results at upstream control site CHCK01.

During the reporting period, there were 19 instances where measured concentrations at CHCK06 exceeded the trigger value, and 26 instances at CHCK04A. Both sets of data are detailed in Table 22. At CHCK06, the majority of exceedances were linked to elevated concentrations of dissolved copper, with additional exceedances observed for dissolved cobalt, total nitrogen and total suspended solids.

Figure 2 shows the water pollution pathway for the monitoring locations and compliance points.

The dominant sources of contamination at CHCK06 were CHCK03 and CHCK05. These catchments are directly associated with the Cosmo Waste Rock Dump (WRD), from which seepage and surface runoff carry elevated concentrations of metals during rainfall events.

- CHCK03 primarily receives drainage from the southern and eastern sections of the Cosmo WRD.
- CHCK05 captures surface runoff and seepage from the northern and central areas of the WRD.

Pollution loading assessments confirm that together, CHCK03 and CHCK05 contribute approximately 90% of the total heavy metal load reaching CHCK06 during major storm events.

At CHCK04A, exceedances were primarily due to dissolved oxygen measurements falling outside the acceptable and elevated electrical conductivity. Less frequent exceedances were recorded for pH, iron, total phosphorus and turbidity. These results coincided with periods of low flow and surface runoff via a roadside drain, which introduced salts, nutrient-rich sediments, and organic material into the creek. These inputs are considered the dominant contributors to the observed water quality exceedances at CHCK04A.

There were five notifiable incidents recorded at CHCK06, while CHCK04A had eight. In accordance with Schedule 1 Item 10 of the WDL, any water quality results that triggered a notifiable incident required formal notification and submission of an investigation report to NT DEPWS. These requirements were met for all incidents.

TABLE 22 EXCEEDANCE RESULTS AGAINST WDL 180-09 TVS

Site	Date	Analyte Result										Occurred During Authorised Discharge ?	Notifiable Incident Triggered?
	Parameter	DO	EC	pH	Co	Cu	Fe	TN	TP	TSS	Turbidity		
		% sat	µs/m	pH units	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	NTU		
	TV	45- 120	700	6.0 - 8.0	13	1.8	428	350	30	28	32		
CHCK06	30/12/2024	-	-	-	-	4	-	-	-	-	-	Yes	No
CHCK06	07/01/2025	-	-	-	22	6	-	400	-	48	-	Yes	Cu notifiable event as per Item 10 (c) emailed on 16/01/25
CHCK06	28/01/2025	-	-	-	-	2	-	-	-	-	-	Yes	No
CHCK06	10/02/2025	-	-	-	-	3	-	-	-	-	-	Yes	No
CHCK06	24/02/2025	-	-	-	17	2	-	-	-	-	-	Yes	No
CHCK06	4/03/2025	-	-	-	15	-	-	-	-	-	-	No	No
CHCK06	12/03/2025	-	-	-	-	2	-	-	-	-	-	No	No
CHCK06	17/03/2025	-	-	-	-	3	-	-	-	-	-	No	No
CHCK06	25/03/2025	-	-	-	-	2	-	-	-	39	-	Yes	Cu notifiable event as per Item 10 (a) emailed on 09/04/25
CHCK06	01/04/2025	-	-	-	-	5	-	-	-	32	-	No	Cu notifiable event as per Item 10 (a) emailed on 14/04/25
CHCK06	07/04/2025	-	-	-	16	4	-	-	-	45	-	Yes	Cu and TSS notifiable event as per Item 10 (a) emailed on 24/04/25
	TV	90- 120	250	6.0 - 8.0	13	2.5	300	350	10	ND	15		
CHCK04A	29/01/2025	83.1	515.0	-	-	-	-	-	-	-	-	No	No
CHCK04A	04/02/2025	76.6	296.9	5.96	-	-	-	-	-	-	-	No	No
CHCK04A	12/02/2025	75.2	-	-	-	-	540	-	-	-	-	No	DO notifiable event as per Item 10 (b) emailed on 06/03/25
CHCK04A	17/02/2025	86.2	-	-	-	-	-	-	-	-	-	No	DO notifiable event as per Item 10 (b) emailed on 27/02/25
CHCK04A	26/02/2025	77.1	396.7	-	-	-	-	-	-	-	-	No	DO notifiable event as per Item 10 (b) emailed on 07/03/25
CHCK04A	03/03/2025	63.1	476.5	-	-	-	-	-	20	-	-	No	DO notifiable event as per Item 10 (b) emailed on 12/03/25
CHCK04A	12/03/2025	63.1	557.0	-	-	-	-	-	20	-	-	No	DO notifiable event as per Item 10 (b) emailed on 20/03/25
CHCK04A	17/03/2025	72.0	351.3	-	-	-	-	-	20	-	-	No	DO and EC notifiable event as per Item 10 (b) and TP notifiable event as per Item 10 (a) emailed on 31/03/25

CHCK04A	25/03/2025	76.9	285.9	-	-	-	-	-	20	-	-	No	DO and EC notifiable event as per Item 10 (b) emailed on 31/03/25. TP notifiable event as per Item 10 (a) emailed on 09/04/25
CHCK04A	01/04/2025	75.9	366.6	-	-	-	-	-	20	-	33	No	DO and EC notifiable event as per Item 10 (b) and TP notifiable event as per Item 10 (a) emailed on 14/04/25

3.11 Ecotoxicology Results

As outlined in WDL180-09, an annual ecotoxicology program is required to assess the potential impacts of mine wastewater to Howley Creek and Hayes Creek.

To evaluate water quality, screening bioassays were conducted at CHCK06 and CHCK04A. Assessments used undiluted water samples from each site and compared the results to controls including PCCK16 and a laboratory water control sample. A result showing greater than 80% successful reproduction or growth in test organisms, relative to the controls indicate no significant toxicity in the tested water.

The cladoceran (*Ceriodaphnia dubia*) was selected for chronic screening due to its known sensitivity to treated mine water, as demonstrated in previous ecotoxicity programs conducted at CHPA.

Results Summary

CHCK06 (Howley Creek): Cladoceran reproduction and survival rates were 57% and 70%, respectively, indicating potential toxicity. These results represent a marked improvement compared to the 2024 outcomes, which showed 100% mortality and 0% reproduction.

CHCK04A (Hayes Creek): Reproduction and survival rates were 107% and 100%, respectively, indicating no significant toxicity.

For detailed findings, refer to the Ecotoxicological Report in Appendix 1.

3.12 Macroinvertebrate and Sediment Results

As outlined in WDL180-09, an annual Macroinvertebrate and Sediment program is required to assess the potential impacts of mine wastewater to Howley Creek and Hayes Creek. NTMO engages Aquatic Ecology Services to undertake biological monitoring following the 2024-2025 wet season.

Sediment monitoring results help assist with the interpretation of macroinvertebrate data by providing an integrated assessment of long-term impacts from mine water, while also contributing to identify any improvements resulting from rehabilitation. Sediment results are compared to available default guideline values (ANZG 2025). Univariate macroinvertebrate indices assessed in the program were relative abundance, taxa richness, PET richness (more sensitive taxa), SIGNAL-2. An assessment of the differences in community composition was also undertaken (NMDS ordination).

Results Summary

All acid-extractable metal concentrations at compliance point CHCK06 were below long-term medians. Arsenic concentrations that have been historically elevated, continue to decline, reaching their lowest level.

Sediment monitoring results at CHCK04A showed arsenic as the only metal that exceeded guideline values

CHCK06 and CHCK04A supported macroinvertebrate communities dominated by pollution-tolerant taxa. Macroinvertebrate data at CHCK02 and MTSW02 indicate that rehabilitation efforts are yielding measurable improvements in aquatic health downstream. The key biological metrics at CHCK06 were comparable to upstream reference sites.

For detailed findings, refer to the Biological and Sediment Monitoring Report in Appendix 3.

4.PERFORMANCE IMPROVEMENT REPORT

In 2024, rock drains were installed at the MWD and Acid Pond 4 to intercept contaminated seepage from the Cosmo WRD, resulting in notable improvements in dissolved metal concentrations at CHCK05 and CHCK03. At CHCK05, aluminium levels dropped significantly from 7,300 µg/L to 1,300 µg/L, copper decreased from 130 µg/L to 50 µg/L, and cobalt reduced from 210 µg/L to 150 µg/L. Similarly, CHCK03 recorded a reduction in aluminium from 2,200 µg/L to 135 µg/L, copper from 58 µg/L to 13 µg/L, and cobalt from 58 µg/L to 53 µg/L. These trends indicate that the containment measures are effectively reducing the transport of seepage into downstream environments. For detailed water quality data, refer to Appendix 2.

5.QA/QC EVALUATION

Results presented in this report have been reviewed for data completeness, accuracy, and precision. NTMO staff adhere to internal standard operating procedures that support consistent surface water sampling across all operational areas, with appropriate quality assurance and quality control (QA/QC) measures in place. Surface water sampling is conducted as per the guidelines outlined in AS/NZS 5667.1:1998 (Standards Australia/Standards New Zealand, 1998).

The collection and dispatch process for all samples is conducted the same for every surface water sample. This includes the correct labelling of each bottle, including its contents, date, author and location of sample. Samples are kept in a monitored fridge which is set at 4°C, until dispatch which occurs approx. 1-3 days after collection. As samples are dispatched, they are kept in an esky with freezer blocks to obtain a cool environment. All sample results are taken by qualified environmental scientists and results are logged both digitally and manually, these records are kept on file. The calibration probe is calibrated every week before entering out into the field, for each new site visited the probe is recalibrated regardless of if it has already been completed for that week. The calibration results are set within the standards of solution containers, if the results are not met then the probe is recalculated until the results are within an acceptable range. The results captured are accordance to the standard set out by the WDL.

Where samples could not be collected due to sampling limitations for example access to a sample site after high rainfall, sampling was undertaken in the next possible opportunity by NTMO staff. Samples are consistently taken at same sample point as per WDL requirements and samples are dispatched to external accredited water analysis laboratory.

Envirolab Services undertakes the external water analysis. Envirolab Services has a large NATA scope of accreditation - Accreditation number 2901. NTMO receives a certificate of analysis for each set of samples and is reviewed against standards set out in the WDL TVs and uploaded to internal data software INX Inviron.

6. DISCUSSION

Howley Creek

The monitoring results for the Howley Creek Catchment during the 2024–2025 reporting period provide a comprehensive overview of water discharge, treatment, rainfall, water balance, and surface water quality. The authorised discharge of 1,682.7 ML from AD1/RM2 into Howley Creek was conducted in eight separate events. These discharges were managed under regulatory conditions, and the use of approx. 1,743 tonnes of quicklime for water treatment reflected a significant effort to mitigate environmental impacts.

Rainfall data revealed a total of 1,907.4 mm, influencing both creek flow and water storage dynamics. The water balance analysis showed an increase in total water inventory to 10,713 ML by May 2025, with notable changes in pH levels indicating a shift from more acidic conditions in June 2024 to relatively neutral conditions by May 2025. This suggests that both treatment and natural processes are helping stabilise water chemistry.

A key concern throughout the period was contaminant loading, particularly from metals such as aluminium, cobalt, copper, and manganese. These contaminants exceeded trigger values at multiple monitoring points, indicating ongoing pressure on the aquatic system. However, there were also signs of improvement. At CHCK03, water quality improved compared to the previous year, likely due to the installation of a rock drain in 2024. This drain appears to be successfully intercepting contaminated seepage from Acid Ponds 1 to 4 before it reaches the creek. Although some metal concentrations are still above acceptable levels, the overall trend is positive.

CHCK05 also showed notable improvements following the installation of two rock drains. Aluminium concentrations dropped significantly, and levels of copper and cobalt declined as well. These results suggest that the infrastructure is effectively capturing and redirecting seepage before it reaches the monitoring site. Continued monitoring and adaptive management will be key to maintaining and building on these gains.

Dam 3 was sampled more frequently than CHCK05, and while its discharge water showed near-neutral pH, CHCK05 exhibited more alkaline conditions, likely influenced by flow dynamics and sediment disturbance during high-flow periods, which may be contributing to elevated metal concentrations downstream.

Ecotoxicology results at CHCK06 exhibited cladoceran reproduction and survival rates of 57% and 70%, respectively, indicating potential toxicity; however, these results reflect a substantial improvement from the 2024 outcomes, which showed complete mortality and no reproduction, suggesting early signs of ecological recovery.

The macroinvertebrate data, combined with sediment results, indicate that cumulative impacts from mine water are decreasing at CHCK06. While the community still reflects some influence from upstream sources, the overall condition suggests that rehabilitation is contributing to ecological stability at this compliance point.

Hayes Creek

CHCK04A, which previously received pollutants from various operational sources, recorded several exceedances of water quality trigger values during the 2024–2025 reporting period. Despite these exceedances, overall water quality remained generally within acceptable limits, and ecotoxicology testing showed no significant toxicity. Cladoceran reproduction and survival rates were notably high at 107% and 100%, respectively, indicating healthy ecological conditions.

Arsenic concentrations in sediment at CHCK04A remained above guideline values, which has been a persistent trend since rehabilitation commenced. An impaired macroinvertebrate community was observed

at CHCK04A with a general trend in the prevalence of pollution tolerant taxa. CHCK04A is located in the headwaters of Hayes Creek and is therefore experienced more variable volume and frequency of flows. Habitat complexity at the site is lower due to its position in the catchment and therefore diversity of macroinvertebrates followed the same trend.

Currently, there is no active discharge from CHPA to CHCK04A, and the site is primarily influenced by roadside runoff. All former discharge pathways have been rehabilitated or redirected, with flows either integrated into other monitored systems or isolated from environmental contact. Based on these operational changes and long-term environmental data, CHCK04A is being considered for decommissioning as a compliance monitoring site, reflecting its reduced environmental risk and the effectiveness of rehabilitation efforts.

7.CONCLUSION

The 2024-2025 monitoring period for the Howley Creek Catchment highlighted encouraging signs of ecological recovery at CHCK06. While previous years showed significant toxicity, the latest ecotoxicology results revealed marked improvements. These outcomes suggest that environmental conditions at the site are beginning to stabilise, likely reflecting the benefits of upstream containment and treatment efforts. Although some indicators still point to residual stressors, the positive trajectory at CHCK06 underscores the effectiveness of recent interventions and the importance of continued monitoring to support and sustain this recovery.

A key development during the reporting period was the installation of rock drains at the Mine Water Dam and Acid Pond 4, which played a critical role in intercepting and redirecting contaminated seepage. These interventions led to measurable reductions in dissolved metal concentrations at CHCK05 and CHCK03, suggesting that targeted containment infrastructure is beginning to mitigate environmental impacts. While rehabilitation efforts are progressing, further monitoring is needed to confirm the long-term effectiveness of these measures, particularly considering fluctuating rainfall and flow dynamics that continue to influence contaminant mobility and water quality outcomes.

CHCK04A also recorded several exceedances during the reporting period, though overall water quality remained within acceptable limits. Ecotoxicology testing showed no significant toxicity. With no active discharge from CHPA and the site now primarily influenced by roadside runoff, its continued use as a compliance location is under review. Long-term environmental data and operational changes, including the rehabilitation and redirection of former discharge pathways, support the potential decommissioning of CHCK04A. Macroinvertebrate and sediment testing showed active discharge from the CHPA did not result in significant impacts to aquatic ecosystem health during the 2024–2025 wet season, with macroinvertebrate communities downstream showing similar composition to upstream sites. Localised stress was observed at CHCK03 and CHCK05, likely due to passive discharge, while downstream sites such as CHCK02 showed signs of ecological improvement linked to rehabilitation efforts.

8. REFERENCES

Standards Australia/Standards New Zealand. (1998). *AS/NZS 5667.1:1998 Water quality—Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples*. Standards Australia/Standards New Zealand.

APPENDIX 1

Ecotoxicology Report 2025



Cosmo Howley Project Area

2025 Ecotoxicology Report

Agnico Eagle NT Mining Operations

Dorat Road
Hayes Creek NT 0822

Prepared by:

SLR Consulting Australia

SLR Project No.: 620.041992

25 April 2025

Revision: 1.0

Revision Record

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	Click to enter a date.			

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Agnico Eagle NT Mining Operations (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.



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Appendices

Appendix A Chemistry Results

Appendix B Ecotoxicology Results



1.0 Introduction

Agnico Eagle Australia's Northern Territory Mining Operations (NTMO) manage the discharge of treated mine water from the Cosmo Howley Project Area (CHPA) under Waste Discharge License (WDL) 180-09 and the Adaptive Management Strategy provided to NTMO by the then NT Department of Environment and Natural Resources (DENR) in 2018. The controlled discharge of treated mine water from the site is managed based on an electrical conductivity (EC) site-specific trigger value (SSTV) of 700 $\mu\text{S}/\text{cm}$ to be met at the compliance point, CHCK06, in Howley Creek. The discharge is managed based on flow in Howley Creek, EC of treated mine water from Cosmo Pit, Dam 3 and upstream water following an internal procedure (Discharge Management SOP52).

An ecotoxicological program is required to assess the potential impact to the receiving ecosystem of the CHPA treated mine water discharge to Howley Creek. The testing will assist in determining the potential toxicity of the discharge and provide a line of evidence to assess and manage the health of the aquatic populations within Howley Creek. An Ecotoxicology Plan was prepared for CHPA (GHD 2018), with particular attention paid to the EC of the treated mine water at CHCK06. This plan was updated by Agnico Eagle in 2022 (Agnico Eagle 2022) and additional recommendations were made in the 2024 Cosmo Howley Ecotox Report (SLR 2024).

1.1 Recommendations from SLR (2024)

The following items are recommended to be addressed in future ecotoxicity programs for the CHPA:

- Maintain the program as conducted in 2024 for 2024/25.
- Revise the ecotoxicology program as identified in WDL180-08 '*CHPA Cosmo Howley Project Area Biological Monitoring Plan 2022 (Macroinvertebrate, Sediment and Ecotoxicity)*' October 2022, Agnico Eagle to correspond with the monitoring outlined in this report.
- Ensure that there is discharge from the CHPA during sampling. Record the source of the discharge.
- Investigation into CHCK06 toxicity:
 - o Conduct a screening cladoceran reproduction and survival bioassay on a sample of CHCK06 taken when discharge of Dam 3 is not occurring to confirm the toxicity observed in this monitoring program.
 - o Conduct chemistry analysis on CHCK06, CHCK01 and Dam 3

1.2 Ecotoxicology Plan

The Biological Monitoring Plan (Agnico Eagle 2022) provides the requirements and methodology for assessing the potential toxicity of treated mine water prior to discharge and the potential toxicity in Howley Creek downstream of the discharge point during discharge. The Plan was prepared to guide the assessment of the potential impacts of the active discharge of treated mine water and to meet the requirements of the Department of Industry, Tourism and Trade (DITT) in accordance with the approved CHPA Mining Management Plan (MMP) and Water Management Plan (WMP). The ecotoxicological monitoring for 2022, 2023 and 2024 was conducted based on the following recommendations in the Cosmo Howley Ecotox Report 2021 (SLR 2021):



- “Remove duckweed from the program as it is not as sensitive as the cladoceran reproduction bioassay.
- Normalise electrical conductivity (EC) to 100 $\mu\text{S}/\text{cm}$ for upstream and downstream samples with EC less than 100 $\mu\text{S}/\text{cm}$ to avoid confounding toxicity data due to low EC.”

The updated 2022 ecotoxicology program was designed to provide information to assist with the management of the CHPA treated water discharge to support dewatering the site. The results of the ecotoxicological testing conducted to date (2018-2024) have shown the following.

An EC of 700 $\mu\text{S}/\text{cm}$ has not resulted in detectable adverse impacts on exposed organisms and the 2018/19, 2019/20, 2020/21, 2021/22 and 2022/23 testing validated the application of an EC SSTV of 700 $\mu\text{S}/\text{cm}$ to the compliance point (CHCK06) in Howley Creek. The 2024 results for CHCK06 in 2024 showed toxicity that was not attributed to EC.

1.3 Scope of Work

To meet the requirements of WDL 180-09, the CHPA MMP, the Biological Monitoring Plan (2022) and the Adaptive Management Strategy (2018) the following work was conducted:

- Review and assessment of 2025 ecotoxicity testing results.
- Review and assessment of 2025 water chemistry results.
- Interpretation of ecotoxicity and chemistry results.
- Reporting ecotoxicity to meet the regulatory requirements.

1.4 Objectives

This report has been developed to meet Condition 27 of WDL 180-09:

“Condition 27. From the Commencement Date of this licence, the Licensee must implement and comply with the Monitoring Program specified in Item 11.

Item 11. The Monitoring Program includes:

(a) Surface water monitoring in accordance with Appendix 2; and

(b) Macroinvertebrate, sediment and ecotoxicological monitoring in accordance with NTMO CHPA Biological Monitoring Plan 2022 at Item 4.”

1.5 Assumptions

In interpreting the ecotoxicological and chemistry results provided by NTMO, SLR notes the following.

- It is assumed all samples collected by NTMO are representative of each of the identified sample sites, were handled in accordance with procedures identified by the laboratory and were assayed appropriately.
- SLR did not independently verify the chemistry results provided by NTMO.



2.0 Ecotoxicology Program

2.1 Introduction

An ecotoxicology monitoring program was initially developed for CHPA to validate the application of an EC SSTV of 700 $\mu\text{S}/\text{cm}$ to be applied at CHCK06 in Howley Creek during the 2018/19 wet season. The results from the 2018/19 program and subsequent programs validated the application of this EC SSTV at CHCK06. The Agnico Eagle (2022) Biological Monitoring Plan provides the background and basis for the 2024/25 ecotoxicology monitoring program, however, the 2022 Plan has been modified based on rehabilitation activities conducted at CHPA.

2.2 Direct Toxicity Assessment

Direct toxicity assessments (DTA) were conducted in the 2019/20, 2020/2021 and 2021/22 ecotox program on the HW Pit and Dam 3. DTA uses a dilution series with a diluent (usually upstream water from the site) to determine the toxicity of a complex mixture such as mine wastewater. The 2025 dilution series for Dam 3 used a geometric progression series of 100% sample, 50%, 25%, 12.5%, 6.3%. HW Pit was removed from the program in 2023 as it had been emptied and rehabilitated. The 2022/23 program included the Cosmo Pit and Dam 3 samples in the screening bioassays program and the 2024/25 program included a DTA on Dam 3.

2.2.1 Dilution Water

ANZG (2018) recommends the use of water upstream of the impact source as the diluent in DTAs. Upstream Howley Creek water was not collected in this program, therefore the Copperfield Creek upstream water that was collected from the upstream site PCCK16 and used as the diluent in the PCPWD serial dilution bioassays was also used as the diluent for Dam 3. The water chemistry, in particular the EC for the upstream Howley Creek site (CHCK01) is similar to the Copperfield Creek upstream site, PCCK16. **Table 2-1** shows the similarities between PCCK16 (upstream Copperfield Creek) and CHCK01 (upstream Howley Creek) average data between 2020 and 2024. The low EC (39 $\mu\text{S}/\text{cm}$) occurring naturally in the PCCK16 diluent may confound the toxicity of the test sample and for the 2025 program the EC was adjusted to $\sim 101 \mu\text{S}/\text{cm}$.

Table 2-1 Upstream Water Quality Comparisons (Average 2020-2024)

Analyte	PCCK16	CHCK01
EC ($\mu\text{S}/\text{cm}$)	33	27
pH	6.8	6.7
Sulfate (mg/L)	<1	<1
Copper ($\mu\text{g}/\text{L}$)	<1	<1
Nickel ($\mu\text{g}/\text{L}$)	<1	<1
Zinc ($\mu\text{g}/\text{L}$)	3	3

2.3 Screening Bioassays

Screening bioassays are used to assess the toxicity of natural waterways where the water quality is not expected to show high toxicity. The screening bioassays use an undiluted



water sample from each site for the assessment. The results of the screening bioassay are compared to controls including an upstream water sample and a laboratory water control sample. An observation of >80% successful reproduction or growth in the organisms tested when compared to controls indicates that the water quality of the tested sample shows no significant toxicity. The screening results can also be used to compare water chemistry and toxicity spatially across a site and temporally if historical results are available.

2.3.1 Selected Species

The cladoceran (water flea, *Ceriodaphnia dubia*) has been selected for use in the chronic undiluted screening and DTA bioassays (see **Section 2.7**) based on its sensitivity to treated mine water as determined in previous ecotoxicity programs conducted at CHPA. The cladoceran bioassay provides information on both chronic and acute endpoints. Information on the cladoceran bioassay is shown in **Table 2-2**.

Table 2-2 Cladoceran bioassay details

Species	Test duration and temperature	Endpoint	Key reference
Cladoceran (<i>Ceriodaphnia dubia</i>)	7 days 25 ± 1°C	Reproduction (Chronic) Survival (Acute)	USEPA (2002)

The bioassays shown in **Table 2-2** are NATA accredited and conducted by Ecotox Services Australasia (ESA) located in Sydney.

2.4 Quality Assurance

The bioassays listed in **Table 2-2** are NATA accredited and are regulated to ensure quality assurance. The bioassays are conducted concurrently with a laboratory control (the water in which the organisms are grown) and a reference toxicant (positive control).

2.5 Water Chemistry

All water samples for ecotoxicology testing were analysed for the suite of analytes shown in **Table 2-3**. Analysis was conducted by a NATA accredited laboratory and water sampled according to Australian Standards and NTMO's Standard Operating Procedures (SOPs). It is recommended that samples are taken for ecotoxicology testing on the same day as routine WDL sampling occurs¹, then the routine chemistry results are used to interpret the ecotoxicology assessment.

Table 2-3 Analytes for surface water chemistry

Category	Analytes
<i>In Situ</i>	Electrical Conductivity (µS/cm), pH, Dissolved Oxygen (%), Temperature (°C), TSS (mg/L)
Metals (Total and Filtered 0.45 µm)	Aluminium, Arsenic, Cadmium, Cobalt, Chromium, Copper, Iron, Lead, Manganese, Nickel, Selenium, Uranium, Zinc

¹ This recommendation was also followed for the 2022 and 2025 Ecotoxicology program (see **Section 2.7**).



Category	Analytes
Others	- Filtered - Calcium, Potassium, Sodium, Magnesium, Sulphate. - Hardness (CaCO₃), Total Suspended Solids (TSS) Total Dissolved Solids (TDS) - Total Phosphorus (TP), Total Nitrogen (TN)

2.6 Sample Sites and Dates

Samples were collected for chemistry and ecotoxicology testing at the sites listed in **Table 2-4** after discharge on the 3 March 2025.

Table 2-4 Sample sites

Site	Testing	Location
CHCK04A	Ecotox and chemistry	Creek 4 Compliance Monitoring Point at Dorat Rd crossing
CHCK06	Ecotox and chemistry	Howley Creek Downstream Compliance Monitoring Point for Cosmo Howley Mine site
Dam 3	Ecotox and chemistry	Secondary Storage/Holding Dam for treated water
Cosmo Pit	Ecotox and Chemistry	Pit undergoing rehabilitation and previously treated

2.7 Ecotoxicology Program

The program conducted for the 2024/25 wet season for CHPA is shown in **Table 2-5** and is based on the revised Agnico Eagle (2022) ecotoxicology program which includes the rationale for testing during discharge.

Table 2-5 Ecotoxicological sampling and testing program 2023/24 wet season

Site	Bioassay	Type	Rationale
CHCK04A	Cladoceran	Screening and chemistry	Assess downstream toxicity during passive discharge at compliance point
CHCK06	Cladoceran	Screening and chemistry	Assess downstream toxicity during active discharge at compliance point
Dam 3	Cladoceran	DTA and chemistry	To assess if the water quality and toxicity has changed historically.
Cosmo Pit	Cladoceran	Screening and chemistry	To assess if the water quality and toxicity has changed historically.



3.0 Results

3.1 Sample Collection

Samples were collected by NTMO on the 3 March 2025 and dispatched to Ecotoxicology Services Australasia (ESA) on the 5 March 2024. The samples were chilled after collection and sent to ESA for ecotoxicology testing where they were received on 7 March 2025. All samples were kept chilled in eskies during storage and transport and the samples recorded 8°C upon receipt at ESA. The relevant Chain of Custody form is located in Appendix B.

Water samples were submitted for chemistry analysis at the same time as samples for ecotoxicology testing. Chemistry samples were dispatched to Envirolab Group for analysis and the Certificate of Analysis supplied to SLR by NTMO and is located in Appendix A.

Table 3-1 shows the conditions at each site at the time of sampling.

Table 3-1 Site conditions March 2025

Site	Conditions ⁽¹⁾
CHCK04A	Water was clear, fish, vegetation was healthy, had removed tiny bit of plant matter to increase water flow for DO% saw minor increase and made water murky and ecotox sample was collected.
CHCK06	Water is clear, sandy creek bed, air is still and muggy, dew on plants, ground on bank damp/hard, cow manure and new Silver Lady Fern growing along the bank next to the board walk.
Dam 3	Small fish, clear, vegetation looks healthy, ground is dry and hard.
Cosmo Pit	Water was clear, had a rocky base with little sediment on the bottom, ground on bank was dry/hard, sunny with little cloud cover, ecotox sample collected.
⁽¹⁾ Agnico Eagle Field Notes	

3.2 Dam 3 Discharge

Dam 3 discharged 699.29 ML to Howley Creek during February 2025 prior to obtaining samples for toxicity testing. **Table 3-2** shows the daily and cumulative discharge during February 2025. Dam 3 was not discharging in the week prior to sampling for ecotoxicological analysis at CHCK06.

Table 3-2 Dam 3 Discharge to Howley Creek During February 2024

Date ⁽¹⁾	Discharge ML	Cumulative Discharge ML	CHCK06 Daily EC (µS/cm)
1/02/2024	0.00	285.06 (from the start of the wet season)	217
2/02/2025	0.00	285.06	196
3/02/2025	0.00	285.06	201
4/02/2025	27.13	312.19	289
5/02/2025	68.43	380.62	120
6/02/2025	68.43	449.05	182
7/02/2025	68.43	517.48	539



Date ⁽¹⁾	Discharge ML	Cumulative Discharge ML	CHCK06 Daily EC (µS/cm)
8/02/2025	63.35	580.83	332
9/02/2025	60.31	641.14	252
10/02/2025	60.31	701.44	373
11/02/2025	60.31	761.75	554
12/02/2025	22.62	784.37	307
13/02/2025	10.99	795.35	168
14/02/2025	18.84	814.19	268
15/02/2025	7.06	821.25	226
16/02/2025	0.00	821.25	95
17/02/2025	12.56	833.81	97
18/02/2025	37.67	871.48	273
19/02/2025	37.67	909.15	517
20/02/2025	21.97	931.12	387
21/02/2025	0.00	931.12	115
22/02/2025	13.31	944.43	229
23/02/2025	22.81	967.24	426
24/02/2025	17.11	984.35	358
25/02/2025	0.00	984.35	314
26/02/2025	0.00	984.35	330
27/02/2025	0.00	984.35	351
28/02/2025	0.00	984.35	444
⁽¹⁾ Midnight to midnight			

3.3 Water Chemistry Results

SLR has not independently verified the chemistry results supplied by NTMO; the results have been taken on face value in this report. A summary of water quality data provided to SLR by NTMO is shown in **Table 3-3**. Chemistry results as provided by NTMO are located in **Appendix A**.

Table 3-3 March 2025 water chemistry results for ecotoxicity samples

Analyte	CHCK04A	CHCK06	Dam 3	Cosmo Pit	SSTV CHCK04A	SSTV CHCK06
Field parameters						
EC (µS/cm)	477	475	2,937 ^(a)	3,969	250	700
pH	6.2	6.7	7.5	6.2	6.0-8.0	6.0-8.0
DO (%)	63	88	99	119	90-120	45-120



Analyte	CHCK04A	CHCK06	Dam 3	Cosmo Pit	SSTV CHCK04A	SSTV CHCK06
Temp (°C)	32.4	28.9	33.7	33.4	-	-
Turbidity (NTU)	5.9	6.6	4.3	0.6	15	32
Others (mg/L)						
Calcium	35	19	420	530	-	-
Chloride	2	3	5	12	13	6
Magnesium	34	35	260	440	-	-
Potassium	3	1	4	16	-	-
Sodium	11	11	36	94	-	-
Sulphate	170	190	1,800	2,700	-	408
Hardness	230	190	2,100	3,100	-	
TSS	<10	16	15	<10	-	28
TDS	310	309	1,909	2,575	-	-
TP (µg/L)	20	10	<10	<10	10	10
TN (µg/L)	100	100	200	<100	350	350
Metals dissolved (µg/L)						
Aluminium	<10	30	110	50	150	196
Arsenic	7	<1	1	4	140	42
Cadmium	<0.1	<0.1	0.4	0.1	0.8	0.4
Chromium	<1	<1	<1	<1	40	6
Cobalt	4	15	110	8	13	13
Copper	<1	<1	21	<1	2.5	1.8
Iron	100	30	20	<10	300	428
Lead	<1	<1	<1	<1	9.4	5.6
Manganese	520	770	3,400	320	3,600	2,500
Nickel	4	25	120	15	17	13
Selenium	<1	<1	<1	<1	34	18
Uranium	<0.5	<0.5	0.6	0.9	-	-
Zinc	<1	11	78	7	31	15
^(a) ESA reported the EC for Dam 3 as 1,983 µS/cm SSTV = Site specific trigger value Highlighted cells are above the WDL 180-09 SSTV for CHCK04A and CHCK06 compliance						

points

3.4 Ecotoxicology Results

ESA provided a report on the NATA accredited bioassays titled 'Toxicity Assessment of Wastewater and Receiving Water Samples'. Agnico Eagle Test Report March 2025. This report is attached as **Appendix B**. The ecotoxicological assessment results are presented in **Table 3-4**. All toxicity tests met the QA/QC criteria.



3.4.1 Screening tests

In accordance with the ecotoxicity testing program described in **Section 2.8**, water samples from sites CHCK04A, CHCK06 and Cosmo Pit were assessed with screening bioassays using the cladoceran reproduction and survival bioassays. The results of the screening bioassays are shown in **Table 3-4**.

Table 3-4 Screening cladoceran bioassay results (March 2025)

Site	EC ⁽¹⁾ (µS/cm)	Cladoceran	
		Reproduction (%) ⁽²⁾	Survival (%)
Lab Control	175	100	100
Upstream Control (PCCK16)	101	102	100
CHCK04A	467	107	100
CHCK06	473	57	70
Cosmo Pit	3,950	5.9	0

(1) ESA Laboratory data (Appendix B).
 (2) Reproduction is normalised with the control results as: [Number of young (treatment)/Number of young (control)] X100
 (3) An observation of >80% successful reproduction in the organisms tested when compared to controls indicates that the water quality of the tested sample shows no significant toxicity.

Table 3-5 Dam 3 DTA cladoceran bioassay results (March 2025)

EC ⁽¹⁾ (µS/cm)	Reproduction			
	EC10 ⁽²⁾	EC50 ⁽³⁾	NOEC ⁽⁴⁾	LOEC ⁽⁵⁾
1,983	13	18	12.5	25
	Survival			
	13	15	12.5	25

(1) ESA Laboratory data (Appendix B).
 (2) EC10 – Concentration that causes a 10% reduction in the test population of the test endpoint
 (3) EC50 - Concentration that causes a 50% reduction in the test population of the test endpoint
 (4)NOEC – No observable effect concentration
 (5)LOEC – Lowest observable effect concentration
 Note: 100% survival and reproduction in 12.5% treatment



4.0 Discussion

4.1 CHCK04A

Water was flowing through CHCK04A at the time of sampling, however, based on the metals chemistry data shown in **Table 3-3** the compliance point CHCK04A was not impacted by mine affected water at the time of sampling. Even though the EC SSTV was exceeded at WDL 180-09 compliance point CHCK04A, there was no acute (survival) or chronic (reproduction) toxicity detected in the cladoceran tests conducted with the March 2025 sample (**Table 3-3** and **Table 3-4**).

Reproduction in the sample from this site when compared to the laboratory controls was greater than 80% and 100% survival was observed. The 2023 and 2024 CHCK04A samples also showed elevated EC of 549 $\mu\text{S}/\text{cm}$ and 512 $\mu\text{S}/\text{cm}$, respectively, with a lack of toxicity similar to what was observed for the 2025 sample, i.e. cladoceran reproduction 107% and survival 100%. The 2023 sample was taken from a static pool and the cobalt concentration was slightly above (19 $\mu\text{g}/\text{L}$) the SSTV (13 $\mu\text{g}/\text{L}$) (SLR 2023). Neither of the exceedances of the SSTVs resulted in toxicity of the 2023 sample. No exceedances of dissolved metals were observed in the 2024 (SLR 2024) or the 3 March 2025 samples.

4.2 CHCK06

The 2025 results for the WDL 180-09 compliance point CHCK06 show that there was acute and chronic toxicity in the screening cladoceran bioassays in contrast to previous years' bioassay results (2018 -2023) (**Table 4-1**). However, the 2025 results vary significantly from the 2024 results which showed 100% mortality and 0% reproduction (**Table 4-1**). The 2024 results are similar to those of 2014 when untreated water from CHPA discharged to Howley Creek, however, the chemistry data does not support the toxicity observed in 2024.

Table 4-1 shows the change in observed toxicity at CHCK06 since discharge of treated water from Dam 3 commenced.

Table 4-1 CHCK06 toxicity 2014-2025

Bioassay ⁽¹⁾	2014 untreated	2018 treated	2019 treated	2020 treated	2021 treated	2022 treated	2023 treated	2024 treated	2025 treated
Cladoceran reproduction ⁽²⁾	0%	117%	97%	54% ⁽³⁾	97%	97%	98%	0%	57
Cladoceran survival ⁽²⁾	0%	100%	100%	100%	100%	100%	100%	0%	70
⁽¹⁾ Results are reported as percentages compared with controls. ⁽²⁾ An observation of >80% successful reproduction or growth in the organisms tested when compared to controls indicates that the water quality of the tested sample shows no significant toxicity. Shaded cells are those where chronic toxicity was observed. ⁽³⁾ The cause of the observed toxicity was unable to be determined but, based on the chemistry results, it was not attributable to the mine discharge (SLR 2020).									

In 2020 and 2023 cobalt, copper and nickel exceeded the WDL 180-09 SSTVs in the CHCK06 sample with zinc also exceeding its SSTV in 2020 (**Table 4-2**). The 2025 sample exceed the cobalt and nickel SSTVs. However, no toxicity was observed in the 2023 sample and these exceedances were considered unlikely to cause adverse environmental harm.



Table 4-2 CHCK06 2020-2025 Chemistry

Analyte	2020		2023		2024		2025		SSTV ⁽²⁾
	Conc	TU	Conc	TU	Conc	TU	Conc	TU	
Cobalt (µg/L)	15	1.2	60	4.6	46	3.5	15	1.2	13
Copper (µg/L)	2	1.1	2.4	1.3	3	1.7	<1	<1	1.8
Nickel (µg/L)	32	2.5	47	3.6	49	3.8	25	1.9	13
Zinc (µg/L)	28	1.9	11	0.73	38	2.5	11	0.73	15
EC (µS/cm)	1,061	1.5	566	0.81	311	0.44	473	0.68	700
TU Total		8.1		11		12		4.8	
Cladoceran reproduction ⁽¹⁾ (%)		54		98		0		57	-
⁽¹⁾ From Table 4-1 ⁽²⁾ WDL 180-09 TU = Toxic Unit (Concentration divided by SSTV) Shaded cells exceed SSTV									

Toxic Units (TUs) were calculated from the CHCK06 sample and the relevant SSTVs from WDL180-08 to assist in understanding the impacts of dissolved metals and EC on the toxicity of samples taken from CHCK06. **Table 4-2** shows that the 2023 and 2024 samples had similar total TU values whereas the 2024 sample showed chronic toxicity with 0% reproduction and the 2023 sample showed no chronic toxicity. Therefore, it is difficult to attribute the toxicity observed in 2024 and 2025 to a concentration of an individual analyte in these two years. However, concentrations of zinc were higher in 2020 and 2024 when compared to 2023 and 2025, ANZG (2018)² reports that chronic No Observed Effect Concentration (NOEC) values for *Ceriodaphnia dubia* range between 5.5 to 25.3 µg/L zinc and Markich et al. (2002) reports a median effect concentration (EC₅₀) for cladoceran reproduction of 49 µg/L at 25°C. Based on these published zinc toxicity data, it is possible that some of the toxicity observed in 2024 could be attributed to the presence of zinc and nickel at the concentrations reported (38 µg/L and 49 µg/L respectively). Zinc is unlikely to be contributing to the toxicity observed in 2025.

4.3 Dam 3

The cladoceran screening bioassays for Dam 3 for the 2025 ecotoxicology program showed that chronic toxicity and acute toxicity was observed with a 100% reduction in reproduction and 0% survival (**Table 3-4**). Historical toxicity data show that the toxicity within Dam 3 is variable (**Table 4-3**) and is related to elevated concentrations of sulphate, cobalt, copper, nickel and zinc (**Table 4-5**). Samples collected in each year since 2020 have shown chronic toxicity in the cladoceran bioassay, however those collected in 2020, 2022, 2024 and 2025 also showed acute toxicity.

² <https://www.waterquality.gov.au/guidelines/anz-fresh-marine>



Table 4-3 Dam 3 screening test toxicity (2020-2025)

Bioassay ⁽¹⁾	2020	2021	2022	2023	2024	2025
Cladoceran reproduction	0% ⁽²⁾	53% ⁽²⁾	0% ⁽²⁾	55% ⁽²⁾	0 ⁽²⁾	0 ⁽²⁾
Cladoceran survival	0% ⁽²⁾	100%	0% ⁽²⁾	100%	0 ⁽²⁾	0 ⁽²⁾
⁽¹⁾ Results are reported as percentages compared with controls. ⁽²⁾ An observation of >80% successful reproduction or growth in the organisms tested when compared to controls indicates that the water quality of the tested sample shows no significant toxicity. Shaded cells are those where chronic or acute toxicity was observed.						

Table 4-4 Dam 3 DTA results (2020 – 2025)

Year	EC (µS/cm)	EC10 ⁽¹⁾	EC50 ⁽²⁾	NOEC ⁽³⁾	LOEC ⁽⁴⁾
Reproduction					
2020	3,370	17	33	25	50
2021	4,140	65	>100	>100	50
2022	2,990	7.7	14	6.3	12.5
2025	1,983	13	18	12.5	25
Survival					
2020	3,370	33	35	25	50
2021	4,140	>100	>100	>100	>100
2022	2,990	16	28	25	50
2025	1,983	13	15	12.5	25
⁽¹⁾ EC10 – Concentration that causes a 10% reduction in the test population of the test endpoint ⁽²⁾ EC50 - Concentration that causes a 50% reduction in the test population of the test endpoint ⁽³⁾ NOEC – No observable effect concentration ⁽⁴⁾ LOEC – Lowest observable effect concentration					

Table 4-5 Dam 3 Historical water chemistry (2020-2025)

Analyte	2020	2021	2022	2023	2024	2025	
						Conc	TU
EC (µS/cm)	3,184	4,106	2,747	2,464	1,278	1,983	2.8
Sulphate (mg/L)	2,300	3,000	2,100	2,100	800	1,800	4.4
Cobalt (µg/L)	110	5	390	54	200	110	8.5
Copper (µg/L)	49	3	190	17	94	21	12
Nickel (µg/L)	230	22	530	250	260	120	9.2
Zinc (µg/L)	140	9	370	130	170	78	5.2



Toxic Units (TUs) were calculated from the 2025 Dam 3 sample and the CHCK06 SSTVs from WDL180-08 to assist in understanding the impacts of dissolved metals and EC on the toxicity of samples taken from Dam 3. Based on the TUs shown in **Table 4-5**, EC has a minimal effect on the observed toxicity. Copper, cobalt and nickel concentrations recorded the highest TUs and these dissolved metals may be contributing to the majority of the observed toxicity in 2025. Note: variations in Dam 3 chemistry are related to the amount of rainfall in the current wet season.

4.4 Cosmo Pit

The 2025 results of the screening bioassays for the CHPA show that both chronic and acute toxicity was observed in the Cosmo Pit sample (**Table 3-4**). The 2025 sample showed a 94% reduction in reproduction when compared to the cladoceran controls and a 0% survival rate. The 0% survival rate occurred as all the cladocerans died prior to the end of the 7-day bioassay but some cladocerans were able to produce very low numbers of neonates prior to death.

Acute and chronic toxicity was also observed in the 2023 and 2024 Cosmo Pit samples (**Table 4-6**).

Table 4-6 Cosmo Pit Cladoceran Bioassay Results (2023-2025)

Bioassay ⁽¹⁾	2023	2024	2025
EC (µS/cm)	4,180	3,610	3,950
Cladoceran reproduction ⁽²⁾	19%	51%	5.9%
Cladoceran survival ⁽²⁾	50%	0%	0%
⁽¹⁾ Results are reported as percentages compared with controls. ⁽²⁾ An observation of >80% successful reproduction or growth in the organisms tested when compared to controls indicates that the water quality of the tested sample shows no significant toxicity. Shaded cells are those where chronic or acute toxicity was observed.			

Table 4-7 Cosmo Pit Historical Water Chemistry (2023-2025)

Analyte	2023	2024	2025	
			Conc	TU
EC (µS/cm)	4,181	3,067	3,950	5.6
Sulphate (mg/L)	3,400	2,200	2,700	6.6
Cobalt (µg/L)	27	7	8	0.6
Copper (µg/L)	5.7	8	<1	<1
Nickel (µg/L)	41	17	15	1.2
Zinc (µg/L)	47	7	7	0.47

Toxic Units (TUs) were calculated from the 2025 Cosmo Pit sample and the CHCK06 SSTVs from WDL180-08 to assist in understanding the impacts of dissolved metals and EC on the toxicity of the 2025 sample taken from Cosmo Pit. Based on the TUs shown in **Table 4-7**, EC and sulphate see to contribute to the majority of the toxicity of the Cosmo Pit water. Similar results also occur in the 2023 and 2024 samples (SLR 2024).



5.0 Conclusions and Recommendations

5.1 Conclusions

An ecotoxicity program was implemented by NTMO to assess the environmental impact to Howley Creek from the active discharge of treated mine water to Howley Creek and passive discharge from CHPA to Creek 4. The program conducted included screening tests using a sensitive species to assess acute and chronic toxicity of samples representative of the receiving environment (CHCK04A and CHCK06) and on site treated water (Dam 3 and Cosmo Pit).

The sample from the WDL 180-09 compliance point CHCK04A (which receives passive discharge from the CHPA) showed no chronic or acute toxicity. Whereas compliance point CHCK06 (which receives active discharge from Dam 3) showed both chronic and acute toxicity. As Dam 3 was not discharging at the time of sampling, the observed toxicity is unlikely to be directly due the Dam 3 discharge. Copper and nickel concentrations in the CHCK06 sample were slightly elevated when compared to the SSTVs and these may have contributed to the slight toxicity observed in the sample. The results do not assist in interpreting the differences in toxicity between the 2023 and 2024 samples.

The sample from Dam 3 showed chronic toxicity and acute toxicity which can be attributed to elevated metals (copper, cobalt and nickel).

The 2025 sample from Cosmo Pit resulted in acute and chronic toxicity in cladoceran bioassays. The observed toxicity may be attributable to elevated EC and sulphate.

5.2 Recommendations

The following items are recommended to be addressed in future ecotoxicity programs for the CHPA:

- Maintain the program as conducted in 2025 for 2025/26.
- Revise the ecotoxicology program as identified in WDL180-08 '*CHPA Cosmo Howley Project Area Biological Monitoring Plan 2022 (Macroinvertebrate, Sediment and Ecotoxicity)*' October 2022, Agnico Eagle to correspond with the monitoring outlined in this report.
- Ensure that there is discharge from the Dam 3 during sampling. Record the source of the discharge.



6.0 References

Agnico Eagle.2022. Cosmo Howley Project Area Biological Monitoring Plan 2022 (Macroinvertebrate, Sediment and Ecotoxicity). October 2022.

GHD (2018). Kirkland Lake Gold Northern Territory Mining Operations CHPA Ecotoxicological Plan 2018/19. October 2018.

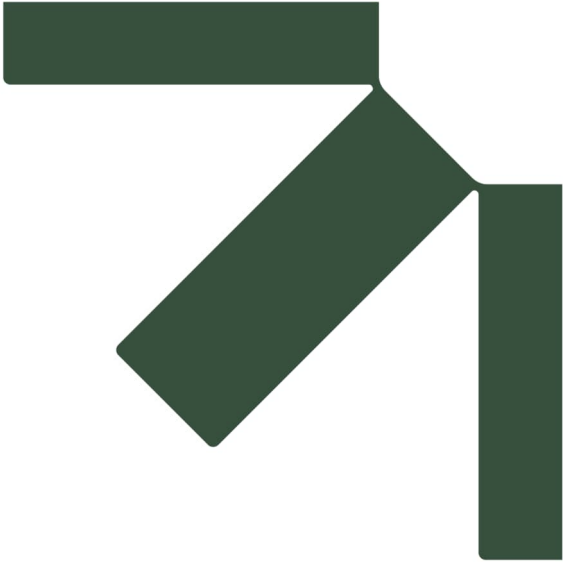
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SLR. 2021. Cosmo Howley Ecotox Report. Kirkland Lake Gold. April 2021.

SLR. 2024. Cosmo Howley Ecotox 2024. Interpretive Report. Project Number 620.040786. SLR Consulting Australia.

US EPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.





Appendix A Chemistry Results

Cosmo Howley Project Area

2025 Ecotoxicology Report

Agnico Eagle NTMO

SLR Project No.: 620.041992

25 April 2025

CERTIFICATE OF ANALYSIS 374978

Client Details

Client	NT Mining Operations Pty Ltd
Attention	AEM result
Address	GPO 469, Darwin, NT, 0800

Sample Details

Your Reference	<u>Cosmo Howley Mine Site</u>
Number of Samples	19 Water
Date samples received	07/03/2025
Date completed instructions received	07/03/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	11/03/2025
Date of Issue	11/03/2025
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Inorganics Supervisor
Giovanni Agosti, Group Technical Manager
Jenny He, Inorganic Team Leader

Authorised By

Nancy Zhang, Laboratory Manager

Client Reference: Cosmo Howley Mine Site

HM in water - dissolved						
Our Reference		374978-1	374978-2	374978-3	374978-4	374978-5
Your Reference	UNITS	CHCK01	CHCK03	CHCK05	DAM3	CHCK06
InViron ID Croc Gold		571420	571422	571424	571425	571436
Date Sampled		3/03/2025	3/03/2025	3/03/2025	3/03/2025	4/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Dissolved	µg/L	<10	13,000	190	110	30
Arsenic-Dissolved	µg/L	<1	1	3	1	<1
Cadmium-Dissolved	µg/L	<0.1	0.5	0.4	0.4	<0.1
Cobalt-Dissolved	µg/L	<1	200	140	110	15
Chromium-Dissolved	µg/L	<1	3	<1	<1	<1
Copper-Dissolved	µg/L	<1	130	12	21	<1
Iron-Dissolved	µg/L	160	610	570	20	30
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Manganese-Dissolved	µg/L	20	2,900	6,400	3,400	770
Nickel-Dissolved	µg/L	<1	260	140	120	25
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Uranium-Dissolved	µg/L	<0.5	5.7	0.6	0.6	<0.5
Zinc-Dissolved	µg/L	<1	110	73	78	11

Client Reference: Cosmo Howley Mine Site

HM in water - dissolved						
Our Reference		374978-6	374978-7	374978-8	374978-9	374978-10
Your Reference	UNITS	CHCK04C	DAM2	DAM7	DAM6	SFD
InViron ID Croc Gold		571463	571464	571465	571466	571467
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Dissolved	µg/L	<10	60	2,500	30	2,800
Arsenic-Dissolved	µg/L	4	<1	4	2	5
Cadmium-Dissolved	µg/L	<0.1	0.5	1.2	0.2	1.7
Cobalt-Dissolved	µg/L	5	75	330	41	200
Chromium-Dissolved	µg/L	<1	1	<1	<1	<1
Copper-Dissolved	µg/L	<1	16	180	7	63
Iron-Dissolved	µg/L	30	<10	60	30	140
Lead-Dissolved	µg/L	<1	<1	<1	<1	3
Manganese-Dissolved	µg/L	41	1,600	7,300	1,900	7,900
Nickel-Dissolved	µg/L	<1	79	390	47	140
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Uranium-Dissolved	µg/L	<0.5	1.4	3.6	<0.5	3.3
Zinc-Dissolved	µg/L	<1	47	250	21	440

Client Reference: Cosmo Howley Mine Site

HM in water - dissolved						
Our Reference		374978-11	374978-12	374978-13	374978-14	374978-15
Your Reference	UNITS	Cosmo Pit	HOW PIT	BIG HOW PIT	BILLABONG	CHINESE3
InViron ID Croc Gold		571468	571469	571470	571471	571473
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Dissolved	µg/L	50	120,000	6,000	<10	11,000
Arsenic-Dissolved	µg/L	4	4	2	5	6
Cadmium-Dissolved	µg/L	0.1	8.5	2.4	<0.1	2.8
Cobalt-Dissolved	µg/L	8	2,100	350	<1	540
Chromium-Dissolved	µg/L	<1	21	<1	<1	<1
Copper-Dissolved	µg/L	<1	1,800	98	<1	400
Iron-Dissolved	µg/L	<10	27,000	260	70	340
Lead-Dissolved	µg/L	<1	9	52	<1	3
Manganese-Dissolved	µg/L	320	28,000	13,000	6	7,000
Nickel-Dissolved	µg/L	15	2,500	250	<1	580
Selenium-Dissolved	µg/L	<1	3	<1	<1	<1
Uranium-Dissolved	µg/L	0.9	59	5.3	<0.5	10
Zinc-Dissolved	µg/L	7	1,500	840	<1	790

Client Reference: Cosmo Howley Mine Site

HM in water - dissolved					
Our Reference		374978-16	374978-17	374978-18	374978-19
Your Reference	UNITS	MOTT PIT	CHSPST	CHPD	CHCK04A
InViron ID Croc Gold		571484	571485	571486	
Date Sampled		2/03/2025	3/03/2025	3/03/2025	3/03/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Dissolved	µg/L	30,000	<10	<10	<10
Arsenic-Dissolved	µg/L	5	3	3	7
Cadmium-Dissolved	µg/L	3.8	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	820	38	17	4
Chromium-Dissolved	µg/L	5	<1	<1	<1
Copper-Dissolved	µg/L	990	<1	<1	<1
Iron-Dissolved	µg/L	1,100	450	10	100
Lead-Dissolved	µg/L	12	<1	<1	<1
Manganese-Dissolved	µg/L	12,000	2,200	1,300	520
Nickel-Dissolved	µg/L	1,000	20	27	4
Selenium-Dissolved	µg/L	1	<1	<1	<1
Uranium-Dissolved	µg/L	27	<0.5	<0.5	<0.5
Zinc-Dissolved	µg/L	800	5	3	<1

Client Reference: Cosmo Howley Mine Site

HM in water - total						
Our Reference		374978-1	374978-2	374978-3	374978-4	374978-5
Your Reference	UNITS	CHCK01	CHCK03	CHCK05	DAM3	CHCK06
InViron ID Croc Gold		571420	571422	571424	571425	571436
Date Sampled		3/03/2025	3/03/2025	3/03/2025	3/03/2025	4/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Total	µg/L	210	13,000	240	170	140
Arsenic-Total	µg/L	<1	1	3	2	2
Cadmium-Total	µg/L	<0.1	0.5	0.4	0.4	<0.1
Cobalt-Total	µg/L	<1	180	130	100	12
Chromium-Total	µg/L	10	2	5	<1	<1
Copper-Total	µg/L	<1	120	17	21	4
Iron-Total	µg/L	1,200	870	560	90	770
Lead-Total	µg/L	<1	<1	<1	<1	<1
Manganese-Total	µg/L	15	2,400	5,400	2,900	870
Nickel-Total	µg/L	<1	240	130	110	23
Selenium-Total	µg/L	<1	<1	<1	<1	<1
Uranium-Total	µg/L	<0.5	6.0	0.6	0.6	<0.5
Zinc-Total	µg/L	8	100	68	72	41

Client Reference: Cosmo Howley Mine Site

HM in water - total						
Our Reference		374978-6	374978-7	374978-8	374978-9	374978-10
Your Reference	UNITS	CHCK04C	DAM2	DAM7	DAM6	SFD
InViron ID Croc Gold		571463	571464	571465	571466	571467
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Total	µg/L	100	160	2,400	140	2,800
Arsenic-Total	µg/L	11	2	4	3	6
Cadmium-Total	µg/L	<0.1	0.4	1.4	0.2	1.9
Cobalt-Total	µg/L	4	72	310	41	190
Chromium-Total	µg/L	<1	2	10	<1	<1
Copper-Total	µg/L	<1	23	180	10	60
Iron-Total	µg/L	800	50	180	340	140
Lead-Total	µg/L	<1	<1	<1	<1	3
Manganese-Total	µg/L	49	1,500	6,400	1,600	7,100
Nickel-Total	µg/L	<1	79	370	47	130
Selenium-Total	µg/L	<1	1	<1	<1	<1
Uranium-Total	µg/L	<0.5	1.7	3.9	<0.5	3.4
Zinc-Total	µg/L	1	54	240	27	410

Client Reference: Cosmo Howley Mine Site

HM in water - total						
Our Reference		374978-11	374978-12	374978-13	374978-14	374978-15
Your Reference	UNITS	Cosmo Pit	HOW PIT	BIG HOW PIT	BILLABONG	CHINESE3
InViron ID Croc Gold		571468	571469	571470	571471	571473
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Total	µg/L	80	120,000	6,200	<10	11,000
Arsenic-Total	µg/L	4	5	3	7	6
Cadmium-Total	µg/L	0.1	8.4	2.5	<0.1	2.8
Cobalt-Total	µg/L	7	2,100	350	<1	520
Chromium-Total	µg/L	32	23	5	1	<1
Copper-Total	µg/L	2	1,800	96	<1	390
Iron-Total	µg/L	330	27,000	320	250	350
Lead-Total	µg/L	<1	9	50	<1	3
Manganese-Total	µg/L	270	27,000	13,000	33	6,600
Nickel-Total	µg/L	16	2,500	250	<1	560
Selenium-Total	µg/L	<1	3	<1	<1	<1
Uranium-Total	µg/L	0.99	61	5.1	<0.5	10
Zinc-Total	µg/L	10	1,500	810	2	730

Client Reference: Cosmo Howley Mine Site

HM in water - total					
Our Reference		374978-16	374978-17	374978-18	374978-19
Your Reference	UNITS	MOTT PIT	CHSPST	CHPD	CHCK04A
InViron ID Croc Gold		571484	571485	571486	
Date Sampled		2/03/2025	3/03/2025	3/03/2025	3/03/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025
Aluminium-Total	µg/L	31,000	20	60	<10
Arsenic-Total	µg/L	6	21	13	7
Cadmium-Total	µg/L	4.3	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	840	37	16	3
Chromium-Total	µg/L	62	4	<1	28
Copper-Total	µg/L	1,000	<1	1	<1
Iron-Total	µg/L	1,600	1,900	350	410
Lead-Total	µg/L	12	<1	<1	<1
Manganese-Total	µg/L	13,000	2,100	1,200	430
Nickel-Total	µg/L	1,000	21	27	5
Selenium-Total	µg/L	2	<1	<1	<1
Uranium-Total	µg/L	27	<0.5	<0.5	<0.5
Zinc-Total	µg/L	800	14	8	3

Client Reference: Cosmo Howley Mine Site

Miscellaneous Inorganics						
Our Reference	UNITS	374978-1	374978-2	374978-3	374978-4	374978-5
Your Reference		CHCK01	CHCK03	CHCK05	DAM3	CHCK06
InViron ID Croc Gold		571420	571422	571424	571425	571436
Date Sampled		3/03/2025	3/03/2025	3/03/2025	3/03/2025	4/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Acidity as CaCO ₃	mg/L	<5	140	<5	<5	<5
Total Suspended Solids	mg/L	<10	<10	<10	15	16
Turbidity	NTU	6.6	4.3	1.1	4.3	6.6
Total Phosphorus	mg/L	0.03	0.01	0.02	<0.01	0.01
Total Nitrogen in water	µg/L	100	<100	100	200	100
Ammonia as N in water	mg/L	0.005	<0.005	0.026	0.006	0.006
NOx as N in water	mg/L	0.02	0.05	0.04	0.1	0.03
Total Organic Carbon	mg/L	3	2	3	2	3

Miscellaneous Inorganics						
Our Reference	UNITS	374978-6	374978-7	374978-8	374978-9	374978-10
Your Reference		CHCK04C	DAM2	DAM7	DAM6	SFD
InViron ID Croc Gold		571463	571464	571465	571466	571467
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Acidity as CaCO ₃	mg/L	<5	<5	42	<5	42
Total Suspended Solids	mg/L	<10	<10	<10	<10	<10
Turbidity	NTU	4.0	0.5	0.1	4.6	0.1
Total Phosphorus	mg/L	0.02	[NA]	[NA]	<0.01	<0.01
Total Nitrogen in water	µg/L	100	[NA]	[NA]	200	<100
Ammonia as N in water	mg/L	0.017	[NA]	[NA]	<0.005	<0.005
NOx as N in water	mg/L	0.006	[NA]	[NA]	<0.005	<0.005
Total Organic Carbon	mg/L	3	[NA]	[NA]	4	2

Client Reference: Cosmo Howley Mine Site

Miscellaneous Inorganics						
Our Reference		374978-11	374978-12	374978-13	374978-14	374978-15
Your Reference	UNITS	Cosmo Pit	HOW PIT	BIG HOW PIT	BILLABONG	CHINESE3
InViron ID Croc Gold		571468	571469	571470	571471	571473
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Acidity as CaCO ₃	mg/L	<5	990	97	<5	120
Total Suspended Solids	mg/L	<10	<10	<10	<10	<10
Turbidity	NTU	0.6	1.9	<0.1	1.8	0.6
Total Phosphorus	mg/L	<0.01	[NA]	[NA]	0.02	[NA]
Total Nitrogen in water	µg/L	<100	[NA]	[NA]	500	[NA]
Ammonia as N in water	mg/L	<0.005	[NA]	[NA]	<0.005	[NA]
NOx as N in water	mg/L	0.02	[NA]	[NA]	<0.005	[NA]
Total Organic Carbon	mg/L	2	[NA]	[NA]	6	[NA]

Miscellaneous Inorganics					
Our Reference		374978-16	374978-17	374978-18	374978-19
Your Reference	UNITS	MOTT PIT	CHSPST	CHPD	CHCK04A
InViron ID Croc Gold		571484	571485	571486	
Date Sampled		2/03/2025	3/03/2025	3/03/2025	3/03/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Acidity as CaCO ₃	mg/L	300	<5	<5	<5
Total Suspended Solids	mg/L	<10	12	14	<10
Turbidity	NTU	0.5	24	5.5	5.9
Total Phosphorus	mg/L	[NA]	0.02	0.02	0.02
Total Nitrogen in water	µg/L	[NA]	300	100	100
Ammonia as N in water	mg/L	[NA]	0.030	0.015	0.050
NOx as N in water	mg/L	[NA]	0.1	0.007	0.03
Total Organic Carbon	mg/L	[NA]	4	3	3

Client Reference: Cosmo Howley Mine Site

Ion Balance						
Our Reference	UNITS	374978-1	374978-2	374978-3	374978-4	374978-5
Your Reference		CHCK01	CHCK03	CHCK05	DAM3	CHCK06
InViron ID Croc Gold		571420	571422	571424	571425	571436
Date Sampled		3/03/2025	3/03/2025	3/03/2025	3/03/2025	4/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Calcium - Dissolved	mg/L	1	38	230	420	19
Potassium - Dissolved	mg/L	0.6	1	3	4	1
Sodium - Dissolved	mg/L	7.4	11	35	36	11
Magnesium - Dissolved	mg/L	4	120	270	260	35
Hardness (calc) equivalent CaCO ₃	mg/L	19	590	1,700	2,100	190
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	34	<5	14	14	42
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	34	<5	14	14	42
Sulphate, SO ₄	mg/L	1	650	1,300	1,800	190
Chloride, Cl	mg/L	2	2	5	5	3
Ionic Balance	%	-3.0	-4.0	12	9.0	-6.0

Ion Balance						
Our Reference	UNITS	374978-6	374978-7	374978-8	374978-9	374978-10
Your Reference		CHCK04C	DAM2	DAM7	DAM6	SFD
InViron ID Croc Gold		571463	571464	571465	571466	571467
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Calcium - Dissolved	mg/L	6.2	760	94	20	26
Potassium - Dissolved	mg/L	2	5	5	2	4
Sodium - Dissolved	mg/L	5.4	34	57	13	7.1
Magnesium - Dissolved	mg/L	12	270	210	66	74
Hardness (calc) equivalent CaCO ₃	mg/L	66	3,000	1,100	320	370
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	42	15	<5	24	<5
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	42	15	<5	24	<5
Sulphate, SO ₄	mg/L	37	2,500	1,000	270	330
Chloride, Cl	mg/L	3	6	3	2	2
Ionic Balance	%	-2.0	7.0	7.0	7.0	7.0

Client Reference: Cosmo Howley Mine Site

Ion Balance						
Our Reference		374978-11	374978-12	374978-13	374978-14	374978-15
Your Reference	UNITS	Cosmo Pit	HOW PIT	BIG HOW PIT	BILLABONG	CHINESE3
InViron ID Croc Gold		571468	571469	571470	571471	571473
Date Sampled		2/03/2025	2/03/2025	2/03/2025	2/03/2025	2/03/2025
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Calcium - Dissolved	mg/L	530	120	39	3	49
Potassium - Dissolved	mg/L	16	3	5.6	2	3
Sodium - Dissolved	mg/L	94	19	6.9	2	7.8
Magnesium - Dissolved	mg/L	440	590	82	4	150
Hardness (calc) equivalent CaCO ₃	mg/L	3,100	2,700	430	23	730
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	55	<5	<5	31	<5
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	55	<5	<5	31	<5
Sulphate, SO ₄	mg/L	2,700	3,400	470	5	860
Chloride, Cl	mg/L	12	5	2	2	1
Ionic Balance	%	8.0	-12	-4.0	-9.0	-9.0

Ion Balance					
Our Reference		374978-16	374978-17	374978-18	374978-19
Your Reference	UNITS	MOTT PIT	CHSPST	CHPD	CHCK04A
InViron ID Croc Gold		571484	571485	571486	
Date Sampled		2/03/2025	3/03/2025	3/03/2025	3/03/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
Calcium - Dissolved	mg/L	150	51	48	35
Potassium - Dissolved	mg/L	5	5.6	5	3
Sodium - Dissolved	mg/L	23	15	14	11
Magnesium - Dissolved	mg/L	340	50	47	34
Hardness (calc) equivalent CaCO ₃	mg/L	1,800	330	310	230
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	<5	50	33	38
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	<5	50	33	38
Sulphate, SO ₄	mg/L	1,900	270	270	170
Chloride, Cl	mg/L	4	2	2	2
Ionic Balance	%	-4.0	6.0	6.0	7.0

Method ID	Methodology Summary
Inorg-005	Acidity - determined titrimetrically in accordance with APHA latest Edition, 2310-B.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA latest edition, 2130-B.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Total Phosphorus determined after persulphate digestion followed by colourimetric analysis.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stoichiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

Client Reference: Cosmo Howley Mine Site

QUALITY CONTROL: HM in water - dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	374978-2
Date prepared	-			10/03/2025	1	10/03/2025	10/03/2025		10/03/2025	10/03/2025
Date analysed	-			10/03/2025	1	10/03/2025	10/03/2025		10/03/2025	10/03/2025
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	91	#
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	81	77
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	84	83
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	84	#
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	84	95
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	84	85
Iron-Dissolved	µg/L	10	Metals-022	<10	1	160	140	13	86	#
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	86	81
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	20	19	5	85	#
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	84	#
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	84	85
Uranium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	89	77
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	85	88

QUALITY CONTROL: HM in water - dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	10/03/2025	10/03/2025		[NT]	[NT]
Date analysed	-			[NT]	11	10/03/2025	10/03/2025		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	50	50	0	[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	11	4	4	0	[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	11	0.1	<0.1	0	[NT]	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	[NT]	11	8	8	0	[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Iron-Dissolved	µg/L	10	Metals-022	[NT]	11	<10	<10	0	[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	[NT]	11	320	320	0	[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	11	15	15	0	[NT]	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	[NT]	11	0.9	1	11	[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	11	7	7	0	[NT]	[NT]

Client Reference: Cosmo Howley Mine Site

QUALITY CONTROL: HM in water - total						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	374978-3
Date prepared	-			10/03/2025	2	10/03/2025	10/03/2025		10/03/2025	10/03/2025
Date analysed	-			10/03/2025	2	10/03/2025	10/03/2025		10/03/2025	10/03/2025
Aluminium-Total	µg/L	10	Metals-022	<10	2	13000	13000	0	81	#
Arsenic-Total	µg/L	1	Metals-022	<1	2	1	1	0	88	80
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	2	0.5	0.5	0	82	82
Cobalt-Total	µg/L	1	Metals-022	<1	2	180	190	5	85	80
Chromium-Total	µg/L	1	Metals-022	<1	2	2	2	0	86	77
Copper-Total	µg/L	1	Metals-022	<1	2	120	130	8	86	86
Iron-Total	µg/L	10	Metals-022	<10	2	870	890	2	89	#
Lead-Total	µg/L	1	Metals-022	<1	2	<1	<1	0	86	81
Manganese-Total	µg/L	5	Metals-022	<5	2	2400	2500	4	85	#
Nickel-Total	µg/L	1	Metals-022	<1	2	240	250	4	85	#
Selenium-Total	µg/L	1	Metals-022	<1	2	<1	<1	0	85	83
Uranium-Total	µg/L	0.5	Metals-022	<0.5	2	6.0	6.3	5	87	81
Zinc-Total	µg/L	1	Metals-022	<1	2	100	110	10	86	79

QUALITY CONTROL: HM in water - total						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	10/03/2025	10/03/2025		[NT]	[NT]
Date analysed	-			[NT]	11	10/03/2025	10/03/2025		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	80	60	29	[NT]	[NT]
Arsenic-Total	µg/L	1	Metals-022	[NT]	11	4	4	0	[NT]	[NT]
Cadmium-Total	µg/L	0.1	Metals-022	[NT]	11	0.1	0.1	0	[NT]	[NT]
Cobalt-Total	µg/L	1	Metals-022	[NT]	11	7	7	0	[NT]	[NT]
Chromium-Total	µg/L	1	Metals-022	[NT]	11	32	33	3	[NT]	[NT]
Copper-Total	µg/L	1	Metals-022	[NT]	11	2	2	0	[NT]	[NT]
Iron-Total	µg/L	10	Metals-022	[NT]	11	330	310	6	[NT]	[NT]
Lead-Total	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Manganese-Total	µg/L	5	Metals-022	[NT]	11	270	280	4	[NT]	[NT]
Nickel-Total	µg/L	1	Metals-022	[NT]	11	16	16	0	[NT]	[NT]
Selenium-Total	µg/L	1	Metals-022	[NT]	11	<1	<1	0	[NT]	[NT]
Uranium-Total	µg/L	0.5	Metals-022	[NT]	11	0.99	1.0	1	[NT]	[NT]
Zinc-Total	µg/L	1	Metals-022	[NT]	11	10	10	0	[NT]	[NT]

Client Reference: Cosmo Howley Mine Site

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	374978-2
Date prepared	-			07/03/2025	1	07/03/2025	07/03/2025		07/03/2025	07/03/2025
Date analysed	-			07/03/2025	1	07/03/2025	07/03/2025		07/03/2025	07/03/2025
Acidity as CaCO ₃	mg/L	5	Inorg-005	<5	1	<5	<5	0	97	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<10	[NT]		95	[NT]
Turbidity	NTU	0.1	Inorg-022	<0.1	1	6.6	6.6	0	91	[NT]
Total Phosphorus	mg/L	0.01	Inorg-060	<0.01	1	0.03	0.03	0	98	120
Total Nitrogen in water	µg/L	100	Inorg-055/062/127	<100	1	100	100	0	118	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.005	<0.005	0	109	121
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.02	0.02	0	103	105
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	3	3	0	90	94

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	07/03/2025	07/03/2025		[NT]	[NT]
Date analysed	-			[NT]	11	07/03/2025	07/03/2025		[NT]	[NT]
Acidity as CaCO ₃	mg/L	5	Inorg-005	[NT]	11	<5	<5	0	[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	11	<10	[NT]		[NT]	[NT]
Turbidity	NTU	0.1	Inorg-022	[NT]	11	0.6	0.6	0	[NT]	[NT]
Total Phosphorus	mg/L	0.01	Inorg-060	[NT]	11	<0.01	[NT]		[NT]	[NT]
Total Nitrogen in water	µg/L	100	Inorg-055/062/127	[NT]	11	<100	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	11	<0.005	<0.005	0	[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	11	0.02	0.02	0	[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	11	2	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	17	07/03/2025	07/03/2025		[NT]	[NT]
Date analysed	-			[NT]	17	07/03/2025	07/03/2025		[NT]	[NT]
Acidity as CaCO ₃	mg/L	5	Inorg-005	[NT]	17	<5	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	17	12	[NT]		[NT]	[NT]
Turbidity	NTU	0.1	Inorg-022	[NT]	17	24	[NT]		[NT]	[NT]
Total Phosphorus	mg/L	0.01	Inorg-060	[NT]	17	0.02	0.02	0	[NT]	[NT]
Total Nitrogen in water	µg/L	100	Inorg-055/062/127	[NT]	17	300	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	17	0.030	[NT]		[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	17	0.1	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	17	4	[NT]		[NT]	[NT]

Client Reference: Cosmo Howley Mine Site

QUALITY CONTROL: Ion Balance						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	374978-2
Date prepared	-			07/03/2025	1	07/03/2025	07/03/2025		07/03/2025	07/03/2025
Date analysed	-			07/03/2025	1	07/03/2025	07/03/2025		07/03/2025	07/03/2025
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	[NT]		109	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	0.6	[NT]		96	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	7.4	[NT]		86	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	4	[NT]		111	[NT]
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	<3	1	19	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	34	31	9	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	34	31	9	114	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	1	[NT]		104	#
Chloride, Cl	mg/L	1	Inorg-081	<1	1	2	[NT]		101	101
Ionic Balance	%		Inorg-040	[NT]	1	-3.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	374978-4
Date prepared	-			[NT]	3	07/03/2025	07/03/2025		[NT]	07/03/2025
Date analysed	-			[NT]	3	07/03/2025	07/03/2025		[NT]	07/03/2025
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	3	230	230	0	[NT]	#
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	3	3	4	29	[NT]	99
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	3	35	36	3	[NT]	85
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	3	270	290	7	[NT]	#
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	[NT]	3	1700	1800	6	[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	[NT]	3	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	3	14	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	3	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	3	14	[NT]		[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	3	1300	1300	0	[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	3	5	5	0	[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	3	12	[NT]		[NT]	[NT]

Client Reference: Cosmo Howley Mine Site

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	07/03/2025	07/03/2025		[NT]	[NT]
Date analysed	-			[NT]	11	07/03/2025	07/03/2025		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	530	[NT]		[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	16	[NT]		[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	94	[NT]		[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	440	[NT]		[NT]	[NT]
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	[NT]	11	3100	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	[NT]	11	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	11	55	56	2	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	11	<5	<5	0	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	11	55	56	2	[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	11	2700	2600	4	[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	11	12	12	0	[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	11	8.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	12	07/03/2025	07/03/2025		[NT]	[NT]
Date analysed	-			[NT]	12	07/03/2025	07/03/2025		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	12	120	120	0	[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	12	3	3	0	[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	12	19	19	0	[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	12	590	580	2	[NT]	[NT]
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	[NT]	12	2700	2700	0	[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	[NT]	12	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	12	<5	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	12	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	12	<5	[NT]		[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	12	3400	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	12	5	[NT]		[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	12	-12	[NT]		[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TSS: PQL has been raised due to the small volume of sample supplied.

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

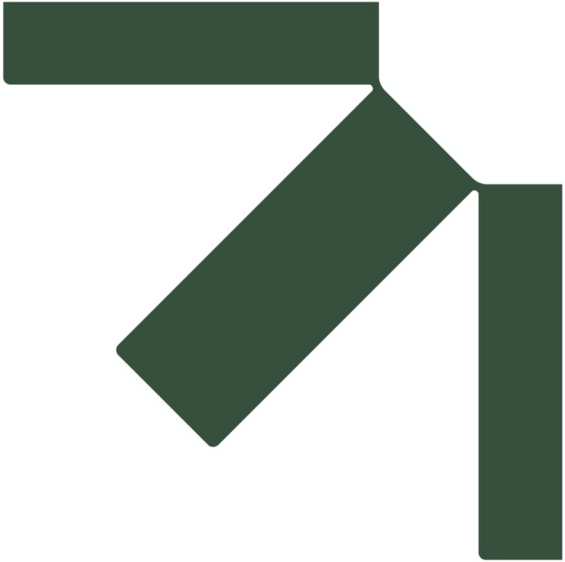
Dissolved Metals: The preserved sample provided for #7 and 8 was not identified as either total or dissolved, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.

Note: there is a possibility some elements may be underestimated.

Total Metals: The preserved sample provided for #7 and 8 was not identified as either total or dissolved, therefore the analysis was conducted from the unpreserved sample.

Note: there is a possibility some elements may be underestimated

ION_BALANCE: # Percent recovery is not applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.



Appendix B Ecotoxicology Results

Cosmo Howley Project Area

2025 Ecotoxicology Report

Agnico Eagle NT Mining Operations

SLR Project No.: 620.041992

25 April 2025

Toxicity Assessment of Wastewater and Receiving Water Samples

Agnico Eagle

Test Report

March 2025

Toxicity Test Report: TR2307/1

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Accredited for compliance with ISO/IEC 17025

Client:	Agnico Eagle Australia Dorat Rd Hayes Creek NT 0822	ESA Job #:	PR2307
Attention:	Sam Yang	Date Sampled:	03-04 March 2025
Client Ref:	PO 901180	Date Received:	07 March 2025
		Sampled By:	Client
		ESA Quote #:	PL2307_q01

Lab ID No.:	Sample Name:	Sample Description:
11936	CHCK06	Aqueous sample, pH 7.1*, conductivity 473µS/cm*. Sample received at 8°C* in apparent good condition.
11937	CHCK04A	Aqueous sample, pH 6.5*, conductivity 467µS/cm*. Sample received at 8°C* in apparent good condition.
11938	Dam 3	Aqueous sample, pH 6.4*, conductivity 1983µS/cm*. Sample received at 8°C* in apparent good condition.
11939	Cos PIT	Aqueous sample, pH 7.6*, conductivity 3950µS/cm*. Sample received at 8°C* in apparent good condition.
11940	PCPWD	Aqueous sample, pH 5.4*, conductivity 1366µS/cm*. Sample received at 8°C* in apparent good condition.
11941	PCCK16	Aqueous sample, pH 7.1*, conductivity 38.5µS/cm*. Sample received at 8°C* in apparent good condition.
11942	PCCK06	Aqueous sample, pH 7.1*, conductivity 48µS/cm*. Sample received at 8°C* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	Partial life-cycle toxicity test using the freshwater cladoceran <i>Ceriodaphnia dubia</i>
Test Protocol:	ESA SOP 102 (ESA 2016), based on USEPA (2002) and Bailey <i>et al.</i> (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Samples CHCK06, CHCK04A, Cosmo PIT and PCCK06 (Lab ID 11936, 11937, 11939 and 11942, respectively) were tested undiluted. The conductivity of sample PCCK16 (Lab ID 11941) used as the diluent was raised to 100µS/cm. Salinity raised sample PCCK16 was then used to serially dilute sample Dam 3 and PCPWD (Lab ID 11938 and 11940) to achieve the test concentrations. A DMW control and a Diluent Control (sample PCCK16) were tested concurrently with the samples.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	07 March 2025 at 1700

Toxicity Test Report: TR2307/1

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Sample	% Unaffected at 7 days (Mean ± SD)	Sample	Number of Young (Mean ± SD)
DMW Control	100 ± 0.0	DMW Control	15.9 ± 1.4
Diluent Control (PCCK16)	100 ± 0.0	Diluent Control (PCCK16)	16.2 ± 1.4
CHCK06	70.0 ± 48.3	CHCK06	9.1 ± 2.9 ***
CHCK04A	100 ± 0.0	CHCK04A	17.0 ± 2.2
Cos PIT	0.0 ± 0.0	Cos PIT	0.9 ± 0.9 ***
PCCK06	60.0 ± 51.6 *	PCCK06	2.2 ± 1.7 ***

*Significantly lower percent unaffected compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)

**Significantly lower number of young compared with the Diluent Control (Homoscedastic t test, 1-tailed, P=0.05)

Sample 11938: Dam 3 Concentration (%)	% Unaffected at 7 days (Mean ± SD)	Sample 11938: Dam 3 Concentration (%)	Number of Young (Mean ± SD)
DMW Control	100 ± 0.0	DMW Control	15.9 ± 1.4
Diluent Control (PCCK16)	100 ± 0.0	Diluent Control (PCCK16)	16.2 ± 1.4
6.3	90.0 ± 31.6	6.3	14.7 ± 5.3
12.5	100 ± 0.0	12.5	15.7 ± 1.2
25	0.0 ± 0.0	25	0.0 ± 0.0
50	0.0 ± 0.0	50	0.0 ± 0.0
100	0.0 ± 0.0	100	0.0 ± 0.0
7 day EC10 (unaffected) = 13.1%*		7 day IC10 (reproduction) = 13.0%*	
7 day EC50 (unaffected) = 14.8 (13.98-17.74)%		7 day IC50 (reproduction) = 18.3 (17.41-18.75)%	
NOEC = 12.5%		NOEC = 12.5%	
LOEC = 25%		LOEC = 25%	

*The 95% Confidence limits are not reliable.

Sample 11940: PCPWD Concentration (%)	% Unaffected at 7 days (Mean ± SD)	Sample 11940: PCPWD Concentration (%)	Number of Young (Mean ± SD)
DMW Control	100 ± 0.0	DMW Control	15.9 ± 1.4
Diluent Control (PCCK16)	100 ± 0.0	Diluent Control (PCCK16)	16.2 ± 1.4
6.3	0.0 ± 0.0	6.3	0.0 ± 0.0
12.5	0.0 ± 0.0	12.5	0.0 ± 0.0
25	0.0 ± 0.0	25	0.0 ± 0.0
50	0.0 ± 0.0	50	0.0 ± 0.0
100	0.0 ± 0.0	100	0.0 ± 0.0
7 day EC10 (unaffected) = <6.3%		7 day IC10 (reproduction) = <6.3%	
7 day EC50 (unaffected) = <6.3%		7 day IC50 (reproduction) = <6.3%	
NOEC = <6.3%		NOEC = <6.3%	
LOEC = 6.3%		LOEC = 6.3%	

Toxicity Test Report: TR2307/1

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QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected	≥80.0%	100%	Yes
Control mean number of young per surviving adult	≥15.0	15.9	Yes
Reference Toxicant within cusum chart limits	182.7-215.1mgKCl/L	191.7mgKCl/ L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 28 March 2025

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2016) ESA SOP 102 – *Acute Toxicity Test Using Ceriodaphnia dubia*. Issue No 11. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. 4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.

Toxicity Test Report: TR2307/2

(Page 1 of 2)

Accredited for compliance with ISO/IEC 17025

Client:	Agnico Eagle Australia Dorat Rd Hayes Creek NT 0822	ESA Job #:	PR2307
Attention:	Sam Yang	Date Sampled:	04 March 2025
Client Ref:	PO 901180	Date Received:	07 March 2025
		Sampled By:	Client
		ESA Quote #:	PL2307_q01

Lab ID No.:	Sample Name:	Sample Description:
11940	PCPWD	Aqueous sample, pH 5.4*, conductivity 1366µS/cm*, total ammonia <2.0mg/L*. Sample received at 8°C* in apparent good condition.
11941	PCCK16	Aqueous sample, pH 7.1*, conductivity 38.5µS/cm*, total ammonia <2.0mg/L*. Sample received at 8°C* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	Partial life-cycle toxicity test using the freshwater cladoceran <i>Ceriodaphnia dubia</i>
Test Protocol:	ESA SOP 102 (ESA 2016), based on USEPA (2002) and Bailey <i>et al.</i> (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The conductivity of sample PCCK16 (Lab ID 11941) was raised to 100µS/cm. salinity raised sample PCCK16 was then used to serially dilute sample PCPWD (Lab ID 11940) to achieve the test concentrations. A DMW control and a Diluent Control (sample PCCK16) were tested concurrently with the samples.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	12 March 2025 at 1730

Sample 11940: PCPWD		Sample 11940: PCPWD	
Concentration (%)	% Unaffected at 7 days (Mean ± SD)	Concentration (%)	Number of Young (Mean ± SD)
DMW Control	100 ± 0.0	DMW Control	16.1 ± 0.9
Diluent Control (PCCK16)	100 ± 0.0	Diluent Control (PCCK16)	16.0 ± 1.3
0.4	100 ± 0.0	0.4	16.3 ± 1.1
0.8	90.0 ± 31.6	0.8	8.7 ± 3.8 *
1.6	0.0 ± 0.0	1.6	0.0 ± 0.0
3.1	0.0 ± 0.0	3.1	0.0 ± 0.0
6.3	0.0 ± 0.0	6.3	0.0 ± 0.0
7 day EC10 (unaffected) = 0.8 (0.73-1.07)%		7 day IC10 (reproduction) = 0.5 (0.45-0.52)%	
7 day EC50 (unaffected) = 0.9 (0.86-1.16)%		7 day IC50 (reproduction) = 0.9 (0.74-1.00)%	
NOEC = 0.8%		NOEC = 0.4%	
LOEC = 1.6%		LOEC = 0.8%	

*Significantly lower number of young compared with the Diluent Control (Steel's Many-One Rank, 1-tailed, P=0.05)

Toxicity Test Report: TR2307/2

(Page 2 of 2)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected	≥80.0%	100%	Yes
Control mean number of young per surviving adult	≥15.0	16.1	Yes
Reference Toxicant within cusum chart limits	181.8- 215.4mgKCl/L	196.8mgKCl/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 28 March 2025

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2016) ESA SOP 102 – *Acute Toxicity Test Using Ceriodaphnia dubia*. Issue No 11. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. 4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.

Chain-of-Custody Documentation



Sample Receipt Notification

Attention : Sam Yang

Client : Agnico Eagle Australia
Dorat Rd
Hayes Creek NT 0822

Email : sam.yang@agnicoeagle.com
Telephone : 08 8978 1737
Facsimile :

Date : 7/03/2025

Re : Receipt of Samples

Pages : 2

ESA Project : PR2307

☒ For Review

☐ Additional Documentation Required - Please Respond

Sample Delivery Details

Completed Chain of Custody accompanied samples: YES

Samples received in apparent good condition and correctly bottled: YES

Security seals on sample bottles and esky intact: YES

Date samples received : 7/03/2025

Time samples received : 12:30

No. of samples received : 7

Sample matrix : Aqueous

Sample temperature : 6-10°C

Comments : 2 x 5L of PCCK16 and 1 x 5L of the other samples received at 8 degrees C in apparent good condition

Contact Details

Projects Manager : Dr Rick Krassoi
Telephone : 61 2 9420 9481
Facsimile : 61 2 9420 9484
Email : rkrassoi@ecotox.com.au

Please contact customer services officer for all queries or issues regarding samples

Note that the chain-of-custody provides definitive information on the tests to be performed

Ecotox Services Australia

ABN 95619426201

Unit 27, 2 Chaplin Drive

Lane Cove NSW 2066 Australia

Phone : 61 2 9420 9481

Fax : 61 2 9420 9484

Email : info@ecotox.com.au

(please provide an email address for sample receipt notification)

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
Of:	Time:	Of:	Time:	Of:	Time:	Of:	Time:
		<i>EC</i>	7/3/25				
		<i>EC</i>	1230				

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Chain-of-Custody / Service Request Form



Customer: NTMO AGNICO EAGLE NT Ship To: 12 Ashley St, Chatswood, NSW 2067
Contact Name: Environmental Team Attention: Rick Krassoi
Phone: Eden Williams, Jessie Simpson, Liam Craighead Email: aem_k_ntmoenvironment@agnicoeagle.com (please provide an email address for sample receipt notification)
Sampled by:

Sample Date (day/month/year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance)				Comments / Instructions
									Note that testing will be delayed if an incomplete chain of custody is received • Additional treatment of samples (i.e. spiking) • Sub-contracted services (i.e. chemical analyses) • Dilutions required (if different than 100% down to 6.25%) • Sample holding time restriction (if applicable) • Sample used for litigation (if applicable) Note: An MSDS must be attached if Available ESA Project Number: PR 2307
11 936		CHCK06	Grab	1 x 5L					
11 932		CHCK4A	Grab	1 x 5L					
11 938		DAM 3	Grab	1 x 5L					
11 939		COS PIT	Grab	1 x 5L					

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
Of:	Time:	Of:	Time:	Of:	Time:	Of:	Time:
		<i>EC</i>	<i>7/3/25</i>				
		<i>ESB</i>	<i>1230</i>				

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

**Statistical Printouts for the 3-
brood Partial Life Cycle Test with
*Ceriodaphnia dubia***

Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	17.000	18.000	15.000	14.000	17.000	16.000	14.000	17.000	16.000	15.000
Diluent Control	17.000	17.000	19.000	14.000	16.000	16.000	17.000	15.000	16.000	15.000
6.3	17.000	15.000	17.000	17.000	0.000	15.000	16.000	18.000	15.000	17.000
12.5	16.000	17.000	15.000	14.000	15.000	16.000	15.000	18.000	15.000	
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

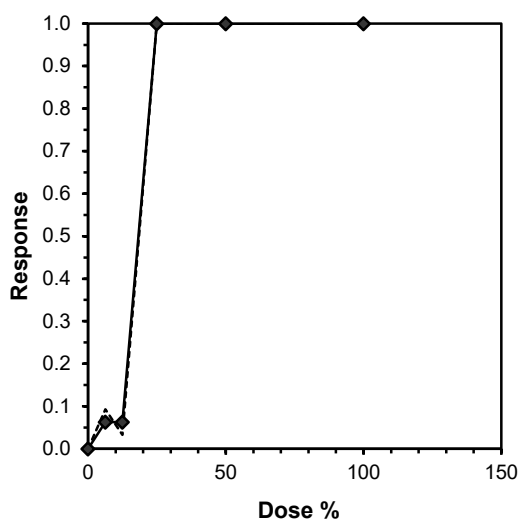
Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
DMW Control	15.900	0.9815	15.900	14.000	18.000	8.618	10				
Diluent Control	16.200	1.0000	16.200	14.000	19.000	8.632	10		*	16.200	1.0000
6.3	14.700	0.9074	14.700	0.000	18.000	35.861	10	104.50	78.00	15.183	0.9372
12.5	15.667	0.9671	15.667	14.000	18.000	7.818	9	79.00	65.00	15.183	0.9372
25	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000
50	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000
100	0.000	0.0000	0.000	0.000	0.000	0.000	9			0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.05$)	0.617126	0.926	-3.73119	17.5236
Bartlett's Test indicates unequal variances ($p = 2.19\text{E-}05$)	21.46028	9.21034		
The control means are not significantly different ($p = 0.63$)	0.484544	2.100922		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	12.5	25	17.67767	8
Treatments vs Diluent Control				

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL	Skew	
IC05*	5.019	4.553	1.785	13.125	0.1375
IC10	12.997	3.671	3.569	13.750	-1.1933
IC15	13.664	2.205	5.354	14.375	-3.0468
IC20	14.330	1.004	12.856	15.000	-6.0402
IC25	14.997	0.540	13.615	15.625	-0.9457
IC40	16.998	0.432	15.892	17.500	-0.9457
IC50	18.332	0.360	17.410	18.750	-0.9457

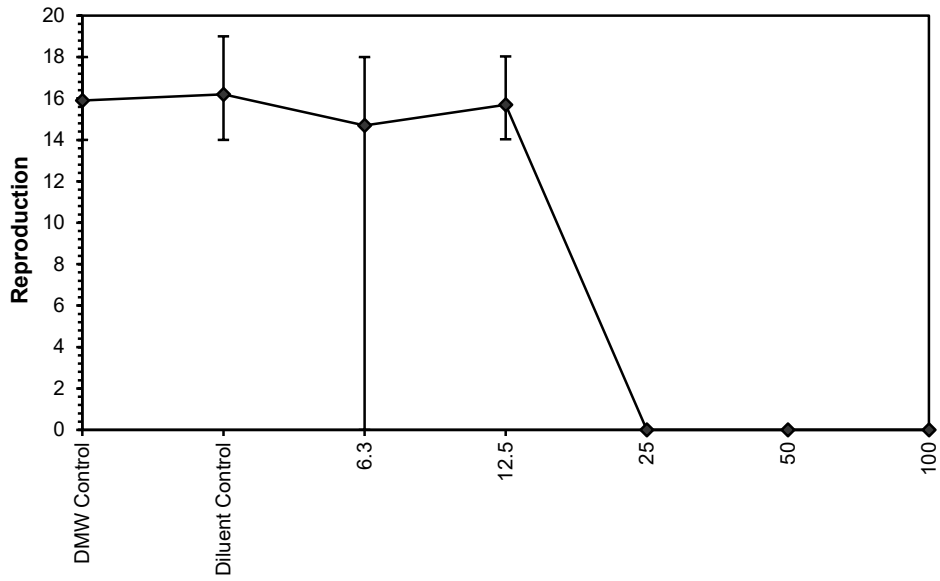
* indicates IC estimate less than the lowest concentration



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	15.90	14.00	18.00	1.37	7.36	10
Diluent Control		16.20	14.00	19.00	1.40	7.30	10
6.3		14.70	0.00	18.00	5.27	15.62	10
12.5		15.67	14.00	18.00	1.22	7.06	9
25		0.00	0.00	0.00	0.00		10
50		0.00	0.00	0.00	0.00		10
100		0.00	0.00	0.00	0.00		10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
6.3		90.00	0.00	100.00	31.62	6.25	10
12.5		100.00	100.00	100.00	0.00	0.00	9
25		0.00	0.00	0.00	0.00		10
50		0.00	0.00	0.00	0.00		10
100		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
6.3		7.30	7.30	7.30	0.00	0.00	1
12.5		7.00	7.00	7.00	0.00	0.00	1
25		6.90	6.90	6.90	0.00	0.00	1
50		6.80	6.80	6.80	0.00	0.00	1
100		6.40	6.40	6.40	0.00	0.00	1
DMW Control	DO %	99.30	99.30	99.30	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
6.3		100.30	100.30	100.30	0.00	0.00	1
12.5		100.30	100.30	100.30	0.00	0.00	1
25		100.20	100.20	100.20	0.00	0.00	1
50		100.30	100.30	100.30	0.00	0.00	1
100		99.50	99.50	99.50	0.00	0.00	1
DMW Control	Cond uS/cm	175.00	175.00	175.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
6.3		347.00	347.00	347.00	0.00	0.00	1
12.5		437.00	437.00	437.00	0.00	0.00	1
25		965.00	965.00	965.00	0.00	0.00	1
50		1286.00	1286.00	1286.00	0.00	0.00	1
100		1983.00	1983.00	1983.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

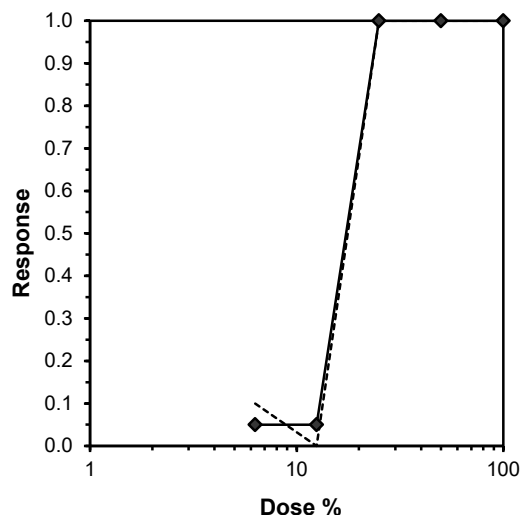
Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Diluent Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	N-Mean
DMW Control	1.0000	1.0000	0	10	10	10	0.6238			
Diluent Control	1.0000	1.0000	0	10	10	10	*		1.0000	1.0000
6.3	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.9500	0.9500
12.5	1.0000	1.0000	0	9	9	9	1.0000	0.0500	0.9500	0.9500
25	0.0000	0.0000	10	0	10	10			0.0000	0.0000
50	0.0000	0.0000	10	0	10	10			0.0000	0.0000
100	0.0000	0.0000	10	0	10	10			0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	12.5	25	17.67767	8
Treatments vs Diluent Control				

Log-Logit Interpolation (200 Resamples)

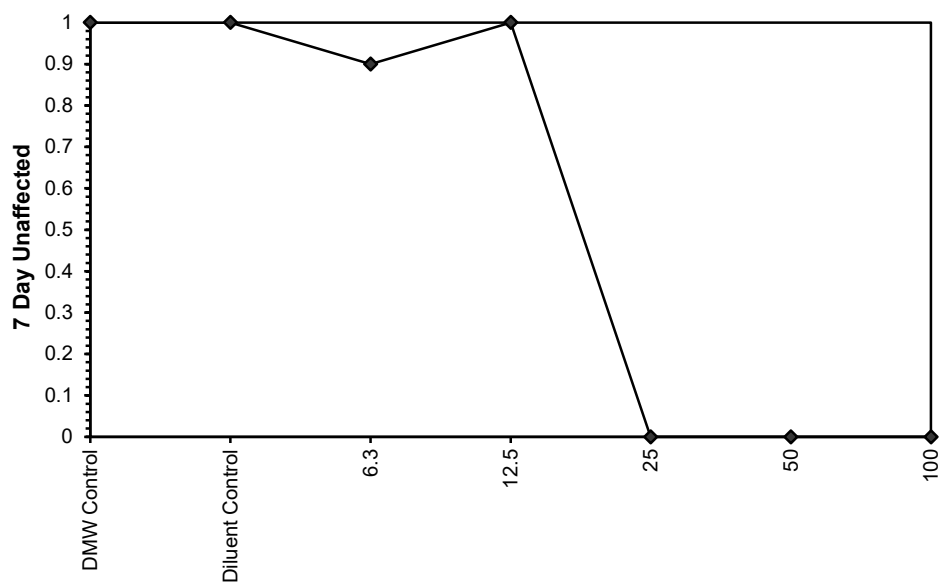
Point	%	SD	95% CL	Skew
IC05	12.500	4.401	4.292 15.872	-0.7761
IC10	13.055	2.633	5.455 16.326	-1.4913
IC15	13.410	1.818	12.500 16.614	-0.1939
IC20	13.683	1.687	12.785 16.833	0.3817
IC25	13.913	1.663	13.024 17.017	0.3812
IC40	14.481	1.601	13.618 17.467	0.3801
IC50	14.823	1.562	13.978 17.735	0.3794



Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	7/03/2025 17:00	Test ID:	PR2307/02	Sample ID:	Dam 3
End Date:	14/03/2025 17:00	Lab ID:	11938	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	15.90	14.00	18.00	1.37	7.36	10
Diluent Control		16.20	14.00	19.00	1.40	7.30	10
6.3		14.70	0.00	18.00	5.27	15.62	10
12.5		15.67	14.00	18.00	1.22	7.06	9
25		0.00	0.00	0.00	0.00		10
50		0.00	0.00	0.00	0.00		10
100		0.00	0.00	0.00	0.00		10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
6.3		90.00	0.00	100.00	31.62	6.25	10
12.5		100.00	100.00	100.00	0.00	0.00	9
25		0.00	0.00	0.00	0.00		10
50		0.00	0.00	0.00	0.00		10
100		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
6.3		7.30	7.30	7.30	0.00	0.00	1
12.5		7.00	7.00	7.00	0.00	0.00	1
25		6.90	6.90	6.90	0.00	0.00	1
50		6.80	6.80	6.80	0.00	0.00	1
100		6.40	6.40	6.40	0.00	0.00	1
DMW Control	DO %	99.30	99.30	99.30	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
6.3		100.30	100.30	100.30	0.00	0.00	1
12.5		100.30	100.30	100.30	0.00	0.00	1
25		100.20	100.20	100.20	0.00	0.00	1
50		100.30	100.30	100.30	0.00	0.00	1
100		99.50	99.50	99.50	0.00	0.00	1
DMW Control	Cond uS/cm	175.00	175.00	175.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
6.3		347.00	347.00	347.00	0.00	0.00	1
12.5		437.00	437.00	437.00	0.00	0.00	1
25		965.00	965.00	965.00	0.00	0.00	1
50		1286.00	1286.00	1286.00	0.00	0.00	1
100		1983.00	1983.00	1983.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

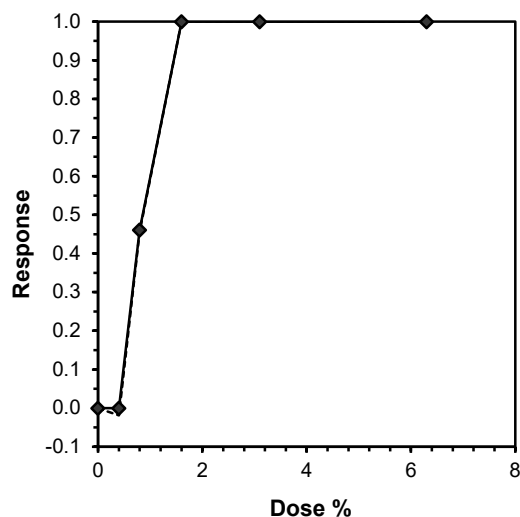
Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	17.000	17.000	15.000	16.000	16.000	15.000	16.000	17.000	15.000	17.000
Diluent Control	16.000	16.000	15.000	19.000	15.000	16.000	16.000	17.000	16.000	14.000
0.4	17.000	15.000	18.000	18.000	16.000	16.000	16.000	15.000	16.000	16.000
0.8	12.000	9.000	8.000	8.000	13.000	12.000	6.000	0.000	8.000	11.000
1.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
DMW Control	16.100	1.0063	16.100	15.000	17.000	5.438	10				
Diluent Control	16.000	1.0000	16.000	14.000	19.000	8.333	10		*	16.150	1.0000
0.4	16.300	1.0188	16.300	15.000	18.000	6.499	10	113.00	79.00	16.150	1.0000
*0.8	8.700	0.5438	8.700	0.000	13.000	43.702	10	55.00	79.00	8.700	0.5387
1.6	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000
3.1	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000
6.3	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.05$)	0.851051	0.927	-1.45414	6.185201
Bartlett's Test indicates unequal variances ($p = 2.84E-04$)	16.33086	9.21034		
The control means are not significantly different ($p = 0.85$)	0.198246	2.100922		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	0.4	0.8	0.565685	250
Treatments vs Diluent Control				

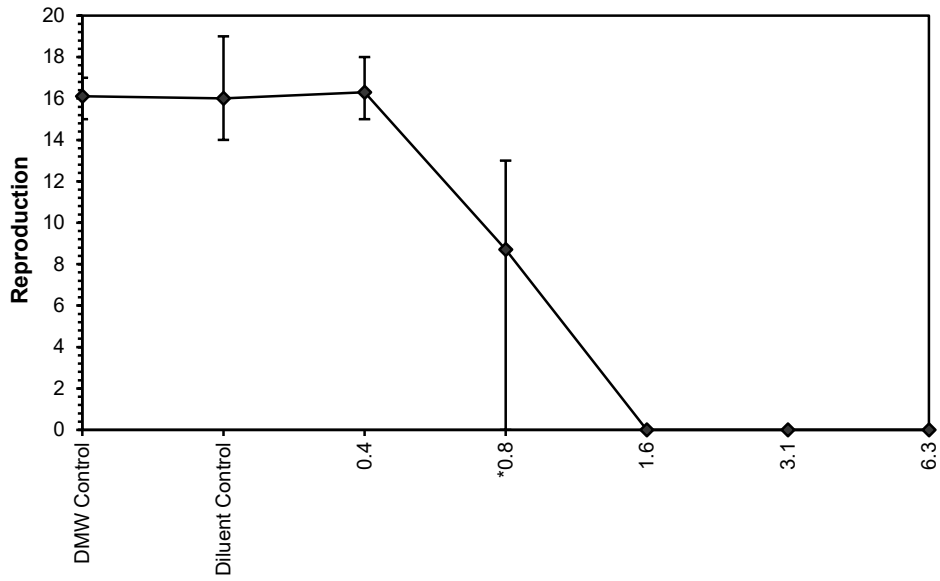
Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL	Skew	
IC05	0.4434	0.0114	0.4116	0.4604	-1.0529
IC10	0.4867	0.0162	0.4519	0.5208	0.0904
IC15	0.5301	0.0221	0.4947	0.5812	0.4281
IC20	0.5734	0.0284	0.5314	0.6415	0.5346
IC25	0.6168	0.0349	0.5656	0.7019	0.5742
IC40	0.7468	0.0548	0.6683	0.8823	0.4779
IC50	0.8575	0.0742	0.7353	1.0019	-0.0196



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	16.10	15.00	17.00	0.88	5.81	10
Diluent Control		16.00	14.00	19.00	1.33	7.22	10
0.4		16.30	15.00	18.00	1.06	6.31	10
0.8		8.70	0.00	13.00	3.80	22.41	10
1.6		0.00	0.00	0.00	0.00		10
3.1		0.00	0.00	0.00	0.00		10
6.3		0.00	0.00	0.00	0.00		10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
0.4		100.00	100.00	100.00	0.00	0.00	10
0.8		90.00	0.00	100.00	31.62	6.25	10
1.6		0.00	0.00	0.00	0.00		10
3.1		0.00	0.00	0.00	0.00		10
6.3		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
0.4		7.40	7.40	7.40	0.00	0.00	1
0.8		7.40	7.40	7.40	0.00	0.00	1
1.6		7.40	7.40	7.40	0.00	0.00	1
3.1		7.30	7.30	7.30	0.00	0.00	1
6.3		7.10	7.10	7.10	0.00	0.00	1
DMW Control	DO %	98.60	98.60	98.60	0.00	0.00	1
Diluent Control		100.10	100.10	100.10	0.00	0.00	1
0.4		99.90	99.90	99.90	0.00	0.00	1
0.8		99.90	99.90	99.90	0.00	0.00	1
1.6		103.00	103.00	103.00	0.00	0.00	1
3.1		103.00	103.00	103.00	0.00	0.00	1
6.3		102.00	102.00	102.00	0.00	0.00	1
DMW Control	Cond uS/cm	174.00	174.00	174.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
0.4		106.00	106.00	106.00	0.00	0.00	1
0.8		116.00	116.00	116.00	0.00	0.00	1
1.6		129.00	129.00	129.00	0.00	0.00	1
3.1		156.00	156.00	156.00	0.00	0.00	1
6.3		208.00	208.00	208.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

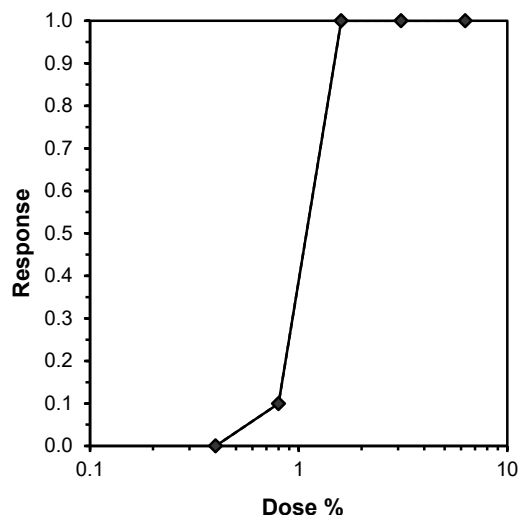
Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Diluent Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
1.6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6.3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	N-Mean
DMW Control	1.0000	1.0000	0	10	10	10	0.6238			
Diluent Control	1.0000	1.0000	0	10	10	10	*		1.0000	1.0000
0.4	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
0.8	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.9000	0.9000
1.6	0.0000	0.0000	10	0	10	10			0.0000	0.0000
3.1	0.0000	0.0000	10	0	10	10			0.0000	0.0000
6.3	0.0000	0.0000	10	0	10	10			0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	0.8	1.6	1.131371	125
Treatments vs Diluent Control				

Log-Logit Interpolation (200 Resamples)

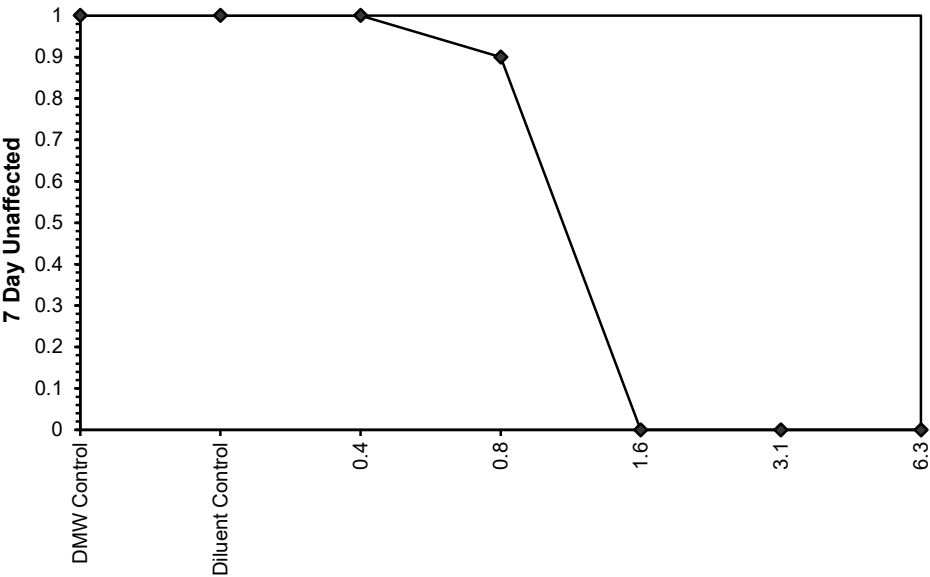
Point	%	SD	95% CL	Skew
IC05	0.7524	0.1480	0.6901 1.0398	0.5483
IC10	0.8000	0.1417	0.7284 1.0705	0.5206
IC15	0.8270	0.1385	0.7526 1.0897	0.5091
IC20	0.8477	0.1359	0.7711 1.1043	0.4992
IC25	0.8649	0.1336	0.7865 1.1164	0.4918
IC40	0.9070	0.1275	0.8293 1.1459	0.4765
IC50	0.9321	0.1236	0.8566 1.1633	0.4707



Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	12/03/2025 17:30	Test ID:	PR2307/05	Sample ID:	PCPWD
End Date:	19/03/2025 17:30	Lab ID:	11940	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	16.10	15.00	17.00	0.88	5.81	10
Diluent Control		16.00	14.00	19.00	1.33	7.22	10
0.4		16.30	15.00	18.00	1.06	6.31	10
0.8		8.70	0.00	13.00	3.80	22.41	10
1.6		0.00	0.00	0.00	0.00		10
3.1		0.00	0.00	0.00	0.00		10
6.3		0.00	0.00	0.00	0.00		10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
0.4		100.00	100.00	100.00	0.00	0.00	10
0.8		90.00	0.00	100.00	31.62	6.25	10
1.6		0.00	0.00	0.00	0.00		10
3.1		0.00	0.00	0.00	0.00		10
6.3		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
0.4		7.40	7.40	7.40	0.00	0.00	1
0.8		7.40	7.40	7.40	0.00	0.00	1
1.6		7.40	7.40	7.40	0.00	0.00	1
3.1		7.30	7.30	7.30	0.00	0.00	1
6.3		7.10	7.10	7.10	0.00	0.00	1
DMW Control	DO %	98.60	98.60	98.60	0.00	0.00	1
Diluent Control		100.10	100.10	100.10	0.00	0.00	1
0.4		99.90	99.90	99.90	0.00	0.00	1
0.8		99.90	99.90	99.90	0.00	0.00	1
1.6		103.00	103.00	103.00	0.00	0.00	1
3.1		103.00	103.00	103.00	0.00	0.00	1
6.3		102.00	102.00	102.00	0.00	0.00	1
DMW Control	Cond uS/cm	174.00	174.00	174.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
0.4		106.00	106.00	106.00	0.00	0.00	1
0.8		116.00	116.00	116.00	0.00	0.00	1
1.6		129.00	129.00	129.00	0.00	0.00	1
3.1		156.00	156.00	156.00	0.00	0.00	1
6.3		208.00	208.00	208.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-Reproduction

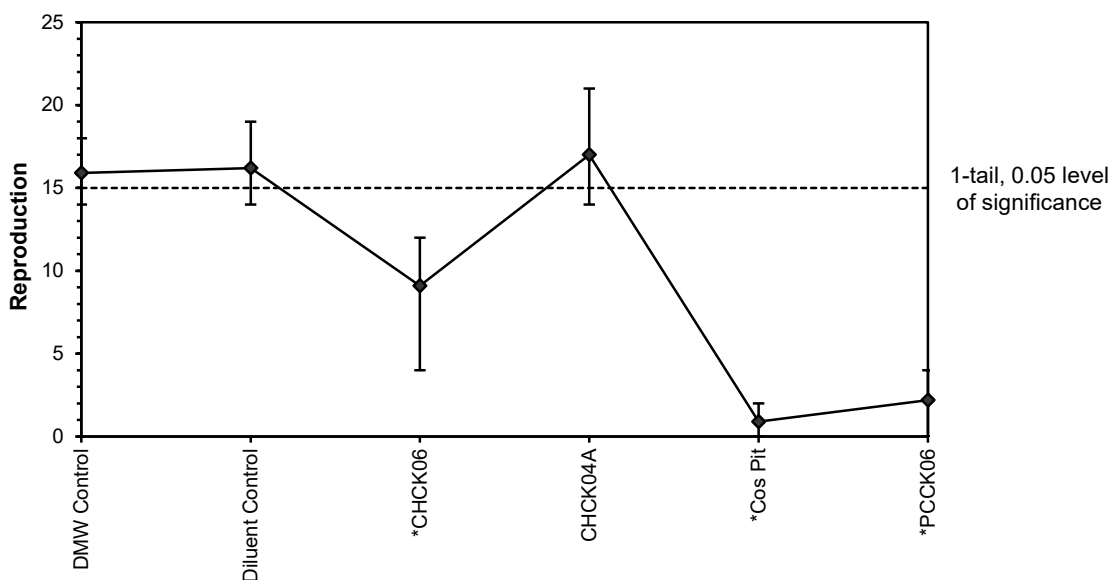
Start Date:	7/03/2025 17:00	Test ID:	PR2307/03	Sample ID:	Screens
End Date:	14/03/2025 17:00	Lab ID:	Various	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-	1	2	3	4	5	6	7	8	9	10
DMW Control	17.000	18.000	15.000	14.000	17.000	16.000	14.000	17.000	16.000	15.000
Diluent Control	17.000	17.000	19.000	14.000	16.000	16.000	17.000	15.000	16.000	15.000
CHCK06	4.000	4.000	11.000	12.000	10.000	11.000	11.000	9.000	11.000	8.000
CHCK04A	17.000	20.000	21.000	17.000	16.000	14.000	16.000	16.000	16.000	
Cos Pit	0.000	0.000	2.000	1.000	0.000	1.000	2.000	1.000	2.000	0.000
PCCK06	0.000	3.000	0.000	4.000	2.000	0.000	4.000	3.000	2.000	4.000

Conc-	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%	N			
DMW Control	15.900	0.9815	15.900	14.000	18.000	8.618	10			
Diluent Control	16.200	1.0000	16.200	14.000	19.000	8.632	10	*		
*CHCK06	9.100	0.5617	9.100	4.000	12.000	32.122	10	6.929	1.734	1.777
CHCK04A	17.000	1.0494	17.000	14.000	21.000	12.820	9	-0.963	1.740	1.446
*Cos Pit	0.900	0.0556	0.900	0.000	2.000	97.288	10	29.324	1.734	0.905
*PCCK06	2.200	0.1358	2.200	0.000	4.000	76.661	10	20.207	1.734	1.201

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.959941	0.947	-0.53532	0.998443		
Bartlett's Test indicates equal variances (p = 0.01)	12.7506	13.2767				
The control means are not significantly different (p = 0.63)	0.484544	2.100922				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences	1.201395	0.07416	553.1684	3.75	6.9E-25	4, 44
Treatments vs Diluent Control						

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date:	7/03/2025 17:00	Test ID:	PR2307/03	Sample ID:	Screens
End Date:	14/03/2025 17:00	Lab ID:	Various	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	15.90	14.00	18.00	1.37	7.36	10
Diluent Control		16.20	14.00	19.00	1.40	7.30	10
CHCK06		9.10	4.00	12.00	2.92	18.79	10
CHCK04A		17.00	14.00	21.00	2.18	8.68	9
Cos Pit		0.90	0.00	2.00	0.88	103.97	10
PCCK06		2.20	0.00	4.00	1.69	59.03	10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
CHCK06		70.00	0.00	100.00	48.30	9.93	10
CHCK04A		100.00	100.00	100.00	0.00	0.00	9
Cos Pit		0.00	0.00	0.00	0.00		10
PCCK06		60.00	0.00	100.00	51.64	11.98	10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
CHCK06		7.30	7.30	7.30	0.00	0.00	1
CHCK04A		6.50	6.50	6.50	0.00	0.00	1
Cos Pit		7.60	7.60	7.60	0.00	0.00	1
PCCK06		7.10	7.10	7.10	0.00	0.00	1
DMW Control	DO %	99.30	99.30	99.30	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
CHCK06		96.30	96.30	96.30	0.00	0.00	1
CHCK04A		93.80	93.80	93.80	0.00	0.00	1
Cos Pit		100.20	100.20	100.20	0.00	0.00	1
PCCK06		94.70	94.70	94.70	0.00	0.00	1
DMW Control	Cond uS/cm	175.00	175.00	175.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
CHCK06		473.00	473.00	473.00	0.00	0.00	1
CHCK04A		467.00	467.00	467.00	0.00	0.00	1
Cos Pit		3950.00	3950.00	3950.00	0.00	0.00	1
PCCK06		48.00	48.00	48.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date: 7/03/2025 17:00 Test ID: PR2307/03 Sample ID: Screens
 End Date: 14/03/2025 17:00 Lab ID: Various Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
 Comments:

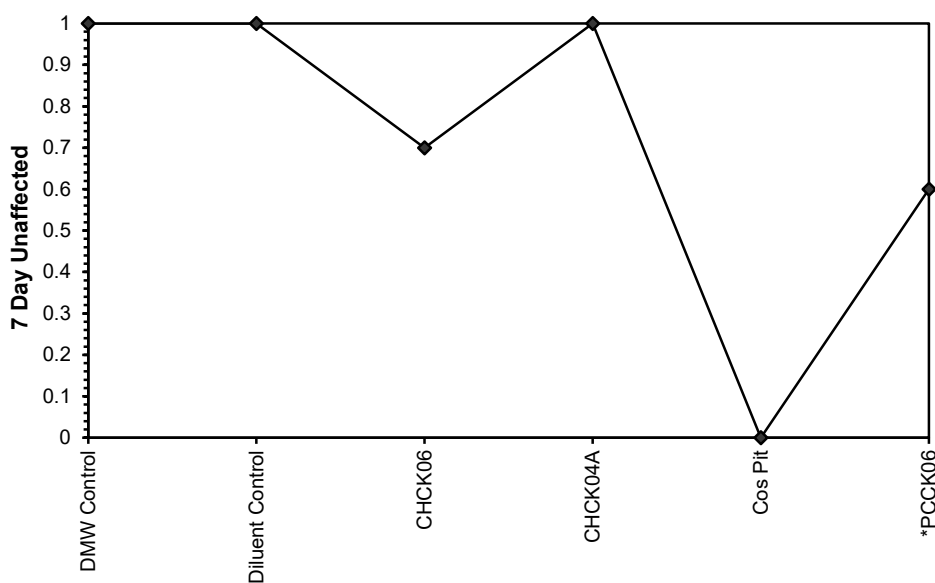
Conc-	1	2	3	4	5	6	7	8	9	10
DMW Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Diluent Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CHCK06	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
CHCK04A	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Cos Pit	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PCCK06	0.0000	0.0000	0.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000

Conc-	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
DMW Control	1.0000	1.0000	0	10	10	10	0.6238	
Diluent Control	1.0000	1.0000	0	10	10	10	*	
CHCK06	0.7000	0.7000	3	7	10	10	0.1053	0.0500
CHCK04A	1.0000	1.0000	0	9	9	9	1.0000	0.0500
Cos Pit	0.0000	0.0000	10	0	10	10		
*PCCK06	0.6000	0.6000	4	6	10	10	0.0433	0.0500

Hypothesis Test (1-tail, 0.05)

Fisher's Exact Test indicates significant differences
 Treatments vs Diluent Control

Dose-Response Plot

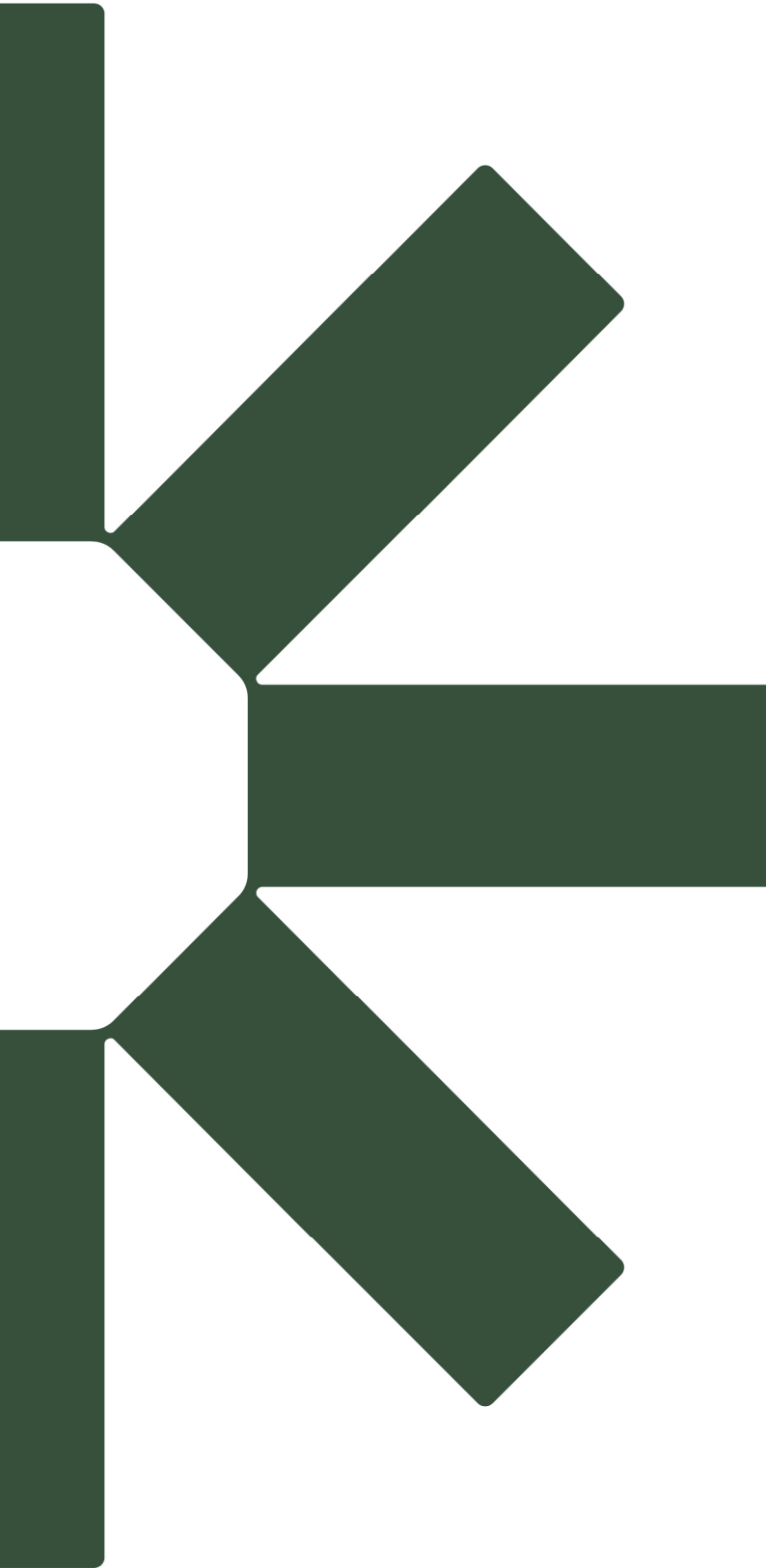


Ceriodaphnia Partial Life-Cycle Test-7 Day Unaffected

Start Date:	7/03/2025 17:00	Test ID:	PR2307/03	Sample ID:	Screens
End Date:	14/03/2025 17:00	Lab ID:	Various	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	15.90	14.00	18.00	1.37	7.36	10
Diluent Control		16.20	14.00	19.00	1.40	7.30	10
CHCK06		9.10	4.00	12.00	2.92	18.79	10
CHCK04A		17.00	14.00	21.00	2.18	8.68	9
Cos Pit		0.90	0.00	2.00	0.88	103.97	10
PCCK06		2.20	0.00	4.00	1.69	59.03	10
DMW Control	% unaffected	100.00	100.00	100.00	0.00	0.00	10
Diluent Control		100.00	100.00	100.00	0.00	0.00	10
CHCK06		70.00	0.00	100.00	48.30	9.93	10
CHCK04A		100.00	100.00	100.00	0.00	0.00	9
Cos Pit		0.00	0.00	0.00	0.00		10
PCCK06		60.00	0.00	100.00	51.64	11.98	10
DMW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
CHCK06		7.30	7.30	7.30	0.00	0.00	1
CHCK04A		6.50	6.50	6.50	0.00	0.00	1
Cos Pit		7.60	7.60	7.60	0.00	0.00	1
PCCK06		7.10	7.10	7.10	0.00	0.00	1
DMW Control	DO %	99.30	99.30	99.30	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
CHCK06		96.30	96.30	96.30	0.00	0.00	1
CHCK04A		93.80	93.80	93.80	0.00	0.00	1
Cos Pit		100.20	100.20	100.20	0.00	0.00	1
PCCK06		94.70	94.70	94.70	0.00	0.00	1
DMW Control	Cond uS/cm	175.00	175.00	175.00	0.00	0.00	1
Diluent Control		101.00	101.00	101.00	0.00	0.00	1
CHCK06		473.00	473.00	473.00	0.00	0.00	1
CHCK04A		467.00	467.00	467.00	0.00	0.00	1
Cos Pit		3950.00	3950.00	3950.00	0.00	0.00	1
PCCK06		48.00	48.00	48.00	0.00	0.00	1



Making Sustainability Happen

APPENDIX 2

Performance Improvement Report



Cosmo Howley Project Area Performance Improvement Report

2024-25



AGNICO EAGLE

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1. Introduction

This Performance Improvement Report outlines the outcomes of initiatives completed in 2024 at the Cosmo Howley Project Area, including the installation of new rock drains at the Mine Water Dam and Acid Pond 4. These installations have contributed to measurable improvements in water quality at environmental monitoring locations CHCK05 and CHCK03. The implementation of these containment measures is also expected to support long-term improvements in downstream water quality, including at CHCK06.

2. Mine Water Dam

2.1 Rock Drain Construction Completion

During the 2023–24 reporting period, NTMO identified inadequate seepage collection on the northwestern side of the Cosmo Waste Rock Dump and subsequently initiated measures to enhance containment and improve overall management of seepage in that area.

In October 2025, two new rock drains were constructed as shown in Figure 1. The installation was designed to improve the water quality at environmental monitoring location CHCK05, which is situated downstream of the Mine Water Dam. Table 1 highlights a positive trend in water quality at CHCK05 from 2023-24 reporting period to 2024-25, particularly in reduced metal concentrations and improved pH levels.

CHCK05 recorded a median pH of 3.95, whereas in the 2024-25 reporting period, pH levels increased to 4.75. Electrical conductivity also rose, from 1,035 µS/cm in the wet season to 1,833 µS/cm at CHCK05. Dissolved aluminium concentrations dropped significantly from 7,300 µg/L to 1,300 µg/L. Cobalt decreased from 210 µg/L to 150 µg/L, while copper fell from 130 µg/L to 50 µg/L.

TABLE 1 CHCK05 MEDIAN WATER QUALITY RESULTS 2023-25

Analyte	Units	CHCK06 TV	Median	
			2023-24	2024-25
Field Measurements				
pH	pH units	6.0–8.0	3.95	4.75
EC	µS/cm	700 ⁴	1,035	1,833
DO	% saturation	45 – 120 ⁴	91.9	90.6
Dissolved Metals				
Al	µg/L	196 ⁴	7,550	1,300
As		42 ²	5	3
Cd		0.4 ²	0.95	0.7
Cr		6 ²	0.5	0.5
Co		13 ²	215	150
Cu		1.8 ²	135	50
Fe		428 ⁴	1,020	420
Pb		5.6 ²	1	0.5
Mn		2,500 ²	6,450	5,200
Ni		13 ²	265	180
Se		18 ²	0.5	0.5
Zn		15 ²	155	100
General Chemistry				
Turbidity	NTU	32 ⁴	54	4.4
TSS	mg/L	28 ⁴	58	5
Cl ⁻		6 ⁴	6	5
SO ₄		408 ⁴	2100	990
Nutrients				
TN	mg/L	0.35 ¹	0.2	0.2
TP		0.03 ⁵	0.005	0.01



FIGURE 1 MINE WATER DAM ROCK DRAIN INSTALLATION

3. Acid Pond 4

3.1 Rock Drain Construction

Acid Pond 4 currently inadequately captures seepage from the northeastern side of Cosmo Waste Rock Dump. In October 2025, one new rock drain was constructed as shown in Figure 2. The installation was designed to improve the water quality at environmental monitoring location CHCK03, which is situated downstream of Acid Pond 4.

Table 1 highlights several notable changes in water quality at CHCK03 from 2023-24 reporting period to 2024-25. The median pH increased from 4.44 to 4.74, indicating a slight reduction in acidity. Electrical conductivity rose from 429 $\mu\text{S}/\text{cm}$ to 565 $\mu\text{S}/\text{cm}$, suggesting an increase in dissolved ions. Aluminium concentrations dropped significantly from 2,200 $\mu\text{g}/\text{L}$ to 135 $\mu\text{g}/\text{L}$, while cobalt decreased slightly from 58 $\mu\text{g}/\text{L}$ to 53 $\mu\text{g}/\text{L}$. Copper levels saw a substantial decline, falling from 58 $\mu\text{g}/\text{L}$ to just 13 $\mu\text{g}/\text{L}$. These trends suggest improvements in metal containment and a shift in water chemistry over the reporting period.

TABLE 2 CHCK03 MEDIAN WATER QUALITY RESULTS 2023-25

Analyte	Units	CHCK06 TV	Median	
			2023-24	2024-25
Field Measurements				
pH	pH units	6.0 – 8.0	4.44	4.74
EC	µS/cm	700 ⁴	429	565
DO	% saturation	45 – 120 ⁴	91.5	87.3
Dissolved Metals				
Al	µg/L	196 ⁴	2,200	135
As		42 ²	0.75	1.00
Cd		0.4 ²	0.2	0.2
Cr		6 ²	0.5	0.5
Co		13 ²	58	53
Cu		1.8 ²	58	13
Fe		428 ⁴	630	275
Pb		5.6 ²	0.5	0.5
Mn		2,500 ²	1,095	1,250
Ni		13 ²	81.0	52.5
Se		18 ²	0.5	0.5
Zn		15 ²	37.5	26.0
General Chemistry				
Turbidity	NTU	32 ⁴	3.9	4.8
TSS	mg/L	28 ⁴	15	11
Cl ⁻		6 ⁴	1	2
SO ₄		408 ⁴	200	255
Nutrients				
TN	mg/L	0.35 ¹	0.075	0.10
TP		0.03 ⁵	0.01	0.01



FIGURE 2 ACID POND 4 COMPLETED ROCK DRAIN INSTALLATION

APPENDIX 3

Biological and Sediment Report

Cosmo Howley Project Area

Biological and Sediment Monitoring 2025

Final Report



This report has been prepared for Northern Territory Mining Operations as a technical document to inform the Waste Discharge Licence Report.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. As a result, not all relevant site features and conditions may have been identified in this report.

Flow data, water quality data and rainfall data were obtained from NTMO and external sources. Aquatic Ecology Services has made the assumption that all data has been validated and is correct.

Version	Prepared by	Reviewed by	Review Date
Draft 1.0	T Steele	E Ordogh	5/08/2025
Final 2.0	T Steele		



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1. Background

1.1 Catchment

The Cosmo Howley Project Area (CHPA) is owned by Agnico Eagle (trading as NTMO), and includes many historical open-pit mining areas, as well as the Cosmo Deeps Underground Mine. NTMO ceased mining the underground area in March 2020 and entered a closure phase later the same year.

The catchment of the CHPA lies within the Adelaide River catchment to the north and the Daly River catchment to the south of the site. Howley Creek is the main sub-catchment system and is fed by creeks including unnamed tributaries draining the CHPA. Other minor sub-catchments in the CHPA are Hayes Creek and Bridge Creek. Howley Creek flows into the Margaret River which then flows to the Adelaide River, approximately 65 km northwest of the CHPA. The upper reaches of Bridge and Howley Creeks are approximately 210 km from the mouth of the Adelaide River. The creeks and associated tributaries draining the catchments are ephemeral, flowing only during the wet season. Stream flows are highly variable and extremely responsive to rainfall, reaching peak levels between January and March.

1.2 Mining and Rehabilitation

The CHPA has been mined over many years utilising both open cut and underground mining methods. The most recent operational phase ran from 2018 to 2020 as an underground mine with its portal located in the Cosmo Pit. During operations, rehabilitation of historical mining areas began with the aim of reducing the volume of waste rock exposed to the environment. Pit filling and reshaping continued after mine closure in early 2020, resulting in rehabilitation of the Mottrams and Howley waste rock dumps. Potentially acid forming (PAF) material has been placed within Cosmo Pit and capped to reduce negative impacts associated with passive discharge to the environment. Water treated in the 2024-2025 wet season was discharged to the environment using an operating procedure that calculates discharge volumes based on prevailing rainfall and flow conditions upstream in Howley Creek. Rehabilitation works are ongoing, with the acid ponds down-gradient of the Cosmo Waste Rock Dump being replaced by interception seepage sumps, and remediation works in the Mine Water Dam continuing. It is expected that a minimum of five years of monitoring will be completed after rehabilitation works are concluded.

1.3 Monitoring Program

Agnico Eagle, trading under NT Mining Operations (NTMO) have adopted an integrated, multiple lines of evidence approach to managing the environmental influences from active and passive discharges entering Howley Creek. This approach includes surface water monitoring, ecotoxicological assessment, macroinvertebrate, and sediment monitoring programs; the results of which are used to assess the effects to aquatic ecosystems following active and passive discharges.

Biological monitoring has occurred in the CHPA since 2010 and sediment monitoring at the same sites from 2016. In January 2019, NTMO submitted a Biological Monitoring Plan (BMP) to DENR, and was updated in 2022. This requires macroinvertebrate monitoring to be undertaken annually when active discharges of mine water have occurred during the previous wet season. In addition to biological monitoring, sediment

quality monitoring results assist with interpretation of macroinvertebrate community data. By monitoring both macroinvertebrates and sediment, an integrated assessment of long-term impacts from exposure to mine water, as well as any improvements as an outcome of rehabilitation can be determined.

1.4 **Scope**

Aquatic Ecology Services was engaged by NTMO to undertake biological monitoring at the CHPA, following the 2024-2025 wet season. In addition to field sampling, macroinvertebrate identification and data analysis were required. This report presents the findings of monitoring undertaken in the post-wet season of 2025.

2. Study Design

2.1 Sampling sites

Eight sites were visited during sampling (Table 1). This included one upstream and five downstream sites in the Howley Creek catchment. Two sites on Howley Creek (CHCK06 and CHCK05) are located downstream of active discharge points, and the three downstream sites (CHCK02, CHCK03 and MTSW02) are located downstream of passive discharges.

Two sites were also sampled on Hayes Creek, downstream of the CHPA. As the Hayes Creek headwaters are located within the CHPA boundary, there is no upstream site available in this catchment. The Hayes Creek catchment receives passive discharge from the CHPA including the ROM area.

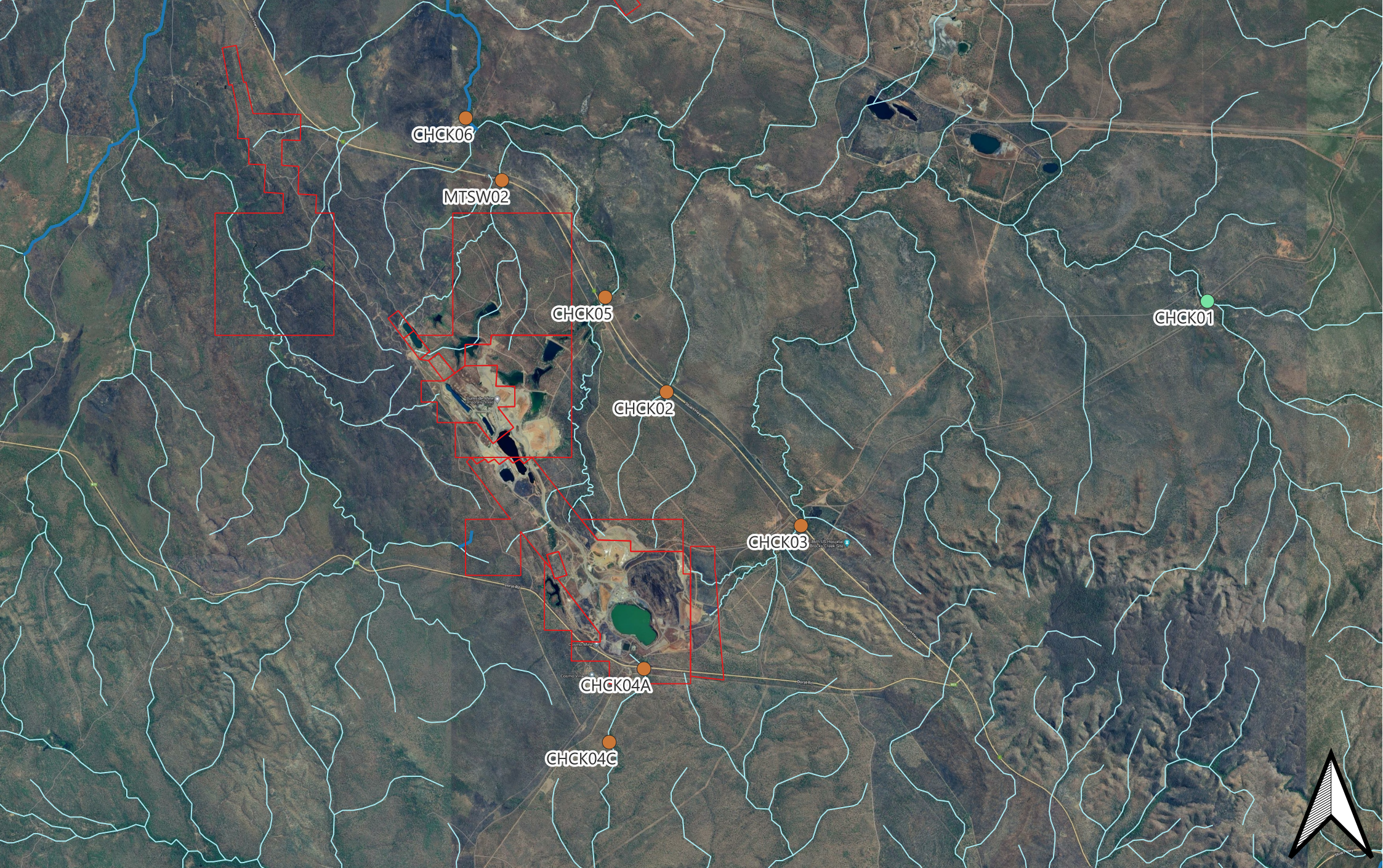
Site locations are presented in Figure 1.

Table 1 – Sampling sites at the CHPA

Site Code	Site type	Description	Easting	Northing
CHCK01	Upstream	Howley Creek Upstream water quality control point of Cosmo Howley Mine site	765996	8506947
CHCK02	Downstream	On the Stuart Hwy, upstream of the confluence with Howley Creek	757789	8505652
CHCK03	Downstream	Tributary of Howley Creek downstream of Acid Ponds and adjacent to haul road.	756770	8506992
MTSW02	Downstream	Tributary of Howley Creek, on the Stuart Hwy, heading towards Darwin. Overflow of SFD	755272	8508888
CHCK05	Downstream	Stuart Hwy crossing upstream of Howley Creek confluence	756770	8506992
CHCK06	Downstream	Howley Creek Downstream Compliance Monitoring Point of Cosmo Howley Mine site	754707	8509826
CHCK04A	Downstream	Unnamed tributary of Daly River, adjacent to Dorat Rd	757366	8501452
CHCK04C	Downstream	Hayes Creek, approximately 1 km downstream of the Mine Lease Boundary, within the Douglas Daly catchment.	756837	8500358

2.2 Timing

Sampling has routinely been conducted in the post-wet season during the recessional flow period, to capture the potential effects of mine site runoff during the preceding wet season. The timing of sampling has generally been undertaken in late April to mid-May. In 2025, rainfall was unseasonal and delayed sampling. Work was undertaken between 19-20th June to target adequate water availability at all sites.



3. Methods

All methods discussed below follow protocols set out in the BMP (NTMO 2022).

3.1 Habitat assessment

At each site, descriptions of habitat characteristics were recorded following the criteria listed in the Northern Territory AUSRIVAS "Darwin-Daly Region Model" field sheets (Lamche, 2007). Habitat assessments were undertaken in consideration of the whole reach sampled, including:

- Site description
- Water quality
- Instream physical characteristics (flow velocity and depth, instream habitat characteristics, bank height, riparian zone width)
- Riparian vegetation characteristics (types, %cover, exotic species, erosion, land use)
- Water quality observations (clarity, odour, oils, foam/scum, plumes etc.)
- Sketches of the site, including a cross - section of the reach

The information recorded was used to assist interpretation of biological data and to provide input data for the Northern Territory AUSRIVAS model. Data recorded is also used in conjunction with the biological community information as the basis of the overall health assessment.

Photos were taken of upstream and downstream portions of the reach sampled, as well as bank habitat and other key habitat features. This further characterises the habitat conditions at each site, serving as a pictorial record of site conditions that can be tracked over time using photos taken from the same photo points.

3.2 Water quality

The physico-chemical parameters of the water at each site were measured using a calibrated multi-parameter water quality meter. The following parameters were recorded:

- Water temperature (°C)
- Dissolved oxygen (DO) concentrations (mg/L and % saturation)
- pH
- Electrical conductivity (EC) (µS/cm)
- Turbidity

Water quality grab samples were also collected and analysed for dissolved metals that match parameters tested in sediment quality samples.

3.3 Sediment quality

Sediment sampling methods utilised at each site were in accordance with those outlined in ANZECC (2000) and Simpson and Batley (2016) and involved:

- The collection of multiple sub-samples using a spade of inert material.
- Compositing the sub-samples into a receptacle (also composed of inert material) and mixing the contents.
- The collection of one QA/QC duplicate sample per project area to validate results.
- Collecting a sub-sample from the mixture and placing it into a laboratory-supplied container, labelled with site and sample details.
- Sieving the sample to retain the <2mm fraction of sediment as per ANZG (2018) protocols
- Keeping samples in chilled eskies for onward delivery to a NATA accredited laboratory for testing.

Bioavailable metals data (from 1M HCl dilute acid digestion analysis) were analysed for the parameters shown in Table 2. Within each project area, comparisons were made between results from upstream and downstream of release points.

Table 2 – Testing parameters for sediments collected at CHPA

Group	Analytes
Metals: 1 M HCl acid digest, total metals	Al, As, Cd, Co, Cu, Fe, Mn, Ni, Zn
Ions	Total sulphur, sulfate,
Others	PSD, saturated pH, TOC

3.4 Macroinvertebrates

3.4.1 Field sampling

Macroinvertebrate sampling and processing followed procedures outlined in the Northern Territory AUSRIVAS Manual for the Darwin-Daly Region (Lamche, 2007). Sampling involved one field team member scraping submerged root matter associated with the lower bank to agitate and remove macroinvertebrates into the water column, while the other field team member swept a dip net through the water column downstream of the edge habitat, to collect the dislodged animals. Areas of riffle or fast flowing habitat, Pandanus roots and severe bank undercuts were avoided when collecting edge habitat samples.

Once collected, the samples were washed through 10 mm and 250 µm mesh sieves. The course mesh sieve was examined for large, conspicuous taxa, and these were placed in the labelled sample container. The sample collected in the fine mesh sieve was also placed in the labelled sample container and filled with 70% ethanol. All samples were sent to the macroinvertebrate laboratory for further processing and identification.

3.4.2 Laboratory processing

Samples were washed through a series of sieves (10 mm, 500 µm and 250 µm mesh sizes). Any large, conspicuous taxa identified in the 10 mm mesh sieve were added to the contents of the large mesh fraction retained in the field. The contents of the 500 µm mesh sieve were retained for macroinvertebrate identification and enumeration, while the 250 µm fraction was retained as sample residue for quality assurance purposes. The contents of the 500 µm mesh fraction was poured into a Marchant sub-sampler (Marchant, 1989) and extractions made randomly from cells (aliquots) in this apparatus. These extractions were placed under a microscope and the taxa identified and counted. This process continued until either all aliquots were examined, or a total of 200 individuals had been counted and identified. The number of aliquots required to be processed to obtain a minimum 200 individual sub-sample was recorded in order to be able to calculate abundance. A Leica stereo-dissection microscope was used to examine specimens.

In 2019, taxa were identified to species level, between 2020 and 2024, genus level identifications were undertaken, as there was little additional information gathered using species data versus genus or even family-level data (GHD 2019). Methodology was updated in 2022 and implemented in 2025 to identify samples to family level. Taxa were identified to family where possible, with the exception of key taxa identified in Lamche (2007), requiring identification to order level (e.g., Conchostraca). Quality assurance processes were followed as per Lamche (2007). Five percent of samples were sent to an external laboratory and checked for correct identification by an AUSRIVAS accredited Senior Taxonomist.

3.5 Data analysis

3.5.1 Water and sediment quality

Water and sediment grab samples collected were analysed by a NATA accredited laboratory. The results were compared to available default guideline values (ANZG 2025). Surface water guideline values utilised were based on the determination that the watercourses are slightly to moderately disturbed.

3.5.2 Macroinvertebrates

A number of indices can be used to assess and/or quantify the influence of anthropogenic activities on macroinvertebrate communities. Responses to contaminants or changes in flow can result in anything from changes in abundance and diversity through to changes in community composition through the loss or reduction of sensitive taxa. As such, the multiple lines of evidence approach has been adopted with regards to interpreting macroinvertebrate community data. Where possible, data from 2025 were compared against historical data collected by NTMO, as well as Crocodile Gold macroinvertebrate monitoring data from 2010-2012.

In previous years, macroinvertebrate data was assessed using the NT AUSRIVAS Darwin-Daly Early (dry season) Family level Edge habitat model. New guidance on the use of these models in the NT to understand impacts of point source pollution have been published (ANZG 2021). The updated guidance states that the models are not useful in understanding aquatic ecosystem health outside of the large rivers where macroinvertebrates have been collected, and therefore the use of AUSRIVAS modelling was discontinued in 2020. AUSRIVAS habitat variables continue to be collected to allow for long-term analysis of changes in

habitat quality if required, and to allow for future modelling to take place should guidance from ANZG change.

Macroinvertebrate community indices will be calculated for each sample at each site. Long-term medians will be calculated using historical data. The use of median values allows for consideration of the overall performance of metrics at a particular site over previous years. Metrics and their long-term median values will be compared between sites to understand the temporal and spatial differences of sites within the catchment. A one-way ANOVA was performed, comparing metric results from each treatment (upstream or downstream). Results were only used from Howley Creek, as these sites are located directly upstream and downstream of discharges from CHPA. Sites located on Howley Creek, or directly downstream of the discharge were used for analysis. Analyses were conducted in Statistica v12.

A summary of the univariate macroinvertebrate indices assessed as part of this study are provided below:

- Relative abundance – Total number of individual taxa collected at a site. This information is calculated based on processing requirements in the laboratory (% of sample processed).
- Taxa richness – Total number of taxa present at the site used as a measure of diversity of families (used for long-term data analysis).
- PET richness – total number of families from orders Plecoptera, Ephemeroptera and Trichoptera. PET taxa are generally more sensitive to disturbance.
- SIGNAL-2 – a biotic index that allocates a value to each macroinvertebrate family based on their sensitivity to pollution. The metric is calculated by averaging the index of all families collected. Lamche (2007) cautions against the use of the SIGNAL-2 index for assessing the status of Northern Territory macroinvertebrate communities. This measure is however, considered appropriate for this study as the number of pollution-sensitive versus pollution-tolerant families does provide some insight to the level of stress that the macroinvertebrate community is experiencing.

In addition to univariate analysis of metrics, an assessment of differences in the macroinvertebrate community composition will be undertaken. NMDS Ordination provides a representation of the relative similarity of entities (i.e., samples) based on their attributes (i.e. macroinvertebrate community composition) within a reduced dimensional space. The more similar sites are to each other, the closer they are located in the NMDS ordination space. In this study, NMDS plots were used to display the similarity between site types (Impacted and Control) and Years (sampling events). A similarity matrix for all pairs of samples based on the Bray-Curtis similarity coefficient was calculated. Stress, which is a measure of the distortion produced by compressing multi-dimensional data into a reduced set of dimensions, was used to gauge how reliable the patterns presented in two-dimensional NMDS plots are. Stress levels above 0.20 indicate a poor representation of inter-sample similarity and, as such, the NMDS results with stress values of this order require interpretation with caution (Clarke *et al.* 2014).

4. Results and Discussion

4.1 Site conditions

4.1.1 Rainfall and flow

Rainfall recorded at Cosmo Mine is presented below in Figure 2. A total of 1907.4mm of rain was recorded in the 2024-2025 wet season, which was spread more evenly throughout the season when compared with the previous year. Widespread rainfall through the wet season resulted in flow being present in Howley Creek from December and ceasing in early June (Figure 3). Peak flows were recorded in February 2025. In the months leading up to sampling, unseasonal rainfall was recorded in May, which maintained flows through Howley Creek into June. Although data is not available for May 2025, flow was observed during an earlier attempt to sample Howley Creek in May. Rainfall was not recorded for the month leading up to sampling, which allowed for flow and conditions at sites in the Howley and Hayes Creek catchments to stabilise and be appropriate for sampling in June 2025.

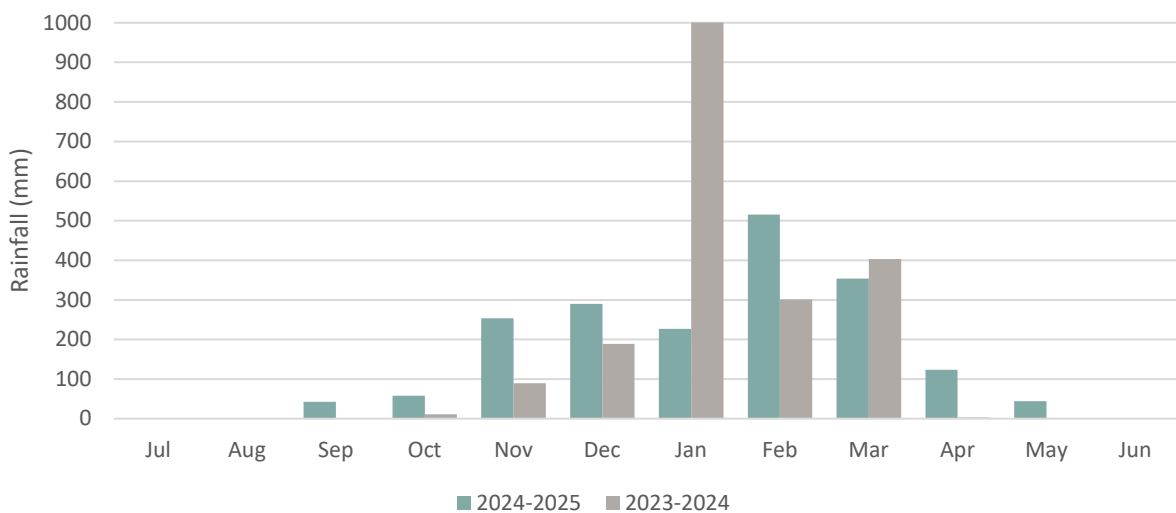


Figure 2 – Monthly Rainfall recorded at CHPA July 2024 – June 2025 compared with previous years' data

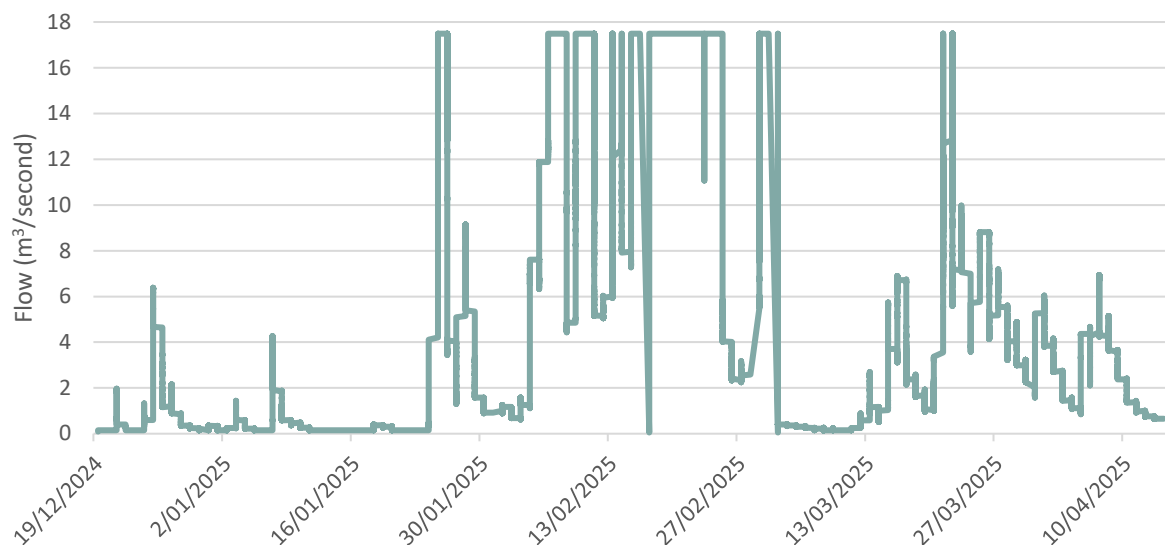


Figure 3 – Creek height at CHCK06 December 2024 – May 2025

4.1.2 *Habitat characteristics*

Habitat characteristics of each site are detailed below in Table 3. All sites were flowing at the time of sampling, and it is considered that conditions were appropriate for macroinvertebrate sampling across the Howley and Hayes Creek catchments.

Table 3 – BMP site descriptions, June 2025

Site description	Site photo
CHCK01 – Upstream The site was a mixture of runs and pools with cobbles, sand and silt covered by detritus making up the majority of substrate. Edges were a combination of undercut banks and exposed roots and sand. Shading was high, and riparian vegetation was made up of two layers: trees and grasses.	
CHCK05 – Downstream The site is located downstream of the Stuart highway and downstream of active and passive discharges from CHPA. The site did not contain water at the time of sampling. The bed was covered by iron-producing bacteria, and a sediment sample was taken.	Photo unavailable
CHCK06 – Downstream Habitat characteristics were similar to those at CHCK01. The riparian zone was intact, and shading was high. The site was made up of one long pool, with a run and the upstream end of the site. Water was very clear, and the bed was covered by a mixture of detritus, exposed roots and sand.	

Site description	Site photo
MTSW02 – Downstream The site is located downstream of a multiple piped culvert on the Stuart Highway. The site was characterised by a deep pool at the highway crossing flowing downstream to a long run. The entire site was heavily shaded by the thick growth of bamboo. Detritus was heavily deposited in the pool, channel and along banks, and was abundant in the wetted areas of the creek. Water was clear, but banks were heavily disturbed by pigs.	
CHCK02 – Downstream The site was located in a pool directly upstream of a multiple piped culvert on the Stuart Highway. The pool was lined by small paperbark trees and had a dense growth of both emergent and submerged macrophytes. Fine detritus and sediment lined the bed of the pool. Moderate shade was provided by riparian vegetation and paperbarks growing within the creek bed.	
CHCK03 – Downstream The site was located upstream of the Stuart Highway. The site was heavily shaded, and consisted of a large, shallow pool surrounded by bamboo and riparian tree species. The pool was shallow, with runs upstream and downstream of the site. The majority of substrate was sand with a cover of thick silt. Iron producing bacteria was common throughout the site, and large woody debris buildup indicated elevated flows during the wet season.	
CHCK04A – Downstream The site consisted of a narrow channel connecting pools with a sparse riparian zone. Pastoral grasses were common along edges, with the downstream end of the pool containing a small patch of large woody debris. Detritus was common along the pool bed; the substrate was mainly clay and pebbles.	

Site description	Site photo
CHCK04C – Downstream Although the site is located away from human disturbances, there was some evidence of livestock access to the creek. The riparian zone was close to intact, with some weeds present. Shading was high, and detritus was thick on the creek bed. Some trailing vegetation in the form of grass and overhanging shrubs was present. Pig damage was observed on both banks and in the riparian zone.	

4.2 Water quality

Water quality data collected at sampling sites is presented below in Table 4. Sites on Howley Creek directly downstream of passive discharges (CHCK02, CHCK03 and MTSW02) also showed elevated EC values. Turbidity was relatively similar at all sites. In general, pH values were circumneutral, except for CHCK03, which was more than a pH unit lower than any other site.

In situ water quality results from sites in the Hayes Creek catchment, were indicative of their position within the catchment. With increased distance from the CHPA, EC decreased, whereas pH and turbidity remained similar.

Table 4 – *In situ* water quality results from sites visited in June 2025

Site Code	Date	Time	Temp (°C)	pH	DO (%)	DO (mg/L)	EC (µS/cm)	Depth (m)
CHCK01	20/06/2025	10:50	21.3	6.98	40.4	3.56	157.6	0.4
CHCK06	19/06/2025	8:37	17.7	7.31	18.6	1.69	847	0.25
CHCK02	19/06/2025	13:35	21.1	7.17	74.3	6.87	325	0.3
CHCK03	19/06/2025	15:18	21.2	5.88	85.4	7.52	1440	0.4
MTSW02	19/06/2025	10:30	20	7.22	24.2	2.14	733	0.2
CHCK04A	20/06/2025	10:05	17.7	6.68	55.6	5.24	791	0.3
CHCK04C	20/06/2025	8:10	16.6	6.61	45.3	4.43	242.9	0.15

4.3 Sediment quality

Sediment samples were compared to guideline values and long-term medians as presented in Table 5 and Table 6. Total organic carbon (TOC) levels were variable but generally low, suggesting limited potential for TOC to reduce the bioavailability of metals in sediments from Howley Creek and Hayes Creek.

Although SQGVs are unavailable for several metals, acid-extractible metal concentrations at downstream sites exceeded upstream reference concentrations in Howley Creek. At site CHCK05, both arsenic and copper concentrations were recorded above guideline values and long-term medians. These metals have shown variability over time at this site, with no evidence of decline (Figure 4 and Figure 5). Other metals (aluminium, cobalt, nickel, and zinc) also exceeded long-term medians. For most metals, the lowest values were recorded at CHCK02, downstream of rehabilitation works at the Mine Water Dam (MWD)

In contrast, all acid-extractible metal concentrations at compliance point CHCK06 were below long-term medians. Arsenic concentrations that have been historically elevated, continue to decline, reaching their lowest level in 2025 (Figure 6).

Hayes Creek exhibited a similar spatial trend, with metal concentrations decreasing downstream of the CHPA. Arsenic remained above guideline values—a persistent trend since rehabilitation commenced (Figure 7), though data is not available from the site during the operations period. The circumneutral pH of surface waters in the catchment suggests low bioavailability of metals present in sediments.

Table 5 – Analysis results of sediment parameters from 2025, compared with long-term medians. All values (except pH) are presented in mg/kg – Howley Creek Catchment

Site Type	Site	TOC	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Zinc
SQGV		-	-	20	1.5	80	-	65	-	50	-	21	200
SQGV-high		-	-	70	10	370	-	270	-	220	-	52	410
LOR		1,000	1	4	0.5	1	1	1	1	1	1	1	1
Upstream	CHCK01	3,700	230	<4	<0.5	<1	1.5	1	1400	3	66	<1	2
	Median	5,600	380	<4	<0.5	<1	2	3	1,400	4	68	1	3
Downstream	CHCK05	17,000	5,800	54	<0.5	2	36	110	2,800	13	110	17	50
	Median	17,000	5,400	37	<0.5	2	34	80	5,000	13	200	14	28
	CHCK06	3,400	700	<4	<0.5	<1	25	9	1,300	3	390	9	20
	Median	12,000	2,200	12	<0.5	<1	60	33	2,300	6	640	30	44
	CHCK02	13,000	400	<4	<0.5	<1	4.7	4	2,400	5	91	2	4
	Median	24,500	740	4	<0.5	3	8	10	2,550	7	170	5	7
	CHCK03	7,200	3,400	4	<0.5	2	22	55	3,300	5	170	6	13
	Median	7,600	2,300	4	<0.5	2	16.5	42	3,000	6	185	5.5	9
	MTSW02	18,000	1,300	<4	<0.5	<1	21	11	3,300	12	370	8	43
	Median	26,500	4,400	7	<0.5	4	19	23	2,800	12	205	7	63

Table 6 - Analysis results of sediment parameters from 2025, compared with long-term medians. All values (except pH) are presented in mg/kg – Hayes Creek Catchment

Site Type	Site	TOC	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
SQGV		-	-	20	1.5	-	80	65	-	50	-	21	200
SQGV-high		-	-	70	10	-	370	270	-	220	-	52	410
LOR		1,000	1	4	0.5	1	1	1	1	1	1	1	1
	CHCK04A	25000	1100	40	<0.5	3	7.9	12	4900	14	160	4	11
	Median	6000	440	29	<0.5	2	4.7	10	1100	7	83	2	2
	CHCK04C	3600	260	10	<0.5	<1	1.5	3	1400	3	21	<1	1
	Median	6000	460	19	<0.5	1.5	2.6	10	1700	3	34	2	2

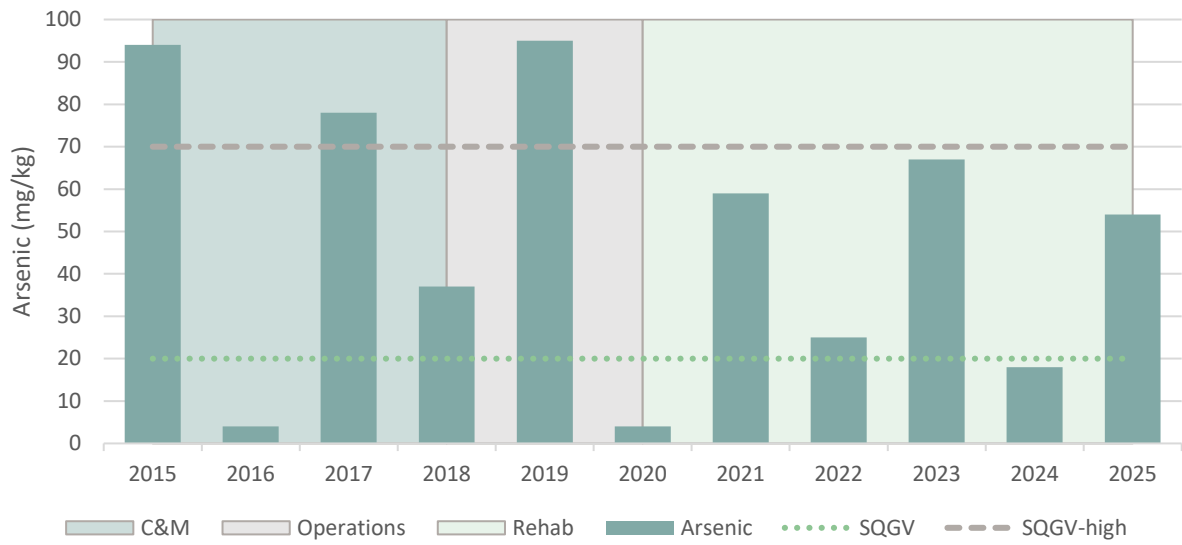


Figure 4 - Historical acid-extractable arsenic in sediments at CHCK05

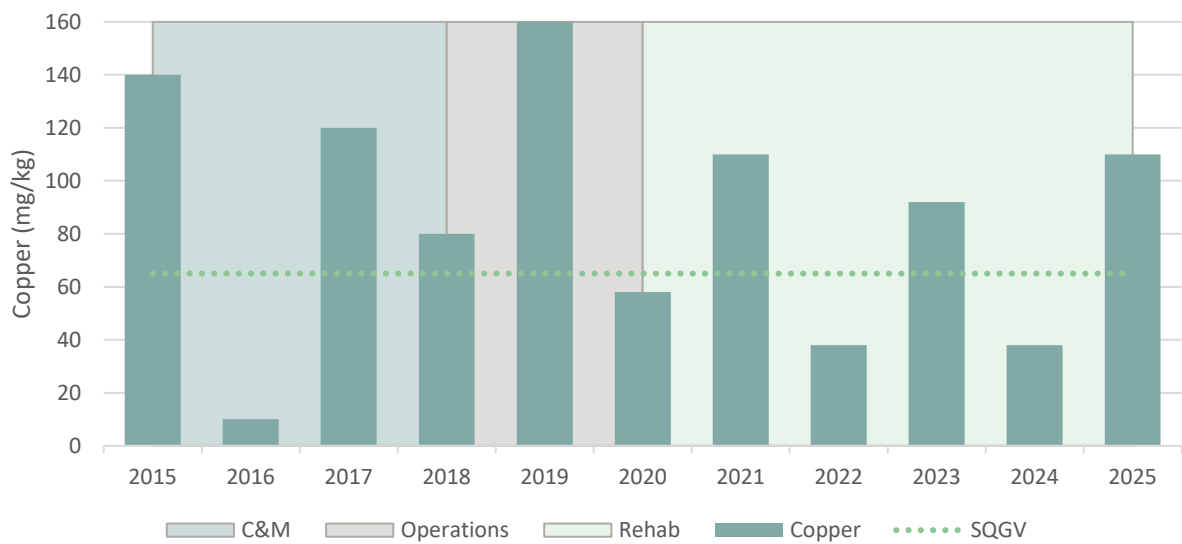


Figure 5 – Historical acid-extractable copper in sediments at CHCK05

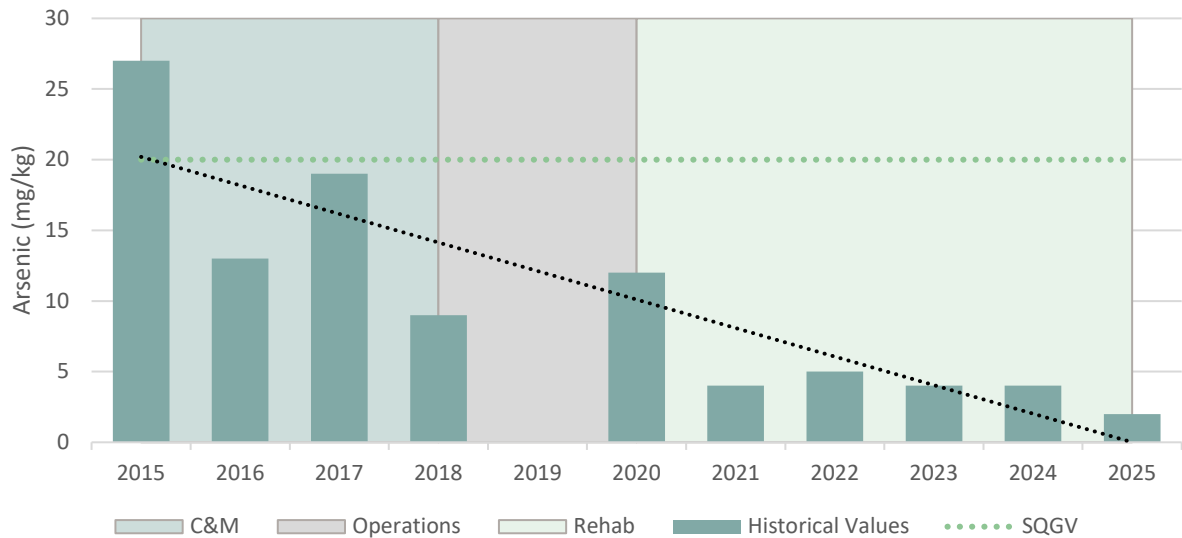


Figure 6 - Historical acid-extractable arsenic concentrations at CHCK06

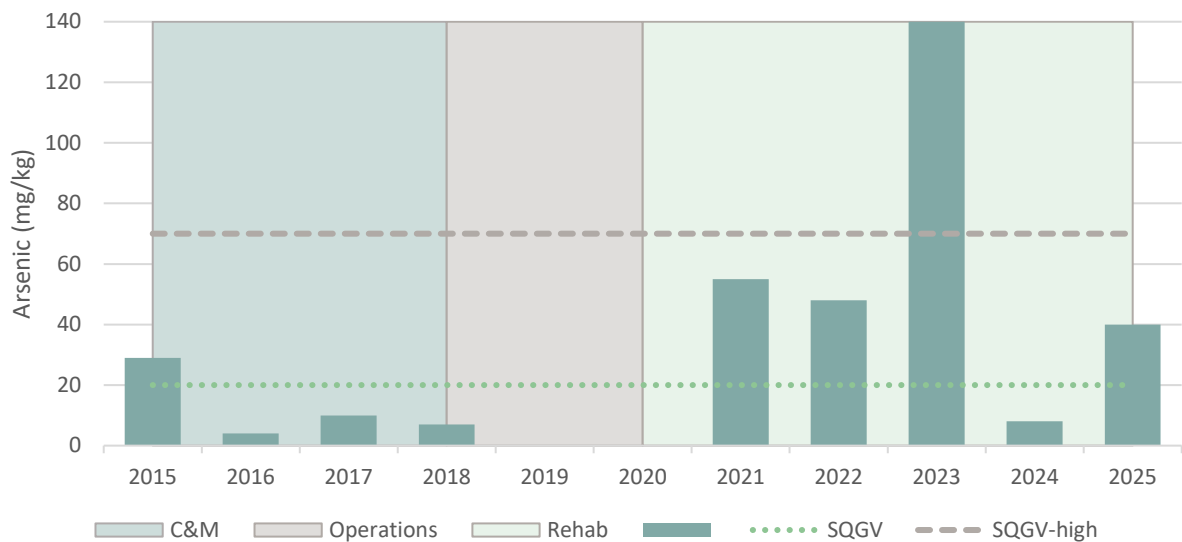


Figure 7 - Historical acid-extractable arsenic concentrations at CHCK04A

4.4 Macroinvertebrates

The following sections summarise the findings of results from 2025, including historical comparisons of aquatic ecosystem health. Raw data is attached in Appendix B.

4.4.1 Relative abundance

The relative abundance of macroinvertebrates collected in 2025 are presented compared with long-term medians in Figure 8 and Figure 9. The relative abundance of samples collected on Howley Creek downstream of the CHPA were higher than the long-term median except at site CHCK02. A significant difference in relative abundance between the treatments was found (Table 7, Figure 10), which is contributed to by samples collected at CHCK02 and CHCK03.

The relative abundance of samples from sites on Hayes Creek were also above median values, and similar at both sites.

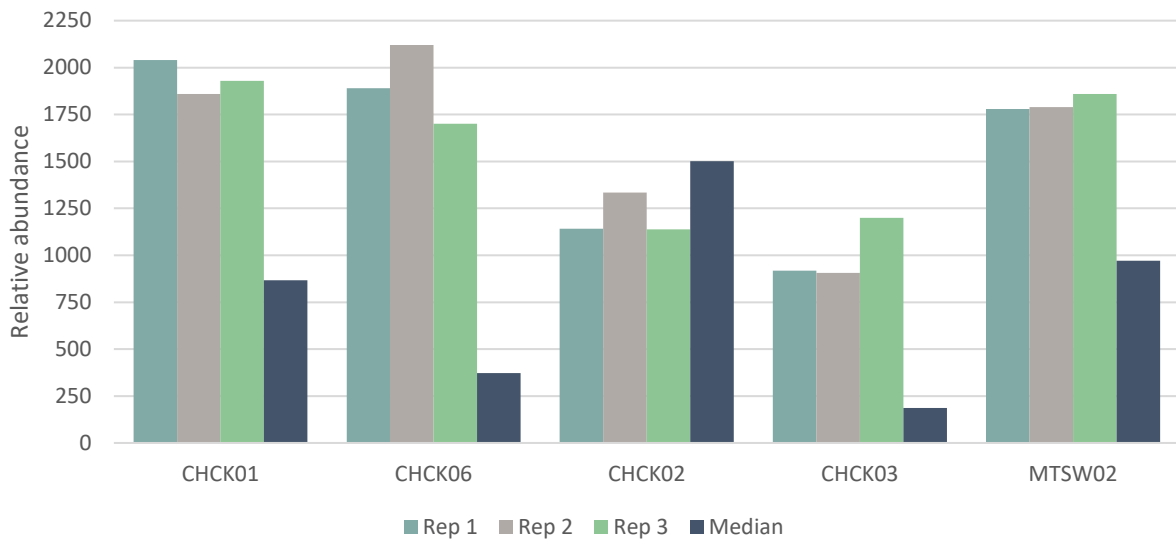


Figure 8 – Relative abundance of samples collected in 2025 compared with long-term median – Howley Creek

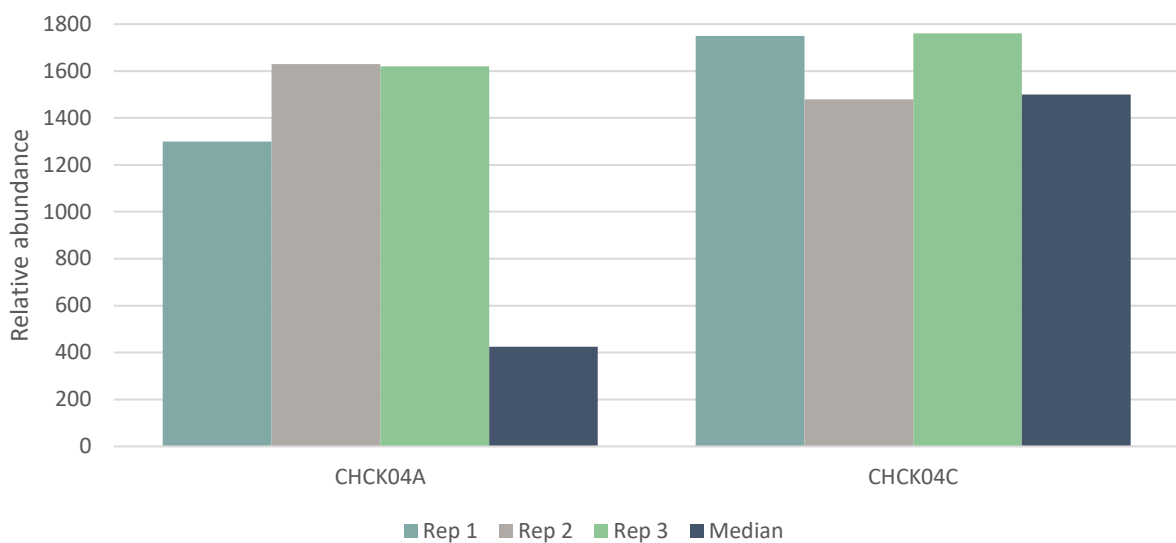


Figure 9 – Relative abundance of samples collected in 2025 compared with long-term median – Hayes Creek

Table 7 – One-way ANOVA results for samples collected on Howley Creek

Effect	df	SS	MS	F	<i>p</i>
Groups (between groups)	1	816348.9307	816348.9307	7.1124	0.02362
Error (within groups)	10	1147785.559	114778.5559		
Total	11	1964134.489	178557.6809		

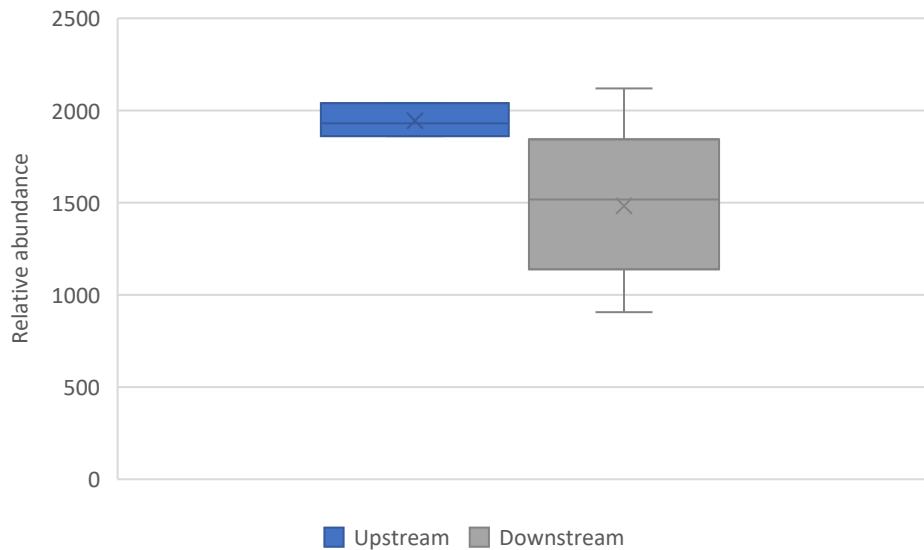


Figure 10 – Difference in relative abundance between site types in 2025

4.4.2 Taxa richness

The family taxa richness for samples collected in 2025 are presented in Figure 11 and Figure 12. The majority of samples at each site recorded taxa richness above or equal to the long-term median, and taxa richness similar at the upstream and compliance sites. Although there were some visible differences in taxa richness of samples collected downstream of the CHPA compared with upstream, and there was no significant difference found between the treatments (Appendix A, Table 8)

Samples collected at sites on Hayes Creek showed similar diversity between samples, and results were above the long-term median downstream at CHCK04C (Figure 12). The median value for CHCK04A contains far less data compared to the downstream site, and so data should be treated with some caution. Differences in habitat availability between the two sites on Hayes Creek were evident, and so this may be impacting the results at the site.

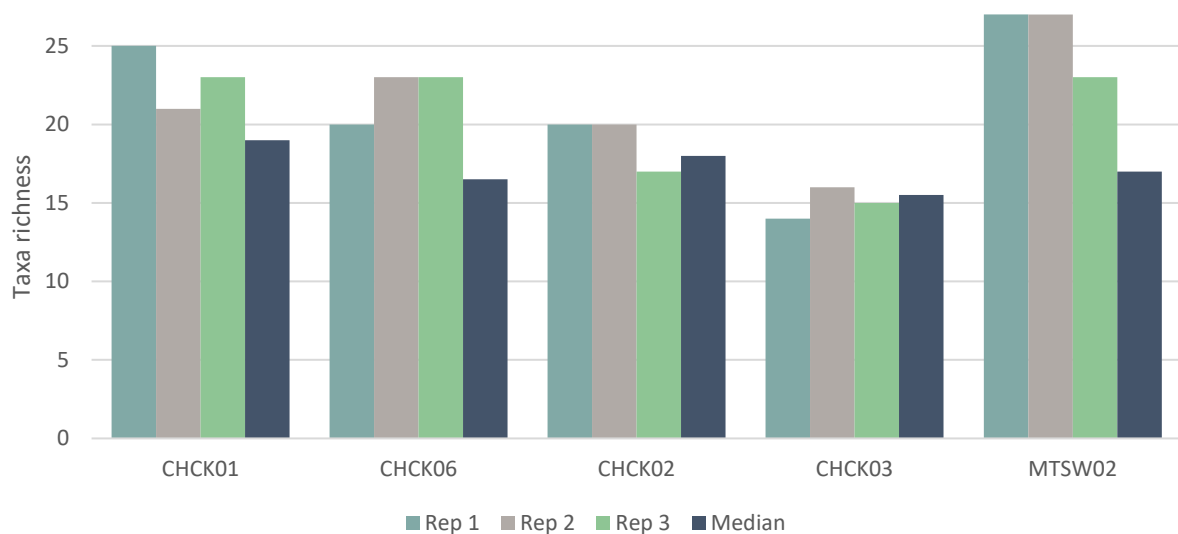


Figure 11 -Family taxa richness from sites sampled in 2025 compared with long-term median values – Howley Creek

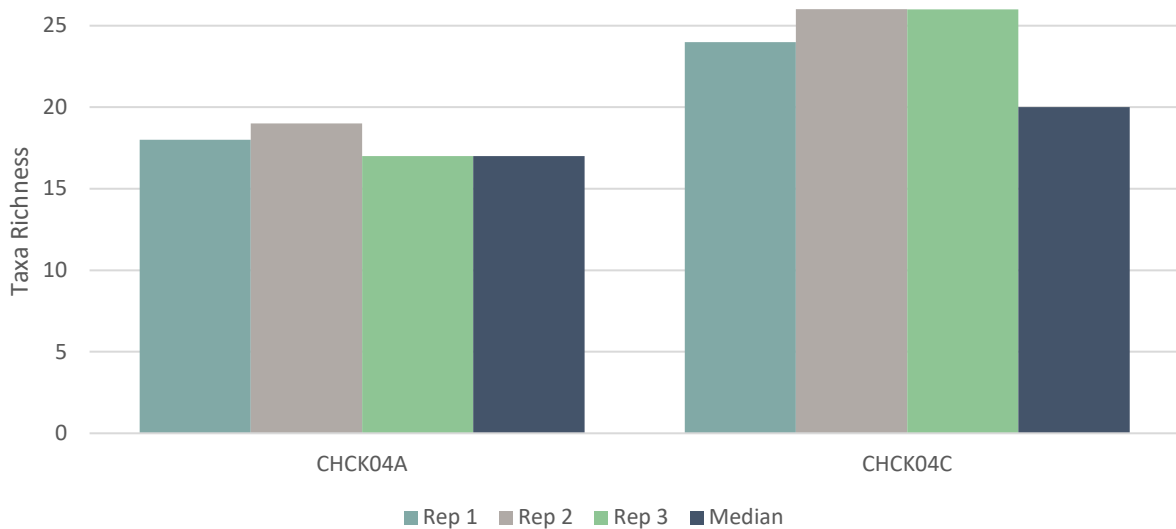


Figure 12 - Family taxa richness from sites sampled in 2025 compared with long-term median values – Hayes Creek

4.4.3 PET richness

PET richness results for samples collected in 2025 are presented in Figure 13 and Figure 14. There was a greater number of PET taxa collected upstream when compared to the compliance site CHCK06. Other downstream sites CHCH02 and CHCK03 recorded lower numbers, whereas MTSW02 was well above the long-term median and similar to the upstream site. The variable results across the downstream sites resulted in no significant difference between site types (Appendix A, Table 9).

Samples from sites on Hayes Creek increased in PET richness. All samples were either equal to or above the long-term median.

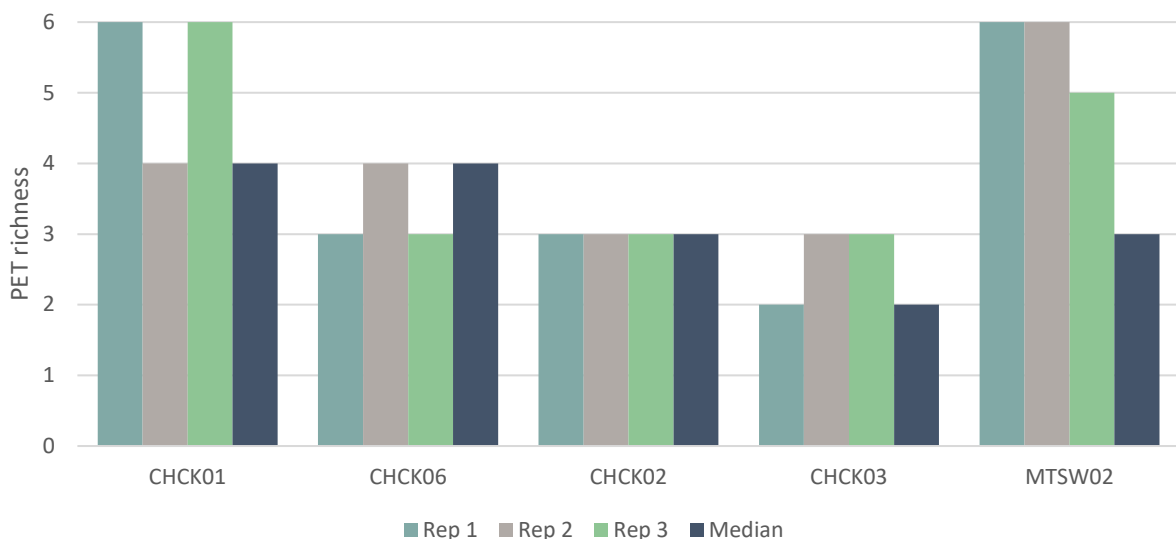


Figure 13 – PET richness from sites sampled in 2025 compared with long-term median values Howley Creek

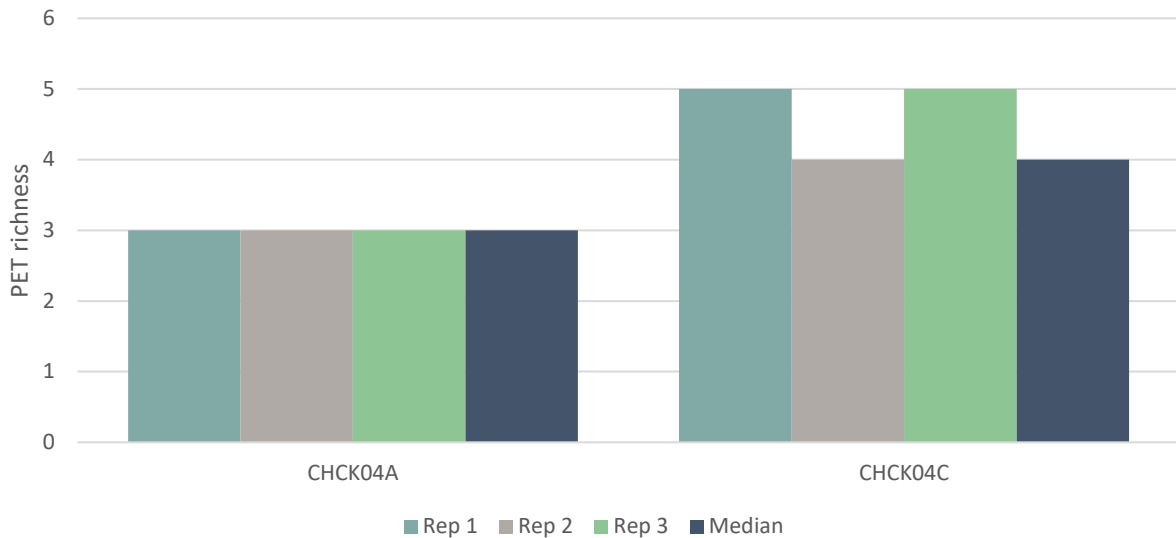


Figure 14 – PET richness from sites sampled in 2025 compared with long-term median values Hayes Creek

4.4.4 SIGNAL-2

SIGNAL-2 scores calculated for samples collected in 2025 are presented in Figure 15 and Figure 16. All SIGNAL-2 scores downstream on Howley Creek were similar, and resulted in no significant difference being found between site types (Appendix A, Table 10). All sites showed results similar to the long-term median. SIGNAL-2 values across the Howley Creek catchment indicate a community that is pollution tolerant.

SIGNAL-2 scores on Hayes Creek were well similar to each other and similar to the median value at both sites, indicating a similar sensitivity to pollution at both sites.

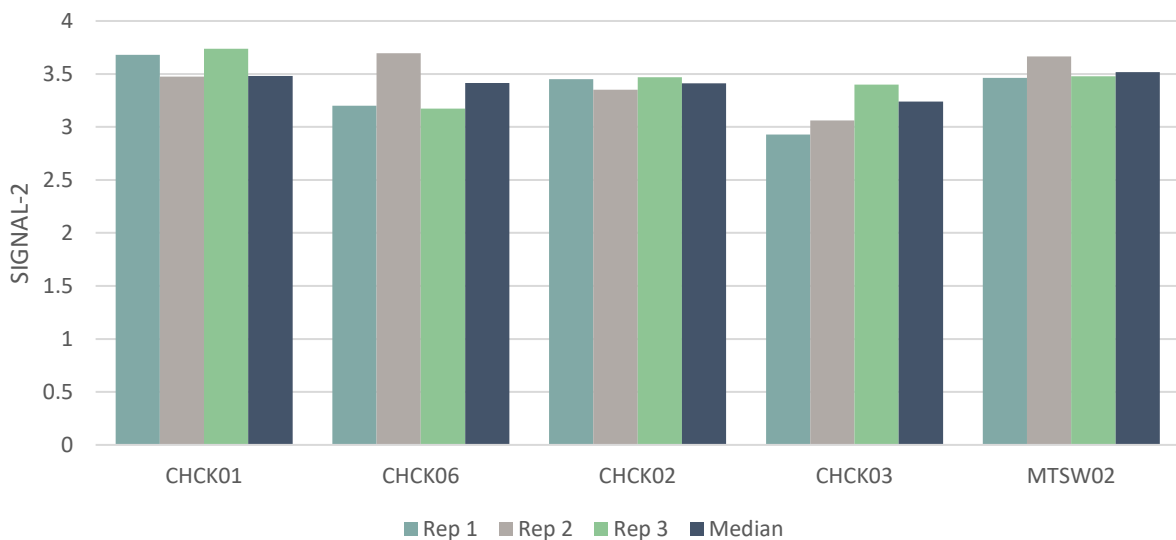


Figure 15 – SIGNAL-2 scores for samples collected in 2025 compared with long-term medians – Howley Creek

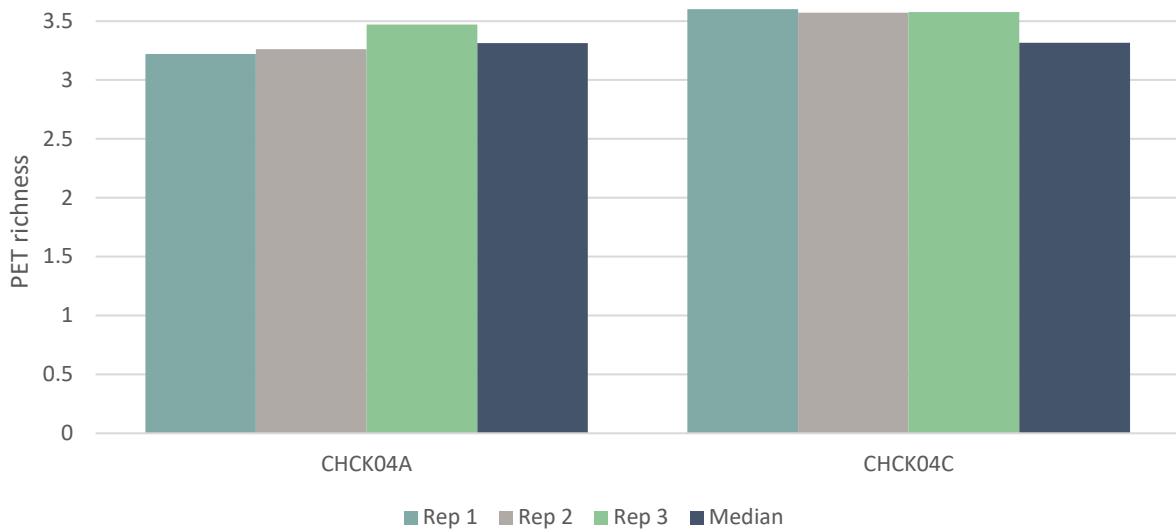


Figure 16 - SIGNAL-2 scores for samples collected in 2025 compared with long-term medians – Hayes Creek

4.4.5 Community composition

Family-level data was used to analyse community composition of 2025 data from Howley Creek (Figure 17). The NMDS plot shows a grouping of samples into two groups of 60% overall similarity in community composition. The greatest similarity in community composition was found among samples at CHCK03, with the remainder of samples being at least 60% similar to each other. There was no pattern in community composition that suggested a significant difference between families occurring at upstream and most downstream sites, which concurs with univariate results.

The Grouping of samples from CHCK03 supports diversity and abundance metrics for the sites when compared with others on Howley Creek, and reflects the water/sediment quality recorded at those sites.

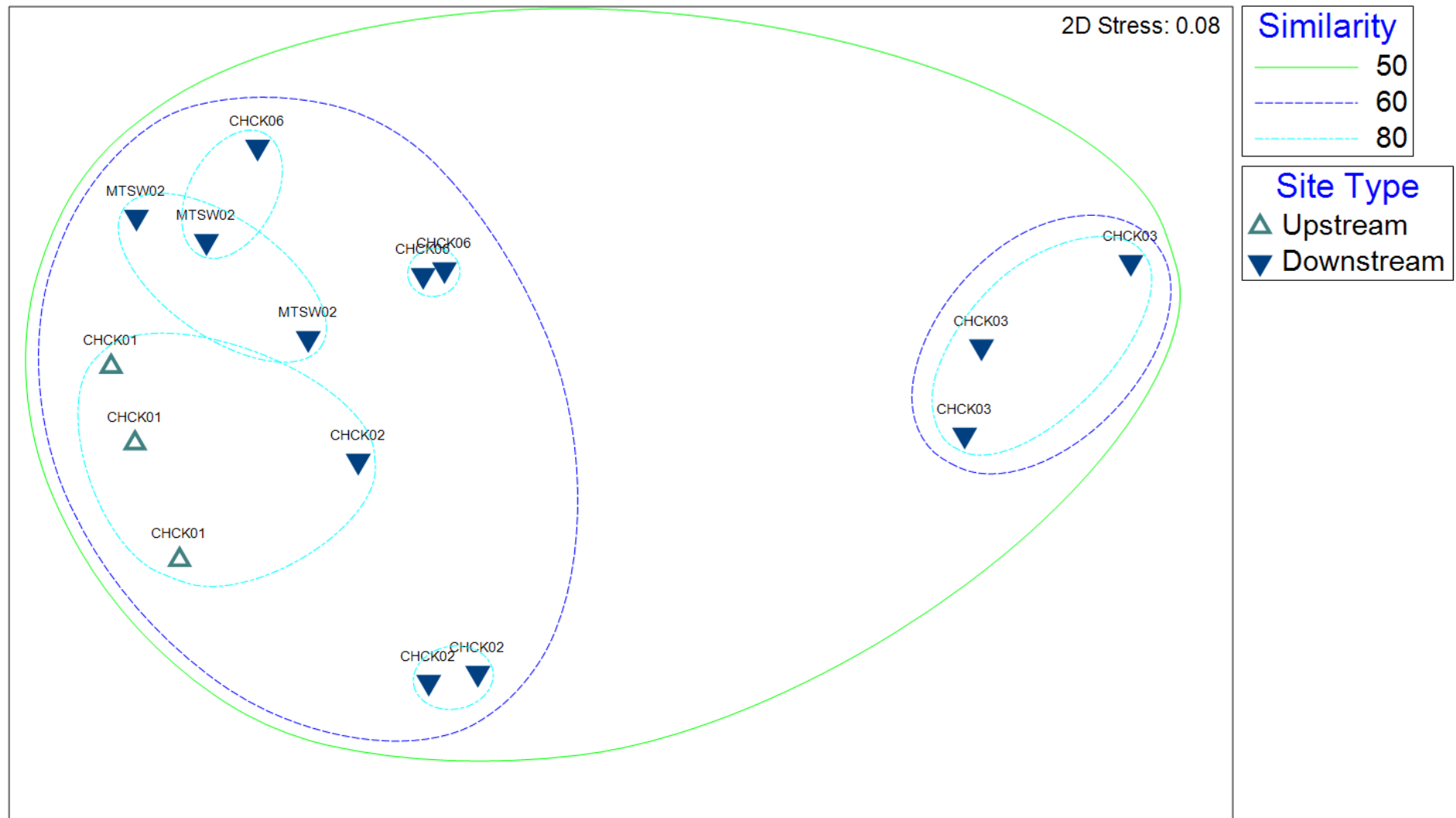


Figure 17 - NMDS plot demonstrating community composition between site types of samples collected on Howley Creek 2025

4.5 Discussion

4.5.1 Howley Creek Catchment

Wet season conditions in 2024-2025 were irregular, with rain spread throughout the wet season with rain occurring late and in short bursts into the early dry season. June 2025 represented the latest macroinvertebrate sampling event since sampling began in 2010 due to rain recorded in May. Although two peaks in flow were recorded (late February and May), consistent flow was recorded from December 2024. In particular, the months leading up to the sampling event recorded rainfall and resultant conditions were favourable to macroinvertebrate community establishment.

Weak-acid extraction of metals showed that the concentration of metals was higher at sites downstream of the CHPA compared with upstream. The diversion of seepage to the MWD away from the spillway towards CHCK02 has resulted in improved sediment quality being recorded at the site, with sediment results closest to upstream values. Macroinvertebrate results at CHCK02 were similar to or above the long-term median indicating an overall improvement for the site, along with the macroinvertebrate community composition of one sample being at least 80% similar to the reference site samples.

Sites closest to mine infrastructure (CHCK05 and CHCK03) showed the greatest level of influence of mine-affected water on sediment metal accumulation. Macroinvertebrates could not be collected at CHCK05, but it is assumed that based on previous results for sediment and biological monitoring at the site, an impact to macroinvertebrate community was likely. The lower pH of waters at CHCK03 suggest that metals would be more bioavailable at that site compared with others, which was reflected in macroinvertebrate community results the site. Sediment metal concentrations at CHCK05 don't appear to be migrating downstream, with all metals reduced downstream at CHCK06. With increased distance downstream of the CHPA, both metal concentrations and aquatic ecosystem health metrics improved, indicating that poor water quality impacts are spatially limited close to the mine.

Metal concentrations in sediments at CHCK06 were consistently lower than long-term median results in 2025. There also appeared to be a decrease over time of a number of metals at the site. For example, the arsenic concentration in sediments have reached their lowest level to date with a trend in reduction of metal load since rehabilitation began. The below long-term average concentrations for all metals at CHCK06 indicates that there has been a reduction in cumulative impacts associated with mine water reaching the receiving environment. Notable improvements have been observed at CHCK02 and MTSW02.

Results of multivariate analyses showed a distinct grouping of sites based on community composition, which was reflected in diversity and abundance metrics. In general, samples from each site grouped together denoting the influence of habitat characteristics of a site on the macroinvertebrate community present. The distinction of CHCK03 from other sites indicates that poor water and subsequent sediment quality is likely to be driving community composition and poor aquatic ecosystem health at the site.

A site downstream of CHCK06 would be helpful to understand ecosystem recovery. The use of a "Recovery" site type allows for the analysis of results to compare sites upstream to recovery sites and can assist in demonstration of the geographical extent of changes in the macroinvertebrate community downstream of

the CHPA. The establishment of a site would be subject to access and landholder agreement. Additionally, a second upstream site would allow for more robust analysis of data when comparing upstream and downstream sites.

Active discharge from the CHPA does not appear to have resulted in any significant impacts to aquatic ecosystem health at Howley Creek in the 2024-2025 wet season. Despite the poor results closer to the CHPA, remediation of contaminant sources on site appears to be improving the overall aquatic ecosystem health of Howley Creek. The detection of impacts to aquatic ecosystem health close the CHPA are more likely to be associated with passive discharges that are being actively remediated, and so it is anticipated that improvement will continue over time. A trend in improved ecosystem health appears to be emerging, but this needs to be confirmed through collection of data over time.

4.5.2 *Hayes Creek*

There was a record above the SQGV at CHCK04A on Hayes Creek. A general trend in the prevalence of pollution tolerant taxa and an impaired macroinvertebrate community was observed at CHCK04A, with an increase in all macroinvertebrate metrics and decrease in metal concentration in sediments observed downstream at CHCK04C. Site CHCK04A is located in the headwaters of Hayes creek and is therefore likely to experience more variable volume and frequency of flows. Due to its position in the catchment, habitat complexity at the site is expected to be lower, and therefore diversity of macroinvertebrates would follow the same trend. The elevated metal concentrations in sediments should continue to be monitored to understand if the elevated results will be a persistent issue as rehabilitation continues. More complex and favourable habitat may be possible to sample downstream of the current location of sampling, which should be explored during the next sampling event.

5. Conclusions and Recommendations

- Active discharge from the CHPA has not resulted in any impacts to aquatic ecosystem health in the 2024-2025 wet season.
- Although discernible differences could be seen in macroinvertebrate metrics directly downstream of passive discharges from the CHPA, there were no significant differences in the macroinvertebrate community between sites upstream and downstream for metrics except relative abundance. The similarities in the composition of taxa were grouped relative to their position on Howley Creek.
- The macroinvertebrate community at CHCK05 and CHCK03 is likely to be experiencing stress related to habitat uniformity and passive discharge influences. These sites are located close to the CHPA boundary, and sites further downstream do not appear to be experiencing the same level of impairment, indicating that the impact is localised. Metal accumulation in sediments and low pH at CHCK03 continue to be a spatially restricted issue at the site for macroinvertebrate community health.

- Rehabilitation works occurring at CHPA appear to be improving aquatic ecosystem health downstream of remediated areas, such as CHCK02 and MTSW02. The trend is preliminary and requires more data to confirm.
- An additional site type “recovery” may be considered for Howley Creek sites downstream of CHCK06. This will increase statistical power in analysis of impacts from the CHPA. Similarities in historical sites downstream of CHCK06 denote that a single site could be chosen to represent recovery.
- There is likely to be low impact to biota in Hayes Creek as a result of CHPA operations due to neutrality of surface waters. Habitat availability close to the CHPA is likely to be having a greater impact on the macroinvertebrate community, which appears to improve with distance downstream.

6. References

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Appendix A. Macroinvertebrate Univariate Results

Table 8 – One-way ANOVA results of family-level taxa richness data collected on Howley Creek

Effect	df	SS	MS	F	<i>p</i>
Groups (between groups)	1	15	15	0.8442	0.3749
Error (within groups)	13	231	17.7692		
Total	14	246	17.5714		

Table 9 – Results of one-way ANOVA performed on PET richness data collected on Howley Creek

Effect	df	SS	MS	F	<i>p</i>
Groups (between groups)	1	6.6667	6.6667	4.0625	0.065
Error (within groups)	13	21.3333	1.641		
Total	14	28	2		

Table 10 - Results of one-way ANOVA performed on SIGNAL-2 data collected on Howley Creek

Effect	df	SS	MS	F	<i>p</i>
Groups (between groups)	1	0.1751	0.1751	3.6324	0.07902
Error (within groups)	13	0.6265	0.04819		
Total	14	0.8015	0.05725		

Appendix B. Raw Macroinvertebrate Data

Order	Lowest Taxon	CHCK01	CHCK01	CHCK01	CHCK02	CHCK02	CHCK02	CHCK03	CHCK03	CHCK03	CHCK04C	CHCK04C	CHCK04C	CHCK04A	CHCK04A	CHCK04A	CHCK06	CHCK06	CHCK06	MTSW02	MTSW02	MTSW02
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Acarina	Acarina	20	10	30	0	0	0	0	0	0	40	10	10	8	20	10	0	0	0	0	10	0
Bivalvia	Corbiculidae	0	0	0	8	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
Bivalvia	Hyriidae	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0
Coleoptera	Dytiscidae	20	30	30	42	27	8	13	20	53	40	50	30	42	60	20	30	80	80	60	20	40
Coleoptera	Elmidae	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
Coleoptera	Hydraenidae	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Coleoptera	Hydrochidae	0	0	0	0	0	0	6	33	33	20	20	20	0	0	0	0	0	0	0	10	30
Coleoptera	Hydrophilidae	60	50	80	33	80	38	175	147	207	60	30	80	42	40	100	10	60	40	20	20	20
Coleoptera	Noteridae	10	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0
Crustacea	Atyidae	80	50	50	17	53	69	0	0	0	20	30	40	50	80	80	20	60	70	50	50	20
Crustacea	Conchostraca	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Decapoda	Palaemonidae	10	10	10	17	7	15	0	0	7	20	30	10	0	0	0	20	0	10	40	30	20
Decapoda	Parathelphusidae	20	10	10	8	7	8	0	0	0	20	20	20	8	0	0	10	10	10	20	20	10
Diptera	Ceratopogonidae	50	20	50	8	53	46	13	20	33	40	20	80	50	50	50	50	80	40	60	40	80
Diptera	Chironominae	210	180	250	183	193	154	113	100	193	200	180	110	100	180	90	290	350	240	180	260	190
Diptera	Culicidae	10	0	0	8	7	0	0	7	0	10	10	10	0	10	10	20	0	10	10	20	20
Diptera	Dolichopodidae	0	0	0	17	0	8	0	0	0	10	10	10	0	10	0	10	0	10	0	20	0
Diptera	Orthocladiinae	230	220	160	100	120	69	131	140	187	230	190	200	133	250	210	260	190	100	180	310	250
Diptera	Tabanidae	0	10	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	10
Ephemeroptera	Ancyliidae	120	60	110	8	33	15	0	0	0	20	50	40	0	10	0	0	10	20	30	10	20
Ephemeroptera	Baetidae	550	490	290	100	187	208	75	67	107	240	210	310	100	180	100	260	250	210	200	280	390
Ephemeroptera	Caenidae	290	200	570	408	293	392	344	320	313	480	310	360	508	590	670	470	410	360	410	210	390
Ephemeroptera	Leptophlebiidae	0	0	10	0	0	0	0	0	7	10	0	0	0	0	0	0	10	0	10	10	0
Gastropoda	Planorbidae	0	0	0	8	0	8	0	0	0	20	10	10	0	0	0	0	0	0	10	0	0
Gastropoda	Viviparidae	0	10	10	17	13	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemiptera	Gerridae	10	210	30	8	7	8	6	7	13	0	10	40	0	10	20	10	10	20	10	0	30
Hemiptera	Hydrometridae	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	10	10	10
Hemiptera	Mesoveliidae	0	0	0	0	0	0	6	0	0	0	0	0	8	0	0	0	0	0	10	0	0
Hemiptera	Micronectidae	110	160	90	125	187	46	13	7	20	240	150	280	200	100	190	230	310	180	210	220	150
Hemiptera	Nepidae	10	0	10	0	7	0	0	0	0	0	10	10	0	0	0	0	10	0	10	10	0
Hemiptera	Notonectidae	0	0	0	0	0	0	13	13	7	0	0	0	8	10	0	10	10	10	10	0	0
Hemiptera	Pleidae	0	0	0	0	0	0	6	0	0	0	0	0	17	20	30	10	50	10	0	0	0
Hemiptera	Veliidae	20	0	10	0	7	0	0	0	0	10	0	0	8	0	0	0	10	40	20	30	0
Odonata	Aeshnidae	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	20	10	0	0	13	0	0	7	7	0	20	30	8	10	10	20	0	20	40	30	10
Odonata	Corduliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20	20	10	40	20
Odonata	Gomphidae	0	0	0	8	0	0	0	0	0	10	10	0	0	0	10	0	20	0	10	0	0
Odonata	Libellulidae	20	10	10	0	7	0	0	0	0	10	20	0	8	10	10	20	20	40	20	30	10
Trichoptera	Calamoceratidae	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Ecnomidae	20	10	10	0	0	0	0	0	0	0	10	10	0	0	0	0	10	0	20	10	40
Trichoptera	Hydroptilidae	10	0	10	0	0	0	0	0	0	10	0	10	0	0	0	0	10	0	20	10	10
Trichoptera	Leptoceridae	120	100	90	17	33	23	0	7	0	20	30	20	8	10	20	120	130	150	100	80	90
Turbillaria	Dugesiidae	0	0	0	0	0	0	6	7	13	0	0	0	0	0	0	0	0	10	0	0	0



Good science at a fair price