

Waste Discharge Licence 248: Monitoring Report 2024

August 2024

Project Details

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EXECUTIVE SUMMARY

Lithium Developments (Grants NT) Pty Ltd (LDGNT) operates the Grants Lithium Project on Mineral Lease 31726. LDGNT was granted Waste Discharge Licence (WDL248) on 25 July 2022, pursuant to Section 74 of the *Water Act 1992*. WDL248 licences the controlled discharge of mine wastewater from Mine Water Dam 1 (MWD1), via authorised Discharge Point 1 (DP1) subject to meeting licence conditions. Monitoring is required to be undertaken in accordance with Appendix 3 - 5 of the WDL, and Appendix 2 provides assessment criteria for the licence compliance point (GDS SW5).

The purpose of this WDL Monitoring Report is to fulfil the reporting requirements of WDL248 Condition 45, which stipulates that LDGNT must provide a Monitoring Report within 10 business days after each Anniversary Date of the licence (i.e., within 10 business days of 25 July). The report period is 25 July 2022 to 25 July 2023. An amendment to the WDL (WDL248-01) was granted on 20 December 2023. The amendment was made to allow the controlled discharge of mine affected water from MWD1 with elevated nutrient levels and included a revised total nitrogen (TN) trigger value (TV) and an additional TV for ammonium.

Controlled discharge via the authorised discharge point DP1, occurred between 29 January 2024 and 15 March 2024. A total of 374.1 ML of mine wastewater was discharged over this period.

Monitoring was undertaken consistent with the WDL248 Monitoring Program (EcOz, 2022) and comprised:

- Surface water - flow, water level and field parameters, nutrients, metals and metalloids, major ions and alkalinity, and total solids.
- Fluvial sediment particle size distribution and chemistry
- Biota monitoring including macroinvertebrates, riparian vegetation, and seagrass.

This report presents the data collected and provides interpretation and recommendations to address the TV exceedances, and incidents of non-compliance with the WDL. The load of key contaminants for the reporting period have been calculated and are presented in section 5.

The MWD1 had elevated nitrogen concentrations, dominated by nitrate that data suggest was quickly bound by organic matter in the receiving environment. The remaining contaminants, specifically total suspended solids, aluminium, and iron were elevated at the sediment basins relative to MWD1. pH, whilst elevated when compared to the WDL248 TV, was consistent across

all sites except the upstream site GUS SW7. The total phosphorus TV (10 µg/L) at GDS SW5 was exceeded on 64 percent of all sampling occasions over the reporting period.

The freshwater macroinvertebrate data demonstrate that active discharge from MWD1 has had no significant impact on the aquatic ecosystems of waterways draining to Darwin Harbour. The compliance point, GDS SW5, showed an improvement in almost all metrics in 2024 when compared to previous years, which aligned with other sites in the catchment.

No algal blooms or similar indicators of nutrient enrichment were observed over the reporting period. All chl-a concentrations are comparable between sites, with the highest concentrations observed at the marine sampling locations.

No impacts on downstream riparian vegetation were observed for the reporting period, and no seagrass was detected at the Darwin Harbour monitoring sites GDS DH1, GDS DH2 and GDS DH3.

In conclusion, data collected over the reporting period and its subsequent analysis has been used to inform the development and implementation of several measures to improve water management.

Sediment basins

The sediment basins were demonstrated to be the primary source of suspended solids, aluminium and iron. To address this, LDGNT have relocated sediment basins 1 and 5 and installed auto dosing equipment for the application of flocculant, purchased a large agricultural drone for the rapid application of flocculant as required to all water management infrastructure, and developed a water management strategy document to guide the operation of basins, pumps and dams.

Mine Water Dam

LDGNT have constructed additional mine affected water storage capacity at the MWD1, increasing total storage capacity to 286ML. The construction of the second and third cells of MWD1 enables greater control of water treatment and optimum conditions for discharge.

Source control

Analysis of water quality data completed for the preparation of this report has refined the understanding of different water qualities on site and informed the development of management strategies to segregate and tailor treatment methods appropriately.

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Attachment A: WDL248

Attachment B: WDL 248 Monitoring Program

Attachment C: Tabulated Water Quality Monitoring Data

Attachment D: Macroinvertebrate Sampling Report

Attachment E: Riparian Vegetation Monitoring Report

1 Introduction

1.1 Background

Lithium Developments (Grants NT) Pty Ltd (LDGNT) operates the Grants Lithium Project (GLP) on Mineral Lease (ML) 31726. GLP commenced construction during quarter 4 of 2021, in accordance with Authorisation 1021-01. The approved Mining Management Plan, and supporting Water Management Plan, document the mining activities and water and wastewater management strategies to be implemented at GLP. One water management strategy is to discharge excess mine water and mine wastewater to an unnamed tributary which runs east of GLP, and then flows north, ultimately discharging to the West Arm of Darwin Harbour.

Lithium Developments (Grants NT) Pty Ltd was granted amended Waste Discharge Licence (WDL) 248-02 on 20 December 2023, pursuant to Section 74 of the Water Act 1992 (NT). WDL248 licences the controlled discharge of mine wastewater from Mine Water Dam 1 (MWD1), via authorised Discharge Point 1 (DPI), subject to meeting licence conditions (see Appendix A).

Monitoring is required to be undertaken in accordance with Appendix 3 - 5 of WDL248, as detailed in Appendix B.

1.2 Scope and Purpose

The purpose of this WDL Monitoring Report is to fulfil the reporting requirements of WDL248 Condition 45, which stipulates that LDGNT must provide a Monitoring Report within 10 business days after each Anniversary Date of the licence (i.e., within 10 business days of 25 July). Condition 46 states:

The licensee must ensure that each Monitoring Report:

(46.1) 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);

(46.2) includes a tabulation of all monitoring data required as a condition of this licence (data must be provided electronically in Microsoft Excel format);

(46.3) includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge point listed at Item 5. Contaminant loads must be calculated for total metals, total metalloids, total nutrients and other parameters (excluding field parameters) listed in Appendix 3. 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 estimate using Linear Interpolation methodology;

(46.4) includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the Licenced Action over a minimum period of three years (where the data is available); and

(46.5) includes an assessment of environmental impact from the Licenced Action.

The monitoring required to be undertaken is detailed in Table 1-1 below.

Table 1-1 Summary of all monitoring to be undertaken for WDL248

Category	Sample Site	Easting	Northing	Surface water quality ¹	Sediment quality	Macroinvertebrate rate	Riparian Vegetation	Seagrass
Freshwater stream	GDS SW1	693239	8599446	Daily, weekly, monthly	Annually	-	-	-
	GDS SW2	692989	8600073	Daily, weekly, monthly	Annually	-	-	-
	GUS SW4	693903	8599235	Daily, weekly, monthly	Annually	-	-	-
	GUS SW7	691498	8598943	Daily, weekly, monthly	Annually	-	-	-
	GDS SW8	692498	8599951	Daily, weekly, monthly	Annually	-	-	-
WDL compliance site	GDS SW5	693374	8600709	Daily, weekly, monthly	Annually	Annually	-	-
Sediment basins	Sed1	693167	8598623	Weekly, monthly	-	-	-	-
	Sed2	692657	8599847	Weekly, monthly	-	-	-	-
	Sed3	692155	8599446	Weekly, monthly	-	-	-	-
	Sed4	691928	8598961	Weekly, monthly	-	-	-	-
	Sed5	692775	8598072	Weekly, monthly	-	-	-	-
WDL discharge point	MWD1	693030	8598504	Prior to discharge, daily, weekly, monthly	Annually	-	-	-
Pit water body	PIT	693037	8598990	Monthly	-	-	-	-
Darwin Harbour	GDS DH1	694262	8603365	Monthly	Annually	Annually	-	Annually
Riparian vegetation	MVS1	694035	8601220	-	-	-	Annually	-
	RVS2	693834	8601132	-	-	-	Annually	-
	SVS3	693706	8600969	-	-	-	Annually	-

¹ Frequency of surface water quality monitoring depends on discharge. Freshwater sites will only be sampled when the watercourse is flowing, and Darwin Harbour sites will only be sampled for surface water quality during the wet season months.

1.3 Reporting Period

The monitoring report period is 25 July 2023 to 25 July 2024. Controlled discharge via the authorised discharge point DP1, occurred between 29 January 2024 and 16 March 2024 within the reporting period.

1.4 Certification

I Paul McHugh, Site Manager, 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.

2 Activities Within Reporting Period

2.1 Mining Activities

Mining activities within the reporting period included:

- Conventional open cut mining of approximately 5.75M BCM of waste rock and ore using drill and blast, hydraulic excavation, and haulage by rear dump trucks.
- Crushing of pegmatite ore and processing via dense media separation.
- Road haulage of concentrate product to Darwin Port.

Additional civil construction activities undertaken during the reporting period included:

- Installation and commissioning of non-production infrastructure heavy vehicle / light vehicle wash down facility, road train wheel wash facility, and the processing administration area.
- Construction of water management infrastructure.

2.2 Wastewater discharges

Table 2-1 provides the daily and cumulative discharge volumes for the months of January, February, and March 2024.

Table 2-1 DPI Discharge Volumes

January 2024			February 2024			March 2024		
Date	Daily (ML)	Cumulative (ML)	Date	Daily (ML)	Cumulative (ML)	Date	Daily (ML)	Cumulative (ML)
1			1	4.8	19.26	1		
2			2	4.8	24.06	2		
3			3	7.85	31.91	3		
4			4	7.85	39.76	4		
5			5	3.31	43.07	5		
6			6	7.85	50.92	6		
7			7	7.85	58.77	7	7.34	242.04
8			8	7.85	66.62	8	7.34	249.38
9			9	7.85	74.47	9	7.34	256.72
10			10	7.85	82.32	10	7.34	264.06
11			11	7.85	90.17	11	7.34	271.4
12			12	7.85	98.02	12	7.34	278.74
13			13	7.85	105.87	13	25.41	304.15
14			14	7.85	113.72	14	25.41	329.56
15			15	7.77	121.49	15	25.41	354.97
16			16	7.77	129.26	16	19.13	374.1
17			17	7.77	137.03	17		
18			18	7.77	144.8	18		
19			19	7.77	152.57	19		
20			20	7.77	160.34	20		
21			21	7.77	168.11	21		
22			22	7.77	175.88	22		
23			23	7.77	183.65	23		
24			24	7.77	191.42	24		
25			25	7.77	199.19	25		
26			26	7.77	206.96	26		
27			27	7.77	214.73	27		
28			28	19.97	234.7	28		
29	4.86	4.86				29		
30	4.8	9.6				30		
31	4.8	14.46				31		

Daily and cumulative volumes discharged for the reporting period are shown in Figure 2-1. A total of 374.1 ML of water was discharged from DP1.

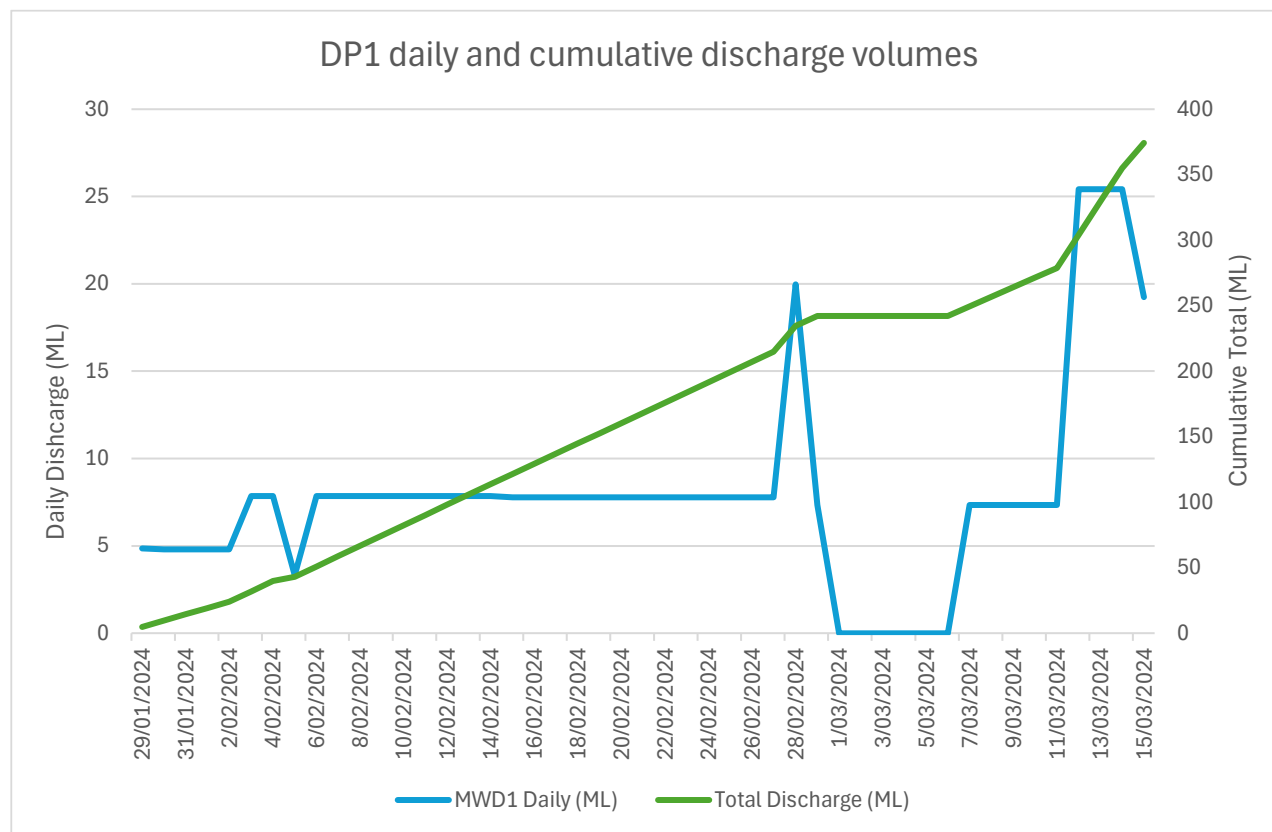


Figure 2-1 DP1 daily and cumulative discharge volumes

3 Monitoring Program

This section provides a summary of the WDL248 Monitoring Program for the GLP, consistent with:

- Appendix 3 of WDL248: Surface water monitoring program
- Appendix 4 of WDL248: Fluvial sediment monitoring program, and
- Appendix 5 of WDL248: Biota monitoring program.

3.1 Surface Water Monitoring

The surface water monitoring program involves the regular monitoring of surface water sites upstream and downstream of the discharge point during discharge, the weekly monitoring of sediment basins during discharge, and monthly monitoring of the pit water. Discharge monitoring was undertaken at MWD1, close to DP1, the licenced discharge point, prior to discharge, and daily and weekly during discharge.

The compliance point for WDL248 is GDS SW5. The locations of surface water monitoring sites, sampled in accordance with WDL248 are shown on Figure 3-1. A summary of sites, analytes and monitoring frequency are provided in Table 3-1.

All surface water sampling will be in accordance with relevant standards and guidelines including:

- Australian/New Zealand Standard on Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS/NZS 5667.1:1998/2016), Standards Australia, New South Wales.
- Australian Standard on Water Quality Sampling - Part 6: Guidance on sampling of rivers and streams (AS/NZS 5667.6:1998), Standards Australia, New South Wales.
- Australian/New Zealand Standard on Water Quality Sampling - Part 9: Sampling Guidance on sampling from marine waters (AS/NZS 5667.9:1998/2016), Standards Australia, New South Wales.
- ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
- EcOz Standard Operating Procedure Surface Water Sampling - update July 2020.

Freshwater sites were accessed on foot or via ATV, and samples collected from the side of the watercourse. Watercourses were only sampled when flowing.

Marine sites were accessed via marine vessel (boat), and grab samples obtained from ~30 cm below the surface of the water, using sample poles.

Field parameters were measured in-situ using calibrated field equipment. Laboratory samples were collected in laboratory supplied, suitably treated containers, and stored chilled (in esky with ice bricks or portable fridge) until the samples can be dispatched to the laboratory. All samples were submitted to a NATA accredited laboratory, with Chain of Custody forms provided to allow for the tracking of samples.

All sampling equipment was maintained and cleaned between sample sites to avoid cross contamination. Further details of sample methods are provided in the WDL248 Monitoring Program (Appendix B).

The names of all monitoring locations have been abbreviated for the purpose of preparing this report. For example, GDS SW1 is referred to as SW1. This has been done to avoid confusing between sites. For all parameter values less than the laboratory limit of detection (LOR), half of the LOR was used for statistical analysis.

3.2 Fluvial sediment monitoring

Sediment samples were collected at four sites as described in Table 3-2. The sediment sampling locations are shown on Figure 3-1. Sediment samples are collected annually, during recessional flows (late wet season). Sediment sampling and analysis was undertaken in accordance with relevant standards and guidelines, including:

- Australian Standard on Water Quality Sampling - Part 19: Guidance on sampling of marine sediments (ISO 5667.19:2004)
- Australian Standard on Water Quality Sampling - Part 12: Guidance on sampling of bottom sediments (ISO 5667.12:1999)
- Recommendations for sampling and analysis of Darwin Harbour sediment (Munksgard 2013) and
- Simpson & Batley (2016): Sediment Quality Assessment.

The mine and freshwater sites were sampled in early May 2024 using a trowel. 1 kg of sample at each location was collected to permit particle size distribution analysis.

In accordance with Appendix 4 of WDL248 samples were analysed for:

- Particle size distribution
- pH
- Electrical Conductivity (EC)
- Moisture content
- Metals:
 - Aluminium (Al)
 - Arsenic (As)
 - Cadmium (Cd)
 - Chromium (Cr)
 - Copper (Cu)
 - Iron (Fe)
 - Lead (Pb)
 - Lithium (Li)
 - Mercury (Hg)
 - Nickel (Ni)
 - Zinc (Zn) and
- Sulphate (SO₄), chloride (Cl), calcium (Ca), sodium (Na), potassium (K) and magnesium (Mg).

Metal analysis was completed on the <63µm fraction. For all parameter values less than the laboratory limit of detection (LOR), half of the LOR was used for statistical analysis.

3.3 Biota monitoring

A summary of the biota monitoring program is provided in Table 3-3. A short description of each program is provided below. Technical reports, providing detailed methodology, results and interpretation of data collected during this reporting period are provided as appendices to this report.

3.3.1 Freshwater macroinvertebrates

Five monitoring locations, including a reference site (BP4 located on an unnamed creek upstream of Cox Peninsula Road), an upstream site (UC3 located on a tributary entering the unnamed creek between UC2 and GDS SW5) and three downstream sites (UC2, GDS SW5 and UC1) were sampled in early May 2024. The sampling locations are shown on Figure 3-2.

Sampling was consistent with the protocols outlined in the Darwin-Daly AUSRIVAS sampling manual (Lamche, 2007). Surface water and sediment samples were collected concurrently to facilitate the interpretation of data. Sediment samples were bank sieved to 2 mm and analysed for total metal and metalloid concentrations. Metal and metalloids (total and filtered), major ions and alkalinity, and nutrient concentrations were determined in water.

The univariate macroinvertebrate indices assessed at each site included:

- Relative abundance
- Taxa richness (family)
- PET richness,
- SIGNAL-2 and
- Community composition.

A detailed description of the biota monitoring program can be found in Section 5 of the WDL248 Monitoring Program (Appendix B) and the 2024 technical report (Appendix D).

Surface water and sediment samples were collected concurrently to facilitate the interpretation of data. Sediment samples sieved to 2 mm and analysed for total metal and metalloid concentrations. Metal and metalloids (total and filtered), major ions and alkalinity, and nutrient concentrations were determined in water.

3.3.2 Riparian vegetation

Riparian vegetation occurs along watercourses and surface water features and are significant vegetation communities as they are spatially restricted and provide habitat to a relatively large number of species (DENR, 2019). Riparian vegetation monitoring was undertaken in accordance with WDL248 and WDL248 Monitoring Program to detect any changes to riparian vegetation health or extent which could occur from the discharge of mine wastewater from MWD1. There are two components of the survey:

- a drone survey and
- riparian vegetation site assessment survey (which included photo-point monitoring).

The post wet-season riparian vegetation assessments were undertaken by two experienced botanists in May 2024. The drone survey was undertaken along a predefined flight path to map riparian vegetation extent and density and detect any changes in riparian vegetation condition since the baseline survey in 2019. The drone survey was designed to survey the three different riparian vegetation communities captured in the previous study (EcOz 2019) – mangrove, riparian and swamp. Drone images were imported to create an orthomosaic image, and analysis was undertaken to assess vegetation extent and density (health) over time.

Riparian vegetation site assessments (on-ground) were undertaken at three established potential impact sites (MVS1, RVS2, SVS3) to record riparian vegetation species diversity and composition. The site locations are shown on Figure 3-3. Vegetation and photo monitoring data was compiled into a database that can be added to over time as monitoring data is collected annually. The vegetation data was analysed by comparing 2019 baseline data with the 2024 survey results to assess if there were any changes in vegetation health or the extent of the riparian vegetation.

A detailed description of the biota monitoring program can be found in Section 4 of the WDL248 Monitoring Program (Appendix B) and the 2024 technical report (Appendix H).



WDL248 MONITORING LOCATIONS

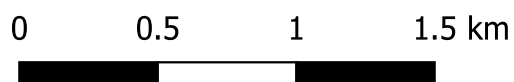


Figure 3-1 WDL248 Monitoring Locations

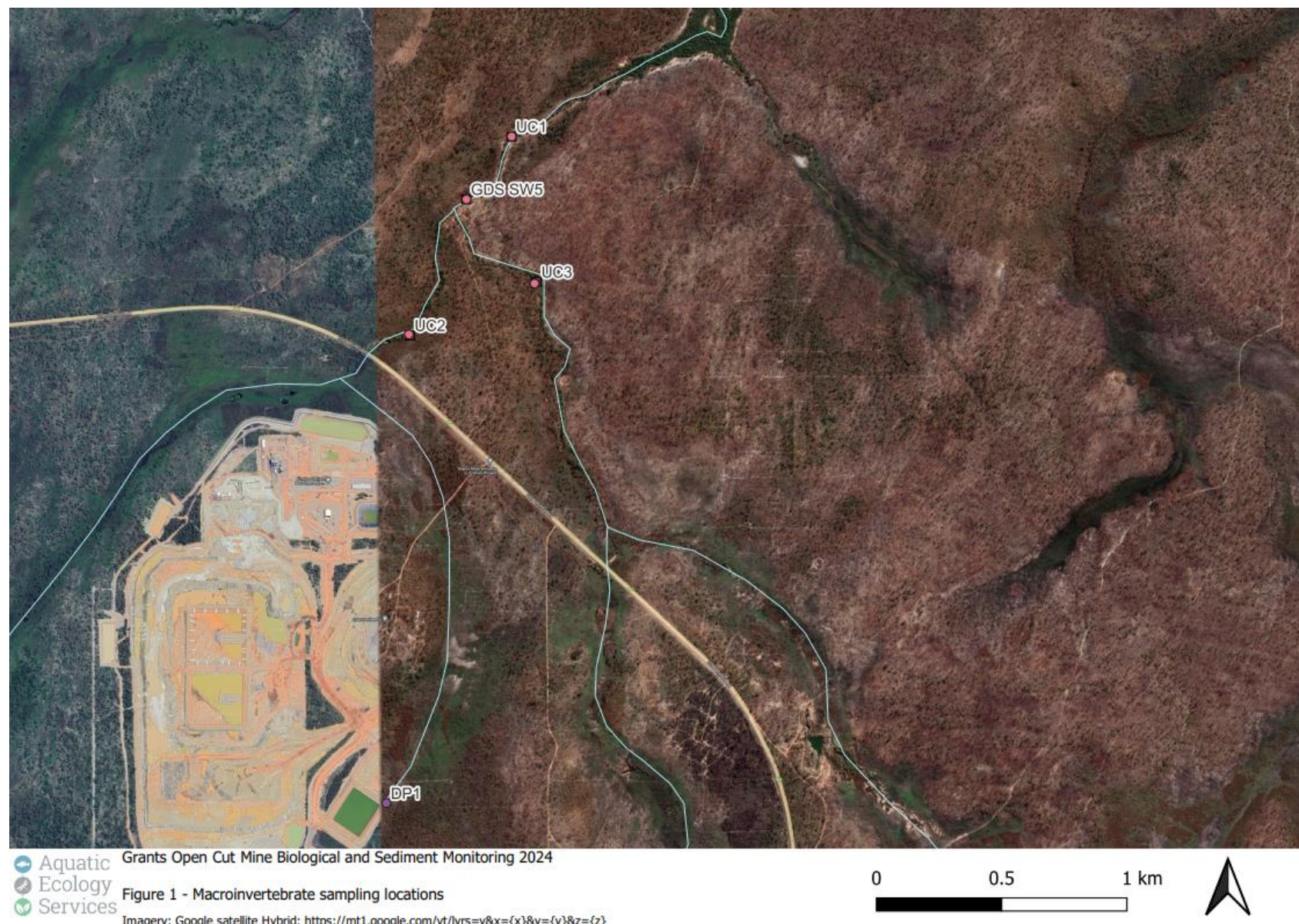


Figure 3-2 Freshwater Macroinvertebrate sampling locations.

Figure 3-3 WDL248 Riparian Vegetation Monitoring Locations

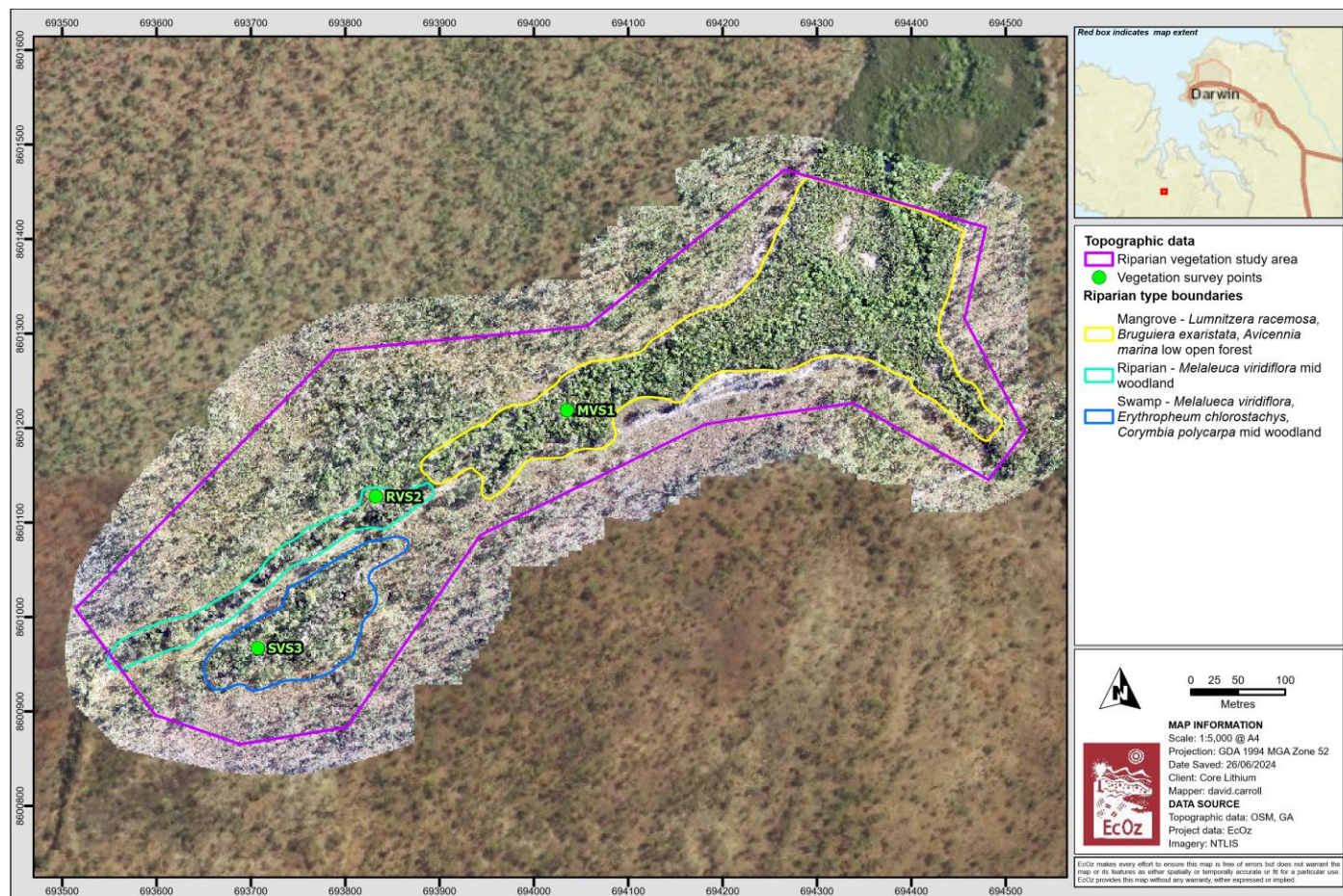


Table 3-1 WDL248 Surface Water monitoring program

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Downstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Sediment Basins 1- 5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GDS SW4	GDS SW5	GDS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
				FREQUENCY													
Field Parameters																	
Flow		kL/day	In situ	D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	C	N/A	N/A	
Water Level		Measure		D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	P, W	N/A	N/A	
pH	pH	pH		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Electrical Conductivity	EC	µS/cm		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Turbidity	NTU	NTU		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Temperature	Temp	°C		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Oxidation Reduction Potential	OR	mV		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Dissolved Oxygen	DO	% sat.		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Nutrients																	
Ammonia	NH ₃	µg/L	Unfiltered (Excluding FRP)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Oxides of Nitrogen	NO _x			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nitrate	NO ₃			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Nitrogen	TN			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Phosphorus	TP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Filterable Reactive Phosphorus	FRP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chlorophyll a	Chl-a			W	W	W	W	W	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M ³	
Metals and Metalloids																	
Aluminium	Al	µg/L	Total and Filtered (0.45µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Arsenic	As			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Cadmium	Cd			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chromium	Cr			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Copper	Cu			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Iron	Fe			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lead	Pb			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

Sampling Points Site Code Easting Northing				Grants	Grants	Grants	Grants	Grants	Sediment Basins 1- 5					Discharge	Mine Pit	Grants
				Downstream	Downstream	Downstream	Downstream	Downstream						Point	Sump	Downstream
				Surface Water	Surface Water	Surface Water	Surface Water	Surface Water								Darwin
				1	2	4	5	7								Harbour 1
				GDS SW1	GDS SW2	GDS SW4	GDS SW5	GDS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1
				693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY												
Lithium	Li	µg/L	Total and Filtered (0.45µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³
Mercury	Hg			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³
Nickel	Ni			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³
Zinc	Zn			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³
Full elemental scan	-			A	A	A	A	A	A	A	A	A	A	A	A	A
Treatment Reagents (Item 9 Conditions on Discharge)																
Acrylamide	C ₃ H ₅ NO	µg/L	Total and Filtered (0.45µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³
Other																
Sulphate	SO ₄	µg/L	Filtered (0.45µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Calcium	Ca			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Chloride	Cl			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Sodium	Na			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Potassium	K			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Magnesium	Mg			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Carbonate	CO ₃ ²⁻			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Bicarbonate	HCO ₃			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A
Total Dissolved Solids	TDS		W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Suspended Solids	TSS		Unfiltered	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³

Key:
P = prior to discharge
C = continuous
D = within 24 hours of commencement of discharge **and** daily during discharge. When no discharge is occurring monitoring will be on a weekly basis.
W = within 24 hours of discharge **and** weekly during discharge. When no discharge is occurring monitoring will be on a monthly basis.
F = weekly whilst discharging from sediment basins, Monthly during Wet Season irrespective of discharge.
M = monthly
A = Annually, at end of Wet Season on recessional flows.
¹ The sampling point in MWD1 will be located close to DP1 to ensure it is representative of discharge water quality.
² This sampling is only required where the licensee has conducted water treatment onsite using flocculants containing Acrylamide.
³ During Wet Season only.

Table 3-2 Fluvial sediment monitoring program

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Downstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Discharge Point	Mine Pit Sump	
				GDS SW1	GDS SW2	GDS SW4	GDS SW5	GDS SW7	MWD1 ¹	Pit	
				Easting	693239	692989	693903	693374	691498	693030	693037
				Northing	8599446	8600073	8599235	8600709	8598943	8598504	8598990
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY							
Environmental Field Data											
pH	pH	pH		A	A	A	A	A	A	A	
Electrical Conductivity	EC	µS/cm		A	A	A	A	A	A	A	
Moisture Content		%		A	A	A	A	A	A	A	
Particle Size Distribution	PSD	%	<63µm ≥63 µm & ≤2mm >2mm	A	A	A	A	A	A	A	
Aluminium	Al	mg/kg	<63µm sediment fraction	A	A	A	A	A	A	A	
Arsenic	As			A	A	A	A	A	A	A	
Cadmium	Cd			A	A	A	A	A	A	A	
Chromium	Cr			A	A	A	A	A	A	A	
Copper	Cu			A	A	A	A	A	A	A	
Iron	Fe			A	A	A	A	A	A	A	

Sampling Points

Site Code

Easting

Northing

Grants	Grants	Grants	Grants	Grants	Discharge	Mine Pit
GDS SW1	GDS SW2	GDS SW4	GDS SW5	GDS SW7	MWD1 ¹	Pit
693239	692989	693903	693374	691498	693030	693037
8599446	8600073	8599235	8600709	8598943	8598504	8598990

PARAMETER	Abbrev.	Units	Analysis	FREQUENCY						
Environmental Field Data										
Lead	Pb	mg/kg	<63µm sediment fraction	A	A	A	A	A	A	A
Lithium	Li			A	A	A	A	A	A	A
Mercury	Hg ⁺			A	A	A	A	A	A	A
Nickel	Ni ₃			A	A	A	A	A	A	A
Zinc	Zn			A	A	A	A	A	A	A
Other										
Sulphate	SO ₄	mg/kg	Soluble ion extract	A	A	A	A	A	A	A
Calcium	Ca			A	A	A	A	A	A	A
Chloride	Cl			A	A	A	A	A	A	A
Sodium	Na			A	A	A	A	A	A	A
Potassium	K			A	A	A	A	A	A	A
Magnesium	Mg			A	A	A	A	A	A	A

Key:

A = Annually during recessional flow (late Wet Season / early Dry Season)

Table 3-3 Biota Monitoring Program

Project Name	Locations	Project Description	Report Frequency
Seagrass Assessment	West Arm, Darwin Harbour	Seagrass monitoring to determine whether any observed change in seagrass distribution or composition has occurred in the marine waters of West Arm, Darwin Harbour. Monitoring should aim to determine whether any change identified is naturally occurring or related to mine operations.	Annually
Vegetation Monitoring	Areas downstream of ML 31726	Monitoring of vegetation downstream of ML31726 to determine if mining activities are impacting riparian vegetation communities.	Annually
Macroinvertebrate study	Darwin Harbour and Areas downstream of ML 31726	Survey of macro-invertebrate abundance and diversity in aquatic ecosystems. Data is used to monitor potential impacts from mine operations.	Annually during recessional flow (late Wet Season / early Dry Season)

3.4 Assessment criteria and non-compliance reporting

A summary of the assessment criteria, as per WDL248, is provided in Table 3-4.

Table 3-4 WDL248 Discharge Trigger Values

			Sampling Points	Compliance
			Site Code	GDS SW5
			Easting	693374
			Northing	8600709
Parameter	Abbrev.	Units	Analysis	Trigger Values
Environmental Field Data				
pH	pH	pH	In situ	5.2-6.6 ²
Electrical Conductivity	EC	µS/cm		250 ¹
Turbidity	NTU	NTU		12 ³
Dissolved Oxygen	DO	% sat.		50-100 ²
Nutrients				
Total Nitrogen	TN	µg/L	Unfiltered	400 ³
Total Phosphorus	TP			10 ³
Metals and Metalloinds ⁵				
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	70 ³
Arsenic	As			13 ¹
Cadmium	Cd			0.2 ¹
Chromium	Cr			1 ¹
Copper	Cu			1.4 ¹
Iron	Fe			110 ³
Lead	Pb			3.4 ¹
Lithium	Li			430 ⁴
Mercury	Hg			0.6 ¹
Nickel	Ni			11 ¹
Zinc	Zn			8 ¹

Key:

¹ ANZG (2018) 95% species protection, freshwater.

² 20th and 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan and data provided in support of amendment application 20 September 2023.

³ 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan and data provided in support of amendment application 20 September 2023.

⁴ Ecotoxicity Assessment, sections 8.3 and 8.4 of the Water Management Plan.

⁵ SSTVs for metals and metalloids apply to filtered samples only.

3.5 Monitoring undertaken during reporting period

Monitoring over the reporting period was undertaken in line with the intent of the WDL and monitoring program. Some gaps in monitoring were noted, typically relating to faulty in-situ probes, which will be addressed prior to the commencement of the 2023/2024 wet season. There were 8 reportable incidents over the reporting period, a summary of which is provided in Table 3-5. All incidents relate to the monitoring compliance point, GDS SW5.

Table 3-5 Summary of WDL248 non-conformances

Date	Description	Actions
31/01/24	pH and Turbidity three times the trigger value on three consecutive occasions.	Reported to NT EPA 01/02/24
04/02/24	pH three times the trigger value on three consecutive occasions.	Reported to NT EPA 06/02/24
07/02/24	pH three times the trigger value on three consecutive occasions	Reported to NT EPA on 08/02/24
20/02/24	Exceedances of turbidity three or more times the trigger value, on three separate occasions	Reported to NT EPA on 20/02/24
28/02/24	Exceedance of turbidity trigger values on three consecutive occasions.	Reported to NT EPA on 28/02/24
07/03/24	Exceedances of turbidity three or more times the trigger value.	Reported to NT EPA on 08/03/24
08/03/24	An exceedance of trigger values for Total Phosphorus (three times the trigger value on one occasion) and Total Nitrogen (three consecutive occasions)	Reported to NT EPA on 08/03/24
13/03/24	Exceedance of turbidity trigger values on three consecutive occasions.	Reported to NT EPA on 14/03/24

4 Results and Discussion

4.1 Surface Water

4.1.1 Flow and water level

Flow and water depth is recorded at the downstream compliance point (GDS SW5) by a telemetered gauging station. Sustained flow at the compliance point was first recorded on 24 January 2024 and ceased on 2 May 2024. There were 30 hours of creek flow in excess of 10,000 L/s following intense rainfall events. The data tabulated below, and presented graphically, has been smoothed by removing these peak flow events.

Table 4-1 Summary statistics of creek flow as measured at GDS SW5

Grants Downstream Sample Site – SW5		
	Flow (L/s)	Depth (m)
Minimum	9.5	0.24
Maximum	9179.2	1.77
Mean	1025.7	0.52

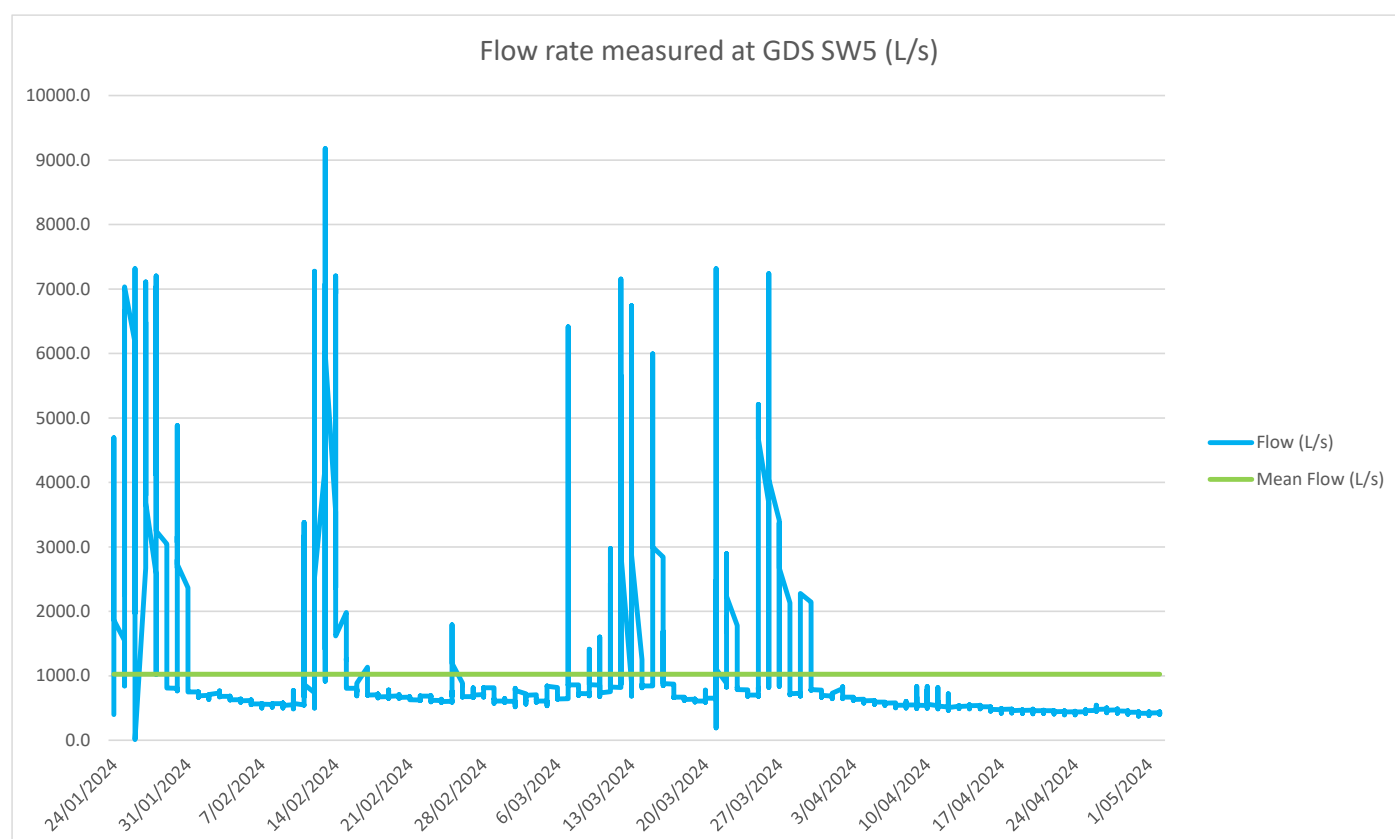


Figure 4-1. Flow at WDL248 compliance point (GDS SW5)

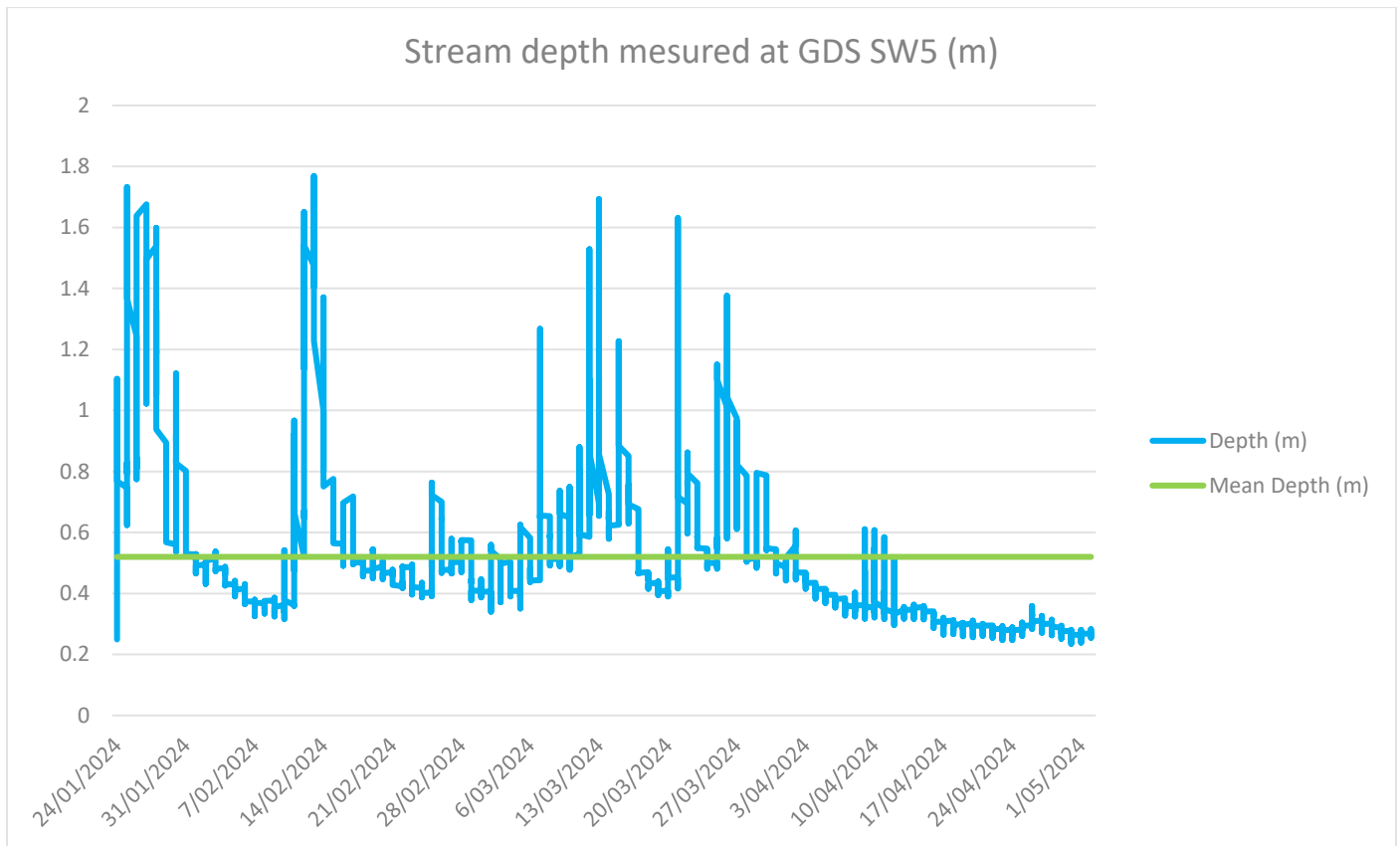


Figure 4-2. Water depth at WDL248 compliance point (GDS SW5)

4.1.2 In-situ water quality

A summary of the field data is provided in Table 4-2. The numbers in bold are above the respective WDL248 Trigger Value (TV) and any exceedance at the compliance point (GDS SW5) is shaded green.

Table 4-2. Field parameter summary data

Site/Parameter		pH	EC (µS/cm)	Turbidity (NTU)	DO (% Saturation)	Temperature (°C)	ORP (mV)
SW4	Median	6.3	20.13	10.6	75.7	28.2	165.1
	80th %ile	6.8	28.32	13.2	90.3	29.5	222.5
SW7	Median	6.1	12.13	10.5	89.8	28.1	165.3
	80th %ile	6.5	13.93	12.3	96.6	29.6	244.0
MWD1	Median	7.4	160.50	15.4	102.8	29.4	130.0
	80th %ile	8.3	256.46	22.3	141.6	30.3	201.7
SW1	Median	6.5	68.20	22.8	44.0	28.0	166.9
	80th %ile	7.0	97.26	70.8	62.8	29.2	218.8
SW2	Median	6.6	24.10	23.3	0.0	28.2	153.5
	80th %ile	7.0	31.24	43.1	20.3	29.3	207.8
SW5	Median	6.4	22.95	15.6		28.6	169.3
	80th %ile	6.9	27.00	33.7	17.6	29.3	215.4
Sed1	Median	7.0	32.10	353.2	99.0	28.9	194.5
	80th %ile	7.5	34.82	1152.5	103.0	30.0	235.8
Sed2	Median	7.1	41.30	431.9	25.8	28.8	173.2
	80th %ile	7.5	52.64	714.2	33.5	30.1	223.2
Sed3	Median	6.7	23.70	481.8	15.4	29.0	196.6
	80th %ile	7.1	32.22	1098.2	20.9	29.8	232.8
Sed4	Median	6.5	13.70	109.0	8.8	29.2	170.9
	80th %ile	7.1	15.48	163.8	9.7	30.3	242.3
Sed5	Median	6.2	15.90	102.1	10.3	29.3	202.0
	80th %ile	7.4	17.74	165.1	11.5	29.8	252.0
WDL SSTV		5.2 - 6.6	250	12	50 - 100	-	-

4.1.3 pH

The upper pH limit of 6.6 was commonly exceeded at all monitoring locations. Except for SW7, all median pH values were above the TV. The 80th percentile exceeded the TV at all sites (including SW7). The spread in data is illustrated in Figure 4-3.

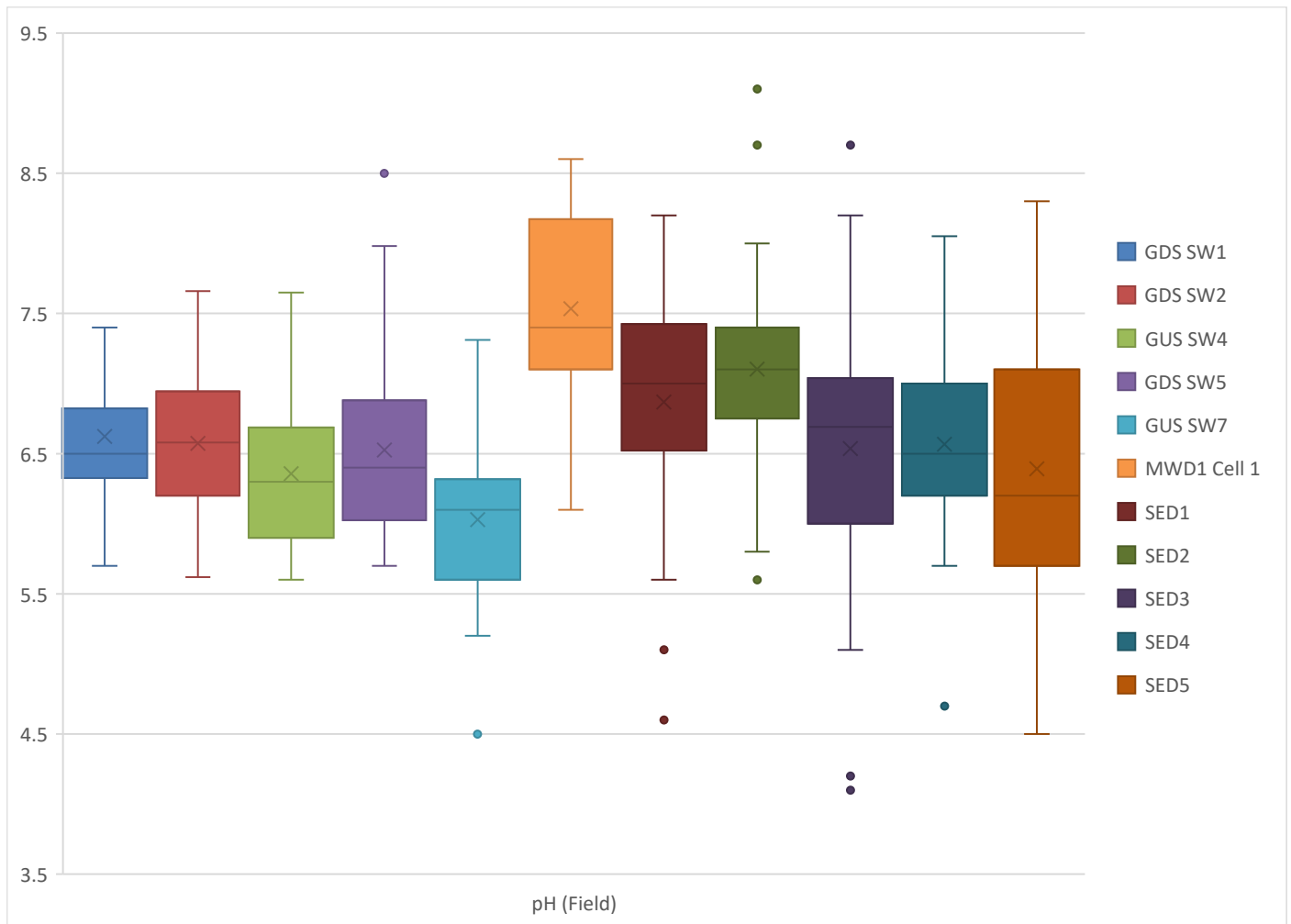


Figure 4-3. pH

4.1.4 Electrical Conductivity

All freshwater EC values remained below the WDL248 TV of 250 $\mu\text{S}/\text{cm}$. The highest EC values were reported for MWD1 as shown in Table 4-2 and illustrated in Figure 4-4.

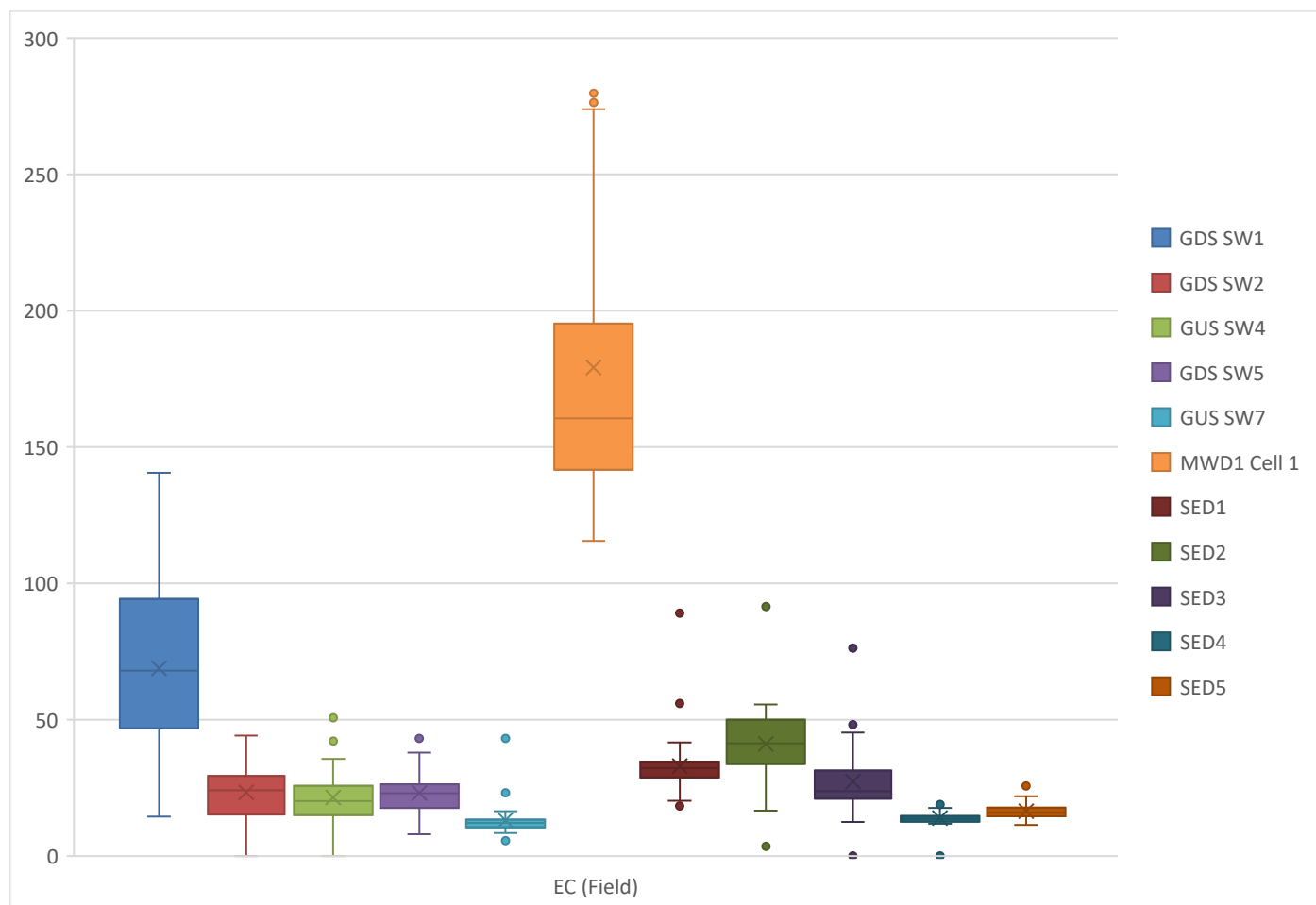


Figure 4-4 Electrical Conductivity

4.1.5 Turbidity

Turbidity, measured as NTU, was elevated at all freshwater sites except for SW7. At SW4, the second upstream site, the median and 80th percentile NTU values exceeded the WDL248 TV of 12 NTU. The spread in data is illustrated in Figure 4-5. Turbidity was highest in the sediment basins, and the first downstream sampling location SW1.

Turbidity at GDS SW5 exceeded the WDL248 TV of 12 NTU on 34 of 56 sampling occasions (61% of sampling occasions). Turbidity is temporally presented in Figure 4-6.

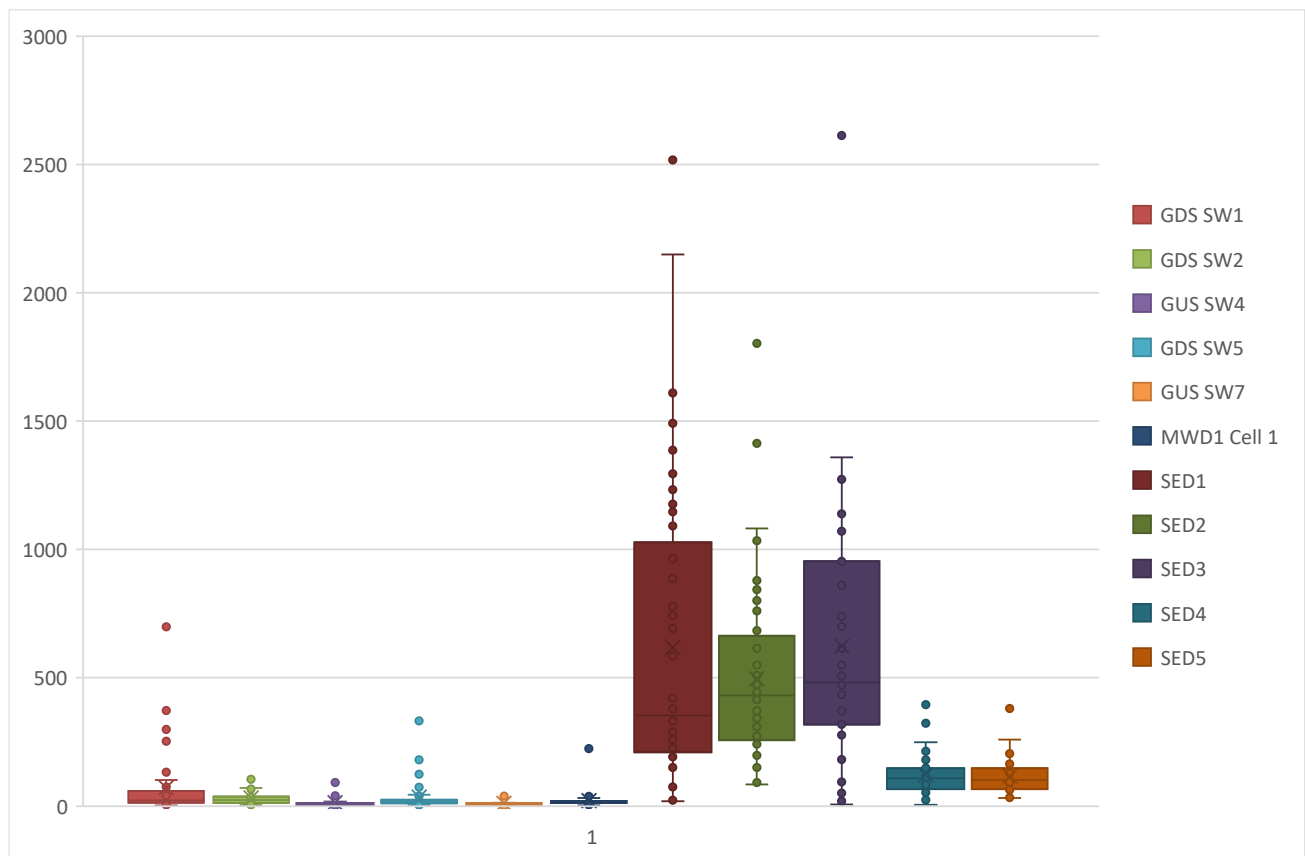


Figure 4-5. Turbidity

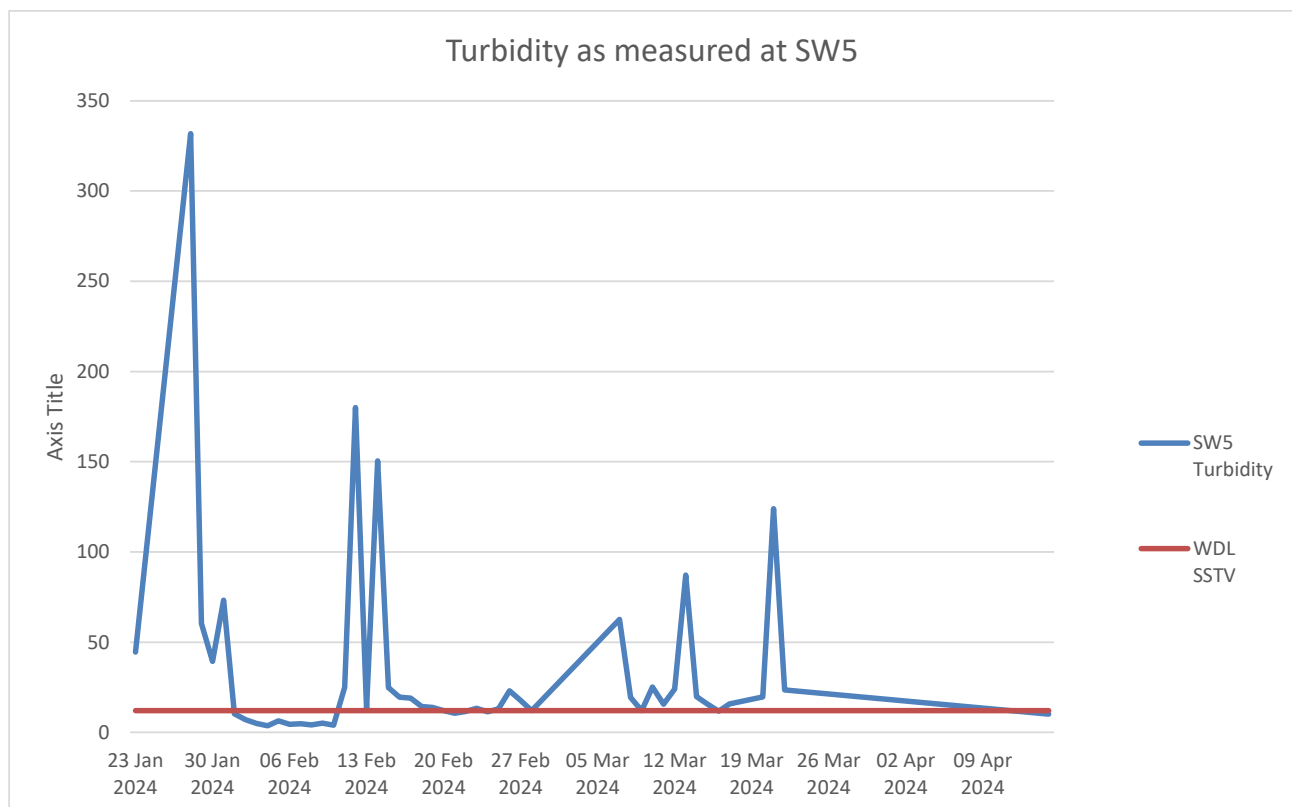


Figure 4-6. Compliance Point (GDS SW5) turbidity

4.1.6 Temperature

Water temperature was consistent across all sites, with median values ranging between 27.8 °C and 28.2 °C in the freshwater environment. Water temperatures were higher in the marine environment and at the water storages.

4.1.7 Dissolved oxygen

Dissolved oxygen (DO) concentrations were consistently above the lower WDL248 GV of 70%. The highest median concentration was 94.9 % saturation at SW1 (Figure 4-7). No correlation between DO and chlorophyll-a was observed.

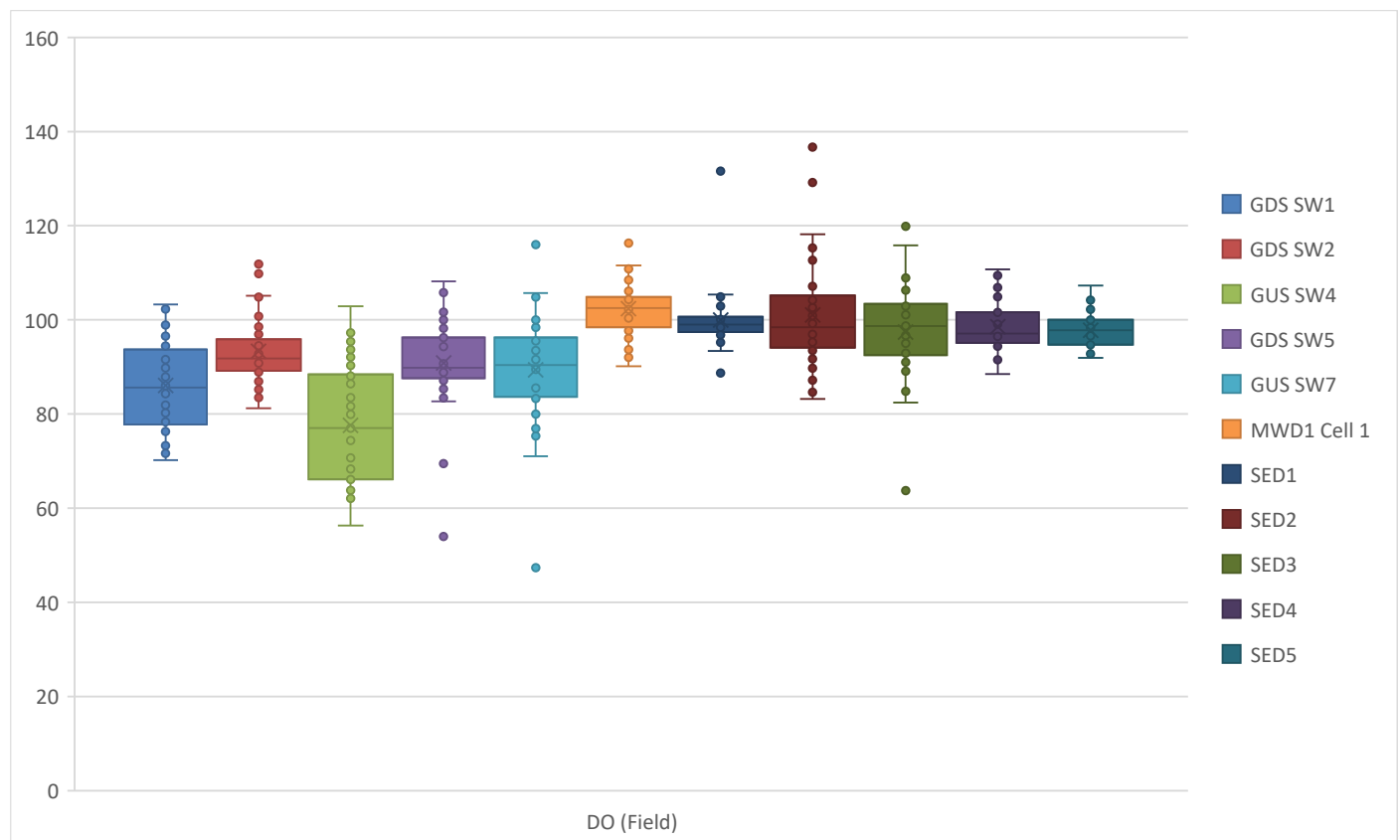


Figure 4-7. Dissolved oxygen percent saturation

4.1.8 Nutrients

The median and 80th percentile values for nutrients are provided in Table 4-3. Those numbers in bold are above the respective WDL248 Trigger Value (TV) and any exceedance at the compliance point (GDS SW5) is shaded green.

Table 4-3. Nutrient concentrations (mg/L)

Site/Parameter		NH ₃	NO _x	NO ₃	T_N	T_P	FRP	Chl-a	WDL SSTV (T_N)	WDL SSTV (T_P)
Limit of Reporting		0.01	0.01	0.01	0.1	0.01	#	0.001		
SW4	Median	0.06	0.01	0.01	0.30	0.01	0.00	0.00	0.4	0.01
	80th %ile	0.10	0.16	0.16	0.54	0.01	0.00	0.00		
SW7	Median	0.15	0.01	0.01	0.35	0.01	0.00	0.00	0.4	0.01
	80th %ile	0.40	0.01	0.01	0.60	0.01	0.00	0.00		
MWD1	Median	0.06	12.90	12.15	14.25	0.03	0.01	0.01	0.4	0.01
	80th %ile	1.27	23.88	27.00	28.00	0.07	0.01	0.01		
SW1	Median	0.05	0.54	0.54	1.10	0.01	0.00	0.00	0.4	0.01
	80th %ile	0.22	4.40	4.39	5.12	0.02	0.00	0.00		
SW2	Median	0.06	0.01	0.01	0.30	0.01	0.00	0.00	0.4	0.01
	80th %ile	0.10	0.16	0.16	0.54	0.01	0.00	0.00		
SW5	Median	0.03	0.10	0.10	0.50	0.03	0.00	0.00	0.4	0.01
	80th %ile	0.06	0.32	0.32	0.60	0.06	0.00			
Sed1	Median	0.04	2.08	1.73	2.65	0.10	0.00		0.4	0.01
	80th %ile	0.14	2.90	2.64	3.82	0.33	0.00			
Sed2	Median	0.08	2.88	2.82	3.00	0.29	0.05		0.4	0.01
	80th %ile	0.16	5.35	5.31	6.34	0.51	0.07			
Sed3	Median	0.07	0.86	0.86	1.85	0.34	0.01		0.4	0.01
	80th %ile	0.08	1.32	1.32	2.42	0.73	0.01			
Sed4	Median	0.02	0.35	0.35	0.60	0.04	0.00		0.4	0.01
	80th %ile	0.05	0.44	0.44	0.86	0.20	0.00			
Sed5	Median	0.05	0.37	0.43	0.65	0.02	0.00		0.4	0.01
	80th %ile	0.08	0.50	0.50	1.00	0.06	0.00			
WDL SSTV		-	-	-	400	10	-	-		

Variable LOR due to matrix interference.

4.1.9 Ammonia

All ammonia (NH₃) concentration at the compliance point GDS SW5, were below the ANZG (2018) 95% species protection acute toxicity value of 0.9 mg/L.

4.1.10 Nitrogen

There were six exceedances of the WDL248 Total Nitrogen (TN) TV of 0.4 mg/L recorded at the compliance point GDS SW5 over the reporting period. Figure 4-8 shows the median nitrogen concentrations at the upstream and downstream monitoring locations.

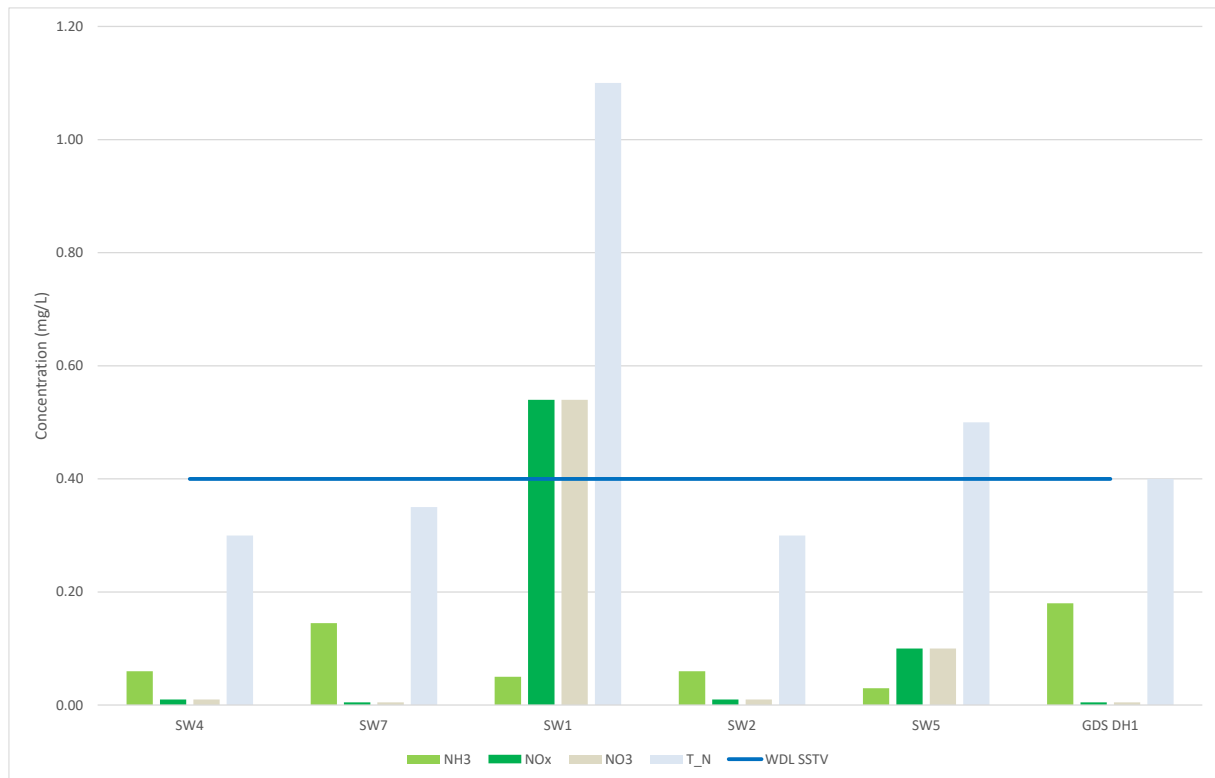


Figure 4-8. Median nitrogen concentrations upstream and downstream of DP1

The highest concentrations of TN were observed at MWD1 (Figure 4-9). TN concentrations were variable as shown in Figure 4-10.

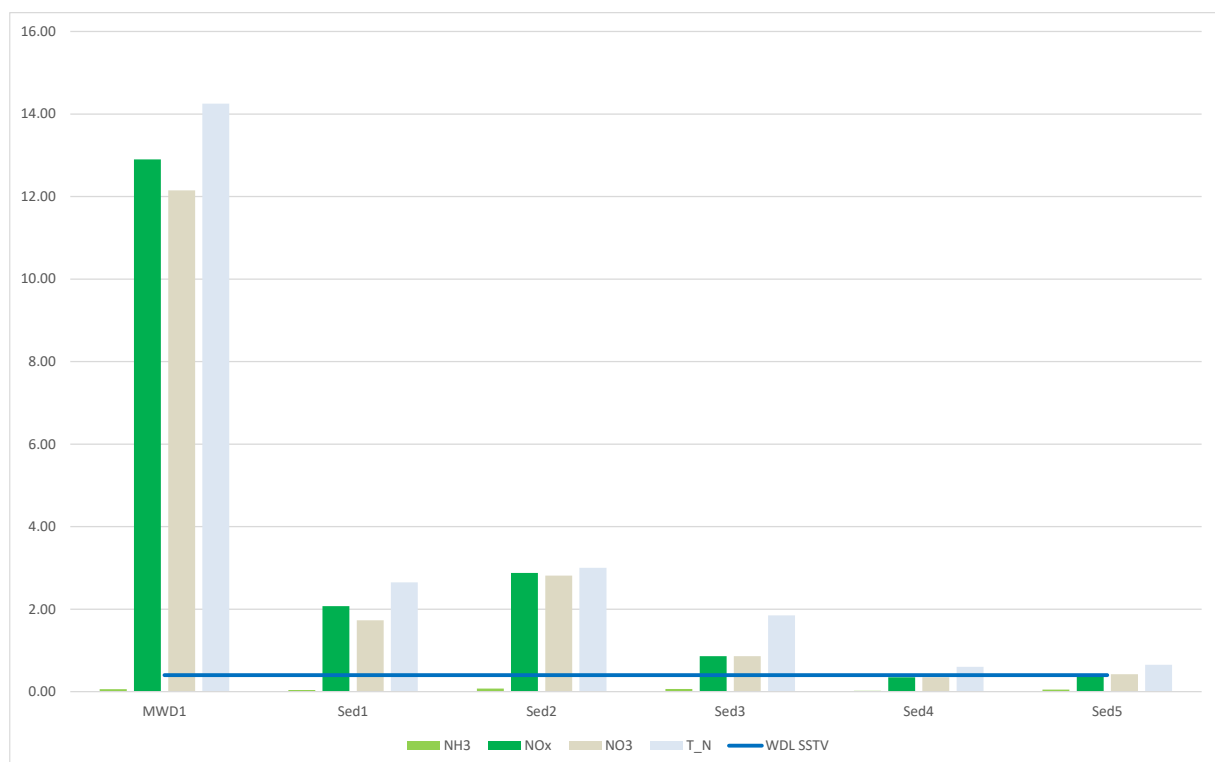


Figure 4-9. Median nitrogen concentrations at Grants water management storages

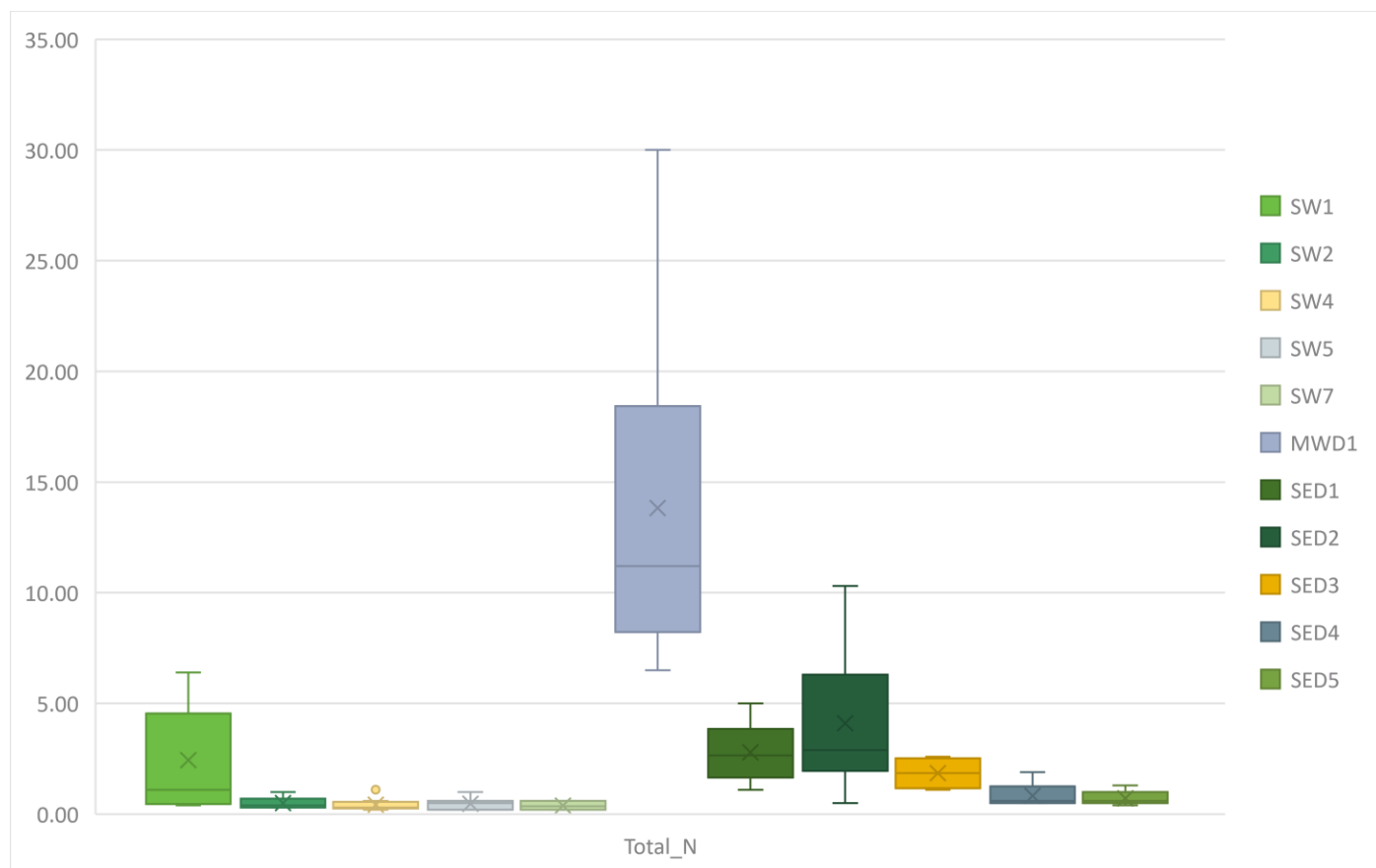


Figure 4-10. Total Nitrogen concentrations

As shown in Figure 4-11, TN at MWD1 largely comprised of nitrate, in contrast to the upstream sites and GDS SW5, which were dominated by Total Kjeldahl Nitrogen (TKN). TKN is the sum of nitrogen bound in organic substances and ammonium.

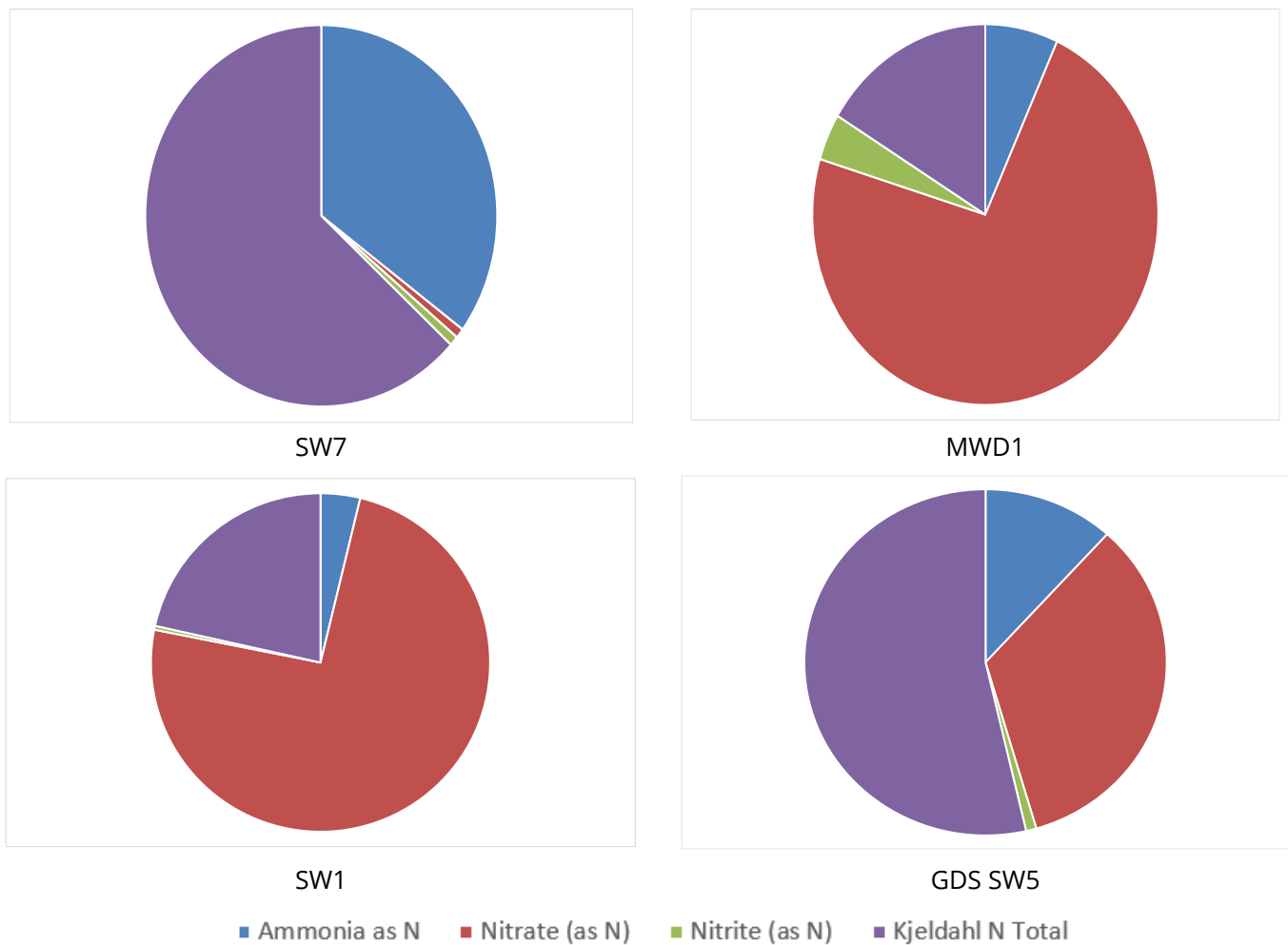


Figure 4-11. Nitrogen by form

4.1.11 Nitrate

The box and whisker plots below demonstrate the spread of nitrate concentrations, for the upstream and downstream environment (Figure 4-12) and mine water management infrastructure (Figure 4-13).

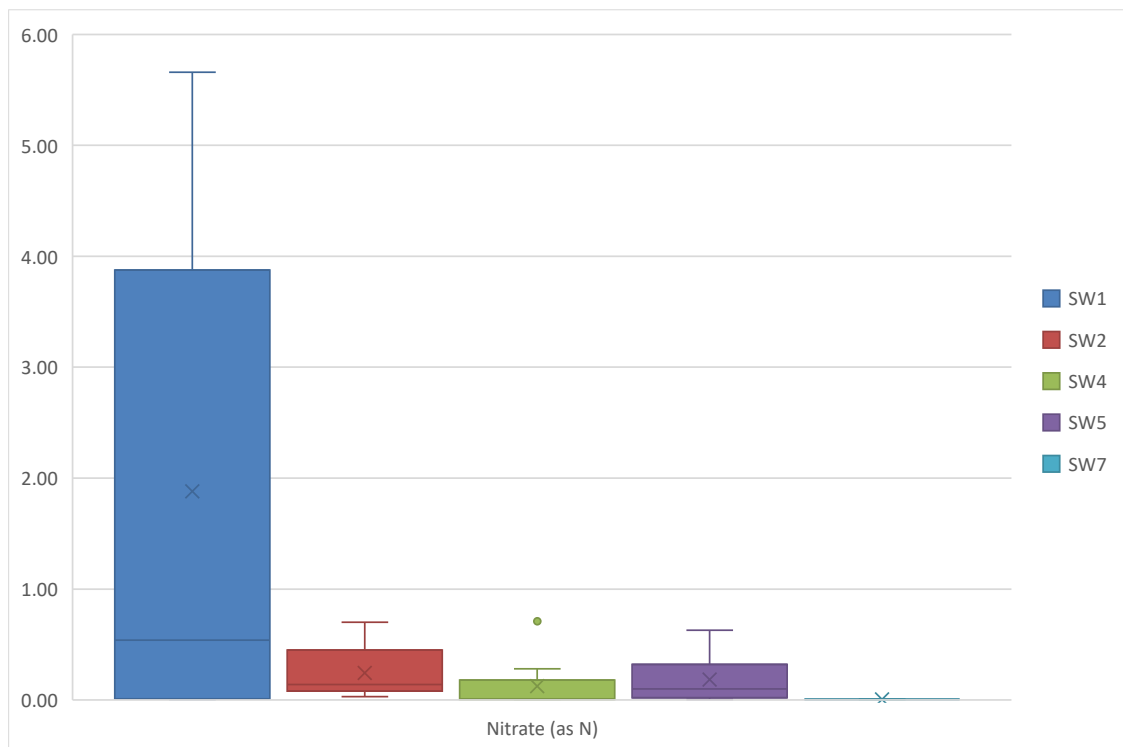


Figure 4-12. Nitrate concentrations upstream and downstream of DP1

Nitrate concentrations were an order of magnitude higher at the mine, when compared to the upstream monitoring locations and GDS SW5. Samples collected in the late dry season (November and December 2023) returned significantly elevated Nitrate concentrations due to low water levels and evapo-concentration of solutes during the dry season.

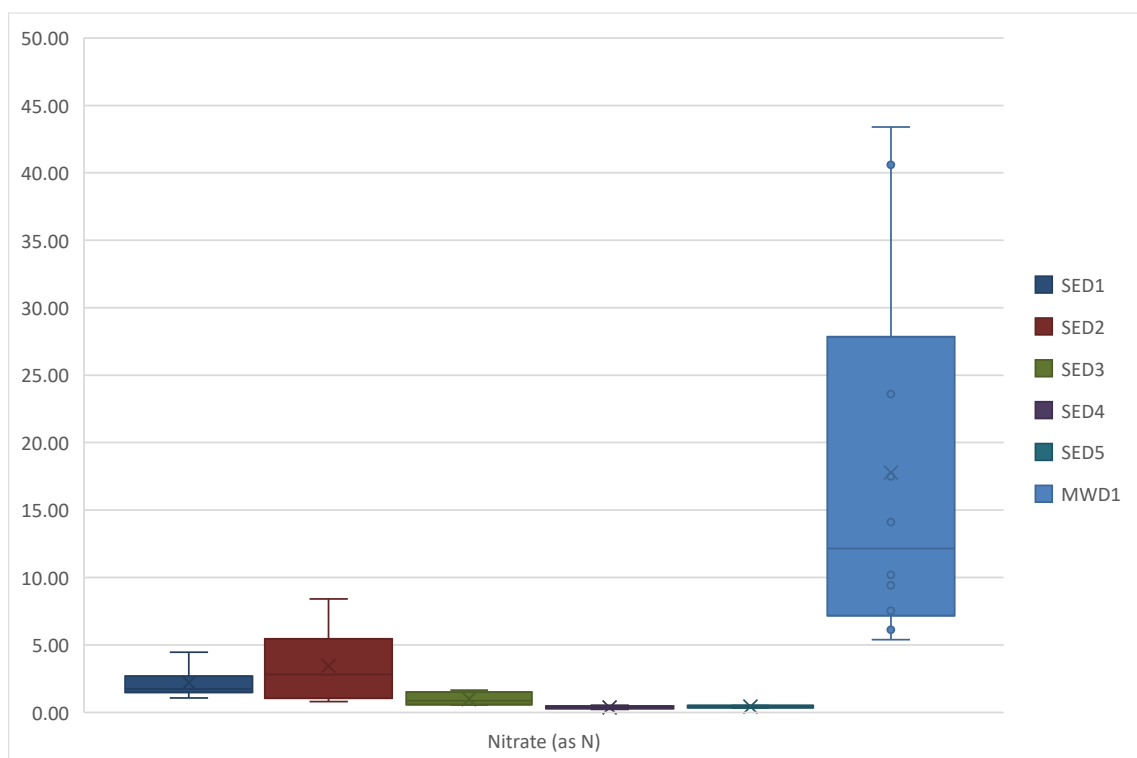


Figure 4-13. Nitrate concentrations at Grants water management storages

4.1.12 Phosphorus

Median Total Phosphorus (TP) concentrations for the reporting period are shown in Figure 4-14. Median phosphorus and chlorophyll-a concentrations. Total Phosphorus at GDS SW5 exceeded the WDL248 TV of 0.01 mg/L (10 µg/L) on 7 of 11 sampling occasions (64% of sampling occasions).

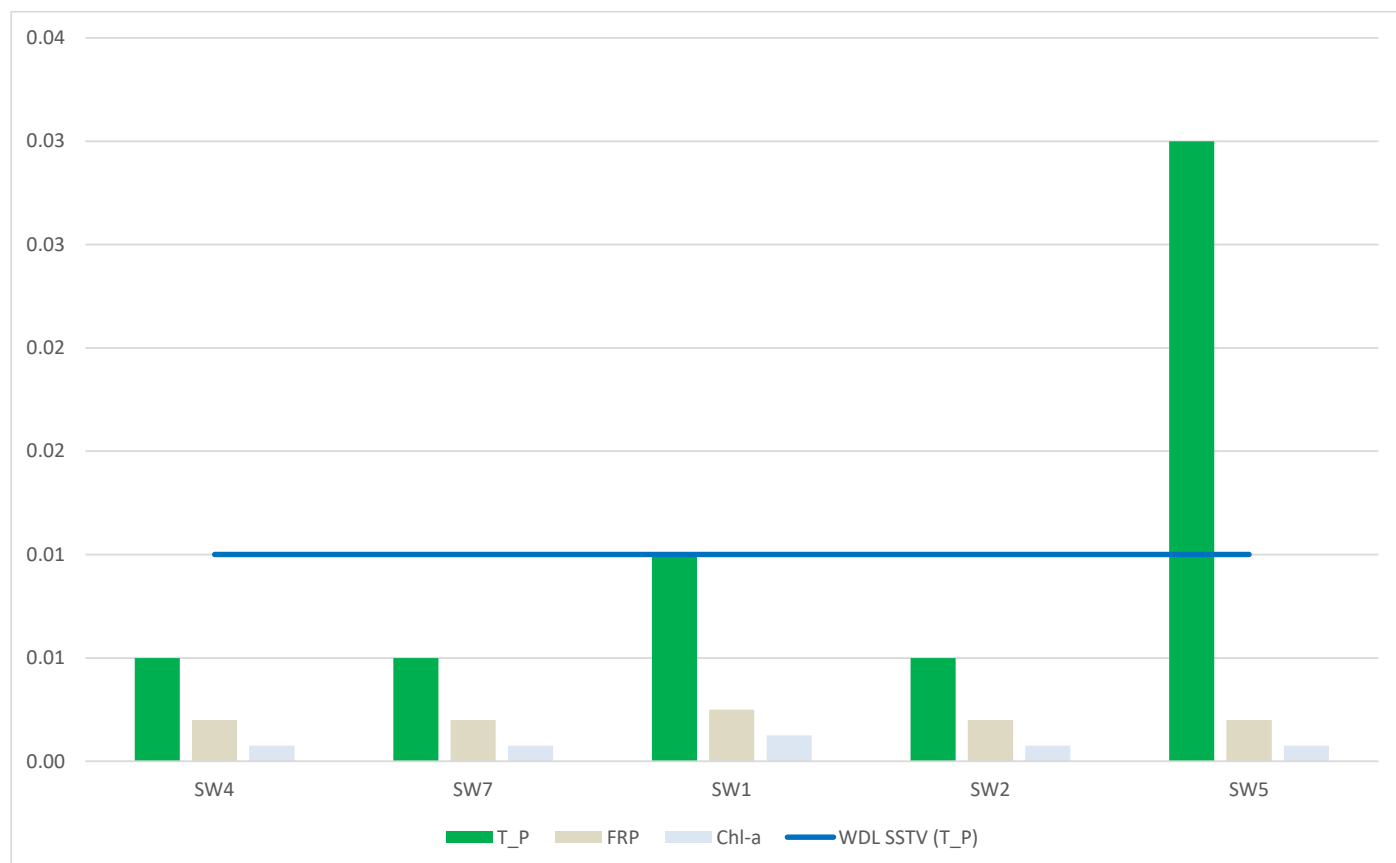


Figure 4-14. Median phosphorus and chlorophyll-a concentrations

Temporally TP was variable, as shown in Figure 4-15.

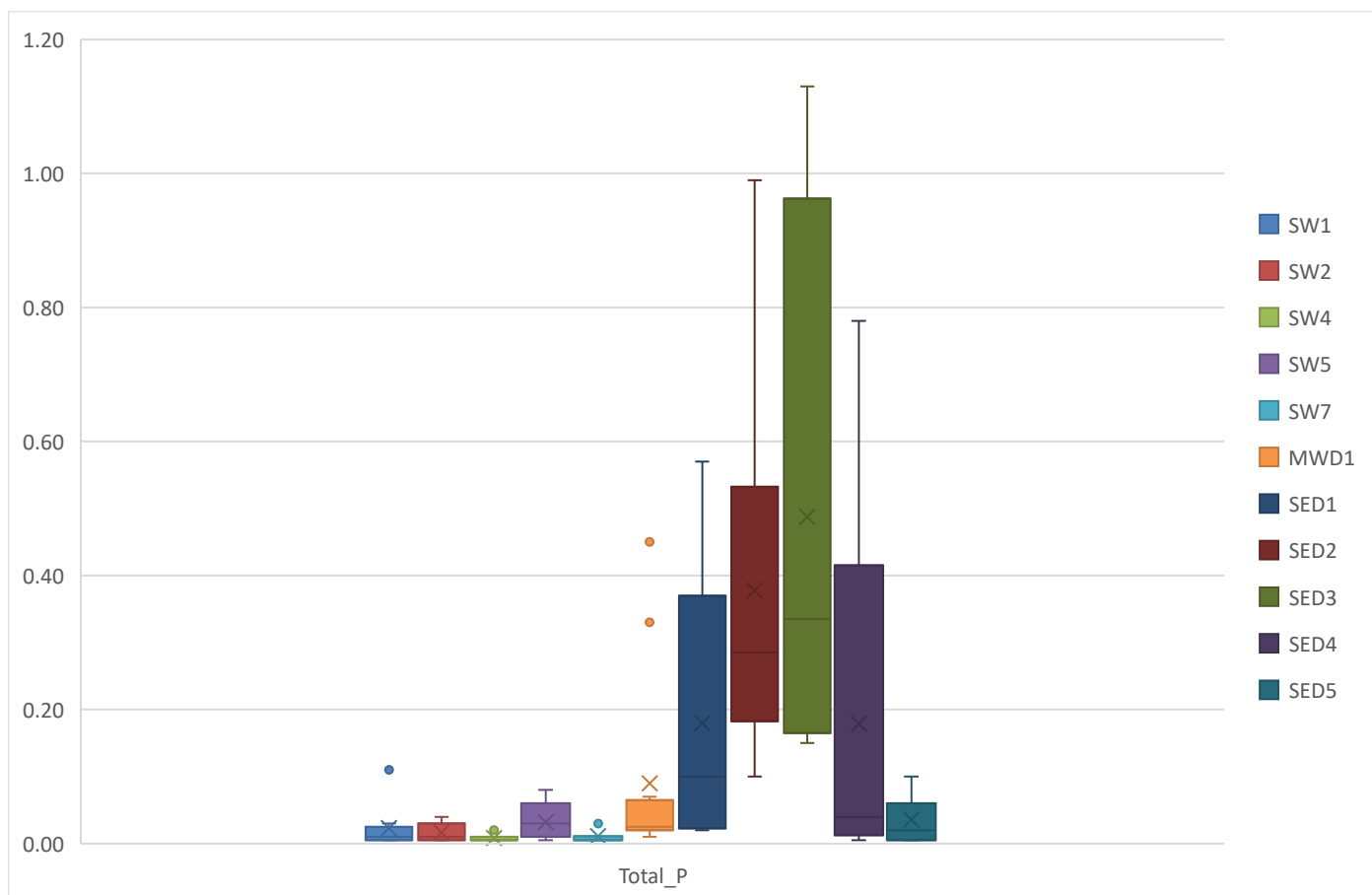


Figure 4-15. Total Phosphorus concentrations

4.1.13 Chlorophyll-a

Monitoring of chlorophyll-a (chl-a) commenced on 9 March 2023, consistent with the amended WDL dated 7 March 2023. Chl-a concentrations are reported in Table 4-3 and shown in Figure 4-14. Chl-a concentrations were generally low with no clear correlation to nutrient concentrations.

4.1.14 Metals and metalloids

The median and 80th percentile values for metal and metalloids are provided in Table 4-4 and Table 4-5. Each table provides data for the total and filtered fraction. Those numbers in bold are above the respective WDL248 Trigger Value (TV) and any exceedance at the compliance point (GDS SW5) is shaded green.

All mercury concentrations were less than the LOR and are not presented in the tables.

Table 4-4. Metal and metalloid concentrations (Total) (mg/L)

		Aluminium	Arsenic	Cadmium	Chromium (III+VI)	Copper	Iron	Lead	Lithium	Nickel	Zinc
Limit of Reporting		0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.001	0.005
SW1	Median	0.32	0.002	0.00005	0.0005	0.0005	0.31	0.0005	0.106	0.0005	0.0025
	80th %ile	1.252	0.002	0.00005	0.0005	0.0007	1.116	0.0005	0.159	0.0005	0.0051
SW2	Median	0.31	0.0005	0.00005	0.0005	0.0005	0.38	0.0005	0.038	0.0005	0.0025
	80th %ile	0.614	0.0007	0.00005	0.0005	0.0005	0.698	0.0005	0.054	0.0005	0.0025
SW4	Median	0.15	0.001	0.00005	0.0005	0.0005	0.49	0.0005	0.004	0.0005	0.0025
	80th %ile	0.376	0.002	0.00005	0.0005	0.0005	0.864	0.0005	0.022	0.0005	0.0025
SW5	Median	0.5	0.001	0.00005	0.0005	0.0005	0.6	0.0005	0.026	0.0005	0.0025
	80th %ile	0.66	0.002	0.00005	0.0005	0.001	1.28	0.0005	0.048	0.0005	0.0025
SW7	Median	0.15	0.0005	0.00005	0.0005	0.0005	0.11	0.0005	0.0005	0.0005	0.0025
	80th %ile	0.254	0.0005	0.00005	0.0005	0.0005	0.134	0.0005	0.0024	0.0005	0.0025
MWD1	Median	0.2	0.017	0.00005	0.0005	0.0005	0.2	0.0005	0.519	0.002	0.0025
	80th %ile	1.33	0.02	0.00005	0.0005	0.001	0.81	0.0005	1.91	0.002	0.007
SED1	Median	2.385	0.0025	0.00005	0.0035	0.0025	3.245	0.002	0.0405	0.0025	0.0095
	80th %ile	23.464	0.0078	0.00014	0.0292	0.0242	31.56	0.0148	0.14	0.0236	0.0876
SED2	Median	4.56	0.0065	0.0002	0.006	0.011	5.31	0.0085	0.3175	0.006	0.0275
	80th %ile	10.752	0.0092	0.0004	0.0134	0.0152	13.688	0.0128	0.475	0.012	0.0616
SED3	Median	4.815	0.008	0.00005	0.006	0.007	6.895	0.003	0.087	0.0055	0.021
	80th %ile	9.808	0.0116	0.00007	0.0124	0.0158	14.512	0.0084	0.141	0.0118	0.0444
SED4	Median	1.52	0.002	0.00005	0.001	0.002	1.58	0.001	0.01	0.002	0.007
	80th %ile	2.058	0.002	0.00005	0.0022	0.0028	2.488	0.001	0.0106	0.0022	0.0078
SED5	Median	1.99	0.0005	0.00005	0.00075	0.0005	0.925	0.00125	0.005	0.00075	0.0025
	80th %ile	2.71	0.0005	0.00005	0.002	0.0005	1.29	0.002	0.006	0.001	0.0025

Table 4-5. Metal and metalloid concentrations (Filtered) (mg/L)

		Aluminium (filtered)	Arsenic (filtered)	Cadmium (filtered)	(III+VI) (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Lithium (filtered)	Nickel (filtered)	Zinc (filtered)
Limit of Reporting		0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.001	0.005
SW1	Median	0.01	0.001	0.00005	0.0005	0.0005	0.025	0.0005	0.106	0.0005	0.0025
	80th %ile	0.034	0.002	0.00005	0.0005	0.0005	0.076	0.0005	0.1718	0.0005	0.0025
SW2	Median	0.015	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.0395	0.0005	0.0025
	80th %ile	0.026	0.0005	0.00005	0.0005	0.0005	0.04	0.0005	0.0546	0.0005	0.0025
SW4	Median	0.03	0.001	0.00005	0.0005	0.0005	0.07	0.0005	0.002	0.0005	0.0025
	80th %ile	0.044	0.002	0.00005	0.0005	0.0005	0.346	0.0005	0.0268	0.0005	0.0025
SW5	Median	0.03	0.0005	0.00005	0.0005	0.0005	0.08	0.0005	0.024	0.0005	0.0025
	80th %ile	0.04	0.001	0.00005	0.0005	0.0005	0.16	0.0005	0.042	0.0005	0.0025
SW7	Median	0.02	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.0005	0.0005	0.0025
	80th %ile	0.02	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.0007	0.0005	0.0025
MWD1	Median	0.005	0.0165	0.00005	0.0005	0.0005	0.025	0.0005	0.487	0.0005	0.0025
	80th %ile	0.012	0.0176	0.00005	0.0005	0.0005	0.025	0.0005	1.808	0.001	0.0025
SED1	Median	0.005	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.0395	0.0005	0.0025
	80th %ile	0.038	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.0584	0.0005	0.0025
SED2	Median	0.025	0.003	0.00005	0.0005	0.0005	0.025	0.0005	0.3575	0.0005	0.0025
	80th %ile	0.04	0.0036	0.00005	0.0005	0.0005	0.025	0.0005	0.5234	0.0005	0.0025
SED3	Median	0.025	0.001	0.00005	0.0005	0.0005	0.025	0.0005	0.0525	0.0005	0.0025
	80th %ile	0.038	0.0046	0.00005	0.0005	0.0005	0.035	0.0005	0.111	0.0005	0.0025
SED4	Median	0.02	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.006	0.0005	0.0025
	80th %ile	0.056	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.007	0.0005	0.0025
SED5	Median	0.035	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.001	0.0005	0.0025
	80th %ile	0.04	0.0005	0.00005	0.0005	0.0005	0.025	0.0005	0.002	0.0005	0.0025
WDL SSTV		0.07	0.013	0.002	0.001	0.0014	0.11	0.0034	0.43	0.011	0.008

As indicated in Table 4-4, the median and 80th percentile concentrations for total aluminium and iron and the 80th percentile concentration for lithium were above respective WDL248 TVs though these trigger values apply to filtered samples only. Median concentrations for all analytes as measured at SW5 were below their respective WDL248 TVs. These results demonstrate an improvement in water quality at the downstream compliance point when compared to wet season 2022/23 sampling.

4.1.15 Treatment reagents

Flocculants containing Acrylamide are not used on site and therefore no analysis of samples for this parameter occurred during this reporting period.

4.1.16 Other

The median and 80th percentile values for major ions, alkalinity and solids are provided in Table 4-6. There are no TV identified in WDL248 for these parameters. All carbonate concentrations were less than the LOR and are not presented in the table.

Table 4-6. Major ions, alkalinity and solids

Site/Parameter		SO ₄	Cl ⁻	Ca	Mg	K	Na	HCO ₃	TDS	TSS
SW4	Median	0.5	4.0	0.5	0.5	0.5	3.0	2.0	2.0	32.0
	80th %ile	2.4	4.0	0.5	0.5	0.5	5.0	3.4	3.4	39.8
SW7	Median	0.5	2.0	0.5	0.5	0.5	2.0	1.0	1.0	21.5
	80th %ile	0.5	3.0	0.5	0.5	0.5	2.2	1.4	1.4	24.6
MWD1	Median	30.5	3.5	11.5	7.5	5.5	14.0	18.5	18.5	160.0
	80th %ile	33.2	4.6	14.0	9.6	7.0	17.2	19.6	19.6	224.4
SW1	Median	5.0	3.0	2.0	2.0	2.0	6.0	8.0	8.0	78.0
	80th %ile	14.2	4.0	3.4	2.8	2.4	9.0	10.2	10.2	87.0
SW2	Median	1.0	2.0	0.5	0.5	0.5	3.0	3.0	3.0	32.0
	80th %ile	4.0	3.0	0.5	0.5	0.5	4.8	6.4	6.4	42.6
SW5	Median	0.5	2.5	0.5	0.5	0.5	2.5	2.0	2.0	32.0
	80th %ile	2.0	4.0	0.5	0.5	0.5	4.0	4.0	4.0	42.0
Sed1	Median	8.0	2.0	1.0	2.0	1.0	3.0	2.0	2.0	58.5
	80th %ile	8.0	2.8	1.8	2.0	2.0	3.8	2.0	2.0	102.0
Sed2	Median	7.0	3.0	3.0	2.0	2.0	3.0	6.0	6.0	94.0
	80th %ile	7.8	3.8	4.8	2.8	2.0	4.8	6.8	6.8	130.0
Sed3	Median	4.5	3.0	0.5	1.0	1.0	3.0	3.5	3.5	79.5
	80th %ile	6.2	4.4	0.5	1.0	1.4	3.4	5.0	5.0	104.8
Sed4	Median	1.0	3.0	0.5	0.5	0.5	2.0	0.5	0.5	42.0
	80th %ile	2.4	3.4	0.5	0.5	0.5	2.0	1.2	1.2	50.4
Sed5	Median	1.3	3.0	0.5	0.5	0.5	2.0	0.5	0.5	69.0
	80th %ile	2.0	3.0	0.5	0.5	0.5	2.0	0.5	0.5	113.0

With the exception of the marine monitoring locations, water is soft with low concentrations of major anions and cations.

Total suspended solids (TSS) concentrations were highest in sediment basins 1, 2, and 3 as shown in Figure 4-16.

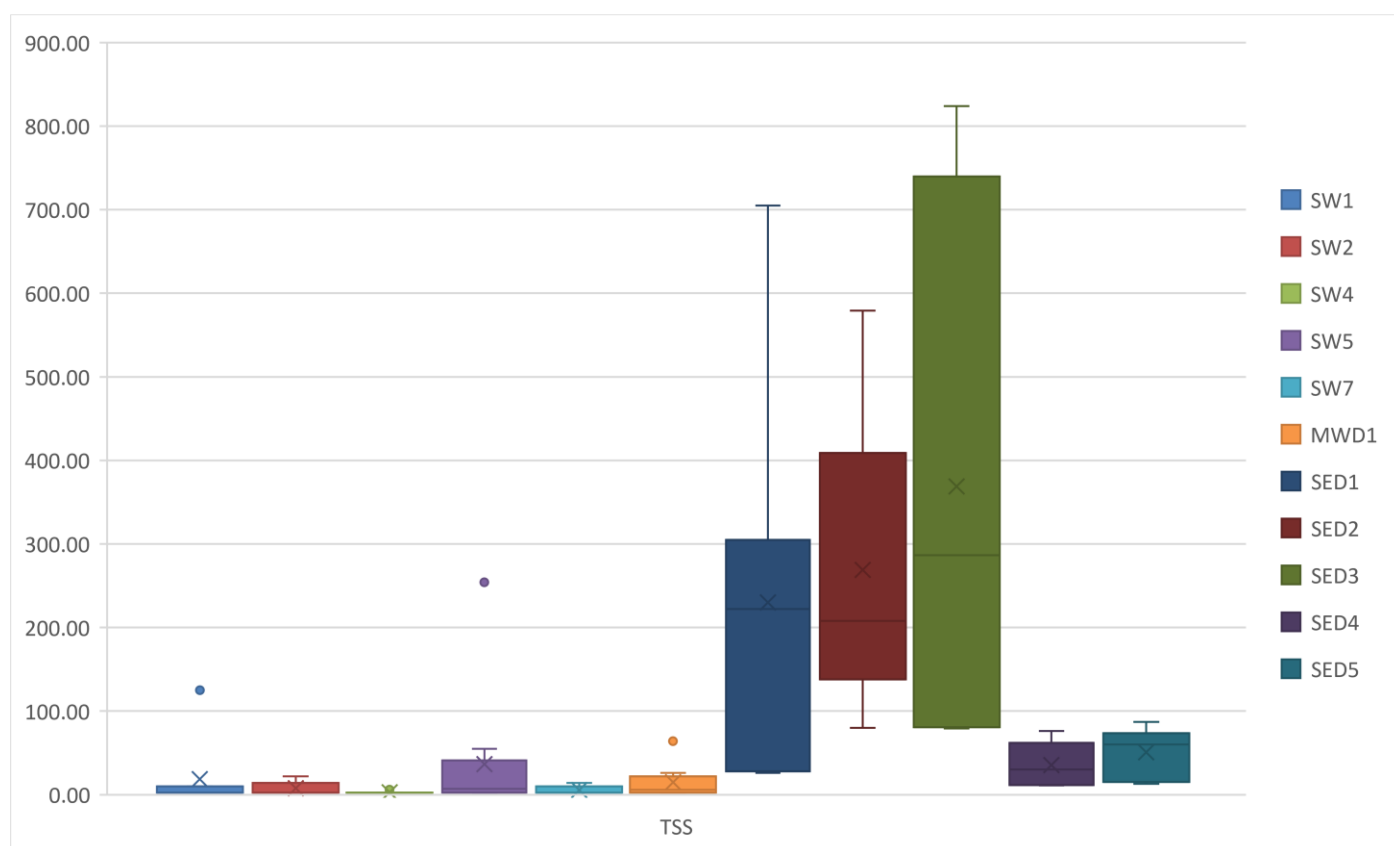


Figure 4-16. Total Suspended Solids concentrations

4.2 Quality Assurance / Quality Control

When completing the QA/QC assessment for the project and data, the following indicators (as identified in the data quality objectives or DQOs) were used to assess if the data obtained is considered fit for its intended uses; specifically, representativeness, completeness and comparability.

4.2.1 Field QA/QC

Sampling was undertaken in accordance with the following QA/QC protocols:

- All site workers were made familiar with the sampling methodology.
- Full details of all field activities and sample collection were recorded in field notes including detailed and relevant descriptions such as date and time, sampling point ID, depth of sampling, equipment used for sampling, sample appearance (colour, odour, clarity, sheen, etc.) and in-situ parameters results surface water.
- New sterile nitrile gloves were worn and changed at each sample location and between samples to avoid cross-contamination.
- Sediment samples were collected using a Ponar 'Grab' Sampler and a trowel (where collected from the edge of the waterbody). Marine sediment samples were taken using a VanVeen grab sampler. Grab sampling equipment was cleaned before collecting the next sample.
- Surface water samples were collected using a sample pole and the Van Dorn grab sampler.

- Any equipment that came into contact with the sample (e.g., trowels, auger, water quality meter, jugs, grab samplers) was cleaned prior to sampling, and thoroughly rinsed with Decon 90 and demineralised water between samples.
- Sample containers were clearly marked with unique identification details, sampling date, sampler initials, project name and number and analyses required.
- Samples were stored in appropriate jars, bottles or bags, within a chilled insulated container with ice bricks. Of note is that despite the samples being kept chilled until dispatched to the laboratory, it was not possible to maintain them at temperatures below 6°C as recommended by the laboratories. Achieving low temperatures when storing the samples collected was particularly challenging due to the commonly high ambient temperatures in the Project area, as well as the limitations faced to maintain low storage temperatures when transporting samples from the Project area to Darwin. High temperatures in the samples can facilitate their degradation, and as such, reduce the accuracy of the results obtained. However, given samples were submitted to the laboratory within their respective holding time, the effect of any potential degradation is not expected to impact largely on the assessment of the results obtained.
- Chain of Custody (CoC) procedures were adhered to for all sample transfers. CoC's detailed all relevant contact details, sample numbers, sampling date and time, condition of sample, description of sample containers and sizes (including details of preservation), analyses required, detection or reporting limits and specific instructions and were signed by each person transferring and accepting custody.

4.2.2 Comparability

Comparability is a term used to express the ability to fairly compare sample test results taken from the same site at different times. All field personnel assigned to undertake the sampling for the project were briefed and made familiar with the sampling methodology so they would be aware of the sampling procedures to be followed.

No deviations from the sampling procedures were observed during the fieldwork and therefore no bias in the data collection is expected.

4.2.3 Laboratory QA/QC

Samples were analysed using the techniques and methods outlined in each sampling plan. In total there were 71 workorders undertaken with ALS.

An assessment of the laboratory data quality included a review of received laboratory reports and methods listed below.

- CoC form with laboratory signature and sample receipt notifications, date and time of receipt of samples and comment on the condition of samples, such as temperature, or damaged/missing/mislabelled samples
- Analytical methods and laboratory accreditation for methods used
- Laboratory LOR
- Holding and extraction times for each analysis and sample
- Method blanks
- Surrogate recoveries

- Matrix spikes recoveries
- Laboratory control samples
- Laboratory duplicates
- Parameter frequencies and summary of QA/QC outliers.

4.2.4 Laboratory documentation

Care was taken by the field team leader to ensure all samples were submitted to the laboratory. However, due to different field staff collecting samples, there were some instances where some field staff labelled samples differently (e.g., DH5 instead of GDS DH5).

4.2.5 Relative percentage difference

An acceptance criterion of 30% relative percentage difference (RPD) was adopted for samples and field duplicates, however, where concentrations are at least 10 times the limit of reporting, they are considered too low to determine RPDs with accuracy.

4.2.6 QA/QC summary

Laboratory QA/QC outliers, RPDs above the criteria and the detection of some metals and inorganic compounds in duplicate samples were reported in this investigation. However, these are not likely to impact largely on the assessment of the results obtained.

4.3 Fluvial sediment

Sediment sampling was undertaken as a component of biological monitoring. Results from samples collected downstream of the Grants mine suggest that arsenic is likely to be naturally present in sediments in the lower catchment. Samples collected at sites closer to the mine and discharge point has lower concentrations which suggests that these results are not a result of discharges and sediment transport from the site.

Sediments samples were dominated by fines and sand in the upper catchment and were almost equal parts gravel and sand in the lower catchment. Metal concentrations in sediments increased with distance downstream from the site for all analytes but lithium, which was recorded at its highest concentration at site UC2.

4.3.1 Particle size distribution

The portion of fines, sand and gravel was spatially variable as shown in Figure 4-17. At SW5 sand and gravel (i.e., > 75 µm and >2mm) represented almost 99% of the sediment sampled.

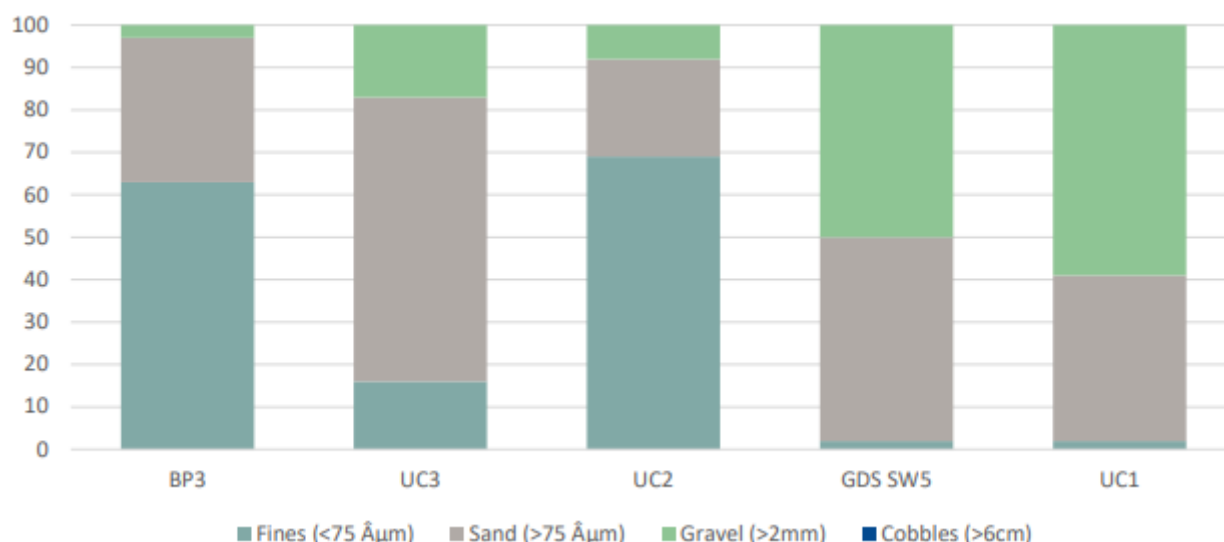


Figure 4-17. Fluvial sediment particle size distribution

4.3.2 Chemistry

Whilst there are no compliance trigger values for sediment, data have been compared against the guideline values for sediment quality (ANZG, 2018). Table 4-7 provides the average sediment pH, EC and toxicant concentrations at each site. The default and GV-high values are shown, and any exceedances are shaded grey.

Table 4-7. Average sediment total metal and metalloid concentrations (mg/kg)

Analyte	LOR*	BP4	UC3	UC2	GDS·SW5	UC1	DGV	GV-high
Aluminium	50	4560	8460	13900	9610	7410	-	-
Arsenic	1	<1.00	7.4	2.96	58.7	47	20	70
Cadmium	1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	10
Chromium	2	3.3	15.5	17	35.4	26.4	80	370
Copper	5	5.5	9	11.7	22.2	19.5	65	270
Iron	50	3280	15400	17800	47400	43000	-	-
Lead	5	7	14.1	13.8	20	15.3	50	220
Lithium	0.1	2.3	13.7	40	23.4	18.9	-	-
Mercury	0.01	0.02	0.02	0.02	0.02	0.02	0.15	1.00
Nickel	2	3.3	6.7	9.7	10.3	10.6	21	52
Zinc	5	7.4	20.6	25.5	34.9	53.9	200	410

Variable LOR due to matrix interference.

Arsenic was the only metal that was detected in concentrations which exceeded the ANZG 2018 default guideline values for sediment. The concentration of arsenic in sediment sampled at SW5 exceeded the DGV of 20 mg/kg.

Arsenic is known to be naturally high in Darwin Harbour sediments. Fortune concluded that the observed levels of arsenic in Darwin Harbour most likely reflect natural weathering of arsenic rich coastal substrata (Fortune,

2006) and Munksgaard et al., (2013) similarly that given the spatial extent of elevated arsenic levels throughout the study area (Darwin Harbour), it is likely to be indicative of local geology.

Select sediment metal concentrations are shown in Figure 4-18.

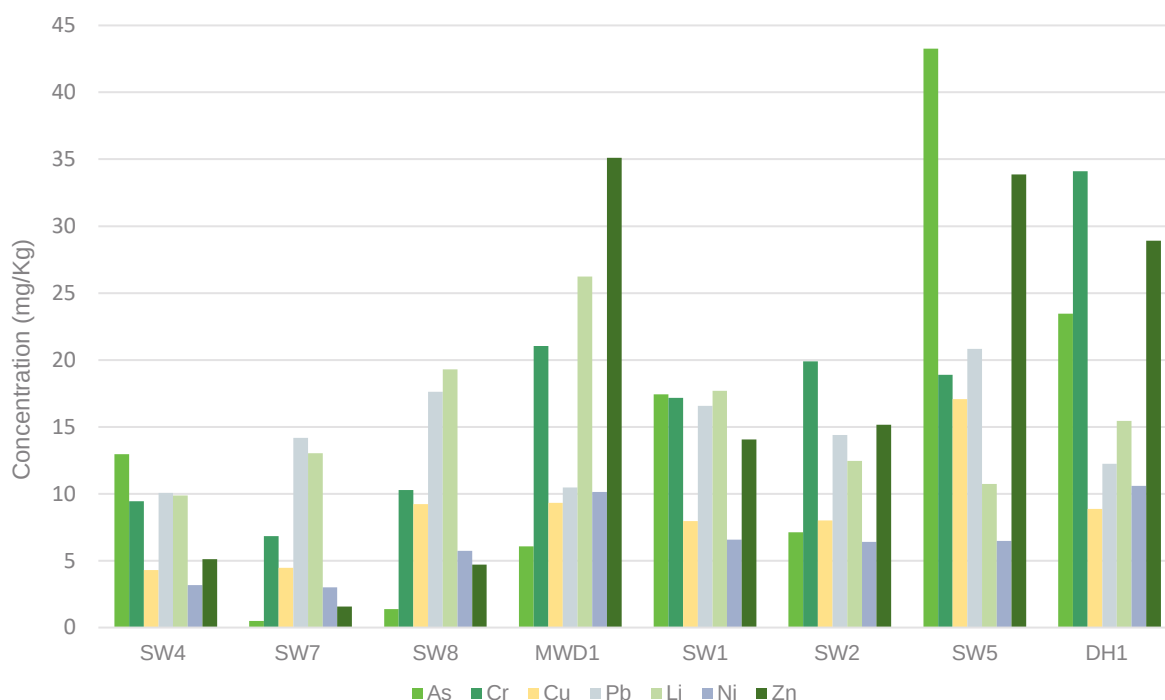


Figure 4-18. Average sediment metal and metalloid concentrations

4.4 Biota

4.4.1 Freshwater macroinvertebrates

A copy of the technical report (deliverable) is provided as Appendix E. In summary, in 2024, macroinvertebrate sampling results showed the highest relative abundance of the community at UC2 directly downstream of the GLP, and improvements in aquatic ecosystem health with distance downstream. This is in contrast with sample results from 2023 which indicated an impairment of the community at UC2. No visible pattern was present in the results when viewed in the context of position in the catchment relative to Grants.

Historical data indicates that there were higher relative abundances at all sites except UC3 in 2024. The compliance point, GDS SW5 showed an improvement in almost all metrics in 2024 when compared to previous years, which aligned with other sites in the catchment. The significant difference between baseline data and PET taxa richness can be attributed to higher values recorded in 2024. The increase in 2024 is directly relative to increases in taxa richness. This significant difference is not considered to be a cause for concern, as it aligns with other metrics in terms of the ecosystem's response to above average rainfall.

Macroinvertebrate and sediment sampling at Grants in 2024 was completed after an above-average wet season, and site conditions reflected those conditions. Habitat characteristics of each site appeared to influence the differences in macroinvertebrate metrics and community composition. The results of sampling in 2024 demonstrate that active discharge from Grants has had no significant impact on the aquatic ecosystems of waterways draining to Darwin Harbour.

4.4.2 Riparian vegetation

A copy of the technical report (deliverable) is provided as Appendix H. In summary, the monitoring did not identify any significant changes in the extent or species composition of riparian vegetation communities downstream of the GLP that could be attributed to the discharge of mine impacted wastewater.

The drone survey results indicated an overall increase in riparian vegetation of 1.31 ha, compared to the 2019 baseline survey, with the main increase observed in the mangrove community. The swamp and riparian vegetation communities were in a stable condition, with no significant change in the extent of the vegetation communities identified in the 2024 drone survey.

Based on the riparian vegetation site assessment, some minor vegetation composition changes were noted, mostly occurring in the mid-stratum and ground stratum. The slight variations in the ground stratum could be attributed to the timing of monitoring (i.e., seasonal variations).

5 Contaminant Loads

Contaminant loads were calculated for DP1 (MWD1) over the reporting period. As tabulated in section 2.2, discharge from DP1 commenced on 29 January 2024 and ceased 15 March 2024. The calculations were based on the daily discharge volume and concentration of contaminant present in the discharge on that day. On the days when a sample was not taken, the concentration of the contaminant was estimated using linear interpolation methodology.

The contaminant loads for the reporting period are shown in Table 5-1. The contaminants are listed in order of load (highest to lowest).

Table 5-1. Monthly and annual contaminant loads

Parameter	Jan (kg)	Feb (kg)	Mar(kg)	Total 2024(kg)
Total Suspended Solids	432.54	3122.53	936.47	4491.54
Nitrogen (Total)	166.85	2176.90	797.17	3140.92
Nitrate (as N)	197.68	1308.62	405.91	1912.21
Sulphate	14.58	511.55	60.14	586.27
Kjeldahl Nitrogen Total	23.61	159.38	82.13	265.12
Nitrite (as N)	14.14	44.83	120.67	179.65
Iron	1.47	110.15	46.92	158.54
Ammonia as N	4.63	35.65	103.32	143.61
Lithium	8.84	72.99	32.27	114.10
Aluminium	2.24	83.71	14.60	100.54
Total Phosphorus	1.80	4.74	3.35	9.89
Arsenic	0.24	4.71	2.22	7.17
Zinc	0.04	0.55	0.30	0.89
Nickel	0.03	0.35	0.10	0.48
Chromium (III+VI)	0.01	0.18	0.06	0.25
Copper	0.01	0.11	0.06	0.18
Lead	0.01	0.11	0.06	0.18
Cadmium	0.00	0.01	0.01	0.02

6 Long Term Trend Analysis

Operations at GLP commenced in October 2022. This report is the third WDL monitoring report since commencing operations, and previous data are limited to baseline data from which the site-specific trigger values were developed. The data do not permit an assessment of long-term temporal trends.

7 Impacts of Wastewater Discharge

The macroinvertebrate data showed some impairment of the community furthest downstream of Grants at UC1, yet other sites downstream demonstrated an improvement of similarity in health metrics from previous data. Differences in community health and composition at UC1 were not consistent with poor water or sediment quality results. Differences in the macroinvertebrate community is more likely associated with water quality changes due to tidal influences during spring tides.

pH, whilst elevated when compared to the WDL248 TV, was consistent across all sites except for GUS SW7. Following the collection of an additional 12 months of data, it may be timely to revisit the baseline and upstream site data and amend the TV as appropriate.

No algal blooms or similar indicators of nutrient enrichment were observed over the reporting period. All chl-a concentrations are comparable between sites, with the highest concentrations observed at the marine sampling locations.

Following discharge, the data indicate that nitrate is quickly bound to organic matter. TN at MWD1. All remaining monitoring locations, including at SW1 immediately downstream of DP1 are dominated by TKN, indicating at these sites the nitrogen is organically bound and less bioavailable. LDGNT intend to review the baseline and upstream site data and seek an amendment to the WDL248 TV for TN, to better reflect potential downstream impact and initiate appropriate response to prevent that impact.

Direct toxicity assessment of mine affected water was completed in March 2024 using a range of concentrations of water sourced from the Fines Storage Facility, Grants Pit, and the downstream compliance point SW5. No acute toxicity was observed in any of the samples. However, chronic toxicity was observed in the Grants Pit and TSF samples, with the TSF showing the most chronic toxicity.

Arsenic concentrations in surface water downstream of DP1 do not indicate an impact relating to discharge. Fluvial sediment data, however, suggest that arsenic is either naturally present in sediments in the catchment or bound in sediments that are being transported from the site. The particle size distribution data indicate that the bioavailability of arsenic at GDS SW5 is likely limited given the coarseness of the sediment. The data indicate a potential risk to aquatic ecosystems, should arsenic become bioavailable, via resuspension under differing pH conditions for example.

No impacts on downstream riparian vegetation were observed for the reporting period.

No seagrass was detected at the Darwin Harbour monitoring sites GDSDH1, GDSDH2 and GDSDH3. This is consistent with the benthic habitat mapping for Darwin Harbour, which shows low likelihood of seagrass habitat within West Arm. As per the WDL Monitoring Program (Appendix B), LDGNT intend to seek an amendment to WDL248 to remove the requirement to monitor seagrass in West Arm.

8 Conclusion

The data collected over the reporting period indicate that the sediment basins 1, 2 and to a lesser extent 3 are the primary source of suspended solids, aluminium, and iron. Sediment Basins 4 and 5 continue to operate efficiently which is partly attributable to the reduced operational intensity in these catchments. While the utilisation of an agricultural drone to apply flocculant chemicals has improved the efficacy and responsiveness of that water treatment the above average wet season and pattern of rainfalls resulted in periods of passive release of turbid water from these basins.

Discharge of 374.1 ML of Mine Affected Water through DP1 occurred between the 29th of January and the 15th of March 2024. This represents a 75% increase in the volume released under the WDL conditions. The median concentrations for nutrients, metals and metalloids at SW5 did not exceed the SSTVs during this period.

LDGNT will review and update the WDL248 Monitoring Program considering the past 12 months of operations and transition of the site to a non-operational status and may seek an amendment to WDL conditions if empirical data support this.

The following actions are proposed to improve the WDL 248 Monitoring Program:

- Installation of telemetered gauging station at the unnamed tributary entering the creek immediately upstream of SW5.
- Monitoring of sediment quality in the GLP sediment basins.
- Undertaking total and weak acid extractable metal analysis for sediments.
- Arsenic concentrations will continue to be monitored closely to understand trends associated with active discharge, annual rainfall and erosion and sedimentation.

The following actions are proposed to improve water management in accordance with conditions of WDL248:

- Installation of submersible pump in the Grants Pit to manage water inflows at a reduced and sustained rate. This will redirect water management activities to surface infrastructure thereby reducing complexity, labour requirements and reactive management of storm events.
- Clean out of sediment control infrastructure to restore and repair assets damaged by above average wet season flows.
- Complete construction of water piping infrastructure to maximise water recycling within the operation and to reduce fresh water inputs and discharge requirements.

9 References

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ATTACHMENT A

Waste Discharge Licence 248

WASTE DISCHARGE LICENCE

(Pursuant to section 74 of the *Water Act 1992*)

Licensee	Lithium Developments (Grants NT) Pty Ltd
Licence Number:	WDL248-02
Registered Business Address:	Level 5, Flinders Street Adelaide SA 5000
ACN:	622 047 232
ABN:	70 622 047 232
Commencement Date:	25 July 2022
Amended on:	7 March 2023 20 December 2023
Expiry Date:	24 July 2025
Licensed Action:	Controlled discharge of wastewater from Mine Water Dam 1 (MWD1) through authorised discharge point (DP1) and into an unnamed ephemeral stream that feeds into West Arm, Darwin Harbour in accordance with Table 2 and subject to the conditions of this licence.

WASTE DISCHARGE LICENCE (WDL248-02)

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WASTE DISCHARGE LICENCE (WDL248-02)

INFORMATION ABOUT THIS LICENCE

This waste discharge licence is granted pursuant to section 74 of the *Water Act 1992* (NT) (*Water Act*), which empowers the Controller of Water Resources to, in accordance with the *Water Act*, grant a licence to a person to carry out an action that would otherwise be an offence against this Act.

Responsibilities of Licensee

- In addition to the conditions set out in this licence, general responsibilities of licensees are set out in the *Waste Management and Pollution Control Act 1998* (NT) (**WMPC Act**), the *Water Act* and the *Water Regulations 1992* (NT) (**Water Regulations**).
- It is an offence under the *Water Act*, if the holder of a waste discharge licence contravene or cause, suffer or permit a person to contravene a term or condition to which the waste discharge licence is subject (s 76 *Water Act*).
- Except as expressly provided for in this licence or applicable law, it is an offence under section 16 of the *Water Act* to wilfully cause or cause, directly or indirectly:
 - waste to come into contact with water; or
 - water to be polluted.

Duration of licence

- This licence will remain in force until its Expiry Date, it is surrendered by the licensee, or until it is suspended or revoked by the Controller of Water Resources.
- A licensee may surrender its licence at any time (s 94 *Water Act*).
- If the licensee wishes to surrender its licence it should complete the notification form approved by the Controller of Water Resources and provide a copy of the completed form to the Administering Agency.
- The authority to allow waste to come into contact with water or water to be polluted ends once a licence is surrendered, and any such occurrence after a licence is surrendered is an offence pursuant to s 16 of the *Water Act*.

Amendment, Modification or Revocation of Licence

- As set out in section 93 of the *Water Act*, the Controller of Water Resources may, by notice served on the holder of the licence:
 - amend or modify the terms and conditions of a licence; or
 - where the Controller of Water Resources is satisfied that the holder of the licence has contravened or failed to comply with a term or condition of the licence or of any other licence previously held by the person for a similar purpose during the 12 months immediately preceding the grant of the first-mentioned licence, the Controller of Water Resources may:
 - revoke a licence; or
 - suspend a licence.

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Transfer of Licence

- Where a waste discharge licence is granted to a person in relation to the person's use of land and, during the period of this licence, the person's interest in the land is transferred to another person, the waste discharge licence shall be deemed to have also been transferred to the other person (s 92 Water Act).
- The licensee must ensure the contact details recorded with the Administering Agency for the licence are correct at all times in accordance with condition 6. Accordingly, it is recommended the transferee complete the Controller of Water Resources approved notification of transfer of a waste discharge licence form.

Public Register

- A copy of this Licence will be placed on the Register in accordance with section 95 of the Water Act.
- A copy of plans for environmental management, reports, submissions or documents provided at Schedule 1 Item 13 will be placed on the Register.
- The Register is freely available from the Northern Territory Environment Protection Authority (**NT EPA**) website.

Water Quality Standards

- The Administrator may declare, by notice in the *Gazette*, a beneficial use, quality standard, criteria or objectives which apply in relation to any waste or class of waste, or water or class of water (s 73 Water Act).
- A water or waste beneficial use, quality standard, criteria or objectives declared under s 73 of the Act and in force is an Environment Protection Objective for the purposes of the WMPC Act (s 18 WMPC Act).
- An Environment Protection Objective is a statutory instrument to establish principles on which:
 - Environmental quality is to be maintained, enhanced, managed or protected;
 - Pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; or
 - Effective waste management is to be implemented or evaluated.
- Schedule 1 Item 1 specifies the beneficial use, quality, standard, criteria or objective relevant to this licence at the date of issue.

Environmental Interests

- Environmentally sensitive or significant areas may be captured by and protected under the *Environment Protection Act 2019* (NT) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). As such, and to best protect and regulate our waterways, waste discharge licences must identify the sensitivity of the environment surrounding the location of the Licensed Action.
- Schedule 1 Item 2 specifies the sites of conservation significance (if any) relevant to this licence at the date of issue.
- Schedule 1 Item 3 specifies the Ramsar wetlands (if any) relevant to this licence at the date of issue.

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Cultural Interests

- Under Commonwealth and Northern Territory laws it can be an offence to enter or remain on or damage a sacred site.
- Sites of Aboriginal significance including registered and recorded Aboriginal sacred sites may exist in the vicinity of the Licensed Action.
- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the Licensed Action are obtained and complied with.
- Further specific advice on any cultural requirement or implication of the licenced activity should be sought from the relevant land council and the Aboriginal Areas Protection Authority.

END NOTES

This licence is an amendment to WDL248-01.

WDL248-01 was an amendment, issued 7 March 2023.

WDL248 was issued 25 July 2022.

WASTE DISCHARGE LICENCE (WDL248-02)

SCHEDULE 1 - ITEMS

1. Beneficial uses (condition 20)	Beneficial Uses and Objectives for the Darwin Harbour Region (Gazette No. 27, 7 July 2010).	
2. Sites of conservation significance (condition 20)	SOCS No. 6 Darwin Harbour.	
3. Ramsar wetlands (condition 20)	Not applicable.	
4. Licence Documents (condition 13)	(a) Water Management Plan - Appendix K, Mine Management Plan Grants Lithium Project (approved 10 June 2021). (b) Emergency Response Plan - Appendix R, Mine Management Plan Grants Lithium Project (approved 28 June 2019). (c) Stakeholder Engagement Plan - Core Lithium Grants Lithium Project Stakeholder Engagement Plan (issued 7 June 2021).	
5. Authorised Discharge Point(s) (condition 23)	Discharge Point 1 (DP1) from Mine Water Dam 1 (MDW1) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693153 Northing: 8598441
6. Source(s) of waste (condition 26)	Pit water, direct rainfall, and mine influenced water collected from Mineral Lease 31726 that is captured and stored in sediment basins and Mine Water Dam 2 (MWD2) and pumped to MWD1. Waters discharged through DP1 are pumped over the wall of MWD1 and released by a tee valve into the flow path of an adjacent unnamed ephemeral stream as shown at Appendix 1.	
7. Trigger values (condition 26)	The limits for parameters listed in Appendix 2.	
8. Compliance point (condition 26)	Grants Downstream Surface Water 5 (GDS SW5) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693374 Northing: 8600709
9. Conditions on discharge (condition 26)	Any authorised discharge must: (a) Not include wastewater generated outside of Mineral Lease 31726; (b) Not include wastewater treated with polyacrylamide flocculants with more than 0.05% of the neuro-toxin acrylamide monomer; (c) Occur only when the stream gauge at the compliance point GDS SW5 shows there is a sufficient flow to achieve trigger values at the compliance point at Item 8; (d) In the event wastewater is treated, occurs only when the treatment process has finished, including allowing sufficient residence time for settlement of flocculants and target contaminants.	
10. Monitoring Program (condition 30)	The Monitoring Program includes: (a) Surface water monitoring in accordance with Appendix 3. (b) Fluvial sediment monitoring in accordance with Appendix 4. (c) Biota monitoring in accordance with Appendix 5.	

WASTE DISCHARGE LICENCE (WDL248-02)

11. Critical contaminants	Aluminium (Al), Arsenic (As), Copper (Cu), Iron (Fe), Lithium (Li), Zinc (Zn), Total Phosphorus (TP), Total Nitrogen (TN), Nitrate (NO ₃) and Ammonia (NH ₃).
12. Notifiable incidents (Conditions 41 -43)	Notifiable incidents include: (a) An exceedance of three or more times a trigger value specified in Item 7 at the compliance point in Item 8; (b) For physical and chemical stressors, an exceedance (or measurement outside the range) of a trigger value specified in Item 7 at the compliance point in Item 8, on three consecutive sampling occasions; (c) For toxicants, two or more exceedances of a trigger value specified in Item 7, at the compliance point in Item 8, during one annual reporting period ; (d) A discharge at a point not specified in Item 5; (e) A discharge from a source not specified in Item 6; (f) A failure to comply with condition 29; or (g) A failure to comply with condition 38.
13. Documents placed on Register (condition 13)	The following documents will be placed on the Register: (a) The Licence Documents at Item 4. (b) The Monitoring Report provided in accordance with condition 45. (c) The Annual Return.
14. Compliance with trigger values (condition 26)	For the annual reporting period, the trigger values at Item 7 shall be regarded as being complied with if: (a) For metals, hydrocarbons and other toxicants, not more than one measurement or, if more than 20 samples are collected, 5% of measured values, exceed the trigger values specified in Item 7; (b) For nutrients and physico-chemical parameters (DO, pH, EC, temperature), the median value of measurements does not exceed, or is not outside the range of, the trigger values specified in Item 7; and (c) For any other indicators, not more than 20% of samples exceed, or are outside the range of, the trigger values specified in Item 7.
15. Special conditions (condition 51)	By 31 January 2024 the licensee must (a) select an additional control site for inclusion in the water quality monitoring program that is representative of local background water quality and is not affected by activities conducted under the Mining Management Plan (b) Provide details of the location of the site and a justification for its suitability. (c) Commence monitoring the site at the same frequency and for the same parameters as listed in Appendix 3 for site GUS SW4.

WASTE DISCHARGE LICENCE (WDL248-02)

LICENCE CONDITIONS

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

1. Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
2. Any reference to any standard, guideline or code of practice (Australian or international) in this licence means the relevant parts of the current version of that standard, guideline or code of practice.
3. In this licence, unless the contrary intention appears, words that are defined in the Water Act are intended to have the meaning given to them in that Act.
4. In this licence, unless a contrary intention appears, terms are defined in the Definitions at the end of this licence.
5. In this licence a reference to an Item is a reference to an Item in Schedule 1.

GENERAL

6. The licensee must ensure the contact details recorded with the Administering Agency for this licence are correct at all times.
7. The licensee must at all times have a 24-hour emergency contact.
8. The licensee must notify the Administering Agency prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
9. The licensee must display clear and legible signage, in English, in a prominent location at each public entrance to the premises of the Licensed Action that includes the following details:
 - 9.1. waste discharge licence number issued under the Water Act; and
 - 9.2. 24-hour emergency contact details.
10. The licensee must cause a hard copy of this licence to be available for inspection, at the premises of the Licensed Action, by any person on request.
11. Unless otherwise specified, within 10 business days of a request, the licensee must provide to the Administering Agency a copy of any document, monitoring data or other information in relation to the Licensed Action in electronic form by emailing environmentalregulation@nt.gov.au.
12. All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by emailing environmentalregulation@nt.gov.au.
13. The licensee must maintain, implement and comply with the current version of the documents listed in Item 4.
14. Within 10 business days of any amendment being made to a document listed in Item 4, the licensee must provide the amended document to the Administering Agency, along with:
 - 14.1. a tabulated summary of the amendment(s) with document references;
 - 14.2. reasons for the amendment(s); and
 - 14.3. an assessment of environmental risk associated with the amendment(s).
15. The Administering Agency may require the licensee to revise or amend and resubmit any document provided in accordance with this licence. Where the Administering Agency requires any document to be revised or amended, the licensee must submit it to the Administering Agency by the date specified by the Administering Agency.
16. The licensee must operate and maintain a community feedback telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the Licensed Action, and to which the licensee must respond. The community feedback telephone number must be displayed:

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- 16.1. where the licensee has a website, in a prominent location on the licensee's website;
 - 16.2. in the Stakeholder Engagement Plan; and
 - 16.3. in other publicly available documents relating to the Licensed Action.
17. The licensee must maintain a register of complaints that records the details of each complaint received in relation to the Licensed Action and provide a copy to the Administering Agency on request. Details of the complaint must (as is reasonably practicable) include, the following information:
- 17.1. the person to whom the complaint was made;
 - 17.2. the person responsible for managing the complaint;
 - 17.3. the date and time the complaint was reported;
 - 17.4. the date and time of the event(s) that led to the complaint;
 - 17.5. the contact details of the complainant if known, or where no details are provided a note to that effect;
 - 17.6. the nature of the complaint;
 - 17.7. the nature of event(s) giving rise to the complaint;
 - 17.8. prevailing weather conditions at the time (where relevant to the complaint);
 - 17.9. the action taken in relation to the complaint, including any follow-up contact with the complainant; and
 - 17.10. if no action was taken, why no action was taken.

MONITORING INFORMATION

18. If the licence expires or is otherwise surrendered, suspended or revoked and the licence contained a condition that the licensee provide a report, record or other information, including in accordance with a monitoring program pursuant to section 77 of the Water Act, the licensee must provide any report, record, information or data available to the licensee up to and including the date the licence expired or was surrendered, suspended or revoked.

OPERATIONAL

19. Without limiting the conditions of this licence, in conducting the Licensed Action, the licensee must do all things reasonable and practicable to:
- 19.1. prevent or minimise the likelihood of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.2. prevent or minimise the likelihood of environmental harm occurring as a result, or in connection with, the Licensed Action;
 - 19.3. effectively respond to pollution and the risk of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.4. effectively respond to environmental harm and the risk of environmental harm occurring as a result of or in connection with the Licensed Action; and
 - 19.5. apply the principles of ecologically sustainable development.
20. The licensee must, without limiting any other condition of this licence, in conducting the Licensed Action do all things reasonable and practicable to ensure the Licensed Action does not adversely affect any:
- 20.1. declared beneficial use, quality, standard or objectives declared under section 73 of the Water Act;
 - 20.2. sites of conservation significance; or
 - 20.3. designated Ramsar wetlands,

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including, but not limited to, those listed at Items 1, 2 and 3.

21. The licensee must ensure any plant and equipment used by the licensee in conducting the Licensed Action:
 - 21.1. is reasonably fit for the purpose and use to which it is put;
 - 21.2. is maintained and operational; and
 - 21.3. is operated by a person trained to use the plant and equipment.
22. No change, replacement or alteration of plant and equipment is permitted if the change, replacement or alteration increases the risk of environmental harm for the Licensed Action, unless approved by the Administering Agency.

DISCHARGES

23. The Licensee must only discharge waste to water from the authorised discharge points specified in Item 5.
24. Where the Administering Agency directs the licensee to cease discharge from an authorised discharge point identified in Item 5, the licensee must immediately cease the discharge.
25. A direction to cease discharge may be verbal or written, but a verbal direction from the Administering Agency will be provided in writing within 48 hours of the verbal direction. A failure to provide a written direction does not affect the requirement to comply with a verbal direction.
26. The licensee must ensure that discharge from each authorised discharge point:
 - 26.1. consists only of waste from the source(s) as specified in Item 6;
 - 26.2. does not cause a non-compliance with the conditions specified at Item 14 at the compliance point at Item 8;
 - 26.3. meets the conditions at Item 9.
27. Following any exceedance of a trigger value limit specified in Item 7 at the compliance point specified in Item 8, the Licensee must:
 - 27.1. investigate the exceedance, including undertaking targeted monitoring, in addition to routine monitoring; and
 - 27.2. take corrective action to mitigate any environmental harm and ensure the exceedance does not reoccur; and
 - 27.3. make a record of:
 - 27.3.1. when the exceedance was detected and by whom;
 - 27.3.2. the date and time of the exceedance;
 - 27.3.3. the actual and potential causes and contributing factors to the exceedance;
 - 27.3.4. the risk of environmental harm arising from the exceedance;
 - 27.3.5. exceedances and details of the investigation and corrective action taken; and
 - 27.3.6. if no action was taken, why no action was taken.
28. The licensee must, for each authorised discharge point, install, operate and maintain a device to measure and record, for each discharge event:
 - 28.1. the time the discharge commenced and the duration of the discharge;
 - 28.2. the discharge rate of flow; and
 - 28.3. the discharge volume.
29. The licensee must ensure that the discharge from all discharge events at each authorised discharge point does not:

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- 29.1. contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;
- 29.2. cause or generate odours which would adversely affect the use and amenity of surrounding waters;
- 29.3. cause algal blooms in the receiving water;
- 29.4. pollute groundwater;
- 29.5. cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;
- 29.6. cause mortality of fish or other aquatic organisms;
- 29.7. cause erosion or degradation to the beds and banks of a watercourse; or
- 29.8. cause adverse impacts on plants or animals.

MONITORING

- 30. From the Commencement Date of this licence, the licensee must implement and comply with the Monitoring Program specified in Item 10.
- 31. The licensee must ensure that the Monitoring Program is designed, maintained and implemented in accordance with the following principles:
 - 31.1. the need to monitor loads upstream and downstream, including in-stream decay in loads downstream, of authorised discharge points;
 - 31.2. the need for event-based monitoring, in addition to routine monitoring, including revisiting sampling points as soon as practicable when samples cannot be collected at frequencies set in the Monitoring Program;
 - 31.3. the need for special studies to better described in-stream physical, chemical and biological processes;
 - 31.4. the need to target the possible critical contaminants listed at Item 11;
 - 31.5. the need to select sampling points that provided representative (well mixed) samples;
 - 31.6. the need to collect samples that are representative of discharge conditions, including taking samples from sampling points on the same day as discharge and consecutively from upstream to downstream; and
 - 31.7. the need to adopt a range of biological surveys to assess the health of the system.
- 32. The licensee must ensure that all samples and field environmental data are collected in accordance with recognised Australian Standards and guidelines (such as AS/NZS 5667.1 1998, ANZG (2018), as updated from time to time).
- 33. For the parameters that require analysis at a laboratory, the licensee must ensure that all samples are analysed at a laboratory with current NATA accreditation or equivalent.
- 34. The licensee must ensure any samples collected in accordance with the Monitoring Program or in connection with the Licensed Action or this licence, are obtained by, or under the supervision of a qualified sampler.
- 35. The licensee must ensure that, for each sample collected in accordance with the Monitoring Program or the Licensed Action, the following information must be recorded and retained:
 - 35.1. the date on which the sample was collected;
 - 35.2. the time at which the sample was collected;
 - 35.3. the location at which the sample was collected;
 - 35.4. the name of the person who collected the sample;
 - 35.5. the chain of custody forms relating to the sample;
 - 35.6. the field measurements (if any) and analytical results (if any) relating to the sample; and

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- 35.7. laboratory quality assurance and quality control documentation.
- 36. The licensee must for all land based monitoring points specified in the Monitoring Program:
 - 36.1. install and maintain appropriate identification signage so that they are reasonably identifiable at all times; and
 - 36.2. maintain safe access and egress, as is reasonably practicable.
- 37. The licensee must ensure that any proposed revisions to the Monitoring Program (other than typographical changes or revisions to formatting or referencing) are:
 - 37.1. reviewed by a Qualified Person, who must produce a written report about their review;
 - 37.2. submitted to the Administering Agency with justification for revisions; and
 - 37.3. submitted to the Administering Agency, in both hard copy and electronic form (with a complete copy of the Qualified Person's written review), 20 business days prior to the proposed implementation date.

NOTIFICATION AND REPORTING

- 38. The licensee must keep records of all exceedances of trigger values of parameters specified in Item 7, including those that are not notifiable incidents listed at Item **Error! Reference source not found.**, and provide a copy on request of the Administering Agency.
- 39. The Licensee must keep records of all contraventions with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.
- 40. *This condition has been removed*
- 41. The licensee must notify the Administering Agency of any notifiable incident listed at Item **Error! Reference source not found.** or non-compliance with this licence, by emailing environmentalregulation@nt.gov.au, as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.
- 42. The licensee must include in the notification of the notifiable incident at Item **Error! Reference source not found.** or non-compliance, the following information:
 - 42.1. when the incident or non-compliance was detected and by whom;
 - 42.2. the date and time of the incident or non-compliance;
 - 42.3. whether discharge was occurring at the time of the incident or non-compliance and the source of the discharge;
 - 42.4. whether non-compliant discharge is still occurring; and
 - 42.5. a date (within 10 business days of the incident or non-compliance) when an investigation report will be submitted to the Administering Agency.
- 43. Within 10 business days of notifying the Administering Agency of any notifiable incident at Item **Error! Reference source not found.** or non-compliance, the licensee must provide the Administering Agency an investigation report that includes:
 - 43.1. when the incident or non-compliance was detected and by whom;
 - 43.2. the date and time of the incident or non-compliance;
 - 43.3. whether discharge was occurring at the time of the incident or non-compliance and the source of the discharge;
 - 43.4. the actual and potential causes and contributing factors to the incident or non-compliance;
 - 43.5. monitoring data of the discharge, and upstream and downstream water of the authorised discharge point, collected for the date the incident or non-compliance was detected and three sampling rounds prior;

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- 43.6. available flow rates to demonstrate any influence streams and rivers may have had on the exceedance of trigger values;
 - 43.7. rainfall recorded at the site prior to the exceedance of trigger values and incident or non-compliance;
 - 43.8. the risk of environmental harm arising from the incident or non-compliance;
 - 43.9. the action(s) that have or will be undertaken to mitigate any environmental harm arising from the incident or non-compliance;
 - 43.10. corrective actions that have or will be undertaken to ensure the incident or non-compliance does not reoccur; and
 - 43.11. if no action was taken, why no action was taken.
44. The licensee must submit a completed Annual Return, by emailing environmentalregulation@nt.gov.au, within 10 business days after each Anniversary Date of this licence, which report relates to the preceding 12 month period. The report must
- 44.1. be in the approved form; and
 - 44.2. contain details of all notifiable incidents and non-compliances with this licence during the reporting period.
45. The licensee must complete and provide to the Administering Agency an annual report of data and information obtained through the implementation and performance of the Monitoring Program (the Monitoring Report), as prescribed by this licence, within 10 business days after each Anniversary Date of this licence.
46. The licensee must ensure that each Monitoring Report:
- 46.1. 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);
 - 46.2. includes a tabulation of all monitoring data required as a condition of this licence (data must be provided electronically in Microsoft® Excel® format);
 - 46.3. includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge point listed at Item 5. Contaminant loads must be calculated for total metals, total metalloids, total nutrients and other parameters (excluding field parameters) listed in Appendix 3. 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;
 - 46.4. 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 (where the data is available)
 - 46.5. includes the actions taken and results of investigation for all incidents when a trigger value was exceeded as specified in condition 27; and
 - 46.6. includes an assessment of environmental impact from the Licensed Action.
47. A copy of the documents listed at Item 13 will be placed on the Register.

PERFORMANCE IMPROVEMENT

- 48. *This condition has been removed*
- 49. *This condition has been removed*
- 50. *This condition has been removed*
- 51. The Licensee must comply with the conditions specified in Item 15.

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END OF LICENCE CONDITIONS

This licence is not valid unless signed below:

A handwritten signature in blue ink that reads "Amy Dennis".

For the Controller of Water Resources

Date: 20 December 2023

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DEFINITIONS

In this licence, unless a contrary intention appears:

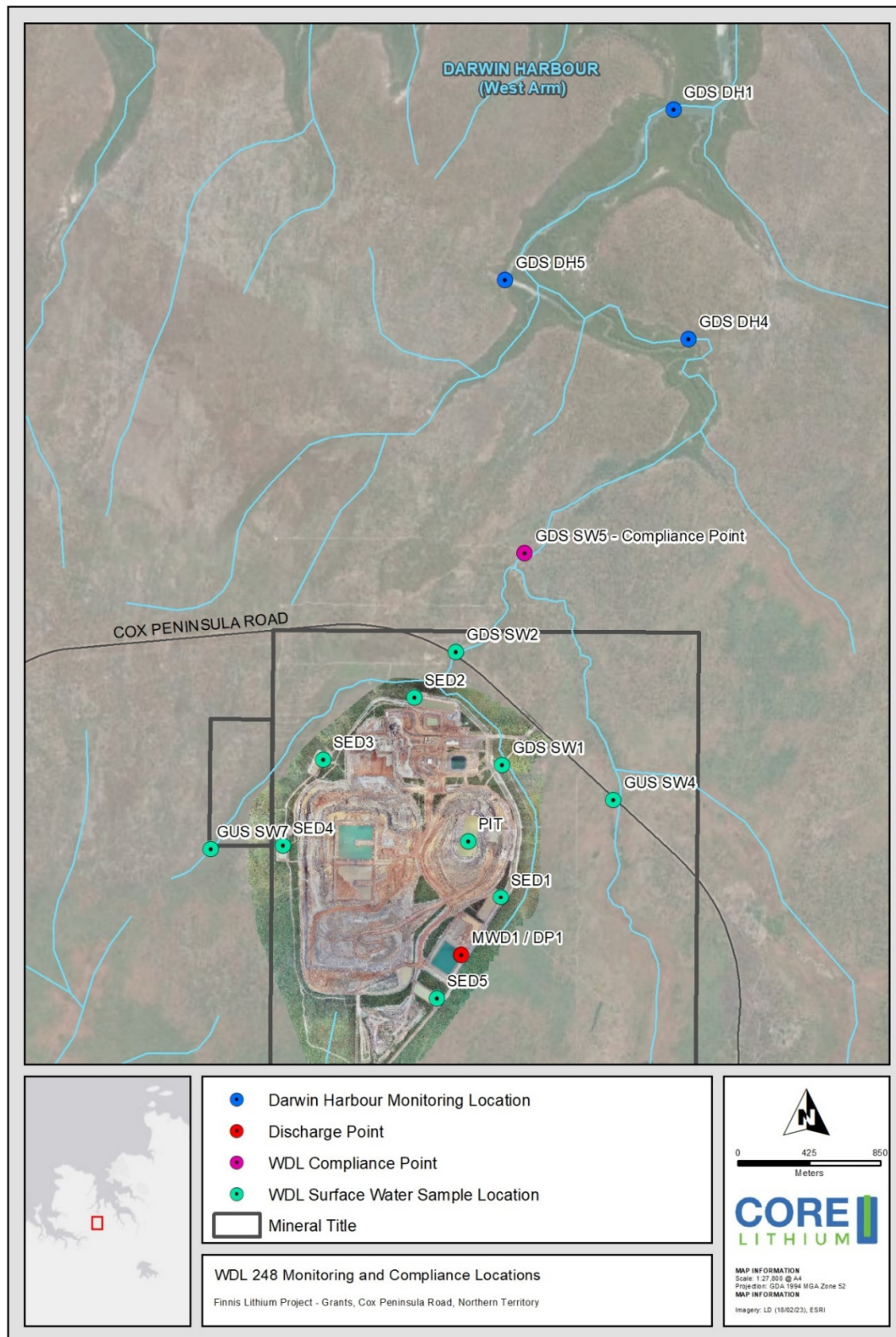
Term	Definition
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the Licensed Action.
Administering Agency	means the NT Government Department with responsibility for administering the Water Act.
AMD	acid and metalliferous drainage
Anniversary Date	annual anniversary of the Commencement Date.
Annual Return	an Administering Agency prescribed format for demonstrating and reporting compliance with the conditions of this licence.
ANZG (2018)	Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines .
Authority Certificate	a certificate issued under s 22(1) of the <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> (NT). An Authority Certificate permits a licensee to carry out work on land with or within the vicinity of a sacred site.
business days	a day not Saturday, Sunday or a public holiday, in Darwin, Northern Territory.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the Licensed Action before, during and after the Licensed Action which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the Licensed Action.
contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and Licensed Action.
contaminant	has the meaning given in section 4 of the WMPC Act.
discharge	releasing or allowing a liquid, gas or other substance to flow out from where it has been confined.
Dry season	means 1 May to 31 October.
Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the Licensed Action and that may cause environmental harm.
land	includes water and air on, above or under land.
Licensed Action	the Licensed Action as described on the covering page of this licence.
Linear Interpolation	a method to construct new data points within the range of known data points. $y = y1 + ((x - x1) * ((y2 - y1) / (x2 - x1)))$ y in the unknown concentration between known concentrations y1 and y2 y1 in the first known concentration y2 is the second known concentration x is the day of the unknown concentration y x1 is the day of the first known concentration y1

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	x2 is the day of the second known concentration y2
litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
NATA	National Association of Testing Authorities, Australia.
Incident and non-compliance notification	an Administering Agency prescribed format for notifying the Administering Agency of a non-compliance.
plant and equipment	all material items used in association with the Licensed Action, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
pollution	has the meaning given in section 4 of the WMPC Act.
public entrance	access to the licensed premises that is utilised by the public.
Qualified Person	a person registered under Section 68 of the WMPC Act.
qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Register	the register available at the website of the Northern Territory Environment Protection Authority (NT EPA).
waste	takes its meaning from the term in the WMPC Act.
wastewater	water that contains a contaminant or waste.
Water Act	<i>Water Act</i> (NT)
Wet season	means 1 November to 30 April and for the purposes of Appendix 3 includes any part of the Dry Season that discharge is occurring.
WMPC Act	<i>Waste Management and Pollution Control Act 1998</i> (NT)

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APPENDIX 1: Map of Discharge Point, Compliance Point and Monitoring Sites



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APPENDIX 2 : Discharge Trigger Values

Sampling Points				Compliance Point
Site Code				GDS SW5
Easting				693374
Northing				8600709
PARAMETER	Abbrev.	Units	Analysis	Trigger Values
Environmental Field Data				
pH	pH	pH	In situ	5.2-6.6 ²
Electrical conductivity	EC	µS/cm		250 ¹
Turbidity	NTU	NTU		12 ³
Dissolved oxygen	DO	% sat.		50-100 ²
Nutrients				
Total Nitrogen	TN	µg/L	Unfiltered	400 ³
Total Phosphorus	TP			10 ³
Metals and Metalloids ⁵				
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	70 ³
Arsenic	As			13 ¹
Cadmium	Cd			0.2 ¹
Chromium	Cr			1 ¹
Copper	Cu			1.4 ¹
Iron	Fe			110 ³
Lead	Pb			3.4 ¹
Lithium	Li			430 ⁴
Mercury	Hg			0.6 ¹
Nickel	Ni			11 ¹
Zinc	Zn			8 ¹

Key:

¹ ANGZ (2018) 95% species protection, freshwater.

² 20th and 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan and data provided in support of amendment application 20 September 2023.

³ 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan and data provided in support of amendment application 20 September 2023.

⁴ Ecotoxicity Assessment, sections 8.3 and 8.4 of the Water Management Plan.

⁵ SSTVs for metals and metalloids apply to filtered samples only

WASTE DISCHARGE LICENCE (WDL248-02)

APPENDIX 3: Surface Water Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Field Parameters																	
Flow	-	kL/day	In situ	D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	C	N/A	N/A	
Water Level	-	measure		D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	P, W	N/A	N/A	
pH	pH	pH		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Electrical conductivity	EC	µS/cm		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Turbidity	NTU	NTU		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Temperature	Temp	°C		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Oxidation Reduction Potential	OR	mV		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Dissolved oxygen	DO	% sat.		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Nutrients																	
Ammonia	NH ₃	µg/L	Unfiltered (excluding FRP)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Oxides of Nitrogen	NO _x			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nitrate	NO ₃			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Nitrogen	TN			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Phosphorus	TP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Filterable Reactive Phosphorus	FRP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chlorophyll a	Chl-a			W	W	W	W	W	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M ³	
Metals and Metalloids																	
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Arsenic	As			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Cadmium	Cd			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chromium	Cr			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Copper	Cu			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Iron	Fe			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lead	Pb			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lithium	Li			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Mercury	Hg			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nickel	Ni			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

WASTE DISCHARGE LICENCE (WDL248-02)

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Zinc	Zn			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Full elemental scan	-			A	A	A	A	A	A	A	A	A	A	A	A	A	
Treatment reagents (Item 9 Error! Reference source not found.)																	
Acrylamide ²	C ₃ H ₅ NO	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Other																	
Sulphate	SO ₄	mg/L	Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Calcium	Ca			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Chloride	Cl			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Sodium	Na			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Potassium	K			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Magnesium	Mg			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Carbonate	CO ₃ ²⁻			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Bicarbonate	HCO3			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Dissolved Solids	TDS			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Suspended Solids	TSS			Unfiltered	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³

Key:

P = prior to discharge.

C = continuous

D = within 24 hours of commencement of discharge **and** daily during discharge. When no discharge is occurring monitoring will be on a weekly basis.

W = within 24 hours of discharge **and** weekly during discharge. When no discharge is occurring monitoring will be on a monthly basis.

F = weekly whilst discharging from sediment basins, Monthly during Wet season irrespective of discharge.

M = monthly.

A = Annually, at end of Wet season on recessional flows.

N/A = not applicable.

¹ The sampling point in MWD1 will be located close to DP1 to ensure it is representative of discharge water quality.

² This sampling is only required where the licensee has conducted water treatment onsite using flocculants containing Acrylamide.

³ During Wet season only

WASTE DISCHARGE LICENCE (WDL248-02)

APPENDIX 4: Fluvial Sediment Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				Site Code	GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Environmental Field Data												
pH	pH	pH		A	A	A	A	A	A	A	A	
Electrical conductivity	EC	µS/cm		A	A	A	A	A	A	A	A	
Moisture content		%		A	A	A	A	A	A	A	A	
Particle size distribution	PSD	%	<63µm >=63µm & <=2mm >2mm	A	A	A	A	A	A	A	A	
Aluminium	Al	mg/kg	<63µm sediment fraction	A	A	A	A	A	A	A	A	
Arsenic	As			A	A	A	A	A	A	A	A	
Cadmium	Cd			A	A	A	A	A	A	A	A	
Chromium	Cr			A	A	A	A	A	A	A	A	
Copper	Cu			A	A	A	A	A	A	A	A	
Iron	Fe			A	A	A	A	A	A	A	A	
Lead	Pb			A	A	A	A	A	A	A	A	
Lithium	Li			A	A	A	A	A	A	A	A	
Mercury	Hg			A	A	A	A	A	A	A	A	

WASTE DISCHARGE LICENCE (WDL248-02)

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1	
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Nickel	Ni			A	A	A	A	A	A	A	A	
Zinc	Zn			A	A	A	A	A	A	A	A	A
Other												
Sulphate	SO ₄	mg/kg	Soluble ion extract	A	A	A	A	A	A	A	A	
Calcium	Ca			A	A	A	A	A	A	A	A	A
Chloride	Cl			A	A	A	A	A	A	A	A	A
Sodium	Na			A	A	A	A	A	A	A	A	A
Potassium	K			A	A	A	A	A	A	A	A	A
Magnesium	Mg			A	A	A	A	A	A	A	A	A

Key:

A = Annually during recessional flow (late Wet season/early Dry season)

WASTE DISCHARGE LICENCE (WDL248-02)

APPENDIX 5: Biota Monitoring Program

Project Name	Locations	Project Description	Report Frequency
Seagrass assessment	West Arm, Darwin Harbour	Seagrass monitoring to determine whether any observed change in seagrass distribution or composition has occurred in the marine waters of West Arm, Darwin Harbour. Monitoring should aim to determine whether any change identified is naturally occurring or related to mine operations.	Annually
Vegetation monitoring	Areas downstream of ML 31726	Monitoring of vegetation downstream of ML 31726 to determine if mining activities are impacting riparian vegetation communities.	Annually
Macroinvertebrate study	Darwin Harbour and Areas downstream of ML 31726	Survey of macro-invertebrate abundance and diversity in aquatic ecosystems. Data is used to monitor potential impacts from mine operations.	Annually during recessional flow (late Wet season/early Dry season)

WASTE DISCHARGE LICENCE (WDL248-02)

APPENDIX 6: Environmental Risk Mitigation 2022/23

3.2 Environmental Risk Mitigation

LDGNT are committed to best practice environmental management and to minimising impacts associated with mining. LDGNT propose to undertake the following to further investigate potential impacts and provide further data on any impacts associated with a change to monitoring and compliance of TN:

- WDL 248 requires monitoring from one site in Darwin Harbour (GDS DH1) monthly during discharge. LDGNT Propose to temporarily increase the frequency of sampling at the proposed temporary mixing zone compliance point (GDS DH1) to weekly to provide additional supporting information of appropriate mixing within the harbour and to bring monitoring requirements in line with existing compliance location, GDS SW5.
- Additional sample locations within the mixing zone have been proposed (DH4 and DH5 in Figure 1) to provide additional information the appropriate dilution of TN as it moves downstream through the mixing zone.
- Monthly water quality monitoring at two additional locations (GDS DH2 and GDS DH3) in the West Arm of Darwin Harbour during the wet season (when mine site discharges will occur) will be collected in accordance with the existing EcOz (2022) WDL 248 Monitoring Program (Attachment A). LDGNT will continue to collect water quality samples at these locations to provide a better understanding of the water quality in the West Arm region, and allow for comparison of water quality across West Arm.
- LDGNT will also undertake marine macroinvertebrate sampling at those same three Darwin Harbour water quality monitoring sites once per year, to assess whether mine site discharges are impacting on benthic infauna in West Arm. Again, this is additional monitoring to that required in WDL 248.
- LDGNT are planning to undertake additional ecotoxicity assessments of mine site water, to provide additional site specific ecotox data on a range of parameters. Currently, ecotoxicity assessment has been undertaken to develop a site-specific trigger value for lithium. Additional ecotox assessment will be undertaken in 2023

to further refine and investigate site specific trigger values, and data can be interpreted to investigate potential impacts from turbidity.

- In May 2022, LDGNT engaged consultants to undertake baseline freshwater macroinvertebrate sampling in freshwater streams downstream of GLP, as well as one reference (control) site. LDGNT now have two rounds of baseline macroinvertebrate data that can be used as a baseline for future 'impact' macroinvertebrate monitoring rounds. This data will allow assessment of potential impacts of mine site water and wastewater discharges on aquatic ecosystems downstream. LDGNT will ensure that future macroinvertebrate data analysis considers macroinvertebrate species that are susceptible to toxicity (e.g. from metals) and also turbidity.
- LDGNT will irrigate mine wastewater as much as possible, with discharge as a last resort. LDGNT are developing an Irrigation Management Plan which will include nutrient load balance and limits, salinity/sodicity assessment, management procedures for irrigation and grass/vegetation management in the irrigation area, and monitoring requirements. Irrigation of wastewater at GLP is approved under the Mining Management Plan, however, LDGNT are developing the Irrigation Management Plan as an additional strategy to ensure irrigation is undertaken with minimal potential for environmental impacts.

(Source: Core Lithium – Waste Discharge Licence Amendment - Supporting Information, February 2023. NTEPA2021/0155-005~0001)

ATTACHMENT B

WDL248 Monitoring Program



Waste Discharge Licence 248 Monitoring Program

Lithium Developments Grants Northern Territory



DOCUMENT CONTROL RECORD

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Appendices

Attachment A –Waste Discharge Licence 248 for Lithium Developments Grants Northern Territory

Attachment B –Procedure for Surface Water Sampling

Attachment C – Field Sheets from the Darwin-Daly AUSRIVAS Manual

1 INTRODUCTION

Waste Discharge Licence (WDL) 248 was granted to Lithium Developments Grants Northern Territory (LDGNT) on 25 July 2022. WDL 248 authorises discharge of mine wastewater from the Grants Lithium Project (GLP) site. Controlled discharge will occur from Water Dam 1 (MWD1), via authorised discharge point 1 (DP1), into an unnamed watercourse which ultimately discharges into West Arm, Darwin Harbour. The WDL is provided as Attachment A of this document.

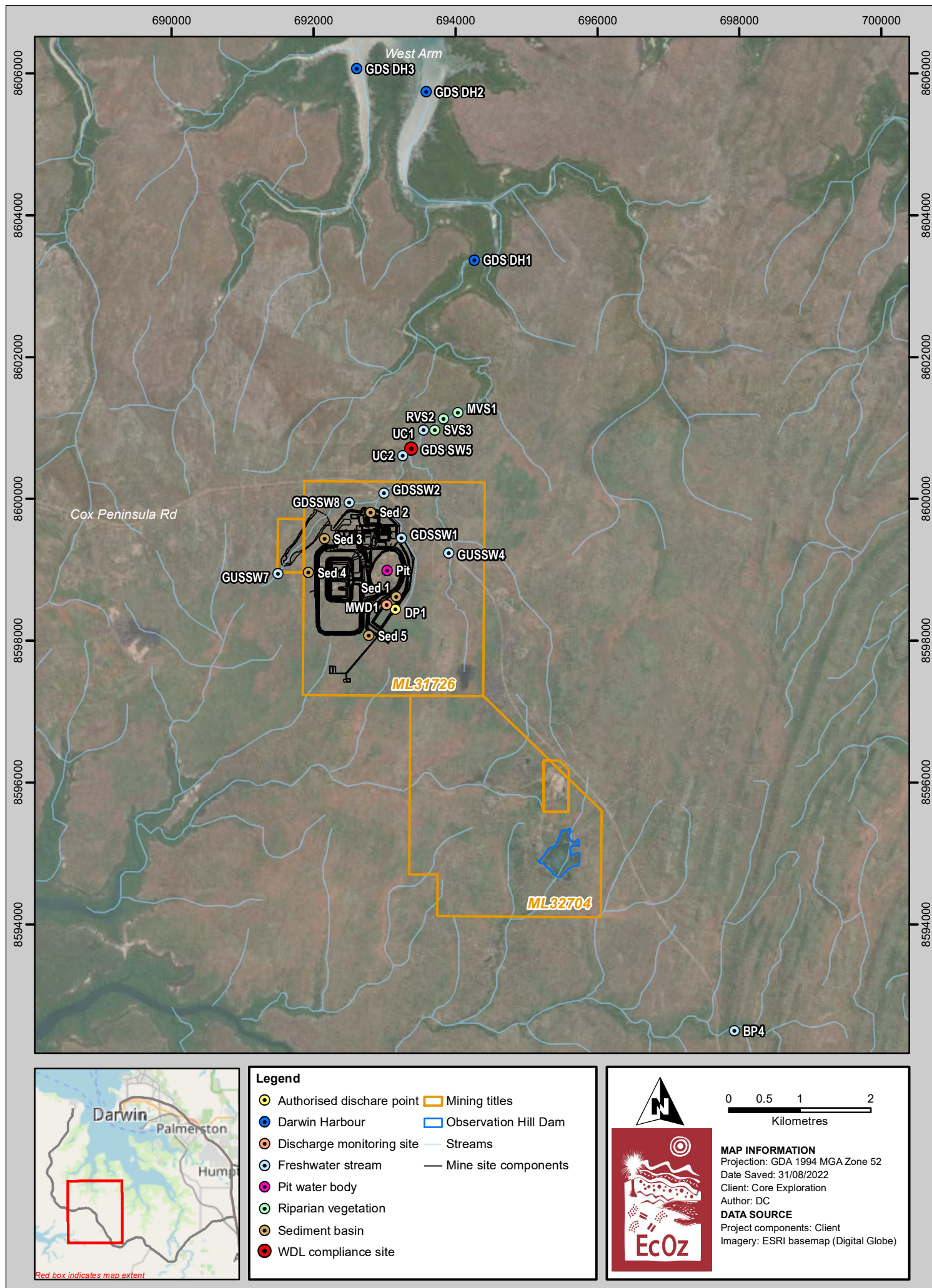
Condition 30 of WDL 248 requires implementation of the monitoring program, detailed in Appendices 3 to 5 of the WDL. Monitoring is required to be undertaken for surface water quality, fluvial sediment quality, and biota in watercourses downstream of GLP and in the West Arm of Darwin Harbour. A summary of all WDL monitoring sites, and type of monitoring that is to be undertaken at each site, is provided in Table 1-1. The locations of monitoring sites are shown on Figure 1-1.

This document details the monitoring that will be undertaken by LDGNT to satisfy the requirements of WDL 248. The monitoring program identifies monitoring locations, describes sampling methodology where appropriate, and references supporting documents which form part of LDGNT's overall Environmental Management System.

Table 1-1. Summary of all monitoring to be undertaken for WDL 248

Category	Sample Site	Easting	Northing	Surface water quality ¹	Sediment quality	Macroinvertebrate	Riparian Vegetation	Seagrass
Freshwater stream	GDS SW1	693239	8599446	Daily, weekly, monthly	Annually	-	-	-
	GDS SW2	692989	8600073	Daily, weekly, monthly	Annually	-	-	-
	GUS SW4	693903	8599235	Daily, weekly, monthly	Annually	-	-	-
	GUS SW7	691498	8598943	Daily, weekly, monthly	Annually	-	-	-
	GDS SW8	692498	8599951	Daily, weekly, monthly	Annually	-	-	-
WDL compliance site	GDS SW5	693374	8600709	Daily, weekly, monthly	Annually	Annually	-	-
Sediment basins	Sed1	693167	8598623	Weekly, monthly	-	-	-	-
	Sed2	692657	8599847	Weekly, monthly	-	-	-	-
	Sed3	692155	8599446	Weekly, monthly	-	-	-	-
	Sed4	691928	8598961	Weekly, monthly	-	-	-	-
	Sed5	692775	8598072	Weekly, monthly	-	-	-	-
WDL discharge point	MWD1	693030	8598504	Prior to discharge, daily, weekly, monthly	Annually	-	-	-
Pit water body	PIT	693037	8598990	Monthly	-	-	-	-
Darwin Harbour	GDS DH1	694262	8603365	Monthly	Annually	Annually	-	Annually
	GDS DH2	693587	8605738	Monthly	Annually	Annually	-	Annually
	GDS DH3	692608	8606060	Monthly	Annually	Annually	-	Annually
Freshwater stream	UC1	693544	8600969	Annually	Annually	Annually	-	-
	UC2	693255	8600608	Annually	Annually	Annually	-	-
	BP4	697926	8592497	Annually	Annually	Annually	-	-
Riparian vegetation	MVS1	694035	8601220	-	-	-	Annually	-
	RVS2	693834	8601132	-	-	-	Annually	-
	SVS3	693706	8600969	-	-	-	Annually	-

¹ Frequency of surface water quality monitoring depends on discharge; refer to Table 2-1 for detail. Freshwater sites will only be sampled when the watercourse is flowing, and Darwin Harbour sites will only be sampled for surface water quality during the wet season months. Refer to Table 2-1 Attachment A for the detailed surface water quality monitoring schedule.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21190 - Grants Waste Discharge Licence - Core Lithium\01 Project Files\Report maps\All monitoring locations.mxd

Figure 1-1. All Grants WDL Monitoring Sites

2 SURFACE WATER QUALITY

2.1 Freshwater

Surface water quality sampling will be undertaken in accordance with Appendix 3 of WDL 248 (see Attachment A). This includes regular monitoring of surface water sites upstream and downstream of the discharge point during discharge, weekly monitoring of sediment basins during discharge, and monthly monitoring of the pit water. Discharge monitoring will be undertaken at MWD1, close to DP1, the licenced discharge point, prior to discharge, and daily and weekly during discharge. The compliance point for the WDL is GDS SW5, and frequent monitoring will be undertaken during discharge. Details of water quality monitoring methodology and monitoring locations are provided in the Water Management Plan for the GLP. Locations of surface water monitoring sites which will be sampled in accordance with WDL 248 are shown on Figure 2-1. A summary of sites, analytes and monitoring frequency are provided in Table 2-1.

Table 2-1. Surface water monitoring program for WDL (freshwater sites)

Site	Description	Analytes	Frequency
GUS SW4, GUS SW7	Freshwater streams – upstream or reference	Field parameters: Flow, water level, pH, electrical conductivity, temperature, ORP, dissolved oxygen, turbidity.	During discharge²: Daily field measurements Weekly laboratory parameters
GDS SW1, GDS SW2	Freshwater stream – downstream of mine site	Nutrients: Total nitrogen, nitrate, oxides of nitrogen, ammonia, total phosphorus, filterable reactive phosphorus.	When not discharging: Weekly field measurements Monthly laboratory parameters
GDS SW5	Compliance point	Metals and metalloids: Total and dissolved Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn *Full elemental scan once per year	As above, and continuous flow and water level monitoring
MWD1	Discharge point	Other: SO ₄ , Ca, Cl, Na, K, Mg, CO ₃ ²⁻ , HCO ₃ , total dissolved solids, total suspended solids.	Continuous flow During discharge: Prior to discharge (all analytes) Daily field measurements Weekly laboratory parameters When not discharging: Weekly field measurements Monthly laboratory parameters
Sed 1, Sed 2, Sed 3, Sed 4, Sed 5	Sediment basins		During discharge: Weekly (all analytes) When not discharging: Monthly (all analytes) – wet season only Note flow and level are N/A
Pit	Mine site pit (discharge source water)		Monthly (all analytes) Note flow and level are N/A

² For all monitoring during discharge, the first monitoring event must occur within 24 hours of discharge commencing.

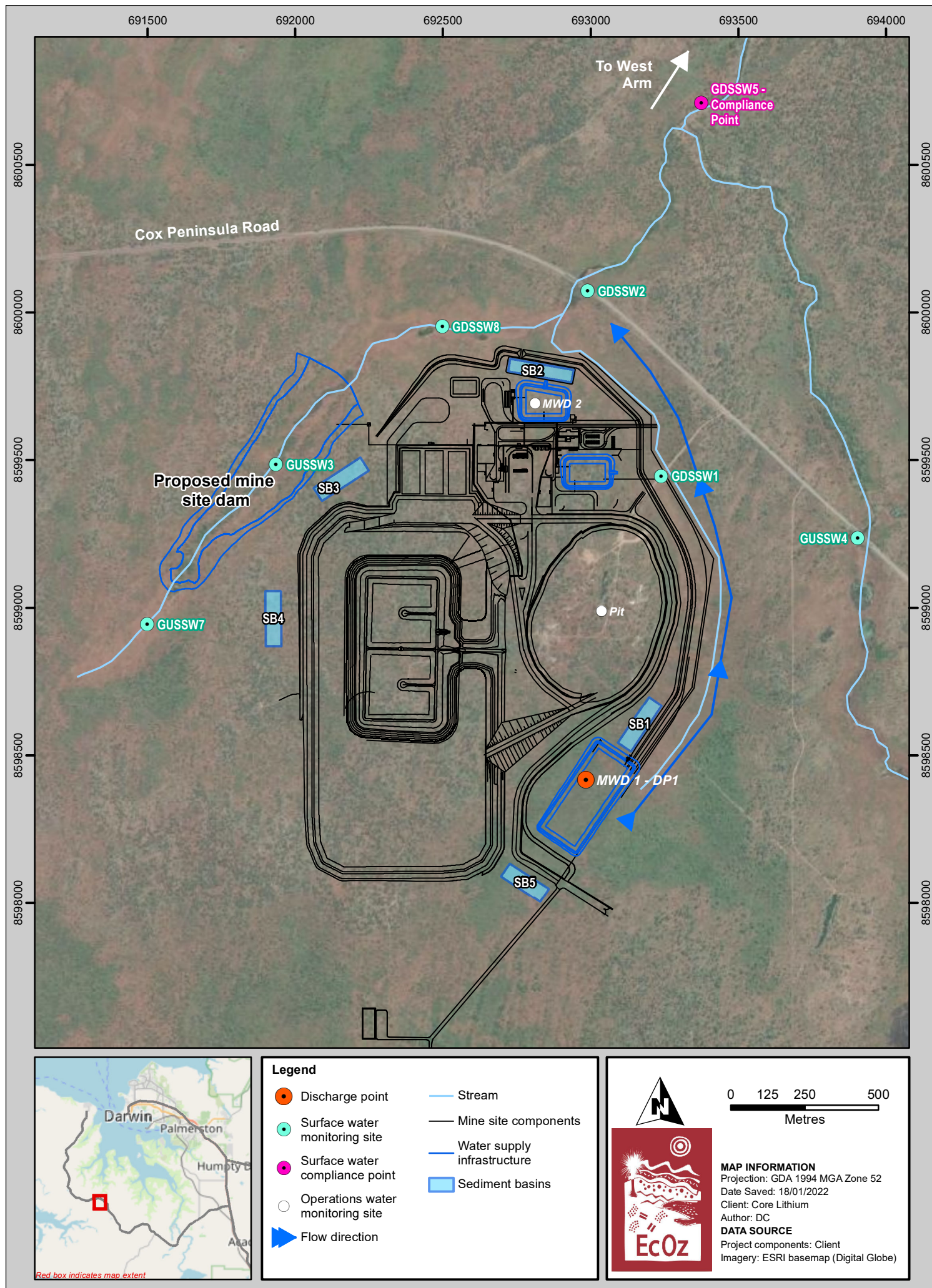


Figure 2-1. Map of surface water sites (freshwater) to be monitored for WDL248

2.2 Marine Water

Appendix 3 of WDL 248 requires monthly monitoring of GDS DH1, located within Darwin Harbour, to be undertaken during the wet season. Two additional sites will also be sampled to provide context for comparison of data from GDS DH1 and provide water quality data for areas of Darwin Harbour downstream of the discharge point to identify any potential impacts from mine site discharges. Details of the monitoring to be undertaken in Darwin Harbour is provided in Table 2-2, and locations are shown on Figure 1-1.

Table 2-2. Darwin Harbour Monitoring Program

Monitoring Location	Description	Analytes	Frequency
GDS DH1	Marine monitoring site, ~4km downstream of WDL compliance point (GDS SW5).	Field parameters: Temperature, pH, electrical conductivity, salinity, ORP, dissolved oxygen, turbidity.	Monthly during the wet season
GDS DH2	Marine monitoring site, ~8 km downstream of compliance point, near confluence of branch of western arm of West Arm.	Nutrients: Ultra-trace in saline waters Total nitrogen, nitrate, oxides of nitrogen, ammonia, total phosphorus, filterable reactive phosphorus.	Plus a full elemental scan of metals (total and dissolved) once per year, nominally at end of each wet season.
GDS DH3	Marine monitoring site, reference site, on western arm of West Arm.	Metals: Total and dissolved (ultra-trace) Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn Total suspended solids	

2.3 Sample methods

All surface water sampling will be in accordance with relevant standards and guidelines including:

- *Australian/New Zealand Standard on Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998/2016), Standards Australia, New South Wales.
- *Australian Standard on Water Quality Sampling – Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998), Standards Australia, New South Wales.
- *Australian/New Zealand Standard on Water Quality Sampling - Part 9: Sampling Guidance on sampling from marine waters* (AS/NZS 5667.9:1998/2016), Standards Australia, New South Wales.
- ANZG 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
- *EcOz Standard Operating Procedure Surface Water Sampling* – Update July 2020.

This will ensure representative samples are collected, and also avoid contamination of samples (of particular importance for saline waters which require ultra-trace analysis for nutrients and metals).

Freshwater sites will be accessed on foot or via ATV, and samples will be collected from the side of the watercourse. Watercourses will only be sampled when flowing.

Marine sites will be accessed via marine vessel (boat), and grab samples will be obtained from ~30 cm below the surface of the water, using sample poles. Sampling will be undertaken during neap tides, on an outgoing (ebb) tide.

Field parameters will be measured in-situ using calibrated field equipment. Laboratory samples will be collected in laboratory supplied, suitably treated containers, and stored chilled (in esky with ice bricks or portable fridge) until the samples can be dispatched to the laboratory. All samples will be submitted to a NATA accredited laboratory, within required holding times, and Chain of Custody forms will be provided to allow for tracking of samples.

All sampling equipment will be maintained and cleaned between sample sites to avoid cross contamination. Details of sample methods are provided in the standards and guidelines listed above.

A detailed description of general surface water sampling methodology is provided in the *Procedure for Surface Water Sampling*, at Appendix B.

2.4 Data management and reporting

All surface water data will be entered into the Surface Water Quality Database and compared to guideline values; site-specific trigger values, the default ANZG 2018 guideline values (for fresh or marine waters as applicable), and the Darwin Harbour Water Quality Objectives. Field data will be entered manually, while laboratory data will be provided in ESdat form, and will automatically be entered into the database. In order to ensure laboratory results are automatically issued to ESdat, ensure the following email address is listed on the COC to receive results: esdat_au+corelithium@esdatlabsync.net.

Data will be compared to guideline values and any exceedance of a guideline value will be investigated. This may include additional water quality sampling. Data will also be compared over time to identify any trends in water quality that may be attributable to waste discharges or mine site operations.

As per Condition 44 and Condition 45 of WDL 248, LDGNT will prepare an Annual Return and a Monitoring Report and submit both reports to the Administering Agency annually, within 10 business days of 25 July (the licence anniversary date).

In the event that the surface water monitoring program identifies a non-compliance with WDL 248, LDGNT will notify the Administering Agency as soon as practicable (and in any case within 24 hours) after first becoming aware of the non-compliance. If a non-compliance with WDL 248 occurs, then an investigation report will be prepared and submitted to the Administering Agency within 10 business days of the notification. As per Item 12 of Schedule 1 of WDL 248, a non-compliance with WDL 248 includes:

- An exceedance of a trigger value stipulated in the licence at the compliance point (GDS SW5) on three consecutive sampling occasions
- An exceedance of three or more times the trigger value at the compliance point (GDS SW5).

Trigger values are provided in Appendix 2 of WDL 248 (see Attachment A).

3 SEDIMENT

Fluvial sediment monitoring will be undertaken annually in accordance with Appendix 4 of WDL248 (see Attachment A).

3.1 Sample methods

Sediments will be sampled from freshwater sites GDS SW1, GDS SW2, GUS SW4, GDS SW5, GDS SW7, GDS SW8 and MWD1 – locations shown on Figure 1-1. Sediment sampling will be undertaken in accordance with relevant standards and guidelines, including:

- Australian Standard – *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1: non-volatile and semi volatile compounds* (AS 4482.1-2005)
- Australian Standard on Water Quality Sampling – Part 19: *Guidance on sampling of marine sediments* (ISO 5667.19:2004)
- Australian Standard on Water Quality Sampling – Part 12: *Guidance on sampling of bottom sediments* (ISO 5667.12:1999)
- *Recommendations for sampling and analysis of Darwin Harbour sediment* (Munksgard 2013)
- Simpson & Batley (2016): *Sediment Quality Assessment*.

Sediment samples are to be collected annually, during recessional flows (late wet season), and for efficiency will usually be collected at the same time as macroinvertebrate samples (see Section 5).

At each sample site, three grab samples will be collected from the stream. If water is present in the stream, samples will be collected from each side of the bank, or along one bank depending on access (e.g. two samples from the left bank and one from the right bank, or three samples spread along a length of the bank). Entering watercourses with flowing water or deep pools in them is not safe due to the risk of crocodile interaction. If, however, the watercourse is dry, then sediment samples can be collected across the stream; one from either bank and one from the middle of the stream. Note that, when selecting sample locations, ensure that they will be representative of sediment settling in the watercourse. The use of a shovel may be required to ensure representative samples are collected.

Samples are collected using the following methodology:

1. Clean sample equipment (trowel and/or shovel) using a 5/95 mix of Decon 90 and demineralised water.
2. Ensure sampler is wearing new nitrile powder free gloves (new gloves are to be worn for each sample).
3. Scrape away leaf litter or other debris from the ground surface. Avoid collecting pebbles and gravel as the laboratory cannot analyse large fractions.
4. Use the shovel and/or trowel to dig up sediment and transfer sample to clean, appropriately treated and laboratory supplied sample containers (250 mL sample jars and 500 mL sample bags).
5. Metals analysis is to be undertaken on the <63 µm fraction of sediment, and as such 1 kg of sample is to be provided to the laboratory for metals analysis, plus sufficient sample volume for particle size distribution and the other analytes. Samplers are to check sample volume requirements with the laboratory prior to undertaking the sampling.
6. Samples will be kept separate (i.e. collect and submit three samples per site for analysis); do not composite the samples as that will influence how the guideline values are applied.

7. Once sample containers are full, place samples in an esky with ice bricks, or vehicle fridge, until they are delivered to a NATA accredited laboratory for analysis.
8. Clean sample equipment before collecting the next sample (firstly wipe off any residual sediment with paper towel, and then wash with the Decon 90 mixture).
9. Once all sediment samples have been collected, submit the samples to a NATA accredited laboratory, with accompanying Chain of Custody forms.

In accordance with Appendix 4 of the WDL (at Attachment A), samples will be analysed for pH, EC, moisture content, particle size distribution, metals (Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn) and sulphate, calcium, chloride, sodium, potassium and magnesium. As discussed above, metals are to be analysed on the <63 µm fraction.

Sediment samples will also be collected from the three Darwin Harbour sites, as per Table 3-1 below (locations are shown on Figure 1-1) and from the macroinvertebrate sampling locations (see Section 5 below). At GDS DH1 – GDS DH3, sediment will be collected from a boat, using a Van Veen grab sampler (or similar), and then placed in suitable laboratory supplied containers, for submission to a NATA accredited laboratory for analysis. Sampling equipment will be cleaned between sites as per the above sample procedure.

Table 3-1. Darwin Harbour Sediment monitoring

Monitoring Location	Description	Analytes	Frequency
GDS DH1	Marine sediment monitoring site, ~4km downstream of compliance point.	pH, EC, moisture content Particle size distribution Metals:	Annually, at end of the wet season (nominally May)
GDS DH2	Marine monitoring site, ~8 km downstream of compliance point, near confluence of branch of western arm of West Arm.	<63 µm fraction Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn Anions/cations:	
GDS DH3	Marine monitoring site, reference site, on western arm of West Arm.	Sulphate, calcium, chloride, sodium, potassium and magnesium	

3.2 Data management and reporting

All sediment quality data will be entered into the Sediment Quality Database and compared to the ANZG (2018) toxicant default guidelines for sediment quality, as well as relevant baseline studies (for example, benthic sediment sampling campaign of Middle Arm and West Arm, Darwin Harbour [Radke et al. 2021]). Data will be compared over time to determine if there are detectable changes or trends in sediment quality. Changes or trends will be investigated to assess whether the change is attributable to mine site discharges

As with surface water quality data, laboratory data will be automatically entered into the database in ESdat form, and compared to guideline values. In order to ensure laboratory results are automatically issued to ESdat, ensure the following email address is listed on the COC to receive results: esdat_au+corelithium@esdatlabsync.net.

Reporting on sediment data will be within the Monitoring Report, which will be prepared and submitted annually, within 10 business days of 25 July of each year.

4 RIPARIAN VEGETATION

Riparian vegetation occurs along watercourses and surface water features and are significant vegetation communities as they are spatially restricted and provide habitat to a relatively large number of species (DENR 2019). Riparian vegetation monitoring will be undertaken in accordance with Appendix 5 of the Draft WDL, to detect any changes to riparian vegetation health or extent which could occur as a result of discharge of mine wastewater from MWD1.

Below is a Riparian Vegetation Monitoring Plan (RVMP) which includes:

- Assessment of baseline information
- Monitoring parameters, methodology and frequency
- Data analysis

4.1 Baseline surveys

A previous survey, The Mangrove and Riparian Vegetation Assessment (EcOz 2019) was undertaken to assess the riparian vegetation prior to mining activities commencing.

Three types of monitoring were undertaken; an aerial drone survey to look at the overall riparian vegetation health and assist in mapping the riparian vegetation extent, an on-ground field survey to assess vegetation structure and composition within the mapped riparian vegetation extent, and photo point monitoring. Note, the drone survey was undertaken post-wet season (March) and the vegetation site assessments and photo point monitoring was undertaken in the dry season (June).

Three riparian vegetation survey plots were established within the mangrove study site, representing riparian, swamp and mangrove communities (MVS1, RVS2 and SVS3). Table 4-1 provides a summary of baseline survey results, and Figure 4-1 shows the location of the three different riparian communities, and the monitoring sites. No reference site has been established for LDGNT (as there are no suitable sites within close proximity to the mine site), and there is no intent to add a site as part of this RVMP as the objective is to examine if there is a change in vegetation compared to baseline. The BP33 reference site, located upstream of Charlotte's creek will be used as a reference site if required – the details are within the BP33 Riparian Vegetation Monitoring Plan (EcOz 2022).

The baseline study provides a spatial dataset from which to monitor changes in riparian vegetation boundaries within the study sites. The baseline assessment indicates that vegetation communities within the study sites are in good condition, with limited pre-development disturbance. This is with the exception of the swamp community, which occurs downstream of the mine site in the West Arm catchment. Weeds and impacts from off-road racing tracks were observed within this vegetation community.

The baseline riparian vegetation site assessments and photo point monitoring was undertaken in the dry season (June). In future, the monitoring will be undertaken using the same methods as baseline, however in the post-wet season (March) when water discharge events occur.

Table 4-1. Summary of baseline riparian vegetation descriptions

Vegetation type & survey site	Vegetation Description	Other species present	NVIS code	Landform	Soil	Drainage	Fire	Weeds	Disturbance	Hydrology	Intact riparian vegetation area size (ha)
Mangrove (MVS1)	<i>Lumnitzera racemosa</i> , <i>Bruguiera exaristata</i> , <i>Avicennia marina</i> with isolated <i>Excoecaria ovalis</i> low open forest, over <i>Fimbristylis</i> sp. and <i>Xerochloa imberbis</i> mid sparse tussock grassland	None recorded	T6c	Mangrove flat near tidal creek	Brown sandy clay surface soils, some pebbles present ranging in size (2 – 6 cm)	Very poorly drained	Nil	None	None	Tidal, towards upper tide limit. Large pool located adjacent to vegetation assessment site – approximately 4 m wide.	5.18
Riparian (RVS2)	<i>Melaleuca viridiflora</i> mid woodland over <i>Acacia plectocarpa</i> , <i>Lumnitzera racemosa</i> (on the edge of creek) and <i>Avicennia marina</i> (in creek channel) mid open shrubland, over <i>Germainia grandiflora</i> , <i>Dapsilanthus</i> sp. and <i>Xerochloa imberbis</i> mid tussock grassland	Mid stratum <i>Thespesia populneoides</i> Ground stratum <i>Asteraceae</i> sp., <i>Wrightia saligna</i> , <i>Flagellaria indica</i> , <i>Acrostichum speciosum</i> , <i>Gymnanthera nitida</i> , <i>Lindernia lobelioides</i> , <i>Diospyros littorea</i>	T7i	Flat, adjacent to creek channel	Brown clay loam; rocks and pebbles common in channel adjacent to site	Poorly drained	2+ years since last fire causing minimal impact	None	Motorbike tracks nearby	Some pools nearby, inundated on large high tides and with freshwater during wet season	0.76
Swamp (SVS3)	<i>Melaleuca viridiflora</i> , <i>Erythrophleum chlorostachys</i> and <i>Corymbia polycarpa</i> mid woodland over <i>Lophostemon lactifluus</i> , <i>Clerodendrum floribundum</i> and <i>Denhamia obscura</i> mid open shrubland over <i>Sorghum intrans</i> , <i>Aristida</i> sp. and <i>Pandanus spiralis</i> mid tussock grassland	Mid stratum (M1): <i>Alphitonia excelsa</i> , <i>Grevillea decurrens</i> Ground stratum <i>Germainia grandiflora</i> , <i>Acacia difficilis</i> , <i>Fern</i> sp., <i>Themeda</i> sp., <i>Wrightia saligna</i> , <i>Livistona humilis</i> , <i>Osbeckia australiana</i> , <i>Dianella odorata</i> , <i>Brachychiton megaphyllus</i> , <i>Fern</i> sp.1, <i>Antidesma ghesaembilla</i>	T7i	Lower slope, flat open depression	Brown sandy loam. Some quartz present near creek	Poorly drained – some wet season inundation	Last year (relatively low impact fire)	Annual mission grass scattered near site. Patches of <i>Hyptis suaveolens</i> , <i>Calopogonium mucunoides</i> and <i>Passiflora foetida</i> recorded nearby	None	Wet season inundation	1.5

4.1.1 Standards and guidelines

Monitoring will be in accordance with best practice guidelines and standards, including *Northern Territory guidelines and field methodology for vegetation survey and mapping* (Brocklehurst et. al. 2007) and the *NT Sampling and Processing Manual* (Llyod and Cook 1996). Details are provided below for each type of monitoring.

4.2 Methods

Drone survey

A drone survey will occur annually, post-wet season (April/May). The drone will be flown along the existing flight path corresponding to the baseline survey (EcOz 2019) to capture the riparian vegetation extent (see Figure 4-1).

- Use DJI Phantom 4pro drone to capture images at a height of 75m (75% front overlap and 65% side overlap) using the DroneDeploy app.
- Drone will be flown in the desirable conditions i.e. in the middle of the day to avoid sun light interference. Observations will also be noted i.e. timing of flight, and the weather to replicate similar conditions for future surveys.
- When importing drone data to create the orthomosaic, the same methods as per methods in baseline report outlined in Section 3, will be applied.
- A 5cm pixel image will be exported for the survey site, a colour orthomosaic and a plant health image, displayed in red, green and blue.
- The boundary of the riparian vegetation will then be delineated using the orthomosaic imagery and remote sensing techniques.

Riparian vegetation site assessments

Monitoring will be undertaken post-wet season (April/May), after wastewater discharge events. Three riparian vegetation monitoring sites MVS1, RVS2 and SVS3 will be monitored using the same monitoring method outlined in Section 3 in the Mangrove and Riparian Vegetation Assessment (EcOz 2019). Plots will be established and vegetation species, height and % cover will be recorded within each plot. Vegetation continuity will also be monitored by traversing a 100 m long transect and estimating the canopy cover. Photo points will be established and four photographs will be taken in the same location, facing north, east, south and west, each monitoring round, to allow comparison over time.

4.3 Monitoring schedule

Table 4-2 outlines the riparian vegetation monitoring schedule that will be followed for the duration the of the WDL.

Table 4-2. Riparian vegetation monitoring schedule

Monitoring	Objective	When	Monitoring undertaken	Frequency of monitoring	Locations
Riparian vegetation site assessment survey	To capture data outlined in Table 4-1 after wet season discharges	End of Wet season (April/May)	Site assessment at all identified locations	Annual - 2023 onwards	MVS1, RVS2 and SVS3
Photo point monitoring	To capture photo points after wet season discharges	End of Wet season (April/May)	Photo monitoring at riparian vegetation assessment sites	Annual - 2023 onwards	MVS1, RVS2 and SVS3
Ongoing drone survey	To continue drone survey monitoring after wet season discharges	End of Wet season (April/May)	Drone flight	Annual - 2023 onwards	Flight path as per previous survey

4.4 Data management and reporting

4.4.1 Drone survey

The intent of analysing drone data is to determine if there is reduction in riparian vegetation extent and/or structure compared to baseline survey. If there are gaps in vegetation i.e. if there is a retraction of mapped riparian vegetation, further on-ground assessments will be undertaken. A vegetation monitoring database will be maintained which will record:

- The riparian vegetation area size (ha) based on drone mapping
- All drone images captured during the drone surveys organised in folders.
- A zip-file of all tiff files derived from drone surveys (both orthomosaic and plant health image).
- Spatial data.

4.4.2 Riparian vegetation site assessments

The data collected will be analysed using the Before After/Control Impact (BACI) approach. BACI will be applied by performing statistical analysis to test whether there is a significant difference between the baseline data and ongoing data sets collected at the same sites. Data analysis will include:

- Species composition (%) using vegetation data collected for upper, mid, ground strata data
- Average heights of plants across riparian vegetation sites.
- Canopy cover (%) for each dominant, and emergent species across riparian vegetation assessment sites compared to reference site data.
- Plants alive or dead (%) across all riparian vegetation sites.

This data will also be stored within the vegetation monitoring database.

4.4.3 Photo point monitoring

The intent of analysing photo point data is to determine if there are visual on-ground changes compared to baseline survey. All photographs will be labelled with site name, direction and date and stored in a separate zip-file.

Results of riparian vegetation monitoring will be reported on annually within the Monitoring Report, which will be prepared and submitted to the Administering Agency within 10 business days of the 25 July of each year.

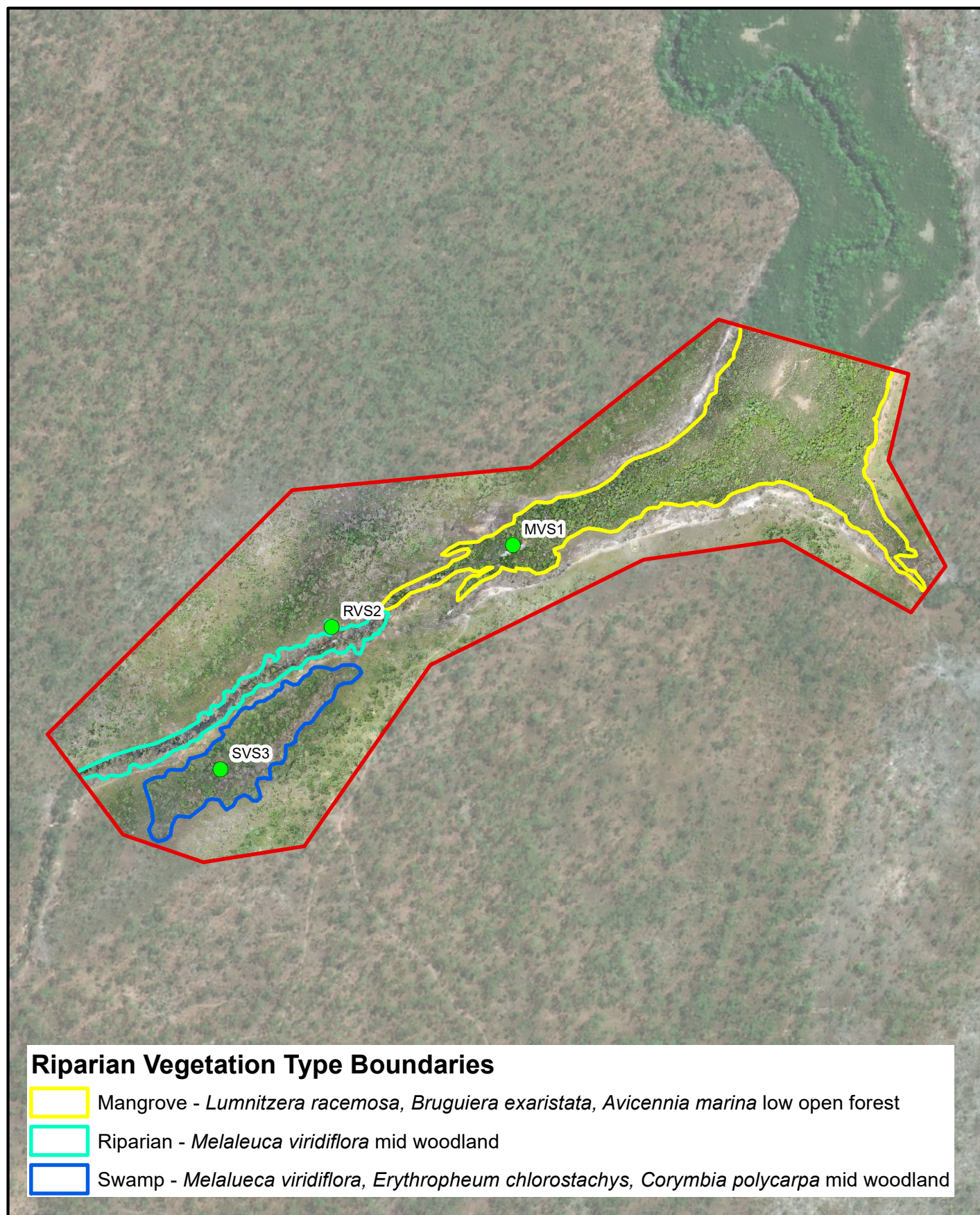


Figure 4-1. Map of riparian vegetation type boundaries and monitoring locations

5 MACROINVERTEBRATES

Appendix 5 of the Draft WDL requires macroinvertebrate monitoring within Darwin Harbour and areas downstream of the GLP. Macroinvertebrate sampling will be undertaken within the freshwater habitats downstream of the discharge point, and within Darwin Harbour sites which are also monitored for water quality, sediment and seagrass habitat.

Baseline macroinvertebrate sampling was undertaken in freshwater habitats downstream of the mine site in 2017, and two of these sites will be monitored ongoing to allow comparison of data over time. Sediment and water quality samples will also be collected during macroinvertebrate sampling to inform macroinvertebrate data analysis. Macroinvertebrate sampling is summarised in Table 5-1.

Table 5-1. Macroinvertebrate monitoring program

Sites	Site type	Purpose	Survey timing
UC1, UC2	Freshwater macroinvertebrates	Comparison to 2017 baseline data – downstream of mine site	Annually during recessional flows (April/May)
GDS SW5		Compliance point data	
Control (BP4)		Reference site	
GDS DH1, GDS DH2	Marine macroinvertebrates	Darwin Harbour sites downstream of mine site	Annually during recessional flows (April/May)
GDS DH3		Reference site	

5.1 Sample methods

Macroinvertebrate sampling will be undertaken annually during the recessional flows each wet season (April/May). Site locations are shown on Figure 1-1. The freshwater sites were visited and sampled in May 2022, and so are known to be accessible and appropriate for macroinvertebrate sampling. A suitable and accessible reference site near the LDGNT site could not be located, and so a reference site on an unnamed tributary of the Charlotte River, upstream of Cox Peninsula Road, has been selected as a representative reference site for both LDGNT and the adjacent BP33 mine site. The location of this site is shown on Figure 1-1 (see 'BP4'). If, during future monitoring events, the reference site UC3 (which was sampled by GHD in 2017) is found to be suitable, then it may also be sampled as a reference site. However, during sampling in 2022 there was insufficient water at site UC3 which indicates it ceases to flow soon after the wet season.

For both marine and freshwater sites, water quality samples will be collected (including measurement of field parameters and collection of surface water samples) prior to sediment and macroinvertebrate sampling to minimise contamination of water quality samples (e.g. with sediment or vegetation). Water will be analysed for the same parameters as per the surface water monitoring schedule (see Section 2). Following collection of water samples, macroinvertebrate sampling will be undertaken, and sediment samples will be collected (to be analysed for the same parameters as per Section 3).

Freshwater

Macroinvertebrate sampling will be undertaken in accordance with the *NT AUSRIVAS Sampling and Processing Manual* (Lloyd and Cook 2001) and the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory* (Lamche 2007). All sampling sites are chosen from steep edge habitat with no undercut and away from any fast-flowing stream sections. Habitat descriptions of the site will be noted on the Field Sheets from the NT Darwin-Daly Region AUSRIVAS User Manual (provided at Attachment C); field notes will include site location, a sketch of the site, water quality field data, and a description of the sampled site).

At each site one person will rake along the bank and submerged root matter, and another will sweep through the water in the disturbed area with a 250 µm net to capture the removed material, which will include macroinvertebrates. Samples will be sieved on the bank through sieves of decreasing aperture to remove leaf litter and other material. This material is then thoroughly rinsed with water collected from the sample site multiple times. The remaining material is examined for any macroinvertebrates before being disposed of. All material from the finest sieve (250 µm) will be washed into a jar, which is then filled with ethanol for preservation.

Refer to the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory User Guide* (Lamche 2007) for detailed sample methodology.

Samples will be labelled and stored upright in an esky, transported safely to avoid accidental damage to samples. Samples will be submitted to a suitably qualified AUSRIVAS taxonomist for identification and data analysis.

Marine water

Marine macroinvertebrate samples will be collected via a boat, using a Van Veen grab sampler. The Van Veen will be lowered over the boat and a grab sample collected. The sediment will be emptied into a clean stainless steel container for onboard processing. A number of different sized sieves will be used to remove as much sediment, sand, rock, coral and other material from the sample, using filtered marine water to carefully wash the material through the sieves. Material from the finest sieve (10 µm) will be washed into a sample jar, which is then filled with ethanol for preservation. All samples will be submitted to a suitably qualified taxonomist with experience processing and analysing marine macroinvertebrate samples.

5.2 Data management and reporting

Freshwater

Freshwater samples will be analysed in accordance with the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory* (Lamche 2007). Taxa will be identified to family level where possible, except for key taxa (as per Darwin-Daly regional AUSRIVAS User Manual) which either require identification to only order level, or sub-family level. Following identification, taxa counts will be recorded in a database and samples preserved and archived.

Macroinvertebrate metrics will be generated (abundance, taxa richness, PET richness, Signal-2) and presented for each site. AUSRIVAS modelling will be completed and OE50 scores and bandings presented for each site. Multivariate analysis of macroinvertebrate community composition will be completed to understand the differences and similarities between the sites. Data will be compared between years to identify whether there is any change in macroinvertebrate diversity (species richness) or abundance.

Marine

Marine samples will be analysed and macroinvertebrates (aka benthic infauna) identified to the lowest taxonomic level possible, or morpho-species. Statistical analysis will be undertaken on the samples (e.g. PRIMER and P.A.S.T) to calculate:

- Diversity indices, to assess species richness, diversity, evenness and dominance within samples
- Multivariate analysis to assess species abundance
- Environmental correlations – to assess whether there is a correlation between environmental data (e.g. water quality data) and macroinvertebrate data.

Results of macroinvertebrate sample processing and analysis will be reported in standalone reports prepared by the taxonomist. Key findings of macroinvertebrate sampling will be reported in the annual Monitoring Report, to be prepared and submitted to the Administering Agency within 10 business days of the 25 July each year.

6 SEAGRASS

Seagrass monitoring will be undertaken in West Arm, at sites GDS DH1, GDS DH2 and GDS DH3 (see Table 2-2 and Figure 1-1 for locations), in accordance with Appendix 5 of the Draft WDL. Benthic habitat mapping, based on modelling undertaken by the Australian Institute of Marine Science (AIMS) in collaboration with the Northern Territory Government, shows low likelihood of seagrass habitat within West Arm (Galaiduk et al. 2019 and Siwabessy et al. 2020). Additionally, the extent of seagrass is known to fluctuate in the Darwin Region, due to factors such as turbidity and wind and wave action, which tends to be greater during the wet season. As such, the spatial extent and percentage cover of seagrass generally declines during the wet season and recovers and expands during the dry season (Cardno 2014). Cardno noted low seagrass cover in wet season months such as February, but greater seagrass cover in May through to October/November.

Seagrass surveys are generally undertaken in accordance with the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy – Guidance on seagrass monitoring* (Qld DES 2018) and associated resources including the *Manual for Scientific Monitoring of Seagrass Habitat* (Short et. al. 2015). However, seagrass monitoring usually focusses on well-established seagrass meadows and their extent, composition and biomass over time, and many of the proposed methods in DES (2018) are designed and selected for seagrass meadows. The methods are inappropriate for application in this case as the study area is situated within mangrove lined tidal channels with no known seagrass meadows in the vicinity.

The method proposed below was selected based on the likely limited presence of seagrass, access, and safety considerations:

- Three monitoring locations will be accessed via boat (locations shown on Figure 1-1 and Table 1-1).
- At each location one 50 m transect will be established perpendicular to the channel (i.e. across the channel).
- Seagrass survey will be undertaken at three sites along the transect; one at each end and one in the middle.
- At each of the three sites along the transect, a 0.5 m x 0.5 m quadrat on a frame will be lowered to the seabed.
- A GoPro camera will be attached to the frame, which will be programmed to take photos of the quadrat within a short time frame, i.e. every 10 seconds. The frame will be moved slightly between photographs to collect four photographs per site.
- Once photographs are taken, the quadrat will be lifted to the surface again via a davit, before moving on to the next site.
- Seagrass (if present) will be identified to the genus level as per Roeleofs et al. 2005 and photographs will be used to assess percent cover using the seagrass percentage cover photo guide in *Manual for Scientific Monitoring of Seagrass Habitat* (Short et. al. 2015).
- Common species in the Darwin Harbour area include *Halophila ovalis*, *Halophila decipiens* and *Halodule uninervis* and it is anticipated that, if present, these will be identifiable from the imagery obtained.

The survey will be undertaken in May, at the same time as Darwin Harbour water quality, sediment and macroinvertebrate sampling. The survey will occur when seagrass is likely to be recovering, and, if present, will likely be visible. The survey will be timed for neap tides, to maximise visibility (water clarity) and ensure photographs show visible/identifiable seabed. Photographs will be reviewed, and presence/absence of seagrass noted, as well as percent cover if present.

Results of seagrass monitoring will be reported on in the annual Monitoring Report, to be prepared and submitted to the Administering Agency within 10 business days of the 25 July each year.

One round of seagrass monitoring will be undertaken, following which the requirement for ongoing seagrass monitoring will be reviewed. If no seagrass is present in the tributaries of West Arm downstream of GLP then LDGNT will seek to remove the requirement for seagrass monitoring from WDL 248.

LDGNT is open to opportunities for collaboration with government and industry, or contribution to broader seagrass monitoring programs within Darwin Harbour to assess long term harbour health. Guidance from the Northern Territory Environment Protection Authority and/or Department of Environment, Parks and Water Security would be sought in this regard.

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ATTACHMENT A –WASTE DISCHARGE LICENCE 248 FOR LITHIUM DEVELOPMENTS GRANTS NORTHERN TERRITORY



Northern
Territory
Government

WASTE DISCHARGE LICENCE

(Pursuant to section 74 of the *Water Act 1992*)

Licensee Lithium Developments (Grants NT) Pty Ltd

Licence Number: **WDL248**

Registered Business Address: Level 5, Flinders Street
Adelaide SA 5000

ACN: 622 047 232

ABN: 70 622 047 232

Commencement Date: 29 July 2022

Expiry Date: 24 July 2025

Licensed Action: Controlled discharge of wastewater from Mine Water Dam 1 (MWD1) through authorised discharge point (DP1) and into an unnamed ephemeral stream that feeds into West Arm, Darwin Harbour in accordance with Table 2 and subject to the conditions of this licence.

WASTE DISCHARGE LICENCE (WDL248)

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INFORMATION ABOUT THIS LICENCE

This waste discharge licence is granted pursuant to section 74 of the *Water Act 1992* (NT) (*Water Act*), which empowers the Controller of Water Resources to, in accordance with the *Water Act*, grant a licence to a person to carry out an action that would otherwise be an offence against this Act.

Responsibilities of Licensee

- In addition to the conditions set out in this licence, general responsibilities of licensees are set out in the *Waste Management and Pollution Control Act 1998* (NT) (**WMPC Act**), the *Water Act* and the *Water Regulations 1992* (NT) (**Water Regulations**).
- It is an offence under the *Water Act*, if the holder of a waste discharge licence contravene or cause, suffer or permit a person to contravene a term or condition to which the waste discharge licence is subject (s 76 *Water Act*).
- Except as expressly provided for in this licence or applicable law, it is an offence under section 16 of the *Water Act* to wilfully cause or cause, directly or indirectly:
 - waste to come into contact with water; or
 - water to be polluted.

Duration of licence

- This licence will remain in force until its Expiry Date, it is surrendered by the licensee, or until it is suspended or revoked by the Controller of Water Resources.
- A licensee may surrender its licence at any time (s 94 *Water Act*).
- If the licensee wishes to surrender its licence it should complete the notification form approved by the Controller of Water Resources and provide a copy of the completed form to the Administering Agency.
- The authority to allow waste to come into contact with water or water to be polluted ends once a licence is surrendered, and any such occurrence after a licence is surrendered is an offence pursuant to s 16 of the *Water Act*.

Amendment, Modification or Revocation of Licence

- As set out in section 93 of the *Water Act*, the Controller of Water Resources may, by notice served on the holder of the licence:
 - amend or modify the terms and conditions of a licence; or
 - where the Controller of Water Resources is satisfied that the holder of the licence has contravened or failed to comply with a term or condition of the licence or of any other licence previously held by the person for a similar purpose during the 12 months immediately preceding the grant of the first-mentioned licence, the Controller of Water Resources may:
 - revoke a licence; or
 - suspend a licence.

WASTE DISCHARGE LICENCE (WDL248)

Transfer of Licence

- Where a waste discharge licence is granted to a person in relation to the person's use of land and, during the period of this licence, the person's interest in the land is transferred to another person, the waste discharge licence shall be deemed to have also been transferred to the other person (s 92 Water Act).
- The licensee must ensure the contact details recorded with the Administering Agency for the licence are correct at all times in accordance with condition 6. Accordingly, it is recommended the transferee complete the Controller of Water Resources approved notification of transfer of a waste discharge licence form.

Public Register

- A copy of this Licence will be placed on the Register in accordance with section 95 of the Water Act.
- A copy of plans for environmental management, reports, submissions or documents provided at Schedule 1 Item 13 will be placed on the Register.
- The Register is freely available from the Northern Territory Environment Protection Authority (NT EPA) website.

Water Quality Standards

- The Administrator may declare, by notice in the *Gazette*, a beneficial use, quality standard, criteria or objectives which apply in relation to any waste or class of waste, or water or class of water (s 73 Water Act).
- A water or waste beneficial use, quality standard, criteria or objectives declared under s 73 of the Act and in force is an Environment Protection Objective for the purposes of the WMPC Act (s 18 WMPC Act).
- An Environment Protection Objective is a statutory instrument to establish principles on which:
 - Environmental quality is to be maintained, enhanced, managed or protected;
 - Pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; or
 - Effective waste management is to be implemented or evaluated.
- Schedule 1 Item 1 specifies the beneficial use, quality, standard, criteria or objective relevant to this licence at the date of issue.

Environmental Interests

- Environmentally sensitive or significant areas may be captured by and protected under the *Environment Protection Act 2019* (NT) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). As such, and to best protect and regulate our waterways, waste discharge licences must identify the sensitivity of the environment surrounding the location of the Licensed Action.
- Schedule 1 Item 2 specifies the sites of conservation significance (if any) relevant to this licence at the date of issue.
- Schedule 1 Item 3 specifies the Ramsar wetlands (if any) relevant to this licence at the date of issue.

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Cultural Interests

- Under Commonwealth and Northern Territory laws it can be an offence to enter or remain on or damage a sacred site.
- Sites of Aboriginal significance including registered and recorded Aboriginal sacred sites may exist in the vicinity of the Licensed Action.
- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the Licensed Action are obtained and complied with.
- Further specific advice on any cultural requirement or implication of the licenced activity should be sought from the relevant land council and the Aboriginal Areas Protection Authority.

END NOTES

This licence is a new licence, as such there are no historical records associated with the licence.

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SCHEDULE 1 - ITEMS

1. Beneficial uses	Beneficial Uses and Objectives for the Darwin Harbour Region (Gazette No. 27, 7 July 2010).	
2. Sites of conservation significance	SOCS No. 6 Darwin Harbour.	
3. Ramsar wetlands	Not applicable.	
4. Licence Documents	(a) Water Management Plan - Appendix K, Mine Management Plan Grants Lithium Project (approved 10 June 2021). (b) Emergency Response Plan - Appendix R, Mine Management Plan Grants Lithium Project (approved 28 June 2019). (c) Stakeholder Engagement Plan - Core Lithium Grants Lithium Project Stakeholder Engagement Plan (issued 7 June 2021).	
5. Authorised Discharge Point(s)	Discharge Point 1 (DP1) from Mine Water Dam 1 (MDW1) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693153 Northing: 8598441
6. Source(s) of waste	Pit water, direct rainfall, and mine influenced water collected from Mineral Lease 31726 that is captured and stored in sediment basins and Mine Water Dam 2 (MWD2) and pumped to MWD1. Waters discharged through DP1 are pumped over the wall of MWD1 and released by a tee valve into the flow path of an adjacent unnamed ephemeral stream as shown at Appendix 1.	
7. Trigger values	The limits for parameters listed in Appendix 2.	
8. Compliance point	Grants Downstream Surface Water 5 (GDS SW5) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693374 Northing: 8600709
9. Conditions on discharge	Any authorised discharge must: (a) Not include wastewater generated outside of Mineral Lease 31726; (b) Not include wastewater treated with polyacrylamide flocculants with more than 0.05% of the neuro-toxin acrylamide monomer; (c) Occur only when the stream gauge at the compliance point GDS SW5 shows there is a sufficient amount of water to dilute discharge water to achieve trigger values; (d) In the event wastewater is treated, occurs only when the treatment process has finished, including allowing sufficient residence time for settlement of flocculants and target contaminants.	
10. Monitoring Program	The Monitoring Program includes: (a) Surface water monitoring in accordance with Appendix 3. (b) Fluvial sediment monitoring in accordance with Appendix 4. (c) Biota monitoring in accordance with Appendix 5.	
11. Critical contaminants	Aluminium (Al), Arsenic (As), Copper (Cu), Iron (Fe), Lithium (Li), Zinc (Zn) and Total Phosphorus (TP).	

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12. Non-compliances	Non-compliances include the following exceedances: (a) An exceedance of a trigger value specified in Item 7 at the compliance point in Item 8, on three consecutive sampling occasions. (b) An exceedance of three times or more a trigger value specified in Item 7 at the compliance point in Item 8.
13. Documents placed on Register	The following documents will be placed on the Register: (a) The Licence Documents at Item 4. (b) The Monitoring Report provided in accordance with clause 45. (c) The Annual Return.

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LICENCE CONDITIONS

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

1. Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
2. Any reference to any standard, guideline or code of practice (Australian or international) in this licence means the relevant parts of the current version of that standard, guideline or code of practice.
3. In this licence, unless the contrary intention appears, words that are defined in the Water Act are intended to have the meaning given to them in that Act.
4. In this licence, unless a contrary intention appears, terms are defined in the Definitions at the end of this licence.
5. In this licence a reference to an Item is a reference to an Item in Schedule 1.

GENERAL

6. The licensee must ensure the contact details recorded with the Administering Agency for this licence are correct at all times.
7. The licensee must at all times have a 24 hour emergency contact.
8. The licensee must notify the Administering Agency prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
9. The licensee must display clear and legible signage, in English, in a prominent location at each public entrance to the premises of the Licensed Action that includes the following details:
 - 9.1. waste discharge licence number issued under the Water Act; and
 - 9.2. 24 hour emergency contact details.
10. The licensee must cause a hard copy of this licence to be available for inspection, at the premises of the Licenced Action, by any person on request.
11. Unless otherwise specified, within 10 business days of a request, the licensee must provide to the Administering Agency a copy of any document, monitoring data or other information in relation to the Licensed Action in electronic form by emailing waste@nt.gov.au.
12. All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by emailing waste@nt.gov.au.
13. The licensee must maintain, implement and comply with the current version of the documents listed in Item 4.
14. Within 10 business days of any amendment being made to a document listed in in Item 4, the licensee must provide the amended document to the Administering Agency, along with:
 - 14.1. a tabulated summary of the amendment(s) with document references;
 - 14.2. reasons for the amendment(s); and
 - 14.3. an assessment of environmental risk associated with the amendment(s).
15. The Administering Agency may require the licensee to revise or amend and resubmit any document provided in accordance with this licence. Where the Administering Agency requires any document to be revised or amended, the licensee must submit it to the Administering Agency by the date specified by the Administering Agency.
16. The licensee must operate and maintain a community feedback telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the Licensed Action, and to which the licensee must respond. The community feedback telephone number must be displayed:

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- 16.1. where the licensee has a website, in a prominent location on the licensee's website;
 - 16.2. in the Stakeholder Engagement Plan; and
 - 16.3. in other publicly available documents relating to the Licensed Action.
17. The licensee must maintain a register of complaints that records the details of each complaint received in relation to the Licensed Action and provide a copy to the Administering Agency on request. Details of the complaint must (as is reasonably practicable) include, the following information:
- 17.1. the person to whom the complaint was made;
 - 17.2. the person responsible for managing the complaint;
 - 17.3. the date and time the complaint was reported;
 - 17.4. the date and time of the event(s) that led to the complaint;
 - 17.5. the contact details of the complainant if known, or where no details are provided a note to that effect;
 - 17.6. the nature of the complaint;
 - 17.7. the nature of event(s) giving rise to the complaint;
 - 17.8. prevailing weather conditions at the time (where relevant to the complaint);
 - 17.9. the action taken in relation to the complaint, including any follow-up contact with the complainant; and
 - 17.10. if no action was taken, why no action was taken.

MONITORING INFORMATION

18. If the licence expires or is otherwise surrendered, suspended or revoked and the licence contained a condition that the licensee provide a report, record or other information, including in accordance with a monitoring program pursuant to section 77 of the Water Act, the licensee must provide any report, record, information or data available to the licensee up to and including the date the licence expired or was surrendered, suspended or revoked.

OPERATIONAL

19. Without limiting the conditions of this licence, in conducting the Licensed Action, the licensee must do all things reasonable and practicable to:
- 19.1. prevent or minimise the likelihood of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.2. prevent or minimise the likelihood of environmental harm occurring as a result, or in connection with, the Licensed Action;
 - 19.3. effectively respond to pollution and the risk of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.4. effectively respond to environmental harm and the risk of environmental harm occurring as a result of or in connection with the Licensed Action; and
 - 19.5. apply the principles of ecologically sustainable development.
20. The licensee must, without limiting any other condition of this licence, in conducting the Licensed Action do all things reasonable and practicable to ensure the Licensed Action does not adversely affect any:
- 20.1. declared beneficial use, quality, standard or objectives declared under section 73 of the Water Act;
 - 20.2. sites of conservation significance; or
 - 20.3. designated Ramsar wetlands,

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including, but not limited to, those listed at Items 1, 2 and 3.

21. The licensee must ensure any plant and equipment used by the licensee in conducting the Licensed Action:
 - 21.1. is reasonably fit for the purpose and use to which it is put;
 - 21.2. is maintained and operational; and
 - 21.3. is operated by a person trained to use the plant and equipment.
22. No change, replacement or alteration of plant and equipment is permitted if the change, replacement or alteration increases the risk of environmental harm for the Licensed Action, unless approved by the Administering Agency.

DISCHARGES

23. This licence authorises discharges of waste to water from the authorised discharge point(s) as identified in Item 5 and in accordance with the conditions of this licence.
24. Where the Administering Agency directs the licensee to cease discharge from an authorised discharge point identified in Item 5, the licensee must immediately cease the discharge.
25. A direction to cease discharge may be verbal or written, but a verbal direction from the Administering Agency will be provided in writing within 48 hours of the verbal direction. A failure to provide a written direction does not affect the requirement to comply with a verbal direction.
26. The licensee must ensure that discharge from each authorised discharge point:
 - 26.1. consists only of waste from the source(s) as specified in Item 6;
 - 26.2. does not exceed the trigger value limits at Item 7 at the compliance point at Item 8;
 - 26.3. meets the conditions at Item 9.
27. Following any exceedance of a trigger value limits at Item 7 at the compliance point at Item 8 the licensee must take corrective action to mitigate any environmental harm and ensure the exceedance does not reoccur.
28. The licensee must, for each authorised discharge point, install, operate and maintain a device to measure and record, for each discharge event:
 - 28.1. the time the discharge commenced and the duration of the discharge;
 - 28.2. the discharge rate of flow; and
 - 28.3. the discharge volume.
29. The licensee must ensure that the discharge from all discharge events at each authorised discharge point does not:
 - 29.1. contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;
 - 29.2. cause or generate odours which would adversely affect the use and amenity of surrounding waters;
 - 29.3. cause algal blooms in the receiving water;
 - 29.4. pollute groundwater;
 - 29.5. cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;
 - 29.6. cause mortality of fish or other aquatic organisms;
 - 29.7. cause erosion or degradation to the beds and banks of a watercourse; or
 - 29.8. cause adverse impacts on plants or animals.

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MONITORING

30. From the Commencement Date of this licence, the licensee must implement and comply with the Monitoring Program specified in Item 10.
31. The licensee must ensure that the Monitoring Program is designed, maintained and implemented in accordance with the following principles:
 - 31.1. the need to monitor loads upstream and downstream, including in-stream decay in loads downstream, of authorised discharge points;
 - 31.2. the need for event-based monitoring, in addition to routine monitoring, including revisiting sampling points as soon as practicable when samples cannot be collected at frequencies set in the Monitoring Program;
 - 31.3. the need for special studies to better described in-stream physical, chemical and biological processes;
 - 31.4. the need to target the possible critical contaminants listed at Item 11;
 - 31.5. the need to select sampling points that provided representative (well mixed) samples;
 - 31.6. the need to collect samples that are representative of discharge conditions, including taking samples from sampling points on the same day as discharge and consecutively from upstream to downstream; and
 - 31.7. the need to adopt a range of biological surveys to assess the health of the system.
32. The licensee must ensure that all samples and field environmental data are collected in accordance with recognised Australian Standards and guidelines (such as AS/NZS 5667.1 1998, ANZG (2018), as updated from time to time).
33. For the parameters that require analysis at a laboratory, the licensee must ensure that all samples are analysed at a laboratory with current NATA accreditation or equivalent.
34. The licensee must ensure any samples collected in accordance with the Monitoring Program or in connection with the Licensed Action or this licence, are obtained by, or under the supervision of a qualified sampler.
35. The licensee must ensure that, for each sample collected in accordance with the Monitoring Program or the Licensed Action, the following information must be recorded and retained:
 - 35.1. the date on which the sample was collected;
 - 35.2. the time at which the sample was collected;
 - 35.3. the location at which the sample was collected;
 - 35.4. the name of the person who collected the sample;
 - 35.5. the chain of custody forms relating to the sample;
 - 35.6. the field measurements (if any) and analytical results (if any) relating to the sample; and
 - 35.7. laboratory quality assurance and quality control documentation.
36. The licensee must for all land based monitoring points specified in the Monitoring Program:
 - 36.1. install and maintain appropriate identification signage so that they are reasonably identifiable at all times; and
 - 36.2. maintain safe access and egress, as is reasonably practicable.
37. The licensee must ensure that any proposed revisions to the Monitoring Program (other than typographical changes or revisions to formatting or referencing) are:
 - 37.1. reviewed by a Qualified Person, who must produce a written report about their review;
 - 37.2. submitted to the Administering Agency with justification for revisions; and

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- 37.3. submitted to the Administering Agency, in both hard copy and electronic form (with a complete copy of the Qualified Person's written review), 20 business days prior to the proposed implementation date.

RECORDING AND REPORTING

38. The licensee must keep records of all exceedances of trigger values of parameters specified in Item 7, including those that are not an exceedance listed at Item 12, and provide a copy on request of the Administering Agency.
39. The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.
40. A non-compliance with this licence includes the exceedances listed at Item 12.
41. The licensee must notify the Administering Agency of any non-compliance with this licence by emailing waste@nt.gov.au, as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.
42. The licensee must include in the notification of non-compliance the following information:
- 42.1. when the non-compliance was detected and by whom;
 - 42.2. the date and time of the non-compliance;
 - 42.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge;
 - 42.4. whether non-compliant discharge is still occurring; and
 - 42.5. a date (within 10 business days of the non-compliance) when an investigation report will be submitted to the Administering Agency.
43. Within 10 business days of notifying the Administering Agency of any non-compliance, the licensee must provide the Administering Agency an investigation report that includes:
- 43.1. when the non-compliance was detected and by whom;
 - 43.2. the date and time of the non-compliance;
 - 43.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge;
 - 43.4. the actual and potential causes and contributing factors to the non-compliance;
 - 43.5. monitoring data of the discharge, and upstream and downstream water of the authorised discharge point, collected for the date the non-compliance was detected and three sampling rounds prior;
 - 43.6. available flow rates to demonstrate any influence streams and rivers may have had on the exceedance of trigger values;
 - 43.7. rainfall recorded at the site prior to the exceedance of trigger values and non-compliance;
 - 43.8. the risk of environmental harm arising from the non-compliance;
 - 43.9. the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
 - 43.10. corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and
 - 43.11. if no action was taken, why no action was taken.
44. The licensee must submit a completed Annual Return, by emailing waste@nt.gov.au, within 10 business days after each Anniversary Date of this licence, which report relates to the preceding 12 month period.

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45. 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), as prescribed by this licence, within 10 business days after each Anniversary Date of this licence.
46. The licensee must ensure that each Monitoring Report:
- 46.1. 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);
 - 46.2. includes a tabulation of all monitoring data required as a condition of this licence (data must be provided electronically in Microsoft® Excel® format);
 - 46.3. includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge point listed at Item 5. Contaminant loads must be calculated for total metals, total metalloids, total nutrients and other parameters (excluding field parameters) listed in Appendix 3. 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;
 - 46.4. 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 (where the data is available); and
 - 46.5. includes an assessment of environmental impact from the Licensed Action.
47. A copy of the documents listed at Item 13 will be placed on the Register.

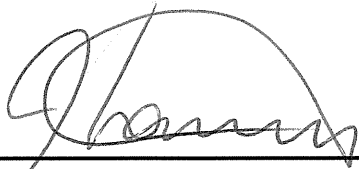
PERFORMANCE IMPROVEMENT

48. Prior to discharge from the authorised discharge point listed at Item 5, the licensee must develop and provide to the Administering Agency, an operational procedure that:
- 48.1. calculates the discharge dilution ratio;
 - 48.2. monitors compliance with condition 26; and
 - 48.3. adjusts the discharge rate during discharge events as flow in the catchment varies.
49. The licensee must ensure that water quality monitoring stations, including water level and flow meters, are installed and operational before 31 October 2022.
50. By 31 August 2023, the licensee must develop a plan for a wastewater management and treatment that provides for:
- 50.1. a reduction in total contaminant loads discharged compared to total contaminant loads discharged during the 2022/23 wet season; and
 - 50.2. details of what flocculants and coagulants and other treatment additives will be used, their breakdown products and their potential to contaminate the environment.

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END OF LICENCE CONDITIONS

This licence is not valid unless signed below:

A handwritten signature in black ink, appearing to read 'Joanne Townsend', is written over a horizontal line.

JOANNE TOWNSEND

Controller of Water Resources

Dated the 25 JULY 2022

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DEFINITIONS

In this licence, unless a contrary intention appears:

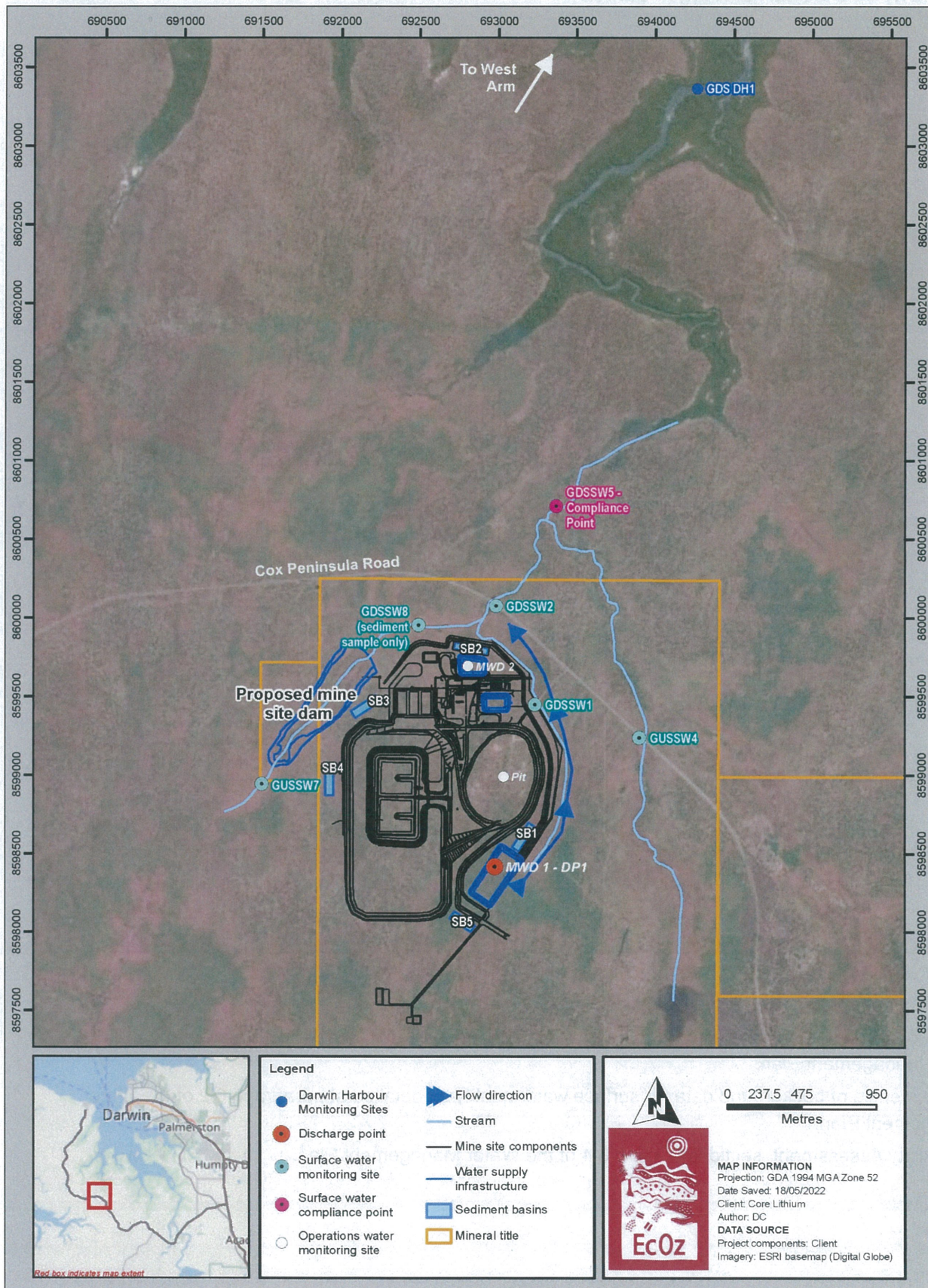
Term	Definition
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the Licensed Action.
Administering Agency	means the NT Government Department with responsibility for administering the Water Act.
Anniversary Date	annual anniversary of the Commencement Date.
Annual Return	an Administering Agency prescribed format for demonstrating and reporting compliance with the conditions of this licence.
ANZG (2018)	Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines .
Authority Certificate	a certificate issued under s 22(1) of the <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> (NT). An Authority Certificate permits a licensee to carry out work on land with or within the vicinity of a sacred site.
business days	a day not Saturday, Sunday or a public holiday, in Darwin, Northern Territory.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the Licensed Action before, during and after the Licensed Action which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the Licensed Action.
contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and Licensed Action.
contaminant	has the meaning given in section 4 of the WMPC Act.
discharge	releasing or allowing a liquid, gas or other substance to flow out from where it has been confined.
Dry season	means 1 May to 31 October.
Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the Licensed Action and that may cause environmental harm.
land	includes water and air on, above or under land.
Licensed Action	the Licensed Action as described on the covering page of this licence.
Linear Interpolation	a method to construct new data points within the range of known data points. $y = y1 + ((x - x1) * ((y2 - y1) / (x2 - x1)))$ y in the unknown concentration between known concentrations y1 and y2 y1 in the first known concentration y2 is the second known concentration x is the day of the unknown concentration y x1 is the day of the first known concentration y1 x2 is the day of the second known concentration y2

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Term	Definition
litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
NATA	National Association of Testing Authorities, Australia.
non-compliance notification	an Administering Agency prescribed format for notifying the Administering Agency of a non-compliance.
plant and equipment	all material items used in association with the Licensed Action, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
pollution	has the meaning given in section 4 of the WMPC Act.
public entrance	access to the licensed premises that is utilised by the public.
Qualified Person	a person registered under Section 68 of the WMPC Act.
qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Register	the register available at the website of the Northern Territory Environment Protection Authority (NT EPA).
waste	takes its meaning from the term in the WMPC Act.
wastewater	water that contains a contaminant or waste.
Water Act	<i>Water Act</i> (NT)
Wet season	means 1 November to 30 April and for the purposes of Appendix 3 includes any part of the Dry Season that discharge is occurring.
WMPC Act	<i>Waste Management and Pollution Control Act 1998</i> (NT)

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 1: Map of Discharge Point, Compliance Point and Monitoring Sites



WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 2 : Discharge Trigger Values

Sampling Points				Compliance Point
Site Code				GDS SW5
Easting				693374
Northing				8600709
PARAMETER	Abbrev.	Units	Analysis	Trigger Values
Environmental Field Data				
pH	pH	pH	In situ	5.2-6.6 ²
Electrical conductivity	EC	µS/cm		250 ¹
Turbidity	NTU	NTU		12 ³
Dissolved oxygen	DO	% sat.		70-92 ²
Nutrients				
Total Nitrogen	TN	µg/L	Unfiltered	200 ³
Total Phosphorus	TP			10 ³
Metals and Metalloids				
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	70 ³
Arsenic	As			13 ¹
Cadmium	Cd			0.2 ¹
Chromium	Cr			1 ¹
Copper	Cu			1.4 ¹
Iron	Fe			110 ³
Lead	Pb			3.4 ¹
Lithium	Li			430 ⁴
Mercury	Hg			0.6 ¹
Nickel	Ni			11 ¹
Zinc	Zn			8 ¹

Key:

¹ ANGZ (2018) 95% species protection, freshwater.

² 20th and 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan.

³ 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan.

⁴ Ecotoxicity Assessment, sections 8.3 and 8.4 of the Water Management Plan.

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 3: Surface Water Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Field Parameters																	
Flow	-	kL/day	In situ	D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	C	N/A	N/A	
Water Level	-	measure		D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	P, W	N/A	N/A	
pH	pH	pH		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Electrical conductivity	EC	µS/cm		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Turbidity	NTU	NTU		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Temperature	Temp	°C		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Oxidation Reduction Potential	OR	mV		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Dissolved oxygen	DO	% sat.		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Nutrients																	
Ammonia	NH ₄ ⁺	µg/L	Unfiltered (excluding FRP)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Oxides of Nitrogen	NO _x			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nitrate	NO ₃			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Nitrogen	TN			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Phosphorus	TP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Filterable Reactive Phosphorus	FRP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Metals and Metalloids																	
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Arsenic	As			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Cadmium	Cd			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chromium	Cr			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Copper	Cu			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Iron	Fe			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lead	Pb			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lithium	Li			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Mercury	Hg			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nickel	Ni			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Zinc	Zn			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

WASTE DISCHARGE LICENCE (WDL248)

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Full elemental scan	-			A	A	A	A	A	A	A	A	A	A	A	A	A	
Treatment regents (condition Error! Reference source not found.)																	
Acrylamide ²	C ₃ H ₅ NO	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Other																	
Sulphate	SO ₄	mg/L	Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Calcium	Ca			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Chloride	Cl			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Sodium	Na			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Potassium	K			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Magnesium	Mg			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Carbonate	CO ₃ ²⁻			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Bicarbonate	HCO3			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Dissolved Solids	TDS			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Suspended Solids	TSS		Unfiltered	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

Key:

- P = prior to discharge.
- C = continuous
- D = within 24 hours of commencement of discharge **and** daily during discharge. When no discharge is occurring monitoring will be on a weekly basis.
- W = within 24 hours of discharge **and** weekly during discharge. When no discharge is occurring monitoring will be on a monthly basis.
- F = weekly whilst discharging from sediment basins, Monthly during Wet season irrespective of discharge.
- M = monthly.
- A = Annually, at end of Wet season on recessional flows.
- N/A = not applicable.

¹ The sampling point in MWD1 will be located close to DP1 to ensure it is representative of discharge water quality.

² This sampling is only required where the licensee has conducted water treatment onsite using flocculants containing Acrylamide.

³ During Wet season only

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 4: Fluvial Sediment Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1	
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Environmental Field Data												
pH	pH	pH		A	A	A	A	A	A	A	A	
Electrical conductivity	EC	µS/cm		A	A	A	A	A	A	A	A	
Moisture content		%		A	A	A	A	A	A	A	A	
Particle size distribution	PSD	%	<63µm ≥63µm & ≤2mm >2mm	A	A	A	A	A	A	A	A	
Aluminium	Al	mg/kg	<63µm sediment fraction	A	A	A	A	A	A	A	A	
Arsenic	As			A	A	A	A	A	A	A	A	
Cadmium	Cd			A	A	A	A	A	A	A	A	
Chromium	Cr			A	A	A	A	A	A	A	A	
Copper	Cu			A	A	A	A	A	A	A	A	
Iron	Fe			A	A	A	A	A	A	A	A	
Lead	Pb			A	A	A	A	A	A	A	A	
Lithium	Li			A	A	A	A	A	A	A	A	
Mercury	Hg			A	A	A	A	A	A	A	A	

WASTE DISCHARGE LICENCE (WDL248)

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1	
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Nickel	Ni			A	A	A	A	A	A	A	A	
Zinc	Zn			A	A	A	A	A	A	A	A	
Other												
Sulphate	SO ₄	mg/kg	Soluble ion extract	A	A	A	A	A	A	A	A	
Calcium	Ca			A	A	A	A	A	A	A	A	
Chloride	Cl			A	A	A	A	A	A	A	A	
Sodium	Na			A	A	A	A	A	A	A	A	
Potassium	K			A	A	A	A	A	A	A	A	
Magnesium	Mg			A	A	A	A	A	A	A	A	

Key:

A = Annually during recessional flow (late Wet season/early Dry season)

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 5: Biota Monitoring Program

Project Name	Locations	Project Description	Report Frequency
Seagrass assessment	West Arm, Darwin Harbour	Seagrass monitoring to determine whether any observed change in seagrass distribution or composition has occurred in the marine waters of West Arm, Darwin Harbour. Monitoring should aim to determine whether any change identified is naturally occurring or related to mine operations.	Annually
Vegetation monitoring	Areas downstream of ML 31726	Monitoring of vegetation downstream of ML 31726 to determine if mining activities are impacting riparian vegetation communities.	Annually
Macroinvertebrate study	Darwin Harbour and Areas downstream of ML 31726	Survey of macro-invertebrate abundance and diversity in aquatic ecosystems. Data is used to monitor potential impacts from mine operations.	Annually during recessional flow (late Wet season/early Dry season)

ATTACHMENT B –PROCEDURE FOR SURFACE WATER SAMPLING



Procedure Surface Water Sampling



DOCUMENT CONTROL RECORD

Job	EcOz Environmental Consultants internal procedure
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Author(s)	Emma Smith, Mike Welch, Casey Hawkey, Corinne Hutchinson

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2	-	E. Lewis	31 Jul 2020
3	-	J. Dymalla	20 Sept 2021
4	A. Faraone	J. Dymalla	1 Sept 2022

Recipients are responsible for eliminating all superseded documents in their possession.

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1 INTRODUCTION

1.1 Purpose

To ensure sampling methods obtain samples representative of the surface water, and to ensure all sampling is consistent, undertaken in a safe manner and follows best-practice procedures in accordance with relevant standards.

1.2 Scope

This Procedure applies to all surface water sampling undertaken by EcOz Environmental Consultants (EcOz) personnel, noting that some sampling requirements may vary on a project-specific basis.

1.3 Standards and other requirements

To ensure the quality and accuracy of the measurements, sampling procedures have been developed in accordance with the following standards and guidelines:

- Australian Standard on Water Quality Sampling - *Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998);
- Australian Standard on Water Quality Sampling - *Part 4: Guidance on sampling from lakes, natural and man-made* (AS/NZS 5667.4:1998);
- Australian Standard on Water Quality Sampling – *Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998);
- Australian Standard on Water Quality Sampling – *Part 10: Guidance on sampling of waste waters* (AN/NZS 5667.10:1998)
- ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, Available: www.waterquality.gov.au/anz-guidelines
- ANZECC & ARMCANZ 2000, *Australian Guidelines for Water Quality Monitoring and Reporting*, National Water Quality Management Strategy Paper No 7, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

2 EQUIPMENT, SAFETY AND TRAINING

2.1 Equipment

The following equipment list is provided for guidance and personnel should consider project-specific sampling requirements when preparing for field sampling:

- **Map** showing monitoring sites.
- **GPS** – with coordinates uploaded for locating sample sites.
- **Site access or permit** requirements that may be required, such as keys, ID cards, contractor induction certificates, vehicle licence, Indigenous land access permit.
- **Job Safety Plan (JSP)**.
- **Field Data Sheets** – enough for all sample sites plus some spares – see Appendix A – EcOz Surface Water Sampling Field Data Sheet.
- **Folder/clipboard** and waterproof notebook.
- **Stationary**: Pens / pencils, permanent markers for completing sample bottle labelling
- **Sample bottles** obtained from relevant laboratories being used (e.g. ALS, Envirolabs, etc.). Ensure that specific bottles are obtained for each parameter to be tested and appropriate pre-treatment is undertaken (e.g. preservatives). Ensure sufficient sample bottles are available for each bore, a duplicate, split and field blank sample (see definitions in Section 4.2), and spare bottles, particularly the glass bottle types.
- **Insulated cooler** with frozen ice bricks or portable Engle fridge/freezer.
- **Field meters** to measure water parameters (e.g. pH, temperature, EC, DO, ORP, turbidity); calibrated on the day of sampling.
- **Calibration solutions** and copies of the EcOz Calibration Record Sheet (if in field for >1 day) or in the event of an issue with field meters – see Appendix B - Calibration Record Sheet.
- **Camera**
- **Polypropylene sampling jug** for collecting field measurements and filling sample bottles if unable to fill bottles directly from hose.
- **Sample pole**
- **Decon 90** solution mixed with deionised water (1:20) to clean equipment between sample sites.
- **Deionised water** for collection of field blanks and rinsing equipment between sample sites.
- **Syringes and filters** (for sampling dissolved metals/ ultra-trace nutrients etc).
- **Powder-free gloves**
- **Spare batteries** for camera, GPS and field test meters
- **Chain of Custody (COC)** forms from the relevant laboratories (one for bulk of samples and one for spilt samples).
- **Plastic sleeves** (snap-lock bags) to protect COC forms inside the insulated containers.

- **Consignment (Con) Notes** for freighting samples to laboratories (either using Toll, Australian Air Express or TNT depending on the client and sampling location), pre-filled as much as possible with relevant account number, laboratory address, contacts etc.
- **Communications equipment** (e.g. mobile/satellite phone, radio).
- **PPE** – see below.
- **Garbage bag** for used filters, syringes, gloves and other general waste generated during sampling.

2.2 OH&S requirements

A JSP must be completed for each sampling event which includes all project and personnel information including emergency contacts, and an assessment of the potential hazards and required hazard control measures. Standard potential hazards and hazard control measures are listed in Table 2-1 below.

Table 2-1. Standard hazard management for surface water sampling

Task	Potential Hazards	Hazard Controls
Driving to and around site	Animals on road	• Do not swerve to avoid hitting fauna on the road, slow down and maintain line • Avoid travelling on roads early morning, late afternoon and night
	Other vehicles	• Maintain good observation when driving • Even on quiet roads, always assume the possibility of an oncoming vehicle
	Road conditions	• Stay within speed limits and drive according to conditions
	Driver fatigue	• Regularly swap drivers and take breaks
	Flat tyres	• Carry spare tyres, jack and tools • All party members must be proficient in changing a tyre on the type of vehicle being used
	Getting lost	• Use GPS, maps and radio • Ensure at least two personnel if working in remote areas. • Prepare scheduled call-in procedure prior to leaving office and abide by this procedure • Agree on procedure in the event of a missed call-in (e.g. time to wait before calling emergency services)
	Bogging	• Avoid driving in wet areas • Carry vehicle recovery equipment • At least one party member must be proficient safe use of recovery equipment • Maintain communications (e.g. radio channel 40, sat phone) • Vehicle recovery only to be undertaken by personnel who have undertaken 4WD recovery training In areas of high risk, vehicles to travel in pairs, with the second vehicle not proceeding into boggy areas until first vehicle has made it through
	Mechanical failure	• Pre-start vehicle checks • Maintain communications (e.g. radio channel 40, sat phone)
Surface water sampling	Unsafe worksite	• Upon arrival to each site, perform an assessment of potential risks/dangers unique to the area and mitigate accordingly (Take 5)
	Cuts/abrasions	• Wear full PPE when performing sampling
	Tripping/slipping/strains	• Care taken walking in rough / overgrown terrain (or seek alternative route) • Use appropriate lifting techniques (e.g. bend knees), 2 person lifts and lift within capabilities
	Dehydration/heat	• Adequate water and electrolyte replacement carried for all personnel

	exhaustion	• Competent first aid trained person within sampling group • Correct PPE • First aid is readily available
	Sunburn	• Use sunscreen and wear correct PPE (e.g. hat, long sleeves)
	Fast flowing water	• Always sample with more than one person (one person to act as a spotter) • Carry communications (e.g. radio/mobile) • Use sample pole to sample sites with fast flow • All personnel must be competent swimmers
	Snake bite	• Correct PPE (e.g. sturdy boots, long pants/gators) • All personal have first aid training • Care taken when stepping over logs • Each person to carry snake bandage at all times
	Dangerous animals (e.g. cattle, buffalo, pigs)	• Assess each site for potential dangerous animals upon arrival (Take 5) • Maintain safe distance from any animals • Shelter in vehicle if required
	Ticks	• Check body and clothing for ticks at the end of each day • Shirts to remain tucked into the trousers • Advising other personnel of the locations where ticks have been seen/recorded • Ticks to be carefully removed to avoid squeezing the tick • Seek medical advice if a tick bite is found
	Crocodiles	• Assess sample site for crocodiles and evidence of slides upon arrival • Do not enter water • Use sample pole to maintain distance from edge • Always have two people with one person acting as a spotter at any given time • Always have radio or satellite phone to ensure communication in case of emergency
Sampling contaminated sites	Getting lost finding sites	• Always carry a GPS and maps • Ensure all personnel are fit and capable of task prior to leaving • Make GPS waypoint of vehicle prior to leaving • Carry a radio and sat phone • Avoid travelling to unknown areas if no clear path • Prepare scheduled call-in procedure prior to leaving office and abide by this procedure • Agree on procedure in the event of a missed call-in i.e. time to wait before calling emergency services
	Working around contaminated water	• Assess site for safety considerations prior to commencing work • Have an evacuation plan and recovery equipment prepared • Use sampling pole to allow distance from edge • Know the location of the nearest emergency shower and whether it is in operating condition • Take care near edges and have a spotter present • Do not work near edge of if risk of falling • Always carry a radio and sat phone to ensure communication
	Acidic water in pits and drains	• Avoid coming into contact with water • Wear gloves if handling water
	Exposure	• Adequate water and electrolyte replacement carried • Correct PPE • First aid is readily available

Standard PPE should be worn, including:

- Sturdy boots (steel cap and laces if industrial/mine site).
- Hat, safety/polarised sunglasses, sunscreen.
- Protective gloves for manual handling.
- Hard hat (if required for working around machinery)

- Long pants and shirt (high-visibility if industrial/mine site).

2.3 Training and competency

All personnel conducting water sampling shall be familiar with this Procedure and have received field training from experienced personnel. This includes training in sample collection, using and calibrating field meters.

All personnel conducting water sampling shall have a current first-aid certificate.

Each field party conducting sampling in a remote area with difficult or boggy access must include a member trained in vehicle recovery who has completed the 4WD training course and has field experience in vehicle recovery.

2.4 Site access

Personnel must ensure that any required permits (e.g. Indigenous land access permit), and/or land access permissions are obtained prior to undertaking water sampling.

Personnel must also ensure that all site induction requirements are fulfilled, ID cards (e.g. Aviation Security ID Card (ASIC), Maritime Security ID Card (MSIC)), licences, contractor induction cards/certificates and keys are obtained prior to mobilising to site.

Ensure that all possible site restrictions are known, such as possession and/or use of mobile phones, cameras, flammables, particular chemicals, prior to mobilisation to site.

3 PROCEDURE

3.1 Contamination prevention precautions

- 3.1.1 Keep hands away from sample bottle openings and the inside of bottle lids. Be aware that sources of contamination include permanent markers, insect repellent, sunscreen, deodorant, dust and perspiration.
- 3.1.2 Always wear powder-free gloves and use new gloves for each sample site.
- 3.1.3 Do not allow the opening of sample bottles and bottle lids to touch the ground.
- 3.1.4 Only clean, sealed and pre-prepared preserved sample bottles obtained from a NATA accredited laboratory are to be used for laboratory samples.
- 3.1.5 Ensure equipment is cleaned thoroughly after each sample site with Decon 90 solution (5 %) and rinsed with deionised water.
- 3.1.6 Ensure sample bottles are filled to the top leaving no headspace unless otherwise specified by the laboratory.
- 3.1.7 Do not overfill the bottle, particularly not for sample bottles with preservative.
- 3.1.8 For the bottles containing preservative, after sample collection, put the lid on and shake immediately.
- 3.1.9 After sample collection, ensure all sample bottles are tightly sealed and stored upright in an insulated cooler (with ice-bricks) or fridge at <4°C. Do not use loose ice as this can contaminate the samples if they are left in the melted ice water.

3.2 Preparation

- 3.2.1 Prior to undertaking a field sampling trip, ensure that a JSP has been completed and signed by all field personnel, and by the Project Manager.
- 3.2.2 Gather all equipment listed in Section 2.1.
- 3.2.3 Bottles may need to be ordered from the laboratory. Contact the laboratory for advice on what bottles are required (certain analytes require particular bottles and preservatives).
- 3.2.4 Put together a package of sample bottles for each site (i.e. in a large snap-lock bag), including bottles for duplicates, split samples and blanks.
- 3.2.5 Label each bottle with the site name (or duplicate, split, blank) and sampler's name. Sample date and time are to be labelled in the field at the time of sample collection.
- 3.2.6 For metals analysis, tick the box on the bottle label for either *dissolved metals field filtered* or *total metals*, depending on whether samples for metals analysis will be filtered in the field.
- 3.2.7 Calibrate the field test meters (e.g. pH, temperature, EC, DO, ORP, turbidity) according to the manufacturer's instructions. Complete a Calibration Record Sheet (Appendix B).

- 3.2.8 Ensure camera and GPS (if required) are fully charged and have sufficient memory.
- 3.2.9 Depending on the number of sites being sampled, prepare a sufficient volume of Decon 90 solution (i.e. 1:20 Decon:deionised water) to use for cleaning sampling equipment in the field.
- 3.2.10 Print out the required number of blank Surface Water Sampling Field Data Sheets (Appendix A), laboratory COC forms, maps and bore reports.
- 3.2.11 Ensure that ice bricks have been put in the freezer, or the Engel fridge has been sufficiently chilled, to keep samples cool as they are collected.

3.3 Travel to sample sites

- 3.3.1 Review JSP prior to travel to ensure that all potential hazards have been assessed and personnel are familiar with any risks.
- 3.3.2 When undertaking routine surface water sampling, it is best that at least one of the field team has previous experience sampling all the sites.
- 3.3.3 Refer to maps, photos and marked GPS locations to confirm the correct location.

3.4 Field observations and in-situ parameters

- 3.4.1 Fill in the Surface Water Sampling Field Data Sheet with the sample site ID, date, time, your name, field observations such as weather conditions, water colour, clarity, water depth, flow rate, any obvious pollution (e.g. rubbish, odours, surface film, etc.), flora/fauna present, and any other issues that may affect the samples.
- 3.4.2 Wear powder-free gloves when collecting field samples.
- 3.4.3 Ideally, in-situ readings (pH, temperature, DO, EC, ORP and turbidity) are collected directly from the water body being sampled by immersing the meters in the water to be sampled. However, if safety and/or logistical issues preclude this, field readings may need to be taken from the sampling jug. In this case the DO sensor will need to be slowly swirled in the sampling jug to move water over the membrane. The sample pole can be used to collect water from water bodies that are difficult to access.
- 3.4.4 Record the in-situ parameters just below the water surface (between 0.2 and 0.5 m depth), depending on water depth. Alternatively, if collecting samples from various depths (e.g. depth profiling), ensure the field meter is lowered to the desired depth.
- 3.4.5 If collecting field readings from the sampling jug, collect a representative water sample using the jug, or sampler mounted on a sampling pole. Ensure that the jug/sampler is fully immersed and rinsed at least 3 times, tipping the rinse water away from (e.g. on the bank), or downstream of, where the sample is to be collected.
- 3.4.6 If sampling flowing waters, ensure that you are standing downstream of where you are sampling so as not to contaminate the sample.
- 3.4.7 Record all the readings on the Surface Water Sampling Field Data Sheet; one sheet to be filled out per site.

3.5 Laboratory sample collection

- 3.5.1 Wear powder-free gloves when collecting laboratory samples.
- 3.5.2 Take out the required pre-labelled sample bottles. Label bottles with sample date and time.
- 3.5.3 Keep hands away from sample bottle openings and the inside of bottle lids. Be aware that sources of contamination include permanent markers, insect repellent, sunscreen, deodorant, dust and perspiration.
- 3.5.4 If safe to do so, fill bottles directly from the water body being sampled, otherwise use the jug and/or the sample pole to collect a water sample. Be careful not to overfill bottles which contain preservatives. If the flow rate is very rapid, it may be required to fill the bottles containing preservative using a jug (pre-cleaned with Decon 90 and deionised water). Rinse the jug three times with water being sampled (disposing of rinse water away from, or downstream of, sample collection point) prior to filling laboratory bottles from jug.
- 3.5.5 For samples requiring field filtering (e.g. dissolved metals), draw some water from the jug into a syringe, put a filter on the end of the syringe, rinse the filter by pushing a few drops of the sample through onto the ground, then fill the bottle leaving no headspace. Depending on the size of the syringe, it may be necessary to draw several syringes-full of water to fill the sample bottle.
- 3.5.6 Once all bottles are filled and tightly capped with lids, place them upright into the insulated cooler and store below 4°C.

3.6 Collection of field blanks, split samples and duplicates

- 3.6.1 To collect a field blank, simply follow the steps outlined in Section 3.5 above using laboratory supplied rinsate water/field blank water instead of water from the site being sampled.
- 3.6.2 For split samples and duplicates, repeat all the above steps outlined in Section 3.5 above at the site(s) chosen for these samples (generally at least 1 in 10 sample sites). Label the sample bottle as 'Split' or 'Duplicate'. Be sure to note collection of these samples on the Surface Water Sampling Field Data Sheet otherwise it will not be possible to track which site these samples were collected from because the site name is not permitted to be recorded on the bottle.

3.7 Cleaning of field equipment

- 3.7.1 After sampling each site, rinse all sampling equipment (e.g. jugs, field meter probes) with the pre-mixed Decon 90 solution, followed by deionised water.
- 3.7.2 Dispose of used filters, syringes, and gloves appropriately. Consumable sampling equipment are single use only and fresh gloves, syringes and filters are required at each site.

3.8 Sample dispatch

- 3.8.1 Once sampling is completed, pack the samples securely in an insulated cooler with ice bricks. Ensure that samples have sufficient contact with the ice bricks to stay as cool as possible.
- 3.8.2 Fill out the COC, put in a plastic sleeve (snap-lock bag) and place inside the insulated container.
- 3.8.3 If required, provide a copy of the COC to the client.

3.8.4 Samples must be dispatched to a NATA accredited laboratory within the required holding times, noting that:

- Samples must be dropped off at the receiving laboratory no later than 14:00 each day.
- Sample dispatch on Fridays and weekends is not acceptable for sample analysis with short holding times (e.g. microbiological, nutrients) as samples will not be transported from Darwin until the following Monday. Other parameters with longer holding times can be kept in a fridge until dispatch on Monday.

3.8.5 If sending samples direct to the laboratories:

- Tape up an insulated cooler and label with an address, consignment note and the appropriate handling stickers (e.g. fragile, keep chilled etc.).
- Deliver samples direct to freight company or organise pick-up, ensuring that samples will be dispatched in time to meet laboratory holding times (usually by 16:00 on day of sampling for overnight priority service).

3.8.6 Remember to also prepare a small insulated cooler containing the split sample for sending to a separate laboratory.

3.9 Data management

3.9.1 All Surface Water Sample Data Sheets should be saved to the project file Field and Lab Data folder on MFiles, and all photographs are to be saved to the project folder at Z:\02 EcOz Resource Materials\01 Image Bank, and labelled according to the relevant site name.

3.9.2 Correspondence and document from the laboratory should be saved to the project file Field and Lab Data folder on MFiles (e.g. results, sample receipt notices, certificate of analysis and QA/QC information).

4 ACRONYMS AND DEFINITIONS

4.1 Acronyms

COC	Chain of Custardy
DO	Dissolved Oxygen
EC	Electrical Conductivity
JSP	Job Safety Plan
mbgl	Meters below ground level
NATA	Nation Association of Testing Authorities
ORP	Oxidation-Reduction Potential
pH	Measurement of an aqueous solutions acidity or basicity. Ranges between 1 and 14.
PPE	Personal Protective Equipment
SWQ	Surface Water Quality
TOC	Top of Casing

4.2 Definitions

- QA/QC** Quality Assurance/Quality Control, which may include:
- Duplicate sample – collected during each sampling event (e.g. 1 duplicate for every 10 samples collected) to detect both natural environmental variation, and any errors from filed sampling methodologies.
 - Split sample - collected during each sampling event (e.g. 1 split for every 10 sample sites) and sent to a different laboratory to detect any Lab-based discrepancies.
 - Field blank sample – collected during each sampling event to evaluate potential contamination from personnel and/or sampling equipment.

APPENDIX A SURFACE WATER SAMPLING FIELD DATA SHEET

Surface Water Field Data Sheet

PROJECT:		DATE and TIME:		
SITE NUMBER / NAME:				
SAMPLERS NAME:		PHOTO NOS:		
EASTING:		NORTHING:		
GENERAL OBSERVATIONS				
WATER COLOUR		PRESENCE OF AQUATIC FAUNA		
ODOUR		AQUATIC PLANTS		
SURFACE SCUM/ALGAE		EROSION		
RIPARIAN CONDITION		GROSS POLLUTANTS		
WATER CONDITIONS				
APPROX DEPTH OF WATER (m)		WATER FLOW (m/sec)		
WEATHER CONDITIONS				
Cloud cover/ precipitation/ wind conditions:				
FIELD SAMPLES				
Parameter	Unit	Result	Meter Used	Date of calibration
pH				
Temperature				
E.C				
TDS				
Salinity				
D.O				
ORP				
Turbidity				
LABORATORY SAMPLES				
Analytes Requested		Containers Used	QA/QC Samples Collected (circle)	
			☐ Duplicate ☐ Split ☐ Blank	

Any other comments or special procedures (see over):

APPENDIX B FIELD METER CALIBRATION RECORD SHEET



EcOz Environmental Consultants

Probe Calibration Record Sheet

Date:				Calibrated By:			
Serial # of Probes Calibrated:		pH:		EC:		DO:	
Turbidity:							
Pre-Calibration Reading:				Post Calibration Reading (Checking):			
pH							
pH 7.00 Standard:		pH 4.01 Standard:		pH 7.00 Standard:		pH 4.01 Standard:	
pH:	mV:	pH:	mV:	pH:	mV:	pH:	mV:
For pH 7.00: mV should be zero $\pm$ 50 mV.							
For pH 4.01: mV should be +165 to +180 mV greater than the pH 7.00 mV value.							
pH readings (circle): Good Some Problems explain here:							
EC							
Temperature at time of calibration:				Relative calibration value:			
EC Calibration Solution Used (circle): 447 μ S/cm 1413 μ S/cm 2570 μ S/cm 12880 μ S/cm							
EC μ S/cm:	TDS g/L:	Sal ppt:	EC μ S/cm:	TDS g/L:	Sal ppt:	EC μ S/cm:	TDS g/L:
EC readings (circle): Good Some Problems explain here:							
Turbidity							
Turbidity 0 NTU		Turbidity 124 NTU		Turbidity 1010 NTU			
Pre cal:	Post cal:	Pre cal:	Post cal:	Pre cal:	Post cal:	Pre cal:	Post cal:
Turbidity readings (circle): Good Some Problems explain here:							
DO							
Barometric Pressure (mmHg) set for DO: (Look up local hPa on BeM usually around 1010)				DO reading after stabilization:			
DO readings (circle): Good Some Problems explain here:							
ORP							
240 MV standard							
ORP Pre calibration:				ORP post calibration:			
Probes require servicing? (e.g. DO membrane needs changing, probes need to be cleaned or sent away, batteries need replacing)							
						Actioned (tick): ☐	
						Date:	
Any other actions required? (e.g. order more calibration solutions or DO replacement membranes)							
						Actioned (tick): ☐	
						Date:	

Calibrator's Signature:



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ATTACHMENT C – FIELD SHEETS FROM THE DARWIN-DALY AUSRIVAS MANUAL

6. APPENDIX 1 – FIELD SHEETS

FIELD SHEETS AUSRIVAS - Darwin Daly regional Models

Date	Site Code	Site Name	Field Team
------	-----------	-----------	------------

GPS coordinates: (*predictor variables family level model*):

Zone (UTM)	Easting	Northing	Datum
------------	---------	----------	-------

Landholders and contact details

Site comments, observations

ACCESS SKETCH

SITE NAME

SITE CODE

Indicate any features that assist locating exact sample site on subsequent trips.

WATER QUALITY

Time	Instrument	Instrument Serial No.
pH	units	E.C.
D.O.	mg/L	Water Temperature
Turbidity	NTUs	Instrument and serial number

Water samples for laboratory water quality analysis

(ALKALINITY is a *predictor variable for genus level model*)

Bottle lable	Analysis
	Alkalinity

Observations relating to water quality (e.g. water oil, scum, foam, sediment odours)

MACROINVERTEBRATE SAMPLING

EDGE

Length sampled _____m

Collected by _____

No. of containers used _____

Edge description

- ☐ Vertical 90°
- ☐ Angled 45-90°
- ☐ Undercut

Edge habitat mainly composed of roots from

- ☐ Paperbark / Melaleuca ☐ shrub
- ☐ other common riparian trees ☐ grass

Edge habitat

- ☐ roots covered by algae ☐ overhanging vegetation

Habitat velocity & depth

Flow meter serial no. _____ Fan set no. _____

(predictor variable genus level model)

Meter Reading (Revolutions per 40s)			Fan details	Habitat depth (cm)		
1	2	3		1	2	3

Stream Width (at water level) *(predictor variable genus and family level models)*: six measurements or estimations are taken in a 100m reach upstream of the macroinvertebrate sampling site.

Number	1	2	3	4	5	6
Width (m)						

- ☐ measured ☐ estimate only

Comments

DESCRIPTION OF THE REACH (reach 100 m upstream of sample site)

Habitats within 100 m reach

Sand/Silt bed	☐	Riffle	☐
Gravel/Rock bed	☐	Run	☐
Macrophytes	☐	Pool	☐
Snags	☐		

Description of stream characteristics

Width between top of levee banks (bankfull width) _____ m

Other levees ☐

Height of levee bank from water surface _____ m

Flow observable ☐

RIPARIAN ZONE (within 100 m reach)

Riparian zone width -left bank (facing downstream) _____ m
 -right bank _____ m

Riparian vegetation type

Monsoon-vine forest/Rainforest	☐	Riparian shrubland	☐
Riparian forest	☐	Riparian grassland	☐
Riparian woodland	☐	Other: _____	

Weeds ☐

Evidence of fire

Riparian Zone	☐
Beyond Levee Banks	☐

Cattle access ☐

Comments

SKETCH OF 100 M REACH

Indicate: ■ water quality measurements macroinvertebrate sample sites location of vehicle access
• water sample collection width measurements
✎ location of Photographs direction of flow



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ATTACHMENT C

Tabulated Water Quality Monitoring Data

ATTACHMENT E

Macroinvertebrate Sampling Report

Grants Open Cut Mine

Biological and Sediment Monitoring 2024

Final Report



This report has been prepared for Core Lithium as a technical document. 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.

Rainfall and flow data were obtained from Core Lithium. 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	C. Pietsch	12/07/2024
Draft 1.1	T Steele	P. Lander	19/08/2024
Final 2.0	T Steele		



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1. Background

1.1 Project Description

The Finnis Lithium Project is the flagship mining project for Core Lithium Limited (Core), located on the Cox Peninsula approximately 25km from Darwin. Lithium Developments (Grants NT) Pty Ltd (LDGNT) is a 100% owned subsidiary of Core and is the operator of the Grants Lithium Project, situated on mineral titles ML31726, ML32074, ML32278 and EMP28651. A Mining Authorisation was granted on 1 April 2020 under the *Mining Management Act 2001* for the Grants open cut mine. A mining operation and processing facility has been developed on ML31726 and the key physical components comprise an open cut pit, integrated waste rock dump and tailings storage facility, run-of mine pad, water management infrastructure and processing plant. Mining was suspended at the site in December 2023, with processing of ore continuing through to June 2024.

1.2 Catchment

The Grants open cut mine is located within the wider Darwin Harbour catchment. The catchment consists of several low order streams that are predominately unnamed tidal creek systems that flow to the West Arm of Darwin Harbour. The mine intersects two stream catchments. The freshwater sections of both catchments are short, and the mine is located at the headwaters of these catchments. The combined area of these two catchments is 13.6 km². Pre-mining, there was one existing water body (Observation Hill Dam) that was established in the 1980's, and which is used by LDGNT as a water source for mining operations. Observation Hill Dam is situated in the headwaters of a drainage line that discharges to the Charlotte River, approximately 3 km downstream. BP33 is also situated in the headwaters of the Charlotte River/Bynoe Harbour catchment.

1.3 Monitoring Program

In 2017, GHD conducted aquatic ecology surveys as part of the approvals process for the Finnis Lithium Project. This represented the first aquatic ecology surveys completed in the freshwater section of the Darwin Harbour catchment. The surveys included collection of data on fish, macroinvertebrate and *in situ* water quality. The sampling design for monitoring in 2024 has adopted the sampling design for Grants, with an additional site included in a reference waterway in the Charlotte River catchment.

The Waste Discharge Licence (WDL248) for Grants authorises controlled discharge of wastewater from Mine Water Dam 1 through authorised discharge point (DP1) and into an unnamed ephemeral stream that feeds into West Arm, Darwin Harbour. The WDL stipulates the monitoring requirements for surface water, fluvial sediment and biota. A biological and sediment monitoring program was implemented to gather data before active discharge occurred from Grants. This follows the BACI design (Before, After, Control, Impact), allowing for temporal comparison of aquatic ecosystem health that includes a period prior to mining commencing (2017 and 2022).

1.4 **Scope**

Aquatic Ecology Services was engaged by Core Lithium to complete macroinvertebrate sampling and ID, data analysis and reporting for the freshwater biological and sediment components of the monitoring program. This report details the outcome of sampling completed in the early dry season of 2024 at both sites.

2. Study Design

2.1 Sampling sites

Five sites were visited during macroinvertebrate and sediment sampling in 2024 (Table 1). This included four downstream sites in the Darwin Harbour catchment, and one Reference site located upstream of all mining activity in the Charlotte River Catchment. Sites UC1, UC2 and UC3 were previously sampled by GHD in 2017. Site UC3 was not sampled in 2022 but was added to the monitoring program in 2023. Site UC3 is located on an unnamed tributary, east of the Grants site as shown in Figure 1. Site UC3 is an Upstream site, as it is located within a different hydrological sub-catchment as shown on Figure 1.

Table 1 – Sampling sites for the Grants Project Area. All coordinates in Zone 52L

Site Code	Site type	Description	Easting	Northing
BP4	Reference	Unnamed Creek upstream of Cox Peninsula Road	697786	8592522
UC3	Upstream	Tributary entering the unnamed creek between UC2 and GDS SW5	693645	8600380
UC2	Downstream	Unnamed Creek directly downstream of Grants, also referred to as GDS SW2	693137	8600170
GDS SW5	Downstream	Unnamed Creek at WDL compliance point	693365	8600709
UC1	Downstream	Unnamed Creek furthest downstream, directly upstream of estuary	693549	8600956

2.2 Timing

To meet the protocols outlined in the Darwin-Daly AUSRIVAS sampling manual (Lamche 2007), sampling was conducted in the post-wet season. Sampling must be conducted in the post-wet season during the recessional flow period, to capture the potential effects of mine water discharge during the preceding wet season. Sampling was undertaken in early May, which reflected the previous wet season rainfall and flow conditions in the catchment.



3. Methods

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. Data recorded was 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 and sediment quality

3.2.1 *In situ 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

The results were compared against the WDL Discharge Trigger Values (Appendix 2 of WDL248). The WDL Discharge Trigger Values (DTVs) are applicable at the downstream compliance site, GDS SW5.

3.2.2 Sediment grab sampling

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

- The collection of a composite sample of sediment grabs from random areas of the substrate and sieved to 2mm
- Placing sediments into a laboratory-supplied container, labelled with site and sample details
- Keeping samples in chilled eskies for onward delivery to a NATA accredited laboratory for testing.

Total and acid-extractible metals were analysed for the parameters shown in Table 2.

Table 2 – Testing parameters for sediments collected at Grants

Lab Analyses	Analytes
Total recoverable metals	Aluminium, arsenic, cadmium, chromium, copper, iron, lead, lithium, mercury, nickel, zinc
Other parameters	Particle size distribution (PSD), total organic carbon (TOC), moisture content

Sediment quality results were compared against the toxicant default guidelines values (DGVs) for sediment quality (ANZG 2024). The sediment DGVs indicate the concentrations below which there is a low risk of unacceptable effects occurring, and should be used, with other lines of evidence, to protect aquatic ecosystems. In contrast, the 'upper' guideline values (GV-High), provide an indication of concentrations at which you might already expect to observe toxicity-related adverse effects.

3.3 Macroinvertebrates

3.3.1 *Field sampling*

Macroinvertebrate sampling followed procedures outlined in the Northern Territory AUSRIVAS Manual for the Darwin-Daly Region (Lamche, 2007). Sampling involved scraping submerged root matter associated with the lower bank to agitate and remove macroinvertebrates into the water column and sweeping 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 10mm and 250µm mesh sieves. The coarse mesh sieve was examined for large, conspicuous taxa, and these were placed in a 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.

3.3.2 *Laboratory processing*

Samples were washed through a series of sieves (10mm, 500µm and 250µm 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 500µm mesh sieve were retained for macroinvertebrate identification and enumeration, while the 250µm fraction was retained as sample residue for quality assurance purposes. The contents of the 500µm 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 relative abundance. A Leica stereo-dissection microscope was used to examine specimens.

Taxa were identified to family level where possible, with the exception of key taxa identified in Lamche (2007), requiring identification to order level (e.g., Conchostraca, Oligochaeta etc.). 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.

3.4 Data analysis

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. Macroinvertebrate community indices were calculated for each sample at each site.

A one-way ANOVA was performed for each macroinvertebrate index to understand if significant differences are present between baseline (2017 and 2022) and operations (2024) data. A summary of the univariate macroinvertebrate indices assessed as part of this study is 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 (Family) – 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.
- To further interrogate SIGNAL-2 results, the tolerant taxa index was calculated from SIGNAL grade numbers. Taxa with SIGNAL grade numbers of 3 or less are designated as tolerant (Marshall *et al.* 2001), and the number of these tolerant taxa are compared to the overall taxa count and expressed as a percentage. This approach allows for a more nuanced assessment of any impacts associated with active discharge from Mine Water Dam 1 in the future and provides background data on the overall tolerance of taxa in the catchments.

Prior to 2021, biological monitoring programs commonly utilised 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 since been published (ANZG 2024a). 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 AUSRIVAS modelling has not been undertaken on the data collected in 2024.

In addition to univariate analysis of metrics, an assessment of differences in the macroinvertebrate community composition was undertaken. Statistical analysis was undertaken comparing sample groups from baseline (2022) and operations (2024). Sample data was fourth-root transformed prior to multivariate analysis and was completed using PRIMER Version 7.0.21. Non-metric Multidimensional Scaling (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, a NMDS plot was used for data to display the similarity between site types (Reference and Downstream). 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).

The ANOSIM (ANalysis Of SIMilarity) routine was applied on the similarity matrix for each ordination analysis to determine if the differences between sites observed within the ordination plots were significantly different. This analysis provides a measure of the dissimilarity of groups of samples (years) in the form of an R-statistic that typically lies between 0 and 1; values close to 1 imply that these groups are very dissimilar and those approaching 0 are very similar. A p-value is calculated to determine the statistical significance of the sites groupings. The interpretation of group separation is not wholly based upon the p-value, but rather the R-statistic, as the numbers of replicates within the groups being compared does not unduly affect the R value.

4. Site Conditions

Rainfall recorded on site is presented in Figure 2 and compared with totals for each month from the 2023-2024 wet season. A total of 3085.6 mm of rain was recorded in the 2023/2024 wet season, as opposed to the 1354.3 that fell in 2022-2023. The majority of rain fell in January with the following two months also recording more than twice the rainfall recorded in 2023. Discharges to Unnamed Creek were undertaken January to March, and discharge volumes reflected rainfall and subsequent flow in each month (Garry Law, Core Lithium *pers comm*).

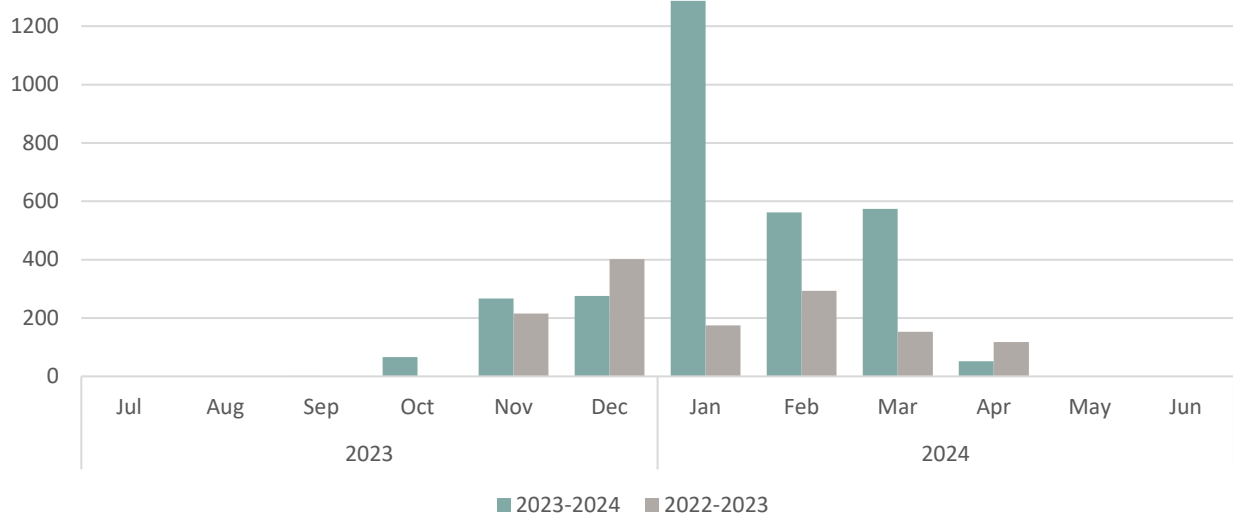


Figure 2 – Monthly Rainfall recorded at Grants July 2023-June 2024 compared with previous years rainfall

5. Results

5.1 Habitat characteristics

Habitat characteristics of each site are detailed below in Table 3. All sites downstream of Grants were flowing at the time of sampling.

Table 3 – Grants site descriptions, May 2024

Site description	Site photo
BP4 – Reference The site is located on an unnamed creek upstream of Cox Peninsula Road. The riparian zone was intact and consisted of paperbarks and pandanus, with little understorey. The riparian zone provided high shading, exposed roots and detritus in the creek bed. Sediments were made up of sand and silt, and some algae was present. Floating and submerged macrophytes were observed in deeper pools.	
UC2 – Downstream The site was made up of pool habitat connected by shallow runs. Floating and submerged macrophytes were present in deeper pools. Large woody debris, detritus and exposed roots were common. The riparian zone consisted of large paperbark trees, providing moderate shade. Native grasses and herbs were present in the understorey and were trailing in the water.	
GDS SW5 - Downstream The site is located at the WDL compliance point. There was less riparian vegetation present at the site compared with other sites, and filamentous algae was observed. Despite a lack of vegetation, there was little erosion, and the substrate was made up of a mix of pebbles and gravel along with sand and silt. There were no deep pools present, and runs were connected by shallow riffles.	

Site description	Site photo
UC1 – Downstream The site was a series of slow-flowing pools connected by shallow runs. The substrate was made up of gravel, sand and silt. Large woody debris and undercut banks were common, with leaf packs and algae present in backwaters. Riparian vegetation was sparse, mainly being made up of large overhanging Melaleucas. Juvenile mangroves were also observed along the wetted fringe.	

5.2 Water quality

5.2.1 *In situ*

In situ water quality data collected at sampling sites is presented in Table 4. The following observations can be made about water parameters at sites associated with Grants:

- Water temperatures were similar at most sites, and warmest furthest downstream at GDS SW5.
- Dissolved oxygen was variable and did not appear to have a relationship to catchment position. DO was lowest at the Reference site, BP4.
- Conductivity was below the WDL DTV at GDS SW5, and water was considered fresh. The highest result was downstream at UC1.
- pH readings were above the upper WDL DTV and highest at GDS SW5. All other pH values were circumneutral.
- Turbidity was below the WDL discharge trigger value at GDS SW5, and similar at all sites.

Table 4 – *In situ* water quality results from Grants sites visited in April 2024. Exceedances highlighted in grey

Site Code	Time	Temp (°C)	DO (%)	EC (µS/cm)	pH	Turbidity (NTU)
WDL Discharge Trigger Values ¹			70-92	250	5.2-6.6	12
BP4	11:15	25.76	61.9	23	7.56	7.10
UC3	15:34	31.08	116.7	19.12	7.08	4.45
UC2	11:39	27.54	69.17	26.33	6.51	7.43
GDS SW5	14:23	33.55	142.82	154.28	8.30	4.47
UC1	13:25	30.33	105.23	445.23	7.05	6.51

¹ Applicable at WDL248 Compliance Point GDS SW5.

5.3 Sediment quality

Sediment particle size analysis and sediment quality results, for samples collected at sites associated with Grants are presented in Figure 3 and Table 5. Data are compared against the ARMCANZ & ANZECC 2000 default guidelines for toxicants in sediment. Results are presented as total metals. The following observations are made based on the results:

- Sediments were dominated by fines and sand in the upper catchment, and were almost equal parts gravel and sand in the lower catchment.
- Total arsenic was above the DGV at GDS SW5 and UC1.
- Cadmium was not detected above the limit of reporting at any site.
- Metal concentrations in sediments increased with distance downstream for all but lithium, which recorded its highest concentration at UC2.

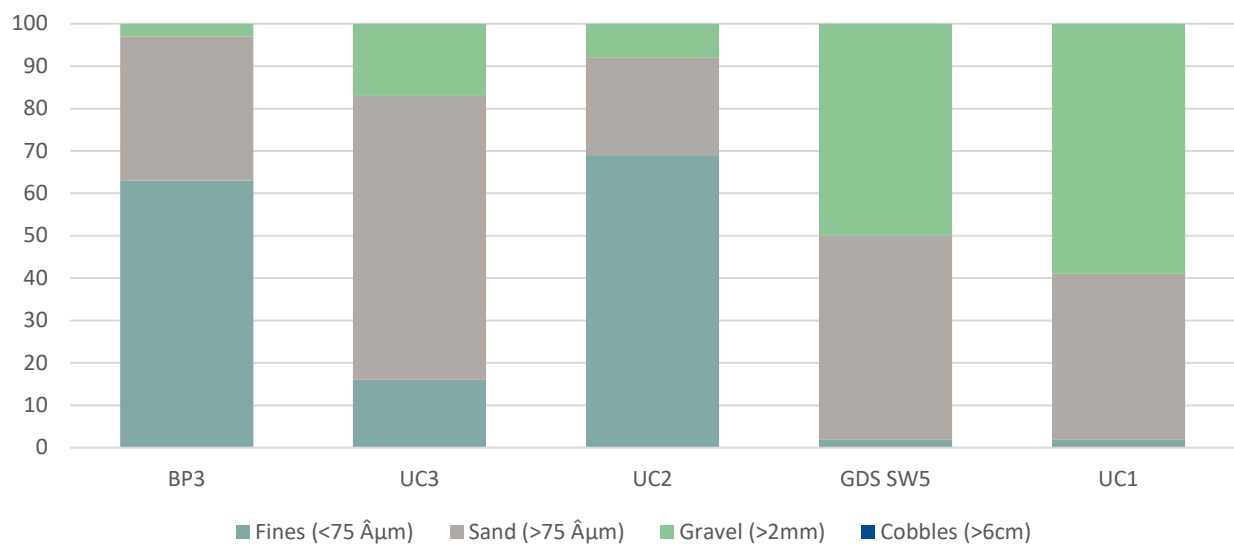


Figure 3 - Sediment particle size distribution of samples collected at Grants

Table 5 - Sediment quality results for samples collected at Grants. All results are presented in mg/kg

Analyte	LOR*	BP4	UC3	UC2	GDS SW5	UC1	DGV	GV-high
Aluminium	50	4560	8460	13900	9610	7410	-	-
Arsenic	1	<1.00	7.4	2.96	58.7	47	20	70
Cadmium	1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	10
Chromium	2	3.3	15.5	17	35.4	26.4	80	370
Copper	5	5.5	9	11.7	22.2	19.5	65	270
Iron	50	3280	15400	17800	47400	43000	-	-
Lead	5	7	14.1	13.8	20	15.3	50	220
Lithium	0.1	2.3	13.7	40	23.4	18.9	-	-
Mercury	0.01	0.02	0.02	0.02	0.02	0.02	0.15	1.00
Nickel	2	3.3	6.7	9.7	10.3	10.6	21	52
Zinc	5	7.4	20.6	25.5	34.9	53.9	200	410

5.4 Macroinvertebrates

5.4.1 Relative abundance

The relative abundance of all samples collected in 2024 are presented in Figure 4. The highest relative abundance was recorded at UC2, with more than double the number of animals in each sample compared with any other site. No visible pattern was present in the results when viewed in the context of position in the catchment relative to Grants.

Historical data collected from 2017-2024 (Figure 5) showed higher relative abundances at all sites except UC3 in 2024, yet no significant difference found between baseline years and data collected in 2024 ($p > 0.05$, Appendix C). The significantly higher relative abundance score at UC2 in 2024 was the highest result received at a site to date.

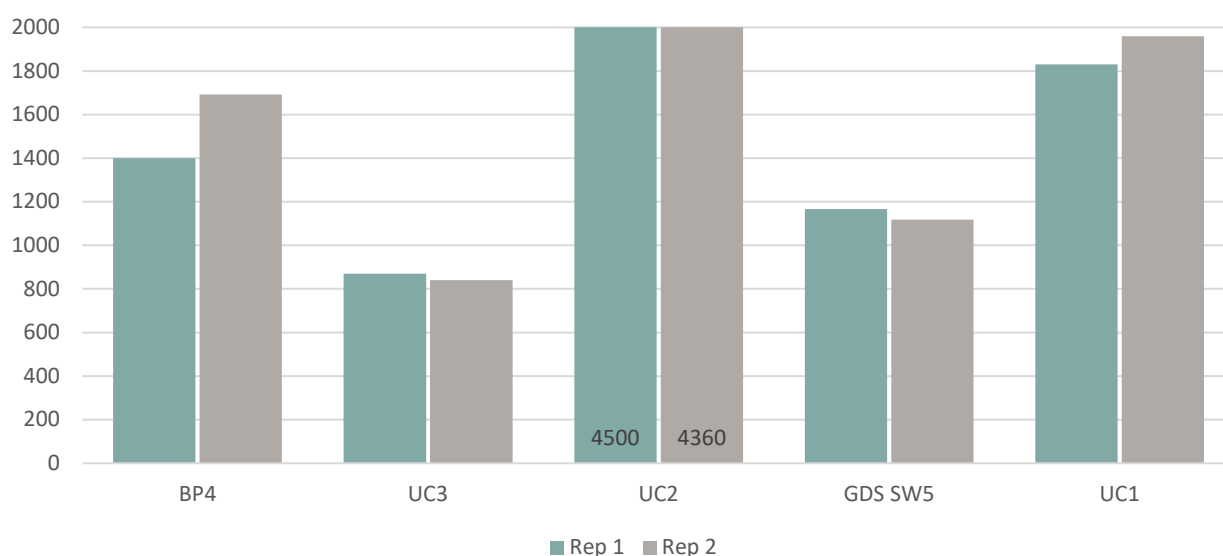


Figure 4 - Relative abundance of samples collected at Grants, May 2024

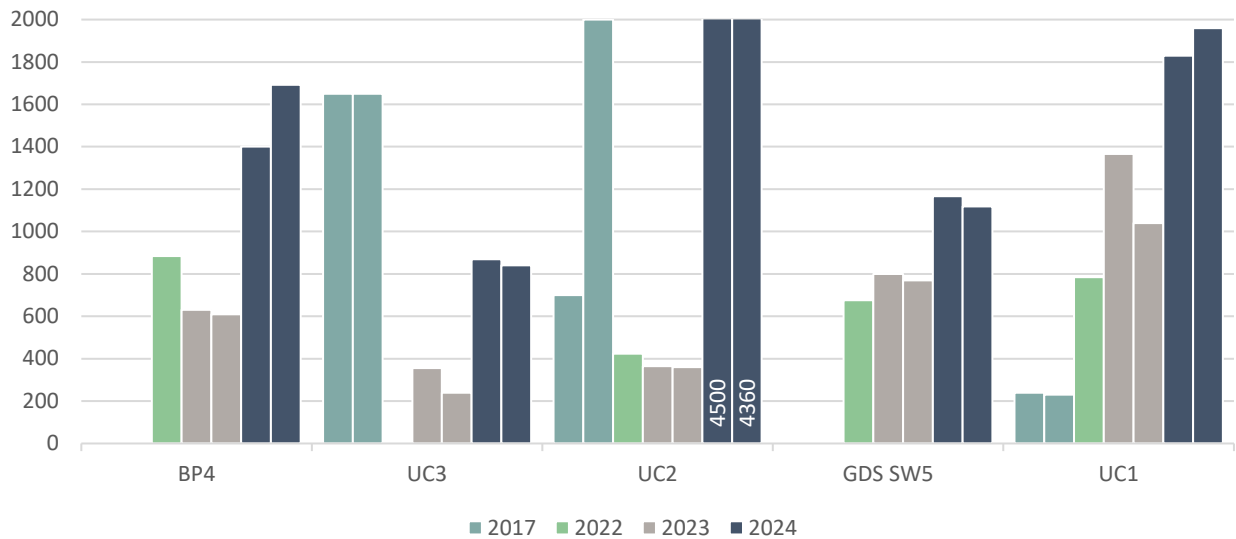


Figure 5 - Relative abundance of samples collected at Grants 2017 - 2024

5.4.2 Taxa richness

The taxa richness of samples collected in 2024 are presented in Figure 6. Macroinvertebrate diversity was lowest at the tributary site UC3, and increased with distance downstream between UC2 and GDS SW5.

Data collected from 2017-2024 is presented in Figure 7. Taxa richness results were higher at all sites in 2024 except UC1, where results were similar to 2022. More than twice the number of taxa were collected at UC2 in 2024 compared with last year. Despite some notable differences in taxa richness, there was no significant difference ($p > 0.05$) between baseline and 2024 data (Appendix C).

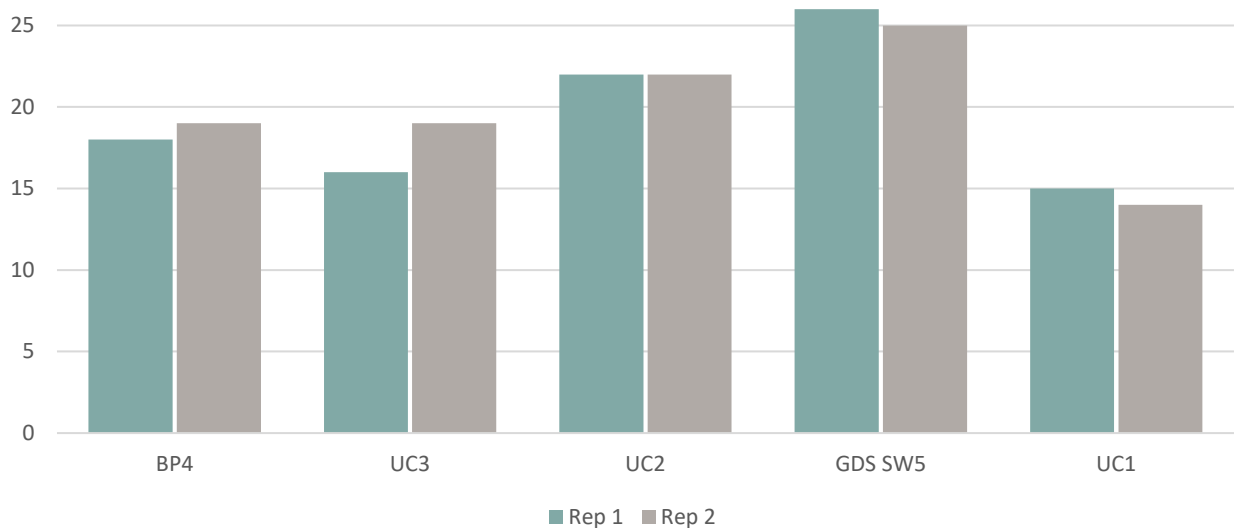


Figure 6 – Taxa richness of samples collected at Grants, May 2024

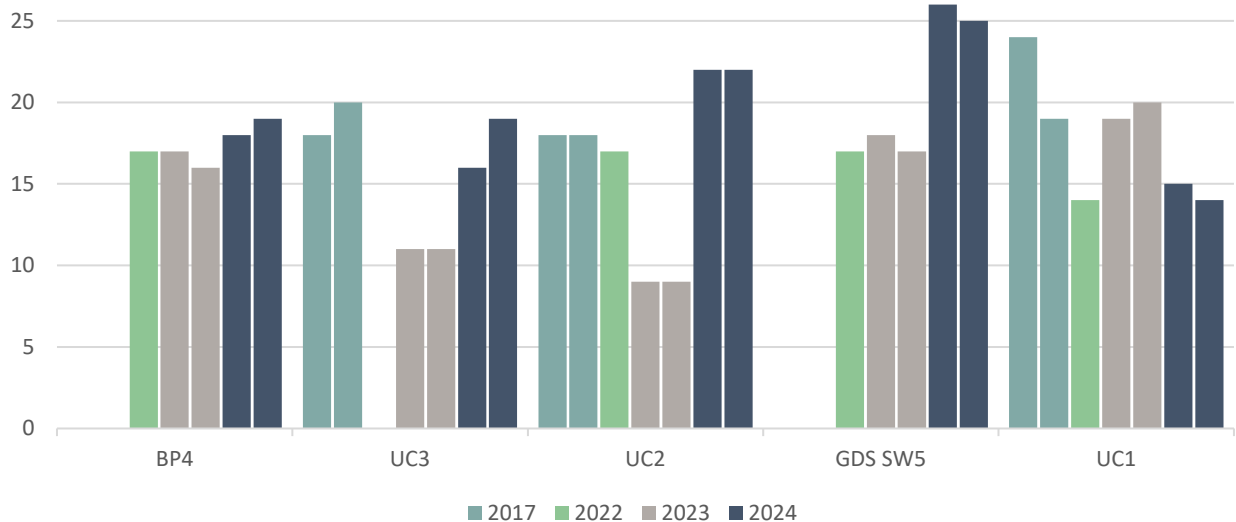


Figure 7 - Taxa richness of samples collected at Grants 2017 - 2024

5.4.3 PET richness

The PET richness of samples collected in 2024 are presented in Figure 8. As for taxa richness, there were more PET taxa found at GDS SW5 compared with other sites. the remaining sites contained similar numbers of PET taxa.

When reviewing historical results, PET richness varied between years, but were similar over time (Figure 9). Lower numbers of PET taxa were found at UC1 compared with previous years, whereas the same or higher PET richness was recorded at GDS SW5. There was a significant difference found between years ($p > 0.03885$, Table 6). Differences between time periods were mainly contributed to by high PET richness results recorded in 2024 (Figure 10).

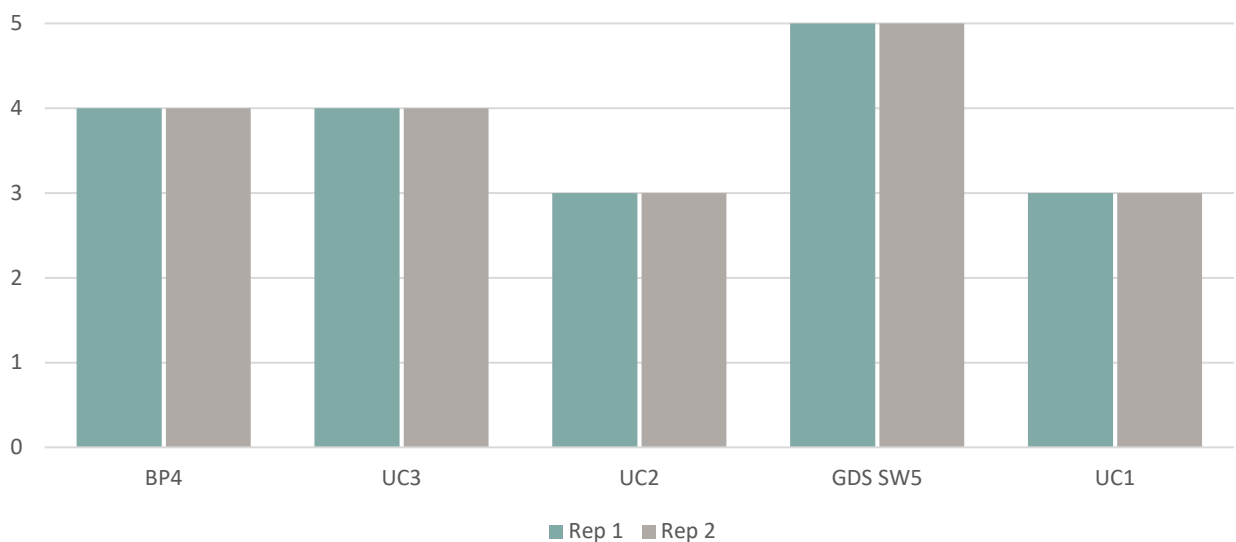


Figure 8 – PET richness of samples collected at Grants, May 2024

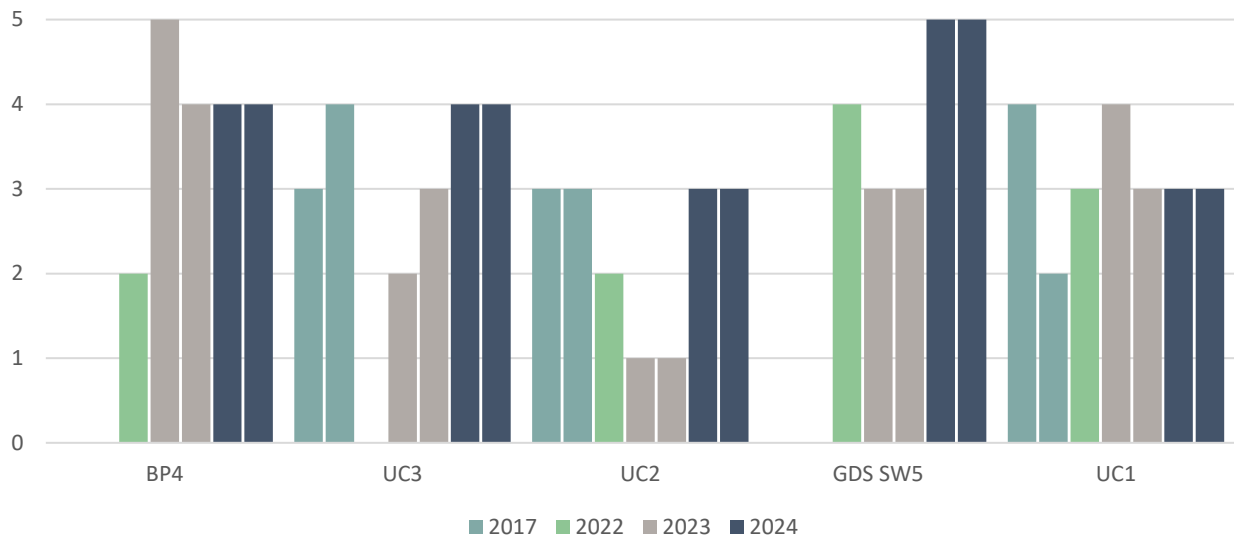


Figure 9 – PET richness of samples collected at Grants 2017 – 2024

Table 6 - Results of one-way ANOVA between baseline and 2024 data

Source	DF	Sum of Square	Mean Square	F Statistic	P-value
Groups (between groups)	1	3.2	3.2	4.9655	0.03885
Error (within groups)	18	11.6	0.6444		
Total	19	14.8	0.7789		

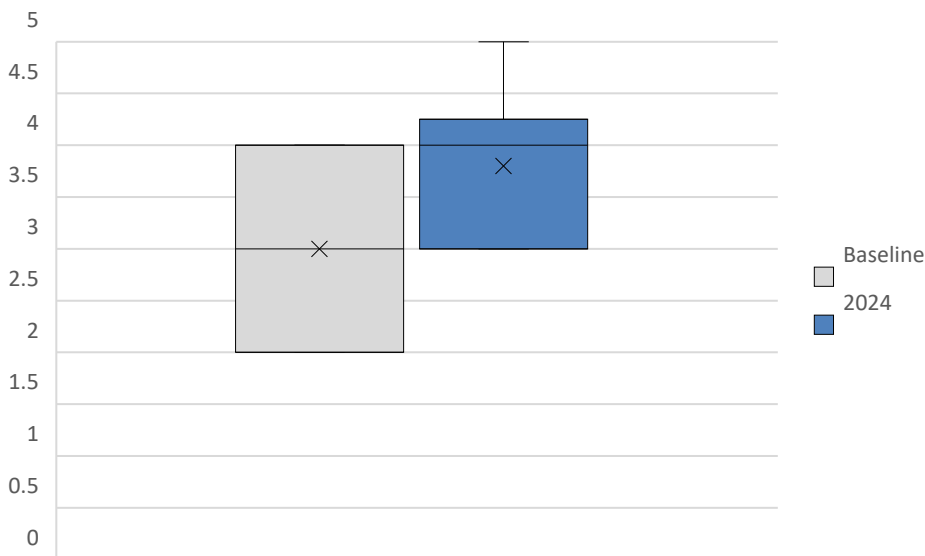


Figure 10 – Box and whisker plot demonstrating differences in PET richness between baseline and 2024

5.4.4 SIGNAL-2

SIGNAL-2 results are presented in Figure 11. Results were similar at sites in the Unnamed Creek, and higher at the reference site. When comparing historical results, similar SIGNAL-2 scores were recorded at BP4, but generally lower at all other sites. In 2024 There was no significant difference found between years ($p > 0.05$, Appendix C). SIGNAL-2 scores are indicative of a pollution tolerant community at all sites. Lower SIGNAL-2

results at all sites are related to higher taxa richness results at all sites, as the score is calculated based on an average.

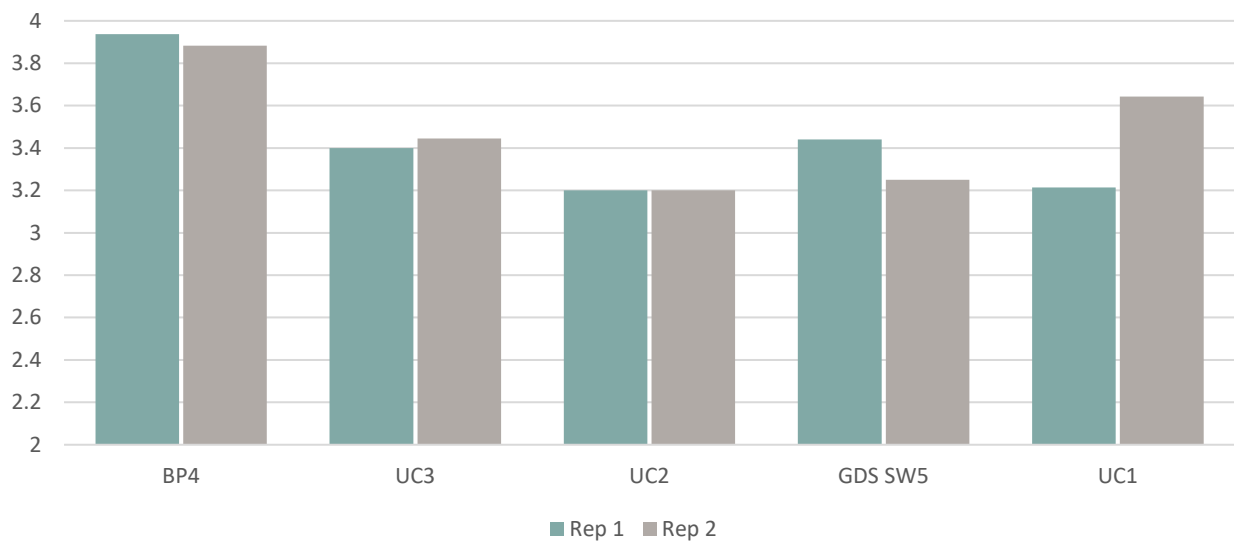


Figure 11 - SIGNAL-2 scores for samples collected at Grants, May 2024

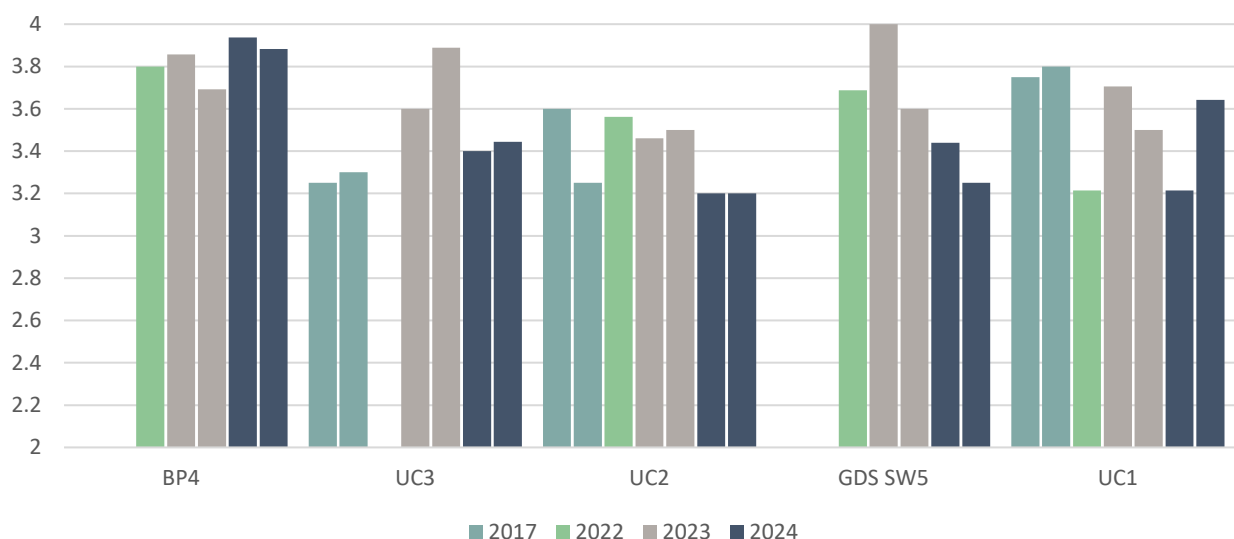


Figure 12 - SIGNAL-2 scores for samples collected at Grants, 2017 - 2024

5.4.5 Community composition

Approximately 19,746 individuals were collected across the Grants sites, comprising of 36 families from 12 orders. The proportion of each macroinvertebrate order in each sample is presented in Figure 13. Samples were dominated by True Flies (Diptera) and freshwater shrimp and prawns (Decapoda). Sites furthest downstream were dominated by similar taxa, with the lowest diversity of orders recorded at UC1. There was a clear inverse relationship in abundance of Diptera present at UC3 and UC2, and Decapoda (namely Atyidae) at UC3 and UC1.

The NMDS plot (Figure 14) demonstrates the similarity of the community at all sites, besides UC1. Samples at each site were more similar to each other, which indicated that the habitat characteristic of the site is likely contributing to community composition at each site. When comparing historical composition data

(Figure 15), there is a clear similarity between samples in a given year. Results from 2022 (baseline) and 2024 (operations) were most similar. The dissimilarity in the composition of samples at UC1 in 2024 is also evident when looking at the site in a historical context.

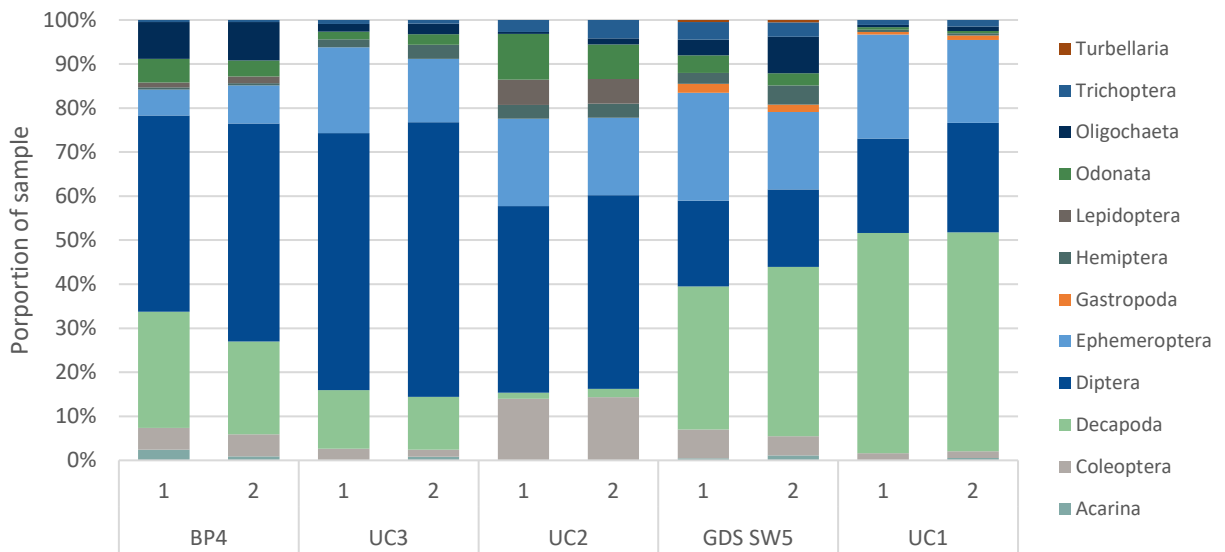


Figure 13 - Proportional abundance of macroinvertebrate orders collected in 2024



Figure 14 - NMDS plot showing variation in community composition between Grants sites

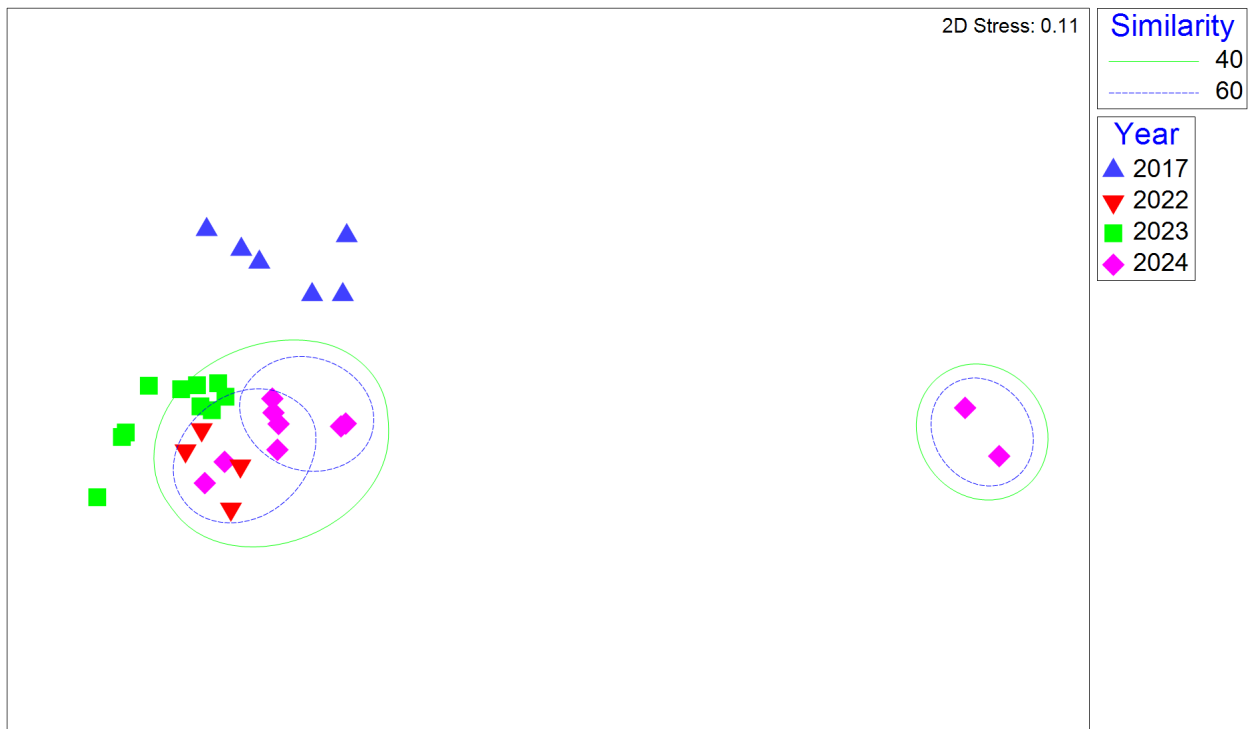


Figure 15 - NMDS plot showing variation in community composition between Grants sites 2017-2024

6. Discussion

Sediment results downstream of Grants suggest that arsenic is likely to be naturally present in sediments in the lower catchment. The two sites furthest downstream returned arsenic values above the sediment DGVs, which were detected at both sites since baseline data collection in 2022 and again in 2023 (AES 2022, AES 2023). The low concentration of arsenic at UC2, which is also downstream of Grants suggests that these results are not a result of discharges and sediment transport from the site. Water and sediment results from a tributary entering the unnamed creek downstream of UC2, did not report elevated arsenic and are therefore not expected to be contributing to the results found downstream. Arsenic results indicate a potential risk to aquatic ecosystems, should it become bioavailable. It should be noted however, that a low proportion of fine sediments were present in samples at GDS SW5 and UC1, and thus reflect a lower risk of significant concentrations of arsenic dissolving in solution. Further, pH values were above neutral, posing little risk of arsenic becoming bioavailable. There were no patterns in macroinvertebrate metrics or community composition that appeared to be associated to DGV exceedances.

In 2024, macroinvertebrate sampling results showed some impairment furthest downstream of Grants at UC1, yet other sites downstream demonstrated an improvement or similarity in health metrics from previous data. Differences in community health and composition at UC1 were not consistent with poor water or sediment quality results. Differences in the macroinvertebrate community is more likely associated with water quality changes due to tidal influence during spring tides. The changes in water quality are not considered to be ecotoxic, but are likely to be non-preferential to some macroinvertebrate families, resulting in their absence or low abundance at the site.

Historical data analysis indicates that inter-annual factors are likely to be having an impact on results across all sites. The cause of the changes cannot be directly attributed to the discharge from MWD1, as environmental factors, such as above average rainfall, and higher flow need to be considered. There were similarities in macroinvertebrate community composition between sites in each year, which further demonstrates the role that interannual climate variability has on the results of sampling.

The compliance point, GDS SW5 showed an improvement in almost all metrics in 2024 compared to previous years, which aligned with other sites in the catchment. Although there were some observable differences between years, there was no significant difference found across sites sampled in both years for the majority of macroinvertebrate metrics. The significant difference between baseline data and PET taxa richness can be attributed to higher values recorded in 2024. The increase in 2024 is directly relative to increases in taxa richness. This significant difference is not considered to be a cause for concern, as it aligns with other metrics in terms of the ecosystem's response to above average rainfall.

Macroinvertebrate and sediment sampling at Grants in 2024 was completed after an above-average wet season, and site conditions reflected those conditions. Habitat characteristics of each site appeared to influence the differences in macroinvertebrate metrics and community composition. The results of sampling in 2024 demonstrate that active discharge from Grants has had no significant impact on the aquatic ecosystems of waterways draining to Darwin Harbour.

7. Recommendations

The reference site, BP4 is located on a larger and permanently inundated stream (East Charlotte River). There has been very little difference in macroinvertebrate metrics at the site over time, which is not surprising, given the morphology and permanent water presence at the site. The smaller intermittent streams that drain to Darwin Harbour, such as the creek downstream of Grants are much more flow reactive during rainfall events, and macroinvertebrate communities are heavily influenced by inter-annual differences in rainfall. It is suggested that BP4 is not a suitable reference site for this program, and that UC3 continue as the upstream reference, due to its similarity in morphology and position in the catchment. Although there is only a single year of baseline data for the site collected in 2017, it is considered to be a more analogous site for the future understanding of changes in aquatic ecosystem health associated with climatic conditions and mine water discharge.

Site UC1 is located in an ecotone of the unnamed creek draining from Grants. The intermittent influence of the tide is likely to be altering the macroinvertebrate community, depending on flow at the time of spring tides. The site is unlikely to be a reliable monitoring point in the long-term. To continue the replication of downstream sites, it is suggested that a monitoring point should be established upstream of the confluence of the Unnamed Creek containing UC3 and Cox Peninsula Road.

It is understood there is an upstream site on the Unnamed Creek to the north-west of the site. Due to the site's location in the top headwaters of the stream, it is unlikely that there would be water available for macroinvertebrate sampling. It is recommended that sediment monitoring is completed at the site during biological and sediment monitoring to assist with understanding background sediment chemistry of the catchment.

8. References

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Appendix A. Sediment Data

Analyte	Unit	LOR	BP4	UC3	UC2	GDS SW5	UC1
pH Value	Unit	0.1	5.2	5.4	5.5	5.8	6.3
Sulfate as SO4 2-	mg/kg	10	<10	<10	<10	10	40
Chloride	mg/kg	10	30	<10	80	70	220
Calcium	mg/kg	10	<10	<10	<10	<10	<10
Magnesium	mg/kg	10	<10	<10	<10	<10	<10
Sodium	mg/kg	10	10	<10	50	40	110
Potassium	mg/kg	10	<10	<10	40	<10	<10
Aluminium	mg/kg	50	4560	8460	13900	9610	7410
Iron	mg/kg	50	3280	15400	17800	47400	43000
Arsenic	mg/kg	1	<1.00	7.4	2.96	58.7	47
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	1	3.3	15.5	17	35.4	26.4
Copper	mg/kg	1	5.5	9	11.7	22.2	19.5
Lead	mg/kg	1	7	14.1	13.8	20	15.3
Nickel	mg/kg	1	3.3	6.7	9.7	10.3	10.6
Zinc	mg/kg	1	7.4	20.6	25.5	34.9	53.9
Lithium	mg/kg	0.1	2.3	13.7	40	23.4	18.9
Mercury	mg/kg	0.01	0.02	0.02	0.02	0.02	0.02
Total Organic Carbon	%	0.02	0.7	1.14	7.2	0.11	0.23

Appendix B. Raw Macroinvertebrate Data

Order	Family/Sub-family	BP4	BP4	UC3	UC3	UC2	UC2	GDS SW5	GDS SW5	UC1	UC1
		1	2	1	2	1	2	1	2	1	2
Acarina	Acarina	33	15	0	7	0	0	6	12	0	10
Coleoptera	Dytiscidae	40	15	0	7	80	60	56	47	10	0
Coleoptera	Elmidae	0	0	0	0	0	0	6	0	0	0
Coleoptera	Hydraenidae	13	23	0	0	60	40	6	6	0	0
Coleoptera	Hydrochidae	53	54	23	13	300	220	28	12	30	30
Coleoptera	Hydrophilidae	0	8	0	0	260	360	33	29	0	0
Crustacea	Atyidae	333	338	54	67	40	60	344	400	860	940
Decapoda	Palaemonidae	27	15	62	33	0	0	11	6	40	30
Decapoda	Parathelphusidae	0	0	0	0	20	20	6	6	10	10
Diptera	Ceratopogonidae	27	8	23	13	20	40	0	0	0	0
Diptera	Chironominae	467	731	238	180	1060	1360	61	47	100	100
Diptera	Culicidae	0	0	15	7	60	20	33	24	120	100
Diptera	Orthoclaadiinae	0	0	38	27	0	0	0	0	0	0
Diptera	Tanypodinae	113	92	192	293	740	480	122	118	170	290
Ephemeroptera	Baetidae	13	31	146	80	660	580	139	100	220	170
Ephemeroptera	Caenidae	67	115	23	40	220	180	133	88	210	200
Gastropoda	Planorbidae	0	0	0	0	0	0	22	18	10	20
Hemiptera	Gerridae	0	8	0	7	20	20	0	6	0	10
Hemiptera	Hydrometridae	0	0	0	0	0	0	0	0	10	0
Hemiptera	Mesoveliidae	7	0	8	7	0	0	0	0	0	0
Hemiptera	Micronectidae	0	0	0	0	20	40	6	12	0	0
Hemiptera	Notonectidae	0	0	8	13	100	80	22	29	0	0
Isopoda	Crambidae	13	23	0	0	240	220	0	0	0	0
Notostraca	Aeshnidae	0	0	0	0	20	20	0	0	0	0
Odonata	Coenagrionidae	0	0	0	13	300	200	17	12	0	0
Odonata	Corduliidae	13	8	8	7	0	0	6	0	0	0
Odonata	Isostictidae	0	0	8	0	0	0	0	0	0	0
Odonata	Libellulidae	13	15	0	0	40	40	17	12	0	10
Odonata	Lindeniidae	0	0	0	0	0	0	6	6	10	0
Odonata	Zygoptera	47	38	0	0	100	80	0	0	0	0
Odonata	Zygoptera	47	38	0	0	100	80	0	0	0	0
Oligochaeta	Oligochaeta	113	146	15	20	20	60	39	88	10	20
Trichoptera	Calamoceratidae	7	0	0	0	0	0	0	0	0	0
Trichoptera	Ecnomidae	0	0	8	7	0	0	6	6	0	0
Trichoptera	Hydroptilidae	0	0	0	0	0	0	28	24	20	30
Trichoptera	Leptoceridae	0	8	0	0	120	180	11	6	0	0
Turbellaria	Dugesiiidae	0	0	0	0	0	0	6	6	0	0

Appendix C. ANOVA Results

Relative abundance

Source	DF	Sum of Square	Mean Square	F Statistic	P-value
Groups (between groups)	1	5622302.239	5622302.239	4.3388	0.05478
Error (within groups)	15	19437083.99	1295805.599		
Total	16	25059386.23	1566211.639		

Taxa richness

Source	DF	Sum of Square	Mean Square	F Statistic	P-value
Groups (between groups)	1	9.8	9.8	0.84	0.3715
Error (within groups)	18	210	11.6667		
Total	19	219.8	11.5684		

SIGNAL-2

Source	DF	Sum of Square	Mean Square	F Statistic	P-value
Groups (between groups)	1	0.01818	0.01818	0.2688	0.6104
Error (within groups)	18	1.2174	0.06763		
Total	19	1.2355	0.06503		

Appendix D. Macroinvertebrate QA



Macroinvertebrate Identification Quality Assurance Certificate

Site Code: BP4

Replicate: 1 of 2

Habitat: Edge

Identification Date: 10/06/2024

Identifier: T Steele

Identification Level: Family

QA Date: 22/06/2024

Senior Taxonomist: S Jones

Percentage Correct: 100%

QA Result: Pass

Taxonomy	Original Count	QA Count	Comment
Acarina	1	1	
Dytiscidae	1	1	
Hydraenidae	2	1	
Hydrochidae	4	4	
Hydrophilidae	1	1	
Atyidae	23	23	
Palaemonidae	1	1	
Ceratopogonidae	1	1	
Chironominae	49	48	
Tanypodinae	6	6	
Baetidae	2	2	
Caenidae	8	8	
Gerridae	1	1	
Crambidae	2	2	
Corduliidae	1	1	
Libellulidae	1	1	
Zygoptera	3	3	
Oligochaeta	10	10	
Leptoceridae	1	1	



Good science at a fair price

ATTACHMENT F

Riparian Vegetation Monitoring Report



Riparian Vegetation Assessment Report 2024 Lithium Developments (Grants NT) Pty Ltd



DOCUMENT CONTROL RECORD

Job	EZ24084
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1 INTRODUCTION

Lithium Developments (Grants NT) Pty Ltd (LDGNT) operate the Grants Lithium Project (GLP) located on Cox Peninsula Road approximately 90 km southwest of Darwin by road (Figure 1-1). LDGNT was granted Waste Discharge Licence (WDL248) which permits the controlled discharge of mine wastewater from Mine Water Dam 1 into an unnamed watercourse which flows north of the GLP, ultimately discharging to the West Arm of Darwin Harbour. Schedule 10 of WDL248 requires LDGNT to undertake a monitoring program in accordance with licence conditions, which (as per Appendix 5 of the WDL) includes annual monitoring of vegetation downstream of ML31726 to determine if mining activities are impacting riparian vegetation communities.

EcOz Environmental Consultants Pty Ltd (EcOz) developed the WDL248 Monitoring Program (attached as Appendix A), which outlines the monitoring required and methodology relating to riparian vegetation, to comply with WDL248 Conditions. Specifically, riparian vegetation monitoring is to be undertaken once annually at the end of each wet season, at three survey sites. These results are compared against baseline data and previous annual surveys to determine if there are changes to riparian vegetation over time.

The methods and findings of the May 2024 post-wet season riparian vegetation survey are presented in this document, along with a comparison of the findings with surveys conducted in 2019 (baseline) and 2023.

1.1 Background

Riparian communities are essential for maintaining healthy ecosystems and economic productivity along rivers (DENR 2019). When maintaining a riparian vegetation system, it is vital to retain a diverse vegetation cover to assist in maintaining the functions that a riparian vegetation community provides i.e. supporting aquatic habitats, shading the river and regulating the temperature, bank stabilisation, filtering of sediments and improving water quality by reducing contaminants (Dixon & Douglas 2015).

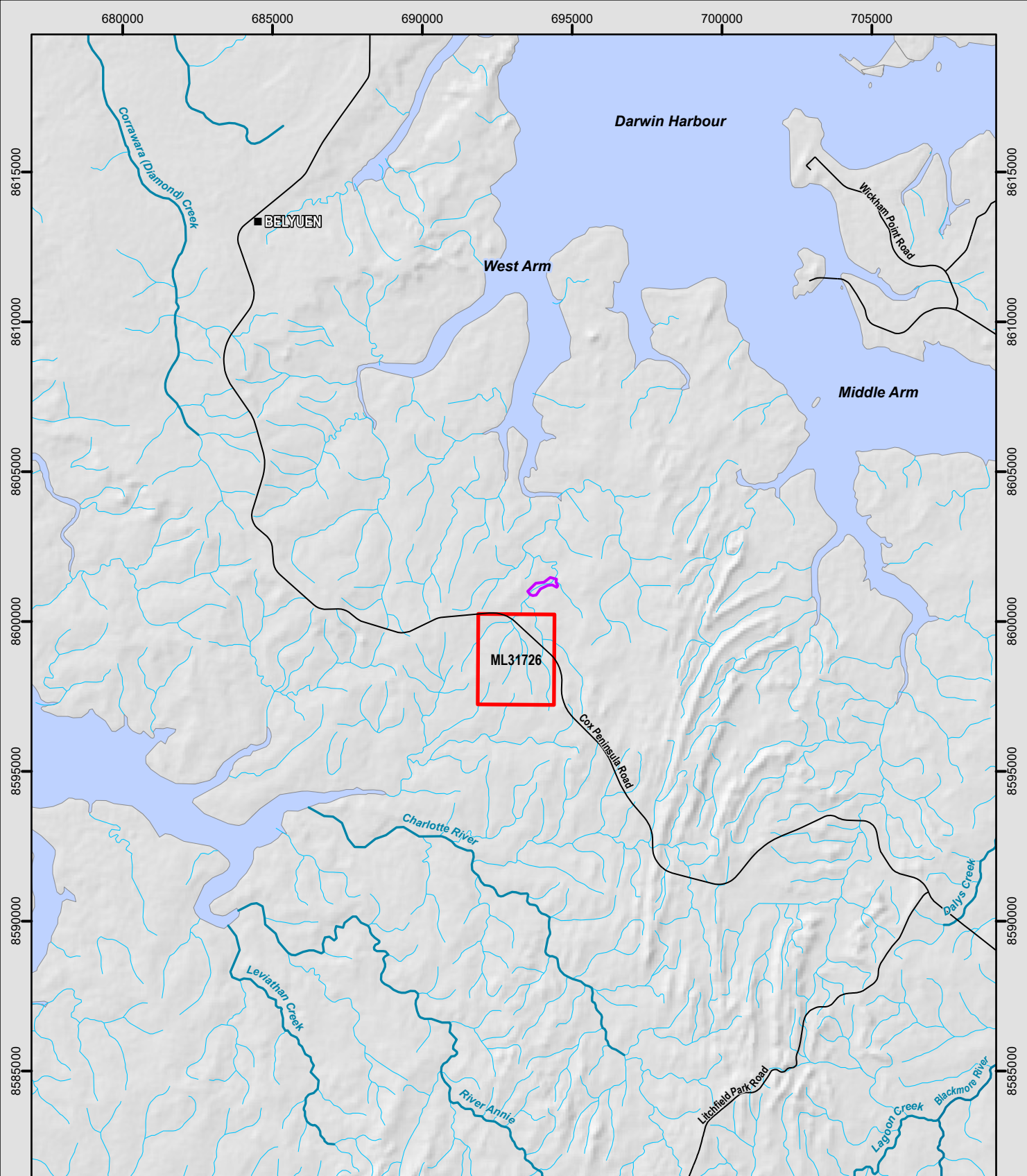
Monitoring changes in riparian vegetation over time (i.e. vegetation structure, species composition, or extent of vegetation) can be an indicator of a change in water quality. Riparian vegetation monitoring is one of the multiple lines of evidence within the monitoring program, which also includes water and sediment quality monitoring, macroinvertebrate sampling and seagrass monitoring in Darwin Harbour.

A baseline survey was undertaken in 2019 which presents a reference condition against which the 2023 and the recent 2024 monitoring data can be compared (EcOz 2019). It should be noted the baseline drone survey was undertaken towards the end of the annual wet-season, and the vegetation site assessment was undertaken in early June 2019. Monitoring undertaken as part of the WDL248 Monitoring Program will be undertaken at the end of each wet season (April/May each year) for consistency and to assist with comparison between years.

1.2 Discharge volumes and dates

The total volume of mine wastewater discharged over the 2023/2024 wet season was 374.1 ML. The discharge occurred over two discrete time periods:

- 234.7 ML between 29 January and 28 February 2024, and
- 139.4 ML between 7 March and 16 March 2024.



- Topographic data**
- Town
 - Road
 - River/Creek
 - Minor Drainage
 - ▭ Riparian vegetation study area
 - ▭ ML31726
 - Streams



0 1.25 2.5 5
Kilometres



MAP INFORMATION

Scale: 1:175,000 @ A4
Projection: GDA 1994 MGA Zone 52
Date Saved: 15/07/2024
Client: Core Lithium
Mapper: david.carroll

DATA SOURCE

Topographic data: OSM, GA
Project data: EcOz
Imagery: NTLIS

Figure 1-1. Location map including riparian vegetation study area

2 METHODS

The post wet-season riparian vegetation assessments and drone survey was undertaken by experienced botanist Nicole Clark on 2 May 2024. Monitoring was undertaken in accordance with the methods detailed in the WDL248 Monitoring Program (see Appendix A). There were two components: a drone survey and riparian vegetation site assessment survey (which included photo-point monitoring).

The drone survey was undertaken along a predefined flight path to map riparian vegetation extent and density, and detect any changes in riparian vegetation condition since the baseline survey in 2019 and riparian monitoring in 2023 and 2024. The drone survey was designed to capture the three different riparian vegetation communities surveyed in the previous study (EcOz 2019) – mangrove, riparian, and swamp.

Drone images were imported to create an orthomosaic image, and analysis was undertaken to assess vegetation extent and density (health) over time. The intent of analysing drone data overtime is to determine if there is a reduction in riparian vegetation biomass (ha). If there is a 'retraction' of mapped riparian vegetation i.e. 10% or greater loss of vegetation biomass, further on-ground assessments need to be undertaken. A 'stable' overall status indicates there is no greater than 10% loss of the vegetation biomass, comparable to baseline mapping. An 'increase' in the overall status indicates 10% or greater vegetation biomass, compared to baseline mapping.

Riparian vegetation site assessments (on-ground) were undertaken at three established potential impact sites (MVS1, RVS2, SVS3 – see Figure 3-1) to record riparian vegetation species diversity and composition. Vegetation and photo monitoring data was compiled into a database that can be added to over time as monitoring data is collected annually. The vegetation data was analysed by comparing 2019 baseline data with the 2023 and 2024 survey results, by assessing if there were any changes in vegetation health i.e. no tree mortality, or physical changes to health of plants through the use of on-ground assessment and photo monitoring points (See Appendix B).

3 RESULTS

3.1 Drone survey

Vegetation maps were created to record boundary locations of the three different riparian vegetation communities. The climatic conditions were suitable for flying on the day, with minimal wind and cloud cover. The vegetation type map is presented in Figure 3-1.

There were relatively minor changes to the area size (ha) and extent of each riparian vegetation patch size compared to the 2019 baseline survey (Table 3-1). There was an overall increase of 1.43 ha of riparian vegetation compared to 2019. This may be attributed to the below average wet season in 2018/2019 and an above average wet season 2023. Additionally, the current 2024 rainfall data is above average with some large rainfall events occurring from January - March (i.e. a total of 1286 mm rainfall in January, total of 562 mm in February, and a total of 574 mm in March) prior to the 2024 survey which may have resulted in an overall increase in riparian vegetation.

The largest increase, of 1.22 ha, was observed in the mangrove riparian vegetation community. The riparian vegetation community and swamp riparian vegetation remained stable (Table 3-1).

Table 3-1. Area size (ha) of each vegetation type and overall status

Vegetation community	Area (ha) 2019 survey	Area (ha) 2023 survey	Area (ha) 2024 survey	Difference between 2024 survey and baseline	Overall status
Mangrove	5.18	6.40	6.28	1.10 ha	Increase
Riparian	0.76	1.10	1.01	0.25 ha	Stable
Swamp	1.50	1.25	1.58	0.08 ha	Stable
Total	7.44	8.75	8.87	1.43 ha	Increase

3.2 Riparian vegetation site assessment

Three established monitoring sites (MVS1, RVS2, SVS3) were assessed during field investigations. A summary of each riparian site assessment is provided below in Table 3-2

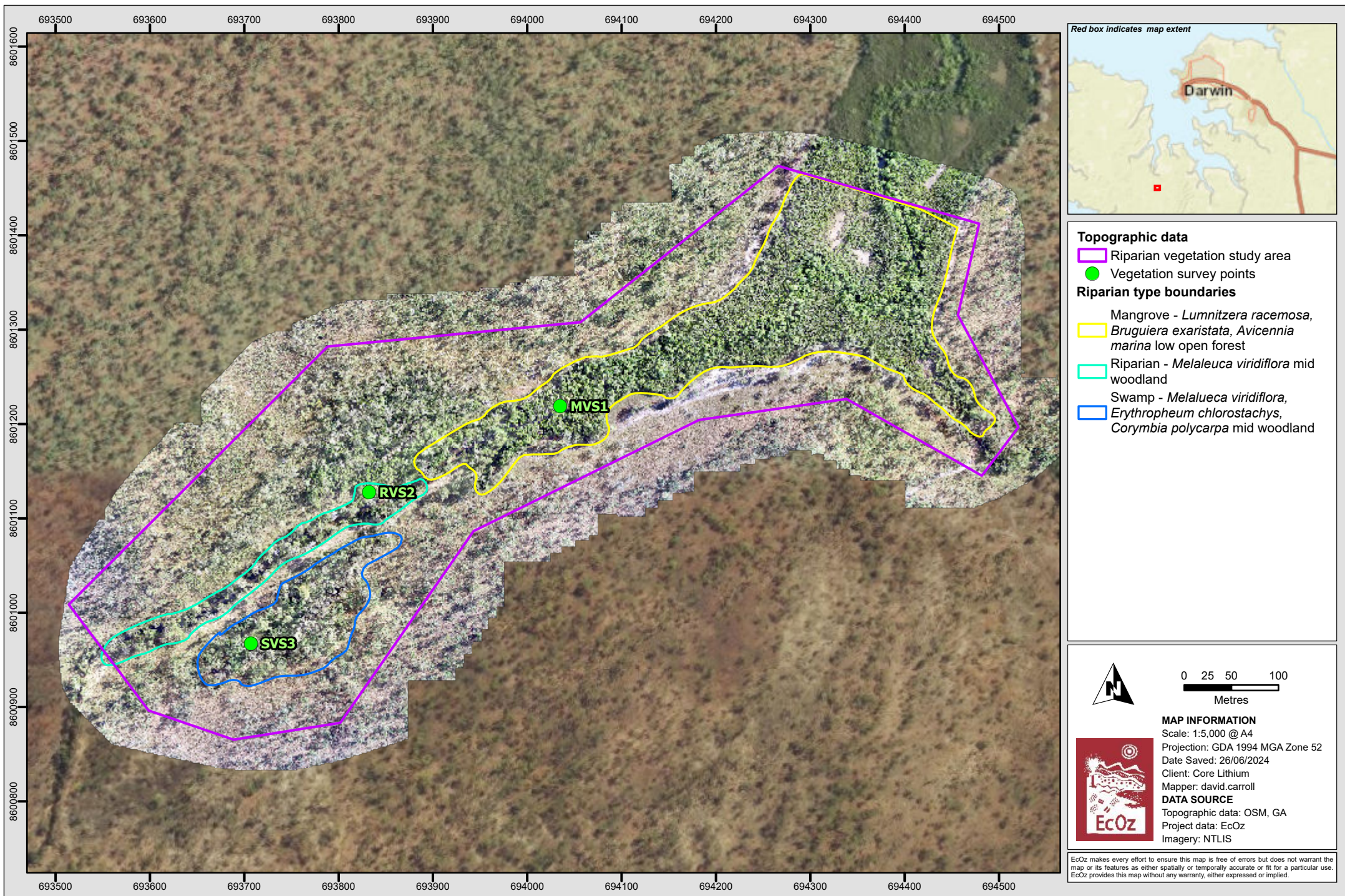
The vegetation map showing riparian vegetation assessment sites is presented in Figure 3-1, and a table showing the results of field data collected at each survey site is present in Table 3-2. Overall, the vegetation composition and structure at all monitoring sites was mostly consistent compared to 2019 and 2023 results. There were a few minor changes noted (see Table 3-2).

No major weed populations or fire impacts were observed. Similar disturbance results were recorded within the landward swamp riparian community, compared to the baseline survey in 2019. All the same weed species recorded within the swamp community in the 2019 baseline survey and the 2023 survey, were also recorded as part of the 2024 survey, these included:

- Hyptis (*Hyptis suaveolens*), declared under the NT *Weeds Management Act 2001* - Class B (spread to be controlled).
- Environmental weeds (not declared) Annual mission grass (*Cenchrus pedicellatus*) and Stinking passionfruit (*Passiflora foetida*).

Table 3-2. Summary of riparian vegetation site assessment descriptions

Survey site	Vegetation Description	Vegetation type	Comparison to baseline survey (EcOz 2019)
MVS1	The upper stratum comprised of <i>Lumnitzera racemosa</i> and <i>Avicennia marina</i> mid open forest with a sub-stratum of <i>Bruguiera exaristata</i>, with isolated <i>Excoecaria ovalis</i> and occasional <i>Ceriops tagal</i>. Height ranging from 1 – 3 m tall. The ground stratum comprised of sparse tussock grasslands, dominated by <i>Cyperus sp.</i>, and <i>Xerochloa imberbis</i> and <i>Acrostichum speciosum</i> (restricted to the creek bank only).	Mangrove	Minor variation in species composition. One additional mid-stratum species (<i>Ceriops tagal</i>) was recorded in 2024, and two additional ground stratum sp (<i>Cyperus sp.</i> and <i>Acrostichum speciosum</i>) was recorded in 2024. Structurally, the vegetation was consistent.
RVS2	The upper stratum comprised of <i>Melaleuca viridiflora</i> mid woodland with a sub-stratum (mid shrubland) of <i>Acacia plectocarpa</i>, <i>Lumnitzera racemosa</i>, <i>Avicennia marina</i> and occasional <i>Hibiscus tiliaceus</i> (restricted to creek bank). The ground stratum comprised of sparse tussock grasslands, dominated by <i>Germainia grandiflora</i>, <i>Sorghum intrans</i> and <i>Eriachne trisetata</i>. Mangrove fern (<i>Acrostichum speciosum</i>) was also present, however restricted to the edge of the creek channel.	Riparian	Some variation in species composition. One additional mid-stratum species (<i>Hibiscus tiliaceus</i>) was recorded in 2024, and three additional ground stratum species (<i>Acrostichum speciosum</i>, <i>Sorghum intrans</i> and <i>Eriachne trisetata</i>). No <i>Dapsilanthus spathaceus</i> was recorded in the 2024 survey, compared to 2019. Structurally, the vegetation was consistent.
SVS3	The upper stratum comprised of <i>Melaleuca viridiflora</i>, <i>Erythrophleum chlorostachys</i> and <i>Corymbia polycarpa</i> mid woodland with a sub-stratum of <i>Lophostemon lactifluus</i>, <i>Clerodendrum floribundum</i> and <i>Erythrophleum chlorostachys</i>. The ground stratum comprised of mid tussock grasslands, dominated by <i>Sorghum intrans</i>, <i>Eriachne trisetata</i> and <i>Pandanus spiralis</i>.	Swamp	Minor variation in species composition. <i>Denhamia obscura</i> was replaced with <i>Erythrophleum chlorostachys</i> as one of the dominant mid-stratum plants present in the 2024 survey. The mid-stratum plant (<i>Denhamia obscura</i>) continues to persist within the midstory. <i>Eriachne trisetata</i> was an additional ground cover species recorded in the 2024 survey. No <i>Aristida sp.</i> was recorded in the 2024 survey, compared to 2019.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ24084 - Grants - Post wet-season Riparian Veg 2024\1. Project Files\2. Report Maps\EZ24084 - Post wet season riparian monitoring\EZ24084 - Post wet season riparian monitoring.aprx

Figure 3-1. Map of riparian vegetation boundaries and assessment sites

4 CONCLUSION

This report provides a summary of the 2024 riparian vegetation survey results, compared to the baseline collected in 2019 and post-wet season survey results from 2023.

Mine wastewater was discharged over the 2023/2024 wet season. The drone survey results indicate an overall increase in riparian vegetation of 1.43 ha, compared to the 2019 survey. The majority of the increase was represented in the mangrove riparian vegetation community. The swamp and riparian vegetation communities were in a stable condition, with no significant change in the extent of the vegetation communities identified in the 2024 drone survey.

Overall, there was negligible difference in riparian vegetation (0.12 ha increase) between the 2023 survey results compared to the 2024 survey.

Based on the riparian vegetation site assessment, some minor vegetation composition changes were noted – mostly occurring in the mid-strum and ground stratum. The slight variations in the ground stratum could be attributed to the timing of monitoring (i.e. seasonal variations). Baseline monitoring was not undertaken until the middle of the dry season, compared to the end of the wet season/early dry season in 2024.

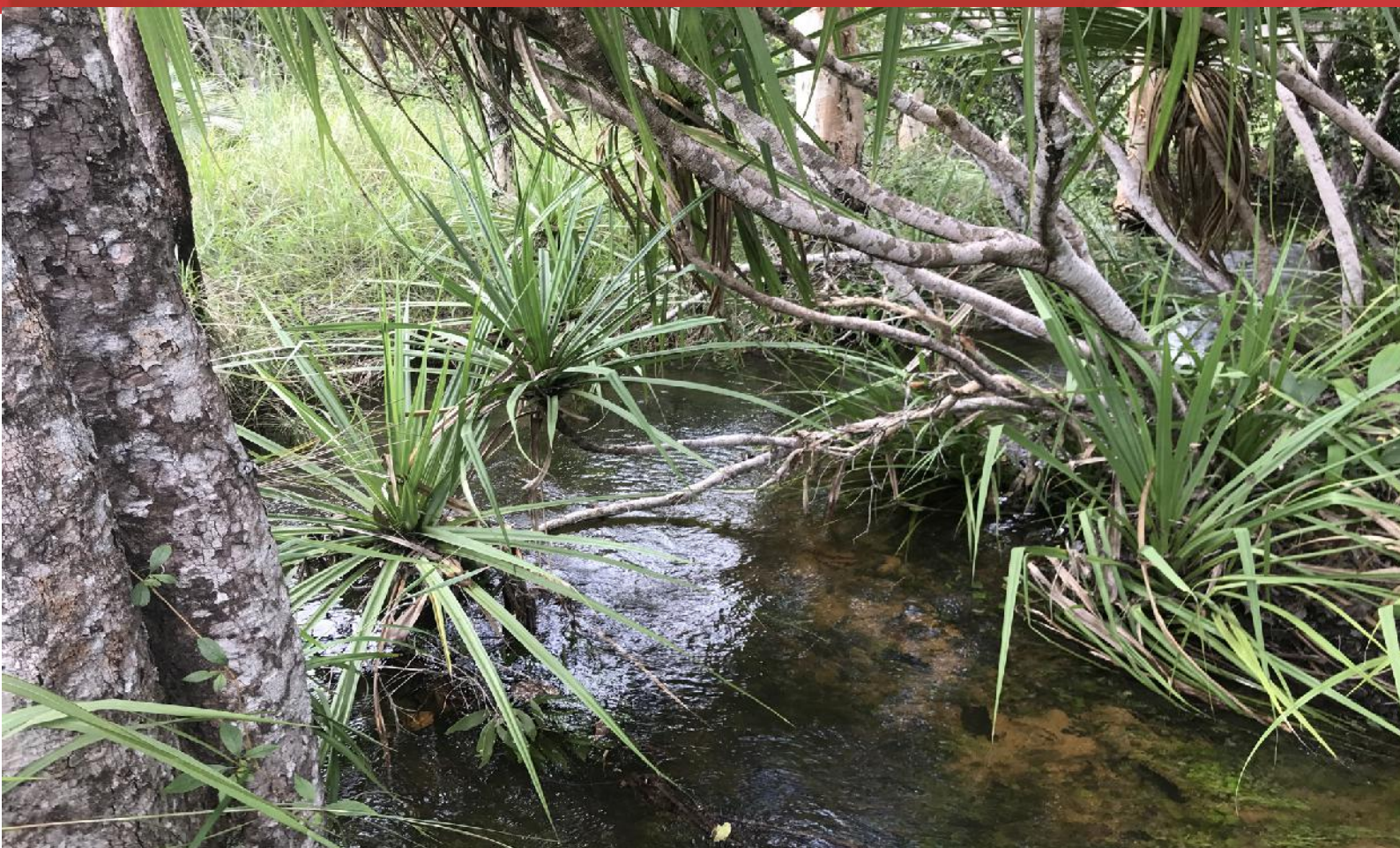
Overall, the riparian vegetation monitoring undertaken in 2024 did not identify any significant changes in the extent or species composition of riparian vegetation communities downstream of GLP that could be attributed to discharge of mine wastewater.

The next round of riparian vegetation monitoring is scheduled to be undertaken at the end of the wet season in 2025 (nominally April/May). It is recommended to establish a downstream reference site as part of the next monitoring event to analyse data at the established monitoring sites (potential impact sites), compared to a control site.

APPENDIX A WDL248-01 MONITORING PROGRAM



Waste Discharge Licence 248 Monitoring Program Lithium Developments Grants Northern Territory



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Appendices

Attachment A –Waste Discharge Licence 248 for Lithium Developments Grants Northern Territory

Attachment B –Procedure for Surface Water Sampling

Attachment C – Field Sheets from the Darwin-Daly AUSRIVAS Manual

1 INTRODUCTION

Waste Discharge Licence (WDL) 248 was granted to Lithium Developments Grants Northern Territory (LDGNT) on 25 July 2022. WDL 248 authorises discharge of mine wastewater from the Grants Lithium Project (GLP) site. Controlled discharge will occur from Water Dam 1 (MWD1), via authorised discharge point 1 (DP1), into an unnamed watercourse which ultimately discharges into West Arm, Darwin Harbour. The WDL is provided as Attachment A of this document.

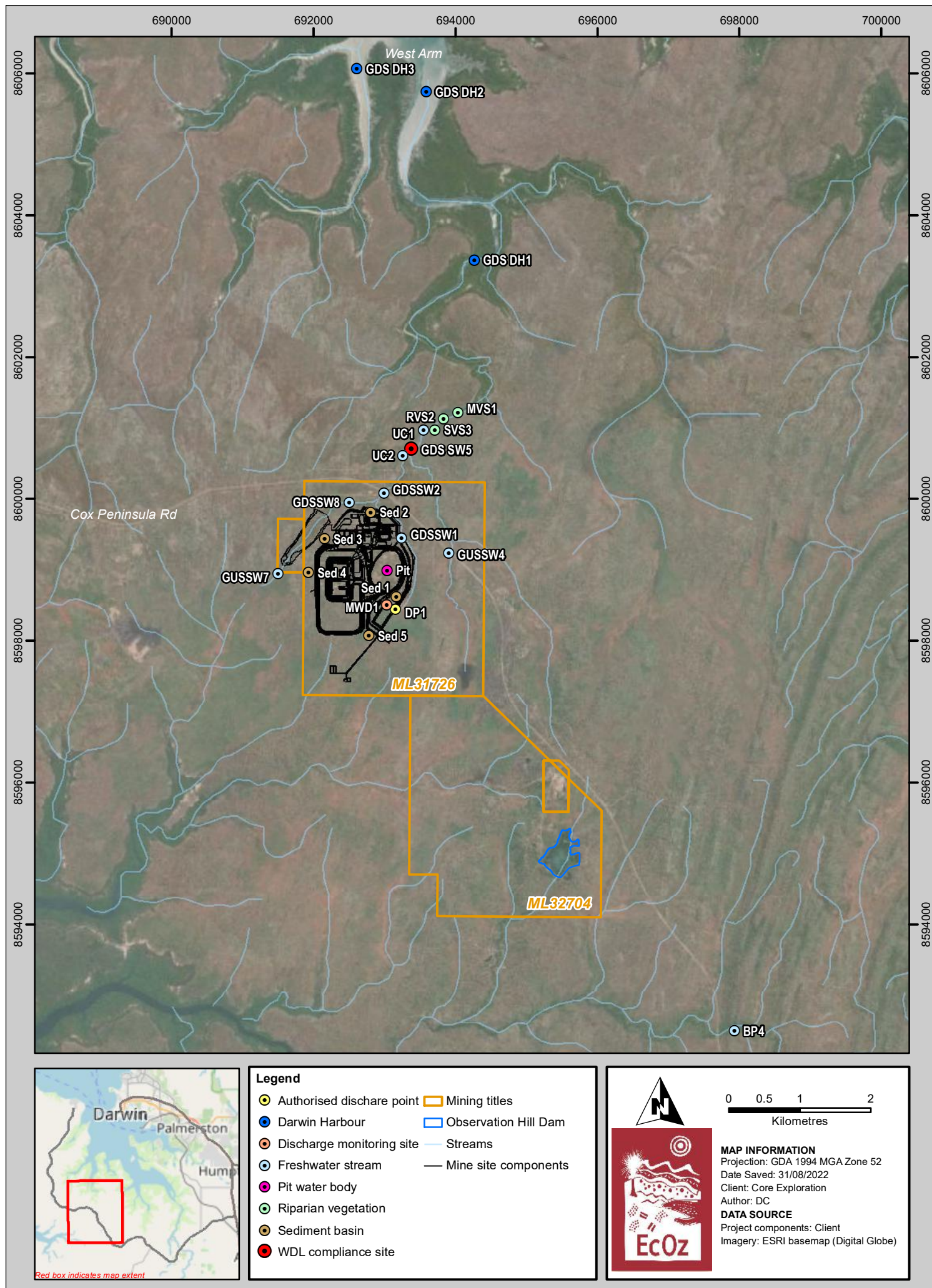
Condition 30 of WDL 248 requires implementation of the monitoring program, detailed in Appendices 3 to 5 of the WDL. Monitoring is required to be undertaken for surface water quality, fluvial sediment quality, and biota in watercourses downstream of GLP and in the West Arm of Darwin Harbour. A summary of all WDL monitoring sites, and type of monitoring that is to be undertaken at each site, is provided in Table 1-1. The locations of monitoring sites are shown on Figure 1-1.

This document details the monitoring that will be undertaken by LDGNT to satisfy the requirements of WDL 248. The monitoring program identifies monitoring locations, describes sampling methodology where appropriate, and references supporting documents which form part of LDGNT's overall Environmental Management System.

Table 1-1. Summary of all monitoring to be undertaken for WDL 248

Category	Sample Site	Easting	Northing	Surface water quality ¹	Sediment quality	Macroinvertebrate	Riparian Vegetation	Seagrass
Freshwater stream	GDS SW1	693239	8599446	Daily, weekly, monthly	Annually	-	-	-
	GDS SW2	692989	8600073	Daily, weekly, monthly	Annually	-	-	-
	GUS SW4	693903	8599235	Daily, weekly, monthly	Annually	-	-	-
	GUS SW7	691498	8598943	Daily, weekly, monthly	Annually	-	-	-
	GDS SW8	692498	8599951	Daily, weekly, monthly	Annually	-	-	-
WDL compliance site	GDS SW5	693374	8600709	Daily, weekly, monthly	Annually	Annually	-	-
Sediment basins	Sed1	693167	8598623	Weekly, monthly	-	-	-	-
	Sed2	692657	8599847	Weekly, monthly	-	-	-	-
	Sed3	692155	8599446	Weekly, monthly	-	-	-	-
	Sed4	691928	8598961	Weekly, monthly	-	-	-	-
	Sed5	692775	8598072	Weekly, monthly	-	-	-	-
WDL discharge point	MWD1	693030	8598504	Prior to discharge, daily, weekly, monthly	Annually	-	-	-
Pit water body	PIT	693037	8598990	Monthly	-	-	-	-
Darwin Harbour	GDS DH1	694262	8603365	Monthly	Annually	Annually	-	Annually
	GDS DH2	693587	8605738	Monthly	Annually	Annually	-	Annually
	GDS DH3	692608	8606060	Monthly	Annually	Annually	-	Annually
Freshwater stream	UC1	693544	8600969	Annually	Annually	Annually	-	-
	UC2	693255	8600608	Annually	Annually	Annually	-	-
	BP4	697926	8592497	Annually	Annually	Annually	-	-
Riparian vegetation	MVS1	694035	8601220	-	-	-	Annually	-
	RVS2	693834	8601132	-	-	-	Annually	-
	SVS3	693706	8600969	-	-	-	Annually	-

¹ Frequency of surface water quality monitoring depends on discharge; refer to Table 2-1 for detail. Freshwater sites will only be sampled when the watercourse is flowing, and Darwin Harbour sites will only be sampled for surface water quality during the wet season months. Refer to Table 2-1 Attachment A for the detailed surface water quality monitoring schedule.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21190 - Grants Waste Discharge Licence - Core Lithium\01 Project Files\Report maps\All monitoring locations.mxd

Figure 1-1. All Grants WDL Monitoring Sites

2 SURFACE WATER QUALITY

2.1 Freshwater

Surface water quality sampling will be undertaken in accordance with Appendix 3 of WDL 248 (see Attachment A). This includes regular monitoring of surface water sites upstream and downstream of the discharge point during discharge, weekly monitoring of sediment basins during discharge, and monthly monitoring of the pit water. Discharge monitoring will be undertaken at MWD1, close to DP1, the licenced discharge point, prior to discharge, and daily and weekly during discharge. The compliance point for the WDL is GDS SW5, and frequent monitoring will be undertaken during discharge. Details of water quality monitoring methodology and monitoring locations are provided in the Water Management Plan for the GLP. Locations of surface water monitoring sites which will be sampled in accordance with WDL 248 are shown on Figure 2-1. A summary of sites, analytes and monitoring frequency are provided in Table 2-1.

Table 2-1. Surface water monitoring program for WDL (freshwater sites)

Site	Description	Analytes	Frequency
GUS SW4, GUS SW7	Freshwater streams – upstream or reference	Field parameters: Flow, water level, pH, electrical conductivity, temperature, ORP, dissolved oxygen, turbidity.	During discharge²: Daily field measurements Weekly laboratory parameters
GDS SW1, GDS SW2	Freshwater stream – downstream of mine site	Nutrients: Total nitrogen, nitrate, oxides of nitrogen, ammonia, total phosphorus, filterable reactive phosphorus.	When not discharging: Weekly field measurements Monthly laboratory parameters
GDS SW5	Compliance point	Metals and metalloids: Total and dissolved Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn *Full elemental scan once per year	As above, and continuous flow and water level monitoring
MWD1	Discharge point	Other: SO ₄ , Ca, Cl, Na, K, Mg, CO ₃ ²⁻ , HCO ₃ , total dissolved solids, total suspended solids.	Continuous flow During discharge: Prior to discharge (all analytes) Daily field measurements Weekly laboratory parameters When not discharging: Weekly field measurements Monthly laboratory parameters
Sed 1, Sed 2, Sed 3, Sed 4, Sed 5	Sediment basins		During discharge: Weekly (all analytes) When not discharging: Monthly (all analytes) – wet season only Note flow and level are N/A
Pit	Mine site pit (discharge source water)		Monthly (all analytes) Note flow and level are N/A

² For all monitoring during discharge, the first monitoring event must occur within 24 hours of discharge commencing.

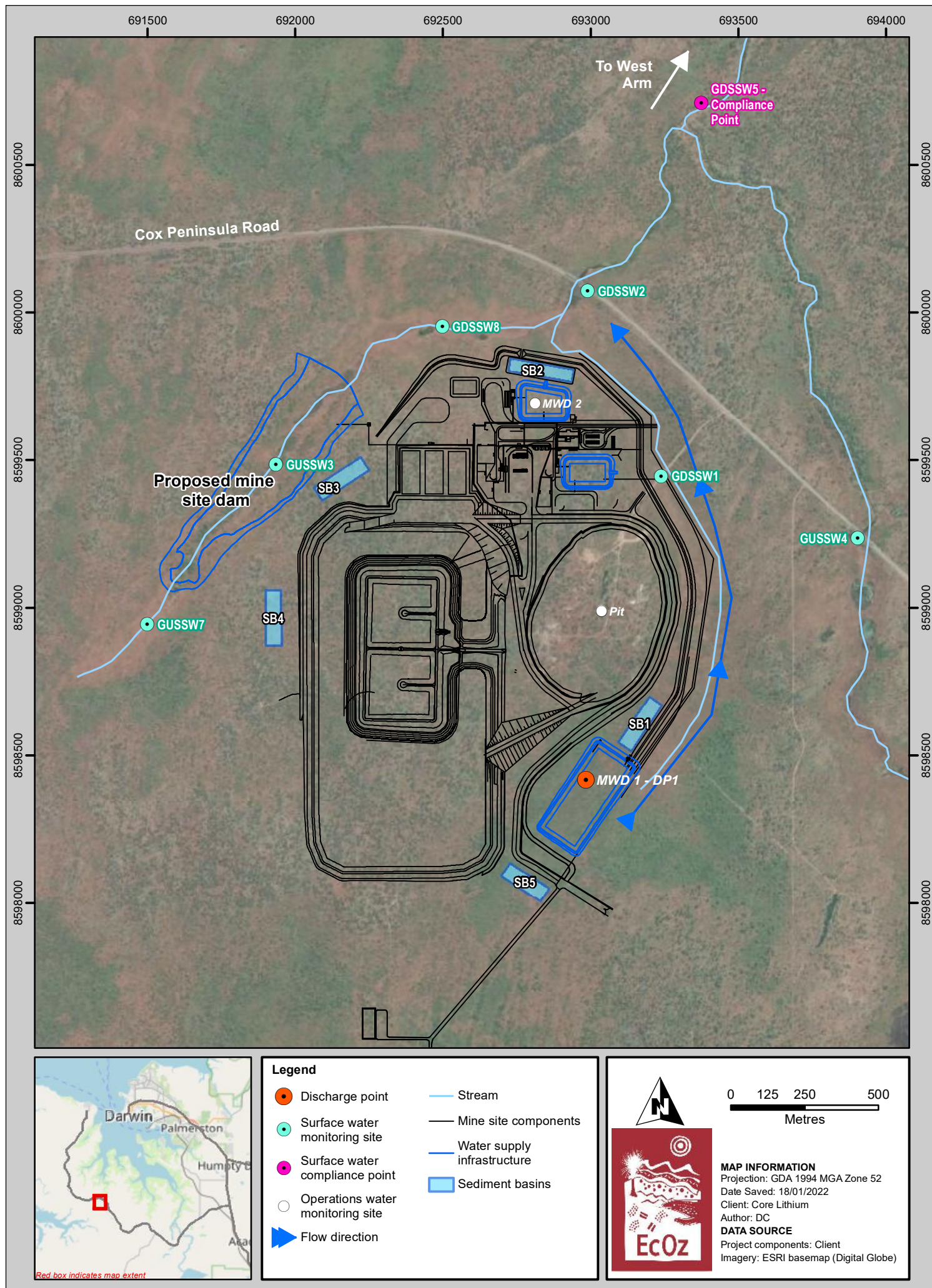


Figure 2-1. Map of surface water sites (freshwater) to be monitored for WDL248

2.2 Marine Water

Appendix 3 of WDL 248 requires monthly monitoring of GDS DH1, located within Darwin Harbour, to be undertaken during the wet season. Two additional sites will also be sampled to provide context for comparison of data from GDS DH1 and provide water quality data for areas of Darwin Harbour downstream of the discharge point to identify any potential impacts from mine site discharges. Details of the monitoring to be undertaken in Darwin Harbour is provided in Table 2-2, and locations are shown on Figure 1-1.

Table 2-2. Darwin Harbour Monitoring Program

Monitoring Location	Description	Analytes	Frequency
GDS DH1	Marine monitoring site, ~4km downstream of WDL compliance point (GDS SW5).	Field parameters: Temperature, pH, electrical conductivity, salinity, ORP, dissolved oxygen, turbidity.	Monthly during the wet season
GDS DH2	Marine monitoring site, ~8 km downstream of compliance point, near confluence of branch of western arm of West Arm.	Nutrients: Ultra-trace in saline waters Total nitrogen, nitrate, oxides of nitrogen, ammonia, total phosphorus, filterable reactive phosphorus.	Plus a full elemental scan of metals (total and dissolved) once per year, nominally at end of each wet season.
GDS DH3	Marine monitoring site, reference site, on western arm of West Arm.	Metals: Total and dissolved (ultra-trace) Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn Total suspended solids	

2.3 Sample methods

All surface water sampling will be in accordance with relevant standards and guidelines including:

- *Australian/New Zealand Standard on Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998/2016), Standards Australia, New South Wales.
- *Australian Standard on Water Quality Sampling – Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998), Standards Australia, New South Wales.
- *Australian/New Zealand Standard on Water Quality Sampling - Part 9: Sampling Guidance on sampling from marine waters* (AS/NZS 5667.9:1998/2016), Standards Australia, New South Wales.
- ANZG 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
- *EcOz Standard Operating Procedure Surface Water Sampling* – Update July 2020.

This will ensure representative samples are collected, and also avoid contamination of samples (of particular importance for saline waters which require ultra-trace analysis for nutrients and metals).

Freshwater sites will be accessed on foot or via ATV, and samples will be collected from the side of the watercourse. Watercourses will only be sampled when flowing.

Marine sites will be accessed via marine vessel (boat), and grab samples will be obtained from ~30 cm below the surface of the water, using sample poles. Sampling will be undertaken during neap tides, on an outgoing (ebb) tide.

Field parameters will be measured in-situ using calibrated field equipment. Laboratory samples will be collected in laboratory supplied, suitably treated containers, and stored chilled (in esky with ice bricks or portable fridge) until the samples can be dispatched to the laboratory. All samples will be submitted to a NATA accredited laboratory, within required holding times, and Chain of Custody forms will be provided to allow for tracking of samples.

All sampling equipment will be maintained and cleaned between sample sites to avoid cross contamination. Details of sample methods are provided in the standards and guidelines listed above.

A detailed description of general surface water sampling methodology is provided in the *Procedure for Surface Water Sampling*, at Appendix B.

2.4 Data management and reporting

All surface water data will be entered into the Surface Water Quality Database and compared to guideline values; site-specific trigger values, the default ANZG 2018 guideline values (for fresh or marine waters as applicable), and the Darwin Harbour Water Quality Objectives. Field data will be entered manually, while laboratory data will be provided in ESdat form, and will automatically be entered into the database. In order to ensure laboratory results are automatically issued to ESdat, ensure the following email address is listed on the COC to receive results: esdat_au+corelithium@esdatlabsync.net.

Data will be compared to guideline values and any exceedance of a guideline value will be investigated. This may include additional water quality sampling. Data will also be compared over time to identify any trends in water quality that may be attributable to waste discharges or mine site operations.

As per Condition 44 and Condition 45 of WDL 248, LDGNT will prepare an Annual Return and a Monitoring Report and submit both reports to the Administering Agency annually, within 10 business days of 25 July (the licence anniversary date).

In the event that the surface water monitoring program identifies a non-compliance with WDL 248, LDGNT will notify the Administering Agency as soon as practicable (and in any case within 24 hours) after first becoming aware of the non-compliance. If a non-compliance with WDL 248 occurs, then an investigation report will be prepared and submitted to the Administering Agency within 10 business days of the notification. As per Item 12 of Schedule 1 of WDL 248, a non-compliance with WDL 248 includes:

- An exceedance of a trigger value stipulated in the licence at the compliance point (GDS SW5) on three consecutive sampling occasions
- An exceedance of three or more times the trigger value at the compliance point (GDS SW5).

Trigger values are provided in Appendix 2 of WDL 248 (see Attachment A).

3 SEDIMENT

Fluvial sediment monitoring will be undertaken annually in accordance with Appendix 4 of WDL248 (see Attachment A).

3.1 Sample methods

Sediments will be sampled from freshwater sites GDS SW1, GDS SW2, GUS SW4, GDS SW5, GDS SW7, GDS SW8 and MWD1 – locations shown on Figure 1-1. Sediment sampling will be undertaken in accordance with relevant standards and guidelines, including:

- Australian Standard – *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1: non-volatile and semi volatile compounds* (AS 4482.1-2005)
- Australian Standard on Water Quality Sampling – Part 19: *Guidance on sampling of marine sediments* (ISO 5667.19:2004)
- Australian Standard on Water Quality Sampling – Part 12: *Guidance on sampling of bottom sediments* (ISO 5667.12:1999)
- *Recommendations for sampling and analysis of Darwin Harbour sediment* (Munksgard 2013)
- Simpson & Batley (2016): *Sediment Quality Assessment*.

Sediment samples are to be collected annually, during recessional flows (late wet season), and for efficiency will usually be collected at the same time as macroinvertebrate samples (see Section 5).

At each sample site, three grab samples will be collected from the stream. If water is present in the stream, samples will be collected from each side of the bank, or along one bank depending on access (e.g. two samples from the left bank and one from the right bank, or three samples spread along a length of the bank). Entering watercourses with flowing water or deep pools in them is not safe due to the risk of crocodile interaction. If, however, the watercourse is dry, then sediment samples can be collected across the stream; one from either bank and one from the middle of the stream. Note that, when selecting sample locations, ensure that they will be representative of sediment settling in the watercourse. The use of a shovel may be required to ensure representative samples are collected.

Samples are collected using the following methodology:

1. Clean sample equipment (trowel and/or shovel) using a 5/95 mix of Decon 90 and demineralised water.
2. Ensure sampler is wearing new nitrile powder free gloves (new gloves are to be worn for each sample).
3. Scrape away leaf litter or other debris from the ground surface. Avoid collecting pebbles and gravel as the laboratory cannot analyse large fractions.
4. Use the shovel and/or trowel to dig up sediment and transfer sample to clean, appropriately treated and laboratory supplied sample containers (250 mL sample jars and 500 mL sample bags).
5. Metals analysis is to be undertaken on the <63 µm fraction of sediment, and as such 1 kg of sample is to be provided to the laboratory for metals analysis, plus sufficient sample volume for particle size distribution and the other analytes. Samplers are to check sample volume requirements with the laboratory prior to undertaking the sampling.
6. Samples will be kept separate (i.e. collect and submit three samples per site for analysis); do not composite the samples as that will influence how the guideline values are applied.

7. Once sample containers are full, place samples in an esky with ice bricks, or vehicle fridge, until they are delivered to a NATA accredited laboratory for analysis.
8. Clean sample equipment before collecting the next sample (firstly wipe off any residual sediment with paper towel, and then wash with the Decon 90 mixture).
9. Once all sediment samples have been collected, submit the samples to a NATA accredited laboratory, with accompanying Chain of Custody forms.

In accordance with Appendix 4 of the WDL (at Attachment A), samples will be analysed for pH, EC, moisture content, particle size distribution, metals (Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn) and sulphate, calcium, chloride, sodium, potassium and magnesium. As discussed above, metals are to be analysed on the <63 µm fraction.

Sediment samples will also be collected from the three Darwin Harbour sites, as per Table 3-1 below (locations are shown on Figure 1-1) and from the macroinvertebrate sampling locations (see Section 5 below). At GDS DH1 – GDS DH3, sediment will be collected from a boat, using a Van Veen grab sampler (or similar), and then placed in suitable laboratory supplied containers, for submission to a NATA accredited laboratory for analysis. Sampling equipment will be cleaned between sites as per the above sample procedure.

Table 3-1. Darwin Harbour Sediment monitoring

Monitoring Location	Description	Analytes	Frequency
GDS DH1	Marine sediment monitoring site, ~4km downstream of compliance point.	pH, EC, moisture content Particle size distribution Metals:	Annually, at end of the wet season (nominally May)
GDS DH2	Marine monitoring site, ~8 km downstream of compliance point, near confluence of branch of western arm of West Arm.	<63 µm fraction Al, As, Cd, Cr, Cu, Fe, Pb, Li, Hg, Ni, Zn Anions/cations:	
GDS DH3	Marine monitoring site, reference site, on western arm of West Arm.	Sulphate, calcium, chloride, sodium, potassium and magnesium	

3.2 Data management and reporting

All sediment quality data will be entered into the Sediment Quality Database and compared to the ANZG (2018) toxicant default guidelines for sediment quality, as well as relevant baseline studies (for example, benthic sediment sampling campaign of Middle Arm and West Arm, Darwin Harbour [Radke et al. 2021]). Data will be compared over time to determine if there are detectable changes or trends in sediment quality. Changes or trends will be investigated to assess whether the change is attributable to mine site discharges

As with surface water quality data, laboratory data will be automatically entered into the database in ESdat form, and compared to guideline values. In order to ensure laboratory results are automatically issued to ESdat, ensure the following email address is listed on the COC to receive results: esdat_au+corelithium@esdatlabsync.net.

Reporting on sediment data will be within the Monitoring Report, which will be prepared and submitted annually, within 10 business days of 25 July of each year.

4 RIPARIAN VEGETATION

Riparian vegetation occurs along watercourses and surface water features and are significant vegetation communities as they are spatially restricted and provide habitat to a relatively large number of species (DENR 2019). Riparian vegetation monitoring will be undertaken in accordance with Appendix 5 of the Draft WDL, to detect any changes to riparian vegetation health or extent which could occur as a result of discharge of mine wastewater from MWD1.

Below is a Riparian Vegetation Monitoring Plan (RVMP) which includes:

- Assessment of baseline information
- Monitoring parameters, methodology and frequency
- Data analysis

4.1 Baseline surveys

A previous survey, The Mangrove and Riparian Vegetation Assessment (EcOz 2019) was undertaken to assess the riparian vegetation prior to mining activities commencing.

Three types of monitoring were undertaken; an aerial drone survey to look at the overall riparian vegetation health and assist in mapping the riparian vegetation extent, an on-ground field survey to assess vegetation structure and composition within the mapped riparian vegetation extent, and photo point monitoring. Note, the drone survey was undertaken post-wet season (March) and the vegetation site assessments and photo point monitoring was undertaken in the dry season (June).

Three riparian vegetation survey plots were established within the mangrove study site, representing riparian, swamp and mangrove communities (MVS1, RVS2 and SVS3). Table 4-1 provides a summary of baseline survey results, and Figure 4-1 shows the location of the three different riparian communities, and the monitoring sites. No reference site has been established for LDGNT (as there are no suitable sites within close proximity to the mine site), and there is no intent to add a site as part of this RVMP as the objective is to examine if there is a change in vegetation compared to baseline. The BP33 reference site, located upstream of Charlotte's creek will be used as a reference site if required – the details are within the BP33 Riparian Vegetation Monitoring Plan (EcOz 2022).

The baseline study provides a spatial dataset from which to monitor changes in riparian vegetation boundaries within the study sites. The baseline assessment indicates that vegetation communities within the study sites are in good condition, with limited pre-development disturbance. This is with the exception of the swamp community, which occurs downstream of the mine site in the West Arm catchment. Weeds and impacts from off-road racing tracks were observed within this vegetation community.

The baseline riparian vegetation site assessments and photo point monitoring was undertaken in the dry season (June). In future, the monitoring will be undertaken using the same methods as baseline, however in the post-wet season (March) when water discharge events occur.

Table 4-1. Summary of baseline riparian vegetation descriptions

Vegetation type & survey site	Vegetation Description	Other species present	NVIS code	Landform	Soil	Drainage	Fire	Weeds	Disturbance	Hydrology	Intact riparian vegetation area size (ha)
Mangrove (MVS1)	<i>Lumnitzera racemosa</i> , <i>Bruguiera exaristata</i> , <i>Avicennia marina</i> with isolated <i>Excoecaria ovalis</i> low open forest, over <i>Fimbristylis</i> sp. and <i>Xerochloa imberbis</i> mid sparse tussock grassland	None recorded	T6c	Mangrove flat near tidal creek	Brown sandy clay surface soils, some pebbles present ranging in size (2 – 6 cm)	Very poorly drained	Nil	None	None	Tidal, towards upper tide limit. Large pool located adjacent to vegetation assessment site – approximately 4 m wide.	5.18
Riparian (RVS2)	<i>Melaleuca viridiflora</i> mid woodland over <i>Acacia plectocarpa</i> , <i>Lumnitzera racemosa</i> (on the edge of creek) and <i>Avicennia marina</i> (in creek channel) mid open shrubland, over <i>Germainia grandiflora</i> , <i>Dapsilanthus</i> sp. and <i>Xerochloa imberbis</i> mid tussock grassland	Mid stratum <i>Thespesia populneoides</i> Ground stratum <i>Asteraceae</i> sp., <i>Wrightia saligna</i> , <i>Flagellaria indica</i> , <i>Acrostichum speciosum</i> , <i>Gymnanthera nitida</i> , <i>Lindernia lobelioides</i> , <i>Diospyros littorea</i>	T7i	Flat, adjacent to creek channel	Brown clay loam; rocks and pebbles common in channel adjacent to site	Poorly drained	2+ years since last fire causing minimal impact	None	Motorbike tracks nearby	Some pools nearby, inundated on large high tides and with freshwater during wet season	0.76
Swamp (SVS3)	<i>Melaleuca viridiflora</i> , <i>Erythrophleum chlorostachys</i> and <i>Corymbia polycarpa</i> mid woodland over <i>Lophostemon lactifluus</i> , <i>Clerodendrum floribundum</i> and <i>Denhamia obscura</i> mid open shrubland over <i>Sorghum intrans</i> , <i>Aristida</i> sp. and <i>Pandanus spiralis</i> mid tussock grassland	Mid stratum (M1): <i>Alphitonia excelsa</i> , <i>Grevillea decurrens</i> Ground stratum <i>Germainia grandiflora</i> , <i>Acacia difficilis</i> , <i>Fern</i> sp., <i>Themeda</i> sp., <i>Wrightia saligna</i> , <i>Livistona humilis</i> , <i>Osbeckia australiana</i> , <i>Dianella odorata</i> , <i>Brachychiton megaphyllus</i> , <i>Fern</i> sp.1, <i>Antidesma ghesaembilla</i>	T7i	Lower slope, flat open depression	Brown sandy loam. Some quartz present near creek	Poorly drained – some wet season inundation	Last year (relatively low impact fire)	Annual mission grass scattered near site. Patches of <i>Hyptis suaveolens</i> , <i>Calopogonium mucunoides</i> and <i>Passiflora foetida</i> recorded nearby	None	Wet season inundation	1.5

4.1.1 Standards and guidelines

Monitoring will be in accordance with best practice guidelines and standards, including *Northern Territory guidelines and field methodology for vegetation survey and mapping* (Brocklehurst et. al. 2007) and the *NT Sampling and Processing Manual* (Llyod and Cook 1996). Details are provided below for each type of monitoring.

4.2 Methods

Drone survey

A drone survey will occur annually, post-wet season (April/May). The drone will be flown along the existing flight path corresponding to the baseline survey (EcOz 2019) to capture the riparian vegetation extent (see Figure 4-1).

- Use DJI Phantom 4pro drone to capture images at a height of 75m (75% front overlap and 65% side overlap) using the DroneDeploy app.
- Drone will be flown in the desirable conditions i.e. in the middle of the day to avoid sun light interference. Observations will also be noted i.e. timing of flight, and the weather to replicate similar conditions for future surveys.
- When importing drone data to create the orthomosaic, the same methods as per methods in baseline report outlined in Section 3, will be applied.
- A 5cm pixel image will be exported for the survey site, a colour orthomosaic and a plant health image, displayed in red, green and blue.
- The boundary of the riparian vegetation will then be delineated using the orthomosaic imagery and remote sensing techniques.

Riparian vegetation site assessments

Monitoring will be undertaken post-wet season (April/May), after wastewater discharge events. Three riparian vegetation monitoring sites MVS1, RVS2 and SVS3 will be monitored using the same monitoring method outlined in Section 3 in the Mangrove and Riparian Vegetation Assessment (EcOz 2019). Plots will be established and vegetation species, height and % cover will be recorded within each plot. Vegetation continuity will also be monitored by traversing a 100 m long transect and estimating the canopy cover. Photo points will be established and four photographs will be taken in the same location, facing north, east, south and west, each monitoring round, to allow comparison over time.

4.3 Monitoring schedule

Table 4-2 outlines the riparian vegetation monitoring schedule that will be followed for the duration the of the WDL.

Table 4-2. Riparian vegetation monitoring schedule

Monitoring	Objective	When	Monitoring undertaken	Frequency of monitoring	Locations
Riparian vegetation site assessment survey	To capture data outlined in Table 4-1 after wet season discharges	End of Wet season (April/May)	Site assessment at all identified locations	Annual - 2023 onwards	MVS1, RVS2 and SVS3
Photo point monitoring	To capture photo points after wet season discharges	End of Wet season (April/May)	Photo monitoring at riparian vegetation assessment sites	Annual - 2023 onwards	MVS1, RVS2 and SVS3
Ongoing drone survey	To continue drone survey monitoring after wet season discharges	End of Wet season (April/May)	Drone flight	Annual - 2023 onwards	Flight path as per previous survey

4.4 Data management and reporting

4.4.1 Drone survey

The intent of analysing drone data is to determine if there is reduction in riparian vegetation extent and/or structure compared to baseline survey. If there are gaps in vegetation i.e. if there is a retraction of mapped riparian vegetation, further on-ground assessments will be undertaken. A vegetation monitoring database will be maintained which will record:

- The riparian vegetation area size (ha) based on drone mapping
- All drone images captured during the drone surveys organised in folders.
- A zip-file of all tiff files derived from drone surveys (both orthomosaic and plant health image).
- Spatial data.

4.4.2 Riparian vegetation site assessments

The data collected will be analysed using the Before After/Control Impact (BACI) approach. BACI will be applied by performing statistical analysis to test whether there is a significant difference between the baseline data and ongoing data sets collected at the same sites. Data analysis will include:

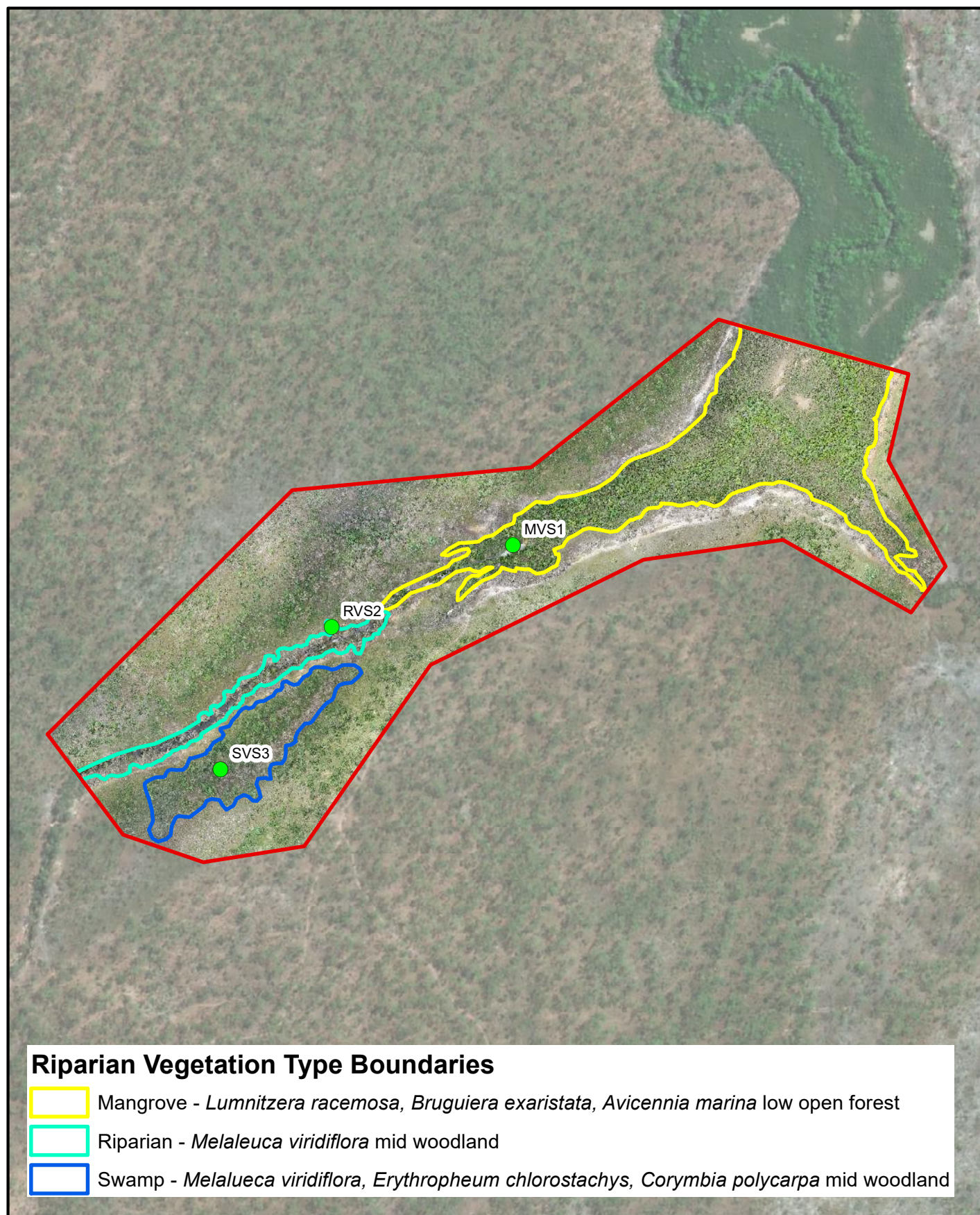
- Species composition (%) using vegetation data collected for upper, mid, ground strata data
- Average heights of plants across riparian vegetation sites.
- Canopy cover (%) for each dominant, and emergent species across riparian vegetation assessment sites compared to reference site data.
- Plants alive or dead (%) across all riparian vegetation sites.

This data will also be stored within the vegetation monitoring database.

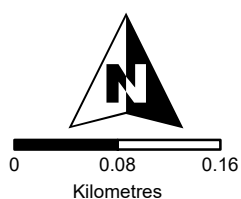
4.4.3 Photo point monitoring

The intent of analysing photo point data is to determine if there are visual on-ground changes compared to baseline survey. All photographs will be labelled with site name, direction and date and stored in a separate zip-file.

Results of riparian vegetation monitoring will be reported on annually within the Monitoring Report, which will be prepared and submitted to the Administering Agency within 10 business days of the 25 July of each year.



- Vegetation survey plots
- Study site boundary



MAP INFORMATION
 Name: Project location
 Projection: GDA 1994 MGA Zone 52
 Date Saved: 18-Oct-19
 Client: Core Lithium
 Author: D. vdHoek
 (reviewed by K. Welch)
DATA SOURCE
 Study site: EcOz
 Study site image: EcOz
 Background: ESRI imagery

Figure 4-1. Map of riparian vegetation type boundaries and monitoring locations

5 MACROINVERTEBRATES

Appendix 5 of the Draft WDL requires macroinvertebrate monitoring within Darwin Harbour and areas downstream of the GLP. Macroinvertebrate sampling will be undertaken within the freshwater habitats downstream of the discharge point, and within Darwin Harbour sites which are also monitored for water quality, sediment and seagrass habitat.

Baseline macroinvertebrate sampling was undertaken in freshwater habitats downstream of the mine site in 2017, and two of these sites will be monitored ongoing to allow comparison of data over time. Sediment and water quality samples will also be collected during macroinvertebrate sampling to inform macroinvertebrate data analysis. Macroinvertebrate sampling is summarised in Table 5-1.

Table 5-1. Macroinvertebrate monitoring program

Sites	Site type	Purpose	Survey timing
UC1, UC2	Freshwater macroinvertebrates	Comparison to 2017 baseline data – downstream of mine site	Annually during recessional flows (April/May)
GDS SW5		Compliance point data	
Control (BP4)		Reference site	
GDS DH1, GDS DH2	Marine macroinvertebrates	Darwin Harbour sites downstream of mine site	Annually during recessional flows (April/May)
GDS DH3		Reference site	

5.1 Sample methods

Macroinvertebrate sampling will be undertaken annually during the recessional flows each wet season (April/May). Site locations are shown on Figure 1-1. The freshwater sites were visited and sampled in May 2022, and so are known to be accessible and appropriate for macroinvertebrate sampling. A suitable and accessible reference site near the LDGNT site could not be located, and so a reference site on an unnamed tributary of the Charlotte River, upstream of Cox Peninsula Road, has been selected as a representative reference site for both LDGNT and the adjacent BP33 mine site. The location of this site is shown on Figure 1-1 (see 'BP4'). If, during future monitoring events, the reference site UC3 (which was sampled by GHD in 2017) is found to be suitable, then it may also be sampled as a reference site. However, during sampling in 2022 there was insufficient water at site UC3 which indicates it ceases to flow soon after the wet season.

For both marine and freshwater sites, water quality samples will be collected (including measurement of field parameters and collection of surface water samples) prior to sediment and macroinvertebrate sampling to minimise contamination of water quality samples (e.g. with sediment or vegetation). Water will be analysed for the same parameters as per the surface water monitoring schedule (see Section 2). Following collection of water samples, macroinvertebrate sampling will be undertaken, and sediment samples will be collected (to be analysed for the same parameters as per Section 3).

Freshwater

Macroinvertebrate sampling will be undertaken in accordance with the *NT AUSRIVAS Sampling and Processing Manual* (Lloyd and Cook 2001) and the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory* (Lamche 2007). All sampling sites are chosen from steep edge habitat with no undercut and away from any fast-flowing stream sections. Habitat descriptions of the site will be noted on the Field Sheets from the NT Darwin-Daly Region AUSRIVAS User Manual (provided at Attachment C); field notes will include site location, a sketch of the site, water quality field data, and a description of the sampled site).

At each site one person will rake along the bank and submerged root matter, and another will sweep through the water in the disturbed area with a 250 µm net to capture the removed material, which will include macroinvertebrates. Samples will be sieved on the bank through sieves of decreasing aperture to remove leaf litter and other material. This material is then thoroughly rinsed with water collected from the sample site multiple times. The remaining material is examined for any macroinvertebrates before being disposed of. All material from the finest sieve (250 µm) will be washed into a jar, which is then filled with ethanol for preservation.

Refer to the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory User Guide* (Lamche 2007) for detailed sample methodology.

Samples will be labelled and stored upright in an esky, transported safely to avoid accidental damage to samples. Samples will be submitted to a suitably qualified AUSRIVAS taxonomist for identification and data analysis.

Marine water

Marine macroinvertebrate samples will be collected via a boat, using a Van Veen grab sampler. The Van Veen will be lowered over the boat and a grab sample collected. The sediment will be emptied into a clean stainless steel container for onboard processing. A number of different sized sieves will be used to remove as much sediment, sand, rock, coral and other material from the sample, using filtered marine water to carefully wash the material through the sieves. Material from the finest sieve (10 µm) will be washed into a sample jar, which is then filled with ethanol for preservation. All samples will be submitted to a suitably qualified taxonomist with experience processing and analysing marine macroinvertebrate samples.

5.2 Data management and reporting

Freshwater

Freshwater samples will be analysed in accordance with the *Darwin-Daly Regional AUSRIVAS Models – Northern Territory* (Lamche 2007). Taxa will be identified to family level where possible, except for key taxa (as per Darwin-Daly regional AUSRIVAS User Manual) which either require identification to only order level, or sub-family level. Following identification, taxa counts will be recorded in a database and samples preserved and archived.

Macroinvertebrate metrics will be generated (abundance, taxa richness, PET richness, Signal-2) and presented for each site. AUSRIVAS modelling will be completed and OE50 scores and bandings presented for each site. Multivariate analysis of macroinvertebrate community composition will be completed to understand the differences and similarities between the sites. Data will be compared between years to identify whether there is any change in macroinvertebrate diversity (species richness) or abundance.

Marine

Marine samples will be analysed and macroinvertebrates (aka benthic infauna) identified to the lowest taxonomic level possible, or morpho-species. Statistical analysis will be undertaken on the samples (e.g. PRIMER and P.A.S.T) to calculate:

- Diversity indices, to assess species richness, diversity, evenness and dominance within samples
- Multivariate analysis to assess species abundance
- Environmental correlations – to assess whether there is a correlation between environmental data (e.g. water quality data) and macroinvertebrate data.

Results of macroinvertebrate sample processing and analysis will be reported in standalone reports prepared by the taxonomist. Key findings of macroinvertebrate sampling will be reported in the annual Monitoring Report, to be prepared and submitted to the Administering Agency within 10 business days of the 25 July each year.

6 SEAGRASS

Seagrass monitoring will be undertaken in West Arm, at sites GDS DH1, GDS DH2 and GDS DH3 (see Table 2-2 and Figure 1-1 for locations), in accordance with Appendix 5 of the Draft WDL. Benthic habitat mapping, based on modelling undertaken by the Australian Institute of Marine Science (AIMS) in collaboration with the Northern Territory Government, shows low likelihood of seagrass habitat within West Arm (Galaiduk et al. 2019 and Siwabessy et al. 2020). Additionally, the extent of seagrass is known to fluctuate in the Darwin Region, due to factors such as turbidity and wind and wave action, which tends to be greater during the wet season. As such, the spatial extent and percentage cover of seagrass generally declines during the wet season and recovers and expands during the dry season (Cardno 2014). Cardno noted low seagrass cover in wet season months such as February, but greater seagrass cover in May through to October/November.

Seagrass surveys are generally undertaken in accordance with the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy – Guidance on seagrass monitoring* (Qld DES 2018) and associated resources including the *Manual for Scientific Monitoring of Seagrass Habitat* (Short et. al. 2015). However, seagrass monitoring usually focusses on well-established seagrass meadows and their extent, composition and biomass over time, and many of the proposed methods in DES (2018) are designed and selected for seagrass meadows. The methods are inappropriate for application in this case as the study area is situated within mangrove lined tidal channels with no known seagrass meadows in the vicinity.

The method proposed below was selected based on the likely limited presence of seagrass, access, and safety considerations:

- Three monitoring locations will be accessed via boat (locations shown on Figure 1-1 and Table 1-1).
- At each location one 50 m transect will be established perpendicular to the channel (i.e. across the channel).
- Seagrass survey will be undertaken at three sites along the transect; one at each end and one in the middle.
- At each of the three sites along the transect, a 0.5 m x 0.5 m quadrat on a frame will be lowered to the seabed.
- A GoPro camera will be attached to the frame, which will be programmed to take photos of the quadrat within a short time frame, i.e. every 10 seconds. The frame will be moved slightly between photographs to collect four photographs per site.
- Once photographs are taken, the quadrat will be lifted to the surface again via a davit, before moving on to the next site.
- Seagrass (if present) will be identified to the genus level as per Roeleofs et al. 2005 and photographs will be used to assess percent cover using the seagrass percentage cover photo guide in *Manual for Scientific Monitoring of Seagrass Habitat* (Short et. al. 2015).
- Common species in the Darwin Harbour area include *Halophila ovalis*, *Halophila decipiens* and *Halodule uninervis* and it is anticipated that, if present, these will be identifiable from the imagery obtained.

The survey will be undertaken in May, at the same time as Darwin Harbour water quality, sediment and macroinvertebrate sampling. The survey will occur when seagrass is likely to be recovering, and, if present, will likely be visible. The survey will be timed for neap tides, to maximise visibility (water clarity) and ensure photographs show visible/identifiable seabed. Photographs will be reviewed, and presence/absence of seagrass noted, as well as percent cover if present.

Results of seagrass monitoring will be reported on in the annual Monitoring Report, to be prepared and submitted to the Administering Agency within 10 business days of the 25 July each year.

One round of seagrass monitoring will be undertaken, following which the requirement for ongoing seagrass monitoring will be reviewed. If no seagrass is present in the tributaries of West Arm downstream of GLP then LDGNT will seek to remove the requirement for seagrass monitoring from WDL 248.

LDGNT is open to opportunities for collaboration with government and industry, or contribution to broader seagrass monitoring programs within Darwin Harbour to assess long term harbour health. Guidance from the Northern Territory Environment Protection Authority and/or Department of Environment, Parks and Water Security would be sought in this regard.

7 REFERENCES

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ATTACHMENT A –WASTE DISCHARGE LICENCE 248 FOR LITHIUM DEVELOPMENTS GRANTS NORTHERN TERRITORY



Northern
Territory
Government

WASTE DISCHARGE LICENCE

(Pursuant to section 74 of the *Water Act 1992*)

Licensee Lithium Developments (Grants NT) Pty Ltd

Licence Number: **WDL248**

Registered Business Address: Level 5, Flinders Street
Adelaide SA 5000

ACN: 622 047 232

ABN: 70 622 047 232

Commencement Date: 29 July 2022

Expiry Date: 24 July 2025

Licensed Action: Controlled discharge of wastewater from Mine Water Dam 1 (MWD1) through authorised discharge point (DP1) and into an unnamed ephemeral stream that feeds into West Arm, Darwin Harbour in accordance with Table 2 and subject to the conditions of this licence.

WASTE DISCHARGE LICENCE (WDL248)

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WASTE DISCHARGE LICENCE (WDL248)

INFORMATION ABOUT THIS LICENCE

This waste discharge licence is granted pursuant to section 74 of the *Water Act 1992* (NT) (*Water Act*), which empowers the Controller of Water Resources to, in accordance with the *Water Act*, grant a licence to a person to carry out an action that would otherwise be an offence against this Act.

Responsibilities of Licensee

- In addition to the conditions set out in this licence, general responsibilities of licensees are set out in the *Waste Management and Pollution Control Act 1998* (NT) (**WMPC Act**), the *Water Act* and the *Water Regulations 1992* (NT) (**Water Regulations**).
- It is an offence under the *Water Act*, if the holder of a waste discharge licence contravene or cause, suffer or permit a person to contravene a term or condition to which the waste discharge licence is subject (s 76 *Water Act*).
- Except as expressly provided for in this licence or applicable law, it is an offence under section 16 of the *Water Act* to wilfully cause or cause, directly or indirectly:
 - waste to come into contact with water; or
 - water to be polluted.

Duration of licence

- This licence will remain in force until its Expiry Date, it is surrendered by the licensee, or until it is suspended or revoked by the Controller of Water Resources.
- A licensee may surrender its licence at any time (s 94 *Water Act*).
- If the licensee wishes to surrender its licence it should complete the notification form approved by the Controller of Water Resources and provide a copy of the completed form to the Administering Agency.
- The authority to allow waste to come into contact with water or water to be polluted ends once a licence is surrendered, and any such occurrence after a licence is surrendered is an offence pursuant to s 16 of the *Water Act*.

Amendment, Modification or Revocation of Licence

- As set out in section 93 of the *Water Act*, the Controller of Water Resources may, by notice served on the holder of the licence:
 - amend or modify the terms and conditions of a licence; or
 - where the Controller of Water Resources is satisfied that the holder of the licence has contravened or failed to comply with a term or condition of the licence or of any other licence previously held by the person for a similar purpose during the 12 months immediately preceding the grant of the first-mentioned licence, the Controller of Water Resources may:
 - revoke a licence; or
 - suspend a licence.

WASTE DISCHARGE LICENCE (WDL248)

Transfer of Licence

- Where a waste discharge licence is granted to a person in relation to the person's use of land and, during the period of this licence, the person's interest in the land is transferred to another person, the waste discharge licence shall be deemed to have also been transferred to the other person (s 92 Water Act).
- The licensee must ensure the contact details recorded with the Administering Agency for the licence are correct at all times in accordance with condition 6. Accordingly, it is recommended the transferee complete the Controller of Water Resources approved notification of transfer of a waste discharge licence form.

Public Register

- A copy of this Licence will be placed on the Register in accordance with section 95 of the Water Act.
- A copy of plans for environmental management, reports, submissions or documents provided at Schedule 1 Item 13 will be placed on the Register.
- The Register is freely available from the Northern Territory Environment Protection Authority (NT EPA) website.

Water Quality Standards

- The Administrator may declare, by notice in the *Gazette*, a beneficial use, quality standard, criteria or objectives which apply in relation to any waste or class of waste, or water or class of water (s 73 Water Act).
- A water or waste beneficial use, quality standard, criteria or objectives declared under s 73 of the Act and in force is an Environment Protection Objective for the purposes of the WMPC Act (s 18 WMPC Act).
- An Environment Protection Objective is a statutory instrument to establish principles on which:
 - Environmental quality is to be maintained, enhanced, managed or protected;
 - Pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; or
 - Effective waste management is to be implemented or evaluated.
- Schedule 1 Item 1 specifies the beneficial use, quality, standard, criteria or objective relevant to this licence at the date of issue.

Environmental Interests

- Environmentally sensitive or significant areas may be captured by and protected under the *Environment Protection Act 2019* (NT) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). As such, and to best protect and regulate our waterways, waste discharge licences must identify the sensitivity of the environment surrounding the location of the Licensed Action.
- Schedule 1 Item 2 specifies the sites of conservation significance (if any) relevant to this licence at the date of issue.
- Schedule 1 Item 3 specifies the Ramsar wetlands (if any) relevant to this licence at the date of issue.

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Cultural Interests

- Under Commonwealth and Northern Territory laws it can be an offence to enter or remain on or damage a sacred site.
- Sites of Aboriginal significance including registered and recorded Aboriginal sacred sites may exist in the vicinity of the Licensed Action.
- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the Licensed Action are obtained and complied with.
- Further specific advice on any cultural requirement or implication of the licenced activity should be sought from the relevant land council and the Aboriginal Areas Protection Authority.

END NOTES

This licence is a new licence, as such there are no historical records associated with the licence.

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SCHEDULE 1 - ITEMS

1. Beneficial uses	Beneficial Uses and Objectives for the Darwin Harbour Region (Gazette No. 27, 7 July 2010).	
2. Sites of conservation significance	SOCS No. 6 Darwin Harbour.	
3. Ramsar wetlands	Not applicable.	
4. Licence Documents	(a) Water Management Plan - Appendix K, Mine Management Plan Grants Lithium Project (approved 10 June 2021). (b) Emergency Response Plan - Appendix R, Mine Management Plan Grants Lithium Project (approved 28 June 2019). (c) Stakeholder Engagement Plan - Core Lithium Grants Lithium Project Stakeholder Engagement Plan (issued 7 June 2021).	
5. Authorised Discharge Point(s)	Discharge Point 1 (DP1) from Mine Water Dam 1 (MDW1) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693153 Northing: 8598441
6. Source(s) of waste	Pit water, direct rainfall, and mine influenced water collected from Mineral Lease 31726 that is captured and stored in sediment basins and Mine Water Dam 2 (MWD2) and pumped to MWD1. Waters discharged through DP1 are pumped over the wall of MWD1 and released by a tee valve into the flow path of an adjacent unnamed ephemeral stream as shown at Appendix 1.	
7. Trigger values	The limits for parameters listed in Appendix 2.	
8. Compliance point	Grants Downstream Surface Water 5 (GDS SW5) as shown on the plan at Appendix 1.	Zone: 52 L Easting: 693374 Northing: 8600709
9. Conditions on discharge	Any authorised discharge must: (a) Not include wastewater generated outside of Mineral Lease 31726; (b) Not include wastewater treated with polyacrylamide flocculants with more than 0.05% of the neuro-toxin acrylamide monomer; (c) Occur only when the stream gauge at the compliance point GDS SW5 shows there is a sufficient amount of water to dilute discharge water to achieve trigger values; (d) In the event wastewater is treated, occurs only when the treatment process has finished, including allowing sufficient residence time for settlement of flocculants and target contaminants.	
10. Monitoring Program	The Monitoring Program includes: (a) Surface water monitoring in accordance with Appendix 3. (b) Fluvial sediment monitoring in accordance with Appendix 4. (c) Biota monitoring in accordance with Appendix 5.	
11. Critical contaminants	Aluminium (Al), Arsenic (As), Copper (Cu), Iron (Fe), Lithium (Li), Zinc (Zn) and Total Phosphorus (TP).	

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12. Non-compliances	Non-compliances include the following exceedances: (a) An exceedance of a trigger value specified in Item 7 at the compliance point in Item 8, on three consecutive sampling occasions. (b) An exceedance of three times or more a trigger value specified in Item 7 at the compliance point in Item 8.
13. Documents placed on Register	The following documents will be placed on the Register: (a) The Licence Documents at Item 4. (b) The Monitoring Report provided in accordance with clause 45. (c) The Annual Return.

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LICENCE CONDITIONS

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

1. Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
2. Any reference to any standard, guideline or code of practice (Australian or international) in this licence means the relevant parts of the current version of that standard, guideline or code of practice.
3. In this licence, unless the contrary intention appears, words that are defined in the Water Act are intended to have the meaning given to them in that Act.
4. In this licence, unless a contrary intention appears, terms are defined in the Definitions at the end of this licence.
5. In this licence a reference to an Item is a reference to an Item in Schedule 1.

GENERAL

6. The licensee must ensure the contact details recorded with the Administering Agency for this licence are correct at all times.
7. The licensee must at all times have a 24 hour emergency contact.
8. The licensee must notify the Administering Agency prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
9. The licensee must display clear and legible signage, in English, in a prominent location at each public entrance to the premises of the Licensed Action that includes the following details:
 - 9.1. waste discharge licence number issued under the Water Act; and
 - 9.2. 24 hour emergency contact details.
10. The licensee must cause a hard copy of this licence to be available for inspection, at the premises of the Licensed Action, by any person on request.
11. Unless otherwise specified, within 10 business days of a request, the licensee must provide to the Administering Agency a copy of any document, monitoring data or other information in relation to the Licensed Action in electronic form by emailing waste@nt.gov.au.
12. All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by emailing waste@nt.gov.au.
13. The licensee must maintain, implement and comply with the current version of the documents listed in Item 4.
14. Within 10 business days of any amendment being made to a document listed in in Item 4, the licensee must provide the amended document to the Administering Agency, along with:
 - 14.1. a tabulated summary of the amendment(s) with document references;
 - 14.2. reasons for the amendment(s); and
 - 14.3. an assessment of environmental risk associated with the amendment(s).
15. The Administering Agency may require the licensee to revise or amend and resubmit any document provided in accordance with this licence. Where the Administering Agency requires any document to be revised or amended, the licensee must submit it to the Administering Agency by the date specified by the Administering Agency.
16. The licensee must operate and maintain a community feedback telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the Licensed Action, and to which the licensee must respond. The community feedback telephone number must be displayed:

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- 16.1. where the licensee has a website, in a prominent location on the licensee's website;
 - 16.2. in the Stakeholder Engagement Plan; and
 - 16.3. in other publicly available documents relating to the Licensed Action.
17. The licensee must maintain a register of complaints that records the details of each complaint received in relation to the Licensed Action and provide a copy to the Administering Agency on request. Details of the complaint must (as is reasonably practicable) include, the following information:
- 17.1. the person to whom the complaint was made;
 - 17.2. the person responsible for managing the complaint;
 - 17.3. the date and time the complaint was reported;
 - 17.4. the date and time of the event(s) that led to the complaint;
 - 17.5. the contact details of the complainant if known, or where no details are provided a note to that effect;
 - 17.6. the nature of the complaint;
 - 17.7. the nature of event(s) giving rise to the complaint;
 - 17.8. prevailing weather conditions at the time (where relevant to the complaint);
 - 17.9. the action taken in relation to the complaint, including any follow-up contact with the complainant; and
 - 17.10. if no action was taken, why no action was taken.

MONITORING INFORMATION

18. If the licence expires or is otherwise surrendered, suspended or revoked and the licence contained a condition that the licensee provide a report, record or other information, including in accordance with a monitoring program pursuant to section 77 of the Water Act, the licensee must provide any report, record, information or data available to the licensee up to and including the date the licence expired or was surrendered, suspended or revoked.

OPERATIONAL

19. Without limiting the conditions of this licence, in conducting the Licensed Action, the licensee must do all things reasonable and practicable to:
- 19.1. prevent or minimise the likelihood of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.2. prevent or minimise the likelihood of environmental harm occurring as a result, or in connection with, the Licensed Action;
 - 19.3. effectively respond to pollution and the risk of pollution occurring as a result of, or in connection with, the Licensed Action;
 - 19.4. effectively respond to environmental harm and the risk of environmental harm occurring as a result of or in connection with the Licensed Action; and
 - 19.5. apply the principles of ecologically sustainable development.
20. The licensee must, without limiting any other condition of this licence, in conducting the Licensed Action do all things reasonable and practicable to ensure the Licensed Action does not adversely affect any:
- 20.1. declared beneficial use, quality, standard or objectives declared under section 73 of the Water Act;
 - 20.2. sites of conservation significance; or
 - 20.3. designated Ramsar wetlands,

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including, but not limited to, those listed at Items 1, 2 and 3.

21. The licensee must ensure any plant and equipment used by the licensee in conducting the Licensed Action:
 - 21.1. is reasonably fit for the purpose and use to which it is put;
 - 21.2. is maintained and operational; and
 - 21.3. is operated by a person trained to use the plant and equipment.
22. No change, replacement or alteration of plant and equipment is permitted if the change, replacement or alteration increases the risk of environmental harm for the Licensed Action, unless approved by the Administering Agency.

DISCHARGES

23. This licence authorises discharges of waste to water from the authorised discharge point(s) as identified in Item 5 and in accordance with the conditions of this licence.
24. Where the Administering Agency directs the licensee to cease discharge from an authorised discharge point identified in Item 5, the licensee must immediately cease the discharge.
25. A direction to cease discharge may be verbal or written, but a verbal direction from the Administering Agency will be provided in writing within 48 hours of the verbal direction. A failure to provide a written direction does not affect the requirement to comply with a verbal direction.
26. The licensee must ensure that discharge from each authorised discharge point:
 - 26.1. consists only of waste from the source(s) as specified in Item 6;
 - 26.2. does not exceed the trigger value limits at Item 7 at the compliance point at Item 8;
 - 26.3. meets the conditions at Item 9.
27. Following any exceedance of a trigger value limits at Item 7 at the compliance point at Item 8 the licensee must take corrective action to mitigate any environmental harm and ensure the exceedance does not reoccur.
28. The licensee must, for each authorised discharge point, install, operate and maintain a device to measure and record, for each discharge event:
 - 28.1. the time the discharge commenced and the duration of the discharge;
 - 28.2. the discharge rate of flow; and
 - 28.3. the discharge volume.
29. The licensee must ensure that the discharge from all discharge events at each authorised discharge point does not:
 - 29.1. contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;
 - 29.2. cause or generate odours which would adversely affect the use and amenity of surrounding waters;
 - 29.3. cause algal blooms in the receiving water;
 - 29.4. pollute groundwater;
 - 29.5. cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;
 - 29.6. cause mortality of fish or other aquatic organisms;
 - 29.7. cause erosion or degradation to the beds and banks of a watercourse; or
 - 29.8. cause adverse impacts on plants or animals.

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MONITORING

30. From the Commencement Date of this licence, the licensee must implement and comply with the Monitoring Program specified in Item 10.
31. The licensee must ensure that the Monitoring Program is designed, maintained and implemented in accordance with the following principles:
 - 31.1. the need to monitor loads upstream and downstream, including in-stream decay in loads downstream, of authorised discharge points;
 - 31.2. the need for event-based monitoring, in addition to routine monitoring, including revisiting sampling points as soon as practicable when samples cannot be collected at frequencies set in the Monitoring Program;
 - 31.3. the need for special studies to better described in-stream physical, chemical and biological processes;
 - 31.4. the need to target the possible critical contaminants listed at Item 11;
 - 31.5. the need to select sampling points that provided representative (well mixed) samples;
 - 31.6. the need to collect samples that are representative of discharge conditions, including taking samples from sampling points on the same day as discharge and consecutively from upstream to downstream; and
 - 31.7. the need to adopt a range of biological surveys to assess the health of the system.
32. The licensee must ensure that all samples and field environmental data are collected in accordance with recognised Australian Standards and guidelines (such as AS/NZS 5667.1 1998, ANZG (2018), as updated from time to time).
33. For the parameters that require analysis at a laboratory, the licensee must ensure that all samples are analysed at a laboratory with current NATA accreditation or equivalent.
34. The licensee must ensure any samples collected in accordance with the Monitoring Program or in connection with the Licensed Action or this licence, are obtained by, or under the supervision of a qualified sampler.
35. The licensee must ensure that, for each sample collected in accordance with the Monitoring Program or the Licensed Action, the following information must be recorded and retained:
 - 35.1. the date on which the sample was collected;
 - 35.2. the time at which the sample was collected;
 - 35.3. the location at which the sample was collected;
 - 35.4. the name of the person who collected the sample;
 - 35.5. the chain of custody forms relating to the sample;
 - 35.6. the field measurements (if any) and analytical results (if any) relating to the sample; and
 - 35.7. laboratory quality assurance and quality control documentation.
36. The licensee must for all land based monitoring points specified in the Monitoring Program:
 - 36.1. install and maintain appropriate identification signage so that they are reasonably identifiable at all times; and
 - 36.2. maintain safe access and egress, as is reasonably practicable.
37. The licensee must ensure that any proposed revisions to the Monitoring Program (other than typographical changes or revisions to formatting or referencing) are:
 - 37.1. reviewed by a Qualified Person, who must produce a written report about their review;
 - 37.2. submitted to the Administering Agency with justification for revisions; and

WASTE DISCHARGE LICENCE (WDL248)

- 37.3. submitted to the Administering Agency, in both hard copy and electronic form (with a complete copy of the Qualified Person's written review), 20 business days prior to the proposed implementation date.

RECORDING AND REPORTING

38. The licensee must keep records of all exceedances of trigger values of parameters specified in Item 7, including those that are not an exceedance listed at Item 12, and provide a copy on request of the Administering Agency.
39. The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.
40. A non-compliance with this licence includes the exceedances listed at Item 12.
41. The licensee must notify the Administering Agency of any non-compliance with this licence by emailing waste@nt.gov.au, as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.
42. The licensee must include in the notification of non-compliance the following information:
- 42.1. when the non-compliance was detected and by whom;
 - 42.2. the date and time of the non-compliance;
 - 42.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge;
 - 42.4. whether non-compliant discharge is still occurring; and
 - 42.5. a date (within 10 business days of the non-compliance) when an investigation report will be submitted to the Administering Agency.
43. Within 10 business days of notifying the Administering Agency of any non-compliance, the licensee must provide the Administering Agency an investigation report that includes:
- 43.1. when the non-compliance was detected and by whom;
 - 43.2. the date and time of the non-compliance;
 - 43.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge;
 - 43.4. the actual and potential causes and contributing factors to the non-compliance;
 - 43.5. monitoring data of the discharge, and upstream and downstream water of the authorised discharge point, collected for the date the non-compliance was detected and three sampling rounds prior;
 - 43.6. available flow rates to demonstrate any influence streams and rivers may have had on the exceedance of trigger values;
 - 43.7. rainfall recorded at the site prior to the exceedance of trigger values and non-compliance;
 - 43.8. the risk of environmental harm arising from the non-compliance;
 - 43.9. the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
 - 43.10. corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and
 - 43.11. if no action was taken, why no action was taken.
44. The licensee must submit a completed Annual Return, by emailing waste@nt.gov.au, within 10 business days after each Anniversary Date of this licence, which report relates to the preceding 12 month period.

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45. 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), as prescribed by this licence, within 10 business days after each Anniversary Date of this licence.
46. The licensee must ensure that each Monitoring Report:
- 46.1. 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);
 - 46.2. includes a tabulation of all monitoring data required as a condition of this licence (data must be provided electronically in Microsoft® Excel® format);
 - 46.3. includes a tabulation of monthly and annual contaminant loads discharged from the authorised discharge point listed at Item 5. Contaminant loads must be calculated for total metals, total metalloids, total nutrients and other parameters (excluding field parameters) listed in Appendix 3. 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;
 - 46.4. 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 (where the data is available); and
 - 46.5. includes an assessment of environmental impact from the Licensed Action.
47. A copy of the documents listed at Item 13 will be placed on the Register.

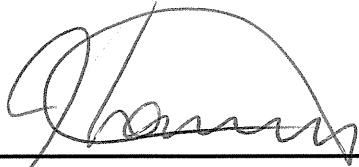
PERFORMANCE IMPROVEMENT

48. Prior to discharge from the authorised discharge point listed at Item 5, the licensee must develop and provide to the Administering Agency, an operational procedure that:
- 48.1. calculates the discharge dilution ratio;
 - 48.2. monitors compliance with condition 26; and
 - 48.3. adjusts the discharge rate during discharge events as flow in the catchment varies.
49. The licensee must ensure that water quality monitoring stations, including water level and flow meters, are installed and operational before 31 October 2022.
50. By 31 August 2023, the licensee must develop a plan for a wastewater management and treatment that provides for:
- 50.1. a reduction in total contaminant loads discharged compared to total contaminant loads discharged during the 2022/23 wet season; and
 - 50.2. details of what flocculants and coagulants and other treatment additives will be used, their breakdown products and their potential to contaminate the environment.

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END OF LICENCE CONDITIONS

This licence is not valid unless signed below:

A handwritten signature in black ink, appearing to read 'Joanne Townsend', is written over a horizontal line.

JOANNE TOWNSEND

Controller of Water Resources

Dated the 25 JULY 2022

WASTE DISCHARGE LICENCE (WDL248)

DEFINITIONS

In this licence, unless a contrary intention appears:

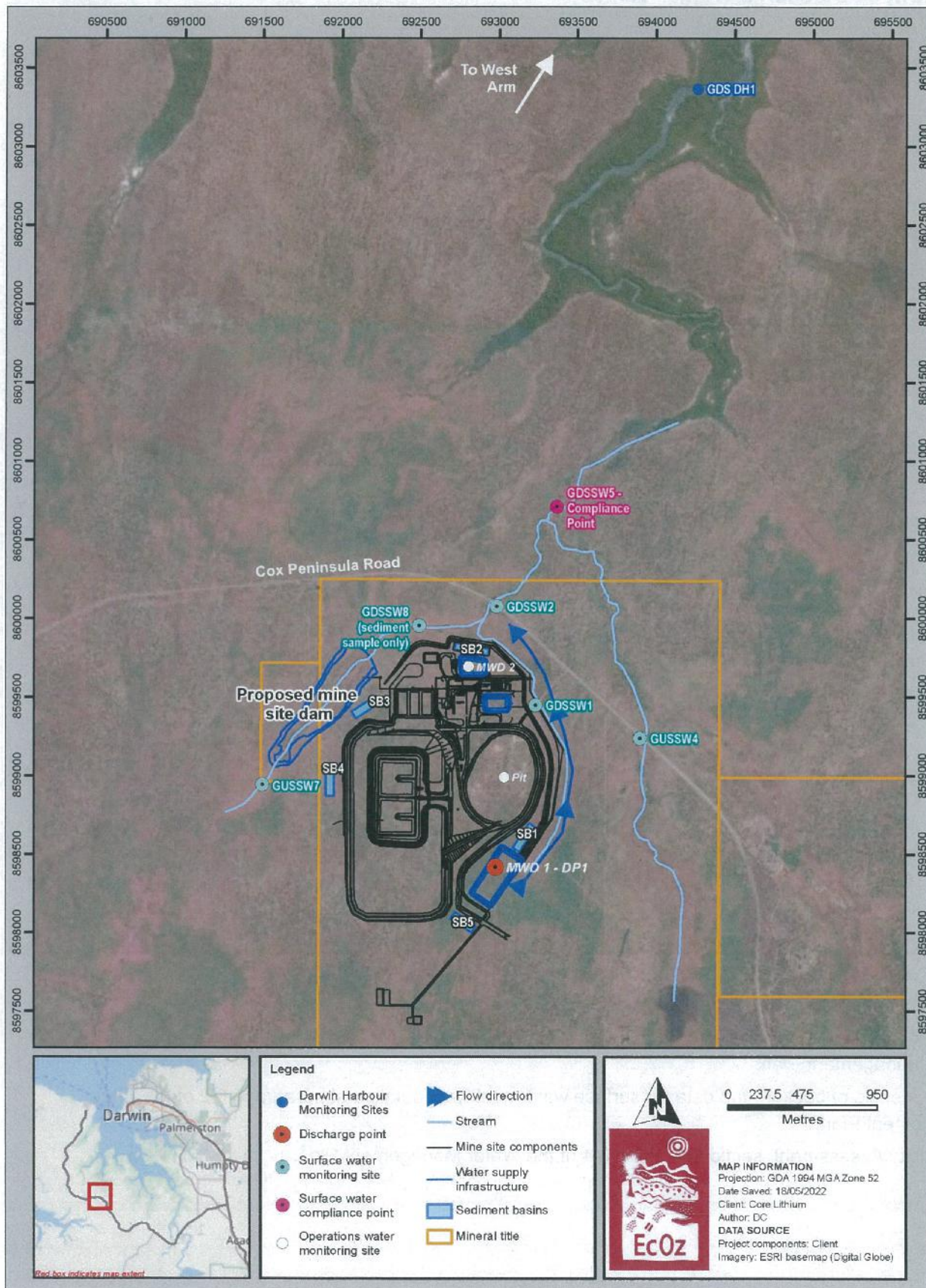
Term	Definition
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the Licensed Action.
Administering Agency	means the NT Government Department with responsibility for administering the Water Act.
Anniversary Date	annual anniversary of the Commencement Date.
Annual Return	an Administering Agency prescribed format for demonstrating and reporting compliance with the conditions of this licence.
ANZG (2018)	Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines .
Authority Certificate	a certificate issued under s 22(1) of the <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> (NT). An Authority Certificate permits a licensee to carry out work on land with or within the vicinity of a sacred site.
business days	a day not Saturday, Sunday or a public holiday, in Darwin, Northern Territory.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the Licensed Action before, during and after the Licensed Action which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the Licensed Action.
contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and Licensed Action.
contaminant	has the meaning given in section 4 of the WMPC Act.
discharge	releasing or allowing a liquid, gas or other substance to flow out from where it has been confined.
Dry season	means 1 May to 31 October.
Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the Licensed Action and that may cause environmental harm.
land	includes water and air on, above or under land.
Licensed Action	the Licensed Action as described on the covering page of this licence.
Linear Interpolation	a method to construct new data points within the range of known data points. $y = y1 + ((x - x1) * ((y2 - y1) / (x2 - x1)))$ y in the unknown concentration between known concentrations y1 and y2 y1 in the first known concentration y2 is the second known concentration x is the day of the unknown concentration y x1 is the day of the first known concentration y1 x2 is the day of the second known concentration y2

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Term	Definition
litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
NATA	National Association of Testing Authorities, Australia.
non-compliance notification	an Administering Agency prescribed format for notifying the Administering Agency of a non-compliance.
plant and equipment	all material items used in association with the Licensed Action, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
pollution	has the meaning given in section 4 of the WMPC Act.
public entrance	access to the licensed premises that is utilised by the public.
Qualified Person	a person registered under Section 68 of the WMPC Act.
qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Register	the register available at the website of the Northern Territory Environment Protection Authority (NT EPA).
waste	takes its meaning from the term in the WMPC Act.
wastewater	water that contains a contaminant or waste.
Water Act	<i>Water Act</i> (NT)
Wet season	means 1 November to 30 April and for the purposes of Appendix 3 includes any part of the Dry Season that discharge is occurring.
WMPC Act	<i>Waste Management and Pollution Control Act 1998</i> (NT)

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 1: Map of Discharge Point, Compliance Point and Monitoring Sites



WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 2 : Discharge Trigger Values

Sampling Points				Compliance Point
Site Code				GDS SW5
Easting				693374
Northing				8600709
PARAMETER	Abbrev.	Units	Analysis	Trigger Values
Environmental Field Data				
pH	pH	pH	In situ	5.2-6.6 ²
Electrical conductivity	EC	µS/cm		250 ¹
Turbidity	NTU	NTU		12 ³
Dissolved oxygen	DO	% sat.		70-92 ²
Nutrients				
Total Nitrogen	TN	µg/L	Unfiltered	200 ³
Total Phosphorus	TP			10 ³
Metals and Metalloids				
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	70 ³
Arsenic	As			13 ¹
Cadmium	Cd			0.2 ¹
Chromium	Cr			1 ¹
Copper	Cu			1.4 ¹
Iron	Fe			110 ³
Lead	Pb			3.4 ¹
Lithium	Li			430 ⁴
Mercury	Hg			0.6 ¹
Nickel	Ni			11 ¹
Zinc	Zn			8 ¹

Key:

¹ ANGZ (2018) 95% species protection, freshwater.

² 20th and 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan.

³ 80th percentile of background data for surface water quality as detailed at paragraph 6.2 of the Water Management Plan.

⁴ Ecotoxicity Assessment, sections 8.3 and 8.4 of the Water Management Plan.

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 3: Surface Water Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Field Parameters																	
Flow	-	kL/day	In situ	D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	C	N/A	N/A	
Water Level	-	measure		D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	P, W	N/A	N/A	
pH	pH	pH		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Electrical conductivity	EC	µS/cm		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Turbidity	NTU	NTU		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Temperature	Temp	°C		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Oxidation Reduction Potential	OR	mV		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Dissolved oxygen	DO	% sat.		D	D	D	D	D	F	F	F	F	F	P, D	M	M ³	
Nutrients																	
Ammonia	NH ₄ ⁺	µg/L	Unfiltered (excluding FRP)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Oxides of Nitrogen	NO _x			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nitrate	NO ₃			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Nitrogen	TN			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Total Phosphorus	TP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Filterable Reactive Phosphorus	FRP			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Metals and Metalloids																	
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Arsenic	As			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Cadmium	Cd			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Chromium	Cr			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Copper	Cu			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Iron	Fe			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lead	Pb			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Lithium	Li			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Mercury	Hg			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Nickel	Ni			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Zinc	Zn			W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

WASTE DISCHARGE LICENCE (WDL248)

Sampling Points				Grants Downstream Surface Water 1	Grants Downstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Upstream Surface Water 7	Sediment Basins 1-5					Discharge Point	Mine Pit Sump	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GUS SW7	Sed1	Sed2	Sed3	Sed4	Sed5	MWD1 ¹	Pit	GDS DH1	
				Easting	693239	692989	693903	693374	691498	693167	692657	692155	691928	692775	693030	693037	694262
				Northing	8599446	8600073	8599235	8600709	8598943	6598623	8599847	8599446	8598961	8598072	8598504	8598990	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY													
Full elemental scan	-			A	A	A	A	A	A	A	A	A	A	A	A	A	
Treatment regents (condition Error! Reference source not found.)																	
Acrylamide ²	C ₃ H ₅ NO	µg/L	Total and Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	
Other																	
Sulphate	SO ₄	mg/L	Filtered (0.45 µm)	W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Calcium	Ca			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Chloride	Cl			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Sodium	Na			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Potassium	K			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Magnesium	Mg			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Carbonate	CO ₃ ²⁻			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Bicarbonate	HCO3			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Dissolved Solids	TDS			W	W	W	W	W	F	F	F	F	F	P, W	M	N/A	
Total Suspended Solids	TSS		Unfiltered	W	W	W	W	W	F	F	F	F	F	P, W	M	M ³	

Key:

- P = prior to discharge.
- C = continuous
- D = within 24 hours of commencement of discharge **and** daily during discharge. When no discharge is occurring monitoring will be on a weekly basis.
- W = within 24 hours of discharge **and** weekly during discharge. When no discharge is occurring monitoring will be on a monthly basis.
- F = weekly whilst discharging from sediment basins, Monthly during Wet season irrespective of discharge.
- M = monthly.
- A = Annually, at end of Wet season on recessional flows.
- N/A = not applicable.

¹ The sampling point in MWD1 will be located close to DP1 to ensure it is representative of discharge water quality.

² This sampling is only required where the licensee has conducted water treatment onsite using flocculants containing Acrylamide.

³ During Wet season only

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 4: Fluvial Sediment Monitoring Program

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1	
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Environmental Field Data												
pH	pH	pH		A	A	A	A	A	A	A	A	
Electrical conductivity	EC	µS/cm		A	A	A	A	A	A	A	A	
Moisture content		%		A	A	A	A	A	A	A	A	
Particle size distribution	PSD	%	<63µm ≥63µm & ≤2mm >2mm	A	A	A	A	A	A	A	A	
Aluminium	Al	mg/kg	<63µm sediment fraction	A	A	A	A	A	A	A	A	
Arsenic	As			A	A	A	A	A	A	A	A	
Cadmium	Cd			A	A	A	A	A	A	A	A	
Chromium	Cr			A	A	A	A	A	A	A	A	
Copper	Cu			A	A	A	A	A	A	A	A	
Iron	Fe			A	A	A	A	A	A	A	A	
Lead	Pb			A	A	A	A	A	A	A	A	
Lithium	Li			A	A	A	A	A	A	A	A	
Mercury	Hg			A	A	A	A	A	A	A	A	

WASTE DISCHARGE LICENCE (WDL248)

Sampling Points				Grants Downstream Surface Water 1	Grants Upstream Surface Water 2	Grants Upstream Surface Water 4	Grants Downstream Surface Water 5	Grants Downstream Surface Water 7	Grants Downstream Surface Water 8	Discharge Point	Grants Downstream Darwin Harbour 1	
				GDS SW1	GDS SW2	GUS SW4	GDS SW5	GDS SW7	GDS SW8	MWD1	GDS DH1	
				Easting	693239	692989	693903	693374	691498	692465	693030	694262
				Northing	8599446	8600073	8599235	8600709	8598943	8599942	8598504	8603365
PARAMETER	Abbrev.	Units	Analysis	FREQUENCY								
Nickel	Ni			A	A	A	A	A	A	A	A	
Zinc	Zn			A	A	A	A	A	A	A	A	
Other												
Sulphate	SO ₄	mg/kg	Soluble ion extract	A	A	A	A	A	A	A	A	
Calcium	Ca			A	A	A	A	A	A	A	A	
Chloride	Cl			A	A	A	A	A	A	A	A	
Sodium	Na			A	A	A	A	A	A	A	A	
Potassium	K			A	A	A	A	A	A	A	A	
Magnesium	Mg			A	A	A	A	A	A	A	A	

Key:

A = Annually during recessional flow (late Wet season/early Dry season)

WASTE DISCHARGE LICENCE (WDL248)

APPENDIX 5: Biota Monitoring Program

Project Name	Locations	Project Description	Report Frequency
Seagrass assessment	West Arm, Darwin Harbour	Seagrass monitoring to determine whether any observed change in seagrass distribution or composition has occurred in the marine waters of West Arm, Darwin Harbour. Monitoring should aim to determine whether any change identified is naturally occurring or related to mine operations.	Annually
Vegetation monitoring	Areas downstream of ML 31726	Monitoring of vegetation downstream of ML 31726 to determine if mining activities are impacting riparian vegetation communities.	Annually
Macroinvertebrate study	Darwin Harbour and Areas downstream of ML 31726	Survey of macro-invertebrate abundance and diversity in aquatic ecosystems. Data is used to monitor potential impacts from mine operations.	Annually during recessional flow (late Wet season/early Dry season)

ATTACHMENT B –PROCEDURE FOR SURFACE WATER SAMPLING



Procedure Surface Water Sampling



DOCUMENT CONTROL RECORD

Job	EcOz Environmental Consultants internal procedure
Document ID	202888-14
Author(s)	Emma Smith, Mike Welch, Casey Hawkey, Corinne Hutchinson

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2	-	E. Lewis	31 Jul 2020
3	-	J. Dymalla	20 Sept 2021
4	A. Faraone	J. Dymalla	1 Sept 2022

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1 INTRODUCTION

1.1 Purpose

To ensure sampling methods obtain samples representative of the surface water, and to ensure all sampling is consistent, undertaken in a safe manner and follows best-practice procedures in accordance with relevant standards.

1.2 Scope

This Procedure applies to all surface water sampling undertaken by EcOz Environmental Consultants (EcOz) personnel, noting that some sampling requirements may vary on a project-specific basis.

1.3 Standards and other requirements

To ensure the quality and accuracy of the measurements, sampling procedures have been developed in accordance with the following standards and guidelines:

- Australian Standard on Water Quality Sampling - *Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998);
- Australian Standard on Water Quality Sampling - *Part 4: Guidance on sampling from lakes, natural and man-made* (AS/NZS 5667.4:1998);
- Australian Standard on Water Quality Sampling – *Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998);
- Australian Standard on Water Quality Sampling – *Part 10: Guidance on sampling of waste waters* (AN/NZS 5667.10:1998)
- ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, Available: www.waterquality.gov.au/anz-guidelines
- ANZECC & ARMCANZ 2000, *Australian Guidelines for Water Quality Monitoring and Reporting*, National Water Quality Management Strategy Paper No 7, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

2 EQUIPMENT, SAFETY AND TRAINING

2.1 Equipment

The following equipment list is provided for guidance and personnel should consider project-specific sampling requirements when preparing for field sampling:

- **Map** showing monitoring sites.
- **GPS** – with coordinates uploaded for locating sample sites.
- **Site access or permit** requirements that may be required, such as keys, ID cards, contractor induction certificates, vehicle licence, Indigenous land access permit.
- **Job Safety Plan (JSP)**.
- **Field Data Sheets** – enough for all sample sites plus some spares – see Appendix A – EcOz Surface Water Sampling Field Data Sheet.
- **Folder/clipboard** and waterproof notebook.
- **Stationary**: Pens / pencils, permanent markers for completing sample bottle labelling
- **Sample bottles** obtained from relevant laboratories being used (e.g. ALS, Envirolabs, etc.). Ensure that specific bottles are obtained for each parameter to be tested and appropriate pre-treatment is undertaken (e.g. preservatives). Ensure sufficient sample bottles are available for each bore, a duplicate, split and field blank sample (see definitions in Section 4.2), and spare bottles, particularly the glass bottle types.
- **Insulated cooler** with frozen ice bricks or portable Engle fridge/freezer.
- **Field meters** to measure water parameters (e.g. pH, temperature, EC, DO, ORP, turbidity); calibrated on the day of sampling.
- **Calibration solutions** and copies of the EcOz Calibration Record Sheet (if in field for >1 day) or in the event of an issue with field meters – see Appendix B - Calibration Record Sheet.
- **Camera**
- **Polypropylene sampling jug** for collecting field measurements and filling sample bottles if unable to fill bottles directly from hose.
- **Sample pole**
- **Decon 90** solution mixed with deionised water (1:20) to clean equipment between sample sites.
- **Deionised water** for collection of field blanks and rinsing equipment between sample sites.
- **Syringes and filters** (for sampling dissolved metals/ ultra-trace nutrients etc).
- **Powder-free gloves**
- **Spare batteries** for camera, GPS and field test meters
- **Chain of Custody (COC)** forms from the relevant laboratories (one for bulk of samples and one for spilt samples).
- **Plastic sleeves** (snap-lock bags) to protect COC forms inside the insulated containers.

- **Consignment (Con) Notes** for freighting samples to laboratories (either using Toll, Australian Air Express or TNT depending on the client and sampling location), pre-filled as much as possible with relevant account number, laboratory address, contacts etc.
- **Communications equipment** (e.g. mobile/satellite phone, radio).
- **PPE** – see below.
- **Garbage bag** for used filters, syringes, gloves and other general waste generated during sampling.

2.2 OH&S requirements

A JSP must be completed for each sampling event which includes all project and personnel information including emergency contacts, and an assessment of the potential hazards and required hazard control measures. Standard potential hazards and hazard control measures are listed in Table 2-1 below.

Table 2-1. Standard hazard management for surface water sampling

Task	Potential Hazards	Hazard Controls
Driving to and around site	Animals on road	• Do not swerve to avoid hitting fauna on the road, slow down and maintain line • Avoid travelling on roads early morning, late afternoon and night
	Other vehicles	• Maintain good observation when driving • Even on quiet roads, always assume the possibility of an oncoming vehicle
	Road conditions	• Stay within speed limits and drive according to conditions
	Driver fatigue	• Regularly swap drivers and take breaks
	Flat tyres	• Carry spare tyres, jack and tools • All party members must be proficient in changing a tyre on the type of vehicle being used
	Getting lost	• Use GPS, maps and radio • Ensure at least two personnel if working in remote areas. • Prepare scheduled call-in procedure prior to leaving office and abide by this procedure • Agree on procedure in the event of a missed call-in (e.g. time to wait before calling emergency services)
	Bogging	• Avoid driving in wet areas • Carry vehicle recovery equipment • At least one party member must be proficient safe use of recovery equipment • Maintain communications (e.g. radio channel 40, sat phone) • Vehicle recovery only to be undertaken by personnel who have undertaken 4WD recovery training In areas of high risk, vehicles to travel in pairs, with the second vehicle not proceeding into boggy areas until first vehicle has made it through
	Mechanical failure	• Pre-start vehicle checks • Maintain communications (e.g. radio channel 40, sat phone)
Surface water sampling	Unsafe worksite	• Upon arrival to each site, perform an assessment of potential risks/dangers unique to the area and mitigate accordingly (Take 5)
	Cuts/abrasions	• Wear full PPE when performing sampling
	Tripping/slipping/strains	• Care taken walking in rough / overgrown terrain (or seek alternative route) • Use appropriate lifting techniques (e.g. bend knees), 2 person lifts and lift within capabilities
	Dehydration/heat	• Adequate water and electrolyte replacement carried for all personnel

	exhaustion	• Competent first aid trained person within sampling group • Correct PPE • First aid is readily available
	Sunburn	• Use sunscreen and wear correct PPE (e.g. hat, long sleeves)
	Fast flowing water	• Always sample with more than one person (one person to act as a spotter) • Carry communications (e.g. radio/mobile) • Use sample pole to sample sites with fast flow • All personnel must be competent swimmers
	Snake bite	• Correct PPE (e.g. sturdy boots, long pants/gators) • All personal have first aid training • Care taken when stepping over logs • Each person to carry snake bandage at all times
	Dangerous animals (e.g. cattle, buffalo, pigs)	• Assess each site for potential dangerous animals upon arrival (Take 5) • Maintain safe distance from any animals • Shelter in vehicle if required
	Ticks	• Check body and clothing for ticks at the end of each day • Shirts to remain tucked into the trousers • Advising other personnel of the locations where ticks have been seen/recorded • Ticks to be carefully removed to avoid squeezing the tick • Seek medical advice if a tick bite is found
	Crocodiles	• Assess sample site for crocodiles and evidence of slides upon arrival • Do not enter water • Use sample pole to maintain distance from edge • Always have two people with one person acting as a spotter at any given time • Always have radio or satellite phone to ensure communication in case of emergency
Sampling contaminated sites	Getting lost finding sites	• Always carry a GPS and maps • Ensure all personnel are fit and capable of task prior to leaving • Make GPS waypoint of vehicle prior to leaving • Carry a radio and sat phone • Avoid travelling to unknown areas if no clear path • Prepare scheduled call-in procedure prior to leaving office and abide by this procedure • Agree on procedure in the event of a missed call-in i.e. time to wait before calling emergency services
	Working around contaminated water	• Assess site for safety considerations prior to commencing work • Have an evacuation plan and recovery equipment prepared • Use sampling pole to allow distance from edge • Know the location of the nearest emergency shower and whether it is in operating condition • Take care near edges and have a spotter present • Do not work near edge of if risk of falling • Always carry a radio and sat phone to ensure communication
	Acidic water in pits and drains	• Avoid coming into contact with water • Wear gloves if handling water
	Exposure	• Adequate water and electrolyte replacement carried • Correct PPE • First aid is readily available

Standard PPE should be worn, including:

- Sturdy boots (steel cap and laces if industrial/mine site).
- Hat, safety/polarised sunglasses, sunscreen.
- Protective gloves for manual handling.
- Hard hat (if required for working around machinery)

- Long pants and shirt (high-visibility if industrial/mine site).

2.3 Training and competency

All personnel conducting water sampling shall be familiar with this Procedure and have received field training from experienced personnel. This includes training in sample collection, using and calibrating field meters.

All personnel conducting water sampling shall have a current first-aid certificate.

Each field party conducting sampling in a remote area with difficult or boggy access must include a member trained in vehicle recovery who has completed the 4WD training course and has field experience in vehicle recovery.

2.4 Site access

Personnel must ensure that any required permits (e.g. Indigenous land access permit), and/or land access permissions are obtained prior to undertaking water sampling.

Personnel must also ensure that all site induction requirements are fulfilled, ID cards (e.g. Aviation Security ID Card (ASIC), Maritime Security ID Card (MSIC)), licences, contractor induction cards/certificates and keys are obtained prior to mobilising to site.

Ensure that all possible site restrictions are known, such as possession and/or use of mobile phones, cameras, flammables, particular chemicals, prior to mobilisation to site.

3 PROCEDURE

3.1 Contamination prevention precautions

- 3.1.1 Keep hands away from sample bottle openings and the inside of bottle lids. Be aware that sources of contamination include permanent markers, insect repellent, sunscreen, deodorant, dust and perspiration.
- 3.1.2 Always wear powder-free gloves and use new gloves for each sample site.
- 3.1.3 Do not allow the opening of sample bottles and bottle lids to touch the ground.
- 3.1.4 Only clean, sealed and pre-prepared preserved sample bottles obtained from a NATA accredited laboratory are to be used for laboratory samples.
- 3.1.5 Ensure equipment is cleaned thoroughly after each sample site with Decon 90 solution (5 %) and rinsed with deionised water.
- 3.1.6 Ensure sample bottles are filled to the top leaving no headspace unless otherwise specified by the laboratory.
- 3.1.7 Do not overfill the bottle, particularly not for sample bottles with preservative.
- 3.1.8 For the bottles containing preservative, after sample collection, put the lid on and shake immediately.
- 3.1.9 After sample collection, ensure all sample bottles are tightly sealed and stored upright in an insulated cooler (with ice-bricks) or fridge at <4°C. Do not use loose ice as this can contaminate the samples if they are left in the melted ice water.

3.2 Preparation

- 3.2.1 Prior to undertaking a field sampling trip, ensure that a JSP has been completed and signed by all field personnel, and by the Project Manager.
- 3.2.2 Gather all equipment listed in Section 2.1.
- 3.2.3 Bottles may need to be ordered from the laboratory. Contact the laboratory for advice on what bottles are required (certain analytes require particular bottles and preservatives).
- 3.2.4 Put together a package of sample bottles for each site (i.e. in a large snap-lock bag), including bottles for duplicates, split samples and blanks.
- 3.2.5 Label each bottle with the site name (or duplicate, split, blank) and sampler's name. Sample date and time are to be labelled in the field at the time of sample collection.
- 3.2.6 For metals analysis, tick the box on the bottle label for either *dissolved metals field filtered* or *total metals*, depending on whether samples for metals analysis will be filtered in the field.
- 3.2.7 Calibrate the field test meters (e.g. pH, temperature, EC, DO, ORP, turbidity) according to the manufacturer's instructions. Complete a Calibration Record Sheet (Appendix B).

- 3.2.8 Ensure camera and GPS (if required) are fully charged and have sufficient memory.
- 3.2.9 Depending on the number of sites being sampled, prepare a sufficient volume of Decon 90 solution (i.e. 1:20 Decon:deionised water) to use for cleaning sampling equipment in the field.
- 3.2.10 Print out the required number of blank Surface Water Sampling Field Data Sheets (Appendix A), laboratory COC forms, maps and bore reports.
- 3.2.11 Ensure that ice bricks have been put in the freezer, or the Engel fridge has been sufficiently chilled, to keep samples cool as they are collected.

3.3 Travel to sample sites

- 3.3.1 Review JSP prior to travel to ensure that all potential hazards have been assessed and personnel are familiar with any risks.
- 3.3.2 When undertaking routine surface water sampling, it is best that at least one of the field team has previous experience sampling all the sites.
- 3.3.3 Refer to maps, photos and marked GPS locations to confirm the correct location.

3.4 Field observations and in-situ parameters

- 3.4.1 Fill in the Surface Water Sampling Field Data Sheet with the sample site ID, date, time, your name, field observations such as weather conditions, water colour, clarity, water depth, flow rate, any obvious pollution (e.g. rubbish, odours, surface film, etc.), flora/fauna present, and any other issues that may affect the samples.
- 3.4.2 Wear powder-free gloves when collecting field samples.
- 3.4.3 Ideally, in-situ readings (pH, temperature, DO, EC, ORP and turbidity) are collected directly from the water body being sampled by immersing the meters in the water to be sampled. However, if safety and/or logistical issues preclude this, field readings may need to be taken from the sampling jug. In this case the DO sensor will need to be slowly swirled in the sampling jug to move water over the membrane. The sample pole can be used to collect water from water bodies that are difficult to access.
- 3.4.4 Record the in-situ parameters just below the water surface (between 0.2 and 0.5 m depth), depending on water depth. Alternatively, if collecting samples from various depths (e.g. depth profiling), ensure the field meter is lowered to the desired depth.
- 3.4.5 If collecting field readings from the sampling jug, collect a representative water sample using the jug, or sampler mounted on a sampling pole. Ensure that the jug/sampler is fully immersed and rinsed at least 3 times, tipping the rinse water away from (e.g. on the bank), or downstream of, where the sample is to be collected.
- 3.4.6 If sampling flowing waters, ensure that you are standing downstream of where you are sampling so as not to contaminate the sample.
- 3.4.7 Record all the readings on the Surface Water Sampling Field Data Sheet; one sheet to be filled out per site.

3.5 Laboratory sample collection

- 3.5.1 Wear powder-free gloves when collecting laboratory samples.
- 3.5.2 Take out the required pre-labelled sample bottles. Label bottles with sample date and time.
- 3.5.3 Keep hands away from sample bottle openings and the inside of bottle lids. Be aware that sources of contamination include permanent markers, insect repellent, sunscreen, deodorant, dust and perspiration.
- 3.5.4 If safe to do so, fill bottles directly from the water body being sampled, otherwise use the jug and/or the sample pole to collect a water sample. Be careful not to overfill bottles which contain preservatives. If the flow rate is very rapid, it may be required to fill the bottles containing preservative using a jug (pre-cleaned with Decon 90 and deionised water). Rinse the jug three times with water being sampled (disposing of rinse water away from, or downstream of, sample collection point) prior to filling laboratory bottles from jug.
- 3.5.5 For samples requiring field filtering (e.g. dissolved metals), draw some water from the jug into a syringe, put a filter on the end of the syringe, rinse the filter by pushing a few drops of the sample through onto the ground, then fill the bottle leaving no headspace. Depending on the size of the syringe, it may be necessary to draw several syringes-full of water to fill the sample bottle.
- 3.5.6 Once all bottles are filled and tightly capped with lids, place them upright into the insulated cooler and store below 4°C.

3.6 Collection of field blanks, split samples and duplicates

- 3.6.1 To collect a field blank, simply follow the steps outlined in Section 3.5 above using laboratory supplied rinsate water/field blank water instead of water from the site being sampled.
- 3.6.2 For split samples and duplicates, repeat all the above steps outlined in Section 3.5 above at the site(s) chosen for these samples (generally at least 1 in 10 sample sites). Label the sample bottle as 'Split' or 'Duplicate'. Be sure to note collection of these samples on the Surface Water Sampling Field Data Sheet otherwise it will not be possible to track which site these samples were collected from because the site name is not permitted to be recorded on the bottle.

3.7 Cleaning of field equipment

- 3.7.1 After sampling each site, rinse all sampling equipment (e.g. jugs, field meter probes) with the pre-mixed Decon 90 solution, followed by deionised water.
- 3.7.2 Dispose of used filters, syringes, and gloves appropriately. Consumable sampling equipment are single use only and fresh gloves, syringes and filters are required at each site.

3.8 Sample dispatch

- 3.8.1 Once sampling is completed, pack the samples securely in an insulated cooler with ice bricks. Ensure that samples have sufficient contact with the ice bricks to stay as cool as possible.
- 3.8.2 Fill out the COC, put in a plastic sleeve (snap-lock bag) and place inside the insulated container.
- 3.8.3 If required, provide a copy of the COC to the client.

3.8.4 Samples must be dispatched to a NATA accredited laboratory within the required holding times, noting that:

- Samples must be dropped off at the receiving laboratory no later than 14:00 each day.
- Sample dispatch on Fridays and weekends is not acceptable for sample analysis with short holding times (e.g. microbiological, nutrients) as samples will not be transported from Darwin until the following Monday. Other parameters with longer holding times can be kept in a fridge until dispatch on Monday.

3.8.5 If sending samples direct to the laboratories:

- Tape up an insulated cooler and label with an address, consignment note and the appropriate handling stickers (e.g. fragile, keep chilled etc.).
- Deliver samples direct to freight company or organise pick-up, ensuring that samples will be dispatched in time to meet laboratory holding times (usually by 16:00 on day of sampling for overnight priority service).

3.8.6 Remember to also prepare a small insulated cooler containing the split sample for sending to a separate laboratory.

3.9 Data management

3.9.1 All Surface Water Sample Data Sheets should be saved to the project file Field and Lab Data folder on MFiles, and all photographs are to be saved to the project folder at Z:\02 EcOz Resource Materials\01 Image Bank, and labelled according to the relevant site name.

3.9.2 Correspondence and document from the laboratory should be saved to the project file Field and Lab Data folder on MFiles (e.g. results, sample receipt notices, certificate of analysis and QA/QC information).

4 ACRONYMS AND DEFINITIONS

4.1 Acronyms

COC	Chain of Custardy
DO	Dissolved Oxygen
EC	Electrical Conductivity
JSP	Job Safety Plan
mbgl	Meters below ground level
NATA	Nation Association of Testing Authorities
ORP	Oxidation-Reduction Potential
pH	Measurement of an aqueous solutions acidity or basicity. Ranges between 1 and 14.
PPE	Personal Protective Equipment
SWQ	Surface Water Quality
TOC	Top of Casing

4.2 Definitions

- QA/QC** Quality Assurance/Quality Control, which may include:
- Duplicate sample – collected during each sampling event (e.g. 1 duplicate for every 10 samples collected) to detect both natural environmental variation, and any errors from filed sampling methodologies.
 - Split sample - collected during each sampling event (e.g. 1 split for every 10 sample sites) and sent to a different laboratory to detect any Lab-based discrepancies.
 - Field blank sample – collected during each sampling event to evaluate potential contamination from personnel and/or sampling equipment.

APPENDIX A SURFACE WATER SAMPLING FIELD DATA SHEET

Surface Water Field Data Sheet

PROJECT:		DATE and TIME:		
SITE NUMBER / NAME:				
SAMPLERS NAME:		PHOTO NOS:		
EASTING:		NORTHING:		
GENERAL OBSERVATIONS				
WATER COLOUR		PRESENCE OF AQUATIC FAUNA		
ODOUR		AQUATIC PLANTS		
SURFACE SCUM/ALGAE		EROSION		
RIPARIAN CONDITION		GROSS POLLUTANTS		
WATER CONDITIONS				
APPROX DEPTH OF WATER (m)		WATER FLOW (m/sec)		
WEATHER CONDITIONS				
Cloud cover/ precipitation/ wind conditions:				
FIELD SAMPLES				
Parameter	Unit	Result	Meter Used	Date of calibration
pH				
Temperature				
E.C				
TDS				
Salinity				
D.O				
ORP				
Turbidity				
LABORATORY SAMPLES				
Analytes Requested		Containers Used	QA/QC Samples Collected (circle)	
			Duplicate Split Blank	

Any other comments or special procedures (see over):

APPENDIX B FIELD METER CALIBRATION RECORD SHEET

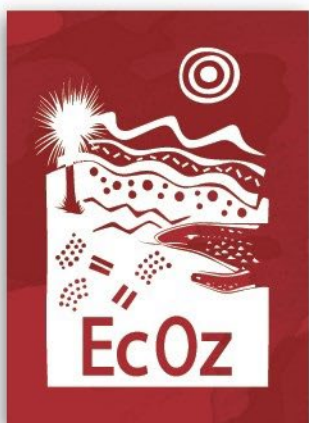


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Probe Calibration Record Sheet

Date:				Calibrated By:			
Serial # of Probes Calibrated:		pH:		EC:		DO:	
Turbidity:							
Pre-Calibration Reading:				Post Calibration Reading (Checking):			
pH							
pH 7.00 Standard:		pH 4.01 Standard:		pH 7.00 Standard:		pH 4.01 Standard:	
pH:	mV:	pH:	mV:	pH:	mV:	pH:	mV:
For pH 7.00: mV should be zero $\pm$ 50 mV.							
For pH 4.01: mV should be +165 to +180 mV greater than the pH 7.00 mV value.							
pH readings (circle): Good Some Problems explain here:							
EC							
Temperature at time of calibration:				Relative calibration value:			
EC Calibration Solution Used (circle): 447 μ S/cm 1413 μ S/cm 2570 μ S/cm 12880 μ S/cm							
EC μ S/cm:	TDS g/L:	Sal ppt:	EC μ S/cm:	TDS g/L:	Sal ppt:	EC μ S/cm:	TDS g/L:
EC readings (circle): Good Some Problems explain here:							
Turbidity							
Turbidity 0 NTU		Turbidity 124 NTU		Turbidity 1010 NTU			
Pre cal:	Post cal:	Pre cal:	Post cal:	Pre cal:	Post cal:	Pre cal:	Post cal:
Turbidity readings (circle): Good Some Problems explain here:							
DO							
Barometric Pressure (mmHg) set for DO: (Look up local hPa on BeM usually around 1010)				DO reading after stabilization:			
DO readings (circle): Good Some Problems explain here:							
ORP							
240 MV standard							
ORP Pre calibration:				ORP post calibration:			
Probes require servicing? (e.g. DO membrane needs changing, probes need to be cleaned or sent away, batteries need replacing)							
						Actioned (tick): ☐	
						Date:	
Any other actions required? (e.g. order more calibration solutions or DO replacement membranes)							
						Actioned (tick): ☐	
						Date:	

Calibrator's Signature:



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ATTACHMENT C – FIELD SHEETS FROM THE DARWIN-DALY AUSRIVAS MANUAL

6. APPENDIX 1 – FIELD SHEETS

FIELD SHEETS AUSRIVAS - Darwin Daly regional Models

Date	Site Code	Site Name	Field Team
------	-----------	-----------	------------

GPS coordinates: (*predictor variables family level model*):

Zone (UTM)	Easting	Northing	Datum
------------	---------	----------	-------

Landholders and contact details

Site comments, observations

ACCESS SKETCH

SITE NAME

SITE CODE

Indicate any features that assist locating exact sample site on subsequent trips.

WATER QUALITY

Time	Instrument	Instrument Serial No.
pH	units	E.C.
D.O.	mg/L	Water Temperature
Turbidity	NTUs	Instrument and serial number

Water samples for laboratory water quality analysis

(ALKALINITY is a *predictor variable for genus level model*)

Bottle lable	Analysis
	Alkalinity

Observations relating to water quality (e.g. water oil, scum, foam, sediment odours)

MACROINVERTEBRATE SAMPLING

EDGE

Length sampled _____m

Collected by _____

No. of containers used _____

Edge description

- ☐ Vertical 90°
- ☐ Angled 45-90°
- ☐ Undercut

Edge habitat mainly composed of roots from

- ☐ Paperbark / Melaleuca ☐ shrub
- ☐ other common riparian trees ☐ grass

Edge habitat

- ☐ roots covered by algae ☐ overhanging vegetation

Habitat velocity & depth

Flow meter serial no. _____ Fan set no. _____

(predictor variable genus level model)

Meter Reading (Revolutions per 40s)				Habitat depth (cm)		
1	2	3	Fan details	1	2	3

Stream Width (at water level) *(predictor variable genus and family level models)*: six measurements or estimations are taken in a 100m reach upstream of the macroinvertebrate sampling site.

Number	1	2	3	4	5	6
Width (m)						

- ☐ measured ☐ estimate only

Comments

DESCRIPTION OF THE REACH (reach 100 m upstream of sample site)

Habitats within 100 m reach

Sand/Silt bed	☐	Riffle	☐
Gravel/Rock bed	☐	Run	☐
Macrophytes	☐	Pool	☐
Snags	☐		

Description of stream characteristics

Width between top of levee banks (bankfull width) _____ m

Other levees ☐

Height of levee bank from water surface _____ m

Flow observable ☐

RIPARIAN ZONE (within 100 m reach)

Riparian zone width -left bank (facing downstream) _____ m
 -right bank _____ m

Riparian vegetation type

Monsoon-vine forest/Rainforest	☐	Riparian shrubland	☐
Riparian forest	☐	Riparian grassland	☐
Riparian woodland	☐	Other: _____	

Weeds ☐

Evidence of fire

Riparian Zone	☐
Beyond Levee Banks	☐

Cattle access ☐

Comments

SKETCH OF 100 M REACH

Indicate: ■ water quality measurements macroinvertebrate sample sites location of vehicle access
• water sample collection width measurements
✎ location of Photographs direction of flow



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APPENDIX B SITE DATA VEGETATOIN DESCRIPTIONS

Site MVS1 – *Lumnitzera racemosa*, *Bruguiera exaristata*, *Avicennia marina* low open forest over *Fimbristylis* sp. and *Xerochloa imberbis* mid sparse tussock grassland

NVIS Code: T6c

Location (GDSA94, z52): 694035E, 8601220N

Upper 1: Mid open forest dominated by *Lumnitzera racemosa* and *Avicennia marina*. Height ranging from 3 – 6 m.

Mid 1: *Lumnitzera racemosa*, *Ceriops tagal*, *Bruguiera exaristata*, and *Avicennia marina* Height ranging from 1 – 3 m tall.

Ground 1: Sparse tussock grassland (30 – 35 % cover) dominated by *Cyperus* sp., *Acrostichum speciosum*., *Xerochloa imberbis* and some mangrove recruits <1 m tall.



Land unit (Greater Darwin 25K) – 9b Marine

Landform: Mangrove flat near tidal creek

Soils: Brown sandy loam soils, mottled orange/ tan surface soils.

Drainage: Moderate to well drained

Fire history: No fire impact

Weeds: Absent

Other disturbances: Pig tracks and diggings

Hydrology: Creek not flowing at time of survey, some aquatic fish present, no sediment, scattered leaf litter and pebble creek bed.

Site RVS2 – <i>Melaleuca viridiflora</i> mid woodland over <i>Acacia plectocarpa</i> mid open shrubland over <i>Germainia grandiflora</i> mid tussock grassland	
NVIS Code: T7i	
Location (GDA94, z52): 693834E 8601132N	
Upper 1: Mid (10 – 15 %) woodland dominated by <i>Melaleuca viridiflora</i> . Height ranging from 10 – 14 m tall.	
Mid 1: Mid (50 – 60 %) shrubland dominated by <i>Acacia plectocarpa</i> , <i>Lumnitzera racemosa</i> (on the edge of creek) and <i>Avicennia marina</i> (in creek channel). Other species include <i>Hibiscus tiliaceus</i> , <i>Wrightia saligna</i> , and <i>Petalostigma pubescens</i> . Height ranging from 3 – 5 m tall.	
Ground 1: Mid tussock grassland (70 % cover) dominated by <i>Germainia grandiflora</i> , <i>Eriachne trisetata</i> and <i>Sorghum intrans</i> . Mangrove fern, <i>Acrostichum speciosum</i> also present fringing the creekline.	
	
Land unit (Greater Darwin 25K) – 6b Drainage system	
Landform: Upper creek bank, adjacent to main creek channel	
Soils: Dark brown loam/ sandy clay soils	
Drainage: Moderate to well drained	
Fire history: Burnt a few years ago	
Weeds: Hyptis present (only a few scattered)	
Disturbance: Pig tracks	
Hydrology: Some creek flow at time of survey, some aquatic fish and mosses present, no sediment and clear water	

Site SVS3 – *Melaleuca viridiflora*, *Erythrophleum chlorostachys* and *Corymbia polycarpa* mid woodland over *Lophostemon lactifluus* mid open shrubland over *Sorghum intrans* mid tussock grassland

NVIS Code: T7i

Location (GDA94, z52): 693708E, 8600969N

Upper 1: Mid woodland (20 – 25 %) dominated by *Erythrophleum chlorostachys*, *Corymbia polycarpa* and *Melaleuca viridiflora*. Height ranging from 8 – 12 m tall.

Mid 1: Mid shrubland (40 – 45 %) dominated by *Lophostemon lactifluus*, *Melaleuca viridiflora*, and *Clerodendrum floribundum*. Height ranging from 4 – 6 m tall.

Ground 1: Mid tussock grassland (50 – 55 %) dominated by *Eriachne trisetia*, *Sorghum intrans*, and *Pandanus spiralis*.



Land unit (Greater Darwin 25K) – 6b: Drainage system

Landform: Drainage depression

Soils: Light brown/ grey sandy loam.

Drainage: Poorly drained

Fire history: Last season burn, 2023, fire scars present

Weeds: Annual mission grass, *Hyptis suaveolens*, and *Passiflora foetida* present.

Disturbance: Motorbike/ quad bike tracks

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