

Chapter 15
Water quality

ESMERALDA GRAPHITE PROJECT

aarc ENVIRONMENTAL SOLUTIONS
APEM Group

GRAPHINEX

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Glossary, acronyms and abbreviations

Acronym or Abbreviation	Meaning
AARC	AARC Environmental Solutions Pty Ltd
AEP	Annual Exceedance Probability
ANC	Acid Neutralising Capacity
ANZG	Australian and New Zealand Guidelines
AS	Australian Standard
BOM	Bureau of Meteorology
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
DESI	Department of Environment, Science and Innovation
DETSI	Department of the Environment, Science, Innovation and Tourism
DGV	Default guideline value
DLGWV	Department of Local Government, Water and Volunteers
DNRMMRRD	Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development
DO	Dissolved oxygen
DSITI	Department of Science, Information Technology and Innovation
EA	Environmental Authority
EC	Electrical conductivity
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1994*
EP Regulation	Environmental Protection Regulation 2019
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPP	Environmental Protection Policy
ESCP	Erosion and Sediment Control Plan
EV	Environmental values
GAB	Great Artesian Basin
GABORA	Great Artesian Basin and Other Regional Aquifers

Acronym or Abbreviation	Meaning
GDE	Groundwater Dependant Ecosystems
GES	General Ecological Significance
GL	gigalitre
GRF	Gilbert River Formation
GW	Groundwater
GWDB	Groundwater database
HDPE	High-density polyethylene
HMTV	Hardness modified trigger values
IECA	International Erosion Control Association
LC	Low capacity
MAW	Mine affected water
ML	Mining Lease
MLA	Mining Lease Application
NAF	Non-acid forming
NATA	National Association of Testing Authorities
PAF	Potentially acid forming
PDD	Pit Dewatering Dam
PRCP	Progressive Rehabilitation and Closure Plan
PWD	Process Water Dam
QLD	Queensland
QWQG	Queensland Water Quality Guidelines
RE	Regional Ecosystems
REMP	Receiving Environment Monitoring Program
ROM	Run-of-Mine
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
TOR	Terms of Reference
TSF	Tailings Storage Facilities
VM Act	*Vegetation Management Act 1999*
WMP	Water Management Plan
WMS	Water Management System
WQO	Water Quality Objectives

Acronym or Abbreviation	Meaning
WRD	Waste rock dump
WWP	Water monitoring program

15 Water quality

QLD Aus Graphite Pty Ltd (Graphinex) is seeking approval to develop the Esmeralda Graphite Project (the Project). This Project proposes the mining of the Esmeralda Granite Unit and on-site concentration of graphite ore on Mining Lease Applications (MLA) 100431 and MLA 100430.

This chapter describes the existing water quality (surface water and groundwater) within and around the Project and assess the Project's potential impacts. To support this application a range of technical studies were undertaken:

- Surface Water Impact Assessment (Appendix K), prepared by Engeny;
- Groundwater Impact Assessment (Appendix L), prepared by Hydrogeologist;
- Geochemistry Assessment of Mine materials and Tailings (Appendix U), prepared by RGS;
- Pit Void Water Quality Modelling (Appendix V), prepared by RGS;
- Terrestrial Ecology Assessment (Appendix E), prepared by AARC Environmental Solutions (AARC);
- Aquatic Ecology Assessment (Appendix D), prepared by AARC; and
- Stygofauna Assessment (Appendix F), prepared by EcoLogical Australia.

In addition to the assessment described above this chapter considers the following guidelines:

- Queensland Government, Water – EIS information guideline, ESR/2020/5312
- Queensland Government, Groundwater dependent ecosystems – EIS information guideline, ESR/2020/5301
- Queensland Government, Monitoring and Sampling Manual: Environmental Protection (Water) Policy, 2018
- Queensland Government, Application requirements for activities with impacts to water, ESR/2015/1837
- Queensland Government, Technical guideline - Wastewater release to Queensland waters, ESR/2015/1654
- Queensland Government, Using monitoring data to assess groundwater quality and potential environmental impacts, 2021
- Queensland Government, Stormwater and environmentally relevant activities, ESR/2015/1653.

Various other applicable guidelines have also been utilised and referenced throughout the technical reports.

Per the Terms of Reference (TOR) structure water resources (surface water and groundwater) have been addressed separately in Chapter 14, Water Resources.

15.1 Surface water

This section assesses the existing environmental values (EVs) of surface water quality, potential impacts of the Project, and the mitigation and management measures that will be implemented to minimise any impacts.

15.1.1 Environmental objectives

The detailed assessment presented in this chapter and the relevant appendices demonstrates that the Project will achieve the requirements of the TOR and, through this, the requirements of Schedule 8, Part 3, Division 1 and Division 2 of the EP Regulation.

Specifically, the Project will achieve item 2 of the performance outcomes for each surface water quality objective in satisfaction of Section 2(4) of Schedule 8 of the EP Regulation because the Project will be operated in a way that achieves all of the following:

- There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity.
- The storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillages or leaks.
- Contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water.
- The activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the site without prior treatment.
- The disturbance of any acid sulphate soil, or potential acid sulphate soil, will be managed to prevent or minimise adverse effects on environmental values.
- Acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered.
- Any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland.
- The activity will be managed so that adverse effects on environmental values are prevented or minimised.

Related to surface water quality, the Project will achieve item 2 of the performance outcomes for the wetlands environmental objective of Section 2(4) of Schedule 8 of the EP Regulation because:

- there will be no potential or actual adverse effect on a wetland as part of carrying out the activity; and
- the activity will be managed in a way that prevents or minimises adverse effects on wetlands.

The detailed assessment presented in this chapter and the relevant appendices demonstrates how the Project will achieve the performance outcomes for each surface water quality environmental objective.

15.1.2 Existing environment

15.1.2.1 Regional and local hydrology

The Project is located in Northern Queensland within the Norman River Catchment area, which drains north to the Gulf of Carpentaria (see Figure 15-3). The Norman River Basin has a total catchment of 49,000 km^2 with the main rivers being the Norman River, Clara River and Yappar River.

The key watercourses in the area surrounding the Project are described in the following subsections and shown in Figure 15-4. A detailed description of hydrological values is provided in Chapter 14, Water Resources.

Norman River

The Norman River, a significant QLD river, is defined as a watercourse under the *Water Act 2000* and has a catchment area of approximately 49,000 km^2. It flows through the townships of Normanton and Karumba before its outlet to the Gulf of Carpentaria. The Norman River joins with the Clara River around 100 km downstream of the Project. Other major tributaries of Norman River Include Yappar River (14km north of the site), Belmore Creek (originating in the Croydon township) and Spear Creek.

Warrigal Creek and Borer River

The Project is located immediately north of Warrigal Creek and the Borer River. Warrigal Creek, traverses through the eastern edge of the MLAs, joining Borer River 9km downstream of the site. Multiple braided channels make up the Warrigal Creek, covering a width of 120 m. The Borer River is formed from an anabranch of the Clara River, a stream order 6 watercourse with a sub catchment area of 2275 km^2, which flows towards Warrigal Creek. Borer River joins with Clara River 50 km downstream of the site before converging into Norman River. Borer River's proximity to the Production MLA is shown in Figure 15-3.

Unnamed waterway

There is one unnamed waterway (defined as a watercourse under the *Water Act 2000*) within the Project's MLA boundaries. The stream order 3 waterway tracks north westerly through the central line of the MLAs (Figure 15-1). The waterway is ephemeral with flow occurring immediately following rainfall events.

Wetlands

The Map of Queensland wetland environmental values identified several GES wetlands intersecting the Project area. These included both palustrine and riverine wetlands (DNRMMRRD 2026). Palustrine wetlands are primarily vegetated (with more than 30% emergent vegetation) non-riverine or non-channel environments of less than eight hectares. This includes billabongs, swamps, bogs, springs, soaks and similar features (DETSI 2013b). In comparison, riverine wetlands include all wetland and deepwater habitat that occurs within a channel. The channels can be naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. This includes rivers, streams, creeks, brooks, rivulets, canals, channels, and watercourses and tributaries (DETSI 2023).

Regional ecosystems associated with wetlands and waterways

In the Project area, Warrigal creek and the unnamed tributary of Warrigal creek are vegetated with River Red Gum (*Eucalyptus camaldulensis*) woodland to low woodland, with *Melaleuca* spp. along them. There are some areas of River Red Gum (*Eucalyptus camaldulensis*) low woodland, with Broad-leaved Paperbark (*Melaleuca viridiflora*), often in the smaller channels.

The wetlands are mapped as seasonal swamps with either Coolibah (*Eucalyptus microtheca*) and Broad-leaved Paperbark (*Melaleuca viridiflora*) woodland in closed depressions on alluvial plains, or Broad-leaved Paperbark (*Melaleuca viridiflora*) low woodland in shallow closed depressions on sand sheets (Table 15-1, Figure 15-2).

Table 15-1: Regional Ecosystems analogous with Wetlands in the study area

RE	Description	VM Act status	Wetland association
RE 2.3.26a	River Red Gum (*Eucalyptus camaldulensis*) woodland to low woodland, with *Melaleuca* spp., on fringes and in channels of minor watercourses	Least concern	Riverine
RE 2.3.26c	River Red Gum (*Eucalyptus camaldulensis*) low woodland, with Broad-leaved Paperbark (*Melaleuca viridiflora*), on fringes of minor watercourses in broad sand sheets	Least concern	Riverine
RE 2.3.55d	Seasonal swamp (wooded). Broad-leaved Paperbark (*Melaleuca viridiflora*) low woodland in shallow closed depressions on sand sheets	Least concern	Palustrine
RE 2.3.61c	Seasonal swamp (wooded). Coolibah (*Eucalyptus microtheca*) and Broad-leaved Paperbark (*Melaleuca viridiflora*) woodland in closed depressions on alluvial plains	Least concern	Palustrine

Flooding

The surface topography within the Project MLA areas is generally flat (Figure 15-5) which results in widespread flooding with interactions between the major waterways during significant flood events (Engeny 2026a). The surface topography in the vicinity of the MLA areas slope northwest at an average grade of 0.2%.

Flooding at the Project location is dominated by breakout from the northern banks of Warrigal Creek and the Borer River which are influenced by flooding interactions with other major waterways. Other key breakout flooding interactions relevant to the Project location are from Yapper River into Warrigal Creek (22 km and 40 km upstream of the Project) and from the Clara River into the Norman River (66 km upstream of the Project).

Flooding and associated risks are detailed further in Chapter 16, Flooding and regulated structures.

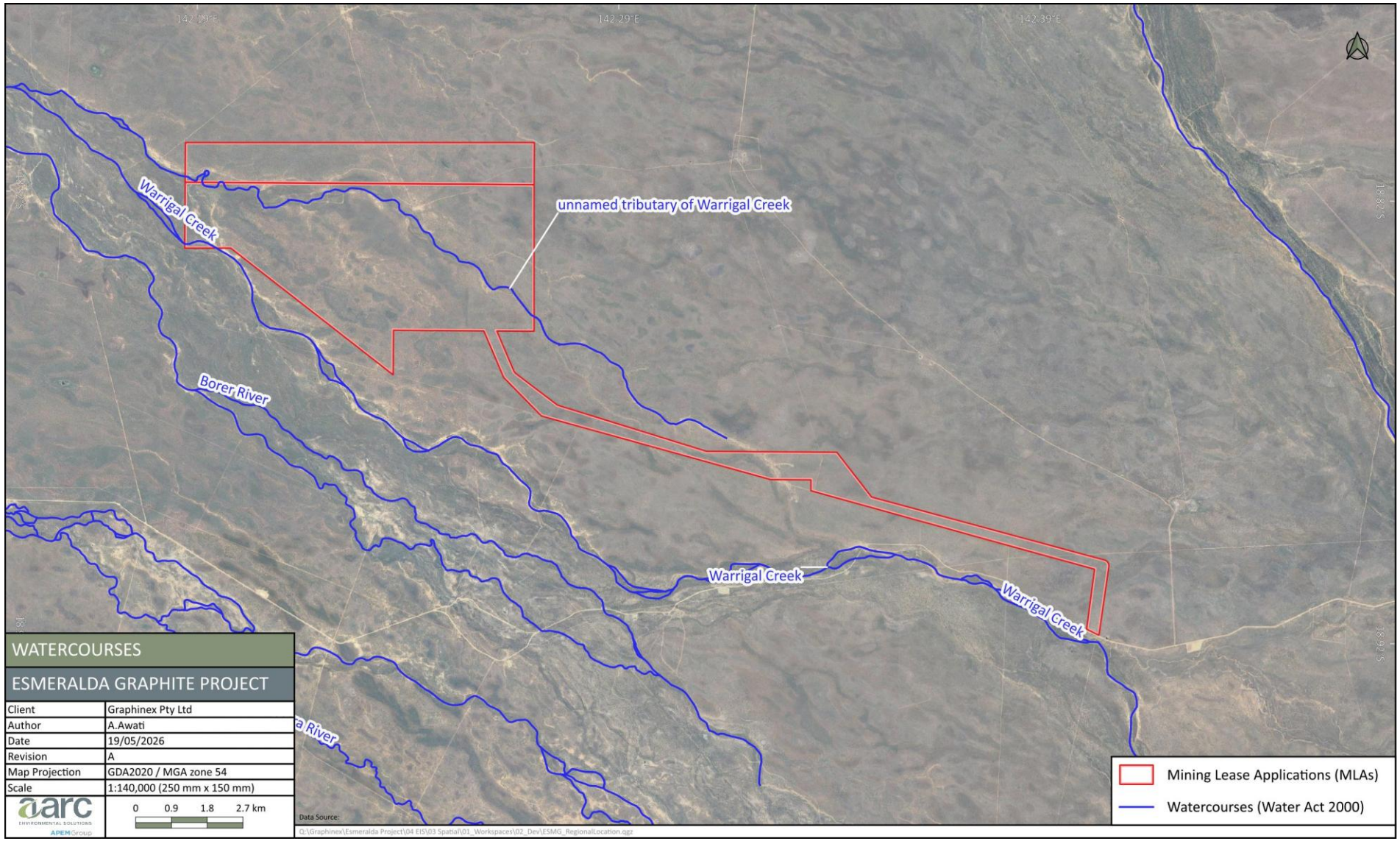


Figure 15-1: Unnamed tributary of Warrigal Creek

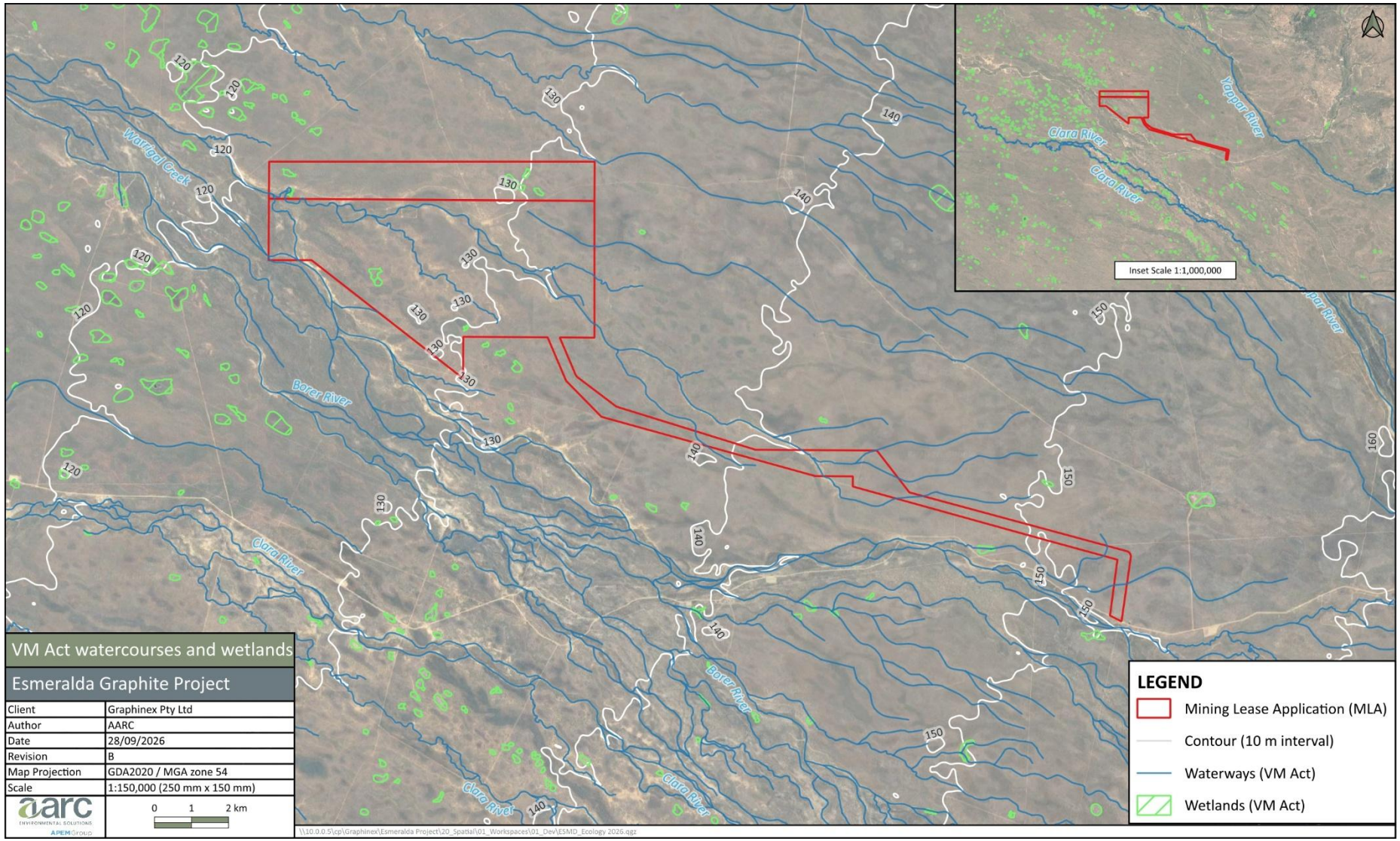


Figure 15-2: Wetlands

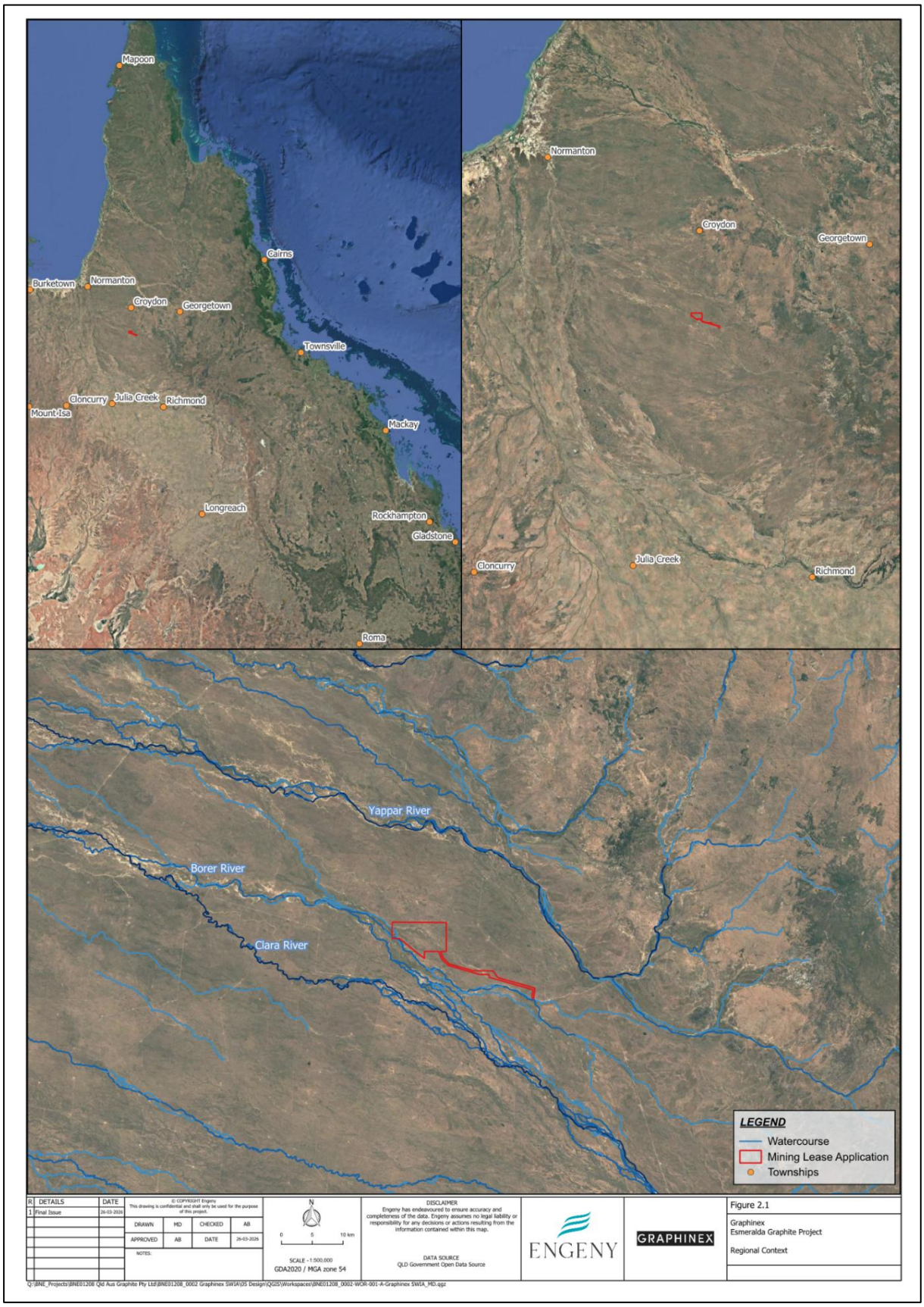


Figure 15-3: Regional context

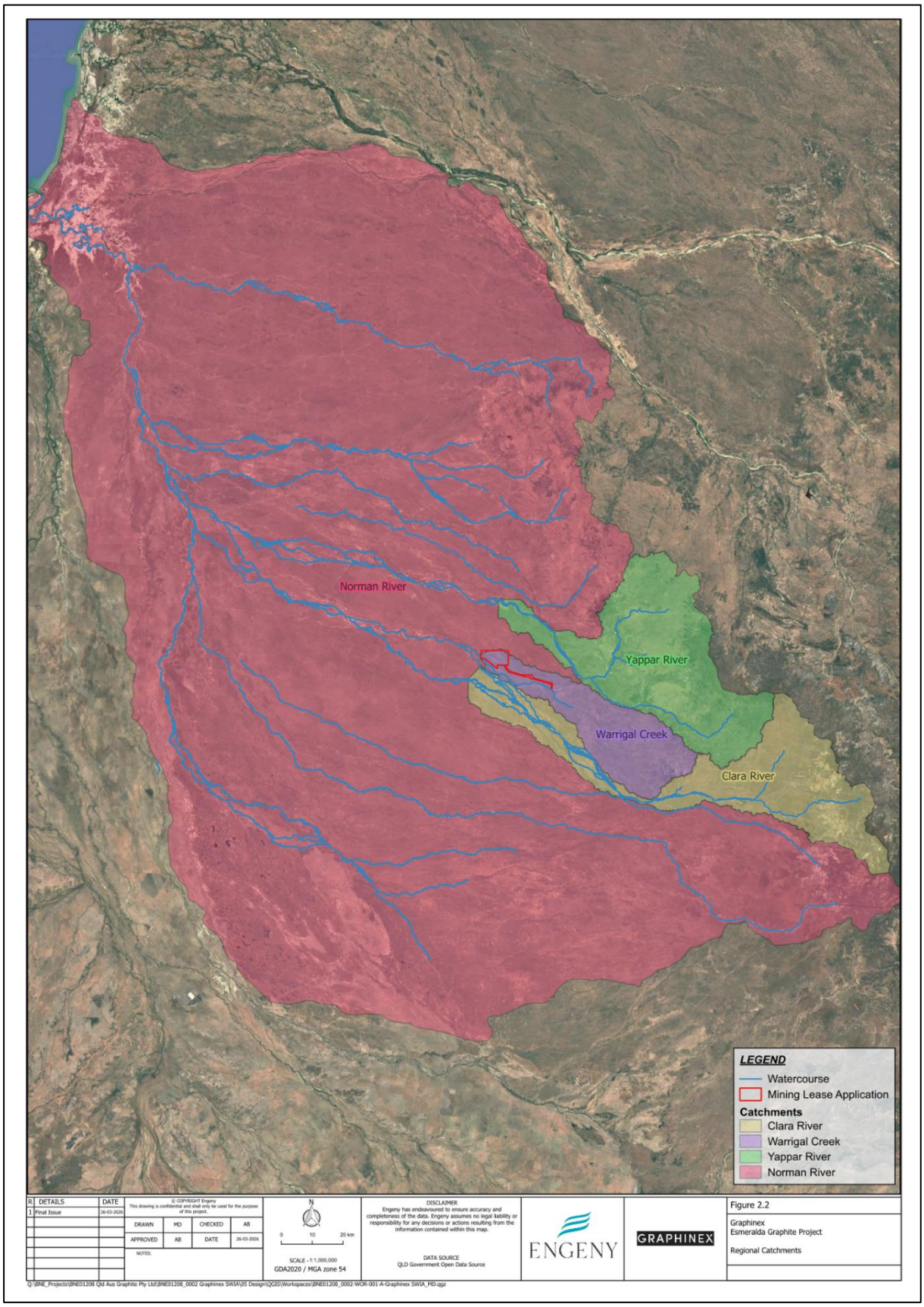


Figure 15-4: Regional catchments

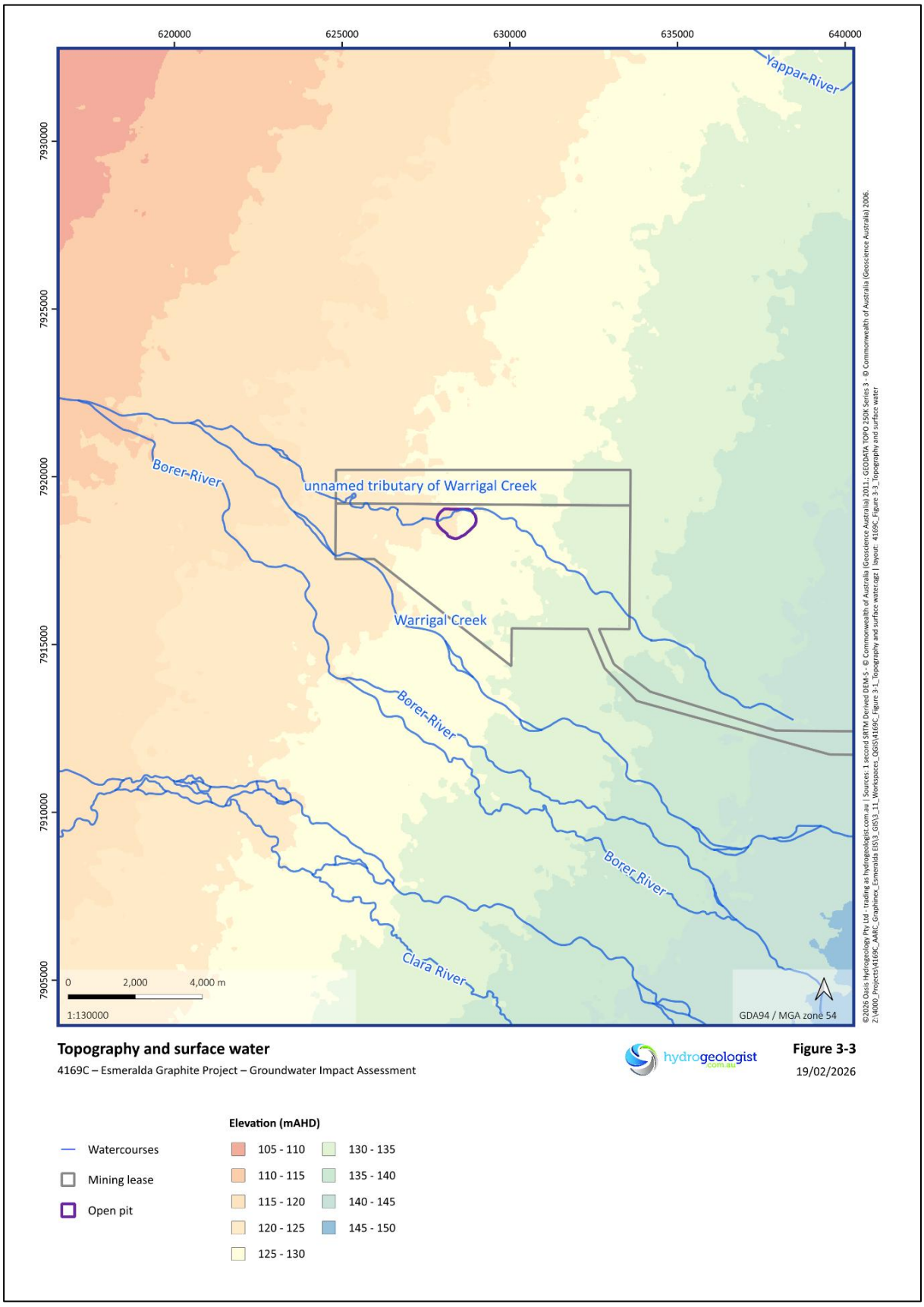


Figure 15-5: Topography and surface water

15.1.2.2 Surface water environmental values

As described in Chapter 14, Water Resources, there are no prescribed EVs for the Norman River catchment under the current legislation guidelines or policies. The Surface Water Impact Assessment (Engeny 2026) considered the following values (Table 15-2) to be relevant for the Project surface water, based on all available information and legislative requirements:

Table 15-2: Summary of environmental values

Environmental Value	Description
Aquatic Ecosystem.	There are no published ecosystem condition categories for the waterways surrounding the Project under the EPP Water and Wetland Biodiversity or other Queensland guidelines, such as the Queensland Water Quality Guidelines 2009 (QWQG). Having regard to the aquatic ecosystem classification frameworks provided in the EPP, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG), and the QWQG, the waterways surrounding the Project are likely to be classified as 'slightly to moderately disturbed'. This reflects the surrounding land use, which comprises pastureland, including native pastures and areas of current or potential sown pastures. These areas are therefore modified (i.e. not high value waters) but are unlikely to be sufficiently impacted to be considered highly disturbed.
Aquaculture and human consumption	The closest surface water entitlement on the Norman River is located 170 km downstream of the Project. The water obtained by the existing surface water entitlements and blended with Artesian Bore water are treated and used to supply Normanton and Karumba Townships (Carpentaria Shire Council 2025).
Agriculture	There are two existing surface water entitlements authorised under the Water Plan (Gulf) 2007 on the Norman River, 170 km downstream of the Project that have an authorised purpose for 'any' purpose.
Recreational uses	Flow within the Borer River is seasonal; however, segregated waterholes within the river channel can persist for longer periods of time into the dry season without additional inflows. It is not known if the Borer River is used for recreational use; however, it is possible that, when water persists within the channel, recreational purposes would include activities such as swimming (primary recreational use) and fishing (secondary recreational use).
Drinking water	The Glenore weir is located 170 km downstream of the Project and is used for drinking water supplies.
Visual Recreation	It is considered that Borer River provides aesthetic quality or recreational fishing for visual recreational use.
Cultural and spiritual values	It is possible that the waterways provide cultural and spiritual value.

Regional surface water use

There are two existing water licences downstream of the Project in the Norman River Catchment. The two licences are attached to the same property (8/NM142) and are located approximately 170 km downstream of the Project. The licences are held by Carpentaria Shire Council and authorise the impoundment and use of un-supplemented water from the Glenore Weir mainly for potable supply purposes. The existing licences have a

combined annual entitlement (Annual Volumetric Limit) of 4,100 ML/and are authorised for any use. On this basis, it is likely that some of the surface water taken under these licences is used for agricultural purposes, including grazing and farm water supply.

Industrial use is not considered a likely environmental value for the Project, as the Project is the only mining operation located within the Borer River catchment. However, several mines are located within the larger Norman River Catchment, located along a downstream tributary in the Croydon Township. Outside of the Norman Catchment, mining sites exist ~ 150km away in the upstream tributaries of the Flinders River and to the east within the Gilbert River Catchment. A summary of mines within 150 km of the Project is summarised in Table 15-3.

Table 15-3: Nearby mines

Name	Proximity	Activity
Croydon	70 km (Norman River Catchment)	Gold (Au), Silver (Ag)
Croydon King	65 km (Norman River Catchment)	Au, Ag
Shamrock	150 km (Flinders River Catchment)	Copper (Cu), Lead (Pb), Zinc (Zn), Ag, Au
Soapspar	150 km (Flinders River Catchment)	Titanium (Ti), Cu, Pb, Zn, Ag, Au
Northstar	150 km (Flinders River Catchment)	Cu, Pb, Zn, Ag, Au
Sandy Creek	150 km (Flinders River Catchment)	Cu, Pb, Zn, Ag, Au
Flat Creek	150 km (Flinders River Catchment)	Cu, Pb, Zn, Ag, Au
Agate Creek	130 km (Gilbert River Catchment)	Cu, Pb, Zn, Ag, Au
Diggers Creek	130 km (Gilbert River Catchment)	Tin (Sn), Au

15.1.2.3 Water quality objectives and environmental objectives

In Queensland, Water Quality Objectives (WQOs) for protection of the identified category of waters (including specific thresholds for water quality parameters) are usually scheduled under the EPP (Water and Wetland) for the relevant catchment. WQOs for the Gulf Catchment are yet to be derived and scheduled under the EPP (Water and Wetland). In the absence of scheduled WQOs, the EPP (Water and Wetland) requires WQOs to be a set of water quality guidelines for all indicators that will protect all environmental values for the water.

The Australian and New Zealand guidelines for fresh and marine water quality (ANZG) (ANZG 2018) and QWQG (DEHP 2009) provide broad-scale thresholds for water quality parameters for varying levels of ecosystem protection. However, both guidelines strongly encourage the collection of local data, where available, to develop guidelines relevant to the area in question and provide guidance on minimum monitoring program requirements to obtain suitable water quality datasets that capture both spatial and temporal variation.

A surface water monitoring program for the Project has been developed and detailed in 15.1.5.1 to meet these objectives. The water quality monitoring program outlines water quality monitoring locations and indicators which will allow development of site-specific WQOs during the project commencement.

In the absence of published WQOs for the Gulf catchment, draft WQOs have been adopted from the ANZG (2018) guidelines, to ensure the suitable assessment of the EVs described in the subsection above. The draft WQOs developed for the Project are detailed in Table 15-4.

The ANZG default guideline values for each of the Project EVs were reviewed, and the most conservative threshold was adopted to ensure all EVs were considered and protected.

Surface water monitoring samples were collected at locations upstream and downstream of the Project. However, due to the remote nature of the Project locality and the ephemeral characteristics of the waterways, opportunities for sampling during the assessment process have been limited. Consequently, insufficient data are currently available to develop site specific WQOs. The available monitoring data is presented in Section 15.1.2.4. Where background concentrations are likely to exceed default guideline values, the WQOs for these parameters will be refined following the collection of additional site-specific monitoring data.

Indicators that don't have ANZG default guideline values (e.g., dissolved organic carbon) will have appropriate thresholds developed once sufficient representative baseline data has been collected for the Project.

Table 15-4: Draft surface water quality objectives

Indicator	**Draft** WQO	Corresponding EV
pH	6.5-8.5	Drinking Water
Electrical Conductivity	550 µS/cm	Aquatic Ecosystems
Total Dissolved Solids	500 mg/L	Aquatic Ecosystems
Ammonia N	20 µg/L	Aquatic Ecosystems
Oxidised N	-	Aquatic Ecosystems
Organic N	-	Aquatic Ecosystems
Nitrate	1.1 mg/L	Aquatic Ecosystems
Nitrite	3 mg/L	Drinking Water
Total Nitrogen	500 µg/L	Aquatic Ecosystems
Reactive Phosphorus	4 µg/L	Aquatic Ecosystems
Total Phosphorus	10 µg/L	Aquatic Ecosystems
Dissolved Oxygen	>85%	Drinking Water
Turbidity	5 NTU	Drinking Water
Suspended Solids	10 mg/L	Aquatic Ecosystem
Sulphate	25 mg/L	Aquatic Ecosystem
Cryptosporidium	0 cysts	Drinking Water
Hardness (as $CaCO_3$)	200 mg/L	Drinking Water
Sodium	30 mg/L	Drinking Water
Chloride	250 mg/L	Drinking Water

Indicator	**Draft** WQO	Corresponding EV
Aluminium (Dissolved)	55 µg/L	Aquatic Ecosystems
Aluminium (Total)	200 µg/L	Drinking Water
Arsenic (Dissolved)	13 µg/L	Aquatic Ecosystems
Arsenic (Total)	10 µg/L	Drinking water
Beryllium (Dissolved)	-	Aquatic Ecosystems
Beryllium (Total)	60 µg/L	Drinking Water
Boron (Dissolved)	940 µg/L	Aquatic Ecosystems
Boron (Total)	500 µg/L	Irrigation
Cadmium (Dissolved)	0.2 µg/L	Aquatic Ecosystems
Cadmium (Total)	2 µg/L	Drinking Water
Chromium (Dissolved)	1 µg/L	Aquatic Ecosystems
Chromium (Total)	50 µg/L	Drinking Water
Cobalt (Dissolved)	1.4 µg /L	Aquatic Ecosystems
Cobalt (Total)	50 µg /L	Irrigation
Copper (Dissolved)	1.4 µg/L	Aquatic Ecosystems
Copper (Total)	200 µg /L	Irrigation
Fluoride	1,000 µg/L	Irrigation
Iron (Dissolved)	280 µg/L	Aquatic Ecosystems
Iron (Total)	0.2 mg/L	Irrigation
Lead (Dissolved)	3.4 µg/L	Aquatic Ecosystems
Lead (Total)	5 µg/L	Drinking Water
Lithium (total)	2.5 µg/L	Irrigation
Manganese (Dissolved)	1.9 mg/L	Aquatic Ecosystems
Manganese (Total)	0.1 mg/L	Drinking Water
Mercury (Dissolved)	0.6 µg/L	Aquatic Ecosystems
Mercury (Total)	1 µg/L	Drinking Water
Molybdenum (Dissolved)	34 µg/L	Aquatic Ecosystems
Molybdenum (Total)	20 µg/L	Irrigation
Nickel (Dissolved)	11 µg/L	Aquatic Ecosystems

Indicator	**Draft** WQO	Corresponding EV
Nickel (Total)	20 µg/L	Drinking Water
Selenium (Dissolved)	11 µg/L	Aquatic Ecosystems
Selenium (Total)	4 µg/L	Drinking Water
Uranium (Dissolved)	0.5 µg/L	Aquatic Ecosystems
Uranium (Total)	10 µg/L	Irrigation
Vanadium (Dissolved)	6 µg/L	Aquatic Ecosystems
Vanadium (Total)	100 µg/L	Irrigation
Zinc (Dissolved)	8 µg/L	Aquatic Ecosystems
Zinc (Total)	2000 µg/L	Irrigation

15.1.2.4 Surface water quality

A Surface Water Monitoring Program has been developed in accordance with QWQG (DEHP 2009) and the National Water Quality Management Strategy Guideline (ANZG 2018), with the goal of collecting baseline water quality data representative of the local receiving environment, including upstream and downstream of the Project.

Water samples were collected during the 2025 aquatic survey while additional samples were collected following a significant rainfall event in January 2026. Water samples have been collected from the monitoring sites shown in Figure 15-6 and the results are listed in Table 15-5.

The results from the surface water quality analysis were compared to the draft WQOs detailed in Table 15-4 to identify possible baseline water quality parameters which may be elevated compared to the draft WQOs. The data collected shows the existing water quality has the following characteristics:

- slightly alkaline with an average pH of 6.73 and ranging between 6.22 and 7.43;
- low salinity with an average total dissolved solids of 54.5 mg/L and electrical conductivity of 84 µS/cm;
- turbidity concentrations exceeding the draft WQO during the February 2025 monitoring event, likely reflecting naturally elevated suspended sediment loads associated with flow events in ephemeral waterways;
- dissolved oxygen (DO) concentrations below the interim WQO at two monitoring locations during the February 2025 monitoring event, likely associated with low flow conditions and/or elevated water temperatures at the time of sampling;
- elevated concentrations of nutrients with the draft WQOs being exceeded for Ammonia, Total Nitrogen and Total Phosphorus;
- detectable concentrations of dissolved metals including Aluminium (Al), Barium, Copper, Manganese, Nickel and Iron;
- dissolved concentrations of Aluminium and Iron regularly exceeded the draft WQO; and
- detectable concentrations of hydrocarbons in a small number of samples.

A review of the collected data suggested that several factors, such as grazing and agricultural land practices and direct access of cattle to the waterways, are likely to influence these water quality results.

The elevated parameters of aluminium and copper were assumed to be linked to natural mineralisation in the sub-soils of the area. Despite elevated concentrations of the parameters, baseline water quality results were considered typical of a slightly disturbed aquatic ecosystem in this region (AARC 2026).

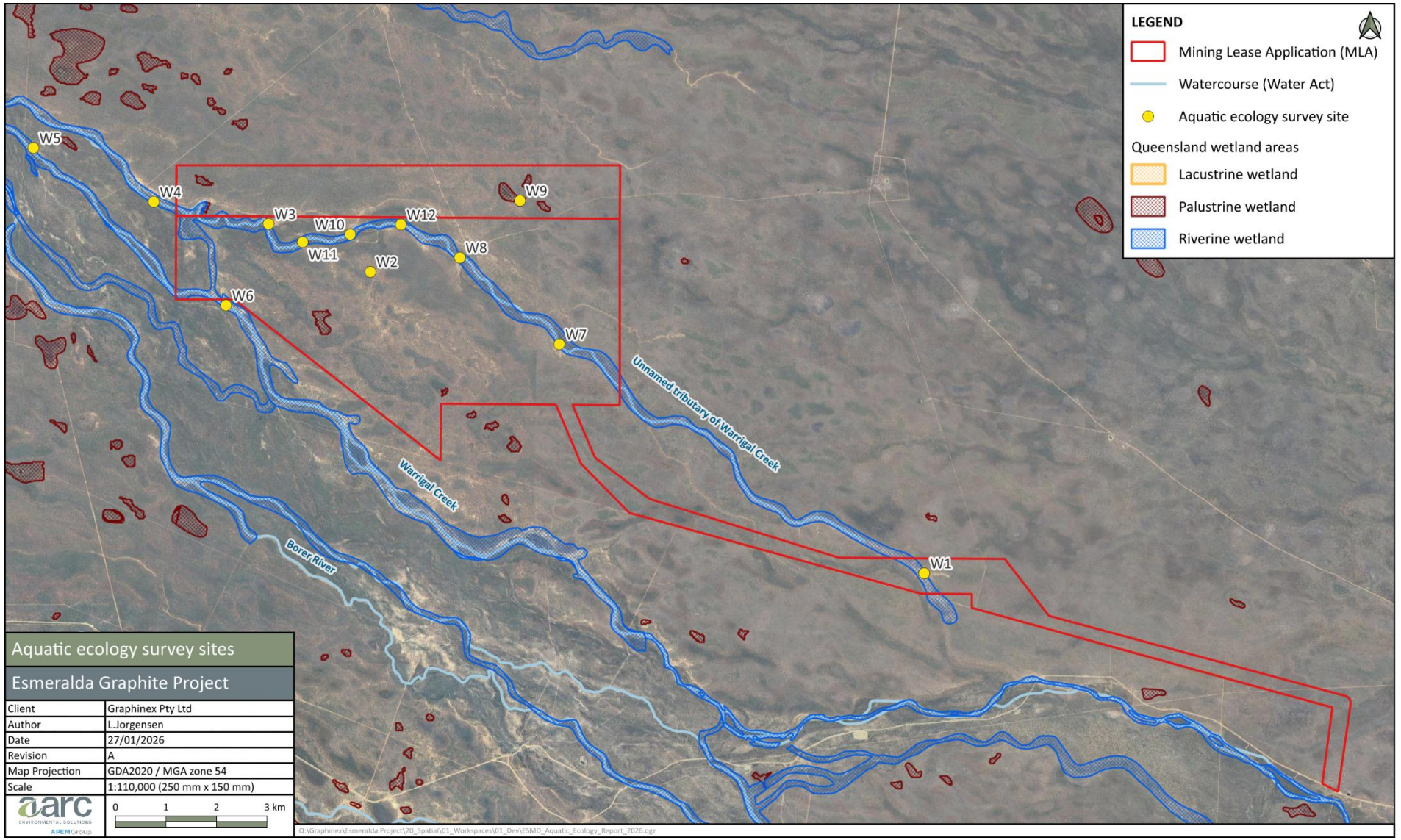


Figure 15-6: Water monitoring locations

Table 15-5: Surface water quality results and comparison to draft WQOs for the Project area

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Physico-chemical (in situ)												
Electrical conductivity (EC)	uS/cm	550	February 2025	96.2	195.7	88.5	82.3	86.1	85.5	109.9	101.6	NA*
			January 2026	381.4	121.2	60.1	60.8	86.8	79.1	61.7	62.9	NA*
pH	pH units	6.5-8.5	February 2025	6.44	6.88	6.97	6.71	7.04	6.87	6.9	6.86	NA*
			January 2026	6.45	7.10	6.83	6.62	7.00	6.97	6.99	6.94	NA*
Dissolved oxygen (DO)	%	>85	February 2025	81.8	90	105	85.1	95.5	83.8	104.8	100.3	NA*
			January 2026	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
Turbidity	NTU	5	February 2025	227.2	118.8	100.5	50.7	44.7	46.1	67.7	61.4	NA*
			January 2026	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
Temperature	°C	-	February 2025	30.1	36.2	37.6	36.5	30.6	29.5	37.5	37.6	NA*
			January 2026	34.8	34.4	33.3	33.4	33.3	33.4	31.8	32.2	NA*
Major ions												
Sulphate (as SO_4)	mg/L	25	February 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1
			January 2026	<1	<1	<1	<1	<1	<1	<1	<1	NA*
Fluoride (total)	mg/L	1	February 2025	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*
Calcium (total)	mg/L	1000	February 2025	<1	2	<1	2	2	2	2	2	2
			January 2026	3	4	4	3	2	2	4	4	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Magnesium (total)	mg/L	500	February 2025	<1	2	<1	2	2	2	2	1	1
			January 2026	2	2	2	2	1	1	2	2	NA*
Nutrients												
Ammonia (total)	mg/L	0.02	February 2025	<0.01	0.23	0.34	0.25	<0.01	0.42	0.13	<0.01	0.02
			January 2026	0.01	<0.01	0.03	0.02	<0.01	<0.01	0.03	<0.01	NA*
Nitrogen (total)	mg/L	0.5	February 2025	0.4	1.3	0.8	0.8	0.9	1.4	0.9	0.4	2.3
			January 2026	0.9	0.7	0.8	0.8	0.6	0.7	0.7	0.8	NA*
Phosphorus (total)	mg/L	0.01	February 2025	0.05	0.10	0.07	0.05	0.04	0.04	0.06	0.03	0.17
			January 2026	0.03	0.05	0.05	0.04	0.03	0.04	0.04	0.05	NA*
Dissolved metals												
Aluminium	mg/L	0.055	February 2025	0.34	0.63	0.25	0.09	0.06	0.07	0.36	0.29	0.07
			January 2026	0.23	0.15	0.22	0.27	0.11	0.15	0.23	0.26	NA*
Arsenic	mg/L	0.013	February 2025	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Boron	mg/L	0.94	February 2025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
			January 2026	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA*
Cadmium	mg/L	0.0002	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Chromium	mg/L	0.001	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Cobalt	mg/L	0.0014	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Copper	mg/L	0.0014	February 2025	<0.001	0.002	<0.001	0.001	0.001	0.001	0.001	<0.001	0.002
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Lead	mg/L	0.0034	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Manganese	mg/L	1.9	February 2025	0.004	0.045	0.009	0.059	0.017	0.009	0.076	0.009	0.022
			January 2026	0.002	0.002	0.018	0.011	0.005	0.005	0.013	0.018	NA*
Mercury	mg/L	0.0006	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Molybdenum	mg/L	0.034	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Nickel	mg/L	0.011	February 2025	<0.001	0.002	<0.001	0.001	0.002	0.001	0.003	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Silver	µg/L	0.05	February 2025	0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
			January 2026	0.14	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*
Uranium	mg/L	0.0005	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Vanadium	mg/L	0.006	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Zinc	mg/L	0.008	February 2025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
			January 2026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA*
Total metals												
Aluminium	mg/L	0.2	February 2025	4.66	3.33	1.87	1.13	1.04	0.93	1.52	2.58	0.10
			January 2026	0.47	0.74	0.55	0.56	0.65	1.11	0.47	0.48	NA*
Arsenic	mg/L	0.01	February 2025	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Boron	mg/L	0.5	February 2025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
			January 2026	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA*
Cadmium	mg/L	0.002	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Chromium	mg/L	0.05	February 2025	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	<0.001
			January 2026	<0.001	<0.001	<0.001	0.001	0.002	0.002	<0.001	<0.001	NA*
Cobalt	mg/L	0.05	February 2025	0.001	0.002	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Copper	mg/L	0.2	February 2025	0.002	0.003	0.002	0.002	0.002	0.004	0.002	0.002	0.001
			January 2026	0.002	0.002	0.001	0.001	0.002	0.002	0.001	<0.001	NA*
Lead	mg/L	0.005	February 2025	0.002	0.002	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Manganese	mg/L	0.3	February 2025	0.017	0.063	0.020	0.074	0.028	0.022	0.131	0.025	0.025
			January 2026	0.008	0.019	0.044	0.033	0.017	0.025	0.021	0.027	NA*
Mercury	mg/L	0.001	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Molybdenum	mg/L	0.02	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Nickel	mg/L	0.02	February 2025	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	NA*
Selenium	mg/L	0.004	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NA*
Uranium	mg/L	0.01	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Vanadium	mg/L	0.1	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*
Zinc	mg/L	2	February 2025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
			January 2026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA*
Total recoverable hydrocarbons												
C6- C9 Fraction	µg/L	20	February 2025	<20	<20	<20	<20	<20	<20	<20	<20	<20
			January 2026	<20	<20	<20	<20	<20	<20	<20	<20	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
C10-C36 Fraction (sum)	µg/L	100	February 2025	<50	<50	<50	<50	<50	<50	<50	<50	120
			January 2026	<50	<50	<50	<50	<50	<50	<50	<50	NA*

Note - Cells shaded blue indicate exceedance of objective.
* Indicates sites and/or parameters not assessed during the relevant survey period.

15.1.2.5 Stream sediments

Stream sediment quality was assessed by AARC (2026) (Appendix D), sediment samples were collected during the aquatic surveys completed in February 2025, December 2025 and January 2026 (Figure 15-6). Three additional sites (W10, W11, W12) were also sampled during the December 2025 survey. The sediment quality results were compared with the interim stream sediment quality objectives adopted as per the ANZG (2018) relevant to the Project area and are presented in Table 15-6.

No exceedances of the interim sediment quality objectives were identified during the sediment quality assessment. All results were recorded below both the upper guideline and default guideline values.

The stream sediment physical composition is characterised by high percentages of sand at most sites (averaging 90%), with minimal levels of clay, silt and gravel (Figure 15-7, Figure 15-8, Figure 15-9). The lowest proportion of sand was recorded in February at a site in the Warrigal Creek (76% at W5), while site W8 in the unnamed tributary of Warrigal Creek recorded the highest proportion (99%, December survey). The clay and silt fractions were variable, however, the majority of sites recorded less than 1% of each fraction. All sites recorded minimal cobble at less than 1%.

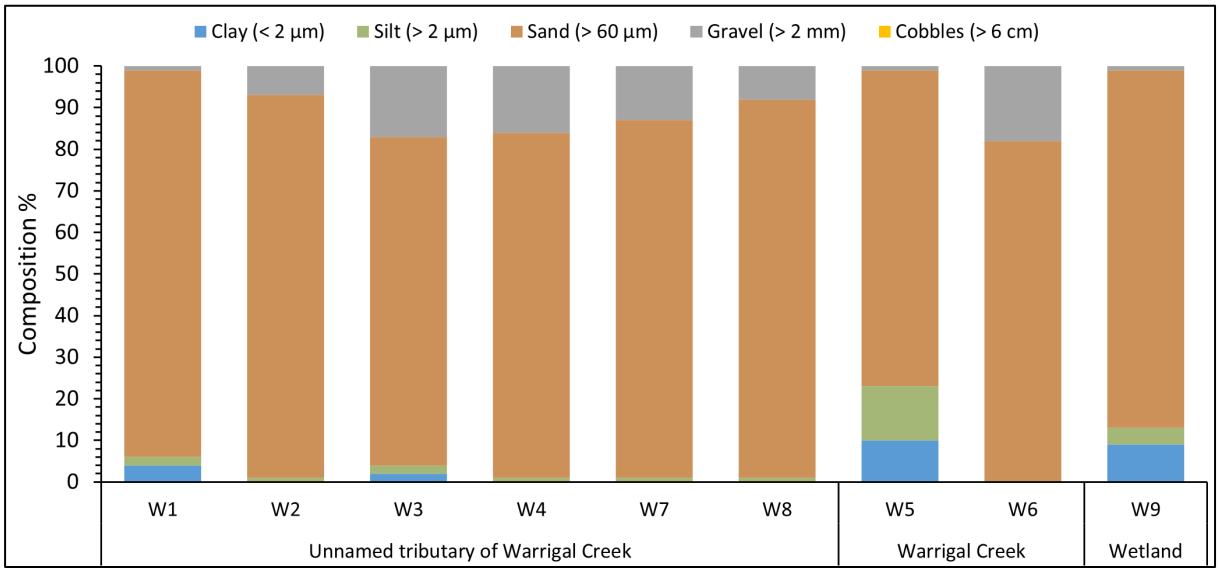


Figure 15-7: Sediment particle size classification (February 2025)

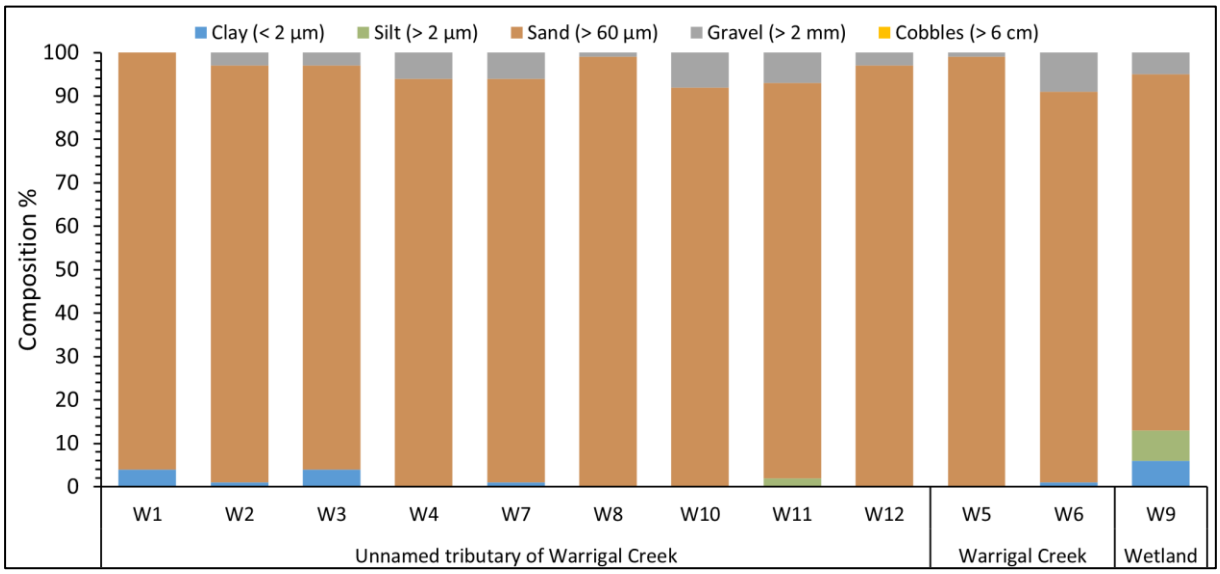


Figure 15-8: Sediment particle size classification (December 2025)

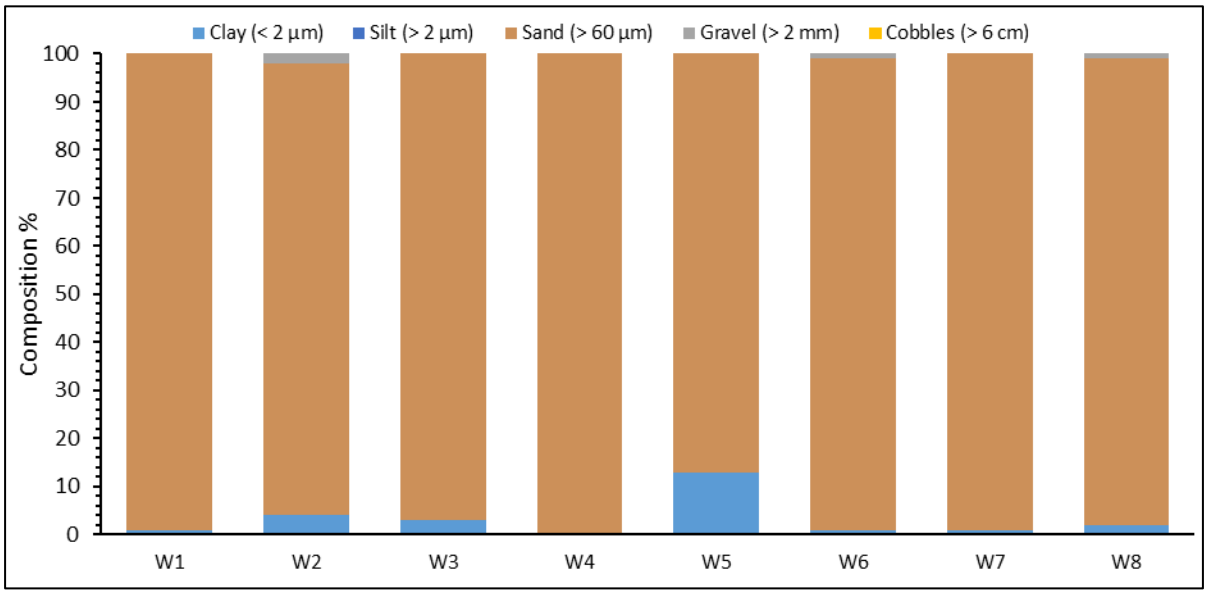


Figure 15-9: Sediment particle size classification (January 2026)

Table 15-6: Sediment quality results and comparison to interim objectives for the Project area

Parameter	Default guideline value(mg/kg)	Upper guideline value (mg/kg)	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Antimony	2.0	25	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Arsenic	20	70	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Cadmium	1.5	10	February 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1	NA*	NA*	NA*
			December 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			January 2026	<1	<1	<1	<1	<1	<1	<1	<1	NA*	NA*	NA*	NA*
Chromium	80	370	February 2025	4	2	3	<2	4	2	4	2	2	NA*	NA*	NA*
			December 2025	5	3	3	<2	2	2	3	2	3	6	3	2
			January 2026	4	3	3	<2	<2	2	2	<2	NA*	NA*	NA*	NA*
Copper	65	270	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Lead	50	220	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

Parameter	Default guideline value(mg/kg)	Upper guideline value (mg/kg)	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Mercury	0.15	1	February 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*
			December 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*	NA*
Nickel	21	52	February 2025	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA*	NA*	NA*
			December 2025	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
			January 2026	<2	<2	<2	<2	<2	<2	<2	<2	NA*	NA*	NA*	NA*
Silver	1.0	4.0	February 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*
			December 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*	NA*
Zinc	200	410	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	9	<5	8	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*

15.1.3 Water Management System

A Water Management System (WMS) has been developed for the Project to ensure water is managed efficiently and responsibly throughout the life of the operation, while protecting the environmental values of surrounding surface water environments. The system has been designed to align with the objectives of the Water Plan (Gulf) 2007 by sustainably managing overland flow, minimising impacts to natural ecosystems, and supporting equitable access to water resources.

The WMS separates and manages different water types across the site, including mine affected water (MAW), sediment water, clean water, raw water, and potable water, to ensure each is appropriately captured, treated, reused, or discharged. The design, storage and operations of this infrastructure is detailed further in Chapter 14, Water Resources, and has been summarised below for completeness.

The key objectives of the WMS include minimising the capture of clean external runoff, preventing uncontrolled releases of MAW, maintaining reliable water supply for operational demands, maximising water recycling and reuse, and supporting ongoing pit dewatering and mine operability.

The proposed water management strategy relies on a range of infrastructure and operational controls to maintain separation of water types and reduce environmental risk. This includes diversion drains to redirect clean water away from disturbed areas, dedicated MAW storages for reuse, sediment basins and erosion controls for sediment-laden runoff, processing ponds for water recirculation, tailings decant systems to maximise water recovery, and raw water storage dams for external supply (Figure 15-10).

Progressive rehabilitation and stabilisation of disturbed areas will also be undertaken to reduce sediment generation over time. Water management infrastructure will largely be constructed during the Project's construction phase and operated throughout the life of mine, with decommissioning planned at closure unless infrastructure is retained under future agreements.

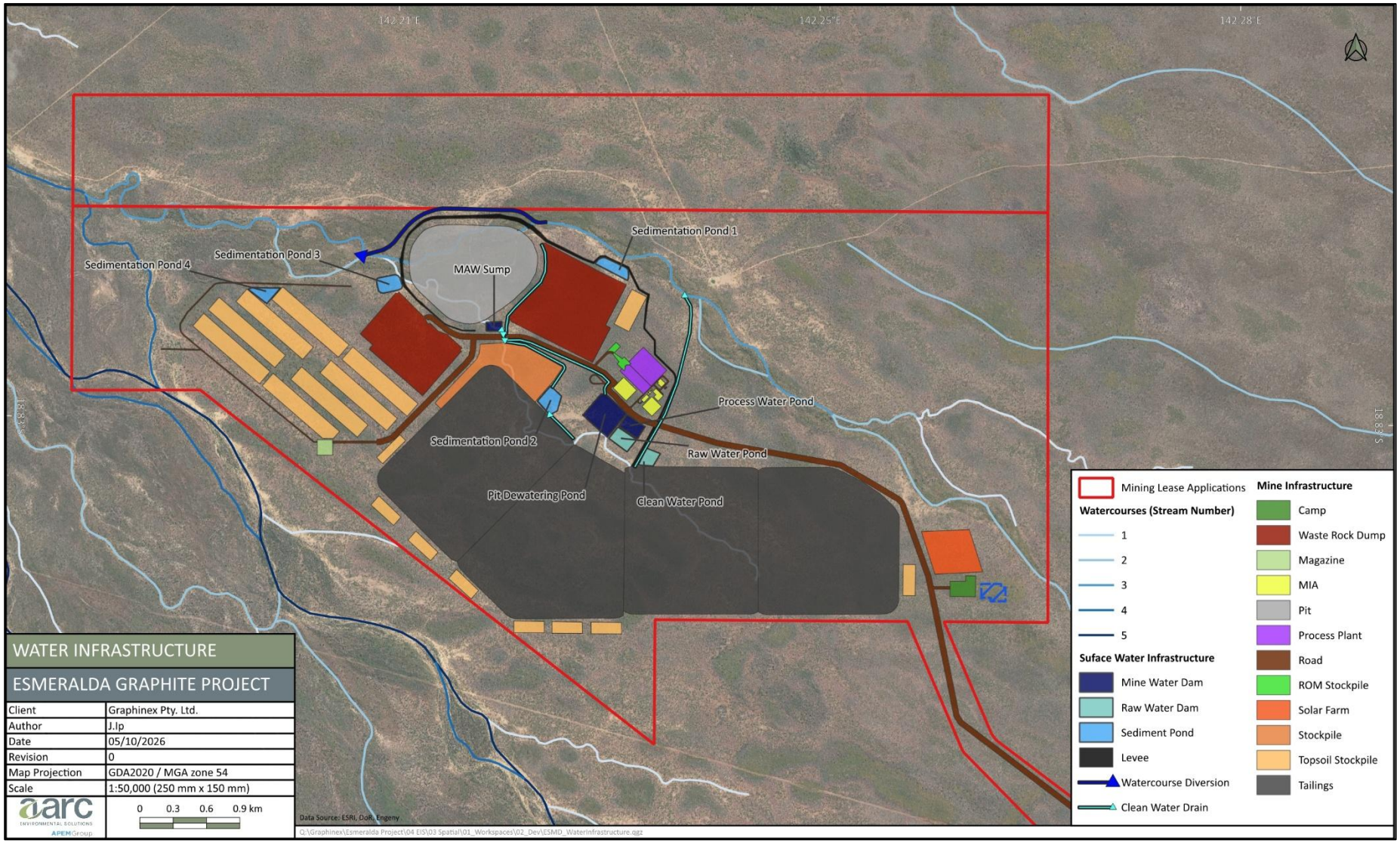


Figure 15-10: Water management infrastructure

15.1.4 Potential impacts

Potential contaminant sources associated with the Project include:

- surface runoff from disturbed areas;
- surface runoff from mine waste or ore;
- accumulated water in the mining pits;
- incidental runoff from chemical/hydrocarbon spills within the processing plant area;
- process waste streams and entrained water; and
- seepage, overtopping or dam failure of mine water storages.

Potential contaminants of concern (CoCs) for the Project have been identified based on the expected mining materials, groundwater quality and processing activities. The identified CoCs are summarises in Table 15-7 and have been used to inform the assessment of potential water quality impacts and the proposed monitoring program.

Table 15-7: Contaminants of Concern

CoC	Draft WQO
pH (pH Unit)	6.5-8.5
Electrical conductivity (µS/cm) (EC)	550 µS/cm
Total Dissolved Solids (TDS)	500 mg/L
Total Suspended Solids (TSS)	10 mg/L
Sodium	30 mg/L
Chloride	250 mg/L
Fluoride	1.6 mg/L
Aluminium	0.055 mg/L
Arsenic	0.013 mg/L
Zinc	0.008 mg/L
Sulfur	-
Copper	0.0014 mg/L
Molybdenum	0.034 mg/L
Rhenium	-
Tellurium	-
Aliphatic Hydrocarbons	-
Aromatic Hydrocarbons	-

Potential impacts to water quality values are discussed in the following sub-sections.

15.1.4.1 Erosion and sedimentation

Disturbance activities for the Project will include vegetation clearing for development of open-cut mining pit, overburden dumps, ROM stockpiles, mine infrastructure hardstand areas, access and haul roads, disturbance for water management storages, infrastructure corridors and the processing plant. Runoff from these areas may contain elevated sediment and other contaminants compared with natural surface water runoff concentrations.

Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids relative to background levels. These structures are designed to detain stormwater and remove the majority of suspended solids before overflowing to the receiving environment (Sedimentation Ponds 1 and 2 overflows to the pit). An overtopping failure of these structures is not expected to have significant impacts on receiving waters.

Sediment dams have been designed in accordance with the 'International Erosion Control Association Guidelines' methodology for Type D sediment basins (IECA 2018). Sediment ponds' 1-3 capacities have been sized sufficiently to contain runoff generated by a 24-hour storm event with an Annual Exceedance Probability (AEP) of 10% (DESI 2024), plus 10% of settling volume for sediment storage.

Sedimentation ponds 1 and 3 will capture runoff from the waste rock dumps, while sedimentation pond 2 will capture runoff from the southern catchments, and sedimentation pond 4 will capture runoff from the western topsoil stockpiles (Figure 15-10).The sediment dams will provide sufficient storage for settlement of suspended solids so that water quality during overtopping events has negligible impact on the water quality in the receiving waterway. Sediment dams will also include overflow control structures with scour protection (rock chutes, rock aprons or level spreaders) to ensure non-erosive discharges.

Sediment Ponds 1 and 2 are expected to have similar water quality characterisation as sediment pond 3 because of the similar catchment land uses.

Sediment Pond 3 will receive runoff from the western WRD and surrounding roads and may also intercept seepage associated with rainfall infiltration through the WRD. Potential seepage from the WRDs is detailed in Section 15.1.4.3. Seepage volumes are expected to be minor relative to surface runoff, particularly during large rainfall events due to the delayed infiltration response. Waste dump seepage is likely to be less than 15% of incident rainfall, while during larger storm events, catchment runoff can exceed 50% of incident rainfall.

Although water quality within Sediment dam 3 is expected to be influenced by WRD seepage, contaminants associated with seepage are expected to be diluted by surface runoff. Considering the dam capacity, relatively low metal concentrations and the smaller contribution of seepage compared with runoff during larger rainfall events, concentrations in overflows are expected to remain below the draft WQOs. The risk of exceeding the draft WQOs is further reduced by dilution within the receiving stream order 3 tributary, which has a contributing catchment of 115 km2, approximately 160 times greater than the Sediment dam 3 catchment.

The operational water balance model indicates that Sediment Dam 3 has a maximum annual overtopping frequency of $\leq$ 10% during the operating years. The sediment load will be reduced during rehabilitation.

Sediment dam 4 is located to the northwest of the Project area and captures runoff from the topsoil stockpiles and surrounding roads. Runoff and seepage flow from the topsoil stockpiles is not expected to contain elevated contaminants compared to the receiving environment. Inflows to the sediment dam are expected to have elevated sediment loads which require treatment through detention before discharging. The risk of sedimentation pond 4 overflows impacting the receiving environment water quality is considered low.

Erosion and sediment impact on EVs are expected to be of low risk and magnitude.

15.1.4.2 Process water

The process plan will use several reagents in the flotation and tailings thickening phase that may produce contaminants in water recycled to the process water pond and the TSFs. The Contaminants of Concern (CoC) associated with these reagents include:

- Diesel – aliphatic and aromatic hydrocarbons and a small potential for thiophenes and thiolanes;
- MIBC (Methyl Isobutyl Carbinol) – aromatic hydrocarbons; and
- Flocculant.

The processing material also has potential to produce CoC with contact water due to the geochemistry of the ore body. Testing of the ore materials captured as part of the geochemical assessment (RGS, 2026a) has been reviewed to characterise the quality of tailings decant and recycled plant water, as well as runoff or seepage from the processing plant and ore stockpiles. RGS tested the in situ geochemistry of the site and noted that:

- some of the mine material samples of Ore Body are classified as potentially acid forming - low capacity (PAF-LC) (2 %) or PAF (38 %);
- solid mine materials and tailing samples may have some enrichment, compared to the median crustal abundance in unmineralised soils, in the following - Copper (Cu) Molybdenum (Mo), Rhenium (Re), Sulphur (S) and Tellurium (Te);
- metal/metalloid concentrations are generally below detection limits, although may contain slightly elevated concentrations of Aluminium (Al), Arsenic (As), and Zinc (Zn); and
- tailing samples behave as a sand. They are likely to be permeable, to drain quickly, and have low water retention characteristics. They are classified as Emerson Class 3 and are expected to have good structure and stability with limited shrink / swell behaviour, and to settle reasonably quickly.

Water used in the concentrator processing plant will be recycled through the various stages and discharged with the tailings material to the four TSFs over the project life. Water returned from the process plant and TSFs to Process Water Pond is expected to have these potential CoCs. Similarly, runoff from the process plant area and ore stockpile areas may therefore contain these potential CoCs.

The TSFs have been designed with a range of measures to manage surface water risks and minimise the potential for uncontrolled releases. Key design features include the installation of a High Density Polyethylene (HDPE) liner to reduce seepage risk, a design storage allowance of approximately 1.62 GL to 1.70 GL to achieve containment of a 1:100 AEP wet season event, and an emergency storm storage allowance of 0.75 m in each dam to contain a 1:100 AEP 72 hour storm event. In addition, each TSF includes a 25 m wide spillway designed to convey storm events rarer than the 0.1% AEP event, including an appropriate wave freeboard allowance. All four TSFs are designed to overflow toward the mining pit and therefore do not discharge off site. Further details regarding flooding and regulated structure design are provided in Chapter 16 – Flooding and Regulated Structures. Accordingly, the potential impacts associated with MAW or accidental spills within the processing plant area on surrounding EVs are expected to be of low risk and low magnitude.

15.1.4.3 Waste rock material runoff and seepage

Waste rock materials from pit excavation will be placed in two out-of-pit dumps adjacent to the mining pit. Rainfall runoff and infiltration from these dumps will be directed to sedimentation ponds. At closure, the dumps will be reshaped, topsoiled and revegetated to support a grazing and a grassland post-mining land use. Geochemical testing of potential waste rock materials indicate that soil, overburden and waste rock materials are typically non-acid forming with low total sulphur content, slightly alkaline, low salinity and only contain slightly elevated concentrations of Aluminium (Al), Arsenic (As), and Zinc (Zn).

Any runoff and seepage produced by the waste rock dumps will be collected in the Sediment Dams 1 and 3, which are designed to contain a 10% AEP, 24 hour storm event. Sediment dam 1 overtops to the mining pit, while sediment dam 3 overtops to the stream order 3 waterway. Any seepage produced during large rainfall

events that result in overtopping of the sediment dam 3 would receive significant dilution immediately in the receiving waterway. The geochemical data for the WRD materials shows:

- Dissolved aluminium concentrations are on average 0.22 mg/L which is 3.3 times the Aquatic Ecosystems WQO of 0.055 m/L. It is noted background monitoring data for the Project shows equivalent average dissolved aluminium concentration in the existing waterways.
- Dissolved arsenic concentrations are on average 0.047 mg/L which is 3.6 times the Aquatic Ecosystems WQO of 0.013 m/L
- Dissolved zinc concentrations are on average 0.007 mg/L which is 1.4 times the Aquatic Ecosystems WQO of 0.005 m/L

Because the metal concentrations in the water materials are low compared to the receiving waterway WQOs, the expected dilution with natural flows in the downstream waterway (1 to 100 dilution based on area) is expected to reduce concentrations below the WQOs. As a result, seepage from the waste rock dumps is expected to be low-risk and unlikely to adversely affect sediment dam water quality or downstream environments.

15.1.4.4 Chemical and hydrocarbon storage

As part of ongoing operations, chemicals and hydrocarbons will be stored in a dedicated fuel and lube facility, which will be constructed in accordance with Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids. Small scale spills of fuel or lubricants may occasionally occur during the refuelling of equipment within the mine area. Any such releases would likely involve limited quantities, typically less than ~ 20 L. Due to the relatively minor volumes and catchment controls in place between the operation and sensitive receiving environments, the potential for contaminants to migrate to surface waters is considered low.

15.1.4.5 Mine affected water storage

Mine affected water will be stored in suitably designed storage structures on site and is a potential contaminant source via pathways of seepage, overtopping, or dam failure. The dams will be HDPE lined and suitably engineered to minimise likelihood of the potential failure pathways. This is discussed further in Chapter 16, Flooding and regulated structures.

The MAW storages have been sized to enable continuous dewatering of the TSFs and the mining pit. The Process Water Dam (PWD) will have a full supply volume of 400 ML and will be lined to prevent seepage and potential environment harm. It will be mostly excavated with perimeter bund for spillway freeboard. The Pit Dewatering Dam (PDD) will have a supply volume of 200 ML and will also have a lined excavated storage and a perimeter bund for spillway freeboard. Meanwhile, the MAW Sump will have a mostly excavated impoundment with a full supply volume of 100 ML and is located immediately within the mining pit's groundwater drawdown extent.

The PWD, PDD and MAW Sump all overflow to the mining pit. The mining pit has excess storage capacity and will contain any overflows from these storages and prevent all discharges reporting to the environment. The water balance model results show no MAW overflows from the mining pit.

Additionally, MAW dams will be preferentially used as water supply Project water demands and will be recycled through the processing plant and TSFs, reducing the quantity and persistence of standing water in the dams. Contaminants are expected to accumulate within the MAW system through recycling and ultimately be entrained with tailings material in the TSFs

Water stored in the MAW dams (PWD, PDD and MAW Sump) is expected to be of poor quality due to contact with material stockpiles, processing areas, the open-cut pit and groundwater inflows. The water quality of these storages may also be impacted by chemical reactions (oxidation) due to the PAF nature of the ore materials. MAW is not proposed to be released to the receiving environment, and will be prohibited from use in dust suppression, with overflows from MAW storages directed to the mining pit.

Water in these storages may contain elevated concentrations of Copper (Cu), Molybdenum (Mo), Rhenium (Re), Sulphur (S) and Tellurium (Te), consistent with the ore body geochemistry. As all mine water dams spill to the open-cut pit, which has substantial excess storage capacity, the risk of uncontrolled overflow to the environment is negligible.

Given that the PWD and PDD will store larger quantities of poor-quality water for extended periods of time they potentially could have a significant impact from seepage on environmental values. Soils testing indicate that the deeper soils (>55cm deep) have a hydraulic conductivity less than 0.01 mm/hour or 0.24 mm/day (GT Environmental 2026). Based on the footprint of the PWD (8.1 ha) and PDD (2.5 ha) daily seepage volumes could reach 6 kL/day and 19 kL/day, respectively.

The PWD and PDD CCA classified the dams as having a significant risk for failure to contain seepage, and therefore require a liner to prevent seepage in accordance with the hydraulic performance criteria

The dams are proposed to be HDPE lined to minimise any potential to impact environmental values.

the storages are proposed to be HDPE lined to minimise any potential to impact environmental values.

The MAW Sump will only store small quantities of water for short duration and is located immediately within the pits groundwater drawdown extent and therefore is not expected to have a significant impact on groundwater from seepage.

At closure, water remaining within the water storages proposed for decommissioning will be managed through evaporation, following which the water storages will be decommissioned and rehabilitated. The liners within the water storages will be removed as part of decommissioning and, where they cannot be recycled, will be collected and disposed of off-site by a licensed waste contractor to an approved waste facility.

At closure, the MAW sump will continue to receive water from the retained TSF underdrainage system. Water within the MAW sump will be managed through evaporation until monitoring confirms that water is no longer reporting from the TSF underdrainage system, after which the MAW sump will be decommissioned and rehabilitated. The liner within the MAW sump will be removed and managed as described above.

15.1.4.6Tailings storage facilities

The Project includes four engineered tailings storage facilities – TSF 1, TSF 2, TSF3, and TSF4, which will operate independently. The cells will be used sequentially for the deposition of tailings fines produced by the mineral processing circuit, and recovery of water to supply water demands. TSFs 1, 2 and 3 will be removed and rehabilitated as part of the pit backfill for mine closure, and TSF 4 will be capped and remain in place at closure.

The design concept for each cell of the TSF incorporates a pontoon-mounted return-water recovery system and perimeter monitoring/recovery bores located downstream, to the south of the TSF (SRE 2026). This is in addition to an underdrainage collection system and sump for capturing seepage and water draining to the base of the TSFs.

The proposed design concept is based on downstream construction techniques with both upstream and downstream slopes of 2.5:1 (H:V). The perimeter embankments are to comprise an engineered, compacted ‘select’ soil embankment with a cut-off trench on the upstream face, with a minimum crest width of 5 m. The downstream section of the embankment will have a minimum crest width of 15 m and comprise traffic compacted mine waste (Wave International 2025). Key design details of the tailings storage facilities relevant to surface water include:

- High-Density Polyethylene (HDPE) Dam Liner to reduce the risk of seepage;
- design Storage Allowance of 1.62 GL to 1.70 GL to achieve 1:100 AEP wet season containment reduce the risk of overflow;
- emergency Storm Storage of 0.75m in each dam to provide containment of the 1:100 72 hour storm event; and

- spillway width of 25 m to convey a storm event rarer than the 0.1% AEP event with suitable wave freeboard allowance, noting all four TSFs are designed to overflow towards the mining pit and do not discharge from site.

15.1.4.7 Raw water dam

The Raw Water Dam will contain treated clean water and water transferred from the Clean Water Diversion Sump which collects clean catchment runoff. Water quality in these dams is expected to be similar to the receiving environment (low contaminant concentrations). Overflows from the Raw Water Dam and Raw Water Diversion Sump are not expected to cause any adverse impacts to humans, third party infrastructure or the environment.

15.1.4.8 Releases

The Project does not propose controlled releases of MAW to the receiving environment. In the unlikely event of accidental releases from the PDD or PWD, they will report to the MAW sump as contingency. The MAW Sump subsequently overflows to the mining pit, which will contain any overflows from these storages and prevent all discharges reporting to the environment.

In standard operating conditions, MAW will be dewatered to the PDD, which will then be transferred to PWD for reuse in the processing plant. This water management system further reduces risk of any releases of MAW to the receiving environment.

Sediment dams 1 and 2 also overflow internally to the MAW sump and the mining pit, while Sediment dams 3 and 4 may overflow to the stream order 3 tributary. This is discussed above in Section 15.1.4.1.

The potential impact of releases on surface water values is therefore expected to be of low risk and magnitude.

Releases, including through failure to contain seepage, failure to contain overtopping, and dam break risks are detailed further in Chapter 16, Flooding and Regulated Structures.

15.1.4.9 Naturally occurring radioactive materials (NORM)

The mine materials were assessed for naturally occurring radioactive materials (NORM) to determine whether NORM represents a potential CoC for the Project. In general, NORM concentrations were slightly above background levels in uncontaminated soil but are unlikely to pose a significant threat to human health or the environment (RGS 2026a). NORM concentrations in overburden and soil were below applicable screening levels, while concentrations in waste rock were higher than those observed in other material types. Meanwhile, NORM concentrations in low grade ore, ore body and tailings were slightly lower than those in waste rock (RGS 2026a).

15.1.5 Mitigation, monitoring and management measures

The Project's WMS has been developed to support the mitigation, management, and monitoring of potential impacts to surface water environmental values throughout the construction, operational, and decommissioning phases of the mine. The WMS described further in Section 15.1.3, provides the framework for the efficient and responsible management of water across the site, including the separation, capture, storage, treatment, reuse, and monitoring of MAW, sediment water, clean water, raw water, and potable water. To support implementation of the WMS, the Project has developed site-specific plans to outline the management of surface waters during the construction, operational and decommissioning phases of the mine, including:

- Water Management Plan (WMP, Chapter 14);
- Erosion and Sediment Control Plan (ESCP, Section 15.1.5.1);
- Receiving Environment Monitoring Program (REMP, Section 15.1.5.3); and

- Progressive Rehabilitation and Closure Plan (PRCP, Appendix T).

15.1.5.1 Erosion and sediment control plan

During operations, the potential transport of contaminants via surface water flow will be managed through erosion and sediment control structures. An ESCP will be prepared for the Project consistent with the IECA recommendations outlined in the 'Best Practice Erosion and Sediment Control Guideline' (IECA 2018) to minimise erosion and sediment generation from disturbed areas and maintain water quality in downstream water systems.

The ESCP will include detail design and maintenance requirements, in accordance with EA requirements, to manage erosion and sediment control measures implemented in association with the Project. The ESCP will define the following aspects of the erosion sediment control requirements for the Project:

- limiting disturbance to prevent sediment runoff generation;
- erosion control measures such as revegetation and rehabilitation, aimed to prevent soil erosion from disturbed areas;
- documenting soil types and disturbed catchment areas on the site and their potential for sediment generation;
- design and management of drainage control measures to prevent erosion from concentrated flows and manage the flow of both clean water and sediment runoff;
- erosion and sediment control requirements associated with temporary disturbance and construction activities;
- design and management of sediment dams including dewatering and desilting requirements and the use of suitable construction materials; and
- water quality testing of sediment dams to assess their performance and inform continual improvements of the erosion and sediment control system.

Additional erosion and sediment controls to be included in the plan are:

- topsoiled areas will be deep ripped to reduce compaction from heavy machinery, encourage infiltration of water and prevent erosion. Areas will be ripped along the contour to reduce the velocity of runoff water down the slope;
- stockpiles will be constructed to less than 3 m high and contoured to encourage water drainage;
- the placement of topsoil stockpiles away from drainage areas, roads, machinery, transport corridors and stock grazing areas;
- preservation of vegetation around drainage lines and riparian zones to reduce the exposure of the B horizon if excavation is necessary;
- use of upslope diversion drains to reduce runoff from undisturbed areas onto disturbed areas;
- the use of downslope collection drains to divert surface water to sediment dams (e.g. mulch berms, sediment ponds and drop inlet protection) to contain sediment-laden runoff from disturbed areas;
- the use of sediment fences and filters to retain and filter suspended solids;
- regular traffic will be confined to maintained tracks and roads; and
- assessment of the integrity and effectiveness of erosion control measures will be undertaken at regular periods, especially following significant rainfall events.

Installed erosion and sediment control structures will not be removed until monitoring indicates that disturbed areas have been stabilised.

15.1.5.2 Surface Water Monitoring

Surface water monitoring will be utilised to ensure that WQOs are being met across all phases of the Project, and relevant EVs are protected. The baseline surface water quality monitoring (Section 15.1.2.4) forms the basis of the proposed ongoing surface water quality monitoring for the Project. The goals of this monitoring are to:

- collect water quality and streamflow data;
- detect and identify any causes in changes from baseline conditions;
- develop a statistically sufficient dataset of baseline local water quality data to produce site-specific WQOs;
- identify any impacts and corrective actions required; and
- assess the performance of the water management system and the effectiveness of any mitigation and management measures.

Water monitoring for the Project has to date been constrained by the remote location of the Project area and the highly ephemeral nature of the waterways. Currently, two rounds of water quality sampling have been collected which is not sufficient to define site specific water quality objectives. Six rising stage samplers have recently been installed across the Project area to assist with capturing water quality during high flow events when access is constrained. Sampling will continue during the EIS process for the Project to define site specific water quality objectives.

Monitoring will then continue for the construction, operation and decommissioning stages of the Project to identify potential water quality impacts. During project operations, monthly sampling of the surface water monitoring locations is proposed. The water quality parameters and WQOs, described in Section 15.1.2.3, for the receiving waterway will be sampled and assessed throughout the construction, operation and decommissioning stages of the Project. This is detailed further in Section 15.1.5.3.

Any required changes or updates to the ongoing water quality and streamflow monitoring for the Project site will be assessed and documented through the development and ongoing updates to the surface water monitoring program. The program will also outline the routine assessment, reporting mechanisms and auditing of water quality data and WQO, as well as mitigation measures and triggers for any corrective actions.

15.1.5.3 Receiving Environment Monitoring Program

A REMP will be developed for the Project in accordance with the 'Model Mining Conditions Guideline' (DESI 2025a) and in consideration of the 'Receiving Environment Monitoring Program Guideline' (DESI 2014).

The aim of a REMP is to monitor, identify and assess the potential impacts to the environmental values, water quality and flows within the receiving environment over the Project life. The REMP will require annual monitoring and reporting and analysis of long-term trends and potential impacts. Outcomes of the monitoring programs will inform further mitigation measures and remediation of existing mitigation measures as required.

The REMP will be developed to include the following:

- background information and descriptions of:
    - site location and history;
    - catchment and watercourses;
    - regional and local land use;
    - local climate conditions; and
    - receiving environment EVs and WQOs.
- monitoring aspects are expected to include stream flow, surface water and sediment quality, ecology, and habitat;

- monitoring methodology will be developed in accordance with the Queensland Monitoring and Sampling Manual (DES, 2018); and
- monitoring locations and selection of sites including consideration of temporal variation.

Water quality monitoring

Both the water quality program, detailed in Section 15.1.5.1 and REMP will monitor the WQOs identified in Section 15.1.2.3, at the proposed monitoring locations shown in Figure 15-11 and listed in Table 15-8.

Table 15-8: REMP water monitoring locations

Monitoring points	Sampling	Easting (GDA 2020)	Northing (GDA 2020)
Upstream monitoring points			
UW1 (Stream Order 3 Tributary)	Water Quality and Sediment	639620	7912130
UW6 (Warrigal Creek)	Streamflow, Water Quality and Sediment	625796	7917437
UW7 (Stream Order 3 Tributary)	Water Quality and Sediment	632395	7916667
UW8 (Stream Order 3 Tributary)	Streamflow, Water Quality and Sediment	630425	7918381
Downstream monitoring points			
DW3 (Stream Order 3 Tributary)	Water Quality and Sediment	626637	7919048
DW4 (Warrigal Creek)	Water Quality and Sediment	624366	7919486
DW5 (Warrigal Creek)	Water Quality and Sediment	621982	7920554

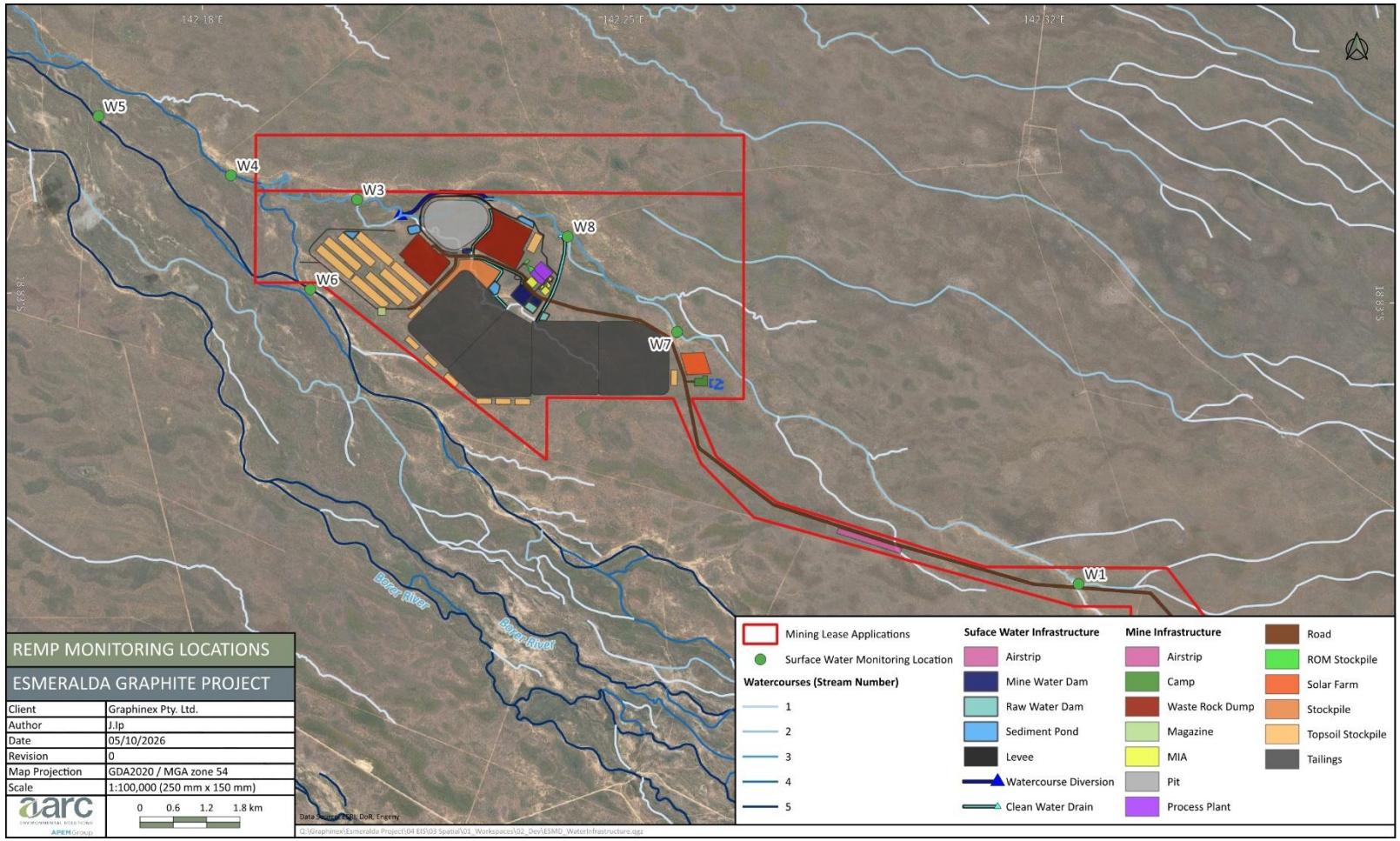


Figure 15-11: REMP monitoring locations

Streamflow monitoring

Streamflow gauging will be required during the operational phase of the Project to assess impacts and to allow for ongoing refinement of surface water models. A streamflow gauge will be installed to collect site-specific streamflow data, with monitoring targeting the local stream order 3 tributary as well as Warrigal Creek/Borer River. No site-specific streamflow monitoring data are currently available for the Project catchment. The streamflow data collected during Project operations will support future model calibration and refinement.

Sampling methods and parameters

Water quality monitoring parameters have been selected to reflect the CoCs identified for the Project and detailed in Table 15-7. These parameters form the basis for ongoing operational monitoring of physio-chemical parameters and contaminants (e.g. metals). Water quality monitoring will be undertaken using a combination of laboratory and in situ sampling and in accordance with the Queensland Monitoring and Sampling Manual (DES 2018).

During the operational phase of the mine, the surface water sampling frequency will be dictated and outlined within environmental approvals and/or site-specific plans. To best meet the Queensland Monitoring and Sampling Manual minimum sample quantity requirements, it is recommended the ongoing monitoring program sample frequency is at least monthly during stream flow events for discrete water quality parameters such as streamflow, pH and electrical conductivity are generally monitored continuously (i.e., real time/in situ). It is recommended that monitoring be conducted for a period of at least one year prior to any statistical analysis being undertaken.

The WQOs associated with the water quality monitoring parameters will be reviewed for the site once a statistically sufficient dataset of baseline local water quality data has been obtained in accordance with Guideline requirements. This review of local water quality data and any potential variation of WQOs will allow for local background correction if required, which will assist the Project develop adaptive and suitable management measures and responses.

Review and reporting

Results from monitoring and sample analysis will be collated, reviewed, and compared to the WQOs defined for the Project. The comparison will include consideration of background data, seasonality, occurrence of mine water discharge events and event specifics (e.g., mine water quality and contaminant levels, volume of discharge, streamflow, etc.).

Where results exceed an identified WQO, further investigations will be undertaken to determine possible causes of the exceedance. Further sampling may be warranted to verify the results. If required, an action plan will be developed and implemented to correct any causal issues.

An annual REMP report outlining the findings of the REMP, including all monitoring results and interpretations, will be prepared and made available to Department of Environment, Tourism, Science and Innovation (DETSI) on request. This report will include an assessment of background reference water quality, a comparative analysis of the condition of downstream water quality and WQO, and the suitability of any discharge limits to protect downstream EVs.

15.1.5.4 Water storage monitoring

A water monitoring program (WWP) is one of the key controls for the ongoing performance assessment of the site and identification of potential impacts. The aim of the WMP is to identify and quantify potential impacts on the receiving waters during operations and assess the adequacy of or improvements to the mitigation measures. A WWP will be developed for the Project that will include water storage monitoring.

Routine sampling and assessment of the site water storages will be conducted monthly to track water quality trends in the storages and allow review of risks to environmental harm. Sampling of water storages will also be completed during overflow events to determine the concentration and quantity of released contaminants to

allow investigation into the extent of environmental harm. Water storages will be sampled for the water quality parameters presented in Table 15-5. Water levels in the storages will be monitored by the automatic monitoring and alert system proposed for the Project which will capture real time water levels in storages with trigger alarms.

Visual assessment of mine affected water storage linings will also be undertaken periodically to ensure functional seepage prevention. Should damaged lining be identified, water storages will be emptied until a replacement liner can be installed.

In addition to the Project water storage monitoring, a network of seven shallow groundwater monitoring bores associated with the TSFs will be installed around the perimeter of the TSFs. These bores will be established prior to the operation of the TSFs and are designed to:

- establish monitoring sites that are located downgradient of the TSFs;
- establish monitoring sites capable of monitoring groundwater flow paths between the TSFs and potential shallow receptors; and
- provide the ability to assess whether there is potential for environmental harm.

The detection of seepage from the TSFs will allow corrective actions to be undertaken, including remediation of any damaged impermeable barriers, and targeted extraction of water from the TSFs.

15.2 Groundwater

This section describes the assessment of the existing environmental values of groundwater quality, potential impacts of the Project, and the mitigation and management measures that will be implemented to minimise any impacts.

15.2.1 Environmental Objectives

This section has been prepared to enable an assessment of groundwater environmental objectives and associated performance outcomes prescribed in the Project TOR and stated in Schedule 8, Part 3, Division 1 of the EP Regulation; specifically, that the construction and operation of the Project will meet the following objectives and performance outcomes.

- no direct or indirect release of contaminants to groundwater from the operation of the activity;
- no actual or potential adverse effect on groundwater from the operation of the activity; and
- to prevent or minimise adverse effects on groundwater or any associated surface ecological systems.

The TOR further requires that Section 126A of the EP Act be addressed. Section 126A relates to applications for an EA involving the exercise of underground water rights and requires a description of the proposed exercise of underground water rights, the areas in which underground water rights are to be exercised, the affected aquifers, anticipated impacts on EVs of groundwater, and mitigation measures to manage the anticipated impacts.

15.2.2 Existing environment

The primary groundwater-bearing unit within the Project area is the Gilbert River Formation (GRF). The GRF is within the Great Artesian Basin and Other Regional Aquifers (GABORA) Water Plan (2017) area, which regulates the management and allocation of groundwater within regional aquifers of the Great Artesian Basin (GAB) (Figure 15-12).

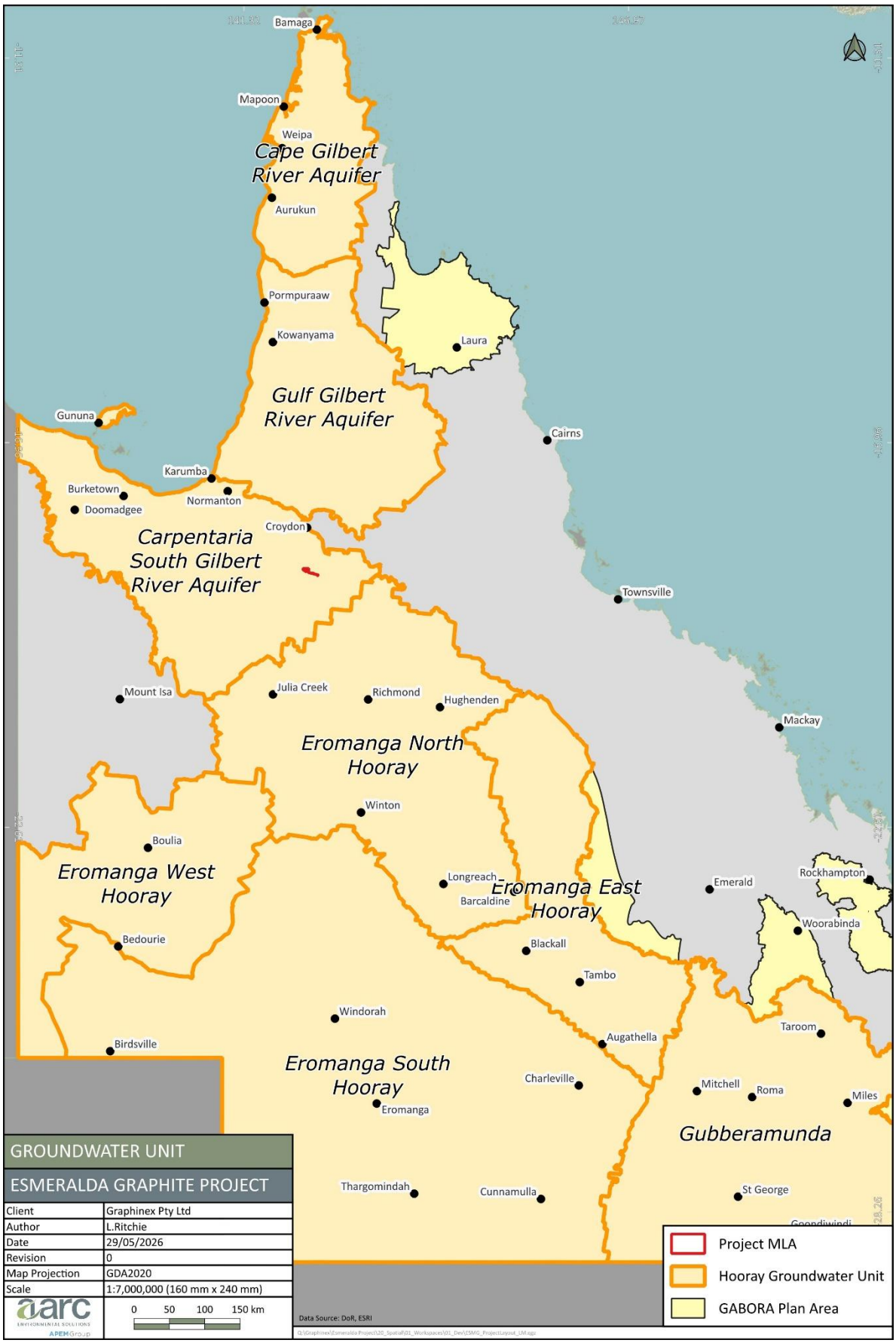


Figure 15-12: Project locality - GABORA

15.2.2.1 Connection with surface water

Surface water quality results (Section 15.1.2.4) and groundwater quality results (Section 15.2.2.4) are dissimilar and do not indicate connectivity. Although dissolved aluminium is elevated in both groundwater and surface water, this does not indicate hydraulic connectivity.

Groundwater samples showed elevated concentrations of TDS, sodium, chloride, fluoride aluminium, arsenic, and zinc when compared against the draft WQOs. Chromium, cobalt, molybdenum and vanadium were also slightly elevated in a small number for samples; however, concentrations were predominantly below the draft WQOs, and these analytes were not considered a risk to surface water quality. In comparison, surface water samples showed elevated levels of total nitrogen, total phosphorus, total ammonia, dissolved aluminium, dissolved copper, and dissolved silver against the draft WQOs.

Groundwater EC values ranged between 803 and 3, 250 µS/cm, as compared to the surface water EC values that remained below the WQO, ranging from 60.1 to 381.4 µS/cm.

This supports the hydrological modelling of the Project area, which determined that the surface water is disconnected from the underlying groundwater table, located typically between 6 m to 10 m below the bed of the watercourses and drainage features (Hydrogeologist 2026).

15.2.2.2 Groundwater environmental values

The Environmental Protection Policy (Water and Wetland Biodiversity) (EPP) is subordinate legislation under the *Environmental Protection Act 1994*. The purpose of the EPP is to identify environmental values (EV) and associated water quality objectives (WQO) associated with Queensland waters and aquifers. Queensland waters include water in rivers, streams, wetlands, lakes, groundwater aquifers, estuaries and coastal areas.

The Project is located within the Norman River sub-catchment of the Gulf Rivers basin. A program to define EVs and WQOs for the Norman River sub-catchment has not currently been completed and therefore EVs and WQOs are not currently scheduled under the EPP.

The Project also lies within the Cape York Southern Basin area under the EPP, for which no formal WQOs have been established for either surface water or groundwater.

For the purposes of this assessment the groundwater resource EVs for the Project have been considered as those attributes of the groundwater systems, within the potential impact area, that are sufficiently important to be protected or enhanced. The EVs for groundwater resources to be enhanced or protected in the Project are considered in Table 15-9.

Table 15-9: Summary of groundwater environmental values

Environmental Value	Description
Aquatic Ecosystem.	Groundwater Dependant Ecosystems (GDEs) represent ecosystems that rely wholly or partially on groundwater to maintain ecological function and EVs. Desktop reviews and field investigations identified no mapped aquatic or terrestrial GDEs within the MLA areas, with the nearest mapped GDE features located approximately 24 km to 32 km away. Although low and moderate potential GDEs are mapped within and adjacent to the MLA areas, investigations indicate these features are extremely unlikely to be groundwater dependent due to the absence of shallow groundwater, dry and unsaturated sediments, groundwater depths of approximately 10 mbGL (metres below ground level), and the ephemeral nature of local drainage features. Stygofauna assessments also identified no evidence of suitable habitat or stygofauna presence within the MLA areas.

Environmental Value	Description
Aquaculture and human consumption	No groundwater resources within the MLA areas are currently identified as supporting aquaculture or human consumption. Desktop reviews identified no springs or permanent groundwater surface expressions within or surrounding the MLA areas, with the nearest mapped springs located more than 30 km away. Available groundwater quality data indicate groundwater is generally fresh and slightly alkaline; however, the limited number of existing groundwater supply bores within the region are primarily associated with monitoring and stock watering purposes rather than potable or aquaculture supply.
Agriculture	Groundwater within the MLA areas is primarily associated with stock watering and monitoring purposes. A desktop review identified 19 registered groundwater bores within 10 km of the MLA areas, including existing groundwater supply bores completed within the GRF. Available water quality data indicate groundwater is generally fresh and slightly alkaline, suggesting it may be suitable for limited agricultural uses, including stock watering. The Proponent is also currently engaged in an agreement to subdivide the underlying Esmeralda Station, which will include ownership of the registered bores within the MLA areas.
Recreational uses	There are no springs, permanent groundwater surface expressions, or groundwater-fed water features identified within or surrounding the MLA areas that would support recreational use. Local drainage features are ephemeral and do not receive groundwater baseflow, and there is no evidence to suggest groundwater is directly used for recreational or aesthetic purposes within the MLA areas.
Drinking water	Available groundwater quality data indicate groundwater within the MLA areas is generally fresh and slightly alkaline, with recorded electrical conductivity levels ranging from 680 µS/cm to 1,310 µS/cm. While this suggests groundwater may be of a quality potentially suitable for human consumption, groundwater resources within the MLA areas are currently associated with monitoring and stock watering purposes rather than potable supply. No registered groundwater bores within the MLA areas are known to be used for drinking water supply.
Visual Recreation	This category of environmental value is considered not applicable to groundwater within the MLA areas.
Cultural and spiritual values	Desktop reviews and field investigations identified no springs, seeps, or permanent groundwater surface expressions within or surrounding the MLA areas. Accordingly, there is no evidence to suggest groundwater resources within the MLA areas support identified cultural or spiritual environmental values.

Based on the assessment completed in Table 15-9, from a hydrogeological perspective, the groundwater quality EVs to be protected by the Project are recognised as drinking water and stock watering.

Groundwater users

Data from registered groundwater bores within approximately 10 km of the Project was obtained from the Department of Local Government, Water and Volunteers (DLGWV) groundwater database (GWDB). A summary of the data collected from the bores is provided in Table 15-10 and shown in Figure 15-13. Observations from this data include that:

- most of the registered bores are constructed within the GRF, a GAB aquifer that underlies the Project; and
- groundwater is generally fresh to slightly brackish and slightly alkaline with recorded electrical conductivity (EC) values ranging from 680 µS/cm to 1,310 µS/cm, and slightly alkaline, with measured pH values of 8.4 to 8.5.

Table 15-10: Registered groundwater bore details and water quality analysis

Registered Bore	Drilled Date	Easting (GDA94 Z54)	Northing (GDA94 Z54)	Aquifer	Type	Original bore name	Status	Screen/open-hole		pH (pH units)	EC (µs/cm)	Date of sampling
								From	To			
5714	1-Jan-1935	632357	7910231	-	Sub-artesian monitoring	Prospect	existing	-	105.15	8.4	1310	08/08/1997
10791	8-Dec-1946	620900	7919210	Gilbert River Formation	Artesian monitoring	Lilly	existing	86.9	109.8	8.5	680	08/09/1987
72210	1-Jan-1987	625587	7910918	-	Sub-artesian monitoring	Lucky Creek	existing	-	-	-	-	-
92367	-	631349	7908759	-	Sub-artesian	Homestead	existing	-	-	-	-	-
109343	29-Sep-2002	638688	7919805	Gilbert River Formation	Sub-artesian	Rowe 2	existing	39	46.5	-	-	-
157196	24-Sep-2013	629524	7920923	Gilbert River Formation	Sub-artesian	-	existing	42	54	-	-	-
157437		625490	7919501	-	-	Lilly	existing	-	-	-	-	-
171468	12-Sep-2016	625719	7926865	Gilbert River Formation	Sub-artesian	-	existing	60	93	-	-	-
208359	24-Jul-2024	627798	7918997	-	Sub-artesian monitoring	-	existing	8.50	11.5	-	995	24/07/2024
208360	25-Jul-2024	627804	7918967	-	Sub-artesian monitoring	-	existing	49	55	-	987	25/07/2024
208361	28-Jul-2024	627804	7918967	-	Sub-artesian monitoring	-	existing	49	55	-	992	28/07/2024

Registered Bore	Drilled Date	Easting (GDA94 Z54)	Northing (GDA94 Z54)	Aquifer	Type	Original bore name	Status	Screen/open-hole		pH (pH units)	EC (µs/cm)	Date of sampling
								From	To			
208362	28-Jul-2024	627252.5	7918970.8	-	Sub-artesian monitoring	-	abandoned and destroyed	-	-	-	-	-
211965	11-Sep-2025	628410	7918655		Sub-artesian monitoring	Prospect	Existing	77.8	83.8	-	-	-

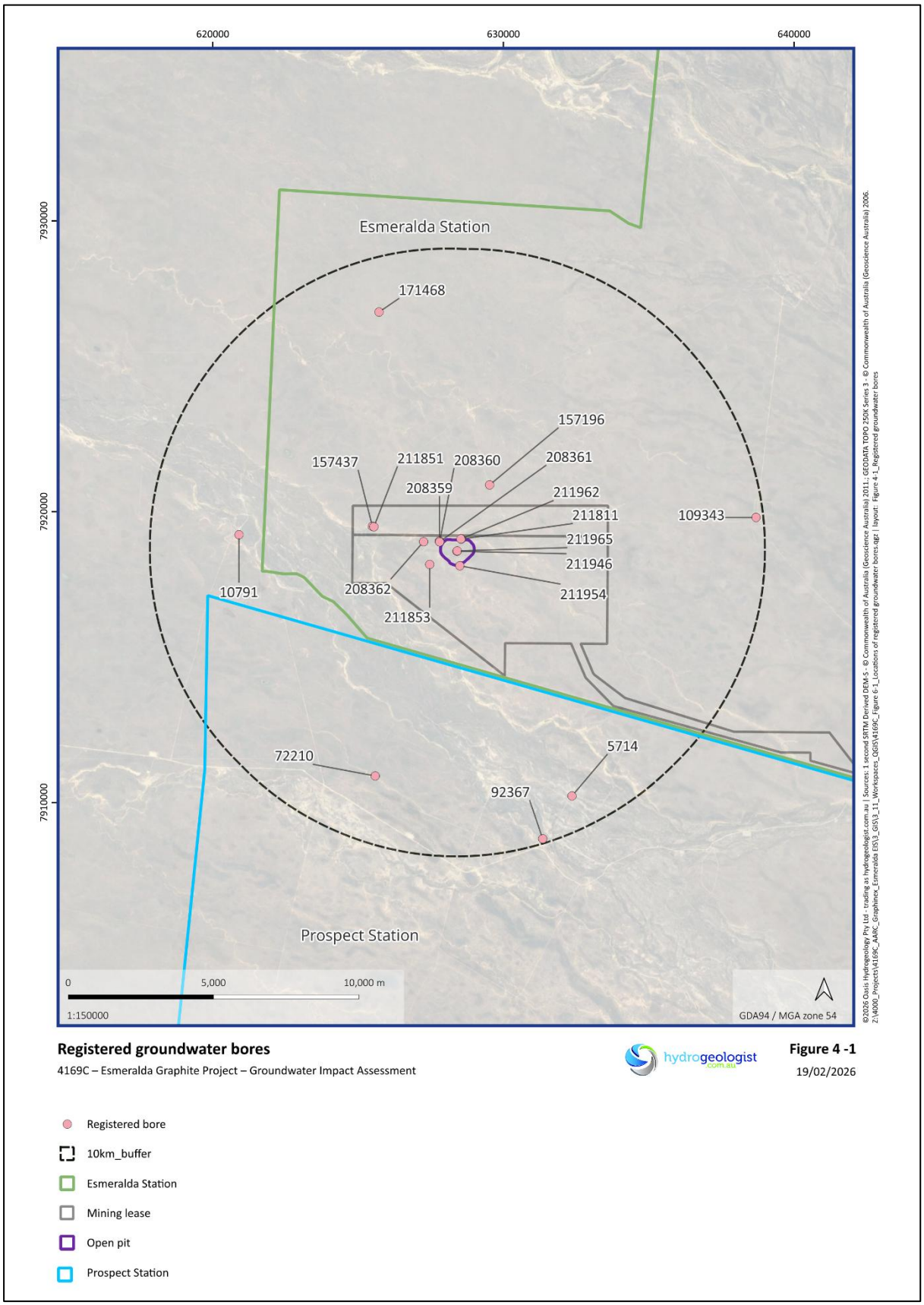


Figure 15-13: Registered groundwater bores

Springs

A desktop review of mapped springs and on-ground observation was conducted as part of the Terrestrial Ecological Baseline Report (Appendix E). A EPBC Act Protected Matters Search Tool identified an endangered 'community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' TEC to potential occur within the local area. This TEC is defined as a combination of native species, not necessarily linked to an RE.

Field surveys completed by AARC between 2024 and 2025 confirmed that of the nine distinct vegetation communities in the MLA areas, none were associated with springs or the natural discharge of groundwater from the GAB. From on-ground observations, AARC (2026) concluded that there are no natural discharges of groundwater within or immediately surrounding the study area. This includes springs, mound springs, mud springs, boggomoss springs, spring pools or groundwater seeps. Consequently, no vegetation associated with the fore-mentioned TEC was identified within the proposed disturbance area during the surveys, and as such the Project is not likely to impact this TEC.

Groundwater dependent ecosystems

AARC (2025) identified thirteen regional ecosystems (comprising 15 RE sub-types) within the proposed MLA, including vegetation communities dominated by eucalyptus, melaleuca and acacia species. Key canopy species recorded across the Project area are presented in Table 15-11.

The BOM GDE Atlas classifies riparian habitats associated with Warrigal Creek, the Borer River and the unnamed tributary (RE2.3.26a) as having a "Moderate Potential" for aquatic GDEs (BOM, 2025). In addition, several wetland depressions mapped as RE2.3.55d and an isolated patch of RE2.3.61 were identified as "Low Potential" aquatic GDEs. Terrestrial GDE mapping is concentrated predominantly south of Warrigal Creek, with additional scattered areas across the MLA areas categorised as having "High", "Moderate" or "Low" potential (BOM, 2025). A mapped potential GDEs based on the BoM GDE Atlas is shown in Figure 15-14. The nearest mapped spring complex occurs approximately 18 km north-east of the Project area, with more extensive spring groupings located approximately 50 km to the south (DCCEEW, 2023) (Figure 15-15). Given the separation distance from the Project area, potential impacts to these spring systems are considered unlikely.

Watermark Eco (2026) completed targeted field investigations of areas identified within the GDE Atlas as potential aquatic or terrestrial GDEs. The assessment found no evidence that woody vegetation within the Project area relies directly on groundwater to sustain transpiration during dry seasonal conditions. Instead, vegetation was observed to depend on moisture retained within the vadose zone. Wetland depressions (RE2.3.55d) and ephemeral drainage habitats (RE2.3.26a) were found to retain moisture for extended periods due to the capture and infiltration of surface water, although this moisture availability decreases during prolonged dry conditions. Temporary saturation within swamp wetland soils was interpreted as short-term perched moisture rather than true groundwater conditions, and these systems were therefore not considered to function as GDEs. In ephemeral drainage lines, perched groundwater may develop seasonally within alluvial sands overlying impermeable basement rock following wet season recharge events. Riparian vegetation may opportunistically utilise this shallow perched groundwater when present; however, these conditions diminish rapidly as seasonal drying occurs, resulting in vegetation reverting to reliance on soil moisture storage within the vadose zone.

Table 15-11: Major canopy species within the MLA and surrounds.

Eucalyptus species (species / common name)
Corymbia grandifolia (large-leaf cabbage gum), *Eucalyptus camaldulensis* (river red gum), *Eucalyptus microtheca* (coolibah), *Corymbia polycarpa* (long-fruited bloodwood), *Corymbia setosa* (rough-leaved bloodwood)
Melaleuca species (including other Myrtaceae genera shrubs)
Melaleuca viridiflora (Broad-leaved tea tree), *Melaleuca fluviatilis* (weeping paperbark), *Melaleuca citrolens* (gulbarn), *Astermyrtus symphiocarpa* (liniment bush)
Acacia species and other species

Eucalyptus species (species / common name)
Acacia holosericea (silver-leaved wattle), *Acacia leptocarpa* (slender-fruited wattle), *Acacia platycarpa* (ghost wattle), *Acacia torulosa* (Torulosa wattle), *Erythrophloeum chlorostachys* (Cooktown ironwood), *Grevillea striata* (beefwood)

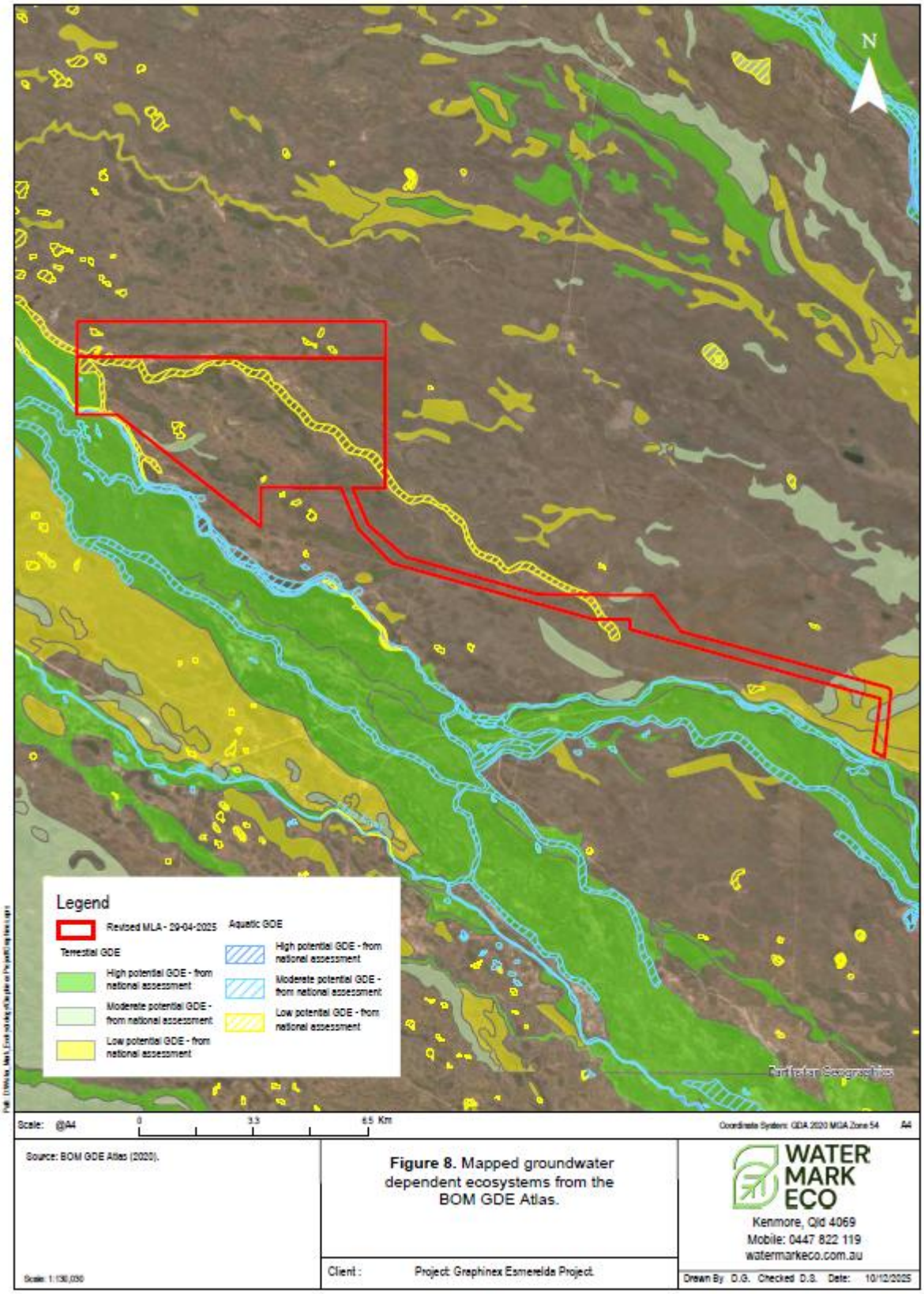


Figure 15-14: Mapped groundwater dependent ecosystems from the BOM GDE Atlas.

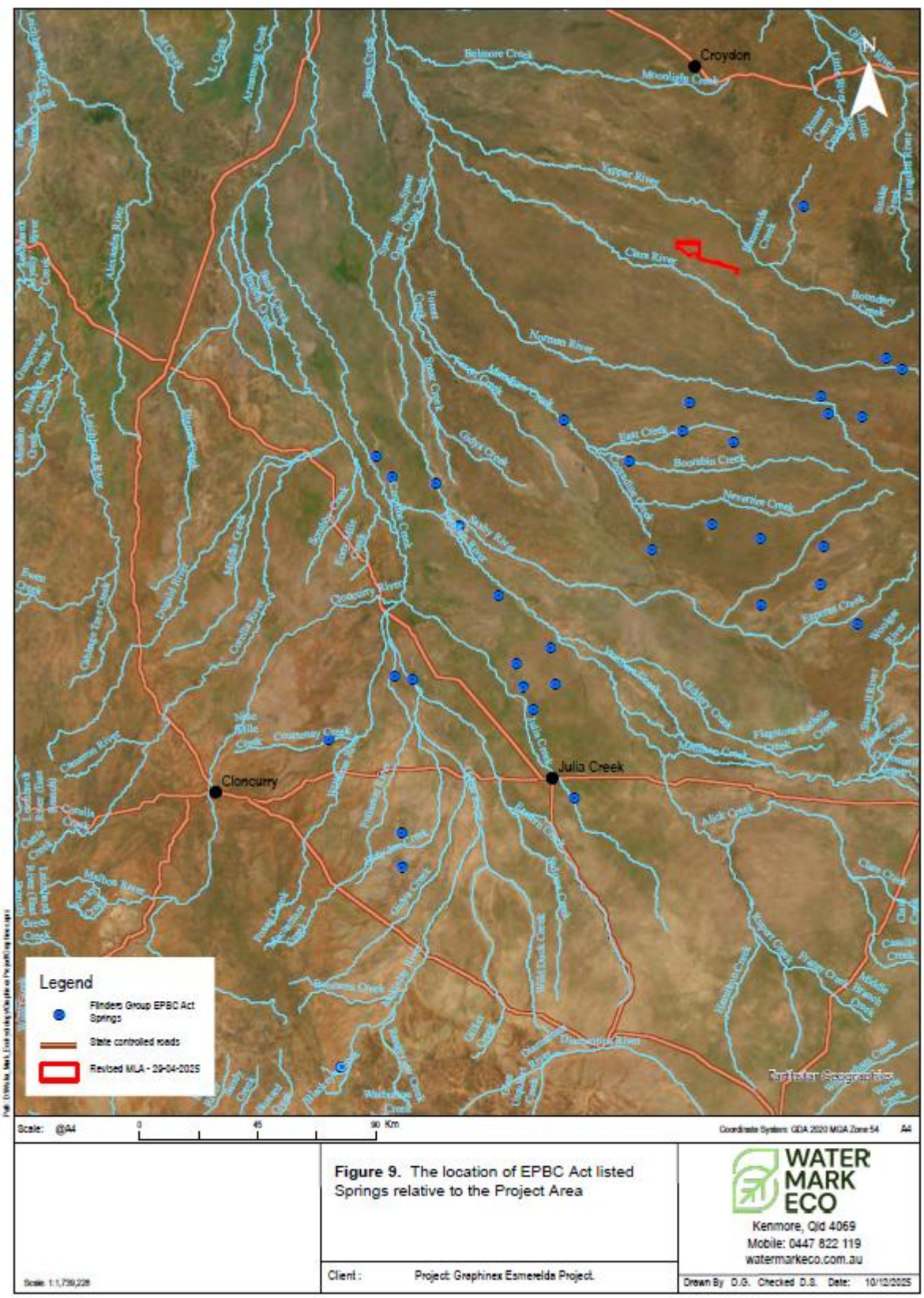


Figure 15-15: The location of EPBC Act listed Springs relative to the Project Area

Stygofauna

EcoLogical Australia (2026) undertook a stygofauna assessment for the Project based on desktop review, assessment of groundwater monitoring data and targeted field sampling. No known records of stygofauna occur within or near the MLA area, with the closest recorded specimens identified from limestone and karst-associated systems at Chillagoe and Lawn Hill, located approximately 290 km north-east and 430 km west of the MLA areas, respectively.

Field investigations included sampling of 12 groundwater bores across the MLA areas. Shallow bores within the Tertiary sediments were dry at the time of survey. With no stygofauna were recorded during sampling of the GRF aquifer. While several monitoring bores were younger than the six-month colonisation period recommended in DSITI (2015), they were sampled to improve spatial coverage and increase the available groundwater physico-chemical dataset.

EcoLogical Australia (2026) concluded that the likelihood of stygofauna occurring within the Project area is low due to a combination of environmental and hydrogeological constraints. These include the limited thickness and intermittent saturation of the alluvium, elevated groundwater temperatures and pH within the GRF, and the potentially limited degree of sandstone fracturing required to provide suitable pore space and connectivity for subterranean fauna movement and groundwater-dependent food webs. The absence of stygofauna during field sampling further supports the conclusion that the MLA areas is unlikely to support stygofauna habitat.

Stygofauna are discussed further in Chapter 18, Flora and Fauna and Appendix F, Stygofauna Assessment.

15.2.2.3 Water quality objectives

To develop site-specific groundwater quality trigger values, Department of Environment and Science (DES) (2021) recommends that a minimum of 18 datapoints over at least 12 and preferably 24 months is gathered. As such, further sampling events are required before any site-specific trigger values can be developed and implemented as water quality objectives. Once a sufficient groundwater quality dataset is available, groundwater quality trigger values will be developed.

15.2.2.4 Groundwater quality

Groundwater quality data has been obtained from multiple groundwater sampling events in September 2024, November 2024, February 2025, July 2025, September 2025, October 2025, November 2025, and December 2025 at the bores shown in Figure 15-16. Groundwater samples were collected from Project groundwater monitoring bores and five landholder groundwater bores, which comprise the monitoring network. The groundwater quality data was assessed using field parameters and laboratory analytical results, which were then compared against relevant guideline values, including ANZG (2018) freshwater guidelines and hardness-modified trigger values where applicable. The groundwater quality data is representative of the GFR. The exception to this is groundwater quality data from ESMB07D which is representative of the Proterozoic basement.

The field electrical conductivity (EC) ranges from 803 µS/cm to 3,250 µS/cm and is lowest in bore ESMB01D and highest in bore Rowe 1 (Figure 15-17), with both bores screened in the GRF. Groundwater is considered too saline for crops at 8,100 µS/cm and < 7,460 µS/cm is considered suitable for beef cattle (Queensland Government, 2018). Pelican bore, Rowe 1 bore and Rowe 2 bore show slightly higher EC concentrations (>2,000 µS/cm) when compared to the site-specific groundwater monitoring bores (between 800 µS/cm and 1,500 µS/cm).

A histogram of EC values from the groundwater monitoring network is presented in Figure 15-18. Using an EC-based salinity classification (fresh water <1,500 µS/cm; brackish water 1,500 – 15,000 µS/cm), the dataset comprises 47 fresh-water samples and 17 brackish-water samples.

The majority of monitoring bores completed within the GRF record fresh-water EC values.
Brackish EC conditions are confined to Pelican Bore, Rowe 1 and Rowe 2, which also target the GRF but are located to the east of the Project area, at distances of approximately 22 km, 15 km and 10 km from the Project

mining area, respectively. All remaining monitoring bores recorded fresh EC values, indicating comparatively lower salinity groundwater within the Project area.

AECOM (2025) Croydon Groundwater Baseline Project Report for Critical Minerals Queensland provides a technical overview of groundwater availability, quality, recharge characteristics and broader water resource considerations relevant to the Project area. The report provides a summary of the hydrochemistry data for the GRF in the Croydon Critical Mineral Zone that indicated EC ranging between 80 µS/cm to 10,750 µS/cm with an average concentration of 1,470 µS/cm.

The site specific EC results fall within this broader range and are consistent with the regional hydrochemical conditions described by AECOM (2025).

The field pH is neutral (7.08) to strongly alkaline (9.17) and is lowest in bore Rowe 1 and highest in bore ESMB02D (Figure 15-19). pH results show moderate variability and would be considered acceptable for drinking water and stock watering applications (ANZG, 2023).

The field pH results are broadly consistent with the regional pH range reported by AECOM (2025) - ranging between 4.8 (acidic) to 8.8 (slightly alkaline). Although, the site values extend slightly further into the alkaline range.

Groundwater quality from the bores is elevated with respect to a number of metal/metalloid parameters relative to the ANZG (2018) 95% freshwater protection limit. Groundwater quality data for dissolved metals, total metals, and major ions are shown in Table 15-12, Table 15-13 and Table 15-14, respectively.

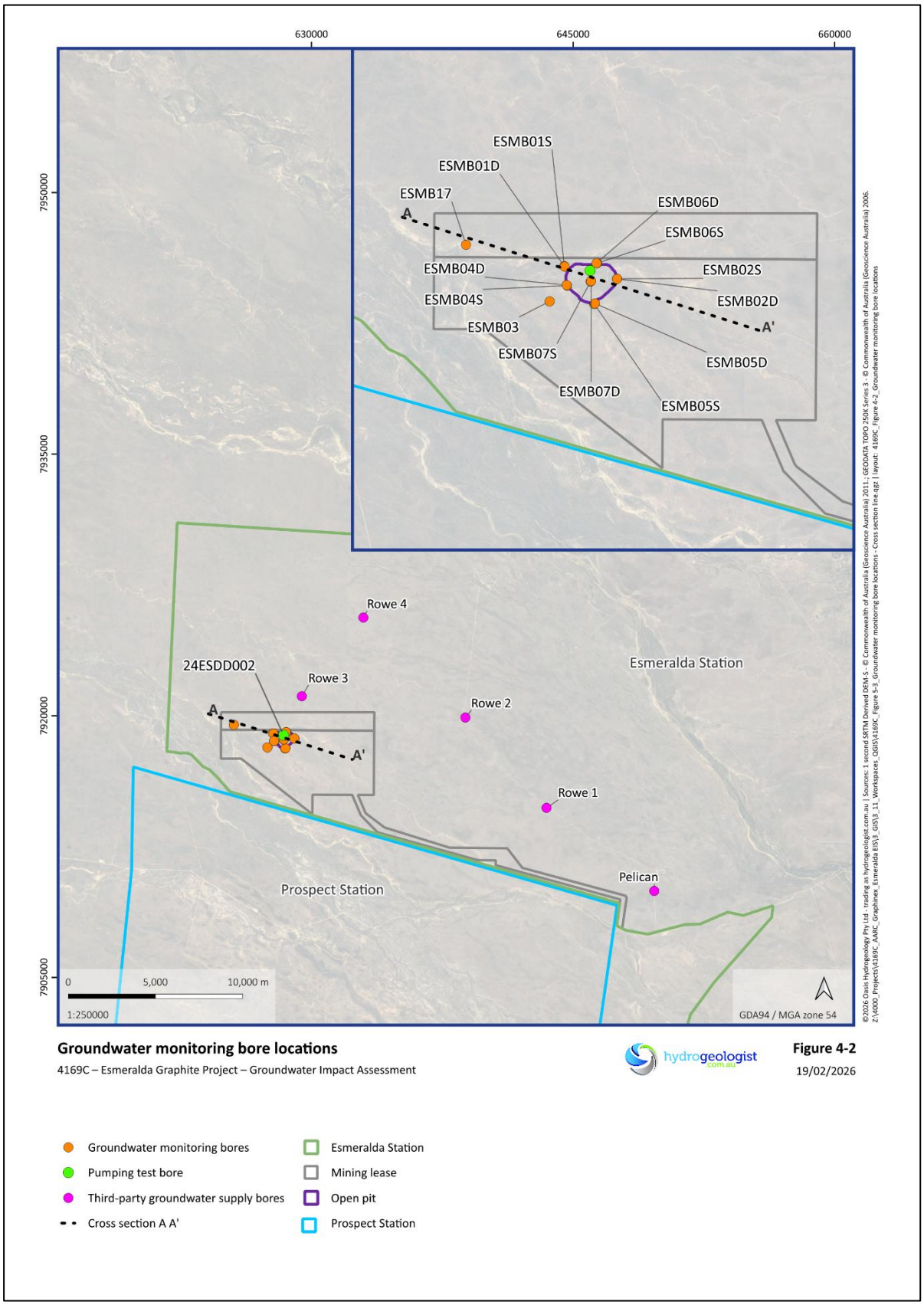


Figure 15-16: Groundwater monitoring bore network

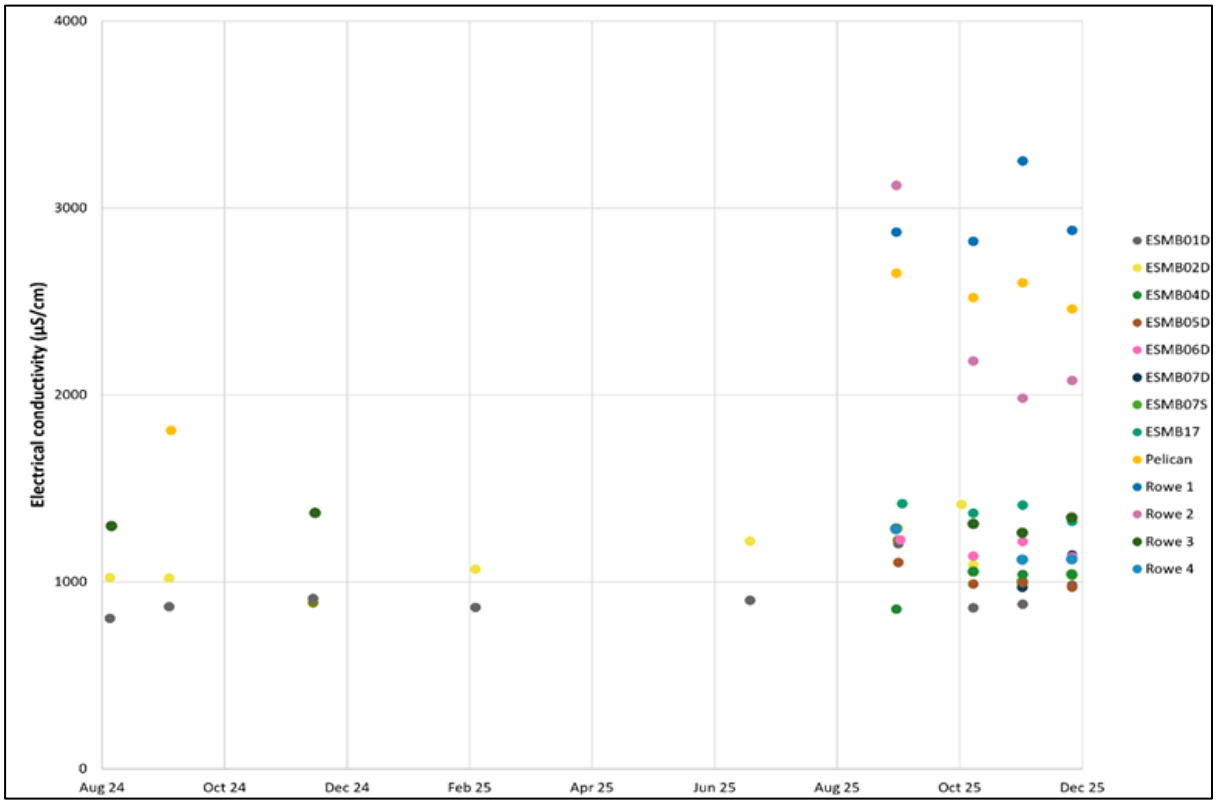


Figure 15-17: Field electrical conductivity

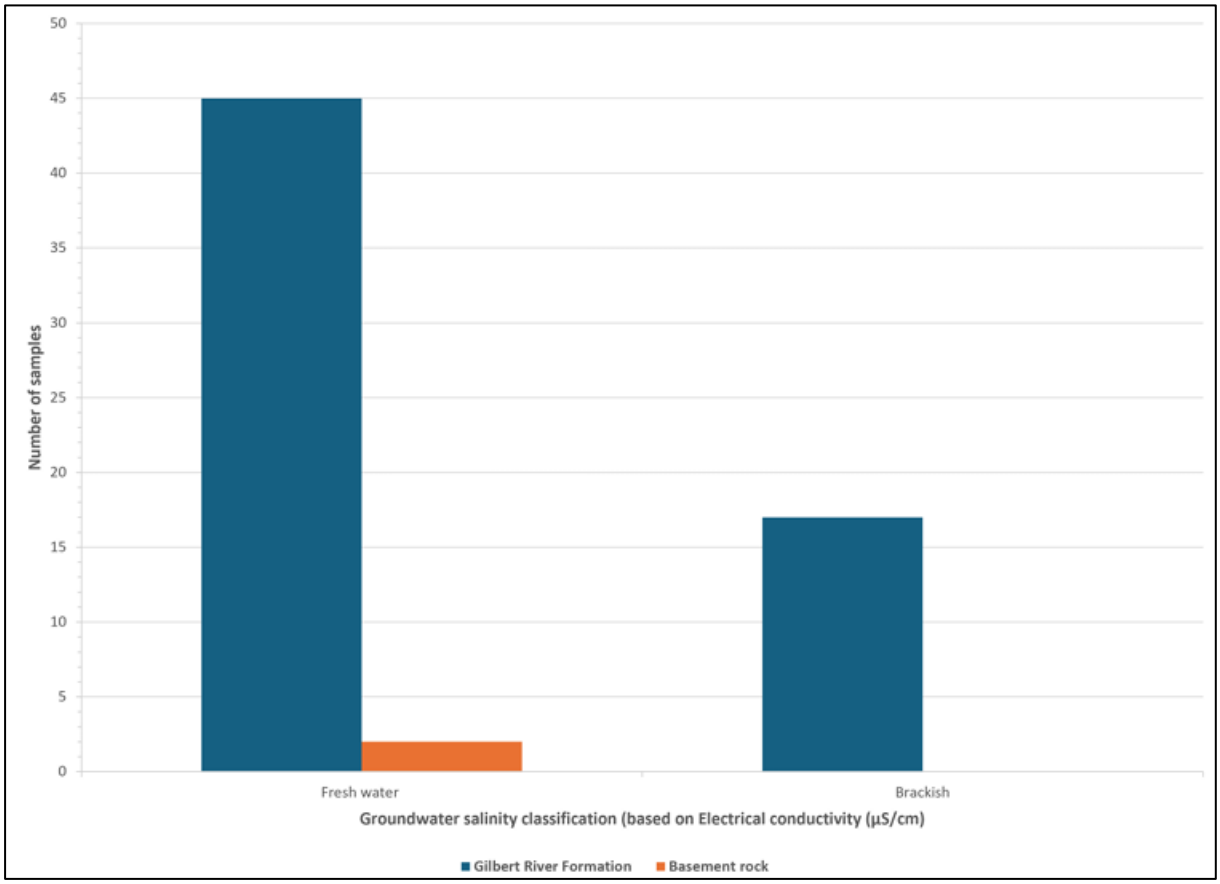


Figure 15-18: Electrical conductivity (µS/cm) histogram

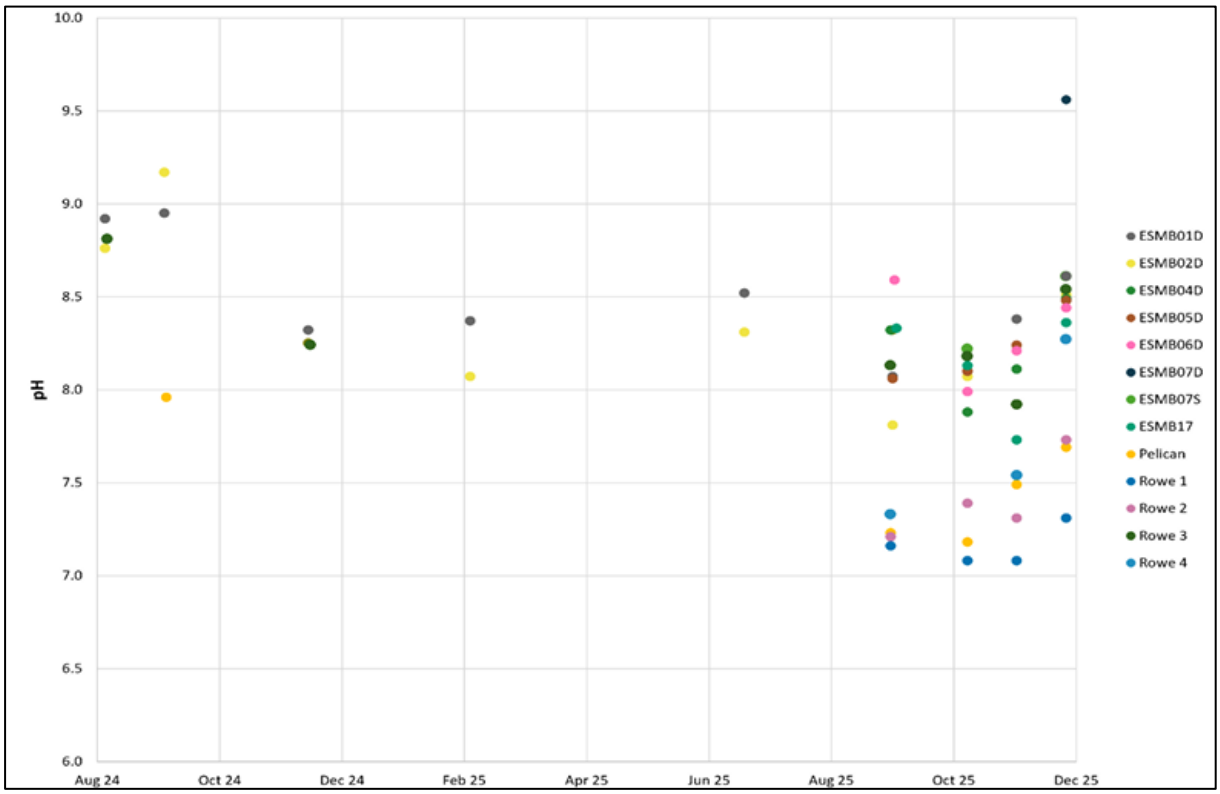


Figure 15-19: Field pH

Table 15-12: Laboratory water quality data – Dissolved metals

Bore ID	Date	ALS Sample Number:	Unit of reporting	Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Uranium	Vanadium	Zinc
ANZG (2018 limit)			**mg/l**	**0.008**	**0.013**	**0.94**	**0.0002**	**0.001**	**0.0014**	**0.014**	**n/a**	**0.0034**	**1.9**	**0.00006**	**0.034**	**0.011**	**0.011**	**0.0005**	**0.006**	**0.005**
HMTV (min)			**mg/l**				**0.0011**					**0.04**				**0.06**				**0.026**
HMTV (mean)			**mg/l**				**0.002**					**0.09**				**0.1**				**0.045**
HMTV (max)			**mg/l**				**0.002**					**0.09**				**0.1**				**0.045**
24ESD002	23/10/2025	ET2505840012	mg/L	0.03	0.006	0.16	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.005	<0.0001	0.02	<0.001	<0.01	n/a	<0.01	<0.005
ESMB01D	14/09/2024	CE177431.001	mg/L	0.21	0.003	0.15	<0.0001	0.001	<0.001	0.001	0.17	<0.001	0.008	<0.00005	0.005	<0.001	<0.001	n/a	0.003	<0.005
	25/11/2024	CE178942.001	mg/L	0.038	0.002	0.15	<0.0001	<0.001	<0.001	0.001	<0.005	<0.001	n/a	<0.00005	0.004	<0.001	<0.003	n/a	<0.001	<0.005
	15/02/2025	ET2500859	mg/L	0.01	0.001	n/a	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	n/a	n/a	0.004	<0.001	<0.01	n/a	<0.01	0.012
	4/07/2025	ET2503782001	mg/L	<0.01	<0.001	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.016	<0.0001	0.004	<0.001	<0.01	n/a	<0.01	0.008
	17/09/2025	ET2505310001	mg/L	<0.01	0.001	0.15	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.058	<0.0001	0.003	<0.001	<0.01	n/a	<0.01	0.023
	25/10/2025	ET2505840001	mg/L	<0.01	<0.001	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.015	<0.0001	0.004	<0.001	<0.01	n/a	<0.01	0.009
	19/11/2025	ET2506279001	mg/L	<0.01	0.001	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.017	<0.0001	0.004	<0.001	<0.010	n/a	<0.01	0.016
	14/12/2025	ET2506806001	mg/L	0.02	0.001	0.16	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.018	<0.0001	0.004	<0.001	<0.01	n/a	<0.01	<0.005
ESMB02D	14/09/2024	CE177431.002	mg/L	0.35	0.012	0.18	<0.0001	<0.001	<0.001	0.001	0.48	<0.001	0.017	<0.00005	0.005	<0.001	<0.001	n/a	0.001	0.007
	25/11/2024	CE178942.002	mg/L	0.02	0.002	0.15	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.001	n/a	<0.00005	0.004	<0.001	<0.003	n/a	<0.001	<0.005
	15/02/2025	ET2500859	mg/L	0.12	0.01	n/a	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	n/a	n/a	0.008	<0.001	<0.01	n/a	<0.01	0.024
	4/07/2025	ET2503782002	mg/L	0.14	0.012	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.022	<0.0001	0.006	<0.001	<0.01	n/a	<0.01	0.012
	17/09/2025	ET2505310002	mg/L	0.13	0.012	0.17	<0.0001	<0.001	<0.001	0.003	0.16	<0.001	0.028	<0.0001	0.005	<0.001	<0.01	n/a	<0.01	0.009
	25/10/2025	ET2505840002	mg/L	0.11	0.012	0.19	<0.0001	<0.001	<0.001	0.001	<0.05	<0.001	0.015	<0.0001	0.006	0.002	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279002	mg/L	0.09	0.014	0.21	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.016	<0.0001	0.006	0.001	<0.010	n/a	<0.01	0.018
	14/12/2025	ET2506806001	mg/L	0.18	0.013	0.18	<0.0001	<0.001	<0.001	0.002	0.12	<0.001	0.025	<0.0001	0.006	0.002	<0.01	n/a	<0.01	0.006
ESMB04D	16/09/2025	ET2505310003	mg/L	0.6	0.004	0.17	<0.0001	<0.001	<0.001	0.001	0.13	<0.001	0.015	<0.0001	0.007	0.001	<0.01	n/a	<0.01	0.006
	25/10/2025	ET2505840003	mg/L	0.03	0.005	0.21	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.062	<0.0001	0.006	0.001	<0.01	n/a	<0.01	0.022
	19/11/2025	ET2506279003	mg/L	0.02	0.008	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.138	<0.0001	0.008	0.002	<0.010	n/a	<0.01	0.01
	14/12/2025	ET2506806001	mg/L	0.31	0.008	0.17	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	0.156	<0.0001	0.008	0.002	<0.01	n/a	<0.01	<0.005
ESMB05D	17/09/2025	ET2505310004	mg/L	0.17	0.025	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.02	<0.0001	0.006	<0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840004	mg/L	0.08	0.018	0.22	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.017	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	0.015
	19/11/2025	ET2506279004	mg/L	0.03	0.014	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.033	<0.0001	0.007	<0.001	<0.010	n/a	<0.01	0.016
	14/12/2025	ET2506806001	mg/L	0.07	0.014	0.19	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.029	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	<0.005
ESMB06D	18/09/2025	ET2505310005	mg/L	0.19	0.007	0.15	<0.0001	0.001	<0.001	0.001	0.06	<0.001	0.007	<0.0001	0.007	0.002	<0.01	n/a	<0.01	0.006

Bore ID	Date	ALS Sample Number:	Unit of reporting	Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Uranium	Vanadium	Zinc
	25/10/2025	ET2505840005	mg/L	0.13	0.008	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.0001	0.008	<0.001	<0.01	n/a	<0.01	0.01
	19/11/2025	ET2506279005	mg/L	0.07	0.013	0.25	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.033	<0.0001	0.013	0.002	<0.010	n/a	<0.01	0.046
	14/12/2025	ET2506806001	mg/L	0.11	0.013	0.18	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.022	<0.0001	0.008	<0.001	<0.01	n/a	<0.01	<0.005
ESMB07D	19/11/2025	ET2506279007	mg/L	0.11	0.009	0.19	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.008	<0.0001	0.038	0.006	<0.010	n/a	<0.01	0.017
	14/12/2025	ET2506806001	mg/L	2.93	0.073	0.21	<0.0001	0.006	0.004	0.004	5.25	0.003	0.103	<0.0001	0.016	0.006	<0.01	n/a	0.02	0.019
ESMB07S	17/09/2025	ET2505310006	mg/L	0.26	0.007	0.16	<0.0001	<0.001	<0.001	0.003	0.11	<0.001	0.007	<0.0001	0.005	0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840006	mg/L	0.08	0.011	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.011	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279006	mg/L	0.02	0.012	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.015	<0.0001	0.004	<0.001	<0.010	n/a	<0.01	0.011
	14/12/2025	ET2506806001	mg/L	0.07	0.011	0.16	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.015	<0.0001	0.006	<0.001	<0.01	n/a	<0.01	0.006
ESMB17	19/09/2025	ET2505310007	mg/L	4.5	0.02	0.16	<0.0001	0.004	0.002	0.006	2.61	0.001	0.075	<0.0001	0.009	0.005	<0.01	n/a	0.03	0.017
	25/10/2025	ET2505840007	mg/L	0.03	0.016	0.38	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.071	<0.0001	0.009	<0.001	<0.01	n/a	<0.01	0.007
	19/11/2025	ET2506279008	mg/L	0.18	0.016	0.24	<0.0001	<0.001	<0.001	<0.001	0.12	<0.001	0.1	<0.0001	0.011	0.001	<0.010	n/a	<0.01	0.008
	14/12/2025	ET2506806001	mg/L	0.1	0.027	0.19	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.074	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	<0.005
Pelican Bore	14/09/2024	CE177431.003	mg/L	0.019	<0.001	0.14	<0.0001	<0.001	<0.001	<0.001	0.01	<0.001	0.005	<0.00005	0.002	<0.001	<0.001	n/a	0.002	<0.005
	17/09/2025	ET2505310012	mg/L	<0.01	<0.001	0.17	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.0001	0.001	<0.001	<0.01	n/a	<0.01	0.048
	25/10/2025	ET2505840011	mg/L	<0.01	<0.001	0.14	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.0001	0.001	<0.001	<0.01	n/a	<0.01	0.022
	19/11/2025	ET2506279013	mg/L	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	0.001	<0.05	<0.001	0.002	<0.0001	0.001	<0.001	<0.010	n/a	<0.01	0.034
	14/12/2025	ET2506806001	mg/L	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.004	<0.0001	0.001	<0.001	<0.01	n/a	<0.01	0.03
Rowe 1	17/09/2025	ET2505310008	mg/L	<0.01	<0.001	0.15	<0.0001	<0.001	0.004	<0.001	<0.05	<0.001	0.005	<0.0001	<0.001	0.002	<0.01	n/a	<0.01	0.043
	25/10/2025	ET2505840008	mg/L	<0.01	<0.001	0.19	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.0001	<0.001	<0.001	<0.01	n/a	<0.01	0.025
	19/11/2025	ET2506279009	mg/L	<0.01	<0.001	0.17	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.0001	<0.001	<0.001	<0.010	n/a	<0.01	0.025
	14/12/2025	ET2506806001	mg/L	<0.01	<0.001	0.14	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.006	<0.0001	<0.001	<0.001	<0.01	n/a	<0.01	<0.005
Rowe 2	17/09/2025	ET2505310009	mg/L	<0.01	<0.001	0.17	<0.0001	<0.001	0.004	<0.001	<0.05	<0.001	0.009	<0.0001	<0.001	0.002	<0.01	n/a	<0.01	0.027
	25/10/2025	ET2505840009	mg/L	<0.01	<0.001	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.008	<0.0001	0.001	<0.001	<0.01	n/a	<0.01	0.021
	25/10/2025	ET2505840010	mg/L	<0.01	0.01	0.2	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.007	<0.0001	0.005	<0.001	<0.01	n/a	<0.01	0.012
	19/11/2025	ET2506279011	mg/L	<0.01	0.011	0.19	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.0001	0.003	<0.001	<0.010	n/a	<0.01	0.014
	14/12/2025	ET2506806001	mg/L	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.009	<0.0001	0.002	<0.001	<0.01	n/a	<0.01	<0.005
Rowe 4	17/09/2025	ET2505310011	mg/L	<0.01	0.014	0.23	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.016	<0.0001	0.002	<0.001	<0.01	n/a	<0.01	0.02
	19/11/2025	ET2506279012	mg/L	<0.01	0.015	0.23	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.017	<0.0001	0.001	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	<0.01	0.015	0.23	<0.0001	<0.001	<0.001	<0.001	0.06	<).001	0.016	<0.0001	0.002	<0.001	<0.01	n/a	<0.01	<0.005

Note: Cell shaded orange indicated exceedance of objective.

Table 15-13: Laboratory water quality data – Total metals

Bore ID	Date	ALS Sample Number:	Unit of reporting	Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Uranium	Vanadium	Zinc
24ESD002	23/10/2025	ET2505840012	mg/L	0.04	0.006	0.16	<0.0001	<0.001	<0.001	<0.001	0.014	<0.005	0.005	n/a	0.021	<0.001	<0.01	n/a	<0.01	<0.005
ESMB01D	14/09/2024	CE177431.001	mg/L	3.3	0.003	0.16	<0.0001	0.003	<0.001	0.003	1.9	0.005	0.038	<0.00005	0.005	0.002	<0.001	n/a	0.006	0.018
	25/11/2024	CE178942.001	mg/L	0.18	0.001	0.15	<0.0001	<0.001	<0.001	0.001	0.17	<0.001	n/a	<0.00005	0.004	<0.001	<0.001	n/a	<0.001	<0.005
	15/02/2025	ET2500859	mg/L	0.64	0.01	n/a	<0.0001	0.002	<0.001	0.01	0.48	0.002	n/a	n/a	0.01	0.001	<0.01	n/a	<0.01	0.028
	4/07/2025	ET2503782001	mg/L	0.06	0.001	0.15	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.02	n/a	0.004	<0.001	<0.01	n/a	<0.01	0.008
	17/09/2025	ET2505310001	mg/L	2.15	0.001	0.14	<0.0001	0.136	0.003	0.009	2.91	0.005	0.072	n/a	0.008	0.069	<0.01	n/a	<0.01	0.028
	25/10/2025	ET2505840001	mg/L	0.05	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.017	n/a	0.004	0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279001	mg/L	0.09	0.001	0.14	<0.0001	0.004	<0.001	<0.001	0.16	<0.001	0.018	n/a	0.004	0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	0.04	0.001	0.16	<0.0001	<0.001	<0.001	<).001	0.09	<0.001	0.18	<0.0001	0.004	<0.001	<0.01	n/a	<0.01	<0.005
ESMB02D	14/09/2024	CE177431.002	mg/L	0.94	0.012	0.19	<0.0001	0.002	<0.001	0.002	1.6	0.003	0.039	<0.00005	0.005	<0.001	<0.001	n/a	0.003	0.017
	25/11/2024	CE178942.002	mg/L	0.4	0.002	0.15	<0.0001	0.002	<0.001	0.002	0.39	0.001	n/a	<0.00005	0.005	0.002	<0.001	n/a	0.001	0.007
	15/02/2025	ET2500859	mg/L	0.03	0.001	n/a	<0.0001	<0.001	<0.001	0.002	0.06	0.001	n/a	n/a	0.004	<0.001	<0.01	n/a	<0.01	0.012
	4/07/2025	ET2503782002	mg/L	0.22	0.012	0.18	<0.0001	<0.001	<0.001	0.003	0.17	0.001	0.026	n/a	0.007	<0.001	<0.01	n/a	<0.01	0.006
	17/09/2025	ET2505310002	mg/L	0.2	0.011	0.17	<0.0001	0.001	<0.001	<0.001	0.14	<0.001	0.017	n/a	0.006	0.001	<0.01	n/a	<0.01	0.006
	25/10/2025	ET2505840002	mg/L	0.16	0.01	0.16	<0.0001	0.003	<0.001	0.003	0.12	<0.001	0.014	n/a	0.005	0.004	0.011	n/a	<0.01	<0.005
	19/11/2025	ET2506279002	mg/L	0.16	0.011	0.15	<0.0001	0.002	<0.001	0.003	0.19	<0.001	0.016	n/a	0.006	0.003	<0.010	n/a	<0.01	0.006
	14/12/2025	ET2506806001	mg/L	0.29	0.011	0.16	<0.0001	<0.001	<0.001	<0.001	0.25	<0.001	0.024	<0.0001	0.005	0.002	<0.01	n/a	<0.01	0.008
ESMB04D	16/09/2025	ET2505310003	mg/L	6.26	0.005	0.16	<0.0001	0.008	0.001	0.003	4.14	0.002	0.071	n/a	0.004	0.003	<0.01	n/a	0.01	0.02
	25/10/2025	ET2505840003	mg/L	4.78	0.004	0.16	<0.0001	0.006	0.002	0.003	3.21	0.002	0.126	n/a	0.005	0.004	<0.01	n/a	<0.01	0.022
	19/11/2025	ET2506279003	mg/L	9.09	0.007	0.15	<0.0001	0.124	0.005	0.012	6.9	0.004	0.24	n/a	0.011	0.059	<0.010	n/a	0.02	0.088
	14/12/2025	ET2506806001	mg/L	1.62	0.007	0.18	<0.0001	0.003	0.002	0.003	1.03	0.001	0.194	<0.0001	0.006	0.008	<0.01	n/a	<0.01	0.019
ESMB05D	17/09/2025	ET2505310004	mg/L	0.26	0.026	0.18	<0.0001	<0.001	<0.001	0.001	0.16	<0.001	0.025	n/a	0.007	<0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840004	mg/L	0.13	0.014	0.12	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.018	n/a	0.006	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279004	mg/L	0.22	0.012	0.17	<0.0001	<0.001	<0.001	0.001	0.25	<0.001	0.036	n/a	0.006	<0.001	<0.010	n/a	<0.01	0.007
	14/12/2025	ET2506806001	mg/L	0.07	0.013	0.19	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.029	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	<0.005
ESMB06D	18/09/2025	ET2505310005	mg/L	0.71	0.007	0.15	<0.0001	0.001	<0.001	0.003	0.56	0.004	0.017	n/a	0.007	0.001	<0.01	n/a	<0.01	0.012
	25/10/2025	ET2505840005	mg/L	0.62	0.007	0.16	<0.0001	0.003	<0.001	0.001	0.035	0.001	0.01	n/a	0.008	0.003	<0.01	n/a	<0.01	0.01
	19/11/2025	ET2506279005	mg/L	0.6	0.013	0.17	<0.0001	<0.001	0.001	0.006	0.37	0.002	0.051	n/a	0.012	0.003	<0.010	n/a	<0.01	0.011
	14/12/2025	ET2506806001	mg/L	0.14	0.012	0.18	<0.0001	<0.001	<0.001	0.001	0.09	0.002	0.023	<0.0001	0.008	<0.001	<0.01	n/a	<0.01	<0.005
ESMB7D	19/11/2025	ET2506279007	mg/L	0.51	0.011	0.18	<0.0001	<0.003	<0.001	0.003	0.75	<0.001	0.019	n/a	0.042	0.011	<0.010	n/a	<0.01	0.03
	14/12/2025	ET2506806001	mg/L	5.22	0.068	0.2	<0.0001	0.014	0.007	0.007	8.08	0.005	0.155	<0.0001	0.011	0.009	<0.01	n/a	0.02	0.036
ESMB07S	17/09/2025	ET2505310006	mg/L	0.55	0.008	0.15	<0.0001	<0.001	<0.001	0.003	0.39	0.002	0.012	n/a	0.006	0.003	<0.01	n/a	<0.01	0.008

Bore ID	Date	ALS Sample Number:	Unit of reporting	Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Uranium	Vanadium	Zinc
	25/10/2025	ET2505840006	mg/L	0.12	0.01	0.16	<0.0001	<0.001	<0.001	0.001	0.08	<0.001	0.014	n/a	0.007	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279006	mg/L	0.1	0.013	0.17	<0.0001	<0.001	<0.001	<0.001	0.15	<0.001	0.018	n/a	0.007	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	0.05	0.011	0.18	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.015	<0.0001	0.006	<0.001	<0.01	n/a	<0.01	<0.005
ESMB17	19/09/2025	ET2505310007	mg/L	16.8	0.021	0.17	<0.0001	0.018	0.008	0.019	10.3	0.005	0.181	n/a	0.005	0.011	<0.01	n/a	0.05	0.041
	25/10/2025	ET2505840007	mg/L	6.27	0.017	0.17	<0.0001	0.007	0.003	0.005	3.61	0.002	0.162	n/a	0.006	0.011	<0.01	n/a	0.02	0.045
	19/11/2025	ET2506279008	mg/L	2.89	0.017	0.19	<0.0001	0.001	0.002	0.002	1.63	0.001	0.175	n/a	0.009	0.008	<0.010	n/a	0.02	0.033
	14/12/2025	ET2506806001	mg/L	0.3	0.024	0.17	<0.0001	<0.001	<0.001	<0.001	0.21	<0.001	0.066	<0.0001	0.007	<0.001	<0.01	n/a	<0.01	<0.005
Pelican Bore	14/09/2024	CE177431.003	mg/L	0.045	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	0.021	<0.001	0.006	<0.00005	0.002	<0.001	<0.001	n/a	0.002	<0.005
	17/09/2025	ET2505310012	mg/L	<0.01	<0.001	0.14	<0.0001	<0.001	<0.001	0.001	<0.05	0.002	0.003	n/a	0.001	<0.001	<0.01	n/a	<0.01	0.029
	25/10/2025	ET2505840011	mg/L	<0.01	<0.001	0.14	<0.0001	<0.001	<0.001	0.002	0.18	<0.001	0.032	n/a	<0.001	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279013	mg/L	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.004	n/a	0.001	<0.001	<0.010	n/a	<0.01	0.019
	14/12/2025	ET2506806001	mg/L	<0.01	<).001	0.15	<0.0001	<0.001	<0.001	0.003	<0.05	0.001	0.005	<0.0001	0.001	<0.001	<0.01	n/a	<0.01	0.033
Rowe 1	17/09/2025	ET2505310008	mg/L	<0.01	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.017	n/a	<0.001	<0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840008	mg/L	0.02	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.069	n/a	<0.001	0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279009	mg/L	<0.01	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.014	n/a	<0.001	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	<0.01	<0.001	0.17	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.007	<0.0001	<0.001	<0.001	<0.001	n/a	<0.01	<0.005
Rowe 2	17/09/2025	ET2505310009	mg/L	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	<0.001	0.22	<0.001	0.009	n/a	<0.001	<0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840009	mg/L	<0.01	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	0.31	<0.001	0.009	n/a	0.001	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279010	mg/L	<0.01	<0.001	0.18	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.009	n/a	0.001	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	<0.01	<0.001	0.17	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.009	<0.0001	0.002	<0.001	<0.01	n/a	<0.01	<0.005
Rowe 3	26/11/2024	CE178942.003	mg/L	0.01	0.011	0.18	<0.0001	<0.001	<0.001	<0.001	0.006	<0.001	n/a	<0.00005	0.005	<0.001	<0.001	n/a	0.003	<0.005
	17/09/2025	ET2505310010	mg/L	<0.01	0.01	0.17	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.005	n/a	0.005	<0.001	<0.01	n/a	<0.01	<0.005
	25/10/2025	ET2505840010	mg/L	<0.01	0.16	n/a	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.006	n/a	0.005	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279011	mg/L	0.04	0.011	0.19	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.048	n/a	0.005	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	0.02	0.011	0.02	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.006	<0.0001	0.005	<0.001	<0.01	n/a	<0.01	<0.005
Rowe 4	17/09/2025	ET2505310011	mg/L	<0.01	0.015	0.2	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.016	n/a	0.002	<0.001	<0.01	n/a	<0.01	<0.005
	19/11/2025	ET2506279012	mg/L	0.03	0.015	0.23	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.015	n/a	0.002	<0.001	<0.010	n/a	<0.01	<0.005
	14/12/2025	ET2506806001	mg/L	<0.01	0.014	0.22	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.015	<0.0001	0.002	<0.001	<0.01	n/a	<0.01	<0.005

Table 15-14: Laboratory water quality data – Major ion composition

Bore ID	Date	Calcium	Magnesium	Sodium	Potassium	Sodium + Potassium	Bicarbonate Alkalinity (HCO3)	Carbonate Alkalinity (CO3)	Chlorine	Sulphate	Fluoride	Bicarbonate Alkalinity + Carbonate Alkalinity	Total Dissolved Solids (TDS)	pH
24ESDD002	23/10/2025	2	1	179	2	181	305	47	46	2	20.8	352	516	8.51
ESMB01D	14/09/2024	1.5	0.3	3.6	190	193.6	340	37	48	6.9	20	377	550	8.6

Bore ID	Date	Calcium	Magnesium	Sodium	Potassium	Sodium + Potassium	Bicarbonate Alkalinity (HCO3)	Carbonate Alkalinity (CO3)	Chlorine	Sulphate	Fluoride	Bicarbonate Alkalinity + Carbonate Alkalinity	Total Dissolved Solids (TDS)	pH
	25/11/2024	1.7	0.4	7.4	200	207.4	330	55	47	1.1	19	385	520	8.6
	15/02/2025	2	1	3	194	197	308	17	38	1	18.8	325	492	8.43
	4/07/2025	2	1	195	3	198	315	61	54	1	21.2	376	593	8.56
	17/09/2025	1	1	186	2	188	320	36	32	1	18.7	356	525	8.57
	25/10/2025	1	1	203	3	206	294	48	42	1	19.6	342	499	8.54
	19/11/2025	2	1	211	3	214	311	53	45	1	18.5	364	548	8.55
	14/12/2025	1	1	199	3	202	276	52	37	1	18.8	328	530	8.56
ESMB02D	14/09/2024	1.4	0.5	6	230	236	360	55	88	0.5	21	415	640	8.7
	25/11/2024	1.5	0.3	6.1	210	216.1	340	39	48	0.8	19	379	530	8.6
	15/02/2025	2	1	5	271	276	342	13	78	1	21	355	668	8.32
	4/07/2025	2	1	220	5	225	382	42	103	1	26.3	424	722	8.42
	17/09/2025	2	1	233	69	302	370	30	68	1	20.7	400	645	8.43
	25/10/2025	2	1	250	5	255	346	37	78	1	21.6	383	608	8.42
	19/11/2025	2	1	249	5	254	362	47	80	1	22.1	409	696	8.47
	14/12/2025	2	1	244	5	249	324	46	73	1	19.4	370	656	8.48
ESMB04D	16/09/2025	1	1	224	4	228	346	54	48	1	21	400	607	8.62
	25/10/2025	1	1	238	4	242	387	1	61	1	22.2	388	584	8.28
	19/11/2025	2	1	245	4	249	383	44	64	1	22.8	427	682	8.46
	14/12/2025	1	1	240	4	244	341	5	56	1	21.6	346	642	8.48
ESMB05D	17/09/2025	2	1	213	3	216	362	27	57	2	19.5	389	623	8.59
	25/10/2025	2	1	231	3	234	346	38	56	1	22.2	384	571	8.43
	19/11/2025	2	1	232	4	236	364	49	61	1	21.9	413	650	8.49
	14/12/2025	2	1	230	3	233	325	48	53	1	20.5	373	619	8.51
ESMB06D	18/09/2025	1	1	245	6	251	334	48	117	6	20.2	382	728	8.58
	25/10/2025	2	1	266	5	271	332	33	122	5	21.1	365	676	8.42
	19/11/2025	2	1	289	6	295	369	53	135	12	20.6	422	832	8.51
	14/12/2025	1	1	270	5	275	313	47	117	6	19.6	360	734	8.5
ESMB07D	19/11/2025	2	1	203	6	209	318	79	55	4	19.4	397	623	8.73
	14/12/2025	3	1	277	19	296	335	139	48	10	20	474	741	9.34
ESMB07S	17/09/2025	2	1	235	4	239	349	48	84	1	21.5	397	682	8.55
	25/10/2025	1	1	240	4	244	330	45	80	1	21.6	375	608	8.51
	19/11/2025	1	1	234	5	239	345	56	89	1	21.3	401	696	8.55
	14/12/2025	1	1	238	4	242	306	55	84	1	20.5	361	663	8.56

Bore ID	Date	Calcium	Magnesium	Sodium	Potassium	Sodium + Potassium	Bicarbonate Alkalinity (HCO3)	Carbonate Alkalinity (CO3)	Chlorine	Sulphate	Fluoride	Bicarbonate Alkalinity + Carbonate Alkalinity	Total Dissolved Solids (TDS)	pH
ESMB17	19/09/2025	3	2	273	5	278	430	1	121	14	24.6	431	806	8.3
	25/10/2025	4	1	309	5	314	434	1	146	7	26.4	435	786	8.17
	19/11/2025	3	1	323	5	328	478	1	145	5	26.6	479	942	8.27
	14/12/2025	1	1	318	5	323	355	49	148	2	24.4	404	864	8.51
Pelican Bore	14/09/2024	10	7.8	9.7	410	419.7	380	5	440	6.9	6.7	385	1200	8.1
	17/09/2025	14	12	502	59	561	411	1	563	11	5.3	412	1570	7.61
	25/10/2025	14	11	470	9	479	394	1	574	10	5.8	395	1520	7.74
	19/11/2025	17	13	506	10	516	423	1	555	10	5.6	424	1640	8.08
	14/12/2025	17	12	504	10	514	379	1	536	11	5.5	380	1650	8.13
Rowe 1	17/09/2025	22	19	455	57	512	336	1	669	18	4.6	337	1710	7.49
	25/10/2025	25	19	510	19	529	327	1	697	18	4.6	328	1700	7.57
	19/11/2025	30	26	566	26	592	352	1	781	25	3.5	353	2050	7.48
	14/12/2025	24	20	511	19	530	317	1	687	23	4.2	318	1910	7.86
Rowe 2	17/09/2025	20	17	510	57	567	312	1	763	12	4.7	313	1870	7.55
	25/10/2025	13	10	419	14	433	302	1	509	6	6	303	1240	7.83
	19/11/2025	12	9	357	13	370	324	1	431	5	6.1	325	1280	7.89
	14/12/2025	13	9	395	13	408	292	1	462	7	5.9	293	1350	8.12
Rowe 3	26/11/2024	1.6	0.6	9.2	300	309.2	400	42	140	0.9	22	442	770	8.6
	17/09/2025	2	1	278	8	286	386	44	144	1	22.9	430	819	8.5
	25/10/2025	2	1	289	4	293	358	53	140	1	24.2	411	754	8.54
	19/11/2025	2	1	274	5	279	376	64	141	1	23.5	440	871	8.58
	14/12/2025	2	1	292	4	296	331	60	125	1	22.3	391	793	8.6
Rowe 4	17/09/2025	2	1	247	72	319	314	1	150	1	11.9	315	682	8.24
	19/11/2025	3	1	225	5	230	295	26	159	1	12	321	741	8.33
	14/12/2025	3	1	243	5	248	253	36	148	1	11.7	289	708	8.43

For comparison purposes the results have been compared to the hardness modified trigger values (HMTVs) for cadmium, lead, nickel and zinc, with values calculated from the minimum, maximum and mean total hardness concentrations. The ANZG (2018) guidelines note that, if the water sample exceeds the standard hardness value of 30 mg/L $CaCO_3$, then it is appropriate to modify the default guideline value (DGV) for all hardness sensitive metals except copper. Site groundwater records a minimum/maximum/mean hardness as $CaCO_3$ of 5 mg/L, 182 mg/L and 29 mg/L, respectively.

The Project site groundwater monitoring bores have detected elevated concentrations of:

- Aluminium (39 samples out of 64) when compared to ANZG (2018) default guideline value;
- Arsenic (13 samples out of 64) when compared to ANZG (2018) default guideline value;
- Chromium (four samples out of 64) when compared to ANZG (2018) default guideline value;
- Cobalt (five samples out of 64) when compared to ANZG (2018) default guideline value;
- Molybdenum (two sample out of 64) when compared to ANZG (2018) default guideline value;
- Vanadium (one sample out of 64) when compared to ANZG (2018) default guideline value; and
- Zinc (40 samples out of 64) when compared to ANZG (2018) default guideline value, with six samples out of 64 when compared to the HMTV calculated from the minimum hardness value for site groundwater and two samples of 64 when compared to the HMTV calculated from the mean/maximum hardness value for site groundwater.

Data from all sampling rounds were converted to milliequivalent concentrations (mEq/L) and water type and normalised to milliequivalent percentages (meq%) for plotting on a Piper trilinear diagram (Figure 15-20) and an Extended Durov diagram (Figure 15-21).

The monitoring bores Pelican Bore, Rowe 1, and Rowe 2 plot firmly within the sodium–chloride water type, reflecting higher salinity and chloride dominance. All remaining monitoring bores plot within the sodium–bicarbonate water type, indicating comparatively lower salinity groundwaters.

Magnesium concentrations are consistently low across all monitoring bores, and calcium concentrations are also low relative to sodium and potassium. Sodium plus potassium concentrations are substantially higher across all monitoring bores, and all monitoring bores therefore exhibit a strongly sodium- and potassium-dominant cation water type.

Pelican Bore, Rowe 1, and Rowe 2 exhibit a chloride-dominant anion water type, while all remaining monitoring bores are characterised by bicarbonate-dominant anion chemistry.

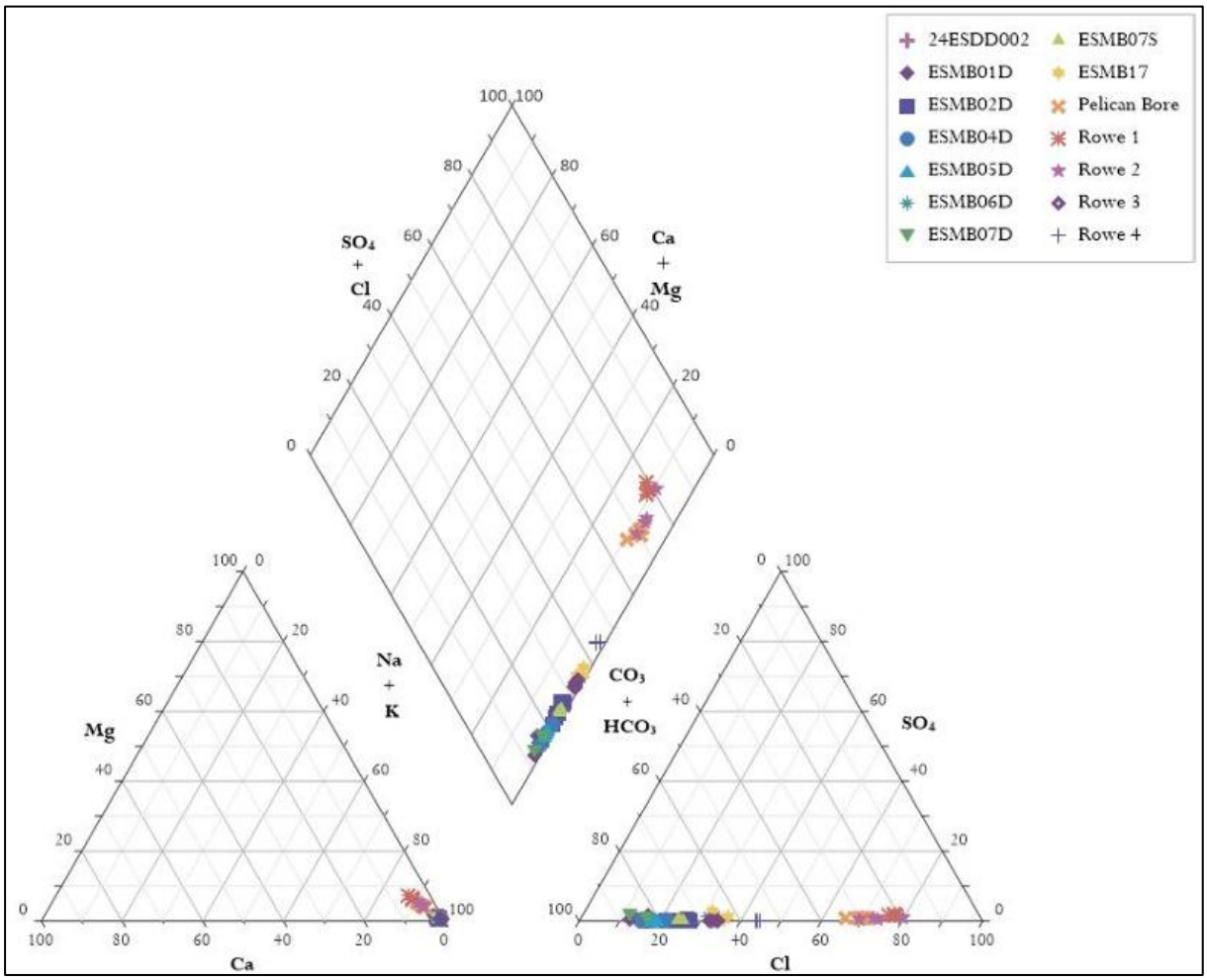


Figure 15-20: Piper trilinear diagram

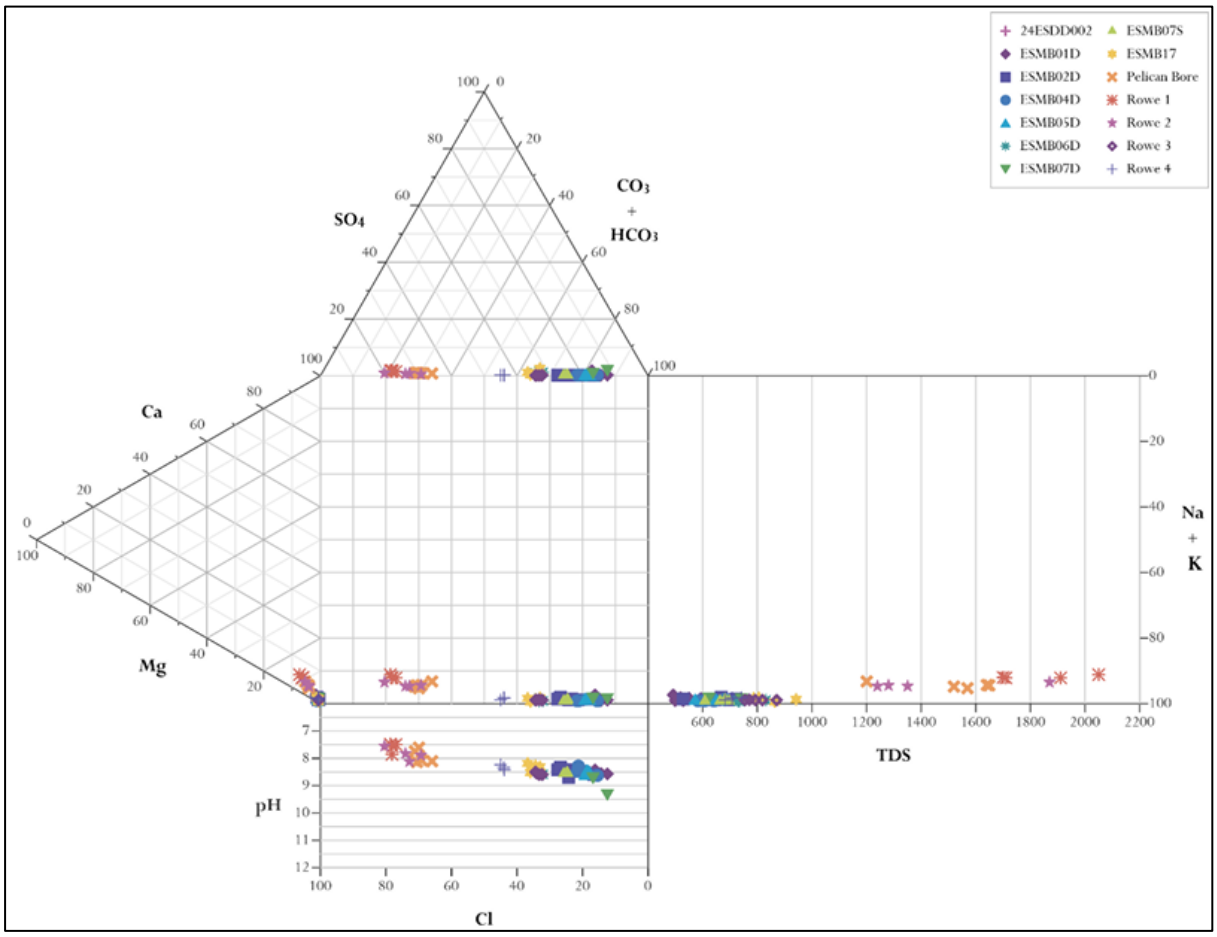


Figure 15-21: Extended Durov diagram

15.2.3 Potential impacts

15.2.3.1 Groundwater quality

Operation

During operation, and as mining progresses, the open-cut pit will be progressively backfilled from year 35. Material from above ground tailings cells will be backfilled first, followed by waste rock to reach the ground surface.

The water quality within the pit is influenced by the geochemistry of the backfill materials and the geochemical processes that occur when those materials interact with water (generally either rainwater or groundwater).

Geochemical characterisation assessments (RGS 2026) classify the mine materials as follows:

- Soil, overburden, and waste rock mine materials typically have low total sulphur content, low to moderate ANC, and most are classified as NAF-Barren. These materials have a negligible risk of acid generation and a high factor of safety with respect to potential for acidic drainage.
- Overburden and waste rock materials are suitable to be disposed as backfill or in out-of-pit waste rock dumps and will not require management for acidic drainage. However, in oxidising conditions overburden can produce neutral metalliferous drainage (NMD), resulting in slightly elevated concentrations of F, Mo, and Se, which will be included in the water monitoring program.
- Low grade ore materials from within the granite ore body are also typically classified as NAF-Barren, although some samples with between 2 and 3 % total carbon can be classified as PAF based on sulphide

sulphur values. Material identified as PAF will be processed at the end of the mine life to extract economic value.

- Tailings are classified as PAF and will require management. The materials could be disposed into the base of the open pit void as backfill and then covered with waste rock and soil capping to minimise potential acid generation and seepage. Groundwater recovery may provide anoxic conditions.

During operations, the pit is actively dewatered and remains unsaturated, preventing groundwater inflow from the surrounding Gilbert River Formation. Once backfilling commences, rainfall infiltration becomes the primary source of water entering the backfill. This water percolates through unsaturated tailings and waste rock, mobilising weathering products and generating solute-rich pore water within the backfill profile.

These geochemical reactions, driven by mineral dissolution, oxidation of exposed waste rock surfaces and flushing of tailings, establish the initial pit/backfill water quality during the operational phase. Because the pit remains dewatered, this water is retained within the WMS and does not interact with or discharge to the surrounding aquifer during mining.

Given the predominantly benign geochemical characteristics of the backfill materials, the containment of water within the WMS, and the limited pathways for groundwater interaction, the potential for impacts to regional groundwater quality during the operational phase is considered to be very low.

The four TSFs will be constructed with impermeable high-density polyethylene (HDPE) lining to prevent seepage. This is in addition to the installation of a MAW sump installed at the base of the TSFs to capture and remove water from the TSFs for re-use in mineral processing. The removal of water from the TFSs will reduce the likelihood and extent of any seepage that may occur. In the unlikely event that the lining and persistent dewatering of the TSFs does not prevent seepage, there may be impacts to environmental values such as groundwater. However, during the operation phase, the drawdown extent from the pit underlies TSF 1 and 2 and is “downstream” of TSF 3 and 4. Therefore, any seepage from the TSFs during operation would be captured by this zone of influence and report to the pit (Hydrogeologist 2026, Appendix L), minimising the potential for impact to groundwater values in the surrounding area. Groundwater drawdown is detailed further in Chapter 14, Water Resources.

Post-closure

At the end of mining, waste material will be rehandled to ensure that no residual void remains. The surface of the backfilled void rehabilitated landform will comprise a 1.5 m cover of suitable waste rock, and 0.5m of growth medium.

An assessment of the post-closure backfilled void water quality was undertaken by RGS (2026b).

As discussed in Chapter 14, Water Resources, groundwater level will recover to pre-mining levels approximately 100-150 years post closure. Active dewatering will stop with finalisation of backfilling in about 2077, and groundwater levels within the pit void are estimated to recover by around 2177-2227. During this time, groundwater cannot leave the pit as hydraulic gradients are directed inward, towards the pit. Inflowing groundwater gradually fills the pore spaces in the backfilled material (tailings and waste rock). This water mobilises solutes from the backfilled material and increases the total dissolved solids concentration of the pore water.

Once groundwater levels have recovered, the backfill will be saturated and pore water will begin to move into the adjacent Gilbert River Formation aquifer. This movement will be driven by:

- movement of groundwater from upgradient into the east-southeast side of the pit; and
- rainfall infiltrating the backfill top surface, with some lost to runoff and evapotranspiration and the remainder percolating downward. This percolating water mobilises weathering products, transporting dissolved solutes from unsaturated waste rock backfill to groundwater.

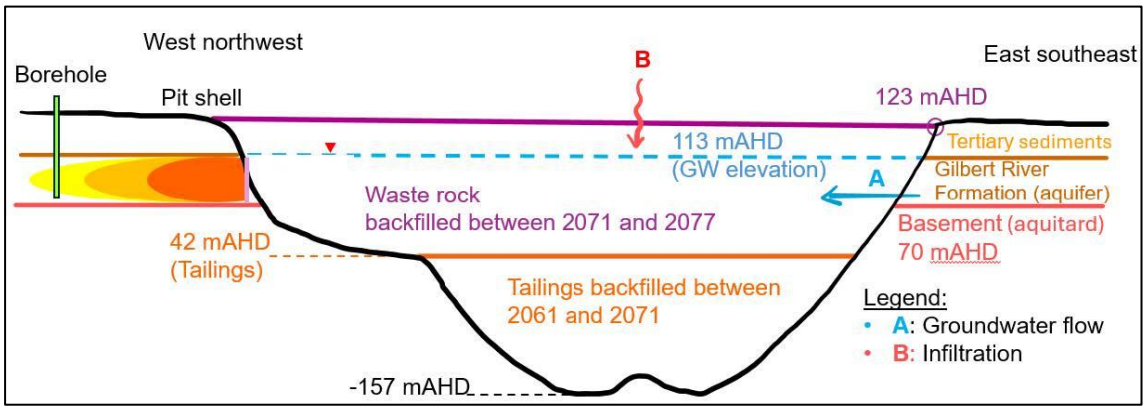


Figure 15-22: Post-closure backfilled pit

As shown in Figure 15-22, void water from the pit will progressively mix with regional groundwater, and a plume of pit-affected groundwater will gradually extend from the pit. The plume will potentially impact pastoral bores downgradient of the pit (RGS 2026b).

Geochemical modelling was carried out across four potential scenarios to assess post closure water quality conditions within the pit void and the quality of water leaving the pit into the GRF aquifer. Of the four scenarios, Scenarios 2 and 4 consider the proposed hydraulic isolation of the tailings, whereby flow within the backfilled pit is limited to the waste rock aquifer. The proposed capping layer above the tailings will ensure hydraulic isolation and reduce water infiltration to approximately 3%. However, Scenario 4 differs from Scenario 2 where the initial void water quality is affected by the solute load associated with acid generation in the tailings during transfer from the above ground facilities into the pit prior to saturation.

The source terms developed for the modelling include neutral pH and low pH unsaturated tailings. The low pH source term represents a conservative condition in which acid generation in the tailings during transfer into the pit increases the release of dissolved constituents prior to saturation in the pit. Kinetic testing showed that the neutralisation capacity of the tailings is initially sufficient to offset acid generation; however, following a lag period, the tailings can generate acidic leachate (RGS 2026).

The four scenarios are summarised below:

- Scenario 1 – Simulates complete mixing of all water entering the pit backfill pore space. That is, groundwater flowing into the pit and seepage through the near surface unsaturated backfill mix with the saturated backfill pore water (tailings and waste rock).
- Scenario 2 – “flow through”. Simulates hydraulic isolation of the saturated tailings. That is, groundwater flowing into the pit and seepage through the near surface unsaturated backfill mix only with the pore water in the saturated waste rock backfill. This scenario simulates the situation in which flow within the backfill pit is limited to the waste rock “aquifer” and there is no interaction with the tailings backfill.
- Scenario 3 – Same as Scenario 1, but the initial void water quality is affected by the solute load associated with acid generation in the tailings during transfer from the above ground facilities into the pit. After backfill saturation the tailings are assumed to not produce acid due to lack of available oxygen.
- Scenario 4 – Same as Scenario 2, but the initial void water quality is affected by the solute load associated with acid generation in the tailings during transfer from the above ground facilities into the pit. After backfill saturation, the tailings are considered hydraulically isolated and the “flow through” conditions apply.

Across all four scenarios, the modelled void water pH remained within the range of pH 6 - 8, broadly consistent with the local groundwater range of pH 7.5-8.7.

Meanwhile, TDS for Scenarios 2 and 4 reached approximately 2,000 mg/L, which is within the local groundwater range of 492-2,050 mg/L as compared to Scenarios 1 and 3, which include solute load from backfill tailings, and reached approximately 9,000 mg/L TDS after 100 years. The modelled pH and TDS are shown in Figure 15-23 and Figure 15-24, respectively.

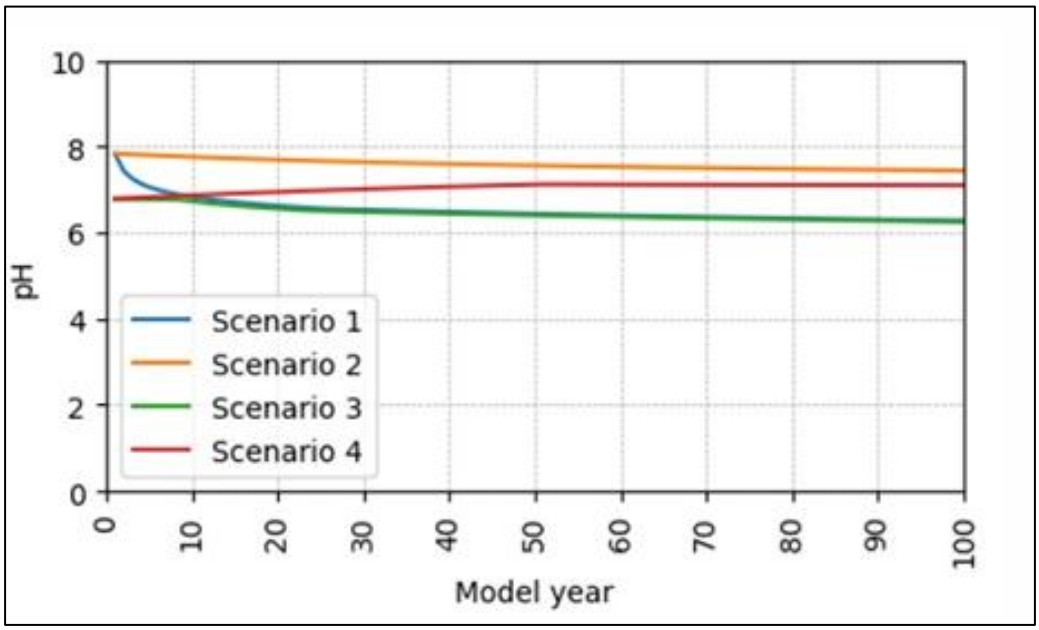


Figure 15-23: Modelled pit void pH

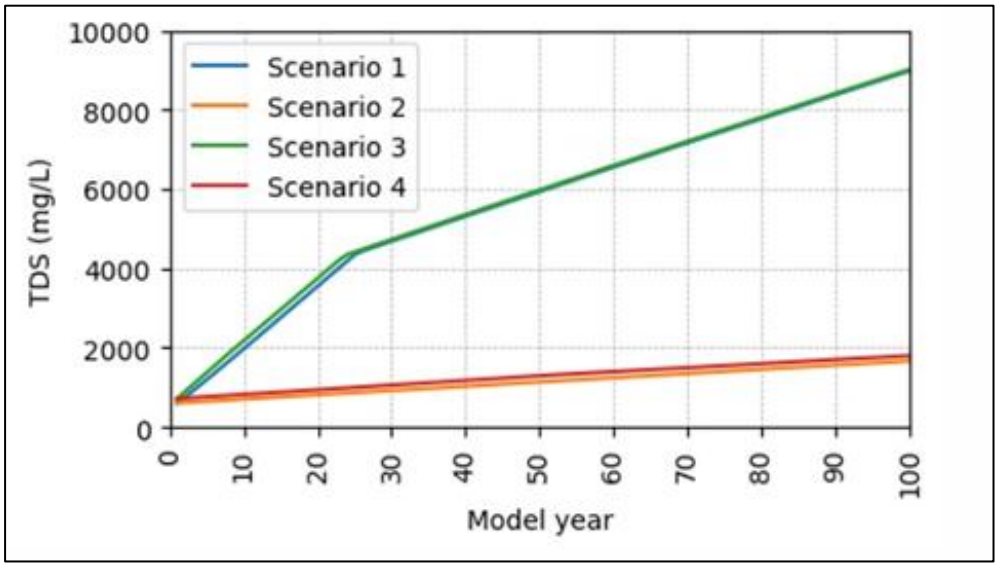


Figure 15-24: Modelled pit void TDS

Figure 15-25 shows the modelled ranges of selected trace elements across all four scenarios, alongside DGV for 95% species protection in freshwater aquatic ecosystems and the measured range of local groundwater concentrations.

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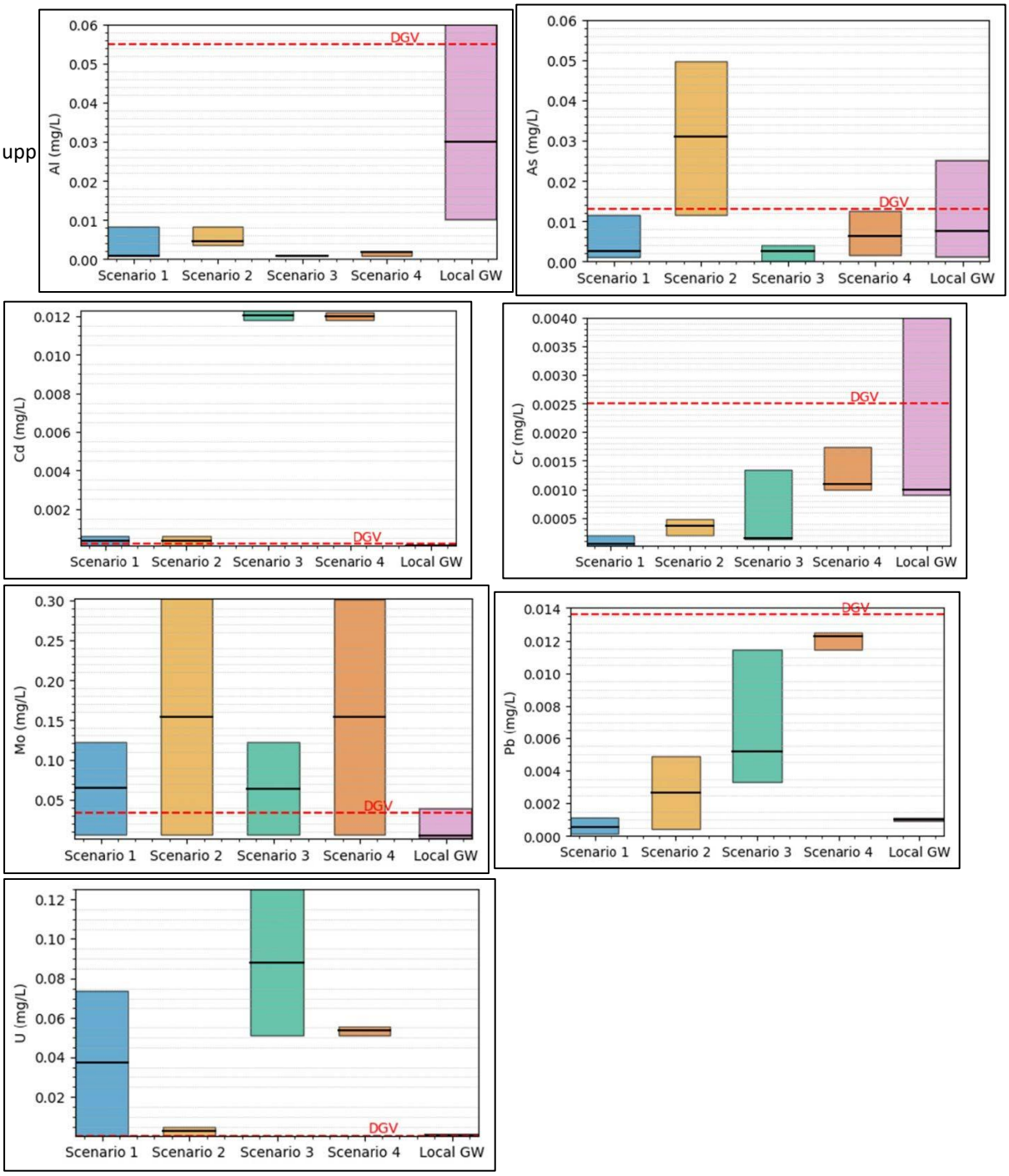


Figure 15-25: Comparison of modelled water quality with local groundwater quality

It is shown in Figure 15-25 that:

- aluminium (Al) concentrations are below DGV and within local groundwater ranges in all scenarios.
- arsenic (As) concentrations are generally below DGV and comparable with local groundwater, except for Scenario 2, where higher pH and alkalinity relative to other scenarios, makes sorption of arsenic on iron oxyhydroxides (as represented by Ferrihydrite in the model) less effective.
- Cadmium, cobalt, copper, nickel and zinc concentrations under Scenario 2 are comparable to DGV and local GW. Scenarios 3 and 4 are significantly higher due to the assumed acid generation in the tailings.
- median chromium (Cr) concentrations are below DGV and local groundwater across all scenarios.

- lead (Pb) concentrations are below hardness-adjusted DGV but are generally higher than the local groundwater across all scenarios.
- Concentrations of molybdenum (Mo), selenium (Se) and vanadium (V) are generally higher than DGV and local groundwater due to elevated source terms in all the scenarios.
- Uranium (U) concentrations under Scenario 2 show a narrower range compared with Scenarios 1 and 3, which reflects the higher contribution of uranium from tailings.

For aluminium, arsenic, chromium and lead, modelled long-term concentrations are comparable with or below guideline values for protection of moderately disturbed freshwater aquatic ecosystems. Exceedances of molybdenum, selenium, and vanadium reflect source term concentrations rather than acid generation and are common across all scenarios.

The geochemical assessment also considered the potential effects of oxidation of the tailings. Initial contact water may contain slightly elevated concentrations of aluminium, although all other metal/metalloid concentrations are expected to be low. If the tailings are left unmanaged and allowed to oxidise, several metals/metalloids, including aluminium, boron, cadmium, copper, lead, manganese, nickel, and zinc can mobilise into pore water under acidic conditions (stabilising at pH 2.8).

An assessment of the potential for mobilisation of elements from the pit into the receiving environment was undertaken by Hydrogeologist (2026). Preliminary seepage transport calculations indicate a delay of more than 500 years before detectable changes could occur at receptors located approximately 100 m downgradient of the pit. This is indicative of the extremely slow advective velocity and dispersion within the aquifer.

The distance of solute movement predicted by the seepage transport model (i.e. 100 m downgradient of the pit) are consistent with the results of the particle tracking undertaken using the post-mining numerical groundwater model for two post closure scenarios. The first scenario assumed the open pit void is fully backfilled with tailings (represented by relatively low hydraulic conductivity and low storage properties), whereas the second scenario assumes the open pit void is fully backfilled with waste rock (represented by relatively high hydraulic conductivity and high storage properties).

The particle tracking results (Figure 15-26) indicate that the particles remain well within the Project MLs after 1,000 years post mining. The particles that originated around the perimeter of the final void pit crest migrate approximately 100 m from the pit crest (to the west northwest). In accordance with the outcomes of the modelling which show extreme slow movement of elements from the pit, impacts on the environmental values identified in Section 15.2.2.2 are not expected to be of significant risk or magnitude. This includes the distance from sensitive receptors including groundwater users or springs, lack of use of the relevant groundwater system by GDEs, lack of presence of stygofauna, and disconnection from the surface water system.

It is noted that neither the particle tracking nor the geochemical seepage transport modelling considers the geochemical degradation of solute constituents, nor the dilution effect that would occur from the mixing with upgradient (unaffected) groundwaters. If both geochemical degradation and dilution were to be taken into account, the geochemical modelling and seepage transport modelling results would likely result in further reduced geochemical changes and transport of solute from the backfilled final pit void, and subsequently lower potential risk or magnitude of impact.

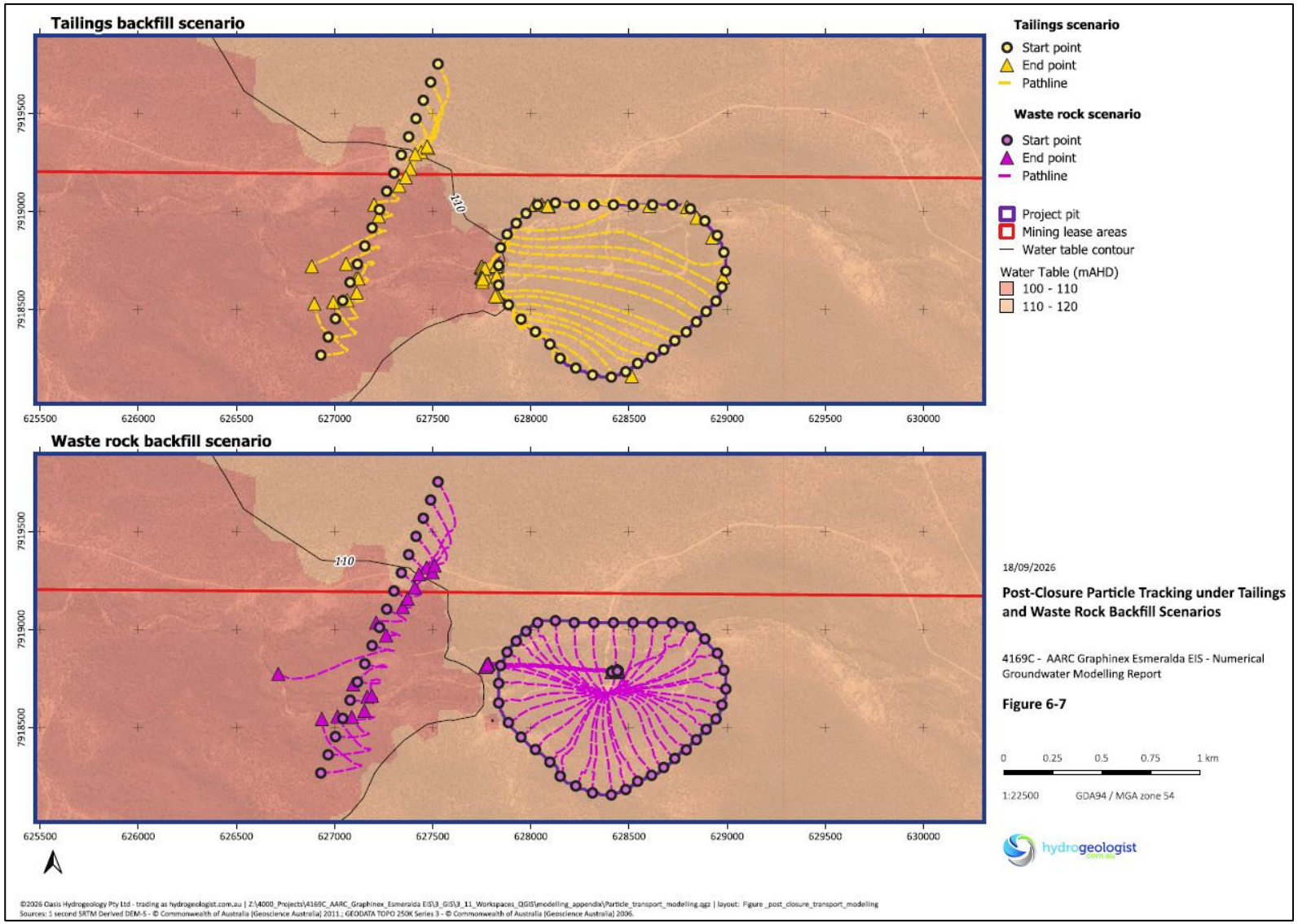


Figure 15-26: Post closure particle tracking - 1000 years

15.2.4 Mitigation, monitoring and management measures

15.2.4.1 Water quality monitoring

A groundwater monitoring program has been developed (refer to Appendix L), and includes the following objectives:

- establishing monitoring sites that are located downgradient of potential sources;
- establishing monitoring sites capable of monitoring groundwater flow paths between sources and receptors;
- establishing a long-term dataset that represents baseline groundwater information (i.e. baseline groundwater level and quality conditions);
- allowing the ability to confirm model predictions of groundwater levels and drawdown resulting from Project mining activities; and
- allowing the ability to assess whether there is potential for environmental harm.

For the groundwater monitoring network to be effective and fit for purpose its monitoring locations have the following objectives:

- monitoring sites will be suitably designed and constructed to provide representative groundwater data;
- monitoring sites will be located within the predicted maximum zone of drawdown in order to validate the groundwater drawdown predictions of the approved mining activity;
- monitoring sites will be spatially distributed around the Project area in order to have a robust understanding of groundwater drawdown effects from approved mining activities; and
- monitoring sites that are representative of groundwater table conditions in order for effects of drawdown to be assessed on the shallow groundwater regime.

The groundwater monitoring network is comprised of 14 site-specific monitoring bores and five landholder bores shown in Figure 15-16. Bore details are discussed in Section 15.2.2.215.2.2.1 and listed in Table 15-10. These bores will form the compliance groundwater monitoring network for the Project. Groundwater level loggers are installed in all the Proponent installed groundwater monitoring bores. Each groundwater level logger and barometric logger will have its data retrieved monthly to two-monthly. Groundwater level and quality monitoring will also be undertaken on a monthly to two-monthly basis at all monitoring bore locations.

To develop site-specific groundwater quality trigger values for a monitoring network, DES (2021) recommends that a minimum of 18 datapoints over at least 12 and preferably 24 months is collected. The current groundwater quality dataset does not yet achieve this sample size, hence further sampling events are recommended before any site-specific trigger values are to be developed.

Interim water quality triggers may be based on default ANZG 2018 guideline values. Prior to mining, the proponent commits to developing site-specific groundwater quality trigger values for the Project groundwater monitoring network and having these approved within the EA conditions for the Project.

Regular comparisons between trigger limits and site data will be carried out as per EA conditions. The frequency of monitoring events may be increased to capture the recommended number of sampling events in a shorter timeframe for permitting (EA) requirements.

Additional monitoring bores will be installed, with the indicative locations detailed in Table 15-15 and shown in Figure 15-27. The new proposed locations include bores beyond the immediate pit area to monitor the extent of groundwater drawdown at varying distances from the pit and provide data for ongoing validation of groundwater model predictions. Additional monitoring is also proposed in the vicinity of the TSFs and WRD to monitor groundwater quality associated with these facilities. As part of the TSF monitoring network, nine groundwater monitoring bores are proposed around the perimeter of the TSF with six bores within the Tertiary

sediments, and three deeper bores proposed within the GRF. These bores will be established prior to TSF operation, with the exception of the proposed upgradient and downgradient monitoring bores associated with TSF4, which will be installed approximately two years prior to construction of TSF3. The monitoring bores will be located to:

- establish monitoring sites that are located proximal to the TSFs;
- establish monitoring sites capable of monitoring groundwater flow paths between the TSF and potential shallow receptors; and
- provide the ability to assess whether there is potential for environmental harm.

The TSF monitoring is not proposed to be included in EA groundwater monitoring, but will instead be used to ensure that TSF design (i.e. the installation and maintenance of HDPE lining) is effectively preventing seepage or other potential groundwater impacts. Should these bores detect any such matters, responsive measures will be undertaken to ensure the protection of environmental values. It is noted that during operations, the pit will act as a sink for the groundwater in the area under the TSFs, and therefore the potential for impacts to environmental values are limited.

Groundwater monitoring bores will be decommissioned as part of the rehabilitation and decommissioning phase of the Project, at the point where groundwater quality monitoring is no longer required. The North_TSF_GRF monitoring bore associated with the TSF will be retained following closure to monitor groundwater quality associated with TSF 4. Once monitoring is no longer required, groundwater monitoring bores will be decommissioned.

Table 15-15: Proposed additional monitoring bores

Hole ID	Easting (MGA94 Zone 54)	Northing (MGA94 Zone 54)	Nominal depth (m)	Target stratigraphy
North_GRF_East	629848	7919385	50	Gilbert River Formation
North_GRF_West	626984	7919193	50	Gilbert River Formation
North_WRD	627417	7918261	50	Tertiary sediments
North_GRF_Centre	628534	7919344	50	Gilbert River Formation
North_TSF_GRF	630519	7916903	50	Gilbert River Formation
South_TSF_GRF	632380	7915535	50	Gilbert River Formation
North_Prot	628595	7919340	100	Proterozoic basement
South_Prot	627933	7917268	100	Proterozoic basement
TFS_MB1	627379	7916777	10	Tertiary sediments
TFS_MB2	627990	7917325	10	Tertiary sediments
TFS_MB3	629649	7915106	10	Tertiary sediments
TFS_MB4	632414	7915597	10	Tertiary sediments
TFS_MB5	630484	7916899	10	Tertiary sediments

Hole ID	Easting (MGA94 Zone 54)	Northing (MGA94 Zone 54)	Nominal depth (m)	Target stratigraphy
TFS_MB6	628416	7915706	10	Tertiary sediments
TFS_MB7	627379	7916777	50	Gilbert River Formation

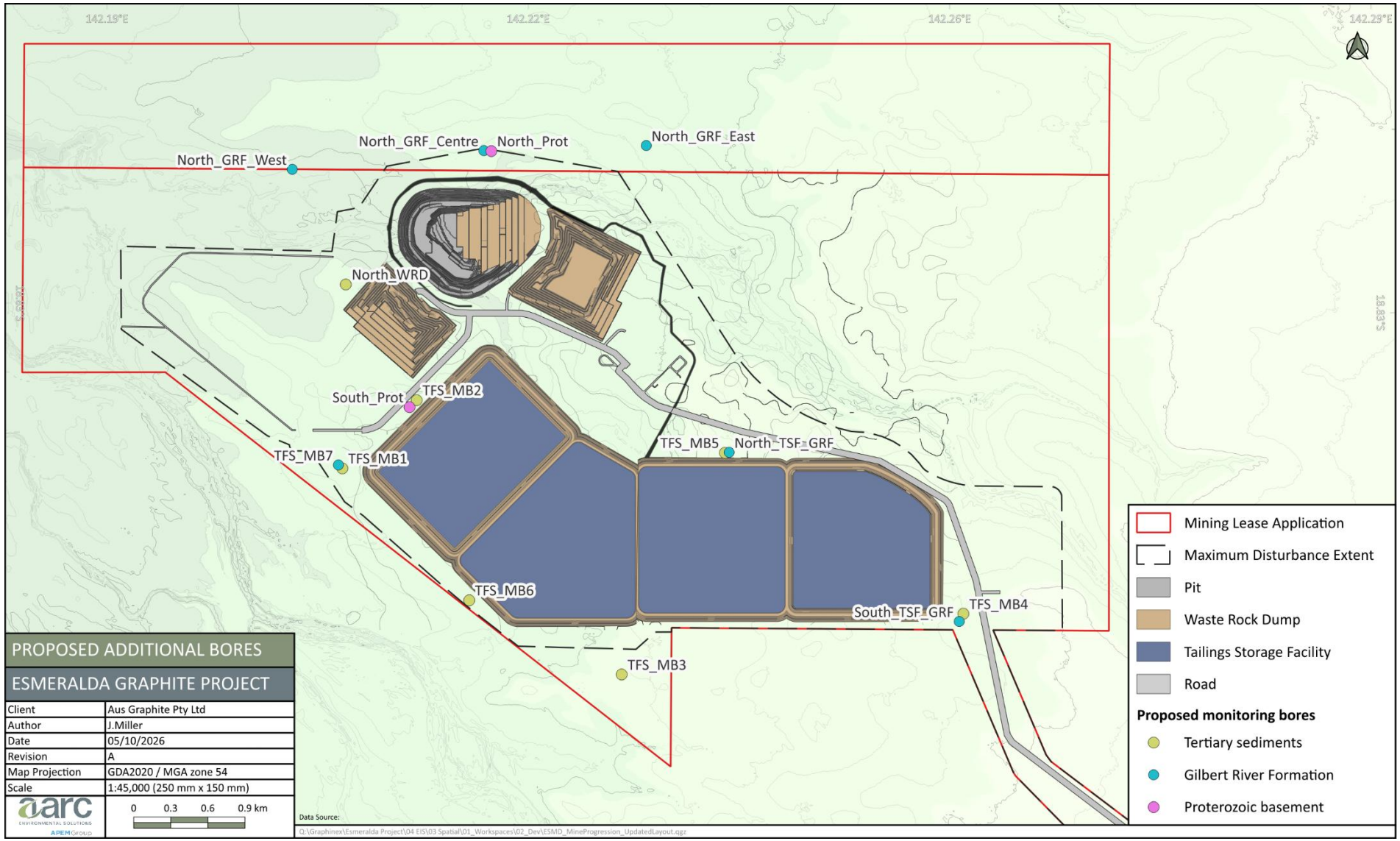


Figure 15-27: Proposed additional monitoring bores

Groundwater sampling

Purging or low flow sampling methods are recommended for groundwater sampling. Low flow methods minimise the impact of the sampling method on the aquifer and are likely to obtain a representative sample, while some high flow pumps can sometimes induce water chemistry changes. Sampling bailers or grab samples will only be used where no other pump can be used. The method of sample collection will be selected to ensure sampling of fresh and undisturbed groundwater or water representative of the aquifer.

Groundwater samples from monitoring bores are required to be representative and repeatable. To achieve this, the groundwater that is collected for analysis needs to be sourced from the target aquifer and will not be a sample from the column of water within the bore that may be stagnant. The groundwater sampling methodology may be different between deep and shallow bores. For all bores, a purged or low flow method is preferred. However, for very deep bores, or bores that are slow to recover, a grab sampling method (e.g. Hydrasleeve) maybe preferred where low flow or purging techniques are technically challenging, or where the sampling methodology affects the long-term groundwater levels.

Field parameters and sample collection

Field parameters will be monitored and recorded. The field water quality meter will be calibrated daily and in accordance with manufacturer's instructions. For low flow sampling methods, the use of a flow through cell is recommended. Field parameters may be considered stable when three consecutive readings (obtained several minutes apart) are (EPA 2015):

- $\pm$ 10 per cent TDS;
- $\pm$ 3 per cent for electrical conductivity (specific conductance); and
- $\pm$ 0.1 for pH.

Storage and transport of samples

All groundwater samples will be collected in supplied laboratory sample bottles. All samples for dissolved metals will be field filtered using a 0.45 micron filter. General metals samples are preserved with nitric acid. Samples must be filtered in the field as close as possible to the time of collection (preferably within 15 minutes). This is particularly important for groundwaters where exposure to atmospheric conditions can trigger redox reactions that cause certain metals to precipitate (particularly iron).

The samples will be clearly labelled with the sample ID and date and time of sampling. The samples will immediately be stored on ice and transported as soon as is reasonably practical to the laboratory for analysis. The samples will be accompanied by a chain of custody form to define the number of, and identity of the samples, the required parameters to be analysed and the persons or companies in control of the samples. It is important to note the laboratory holding times vary for individual analytes. The holding times represent the maximum time that a sample can be stored for representative analysis of a parameter. Transportation of samples will consider the holding times and the time taken for delivery the samples to the laboratory from site.

Groundwater sampling quality assurance and quality control

Quality control and quality assurance processes will be consideration in respect of the following guidelines:

- Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009. Brisbane, Department of Environment and Science;
- AS/NZ 5667 11 1998 - Water quality sampling. Part 11, guidance on sampling of groundwater (Standards Association of Australia & Standards New Zealand, 1998); and
- Australian Governments Groundwater Sampling and Analysis – A Field Guide 2nd Edition.

The following quality assurance and quality control samples will be collected (in the field) at a minimum:

- intra laboratory duplicate for general water quality;
- inter laboratory duplicate for general water quality; and
- rinsate samples daily for reusable equipment (metals analysis only).

A chain of custody record must be filled out and accompany every sample or group of individually identified samples to trace the sample possession from the time of collection. The laboratory undertaking the analytical testing of groundwaters will be accredited by the National Association of Testing Authorities (NATA) for the requested analyses. The laboratory will typically have internal quality control and quality assurance protocols which will be reported as part of the analyses.

Documentation and reporting

All documentation relating to groundwater monitoring will be kept on archive and be readily accessible to facilitate data analysis in relation to adopted assessment criteria. Data will include (but may not be limited to):

- field data sheets (including purge records, equipment calibration certificates);
- laboratory documentation (chain of custody form, sample receipt notification, laboratory certificates);
- photographs of monitoring bores; and
- monitoring reports prepared within 4 weeks of receipt of analytical data.

A monitoring report will include:

- tabulated monitoring data and laboratory analytical reports;
- quality assurance/quality control validation;
- a comparison of groundwater quality with groundwater quality limits;
- a comparison of groundwater level data with drawdown trigger level threshold;
- figures including inferred groundwater flow direction;
- interpretation of data trends over time; and
- recommendations (if required) for revisions to the monitoring program.

Storage and publishing of monitoring data

A groundwater database will be maintained including groundwater level and quality data against which any potential changes to groundwater can be monitored during subsequent mining operations and into closure.

15.3 TOR Reconciliation table

Terms of reference - Content requirements of the EIS		EIS Section
Section 15 - Water quality		
15.1	The following guidance is relevant for the assessment of water quality: (a) Queensland Government, Water – EIS information guideline, ESR/2020/5312 (b) Queensland Government, Groundwater dependent ecosystems – EIS information guideline, ESR/2020/5301 (c) Queensland Government, Monitoring and Sampling Manual: Environmental Protection (Water) Policy, 2018 (d) Queensland Government, Application requirements for activities with impacts to water, ESR/2015/1837 (e) Queensland Government, Technical guideline - Wastewater release to Queensland waters, ESR/2015/1654 (f) Queensland Government, Using monitoring data to assess groundwater quality and potential environmental impacts, 2021 (g) Queensland Government, Stormwater and environmentally relevant activities, ESR/2015/1653.	Section 15
Water quality - Existing environment		
15.2	With reference to the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 and section 9 of the EP Act, identify, map and describe the environmental values of surface water and groundwater in the project footprint, surrounding area and potential impact area.	Section 15.1.2.1 Section 15.2.2.1
15.3	Identify and describe the relevant water and sediment quality objectives and guidelines applicable to the environmental values. Where there are no scheduled EPP water or sediment quality objectives for the project site, these are required to be locally derived in accordance with relevant guidelines, supported by complying water quality monitoring data submitted as part of the EIS.	Section 15.1.2.3 Section 15.2.2.3
15.4	Describe current and historical surface water, groundwater and sediment quality in terms of physical, chemical and biological characteristics in the project footprint, surrounding area and potential impact area. Characterise the nature and extent of any existing surface and groundwater contamination sources, including licenced releases from other developments, that may interact with project activities.	Section 15.1.2.4 Section 15.1.2.5 Section 15.2.3.1
15.5	Analyse water quality variability to identify and describe trends, including those associated with seasonal or climatic factors, variability of freshwater flows and responses to natural and anthropogenic events/changes. This analysis should be supported by raw and quality assured data (including removal of statistical outliers where relevant), clearly presented statistical summaries, time-series graphs and comparisons against relevant water quality objectives and/or water quality guideline values. Use suitable reference locations and statistically robust site-specific data to adequately establish baseline condition and define natural variation, including seasonal variation. All surface water quality data should be presented alongside corresponding flow conditions at the time of sampling.	Section 15.1.2.4

Terms of reference - Content requirements of the EIS		EIS Section
15.6	Within the project footprint, surrounding area and potential impact area, describe: (a) the relationship of water quality to location, rainfall, stream flow and groundwater movement supported by site-specific and local catchment data (b) existing water quality issues (e.g. stratification, eutrophication and deoxygenation) and/or exceedance of existing water quality objectives and/or water quality guideline values (c) the confirmed or likely causes of existing water quality issues, including how they are managed (if known) (d) correlations between groundwater quality data and surface water quality data to inform groundwater-surface water interactions.	Section 15.1.2.4 Section 15.2.2.1
15.7	Surface water samples must as a minimum be analysed for electrical conductivity, temperature, pH, sulfate, fluoride, dissolved oxygen, turbidity, total suspended solids, nutrients, dissolved and total metals and metalloids, total recoverable hydrocarbons and major anions and cations, plus any other potential contaminants relevant to the project. Groundwater samples must be analysed for the same parameters (except turbidity and total suspended solids) as a minimum. Sediments should be analysed for relevant metals (e.g. those elevated above normal crustal abundance and relevant potential contaminants) and relevant influential factors (e.g. sediment particle size for metals). Sample analysis should be appropriate for relevant water quality objectives to be assessed (e.g. laboratory reporting limits appropriate for the relevant objectives).	Section 15.1.2.4 Section 15.1.5
15.8	Discuss how the environmental values relating to water quality informed the project design (i.e. constraints, impact mitigation).	Section 15.1.5
Water quality - Impact assessment		
15.9	Describe and map all potential and/or proposed controlled and uncontrolled discharges of water and contaminants by the project, including the predicted quantity, quality, location, source (point or diffuse) timing and duration. Discharges may include controlled water releases to surface waters, uncontrolled discharges when the design capacity of storages is exceeded, management of spills of products during loading or transportation, stormwater discharge, and contaminated run-off or seepage from operational areas of the site. Address the following matters for each potential discharge: (a) describe the circumstances in which controlled and uncontrolled discharges might occur (b) describe chemical and physical discharge properties, including predicted concentrations of contaminants, at the point of entering natural surface waters along with toxicity of discharge contaminants to relevant environmental values (e.g. aquatic ecosystems, irrigation water etc.) (c) provide receiving environment stream flow data, discharge rates and other relevant information to estimate the potential for in-stream dilution, mixing and resultant water quality (d) provide an assessment of the available assimilative capacity of the receiving waters given existing water quality and other potential point source discharges in the catchment. Investigate options for controlled discharge at times of natural stream flow to ensure that adequate flushing of wastewater is achieved (e) provide draft contaminant release limits and receiving water conditions, with detailed scientific justification to ensure the protection of aquatic ecosystem health, other relevant environmental values and to protect other water uses.	Section 15.1.4

Terms of reference - Content requirements of the EIS		EIS Section
15.10	Identify and assess the impacts of project activities (including point source and diffuse discharges), disturbance and infrastructure on groundwater and surface water and sediment quality and relevant environmental values. Analyse and describe the significance of direct, indirect and cumulative impacts on physical, chemical and biological characteristics in the receiving environment in the context of the assimilative capacity, supported environmental values and relevant water and sediment quality objectives and/or guideline values. This should include potential impacts from air deposition of contaminants from stack point source emissions.	Section 15.1.4 Section 15.2.3.1
Water quality - Mitigation measures		
15.11	Describe proposed measures to avoid, minimise, mitigate or offset predicted impacts to surface water and groundwater quality, and relevant environmental values.	Section 15.1.5 Section 15.2.4
15.12	Describe the management framework for controlled discharges, including: (a) treatment options and requirements prior to discharge (b) receiving environment flows (c) discharge water quality limits and receiving environment conditions designed to comply with water quality objectives and/or water quality guideline values and protect environmental values within the receiving environment.	N/A
15.13	Describe how unplanned or indirect impacts (including uncontrolled discharges) to water quality will be managed, including measures to: (a) avoid, identify, remediate and manage water that is contaminated or may become contaminated (b) limit the impacts of flooding and extreme weather events.	Section 15.1.5
15.14	Demonstrate how the project will meet the environmental objectives for water and performance outcomes in Schedule 8 of the EP Regulation.	Section 15.1.1 Section 15.2.1
15.15	Describe how water quality will be monitored, audited, reported, and how corrective/preventative actions and continual improvement would be managed. Provide measurable criteria, standards and/or indicators that will be used to assess the condition of environmental values and the receiving water environment.	Section 15.1.5.3
15.16	Develop proposed conditions for any proposed release to waters and receiving environment monitoring that meet the requirements of relevant guidelines and are designed to protect environmental values, prevent environmental harm and allow for responsive management and reporting actions.	Section 15.1.5.1