Whitehaven

Blackwater North Extension Project

Appendix E
Aquatic Ecology and Groundwater-Dependent Ecosystems Assessment



DPM ENVIROSCIENCES



Blackwater North Project – Aquatic Ecology and Groundwater-Dependent Ecosystems Assessment

September 2026

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3 September 2026

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Blackwater North Extension Project – Aquatic Ecology and Groundwater-Dependent Ecosystems Assessment

3 September 2026

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EXECUTIVE SUMMARY

Whitehaven Blackwater Pty Ltd (Whitehaven Blackwater) owns and operates the Blackwater Mine (BWM), situated approximately 20 kilometres (km) south of Blackwater, Queensland. The BWM has been operating since 1967 and currently operates under Environmental Authority EPML00717813, with existing run-of-mine coal production at approximately 19 million tonnes per annum.

Whitehaven Blackwater is planning an expansion of its current mining footprint to the east of the existing operation. DPM Envirosciences Pty Ltd (DPM Envirosciences) was commissioned by Whitehaven Blackwater to undertake seasonal aquatic ecology and groundwater-dependent ecosystem (GDE) surveys and assessments across the proposed mine expansion areas defined as the Blackwater North Extension Project (the Project).

The scope of this assessment was to describe the aquatic values of the Blackwater North Extension Project area (the Study Area), identify any conservation significant species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Queensland *Nature Conservation Act 1992* (NC Act), identify the potential for GDEs to occur, identify and describe any aquatic Matters of State or National Environmental Significance, assess impacts of the Project on aquatic and GDE values and propose impact avoidance and mitigation measures to protect these values.

The findings discussed in this report are based on a desktop assessment and seasonal field surveys by DPM Envirosciences in June-July 2025 and October 2025. Earlier aquatic ecology surveys of the Study Area were undertaken by DPM Envirosciences on behalf of EMM Consulting Pty Ltd (EMM) in December 2019 and May 2020. The findings of these earlier surveys form part of the desktop assessment and provide contextual baseline information alongside the 2025 field surveys.

Aquatic ecology surveys were undertaken in accordance with the Australian River Assessment System (AusRivAS) protocols for Queensland streams. Aquatic GDEs were assessed by desktop assessment, field assessment for visual indicators, and comparison of surface water and groundwater samples for major cations and anions consistent with the Australian *Environmental water tracers in environmental impacts assessments for coal seam gas and large coal mining developments – factsheet*. Subterranean GDEs were assessed by desktop assessment and seasonal pilot survey in accordance with the Queensland *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (Department of Science, Information Technology and Innovation 2015). Terrestrial GDEs were assessed by desktop assessment and field measurement of pre-dawn LWP in accordance with the *Australian groundwater-dependent ecosystems toolbox part 2: assessment tools* (Richardson et al. 2011). The assessment of aquatic, subterranean and terrestrial GDEs of the Study Area follows the logical framework identified in the *Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems* (Doody, Hancock and Pritchard 2019).

The waterways of the Study Area range from small first order tributaries to the larger fourth order Two Mile Gully and Taurus Creek. Other named waterways of the Study Area include Sagittarius and Deep Creeks. Mapped wetlands in the Study Area are comprised of artificial or modified lacustrine wetlands and include farm dams and two mine water dams (Deep Creek Dam and Taurus Dam). Several smaller, unmapped lacustrine wetland waterbodies (farm dams and a riverine flood channel wetland) also occur. The waterways of the Study Area are ephemeral and are expected to experience flow only after sustained or intense rainfall and runoff in the catchment. Stream flows are highly variable, with most channels expected to dry during winter to early spring when rainfall and runoff is lower. Consequently, physical attributes, water quality, and the composition of aquatic flora and fauna communities are expected to vary seasonally.

Aquatic habitat assessment was undertaken at 13 sites in June-July 2025. The same 13 sites and an additional three aquatic habitat assessment sites were assessed in October 2025. The additional sites were positioned to address amendments to the layout of the Study Area and proposed waterway crossings. The 16 sites comprised 12 sites on riverine system drainage lines, two farm dam sites and two mine water dams. Detailed survey was undertaken at a subset of these sites and included backpack electrofishing, netting for fish/turtles and aquatic macroinvertebrate sampling. No flow was encountered during both survey periods due to prevailing dry conditions in the months leading up to sampling, therefore detailed survey was limited to isolated riverine pools and the dams. However, these conditions provided an opportunity to identify dry season refuge pools that may be important for 'seeding' waterways with fish, turtles, macrocrustaceans and other obligate aquatic invertebrates in times of flow. The dry conditions also presented an opportunity to inform the likelihood of occurrence of surface expression and terrestrial GDEs.

Fish, macroinvertebrates and turtles were surveyed at most wetted sites. Nine Least Concern native fish species, one pest fish species, two Least Concern native turtle species, and a diversity of aquatic macroinvertebrates were detected. Aquatic macroinvertebrate indices, including taxa richness Plecoptera, Ephemeroptera and Trichoptera richness, Stream Invertebrate Grade Number – Average Level Version 2, tolerant taxa and AusRivAS OE50 scores, were variable but likely reflected seasonality more than catchment impacts.

Seasonal flora surveys across the Study Area detected 22 species of aquatic or semi-aquatic flora species, comprising 20 Least Concern native species and two introduced species of little ecological significance.

Overall aquatic value scored at each of the 16 survey sites ranged from Low to Moderate. Sites on Taurus Creek and Two Mile Gully were rated Moderate, due to their importance as regional conduits for fish passage (mapped High or Major risk waterways for fish passage in State mapping). Riverine sites with a stream order 1-2 were rated as having Low aquatic value, except where the Aquatic Conservation Assessment mapping identified the waterway as being of Medium conservation significance – in which case they were rated Moderate aquatic value. The lacustrine wetlands (farm and mine water dams) were rated Low-Moderate or Moderate. Although these lacustrine wetlands are modified or artificial, the semi-permanence of water offers dry season refuge for Least Concern fish and turtle species.

No conservation significant aquatic flora or fauna species listed under the NC Act and/or EPBC Act were recorded in the Study Area. Due to habitat requirements and distributional range, it is unlikely that any conservation-significant aquatic flora or fauna species occur within the waterways or wetlands of the Study Area as either resident or transient occurrences.

There are no wetlands of International Importance or National Importance identified within the Study Area.

Matters of State Environment Significance (MSES) relevant to this aquatic ecology assessment comprise waterways providing for fish passage, which is an MSES only if waterway barrier works are proposed that would limit the passage of fish along the waterway. While the upper extent of several low order (stream order 1 and 2) waterways would be removed for mining, these waterways do not connect to important fish habitat upstream because upstream reaches are within existing active mining areas. As such, their removal would not fragment fish habitat in these waterways as they do not connect to fish habitat further upstream.

Waterway crossings would be positioned on Deep and Taurus creeks. Fish passage would be maintained between existing upstream and downstream habitats because these waterway crossings would be designed and constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (Department of Primary Industries [DPI] 2025b).

Terrestrial GDEs occur within the Study Area in part of the riparian corridor of Taurus Creek. There is no evidence of surface expression or subterranean GDEs within the Study Area, both of which are unlikely to occur. The presence of stygofauna in an aquifer would indicate a subterranean GDE; however, no stygofauna were detected from five bores and five micropiezometers sampled as part of a pilot survey in both July and October 2025, and there is no evidence of stygofauna having previously been detected from within 5 km of the Study Area.

Groundwater is expected to occur in the shallow alluvium of Taurus Creek as ephemeral, discontinuous perched aquifers in sandier material; with clayey material forming aquitards. The alluvial sediments are expected to be of limited extent and thickness but are likely to be episodically recharged by rainfall run-off when Taurus Creek hosts water, resulting in the presence of perched aquifers associated with the alluvium. Given Taurus Creek is subject to continuous natural wetting and drying cycles, the riparian vegetation likely accesses available moisture in the soil/sediment following rainfall, runoff and flow, and accesses available shallow groundwater in the alluvial aquifer for short periods in drier times. The terrestrial GDEs associated with this aquifer would likely be opportunistic, utilising small inputs of groundwater in the alluvial aquifer on occasion, but likely persisting without this input.

The alluvial aquifer of Taurus Creek is recharged by surface flows within Taurus Creek. The Surface Water Assessment for the Project (WRM Water and Environment Pty Ltd 2026) indicates that, notwithstanding the 8.9 percent (%) reduction in the contributing Taurus Creek catchment area during mining, the Project is not expected to materially alter the overall magnitude, duration or frequency characteristics of flows within Taurus Creek. Accordingly, recharge processes to the alluvial aquifer are anticipated to be maintained. On this basis, potential impacts to terrestrial GDEs associated with perched alluvial aquifers are expected to be low.

With effective implementation of mitigation and management measures presented in this report, the Project is unlikely to result in significant impacts on aquatic ecosystem values, including aquatic Matters of National Environmental Significance or MSES.

CONTENTS

EXECUTIVE SUMMARY ..... **II**
1 INTRODUCTION **1**
1.1 Background 1
1.2 Purpose 2
1.3 Scope of work 2
2 EXISTING ENVIRONMENT **5**
2.1 Climate and weather 5
2.2 Topography and drainage 5
2.3 Land Zones 6
2.4 Land use 6
3 METHODS **7**
3.1 Taxonomic nomenclature 7
3.2 Determination of significance level 7
3.3 Conservation-significant species likelihood of occurrence 7
3.4 Groundwater-dependent ecosystem assessment framework 8
3.4.1 Groundwater-dependent ecosystem risk assessment 8
3.4.2 Ecological value of groundwater-dependent ecosystems 9
3.4.3 Potential impacts to an aquifer and/or associated groundwater-dependent ecosystem 9
3.4.4 Magnitude of risk 10
3.4.5 Risk matrix and determination of management actions 12
3.5 Desktop assessment 13
3.5.1 Surface aquatic ecosystems, including surface expression groundwater-dependent ecosystems 13
3.5.2 Subterranean groundwater-dependent ecosystems 14
3.5.3 Terrestrial groundwater-dependent ecosystems 14
3.6 Survey of surface aquatic ecosystems, including aquatic (surface expression) groundwater-dependent ecosystems 14
3.6.1 Survey timing, site selection and effort 14
3.6.2 Aquatic habitats 19
3.6.3 Surface water quality 19
3.6.4 Fish 20
3.6.5 Turtles 21
3.6.6 Mammals 21
3.6.7 Freshwater macroinvertebrates 21
3.6.8 Aquatic flora 25
3.6.9 Overall aquatic values 26
3.7 Field-verification of subterranean groundwater-dependent ecosystems 26
3.7.1 Stygofauna sampling effort 26
3.7.2 Field sampling 27
3.7.3 Sample processing 28
3.7.4 Personnel 28

3.8 Field-verification of terrestrial groundwater-dependent ecosystems 29
3.8.1 Approach 29
3.8.2 Pre-dawn leaf water potential 30
3.8.3 Soil water potential 30
4 RESULTS – AQUATIC ECOLOGY CHARACTERISTICS OF THE STUDY AREA 32
4.1 Waterways 32
4.1.1 Watercourses 32
4.1.2 Conservation values 34
4.1.3 Waterways for fish passage 36
4.2 Aquatic habitat 38
4.2.1 Physico-chemical water quality 38
4.2.2 Ionic composition of surface waters 42
4.2.3 Instream habitat 45
4.2.4 Bank stability/erosion 46
4.2.5 Adjacent land use 46
4.2.6 Aquatic values 46
4.3 Wetlands 49
4.3.1 Wetlands of International importance 49
4.3.2 Wetlands of National importance 49
4.3.3 Queensland referrable wetlands 49
4.3.4 Queensland Wetland Environmental Values 49
4.4 Aquatic flora 51
4.5 Aquatic fauna 52
4.5.1 Fish 52
4.5.2 Turtles 55
4.5.3 Platypus 55
4.5.4 Aquatic invertebrates 55
4.6 Conservation-significant species 64
4.6.1 Aquatic flora 64
4.6.2 Fish 64
4.6.3 Turtles 64
4.6.4 Platypus 65
4.6.5 Aquatic invertebrates 65
4.7 Introduced species 69
4.7.1 Introduced aquatic flora 69
4.7.2 Pest fish species 70
4.7.3 Introduced aquatic reptiles 70
4.8 Groundwater-dependent ecosystems 71
4.8.1 Subterranean groundwater-dependent ecosystems 71
4.8.2 Surface expression groundwater-dependent ecosystems 78
4.8.3 Terrestrial groundwater-dependent ecosystems 80
4.9 Matters of National Environmental Significance 85
4.10 Matters of State Environmental Significance 86
5 POTENTIAL IMPACTS 88

5.1 Aquatic habitat modification and loss 88
5.2 Fish passage 88
5.3 Release of mine-affected water 90
5.3.1 Existing Environmental Authority release conditions 90
5.3.2 Changes to Environmental Authority release conditions 91
5.4 Changes in surface water 93
5.4.1 Surface water flow 93
5.4.2 Flood regimes 93
5.4.3 Surface water quality 94
5.5 Proliferation of aquatic pests 95
5.6 Changes to groundwater-dependent ecosystems 95
5.6.1 Impact mechanisms 96
5.6.2 Terrestrial groundwater-dependent ecosystem – Taurus Creek riparian vegetation 97
5.7 Final landform 100
5.8 Evaluation of impacts on Matters of National Environmental Significance 100
5.9 Evaluation of impacts on Matters of State Environmental Significance 100
5.9.1 Waterways providing for fish passage 101
6 AVOIDANCE AND MITIGATION MEASURES 104
6.1 Measures to avoid and minimise impacts 104
6.2 Impact mitigation 105
6.3 Management plans 105
7 CONCLUSION 106
8 REFERENCES 107

TABLES

Table 1 Criteria adopted for the likelihood of conservation-significant species, identified from the desktop assessment, occurring within the Study Area 7
Table 2 Criteria adopted for assigning GDE ecological values ratings, adapted from the New South Wales Risk assessment guidelines for GDEs (Serov, Kuginis and Williams 2012) 9
Table 3 Determining the magnitude of potential risk to aquifers and GDEs (Serov, Kuginis and Williams 2012) 10
Table 4 GDE risk matrix (Serov, Kuginis and Williams 2012) 12
Table 5 Aquatic survey effort across the Study Area 17
Table 6 Aquatic habitat assessment variables and categories 19
Table 7 AusRivAS bands and descriptions (based on Coysh et al. 2000) 23
Table 8 AusRivAS post-wet habitat predictor model variables for Queensland Regional Coastal draining sites, and the values applied 24
Table 9 AusRivAS pre-wet habitat predictor model variables for Queensland Regional Coastal draining sites, and the values applied 25
Table 10 Adopted criteria for assigning aquatic values ratings 26
Table 11 Surface water quality measurements, post-wet (June-July) 2025 40
Table 12 Surface water quality measurements, pre-wet (October) 2025 41
Table 13 Aquatic habitat assessment scores for riverine survey sites across the Study Area, post-wet (June-July) 2025 45

Table 14 Aquatic habitat assessment scores for riverine survey sites across the Study Area, pre-wet (October) 2025 45
Table 15 Aquatic values ratings for the Study Area 46
Table 16 Aquatic flora recorded from the Study Area, post-wet (June-July) 2025 51
Table 17 Aquatic flora recorded from the Study Area, pre-wet (October) 2025 52
Table 18 Fishes recorded from the Study Area, post-wet (June-July) 2025 53
Table 19 Fishes recorded from the Study Area, pre-wet (October) 2025 53
Table 20 Conservation-significant aquatic flora species recorded from the desktop Search Area 66
Table 21 Conservation-significant fish species recorded from the desktop Search Area 67
Table 22 Conservation-significant turtle species recorded from the desktop Search Area 68
Table 23 Introduced wetland indicator plants recorded from the desktop Search Area 69
Table 24 Characteristics of groundwater monitoring bores and micropiezometers targeted for stygofauna, July and October 2025 76
Table 25 Matters of State Environmental Significance located within the Study Area 86
Table 26 Flood Events Modelled for Baseline, During Mining and Post-Mining Scenarios (WRM 2026) 94
Table 27 Potential impacts of the Project on the perched alluvial aquifers and associated terrestrial GDEs of Taurus Creek (as per Serov, Kuginis and Williams 2012) 98
Table 28 Magnitude of risk of the Project impacting the perched alluvial aquifers and associated terrestrial GDEs of Taurus Creek (as per Serov, Kuginis and Williams 2012) 99
Table 29 Waterways Providing for Fish Passage Significant Residual Impact Assessment 102
Table 30 Mitigation measures 105

FIGURES

Figure 1 Regional Context 3
Figure 2 Blackwater North Study Area 4
Figure 3 Waterways and wetlands of the Study Area 16
Figure 4 Watercourse identification map 33
Figure 5 Aquatic Conservation Assessment 35
Figure 6 Waterways for Waterway Barrier Works mapping 37
Figure 7 Piper plot showing relative abundance of major cations and anions from surface water and groundwater samples, post-wet (June-July) 2025 43
Figure 8 Piper plot showing relative abundance of major cations and anions from surface water and groundwater samples, pre-wet (October) 2025 43
Figure 9 Gibbs (1970) diagrams and ionic balance of surface water samples, post-wet (June-July) 2025 44
Figure 10 Gibbs (1970) diagrams and ionic balance of surface water samples, pre-wet (October) 2025 44
Figure 11 Queensland Wetland Environmental Values 50
Figure 12 Taxa richness of aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025 57
Figure 13 Taxa richness of aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025 57
Figure 14 PET taxa richness for aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025 58
Figure 15 PET taxa richness for aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025 58
Figure 16 Percentage of pollution-tolerant taxa in aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025 60
Figure 17 Percentage of pollution-tolerant taxa in aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025 60
Figure 18 SIGNAL2 scores for aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025 61

Figure 19 SIGNAL2 scores for aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025 61
Figure 20 OE50 scores for riverine macroinvertebrate samples collected from the Study Area, post-wet (June) 2025 63
Figure 21 OE50 scores for riverine macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025 63
Figure 22 Surface geology of the Study Area 72
Figure 23 Groundwater-dependent ecosystem aquifers 73
Figure 24 Surface expression groundwater-dependent ecosystems 79
Figure 25 Terrestrial groundwater-dependent ecosystems 81
Figure 26 Perched aquifer in creek alluvium, showing seasonal depletion (RDM Hydro, 3D Environmental and Groundwater Enterprises 2023) 82
Figure 27 Pre-dawn leaf water potential (LWP) and soil water potential (SWP) measurements at target sites 83
Figure 28 Aquatic Matters of State Environmental Significance Mapping 87
Figure 29 Existing EA EPML00717813 Mine Affected Water Release Points and Gauging Stations 92

PLATES

Plate 1 Micropiezometers (small, temporary polyvinyl chloride wells) utilised for stygofauna sampling from the stream bed 28
Plate 2 Measuring pre-dawn leaf water potential 30
Plate 3 Measuring soil water potential 31
Plate 4 Fish captured from the Study Area 54
Plate 5 Micropiezometer site MP4 and cyclopoid specimen from Blackwater Creek, July 2025 75
Plate 6 State-mapped ‘moderate confidence’ ‘surface expression groundwater-dependent ecosystem line’ at site MP3 78

APPENDICES

Appendix A: EPBC Act Protected Matters Report
Appendix B: Aquatic Survey Site Profiles
Appendix C: Bores Considered for Stygofauna Sampling
Appendix D: Water Sampling Analytical Results
Appendix E: Aquatic Macroinvertebrate Data
Appendix F: Terrestrial GDE assessment raw field data

Acronyms

Acronym	Description
ACA	Aquatic Conservation Assessment (associated with AquaBAMM)
ALA	Atlas of Living Australia
AquaBAMM	Aquatic Biodiversity Assessment Mapping Methodology
AusRivAS	Australian River Assessment System
BoM	The Bureau of Meteorology
CE	Critically Endangered (threatened fauna species conservation status)
cm	centimetre
DCCEEW	The Commonwealth Department of Climate Change, Environment, Energy and Water
DEHP	The former Queensland Department of Environment and Heritage Protection
DERM	The former Queensland Department of Environment and Resource Management
DES	The former Queensland Department of Environment and Science
DETSI	The Queensland Department of the Environment, Tourism, Science and Innovation
DLGWV	The Queensland Department of Local Government, Water and Volunteers
DNRM	The former Queensland Department of Natural Resources and Mines
DNRMMRRD	Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development
DO	Dissolved Oxygen
DPI	Department of Primary Industries
DSITI	The former Queensland Department of Science, Information Technology and Innovation
E	Endangered (threatened species conservation status)
EA	Environmental Authority
EC	Electrical Conductivity
EO Regulation	Queensland Environmental Offsets Regulation 2014
EPP 2019	*Environmental Protection (Wetland and Water Biodiversity) Policy 2019*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GDA	Geocentric Datum of Australia
GDE	Groundwater-Dependent Ecosystem
GES	General Ecological Significance (relating to wetlands identified under the EPP 2019)
HES	High Ecological Significance (relating to wetlands identified under the EPP 2019)
HEV	High Ecological Value (relating to waters identified under the EPP 2019)
IESC	Independent Expert Scientific Committee
km^2	Square kilometres
LC	Least Concern species conservation status under the NC Act
LEV	Low Ecological Value

LWP	Pre-dawn leaf water potential
m	metres
mAHD	Metres above (or below) the Australian Height Datum
mbgl	Metres Below Ground Level
MDB	Murray-Darling Basin
MNES	Matters of National Environmental Significance
MQWEV	Map of Queensland Wetland Environmental Values
MSES	Matters of State Environmental Significance
NC Act	Queensland *Nature Conservation Act 1992*
NT	Near Threatened (species conservation status)
NTU	Nephelometric Turbidity Units
PET	Plecoptera, Ephemeroptera and Trichoptera macroinvertebrate richness
RE	Regional Ecosystem
SEA	Sensitive Environmental Area
SIGNAL2	Stream Invertebrate Grade Number – Average Level Version 2
SLC	Special Least Concern species conservation status under the NC Act
SWP	Soil water potential
V	Vulnerable (threatened species conservation status)
WoNS	Weeds of National Significance
WQO	Water Quality Objective

Definitions

Term	Description
Aquatic fauna	An aquatic animal is either a vertebrate or invertebrate that lives in water for most or all of its life. It does not include amphibians or waterbirds (which are considered terrestrial fauna).
Aquatic flora	Plants that have adapted to living in aquatic environments (saltwater or freshwater). These plants require special adaptations for living submerged in water, or at the water's surface.
Biosecurity matter	A living thing, other than a human or part of a human; or a pathogenic agent that can cause disease in a living thing, other than a human, or a pathogenic agent that can cause disease in a human, by the transmission of a pathogenic agent from an animal to a human; or a disease; or a contaminant.
Conservation-significant species	Threatened species listed as Critically Endangered, Endangered, or Vulnerable under the EPBC Act, or as Endangered, Vulnerable, or Near Threatened under the NC Act.
Ephemeral waterways	Waterways that flow for short periods of time following rain events.
Focus Area	An area extending 5 kilometres beyond the Study Area, used for consideration of potential groundwater-dependent ecosystems in the broader area.
Groundwater-Dependent Ecosystem	Groundwater-Dependent Ecosystems (or GDEs) are ecosystems that rely upon groundwater for their continued existence. They may be 100% dependent on groundwater, such as aquifer GDEs, or may access groundwater intermittently to supplement their water requirements, such as riparian tree species in arid and semi-arid areas.
Intermittent waterways	Waterways with seasonal flow during certain times of the year when smaller upstream waters are flowing and/or when groundwater provides enough water for stream flow.
Lacustrine wetland	Large, open, water-dominated systems (for example, lakes) typically larger than 8 hectares. This definition also applies to modified systems (for example, dams), which are similar to lacustrine systems (for example, deep, standing or slow-moving waters) (DERM 2011).
Restricted matter	Listed in Schedule 2 of the Queensland *Biosecurity Act 2014* and refers to biosecurity matter that are currently found in Queensland and that are known to have a significant impact on human health, social amenity, the economy or the environment.
Search Area	The areas/extents of the desktop searches identified in Section 3.5.
Study Area	The polygon provided by Whitehaven and their consultant Resource Strategies.
Stygofauna	Stygofauna are aquatic fauna that live part or all their lives in groundwater systems such as aquifers or underground caves. Stygofauna are found in aquifers and caves, inhabiting the water filled pore spaces, voids, cracks and fissures.
Stygoxenes	Fauna that are not obligate inhabitants of groundwater system (i.e. are not stygofauna).
Waterway	Waterways include riverine systems, watercourses, waterways or drainage lines identified in Queensland Wetlands Map 2009, *Fisheries Act 1994*, Queensland Waterways for Waterway Barrier Works map or Watercourse identification map (*Water Act 2000*).
Waterway barrier works	Defined in Schedule 2 of the *Environmental Offsets Regulation 2014*, and means a dam, weir or other barrier across a waterway.
Wetland	Wetlands include marine, estuarine, riverine, lacustrine and palustrine waterbodies and wetland Regional Ecosystems in Queensland identified in the Queensland Wetlands Mapping, Wetlands of International Importance (EPBC Act), Wetlands of National Importance (EPBC Act), or in the Queensland Wetland Environmental Values map.

1 INTRODUCTION

1.1 Background

The Blackwater Mine (BWM) is an existing, open cut metallurgical coal mine located approximately 20 kilometres (km) south-west of Blackwater in the Bowen Basin, Queensland (Figure 1).

The BWM has been in operation since 1967 and operates in accordance with, amongst other authorisations, Environmental Authority (EA) EPML00717813, granted under the *Environmental Protection Act 1994*.

The BWM is a joint venture between Whitehaven Coal Limited (Whitehaven) (70 percent [%]), Nippon Steel Corporation (20%) and JFE Steel Corporation (10%). Whitehaven Blackwater Pty Ltd (Whitehaven Blackwater), a wholly owned subsidiary of Whitehaven, is the operator of BWM.

The existing BWM comprises a series of open-cut mining pits along an approximate 80 km long strike length. The BWM extracts coal using drill and blast methods, draglines, dozers and truck and shovel fleets for overburden removal and haulage. Existing infrastructure at BWM includes two rail spurs and balloon loops from the Bauhinia Railway Line, a coal handling and preparation plant (CHPP), thermal coal plant (TCP), product stockpiles, run-of-mine (ROM) coal stockpiles, tailings storage facility, in-pit spoil (i.e. waste rock) dumps, train-load out facilities, water management infrastructure and other supporting infrastructure (e.g. haul roads, access roads, laydown areas, electricity transmission lines, workshops and offices).

Whitehaven Blackwater proposes to develop the Blackwater North Extension Project (the Project), which would extend the current open cut mining development at the BWM to within Surface Area (SA) 7 on Mining Lease (ML) 1762 and SA 10 on ML 1759. The Project is expected to optimise mining operations at BWM allowing ongoing employment and economic benefits from the BWM to the local area, region, and State of Queensland.

The Project would include the following activities:

- extension of open cut operations into SA 7 on ML 1762 and SA 10 on ML 1759 to allow mining of additional coal reserves to approximately 2055;
- extraction of an additional 200 million tonnes (Mt) (approximately) of ROM coal;
- continued extraction of up to 19 Mtpa of ROM coal;
- continued use of existing BWM infrastructure (e.g. CHPP, TCP, ROM and product coal stockpiles;
- train load-out, water management, tailings management and other supporting infrastructure;
- construction and operation of new water management and water storage infrastructure in support of extended mining operations;
- development of waste rock emplacement areas;
- continued co-disposal of coarse rejects with waste rock and disposal of tailings into an approved tailings storage facility or in-pit void;
- construction of semi-permanent tailings cells to be utilised for the disposal of fine rejects;
- progressive rehabilitation of the Project;
- ongoing exploration activities in the Project area; and
- other associated infrastructure, equipment and activities.

1.2 Purpose

The purpose of this Aquatic Ecology and Groundwater-dependent Ecosystem (GDE) Assessment is to describe the aquatic ecology and GDE values of the Study Area (Figure 2) as relevant to current Commonwealth and State legislation, and to assess the impact of the Project on these values.

This report includes a baseline assessment of aquatic ecology and GDE values of the Study Area based on desktop assessments of available information, a post-wet season survey conducted June-July 2025, and a follow-up pre-wet season survey conducted in October 2025. Earlier aquatic ecology surveys of the Study Area were undertaken by DPM Enviросciences on behalf of EMM Consulting Pty Ltd (EMM) in December 2019 and May 2020. The findings of these earlier surveys form part of the desktop assessment and provide contextual baseline information alongside the 2025 field surveys. In addition to baseline assessment, this report assesses the impact of the Project on these values and proposes measures to avoid, minimise and mitigate these impacts.

1.3 Scope of work

The scope of work for this Aquatic Ecology and GDE Assessment included the following tasks:

- Conduct a desktop review of available literature and previous studies in the vicinity of the Study Area and conduct database searches for conservation-significant aquatic species.
- Undertake aquatic ecology surveys throughout the Study Area using appropriate methodology to:
  - describe aquatic habitats and their value and importance, including features such as substrate, stream type, water quality, and surrounding land uses;
  - describe aquatic flora and fauna (including mammals, fish, reptiles and aquatic invertebrates) present, or likely to be present at any time of the year;
  - identify and describe any conservation-significant aquatic species, and any introduced aquatic species, that are present or likely to be present in the Study Area, and identify their habitat resources;
  - consider relevant State and Commonwealth guidelines associated with conservation-significant aquatic species likely to occur in the Study Area;
  - identify and describe wetlands present, and their value and importance; and
  - identify and describe GDEs.
- Prepare a comprehensive Aquatic Ecology and GDE Assessment that presents the methods and results of the desktop and field studies, assesses the potential impacts of the Project on aquatic and GDE values, and proposes methods to avoid and mitigate impacts on these values.

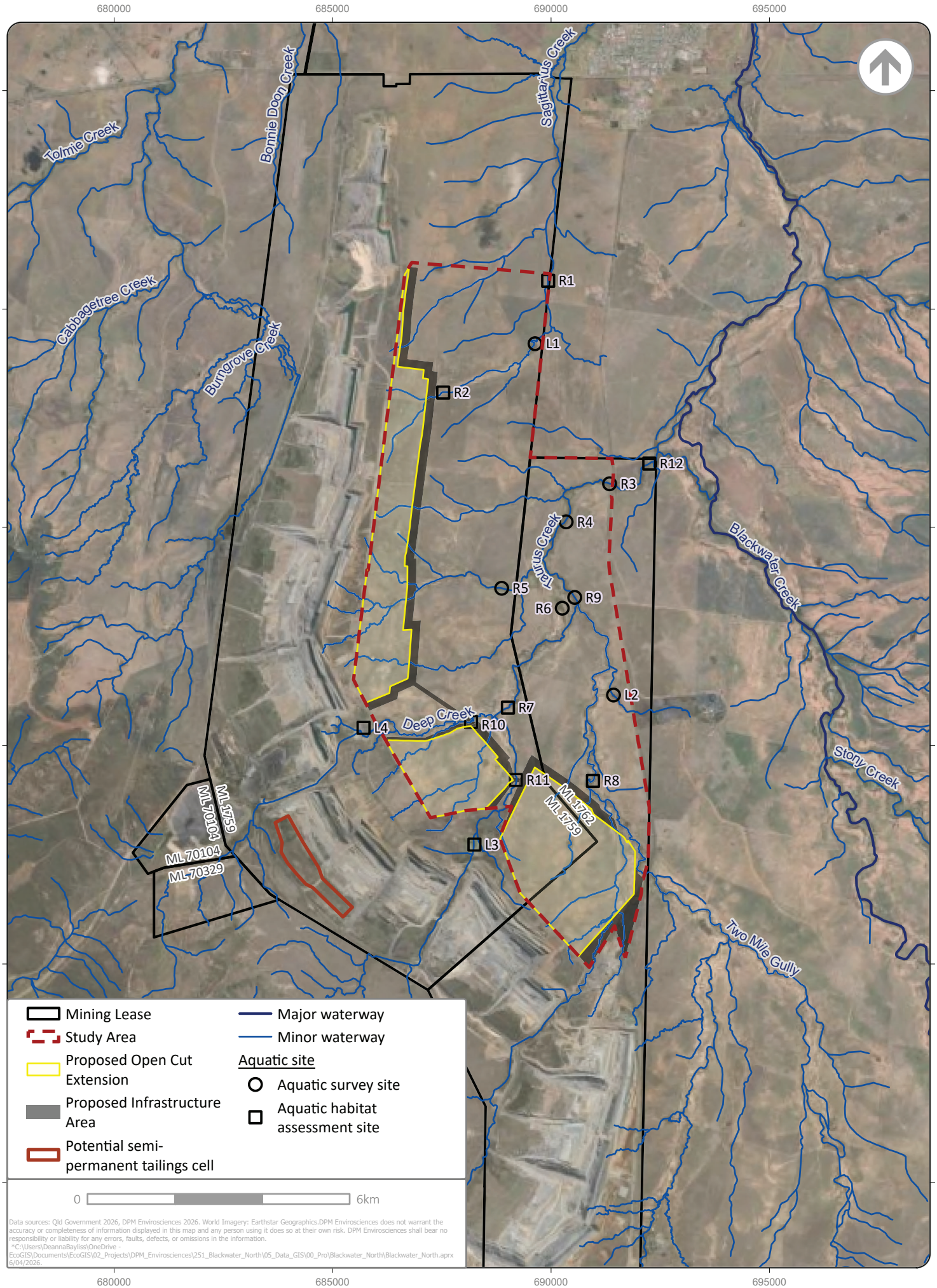


Data sources: Qld Government 2026, DPM Enviroscience 2026. World Hillshade: Esri, USGS.DPM Enviroscience does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. DPM Enviroscience shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.
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REGIONAL CONTEXT

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 1



BLACKWATER NORTH STUDY AREA

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 2

2 EXISTING ENVIRONMENT

2.1 Climate and weather

The Study Area falls within the Central Highlands Region of Queensland. The region's climate is sub-tropical, sub-humid, with nearly half its annual rainfall (535 millimetres [mm] per annum) occurring in summer (The Bureau of Meteorology [BoM] 2025).

In the months preceding the June-July 2025 survey, Blackwater Airport weather station 35134 recorded 85.8 mm of rainfall in March, 79.8 mm in April, and 47.0 mm in May 2025 (BoM 2025), representing above-average rainfall in each month. Dry conditions then prevailed in June, with only 1.4 mm rainfall in the 20 days preceding sampling (BoM 2025).

In the three months preceding the October 2025 survey, Blackwater Airport weather station 35134 recorded 42.4 mm of rainfall in July, 17.2 mm in August and 13.0 mm in September (BoM 2025). Dry conditions then prevailed in October leading into the pre-wet survey.

Mean minimum and maximum temperatures for June 2025 at Blackwater Airport were 8.8°C and 23.3°C, respectively, both slightly below average (BoM 2025). Mean minimum and maximum temperatures for October 2025 at Blackwater Airport were 18.6°C and 35.4°C, respectively; both slightly higher than average (BoM 2025).

2.2 Topography and drainage

The topography of the Study Area is gently undulating and low-lying (less than 300 metres Australian Height Datum [mAHD]). Elevation ranges from about 240 mAHD near tributaries of Two Mile Gully to about 170 mAHD in the downstream-most reach of Sagittarius Creek (Queensland Globe 2025). The Study Area is located within the Mackenzie River Sub-basin of the broader Fitzroy Basin. Two Mile Gully and Deep Creek flow into Taurus Creek within the Study Area, which then flows into Blackwater Creek downstream of the Study Area. Blackwater Creek flows in a general northern direction passing to the east of Blackwater township (Figure 2). Sagittarius Creek flows north and passes to the west of Blackwater township, meeting Blackwater Creek to the north of Blackwater township, then into the Mackenzie River. The Mackenzie River converges with the Dawson River to form the Fitzroy River which flows initially north and then east towards the east coast of Queensland and discharges into the Coral Sea south-east of Rockhampton near Port Alma.

Upstream of the Study Area, a third order tributary of Two Mile Gully has historically been diverted to a third order tributary of Taurus Creek, creating fourth and subsequent fifth order reaches of Taurus Creek within the Study Area (actual stream order, based on Strahler 1952) (Figure 3, Section 3.6.1). The Department of the Environment, Tourism, Science and Innovation (DETSI) Queensland Wetlands Mapping (DETSI 2025e, Section 4.1) and the Department of Primary Industries (DPI) Queensland Waterway Barrier Works mapping (DPI 2025a, Section 4.1.3) present the original flow path and therefore third and fourth order reaches of Taurus Creek within the Study Area. Further references to stream order in this document refer to the actual (on ground) stream order based on Strahler 1952, unless specifically referring to State mapping.

At a regional scale, the Mackenzie River Sub-basin is approximately 13,059 square kilometres (km²) and the broader Fitzroy Basin is approximately 142,483 km² (DETSI 2025a).

The *Environmental Protection (Water) Policy 2009: Mackenzie River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Mackenzie River Sub-basin* (former Department of Environment and Heritage Protection [DEHP] 2011) and accompanying maps identify environmental values (EVs) for the Study Area. The relevant EVs for the Mackenzie southern tributaries are:

- aquatic ecosystems;

- farm supply/use;
- stock water;
- human consumption;
- primary, secondary and visual recreation;
- drinking water;
- industrial use; and
- cultural and spiritual values.

Whitehaven Blackwater is authorised to release mine-affected water directly to Deep Creek, Taurus Creek and a tributary of Two Mile Gully in accordance with EA EPML00717813 (DETSI 2025a).

2.3 Land Zones

The Study Area contains two Land Zones (Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development [DNRMMRRD] 2025a), comprising:

- Land Zone 3 – Recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits, currently under freshwater influence, inland lakes and associated wave-built lunettes. Excludes colluvial deposits such as talus slopes and pediments. Includes a diverse range of soils, predominantly Vertosols and Sodosols; also, with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas.
- Land Zone 4 – Tertiary-early Quaternary clay deposits, usually forming level to gently undulating plains not related to recent Quaternary alluvial systems. Excludes clay plains formed in-situ on bedrock. Mainly Vertosols with gilgai microrelief but includes thin sandy or loamy surfaced Sodosols and Chromosols with the same paleo-clay subsoil deposits.

2.4 Land use

The Study Area is located in the Bowen Basin, where coal mining is prevalent. Land within the Study Area is used predominately for cattle grazing, with areas on the western periphery overlapping with existing coal mining operations at BWM. The land has been largely cleared through past agricultural practices and ongoing disturbance. Relatively small and narrow tracts of remnant vegetation remain (or have re-established) along some of the waterways.

3 METHODS

3.1 Taxonomic nomenclature

Scientific names of fauna used in this report follow those in the WildNet database (DETSI 2025c). Scientific names of flora used in this report follow the Census of the Queensland Flora (Laidlaw 2022).

3.2 Determination of significance level

Conservation-significant species are those taxa listed in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or Queensland *Nature Conservation Act 1992* (NC Act) as Critically Endangered (CE or CR), Endangered (E), Vulnerable (V), Near Threatened (NT) or conservation dependent (i.e. the focus of a specific conservation program and would become V or E without intervention).

All other native species are Special Least Concern (SLC) or Least Concern (LC) under the NC Act.

3.3 Conservation-significant species likelihood of occurrence

Conservation-significant species identified from the desktop assessment were assigned a likelihood of occurrence based on the criteria identified in Table 1. Targeted searches were undertaken in the field for species identified as either being likely to occur or having potential to occur within the Study Area, based on desktop sources. The assessment was applied again after the surveys to determine the likelihood of occurrence once site-based information became available.

Table 1 Criteria adopted for the likelihood of conservation-significant species, identified from the desktop assessment, occurring within the Study Area

Likelihood of occurrence	Description
Known	The species was positively identified and recorded in the Study Area during the field assessment; previous records of occurrence within the Study Area.
Likely	The species was not recorded during the field survey or previously; however, there are known records within 10 km of the Study Area and suitable habitat exists within the Study Area.
Potential	The species was not recorded during the field survey or previously; however, there are known records within 50 km of the Study Area and suitable habitat exists within the Study Area.
Unlikely	Habitat in the Study Area might be suitable; however, the species was not recorded during the field survey, and no known records of the species exist within 50km of the Study Area.

3.4 Groundwater-dependent ecosystem assessment framework

The assessment of aquatic, subterranean and terrestrial GDEs of the Study Area follows the logical framework identified in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019). The steps of the framework include:

1. defining the project impact area (which includes the footprint of surface infrastructure and the extent of groundwater depressurisation);
2. undertaking a desktop study to identify potential GDEs and potential risks to GDEs in the project impact area (which includes the footprint of surface infrastructure and the extent of groundwater depressurisation);
3. assessing the level of groundwater dependence for each GDE and the potential pathways of cause and effect of activities;
4. identifying the baseline ecological condition and value of each GDE;
5. assessing the likelihood, frequency and magnitude of potential impacts on GDEs and determining the risks related to the activity; and
6. prioritising options to avoid or mitigate impacts on GDEs and establishing a monitoring plan to test the effectiveness of mitigation strategies.

This impact assessment presents and discusses the existing Queensland GDE and Potential GDE Aquifer Mapping (DETSI 2025d) with reference to site observations made during post wet and pre-wet surveys (Section 4.8). In addition to the above, this impact assessment considers a remote sensing-derived GDE mapping dataset (2rog Consulting Pty Ltd [2rog Consulting] 2021) developed for several tenements throughout the Bowen Basin, including BWM, applying the remote sensing method recommended by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC 2018). The impact assessment also considers a terrestrial GDE desktop assessment for BWM prepared by RDM Hydro Pty Ltd (RDM Hydro), 3D Environmental and Groundwater Enterprises (2023). These datasets have been used to assess the potential for terrestrial GDEs to occur in the Study Area. Field verification of potential GDEs in July and October 2025 approximated the extent of terrestrial GDEs within the Study Area (Section 4.8).

3.4.1 Groundwater-dependent ecosystem risk assessment

A GDE risk assessment process was undertaken following the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019) (Section 4.8). This included:

- Identifying GDE types and subtypes and their inferred dependency on groundwater;
- determining the ecological value of the aquifer and its associated GDEs;
- determining the impact of an activity to the aquifer and/or associated GDEs;
- determining the magnitude of potential risk from the project; and
- developing management action strategies through a risk matrix approach.

3.4.2 Ecological value of groundwater-dependent ecosystems

Ecological value ratings were assigned to relevant (terrestrial) GDEs following the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov, Kuginis and Williams 2012) (Table 2), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019).

Table 2 Criteria adopted for assigning GDE ecological values ratings, adapted from the New South Wales Risk assessment guidelines for GDEs (Serov, Kuginis and Williams 2012)

Ecological value	Criteria
Category 1 – High Ecological Value (HEV) – Sensitive environmental areas	▪ GDE communities (including stygofauna) where only slight changes in key groundwater attributes below or above a threshold would result in their loss; i.e. entirely dependent ecosystems. ▪ GDEs or aquifers that are partly or wholly located within a State or Federal Reserve System; e.g. National Park / Reserve, or a high conservation area. ▪ Any GDE or aquifer that is relatively unaltered and in good condition. ▪ Any natural GDE that is habitat for any endemic, relictual, rare or endangered biota (fauna or flora), populations or communities as listed under State or Commonwealth legislation or identified as above by an acknowledged expert taxonomist/ecologist.
Category 2 – Moderate Ecological Value (MEV) – Sensitive environmental area	▪ GDE communities where moderate change in groundwater discharge or water tables is required to cause change in their distribution, composition and/or health (the value is based on the potential vulnerability/sensitivity to change). ▪ Any natural GDE system that is habitat for any vulnerable or threatened biota (fauna or flora), populations or communities as listed under State or Commonwealth legislation. ▪ Any GDE or aquifer that provides ecological services to other ecosystems such as rivers, wetlands and estuaries. ▪ GDE communities that exhibit either a threshold or proportional response to changes in groundwater attributes. Moderate systems can include highly dependent systems which can exhibit a threshold response. ▪ Any GDE or aquifer that is regarded as in moderate to good condition from its natural state but not covered by state or federal legislation. ▪ Ecosystems where groundwater appears only to play a minor role in the water balance of such ecosystems such as at the end of a dry season or during extreme drought.
Category 3 – Low Ecological Value (LEV)	▪ Any aquifer or GDE type that is highly modified from that of its natural state (that don't otherwise contain High or Moderate value attributes). ▪ Would likely involve a high cost to rehabilitate, if even possible, and there are other similar GDE types in moderate to good condition; i.e. have little need of rehabilitation, existing within the catchment/aquifer.

3.4.3 Potential impacts to an aquifer and/or associated groundwater-dependent ecosystem

Potential impacts to aquifers and/or associated GDEs within the Study Area were considered following the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019) (Section 5.6).

3.4.4 Magnitude of risk

The magnitude of risk from Project activities on aquifers and/or associated GDEs of the Study Area has been determined following the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems* (Doody, Hancock and Pritchard 2019) (Table 3).

Table 3 Determining the magnitude of potential risk to aquifers and GDEs (Serov, Kuginis and Williams 2012)

Risk factors	High	Moderate	Low	Insufficient data or unknown
Water quantity asset				
What will be the risk of a change in groundwater levels/pressure on GDEs?	Reduction in groundwater level(s) or piezometric pressure beyond seasonal variation, resulting in permanent loss or alteration of defined habitat type.	Reduction in groundwater level(s) or piezometric pressure beyond seasonal variation, resulting in temporary loss or alteration of defined habitat type.	No change to aquifer water levels or pressure.	-
What will be the risk of a change in the timing or magnitude of groundwater level fluctuations on GDEs?	Fluctuation in groundwater level(s) or piezometric pressure beyond established seasonal variation, resulting in permanent loss or alteration of defined habitat type.	Fluctuation in groundwater level(s) or piezometric pressure beyond seasonal variation, resulting in temporary loss or alteration of defined habitat type.	No change in timing of water level fluctuations.	-
What will be the risk of changing base flow conditions on GDEs?	Permanent reversal of base flow conditions.	Temporary reversal of base flow conditions exceeding seasonal variation.	No change in direction of flow.	-
Water quality asset				
What is the risk of changing the chemical conditions of the aquifer?	Permanent change; e.g. in pH, dissolved oxygen (DO), nutrients, temperature and/or turbidity.	Temporary change; e.g. in pH, DO, nutrients, temperature and/or turbidity.	Negligible change (<5%).	-
What is the risk on the aquifer by a change in the salt/freshwater interface?	Permanent change in location or gradient of salt/freshwater interface.	Temporary change in location or gradient of salt/freshwater interface.	No change or not applicable.	-

Risk factors	High	Moderate	Low	Insufficient data or unknown
What is the likelihood of a change in beneficial use of the aquifer?	Reduction in water quality beyond designated beneficial use category (for identified trigger parameters).	Reduction in water quality within designated beneficial use category (for identified trigger parameters).	Negligible change for identified triggers (<5%).	-
Aquifer integrity asset				
What is the risk of damage to the geologic structure?	Permanent destruction of the aquifer matrix. Major cracking/fracturing of the bedrock/stream bed leading to complete dewatering of the GDE.	Temporary adjustment to the aquifer matrix. Major cracking/fracturing of the bedrock/stream bed leading to complete dewatering of the GDE.	No change.	-
Biological integrity				
What is the risk of alterations to the number of native species (i.e. richness) within the groundwater-dependent communities (fauna and flora)?	>10% reduction in number of species.	10 to 5% reduction in number of species.	No reduction in number of species.	-
What is the risk of alterations to the species composition (i.e. diversity) of the groundwater-dependent communities (fauna and flora)?	>10% change in species composition.	10 to 5% change in species composition.	No change in species composition.	-
What is the risk of increasing the presence of exotic flora or fauna?	Large populations of one or more species.	Species in small numbers.	None exist.	-
What is the risk of removing or altering a GDE subtype habitat?	>20% removal or alteration of habitat area.	10 to 20% removal or alteration of habitat.	No removal or alteration of habitat.	-

Exception rule: if the number of unknown exceed 50% of questions, the risk is considered to be high until proven otherwise.

3.4.5 Risk matrix and determination of management actions

A risk matrix was applied consistent with the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019) (Table 4) to outline the most appropriate management response to potential impacts on EVs (Section 5.6.2).

Table 4 GDE risk matrix (Serov, Kuginis and Williams 2012)

Category 1 HEV Sensitive Environmental Area (SEA)	**A**	**B**	**C**
Category 2 MEV SEA	**D**	**E**	**F**
Category 3 LEV	**G**	**H**	**I**
	Category 1 **Low Risk**	**Category 2** **Moderate Risk**	**Category 3** **High Risk**

3.5 Desktop assessment

3.5.1 Surface aquatic ecosystems, including surface expression groundwater-dependent ecosystems

Desktop searches were undertaken prior to field survey in June 2025. This included a review of available aerial imagery and the following:

- The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Act Protected Matters Search Tool, to identify potential aquatic Matters of National Environmental Significance (MNES) within approximately 10 km of the Study Area (Appendix A) (DCCEEW 2025a).
- DETSI Wetland*Info* Wetland Summary Information (including species listings) for the Mackenzie River drainage sub-basin and the broader Fitzroy Basin, incorporating data from the DETSI WildNet database, Queensland Museum and Queensland Herbarium (DESTI 2025b, c).
- Mapping of Matters of State Environmental Significance (MSES) (the former Department of Environment and Science [DES] 2023), to identify aquatic matters of state interest under the *State Planning Policy 2017* and *Environmental Offsets Regulation 2014* (EO Regulation).
- DETSI WildNet database, to identify aquatic species records within approximately 10 km and 50 km of the Study Area (DETSI 2025c).
- Atlas of Living Australia (ALA) (2025), to interrogate existing species records.
- Queensland Waterways for Waterway Barrier Works mapping (Queensland Department of Primary Industries [DPI] 2025a).
- Queensland Watercourse Identification Series (Queensland Department of Local Government, Water and Volunteers [DLGWV] 2025a).
- Queensland GDE and Potential GDE Aquifer Mapping (DETSI 2025d).
- DETSI Queensland Wetland Data Series Version 7 – Queensland Wetlands Mapping (DETSI 2025e), to determine the classification, extent and significance of lacustrine, palustrine and riverine systems within the Study Area and surrounds.
- Queensland Map of Great Barrier Reef Wetland Protection Areas (DETSI 2025f).
- Queensland Map of Queensland Wetland Environmental Values (DETSI 2025g).
- Queensland Aquatic Conservation Assessment (ACA) mapping (DETSI 2025h).
- Published ecological information on conservation-significant and SLC aquatic flora and fauna species.
- Previous studies relating to aquatic ecology in the Project Area, including:
  - Blackwater Mine – North Extension Project, Aquatic Ecology Baseline Assessment (prepared by DPM Enviros ciences for EMM 2023);
- Relevant survey guidelines, including the Australian River Assessment System (AusRivAS) protocols for Queensland streams (the former Queensland Department of Natural Resources and Mines [DNRM] 2001).

3.5.2 Subterranean groundwater-dependent ecosystems

DPM Enviros applied the Queensland *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (the former Queensland Department of Science, Information Technology and Innovation [DSITI] 2015). This included a desktop review to assess the likely presence and composition of subterranean aquatic faunal communities within 5 km of the Study Area. The desktop review involved:

- assessing the suitability of local habitat for subterranean aquatic fauna based on local geological and hydrological conditions; and
- determining the presence and composition of subterranean aquatic fauna in the Focus Area based on any available previous studies or relevant databases, including:
  - *BMA Blackwater Mine: Stygofauna Pilot Survey* (Freshwater Ecology Pty Ltd [Freshwater Ecology] 2021); and
  - the Queensland subterranean aquatic fauna database (Queensland Herbarium 2025), for a search area extending 50 km from the Study Area.

The desktop review results are provided in Section 4.8.1. Freshwater Ecology (2021) sampled 10 bores for stygofauna in November 2020 and May 2021. However, five of these bores are screened too deep (>168 metres below ground level [mbgl]) for subterranean fauna to have access to the borehole and two of the five shallower bores were dry at the time of each seasonal sampling event. Consequently, only three of the 10 bores sampled for stygofauna met the criteria for sampling as per the DSITI (2015) guideline.

DPM Enviros conducted a seasonal stygofauna pilot survey of 10 suitable bores in accordance with the DSITI (2015) guideline, described further in Section 3.7.

3.5.3 Terrestrial groundwater-dependent ecosystems

Desktop searches included a review of the following:

- potential terrestrial GDE mapping in the Queensland GDE and Potential GDE Aquifer Mapping (DETSI 2025d); and
- previous studies relating to the Study Area, including:
  - Remote Sensing of Terrestrial GDEs (2rog Consulting 2021); and
  - BHP Groundwater Dependent Ecosystem Desktop Assessment – Blackwater Mine (RDM Hydro, 3D Environmental and Groundwater Enterprises 2023).

3.6 Survey of surface aquatic ecosystems, including aquatic (surface expression) groundwater-dependent ecosystems

3.6.1 Survey timing, site selection and effort

A post-wet season survey was undertaken across the Study Area by DPM Enviros within the period 18 June to 2 July 2025, aligning with the AusRivAS late wet or post-wet sampling season (May to July). A follow-up dry season survey was undertaken within the period 20 to 25 October 2025, aligning with the AusRivAS early wet or pre-wet sampling season (October to December).

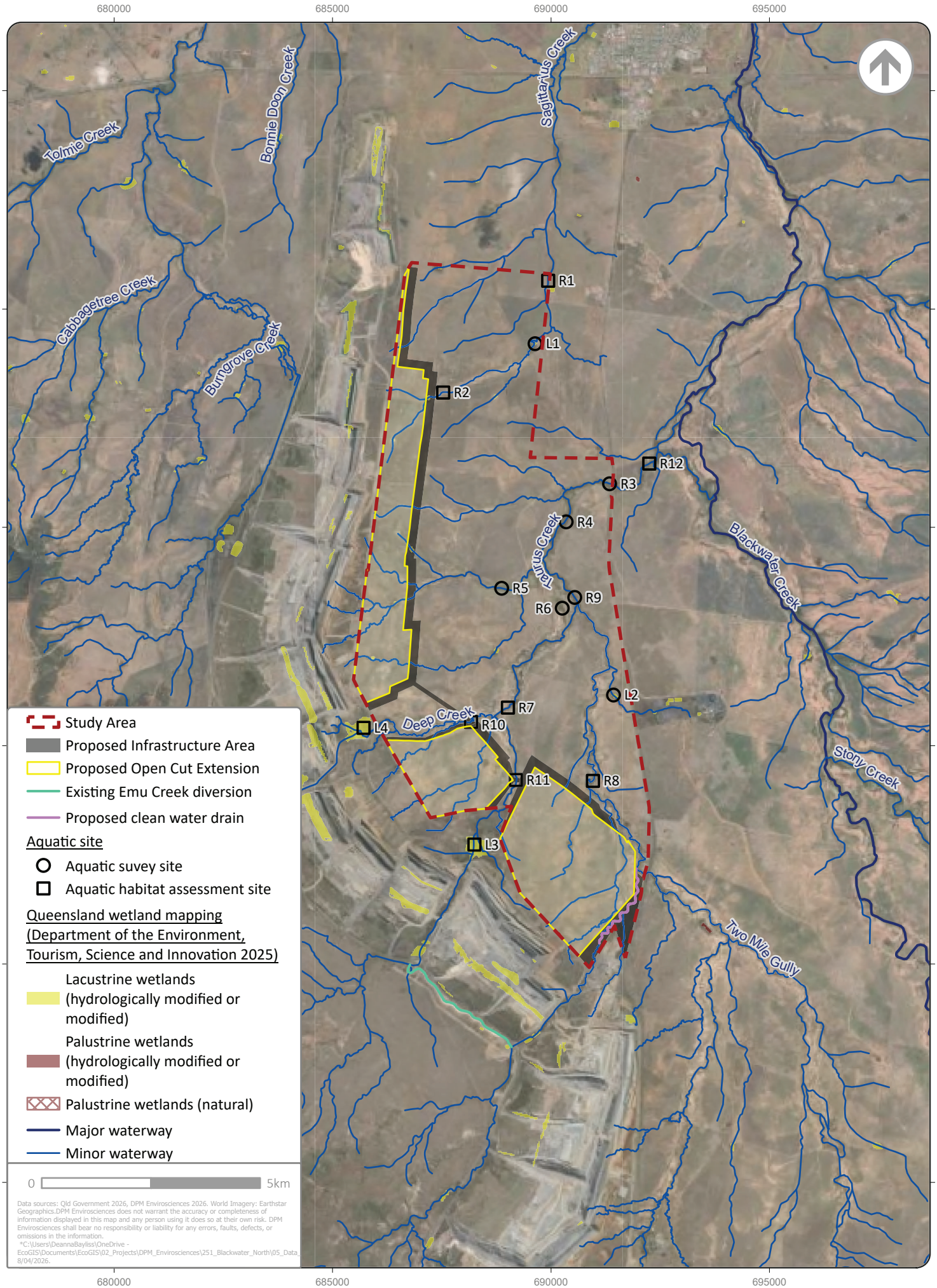
Desktop results were used to identify representative stream reaches and wetland waterbodies for field assessment. Aquatic habitat assessment was undertaken at sites representative of the waterways and wetlands of the Study Area. This comprised 13 sites in June-July 2025 (nine riverine and four wetland sites) (Table 5). The same 13 sites and an additional three riverine aquatic habitat assessment sites were assessed in October 2025, to address amendments to the layout of the Study Area and proposed waterway crossings. Aquatic habitat assessment sites comprised (Figure 3):

1. 12 riverine system drainage lines based on the Strahler (1952) stream order system:
    - three sites (R2, R5 and R10) on second order waterways, including Sagittarius Creek;
    - one site (R1) on third order Sagittarius Creek;
    - four sites (R6, R7, R8 and R11) on fourth order waterways, including Taurus Creek and Two Mile Gully; and
    - four sites (R3, R4, R9 and R12) on the fifth order Taurus Creek (note: appears as fourth order in various State mapping datasets but is verified as a fifth order creek due to the existing Emu Creek Diversion into Taurus Creek.
2. four lacustrine wetland sites (hydrologically modified or artificial):
    - two farm sites on unnamed tributaries (L1 and L2); and
    - two mine water dams on Deep and Taurus creeks (L4 and L3, respectively).

No flow was encountered during the June-July 2025 survey due to prevailing dry conditions in the month leading up to sampling. However, above-average rainfall in March, April and May 2025 resulted in isolated pools and dams sufficient for detailed survey at seven sites in the post-wet (June-July) 2025 survey (Table 5). Detailed survey (including habitat assessment, fish/turtle and macroinvertebrate sampling) was undertaken at five riverine drainage line sites (R3, R4, R5, R6 and R9) and two farm dam sites (L1 and L2). Habitat assessment was undertaken at all 13 sites in June 2025 (Appendix B). Dry conditions provided an opportunity to identify dry season refuge pools important for ‘seeding’ waterways with fish, turtles, macrocrustaceans and other obligate aquatic invertebrates in later times of flow. The dry conditions also presented an opportunity to inform the likelihood of occurrence of surface expression GDEs.

Similarly, lack of rainfall in early October 2025 resulted in dry conditions in the pre-wet survey. Consequently, detailed survey was undertaken at two of the 12 riverine drainage line sites (R3 and R6) and the same two farm dam sites (L1 and L2) in October 2025. All other riverine drainage line sites were dry at the time of assessment. Habitat assessment was undertaken at all 16 sites in October 2025 (Appendix B).

The sampling sites and survey effort are identified in Table 5.



WATERWAYS & WETLANDS OF THE STUDY AREA

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 3

Table 5 Aquatic survey effort across the Study Area

Site description	Site ID	Date	Stream order (actual, Strahler 1952)	Latitude (Geocentric Datum of Australia [GDA] '20)	Longitude (GDA'20)	Fish survey effort			Turtle effort		Macroinverts.		Physico-chemical water quality	Water sample retained for ion analysis	Habitat assess./aquatic plant survey/photos
						Backpack Electrofishing	Fyke nets	Box traps	Fyke nets	Cathedral traps	Bed habitat	Edge habitat			
Riverine drainage system sites															
Sagittarius Creek	R1	17/06/25	3	-23.6287	148.8619	-	-	-	-	-	-	-	-	-	✓
		20/10/25				-	-	-	-	-	-	-	-	-	✓
Sagittarius Creek	R2	17/06/25	2	-23.6521	148.8387	-	-	-	-	-	-	-	-	-	✓
		20/10/25				-	-	-	-	-	-	-	-	-	✓
Taurus Creek	R3	20/06/25	5	-23.6705	148.8762	✓	✓	✓	✓	-	✓	✓	✓	✓	✓
		22/10/25				✓	-	-	-	-	✓	✓	✓	✓	✓
Taurus Creek	R4	20/06/25	5	-23.6785	148.8666	✓	-	-	-	-	✓	✓	✓	✓	✓
		21/10/25				-	-	-	-	-	-	-	-	-	✓
Taurus Creek tributary	R5	18/06/25	2	-23.6924	148.8523	✓	-	-	-	-	✓	✓	✓	✓	✓
		21/10/25				-	-	-	-	-	-	-	-	-	✓
Taurus Creek flood channel	R6	1/07/25	4	-23.6963	148.8660	✓	✓	✓	✓	-	✓	✓	✓	✓	✓
		21/10/25				✓	-	-	-	-	✓	✓	✓	✓	✓
Taurus Creek	R7	1/07/25	4	-23.7170	148.8541	-	-	-	-	-	-	-	-	-	✓
		22/10/25				-	-	-	-	-	-	-	-	-	✓
Two Mile Gully	R8	1/07/25	4	-23.7319	148.8734	-	-	-	-	-	-	-	-	-	✓
		22/10/25				-	-	-	-	-	-	-	-	-	✓
Taurus Creek	R9	18/06/25	5	-23.6941	148.8688	✓	-	✓	-	-	✓	✓	✓	✓	✓
		21/10/25				-	-	-	-	-	-	-	-	-	✓
Deep Creek	R10	21/10/25	2	-23.7201	148.8459	-	-	-	-	-	-	-	-	-	✓
Taurus Creek	R11	21/10/25	4	-23.7320	148.8561	-	-	-	-	-	-	-	-	-	✓
Taurus Creek	R12	23/10/25	5	-23.6662	148.8851	-	-	-	-	-	-	-	-	-	✓

Site description	Site ID	Date	Stream order (actual, Strahler 1952)	Latitude (Geocentric Datum of Australia [GDA] '20)	Longitude (GDA'20)	Fish survey effort			Turtle effort		Macroinverts.		Physico-chemical water quality	Water sample retained for ion analysis	Habitat assess./aquatic plant survey/photos
						Backpack Electrofishing	Fyke nets	Box traps	Fyke nets	Cathedral traps	Bed habitat	Edge habitat			
Lacustrine waterbody sites															
Farm dam	L1	17/06/25	1	-23.6417	148.8591	✓	✓	✓	✓	-	✓		✓	✓	✓
		20/10/25				✓	✓	✓	✓	-	✓		✓	✓	✓
Farm dam	L2	17/06/25	1	-23.7141	148.8778	✓	✓	✓	✓	-	✓		✓	✓	✓
		22/10/25				✓	✓	✓	✓	-	✓		✓	✓	✓
Taurus Dam (mine water)	L3	3/07/25	3	-23.7454	148.8470	-	-	-	-	-	-		✓	✓	✓
		20/10/25				-	-	-	-	-	-		✓	✓	✓
Deep Creek Dam (mine water)	L4	3/07/25	2	-23.7216	148.8217	-	-	-	-	-	-		✓	✓	✓
		20/10/25				-	-	-	-	-	-		✓	✓	✓

3.6.2 Aquatic habitats

Aquatic habitats were described in accordance with AusRivAS protocols for Queensland streams (DNRM 2001). This established a general description of the environment of each site and its immediate surrounds. The classifications are based on flow level, depth, velocity, width, canopy cover, substrate types, habitat attributes, local catchment erosion, sediment deposits, water colour, algae, water odour, substrate odour, presence of large woody debris, riparian zone width and cover, and general signs of disturbance.

Variable flows, caused by natural events such as rainfall, runoff and drought/flood cycles influence the aquatic ecosystems of an area. This should be taken into consideration for future studies which may utilise results contained in this report.

Habitat assessment scores (out of 135) were made for each site based on the 9 AusRivAS categories (Table 6). Aquatic habitat at each site was classified as Poor, Fair, Good or Excellent based on the overall score.

A detailed description of the aquatic habitat encountered at each site is included in the site profiles in Appendix B.

Table 6 Aquatic habitat assessment variables and categories

Habitat variable	Poor	Fair	Good	Excellent
Bottom substrate/available cover	0 – 5	6 – 10	11 – 15	16 – 20
Embeddedness	0 – 5	6 – 10	11 – 15	16 – 20
Velocity/depth category	0 – 5	6 – 10	11 – 15	16 – 20
Channel alteration	0 – 3	4 – 7	8 – 11	12 – 15
Bottom scouring and deposition	0 – 3	4 – 7	8 – 11	12 – 15
Pool/riffle, run/bend ratio	0 – 3	4 – 7	8 – 11	12 – 15
Bank stability	0 – 2	3 – 5	6 – 8	9 – 10
Bank vegetative stability	0 – 2	3 – 5	6 – 8	9 – 10
Streamside cover	0 – 2	3 – 5	6 – 8	9 – 10
Total	**0 – 38**	**39 – 74**	**75 – 110**	**111 – 135**

3.6.3 Surface water quality

In-situ physico-chemical water quality was assessed as a component of the AusRivAS aquatic habitat assessments, to inform initial equipment settings for backpack electrofishing, and to assist in the interpretation of collected macroinvertebrate data. The ionic composition of surface water was sampled and assessed to assist in characterising surface waters of the Study Area, including their likely interaction with groundwater.

In-situ measurements

In-situ physico-chemical water quality parameters were measured at each wetted survey site using a YSI Professional Plus multi-parameter water quality meter and Hach Turbidimeter 2100Q, each calibrated prior to and following sampling. Water quality parameters measured included:

- temperature (°C);
- pH;
- electrical conductivity (EC; micro siemens per centimetre [µS/cm]);
- turbidity (Nephelometric Turbidity Units [NTU]); and
- DO (milligrams per litre [mg/L] and % saturation).

For the purposes of this assessment, salinity descriptors were based on the following EC ranges (the former Department of Agriculture, Fisheries and Forestry 2012):

- fresh – <800 µS/cm;
- marginal – 800 to 1,600 µS/cm;
- brackish – 1,600 to 4,800 µS/cm;
- slightly saline – 4,800 to 10,000 µS/cm;
- moderately saline – 10,000 to 20,000 µS/cm; and
- saline – >20,000 µS/cm.

Ions

Water samples were obtained from each wetted site in accordance with the *Monitoring and Sampling Manual* (DES 2018). Samples were chilled and delivered to ALS Environmental (a National Association of Testing Authorities [NATA] accredited laboratory) and were analysed for the following major ions to assist in characterising surface waters of the Study Area:

- major anions (Cl, SO_4 and alkalinity); and
- major cations (Ca, Mg, Na and K).

Groundwater samples were also obtained from subterranean GDE sampling sites (Section 3.7.2) for analysis and comparison of major anions and cations consistent with the IESC *Fact Sheet: Environmental water tracers in environmental impact assessments for coal seam gas and large coal mining development* (Office of Water Science 2020).

Data analysis

Physico-chemical water quality measurements were compared against Water Quality Objectives (WQOs) nominated in *Environmental Protection (Water) Policy 2009: Mackenzie River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Mackenzie River Sub-basin* (DEHP 2011). This includes WQOs for moderately disturbed aquatic ecosystems (applied to riverine sites) and WQOs for lakes/reservoirs (applied to wetland waterbody sites).

3.6.4 Fish

Fish were surveyed at seven wetted sites using a combination of backpack electrofishing, dip-netting, and overnight deployment of baited box traps and fyke nets (Section 3.6.1) where sufficient depth was encountered (Table 5).

Fish survey effort included:

- backpack electrofishing using a Smith-Root LR-24 electrofisher for up to 1200 seconds power-on time (100 hertz frequency; 20% duty cycle; 200-400 volts, to suit conductivity);
- dip-netting in combination with backpack electrofishing, using an Environet® manoeuvred through the water column;
- fyke netting – with two fyke nets, dual wing, 4 metres (m) wing lengths, 0.6 m drop, 3 mm mesh, baited with apple, banana, beef, spinach and rinsed sardines – deployed overnight to capture active fish (and both carnivorous and omnivorous turtles); and
- box traps – with five traps, 22 centimetres (cm) x 22 cm x 40 cm, 2 mm mesh, 50 mm opening, baited with dry cat food.

Fish survey was restricted to backpack electrofishing and dip-netting at some sites, due to insufficient depth for deployment of fyke nets or box traps (Table 5). However, these sites were thoroughly fished using backpack electrofishing techniques.

Captured fish were identified, with native species released at the point of capture.

3.6.5 Turtles

The Survey Guidelines for Australia's Threatened Reptiles (Department of Sustainability, Environment, Water, Population and Community [DSEWPC] 2011) suggest that the Fitzroy River turtle (*Rheodytes leukops*) can be readily observed in riffle zones by diving with a face mask and snorkel, or collected by seine netting, and also that the partly carnivorous diet of this species indicates it might be attracted to meat baits in traps. Survey guidelines for the white-throated snapping turtle (*Elseya albagula*) are not identified in the DSEWPC (2011) survey guidelines due to the subsequent listing of this species as Critically Endangered (from Least Concern) in November 2014. However, DPM Enviros has successfully captured this species using baited fyke nets and cathedral traps on other projects in the Mackenzie River Sub-basin.

The Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Department of Science, Technology, Innovation and the Arts 2014) suggest that freshwater turtle surveys should employ one or more of the following techniques:

- visual survey;
- snorkelling;
- spotlighting;
- trapping; and
- seine netting.

Freshwater turtles were surveyed at sites R3, R6, L1 and L2 (Section 3.6.1) by overnight deployment of baited fyke nets, as well as observations of the bank and water surface for sunning and breaching turtles. Suitable habitat for the deployment of cathedral traps (i.e. trees or snags overhanging deep pools) was not encountered.

Snorkelling surveys are not permitted by Whitehaven Coal Limited safety policy.

3.6.6 Mammals

Habitat suitability for platypus (*Ornithorhynchus anatinus*) was assessed at each site. This included targeted searches for burrows along banks.

3.6.7 Freshwater macroinvertebrates

Freshwater macroinvertebrate samples were collected from suitable habitats in June 2025 (sites R3, R4, R5, R6, L1 and L2) and October 2025 (sites R3, R6, L1 and L2) to gain an improved understanding of the health, trophic interactions and values of representative aquatic sites. Samples were collected by AusRivAS accredited ecologists following AusRivAS protocols for Queensland streams (DNRM 2001; DES 2018). AusRivAS protocols specify a standardised, qualitative, rapid bioassessment method that aims to consistently sample a wide diversity of macroinvertebrates within a defined timeframe.

The bed and edge habitats were sampled separately at each riverine site in accordance with AusRivAS protocols. At wetland waterbody sites (farm dams), a composite sample was collected incorporating all habitat conditions available (i.e. woody debris, macrophytes, bed and edge, deep and shallow areas).

A standard sized dip net with 250 micrometre (µm) mesh was used to sample macroinvertebrates. Following collection, the samples were transferred to plastic sorting trays, where the contents were sorted and live-picked for 30 minutes. Picked specimens were placed into specimen jars with 70% ethanol.

Samples were identified by an AusRivAS accredited ecologist to AusRivAS taxonomic level in the laboratory under stereomicroscope. AusRivAS taxonomic identification is primarily to Family level, with the exception of lower Phyla such as Porifera, Nematoda and Nemertea, Oligochaetes (freshwater worms), Acarina (mites), and microcrustacea such as Ostracoda, Copepoda and Cladocera. Chironomids (midges) are identified to sub-family taxonomic level.

Data analysis

The macroinvertebrate data was used to calculate a number of community descriptors as described in the following sections.

Taxonomic richness

Taxonomic richness was calculated from the number of taxa present in each sample, with richness typically increasing with ecological condition.

Plecoptera, Ephemeroptera and Trichoptera

The Plecoptera, Ephemeroptera and Trichoptera (PET) richness was calculated from the number of taxa belonging to the three PET orders. These orders are widely accepted as being most sensitive to environmental change, such as habitat degradation and pollution (DEHP 2009). A low PET richness score, due to the absence of these pollution-sensitive taxa, suggests that a site may be impacted by degradation or pollution. Conversely, a high PET richness suggests a system free from degradation or pollution.

Stream Invertebrate Grade Number – Average Level Version 2

Stream Invertebrate Grade Number – Average Level Version 2 (SIGNAL2) indices were calculated, with each taxon allocated a score from 1 to 10 based on Chessman (2003). Taxa with low scores are most tolerant of a range of environmental conditions, and those with high scores are more sensitive to pollution. The presence/absence data of each taxon were used to calculate the SIGNAL2 average for the site, in accordance with the protocols described by Chessman (2003).

Pollution-tolerant taxa

The percentage of pollution-tolerant taxa was calculated based on the SIGNAL2 indices. Tolerant taxa are classified as those with a SIGNAL2 score of 3 or less (Marshall et al. 2001). Macroinvertebrate families in this group are expected to tolerate changes to their environment, including habitat degradation and some pollution. An absence of more sensitive taxa suggests environmental conditions may be too harsh for sensitive taxa (those with SIGNAL2 scores above 3) to tolerate.

Australian River Assessment System OE50

The macroinvertebrate and predictor variables (habitat) data were analysed using the AusRivAS macroinvertebrate predictive modelling program, version 3.2.2 (eWater Ltd 2017). The predictive models are typically based on semi-permanent to permanent reference streams. Although the models provide another useful macroinvertebrate community descriptor, the results are applied to ephemeral waterways with caution.

AusRivAS OE50 values were derived from the AusRivAS model, comparing the observed taxonomic assemblages to those expected (i.e. O/E) (with a >50% chance of occurring at a test site) under 'reference' (least disturbed) conditions in the broader catchment. OE50 taxa are attributed to bands representing different levels of biological condition. The band width is based on the distribution of OE50 taxa values for the reference sites in each model. The AusRivAS bands and descriptions are identified in Table 7.

Table 7 AusRivAS bands and descriptions (based on Coysh et al. 2000)

Band	Description	OE50 taxa	O/E taxa interpretation
X	More biologically diverse than reference	OE50 greater than 90th percentile of reference sites used to create the model.	More families found than expected. Potential biodiversity "hot spot" or mild organic enrichment. Continuous irrigation flow in a normally intermittent stream.
A	Similar to reference	OE50 within ranged of central 80% of reference sites used to create the model.	Expected number of families within the range found at 80% of the reference sites.
B	Significantly impaired	OE50 below 10th percentile of reference sites used to create the model. Same width as Band A.	Fewer families than expected. Potential impact either on water and/or habitat quality resulting in a loss of families.
C	Severely impaired	OE50 below Band B. Same width as band A.	Many fewer families than expected. Loss of families from substantial impairment of expected biota caused by water and/or habitat quality.
D	Extremely impaired	OE50 below Band C down to zero.	Few of the expected families and only the hardy, pollution tolerant families remain.

The AusRivAS models utilised, based on location, season and habitats sampled, are identified in Table 8 (post-wet) and Table 9 (pre-wet), along with the different input variables applied to each season.

Table 8 AusRivAS post-wet habitat predictor model variables for Queensland Regional Coastal draining sites, and the values applied

Code	Description	Riverine site and input value				
		R3	R4	R5	R6	R9
Edge habitat						
ALTITUDE	Height above sea level (mAHD)	182	185	192	190	190
BEDSLOPE	Slope of bed (m/m)	0.002	0.002	0.004	0.002	0.002
LONGITUDE	Decimal degrees to 4 decimal places	148.8762	148.8666	148.8523	148.8660	148.8688
MDMR	Mean dry season monthly rainfall (mm)	21	21	21	21	21
RAINRANGE	Annual range in mean monthly rainfall	74	74	74	74	74
RAWD	Ratio of mean wet season to mean dry season rainfall	3.25	3.25	3.25	3.25	3.25
WETPERCENT	Percentage rainfall in wet season	76	76	76	76	76
Pool/bed habitat						
COBBLE	Percent cobble (64-256 mm diameter sediments) in habitat	0	0	0	0	0
DFS	Distance from source (km)	41	39	6	20	36
MDMR	Mean dry season monthly rainfall (mm)	21	21	21	21	21
MINTEMP	Mean daily minimum temperature (°C)	16.3	16.3	16.3	16.3	16.3
RAINFALL	Mean annual rainfall (mm)	535	535	535	535	535

Notes:

Rainfall and temperature data derived from the BoM station 35134 – Blackwater Airport (2013-2025).

°C = degrees Celsius.

Table 9 AusRivAS pre-wet habitat predictor model variables for Queensland Regional Coastal draining sites, and the values applied

Code	Description	Riverine site and input value	
		R3	R6
Edge habitat			
ALTITUDE	Height above sea level (mAHD)	182	190
LONGITUDE	Decimal degrees to 4 decimal places	148.8762	148.8660
MDMR	Mean dry season monthly rainfall (mm)	21	21
MINTEMP	Mean daily minimum temperature (°C)	16.3	16.3
RAWD	Ratio of mean wet season to mean dry season rainfall	3.25	3.25
WETR	Range in wet season monthly rainfall means (mm)	40.7	40.7
Pool/bed habitat			
COBBLE	Percent cobble (64-256 mm diameter sediments) in habitat	0	0
MDMR	Mean dry season monthly rainfall (mm)	21	21
PROCESSZONE	Process zone category (2 = erosional; 1 = transport; 0 = depositional)	1	1
RAINRANGE	Annual range in mean monthly rainfall	74	74
RAINGETEMP	Mean daily temperature range (°C)	14.1	14.1

Notes:
Rainfall and temperature data derived from the BoM station 35134 – Blackwater Airport (2013-2025).
°C = degrees Celsius.

3.6.8 Aquatic flora

Aquatic plants were surveyed at each site. All aquatic plants were identified to species using available literature and taxonomic keys where needed. The abundance of each species was estimated using the AusRivAS (DNRM 2001) categories: extensive (>75% cover), moderate (50-75%), some (10-50%) or little (1-10%).

3.6.9 Overall aquatic values

An aquatic values rating of Low, Moderate or High was assigned to each site based on the summation of all available information from the desktop and field assessments (Table 10). When assessing each site, the most conservative criteria was applied. The criteria in Table 10 are listed from most to least important.

Table 10 Adopted criteria for assigning aquatic values ratings

Aquatic values/sensitivity	Key aquatic values/criteria
High	A site can have one or more of the following to be considered 'High': ▪ Permanent riverine waterbody or natural wetland. ▪ Wetland of High Ecological Significance. ▪ Conservation-significant species habitat present. ▪ Known presence of platypus breeding place. ▪ Near natural / excellent in-stream habitat. ▪ Mapped as High or Very High conservation significance in ACA mapping. ▪ Excellent habitat assessment score (111 – 135).
Moderate	A site can have one or more of the following to be considered 'Moderate': ▪ Ephemeral or semi-permanent waterbody. ▪ Wetland of General Ecological Significance. ▪ Platypus foraging habitat present. ▪ Some good quality in-stream habitat. ▪ Mapped as Major or High risk of impact from fish barriers. ▪ Mapped as Medium conservation significance in ACA mapping. ▪ Good habitat assessment score (75 – 110). ▪ Dry season riverine refuge for common (Least Concern) species.
Low	A site can have one or more of the following to be considered 'Low': ▪ Ephemeral waterbody. ▪ No conservation-significant species or platypus habitat. ▪ In-stream habitat highly modified/disturbed. ▪ Mapped as Low or Very Low conservation significance in ACA mapping. ▪ Poor to Fair habitat assessment score (0 – 74).

3.7 Field-verification of subterranean groundwater-dependent ecosystems

3.7.1 Stygofauna sampling effort

A seasonal pilot survey was undertaken to sample the local presence of subterranean aquatic fauna in consideration of the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015). Field sampling protocols were consistent with the *Monitoring and Sampling Manual* (DES 2018).

Consideration of existing groundwater bores for sampling

A review of the DLGWV (2025b) groundwater database identified 49 registered bores within 5 km of the Study Area. Bore reports were reviewed to assess the suitability of bores for sampling and their likelihood of containing stygofauna.

The *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015) requires that bores sampled for stygofauna be at least 6-months old, have groundwater present, and are constructed such that subterranean fauna would have access to the borehole. The *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019) identifies characteristics of bores most likely to yield stygofauna, including screen aperture (slot widths) of at least 1 mm wide in the screened interval to allow entry of larger taxa such as amphipods.

Stygofauna in Queensland have been encountered at depths of up to 60 mbgl, at conductivities above 50,000 µS/cm and in both acidic and alkaline environments (Schultz et al. 2013 and Glanville et al. 2016, cited in DES 2018). 4T Consultants Pty Ltd (4T 2012) prepared a desktop assessment of at least 13 stygofauna studies in Queensland and established water quality conditions in which stygofauna were likely to be found. In fractured rock, stygofauna were more likely where the aquifer was <50 mbgl, pH 6.5-8.5 and EC <5,000 µS/cm (4T 2012). In alluvium, stygofauna were more likely where the aquifer was <20 mbgl, pH 6.5-8.5 and EC <2,000 µS/cm (4T 2012).

Bores within the Focus Area with these characteristics, or similar, were targeted for field sampling in July and October 2025. Of the 49 bores within the Focus Area (Appendix C), 10 were considered suitable to target for stygofauna. Of these 10 target bores, only five contained water at the time of sampling (Section 4.8.1). Five micropiezometer sampling sites were established in the sandy/gravelly alluvium of Blackwater Creek (Section 3.7.2) to fulfill the DSITI (2015) guideline requirement for 10 locations sampled (twice/seasonally) in a pilot survey.

3.7.2 Field sampling

Stygofauna sampling from bores

Three sizes of phreatobiological nets were carried in the field for stygofauna sampling, with diameters of 40 mm, 90 mm and 130 mm. Nets are constructed of 50 µm monomesh and are weighted at the bottom. The net tapers to a removable collection chamber at the base, allowing ease of collection for replicate samples following each haul.

Nets were lowered to the bottom of the bore, bounced five to 10 times to dislodge resting animals, then retrieved. The collection chamber was rinsed into a 50 µm mesh sieve at the top of each haul. The 20 litres (L) of purged water was also run through the 50 µm mesh sieve. Once 6 hauls were completed, the entire sieve contents were transferred to a labelled sample jar and preserved in ethanol.

Nets were washed thoroughly three times in deionised water between sampling locations.

Stygofauna sampling from micropiezometers

Samples were collected from the hyporheic zones at the edge of standing pools using a hand-operated bilge-pump to extract water from micropiezometers (13 mm internal diameter, 2 mm openings; of similar construction to Hancock and Boulton 2005) hammered into the sediments with a metal driving rod to a total depth of 1 mbgl and with a screened interval of 0.3-1.0 mbgl (Plate 1). A sample of 10 L was extracted from micropiezometers MP1 to MP5 (Figure 23) and run through a 50 µm monomesh filter. The filtered contents were transferred to a labelled sample jar and preserved in ethanol.



Plate 1 Micropiezometers (small, temporary polyvinyl chloride wells) utilised for stygofauna sampling from the stream bed

Physico-chemical water quality

A water sample was retained from each bore and micropiezometer after the stygofauna sampling. EC and pH were measured from this sample on site using a YSI Professional Plus multi-parameter water quality meter, calibrated prior to and following sampling.

Ions

A separate water sample was retained from each bore immediately after obtaining the water sample for physico-chemical water quality. Samples for major cations were field-filtered and collected in bottles pre-treated with nitric acid. Samples for major anions were placed in bottles without preservative. Samples were chilled and delivered to ALS Environmental (a NATA accredited laboratory) and were analysed for the following major ions to assist in characterising surface water/groundwater interactions of the Project site:

- major anions (Cl, SO_4, F and HCO_3); and
- major cations (Ca, Mg, Na and K).

3.7.3 Sample processing

Field samples were sorted in the laboratory under stereomicroscope. Each sample container was drained of ethanol and washed into a channelled counting tray to create a thin layer of sediment spread across the bottom of the tray. Aquatic animals were picked under stereomicroscope. Potential significant stygofauna would have been sent to Dr Peter Hancock, a stygofauna specialist, for identification to genus/morphospecies taxonomic level; however, no potential stygofauna were detected.

3.7.4 Personnel

Field sampling was led by David Moore, an aquatic ecologist with over 20 years of experience on both surface water and groundwater projects across Australia, including stygofauna sampling. Laboratory processing was undertaken by Chris Pietsch, an aquatic ecologist with 20 years of experience in aquatic assessments across Australia, including processing of aquatic invertebrate samples.

3.8 Field-verification of terrestrial groundwater-dependent ecosystems

3.8.1 Approach

State-mapped terrestrial GDEs were field verified on 19-20 June 2025 using measurements of pre-dawn leaf water potential (LWP) and soil water potential (SWP). Dry conditions in the lead-up to and throughout the fieldwork (only 1.4 mm in 20 days preceding sampling [BoM 2025]) made for suitable conditions to differentiate between trees utilising soil moisture in the upper soil profile versus those trees accessing deeper sources of moisture/groundwater. Follow-up sampling was conducted on 25 October 2025 at the same locations. Additional locations upstream and downstream of the initial survey location were scheduled for October 2025 to further inform the delineation of GDEs along Taurus Creek. However, trees within the original sites were not accessing groundwater in October 2025 and therefore no delineation was undertaken.

LWP is a measure of the resistance of the pathway to water movement and is a function of the soil water availability, evaporative demand and the conductivity of the soil-to-leaf pathway (Richardson et al. 2011). There is generally little to no transpiration of water during the night from most types of plants and so the movement of water through the stem approaches static conditions overnight. For this reason, pre-dawn LWP is generally in equilibrium with the matric potential of the soil (the tension with which water is held to soil particles) at the main depth at which the plant takes up water.

Pre-dawn LWP measurements were used to compare trees against the expected LWP range for known terrestrial GDEs subject to fresh to slightly saline salinity regimes as is expected in the shallow alluvial aquifers of the Study Area. The expected pre-dawn LWP range was drawn from a range of published and unpublished sources including DPM Enviroscsiences (2022), 3D Environmental (2020), Jones et al (2019), Holland et al (2006) and Mensforth et al (1994). Expected pre-dawn LWP for trees in equilibrium with:

- a fresh to marginal saturated source of moisture (EC <1,500 µS/cm) = >-0.2 megapascals (MPa);
- a slightly saline saturated source of moisture (EC >1,500 to 10,000 µS/cm) = <-0.2 to >-0.55 MPa; and
- a moderately saline to saline saturated source of moisture (EC >10,000 to 25,000 µS/cm) = <-0.55 to >-1.4 MPa.

Trees that demonstrated pre-dawn LWP values that were more negative than the expected range for the local groundwater salinity regime (i.e. <-0.55 MPa) were assumed not to be groundwater dependent.

For trees where pre-dawn LWP was within the expected range of values for GDEs accessing fresh to slightly saline saturated sources of moisture (i.e. pre-dawn LWP ≥-0.55 MPa), comparison with SWP values from the soil profile (at 1 and 2 m depths) was undertaken to determine whether moisture for transpiration was likely being supplied from the upper soil profile or whether deeper sources of moisture/groundwater can be inferred.

Field survey results were analysed spatially to distinguish between canopy trees that were likely accessing groundwater at the time of assessment and those which were not.

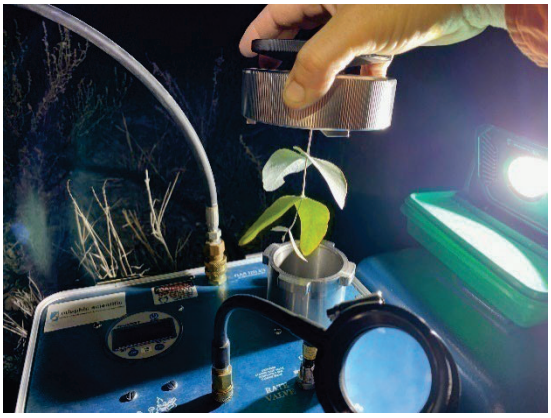
3.8.2 Pre-dawn leaf water potential

Measurements of pre-dawn LWP were obtained within 2-hours of dawn using a pressure chamber (Model 1505D, scale range of 0.0 to 10.0 MPa, PMS Instrument Company, Oregon, USA) filled with nitrogen gas. Measurements were taken from excised shoots, each with 3-10 leaves, sampled from the lower foliage (mean height of 4.7 m from ground level, range 1 to 8 m) of each sample tree (Plate 2). Twelve trees were sampled on 20 June 2025, comprising six trees at each of two sites. Coolibah (*Eucalyptus coolabah*) was the dominant canopy species at each site, with only rare occurrence of other species. Consequently, only coolibah trees were sampled. The same 12 coolibah trees were sampled on 25 October 2025, plus three silver-leaved ironbark (*E. melanophloia*) and two poplar box (*E. populnea*) individuals.

Nitrogen gas was used to apply pressure to each leaf/shoot sample in the pressure chamber. Most of the shoot is placed inside the chamber, but the cut end of the stem (the petiole) is exposed outside the chamber. The amount of pressure it takes to cause water to appear at the cut surface of the petiole indicates how much tension the leaf is experiencing on its water supply. A high value of required pressure means a high value of tension and a high degree of water stress.



Pre-dawn collection of leaves using a pole saw



Pre-dawn measurement of leaf water potential

Plate 2 Measuring pre-dawn leaf water potential

3.8.3 Soil water potential

Soil samples were collected in June and October 2025 from two depths (1 and 2 m below surface) from two locations at each of the two sites using a battery-powered drill, auger bit and soil probe. Samples were not required from 2 m at two locations in June 2025 due to saturated soils at 1 m negating the need for deeper samples. Samples were placed in a 50 millilitre jar, sealed, then analysed later that day using a WP4C chilled mirror hygrometer (Plate 3).



Collection of soil from 1 m and 2 m depths with a drill and probe combination



Analysis of samples with a chilled mirror hygrometer

Plate 3 Measuring soil water potential

4 RESULTS – AQUATIC ECOLOGY CHARACTERISTICS OF THE STUDY AREA

4.1 Waterways

The Queensland Wetlands Mapping (DETSI 2025e) identifies riverine systems, watercourses, waterways or drainage lines (herein referred to collectively as waterways) for the Study Area.

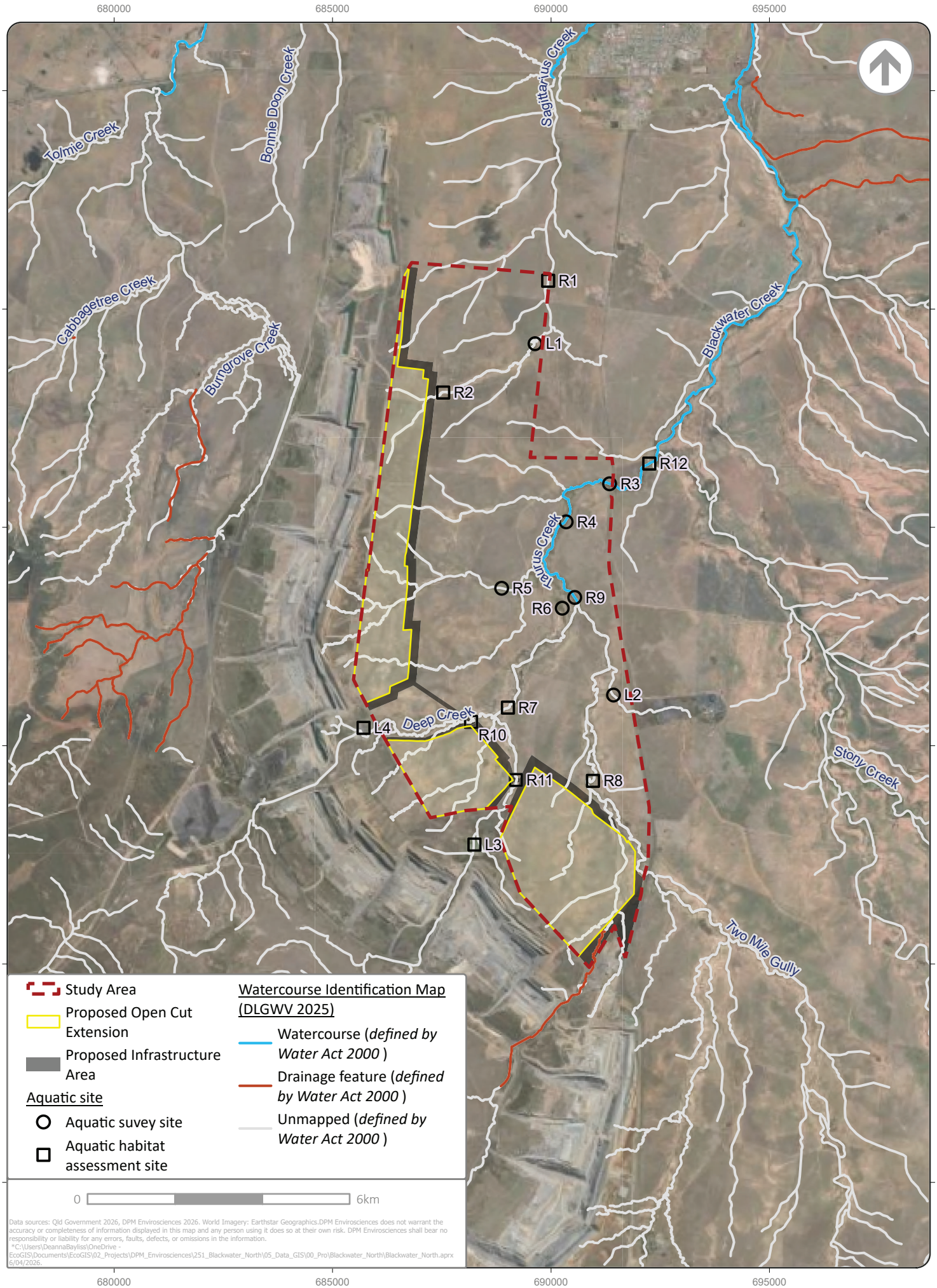
The waterways of the Study Area comprise mainly first and second order waterways (based on Strahler 1952). The third order waterways comprise Sagittarius and Taurus Creeks and an unnamed tributary of Two Mile Gully. The fourth order waterways comprise Taurus Creek and Two Mile Gully. Taurus Creek also includes a fifth order reach within the Study Area (Figure 3).

The waterways of the Study Area are ephemeral, experiencing flow for relatively short duration following rainfall and runoff in the catchment, likely ceasing to flow within days to weeks, and supporting aquatic life whose life cycles are adapted to these conditions. Flow within the larger fifth order Blackwater Creek, approximately 1.8 km downstream of the Study Area, is likely ephemeral to intermittent, with seasonal flow during certain times of the year when smaller upstream waterways are flowing and/or when groundwater contributions provide enough water for stream flow following recharge of the alluvial aquifer.

4.1.1 Watercourses

State-mapped watercourses

The DLGWV (2025a) watercourse identification map (Figure 4) identifies Taurus Creek, downstream of its confluence with Two Mile Gully, as a waterway that exhibits the characteristics of a watercourse as defined by the *Water Act 2000*. All other waterways of the Study Area were yet to be mapped by DLGWV (2025a) at the time of this assessment.



WATERCOURSE IDENTIFICATION MAP

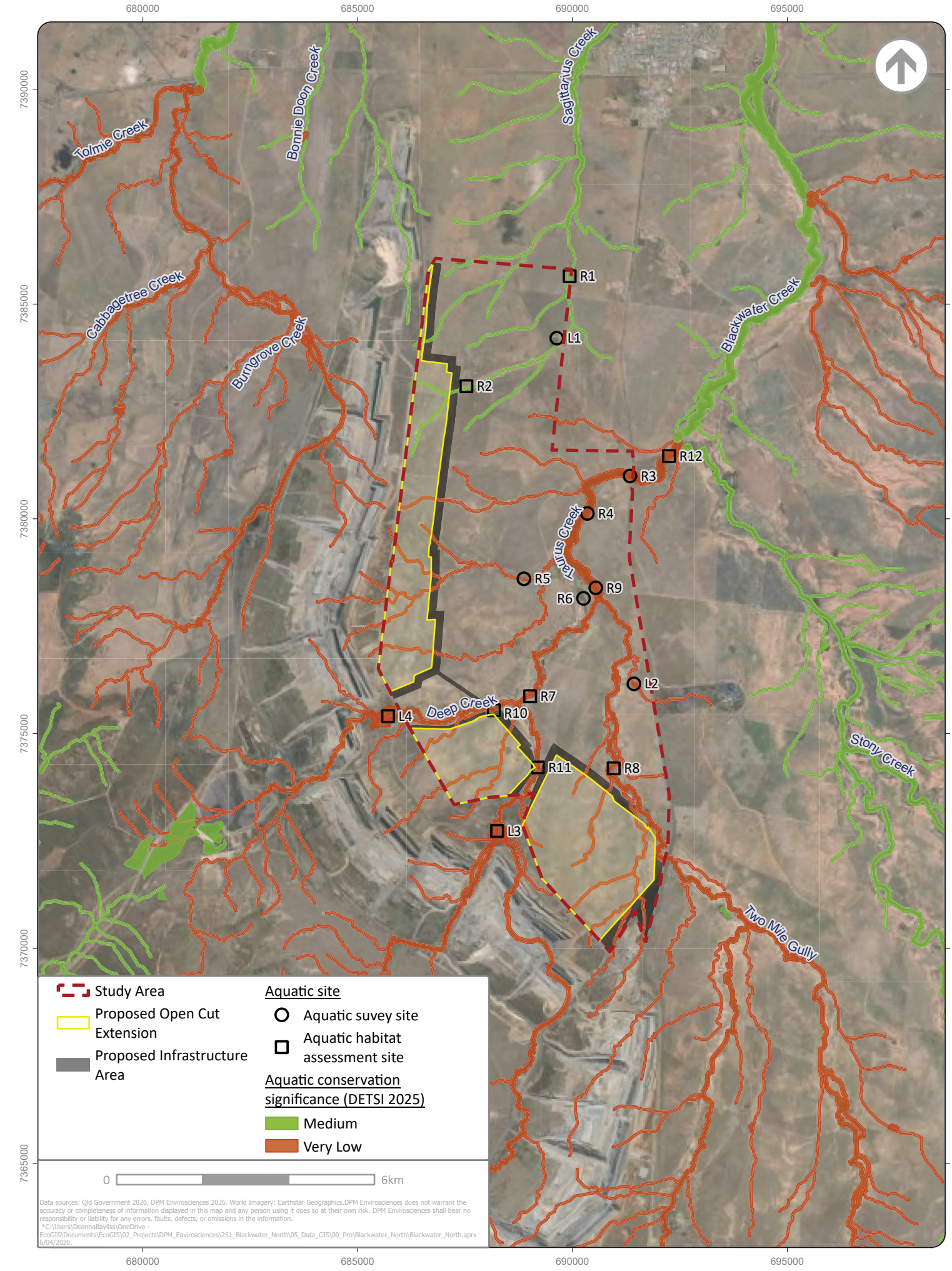
Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 4

4.1.2 Conservation values

The Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM) (Clayton et al. 2006), was developed to assess conservation values of wetlands and waterways in Queensland. It is a comprehensive method that uses available data (including data from expert opinion) to identify relative non-social, non-economic conservation/ecological values within a specified area. The criteria in AquaBAMM are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. The ACA for the riverine (Inglis and Howell 2009) and non-riverine (Rollason and Howell 2012) wetlands of the Great Barrier Reef (produced by the former Queensland Department of Environment and Resource Management) is a product of applying this method. The associated ACA mapping (DETSI 2025h) identifies (Figure 5):

- Sagittarius Creek and its tributaries as being of Medium conservation significance;
- Taurus Creek and its tributaries as being of Very Low conservation significance; and
- Lacustrine waterbodies (farm and mine water dams), where mapped, as being of very low conservation significance.



AQUATIC CONSERVATION ASSESSMENT

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

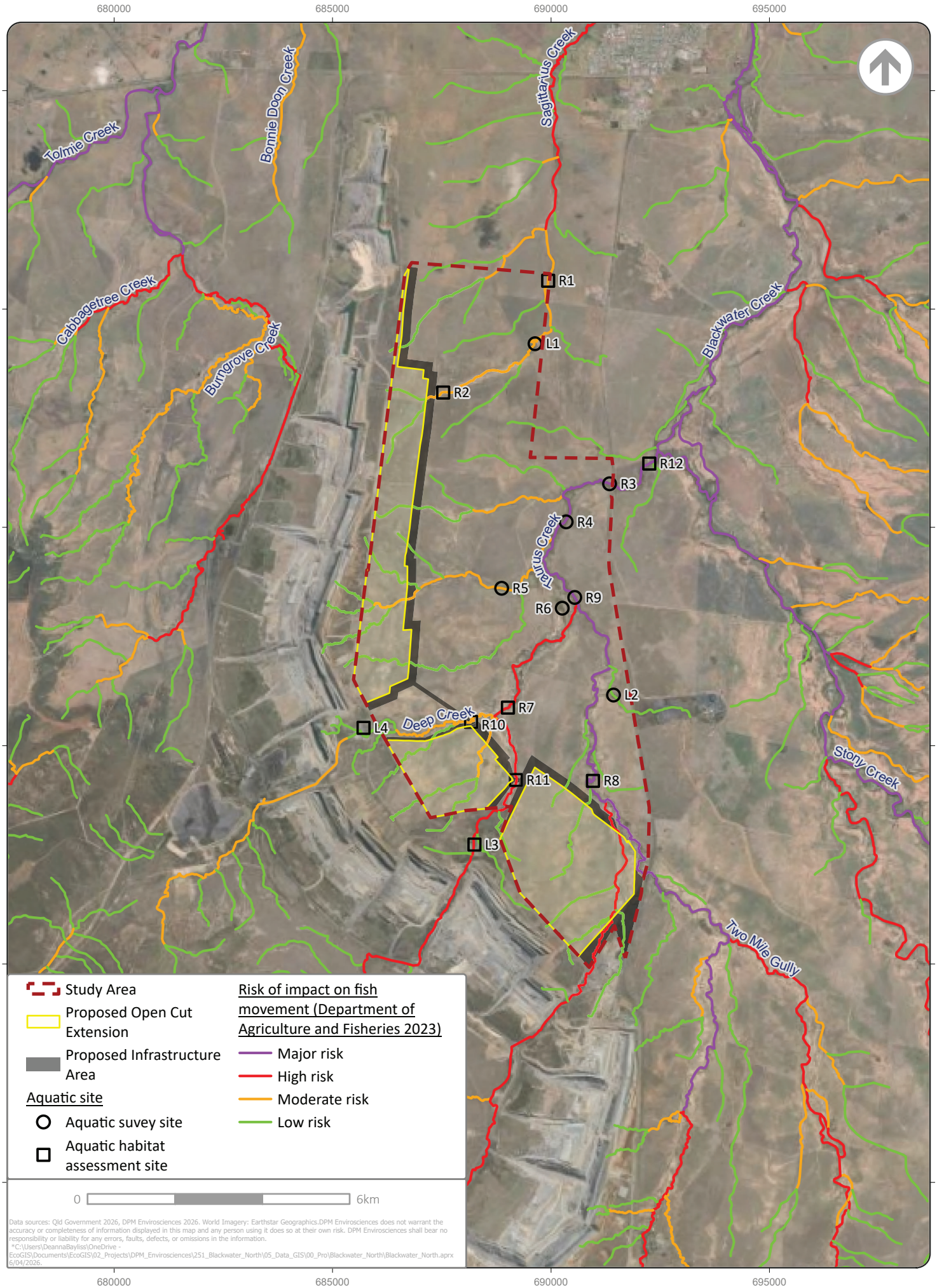
FIGURE 5

4.1.3 Waterways for fish passage

While it is understood that a waterways barrier works permit is not required where the works occur in a ML authorised under an EA, fish passage is a MSES and so is addressed here.

Waterways, as defined by the *Fisheries Act 1994*, include rivers, creeks, streams, watercourses or inlets of the sea. The DPI (2025a) Queensland Waterways for Waterway Barrier Works mapping (Figure 6) indicates the level of 'risk' associated with undertaking waterway barrier works within Queensland waterways. Waterways with higher stream orders, steeper slopes, higher flow rates, greater numbers of fish present and fish with stronger swimming abilities are allocated a higher level of risk (Department of Agriculture and Fisheries 2023).

In consideration of these factors, Two Mile Gully and the downstream reach of Taurus Creek are State-mapped as being at Major risk of adverse impact from waterway barrier works on fish movement (DPI 2025a). Waterways State-mapped as being at High risk of adverse impact from waterway barrier works on fish movement (DPI 2025a) include the upstream reach of Taurus Creek and an unnamed tributary of Two Mile Gully. Other mapped waterways within the Study Area are indicated as being at Low to Moderate risk of adverse impact from waterway barrier works on fish movement (DPI 2025a) (Figure 6).



WATERWAYS FOR WATERWAY BARRIER WORKS MAPPING

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 6

4.2 Aquatic habitat

The waterways of the Study Area are ephemeral and experience flow only after sustained or intense rainfall and runoff in the catchment. Stream flows are highly variable, with most channels expected to dry during winter to early spring when rainfall and runoff is generally lower. During these times, aquatic fauna concentrates in senescing pools and may perish. Consequently, physical attributes, water quality, and the composition of aquatic flora and fauna communities are expected to vary seasonally.

Aquatic habitat was assessed at 12 riverine sites (sites R1 to R12) on representative waterways of the Study Area (Figure 3). No flow was encountered at the time of assessment in June-July 2025, but isolated pools were encountered at sites R3, R4, R5, R6 and R9. In October 2025, isolated pools of much less extent were encountered only at sites R3 and R6.

There are 12 State-mapped (DETSI 2025e) lacustrine wetlands (hydrologically modified or artificial) within the Study Area, all of which are either farm dams with constructed earthen walls on the downstream side or are constructed mine water dams. Numerous smaller farm dams occur throughout the Study Area but are too small to form part of the Queensland Wetland Mapping (DETSI 2025e). The lacustrine wetland waterbodies of the Study Area provide semi-permanent aquatic habitat, although are likely only connective with downstream habitats when flow is encountered following sufficient rainfall and runoff in the catchment that results in filling and spill from these dams. Aquatic habitat was assessed at four of the State-mapped lacustrine wetlands, comprising two representative farm dams (sites L1 and L2) and the two mine water dams (sites L3 and L4) within the Study Area. Site L3 comprises a mine water dam on Taurus Creek referred to as Taurus Dam or Release Point (RP) 2 in EA EPML00717813 (DETSI 2025a). Site L4 comprises a mine water dam on Deep Creek referred to as Deep Creek Dam or RP3 in EA EPML00717813.

4.2.1 Physico-chemical water quality

Post-wet (June-July) 2025

Surface water temperatures at the time of assessment in June-July 2025 ranged from 11.5°C to 17.2°C (Table 11). Water temperatures are influenced by time of day, shading and depth. The slightly higher temperature of 17.2°C at site L2 likely reflects temperature absorption from black sediments containing coal fines washed down from the Cook CHPP, observed in June 2025 (Appendix B) and also in 2019-2020 (EMM 2023).

pH levels ranged from 6.2 (slightly acid) to 8.9 (strongly alkaline), falling within the WQO guideline range of 6.5-8.5 at the riverine sites, falling below the WQO range at farm dam site L1, and exceeding the WQO range at mine water dam sites L3 and L4 (Table 11).

The riverine and farm dam sites exhibited ‘fresh’ (<800 µS/cm) water (Table 11). Marginal water was detected at mine water dam L4 (965 µS/cm) and slightly saline water was detected at mine water dam L3 (5,124 µS/cm). EC levels exceeded the relevant WQO guideline (<310 µS/cm for riverine sites and <250 µS/cm for lakes/reservoirs) at sites R5 (378 µS/cm), L2 (628 µS/cm), L3 and L4. The EC levels at sites L3 and L4 (RP2 and RP3 in EA EPML00717813, respectively) were below the release limit (for context only) of 10,000 µS/cm (being slightly to moderately saline water) identified in EA EPML00717813 (DETSI 2025a).

Surface water DO levels were variable across the Study Area (Appendix B), reflecting several factors including time of day, temperature, organic load, biological activity, flow (or lack thereof) and rate of transfer from the atmosphere. DO measurements ranged from 45.8% (low saturation) at riverine site R9 to 98.4% (saturated) at riverine site R5 (Table 11).

Turbidity levels ranged from 9.6 NTU (high clarity) at farm dam site L1 (fenced to exclude cattle) to 394 NTU (poor clarity; opaque) at riverine site R4 on Taurus Creek. The higher turbidity levels at some sites reflect a high washload (silts and clays held in suspension) likely associated with cattle and other animals accessing these drying pools, as well as bioturbation from aquatic fauna within these pools.

Pre-wet (October) 2025

Surface water temperatures at the time of assessment in October 2025 ranged from 21.3°C to 33.1°C (Table 12). Water temperatures are influenced by time of day, shading and depth.

pH levels ranged from 7.5 (mildly alkaline) to 9.7 (very strongly alkaline), falling within the WQO guideline range of 6.5-8.5 at riverine site R3, exceeding this range at site R6, and exceeding the WQO guideline range of 6.5-8.0 at each lacustrine site (Table 12). The elevated pH levels are associated with high DO levels.

Low DO levels at site R3 reflects a combination of factors including time of day (early morning), lack of flow, and oxygen consumption by aerobic bacteria associated with the breakdown of organic matter in senescing pools. Supersaturated DO levels at sites R6, L1 and L3 reflect the time of day and photosynthetic release of oxygen from the extensive algae and macrophyte cover at these sites. The consumption of carbon dioxide during photosynthesis reduces the formation of carbonic acid and decreases the concentration of hydrogen ions, increasing the pH of the water. Both DO and pH levels are expected to fluctuate vastly over a 24-hour period, especially as isolated waterbodies senesce, nutrients concentrate, temperatures increase, and both algae levels and macrophyte cover proliferate.

The riverine and farm dam sites exhibited ‘fresh’ (<800 µS/cm) water (Table 12). Marginal water was again detected at mine water dam L4 (1,403 µS/cm) and slightly saline water was again detected at mine water dam L3 (4,951 µS/cm). EC levels exceeded the relevant WQO guideline (<310 µS/cm for riverine sites and <250 µS/cm for lakes/reservoirs) at sites R3 (633 µS/cm), R6 (471 µS/cm), L2 (786 µS/cm), L3 and L4. The EC levels at sites L3 and L4 (RP2 and RP3 in EA EPML00717813, respectively) were below the release limit (for context only) of 10,000 µS/cm (being slightly to moderately saline water) identified in EA EPML00717813 (DETSI 2025a).

Turbidity levels ranged from 13.2 NTU (high clarity) at farm dam site L1 (fenced to exclude cattle) to 220 NTU (poor clarity; opaque) at riverine site R3 on Taurus Creek.

Table 11 Surface water quality measurements, post-wet (June-July) 2025

Parameter	Units	WQO (DEHP 2011)	Riverine sites									Lacustrine sites			
			R1	R2	R3	R4	R5	R6	R7	R8	R9	L1	L2	L3	L4
Date	DD/MM/2025	-	18/06	17/06	20/06	20/06	18/06	18/06	1/07	1/07	18/06	17/06	30/06	3/07	3/07
Time	HH:MM	-	12:10	16:30	11:00	07:34	10:21	12:37	12:00	14:28	08:12	13:51	15:57	9:13	7:47
Flow	NA	-	Dry	Dry	Nil	Nil	Nil	Nil	Dry	Dry	Nil	Nil	Nil	Nil	Nil
Physico-chemical water quality															
Temperature	°C	-	-	-	13.0	11.7	13.4	13.8	-	-	11.5	14.1	17.2	13.9	14.5
pH	pH units	6.5-8.5[R], 6.5-8.0[L]	-	-	7.0	7.1	7.6	6.8	-	-	6.6	**6.2**	7.6	**8.4**	**8.9**
EC	µS/cm (@25C°)	<310[R, B], <250[L, B]	-	-	286	187	**378**	234	-	-	159	196	**628**	**5124**	**965**
DO	% saturation	85-110[R], 90-110[L]	-	-	**77.0**	**64.4**	98.4	**81.3**	-	-	**45.8**	**88.5**	**83.7**	**76.6**	94.8
	mg/L	-	-	-	8.10	6.98	10.27	8.35	-	-	5.00	9.10	7.92	7.78	9.63
Turbidity	NTU	50[R], 1-20[L]	-	-	37	**394**	**153**	**217**	-	-	**289**	9.6	11.2	**38**	16.5
Alkalinity (as $CaCO_3$)	mg/L	-	-	-	110	78	171	92	-	-	78	93	121	630	161
Major cations															
Calcium (Ca^{2+})	mg/L	-	-	-	23	15	37	19	-	-	15	16	32	31	35
Magnesium (Mg^{2+})	mg/L	-	-	-	8	5	8	6	-	-	4	6	13	40	14
Sodium (Na^{+})	mg/L	-	-	-	23	16	39	22	-	-	12	19	48	1000	140
Potassium (K^{+})	mg/L	-	-	-	7	6	4	6	-	-	54	5	9	10	6
Major anions															
Chloride (Cl^{-})	mg/L	-	-	-	24	10	18	15	-	-	7	8	40	1160	161
Sulphate (SO_4^{2-})	mg/L	<10[R]	-	-	5	7	4	8	-	-	2	<1	**99**	**537**	**110**
Bicarbonate (HCO_3^{-})	mg/L	-	-	-	110	78	171	92	-	-	78	93	121	578	149

Notes: [R] WQO applies to riverine sites. [B] WQO for no flow or baseflow conditions (differs for high flow conditions). [L] WQO applies to freshwater lakes / reservoirs.* DO levels for fresh waters only apply to flowing waters. Stagnant pools in intermittent streams naturally experience values of DO below 50% saturation (DEHP 2011).

Table 12 Surface water quality measurements, pre-wet (October) 2025

Parameter	Units	WQO (DEHP 2011)	Riverine sites												Lacustrine sites			
			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	L1	L2	L3	L4
Date	DD/MM/2025	-	20/10	20/10	22/10	21/10	21/10	21/10	22/10	22/10	21/10	21/10	21/10	23/10	20/10	22/10	20/10	20/10
Time	HH:MM	-	14:00	11:00	07:15	09:30	10:15	11:40	09:30	12:00	10:40	14:30	15:15	13:30	15:07	12:46	10:04	09:21
Flow	NA	-	Dry	Dry	Nil	Dry	Dry	Nil	Dry	Dry	Dry	Dry	Dry	Dry	Nil	Nil	Nil	Nil
Physico-chemical water quality																		
Temperature	°C	-	-	-	21.3	-	-	33.1	-	-	-	-	-	-	28.6	29.1	29.4	25.2
pH	pH units	6.5-8.5[R], 6.5-8.0[L]	-	-	7.5	-	-	**9.3**	-	-	-	-	-	-	**9.7**	**8.2**	**9.1**	**8.5**
EC	µS/cm (@25C°)	<310[R, B], <250[L, B]	-	-	**633**	-	-	**471**	-	-	-	-	-	-	210	**786**	**4951**	**1403**
DO	% saturation	85-110[R], 90-110[L]	-	-	**20.5**	-	-	**184.0**	-	-	-	-	-	-	**170.5**	91.6	**136.7**	**83.8**
	mg/L	-	-	-	1.82	-	-	13.17	-	-	-	-	-	-	13.15	7.02	10.29	6.88
Turbidity	NTU	50[R], 1-20[L]	-	-	**220**	-	-	**152**	-	-	-	-	-	-	13.2	19.2	**85.3**	**42.7**
Alkalinity (as $CaCO_3$)	mg/L	-	-	-	164	-	-	155	-	-	-	-	-	-	69	145	502	198
Major cations																		
Calcium (Ca^{2+})	mg/L	-	-	-	40	-	-	17	-	-	-	-	-	-	8	31	25	38
Magnesium (Mg^{2+})	mg/L	-	-	-	17	-	-	11	-	-	-	-	-	-	4	23	39	21
Sodium (Na^{+})	mg/L	-	-	-	58	-	-	54	-	-	-	-	-	-	26	96	939	228
Potassium (K^{+})	mg/L	-	-	-	14	-	-	9	-	-	-	-	-	-	4	10	11	7
Major anions																		
Chloride (Cl^{-})	mg/L	-	-	-	87	-	-	48	-	-	-	-	-	-	12	68	948	232
Sulphate (SO_4^{2-})	mg/L	<10[R]	-	-	2	-	-	4	-	-	-	-	-	-	<1	111	352	152
Bicarbonate (HCO_3^{-})	mg/L	-	-	-	164	-	-	147	-	-	-	-	-	-	54	145	488	198

Notes: [R] WQO applies to riverine sites. [B] WQO for no flow or baseflow conditions (differs for high flow conditions). [L] WQO applies to freshwater lakes / reservoirs.* DO levels for fresh waters only apply to flowing waters. Stagnant pools in intermittent streams naturally experience values of DO below 50% saturation (DEHP 2011).

4.2.2 Ionic composition of surface waters

The concentration and proportion of ions in surface waters depends on the location of the waterway (geology, land use, and topography), climate and the proportionate contributions of groundwater flow, interflow and overland flow (Boulton and Brock 2001). These proportionate contributions will vary depending on seasonal and climatic patterns and so the source of ions will also vary. During periods of low to no rainfall or runoff, groundwater contributions can become more evident. During periods of high rainfall and runoff, catchment and atmospheric sources typically dominate.

The concentrations of major anions and cations in surface water (and groundwater) samples collected from the Study Area (and broader GDE Focus Area) are provided in Appendix D. The relative proportions of these major cations and anions are presented in Piper plots for the post-wet sampling in June-July 2025 (Figure 7 and the pre-wet sampling in October 2025 (Figure 8). The Piper plots indicate that most surface waters of the Study Area are mixed bicarbonate waters. These waters are typical of many inland rivers, or the upland reaches of coastal draining rivers, where weak carbonic acid (formed from atmospheric carbon dioxide dissolved in water as well as from rainwater infiltrating carbon dioxide-rich soil) reacts with the sodium, magnesium and calcium in soil, rock or other deposits to form mixed bicarbonate waters.

The surface waters collected from the mine water dams (sites L3 and L4) (and the five sampled bores) were sodium chloride dominated. Chlorides are typically dissolved from rocks and soils derived from evaporites, minerals or igneous rock, although are also concentrated in animal excretions. Mine water runoff containing chlorides from coal and other Permian rock is the likely source of sodium chloride in these mine water dams.

The sodium chloride dominated waters from the mine water dams exhibited a moderate to high concentration (based on the logarithmic scale of Gibbs [1970]) of total dissolved salts (approximately 647 to 3,433 mg/L, inferred from EC levels of 965 to 5,124 µS/cm) (Figure 9 and Figure 10). These waters have incurred a higher contact time with Permian rock of the catchment than the fresh, mixed bicarbonate-dominated waters of the broader Study Area.

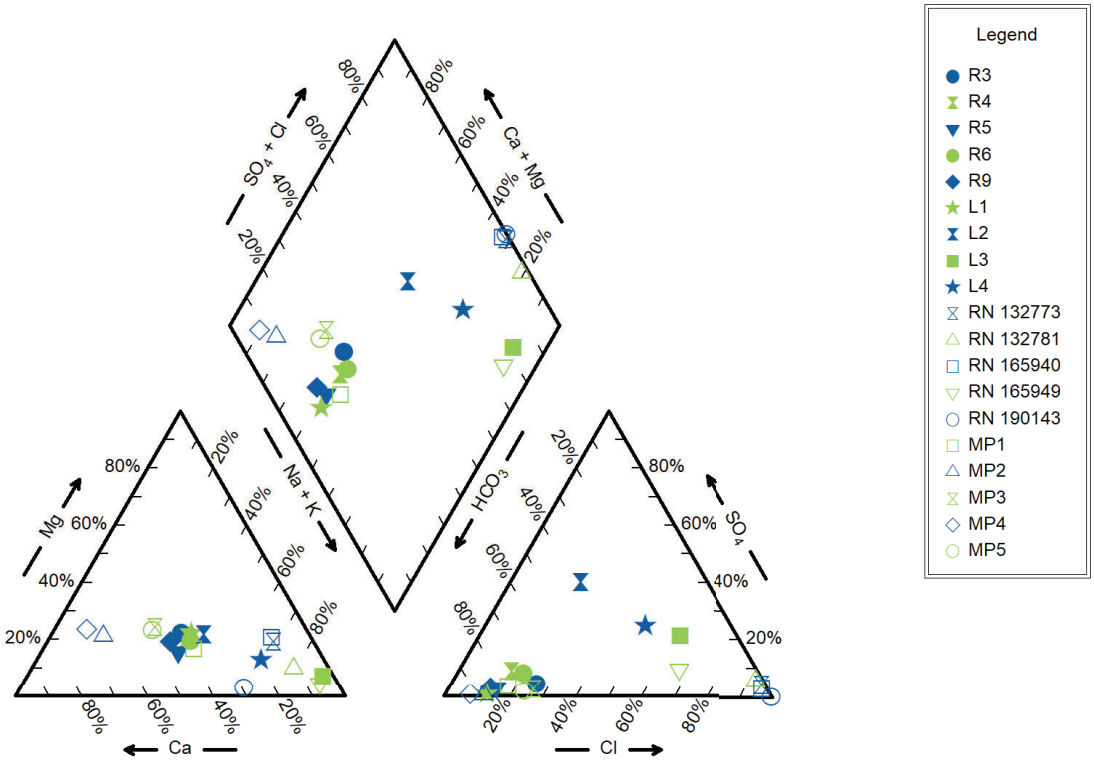


Figure 7 Piper plot showing relative abundance of major cations and anions from surface water and groundwater samples, post-wet (June-July) 2025

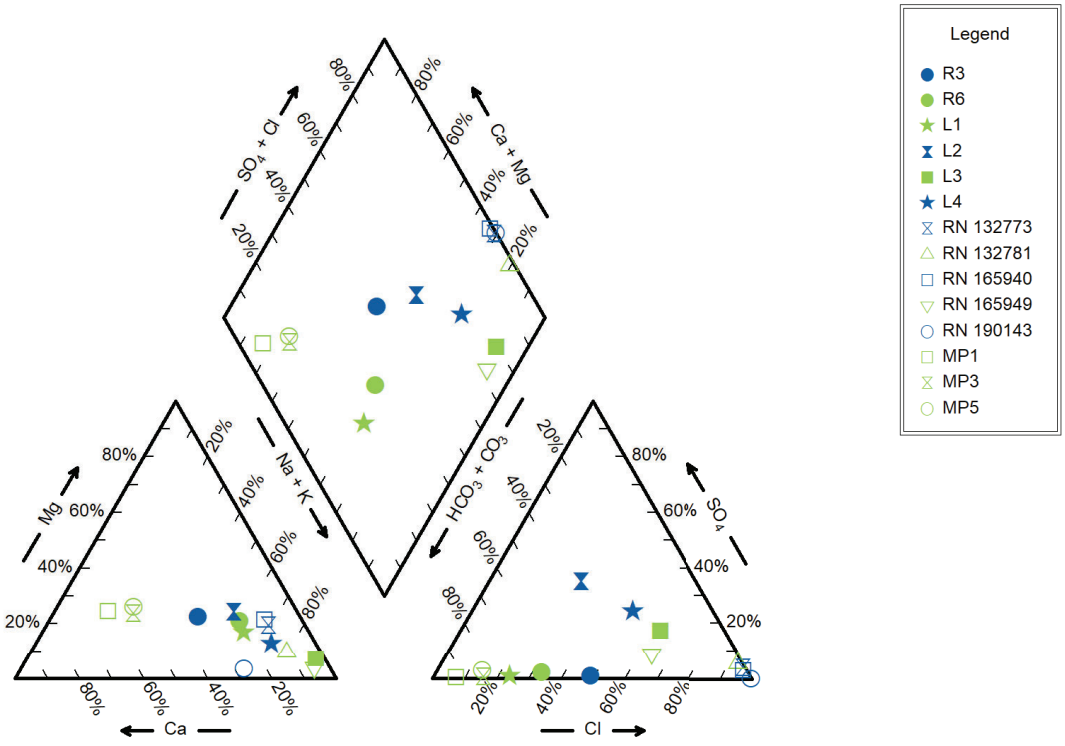


Figure 8 Piper plot showing relative abundance of major cations and anions from surface water and groundwater samples, pre-wet (October) 2025

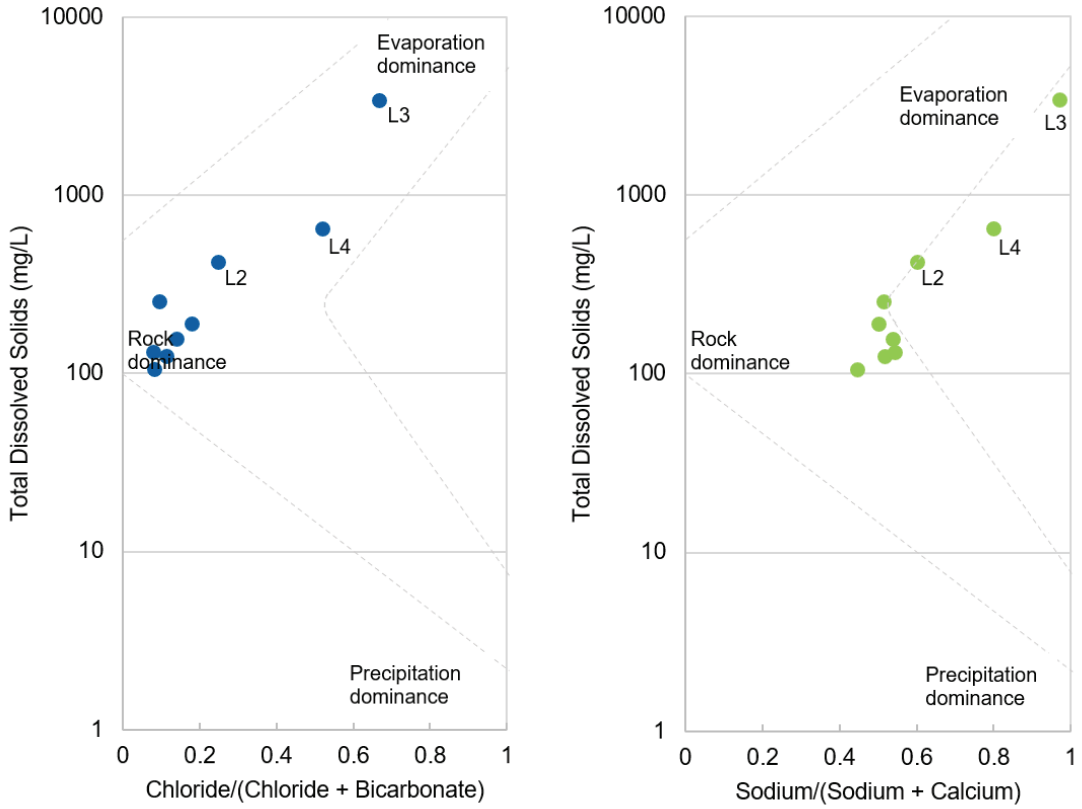


Figure 9 Gibbs (1970) diagrams and ionic balance of surface water samples, post-wet (June-July) 2025

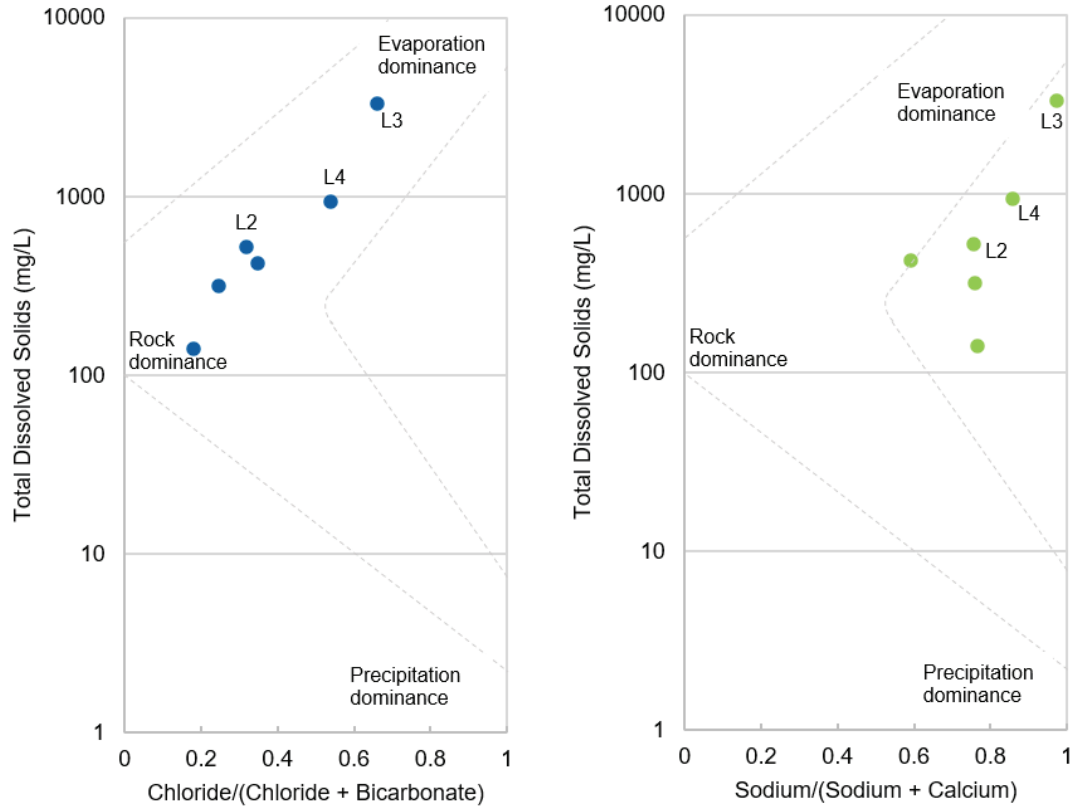


Figure 10 Gibbs (1970) diagrams and ionic balance of surface water samples, pre-wet (October) 2025

4.2.3 Instream habitat

Post-wet (June-July) 2025

Instream (aquatic) habitat assessment scores were Fair at each riverine survey site in the post-wet survey (Table 13). Bottom substrate / available cover and embeddedness was rated Poor at most sites, owing to the dominance of fine sediments (silt/clay and sand) and general lack of the larger pebble, cobble and boulder substrates. However, each site exhibited at least some detritus, sticks, branches and/or logs, providing some instream habitat and refugia for aquatic fauna. The velocity/depth category rated Poor to Fair at each riverine site, due to lack of flow. Sites rated Poor for velocity/depth had only shallow (<0.5 m) isolated pools. Those rated Fair had both shallow and deep (>0.5 m) isolated pools.

Table 13 Aquatic habitat assessment scores for riverine survey sites across the Study Area, post-wet (June-July) 2025

Habitat variable	R1	R2	R3	R4	R5	R6	R7	R8	R9
Bottom substrate/available cover	P (2)	P (2)	F (6)	P (3)	P (2)	P (2)	P (2)	P (2)	F (6)
Embeddedness	P (2)	P (2)	P (3)	P (2)	P (2)	P (2)	P (2)	P (2)	P (3)
Velocity/depth category	P (0)	P (0)	F (6)	F (6)	P (2)	F (6)	P (0)	P (0)	P (2)
Channel alteration	G (8)	F (6)	F (5)	G (8)	G (8)	E (12)	F (5)	F (5)	F (5)
Bottom scouring and deposition	G (8)	G (8)	F (5)	F (5)	G (8)	G (8)	F (5)	F (5)	F (4)
Pool/riffle, run/bend ratio	F (5)	F (4)	F (6)	F (4)	F (5)	F (4)	F (6)	F (5)	F (7)
Bank stability	G (6)	G (7)	G (8)	G (7)	G (8)	G (8)	F (4)	F (5)	F (4)
Bank vegetative stability	E (9)	G (8)	G (7)	F (3)	E (9)	G (8)	G (8)	G (7)	G (7)
Streamside cover	E (9)	E (9)	E (9)	E (10)	E (9)	E (9)	E (9)	G (8)	E (10)
Total (out of 135)	**49**	**46**	**55**	**48**	**53**	**59**	**41**	**39**	**48**
Rating	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

Pre-wet (October) 2025

Instream (aquatic) habitat assessment scores were Fair at each riverine survey site in the pre-wet survey, including the additional sites R10, R11 and R12 (Table 14). Bottom substrate/available cover and embeddedness was rated Poor at most sites. The velocity/depth category rated Poor at each riverine site, due to either dry conditions or only shallow (<0.5 m deep) isolated pools encountered.

Table 14 Aquatic habitat assessment scores for riverine survey sites across the Study Area, pre-wet (October) 2025

Habitat variable	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Bottom substrate/available cover	P (2)	P (2)	P (3)	P (3)	P (2)	P (2)	P (2)	P (2)	P (3)	F (6)	P (3)	P (2)
Embeddedness	P (2)	P (2)	P (3)	P (2)	P (2)	P (2)	P (2)	P (2)	P (3)	P (4)	P (3)	P (2)
Velocity/depth category	P (0)	P (0)	P (3)	P (0)	P (0)	P (2)	P (0)	P (0)	P (2)	P (0)	P (0)	P (0)
Channel alteration	G (8)	F (6)	F (5)	G (8)	G (8)	E (12)	F (5)	F (5)	F (5)	F (7)	F (5)	G (8)
Bottom scouring and deposition	G (8)	G (8)	F (5)	F (5)	G (8)	G (8)	F (5)	F (5)	F (4)	F (7)	F (5)	F (4)
Pool/riffle, run/bend ratio	F (5)	F (4)	F (6)	F (4)	F (5)	F (4)	F (6)	F (5)	F (7)	F (5)	F (4)	F (5)
Bank stability	G (6)	G (7)	G (8)	G (7)	G (8)	G (8)	F (4)	F (5)	F (4)	P (2)	P (2)	G (6)
Bank vegetative stability	G (7)	G (6)	G (7)	F (3)	E (9)	F (5)	G (6)	G (7)	G (7)	G (7)	G (8)	F (5)
Streamside cover	E (9)	E (9)	E (9)	E (10)	E (9)	E (9)	E (9)	G (8)	E (10)	E (9)	E (9)	E (9)
Total (out of 135)	**47**	**44**	**56**	**42**	**51**	**52**	**39**	**39**	**45**	**47**	**39**	**41**
Rating	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

4.2.4 Bank stability/erosion

Bank vegetative stability ranged from Fair to Excellent at the riverine survey sites. Most sites rated Good, indicating that at least 50% of the stream banks were covered by vegetation at the time of assessment. Site R4 rated Fair, due to recent bank scouring removing much of the groundcover. This scoring is expected to improve throughout the dry season as groundcover re-establishes.

Bank stability ranged from Fair to Good across the riverine survey sites. Sites rated Good were moderately stable, with only infrequent, small areas of erosion mostly healed over. Sites rated Fair were moderately unstable, with moderate frequency and size of erosional areas, and present a higher erosion potential during extreme/high flows (Table 13 and Table 14).

4.2.5 Adjacent land use

Land use across the Study Area is dominated by cattle grazing of varying intensity. The Study Area has been largely cleared through past agricultural practices and ongoing disturbance. Relatively small and narrow tracts of remnant vegetation remain (or have re-established) along some of the waterways. Riparian zone widths ranged from approximately 2 m (on the periphery of constructed dams) to 25 m (site R4 on Taurus Creek) (Appendix B). Tree canopy species commonly encountered in riparian zones across the Study Area included yellowwood (*Terminalia oblongata*), brigalow (*Acacia harpophylla*), coolabah (*Eucalyptus coolabah*), forest red gum (*E. tereticornis*), silver-leaved ironbark (*E. melanophloia*), poplar box (*E. populnea*), white bauhinia (*Lysiphyllum hookeri*), red bauhinia (*Lysiphyllum carronii*) and sally wattle (*Acacia salicina*). The shrub layer and groundcover were variable across the Study Area (Appendix B).

4.2.6 Aquatic values

Aquatic values for each site are presented in the site profiles in Appendix B. Ratings for aquatic values were determined for each site based on the criteria in Section 3.6.9 and are presented in Table 15. The sites on Taurus Creek and Two Mile Gully were rated as having Moderate aquatic value due to their importance as regional conduits for fish passage (State-mapped High or Major risk waterways for fish passage, Section 4.1.3). Riverine sites with a stream order 1-2 were rated as having Low aquatic value, except where the ACA mapping identified the waterway as being of Medium conservation significance – in which case it was rated as having Moderate aquatic value.

The lacustrine wetlands (hydrologically modified or artificial) were rated as having Low-Moderate or Moderate aquatic value. Although these lacustrine wetlands are modified or artificial (dammed), the semi-permanence of water offers dry season refuge for Least Concern fish and turtle species.

Table 15 Aquatic values ratings for the Study Area

Site	Waterway	Stream order	Key aquatic values/criteria	Aquatic values rating
R1	Sagittarius Creek	3	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Low risk). ▪ Mapped Medium conservation significance in ACA.	Moderate
R2	Sagittarius Creek	2	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ Mapped Medium conservation significance in ACA.	Moderate

Site	Waterway	Stream order	Key aquatic values/criteria	Aquatic values rating
R3	Taurus Creek	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (mapped Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R4	Taurus Creek	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (mapped Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R5	Unnamed tributary of Taurus Creek	2	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ Mapped Very Low conservation significance in ACA.	Low
R6	Taurus Creek flood channel wetland	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Flood channel wetland on the floodplain of a regional conduit for fish passage (mapped High risk). ▪ Flood channel wetland on floodplain of waterways mapped Very Low conservation significance in ACA.	Moderate
R7	Taurus Creek	3	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (State-mapped High risk, verified Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R8	Two Mile Gully	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (mapped Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R9	Taurus Creek	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (mapped Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R10	Deep Creek	2	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ Mapped Very Low conservation significance in ACA.	Low

Site	Waterway	Stream order	Key aquatic values/criteria	Aquatic values rating
R11	Taurus Creek	4	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (State-mapped High risk, verified Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
R12	Taurus Creek	5	▪ Ephemeral waterway. ▪ Fair habitat bioassessment score. ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Regional conduit for fish passage (mapped Major risk). ▪ Mapped Very Low conservation significance in ACA.	Moderate
L1	Lacustrine wetland waterbody (farm dam)	1	▪ Semi-permanent waterbody. ▪ Modified wetland (constructed dam). ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ Provides dry season refuge for Least Concern aquatic fauna. ▪ On waterway of Medium conservation significance in ACA.	Moderate
L2	Lacustrine wetland waterbody (farm dam)	1	▪ Semi-permanent waterbody. ▪ Modified wetland (constructed dam). ▪ No conservation-significant or SLC aquatic species detected, nor likely. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ Provides dry season refuge for Least Concern aquatic fauna. ▪ Mapped Very Low conservation significance in ACA.	Low-Moderate
L3	Lacustrine wetland waterbody (Taurus Dam – mine water dam)	3	▪ Semi-permanent waterbody. ▪ Modified wetland (constructed dam). ▪ conservation-significant or SLC aquatic species unlikely to occur. ▪ Regional conduit for fish passage (mapped High risk). ▪ May offer dry season refuge for Least Concern aquatic fauna. ▪ Mapped Very Low conservation significance in ACA.	Moderate
L4	Lacustrine wetland waterbody (Deep Creek Dam – mine water dam)	2	▪ Semi-permanent waterbody. ▪ Modified wetland (constructed dam). ▪ conservation-significant or SLC aquatic species unlikely to occur. ▪ Local conduit for fish passage (mapped Moderate risk). ▪ May offer dry season refuge for Least Concern aquatic fauna. ▪ Mapped Very Low conservation significance in ACA.	Low-Moderate

4.3 Wetlands

4.3.1 Wetlands of International importance

There are no wetlands of International Importance (i.e. Ramsar wetlands) identified within the Study Area or broader desktop search area in the EPBC Act Protected Matters Report (DCCEEW 2025a). Wetlands of International Importance nearest to the Study Area include those of the Shoalwater and Corio Bays Area, approximately 200 km to the north-east (DCCEEW 2025b).

4.3.2 Wetlands of National importance

No nationally important wetlands occur in the Mackenzie River Sub-basin (DCCEEW 2025b).

4.3.3 Queensland referrable wetlands

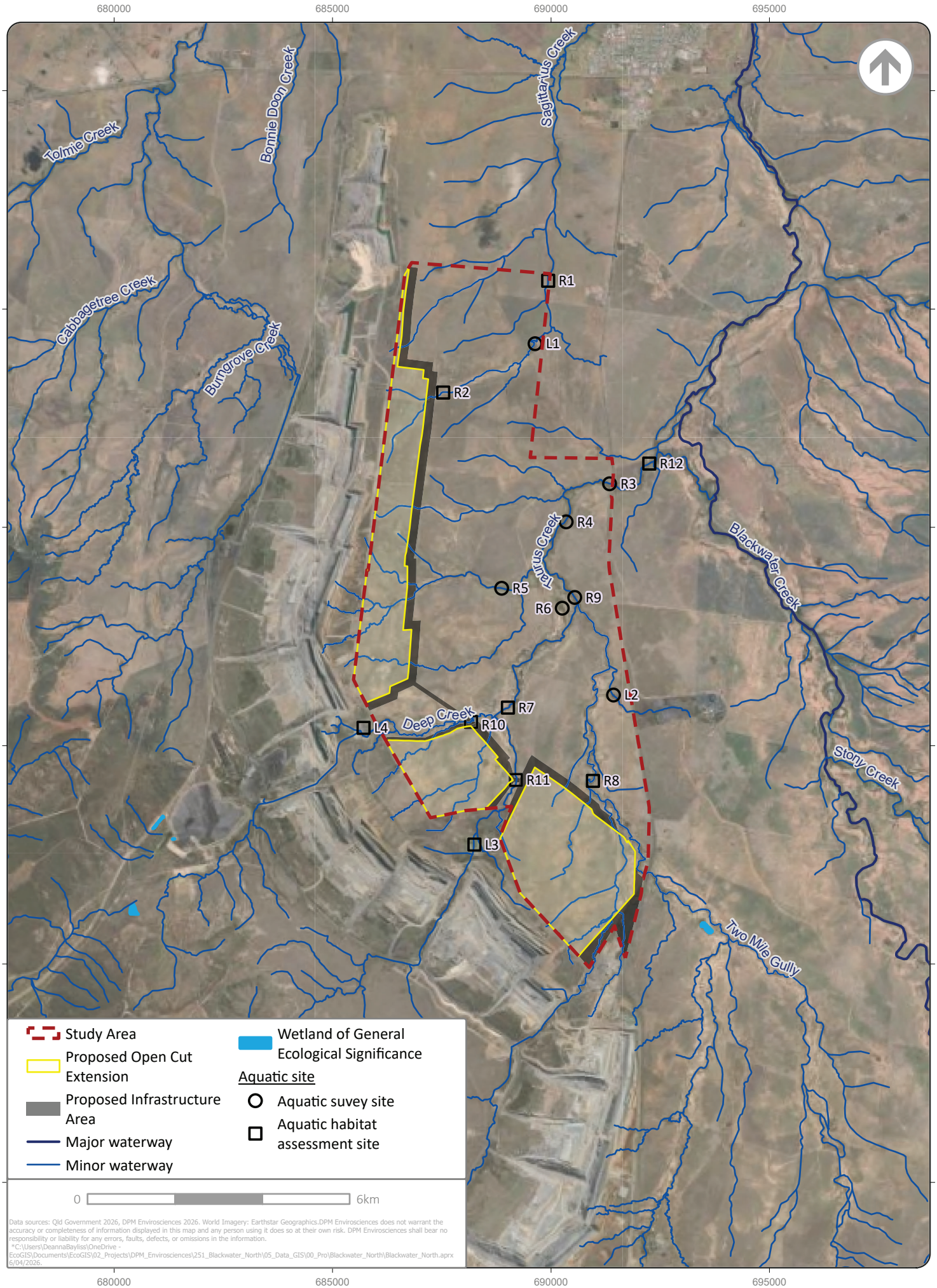
The Map of Great Barrier Reef Wetland Protection Areas (WPAs) (DETSI 2025f) shows the location of WPAs, comprising wetlands of High Ecological Significance (HES wetlands) and their 500 m policy trigger area buffers. These wetlands have been assessed as containing high ecological values by a bioregional ACA, the AquaBAMM (Rollason and Howell 2012). No HES wetlands are mapped as occurring in the Study Area or immediate surrounds.

4.3.4 Queensland Wetland Environmental Values

The Map of Queensland Wetland Environmental Values (MQWEV; DETSI 2025g) identifies the location and ecological significance of wetlands using the EVs for wetlands in section 7 of the *Environmental Protection (Wetland and Water Biodiversity) Policy 2019* (EPP 2019). Wetlands appearing on the MQWEV are considered either HES or General Ecological Significance (GES) for the purposes of allocating EVs. The MQWEV also shows HEV waters management intent under Schedule 2 of the EPP 2019.

No State-mapped HES or GES wetlands are mapped as occurring in the Study Area. One GES wetland is mapped nearby, upstream of the Study Area on Two Mile Gully (Figure 11).

No HEV waters are identified in the MQWEV for the Study Area or immediate surrounds.



QUEENSLAND WETLAND ENVIRONMENTAL VALUES

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 11

4.4 Aquatic flora

A total of 22 species of aquatic or semi-aquatic plants were recorded from the Study Area during the post-wet (June-July) 2025 survey (Table 16). One additional species (*Myriophyllum verrocosum*) was recorded during the pre-wet (October) 2025 survey (Table 17). All native aquatic flora species detected are considered Least Concern under the NC Act. Introduced species are discussed in Section 4.7.1.

Most aquatic flora species encountered are semi-aquatic species including grasses, sedges and rushes. The greatest diversity of aquatic flora was recorded from lacustrine wetland site L2, with 12 species detected in the post-wet 2025 survey.

The lack of both diversity and abundance of aquatic plants at most riverine sites reflects the harsh physical conditions, impacts from cattle grazing and trampling, or a combination of these factors.

Table 16 Aquatic flora recorded from the Study Area, post-wet (June-July) 2025

Scientific name	Common name	Riverine sites									Lacustrine			
		R1	R2	R3	R4	R5	R6	R7	R8	R9	L1	L2	L3	L4
Azolla pinnata	Ferny azolla											L		
Cyperus betchei	-			L		L	L							
Cyperus bifax	Western nutgrass			L	L				L	L				
Cyperus difformis	Rice sedge					L						L		
Cyperus exaltatus	Tall flatsedge										L			
Cyperus pygmaeus	Dwarf sedge						L				L			
*Echinochloa colona**	Awnless barnyard grass*			L		L						L	L	L
*Eclipta prostrata**	White eclipta*			L	L		L				L	L		
Juncus usitatus	Common rush											L		
Lemna aequinoctialis	Common duckweed											L		
Leptochloa digitata	Umbrella canegrass			L									L	L
Ludwigia octovalvis	Willow primrose					L	L							
Ludwigia peploides	Water primrose			L								S		
Najas tenuifolia	Waternymph											L		
Nitella sp.	Branched algae													L
Nymphoides indica	Water snowflake											S		
Persicaria attenuata	-			L			L				M		L	L
Persicaria lapathifolia	Pale knotweed												L	L
Polygonum minuta	Small knotweed													L
Potamogeton crispus	Curly pondweed											L		
Schoenoplectus validus	River clubrush											L	L	
Typha domingensis	Narrow-leaved cumbungi					L					E	S	L	
Species richness		**0**	**0**	**7**	**2**	**5**	**5**	**0**	**1**	**1**	**5**	**12**	**6**	**6**

Notes: * denotes introduced species; L = 1-10% (little); S = 10-50% (some); M = 50-75% (moderate); E = >75% (extensive), as per AusRivAS categories (DNRM 2001).

Table 17 Aquatic flora recorded from the Study Area, pre-wet (October) 2025

Scientific name	Common name	Riverine sites												Lacustrine			
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	L1	L2	L3	L4
Azolla pinnata	Ferny azolla														L		
Cyperus betchei	-			L		L	L										
Cyperus bifax	Western nutgrass			S	L				L	L	L		L				
Cyperus difformis	Rice sedge					L											
Cyperus exaltatus	Tall flatsedge													L	L		
Cyperus pygmaeus	Dwarf sedge						L							L			
*Echinochloa colona**	Awnless barnyard grass*			L		L										L	L
*Eclipta prostrata**	White eclipta*			L	L		L							L	L		
Juncus usitatus	Common rush														L		
Lemna aequinoctialis	Common duckweed														L		
Leptochloa digitata	Umbrella canegrass			L									L			L	L
Ludwigia octovalvis	Willow primrose					L	L										
Ludwigia peploides	Water primrose			L											L		
Myriophyllum verrucosum	Red water-milfoil																L
Najas tenuifolia	Waternymph														L		
Nitella sp.	Branched algae																
Nymphoides indica	Water snowflake														L		
Persicaria attenuata	-			L			L							M		L	L
Persicaria lapathifolia	Pale knotweed															L	L
Polygonum minuta	Small knotweed																L
Potamogeton crispus	Curly pondweed													L	M		
Schoenoplectus validus	River clubrush														L	L	
Typha domingensis	Narrow-leaved cumbungi					L								E	S	L	
Species richness		**0**	**0**	**7**	**2**	**5**	**5**	**0**	**1**	**1**	**1**	**0**	**2**	**6**	**11**	**6**	**6**

Notes: * denotes introduced species; L = 1-10% (little); S = 10-50% (some); M = 50-75% (moderate); E = >75% (extensive), as per AusRivAS categories (DNRM 2001).

4.5 Aquatic fauna

4.5.1 Fish

Nine Least Concern native species and one pest fish species were recorded from the Study Area in each of the post-wet (June-July) and pre-wet (October) 2025 surveys (Table 18 and Table 19). These species are commonly recorded from both high and low order drainage lines throughout the Mackenzie River Sub-basin.

Most fishes captured appeared healthy, with little sign of stress or disease. Some of the bony bream (*Nematalosa erebi*) and spangled perch (*Leiopotherapon unicolor*) collected from site R3 on Taurus Creek in June-July 2025 showed signs of likely epizootic ulcerative syndrome (Plate 4), being an endemic fungal disease that often appears in host species (including bony bream, catfish, rainbowfish and other freshwater and estuarine species) after acid water runoff following heavy rains (Queensland Government 2022).

All native fishes were released at the point of capture. Pest fish were humanely euthanised in accordance with DPM Enviroscences' Animal Ethics Committee approval and General Fisheries Permit.

The species composition is typical of ephemeral waterways and farm dams of Central Queensland.

Table 18 Fishes recorded from the Study Area, post-wet (June-July) 2025

Scientific name	Common name	Riverine sites					Dam site	
		R3	R4	R5	R6	R9	L1	L2
Ambassis agassizii	Agassiz's glassfish	54	27	12	5		55	17
Anguilla reinhardtii	Longfin eel						1	2
*Gambusia holbrooki**	Mosquitofish*						120	
Hypseleotris bucephala	Boofhead carp gudgeon	12	39		8	1	16	45
Leiopotherapon unicolor	Spangled perch	18	21	9	11		6	4
Melanotaenia splendida splendida	Eastern rainbowfish	55	5			1		48
Mogurnda adspersa	Purple-spotted gudgeon	6	8				6	2
Nematalosa erebi	Bony bream	5						
Neosilurus hyrtlii	Hyrtl's catfish	2						
Porochilus rendahli	Rendahl's tandan						6	
Number of individuals		**152**	**100**	**21**	**24**	**2**	**210**	**118**
Species richness		**7**	**5**	**2**	**3**	**2**	**7**	**6**

Notes: * denotes introduced species.

Table 19 Fishes recorded from the Study Area, pre-wet (October) 2025

Scientific name	Common name	Riverine sites		Dam site	
		R3	R6	L1	L2
Ambassis agassizii	Agassiz's glassfish	1	4	42	55
Anguilla reinhardtii	Longfin eel				1
*Gambusia holbrooki**	Mosquitofish*			103	
Hypseleotris bucephala	Boofhead carp gudgeon	41	19	24	38
Leiopotherapon unicolor	Spangled perch	17	38	8	14
Melanotaenia splendida splendida	Eastern rainbowfish	41		12	22
Mogurnda adspersa	Purple-spotted gudgeon	8		12	7
Nematalosa erebi	Bony bream	1	5		
Neosilurus hyrtlii	Hyrtl's catfish		2		
Porochilus rendahli	Rendahl's tandan			1	1
Number of individuals		**109**	**68**	**202**	**138**
Species richness		**6**	**5**	**7**	**7**

Notes: * denotes introduced species.



Agassiz's glassfish (*Ambassis agassizii*)



Longfin eel (*Anguilla reinhardtii*)



Mosquitofish (*Gambusia holbrooki*)*



Boofhead carp gudgeon (*Hypseleotris bucephala*)



Spangled perch (*Leiopotherapon unicolor*)



Eastern rainbowfish (*Melanotaenia splendida splendida*)



Purple-spotted gudgeon (*Mogurnda adspersa*)



Bony bream (*Nematalosa erebi*), with ulcerative lesions



Hyrtl's catfish (*Neosilurus hyrtlii*)



Rendahl's tandan (*Porochilus rendahli*)

Plate 4 Fish captured from the Study Area

4.5.2 Turtles

The Least Concern Krefft's river turtle (*Emydura macquarii krefftii*) was recorded at site L2 in June-July (seven adult males and three adult females) and in October 2025 (one adult male, one adult female and three juveniles), and at site L1 (two adult males) in October 2025. The Least Concern eastern snake-necked turtle (*Chelodina longicollis*) was recorded at site L2 (one juvenile) in October 2025. In an earlier study in December 2019 (EMM 2023) an adult eastern snake--necked turtle was also recorded at site L1. No conservation-significant turtles or their habitat were detected within the Study Area (Section 4.6.3).

4.5.3 Platypus

The platypus is listed as Special Least Concern under the NC Act. The Wetland*Info* database (DETS1 2025b) identifies the platypus as having previously been recorded from the Mackenzie River Sub-basin. The nearest record of platypus is from the Dawson Range Stage Forest, approximately 35 km east-southeast of the Study Area (ALA 2025).

The seasonal nature of waterways of the Study Area is not conducive to sustaining a population of platypus. Similarly, the lacustrine wetlands (i.e. farm and mine water dams) within the Study Area are unlikely to sustain a population of platypus as, despite relative permanence of wetted habitat, these wetlands lack the banks and habitat features required for platypus burrow construction.

No platypus burrows were encountered during the surveys, despite targeted searches at each site. It is considered unlikely that platypus occupies the waterways and bodies of the Study Area.

4.5.4 Aquatic invertebrates

Aquatic macroinvertebrates and stream health

A total of 50 taxa from 1,941 aquatic macroinvertebrates were collected from waterways and wetlands of the Study Area in June 2025. A total of 44 taxa from 986 aquatic macroinvertebrates were collected in October 2025. The raw data is presented in Appendix E. Sampling effort for the riverine sites was limited by the availability of wetted habitat. The post-wet (June) 2025 aquatic macroinvertebrate sampling consisted of five riverine bed habitat samples, five riverine edge habitat samples and two lacustrine wetland samples. Drier conditions were encountered in the pre-wet (October) 2025 sampling, with two riverine bed habitat samples, two riverine edge habitat samples and two lacustrine wetland samples obtained.

Taxonomic composition

The most taxa-rich order of aquatic macroinvertebrates collected from the Study Area in June 2025 was Diptera (true flies), with nine families identified. Hemiptera (true bugs) and Coleoptera (beetles) were also well represented, each with eight families identified. Hemiptera was the most taxa-rich order collected in October 2025, with 12 families identified. Other taxa included Ephemeroptera (mayflies), Trichoptera (caddis flies), Zygoptera (damselflies), Epiprocta (dragonflies), Acarina (mites), Decapoda (yabbies, river prawns and glass shrimp), Gastropoda (snails), Lepidoptera (aquatic caterpillars), Hirudinea (leeches), Nematoda (round worms), Platyhelminths (flat worms), Annelida (segmented worms), Cladocera (water fleas), Copepoda (copepods) and Ostracoda (seed shrimp).

Aquatic macroinvertebrate taxa richness ranged from 13 to 22 in samples collected from riverine bed habitats, from 11 to 31 in samples collected from riverine edge habitats, and from 20 to 34 in composite samples from lacustrine wetlands (farm dams) (Figure 12 and Figure 13). Data is presented alongside the DEHP (2011) WQOs for the Mackenzie River Sub-basin. The WQOs apply to riverine systems only. No taxa richness guidelines are available for lacustrine wetlands.

Taxa richness was variable; largely influenced by the extent of wetted habitat available in the drying pools sampled, and the extent of livestock access (Appendix B). The taxa richness of the five riverine bed habitat samples collected in June 2025 and the two bed habitat samples collected in October 2025 fell within or favourably above the DEHP (2011) 20:80 percentile range. The taxa richness of the riverine edge habitat sample collected from site R3 in June 2025 and the two edge habitat samples collected in October 2025 fell within the DEHP (2011) 20:80 percentile guideline range. Taxa richness was below this range in the edge habitat samples collected from sites R4, R5, R6 and R9 in June 2025 (Figure 12 and Figure 13). Taxa richness was greater in the edge habitats than in the bed habitats of most riverine sites, owing to the greater habitat complexity and food sources available.

Plecoptera, Ephemeroptera and Trichoptera taxa

Two PET taxa were recorded from the Study Area, including one Ephemeroptera (mayfly) family (Baetidae) and one Trichoptera (caddis fly) family (Leptoceridae). No Plecoptera (stonefly) families were recorded, nor were they expected due to lack of rocky substrates and riffle habitat.

PET taxa richness ranged from 0-2 taxa in the riverine bed samples, from 0-2 taxa in the riverine edge samples, and with 2 PET taxa in each of the lacustrine wetland samples (Figure 14 and Figure 15). Data is presented alongside the DEHP (2011) WQOs for the Mackenzie River Sub-basin. The WQOs apply to riverine systems only. As such, no guidelines are presented for the lacustrine wetland sites.

PET taxa in the bed and edge habitat samples collected from site R3 in June 2025 met the DEHP (2011) 20:80 percentile guideline range, indicating an expected number of pollutant sensitive taxa. PET richness was below the guideline range in all other riverine bed and edge habitat samples collected. However, this lower PET taxa richness most likely reflects seasonality and the ephemeral flow nature of these waterways, rather than pollution or other anthropogenic impacts.

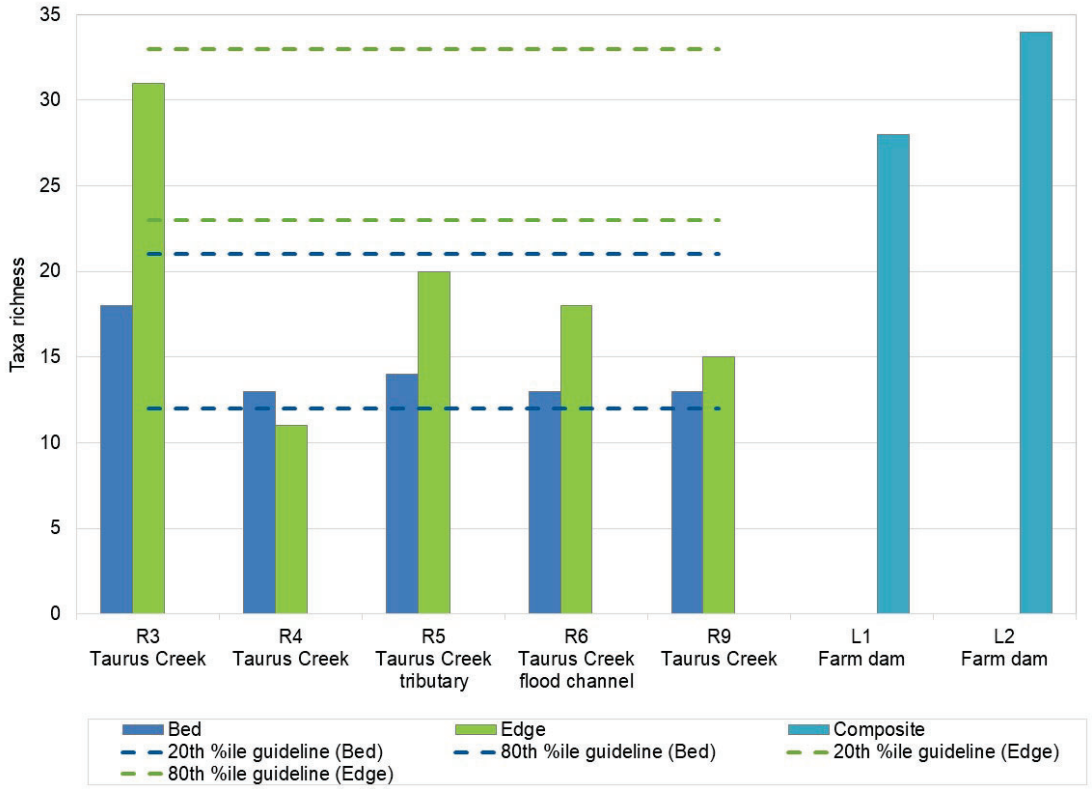


Figure 12 Taxa richness of aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025

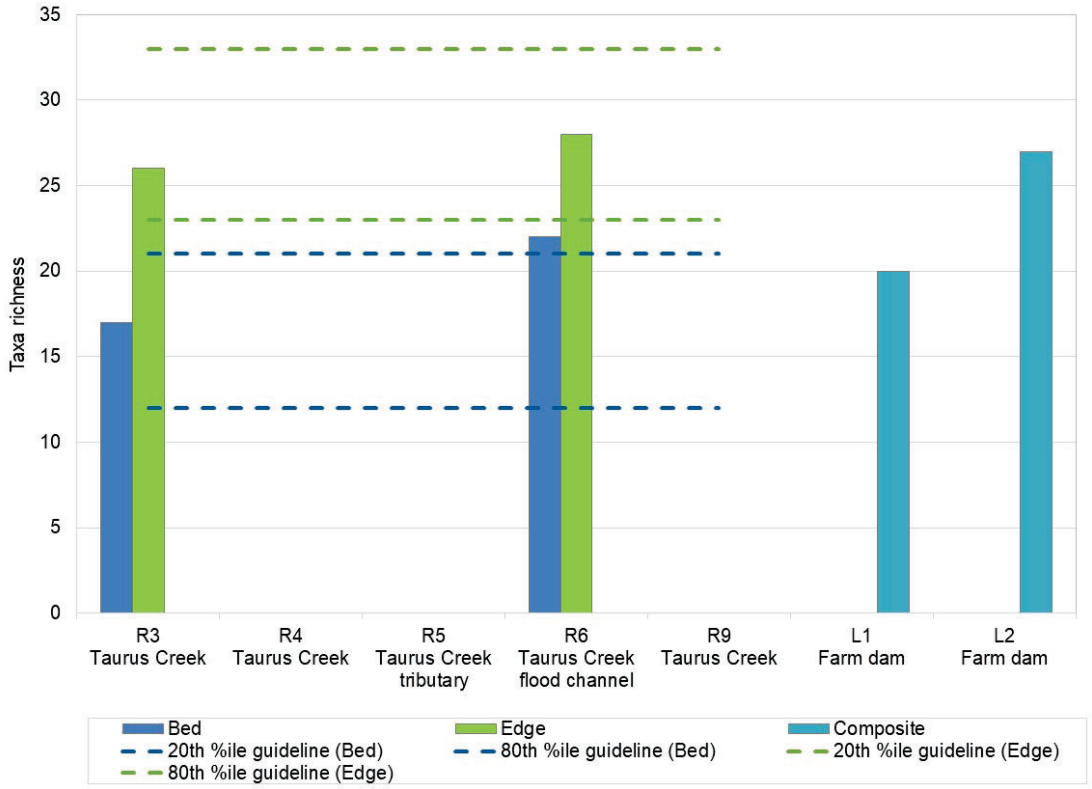


Figure 13 Taxa richness of aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025

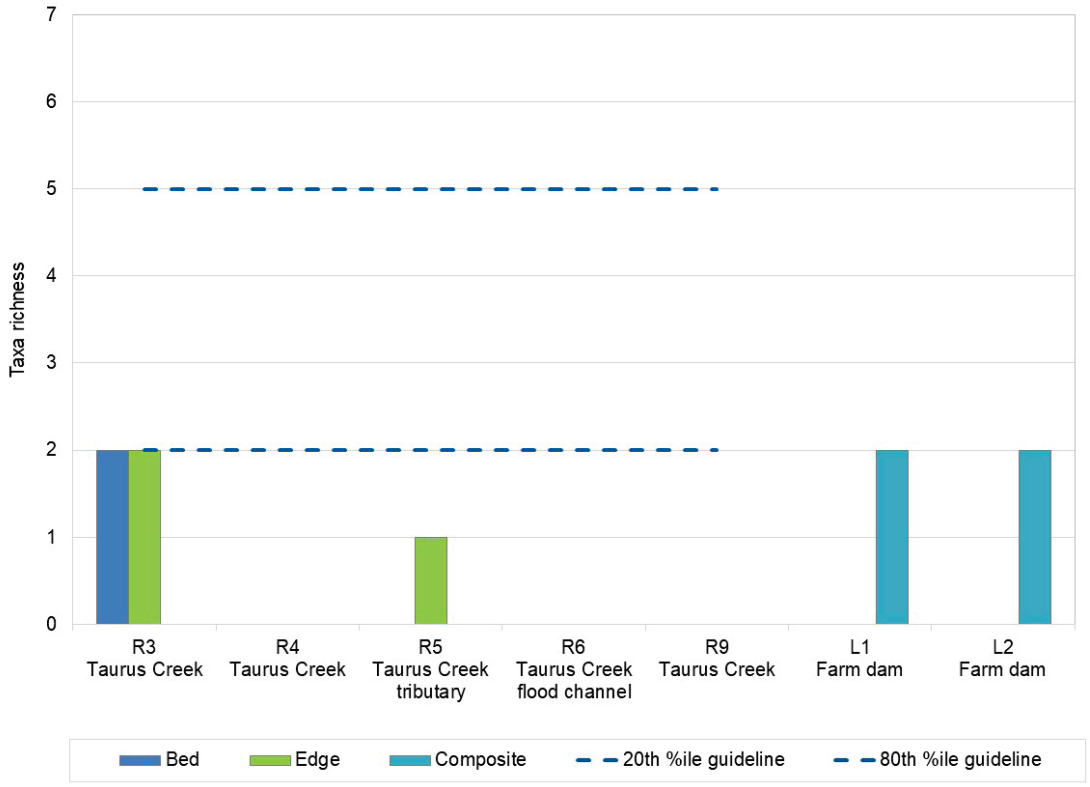


Figure 14 PET taxa richness for aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025

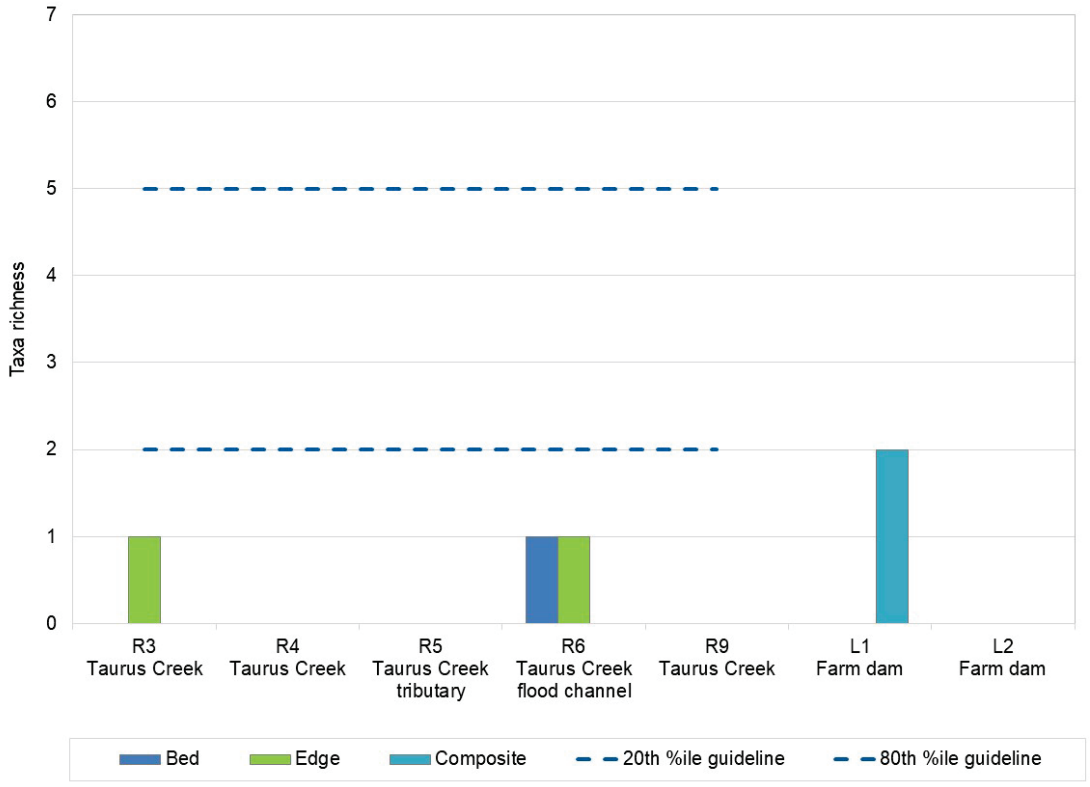


Figure 15 PET taxa richness for aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025

Pollution-tolerant taxa

The percentage of pollution-tolerant taxa (SIGNAL2 score of 1-3) ranged from 40 to 82% in the riverine bed samples, from 40 to 65% in the riverine edge samples, and from 47 to 63% in the lacustrine wetland samples (Figure 16 and Figure 17). Data is presented alongside the DEHP (2011) WQOs for the Mackenzie River Sub-basin. The WQOs apply to riverine systems only. As such, no guidelines are presented for the lacustrine wetland sites.

The percentage of pollution-tolerant taxa exceeded the DEHP (2011) 20:80 percentile guideline range in most riverine samples (Figure 16 and Figure 17), indicating unfavourable physical conditions and/or reduced habitat quality, and likely reflecting the ephemeral flow regime.

Stream Invertebrate Grade Number – Average Level Version 2 scores

Average SIGNAL2 scores ranged from 2.36 to 3.70 for samples collected from riverine bed habitat, from 3.00 to 3.60 for samples collected from riverine edge habitat, and from 3.06 to 3.47 for samples collected from lacustrine wetland sites (Figure 18 and Figure 19). SIGNAL2 results are presented alongside the DEHP (2011) WQOs for the Mackenzie River Sub-basin. The WQOs apply to riverine systems only. As such, no guidelines are presented for the lacustrine wetland sites.

The SIGNAL2 scores for most bed and edge samples fell below the DEHP (2011) 20:80 percentile guideline range, reflecting a lower composition of pollution sensitive taxa (and a higher composition of pollutant tolerant taxa) than what is expected for the broader Mackenzie River Sub-basin. This likely indicates unfavourable physical conditions and/or reduced habitat quality associated with high ephemerality.

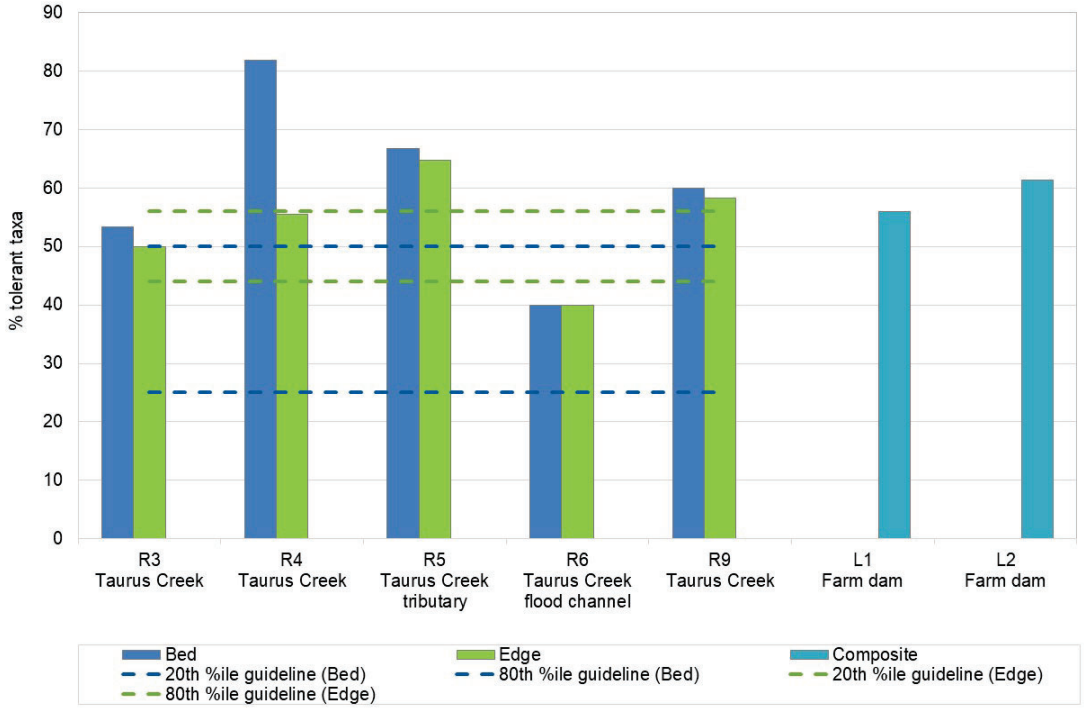


Figure 16 Percentage of pollution-tolerant taxa in aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025

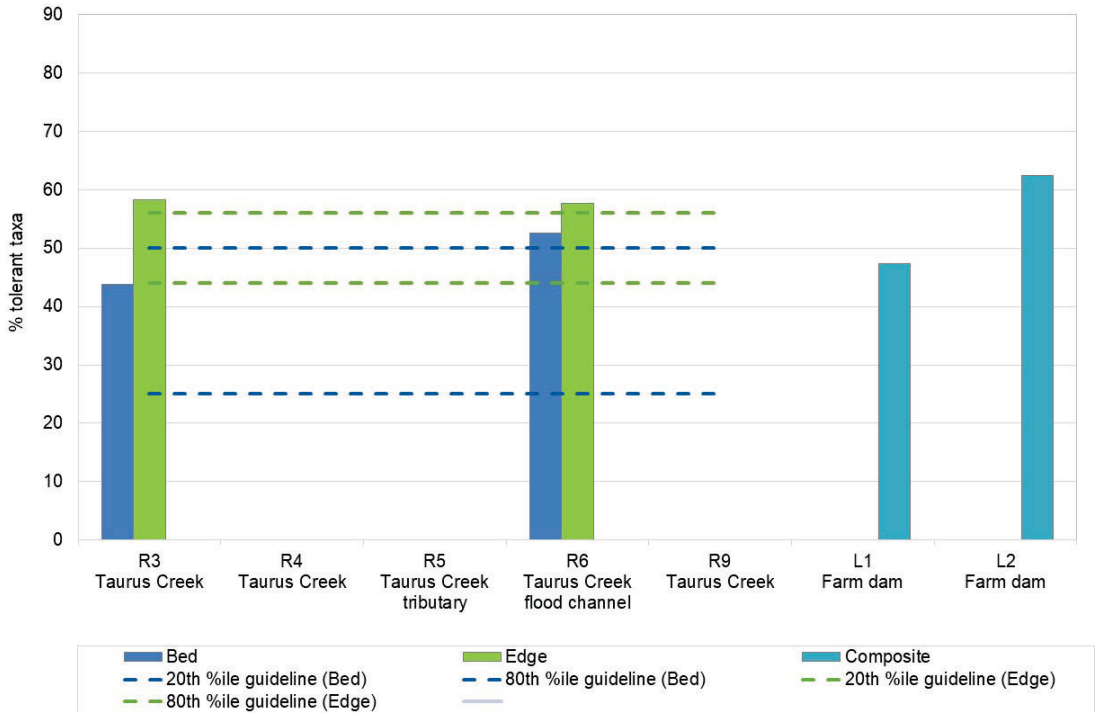


Figure 17 Percentage of pollution-tolerant taxa in aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025

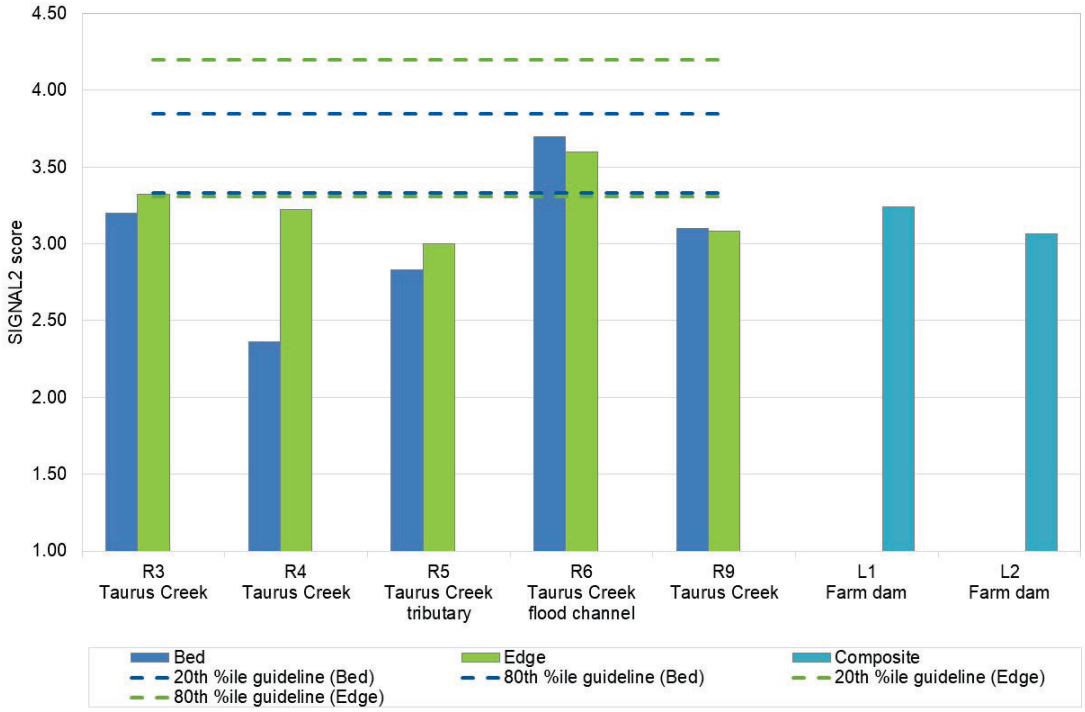


Figure 18 SIGNAL2 scores for aquatic macroinvertebrate samples collected from the Study Area, post-wet (June) 2025

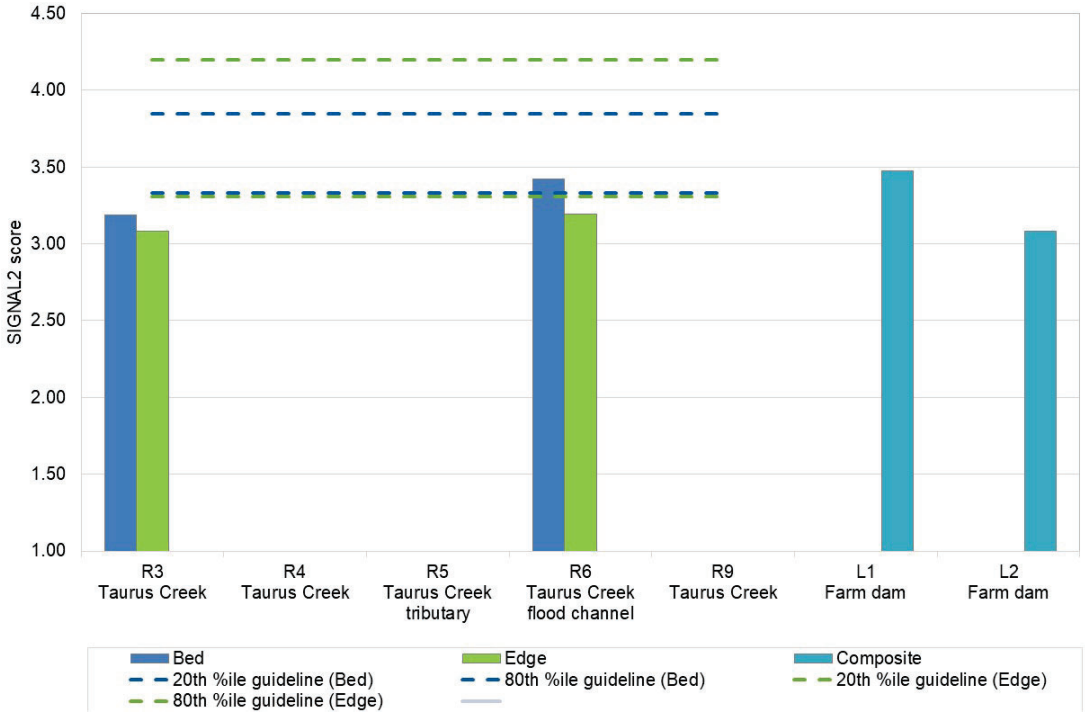


Figure 19 SIGNAL2 scores for aquatic macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025

Australian River Assessment System OE50

Aquatic macroinvertebrate data from the post-wet (June) and pre-wet (October) 2025 sampling rounds was modelled using the AusRivAS Queensland regional coastal models for the seasons and habitats sampled. All riverine sites were within the experience of the models.

AusRivAS observed to expected (OE50) taxa scores indicate that the bed habitat samples were in reference condition (Band A; natural or near natural) at Taurus Creek site R3 in both June (Figure 20) and October 2025 (Figure 21), and at Taurus Creek flood channel site R6 in October 2025. Bed habitat samples were significantly impaired (Band B) in samples collected from Taurus Creek tributary site R5 and site R6 in June 2025. The bed habitat sample was severely impaired (Band C) at Taurus Creek sites R4 and R9 in June 2025, reflecting limited habitat in the senescing pools sampled. Sites R4 and R9 had dried completely by October 2025.

The AusRivAS OE50 taxa scores indicate that the edge habitat samples were in reference condition (Band A; natural or near natural) at Taurus Creek site R3 in June and October 2025, at Taurus Creek tributary site R5 in June 2025 (Figure 20), and at Taurus Creek flood channel site R6 in October 2025 (Figure 21). Edge habitat samples were significantly impaired (Band B) at sites R6 and Taurus Creek site R9 in June 2025. The edge habitat sample was severely impaired (Band C) at Taurus Creek site R4 in June 2025, reflecting limited edge habitat in the senescing pools sampled.

The prevalence of wetted habitat is a key driver in macroinvertebrate community structure and ecosystem functioning, and caution is applied to the use of AusRivAS ratings in ephemeral systems. The lower (Band B and C) OE50 taxa scores for most sites/samples are more likely a reflection of natural seasonality than catchment impacts.

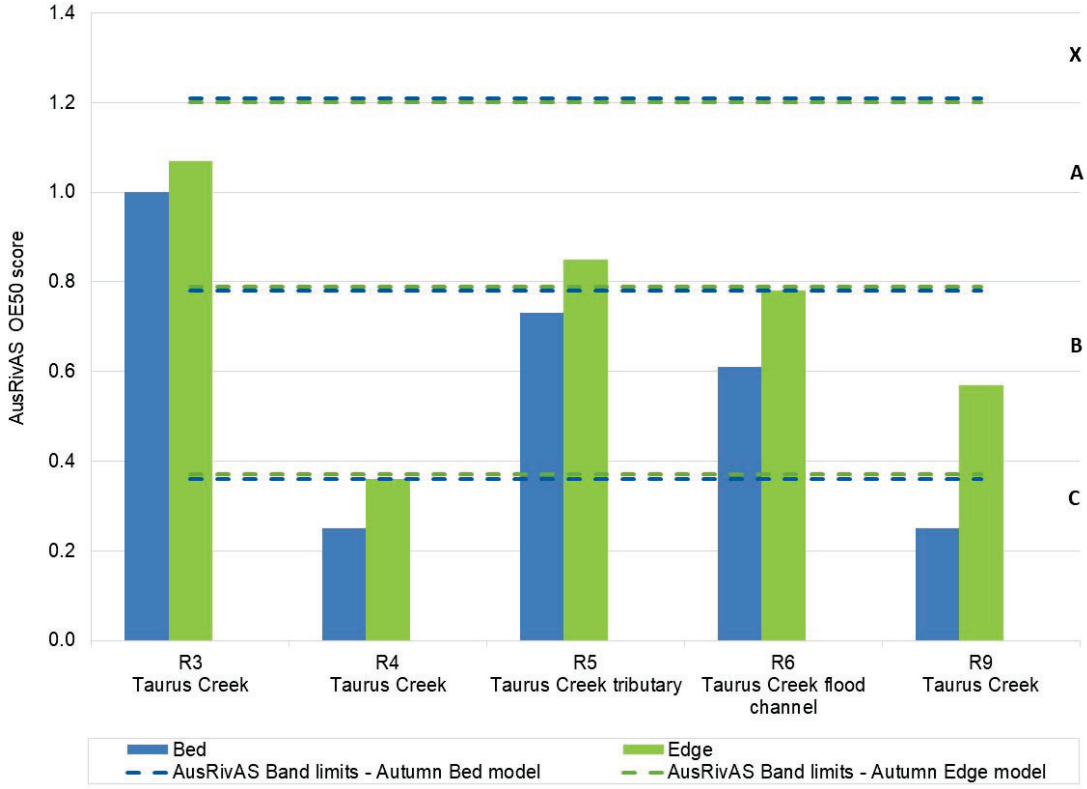


Figure 20 OE50 scores for riverine macroinvertebrate samples collected from the Study Area, post-wet (June) 2025

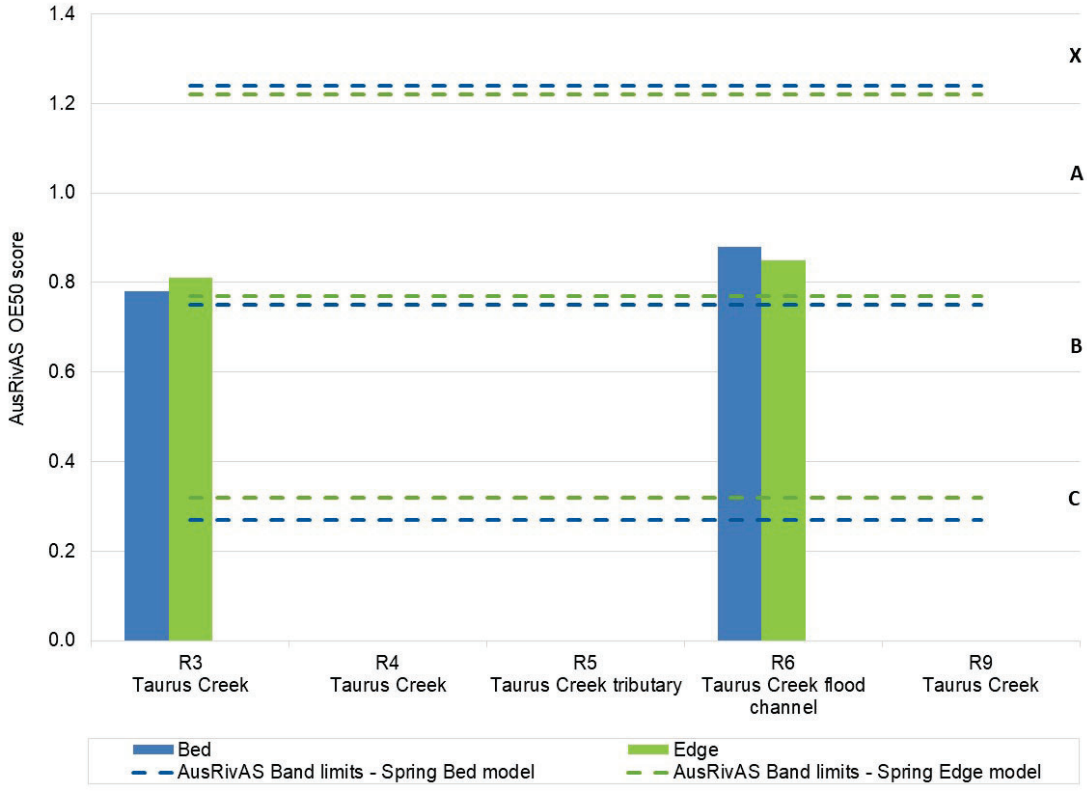


Figure 21 OE50 scores for riverine macroinvertebrate samples collected from the Study Area, pre-wet (October) 2025

4.6 Conservation-significant species

4.6.1 Aquatic flora

No conservation-significant aquatic flora species were recorded during the surveys. The Wetland*Info* database identifies 306 wetland indicator flora species/subspecies previously recorded from the broader Fitzroy Basin (DETSI 2025b). Of these, five are listed as conservation-significant (Table 20):

- salt pipewort/button grass (*Eriocaulon carsonii*) – Endangered (NC Act);
- salt pipewort/button grass (*Eriocaulon carsonii* subsp. *orientale*) – Endangered (EPBC Act and NC Act);
- *Maundia triglochinoides* – Vulnerable (NC Act);
- lesser swamp orchid (*Phaius australis*) – Endangered (EPBC Act and NC Act); and
- swamp fern (*Thelypteris confluens*) – Vulnerable (NC Act).

None of these species were recorded during the survey and are unlikely to occur within the Study Area (Table 20).

4.6.2 Fish

No conservation-significant fish species were recorded during the surveys. The Wetland*Info* database identifies 53 native fish species previously recorded from the Fitzroy Basin (DETSI 2025b). Of these, two are conservation-significant:

- silver perch (*Bidyanus bidyanus*) – Endangered (EPBC Act and NC Act); and
- Murray cod (*Maccullochella peelii*) – Vulnerable (EPBC Act).

It is unlikely that these conservation-significant species occur within waterways or wetlands of the Study Area as either resident or transient occurrences, as suitable habitat is not present, and the Study Area is outside the natural range of these species (Table 21).

4.6.3 Turtles

No conservation-significant turtle species were recorded during the surveys. The Wetland*Info* database identifies seven freshwater turtle species previously recorded from the Fitzroy Basin (DETSI 2025b). Of these, two are conservation-significant:

- white-throated snapping turtle (*Elseya albagula*) – Critically Endangered (EPBC Act and NC Act); and
- Fitzroy River turtle (*Rheodytes leukops*) – Vulnerable (EPBC Act and NC Act).

The white-throated snapping turtle and Fitzroy River turtle are also identified in the EPBC Act Protected Matters Report as ‘may’ occur and ‘likely’ to occur within the Search Area, respectively (DCCEEW 2025a, Appendix A).

It is unlikely that conservation-significant turtle species occur within the Study Area as either resident or transient occurrences, as suitable habitat was not detected during the field survey (Table 22).

4.6.4 Platypus

The Special Least Concern (NC Act) platypus (*Ornithorhynchus anatinus*) was not recorded during field surveys.

The ephemeral nature of the waterways of the Study Area are not conducive to sustaining a population of platypus. Similarly, the lacustrine waterbodies (i.e. farm and mine water dams) of the Study Area are unlikely to sustain a population of platypus as, despite relative permanence of wetted habitat, these waterbodies lack the bank structure required for platypus burrow construction.

4.6.5 Aquatic invertebrates

No conservation-significant aquatic invertebrates are identified in the EPBC Act Protected Matters Report (DCCEEW 2025a, Appendix A), nor in the Wetland*Info* database for the Fitzroy Basin (DETSI 2025b).

Table 20 Conservation-significant aquatic flora species recorded from the desktop Search Area

Scientific name	Common name	Status[1]		Preferred habitat	Likelihood of occurrence within the Project Area based on desktop	Likelihood of occurrence within the Project Area post field surveys	Data Source[2]			
		EPBC Act	NC Act				DCCEEW 2025a	DESTI 2025b (F-Basin)	DESTI 2025c (10km)	DESTI 2025c (50km)
Eriocaulon carsonii (including subsp. *orientale*)	salt pipewort/button grass	E	E	Restricted to saturated soil adjacent to flowing mound springs (Sainty and Jacobs 2003).	**Unlikely**. Mound springs not known to occur within the Study Area. Preferred habitat is unlikely to occur within the Study Area. There are no records within 50 km of the Study Area (DETSI 2025c).	**Unlikely**. Species or species habitat not detected during the field survey.		✓		
Maundia triglochinoides	-		V	Grows in coastal freshwater swamps and streams (Sainty and Jacobs 2003), in waters up to 0.5 m deep, or shallow waters that may dry up seasonally.	**Unlikely**. Preferred habitat unlikely to occur within the Study Area. There are no records within 50 km of the Study Area (DETSI 2025c).	**Unlikely**. Species or species habitat not detected during field surveys.				
Phaius australis	lesser swamp-orchid	E	E	Occurs near the coast. Grows in sandy areas where soils are almost always damp, but not flooded for lengthy periods; occurring in southern Queensland and northern New South Wales (DETSI 2025i).	**Unlikely**. Preferred habitat not known to occur within the Study Area. There are no records within 50 km of the Study Area (DETSI 2025c).	**Unlikely**. Species or species habitat not detected during the field survey.		✓		
Thelypteris confluens	swamp fern		V	Found in permanently swampy areas and mound springs (DETSI 2025i). Occurs in the Queensland pastoral districts on Leichhardt, Moreton and Wide Bay (DETSI 2025i).	**Unlikely**. Preferred habitat not known to occur within the Study Area. There are no records within 50 km of the Study Area (DESTI 2025c).	**Unlikely**. Species or species habitat not detected during the field survey.		✓		

Notes: [1] Status under the Commonwealth EPBC Act and/or Queensland NC Act as E = Endangered or V = Vulnerable.

[2] Data sources: Commonwealth EPBC Act Protected Matters Report – Study Area plus 10 km buffer – created 11 June 2025 (DCCEEW 2025a); Queensland WildNet database – Study Area plus approximate 10 km and 50 km buffers – created 11 June 2025 (DETSI 2025c); and Queensland WetlandInfo – Fitzroy Basin – Wetland Summary Information (DETSI 2025b).

Table 21 Conservation-significant fish species recorded from the desktop Search Area

Scientific name	Common name	Status[1]		Preferred habitat	Likelihood of occurrence within the Project Area based on desktop	Likelihood of occurrence within the Project Area post field surveys	Data Source[2]			
		EPBC Act	NC Act				DCCEEW 2025a	DESTI 2025b (F-Basin)	DETSI 2025c (10km)	DETSI 2025c (50km)
Bidyanus bidyanus	Silver perch	E	E	Faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin (MDB) (Clunie and Koehn 2001, cited in DotE 2013).	**Unlikely**. Distributional range is naturally in the MDB, although translocated to coastal streams in south-east Queensland (and other states). Preferred habitat not detected within the Study Area. No records within 50 km of the Study Area (DETSI 2025c).	**Unlikely**. Species or species habitat not detected during field surveys.	✓	✓		
Maccullochella peelii	Murray cod	V	LC	Deep water with in-stream habitat such as boulders, logs, and overhanging vegetation (Allen et al. 2002). From fast-moving clear upland streams to slow-flowing turbid lowland waters. Most individuals stay within a 10 km reach of the river (Pusey et al. 2004; Allen et al. 2002).	**Unlikely**. Distributional range is naturally in the MDB, although translocated to coastal streams in south-east Queensland (and other states). Preferred habitat not detected within the Study Area. No records within 50 km of the Study Area (DETSI 2025c).	**Unlikely**. Species or species habitat not detected during field surveys.	✓			✓

Notes: [1] Status under the Commonwealth EPBC Act and/or Queensland NC Act as E = Endangered or V = Vulnerable.

[2] Data sources: Commonwealth EPBC Act Protected Matters Report – Study Area plus 10 km buffer – created 11 June 2025 (DCCEEW 2025a); Queensland WildNet database – Study Area plus approximate 10 km and 50 km buffers – created 11 June 2025 (DETSI 2025c); and Queensland WetlandInfo – Fitzroy Basin – Wetland Summary Information (DETSI 2025b).

Table 22 Conservation-significant turtle species recorded from the desktop Search Area

Scientific name	Common name	Status[1]		Preferred habitat	Likelihood of occurrence within the Project Area based on desktop	Likelihood of occurrence within the Project Area post field surveys	Data Source[2]			
		EPBC Act	NC Act				DCCEEW 2025a	DESTI 2025b (F-Basin)	DETSI 2025c (10km)	DETSI 2025c (50km)
Rheodytes leukops	Fitzroy River turtle	V	V	Fast-flowing water of the Fitzroy River and its tributaries (Cogger 2014). Rivers with large, deep pools and rocky, gravelly or sandy substrates, connected by shallow riffles. Preferred areas have high water clarity and are often associated with ribbonweed (*Vallisneria* sp.) (DCCEEW 2025c).	**Unlikely**. Preferred habitat 'likely' to occur within the desktop Search Area (DCCEEW 2025a), but unlikely to occur within the Study Area. Recorded from within 50 km of the Study Area (DETSI 2025c), from the Mackenzie River (ALA 2025).	**Unlikely**. Species or species habitat not detected during field surveys.	✓	✓		
Elseya albagula	White-throated snapping turtle (also known as the southern snapping turtle)	CE	CR	Permanent flowing water habitats where there are suitable shelters and refuges (DETSI 2025i); clear, flowing, well-oxygenated waters (Todd et al. 2013) of the Fitzroy, Mary and Burnett catchments.	**Unlikely**. Preferred habitat 'may' occur within the desktop Search Area (DCCEEW 2025a), but unlikely to occur within the Study Area. Recorded from within 50 km of the Study Area, from the Comet and Mackenzie rivers (ALA 2025).	**Unlikely**. Species or species habitat not detected during field surveys.	✓	✓		

Notes: [1] Status under the Commonwealth EPBC Act and/or Queensland NC Act as E = Endangered or V = Vulnerable or CE = Critically Endangered.

[2] Data sources: Commonwealth EPBC Act Protected Matters Report – Study Area plus 10 km buffer – created 11 June 2025 (DCCEEW 2025a); Queensland WildNet database – Study Area plus approximate 10 km and 50 km buffers – created 11 June 2025 (DETSI 2025c); and Queensland WetlandInfo – Fitzroy Basin – Wetland Summary Information (DETSI 2025b).

4.7 Introduced species

4.7.1 Introduced aquatic flora

There are 22 introduced wetland indicator plant species known from the Fitzroy Basin (DETSI 2025b). Only two of these species were recorded in the Study Area during the seasonal surveys: awnless barnyard grass (*Echinochloa colona*) and white eclipta (*Eclipta prostrata*). Neither are of ecological significance.

Those invasive species considered to pose a particular threat to aquatic biodiversity, and that could potentially occur within the Study Area, are identified as either Weeds of National Significance (WoNS) (Weeds Australia 2025) or Restricted matter category 3 under the Queensland *Biosecurity Act 2014* (Table 23). None were detected in the Study Area.

Table 23 Introduced wetland indicator plants recorded from the desktop Search Area

Scientific name	Common name	National status^	Biosecurity Act status*
Arundo donax	-		
Cyperus esculentus	Yellow nutgrass		
Cyperus involucratus	-		
Cyperus papyrus	Papyrus		
Diplachne fusca var. *uninervia*	-		
Echinochloa colona	**Awnless barnyard grass**		
Echinochloa crus-galli	Barnyard grass		
Eclipta prostrata	**White eclipta**		
Eichhornia crassipes	Water hyacinth	WoNS	Restricted 3
Eleocharis minuta	-		
Hymenachne amplexicaulis 'Olive'	Olive hymenachne	WoNS	Restricted 3
Juncus bufonius	Toad rush		
Nymphaea caerulea	Cape waterlily		
Paspalum distichum	Water couch		
Paspalum vaginatum	Saltwater couch		
Pistia stratiotes	Water lettuce		Restricted 3
Polypogon monspeliensis	Annual beardgrass		
Rorippa nasturtium-aquaticum	Watercress		
Salix babylonica	Weeping willow		
Salvinia molesta	Salvinia	WoNS	Restricted 3
Sparganium erectum subsp. *stoloniferum*	Erect bur-reed		
Urochloa mutica	Para grass		

Notes: ^ Species listed as WoNS; * species listed under the Queensland *Biosecurity Act 2014*; * **Bold text** indicates species detected during field surveys.

4.7.2 Pest fish species

Six introduced fish species have been recorded from the Fitzroy Basin: mosquitofish (*Gambusia holbrooki*), guppy (*Poecilia reticulata*), goldfish (*Carassius auratus*), European carp (*Cyprinus carpio*), tilapia (*Oreochromus mossambicus*) and platy (*Xiphophorus maculatus*) (DETSI 2025b).

Mosquitofish was confirmed from site L1 in June and October 2025 (Section 4.5.1). The mosquitofish is a noxious species listed as restricted categories 3, 5, 6 and 7 in the *Biosecurity Act 2014*. This species was introduced into Australia from North America in 1929 as a biological control for mosquitos; however, this was unsuccessful and the species is now regarded as one of the greatest threats to Australia's native biodiversity (Business Queensland 2020). The mosquitofish has many traits that make them a good invader such as high reproductive potential, flexible diet, broad environmental tolerances and low vulnerability to predation, and they have the potential to rapidly outnumber native fish and dominate aquatic communities (Business Queensland 2020).

4.7.3 Introduced aquatic reptiles

No introduced aquatic reptile species were recorded during the surveys, and none were identified from the desktop assessments as having potential to occur in the Study Area.

4.8 Groundwater-dependent ecosystems

GDEs are ecosystems that rely upon groundwater for their continued existence. They may be 100% dependent on groundwater, such as aquifer GDEs, or may access groundwater intermittently to supplement their water requirements, such as riparian tree species in arid and semi-arid areas (IESC 2018). GDEs can be classified into three broad types:

- aquifer or cave ecosystems (subterranean GDEs);
- ecosystems dependent on the surface expression of groundwater (surface expression GDEs, including river baseflow systems, springs and swamps); and
- ecosystems dependent on the subsurface presence of groundwater (terrestrial GDEs, including some riparian vegetation communities).

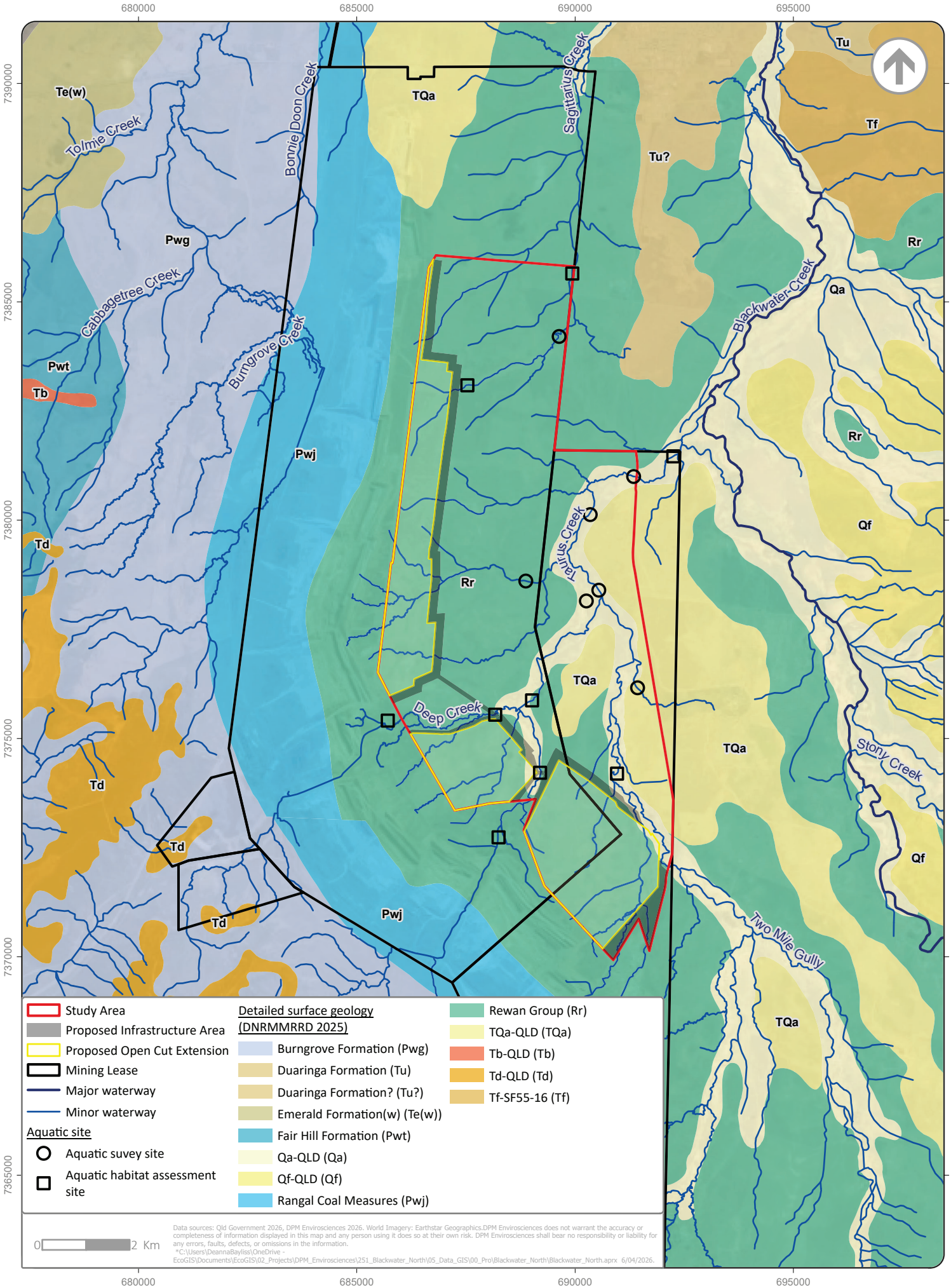
4.8.1 Subterranean groundwater-dependent ecosystems

Stygofauna desktop assessment results

Aquifers of the Study Area

The surface geology of the Study Area (Figure 22) is dominated by lithology belonging to the Rewan Group, which includes lithic sandstone, pebbly lithic sandstone, mudstone and minor volcanilithic pebble conglomerate at the base (DNRMMRRD 2025b). Late Tertiary to Quaternary alluvium, which includes high-level alluvial deposits of poorly consolidated sand, silt, clay and minor gravel, occurs on the broad valleys and floodplains of Taurus Creek and Two Mile Gully, extending east towards Blackwater Creek. The late Tertiary to Quaternary alluvium is intersected by more recent Quaternary alluvium, which includes unconsolidated clay, silt, sand and gravel, on the floodplain and channels of Two Mile Gully and Deep and Taurus creeks (Figure 22). More specifically, these potential GDE aquifers (Figure 23) are identified as 'Quaternary alluvial aquifers with fluctuating, intermittent groundwater connectivity regime and unknown pH' based on expert opinion (DETSI 2025d). These Quaternary alluvial aquifers align broadly with the Quaternary and late Tertiary to Quaternary alluvium identified in the surface geology mapping (DNRMMRRD 2025b) and correspond with the Land Zone mapping (Land Zone 3 [Section 2.3]; DNRMMRRD 2025b).

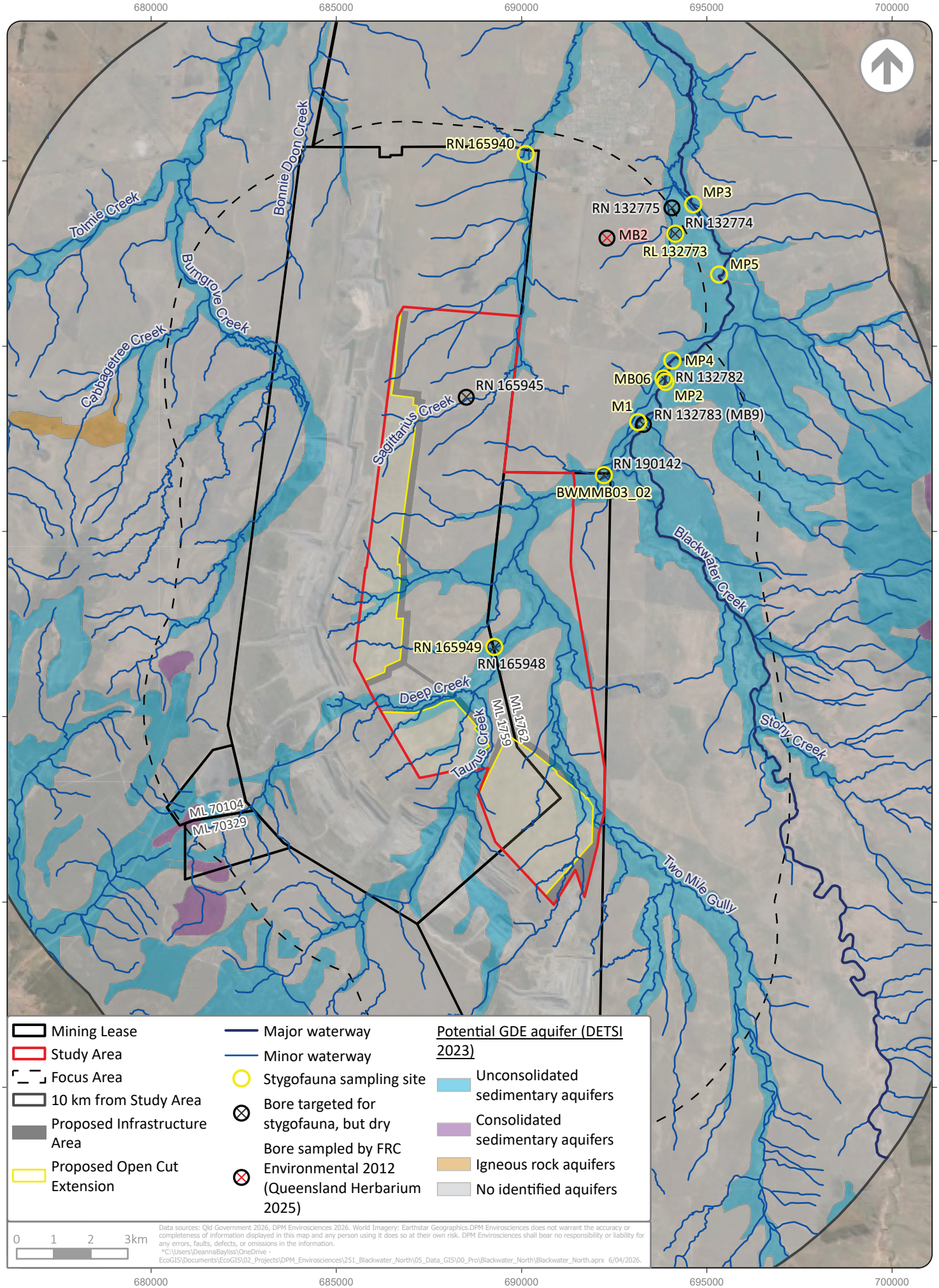
The alluvial aquifers of the Study Area are intercepted by a number of existing monitoring bores (Appendix C) with similar characteristics (lithology, aquifer depth, EC, pH etc.) to other bores in Queensland (4T 2012, DPM Enviroscences 2022 and Queensland Herbarium 2025) in which stygofauna have been previously detected.



SURFACE GEOLOGY OF THE STUDY AREA

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 22



GROUNDWATER-DEPENDENT ECOSYSTEM AQUIFERS

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 23

Stygofauna Potential Presence

The Queensland subterranean aquatic fauna database (Queensland Herbarium 2025) identifies several bores that have been sampled for stygofauna within a 50 km radius of the Study Area. Subterranean fauna (recognised as potential stygofauna at the time) were detected in two of these bores (Table 24) in 2012 by FRC Environmental as part of an assessment of the 'Minyango Project' (Queensland Herbarium 2025), comprising specimens from the:

- insect order Coleoptera (beetles), family Hydraenidae (one individual from bore MB2);
- annelid class Oligochaeta (segmented worms), family Naididae (one individual from bore MB2); and
- crustacean sub-class Copepoda, order Cyclopoida (two individuals from bore MB9).

Since 2012, there is a better understanding of taxa likely to be stygofauna and the previous specimens are considered unlikely to be stygofauna.

Bores MB2 and MB9, sampled by FRC Environmental in 2012, are located within 5 km of the Study Area. DPM Enviros attempted to sample bore MB9 (RN 132783) in July and October 2025, but it was dry at the time of sampling as shown in Table 24 and Figure 23. Bore MB2 (RN 132777) was not targeted by DPM Enviros as it is screened too deep (220--226 mbgl) to be suitable for stygofauna. Various species of hydraenid beetles live in riparian, littoral and aquatic habitats, but are not known to include stygofauna which potentially explains the individual recorded by FRC Environmental from bore MB2.

Oligochaete worms of the family Naididae (detritus worms) are key components of the benthic communities of many freshwater ecosystems. Naidids were once considered members of a community that occurs within the shallow to deep sand and gravel beds associated with areas of groundwater discharge (Gilbert et al. 1994), representing a common group of worms existing in all Australian States and Territories. However, subsequent studies now consider the broader Oligochaeta class as part of the soil fauna (Halse and Pearson 2014). The hydraenid and naidid specimens recorded from bore MB2 may be stygoxenes (i.e. not obligate inhabitants of groundwater systems) but are unlikely to be stygofauna.

Copepods in the taxonomic order Cyclopoida are normally associated with fine to coarse sandy substrates of still water environments of rivers, wetlands, the hyporheic zone and shallow groundwaters. The cyclopoid collected by FRC Environmental from bore MB9 in 2012 represents a likely stygoxene rather than stygofauna (see discussion in the 'Stygofauna sampling results' below).

Freshwater Ecology targeted 10 bores within and surrounding the Study Area in November 2020 and May 2021 (Freshwater Ecology 2021). Five of these bores are screened too deep (>168 mbgl) for stygofauna to have access to the borehole, and two of the five shallower bores were dry at the time of each seasonal sampling event. Consequently, only three of the 10 bores targeted for stygofauna met the criteria for sampling as per the DSITI (2015) guideline. No stygofauna was detected by Freshwater Ecology (2021).

Stygofauna sampling results

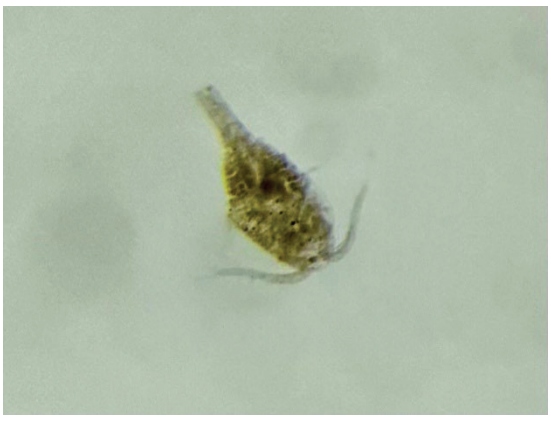
July 2025 sampling

Five wet groundwater bores and five wet micropiezometers were sampled for stygofauna in July 2025, as shown in Table 24 and Figure 23. Standing water levels ranged from 0.3 mbgl in each of the micropiezometers within the bed of Blackwater Creek to 14.55 mbgl at bore RN 132781 (MB6) on the floodplain of Blackwater Creek (Table 24). pH levels ranged from 6.2 (slightly acid) at bore RN 165940 on the floodplain of Sagittarius Creek to 8.3 (moderately alkaline) at micropiezometer site MP1 within Blackwater Creek. Specific conductivity levels ranged from 271 µS/cm (fresh) at site MP1 to 48,984 µS/cm (saline) at bore RN 132773 on the floodplain of Blackwater Creek.

A single cyclopoid copepod was identified in the sample collected from micropiezometer site MP4 on Blackwater Creek (Plate 5). Stygofauna specialist Dr Peter Hancock advised (pers. comm. 29/07/2025) that further taxonomy is unlikely to determine whether the cyclopoid is stygofauna or not. As the sampling was only shallow and close to the creek, it is more likely a surface/hyporheic benthic copepod (a stygoxene) taking refuge in shallow alluvium, but which may still rely on shallow groundwater during dry times. Copepod stygofauna are more commonly represented by harpacticoid copepods in alluvium, rather than cyclopoid copepods, as the large swimming antennae of cyclopoid copepods are not well suited to tightly packed aquifers (pers. comm. Dr Peter Hancock 29/07/2025). The cyclopoid copepod detected is considered to be a stygoxene. No stygofauna were detected.



Site MP4 on Blackwater Creek



Cyclopoid copepod specimen from site MP4

Plate 5 Micropiezometer site MP4 and cyclopoid specimen from Blackwater Creek, July 2025

October 2025

The same 10 locations sampled in July 2025 were targeted for follow-up seasonal sampling in October 2025 (Table 24). Standing water levels ranged from 0.1 mbgl at micropiezometer site MP3 in the bed of Taurus Creek to 14.50 mbgl at bore RN 132781 (MB6) on the floodplain of Blackwater Creek (Table 24). pH levels ranged from 6.4 (slightly acid) to 7.4 (neutral). Specific conductivity levels ranged from 420 µS/cm (fresh) at site MP5 to 48,563 µS/cm (saline) at bore RN 132773 on the floodplain of Blackwater Creek.

No stygofauna were detected.

Table 24 Characteristics of groundwater monitoring bores and micropiezometers targeted for stygofauna, July and October 2025

Bore ID^	Lithology at screened interval	Bore depth (mBGL)	Screen (mBGL)	SWL (mBGL)	Date sampled	pH	EC (µS/cm)	Ion sample	Stygo. sampling	Notes
RN 132773 (MB13A)	Siltstone	15.69	12.3-15.3	11.64	2/07/2025	6.5	48984	✓	✓	Six hauls off bottom, then purged/filtered 20 L (each time).
				11.65	25/10/2025	6.5	48563	✓	✓	
RN 132774 (MB13B)	Alluvial sand	9.15	6-9	-	2/07/2025	-	-	-	-	Dry at the time of sampling.
				-	25/10/2025	-	-	-	-	
RN 132775 (MB12)	Alluvial sand	9.98	6.5-9.5	-	2/07/2025	-	-	-	-	Dry at the time of sampling.
				-	25/10/2025	-	-	-	-	
RN 132781 (MB6)	Siltstone	41.23	32-41	14.55	2/07/2025	7.3	21370	✓	✓	Six hauls off bottom, then purged/filtered 20 L (each time).
				14.50	25/10/2025	6.8	22355	✓	✓	
RN 132782 (MB10)	Alluvial sand	8.45	6-9	-	2/07/2025	-	-	-	-	Dry at the time of sampling.
				-	25/10/2025	-	-	-	-	
RN 132783 (MB9^)	Alluvial sand	11.84	9-12	-	2/07/2025	-	-	-	-	Dry at the time of sampling.
				-	25/10/2025	-	-	-	-	
RN 165940 (MB19BWM02A)	Alluvial clay/sand	15.30	12-15	6.25	1/07/2025	6.2	37384	✓	✓	Six hauls off bottom, then purged/filtered 20 L (each time).
				6.36	20/10/2025	6.4	37326	✓	✓	
RN 165945 (MB19BWM05A)	Claystone	15.06	9-15	-	1/07/2025	-	-	-	-	Dry at the time of sampling.
				-	20/10/2025	-	-	-	-	
RN 165948 (MB19BWM07A)	Alluvial sand and gravel	7.06	4-7	-	1/07/2025	-	-	-	-	Dry at the time of sampling.
				-	22/10/2025	-	-	-	-	
RN 165949 (MB19BWM25P)	Sandstone	20.20	17-20	11.00	1/07/2025	7.3	5420	✓	✓	Six hauls off bottom, then purged/filtered 20 L (each time).
				11.20	22/10/2025	7.4	4601	✓	✓	
RN 190142 (BWMMB03_01)	Alluvial sand and gravel	11.13	8-11	-	2/07/2025	-	-	-	-	Dry at the time of sampling.
				-	23/10/2025	-	-	-	-	
RN 190143 (BWMMB03_02)	Sandstone	40.99	35-41	12.09	3/07/2025	6.6	36033	✓	✓	Six hauls, then purged/filtered 20 L (each time).
				12.12	23/10/2025	7.0	36159	✓	✓	
MP1	Alluvial sand and gravel	1.0	0.3-1.0	0.3	2/07/2025	8.3	271	✓	✓	10 L purged/filtered with micropiezometer.
		1.2	0.5-1.2	0.6	25/10/2025	7.4	743	✓	✓	

Bore ID^	Lithology at screened interval	Bore depth (mBGL)	Screen (mBGL)	SWL (mBGL)	Date sampled	pH	EC (µS/cm)	Ion sample	Stygo. sampling	Notes
MP2	Alluvial sand and gravel	1.0	0.3-1.0	0.3	2/07/2025	7.5	589	✓	✓	10 L purged/filtered with micropiezometer.
		-	-	-	25/10/2025	-	-	-	-	Dry. Excavated sand to dry clay layer beside lowest point in bed.
MP3	Alluvial sand and gravel	1.0	0.3-1.0	0.3	3/07/2025	7.4	341	✓	✓	10 L purged/filtered with micropiezometer (each time).
		0.5	0-0.5	0.1	25/10/2025	7.0	466	✓	✓	
MP4	Alluvial sand and gravel	1.0	0.3-1.0	0.3	3/07/2025	7.0	1112	✓	✓	10 L purged/filtered with micropiezometer.
		-	-	-	25/10/2025	-	-	-	-	Dry, Dard dry clay at 0.2 m below bed level of dried pool.
MP5	Alluvial sand and gravel	1.0	0.3-1.0	0.3	3/07/2025	7.6	315	✓	✓	10 L purged/filtered with micropiezometer (each time).
		1.2	0.5-1.2	0.9	25/10/2025	7.3	420	✓	✓	

Notes:

^ Indicates bores in which subterranean fauna was detected by FRC Environmental in 2012 (Queensland Herbarium 2025); and

* EC = Electrical Conductivity, standardised to 25˚C (i.e. Specific Conductivity).

4.8.2 Surface expression groundwater-dependent ecosystems

Desktop mapping of potential surface expression GDEs throughout Queensland (DETSI 2025d) shows no ‘known’ or ‘derived’ surface expression GDEs within the Study Area. ‘Derived’ surface expression GDE lines and areas of ‘moderate confidence’ are identified in the DETSI (2025d) mapping downstream of the Study Area to the north-east on Blackwater Creek (Figure 24). The lines represent ‘channels on alluvia overlying sandstone ranges with fresh, intermittent flow’, and the areas represent ‘riverine waterbodies on alluvia overlying sandstone ranges with fresh, intermittent flow’; each forming part of ‘Quaternary alluvial aquifers overlying sandstone ranges with fresh, intermittent groundwater connectivity regime’ (DETSI 2025d).

Micropiezometer site MP3 (Figure 23 in Section 4.8.1) was positioned in fresh (341 to 466 µS/cm) saturated alluvium beside an isolated pool on Blackwater Creek (downstream of the Study Area) that forms part of the State-mapped derived surface expression lines.

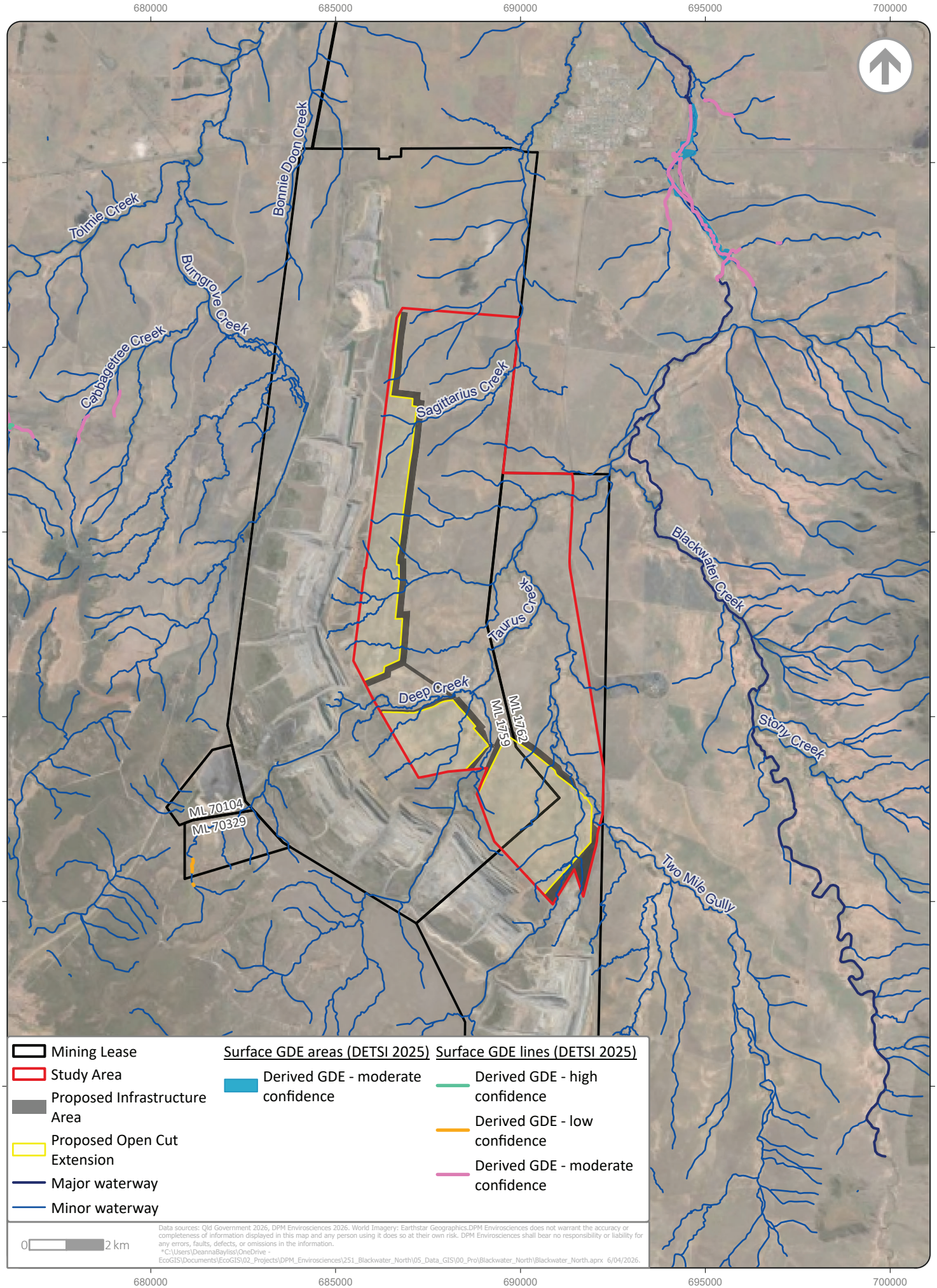
Water samples collected from site MP3 in July and October 2025 were both fresh and bicarbonate dominated, consistent with most surface waters of the Study Area (Figure 7 in Section 4.2.2). The alluvial aquifer of Blackwater Creek is expected to be recharged by rainfall and surface water infiltration in the catchment and channel. Saturated alluvia above the less permeable sandstone base may express water into Blackwater Creek, extending the duration of ephemeral/intermittent flow and isolated pools in Blackwater Creek for longer than waterways that lack alluvia overlying a sandstone base. Consequently, the State-mapped ‘derived’ surface expression GDEs of ‘moderate confidence’ on Blackwater Creek are indeed likely to be surface expression GDEs (Plate 6).

Field observations of waterways and wetlands within the Study Area (i.e. excluding Blackwater Creek) found no obvious evidence of groundwater expressions, salt seeps or other on-ground indicators of surface expression GDEs.



July 2025 October 2025

Plate 6 State-mapped ‘moderate confidence’ ‘surface expression groundwater-dependent ecosystem line’ at site MP3



SURFACE EXPRESSION GROUNDWATER-DEPENDENT ECOSYSTEMS

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

DPM ENVIROSCIENCES

FIGURE 24

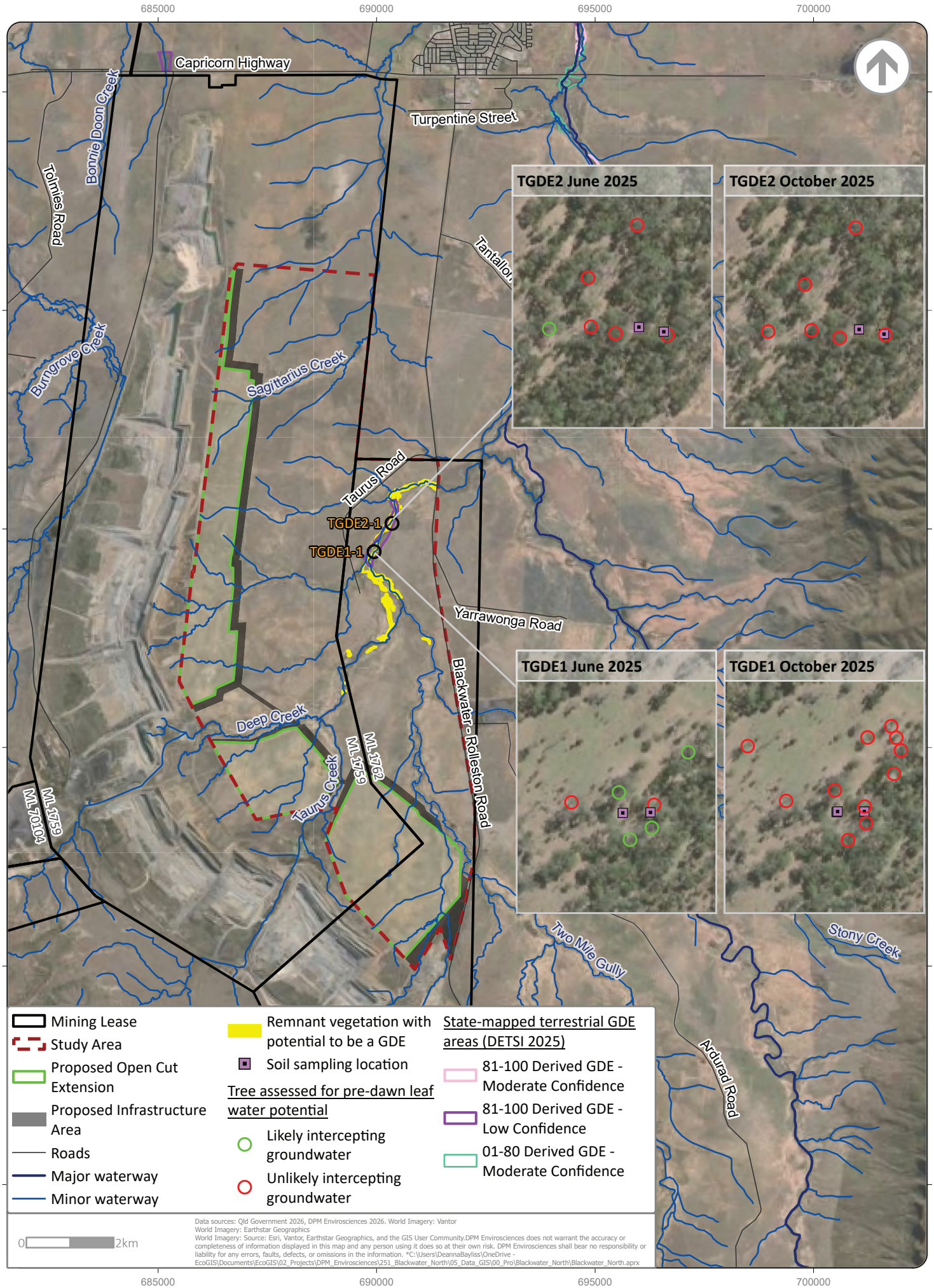
4.8.3 Terrestrial groundwater-dependent ecosystems

State-mapped terrestrial groundwater-dependent ecosystems

Desktop mapping of potential GDEs throughout Queensland (DETSI 2025d) shows no 'known' terrestrial GDEs within the Study Area. However, a single polygon of 'derived' terrestrial GDE of 'low confidence' is identified in the State mapping (DETSI 2025d), based on expert knowledge of the landscape and available spatial datasets (but without field verification) (Figure 25). Specifically, it is identified as a treed Regional Ecosystem (RE) on alluvia, with fluctuating, intermittent flow, that may be dependent on the sub-surface presence of groundwater (DETSI 2025d).

Remote sensing of terrestrial groundwater-dependent ecosystems

2rog Consulting (2021) developed a remote sensing dataset of potential terrestrial GDEs for several tenements throughout the Bowen Basin, applying the remote sensing method recommended by the IESC (Doody, Hancock and Pritchard 2019). This dataset identifies areas that are relatively wetter and greener than surrounding areas, though does not identify regions of confirmed terrestrial GDE. 2rog Consulting mapped potential terrestrial GDEs within a 50 km buffer of the assessed tenements, including BWM. No remotely sensed potential terrestrial GDEs were identified by 2rog Consulting in the BWM Study Area.



TERRESTRIAL GROUNDWATER-DEPENDENT ECOSYSTEMS

Blackwater North Extension Project- Aquatic Ecology and GDE Assessment

DPM ENVIROSCIENCES

FIGURE 25

Conceptual understanding

RDM Hydro, 3D Environmental and Groundwater Enterprises (2023) undertook a desktop assessment to identify the distribution of potential terrestrial GDEs within the Study Area. This included a hydrogeological review of shallow groundwater to better understand the groundwater regime with consideration of terrestrial GDEs. RDM Hydro et al. (2023) determined that the shallow water table is a subdued reflection of topography and is generally in excess of 25 mbgl, except in the vicinity of drainage lines and topographic lows where the water table is likely shallower.

RDM Hydro, 3D Environmental and Groundwater Enterprises (2023) presented conceptual ecohydrological models which are likely to be found across the broader BWM tenements and the wider Bowen Basin based on the findings of the desktop study and previous field assessments of other GDE studies in the Bowen Basin. The conceptual ecohydrological models include perched aquifers in alluvium and systems exhibiting interactions with Tertiary and Permo-Triassic sediments (coal seams and alluvium). For the Quaternary Alluvium formations, which includes Taurus Creek, groundwater occurs as ephemeral, discontinuous perched aquifers in sandier material, with clayey material forming aquitards (RDM Hydro, 3D Environmental and Groundwater Enterprises 2023). The alluvial sediments are of limited extent and thickness but are likely to be episodically recharged by rainfall run-off when the watercourse hosts water, resulting in the presence of perched aquifers associated with the alluvium (Figure 26).

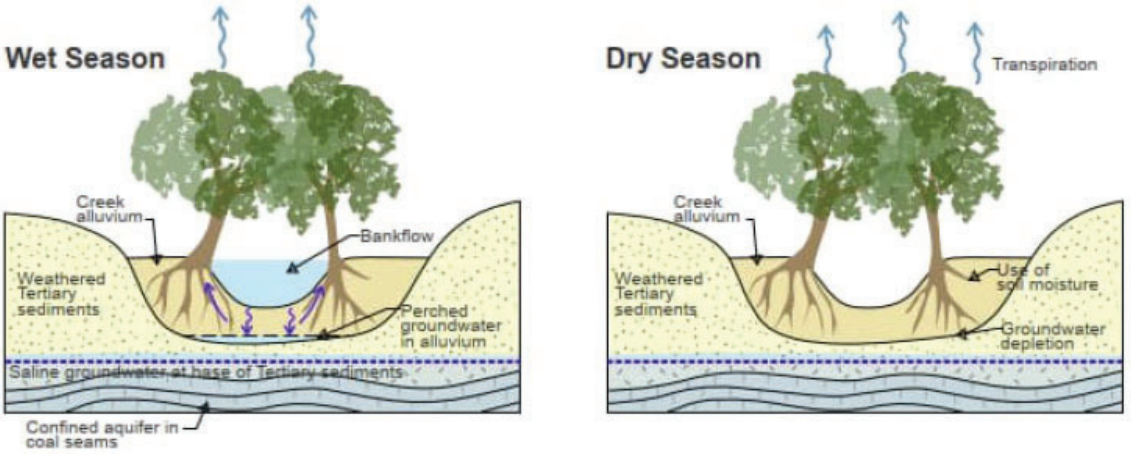


Figure 26 Perched aquifer in creek alluvium, showing seasonal depletion (RDM Hydro, 3D Environmental and Groundwater Enterprises 2023)

The potential terrestrial GDEs of Taurus Creek are dominated by coolibah (*Eucalyptus coolabah*), aligning with RE 11.3.3 on the channel and 11.3.1 further out on the floodplain where brigalow (*Acacia harpophylla*) tends to dominate. RDM Hydro, 3D Environmental and Groundwater Enterprises (2023) identify that the coolibah is likely to utilise groundwater only when groundwater is <5 mbgl and moisture availability in the vadose zone is extremely limited. Brigalow (*Acacia harpophylla*) is also prevalent within the State-mapped terrestrial GDE polygon, particularly on the floodplain away from the channel. However, brigalow is not considered to represent groundwater-dependent vegetation.

Field verification of terrestrial GDEs

Two sites/areas (TGDE-1 and TGDE-2) were field verified for groundwater-dependent trees within the single State-mapped polygon of potential terrestrial GDE (DETSI 2025d) adjoining Taurus Creek in the Study Area (Figure 25). These sites were assessed in June 2025, then again in October 2025. The raw data relating to pre-dawn LWP and SWP measurements is provided as Appendix F and is graphed in Figure 27. Pre-dawn LWP measurements ≥ - 0.55 MPa indicate trees that are likely accessing a saturated source of water (ranging from fresh to slightly saline) in either the soil profile or water table (Section 3.8.1; Figure 27).

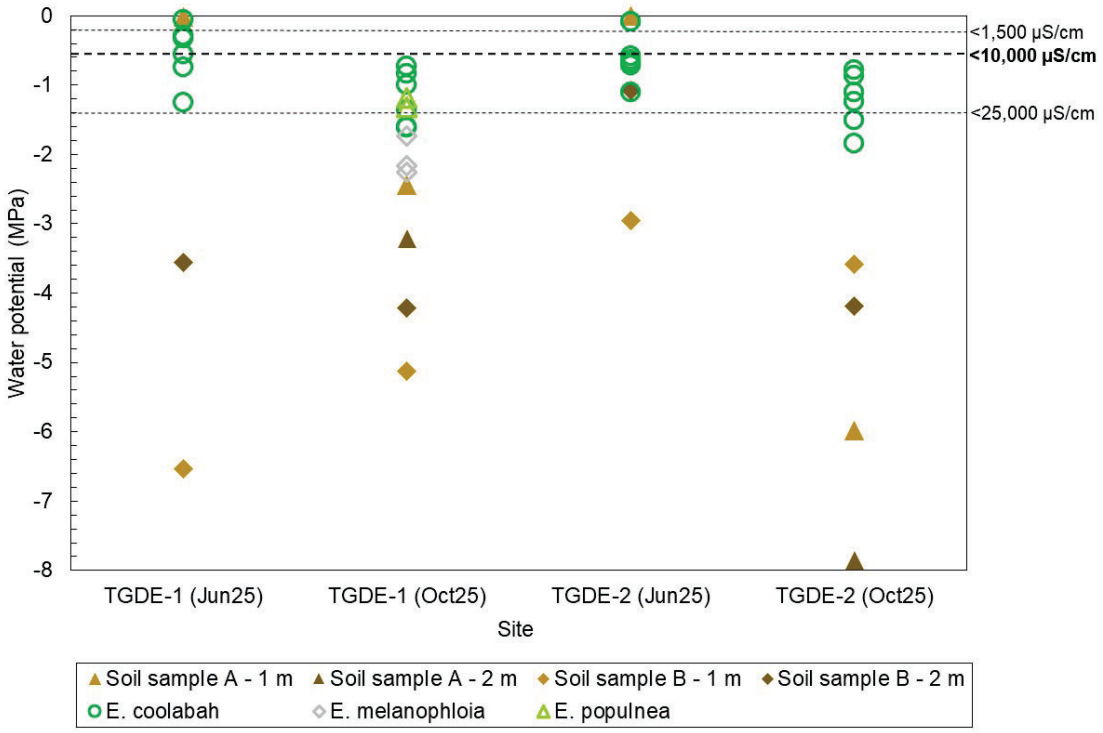


Figure 27 Pre-dawn leaf water potential (LWP) and soil water potential (SWP) measurements at target sites

Note: dashed lines indicate expected LWP value for trees in equilibrium with saturated moisture sources expected at 1,500 µS/cm, 10,000 µS/cm and 25,000 µS/cm.

Five of the 12 trees assessed at sites TGDE-1 and TGDE-2 were likely intercepting either soil water or groundwater at the time of assessment 20 June 2025. This comprised coolibah (*Eucalyptus coolabah*) in the channel, on the stream bank, and on the adjoining floodplain. Saturated sediments were encountered in the upper 1 m of bed sediments. Soil/sediments were much drier in the upper 2 m of the soil/sediment profile on the adjoining floodplain. It is likely that those well-hydrated trees (pre-dawn LWP ≥ -0.55 MPa) sampled on the bed and bank of Taurus Creek were intercepting soil/sediment water in the upper profile. However, some of the well-hydrated trees on the floodplain, which were up to 30 m from the channel, were likely intercepting deeper water in the perched alluvial aquifer at the time of assessment 20 June 2025.

The same 12 coolibah trees were assessed in October 2025. In addition, three silver-leaved ironbark (*E. melanophloia*) and two poplar box (*E. populnea*) individuals (rare occurrence of each in the vegetation community) were also assessed at site TGDE1 in October 2025 (Figure 25). Pre-dawn LWP measurements indicated that these 17 trees were unlikely accessing groundwater at the time of assessment, as indicated by measurements < -0.55 MPa. Sampling of nearby bore RN165949 (approximately 3 km upstream) indicated only brackish conditions (4,601 µS/cm, within the range of fresh to slightly saline [<800 to 10,000 µS/cm]) supporting the notion that trees were unlikely to be accessing any groundwater, as opposed to trees accessing moderately saline to saline groundwater (Section 3.8.1).

Given Taurus Creek is subject to continuous natural wetting and drying cycles, the riparian vegetation would access available moisture in the soil/sediment following rainfall, runoff and flow, and likely accesses shallow groundwater in the alluvial aquifer in drier times. This terrestrial GDE would likely be opportunistic, utilising small inputs of groundwater on occasion, but likely persisting without this input.

The upstream and downstream extents of terrestrial GDEs within the Study Area have not been delineated, but likely correspond with REs 11.3.2, 11.3.25, 11.3.27, 11.3.3 and 11.3.6 on Taurus Creek field verified by E2M Pty Ltd (E2M) (2026) (Figure 25). Remnant vegetation on Two Mile Gully and further upstream on Taurus Creek is unlikely to constitute terrestrial GDEs due to less extensive alluvial deposits and where site observations by DPM Enviroscences (aquatic sites R7, R8 and R11) found the riparian vegetation to be dominated by regrowth yellowwood (*Terminalia oblongata*) and brigalow (*Acacia harpophylla*), neither of which are considered to represent groundwater-dependent vegetation

Ecological value of terrestrial GDEs of the Study Area

The terrestrial GDEs of the Study Area would likely exist without groundwater input but are known to utilise groundwater on occasion (episodic or opportunistic GDEs, not obligate GDEs). Notwithstanding, these vegetation communities form potential habitat for the Endangered (EBPC Act and NC Act) folivorous species koala (*Phascolarctos cinereus*) and likely provide higher leaf moisture levels and nutritional value than surrounding vegetation not able to access groundwater in drier times.

Accordingly, the terrestrial GDEs of the Study Area would be attributed a HEV (Category 1 sensitive environmental area) in accordance with the *Risk Assessment Guidelines for GDEs* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019).

4.9 Matters of National Environmental Significance

World and National Heritage properties

No World Heritage Properties or National Heritage Places are identified for the Search Area in the EPBC Act Protected Matters Report (DCCEEW 2025a; Appendix A).

Wetlands of International Importance

No wetlands of International Importance are identified within the Search Area in the EPBC Act Protected Matters Report (DCCEEW 2025a). Wetlands of International Importance nearest to the Study Area include those of the Shoalwater and Corio Bays Area, approximately 200 km to the north-east. These wetlands are well removed from the Study Area and are hydraulically connected only by the Coral Sea.

Threatened Ecological Communities

No EPBC Act listed TECs, relevant to aquatic ecology, are identified from the Search Area (DCCEEW 2025a). No aquatic TECs are expected to occur within the Study Area.

Threatened Species

No MNES aquatic flora or fauna species were detected during field surveys, nor were any detected during previous surveys of the Study Area (EMM 2023).

Aquatic fauna species that are MNES which are considered to have potential to occur in the broader desktop Search Area include the Critically Endangered white-throated snapping turtle (*Elseya albagula*) and the Vulnerable Fitzroy River turtle (*Rheodytes leukops*), each listed under the EPBC Act. However, due to habitat requirements, it is unlikely these species occur within waterways or wetlands of the Study Area as either resident or transient occurrences. Habitat for these species was not encountered within the Study Area (Section 4.6.3).

No MNES aquatic flora species are likely to occur within the Study Area (Section 4.6.1).

Migratory Species

No aquatic migratory species (i.e. migratory species that live in water for most or all their lives) are identified from the Search Area.

Commonwealth Marine Areas

The Study Area is located approximately 200 km west of any marine area and is separated hydraulically by at least two sub-catchments (Dawson River and the Fitzroy River) with varying land use and water quality.

Nuclear actions (including uranium mines)

The Action does not involve any nuclear actions.

Water resource

A water resource, in relation to coal seam gas development and large coal mining development, is an MNES. This report documents the aquatic ecology of water resources.

4.10 Matters of State Environmental Significance

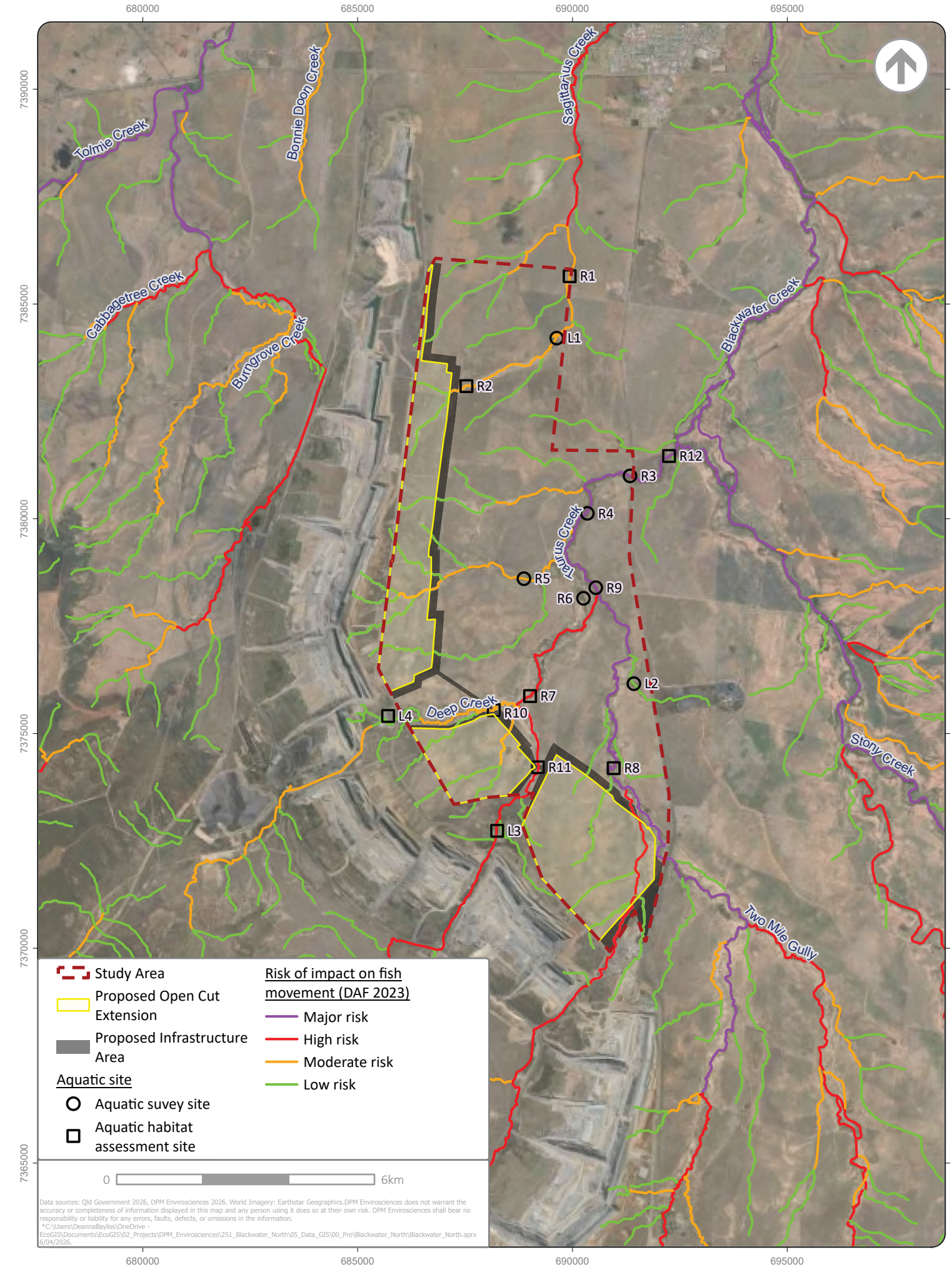
The environmental offsets framework in Queensland includes the *Environmental Offsets Act 2014*, the EO Regulation and the Queensland Environmental Offsets Policy. MSES are defined in the EO Regulation and are a component of the biodiversity state interest identified in the Queensland State Planning Policy.

MSES were identified during the desktop review as occurring within the Study Area (Table 25). Potential MSES of relevance to aquatic ecology include 'waterways providing for fish passage'. A 'waterway providing for fish passage' is only an MSES if waterway barrier work is proposed that would limit the passage of fish along a waterway.

Figure 28 presents the potential aquatic MSES mapping for the Study Area.

Table 25 Matters of State Environmental Significance located within the Study Area

Prescribed Environmental Matter	Within the Study Area	Detail
Regulated vegetation	-	Refer to terrestrial ecology assessment.
Connectivity areas	-	Refer to terrestrial ecology assessment.
Wetlands and watercourses	No	The Study Area does not contain any HES wetlands or High Ecological Value waters or watercourses (Figure 11).
Designated precinct in a strategic environmental area	No	The Study Area is not a designated precinct in a strategic environmental area.
Protected Wildlife Habitat	-	Refer to terrestrial ecology assessment. No Conservation-significant aquatic species observed or assessed as likely to occur.
Protected Areas	No	No Protected Areas occur within or adjoining the Study Area.
Fish Habitat Areas and Highly Protected Zones of State Marine Parks	No	The Study Area is not located in a State Marine Park.
Waterway providing for fish passage	Yes	Waterways within the Study Area provide for fish passage (Figure 28).
Marine Plants	No	The Study Area is not located in a marine environment.
Legally Secured Offset Area	-	Refer to terrestrial ecology assessment.



AQUATIC MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE MAPPING

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 28

5 POTENTIAL IMPACTS

5.1 Aquatic habitat modification and loss

The Project would remove or otherwise modify aquatic habitats in the Project Area, comprising ephemeral waterways and semi-permanent farm dams. These habitats are unlikely to support aquatic species of conservation significance listed under the NC Act or EPBC Act, given the lack of suitable habitat features (Section 4.6).

No 'watercourses', as defined by the *Water Act 2000,* would be directly impacted by the Project. Several first and second order waterways (based on Strahler 1952) would be removed (Section 4.1.3), comprising an aggregate 23.6 km of first order waterways and 5.2 km of second order waterways. Waterway crossings (either bridge, culvert or ford) are proposed on a retained second order reach of Deep Creek and a fourth order reach of Taurus Creek. Aquatic habitat would be modified at each of these locations to enable the construction of properly formed waterway crossings.

All aquatic flora and fauna species detected during the surveys are Least Concern under the NC Act. No aquatic fauna species listed under the EPBC Act or NC Act were detected. The extent of aquatic habitat, and consequently the extent of Least Concern aquatic flora and fauna species within the Project Area, would be reduced because of the Project. The species detected within the Study Area are common and have a broad distribution in the region and so the removal of these habitat areas from the Project area would not have a significant impact on these species as a whole.

5.2 Fish passage

'Waterway barrier works' are defined in the *Fisheries Act 1994* to mean a dam, weir or other barrier across a waterway if the barrier limits fish access and movement along a waterway. While it is understood that a waterways barrier works permit is not required where the works occur in a ML authorised under an EA, fish passage is an MSES and still needs to be considered. A 'waterway providing for fish passage' is an MSES (if located outside of Urban Areas – as per Schedule 2, Section 10 of the EO Regulation) only if a waterway barrier work is proposed that would limit the passage of fish.

The DPI (2025b) *Accepted development requirements for operational work that is constructing or raising waterway barrier works* states the requirements that must be complied with and provides guidance for conducting operational work that involves constructing or raising waterway barrier works. If the proposed waterway crossing does not meet the DPI (2025b) accepted development requirements, it would need to achieve the assessable development requirements (performance outcomes and/or acceptable outcomes) identified in the Department of State Development, Infrastructure and Planning (2025) *State Code 18: Constructing or raising waterways barrier works in fish habitats*, or be otherwise approved by DPI.

At the location of the proposed crossing (site R11), Taurus Creek is mapped by DPI (2025a) as being at High risk of adverse impact from waterway barrier works on fish movement Figure 6). Deep Creek (site R10) and other unnamed tributaries are State-mapped (DPI 2025a) as being at Moderate and Low risk of adverse impact from waterway barrier works on fish movement (Figure 6, Section 4.1.3).

Waterway removal

A number of first and second order (based on Strahler 1952) waterways within the Project area, being waterways State mapped as being at Low or Moderate risk of adverse impact from waterway barrier works on fish movement (Figure 6), would be completely removed or otherwise significantly altered by the Project. This comprises an aggregate 22.3 km of first order / Low risk waterways and 2.8 km of second order / Moderate risk waterways. An approximate 3.9 km third order / State mapped High risk waterway would also be removed and replaced with a constructed diversion channel (see 'Waterway diversion' below). While the Project would remove these waterways and wetlands (small farm dams) that provide fish habitat within the Proposed Project Area and Infrastructure Area, it would not fragment fish habitat as these waterways do not connect to fish habitat further upstream.

Waterway diversion

Approximately 3.9 km of an unnamed tributary of Two Mile Gully would be replaced by an approximate 2.4 km constructed clean water drain within the Project area (Figure 3, Section 3.6.1). This unnamed tributary of Two Mile Gully is State mapped (DPI 2025a) as being at High risk (third order) of adverse impact from waterway barrier works on fish movement (Figure 6), although would be considered only Moderate risk (second order) if considering the Emu Creek diversion already in place upstream.

The proposed clean water drain is a trapezoidal channel with base width of 5 m, a maximum top width of 65 m, 1V:5H (vertical rise to horizontal run) internal batter slopes and a longitudinal slope of 0.7% (WRM 2026). In comparison, the existing tributary (to be diverted) has a base width between <2 m and up to 5 m, with bank slopes of between 1V:5H to 1V:10H, and a longitudinal slope of 0.35% to 0.61% (WRM 2026). In summary, the proposed clean water drain is slightly steeper than the steepest section of the existing tributary being diverted. The channel shape of the proposed clean water drain generally would not replicate the existing tributary, due to the constraints of the site (WRM 2026). Fish passage is not a key consideration for the proposed clean water drain, as it does not connect to fish habitat upstream of the Project area. Notwithstanding, the clean water drain would incorporate a number of deeper pools to provide refuge to fish attempting to inhabit or pass through it.

Flood levees, constrained flow and increased flow velocities

Flood levees, built to contain 1 in 1,000-year flood events, would be positioned between Taurus Creek and the proposed pits and between Deep Creek and the proposed pits (WRM Water and Environment Pty Ltd [WRM] 2026). These levees would constrain flood flows within Taurus and Deep creeks during mining operations, increasing flood flow velocities to varying degrees.

The floodplains of Deep and Taurus creeks would likely be constrained adjoining the proposed open cut pits. However, the flood levees would be sloped and constructed with a rough earthen surface. Accordingly, these reaches are expected to still provide areas of low to no flow on the outer extremities to allow for fish passage and resting opportunities under all low, moderate and high flow conditions.

Waterway crossings

Waterway crossings would be constructed on a Moderate risk reach of Deep Creek (site R10 in Figure 6) and on a High risk reach of Taurus Creek (site R11 in Figure 6). These crossing locations are indicative and may be changed during the design process. Other Low and Moderate risk waterways (Figure 6) may also require either temporary or semi-permanent crossings as part of the Project, such as for development of the Proposed Infrastructure Area ahead of development of the proposed pits (Figure 6).

Of the stream crossing options available, bridges – especially those without instream support sections – would have the least impact on fish passage. It is anticipated that a culvert or ford crossing would be installed at the crossing of Deep Creek and any other waterways field verified as being at Low or Moderate risk of impact to fish passage that may require temporary or semi-permanent crossings as part of the Project (Figure 6).

Poorly designed waterway crossings can create a barrier to fish passage, restricting and/or isolating fish communities and preventing access to fish habitats otherwise available to them. Poorly designed structures can kill or injure fish moving over or around them or can cause fish to become stranded and subjected to poor water quality, lack of food, increased predation, crowding or other conditions that can impact their health, wellbeing and productivity.

Queensland policy and guidance material for waterway barrier works centres largely around the Queensland *Planning Act 2016*, which does not strictly apply to development authorised under the *Mineral Resources Act 1989*. Notwithstanding, the policies and guidance material help to achieve proper consideration of on-lease ecological values.

The Project would require crossings of waterways. However, the Project is unlikely to have a significant impact on Waterways Providing for Fish Passage given waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b).

The detailed design and construction of each waterway crossing will involve an assessment against DPI (2025b), which is beyond the scope of this aquatic ecology and GDE assessment.

5.3 Release of mine-affected water

The Project includes the controlled release of mine affected water in accordance with the conditions of EA EPML00717813 (as amended).

5.3.1 Existing Environmental Authority release conditions

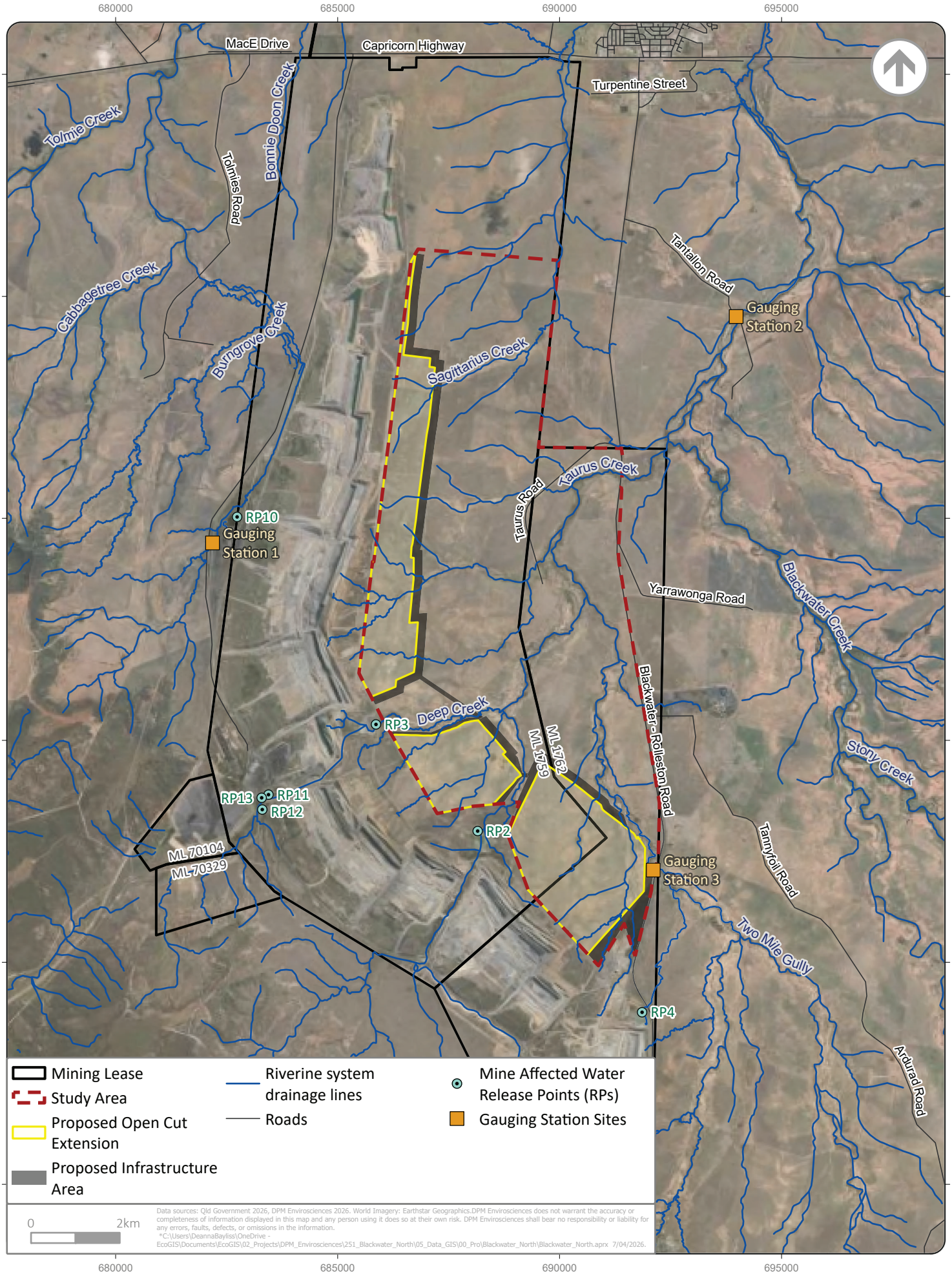
The existing EA includes 11 RPs; three of which are relevant to the Study Area: RP2 (Taurus Dam), RP3 (Deep Creek Dam) and RP4 (Tannyfoil Dam) (Figure 29). These dams are able to release both actively via a gate valve and passively via the spillway.

The existing EA permits the release of mine-affected water with an EC of up to 10,000 µS/cm (being slightly to moderately saline water) from RP3 and RP2 into the second order Deep Creek and fourth order Taurus Creek, respectively, when flows of ≥ 1 cubic metres per second (m^3/s) are encountered 18 km downstream at Gauging Station 2 on the fifth order Blackwater Creek (Figure 29). The existing EA allows for mine-affected water releases to commence when flows at this downstream gauging station exceed ≥ 1 m^3/s. Releases may then continue for up to 28 days, even when flows then fall below the 1 m^3/s, providing that the 80th percentile of EC levels at this downstream gauging station remain below 2,000 µS/cm throughout the release. The existing EA permits the same releases from RP4 into a first order tributary of Two Mile Gully when flows encountered approximately 5 km downstream at Gauging Station 3, on the fourth order Two Mile Gully, exceed ≥ 1 m^3/s.

The existing EA conditions allow for mine-affected water releases into Deep and Taurus creeks when the downstream, and much larger, Blackwater Creek is flowing, but when Deep and Taurus creeks are not necessarily flowing themselves. Such releases have the potential to impact the health and integrity of Deep and Taurus creeks and their ecosystem components, including aquatic ecosystems as well as terrestrial GDEs. The existing EA conditions allow Deep and Taurus creeks (from RP2 and RP3) to be used as conduits for slightly to moderately saline mine--affected water of up to 10,000 µS/cm until these flows reach Blackwater Creek approximately 14 km downstream. The existing EA conditions also allow the tributary of Two Mile Gully between RP4 and Two Mile Gully to be used as a conduit for this mine-affected water.

5.3.2 Changes to Environmental Authority release conditions

It is understood that releases of mine-affected water from Taurus and Deep Creek dams are proposed to continue consistent with the existing EA conditions (EA EPML00717813; DETSI 2025a).The Water Balance Assessment Report (HydroBalance 2026) indicates that the Project would result in relatively small increases to annual release volumes, including an 11-20% increase during median climatic conditions, up to a 7% increase during wet climatic conditions (tenth percentile) and a 2-4% increase during very wet (fifth percentile) climatic conditions (HydroBalance 2026). Release water quality is not expected to change as a result of the Project (HydroBalance 2026). Despite the relatively small increase to annual release volumes, the approved controlled release strategy is sufficient for maintaining excess mine-affected water volumes at BWM (HydroBalance 2026). There are no proposed changes to the currently approved controlled release strategy as a result of the Project (HydroBalance 2026). Accordingly, the release of mine-affected water from the Project is not anticipated to affect the receiving environment beyond existing impacts/conditions already approved under the existing EA for BWM.



EXISTING EA EPML00717813 MINE-AFFECTED WATER RELEASE POINTS AND GAUGING STATIONS

Blackwater North Extension Project - Aquatic Ecology and GDE Assessment

FIGURE 29

5.4 Changes in surface water

Surface water flows and quality are relevant to the health and productivity of aquatic ecosystems. The following sections discuss surface water and potential impacts of the Project on surface water from an ecological perspective. This section draws on the key conclusions from the *Surface Water Assessment* (WRM 2026) for the Project.

5.4.1 Surface water flow

Development of the open cut pits would remove several first and second order (based on Strahler 1952) waterways that are tributaries of Taurus Creek, and the upper reaches of three first order tributaries of Sagittarius Creek.

The Project would result in an approximate 8.9% reduction of the Taurus Creek catchment and a 7.9% reduction of the Sagittarius catchment, associated with capture of upstream catchment areas within the open cut pits (WRM 2026). While the reduction in Taurus Creek catchment area is slightly greater, the reduction in the Sagittarius Creek catchment is also material and therefore potential flow impacts to Sagittarius Creek are not necessarily negligible and require consideration in the context of overall hydrological behaviours.

A flow duration curve prepared for Taurus Creek, at the Taurus Creek downstream gauge near the downstream extent of the Study Area, shows that Taurus Creek is ephemeral, with flows >1 megalitre per day occurring less than 10% of the time (WRM 2026). The flow duration curve for both existing and Project conditions indicate only minor changes in the magnitude and frequency of flows under most flow conditions (WRM 2026). Whilst the Project may change the magnitude of peak flows marginally, the duration of flows in the Taurus Creek main channel would not be materially changed (WRM 2026).

A diversion of an unnamed tributary of Two Mile Gully is proposed within the Project area and is referred to as the proposed clean water drain. This flow would be diverted along the south-eastern margin of the Stewarton Pit to accommodate Project mining activities. Hydraulic modelling indicates the proposed clean water drain would safely convey flows up to and including the 0.1% AEP event, while maintaining an ephemeral, event-driven flow regime consistent with baseline conditions. Predicted changes to flow velocities and stream power would remain well within accepted stability thresholds (WRM 2026).

Further details regarding potential impacts to flows are outlined in the *Surface Water Assessment* (WRM 2026). Overall, notwithstanding the reduction in contributing catchment area, the Project is not expected to fundamentally alter the flow regime characteristics of the remaining waterways within the Project area and broader Study Area. Consequently, adverse impacts to aquatic ecology arising from changes in flow as a result of the Project are expected to be low.

5.4.2 Flood regimes

Protecting the open cut pits from flood ingress from Taurus and Deep creeks will require the construction of flood protection levees. Hydrologic and hydraulic modelling has been undertaken for a range of Annual Exceedance Probability (AEP) events under baseline (existing conditions), during mining and post-mining scenarios (WRM 2026). The events modelled for each scenario are summarised in Table 26.

Table 26 Flood Events Modelled for Baseline, During Mining and Post-Mining Scenarios (WRM 2026)

Mine Stage	Modelling Undertaken					
	50% AEP	5% AEP	2% AEP	1% AEP	0.1% AEP	PMF
Baseline (existing conditions)	✓	✓	✓	✓	✓ [a]	x
During Mining	✓	✓	✓	✓	✓	x
Post-Mining	x	x	x	✓	✓	✓

The modelling scope varies between scenarios to reflect the phase-specific flood, operational requirements and the progressive landform development.

The hydraulic modelling assessed potential changes in flood extent, depth, velocity and afflux associated with the construction of levees and post-mining landforms. The results (WRM 2026) indicate that:

- Predicted increases in peak flood levels are generally minor and contained on-lease for all events up to the 0.1% AEP.
- Increases in peak flood levels are generally less than 0.1 m and peak velocities are generally less than 0.5 m/s across the floodplains within the Project area.
- Increases in peak flood levels greater than 0.1 m and peak velocities greater than 0.5 m/s are generally localised to areas adjacent to the proposed levees, and along the Taurus Creek temporary diversion.
- Predicted velocities and stream power along the proposed clean water drain is predicted to be higher than the existing tributary (under existing conditions); however, would remain within accepted thresholds.

Potential impacts to aquatic flora and fauna are likely to be restricted to changes in flood levels during rare significant flood events (i.e. when the flood protection levees/landforms influence stream levels). Further details regarding potential impacts to flood regimes are outlined in the *Surface Water Assessment* (WRM 2026). Given changes in flood regimes are restricted to localised changes in flood levels during floods, adverse impacts on aquatic ecology are expected to be insignificant.

5.4.3 Surface water quality

Erosion and sedimentation within the Project Area can lead to locally increased dissolved and suspended solids, turbidity, nutrients and contaminants, and reduced DO levels in surface waters. Leaks or spills of hydrocarbon-based fluids from construction equipment and spread of coal dust can also affect surface water quality.

High levels of turbidity can reduce light penetration, photosynthesis and growth of aquatic macrophytes and algae, affecting aquatic ecosystem food chains. Reduced light penetration can also reduce the photosynthetic release of oxygen by these plants and algae, reducing productivity and the extent of habitable conditions available to aquatic fauna. Changes in water quality can also affect the behaviour of aquatic biota (including avoidance response, and reduced foraging) and physiology (including gill damage to fish or reduced efficacy of cloacal respiration in turtles) associated with increased suspended sediment concentrations and deposition. Increased salinity and contaminants such as metals and hydrocarbons can affect the health, reproduction and persistence of aquatic flora and fauna. Increased nutrients can lead to increased or excessive aquatic plant and algal growth, leading to extremes in diurnal DO levels, and in some cases eutrophication and fish kills. These changes in water quality can lead to changes in aquatic and riparian ecological health and community assemblages. The severity of these changes are influenced by the type, concentration and volume of suspended sediments, nutrients, salts and contaminants, along with environmental factors such as dilution and existing exposure levels.

In the absence of suitable controls, potential impacts to surface water quality as a result of the Project would include:

- Ground disturbance associated with vegetation clearing and earthworks may expose dispersive subsoils, increase erosion potential, or impact stream bank stability, which may impact surface water quality (particularly turbidity and suspended sediments).
- Surface water runoff from mine-affected areas may mobilise contaminants into downstream waterways.
- Dust and other airborne particulate matter may enter waterways and increase turbidity, sedimentation, nutrients and contaminants in downstream or other nearby waterways.
- Leaks or spills of hydrocarbon-based fluids from vehicles and equipment used during the Project may spill and enter waterways, impacting water quality.
- Uncontrolled releases of mine-affected water may adversely impact on receiving water quality.
- Continued releases of mine-affected water from Taurus and Deep Creek dams (Section 5.3) in accordance with existing EA conditions (EA EPML00717813; DETSI 2025a), which allows for the release of mine-affected water of up to 10,000 µS/cm (being slightly to moderately saline water), may adversely impact on receiving water quality in Deep Creek and the upper reach of Taurus Creek (until it is diluted in the lower reach of Taurus Creek).

Notwithstanding the above, impacts of the Project on existing water quality are expected to be minimal given the Project is a continuation of existing mining at BWM, with the Project largely utilising existing infrastructure and operating under existing EA conditions. By implementing the mitigation and management measures identified in Sections 6.2 and 6.3, the risk of adverse impacts to the water quality of waterways downstream of the Project is minimal.

5.5 Proliferation of aquatic pests

Aquatic pests, such as invasive pest fishes, can cause a variety of issues within the aquatic environment, such as competing with native fish for food and habitat, preying on native species, habitat disturbance and introduction of disease. Typically, established introduced species have a wide range of environmental tolerances, habitat requirements and food requirements. In addition, they tend to have high reproductive rates and be early maturing, allowing populations to become readily established. These attributes often allow introduced fishes to be more adaptable to changes in the environment, whether natural or manmade, than some native fish species.

The Project is unlikely to result in the addition of new aquatic flora or fauna pest species, nor the growth and spread of aquatic pest species. The Project does not involve the diversion of waterways into adjacent catchments (i.e. beyond the Blackwater Creek catchment) and will not create additional habitat for invasive species. Weed prevention, monitoring and control will continue to be undertaken across the broader BWM to mitigate the number and abundance of weeds. Weed hygiene protocols will continue to be implemented using the dedicated vehicle and machinery cleaning bay located at the Mine Infrastructure Area. Given the controls in place, risks are expected to be low.

5.6 Changes to groundwater-dependent ecosystems

No obligate GDEs are present. Baseline studies confirmed the occurrence of opportunistic facultative terrestrial GDEs within the Study Area (Section 4.8.3). No surface expression or subterranean GDEs were detected within the Study Area, nor are they likely to occur. If present (and undetected), it is likely that any surface expression GDEs would be opportunistic, utilising small inputs of groundwater on occasion, but persisting without this input. Most of the aquatic

biota of the Study Area is adapted to living in ephemeral waterways, reducing the potential risk of impacts to surface expression GDEs should they occur.

The following sections focus on potential impacts of the Project on facultative terrestrial GDEs known to occur within the Project area.

5.6.1 Impact mechanisms

No direct impacts to field-verified facultative GDEs are proposed. Indirect impacts of mining activities are typically associated with reduced surface water recharge, increased groundwater drawdown, and changes in groundwater quality.

Surface water recharge

Groundwater is expected to occur in the shallow alluvium of Taurus Creek as ephemeral, discontinuous perched aquifers in sandier material; with clayey material forming aquitards. The alluvial sediments are expected to be of limited extent and thickness but are episodically recharged by rainfall run-off when Taurus Creek hosts water, resulting in the presence of perched aquifers associated with the alluvium. Pre-dawn LWP measurements in the post-wet season (June 2025) demonstrated that some trees within the Taurus Creek riparian and floodplain corridor were accessing groundwater, likely from a perched alluvial aquifer. Pre-dawn LWP measurements of these same trees (and additional trees) in the pre-wet season (October 2025) demonstrated that none of these trees were accessing groundwater, as the perched alluvial aquifer had likely dried and the deeper tertiary aquifer was likely too deep for these trees to access.

The discontinuous perched aquifers that support opportunistic terrestrial GDEs of the Study Area are recharged by surface flows in Taurus Creek. WRM (2026) has determined that the impact of the Project on the magnitude of flows in Taurus Creek is insignificant and that the duration of flows in the Taurus Creek main channel would not be materially changed (WRM 2026). Consequently, the terrestrial GDEs of the Study Area are unlikely to be affected by the Project.

Groundwater drawdown

Dewatering and depressurisation would result in groundwater drawdown in the regional groundwater table, especially to aquifers near proposed open cut pits.

Dewatering unconfined aquifers can lower the water table to a depth that is inaccessible to tree roots. Terrestrial vegetation that once accessed shallow groundwater in drier times when soil water was not available can begin to show signs of impairment if groundwater levels fall too low. The response of vegetation to this water stress may result in dieback almost immediately or may take years to become obvious (Doody, Hancock and Pritchard 2019).

Changes to subsurface flow paths (by pumping water from mine pits or when groundwater drains through the walls and floors of mine pits) can alter the direction and velocity of groundwater flow, resulting in water moving away from a GDE and towards the extraction point.

Groundwater drawdown in the tertiary and deeper aquifers of the Study Area is unlikely to be of consequence to the terrestrial GDEs of the Study Area, as field surveys have demonstrated that these trees are unlikely to be accessing these regional groundwater aquifers (Section 4.8.3). Consequently, terrestrial GDEs of the Study Area are unlikely to be impacted by groundwater drawdown resulting from the Project.

Change in groundwater water quality

Reduced groundwater volumes and flows in the deeper aquifers can lead to reduced groundwater quality. This can be due to evaporative concentration of salts in mine voids, induced flow of groundwater of reduced quality towards depressurised zones, infiltration of water containing elevated concentrations of dissolved solids, sulphate and metals from waste rock emplacements and mine water storages, or from unintended leaks or spills. However, the discontinuous perched aquifers that support opportunistic terrestrial GDEs of the Study Area are recharged by surface flows in Taurus Creek. The Project is not expected to alter the duration of flows in Taurus Creek, and modelling indicates that changes to flow magnitude would be minor and not ecologically significant.

The facultative terrestrial GDEs of the Study Area are unlikely to be affected by changes in groundwater quality in the deeper aquifers, as field surveys have demonstrated that these trees are unlikely to be accessing these deeper aquifers (Section 4.8.3). Groundwater quality in the shallow perched alluvial aquifers is likely to continue to mirror surface water quality (Section 4.2.2). WRM (2026) identify that release water quality is not expected to change as a result of the Project and determined that impacts on surface water quality in Taurus Creek would be mitigated by adhering to the approved controlled release strategy. The approved controlled release strategy is sufficient for maintaining excess mine-affected water volumes at BWM. There are no proposed changes to the currently approved controlled release strategy as a result of the Project (WRM 2026). Consequently, groundwater quality in the shallow perched alluvial aquifers is unlikely to be impacted by the Project.

5.6.2 Terrestrial groundwater-dependent ecosystem – Taurus Creek riparian vegetation

Ecological value

The facultative terrestrial GDE comprising riparian (including floodplain) vegetation of Taurus Creek would likely exist without groundwater input but is known to utilise groundwater on occasion (episodic or opportunistic GDE, not obligate GDE). Notwithstanding, these vegetation communities form potential habitat for the Endangered (EBPC Act and NC Act) folivorous koala (*Phascolarctos cinereus*) (E2M 2026) and likely provide higher nutrient and leaf moisture levels than surrounding vegetation not able to access groundwater in drier times. Consequently, this terrestrial GDE is attributed a HEV (Category 1 sensitive environmental area) in accordance with the criteria adopted for this assessment (Section 3.4.2).

Impacts

No direct impacts (i.e. clearing) of terrestrial GDEs is proposed. The Project is unlikely to impact the perched alluvial aquifers of Taurus Creek (Section 5.6.1). Consequently, indirect impacts on terrestrial GDEs associated with this aquifer are unlikely. Impacts to the terrestrial GDE comprising riparian/floodplain vegetation of Taurus Creek have been assessed against the impact criteria identified in the *Risk Assessment Guidelines for GDEs* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019). Impacts to the integrity of this terrestrial GDE are considered unlikely based on the majority rule as per Serov, Kuginis and Williams (2012) (Table 27).

Magnitude of risk

The magnitude of risk is determined to be Low when assessed against the criteria identified in the *Risk Assessment Guidelines for GDEs* (Serov, Kuginis and Williams 2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019) (Table 28).

Table 27 Potential impacts of the Project on the perched alluvial aquifers and associated terrestrial GDEs of Taurus Creek (as per Serov, Kuginis and Williams 2012)

Impacts	Likely	Unlikely	Insufficient data
Water quantity impacts			
Will there be an alteration to the water table levels (rising or dropping water tables)?		✓	
Will there be any alteration to the aquifer flow paths?		✓	
Will there be any alteration of aquifer discharge volume to off-site GDEs?		✓	
Will there be an alteration of the frequency/timing of water table level fluctuations?		✓	
Will there be an alteration of surface river base flow?		✓	
Will there be a reduction in artesian/spring water pressure?		✓	
Water quality impacts			
Will there be an alteration to the natural groundwater chemistry and/or chemical gradients?		✓	
Will acid sulphate soils be exposed, resulting in the acidification of groundwater source and acid runoff?		✓	
Will there be an alteration in nutrient loads?		✓	
Will there be an alteration in sediment loads?		✓	
Will there be an alteration in groundwater salinity levels?		✓	
Will there be an alteration in groundwater temperatures?		✓	
Will there be any bioaccumulation of heavy metals?		✓	
Soil and geo-morphological impacts			
Will there be any substrate alteration or compaction; e.g. aquifer, river gravel bed compaction by heavy machinery or over extraction of water?		✓	
Will there be any cracking or fracturing of the bedrock?		✓	
Biological impacts			
Will there be an alteration to the number of native species (i.e. richness) within the groundwater-dependent communities (fauna and flora)?		✓	
Will there be an alteration to the species composition (i.e. diversity) of the groundwater-dependent communities (fauna and flora)?		✓	
Will exotic flora or fauna be introduced?		✓	
Will there be any removal or alteration of a GDE type/subtype habitat?		✓	
Totals	**0**	**19**	**0**
Impact is unlikely (based on the majority rule as per Serov, Kunis and Williams, 2012)			

Table 28 Magnitude of risk of the Project impacting the perched alluvial aquifers and associated terrestrial GDEs of Taurus Creek (as per Serov, Kuginis and Williams 2012)

Risk factors	High	Mod.	Low	ID*	Justification for risk rating
Water quantity asset					
What will be the risk of a change in groundwater levels/pressure on GDEs?			✓		No change to aquifer water levels or pressure.
What will be the risk of a change in the timing or magnitude of groundwater level fluctuations on GDEs?			✓		No change in timing of water level fluctuations.
What will be the risk of changing base flow conditions on GDEs?			✓		No change in direction of flow.
Water quality asset					
What is the risk of changing the chemical conditions of the aquifer?			✓		Negligible change (<5%).
What is the risk on the aquifer by a change in the salt/freshwater interface?			✓		Not applicable.
What is the likelihood of a change in beneficial use of the aquifer?			✓		Negligible change (<5%).
Aquifer integrity asset					
What is the risk of damage to the geologic structure?			✓		No change.
Biological integrity asset					
What is the risk of alterations to the number of native species (i.e. richness) within the groundwater--dependent communities (fauna and flora)?			✓		No reduction in number of species.
What is the risk of alterations to the species composition (i.e. diversity) of the groundwater--dependent communities (fauna and flora)?			✓		No change in species composition.
What is the risk of increasing the presence of exotic flora or fauna?		✓			Little to none.
What is the risk of removing or altering a GDE subtype habitat?			✓		No removal or alteration of habitat.
Total number of attributes	0	1	10	0	
Overall risk	**Low (based on the majority rule as per Serov, Kunis and Williams, 2012)**				

Notes: *ID = Insufficient Data

Application of risk matrix to determine management actions

Terrestrial GDEs comprising riparian (and floodplain) vegetation of Taurus Creek are of HEV but subject to a Low magnitude of risk from Project activities in accordance with Serov, Kuginis and Williams (2012), as referred to in the *Information Guidelines Explanatory Note: Assessing GDEs* (Doody, Hancock and Pritchard 2019). The risk matrix (Table 4, Section 3.4.5) therefore places this terrestrial GDE in the 'A' box, with the relevant management actions identified as (Serov, Kuginis and Williams 2012):

- short-term – protection measures for the aquifer and GDEs, and baseline risk monitoring;
- mid-term – continue protection measures for aquifers and GDEs, and periodic monitoring and assessment; and
- long-term – adaptive management, and continued monitoring.

Considering that impacts to this terrestrial GDE are unlikely, key measures would instead comprise the avoidance of both direct and indirect impacts on terrestrial GDEs.

5.7 Final landform

Final landform modelling for the Project indicates that the final landform would be stable and flood flows will be free draining (WRM 2026). At the conclusion of mining, final voids would remain. Three of these final voids are predicted to become long-term sinks and the remaining two are predicted to be flow through systems reporting to those long-term sinks (SLR 2026). These voids are not predicted to overflow into the environment (WRM 2026). Results of the flood modelling indicate that the proposed final landform design prevents flood ingress to the final void for events up to the 0.1% AEP event. Overall, the final landform is expected to be safe, stable, and with no adverse impacts to surrounding surface water quality or flood behaviour.

5.8 Evaluation of impacts on Matters of National Environmental Significance

The EPBC Act lists 'a water resource, in relation to coal seam gas development and large coal mining development' as an MNES. An assessment of the impacts on water resources is outside the scope of this assessment.

5.9 Evaluation of impacts on Matters of State Environmental Significance

No HES wetlands or HEV waterways are present within or in the vicinity of the Study Area. No aquatic MSES flora or fauna species have been recorded from the Study Area, nor are they likely to occur within or in the vicinity of the Study Area given the lack of suitable habitat. Waterways Providing for Fish Passage is the only MSES relevant to aquatic ecology that is known to occur in the Study Area or surrounds that may be subject to impacts from the Project.

The *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) is used to determine if a prescribed activity would have a significant residual impact on MSES. A significant residual impact is defined as an adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that:

a) remains, or will or is likely to remain (whether temporarily or permanently), despite on-site avoidance and mitigation measures for the prescribed activity; and

b) is, or will or is likely to be significant.

Potential impacts on the MSES Waterways Providing for Fish Passage are discussed below.

5.9.1 Waterways providing for fish passage

Most waterways that would be removed for mining within the Project footprint are mapped as having Low and Moderate risk of impact to fish passage in the Waterway Barrier Works mapping layer (Figure 6, Section 4.1.3). While the Project would remove waterways and wetlands (small farm dams) that provide fish habitat within the Proposed Project Area and Infrastructure Area, it would not fragment fish habitat as these waterways do not connect to fish habitat further upstream.

Approximately 3.9 km of an unnamed tributary of Two Mile Gully would be replaced by an approximate 2.4 km clean water drain within the Project area (Figure 3, Section 3.6.1). This tributary of Two Mile Gully is State mapped (DPI 2025a) as being at High risk (third order) of adverse impact from waterway barrier works on fish movement (Figure 6), although would be considered only Moderate risk (second order) if considering the Emu Creek diversion already in place upstream. Fish passage is not a key consideration for the proposed clean water drain, as it does not connect to fish habitat upstream of the Project area. Notwithstanding, the channel of the proposed clean water drain would incorporate a number of deeper pools to provide refuge to fish attempting to inhabit or pass through it.

At least two semi-permanent waterway crossings for vehicles would be constructed, including a crossing of the State-mapped Moderate risk Deep Creek and a crossing of the State-mapped High risk Taurus Creek. Culvert or ford crossings would be installed at the other crossings of waterways field verified as being at Low or Moderate risk of impact to fish passage.

Fish passage would be considered and maintained at each of these crossings. As described in Section 5.2, waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b).

Fish passage requirements associated with the waterway barrier works (a dam, weir or other barrier across a waterway) are considered in relation to impacts on MSES. An assessment of the potential impacts on this MSES, in accordance with the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP 2014) is provided in Table 29. The assessment concludes that the Project is unlikely to have a significant impact on Waterways Providing for Fish Passage on the basis that waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b). Accordingly, offsets are not triggered for this matter.

Table 29 Waterways Providing for Fish Passage Significant Residual Impact Assessment

Criteria	Assessment/Consideration
An action is likely to have a significant impact on a waterway providing fish passage if there is a real possibility that the action will:	
Result in the mortality or injury of fish	The Project is unlikely to result in barriers that cause the mortality or injury of native fish because: ▪ waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b), so as not to create a barrier to fish movement; ▪ the proposed clean water drain would incorporate a number of deeper pools to provide habitat and refuge for fish inhabiting or attempting to pass through it; ▪ native fish encountered in waterbodies (dams) that are dewatered would be relocated in accordance with a General Fisheries Permit or equivalent; and ▪ the reaches of Deep and Taurus creeks constrained by the proposed open cut pits and their flood levees would still provide areas of low to no flow on the outer extremities to allow for fish passage under all flow conditions (Section 5.2).
Result in conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fishes energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish.	The Project is unlikely to result in conditions that would substantially increase risks to the health, wellbeing and productivity of fish seeking passage because: ▪ waterway crossings would be constructed so as not to create a barrier to fish movement; ▪ the Project is unlikely to lead to substantial changes in water quality parameters beyond existing conditions; and waterways constrained by proposed flood levees are still expected to provide areas of low to no flow on the outer extremities to allow for passage of all fish species under all flow conditions (Section 5.4.2).
Reduce the extent, frequency or duration of fish passage previously found at a site.	The Project would directly remove or otherwise alter the extent of an aggregate 22.3 km of Low risk waterways, 2.8 km of Moderate risk waterways and 3.9 km of High risk waterway (Figure 6). The frequency and duration of fish passage would decrease downstream of these removed waterways, owing to the reduced catchment area. These waterways are of relatively low ecological value (Section 4.2.6). These waterways are highly ephemeral; therefore, fish habitat and passage are restricted to periods during and immediately following rainfall. These waterways do not connect to important fish habitat upstream, given upstream reaches are within existing active mining areas. As such, the Project would remove these waterways providing fish habitat within the Project and Infrastructure areas, but would not fragment fish habitat in these waterways as they do not connect to fish habitat further upstream.

Criteria	Assessment/Consideration
	The Project involves the construction of two internal road crossings across Deep and Taurus creeks adjacent to the Deep Creek open pit. Deep and Taurus creeks are indicated as Moderate and High risk waterways in the DPI (2025a) Queensland Waterways for Waterway Barrier Works mapping in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b). The two proposed road crossings would be designed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b) to facilitate fish passage along Deep and Taurus creeks. The Project is not expected to reduce the frequency or duration of fish passage within Two Mile Gully (WRM 2026).
Substantially modify, destroy or fragment areas of fish habitat (including, but not limited to in-stream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish.	The waterways of the Project area are not known to constitute any rare, unique or particularly important habitats or features essential for the breeding and/or survival of the native fish species known to utilise this area. Waterways verified as low stream order (1 or 2) would be removed or otherwise impacted by mining activities (Section 5.2; Figure 6). These waterways are highly ephemeral and are not considered to constitute, nor provide a conduit to, fish habitat areas essential for the breeding and/or survival of native fish. Waterway crossings would be positioned on Deep and Taurus creeks. Fish passage would be maintained between existing upstream and downstream habitats because these waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b).
Result in a substantial and measurable change in the hydrological regime of the waterway, for example, a substantial change to the volume, depth, timing, duration and frequency of flows.	Surface water hydrology would be altered by the Project as a result of removing waterways, capturing water in pits or dams, water loss due to use for Project operation or pond evaporation. However, the volume, depth, timing, duration and frequency of flows would continue to reflect the ephemeral and variable flow nature of the waterways of the Project area. The Project is considered unlikely to result in a substantial and measurable change in the existing hydrological regime of the waterways draining the Project area. The seasonality of fish movements is unlikely to be affected.
Lead to significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues to movement in local fish species.	The Project is unlikely to lead to substantial changes in water quality parameters beyond existing conditions. Any water releases required by the Project would be managed in accordance with the EA Conditions (as amended). The risk of deteriorating water quality would be mitigated by monitoring and maintaining receiving environment and release water quality and quantity in accordance with the EA Conditions (as amended).

The assessment concludes that significant residual impacts on this MSES are unlikely. Accordingly, offsets are not triggered for this matter.

6 AVOIDANCE AND MITIGATION MEASURES

Consistent with DETSI's management hierarchy, the mitigation strategy for the Project has focused on a hierarchy of:

1. avoidance;
2. minimisation;
3. mitigation; then
4. offset residual impacts.

The avoidance or minimisation of adverse impacts is most relevant to the design phase of the Project, where information collected through desktop analysis and field surveys can be incorporated into the planning and preliminary engineering work (Section 6.1). The mitigation of impacts and the implementation of monitoring and management plans are most relevant to the construction and operational phases of the Project. Table 30 provides a summary of the mitigation measures for the Project, with a brief description of potential impacts and measures that can be implemented during the construction and operational phases of the Project.

The requirement for environmental offsets has not been triggered by aquatic MNES or MSES.

6.1 Measures to avoid and minimise impacts

The following measures would be implemented to avoid and/or minimise impacts on aquatic ecology and GDEs:

- Where possible, waterways have been avoided in the mine design. The larger waterways in the Study Area, comprising of Deep Creek, Taurus Creek and Two Mile Gully do not require diversion.
- The construction of waterway crossings would be scheduled to coincide with periods of no to low flow, where possible.
- Direct impacts (such as clearing for drilling or access tracks) would avoid terrestrial GDEs along Taurus Creek.

6.2 Impact mitigation

Mitigation measures proposed to be implemented for the Project are detailed in Table 30.

Table 30 Mitigation measures

Potential impact	Mitigation measures

1. Aquatic habitat clearing	▪ Clearing of native vegetation undertaken progressively over the life of the mine and only in areas required for mining activities within the following year. This would have the effect of minimising the area of exposed land and associated sedimentation risk.
	▪ Update and implement the existing Environmental Management Plan (or equivalent) for the Blackwater Mine to include vegetation management measures relevant to Blackwater North, including:
	  ▪ demarcate exclusion zones to protect areas of vegetation to be retained prior to clearing; and
	  ▪ clearing of native vegetation to be undertaken progressively.
	▪ Update the BWM Erosion and Sediment Control Plan (Section 6.3) to include reference to the Project.
	▪ Update and implement the existing Environmental Management Plan (or equivalent) for the Blackwater Mine to include fauna species management measures relevant to Blackwater North, including:
	  ▪ use of suitable fauna spotter-catchers for relocation of animals, including any native fish or turtles during dewatering of any waterways (pools) and farm dams;
	  ▪ salvage of microhabitat features (e.g. logs and boulders) from waterway crossing construction footprints and reinstatement immediately downstream.
	▪ Progressive and timely re-instatement and rehabilitation of the disturbed landform consistent with the rehabilitation criteria in EA EPML00717813 (as amended).

2. Increased numbers of pests	▪ Identify and treat aquatic weed infestations that may arise within the Study Area. ▪ Implement strategies for preventing the spread of aquatic weeds and pest fish, including machinery (e.g. excavator) wash-down on arrival, and before entering, the Study Area.
3. Creating a barrier to fish passage	▪ Design and construct waterway crossings consistent with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b). ▪ Incorporate a number of deeper pools into the channel of the proposed clean water drain design to provide habitat and refuge for fish inhabiting or attempting to pass through it. ▪ Where possible, construct waterway crossings in the drier months of the year when surface water flows (and aquatic fauna) are less likely to be encountered.
4. Alteration to surface water quality and/or quantity	▪ Where possible, construct waterway crossings in the drier months of the year when surface water flow (and associated risk of impacting water quality) is less likely to be encountered. ▪ Clearing of native vegetation would be undertaken progressively over the life of the mine and only in areas required for mining activities within the following year. This would have the effect of minimising the area of exposed land and associated sedimentation risk. ▪ Refuel and maintain machinery in designated locations away from waterways. Use machinery that is regularly serviced in accordance with the manufacturer's recommendations. Familiarise operators with the spill response procedure for the BWM. ▪ Update the BWM Erosion and Sediment Control Plan (Section 6.3) to include reference to the Project. ▪ Update the BWM Water Management Plan (Section 6.3). ▪ Continued monitoring of surface water quality for receiving water in accordance with the EA. ▪ Update and implement the Fitzroy Regional Receiving Environment Monitoring Program for the BWM, to incorporate the Project.

6.3 Management plans

The existing management plans which would be updated to include the mitigation measures identified in Table 30 above for are:

- BWM Erosion and Sediment Control Plan (Whitehaven Blackwater 2022);
- BWM Land and Biodiversity Management Plan (Whitehaven Blackwater 2020); and
- BWM Water Management Plan (Whitehaven Blackwater 2023).

7 CONCLUSION

The waterways of the Study Area are predominantly first and second order tributaries, with some reaching up to fourth order, including Two Mile Gully and Taurus Creek. Two Mile Gully flows into Taurus Creek, which then flows north into the fifth order Blackwater Creek downstream of the Study Area. Mapped wetlands are comprised of lacustrine wetland waterbodies and include farm dams and two mine water dams (Deep Creek Dam and Taurus Dam). Several smaller, unmapped lacustrine wetland waterbodies (farm dams and a riverine flood channel wetland) also occur.

The waterways of the Study Area are ephemeral and are expected to experience flow only after sustained or intense rainfall and runoff in the catchment. Stream flows are highly variable, with most channels expected to dry during winter to early spring when rainfall and runoff is historically low. Consequently, physical attributes, water quality, and the composition of aquatic flora and fauna communities are expected to vary seasonally.

No conservation-significant aquatic flora or fauna species listed under the NC Act and/or EPBC Act were recorded from the Study Area. Due to habitat requirements and distributional range, it is unlikely that any conservation-significant aquatic flora or fauna species occur within the waterways or wetlands of the Study Area as either resident or transient occurrences.

There are no wetlands of International Importance or National Importance identified within the Study Area.

MSES relevant to this aquatic ecology assessment comprise waterways providing for fish passage, which is an MSES only if waterway barrier works are proposed that would limit the passage of fish along the waterway. While the upper extent of several low order (stream order 1 and 2) waterways would be removed for mining, these waterways do not connect to important fish habitat upstream, given upstream reaches are within existing active mining areas. Therefore, their removal would not fragment fish habitat in these waterways as they do not connect to fish habitat further upstream.

Waterway crossings would be positioned on retained waterways Deep Creek and Taurus Creek. Fish passage would be maintained between existing upstream and downstream habitats because these waterway crossings would be constructed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DPI 2025b).

No stygofauna have been identified from the stygofauna pilot survey and there is no evidence of stygofauna having previously been detected within the Focus Area.

Given Taurus Creek is subject to continuous natural wetting and drying cycles, the riparian vegetation (dominated by coolibah [*Eucalyptus coolabah*]) likely accesses available moisture in the soil/sediment following rainfall, runoff and flow, and accesses available shallow groundwater in the alluvial aquifer for short periods in drier times. The facultative terrestrial GDEs associated with this aquifer would likely be opportunistic, utilising small inputs of groundwater in the alluvial aquifer on occasion, but likely persisting without this input.

The alluvial aquifer of Taurus Creek is recharged by surface flows within Taurus Creek. The *Surface Water Assessment* for the Project (WRM 2026) indicates that, notwithstanding the 8.9% reduction in the contributing Taurus Creek catchment area during mining, the Project is not expected to materially alter the overall magnitude, duration or frequency characteristics of flows within Taurus Creek. Accordingly, recharge processes to the alluvial aquifer are anticipated to be maintained. On this basis, potential impacts to terrestrial GDEs associated with perched alluvial aquifers are expected to be low.

With effective implementation of mitigation and management measures presented in Section 6 of this report, the Project is unlikely to result in significant impacts on aquatic ecosystem values, including aquatic MNES or MSES.

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Appendix A: EPBC Act Protected Matters Report

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 11-Jun-2025

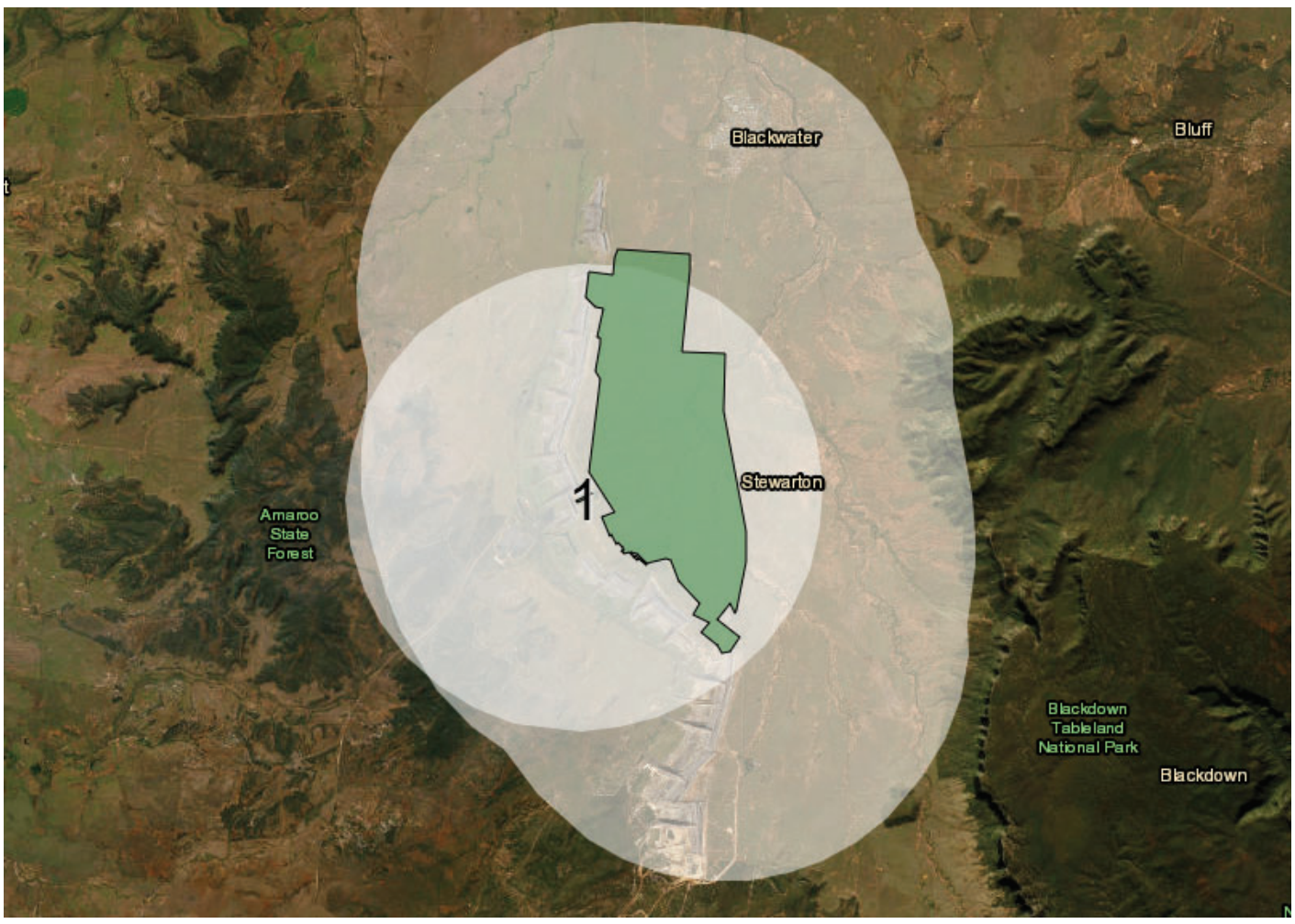
Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements



Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	36
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	12
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area	In buffer area only
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat may occur within area	In buffer area only
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area
PLANT			
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bertya opponens [13792]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Daviesia discolor [3567]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Dichanthium queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat may occur within area	In feature area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Homoranthus decumbens a shrub [55186]	Endangered	Species or species habitat may occur within area	In buffer area only
Macrozamia platyrhachis cycad [3412]	Endangered	Species or species habitat may occur within area	In buffer area only
Polianthion minutiflorum [82772]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Solanum dissectum [75720]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area	In feature area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat may occur within area	In feature area
Hemiaspis damelii Grey Snake [1179]	Endangered	Species or species habitat may occur within area	In feature area
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Endangered	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - BLACKWATER TRAINING DEPOT [30270]	QLD	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata			
Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Blackdown Tableland	National Park	QLD	In buffer area only
Blackwater	Conservation Park	QLD	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Blackwater Mine ? North Extension Project	2023/09723		Assessment	In feature area
rail track to link the proposed MIM Rolleston coal mine to existing rail network	2002/637		Post-Approval	In buffer area only
Controlled action				
Bowen Gas Project	2012/6377	Controlled Action	Post-Approval	In feature area
Construct and operate a coal gasification plant and carbon dioxide capture and storage	2006/3040	Controlled Action	Completed	In buffer area only
Curragh Extension Project, Blackwater, QLD	2015/7508	Controlled Action	Post-Approval	In buffer area only
Norwich Park & Blackwater CSG Fields & supporting infrastructure Bowen Basin	2011/6032	Controlled Action	Completed	In feature area
ZeroGen Integrated Gasification Combined Cycle Power Plant and CO2 Capture, Transport and Storage	2009/5195	Controlled Action	Completed	In feature area
Not controlled action				
Blackwater to Emerald Dual Circuit 132kV Powerline, QLD	2012/6480	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Development and operation of a new multi-seam underground coal mine with associated on-site infrastr	2011/5811	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Blackwater to Rolleston 132 kV transmission line	2002/880	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Curragh West Project	2011/6187	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix B: Aquatic Survey Site Profiles

AQUATIC HABITAT ASSESSMENT

Site code: R1	**Location:** Sagittarius Creek
Date: 17/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6287; 148.8619 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 10 m
Maximum depth: 0 m	**Bankfull height:** 1.8 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: moderate grazing, past vegetation clearing	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 70% silt/clay (<0.05 mm), 27% sand (0.05-2 mm), 3% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 70% silt/clay (<0.05 mm), 27% sand (0.05-2 mm), 3% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (S)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 7 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: N	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 35%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (D)	
Sub-canopy species: *Lysiphyllum carronii* (F), *Terminalia oblongata* subsp. *oblongata* (F), *Acacia harpophylla* (O)	
Shrub species: *Acacia harpophylla* (O), *Acalypha eremorum* (O), *Atalaya hemiglauca* (O), *Geijera parviflora* (O)	
Ground species: *Cenchrus ciliaris** (D), *Parthenium hysterophorus** (O), *Sida* sp. (O), *Enchylaena tomentosa* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	6 (Good)
8. Bank vegetative stability	9 (Excellent)
9. Streamside cover	9 (Excellent)
Overall score	49 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R1	**Location:** Sagittarius Creek
Date: 20/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6287; 148.8619 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 10 m
Maximum depth: 0 m	**Bankfull height:** 1.8 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (S), sticks (S), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: moderate grazing, past vegetation clearing	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 70% silt/clay (<0.05 mm), 27% sand (0.05-2 mm), 3% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 70% silt/clay (<0.05 mm), 27% sand (0.05-2 mm), 3% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 7 m
Bare ground: S	**Grasses/forbs:** M
Shrubs: L	**Trees <10 m:** S
Trees >10m: N	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 35%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (D)	
Sub-canopy species: *Lysiphyllum carronii* (F), *Terminalia oblongata* subsp. *oblongata* (F), *Acacia harpophylla* (O)	
Shrub species: *Acacia harpophylla* (O), *Acalypha eremorum* (O), *Atalaya hemiglauca* (O), *Geijera parviflora* (O)	
Ground species: *Cenchrus ciliaris** (D), *Parthenium hysterophorus** (O), *Sida* sp. (O), *Enchylaena tomentosa* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	6 (Good)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	9 (Excellent)
Overall score	47 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R2	**Location:** Sagittarius Creek
Date: 17/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6521; 148.8387 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 15 m
Maximum depth: 0 m	**Bankfull height:** 1.5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 60% silt/clay (<0.05 mm), 33% sand (0.05-2 mm), 3% gravel (2-4 mm), 2% pebble (4-64 mm), 1% cobble (64-256 mm), 1% boulder (>256 mm), 0% bedrock	
Edge substrates: 60% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 3% gravel (2-4 mm), 2% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: N	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: regrowth	**Dominant stratum:** tree
Health: poor	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 30%
Canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (D), *Lysiphyllum carronii* (O)	
Sub-canopy species: *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Lysiphyllum carronii* (O)	
Shrub species: *Acacia harpophylla* (O), *Carissa ovata* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Archidendropsis basaltica* (O), *Atalaya hemiglauca* (O)	
Ground species: *Cenchrus ciliaris** (D), *Enchylaena tomentosa* (O), *Bothriochloa bladhii* (O), *Parthenium hysterophorus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	

Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: no	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: no	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: none observed	
Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	6 (Fair)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	7 (Good)
8. Bank vegetative stability	8 (Good)
9. Streamside cover	9 (Excellent)
Overall score	46 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R2	**Location:** Sagittarius Creek
Date: 20/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6521; 148.8387 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 15 m
Maximum depth: 0 m	**Bankfull height:** 1.5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (S), sticks (S), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 60% silt/clay (<0.05 mm), 33% sand (0.05-2 mm), 3% gravel (2-4 mm), 2% pebble (4-64 mm), 1% cobble (64-256 mm), 1% boulder (>256 mm), 0% bedrock	
Edge substrates: 60% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 3% gravel (2-4 mm), 2% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: S	**Grasses/forbs:**M
Shrubs: L	**Trees <10 m:** S
Trees >10m: N	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: regrowth	**Dominant stratum:** tree
Health: poor	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 30%
Canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (D), *Lysiphyllum carronii* (O)	
Sub-canopy species: *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Lysiphyllum carronii* (O)	
Shrub species: *Acacia harpophylla* (O), *Carissa ovata* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Archidendropsis basaltica* (O), *Atalaya hemiglauca* (O)	
Ground species: *Cenchrus ciliaris** (D), *Enchylaena tomentosa* (O), *Bothriochloa bladhii* (O), *Parthenium hysterophorus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	6 (Fair)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	7 (Good)
8. Bank vegetative stability	6 (Good)
9. Streamside cover	9 (Excellent)
Overall score	44 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R3	**Location:** Taurus Creek
Date: 20/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6705; 148.8762 (GDA 2020)
Water level: no flow - isolated	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Water quality	
Time (EST): 11:00	**Water temperature:** 13.0˚C
Sp. Conductivity: 286 µS/cm	**pH:** 7.0
Dissolved oxygen: 77.0%	**Dissolved oxygen:** 8.10 mg/L
Turbidity: 36.9 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 90%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: L	**Algae in water column:** N
Emergent macrophytes: L	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 6 m	**Bankfull width:** 25 m
Maximum depth: 1 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (S), branches (S), logs (L), periphyton (S), moss (N), filamentous algae (L), macrophytes (L), bank overhang (N), trailing bank vegetation (L), blanketing silt (L), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): past vegetation clearing, light grazing	
Adjacent landuse (left bank): past vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 60% silt/clay (<0.05 mm), 40% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 60% silt/clay (<0.05 mm), 40% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: loamy clay	**Bank stability:** moderately stable
Bed stability: mod. deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (L), sand (L)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.3/11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 18 m	**EDL cover:** 30%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (F)	
Sub-canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (D), *Lysiphyllum hookeri* (F)	
Shrub species: *A. harpophylla* (O), *T. oblongata* (O), *Cryptostegia grandiflora** (O), *Atalaya hemiglauca* (O)	
Ground species: *Megathyrsus maximus** (D), *Bothriochloa bladhii* (A), *Parthenium hysterophorus** (O), *Cyperus bifax* (O), *Sida* sp. (O), *Calyptocarpus vialis** (F)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (S), *C. betchei* (L), *Persicaria attenuata* (L), *Ludwigia peploides* (L), *Eclipta prostrata** (L), *Echinochloa colona** (L), *Leptochloa digitata* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat (insufficient permanence); no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*, *Nematalosa erebi*, *Neosilurus hyrtlii*

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	6 (Fair)
2. Embeddedness	3 (Poor)
3. Velocity/depth category	6 (Fair)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	6 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	9 (Excellent)
Overall score	55 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R3	**Location:** Taurus Creek
Date: 22/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6705; 148.8762 (GDA 2020)
Water level: no flow - isolated	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Water quality	
Time (EST): 07:15	**Water temperature:** 21.3˚C
Sp. Conductivity: 633 µS/cm	**pH:** 7.5
Dissolved oxygen: 20.5%	**Dissolved oxygen:** 1.82 mg/L
Turbidity: 220 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 90%	**Water colour:** turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: L	**Algae in water column:** L
Emergent macrophytes: L	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 2 m	**Bankfull width:** 25 m
Maximum depth: 0.2 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 30% sandy pool, 0% rocky pool, 70% dry	
Variety of habitat: shallow (<0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (M), sticks (S), branches (S), logs (L), periphyton (S), moss (N), filamentous algae (L), macrophytes (L), bank overhang (N), trailing bank vegetation (L), blanketing silt (L), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): past vegetation clearing, light grazing	
Adjacent landuse (left bank): past vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 60% silt/clay (<0.05 mm), 40% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 60% silt/clay (<0.05 mm), 40% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: loamy clay	**Bank stability:** moderately stable
Bed stability: mod. deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (L), sand (L)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (E)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: M	**Grasses/forbs:** S
Shrubs: L	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.3/11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 18 m	**EDL cover:** 30%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (F)	
Sub-canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (D), *Lysiphyllum hookeri* (F)	
Shrub species: *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Cryptostegia grandiflora** (O), *Atalaya hemiglauca* (O)	
Ground species: *Megathyrsus maximus** (D), *Bothriochloa bladhii* (A), *Cenchrus ciliaris** (O), *Parthenium hysterophorus** (O), *Cyperus bifax* (O), *Sida* sp. (O), *Calyptocarpus vialis** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (S), *C. betchei* (L), *Persicaria attenuata* (L), *Ludwigia peploides* (L), *Eclipta prostrata** (L), *Echinochloa colona** (L), *Leptochloa digitata* (L)	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: yes	
Habitat for platypus: unlikely habitat (insufficient permanence); no burrows detected	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: yes	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: yes	
Aquatic vertebrates encountered: *Ambassis agassizii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*, *Nematalosa erebi*	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	10 (Fair)
2. Embeddedness	3 (Poor)
3. Velocity/depth category	3 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	6 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	9 (Excellent)
Overall score	56 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).
Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R4	**Location:** Taurus Creek
Date: 20/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6785; 148.8666 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Water quality	
Time (EST): 7:34	**Water temperature:** 11.7˚C
Sp. Conductivity: 187 µS/cm	**pH:** 7.1
Dissolved oxygen: 64.4%	**Dissolved oxygen:** 6.98 mg/L
Turbidity: 394 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 100%	**Water colour:** opaque
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 2.5 m	**Bankfull width:** 20 m
Maximum depth: 0.8 m	**Bankfull height:** 5 m
Habitat types: 0% riffle, 0% run, 80% sandy pool, 0% rocky pool, 20% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (S), branches (S), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (L), trailing bank vegetation (L), blanketing silt (L), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): past vegetation clearing, light grazing	
Adjacent landuse (left bank): past vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: loamy clay	**Bank stability:** moderately unstable
Bed stability: mod. deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (S), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (S), cattle pugging (L)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 25 m	**Width of riparian zone on right bank:** 25 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: S	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** M
Composition and health	
State-mapped RE: 11.3.2/11.3.25/11.3.1 (50/45/5)	**Verified RE:** 11.3.3
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 18 m	**EDL cover:** 35%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (O)	
Sub-canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (A), *Acacia salicina* (O), *Brachychiton rupestris* (R), *Cryptostegia grandiflora** (O), *Lysiphyllum hookeri* (F)	
Shrub species: *Acalypha eremorum* (F), *Cryptocarya* sp. (O), *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Cryptostegia grandiflora** (O), *Atalaya hemiglauca* (O)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (F), *Calyptocarpus vialis** (O), *Bryophyllum delagoense** (O), *Bothriochloa bladhii* (O), *Parthenium hysterophorus** (O), *Alternanthera* sp. (O), *Cyperus bifax* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *C. bifax* (L), *Eclipta prostrata** (L)	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: yes	
Habitat for platypus: unlikely habitat,no burrows detected	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: yes	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: *Ambassis agassizii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	3 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	6 (Fair)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	7 (Good)
8. Bank vegetative stability	3 (Fair)
9. Streamside cover	10 (Excellent)
Overall score	48 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R4	**Location:** Taurus Creek
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6785; 148.8666 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 20 m
Maximum depth: 0 m	**Bankfull height:** 5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (S), branches (S), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): past vegetation clearing, light grazing	
Adjacent landuse (left bank): past vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: loamy clay	**Bank stability:** moderately unstable
Bed stability: mod. deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (S), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (S), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 25 m	**Width of riparian zone on right bank:** 25 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: S	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** M
Composition and health	
State-mapped RE: 11.3.2/11.3.25/11.3.1 (50/45/5)	**Verified RE:** 11.3.3
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 18 m	**EDL cover:** 35%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (O)	
Sub-canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (A), *Acacia salicina* (O), *Brachychiton rupestris* (R), *Cryptostegia grandiflora** (O), *Lysiphyllum hookeri* (F)	
Shrub species: *Acalypha eremorum* (F), *Cryptocarya* sp. (O), *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Cryptostegia grandiflora** (O), *Atalaya hemiglauca* (O)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (F), *Calyptocarpus vialis** (O), *Bryophyllum delagoense** (O), *Bothriochloa bladhii* (O), *Parthenium hysterophorus** (O), *Alternanthera* sp. (O), *Argemone mexicana** (O), *Xanthium occidentale** (O)	

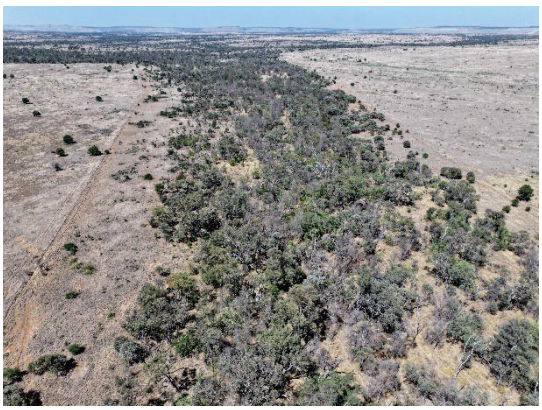
Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: *Cyperus bifax* (L), *Eclipta prostrata** (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat,no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	3 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	7 (Good)
8. Bank vegetative stability	3 (Fair)
9. Streamside cover	10 (Excellent)
Overall score	42 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).
Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R5	**Location:** tributary of Taurus Creek
Date: 18/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6924; 148.8523 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Water quality	
Time (EST): 10:21	**Water temperature:** 13.4˚C
Sp. Conductivity: 378 µS/cm	**pH:** 7.6
Dissolved oxygen: 98.4%	**Dissolved oxygen:** 10.27 mg/L
Turbidity: 153 NTU	**Ion sample collected:** no
Observations within 2 m of sampling point	
Shading: 50%	**Water colour:** moderately turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 10 m
Maximum depth: 0 m	**Bankfull height:** 1 m
Habitat types: 0% riffle, 0% run, 10% sandy pool, 0% rocky pool, 90% dry	
Variety of habitat: macrophytes	
Habitat attributes: detritus (L), sticks (L), branches (N), logs (N), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): vegetation clearing, light grazing	
Adjacent landuse (left bank): vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 65% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 65% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clayey loam	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 10 m	**EDL cover:** 30%
Canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (D), *Acacia salicina* (F)	
Sub-canopy species: *Acacia salicina* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acacia harpophylla* (O), *Eremophila mitchellii* (R)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acalypha eremorum* (R)	
Ground species: *Cenchrus ciliaris** (D), *Parthenium hysterophorus** (O), *Megathyrsus maximus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus betchei* (L), *Ludwigia octovalvis* (L), *Cyperus difformis* (L), *Echinochloa colona** (L), *Typha domingensis* (L)	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: yes	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: yes	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: *Ambassis agassizii*, *Leiopotherapon unicolor*	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	2 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	9 (Excellent)
9. Streamside cover	9 (Excellent)
Overall score	53 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R5	**Location:** tributary of Taurus Creek
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6924; 148.8523 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 10 m
Maximum depth: 0 m	**Bankfull height:** 1 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (N), logs (N), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): vegetation clearing, light grazing	
Adjacent landuse (left bank): vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 65% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 65% silt/clay (<0.05 mm), 35% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clayey loam	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 10 m	**EDL cover:** 30%
Canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (D), *Acacia salicina* (F)	
Sub-canopy species: *Acacia salicina* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acacia harpophylla* (O), *Eremophila mitchellii* (R)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acalypha eremorum* (R)	
Ground species: *Cenchrus ciliaris** (D), *Parthenium hysterophorus** (F)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus betchei* (L), *Ludwigia octovalvis* (L), *Cyperus difformis* (L), *Echinochloa colona** (L), *Typha domingensis* (L)	

Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: yes	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: no	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: none observed	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	9 (Excellent)
9. Streamside cover	9 (Excellent)
Overall score	51 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R6	**Location:** Taurus Creek flood channel wetland
Date: 18/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6963; 148.8660 (GDA 2020)
Water level: no flow - isolated	**Likely flow nature:** episodic
State-mapped watercourse (DLGWV 2025): not applicable	
Likely a watercourse: not applicable	
State-mapped waterway providing for fish passage (DAF 2020): not applicable	
Water quality	
Time (EST): 12:37	**Water temperature:** 13.8˚C
Sp. Conductivity: 234 µS/cm	**pH:** 6.8
Dissolved oxygen: 81.3%	**Dissolved oxygen:** 8.35 mg/L
Turbidity: 217 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 20%	**Water colour:** moderately turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 10 m	**Bankfull width:** 22 m
Maximum depth: 0.7 m	**Bankfull height:** 2 m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (L), periphyton (L), moss (N), filamentous algae (N), macrophytes (L), bank overhang (L), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): moderate grazing, past clearing	
Adjacent landuse (left bank): moderate grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (E)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 15 m	**Width of riparian zone on right bank:** 15 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** M
Trees >10m: L	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.25/11.3.2
Vegetation status: remnant	**Dominant stratum:** tree
Health: average	**Dieback:** 11-25%
EDL height: 15 m	**EDL cover:** 40%
Canopy species: *Eucalyptus tereticornis* (D), *Eucalyptus populnea* (D), *Acacia salicina* (R)	
Sub-canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Lysiphyllum hookeri* (D), *Acacia harpophylla* (O), *Eremophila mitchellii* (O), *Cassia brewsteri* (O), *Acacia salicina* (O)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia salicina* (O), *Carissa ovata* (O)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (D), *Sida* sp. (O), *Basilicum polystachyon* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus betchei* (L), *Ludwigia octovalvis* (L), *Eclipta prostrata** (L), *Cyperus pygmaeus* (L), *Persicaria attenuata* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	6 (Fair)
4. Channel alteration	12 (Excellent)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	8 (Good)
9. Streamside cover	9 (Excellent)
Overall score	59 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R6	**Location:** Taurus Creek flood channel wetland
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6963; 148.8660 (GDA 2020)
Water level: no flow - isolated	**Likely flow nature:** episodic
State-mapped watercourse (DLGWV 2025): not applicable	
Likely a watercourse: not applicable	
State-mapped waterway providing for fish passage (DAF 2020): not applicable	
Water quality	
Time (EST): 11:40	**Water temperature:** 33.1˚C
Sp. Conductivity: 471 µS/cm	**pH:** 9.3
Dissolved oxygen: 184.0%	**Dissolved oxygen:** 13.17 mg/L
Turbidity: 152 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: E	**Algae in water column:** E
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 5 m	**Bankfull width:** 22 m
Maximum depth: 0.2 m	**Bankfull height:** 2 m
Habitat types: 0% riffle, 0% run, 15% sandy pool, 0% rocky pool, 85% dry	
Variety of habitat: shallow (<0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (L), moss (N), filamentous algae (E), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): moderate grazing, past clearing	
Adjacent landuse (left bank): moderate grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (E)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

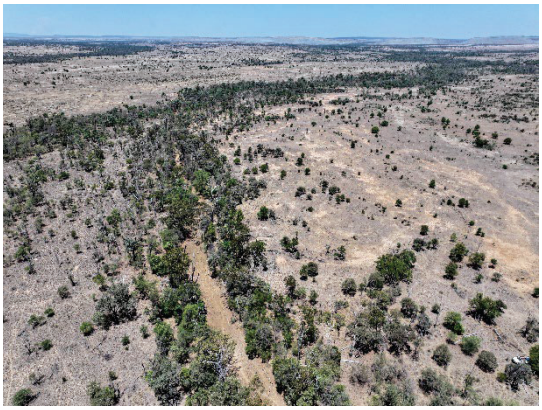
Riparian vegetation	
Cover	
Width of riparian zone on left bank: 15 m	**Width of riparian zone on right bank:** 15 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** M
Trees >10m: L	**Exotic riparian species:** M
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.25/11.3.2
Vegetation status: remnant	**Dominant stratum:** tree
Health: average	**Dieback:** 11-25%
EDL height: 15 m	**EDL cover:** 40%
Canopy species: *Eucalyptus tereticornis* (D), *Eucalyptus populnea* (D), *Acacia salicina* (R)	
Sub-canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Lysiphyllum hookeri* (D), *Acacia harpophylla* (O), *Eremophila mitchellii* (O), *Cassia brewsteri* (O), *Acacia salicina* (O)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia salicina* (O), *Carissa ovata* (O)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (D), *Sida* sp. (O), *Basilicum polystachyon* (O), *Glinus lotoides* (O), *Centipeda minima* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus betchei* (L), *Ludwigia octovalvis* (L), *Eclipta prostrata** (L), *Cyperus pygmaeus* (L), *Persicaria attenuata* (L)	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: yes	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: yes	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: yes	
Aquatic vertebrates encountered: *Ambassis agassizii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Nematalosa erebi*, *Neosilurus hyrtlii*	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	2 (Poor)
4. Channel alteration	12 (Excellent)
5. Bottom scouring and deposition	8 (Good)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	8 (Good)
8. Bank vegetative stability	5 (Fair)
9. Streamside cover	9 (Excellent)
Overall score	52 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R7	**Location:** Taurus Creek
Date: 01/07/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.7170; 148.8541 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, High risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 25 m
Maximum depth: 0 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 7% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 2% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 7% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 2% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: sandy clay	**Bank stability:** moderately unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (L), sand (L)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (M)	



Upstream



Left bank



Downstream



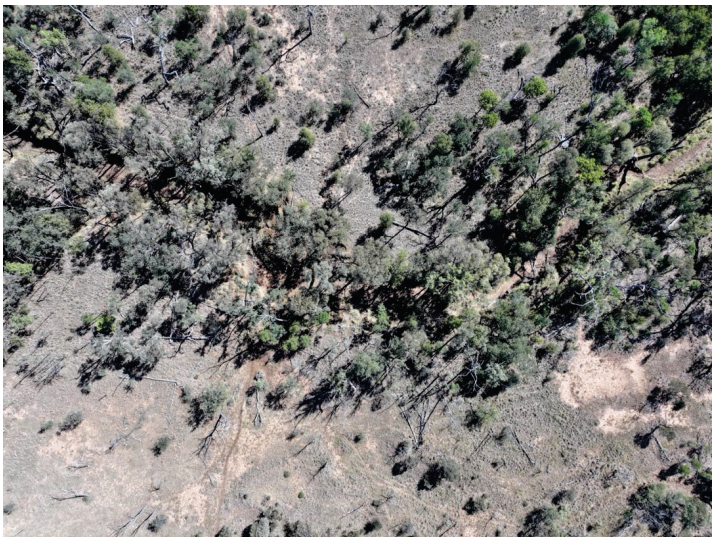
Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 15 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1/11.4.9
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 30%
Canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (O), *Eucalyptus tereticornis* (O), *Blakella tessellaris* (O)	
Sub-canopy species: *Lysiphyllum hookeri* (D), *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Eremophila mitchellii* (O)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Carissa ovata* (O), *Harrisia martinii** (O)	
Ground species: *Cenchrus ciliaris** (D), *Megathyrsus maximus** (D), *Chloris* sp. (O), *Parthenium hysterophorus** (O), *Sida* sp. (O), *Bothriochloa bladhii* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: no	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: no	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: none observed	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	6 (Fair)
7. Bank stability	4 (Fair)
8. Bank vegetative stability	8 (Good)
9. Streamside cover	9 (Excellent)
Overall score	41 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R7	**Location:** Taurus Creek
Date: 22/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7170; 148.8541 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, High risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 25 m
Maximum depth: 0 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): moderate grazing, past vegetation clearing	
Adjacent landuse (left bank): moderate grazing, past vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 7% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 2% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 7% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 2% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: sandy clay	**Bank stability:** moderately unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (L), sand (L)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (S)	



Upstream



Left bank



Downstream



Right bank

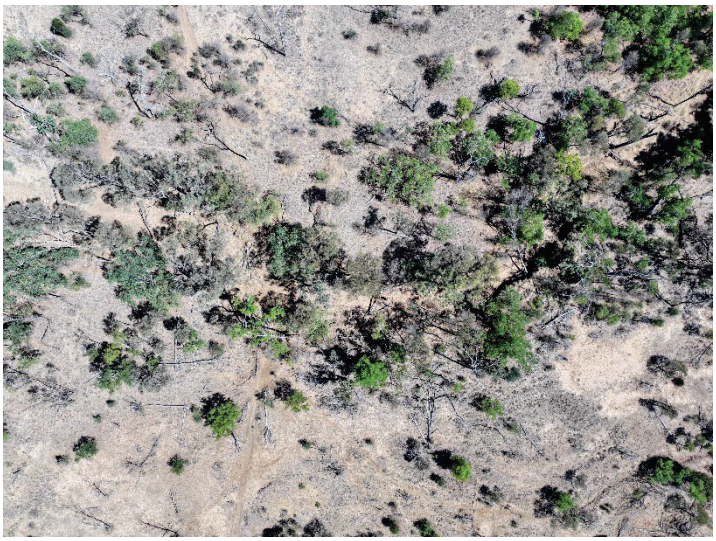
Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 15 m
Bare ground: S	**Grasses/forbs:** M
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1/11.4.9
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 30%
Canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (O), *Eucalyptus tereticornis* (O), *Blakella tessellaris* (O)	
Sub-canopy species: *Lysiphyllum hookeri* (D), *Acacia harpophylla* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Eremophila mitchellii* (O)	
Shrub species: *Lysiphyllum hookeri* (O), *Acacia harpophylla* (O), *Carissa ovata* (O), *Harrisia martinii** (O)	
Ground species: *Cenchrus ciliaris** (D), *Megathyrsus maximus** (F), *Chloris* sp. (O), *Parthenium hysterophorus** (O), *Sida* sp. (O), *Bothriochloa bladhii* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: none observed	

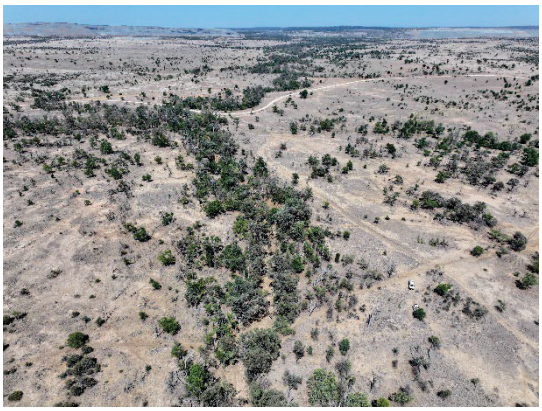
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	6 (Fair)
7. Bank stability	4 (Fair)
8. Bank vegetative stability	6 (Good)
9. Streamside cover	9 (Excellent)
Overall score	39 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R8	**Location:** Two Mile Gully
Date: 01/07/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.7319; 148.8734 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 20 m
Maximum depth: 0 m	**Bankfull height:** 2.5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: macrophytes, large woody debris	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (S), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): vegetation clearing, light grazing	
Adjacent landuse (left bank): vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 10% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 10% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: sandy clay	**Bank stability:** moderately unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (S), sand (L)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: M	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** E
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: poor	**Dieback:** 1-10%
EDL height: 8 m	**EDL cover:** 30%
Canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (F), *Eucalyptus tereticornis* (R), *Blakella tessellaris* (R)	
Sub-canopy species: *Cryptostegia grandiflora** (D), *Lysiphyllum hookeri* (O), *Acacia salicina* (O)	
Shrub species: *Cryptostegia grandiflora** (D), *Terminalia oblongata* subsp. *oblongata* (O), *Acalypha eremorum* (F)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (D), *Bothriochloa bladhii* (F), *Cyperus bifax* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	5 (Fair)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	8 (Good)
Overall score	39 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R8	**Location:** Two Mile Gully
Date: 22/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7319; 148.8734 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 20 m
Maximum depth: 0 m	**Bankfull height:** 2.5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: macrophytes, large woody debris	
Habitat attributes: detritus (M), sticks (L), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (S), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): vegetation clearing, light grazing	
Adjacent landuse (left bank): vegetation clearing, light grazing	
Bed, edge and bank characteristics	
Bed substrates: 10% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 10% silt/clay (<0.05 mm), 90% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: sandy clay	**Bank stability:** moderately unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (S), sand (L)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: M	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** E
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: poor	**Dieback:** 1-10%
EDL height: 8 m	**EDL cover:** 30%
Canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (F), *Eucalyptus tereticornis* (R), *Blakella tessellaris* (R)	
Sub-canopy species: *Cryptostegia grandiflora** (D), *Lysiphyllum hookeri* (O), *Acacia salicina* (O)	
Shrub species: *Cryptostegia grandiflora** (D), *Terminalia oblongata* subsp. *oblongata* (O), *Acalypha eremorum* (F)	
Ground species: *Megathyrsus maximus** (D), *Cenchrus ciliaris** (D), *Bothriochloa bladhii* (F), *Cyperus bifax* (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (L)	

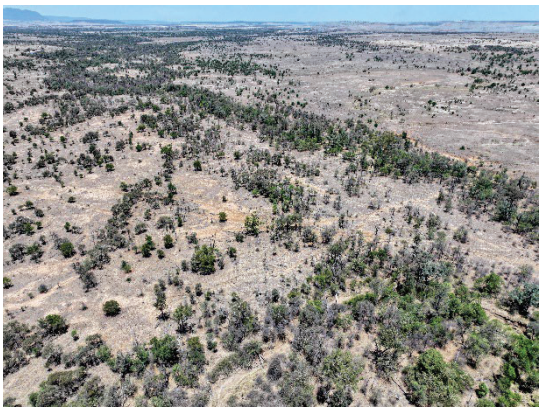
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	5 (Fair)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	8 (Good)
Overall score	39 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: R9	**Location:** Taurus Creek
Date: 18/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6941; 148.8688 (GDA 2020)
Water level: no flow - isolated	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Water quality	
Time (EST): 08:12	**Water temperature:** 11.5˚C
Sp. Conductivity: 159 µS/cm	**pH:** 6.6
Dissolved oxygen: 45.8%	**Dissolved oxygen:** 5.00 mg/L
Turbidity: 289 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 100%	**Water colour:** opaque
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 3 m	**Bankfull width:** 17 m
Maximum depth: 0.4 m	**Bankfull height:** 5 m
Habitat types: 0% riffle, 0% run, 20% sandy pool, 0% rocky pool, 80% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (S), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): light grazing, past clearing	
Adjacent landuse (left bank): light grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 71% silt/clay (<0.05 mm), 25% sand (0.05-2 mm), 3% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 71% silt/clay (<0.05 mm), 25% sand (0.05-2 mm), 3% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clayey loam	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.3/11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 15 m	**EDL cover:** 40%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (F), *Eucalyptus populnea* (O)	
Sub-canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (D), *Lysiphyllum hookeri* (A), *Brachychiton* sp. (R)	
Shrub species: *Acacia salicina* (O), *Acalypha eremorum* (O), *Acacia harpophylla* (O)	
Ground species: *Megathyrsus maximus** (D), *Bothriochloa bladhii* (F), *Lobelia concolor* (O), *Parthenium hysterophorus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat,no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: *Hypseleotris bucephala*, *Melanotaenia splendida splendida*

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	8 (Fair)
2. Embeddedness	3 (Poor)
3. Velocity/depth category	2 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	4 (Fair)
6. Pool/riffle, run/bend ratio	7 (Fair)
7. Bank stability	4 (Fair)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	10 (Excellent)
Overall score	50 (Fair)
Overall aquatic value: Moderate	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R9	**Location:** Taurus Creek
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6941; 148.8688 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 17 m
Maximum depth: 0 m	**Bankfull height:** 5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris, macrophytes	
Habitat attributes: detritus (M), sticks (L), branches (S), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): light grazing, past clearing	
Adjacent landuse (left bank): light grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 71% silt/clay (<0.05 mm), 25% sand (0.05-2 mm), 3% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 71% silt/clay (<0.05 mm), 25% sand (0.05-2 mm), 3% gravel (2-4 mm), 1% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clayey loam	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** M
Trees >10m: S	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.3/11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: good	**Dieback:** 1-10%
EDL height: 15 m	**EDL cover:** 40%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (F), *Eucalyptus populnea* (O)	
Sub-canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (D), *Lysiphyllum hookeri* (A), *Brachychiton rupestris* (R)	
Shrub species: *Acacia salicina* (O), *Acalypha eremorum* (O), *Acacia harpophylla* (O)	
Ground species: *Megathyrsus maximus** (D), *Bothriochloa bladhii* (F), *Parthenium hysterophorus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (L)	
Aquatic biota	
Aquatic macroinvertebrate sampling undertaken: no	
Habitat for platypus: unlikely habitat	
Habitat for EVNT fish species: unlikely	
Fish sampling undertaken: no	
Suitable habitat for EVNT turtle species: unlikely	
Turtle sampling undertaken: no	
Aquatic vertebrates encountered: none observed	

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	3 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	4 (Fair)
6. Pool/riffle, run/bend ratio	7 (Fair)
7. Bank stability	4 (Fair)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	10 (Excellent)
Overall score	42 (Fair)
Overall aquatic value: Moderate	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R10	**Location:** Deep Creek – proposed crossing location
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7201; 148.8459 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 25 m
Maximum depth: 0 m	**Bankfull height:** 3.5 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, light grazing, coal mining	
Adjacent landuse (right bank): light grazing, past clearing	
Adjacent landuse (left bank): light grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 10% silt/clay (<0.05 mm), 55% sand (0.05-2 mm), 10% gravel (2-4 mm), 1% pebble (4-64 mm), 2% cobble (64-256 mm), 2% boulder (>256 mm), 10% bedrock	
Edge substrates: 10% silt/clay (<0.05 mm), 55% sand (0.05-2 mm), 10% gravel (2-4 mm), 1% pebble (4-64 mm), 2% cobble (64-256 mm), 2% boulder (>256 mm), 10% bedrock	
Bank soils: sandy clay	**Bank stability:** unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (L), bank slumping (S), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** regrowth 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 9 m	**EDL cover:** 15%
Canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (O)	
Sub-canopy species: *Lysiphyllum hookeri* (D), *Acacia salicina* (O),	
Shrub species: *Lysiphyllum hookeri* (O), *A. salicina* (O), *A. harpophylla* (O)	
Ground species: *Cenchrus ciliaris** (D), *Bothriochloa bladhii* (O), *Chloris* sp. (O), *Sida* sp. (O), *Parthenium hysterophorus** (O)	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Cyperus bifax* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat, no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	6 (Fair)
2. Embeddedness	4 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	7 (Fair)
5. Bottom scouring and deposition	7 (Fair)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	2 (Poor)
8. Bank vegetative stability	7 (Good)
9. Streamside cover	9 (Excellent)
Overall score	47 (Fair)
Overall aquatic value: Low	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R11	**Location:** Taurus Creek – proposed crossing location
Date: 21/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7320; 148.8561 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, High risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 20 m
Maximum depth: 0 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris	
Habitat attributes: detritus (S), sticks (L), branches (L), logs (L), periphyton (N), moss (N), filamentous algae (N), macrophytes (N), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, light grazing, coal mining	
Adjacent landuse (right bank): light grazing, past clearing	
Adjacent landuse (left bank): light grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 15% silt/clay (<0.05 mm), 68% sand (0.05-2 mm), 10% gravel (2-4 mm), 1% pebble (4-64 mm), 1% cobble (64-256 mm), 2% boulder (>256 mm), 3% bedrock	
Edge substrates: 15% silt/clay (<0.05 mm), 68% sand (0.05-2 mm), 10% gravel (2-4 mm), 1% pebble (4-64 mm), 1% cobble (64-256 mm), 2% boulder (>256 mm), 3% bedrock	
Bank soils: clayey sand	**Bank stability:** unstable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (L), rill (L), tunnel (N), sheet (L), bank slumping (L), cattle pugging (L)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: S	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** regrowth 11.3.1
Vegetation status: regrowth	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 7 m	**EDL cover:** 25%
Canopy species: *Terminalia oblongata* subsp. *oblongata* (D), *Acacia harpophylla* (O), *Eucalyptus tereticornis* (R), *Blakella tessellaris* (R)	
Sub-canopy species: *Lysiphyllum hookeri* (D), *Acacia salicina* (O), *Brachychiton* sp. (R)	
Shrub species: *Carissa ovata* (O), *Acacia salicina* (O), *Lysiphyllum hookeri* (O), *Harrisia martinii** (O), *Terminalia oblongata* subsp. *oblongata* (O)	
Ground species: *Cenchrus ciliaris** (D), *Megathyrsus maximus** (O), *Sida* sp. (O), *Parthenium hysterophorus** (O), *Cynodon dactylon* (O)	

Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: none observed

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat, no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	3 (Poor)
2. Embeddedness	3 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	5 (Fair)
5. Bottom scouring and deposition	5 (Fair)
6. Pool/riffle, run/bend ratio	4 (Fair)
7. Bank stability	2 (Poor)
8. Bank vegetative stability	8 (Good)
9. Streamside cover	9 (Excellent)
Overall score	39 (Fair)
Overall aquatic value: Moderate	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: R12	**Location:** Taurus Creek
Date: 23/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6662; 148.8851 (GDA 2020)
Water level: no flow - dry	**Likely flow nature:** ephemeral
State-mapped watercourse (DLGWV 2025): yes	
Likely a watercourse: yes - clear channel and bank structure, and clear presence of riparian vegetation structure	
State-mapped waterway providing for fish passage (DAF 2020): yes, Major risk of impact	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 0 m	**Bankfull width:** 25 m
Maximum depth: 0 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 0% sandy pool, 0% rocky pool, 100% dry	
Variety of habitat: large woody debris, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (S), logs (S), periphyton (N), moss (N), filamentous algae (N), macrophytes (L), bank overhang (N), trailing bank vegetation (N), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: past vegetation clearing, moderate grazing, coal mining	
Adjacent landuse (right bank): moderate grazing, past clearing	
Adjacent landuse (left bank): moderate grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 20% silt/clay (<0.05 mm), 80% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 20% silt/clay (<0.05 mm), 80% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clayey loam	**Bank stability:** moderately stable
Bed stability: moderate deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (L), bank slumping (L), cattle pugging (E)	



Upstream



Left bank



Downstream



Right bank

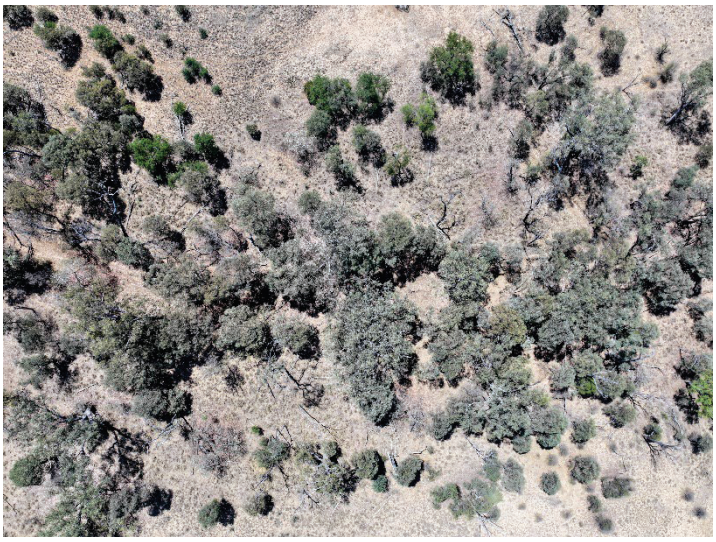
Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 20 m	**Width of riparian zone on right bank:** 20 m
Bare ground: M	**Grasses/forbs:** S
Shrubs: L	**Trees <10 m:** S
Trees >10m: M	**Exotic riparian species: L**
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** 11.3.3/11.3.1
Vegetation status: remnant	**Dominant stratum:** tree
Health: average	**Dieback:** 1-10%
EDL height: 20 m	**EDL cover:** 55%
Canopy species: *Eucalyptus coolabah* (D), *Acacia harpophylla* (F)	
Sub-canopy species: *Acacia harpophylla* (D), *Terminalia oblongata* subsp. *oblongata* (O), *Lysiphyllum hookeri* (O), *Lysiphyllum carronii* (O)	
Shrub species: *Terminalia oblongata* subsp. *oblongata* (O), *Acacia harpophylla* (O), *Harrisia martinii** (O)	
Ground species: *Cenchrus ciliaris** (D), *Parthenium hysterophorus** (F), *Enchylaena tomentosa* (O), *Atriplex* sp. (O), *Sida* sp. (O), *Argemone mexicana** (O),	
Macrophytes	
Submerged macrophytes: none observed	
Floating macrophytes: none observed	
Emergent macrophytes: *Leptochloa digitata* (L), *Cyperus bifax* (L)	

Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat, no burrows detected
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed

Aquatic habitat assessment scoring	
1. Bottom substrate/available cover	2 (Poor)
2. Embeddedness	2 (Poor)
3. Velocity/depth category	0 (Poor)
4. Channel alteration	8 (Good)
5. Bottom scouring and deposition	4 (Fair)
6. Pool/riffle, run/bend ratio	5 (Fair)
7. Bank stability	6 (Good)
8. Bank vegetative stability	5 (Fair)
9. Streamside cover	9 (Excellent)
Overall score	41 (Fair)
Overall aquatic value: Moderate	

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: L1	**Location:** Farm dam on Sagittarius Creek
Date: 17/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.6417; 148.8591 (GDA 2020)
Water level: moderate (= watermark)	**Likely flow nature:** semi-permanent waterbody on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Water quality	
Time (EST): 13:51	**Water temperature:** 14.1˚C
Sp. Conductivity: 196 µS/cm	**pH:** 6.2
Dissolved oxygen: 88.5%	**Dissolved oxygen:** 9.10 mg/L
Turbidity: 9.6 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 100%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: S	**Algae in water column:** N
Emergent macrophytes: M	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 70 m	**Bankfull width:** 100 m
Maximum depth: 2+ m	**Bankfull height:** 3+ m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, macrophytes	
Habitat attributes: detritus (S), sticks (N), branches (N), logs (N), periphyton (S), moss (N), filamentous algae (S), macrophytes (E), bank overhang (N), trailing bank vegetation (E), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing	
Adjacent landuse (right bank): moderate grazing, vegetation clearing	
Adjacent landuse (left bank): moderate grazing, vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 3 m	**Width of riparian zone on right bank:** 3 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** L
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: average	**Dieback:** 1-10%
EDL height: 2.5 m	**EDL cover:** 90%
Canopy species: *Acacia salicina* (R), *Terminalia oblongata* subsp. *oblongata* (R), *Acacia harpophylla* (R)	
Shrub species: *Acacia salicina* (R), *Acacia harpophylla* (R), *Lysiphyllum carronii* (R)	
Ground species: *Typha domingensis* (D), *Persicaria attenuata* (A), *Cyperus exaltatus* (O), *Cenchrus ciliaris** (O), *Basilicum polystachyon* (O), *Bothriochloa bladhii* (O)	

Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: *Typha domingensis* (E), *Persicaria attenuata* (M), *Cyperus exaltatus* (L), *Eclipta prostrata** (L), *Cyperus pygmaeus* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Anguilla reinhardtii*, *Gambusia holbrooki**, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Mogurnda adspersa*, *Porochilus rendahli*
Overall aquatic value: Moderate

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: L1	**Location:** Farm dam on Sagittarius Creek
Date: 20/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.6417; 148.8591 (GDA 2020)
Water level: low (< watermark)	**Likely flow nature:** semi-permanent waterbody on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Moderate risk of impact	
Water quality	
Time (EST): 15:07	**Water temperature:** 28.6˚C
Sp. Conductivity: 210 µS/cm	**pH:** 9.7
Dissolved oxygen: 170.5%	**Dissolved oxygen:** 13.15 mg/L
Turbidity: 13.2 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: S	**Algae in water column:** L
Emergent macrophytes: M	**Submerged macrophytes:** E
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 50 m	**Bankfull width:** 100 m
Maximum depth: 2+ m	**Bankfull height:** 3+ m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, macrophytes	
Habitat attributes: detritus (S), sticks (N), branches (N), logs (N), periphyton (S), moss (N), filamentous algae (S), macrophytes (E), bank overhang (N), trailing bank vegetation (E), blanketing silt (N), substrate anoxia (N)	
Upstream landuse: vegetation clearing, moderate grazing	
Adjacent landuse (right bank): moderate grazing, vegetation clearing	
Adjacent landuse (left bank): moderate grazing, vegetation clearing	
Bed, edge and bank characteristics	
Bed substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 90% silt/clay (<0.05 mm), 10% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** moderately stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (N), sand (N)
Local catchment erosion: gully (N), rill (L), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 3 m	**Width of riparian zone on right bank:** 3 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** L
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: average	**Dieback:** 1-10%
EDL height: 2.5 m	**EDL cover:** 90%
Canopy species: *Acacia salicina* (R), *Terminalia oblongata* subsp. *oblongata* (R), *Acacia harpophylla* (R)	
Shrub species: *Acacia salicina* (R), *Acacia harpophylla* (R), *Lysiphyllum carronii* (R)	
Ground species: *Typha domingensis* (D), *Persicaria attenuata* (A), *Cyperus exaltatus* (O), *Cenchrus ciliaris** (O), *Bothriochloa bladhii* (O), *Chloris* sp. (O)	

Macrophytes
Submerged macrophytes: *Potamogeton crispus* (E)
Floating macrophytes: none observed
Emergent macrophytes: *Typha domingensis* (E), *Persicaria attenuata* (M), *Cyperus exaltatus* (L), *Eclipta prostrata** (L), *Cyperus pygmaeus* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Gambusia holbrooki**, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*, *Porochilus rendahli*, *Emydura macquarii krefftii*
Overall aquatic value: Moderate

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: L2	**Location:** Farm dam on unnamed tributary of Two Mile Gully
Date: 30/06/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.7141; 148.8778 (GDA 2020)
Water level: moderate (= watermark)	**Likely flow nature:** semi-permanent waterbody on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Low risk of impact	

Water quality

Time (EST): 15:57	**Water temperature:** 17.2˚C
Sp. Conductivity: 628 µS/cm	**pH:** 7.6
Dissolved oxygen: 83.7%	**Dissolved oxygen:** 7.92 mg/L
Turbidity: 11.2 NTU	**Ion sample collected:** yes
Notes: Impacted by coal fines in runoff from Cook CHPP upstream	

Observations within 2 m of sampling point

Shading: 90%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: E	

Reach observations (100 m reach, or 10 x modal width)

Mean wetted width: 80 m	**Bankfull width:** 100 m
Maximum depth: 2+ m	**Bankfull height:** 3.5+ m

Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry

Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes

Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (L), moss (N), filamentous algae (L), macrophytes (S), bank overhang (N), trailing bank vegetation (S), blanketing silt (E), substrate anoxia (L)

Upstream landuse: past vegetation clearing, moderate grazing, Cook CHPP

Adjacent landuse (right bank): moderate grazing, past clearing

Adjacent landuse (left bank): moderate grazing, past clearing

Bed, edge and bank characteristics

Bed substrates: 95% silt/clay (<0.05 mm), 5% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock

Edge substrates: 95% silt/clay (<0.05 mm), 5% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock

Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt or sand (N)

Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N),

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: regrowth	**Dominant stratum:** wetland
Health: average	**Dieback:** 1-10%
EDL height: 2 m	**EDL cover:** 20%
Canopy species: *Acacia salicina* (D), *Eucalyptus populnea* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acacia harpophylla* (O)	
Shrub species: *Acacia salicina* (O), *Opuntia tomentosa** (O), *Typha domingensis* (D), *Santalum* sp. (O), *Geijera parviflora* (O), *Eremophila mitchellii* (O)	
Ground species: *Cenchrus ciliaris** (D), *Typha domingensis* (D), *Ludwigia peploides* subsp. *montevidensis* (A), *Megathyrsus maximus** (A), *Parthenium hysterophorus** (O), *Cynodon dactylon** (O)	

Macrophytes
Submerged macrophytes: *Najas tenuifolia* (L), *Potamogeton crispus* (L)
Floating macrophytes: *Lemna aequinoctialis* (L), *Azolla pinnata* (L)
Emergent macrophytes: *Typha domingensis* (S), *Ludwigia peploides* subsp. *montevidensis* (S), *Nymphoides indica* (S), *Cyperus* sp. (L), *Echinochloa colona** (L), *Eclipta prostrata** (L), *Juncus usitatus* (L), *Cyperus difformis* (L), *Schoenoplectus validus* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Anguilla reinhardtii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*, *Emydura macquarii krefftii*
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: L2	**Location:** Farm dam on unnamed tributary of Two Mile Gully
Date: 22/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7141; 148.8778 (GDA 2020)
Water level: no flow – isolated	**Likely flow nature:** semi-permanent waterbody on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Low risk of impact	
Water quality	
Time (EST): 12:46	**Water temperature:** 29.1˚C
Sp. Conductivity: 786 µS/cm	**pH:** 8.2
Dissolved oxygen: 91.6%	**Dissolved oxygen:** 7.02 mg/L
Turbidity: 19.2 NTU	**Ion sample collected:** yes
Notes: Impacted by coal fines in runoff from Cook CHPP upstream	
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** M
Floating macrophytes: S	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 65 m	**Bankfull width:** 100 m
Maximum depth: 2+ m	**Bankfull height:** 3.5+ m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (L), moss (N), filamentous algae (L), macrophytes (S), bank overhang (N), trailing bank vegetation (S), blanketing silt (E), substrate anoxia (L)	
Upstream landuse: past vegetation clearing, moderate grazing, Cook CHPP	
Adjacent landuse (right bank): moderate grazing, past clearing	
Adjacent landuse (left bank): moderate grazing, past clearing	
Bed, edge and bank characteristics	
Bed substrates: 95% silt/clay (<0.05 mm), 5% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 95% silt/clay (<0.05 mm), 5% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: bed stable	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt or sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (S)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 10 m	**Width of riparian zone on right bank:** 10 m
Bare ground: S	**Grasses/forbs:** M
Shrubs: L	**Trees <10 m:** S
Trees >10m: L	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: regrowth	**Dominant stratum:** wetland
Health: average	**Dieback:** 1-10%
EDL height: 2 m	**EDL cover:** 20%
Canopy species: *Acacia salicina* (D), *Eucalyptus populnea* (O), *Terminalia oblongata* subsp. *oblongata* (O), *Acacia harpophylla* (O)	
Shrub species: *Acacia salicina* (O), *Opuntia tomentosa** (O), *Typha domingensis* (D), *Santalum* sp. (O), *Geijera parviflora* (O), *Eremophila mitchellii* (O)	
Ground species: *Cenchrus ciliaris** (D), *Typha domingensis* (F), *Megathyrsus maximus** (F), *Cynodon dactylon** (F), *Ludwigia peploides* subsp. *montevidensis* (O), *Parthenium hysterophorus** (O)	

Macrophytes
Submerged macrophytes: *Potamogeton crispus* (M), *Najas tenuifolia* (L)
Floating macrophytes: *Lemna aequinoctialis* (L), *Azolla pinnata* (S)
Emergent macrophytes: *Typha domingensis* (S), *Ludwigia peploides* subsp. *montevidensis* (L), *Nymphoides indica* (L), *Cyperus exaltatus* (L), *Eclipta prostrata** (L), *Juncus usitatus* (L), *Schoenoplectus validus* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: yes
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: yes
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: yes
Aquatic vertebrates encountered: *Ambassis agassizii*, *Anguilla reinhardtii*, *Hypseleotris bucephala*, *Leiopotherapon unicolor*, *Melanotaenia splendida splendida*, *Mogurnda adspersa*, *Porochilus rendahli*, *Emydura macquarii krefftii*
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: L3	**Location:** Taurus Dam
Date: 3/07/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.7454; 148.8470 (GDA 2020)
Water level: no flow – isolated	**Likely flow nature:** mine water dam on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, High risk of impact	
Water quality	
Time (EST): 9:13	**Water temperature:** 13.9˚C
Sp. Conductivity: 5124 µS/cm	**pH:** 8.4
Dissolved oxygen: 76.6%	**Dissolved oxygen:** 7.78 mg/L
Turbidity: 37.6 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** moderately turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: S	**Algae in water column:** L
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 400 m	**Bankfull width:** 600 m
Maximum depth: 2+ m	**Bankfull height:** 4+ m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (S), moss (N), filamentous algae (L), macrophytes (L), bank overhang (N), trailing bank vegetation (S), blanketing silt (S), substrate anoxia (S)	
Upstream landuse: coal mining	
Adjacent landuse (right bank): coal mining	
Adjacent landuse (left bank): coal mining	
Bed, edge and bank characteristics	
Bed substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: severe deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (E), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 5 m	**Width of riparian zone on right bank:** 5 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** L
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: poor	**Dieback:** 1-10%
EDL height: 1 m	**EDL cover:** 30%
Canopy species: *Acacia salicina* (F), *Acacia* sp. (O), *Lysiphyllum hookeri* (R)	
Shrub species: *Acacia salicina* (F), *Acacia harpophylla* (O), *Typha domingensis* (F), *Sesbania cannabina* (O)	
Ground species: *Cynodon dactylon** (D), *Parthenium hysterophorus** (O), *Chloris* sp. (O), *Eriochloa pseudoacrotricha* (O), *Panicum* sp. (O)	

Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: *Typha domingensis* (L), *Schoenoplectus vallidus* (L), *Persicaria attenuata* (L), *Leptochloa digitata* (L), *Persicaria lapathifolia* (L), *Echinochloa colona** (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed
Notes: Partly de-silted within last year. Mine water being pumped into it at the time of assessment.
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT	
Site code: L3	**Location:** Taurus Dam
Date: 20/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7454; 148.8470 (GDA 2020)
Water level: no flow – isolated (higher than last time)	**Likely flow nature:** mine water dam on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, High risk of impact	
Water quality	
Time (EST): 10:04	**Water temperature:** 29.4˚C
Sp. Conductivity: 4951 µS/cm	**pH:** 9.1
Dissolved oxygen: 29.4%	**Dissolved oxygen:** 10.29 mg/L
Turbidity: 85.3 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** moderately turbid
Water odour: anoxia	**Water surface:** normal
Algae on substrate: E	**Algae in water column:** M
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 420 m	**Bankfull width:** 600 m
Maximum depth: 2+ m	**Bankfull height:** 4+ m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m), deep (>0.5 m), pool, large woody debris, macrophytes	
Habitat attributes: detritus (L), sticks (L), branches (L), logs (L), periphyton (S), moss (N), filamentous algae (M), macrophytes (L), bank overhang (N), trailing bank vegetation (S), blanketing silt (S), substrate anoxia (S)	
Upstream landuse: coal mining	
Adjacent landuse (right bank): coal mining	
Adjacent landuse (left bank): coal mining	
Bed, edge and bank characteristics	
Bed substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: severe deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (E), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 5 m	**Width of riparian zone on right bank:** 5 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** L
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: poor	**Dieback:** 1-10%
EDL height: 1 m	**EDL cover:** 30%
Canopy species: *Acacia salicina* (F), *Acacia* sp. (O), *Lysiphyllum hookeri* (R)	
Shrub species: *Acacia salicina* (F), *Acacia harpophylla* (O), *Typha domingensis* (F), *Sesbania cannabina* (O)	
Ground species: *Cynodon dactylon** (D), *Parthenium hysterophorus** (O), *Chloris* sp. (O), *Eriochloa pseudoacrotricha* (O), *Panicum* sp. (O)	

Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: *Typha domingensis* (L), *Schoenoplectus vallidus* (L), *Persicaria attenuata* (L), *Leptochloa digitata* (L), *Persicaria lapathifolia* (L), *Echinochloa colona** (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

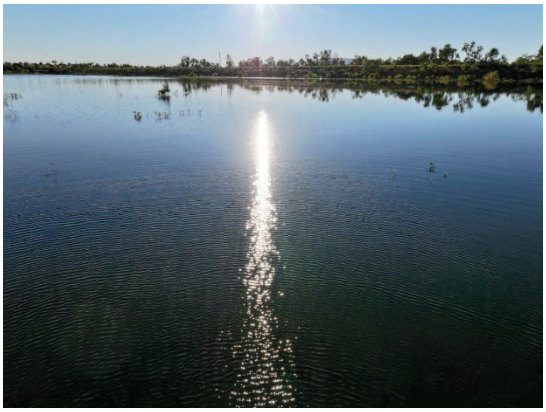
AQUATIC HABITAT ASSESSMENT	
Site code: L4	**Location:** Deep Creek Dam
Date: 3/07/2025	**Season:** late wet
Assessor: DM	**Coordinates:** -23.7216; 148.8217 (GDA 2020)
Water level: no flow – isolated	**Likely flow nature:** mine water dam on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Low risk of impact	
Water quality	
Time (EST): 7:47	**Water temperature:** 14.5˚C
Sp. Conductivity: 965 µS/cm	**pH:** 8.9
Dissolved oxygen: 94.8%	**Dissolved oxygen:** 9.63 mg/L
Turbidity: 16.5 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** clear
Water odour: none detected	**Water surface:** normal
Algae on substrate: L	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 300 m	**Bankfull width:** 400 m
Maximum depth: 1 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m) and deep pool, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (N), logs (N), periphyton (L), moss (N), filamentous algae (L), macrophytes (L), bank overhang (N), trailing bank vegetation (M), blanketing silt (L), substrate anoxia (N)	
Upstream landuse: coal mining	
Adjacent landuse (right bank): coal mining	
Adjacent landuse (left bank): coal mining	
Bed, edge and bank characteristics	
Bed substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: severe deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (M), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	



Upstream



Left bank



Downstream



Right bank

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 2 m	**Width of riparian zone on right bank:** 2 m
Bare ground: L	**Grasses/forbs:** E
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: poor	**Dieback:** 1-10%
EDL height: 1 m	**EDL cover:** 15%
Canopy species: *Acacia harpophylla* (O)	
Shrub species: *Acacia harpophylla* (O), *Sesbania cannabina* (F), *Acacia salicina* (O), *Cryptostegia grandiflora** (R), *Sclerolaena* sp. (O), *Vachellia farnesiana** (R), *Tamarix aphylla** (R)	
Ground species: *Cynodon dactylon** (D), *Parthenium hysterophorus** (O), *Sporobolus* sp. (O), *Melinis repens** (O), *Enchylaena tomentosa* (O), *Trianthema portulacastrum** (O)	

Macrophytes
Submerged macrophytes: *Nitella* sp. (L)
Floating macrophytes: none observed
Emergent macrophytes: *Leptochloa digitata* (L), *Persicaria attenuata* (L), *Echinochloa colona** (L), *Persicaria lapathifolia* (L), *Polygonum minuta* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed
Notes: De-silted in late 2024
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

AQUATIC HABITAT ASSESSMENT

Site code: L4	**Location:** Deep Creek Dam
Date: 20/10/2025	**Season:** dry
Assessor: DM	**Coordinates:** -23.7216; 148.8217 (GDA 2020)
Water level: no flow – isolated (lower than last time)	**Likely flow nature:** mine water dam on ephemeral waterway
State-mapped watercourse (DLGWV 2025): no, unmapped	
Likely a watercourse: no, likely a drainage feature	
State-mapped waterway providing for fish passage (DAF 2020): yes, Low risk of impact	
Water quality	
Time (EST): 9:21	**Water temperature:** 25.2˚C
Sp. Conductivity: 1403 µS/cm	**pH:** 8.5
Dissolved oxygen: 83.8%	**Dissolved oxygen:** 6.88 mg/L
Turbidity: 42.7 NTU	**Ion sample collected:** yes
Observations within 2 m of sampling point	
Shading: 0%	**Water colour:** moderately turbid
Water odour: none detected	**Water surface:** normal
Algae on substrate: N	**Algae in water column:** N
Emergent macrophytes: N	**Submerged macrophytes:** N
Floating macrophytes: N	
Reach observations (100 m reach, or 10 x modal width)	
Mean wetted width: 200 m	**Bankfull width:** 400 m
Maximum depth: 0.5 m	**Bankfull height:** 3 m
Habitat types: 0% riffle, 0% run, 100% sandy pool, 0% rocky pool, 0% dry	
Variety of habitat: shallow (<0.5 m) and deep pool, macrophytes	
Habitat attributes: detritus (S), sticks (L), branches (N), logs (N), periphyton (L), moss (N), filamentous algae (L), macrophytes (L), bank overhang (N), trailing bank vegetation (L), blanketing silt (L), substrate anoxia (N)	
Upstream landuse: coal mining	
Adjacent landuse (right bank): coal mining	
Adjacent landuse (left bank): coal mining	
Bed, edge and bank characteristics	
Bed substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Edge substrates: 100% silt/clay (<0.05 mm), 0% sand (0.05-2 mm), 0% gravel (2-4 mm), 0% pebble (4-64 mm), 0% cobble (64-256 mm), 0% boulder (>256 mm), 0% bedrock	
Bank soils: clay	**Bank stability:** stable
Bed stability: severe deposition	**Bank shape:** concave
Channel shape: U shaped	**Recent deposits:** silt (M), sand (N)
Local catchment erosion: gully (N), rill (N), tunnel (N), sheet (N), bank slumping (N), cattle pugging (N)	

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001).



Upstream



Left bank



Downstream



Right bank

Riparian vegetation	
Cover	
Width of riparian zone on left bank: 1 m	**Width of riparian zone on right bank:** 1 m
Bare ground: L	**Grasses/forbs:** S
Shrubs: L	**Trees <10 m:** L
Trees >10m: N	**Exotic riparian species:** S
Composition and health	
State-mapped RE: Non-remnant	**Verified RE:** Non-remnant
Vegetation status: cleared	**Dominant stratum:** wetland
Health: poor	**Dieback:** 1-10%
EDL height: 0.3 m	**EDL cover:** 15%
Canopy species: *Acacia harpophylla* (O)	
Shrub species: *Acacia harpophylla* (O), *Sesbania cannabina* (F), *Acacia salicina* (O), *Cryptostegia grandiflora** (R), *Sclerolaena* sp. (O), *Vachellia farnesiana** (R), *Tamarix aphylla** (R)	
Ground species: *Cynodon dactylon var. dactylon** (D), *Parthenium hysterophorus** (O), *Sporobolus* sp. (O), *Melinis repens** (O), *Enchylaena tomentosa* (O)	

Macrophytes
Submerged macrophytes: none observed
Floating macrophytes: none observed
Emergent macrophytes: *Leptochloa digitata* (L), *Persicaria attenuata* (L), *Echinochloa colona** (L), *Persicaria lapathifolia* (L), *Polygonum minuta* (L), *Myriophyllum verrucosum* (L)
Aquatic biota
Aquatic macroinvertebrate sampling undertaken: no
Habitat for platypus: unlikely habitat
Habitat for EVNT fish species: unlikely
Fish sampling undertaken: no
Suitable habitat for EVNT turtle species: unlikely
Turtle sampling undertaken: no
Aquatic vertebrates encountered: none observed
Notes: De-silted in late 2024
Overall aquatic value: Low

A



B



C



A: Aerial photograph from 100 m above ground level; upstream (left) to downstream (right)
B: Aerial photograph from 100 m above ground, looking upstream
C: Aerial photograph from 100 m above ground, looking downstream

Notes: Aquatic cover categories: None detected (N), Little (L; 1-10%), Some (S; 10-50%), Moderate (M; 50-75%), Extensive (E; >75%), as per DNRM (2001). Terrestrial cover categories: Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

Appendix C: Bores Considered for Stygofauna Sampling

Registered bore	Other name	Drilled date	Depth (mbgl)	Screened interval (m)	Screen aperture (mm)	Lithology	Logged SWL (mbgl)	Mean pH	Mean EC (µS/cm)	Data points (n)	WHC notes	Suitable?	Can it be accessed?	DPM would like to seek access	DPM notes
RN 190142	BWMMB03_01	27/09/2020	12	8-11	1	Sand and gravel	Unknown	Unknown	Unknown	0		Potential	Yes	Yes	
RN 190143	BWMMB03_02	27/09/2020	41	35-41	1	Sandstone	12.5	7.7	34100	1		x	Yes	x	
RN 158688	MB16	28/08/2012	59.2	50.2-59.2	1	Siltstone	33.0	Unknown	6500	1	Would require a land access agreement	Potential	Possibly	x	Outside of State-mapped aquifer
RN 158687	MB17	28/08/2012	50	38.2-47.2	1	Sandstone	22	Unknown	30000	1	Would require a land access agreement	x	Possibly	x	
RN 132783	MB9	29/11/2011	13	9-12	1	Sand	Unknown	Unknown	Unknown	0	Would require a land access agreement	Potential	Possibly	Yes	
RN 132781	MB6	29/11/2011	41	32-41	1	Siltstone	8.35	Unknown	20000	1	Would require a land access agreement	x	Possibly	x	
RN 132782	MB10	29/11/2011	10	6-9	1	Sand	Unknown	Unknown	Unknown	0	Would require a land access agreement	Potential	Possibly	Yes	
RN 158306	MB8	30/05/2012	438	NA	NA	Coal	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 132780	MB11	29/11/2011	53	44-53	1	Siltstone	Unknown	Unknown	26000	1	Would require a land access agreement	x	Possibly	x	
RN 158305	MB7	9/04/2012	434	NA	NA	Coal	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 158304	MB3R	14/03/2012	65	59-65	1	Sandstone/siltstone	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 132785	MB3	29/11/2011	65	59-65	1	Siltstone	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 132784	MB5	29/11/2011	47	42-45	1	Siltstone	Unknown	Unknown	17500	1	Would require a land access agreement	x	Possibly	x	
RN 158024	MB15	14/12/2011	23	20-23	1	Siltstone	Unknown	Unknown	22000	1	Would require a land access agreement	x	Possibly	x	
RN 132778	MB14A	23/11/2011	35	32-35	1	Siltstone	Unknown	Unknown	12700	1	Would require a land access agreement	x	Possibly	x	
RN 132779	MB14B	23/11/2011	23	20-23	1	Sandstone	Unknown	Unknown	26200	1	Would require a land access agreement	x	Possibly	x	
RN 132776	MB4	29/11/2011	33	27-33	1	Siltstone	Unknown	Unknown	16900	1	Would require a land access agreement	x	Possibly	x	
RN 132777	MB2	27/11/2011	226	220-226	2	Coal	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 158263	MB1	30/11/2011	269	NA	NA	Coal	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 132775	MB12	29/11/2011	9.5	6.5-9.5	1	Sand	Unknown	Unknown	Unknown	0	Would require a land access agreement	Potential	Possibly	Yes	
RN 132773	MB13A	26/11/2011	16	12.3-15.3	1	Siltstone	Unknown	Unknown	Unknown	0	Would require a land access agreement	Potential	Possibly	Yes	
RN 132774	MB13B	29/11/2011	9	6.0-9.0	1	Sand	Unknown	Unknown	Unknown	0	Would require a land access agreement	Potential	Possibly	Yes	
RN 190464	-	10/11/2020	30	21.0-30.0	0.4	Siltstone	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 190459	-	6/11/2020	51	42.0-51.0	0.4	Siltstone	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 165940	MB19BWM02A	13/11/2019	15	12.0-15.0	1	Clay/sand	7.61	Unknown	Brackish	1		Potential	Yes	Yes	
RN 165971	MB19BWM01P	13/11/2019	171	168-171	1	Coal	13.6	8.2	27350	1		x	Yes	x	
RN 165972	MB19BWM04R	15/11/2019	80	71-80	1	Sandstone/siltstone	36.7	Unknown	Salty	1		x	Yes	x	
RN 165945	MB19BWM05A	9/11/2019	15	9-15	1	Claystone	Unknown	Unknown	Unknown	0		Potential	Yes	Yes	Within ML
RN 165941	MB19BWM03P	8/11/2019	234	221-230	1	Siltstone/coal	200	Unknown	Brackish	1		x	Yes	x	
RN 165947	MB19BWM06P	7/11/2019	186	180-186	1	Siltstone/coal	25.8	Unknown	20410	1	Would require a land access agreement	x	Possibly	x	
RN 165973	MB19BWM27P	18/12/2019	189	180-189	4	Coal	25	Unknown	Salty	1		x	Yes	x	
RN 165951	MB19BWM26P	7/12/2019	191	Unknown	Unknown	Siltstone/coal	11.5	Unknown	Salty	1		x	Yes	x	
RN 165950	PB19BWM01P	3/12/2019	198	Unknown	Unknown	Siltstone/coal	30	Unknown	Salty	1		x	Yes	x	
RN 165949	MB19BWM25P	30/11/2019	20	17-20	1	Sandstone	13.8	8.7	4441	1		✓	Yes	Yes	Within ML
RN 165948	MB19BWM07A	29/11/2019	7	4-7	4	Sand and gravel	4	8.7	4400	1		✓	Yes	Yes	Within ML
RN 190679	-	14/09/2021	25	Unknown	1	-	-	Unknown	Unknown	0		x	Yes	x	
RN 165946	MB19BWM09A	4/12/2019	15	Grouted	Unknown	-	-	Unknown	Unknown	0		x	Yes	x	
RN 165936	MB19BWM08P	19/10/2019	190	184-190	1	Sandstone/coal	21.5	8.0	5507	1		x	Yes	x	
RN 209136	C1424W	23/11/2023	176	NA	NA	Coal	Unknown	Unknown	Unknown	0	Would require a land access agreement	x	Possibly	x	
RN 47668	-	1/01/1978	19.2	15.2-19.2	open	Mudstone/shale/silt	Unknown	Unknown	Unknown	0	Abandoned and destroyed	x	No	x	
RN 208478	C1419W	21/07/2024	10	12-15; 17-23	1	Sandstone/siltstone	10	Unknown	Unknown	1	Would require a land access agreement	Potential	Possibly	x	Outside of State-mapped aquifer
RN 205177	C1423W	22/07/2023	27	18-27	1	Sandstone	17	Unknown	Unknown	1	Would require a land access agreement	Potential	Possibly	x	Outside of State-mapped aquifer

Registered bore	Other name	Drilled date	Depth (mbgl)	Screened interval (m)	Screen aperture (mm)	Lithology	Logged SWL (mbgl)	Mean pH	Mean EC (µS/cm)	Data points (n)	WHC notes	Suitable?	Can it be accessed?	DPM would like to seek access	DPM notes
RN 208477	C1420W	21/07/2024	30	18-27	1	Sandstone/siltstone	7	Unknown	Unknown	1	Would require a land access agreement	**Potential**	**Possibly**	**x**	Outside of State-mapped aquifer
RN 208476	C1421W	21/07/2024	23.5	17.5-23.5	1	Sandstone/siltstone	16	Unknown	Unknown	1	Would require a land access agreement	**Potential**	**Possibly**	**x**	Outside of State-mapped aquifer
RN 23022	HPP GEMINI 3	28/08/1980	444	Unknown	Unknown	-	-	Unknown	Unknown	0	Would require a land access agreement	**x**	**Possibly**	**x**	
RN 205176	C1422W	22/07/2023	30	21-30	1	Sandstone	-	Unknown	Unknown	0	Dry during drilling	**x**	**No**	**x**	
RN 23021	HPP GEMINI 2	17/08/1980	443	Unknown	Unknown	-	-	Unknown	Unknown	0	Would require a land access agreement	**x**	**Possibly**	**x**	
RN 23020	HPP GEMINI 4	3/08/1980	465	Unknown	Unknown	-	-	Unknown	Unknown	0	Would require a land access agreement	**x**	**Possibly**	**x**	
RN 23023	HPP GEMINI 1	8/09/1980	609	Unknown	Unknown	-	-	Unknown	Unknown	0	Would require a land access agreement	**x**	**Possibly**	**x**	

Selection criteria:

1. Not a dry bore
2. At least 6 months old
3. Screened interval no deeper than 60 mbgl, and ideally shallower than 50 mbgl (stygofauna rarely found deeper than this due to lack of dissolved organic carbon)
4. Screen aperture 1 mm or greater (exceptions can be made, but non-detection is inconclusive)
5. EC ideally <5,000 uS/cm, although exceptions can be made
6. pH ideally 6.5-8.5, although not as important
7. not purged in the last 1-3 months

Colour coding:

Green cells = likely suitable
Orange cells = marginal, or unknown and potentially suitable
Red cells = not suitable

Appendix D: Water Sampling Analytical Results

CERTIFICATE OF ANALYSIS

Work Order	: **EB2523359**	Page	: 1 of 6
Client	: **DPM ENVIROSCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Contact	: Customer Services EB
Address	: 12 LAUREN DRIVE BUDERIM 4556	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 07-Jul-2025 14:30
Order number	: ----	Date Analysis Commenced	: 07-Jul-2025
C-O-C number	: ----	Issue Date	: 14-Jul-2025 14:48
Sampler	: DAVID MOORE		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 19		
No. of samples analysed	: 19		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	L1	R5	R6	R9	R3
				Sampling date / time	17-Jun-2025 00:00	18-Jun-2025 00:00	18-Jun-2025 00:00	19-Jun-2025 00:00	20-Jun-2025 00:00
					EB2523359-001	EB2523359-002	EB2523359-003	EB2523359-004	EB2523359-005
					Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**93**	**171**	**92**	**78**	**110**
Total Alkalinity as CaCO3	----	1	mg/L		**93**	**171**	**92**	**78**	**110**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<1	**4**	**8**	**2**	**5**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**8**	**18**	**15**	**7**	**24**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**16**	**37**	**19**	**15**	**23**
Magnesium	7439-95-4	1	mg/L		**6**	**8**	**6**	**4**	**8**
Sodium	7440-23-5	1	mg/L		**19**	**39**	**22**	**12**	**23**
Potassium	7440-09-7	1	mg/L		**5**	**4**	**6**	**5**	**7**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**2.08**	**4.01**	**2.43**	**1.80**	**2.98**
ø Total Cations	----	0.01	meq/L		**2.25**	**4.30**	**2.55**	**1.73**	**2.98**
ø Ionic Balance	----	0.01	%		**----**	**3.56**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	R4	L2	RN165940	RN165949	MB06
			Sampling date / time	20-Jun-2025 00:00	30-Jun-2025 00:00	01-Jul-2025 00:00	01-Jul-2025 00:00	02-Jul-2025 00:00
Compound	CAS Number	LOR	Unit	EB2523359-006	EB2523359-007	EB2523359-008	EB2523359-009	EB2523359-010
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	78	121	438	788	280
Total Alkalinity as CaCO3	----	1	mg/L	78	121	438	788	280
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	7	99	502	240	604
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	10	40	13100	1290	7230
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	15	32	995	59	454
Magnesium	7439-95-4	1	mg/L	5	13	1040	26	248
Sodium	7440-23-5	1	mg/L	16	48	6420	1100	3870
Potassium	7440-09-7	1	mg/L	6	9	9	4	15
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	1.99	5.61	389	57.1	222
ø Total Cations	----	0.01	meq/L	2.01	4.98	415	53.0	212
ø Ionic Balance	----	0.01	%	----	5.88	3.23	3.72	2.38

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MP1	MP2	RN132773	L3	L4
			Sampling date / time	02-Jul-2025 00:00	02-Jul-2025 00:00	02-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00
Compound	CAS Number	LOR	Unit	EB2523359-011	EB2523359-012	EB2523359-013	EB2523359-014	EB2523359-015
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	52	11
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	90	249	299	578	149
Total Alkalinity as CaCO3	----	1	mg/L	90	249	299	630	161
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	<1	1000	537	110
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12	20	16900	1160	161
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	15	73	1350	31	35
Magnesium	7439-95-4	1	mg/L	4	15	1290	40	14
Sodium	7440-23-5	1	mg/L	18	19	8850	1000	140
Potassium	7440-09-7	1	mg/L	5	5	12	10	6
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	2.20	5.54	504	56.5	10.0
ø Total Cations	----	0.01	meq/L	2.00	----	----	----	----
ø Total Cations	----	0.01	meq/L	----	5.83	559	48.6	9.14
ø Ionic Balance	----	0.01	%	----	2.57	5.20	7.52	4.72

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MP3	MP4	MP5	RN190143	----
			Sampling date / time	03-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00	----
Compound	CAS Number	LOR	Unit	EB2523359-016	EB2523359-017	EB2523359-018	EB2523359-019	--------
				Result	Result	Result	Result	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**117**	**600**	**125**	**48**	----
Total Alkalinity as CaCO3	----	1	mg/L	**117**	**600**	**125**	**48**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**3**	**2**	**2**	<1	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**25**	**30**	**23**	**12700**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**28**	**178**	**30**	**2240**	----
Magnesium	7439-95-4	1	mg/L	**9**	**38**	**9**	**132**	----
Sodium	7440-23-5	1	mg/L	**18**	**24**	**18**	**5970**	----
Potassium	7440-09-7	1	mg/L	**6**	**12**	**7**	**11**	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**3.10**	**12.9**	**3.19**	**359**	----
ø Total Cations	----	0.01	meq/L	**3.07**	**13.4**	**3.20**	**383**	----
ø Ionic Balance	----	0.01	%	**0.50**	**1.85**	**0.18**	**3.15**	----

QUALITY CONTROL REPORT

Work Order	: **EB2523359**	Page	: 1 of 6
Client	: **DPM ENVIROSCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Contact	: Customer Services EB
Address	: 12 LAUREN DRIVE BUDERIM 4556	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 07-Jul-2025
Order number	: ----	Date Analysis Commenced	: 07-Jul-2025
C-O-C number	: ----	Issue Date	: 14-Jul-2025
Sampler	: DAVID MOORE		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 19		
No. of samples analysed	: 19		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 6702966)									
EB2523359-012	MP2	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	249	248	0.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	249	248	0.6	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 6705412)									
EB2522984-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	76	72	4.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	76	72	4.1	0% - 20%
EB2523359-010	MB06	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	280	279	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	280	279	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 6705427)									
EB2523450-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	32	36	13.7	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	280	278	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	311	315	1.1	0% - 20%
EB2523359-017	MP4	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	600	601	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	600	601	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 6708262)									
EB2523603-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	152	164	7.5	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	644	634	1.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	796	798	0.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 6705160)									
EB2523302-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	10	10	0.0	0% - 50%
EB2523359-005	R3	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5	4	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 6709712)									
EB2523450-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1110	1120	0.8	0% - 20%
EB2523359-018	MP5	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 6714744)									
EB2523359-011	MP1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	3	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 6705161)									
EB2523302-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	<1	<1	0.0	No Limit
EB2523359-005	R3	ED045G: Chloride	16887-00-6	1	mg/L	24	24	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 6709709)									
EB2523450-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4730	4810	1.8	0% - 20%
EB2523359-018	MP5	ED045G: Chloride	16887-00-6	1	mg/L	23	23	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 6714745)									
EB2523359-011	MP1	ED045G: Chloride	16887-00-6	1	mg/L	12	13	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 6703163)									
EB2523114-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	15	15	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	282	281	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 6703172)									
EB2523040-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EB2523241-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	24	25	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 6703173)									
EB2523359-004	R9	ED093F: Calcium	7440-70-2	1	mg/L	15	15	0.0	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 6703173) - continued									
EB2523359-004	R9	ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.0	No Limit
EB2523359-014	L3	ED093F: Calcium	7440-70-2	1	mg/L	31	31	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	40	40	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1000	1010	0.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 6702966)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	50 mg/L	109	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 6705412)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.2	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 6705427)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	104	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 6708262)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	92.1	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6705160)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	94.7	85.0	118
				<1	100 mg/L	108	85.0	118
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6709712)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.6	85.0	118
				<1	100 mg/L	104	85.0	118
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6714744)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.5	85.0	118
				<1	100 mg/L	103	85.0	118
ED045G: Chloride by Discrete Analyser (QCLot: 6705161)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	112	90.0	115
				<1	1000 mg/L	105	90.0	115
ED045G: Chloride by Discrete Analyser (QCLot: 6709709)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	113	90.0	115
				<1	1000 mg/L	110	90.0	115
ED045G: Chloride by Discrete Analyser (QCLot: 6714745)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	110	90.0	115
				<1	1000 mg/L	107	90.0	115
ED093F: Dissolved Major Cations (QCLot: 6703163)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	70.0	130
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	70.0	130
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	70.0	130
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.5	70.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED093F: Dissolved Major Cations (QCLot: 6703172)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.6	70.0	130
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	70.0	130
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	70.0	130
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.6	70.0	130
ED093F: Dissolved Major Cations (QCLot: 6703173)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	110	70.0	130
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	113	70.0	130
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	99.0	70.0	130
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100.0	70.0	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6705160)							
EB2523302-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6709712)							
EB2523450-006	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 6714744)							
EB2523401-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	89.6	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 6705161)							
EB2523302-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	112	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 6709709)							
EB2523450-006	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	# Not Determined	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2523359**	Page	: 1 of 7
Client	: **DPM ENVIROSCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 07-Jul-2025
Site	: ----	Issue Date	: 14-Jul-2025
Sampler	: DAVID MOORE	No. of samples received	: 19
Order number	: ----	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB2523302--002	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB2523450--006	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EB2523450--006	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
ED037P: Alkalinity by PC Titrator						
Clear Plastic Bottle - Natural						
L1	----	----	----	09-Jul-2025	01-Jul-2025	**8**
Clear Plastic Bottle - Natural						
R5, R6	----	----	----	09-Jul-2025	02-Jul-2025	**7**
Clear Plastic Bottle - Natural						
R9	----	----	----	09-Jul-2025	03-Jul-2025	**6**
Clear Plastic Bottle - Natural						
R3, R4	----	----	----	09-Jul-2025	04-Jul-2025	**5**
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural						
RN165940, RN165949	----	----	----	11-Jul-2025	08-Jul-2025	**3**
Clear Plastic Bottle - Natural						
MP1	----	----	----	10-Jul-2025	09-Jul-2025	**1**
Clear Plastic Bottle - Natural						
MB06, MP2, RN132773	----	----	----	11-Jul-2025	09-Jul-2025	**2**
Clear Plastic Bottle - Natural						
L3, L4, MP3, MP4, MP5, RN190143	----	----	----	11-Jul-2025	10-Jul-2025	**1**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) RN165940, RN165949	**01-Jul-2025**	**----**	----	----	**09-Jul-2025**	15-Jul-2025	✓
Clear Plastic Bottle - Natural (ED037-P) MP2, RN132773	**02-Jul-2025**	**----**	----	----	**08-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Natural (ED037-P) MB06	**02-Jul-2025**	**----**	----	----	**09-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Natural (ED037-P) MP1	**02-Jul-2025**	**----**	----	----	**10-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Natural (ED037-P) L3, L4, MP3, MP4, MP5, RN190143	**03-Jul-2025**	**----**	----	----	**09-Jul-2025**	17-Jul-2025	✓
Clear Plastic Bottle - Natural (ED037-P) L1	**17-Jun-2025**	**----**	----	----	**09-Jul-2025**	01-Jul-2025	×
Clear Plastic Bottle - Natural (ED037-P) R5, R6	**18-Jun-2025**	**----**	----	----	**09-Jul-2025**	02-Jul-2025	×
Clear Plastic Bottle - Natural (ED037-P) R9	**19-Jun-2025**	**----**	----	----	**09-Jul-2025**	03-Jul-2025	×
Clear Plastic Bottle - Natural (ED037-P) R3, R4	**20-Jun-2025**	**----**	----	----	**09-Jul-2025**	04-Jul-2025	×
Clear Plastic Bottle - Natural (ED037-P) L2	**30-Jun-2025**	**----**	----	----	**09-Jul-2025**	14-Jul-2025	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) RN165940, RN165949	**01-Jul-2025**	**----**	----	----	**08-Jul-2025**	29-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) MB06, MP2, RN132773	**02-Jul-2025**	**----**	----	----	**08-Jul-2025**	30-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) MP1	**02-Jul-2025**	**----**	----	----	**12-Jul-2025**	30-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) L3, L4, MP3, MP4, MP5, RN190143	**03-Jul-2025**	**----**	----	----	**10-Jul-2025**	31-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) L1	**17-Jun-2025**	**----**	----	----	**08-Jul-2025**	15-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) R5, R6	**18-Jun-2025**	**----**	----	----	**08-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) R9	**19-Jun-2025**	**----**	----	----	**08-Jul-2025**	17-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) R3, R4	**20-Jun-2025**	**----**	----	----	**08-Jul-2025**	18-Jul-2025	✓
Clear Plastic Bottle - Natural (ED041G) L2	**30-Jun-2025**	**----**	----	----	**08-Jul-2025**	28-Jul-2025	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) RN165940, RN165949	**01-Jul-2025**	**----**	----	----	**08-Jul-2025**	29-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) MB06, MP2, RN132773	**02-Jul-2025**	**----**	----	----	**08-Jul-2025**	30-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) MP1	**02-Jul-2025**	**----**	----	----	**12-Jul-2025**	30-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) L3, L4, MP3, MP4, MP5, RN190143	**03-Jul-2025**	**----**	----	----	**10-Jul-2025**	31-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) L1	**17-Jun-2025**	**----**	----	----	**08-Jul-2025**	15-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) R5, R6	**18-Jun-2025**	**----**	----	----	**08-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) R9	**19-Jun-2025**	**----**	----	----	**08-Jul-2025**	17-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) R3, R4	**20-Jun-2025**	**----**	----	----	**08-Jul-2025**	18-Jul-2025	✓
Clear Plastic Bottle - Natural (ED045G) L2	**30-Jun-2025**	**----**	----	----	**08-Jul-2025**	28-Jul-2025	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) RN165940, RN165949	**01-Jul-2025**	**----**	----	----	**11-Jul-2025**	08-Jul-2025	×
Clear Plastic Bottle - Natural (ED093F) MP1	**02-Jul-2025**	**----**	----	----	**10-Jul-2025**	09-Jul-2025	×
Clear Plastic Bottle - Natural (ED093F) MB06, MP2, RN132773	**02-Jul-2025**	**----**	----	----	**11-Jul-2025**	09-Jul-2025	×
Clear Plastic Bottle - Natural (ED093F) L3, L4, MP3, MP4, MP5, RN190143	**03-Jul-2025**	**----**	----	----	**11-Jul-2025**	10-Jul-2025	×
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) L1	**17-Jun-2025**	**----**	----	----	**11-Jul-2025**	15-Jul-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) R5, R6	**18-Jun-2025**	**----**	----	----	**11-Jul-2025**	16-Jul-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) R9	**19-Jun-2025**	**----**	----	----	**11-Jul-2025**	17-Jul-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) R3, R4	**20-Jun-2025**	**----**	----	----	**11-Jul-2025**	18-Jul-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) L2	**30-Jun-2025**	**----**	----	----	**11-Jul-2025**	28-Jul-2025	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	6	36	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	5	39	**12.82**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	5	34	**14.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	5	38	**13.16**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	4	36	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	6	39	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	34	**8.82**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	6	38	**15.79**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	3	39	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	34	**8.82**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	38	**7.89**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	38	**7.89**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030E. This method is compliant with NEPM Schedule B(3)

Environmental Division
Brisbane
Work Order Reference
EB2523359

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Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 2 Byth Street Stafford QLD 4053
ALS Laboratory: please tick → Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 48 Callemondah Drive Gladstone QLD 4680
Ph: 07 4976 7942 E: ALSEnviro.Gladstone@alsglobal.com
MACKAY Unit 2 20 Caterpillar Drive Paget QLD 4740
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Ph: 07 4773 0000 E: ALSEnviro.Townsville@alsglobal.com
WOLLONGONG 1/19-21 Ralph Black Drive, Nth Wollongong NSW
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CHAIN OF CUSTODY

Telephone : + 61-7-3552-668

CLIENT: DPM Enviroscience Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Buderim		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes
PROJECT: Blackwater North Project — PROJECT NO.: DPM25005	ALS QUOTE NO.: EN/333/20	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes
ORDER NUMBER: N/A — PURCHASE ORDER NO.: N/A	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:
PROJECT MANAGER: David Moore — CONTACT PH: 0427 694 433		OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: David Moore — SAMPLER MOBILE: 0427 694 433	RELINQUISHED BY: DAVID MOORE	RECEIVED BY: [signature] 7/7/25	RELINQUISHED BY:
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):	DATE/TIME: 7/7/2025 14:30	DATE/TIME: 1430	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Cations & Anions: Major (Ca, Mg, Na, K, Cl, SO_4, Alkalinity) + Ionic Balance (Suite NT-1 & NT-2)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	L1	17/06/2025	W	P, N	2	✓								
2	R5	18/06/2025	W	P, N	2	✓								
3	R6	18/06/2025	W	P, N	2	✓								
4	R9	19/06/2025	W	P, N	2	✓								
5	R3	20/06/2025	W	P, N	2	✓								
6	R4	20/06/2025	W	P, N	2	✓								
7	L2	30/06/2025	W	P, N	2	✓								
8	RN165940	1/07/2025	W	P	1	✓								
9	RN165949	1/07/2025	W	P	1	✓								
10	MB06	2/07/2025	W	P	1	✓								
11	MP1	2/07/2025	W	P	1	✓								
12	MP2	2/07/2025	W	P	1	✓								
				TOTAL	19									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

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MACKAY Unit 2/20 Gallaghar Drive Paget QLD 4740 Ph: 07 4955 5795 E: ALSEnviro.Mackay@alsglobal.com
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WOLLONGONG 1/19-31 Ralph Black Drive, Unit Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

ALS Laboratory: please tick →

CLIENT: DPM Enviroscience Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Buderim		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: Blackwater North Project **PROJECT NO.:** DPM25005	**ALS QUOTE NO.:** EN/333/20	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: N/A **PURCHASE ORDER NO.:** N/A	**COUNTRY OF ORIGIN:** Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: David Moore **CONTACT PH:** 0427 694 433		OFF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: David Moore **SAMPLER MOBILE:** 0427 694 433	**RELINQUISHED BY:** DAVID MOORE	**RECEIVED BY:** DM 7/7/25	**RELINQUISHED BY:** **RECEIVED BY:**
COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**	DATE/TIME: 7/7/2025 14:30	DATE/TIME: 1430	DATE/TIME: DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			
Email Invoice to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	Cations & Anions: Major (Ca, Mg, Na, K, Cl, SO_4, Alkalinity) + Ionic Balance (Suite NT-1 & NT-2)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	RN132773	2/07/2025	W	P	1	✓								
14	L3	3/07/2025	W	P	1	✓								
15	L4	3/07/2025	W	P	1	✓								
16	MP3	3/07/2025	W	P	1	✓								
17	MP4	3/07/2025	W	P	1	✓								
18	MP5	3/07/2025	W	P	1	✓								
19	RN190143	3/07/2025	W	P	1	✓								
				TOTAL	7									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CERTIFICATE OF ANALYSIS

Work Order	: **EB253995D**	Page	: 1 of 5
Client	: **PMV ENi IROSCIENCES MTY LTP**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Contact	: Customer Services EB
Address	: 12 LAUREN DRIVE BUDERIM 4556	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 28-Oct-2025 11:15
Order number	: ----	Date Analysis Commenced	: 29-Oct-2025
C-O-C number	: ----	Issue Date	: 04-Nov-2025 15:54
Sampler	: DAVID MOORE		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 14		
No. of samples analysed	: 14		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Addtrtoal f tarrorp lrtoa herrtaean ro rstw rehorn btff ue rogad ta rse roffobtac wehl rl re lrrl Qsp earw: y gl ftn Coarrof Rehorrl y Aw C Cop hftl aQe Awwewwp ean ro lwwtwn b trs y gl ftn Re. teb l ad Sl p hfe ReQethnNortrtQl rtoa^

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
6 = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER 0Matrix: WATER4			Sample ID	L(	L3	LD	RN (15) D-	R1
			Sampling date / time	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00
Compound	CAS Number	LOR	Unit	EB253995D7- - (	EB253995D7- - 2	EB253995D7- - 3	EB253995D7- - D	EB253995D7- - 5
				Result	Result	Result	Result	Result
EA- 15: Torl f Hl rdaewwl wCl CO3								
Torl f Hl rdaewwl wCl CO3	----	1	mg/L	31	223	(x(	135-	xx
EP- 39M: Afkl ftatn u, MC Ttrrl ror								
H, dro8tde Afkl ftatn l wCl CO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Cl ruoal re Afkl ftatn l wCl CO3	3812-32-6	1	mg/L	(5	(D	<1	<1	9
BtQl ruoal re Afkl ftatn l wCl CO3	71-52-3	1	mg/L	5D	Dxx	( ) x	D- (	(D9
Torl f Afkl ftatn l wCl CO3	----	1	mg/L	1)	5- 2	( ) x	D- (	(55
EP- D(G: Sgfrhre 0Tgrutdtp enrtQ4l wSOD 27u, PA								
Sgfrhre l wSOD 7Tgrutdtp enrtQ	14808-79-8	1	mg/L	<1	352	(52	D) 1	D
EP- D5G: Csfortde u, PtwQrere Aal f, wer								
Csfortde	16887-00-6	1	mg/L	(2	) Dx	232	((9- -	Dx
EP-) 3F: Ptwwof. ed V l jor Cl rtoaw								
Cl fQtgp	7440-70-2	1	mg/L	x	25	3x	x) 9	(9
V l caewtgp	7439-95-4	1	mg/L	D	3)	2(	)))	((
Sodtgp	7440-23-5	1	mg/L	21	) 3)	22x	5) 2-	5D
Morl wwtgp	7440-09-7	1	mg/L	D	((	9	)	)
EN- 55: loatQBl fl aQe								
ø Torl f Aatoaw	----	0.01	meq/L	(^92	DD^(	(3^9	3Dx	D^53
ø Torl f Cl rtoaw	----	0.01	meq/L	(^) 1	D5^1	(3^9	3x5	D^33
ø loatQBl fl aQe	----	0.01	%	7777	(^15	- ^2-	D^) 1	2^29

Analytical Results

Sub-Matrix: WATER 0Matrix: WATER4			Sample ID	L2	RN (15) D)	R3	RN ( ) - (D3	V M(
			Sampling date / time	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00
Compound	CAS Number	LOR	Unit	EB253995D7- - 1	EB253995D7- - 9	EB253995D7- - x	EB253995D7- -)	EB253995D7- (-
				Result	Result	Result	Result	Result
EA- 15: Torl f Hl rdaewwl wCl CO3								
Torl f Hl rdaewwl wCl CO3	----	1	mg/L	(92	(x(	(9-	5D9-	32D
EP- 39M: Afkl ftatn u, MC Ttrrl ror								
H, dro8tde Afkl ftatn l wCl CO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Cl ruoal re Afkl ftatn l wCl CO3	3812-32-6	1	mg/L	<1	(2	<1	<1	<1
BtCl ruoal re Afkl ftatn l wCl CO3	71-52-3	1	mg/L	(D5	92D	(1D	3)	35-
Torl f Afkl ftatn l wCl CO3	----	1	mg/L	(D5	931	(1D	3)	35-
EP- D(G: Sgfrhre 0Tgrutdtp errtQ4l wSOD 27u, PA								
Sgfrhre l wSOD 7Tgrutdtp errtQ	14808-79-8	1	mg/L	(((	(19	2	<1	<1
EP- D5G: Csfortde u, PtwQrere Aal f, wer								
Csfortde	16887-00-6	1	mg/L	1x	) 23	x9	(23- -	(5
EP-) 3F: Ptwwof. ed V l jor Cl rtoaw								
Cl fQtgp	7440-70-2	1	mg/L	3(	D(	D-	( ) 1-	) 2
V l caewtgp	7439-95-4	1	mg/L	23	( )	(9	(D(	23
Sodtgp	7440-23-5	1	mg/L	) 1	) (5	5x	59x-	25
Morl wwtgp	7440-09-7	1	mg/L	(-	3	(D	(-	)
EN- 55: loatQBl fl aQe								
ø Torl f Aatoaw	----	0.01	meq/L	9'(3	DD'2	5'99	3Dx	9'D2
ø Torl f Cl rtoaw	----	0.01	meq/L	9^x9	D3'5	1'2x	31(	9^x-
ø loatQBl fl aQe	----	0.01	%	D') 9	- ^xD	D'(x	(^xx	2'53

Analytical Results

Sub-Matrix: WATER
0Matrix: WATER4

			Sample ID	VM3	VB-1	VB(3A	VM5	7777
			Sampling date / time	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	28-Oct-2025 00:00	----
Compound	CAS Number	LOR	Unit	EB253995D7-((	EB253995D7-(2	EB253995D7-(3	EB253995D7-(D	77777777
				Result	Result	Result	Result	----
EA-15: Torl f Hl rdaewwl wCl CO3								
Torl f Hl rdaewwl wCl CO3	----	1	mg/L	(59	2(x-	9)3-	(33	7777
EP-39M: Afkl ftatn u, MC Ttrrl ror								
H, dro8tde Afkl ftatn l wCl CO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	7777
Cl ruoal re Afkl ftatn l wCl CO3	3812-32-6	1	mg/L	<1	<1	<1	<1	7777
BtCl ruoal re Afkl ftatn l wCl CO3	71-52-3	1	mg/L	(9x	25(	21)	(19	7777
Torl f Afkl ftatn l wCl CO3	----	1	mg/L	(9x	25(	21)	(19	7777
EP-D(G: Sgfrhre 0Tgrutdtp enrtQ4l wSOD27u, PA								
Sgfrhre l wSOD7Tgrutdtp enrtQ	14808-79-8	1	mg/L	<1	599	)52	D	7777
EP-D5G: Csfortde u, PtwQrere Aal f, wer								
Csfortde	16887-00-6	1	mg/L	(1	9()-	(12--	(5	7777
EP-)3F: Ptwwof. ed Vl jor Cl rtoaw								
Cl fQtgp	7440-70-2	1	mg/L	D3	D1(	((x-	35	7777
Vl caewtgp	7439-95-4	1	mg/L	(2	2D)	(2(-	((	7777
Sodtgp	7440-23-5	1	mg/L	2-	D-(-	x2D-	(D	7777
Morl wwtgp	7440-09-7	1	mg/L	9	(3	(2	)	7777
EN-55: loatQBl fl aQe								
ø Torl f Aatoaw	----	0.01	meq/L	D^(	22-	Dx2	3^xD	7777
ø Torl f Cl rtoaw	----	0.01	meq/L	D^(x	2(x	5(9	3^D)	7777
ø loatQBl fl aQe	----	0.01	%	2^(3	-^31	3^5-	D^x-	7777

QUALITY CONTROL REPORT

Work Order	: **EB253995D**	Page	: 1 of 5
Client	: **MPV ENSIRO0 CIENCE0 PTY LTM**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Contact	: Customer Services EB
Address	: 12 LAUREN DRIVE BUDERIM 4556	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 28-Oct-2025
Order number	: ----	Date Analysis Commenced	: 29-Oct-2025
C-O-C number	: ----	Issue Date	: 04-Nov-2025
Sampler	: DAVID MOORE		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 14		
No. of samples analysed	: 14		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EM739P: Alkalinity by PC Titrator (QC Lot: 6) 65D4) 1									
EB2537745-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	94	94	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	94	94	0.0	0% - 20%
EB2537745-017	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	93	90	3.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	93	90	3.8	0% - 20%
EM739P: Alkalinity by PC Titrator (QC Lot: 6) 65D) 71									
EB2537754-011	MP3	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	178	180	0.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	178	180	0.8	0% - 20%
EM7D8G: 0ulfate (Turbidimetric1as 0OD2- by MA (QC Lot: 6) 654) 81									
EB2537761-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	33	33	0.0	0% - 20%
EB2537754-002	L3	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	352	349	0.8	0% - 20%
EM7D8G: 0ulfate (Turbidimetric1as 0OD2- by MA (QC Lot: 6) 654) 21									
EB2537754-012	MB06	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	577	582	0.8	0% - 20%
EB2537952-006	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	29	28	0.0	0% - 20%
EM7D5G: Chloride by Miscrete Analyser (QC Lot: 6) 654441									
EB2537761-015	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	25	26	0.0	0% - 20%
EB2537754-002	L3	ED045G: Chloride	16887-00-6	1	mg/L	948	972	2.5	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EM7D5G: Chloride by Miscrete Analyser (QC Lot: 6) 6544) 1									
EB2537754-012	MB06	ED045G: Chloride	16887-00-6	1	mg/L	7190	7270	1.0	0% - 20%
EB2537952-006	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	72	72	0.0	0% - 20%
EM7) 3F: Missolved V ajor Cations (QC Lot: 6) 636681									
EB2537528-009	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	28	29	3.7	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	18	18	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	106	107	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	23	23	0.0	0% - 20%
EB2537754-004	RN 165940	ED093F: Calcium	7440-70-2	1	mg/L	897	936	4.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	999	1030	2.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5920	6080	2.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	9	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EM739P: Alkalinity by PC Titrator (QCLot: 6) 65D4) 1								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	92.4	80.0	120
EM739P: Alkalinity by PC Titrator (QCLot: 6) 65D) 71								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	50 mg/L	91.8	80.0	120
EM7D8G: 0 ulfate (Turbidimetric1as 0 OD 2- by MA (QCLot: 6) 654) 81								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.0	85.0	118
				<1	100 mg/L	89.2	85.0	118
EM7D8G: 0 ulfate (Turbidimetric1as 0 OD 2- by MA (QCLot: 6) 654) 21								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	91.5	85.0	118
				<1	100 mg/L	91.0	85.0	118
EM7D5G: Chloride by Miscrete Analyser (QCLot: 6) 654441								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	115	90.0	115
				<1	1000 mg/L	101	90.0	115
EM7D5G: Chloride by Miscrete Analyser (QCLot: 6) 6544) 1								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	114	90.0	115
				<1	1000 mg/L	102	90.0	115
EM7) 3F: Missolved V ajor Cations (QCLot: 6) 636681								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.6	70.0	130
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	70.0	130
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.8	70.0	130
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.8	70.0	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EM7D8G: 0 ulfate (Turbidimetric1as 0 OD 2- by MA (QCLot: 6) 654) 81							
EB2537761-013	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EM7D8G: 0ulfate (Turbidimetric1as 0OD2- by MA (QCLot: 6) 654) 21							
EB2537754-013	MB13A	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70.0	130
EM7D5G: Chloride by Miscrete Analyser (QCLot: 6) 654441							
EB2537761-013	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	109	70.0	130
EM7D5G: Chloride by Miscrete Analyser (QCLot: 6) 6544) 1							
EB2537754-013	MB13A	ED045G: Chloride	16887-00-6	400 mg/L	# Not Determined	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2537754**	Page	: 1 of 5
Client	: **DPM ENVIROSCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVID MOORE	Telephone	: +61-7-3552-8685
Project	: DPM25005 Blackwater North Project	Date Samples Received	: 28-Oct-2025
Site	: ----	Issue Date	: 04-Nov-2025
Sampler	: DAVID MOORE	No. of samples received	: 14
Order number	: ----	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB2537761--013	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB2537754--013	MB13A	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EB2537754--013	MB13A	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA065: Total Hardness as CaCO3							
Clear Plastic Bottle - Natural (ED093F) MP1, MP3, MB06, MB13A, MP5	**28-Oct-2025**	**----**	----	----	**03-Nov-2025**	04-Nov-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) L1, L3, L4, RN 165940, R6, L2, RN 165949, R3, RN 190143	**28-Oct-2025**	**----**	----	----	**03-Nov-2025**	25-Nov-2025	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
L1, L3, L4, RN 165940, R6, L2, RN 165949, R3, RN 190143, MP1, MP3, MB06, MB13A, MP5	**28-Oct-2025**	**----**	----	----	**31-Oct-2025**	11-Nov-2025	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
L1, L3, L4, RN 165940, R6, L2, RN 165949, R3, RN 190143, MP1, MP3, MB06, MB13A, MP5	**28-Oct-2025**	**----**	----	----	**29-Oct-2025**	25-Nov-2025	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
L1, L3, L4, RN 165940, R6, L2, RN 165949, R3, RN 190143, MP1, MP3, MB06, MB13A, MP5	**28-Oct-2025**	**----**	----	----	**29-Oct-2025**	25-Nov-2025	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
MP1, MP3, MB06, MB13A, MP5	**28-Oct-2025**	**----**	----	----	**03-Nov-2025**	04-Nov-2025	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
L1, L3, L4, RN 165940, R6, L2, RN 165949, R3, RN 190143	**28-Oct-2025**	**----**	----	----	**03-Nov-2025**	25-Nov-2025	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. Auto Titrator) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030E. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 31 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 48 Callemondah Drive Gladstone QLD 4680 Ph: 07 4978 7944 E: ALSEnviro.Gladstone@alsglobal.com

MACKAY Unit 7/26 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5795 E: ALSEnviro.Mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

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TOWNSVILLE 13 Carlton Street Kirwan QLD 4817 Ph: 07 4773 0000 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 1/19-21 Ralph Black Drive, Nth Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: DPM Enviroscience Pty Ltd	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Buderim		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: Blackwater North Project **PROJECT NO.:** DPM25005	**ALS QUOTE NO.:** EN/333/20	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: N/A **PURCHASE ORDER NO.:** N/A	**COUNTRY OF ORIGIN:** Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: David Moore **CONTACT PH:** 0427 694 433		OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: David Moore **SAMPLER MOBILE:** 0427 694 433	**RELINQUISHED BY:** DAVID MOORE	**RECEIVED BY:** 28/10/25	**RELINQUISHED BY:** **RECEIVED BY:**
COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**	DATE/TIME: 28/10/2025 11:15	DATE/TIME: 1115	DATE/TIME: DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			
Email Invoice to (will default to PM if no other addresses are listed): dmoore@dpm-enviro.com.au			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	Anions: Major (Cl, SO_4, Alkalinity) (Suite NT-2)	Cations: Major (Ca, Mg, Na, K), Hardness (Suite NT-1D)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	L1	20/10/2025	W	P, N	2	✓	✓							
2	L3	20/10/2025	W	P, N	2	✓	✓							
3	L4	20/10/2025	W	P, N	2	✓	✓							
4	RN 165940	20/10/2025	W	P, N	2	✓	✓							
5	R6	21/10/2025	W	P, N	2	✓	✓							
6	L2	22/10/2025	W	P, N	2	✓	✓							
7	RN 165949	22/10/2025	W	P, N	2	✓	✓							
8	R3	22/10/2025	W	P, N	2	✓	✓							
9	RN 190143	23/10/2025	W	P, N	2	✓	✓							
10	MP1	25/10/2025	W	P	1	✓	✓							
11	MP3	25/10/2025	W	P	1	✓	✓							
12	MB06	25/10/2025	W	P	1	✓	✓							
13	MB13A	25/10/2025	W	P	1	✓	✓							
14	MP5	25/10/2025	W	P	1	✓	✓							
				TOTAL	23									

Environmental Division
Brisbane
Work Order Reference
EB2537754

Telephone : +61-7-3552-8666

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Appendix E: Aquatic Macroinvertebrate Data

DPM25005 - Blackwater North Project - June 2025

Sample picked by			DM	CP	DM	CP	DM	CP	DM	CP	DM	CP	CP	CP
Date sampled			20/06/2025	20/06/2025	20/06/2025	20/06/2025	18/06/2025	18/06/2025	18/06/2025	18/06/2025	19/06/2025	19/06/2025	17/06/2025	30/06/2025
Sample processed by			CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP
Date processed			07/07/2025	07/07/2025	07/07/2025	07/07/2025	25/06/2025	27/06/2025	25/06/2025	25/06/2025	25/06/2025	24/06/2025	08/07/2025	07/07/2025
Site name			R3	R3	R4	R4	R5	R5	R6	R6	R9	R9	L1	L2
Habitat type	SIGNAL 2	AUSRIVAS	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	COMP	COMP
ph. Porifera	4	IA019999												
cl. Hydrozoa														
Clavidae	3	IB029999												
Hydridae	2	IB019999												
ph. Nematoda	3	II999999											4	3
ph. Nemertea	3	IH999999												
ph. Nematomorpha	6	IJ999999												
Gordiidae	5	IJ019999												
ph. Platyhelminthes														
Dalyelliidae														
Dugesiidae	2	IF619999												
Provorticidae														
cl. Temnocephalidea	5	IF419999			1					2		2		
s.c. Hirudinea														
Erpobdellidae	1	LH059999												
Glossiphoniidae	1	LH019999												
Hirudinidae	4	LH999999	1											
ph. Annelida														
s.c. Oligochaeta	2	LO999999	4	13		2	5	8					3	1
cl. Bivalvia														
Corbiculidae	4	KP029999												
Hyriidae	5	KP019999												
Sphaeriidae	5	KP039999												
cl. Gastropoda														
Ancylidae	4	KG069999												1
Bithyniidae	3	KG039999												
Glacidorbidae	5	KG099999												
Hydrobiidae	4	KG029999												
Lymnaeidae	1	KG059999												2
Physidae	1	KG089999												1
Planorbidae	2	KG079999											3	2
Thiaridae	4	KG049999												
Viviparidae	4	KG019999												
cl. Arachnida														
s.c. Acarina	6	MM999999					1	3	3	5			19	13
o. Araneae	-	-												
s.c. Branchiura	1	OK999999												
o. Cladocera	-	OG999999	14	9	12	37	6		17	22	7	50	14	8
s.c. Copepoda	-	OJ999999	18	50	23	50	41	21	19	50	15	50	28	18
o. Conchostraca	1	OF999999												
cl. Ostracoda	-	OH999999	4	8			4	1	12	2	6	1	5	4
o. Amphipoda														
Corophiidae	4	OP059999												
Hyalidae	3	-												
Paramelitidae	4	OP069999												
Talitridae	3	OP019999												
o. Isopoda														
Cirolanidae	2	OR129999												
Scyphacidae	2	OR259999												
Sphaeromatidae	1	OR139999												
su.o. Syncarida														
Psammaspididae	-	ON059999												
o. Decapoda														
Atyidae	3	OT019999	9	1							2		8	1
Palaemonidae	4	OT029999	1	4	17	15	3	3	2		1	5	1	1
Parastacidae	4	OV019999	1		2					3	1	1	1	
s.c. Collembola	1	QA999999												
o. Lepidoptera														
Crambidae	2	QL999999											1	2
o. Megaloptera														
Corydalidae	7	QM019999												
Sialidae	5	QM029999												
o. Neuroptera														
Sisyridae	3	QN059999												
o. Coleoptera														
Carabidae	3	QC059999												
Chrysomelidae	2	QCAH9999												3
Curculionidae	2	QCAN9999												
Dytiscidae	2	QC099999	23	15	10	7	8	9	12	7	14	4	17	12
Elmidae	7	QC349999												
Georissidae	-	-												
Gyrinidae	4	QC109999	4	4										

Sample picked by			DM	CP	DM	CP	DM	CP	DM	CP	DM	CP	CP	CP
Date sampled			20/06/2025	20/06/2025	20/06/2025	20/06/2025	18/06/2025	18/06/2025	18/06/2025	18/06/2025	19/06/2025	19/06/2025	17/06/2025	30/06/2025
Sample processed by			CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP
Date processed			07/07/2025	07/07/2025	07/07/2025	07/07/2025	25/06/2025	27/06/2025	25/06/2025	25/06/2025	25/06/2025	24/06/2025	08/07/2025	07/07/2025
Site name			R3	R3	R4	R4	R5	R5	R6	R6	R9	R9	L1	L2
Habitat type	SIGNAL 2	AUSRIVAS	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	COMP	COMP
Haliplidae	2	QC069999												
Heteroceridae	1	QC369999												
Hydraenidae	3	QC139999	31	14	8	11	31		12		10	8	1	5
Hydrochidae	4	QCAO9999	13	1		1	2	1	4		1		6	23
Hydrophilidae	2	QC119999	8			1	3						2	5
Hygrobiidae	1	QC079999												
Limnichidae	4	QC359999												
Nanophyidae	3	-												
Noteridae	4	QC089999	1						7					3
Psephenidae	6	QC379999												
Ptilodactylidae	10	QC399999												
Scirtidae	6	QC209999									3	1		
Spercheidae	2	-												
Sphaeriusidae	7	-												
Staphylinidae	3	QC189999												
o. Diptera														
Athericidae	8	QD229999												
Blephariceridae	10	QD049999												
Ceratopogonidae	4	QD099999	2	10					1				18	10
Chaoboridae	2	QD059999				1		12				3		
s.f. Aphroteniinae	8	QDAA9999												
s.f. Chironominae	3	QDAJ9999	49	42			7	4	12	6			23	26
s.f. Orthocladiinae	4	QDAF9999								1			1	
s.f. Tanypodinae	4	QDAE9999	2	5				4	2	2			5	14
Corethrellidae	-	-												
Culicidae	1	QD079999	2	4		11	1	1			1	1	1	
Dixidae	7	QD069999												
Dolichopodidae	3	QD369999												
Empididae	5	QD359999												
Ephydridae	2	QD789999				2								
Muscidae	1	QD899999												
Pelecorhynchidae	10	QD209999												
Psychodidae	3	QD129999												
Sciomyzidae	2	QD459999												
Simuliidae	5	QD109999												
Stratiomyidae	2	QD249999												
Syrphidae	2	QD439999												
Tabanidae	3	QD239999											2	
Tanyderidae	6	QD039999												
Thaumaleidae	7	QD119999												
Tipulidae	5	QD019999	2						1					
o. Ephemeroptera														
Ameletopsidae	7	QE049999												
Baetidae	5	QE029999	1	5			1						27	9
Caenidae	4	QE089999												
Leptophlebiidae	8	QE069999												
Teloganodidae	9	QE079999												
o. Hemiptera														
Aphelocheiridae	-	-												
Belostomatidae	1	QH629999												
Corixidae	2	QH659999	1	1			1							
Dipsocoridae	-	-												
Gelastocoridae	5	QH649999												
Gerridae	4	QH579999	9		2		5		1		17			
Hebridae	3	QH539999												
Hydrometridae	3	QH549999	6		2									
Leptopodidae	-	QH589999												
Mesoveliidae	2	QH529999												4
Micronectidae	2	-					19	2	8		2		1	1
Naucoridae	2	QH669999												
Nepidae	3	QH619999	1							2				
Notonectidae	1	QH679999	25	11	14	10	13	16	5	1	25	13		1
Ochteridae	2	QH639999												
Pleidae	2	QH689999	3				1						6	17
Saldidae	1	QH609999												
Veliidae	3	QH569999	11		23	3	20	2	29		22	6		3
s.o. Zygoptera														
Argiolestidae	5	-												
Calopterygidae	-	QO109999												
Chlorocyphidae	-	-												
Chorismagrionidae	-	QO189999												
Coenagrionidae	2	QO029999	3										2	13
Diphlebiidae	6	QO099999												
Hemiphlebiidae	-	QO019999												

Sample picked by			DM	CP	DM	CP	DM	CP	DM	CP	DM	CP	CP	CP
Date sampled			20/06/2025	20/06/2025	20/06/2025	20/06/2025	18/06/2025	18/06/2025	18/06/2025	18/06/2025	19/06/2025	19/06/2025	17/06/2025	30/06/2025
Sample processed by			CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP
Date processed			07/07/2025	07/07/2025	07/07/2025	07/07/2025	25/06/2025	27/06/2025	25/06/2025	25/06/2025	25/06/2025	24/06/2025	08/07/2025	07/07/2025
Site name			R3	R3	R4	R4	R5	R5	R6	R6	R9	R9	L1	L2
Habitat type	SIGNAL 2	AUSRIVAS	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	EDGE	BED	COMP	COMP
Isostictidae	3	QO039999												
Lestidae	1	QO059999												
Lestoideidae	9	QO069999												
Platycnemididae	4	QO049999												
Synlestidae	7	QO089999												
s.o. Epiprocta														
Aeshnidae	4	QO129999	1										1	2
Archipetaliidae	-	QO199999												
Austrocorduliidae	10	QO279999												
Austropetaliidae	-	QO209999												
Brachytronidae	-	-												
Cordulephyidae	5	QO289999												
Corduliidae	5	QO169999												
Gomphidae	5	QO139999							1	1				
Gomphomacromiidae	-	QO249999												
Hemicorduliidae	5	QO309999	1				1							1
Libellulidae	4	QO179999											2	5
Lindeniidae	3	QO229999												2
Macromiidae	8	QO269999												
Oxygastridae	-	QO299999												
Petaluridae	-	QO159999												
Pseudocorduliidae	-	QO259999												
Synthemistidae	2	QO239999												
Telephlebiidae	9	QO219999												
o. Plecoptera														
Gripopterygidae	8	QP039999												
o. Trichoptera														
Antipodoeciidae	8	QT169999												
Atriplectididae	7	QT239999												
Calamoceratidae	7	QT249999												
Calocidae	9	QT189999												
Conoesucidae	7	QT159999												
Dipseudopsidae	9	QT269999												
Ecnomidae	4	QT089999												
Glossosomatidae	9	QT029999												
Helicophidae	10	QT199999												
Helicopsychidae	8	QT069999												
Hydrobiosidae	8	QT019999												
Hydropsychidae	6	QT179999												
Hydroptilidae	4	QT039999												
Kokiriidae	3	QT209999												
Leptoceridae	6	QT259999	14	6									1	5
Limnephilidae	8	QT109999												
Odontoceridae	7	QT229999												
Oeconesidae	8	QT129999												
Philopotamidae	8	QT049999												
Philorheithridae	8	QT219999												
Plectrotarsidae	-	QT119999												
Polycentropodidae	7	QT079999												
Psychomyiidae	-	QT099999												
Stenopsychidae	-	QT059999												
Tasimiidae	8	QT139999												
Notes														
Taxa count			**31**	**18**	**11**	**13**	**20**	**14**	**18**	**13**	**15**	**13**	**28**	**34**
Taxa count (per site)			**31**		**17**		**22**		**22**		**17**		**28**	**34**
No. Individuals			**265**	**203**	**114**	**151**	**173**	**87**	**148**	**104**	**127**	**145**	**203**	**221**
PET taxa			**2**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**2**
Plecoptera			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
% Plecoptera			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ephemeroptera			**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
% Ephemeroptera			**3**	**6**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**3**
Trichoptera			**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
% Trichoptera			**3**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**3**
% Other taxa			**94**	**89**	**100**	**100**	**95**	**100**	**100**	**100**	**100**	**100**	**93**	**94**
SIGNAL 2 average (Family)			**3.32**	**3.20**	**3.22**	**2.36**	**3.00**	**2.83**	**3.60**	**3.70**	**3.08**	**3.10**	**3.24**	**3.06**
Tolerant taxa (SIGNAL2≤3)			**14**	**8**	**5**	**9**	**11**	**8**	**6**	**4**	**7**	**6**	**14**	**19**
% tolerant taxa			**50**	**53**	**56**	**82**	**65**	**67**	**40**	**40**	**58**	**60**	**56**	**61**

DPM25005 - Blackwater North Project - October 2025

Sample picked by			DM	CP	DM	CP	CP	CP
Date sampled			22/10/2025	22/10/2025	21/10/2025	21/10/2025	20/10/2025	22/10/2025
Sample processed by			DM	DM	DM	DM	DM	DM
Date processed			05/11/2025	06/11/2025	04/11/2025	04/11/2025	05/11/2025	06/11/2025
Site name			R3	R3	R6	R6	L1	L2
Habitat type	SIGNAL 2	AUSRIVAS	EDGE	BED	EDGE	BED	COMP	COMP
ph. Porifera	4	IA019999						
cl. Hydrozoa								
Clavidae	3	IB029999						
Hydridae	2	IB019999						
ph. Nematoda	3	II999999					1	
ph. Nemertea	3	IH999999						
ph. Nematomorpha	6	IJ999999						
Gordiidae	5	IJ019999						
ph. Platyhelminthes								
Dalyelliidae								
Dugesiidae	2	IF619999						
Provorticidae								
cl. Temnocephalidea	5	IF419999						
s.c. Hirudinea								
Erpobdellidae	1	LH059999						
Glossiphoniidae	1	LH019999						
Hirudinidae	4	LH999999						
ph. Annelida								
s.c. Oligochaeta	2	LO999999	2	7	1	3	4	
cl. Bivalvia								
Corbiculidae	4	KP029999						
Hyriidae	5	KP019999						
Sphaeriidae	5	KP039999						
cl. Gastropoda								
Ancylidae	4	KG069999						
Bithyniidae	3	KG039999						
Glacidorbidae	5	KG099999						
Hydrobiidae	4	KG029999						
Lymnaeidae	1	KG059999						
Physidae	1	KG089999	6	7				7
Planorbidae	2	KG079999	8		1			17
Thiaridae	4	KG049999		1				3
Viviparidae	4	KG019999		2				
cl. Arachnida								
s.c. Acarina	6	MM999999			6	13	29	15
o. Araneae	-	-						
s.c. Branchiura	1	OK999999						
o. Cladocera	-	OG999999				10		1
s.c. Copepoda	-	OJ999999	3	12	5	10	4	2
o. Conchostraca	1	OF999999						
cl. Ostracoda	-	OH999999	2		9	15		1
o. Amphipoda								
Corophiidae	4	OP059999						
Hyalidae	3	-						
Paramelitidae	4	OP069999						
Talitridae	3	OP019999						
o. Isopoda								
Cirolanidae	2	OR129999						
Scyphacidae	2	OR259999						
Sphaeromatidae	1	OR139999						
su.o. Syncarida								
Psammaspididae	-	ON059999						
o. Decapoda								

Sample picked by			DM	CP	DM	CP	CP	CP
Date sampled			22/10/2025	22/10/2025	21/10/2025	21/10/2025	20/10/2025	22/10/2025
Sample processed by			DM	DM	DM	DM	DM	DM
Date processed			05/11/2025	06/11/2025	04/11/2025	04/11/2025	05/11/2025	06/11/2025
Site name			**R3**	**R3**	**R6**	**R6**	**L1**	**L2**
Habitat type	**SIGNAL 2**	**AUSRIVAS**	**EDGE**	**BED**	**EDGE**	**BED**	**COMP**	**COMP**
Atyidae	3	OT019999	1					
Palaemonidae	4	OT029999	16	12	2		5	5
Parastacidae	4	OV019999	1	1	1	1	1	
s.c. Collembola	1	QA999999						
o. Lepidoptera								
Crambidae	2	QL999999						7
o. Megaloptera								
Corydalidae	7	QM019999						
Sialidae	5	QM029999						
o. Neuroptera								
Sisyridae	3	QN059999						
o. Coleoptera								
Carabidae	3	QC059999						
Chrysomelidae	2	QCAH9999						
Curculionidae	2	QCAN9999						
Dytiscidae	2	QC099999	27	11	21	18	16	27
Elmidae	7	QC349999						
Georissidae	-	-						
Gyrinidae	4	QC109999	5	1		1		
Haliplidae	2	QC069999						
Heteroceridae	1	QC369999						
Hydraenidae	3	QC139999	11	6	4	4	3	6
Hydrochidae	4	QCAO9999	5		21	15	8	19
Hydrophilidae	2	QC119999	1		2			3
Hygrobiidae	1	QC079999						
Limnichidae	4	QC359999						
Nanophyidae	3	-						
Noteridae	4	QC089999	3		8			5
Psephenidae	6	QC379999						
Ptilodactylidae	10	QC399999						
Scirtidae	6	QC209999						
Spercheidae	2	-						
Sphaeriusidae	7	-						
Staphylinidae	3	QC189999						
o. Diptera								
Athericidae	8	QD229999						
Blephariceridae	10	QD049999						
Ceratopogonidae	4	QD099999	3	1	12	10	6	4
Chaoboridae	2	QD059999						
s.f. Aphroteniinae	8	QDAA9999				1		
s.f. Chironominae	3	QDAJ9999	12	44	8	8	13	3
s.f. Orthocladiinae	4	QDAF9999			1			
s.f. Tanypodinae	4	QDAE9999	2	8	25	46	12	6
Corethrellidae	-	-						
Culicidae	1	QD079999			4	1		1
Dixidae	7	QD069999						
Dolichopodidae	3	QD369999						
Empididae	5	QD359999						
Ephydridae	2	QD789999						
Muscidae	1	QD899999						
Pelecorhynchidae	10	QD209999						
Psychodidae	3	QD129999						
Sciomyzidae	2	QD459999						
Simuliidae	5	QD109999						
Stratiomyidae	2	QD249999						

Sample picked by			DM	CP	DM	CP	CP	CP
Date sampled			22/10/2025	22/10/2025	21/10/2025	21/10/2025	20/10/2025	22/10/2025
Sample processed by			DM	DM	DM	DM	DM	DM
Date processed			05/11/2025	06/11/2025	04/11/2025	04/11/2025	05/11/2025	06/11/2025
Site name			**R3**	**R3**	**R6**	**R6**	**L1**	**L2**
Habitat type	**SIGNAL 2**	**AUSRIVAS**	**EDGE**	**BED**	**EDGE**	**BED**	**COMP**	**COMP**
Syrphidae	2	QD439999						
Tabanidae	3	QD239999	5					
Tanyderidae	6	QD039999						
Thaumaleidae	7	QD119999						
Tipulidae	5	QD019999						
o. Ephemeroptera								
Ameletopsidae	7	QE049999						
Baetidae	5	QE029999					2	
Caenidae	4	QE089999						
Leptophlebiidae	8	QE069999						
Teloganodidae	9	QE079999						
o. Hemiptera								
Aphelocheiridae	-	-						
Belostomatidae	1	QH629999					4	2
Corixidae	2	QH659999	1		10	1		
Dipsocoridae	-	-						
Gelastocoridae	5	QH649999						
Gerridae	4	QH579999	14	1	2		3	
Hebridae	3	QH539999			1			
Hydrometridae	3	QH549999			1			
Leptopodidae	-	QH589999						
Mesoveliidae	2	QH529999						
Micronectidae	2	-			10	31		
Naucoridae	2	QH669999						2
Nepidae	3	QH619999	2		2		1	1
Notonectidae	1	QH679999	12	13	14	12		1
Ochteridae	2	QH639999						18
Pleidae	2	QH689999	7	1	3	3	2	
Saldidae	1	QH609999						
Veliidae	3	QH569999	22		5	1		
s.o. Zygoptera								
Argiolestidae	5	-						
Calopterygidae	-	QO109999						
Chlorocyphidae	-	-						
Chorismagrionidae	-	QO189999						
Coenagrionidae	2	QO029999					4	6
Diphlebiidae	6	QO099999						
Hemiphlebiidae	-	QO019999						
Isostictidae	3	QO039999						
Lestidae	1	QO059999						
Lestoideidae	9	QO069999						
Platycnemididae	4	QO049999						
Synlestidae	7	QO089999						
s.o. Epiprocta								
Aeshnidae	4	QO129999						
Archipetaliidae	-	QO199999						
Austrocorduliidae	10	QO279999						
Austropetaliidae	-	QO209999						
Brachytronidae	-	-						
Cordulephyidae	5	QO289999						
Corduliidae	5	QO169999						
Gomphidae	5	QO139999		1	2			4
Gomphomacromiidae	-	QO249999						
Hemicorduliidae	5	QO309999						
Libellulidae	4	QO179999	1			1	1	2

Sample picked by			DM	CP	DM	CP	CP	CP
Date sampled			22/10/2025	22/10/2025	21/10/2025	21/10/2025	20/10/2025	22/10/2025
Sample processed by			DM	DM	DM	DM	DM	DM
Date processed			05/11/2025	06/11/2025	04/11/2025	04/11/2025	05/11/2025	06/11/2025
Site name			**R3**	**R3**	**R6**	**R6**	**L1**	**L2**
Habitat type	**SIGNAL 2**	**AUSRIVAS**	**EDGE**	**BED**	**EDGE**	**BED**	**COMP**	**COMP**
Lindeniidae	3	QO229999						
Macromiidae	8	QO269999						
Oxygastridae	-	QO299999						
Petaluridae	-	QO159999						
Pseudocorduliidae	-	QO259999						
Synthemistidae	2	QO239999						
Telephlebiidae	9	QO219999						4
o. Plecoptera								
Gripopterygidae	8	QP039999						
o. Trichoptera								
Antipodoeciidae	8	QT169999						
Atriplectididae	7	QT239999						
Calamoceratidae	7	QT249999						
Calocidae	9	QT189999						
Conoesucidae	7	QT159999						
Dipseudopsidae	9	QT269999						
Ecnomidae	4	QT089999						
Glossosomatidae	9	QT029999						
Helicophidae	10	QT199999						
Helicopsychidae	8	QT069999						
Hydrobiosidae	8	QT019999						
Hydropsychidae	6	QT179999						
Hydroptilidae	4	QT039999						
Kokiriidae	3	QT209999						
Leptoceridae	6	QT259999	2		2	1	3	
Limnephilidae	8	QT109999						
Odontoceridae	7	QT229999						
Oeconesidae	8	QT129999						
Philopotamidae	8	QT049999						
Philorheithridae	8	QT219999						
Plectrotarsidae	-	QT119999						
Polycentropodidae	7	QT079999						
Psychomyiidae	-	QT099999						
Stenopsychidae	-	QT059999						
Tasimiidae	8	QT139999						
Notes								
Taxa count			**26**	**17**	**28**	**22**	**20**	**27**
Taxa count (per site)			**29**		**32**		**20**	**27**
No. Individuals			**174**	**129**	**183**	**206**	**122**	**172**
PET taxa			**1**	**0**	**1**	**1**	**2**	**0**
Plecoptera			**0**	**0**	**0**	**0**	**0**	**0**
% Plecoptera			**0**	**0**	**0**	**0**	**0**	**0**
Ephemeroptera			**0**	**0**	**0**	**0**	**1**	**0**
% Ephemeroptera			**0**	**0**	**0**	**0**	**5**	**0**
Trichoptera			**1**	**0**	**1**	**1**	**1**	**0**
% Trichoptera			**4**	**0**	**4**	**5**	**5**	**0**
% Other taxa			**96**	**100**	**96**	**95**	**90**	**100**
SIGNAL 2 average (Family)			**3.08**	**3.19**	**3.19**	**3.42**	**3.47**	**3.08**
Tolerant taxa (SIGNAL2≤3)			**14**	**7**	**15**	**10**	**9**	**15**
% tolerant taxa			**58**	**44**	**58**	**53**	**47**	**63**

Appendix F: Terrestrial GDE assessment raw field data

Date	Site no.	Soil samples				Rationale	Leaf samples										Distance to channel (m)	Tree intercepting water
		ID	Texture	Reading (Mpa)	Notes	State-mapped	ID	Time (HH:MM)	Tree species	DBH (cm)	Tree height (mAGL)	Sample height (mAGL)	Reading (Mpa)	Latitude (GDA 94)	Longitude (GDA 94)		
20/06/25	TGDE1				Isolated pools in channel	Low confidence	TGDE1-1	4:55		92	18	6	-0.74	-23.6844	148.8627	0	Unlikely
							TGDE1-2	5:02		57	18	4	-0.55	-23.6842	148.8625	25	Yes
							TGDE1-3	5:07	Eucalyptus coolabah	124	20	4	-1.25	-23.6843	148.8621	55	Unlikely
							TGDE1-4	5:12		63	12	6	-0.06	-23.6846	148.8626	5	Yes
							TGDE1-5	5:16		77	13	4	-0.32	-23.6840	148.8630	13	Yes
							TGDE1-6	5:20	Eucalyptus coolabah	60	18	1	-0.29	-23.6845	148.8627	0	Yes
		TGDE1-A-1m	Gravelly clay	-0.02													
		TGDE1-B-1m	Sandy clay	-6.53													
		TGDE1-B-2m	Sandy clay	-3.56													
20/06/25	TGDE2				Isolated pools in channel	Low confidence	TGDE2-1	6:14		79	18	1	-0.58	-23.6784	148.8666	1	Unlikely
							TGDE2-2	6:12		60	22	8	-0.64	-23.6785	148.8663	15	Unlikely
							TGDE2-3	6:07	Eucalyptus coolabah	67	22	7	-0.72	-23.6781	148.8660	30	Unlikely
							TGDE2-4	6:10		70	21	6	-1.10	-23.6777	148.8664	5	Unlikely
							TGDE2-5	5:50		44	19	5	-0.67	-23.6784	148.8661	10	Unlikely
							TGDE2-6	5:53	Eucalyptus coolabah	44	13	4	-0.09	-23.6784	148.8658	30	Yes
		TGDE2-A-1m	Sandy clay	-0.01													
		TGDE2-B-1m	Clay	-2.96													
		TGDE2-B-2m	Sandy clay	-1.08													
24/10/25	TGDE1				Dry channel	Low confidence	TGDE1-1	3:46		92	18	10	-1.60	-23.6844	148.8627	0	Unlikely
							TGDE1-2	3:36		57	18	9	-0.73	-23.6842	148.8625	25	Unlikely
							TGDE1-3	3:56	Eucalyptus coolabah	124	20	5	-1.36	-23.6843	148.8621	55	Unlikely
							TGDE1-4	3:51		63	12	6	-1.00	-23.6846	148.8626	5	Unlikely
							TGDE1-5	3:29		77	13	5	-0.84	-23.6840	148.8630	13	Unlikely
							TGDE1-6	3:41	Eucalyptus coolabah	60	18	2	-1.61	-23.6845	148.8627	0	Unlikely
							TGDE1-7	3:58		73	18	4	-2.16	-23.6841	148.8629	2	Unlikely
							TGDE1-8	3:32		31	10	2	-1.73	-23.6839	148.8629	20	Unlikely
							TGDE1-9	3:27	Eucalyptus melanophloia	53	10	5	-2.25	-23.6839	148.8618	25	Unlikely
							TGDE1-10	4:04		50	11	4	-1.19	-23.6839	148.8627	35	Unlikely
							TGDE1-11	4:01	Eucalyptus populnea	62	12	3	-1.32	-23.6838	148.8629	32	Unlikely
		TGDE1-A-1m	Gravelly clay	-2.44													
		TGDE1-A-2m	Sandy clay	-3.21													
		TGDE1-B-1m	Sandy clay	-5.12													
		TGDE1-B-2m	Sandy clay	-4.22													
24/10/25	TGDE2				Dry channel	Low confidence	TGDE2-1	2:48		79	18	10	-1.10	-23.6784	148.8666	1	Unlikely
							TGDE2-2	2:58		60	22	8	-0.78	-23.6785	148.8663	15	Unlikely
							TGDE2-3	2:40	Eucalyptus coolabah	67	22	6	-1.51	-23.6781	148.8660	30	Unlikely
							TGDE2-4	2:50		70	21	6	-1.84	-23.6777	148.8664	5	Unlikely
							TGDE2-5	2:55		44	19	6	-1.24	-23.6784	148.8661	10	Unlikely
							TGDE2-6	3:00	Eucalyptus coolabah	44	13	5	-0.86	-23.6784	148.8658	30	Unlikely
		TGDE2-A-1m	Sandy clay	-5.99													
		TGDE2-A-2m	Sandy clay	-7.85													
		TGDE2-B-1m	Clay	-3.58													
		TGDE2-B-2m	Sandy clay	-4.19													