CHAPTER 12 – AQUATIC ECOLOGY

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ISAAC DOWNS EXTENSION PROJECT

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12. AQUATIC ECOLOGY

12.1 Introduction

This chapter describes the aquatic ecology values within and adjacent to the Isaac Downs Extension Project (the Project) area and assesses the potential impacts of the Project on those values. It has been prepared to support the environmental impact statement (EIS) for the Project and is based on the aquatic ecology assessment undertaken by Freshwater Ecology Pty Ltd (**Appendix Q**). The assessment included desktop review, field surveys and impact assessment to identify aquatic ecological values, assess potential direct and indirect impacts, and recommend measures to avoid, minimise and manage impacts to aquatic ecosystems.

The Project is located in the upper Isaac River catchment within the Fitzroy River Basin, approximately 15 km south-east of Moranbah and 150 km south-west of Mackay. Aquatic environments relevant to the assessment include the Isaac River, Cherwell Creek, Conrock Gully, JB Gully, unnamed tributaries, palustrine wetlands, gilgais and shallow depressions within and adjacent to the Project area. These systems are ephemeral, with surface flows and standing water generally influenced by seasonal rainfall and recent flow conditions.

12.2 Regulatory Framework

12.2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the protection and management of nine matters of national environmental significance (MNES). The MNES controlling provisions for the Project are listed threatened species and ecological communities, and water resources that relate to large coal mining development. This chapter assess whether there are listed threatened aquatic species which may be impacted by the Project. **Chapter 11** assesses potential impacts to listed threatened terrestrial species and ecological communities. **Chapters 8, 9** and **10** assess potential impacts to water resources, with this information used to evaluate potential impacts on aquatic ecology.

12.2.2 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) and the subordinate Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water) seek to protect the quality of natural waters in Queensland. There is one high ecological significance (HES) wetland in proximity to the Project area (approximately 1.5 km to the east of the Project area), and no high ecological value (HEV) waterways or wetlands within the Project area or the broader aquatic ecology Study Area.

12.2.3 Nature Conservation Act 1992

The *Nature Conservation Act* 1992 (NC Act) provides the framework for the declaration and management of protected areas, and the protection of wildlife listed as endangered, vulnerable and near threatened under the Nature Conservation Regulation (Plants) 2020 and Nature Conservation Regulation (Animals) 2020.

12.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* (Biosecurity Act) provides a framework for minimising and managing biosecurity risks in Queensland, ensuring the safety of agricultural inputs, aligning responses to biosecurity events to national and international obligations, and managing risks. Potential aquatic pest plants (also recognised

nationally as Weeds of National Significance (WoNS) and pest animals could have an adverse economic, environmental or social impact.

12.2.5 Fisheries Act 1994

The *Fisheries Act 1994* (Fisheries Act) provides for the management and protection of fisheries resources, including regulating development that might impact declared fish habitat areas and fish passage. It regulates the taking and possession of specific fishes, removal of marine vegetation, the control of development in areas of fish habitat and listed noxious fish species. Waterway barrier works approval may be required if new waterway crossings are constructed or existing crossings are modified outside of the mining leases (MLs), but as part of the Project. The Project does not propose activities outside the ML areas and hence approval under the Fisheries Act is not required.

12.2.6 Vegetation Management Act 1999

The purpose of the *Vegetation Management Act 1999* (VM Act) is to regulate the clearing of native vegetation in Queensland, to conserve native vegetation, prevent the loss of biodiversity and maintain ecological processes. The VM Act applies to all vegetation, other than that in state forests, national parks and certain other tenures defined under the *Forestry Act 1959* (Forestry Act) and the *Nature Conservation Act 1992* (NC Act). Approval under the VM Act is not required for activities on a ML, never-the-less the VM Act provides the categorisation of vegetation used in assessments for resource projects on MLs.

12.2.7 Environmental Objectives and Performance Outcomes

The environmental objectives and performance outcomes, based on the *Environmental Protection Regulation 2019* (EP Regulation) and terms of reference (ToR) for the Project's EIS, that are relevant to the aquatic ecology assessment, are provided in Table 12-1. A corresponding EIS section reference is provided demonstrating how the Project meets these environmental objectives and performance outcomes.

Table 12-1 Environmental Objectives and Performance Outcomes

Requirement	Environmental Objectives and Performance Outcomes	EIS Reference
EP Regulation	The activity will be operated in a way that protects the environmental values of wetlands.	12.4.10, 12.5, 12.5.3
Performance Outcome		
1 There will be no potential or actual adverse effect on a wetland as part of carrying out the activity.		Not applicable
2 The activity will be managed in a way that prevents or minimises adverse effects on wetlands.		12.5.3, 12.5.5, 12.5.7 8.4, 8.5, 8.6, 8.7 9.5, 9.5.4, 9.9, 9.9.4.2, 9.9.6 11.5, 11.6

12.2.8 EIS Information Guideline – Aquatic Ecology

The EIS assessment has been undertaken in accordance with the 'EIS Information Guideline – Aquatic Ecology'[1]. The relevant EIS sections where the requirement of this guideline have been addressed are provided in Table 12-2.

Table 12-2 EIS Information Guideline - Aquatic Ecology

Guideline Requirement	Section of the EIS
Ecological surveys	0, 12.3.5
Describe existing aquatic ecological values	12.4, 12.4.10
Potential impacts	12.5, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.5, 12.5.7, 12.5.8, 12.5.9
Avoidance and mitigation measures	12.5, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.5, 12.5.7, 12.5.8, 12.5.9
Offsets	12.7

Aquatic weeds and pests were identified in accordance with Biosecurity—EIS information guideline (ESR/2020/5297)[2] outlined in section 12.4.

12.3 Methodology and Fieldwork

12.3.1 Project Area

The Project area is located in the upper Isaac River catchment in the Fitzroy River Basin of central Queensland, approximately 15 km southeast of Moranbah and 150 km southwest of Mackay. The Project area is located on mining lease application (MLA) 700084, MLA 700081, MLA 700082 and MLA 700083 (Figure 12-1). Surveys were also undertaken adjacent to the Project MLAs in a wider Study Area. The waterways present are highly ephemeral although several retain waterholes for some time following the cessation of rain. The largest waterway that passes through the Project area is the Isaac River which drains into the Mackenzie River approximately 230 kilometres to the south-east. There are three unnamed tributaries, Cherwell Creek, JB Gully (a tributary of Cherwell Creek), and Conrock Gully that pass through the Project area and flow directly into the Isaac River.

The Isaac River is a seasonal waterway, alternatively wet and dry most years according to season. Surface flows in the Isaac River typically occur intermittently, but persist for about half of the year, enough for some plants and animals to complete the aquatic stages of their life cycles, as well as allowing for the passage of aquatic fauna upstream and downstream of the Study Area. Cherwell Creek is the second largest waterway that passes through the Project area, although retains surface water for less time than other waterways. All the smaller tributaries of the Isaac River that pass through the Project area (Conrock Gully and JB Gully being the only two named waterways) are highly ephemeral with a few pools which may persist for some time following the cessation of flows.

[1] https://www.detsi.qld.gov.au/_global/policy-register/policy-register-pdf?getdoc=5295&name=eis-tm-aquatic-ecology-information-guide.pdf

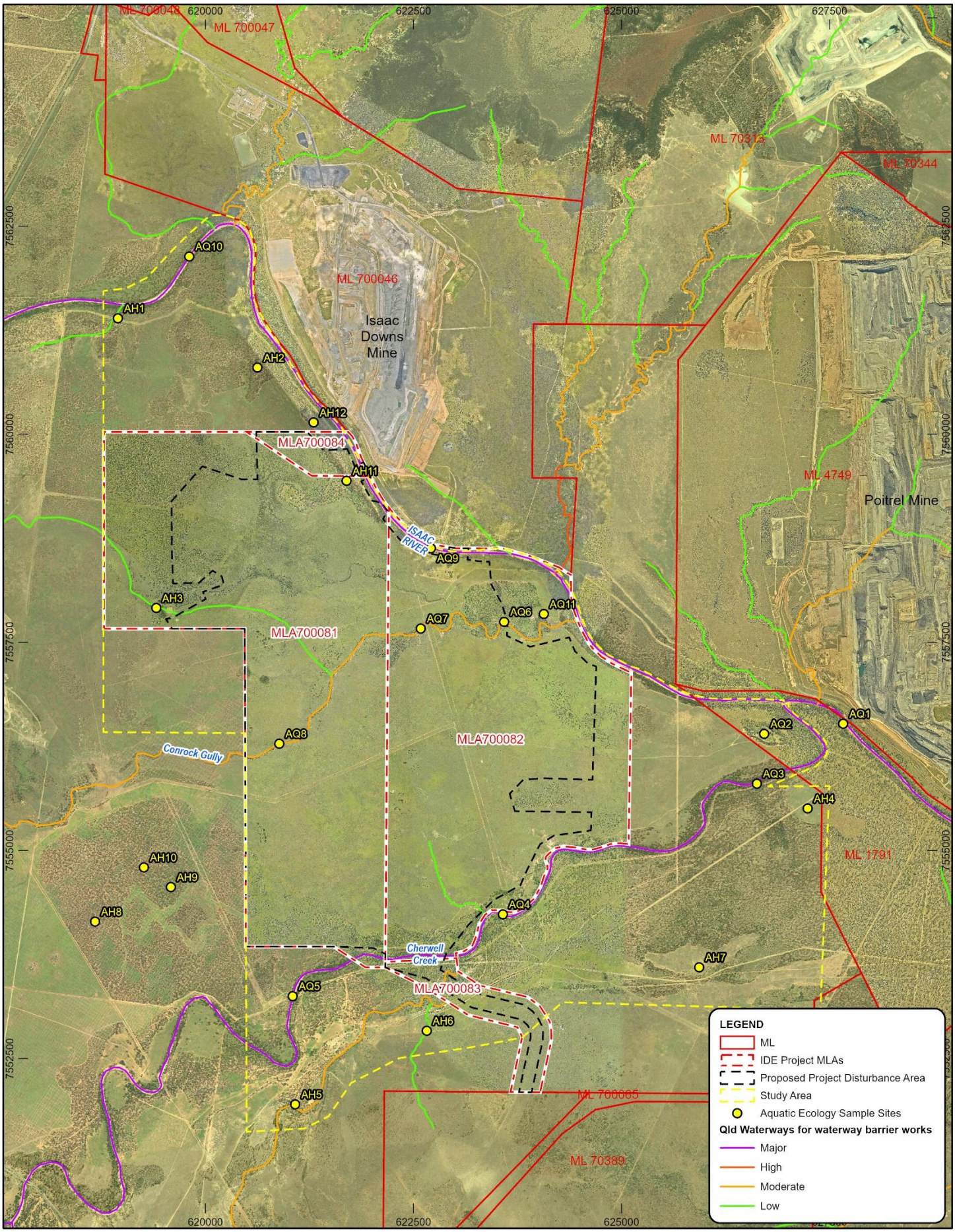
[2] https://www.detsi.qld.gov.au/_global/policy-register/policy-register-pdf?getdoc=5297&name=eis-tm-biosecurity-information-guide.pdf

Several wetlands have been mapped by the State within, and adjacent to, the Study Area (see Figure 12-2). One of the wetlands has been mapped as both a HES and a matter of state environmental significance (MSES) wetland, while the remaining wetlands are mapped as wetlands under the VM Act.

12.3.2 Site Selection

Sites for aquatic ecology surveys were selected to represent the key waterways and wetlands across the Study Area (see Figure 12-1). This included three sites along both the Isaac River (AQ10, AQ9, AQ1) and Cherwell Creek (AQ5, AQ4, AQ3) (one upstream, one adjacent and one downstream of the Project area). Four sites were selected along Conrock Gully (AQ8, A7, AQ6 AQ11), and another on a small unnamed tributary of Conrock Gully (AH3). One site was located on JB Gully (AH5). One on a small unnamed tributary of the Isaac River (AH1), and another site on a small tributary of JB Gully (AH6).

Site AQ2 was the HES mapped wetland located in proximity to the confluence of Cherwell Creek with the Isaac River. Sites AH2, AH12, AH11, AH8, AH10 and AH9 were selected for sampling due to being mapped as wetlands under the VM Act. Two other potential wetland sites were identified following examination of aerial imagery (AH4 and AH7).



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ISAAC DOWNS EXTENSION

Sampling Sites

Figure | **12-1**

12.3.3 Desktop Assessment

A desktop review of available mapping resources and previous aquatic ecology assessments was undertaken to assess the environmental values and aquatic fauna species that could occur in and adjacent to the Project area. The following sources were reviewed as part of the desktop assessment;

- The EPBC Protected Matters Search Tool for MNES aquatic species (Appendix E of **Appendix Q**) and the Queensland Wildnet Search Tool for MSES aquatic species (Appendices F of **Appendix Q**) that may or are likely to occur within a radius of 20 km of the Project area.
- An Atlas of Living Australia search for records of endangered, vulnerable and near threatened (EVNT) species (ALA, 2026) identified in the Protected Matters and Wildnet Search searches.
- Existing mapping layers provided in Queensland Globe, including but not limited to, Watercourse Identification Map, Queensland Waterways for Waterway Barrier Works, Aquatic conservation assessments - non-riverine, and MSES and HES wetlands.
- Aquatic Conservation Assessments (ACAs) for the riverine (Inglis & Howell, 2009) and non-riverine (Rollason & Howell, 2012) wetlands of the Great Barrier Reef catchment.
- Recent aquatic ecology assessments undertaken for other projects in vicinity to the Project including Olive Downs Coking Coal Project: Aquatic Ecology Assessment (Enviros ciences, 2018), Isaac Downs Mine (2019) (FRC Environmental, 2019) , Winchester South Project: Aquatic Ecology and Stygofauna Assessment (ESP, 2021a), Caval Ridge Mine: Horse Pit Extension Project Aquatic Ecology Assessment (ESP, 2021b) and Saraji East Mining Lease Expansion Project (Hydrobiology, 2023).
- Flow data from the Water Monitoring Portal and rainfall data from Moranbah Airport.

12.3.4 Likelihood of Occurrence

Threatened and significant species identified from the desktop assessment (and subsequent field surveys) were assigned a likelihood of occurrence based on the criteria identified in Table 3 of **Appendix Q**. The assessment was based on the knowledge of ecologists, habitat suitability, previous surveys/records near the Study Area and available scientific literature.

12.3.5 Field Sampling

12.3.5.1 Survey timing

An initial site inspection was undertaken in November 2024 during the early wet season. At this time the area was relatively dry despite approximately 50 mm rainfall in the month preceding the inspection. Twenty-one sites were inspected and site photographs taken, several were determined not to be capable of sustaining water at any time and thirteen were identified as potential aquatic habitat.

The late wet season aquatic ecology sampling was undertaken from 17 to 19 March 2025 until localised rainfall closed site access on 19 March and then heavy rainfall occurred across the region from 27 March until 5 April. Sampling was resumed between 1 and 3 April and was completed between 19 and 22 July 2025.

In the late wet season sampling a total of 23 sites were inspected across and immediately upstream and downstream of the Project area (Figure 12-1). Thirteen of these sites were the same as those inspected in November 2024. This included stream orders ranging from 1 to 6 as well as palustrine wetlands and depressions thought to potentially hold water for some time after rain.

Based on monthly rainfall data from the Bureau of Meteorology for Moranbah airport, from February to April 2025 the rainfall values were higher than the mean values. As a result, the wet season sampling was taken within and following a period of above average rainfall.

based on the Isaac River flow gauging station at Deverill (approximately 20kms to the south-east) two low events occurred in late December 2024 and early January 2025. From the commencement of flows on the

in early February 2025 there were continual low flows until mid May 2025. During this period there were high rainfall events that occurred in late February and early April 2025.

All sampling was undertaken four or more weeks following heavy rainfall and notable flow events.

12.3.5.2 Field Sampling Methods

The sampling techniques used in the late wet sampling were in line with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018) and are summarised below and in Section 4 of **Appendix Q** for each site.

12.3.5.3 Aquatic Habitat

An aquatic habitat assessment was undertaken following the Australian River Assessment System (AusRivAS) protocols (DNRM, 2001)

An aquatic habitat inventory was undertaken at each monitoring location to assist in the interpretation of ecological data. This inventory included a general description of the environment within, and immediately surrounding each site.

An aquatic habitat bioassessment was undertaken at all watercourses (this assessment is not relevant for wetlands) in accordance with Queensland AusRivAS Sampling and Processing Manual (DNRM, 2001). Habitat bioassessment score datasheets (DNRM, 2001) were used to numerically score nine criteria, which were then allocated to one of four categories (excellent, good, moderate and poor). The sum of the numerical rating from each category produced an overall habitat condition assessment score.

12.3.5.4 Surface water Quality

In situ water quality collection was completed in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES, 2018) and AS/NZ 5667.6:1998 Guidance on sampling of rivers and streams (AS/NZS 1998).

12.3.5.5 Aquatic Flora

Macrophyte surveys were undertaken following completion of the fish and macroinvertebrate surveys to increase the chance of observing macrophytes that were not abundant throughout the reach. All native and exotic macrophyte species at the site were recorded. Aquatic Macroinvertebrates

Freshwater macroinvertebrates were sampled in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES, 2018) which defaults to those methods adopted by the Queensland AusRivAS Sampling and Processing Manual (DNRM, 2001). Where sufficient aquatic habitat was present a bed and edge sampled were collected. At site AQ3 (where there was little water present) and at palustrine sites, composite samples were collected.

12.3.5.6 Fish

Fish sampling was conducted at each monitoring location in line with the approach outlined in the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES, 2018). Backpack electrofishing was undertaken in all sites that held sufficient water. Unbaited box trapping is a passive fish sampling technique that targets small bodied pelagic and benthic species. Five unbaited box traps were strategically placed at all sites with sufficient habitat for between 30 minutes and 2 hours. A second passive fish sampling method, fyke netting, was used at sites with larger water bodies.

12.3.5.7 Turtles

Sampling for turtles was completed in accordance with the *Australian Survey Guidelines for Australia's Threatened Reptiles* (DSEWPC, 2011), *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*

(Eyra, 2022). Captured turtles were quickly identified, photographed and released back to the location of capture.

12.3.5.8 Frogs

Detection of frogs was restricted to opportunistic visual encounter surveys and call identification. These were undertaken during general aquatic ecology surveys. At each site suitable habitat was searched for any frogs present.

12.3.6 Aquatic Ecosystem Values

The overall aquatic ecosystem values of the waterways and wetlands were identified in accordance with *the Guidelines for Identifying High Ecological Values Aquatic Ecosystems* (Aquatic Ecosystems Task Group 2012). These guidelines identify five core criteria that can be used to determine aquatic ecosystems of high value. These criteria are diversity, distinctiveness, vital habitat, naturalness and representativeness.

Combining the results of the desktop assessment and field surveys, each of these criteria are assessed collectively for larger waterways, smaller waterways and palustrine wetlands (Section 12.4.10).

12.4 Existing Environment

12.4.1 Aquatic Habitat

Full descriptions of physical parameters and habitat for each site in early wet 2024 and late wet 2025 are provided in Appendices A and B of **Appendix Q** respectively. The availability and quality of aquatic habitat is strongly influenced by water permanency. Eleven of the 13 sites were dry during the site inspection in the early wet period (November 2024) and 12 of the 23 sites were dry in the late wet 2025 period (March, April, July 2025). The two sites that retained water in the early wet period held small receding pools only.

12.4.1.1 Waterways

The Isaac River is the largest waterway (stream order 6) within the Study Area and is ephemeral. It has a large defined channel with a substrate strongly dominated by sand. As flow recedes much of it becomes subsurface with intermittent pools along the reach, several of which persist for extended periods of time following heavy rainfall events. Cherwell Creek is similar in characteristic (in channel form, substrate and riparian vegetation) to the Isaac River but of a lower stream order (order 5) and has smaller channel dimensions. Conrock Gully and JB Gully are two 2nd order streams that pass through the Study Area. Both are highly ephemeral, and each had only a single pool found during the late wet sampling, both of which appeared ephemeral.

For a detailed description of the waterways within the Project area, refer to Section 8.3 of **Chapter 8**.

Refer to Figure 12-1 and Section 5.1.1 of **Appendix Q** for an overview of the sites sampled at each of the waterways.

12.4.1.2 Wetlands

Potential wetland sites (nine sites in total) were selected from examination of State wetland mapping layers and from examination of aerial imagery. One of these sites was a listed MSES and HES wetland, while the remaining sites were either mapped as wetlands under the VM Act, or were not identified in State mapping. These sites were then inspected during field surveys to determine whether they met the definition of a wetland under the *Queensland Wetland Definition Guideline* (DES, 2023).

Freshwater wetlands are defined as areas of permanent or periodic/intermittent inundation, with water that is static or flowing, fresh, brackish or salt. To be a wetland, the area must have one or more of the following attributes:

- **Biotic:** The land supports, at least periodically, plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle.
- **Soil:** The substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers.
- **Non-soil, non-biotic:** The substratum is not soil and is saturated with water, or covered by water, at some time. This is assessed by the presence of beds and banks of creeks, rivers, and other drainage lines.

These criteria were assessed in the field to determine whether a wetland, mapped or identified by State mapping or aerial imagery examination, was indeed a wetland or would be more accurately described as a depression (Table 12-3).

Table 12-3 Determination of Wetland Status

Site	Biotic	Soil	Non-soil / non-biotic	Designation
AH2	No evidence of aquatic flora or fauna detected.	No evidence of organic matter accumulation.	No defined banks.	depression
AH4	Aquatic macrophytes of three growth forms detected.	Evidence of accumulated organic matter.	No defined banks.	wetland
AH7	Aquatic macrophytes of three growth forms detected. Developed aquatic macroinvertebrate communities present.	Evidence of accumulated organic matter.	Defined banks.	wetland
AH8	No evidence of aquatic flora or fauna detected.	No evidence of organic matter accumulation.	No defined banks.	depression
AH9	No evidence of aquatic flora or fauna detected.	No evidence of organic matter accumulation.	No defined banks.	depression
AH10	Small amounts of aquatic macrophyte present.	Limited evidence of organic matter accumulation.	No defined banks.	wetland
AH11	Aquatic macrophytes of two growth forms detected. Developed aquatic macroinvertebrate communities present.	Evidence of accumulated organic matter.	Defined banks and riparian vegetation.	wetland
AH12	Macrophytes and bugs	Evidence of accumulated organic matter.	Defined banks and riparian vegetation.	wetland
AQ2	Aquatic macrophytes of three growth forms detected. Developed aquatic macroinvertebrate communities present.	Evidence of accumulated organic matter.	Defined banks and riparian vegetation.	wetland

Site AQ2 is located in a palustrine wetland and is mapped as a HES wetland. When full, this is a relatively large wetland (approximately 6.2 ha). There was extensive emergent macrophyte growth at this site and there were some floating and floating attached macrophytes present. The vegetation surrounding the wetland is similar to that along the Isaac River and Cherwell Creek but slightly sparser.

Two smaller palustrine wetlands were identified at sites AH11 and AH12. These were located along the same drainage line as site AH2, although between these sites there was no defined channel. Sites AH11 and AH12 were surrounded by sparse woodland.

Two gilgais (AH4 and AH7) were sampled in the south-east of the Study Area. These sites held water for longer than smaller depressions and supported a moderately high diversity of aquatic macrophytes. These were relatively shallow, not connected to other waterways by overland flow and surrounded by open grassland with the occasional tree.

Sites AH2, AH8, AH9 and AH10 were located at sites where depressions were considered to potentially hold water but not sufficient to be considered gilgais. Site examination determined that none were likely to hold water for long, although water was still present at site AH10 where a small number of aquatic macrophytes were noted in low abundance. The vegetation around all these sites was sparse woodland.

No Wetlands of International Importance (i.e. 'Ramsar sites') were identified in the desktop assessment (Appendix E of **Appendix Q**).

Out of the nine selected wetland sites sampled, six were given a wetland designation due to meeting one or more of the above-mentioned attributes. AH11 is the only wetland that is within the Project area.

12.4.2 In Situ Water Quality

Standing water was present at only 11 of the 23 sites sampled. The in-situ water quality parameters recorded for sites containing surface water are presented in Table 8 in **Appendix Q**. Water temperatures ranged from 20.1 to 30.0^{o}C and were largely influenced by the time of year and day that they were recorded. DO levels were highly variable ranging from low (28%) to relatively high to very high (101-180% saturation). The electrical conductivity levels were moderately low and ranged from 112-424 µs/cm. All but one site (which was slightly acidic) were slightly to moderately alkaline. Turbidity was highly variable between sites but generally low. The highest turbidity levels were recorded in the lower Cherwell Creek site and in the some of the palustrine wetlands.

12.4.3 Aquatic Habitat Bioassessment

The habitat bioassessment results are presented in Figure 5 in **Appendix Q**, this assessment is only relevant for riverine sites. As the habitat bioassessment was undertaken during the late wet sampling and sampling was undertaken with several weeks of heavy rainfall, these values are likely to represent the upper limit (i.e. highest habitat bioassessment score) of the values for the sites. No sites were considered to be in 'excellent' or 'good' condition from a habitat bioassessment perspective. Six sites were considered to be in 'fair' condition, although this rating would only be applicable while water persisted. All other sites were considered to be in 'poor' condition.

12.4.4 Aquatic Flora

Across all sites, aquatic macrophyte diversity was variable but generally low with none being recorded at eleven sites and between one to four species recorded at six sites, and between five to nine species at six sites (Table 9 in **Appendix Q**). The highest diversity was recorded at gilgai and palustrine wetland sites, which is not surprising as these sites have no flow, clay bases and typically hold water for longer after heavy rainfall than riverine sites.

All macrophyte species recorded are species capable of persisting in the absence of permanent standing water. The macrophyte species that could be identified to species level recorded are native, widespread

and abundant along eastern Australia and none are listed under state or federal legislation as threatened. No aquatic WoNS were recorded.

No WoNS or restricted/invasive plants under the Biosecurity Act were recorded at any site.

12.4.5 Aquatic Macroinvertebrates

Macroinvertebrate relative abundance and taxonomic richness for sites sampled for macroinvertebrates is presented in Section 5.6 of **Appendix Q**. Abundance values were not absolute but in line with the live picking procedures of the AusRivAS methodology (DNRM, 2001). Abundance varied across all sites and samples, ranging from 39 to 272 individuals. Abundances were higher for edge samples than bed samples, which is typical for ephemeral waterways. In nine samples (half of the total) abundances were less than 150 individuals in all samples. AusRivAS methods aim to collect approximately 200 individuals (without over collection of abundant taxa). This illustrates the overall low abundance of aquatic macroinvertebrates in many sites across the Study Area. The low abundances are likely to be due to the largely ephemeral nature of the waterways. Taxa diversity was typical for ephemeral streams in central Queensland.

No exotic or threatened macroinvertebrate species were recorded.

12.4.6 Macrocrustaceans

Macrocrustaceans were collected during both macroinvertebrate and fish sampling, as described in Section 5.7 of **Appendix Q**. Four families recorded were across the Study Area; Atyidae (glass shrimps), Palaemonidae (longarm shrimps), Paratascidae (crayfish) and Gecarcinucidae (freshwater crabs) The most abundant groups across all sites were Atyidae and Palaemonidae which were both recorded from seven sites, although relative abundance varied between sites. The Palaemonidae species is a common and widespread species across eastern Australia.

12.4.7 Fish

Fish from twelve species were collected from the 11 sites that had water across the Study Area (see Section 5.8 of **Appendix Q**). At two sites that held water (AH7 and AQ2) no fish were recorded, reflecting the lack of connectivity to other waterways and the ephemeral nature of these two sites. Ten of the species of fish recorded were native species and are relatively common and widespread across their distributions. Two exotic species were also recorded; one species which is not restricted or prohibited under Queensland legislation, and the second exotic species being tilapia (*Oreochromis mossambica*) which is listed as a restricted species under the Biosecurity Act.

The highest diversity was recorded in the two sites on the Isaac River, AQ10 (12 species) and AQ1 (11 species), followed by ten species at AH5 (JB Gully). At the remaining sites between one and seven species were recorded.

The most abundant species was eastern rainbowfish (*Melanotaenia splendida splendida*) which accounted for 36% of all fish recorded, with just over two thirds of those individuals recorded from just two sites (AQ1 and AQ10). Other abundant species, in descending order of abundance, were; spangled perch (*Leiopotherapon unicolor*), Midgley's carp gudgeon (*Hypseleotris bucephalus*), Agassiz's glassfish (*Ambassis agassizii*), sleepy cod (*Oxyeleotris lineolatus*) and tilapia (*Oreochromis mossambica*). The most widespread fish species were eastern rainbowfish and spangled perch (recorded at eight of the eleven sites sampled), followed by Midgley's carp gudgeon (recorded at seven of the eleven sites sampled).

12.4.8 Frogs and Turtles

Frogs were scarce at the time of sampling, with only three species observed at three sites and none noted as calling during the aquatic ecology surveys.

Four specimens of eastern long-necked turtle (*Chelodina longicollis*) were captured in fyke netting in AQ2, a palustrine wetland.

No observations or signs of frogs, turtles or other aquatic vertebrates were noted at any other sites sampled. All frog and turtle species recorded are capable of surviving extended dry periods by aestivating underground

12.4.9 Surface Expression Aquatic Groundwater-Dependent Ecosystems

There was no evidence to suggest that any waterway within the Study Area was sustained by surface expressions of groundwater. Therefore, the aquatic ecosystems associated with the waterways and wetlands are not reliant on the surface-expression of groundwater.

12.4.10 Aquatic Ecosystem Values

Based on the criteria identified in the Guidelines for Identifying High Ecological Values Aquatic Ecosystems (Aquatic Ecosystems Task Group 2012) the following section summarises each site sampled across the Study Area. The five points for each site represent the five criteria described in Section 12.3.6 and are shown for each site in Table 12-4.

One site, the HES wetland was rated as having high aquatic values, based on its relative distinctness, and aquatic macrophyte diversity. All three sites along the Isaac River were considered to be of moderate value based on extended periods of holding water and supporting moderately diverse fish assemblages, as well as providing passage for fish to habitat further upstream. Sites AH7, AH11 and AH12 was also rated as having moderate aquatic values, due to semi-permanence of wetted habitat and relatively diverse aquatic macrophyte assemblages. All other sites were considered to have low aquatic values due to the lack of water permanency and, in the case of the watercourses, little to no permanent water upstream.

Table 12-4 Aquatic Ecosystem Value Ratings for the Study Area

Site code	Waterway	Stream order	Criteria for value rating	Overall value rating
AH1	Unnamed creek	1	• No standing water, dries quickly, incised channel • No distinctness • No habitat likely to extend beyond days following heavy rainfall • Heavily impacted by land clearing and grazing • Poor example of a lower stream order	Low
AH2	Unnamed depression	1	• Poor diversity with one pool that may persist for a few weeks after heavy rainfall • No distinctness • Short water retention times and poor habitat • Heavily impacted by grazing • Poor example of a wetland	Low
AH3	Unnamed creek	1	• Several small temporary pools, supporting a low diversity of aquatic macrophytes • No distinctness • Not vital habitat • Impacted by land clearing and grazing • Fair example of a lower stream order	Low
AH4	Unnamed gilgai	-	• Poor diversity with one pool that may persist for a several weeks after heavy rainfall • No distinctness	Low

Site code	Waterway	Stream order	Criteria for value rating	Overall value rating
			• No habitat likely to extend beyond weeks following heavy rainfall • Heavily impacted by land clearing, grazing and feral pigs • Poor example of a wetland	
AH5	JB Gully	2	• Moderate diversity of fish and crustacean species • No distinctness • Habitat likely to extend for several months following heavy rainfall • Moderate naturalness, impacted by grazing • Moderate example of semi-permanent refugial pool	Moderate
AH6	Unnamed creek	1	• No standing water, dries quickly, incised channel • No distinctness • No habitat likely to extend beyond days following heavy rainfall • Heavily impacted by land clearing and grazing • Poor example of a lower stream order	Low
AH7	Unnamed gilgai	-	• Moderate diversity of aquatic macrophytes • No distinctness • Aquatic habitat likely to persist for weeks following heavy rainfall • Heavily impacted by grazing and feral pigs once drying out • Good example of a gilgai	Moderate
AH8	Unnamed depression	-	• Poor diversity with one pool that may persist for a few hours after heavy rainfall • No distinctness • Short water retention times and poor habitat • Impacted by grazing • Poor example of a wetland	Low
AH9	Unnamed depression	-	• Poor diversity with one pool that may persist for a few hours after heavy rainfall • No distinctness • Short water retention times and poor habitat • Impacted by grazing • Poor example of a wetland	Low
AH10	Unnamed wetland	-	• Poor diversity with one pool that may persist for a few weeks after heavy rainfall • No distinctness • Short water retention times and poor habitat • Heavily impacted by grazing • Poor example of a wetland	Low
AH11	Unnamed wetland	-	• Moderate diversity of aquatic macrophytes • No distinctness • Aquatic habitat likely to persist for weeks following heavy rainfall • Heavily impacted by grazing and feral pigs once drying out • Moderate example of a wetland	Moderate
AH12	Unnamed wetland	-	• Moderate diversity of aquatic macrophytes • No distinctness • Aquatic habitat likely to persist for weeks following heavy rainfall	Moderate

Site code	Waterway	Stream order	Criteria for value rating	Overall value rating
			• Heavily impacted by grazing and feral pigs once drying out • Moderate example of a wetland	
AQ1	Isaac River	6	• Moderate diversity of fish species only • No distinctness • Habitat likely to persist for months following heavily rainfall. Conduit for fish passage • Ecological character moderately natural • Moderate example of a higher stream order	Moderate
AQ2	Unnamed wetland	-	• Moderate diversity of aquatic macrophytes and riparian vegetation. High wetland values • Moderate distinctness • High value temporary habitat for terrestrial species • Impacted by grazing and feral pigs when drying • Good example of an ephemeral wetland	High
AQ3	Cherwell Creek	5	• Large channel that drains within days following heavy rainfall • No distinctness • No habitat likely to extend beyond weeks following heavy rainfall • Ecological character moderately natural • Moderate example of a highly ephemeral higher stream order	Low
AQ4	Cherwell Creek	5	• Large channel that drains within days following heavy rainfall • No distinctness • No habitat likely to extend beyond weeks following heavy rainfall • Ecological character moderately natural • Moderate example of a highly ephemeral higher stream order	Low
AQ5	Cherwell Creek	5	• Large channel that drains within days following heavy rainfall • No distinctness • No habitat likely to extend beyond weeks following heavy rainfall • Ecological character moderately natural • Moderate example of a highly ephemeral higher stream order	Low
AQ6	Conrock Gully	2	• Poor channel diversity and dries quickly with a few intermittent pools. • No distinctness • No habitat likely to extend beyond weeks following heavy rainfall • Impacted by grazing • Poor example of a lower stream order	Low
AQ7	Conrock Gully	2	• Poor channel diversity and dries quickly with a few intermittent pools. • No distinctness • No habitat likely to extend beyond weeks following heavy rainfall • Impacted by grazing • Poor example of a lower stream order	Low
AQ8	Conrock Gully	2	• Poor channel diversity and dries quickly with a few intermittent pools. • No distinctness	Low

Site code	Waterway	Stream order	Criteria for value rating	Overall value rating
			• No habitat likely to extend beyond weeks following heavy rainfall • Impacted by grazing • Poor example of a lower stream order	
AQ9	Isaac River	6	• Moderate diversity of fish species only • No distinctness • Habitat likely to persist for months following heavily rainfall. Conduit for fish passage • Ecological character moderately natural • Moderate example of a higher stream order	Moderate
AQ10	Isaac River	6	• Moderate diversity of fish species only • No distinctness • Habitat likely to persist for months following heavily rainfall. Conduit for fish passage • Ecological character moderately natural • Moderate example of a higher stream order	Moderate
AQ11	Conrock Gully	2	• Little standing water present, dries quickly through most reaches • No distinctness • Habitat in one pool likely to persist for weeks following heavily rainfall. • Impacted by grazing • Moderate example of a lower stream order	Low

12.4.11 Matters of National Environmental Significance

The literature review identified two EPBC Act listed threatened aquatic fauna species with the potential to occur in and adjacent to the Project area:

- White-throated snapping turtle (*Elseya albagula*) (Critically Endangered)
- Fitzroy River turtle (*Rheodytes leukops*) (Endangered)

No MNES aquatic flora were identified.

A combination of literature reviews and field surveys was used to make an assessment of the likelihood of occurrence for these aquatic MNES. While no aquatic MSES species were identified in the Wildnet search, the two aquatic MNES species (both turtles) identified in the EPBC Protected Matters Search are also listed as MSES species. The likelihood assessment for these species is presented in Table 12-5. Both of the MNES and MSES turtle species identified in the desktop review were determined to be unlikely to be present within the Study Area. This was largely due to a lack of permanent flows and lack of suitable habitat present, and no records for more than 150 kms of stream length from the Project area.

Table 12-5 Likelihood of Occurrence for EVNT Aquatic Species

Species	Status		Preferred habitat	Likelihood of occurrence
	EPBC	NC Act		
White-throated snapping turtle (*Elseya albagula*)	CE	CR	The white-throated snapping turtle is recognised as a habitat specialist. Within the river system the white-throated snapping turtle prefers clear, flowing, well-oxygenated waters. The species prefers waterways with permanent flowing water, with undercut banks, large woody debris, deep pools (6 m deep) and shallow riffle zones.	**Unlikely** the closest records are more than 150 kms by stream length from the Project area and there is no suitable habitat present within or in proximity of the Project area.
Fitzroy River turtle (*Rheodytes leukops*)	E	E	The Fitzroy River Turtle is found in rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. Preferred areas have high water clarity and are often associated with Ribbonweed (*Vallisneria* sp.) beds.	**Unlikely** the closest records are more than 150 kms by stream length from the Project area and there is no suitable habitat present within or in proximity of the Project area.

EPBC designations; CE – Critically Endangered, E – Endangered.
NC Act designations; CR – Critically Endangered, E – Endangered

12.4.12 Matters of State Environmental Significance

There are several MSES relevant to aquatic ecology that occur, or have the potential to occur, in the vicinity of the Project area. These are:

- listed threatened aquatic species
- waterways providing for fish passage
- HES wetlands.

MSES species are regulated under the NC Act. The Wildnet search review did not identify any listed threatened aquatic flora or fauna species with the potential to occur in and adjacent to the Project area, however, the EPBC Protected Matters identified two MSES species - white-throated snapping turtle (*Elseya albagula*) (Critically Endangered) and Fitzroy River turtle (*Rheodytes leukops*) (Endangered). These are discussed in section 12.4.11 and the likelihood assessment for these species is presented in Table 15.

The DAF (2020) Queensland Waterways for Waterway Barrier Works mapping indicates the level of 'risk' associated with undertaking waterway barrier works within Queensland waterways with regards to fish passage. Where the works associated with the Project are undertaken on the MLs under the conditions of an environmental authority (EA) (and not a development approval), a waterway barrier works approval under the Fisheries Act will not be required; however, fish passage requirements in the Project area need to be considered. There are several designations of waterways across the Study Area (Figure 12-1):

- The Isaac River and Cherwell Creek are mapped as major risk (purple) of adverse impact to fish movement.
- All other waterways are mapped as moderate risk (amber) or low risk (green) of adverse impact to fish movement.

There are two HES wetlands within 20 kilometres of the Project area. One is located approximately 1.5 km east of the Project MLAs and within the Study Area (site AQ2). The other is located approximately 15 kms to the south-east adjacent to the Isaac River with no potential to be impacted by the Project.

12.4.13 Matters of Local Environmental Significance

There are eleven fish species, two freshwater crayfish and six Priority species recorded by the ACA Expert Panel Reports for the Fitzroy section of the GBR catchment (Inglis & Howell, 2009) (Rollason & Howell, 2012). Only two of the fish species (golden perch – *Macquaria ambigua oriens* and leathery grunter – *Scortum hillii*), three plant species (tall flatsedge - *Cyperus exaltatus*, water chestnut - Eleocharis dulcis and native hyacinth - *Monochoria cyanea*) occur, or have the potential to occur, in the vicinity of the Project. None are listed as MNES or MSES.

12.5 Potential Impacts and Mitigation

The Project layout has been designed to minimise environmental impacts, including to aquatic ecosystems. This section summarises the potential impacts on aquatic ecology and describes the proposed mitigation measures.

12.5.1 Aquatic Habitat Modification

Conrock Gully will be diverted around the proposed mining area. The diversion construction will commence at the start of the on-ground activities. The majority of Conrock Gully upstream and including the beginning of the proposed diversion is defined as a drainage feature under the Water Act. The 3.2 km downstream reach of Conrock Gully to its confluence with Isaac River is defined as a watercourse under the Water Act. The proposed diversion channel will mimic the existing gully channel geomorphic characteristics, with the design hydraulic conditions similar, and generally improved, to those in the existing Conrock Gully channel (see Section 9.6 **Chapter 9**). Following construction, the diversion will be revegetated to maintain bank stability and reduce erosion and achieve a native vegetation (riparian) post mining land use in accordance with the proposed progressive rehabilitation and closure plan (PRCP) schedule (see **Appendix AC**). The diversion will remain in the post mining landform as a revegetated, rehabilitated, stable landform. This will be essential for bank stability over time. Where possible the diversion will be constructed 'offline' until the works have stabilised, and the vegetation has become established. Monitoring of the diversion establishment and rehabilitation will occur in order to achieve the design outcomes and rehabilitation milestones. A culvert crossing is proposed in the northern end of the diversion, which is discussed further in Section 12.5.4.3.

The Project's functional design report for the Conrock Gully diversion is described in Section 9.6 **Chapter 9**. The following provides an overview of the key design characteristics:

- The hydraulic assessment was used to assess the potential hydraulic impacts and demonstrate the suitability of Conrock Gully diversion's functional design, in accordance with the objectives and design criteria of the 'Guideline: Works that interfere with water in a watercourse for a resource activity—watercourse diversions authorised under the *Water Act 2000* (DNRME, 2019) (DNRME guideline).
- The proposed diversion channel has similar dimensions to the existing channel and thus has similar design capacity.
- The existing channel includes a large meander which contributes significantly to the length of channel being diverted. A number of meanders have been introduced at the upstream end of the diversion which results in a length of channel and bed slope similar to the existing channel. The meanders have similar amplitude, wavelength, sinuosity, and bend radius to bends found in the existing creek channel.
- The main channel has a similar geometry to the existing channel, but with slightly steeper side slopes to reduce the extent of disturbance required. The hydraulic conditions within the existing Conrock Gully channel and proposed diversion channel have been compared for conditions before and after the proposed development, and to the guideline conditions within the DNRME guideline. Within the Conrock Gully diversion, the design hydraulic conditions are similar, and

generally improved, to those in the existing Conrock Gully channel, and are consistent with the DNRME guideline values for channel-averaged shear stress, stream power and velocity.

The downstream remainder of the existing Conrock Gully channel will be excised by the Project. However, this section of Conrock Gully channel is subject to backwater flood flows from the Isaac River as it sits within the Isaac River floodplain and would regularly be inundated by Isaac River backwater during flood flows. **Chapter 9** shows that this downstream reach of Conrock Gully would be inundated by Isaac River backwater flows for flood events greater than the 50% Annual Exceedance Probability (AEP) (1 in 2 year). This means that the loss of catchment from catchment excision from the Conrock Gully Diversion is largely mitigated by Isaac River backwater flows for flow events greater than 50% AEP.

No aquatic species of conservation significance listed under the NC Act (MSES) or EPBC Act (MNES) were recorded in Conrock Gully and, given the lack of suitable habitat features, none are expected to be present. All aquatic ecology survey sites on Conrock Gully were determined to have low aquatic ecology value (see Section 12.4.10). With the proposed diversion design, including rehabilitation, and the low aquatic ecosystem values, the Project will have minor impacts on aquatic ecology values of Conrock Gully.

The Project will result in disturbance to riparian vegetation associated with the crossings of the Isaac River and Cherwell Creek. The proposed bridges and dragline walk route have a nominated 200 m to 250 m construction corridor width respectively, which allows for some flexibility in detailed design. However, it is likely that the disturbance widths in these areas will be reduced. All disturbance within these areas is within the nominated 'disturbance area' for the Project and hence has been assessed as a direct impact in the terrestrial ecology impact assessment (see **Chapter 11**), including identification of significant residual impacts to these areas that require biodiversity offsets. Further, the nominated post mining land use for these locations is riparian vegetation which would ultimately aim to achieve a similar ecosystem to that which existed pre-mining.

12.5.2 Changes to Flow and Surface Water Hydrology

During operations, levees will be constructed to protect the open cut pit area from flooding of the Isaac River, Cherwell Creek and Conrock Gully diversion up to a 0.1% AEP (1:1000 year) flood event.

Three levees have been proposed to protect the mine from local and regional flooding:

- Isaac River levee.
- Cherwell Creek levee plug
- Conrock Gully levee plug.

Detailed hydraulic and hydrology modelling for a range of AEP events has been completed for the Project for the operational and closure periods, inclusive of all Project structures and landforms with the potential to alter hydrology and geomorphology (Section 9.4 and Section 9.5 of **Chapter 9**). The design of infrastructure with the potential to alter hydrology and geomorphology has been undertaken to minimise impacts (e.g. locating the Isaac River levee approximately 100–400 m from the high bank; bridge designs with minimal interference with flows; and a temporary dragline crossing). In addition, hydraulic and hydrology modelling has been completed for five cross sections through the Isaac River and adjoining floodplain upstream, adjacent and downstream of the Project, with the five cross sections representing areas of potential ecological value, containing regional ecosystems (REs), threatened ecological communities (TECs) and groundwater dependent ecosystems (GDEs). This modelling has identified:

- The Project will have negligible impact on hydrology and geomorphology (e.g. flood levels, velocity, bed shear stress and stream power) for more frequent flood events (e.g. 10% AEP or 1:10 year flood event)
- The Project will have negligible to minor impact on hydrology and geomorphology for less frequent flood events (e.g. 1% AEP or 1:100 year flood event) during operations.

- Post mining, with the decommissioning and rehabilitation of the crossing infrastructure and the Isaac River levee, and restoration of the associated floodplain, the Project will have negligible impact on hydrology and geomorphology.
- The Project will result in almost no change in the duration for which flood events will occur (less than 1 hour change in duration for all AEP events), as measured at the nominated cross section locations.
- The proposed design of Conrock Gully diversion will be hydraulically and geomorphically stable, with revegetation to a native ecosystem, and will be similar to the existing Gully.
- The final void is located outside the 0.1% AEP (1:1,000) year flood event.

For further information on the hydrological and geomorphological assessment for the Project, refer to **Chapter 9**.

Based on the findings from the flooding assessment (Section 9.4 and Section 9.5 of **Chapter 9**) impacts to vegetation in floodplains, riparian habitat and vegetation condition from changes to hydrology, hydraulics and geomorphology are expected to be negligible (Section 11.7 of **Chapter 11**).

Section 9.4 and section 9.5 of **Chapter 9** includes modelling of hydrological and geomorphological changes at the HES wetland, including a cross sectional analysis located close to the HES wetland. The modelling demonstrates that the Project will not result in changes to hydrology or geomorphology at the HES wetland.

The Project layout has been designed to avoid waterways as far as practical and minimise impacts where avoidance is not possible. The hydrological and geomorphological modelling suggest negligible impacts resulting from the development of the Project on major waterways. The proposed Conrock Gully diversion has been designed to provide similar habitat characteristics to the existing Gully conditions. Therefore, any impacts on aquatic ecosystems due to changes in flooding and surface water hydrology resulting from the Project are considered to be negligible.

12.5.3 Wetlands

The location of the State mapped wetlands in the vicinity of the Project is shown in Figure 12-2. These are analogous to the aquatic ecology survey sites:

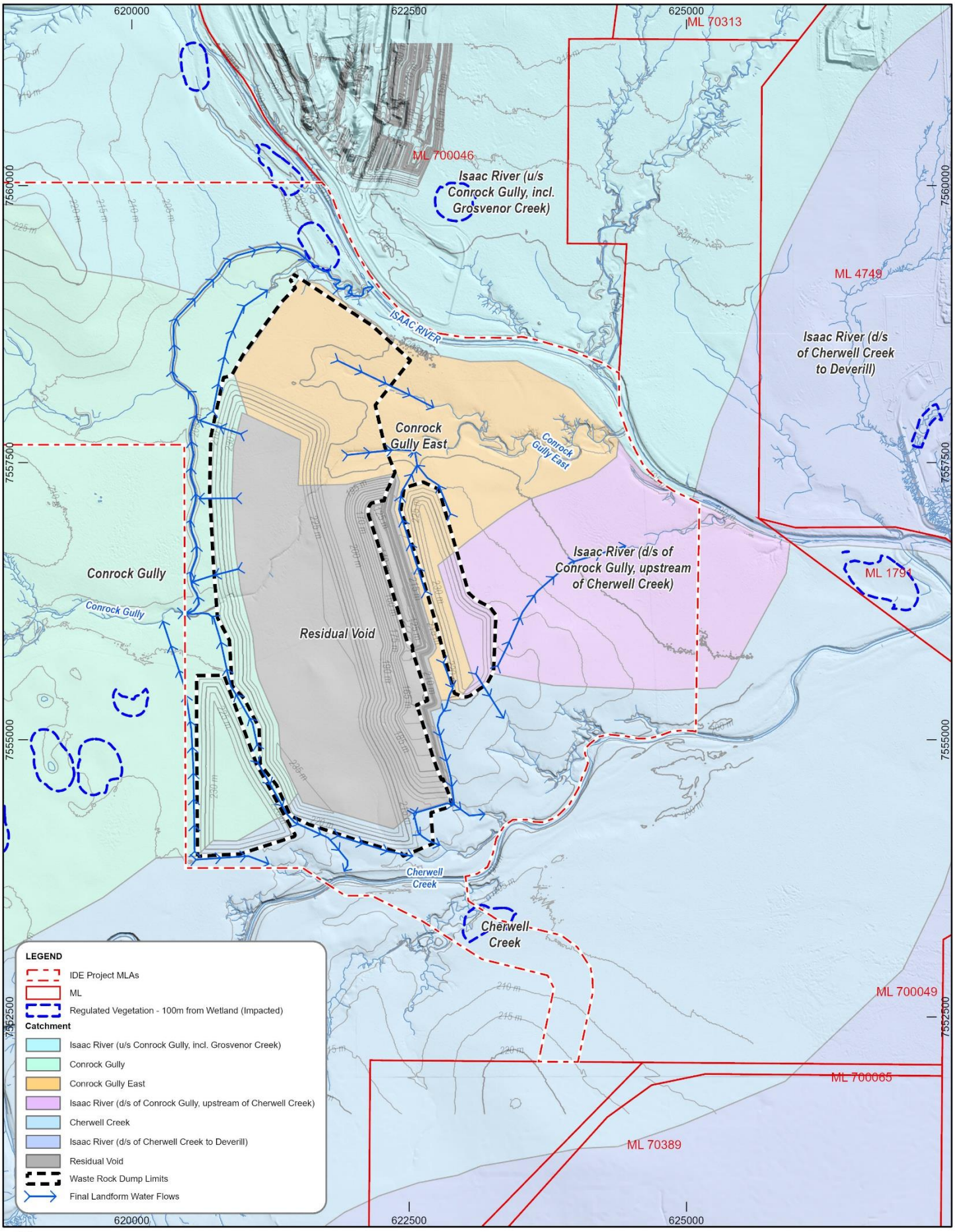
- AQ2, being the HES wetland approximately 1.5 km east of the Project area
- AH8 (depression), AH9 (depression) and AH10 to the west of the Project area
- AH11, AH12 and AH2 (depression) in or to the north of the Project area
- AH6 to the south of Cherwell Creek.

In addition, surveys of other more distant potential wetlands from Project area were undertaken, with results presented in Section 12.4.1.2.

The Project will result in the removal of one wetland in the north of the Project area (AH11), with this site to be included in the Project's assessment of direct impacts to terrestrial ecology values for which there is a significant impact requiring offsets (**Chapter 11**). The remaining wetlands and depressions will remain in place.

The direction of surface water flows across the Project area following rehabilitation is illustrated in Figure 12-2 and demonstrates that the remaining wetlands and depressions will not receive surface water runoff from the Project's rehabilitation areas. During operations mine affected water and sediment water will be managed within their respective water managements systems (see Section 12.5.5 and **Chapter 8**). The mine water system will not result in uncontrolled releases and any releases from sediment water system, in accordance with the proposed design criteria, would be even further constrained than the flows paths shown on Figure 12-2. Therefore, these wetlands are not at risk of changes to surface flows or water quality as a result of the Project, during operations or closure.

An assessment of the likelihood of the HES wetland (AQ2) being a GDE concluded that this wetland relies on a perched groundwater unit that is disconnected from the deeper alluvial aquifer and hence not subject to drawdown (Section 10.8.5 of **Chapter 10**). The flood / hydrology assessment modelled no changes at this wetland (Section 9.5 of **Chapter 9**). Considering the lack of groundwater dependence of this wetland and no changes to the surface water hydrology, the Project will not impact the HES wetland.



Datum:	GDA2020 Zone 55
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stanmore

ISAAC DOWNS EXTENSION

Wetland Protection Areas and Surface Flow Direction Across the Project Area

Figure | **12-2**

12.5.4 Fish Passage

There are two bridges, a dragline walk route, a low level crossing and a culvert crossing proposed for the Project that intersect waterways. Each is described separately below, with additional information provided in Section 4.14 of **Chapter 4**. These activities and infrastructure occur within the proposed Project disturbance area and are included in the Project's assessment of direct impacts to terrestrial ecology values for which there is a significant impact requiring offsets (**Chapter 11**).

12.5.4.1 Bridges

The Isaac River and Cherwell Creek bridges will be approximately 110 m and 70 m long, respectively. The bridge designs are subject to detailed design; however, conceptual design of the bridges includes:

- approximate 15 m bridge width
- dual lanes
- between 2 and 4 concrete and / or steel spans supported by concrete piers, piled into the banks and beds, nominally to a depth a 10 m
- less than 1:10 year flood event immunity
- rip rap rock scour protection for bank abutments to minimise risk of scour, which will be inspected following major flood events and, if required, reinstated to reduce the risk of future scour
- waterway crossings perpendicular to the waterway direction.

The proposed Project Isaac River bridge is expected to be similar to the existing Peak Downs Highway Isaac River bridge located approximately 8 km upstream, while the Cherwell Creek bridge will have a similar design but will be approximately half the length.

Construction of bridges will involve methodologies similar to the following:

- preferentially constructed in the dry season
- geotechnical investigations to determine the stable depth
- temporary (i.e. less than 180 days) sheet piles around each pier location to create a dry work area
- installation of pier piles driven done to a suitable depth
- installation of a reinforced concrete pile cap to tie piles together construction of piers
- construction of abutments adjacent the river banks, with riprap rock protection placed adjacent abutments
- lifting of the of the girders (bridge superstructure) span by span between the abutments and piers
- casting of the bridge deck slab.
- bed scour protection, if required, with any bed scour protection to be at, or below the natural bed level of the waterway, such that it does not alter the profile of the low-flow channel, and no more than 20 m upstream or downstream.

The construction and operation of the bridges will not create a barrier for fish passage. Whilst there will be sites of construction activity within the watercourse (e.g. at each pile location), these will be temporary at each location and not create an impediment to fish passage elsewhere in the river channel.

Following the construction there will be no ongoing impediment to fish movement in the Isaac River or Cherwell Creek, as the bridges will function in the same manner as the existing Peaks Down Highway bridge.

At the end of the closure period, when the bridges are no longer required, the bridges will be decommissioned, with affected lands rehabilitated in accordance with the PRCP schedule to a restore riparian habitat post mining land use. Bridges would be retained if there is an agreement with a third party for their retention.

12.5.4.2 Dragline Walk Route

The dragline currently operating at Isaac Downs Mine (IDM) will be walked to the Project. This will result in a temporary barrier to fish passage in the Isaac River. The proposed walk route is different to the haul road and access road but will exist for only a short time (e.g. a few weeks to a few months), with a temporary crossing of the Isaac River. The walk route may also be utilised by other heavy vehicles to cross the Isaac River prior to bridge construction, in which case the walk route construction, use and removal of material on the bed of the river would occur for less than 180 days (6 months). The dragline walk route will preferentially be constructed and utilised in the dry season when flows in the Isaac River are unlikely.

At the conclusion of mining operations, and once the dragline is no longer required for use in rehabilitation (i.e. approximately 20 years after operations commenced), the temporary crossing will be reestablished for a short duration (e.g. a few weeks). The temporary crossing will not be required for the movement of other equipment at closure as the Isaac River bridge will be available. All walk route crossing construction, use and removal of material on the bed of the river would occur within weeks to a few months (i.e. less than 180 days).

The proposed location for the dragline walk route crossing of the Isaac River has been selected based on relatively shallow and low river banks and minimising areas of remnant vegetation clearing. The dragline crossing construction will involve:

- gravel, road base or similar overlain on the bed of the river to a height of around 100 – 250 mm above the bed (noting that there will be flexibility in the height of the base as part of detailed design)
- bank cuttings on either side of the river to create a suitable gradient to facilitate the dragline's movements
- stabilisation of the banks of the river with rock protection.

Following utilisation of the crossing, and within 180 days of construction commencement, the temporary gravel base will be removed, and any sand that has been removed will be replaced to restore the natural bed of the Isaac River. Bank cuttings and the walk route itself will be stabilised and rehabilitated through topsoiling, seeding and vegetation establishment. Rock protection installed during construction will remain in place. This will create a stable landform during the operational period and prior to the dragline being walked from the Project back to IDM at closure.

At closure those parts of the walk route required for the movement of the dragline will be re-opened during the dry season, with gravel, road base or similar overlain on the bed of the river. Once the dragline has returned to IDM, the crossing will be fully rehabilitated with the gravel base removed, sandy bed reestablished, bank cuttings filled to resemble pre-mining topography and landforms rehabilitated through topsoiling, seeding and revegetation in accordance with the PRCP schedule requirements to restore riparian habitat.

As the dragline crossing will be temporary for the pre and post operational crossings, it will not result in a permanent waterway barrier that will impede fish passage.

The design, construction, operation and rehabilitation of the dragline walk route demonstrates that activities will be temporary in accordance with the Accepted development requirements for operational work that is constructing or raising waterway barrier works for a purple (high risk) waterway (DPI , 2025). Hence any design requirements for waterway barriers will be in accordance with those for temporary structures.

12.5.4.3 Low Level and Culvert Crossings

The secondary access route crossing of JB Gully will be constructed as a bed level crossing based on the principles described in the Department of Primary Industry's (DPI's) '*Accepted development requirements for operational work that is constructing or raising waterway barrier works: September 2025'* (DPI , 2025)

(the Waterway Barrier Works Guideline). At the end of the closure period, when the crossing is no longer required, the crossing will be decommissioned, with affected lands rehabilitated in accordance with the PRCP schedule requirements to restore the pre-mining land use (i.e. grazing).

The crossing of Conrock Gully diversion will be constructed as a culvert crossing based on the principles described in the Waterway Barrier Works Guideline. Following operations this crossing will be decommissioned and rehabilitated, with the diversion continuing to function as a geomorphically stable waterway.

As the crossings of JB Gully and Conrock Gully diversion will be constructed based on the principles in the Waterway Barrier Works Guideline, they will allow for low flows and will not act as waterway barriers to fish passage.

12.5.5 Water Management Systems

The mine site water management system will be integrated with the rest of IPC and is described in detail in **Chapter 8**. The water management strategy is for separation of mine affected water, sediment affected water and clean water, with appropriate management of each of these water types.

A mine affected water dam will store water from the pit, ROM pads, go line and crib area, with the ability to transfer mine affected water to and from IDM and IPM within IPC's integrated water management system, thereby enabling the balancing of water supply and demand. Sediment water drains and dams will be constructed to capture runoff from overburden dumps. Sediment dams will be constructed in stages in accordance with mine progression. An erosion and sediment control plan (ESCP) has been developed for the Project (**Appendix AD**). Clean water drains and dams will be constructed to separate clean water from mine affected water and sediment water.

The water management system assessment (Section 8.6 of **Chapter 8**) demonstrates the following:

- There will be no uncontrolled releases of mine affected water.
- Controlled releases of mine affected water will occur in accordance with receiving environment flow and quality limits that are designed to protect downstream environmental values and water quality objectives.
- Sediment dams will release water in accordance with their engineered design criteria and the ESCP. Modelling demonstrates that releases of water from sediment dams would have a negligible effect on salinity in the receiving environment.
- The Project would not result in a net decline in water quality in the receiving environment in accordance with the "Reef discharge standards for industrial activities" guideline (DESI, 2021).
- Clean water from upgradient of the mining activities will be diverted around the mining activities into the Isaac River or Cherwell Creek, including the diversion of Conrock Gully.

The proposed water management systems will therefore protect downstream water resources and aquatic ecology.

12.5.6 Receiving Environment Monitoring Program

A receiving environment monitoring program (REMP) is typically required by the conditions of an EA for a Project, with the EA specifying the design criteria for the REMP. However, a proponent for a project can elect to be a participant in the Fitzroy Regional Receiving Environment Monitoring Program (FRREMP) (Fitzroy Basin Association, 2025). The FRREMP is supported by the Department of Environment, Tourism, Science and Innovation (DETSI), which has prepared the Fitzroy Basin regional receiving environment monitoring program guideline (DETSI, 2025). The FRREMP provides a single basin-wide REMP that meets the regulatory requirements for each participant, focuses on the freshwater component of the basin and replaces the individual REMPs for each participant. The FRREMP allows for assessment of cumulative changes from multiple projects within the Fitzroy Basin as well as avoiding duplication of monitoring effort between different projects.

The proponent for the Project (Stanmore ID Extension Pty Ltd) is a wholly owned subsidiary of Stanmore Resources Ltd (Stanmore). Stanmore, through a number of its subsidiary entities for various mines in the Bowen Basin, is a participant in the FRREMP. The Project proponent intends to join the FRREMP, consistent with other Stanmore sites including Isaac Plains Mine (IPM), IDM, Poitrel Mine, Red Mountain coal handling and processing plant (CHPP), Millenium Mine and South Walker Creek Mine. Compliance with the FRREMP is expected to become a condition of Project's EA. Project related aquatic ecosystem monitoring and reporting will be done as per FRREMP.

The FRREMP Technical Design Manual (Fitzroy Basin Association, 2025) identifies the locations of existing monitoring sites. There are several existing FRREMP monitoring sites in proximity to the Project that would be applicable for monitoring potential impacts from the Project. However, to distinguish between potential impacts from Project and adjacent mines it is proposed that two additional monitoring sites are included in the FRREMP Technical Design Manual:

- on Cherwell Creek above the confluence with the Isaac River but downstream of the Project's MLs and any potential overland flows, and
- on the Isaac River upstream of the confluence with Cherwell Creek but downstream of the Project's MLs and any potential overland flows.

The Project will work with Fitzroy Basin Association, as a participant in the scheme, to modify the FRREMP to include any additional locations.

12.5.7 Aquatic Pests

One species of invasive fish (tilapia) listed as a restricted species under the Biosecurity Act was recorded as part of the field surveys. This species is known to occur in the broader region of the Isaac River sub-basin. No invasive aquatic plants were recorded during the field surveys. The Project would not result in beneficial change or additional habitat for invasive fish, and hence abundance.

12.5.8 Leaks and Spills

Leaks and spills of hydrocarbons and other chemicals and contaminants can directly impact water quality. This can have both direct (e.g. toxicity) and indirect (e.g. changes to habitat characteristics and condition) influences on aquatic flora and fauna.

Leaks and spills would be managed through the following procedures:

- Facilities at the go line for the storage of fuels and minor maintenance requirements will be constructed and bunded in accordance with the relevant Australian Standard specifications, including but not limited to the provisions of AS 3780:2008 – The storage and handling of corrosive substances, AS 1940:2004 – The storage and handling of flammable and combustible liquids (AS 1940), AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers.
- Fuel storage areas will be inspected regularly, with repair and maintenance work completed as required. Bunds filled with stormwater will be drained or pumped out by a licensed contractor as soon as practicable to maintain the bund volume.
- A waste oil system will collect all waste oils for transfer offsite or recycling onsite, so that waste oils are not released to the environment. Lubricants will be stored in a bunded concrete area with a sump to collect any spills.
- All runoff from areas with potential contaminants will pass through water management controls such as an oily water separator or sediment trap before entering the mine affected water management system.
- Incident reporting and the management of spills will be undertaken in accordance with the site operational incident reporting forms and procedures. A spill response protocol will be developed

and implemented. Spills management procedures will be designed to contain and remediate any spills of fuels or chemicals to prevent impacts on surface waters.
- Specific waste bins and bunding will be used to isolate waste liquids, chemicals and hazardous wastes.
- Spill kits will be available close to areas where chemicals are being used or kept.
- Hazardous liquid wastes awaiting disposal, such as hydrocarbons and oils, will be stored appropriately in accordance with AS1940:2004 'The storage and handling of flammable and combustible liquids'.
- All areas containing potential contaminants or hazardous wastes will be protected from flooding by levees with flood protection for a 0.1% AEP (1:1,000 year) flood event. Hence, they will have a negligible risk of releasing contaminants during flood events.

With the implementation of the proposed mitigation and management measures for the Project, the risk to the aquatic ecological values of the receiving environment from leaks or spills is very low.

12.5.9 Aquatic Biological Diversity

Aquatic habitats in waterways and wetlands in the Study area were typical of ephemeral systems across the broader region, with seasonal patterns in habitat availability and quality. Biological communities (including aquatic plants, macroinvertebrates, macrocrustaceans, fish and turtles) recorded at sites in the Study Area and receiving environment were typical of ephemeral systems in central Queensland. The Project will not impact on the aquatic biological diversity within or adjacent to the Project area.

12.5.10 Matters of National Environmental Significance

As discussed in Section 12.4.11, no aquatic threatened species listed under the EPBC Act were recorded during field surveys, and they are considered unlikely to occur due to a lack of suitable habitat and extensive distances from the closest location from which they have been recorded. Therefore, the Project will be unlikely to result in significant impacts to MNES listed aquatic species.

12.5.11 Matters of State Environmental Significance

As discussed in Section 12.4.12 no aquatic threatened species listed under the NC Act were recorded during field surveys, and they are considered unlikely to occur due to a lack of suitable habitat and extensive distances from the closest location from which they have been recorded. Therefore, the Project will be unlikely to result in significant impacts to MSES listed aquatic species.

The potential impacts on waterways for fish passage and mitigation measures are described in Section 12.5.4.. While approvals for waterway barrier works are not required under the Fisheries Act for activities on the Project's MLs, all waterway crossings will be constructed to not create a barrier for fish passage, in accordance with the principles in the DPI's '*Accepted development requirements for operational work that is constructing or raising waterway barrier works: September 2025*' (DPI , 2025)'. Therefore, no significant residual impacts on fish passage are expected resulting from the development of the Project's mining activities and associated infrastructure.

The MSES listed HES wetland (AQ02) is approximately 1.5 km east of the Project area and there is no risk of changes to surface water flows or quality, or groundwater, that could impact this wetland (Section 12.5.3).

The MSES "Fish Habitat Areas and Highly Protected Zones of State Marine Parks" is not relevant due to the distance of the site from the coast, with Project infrastructure designed to achieve the "Reef discharge standards for industrial activities" guideline (DESI, 2021).

The Project is unlikely to have a significant residual impact on MSES associated with aquatic ecology values.

12.6 Cumulative Impacts

Cumulative impacts on surface water resources are assessed in **Chapter 8** and **Chapter 9**. In summary, these identify that the Project would result in a negligible contribution to cumulative impacts in the region, with existing controls in place across the resource industry to manage impacts to surface waters. Therefore, the Project is expected to result in a negligible contribution to cumulative impacts on aquatic ecology in the region.

12.7 Offsets

The Project is not expected to have any significant residual impacts on aquatic MNES species, MSES species, or other MSES including HES wetlands or fish passage. Therefore, no offsets are required for aquatic ecology under the Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DOTE, 2013) and the Queensland Environmental Offsets Policy – Significant Residual Impact Guideline (EHP, 2014).

12.8 Conclusion

The aquatic ecology assessment for the Project identified aquatic environments within and adjacent to the Project area that are predominantly ephemeral and strongly influenced by seasonal rainfall, surface flow conditions and water permanency. Aquatic habitats within the Study Area include the Isaac River, Cherwell Creek, Conrock Gully, JB Gully, unnamed tributaries, palustrine wetlands, gilgais and shallow depressions. The majority of sites were assessed as having low aquatic ecosystem values, with moderate values recorded along the Isaac River and at selected wetlands and gilgais, and high aquatic values recorded at the mapped HES wetland site AQ2, which is located 1.5 km east of the Project area.

No aquatic threatened species listed under the EPBC Act or NC Act were recorded during field surveys, and the identified MNES/MSES turtle species were considered unlikely to occur within the Study Area due to the absence of suitable habitat and the distance from known records. No threatened aquatic flora, threatened macroinvertebrates or aquatic weeds of national significance were recorded. The aquatic communities recorded, including macrophytes, macroinvertebrates, macrocrustaceans, fish, frogs and turtles, were generally characteristic of ephemeral systems in central Queensland.

Potential impacts to aquatic ecology have been assessed in relation to aquatic habitat modification, changes to surface water hydrology, wetlands, fish passage, water management, aquatic pests, leaks and spills and biological diversity.

The Project layout and design have sought to avoid waterways where possible and minimise impacts where avoidance is not possible. The proposed Conrock Gully diversion has been designed to provide similar habitat characteristics to the existing channel and to remain as a revegetated, rehabilitated and stable landform post-mining. Hydrological and geomorphological modelling indicates that impacts to major waterways, floodplain vegetation and the mapped HES wetland are expected to be negligible to minor, with corresponding negligible impacts in aquatic ecology values.

Waterway crossings associated with the Project, including the Isaac River and Cherwell Creek bridges, the temporary dragline walk route, the JB Gully low-level crossing and the Conrock Gully diversion culvert crossing, have been designed to not create permanent barriers to fish passage. The water management system will separate mine affected water, sediment affected water and clean water, with no uncontrolled releases of mine affected water and controlled releases to occur in accordance with receiving environment flow and quality limits. The water management system is therefore designed to protect downstream aquatic ecology values. The proponent proposes to participate in the FRREMP, with additional monitoring locations recommended to support assessment of potential Project-related impacts during Project activities.

With implementation of the proposed avoidance, mitigation, management, rehabilitation, and monitoring measures, the Project is unlikely to result in significant residual impacts to aquatic ecology values that are MNES or MSES. No aquatic ecology offsets are required under the applicable Commonwealth or Queensland offset frameworks.

12.9 References

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