



9 Aquatic Ecology

9.1 Description of Environmental Values

The aquatic ecological values of the project were defined through reference to:

- Species of conservation significance as listed under relevant legislation (i.e. NC Act and EPBC Act)
- Declared pest species as listed under relevant legislation (i.e. LP Act)
- The BPA for the Northern Brigalow Belt, produced by the EPA (2003)
- General habitat values, including contributions to faunal movement corridors.

The methodology to describe the status of aquatic ecological values in the project area included:

- Searching relevant databases, including the DEWHA Online Protected Matters Search Tool, EPA's Wildlife Online database and Queensland Museum's fauna database and Birds Australia's Atlas database.
- Review of the results of previous surveys in and around the area of interest (WBM 1998, Ecoserve 2006).
- Review of aerial photography
- Ground survey.

The ground survey was undertaken and the detailed methodology is provided in Appendix K. Study site locations are indicated in Table 9.1 and shown on Figure 8.1.

9.1.1 Aquatic Habitat

Aquatic habitats within the project site consist of natural streams and drainage lines, predominantly associated with Cherwell Creek, which flows in the Isaac River approximately 20-30 km downstream of the project site, but also Horse Creek and Nine-Mile Creek, and a number of artificial waterbodies in the form of mine and farm dams, including the modified (dammed) channel of Harrow Creek. All natural drainage lines occurring within the project site are ephemeral, as indicated by deep sandy stream beds and an absence of aquatic (and often riparian) vegetation, with the frequency of flows expected to be considerably reduced and restricted to periods of heavy rainfall, while the artificial dams contain water throughout the year.

During ground survey, natural drainage lines throughout the project site were predominantly dry (despite recent, heavy rainfall events) and largely devoid of aquatic vegetation. This included Cherwell Creek, other than a few isolated, shallow pools that were sampled along with 4 North Dam adjacent the proposed Southern ROM site. Conditions during the ground survey may be seen to represent the prevailing conditions in this locality.

9.1.2 Macroinvertebrates and Stream Health

Due to the ephemeral nature of the natural drainage lines contained within the project site, the scarcity of macrophytes, and the relatively high density of fish within the remaining pools, aquatic macroinvertebrates were relatively sparse during the ground survey. As such, sampling and associated stream health (SIGNAL) analysis was not undertaken.

Macroinvertebrate data recorded in April 2008 from similar habitats within a similarly disturbed landscape as part of an aquatic assessment for the Daunia Coal Mine Project (also located within the Isaac River



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catchment, approximately 20 km to the north-west of the Caval Ridge Project site) indicates that local waterways are significantly or severely impaired when analysed under the AusRivAS model (BMA 2008). According to the model, this suggests fewer macroinvertebrate families were recorded than expected compared to the reference condition, due to impacts on water quality and/or habitat quality (BMA 2008).

9.1.3 Fish

Previous Records

The results of previous surveys of the aquatic fauna within water bodies on the project site and adjacent Peak Downs mining lease indicate that at least six fish species persist within the local catchment, all of which are native, but none of which are listed under Commonwealth or State legislation, and all of which are considered to be common within the Fitzroy drainage system (WBM 1998, Ecoserve 2006). This includes:

- *Ambassis agassizii* Agassiz's Glassfish
- *Hypseleotris klunzingeri* Western Carp Gudgeon
- *Leiopotherapon unicolor* Spangled Perch
- *Melanotaenia splendida* Eastern Rainbowfish
- *Nematalosa erebi* Bony Bream
- *Neosilurus hyrtlil* Hyrtl's Catfish.

Ground Survey Records

Table 9.1 lists the fish present within Cherwell Creek and 4 North Dam during ground survey. In total, three species were collected, all of which are native to the area.

Table 9.1 Fish collected during the aquatic survey

Site	GPS Coordinates	Zoological Name	Common Name
1	S22.155475 E148.094166	<i>Hypseleotris klunzingeri</i>	Western Carp Gudgeon
1		<i>Leiopotherapon unicolor</i>	Spangled Perch
1		<i>Melanotaenia splendida</i>	Eastern Rainbowfish
2	S22.222217 E148.159288	<i>Hypseleotris klunzingeri</i>	Western Carp Gudgeon

The fish species recorded are not noteworthy apart from being typical of rivers of the Fitzroy drainage system, while seasonal factors contributed to the large numbers of pre-adult specimens observed. It is worth noting, however, that no exotic species were recorded during the previous or current surveys, despite their occurrence within natural waterways throughout central Queensland.

9.2 Potential Impacts and Mitigation Measures

9.2.1 Impact Mechanisms

Construction Activities

In addition to the impacts on flora and fauna described in Sections 8.1.2.1 and 8.2.2.1, secondary impacts from clearing associated with soil disturbance/exposure and altered water flow patterns, and subsequent erosion and sedimentation, may potentially alter the physical form, chemical processes and ecological health of downstream aquatic habitats.

More widespread impacts from fuels and chemical spills from storage areas, and oils from heavy machinery entering the environment, can also result if contaminants reach waterways.

Mine Operation

In general, the potential impacts on aquatic ecology during the construction phase of the project are also applicable during mine operation as a result of progressive open cut pit establishment and mining and spoil dumping, stockpiling, coal processing and transport. In addition, the operation of the mine has the potential to further disrupt natural ecological processes within the local area beyond initial clearing, in terms of both the spatial and temporal scale of impact. This includes altering the local surface and ground water environment due to large-scale landform modification, creek diversions and the creation of dams, and subsequent impacts on downstream aquatic habitats, wetlands and riparian vegetation and dependent fauna. This includes alterations to base flows, as well as to the frequency and extent of flooding.

Areas of Impact

Creeks, Drainage Lines and Dams

Several Creeks, drainage lines and dams are present within the project site. Key aquatic areas are:

- Horse Creek
- Cherwell Creek
- Nine-Mile Creek
- Harrow Creek
- A number of mine and farm dams on the property (e.g. 4 North Dam).

With the exception of the artificial dams and the dammed section of Harrow Creek to the west of the haul road, all of these systems are ephemeral. Impacts on Nine-Mile Creek and Harrow Creek are expected to be minimal as they are likely to be limited to disturbance for creek crossings for the conveyor system, haul road and rail corridor.

Conversely, it is proposed that a section of Horse Creek and a section of Caval Creek will be diverted as they currently traverse areas that will be incorporated into Horse pit and part of the industrial area. There will also be the creation of additional dams during the project, which, in combination with the diversions, have the potential to impact on downstream ecosystems through alterations to base flows and the frequency and extent of flooding.

The proposed route for transporting the dragline between Horse and Heyford pits will require the crossing of the main channels of Caval and Cherwell Creeks, with associated potential impacts on aquatic habitat due to direct disturbance, the introduction/spread of weeds and possible fuel spills during dragline transport.

9.2.2 Impact Assessment

An assessment of impacts on significant elements of aquatic ecology is included in Sections 8.1.2.2 and 8.2.2.2.

9.2.3 Impact Mitigation

General Legislative Obligations

Aquatic Fauna

No aquatic fauna of special conservation significance were recorded during current or previous surveys of the project site and immediate surrounds. The ephemeral nature of the natural drainage lines and their substrate within the project site mean that flows of any substance are likely to be restricted to periods of, and immediately after, heavy rainfall.

No legislative constraints are anticipated in regards to aquatic fauna based on the current or previous survey results.

Mitigation Requirements/Recommendations

In addition to, and in combination with, the mitigation measures described in Sections 8.1.2.3 and 8.2.2.3, the maintenance of environmental flows within the project site's natural drainage systems is significant for flora and fauna, both aquatic and terrestrial, in that the riparian zone provides refuge habitat and facilitates movement throughout the local area. Many plant and animal species rely on these areas for survival within the predominantly dry landscape.

The alterations to the present courses of Caval and Horse Creeks, the creation of additional dams and the crossing of Caval and Cherwell Creeks during dragline transport between the pits may represent an issue for environmental flows and water quality. As these systems are ephemeral, any diversions and transporting of draglines undertaken during dry conditions will result in minimal impacts on aquatic species, provided disturbance and fuel spills are minimised and natural creek bank morphology is restored. Environmental flows should also be maintained through controlled release from dams, as required.

Furthermore, while reduced water quality may result from mine run-off (e.g. from processing plants or stockpiles), most of the aquatic species within the vicinity of the project site are wide ranging and capable of withstanding a wide range of aquatic conditions.

Overall, interference with watercourses and flows will be in accordance with the Water Act 2000, including the development of a specific Revegetation Plan for creek diversions.

Ecological Monitoring

For the Caval Ridge Mine, ecological monitoring will be undertaken as outlined in Section 8.1.2.3.



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9.2.4 Residual Impacts and Opportunities for Positive Impacts

Once appropriate mitigation measures and management plans are implemented, the impacts of the construction and operational phases of the mine and associated infrastructure on aquatic ecosystems are predicted to be predominantly minor or negligible (Section 8 Risk Tables).

Riparian and in-channel ecological communities downstream of the diverted sections of Caval and Horse Creeks and additional site dams, and within the path of the proposed dragline transport route, may be affected by alterations in stream morphology, requiring monitoring and the implementation of management actions where required to ensure that the vegetation retains its current ecological function within the local landscape. Monitoring should include bank stability, over-bank flow, and water quality.

As outlined in Section 8.1.2.4, there are also opportunities for positive impacts to result from the reinstatement of habitat as close to the original ecosystem as possible, following mining activities.