



Alpha Coal Project

Biodiversity Offset Strategy

Prepared for
Hancock Coal Pty Ltd (HCPL)

29 June 2012



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Abbreviations

ABBREVIATION	DESCRIPTION
API	Aerial Photograph Interpretation
BOP	Biodiversity Offset Package
BOS	Biodiversity Offset Strategy
BVG	Broad Vegetation Group
CEMP	Construction Environment Management Plan
CHPP	Coal Handling and Processing Plant
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management, Queensland
EE	Ecological Equivalence
EH	Essential Habitat
EIS	Environmental Impact Statement
EOP	Draft Policy Statement: use of environmental offsets under the <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act, 1999</i>
FHMOP	Fish Habitat Management Operational Policy (2002)
FPC	Foliage Projective Cover
HCPL	Hancock Coal Pty Ltd
HVRV	High Value Regrowth Vegetation
LOM	Life of Mine
MNES	Matter of National Environmental Significance (under the EPBC Act)
NC Act	<i>Nature Conservation Act, 1992, Queensland</i>
PR	Performance Requirement
PVMO	Policy for Vegetation Management Offsets- Version 3 (2011)
QBOP	Queensland Biodiversity Offset Policy- Version 1 (2011)
QGEOP	Queensland Government Environmental Offsets Policy
RE	Regional Ecosystem
ROM	Run-of-mine
RVMC	Regional Vegetation Management Code
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SEIS	Supplementary Environmental Impact Statement
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SLATS	State Landcover and Trees Study
SPP	State Planning Policy

ABBREVIATION	DESCRIPTION
SSBV	State Significant Biodiversity Values
TEC	Threatened Ecological Community
VMA	<i>Vegetation Management Act, 1999, Queensland</i>

Executive Summary

INTRODUCTION

Hancock Coal Pty Ltd (HCPL) is proposing to develop the Alpha Coal Project (the Project) located in the Galilee Basin, Queensland. The proposed Project is comprised of two components, being a 30 million tonnes per annum (Mtpa) open-cut thermal coal mine and a standard gauge, single track, non-electrified, 495 kilometre long railway line to transport the processed coal from the coal mine to the Port of Abbot Point in Bowen for export.

The Project is being assessed under the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act) as a declared significant project. The Project is also being assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through an accredited process with the Queensland assessment.

The purpose of this offset strategy is to address the state and Commonwealth biodiversity offset requirements for the Project. The biodiversity offset strategy aims to compensate for the unavoidable, non-mitigated loss of vegetation and biodiversity as a result of the Project, and obtain a net increase in biodiversity values through the provision of suitable offsets consistent with the relevant policies.

The preferred options and processes for achieving a suitable offset are provided, as are the reporting and accountability arrangements for the provision of the biodiversity offsets. The strategy also provides a process to achieve suitable offsets for the Project. Finally, this strategy will be revised, and offset liabilities confirmed, once impact and habitat data are finalised.

APPLICATION OF OFFSET POLICIES

Various offset policies apply to the Project, at both a state and Commonwealth level. The requirements of each policy, for each component of the Project, have been assessed within this strategy and the offset requirements determined.

The offset policies to be considered for each Project component are:

- Rail component -
 - Policy for Vegetation Management Offsets- Version 3 (2011)
 - Biodiversity Offset Policy- Version 1 (2011)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)
 - EPBC Act Environmental Offsets Policy (2007)
- Mine component -
 - Biodiversity Offset Policy- Version 1 (2011) (determination made by Co-ordinator General)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)
 - EPBC Act Environmental Offsets Policy (2007)

PROJECT IMPACTS REQUIRING OFFSETS

Residual impacts requiring offsets under each policy were calculated for both components of the Project. Both the mine and rail components will impact on watercourses, connectivity and threshold regional ecosystems (RE's). While the mine has a larger overall impact, the proposed railway impacts on a larger number of protected matters due to its linear nature and scale. The impacts are summarised in Table 1.

Table 1: Summary of impacts requiring offset

IMPACT TYPE	PROPOSED RAILWAY IMPACT AREA (HA)	PROPOSED MINE IMPACT AREA (HA)
<i>Wetlands</i>	16.3	0
<i>Watercourses</i>	133.2	1,191.9
<i>Connectivity</i>	395.9	5,466.0
<i>Endangered RE</i>	95.3	0
<i>Of Concern RE</i>	88	0
<i>Essential Habitat</i>	13.9	0
<i>Threshold RE</i>	14.8	112
<i>State Protected Animals (high and low potential habitat)</i>	0.0	11,754.2
<i>State Protected Plants (high and low potential habitat)</i>	809.5	6,929.2
<i>Marine Habitat</i>	2.4	0
<i>Matters of NES- TECs</i>	265.7	0
<i>Matters of NES- Species Habitat (high and low potential habitat)</i>	6,436.5	30,807.2
<i>Matters of NES- Migratory Shorebird Habitat</i>	16.3	0

The estimated size of the offset required for the Project was determined by applying offset ratios to the area of residual impacts provided in Table 1. As various offset policies apply to the Project, offset ratios were determined using different methods, dependent on the policy that applies. All estimated offset liability data presented within the strategy requires further field verification before the offset liability is confirmed. While the offset liability estimated in this report is likely to be broadly accurate, further field information will amend some impacts (and associated offset liability).

PROPOSED OFFSET APPROACH

A proposed offset approach has been identified for the Project, which intends to offset all residual and unavoidable impacts resulting from the Project. The preferred method is considered to be the most effective, reliable and efficient approach available to achieve the offsets required, whilst maintaining consistency with the broad offset principles and policies that apply.

The proposed offset approach will utilise a series of offset options in a cascading order of preference. The options used will depend on the availability of each option and whether the option is available under the offset policy that applies. The proposed approach involves the following offset options (Figure 1):

1. Use of lands owned (or proposed to be owned) by the Project (known as Project properties);

2. Purchase other offset properties, including the direct targeting of properties identified in the Galilee Basin Biodiversity Offset Strategy;
3. Use of offset brokers (such as Ecofund and Earth Trade);
4. Use of offset payments; and
5. Use of indirect offsets.

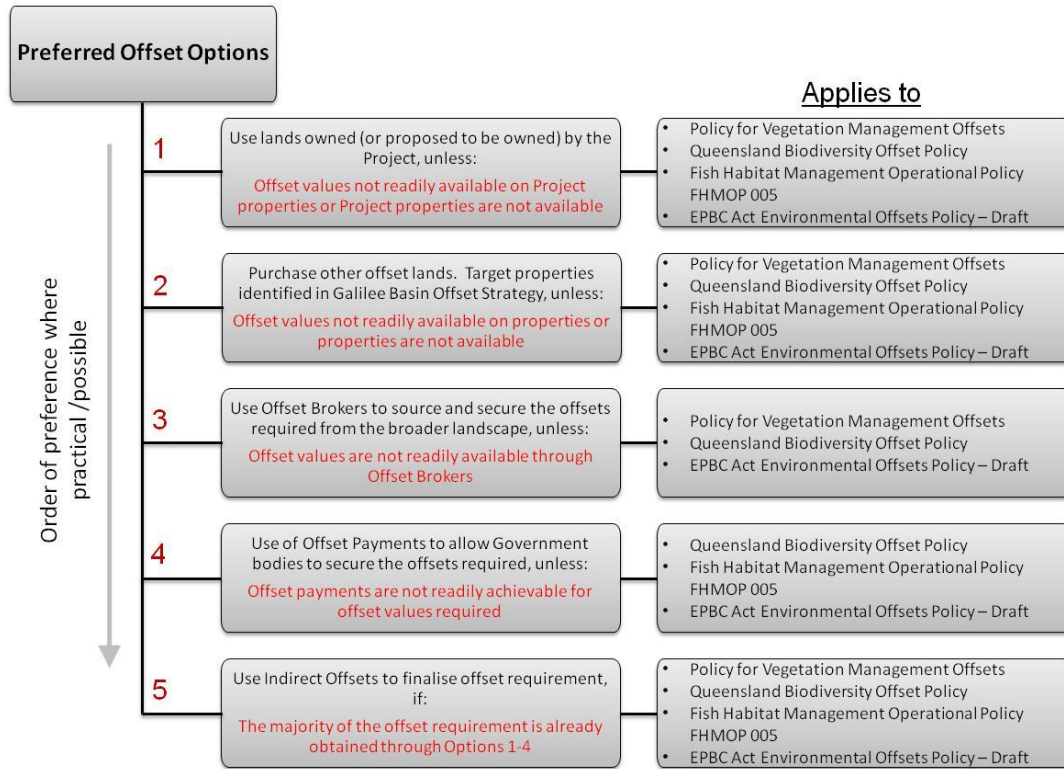


Figure 1: Preferred offset options

A desktop analysis of seven Project properties confirmed the presence of many of the offset values required, including potential offsets for many of the REs, state significant biodiversity values and performance requirements needed. Significant offset areas were also available to achieve Commonwealth offset requirements, including Threatened Ecological Communities (TECs) and habitat for listed threatened species.

Offsets for some values, however, were not available within the Project properties, including thirteen REs and offsets for wetland vegetation. In order to have confidence that these offset types were available in the broader landscape, and that offsets could be achieved for these values, Ecofund were engaged to conduct an assessment of these values across the broader landscape.

Ecofund found, through a desktop assessment, that potential offsets were widely available for all values not identified within the Project properties. Further work is now required to confirm the presence of values (through field survey) on both the Project properties and within the broader landscape.

DELIVERY OF BIODIVERSITY OFFSETS

A process to finalise and deliver the offsets required for the Project has been proposed (Figure 2). The impacts of the Project will be confirmed through additional field surveys and ecological equivalence assessments, with refined Project footprint data also used to update impacts and associated offset liability.

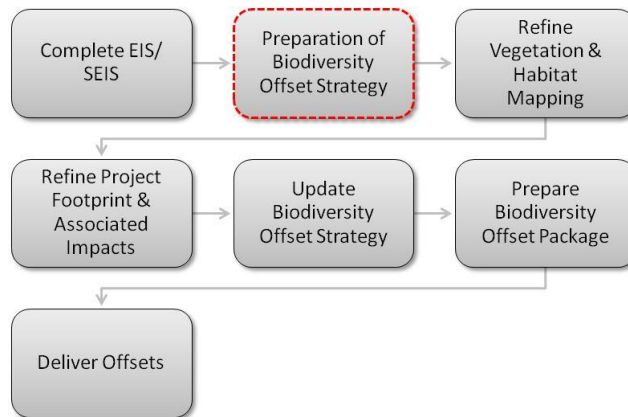


Figure 2: Process to finalise offset requirements and secure offsets

This biodiversity offset strategy will then be updated, and a biodiversity offset package (BOP) prepared that will:

- Finalise the offset mechanisms to be utilised for the Project;
- Identify those Project lands that will be secured as offsets, their location and contributions towards offset requirements;
- Identify those offset requirements that will be secured through the provision of other offset lands, including lands identified in the Galilee Basin Offset Strategy;
- Identify those offset requirements that will be secured through an offset transfer (i.e. offset broker) or offset payment; and
- Identify any indirect offset proposals.

The measures and mechanisms identified within the BOP will then be delivered. This includes conducting ecological assessments of offset sites, legally securing offset sites and the preparation of appropriate offset area management plans. Where offsets are to be secured through brokers and offset payments, contracts will be in place (and payments made) to satisfy these offsets requirements. Finally, all funding for indirect offsets will be in-place with the appropriate institution or department.

As many of the Project components are to be developed over a project timeline of approximately 30 years, HCPL propose to stage the delivery of the necessary offsets over the life of the Project. The staging of offsets will occur over set increments that reflect the clearing and operational cycles of the mine and rail projects (Table 2). It is proposed that all rail related offsets be delivered under the first stage of offset delivery, along with mine related impacts for years 1-5. Stage 2 will also include a 5 year increment (years 5-10), while stages 3 and 4 will involve 10 year increments. As the amount of clearing for the Project will decline as the Project progresses it is anticipated that the size of offsets required will also decline accordingly.

Although the delivery of offsets is proposed to be staged, the assessment of the impacts (and associated offsets) for each stage will take place before any impacts occur as a result of the Project. This will enable HCPL to report on the total impacts of the Project by each stage before the commencement of any clearing, with the offsets required for each stage secured within the appropriate timeframe.

Table 2: Staged offset requirements

STAGE	YEARS	OFFSETS DELIVERED PER STAGE
1	1-5	All rail related offsets Stage 1 mine related offsets (yrs 1-5)
2	5-10	Stage 2 mine related offsets (yrs 5-10)
3	10-20	Stage 3 mine related offsets (yrs 10-20)
4	20-30	Stage 4 mine related offsets (yrs 20-30)

The timing commitments for the delivery of offsets for Stage 1 of the Project are related to HCPL making a final '*Decision to proceed*' with the Project. The decision to proceed will be based on *HCPL obtaining the land and key approvals in order to proceed with the commercial exploitation of coal and its transport to port facilities for export*. The timing listed for each component of the Project will not commence until the decision to proceed is made by HCPL.

The timeline for offset delivery has all offsets delivered for Stage 1 impacts within 36 months of the decision to proceed (Table 36). This timeline is considered appropriate for the size of offset sites estimated for the Project, and with the complexities likely to be encountered while attempting to source and secure offsets. The Department of Employment, Economic Development and Innovation (DEEDI), Department of Environment and Resource Management (DERM) and Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) will receive quarterly updates on progress throughout this time.

Table 3: Timing commitments for offset delivery components (Stage 1)

OFFSET DELIVERY COMPONENT	TASKS REQUIRED	TIMING (FROM DECISION TO PROCEED)
Submit final Biodiversity Offset Strategy	<ul style="list-style-type: none"> Undertake field verification of habitat and vegetation within Project footprint Complete ecological equivalence assessments of impact sites Complete surveys required under species prescriptions Finalise impact footprints for Stage 1 Calculate total Stage 1 project impacts and finalise offset liabilities 	Within 12 months of <u>decision to proceed</u>
Submit Biodiversity Offset Package for approval	<ul style="list-style-type: none"> Finalise the offset mechanisms to be utilised for the Project Identify those Project lands that will be secured as offsets, their location and contributions towards offset requirements Identify those offset requirements that will be secured through the provision of other offset lands, including lands identified in the Galilee Basin Offset Strategy Identify those offset requirements that will be secured through an offset transfer (i.e. offset broker) or offset payment Identify any indirect offset proposals 	Within 24 months of <u>decision to proceed</u>
Legally secure offsets	<ul style="list-style-type: none"> Complete ecological equivalence assessments for any direct offsets to be secured by HCPL Complete on site targeted surveys to confirm threatened species habitat 	Within 36 months of <u>decision to proceed</u>

OFFSET DELIVERY COMPONENT	TASKS REQUIRED	TIMING (FROM DECISION TO PROCEED)
	<ul style="list-style-type: none"> • All direct offset sites sourced by HCPL legally secured with completed offset area management plans • Complete contractual arrangements for any offsets to be sourced through an offset transfer • Complete contractual arrangements for any offsets to be sourced through an offset payment • All funding for indirect offsets will be in-place with the appropriate institution or department 	

Offset delivery for subsequent stages will be reliant on the decision to proceed with the next stage. It is anticipated that the process to identify offset liabilities and source the required offsets will be more efficient, as offsets will already be secured for previous stages. The timelines adopted for each subsequent stage will be the same as those displayed in Table 36.

A variety of offset options will be utilised to deliver the biodiversity offsets for the Project, and will be consistent with the various offset policies applicable to the Project. The offsets for the Project deliver a positive ecological outcome in a suitable timely manner in keeping with the scale of the Project.

1 Introduction

Hancock Coal Pty Ltd (HCPL) is proposing to develop the Alpha Coal Project (the Project) located in the Galilee Basin, Queensland (Figure 3). The Project is comprised of two components:

1. *Proposed Mine* - a 30 million tonnes per annum (Mtpa) product open-cut thermal coal mine to target the seams in the Upper Permian coal measures of the Galilee Basin, Queensland, Australia; and,
2. *Proposed Railway* - a standard gauge, single track, non-electrified, 495 kilometre (km) long railway line for the purposes of transporting processed coal from the coal mine to the Port of Abbot Point in Bowen for export.

1.1 PURPOSE OF OFFSET STRATEGY

The purpose of this offset strategy is to address the state and Commonwealth biodiversity offset requirements for the Project in regards to threatened species and ecological communities. The biodiversity offset strategy aims to compensate for the unavoidable, non-mitigated loss of vegetation and biodiversity as a result of the Project. The strategy aims to obtain a net increase in biodiversity values through the provision of suitable offsets consistent with the policies relevant to the Project.

The offset strategy will outline the preferred options and processes for achieving a suitable offset within the Project timeframe. The strategy will identify reporting and accountability arrangements surrounding the sourcing and provision of the biodiversity offsets and provide commitments to a process of achieving suitable offsets for the Project. This strategy will be revised, and offset liabilities confirmed, once impact and habitat data are finalised for the project.

The proponent has undertaken significant work in progressing its offsets strategy. However, the details contained in this strategy, including:

- How offset policies will apply (Chapter 2);
- The type and amount of environmental values required to be offset (Chapter 4);
- The ratio to be applied for offset; and (Chapter 5); and
- The means by which offsets will be secured and supplied (Chapters 3, and 6 to 8);

remain indicative, and subject to ongoing refinement by the proponent, and verification and agreement with the relevant state and Commonwealth government departments. Other contingencies may also influence the content of this report, for example, the final Galilee Basin Offset Strategy.

Given the scale of the Project, and the complexity of the offset requirements arising from it, a flexible approach to offsetting is necessary with respect to offset requirements. It is considered appropriate for the final details of offset commitments to be addressed by the Biodiversity Offsets Package, in conjunction with individual approval processes and conditions, which are to follow the Co-ordinator Generals (CG) assessment under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

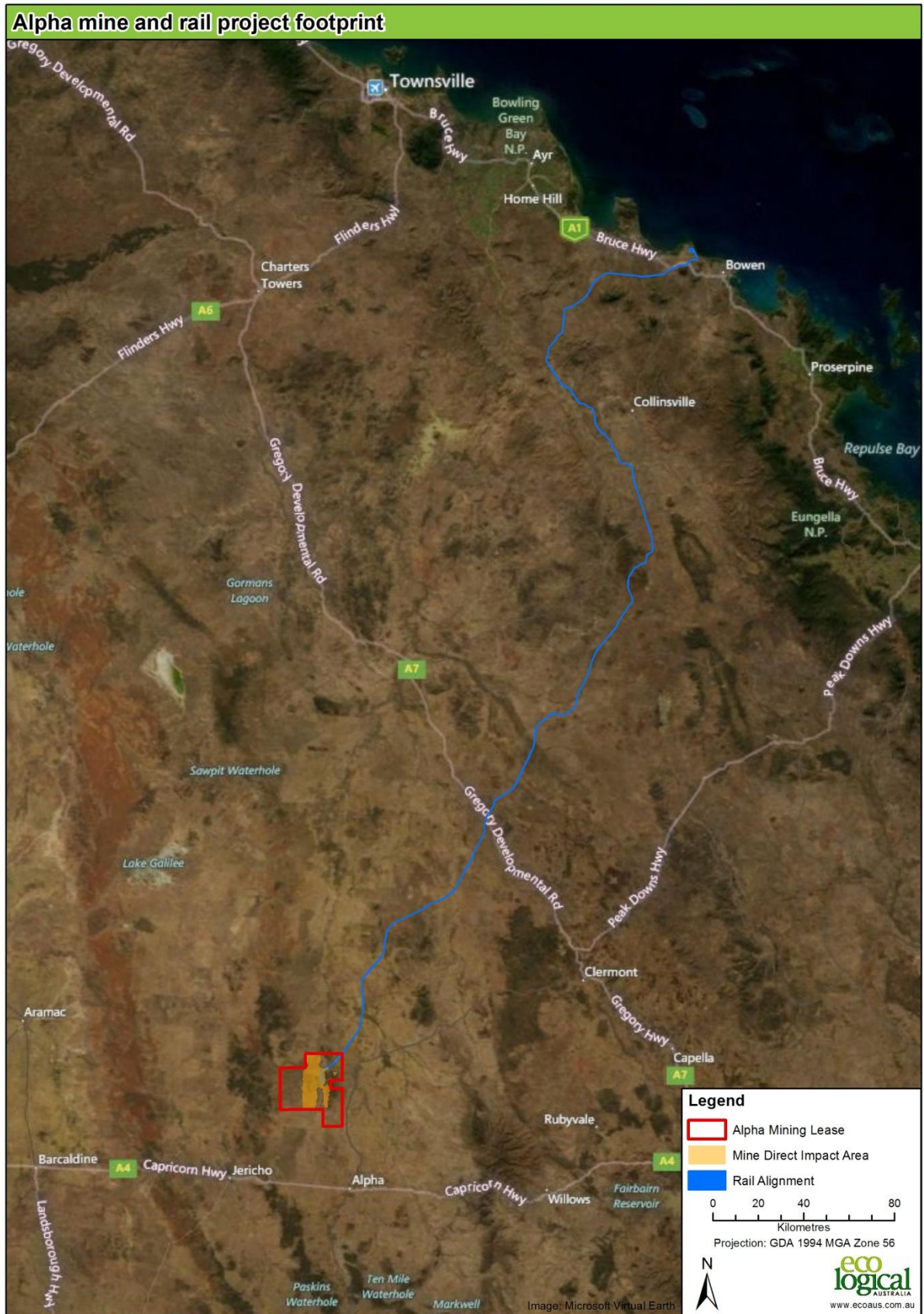


Figure 3: Alpha mine and rail project footprint

1.2 PROJECT BACKGROUND

A description of the Project is provided below, which outlines the approval history for the Project and provides details surrounding the construction, operation and decommissioning phases of the Project.

1.2.1 Project approvals

The Project is being assessed under the Queensland SDPWO Act as a declared significant project. The Project is currently in the later stages of this assessment, with submission of the final Environmental Impact Statement (EIS) and Supplementary Environmental Impact Statement (SEIS) to the Coordinator General in September 2011.

The Project is also being assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through a bilateral agreement with the Queensland assessment.

1.2.2 Project description

The proposed mine is located 130 km south-west of Clermont and approximately 360 km south-west of Mackay in the Galilee Basin, Queensland. The nearest town to the mine is Alpha, which is located approximately 50 km to the south.

The proposed mine will be a new open-cut thermal coal mine located within MLA 70426 (over Exploration Permit Coal 1210 and MDL 333). It will comprise six open cut pits, with a total strike length of ~ 24 km in a north to south direction. The proposed mine is projected to produce 30 Mtpa of thermal coal for the export market for the scheduled Life of Mine (LOM) of 30 years.

The mine will be serviced by the proposed rail line, which will enable the export of up to 60 Mtpa of thermal quality coal over a lifetime of 30 years through the Port of Abbot Point in Bowen. The rail line will be a standard gauge, single track, non-electrified railway 495 kilometre (km) in length. The rail will include additional passing loops to the single line track and selective partial duplication. There is potential to further increase the tonnage of the rail line, and thus service other potential mines within the Galilee Basin in the future. HCPL has undertaken to make the track available to third party users under a Voluntary Undertaking pursuant to the *Trade Practices Act 1974*.

The Project will include a range of mine specific infrastructure, as well as a number of supporting infrastructure elements as outlined below.

The mine infrastructure will include:

- main workshop, (including: stores, administration buildings, security building, emergency services building, tyre bay, ancillary mining vehicle workshop and vehicle wash facilities);
- a light industrial area (incorporating mine support activities such as, rail freight unloading and bunkering, welding shops, light vehicle servicing, specialist maintenance contractors' workshops and offices, warehousing, bulk fuel and other mine consumables storage, tyre fitting and repair, training and conference centres);
- Coal handling infrastructure including conveyors; stockpiles, a train load out facility and rail loop;
- raw water dams and environment dams;
- water and wastewater systems, including water treatment plant and sewage treatment plant;
- construction accommodation village and operational accommodation village;
- mine access roads;
- general waste landfill;

- quarry/borrow pits;
- fuel, oil, and explosives storage facilities;
- creek diversions, drainage channels and levee bunds; and
- electrical systems and communications systems

The infrastructure specific to the proposed railway will include:

- two balloon loops, one at the proposed mine and one at the Port of Abbot Point for loading and unloading;
- nine passing loops each approximately 5 km long and maintenance sidings along the line;
- marshalling yard (including a passing loop at the entry) at Salisbury Plains; and
- five workers accommodation facilities (three semi-permanent and two temporary) for 400 to 500 personnel per facility.

1.2.3 Operational activities

Following the construction phase, the operation of the mine will be ramped-up over a 5 year period until full production is reached of 30 Mtpa of product coal. The operational phase of the mine will involve the mining of the coal, and the processing and transport of that coal for export.

The initiation of mining activities will include the removal of overburden including the stockpiling of topsoil and development of emplacement areas for other forms of overburden. Overburden will be pre-stripped using large rope shovels and backhoe excavators and transported to out-of-pit emplacement areas using rear-dump trucks. The bulk of the overburden will be removed by the construction of up to 9 draglines. Coal mining will be undertaken by front-end loaders and back-hoe excavators, and then transported to the Coal Handling and Preparation Plant (CHPP). 'Run-of-mine' (ROM) Coal will be taken from four pits operating at the same time and transported to the CHPP where it will be processed. Coarse rejects will be transported to emplacement areas, and fine rejects (Tailings) will be transported to and stored in a conventional tailings dam. Product coal will be conveyed to the train-load-out facility and transported to the port of Abbot Point for export.

The development of the mine site will be staged, with the impacts of mining moving progressively from east-west during the 30 year LOM. For the purposes of this biodiversity offset strategy four mine stages have been identified (Stages 1-4). The development of the rail line will not be staged, and as such the impacts of the rail alignment are considered in Stage 1 of the Project. For more information related to the staging of the Project, and associated offsets, see Section 7.3.

1.2.4 Rehabilitation and decommissioning of the Project

The information contained within this section will be updated before provision of the final report. A Construction Environmental Management Plan (CEMP) will be prepared to co-ordinate the removal of all construction waste, equipment and plant once construction of the Project is completed. In addition, following the construction phase of the Project, a Decommissioning and Rehabilitation Plan will be developed to handle the rehabilitation and decommissioning of disturbed areas that are not proposed to be utilised for Project related activities. The plan will be developed closer to the completion of mining operations.

In regards to the proposed railway, following the completion of the construction activities for the civil and track work, all temporary construction facilities and areas will be rehabilitated. However, third party usage of the rail infrastructure is expected and this will result in the effective life of the rail line being extended beyond the expected LOM. Effectively the rail infrastructure is expected to be utilised for an indeterminate period and it is not envisaged that the rail infrastructure would be decommissioned.

2 Application of offset policies

A number of different offset policies apply to the Project at both a state and Commonwealth level. Queensland has developed a new set of offset specific policies, some of which have come into effect within the last year. A summary of the offset policies applicable to the Project is provided below. Detailed information on each policy, and the implications of each policy on the Project, is also provided in this section.

2.1 SUMMARY OF APPLICABLE OFFSET POLICIES

Various offset policies apply to the Project, at both a state and Commonwealth level. The application of each policy has been determined through consultation with DEEDI, DERM and SEWPaC. The requirements of each policy, for each component of the Project, have been assessed within this strategy and the offset requirements of the Project determined.

The offset policies to be considered for each Project component are:

- Rail component -
 - Policy for Vegetation Management Offsets- Version 3 (2011)
 - Biodiversity Offset Policy- Version 1 (2011)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)
 - EPBC Act Environmental Offsets Policy (2007)
- Mine component -
 - Biodiversity Offset Policy- Version 1 (2011) (determination made by Co-ordinator General)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)
 - EPBC Act Environmental Offsets Policy (2007)

Provided below are detailed explanations of each policy and the offset implications for each component of the Project.

2.2 QUEENSLAND OFFSET POLICIES

Several Queensland offset policies apply to the Project, with various policies applying to the different project components (i.e. mine and rail). Advice from DEEDI and DERM has been considered in determining the application of each offset policy to the Project.

2.2.1 Queensland Government Environmental Offsets Policy (2008)

The Queensland Government Environmental Offsets Policy (QGEOP) is a broad over-arching document which underpins the three current specific-issue-offsets policies outlined in the later sections. The QGEOP outlines seven key offset principles with which any offset established under the QGEOP must comply:

Principle 1: Offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy.

Principle 2: Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.

Principle 3: Offsets must achieve an equivalent or better environmental outcome.

Principle 4: Offsets must provide environmental values as similar as possible to those being lost.

Principle 5: Offset provision should minimise the time-lag between the impact and delivery of the offset.

Principle 6: Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values.

Principle 7: Offsets must be legally secured for the duration of the offset requirement.

The QGEOP establishes that a combination of direct and indirect offsets can be used to complete an offset package. Direct offset options outlined include:

- Providing and managing an offset, either directly or through a third-party (landholder or environmental group);
- Purchasing offset credits from suppliers and/or developers who have established an *advance offset*, where an *advance offset* is available; and
- Providing a financial contribution to an *offsets fund* where this option is available.

Indirect offsets must only make a minor contribution to offset outcomes, and can include actions such as funding research programs or implementing recovery plan recommendations.

2.2.2 Queensland Biodiversity Offset Policy- Version 1 (2011)

The Queensland Biodiversity Offsets Policy (QBOP) establishes the requirements for providing an offset to impacts to state significant biodiversity values (SSBV) which cannot be avoided. The objective of the policy is to ensure that there is no net loss of biodiversity. In line with the offset principles outlined in the QGEOP, the applicant must demonstrate that all reasonable attempts have been made to first avoid and then mitigate impacts to protected matters before an offset will be considered.

The QBOP outlines several offset pathways for sourcing and securing offsets. They include land-based offsets, such as direct offsets and offset transfers. Offset payments to DERM are also available under the policy. Indirect offsets can also be provided where the majority of the offset requirement is met by direct offsets.

SSBVs requiring offset under the QBOP include a wide range of habitat features and characteristics. Under the QBOP any actions which impacts a SSBV requires an offset. The list of SSBVs cited in the QBOP includes:

- Endangered, Of Concern, Threshold and Critically Limited Regional Ecosystems (REs);
- High Value Regrowth containing Of concern or Endangered REs;
- Essential habitat and Essential regrowth habitat;

- Wetlands, Significant Wetlands & Wetland Protection Areas;
- Watercourse vegetation;
- Vegetation required for Connectivity;
- Protected Plants & Animals; and
- Previously secured offset areas.

The QBOP provides specific guidance for locating suitable offset areas for each of the listed SSBVs. Once the suitable offset areas have been located, an assessment of ecological equivalency needs to be undertaken between the impact site and the offset site. The details surrounding ecological equivalency assessment are discussed in Section 2.2.6.

In addition to the specific SSBV offset guidelines, the QBOP also establishes additional requirements around what is considered a suitable offset. Under the QBOP a land-based offset must be comprised of 'functioning regional ecosystems' and cannot be composed of remnant vegetation which is mapped on a regional ecosystem map. In addition, the offset cannot contain high value regrowth vegetation that is part of an Endangered or Of Concern RE.

It should be noted that the QBOP does not apply to all development proposals, a number of common exclusions include:

- Development which is a Significant Project declared under Section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act);
- Development that is for an urban purpose in an urban area;
- Development that is a government supported transport infrastructure project; and
- State significant biodiversity values offset under another policy.

In some cases, however, the Co-ordinator General may use discretion to consider the QBOP for Projects under the SDPWO Act.

2.2.3 Implications for the Project

While the Project is not required to be assessed under the QBOP, as it falls into the exclusion category, the Co-ordinator General has made the decision that the proposed mine will be assessed using the principles outlined in the QBOP. As such, the Project is required to be assessed using the ecological equivalency (EE) methodology (see section 2.2.6) and an assessment made of the SSBVs that occur within the impact area. Appropriate offsets will need to be established for the impacts relating to the proposed mine, which meet the requirements outlined in the QBOP. Ultimately the degree to which the QBOP requirements apply to the Project will be determined by the Co-ordinator General, and will be based on consultation with the relevant state agencies.

The QBOP will also apply to clearing associated to the rail alignment for SSBV where the Policy for Vegetation Management Offsets (PVMO) does not apply. The QBOP will specifically apply to the loss of protected animals and protected plants caused by the development of the rail line.

While the BOP is to be applied in assessing the project under the SDPWO Act, it is considered appropriate for the final details and offset obligations for the project to be determined once the proponent's Biodiversity Offsets Package has been finalised. The Biodiversity Offsets Package is to be finalised in conjunction with the individual approval processes, and approval conditions, which will apply following approval by the CG under the SDPWO Act.

2.2.4 Policy for Vegetation Management Offsets- Version 3 (2011)

The PVMO is used to provide guidance surrounding the sourcing and provision of offsets for matters protected under the *Vegetation Management Act 1999* (VMA). The VMA regulates the clearance of vegetation across all tenures and aims to prevent the loss of biodiversity and to conserve ecological processes. The applicant must demonstrate that all reasonable attempts have been made to first avoid and mitigate impacts to matters protected under the PVMO before an offset will be considered.

The PVMO follows a similar structure to the QBOP. The PVMO recognises the main offset pathways outlined in the QGEOP and QBOP (such as direct offsets, offset transfer and offset payments). Similarly, the PVMO states that any offset provided under the PVMO needs to be legally secured and have an offset area management plan.

The PVMO provides some guidance around suitable offsets including that the offset site must be comprised of functioning regional ecosystems and that EE between the offset and impact site must be achieved (discussed in Section 2.2.6). In addition, the policy contains a provision that states that vegetation mapped as remnant on a regional ecosystem map is not considered an acceptable offset.

The policy establishes a set of offset requirements for a series of Performance Requirements (PRs), which need to be considered in regards to any impact. The PRs include:

1. Wetlands;
2. Watercourses;
3. Connectivity;
4. Endangered REs;
5. Of Concern REs;
6. Essential Habitat;
7. Essential Habitat for Koalas (SE QLD);
8. Threshold REs; and
9. Critically Limited REs.

Under the PVMO one offset can be used to satisfy multiple performance criteria. Approval will not be granted until all performance criteria are satisfied.

2.2.5 Implications for the Project

As the rail alignment will result in the removal of vegetation which is protected under the VMA, the PVMO applies to the rail component of the Project. The proposed mine is exempt from assessment under the VMA as outlined in Schedule 24, Part 1 of the *Sustainable Planning Regulations 2009*. As such, the PVMO does not apply to the mine component of the Project.

An assessment of the impacts of the rail component of the Project is required against each PR under the PVMO. Any offsets, which are required as a result of the assessment, will need to be consistent with the requirements set out in the PVMO.

2.2.6 Ecological Equivalency- Version 1 (2011)

EE is a method of comparing the ecological value between an impact site and an offset site to determine if the offset site is sufficient to meet the offset criteria. An EE assessment is required under both the QBOP and the PVMO.

The EE assessment uses a combination of 28 factors which are compared between impact and offset sites to determine if the sites contain equivalent values. The 28 factors are comprised of onsite

assessable measures relating to the ecological condition and functionality of the site, as well as a number of factors and special features which relate to the position of the sites within the landscape. These measures are generally assessed using Geographic Information Systems (GIS) technology.

For ecological equivalence to be achieved, the offset site score for ecological condition and special features must be equal, or exceed, those for the clearing area.

2.2.7 Implications for the Project

Both impact and offset sites will need to be assessed, using the EE methodology, if a direct offset or offset transfer path is chosen to satisfy the requirements of the QBOP and PVMO. EE assessments will be completed, for both impact and offset sites, during the provision of offsets for the Project.

2.2.8 Fish Habitat Management Operational Policy FHMOP 005 (2002)

The Fish Habitat Management Operational Policy 005 (FHMOP) describes the offset options for impacts to fish habitat that could not be avoided or mitigated. The policy aims for no net loss of marine fish habitat. Offsets under the FHMOP include financial offsets, such as contributing towards a state-wide compensation program, or land-based offsets such as acquisition of functional wetlands or replacement of fish habitat. Offsets will only be accepted once on-site mitigation of impacts has been undertaken.

The FHMOP currently recognises three scales of impact, small (<0.001ha), Medium (0.001-0.05ha) & large (>0.05ha). Impacts at all levels are required to demonstrate that impacts have been avoided and mitigated where possible, through modification of work methods and best practice environmental management. Medium and large impacts are required to make financial contributions towards a state-wide compensation program, and large impacts are also required to provide offsets through land acquisition.

2.2.9 Implications for the Project

The FHMOP applies to both the mine and rail components of the Project, however only the rail component of the Project causes impacts requiring offsets under the policy.

The likely impact on habitat protected under the FHMOP is within the Caley Valley Wetlands, within the rail loop at the northern end of the rail way. Given the scale of impacts protected under the FHMOP, it is considered likely that an offset package including land acquisition and/or indirect offsets will be required.

2.3 COMMONWEALTH OFFSET POLICY

The Commonwealth has an environmental offset policy which establishes requirements surrounding offsets for matters which are protected under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. This policy is discussed below.

2.3.1 Draft Policy Statement: Use of Environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999 (2007)

The Draft EPBC Offsets Policy Statement (referred to as the EOP) establishes the framework under which environmental offsets can operate in relation to approvals under the EPBC Act (Part 9 of the Act). The EPBC Act is administered by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) in Canberra. The Draft EOP established offset requirements for unavoidable impacts to Matters of National Environmental Significance (MNES) listed under the EPBC Act.

The EOP aims to ensure that any offsets established under the EPBC Act maintain or enhance the health, diversity and productivity of the environment (as it relates to matters of NES). Offsets are not required for every approval under the Act and are assessed on a case-by-case basis depending on the scale and intensity of the impact.

The draft EOP outlines 8 key principles for providing offsets under the EPBC Act. They are as follows:

- *Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.*
- *A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.*
- *Environmental offsets should deliver a real conservation outcome.*
- *Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets.*
- *Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.*
- *Environmental offsets should be located within the same general area as the development activity.*
- *Environmental offsets should be delivered in a timely manner and be long lasting.*
- *Environmental offsets should be enforceable, monitored and audited.*

It is noted that the Draft EOP is currently being revised and that a *Draft Environmental Offsets Policy – Consultation Draft (2011)* has been released. It is understood that at the time of writing this report, that the original draft policy (2007) is currently still being implemented within SEWPaC, and that the revised draft is at this stage, informing policy direction only.

2.3.2 Implications for the Project

The Draft EOP is relevant to both the mine and rail components of the Project, as the Project will impact on MNES protected by the EPBC Act. Unavoidable impacts to MNES caused by the Project include impacts to:

- Threatened Ecological Communities (TECs);
- Confirmed and potential habitat for threatened species; and
- Potential migratory shorebird habitat.

Undertaking actions which will impact on MNES carries offset obligations under the EPBC Act. Although state government offsets policies may have the capacity to deliver offsets that will satisfy SEWPaC's draft policy and the requirements of the EPBC Act, it should not be assumed that that an offset which satisfies state requirements will automatically satisfy the requirements of the EPBC Act. As such, the offset package developed for the Project will be negotiated with both SEWPaC and the relevant state government agencies to ensure all offset obligations are met.

Offsets to MNES provided as a part of the offsets package for the Project, will take into account the recommendations provided in both the Draft EOP (2007) and the 2011 Consultation Draft.

It is noted that land-based offsets proposed for the project under the EOP can only be legally secured through mechanisms available under Queensland law. Offsets are therefore limited by the nature of the legal protection mechanisms available in Queensland, and the agreement of the Queensland Government.

3 Available offset options

Under the QGEOP and subsequent specific-issue-offset policies, and the Commonwealth draft EOP, there are two main pathways to source and secure offsets. These are land-based offsets (direct offsets) or indirect offsets.

Under the Queensland policies land-based offsets include direct offsets and offset transfers, which are undertaken through an offset broker. Offset payments are also available, and include the provision of funds to government to source and secure offsets on the proponents behalf. A brief discussion of each of the offset pathways available to HCPL is provided below.

In addition, there are a number of other pathways towards achieving an environmental offset, including indirect offsets and the establishment of Advance Offsets. These pathways are also discussed below (Sections 3.4 & 3.5).

3.1 DIRECT OFFSETS

A direct offset is a land based offset approach, where the proponent sources and secures lands containing the required offsets, for values impacted as a result of the project. A direct offset must be proposed at the time of application or during the Development Application (DA) process. Through this pathway an offset must be sourced and provided under a legally binding mechanism. A management plan must also be prepared. A direct offset is acceptable under all policies applicable to the Project.

Direct offsets rely on there being suitable offset sites within the same region or bioregion, which contain the vegetation types and habitat required. The benefit of providing a direct offset is that the proponent is able to select properties which may fit the requirements of approvals at different levels of governance, and that the offset areas can be chosen to meet multiple offset requirements. In addition, if the properties purchased contained surplus vegetation, which was not required for offset, those areas can potentially be declared advance offsets (see section 3.5) to offset planned future development.

Direct offsets require that the proponent go through the process of procuring properties directly rather than handing over the responsibility of that component to a third party. HCPL are pursuing a number of properties that may be able to provide direct offsets for impacts to protected species and communities. These properties may have the potential to provide direct offsets to listed communities, as well as providing additional environmental values through their connectivity with adjacent reserves. More discussion on the suitability of the properties and the potential for use in an offsets package is provided in Section 6.1.

3.2 OFFSET BROKERS

Offset brokers can be used to source and secure offsets using several models. One option includes the use of an offset broker to provide offsets on land of a third party. This approach is a form of direct offset, and can utilise potential offset properties without purchasing the entire property (with agreement of the landholder)

Another option is the use of an offset transfer. Under an offset transfer a proponent enters into an agreement with an offset broker to provide the offsets required for the residual impacts caused by a

project. Any offset transfer agreement between the proponent and an offset broker is required to be approved by DERM.

A number of offset brokers operate in Queensland, which provide such services, including Earth Trade or Ecofund. The use of an offset broker is particularly useful for sourcing difficult to find offsets, or offsets which are required to meet a large number of requirements. It is important to note, however, that the use of an offset transfer for critically limited or threshold REs, or species listed as endangered under the *Nature Conservation Act 1992* (NC Act), may not be accepted by DERM due to their scarcity in the landscape.

3.3 OFFSET PAYMENTS

An offset payment is a non-land-based offset option. Under the QBOP, an offset payment involves a financial payment to *Balance the Earth Trust* (Ecofund Queensland) instead of sourcing direct land-based offsets (either by the proponent or through a broker). The payment to *Balance the Earth Trust* may be used to purchase land containing state significant biodiversity values.

The PVMO also provides an offset payment option, however the policy does not specify a particular trust to which payment must be made, other than that the trust must be for land management or nature conservation purposes and be approved by DERM. The PVMO places more requirements on the proponent to demonstrate the offset can be achieved using an offset payment, and therefore the offset payment option is unlikely to be considered for offsets under the PVMO for this Project.

Offset payments may not be accepted for impacts to lands containing critically limited or threshold REs, or impacts to species listed as endangered, vulnerable or near threatened under the NC Act.

Under the QBOP, the amount payable to *Balance the Earth Trust* can be calculated using a formula developed and provided by DERM. Based on the formula, payment for offsets is provided at a 5:1 offset ratio for the purchase of lands. The calculator also includes management and administrative costs to calculate the final payment required.

3.4 INDIRECT OFFSETS

Indirect offsets provide the opportunity to enhance an offset package by providing financial assistance to various programs. For example, indirect offsets can include funding priority actions identified in recovery plans, research such as PhDs through a recognised research body or funding for rehabilitation works for degraded areas.

For an indirect offset to be considered under the QBOP and PVMO, the accompanying land-based offset must be assessed using the EE methodology and meet the required minimum thresholds for EE indicators. The EE assessment must meet 90% of the EE scores for the clearing area. For Commonwealth offset requirements indirect offsets cannot contribute more than 25% of the total offset package.

3.5 ADVANCE OFFSETS

An advance offset is an offset that has been approved by DERM and assessed using the EE methodology (see section 2.2.6) prior to offsetting any specific development. Once approved an advance offset can then be utilised to offset the impacts of a development(s), where the attributes of the advance offset match offset requirements.

Currently there are no advance offsets that are available to offset the impacts described in this report. The register of advance offsets will continue to be reviewed to identify any offsets that become available during the Project.

3.6 GALILEE BASIN OFFSET STRATEGY

Due to the proposed development of coal reserves in the Galilee Basin, and associated impacts on biodiversity values in the region, DERM are currently preparing a Galilee Basin Offset Strategy (GOS). HCPL are currently in discussions with DERM regarding the GOS, and will consider the GOS when sourcing and securing offsets for the Project.

In addition, in order to address potential east-west connectivity issues, the Proponent is working closely with the Queensland Government with the aim of reaching agreement on offsets in accordance with the proposed GOS.

The GOS is expected to identify broad strategic regions to receive offsets which will provide long-term environmental benefits. The Proponent proposes to coordinate this with the delivery of project offsets which address the potential fragmentation of east-west connectivity relating to EPBC Act listed species

4 Project impacts requiring offsets

The description of impacts associated with the Project, have been undertaken in two parts as follows:

- Section 4.2- Rail
- Section 4.3- Mine

The impacts presented are the residual impacts requiring offsets resulting from the development of both Project components, after avoidance and mitigation measures have been implemented. The figures presented below represent the area requiring offsets only, and do not reflect the total impact area of the Project (i.e impacts not requiring offsets are excluded). The offset areas, and the ratios used in this chapter, are indicative only, and may be subject to change following consultation with relevant state and Commonwealth government departments.

It should be noted that, areas identified as an offset are not mutually exclusive under state or Commonwealth offset policy, and can provide an offset for multiple values. As such, the Indicative Offset Liability values detailed in this chapter should not be aggregated to produce a total net offset area figure, as some areas may provide offsets for multiple values.

4.1 DATA USED TO ESTIMATE PROJECT IMPACTS

Several inputs have been used to calculate the impacts associated with the Project for the strategy. Key inputs include:

- Mine and rail footprint data;
- Regional ecosystem mapping; and
- Threatened species modelling.

Each data input is described below, along with the process to refine the mapping for each input, and therefore, ultimately, the offset liability for the Project.

4.1.1 Project footprint

The project footprint utilised to calculate Project impacts has included:

- A 60m rail alignment buffer (Version 11 of the rail alignment, as used in the SEIS) representing the direct impact footprint of the rail component of the Project. This footprint was also utilised in the SEIS prepared for the Project; and
- An approximately 24km by 10km open cut pit representing the mine component of the Project, including associated areas of disturbance, such as infrastructure etc. The footprint represents the area of direct impact for the mine component of the Project.

The rail alignment is likely to be refined as various design changes are considered. Any changes to the footprint will influence the impacts recorded in this report, and ultimately the offsets required by the Project.

Additional impacts are also likely from ancillary infrastructure. The location of this ancillary infrastructure (such as camps, access roads etc) is yet to be finalised, and will be included (with any other design changes) in a revised biodiversity offset strategy once finalised.

4.1.2 Regional ecosystem mapping

Regional ecosystems were refined during the EIS/SEIS process for both the mine and rail project areas. Additional Aerial Photo Interpretation (API) has since been completed for the rail alignment to fill gaps in survey effort due to access constraints. This new RE mapping, and the existing field verified mapping for the mine footprint, was used to calculate all impacts involving REs for the project.

As additional access is granted for the rail alignment, further on-site assessment is required to confirm the type and extent of REs within the rail alignment. The confirmation of the information will lead to refined impacts, and will be included in the revised offset strategy for the Project.

4.1.3 Species models

A series of species models have been completed for both Commonwealth and state listed species to understand the distribution of high and low potential habitat for each species. These include:

Commonwealth and state listed species

- *Dichanthium queenslandicum* (King Blue Grass)
- *Dichanthium setosum*
- *Eucalyptus raveretiana* (Black Ironbox)
- *Denisonia maculata* (Ornamental Snake)
- *Egernia rugosa* (Yakka Skink)
- *Paradelma orientalis* (Brigalow Scaly-foot)
- *Poephila cincta cincta* (Black-throated Finch)

State listed species

- *Bonamia dietrichiana* (Dietrich's morning glory)
- *Desmodium macrocarpum* (Large-podded Tick-trefoil)
- *Chalinolobus picatus* (Little pied bat)
- *Ephippiorhynchus asiaticus* (Black-necked Stork)
- *Nettapus coromandelianus* (Cotton Pygmy-goose)

The models have relied predominantly on RE data to predict habitat potential, but for some species the models have also considered other habitat features, such as proximity to water etc (Table 4). The models, while providing a good indication of potential habitat, require refinement through field validation and targeted species survey.

This biodiversity offset strategy proposes on site field survey and validation measures to capture more accurate habitat mapping for each state and Commonwealth species considered by the Project, with the field methodology adopted to be approved by the appropriate state and Commonwealth Departments before completion of this task. Similar habitat mapping will also be required on any offset site to confirm the presence of appropriate offset values. This refined mapping will feed into a revised biodiversity offset strategy.

Table 4: Data sources for habitat modelling

DATA SOURCE	DESCRIPTION
<p>RE maps and vegetation</p>	<p>Queensland RE (remnant vegetation) maps were used as the key base data for the modelling. REs are “vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil” (DERM website). It is recognised that species can have a relationship with REs in terms of their habitat requirements and that they can be used to predict potential habitat for certain species.</p> <p>RE data was gathered and applied at three levels:</p> <ul style="list-style-type: none"> • Within the mine site REs were ground-truthed by AARC (2010) and the RE data for the mine site was reported to be very accurate. • Within the rail alignment the RE data was refined using 1:10,000 aerial photographs. This process was undertaken by Simon Danielson (Senior Botanist, GHD) and Andrew Franks (Oberonia Botanical Services), both of whom are experienced in the process of RE map refinements for the area. Based on this exercise the RE data within the rail alignment was reported to be of a high quality. • Outside the project area the general DERM RE maps were used. This data is less accurate than for the mine site and rail alignment but provides an important understanding of REs across the region. <p>In addition to mapped remnant vegetation (i.e. RE mapping), mapped regrowth vegetation and mapped non-remnant vegetation was incorporated into the modelling process, where species-specific habitat preferences warranted its inclusion. Specifically, DERM mapped regrowth vegetation was considered to represent potential habitat for the Brigalow Scaly-foot, Ornamental Snake and Yakka Skink, where the DERM pre-clearance vegetation mapping indicated that this regrowth corresponded with identified (potential) habitat REs for each of these reptiles. Due to its broad habitat requirements, areas of mapped non-remnant vegetation (inclusive of mapped regrowth vegetation) were considered to represent (low value) potential habitat for <i>Dichanthium setosum</i> (with a number of identified exclusions relating to mapped plantations and water bodies).</p> <p>NB: it is important to note that only the REs within the two bioregions in which the project occurs were used in the modelling. These are the Desert Uplands bioregion and the Brigalow Belt North bioregion.</p>
<p>DERM Biodiversity Planning Assessments (BPA) for the Brigalow Belt and Desert</p>	<p>The DERM BPA mapping identifies important landscape scale biodiversity features within the region. Two BPA criteria (EPA 2002) were incorporated into the modelling:</p> <ul style="list-style-type: none"> • <u>Criteria F – Ecosystem Diversity</u>: This criterion describes habitat complexity, based on the number and size of ecosystems and wetlands present in an area (Queensland Environmental Protection Agency (EPA) (now DERM,

DATA SOURCE	DESCRIPTION
Uplands bioregions	<p>2002). The concepts of 'richness' (number of different ecosystems) and 'evenness' (relative abundance of ecosystems) are considered when attributing an Ecosystem Diversity rating to a particular area (EPA, 2002).</p> <p>Ecosystem Diversity is rated as: Low, Medium, High or Very High for individual remnant vegetation units (i.e. RE polygons).</p> <ul style="list-style-type: none"> • Criteria G – Context and Connection: This criterion is based upon the extent to which a mapped RE polygon incorporates or buffers other ecologically noteworthy areas (i.e. other remnant vegetation units and/or wetlands/waterways) (EPA, 2002). With respect to connection, remnant vegetation units that are connected to other REs are considered to be more representative of biodiversity, contribute more to a habitat network (i.e. connectivity) and exhibit greater resilience to disturbance (EPA, 2002). <p>The extent to which an RE incorporates/buffers/connects to other mapped vegetation and/or wetlands/waterways determines its BPA (Criteria G) rating: Low, Medium, High or Very High for individual remnant vegetation units (i.e. RE polygons).</p>
Water sources	<p>Queensland water source and stream category data was applied for species that had habitat that correlated with water.</p> <p>Proximity to water was used as a modelling criterion for species that had habitat that correlated with water. A proximity buffer (< 3 km / ≥ 3 km) around mapped natural water courses (perennial and non-perennial) and mapped wetlands (datasets sourced from the DERM) was used (in addition to selected BPA criteria) to distinguish between 'high value potential habitat' and 'low value potential habitat' (where the RE criteria was met). Stream order classifications were also used to understand the ability of a mapped watercourse to contribute to the habitat value within the landscape and therefore were applied to differentiate potential habitat values.</p>
Species records	<p>Species records were applied to the models to highlight what records exist within the region and provide an indication of the outcomes of the potential habitat modelling. Records were obtained from:</p> <ul style="list-style-type: none"> • field studies undertaken for the Project; • key threatened species documents (e.g. recovery plans, policy statements etc); • Queensland species databases (e.g. from the Queensland Herbarium, Queensland Museum); and • other publicly available impact assessment documents for the region. <p>Given that the accuracy of many of the species records is subject to uncertainty, the accuracy of each point is also illustrated on the maps.</p>

DATA SOURCE	DESCRIPTION
Distribution	<p>Brigalow Belt reptile modelled distribution mapping prepared by SEWPaC was used as a criterion for the Brigalow Scaly-foot, Ornamental Snake and Yakka Skink.</p> <p>Potential habitat modelling for the Black Ironbox was restricted to those river catchments occurring within / intersected by the Project Area from which the tree has been historically recorded (based on records from this Project and those held by the Queensland Herbarium).</p>

Other data such as altitude was considered for use in the modelling. However, it was determined that these data sets were not influential or relevant to the model and were not included.

Modelling methodology

The process for modelling each species involved the following steps. The details of this process and the modelling criteria specific to each species are outlined in ELA 2012.

1. Gathering background information for the species including habitat requirements and species records.
2. Defining a set of modelling criteria for each species that would model:
 - high potential habitat;
 - low potential habitat; and
 - generally unsuitable habitat.
3. Applying those criteria to the Desert Uplands and Brigalow Belt North bioregions.

Interpretation and Limitations

Modelling potential species habitat is based on a set of assumptions. It is well understood that a perfect representation of species habitat is not possible through modelling. However, it is also recognised that it can provide a better understanding of the context across the landscape and inform the level of risk to a species.

The two key limitations of the modelling used in this report are:

- There is a paucity of records across the region for the majority of species. This means that statistical habitat modelling based on a necessary number of records to inform the process is not possible.
- The base RE maps outside of the project site have an inherent level of uncertainty. The RE mapping was improved for the project area through survey (at the mine) and more detailed aerial photo interpretation (along the rail alignment).

The main assumption underpinning the modelling is that potential habitat for each species correlates well with the modelling criteria (most notably, RE mapping). Where this was assumption was not founded, such as with the Squatter Pigeon, potential habitat modelling was not applied.

It is important to note that the modelling does not map actual habitat. It aims to identify areas where potential habitat may occur based on broad habitat features which are more likely to contain the requisite microhabitat and condition factors that influence species-specific habitat use. For instance, the criteria used in the modelling convey a range of information relating to land form, soil type (including the likely presence or association with gilgai), and vegetation in the canopy, mid-storey and likely understorey. However, it is not able to locate the actual presence of certain microhabitat features such as leaf litter and fallen debris. Furthermore, the data does not convey on-ground condition of habitats, such as erosion, livestock degradation or weed infestation.

The modelling undertaken is conservative, as it makes the assumption that the microhabitat features often associated with these broad habitats will be present and that the area will not be degraded to the extent that it negates species-specific habitat use.

4.2 RAIL RELATED IMPACTS

The impacts of the proposed railway are confined to the Brigalow Belt Bioregion. A number of the PR's outlined in the PVMO and the associated Regional Vegetation Management Code (RVMC) for the Brigalow Belt Bioregion, are impacted by the proposed railway, and therefore require offsetting consistent with the policy.

Table 5 provides a summary of those PRs impacted by the proposed railway. The impact to each PR is then described in more detail.

Table 5: Performance requirements impacted (rail)

PERFORMANCE REQUIREMENT	IMPACT
Wetlands	Yes
Watercourses	Yes
Connectivity	Yes
Endangered REs	Yes
Of Concern REs	Yes
Essential Habitat	Yes
Essential Habitat for Koalas in SE QLD	No
Threshold RE's	Yes
Critically Limited RE's	No

4.2.1 Wetlands

The proposed railway impacts on 16.3ha of wetland vegetation which requires an offset under the PVMO (see Table 6). The impact occurs at the northern rail loop for the proposed railway, within the Caley Valley wetlands. The impacted RE (11.3.27x1c) wetland is considered 'significant' under the Brigalow Belt RVMC.

It is recognised that the Caley Valley Wetland is protected under the State Planning Policy 4/11, being a protected wetland of high ecological significance in Great Barrier Reef catchments. SPP 4/11 states that any impacts are to be offset consistent with the QBOP. However, due to the impacts of the rail line already being offset consistent with the PVMO, an additional offset under the QBOP is not proposed.

Table 6: Wetland vegetation impacts (rail)

FEATURE NAME	IMPACT AREA (HA)
Significant wetland vegetation (11.3.27x1c)	16.3

4.2.2 Watercourses

The proposed railway impacts on a total of 133.2ha of watercourse vegetation. The impacts occur across five stream orders, with the largest impact occurring to 1st order streams. Impacts to watercourse vegetation will be offset under the PVMO. The details of the impact are outlined in Table 7.

Table 7: Watercourse vegetation impacts (rail)

STREAM ORDER	IMPACT AREA (HA)
1	44.6
2	27.8
3	22.4
4	17.4
5+	20.9
<i>Total</i>	133.2

4.2.3 Connectivity

The scale and location of the proposed railway means that there is an impact of 395.6ha to connective vegetation (see Table 8), which is likely to result in the fragmentation of some resources within the landscape. Impacts to connectivity will be offset under the PVMO.

The estimate of connective vegetation impacted for the proposed railway was obtained from the SEIS prepared previously for the project. This figure is currently being refined, in consultation with DERM, and will be updated in subsequent versions of this BOS (if required).

Table 8: Connectivity impacts (rail)

FEATURE NAME	IMPACT AREA (HA)
Connectivity	395.9

4.2.4 Regional ecosystems

A total of 198.1ha of vegetation which requires an offset under the PVMO will be impacted as a result of the proposed railway. The vegetation to be impacted is comprised of nine Endangered RE's, 16 Of Concern RE's and four Threshold RE's (Table 9). It should be noted that the impacts presented below are those which require an offset under the PVMO and do not constitute the total impact as a result of the proposed railway.

Table 9: Regional ecosystem impacts (rail)

RE NAME	RE DESCRIPTION	BVG	IMPACT AREA (HA)	VM ACT STATUS
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on alluvial plains	25a	5.7	E
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	25a	57.3	E
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	25a	23.6	E
11.5.16	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest in depressions on Cainozoic sand plains/remnant surfaces	25a	0.3	E
11.9.1	<i>Acacia harpophylla</i> - <i>Eucalyptus cambageana</i> open forest to woodland on fine-grained sedimentary rocks	25a	2.6	E
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	25a	0.1	E
11.12.21	<i>Acacia harpophylla</i> open forest on igneous rocks. Colluvial lower slopes	25a	0.8	E
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrelba spp.</i> grassland on alluvial plains. Cracking clay soils	30a	0.1	E
11.9.12	<i>Dichanthium sericeum</i> grassland with clumps of <i>Acacia harpophylla</i> on fine-grained sedimentary rocks	30b	4.8	E
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	16c	14.9	OC
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> tall woodland on alluvial plains	16c	6.2	OC
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	17a	19.9	OC
11.4.2	<i>Eucalyptus spp.</i> and/or <i>Corymbia spp.</i> grassy or shrubby woodland on Cainozoic clay plains	17a	1.0	OC
11.11.10	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	17b	0.1	OC
11.5.10	<i>Melaleuca tamariscina</i> shrubland on Cainozoic sand plains/remnant surfaces	21b	6.1	OC
11.11.13	<i>Acacia harpophylla</i> or <i>A. argyrodendron</i> , <i>Terminalia oblongata</i> low open forest on deformed and metamorphosed sediments and interbedded volcanics	25a	4.8	OC
11.9.10	<i>Acacia harpophylla</i> , <i>Eucalyptus populnea</i> open forest on fine-grained sedimentary rocks	25a	0.8	OC
11.3.33	<i>Eremophila mitchellii</i> open woodland on alluvial plains	26a	7.9	OC
11.4.5	<i>Acacia argyrodendron</i> woodland on Cainozoic clay plains	26a	0.4	OC
11.4.6	<i>Acacia cambagei</i> woodland on Cainozoic clay plains	26a	1.6	OC

RE NAME	RE DESCRIPTION	BVG	IMPACT AREA (HA)	VM ACT STATUS
11.3.34	<i>Acacia tephрина</i> woodland on alluvial plains	27a	3.5	OC
11.3.13	<i>Grevillea striata</i> on coastal alluvial plains	27c	0.2	OC
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	30b	8.2	OC
11.2.3	Microphyll vine forest (beach scrub) on sandy beach ridges	3b	10.3	OC
11.12.10	<i>Corymbia clarksoniana</i> woodland on igneous rocks	9c	2.1	OC
11.4.11	<i>Dichanthium sericeum</i> , <i>Astrebla spp.</i> and patchy <i>Acacia harpophylla</i> , <i>Eucalyptus coolabah</i> on Cainozoic clay plains	30b	7.4	OC (Threshold)
11.5.5	<i>Eucalyptus melanophloia</i> , <i>Callitris glaucophylla</i> woodland on Cainozoic sand plains/remnant surfaces. Deep red sands	17b	2.5	LC (Threshold)
11.3.5	<i>Acacia cambagei</i> woodland on alluvial plains	26a	3.6	LC (Threshold)
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains/remnant surfaces	7a	1.3	LC (Threshold)
Total			198.1	N/A

4.2.5 Essential habitat

The proposed railway will impact a total of 13.9ha of Essential Habitat (EH) for the Ornamental Snake (*Denisonia maculata*) and *Bonamia dietrichiana* (Table 10). Offsets to areas of EH will be addressed under the PVMO.

Table 10: Essential habitat impacts (rail)

FEATURE NAME	IMPACT AREA (HA)
<i>Ornamental snake</i>	4.2
<i>Bonamia dietrichiana</i>	9.7
Total	13.9

4.2.6 State protected flora and fauna species

The species outlined in Table 11 are those flora species listed under the Queensland *Nature Conservation Act 1992* (NC Act) only, that are 'known' or 'likely' to be impacted by the proposed rail development. Impacts to those species listed under both the Queensland NC Act and Commonwealth EPBC Act, and likely to be impacted by the rail alignment, are discussed in Section 4.2.8.

One flora species listed under only the Queensland NC Act was identified during the EIS/SEIS as being present along the rail alignment (*Bonamia dietrichiana*). An additional species is considered likely to be impacted by the rail alignment (*Desmodium macrocarpum*). Any impacts to these flora species will require offset under Criteria B2 of the QBOP.

The figures shown in Table 11 represent direct impacts to areas of 'High Value Potential habitat' and 'Low Value Potential habitat' obtained from species models performed across the Project footprint. Further field assessment and targeted survey is required for these species to confirm the quality and amount of habitat to be impacted. Pre-clearance surveys will include identification and counts for all recorded threatened flora species.

Offsets for impacts to threatened state fauna caused by the rail line are not required under the PVMO. Should other clearing activities take place that impact on state listed threatened fauna habitat, and that are captured under the QBOP, the required offsets will be calculated and provided.

Table 11: State protected flora and fauna impacts (rail)

SPECIES NAME	COMMON NAME	NC ACT STATUS)	IMPACT AREA - HIGH POTENTIAL (HA)	IMPACT AREA- LOW POTENTIAL (HA)
<i>Bonamia dietrichiana</i>	Dietrich's morning glory	NT	10.3	0.02
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	NT	425.3	373.9

4.2.7 Marine habitat

A total of 2.4ha of impact to marine plants will be impacted as a result of the proposed railway (Table 12). The REs that constitute this impact include 11.1.2, 11.2.2b and 11.1.4. These impacts require offsetting under the FHMOP (see section 2.2.8).

The impacts to 16.3ha of wetland habitat are already being offset under the PVMO, and therefore an additional offset is not proposed under the FHMOP.

Table 12: Marine habitat impacts (rail)

FEATURE NAME	IMPACT AREA (HA)
Marine Plants (11.1.2, 11.2.2b and 11.1.4)	2.4

4.2.8 Matters of NES

Several MNES are impacted by the proposed rail alignment, including TECs, listed threatened species and migratory shorebirds. The information presented within this section may be amended after consultation with SEWPaC in the coming weeks.

Threatened Ecological Communities (TEC)

A total of 265.7ha of TEC listed under the EPBC Act will require an offset as a result of the proposed railway. The impact area requiring an offset is composed of three TECs listed under the Act as described in Table 13. The offset provided will be required to meet the offset requirements outlined in the EOP (see section 2.3).

Table 13: Impacts to EPBC listed Threatened Ecological Communities (rail)

TEC NAME	IMPACT AREA (HA)
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	151.0
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	100.5
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	14.2
Total	265.7

Threatened Species

A total of 7 species listed under both the EPBC Act and the NC Act (and identified as 'known' or 'likely' to occur) (ELA 2012), have the potential to be impacted as a result of the proposed railway and have modelled species data available across the study area (Table 14). One species is listed as endangered (Black Throated Finch), and six are listed as vulnerable. Two species listed below were confirmed as present within the rail alignment, including *Eucalyptus raveretiana* and Ornamental snake.

An additional vulnerable species, *Geophaps scripta scripta* (Squatter Pigeon), was confirmed within the rail project footprint, however due to its broad ranging habitat requirements modelling was not considered feasible for the species. Therefore impacts, and associated offsets, have been based on the total impacts for the rail, rather than a modelled output for the species. See Section 5.2.2 for more information on the approach to offsets for the Squatter Pigeon.

Several other species were identified as potentially occurring, however the habitat for these species is more marginal, and there is a low risk for these species of significant impacts (ELA 2012).

State and Commonwealth offset policies are considered compatible with regards to impacts to MNES and state listed threatened species, in that one offset can satisfy the multiple offset requirements across both jurisdictions. Therefore, it is proposed that the impacts listed below for each state and Commonwealth listed species be satisfied with one common offset outcome.

Table 14: Impacts to EPBC listed threatened species (rail)

SPECIES NAME	COMMON NAME	EPBC ACT STATUS	NC ACT STATUS	IMPACT AREA - HIGH POTENTIAL (HA)	IMPACT AREA- LOW POTENTIAL (HA)
<i>Dichanthium queenslandicum</i>	King Bluegrass	V	V	89.0	32.9
<i>Dichanthium setosum</i>		V	NT	217.0	2,326.0
<i>Eucalyptus raveretiana</i>	Black Ironbox	V	V	28.9	1.9
<i>Denisonia maculata</i>	Ornamental snake	V	V	251.2	192.9
<i>Egernia rugosa</i>	Yakka skink	V	V	811.8	649.8
<i>Paradelma orientalis</i>	Brigalow scaly-foot	V	V	189.2	272.0
<i>Poephila cincta cincta</i>	Black-throated finch	E	V	778.2	595.9

Migratory Shorebirds

It is considered likely that impacts to migratory shorebirds will occur at the rail loop within the Caley Valley wetlands at the northern end of the rail line. Additional survey is required to confirm the presence and amount of suitable habitat for migratory shorebirds, however the precautionary principle has been applied for this biodiversity offset strategy and the potential habitat for migratory shorebirds will be offset.

The impact to potential migratory shorebird habitat caused by the rail loop is 16.3ha, and is already being considered by the wetlands PR under the PVMO (Table 15). Although not yet quantified, there

may also be additional indirect offsets to migratory shorebird habitat through the construction and operation of the railway. Further analysis of this issue will be conducted, and will be presented in the updated biodiversity offset strategy.

It is proposed that offsets for this area be combined if satisfactory habitat is available to satisfy both the PVMO and EOP.

Table 15: Impacts to EPBC migratory shorebird habitat (rail)

FEATURE NAME	IMPACT AREA (HA)
Migratory Shorebird Habitat	16.3

4.3 MINE RELATED IMPACTS

A number of state significant biodiversity values (SSBVs) will be impacted by the proposed mine, with all impacts confined to the Desert Uplands Bioregion of Queensland.

The mine will impact on 5 features listed as SSBVs. The mine will impact on threshold RE, watercourses, connectivity and state protected animals and plants. The mine will not impact on wetland vegetation, legally secured offsets under state legislation or critically limited RE's. A summary of impacts is provided in Table 16. Each impact is then described in detail.

Table 16: State significant biodiversity values impacted (mine)

STATE SIGNIFICANT BIODIVERSITY VALUE	IMPACT
Wetland	No
Significant Wetland	No
Wetland Protection Areas (State Planning Policy)	No
Watercourses	Yes
Connectivity	Yes
Remnant Endangered RE's	No
Remnant Endangered Grassland RE's	No
Remnant Of Concern RE's	No
Remnant Of Concern Grassland RE's	No
High Value Regrowth Vegetation containing Endangered RE's	No
High Value Regrowth Vegetation containing Of Concern RE's	No
Threshold RE's	Yes
Critically Limited RE's	No
Essential Habitat	No
Essential Regrowth Habitat	No
Protected Animals	Yes
Protected plants (<i>Nature Conservation Act, 1992</i>)	Yes
Legally secured offsets under State legislation	No

4.3.1 Watercourses

A total of 1,191.9ha of watercourse vegetation will be impacted as a result of the development of the proposed mine. The largest impact is to 5th order watercourse vegetation (see Table 17). The watercourse vegetation is required to be offset under the QBOP.

Table 17: Watercourse vegetation impacts (mine)

STREAM ORDER	IMPACT AREA (HA)
1	156.7
2	83.6
3	234.5
4	5.7
5+	711.4
Total	1,191.9

4.3.2 Connectivity

The proposed mine will impact an area of 5,466ha of connective vegetation (Table 18). The connectivity impact is required to be offset under the QBOP.

The amount of connectivity vegetation impacted by the mine footprint was calculated by using the first two steps identified in the QBOP, including:

1. Identifying all remnant vegetation identified as a SSBV or within 500m of a SSBV
2. Identifying patches larger than 5 ha or 'stepping stones' in the landscape. As the majority of the vegetation identified on site has a patch size larger than 5 ha the vast majority of the vegetation identified was retained in the assessment.

The final step of the methodology in the QBOP involves an assessment of whether the proposed impact will 'compromise the function' of an SSBV. Discussions are continuing with DERM regarding the purpose of this assessment and how it should be applied to the Alpha Project, however at this point a precautionary principle has been applied and all vegetation identified in 1 and 2 above has been retained in the assessment. The connectivity figure will be updated once discussions with DERM are finalised.

In addition, the mapping of threatened species habitat will need to be considered in the calculation of connectivity. The current mapping is based on a landscape model which requires field validation and revision for each species. Once field work and validation is complete the threatened species habitat identified on site will be incorporated into the assessment of connectivity. DERM will be consulted on the proposed approach to field validation for each species.

The connectivity calculations and outcomes are considered interim pending the finalisation of the points listed above.

Table 18: Connective vegetation impacts (mine)

FEATURE NAME	IMPACT AREA (HA)
Connectivity	5,466.0

4.3.3 Regional ecosystems

The impacts to remnant regional ecosystems as a result of the proposed mine are limited to 112ha to the threshold RE 11.5.5b. 11.5.5b is an outlier RE within the Desert Uplands Bioregion (Table 19).

Table 19: Regional ecosystem impacts (mine)

RE NAME	RE DESCRIPTION	BVG	IMPACT AREA (HA)	VM ACT STATUS
11.5.5b*	<i>Callitris glaucophylla</i> , <i>Eucalyptus melanophloia</i> , <i>Eucalyptus populnea</i> +/- <i>Corymbia tessellaris</i> woodlands	20a	112	LC (Threshold)

*11.5.5b is an outlier RE within Bioregion 10.

4.3.4 State protected flora and fauna species

A total of 4 species listed under the Queensland NC Act have potential habitat which has been identified as likely to be impacted as a result of the proposed mine. As with rail impacts, species that are also listed on the EPBC Act are excluded from this list and referred to in Section 4.3.5. Only the Little pied bat was identified within the mine footprint.

The impacts to potential habitat for these species will require offset under the QBOP (Table 20). Again the figures presented represent direct impacts to areas of 'High Value Potential habitat' and 'Low Value Potential habitat' obtained from species models performed across the Project footprint. Further field assessment and targeted survey is required for these species to confirm presence and the amount of habitat to be impacted.

Table 20: State protected flora and fauna impacts (mine)

SPECIES NAME	COMMON NAME	NC ACT STATUS	IMPACT AREA-HIGH POTENTIAL (HA)	IMPACT AREA-LOW POTENTIAL (HA)
<i>Chalinolobus picatus</i>	Little pied bat	NT	9,589.5	2,160.9
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	NT	5,465.2	1,464.1
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	NT	3.8	0.05
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	NT		

4.3.5 Matters of NES

No TECs listed under the EPBC Act will be impacted as a result of the proposed mine, however several threatened species have been identified as having potential habitat which may be impacted as a result of the mine (Table 21). A total of 4 species listed under the EPBC Act are considered 'known' or 'likely' to be impacted as a result of the proposed mine, and have modelled data available (ELA 2012). One species is listed as endangered (Black-Throated Finch), and the other three are listed as vulnerable. All species are also listed on the NC Act.

Again, the vulnerable species Squatter Pigeon was confirmed within the mine project footprint. As with the impacts associated with the rail alignment, due to its broad ranging habitat requirements modelling for the species was not considered feasible. Therefore impacts, and associated offsets, have been based on the total impacts for the mine, rather than a modelled output for the species. See Section 5.2.2 for more information on the approach to offsets for the Squatter Pigeon.

Several other species were identified as potentially occurring, however the habitat for these species is more marginal, and there is a low risk for these species of significant impacts (ELA 2012).

As discussed previously, state and Commonwealth offset policies are considered compatible with regards to impacts to MNES and state listed threatened species, in that one offset can satisfy the multiple offset requirements across both jurisdictions. Therefore, it is proposed that the impacts listed below for each state and Commonwealth listed species will be satisfied with one common offset outcome.

Table 21: Impacts to EPBC threatened species (mine)

SPECIES NAME	COMMON NAME	EPBC ACT STATUS	NC ACT STATUS	IMPACT AREA - HIGH POTENTIAL (HA)	IMPACT AREA- LOW POTENTIAL (HA)
<i>Dichanthium setosum</i>		V	NT	0	8,632.0
<i>Denisonia maculata</i>	Ornamental snake	V	V	1,542.7	545.5
<i>Egernia rugosa</i>	Yakka skink	V	V	8,152.0	1,631.1
<i>Poephila cincta cincta</i>	Black-throated finch	E	V	7,154.1	3,149.8

4.4 SUMMARY OF IMPACTS

A summary of the impacts requiring offset for each component of the Project is provided below (Table 22). Both the mine and rail components of the Project will impact on watercourses, connectivity and threshold RE's. While the mine has a larger overall impact, the proposed railway impacts on a larger number of protected matters due to its linear nature and scale.

Table 22: Summary of impacts requiring offset

IMPACT TYPE	PROPOSED RAILWAY IMPACT AREA (HA)	PROPOSED MINE IMPACT AREA (HA)
<i>Wetlands</i>	16.3	0
<i>Watercourses</i>	133.2	1,191.9
<i>Connectivity</i>	395.9	5,466.0
<i>Endangered RE</i>	95.3	0
<i>Of Concern RE</i>	88.0	0
<i>Essential Habitat</i>	13.9	0
<i>Threshold RE</i>	14.8	112.0
<i>State Protected Animals (high and low potential habitat)</i>	0.0	11,754.2
<i>State Protected Plants (high and low potential habitat)</i>	809.5	6,929.2
<i>Marine Habitat</i>	2.4	0
<i>Matters of NES- TECs</i>	265.7	0
<i>Matters of NES- Species Habitat (high and low potential habitat)</i>	6,436.5	30,807.2

<i>Matters of NES- Migratory Shorebird Habitat</i>	16.3	0
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The scale and type of impacts resulting from the Project referred to in this chapter as requiring offset remain indicative only, and are subject to verification by the proponent and confirmation and agreement with relevant state and Commonwealth departments (for example, the refinement referred to in Section 7.1.1 of this strategy).

4.5 OFFSET RULES

A number of protected matters will be impacted by both the mine and rail components of the Project. Table 23 outlines the offset rules under the QBOP and PVMO that must be considered for each of the protected matters impacted by the Project.

Table 23: Summary of offset rules under the PVMO and QBOP

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
Wetlands	<p>Criteria 2 (8.2.1)</p> <p>An offset area for wetlands must:</p> <ul style="list-style-type: none"> a) Be located within the same bioregion b) Have the same or higher wetland status (i.e. either a wetland or significant wetland) as identified in the relevant part of the RVMC. c) Be a wetland area or RE listed in the RVMC d) Be an RE associated with a wetland or significant wetland, which assists with maintaining water quality, aquatic habitat and terrestrial habitat. 	<p>Section 11 (B1)</p> <p>The offset must:</p> <ul style="list-style-type: none"> a) Be located within the same bioregion b) Have the same or higher status as the area proposed to be impacted <p>Be an RE associated with a wetland or significant wetland. That is, the offset must assist with maintaining water quality, aquatic habitat and terrestrial habitat.</p>
Watercourses	<p>An offset area for watercourses must be:</p> <ul style="list-style-type: none"> a) Located within the same bioregion b) The same or higher stream order as the watercourse proposed for clearing c) An RE associated with a watercourse, which assists with maintaining bank stability, aquatic habitat and terrestrial habitat. 	<p>The offset must be:</p> <ul style="list-style-type: none"> a) Located within the same Bioregion d) The same or higher stream order as the watercourse proposed to be impacted b) An RE associated with a watercourse, which assists with maintaining bank stability, aquatic habitat and terrestrial habitat.

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
Connectivity	<p>An offset area for connectivity must be:</p> <ul style="list-style-type: none"> a) Located within the same bioregion b) Identified on a map within one of the following: <ul style="list-style-type: none"> i. A strategic area or strategic rehabilitation area identified by DERM ii. An ecological corridor identified by the Commonwealth, State or local government. iii. A DERM approved strategic corridor identified by a recognised organisation or group. 	<p>An offset area for connectivity must be:</p> <ul style="list-style-type: none"> a) Located within the same bioregion b) Identified on a map within one of the following: <ul style="list-style-type: none"> i. A strategic area or strategic rehabilitation area identified by DERM ii. An ecological corridor identified by the Commonwealth, State or local government. iii. A DERM approved strategic corridor identified by a recognised organisation or group.
Endangered RE	<p>An offset area for an Endangered RE must:</p> <ul style="list-style-type: none"> a) Be an endangered RE in the same BVG b) Be located within the same bioregion 	<p>An offset area for an Endangered RE (including Grassland RE's) must:</p> <ul style="list-style-type: none"> a) Be an endangered RE in the same BVG b) Be located within the same bioregion
Of Concern RE	<p>An offset area for an Of Concern RE must be:</p> <ul style="list-style-type: none"> a) An Of Concern RE in the same BVG b) Located within the same bioregion c) The same or higher conservation status as the area proposed for clearing 	<p>An offset area for an Of Concern RE (including Grassland RE's) must be:</p> <ul style="list-style-type: none"> a) An Of Concern RE in the same BVG b) Located within the same bioregion c) The same or higher conservation status as the area proposed for clearing

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
Essential Habitat	<p>An offset area for EH must be:</p> <ul style="list-style-type: none"> a) Located within the same bioregion b) Include at least three essential factors for the protected wildlife, and must include any EH factors that are stated as mandatory for the protected wildlife in the EH database, or be an area utilised by the protected wildlife at any stage of its lifecycle for which there is recent evidence c) Demonstrate that the direct impacts on the protected wildlife are mitigated by the offset area and surrounding environment. 	<p>An offset area for EH or Essential Regrowth Habitat must:</p> <ul style="list-style-type: none"> a) Be located within the same bioregion b) Include at least three essential factors for the protected wildlife, and; <ul style="list-style-type: none"> i. must include any EH factors that are stated as mandatory for the protected wildlife in the EH database; or ii. any Essential regrowth habitat factors that are stated as mandatory for the protected wildlife in the essential regrowth habitat database; or iii. be an area utilised by the protected wildlife at any stage of its lifecycle for which there is recent evidence c) Demonstrate that the direct impacts on the protected wildlife are mitigated by the offset area and surrounding environment.
Threshold RE	<p>An offset area for a Threshold RE must:</p> <ul style="list-style-type: none"> a) be the same RE, as the RE proposed for clearing b) be located within the same bioregion. 	<p>An offset area for a Threshold RE must:</p> <ul style="list-style-type: none"> a) be the same RE, as the RE proposed for clearing b) be located within the same bioregion.

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
State Protected Animals	N/A	<p>An offset area for a protected animal must:</p> <ul style="list-style-type: none"> a) Be known habitat for the species being impacted, which contains the elements necessary for the survival of the species being offset. b) Be an area utilised by the species at any stage of its life cycle for which there is recent evidence c) Demonstrate that the direct impacts on the species are mitigated by the offset area and surrounding environment. d) Be consistent with the requirements of an approved recovery plan (where it exists) for the species or relevant community. <ul style="list-style-type: none"> i. Where a specific plan for the species does not exist, advice from a suitably qualified and experienced person should be sought and provided about the conditions and requirements for the survival of the species. <p>In the absence of scientific information about the habitat of the species being impacted, the offset area must contain the same RE containing the protected animal as being impacted.</p>
State Protected Plants	N/A	<p>A biodiversity offset for protected plants:</p> <ul style="list-style-type: none"> a) May be of the following: <ul style="list-style-type: none"> i. A direct offset ii. An offset transfer b) May be used to satisfy multiple offset requirements, where an offset is required under another Act or policy of Commonwealth, state or local government for the one development application, providing the requirements of this policy are met. c) May be located on land owned by the applicant or by a third party d) Must be in an area where the protected plant species has the

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
		<p>conditions and requirements necessary to survive.</p> <p>The Offset must:</p> <ul style="list-style-type: none"> a) Be within the known distribution of the species being offset b) Be in an area which contains the conditions necessary for the survival of the species being offset, such as sunlight, water availability, soil type or position in the landscape. c) Demonstrate like for like for the species being cleared, by replacing the species being impacted on in the impact area with the same species in the offset area d) Achieve a net conservation gain for the species affected, using the following offset ratios: <ul style="list-style-type: none"> i. At least 1:5 for endangered species (i.e. 5 plants must be replanted to replace 1 plant cleared) ii. At least 1:3.5 for vulnerable species iii. At least 1:3 for near threatened species

MATTER IMPACTED	PMVO APPLICABLE REQUIREMENTS	QBOP APPLICABLE REQUIREMENTS
		<ul style="list-style-type: none"> e) Be replaced in an area likely to be viable and display inter-relationships the species needs to survive f) Have a management plan that clearly identifies how the offset area will be managed to ensure a self-sustaining wild plant population is created g) For endangered plants, the offset must be consistent with the requirements of an approved recovery plan (where it exists) for the species or relevant community as well as the <i>Nature Conservation (Protected Plants) Conservation Plan 2000</i> which is available on the Office of the Queensland Parliamentary Council Website. Where a specific plan for the species does not exist, advice from the Queensland Herbarium (or from a suitably qualified and experienced person) should be sought and provided about the conditions and requirements for the survival of the species.

5 Offset ratios and indicative offset liability

The size of the offset required for the Project is generally determined by offset ratios applied to the area of residual impacts associated with the Project. Due to the various jurisdictions and policies applicable to the Project, offset ratios will be determined for the Project using different methods, dependent on the policy that applies. The method used to determine the offset ratios for the various policies are provided below, and indicative offset liabilities for each feature requiring an offset are also provided. An assessment of the offsets available to meet the indicative offset liability is contained in Section 8.

All data presented below requires field verification. While the offset liability estimated below is likely to be broadly accurate, further field information will amend some impacts (and associated offset liability).

It is important to note several points before reviewing the indicative offset liability for the Project.

1. Where possible the offset requirements under state and Commonwealth offset policies will be achieved concurrently. That is, if habitat types for several species or communities are similar, and can be obtained within the same offset area, HCPL will attempt to align offsets in order to achieve this outcome. Where offset requirements and habitats are not similar, separate offset areas and types will be secured; and
2. The impacts calculated for the Project in many cases overlap (i.e. habitat mapped for several species may overlap, or habitat and impacted REs may also overlap). As impacts (and associated offset requirements) overlap, so too will habitat within offset properties. Therefore one offset area may provide offsets for several values being offset.

Taking into consideration the above points, the offsets secured for the Project may be significantly lower than the sum of all indicative offset liabilities listed in this strategy, and will depend on the combination of values secured at offset sites.

5.1 QUEENSLAND POLICY RATIOS AND INDICATIVE OFFSET LIABILITY

5.1.1 Queensland Biodiversity Offset Policy and Policy for Vegetation Management Offsets

The offset size required (compared to the size of the residual impacts) under the QBOP and PVMO is generally determined by the results of an ecological equivalence assessment. As previously described, the ecological equivalence methodology considers two broad measures (ecological condition and special features) on both impact and offset sites, and compares ecological attributes between the two sites at the site-scale and the landscape-scale.

The result of the assessments at both impact and offset sites determines the size of offsets required to fully offset the residual impacts of the Project. For ecological equivalence to be achieved, the offset site score for ecological condition and special features must be equal, or exceed, those for the clearing area. One option to improve the score of potential offset areas is to increase the area being offered as an offset.

As the ecological equivalence assessments are yet to be completed for either impact or offset sites, offset ratios under the QBOP and PVMO cannot yet be determined. As a general guide, however, an

offset ratio of 4:1 has been assumed for these policies. This will be confirmed after completion of the ecological equivalence assessments.

Table 24 demonstrates the offsets required under the PVMO and QBOP for the rail and mine components of the Project using the data currently available. These figures have been used to determine if offsets are achievable for the Project (Section 8), and are a guide only

Table 24: Indicative offset liability under PVMO and QBOP (mine and rail)

IMPACT TYPE	PROPOSED RAILWAY IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY- RAIL (HA)	PROPOSED MINE IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY- MINE (HA)
<i>Wetlands</i>	16.3	65.2	0.0	0.0
<i>Watercourses</i>	133.2	532.8	1,191.9	4,767.6
<i>Connectivity</i>	395.9	1,583.6	5,466.0	21,864.0
<i>Endangered RE</i>	94.3	381.2	0.0	0.0
<i>Of Concern RE</i>	88.0	352.0	0.0	0.0
<i>Essential Habitat</i>	13.9	55.6	0.0	0.0
<i>Threshold RE</i>	14.8	59.2	112.0	448.0
<i>State Protected Animals (high and low potential habitat)</i>	0.0	0.0	11,754.2	47,017.0

State protected plants, which require offsets under the QBOP, are one value where the offset ratio is not determined by an ecological equivalence assessment. For state protected plants a set of offset ratios are provided within the BQOP, which include:

- 5:1 for endangered species
- 3.5:1 for vulnerable species
- 3:1 for near threatened species

As described in Section 4, modelling for these species has indicated impacts to high and low potential habitat of between 809.5ha for the rail alignment and 6,929.2ha for impacts caused by the proposed mine footprint.

The expected area of habitat required for each protected plant is provided in Table 25, and again requires confirmation through field verification of the habitat available. The offset ratio for each species impacted is 3:1 (due to their status as near threatened species).

Table 25: Indicative offset liability under PVMO and QBOP for state protected plants (mine and rail)

IMPACT TYPE	PROPOSED RAILWAY IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY- RAIL (HA)	PROPOSED MINE IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY- MINE (HA)
<i>State Protected Plants (high and low potential habitat)</i>	809.5	2,428.6	6,929.2	20,787.7

5.1.2 Fish Habitat Management Operational Policy FHMOP 005

The FHMOP does not stipulate an offset ratio to be applied to impacts on marine plants. Therefore an offset ratio of 4:1 is proposed for the impact of 2.4ha. The indicative offset liability is therefore 9.6ha (Table 26). Negotiations will be held to determine if a 4:1 offset ratio is appropriate for impacts to marine plants

Table 26: Indicative offset liability for marine plants

FEATURE NAME	IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY (HA)
Marine Plants (11.1.2, 11.2.2b and 11.1.4)	2.4	9.6

5.2 COMMONWEALTH POLICY RATIOS AND INDICATIVE OFFSET LIABILITY

Offset ratios for residual impacts to MNES are proposed below for TECs, vulnerable and endangered species and migratory shorebird habitat. As described above the area and type of impact for each MNES requires confirmation through field verification and pre-clearance surveys before the size of offset required is known. The offset ratios described below will be applied to each MNES once the final impact is determined, and offsets with the required attributes secured.

5.2.1 Threatened Ecological Communities

Residual impacts to TECs occur along the rail footprint, with no impacts recorded to TECs from the development of the mine footprint. In order to offset the residual impacts to TECs by the Project the following offset ratios are proposed:

- 5:1 for offsets provided in remnant vegetation;
- 8:1 if offsets are provided in areas of non-remnant vegetation that require significant revegetation and/or rehabilitation.

The ratio of 5:1 for offsets into remnant vegetation will provide significant offsets to compensate for the loss of the TEC community across the rail alignment. These offset areas will be managed to maintain the functioning ecosystems already present within the offset.

The higher ratio (8:1) for non-remnant offset areas acknowledges the greater risk in utilising non-remnant areas as offsets, with rehabilitation and revegetation required within these areas to ensure the re-establishment of the community in question.

A total of 265.7ha of TEC vegetation is impacted by the Project (rail alignment), requiring an offset of 1,328ha if the offset is secured using only remnant vegetation, and 2,124ha if the offset is secured using only non-remnant vegetation (Table 27). Where possible all Commonwealth offset requirements will be achieved in remnant vegetation.

Table 27: Indicative MNES offset liability- TECs

TEC NAME	IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY- REMNANT VEGETATION (5:1) (HA)	INDICATIVE OFFSET LIABILITY- NON- REMNANT VEGETATION (8:1) (HA)
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	151.0	755.0	1,208.0
Brigalow (Acacia harpophylla dominant and co-dominant)	100.5	502.5	804.0
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	14.2	71.0	112.8
Total	265.7	1,328.0	2,124.8

5.2.2 Vulnerable and endangered species

As discussed earlier in this strategy, a number of vulnerable and endangered threatened species (identified as 'known' or 'likely' to occur) will be impacted by the Project (ELA 2012). The habitat lost for these species will be offset.

A set of post-approval species prescriptions are proposed for each species identified as 'known' or 'likely' to occur in this report, including additional survey effort and avoidance measures (described in Section 7.1 and ELA 2012). The species prescriptions will provide a definitive result regarding the total impacts to various habitat types being impacted by the Project, and will classify impacts into distinct categories, being confirmed habitat, high potential habitat, moderate potential habitat and low potential habitat (ELA 2012). The offset ratios proposed for each of these habitat types for vulnerable and endangered species are provided in Table 28 and Table 29.

Table 28: Proposed MNES offset ratios- vulnerable species

IMPACTED HABITAT	OFFSET HABITAT			
	CONFIRMED HABITAT (CH)	HIGH POTENTIAL HABITAT (HP)	MODERATE POTENTIAL HABITAT (MP)	LOW POTENTIAL HABITAT (LP)
Confirmed Habitat (CH)	4:1			
High Potential Habitat (HP)	2:1	4:1	6:1	
Moderate Potential Habitat (MP)	1:1	2:1	4:1	6:1
Low Potential Habitat (LP)	0.5:1	1:1	2:1	4:1

Table 29: Proposed MNES offset ratios- endangered species

IMPACTED HABITAT	OFFSET HABITAT			
	CONFIRMED HABITAT (CH)	HIGH POTENTIAL HABITAT (HP)	MODERATE POTENTIAL HABITAT (MP)	LOW POTENTIAL HABITAT (LP)
Confirmed Habitat (CH)	6:1			
High Potential Habitat (HP)	4:1	6:1	8:1	
Moderate Potential Habitat (MP)	2:1	4:1	6:1	8:1
Low Potential Habitat (LP)	1:1	2:1	4:1	6:1

The proposed offset ratios rely on two inputs to determine the ratio applied. Firstly, larger offsets are required where impacts occur to areas of better habitat type (i.e. confirmed or high potential habitat etc). The larger ratios provided recognise that impacts to species in these areas are likely to be more significant.

The second input to the offset ratio for each species is the quality of habitat on the offset site. Offsetting into good quality habitat (confirmed or high potential) is preferred, and therefore the use of better quality habitat on offset sites will reduce the offset ratio for threatened species. A reduced ratio will also be applied where HCPL can demonstrate that rehabilitation and restoration of lower quality habitat on the offset site will lead to improved habitat quality for the species being considered.

The matrices presented provide flexibility in securing the offsets necessary for the Project. Options available to HCPL in securing the offsets for the Project include:

- Securing smaller areas of higher quality habitat to offset the impacts associated to the Project; and/or
- Rehabilitating and restoring habitat to improve habitat quality, therefore utilising the reduced offset ratios of the higher habitat type; and/or
- Providing larger areas of lower quality habitat.

The offset ratios for vulnerable species range from 0.5:1 to 6:1, depending on the combination of impact and offset site habitat factors. Confirmed habitat must be offset with confirmed habitat. High potential habitat cannot be offset within low potential habitat.

The ratios are higher for endangered species, with ratios ranging from 1:1 to 8:1. Again, confirmed habitat must be offset with confirmed habitat, and high potential habitat cannot be offset within low potential habitat.

The potential offset liability for each species is provided in Table 30. To generate these figures it has been assumed that:

- Impacted high potential habitat has been offset into high potential habitat; and
- Impacted low potential habitat has been offset into low potential habitat.

Again, as stated throughout this report, additional field verification (as outlined in the species prescriptions) is required to confirm impacts on each species and the presence and quality of habitat on offset sites.

Squatter Pigeon

Predictive habitat modelling was not considered feasible for the Squatter Pigeon, as it was found not to have a strong association with Regional Ecosystems – the key data source used in the modelling. Instead, the species is known to occur across a variety of habitat types with suitable foraging and nesting habitat widely available in areas within and adjacent to the project area, and within the broader region.

An assessment of total project impacts is therefore potentially more suitable for this species at this stage, with refinement of the total impacts to the species able to be conducted consistent with the survey described in the species prescriptions provided in ELA 2012.

In total the project impacts on approximately 13,180 ha of remnant vegetation, including impacts to approximately 1,448 ha of remnant vegetation from the rail corridor, and approximately 11,732 ha of remnant vegetation clearing associated with the mine footprint.

As the Squatter Pigeon is listed as vulnerable under the EPBC Act, an average offset ratio of 4:1 is to be applied to impacts to Squatter Pigeon habitat as outlined in Table 28. The application of this offset ratio results in an indicative offset requirement of 52,720 ha for the Squatter Pigeon. This indicative estimate is likely to reduce after the species prescription measures are completed and the Squatter Pigeon habitat is refined.

The amount of offset expected to be required for the Project for other impacts is likely to significantly exceed the indicative amount currently estimated for Squatter Pigeon. Therefore due to the wide ranging nature of the species, and the presence of the species across much of the broader region where offsets will be located, the offsets proposed for the Project will satisfy the offset requirements for the Squatter Pigeon, and will be confirmed through field verification of each offset site proposed.

Table 30: Indicative MNES offset liability- threatened species

SPECIES NAME	COMMON NAME	EPBC STATUS	IMPACT AREA- RAIL (HA)		IMPACT AREA- MINE (HA)		INDICATIVE OFFSET LIABILITY (HA)	
			HIGH POTENTIAL HABITAT	LOW POTENTIAL HABITAT	HIGH POTENTIAL HABITAT	LOW POTENTIAL HABITAT	HIGH POTENTIAL HABITAT	LOW POTENTIAL HABITAT
<i>Dichanthium queenslandicum</i>	King Bluegrass	V	89.0	32.9	0.0	0.0	355.8	131.5
<i>Dichanthium setosum</i>		V	217.0	2,326.0	0.0	8,632.0	868.1	43,832.2
<i>Eucalyptus raveretiana</i>	Black Ironbox	V	28.9	1.9	0.0	0.0	115.5	7.6
<i>Denisonia maculata</i>	Ornamental snake	V	251.2	192.9	1,542.7	545.5	7,175.6	2,953.7
<i>Egernia rugosa</i>	Yakka skink	V	811.8	649.8	8,152.0	1,631.1	35,855.0	9,123.7
<i>Paradelma orientalis</i>	Brigalow scaly-foot	V	189.2	272.0	0.0	0.0	756.8	1,088.0
<i>Poephila cincta cincta</i>	Black-throated finch	E	778.2	595.8	7,154.1	3,149.8	47,593.6	22,473.2

5.2.3 Migratory shorebirds

Impacts to migratory shorebird habitat are likely to occur within the Caley Valley wetlands through the development of the northern rail loop for the Project. The total impact recorded for migratory shorebirds is 16.3ha.

At this stage the presence of migratory shorebird habitat is not confirmed, however offsets are proposed to compensate for the loss of potential habitat.

This same feature is being offset through the wetlands performance requirement under the Queensland PVMO. Under the PVMO an ecological equivalence assessment is required to determine the offset ratio under this performance requirement. Although the outcome of the ecological equivalence assessment is not yet known, an offset ratio of 5:1 is proposed for impacts to migratory shorebird habitat. Table 31 contains details of the indicative offset liability for migratory shorebirds.

Table 31: Indicative MNES offset liability- migratory shorebird habitat

HABITAT	IMPACT AREA (HA)	INDICATIVE OFFSET LIABILITY (HA)
Migratory Shorebirds	16.3	81.5

6 Proposed offset approach

A preferred offset approach has been identified for the Project, which intends to offset residual and unavoidable impacts of the Project. The preferred method is considered to be the most effective, reliable and efficient approach available to achieve the offsets for the Project, whilst maintaining consistency with the broad offset principles and policies that apply.

The offset approach preferred by the Project, and proposed in this biodiversity offset strategy, will compensate for all unavoidable impacts and loss of biodiversity caused by the development of the rail and mine components of the Project. The approach focuses on several key offset principles and components, and aims to:

- Ensure strategic, viable offsets are legally secured and managed;
- Secure larger offset sites containing many offset values required rather than a large number of small sites;
- Secure offsets that are well connected and adjacent to existing areas of remnant and/or protected native vegetation;
- Protect and maintain state biodiversity corridors, where possible;
- Ensure offsets are located as close as possible to the impact sites (i.e. close to mine operations and the rail alignment);
- Protect a mixture of remnant and non-remnant vegetation to satisfy the multiple offset policies that apply to the Project. At this stage, the provision of remnant vegetation is likely to be predominantly utilised to fulfil requirements for offset under the EPBC Act. Whereas, the provision of non-remnant vegetation is likely to be predominantly utilised to fulfil requirements in line with the PMVO and QBOP; and
- Undertake management of offset sites consistent with an offset management plan to restore functioning ecosystems in areas of non-remnant vegetation and/or maintain functioning regional ecosystems where remnant vegetation is protected.

When determining the suitability of a property to be provided as a direct offset under the identified preferred approach, consideration will be given to issues such as proposed land use and future tenure, including that of any possible mining interests.

In addition, the proposed offset approach for the Project will also meet the policies listed below for each project component:

- Rail component -
 - Policy for Vegetation Management Offsets- Version 3 (2011)
 - Biodiversity Offset Policy- Version 1 (2011)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)
 - EPBC Act Environmental Offsets Policy (2007)
- Mine component -
 - Biodiversity Offset Policy- Version 1 (2011) (determination made by Co-ordinator General)
 - Fish Habitat Management Operational Policy FHMOP 005 (2002)

- EPBC Act Environmental Offsets Policy (2007)

The proposed offset approach will utilise a series of offset options in cascading order of preference. The proposed approach involves the following offset options:

1. Use of lands owned (or proposed to be owned) by the Project (known as Project properties). These lands are situated surrounding the Project footprint and provide many values consistent with those required to offset the residual impacts of the Project.
2. Purchase other offset properties. This option includes the direct targeting of properties identified in the Galilee Basin Offset Strategy.
3. Use of offset brokers (such as Ecofund and Earth Trade) to source and secure the required offsets from the broader landscape on behalf of HCPL. It is anticipated the offset brokers will be commissioned for difficult to obtain offset types, or those offset types not available on Project properties. An offset broker may be used to secure an offset through a third party, or through an offset transfer.
4. Use of offset payments to allow Government bodies to secure the offsets required for the Project. This option would include significant consultation and negotiation with the relevant Government departments should this option be required.
5. Use of Indirect Offsets should the options above meet a significant proportion of the offset requirement.

At this stage it is not possible to estimate the amount of area or offset value provided by each option, and further on-site assessment is required before this figure is known. However, HCPL are committed to providing as much of the offset as possible from the Project properties.

It is important to note that not all options listed are applicable to all offset policies. Direct offsets are generally accepted by all policies, and therefore options 1 and 2 are the preferred offset mechanisms. The use of offset brokers is a permitted approach under both the PVMO and QBOP, and may be acceptable to satisfy Commonwealth EPBC EOP offset requirements. There is no provision for the use of offset brokers within the FHMOP 005.

The use of offset payments will be considered for the QBOP and FHMOP 005, however will not be applied to offsets required under the PVMO, and would likely require negotiation under the EPBC EOP. Finally, indirect offsets will only be utilised for the Project where the majority of offset requirements have already been achieved. For PVMO and QBOP offset requirements DERM permits the use of indirect offsets after 90% of the ecological equivalence score of the impact site has been obtained, while the Commonwealth EPBC EOP requires that a maximum of 25% of all offset actions can be indirect. Indirect offsets can also apply to the FHMOP 005.

The proposed offset approach has been tested by comparing the indicative offset liabilities described in Section 5, with offsets available across the Project properties and within the broader landscape (analysis conducted by Ecofund). The results of the analysis indicate that the proposed approach is achievable (analysis is available in Section 8).

The process, and to which offset policy each option applies, is demonstrated by Figure 4, and each option is outlined in Sections 6.1 to 6.5.

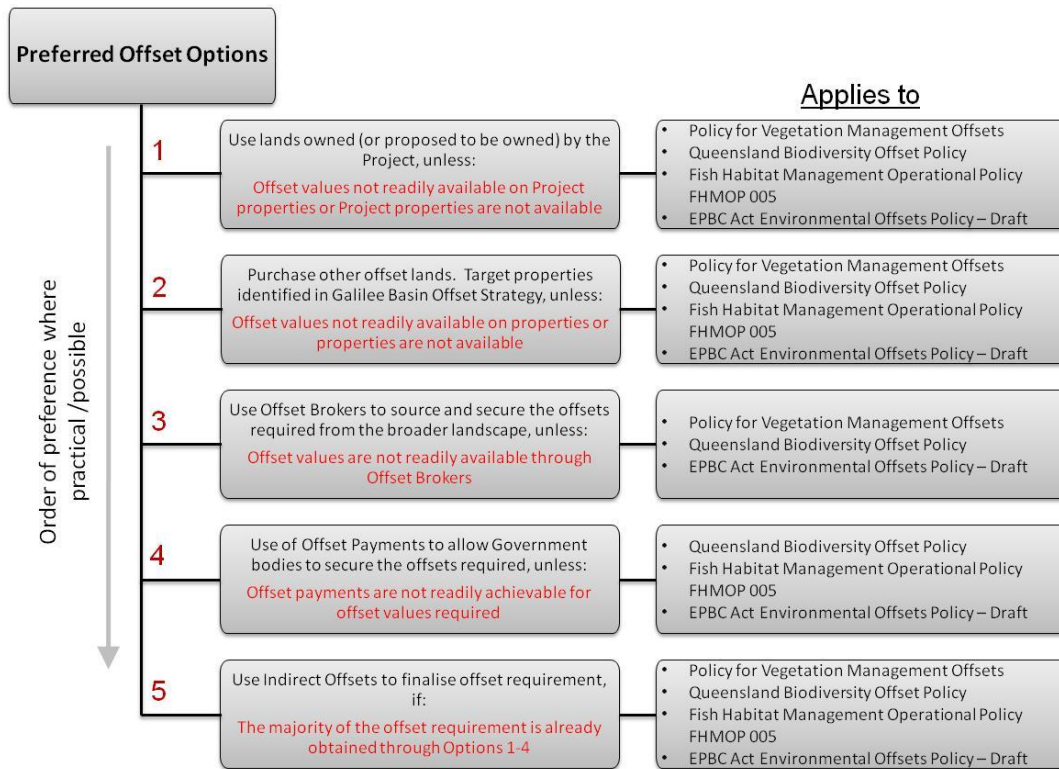


Figure 4: Preferred offset options

6.1 PROJECT PROPERTIES (OPTION 1)

The Project has purchased, or is in the process of purchasing, several properties surrounding the mine site and rail alignment that contain significant biodiversity values. The properties present an excellent opportunity to secure the offsets required for the Project as they are in close proximity to the impact site, contain biodiversity values similar to those being impacted, are well connected and do have (or are highly likely to have) favourable ownership. It is for this reason that these properties are the preferred option for sourcing and securing the offsets required for the Project.

Nine properties were initially considered, however on further investigation (using desktop data) seven sites showed some potential. The combined area of the properties totals approximately 100,000ha.

The location and name of the seven properties cannot be provided in this report as purchase negotiations are still being conducted for several properties. General information, however, is provided for each site. The properties are referenced in this report as 'Property A' to 'Property G'. Table 32 contains details on their size, and the amount of remnant and non-remnant native vegetation contained on each property.

Table 32: Project properties

OFFSET NAME	NON-REMNANT VEGETATION (HA)	REMNANT VEGETATION (HA)	TOTAL (HA)
Property A	44	20,081	20,125
Property B	4,414	5,296	9,710
Property C	14,970	16,573	31,543
Property D	704	10,511	11,215
Property E	4,320	1,994	6,314
Property F	6,422	7,269	13,691
Property G	1,751	885	2,636

Property A, Property B and Property C are located in the region surrounding the mine footprint, and will be the first sites investigated to offset mine impacts. The sites are well connected to remnant vegetation, containing significant areas of remnant and non-remnant vegetation identified in DERM state biodiversity corridor mapping ('Criteria J' areas). The sites also lie in close proximity (and in some cases are adjacent) to existing protected native vegetation.

Property D, Property E, Property F and Property G are located along the length of the rail alignment, with Property D at the south-western end of the rail alignment, Property E at an approximate rail alignment midpoint and Properties F and G lying at the far north-eastern extent of the rail alignment. The properties contain an even distribution of non-remnant and remnant vegetation, include (or are adjacent to) state biodiversity corridors, have significant endangered and of concern regional ecosystems present and contain significant areas of EPBC listed TECs. These properties are preferred to provide the offsets for the impacts caused by the rail alignment.

The Project properties will be the first offset options investigated for the Project, and as such significant desktop analysis has been conducted into their values and how they compare to the indicative Project offset requirements (Section 5). This analysis is intended to demonstrate the effectiveness of the Project properties in providing many of the offsets required for the Project.

Where possible the Project properties will be legally secured to fulfil offset requirements, however details on exactly which properties are available, and the area of each property that can be secured, are not available at this time for several reasons:

1. The biodiversity values of each property have been reviewed to a desktop level only. It is important that field assessment of each potential offset property be conducted before a decision can be made as to whether the property contains the values required to offset the impacts of the Project; and
2. The overall availability of each Project property has not yet been determined, and more information is required on each of the Project properties before an offset on these lands can be confirmed. Significant work is required (and is currently being completed) to determine the legal status of each of the properties, and whether any restrictions exist that would exclude the properties from being used as offset sites. Confirmation of mining interests, for instance, is required before any of the Project properties can be legally secured.

Should some of the required offsets not be available on Project properties, or some Project properties have legal restrictions that exclude the site from being legally secured as an offset, an alternative approach will be required. In the cascading order of offset preferences HCPL propose that the next

logical step would be to purchase and secure additional lands to satisfy offset requirements, particularly if these lands are identified in the Galilee Basin Offset Strategy.

6.2 PURCHASE OF OTHER OFFSET PROPERTIES (OPTION 2)

The purchase of additional offset lands to provide direct offsets for the Project will be considered if other Project properties do not provide the necessary offset values. In order to determine which properties to pursue HCPL will initially conduct desktop spatial analysis to identify potential offsets for any outstanding offset requirements. Data considered will include:

- Outstanding offset values required (e.g. regional ecosystems, watercourses, TECs, species habitat etc);
- Distance of property from Project impacts;
- Constraints due to existing tenure or land use;
- Size and connectedness to other vegetation, including protected areas;
- Existence of remnant and non-remnant vegetation; and
- Specific habitat features, such as drainage lines, wetlands or essential habitat features.

HCPL will also directly target the purchase of offset land in regions and/or specific locations identified by the Galilee Basin Offset Strategy (currently being prepared by DERM). HCPL are currently in discussions with DERM regarding the Galilee Basin Offset Strategy and will continue to work collaboratively to achieve conservation outcomes identified in the strategy.

6.3 OFFSET BROKERS (OPTION 3)

Offset brokers, such as Ecofund and Earth Trade, operate throughout Queensland to identify, source and secure offsets for clients. As described in Section 3.2, an offset broker may be used to secure an offset through a third party, or through an offset transfer.

Should options 1 and 2 described above not satisfy the offset requirements of the Project, HCPL will engage the services of offset brokers to source and secure the offsets required for the Project. Where necessary several brokers will be engaged to streamline the process and ensure offsets are obtained for all values in the shortest possible timeframes.

Ecofund and Earth Trade have been engaged by the Project to conduct a regional analysis for offset types not available on Project properties, or for difficult to find offset types that are not widely available across the landscape. While some of this analysis is ongoing at the time of producing this report, some of the work has been completed and summarised in Section 8. The full report is contained in Appendix A.

6.4 OFFSET PAYMENTS (OPTION 4)

Offset payments are also available under several of the offset policies that apply to the Project, but are most relevant to those impacts related to the mine site and impacts to marine plants at the terminus of the rail alignment. Should preferred offset options 1, 2 and 3 (above) not satisfy all offset requirements, HCPL will investigate fulfilling the remaining offset requirements through an offset payment.

Any use of offset payments to meet offset requirements will be discussed with the relevant regulators to determine whether the use of offset payments is appropriate for the values being impacted.

6.5 INDIRECT OFFSETS (OPTION 5)

The use of indirect offsets will be the final option utilised to meet the offset requirements of the Project, and will only be used where the previous 4 options have not been able to provide the offsets required. It is intended that indirect offsets only contribute a small proportion to the overall strategy, particularly for the QBOP and PVMO (indirect offsets can only be used where 90% of the ecological equivalence score of the impact site has been obtained) and Commonwealth offset requirements (where indirect offsets can comprise only 25% of the overall package).

The QBOP outlines criteria for what is considered an acceptable indirect offset. Under the QBOP, an indirect offset must be an activity that will:

- Result in, or improve the spatial capture of vegetation and wildlife information;
- Be associated with a threatening process identified in a conservation or recovery plan; and
- Be for species or ecosystems within the same bioregion.

Examples of indirect offsets that may be utilised for the Project include:

- Habitat mapping/modelling for priority endangered, vulnerable or near threatened species listed under the NC Act using methodology approved by DERM;
- Development of RE Biocondition benchmarks using methodology identified by DERM;
- Fine scale vegetation mapping for DERM-identified areas;
- Research and monitoring programs for species impacted by the Project to increase knowledge and data available;
- Fauna survey of strategic areas where inadequate data exists; and
- Implementation of recovery or conservation plan actions, and addressing threatening processes, identified for species and vegetation communities impacted by the proposal.

Should indirect offsets be required HCPL will consult with the relevant agencies to determine which options and actions are the most appropriate to fulfil offset obligations.

7 Delivery of biodiversity offsets

The following section provides details on how the offset requirements will be finalised and delivered. This includes the applicable offset ratios for the various project impacts and information on how the offsets will be legally secured and managed. The proposed staging of offsets is also provided, along with the approach and timing of consultation with regulators and HCPL biodiversity offset commitments.

7.1 FINALISE OFFSET REQUIREMENTS

The delivery of biodiversity offsets for the Project relies on the completion of several tasks to finalise offset requirements (outlined in Figure 5). Initially the mapping of habitat and vegetation within the Project footprint must be confirmed through further on-site survey and the completion of ecological equivalence assessments. The impacts of the Project then must be refined, with rail and mine footprints finalised and the staging of impacts confirmed.

Once the above data is available, this offsets strategy will be updated to include precise information on the final impacts of the Project, with a Biodiversity Offset Package (BOP) subsequently developed. Once approved the offset package will be implemented and all offsets secured for the Project.

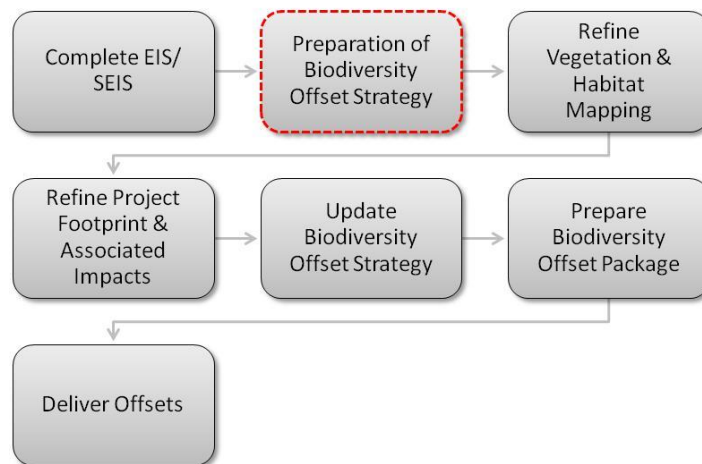


Figure 5: Process to finalise offset requirements and secure offsets

7.1.1 Refine vegetation and habitat mapping

The data available for the preparation of this Biodiversity Offset Strategy was predominantly collected during the EIS and SEIS process for the Project, with additional data made available through finer scale regional ecosystem mapping of the rail alignment and updated species habitat models for impacted threatened species.

Before offset requirements are finalised further refined data is required for the Project footprint. This data is required for several reasons. Firstly, while the survey effort during the EIS/SEIS process was substantial, the collection of additional data across the large project footprint will assist in determining the final offset requirements of the Project. In addition, access constraints along the rail alignment

limited the amount of field work conducted for the EIS and SEIS, and therefore improved data is required to confirm the vegetation and species habitat present.

The additional field assessment will include pre-clearance surveys and ecological equivalence assessments. Details of each approach are provided below.

Pre-clearance and Species Prescription Surveys

Pre-clearance surveys will be conducted for both the mine and rail footprints to refine the data previously collected for the Project. The field work will incorporate surveys to verify the extent and condition of regional ecosystems present on site, while additional targeted threatened species survey and habitat mapping will also be conducted for listed threatened species.

HCPL will seek input and approval of the field assessment methodology from the relevant state and Commonwealth government departments. For each species habitat mapping will be refined, and surveys conducted, to identify confirmed habitat, high potential habitat, moderate potential habitat and low potential habitat. Surveys will also include identification and counts for threatened flora species to ensure consistency with the QBOP. Avoidance measures will then be considered, with any residual impacts offset using the offset ratios described in Section 5.2.

All data collected during the pre-clearance and species prescription surveys will be consolidated and will be included in an updated version of this BOS.

Ecological Equivalence Assessments

Under the PVMO and QBOP ecological equivalence assessments are required to confirm the values of the impact sites versus those of the offset sites. Therefore, before any works are undertaken within the mine or rail footprint, an ecological equivalence assessment must be conducted.

The ecological equivalence assessment methodology considers two broad measures (ecological condition and special features) at both impact and offset sites, and compares ecological attributes between the two sites at the site-scale and the landscape-scale. It is proposed that, at this stage, ecological equivalence assessments be completed at the impact sites only, and that assessments of potential offset sites only be conducted once the availability of the offset site is confirmed.

Therefore, during pre-clearance surveys the required information to complete an ecological equivalence assessment will also be captured. This information will be provided to DERM for review, and will also assist in short-listing offset site requirements.

7.1.2 Refine project footprint and associated impacts

The project footprint, including the rail alignment, staging of mine impacts and ancillary works associated with the Project, continue to be refined as more data is collected for each component. Minor changes to the footprint will continue until a final alignment is chosen for the rail, and a final footprint and staging plan is made available for the mine.

Once finalised the final Project footprint will be combined with the biodiversity values confirmed through pre-clearance surveys and ecological equivalence assessments to determine the impacts of the Project and associated offset requirements.

7.1.3 Update biodiversity offset strategy

The capture of updated environmental and impact data will most likely amend the offset requirements presented in this report. It is anticipated that the changes to the data within this report will be relatively minor.

Once the data is finalised this biodiversity offset strategy will be updated to contain the latest confirmed impacts of the Project. Any changes to offset availability will also be included, and the report will be submitted to DERM and SEWPaC for review and feedback.

7.1.4 Prepare biodiversity offset package and deliver offsets

After approval of the updated Biodiversity Offset Strategy, a Biodiversity Offset Package (BOP) will be presented to DERM and SEWPaC for approval. The BOP will:

- Finalise the offset mechanisms to be utilised for the Project;
- Identify those Project lands that will be secured as offsets, their location and contributions towards offset requirements;
- Identify those offset requirements that will be secured through the provision of other offset lands, including lands identified in the Galilee Basin Offset Strategy;
- Identify those offset requirements that will be secured through an offset transfer (i.e. offset broker) or offset payment; and
- Identify any indirect offset proposals.

A future land use risk assessment will be completed for any direct offset site proposed by the Project during the development of the Biodiversity Offset Package. This risk assessment will help ensure (to the best of HCPLs ability) any direct offset proposed for the Project is not subject to future non-compatible land uses, such as mining.

Consultation will be conducted with DERM and SEWPaC during the development of the BOP to ensure all offset issues are identified and discussed before the package is finalised.

The measures and mechanisms identified within the BOP will then be secured. This will include conducting ecological assessments of offset sites, legally securing the offset sites and the preparation of appropriate offset area management plans. Where offsets are to be secured through brokers and offset payments, contracts will be in place (and payments made) to satisfy these offsets requirements. Finally, all funding for indirect offsets will be in-place with the appropriate institution or department.

7.2 SECURE AND MANAGE OFFSETS

Provided below are details relating to the mechanisms to be used to secure offset sites for the Project. Details are also provided regarding the preparation of offset area management plans, which will outline the ongoing management actions required at each site.

7.2.1 Legally secured offsets

All direct offset sites (either owned by HCPL or secured through an offset transfer with an offset broker) will be secured using a legally binding mechanism to ensure the protection of the offset in the long-term. Adequately securing offset sites is a key requirement of both state and Commonwealth offset policies, and HCPL intend to meet the requirements of all offset policies by securing offsets using one of the following mechanisms:

- Gazettal as a protected area (e.g. a nature refuge) under the *Nature Conservation Act 1992*
- Declaration of an area of high nature conservation value under the *Vegetation Management Act 1999*
- Use of a covenant under the *Land Title Act 1994* or *Land Act 1994*

If appropriate HCPL will also consider the transfer of ownership to a conservation tenure (e.g. national park) if the relevant Queensland government departments agree to receive the offset lands. The receipt of offset lands by the Queensland government as a national park may be dependent on the condition of vegetation on the offset site, with the site more likely to become a national park if the offset site contains a large area of remnant vegetation and is well connected.

The mechanisms adopted to secure offsets will ultimately depend upon the approval of relevant government departments, and any landholders or parties with interests over the offset properties. It is noted that the legal protections available for offset properties are limited by the legal protection mechanisms available and agreed to by the relevant parties.

7.2.2 Managing and monitoring offset sites

Offset area management plans will be prepared for each offset site. The offset area management plans will provide extensive details on the management actions required on each offset site, an estimate of the costs of management and details regarding the reporting and monitoring of offset actions and outcomes.

A mixture of remnant vegetation (for Commonwealth offset requirements) and non-remnant vegetation (for state offset requirements) is likely to be present on offset sites. The offset area management plans will therefore include details on where active management is required to restore functional ecosystems, whilst also identifying appropriate management actions for those remnant areas that require more passive actions to maintain remnant vegetation status.

The management actions recommended will be dependent on the condition of vegetation and habitat, landscape characteristics of the offset site and active threats in the region. Management actions recommended are likely to include:

- Management of grazing;
- Weed suppression and control;
- Pest control;
- Management of fire;
- Fencing to restrict informal access; and
- Revegetation and supplementary planting (for areas of non-remnant vegetation).

The length of active management will be determined by the offset area management plan, and is likely to be influenced by the condition of vegetation, type of habitat and vegetation on site, as well as existing management issues and environmental factors such as soil types and climatic variability. It is anticipated that the active management of the offset site will be between 5-20 years, dependant on the above factors, and will be specified in the offset area management plan.

A management period of 5 years is justified for remnant vegetation in good condition, where the aim of management is to maintain the extent and condition of vegetation on the offset site. A management period of 20 years is more likely to be applied to areas of non-remnant vegetation requiring longer term rehabilitation. The period of 20 years allows for regular monitoring and reporting over a significant timeframe, and is consistent with the 'Offset Payment Calculation' contained with the QBOP (Appendix 7) which calculates offset payments using a 20 year timeline.

Finally, the offset area management plans will also include details on the reporting and monitoring requirements for the offset site. Annual reporting will be undertaken and will assess the progress of the offset site against the actions specified. The annual reports will be provided to regulators. A schedule to monitor the improvement in offset condition and habitat availability will also be outlined, with regular

vegetation and targeted species surveys to be conducted to measure improvement in offset condition and habitat available.

It is noted that the management of established offsets is finalised once legally binding mechanisms are registered on the land. This allows the obligations with respect to the provision of offsets to be transferred to landholders once legal binding mechanisms are established.

7.3 STAGING OFFSET REQUIREMENTS

Many components of the Project are to be developed over a project timeline of approximately 30 years, and while a significant proportion of the Project impacts will occur within a relatively short time, other impacts will not occur for several decades. As such HCPL propose to stage the delivery of the necessary offsets over the life of the Project. This approach allows the offsets for the Project to be sourced and secured at the appropriate time and accounts for the incremental nature of the Project. The delivery of the offset is defined for the Project as entering into agreements to establish an offset with the relevant landholder or organisation.

Although the delivery of offsets is proposed to be staged, the assessment of the impacts (and associated offsets) for each stage will take place before any impacts occur as a result of the Project. This will enable the Proponent to report on the total impacts of the Project by each stage before the commencement of any clearing, with the offsets required for each stage secured within the appropriate timeframe.

It is proposed that the staging of offsets occurs over set increments that reflect the clearing and operational cycles of the mine and rail projects. The timeframes recommended are contained in Table 33. An indicative mine sequence plan is provided in Figure 6 to demonstrate the progressive and incremental nature of mine impacts over time.

Table 33: Staged offset requirements

STAGE	YEARS	OFFSETS DELIVERED PER STAGE
1	1-5	All rail related offsets Stage 1 mine related offsets (yrs 1-5)
2	5-10	Stage 2 mine related offsets (yrs 5-10)
3	10-20	Stage 3 mine related offsets (yrs 10-20)
4	20-30	Stage 4 mine related offsets (yrs 20-30)

It is proposed that all rail related offsets be delivered under the first stage of offset delivery, along with mine related impacts for years 1-5. As this stage of the Project involves the most clearing, it is anticipated that a large proportion of the offsets for the Project will be delivered through this first stage. An indicative breakdown of impacts from both the rail and mine components for Stage 1 is provided below in Table 34. An indicative breakdown of impacts associated within Stages 2, 3 and 4 is included in Table 35.

Table 34: Indicative impact area (ha) resulting from Stage 1 works

IMPACT TYPE	COMMON NAME	PROPOSED RAILWAY IMPACT AREA (HA)	PROPOSED MINE IMPACT AREA (HA)
State Matters			
<i>Wetlands</i>		16.3	0
<i>Watercourses</i>		133.2	780

IMPACT TYPE	COMMON NAME	PROPOSED RAILWAY IMPACT AREA (HA)	PROPOSED MINE IMPACT AREA (HA)
<i>Connectivity</i>		395.9	3,484.50
<i>Endangered RE</i>		95.3	0
<i>Of Concern RE</i>		88.0	0
<i>Essential Habitat</i>		13.9	0
<i>Threshold RE</i>		14.8	68.5
<i>Chalinolobus picatus</i>	Little pied bat	0.0	6,872.6/461.9*
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	0.0	1.8/0.1*
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose		
<i>Bonamia dietrichiana</i>	Dietrich's morning glory	10.3/0.02*	0.0
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	425.3/373.9*	3,551.0/149.0*
<i>Marine Habitat</i>		2.4	0
Matters of NES			
<i>Matters of NES- TECs</i>		265.7	0
<i>Dichanthium queenslandicum</i>	King Bluegrass	89.0/32.9*	0.0
<i>Dichanthium setosum</i>		217.0/2,326.0*	0/5,685.0*
<i>Eucalyptus raveretiana</i>	Black Ironbox	28.9/1.9*	0.0
<i>Denisonia maculata</i>	Ornamental snake	251.2/192.9*	931.3/279.0*
<i>Egernia rugosa</i>	Yakka skink	811.8/649.8*	6,046.1/197.9*
<i>Paradelma orientalis</i>	Brigalow scaly-foot	189.2/272.0*	0.0
<i>Poephila cincta cincta</i>	Black-throated finch	778.2/595.9*	4,444.5/1,443.9*
<i>Migratory Shorebird Habitat</i>		16.3	0

* Indicates area of High Potential Habitat/Low Potential Habitat

Table 35: Indicative impact area (ha) resulting from Stage 2, 3 and 4 works

IMPACT TYPE	COMMON NAME	STAGE 2- PROPOSED MINE IMPACT AREA (HA)	STAGE 3- PROPOSED MINE IMPACT AREA (HA)	STAGE 4- PROPOSED MINE IMPACT AREA (HA)
State Matters				
<i>Wetlands</i>		0	0	0
<i>Watercourses</i>		73	146.5	192.4
<i>Connectivity</i>		401.4	763.1	817
<i>Endangered RE</i>		0	0	0
<i>Of Concern RE</i>		0	0	0
<i>Essential Habitat</i>		0	0	0
<i>Threshold RE</i>		0	0	0
<i>Chalinolobus picatus</i>	Little pied bat	643.2/219.0	1078.4/369.3	995.3/1,110.9
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	0	0	2.0/0
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose			
<i>Bonamia dietrichiana</i>	Dietrich's morning glory	0	0	0
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	226.5/73.8	772.3/264.0	915.4/977.3
<i>Marine Habitat</i>		0	0	0
Matters of NES				
<i>Matters of NES- TECs</i>		0	0	0

IMPACT TYPE	COMMON NAME	STAGE 2- PROPOSED MINE IMPACT AREA (HA)	STAGE 3- PROPOSED MINE IMPACT AREA (HA)	STAGE 4- PROPOSED MINE IMPACT AREA (HA)
<i>Dichanthium queenslandicum</i>	King Bluegrass	0	0	0
<i>Dichanthium setosum</i>		0/410.5	0/974.6	0/1,561.9
<i>Eucalyptus raveretiana</i>	Black Ironbox	0	0	0
<i>Denisonia maculata</i>	Ornamental snake	326.1/76.3	221.0/102.3	63.3/87.9
<i>Egernia rugosa</i>	Yakka skink	316.3/142.6	857.6/267.2	932.0/1,023.4
<i>Paradelma orientalis</i>	Brigalow scaly-foot	0	0	0
<i>Poephila cincta cincta</i>	Black-throated finch	636.0/225.8	1078.3/369.2	995.3/1,110.9
<i>Migratory Shorebird Habitat</i>		0	0	0

* Indicates area of High Potential Habitat/Low Potential Habitat

Stage 2 will also include a 5 year increment (years 5-10), while stages 3 and 4 will involve 10 year increments. As the amount of clearing for the Project will decline as the Project progresses it is anticipated that the size of offsets required will also decline accordingly.

HCPL propose to confirm the stage boundaries and impacts, and associated offset commitments, at least 12 months before the commencement of any action leading to impacts on native vegetation or habitat. At this time a revised biodiversity offset strategy, and associated offset package, will be provided for review to the relevant agencies. Once approved the biodiversity offsets will be secured for the stage in question using the process identified in Section 5 of this report.

7.4 REPORTING PROGRESS AND CONSULTATION WITH REGULATORS

The open and consultative approach to offsets will be maintained for the Project after the completion of this biodiversity offset strategy. Close consultation with both DERM and SEWPaC will continue during the refinement of habitat and vegetation mapping, the confirmation of project impacts, the development of the biodiversity offset package and delivery of the offsets for the Project.

Offsets proposed will be submitted to DERM and SEWPaC for review and comment, and the biodiversity offset package for the Project will only be finalised once the requirements of both DERM and SEWPaC are met.

DEEDI, DERM and SEWPaC will receive regular updates on the progress of offsets for the Project in the form of written advice. Meetings will be held with departments, if required.

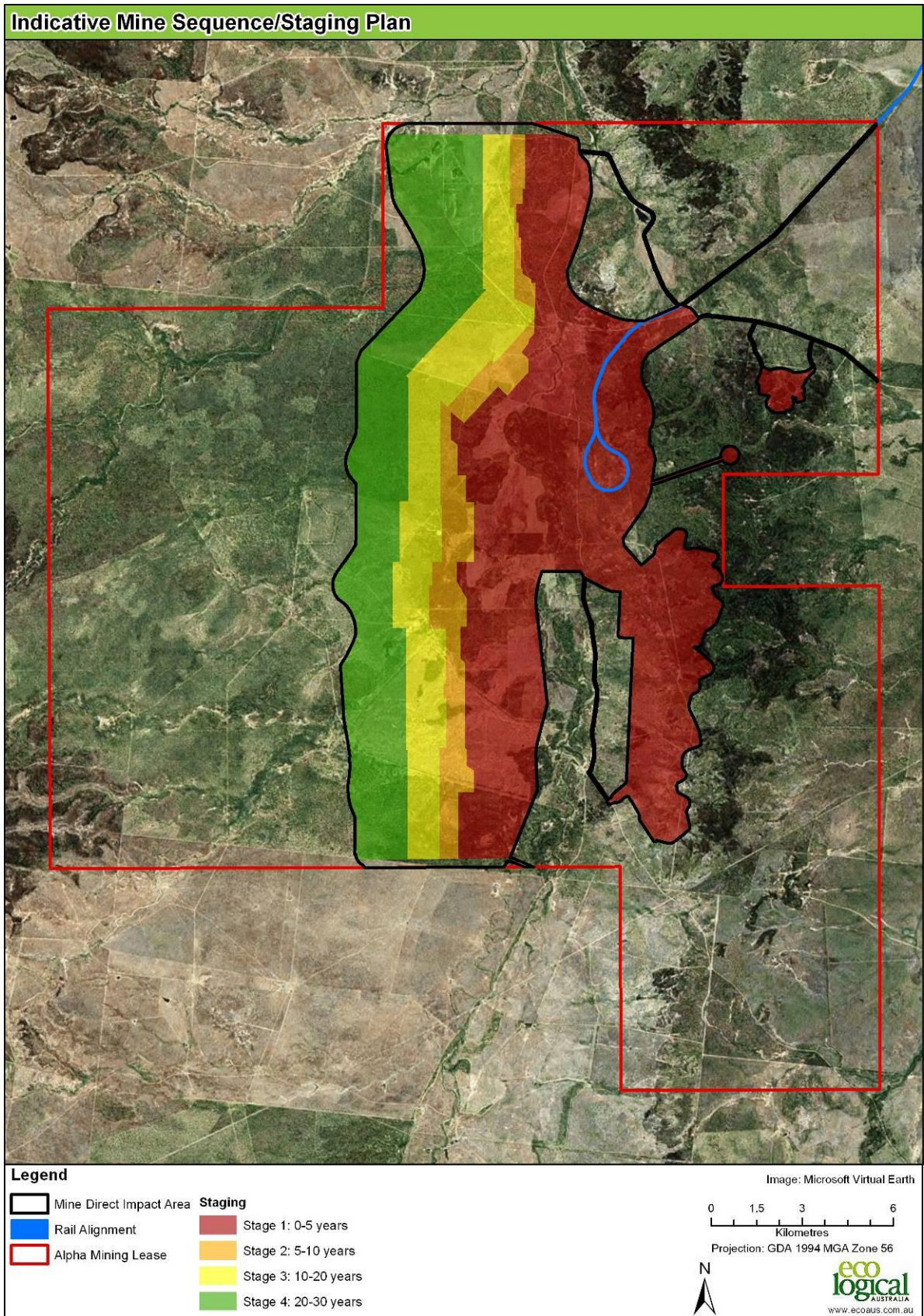


Figure 6: Indicative mine sequence/staging plan

7.5 BIODIVERSITY OFFSET TIMEFRAMES

As described in this report, the final unavoidable impacts requiring offsets for the Project are to be confirmed through on-site field verification and survey. The confirmation of both rail and mine impact footprints is also required. The timing of the final delivery of biodiversity offsets for the Project, therefore, is related to the availability of this data.

Other factors may also influence the timing of the Alpha Project, which are not related to the delivery of biodiversity offsets for the Project. Such factors may delay development of the mine or rail components of the Project, and therefore also delay the timing of offset liabilities.

For these reasons the timing commitments for the delivery of offsets for Stage 1 of the Project (Table 36) are related to HCPL making a final '*Decision to proceed*' with the Project. The *Decision to proceed* will be based on:

HCPL obtaining the land and key approvals in order to proceed with the commercial exploitation of coal and its transport to port facilities for export.

The timing listed for each component of the Project will not commence until the decision to proceed is made by HCPL.

The timeline for offset delivery has all offsets delivered for Stage 1 impacts within 36 months of the decision to proceed. This timeline is considered appropriate for the size of offset sites estimated for the Project, and with the complexities likely to be encountered while attempting to source and secure offsets. DEEDI, DERM and SEWPaC will receive quarterly updates on progress throughout this time.

Table 36: Timing commitments for offset delivery components (Stage 1)

OFFSET DELIVERY COMPONENT	TASKS REQUIRED	TIMING (FROM DECISION TO PROCEED)
Submit final Biodiversity Offset Strategy	<ul style="list-style-type: none"> • Undertake field verification of habitat and vegetation within Project footprint • Complete ecological equivalence assessments of impact sites • Complete surveys required under species prescriptions • Finalise impact footprints for Stage 1 • Calculate total Stage 1 project impacts and finalise offset liabilities 	Within 12 months of <u>decision to proceed</u>
Submit Biodiversity Offset Package for approval	<ul style="list-style-type: none"> • Finalise the offset mechanisms to be utilised for the Project • Identify those Project lands that will be secured as offsets, their location and contributions towards offset requirements • Identify those offset requirements that will be secured through the provision of other offset lands, including lands identified in the Galilee Basin Offset Strategy • Identify those offset requirements that will be secured through an offset transfer (i.e. offset broker) or offset payment • Identify any indirect offset proposals 	Within 24 months of <u>decision to proceed</u>
Legally secure offsets	<ul style="list-style-type: none"> • Complete ecological equivalence assessments for any direct offsets to be secured by HCPL • Complete on site targeted surveys to confirm threatened species habitat • All direct offset sites sourced by HCPL legally secured with completed offset area management plans • Complete contractual arrangements for any offsets to be sourced through an offset transfer • Complete contractual arrangements for any offsets to be sourced through an offset payment • All funding for indirect offsets will be in-place with the appropriate institution or department 	Within 36 months of <u>decision to proceed</u>

Offset delivery for subsequent stages will be reliant on the decision to proceed with the next stage. It is anticipated that the process to identify offset liabilities and source the required offsets will be more efficient, as offsets will already be secured for previous stages. The timelines adopted for each subsequent stage will be the same as those displayed in Table 36.

8 Offset values available

Investigations were conducted into several offset options available to satisfy both state and Commonwealth offset requirements for the Project. The purpose of these investigations was to determine and confirm the availability of offsets in the broader region, and provide confidence that the Project can source, secure and manage the offsets required for the residual impacts of the Project.

Analysis conducted for various offset options includes:

- The use of properties owned (or currently being purchased) by the Project;
- The use of offset brokers to provide the required offsets.

The approach to determine the availability of offsets is described below, followed by information on the values available to achieve the requirements of each offset liability for state and Commonwealth offset requirements.

8.1 METHOD USED TO ASSESS OFFSET VALUE OF PROJECT PROPERTIES

The investigation of the Project properties as potential offset sites was a logical initial step for the Project, and a desktop assessment of these properties was therefore conducted to determine the capacity of the Project properties to provide the indicative offsets required for the Project.

Several tasks were completed to conduct the desktop assessment of each of the Project properties. As a first step all current mining leases were excluded from the Project properties, with an assumption that these areas would not be able to be legally secured as offsets. In addition, as several of the Project properties also occur along the rail alignment, a 60m rail alignment buffer was excluded where the rail alignment passed through the Project properties.

A composite vegetation layer was then developed for the Project properties, providing information on both remnant and non-remnant vegetation within each property. As a base the remnant regional ecosystem data layers (Version 6.1) for Brigalow Belt North and Desert Uplands were clipped to each Project land boundary, providing the base remnant vegetation statistics across each of the Project properties.

A layer of non-remnant vegetation was then created for the remaining areas. Pre-cleared regional ecosystem information was combined with 2007 Foliage Projective Cover (FPC) data compiled by the Queensland Statewide Landcover and Trees Study (SLATS). This FPC data was used to distinguish areas with $\leq 5\%$ FPC (likely to be cleared or heavily degraded lands) from those areas with $\geq 6\%$ FPC (likely to be areas of regrowth). This information is important when identifying offset potential, as lands containing regrowth vegetation are more likely to meet state offset requirements than those lands containing $\leq 5\%$ FPC.

The composite vegetation layer was also used to identify the extent of EPBC listed Threatened Ecological Communities (TECs), including:

- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin;
- Brigalow (*Acacia harpophylla* dominant and co-dominant);

- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; and
- Weeping Myall Woodland.

To determine whether the Project properties could provide the necessary offsets several different approaches are required, depending on whether the offset is being secured to satisfy state or Commonwealth offset obligations.

State offset policies generally require the management of non-remnant vegetation to satisfy offset requirements, while Commonwealth offset requirements generally prefer remnant vegetation be secured and managed. Therefore, when assessing the potential of the Project properties non-remnant vegetation has been used for state offset requirements, and remnant vegetation for Commonwealth requirements.

The availability of species offsets utilised the 2012 species modelling conducted by GHD for the Project. This modelling identified areas of high and low potential habitat across the Project footprint and broader region, and was used to estimate the area of habitat available for each species on each Project property, and in some cases across the broader region.

Finally, for each feature requiring offset, the offset rules outlined in the BOP and PVMO were applied to determine whether an offset was available on the Project properties. Offset rules considered for each matter are provided in Table 23.

8.2 VALUES AVAILABLE TO ACHIEVE QUEENSLAND OFFSET REQUIREMENTS

The impacts of the Project, and indicative offsets required, were assessed against the Project properties for the state offset requirements. The offsets available to satisfy the state offset requirements of the PVMO, QBOP and FHMOP were assessed. The data is presented below for:

1. Regional ecosystems;
2. Other State significant biodiversity values and performance requirements;
3. Marine habitat; and
4. State listed threatened species.

8.2.1 Regional ecosystems

The results relating to the offset requirements for regional ecosystems, for both the mine and rail components of the project, are presented in Table 37 and Table 38. The tables outline the conservation status and the indicative offset liability for impacts to regional ecosystems and compare the relative proportion of offsets required, against the vegetation available for offset within the Project properties. In many circumstances, under the applicable Queensland offset policies, vegetation within the same broad vegetation group (BVG) can be provided as an offset. In these circumstances, multiple REs can be utilised to offset an impact to a particular RE. In these circumstances appropriate REs which are present in the Project properties are also identified. Please note that that Table 38 contains only those REs that are represented on the potential Project property offset sites. Offsets for those REs not represented are discussed in Appendix A.

The only RE requiring an offset associated with the impacts of the mine footprint (11.5.5b) is not available on the Project properties assessed, and was therefore provided to Ecofund to be included in the assessment of regional offset opportunities (Section 8.4 and Appendix A).

Table 37: Potential offsets available on project properties for regional ecosystems- mine related impacts

FEATURE NAME	INDICATIVE OFFSET LIABILITY (HA)	PROPERTY A			PROPERTY B			PROPERTY C		
		NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM
11.5.5b (Threshold RE)*	448.0	0	0	0	0	0	0	0	0	0

* Included in Ecofund analysis (Appendix A) due to the lack of suitable non-remnant vegetation on the Project properties

Table 38: Potential offsets available on project properties for regional ecosystems- rail related impacts

RE NAME	INDICATIVE OFFSET LIABILITY (HA)	CONSERVATION STATUS (NCA)	BVG	RES AVAILABLE THAT MEET OFFSET RULES	PROPERTY D			PROPERTY E			PROPERTY F			PROPERTY G		
					NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM
11.3.3*	59.6	OC	16c	11.3.3	1	1	367	0	0	0	0	0	0	0	0	0
11.3.4*	24.8	OC														
11.3.2	79.6	OC	17a	11.3.2	9	24	1,227	161	191	530	0	0	0	0	0	0
11.4.2	4	OC		11.4.2	0	0	0	174	44	180	0	0	0	0	0	0
11.11.13	19.2	OC	25a	11.3.1 11.4.9 11.9.1 11.9.5	12 0 0 0	116 0 0 0	260 0 0 0	0 2,023 32 2	0 1,126 50 3	0 313 183 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
11.12.21	3.2	E														
11.3.1	22.8	E														
11.4.8	229.2	E														
11.4.9	94.4	E														
11.5.16	1.2	E														
11.9.1	10.4	E														
11.9.5	0.4	E														
11.9.10	3.2	OC														
11.3.33*	31.6	OC														
11.3.5	14.4	LC (Threshold)	11.3.5	16	29	87	0	0	0	0	0	0	0	0	0	0

RE NAME	INDICATIVE OFFSET LIABILITY (HA)	CONSERVATION STATUS (NCA)	BVG	RES AVAILABLE THAT MEET OFFSET RULES	PROPERTY D			PROPERTY E			PROPERTY F			PROPERTY G		
					NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM	NON-REM (≤5%)	NON-REM (≥6%)	REM
11.4.5	1.6	OC														
11.4.6	6.4	OC														
11.3.34	14	OC	27a	11.3.34	0	0	0	0	0	0	216	31	637	0	0	0
11.3.13	0.8	OC	27c	11.3.13	0	0	0	0	0	0	67	2	2	52	2	1
11.8.11*	32.8	OC	30b	11.8.11	1	3	1,720	0	0	0	0	0	0	0	0	0
11.2.3*	41.2	OC	3b	11.2.3	0	0	0	0	0	0	0	0	0	0	0	34
11.12.10*	8.4	OC	9c	11.12.10	0	0	0	0	0	0	0	0	86	0	0	0

* Included in Ecofund analysis (Appendix A) due to the lack of suitable non-remnant vegetation on the Project properties

The results of the desktop assessment for the rail offset requirements were more positive. 16 of 29 REs requiring offset along the rail alignment are represented, to an adequate level, within the Project properties. 12 of these REs are represented within Property D and Property E, with large amounts of non-remnant ($\leq 5\%$, $\geq 6\%$) and remnant vegetation available. Property F and Property G provide the offsets for the other 4 REs, and again contain sufficient amounts of non-remnant and remnant vegetation.

Whilst remnant vegetation is available on the Project properties for other REs impacted, the offset rules under the PVMO and QBOP require non-remnant vegetation to provide the offset, and therefore offsets for these REs will be difficult to achieve on the Project properties. The offset requirements for these REs were therefore provided to Ecofund to perform a regional assessment of their abundance. The results of this assessment are contained in Section 8.4 and Appendix A.

8.2.2 Other state significant biodiversity values and performance requirements

An assessment was then completed for the other state offsets required under the PVMO and QBOP, including the PRs and SSBVs identified as being impacted by the Project. The outcome of the analysis is provided in Table 39 and Table 40.

QBOP

The SSBVs requiring offset for the impacts of the mine footprint (watercourse vegetation and connectivity) are well represented within the three Project properties assessed, however the vegetation present is predominantly remnant vegetation and therefore does not strictly meet the requirements of the QBOP. Additional analysis has therefore been conducted by Ecofund to confirm the presence of these features in the broader landscape (Appendix A).

PVMO

The offsets for PRs under the PVMO were then also considered. Potential offsets for Essential Habitat for both Ornamental snake and *Bonamia dietrichiana* were calculated on the Project Properties using data relevant to several of the criteria for each species provided by the 'essential habitat database'. The criteria selected for each species were based on analysis that could be conducted at a desktop level.

For *Bonamia dietrichiana* several criteria were included in the assessment, including selected REs, altitude (0-600m), and land within 50m of a drainage line. The assessment for Ornamental snake included selected REs, altitude (100-450m) and land within 50m of wetlands and/or drainage lines.

The results of the assessment suggest that essential habitat for each species is represented within the Project properties, particularly in Property D and Property E for Ornamental snake and Property F and Property G for *Bonamia dietrichiana*. To confirm the existence of the potential offset habitat the essential habitat factors listed in the essential habitat database for each species must be verified on site through field survey.

Impacts to 133.2ha of watercourse vegetation is potentially difficult to offset within the four Project properties along the rail line, with available non-remnant vegetation not able to meet all stream order types (Table 40). Additional analysis by Ecofund has been conducted (Appendix A) for this offset type. The offset requirement for connectivity vegetation is able to be achieved within 3 of the 4 Project properties investigated, including Property D, Property E and Property F.

Impacts, and associated offsets, for wetland vegetation cannot be achieved within the Project properties (Table 40). Again the offset requirement for this PR was provided to Ecofund to perform an assessment of abundance in the region (Section 8.4 and Appendix A).

Table 39: Potential offsets available on project properties for SSBV- mine related impacts

FEATURE NAME	INDICATIVE OFFSET LIABILITY (HA)	PROPERTY A			PROPERTY B			PROPERTY C		
		NON- REM (≤5%)	NON-REM (≥6%)	REM	NON- REM (≤5%)	NON-REM (≥6%)	REM	NON- REM (≤5%)	NON-REM (≥6%)	REM
Watercourse vegetation	4,767.6	2	7	2,954	445	122	878	255	291	1,300
1*	626.8	2	7	1,502	344	58	357	136	123	389
2*	334.4	0	0	552	64	30	71	9	40	279
3*	938.0	0	0	470	20	19	233	59	72	165
4*	22.8	0	0	431	16	15	218	51	52	264
5+*	2,845.6	0	0	0	0	0	0	1	5	202
Connectivity	21,864.0	0	0	15,218	850	153	2,288	668	939	757

* Included in Ecofund analysis (Appendix A) due to the lack of suitable non-remnant vegetation on the Project properties

Table 40: Potential offsets available on project properties for other PRs- rail related impacts

FEATURE NAME	INDICATIVE OFFSET LIABILITY (HA)	PROPERTY D			PROPERTY E			PROPERTY F			PROPERTY G		
		NON- REM (≤5%)	NON-REM (≥6%)	REMNANT	NON- REM (≤5%)	NON-REM (≥6%)	REMNANT	NON- REM (≤5%)	NON-REM (≥6%)	REMNANT	NON- REM (≤5%)	NON-REM (≥6%)	REMNANT
Essential Habitat	55.6												
<i>Ornamental snake</i>	16.8	82	144	0	42	191	6	0	0	0	0	2	0
<i>Bonamia dietrichiana</i>	38.8	0	0	0	0	0	0	71	44	57	0	0	68
Watercourse vegetation	532.8	141	194	543	7	11	239	733	258	1,633	238	64	235
1*	178.4	44	43	113	0	0	149	249	71	745	91	22	116
2*	111.2	9	13	28	7	11	90	118	64	239	32	3	50
3	89.6	26	55	15	0	0	0	318	110	416	68	23	44
4*	69.6	0	0	0	0	0	0	48	14	103	48	16	25
5+*	83.6	62	83	387	0	0	0	0	0	130	0	0	0
Wetland vegetation*	65.2	3	1	32	0	0	0	15	0	1	9	0	203
Connectivity	1,583.6	1,033	516	1,025	3,878	2,594	3,266	3,961	455	5,802	0	0	0

* Included in Ecofund analysis (Appendix A) due to the lack of suitable non-remnant vegetation on the Project properties

8.2.3 Marine habitat

Offsets for impacts to marine habitat were also identified across several properties on a like-for-like basis, with the required REs available within Properties F and G. Property G in particular contains a significant amount of offset vegetation, with over 200ha of remnant vegetation available (Table 41).

Table 41: Potential offsets available on project properties for marine habitat

FEATURE NAME	INDICATIVE OFFSET LIABILITY (HA)	PROPERTY F			PROPERTY G		
		NON-REM (≤5%)	NON-REM (≥6%)	REMNANT	NON-REM (≤5%)	NON-REM (≥6%)	REMNANT
Marine Plants (11.1.2, 11.2.2b and 11.1.4)	9.6	15	0	1	9	0	203

Should offsets not be achievable for the impacts to marine habitat an offset payment or indirect offsets may be considered to achieve the required offset outcome. Appendix A provides more information on indirect offset options to satisfy this offset requirement.

8.2.4 State listed threatened species

The total impact of the Project, and the offsets available, were assessed for each state listed threatened species across all offset sites. The results demonstrate that all species are adequately represented within the Project properties (Table 42), with the offset requirements met for all but one species- *Desmodium macrocarpum* (low potential habitat). Significant residual high potential habitat is available for the species, however, which is sufficient to satisfy the indicative offsets required for the species.

Table 42: Potential offsets available on Project properties for state listed threatened species habitat

SPECIES NAME	COMMON NAME	INDICATIVE OFFSET LIABILITY- HIGH POTENTIAL HABITAT (HA)	INDICATIVE OFFSET LIABILITY- LOW POTENTIAL HABITAT (HA)	POTENTIAL OFFSET AVAILABLE- HIGH POTENTIAL HABITAT (HA)	POTENTIAL OFFSET AVAILABLE- LOW POTENTIAL HABITAT (HA)
<i>Bonamia dietrichiana</i>	Dietrich's morning glory	31	0	42	0
<i>Chalinolobus picatus</i>	Little pied bat	38,358	8,643	44,887	17,008
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	17,672	5,514	21,139	5,258
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	15	0.2	805	255
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose				

In the event that the proposed offset properties have a short fall for a particular species, further assessment was undertaken for all state listed species to determine the availability of suitable habitat within the landscape. The species modelling completed for the project was queried to determine the amount of potential habitat for each species available in the broader landscape. To complete the assessment of habitat available existing mining leases, national parks estate and Project properties already considered were excluded from the assessment. In addition, only habitat available on lands lease (LL) or freehold (FH) tenure were included.

Based on this assessment, it is considered that sufficient habitat exists within the wider landscape that additional offsets are attainable if required. A summary of the indicative offset liability for state listed species, and the amount of suitable habitat within the wider landscape, are provided in Table 43.

Table 43 Availability of additional habitat within the landscape for state listed threatened species habitat

SPECIES NAME	COMMON NAME	INDICATIVE OFFSET LIABILITY- HIGH POTENTIAL HABITAT (HA)	INDICATIVE OFFSET LIABILITY- LOW POTENTIAL HABITAT (HA)	HIGH POTENTIAL HABITAT AVAILABLE IN LANDSCAPE	LOW POTENTIAL HABITAT AVAILABLE IN LANDSCAPE
<i>Bonamia dietrichiana</i>	Dietrich's morning glory	31	0	897	634
<i>Chalinolobus picatus</i>	Little pied bat	41,773	11,143	1,760,845	1,037,689
<i>Desmodium macrocarpum</i>	Large-podded Tick-trefoil	17,672	5,514	899,615	646,309
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	121	29	62,269	19,648
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose				

Finally, additional information on the distribution and propagation of threatened flora species is contained in Appendix B, with information relating to threatened fauna, their habitat and distribution contained in Appendix C.

8.3 VALUES AVAILABLE TO ACHIEVE COMMONWEALTH OFFSET REQUIREMENTS

An assessment of offsets required due to impacts to MNES was also completed. Details on TECs, threatened species and migratory shorebirds are provided below.

8.3.1 Threatened Ecological Communities

Three TECs are impacted by the rail alignment, including Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin, Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions. The availability of each TEC on the Project properties was assessed.

The results for EPBC listed TECs indicate that all TECs impacted by the rail alignment are available within the Project properties, with the amounts available consistent with the offset ratios to be applied (Table 44).

Property E contains a significant amount of remnant Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin and Brigalow (*Acacia harpophylla* dominant and co-dominant). The property also contains a significant amount of Weeping Myall Woodland, which while not impacted by the Project is an EPBC listed TEC and may be of interest in any offset package.

Large amounts of Brigalow (*Acacia harpophylla* dominant and co-dominant) is available within Property D, and offsets for Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions are available within Property D and Property G. Due to the lower amount of remnant Semi-evergreen vine thickets available on Property D and Property G, and the higher availability of non-remnant Semi-evergreen vine thickets, a mixture of remnant and non-remnant offsets may need to be sourced for this community. Where this is the case the higher offset ratio will be applied.

8.3.2 Commonwealth listed threatened species

The offset habitat available was then assessed for the seven EPBC listed threatened species impacted by the Project footprint. As with the state listed species the availability of high and low potential habitat was assessed across all Project properties identified as potential offset sites.

Three of the seven species identified as requiring offsets have adequate offset areas within the seven Project properties identified (Table 45). This includes offsets for both high and low potential habitat. The species with adequate offset habitat include the flora species *Dichanthium queenslandicum* and two reptiles- Yakka Skink and Brigalow Scaly-foot.

The Project properties do not contain adequate offsets for Ornamental Snake or Black-throated finch and do not contain adequate high potential habitat for both *Dichanthium setosum* and *Eucalyptus raveretiana*. To ensure that adequate offsets for the remaining species can be achieved in the landscape, an analysis of regional habitat mapping was conducted to determine habitat availability, the outcomes of which are presented in Table 46. Again, in order to complete this assessment existing mining leases, national parks estate and Project properties already considered were excluded from the assessment, and only habitat available on lands lease (LL) or freehold (FH) tenure was included.

The Ornamental Snake requires additional offset area for both high potential and low potential habitat. In total an additional 2,762ha of high potential habitat and 437ha of low potential habitat is required to fulfil the current indicative offset liability for the species. A review of the species modelling data for the region has mapped approximately 391,471ha of high potential habitat and 256,500ha of low potential habitat. The vast amount of habitat mapped in the region for this species suggests that the additional offsets described above will be achievable for the Project.

The shortfall for the Black-throated finch is for high potential offset habitat, with enough offset available to satisfy the low potential requirement. In total an additional 11,962ha of high potential habitat is required. Again, an analysis of the region wide habitat mapping was conducted to determine the likely availability of this additional offset requirement in the landscape. The species modelling indicates that over 1,300,000ha of high potential habitat is available in the region. This figure suggests that an additional offset for the species of 11,962ha will be achievable.

Dichanthium setosum and *Eucalyptus raveretiana* fall short for high potential habitat by 89ha and 93ha respectively. Analysis of the landscape determined that there is over 198,003ha of high potential habitat is available in the region for *Dichanthium setosum* and 36,694ha available for *Eucalyptus raveretiana*, suggesting that offsets for both species are achievable.

The landscape analysis indicates that significant amounts of habitat are available for all species within the wider landscape. As such, any unforeseen additional offsets that maybe required due to shortfalls on the Project properties are considered to be attainable.

Finally, as described previously, habitat mapping is not available for the Squatter Pigeon as the species was found not to have a strong association with Regional Ecosystems. Using the current total impacts for the Project, and the vulnerable species offset ratio of 4:1, an indicative offset requirement of 52,720 ha is estimated for the species. The amount of offset expected to be required for the Project for other impacts is likely to significantly exceed the indicative amount currently estimated for Squatter Pigeon. Therefore due to the wide ranging nature of the species, and the presence of the species across much of the broader region where offsets will be located, the offsets proposed for the Project will satisfy the offset requirements for the Squatter Pigeon, and will be confirmed through field verification of each offset site proposed.

Table 44: Potential offsets available on project properties for MNES (TECs)

TEC NAME	INDICATIVE OFFSET LIABILITY- REMNANT VEGETATION (5:1) (HA)	INDICATIVE OFFSET LIABILITY- NON- REMNANT VEGETATION (8:1) (HA)	PROPERTY D			PROPERTY E			PROPERTY F			PROPERTY G		
			NON- REM (≤5%)	NON- REM (≥6%)	REMNANT	NON- REM (≤5%)	NON- REM (≥6%)	REMNANT	NON- REM (≤5%)	NON- REM (≥6%)	REMNANT	NON- REM (≤5%)	NON- REM (≥6%)	REMNANT
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	755	1,208	0	0	0	1	3	1,712	0	0	0	0	0	0
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	503	804	2,064	1,189	497	12	116	260	0	0	0	0	0	0
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	71	113	129	83	9	0	0	0	0	0	0	0	0	34
Weeping Myall Woodland	0	0	159	188	529	9	24	1,227	0	0	0	0	0	0

Table 45: Potential offsets available on Project properties for MNES threatened species

SPECIES NAME	COMMON NAME	INDICATIVE OFFSET LIABILITY- HIGH POTENTIAL HABITAT (HA)	INDICATIVE OFFSET LIABILITY- LOW POTENTIAL HABITAT (HA)	POTENTIAL OFFSET AVAILABLE- HIGH POTENTIAL HABITAT (HA)	POTENTIAL OFFSET AVAILABLE- LOW POTENTIAL HABITAT (HA)
<i>Dichanthium queenslandicum</i>	King Bluegrass	356	132	836	266
<i>Dichanthium setosum</i>		868	43,832	779	58,489
<i>Eucalyptus raveretiana</i>	Black Ironbox	116	8	23	353
<i>Denisonia maculata</i>	Ornamental Snake	7,176	2,954	4,414	2,517
<i>Egernia rugosa</i>	Yakka Skink	35,855	9,124	43,562	16,828
<i>Paradelma orientalis</i>	Brigalow Scaly-foot	757	1,088	765	1,397
<i>Poephila cincta cincta</i>	Black-throated Finch	47,594	22,473	35,631	23,858

Table 46: Availability of additional habitat within the landscape for MNES threatened species

SPECIES NAME	COMMON NAME	INDICATIVE OFFSET LIABILITY (HIGH POTENTIAL HABITAT)	INDICATIVE OFFSET LIABILITY (LOW POTENTIAL HABITAT)	HIGH POTENTIAL HABITAT AVAILABLE IN LANDSCAPE	LOW POTENTIAL HABITAT AVAILABLE IN LANDSCAPE
<i>Dichanthium queenslandicum</i>	King Bluegrass	356	132	37,024	41,884
<i>Dichanthium setosum</i>		868	43,832	197,833	3,981,210
<i>Eucalyptus raveretiana</i>	Black Ironbox	116	8	36,674	2,880
<i>Denisonia maculata</i>	Ornamental Snake	7,176	2,954	391,247	222,803
<i>Egernia rugosa</i>	Yakka Skink	35,855	9,124	1,649,101	1,053,484
<i>Paradelma orientalis</i>	Brigalow Scaly-foot	757	1,088	655,730	425,177
<i>Poephila cincta cincta</i>	Black-throated Finch	47,594	22,473	1,346,029	1,269,366

8.3.3 Migratory shorebirds

Although not confirmed through on-site survey, habitat is present which may support migratory shorebirds on several of the offset sites, particularly the property situated on the coast (Property G). Evidence suggests that should migratory shorebirds be present an offset of sufficient size should be available (Table 47).

Should additional offsets be required for migratory shorebirds, additional wetland habitat has been identified by Ecofund. See Appendix A for more detailed information.

Table 47: Potential offsets available on project properties for MNES migratory shorebirds

FEATURE NAME	INDICATIVE OFFSET LIABILITY (HA)	PROPERTY F			PROPERTY G		
		NON-REM (≤5%)	NON-REM (≥6%)	REMNANT	NON-REM (≤5%)	NON-REM (≥6%)	REMNANT
Migratory Shorebirds	81.5	15	0	1	9	0	203

8.4 INVESTIGATIONS CONDUCTED BY ECOFUND

The results of the assessment of the Project properties identified several offset types that were not available, or which may not be available in the required amount. In order to have confidence that these offset types were available in the broader landscape, and that offsets could be achieved for these values, Ecofund were engaged to conduct an assessment of these values across the broader landscape. The values assessed by Ecofund are provided in Table 48.

Table 48: Offset values assessed by Ecofund

PROJECT COMPONENT	RE/FEATURE NAME	IMPACT AREA (HA)
Mine (QBOP)	11.5.5b	112
	Stream Order 1	156.7
	Stream Order 2	83.6
	Stream Order 3	234.5
	Stream Order 4	5.7
	Stream Order 5	711.4
	Connectivity	5,466.0
Rail (PVMO)	11.3.3	14.9
	11.3.33	7.9
	11.3.4	6.2
	11.11.10	0.1
	11.5.5	2.5
	11.5.10	6.1
	11.3.21	0.1
	11.4.11	7.4
	11.9.12	4.8
	11.8.11	8.2
	11.2.3	10.3
	11.5.15	1.3

PROJECT COMPONENT	RE/FEATURE NAME	IMPACT AREA (HA)
	11.12.10	2.1
	Wetland vegetation	16.3
	Stream Order 1	44.6
	Stream Order 2	27.8
	Stream Order 4	17.4
	Stream Order 5	20.9

The full report produced by Ecofund is provided in Appendix A. The summary contained in the report concludes (Ecofund 2012):

Ecofund has assessed the potential offset availability for the impact values within the Brigalow Belt Bioregion and Desert Uplands bioregion. The results of the desktop assessment are summarised for each impacted value in terms of hectares of potential offset areas with FPC > 6%, and the number of lots that contain these areas.

The results of this desktop assessment indicate that all mine and rail related impact values (with the exception of 11.5.5b which cannot be determined at a desktop level) have some potential to be offset within the relevant bioregion. For the majority of impacted values there are likely to be ample areas available for use as environmental offsets. However, three of the REs (11.5.10, 11.2.3 and 11.12.10) may be more difficult to offset as there are only 20 properties or less within the bioregion which contain 1 ha or greater suitable areas of the relevant environmental value. In addition, due to the very low presence of mapped RE 11.5.5b, potential offset availability cannot be determined at a desktop level, and therefore field assessments are required to determine the availability of offsets to counterbalance impacts to this value.

While compliant offset areas may be available for each impact value, the capacity to secure offsets will ultimately be dependent on a number of factors including:

- *the verification of environmental values on the ground, including ecological equivalence assessments and subsequent offset area requirements.*
- *regulatory support in terms of compliance with relevant policy/policies*
- *a range of non-environmental issues such as land use, landholder agreement, cost, tenure issues, mining and energy interests, and native title.*

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Appendix A: The Alpha Coal Project – Potential Offset Availability for Residual Offset Requirements (Prepared by Ecofund)

THE ALPHA COAL PROJECT – POTENTIAL OFFSET AVAILABILITY FOR RESIDUAL OFFSET REQUIREMENTS

PROJECT	Alpha Coal Project
PREPARED FOR	Hancock Coal Pty Ltd
PREPARED BY	Biodiversity and Carbon
DATE	May 2012



COMMERCIAL IN CONFIDENCE

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ABBREVIATIONS AND ACRONYMS

BVG	broad vegetation group
DERM	Department of Environment and Resource Management
EIS	environmental impact statement
FPC	Foliage Projective Cover
HCPL	Hancock Coal Pty Ltd
PVMO 2011	<i>Policy for Vegetation Management Offsets Version 3</i>
QBOP 2011	<i>Queensland Biodiversity Offset Policy Version 1</i>
RE	regional ecosystem
SEIS	supplementary EIS
the project	the Alpha Coal Project
the strategy	Alpha Coal Project Biodiversity Offset Strategy
VM Act	<i>Vegetation Management Act 1999</i>

1 BACKGROUND

1.1 The Alpha Coal Project

Hancock Coal Pty Ltd (HCPL) proposes to develop the Alpha Coal Project (the project) in the Galilee Basin in Central Queensland. The project involves the development of a 30 million tonne per annum open cut thermal coal mine and the construction of a single track 495 kilometre railway line for the transportation of coal to the Port of Abbot Point (located 25 km north of Bowen; **Figure 1**).

On 21 October 2008 the project was declared a 'significant project for which an environmental impact statement (EIS) is required' in accordance with the *State Development and Public Works Organisation Act 1971* (Qld). On 13 January 2009 the project was declared a 'controlled action' for potential impacts on matters of national environmental significance, triggering assessment under the *Environment Protection and Biodiversity Conservation Act 1999*. The relevant controlling provisions include:

- World Heritage properties (section 12 & 15A)
- National Heritage places (section 15B & 15C)
- Listed threatened species and communities (section 18 & 18A)
- Listed migratory species (sections 20 & 20A).

The EIS process was accredited under a bilateral agreement to address Queensland and Australian Government requirements. HCPL has prepared an EIS and supplementary EIS (SEIS) for the project in accordance with the Terms of Reference. The EIS and SEIS outline the potential environmental impacts resulting from the mine and rail developments and measures to be undertaken to avoid, minimise and mitigate impacts over the life of the project.

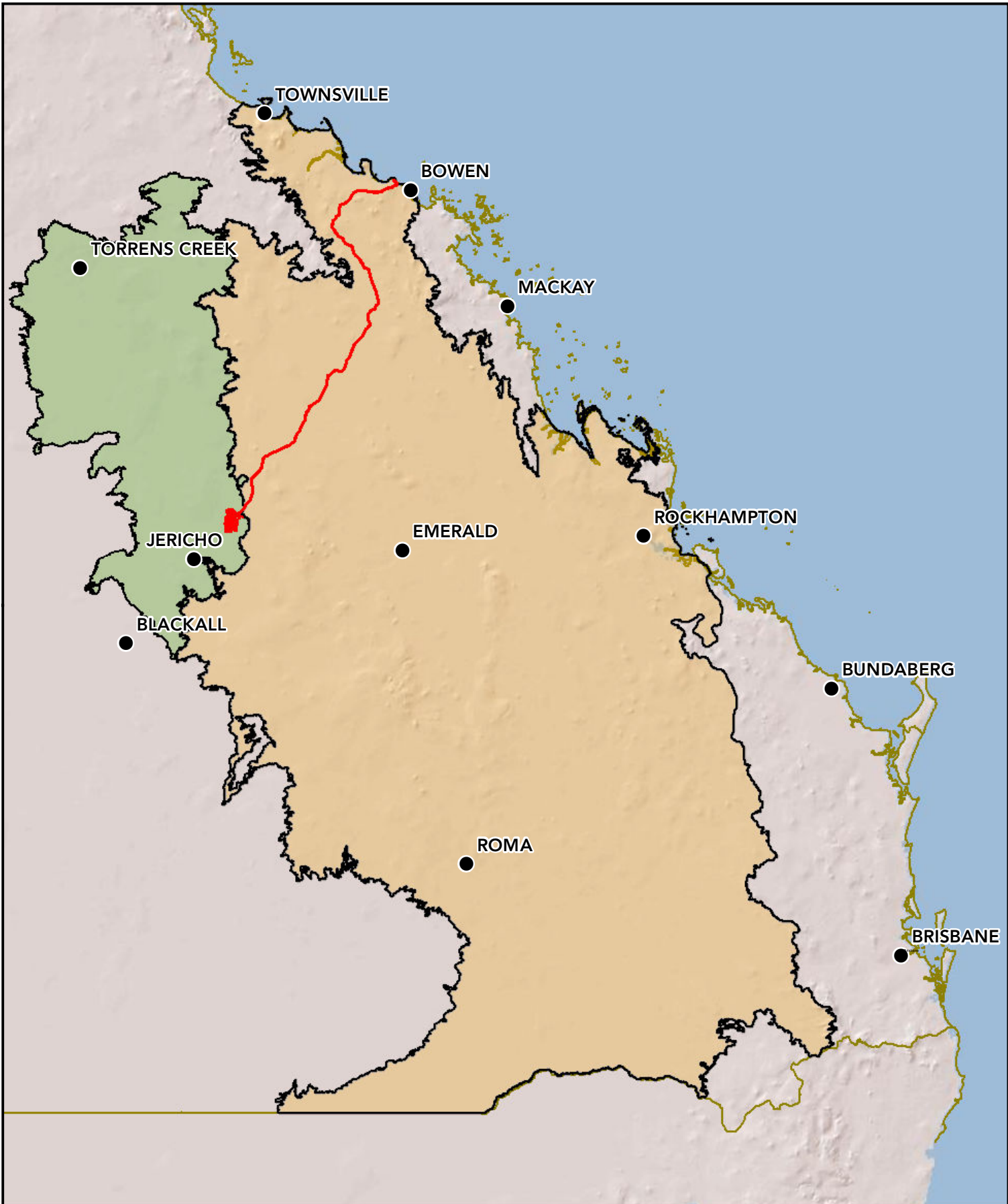
While every effort has been made by HCPL to avoid, minimise and mitigate impacts to significant environmental values, the EIS and SEIS process has determined unavoidable impacts will result from the development of the project. Consequently, HCPL is committed to offsetting these impacts in accordance with relevant Queensland and Australian Government offset policies.

1.2 Alpha Coal Project Biodiversity Offset Strategy

To compliment the Alpha Coal Project Biodiversity Offset Strategy (the strategy), Ecofund has been engaged to prepare a Potential Offset Availability report addressing residual offset requirements¹ of the project including:

- analysis of the residual offset requirements of the project under the
 - » *Policy for Vegetation Management Offsets Version 3* (PVMO 2011)
 - » *Queensland Biodiversity Offset Policy Version 1* (QBOP 2011)
- development of a method to identify the availability of offsets in the landscape based on the criteria of the relevant offset policy
- data analysis and mapping of potential offset availability.

¹ Residual offset requirements are associated with the impacts listed in Table 1 that are not addressed in the Alpha Coal Project Biodiversity Offset Strategy



Hancock Coal Pty Ltd - Alpha Coal Project

LOCATION DIAGRAM

Figure 1: Location of Alpha Coal Project Infrastructure and Offset Study Areas

DATA SOURCE:

Alpha Coal Project Infrastructure - WorleyParsons
 (Date received: 17/02/2012)
 Brigalow Belt North (IBRA V4.1) NB area is based on the
 biosubregions mapped by DERM that fall into the IBRA
 Brigalow Belt North Region
 Biogeographic Regions - Queensland (2010) © State of Qld
 (Department of Environment and Resource Management) 2012

- Rail alignment and Alpha Mine footprint
- Brigalow Belt Bioregion
- Desert Uplands Bioregion



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2 METHODS

2.1 Impacts of the Alpha Coal Project

Impacts of the project addressed in this report were provided to Ecofund by Eco Logical Australia in March 2012 and by HCPL in April 2012.

2.2 Desktop assessment of offset availability

Ecofund has estimated the potential offset areas available for each residual offset requirement based on a desktop assessment. Offset requirements for each impact value were determined based on the relevant criteria outlined in the PVMO 2011 and the QBOP 2011. The results of the assessment are presented in terms of hectares of 'potential offset areas with Foliage Projective Cover data (FPC; Department of Environment and Resource Management (DERM) 2008) $\geq 6\%$ ' that are available within the study areas. The total number of lots that contain these potential offset areas is also provided.

2.2.1 Study areas

This desktop assessment was based on two study areas as the rail and mine are located in two different bioregions:

- For all rail-related impact values listed in **Table 1**, Ecofund assessed the potential offset availability within the Brigalow Belt Bioregion (as defined by the Bioregional Map of Queensland Version 3).
- For all mine-related impact values listed in **Table 1**, Ecofund assessed the potential offset availability within the Desert Uplands Bioregion (as defined by the Bioregional Map of Queensland Version 3).

2.2.2 Potential offset areas

Statistics provided are based on lots on plans (rather than properties which may consist of more than one lot). Potential offset areas have been identified where all of the following apply:

- lot size is greater than 2 ha
- lot tenure is lands lease (LL) or freehold (FH) – using the Queensland Digital Cadastral Database (DCDB); DERM, updated 25 September 2011
- contain suitable mapped environmental values as per the relevant policy criteria – note that results for impacts on regional ecosystems include areas of relevant regional ecosystems (REs) listed as dominant (RE1) and also subdominant (RE2 only)
- contain areas mapped as non-remnant, compliant high value regrowth vegetation or category X on a property map of assessable vegetation.
- mapped with FPC $\geq 6\%$ (except for grassland REs – see Section 2.2.4).

Lots which contain potential offset areas smaller than 1 ha have been excluded from results, as these areas would not be practical to secure as environmental offsets.

Note that potential offset areas do not include high value regrowth that is an endangered RE on freehold or indigenous land, an endangered or of concern RE on leasehold land, essential regrowth habitat or wetland protection areas. Lots mapped as Queensland Estate and other land (DERM 2011), and parts of lots declared as nature refuges (DERM 2011), strategic cropping trigger areas (DERM 2011) or lots containing existing mining leases (Department of Employment, Economic Development and Innovation, current as of November 2011) have also been excluded.

2.2.3 Notes on methods for RE 11.5.5b

The data analysis indicated that there is only one polygon which is mapped as containing RE 11.5.5b. This polygon contains RE 11.5.5b as a subdominant RE (RE2) and crosses two lots – only one of which would be suitable for use as an offset (suitable land tenure and mapped as Category X on a PMAV). Further analysis indicated that there are no other lots mapped as containing RE 11.5.5b as RE1, RE2, RE3, RE4 or RE5 in any remnant, high value regrowth or non-remnant areas. This suggests that this RE is not well represented in the RE mapping, and on-ground assessments will be required to identify suitable offset areas. This desktop search will provide target areas for on-ground assessment based on the assumption that RE 11.5.5 may contain on ground values analogous with RE 11.5.5b.

2.2.4 Notes on methods for grassland REs

Potential offset areas for impacts to grassland REs (11.3.21, 11.4.11, 11.9.12, 11.8.11) have been sourced from suitable areas as described in Section 2.2.2, with the exception of FPC data. FPC data has not been applied to for the analysis of offsets for grassland REs as it refers to the percentage of ground area occupied by the vertical projection of foliage (i.e. woody vegetation) which is not applicable in ecosystems dominated by grasses.

2.2.5 Notes on methods for significant wetlands

Potential offset areas for impacts to significant wetlands have been sourced from suitable areas as described in Section 2.2.2, using two sets of mapped environmental values to comply with the definition of a 'significant wetland':

- Great Barrier Reef (GBR) regrowth wetlands data and GBR wetlands data have been used for parts of the bioregion within GBR catchments
- wetland REs listed in the Regional Vegetation Management Code Brigalow Belt and New England Tablelands Bioregions (version 2) have been used for parts of the bioregion outside of GBR catchments.

2.2.6 Notes on methods for watercourse vegetation and connectivity

Offset availability for watercourse vegetation was determined using two methods. Firstly, the total length of streams of suitable stream order in the study area was calculated. Secondly, potential offset areas (sourced as described in Section 2.2.2) were identified using REs on landzone 3 (Quaternary alluvial systems) as these REs are by definition associated with river and creek flats.

Offset availability for connectivity was determined by calculating potential offset areas (as described in Section 2.2.2) within the Biodiversity Planning Assessment State and Regional corridor mapping within the study area.

2.2.7 Limitations

The following limitations apply to the potential offset areas identified in this report:

- This is a desktop assessment only. The offset potential of the identified areas is subject to on-ground verification of environmental values.
- Potential offset areas may include areas which have conflicting land uses, such as agriculture, other mining interests, local government recreational parks or conservation areas, large urban blocks and lots covered by existing development application approvals. However, this has been minimised by integrating the FPC $\geq 6\%$ criterion.
- Some areas may include non-compliant high value regrowth vegetation which is within a stream protection zone or on a slope greater than 12%.
- Some areas may not meet the policy requirement to be greater than 10 ha or connected to existing remnant vegetation that is in total greater than 10 ha.
- Some areas may be cleared and therefore may not meet the policy requirement of containing functional REs. Other areas may be partially cleared and require extensive revegetation. However, this has been minimised by integrating the FPC $\geq 6\%$ criterion.
- Ecological Equivalence Assessments will need to be undertaken to determine the suitability of the offset and the size of the offset required for each impact.
- Landowners who own or lease lots containing the identified potential offset areas may not be interested in using parts of their land as an environmental offset.

3 IMPACTS

The project impacts outlined in **Table 1** will require offsets under the relevant Queensland Government offset policies. This includes impacts on threshold REs, endangered and of concern grassland REs, of concern REs, freshwater wetlands, watercourse vegetation and connectivity. The applicable offset policy to the impact value is also provided in **Table 1**.

Table 1: Impacts of the project identified in the strategy as difficult to address

IMPACTED VALUE	DESCRIPTION	BVG ²	IMPACT AREA (HA)	CONSERVATION STATUS (VM ACT ³)	PROJECT COMPONENT	BIOREGION	APPLICABLE OFFSET POLICY
11.5.5b (outlier in Bioregion 10)	<i>Callitris glaucophylla</i> , <i>Eucalyptus melanophloia</i> , <i>Eucalyptus populnea</i> +/- <i>Corymbia tessellaris</i> woodlands	20a	112.00	Least concern (Threshold)	Mine	Desert Uplands (outlier)	QBOP 2011
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	16c	14.90	Of concern	Rail	Brigalow Belt	PVMO 2011
11.3.33	<i>Eremophila mitchellii</i> open woodland on alluvial plains	26a	7.90	Of concern	Rail	Brigalow Belt	PVMO 2011
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> tall woodland on alluvial plains	16c	6.20	Of concern	Rail	Brigalow Belt	PVMO 2011
11.11.10	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanic	17b	0.10	Of concern	Rail	Brigalow Belt	PVMO 2011
11.5.5	<i>Eucalyptus melanophloia</i> , <i>Callitris glaucophylla</i> woodland on Cainozoic sand plains/remnant surfaces. Deep red sands	17b	2.50	Least concern (Threshold)	Rail	Brigalow Belt	PVMO 2011
11.5.10	<i>Melaleuca tamariscina</i> shrubland on Cainozoic sand plains/remnant surfaces	21b	6.10	Of concern	Rail	Brigalow Belt	PVMO 2011
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrebla spp.</i> grassland on alluvial plains. Cracking clay soils	30a	0.10	Endangered	Rail	Brigalow Belt	PVMO 2011
11.4.11	<i>Dichanthium sericeum</i> , <i>Astrebla spp.</i> and patchy <i>Acacia harpophylla</i> , <i>Eucalyptus coolabah</i> on Cainozoic clay plains	30b	7.40	Of concern (Threshold)	Rail	Brigalow Belt	PVMO 2011

² Broad vegetation group as defined in PVMO 2011

³ *Vegetation Management Act 1999*

IMPACTED VALUE	DESCRIPTION	BVG ²	IMPACT AREA (HA)	CONSERVATION STATUS (VM ACT ³)	PROJECT COMPONENT	BIOREGION	APPLICABLE OFFSET POLICY
11.9.12	<i>Dichanthium sericeum</i> grassland with clumps of <i>Acacia harpophylla</i> on fine-grained sedimentary rocks	30b	4.80	Endangered	Rail	Brigalow Belt	PVMO 2011
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	30b	8.20	Of concern	Rail	Brigalow Belt	PVMO 2011
11.2.3	Microphyll vine forest (beach scrub) on sandy beach ridges	3b	10.30	Of concern	Rail	Brigalow Belt	PVMO 2011
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains/remnant surfaces	7a	1.30	Least concern (Threshold)	Rail	Brigalow Belt	PVMO 2011
11.12.10	<i>Corymbia clarksoniana</i> woodland on igneous rocks	9c	2.10	Of concern	Rail	Brigalow Belt	PVMO 2011
Wetland vegetation	Freshwater wetlands	-	16.30	-	Rail	Brigalow Belt	PVMO 2011
Watercourse vegetation	Stream order 1	-	44.60	-	Rail	Brigalow Belt	PVMO 2011
	Stream order 2	-	27.80	-	Rail	Brigalow Belt	PVMO 2011
	Stream order 4	-	17.40	-	Rail	Brigalow Belt	PVMO 2011
	Stream order 5	-	20.90	-	Rail	Brigalow Belt	PVMO 2011
	Stream order 1	-	156.70	-	Mine	Desert Uplands	QBOP 2011
	Stream order 2	-	83.60	-	Mine	Desert Uplands	QBOP 2011
	Stream order 3	-	234.50	-	Mine	Desert Uplands	QBOP 2011
	Stream order 4	-	5.70	-	Mine	Desert Uplands	QBOP 2011
Connectivity	-	-	5466.00	-	Mine	Desert Uplands	QBOP 2011

4 POTENTIAL OFFSET AVAILABILITY

4.1 Potential offset availability within Brigalow Belt Bioregion

Potential offset availability within the Brigalow Belt Bioregion for rail-related impacts on regional ecosystems and wetland vegetation are presented in **Table 2** and **Figure 2**. Potential offset availability within the Brigalow Belt Bioregion for rail-related impacts on watercourse vegetation are presented in **Table 3** and **Figure 3**. Potential offset areas are described in areas (hectares) of policy compliant land in terms of 'potential offset areas with FPC \geq 6%.' The total number of lots that contain these potential offset areas is also provided.

This desktop assessment indicates that all rail-related impact values (with the exception of 11.5.5b which cannot be determined at a desktop level) have some potential to be offset within the Brigalow Belt Bioregion. However, three of the REs (11.5.10, 11.2.3 and 11.12.10) may be more difficult to offset as there are only 20 properties or less within the bioregion which contain 1 ha or greater suitable areas of the relevant environmental value. In addition, as discussed in Section 2.2.3, RE 11.5.5b does not appear to be well represented on the RE mapping. Therefore ground-truthing of areas mapped as RE 11.5.5 will be required to identify potential offset areas containing on-ground values analogous with RE 11.5.5b.

Table 2: Potential offset availability for impacts on regional ecosystems and wetland vegetation

IMPACTED VALUE	BVG	CONSERVATION STATUS	IMPACT AREA (HA)	COMPLIANT REs	POTENTIAL OFFSET AREAS FPC \geq 6% (HA)	TOTAL # LOTS
RE 11.5.5b ⁴ (outlier in Bioregion 10)	20a	Least concern (Threshold)	112.00	11.5.5b	65.77	1
				11.5.5 (subject to ground-truthing)	49,288.64	832
RE 11.3.3	16c	Of concern	14.90	11.3.15 11.3.28 11.3.3	225,445.32	7,908
RE 11.3.4	16c	Of concern	6.20	11.3.38 11.3.4		
RE 11.3.33	26a	Of concern	7.90	11.4.5 11.4.6 11.3.33	61,537.07	189
RE 11.11.10	17b	Of concern	0.10	11.11.10	56,949.44	912
RE 11.5.5	17b	Least concern (Threshold)	2.50	11.5.5	49,288.64	832
RE 11.5.10	21b	Of concern	6.10	11.5.10	229.72	20
RE 11.3.21	30a	Endangered	0.10	11.3.21	29,170.50 ⁵	883
RE 11.4.11	30b	Of concern (Threshold)	7.40	11.4.11	36,549.02 ⁵	84
RE 11.9.12	30b	Endangered	4.80	11.9.12	7,404.07 ⁵	97
RE 11.8.11	30b	Of concern	8.20	11.11.17 11.4.11 11.8.11 11.9.12	80,665.59 ⁵	1,016
RE 11.2.3	3b	Of concern	10.30	11.2.3	50.77	18

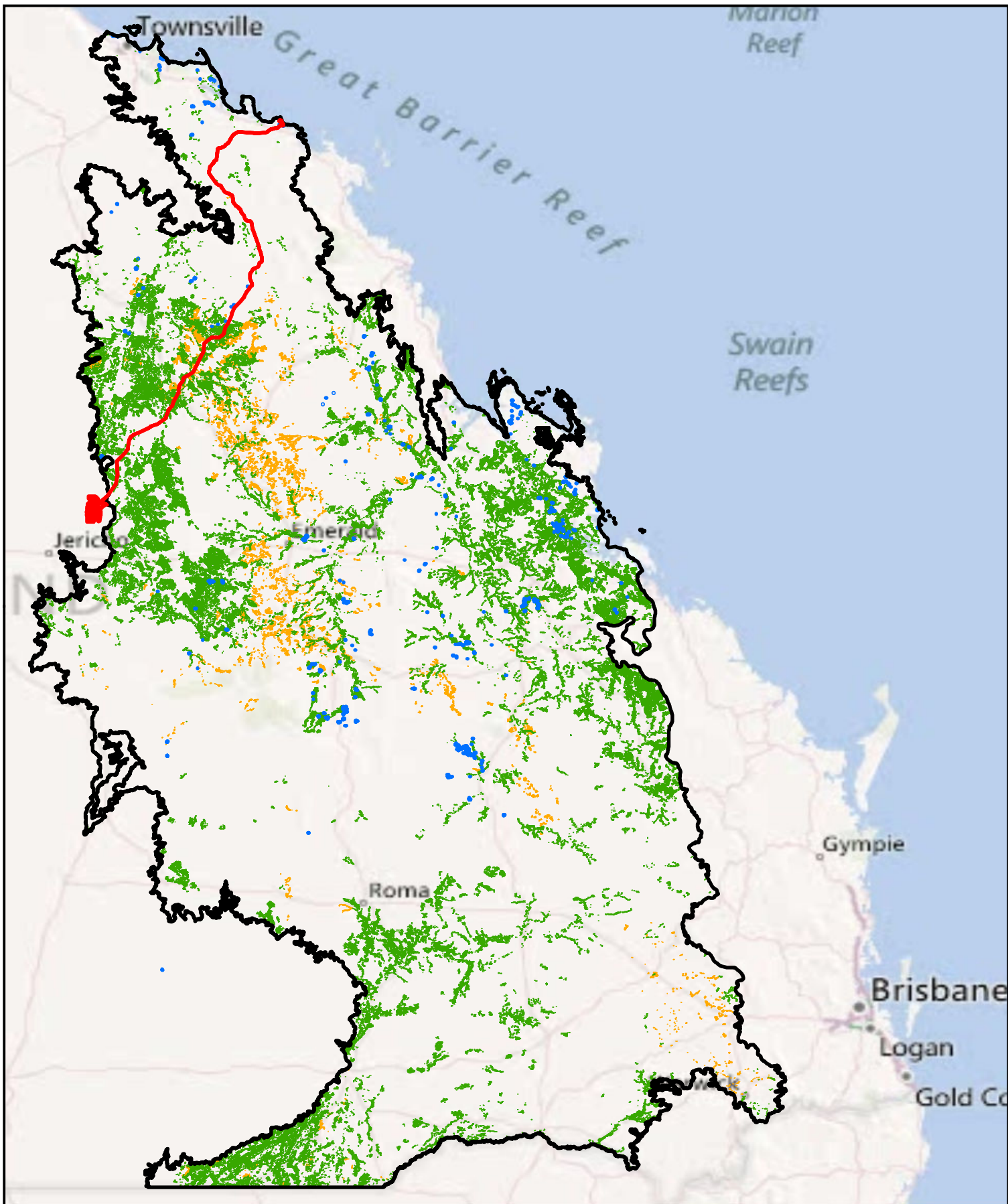
⁴ Refer to Section 2.2.3 for further details on the assessment of RE 11.5.5b.

⁵ Note that FPC data has not been considered when calculating potential offset availability for grassland REs (see Section 2.2.4).

IMPACTED VALUE	BVG	CONSERVATION STATUS	IMPACT AREA (HA)	COMPLIANT REs	POTENTIAL OFFSET AREAS FPC ≥ 6% (HA)	TOTAL # LOTS
RE 11.5.15	7a	Least concern (Threshold)	1.30	11.5.15	5,485.64	206
RE 11.12.10	9c	Of concern	2.10	11.12.10	130.16	7
Wetland Vegetation	NA	NA	16.30	Offsetable GBR or GBR regrowth wetlands (within GBR catchments); or REs 11.2.4, 11.3.22, 11.3.27, 11.5.17, 11.10.14 (outside GBR catchments)	1,644.16	168

Table 3: Potential offset availability for impacts on watercourse vegetation

IMPACTED VALUE	STREAM ORDER	IMPACT AREA (HA)	OFFSET CRITERIA – METHOD 1	TOTAL STREAM LENGTH (KM)	OFFSET CRITERIA – METHOD 2	POTENTIAL OFFSET AREAS FPC ≥ 6% (HA)	TOTAL # LOTS
Watercourse vegetation	1	44.60	Length of watercourses ≥ stream order 1 in Bioregion	340,622.51	Landzone 3 REs	863,794.55	18,657
Watercourse vegetation	2	27.80	Length of watercourses ≥ stream order 2 in Bioregion	148,267.40			
Watercourse vegetation	4	17.40	Length of watercourses ≥ stream order 4 in Bioregion	47,661.47			
Watercourse vegetation	5	20.90	Length of watercourses ≥ stream order 5 in Bioregion	26,394.16			



Hancock Coal Pty Ltd - Alpha Coal Project

LOCATION DIAGRAM

Figure 2:
Brigalow Belt Bioregion
Potential Offset Areas:
Regional Ecosystems
and Wetlands

- Infrastructure footprint
- Brigalow Belt Bioregion
- Potential regional ecosystem offset areas
- Potential regional ecosystem offset areas (grassland)
- Potential wetland offset areas



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 Kilometres
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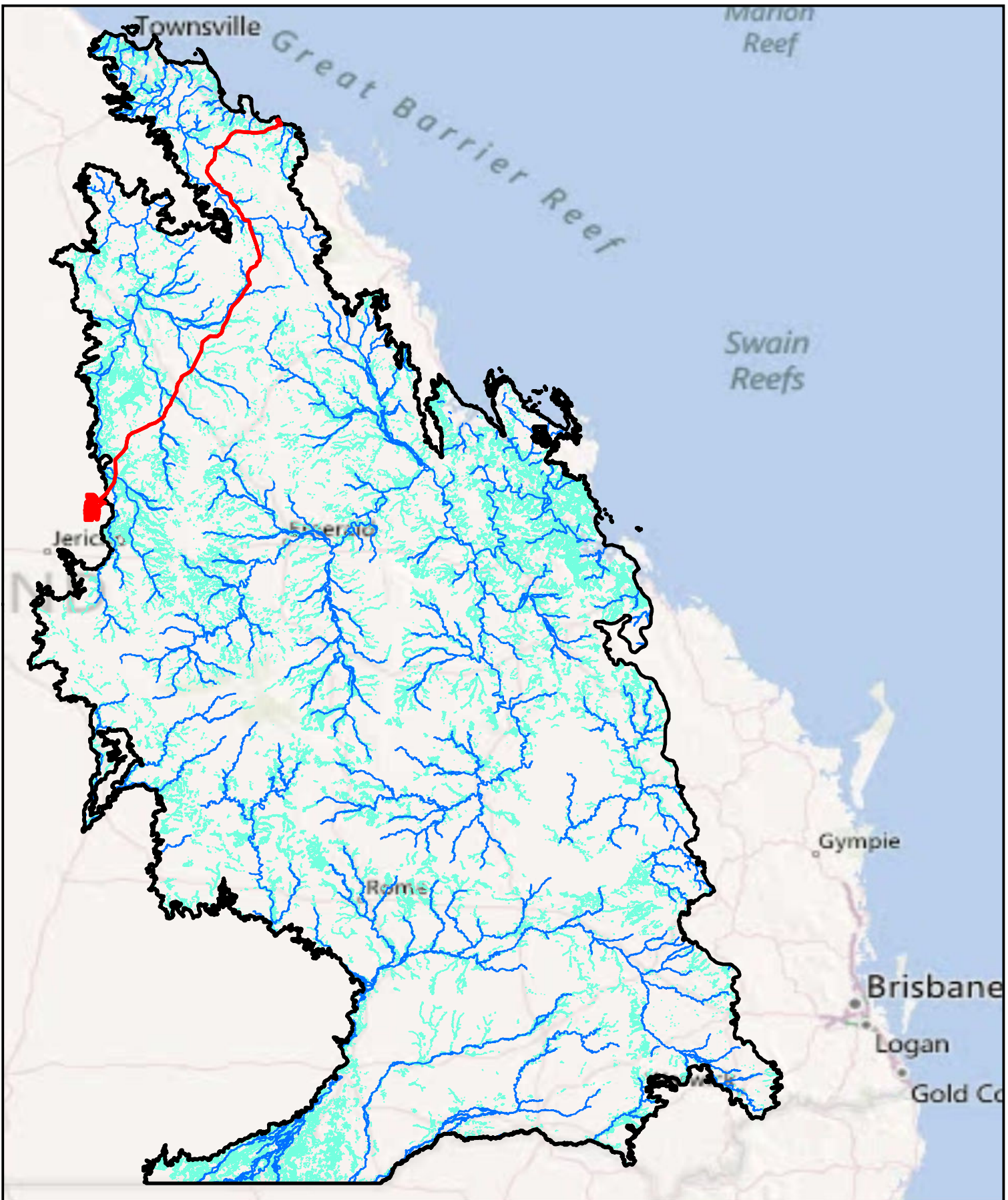


DATA SOURCE:

Alpha Coal Project Infrastructure - WorleyParsons
 (Date received: 17/02/2012)
 Potential offset areas © Ecofund Qld using data licenced
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Hancock Coal Pty Ltd - Alpha Coal Project LOCATION DIAGRAM

**Figure 3:
Brigalow Belt Bioregion
Potential Offset Areas:
Watercourses**

- Infrastructure footprint
- Brigalow Belt Bioregion
- Ordered drainage (stream order >4)
- Potential watercourse offset areas

DATA SOURCE:
Alpha Coal Project Infrastructure - WorleyParsons
(Date received: 17/02/2012)
Ordered Drainage 100K - Queensland (2010) © State of Qld
(Department of Environment and Resource Management) 2012
Potential offset areas © Ecofund Qld using data licenced
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ecofund
queensland

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4.2 Potential offset availability within the Desert Uplands Bioregion

Potential offset availability within the Desert Uplands Bioregion for mine-related impacts on watercourse vegetation are presented in **Table 4** and **Figure 4**. Potential offset availability within the Desert Uplands Bioregion for mine-related impacts on connectivity are presented in **Table 5** and **Figure 5**. Potential offset areas are described in areas (hectares) of policy compliant land in terms of 'potential offset areas with FPC \geq 6%.' The total number of lots that contain these potential offset areas is also provided.

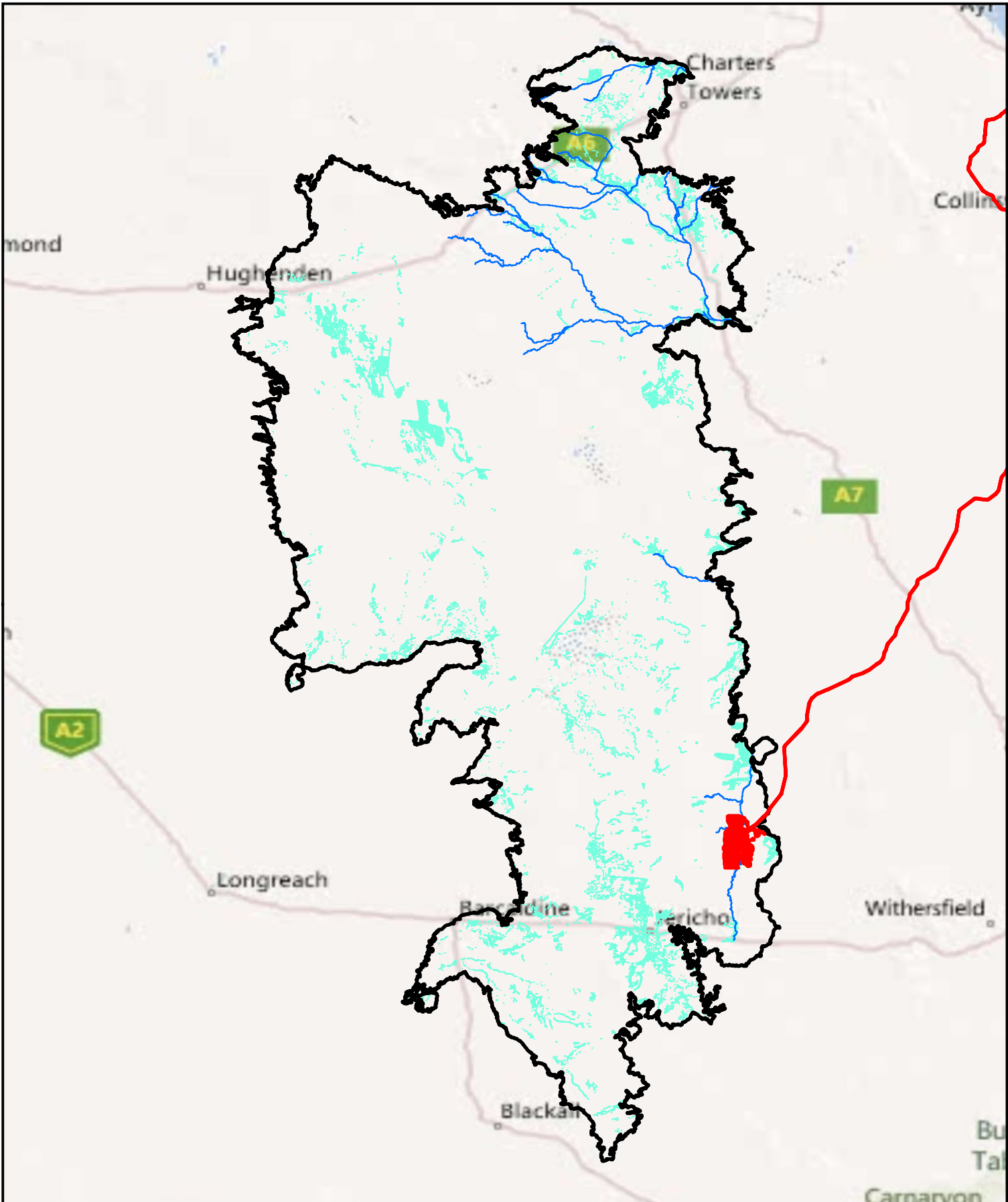
This desktop analysis indicates that for mine-related impacts on watercourse vegetation and connectivity there are likely to be sufficient suitable areas within the Desert Uplands Bioregion for use as environmental offsets.

Table 4: Potential offset availability for impacts on watercourse vegetation

IMPACTED VALUE	STREAM ORDER	IMPACT AREA (HA)	OFFSET CRITERIA – METHOD 1	TOTAL STREAM LENGTH (KM)	OFFSET CRITERIA – METHOD 2	POTENTIAL OFFSET AREAS FPC \geq 6% (HA)	TOTAL # LOTS
Watercourse vegetation	1	156.70	Length of watercourses \geq stream order 1 in Bioregion	17,298.95	Landzone 3 REs	101,792.25	524
Watercourse vegetation	2	83.60	Length of watercourses \geq stream order 2 in Bioregion	8,298.12			
Watercourse vegetation	3	234.50	Length of watercourses \geq stream order 3 in Bioregion	4,730.68			
Watercourse vegetation	4	5.70	Length of watercourses \geq stream order 4 in Bioregion	2,448.75			
Watercourse vegetation	5	711.40	Length of watercourses \geq stream order 5 in Bioregion	1,190.37			

Table 5: Potential offset availability for impacts on connectivity





IMPACTED VALUE	IMPACT AREA (HA)	COMPLIANT OFFSET AREAS	POTENTIAL OFFSET AREAS FPC \geq 6% (HA)	TOTAL # LOTS
Connectivity	5466.00	Offsetable areas in BPA corridors	39,505.40	301




Hancock Coal Pty Ltd - Alpha Coal Project LOCATION DIAGRAM

Figure 4:
Desert Uplands Bioregion
Potential Offset Areas:
Watercourses

DATA SOURCE:
 Alpha Coal Project Infrastructure - WorleyParsons
 Date received: 17/02/2012
 Ordered Drainage 100K - Queensland (2010) © State of Qld
 Department of Environment and Resource Management) 2012
 Potential offset areas © Ecofund Qld using data licenced
 by DERM

	Infrastructure footprint
	Desert Uplands Bioregion
	Ordered drainage (stream order >4)
	Potential watercourse offset areas

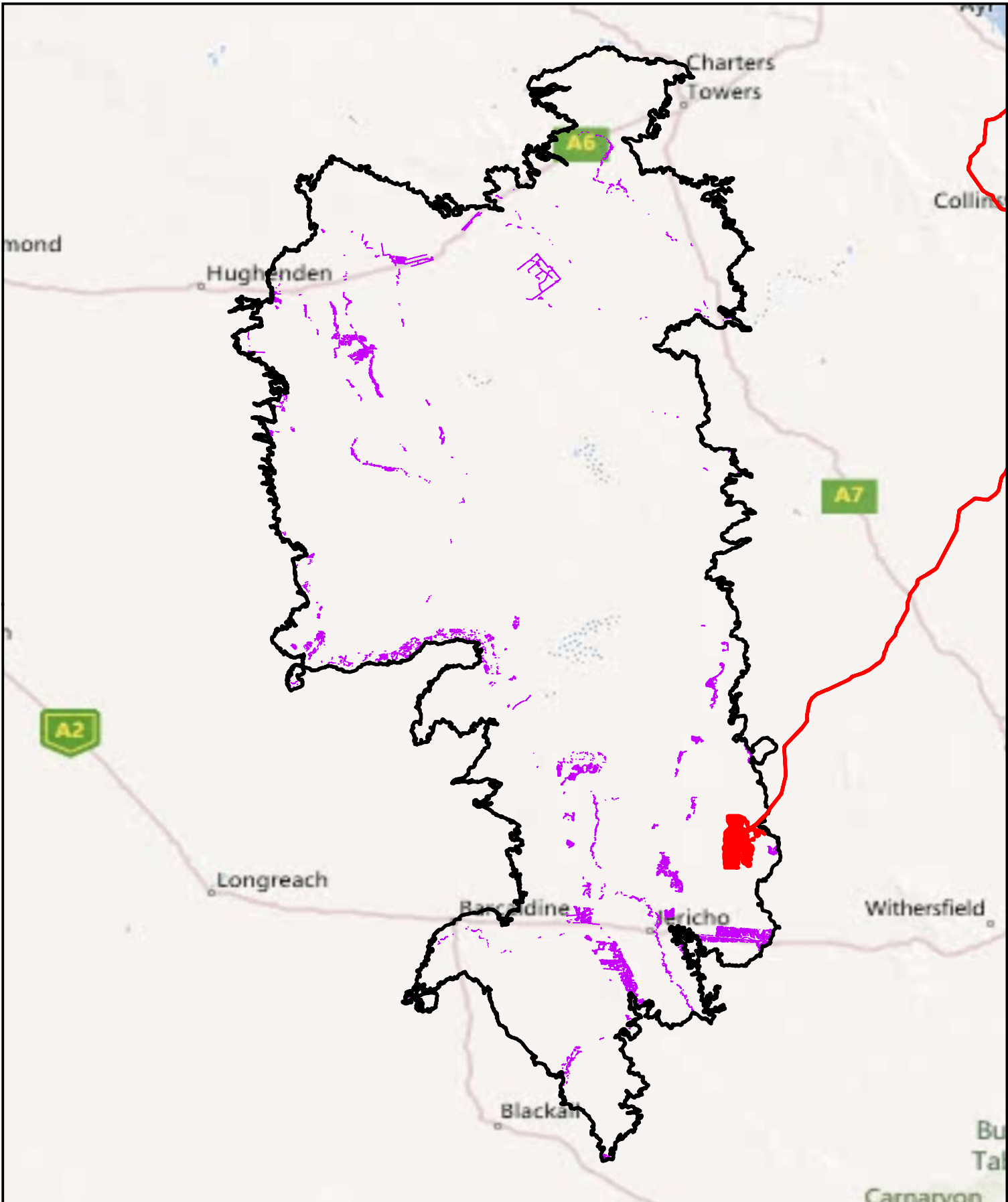
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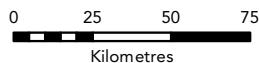
LOCATION DIAGRAM

**Figure 5:
Desert Uplands Bioregion
Potential Offset Areas:
Connectivity**

DATA SOURCE:

Alpha Coal Project Infrastructure - WorleyParsons
(Date received: 17/02/2012)
Potential offset areas © Ecofund Qld using data licenced
by DERM

- Infrastructure footprint
- Desert Uplands Bioregion
- Potential connectivity offset areas



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DATE	AUTHOR	REQUESTED BY
04/05/2012	RF	KH



4.3 Marine habitat offsets

HCPL is committed to providing offsets in accordance with the *Fish Habitat Management Operation Policy 2002*, to counterbalance the unavoidable impacts of the project on marine habitat. To fulfil these offset requirements HCPL propose to secure a direct offset, the details of which are outlined in the strategy. If required, HCPL will provide an indirect offset to supplement the direct offset in order to fulfil the offset requirements of the project. Examples of indirect offsets that may be implemented to supplement direct offset options include:

- Collaboration with a local community based organisation, such as a local natural resource management group, to provide financial support for the restoration of an identified degraded marine fish habitat site.
- Contribution to a larger marine habitat offset required as part of an assessment or approval for other development in the region.
- Provision of financial support to undertake additional fish habitat mapping and monitoring in central and other coastal regions of Queensland, outside of current monitoring programs.
- Funding a project to identify and prioritise lands in the Bowen region that might be considered for rehabilitation, purchase, protection of fisheries resources and habitat.
- Contribution of funds for applied research or education programs.

Ecofund anticipates that, if required, an appropriate mix of indirect offset measures will be finalised after further discussion between relevant offset regulators and HCPL.

5 SUMMARY

Ecofund has assessed the potential offset availability for the impact values within the Brigalow Belt Bioregion and Desert Uplands bioregion. The results of the desktop assessment are summarised for each impacted value in terms of hectares of potential offset areas with FPC > 6%, and the number of lots that contain these areas.

The results of this desktop assessment indicate that all mine and rail related impact values (with the exception of 11.5.5b which cannot be determined at a desktop level) have some potential to be offset within the relevant bioregion. For the majority of impacted values there are likely to be ample areas available for use as environmental offsets. However, three of the REs (11.5.10, 11.2.3 and 11.12.10) may be more difficult to offset as there are only 20 properties or less within the bioregion which contain 1 ha or greater suitable areas of the relevant environmental value. In addition, due to the very low presence of mapped RE 11.5.5b, potential offset availability cannot be determined at a desktop level, and therefore field assessments are required to determine the availability of offsets to counterbalance impacts to this value.

While compliant offset areas may be available for each impact value, the capacity to secure offsets will ultimately be dependent on a number of factors including:

- the verification of environmental values on the ground, including ecological equivalence assessments and subsequent offset area requirements.
- regulatory support in terms of compliance with relevant policy/policies
- a range of non-environmental issues such as land use, landholder agreement, cost, tenure issues, mining and energy interests, and native title.



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Appendix B: Analysis of offset suitability for state listed threatened flora species

INTRODUCTION

A review of the literature was undertaken for a number of state listed flora species, which require offset under the BOS. Offsets for residual impacts as a result of the Alpha Coal Mine Project are required for the following species:

- Large-podded Tick-trefoil (*Desmodium microcarpum*)
- Dietrich's Morning Glory (*Bonamia dietrichiana*)
- Black Ironbox (*Eucalyptus raveretiana*)
- King Bluegrass (*Dichanthium queenslandicum*)
- Blue Grass (*Dichanthium setosum*)

An assessment of each species is undertaken in the report below. The ecological characteristics pertinent to each species are outlined, including habitat requirements. An assessment of the suitability of the proposed offset sites has been undertaken and is provided for each of the species listed above (Table 49 to Table 53).

Species descriptions

Large-podded Tick-trefoil (*Desmodium microcarpum*)

Near Threatened (under review) (Queensland)

Large-podded Tick-trefoil (*Desmodium macrocarpum*) is a perennial twining herb to 0.5 m tall characterised by hairy stems and leaf stalks, and prominent, persistent, triangular stipules to 12 mm long and 5 mm wide. It has entire or trifoliate leaves with coarse, hairy, oval-shaped leaflets to 65 mm long and 55 mm wide. Pale pink, pea-shaped flowers to 8 mm long and 7 mm wide appear in loose clusters along leafless stalks from late autumn to early summer and flattened, constricted seed pods to 4.5 mm long and 3.5 mm wide are produced year round but mostly in autumn (DNR, 1999). This species is a member of the Fabaceae family and is currently listed as Near Threatened in Queensland under the *Nature Conservation Act 1992* (NCA). This conservation listing is under review by the Species Technical Committee from the Queensland Department of Environment and Resource Management (DERM) (DERM, 2012).

Large-podded Tick-trefoil is restricted to eastern Queensland, from Forty Mile Scrub to Mundubbera, where it prefers open forests and woodlands in sandy soils and often in association with a sparse shrubby understorey of Currant Bush (*Carissa ovata*) and Dysentery Bush (*Grewia retusifolia*); and semi-evergreen vine thickets in red earths, rarely sandy clay soils, at altitudes to 884 m. Associated species include with Poplar Box (*Eucalyptus populnea*), Narrow-leaved Red Ironbark (*E. crebra*), Silver-leaved Ironbark (*E. melanophloia*), Spotted Gum (*Corymbia maculata*), Shirley's Silver-leaved Ironbark (*E. shirleyi*), Grey Ironbark (*E. siderophloia*) and Narrow-leaved White Mahogany (*E. tenuipes*). It is known to the Bimblebox Nature Refuge and Forty Mile Scrub National Parks and is potential threats

include habitat destruction / degradation as a result of vegetation clearing and inappropriate grazing and fire regimes (BMA, 2009; DNR, 1999).

Large-podded Tick-trefoil is self-pollinating and reproduces from root nodules (DNR, 1999). Little information is available on the successful propagation or translocation of this species; however, other species within the *Desmodium* genus have been successfully propagated from seed collected in the field. There are 28 species of *Desmodium* known to Queensland including 9 non-native or naturalised species (Bostock and Holland, 2010). Seeds of the *Desmodium* genus are characterised by a hard seed coat which cause physical dormancy; however, seeds of the Slender Tick-trefoil (*D. varians*), Southern Tick-trefoil (*D. gunnii*) and Silverleaf Desmodium (*D. uncinatum*) are known to germinate well after scarification or hot water treatments (Botanic Gardens Trust, Ralph, 1993). Silverleaf Desmodium is readily used as a pasture species suggesting the ease of propagation and establishment of this species (Sweeney and Hopkinson, 1975).

Dietrich's Morning Glory (*Bonamia dietrichiana*)

Near Threatened (under review) (Queensland)

Dietrich's Morning Glory (*Bonamia dietrichiana*) is a twining vine to 3 – 8 m tall with alternate, oval-shaped, velvety leaves to 8 – 35 mm long and 5 – 20 mm wide. White funnel-shaped flowers with fused petals to 30 – 40 mm diameter appear in the leaf axils from early autumn to early winter and late spring and brown, 4-valved fruit capsules to 8 – 10 mm long and 6 – 9 mm wide are produced early winter to late spring (Calvert *et. al.*, 2005; Cooper, 2004). This species is a member of the Convolvulaceae family and is currently listed as Near Threatened in Queensland under the NCA. This conservation listing is under review by the STC from DERM (DERM, 2012).

Dietrich's Morning Glory is restricted vine thickets and rainforests with shrubby undergrowth in fine-grained sediments on granite boulders along the central Queensland coast, from Marlborough to Magnetic Island. It is thought to be restricted to areas overlying acid intrusive rocks (Scheltinga and Hayden, 2005) but is also known to alluvial environments (JCU, 2012) and is found in association with Moo-jee (*Terminalia melanocarpa*), Burdekin Plum (*Pleiogynium timorense*) and Red-fruited Kurrajong (*Sterculia quadrifida*). This species is known from the Magnetic Island National Park and The Domes and Cedars Nature Refuges and is considered under threat from habitat clearing for road and powerline construction, weed invasion, fire and genetic isolation resulting from habitat fragmentation (Calvert *et. al.*, 2005; Cooper, 2004).

Little is known about the reproduction or propagation of this species; however, research suggests this species is probably pollinated by hawk moths and seeds are probably dispersed by gravity (Calvert *et. al.*, 2005). There are 12 native species of *Bonamia* known to Queensland (Bostock and Holland, 2010), some of which and including Dietrich's Morning Glory, are known to sucker from lateral roots. Seeds of the *Bonamia* genus are characterised by a hard seed coat which is suspected to cause physical dormancy (Jayasuriya *et. al.*, 2008); however, propagation of *Bonamia* species such as the Hawaiian *Bonamia* (*B. menziesii*) has been successful in the United States of America with seed readily germinating from scarification and water soaking treatments (Hawaii Horticulture, 2011; Jayasuriya *et. al.*, 2008).

Black Ironbox (*Eucalyptus raveretiana*)

Vulnerable (Australia)

Vulnerable (Queensland)

Black Ironbox (*Eucalyptus raveretiana*) is an evergreen tree to 21 m tall with persistent, grey-brown and box-like bark on the lower trunk (sometimes covering entire trunk and base of largest branches), and smooth, grey often with red and brown streaked bark on the upper trunk. It has alternate leaves that are paler below to 70 – 150 mm long and 10 – 30 mm wide and small, egg-shaped flower buds to 2 – 4 mm long and 1 – 2 mm diameter with conical caps. Small, white flowers to 5 mm diameter are borne in terminal clusters (7-flowered) appear in summer and small, woody, 3-4-valved, goblet-shaped nuts to 2 mm long and 2 mm diameter are produced from late summer to mid autumn (Calvert *et. al.*, 2005; DSEWPaC, 2012). This species is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NCA.

Black Ironbox has been recorded in scattered populations in central Queensland, from Rockhampton to Ayr (an area of 90 000 sq. km) with 23 subpopulations recorded across two main areas: Nebo to Ayr and Apis Creek to Rockhampton. This species prefers open forests or woodlands in association with Queensland Blue Gum (*Eucalyptus tereticornis*), Moreton Bay Ash (*Corymbia tessellaris*), River Red Gum (*E. camaldulensis*), *Melaleuca* spp. and River She-oak (*Casuarina cunninghamiana*) along watercourses and on river flats in alluvial soils including sands, loams, light clays or cracking clays (Calvert *et. al.*, 2005). This salt tolerant species is known to several protected reserves including the Dipperu, Eungella, Homevale and Goodedulla National Parks and is considered under threat from land clearance, loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases, weed invasion particularly Rubber Vine (*Cryptostegia grandiflora*), inappropriate fire regimes, poor land management leading to stream bank erosion, logging and development (Calvert *et. al.*, 2005; DSEWPaC, 2012).

Black Ironbox is pollinated by insects and birds and seeds are dispersed by wind and water. It is a millable timber and has been successfully propagated in Australia by placing fruit in paper bags in a warm position, and also the United States of America (Pioneer Catchment and Landcare Group, 2012; RIRDC, 2004).

King Bluegrass (*Dichanthium queenslandicum*)

Vulnerable (Australia)

Vulnerable (Queensland)

King Bluegrass is a perennial, tufted grass with erect stems to 80 cm tall, bearded nodes and hairy leaf sheaths. Leaves are hairy and scaberulous to 18 cm long and 5 mm wide and paired, stalked spikelets to 10 cm appear late spring to late summer (Sharp and Simon, 2002). This species is listed as Vulnerable under the EPBC Act and NCA.

King Bluegrass is primarily restricted to native grasslands in black clay soils in central eastern Queensland but has also been recorded in Mountain Coolibah (*E. orgadophila*) open woodland and Silver-leaved Ironbark (*E. melanophloia*) woodland (Sharp and Simon, 2002). It is known to the Minerva Hills National Park (DERM, 2011a) and considered under threat from competition and land degradation by rabbits, loss of terrestrial climatic habitat caused by

anthropogenic emissions of greenhouse gases, inappropriate fire regimes, weeds, broad-scale vegetation clearing, grazing and increased habitat fragmentation (Sharp and Simon, 2002).

There are 11 species of *Dichanthium* in Queensland including three non-native species (Bostock and Holland, 2010). Little information is available on the propagation of King Bluegrass; however, the *Dichanthium* genus is a popular pasture crop readily propagated by seed. Species such as Queensland Bluegrass (*D. sericeum*), which is known to occur with King Bluegrass, have been successfully propagated in Queensland including but not limited to at the Blair Athol Mine where trials have commenced (Pacific Coal, 2003).

Bristly Bluegrass (*Dichanthium setosum*)

Vulnerable (Australia)

Near Threatened (under review) (Queensland)

Bristly Bluegrass is a perennial, densely tufted grass with erect, 2 – 4-noded culms to 30 – 70 cm tall, scaberulous or scabrous, glabrous or pilose or hairy leaves to 7 – 15 cm long and 2 – 3.5 mm wide and ramose flowerheads with paired spikelets that appear late spring to early winter (Sharp and Simon, 2002). This species is listed as Vulnerable under the EPBC Act and Near Threatened under the NCA; though this state listing is currently under review by the STC from DERM (DERM, 2012).

Bristly Bluegrass is restricted to southern Queensland and northern New South Wales, preferring heavy basaltic soils and stony red-brown hard-setting loams with clay subsoils. This species has been recorded in *Dichanthium* grasslands and open woodlands dominated by Narrow-leaved Red Ironbark and Variable-barked Bloodwood (*Corymbia erythrophloia*) and Mountain Coolibah, as well as moderately disturbed areas including cleared woodlands, grassy roadside remnants, grazed lands and highly disturbed pastures (Sharp and Simon, 2002). It is known to the Main Range National Park and is considered under threat from clearing of habitat, weed invasion and inappropriate fire and grazing regimes (Sharp and Simon, 2002) as well as competition and land degradation by rabbits and loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases (DSEWPaC, 2012).

As discussed above, the *Dichanthium* genus is a popular pasture crop readily propagated by seed. And whilst little information is available on the propagation of Bristly Bluegrass, trials propagating Queensland Bluegrass, a similar species known to occur in association with Bristly Bluegrass, at the Blair Athol Mine have been successful (Pacific Coal, 2003).

EXTENT AND DISTRIBUTION OF HABITAT AREAS SUITABLE FOR OFFSET

Habitat Modelling Methodology

Habitat modelling and mapping methodology was developed to spatially depict, assess and quantify suitable habitat areas within proposed offset properties. The methodology for modelling and mapping threatened species habitat involved the identification of species-specific habitat criteria which were input into a model that identified potential habitat. The model was underpinned by amended vegetation (Regional Ecosystem [RE]) mapping.

A variety of sources were consulted in the development of the species-specific habitat criteria. The DERM Essential Habitat factors for individual species were reviewed where these were

available. These factors relate to habitat features associated with individual species listed under the NCA, for which Essential Habitat is mapped. Essential Habitat factors (where available) that were input into the habitat model included REs and altitude. Where Essential Habitat factors were not available, REs were selected based on knowledge of the species' broad habitat preferences and in consideration of the REs associated with species with similar habitat preferences.

The DERM Biodiversity Planning Assessments (BPA) for the Brigalow Belt and Desert Uplands bioregions were reviewed as part of the habitat model development. BPAs (and associated mapping and geospatial data) identify landscape scale biodiversity features at varying levels of significance (local, regional, state / low – very high). The mapping methodology is underpinned by DERM's remnant vegetation (i.e. RE) mapping, and based upon the DERM Biodiversity Assessment and Mapping Methodology (EPA, 2002). Expert panel reports provide information on the landscape-scale values of bioregions, and in some instance identify bioregional priority taxa. Such that an indication of the 'value' of mapped vegetation units (i.e. mapped RE polygons) could be ascertained (in lieu of assessing the value of habitats in the broader study area), two BPA criteria were input into the habitat model:

- Criteria F - Ecosystem Diversity:
 - This criterion describes habitat complexity, based on the number and size of ecosystems and wetlands present in an area. The concepts of 'richness' (number of different ecosystems) and 'evenness' (relative abundance of ecosystems) are considered when attributing an Ecosystem Diversity rating to a particular area. By way of example, areas with high Ecosystem Diversity typically have relatively many REs and ecotones. Simpson's Diversity Index is used to determine Ecosystem Diversity. Ecosystem Diversity is rated as: Low, Medium, High or Very High for individual remnant vegetation units (i.e. RE polygons); and
- Criteria G – Context and Connection:
 - This criterion is based upon the extent to which a mapped RE polygon incorporates or buffers other ecologically noteworthy areas (i.e. other remnant vegetation units and/or wetlands/waterways). With respect to connection, remnant vegetation units that are connected to other REs are considered to be more representative of biodiversity, contribute more to a habitat network (i.e. connectivity) and exhibit greater resilience to disturbance. The extent to which an RE incorporates/buffers/connects to other mapped vegetation and/or wetlands/waterways determines its BPA (Criteria G) rating: Low, Medium, High or Very High for individual remnant vegetation units (i.e. RE polygons).

In addition to the Essential Habitat factors and BPA criteria, the habitat model considered proximity to mapped waterways (i.e. rivers, streams, wetlands), where this was considered to be an important habitat feature or considered necessary for the species' presence. The outputs of the model allowed for four potential habitat categories to be mapped: Confirmed

habitat; High value potential habitat; Low value potential habitat; and Generally not suitable as habitat.

Where confirmed records of a species were available (based previous studies and herbarium records), a 5 km buffer about the locality was selected as 'confirmed habitat'. For the 'potential habitat' categories the primary mapping criterion (filter) was Queensland DERM RE mapping (Version 6.0b) (amended based on field surveys at selected locations). Subsequent criteria used to value habitat varied by species, and included:

- Ecosystem Diversity (Criteria F) and Context and Connection (Criteria G) rating (of mapped RE polygon [as selected via primary filter]) – these values were extracted from the Queensland DERM BPA mapping for the Project study area;
- Proximity of RE polygon to water sources (natural and artificial) – proximity varied by species depending on degree of association with water;
- Wetlands of High Ecological Significance and General Ecological Significance;
- Altitude (species-specific information acquired from DERM Essential Habitat factors database, where available); and
- Where the primary criterion (i.e. REs attributed to individual species) did not occur, or where available information on species' distribution indicated lack of presence, RE polygons (or non-remnant patches) were mapped as 'generally not suitable'.

Habitat mapping was undertaken at two scales:

- Regional scale: a map displaying the Project area and surrounding landscape, with all four habitat categories mapped across the landscape; and
- Mine and rail study areas ('local') scale: a map series displaying 'confirmed habitat', 'high value potential habitat' and 'low value potential habitat'.

Extent of Potential Offset Habitat Areas for Threatened Flora Species

This section describes the extent of suitable habitat areas within each proposed offset property for each threatened flora species (Table 49 to Table 53). Offset properties have been chosen for their location, proximate to known populations and the Alpha Coal Project site and habitat diversity and connectivity.

Properties C to G provide suitable habitat for Dietrich's Morning Glory, Black Ironbox and Bristly Bluegrass whilst Properties D and E can be utilised as offset habitat for King Bluegrass and all of the properties support at least one suitable habitat type for the Large-podded Tick-trefoil.

Table 49: Suitable Habitat Areas for the Large-podded Tick-trefoil within Potential Offset Properties

Habitat Type (Corresponding RE Code)	Property						
	A	B	C	D	E	F	G
Ironbark woodland on alluvial soils (10.3.28)	✓	✓	✓				
Ironbark woodland on sand plains (10.5.5)	✓	✓	✓	✓			
Poplar woodland on alluvial soils (11.3.2)			✓	✓	✓	✓	✓
Poplar – Ironbark on textured soils (11.5.3)					✓		
Ironbark woodland on igneous rocks (11.12.1)						✓	✓
Ironbark woodland with vine thicket on igneous (11.12.7)							✓

Table 50 Suitable Habitat Areas for the Dietrich's Morning Glory within Potential Offset Properties

Habitat Type (Corresponding RE Code)	Property						
	A	B	C	D	E	F	G
Poplar woodland on alluvial soils (11.3.2)			✓	✓	✓	✓	✓

Table 51: Suitable Habitat Areas for the Black Ironbox within Potential Offset Properties

Habitat Type (Corresponding RE Code)	Property						
	A	B	C	D	E	F	G
Eucalypt woodland fringing drainage lines (11.3.25)			✓	✓	✓	✓	✓

Table 52: Suitable Habitat Areas for the King Bluegrass within Potential Offset Properties

Habitat Type (Corresponding RE Code)	Property						
	A	B	C	D	E	F	G
Dichanthium native grassland on clay plains (11.4.4)					✓		
Coolibah open woodland on igneous rocks (11.8.5)					✓		
Dichanthium native grassland on igneous rocks (11.8.11)				✓			

Table 53: Suitable Habitat Areas for the Bristly Bluegrass within Potential Offset Properties

Habitat Type (Corresponding RE Code)	Property						
	A	B	C	D	E	F	G
Eucalypt woodland fringing drainage lines (11.3.25)			✓	✓	✓	✓	✓
Coolibah open woodland on igneous rocks (11.8.5)					✓		
Ironbark woodland on fine-grained sedimentary (11.9.9)					✓		

Suitability of Offset Habitat Areas

The management of threatened flora species populations within the Alpha Coal Project site will include the translocation and / or replacement of individuals to a designated protected area (a compensatory habitat area) to ensure there is no net loss in threatened flora species as a result of the Project. The translocation and establishment of threatened flora species will be undertaken in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee *et. al.*, 2004), which outlines measures to ensure there is no net loss in individuals or genetic material by collecting seed and cuttings from the population proposed to be cleared; establishing a propagated population to be planted in conjunction with any translocation and ongoing monitoring and weed and watering programs.

The location of potential offset or compensatory habitat areas is largely based on current and pre-clear vegetation mapping by DERM and the preferred habitat characteristics for each species. Biocondition assessment will be undertaken in accordance with DERM methodology (DERM, 2011b) for these areas to further determine the suitability as habitat and likelihood of successful establishment of threatened flora species.

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Appendix C: Threatened fauna species descriptions

Provided below are details for each of the state listed threatened fauna species potentially impacted by the Project, a description of the habitat requirements for each species and details on the current known distribution of each species. Information related to the amount of habitat modeled for each species across the region, and the total amount impacted, is also presented. Finally, an example of the avoidance and mitigation measures to be implemented during the Project are also provided.

SPECIES DESCRIPTIONS

The Alpha Coal Project is considered likely to impact on a number of fauna species which are listed under the Queensland *Nature Conservation Act, 1992* (NC Act). Several of these species are also listed on the Commonwealth EPBC Act.

A total of 7 fauna species may be impacted by the Project, three of which were confirmed within the Project footprint. A summary of habitat requirements, distribution and the anticipated impact of the Project is provided below for each species.

The state listed species of concern are:

- Black-throated Finch
- Cotton Pygmy-Goose
- Black-necked Stork
- Brigalow Scaly-foot
- Ornamental Snake
- Yakka Skink
- Little Pied Bat

BLACK-THROATED FINCH (*POEPHILA CINCTA CINCTA*)

Species overview

The Black-throated Finch (southern) (*Poephila cincta cincta*) is a small, largely sedentary and gregarious grass-finch that is listed as endangered under the NC Act.

Distribution and habitat requirements

Historically the subspecies occurred from north-east NSW to Queensland's Atherton Tablelands and west to central Queensland (Black-throated Finch Recovery Team *et al*, 2007). However, the Black-throated Finch is now thought to be extinct at most sites south of the Burdekin River (several hundred kilometres north of the mine site) (SEWPAC, 2012a). The species is known to occur in the Townsville region (Townsville and Charters Towers) which is considered to be a stronghold for the subspecies; and also at scattered sites in central-eastern Queensland.

The subspecies inhabits grassy open woodland and open forest habitats characterised by trees belonging to the genera *Eucalyptus*, *Corymbia*, *Acacia* and *Melaleuca* (SEWPAC, 2012a). It generally occurs in habitats near watercourses or water bodies with almost all recent records of the subspecies south of the tropics being in riparian areas (SEWPAC, 2012a).

Threats

The decline in the Black-throated Finch is thought to have coincided with the advent of pastoralism in the early 20th century and the ongoing clearing of woodland habitats (SEWPAC, 2012a).

DEWHA (2009a) identified the principal threats to the subspecies as:

- clearing and fragmentation of nesting sites;
- clearing and fragmentation of foraging habitat;
- reduction in the availability of water;
- alteration in grass species composition or seed availability;
- inappropriate grazing and fire regimes; and
- introduction of exotic weeds.

Field survey results

No records of the Black-throated Finch were made during the surveys for the Project. Recent sightings (2011) for the subspecies have been made near to the town of Alpha. It is understood that these sightings are in the process of being confirmed. This suggests that the region around the mine may support the presence of the species.

Modelling

Potential habitat modelling for the Black-throated Finch is challenging as there are few records of the subspecies over the last 20 or 30 years within the region. The key elements of the modelling criteria used included:

- REs likely to contain habitat resources suitable for either foraging or breeding.
- BPA criteria relating to ecosystem diversity and context/connection which rank as High or Very High. These criteria were used as granivorous species such as finches require a variety of annual seed resources for feeding.
- Proximity to natural water courses (including both perennial and non-perennial) with a stream order of 3 or above (where lower stream order water courses are less likely to support pooling water through the drier months) and wetlands.

The results of the modelling are presented below:

MODELLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	7,154	778
Low Potential Habitat	3,150	596

This combined area represents around 0.38% of potential habitat predicted to occur within the region.

Summary

The species was not recorded within the Project area during the field surveys; however, the species has previously recorded within the area surrounding the Project. The modelling suggests that approximately 8,000 ha of high potential habitat and 3,746 ha of low potential habitat will be cleared across the mine site and rail alignment. This represents only 0.38% of similar potential habitat within the region.

Given that the species was not observed within the Project area, and that there is a large amount of habitat available within the broader region, the Project is considered unlikely to place the species at an unreasonable level of risk.

BLACK-NECKED STORK (EPHIPPIORHYNCHUS ASIATICUS)

Species overview

The Black-necked Stork is an iconic large wading bird, which is listed as Near Threatened under the NC Act.

Distribution and habitat requirements

Black-necked Storks are primarily found on shallow, permanent freshwater wetlands (NSW DEC, 2005b), including floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water.

Threats

The major threats to this species include:

- drainage of wetlands;
- felling of nest trees;
- development;
- encroachment of agriculture or aquaculture;

Field survey results

This species was not recorded during field surveys conducted in the Project area.

Modelling

The predicted distribution of the species within the vicinity of the Project was modelled. The key elements of the modelling included:

- Regional Ecosystems (REs) likely to contain habitat resources suitable for either foraging or breeding, including the presence of wetlands
- BPA criteria F and BPA criteria G.

The results of the modelling are presented below:

MODELLLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	3.8	26.4
Low Potential Habitat	0.05	7.3

With over 126,000 ha of habitat mapped for this species according to the model prepared, the impact equates to approximately 0.03% of the mapped potential habitat in the broader region.

Summary

The species was not observed during the field surveys undertaken within the Project area. Based on the species not being observed, and the results of the species modelling, it is considered unlikely that the Project will place the species at an unreasonable level of risk.

COTTON PYGMY-GOOSE

Species overview

The Cotton Pygmy-geese is a small species of duck which is listed as Near Threatened under the NC Act.

Distribution and habitat requirements

The Cotton Pygmy-geese is an almost entirely aquatic species. Preferred habitat is deep freshwater lagoons, swamps and dams, particularly those with waterlilies or other floating vegetation, such as *Hydrilla*, *Ceratophyllum*, *Vallisneria*, *Najas*, *Lemna* and *Chara* species (NSW NPWS, 1999). The species tends to avoid running water where deep-water vegetation cannot grow (NSW NPWS, 1999).

Behaviour and ecology

Cotton Pygmy-Geese are found on freshwater lakes where it feeds almost predominantly on aquatic vegetation. The species utilises dead trees with hollows near water for nesting and roosting sites (NSW NPWS, 1999).

Threats

The major threats to this species include:

- Loss of habitat, especially dead trees with hollows near water;
- Spread of invasive exotic grasses, particularly Water Hyacinth (*Eichhornia crassipes*);
- Changes to hydrology and water quality and local land use;
- Historical shooting by humans; and
- Drainage of wetlands for flood control (NSW NPWS, 1999).

Field survey results

This species was recorded during fieldwork for the rail component of the Project, but was not recorded during surveys for the mine. A number of individuals of the species were recorded at Star of Hope Dam during both the wet and dry season surveys.

Modelling

As with Black-necked Stork, the predicted distribution of the species within the vicinity of the Project was modelled. The key elements of the modelling included:

- REs likely to contain habitat resources suitable for either foraging or breeding, including the presence of wetlands
- BPA criteria F and BPA criteria G.

The results of the modelling are presented below:

MODELLLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	3.8	26.4
Low Potential Habitat	0.05	7.3

With over 126,000 ha of habitat mapped for the species through the species modelling, the impact equates to approximately 0.03% of the mapped potential habitat in the broader region.

Summary

The species was observed within the proposed railway alignment during field surveys. Based on the modelling, the Project will impact on 0.03% of the habitat available within the broader region. Due to this minimal impact it is considered unlikely that the Project will place the species at an unreasonable level of risk.

BRIGALOW SCALY-FOOT (*PARADELMA ORIENTALIS*)

Species overview

The Brigalow Scaly-foot (*Paradelma orientalis*) is a legless lizard listed as vulnerable under the NC Act.

Distribution and habitat requirements

The Brigalow Scaly-foot's distribution is highly fragmented and occurs predominantly across central Queensland. The species is known to occur in the Brigalow Belt area (both north and south sub bioregions), Desert Uplands and Mulga Lands bioregions (SEWPAC, 2012b). Within these areas, the species is associated with a wide diversity of remnant and non-remnant open forest and woodland habitats including:

- Brigalow (*Acacia harpophylla*) communities.
- Gidgee (*Acacia cambagei*).
- Bendee (*Acacia catenulata*).
- Lancewood (*Acacia shirleyi*).
- Broad-leaved hickory wattle (*Acacia falciformis*).
- Blue spotted gum (*Corymbia citriodora*).
- Narrow-leaved ironbark (*Eucalyptus crebra*).
- Bimble/poplar box (*Eucalyptus populnea*).
- Belah (*Casuarina cristata*).
- Cypress pine (*Callitris columellaris*).
- Buloke/bull oak (*Allocasuarina luehmannii*).

Breeding and ecology

The Brigalow Scaly-foot is primarily a ground-dwelling and nocturnal species. Sap forms a major portion of the diet of both adults and juveniles. The species also feeds on spiders, insects and plants. During the day, the species shelters beneath sandstone slabs, logs, loose bark, dense leaf litter and in grass tussocks, including Spinifex (SEWPAC, 2012b).

Threats

The Brigalow scaly-foot is threatened by:

- habitat loss due to land clearing and thinning operations and grazing,
- inappropriate fire regimes,
- inappropriate road side management, and
- predation by feral animals such as cats.

Habitat degradation from overgrazing, accidental deaths on roads and misidentification with snakes, may pose additional threats.

Field survey results

This species was not recorded during field surveys of the Project area.

Modelling

The predicted distribution of the species within the vicinity of the Project was modelled. The key elements of the modelling included:

- REs likely to contain habitat resources suitable for the species, including those which are known or likely to support the microhabitat features required such as large logs, fallen bark sheets and leaf litter.
- BPA criteria relating to ecosystem diversity and context/connection which rank as High or Very High. These criteria were used as large, contiguous areas of vegetation are more likely to support important populations of the species.
- Areas that fall within the modelled distribution of the species presented in the Draft Referral Guidelines for Nationally Listed Brigalow Belt Reptiles (SEWPaC 2011).

The results of the modelling are presented below:

MODELLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	0	189 ha
Low Potential Habitat	0	272 ha

This combined area represents around 0.35% of potential habitat predicted to occur within the region.

Summary

No records of the Brigalow Scaly-foot were made during the surveys for the Project. The modelling suggests that approximately 189 ha of high potential habitat and 272 ha of low potential habitat will be cleared within the proposed railway. This represents only 0.35% of similar potential habitat within the region. For these reasons, it is considered unlikely that the Project will place the species at an unreasonable level of risk.

ORNAMENTAL SNAKE (*DENISONIA MACULATA*)

Species Overview

The Ornamental Snake (*Denisonia maculata*) is a snake species restricted to the Brigalow Belt Bioregion, which is listed as Vulnerable under the NC Act.

Distribution and habitat requirements

The Ornamental Snake is known from the Brigalow Belt North and parts of the Brigalow Belt South bioregions (SEWPAC, 2012c). The core of the species' distribution is associated with the drainage systems of the Fitzroy and Dawson Rivers (SEWPAC, 2012c). The Ornamental Snake is endemic to Queensland.

Preferred habitat is woodlands and open forests associated with moist areas, similar to the habitat for frogs, which are its favoured prey (SEWPAC, 2012c). Microhabitat components for this species include logs, coarse woody debris, and ground litter (SEWPAC, 2012c). The most common Queensland RE in which the species has been recorded is RE 11.4.3:

Behaviour and ecology

The snake is a viviparous species with a litter size of 3 – 11. It is regarded as being potentially dangerous and has a very distinctive defence posture.

Ornamental Snakes are nocturnally active, sheltering during the day under fallen timber, rocks, bark and in deep soil cracks. The diet of this species consists predominantly of frogs (Cogger et al. 1993), foraging occurs at night around water and in damp nearby sites.

Threats

The Ornamental snake has undergone a decline in abundance in the past few decades. The primary threats to the persistence of the Ornamental Snake include:

- Habitat loss, fragmentation and degradation through land clearance, vegetation thinning and agriculture.
- Interactions with the Cane Toad.
- Invasive weeds.
- Predation by and competition with feral species

Field survey results

This species was recorded during opportunistic surveys along the proposed railway near chainage 355,000 and has been recorded within the broader region. Suitable habitat for the species occurs around the Dawson River catchment area within the central parts of the alignment.

Modelling

Modelling was undertaken to further estimate the potential distribution of the species within the project area. The key elements of the modelling criteria included:

- RE's likely to contain suitable habitat for the species, which contain microhabitat features such as cracking clays, gilgai or seasonal inundation.
- BPA criteria relating to the ecosystem diversity and context/connection which rank as high or very high.
- The modelled distribution presented in the *Draft Referral Guidelines for the Nationally listed Brigalow Belt Reptiles* (SEWPAC, 2011)

The results of the modelling are presented below:

MODELLED HABITAT TYPE	MINE IMPACTS(HA)	RAIL IMPACTS (HA)
High Potential Habitat	1,543	251
Low Potential Habitat	546	193

This combined area represents around 0.35% of potential habitat predicted to occur within the region.

Summary

The ornamental snake was recorded opportunistically within the Project area during surveys undertaken. Further modelling suggests that a total of 251 ha of high potential habitat along the proposed railway will be lost, including the area of known habitat around chainage 355,000 where the species has been observed. A further 1,543 ha of high potential habitat will be cleared across the mine site, as well as 739 ha of low potential habitat across the mine and railway. While some areas of potential habitat will be impacted by the Project, the total area of potential habitat to be cleared represents only 0.35% of potential regional habitat available to the species. For these reasons, the Project is considered unlikely to place the species at an unreasonable level of risk.

YAKKA SKINK (EGERNIA RUGOSA)

Species overview

The Yakka Skink (*Egernia rugosa*) is a thick-tailed lizard which grows up to 40cm in length. It is listed as vulnerable under the NC Act.

Distribution and habitat requirements

The Yakka Skink has a discontinuous and patchy distribution stretching from Cape York Peninsula to south east Queensland and the NSW border. It occurs from the coast to the hinterland of sub-humid to semi-arid eastern Queensland. Within this wide distribution, the Yakka Skink is known to occur in open, dry sclerophyll forest, woodland and scrub. It inhabits a wide variety of vegetation types. The species is commonly found in cavities under and between partially buried rocks, logs or tree stumps and root cavities. It can also persist in clearings where shelter sites such as tunnel erosion, rabbit warrens and log piles exist (SEWPAC, 2012d).

Behaviour and ecology

The Yakka Skink, like other *Egernia* species, has been described as highly gregarious, with populations occurring primarily as colonies or aggregations. These groups consist of both adults and juveniles of a wide variety of body sizes. A colony of Yakka Skinks may use several sites during the year with the occupied burrow identified by scat piles near the entrance (Brigalow Belt Reptiles Workshop, 2010).

The Yakka Skink exhibits high site-fidelity and is limited in its capacity to disperse from a colony site (Brigalow Belt Reptiles Workshop, 2010). Individual skinks dig a deep burrow system under and between partly buried rocks or logs, or into old root tracts at the base of remnant stumps. The Yakka Skink may also utilise old rabbit warrens, deep gullies, tunnel erosion/sinkholes or under rural buildings (Brigalow Belt Reptiles Workshop 2010).

Threats

The main threat to the Yakka Skink is habitat reduction and degradation through land clearing for agriculture and urban development (Brigalow Belt Reptiles Workshop, 2010; SEWPAC, 2012d). Other threats to the Yakka Skink include:

- Inappropriate roadside management, including road widening and removal of microhabitat, such as rocks, logs, dense leaf litter and fallen bark.
- Removal of woody debris and rocks, which reduced microhabitat.
- Ripping of rabbit warrens, by removing habit and killing individual skinks.
- Feral animal predation from Foxes (*Vulpes vulpes*) and Feral Cats (*Felis catus*).

Field survey results

This species was not recorded during field surveys of the Project area.

Modelling

The predicted distribution of the species within the vicinity of the Project was modelled. The key elements of the modelling included:

- REs likely to contain habitat resources suitable for the species, including those which are known or likely to support the microhabitat features required such as suitable burrowing substrate.
- BPA criteria relating to ecosystem diversity and context/connection which rank as High or Very High. These criteria were used as large, contiguous areas of vegetation are more likely to support important populations or important areas of habitat for the species.
- The modelled distribution of the species presented in the Draft Referral Guidelines for Nationally Listed Brigalow Belt Reptiles (SEWPAC 2011).

The results of the modelling are presented below:

MODELLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	8,152	812
Low Potential Habitat	1,631	650

This combined area represents around 0.36% of potential habitat predicted to occur within the region.

Summary

Direct impacts to the Yakka Skink are difficult to quantify given that the species has not been recorded within the Project area. As such, there will be no loss of confirmed habitat for the species as a result of the Project. However, a total of 8,964 ha of high potential habitat and 2,281 ha of low potential habitat will be cleared across the mine site and rail alignment. This represents approximately 0.36% of similar potential habitat within the region. Given that the species was not recorded on site, and that there is a large amount of potential habitat available within the region it is considered unlikely that the Project will place the species at an unreasonable level of risk.

LITTLE PIED BAT (*CHALINOLOBUS PICATUS*)

Species overview

The species is a small micro-bat which is characterised by distinct pied colouring. The species is listed as Near Threatened under the NC Act.

Distribution and Habitat requirements

Little Pied Bat is a small insectivorous bat whose range extends from the central Queensland coast, through western New South Wales and into far eastern South Australia (Van Dyck and Strahan, 2008). Churchill (2008) notes, that it has been caught in dry open forest, open woodland, chenopod shrublands and *Callitris* forest. It is now known to be captured more frequently close to permanent or semi-permanent waterbodies (Ellis and Pennay, 2008).

It is known to roost in Black Oak (*Casuarina pauper*) and Mulga (*Acacia aneura*) as well as bloodwoods and other large eucalypts (Churchill, 2008). Other roosting habitat includes caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings (NSW DEC, 2005a).

Threats

No threatening processes have been identified for this species. It is likely that populations will be threatened by:

- Loss or modification of habitat;
- Predation by cats;
- Application of pesticides in or adjacent to foraging areas (NSW DEC, 2005a);
- Roost disturbance;

- Harvesting of timber in State Forest lands; and
- Changing fire regimes (Ellis and Pennay,2008).

Field survey results

This species was recorded during field surveys of the Project area within the proposed mine footprint in Silver-leaved Ironbark Woodland.

Modelling

The predicted distribution of the species within the vicinity of the Project was modelled. The key elements of the modelling included the following:

- REs likely to contain habitat resources suitable for the species, including those which are known or likely to support the microhabitat features required.
- BPA criteria relating to ecosystem diversity and context/connection which rank as High or Very High. These criteria were used as large, contiguous areas of vegetation are more likely to support important populations or important areas of habitat for the species.

The results of the modelling are presented below:

MODELLED HABITAT TYPE	MINE IMPACTS (HA)	RAIL IMPACTS (HA)
High Potential Habitat	9,590	854
Low Potential Habitat	2,161	625

This combined area represents around 0.4% of potential habitat predicted to occur within the region.

Summary

The species was recorded within the mine footprint associated with the Project. The modelling suggests that there is a large amount of potential habitat available within the broader region (over 3 million hectares). For these reasons, the Project is considered unlikely to place the species at an unreasonable level of risk.

MITIGATION AND AVOIDANCE MEASURES

In order to minimise the total impacts to threatened fauna by the Project, several on-site avoidance and mitigation measures will be applied (where appropriate). The table below provides examples of the actions that can be undertaken to reduce impacts on threatened fauna across the Project footprint.

ACTION	TIMING
Ensuring a fauna spotter is located on site prior to and during all vegetation removal to identify, capture and relocate fauna, including conservation significant fauna;	Construction Phase
Developing a flora and fauna species relocation plan particularly for threatened species to allow individuals to be relocated according to species requirements (particularly if threatened species are encountered during clearing activities);	Pre-construction
Erecting temporary fencing around the construction zone to exclude mobile animals such as livestock, macropods, echidnas, snakes and lizards from the construction zone;	Construction Phase
If any pits/trenches are to remain open after daily site works have completed, ensure they are securely covered by an impenetrable barrier, if possible, or fauna ramps (e.g. log ramps or wooden planks) are put in place to provide a potential means of escape for trapped fauna;	Construction Phase
Work areas are to be checked for fauna that may have become trapped within the worksite before work commences each day;	Construction Phase
Educating employees of environmental responsibilities during inductions including treating all native fauna species as protected;	Construction Phase
Enforcing on-site speed limits to restrict the incidence of wildlife road kill;	Construction and Operation Phase
Construction to occur during the dry season to minimise direct mortality of aquatic fauna or migratory species (Caley Valley wetlands and the Bowen River, between Birralee and Pelican Creeks); and	Construction Phase
A fauna mortality register is to be kept and maintained to determine the location, frequency of mortality, and types of species most susceptible to enable further modifications to fauna conservation mechanisms to be made where necessary.	Construction and Operation Phase

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