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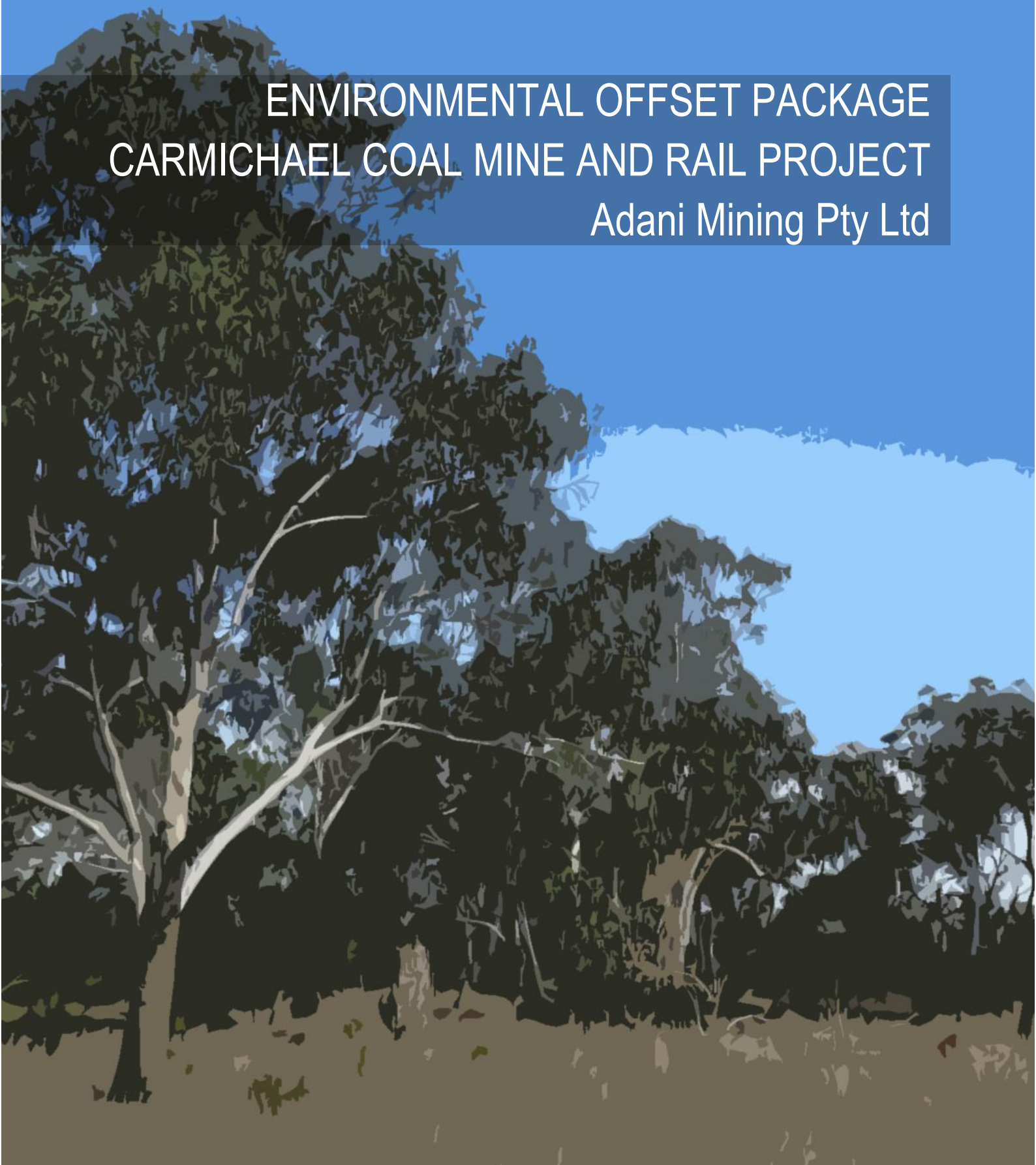
ENVIRONMENTAL OFFSET PACKAGE
CARMICHAEL COAL MINE AND RAIL PROJECT
Adani Mining Pty Ltd



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REPORT TITLE:	Environmental Offset Package for the Carmichael Coal Mine and Rail Project
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DATE:	5 November 2013

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EXECUTIVE SUMMARY

Adani Mining Pty Ltd (Adani) is the proponent for the Carmichael Coal Mine and Rail project (the project). The project is an integrated, thermal coal mine located in the northern Galilee Basin approximately 160 kilometres north-west of Clermont, Queensland. Sixty million tonnes of product coal per annum will be transported by rail from the mine to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited. The coal will be exported via the Port of Hay Point and the Port of Abbot Point over the 60 year mine life[1]. Project components are as follows:

- Mine: a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes open cut and underground mining, onsite mine infrastructure, associated mine processing facilities and the mine offsite infrastructure which includes a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure.
- Rail: a 95 m wide and 189 km long greenfield rail line connecting the mine to the existing Goonyella and Newlands rail systems. Temporary infrastructure areas and a construction camp are also required during the rail construction phase. The rail component includes:
    - Rail (west): a 120 km dual gauge portion running west from the mine site east to Diamond Creek
    - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah.
- Quarries: five local quarries to extract quarry materials for construction and operational purposes.

The project was declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (Qld; SDPWO Act), which triggered the requirement for an environmental impact statement (EIS). The EIS process was accredited by the Australian Government, under its bilateral agreement with the Queensland Government, to be conducted under the SDPWO Act. The project was also designated as a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth; EPBC Act), requiring assessment and approval under the EPBC Act.

Adani subsequently prepared an EIS (submitted in December 2012) in accordance with the terms of reference issued by the Queensland Coordinator-General in May 2011 (Queensland Government, 2011). The EIS process is managed under section 26(1) (a) of the SDPWO Act, which is administered by the Queensland Government's Department of State Development, Infrastructure and Planning (DSDIP). The EIS assessed the environmental, social and economic impacts associated with the development and operation of the project and identified strategies to avoid and mitigate potentially adverse impacts. Environmental impacts that cannot be reasonably avoided or mitigated (i.e. residual impacts) are required to be offset in accordance with Australian and Queensland Government offset policies.

An Environmental Offset Strategy the Carmichael Coal Mine and Rail project (the offset strategy), prepared by Ecofund Queensland Pty Ltd (Ecofund), was submitted as a component of the EIS (Ecofund, 2012). The offset strategy:

- reviewed and confirmed the initial residual impacts on environmental values
- identified offset requirements under relevant Australian and Queensland Government policies
- provided an overview of potential offset areas and delivery methods.

This Environmental Offset Package for the Carmichael Coal Mine and Rail Project (the offset package) is the second stage in the delivery of the project's offset plan. The offset package is based on updated project information and will support the supplementary environmental impact statement (SEIS) as well as address stakeholder submissions raised with reference to the EIS. Specifically, this package:

[1] Listed as 90 years in the EIS (GHD, 2012)

- presents the offsets legislative framework applicable to the project
- refines and confirms the residual impacts of the project which will require offsets
- provides specific solutions for acquitting the project's offset requirements through a combination of direct offsets, indirect offsets (or compensatory measures) and offset payments (as applicable)
- identifies the preferred offset package for acquitting the project's offset requirements
- outlines the approach for implementation and delivery of the offset package.

In August 2013 Adani submitted the SEIS for the project, including a comprehensive offset package, to the Queensland and Australian Governments. Following its review the Queensland Government requested Adani revise project impact calculations due to the uncertainty of how subsidence associated with underground mining activities will impact state significant biodiversity values (SSBV). In addition, the Queensland Government advised Adani that vegetation identified as remnant, as defined by the *Vegetation Management Act 1999* (Qld), is acceptable to acquit project offset requirements for SSBV. The Australian Government has also requested that Adani provide additional information about the potential to deliver offsets for impacts on matters of national environmental significance, including providing greater certainty that commensurate offsets are available and can be delivered, particularly for the black throated finch (*Poephila cincta cincta)*.

Based on data provided by GHD Pty Ltd, Ecofund identified 51 environmental values that will be affected by the project's residual impacts, including 27 threatened fauna species, one threatened flora species, one threatened ecological community, listed regional ecosystems as well as habitat connectivity, watercourses and wetlands. The preferred offset package was identified through a process that included a strategic desktop assessment, spatial analysis and consultation with Adani. The preferred offset package consists of five properties that together are expected to acquit the offset requirements for 50 of the 51 environmental values impacted by residual project impacts. While Adani's preference is to offset impacts using direct offsets, one value may not be offset through direct offsets – wetland protection areas. The lack of suitable direct offsets for wetland protection areas is likely a result of limitations of the desktop analysis.

As part of the implementation of the package, Adani will conduct landholder engagement and ecological surveys to confirm the suitability of the preferred offset package. In addition, Adani will conduct detailed surveys of proposed offset options to ascertain if suitable offset areas for wetland protection areas exist. Following this Adani will refine and confirm the offset package. This may include acquitting its obligation through offset payments and/or indirect offsets, which are likely to be in the form of contribution to species-specific management plans and targeted recovery actions. Adani proposes to acquit all offset requirements related to on-site vegetation clearing, off-site vegetation clearing and high impact subsidence. In order to identify areas of high impact subsidence, Adani has undertaken a comprehensive assessment which involved modelling the cumulative impacts of a combination of subsidence, cracking and ponding.

Once the Australian and Queensland Governments endorse the package, it will be implemented in a staged approach to correspond with the sequential development of coal extraction over the production life of the mine.

ABBREVIATIONS AND ACRONYMS

BVG	broad vegetation group
CAMBA	Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment
DEHP	Department of Environment and Heritage Protection (Qld)
DERM	former Department of Environment and Resource Management (Qld)
DoTE	Department of the Environment (Cwlth)
DSDIP	Department of State Development, Infrastructure and Planning (Qld)
EEM guideline	Ecological Equivalence Methodology Guideline Policy for Vegetation Management Offsets Queensland Biodiversity Offset Policy Version 1 3 October 2011
EIS	environmental impact statement
EMP	environmental management plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPBC Act Environmental Offsets Policy	*Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy October 2012
EPC	permit for exploration of coal
FPC	foliage projective cover
GBOS	Galilee Basin Offset Strategy (Qld)
HVR	high value regrowth
JAMBA	Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment
MIA	mine infrastructure area
MNES	matters of national environmental significance
NC Act	*Nature Conservation Act 1992* (Qld)
OAMP	offset area management plan
the offsets assessment guide	EPBC Act Offsets Assessment Guide

the offset package	Environmental Offset Package for the Carmichael Coal and Rail Project (this report)
the offset strategy	Environmental Offset Strategy for the Carmichael Coal Mine and Rail Project (Ecofund, 2012)
the project	Carmichael Coal Mine and Rail Project
PVMO	Policy for Vegetation Management Offset Version 3 2011 (Qld)
QBOP	Queensland Biodiversity Offset Policy Version 1 2011
QGEOP	Queensland Government Environmental Offset Policy 2008
RE	regional ecosystem
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SEWPaC	former Department of Sustainability, Environment, Water, Population and Communities
SEIS	supplementary environmental impact statement
SMP	draft Subsidence Management Plan for the Carmichael Coal and Rail Project (Adani, 2013)
SSBV	state significant biodiversity values
TEC	threatened ecological community
ToR	terms of reference
VM Act	*Vegetation Management Act 1999* (Qld)
WPA	wetland protection areas

1. INTRODUCTION

1.1. PROJECT DESCRIPTION

Adani Mining Pty Ltd (Adani) is the proponent for the Carmichael Coal Mine and Rail project (the project; **Figure 1**). The project is an integrated, thermal coal mine located in the northern Galilee Basin approximately 160 kilometres north west of Clermont, Queensland. Sixty million tonnes of product coal per annum will be transported by rail from the mine to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited. The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year mine life[2]. Project components are as follows:

- Mine: a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes open cut and underground mining, onsite mine infrastructure, associated mine processing facilities and the mine offsite infrastructure which includes a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure.
- Rail: a 95 m wide and 189 km long greenfield rail line connecting the mine to the existing Goonyella and Newlands rail systems. Temporary infrastructure areas and a construction camp are also required during the rail construction phase. The rail component includes:
    - Rail (west): a 120 km dual gauge portion running west from the mine site east to Diamond Creek
    - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah.
- Quarries: five local quarries to extract quarry materials for construction and operational purposes.

The development of the open cut, underground and overburden disposal areas will begin during construction and continue through the operation phase following the establishment of the mine infrastructure area (MIA) and off-site infrastructure. The proposed project area spans the boundary between the Desert Uplands and Brigalow Belt Bioregions and currently supports stock grazing and agriculture (GHD, 2010).

1.2. APPROVAL PROCESS

In November 2010, the project was declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (Qld; SDPWO Act), which triggered the requirement for an environmental impact statement (EIS). In January 2011, the project was also designated a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth; EPBC Act), requiring assessment and approval under the EPBC Act. The EIS process was accredited by the Australian Government, under its bilateral agreement with the Queensland Government, to be conducted under the SDPWO Act.

Adani subsequently prepared an EIS in accordance with the terms of reference (ToR) issued by the Queensland Coordinator-General in May 2011 (DSDIP, 2011). The EIS process is managed under section 26(1) (a) of SDPWO Act, which is administered by the Queensland Government's Department of State Development, Infrastructure and Planning (DSDIP).

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with the development and operation of the project and identified strategies to avoid and mitigate potentially adverse impacts. Environmental offsets are required in accordance with Australian and Queensland Government offset policies to counterbalance the project impacts that cannot be reasonably avoided or mitigated (i.e. residual impacts).

The Environmental Offset Strategy for the Carmichael Coal Mine and Rail Project (the offset strategy; Ecofund, 2012) was submitted as a component of the EIS. The offset strategy identified the residual impacts on environmental values, the offset requirements under relevant Queensland and Australian Government policies and provided an overview of

[2] Listed as 90 years in the EIS (GHD, 2012)

potential offset areas and delivery methods. Moray Downs, an 116,528 ha Adani-owned property was assessed as part of the offset strategy as a priority offset area to acquit the project's offset requirements. The strategy identified sufficient availability of potential offset areas, including Moray Downs, to fulfil the majority of the Queensland and Australian Government offset requirements. The strategy also advised that the delivery of direct offsets would require securing land across multiple lots to compensate for the environmental values affected by the project.

Subsequently, Ecofund prepared the initial Environmental Offset Package for the Carmichael Coal Mine and Rail Project (the offset package; Ecofund, 2013), which detailed Adani's preferred approach to acquitting the offset requirements of the project. In August 2013, Adani submitted the supplementary environmental impact assessment (SEIS) for the project, including the offset package, to the Queensland and Australian Governments. Following its review the Queensland Government requested Adani revise project impact calculations due to the uncertainty of how subsidence associated with underground mining activities will impact state significant biodiversity values (SSBV). In addition, the Queensland Government advised Adani that vegetation identified as remnant, as defined by the *Vegetation Management Act 1999* (Qld; VM Act), is acceptable to acquit project offset requirements for SSBV. The Australian Government has also requested that Adani provide additional information about the potential to deliver offsets for impacts on matters of national environmental significance (MNES), including providing greater certainty that commensurate offsets are available and can be delivered, particularly for the black-throated finch (*Poephila cincta cincta*).

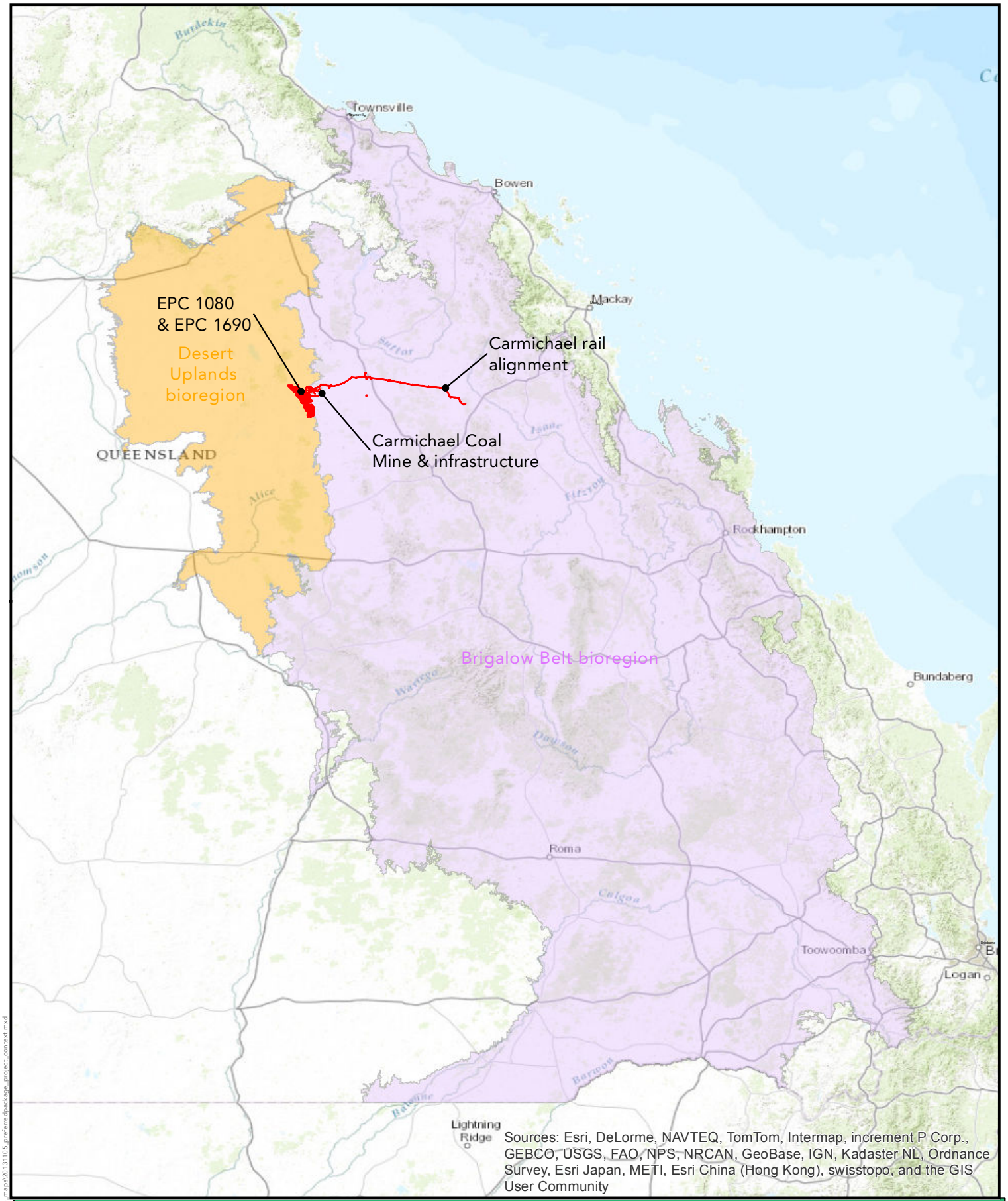
1.3. REPORT PURPOSE

This package is the second stage in the delivery of the project's offset plan and demonstrates that Adani can adequately compensate for the unavoidable, residual impacts of the project. Specifically, this offset package:

- presents the offsets legislative framework applicable to the project
- confirms and identifies the residual impacts of the project which will require offsets, including detailed modelling of subsidence
- provides specific solutions for acquitting the project's offset requirements through a combination of direct offsets, indirect offsets (or compensatory measures) and offset payments (as applicable)
- identifies the preferred offset package for acquitting the project's offset requirements
- outlines the approach for implementation and delivery of the offset package.

As this version of the environmental offsets package is publically available, confidential property information has been excluded. Specifically, information that has been omitted from this version of the offset package includes;

- lot on plan numbers and addresses of offset properties
- general property descriptions such as location adjacent to protected areas and names of watercourses
- property specific desktop assessments
- maps of offset properties.



Adani Mining Pty Ltd - Charmichael Coal Mine and Rail Project

LOCATION DIAGRAM

Figure 1: Carmichael Coal Mine Context

Project footprint
Brigalow Belt
Desert Uplands

CO_2

0 50 100 150
Kilometres

1:5,500,000

(A4) GCS GDA 1994

DATA SOURCE:

Project footprint provided by GHD (12/07/2013 and 25/10/2013)
The following datasets are © State of Qld 2013:
- Cadastral Data (2013)
- GBOS Strategic Footprint (2012)

DATE	AUTHOR	REQUESTED BY
05-11-2013	RF	KM

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2. LEGISLATIVE FRAMEWORK

This section provides a summary of the current legislative and policy framework for environmental offsets. It is important to note; however, that Queensland legislation is currently undergoing revision and is expected to be updated and published in mid-2014. Ecofund will give consideration to the new offset legislation and its application to the project.

2.1. EPBC ACT ENVIRONMENTAL OFFSETS POLICY

The purpose of the EPBC Act Environmental Offsets Policy October 2012 (EPBC Act Environmental Offsets Policy) is to outline the Australian Government's position on the use of environmental offsets to compensate for significant adverse impacts on MNES protected under the EPBC Act. Offsets seek to provide a net environmental gain through targeted actions (direct or indirect) and do not necessarily facilitate onsite impact. Under the EPBC Act, environmental offsets can be used to maintain or enhance the health, diversity and productivity of the environment.

2.2. QUEENSLAND GOVERNMENT ENVIRONMENTAL OFFSETS POLICY

The Queensland Government Environmental Offsets Policy 2008 (QGEOP) is based on seven principles that guide the use of offsets to achieve ecologically sustainable development. The principles are described below:

- 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
- environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact
- offsets must achieve an equivalent or better outcome
- offsets must provide environmental values as similar as possible to those being lost
- offset provision should minimise lag time between the impact and the offset delivery
- offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values
- offsets must be legally secured for the duration of the offset requirement
- where possible, the QGEOP supports the development of offset packages that meet the combined requirement of Queensland and Australian Government policies.

2.3. POLICY FOR VEGETATION MANAGEMENT OFFSETS

The Policy for Vegetation Management Offset Version 3 2011 (Qld; PVMO) supports the VM Act, which regulates vegetation clearing in Queensland. The VM Act is not applicable to Level 1 mining activities as Level 1 mining activities are defined as 'not assessable development' under the Sustainable Planning Regulation 2009. As such, the PVMO applies to the rail component of the project but not the project activities that are subject to a mining lease. The PVMO applies to vegetation clearing activities within the rail corridor.

2.4. QUEENSLAND BIODIVERSITY OFFSET POLICY

The Queensland Biodiversity Offset Policy Version 1 2011 (QBOP) does not expressly apply to projects declared as 'significant projects' under the SDPWO Act; however, the Coordinator-General may use discretionary powers to require compliance with the policy for approval. The QBOP's objective is to increase long-term protection and viability of SSBV by offsetting residual impacts from development. Based on the project's residual impacts on SSBV, and recent approvals for projects of a similar scale, Ecofund has assumed that Adani will be subject to the policy.

2.5. OFFSETS

As a condition of project approval, environmental offsets are required in accordance with Queensland Government's offset policies and the EPBC Act Environmental Offsets Policy where significant project-related impacts cannot be avoided or mitigated. Current Queensland and Australian Government offset policies allow the delivery of offsets by means of direct offsets, indirect offsets, offset transfers and offset payments.

2.5.1. Direct Offsets

Direct offsets are an essential part of an offset plan and involve the identification and securing of land to be managed for conservation purposes. To be suitable, an offset area must have similar environmental values, function and habitat. Direct offsets may involve the:

- acquisition of good or better quality land for enduring protection through inclusion in the conservation estate (including covenanting arrangement on private land) (EPBC Act Environmental Offsets Policy)
- maintenance or improvement of land targeted toward the impacted value, including rehabilitation of existing vegetation in poor condition or revegetation of environmentally degraded land (EPBC Act Environmental Offsets Policy)
- acquisition of compliant land included in the protected area estate (QBOP; PVMO)
- rehabilitation and protection of regrowth vegetation (QBOP; PVMO)

2.5.2. Indirect Offsets

Indirect offsets may supplement direct offsets when the direct offset does not acquit a project's offset requirements. Indirect offsets may be land-based as well as financial contributions or involve management and research funding targeting the impacted environmental values.

The delivery of indirect offsets (or compensatory measures) that establish positive social and economic co-benefits are encouraged (EPBC Act Environmental Offsets Policy). Indirect offsets may involve:

- implementing priority actions outlined in relevant recovery plans (EPBC Act Environmental Offsets Policy)
- enhancing habitat quality or reducing threats to the protected matter on a site that is not part of a direct offset (EPBC Act Environmental Offsets Policy)
- contributing to relevant research or education programs (EPBC Act Environmental Offsets Policy)
- an activity that will result in, or improve the spatial capture of vegetation and wildlife information (QBOP; PVMO) including:
    - habitat mapping/modelling for priority species
    - development of regional ecosystem (RE) BioCondition benchmarks
    - finer scale RE mapping
    - fauna surveys in identified strategic areas
- approved 'on-ground' and 'research and monitoring' actions derived from the Back on Track species prioritisation framework Action Plans
- an action addressing a threatening process for a species or ecosystem (within the same bioregion) identified in a Queensland or Australian Government approved conservation or recovery plan.

2.5.3. Offset Payments

Financial offsets payments may be made to an approved trust[3] established for land management or nature conservation purposes. The payment may be used to purchase land containing SSBV or areas located within a mapped strategic area or recognised corridor.

2.5.4. Offset Transfers

Offset transfers involve a contractual agreement with an offset broker for the delivery of an offset area. For an offset transfer to be considered, it must be reasonably evident that a suitable offset is available at the time of the development approval being issued and the offset can be legally secured with 12 months. It is important to note that while the applicant can undertake an offset transfer to an offset broker as a means of securing the applicant's offset requirements, the offset obligation still remains with the applicant (personal communication DERM, 29 March 2012).

[3] QBOP specifies that payments be made to the Balance the Earth trust

3. METHODS

3.1. OFFSET REQUIREMENTS

The legislative offset requirements of the project were identified by reviewing the following policies with regard to their applicability to the project:

- EPBC Act Environmental Offsets Policy
- QGEOP
- PVMO
- QBOP.

3.2. RESIDUAL IMPACT IDENTIFICATION

The impact data presented in this package were provided by GHD as part of the EIS (GHD, 2012) and SEIS (GHD, 2013c) process. Residual impacts of subsidence requiring offsets, as per the draft Subsidence Management Plan (Adani, 2013), include high impact subsidence areas where modelled:

- slope changes by more than 2% (> 5 m); or
- cracking of > 100 mm in width occurs; or
- ponding occurs for more than two days.

3.3. OFFSET IDENTIFICATION

Ecofund identified potential offset areas through a strategic desktop assessment and spatial analysis that incorporated the legislative requirements under the applicable offset policies relevant to the affected environmental values. The package utilised information from the sources listed in **Table 1**.

Table 1. Data Sources for Environmental Values Requiring Offsets

ENVIRONMENTAL VALUE	DATA SOURCE
Threatened flora and fauna	• Essential Habitat Factors V 3.1. VM Act • Species Profile and Threats Database and species recovery plans • Wildlife Online (DEHP) • Protected matters search tool. EPBC Act 1999 • Relevant scientific literature • RE mapping (Version 6.1) • RE description database (Version 6.1) • Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
Threated ecological communities	• SPRAT Profile including Recovery Plans and Policy Statements • RE mapping (Version 6.1) • RE description database (Version 6.1) • Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
Threatened regional ecosystems and high value regrowth	• RE/remnant vegetation mapping (Version 6.1) • RE description database (Version 6.1) • Regrowth vegetation (RV) mapping (Version 2.1) • Property maps of assessable vegetation (PMAVs) (DEHP, 2013) • Regrowth vegetation code (DEHP, 2011) • Broad vegetation groups (DEHP, 2012) • RE description database (Version 6.1)

ENVIRONMENTAL VALUE	DATA SOURCE
	• Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
Wetlands and wetland protected areas	• RE mapping (Version 6.1) • RE description database (Version 6.1); specifically RE associated with a wetland • State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments • Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)
Watercourse vegetation	• RE mapping (Version 6.1) • RE description database (Version 6.1); specifically land zone 3 (quaternary alluvial systems) • Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009) • Ordered Draingage 100K – Queensland (2010)
Connectivity	• Biodiversity Planning Assessment State and Regional corridor mapping • RE mapping (Version 6.1) • RE description database (Version 6.1) • Regrowth vegetation mapping (Version 2.0) • Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland (2009)

Potential direct offsets were considered within areas that:

- are land lease, leasehold or freehold lots[4] as per the Queensland Government's Digital Cadastral Database, which are greater than or equal to 5 ha
- are priority-designated areas within the Galilee Basin Offset Strategy (GBOS; DNRM *et al*. 2012)
- contain suitable environmental values as per the relevant policy criteria
- do not include non-compliant high value regrowth (HVR) that is:
- an endangered RE on freehold or indigenous land
- an endangered or of concern RE on leasehold land (agriculture and grazing)
- essential regrowth habitat
- within a wetland protection area (WPA) (QBOP)
- contain remnant, HVR vegetation and/or non-remnant vegetation (EPBC Act Environmental Offsets Policy)
- contain foliage projective cover (FPC)[5] ≥15% (note this data will not be applied to grassland RE).
- do not include lots mapped as Queensland Estate, state-protected areas (including nature refuges) (DEHP, 2012) or strategic cropping trigger areas (DEHP, 2011)
- do not include parts of lots that contain mining leases (DSDIP, 2012).

The Australian Government offset-to-impact ratios were superseded by the EPBC Act Offsets Assessment Guide (the offsets assessment guide) in October 2012. The offsets assessment guide applies where the impacted environmental value is an MNES species or ecological community. It utilises a balance sheet approach to measure and compare values essential to each MNES (i.e. habitat quality) between the impact area and offset area. The completed guide is used as a tool by the Department of the Environment (Cwlth; DoTE; formerly the Department of Sustainability, Environment, Water, Population and Communities) assessment officers to determine the suitability of the proposed offset. The Queensland Government calculates suitable offset requirements using the application of its ecological equivalence methodology. Ecological equivalence involves site-based ecological surveys combined with spatial analysis to score both impact and offset areas. For an offset to be accepted in must score the same or higher than the associate impact site.

[4] Offset identification is based on lots, not properties (i.e. some properties consist of more than one lot)
[5] The results of the assessment are presented in terms of hectares of potential offset areas with Foliage Projective Cover 2010 (FPC; DERM 2012) ≥15% that are available within each property.

To manage the risks of uncertainty these two methods introduce when conducting a desktop analysis, Ecofund has prioritised properties that contain large areas of potential offsets. In addition, the results of the desktop and spatial analysis were added to the assessment of several additional properties identified by Adani as potentially suitable offset areas.

3.4. ASSUMPTIONS AND LIMITATIONS

Ecofund has recommended an approach to offset delivery based on the offset requirements identified in this report. Further refinement of project impacts and field work may change the project's offset requirements and potentially alter the approach to offset delivery.

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. The extent and suitability of the identified offset areas will be verified following future field work to determine the ecological equivalence of each offset property with respect to the environmental values impacted by the project.
- 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.
- Potential offset areas may include areas that have conflicting land uses, such as agriculture, mining interests not on mining lease title, local government recreational parks or conservation areas, large urban blocks, state-owned freehold land which is not a protected area and lots covered by existing development application approvals.
- Some areas may include non-compliant HVR vegetation which is on a slope greater than 12% (non-compliant for requirements under PVMO only) or within a stream protection zone.
- Some areas may be cleared and therefore may not meet the PVMO and QBOP requirement of containing functional RE. Other areas may be partially cleared and require extensive revegetation; however, this has been minimised by integrating the FPC ≥15% criterion.
- Habitat modelling considered species 'known to occur' or 'likely to occur' in the project area as determined by GHD's likelihood of occurrence assessment. The offset strategy and package do not analyse project impacts on species that 'may occur' or are 'unlikely to occur' in the project area.
- Environmental values expected to be affected by residual project impacts have been provided to Ecofund by GHD. Potential additional impacted values not provided by GHD have not been considered as part of this package.
- Area (ha) of listed RE (i.e. of concern and endangered) within Category A areas were compiled and are presented with all listed RE data affected by residual project impacts.
- Impacts on migratory bird habitat from activities associated with the construction and operation of the mine are assumed to be *onsite* activities (as opposed of offsite activities or subsidence effects)
- Blank cells or cells labelled 'no value' in columns of data values located in spread sheets provided to Ecofund by GHD are assumed to be 0.00 where applicable.

4. AVOIDANCE AND MITIGATION

In accordance with the provisions of the EPBC Act and the SDPWO Act, Adani prepared an EIS to ensure that potentially adverse environmental, social and economic impacts as a result of project construction and operation are identified and avoided or mitigated (GHD, 2012).

Adani conducted a comprehensive investigation to avoid project impacts on environmental values. Potential coal sources able to meet the specific resource quantity and delivery timeframe requirements were investigated; however, Adani did not identify any viable alternatives to the proposed located (GHD, 2012). Similarly, the development of the rail corridor could not be avoided as the Galilee Basin is not currently serviced by rail infrastructure that would enable coal export from the project site. Avoiding all impacts by not developing the mine or the rail (i.e. no action option) will likely lead to Adani's demand for coal being met outside Australia and thus, diverting an approximate $21.5 billion investment.

Technical reports were prepared detailing the existing environmental values within the project site and the potential impacts and mitigation measures. To assist the EIS, a draft environmental management plan (EMP) was developed parallel to the EIS to provide a framework for management and mitigation implementation based on the findings and recommendations of studies undertaken for the EIS. These documents have been further refined through the preparation of the supplementary EIS (SEIS).

As part of the SEIS, Adani has also developed a draft Subsidence Management Plan (SMP), which provides the mitigation measures for subsidence impacts from the underground operations of the mine on SSBV and MNES (Adani, 2013). The SMP has also been developed in response to submissions received from the Department of Environment and Heritage Protection (Qld; DEHP) and DoTE on the SEIS. Adani will update the draft SMP as the project progresses to the detail design phase and prepare a finalised SMP for approval prior to the commencement of underground mining activities.

Mitigation measures outlined in the draft SMP include:

- Design and pre-construction proposed controls:
    - During detailed design of infrastructure, if mining infrastructure is to cross the underground mining footprint, design infrastructure to be resistant to the effects of subsidence.
    - Prior to development of diversions, design creek diversions around the open cut areas to remain functional after subsidence.
- Operations proposed controls:
    - Establish monitoring locations, including one point immediately upstream, one mid-point and one point immediately downstream of underground footprint on waterway diversions.
    - Determine detailed monitoring methodologies for vegetation health, habitat value and characteristics, stream condition and photo monitoring, drawing on established methodologies.
- Monitoring and management:
    - Inspect subsided areas for new and existing tension cracks annually. Document locations and size of cracks and changes in crack size. Grade and/or fill cracks with inert material, cover with topsoil and revegetate. Use small scale equipment to minimize damage to intact vegetation and soils.
    - Monitor extent of ponding in subsidence troughs annually and partially or fully drain ponds if required.
- Rehabilitation:
    - Retain a series of low flow connection channels to provide a continuous path for flows to pass through the areas of predicted subsidence and into a diversion channel and/or existing waterway.
    - Re-profile subsided areas to prevent future ponding of water.

- Reporting:
    - A report will be prepared annually following commencement of underground mining activities. The purpose of the report will be to detail mining activities, management, monitoring and rehabilitation activities undertaken as part of the SMP.

5. SUMMARY OF RESIDUAL PROJECT IMPACTS

Fifty-one environmental values listed under the Australian and Queensland Governments are expected to be affected by residual project impacts. The affected environmental values consist of:

- one threatened ecological community (TEC)
- 20 MNES fauna species
- 27 SSBV fauna species (including 20 species also listed as MNES)
- one MNES flora species
- eight endangered and of concern RE, two threshold RE and one grassland RE
- four HVR broad vegetation groups (BVG)
- three watercourses, one significant wetlands and a WPA
- connectivity.

A summary of the project's residual impacts and the extent of the impacts [represented by area (ha)] are presented in **Table 2.**

Table 2. Summary of Project (Mine and Rail) Impacts on Environmental Values

ENVIRONMENTAL VALUE	EPBC ACT STATUS	NC ACT STATUS[6]	PROPOSED IMPACT AREA (ha)				TOTAL
			MINES			RAIL	
			ON SITE	OFF SITE	SUBSIDENCE[7]		
THREATENED ECOLOGICAL COMMUNITY							
Brigalow	E	-	580.51	0.01	0.00	26.63	610.22
THREATENED FAUNA							
yakka skink	V	V	10,303.34	2.48	162.49	0.00	10,468.31
Brigalow scaly-foot	-	V	6,264.59	3.45	96.61	355.49	6,720.14
ornamental snake	V	V	959.39	314.06	0.00	349.48	1,622.94
cotton pygmy-goose	-	NT	20.45	0.00	0.00	299.81	320.26
black-necked stork	-	NT	20.45	0.00	0.00	0.00	20.45
square-tailed kite	-	NT	8,529.51	0.00	162.49	299.81	8,991.81
squatter pigeon (southern)	V	V	10,691.34	5.02	163.32	337.04	11,196.72
black-chinned honeyeater	-	NT	8,529.51	0.00	162.49	299.81	8,991.81
black-throated finch (southern)	E	E	9,547.81	2.53	163.32	16.24	9,729.90
echidna	-	SLC	9,997.27	2.48	0.00	0.00	9,999.75
koala	V[8]	SLC	9,918.98	2.53	163.32	176.88	10,261.71

6 E- endangered, LC- least concern, M- migratory, NT- near threatened, OC- of concern, SLC- special least concern, V- vulnerable.
7 Only includes high impact subsidence areas as detailed in the SMP.
8 The koala was listed under the EPBC Act after the project was designated a control action and is only assessed as a state significant biodiversity value in this package (i.e. not assessed as an MNES)

ENVIRONMENTAL VALUE	EPBC ACT STATUS	NC ACT STATUS[6]	PROPOSED IMPACT AREA (ha)				TOTAL
			MINES			RAIL	
			ON SITE	OFF SITE	SUBSIDENCE[7]		
THREATENED FAUNA							
little pied bat	-	NT	10,424.93	2.50	163.32	0.00	10,590.75
MIGRATORY BIRDS							
eastern great egret	M	SLC	20.45	0.00	0.00	299.80	320.25
cattle egret	M	SLC	8554.82	0.14	0.00	2,087.92	15,755.51
glossy ibis	M	SLC	8.60	0.00	0.00	0.00	8.60
white-bellied sea-eagle	M	SLC	20.45	0.00	0.00	61.00	81.45
Latham's snipe	M	SLC	27.00	0.01	0.00	143.23	173.30
black-tailed godwit	M	SLC	8.60	0.00	0.00	0.00	8.60
common greenshank	M	SLC	8.60	0.00	0.00	0.00	8.60
marsh sandpiper	M	SLC	8.60	0.00	0.00	0.00	8.60
common sandpiper	M	SLC	8.60	0.00	0.00	0.00	8.60
curlew sandpiper	M	SLC	8.60	0.00	0.00	0.00	8.60
caspian tern	M	SLC	8.60	0.00	0.00	0.00	8.60
fork-tailed swift	M	SLC	10,470.25	285.90	163.32	2,703.19	13,622.66
white-throated needletail	M	SLC	10,470.25	285.90	163.32	2,703.19	13,622.66
rainbow bee-eater	M	SLC	10,470.25	285.90	163.32	2,703.19	13,622.66
satin flycatcher	M	SLC	4.87	0.00	0.00	361.37	366.24
THREATENED FLORA							
waxy cabbage palm	V	V	3.56	0.00	0.00	0.00	3.56
REGIONAL ECOSYSTEMS							
11.3.1 (BVG 25a)	-	E	49.41	0.00	0.00	8.69	58.09
11.4.8 (BVG 25a)	-	E	0.00	0.00	0.00	3.68	3.68
11.4.9 (BVG 25a)	-	E	199.81	0.00	0.00	14.26	214.07
11.3.3 (BVG 16c)	-	OC	12.44	0.00	0.00	66.87	79.31
11.4.5 (BVG 26a)	-	OC	0.33	0.00	0.00	1.52	1.85
11.4.6 (BVG 26a)	-	OC	148.01	0.00	0.00	41.41	189.42
11.4.11 (BVG 30b)	-	OC	2.93	0.00	0.00	145.81	148.74
THRESHOLD REGIONAL ECOSYSTEMS							
11.3.5	-	LC	56.01	0.00	0.00	0.00	56.01

ENVIRONMENTAL VALUE	EPBC ACT STATUS	NC ACT STATUS[6]	PROPOSED IMPACT AREA (ha)				TOTAL
			MINES			RAIL	
			ON SITE	OFF SITE	SUBSIDENCE[7]		
THRESHOLD REGIONAL ECOSYSTEMS							
11.4.11	-	OC	2.93	0.00	0.00	145.81	148.74
GRASSLAND REGIONAL ECOSYSTEMS							
11.4.11	-	OC	2.93	0.00	0.00	145.81	148.74
HIGH VALUE REGROWTH							
BVG 25a	-	E	0.00	0.00	0.00	9.56	9.56
BVG 30b	-	OC	0.00	0.00	0.00	1.08	1.08
BVG 26a	-	OC	3.53	0.00	0.00	4.20	7.73
BVG 16c	-	OC	0.88	0.00	0.00	2.89	3.77
WATERCOURSES							
stream order 2	-	-	398.52	0.01	2.57	35.55	436.65
stream order 4	-	-	137.63	0.00	0.00	13.03	150.66
stream orders 8	-	-	8.33	0.00	0.00	20.91	29.24
WETLANDS							
significant wetland	-	-	4.42	0.00	0.00	0.00	4.42
WPA	-	-	6.04	0.00	0.00	0.00	6.04
CONNECTIVITY							
connectivity	-	-	10,447.36	5.02	6,944.44	515.03	17,911.85

6. RESIDUAL MINE IMPACTS

6.1. THREATENED ECOLOGICAL COMMUNITY

On-site vegetation clearing is expected to affect 580.51 ha of endangered Brigalow TEC within the mine footprint.

6.2. THREATENED FAUNA

Field surveys confirmed the presence of 11 fauna species listed under the EPBC Act and/or the *Nature Conservation Act 1992* (Qld; NC Act) within the mine footprint. An additional 16 fauna species, or their habitat, were determined 'likely to occur' through GHD's likelihood of occurrence assessment (GHD, 2012). Of the species likely to occur, ten bird species are listed as migratory under the EPBC Act as well as international acts, including the Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA) and the Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA). Birds designated under JAMBA and CAMBA are also listed as special least concern under the NC Act.

The listed fauna species, and/or their habitat, confirmed or likely to occur within the mine site are listed in **Table 3**.

6.3. THREATENED FLORA

Ecological studies undertaken for the SEIS (GHD, 2013c) confirmed the presence of, and identified likely impacts on, the EPBC Act listed threatened waxy cabbage palm (*Livistona lanuginosa*). On-site clearing is expected to result in the removal of 3.56 ha of waxy cabbage palm habitat.

Avoidance and mitigation activities will be undertaken to prevent and lessen the direct impact on waxy cabbage palm, and its habitat within the Carmichael River channel; however, potential indirect impacts to individual plants may occur as a result of ground and surface water changes.

Table 3. Residual Mine Impacts on Fauna Species

COMMON NAME	SCIENTIFIC NAME	EPBC ACT STATUS	NC ACT STATUS[9]	LIKELIHOOD OF OCCURRENCE[10]	MINE IMPACT (ha)			
					ON SITE	OFFSITE	SUBSIDENCE[11]	TOTAL
REPTILES								
yakka skink	*Egernia rugosa*	V	V	likely	10,303.34	2.48	162.49	10,468.31
Brigalow scaly-foot	*Paradelma orientalis*	-	V	likely	6,264.59	3.45	96.61	6,364.65
ornamental snake	*Denisonia maculata*	V	V	likely	959.39	314.06	0.00	1,273.45
BIRDS								
cotton pygmy-goose	*Nettapus coromandelianus*	-	NT	confirmed	20.45	0.00	0.00	20.45
black-necked stork	*Ephippiorhynchus asiaticus*	-	NT	confirmed	20.45	0.00	0.00	20.45
square-tailed kite	*Lophoictinia isura*	-	NT	likely	8,529.51	0.00	162.49	8,692.00
squatter pigeon (southern)	*Geophaps scripta scripta*	V	V	confirmed	10,691.34	5.02	163.32	10,859.68
black-chinned honeyeater	*Melithreptus gularis*	-	NT	likely	8,529.51	0.00	162.49	8,692.00
black throated finch (southern)	*Poephila cincta cincta*	E	E	confirmed	9,547.81	2.53	163.32	9,713.66
MAMMALS								
koala[12]	*Phascolarctos cinereus*	-	SLC	confirmed	9,918.98	2.53	163.32	10,084.83
echidna	*Tachyglossus aculeatus*	-	SLC	confirmed	9,997.27	2.48	0.00	9,999.75
little pied bat	*Chalinolobus picatus*	-	NT	confirmed	10,424.93	2.5	163.32	10,590.75

[9] E- endangered, LC- least concern, M- migratory, NT- near threatened, OC- of concern, SLC- special least concern, V- vulnerable.
[10] Based on the EPBC Act Protected Matters Search Tool database
[11] Only includes high impact subsidence areas as detailed in the SMP
[12] The koala was listed under the EPBC Act after the project was designated a control action and is only assessed as a state significant biodiversity value in this package (i.e. not a MNES)

COMMON NAME	SCIENTIFIC NAME	EPBC ACT STATUS	NC ACT STATUS	LIKELIHOOD OF OCCURRENCE[13]	MINE IMPACT (ha)			
					ON SITE	OFFSITE	SUBSIDENCE	TOTAL
MIGRATORY BIRDS								
eastern great egret	*Ardea modesta*	M	SLC	confirmed	20.45	0.00	0.00	20.45
cattle egret	*Ardea ibis*	M	SLC	likely	8,554.82	0.14	0.00	8,554.96
glossy ibis	*Plegadis falcinellus*	M	SLC	likely	8.6	0.00	0.00	8.60
white-bellied sea eagle	*Haliaeetus leucogaster*	M	SLC	confirmed	20.45	0.00	0.00	20.45
Latham's snipe	*Gallinago hardwickii*	M	SLC	likely	27	0.01	0.00	27.01
black-tailed godwit	*Limosa limosa*	M	SLC	likely	8.6	0.00	0.00	8.60
common greenshank	*Tringa nebularia*	M	SLC	likely	8.6	0.00	0.00	8.60
marsh sandpiper	*Tringa stagnatilis*	M	SLC	likely	8.6	0.00	0.00	8.60
common sandpiper	*Actitis hypoleucos*	M	SLC	likely	8.6	0.00	0.00	8.60
curlew sandpiper	*Calidris ferruginea*	M	SLC	likely	8.6	0.00	0.00	8.60
caspian tern	*Hydroprogne caspia*	M	SLC	likely	8.6	0.00	0.00	8.60
fork-tailed swift	*Apus pacificus*	M	SLC	likely	10,470.25	6,944.44	163.32	17,578.01
white-throated needletail	*Hirundapus caudacutus*	M	SLC	likely	10,470.25	6,944.44	163.32	17,578.01
satin flycatcher	*Myiagra cyanoleuca*	M	SLC	confirmed	4.87	0.00	0.00	4.87
rainbow bee-eater	*Merops ornatus*	M	SLC	confirmed	10,470.25	6,944.44	163.32	17,578.01

[13] Based on the EPBC Act Protected Matters Search Tool

6.4. REGIONAL ECOSYSTEMS

On site vegetation clearing and subsidence affects within the mine site are expected to impact 412.92 ha of remnant vegetation listed as endangered and least concern under the VM Act. Approximately 60% of the remnant vegetation (249.21 ha) is associated with endangered RE (RE 11.3.1, RE 11.4.8 and 11.4.9) (**Table 4**). Two threshold RE are also expected to be affected by on site vegetation clearing within the mine site (**Table 5**).

Table 4. Residual Mine Impacts on Endangered and Of Concern Regional Ecosystems

RE	DESCRIPTION	VM ACT CLASS[14]	BVG	MINE IMPACTS (ha)			
				ON SITE	OFF SITE	SUBSIDENCE	TOTAL
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	E	25a	49.41	0.00	0.00	49.41
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	E	25a	0.00	0.00	0.00	0.00
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	E	25a	199.81	0.00	0.00	199.81
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	OC	16c	12.44	0.00	0.00	12.44
11.4.5	*Acacia argyrodendron* woodland on Cainozoic clay plains	OC	26a	0.33	0.00	0.00	0.33
11.4.6	*Acacia cambagei* woodland on Cainozoic clay plains	OC	26a	148.01	0.00	0.00	148.01
11.4.11	Dichanthium sericeum, Astrebla spp. and patchy Acacia harpophylla, Eucalyptus coolabah on Cainozoic clay plains	OC	30b	2.93	0.00	0.00	2.93
TOTAL				412.92	0.00	0.00	412.92

Table 5. Residual Mine Impacts on Threshold Regional Ecosystems

THRESHOLD RE	VM ACT STATUS	MINE IMPACTS (ha)			
		ON SITE	OFFSITE	SUBSIDENCE	TOTAL
11.4.11	OC	2.93	0.00	0.00	2.93
11.3.5	LC	56.01	0.00	0.00	56.01
TOTAL		58.94	0.00	0.00	58.94

6.5. GRASSLAND REGIONAL ECOSYSTEM

Approximately 3 ha of grassland RE 11.4.11, listed as of concern under the VM Act, is expected to be impacted within the mine site. RE 11.4.11 is described as native grasses (*Dichanthium sericeum* and *Astrebla spp.*), patchy Brigalow (*Acacia harpophylla*) and coolabah (*Eucalyptus coolabah*) on Cainozoic clay plains.

[14] E- endangered; OC- of concern

6.6. HIGH VALUE REGROWTH

Approximately 4.4 ha of HVR vegetation is predicted to be impacted by on site vegetation clearing within the mine site (**Table 6**).

Table 6. Residual Mine Impacts on High Value Regrowth Vegetation

BVG	VM ACT CLASS[15]	MINE IMPACTS (ha)			
		ON SITE	OFF SITE	SUBSIDENCE	TOTAL
25a	E	0.00	0.00	0.00	0.00
30b	OC	0.00	0.00	0.00	0.00
26a	OC	3.53	0.00	0.00	3.53
16c	OC	0.88	0.00	0.00	0.88
TOTAL		4.41	0.00	0.00	4.41

6.7. CATEGORY A AREAS

A Category A area is a declared area, an offset area, an exchange area or has been unlawfully cleared or subject to a restoration or enforcement notice (VM Act). Due to the illegal land clearing of remnant and endangered vegetation on Moray Downs by a previous landholder, areas within the property are subject to a compliance notice. In accordance with the compliance notice, the cleared area is to be restored until it achieves remnant status or until 2044. Five of concern and endangered RE occur within this Category A area and are compiled with RE data.

6.8. WATERCOURSES

The majority of the watercourses within the mine site are ephemeral consisting of stream order 1 and 2 watercourses that channel runoff to the Carmichael River or Belyando River via Eight Mile Creek during heavy downpour or flooding events (GHD, 2013c).

Project actions are expected to impact approximately 550 ha of remnant watercourse vegetation in the mine site primarily as a result of one site clearing; however, the removal of the ephemeral watercourses will occur gradually throughout the life of the mine (**Table 7**).

The impact to watercourses within the mine site occurs entirely within the Desert Uplands Bioregion.

Table 7. Residual Mine Impacts on Watercourses

STEAM ORDER	MINE IMPACTS (ha)			TOTAL (ha)
	ON SITE	OFF SITE	SUBSIDENCE	
2	398.52	0.01	2.57	401.10
4	137.63	0.00	0.00	137.63
8	8.33	0.00	0.00	8.33
TOTAL	544.48	0.01	2.57	547.07

[15] E- endangered; OC- of concern

6.9. WETLANDS

Wetland protection areas are mapped by DEHP using the Biodiversity Assessment Mapping Methodology (AquaBAMM) to identify wetlands with high ecological significance and surrounding trigger areas (Clayton et al., 2006). Three areas within the mine area are mapped as WPA (GHD, 2013c). On-site vegetation clearing is expected to impact 4.42 ha of WPA and 6.04 ha of significant wetlands (**Table 8**).

Table 8. Residual Mine Impacts on Wetlands

TYPE	DEFINITION	MINE IMPACTS (ha)			TOTAL (ha)
		ONSITE	OFFSITE	SUBSIDENCE	
WPA	HES wetlands located on the map of referable wetlands in the Great Barrier Reef catchment	6.04	0.00	0.00	6.04
significant wetland	A wetland designated under the VM Act	4.42	0.00	0.00	4.42
TOTAL		10.46	0.00	0.00	10.46

6.10. CONNECTIVITY

Vegetation clearing and subsidence impacts within the mine footprint is expected to reduce connectivity across the landscape by affecting 17,396.82 ha of vegetation (GHD, 2013c).

7. RESIDUAL RAIL IMPACTS

7.1. THREATENED ECOLOGICAL COMMUNITY

Vegetation clearing within the rail footprint is predicted to affect 26.63 ha of endangered Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (GHD, 2013c).

7.2. THREATENED FAUNA

Field surveys confirmed the presence of eight fauna species listed under the EPBC Act and/or the NC Act within the rail footprint. An additional eight fauna species, or their habitat, were determined 'likely to occur' through GHD's likelihood of occurrence assessment. The listed fauna species confirmed or likely to occur within the mine site are listed in **Table 9**.

Table 9. Residual Rail Impact on Fauna Species

COMMON NAME	SCIENTIFIC NAME	EPBC ACT STATUS	NC ACT STATUS[16]	LIKELIHOOD OF OCCURRENCE	RAIL IMPACT (ha)
REPTILES					
Brigalow scaly-foot	*Paradelma orientalis*	-	V	likely	355.49
ornamental snake	*Denisonia maculata*	V	V	likely	349.48
BIRDS					
cotton pygmy-goose	*Nettapus coromandelianus*	-	NT	likely	299.81
square-tailed kite	*Lophoictinia isura*	-	NT	likely	299.81
squatter pigeon (southern)	*Geophaps scripta scripta*	V	V	confirmed	337.04
black-chinned honeyeater	*Melithreptus gularis*	-	NT	likely	299.81
black throated finch (southern)	*Poephila cincta cincta*	E	E	likely	16.24
MAMMALS					
koala	*Phascolarctos cinereus*	V[17]	SLC	likely	176.88
MIGRATORY BIRDS					
eastern great egret	*Ardea modesta*	M	SLC	confirmed	299.80
cattle egret	*Ardea ibis*	M	SLC	likely[18]	2,087.92
white-bellied sea eagle	*Haliaeetus leucogaster*	M	SLC	confirmed	61.00
Latham's snipe	*Gallinago hardwickii*	M	SLC	likely	143.23
fork-tailed swift	*Apus pacificus*	M	SLC	may occur	2703.19
white-throated needletail	*Hirundapus caudacutus*	M	SLC	may occur	2703.19

16 E- endangered, M- migratory, NT- near threatened, SLC- special least concern, V- vulnerable.
17 The koala was listed under the EPBC Act after the project was designated a control action and is only assessed as a state significant biodiversity value in this package (i.e. not assessed as an MNES)
18 Based on the EPBC Act Protected Matters Search Tool database

COMMON NAME	SCIENTIFIC NAME	EPBC ACT STATUS	NC ACT STATUS[16]	LIKELIHOOD OF OCCURRENCE	RAIL IMPACT (ha)
MIGRATORY BIRDS					
satin flycatcher	*Myiagra cyanoleuca*	M	SLC	likely	361.37
rainbow bee-eater	*Merops ornatus*	M	SLC	confirmed	2703.19

7.3. THREATENED FLORA

No threatened flora were detected within the rail footprint.

7.4. REGIONAL ECOSYSTEMS

Vegetation clearing within the rail footprint is expected to impact 282.24 ha of remnant vegetation listed as endangered and of concern under the VM Act (**Table 10**).

Table 10. Residual Rail Impacts on Endangered and Of Concern Regional Ecosystems

RE	DESCRIPTION	VM ACT CLASS[19]	BVG	RAIL IMPACTS (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	E	25a	8.69
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla or A. argyrodendron* on Cainozoic clay plains	E	25a	3.68
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	E	25a	14.26
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	OC	16c	0.00
11.4.5	*Acacia argyrodendron* woodland on Cainozoic clay plains	OC	26a	66.87
11.4.6	*Acacia cambagei* woodland on Cainozoic clay plains	OC	26a	1.52
11.4.11	*Dichanthium sericeum*, *Astrebla spp.* and patchy *Acacia harpophylla*, *Eucalyptus coolabah* on Cainozoic clay plains	OC	30b	41.41
TOTAL				282.24

7.5. GRASSLAND REGIONAL ECOSYSTEM

Vegetation clearing within the rail footprint is expected to impact approximately 146 ha of RE 11.4.11 which is listed as an of concern RE under the VM Act. RE 11.4.11 is described as native grasses, patchy Brigalow and coolabah on Cainozoic clay plains.

7.6. HIGH VALUE REGROWTH

Approximately 18 ha of HVR vegetation is predicted to be impacted by the rail development (**Table 11**).

[19] E- endangered; OC- of concern

Table 11. Residual Rail Impacts on High Value Regrowth Vegetation

BVG	VM ACT CLASS[20]	RAIL IMPACTS (ha)
25a	E	9.56
30b	OC	1.08
26a	OC	4.20
16c	OC	2.89
TOTAL		17.73

7.7. WATERCOURSES

The rail alignment is predicted to impact approximately 70 ha of watercourse vegetation (**Table 12**). The impact to watercourses within the rail footprint occurs entirely within the Brigalow Belt Bioregion.

Table 12. Residual Rail Impacts on Watercourses

STREAM ORDER	RAIL IMPACTS (ha)
2	35.55
4	13.03
8	20.91
TOTAL	69.49

7.8. WETLANDS

No WPA, significant wetlands or wetlands recognised under the VM Act were recorded in the rail footprint.

7.9. CONNECTIVITY

Vegetation clearing within the rail footprint is expected to reduce connectivity across the landscape by affecting 515.03 ha of vegetation (GHD, 2013c).

[20] E- endangered; OC- of concern

8. OFFSET REQUIREMENTS

Project actions are predicted to have a residual impact on 51 environmental values within the mine and the rail footprints. To counterbalance the project's residual impact, environmental offsets are required in accordance with Queensland and Australian Government policies.

8.1. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act Environmental Offset Policy stipulates that suitable offsets be proportionate to the size and scale of the impact and generally deliver an overall conservation outcome that improves or maintains the viability of MNES (**Section 2.1**). Adani has assessed the residual impacts of the project on MNES against DoTE's Significant Impact Guidelines to determine which MNES are significantly impacted and consequently require offsets. The project's offset requirements under the EPBC Act are summarised in **Table 13.** All three MNES are confirmed as present within the project site. The offsets assessment guide will be completed to quantify the suitability of the offset package for MNES.

Table 13. EPBC Act Offset Policy Offset Requirements

ENVIRONMENTAL VALUE	EPBC ACT STATUS	OFFSET REQUIREMENTS [MINIMUM IMPACT AREA (ha)]
THREATENED ECOLOGICAL COMMUNITY		
Brigalow	Endangered	610.22
THREATENED FAUNA		
black-throated finch (southern)	Endangered	9,729.90
THREATENED FLORA		
waxy cabbage palm	Vulnerable	3.56

8.2. STATE SIGNIFICANT BIODIVERSITY VALUES

The QBOP specifies that suitable offsets aim to achieve an equivalent or better environmental outcome (**Section 2.4**). The ecological equivalence methodology as set out in the Ecological Equivalence Methodology Guideline (EEM guideline; DERM, 2011) will be completed to quantify the suitability of an offset package for SSBV. The project's offset requirements are summarised in **Table 14.**

Table 14. Government Offset Policies' Offset Requirements

ENVIRONMENTAL VALUE	EPBC ACT STATUS	NC ACT STATUS[21]	OFFSET REQUIREMENTS [MINIMUM IMPACT AREA (ha)]
THREATENED FAUNA			
yakka skink	V	V	10,468.31
Brigalow scaly-foot	-	V	6,720.14
ornamental snake	V	V	1,622.94
cotton pygmy-goose	-	NT	320.26
eastern great egret	M	SLC	320.25
cattle egret	M	SLC	15,755.51
glossy ibis	M	SLC	8.60
black-necked stork	-	NT	20.45
square-tailed kite	-	NT	8,991.81
white-bellied sea-eagle	M	SLC	81.45
Latham's snipe	M	SLC	173.30
black-tailed godwit	M	SLC	8.60
common greenshank	M	SLC	8.60
marsh sandpiper	M	SLC	8.60
common sandpiper	M	SLC	8.60
curlew sandpiper	M	SLC	8.60
caspian tern	M	SLC	8.60
squatter pigeon (southern)	V	V	11,196.72
fork-tailed swift	M	SLC	13,622.66
white-throated needletail	M	SLC	13,622.66
rainbow bee-eater	M	SLC	13,622.66
black-chinned honeyeater	-	NT	8,991.81
satin flycatcher	M	SLC	366.24
black-throated finch (southern)	E	E	9,729.90
koala	V[22]	SLC	10,261.71
echidna	-	SLC	9,999.75
little pied bat	-	NT	10,590.75
THREATENED FLORA			
waxy cabbage palm	V	V	3.56

[21] E- endangered, LC- least concern, M- migratory, NT- near threatened, OC- of concern, SLC- special least concern, V- vulnerable.
[22] The koala was listed under the EPBC Act after the project was designated a control action and is not included as a MNES in this package

ENVIRONMENTAL VALUE	EPBC ACT STATUS	NC ACT STATUS[21]	OFFSET REQUIREMENTS [MINIMUM IMPACT AREA (ha)]
REGIONAL ECOSYSTEMS			
BVG 25a (11.3.1, 11.4.8 and 11.4.9)	-	E	275.84
BVG 16c (11.3.3)	-	OC	79.31
BVG 26a (11.4.5 and 11.4.6)	-	OC	191.27
BVG 30b (11.4.11)	-	OC	148.74
THRESHOLD REGIONAL ECOSYSTEMS			
11.3.5	-	LC	56.01
11.4.11	-	OC	148.74
GRASSLAND REGIONAL ECOSYSTEMS			
BVG 30b (11.4.11)	-	OC	148.74
HIGH VALUE REGROWTH			
BVG 25a	-	E	9.56
BVG 16c	-	OC	3.77
BVG 26a	-	OC	7.73
BVG 30b	-	OC	1.08
WATERCOURSES			
stream order 2	-	NA	436.65
WATERCOURSES			
stream order 4	-	NA	150.66
stream order 8	-	NA	29.24
WETLANDS			
significant wetland	-	NA	4.42
WPA	-	NA	6.04
CONNECTIVITY			
connectivity	-	NA	17,911.85

9. DIRECT OFFSET OPTIONS

9.1. OVERVIEW

Ecofund identified potential direct offsets through a strategic desktop assessment and spatial analysis that incorporated the offset policy requirements relevant to the affected environmental values. The preferred offset package, composed of five properties, is expected to acquit the offset requirements for 50 of the 51 environmental values predicted to be affected by residual project impacts. The final suitability of these land-based offsets will be subject to future fieldwork (e.g. ecological equivalence, ground-truthing, target species surveys) as well as landholder consultation.

The offset options have been included as examples of how direct offsets for the project could be delivered. Should the preferred offset package not prove viable, the landscape availability analysis demonstrates that additional alternative options are available (see **Section 9.4**). It should also be noted that this report makes no assumptions on the actual availability of the properties under assessment to be used as offsets. Should Adani deem it necessary (e.g. for commercial considerations, landholder willingness to participate), different properties that contain comparable environmental values may be substituted for the priority offset options.

The properties within the preferred offset package have yet to be ground-truthed to determine the actual extent and suitability of environmental values on the ground and the figures represented in this package are based on a desktop assessment and spatial analysis.

The following direct offset properties were identified using the methodology presented in **Section 3** in accordance with the applicable legislation outlined in **Section 2**.

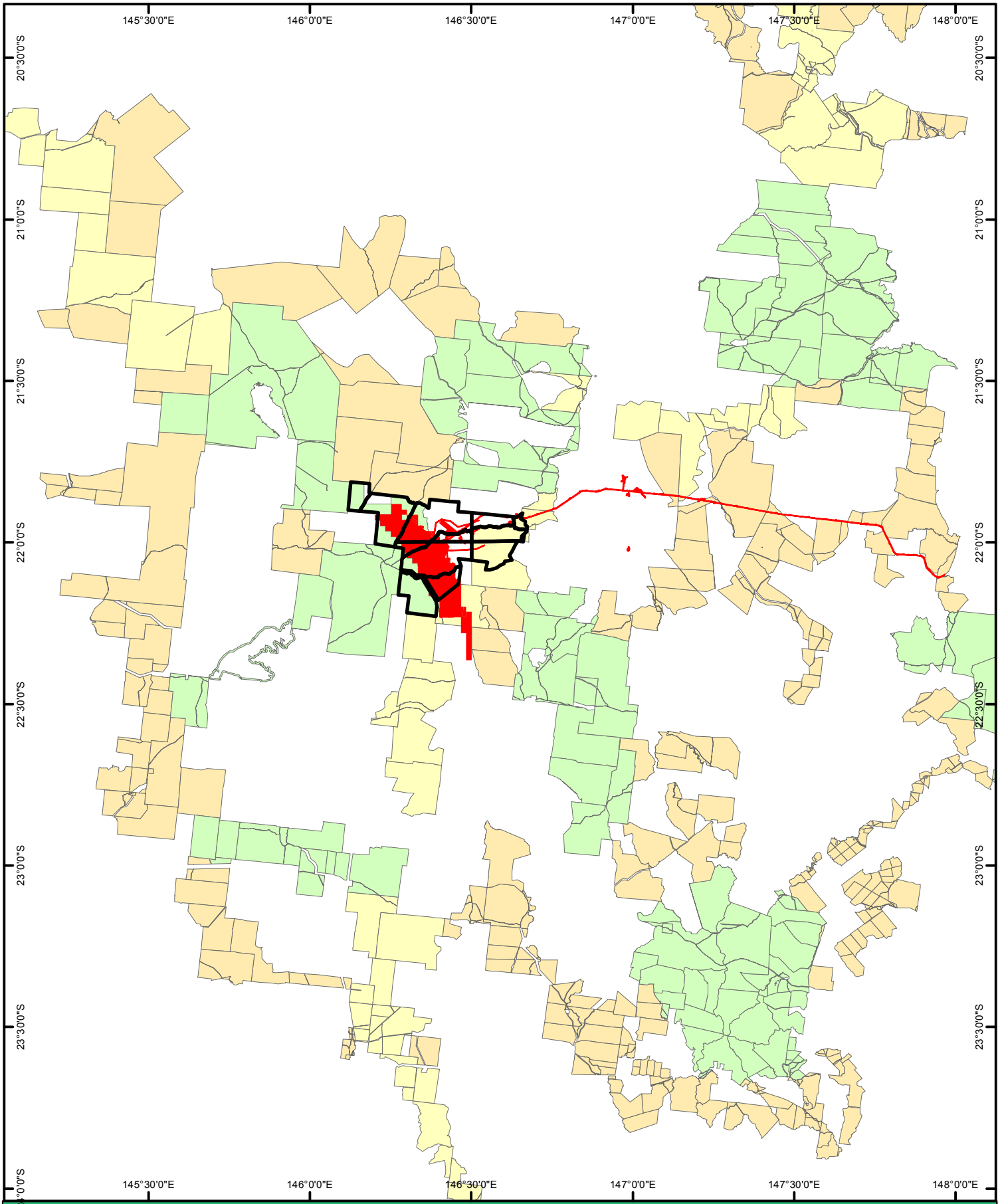
9.2. PREFERRED OFFSET PACKAGE

The preferred offset package consists of five properties designated as Priority 1 and Priority 3 under GBOS (**Figure 2**; **Table 15**).

Table 15. Preferred Offset Package

PROPERTY NAME	GBOS PRIORITY	OFFSET AREA (ha)
Property 1	1	Confidential information removed
Property 2	1	Confidential information removed
Property 3	3	Confidential information removed
Property 4	3	Confidential information removed
Property 5	1	Confidential information removed

The ability of the preferred offset package to acquit the project's offset requirements is detailed in **Table 16** and **Table 17**.



Adani Mining Pty Ltd - Charmichael Coal Mine and Rail Project

LOCATION DIAGRAM

Figure 2: Priority Offset Option General Location

DATA SOURCE:

Project footprint provided by GHD (12/07/2013 and 25/10/2013)
The following datasets are © State of Qld 2013:
- Cadastral Data (2013)
- GBOS Strategic Footprint (2012)

- Project footprint
- Moray Downs property
- Priority 1 (GBOS)
- Priority 2 (GBOS)
- Priority 3 (GBOS)

CO_2

0 10 20 30 40
Kilometres

1:1,730,000

(A4) GCS GDA 1994

DATE	AUTHOR	REQUESTED BY
05-11-2013	RF	KM

N

Path: P:\GISData\projects\Adani\920_20131105_offsetPackage_update_maps\20131105_preferredpackage_external.mxd

9.3. PROPERTY DETAILS

9.3.1. Property 1

Figure 3. Property 1 Environmental Values

9.3.2. Property 2

Figure 4: Property 2 Environmental Values

9.3.3. Property 3

Figure 5. Property 3 Environmental Values

9.3.4. Property 4

Figure 6. Property 4 Environmental Values

9.3.5. Property 5

Figure 7. Property 5 Environmental Values

Table 16. EPBC Act Environmental Offset Policy Offset Requirements

ENVIRONMENTAL VALUE	STATUS[23]		MINMUM PROJECT IMPACT (ha)	PROPERTIES IN THE PREFERRED OFFSET PACKAGE					
	EPBC ACT	NC ACT		PROPERTY 1	PROPERTY 2	PROPERTY 3	PROPERTY 4	PROPERTY 5	TOTAL (ha)
THREATENED ECOLOGICAL COMMUNITY									
Brigalow	E	-	610.22						5,077.47
THREATENED FAUNA									
black throated finch (southern)	E	E	9,729.90						54,082.41
THREATENED FLORA									
waxy cabbage palm	V	V	3.56						6,056.84

[23] E- endangered, LC- least concern, M- migratory, NT- near threatened, OC- of concern, SLC- special least concern, V- vulnerable.

Table 17. Offset requirements under the Queensland Government Biodiversity Offset Policy

ENVIRONMENTAL VALUE	STATUS[24]		MINIMUM PROJECT IMPACT (ha)	PROPERTIES IN THE PREFERRED OFFSET OPTION					
	EPBC ACT	NC ACT		PROPERTY 1	PROPERTY 2	PROPERTY 3	PROPERTY 4	PROPERTY 5	TOTAL (ha)
THREATENED FAUNA									
yakka skink	V	V	10,468.31						125,997.78
Brigalow scaly-foot	-	V	6,720.14						125,997.78
ornamental snake	V	V	1,622.94						16,028.07
cotton pygmy-goose	-	NT	320.26						41,454.54
eastern great egret	M	SLC	320.25						41,454.54
cattle egret	M	SLC	15,755.51						56,227.62
glossy ibis	M	SLC	8.60						56,646.33
black-necked stork	-	NT	20.45						56,227.62
square-tailed kite	-	NT	8,991.81						154,609.58
white-bellied sea-eagle	M	SLC	81.45						56,227.62
Latham's snipe	M	SLC	173.30						56,227.62
black-tailed godwit	M	SLC	8.60						56,227.62
common greenshank	M	SLC	8.60						56,227.62
marsh sandpiper	M	SLC	8.60						56,227.62
common sandpiper	M	SLC	8.60						56,227.62

[24] E- endangered, LC- least concern, M- migratory, NT- near threatened, OC- of concern, SLC- special least concern, V- vulnerable.

ENVIRONMENTAL VALUE	STATUS[24]		MINIMUM PROJECT IMPACT (ha)	PROPERTIES IN THE PREFERRED OFFSET OPTION					
	EPBC ACT	NC ACT		PROPERTY 1	PROPERTY 2	PROPERTY 3	PROPERTY 4	PROPERTY 5	TOTAL (ha)
THREATENED FAUNA									
curlew sandpiper	M	SLC	8.60						56,227.62
caspian tern	M	SLC	8.60						41,454.54
squatter pigeon (southern)	V	V	11,196.72						127,599.98
fork-tailed swift	M	SLC	13,622.66						168,168.65
white-throated needletail	M	SLC	13,622.66						168,168.65
rainbow bee-eater	M	SLC	13,622.66						168,168.65
black-chinned honeyeater	-	NT	8,991.81						97,658.31
satin flycatcher	M	SLC	366.24						97,658.31
black throated finch (southern)	E	E	9,729.90						54,082.41
koala	V[25]	SLC	10,261.71						57,318.67
echidna	-	SLC	9,999.75						168,168.65
little pied bat	-	NT	10,590.75						89,941.40
THREATENED FLORA									
waxy cabbage palm	V	V	3.56						6,056.84
REGIONAL ECOSYSTEMS									
BVG 25a (RE 11.3.1, RE 11.4.8 and 11.4.9)	-	E	275.84						5,084.24

[25] The koala was listed under the EPBC Act after the project was designated a control action and is not included as a MNES in this package

ENVIRONMENTAL VALUE	STATUS[24]		MINIMUM PROJECT IMPACT (ha)	PROPERTIES IN THE PREFERRED OFFSET OPTION					
	EPBC ACT	NC ACT		PROPERTY 1	PROPERTY 2	PROPERTY 3	PROPERTY 4	PROPERTY 5	TOTAL (ha)
REGIONAL ECOSYSTEMS									
BVG 16c (RE 11.3.3)	-	OC	79.31						2,785.94
BVG26a (RE 11.4.5 and 11.4.6)	-	OC	191.27						1,364.20
BVG 30b (RE 11.4.11)	-	OC	148.74						387.13
HIGH VALUE REGROWTH									
BVG 25a	-	E	9.56						5,084.24
BVG 16c	-	OC	3.77						2,785.94
BVG 26a	-	OC	7.73						1,364.20
BVG 30b	-	OC	1.08						387.13
THRESHOLD REGIONAL ECOSYSTEMS									
BVG 26a (RE 11.3.5)	-	LC	56.01						413.10
BVG 30b (RE 11.4.11)	-	OC	148.74						387.13
GRASSLAND REGIONAL ECOSYSTEMS									
BVG 30b (RE 11.4.11)	-	OC	148.74						387.13
WATERCOURSES[26]									
stream order 2 – BRB	-	NA	35.55						86,508.09
stream order 2 – DUB	-	NA	401.10						81,660.56
stream order 4 – BRB	-	NA	13.03						86,508.09

[26] Impacts to watercourses within the mine occur in the Desert Uplands Bioregion (DUB). Impacts to watercourses within the rail footprint occur in the Brigalow Belt Bioregion (BRB)

ENVIRONMENTAL VALUE	STATUS[24]		MINIMUM PROJECT IMPACT (ha)	PROPERTIES IN THE PREFERRED OFFSET OPTION					
	EPBC ACT	NC ACT		PROPERTY 1	PROPERTY 2	PROPERTY 3	PROPERTY 4	PROPERTY 5	TOTAL (ha)
WATERCOURSES									
stream order 4 – DUB	-	NA	137.63						81,660.56
stream order 8 – BRB	-	NA	20.91						18,645.93
stream order 8 - DUB	-	NA	8.33						26,047.10
WETLANDS									
significant wetland	-	NA	4.42						181.20
WPA	-	NA	6.04						833.11
CONNECTIVITY									
connectivity	-	NA	17,911.85						105,734.55

<CONFIDENTIAL INFORMATION REMOVED>

10. OFFSET PAYMENTS

Under QBOP and PVMO, eligible applicants are allowed to make financial offset payments to an approved trust[27] established for land management or nature conservation purposes. If an applicant is eligible to make an offset payment, the offset obligation is transferred to the approved trust.

The payment under QBOP may be used to either purchase land containing SSBV to add to the protected area estate or to purchase or secure suitable areas with SSBV or areas located within a mapped strategic area or recognised corridor. Under PVMO, the trustee must locate an offset area within a strategic biodiversity corridor that meets the offset requirements consistent with the policy.

While Adani's preference is to offset impacts using direct offsets, wetland protection areas may not be offset through direct offsets. The lack of suitable directs offset for wetland protection areas is likely a result of limitations of the desktop analysis.

Adani will conduct detailed surveys of proposed offset properties to ascertain if suitable offset areas for this environmental value exists; however, if detailed surveys fail to identify a suitable offset, Adani may acquit its obligation through offset payments or indirect offsets.

[27] QBOP specifies that payments be made to the Balance the Earth Trust.

11. INDIRECT OFFSETS

11.1. PURPOSE

To supplement direct offsets, indirect offsets in the form of research activities and/or the implementation of financial contributions towards research and education programs will be explored. Indirect offsets will be particularly pertinent where such initiatives complement other environmental management initiatives, such as species-specific management plans required for the project.

Where possible, on-ground initiatives should be implemented to compliment direct offsets and other environmental impact mitigation initiatives proposed for the project. Such initiatives are in line with direct offset options under the EPBC Act Environmental Offsets Policy, QBOP and PVMO; however, offset options that nominate a complementary approach need to be negotiated with DoTE and DEHP to confirm that these options satisfy the requirements of all relevant policies.

11.2. GUIDING PRINCIPLES

Adani will use the following principles to guide selection of suitable indirect offset methods:

- deliver an overall conservation outcome that improves or maintains the viability project impacted environmental values
- reflect the level of regulatory protection that applies to the environmental values
- effectively account for and manage the risk of the indirect offset not being effective
- be efficient, effective, timely, transparent, scientifically robust and reasonable
- be readily measured, monitored, audited and enforced.

11.3. EXAMPLES OF INDIRECT OFFSETS

11.3.1. Black-throated Finch

Potential indirect offset options include the development or support of species-specific management plans. The black-throated finch in particular, is listed as endangered under the EPBC Act and the NC Act and has a national recovery plan, which specifies threats and priority management objectives. Subject to regulatory support, the management of black-throated finch threats (e.g. feral predators) is expected to improve the quality of black-throated finch habitat and indirectly offset the project's residual impact while complementing a required species management plan (i.e. black-throated finch).

Examples of actions (and indicative funding options) that may be undertaken include:

- Investigate breeding requirements and threats to key breeding areas as there is currently no knowledge of factors affecting breeding success in wild black-throated finch.
    - Conduct a study to investigate breeding in relation to landscape and management variables (e.g. landscape pattern, vegetation structure, fire, livestock grazing, rainfall and land condition)
    - Existing mapping and habitat modelling will be collated to determine all future mapping and modelling needs for the subspecies. New mapping and habitat modelling will be undertaken to remove gaps and identify further areas of potential habitat for the species.
- Undertake targeted surveys.
    - Surveys should target areas of potential habitat and determine the status of the subspecies at each area.

11.3.2. Waxy Cabbage Palm

Residual project impacts on waxy cabbage palm can be sufficiently offset through the delivery of land-based direct offsets (see **Table 16** and **Table 17**). In addition to the delivery of direct offsets and the proposed mitigation measures detailed in the SEIS (GHD, 2013c), indirect offsets may also be delivered through the following methods:

- Seed collection and planting programs within upstream reaches of the Carmichael River
- Relocation of individual plants if deemed a viable and successful method
- Contributing to further research objectives for the species to broaden the understanding of distributional range, water dependency requirements and threatening process triggers.

11.3.3. Back on Track

Indirect offsets may also support the state-initiated Back on Track species prioritisation framework, which prioritises Queensland's native species to guide species conservation, management and recovery. Adani may contribute to mitigating species-specific threats, which are identified in national and state conservation initiatives by implementing activities such as feral predator control and weed management. These activities would complement Adani's obligations under their environmental management framework.

11.4. COMPLEMENTING DIRECT OFFSETS

Other compensatory measures may involve a holistic approach and incorporate environmental values at risk in the immediate project area (outside the footprint) or associated with direct offset areas. As the details of these compensatory measures include properties descriptions and locations, they have been excluded from this public version of the offset package.

12. OFFSET IMPLEMENTATION

The offset requirements of the project consider impacts from the construction and operation phases of the project's mine and rail components. Direct and indirect impacts consequently linked to project activities will occur in stages to reflect the proposed incremental nature of the development of the project.

12.1. PROJECT DEVELOPMENT TIMEFRAME

Adani proposes to construct, operate and decommission the project as summarised in **Table 18.**

Table 18. Project Development Timeframe

STAGE	YEAR	PROJECT DEVELOPMENT
1 (2014-2020)	2014	Commence Rail construction Commence Quarry construction Undertake redevelopment of Moray Carmichael Road from Gregory Development Road to Mine site Commence construction of power, water supply and other external services Commence construction of workers accommodation village stage 1 & 2 Commence construction of permanent airport Commence construction of power, construction water supply and other external services Construction of flood harvesting infrastructure Commence construction of open cut facilities including Pits B/C and D/E MIA's, Site Fencing, Water Storage Dams and Temporary Roads.
	2015	Commence B ,D and E Pit box-cut Complete Pit B Diversion Drains Construct Carmichael River Northern Flood Protection Levies Commence construction of workers accommodation village stage 3 & 4 Complete construction of Permanent Airport Construct Additional Stages of Flood Harvesting Facilities
	2016	Commence C Pit box cut Produce first coal from open cut B, D & E Pits Complete open cut facilities for Pit B/C and D/E MIA, ROM and Overland Conveyors Complete B,D&E Pits HV Roads and HV Power Distribution Complete Coal Handling and Processing Plant Modules 1&2 and Tailings Cell Complete Product Handling and Train Load-out Facility Commence construction of workers accommodation village stage 5
	2017	First Coal Production from open cut C Pit Construct Underground Mine 1 MIA facilities Complete C Pit water diversion drain and HV Roads
	2018	Commence development and longwall operations of underground mine UG 1 Complete Coal Handling and Processing Plant Modules 3 & 4
	2019	Complete development operations in UG1 and commence longwall operations Construct coal processing plant (CPP) Bypass systems

STAGE	YEAR	PROJECT DEVELOPMENT
2 (2021-2031)	2021	Construct Carmichael River southern flood protection levee Construct Carmichael River Crossing Commence development of underground mine UG 5 Dragline 1 commences in D Pit Commence G Pit Commence minor rehabilitation of out of pit spoil emplacement (OOPSE)
	2022	Commence development of underground mines UG 4 and 5 Commence open cut facilities for Pit F/G and UG 4, MIA, ROM and Overland Conveyors
	2023	Complete open cut facilities for Pit F / G, Water Management
	2026	Commence F Pit Commence longwall operation of underground mine UG 5 Complete UG 5 MIA
	2027	Commence longwall operation of underground mine UG 4 Complete UG 4 overland conveyors and facilities
	2028	Commence development of underground mine UG 3 Complete expansion of Pit D/E MIA for UG 3
	2029	Rehabilitation works on Pits B, C, D, E OOPSE
	2030	Complete UG 5 Infrastructure Complete UG 1 longwall Operations
3 (2032-2071)	2035	Commence development of underground mine UG 2 Commence UG 2 MIA
	2036	Commence longwall operation of underground mine UG 3 Complete UG3 Infrastructure
	2040	Complete UG 4 longwall Operations
	2045	Complete UG 5 longwall Operations
	2051	Complete UG 3 longwall Operations Complete mining in C Pit commence final rehabilitation.
	2053	Complete mining in E Pit commence final rehabilitation
	2059	Complete UG 2 longwall Operations
	2061	Complete mining in D Pit commence final rehabilitation
	2068	Complete mining in G Pit commence final rehabilitation
	2069	Complete mining in F Pit commence final rehabilitation
	2070	Decommission Southern ROMs
	2071	Complete mining in B Pit commence final rehabilitation. Decommission Southern ROMs Commence mine site rehabilitation
	2072	Rehabilitate mine site

12.2. IMPLEMENTATION TIMEFRAME

It is proposed that the offsets for the project will be delivered in three stages to reflect the stages of project development. The three stages of offset delivery are presented in **Table 19**.

These tasks and timeframes are subject to change due to a number of variables, including regulatory approval, regulatory requirements, landholder negotiation, climatic conditions, land access, stakeholder inactivity and other unexpected delays.

Table 19. Offset Delivery Timeframe

STAGE	TASK	ESTIMATED TIMEFRAME
Pre-Delivery	Submission of the environmental offset package	Q4 2013
	In principle support of the environmental offset package received from regulators	Q4 2013
	Preparation of preliminary offsets assessment guides for the preferred offset package	
	Completion of subsidence modelling and estimation of proportion of environmental values that will remain. Update of environmental offset package accordingly.	
1 2013 – 2020	If applicable, the provision of offset payments to the Balance the Earth Trust and the provision of indirect offsets	Q4 2014
	If applicable, the establishment of offset transfer arrangements for initial stage of offsets	Q4 2014
	If required, landholder engagement and negotiation with the owners of the identified properties	Q4 2013 to Q4 2014
	Ecological equivalence assessments of the offset sites required for the initial stage of offsets to verify that the values identified through desktop assessments are present, and that they are ecologically equivalent to the impact sites Preparation of final offsets assessment guides for Australian Government offsets	Q4 2013 to Q2 2014
	Development of offset area management plans for the initial stage of offsets in accordance with the requirements of the relevant offset policies	Q4 2013 to Q2 2014
	Application of a legally binding mechanism to secure the environmental values of the offset area in perpetuity	Q4 2014
	Implementation of the offset area management plan including ongoing monitoring and reporting	Q1 2015 ongoing
	Review of impacts of Stage 1 of project to identify any oversupply of offsets	Q3 2020
2 2021 – 2031	Submission of a revised environmental offset package to regulators for approval	2021
	Implementation of the environmental offset package for Stage 2 offset requirements	2022 - ongoing
	Review of impacts of Stage 2 of project to identify any oversupply of offsets	Q3 2031
3	Submission of a revised environmental offset package to regulators for approval	2032

STAGE	TASK	ESTIMATED TIMEFRAME
2032 - 2071	Implementation of the environmental offset package for Stage 3 offset requirements	2033 – ongoing

12.3. SUBSIDENCE MODELLING

Due to the uncertainty associated with subsidence impacts in the Galilee Basin, Adani has included an assessment considering a potential full offset of all subsidence impacts for Stage 1 activities and revise offset requirements pending detailed modelling of surface impacts. Preliminary results of this modelling suggest that the key impacts associated with subsidence will be surface cracking and altered water flows, which lead to 'ponding'. The extent of these impacts is still to be quantified but is subject to a number of variables in particular depth of the underground mine. Adani acknowledges that there is likely to be significant areas of vegetation that are not affected by subsidence and is undertaking detailed modelling to provide a robust estimate. This will be considered during the implementation of the offset package and where necessary Adani will revise offset requirements accordingly, in consultation with the regulators.

12.4. ECOLOGICAL EQUIVALENCE

Ecological equivalence assessment of the impact and offset areas will be conducted in accordance with the EEM guideline to ensure that the environmental values in the offset areas are equivalent to those being impacted by the project. Ecological equivalence assessments have been completed for the Offsite Infrastructure Areas (undertaken by GHD) and have commenced for the mining areas (undertaken by Ecological Australia). The results of the ecological equivalence assessments and landholder consultation will be used to finalise the configuration of offsets.

12.5. LANDHOLDER ENGAGEMENT AND NEGOTIATION

Landholder engagement has commenced on potential offset areas that are located within GBOS. Under GBOS, landholders owning property possessing significant biodiversity offset values initially receive information about GBOS and have the opportunity to register their interest in the strategy. Should landholders wish to decline their involvement in GBOS, alternative offset areas will be identified.

12.6. EPBC ACT OFFSETS ASSESSMENT GUIDE

The offsets assessment guide will be applied by Adani to assess the suitability of offsets for MNES (including listed species and the Brigalow TEC). Adani is in the process of preparing the offsets assessment guides for the preferred offset package which will be supplied to the Australian Government. The offsets assessment guides will be refined based on the results of upcoming field assessments. Following finalisation, the offsets assessment guides will be presented to the Australian Government, accompanied by explanation and justification of the assumptions made for each MNES assessed.

12.7. FIELD ASSESSMENT OF OFFSET AREAS

Field assessments of each offset option will be undertaken, including ecological equivalence assessments and flora and fauna surveys where appropriate. The aim of the field assessment is to verify that the values identified through desktop assessments are present on each offset property and confirm the suitability of the property as an offset. Assessments will also inform the size of the offset area and the management requirements of each offset property. Replacement properties will be utilised should the results of field assessments indicate that the identified environmental values are not present on the ground.

12.8. PROPERTY REPORTS

If required, individual property reports will be prepared to:

- outline the results of field assessments and landholder engagement
- further define the MNES and SSBV that will be offset on the property
- describe the compliance of the proposed offset with the relevant offset policies, including results of the ecological equivalence assessment and the offsets assessment guide.

12.9. OFFSET AREA MANAGEMENT PLANS

Offset area management plans (OAMP) will be developed for each offset property. These plans will be based on field assessments and will outline the specific management objectives and outcomes for each property. Each OAMP will be developed in consultation with regulators, Adani and the relevant landholders and will then be submitted to the regulators for review and endorsement. OAMPs will include:

- a map of the offset area, including GPS points
- the type and location of values to be offset
- the ecological equivalence assessment of the offset area, if appropriate
- the offset area management objectives and outcomes
- activities that will be undertaken to achieve the management objectives and outcomes
- an analysis of the risks to achieving the management objectives and outcomes
- a monitoring and reporting program
- estimated time until the offset management objectives and outcomes will be achieved
- identification of all registered interests including mortgages, leases, subleases, covenants, easements and building statements, that have been registered on title under the *Land Act 1994* (Qld) and *Land Title Act 1994* (Qld).

12.10. LEGALLY BINDING MECHANISMS

All offsets must be secured by a legally binding mechanism. The appropriate mechanism for each offset will be determined through negotiation with regulators, Adani and the landholder. Legally binding mechanisms may include the following, as recognised by the NC Act:

- Conservation Park - under the NC Act a conservation park is to be managed to:
    - conserve and present the area's cultural and natural resources and their values
    - provide for the permanent conservation of the area's natural condition to the greatest possible extent
    - ensure that any commercial use of the area's natural resources, including fishing and grazing, is ecologically sustainable.
- Nature refuge - A nature refuge is a voluntary agreement between a landholder and the Queensland Government that acknowledges a commitment to manage and preserve land with significant conservation values while allowing compatible and sustainable land uses to continue. Under the NC Act a nature refuge is to be managed to:
    - conserve the area's significant cultural and natural resources
    - provide for the controlled use of the area's cultural and natural resources
    - provide for the interests of landholders to be taken into account.
- Resource reserve - under the NC Act a resources reserve is to be managed to:
    - recognise and, if appropriate, protect the area's cultural and natural resources
    - provide for the controlled use of the area's cultural natural resources
    - ensure that the area is maintained predominantly in its natural condition

    - eliminate the felling of timber for a commercial purpose.
- National park - under the NC Act a national park is to be managed to:
    - provide, to the greatest possible extent, for the permanent preservation of the area's natural condition and the protection of the area's cultural resources and values - the cardinal principle for the management of national parks
    - present the area's cultural and natural resources and their values
    - ensure that the only use of the area is nature-based and ecologically sustainable.

Legally binding mechanisms may include conservation agreements under the EPBC Act. This involves an agreement between the Australian Government Environment Minister and another person for the protection and conservation of biodiversity in an area of land or sea. A conservation agreement may provide for:

- activities that promote the protection and conservation of the following:
    - biodiversity
    - the world heritage values of declared World Heritage properties
    - the National Heritage values of National Heritage places
    - the Commonwealth Heritage values of Commonwealth Heritage places
    - the ecological character of a declared Ramsar wetland
    - the environment, in respect of the impact of a nuclear action
    - the environment in a Commonwealth marine area
    - the environment on Commonwealth land
- financial, technical or other assistance from the Commonwealth
- monitoring compliance with the agreement.

Offsets may also be protected through a Voluntary Declaration as recognised under the VM Act. A voluntary declaration is registered on the property title. For the area to be considered for declaration as an area of high nature conservation value the area must be one or more of the following:

- a wildlife refuge—an area where a species or a group of species has retreated due to a threatening process (e.g. climatic change)
- a centre of endemism—an area containing concentrations of species that are largely restricted to the area
- an area containing a vegetation clump or corridor that contributes to the maintenance of biodiversity
- an area that makes a significant contribution to the conservation of biodiversity
- an area that contributes to the conservation value of a wetland, lake or spring
- another area that contributes to the conservation of the environment.

13. CONCLUSION

Adani is committed to delivering a comprehensive offset program to compensate for the residual project impacts on environmental values resulting from the development of the Carmichael Coal Mine and Rail Project.

This environmental offset package demonstrates that it is possible to deliver compliant offsets in accordance with Australian and Queensland Government offset legislation through direct, land-based offsets supplemented with indirect and compensatory measures. The preferred offset package option consists of securing five offset areas that also match broader regional priorities as outlined in GBOS.

While Adani's preference is to offset impacts using direct offsets, direct land-based offsets could not be delivered to acquit the offset requirements relating to wetland protection areas due to limitations in the desktop analysis.

As part of the implementation of the package, Adani will conduct landholder engagement and ecological surveys to confirm the suitability of the preferred offset package. In addition, Adani will conduct detailed surveys of proposed offset properties to ascertain if suitable offset areas for wetland protection areas exist. Subsequently, Adani will refine the package which may include acquitting its offset requirements through offset payments and/or indirect offsets. Offset payments and indirect offsets are likely to contribute to species-specific management plans and targeted recovery actions.

Adani proposes to initially offset all of the environmental values specified in this offset package that will be adversely impacted by project actions relating to on-site vegetation clearing, off-site vegetation clearing and subsidence acquit for the environmental values identified.

Once the Australian and Queensland Governments endorse the package, the package will be implemented in a staged approach to correspond with the sequential development of coal extraction over the production life of the mine.

14. REFERENCES

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APPENDIX A: EIS SUBMISSIONS ON EIS OFFSET STRATEGY

ORGANISATION	FEEDBACK	ACTION	SECTION REFERENCE
DEHP	The offset strategy (two copies) provided at Appendix AH and AK and overview at Volume Section 9) is a framework strategy. Definitive quantitative information on SSBV impacts and offsets to be provided will be required from the EIS process before EA conditions can be developed. No clearing on site will be allowed without quantitative offsets information. Mining stages can be considered however, estimates of life of mine offsets should be in the EIS	Ecological equivalence (EE) assessments are required to provide quantitative information on offset area requirements. EE assessments will be undertaken as part of the implementation of the package	12.4
DEHP	Inconsistent description of offsite infrastructure areas	The package is based on latest impact data and the description of project elements is consistent with SEIS	3.0
DEHP	Lack of a subsidence management plan	Adani has drafted a subsidence management plan which will be finalised prior to construction and proposes to offset high impact subsidence.	3.2, SEIS Volume 4, Appendix I
DEHP	The base-line EE should be carried out for the open cut, subsidence and out of pit waste dump areas in order to quantify the offset requirements, monitor the impact, justify the offset requirements for the subsidence area.	EE assessments of impact areas will be undertaken as part of the development and implementation of the package prior to the disturbance of MNES or SSBV.	12.4
DEHP	There is substantial variation in the survey effort (frequency, intensity, level of site survey between ecological surveys in EPC 1690 and EPC 1080 and off-lease development areas. The off-lease development areas actually changed location after surveys had been completed. While this is not seen as a significant problem for the ecological information presented in the EIS, recognising that further surveys will be needed to meet the requirements of the offset strategy, the statement of survey methodology and survey effort in Volume 2, Section 5 Nature Conservation should clearly reflect what has been done and not require the reader to search to an appendix level determine this (Volume 4, Appendix N1, Appendix B)	Adani has undertaken substantial survey effort as detailed in the SEIS. The package is based on the latest impact information data which incorporates the findings of recent surveys.	3.0
DEHP	The northern area of EPC 1080 has not been comprehensively surveyed for both flora and fauna. It is acknowledged that the area underwent an extensive fire at the time of surveying in November 2011. The best time for survey work is March to May.		

ORGANISATION	FEEDBACK	ACTION	SECTION REFERENCE
DEHP	Brigalow scaly-foot has been located two properties to the west of Moray Downs in the catchment of the Carmichael River and therefore it is likely to occur on the project area and should be accounted for in MNES offset requirements		
DEHP	It is unlikely that there are 37, 839 ha of potential compliant offset for black-throated finch habitat to the west of the mining lease within Moray Downs as at least half of this area is unsuitable as habitat. Offset areas for black-throated finch which already contain the species will need to demonstrate improvement of finch conservation outcomes through specific management improvements or decrease of threats. The maintenance of black-throated finch habitat within the mining lease should be a high priority	At the time of writing, field work is currently being undertaken to determine the extent and quality of species-specific habitat values within the offset areas, including Moray Downs.	12.7
DEHP	It is not clear how the proponent avoided and minimised disturbance in both EPC1690 and EPC1080 in setting out the mine plan. It is not apparent from the EIS document.	Adani conducted a comprehensive avoidance and mitigation assessment.	4
DEHP	The EIS does not demonstrate, or even discuss, minimisation of impact of mining operations (on-lease activities especially out-of- pit waste dumps) on biodiversity values requiring offset. This relates to the need for a more advanced mine plan than the schematic provided in Volume 2 Section 2.		
DEHP	Avoidance and mitigation measures have not been demonstrated to meet the ToR, especially re the Bygana West NR (from ToR adequacy spreadsheet).		
DEHP	The Environmental Offset Strategy is an early outline only and to be useful for public review would need to define offset area values (or other offset type) and likely establishment timeline. The timeline needs to be related to the timing of the EIS outcome, draft environmental authority, final environmental authority, and commencement of mining activities e.g. when ecological equivalence will be completed and when direct offsets will be established.	An updated project development and offset implementation timeline has been prepared	12.1, 12.2
DEHP	The EHP Galilee Offsets Strategy has been released to aide in selecting suitable offsets sites for best biodiversity outcomes.	Environmental offset package utilised direct offset options available on Adani owned properties and areas recognised as	9.0

ORGANISATION	FEEDBACK	ACTION	SECTION REFERENCE
		possessing 'high conservation value' within the Galilee Basin Offset Strategy.	
DEHP	The Environmental Offset Strategy describes the impact area on each environmental value within the open cut, subsidence, off-site and rail corridor area. The area required for each stage (1,2 and 3) of mining for each component should be presented. The offset requirements for stage one (2013 to 2027) should be presented including the areas likely to be used for offset requirements.	The package is based on impact data provided by GHD.	3.0
DEHP	(The EM Plan - Mine) Format is acceptable. The intended series of operations plans (Table 13.4) should include a subsidence management plan and an offsets management plan (if direct offsets are used).	Offset management plans cannot be finalised until specific direct offset areas are confirmed and on-ground assessments are undertaken to determine the nature and extent of the required management actions.	12.0
SEWPaC	Consider the high biodiversity values of Bygana West NR and, in accordance with mining best practice, first demonstrate ways to avoid impacting this area, second demonstrate mitigating measures and offsetting impacts relating to Bygana West Nature Refuge.	The SEIS has been updated to address avoidance and minimisation of impacts	3.0, 4.0
SEWPaC	Describe any departure from no net loss of ecological values.	The environmental offset package is compliant with current offset policies and adopts the policies' approach to 'no net loss' of ecological values.	2
DEHP	The proponent should present in table and map form the impact areas which require offsets for both Commonwealth and State offset requirements for each of the proposed three stages of the project. It is likely that the State values impacted by underground mining (such as subsidence) will require offsets.	An updated project development and offset implementation timeline has been prepared	12.2
DEHP	The proponent should revise the estimated offset potential area within Moray Downs to more accurately reflect the likely availability of 6% FPC areas. Please contact EHP officers for further mapping information.	Final offset areas will be ecologically equivalent and subject to the offsets assessment guide.	12.4, 12.6
DEHP	The proponent should assess the ecological equivalence of the impact area and the proposed offset areas in order to determine the ratio of offset required and to determine the suitability of the habitat for the target species. This will also enable the proponent to determine the management actions required to ensure the survival of the species and ecosystems in this basin. It is	The offset implementation timeline has been updated	12.2

ORGANISATION	FEEDBACK	ACTION	SECTION REFERENCE
	recommended that the proponent provide maps of the availability of each offset value within Moray Downs in order to better assess the availability of offset values on this property.		
DEHP	The offset strategy should be in accordance with the existing Queensland Biodiversity Offset Policy (EHP 2011) and Galilee Basin Offset Strategy (EHP 2012). An offset proposal would not be accepted where the site is located within a mining lease area or mining lease application area. If the offset is in the Galilee Investment Hub shown in the Galilee Basin Offset Strategy, an offset may be supported with the provision of supporting information such as demonstration that there is a nexus between the values impacted and the proposed offset and that a conservation gain can be achieved.	Offset areas have been identified in accordance with the Australian and Queensland Government offset legislation focusing on priority GBOS properties.	2.0, 12.2
DEHP	If the offset is not in the Galilee Investment Hub, it may be supported provided that the Queensland Biodiversity Offset Policy (BOP) requirements are met. This includes: - a demonstrated clear conservation gain; - ecological equivalence requirements met; - remnant regional ecosystems - the offset must be in the same bioregion, same broad vegetation group, not remnant, and with the same conservation status or higher; and - protected plants and animals – the specific policy requirements under the QBOP are met (e.g. page 31 and 33 of QBOP).	Offset areas have been identified in accordance with the Australian and Queensland Government offset legislation focusing on priority GBOS properties.	2, 12.2
Macmines Austrasia Pipelines	MacMines request that no offset areas are secured or approved on land underlying the proposed Project China Stone MLA area. The securing of such offsets would significantly constrain the proposed mining activities within the MLA area and is likely to make the project not economically viable.	Consideration will be given to existing exploration permits and mining leases during the finalisation of the offset plan.	-