Appendix 22

Assessment of Impacts on Matters of National Environmental Significance

Byerwen Coal Pty Ltd

Byerwen Coal Project

Matters of National Environmental Significance Assessment Report

BYC002-ENV-RPT-0002
Revision F

28th February 2013

Revision	Date	Description	Prepared	Reviewed	Approved		
					Study Manager	Sign-off	Client
A	10/12/12	MNES Report	KH	TH	JC		
B	11/01/13	MNES Report	WM	JR	JC		
C	05/02/13	MNES Report	WM	JR	JC		
D	05/02/13	MNES Report	WM	JR	JC		
E	13/02/2013	MNES Report	WM	JR	JC		
F	28/02/2013	MNES Report	WM	JR	JC		

Item	Page	Section	Comments

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1. INTRODUCTION

Unidel Group Pty Ltd (now AMEC Environment and Infrastructure Pty Ltd) was engaged by Byerwen Coal Pty Ltd (the proponent) to undertake a terrestrial ecology impact assessment of the proposed Byerwen Coal Project (the Project). The project involves the development of an open cut mine and associated infrastructure. The project is located in the Brigalow Belt North Bioregion, approximately 20 km west of Glenden and 140 km west of Mackay (**Figure 1.1**).

The project was referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) given its potential to have a significant impact on Matters of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The project was determined to be a controlled action on 13 January 2010 (reference EPBC 2010/5778). The controlling provisions are:

- Sections 18 and 18A–listed threatened species and communities
- Sections 20 and 20A–listed migratory species.

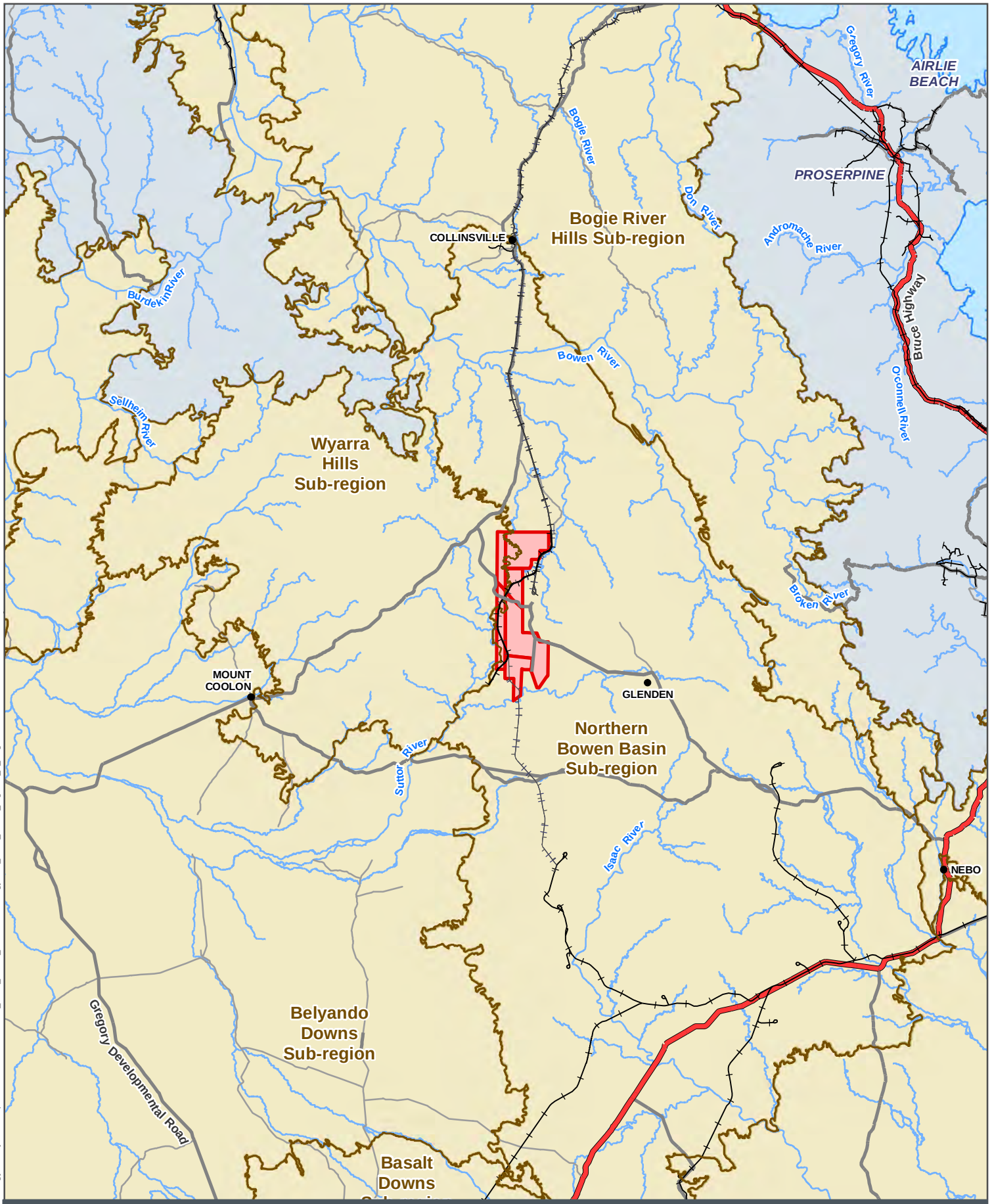
The project is to be assessed under the bilateral agreement between the Queensland and Commonwealth Governments.

This report has been prepared to address the requirement to prepare a stand-alone MNES report for the Byerwen Coal Project Environmental Impact Statement (EIS). The report summarises the results of desktop and field studies undertaken to define the MNES in the project area, assesses the likely impacts of the project on those values and recommends mitigation measures to avoid, minimise or offset adverse impacts associated with the project.

1.1 Purpose

The purpose of this report is to:

- Describe the ecological features of the region in which the mine is proposed.
- Describe the presence, extent and ecology of MNES species and communities within the project area.
- Assess the potential impacts that may arise on MNES from the construction, operation and decommissioning of the project.
- Recommend management strategies to minimise potential impacts on MNES of the site and the region.



BYERWEN COAL - BYC002-Ecology Surveys and Impact Assessment

Figure 1.1 - Regional Location

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Physical Road Network © State of Queensland 2010
Mining Leases © State of Queensland 2011
Remnant Watercourses © State of Queensland 2011
StreetPro Australia © Pitney Bowes Business Insight (PSMA Australia Ltd and Department of Health and Ageing) 2009

LEGEND

- Town
- Highway
- Main Road
- Secondary Road
- Railway
- Proposed Alpha Coal Project Rail Line
- Goonyella to Abbot Point Railway
- GAP Railway
- Stream Order
- Byerwen Mining Lease
- Brigalow Belt North Bioregion

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QC Check List: Completed

2. BACKGROUND

2.1 Project Area

The project area for this impact assessment is the Byerwen Coal Project and is defined by six mining lease application (MLA) areas which cover a total area of approximately 22 697 hectares (ha) adjacent to the existing Newlands coal mine. The six MLAs comprising the Byerwen Coal project area are shown in **Figure 2.1** and are:

- MLA 10355
- MLA 10356
- MLA10357
- MLA 70434
- MLA 70435
- MLA 70436.

In addition to the 2012 ecological survey program, previous flora and fauna assessments were undertaken by Central Queensland University (Wormington *et al* 2009) and Unidel (2010, 2011 and 2012), on exploration tenures (EPC 614, EPC 739) which overlap the project area (Figure 2.2). The results of studies undertaken for both the project area and the previous exploration tenures have been combined to form the basis for the description of terrestrial flora and fauna values presented in this report (**Section 3** of this report).

2.2 Project Description

The project involves the development of a proposed new open cut coal mine, located in the Northern Bowen Basin, approximately 20 km west of Glenden and 140 km west of Mackay. The project proponent is Byerwen Coal Pty Ltd (Byerwen Coal) a joint venture between QCoal Pty Ltd and JFE Steel.

The proposed life of the project is 50 years, including the construction, operation and decommissioning phases. Coal will be extracted from the open cut mine using conventional large excavators and trucks in combination with electric rope shovels and dragline. Mining activities will be carried out on a full time basis (i.e. 24 hours, 7 days per week, 52 weeks per year).

The proposed mine layout and associated infrastructure is shown in **Figure 2.3**. The project as assessed in this report includes:

- Progressive development of several open cut pits. The North and West Pits form single footprints while the South and East Pits are split. For the purposes of this impact assessment, six separate pit footprints are discussed – the North Pit, West Pit (comprising West Pit 1, West Pit 2 and West Pit 3), South Pit 1, South Pit 2, East Pit 1 and East Pit 2.
- Spoil placement areas external to the pits will be used for placement of overburden material from initial box cuts.
- A Northern Infrastructure Area servicing the North Pit, comprising a coal handling and processing plant (CHPP) and mine infrastructure area (MIA), associated run-of-mine (ROM) and product coal stockpiles, raw water storage, tailings and reject co-disposal areas, various roads and conveyors. This area also includes rail load out facilities and a rail loop connecting to the Goonyella to Abbott Point (GAP) rail line.

- A Southern Infrastructure Area servicing the remaining open cut pits, comprising a separate CHPP and MIA, associated ROM and product coal stockpiles, raw water storage, co-disposal areas, roads, conveyors, a separate rail load out facility and rail loop connecting to the GAP rail line.
- A proposed 60 m wide central infrastructure corridor connecting the Northern and Southern Infrastructure Areas, including road, water supply pipeline, power supply and crossings across tributaries of Kangaroo Creek.
- Access roads and internal haul roads connecting the pits and MIA.
- Diversions of existing creek lines (two tributaries of the Suttor River and a tributary of Kangaroo Creek).
- Diversions of existing power infrastructure.
- Mine water management infrastructure, including environmental dams and associated pipelines.

The direct footprint of all mining and infrastructure areas as provided by QCoal and described in Chapter 7 of the terrestrial ecological impact assessment totals approximately 7,000 ha. For the purpose of the terrestrial ecology impact assessment this footprint area has been buffered so that any additional areas that will be isolated or cleared as a result of mining and/or associated infrastructure (e.g. non-viable linear corridors between haul roads and pits) are included within the impact footprint. The total impact footprint considered for the terrestrial ecology impact assessment is approximately 7, 480 ha. The breakdown of difference between the direct footprint area provided by QCoal and the buffered footprint area adopted for the terrestrial ecology impact assessment in terms of REs, RE category and TECs is provided in Table 2.1, Table 2.2 and Table 2.3 respectively of the terrestrial ecological assessment report.

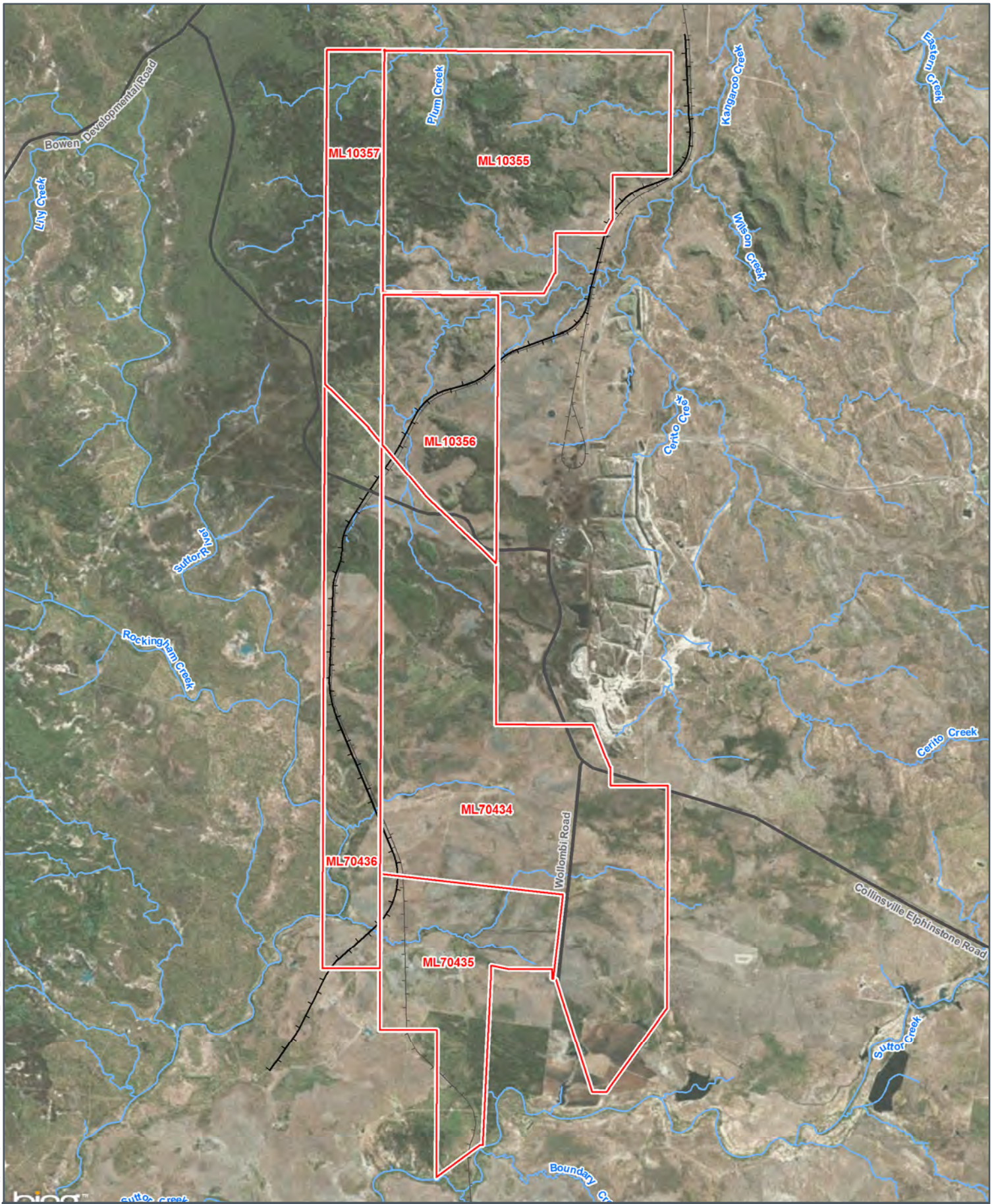

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Figure 2.1 - Project Area

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Physical Road Network © State of Queensland 2010
Mining Leases © State of Queensland 2011
Remnant Watercourses © State of Queensland 2011

LEGEND

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and Above)
- Byerwen Mining Lease

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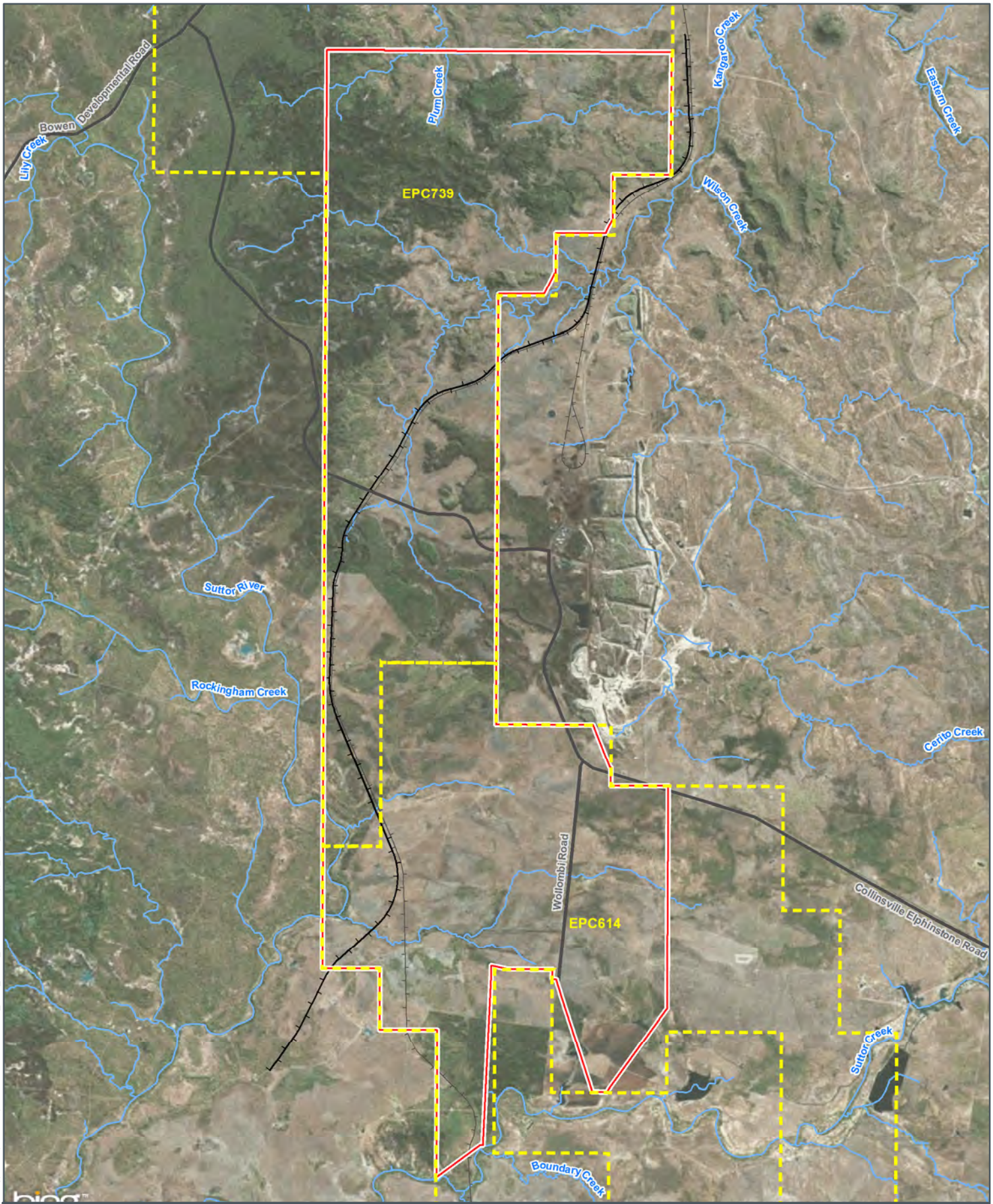

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Figure 2.2 - Exploration Tenures

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011
Exploration Tenures © State of Queensland 2012

LEGEND

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and Above)
- Project Area
- EPC Boundary

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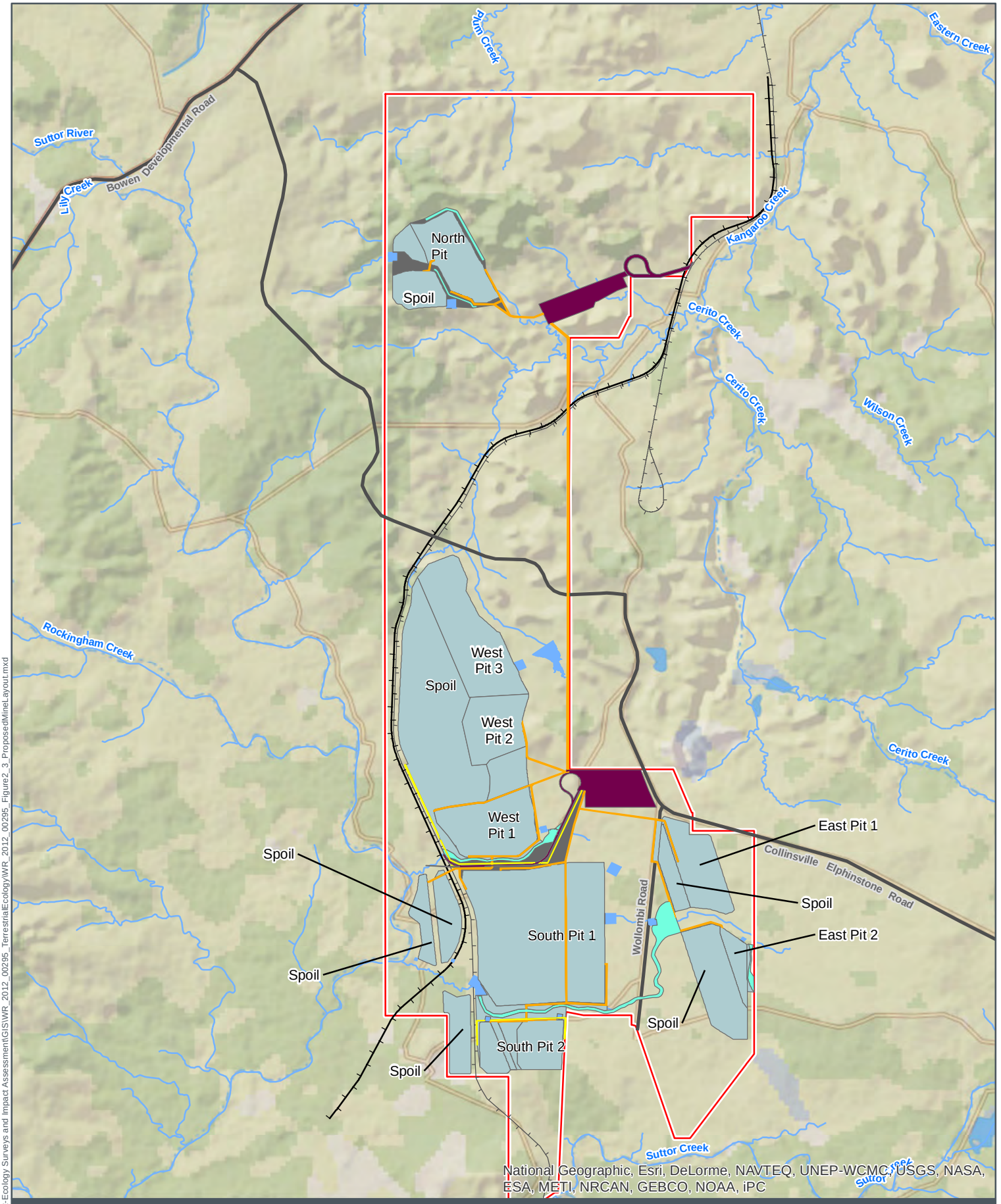

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Figure 2.3 - Proposed Mine Layout

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Physical Road Network © State of Queensland 2010
Remnant Watercourses © State of Queensland 2011

LEGEND

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Powerline Diversion
- Stream Order (2 and above)
- Project Area
- Haul Road
- Powerline Diversion
- Creek Diversion
- Dam
- Pit
- Impact Footprint
- Infrastructure Area

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LOCATION DIAGRAM

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3. METHODOLOGY

Terrestrial flora and fauna values in the project area have been described using the results of desktop and field assessments carried out in the project area between 2009 and 2012. This includes assessments undertaken for previous exploration tenures (EPC 614, EPC 739).

3.1 Taxonomic Nomenclature

Scientific and common names used in this report are consistent with those used in the following sources:

- Bostock and Holland (2007) and botanical binomials presently accepted by the Queensland Herbarium for flora
- Cogger (2000) for amphibians and reptiles
- Morcombe (2000) for birds
- Van Dyck and Strahan (2008) for mammals.

3.2 Desktop Assessments

MNES with the potential to occur within 20 km of the project area were identified through searches of the EPBC Protected Matters search tool using the coordinates in **Table 3-1**. MNES searches were supplemented with species records sourced from a number of other databases as outlined in **Table 3-1**.

Table 3-1 Search Areas applied to Desktop Searches

Search Type	Search Area	
	Latitude	Longitude
DSEWPaC Protected Matters Search Tool	-20.90156	147.62248
	-20.89912	148.10683
	-21.56741	148.11183
	-21.56994	147.62529
Queensland Herbarium (HERBRECS)	-21.0576	147.8264
	-21.6559	147.9770
Queensland Museum Records	-20.98333	147.716667
	-20.98333	147.916667
	-21.38333	147.916667
	-21.38333	147.716667
Birds Australia Bird Atlas	-21.187	147.4821

The following previous studies and reports prepared for the project and for other nearby mines were also reviewed:

- Flora and Fauna Assessment of the Exploration Permit Coal 614 Study Area near Glenden, Central Queensland, a report to QCoal Pty Ltd by the Centre for Environmental Management, Central Queensland University (2009)

- Byerwen Coal Baseline Flora and Fauna Study, a report to QCoal Pty Ltd by Unidel (Report Number BYC001-ENV-RPT-0002, Rev C July 2011)
- Byerwen Coal 2011 Wet Season Baseline Limnology Survey (NRA 2011)
- Environmental Impact Statements for the Ellensfield, Caval Ridge and Daunia coal mine projects.

3.3 Vegetation and Flora Field Assessments

The description of terrestrial vegetation and flora values in the study area has been derived from desktop and field surveys comprising:

- General surveys to verify 1:100 000 scale regional ecosystem (RE) mapping and to identify and prioritise terrestrial flora values in the project area
- A targeted survey to assess whether native grasslands in the eastern part of the project area met the criteria for the 'Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin' threatened ecological community (Natural grasslands Threatened Ecological Community (TEC)).

Terrestrial flora field surveys and the timing for each are summarised in **Table 3-2**. Additional surveys were also undertaken to define habitat for a previously undescribed flora species, *Kelita uncinella* which is not currently listed as threatened or near threatened under any environmental legislation. Further details on this species have been reported separately (AMEC 2012) and are not addressed in this report.

Table 3-2 Summary of Terrestrial Flora Field Surveys

Purpose	Project Area	Wet Season Survey	Dry Season Survey
General flora survey (CQU)	EPC 614	30 March–10 April 2009	3 August 2009
General flora survey	EPC 739	-	14–22 October 2010
Targeted grassland survey	EPC 739	-	2–3 June 2011
General flora survey	EPC 739 and EPC 614	5–9 March 2012	-

3.3.1 General Flora Surveys and Vegetation Mapping

The primary objective of general flora surveys was to identify and describe vegetation communities and terrestrial flora values and to ground-truth existing RE mapping for the project area. Surveys were carried out in accordance with the Queensland Herbarium's 'Methodology for the Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland' (Neldner *et. al.* 2005). A total of 143 sites across the project area were assessed over three surveys. The location of these sites is shown in **Figure 3.1**.

The information collected during general flora surveys was used to refine 1:100 000 scale certified RE mapping (version 6.1) prepared by the Department of Environment and Heritage (DEHP). This layer was edited using hard copy stereo imagery sourced from the DEHP aerial photographic library (**Table 3-3**). Historical aerial photography (1947) was also reviewed to assess historic disturbance and vegetation condition.

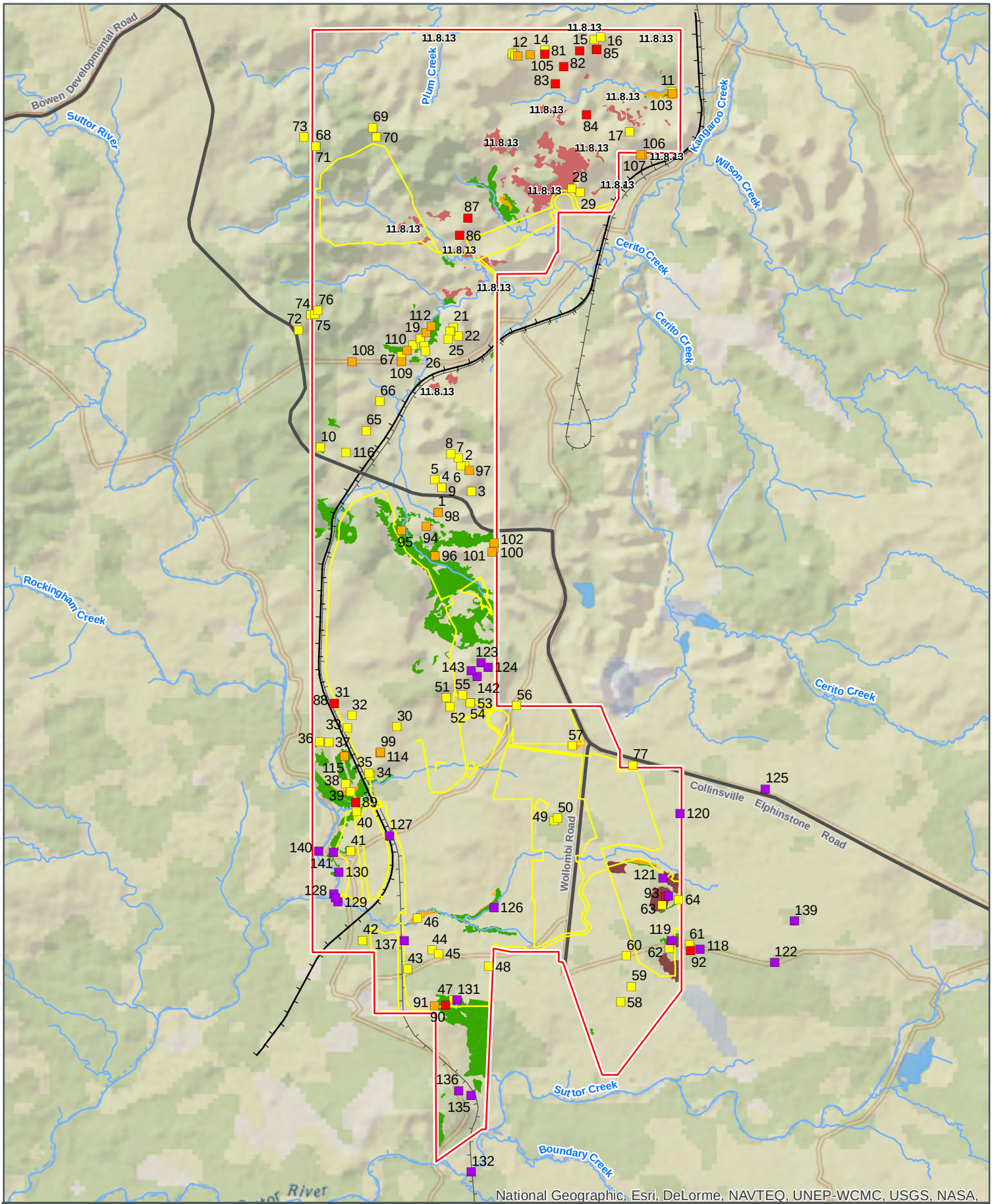

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Figure 3.1 - Flora Survey Sites

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area
- Project Footprint

Flora Survey Type
- Secondary
- Tertiary
- Quarternary
- CQU (2009) 2500m² Plot

TEC
- Brigalow TEC (Regrowth)
- Brigalow TEC (RE)
- SEVT TEC (RE)
- Natural Grassland

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QC Check List: Completed

Table 3-3 Aerial Photographic Imagery as the Basis of Revised RE Maps

Map Name/Film Number	Year	Scale	Run/Photograph
Byerwen/QAP5812	2000	1:40,000	Run 2, 18–22 Run 3, 71–74 Run 4, 112–114 Run 5, 163–165
Byerwen/QAP5831	2000	1:40,000	Run 6, 183–188 Run 7, 237–241

DEHP certified RE mapping was referenced throughout all stages of stereoscopic assessment to provide a preliminary indication of the limitations of existing mapping, as well as assist with the selection of survey site locations. Recent satellite imagery from Google Earth (2009) was consulted where necessary throughout the project area to provide an indication of recent clearing and land use patterns. The revised RE map has also been refined using 2011 high resolution aerial imagery to reflect more recent clearing that has occurred in the project area.

The revised RE mapping presented in this report is based on aerial photo interpretation and ground validation of the certified RE map. DEHP certified RE mapping is presented at a scale of 1:100 000 which generally delineates polygons of >20 ha with a minimum polygon size for remnant vegetation (isolated by non-remnant vegetation) of 5 ha. The revised mapping produced for this assessment defines remnant polygons down to a size of 5 ha. Where possible, significant ecosystems are mapped as homogenous rather than heterogeneous polygons, giving greater certainty to the location of sensitive vegetation types. Revised RE mapping is considered to more accurately define the spatial extent of REs in the project area and forms the basis of the impact assessment component of this report.

Stereoscopic assessment of aerial photography was used to establish the boundary of Tertiary landforms (Laterite jump-ups) within the project area as a means to prioritise areas for mapping revision. Lateritic landforms are considered to be low risk in terms of their potential to host significant vegetation communities and therefore detailed mapping revision was not undertaken in these areas. Vegetation present on the lateritic landforms (north western portion of the project area) was assumed to be consistent with DEHP certified RE mapping.

In total, a 10 463 ha portion of the project area was subject to detailed mapping revision. The revised mapping is represented at a spatial scale of 1:40 000, the scale of aerial photography used, with captured vegetation linework developed with an accuracy of +/- 40 m.

3.3.2 Regrowth Vegetation

The project area supports various stages of regrowth vegetation (i.e. vegetation which has regrown following previous clearing). Regrowth vegetation was mapped for the project area using historical aerial photography from 1963 (Commonwealth, 1:50 000 scale) and 2000 (Byerwen 8455, 1:40 000 scale). The boundaries of regrowth areas from the 2000 aerial photography were subsequently overlain on 2009 aerial imagery available at the time of mapping and clipped to show current regrowth boundaries. Areas of regrowth, in

particular areas of regrowth brigalow, were examined during the field survey to characterise the various stages of regrowth development within the project area.

Discussion with local graziers indicate that brigalow regrowth in the project area has been subject to long-term, cyclical disturbance. Regrowth brigalow is pulled on a roughly six-year cycle to maximise the grazing capacity of the land, allowing brigalow shrubs to replenish soil nitrogen prior to removal. As a result, many of the areas mapped by DEHP as high value regrowth (HVR) are poorly developed regrowth habitats, often with a development age of less than five years or comprising stunted, widely spaced and often dead shrubs. These areas have been assessed as having limited value and have been excluded from the revised RE map.

Based on historical aerial photo analysis, field survey and discussions with landholders, three categories of regrowth vegetation are recognised within the project area. These are:

- Regrowth vegetation which has achieved remnant status (i.e. where the vegetation has reached 70% of the height and 50% of the canopy cover of an undisturbed example of the same RE). These areas have been mapped as remnant in the revised RE map.
- Advanced regrowth vegetation that has not yet achieved remnant status but exhibits the structural and floristic elements of a defined RE type. Areas of advanced regrowth vegetation intersecting areas of high value regrowth (HVR) (as mapped by DEHP) have been mapped as HVR in the revised RE map. Due to the inclusion of regrowth Brigalow as a TEC under the EPBC Act[1], particular care has been taken to identify areas of regrowth Brigalow which meet the condition class criteria set out under the Brigalow TEC SPRAT profile (DSWEPAC 2013). Important considerations are that the regrowth community is: (i) generally more than 15 years of age; (ii) exotic perennial plants have no more than 50% cover (assessed in a minimum area of 0.5ha); and (iii) individual patches are greater than 0.5ha. Areas of Brigalow mapped as HVR and other areas of advanced regrowth Brigalow were assessed against the criteria to determine whether they should also be identified as the Brigalow TEC.
- Other woody regrowth vegetation. These areas have been mapped as non-remnant in the revised RE map.

3.3.3 Targeted Native Grassland Surveys

Targeted surveys were undertaken over a two day period in June 2011 to record the extent and condition of native grassland communities in the northern part of EPC 739 and to establish whether these met the criteria for the 'Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin' TEC. Groundcover was assessed using five 1 m x 1 m subplots placed at 10 m intervals along a transect with visual cover estimations of dominant species. Ecological and structural data together with full species lists were also recorded. Targeted assessments were undertaken at sites S51, S52, S53, S54, S55, S56, S57, S58 and S59.

3.3.4 Survey Limitations

The vegetation mapping is represented at a spatial scale of 1:40 000, the scale of aerial photography used, with captured vegetation line work produced with an accuracy of

[1] Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community

+/-40 m. The effort expended for vegetation survey is consistent with the requirements of Neldner *et al* (2005), and importantly accounts for seasonal variation. In this regard the survey is consistent with the project terms of reference.

Access to some parts of the project area was restricted as a result of rugged terrain and/or the absence of constructed roads or access tracks. In particular, vegetation communities on rugged breakaway country (land zone 7) in the northern and central parts of the project area were difficult to access. Access was also restricted to the north-west portion of the project area. In general, these areas are characterised by a simple suite of vegetation communities that can be mapped and attributed with a high degree of confidence from available aerial imagery. Survey of representative habitats in accessible locations provided information relevant to the structural and floristic characterisation of vegetation in areas that could not be accessed.

Field survey effort was concentrated in areas of predicted impact based on a preliminary impact footprint provided by Byerwen Coal. As a result of subsequent modifications to the impact footprint based on the results of studies completed for the EIS, a number of survey sites are now located outside the project footprint. Again, structural and floristic data from representative vegetation communities is considered adequate to extrapolate across unsurveyed areas.

Perennial trees and shrubs remain identifiable outside optimum sampling periods and timing is not a constraint with respect to threatened flora potentially occurring in the project area. The timing of surveys (early March) in native grasslands in the south-eastern portion of the project area was considered favourable to detect annual grass species (king bluegrass (*Dichanthium queenslandicum*), *Dichanthium setosum* and finger panic (*Digitaria porrecta*)).

3.4 Terrestrial Fauna Field Assessments

The existing terrestrial fauna values of the project area described in this report have been derived from desktop and field surveys conducted in the project area between 2009 and 2012 (**Table 3-4**). Baseline fauna surveys involved fauna trapping at 13 sites and secondary habitat assessments at 22 sites within representative habitat types. Trapping and habitat assessment sites in the project area are shown on **Figure 3.2**.

Table 3-4 Summary of Terrestrial Fauna Field Surveys

Purpose	Project area	Wet Season Survey	Dry Season Survey
General fauna survey (CQU)	EPC 614	30 March–10 April 2009	3–12 August 2009
General fauna survey	EPC 739	-	14–22 October 2010
General fauna survey	EPC 739	5–9 March 2012	-

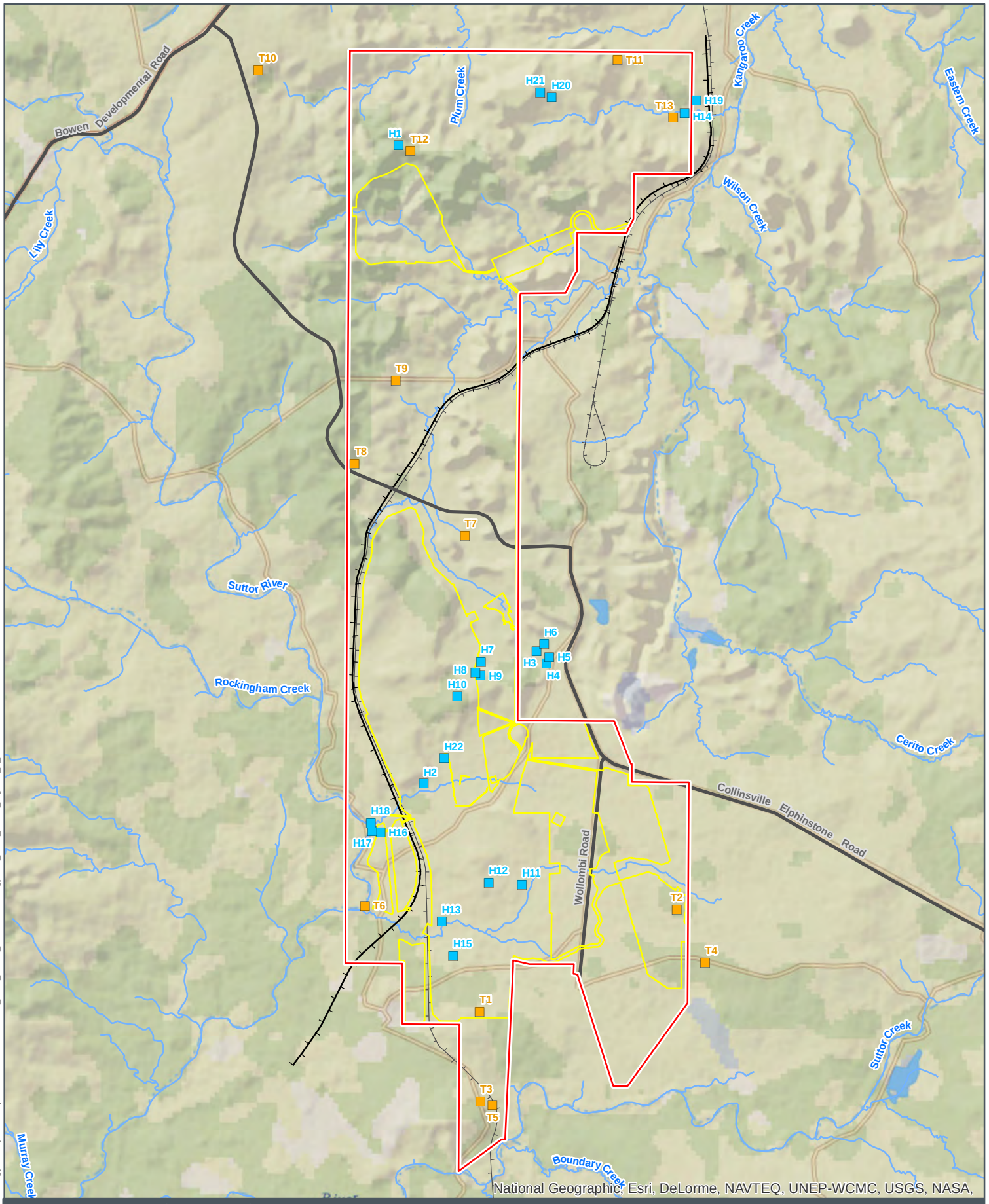

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Figure 3.2 - Fauna Survey Sites

WORK REQUEST NUMBER: WR_2012_00216

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area
- Project Footprint
- Trapping Location
- Habitat Assessment Site

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QC Check List: Completed

3.4.1 Consideration of Survey Guidelines

Fauna survey methodologies have been developed having regard to the following survey guidelines:

- Reptiles
  - Guidelines for detecting reptiles listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment, Water, Heritage and the Arts (DEWHA) 2011a)
  - *Environment Protection and Biodiversity Conservation Act 1999* Draft referral guidelines for the nationally listed Brigalow Belt reptiles (DEWHA 2011b)
- Birds
  - Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010)
  - Black-throated finch – DSEWPaC Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*) (BTF Recovery Team 2009)
- Mammals
  - Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2011c)
  - Bats – Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).

3.4.2 Survey Site Selection

Survey sites were located to maximise detection and/or capture of target (threatened, near threatened and regionally significant) fauna species. At the landscape scale, DEHP certified RE and HVR mapping was used to target:

- Vegetation types that provide a representative example of the various habitat types that occur within the project area
- Vegetation types that exhibit preferred habitat qualities for fauna species, in particular threatened or near threatened species known or potentially occur within the project area
- The presence of wetlands and or dams that provide watering points for fauna species
- The presence of bioregional corridors which facilitate fauna dispersal across the landscape
- Riparian vegetation along watercourses that can act as fauna dispersal corridors and often contain microhabitat features such as hollow bearing trees
- The presence of rocky outcrops that can provide potential habitat for fauna species such as quolls and bats
- Soil types with a particular focus on the black clay soils located to the north west of the project area that may represent preferred habitat for reptile species.

At the site-scale, trapping and observation was undertaken in microhabitats providing the best opportunity for detection of target species.

3.4.3 Fauna Trapping

Fauna trapping was undertaken across representative habitat types in the project area. Habitats sampled by survey event are summarised in **Table 3-5**.

Table 3-5 Habitat Types Sampled by Survey Event

Survey	Lateritic Uplifts	Undulating Black Cracking Clays	Undulating Sandy Plains	Clay Floodplains With Gilgai	Alluvial Floodplains	Wetlands	Cleared
CQU (2009)	-	-	✓	✓	✓	-	✓
AMEC (2010)	✓	✓	✓	-	✓	-	-
AMEC (2012)	✓	✓	✓	✓	✓	✓	✓

A summary of trapping techniques used for the fauna surveys is provided in **Table 3-6**. Detailed fauna survey methodologies including a summary of trapping hours and techniques are provided in **Attachment B** of the Terrestrial Ecology Impact Assessment (Document No. BYC002-ENV-RPT-0001).

Table 3-6 Fauna Sampling Techniques

Trapping Technique	Description
Elliott Traps	At each trapping location, both Type A and Type B Elliott traps were placed 5–8 m apart and baited with a mixture of rolled oats and peanut butter. Trap placement was influenced by vegetation diversity, the size and shape of the vegetation patches, and naturally occurring features such as logs, rock outcrops, tree bases and clumping vegetation. Traps were cleared each morning and reset in the afternoon in accordance with animal ethics requirements.
Pitfall Traps	Pitfall traps are PVC tubes that are approximately 25 cm in diameter and 45 cm deep. These tubes were placed approximately 5 m apart along a plastic line fence.
Funnel Traps	Funnel traps were deployed on either side of a drift fence flush to the ground surface. A shade cloth covering each funnel trap was used to protect trapped species from daytime heat. Funnel trap lines were cleared early morning and late afternoon in accordance with animal ethics requirements.
Camera Traps	Camera trapping involves the placement of motion activated cameras in areas likely to be frequented by fauna species. Camera traps were deployed at a large dam in the southern portion of the project area (Site T8) and along a fence line on a vehicle track where frequent fauna movement was evident (Site T9).
Ultrasonic Bat Recording	Ultrasonic bat recording using both Anabat and Binary Acoustic Technology equipment was undertaken at various locations throughout the project area. Such devices record frequencies in the ultrasonic spectrum to enable the identification of bat species.
Mist Netting	Mist nets comprised of thin nylon mesh suspended between two poles. This trapping technique was applied along a creek line in the north of a project area to confirm the identity of bat species recorded by the Ultrasonic recording system.

Trapping Technique	Description
Spotlighting	Hand-held spotlights and head torches were used to sample nocturnal mammals (flying, arboreal and terrestrial), birds (owls and nightjars), reptiles and frogs.
Mawbey Traps	Mawbey traps were utilised to trap possums, quolls and bandicoots. Baited with jam coated apple and pet jerky, these traps were placed under trees and grass clumps at Site T2.
Intensive Diurnal Searches	Active diurnal searches were undertaken that involved intensive investigation of ground layer (under logs, rocks and leaf litter), low vegetation (under bark and in tree stumps) and rock crevices for all amphibians, reptiles, bats and animal signs (e.g. scats, bird feeding remnants, remains and tracks).
Owl Audio Call Playback	Recorded owl calls were utilised to elicit identifiable calls of nearby birds.

3.4.4 Habitat Assessments

Habitat assessments captured specific microhabitat data from numerous locations within different vegetation groups across the project. This assessment of habitat features identified the presence, abundance and quality of microhabitat features considered critical for the survival of threatened, near threatened and regionally significant fauna species. Consideration of habitat quality as a predictor of the likelihood of occurrence is considered to be a precautionary approach and is particularly relevant for cryptic species.

Targeted fauna habitat assessments were carried out at 22 sites of approximately 100 m x 100 m within the project area with the aim of identifying microhabitat features for target fauna species identified through the desktop analysis. The location of these sites is shown on Figure 3.2. The presence and density of the following microhabitat features were recorded at each of the sites:

- RE
- Total basal area (m^2/ha)
- Stems >10 cm diameter at breast height (dbh)(stems/ha)
- Density hollow trees (no./ha)
- Average height of tallest trees (m)
- Canopy cover (%)
- Canopy species
- Samplings (stems/ha)
- Shrubs (stems/ha)
- Live trees, decorticating bark (m^2/ha)
- Dead trees, exfoliating bark (m^2/ha)
- Logs-solid (no./ha)
- Logs-hollow (no./ha)
- Grass cover (%)
- Average grass height (cm)
- Low shrub cover (%)

- Fine litter cover (%)
- Coarse litter cover (%)
- Rocks present
- Soil cracks
- Free water present
- Caves present
- Soil texture.

3.5 Assessment of Impacts on MNES Species

Impacts on potential habitat for flora and fauna species have been calculated based on RE associations for individual species derived from known habitat associations and published literature. RE associations provide an indication of the presence of suitable habitat but do not take account of the actual distribution of suitable microhabitat (e.g. logs, leaf litter) or niche habitat (e.g. suitable nesting sites) within each RE. The areas are therefore likely to represent an overestimate of actual habitat availability for most species.

4. PROJECT AREA DESCRIPTION

The project area is located within the Brigalow Belt North Bioregion and on the boundary of two subregions–Wyarra Hills to the east, and the Northern Bowen Basin to the west. The region is characterised by a sub-humid to semi-arid climate.

The Wyarra Hills subregion comprises a fringing core of low hills with duplex soils and lateritic mesa tops and breakaways with shallow rocky soils. Vegetation characteristic of the subregion comprises silver-leaved ironbark (*Eucalyptus melanophloia*) woodlands with bloodwoods (*Corymbia* spp.) and lancewood (*Acacia shirleyi*) and/or bendee (*A. catenulata*) on scarps and mesas, and *Eucalyptus persistens* and poplar box (*E. populnea*) on lower slopes (Young *et. al.* 1999).

The Northern Bowen Basin subregion contains the major areas of outcrop of Triassic and Permian sediments within the Bowen Basin and there are also areas of basalt and Tertiary sediments (Young *et. al.* 1999). The landscape is predominantly undulating with brigalow (*Acacia harpophylla*) and Dawson gum (*E. cambageana*) dominant on clay soils, and an open woodland of narrow-leaved ironbark (*E. crebra*) or poplar box (*E. populnea*) on shallower texture-contrast soils (Young *et. al.* 1999). There are also areas of bluegrass (*Dichanthium sericeum*) downs with the sandstone range areas dominated by narrow-leaved ironbark (*E. crebra*) and bloodwoods (*Corymbia* spp.) (Young *et. al.* 1999).

Land use within the Brigalow Belt North Bioregion includes grazing, cropping, tourism and mining, particularly coal, with coal deposits occurring in the Bowen and Galilee Basins. Nature conservation has received increasing attention in the bioregion due to the extensive loss of habitat that has occurred, and accompanying declines in species populations (Young *et. al.* 1999).

4.1 Landform

The project area is comprised of diverse geological features, which combine to provide a diverse and complex array of habitats. Significant tracts of land in the northern and central portions of the project area are found on sandstone plateaus which fall to form steep wash out slopes and grade into broad undulating plains with heavier clay soils and sandy soils. These plans are dissected by incised alluvial systems often with deep outer banks displaying significant soil profiles and bedrock. Basaltic and lateritic outcrops occur sporadically within the project area providing varying soil structures and complex vegetation composition and habitat features such as rocky outcrops and scalds.

4.2 Drainage, Waterways and Wetlands

The project area is located in the Burdekin River catchment. The northern and most of the central sections of the project area are within the Bowen sub-catchment and are drained by Plum Creek, Kangaroo Creek and their tributaries, which form part of the Broken River sub-catchment. The southern section of the project area is within the Suttor sub-catchment and is drained by the Suttor River and its tributaries (**Figure 4.1**). Watercourses in the project area are ephemeral and flow only after sustained or intense rainfall in the catchment. Stream flows are highly variable, with flows typically occurring during the wetter months (January–March) with low to no flow for the rest of the year.

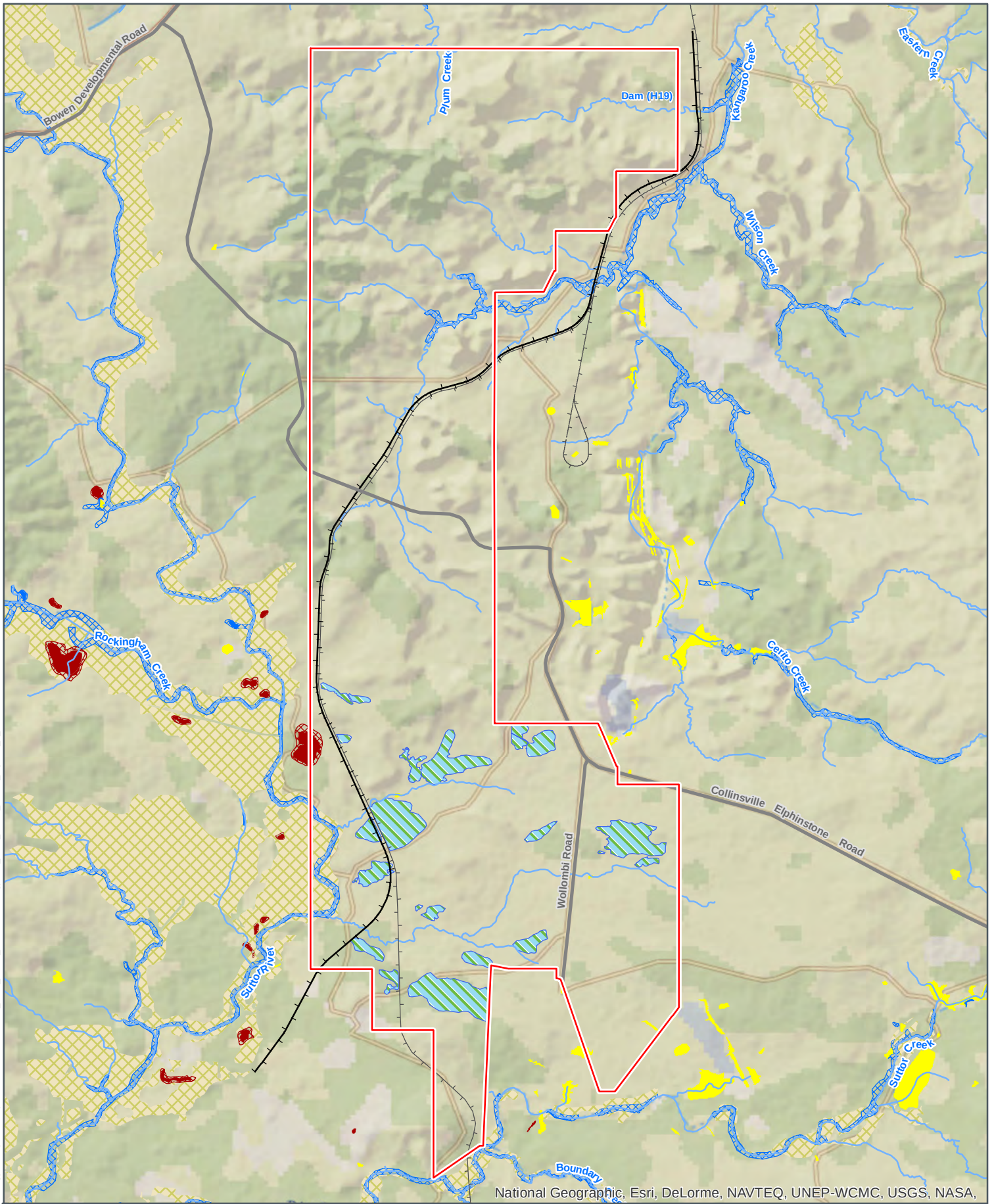

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Figure 4.1 - Wetlands and Drainage Features

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Wetland Info © State of Queensland 2011
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area
- Indicative extent of gilgai wetland habitat
- Lucastrine System (Water Body)
- Palustrine System (Water Body)
- Riverine System (Water Body)
- Palustrine System (Regional Ecosystem)
- Riverine System (Regional Ecosystem)
- Remnant Regional Ecosystem 1-50% Wetland (Mosaic Units)

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
16/11/2012	SN	JC	Issued for Review	B
04/12/2012	CM	JC	Issued for Review	C
11/01/2013	AB	JC	Issued for Review	D
08/03/2013	SG	JC	Issued for Use	0

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QC Check List: Completed

Permanent and semi-permanent water sources in the project area are associated with farm dams and wetland habitats. In particular, farm dams are located at sites H2 and H13 in the southern part of the project area and H19 in the northern part of the project area. The dam at H2 is shown in **Figure 4.2**. It should be noted that the water level evident in the dam is reflective of the wet season survey period.

Figure 4.2 Permanent Water Source associated with Farm Dam at Site H2, May 2012

There is also a palustrine wetland (Aquatic Survey Site S3) situated on a closed depression of the Suttor River floodplain in the western portion[2] of the project area (**Figure 4.3**). At the time of surveys, this wetland was a vegetated swamp covering approximately 60ha (1km X 0.6km), with an average depth of 0.5m. It was dominated by forest red gum (*Eucalyptus tereticornis*) and emergent macrophytes.

[2] The wetland straddles the boundary of the project area, with approximately 40% falling within the project area and approximately 60% falling between the western boundary of the project project area and the Suttor River.

Figure 4.3 Palustrine Wetland the Western Boundary of the Project area, May 2012

4.3 Vegetation

The southern part of the project area is characterised by undulating grazing lands dominated by exotic pasture species with fragmented areas of brigalow and eucalypt woodland. There are intact areas of riparian vegetation along the Suttor River with riparian vegetation along tributaries of the Suttor River generally fragmented. There are areas of native grassland along the south-eastern boundary of the project area.

Observed vegetation patterns in the northern and central parts of the project area reflect variations in geology and soil type, with areas dominated by woodland communities characteristic of lateritic jump ups grading into woodland, open woodland, brigalow and vine thicket communities in areas of lower relief.

A description of vegetation communities recorded from the project area is provided in **Table 4-1** . Vegetation communities are described according to the corresponding RE description from the Queensland Regional Ecosystem Description Database. The distribution of RE types based on revised RE mapping prepared for the project is shown in **Figure 4.4**, **Figure 4.5** and **Figure 4.6**.

4.4 Habitats

Seven broad habitat types were observed within the project area:

- Lateritic topped uplift and escarpments
- Undulating black cracking clays supporting brigalow
- Undulating sandy plains supporting eucalypt forest with shrubby understory
- Clay floodplains with gilgai supporting brigalow
- Alluvial floodplains with poplar box/blue gum
- Natural and artificial wetlands
- Cleared areas.

Detailed descriptions of each of these habitat types is provided in **Table 4.2**. Habitat connectivity in the project area is linked to riparian corridors associated with the Suttor River and Kangaroo Creek and contiguous areas of terrestrial vegetation in the central and northern portions of the project area.

Table 4-1 Regional Ecosystems Occurring in the Project area

RE	Description	TEC	Site Assessments	Area (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Brigalow	T35, T40, Q80, Q106	118
HVR 11.3.1	Advanced regrowth *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.[3]	Brigalow	T21	36
11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	–	T34, Q104, Q105	78
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains.	–	T39, Q36	223
11.3.25	*Eucalyptus tereticornis* or *Eucalyptus camaldulensis* woodland fringing drainage lines.	–	Q20, T21, Q38	157
11.3.27 (11.3.27f)	Freshwater wetlands/ Lacustrine wetland (eg lake)/Palustrine wetland (eg vegetated swamp)/ *Eucalyptus coolabah* and/or *E. tereticornis* open woodland to woodland fringing swamps.	–	Q68	20
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains.	–	Q73, Q76, Q77, Q78, Q79, Q86, T83	566
11.4.8	*Eucalyptus cambageana* woodland to open-forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Brigalow	Q65, Q66, Q75, Q81, Q85, T70, T75	155
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with Terminalia oblongata on Cainozoic clay plains.	Brigalow	Q3, T15, T16, Q72, Q74, Q81, S82, T83	237
HVR 11.4.9	Advanced regrowth *Acacia harpophylla* shrubby open forest to woodland with Terminalia oblongata on Cainozoic clay plains[4].	Brigalow	Not observed	18
11.5.1	*Eucalyptus crebra*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sandplains/remnant surfaces.	–	Q14, Q90, Q91, Q93, T33	58

[3] Only those areas of regrowth Brigalow which meet the condition class criteria set out under the Brigalow TEC SPRAT profile (DSWEPAC 2013) have been included in this calculation.

[4] Only those areas of regrowth Brigalow which meet the condition class criteria set out under the Brigalow TEC SPRAT profile (DSWEPAC 2013) have been included in this calculation.

RE	Description	TEC	Site Assessments	Area (ha)
11.5.3	*Eucalyptus populnea* +/-*E. melanophloia* +/-*Corymbia clarksoniana* on Cainozoic sand plains/ remnant surfaces.	–	Q14, T33, Q61, S63, Q81, S82, T83, Q88, Q103	93
11.5.9 (b, c)	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains/remnant surfaces.	–	Q103, Q107, Q108, Q109, Q110, Q111, Q112, Q113, Q114, Q115	450
11.5.16	*Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains/ remnant surfaces.	Brigalow	T2, T5, T19	581
11.7.1	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust.	–	Q4, T17, T25, Q41	71
11.7.1 x 1	Semi-evergreen vine thicket.	-	T1, Q43	534
11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	–	Q6, Q7, Q8, T9, Q10, Q13, T18, Q23, T33, Q43, Q47, Q103, Q107, Q108, Q109, Q110, Q112, Q113, Q114, Q115	2302
11.7.3	*Eucalyptus persistens*, *Triodia mitchellii* open woodland on stripped margins of Cainozoic lateritic duricrust.	–	Not observed	296
11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* on Cainozoic lateritic duricrust.	–	Q24, T60, Q61, Q62, Q65, Q87, Q88, Q90, Q91	291
11.7.6	*Corymbia citriodora* or *Eucalyptus crebra* woodland on Cainozoic lateritic duricrust.	–	T9, T18, Q42, T60, Q62, Q87, Q112	1942

RE	Description	TEC	Site Assessments	Area (ha)
11.8.4	*Eucalyptus melanophloia* woodland on Cainozoic igneous rocks. Hillsides.	–	Q28, Q30, Q37, Q44, Q50	1422
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks.	–	Q3, T15, T16, S22, T26, Q27, Q28, Q29, Q30, T32, T35, Q36, Q37, Q38, T39, T40, Q44, Q45, Q46, Q61, S97, S98, Q99, Q100, S102, Q104, Q105, Q106	1334
11.8.11	*Dichanthium sericeum* grassland on Cainozoic igneous rocks.	Natural grasslands	S22, T26, Q27, Q28, Q29, Q30, Q98, Q99, Q100, Q101, S102	117
11.8.13	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.	Semi-evergreen vine thicket	Q29, Q46, Q49, T31, T48	345
HVR 11.8.13	Regrowth semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.	–	Not observed	8
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	Brigalow	Not observed	21
HVR 11.9.5	Regrowth *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks[5].	Brigalow	Not observed	6

Note #: Detailed in the Regional Ecosystem Description Database or as assessed during field surveys.

[5] Only those areas of regrowth Brigalow which meet the condition class criteria set out under the Brigalow TEC SPRAT profile (DSWEPAC 2013) have been included in this calculation.

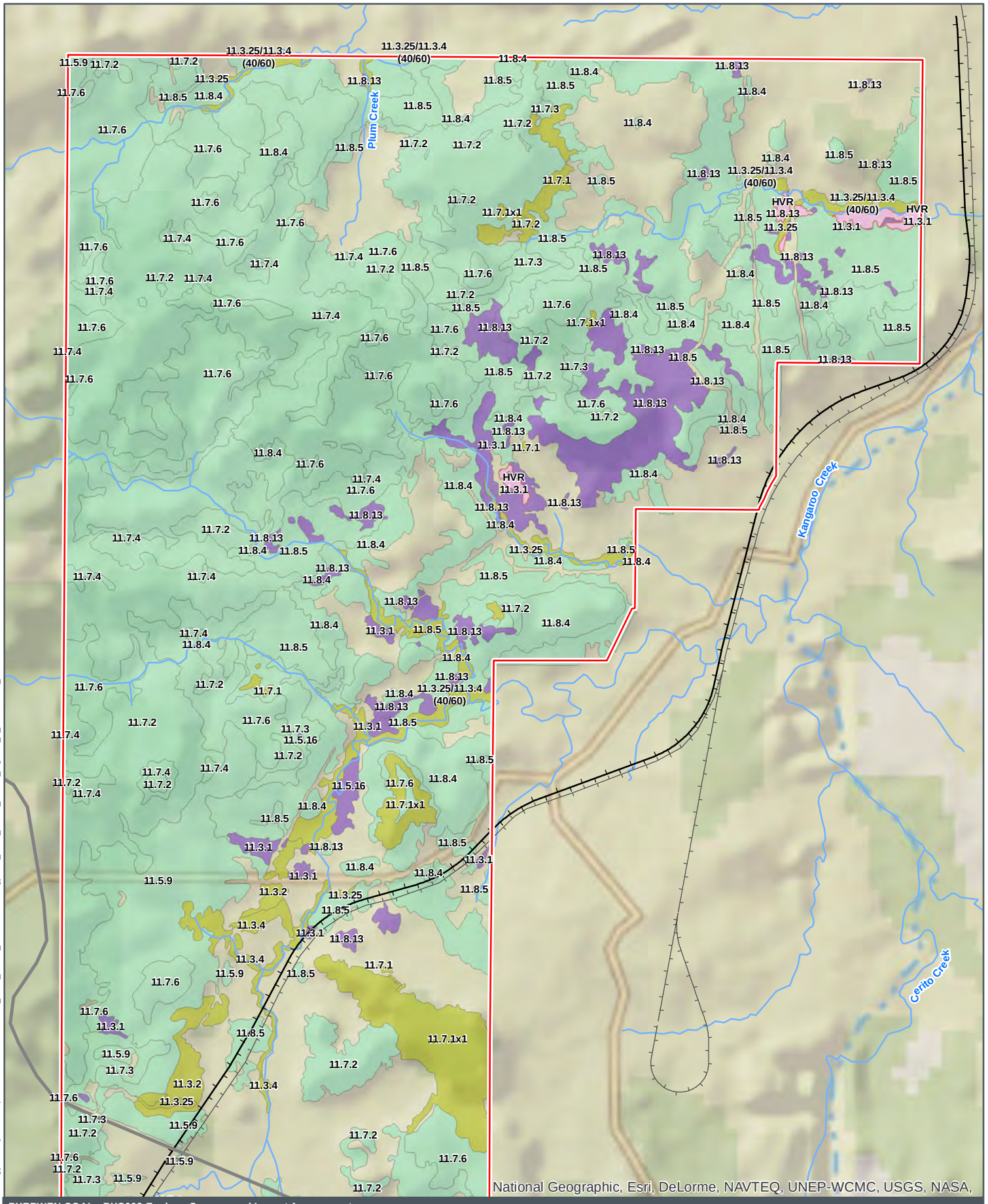

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Figure 4.4 - Revised Regional Ecosystem Mapping (North Section)

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

Main Road
Proposed Alpha Coal Project Rail Line
GAP Railway
Stream Order (2 and above)
Project Area

Regional Ecosystems
Endangered
Of Concern
No Concern
High Value Regrowth (Least Concern & Endangered)

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
04/10/2012	AB	JC	Issued for Review	A
14/11/2012	SN	JC	Issued for Review	B
04/12/2012	SH	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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QC Check List: Completed

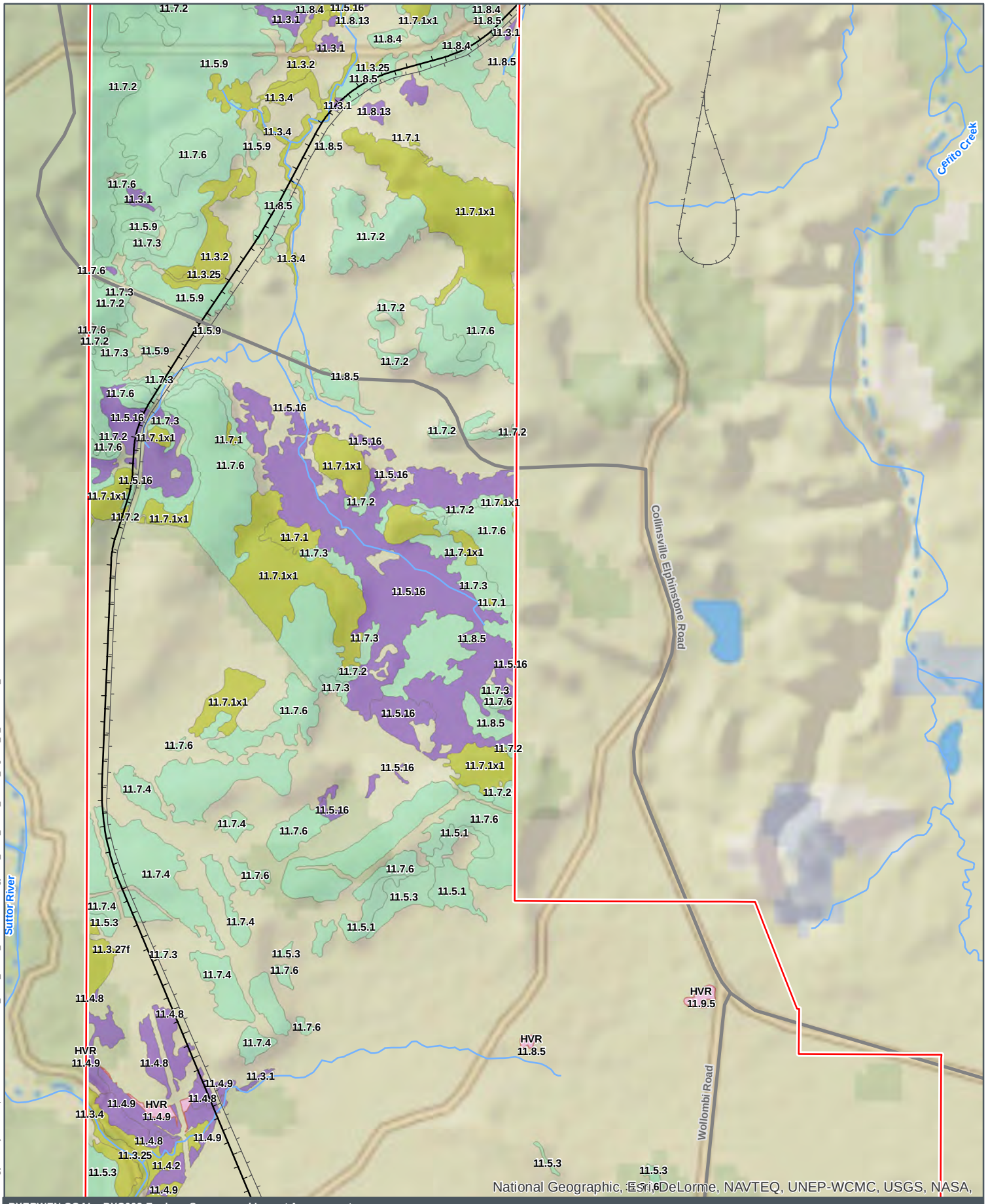

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Figure 4.5 - Revised Regional Ecosystem Mapping (Central Section)

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area

Regional Ecosystems

- Endangered
- Of Concern
- No Concern
- High Value Regrowth (Least Concern & Endangered)

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
02/10/2012	AB	JC	Issued for Review	A
14/11/2012	SN	JC	Issued for Review	B
05/12/2012	SH	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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QC Check List: Completed

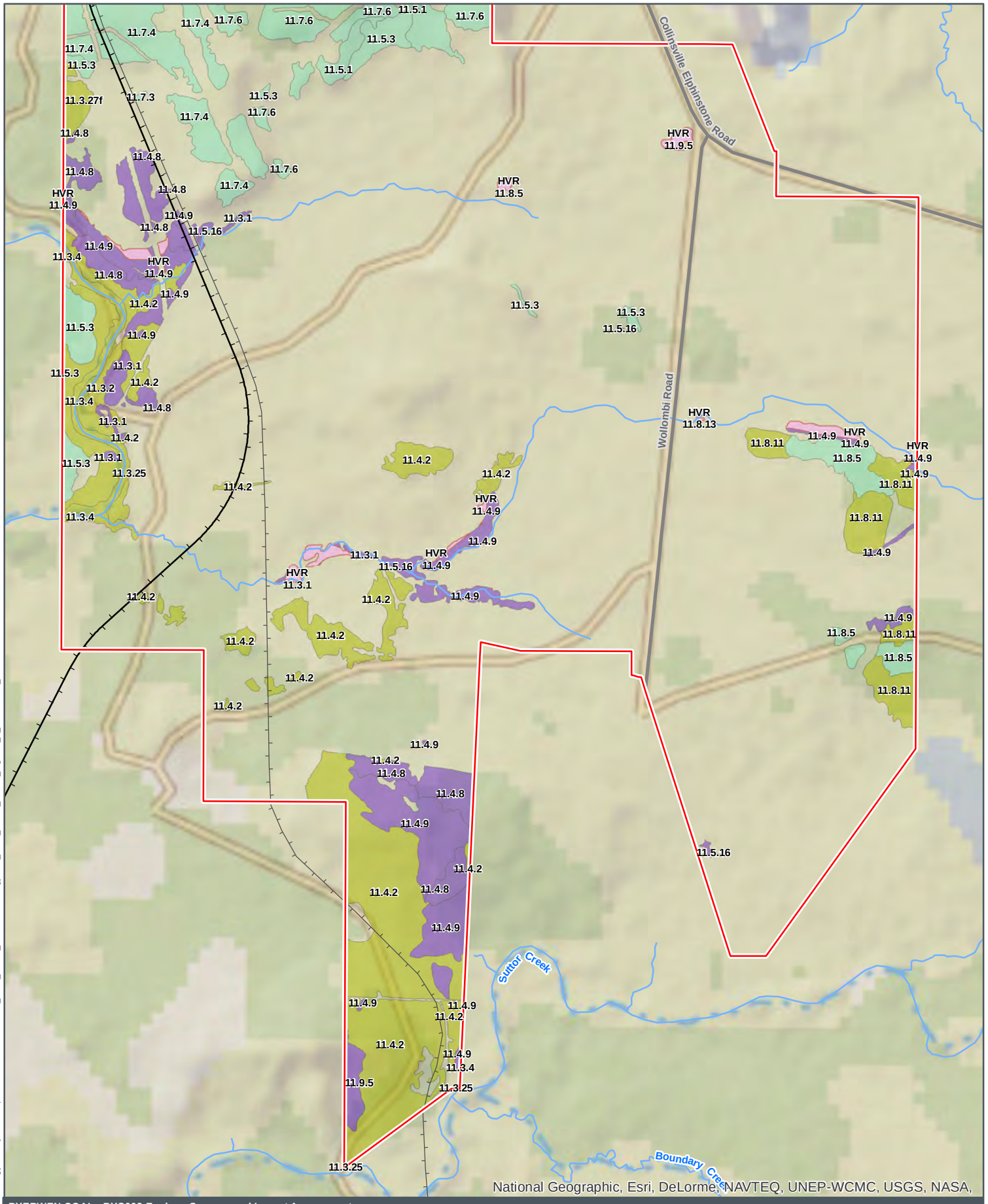

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Figure 4.6 - Revised Regional Ecosystem Mapping (South Section)

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area

Regional Ecosystems

- Endangered
- Of Concern
- No Concern
- High Value Regrowth (Least Concern & Endangered)

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
02/10/2012	AB	JC	Issued for Review	A
14/11/2012	SN	JC	Issued for Review	B
04/12/2012	SH	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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QC Check List: Completed

Table 4.2 Fauna Habitats that Occur within the Project Area

Habitat Type	Site Number	Survey Type	Habitat Description
Lateritic uplift and escarpments	T10, T12, H1, H4, H6, H8, H21	Trapping, Habitat Assessment, Spotlighting	This habitat type occurred on the northern uplifts located to the north west (T10, T12, H1 and isolated rocky knolls (H4, H6) and escarpments (H8) located in the central portion of the project area. The RE commonly associated with this habitat are those on land zone 7. Generally this habitat type occurred on lateritic soils that cap the sandstone uplifts. In higher areas, soils were generally shallow and rocky, with soil depth increasing further down slope or in eroded gullies. Sandstone escarpments and rocky outcrops were common. Wind eroded caves were generally found to be underdeveloped and accordingly were not considered suitable habitat for the northern quoll (*Dasyurus hallucatus*), rock wallabies or cave roosting microbats. However, these caves may provide habitat for reptile species (H6). In the northern escarpments vegetation was generally dominated by lancewood (*Acacia shirleyi*) with emergent shrub species with small pockets of dry rainforest species observed in incised gullies with exposed rocky substrates. Whilst on knolls and escarpments in the centre of the project area, lancewood dominated the upper slopes while Brigalow species were observed on the deeper black or sandy/clay soils located down slope. On the higher slopes, where vegetation was sparse and rocky scalds common, low densities of ground cover and fallen timber development occurred. Downslope, as canopy cover increased, the amount of fallen timber and leaf matter development generally increased. Microhabitat such as fallen timer was particularly prevalent at the trapping site T12 and accordingly was selected for trapping purposes due to its potential to provide favourable habitat for reptiles and a range of other species. Numerous bird species were observed within this habitat, most notably passerine species. The bioregionally significant grey crowned babbler (*Pomatostomus temporalis temporalis*) was also regularly recorded in these areas. Common reptile species were regularly observed foraging and sheltering in leaf litter and under bark such as Bynoe's gecko (*Heteronotia binoei*) and barred-sided skink (*Eulamprus tenuis*). Numerous common microbat species were observed and captured throughout this habitat such as Gould's wattled bat (*Chalinolobus gouldii*), inland broad-nosed bat (*Scotorepens balstoni*) and lesser long-eared bat (*Nyctophilus geoffroyi*). Transects undertaken during the night observed a high density of cane toads (*Bufo marinus*). This introduced species is known to potential represent a threat to carnivorous native fauna such as amphibian specialist snake species or the northern quoll should it be present within this habitat.

Habitat Type	Site Number	Survey Type	Habitat Description
Undulating black cracking clays supporting brigalow	T7, T11, T13, H3, H5, H7	Trapping, Habitat Assessment	This habitat type occurred on black cracking clays adjacent to extensive sandstone escarpments (H7) which widened into large flat alluvial/clay plains (H5, T13, T7) located within the north east portion of the project area. Scattered emergent ironbark and suppressed belah occurred across the broader plain, with areas of regenerating and mature brigalow communities occurring on lower slopes. Woody debris and microhabitat features such as sandy banks were common throughout this habitat and potentially afforded denning and roosting sites for species such as bee-eaters, pardalotes and terrestrial reptiles and mammals. As this area has been largely disturbed by clearing and cattle grazing, the shrub layer was largely absent, however where small patches occurred, the shrub layer afforded foraging and refuge habitat for passerine and common terrestrial fauna species (H7). Fallen timber and complex ground cover development was minimal. However, the cracking soils provided habitat for small terrestrial fauna species such as amphibians and reptiles.
Undulating sandy plains supporting eucalypt forest with shrubby understorey	T3, T4, T5, T8, T9, H9, H10, H12, H14, H20	Trapping, Habitat Assessment	This habitat type was found within broad undulating plain typically found on sandy loam soils in the central western portions of the project area. A large rocky sandstone escarpment borders the area to the north (H9). Vegetation on site is dominated by remnant poplar box (T9, T5, H12, and H14) with areas of bloodwood and ironbark (H20, H10, H9, and T3). These areas are indicative of RE 11.5.3 and 11.9.9, respectively. This area has been subject to historic clearing, thinning and cattle grazing resulting in the ground cover being dominated by improved pasture grasses with little fallen timber or leaf litter development. In areas where a more complex understorey was present (H14, H9, T3) refuge habitat for smaller terrestrial species was noted, particularly for small passerines. Rocky areas along the lower slope of the escarpment provided potential microhabitat for reptiles and small marsupials, with sandy soils providing potential habitat for burrowing or fossorial species. The shrub layer composed of sandalwood and wilga provided potential habitat for small passerine species, such as lorikeets, thornbills and honey-eaters. Hollows were present in areas with mature eucalypts (H14) and were likely to be utilised by hollow-dependant species such as parrots, gliders and some microbat species.

Habitat Type	Site Number	Survey Type	Habitat Description
Clay floodplains with gilgai supporting brigalow	T1, H22	Trapping, Habitat Assessment, Spotlighting	This habitat type occurred on a broad, sandy clay floodplain within the southern central portion of the project area. Gilgai were present within the lowest part of the floodplain and support regenerating brigalow regrowth and dense pastoral grasses. Large areas of this habitat type (H22) provided marginal habitat for wetland birds such as egrets, large mobile mammals such as macropods, amphibian and wetland associated reptile species as tall grass development was dense and gilgais were typically small in size and shallow in nature. This habitat type has been subjected to historical broad scale clearing and grazing pressure resulting in minimal timber or leaf litter development. The condition of this habitat is poor relative to the pre-clearing habitat types which are likely to have been present.
Alluvial floodplains with poplar box/blue gum	T6, H11, H15, H16, H17, H18,	Trapping, Habitat Assessment	The Suttor River's alluvial floodplains in the south western portion of the project area were characterised by sandy/clay soils and supported remnant vegetation dominated by blue gum/poplar box analogous with RE 11.3.25. Some areas along the river (H15, H16 and H17) supported very small pockets of regenerating semi-evergreen vine thicket species while sandy river banks provide potential nesting habitat for birds, such as the rainbow bee-eater (*Merops ornatus*). Hollows and stags present habitat for arboreal fauna such as parrots, gliders, owls, micro bats and reptiles. The shrub layer was largely absent as a result of historic clearing and pressure from grazing however, the ground layer consisted of dense pastoral and native grasses as well as areas of good timber and leaf litter development which may have potentially serve as potential habitat for terrestrial fauna such fossorial reptiles. The threatened listed species, the ornamental snake (*Denisonia maculata*) was detected at H17. It is likely that the Suttor River acts a contiguous corridor which is an important ecological feature allowing the movement of wildlife through the landscape.

Habitat Type	Site Number	Survey Type	Habitat Description
Natural and artificial wetlands	H2, H13, H19, S3	Habitat Assessment	This habitat type includes a series of artificial dams and natural wetlands, however little natural wetland habitat occurred within the project area. A palustrine wetland is however located at Aquatic Survey Site S3 . At the time of surveys, this wetland was a vegetated swamp covering approximately 60ha (1km X 0.6km), with an average depth of 0.5m. It was dominated by forest red gum (*Eucalyptus tereticornis*) and emergent macrophytes. Dams constructed at H13 and H19 are characterised by soils with high clay content fringed by eucalypt or brigalow vegetation communities. The recently constructed dam found at H2 has created a large shallow wetland habitat with an island of vegetation (persisting at the time of survey) in the middle. This island and wetland was supporting significant bird activity.. All dams recently assessed within the project area exhibit signs of disturbance however, supported relatively higher levels of bird activity. Fauna recorded at H2, H13 and H19 included wetland species such as ducks, egrets, herons, plovers and turtles. The square-tailed kite (*Lophoictinia isura*) and squatter pigeon (*Geophaps scripta scripta*) were detected in proximity to a wetland at H2 and H19 respectively. The threatened black throated finch (*Poephila cinta cincta*) was tentatively recorded from the same area, although a positive identification was not made. Low lying areas adjacent to the dams and wetlands support emergent vegetation and affords habitat for cryptic wetland birds such as rails, crakes, bitterns and snipes. Natural wetlands within the project area support a range of unique fauna habitat values and are likely to provide suitable habitat for a range of wetland bird species. Artificial wetlands however, are typically of low overall fauna habitat value (particularly in the absence of fringing vegetation) and are common across the landscape.

Habitat Type	Site Number	Survey Type	Habitat Description
Cleared pastoral areas	T2	Trapping	Grasslands occurred across a significant portion of the project area. Generally these areas were dominated by exotic pasture species with small areas representing native grassland communities (RE 11.8.11). The majority of these habitats were displaying deleterious impacts associated with cattle grazing. These impacts can reduce the diversity and abundance of reptiles and other terrestrial species (Woinarski & Ash 2002). Bird species were the most common fauna group observed within grassland habitats. The squatter pigeon was observed foraging in non-native grasslands within the project area. Wetland and wide ranging species species such as the listed squatter pigeon is known to forage in cleared pastoral areas where suitable seed is available and water is proximate. The Australian painted snipe and the migratory Latham's snipe will forage in flooded pastoral areas. Other migratory species such as the white-throated needletail (*Hirundapus caudacutus*), cattle egret (*Bubulcus ibis*) and rainbow bee-eater (*Merops ornatus*) will also forage above paddocks. The overall habitat value is low in cleared pastoral areas.

5. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The following section summarises the relevant MNES for the project area which have been derived from desktop assessments including searches of the EPBC Protected Matters Search Tool and other relevant databases. The likelihood of occurrence for individual MNES species has been determined based on a review of previous records, field survey results, a review of known habitat preferences and an assessment of habitat availability and the presence of microhabitat features within the project area. This included known RE associations for each species, known records and distribution ranges. Species are assigned to one of the following categories:

- **Known to occur**: this category includes species or communities which have been recorded from the project area.
- **Likely to occur**: this category includes species previously recorded in proximity to the project area, and which have suitable habitat features available on site which may support the species.
- **May occur**: this category includes those species where suitable habitats or RE associations are present in the project area but where there are no known records in the area.
- **Unlikely to occur**: this category includes those species for which the project area offers limited or no potential habitat, is outside their known range and/or is without broader habitat requirements.

Impacts on MNES species known or likely to occur in the project area are assessed in the following sections of this report.

5.1 Threatened Ecological Communities

All three TECs identified in the desktop assessment were confirmed as present within the project area however, the extent and distribution of each has been revised. In particular, areas mapped as natural grasslands (RE 11.8.11) in the north of the project area have been remapped as non-remnant due to the dominance of the exotic grass species *Bothriochloa pertusa* (Indian bluegrass). The area of brigalow TEC has increased by 149 ha and semi-evergreen vine thicket (SEVT) TEC decreased by 998 ha.

The area of each TEC and its constituent RE types are summarised in **Table 5-1**. The extent and distribution of TECs in the project area is shown in **Figure 5.1**.

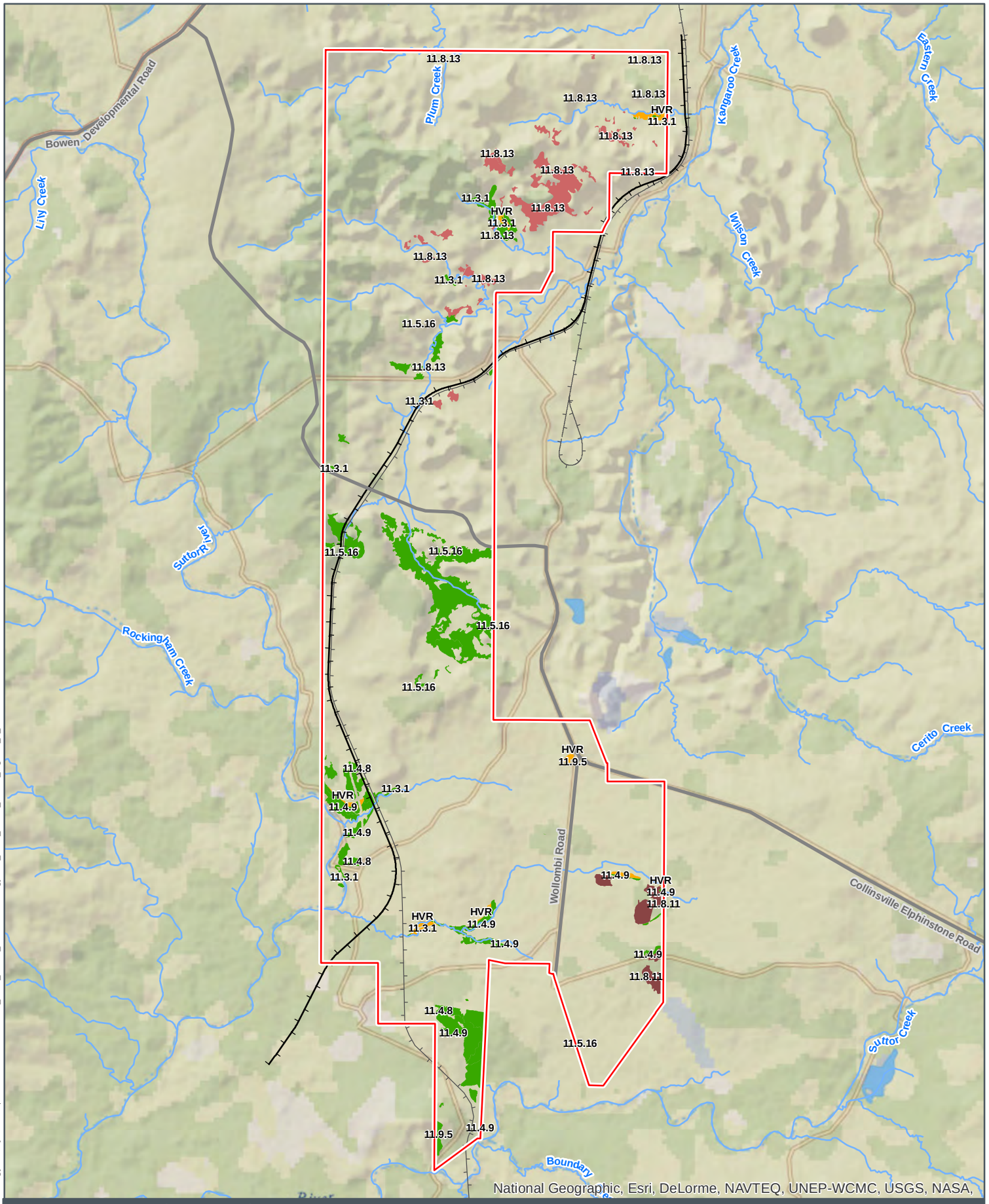
Table 5-1 TECs and Equivalent REs Mapped for the Project Area

TEC Description	Equivalent RE	Area of RE* (ha)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	11.3.1	154#
	11.4.8	155
	11.4.9	255#
	11.5.16	581
	11.9.5	27#
	Total Brigalow TEC	1 172
Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions	11.8.13	345
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	11.8.11	117

Notes:
* Calculated from revised RE map
\# Estimated areas for brigalow TEC take into account the regrowth vegetation more than 15 years old which meets the listing requirements for the TEC.

5.2 Threatened Flora Species

No MNES flora species were recorded in the project area. Based on an assessment of nearby records and habitat within the project area two species, *Dichanthium queenslandicum* (king blue-grass) and *Dichanthium setosum* (blue grass) may occur within the project area. Habitat requirements and an assessment of the likelihood of occurrence for MNES flora species identified through the desktop assessment is provided in **Table 5-2**.



BYERWEN COAL - BYC002-Ecology Surveys and Impact Assessment

Figure 5.1: Threatened Ecological Communities

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area

TEC

- Brigalow TEC (Regrowth)
- Brigalow TEC (RE)
- SEVT TEC (RE)
- Natural Grassland

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
28/09/2012	AB	JC	Issued for Review	A
16/11/2012	SN	JC	Issued for Review	B
04/12/2012	CM	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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QC Check List: Completed

Table 5-2 Description, Habitat and Likelihood of Occurrence for MNES Flora Species

Species	Common Name	Status	Description and Habitat	Assessment Summary
May Occur				
Dichanthium queenslandicum	king blue-grass	V	An erect perennial grass to 80 cm which is known from the Brigalow Belt (North and South) bioregions. A single Queensland Herbarium (HERBRECS) record occurs in non-remnant grasslands just beyond the eastern boundary of the project area. The species inhabits both remnant and non-remnant grasslands.	A single HERBRECS record occurs just outside the eastern boundary of the project area in non-remnant grassland immediately west of the Newlands Coal Mine. Detailed survey of the species' primary habitat (RE 11.8.1) was undertaken without additional specimens being located[6]. This degree of survey effort is considered sufficient to exclude *D. queenslandicum* as a known occurrence.
Dichanthium setosum	blue-grass	V	*Dichanthium setosum* is associated with heavy basaltic black soils and stony red-brown hardsetting loam with clay subsoil (Ayers *et al*., 1996; DEC, 2005a) and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. The primary habitat for this species is RE 11.8.11.	This species was not recorded within the project area, nor within a 20km radius of the project area. However, there are nine Queensland Herbarium specimen records from the broader Isaac Regional Council local government area, and *D. setosum* is often co-located with *D. queenslandicum*. Detailed survey of the species' primary habitat (RE 11.8.11) (refer discussion above for *D. queenslandicum*) is considered sufficient to exclude *D. setosum* as a known occurrence.

[6] The areas mapped as RE 11.8.11 (and a 2km radius surrounding these polygons) in the southeast of the project area have been subject to the following survey effort: (i) three 2500m^2 survey plots were established by CQU within (or in the ecotone) of the RE 11.8.11- mapped polygons (CQU 2009) (polygons 117, 119 & 121 (Figure 3.1); (ii) three 500m^2 polygons were established within (or in the ecotone) of the RE 11.8.11-mapped polygons (Unidel 2010) (Polygons 62, 63 & 93) (Figure 3.1); (iv) two 2500m^2 survey plots were established within 2km of the RE 11.8.11-mapped polygons (CQU 2009) (Polygons 118 & 120); (v) six 500m^2 polygons were established within 2km of the RE 11.8.11-mapped polygons (Unidel 2010) (Polygons 58-61; 64 & 92) and (vi) significant traverse within the area bound by the noted survey plots was undertaken to define the extent of the RE 11.8.11 polygons.

Species	Common Name	Status	Description and Habitat	Assessment Summary
Croton magneticus	–	V	A deciduous small tree or shrub growing to 5 m. Its distribution ranges from Greenvale to near Collinsville, extending to the coastal islands of Magnetic and Gloucester. It inhabits vine thickets on sandstone, acid volcanic or granitic substrates. A single Queensland Herbarium (HERBRECS) record occurs approximately 10 km north of the project area.	This species was not recorded during field surveys may occur in vine thicket communities in the northern part of the project area.
Digitaria porrecta	finger panic grass	E	*Digitaria porrecta* is a loosely tufted perennial grass growing to 60 cm, known from four disjunct populations with a range extending over 1000 km. Major populations are found in the Dalby area although the species is known from the Central Highlands district near Nebo (TSSC 2008b) but no records exist for the South Kennedy pastoral district in which the project area is located. The nearest records are located 100 km south of the project area.	This species was not recorded during field surveys but may occur in areas of REs 11.8.11 and RE 11.8.5 as well as disturbed areas on heavier clay soils.
Eucalyptus raveretiana	black ironbox	V	*Eucalyptus raveretiana* is a tree reaching 30–40 m that is endemic to central coastal and sub coastal Queensland. It typically occurs along rivers and streams where it may grow in association with Queensland blue gum (*Eucalyptus tereticornis*), Moreton Bay ash (*Corymbia tessellaris*), river oak (*Casuarina cunninghamiana*) and paperbark (*Melaleuca* spp.), or in coastal habitats as an emergent to rainforest on alluvium. Its distribution is scattered and disjunct, being known from the tributaries of the Fitzroy River, the Suttor and its upper tributaries; the Bowen, Burdekin, Don, Bogie, Broughton, O'Connell, and Andromache rivers.	This species was not recorded during field surveys may occur along the Suttor River and tributaries in association with RE 11.3.25.

Unlikely to Occur

Acacia ramiflora		V	A slender shrub, similar in appearance to *Acacia simsii*. It is geographically restricted to the Great Dividing Range. It has been observed on sandstone hills in the Torrens Creek/Pentland area and Robertson River area. Its distribution is not known to overlap with any EPBC Act significant ecological communities (TSSC 2008a). Known populations of this species are located within White Mountains National Park, approximately 400 km north-west of the project area.	There are no known records in the vicinity of the project area and this species is considered unlikely to occur in the project area.
Cajanus mareebensis		E	This species occurs in *Melaleuca-Acacia*, *Eucalyptus-Callitris* and/or *Eucalyptus-Corymbia* grassy woodlands on sandy soils derived from granite with a lower horizon of impeded drainage.	There are no known records in the vicinity of the project area and this species is considered unlikely to occur in the project area.
Cycas ophiolitica		E	A trunked cycad that rarely grows to 4 m. *Cycas ophiolitica* grows on hills and slopes in sparse, grassy open forest at altitude ranges 80–400 m above sea level. Preferred habitat includes shallow, stony, infertile soils, which are developed on sandstone and serpentinite, and is associated with species such as *Corymbia dallachiana*, *C. erythrophloia*, *C. xanthope* and *Eucalyptus fibrosa*. *Cycas ophiolitica* has also been found on mudstone in association with *Corymbia dallachiana*, *C. erythrophloia* and *Eucalyptus crebra*, and on alluvial loams with *Corymbia intermedia*, *Eucalyptus drepanophylla* and *E. tereticornis* (Hill 1998a; Queensland Herbarium 2007).	There are no known records in the vicinity of the project area and this species is considered unlikely to occur in the project area.
Leucopogon cuspidatus		V	*Leucopogon cuspidatus* occurs in eastern Queensland from Blackdown Tableland in the south to the Mount Stewart area near Homestead Township in the north occurs in open forests, woodlands and heath on rocky slopes with granitic or serpentinite substrates (DSEWPaC 2008).	There are no known records in the vicinity of the project area and this species is considered unlikely to occur in the project area.

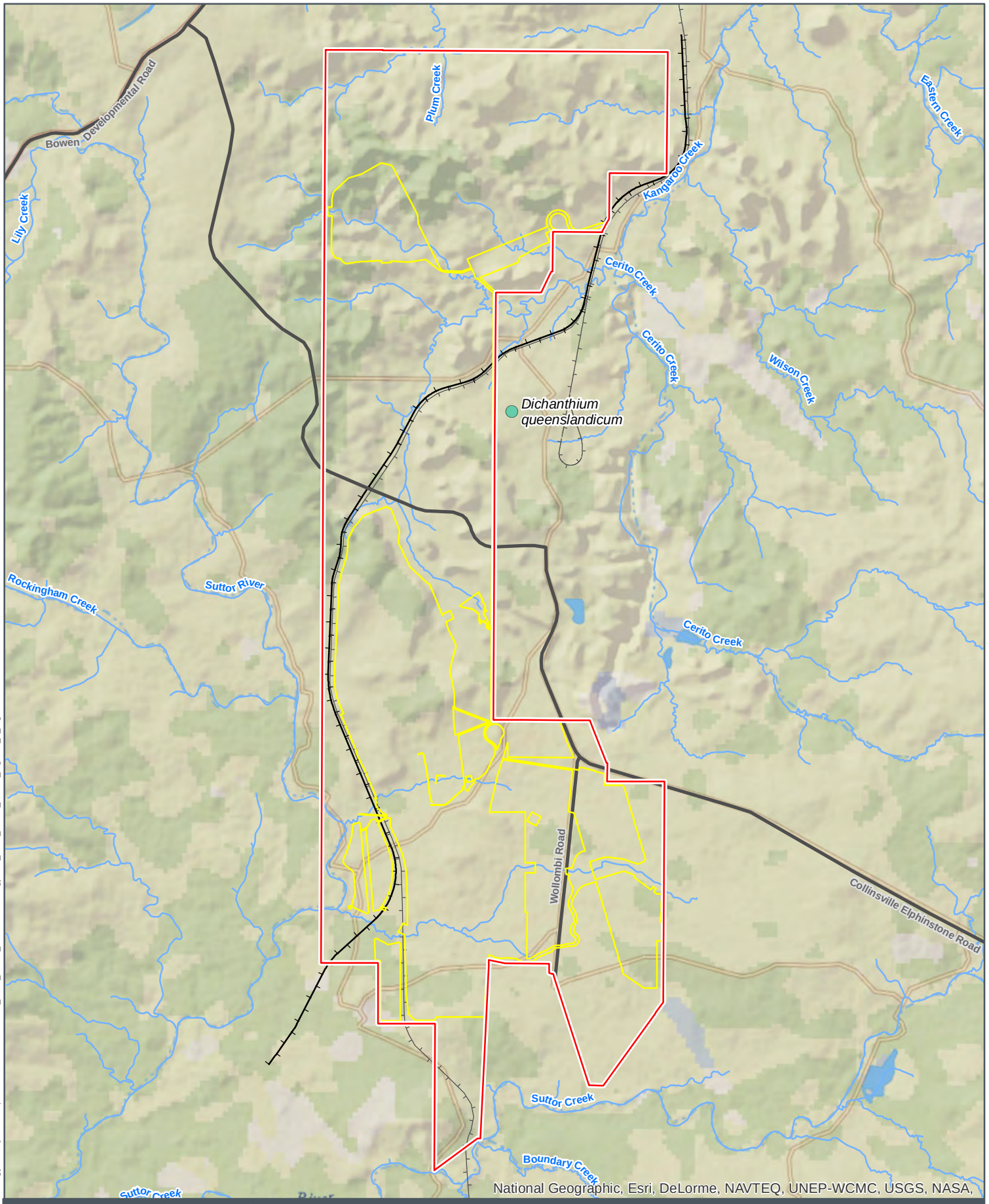

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Figure 5.2 - Significant Flora

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Physical Road Network © State of Queensland 2010
Remnant Watercourses © State of Queensland 2011

Main Road
Proposed Alpha Coal Project Rail Line
GAP Railway
Stream Order (2 and above)
Project Area
Project Footprint

MNES Flora Species
Vulnerable

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
04/10/2012	AB	JC	Issued for Review	A
16/11/2012	SN	JC	Issued for Review	B
05/12/2012	SH	JC	Issued for Review	C
08/03/2013	AB	JC	Issued for Use	0

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Kilometres
1:150,000
(A4) GDA 1994 MGA Zone 55

QC Check List: Completed

5.3 Threatened Fauna Species

Two MNES threatened fauna species were recorded during fauna surveys in the project area: the squatter pigeon (*Geophaps scripta scripta*) and ornamental snake (*Denisonia maculata*). The black-throated finch (*Poephila cincta cincta*) was tentatively recorded from two brief sightings made without the aid of binoculars. The black-throated finch (southern) may be confused with the chestnut-breasted mannikin (*Lonchura castaneothorax*) in particular, which is common along the north east coast of Australia and from which it cannot be distinguished without close examination. Two MNES fauna species are considered likely to occur in the project area: black-throated finch (*Poephila cincta cincta*) and Australian painted snipe (*Rostratula australis*). Habitat requirements and an assessment of the likelihood of occurrence for MNES threatened fauna species identified through the desktop assessment is provided in **Table 5-3**. The location of MNES threatened fauna species records in the project area is shown on **Figure 5.3**.

5.4 Migratory Species

Five MNES migratory species were recorded during fauna surveys in the project area: the eastern great egret (*Ardea modesta*), white-bellied sea-eagle (*Haliaeetus leucogaster*), Latham's snipe (*Gallinago hardwickii*), rainbow bee-eater (*Merops ornatus*) and rufous fantail (*Rhipidura rufifrons*). A further five species are likely to occur in habitats within the project area. Habitat requirements and an assessment of the likelihood of occurrence for MNES migratory species identified through the desktop assessment is provided in **Table 5-4**. The location of MNES migratory species records in the project area is shown on **Figure 5.4**.

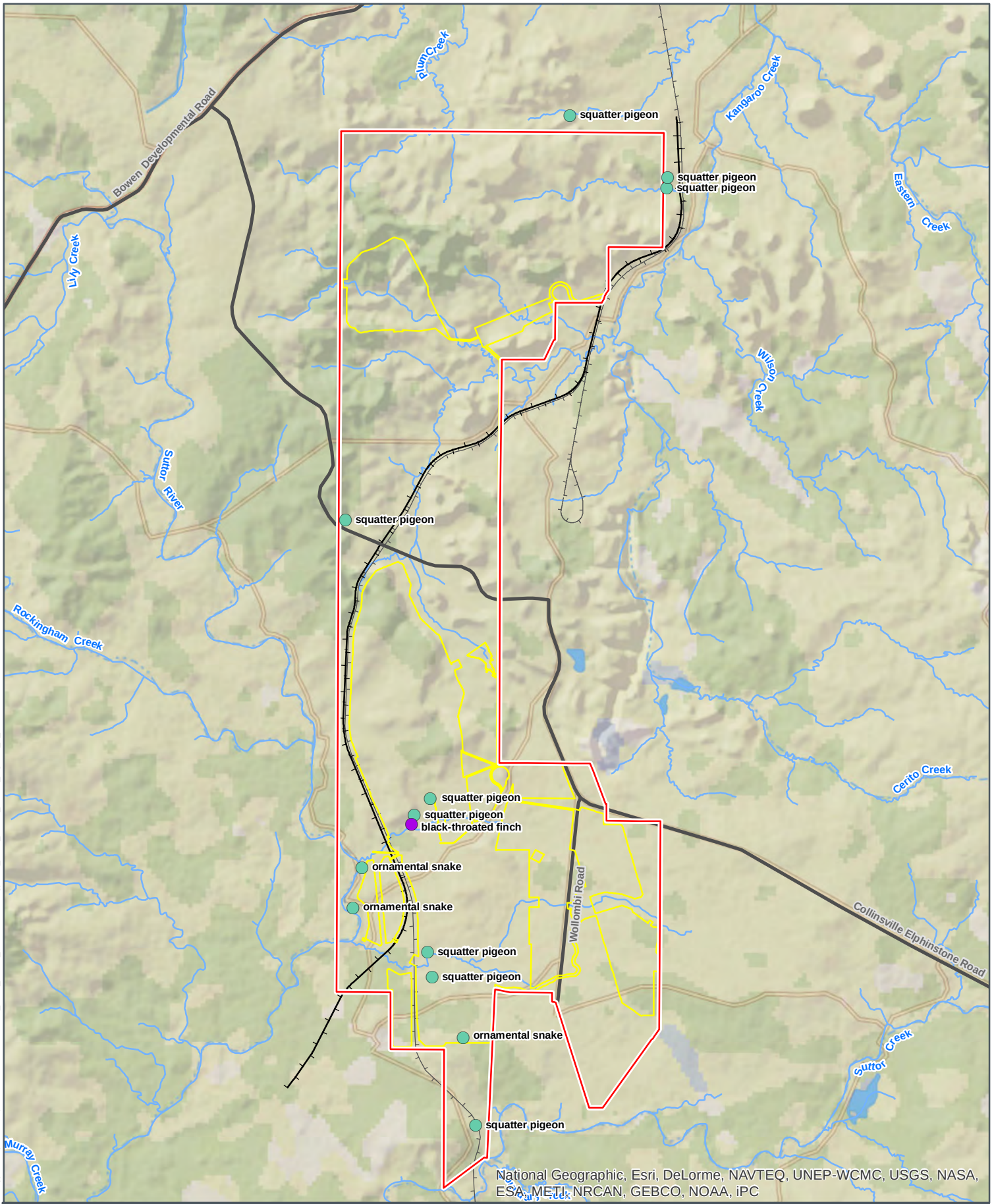
Table 5-3 Description, Habitat and Likelihood of Occurrence for MNES Threatened Fauna Species

Common Name	Species	Status	Habitat Requirements	Assessment Summary
Known to Occur				
Ornamental snake	*Denisonia maculata*	V	Woodlands and open forests containing brigalow (*Acacia harpophylla*), gidgee (*Acacia cambagei*), blackwood (*Acacia argyrodendron*) or coolabah (*Eucalyptus coolabah*) communities or pure grassland associated with gilgais or other wetlands. Microhabitat features include coarse woody debris such as fallen timber as well as rocky areas and deep soil cracks.	The ornamental snake was recorded during the 2009 and 2012 surveys from riparian forests associated with the Suttor River floodplain and brigalow communities in the southern part of the project area. The habitat condition on the site is considered generally poor relative to pre-clearing or remnant condition (due to thinning and grazing impacts); however the habitat quality for this species is moderate to high and provides important habitat. This species occurs in many disturbed areas, including cleared land with gilgai microrelief.
Squatter pigeon (southern)	*Geophaps scripta scripta*	V	Open dry eucalypt woodland on sandy soil near permanent water.	Squatter pigeons were detected during all surveys from grassy woodlands in the northern and southern parts of the project area. Despite its conservation status, this species is widespread in central Queensland (Wormington *et. al.* 2009) and is expected to occur in grassy woodland habitats in proximity to watering points throughout the site. Overall habitat quality for this species is moderate to high within remnant vegetation and low in previously cleared lands and regrowth vegetation.
Likely to Occur				
Black-throated finch (southern)	*Poephila cincta cincta*	E	Riparian areas within open eucalypt, acacia or melaleuca forest and woodlands.	Two individuals suspected to be *Poephila cincta cincta* were recorded during baseline surveys, although a positive identification was not made. Although they could not confidently be attributed to *P. cincta cincta* in the field, a precautionary approach is adopted and the species has been considered as a likely occurrence. The condition of riparian forests and woodlands is generally poor across the project area.

Common Name	Species	Status	Habitat Requirements	Assessment Summary
Australian painted snipe	*Rostratula australis*	V	The Australian painted snipe inhabits shallows and margins of freshwater wetlands, dams, marshy areas and wet pastures.	This cryptic species was not recorded during field surveys but is considered likely to occur in association with natural wetlands, particularly the palustrine wetland at Aquatic Survey Site S3 on the western boundary of the project area. The majority of artificial waterbodies across the project area do not provide suitable habitat for this species as they lack fringing vegetation cover.
May Occur				
Star finch	*Neochima ruficauda ruficauda*	E	Damp grasslands, sedgelands or grassy woodlands (composed of *Eucalyptus coolabah*, *E tereticornis*, *E. tessellaris*, *Melaleuca leucadendra*, *E. camaldulensis* and *Casuarina cunninghamii*) near permanent water or regularly inundated areas.	Not recorded during field surveys, nor are there records in proximity to the project area. Poplar box/blue gum woodlands associated with the Suttor River may represent potential habitat for this species.
Red goshawk	*Erythrotriorchis radiatus*	E	Coastal and sub coastal tall, open forest, tropical savannah, woodland, rainforest edges and gallery forest along, or adjacent to, watercourses and wetlands.	Eucalypt forest and woodlands adjacent to the Suttor River and the south-west of the project area afford foraging and potentially breeding habitat. This species was not detected during the survey. This species breeds in tall riparian forests and is associated with only the most extensive habitat networks in the landscape. Habitat in the project area is considered to be of low overall quality of this species.
Koala	*Phascolarctos cinereus*	V	Eucalyptus dominated temperate, sub-tropical and tropical forest, woodland and semi-arid habitats.	No koala observations were recorded during the fauna survey. Eucalyptus woodland in riparian corridor (RE 11.3.25) may afford habitat however if koala are present within the project area they are expected to be unlikely.
Northern quoll	*Dasyurus hallucatus*	E	Forest or woodland with rocky areas and complex vegetation structure in a variety of vegetation types including: eucalypt forest and woodlands, rainforests, sandy lowlands, shrublands and grasslands.	Not recorded in the project area despite active searching for scats and overhangs which may provide shelter for denning purposes.

Common Name	Species	Status	Habitat Requirements	Assessment Summary
South-eastern long-eared bat	*Nyctophilus corbeni*	V	Inland woodland vegetation dominated by eucalypt and bloodwood species as well as box, ironbark and cypress pine woodlands. Loose bark, fissures and hollows on trees afford roosting habitat.	This species was not recorded during the fauna surveys, however potentially suitable habitat occurs in woodland vegetation dominated by eucalypt and bloodwood species as well as box, ironbark and cypress pine woodlands. Loose bark, fissures and hollows on trees afford roosting habitat.
Mount Cooper striped lerista	*Lerista vittata*	E	Woodlands dominated by ironbark (*Eucalyptus crebra* and *E. melanophloia*) and bloodwood (*Corymbia clarksoniana* and *C. intermedia*) with shrub and/or grassy ground layers on deep red earths, undulating plains and steep hills on granitic rocks as well as SEVT which extends onto areas of ironstone (duricrust) and spinifex communities.	This species was not detected during fauna surveys, however lower quality habitat in RE 11.5.9 and SEVT vegetation areas exists in the north-west section of the project area.
Yakka skink	*Egernia rugosa*	V	Dense ground cover and abundant course woody debris (eg hollow logs) or rock in a variety of vegetation types including: poplar box (*Eucalyptus populnea*), ironbark, brigalow (*Acacia harpophylla*), cypress pine (*Callitris glaucophylla*), mulga (*A. aneura*), bendee (*A. catenulata*) lancewood (*A. shirleyi*) woodlands and open forests.	This species was not detected during fauna surveys but habitat may be suitable within remnant vegetation on the uplifts and escarpments in the north-western parts of the site within areas that have dense ground cover and fallen hollow logs.
Unlikely to Occur				
Retro slider	*Lerista allenae*	E	Dense leaf litter or other ground cover in low and tall open forests, open woodland (all with grassy understory), wet sclerophyll forest, coastal microphyll /notophyll vine forests/thickets, eucalypt forest and woodland with dense grass trees (*Xanthorrhoea* sp.) and Acacia mid-storey to understory, spinifex, and seasonally dry tea-tree (*Melaleuca viridiflora*) swamp.	The distribution of this species is not expected to extend past the Clarke Range approximately 100 km west of the project area. If present, it would be expected to be found in areas of remnant vegetation located on the foothills of uplifts in the north-western parts of the project area.

Common Name	Species	Status	Habitat Requirements	Assessment Summary
Stripe-tailed delma	*Delma labialis*	V	Non-cracking black soils on undulating plains formed on basalt, shale, sandstone and unconsolidated sediments.	All known records taken from the Basalt Downs subregion near Clermont (Young *et. al.* 1989). Considered unlikely to occur because of its restricted distribution.
Brigalow scaly-foot	*Paradelma orientalis*	V	Open forests and woodland containing remnant vegetation, including: Brigalow, cypress, bull oak, spotted gum, vine thickets and *Acacia falciformis*, with abundant coarse woody debris and dense leaf litter.	Although the project site occurs within the modelled distribution of the brigalow scaly-foot (DSEWPaC 2011), this species reaches its northern distributional limit at Nebo, in Dipperru National Park. Numerous field surveys for coal mining projects between Nebo and Collinsville over the past 10 years have failed to detect the species, including surveys at Hail Creek Mine, Burton Mine, Suttor Creek, Eastern Creek, Newlands, Rosella Creek, Lenton and Collinsville Mines. As the project site is outside of the known distributional limits of the species, neither important habitat nor an important population is considered to be present.



BYERWEN COAL - BYC002-Ecology Surveys and Impact Assessment

Figure 5.3 - Threatened Fauna

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Remnant Watercourses © State of Queensland 2011

Main Road
Proposed Alpha Coal Project Rail Line
GAP Railway
Stream Order (2 and above)
Project Area
Project Footprint

MNES Threatened Fauna
Endangered
Vulnerable

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
04/10/2012	AB	JC	Issued for Review	A
16/11/2012	SN	JC	Issued for Review	B
05/12/2012	SH	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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(A4) GDA 1994 MGA Zone 55

QC Check List: Completed

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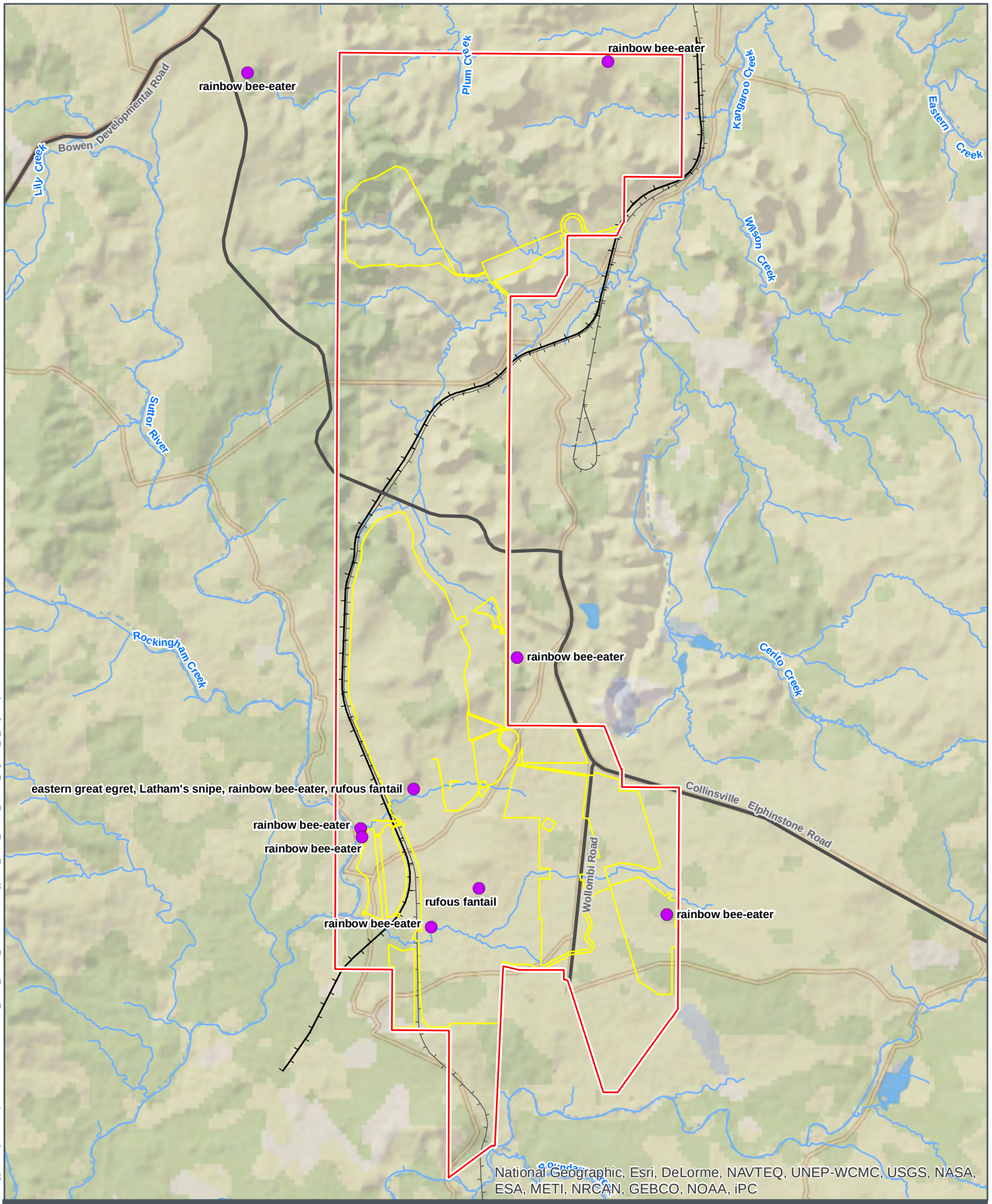
Table 5-4 Description, Habitat and Likelihood of Occurrence for MNES Migratory Species

Common Name	Species	Status	Habitat Requirements	Assessment Summary
Known to Occur				
Eastern great egret	*Ardea modesta*	M	Freshwater wetlands and intertidal mudflats.	Recorded utilising farm dams within the project area. No suitable nest sites were observed in the project area.
White-bellied sea-eagle	*Haliaeetus leucogaster*	M	Permanent waterbodies including: estuaries, dams and wetlands.	Recorded at a small farm dam adjacent to Kangaroo Creek to the north east of the project area. Could nest in proximity to the Suttor River
Latham's snipe	*Gallinago hardwickii*	M	Open, freshwater wetlands with low, dense vegetation including: swamps, flooded grasslands or heathlands and bogs.	Recorded at large dam (H2) located to the south west of the project area. Inhabits open, freshwater wetlands with low, dense vegetation. Suitable habitat present in association with Palustrine wetland (S3). Foraging habitat rather than breeding habitat as species does not breed in Australia.
Rainbow bee-eater	*Merops ornatus*	M	Ubiquitous, potentially foraging over any habitat type. Nests in soft, loamy soil or flat ground of a bank.	This species was detected numerous times during the fauna surveys. Stream banks in the project area may provide burrow sites for this species.
Rufous fantail	*Rhipidura rufifrons*	M	The undergrowth of woodlands, forests, coastal and sub-coastal scrub including semi evergreen vine thicket, riparian areas and mangroves. This species breeds in temperate and rainforest habitats mainly in south-eastern Australia.	This species was recorded at H2 and H12 in the project area and is associated with the undergrowth of woodlands, forests and riparian areas. There are no breeding records in proximity to the project area and no suitable nest sites were observed at the time of the fauna survey.
Likely to Occur				
Cattle egret	*Ardea ibis*	M	Grassy, open pastures and shallow, open wetlands.	Riparian areas of the project area. Suitable habitat present in association with Palustrine wetland (S3).
Fork-tailed swift	*Apus pacificus*	M	High to low airspace over varied habitat (rainforest to semi-desert).	This species forages aerially over a range of habitat types and is considered likely to occur in the project area.
White-throated needletail	*Hirundapus caudacutus*	M	Cosmopolitan species, potentially foraging over any habitat type.	This species forages aerially over a range of habitat types and is considered likely to occur in the project area.
Australian	*Rostratula*	M	The Australian painted snipe inhabits shallows and	Cryptic species with irregular occurrence. The large dam

Common Name	Species	Status	Habitat Requirements	Assessment Summary
painted snipe	*australis*		margins of freshwater wetlands, dams, marshy areas and wet pastures.	(H2) within the south-west of the project area and the ephemeral gilgai wetlands afford habitat for this species. Suitable habitat present in association with Palustrine wetland (S3).
satin flycatcher	*Myiagra cyanoleuca*	M	Inhabits heavily vegetated gullies in eucalypt dominated forests and taller woodlands, often near wetlands and watercourses.	This species was recorded at locations outside the project area and is considered likely to occur in riparian environs along the Suttor River.
May Occur				
glossy ibis	*Plegadis falcinellus*	M	Well vegetated freshwater wetlands, wet pastures, flood plains saline areas.	Grassy, open pastures and shallow, open wetlands in riparian areas of the project area. Suitable habitat present in association with Palustrine wetland (S3).
Unlikely to Occur				
barn swallow	*Hirundo rustica*	M	Prefers disturbed open agricultural areas and open urban areas for forage and roost.	Prefers disturbed open agricultural areas and open urban areas for forage and roost. Most recordings originate from coastal areas.



BYERWEN COAL - BYC002-Ecology Surveys and Impact Assessment

Figure 5.4 - Migratory Fauna

WORK REQUEST NUMBER: WR_2012_00295

DATA SOURCES:
Physical Road Network © State of Queensland 2010
Remnant Watercourses © State of Queensland 2011

- Main Road
- Proposed Alpha Coal Project Rail Line
- GAP Railway
- Stream Order (2 and above)
- Project Area
- Project Footprint

Significant Fauna
- Migratory Fauna

DATE	AUTHOR	APPROVED	REVISION NOTE	REV.
04/10/2012	AB	JC	Issued for Review	A
14/11/2012	SN	JC	Issued for Review	B
05/12/2012	SH	JC	Issued for Review	C
08/03/2013	SG	JC	Issued for Use	0

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(A4) GDA 1994 MGA Zone 55

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QC Check List: Completed

6. POTENTIAL IMPACTS ON MNES AND MITIGATION

6.1 Summary of Direct Impacts

6.1.1 Land Clearance

Land clearance would occur during the construction phase for the establishment of supporting infrastructure, including the Northern and Southern Infrastructure Areas, internal haul roads, linear infrastructure and creek diversions and during the operational phase for the progressive development of open cut pits and associated spoil placement areas.

Land clearance within the project area has been minimised by concentrating development within cleared areas in the southern part of the project area. Only very limited clearing of remnant vegetation is required for the establishment of the South and East pits and the Southern Infrastructure Area. In particular, pits and associated infrastructure have been sited to avoid substantial impacts on remaining areas of contiguous remnant vegetation in the southern part of the project area. This includes substantial areas of endangered and of concern vegetation communities and remnant vegetation associated with the Suttor River.

While the need for land clearance has been minimised through the site layout, full development of the project over the 50 year period would result in the loss of approximately 2391.9 ha of remnant native vegetation. The majority of this vegetation would be cleared from the West Pit, North Pit and Northern Infrastructure Area with smaller areas of clearing associated with the other pits as well as the central infrastructure corridor connecting the Northern and Southern Infrastructure Areas.

The effects of land clearance may include:

- Loss of vegetation communities or individual threatened species
- Reduced species abundance and biodiversity
- Loss of habitat, loss of connectivity between habitat areas and associated diminished fauna movement
- Loss of land stabilisation and riparian filtration functions.

General mitigation measures to be implemented to reduce the impacts of vegetation clearance and habitat loss are:

- Clear delineation of areas of native vegetation requiring removal to equipment operators and supervisors before any clearance to ensure disturbance is minimised.
- Maintenance of retained areas of existing vegetation to assist in providing a source of seed for mine rehabilitation works.
- Preparation of a site rehabilitation management plan which incorporates rehabilitation monitoring and trials.
- Use of native species for rehabilitation wherever possible. If native species are unsuccessful, introduced stoloniferous grasses may be used to achieve rapid surface coverage. Buffel grass (*Cenchrus ciliaris*) or a similar species may be used in areas identified for grazing where a suitable buffer to native vegetation is established using a non-invasive cover crop mixed with native grass seed.

- Monitoring of rehabilitation success to be conducted at locations representative of the range of conditions on the rehabilitating areas. Reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness.

6.1.2 Habitat Loss

Habitat loss has been minimised by concentrating development in cleared areas as described above. The condition of these cleared areas is generally poor due to chronic disturbance factors such as cattle grazing and vegetation clearing. The primary residual impacts on habitat within the project footprint would be expected to arise as a result of:

- Removal of permanent, yet artificial, water sources associated with the dams at H2 and H13. These dams are the only sources of permanent water in the southern part of the project area and are a resource for wetland birds and other terrestrial fauna species. This includes threatened and migratory species which were observed near site H2 such as the squatter pigeon and cotton pygmy-goose. Removal of these dams represents the loss of a habitat resource for these species. Other potentially permanent water sources identified using aerial photography are located approximately 6.5 km to the north-west (adjacent to the Suttor River) and 6 km to the south-west.
- Removal of gilgai wetland habitat from the southern part of the project area. Historic clearing has reduced the habitat value of these wetlands through the removal of vegetation and microhabitat features however, gilgai on cracking clay soils represent a loss of potential habitat for the ornamental snake.
- Encroachment on riparian vegetation associated with Suttor Creek by the spoil dumps associated with South Pit 1.
- Removal of riparian vegetation associated with the North Pit footprint.
- Removal of habitat, such as tree hollows and coarse woody debris, from within pit and infrastructure footprints.
- During mining, the catchment supplying water to the palustrine wetland on the south-western project area boundary would be disrupted, temporarily reducing flow to the wetland (KBR 2012a). Impacts and proposed mitigation are discussed in Section 8.1.3 of the Aquatic Ecology Impact Assessment (AMEC 2012).

Impacts on habitat and associated fauna can be minimised by:

- Minimising vegetation clearance along drainage features in order to maintain bank stability, habitat connectivity and movement corridors for terrestrial fauna species and a habitat refuge for fauna seeking shelter and water.
- Clearing riparian vegetation in a staged manner to allow fauna to migrate to adjacent habitats.
- Having a suitably qualified spotter-catcher available when clearing in habitat areas.
- Progressive rehabilitation of mined areas to incorporate the provision of nest hollows and microhabitat features such as trees and logs.

It should be noted that habitat loss calculations presented for threatened and migratory species in the following sctions are based on broadly suitable habitat only. As such, areas

of broadly suitable habitat which have been identified may not actually be of significance, or therefore require mitigation, when determining impacts on the species in question.

6.1.3 Habitat Fragmentation/Loss of Connectivity

Habitat fragmentation occurs when continuous areas of habitat, such as forests, woodlands or grasslands, are subdivided into a number of separate components. This term encompasses two interrelated components: habitat loss (i.e. a reduction in the amount of habitat) and fragmentation (i.e. a breaking apart of habitat) (Bennett 2006). The impacts of habitat fragmentation are also scale-dependent and may differ depending on the species or community under consideration. For example, loss of small areas of habitat that do not present a significant barrier to movement by highly mobile species (e.g. birds of prey) may present a much greater barrier to dispersal of less mobile or far-ranging species (e.g. amphibians or small reptiles such as skinks).

Connectivity across the broader project area has been considered in terms of habitat connections and broader corridors with regional linkages beyond the boundaries of the project area. Within the project area connectivity is linked to riparian corridors associated with the Suttor River and Kangaroo Creek and contiguous areas of terrestrial vegetation in the central and northern portions of the project area.

There are three primary areas of impact on connectivity within the project area as a result of the project:

- Loss of connectivity within the band of terrestrial vegetation in the central part of the project area associated with the establishment of the West Pit. This would result in areas to the east of the pit footprint becoming isolated from large, contiguous tracts of vegetation to the west of the project area. While isolated, this patch of vegetation is still relatively large and will sustain habitat but has the potential to fragment populations of less mobile species.
- Removal of riparian corridors along the tributary of Kangaroo Creek and excise of remnant vegetation from the contiguous band in the northern part of the project area associated with the establishment of the North Pit.
- Reduced connectivity of riparian corridors along Kangaroo Creek associated with the construction of the central infrastructure corridor. Fauna movement along this corridor and access for less mobile species to upstream habitats to the south and west would be restricted. The alignment of the road also increases the potential for interaction between vehicles and fauna moving along the corridor, which would be mitigated by imposing slower speed limits at the crossing point.

6.2 Threatened Ecological Communities

6.2.1 Brigalow TEC

Historically, the brigalow TEC has been extensively cleared for cropping and/or pasture improvement over most of its range and has been subject to altered fire regimes and the introduction of exotic plants and animal species (DSEWPaC 2012a). Any activities which further reduce the extent of the brigalow TEC, will cause a further decline in vegetation condition or impede its recovery are considered the key threats to this TEC

(DSEWPaC 2012a). Continued tree clearing, high total grazing pressure and the proliferation of exotic species are key ongoing threats for this TEC (Young *et. al.* 1999).

Table 6-1 provides an assessment of the potential impacts on brigalow TEC against the EPBC significant impact criteria for endangered ecological communities.

Table 6-1 Brigalow TEC Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility it will:	
Reduce the extent of an ecological community.	The project would require the loss of 316.3 ha of brigalow TEC from the project area. Based on current certified RE mapping (Version 6.1), this represents a reduction in the extent of brigalow TEC within the Brigalow Belt North Bioregion of approximately 0.1%. Clearing in brigalow TEC may be offset in accordance with the EPBC Environmental Offsets Policy.
Fragment or increase fragmentation of an ecological community.	Approximately 50% of clearing within the brigalow TEC would result from the loss of small, fragmented patches in the southern part of the project area and clearing along the edge of patches of brigalow vegetation. No increase in fragmentation of the ecological community would occur in these areas. Establishment of the West Pit would fragment a band of terrestrial vegetation in the central part of the project area which contains the brigalow TEC.
Adversely affect habitat critical to the survival of an ecological community.	The project would not adversely affect habitat critical to the survival of this community.
Modify or destroy abiotic factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The project would be expected to result in the altered distribution of brigalow cracking clay soils, which would be removed from open cut mining areas and replaced during rehabilitation. However, this is not expected to impact the long-term survival of the ecological community as a whole.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	Subject to appropriate management of fire regimes, no substantial change in species composition in retained areas would be expected to result from the project. Development and implementation of a site-specific fire management plan should address the need to minimise fire risk in areas of fire-sensitive brigalow.

Significant Impact Criteria	Response
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community including but not limited to: • Assisting invasive species that are harmful to the listed ecological community to become established • Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	Subject to appropriate management of the spoil dump within the Suttor River floodplain, the project would not be expected to result in a substantial reduction in the quality or integrity of an occurrence of brigalow TEC.
• Interfere with the recovery of the ecological community.	The project would result in clearing of approximately 0.1% of the remaining brigalow TEC in the Brigalow Belt North Bioregion, which would be offset under approval from DSEWPaC. As such, the project is not expected to interfere with the recovery of the ecological community.

In addition to those measures outlined in **Section 6.1.1**, mitigation and management measures to be implemented to reduce the potential impacts to brigalow TEC are:

- Implement management methods for declared weeds in the project area in accordance with a site-specific weed and pest management plan.
- Implementing appropriate fire management regimes in areas containing brigalow TEC.
- Provision of offsets for residual impacts (i.e. clearing of 316.3 ha of brigalow TEC).

6.2.2 Natural Grasslands TEC

Grasslands and grassy woodlands are among the most threatened ecosystems in Australia (DSEWPaC 2012b). The major threats to the natural grasslands TEC have been identified as the conversion of native pastures for grazing, cropping and pasture improvement, introduction of weeds and pest animals, physical destruction as a result of mining activities and the construction of roads and other infrastructure (DSEWPaC 2012b).

Table 6-2 provides an assessment of the potential impacts on natural grasslands TEC against the EPBC significant impact criteria for endangered ecological communities.

Table 6-2 Natural Grasslands TEC Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility it will:	
Reduce the extent of an ecological community.	The project would require the loss of 84.4 ha of natural grasslands TEC from the project area. Based on current certified RE mapping (Version 6.1), this represents a reduction in the extent of natural grasslands TEC within the Brigalow Belt North Bioregion of approximately 0.2%.
Fragment or increase fragmentation of an ecological community.	Establishment of the East Pit 2 would result in clearing the western-most extent of two patches of natural grasslands TEC. Clearing in the northern occurrence would reduce the patch size and result in a very small area becoming isolated from the remaining patch. While not directly located in the impact footprint, the remaining area is unlikely to remain a viable remnant. Clearing in the southern occurrence would expose a new edge to this community but this patch would be expected to remain viable
Adversely affect habitat critical to the survival of an ecological community.	The project would not adversely affect habitat critical to the survival of this community.
Modify or destroy abiotic factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The project would not modify or destroy abiotic factors necessary for the survival of the natural grasslands TEC beyond areas of direct impact.

Significant Impact Criteria	Response
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	Parthenium (*Parthenium hysterophorus*) was recorded at a number of locations in proximity to occurrences of natural grasslands TEC in the south-east of the project area. Establishment of the East Pit 2 would disturb intact areas of native grassland with limited incursion of exotic species. Disturbance would create a new edge which has the potential to allow parthenium to establish within adjacent areas of natural grasslands. Appropriate measures can be taken to prevent parthenium becoming established in retained areas of natural grassland to the east of the disturbance. Management measures should include: • Development of a weed management plan which specifically addresses measures to prevent spread of parthenium into intact areas of natural grasslands TEC. • Implementation of appropriate weed management protocols, including the provision of vehicle wash down facilities as described in Section 8.1.12 of the Terrestrial Ecology Impact Assessment Report (AMEC 2012). • Monitoring in grasslands adjacent to the disturbance area and undertaking appropriate weed eradication programs as required.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community including but not limited to: • Assisting invasive species that are harmful to the listed ecological community to become established • Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	If not appropriately managed, the establishment of parthenium weed in intact areas of natural grasslands TEC would cause a substantial reduction in their quality and integrity. Management measures would be undertaken to prevent the spread of parthenium across the site as described above.
• Interfere with the recovery of the ecological community.	The project would result in clearing of approximately 0.2% of the remaining natural grasslands TEC in the Brigalow Belt North Bioregion, which can be offset. As such, the project is not expected to interfere with the recovery of the ecological community.

6.2.3 Semi-evergreen Vine Thicket TEC

Semi-evergreen vine thicket (SEVT) is considered an extreme form of dry seasonal subtropical rainforest. It occurs in areas with a subtropical, seasonally dry climate on soils of high to medium fertility and is generally characterised by the prominence of trees with microphyll sized leaves (2.5–7.5cm long) and the frequent presence of swollen-stemmed "bottle trees" (Brachychiton australis, B. rupestris) as emergents from the vegetation. The thickets typically have an uneven canopy 4–9m high with mixed evergreen, semi-evergreen and deciduous emergent tree species 9–18m high. Vines, twining or scrambling plants are prominent (McDonald 2010).

Table 6-3 provides an assessment of the potential impacts on SEVT TEC against the EPBC significant impact criteria for endangered ecological communities.

Table 6-3 SEVT TEC Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility it will:	
Reduce the extent of an ecological community.	The project would result in the loss of 18.0 ha of SEVT TEC from the project area. Based on current certified RE mapping (Version 6.1), this represents a reduction in the extent of SEVT TEC within the Brigalow Belt North Bioregion of approximately 0.1%.
Fragment or increase fragmentation of an ecological community.	Disturbance associated with the central infrastructure corridor and the haul road linking the North Pit with the Northern Infrastructure Area would bisect two small patches of SEVT TEC. This would result in the creation of smaller patches with a larger edge area, exposing the remaining vegetation to edge effects associated with dust deposition from haul roads, exposure to weeds and increased fire risk. Management measures to minimise adverse impacts on this patch may include: • Ongoing management of weeds, particularly those which pose a threat in terms of increased fire risk. • Undertaking dust suppression on haul roads adjacent to new edges.
Adversely affect habitat critical to the survival of an ecological community.	The project would not adversely affect habitat critical to the survival of this community.

Significant Impact Criteria	Response
Modify or destroy abiotic factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	SEVT TEC is generally regarded as a fire-sensitive community and remnants are typically (but not always) located in areas protected from fire by topography and/or substrate (Fensham 1995). The greatest fire risk to this community is associated with the rail loop associated with the Northern Infrastructure Area where sparking from train traffic is a potential ignition source. It is recommended that a narrow fire break be provided where the rail loop abuts the large patch of SEVT TEC to the north. This fire break should be managed for fuel loads and to prevent incursion of exotic pasture grass species such as buffel grass and parthenium, which increase fire risk (Fensham 1995). While no parthenium was recorded in proximity to areas of SEVT to be disturbed, appropriate weed management measures should be implemented to prevent its spread throughout the site.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	Fragmentation and associated edge effects and inappropriate fire regimes have the potential to alter species composition of the impacted areas of SEVT through the establishment of weed species and the ultimate loss of fire-sensitive species which comprise the TEC. Impacts on species composition may be avoided through appropriate management of these factors as described above.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community including but not limited to: • Assisting invasive species that are harmful to the listed ecological community to become established • Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	Given the small patch size of the affected areas, the haul road and central infrastructure corridor would be expected to cause a substantial reduction in the quality and integrity of these occurrences of the TEC. This may be avoided by: • Refinement of the central infrastructure corridor and North Pit haul road during detailed design to avoid fragmentation of these two patches. • Undertaking dust suppression on haul roads. • Ongoing management of weeds in adjacent areas, particularly those weed species which pose a threat in terms of increased fire risk.
Interfere with the recovery of the ecological community.	The project would result in clearing of approximately 0.1% of the remaining SEVT TEC in the Brigalow Belt North Bioregion.. As such, the project is not expected to interfere with the recovery of the ecological community.

6.3 Threatened Fauna Species

The assessment of impacts on threatened fauna species generally considers the criteria established by the Significant Impact Guidelines – EPBC Act Policy Statement 1.1 *Environment Protection and Biodiversity Conservation Act 1999*. However, a number of more prescriptive guidelines have been published for species or groups of species, and those which are relevant to the project are described below.

6.3.1 Species Specific Assessment Guidelines

6.3.1.1 Black-throated finch

The impact assessment for black-throated finch has been completed in accordance with EPBC Act Policy Statement 3.13 - Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*). In accordance with the guidelines, significant impact judgements must be made on a case by case basis and with consideration for the context of the action. The potential for a significant impact on a listed threatened species depend on the:

- Intensity, duration, magnitude and geographic extent of the impact
- Sensitivity, value and quality of the environment on and around the site
- Cumulative effect of on-site, off-site, direct and indirect impacts
- Presence of this and other matters of national environment significance.

A significant impact on the black-throated finch (southern) is likely if an action threatens to disrupt access to or availability of one or more of the three key resources (water, seeding grasses and nesting trees). Key elements of the guidelines are presented below.

Significant Impact Thresholds

As a guide, the character and quality of the habitat may be significantly diminished if an action results in:

- Net loss or degradation of water sources (either permanent or seasonal) in the locality
- Widespread or indiscriminate loss of trees, including known nest trees within 1 km of a water source
- A decrease in tree recruitment capacity which limits the area's ability to be self-sustaining
- The degradation of foraging habitat (grassland) where black-throated finch (southern) records exist, including the intensification of biomass reduction or stocking rates.

Actions that may lead to the loss, degradation and/or fragmentation of black-throated finch (southern) habitat and may have a significant impact on the subspecies, could include, but are not limited to:

- Clearing of grassland and/or grassy woodland
- Damming or disrupting the natural flows of creeks and rivers
- Earthworks or excavation
- Pasture improvement (to previously unimproved grassland)
- Changes in management regimes, such as burning, slashing and grazing

- Construction of roads, structures and/or hard surfaces
- Construction of temporary or permanent structures for storage and accommodation
- The introduction of domestic and agricultural animals
- The introduction of exotic plants, particularly exotic grasses
- Substantial increases in human traffic and/or recreational activities (e.g. Trail bike riding, dog walking etc).

Mitigation Measures

Mitigation includes all measures undertaken on the site of the action to avoid or reduce the impacts. Measures should be incorporated into the design of the action at the conceptual and planning stage(s) to:

- Reduce the level of the impact to below the significant impact thresholds
- Monitor the performance of the mitigation measures (e.g. by using performance indicators measured at seasonally/annually nominated times)
- Incorporate feedback into an adaptive management plan, to quickly react to any changes in performance.

Mitigation and management actions must:

- Prioritise impact avoidance over impact reduction measures
- Avoid negative impacts on other MNES
- Be consistent with relevant recovery, conservation or action plans.

Impacts on the black-throated finch (southern) can be minimised by:

- Retaining remnant woodland within 1 km of water sources (nesting habitat).
- Maintaining all foraging habitat within 400 m of known nesting habitat, and within 3 km of water sources.
- Maintaining connectivity between important habitat, or areas known or likely to contain the black-throated finch (southern), with corridors of at least 100 m in width. (Note: when planning corridors and buffers, priority should be given to riparian areas and alluvial plains, where early flowering perennial grasses are likely to occur. Land uses adjoining corridors should be planned and conditioned so as to not impact the ecological integrity of the corridor. Also, the effectiveness of habitat corridors diminishes with increasing length).
- Building structures (e.g. buildings, roads etc.) at least 1 km from key water sources and nesting trees.
- Enhancing the availability of water in the landscape through management and construction of water sources.
- Limiting livestock grazing to ensure that the herbaceous layer (particularly perennial grasses) is maintained in a healthy condition. Care should be taken to plan a grazing regime that will achieve this.
- Enhancing the availability of seeding grasses in the landscape through the incorporation of conservative stocking rates and wet season spelling into any grazing regime.

6.3.1.2 Listed Brigalow Belt Reptiles

DSEWPaC (2011) provides draft referral guidelines for the nine MNES-listed reptile species in the Brigalow Belt Bioregion.

When assessing whether an action is likely to have a significant impact on a species listed as vulnerable under the EPBC Act, DSEWPaC considers nine significant impact criteria (see page 11 of EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance). Four of these criteria relate to impacts on important populations of the listed vulnerable species.

However, given that the listed Brigalow Belt reptiles are difficult to detect and population information is limited, DSEWPaC regards important habitat as a surrogate for important populations in the assessment of whether an action is likely to have a significant impact on one or more of these species.

Suitable habitat for any one of the listed Brigalow Belt reptiles is considered important if it is:

- Habitat where the species has been identified during a survey
- Near the limit of the species' known range
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations)
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

6.3.2 Species Known to Occur in the Project Area

The sections below provide an assessment of the potential impacts on threatened fauna species known to occur in the project area against the EPBC significant impact criteria.

6.3.2.1 Ornamental Snake

Table 6-4 Ornamental Snake (*Denisonia maculata*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on vulnerable species if there is a real chance or possibility it will:	

Significant Impact Criteria	Response
Lead to a long-term decrease in the size of an important population of a species.	The project site is known to support the ornamental snake, and as such, the habitat is considered to be important habitat for the species as per draft referral guidelines for the nine MNES-listed reptile species in the Brigalow Belt Bioregion which explicitly define important habitat for this group. As discussed above, important habitat is used as a surrogate for "important populations" in the case of the listed Brigalow Belt Reptiles. This species is strongly associated with brigalow woodland (RE 11.4.9 and 11.3.1 in particular) and riparian woodlands, particularly in association with cracking clay soils. South Pit 1 and 2 will in particular impact on these habitat types. The habitat condition for the ornamental snake in the project area is poor relative to pre-clearing vegetation types; however, the habitat quality for this species in the project area is moderate to high. This species is known to persist in cleared areas which support gilgai micro-relief. The loss of these habitat areas is likely to lead to a decrease in the size of an important population of the ornamental snake. Subject to re-instatement of the pre-disturbance landform, it is likely that the ornamental snake will recolonise disturbed areas from habitat patches which remain undisturbed as the mine progresses.
Reduce the area of the occupancy of an important population.	The area of occupancy for the ornamental snake population will be reduced. As discussed above, the population is considered to be an important population because the habitat is known to be occupied and considered to be important habitat.
Fragment an existing important population into two or more populations.	The ornamental snake is strongly associated with creeks, floodplains and associated clay plains and occupies a more or less continuous distribution from Collinsville in the north to Moura in the south and east to Rockhampton. The population is considered to be a single continuous population. Loss of habitat on the project site is not likely to fragment this population.
Adversely affect habitat critical to the survival of a species	The habitat on the project site is not critical to the survival of the species, which is locally common and abundant in many parts of the Brigalow Belt North Bioregion in particular.
Disrupt the breeding cycle of an important population.	The proposed action will reduce the area of occupancy of the population and impact on the breeding cycle of those individuals which occur in those habitats. There will however, be substantial areas of suitable habitat retained adjacent to Suttor Creek and to the south of South Pit 2. Breeding is likely to continue unabated in these areas.
Modify, destroy, remove or isolate or decrease the availability or quality habitat to the extent that the species is likely to decline.	The species remains widespread and abundant in the Brigalow Belt and is known to utilise completely cleared land and degraded sites which contain areas of gilgai microrelief. The loss of habitat associated with this project is very unlikely to result in the decline of the species.

Significant Impact Criteria	Response
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	A range of exotic flora and six introduced pest fauna species were recorded during the field surveys. Of these, the cane toad is the species which presents the greatest threat to the ornamental snake. Field surveys found the cane toad to be a widespread and common species in the project area. The project will establish additional areas of ponded water, which could be used as breeding sites by the cane toad. However, as the cane toad is already widespread and common in the project area it is unlikely to gain significant additional benefit from the establishment of these dams. No further invasive species are likely to be introduced to the project site.
Introduce disease that may cause the species to decline.	This species is not known to be susceptible to any disease which may be transferred or introduced to the project area as a result of the proposed action.
Interfere substantially with the recovery of the species.	The Queensland Brigalow Belt Reptile Recovery Plan (2008) lists a range of actions relevant to the ornamental snake, focussing on research, education and protection of habitat. The proposed action is considered inconsistent with the recovery objectives insomuch as habitat for the species will be lost in the short term. Provided that appropriate habitat can be secured elsewhere and managed to the conservation benefit of this species, this interference is considered unlikely to result in a substantial impact on the species.

6.3.2.1 Squatter Pigeon

Table 6-5 Squatter pigeon (*Geophaps scripta scripta) Significant* Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on vulnerable species if there is a real chance or possibility it will:	
Lead to a long-term decrease in the size of an important population of a species.	The population of squatter pigeon within the project area not considered to be an important population. The population is not likely to be a key source population, necessary for maintaining genetic diversity or near to the geographic limits of its range. This species is one of the most frequently recorded pigeon species in the northern Brigalow Belt and is ubiquitous in relation to the range of habitats it occurs in and its capacity to cope with disturbance.
Reduce the area of the occupancy of an important population.	The population is not considered to be an important population.
Fragment an existing important population into two or more populations.	The population is not considered to be an important population.

Significant Impact Criteria	Response
Adversely affect habitat critical to the survival of a species.	The habitat on the project site is considered unlikely to be critical to the survival of the species, which is widespread in the sub-region and broader region and persists in many disturbed areas.
Disrupt the breeding cycle of an important population.	The population is not considered to be an important population.
Modify, destroy, remove or isolate or decrease the availability or quality habitat to the extent that the species is likely to decline.	The squatter pigeon typically occurs in proximity to water. Clearing in proximity to water would result in a localised reduction of breeding and foraging habitat in the southern part of the project area however, this habitat type is widespread in the region and impacts on the species as a whole would not be significant.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	A range of exotic flora and six introduced pest fauna species were recorded during the field surveys. No further invasive species are likely to be introduced to the project site as a result of the proposed action.
Introduce disease that may cause the species to decline.	This species is not known to be susceptible to any disease which may be transferred or introduced to the project area as a result of the proposed action.
Interfere substantially with the recovery of the species.	There is no recovery plan in place for this species. The proposed action is not expected to substantially interfere with the recovery of the species.

6.3.3 Species Likely to Occur in the Project Area

The sections below provide an assessment of the potential impacts on threatened fauna species likely to occur in the project area against the EPBC significant impact criteria.

Table 6-6 Black-throated finch (*Poephila cincta cincta) Significant* Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility it will:	
Lead to a long-term decrease in the size of a population.	The southern subspecies of the black-throated finch is thought to occur as a single, contiguous population, but this estimate is considered to be of low reliability, due to uncertainty about the number of subpopulations and/or the extent of genetic separation (Garnett & Crowley 2000). A such any birds which occur on the project site would be considered to be a part of the overall population, estimated to comprise some 20 000 individuals. The lack of records of the species from the broader locality suggests that the occurrence of this species on the project site is likely to be transitory, as semi-permanent water bodies during wetter seasons is thought to allow the black-throated finch (southern) to expand its range over a greater area of the landscape (NRA 2005). The lack of confirmed records from baseline surveys and the absence of historical records suggests a lack of a resident population within the project area. Loss of habitat may impact on a small number of individuals, however, a long-term decline in the overall population as a result of the proposed action is considered unlikely.
Reduce the area of occupancy of the species.	The area of occupancy is estimated to be 5000 km², based on the number of 1 km² grid squares that the subspecies is thought to occur in at the time when the population is most constrained. This estimate is considered to be of low reliability (Garnett & Crowley 2000). The proposed action will contribute to habitat loss and modification within the area of occupancy of the species. The area of habitat to be disturbed is relatively small and supported what was potentially a pair of black-throated finches at the time of survey, although the identification of this species has not been confirmed. Loss of habitat is therefore considered unlikely to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations.	The subspecies is thought to occur as a single, contiguous population. As such, the two birds recorded from the project site are considered to be a part of the overall population, estimated to comprise some 20 000 individuals. There are many gaps which occur in the distribution of the subspecies resulting in widely separated sub-populations. However, these sub-populations are not considered to be genetically distinct and are considered to be part of one population. Displacement of this species and its habitat from the project site are not likely to fragment the overall population into two or more populations.

Significant Impact Criteria	Response
Adversely affect habitat critical to the survival of a species.	All areas of habitat within 5 km of a post 1995 sighting of the subspecies are considered to be important habitat. However, the project site and broader locality are not known to support a resident population of black-throated finches. Areas which support large numbers of birds over many years are considered to contain habitat critical to the survival of the subspecies. Other areas, such as the project site, are considered to be important habitat but not likely to be critical to the survival of the species.
Disrupt the breeding cycle of a population.	The subspecies is thought to occur as a single, contiguous population, estimated to comprise some 20 000 individuals. It is not known whether the black-throated finch breeds in the locality. Black-throated finches (southern) breed in colonies, mainly in non-remnant native vegetation associated with solodic soils and alluvial plains (NRA 2005), with the dispersion of nests within colonies varying. As there was no evidence of nesting by the subspecies on the project site and no breeding colony recorded, the proposed action is considered unlikely to disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The most important area of habitat for the black-throated finch is likely to be the riparian woodlands associated with the Suttor River and its tributaries. Almost all recent records of the finch from south of the tropics have been in riparian habitat (Baldwin 1976; BTF Recovery Team 2004; Ley & Cook 2001). These habitats will be largely avoided by the proposed action. There will be removal of permanent, yet artificial, water sources associated with two dams. These dams are the only sources of permanent water in the southern part of the project area and are potentially important refuges for the black-throated finch. Other potentially permanent water sources identified using aerial photography are located approximately 6.5 km to the north-west (adjacent to the Suttor River) and 6 km to the south-west. It is likely that water storages will be constructed within the project area and these will offset the removal of the two existing dams. Vegetation clearing (and habitat) loss associated with the project are skewed away from the preferred riparian and floodplain habitats of the black-throated finch. The avoidance of these broad habitats has minimised impacts on potential habitat for the black-throated finch. The loss of habitat associated with the proposed action are not considered likely to result in the decline of the species.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	A range of exotic flora and six introduced pest fauna species were recorded during the field surveys including the feral cat, which represents the greatest threat to the black-throated finch. No further invasive species are likely to be introduced to the project site as a result of the proposed action.

Significant Impact Criteria	Response
Introduce disease that may cause the species to decline.	This species is not known to be susceptible to any disease which may be transferred or introduced to the project area as a result of the proposed action.
Interfere substantially with the recovery of the species.	The overall objective of the National recovery plan for the Black-throated finch southern subspecies (*Poephila cincta cincta*) (BTF Recovery Team *et. al.* 2007) is to manage and protect the species and its habitat, and to promote the recovery of the southern subspecies. The proposed action is considered inconsistent with the recovery objectives insomuch as potential habitat for the species will be lost (albeit introduced dams). This interference will not result in a substantial impact on the species.

Table 6.7 Australian painted snipe (*Rostratula australis)* Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on vulnerable species if there is a real chance or possibility it will:	
Lead to a long-term decrease in the size of an important population of a species.	The concept of an 'important population' is central to assessing the potential for an action to have a significant impact on a vulnerable species. The Significant Impact Guidelines define an important population as "…a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal; • populations that are necessary for maintaining genetic diversity; and/or • populations that are near the limit of the species range." The Australian painted snipe has not been recorded from the project site. Should this species actually occur, the population is likely to be small and transitory, which is typical of the Bowen Basin (pers. Obs. J. Richard). The population could not be considered a key population for breeding or dispersal, necessary for maintaining genetic diversity or near the limits of the species range. An important population of the Australian painted snipe is therefore not known to occur on the project site.
Reduce the area of the occupancy of an important population.	The species is not known from the project site. Should the Australian painted snipe be present, the population would not be classified as an important population when considered against the relevant criteria.
Fragment an existing important population into two or more populations.	The species is not known from the project site. Should the Australian painted snipe be present, the population would not be classified as an important population when considered against the relevant criteria.

Significant Impact Criteria	Response
Adversely affect habitat critical to the survival of a species.	The removal or degradation of ephemeral water bodies may impact the Australian painted snipe. The highest value habitat in the project area is the ephemeral wetland (Aquatic Survey Site S3) on the western boundary of the project area and outside the impact area. The wetland habitat on the project site is considered unlikely to be critical to the survival of the species, which is widespread in the sub-region and broader region and persists in many disturbed areas.
Disrupt the breeding cycle of an important population.	The species is not known from the project site. Should the Australian painted snipe be present, the population would not be classified as an important population when considered against the relevant criteria.
Modify, destroy, remove or isolate or decrease the availability or quality habitat to the extent that the species is likely to decline.	The extent of occurrence of the Australian painted snipe is estimated, with low reliability, to be 4 500 000 km² (Garnett & Crowley 2000). The Australian painted snipe is considered to occur in a single, contiguous breeding population (Garnett & Crowley 2000). The loss of small areas of habitat which is not known habitat, and not high quality habitat, is very unlikely to result in the further decline of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the venerable species' habitat.	A range of exotic flora and six introduced pest fauna species were recorded during the field surveys. No further invasive species are likely to be introduced to the project site as a result of the proposed action.
Introduce disease that may cause the species to decline.	This species is not known to be susceptible to any disease which may be transferred or introduced to the project area as a result of the proposed action.
Interfere substantially with the recovery of the species.	There is no recovery plan in place for this species. The proposed action is considered inconsistent with recovery objectives insomuch as habitat for the species will be lost. This interference will not result in a substantial impact on the species.

6.4 Migratory Species

Central to the assessment of impacts on listed migratory species are the concepts of "important habitat" and "ecologically significant proportion of the population". Should a project site support neither of these values in relation to a particular migratory species, then project impacts cannot be considered significant.

An area of 'important habitat' for a migratory species is:

a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
b) Habitat that is of critical importance to the species at particular life-cycle stages
c) Habitat utilised by a migratory species which is at the limit of the species range
d) Habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the

population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

Specific impact assessment guidelines have been published for 36 migratory shorebirds in Australia (DEWHA 2009). The widely accepted and applied approach to identifying internationally important shorebird habitat throughout the world has been through the use of criteria adopted under the Ramsar Convention on Wetlands. According to this approach, a wetland should be considered internationally important if it regularly supports:

- One per cent of the individuals in a population of one species or subspecies of waterbird
- A total abundance of at least 20 000 waterbirds.

6.4.1 Species Known to Occur in the Project Area

The sections below provide an assessment of the potential impacts on migratory species known to occur in the project area against the EPBC significant impact criteria.

Table 6-8 Eastern great egret (*Ardea modesta*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	There has been no systematic survey of the Australian population of the Eastern Great Egret. A preliminary estimate of 60 000 individuals was derived from data on breeding colonies (Jaensch 2003) and supports the current published estimate of 25 000–100 000 individuals (Wetlands International 2006). The small number of birds observed in the project area does not constitute an ecologically significant proportion of this population.

Table 6-9 White bellied sea eagle (*Haliaeetus leucogaster*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	By applying a population density of one pair per 40 km to the entire length of the Australian coastline (approximately 20 000 km), and taking into account the various inland river systems occupied by the species, the total population size of the White-bellied Sea-Eagle in Australia is estimated at more than 500 pairs. This estimate is likely to be of low reliability, and may significantly underestimate the size of the population (Ferguson-Lees & Christie 2001). In any case, the small number of birds observed in the project area does not constitute an ecologically significant proportion of this population.

Table 6-10 Latham's snipe (*Gallinago hardwickii*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	Important habitat for Latham's snipe occurs at those sites that are identified as internationally important for the species, or those sites: • That support at least 18 individuals of the species • That have the following characteristics: a naturally occurring freshwater wetland with vegetation cover nearby (for example tussock grasslands, sedges, lignum and reeds). The project site is not known to support at least 18 individuals of Latham's snipe and is not considered important habitat.

Significant Impact Criteria	Response
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not meet published criteria for consideration as important habitat for Latham's snipe.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	There are no published guidelines for determining what constitutes an ecologically significant proportion of the population of this species. However, the small number of individuals observed in the project area is not considered to represent an ecologically significant proportion of the population. The proposed action will not seriously disrupt the lifecycle of a significant proportion of a population of a migratory species.

Table 6-.11 Rainbow bee-eater (*Merops ornatus*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The total population size of the rainbow bee-eater in Australia has not been estimated. However, the population size is assumed to be reasonably large based on reporting rates for the species (i.e. the Atlas of Australian Birds has received more than 30 000 records of the Rainbow Bee-eater since 1998). The small number of birds observed in the project area does not constitute an ecologically significant proportion of this population.

Table 6-.12 Rufous fantail (*Rhipidura rufifrons*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	

Significant Impact Criteria	Response
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Rufous fantail is a common and secure species (Blakers *et. al.* 1984) for which there are no reliable population estimates. Estimates of population density vary from 0.02 birds/ha near Canberra (Bell 1980) to 2.66 birds/ha at Lower Bucca State Forest in north-east NSW (Huggett 2000) indicating a potentially enormous overall population. The small number of birds observed in the project area does not constitute an ecologically significant proportion of this population.

6.4.2 Species Likely to Occur in the Project Area

The sections below provide an assessment of the potential impacts on migratory species likely to occur in the project area against the EPBC significant impact criteria.

Table 6-13 Cattle egret (*Ardea alba*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.

Significant Impact Criteria	Response
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The population estimate for Australia, New Guinea and New Zealand is 100 000 birds (Maddock & Geering 1994). The species has not been recorded from the project area. If it is present, the population would be small and/or transitory as it avoided detection during baseline surveys. It is very unlikely that an ecologically significant proportion of the population of this species is present.

Table 6-.14 Fork-tailed swift (*Apus pacificus*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	There are no measures of abundance in Australia. The largest flocks recorded in Australia were 90 000 near Mildura, Victoria, during 1961 (Simpson 1961); 50 000 at Portland, south-west Victoria, during January 1960 (Anon. 1960); and 50 000 at Ivanhoe, NSW (Anon. 1972). The species has not been recorded from the project area. If it is present, the population would be small and/or transitory as it avoided detection during baseline surveys. It is very unlikely that an ecologically significant proportion of the population of this species is present.

Table 6-15 White-throated needletail (*Hirundapus caudacutus*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	

Significant Impact Criteria	Response
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The study region is not known to support an ecologically significant proportion of the population of this species. The habitat present is not known or likely to be of critical importance to this species, nor is the species at limits of its range or known to be in decline in the region. As such, the project will not substantially modify, destroy or isolate an area of important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The species' total population is unknown. It is described as 'abundant' in some regions of Australia during the non-breeding season (Chantler 1999). The species has not been recorded from the project area. If it is present, the population would be small and/or transitory as it avoided detection during baseline surveys. It is very unlikely that an ecologically significant proportion of the population of this species is present.

Table 6-16 Satin flycatcher (*Myiagra cyanoleuca*) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The satin flycatcher inhabits heavily vegetated gullies in eucalypt dominated forests and taller woodlands, often near wetlands and watercourses. This species was recorded at locations outside the project area and is considered likely to occur in riparian environs along the Suttor River. The riparian habitats of the Suttor River will not be directly affected by the project, but may be subject to indirect impacts associated with development in the catchment and encroachment of a waste rock dump onto the Suttor River floodplain.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.

Significant Impact Criteria	Response
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The satin flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The project area does not contain significant habitat for this species, and the adjoining areas of the Suttor River which do provide potential habitat are unlikely to be significantly affected by the project. It is considered unlikely that the project will affect an ecologically significant proportion of the species' population.

Table 6-17 Australian painted snipe (*Rostratula australis*[7]) Significant Impact Assessment

Significant Impact Criteria	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility it will:	
Substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The highest value habitat in the project area is the ephemeral wetland (Aquatic Survey Site S3) on the western boundary of the project area and outside the impact area. The wetland habitat on the project site is considered unlikely to be critical to the survival of the species, and is considered unlikely to be important habitat. The project will not substantially modify important habitat for the Australian painted snipe.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The project area does not support an area of important habitat for this species for the reasons set out above.

[7] Listed as *Rostratula benghalensis* (*sensu lato*) under the marine and migratory provisions of the EPBC Act, but it is now widely accepted that all specimens within Australia are *Rostratula australis*.

Significant Impact Criteria	Response
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The extent of occurrence of the Australian painted snipe is estimated, with low reliability, to be 4 500 000 km² (Garnett & Crowley 2000). The Australian painted snipe is considered to occur in a single, contiguous breeding population (Garnett & Crowley 2000). The highest value habitat in the project area is the ephemeral wetland (Aquatic Survey Site S3) on the western boundary of the project area and outside the impact area. The wetland habitat on the project site is considered unlikely to be critical to the survival of the species, which is widespread in the sub-region and broader region and persists in many disturbed areas. It is considered unlikely that the project area supports an ecologically significant proportion of the species' population.

6.5 Conclusions

This assessment has considered the potential impacts of the project on MNES against the Significant Impact Guidelines. Based on this assessment, it is considered that the project has the potential to result in significant residual (post avoidance and mitigation) impacts on one listed threatened species (the vulnerable ornamental snake) and three listed Threatened Ecological Communities (brigalow, native grassland and SEVT ecological communities) listed under the EPBC Act. The project will therefore need to consider the EPBC Act Environmental Offsets Policy.

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ATTACHMENT 1 – BRIGALOW TEC SITE ASSESSMENT SHEETS

RE 11.3.1

VEGETATION SURVEY
Brigalow (*Acacia harpophylla*) woodland on alluvial plain (T 35)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.3.1
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.8.5
Width of RE:	100m
Survey Level:	Tertiary

Site Description	
Location:	**11km WNW of Newlands Mine**
Site Description:	Broad alluvial flat with mosaic of woodland and Brigalow
Orientation of Transect:	280
Datum:	GDA94
Latitude / Longitude:	-21.1686; 147.8433

Vegetation Community Description												
Open forest												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		13			1.5				12		
Owenia acidula	A					5					3	
Erythroxylon australe	A					2						
Alectryon diversifolius	A					3						
Carissa ovata	A					1.5						
Lysiphyllum carronii	A					2						
Poaceae spp.	A					0.25						
Opuntia stricta	#					0.5						
Ground Cover	50% Bare Ground		20% Leaf Litter						30% Grass (Aristida sp.)			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, #												

Vegetation Community Description
= weed, ## = declared plant O = outside plot

Cover % PCC					Species	Stem Count(500m²)					
E	T1	T2	T3	S1		E	T1	T2	T3	S1	S2
<5	60%			<2	*Acacia harpophylla*		47			5	
				<2	*Owenia acidula*					2	
				<2	*Erythroxylon australe*					2	
				<2	*Carissa ovata*					5	
				<2	*Lysiphyllum carronii*					3	
				<2	*Poaceae* spp.					7	
				<2	*Opuntia stricta*					1	

Community Health and Condition	
Overall Health:	Moderate– Evidence of prior physical disturbance (>15yrs)
Potential EVNT Flora Species Habitat:	Limited
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Parthenium hysterophorus* (outside plot)
Weed Cover (%):	< 5%
Disturbance:	Minor incursion of exotic species into ground covers. Evidence of prior physical disturbance
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Alluvial outwash plain joining floodplain of major drainage line
Altitude:	260m
Relief:	0
Slope:	Very low
Slope Class:	0
Erosional Landform Pattern:	0
Soils:	Alluvial
Soil Colour:	Grey
Soil Texture:	Silty clay loam
Geology:	Alluvial plain

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	T 35
Date / Time:	19 / 10 / 2010; 10.30 am

VEGETATION SURVEY
Brigalow (*Acacia harpophylla*) woodland on alluvial plain (T 40)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.3.1
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.8.5
Width of RE:	100m
Survey Level:	Tertiary

Site Description	
Location:	11km WNW of Newlands Mine
Site Description:	Upper alluvial terrace of major drainage line – heavily dissection on margins of colluvium
Orientation of Transect:	240
Datum:	GDA94
Latitude / Longitude:	-21.1621; 147.8499

Vegetation Community Description												
Woodland to 16m with emergent eucalypts												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		16	10		1.5				9		
Grevillea parallela	A		16							2		
Owenia acidula	A					5					3	
Eremophila mitchellii						5						
Flindersia maculosa						6						
Bursaria spinosa						3						
Cassia brewsteri						4						
Carissa ovata							2					
Ground Cover	50% Bare Ground			30% Leaf Litter					20% Grass (Aristida sp.)			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					Species	Stem Count(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
<5	40%				*Acacia harpophylla*		21	5		3	
	10%				*Grevillea parallela*					2	
				<5	*Owenia acidula*					1	
				10	*Eremophila mitchellii*					17	
				<5	*Flindersia maculosa*					2	
				<5	*Bursaria spinosa*					1	
				<5	*Cassia brewsteri*					5	
				<5	*Carissa ovata*						3

Community Health and Condition	
Overall Health:	Moderate – Evidence of prior physical disturbance (>15yrs) and severe grazing regime
Potential EVNT Flora Species Habitat:	Limited
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Eriocereus martinii* (outside plot)
Weed Cover (%):	< 2%
Disturbance:	Minor incursion of exotic species into ground covers. Evidence of prior physical disturbance
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Margins of alluvial flood plain with overlapping sediments derived from colluvial wash
Altitude:	260m
Relief:	Very low
Slope Class:	Gentle (1-3%)
Erosional Landform Pattern:	0
Soils:	Alluvial
Soil Colour:	Grey
Soil Texture:	Silty clay loam mixed with gravel
Geology:	Alluvial plain/ slope wash deposit

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	T 40
Date / Time:	19 / 10 / 2010; 12.00 pm

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (Q 80)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.3.1
EPBC Status:	Endangered
VMA Status:	Endangered
EPA Status:	Endangered
DNRW Mapped as:	11.8.13
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.86 km SW West of Newlands Mine
Site Description:	Narrow flood channel on broad watercourse. Fragmented grazing land
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.32255; 147.84615

Vegetation Community Description												
Low open forest with canopy from 8 – 12m. PCC of 60%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Acacia harpophylla	D		9			5						
Terminalia oblongifolia	A		9									
Eucalyptus cambageana	A	11										
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate. Disturbed habitat with dead emergent canopy trees. Regrowth from partial clearing.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	Not recorded
Weed Cover (%):	Not recorded
Disturbance:	Disturbance to original canopy and occasional dead remnant trees
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Narrow flood plain in broader clay plain.
Altitude:	285 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Alluvial channel with associated narrow flood plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 80
Date / Time:	6 / 03 / 2011; 4.45 pm

VEGETATION SURVEY

Brigalow (*Acacia harpophylla*) woodland on alluvial plain (Q 106)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.3.1
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.8.5
Width of RE:	Not recorded
Survey Level:	Quaternary

Site Description	
Location:	6.5km NW of Newlands Mine
Site Description:	Broad alluvial flat with mosaic of woodland and brigalow
Orientation of Transect:	280
Datum:	GDA94
Latitude / Longitude:	-21.1701; 147.8418

Vegetation Community Description												
Open forest												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Acacia harpophylla	D		13			1.5				12		
Alectryon oleifolius	A					3						
Carissa ovata	A					1.5						
Lysiphyllum carronii	A					2						
Poaceae spp.	A					0.25						
Ground Cover	Not Recorded			Not Recorded					Not Recorded			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate– Evidence of prior physical disturbance (>15yrs)
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Parthenium hysterophorus*
Weed Cover (%):	Not Measured
Disturbance:	Minor incursion of exotic species into ground covers. Evidence of prior physical disturbance
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Alluvial outwash plain joining floodplain of major drainage line
Altitude:	284m
Relief:	0
Slope:	Very low
Slope Class:	Very Gentle to Gentle (1-3°)
Erosional Landform Pattern:	Base of basalt hillslope.
Soils:	Alluvial
Soil Colour:	Grey
Soil Texture:	Silty clay loam
Geology:	Alluvial plain

Survey Details	
Recorder / s:	David Stanton / Stephen Catchpoole
Field Site Number:	Q 106
Date / Time:	8 / 03 / 2012; 15.15

HVR RE 11.3.1

VEGETATION SURVEY
Brigalow (*Acacia harpophylla*) woodland on alluvial plain (T 21)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.3.1
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.9.2/11.9.3/11.3.25
Width of RE:	100
Survey Level:	Tertiary

Site Description	
Location:	Byerwen Station
Site Description:	Grazed upper alluvial terrace near feed lots
Orientation of Transect:	270
Datum:	GDA94
Latitude / Longitude:	-21.0991; 147.91527

Vegetation Community Description

Open forest

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		8			3				7		
Corymbia dallachiana	A		8									
Lysiphyllum carronii	A					1.5						
Eremophila mitchellii	A					1.5						
Grevillea parallela	A					1.5						
Carissa ovata	A					1.5						
Parthenium hysterophorus	#					0.25						
Poaceae spp	A					0.25						
Ground Cover	50% Bare Ground			20% Leaf Litter					30% Grass (Aristida sp.)			

Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot

Cover % PCC					Species	Stem Count(500m²)					
E	T1	T2	T3	S1		E	T1	T2	T3	S1	S2
<5	40%			<2	*Acacia harpophylla*		11	3			
				<2	*Corymbia dallachiana*		1				
				<2	*Lysiphyllum carronii*					7	
				<2	*Eremophila mitchellii*					2	
				<2	*Grevillea parallela*						
				<2	*Carissa ovata*					4	
				<2	*Parthenium hysterophorus*						
				<2	*Poaceae* spp						

Community Health and Condition	
Overall Health:	Moderate to Poor - Evidence of severe physical disturbance (>15yrs old)
Potential EVNT Flora Species Habitat:	Limited
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Eriocereus martinii* (Class 2 LPA) *Parthenium hysterophorus*
Weed Cover (%):	< 5%
Disturbance:	Minor incursion of exotic species into ground covers. Evidence of prior extreme physical disturbance. Site is heavily grazed
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Upper alluvial terrace of major drainage line
Altitude:	290 m
Relief:	Very low
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Silt
Soil Colour:	Grey-brown
Soil Texture:	Silty clay loam
Geology:	Alluvial wash derived occasional overbank flow

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	T 21
Date / Time:	18 / 10 / 2010; 8.30 am

RE 11.4.8

VEGETATION SURVEY

***Eucalyptus cambageana* + *Acacia harpophylla* woodland (Q 65)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8 (fragmented remnant)
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.7.4
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.3km SW West of Newlands Mine
Site Description:	Clay plain / depression
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.27081; 147.82718

Vegetation Community Description												
Woodland to open forest with canopy from 17 – 25m. PCC of 50%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		15	10						Not Measured		
Acacia harpophylla	D			10		5						
Terminalia oblongata	A					5						
Cassia brewsteri	A					5						
Pennisetum ciliare#	D							0.5				
Harrisia martini##	A							0.5				
*Urochloa mosambicensis**	A							0.5				
Bothriochloa pertusa	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Poor. Regrowth from partial clearing. Marginal remnant.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (Class 2) *Pennisetum ciliare* (pasture grass), *Bothriochloa pertusa*
Weed Cover (%):	Not recorded
Disturbance:	Regrowth from partial clearing. Large canopy gaps.
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Clay plain - depression
Altitude:	292 m
Relief:	Very low
Slope:	Flat / depression
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 65
Date / Time:	5 / 03 / 2011; 10.00 am

VEGETATION SURVEY

***Eucalyptus cambageana* + *Acacia harpophylla* woodland (Q 66)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8 (disturbed/ marginal remnant)
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.13
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.3km SW West of Newlands Mine
Site Description:	Clay plain / depression
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.2840; 147.83337

Vegetation Community Description												
Woodland to open forest with canopy from 14 – 23m. PCC of 30%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		15	10						Not Measured		
Acacia harpophylla	D			10		5						
Terminalia oblongata	A					5						
Cassia brewsteri	A					5						
Pennisetum ciliare#	D							0.5				
Harrisia martini##	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Poor to Moderate. Highly fragmented although original canopy is largely intact.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (Class 2) *Pennisetum ciliare* (pasture grass)
Weed Cover (%):	Not recorded
Disturbance:	Fragmented and ground covers dominated by exotic species
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Clay plain with minor influence from colluvial sediments
Altitude:	290 m
Relief:	Very low
Slope:	Flat / depression
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 66
Date / Time:	5 / 03 / 2011; 11.00 am

VEGETATION SURVEY
***Eucalyptus cambageana* + *Acacia harpophylla* woodland (Q 75)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8 (fragmented remnant)
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	Non-remnant
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	8.3km SW West of Newlands Mine
Site Description:	Clay plain
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.30427; 147.8281

Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		15	10						Not Measured		
Acacia harpophylla	D			10		5						
Terminalia oblongata	C					5						
Eremophila mitchellii	C					5						
Pennisetum ciliare#	D							0.5				
Carissa ovata	A						1	0.5				
*Urochloa mosambicensis**	A							0.5				
Stylosanthes scabra	A							0.5				

Bothriochloa pertusa	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate. Regrowth from partial clearing. Marginal remnant.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare* (pasture grass), *Bothriochloa pertusa*
Weed Cover (%):	Not recorded
Disturbance:	Regrowth from partial clearing with a few remnant original trees. Large canopy gaps.
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Clay plain. Heavy clay soils
Altitude:	291 m
Relief:	Very low
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 75
Date / Time:	6 / 03 / 2011; 15.00 pm

VEGETATION SURVEY

***Eucalyptus cambageana* + *Acacia harpophylla* woodland (Q 81)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.4.9 / 11.5.3
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	9.6km SSW West of Newlands Mine
Site Description:	Tract of intact remnant vegetation surrounding by heavily fragmented grazing land.
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.34462; 147.85583

Vegetation Community Description												
Woodland to 18 – 24m. PCC of 30%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		21	12						5		
Brachychiton rupestris	A			14							1	
Acacia harpophylla	A			12							1	
Psydrax attenuata	A					8	3					
Erythroxylum australe	A					5	2					
Ehretia membranifolia	A					5	3					
Alphitonia excelsa	A					7						
Hovea sp.	A						3					
Carissa ovata							1.5					

Vegetation Community Description												
Eragrostis sp.								0.5				
Paspalidium caespitosum	A							0.5				
Aristida sp.	A							0.5				
Pennisetum ciliare#	D							0.5				
Harrisia martini##	A							0.5				
Cyperus sp.	A							0.5				
Urochloa mosambicensis#	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Good to moderate. Intact canopy with incursion of exotic species into ground covers
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (Class 2) *Pennisetum ciliare* (pasture grass),
Weed Cover (%):	Up to 60% of ground cover occupied by buffel grass.
Disturbance:	Partial disturbance to canopy
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Strongly hummocked clay plain
Altitude:	306 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Residual clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Clay
Geology:	Cainozoic clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 81
Date / Time:	7 / 03 / 2011; 8.00 am

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (Q 85)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	Non-remnant
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.86 km SW West of Newlands Mine
Site Description:	Small copse (0.5ha) of regrowth brigalow associated with a broader fragment of remnant vegetation
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.29602; 147.883154

Vegetation Community Description												
Low open forest with canopy from 6– 10m. PCC of 40%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Acacia harpophylla	D		9			5						
Eucalyptus populnea	A	11										
Megathyrsus maximum var. trichoglume	D							0.5				
Echinochloa colona	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate. Disturbed habitat comprising a mix of remnant and regrowth trees
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	Not recorded
Weed Cover (%):	Not recorded
Disturbance:	Disturbance to original canopy and occasional dead remnant trees
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Minor depression on broader clay plain.
Altitude:	308 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Cainozoic Clay Plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 85
Date / Time:	7 / 03 / 2011; 1.30 pm

VEGETATION SURVEY
***Eucalyptus cambageana* + *Acacia harpophylla* woodland (T 70)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.9.6
Width of RE:	Not linear
Survey Level:	Tertiary

Site Description	
Location:	7.3km SW West of Newlands Mine
Site Description:	Flat topped rise formed of gravel and silt clay loam soils
Orientation of Transect:	110°
Datum:	GDA94
Latitude / Longitude:	-21.27856; 147.82634

Vegetation Community Description												
Woodland to open forest with canopy from 16 – 23m. PCC of 46%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		19	10						10		
Paspalidium caespitosum	A							0.5				
Aristida sp.	A							0.5				
Bothriochloa pertusa#	C							0.5				
Pennisetum ciliare#	A							0.5				
Harrisia martini##	A							0.5				
Cyperus sp.	A							0.5				

Vegetation Community Description												
Eragrostis sp.	A							0.5				
Cymbopogon sp.	A							0.5				
Panicum decompositum	A							0.5				
Alloteropsis semialata	A							0.5				
Dodonaea viscosa	A					1.5						
Melinis repens#	A							0.5				
Dactyloctenium radulans	A							0.5				
Erythroxylum australe	A					1.5						
Grewia retusifolia	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					Species	Stem Count(500m²)					
E	T1	T2	T3	S1		E	T1	T2	T3	S1	S2
	46%			<	*Eucalyptus Cambageana*		5				
					Cassia brewsteri					3	
				4%	*Dodonaea viscosa*					2	
					Erythroxylum australe					1	
					Breynia oblongifolia					2	

Community Health and Condition	
Overall Health:	Good to moderate. Intact canopy with incursion of exotic species into ground covers
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (Class 2) *Pennisetum ciliare* (pasture grass), *Bothriochloa pertusa*
Weed Cover (%):	Not recorded
Disturbance:	Partial disturbance to canopy
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Rise on clay plain
Altitude:	295 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Former surface of loamy clay plain
Soils:	Dermosol
Soil Colour:	Grey-brown
Soil Texture:	Silty clay loam with gravel
Geology:	Cainozoic rise formed on clay / clay loam

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	T 70
Date / Time:	6 / 03 / 2011; 12.30 pm

RE 11.4.9

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland and sparse woodland (Q 3)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	Endangered
DERM Mapped as:	11.4.9/11.5.15 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Quaternary

Site Description	
Location:	3km West of Newlands Mine
Site Description:	Low basalt rise within broader alluvial plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.2125; 147.85173

Vegetation Community Description									
Structural Description		Open woodland							
Canopy Height		15 -23m							
Canopy Cover (%)		20%							
Botanical Species		**Status***	**Average Height (m)**						
			E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Eucalyptus orgadophila				18	12				
Terminalia oblongifolia							5		
Corymbia erythrophloia					12				
Alphitonia excelsa							3		
Bothriochloa sp.									0.25
Pennisetum ciliaris		#							0.25
Parthenium hysterophorus		# class 2 LPA							0.25
80% Grass (buffel)	10% Leaf litter	10% Bare Ground							

Community Health and Condition	
Overall Health:	Poor – heavily fragmented with ground cover dominated by exotic pasture grass (>15yrs)
Potential EVNT Flora Species Habitat:	Limited
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* *Parthenium hysterophorus* *Pennisetum ciliare* (buffel grass)
Weed Cover (%):	80% dominantly buffel
Disturbance:	Heavy fragmentation and degradation of ground
Disturbance Cover (%):	-

Topography and Landform	
Landform Situation:	Basalt rise within broad erosional valley
Altitude:	320 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	Q 3
Date / Time:	16 / 10 / 2010; 2.30 pm

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland and sparse woodland (T 15)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	No Concern at Present
DERM Mapped as:	11.4.9/11.5.15 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Tertiary

Site Description	
Location:	5km West of Newlands Mine adjacent to main road.
Site Description:	Low basalt rise within broader alluvial plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.2125; 147.85173

Vegetation Community Description

Woodland with canopy 15 to 23m

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus orgadophila	D		18	12						4	1	
Carissa ovata	A					1						
Acacia holosericea	A					1						
Lysiphyllum carronii	A					2						
Bothriochloa sp.	D											
Grewia latifolia	A					0.5						
Parthenium hysterophorus	# class 2 LPA											
Pennisetum ciliare	#											
Sarga sp.	A											
Opuntia stricta	# class											

Vegetation Community Description												
	2 LPA											
Heteropogon contortus	A											
Ground Cover	10% Bare Ground			10% leaf litter			80% Grass					
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
	20%			<	*Eucalyptus orgadophila*		4	1			
				<2	*Carissa ovata*		1				
				<2	*Acacia holosericea*					2	
				<2	*Lysiphyllum carronii*						
				<2	*Bothriochloa* sp.						
				<2	*Grewia latifolia*						
				<2	*Parthenium hysterophorus*						
				<2	*Pennisetum ciliare*						
				<2	*Sarga* sp.						
				<2	*Opuntia stricta*						
				<2	*Heteropogon contortus*						

Community Health and Condition	
Overall Health:	Moderate– Strata dominated by native species although heavily fragmented on margins with incursion of exotic ground cover.
Potential EVNT Flora Species Habitat:	Potential for *Dichanthium queenslandicum* (Vulnerable NCA, Vulnerable EPBC)
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* *Parthenium hysterophorus* *Pennisetum ciliare* (buffel grass)
Weed Cover (%):	10%
Disturbance:	Minor dieback of canopy with heavy fragmentation of community on margins
Disturbance Cover (%):	-

Topography and Landform	
Landform Situation:	Basalt rise within broad erosional valley
Altitude:	320m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between laterite scarps
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 15
Date / Time:	17 / 10 / 2010; 1.30 pm

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland and sparse woodland (T 16)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	No Concern at Present
DERM Mapped as:	11.4.9/11.5.15 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Tertiary

Site Description	
Location:	5km West of Newlands Mine adjacent to main road.
Site Description:	Low basalt rise within broader alluvial plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.2125; 147.85173

Vegetation Community Description

Woodland with canopy 15 to 23m

Dominant Species (50 m x 10 m area)

Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Eucalyptus orgadophila	D		18	12						4	1	
Carissa ovata	A					1						
Acacia holosericea	A					1						
Lysiphyllum carronii	A					2						
Bothriochloa sp.	D											
Grewia latifolia	A					0.5						
Parthenium hysterophorus	# class 2 LPA											
Pennisetum ciliare	#											
Sarga sp.	A											
Opuntia stricta	# class											

Vegetation Community Description												
	2 LPA											
Heteropogon contortus	A											
Ground Cover	10% Bare Ground			10% leaf litter			80% Grass					
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
	20%			<	*Eucalyptus orgadophila*		4	1			
				<2	*Carissa ovata*		1				
				<2	*Acacia holosericea*					2	
				<2	*Lysiphyllum carronii*						
				<2	*Bothriochloa* sp.						
				<2	*Grewia latifolia*						
				<2	*Parthenium hysterophorus*						
				<2	*Pennisetum ciliare*						
				<2	*Sarga* sp.						
				<2	*Opuntia stricta*						
				<2	*Heteropogon contortus*						

Community Health and Condition	
Overall Health:	Moderate– Strata dominated by native species although heavily fragmented on margins with incursion of exotic ground cover.
Potential EVNT Flora Species Habitat:	Potential for *Dichanthium queenslandicum* (Vulnerable NCA, Vulnerable EPBC)
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* *Parthenium hysterophorus* *Pennisetum ciliare* (buffel grass)
Weed Cover (%):	10%
Disturbance:	Minor dieback of canopy with heavy fragmentation of community on margins
Disturbance Cover (%):	-

Topography and Landform	
Landform Situation:	Basalt rise within broad erosional valley
Altitude:	320 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between laterite scarps
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 16
Date / Time:	17 / 10 / 2010; 1.30 pm

VEGETATION SURVEY
***Acacia harpophylla* low open forest and woodland (Q 72)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.9
EPBC Status:	Endangered
VMA Status:	Endangered
EPA Status:	Endangered
DNRW Mapped as:	11.8.13
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.7km WSW of Newlands Mine
Site Description:	Clay plain on margins of broader Cainozoic rise
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.28826; 147.82805

Vegetation Community Description												
Low open forest with canopy from 6- 10m. PCC of 40%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 5m (4 –8m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Acacia harpophylla	D		8							10		
Terminalia oblongata	A					5						
Eucalyptus cambageana	A	12										
Bothriochloa pertusa#	D							0.5				
Carissa ovata	A						1					
Paspalidium caespitosum	C							0.5				
Salsola kali	A							0.5				

Vegetation Community Description												
Pennisetum ciliaris#	C							0.5				
Sporobolus caroli	A							05				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate. Original canopy is partially cleared and habitat comprises mixed regrowth and original canopy trees. Ground cover dominated by exotic species
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Bothriochloa pertusa*, *Pennisetum ciliare* (pasture grasses)
Weed Cover (%):	60% ground cover
Disturbance:	Regrowth from total clearing
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Clay plain
Altitude:	292m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat to Gently Inclined (<3%)
Erosional Landform Pattern:	Clay plain – eroded surface of Cainozoic clay rise
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Clay loam
Geology:	Cainozoic clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 72
Date / Time:	6 / 03 / 2011; 1.30 pm

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (Q74)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.9
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.13
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7.86 km SW West of Newlands Mine
Site Description:	Narrow flood channel on broad watercourse. Fragmented grazing land
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.29355; 147.82976

Vegetation Community Description												
Low open forest with canopy from 6– 10m. PCC of 40%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Acacia harpophylla	D		9			5						
Eucalyptus cambageana	A	11										
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition

Overall Health:	Moderate. Disturbed habitat with dead emergent canopy trees. Regrowth from partial clearing.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	Not recorded
Weed Cover (%):	Not recorded
Disturbance:	Disturbance to original canopy and occasional dead remnant trees
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Narrow flood plain in broader clay plain.
Altitude:	288 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Cainozoic Clay Plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 74
Date / Time:	6 / 03 / 2011; 1.30 pm

VEGETATION SURVEY

***Eucalyptus cambageana* + *Acacia harpophylla* woodland (Q 81)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.8
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.4.9 / 11.5.3
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	9.6km SSW West of Newlands Mine
Site Description:	Tract of intact remnant vegetation surrounding by heavily fragmented grazing land.
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.34462; 147.85583

Vegetation Community Description												
Woodland to 18 – 24m. PCC of 30%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus cambageana	D		21	12						5		
Brachychiton rupestris	A			14							1	
Acacia harpophylla	A			12							1	
Psydrax attenuata	A					8	3					
Erythroxylum australe	A					5	2					
Ehretia membranifolia	A					5	3					
Alphitonia excelsa	A					7						
Hovea sp.	A						3					
Carissa ovata							1.5					

Vegetation Community Description												
Eragrostis sp.								0.5				
Paspalidium caespitosum	A							0.5				
Aristida sp.	A							0.5				
Pennisetum ciliare#	D							0.5				
Harrisia martini##	A							0.5				
Cyperus sp.	A							0.5				
Urochloa mosambicensis#	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Good to moderate. Intact canopy with incursion of exotic species into ground covers
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (Class 2) *Pennisetum ciliare* (pasture grass),
Weed Cover (%):	Up to 60% of ground cover occupied by buffel grass.
Disturbance:	Partial disturbance to canopy
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Strongly hummocked clay plain
Altitude:	306 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Residual clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Clay
Geology:	Cainozoic clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 81
Date / Time:	7 / 03 / 2011; 8.00 am

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (S 82)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	11.4.9
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.4.9 / 11.5.3
Width of RE:	Not linear
Survey Level:	Secondary

Site Description	
Location:	9.7 km SSW West of Newlands Mine
Site Description:	Intact tract of remnant vegetation
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.34617; 147.8538

Vegetation Community Description												
Low open forest with canopy from 11 – 14m. PCC of 56%												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 16m (13 – 18m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Acacia harpophylla	D		12			5				9		
Eucalyptus cambageana	A		13									
Terminalia oblongifolia	A					8						
Paspalidium caespitosum	C							0.5				
Enchylaena tomentosa	A							0.5				
Pennisetum ciliare	C							0.5				
Solanum ellipticum	A							0.5				
Panicum effusum	A							0.5				
Cyperus gracilis	A							0.5				

Vegetation Community Description												
Sida sp. (Aramac E.J. Thompson+JER 192)	A							0.5				
Carissa ovata	A						1					
Eremophila mitchellii	A					5						
Casuarina cristata	A			8								
Megathyrsus maximus var. pubiglume	A							1				
Aristida sp.	A							0.5				
Capparis lasiantha	A						1					
Harrisia martini##	A							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					Species	Stem Count(500m²)					
E	T1	T2	T3	S1		E	T1	T2	T3	S1	S2
	46				*Acacia harpophylla*		26				
	5			<	*Eucalyptus Cambageana*		1				

Cover % (Ground)	
Paspalidium caespitosum	21
Leaf litter	33
Bare Ground	20
brigalow *(seedlings)*	2
Enchylaena tomentosa	2
Pennisetum ciliare	16
Solanum ellipticum	<2
Panicum effusum	<2
Cyperus gracilis	<1
Sida sp.	<1

Community Health and Condition	
Overall Health:	Good condition. Canopy intact. Some incursion of exotic species into ground cover.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Harrisia martini* (class 2), *Pennisetum ciliare*
Weed Cover (%):	
Disturbance:	Minimal disturbance to original canopy.
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Hummocked clay plain
Altitude:	306 m
Relief:	Very low
Slope:	Flat
Slope Class:	Flat
Erosional Landform Pattern:	Clay plain
Soils:	Vertosol
Soil Colour:	Grey-brown
Soil Texture:	Heavy clay loam
Geology:	Cainozoic clay plain.

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	S 82
Date / Time:	7 / 03 / 2011; 9.30 am

VEGETATION SURVEY

***Eucalyptus populnea* woodland on Cainozoic clay plain (T 83)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.4.2
EPBC Status:	NA
VM Status:	Of concern
BD Status:	Of concern
DERM Mapped as:	11.4.9/11.5.3
Width of RE:	Not linear
Survey Level:	Tertiary

Site Description	
Location:	9.7km SSW of Newlands Mine
Site Description:	Woodland on gently sloping plain
Orientation of Transect:	270
Datum:	GDA94
Latitude / Longitude:	-21.3462; 147.85083

Vegetation Community Description												
Woodland with canopy 15 to 20m												
Dominant Species (50 m x 10 m area)												
Botanical Species	Status*	Average Height (m) 14 (13 – 19m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	S1
Eucalyptus populnea	D		17	11						5		
Ventilago viminalis	A			11		5					3	
Psydrax attenuata	A					5	1.5					
Eremophila mitchellii	A					7						
Erythroxylum australe	A					3						
Alstonia constricta	A					3						
Urochloa mosambicensis#	A							0.5				
Pennisetum ciliare	A							0.5				
Sida sp.	A							0.5				

Vegetation Community Description												
Eragrostis sp.	A							0.5				
Convolvulaceae sp.	A							0.5				
Bothriochloa pertusa#	D							0.5				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Good. Minor canopy disturbance and minor incursion of exotic species into ground cover.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Bothriochloa pertusa*. *Pennisetum ciliare* (pasture grasses)
Weed Cover (%):	25% (Ground)
Disturbance:	Minor canopy disturbance
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Loamy soils over clay.
Altitude:	306m
Relief:	Very low
Slope:	Flat to gently inclined
Slope Class:	Flat to gently inclined (1 – 3%)
Erosional Landform Pattern:	Clay plain
Soils:	Dermosol
Soil Colour:	Grey-brown
Soil Texture:	Clay loam
Geology:	Incised Cainozoic clay plain

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	T 83
Date / Time:	7 / 03 / 2012; 11.00 am

RE 11.5.16

VEGETATION SURVEY

Brigalow (*Acacia harpophllya*) Woodland on colluvial wash (T 5)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.5.16
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.4.8/11.5.15
Width of RE:	Not linear
Survey Level:	Tertiary

Site Description	
Location:	4km West of Newlands Mine
Site Description:	Erosional valley with colluvial/alluvial clay and gravel soils
Orientation of Transect:	310
Datum:	GDA94
Latitude / Longitude:	-21.22422; 146.85097

Vegetation Community Description												
Low woodland/ open forest to shrubland (6-10m height)												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		8							13		
Terminalia oblongata	A					6						
Alectryon diversifolius	A					1.5						
Capparis arborea	A						1					
Carissa ovata	A						1					
Sida sp.	A							0.5				
Aristida sp.	D							0.5				
Pennisetum ciliare	A							0.5				
Parthenium hysterophorus	A							0.25				
60% Grass (Aristida)	20% Leaf litter	20% Bare Ground										
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
<5	60%			<2	*Terminalia oblongata*		81	8			
					Alectryon diversifolius		3				
					Capparis arborea					2	
					Carissa ovata						7
					Sida sp.						
					Aristida sp.						
					Pennisetum ciliare						
					Parthenium hysterophorus						

Community Health and Condition	
Overall Health:	Poor – Regrowth from past clearing (>15yrs)
Potential EVNT Flora Species Habitat:	*Limited*
EVNT Flora Species Recorded:	No
Weed Species:	*Parthenium hysterophorus* *Pennisetum ciliare* (pasture grass) *Opuntia stricta*
Weed Cover (%):	< 2
Disturbance:	20% Ground cover comprising of buffel with minor cover of other exotic species
Disturbance Cover (%):	Entire community has been previously disturbed

Topography and Landform	
Landform Situation:	Erosional valley between laterite mesas
Altitude:	314m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Silt/ gravel and clay with minor gilgai development
Soil Colour:	Red-brown
Soil Texture:	Silty clay loam
Geology:	Colluvial/ alluvial wash derived from eroding laterite scarps

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 5
Date / Time:	16 / 10 / 2010; 4.30 pm

VEGETATION SURVEY
Brigalow (*Acacia harpophylla*) woodland on colluvial plain (T 19)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.5.16
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.4.8/11.5.15
Width of RE:	Not linear
Survey Level:	Tertiary

Site Description	
Location:	3km West of Newlands Mine
Site Description:	Erosional valley with colluvial/alluvial clay and gravel soils
Orientation of Transect:	270
Datum:	GDA94
Latitude / Longitude:	-21.22067; 147.8670

Vegetation Community Description												
Open forest												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		13			1.5				15		
Lysiphyllum carronii	A					1.5					3	
Erythroxylon australe	A					1.5						
Alectryon diversifolius	A					1.5						
Ehretia grahamii	A					1.5						
Eremophila mitchellii	A					1.5						
Bursaria spinosa	A					1.5						
Carissa ovata	A					1.5						
Parthenium hysterophorus	#					0.25						
Poaceae spp	A					0.25						
Ground Cover	30% Bare Ground			20% Leaf Litter					50% Grass (*Aristida* sp.)			

Vegetation Community Description
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot

Cover % PCC					Species	Stem Count(500m²)					
E	T1	T2	T3	S1		E	T1	T2	T3	S1	S2
<5	60%			<2	*Acacia harpophylla*		64	8			
				<2	*Lysiphyllum carronii*					2	
				<2	*Erythroxylon australe*					7	
				<2	*Alectryon diversifolius*					10	
				<2	*Ehretia grahamii*						
				<2	*Eremophila mitchellii*					3	
				<2	*Grevillea parallela*					1	
				<2	*Carissa ovata*					7	
				<2	*Bursaria spinosa*					1	

Community Health and Condition	
Overall Health:	Moderate– Evidence of prior physical disturbance (>15yrs)
Potential EVNT Flora Species Habitat:	Limited
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Eriocereus martinii* (outside plot) *Pennisetum ciliare* (pasture grass) *Parthenium hysterophorus*
Weed Cover (%):	< 5%
Disturbance:	Minor incursion of exotic species into ground covers. Evidence of prior physical disturbance
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Erosional valley between laterite mesas
Altitude:	290 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Silt/ gravel and clay with minor gilgai development
Soil Colour:	Red-brown
Soil Texture:	Silty clay loam
Geology:	Colluvial/alluvial wash derived from eroding laterite scarps

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 19
Date / Time:	17 / 10 / 2010; 4.30 pm

ATTACHMENT 2 – NATURAL GRASSLANDS SITE ASSESSMENT SHEETS

RE 11.8.11

VEGETATION SURVEY
Native Grasslands on basalt (S 22)

Regional Ecosystem Profile	
Regional Ecosystem Type:	Non- remnant
EPBC Status:	n/a
VMA Status:	n/a
EPA Status:	n/a
DNRW Mapped as:	11.8.11/11.8.5/ 11.8.13
Width of RE:	n / a
Survey Level:	Secondary

Site Description	
Location:	4km west of Byerwen Station
Site Description:	Raised basalt plain
Orientation of Transect:	360
Datum:	GDA94
Latitude / Longitude:	-21.08827; 147.8913

Vegetation Community Description												
Grassland with emergent shrubs and trees												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Corymbia erythrophloia	A	5						0.5				
Planchonia careya	A	7						0.5				
Bothriochloa pertusa.	D							0.5				
Sida sp.	A							0.5				
Heteropogon contortus	A							1.5				
Opuntia sp.	#							0.5				
Indigofera pratensis	A							0.5				
Indigofera linnaei	A							0.5				
Hybanthus stellarioides	A							0.5				
Crotalaria montana	A							0.5				
Glycine tomentella	A							0.5				

Vegetation Community Description												
Eriachne sp.	A							0.5				
Bursaria incana	A							0.5				
Sida sp.	A							0.5				
Rostellularia adscendens	A							0.5				
Ground Cover	90% Grass			5% Leaf Litter					5% Rock			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover %	E	G
Corymbia erythrophloia	5	
Planchonia careya	<2	
Bothriochloa pertusa.		90
Sida sp.		5
Heteropogon contortus		3
Planchonia careya		<2
Opuntia sp.		<2
Indigofera pratensis		<2
Indigofera linnaei		<2
Hybanthus stellarioides		<2
Crotalaria montana		<2
Glycine tomentella		<2
Eriachne obtusa		<2
Bursaria incana		<2

Community Health and Condition	
Overall Health:	Excellent - Lightly grazed with limited incursion of exotic species.
Potential EVNT Flora Species Habitat:	Potential habitat *for Dicanthium queenslandicum, Digitaria porrecta*
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (Class 2 LPA)
Weed Cover (%):	< 1%
Disturbance:	Minor impacts from light grazing
Disturbance Cover (%):	0

Topography and Landform	
Landform Situation:	Raised basalt plain
Altitude:	340 m
Relief:	Very low
Slope Class:	Gently Inclined (5 %)
Erosional Landform Pattern:	Underlying stratigraphic unit below Tertiary age cap rock
Soil Colour:	Grey brown
Soil Texture:	Clay with Gilgai
Geology:	Weathered basalt plain

Survey Details	
Recorder / s:	Wayne Harris
Field Site Number:	S 22
Date / Time:	18 / 10 / 2010; 11.00 am

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland and sparse woodland (T 26)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	No Concern at Present
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Tertiary

Site Description	
Location:	8km West of Byerwen Station
Site Description:	Low basalt rise within broader alluvial plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.0884; 147.8768

Vegetation Community Description								
Structural Description	Open woodland							
Canopy Height	15 -23m							
Canopy Cover (%)	20%							
Botanical Species	**Status***	**Average Height (m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Eucalyptus orgadophila	D		18	12				
Corymbia erythrophloia	A			10				
Cassia brewsteri	A					1		
Bothriochloa sp.	A					1		
Sida sp.	A					2		
90% Grass	05% Leaf litter			5% Bare Ground				

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
	15%			<	*Eucalyptus orgadophila*		4	1			
				<2	*Corymbia erythrophloia*		1				

				<2	*Cassia brewsteri*					2	
				<2	*Bothriochloa* sp.						
				<2	*Sida* sp.						

Community Health and Condition	
Overall Health:	Excellent – Minor disturbance from grazing
Potential EVNT Flora Species Habitat:	Potential for *Dichanthium queenslandicum* (Vulnerable NCA, Vulnerable EPBC)
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Parthenium hysterophorus* (outside plot)
Weed Cover (%):	10%
Disturbance:	Minor grazing pressure
Disturbance Cover (%):	-

Topography and Landform	
Landform Situation:	Basalt rise within broad erosional valley
Altitude:	320m
Relief:	Very low
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Basalt plain amongst broader ironstone mesa dominated landscape
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	T 26
Date / Time:	17 / 10 / 2010; 1.40 pm

VEGETATION SURVEY
Native Grasslands on basalt (Q 27)

Regional Ecosystem Profile	
Regional Ecosystem Type:	Non-remnant
EPBC Status:	n/a
VM Status:	n/a
BD Status:	n/a
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13
Width of RE:	n / a
Survey Level:	Quaternary

Site Description	
Location:	4km west of Byerwen Station
Site Description:	Raised basalt plain
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.0873; 147.8807

Vegetation Community Description												
Grassland with emergent shrubs and trees												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Corymbia erythrophloia	A	5						0.5				
Planchonia careya	A	7						0.5				
Bothriochloa pertusa.	D							0.5				
Sida sp.	A							0.5				
Heteropogon contortus	A							1.5				
Indigofera pratensis	A							0.5				
Sida sp.	A							0.5				
Ground Cover	90% Grass			5% Leaf Litter					5% Rock			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Community Health and Condition	
Overall Health:	Moderate - Lightly grazed with limited incursion of exotic species.
Potential EVNT Flora Species Habitat:	Potential habitat *for Dichanthium queenslandicum, Digitaria porrecta*
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (Class 2 LPA)
Weed Cover (%):	< 1%
Disturbance:	Minor impacts from light grazing
Disturbance Cover (%):	0

Topography and Landform	
Landform Situation:	Raised basalt plain
Altitude:	340m
Relief:	Very low
Slope Class:	Gently Inclined (5 %)
Erosional Landform Pattern:	Underlying stratigraphic unit below Tertiary age cap rock
Soil Colour:	Grey brown
Soil Texture:	Clay with Gilgai
Geology:	Weathered basalt plain

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 27
Date / Time:	18 / 10 / 2010; 1.00 pm

VEGETATION SURVEY
***Corymbia erythrophloia* dominant low sparse woodland (Q 28)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.4
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	No Concern at Present
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13 (EPBC Endangered)
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	7km west of Byerwen Station
Site Description:	Footslope of basalt interbed
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.0843; 147.8940

Vegetation Community Description								
Structural Description	Open woodland							
Canopy Height	10-15m							
Canopy Cover (%)	50%							
Botanical Species	**Status***	**Structural Representation (average height m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Corymbia erythrophloia	D		12			3		
Corymbia dallachiana	A		12			3		
Eucalyptus orgadophila	A		12					
Planchonia careya	A					3		
Bursaria tenuifolia	A					2		
Bothriochloa sp.	D							0.5
Ground Cover	90% Grass			*5% Bare Ground*		5% Leaf litter		

Community Health and Condition	
Overall Health:	Excellent – limited disturbance and weed invasion

Potential EVNT Flora Species Habitat:	*Dichanthium queenslandicum*
EVNT Flora Species Recorded:	No
Weed Species:	*Parthenium hysterophorus* (outside plot)
Weed Cover (%):	0
Disturbance:	No obvious disturbance – minor grazing
Disturbance Cover (%):	unknown

Topography and Landform	
Landform Situation:	Basalt rubble slope
Altitude:	320m
Aspect	east
Relief:	Low
Slope Class:	Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Basalt plain amongst broader ironstone dominated landscape
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 28
Date / Time:	18/ 10 / 2010; 12.50 pm

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (Q 29)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13 (EPBC Endangered)
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	5km west of Byerwen Station
Site Description:	Basaltic terrain near powerline
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.08369; 147.8958

Vegetation Community Description								
Structural Description	Low open forest							
Canopy Height	14-18m							
Canopy Cover (%)	50%							
Botanical Species	**Status ***	**Structural Representation (average height m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Acacia harpophylla	D		10					
Lysiphyllum carronii	A					2		
Carissa ovata	A					1.5		
Ground Cover	90% Grass			*5% Bare Ground*		5% Leaf litter		

Community Health and Condition	
Overall Health:	Moderate – Community has been impacted by grazing and prior mechanical disturbance
Potential EVNT Flora Species Habitat:	Unlikely
EVNT Flora Species Recorded:	No

Weed Species:	*Parthenium hysterophorus*
Weed Cover (%):	<1%
Disturbance:	Grazing – prior mechanical disturbance
Disturbance Cover (%):	unknown

Topography and Landform	
Landform Situation:	Basalt hills
Altitude:	277m
Aspect	-ENE
Slope Class:	Gently inclined – 5%
Soils:	Rocky
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 29
Date / Time:	18/ 10 / 2010; 1.50. pm

VEGETATION SURVEY
***Corymbia erythrophloia* dominant woodland on basalt (Q 30)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.4
EPBC Status:	n / a
VM Status:	Least Concern
BD Status:	No Concern at Present
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13 (EPBC Endangered dominant)
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	5.5km WSW of Byerwen Station
Site Description:	Basaltic terrain near powerline
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.1093; 147.9036

Vegetation Community Description								
Structural Description	Open woodland							
Canopy Height	10-15m							
Canopy Cover (%)	50%							
Botanical Species	**Status ***	**Structural Representation (average height m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Corymbia erythrophloia	D		18	12				
Eucalyptus crebra	A		18					
Planchonia careya	A					3		
Bursaria spinosa	A							
Themeda triandra	D							0.5
Heteropogon triticeus	D							1.5
Pogonolobus reticulatus	A					1.5		

Vegetation Community Description			
Ground Cover	70% Grass	20% *Basalt talus*	10% Leaf litter

Community Health and Condition	
Overall Health:	Excellent – limited disturbance and weed invasion
Potential EVNT Flora Species Habitat:	Limited potential
EVNT Flora Species Recorded:	Nil
Weed Species:	Nil
Weed Cover (%):	0
Disturbance:	No obvious disturbance
Disturbance Cover (%):	0

Topography and Landform	
Landform Situation:	Basalt rubble slope
Altitude:	264m
Aspect	North -East
Relief:	Moderate
Slope Class:	Gently Inclined (10 %)
Erosional Landform Pattern:	Exposed basalt interbed
Soils:	Rudosol
Soil Colour:	Red-brown
Soil Texture:	Rock mixed with loamy clay
Geology:	Basalt talus

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 30
Date / Time:	18/ 10 / 2010; 2.00 pm

VEGETATION SURVEY
Native grassland on basalt (Q 98)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.11
EPBC Status:	Endangered (Grassland) ecological community)
VM Status:	Of Concern
BD Status:	Of Concern
DERM Mapped as:	11.8.11/11.8.5
Width of RE:	NA
Survey Level:	Quaternary

Site Description	
Location:	8km west of SSE of Newlands Mine
Site Description:	Raised basalt plain
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.3297; 147.9198

Vegetation Community Description												
Grassland with emergent eucalypts (<5% Cover)												
Dominant Species (50 m x 20 m area)												
Botanical Species	Status*	Average Height (m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Eucalyptus orgadophila	A	18m										
Paspalidium sp. (*larcomianum/laevinode*)	D							0.75	Not applicable			
Panicum queenslandicum	C							0.75				
Aristida leptopoda	C							0.75				
Desmodium sp.	A							0.75				
Iseilema membranaceum	A							0.5				

Vegetation Community Description												
Neptunia sp.	A							0.75				
Bothriochloa pertusa#.	A							0.75				
Verbena macrostachya	A							0.75				
Parthenium hysterophorus#	A							0.5				
Flinders poppy.(Pimelea haemostachya	A							0.5				
Conyza bonariensis	A							0.5				
Cyperus sp.	A							0.5				
Galactic tenuiflora	A							0.5				
Dichanthium sericeum subsp. *sericeum*	A							0.5				
Hybanthus stellarioides	A							0.5				
Ground Cover	80% Grass and Herb			10% Leaf Litter					10% Bare Ground			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Species	Cover % (Estimated)
Paspalidium sp. (*larcomianum/laevinode*)	20
Panicum queenslandicum	10
Aristida leptopoda	5
Desmodium sp.	<1
Iseilema membranaceum	5
Oxalis radicosa	<1
Bothriochloa pertusa#.	15
Melinis minutiflora#	5
Verbena macrostachya	<1
Abelmoschus ficulneus	<1
Sida trichopoda	<1
Parthenium hysterophorus#	5
Flinders poppy.(Pimelea haemostachya)	<1
Leaf Litter	10
Bare Ground	10
Totals / 100m2 Plot	100

Community Health and Condition	
Overall Health:	Good to Moderate - Lightly grazed with minor incursion of exotic species into ground covers.
Potential EVR Flora Species Habitat:	Potential habitat for *Dichanthium queenslandicum*, *Digitaria porrecta*
EVR Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (Class 2 LPA)
Weed Cover (%):	< 25%
Disturbance:	Minor impacts from light grazing. Edge effects along access track with a 10m wide strip of grassland dominated by *Bothriochloa pertusa*
Disturbance Cover (%):	0

Topography and Landform	
Landform Situation:	Raised basalt plain
Altitude:	320 m
Relief:	Very low
Slope Class:	Very Gently Inclined (1 - 3 %)
Erosional Landform Pattern:	Underlying stratigraphic unit below Tertiary age cap rock
Soil Colour:	Grey brown
Soil Texture:	Clay with Gilgai
Geology:	Weathered basalt plain

Survey Details	
Recorder / s:	David Stanton / Stephen Catchpoole
Field Site Number:	Q 98

Date / Time:	9 / 03 / 2012; 11.30 am

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland (droughted) on basalt (Q 99)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	NA
VM Status:	Least Concern
BD Status:	Endangered
DERM Mapped as:	11.8.11/11.8. 5 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Quaternary

Site Description	
Location:	8.2km SSE of Newlands Mine
Site Description:	Low basalt rise above broader clay plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.3307; 147.9144

Structural Description		Open woodland						
Canopy Height		15 -23m						
Canopy Cover (%)		20% (90% of the original canopy cover has been killed by drought)						
Botanical Species		Status*	Average Height (m)					
			E	T1	T2	T3	S1	S2	G
Eucalyptus orgadophila (original canopy droughted)				18 (droughted)	12				
Corymbia erythrophloia					12				
Bothriochloa pertusa#.		D							0.25
Parthenium hysterophorus##		A							0.25
Dichanthium sericeum		A							0.25
Paspalidium globoideum		A							
80% Grass (Bothriochloa pertusa)	10% Leaf litter	10% Bare Ground							

Community Health and Condition	
Overall Health:	Poor – Drought has killed original canopy trees and ground cover is dominated by exotic species. Assigned remnant status due to senescence caused by natural process.
Potential EVR Flora Species Habitat:	Limited
EVR Flora Species Recorded:	No
Weed Species:	*Bothriochloa pertusa* *Parthenium hysterophorus*
Weed Cover (%):	80% dominated by *Bothriochloa pertusa*
Disturbance:	Canopy droughting and degradation of ground cover.
Disturbance Cover (%):	80% cover of exotic species in ground cover

Topography and Landform	
Landform Situation:	Basalt rise within broad erosional valley
Altitude:	320 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 99
Date / Time:	9 / 3 / 2012; 11.30 am

VEGETATION SURVEY
***Eucalyptus orgadophila* woodland on basalt (Q 100)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.5
EPBC Status:	NA
VM Status:	Least Concern
BD Status:	Endangered
DERM Mapped as:	11.8.11/11.8. 5 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Quaternary

Site Description	
Location:	6 km SSE of Newlands Mine
Site Description:	Low basalt rise above broader clay plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.3188; 147.9124

Structural Description	Open woodland							
Canopy Height	15 -20m							
Canopy Cover (%)	20%							
Botanical Species	Status*	Average Height (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus orgadophila (original canopy droughted)	D		18	12				
Corymbia erythrophloia	A			10				
Dichanthium sericeum	C							0.75
Paspalidium globoideum	C							0.75
Panicum queenslandicum	C							0.75
Bothriochloa pertusa#.	C							0.75
Parthenium hysterophorus##	A							0.75
Melinis repens	A							0.75
Paspalidium globoideum	A							0.75
80% grass and herb / 10% Leaf litter	10% Bare Ground							

Community Health and Condition	
Overall Health:	Moderate – Drought has killed a portion of the original canopy trees and ground cover partially occupied by exotic species.
Potential EVR Flora Species Habitat:	*Dichanthium queenslandicum*, *Digitaria porrecta*
EVR Flora Species Recorded:	No
Weed Species:	*Bothriochloa pertusa* *Parthenium hysterophorus*
Weed Cover (%):	20% ground cover occupied by Bothriochloa pertusa
Disturbance:	Canopy droughting and degradation of ground cover.
Disturbance Cover (%):	Not recorded

Topography and Landform	
Landform Situation:	Basalt rise within broader clay landscape
Altitude:	320 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Located within erosional valley between scarps
Soils:	Heavy clay (gilgai) with basalt corestone
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 100
Date / Time:	9 / 3 / 2012; 12.00 am

VEGETATION SURVEY
Exotic grassland on basalt (Q 101)

Regional Ecosystem Profile	
Regional Ecosystem Type:	Non-remnant
EPBC Status:	Non-remnant
VM Status:	Non-remnant
BD Status:	Non-remnant
DERM Mapped as:	11.8.11/11.8. 5 (EPBC Endangered)
Width of RE:	Not linear
Survey Level	Quaternary

Site Description	
Location:	6.2 km SSE of Newlands Mine
Site Description:	Low basalt rise above broader clay plain
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.31748; 147.9169

Structural Description		Exotic grassland						
Botanical Species		Status*	Average Height (m)					
			E	T1	T2	T3	S1	S2	G
Pennisetum ciliare		D							1
80% grass and herb	10% Leaf litter	10% Bare Ground						

Community Health and Condition	
Overall Health:	Poor – 100% of ground cover occupied by exotic species
Potential EVR Flora Species Habitat:	*Dichanthium queenslandicum*, *Digitaria porrecta*
EVR Flora Species Recorded:	No
Weed Species:	*Pennisetum ciliare*
Weed Cover (%):	80%

Disturbance:	Ploughed buffel paddock
Disturbance Cover (%):	100%

Topography and Landform	
Landform Situation:	Basalt rise within broader clay landscape
Altitude:	320 m
Relief:	Very low
Slope:	Flat
Slope Class:	Very Gently Inclined (1 – 3 %)
Erosional Landform Pattern:	Basalt plain
Soils:	Vertosol derived from basalt.
Soil Colour:	Grey – dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton/ Stephen Catchpoole
Field Site Number:	Q 101
Date / Time:	9 / 3 / 2012; 12.30 pm

VEGETATION SURVEY
Native grassland on basalt (S 102)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.11
EPBC Status:	Endangered (Grassland)
VM Status:	Of Concern
BD Status:	Of Concern
DERM Mapped as:	11.8.11/11.8.5
Width of RE:	NA
Survey Level:	Secondary

Site Description	
Location:	6.4km SSE of Newlands Mine
Site Description:	Raised basalt plain
Orientation of Transect:	80°
Datum:	GDA94
Latitude / Longitude:	-21.3166; 147.9134

Vegetation Community Description												
Grassland												
Dominant Species (50 m x 20 m area)												
Botanical Species	Status*	Average Height (m)							Abundance (m2 / ha)			
		E	T1	T2	T3	S1	S2	G	E	T1	T2	T3
Dichanthium sericeum	C								Not applicable			
Panicum sp. (*larcominanum* or *laevinode*)	C							0.75				
Panicum queenslandicum	C							0.75				
Aristida leptopoda	C							0.75				
Desmodium sp.	C							0.75				
Iseilema	A							0.5				

Vegetation Community Description												
membranaceum												
Oxalis radicosa	A							0.75				
Eriochloa procera	A							0.75				
Neptunia sp.	A							0.75				
Bothriochloa pertusa#.	A							0.75				
Melinis minutiflora	A							0.75				
Verbena macrostachya	A							0.75				
Abelmoschus ficulneus	A							0.75				
Grewia retusifolia												
Sida trichopoda	A							1.5				
Aristida jerichoensis var. *subspinulifera*	A							0.5				
Adriana urticoides var. urticoides	A											
Parthenium hysterophorus#	A							0.5				
Flinders poppy.(Pimelea haemostachya	A							0.5				
Galactic tenuiflora	A							0.5				
Phyllanthus virgatus	A							0.5				
Neptunia gracilis	A							0.5				
Indigofera linnaei	A							0.5				
Hybanthus stellarioides	A							0.5				
Glycine tomentella	A							0.5				
Ground Cover	69% Grass and Herb			15% Leaf Litter					16% Bare Ground			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVR = significant species, # = weed, ## = declared plant O = outside plot												

Species	Cover %	Native Grass Tussocks / 1000m2
Dichanthium sericeum	20	1200
Panicum sp. (*larcominanum* or *laevinode*)	25	100
Panicum queenslandicum	2	200
Aristida leptopoda	10	800
Dichanthium sericeum subsp. *sericeum*	2	100
Desmodium sp.	25	NA
Iseilema membranaceum	2	300
Eriochloa procera	2	100
Bothriochloa pertusa#.	5	NA
Verbena macrostachya	1	NA
Grewia retusifolia	<1	NA
Neptunia gracilis	1	NA
Pennisetum ciliare	2	NA
Parthenium hysterophorus#	2	NA
Totals / 100m2 Plot	100	2800

Community Health and Condition	
Overall Health:	Excellent - Lightly grazed with limited incursion of exotic species.
Potential EVR Flora Species Habitat:	Potential habitat for *Dichanthium queenslandicum*, *Digitaria porrecta*
EVR Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (Class 2 LPA)
Weed Cover (%):	< 5%
Disturbance:	Minor impacts from light grazing. Edge effects along access track with a 1rm wide strip of grassland dominated by *Bothriochloa pertusa* and *Pennisetum ciliare*
Disturbance Cover (%):	5

Topography and Landform

Landform Situation:	Raised basalt plain
Altitude:	320 m
Relief:	Very low
Slope Class:	Very Gently Inclined (1 = 3 %)
Erosional Landform Pattern:	Underlying stratigraphic unit below Tertiary age cap rock
Soil Colour:	Grey brown
Soil Texture:	Clay with Gilgai
Geology:	Weathered basalt plain

Survey Details	
Recorder / s:	David Stanton / Stephen Catchpoole
Field Site Number:	S 102
Date / Time:	9 / 03 / 2012; 12.30 am

ATTACHMENT 3 – SEMI-EVERGREEN VINE THICKET SITE ASSESSMENT SHEETS

RE 11.8.13

VEGETATION SURVEY
***Acacia harpophylla* dominant woodland (Q 29)**

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.11/11.8.5/ 11.8.13 (EPBC Endangered)
Width of RE:	Not linear
Survey Level:	Quaternary

Site Description	
Location:	5km west of Byerwen Station
Site Description:	Basaltic terrain near powerline
Orientation of Transect:	No Transect
Datum:	GDA94
Latitude / Longitude:	-21.08369; 147.8958

Vegetation Community Description								
Structural Description	Low open forest							
Canopy Height	14-18m							
Canopy Cover (%)	50%							
Botanical Species	**Status ***	**Structural Representation (average height m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Acacia harpophylla	D		10					
Lysiphyllum carronii	A					2		
Carissa ovata	A					1.5		
Ground Cover	90% Grass			*5% Bare Ground*		5% Leaf litter		

Community Health and Condition	
Overall Health:	Moderate – Community has been impacted by grazing and prior mechanical disturbance
Potential EVNT Flora Species Habitat:	Unlikely
EVNT Flora Species Recorded:	No

Weed Species:	*Parthenium hysterophorus*
Weed Cover (%):	<1%
Disturbance:	Grazing – prior mechanical disturbance
Disturbance Cover (%):	unknown

Topography and Landform	
Landform Situation:	Basalt hills
Altitude:	277m
Aspect	-ENE
Slope Class:	Gently inclined – 5%
Soils:	Rocky
Soil Colour:	Grey - dark
Soil Texture:	Clay loam
Geology:	Clay soil derived insitu from basalt

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 29
Date / Time:	18/ 10 / 2010; 1.50. pm

VEGETATION SURVEY
Microphyll Vine Thicket on basalt pile (Q 46)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.5
Width of RE:	< 1ha area in total
Site Level	Quaternary

Site Description	
Location:	11km NW of Newlands Mine
Site Description:	Basalt rock pile protruding above alluvial plain
Orientation of Transect:	No transect
Datum:	GDA94
Latitude / Longitude:	-21.1688; 147.8483

Vegetation Community Description								
Structural Description	Microphyll thicket							
Canopy Height	4-8m							
Canopy Cover (%)	60% (broken by rock rubble)							
Botanical Species	**Status***	**Average Height (m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Diospyros humilis			5					
Brachychiton australis			6					
Croton insularis			5					
Drypetes deplanchei			4					
Alyxia ruscifolia			3			2		
Alectryon connatus			6					
Acalypha eremorum								
Erythroxylon australe			5					
Denhamia oleaster			6					
Trema tomentosa						2		
Carissa ovata						2		0.5
Plectranthus sp.								0.5
Ground Cover:	80% Rock Rubble			10% Plectranthus			10% Leaf litter	

Community Health and Condition	
Overall Health:	Very Good although occurrence is limited in size and surrounded by fragmented vegetation.
Potential EVNT Flora Species Habitat:	*Croton magneticus, Cerbera dumicola*
EVNT Flora Species Recorded:	Nil
Weed Species:	Nil
Weed Cover (%):	Nil
Disturbance:	Nil
Disturbance Cover (%):	0

Topography and Landform	
Landform Situation:	Basalt boulder pile sitting above alluvial plain
Altitude:	283 m
Relief:	Moderate
Slope Class:	Moderately Inclined (10-15%)
Soils:	Rudosol – limited soil development
Soil Colour:	Red-browns
Soil Texture:	Rock rubble
Geology:	Basalt boulder pile

Survey Details	
Recorder / s:	David Stanton
Field Site Number:	Q 46
Date / Time:	19 / 10 / 2010; 2.00 pm

VEGETATION SURVEY
Microphyll Vine Thicket on basalt slope (Q 49)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.13 (EPBC / VMA Endangered).
Width of RE:	Not linear
Site Level	Quaternary

Site Description	
Location:	4.5km SSW of Byerwen, Byerwen Station
Site Description:	South-west facing hillslope above alluvial plain
Orientation of Transect:	270°
Datum:	GDA94
Latitude / Longitude:	-21.1246 147.8880

Vegetation Community Description								
Structural Description	Microphyll vine thicket with emergents							
Canopy Height	3-6m							
Canopy Cover (%)	40%							
Botanical Species	**Status***	**Average Height (m)**						
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**
Croton insularis	A		5					
Gossia bidwillii	A		5					
Pleiogynium timorense	A		5					
Ficus platypoda	A		4					
Bridelia leichhardtii.	A					3		
Melodorum leichhardtii	A					4		
Ricinocarpos ledifolius	A					2		
Ehretia grahamii	A					1		0.5
Breynia oblongifolia	A					2		
Psydrax odorata	A		5					
Lysiphyllum carronii	A							0.2
Phyllanthus sp.	A							
Acalypha eremorum	A							
Erythroxylon australe	A							
Pouteria cotinifolia	A							
Pouteria myrsinoides	A							
Carissa ovata	A							
Alectryon connatus	A							
Bursaria spinosa	A							
Geijera salicifolia	A							
Diospyros humilis	A							
Brachychiton australis (o)	E	16						
Drypetes deplanchei (o)	A							
Notelaea microcarpa	A							
Cissus sp.	A							
Croton insularis	A							
Gossia bidwillii	A							
Pleiogynium timorense	A							
Ficus platypoda	A		4					
Dioscorea transversa	A							
Ground Cover:	*60% Rock Rubble*		20% Aristida		20% Leaf litter			

Community Health and Condition	
Overall Health:	Moderate – some evidence of fire incursion and grazing on footslopes
Potential EVNT Flora Species Habitat:	*Croton magneticus, Cerbera dumicola*
EVNT Flora Species Recorded:	No
Weed Species:	Nil
Weed Cover (%):	Nil
Disturbance:	Nil
Disturbance Cover (%):	Nil

Topography and Landform	
Landform Situation:	Footslope
Altitude:	227m
Relief:	Low
Slope Class:	Moderately Inclined (10-15 %)
Soils:	Rudosol (rocky soils)
Soil Colour:	Red-browns
Soil Texture:	Silty loam mixed with rock rubble
Geology:	Weathered footslope

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	Q 49
Date / Time:	20 / 10 / 2010; 8.00 am

VEGETATION SURVEY
Brigalow (*Acacia harpophylla*) open forest on basalt (T 31)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered (Brigalow ecological community)
VM Status:	Endangered dominant
BD Status:	Endangered
DERM Mapped as:	11.4.8/11.5.15
Width of RE:	Not linear
Survey Level:	Tertiary

Site Description	
Location:	5km SSW of Byerwen, Byerwen Station
Site Description:	Footslope on rocky basalt hillside
Orientation of Transect:	270
Datum:	GDA94
Latitude / Longitude:	-21.1156; 147.9071

Vegetation Community Description												
Open forest												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Acacia harpophylla	D		15				1.5			14	3	
Lysiphyllum carronii	A					5	1.5				3	
Erythroxylum australe	A						1.5					
Acalypha eremorum	A						1.5					
Alectryon diversifolius	A						1.5					
Eremophila mitchellii	A						1.5					
Bursaria spinosa	A						1.5					
Carissa ovata	A						1.5					
Denhamia oleaster	A					6						
Terminalia oblongata	A					6						
Poaceae spp	A						1.5					
Eriocereus martinii	A							0.5				

Vegetation Community Description													
Opuntia stricta								1					
Ground Cover	40% Bare Ground		10% Leaf Litter			40% *Carissa ovata*			10% Grass (Aristida sp.)				
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot													

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**S1**	**S2**	**G**
	50%			<2	*Acacia harpophylla*		31	7			
				<2	*Lysiphyllum carronii*					1	
				<2	*Erythroxylum australe*					3	
				<5	*Acalypha eremorum*					7	
				<5	*Alectryon diversifolius*					2	
				<5	*Eremophila mitchellii*					1	
				<2	*Bursaria spinosa*					3	
				40	*Carissa ovata*					16	
				<2	*Denhamia oleaster*				2		
					Terminalia oblongifolia				5		
					Poaceae spp						
					Eriocereus martinii					5	
					Opuntia stricta					3	

Community Health and Condition	
Overall Health:	Excellent– No evidence of prior physical disturbance and minor invasion of exotic species (>15yrs)
Potential EVNT Flora Species Habitat:	*Cerbera dumicola* *Croton magneticus*
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot) *Eriocereus martinii* (outside plot)
Weed Cover (%):	< 5%
Disturbance:	Minor incursion of exotic species into ground covers. No evidence of prior physical disturbance
Disturbance Cover (%):	Unknown

Topography and Landform	
Landform Situation:	Footslope of basalt hillside
Altitude:	253m
Relief:	Moderate
Slope Class:	Moderately Inclined (5-10 %)
Soils:	Rocky
Soil Colour:	Red-brown
Soil Texture:	Silty clay loam with basalt corestone
Geology:	Basalt scree slope

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 31
Date / Time:	18 / 10 / 2010; 4.30 pm

VEGETATION SURVEY
Microphyll Vine Thicket on basalt slope (T 48)

Regional Ecosystem Profile	
Regional Ecosystem Type:	RE 11.8.13
EPBC Status:	Endangered
VM Status:	Endangered
BD Status:	Endangered
DERM Mapped as:	11.8.13 (EPBC / VMA Endangered).
Width of RE:	Not linear
Site Level	Tertiary

Site Description	
Location:	5km SSW of Byerwen, Byerwen Station
Site Description:	South facing hillslope above alluvial plain
Orientation of Transect:	270°
Datum:	GDA94
Latitude / Longitude:	-21.0700; 147.8120

Vegetation Community Description												
Microphyll vine thicket with canopy (S1) 3 – 6m and emergents to 15m.												
Dominant Species (50 m x 10 m area)												
Botanical Species	**Status***	**Average Height (m)**							**Abundance (m^2 / ha)**			
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**G**	**E**	**T1**	**T2**	**T3**
Croton insularis			5									
Gossia bidwillii			5									
Pleiogynium timorense			6									
Ficus platypoda			5									
Cleistanthus xerophilus			3									
Alectryon diversifolius			3									
Melodorum leichhardtii						2						
Denhamia oleaster			6									
Ricinocarpos ledifolius			3									
Ehretia grahamii			3									
Breynia oblongifolia						2						
Psydrax odorata			4									
Lysiphyllum carronii			3									
Phyllanthus sp.						2						
Acalypha eremorum			4									
Erythroxylon australe			4									
Pouteria cotinifolia			5									
Pouteria myrsinoides			5									
Carissa ovata								0.5				
Alectryon connatus			5									
Bursaria spinosa			4									
Alphitonia excelsa			5									
Geijera salicifolia			5									
Alstonia constricta			4									
Diospyros humilis			5									
Aristida sp								0.2				
Brachychiton australis (o)		15							1			
Opuntia stricta # (o)						3						
Drypetes deplanchei (o)			5									
Maclura cochinchinensis			5									
Owenia acidula			4									
Notelaea microcarpa			5									
Cissus sp.						2						
Ground Cover:	20% Leaf litter				30% Aristida sp.				50% bare ground			
Status: D = dominant, C = Codominant, S = subdominant, A = associate, EVNT = significant species, # = weed, ## = declared plant O = outside plot												

Cover % PCC					**Species**	**Stem Count**(500m²)					
E	**T1**	**T2**	**T3**	**S1**		**E**	**T1**	**T2**	**T3**	**S1**	**S2**
	4				*Croton insularis*		11		2		
	<2				*Gossia bidwillii*		1				
	<2				*Pleiogynium timorense*		1				
	<2				*Ficus rubiginosa*		1				
	<2				*Cleistanthus* sp.		2				
	<2				*Alectryon diversifolius*		3		3		
	<2				*Melodorum leichhardtii*				1		
	<2				*Denhamia oleaster*		2				
	<2				*Ricinocarpos ledifolius*		3		7		
	10				*Ehretia grahamii*		3		4		
	<2				*Breynia oblongifolia*				1		
	<2				*Psydrax odorata*		1				
	<2				*Lysiphyllum carronii*		3				
	<2				*Phyllanthus* sp.				2		
	<2				*Acalypha eremorum*		32		17		
	<2				*Erythroxylon australe*		4				
	10				*Pouteria cotinifolia*		7				
	<2				*Pouteria myrsinoides*		3				

	<2				*Carissa ovata*		2		7		
	<2				*Alectryon connatus*		1				
	4				*Bursaria spinosa*		8		2		
	<2				*Alphitonia excelsa*						
	<2				*Geijera salicifolia*		5				
	10				*Diospyros humilis*		4		2		
<5	<2				*Brachychiton australis* (o)	1					
	<2				*Opuntia stricta # (o)*				1		
	<2				*Drypetes deplanchei (o)*		1				
	<2				*Maclura cochinchinensis*		3				
	<2				*Owenia acidula*		9				
	4				*Notelaea microcarpa*		1				
	<2				*Cissus* sp.				2		

Community Health and Condition	
Overall Health:	Moderate – some evidence of fire incursion and grazing on footslopes
Potential EVNT Flora Species Habitat:	*Croton magneticus, Cerbera dumicola*
EVNT Flora Species Recorded:	No
Weed Species:	*Opuntia stricta* (outside plot)
Weed Cover (%):	< 2
Disturbance:	Minor introduced flora
Disturbance Cover (%):	< 2

Topography and Landform	
Landform Situation:	Footslope
Altitude:	227 m
Relief:	Low
Slope Class:	Moderately Inclined (10-15 %)
Soils:	Rudosol (rocky soils)
Soil Colour:	Red-browns
Soil Texture:	Silty loam mixed with rock rubble
Geology:	Weathered footslope

Survey Details	
Recorder / s:	David Stanton/ Wayne Harris
Field Site Number:	T 48
Date / Time:	20 / 10 / 2010; 8.00 am