


Central North Extension – Jellinbah Coal Mine

Environmental Authority Amendment – Supporting Information

Prepared for:

Jellinbah Group Pty Ltd on behalf of Jellinbah East Joint Venture

September 2015

AustralAsian Resource Consultants

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AARC	AustralAsian Resource Consultants Pty Ltd
AEP	annual exceedance probability
AMD	acid mine drainage
ANC	acid neutralising capacity
CHMP	Cultural Heritage Management Plan
CPP	coal processing plant
DNRM	Department of Natural Resources and Mines
E	Endangered
EA	Environmental Authority
EHP	(Department of) Environment and Heritage Protection
EIS	Environmental Impact Statement
EP	equivalent persons
EP Act	*Environmental Protection Act 1994*
EP Regulation	*Environmental Protection Regulation 2008*
EPP (Air)	*Environmental Protection (Air) Policy 2008*
EPP (Water)	*Environmental Protection (Water) Policy 2009*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
GHG	greenhouse gas
GQAL	good quality agricultural land
ha	hectare(s)
Jellinbah Group	Jellinbah Group Pty Ltd
Jellinbah Mining	Jellinbah Mining Pty Ltd
JV	joint venture
km	kilometre(s)
LC	Least Concern

LP Act	*Land Protection (Pest and Stock Route Management) Act 2002*
MDL	Mineral Development Licence
ML	Mining Lease
MLA	Mining Lease Application
MSES	Matter of State Environmental Significance
Mt	million tonnes
Mtpa	million tonnes per annum
NAF	non acid forming
NAPP	net acid producing potential
NC Act	*Nature Conservation Act 1992*
NL	Not Listed
NT	Near Threatened
PAF	potentially acid forming
PAWHC	plant available water holding capacity
PCI	pulverised coal injection
$PM_{2.5}$	particulate matter with an aerodynamic diameter of less than 2.5 µm
PM_{10}	particulate matter with an aerodynamic diameter of less than 10 µm
RE	regional ecosystem
ROM	run of mine
SCA	Strategic Cropping Area
SMU	soil management unit
SWMP	Site Water Management Plan
TSP	total suspended particulates
V	Vulnerable
VM Act	*Vegetation Management Act 1999*
WQO	Water Quality Objective
µg	microgram

µm	micrometre

1.0 INTRODUCTION

AustralAsian Resource Consultants Pty Ltd (AARC) was commissioned by Jellinbah Group Pty Ltd (Jellinbah Group), on behalf of Jellinbah East Joint Venture (JV), to prepare an Environmental Authority (EA) Amendment Application for the proposed Central North Extension (the Project[1]). This report provides the Supporting Information required for submission with the EA Amendment Application.

This Supporting Information document describes the proposed Project, identifies the environmental values of the Project site and potential impacts to these values, and outlines management strategies to mitigate or minimise these impacts.

1.1 JELLINBAH COAL MINE

The Jellinbah Coal Mine is located in the Bowen Basin in Central Queensland. The operational area of the existing mine is located approximately 24 kilometres (km) north-north-east of Blackwater and 190 km west of Rockhampton, within the Central Highlands Regional Council area. The Jellinbah Coal Mine encompasses 14 approved Mining Leases (MLs): ML 2418, ML 6992, ML 80140, ML 80184, ML 80068, ML 80129, ML 80018, ML 80053, ML 80108, ML 80165, ML 70445, ML 70448, ML 70449 and ML 70446. Jellinbah Coal Mine is currently authorised by EA EPML00516813, which took effect on 7th April 2015.

The Jellinbah Coal Mine is an open-cut coal operation, mining shallow, low stripping ratio coal reserves and producing approximately 4.5 – 5.0 million tonnes per annum (Mtpa) of pulverised coal injection (PCI) and a minor amount of thermal coal, primarily for export. The Project currently encompasses two operating mine areas – Jellinbah Central, operated by Jellinbah Mining Pty Ltd (Jellinbah Mining), and Jellinbah Plains, a contractor-run operation. Ongoing exploration is undertaken to continually assess the coal resource.

Overburden is drilled and blasted to provide access to the high-grade, low-ash, low-sulphur coal resource, which is extracted using conventional open-cut truck and excavator methods. Strip mining is used in areas where coal seam dip is less than 10 degrees (Central) and terrace mining in more steeply dipping areas (Plains). Coal seams are mined separately with partings selectively removed down to 150 millimetres (mm). Vegetation is cleared prior to mining and topsoil is selectively stripped for immediate reuse, or stockpiled for future use in rehabilitation. Overburden is initially used to form bunds, haul roads and hardstands or is transported to an out-of-pit spoil dump located clear of the coal resource. Most overburden is placed in-pit to backfill mined-out areas.

Run of mine (ROM) coal is crushed and screened, followed by washing (if required) at the coal processing plant (CPP) located at Jellinbah Central (ML 80053). Washery rejects produced at the CPP are disposed of with overburden and tailings in the mining voids. Raw and washed coal is transported by truck to the rail loading area east of Blackwater for rail transport to Gladstone.

1.1.1 Approved Activities

The principal activities undertaken at the existing Jellinbah Coal Mine are:

- Mining of a high-grade coal;

[1] For the purposes of this report, 'the Project' refers specifically to the Central North Extension. The existing mine to which the Project relates will be referred to as the 'Jellinbah Coal Mine'.

- Continuous assessment of the coal resource by exploration;
- Clearing of any remaining vegetation in advance of mining;
- Selective stripping of available topsoil under supervision to be immediately reused or stockpiled for future use in the rehabilitation program;
- Drilling and blasting of overburden to provide access to coal resources;
- Operation of a conventional open-cut truck and excavator mine to maintain production to meet market demands;
- Overburden used to form bunds, haul roads and hardstands or transported to out-of-pit spoil dumps located clear of the coal resource but within the boundary of the MLs or placed in the previous mining strip to backfill mined-out areas;
- Reshaping of spoil dumps, replacement of topsoil and revegetation of the mined out and backfilled area;
- Crushing and screening of ROM coal;
- Coal washing (if required) at the CPP, located on ML 80053;
- Disposal of CPP rejects together with overburden (coarse rejects) and tailings (fine rejects) within existing mining voids;
- Transport of crushed and washed coal by private road to the existing rail loading area for rail transport to Gladstone;
- Operation of water management infrastructure such as regulated dams, sediment ponds, drains and bunds;
- Ongoing staged construction of a levee bank at Jellinbah Plains to protect mining operations from flooding of the Mackenzie River;
- Utilisation of existing infrastructure facilities, including offices, power and water; and
- Continued direct and contract employment of operating workers and support personnel with flow-on employment through the provision of associated goods and services.

1.2 PURPOSE OF AMENDMENT

The purpose of the Central North Extension is to extend mining activities at Jellinbah Plains into new resource areas and expand the area available for dumping of spoil. No changes to the currently approved mining methods or production rates are proposed as part of the Project. Figure 1 indicates the proposed Project area in relation to the Jellinbah Coal Mine.

This EA Amendment Application pertains to the application for new MLs made by Jellinbah Group, on behalf of Jellinbah East JV, for the Central North Extension.

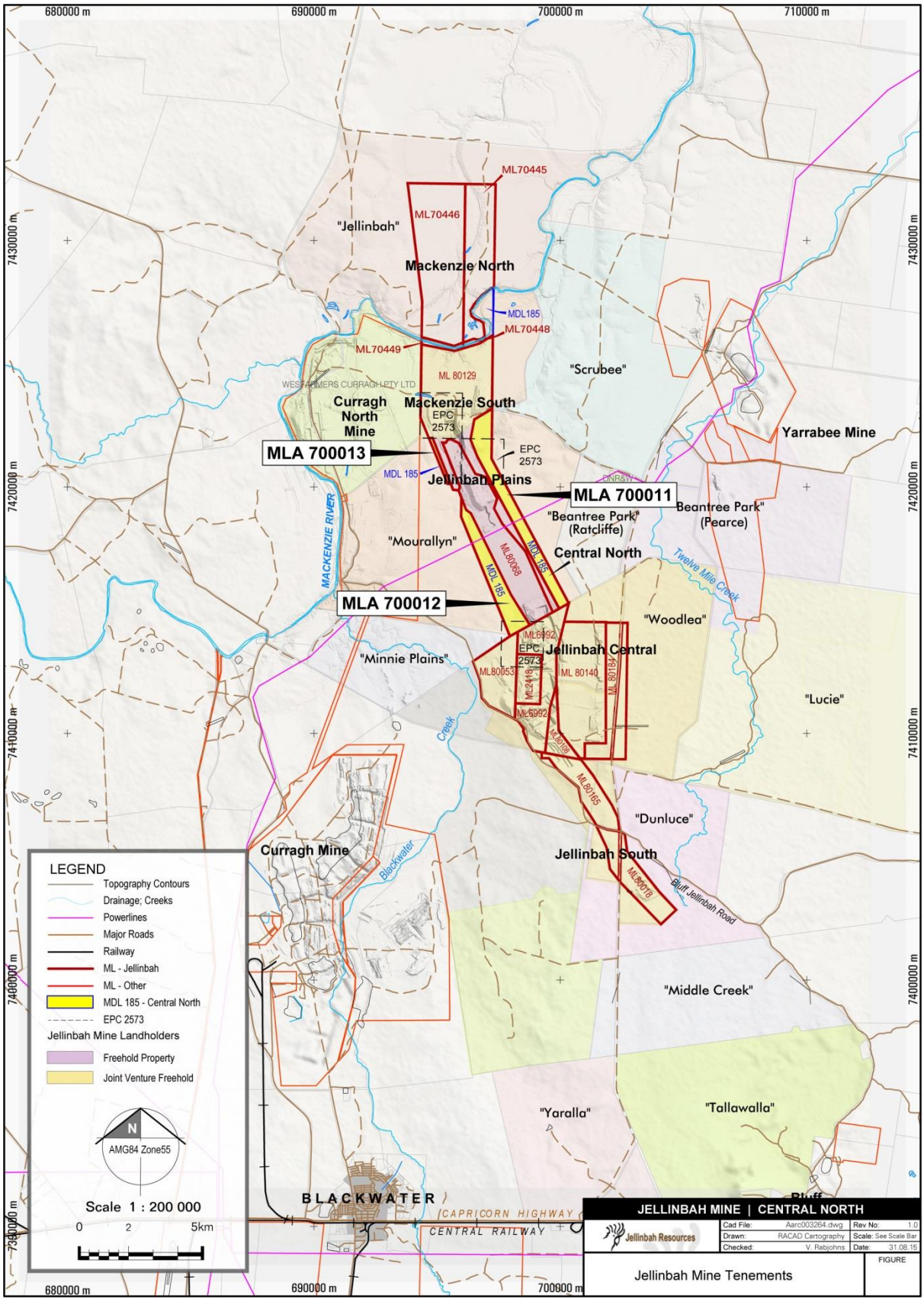

Figure 1 Central North Extension and the Jellinbah Coal Mine

1.2.1 Change of Application

This EA Amendment Application was initially lodged to the Mining Registrar together with applications for three additional MLs on 11 June 2015. The assessment level decision (12 August 2015) determined that the application constituted a major amendment, with no EIS required.

Written notice of the change to application is provided to the Department of Environment and Heritage Protection (EHP) together with the amended Supporting Information and appendix reports.

Changes to the EA Amendment Application, Flora and Fauna Report, and Environmental Offsets Strategy include:

- Revision of proposed maximum disturbance footprint to incorporate additional areas for topsoil stockpiling, out-of-pit spoil dumping and other mining activities;
- Revised areas of impact to vegetation communities; and
- Finalised Mining Lease Application (MLA) numbers.

These changes will not alter the anticipated assessment level decision in accordance with sections 228 – 230 of the *Environmental Protection Act 1994* (EP Act). No change to the purpose of the Central North Extension is proposed by this change of application.

1.3 STATE APPROVAL PROCESS

A pre-lodgement meeting was held with the EHP on 11th December 2014. Advice from EHP during the meeting indicated that the application would likely form a major amendment, with no EIS required.

During this meeting, it was agreed that an ecology survey of the proposed new ML areas would be required to properly assess the nature conservation values applicable to the EA Amendment Application.

For other environmental values, it was agreed that existing environmental studies combined with long-term site experience and comprehensive site management plans would likely be sufficient to assess and protect environmental values applicable to the Central North Extension.

1.3.1 Assessment Level Decision

The assessment level decision, made on 12 August 2015, determined that the original application constituted a major amendment, with no EIS required. This change of application is not anticipated to alter the assessment level decision for the Project.

The Project does not trigger the requirement for an Environmental Impact Statement (EIS) under the EP Act for the following reasons:

- No increase to currently approved production rates is proposed;
- No Category A Environmentally Sensitive Areas (ESAs) are present and limited impacts to Category B ESAs will occur; and
- No substantial changes to mining operations and/or the use of novel techniques are proposed.

In accordance with the requirements of the EP Act, the assessment process for a major amendment will include public notification of the application. This will occur simultaneously with the public notice for the resource tenure application. EHP will consider all properly made submissions in the decision stage.

1.4 REQUIREMENTS OF SUPPORTING INFORMATION DOCUMENT

In accordance with section 226 of the EP Act, this Supporting Information document includes the components described in Table 1.

Table 1 EP Act Requirements for Supporting Information

Component	Relevant Section(s)
Description of the Project.	Section 2.0
Description of the land that will be affected by the Project.	Section 2.1, 2.3, 2.4 Section 4.5
Description of any development permits in effect under the *Sustainable Planning Act 2009* for the carrying out of the relevant activity for the authority.	No development permits under the *Sustainable Planning Act 2009* are in effect for the Project.
Details of any changes to conditions identified in the authority as a standard condition.	No changes to standard conditions are proposed.
Assessment of the likely impact of the Project on environmental values, including: • Description of environmental values likely to be affected; • Details of any emissions or releases likely to be generated; • Description of the risk and likely magnitude of impacts on the environmental values; • Details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and • Details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.	Section 4.0 Section 3.0
Description of the proposed measures for minimising and managing wastes.	Section 5.0
Details of any relevant management plans.	Section 6.0

2.0 CENTRAL NORTH EXTENSION

2.1 PROJECT LOCATION

The Jellinbah Coal Mine and proposed Central North Extension are located in the Bowen Basin in central Queensland. The operational area of the current mine is located approximately 24 km north-north-east of Blackwater and 190 km west of Rockhampton, within the Central Highlands Regional Council area. The mine incorporates two operating mine areas – Jellinbah Central, operated by Jellinbah Mining, and Jellinbah Plains, a contractor-run operation.

The proposed Central North Extension area is located south of the Mackenzie River and adjacent to Jellinbah Plains within MDL 185. Figure 2 shows the regional location of the Project area and the Jellinbah Coal Mine.

2.2 PROJECT PROPONENT

The principal applicant for the Central North Extension is Jellinbah Group, acting on behalf of the Jellinbah East JV, an unincorporated Australian JV. The beneficial owners of the JV are listed in Table 2. Jellinbah Group is the principal holder of all MLs and the EA associated with the Jellinbah Coal Mine.

Table 2 Jellinbah East Joint Venture Participants

Participant	ACN	Percent Share (%)
Jellinbah Group Pty Ltd	010 754 793	29.92
Marubeni Coal Pty Ltd	009 932 236	15.00
Sojitz Coal Resources Pty Ltd	063 050 680	15.00
Tremell Pty Ltd	010 949 774	40.08

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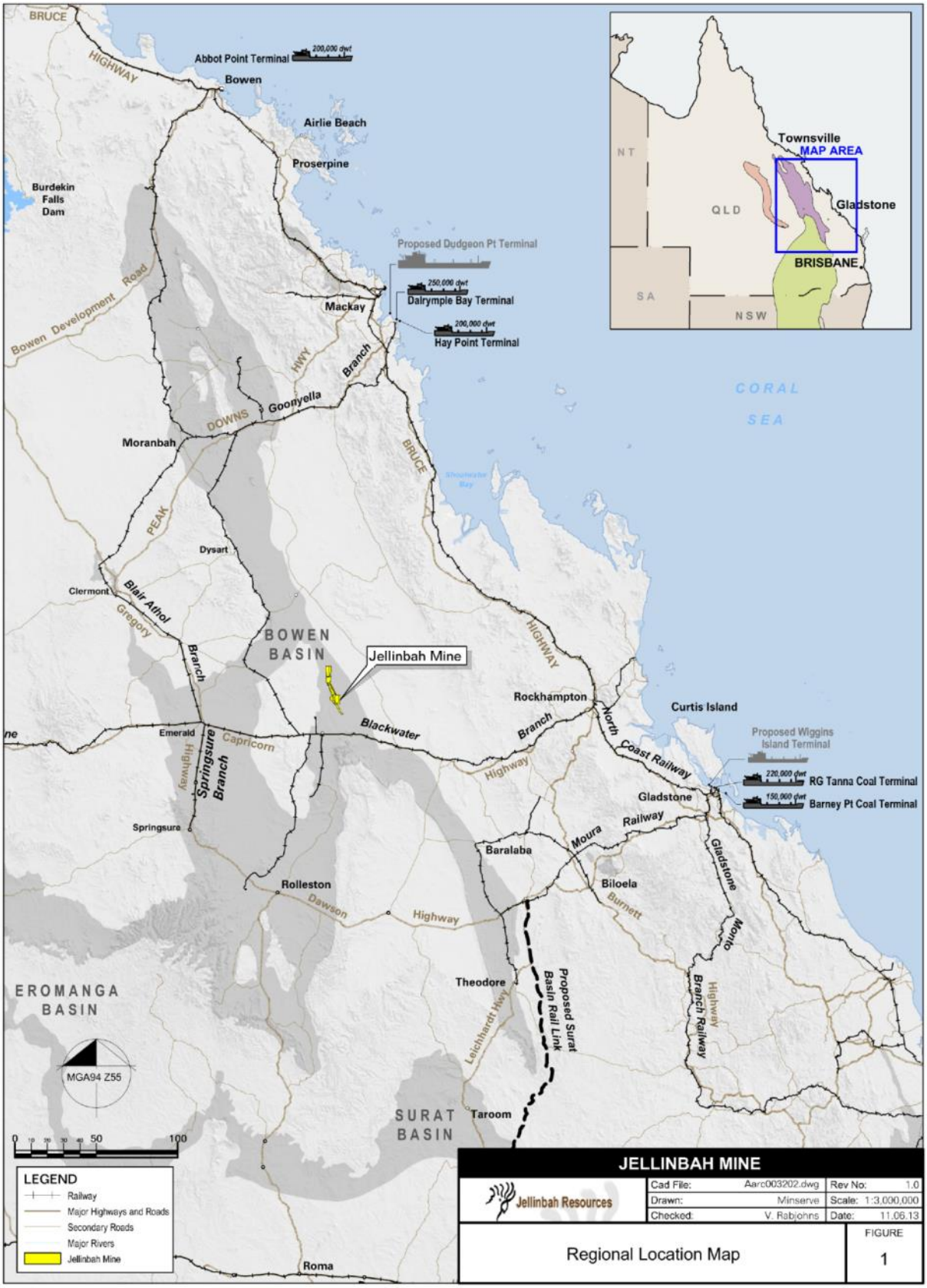

Figure 2 Regional Location of the Project and Jellinbah Coal Mine

2.3 MINING TENEMENTS

The Project occupies three MLAs, as shown in Figure 1. These areas are currently encompassed by MDL 185. Table 3 provides details of the proposed MLAs associated with the Central North Extension.

Table 3 Central North Extension Tenements

Tenement	Name	Holder	Status	Lodge Date	Area (ha)
MLA 700011	Plains Eastern Extension	Jellinbah East JV Participants	Application	9/06/2015	445.7
MLA 700012	Plains South West	Jellinbah East JV Participants	Application	9/06/2015	333.5
MLA 700013	Plains North West	Jellinbah East JV Participants	Application	9/06/2015	25.8
Total					**805**

2.4 UNDERLYING AND ADJACENT TENURE

2.4.1 Resource Tenements

Existing resource tenements underlying MDL 185 and the proposed MLAs include Exploration Permits (Petroleum) (EPPs) and Exploration Permits (Coal) (EPCs). Details are provided in Table 4 and the locations of these tenements in relation to the Project are shown in Figure 3 and Figure 4.

Table 4 Underlying Resource Tenements

Tenure	Holder	Status	Lodge Date	Expiry Date
EPP 806	OME Resources Australia Pty Ltd	Granted	03/03/2003	30/042019
EPP 1025	Bow CSG Pty Ltd	Granted	04/08/2008	28/02/2021
EPC 2573	Jellinbah East JV Participants	Granted	30/05/2011	03/03/2020
EPC 912	Bullock Creek Coal Pty Ltd	Granted	15/10/2004	28/03/2020

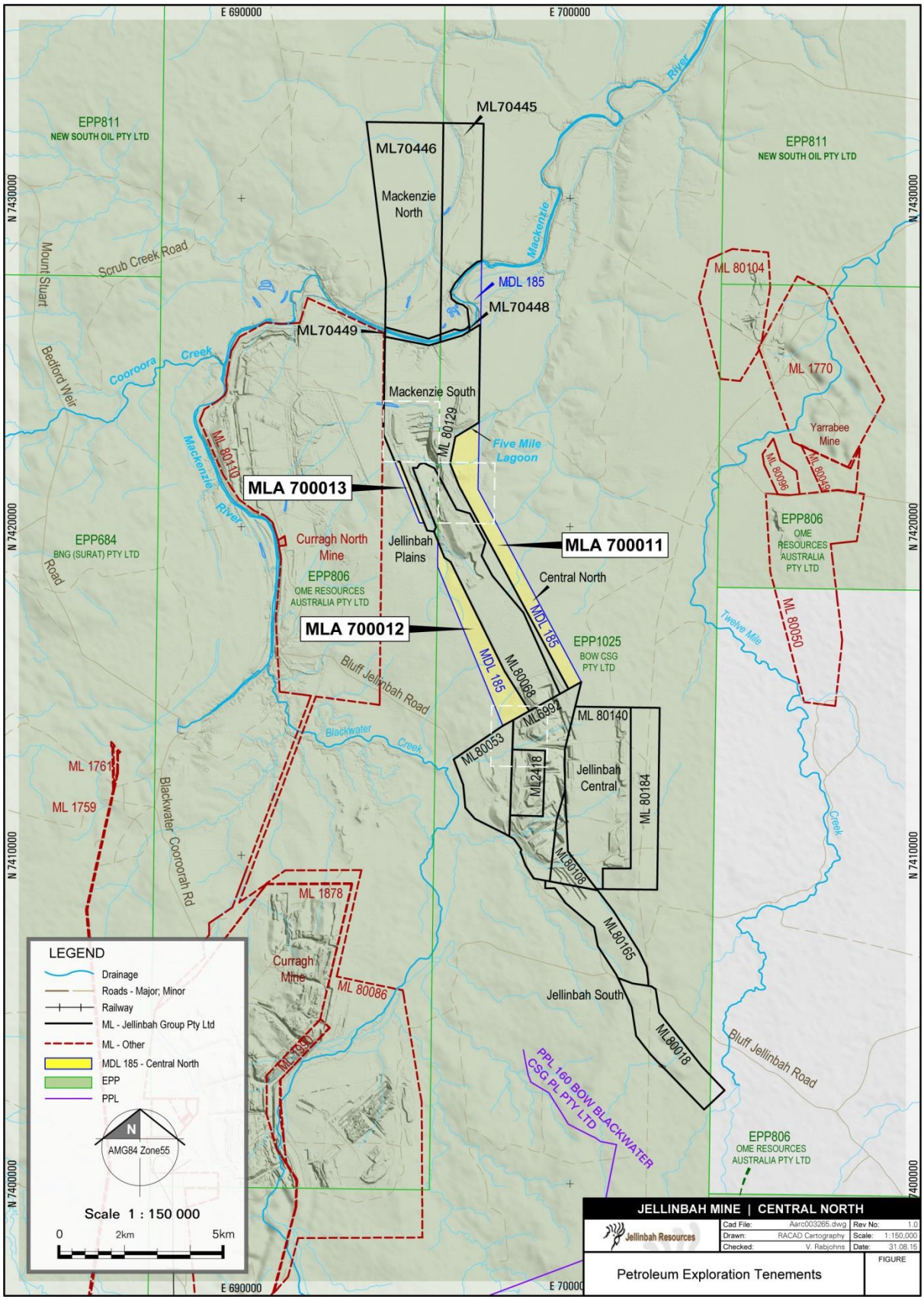

Figure 3 Underlying Resource Tenements – EPP

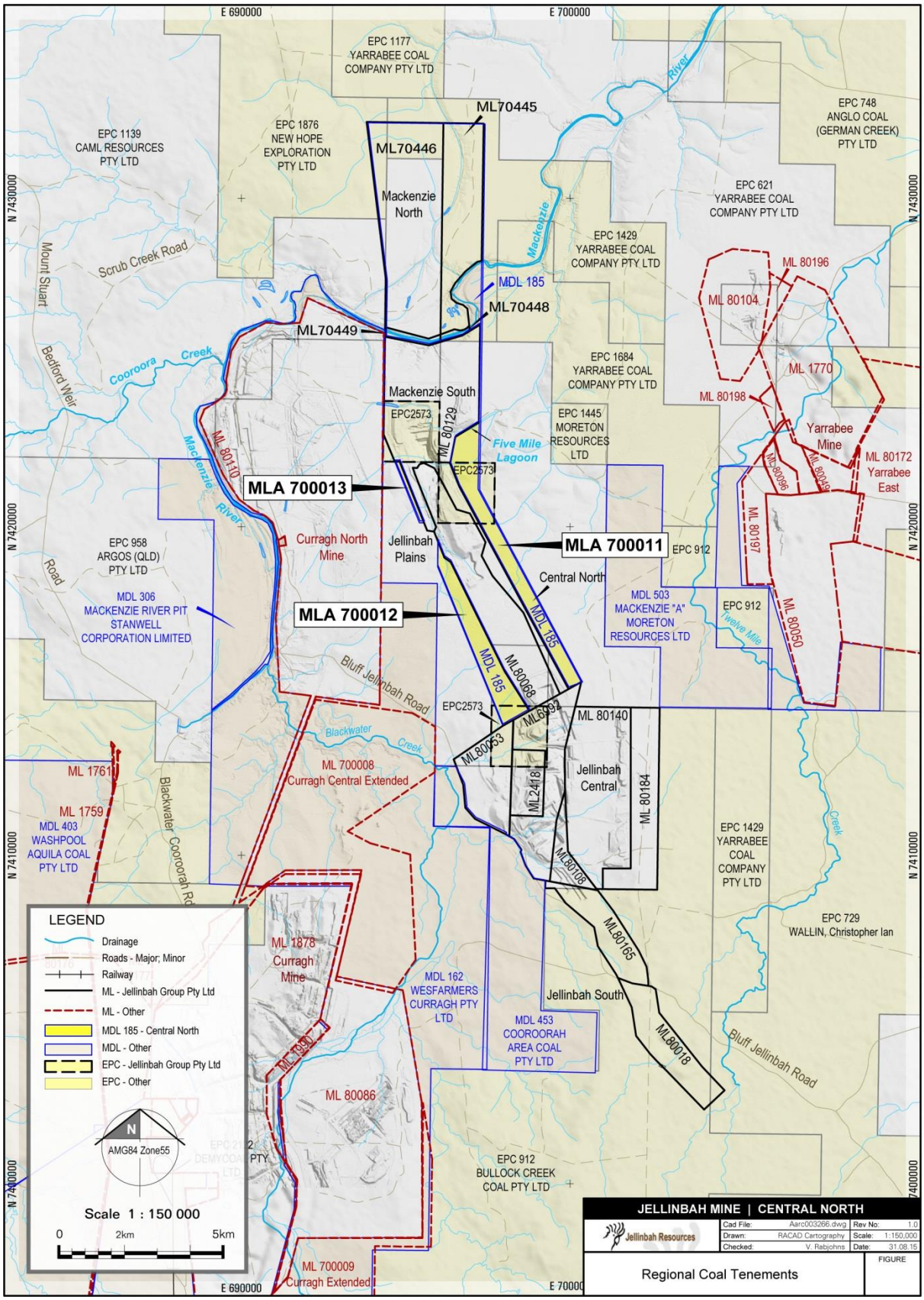

Figure 4 Underlying Resource Tenements – EPC

2.4.2 Real Property Descriptions and Sensitive Receivers

Properties underlying the Project site are detailed in Table 5 and shown in Figure 5. Table 6 provides details of the sensitive receivers located in the vicinity. Figure 6 shows the location of sensitive receivers in relation to the Project area.

Table 5 Properties Underlying the Central North Extension Area

Real Property Description	Tenure	Land Holder
6 LR94	Freehold	Peter John Dunne
100 SP230773	Freehold	Jellinbah East JV
14 RP885348	Freehold	Jellinbah East JV
2 SP213140	Freehold	Peter John Dunne
3 SP213140	Freehold	Jellinbah East JV

Table 6 Sensitive Receivers

Name	Real Property Description	Tenure	Easting	Northing	Receiver Type
Jellinbah 2	2 TT422	Lands Lease	697166	7439113	Homestead
Jellinbah 1	3 TT422	Lands Lease	688601	7429573	Homestead
Tarcoola	14 LE801034	Freehold	704744	7434774	Homestead
Scrubee	1 SP161090	Freehold	701320	7428091	Homestead
Mourallyn	6 LR94	Freehold	699755	7421158	Homestead
Barnett	3 TT286	Freehold	686668	7422143	Homestead
Bedford	7 SP159655	Freehold	686967	7414631	Infrastructure
Woodlea *	14 RP885348	Freehold	703455	7410174	Homestead
	100 SP230773	Freehold			
Lucie	65 SP160573	Freehold	706284	7408548	Homestead
	66 SP160573	Freehold			
New Caledonia	10 SP224570	Freehold	696812	7407446	Homestead
Dunluce	13 RP861407	Freehold	704915	7404307	Homestead
Top End	11 SP147347	Freehold	699218	7398802	Homestead

Note: Coordinates are in MGA GDA 94, Zone 55. * Jellinbah East JV is the landholder.

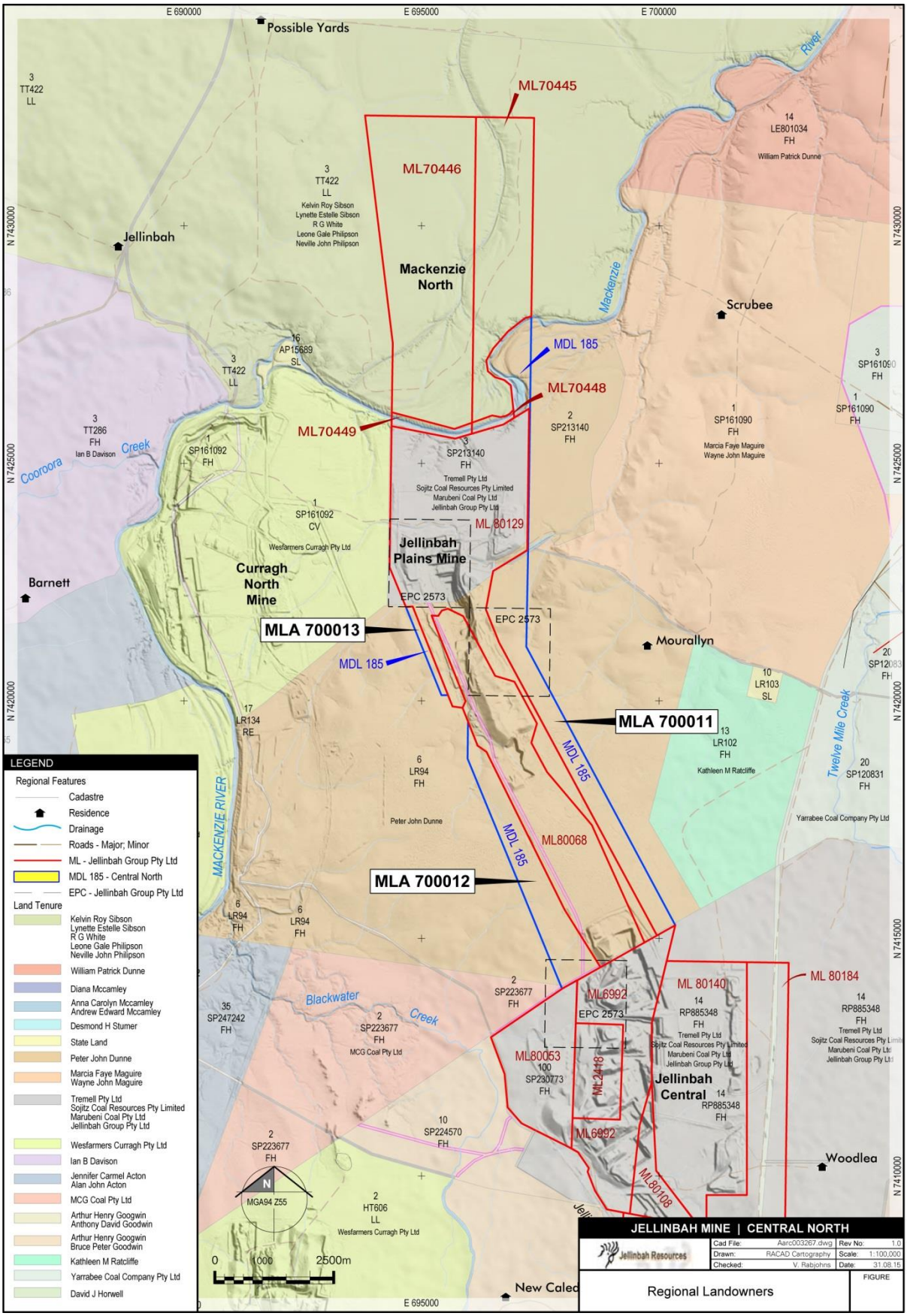

Figure 5 Land Tenure associated with the Project

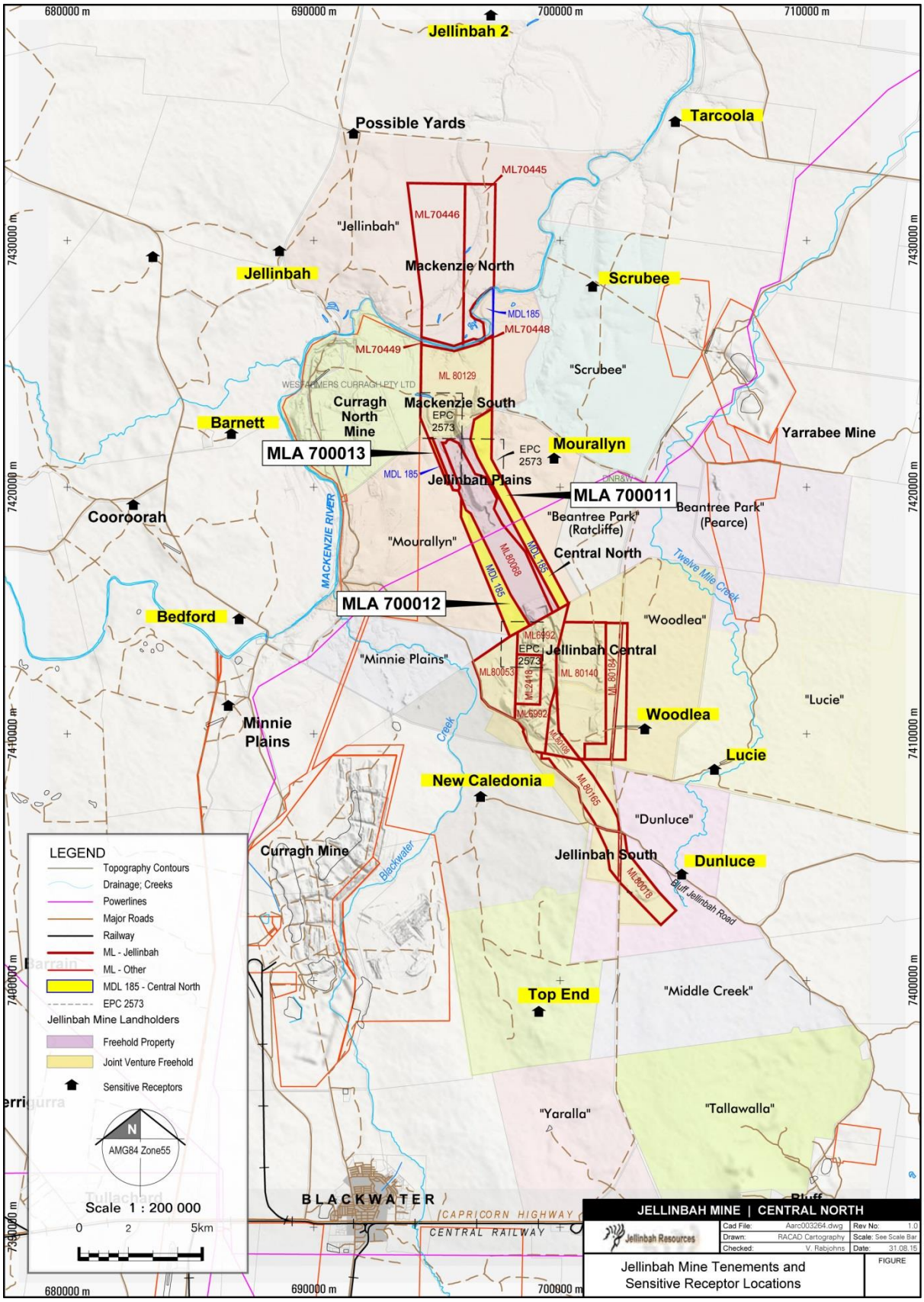

Figure 6 Sensitive Receivers associated with the Project

2.5 COAL RESOURCE

Economically viable coal resources have been identified in a long narrow section to the east of ML 80068. Within this area (MLA 700011), coal seams occur in both the Rangal Coal Measures and Burngrove Formation. However, not all coal seams have reasonable prospects for economic extraction and not all are classified as coal resources. Measured, indicated and inferred coal resources, in accordance with the Joint Ore Reserve Committee's *Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves*, associated with the Central North Extension are detailed in Table 7.

Table 7 MLA 700011 in situ Tonnes and Indicative Quality: Estimated (March 2015)

Resource Class	Seam	In situ Tonnes (1,000,000 t)	Ash (% adb)	TS (% adb)	Average Thickness (m)	In situ RD (t / m^3)
Measured	PLXU	0	0	0	0	0
	PLXL	0	0	0	0	0
	Total	**0**	**-**	**-**	**-**	**-**
Indicated	PLXU	15.03	12.5	0.50	3.27	1.41
	PLXL	16.83	10.5	0.60	3.72	1.39
	Total	**31.86**	**-**	**-**	**-**	**-**
Inferred	PLXU	6.60	12.5	0.50	3.98	1.41
	PLXL	7.00	9.4	0.50	4.31	1.38
	Total	**13.60**	**-**	**-**	**-**	**-**
TOTAL	**-**	**45.46**	**11.3**	**0.54**	**-**	**-**

Source: Jellinbah Group 2015.

2.6 PROPOSED ACTIVITIES

The Central North Extension consists of two primary components:

1. The mining of coal at MLA 700011, east of ML 80068, which has an estimated resource of 45.5 million tonnes (Mt) of PCI and minor amounts of thermal coal within the Rangal Coal Measures; and

2. The placement of overburden and topsoil in MLA 700012 and MLA 700013, west of ML 80068.

A conceptual design for the Central North Extension is shown in Figure 7.

Coal mining will only be conducted in MLA 700011. The production life for the Central North Extension is anticipated to be greater than 20 years based on current economic assessment of the resource. Development of the Project will involve construction and operation of the following major elements:

- Open-cut mining excavations;
- Access / haul roads;
- Sediment dams for water management;

- Water management drains; and
- Topsoil stockpiling and spoil dumping.

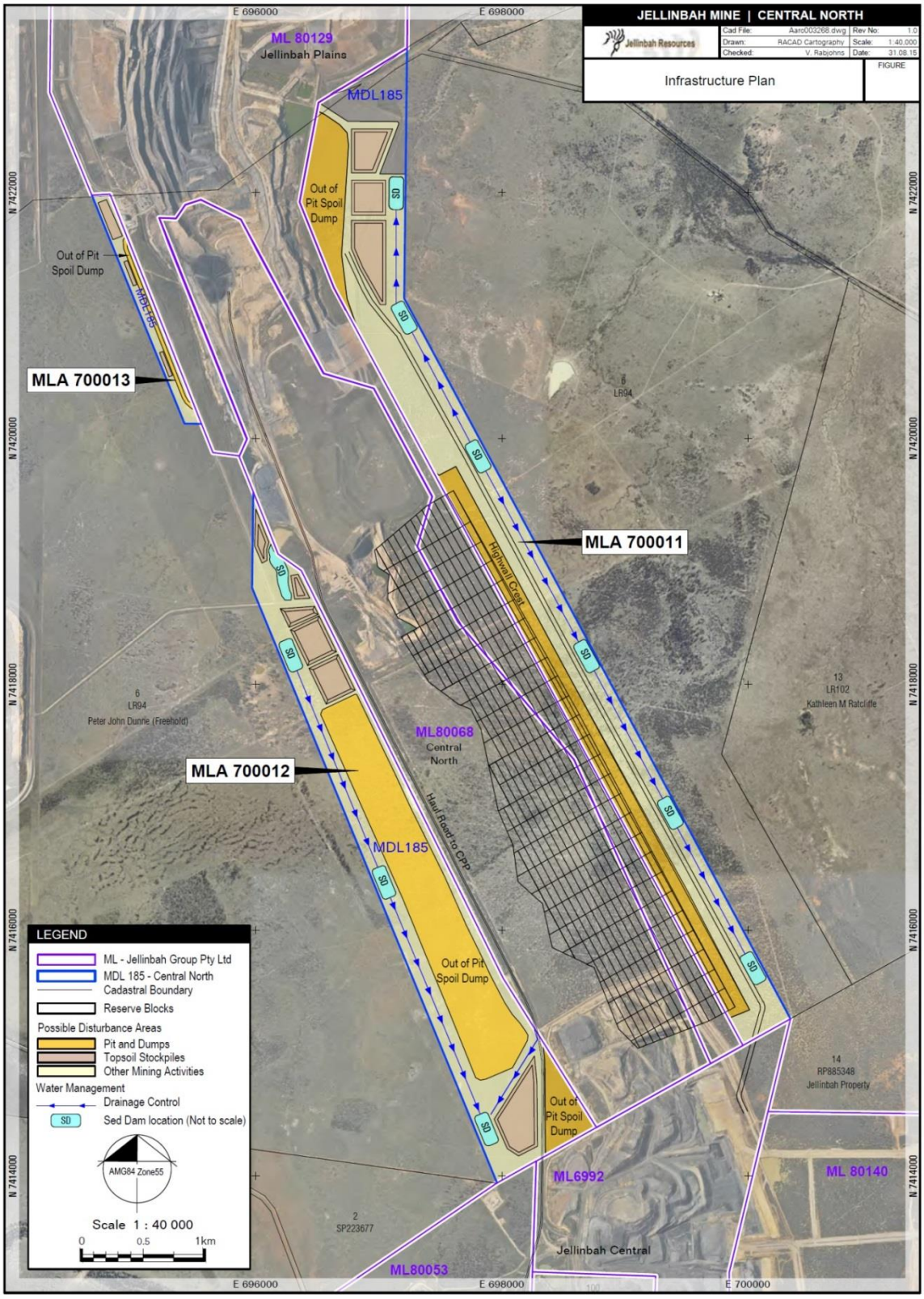

Figure 7 Central North Extension Conceptual Layout

2.6.1 Mining and Processing

The Project intends to extract approximately 17 Mt of *in situ* coal located at a depth shallower than 150 m below the surface. The depth of coal to mine will be determined on an economic basis prior to the commencement of mining in this area. The Central North Extension is anticipated to augment the current production of the Jellinbah Coal Mine by an average of 1.0 Mtpa ROM coal in future years, thereby extending the mine's overall production life. No increase in mining or production rates is proposed for the Jellinbah Coal Mine, as a result of the Central North Extension.

The Project will involve open-cut mining using truck and excavator methods. Topsoil stripped prior to mining will be stockpiled for later use in rehabilitation. Overburden will be relocated from above the coal seams to in-pit dumps and out-of-pit spoil dumps located on site.

Coal mined from the Project will continue to be transported in trucks for processing using existing Jellinbah Coal Mine infrastructure. Product coal will be transported by rail to Gladstone Port along Aurizon's Blackwater rail line where it will be exported through the RG Tanna Coal Export Terminal.

Overburden placement on MLA 700012 is scheduled to commence within the next two years. Coal mining in ML 80068 is not anticipated to commence until 2023, based on current mine plans. Mining will progress down-dip into the proposed new mining areas in MLA 700011 approximately five years thereafter.

2.6.2 Land Clearing

Vegetation and topsoil are selectively stripped from the mine footprint areas for immediate reuse or stockpiled for subsequent rehabilitation prior to the development of open-cut pits, spoil dumps, haul roads or infrastructure. Scraper contractors are used for topsoil movement and general maintenance work.

Large vegetation is pushed first and windrowed alongside the area where topsoil will be stockpiled. Smaller vegetation and grasses are removed with the topsoil and stockpiled. Where necessary, stockpiles will be ripped and seeded to encourage water infiltration and prevent erosion. Topsoil is respread on surfaces to be rehabilitated as soon as possible to benefit from the viability of the topsoil seed bank.

A Topsoil Management Plan is currently in place for the existing mine and will be amended to incorporate the proposed Central North Extension prior to the commencement of activities in this area. Suitable topsoil is identified and recovered ahead of disturbance and is either directly used on existing disturbed areas to be rehabilitated, or stored in a way that preserves its quality to maximise its use in rehabilitation. The Topsoil Management Plan contains recommendations for topsoil stripping and storage.

2.6.3 Site Water Management

The site water management system has been designed to adequately provide for the collection and controlled discharge of water from disturbed areas. This ensures that the quality and quantity of water entering the environment is maintained at acceptable levels.

A Site Water Management Plan (SWMP) has been developed for the Jellinbah Coal Mine and details control strategies for water quality and quantity, including the following:

- Isolate sub-catchments contributing to ‘clean’ and ‘mine affected’ runoff;

- Divert ‘clean’ runoff into the natural streams beside the MLs and MLAs by the use of bunds so that water does not enter the mine pits or infrastructure area;

- Direct all mine drainage leaving MLs and MLAs to freshwater storage dams for stock and wildlife, as well as back-up for use on the mine; and

- Design the system with maximum flexibility for ongoing staged development of the Jellinbah Coal Mine.

Sediment control is initially achieved by the use of sediment ponds, and subsequently by vegetation growth. A proportion of rainfall runoff from disturbed areas, related to the erodibility of the catchment and the ability of suspended solids to settle, is initially intercepted and directed to an appropriately-sized sediment dam. Use or transfer of the collected waste waters for a beneficial purpose within a reasonable time period will reinstate the required storage volume in preparation for the next storm event.

Water from the operational pits and sediment ponds will be reused within the mine, supplemented by a pipeline from the Bedford Weir, if required. This water is used primarily for dust suppression and vehicle washing. Water for the CPP is supplied from the tailings dam and a water storage located adjacent to the CPP.

All administration and office facilities are demountable units with waste water disposal using conventional in-ground systems.

2.6.3.1 Design Criteria

The design of Jellinbah Coal Mine’s SWMP is based on the following criteria:

- A detention of 24 hours of runoff resulting from a 1 in 5 year storm for sediment dams and a 1 in 10 year storm for detention dams and the retention of all water pumped from the pit. During a storm greater than 1 in 10 years, the volume and turbidity of flow in Blackwater Creek and the Mackenzie River will be such that any contribution from the mine will be negligible;

- Structures such as channels, embankments and spillways with low risk of environmental harm in the case of failure, have been designed based on a 1 in 10 year storm event;

- Detention dams have been designed for a 1 in 10 year critical duration storm, with allowance for siltation;

- Main channels employed in the drainage channels are designed to be grass lined and maintain runoff flow velocities for a 1 in 10 year storm at <2.0 m/s as an absolute maximum and <1.5 m/s as a desirable maximum;

- Flood control levees at Jellinbah Plains and Mackenzie North are designed to prevent inundation of the pit and major disruptions to operations during a 1 in 1000 year design storm event; and

- No runoff from un-rehabilitated areas will pass off site without being routed through a detention dam.

Storage volumes are based on critical storm events or wet season rainfall as appropriate, while short-duration events control the dimensions of diversion drains and spillway structures. Duration of critical events is the time of concentration in the relevant sub-catchment.

The size of the settlement pond required for the mine affected runoff was determined from the maximum volume of runoff generated within a 24 hour period during the design storm. This volume will be equal to the volume of storage required to provide a detention time of 24 hours.

The probability of the design storm occurring when the storages are full from recent rain is high, considering monthly rainfall records, monthly evaporation and estimated monthly usage of water dust control. It is therefore important to ensure uniform flow through the basin by correct geometry and low inflow and outflow velocities, to avoid mixing of incoming mine affected water with outgoing clean water.

The dimensions of the incoming drains and outlets to the settlement ponds are based on the Q20 flow. While a Q20 flood will pass safely through the structures without overtopping, the detention time and effectiveness of sedimentation will be reduced for a storm greater than Q5.

2.6.3.2 Water Management Infrastructure

The locations of the major settlement ponds at Jellinbah Coal Mine were selected to minimise conflict with future mining and to maximise the period for which they would service the mining operation. It is not anticipated that any further ponds will be necessary within the existing mining operation, although the occasional removal of sediment may be required to maintain the storage capacity. Pond depths will be checked during the dry winter months and cleaned out if necessary.

It is intended that water in the pits will be pumped out into drains, which will convey water to one of the holding ponds. No intermediate storages are necessary. This will be a minor drain as pumping rates of <0.1 m^3/s are expected.

Additional water management infrastructure proposed as part of the Central North Extension includes several sediment dams and diversion drains to control surface water flow. Figure 7 illustrates additional water management infrastructure and drainage control on the Project site. The SWMP will be updated reflect these changes prior to commencement of the Project.

Freshwater Dams

Freshwater dams are used for water supply and are designed to intercept mine site water, including discharge from the sediment dams. There are no discharge restrictions on water from these dams as they are designed to store only runoff from undisturbed catchments and acceptable runoff from sediment dams. These dams are permanent features of the property and will remain at mine closure.

Sediment Control Dams

Sediment control dams act as sumps for sediment-laden runoff from the various disturbed catchments on the MLs, including spoil dumps. They are also used as water supply for watering of haul roads. The dams will be cleaned as required to maintain trap efficiency. These dams are to be a permanent feature of the property and will remain after completion of mining.

An additional ten sediment dams are proposed to be constructed on MLA 700011 and MLA 700012.

Voids

Water accumulating in voids varies in quality (i.e. direct precipitation and runoff containing sediment). Where possible, surface water runoff is diverted from the voids using designed diversion banks during mine operations. Water in the pit is pumped to highwall ponds or the tailings dam and used as a source of water for haul road watering or CPP makeup water. Experience to date and geological drilling in the mining area indicates that groundwater inflow will not present a problem.

Diversion Banks

All diversion banks on the site have been installed for catchment segregation purposes and have been designed to accommodate a 1 in 10 year, 24 hour rainfall event. Associated waterways have been designed such that the maximum flow velocity is <2.0 m/s.

Plains Levee

A levee has been developed (staged construction) on the south side of the Mackenzie River to protect mining operations at Jellinbah Plains from inundation when the Mackenzie River is in flood. The levee has been designed to withstand a 1 in 1000 Annual Exceedance Probability (AEP) flood event in the Mackenzie River, consistent with the design of the proposed Mackenzie North levee and the upstream Curragh North levee.

No additional levees will be required for the Central North Extension.

Water management infrastructure at the Project site is shown in Figure 7 above.

2.6.4 Waste Management

The major waste streams produced by Jellinbah Coal Mine include domestic waste, sewage sludge, scrap steel, tyres, vehicle batteries, waste oil / solvents and oil and fuel drums. Treatment of each of these major waste streams is detailed in the Waste Management Plan. No changes to waste management practices are proposed by this Project.

Waste management includes the following:

- Domestic wastes (typically generated in the workshop and administration areas) are collected in the rubbish bins provided across the site and are regularly collected and disposed of by burial in the spoil.

- Sewage is managed by an onsite septic system operated by Jellinbah Mining. As required, sewage sludge is collected and removed from the Project site for safe disposal by a licensed contractor. The sewage sludge is then disposed within a waste disposal facility licensed to accept regulated waste.

- Scrap steel is segregated into designated bins from where a licensed contractor collects the waste for recycling as required.

- Used fuel and oil drums are collected and stored in the vicinity of the workshop area. These items are also removed from site by a licensed waste management contractor as required.

- Disposal of tyres at the Jellinbah Coal Mine follows the principles outlined in the EHP (2012) *Operational Policy: Disposal and storage of scrap tyres at mine sites*. Waste tyres are segregated and stockpiled in an area adjacent to the workshop facility. Prior to the waste tyre

stockpile reaching the maximum size recommended by the guideline, the tyres are transported to a mined-out area of the pit and buried.

- Vehicle batteries are segregated and stockpiled for collection by a licensed regulated waste transporter and recycled at a licensed facility.

- Waste oil is collected in purpose-built tanks and treated onsite at a waste oil treatment plant. Treated waste oil is mixed with diesel and reused in blasting activities. All remaining waste oil (from the treatment process and blasting activities) is collected and removed from the site by a licensed waste contractor for transport to a licensed recycling facility.

The septic system at the existing Jellinbah Coal Mine includes the following sewage collection and primary holding facilities (Table 8).

Jellinbah Mining does not operate a camp, accommodation or kitchen facilities on site. Sewage is collected and directed to septic tanks. There are no sewage treatment works with a capacity greater than 21 Equivalent Persons (EP). The liquid overflow from the septic systems is discharged to the ground via soaking trenches and one small spray irrigation system.

Table 8 Details of Existing Septic Tanks Associated with the Jellinbah Coal Mine

Location of Septic Tanks	Approximate Size (L)	EP*	Actual EP
Office / Training Area	2,000	10	4.0
Central Workshop	1,000	5	2.0
Central Muster Facility / Crib Hut	600	3	1.0
Electric Workshop	100	0.5	0.1
CPP	1,000	5	1.4
Plains Mining Area	2 x 2,000	20	8.0
Total	8,700	43.3	16.5

Note: * EP (Equivalent Persons) in relation to sewage treatment, has the meaning given by Schedule 2, s.63 of the *Environmental Protection Regulation 2008*.

2.6.5 Infrastructure

2.6.5.1 Existing Infrastructure

No change is proposed to existing infrastructure at the Jellinbah Coal Mine. Infrastructure currently existing or approved for construction at the Jellinbah Coal Mine includes:

- CPP;

- Private haul road for delivery of coal to the Boonal rail loader, which is located 10 km west of Bluff and 8 km east of Blackwater;

- Workshop, change rooms, store, first aid station and offices;

- Haul road and stockpile hardstands;

- Raw water storage;

- Water treatment and reticulation;
- Septic tanks;
- Mine affected water and settlement ponds;
- Tailings disposal facilities;
- Fuel storage;
- Water management infrastructure (levee); and
- Power reticulation / substation and switchyard.

Power Supply

Power supply for the Jellinbah Coal Mine is sourced from a 22 kilovolt network supplied by Ergon Energy. Onsite generator sets will be used to supply the small amount of electricity where reticulation from the grid is not viable.

2.6.5.2 Project Infrastructure

The Central North Extension will require only minimal additional support infrastructure. Infrastructure requirements include haul roads, sediment dams, and diversion drains. Haul roads will be used to transport ROM coal to ROM stockpiles and overburden to spoil dumps. Sediment dams and diversion drains, as discussed in Section 2.6.3.2, will direct the flow of water on the Project site to minimise the risk of environmental harm to the receiving environment. No regulated dams are proposed as part of this EA Amendment Application.

2.6.6 Workforce

Mining operations at the Project will not result in any material change to the workforce currently employed for existing Jellinbah Coal Mine operations. No changes to production or mining rates are proposed.

2.7 NOTIFIABLE AND ENVIRONMENTALLY RELEVANT ACTIVITIES

No additional notifiable activities will be conducted on the Project site as a result of the Central North Extension. Currently approved notifiable activities for the Jellinbah Coal Mine are detailed below:

- 1. Abrasive Blasting – Carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
- 6. Chemical manufacture or formulation – Manufacturing, blending, mixing or formulating chemicals if –

    (a) the chemicals are designated dangerous goods under the dangerous goods code; and

    (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.

- 7. Chemical storage (other than petroleum products or oil) – Storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.

- 20. Landfill – Disposing of waste (excluding inert construction and demolition waste)

- 23. Metal treatment or coating – Treating or coating metal, including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).

- 24. Mine wastes –

    (a) storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or

    (b) exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.

- 29. Petroleum product or oil storage –

    (a) operating a petrol depot, terminal or refinery; or

    (b) operating a facility for the recovery, reprocessing or recycling of petroleum-based materials.

Similarly, there will be no changes to the currently approved environmentally relevant activities for Jellinbah Coal Mine, as described in Table 9.

Table 9 Environmentally Relevant Activities

ERA No.	Description	AES	Licence Fee
Schedule 2 – Prescribed ERAs and aggregate environmental scores			
ERA 8 – Chemical storage	Storing more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).	85	$20,799.50
ERA 15 – Fuel burning	Using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.	35	$8,564.50
ERA 16 – Extractive and screening industries	Extracting, other than by dredging, in a year, the following quantity of material—more than 1,000,000 t. Screening, in a year, the following quantity of material—more than 1,000,000 t.	57 47	$13,947.90 $11,500.90
ERA 31 – Mineral processing	Processing, in a year, the following quantities of mineral products, other than coke—more than 100,000 t.	280	$68,516.00
ERA 33 – Crushing, milling, grinding or	Crushing, grinding, milling or screening more than 5000 t of material in a year.	n/a	$609.00

ERA No.	Description	AES	Licence Fee
screening			
ERA 38 – Surface coating	Anodising, electroplating, enamelling or galvanising using, in a year, the following quantity of surface coating materials—1 t to 100 t.	10	$2,447.00
ERA 60 – Waste disposal	Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(a)—less than 50,000 t.	50	$12,235.00
Schedule 2A – Aggregate environmental scores for particular resource activities			
ERA 13 – Mining black coal	Mining black coal.	128	$62,656.00

3.0 REHABILITATION

Significant negotiation with the underlying tenure holders has occurred throughout the life of the Jellinbah Coal Mine. Underlying tenure holders have requested that disturbed areas be rehabilitated such that the land supports the pre-mining land use of low-intensity grazing. This request has culminated in the development of a compensation agreement between the owners of the Jellinbah Coal Mine and the underlying landholders for specific MLs within the mine area.

EHP has approved the post-mining land use of the existing Project as predominately low-intensity cattle grazing. An identical post-mining land use is proposed for the Project area. Suitable decommissioning and rehabilitation strategies, outlined in Section 3.2, will be employed to achieve the post-mining land use objectives.

A Final Landform and Rehabilitation Management Plan has been developed and implemented for the Jellinbah Coal Mine, which will be updated to reflect the addition of the Central North Extension. Rehabilitation strategies and methods were developed in accordance with *Guideline: Rehabilitation requirements for mining resource activities (EM1122)* (EHP 2014) and *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME 1995).

No change to the rehabilitation objectives or strategy is proposed by this EA Amendment Application.

3.1 REHABILITATION GOALS

Rehabilitation goals for the Jellinbah Coal Mine and Central North Extension are to create an environment that is:

- Safe to humans and wildlife;
- Non-polluting;
- Stable landform; and
- Sustains the agreed post mining land use.

A Final Landform and Rehabilitation Management Plan has been prepared for the existing mining operation to provide a clear strategy for the achievement of conditions set out in the EA. The scope of the plan is to provide:

- Specific rehabilitation objectives;
- Identification of the indicators that will be measured to establish when rehabilitation is complete, by reference to specific completion criteria. Indicators may be different for different parts of the land that have different types of disturbance;
- A description of the final landform design and rehabilitation methods for each disturbance type listed in the EA;
- Revegetation completion criteria for each disturbance type; and
- A rehabilitation monitoring program.

The Final Landform and Rehabilitation Management Plan will be updated to incorporate the Central North Extension prior to the commencement of activities in this area.

3.2 REHABILITATION OBJECTIVES

In order to achieve the described rehabilitation goals for the site, specific rehabilitation objectives have been developed for each disturbance type. The final landform objectives for each disturbance type on the Jellinbah Coal Mine and Central North Extension are described in Table 10.

Table 10 Final Land Use and Rehabilitation Approval Schedule

Disturbance Type	Projective Surface Area at Closure (ha)	Post Mining Land Description	Post Mining Land Use	Post Mining Land Suitability Classification
Infrastructure and other mining areas	837	Endemic pasture species	Low intensity cattle grazing	5
Levee Bank	86			5
Haul Roads	218			4
Topsoil stripped	300			3
Spoil areas (<10% slope)	2300			4
Spoil areas (>10% slope)	2347	Endemic pasture species	Endemic vegetation community	5
Dams	50	Water containment	Water containment	5
	55	Pasture species	Low intensity cattle grazing	
Final Voids	744	Water containment	Water containment	5
Anabranch Diversion	140	Endemic pasture species with a native species over-storey	Corridor conservation	5
Three to Five Mile Lagoon drainage line	n/a			

Note: Topsoil stockpiles are not included in the projected surface area at mine closure.

3.3 REHABILITATION STRATEGY

Rehabilitation strategies for domains relevant to the proposed Project have been outlined below. The strategies are unchanged from existing approved rehabilitation strategies for the Jellinbah Coal Mine.

3.3.1 Residual Voids

Final voids will remain as valuable landforms for water storage, wildlife habitat and possible recreation. The use of the final void as a sediment dam provides a mechanism for reducing any impacts of mining on the river system. Runoff from the Project site can be channelled into the final void, allowing

sediment loads to accumulate in the void rather than entering the river system. Where the final void is located away from a creek, its use as an active water storage structure is limited. However, if the final void can be located where surface flow can be directed into the void, its use as a water storage structure is possible and will be investigated.

Final voids will be left in a safe condition by constructing a safety bund wall around each void from competent rock and/or fencing, depending on the terrain, to limit human and livestock / animal access. The safety bund wall will be constructed as described in the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME 1995). This guideline states that the bund wall should be a minimum height of 2 m, with a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the pit edge.

Prior to relinquishment, a report will be prepared and will include the following:

- The intended final land use for final voids (including those containing tailings);
- Void water quality consistent with the post-mining land use;
- Geotechnical and hydrological landform stability;
- Self-sustaining vegetation cover attributes; and
- Objective measures to determine when outcomes are achieved.

3.3.2 Spoil Dumps

The outer batters of the spoil dumps will be re-profiled to a maximum slope of 17%. The upper surface of these out-of-pit spoil landforms will be internally draining at an overall slope of less than 5%. A system of ponds will be constructed across the upper surface of the spoil dumps to capture rainfall runoff from a nominal 10-year design AEP storm with six hours duration.

Topsoil will then be spread over the re-profiled landform and the area deep ripped using the rear tines of a bulldozer. Improved pasture will then be planted into this freshly ripped landform. Once established, the area will then be available for low-intensity cattle grazing. This rehabilitation technique has been successfully employed at the mine site for several years.

Some spoil dumps are also required to contain spoil which will not be contained by the in-pit dumping. The locations of these spoil dumps have been determined to mitigate potential environmental impacts. Spoil dumps will be re-profiled to safe and stable final landforms as part of ongoing rehabilitation activities.

The locations of the spoil dumps are also based on their proximity to the pit. This reduces haulage costs, thereby maximising the economic resource, greenhouse gas emissions from haul trucks transporting the spoil to the spoil dump, dust emissions from transport and water consumption required for dust suppression over these shorter haulage distances.

3.3.3 Access Roads

Access roads required for landholder access, grazing or other land use activities will not be rehabilitated. This will be confirmed by written agreement with the landholder. Roads that can be rehabilitated will be deep-ripped and, if necessary, seeded with a mix of pasture grass and tree species.

3.3.4 Dams

Dams will be left for the use of the landowners following relinquishment of the lease or, where this is not appropriate, decommissioned and rehabilitated. If water quality does not meet appropriate standards for the post-mining land use, the dams or ponds will be decommissioned. Planned rehabilitation activities include progressive revegetation of embankments and provision of permanent access for wildlife and stock. Existing site dams are already extensively used by stock and wildlife.

3.4 REHABILITATION MONITORING

The following procedure for monitoring rehabilitation success has been adopted at the existing Project. The method is as outlined in *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME 1995). This procedure has been used at Jellinbah Coal Mine and other sites for a number of years.

The step transect method is employed to estimate cover at systematic points along a transect. This involves walking along a fixed path and noting the cover category at the point at the tip of the boot. The cover category is assessed at every step (data point) along the transect. Cover is classified according to the following categories:

- Bare Soil – any area that does not contain vegetation (except roads). This includes any soil that is eroded. Rocks are also classified as bare soil;

- Grass (Basal and Aerial Vegetation) – These two categories are defined by the appearance of the grass at the tip of the boot. Where the vegetative cover at the point is the base of the plant, it is classified as basal vegetation. Where the ground at that point is under the canopy of the vegetation, it is classified as aerial vegetation. Dead grass is classified as litter. Where grass growth is too dense to see the top of the boot, the point is classified as basal grass;

- Shrub – small non-grass plants. The most common species are *Enchylaena tomentosa*, *Atriplex muelleri* and *Salsola kali*. As the grass cover increases these plants diminish and with the thickening of the grass it is difficult to discern these plants; and

- Litter – Dead grass or other non-living plant matter.

The Rehabilitation Monitoring Program will be amended to include the Central North Extension area prior to the commencement of operations in this area.

3.5 REHABILITATION ACCEPTANCE CRITERIA

Monitoring of rehabilitated areas will include areas undergoing rehabilitation, areas already rehabilitated and topsoil inventories. Revegetated areas will be monitored annually until the rehabilitation acceptance criteria have been met for three consecutive years.

Rehabilitation acceptance criteria have been determined with regard to the results of rehabilitation monitoring throughout the life of the mine, as well as relevant standards and guidelines. Rehabilitation acceptance criteria for the existing Jellinbah Coal Mine have been prepared and submitted to EHP.

Land within the boundaries of the MLs not required for mining activities will remain undisturbed and will retain the original land use after mining. Disturbance areas at the existing mine are deemed to be successfully rehabilitated when:

- Slopes of each land suitability type achieve the outcomes defined in Table 11;

- Maximum slope length for slope angles meets the criteria in Table 12;
- Basal vegetation cover of pasture grass species achieve 30% for Classes 4 and 5 and 50% for Class 3, as defined by the heel-toe method;
- Declared plants (noxious weeds) are managed in accordance with the requirements of the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act);
- Density of declared plants (noxious weeds) is no greater than the density of adjacent areas used for grazing;
- Rehabilitated areas are not subject to excessive erosion including colonisation of rills and gullies;
- All spoil placements are contained within the MLs;
- The mass stability of the rehabilitated landform, monitored using successive aerial photography, indicates that overall landform subsidence and movement is negligible;
- Runoff water quality is <1,000 µs/cm and pH is in the range 6.5 – 9.0;
- Disturbed areas are rehabilitated with pasture grass species suitable for grazing;
- Self-sustaining vegetation cover can be maintained;
- There is evidence of seeding and recruitment;
- The species established are suitable for light grazing;
- Stocking rates will be maintained at no greater than 2 head/ha;
- The high and low wall of final voids will be protected by an earthen diversion bund with a 1 in 100 year design capacity to prevent uncontrolled water ingress;
- Final void slopes at the low wall will be revegetated with pasture grass species; and
- Maintenance requirements are consistent with the proposed post-mining land use of grazing.

Table 11 Slope Acceptance Criteria

Disturbance Type	Slope Range (% or °)	Projective Surface Area (ha)
Infrastructure	<10%	422
Haul roads	<5%	218
Topsoil stripped	<10%	300
Slopes of final void in competent rock	<70°	744
Spoil areas	<17%	4646

Table 12 Landform Design Acceptance Criteria

Slope Angle (%)	Vertical Height (m)	Maximum Slope Length (m)
20	10	50
15	20	133
10	22	220
5	26	520
3	28	900

4.0 ENVIRONMENTAL VALUES, IMPACTS AND MANAGEMENT STRATEGIES

4.1 AIR

A desktop assessment was conducted to estimate the likely risk and magnitude of air quality impacts to sensitive receivers. The following reports were reviewed:

- *Air Quality Assessment of the Mackenzie North Project* (Katestone Environmental 2013); and
- *Mackenzie South Project: Air Quality Impact Assessment* (Pacific Air & Environment 2006).

The likelihood of increased impacts on sensitive receivers was assessed using existing understanding of air quality emissions and long-term operating experience at the Jellinbah Coal Mine.

4.1.1 Description of Environmental Values

Air quality in the vicinity of the Project is typical of a rural environment with a prominent resource industry. Existing sources of emissions affecting the quality of the air environment include:

- Pastoral and agricultural activities;
- Resource development, particularly the Jellinbah Coal Mine, Curragh Mine and Yarrabee Mine; and
- Vehicle use on sealed and unsealed roads and highways in the vicinity of the Project.

These activities result in the emission of dust and particulate matter, as well as releasing hydrocarbons to the atmosphere. Ambient air quality, as described by Katestone (2013) is provided in Table 13.

Table 13 Ambient Air Quality

Indicator	Background Concentration	Averaging Period
Dust deposition	43 $mg/m^2/day$	One year
$PM_{2.5}$	2.3 $\mu g/m^3$	24 hours
	2 $\mu g/m^3$	One year
PM_{10}	20 $\mu g/m^3$	24 hours
Total suspended particulates (TSP)	57.2 $\mu g/m^3$	One year

Source: Katestone (2013)

4.1.2 Potential Impacts, Emissions or Releases

The potential air quality impacts from the activities at the existing Jellinbah Coal Mine may include:

- Air emissions from diesel generators;
- Air emissions from company vehicles and heavy equipment;
- Dust from vehicle movements on unsealed roads;

- Dust from clearing activities;
- Dust generated from disturbed areas on the MLs, such as spoil dumps;
- Dust from blasting and mining of open cut pits; and
- Dust from materials handling and crushing on the MLs.

4.1.2.1 Risk and Magnitude of Impacts to Environmental Values

Particulate Matter Emissions and Dust Deposition

Total dust generation at the Jellinbah Coal Mine is not expected to increase as a result of the Central North Extension, as no changes to mining or production rates are proposed. The Project proposes to extend mining and dumping activities into new areas directly adjacent to the approved MLs. This impact assessment therefore focuses on the change to emission source locations relative to the nearest sensitive receivers.

Dust particulates are the principal contributor to air quality impacts resulting from mining activities. Emissions of dust and particulate matter will arise from drilling, blasting and excavation activities in the pit, wind erosion of disturbed land and spoil dumps, transport of spoil, and vehicles travelling on unsealed roads (Pacific Air & Environment 2006).

Jellinbah Coal Mine Particulate Matter Emissions and Dust Deposition

Modelling conducted for the Mackenzie South air quality assessment determined that the greatest impacts would occur to the west of the site due to prevailing easterly/south-easterly winds (Pacific Air & Environment 2006). The assessment found that the Mackenzie South development resulted in negligible additional levels of TSP, PM_{10} and dust deposition at sensitive receivers (Pacific Air & Environment 2006). Similarly, the air quality assessment of the Mackenzie North Project (Katestone 2013) found that all predicted concentrations were well below air quality objectives specified in the EA and the *Environmental Protection (Air) Policy 2008*.

Assessment of Emission Source Locations Relative to Sensitive Receivers

There are 12 sensitive receivers in the vicinity of the Central North Extension and Jellinbah Coal Mine. Table 14 provides an assessment of the likelihood and magnitude of air quality impacts at sensitive receivers, based on the distance and direction to the nearest pits and spoil dumps at the Central North Extension and Jellinbah Coal Mine.

Of all sensitive receivers within 6 km of the Central North Extension, only one (Mourallyn) will be closer to mining activities (pit excavations and spoil dumping) due to development of the Central North Extension. All other receivers will remain the same distance from current mining activities at the Jellinbah Coal Mine. For residences other than Mourallyn, it is reasonable to conclude that there will be no additional air quality impacts as a result of the Project.

The proposed Central North Extension mining operations are located approximately 470 m closer to Mourallyn than currently approved mining operations at Jellinbah Coal Mine. Based on existing mine operating experience, Jellinbah Mining believes that air quality emissions can be managed to achieve compliance with the existing EA limits at this residence. Considering the Mourallyn homestead is located upwind of the predominant wind direction, the risk of significant dust increase as a result of the Central North Extension is low and manageable.

Further to this, a Compensation Agreement is in place between the owner of the Mourallyn property (Mr Peter Dunne) and Jellinbah East JV, in which Mr Dunne has provided consent to Jellinbah Coal Mine's MLs. Due to the existing MLs located on the Mourallyn property, Jellinbah Mining and Mr Dunne have worked closely over a long period of time, resulting in both parties having a high level of understanding of the impacts of each other's businesses.

Jellinbah Mining maintains a Complaints Register for recording complaints pertaining to dust and particulate emissions at nearby residences. Where investigative monitoring finds that dust and particulate matter exceed the prescribed objectives, Jellinbah Mining must address the complaint and immediately implement abatement measures.

Vehicular emissions throughout construction, operation and decommissioning will emit oxides of carbon, nitrogen and sulphur; however, these emissions are anticipated to be minor.

Odour

Mining activities on the Project site will not produce any significant odour. The only activities associated with the Jellinbah Coal Mine that have the potential to cause odour are the disposal of putrescible wastes and operation of septic treatment facilities. These activities are already conducted at the existing Jellinbah Coal Mine and the development and operation of the Central North Extension will not result in any material change to odour production. Given the slight increase in proximity of the nearest sensitive receiver to these existing activities, it is unlikely that additional odour nuisance will occur. There have been no complaints about odour nuisance from operations to date.

Greenhouse Gas Emissions

Sources of greenhouse gas (GHG) emissions associated with the Central North Extension are:

- Fuel consumption;
- Electricity consumption;
- Blasting;
- Fugitive methane emissions; and
- Land clearing.

Modelling for the Mackenzie North Project found that diesel combustion and fugitive methane emissions were the greatest contributors to Scope 1 and 2 emissions. As the Project will not result in an overall increase in mining or production rate of the existing mine, it is reasonable to conclude that no increase in GHG emissions will result from the Project.

Table 14 Air Quality Impacts at Sensitive Receivers

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Air Quality Impacts
	Existing	Central North			
Jellinbah 2	**15.01**	16.53	NE	Existing	Proposed operations will be 1.5 km further away from Jellinbah 2 than current mining operations. Due to the current proximity of the receiver to the existing operations, and the distance to the proposed Central North operations, the Project is considered unlikely to contribute to additional air quality impacts at this receiver.
Jellinbah 1	**8.64**	10.50	NW	Existing	Proposed operations will be more than 1.5 km further away from Jellinbah 1 than current operations. Due to the current proximity of the receiver to the existing operations, and the distance to the proposed Central North operations, the Project is considered unlikely to contribute to additional air quality impacts at this receiver.
Tarcoola	**13.35**	14.67	NE	Existing	Proposed spoil dumps will be greater than 1 km further away from Tarcoola than current mining operations. The proposed operations are slightly further from Tarcoola than existing mining operations. Additional air quality impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Scrubee	**6.08**	7.24	NE	Existing	Proposed spoil dumps will be more than1 km further away from Scrubee than current mining operations. The proposed operations are slightly further from Scrubee than existing mining operations. Additional air quality impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Mourallyn	3.01	**2.54**	E	Central North Extension	Mourallyn will be slightly closer to proposed Central North operations. Although the proposed pit and spoil dumps are slightly closer to Mourallyn (by approximately 467 m) than the existing pit and dumps, the difference is considered to be negligible, particularly for the spoil dump. Air quality management and mitigation strategies will be implemented to reduce

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Air Quality Impacts
	Existing	Central North			
					potential impacts at this receiver. Jellinbah East JV has entered into a Compensation Agreement with the landowner of the Mourallyn property.
Barnett	**8.05**	9.67	W	Existing	The proposed Central North operations will be greater than 1.5 km further away from Barnett than existing mining operations. Additional air quality impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Bedford	10.40	**10.05**	W	Central North Extension	The proposed Central North mining operations will be slightly closer to the receiver by approximately 350 m. Additional air quality impacts are considered to be negligible due to this minor change in proximity, particularly given the size of the Central North Extension in comparison to the existing mine.
Woodlea *	**1.65**	6.23	SE	Existing	Proposed mining operations will be more than 4 km further away from Woodlea than current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional air quality impacts at this receiver. As the Woodlea property is owned and operated by the Jellinbah East JV, impacts at this receiver are not considered to cause nuisance.
Lucie	**4.67**	9.26	SE	Existing	Proposed mining operations will be greater than 4 km further away from Lucie than current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional air quality impacts at this receiver.

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Air Quality Impacts
	Existing	Central North			
New Caledonia	**3.10**	6.91	SW	Existing	Proposed operations will be greater than 3 km further away from New Caledonia than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional air quality impacts at this receiver.
Dunluce	**1.71**	11.84	SSW	Existing	Proposed Central North operations will be more than 10 km further away from Dunluce than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the significant distance to the proposed Central North pits and dumps, no additional air quality impacts are anticipated to occur as a result of the Project.
Top End	**6.41**	15.44	S	Existing	Proposed Central North operations will be greater than 9 km further away from Top End than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the significant distance to the proposed Central North pits and dumps, no additional air quality impacts are anticipated to occur as a result of the Project.

Note: * owned by the Jellinbah East JV.

4.1.3 Air Quality Management Strategies

Air quality management strategies currently employed at Jellinbah Coal Mine and relevant to the operation of the Central North Extension include the following:

- Haul roads are watered by water trucks whenever mining or haulage operations generating dust are undertaken;
- Land clearing operations are scheduled so as to avoid topsoil stripping when winds are blowing towards sensitive locations and wind speeds are >5 m/s;
- Land clearance is kept to an operational minimum (i.e. to what is required for safe and efficient operations);
- Burning cleared vegetation is avoided. If it is necessary, burning is avoided when wind direction is towards sensitive receptors;
- Any heating or spontaneous combustion is to be extinguished as quickly as feasible;
- Roads at the mine are constructed and maintained in a manner that promotes surface cohesion and strength;
- Rehabilitation is conducted as soon as operationally possible on disturbed areas to allow establishment of a protective vegetative cover;
- Dust control measures are employed on all drill rigs used for exploration and to prepare blast holes;
- Where operationally possible, blasting operations are not conducted when winds are blowing towards sensitive locations;
- Onsite vehicular speeds are limited;
- External haul roads have a bitumen surface and replace gravel rural roads; and
- All complaints about Jellinbah Coal Mine operations are handled in a prompt manner using the complaints handling procedure. As required, monitoring is conducted to investigate legitimate concerns.

Consistent with common industry practice, haul roads, ramps, tracks and industrial areas where there is likely to be a dust source will be routinely watered. Recycled water is sprayed onto dry areas from large tankers. If required, control strategies will be implemented to promptly address any legitimate complaints and to ensure compliance with the EA. All statutory requirements will continue to be addressed.

4.1.3.1 Dust Emission Mitigation Measures

The following dust management strategies are currently in place at the existing Jellinbah Coal Mine and will be implemented at the Central North Extension:

- Water and grade haul roads to suppress dust;
- Water stockpile pads and prepared ground;

- Install water sprays at both ends of crushers;
- For transport of product coal by road train, profile coal and apply citrus-based dust suppressant; and
- Progressively rehabilitate disturbed areas as they become available to minimise area conducive to dust emissions.

4.1.3.2 Greenhouse Gas Emission Mitigation Measures

Where practicable, the following strategies will be implemented to reduce GHG emissions associated with the Central North extension:

- Equipment purchase and energy efficiency:
    - Use variable speed pumps and high-efficiency motors; and
    - Install light-sensitive switches and energy-efficient lighting.
- Mine planning:
    - Design pit and dump haul roads and ramps to limit the travel time and duty cycle for waste and coal trucks, particularly when carrying a full load.
- New technology initiatives:
    - Implementation of an autonomous system for hauling. This will result in a significant reduction in empty truck weight and minimise fuel burn; and
    - Use of clean energy sources, such as solar energy. Solar panels have been installed at existing workshops and diesel lighting plants.
- Management:
    - The Mine Energy Management System currently in place for the Jellinbah Coal Mine will be amended to include Central North operations.

4.2 NOISE AND VIBRATION

A desktop assessment was conducted to estimate the likely risk and magnitude of noise impacts to sensitive receivers. The following reports were reviewed:

- *Jellinbah Mine – Mackenzie North Mining Lease Area: Noise and Vibration Assessment* (ASK Consulting Engineers 2013); and
- *Mackenzie South Project: Ground Vibration, Airblast Overpressure and Noise from Plant* (Noise Measurement Services 2006).

The likelihood of increased impacts on sensitive receivers was assessed based on existing understanding of noise emissions and long term operating experience at the Jellinbah Coal Mine.

4.2.1 Description of Environmental Values

Regional background noise levels are generally low and typical of a rural setting with intermittent increases due to rustling of leaves and noises from birds, insects, cattle, vehicles and agricultural equipment. The Mackenzie North Noise and Vibration Assessment (ASK 2013) noted that noise from a number of surrounding mines including Yarrabee Mine, Curragh Mine and Curragh North Mine also contributed to background noise levels in the area.

Background noise logging and attended measurements conducted for the Mackenzie North Noise and Vibration Assessment (ASK 2013) revealed that the existing Yarrabee and Curragh North Mines contribute substantially to noise levels at sensitive receivers. The following noise impacts were identified at sensitive receivers:

- At Jellinbah 1, noise impacts of the Curragh North Mine were measured to be 21 – 25 dBA;
- At Jellinbah 2, an unknown mine source, possibly Curragh North, Jellinbah Plains or Yarrabee Mine, contributed to noise, measured to be 25 – 28 dBA;
- At Scrubee, the Yarrabee Mine contributed to noise impacts, measured to be 33 – 36 dBA (light easterly breeze blowing); and
- At Mourallyn, noise impacts of the Yarrabee Mine were measured to be 27 – 32 dBA (light easterly breeze blowing).

An assessment of measured noise levels at the noise monitoring locations described above, outlined in the Mackenzie North Noise and Vibration Assessment (ASK 2013), found that the ambient background noise levels (based on the lowest 10^{th} percentile of noise levels) in the area ranged from 27 to 30 dBA during the daytime, 25 to 26 dBA in the evening, and 20 to 25 dBA at night (ASK 2013). These ambient noise levels represent periods when mining noise is low or insignificant and the natural noises are the most prevalent (ASK 2013).

4.2.2 Potential Impacts, Emissions or Releases

Potential noise and vibration sources resulting from activities at the Jellinbah Coal Mine are largely associated with the operation of machinery and equipment, including:

- Mining equipment for overburden transport;
- Haul road vehicles;
- Loading equipment; and
- Light vehicles accessing the site.

4.2.2.1 Risk and Magnitude of Impacts to Environmental Values

Total noise generation at the Jellinbah Coal Mine is not expected to increase as a result of the Central North Extension. While the Project will extend mining and dumping into new areas directly adjacent to the Jellinbah Coal Mine, no changes to mining or production rates are proposed. This impact assessment therefore focuses on the change to emission source locations relative to the nearest sensitive receivers.

Noise Emissions

Assessment of Emission Source Locations Relative to Sensitive Receivers

There are 12 sensitive receivers in the vicinity of the Central North Extension and Jellinbah Coal Mine. Table 15 provides an assessment of the likelihood and magnitude of noise impacts at the 12 sensitive receivers in the vicinity of the Central North Extension and Jellinbah Coal Mine. This assessment is based on receivers' location (distance and direction) relative to the nearest pits and dumps at the Central North Extension and Jellinbah Coal Mine.

Of all sensitive receivers within 6 km of the Central North Extension, only one (Mourallyn) will be closer to mining activities (pit excavations and spoil dumping) due to development of the Central North Extension. All other receivers will remain the same distance from current mining activities at the Jellinbah Coal Mine. For residences other than Mourallyn, it is reasonable to conclude that there will be no additional noise impacts as a result of the Project.

The proposed Central North Extension mining operations are located approximately 470 m closer to Mourallyn than currently approved mining operations at Jellinbah Coal Mine. Based on existing mine operating experience, Jellinbah Mining believes that noise emissions can be managed to achieve compliance with the existing EA limits at this residence. Considering the Mourallyn homestead is located upwind of the predominant wind direction, the risk of significant noise increase as a result of the Central North Extension is low and manageable.

Further to this, a Compensation Agreement is in place between the owner of the Mourallyn property (Mr Peter Dunne) and Jellinbah East JV, in which Mr Dunne has provided consent to Jellinbah Coal Mine's MLs. Due to the existing MLs located on the Mourallyn property, Jellinbah Mining and Mr Dunne have worked closely over a long period of time, resulting in both parties having a high level of understanding of the impacts of each other's businesses.

Jellinbah Mining maintains a Complaints Register for recording complaints pertaining to noise impacts at nearby residences. Where investigative monitoring finds that noise emissions exceed the prescribed objectives, Jellinbah Mining must address the complaint and immediately implement abatement measures. To date, no noise-related complaints have been received.

Table 15 Noise and Vibration Impacts at Sensitive Receivers

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Noise Impacts
	Existing	Central North			
Jellinbah 2	**15.01**	16.53	NE	Existing	Proposed operations will be 1.5 km further away from Jellinbah 2 than current mining operations. Due to the current proximity of the receiver to the existing operations, and the distance to the proposed Central North operations, the Project is considered unlikely to contribute to additional noise impacts at this receiver.
Jellinbah 1	**8.64**	10.50	NW	Existing	Proposed operations will be more than 1.5 km further away from Jellinbah 1 than current operations. Due to the current proximity of the receiver to the existing operations, and the distance to the proposed Central North operations, the Project is considered unlikely to contribute to additional noise impacts at this receiver.
Tarcoola	**13.35**	14.67	NE	Existing	Proposed spoil dumps will be greater than 1 km further away from Tarcoola than current mining operations. The proposed operations are slightly further from Tarcoola than existing mining operations. Additional noise impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Scrubee	**6.08**	7.24	NE	Existing	Proposed spoil dumps will be more than1 km further away from Scrubee than current mining operations. The proposed operations are slightly further from Scrubee than existing mining operations. Additional noise impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Mourallyn	3.01	**2.54**	E	Central North Extension	Mourallyn will be slightly closer to proposed Central North operations. Although the proposed pit and spoil dumps are slightly closer to Mourallyn (by approximately 467 m) than the existing pit and dumps, the difference is considered to be negligible, particularly for the spoil dump. Noise management and mitigation strategies will be implemented to reduce

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Noise Impacts
	Existing	Central North			
					potential impacts at this receiver. Jellinbah East JV has entered into a Compensation Agreement with the landowner of the Mourallyn property.
Barnett	**8.05**	9.67	W	Existing	The proposed Central North operations will be approximately 210 m further away from Barnett than existing mining operations. Additional noise impacts are considered to be negligible, particularly given the size of the Central North Extension in comparison to the existing mine.
Bedford	10.40	**10.05**	W	Central North Extension	The proposed Central North mining operations will be slightly closer to the receiver by approximately 350 m. Additional noise impacts are considered to be negligible due to this minor change in proximity, particularly given the size of the Central North Extension in comparison to the existing mine.
Woodlea *	**1.65**	6.23	SE	Existing	Proposed mining operations will be more than 4 km further away from Woodlea than current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional noise impacts at this receiver. As the Woodlea property is owned and operated by the Jellinbah East JV, impacts at this receiver are not considered to cause nuisance.
Lucie	**4.67**	9.26	SE	Existing	Proposed mining operations will be greater than 4 km further away from Lucie than current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional noise impacts at this receiver.
New Caledonia	**3.10**	6.91	SW	Existing	Proposed operations will be greater than 3 km further away from New Caledonia than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the distance to the proposed Central North pits and dumps, the Project is considered unlikely to contribute to additional noise impacts at this receiver.

Name	Distance to Mining Operations (km)		Direction from Project	Closest Operation	Magnitude and Likelihood of Noise Impacts
	Existing	Central North			
Dunluce	**1.71**	11.84	SSW	Existing	Proposed Central North operations will be more than 10 km further away from Dunluce than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the significant distance to the proposed Central North pits and dumps, no additional noise impacts are anticipated to occur as a result of the Project.
Top End	**6.41**	15.44	S	Existing	Proposed Central North operations will be greater than 9 km further away from Top End than the current operations. Due to the current proximity of the receiver to the existing pits and spoil dumps, and the significant distance to the proposed Central North pits and dumps, no additional noise impacts are anticipated to occur as a result of the Project.

Note: * owned by the Jellinbah East JV.

4.2.3 Noise Management Strategies

At Jellinbah Coal Mine, one or more of the following control options are currently implemented to reduce noise and vibration impacts from mining operations to below nuisance levels. These strategies will also be implemented at the Central North Extension:

- Equipment will be operated in the correct manner and will receive appropriate maintenance to reduce operational sound power levels;
- Blasting parameters including size and timing will be controlled to ensure compliance;
- Conducting blasting activities only during daylight hours;
- When purchasing new mining equipment, Jellinbah Mining will consider the sound power outputs of the machinery;
- Maintaining any diesel generators in proper working order to prevent unnecessary noise being emitted;
- Ensuring that vehicle mufflers are fitted to all heavy and light vehicles;
- Maintaining the process and crushing plants in proper working order to prevent unnecessary noise being emitted; and
- Maintaining a complaints register and responding to bona fide noise complaints.

Jellinbah Mining has established a consultation strategy with nearby residents to ensure response to perceived problems. Monitoring will be undertaken as required and in response to complaints to establish whether compliance with acceptable noise levels is being achieved. If a complaint is received, Jellinbah Mining will thoroughly investigate the complaint, establish the legitimacy of the complaint and undertake remedial action as necessary. All statutory requirements will continue to be addressed.

4.3 WATER

The following documents were reviewed to identify environmental values and potential impacts, emissions or releases:

- *Environmental Protection (Water) Policy 2009 Mackenzie River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Mackenzie River Sub-basin* (EHP 2011);
- *Jellinbah Mine Site: Site Water Management Plan* (UDP 2014); and
- *Mackenzie South Project: Groundwater Impact Assessment* (Australasian Groundwater and Environmental (AGE) 2006).

4.3.1 Description of Environmental Values

4.3.1.1 Surface Water

Surface waters in the region are of environmental value to the surrounding grazing industry, existing mining operations, the local community and native flora and fauna. The Project is located within the catchment of Blackwater Creek and the Mackenzie River. Blackwater Creek runs parallel to the western boundaries of the existing Jellinbah Central area. The Mackenzie River traverses the Jellinbah Coal Mine between the future Mackenzie North area and the existing mining operations at Jellinbah Plains and Jellinbah Central.

The Mackenzie River is a major tributary of the Fitzroy River which flows to the Coral Sea at Rockhampton. The total catchment area of Mackenzie River to the Bingegang Weir (35 km downstream of the Jellinbah Coal Mine) is approximately 50,960 km^2 and incorporates the Comet and Nogoa River sub-catchments. Beyond the towns of Clermont, Emerald, Springsure and Blackwater, the catchment is sparsely populated. Land use is typically rural with substantial areas cleared for grazing.

Watercourses within the region are ephemeral, with the exception of the Mackenzie River which carries controlled releases from Fairbairn Dam, along the Nogoa River, upstream of Jellinbah Coal Mine. Releases are made from the dam to deliver supplies to downstream riparian water users and to maintain supplies from Bedford and Bingegang Weirs to various towns, mines and irrigators. Water captured in Bingegang Weir, downstream of the mine, is used to supply the towns of Middlemount and Dysart. Semi-permanent pools exist in Blackwater Creek and the Mackenzie River, as well as Three and Five Mile Lagoons located adjacent to the Jellinbah Plains operation.

Within the Project site, there are a number of minor ephemeral streams, best described as drainage features (stream order 1 or 2) identified on the Vegetation Management Watercourse Map (version 1.3). These streams have already been disturbed by existing mining pits. One stream order 3 stream traverses the northern area of MLA 700011. Streams occurring with the Central North Extension area are shown in Figure 8. Within the Project area, these upper catchment drainage features generally do not contain riparian vegetation and have poorly defined banks. Catchments to the drainage features are limited to the immediate surrounding landscape.

Runoff from the majority of the Project area flows northeast towards the Mackenzie River. Two small drainage features in the southwest corner of the Central North Extension area (MLA 700012) flow west towards Blackwater Creek, which in turn flows into the Mackenzie River to the north.

Environmental Values

Under the *Environmental Protection (Water) Policy 2009* (EPP (Water)) of the EP Act, environmental values and water quality objectives are described for the Mackenzie River Sub-basin area in the *Mackenzie River Sub-basin Environmental Values and Water Quality Objectives* document (EHP 2011). Environmental values ascribed to developed areas of the southern tributaries of the Mackenzie River Sub-basin are:

- Protection of aquatic ecosystems;
- Suitability for farm supply and use;
- Suitability for stock water;
- Suitability for human consumption of aquatic foods;

- Suitability for primary contact recreation;
- Suitability for secondary contact recreation;
- Suitability for visual recreation
- Suitability for drinking water supply;
- Suitability for industrial use; and
- Protection of cultural and/or spiritual values.

The EPP (Water) provides Water Quality Objectives (WQOs) to support and protect the various environmental values identified for waters within the Mackenzie River catchments. WQOs are provided in two main parts a) for the purposes of protecting the aquatic ecosystem environmental value; and 2) for environmental values other than aquatic ecosystems. Within the vicinity of the Jellinbah Coal Mine and the Project site, water resources are primarily used for stock watering purposes. The primary environmental values associated with the Project site are aquatic ecosystems suitability and stock watering suitability.

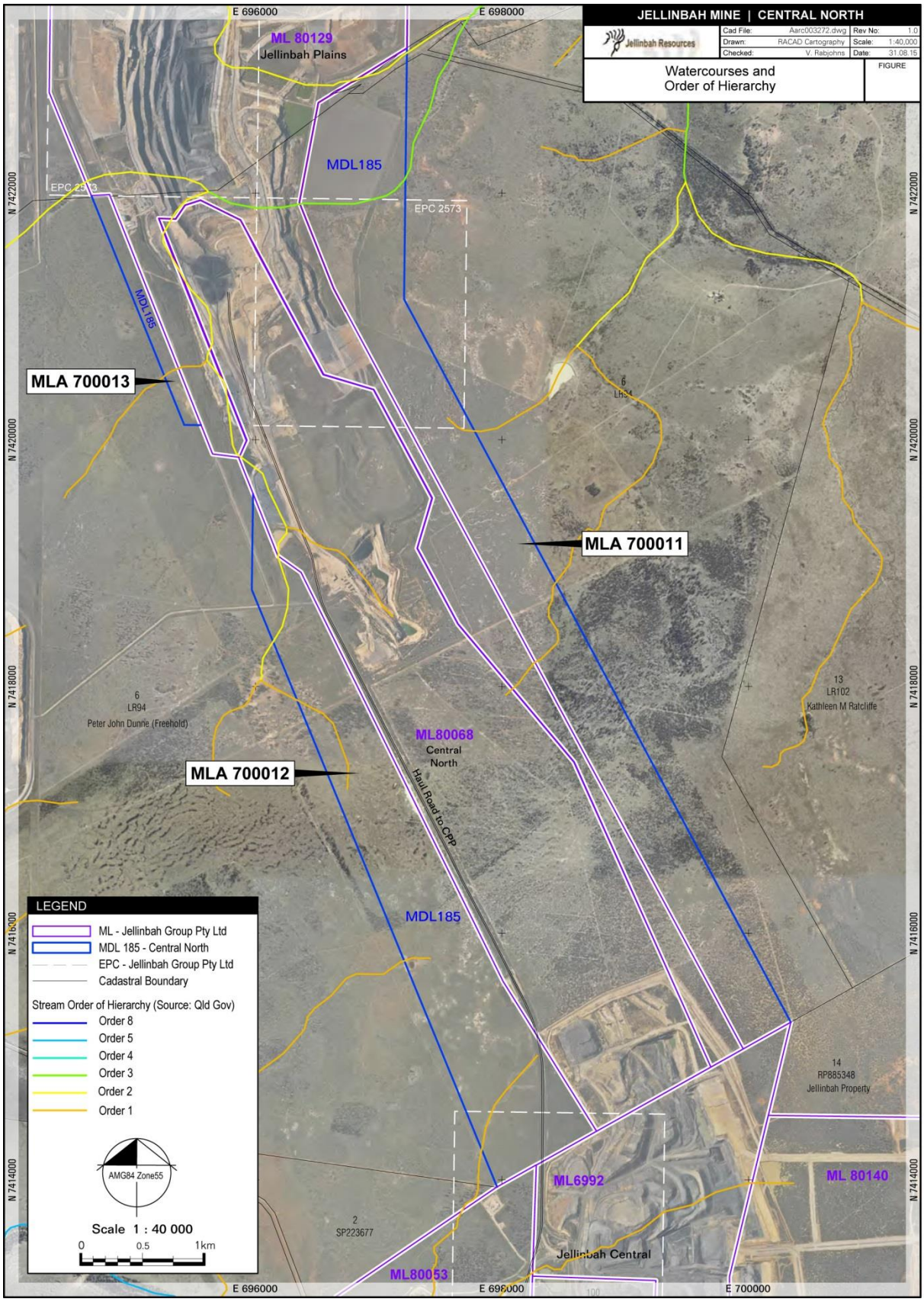

Figure 8 Streams within the Proposed Project MLs

4.3.1.2 Groundwater

A groundwater census has previously been completed for the existing Jellinbah Coal Mine. Groundwater yield from exploration holes and active mining pits has typically been very low and no significant groundwater has been encountered during the course of mining at the Jellinbah Central operation.

Exploration has occurred over much of the Jellinbah Coal Mine area. The only aquifers intersected are coal seams that carry small amounts of saline water. Pit developments associated with the existing Jellinbah Coal Mine have encountered negligible groundwater resources and a limited monitoring program has been undertaken in accordance with the SWMP.

Environmental Values

The *Mackenzie River Sub-basin Environmental Values and Water Quality Objectives* document (EHP 2011) also identifies environmental values for groundwater associated with the Mackenzie River sub-catchment. These environmental values are:

- Protection of aquatic ecosystems;
- Suitability for irrigation;
- Suitability for farm supply and use;
- Suitability for stock water;
- Suitability for drinking water supply;
- Suitability for industrial use; and
- Protection of cultural and/or spiritual values.

Groundwater in the region is not used by local industries or the community. The alluvium in the region of the Project is considered to be a poor aquifer with a low long-term yield, precluding its value as a viable long-term water supply (AGE 2006). The environmental value of groundwater applicable to the Project is limited to the protection of aquatic ecosystems associated with alluvial aquifers associated with the Mackenzie River or other watercourses.

4.3.2 Potential Impacts, Emissions or Releases

Surface Water

The potential surface water quality impacts from activities associated with the Project include:

- Surface water runoff containing elevated levels of sediment or contaminants from cleared areas, spoil dumps and stockpiles;
- Overflow of the contaminated water management system due to extreme rainfall events; and
- Spills of contaminants potentially resulting in contamination of surface water.

Groundwater

Potential groundwater quality impacts from the Project activities could include infiltration of process water, mine water or leachate to the groundwater from areas such as:

- Voids containing pit water or tailings;
- Spoil dumps and stockpiles; and
- Dams and ponds.

In addition, groundwater aquifers associated with the Project have the potential to interact with the Mackenzie River.

4.3.2.1 Risk and Magnitude of Impacts to Environmental Values

Surface Water

Development of the Central North Extension is not anticipated to pose any further risks to the downstream surface water environment beyond those already managed at the Jellinbah Coal Mine. The Project is a relatively small extension of the Jellinbah Coal Mine and will not necessitate any substantial changes to current surface water management practices.

Overflows from the contaminated and clean water management systems are considered unlikely to occur as a result of the Project. Contaminated water storages have sufficient capacity to accommodate annual rainfall and continual monitoring of water levels and storage capacities throughout the year is undertaken to ensure adequate storage for the wet season and onsite water use.

The addition of the Central North Extension will not result in any substantial change to water quality or water management. No additional regulated structures, contaminated water storages or release points are proposed. Any water released to the receiving environment will be via currently authorised release points at Jellinbah Coal Mine and in accordance with current EA conditions.

Site experience indicates that the current SWMP is operating in accordance with its design intent with minimal risk of contaminated water release. Existing controls to manage sediment runoff are successfully achieving minimal impact on the receiving environment. The SWMP will be updated to include the proposed Project, prior to the commencement of any activities in this area. Given the success of the current SWMP in managing site water runoff and releases, it is considered likely that the addition of the Central North Extension area, managed in accordance with an updated SWMP, will not result in any additional impacts to downstream waterways.

Groundwater

Typically, during the operation of an open-cut mine, groundwater inflows exceed any outflow, meaning that the pit acts as a sump requiring dewatering. As such, contamination of the groundwater system with mine affected water is not expected (AARC 2013a). In addition, any cone of depression created around the pit is unlikely to affect groundwater users due to the lack of registered bores in the region (AGE 2006).

A previous groundwater study for the Mackenzie South development indicated that there is limited hydraulic connectivity between the Mackenzie River and the alluvium (AGE 2006). Dewatering of the pit on the Project site is therefore unlikely to affect the Mackenzie River.

Proposed mining at Central North Extension is within a similar geological setting and similar dewatering rates are anticipated. Proposed mining areas are located further south of the Mackenzie River and no impact is expected.

4.3.3 Water Management Strategies

4.3.3.1 Surface Water

Jellinbah Mining will ensure that water quality, water access, and the physical, chemical and biological characteristics of the adjacent streams are not degraded by operations at the Project. The key mechanism utilised in order to achieve this is the SWMP (UDP 2014).

The SWMP (UDP 2014) has proven successful in managing water at Jellinbah Coal Mine and mitigating risks to surface water quality. The SWMP will be updated to include the new infrastructure associated with the Central North Extension. The following mitigation strategies relevant to the proposed Project will be implemented in accordance with the SWMP:

- Contaminated and uncontaminated sources of runoff are separated as much as possible;
- Clean water drainage is handled by designed dams and drains, prior to removal offsite to the natural waterways;
- Drainage systems are in place around the Jellinbah Coal Mine, allowing for natural flows to be diverted around the pit and any areas that may contaminate water and directed to catchment dams to collect sediment and minimise flows offsite;
- Contaminated water is managed by a selection of dams, pumps and pipelines, and consumed on site by recycling and evaporation;
- Drainage from rehabilitation areas and non-contaminating spoil dumps is dealt with separately from pit water or contaminated water; and
- A system of dams allows sediment to settle out of the water.

In addition, the Jellinbah Coal Mine operates in accordance with a number of management plans which assist in preventing environmental harm. These management plans include:

- A Chemical and Fuel Management Plan, which documents the procedures for preventing and cleaning up spills of contaminants. Control strategies assisting in the protection of downstream environmental values include:
    - Bunding of chemical and fuel storage areas in accordance with Australian Standard *AS 1940 – Storage and Handling of Flammable and Combustible Liquids*; and
    - Implementation of spill containment and notification procedures;
- An Erosion and Sediment Control Plan, which provides for the prevention and control of potential erosion at Jellinbah Coal Mine, preventing sedimentation of surface water. Control strategies and structures in place which assist in the protection of downstream environmental values include:
    - Diversion drains and banks to divert clean runoff into sediment detention basins before release to natural streams in receiving environment;

- Sediment fences to slow the flow of water and catch sediments in erosion susceptible locations; and

- Sediment control dams to intercept runoff and allow sediments in runoff to settle out before release to the receiving environment or recycling.

These management plans will be updated to reflect the addition of the Central North Extension prior to development in this area.

4.3.3.2 Groundwater

Groundwater monitoring is currently undertaken at the Jellinbah Coal Mine in accordance with the EA. Additional groundwater monitoring bores will be established at the Project site to monitor groundwater quality, groundwater levels and drawdown fluctuations. Ongoing monitoring will also ensure there remains no connectivity between mining operations and the Mackenzie River.

4.4 SPOIL AND TAILINGS

A desktop assessment utilising existing information was undertaken to assess and interpret the likely physical and chemical characteristics of spoil at the Central North Extension. An assessment of the risks and likely magnitude of potential impacts to environmental values resulting from spoil was also conducted. The following sources were assessed:

- *Mackenzie South: Assessment of Overburden for Salinity, Sodicity and Acid Drainage* (Ison Environmental Planners 2005);

- *Jellinbah Central East: Assessment of Overburden for Salinity, Sodicity and Acid Drainage* (Ison Environmental Planners 2007); and

- *Geochemical Assessment of the Mackenzie North Coal Project* (Environmental Geochemistry International 2013).

Interpretation and extrapolation of existing data is considered to be sufficient to meet the information requirements of the supporting information document, as the Central North Extension will target the same seams as the existing Jellinbah Coal Mine.

4.4.1 Description of Environmental Values

Spoil will be produced through the mining excavation process during the operational stage of the Project. Spoil will be placed both in pit and in out of pit spoil dumps within the proposed Project boundary.

No change to the existing tailings disposal strategy is proposed by the Central North Extension.

4.4.2 Potential Impacts, Emissions or Releases

Potential impacts associated with the production and storage / disposal of spoil and tailings material include:

- Acid mine drainage;

- Contamination of runoff draining into the receiving environment;

- Reduced plant growth;
- Erosion; and
- Reduced land suitability.

4.4.2.1 Risk and Magnitude of Impacts to Environmental Values

Spoil Characterisation

Spoil is typically characterised using the acid-base accounting method, which calculates the net acid producing potential (NAPP) by balancing the total acid forming potential (based on the measured sulphide sulphur content) and the acid neutralising capacity (ANC) (measured directly) (Ison 2005). A sample with a NAPP value of >0 is classed as potentially acid forming (PAF), while sample with a NAPP value of ≤0 is classed as non acid forming (NAF) or potentially acid consuming (Ison 2005).

A review of the aforementioned waste characterisation reports for the Jellinbah Coal Mine has revealed the following key conclusions:

- Testing conducted for three previous waste characterisation assessments have indicated that overburden at Jellinbah Coal Mine is either NAF or potentially acid consuming. No specific management strategies are required for acid mine drainage at the Jellinbah Mine (EGI 2013, Ison 2005, Ison 2007).
- Spoil at the Jellinbah Coal Mine is non-saline. Sampling conducted by EGI (2013) for the Mackenzie North project indicated that it was unlikely for overburden / interburden to release significant salinity or metals / metalloids. This has been supported by existing mine operational experience.
- Some fresh spoil at the Jellinbah Coal Mine is likely to be partly sodic but not highly dispersive (EGI 2013). However, this fresh material has potential to become dispersive under certain weathering conditions. Existing management experience at the Jellinbah Mine suggests that dispersive spoil can be adequately managed through the management of surface runoff.

Results from existing areas of Jellinbah Coal Mine are considered to reflect the likely spoil characteristics of the Central North Extension, which proposes to target the same coal seams as those currently mined at Jellinbah Coal Mine (i.e. Rangal Coal Measures, specifically the Pollux Upper and Pollux Lower seams). Spoil produced at the Central North Extension is unlikely to pose any risk to the environment.

Tailings Material

Operation of the CPP process results in the generation of coarse and fine rejects. Coarse rejects are dumped into current work areas and fine rejects are pumped as slurry into the Max Pit tailings dam, a disused mine void.

The development of the Project will replace coal mining from other existing operating areas on the Jellinbah Coal Mine. The rate of tailings production is therefore not expected to change and there is no risk insufficient tailings storage.

No additional risk to environmental values is anticipated as a result of the Central North Extension, as the same coal seams are proposed to be mined. No change to tailings properties is anticipated and current management strategies have proven successful.

4.4.3 Spoil and Tailings Management Strategies

4.4.3.1 Spoil Management Strategies

No specific management strategies associated with AMD are proposed due to the low risk of the Project.

Existing management strategies at the Jellinbah Coal Mine for management of potentially sodic or dispersive spoil include:

- Diversion drains and banks – designed to divert clean runoff into sediment detention basins before release to natural watercourses in receiving environment;
- Catch drains – designed to capture mine affected water which is then conveyed to settlement detention ponds for recycling;
- Rock line drains – installed on rehabilitated landforms to manage runoff and prevent sediment loss particularly on spoil dumps above the natural ground surface;
- Final landform design – spoil areas above the natural ground surface will be design to <17% slope with batters. Levee banks will be designed to <33% slope.
- Sediment control dams – designed to intercept runoff and allow sediments in runoff to settle out before release to the receiving environment or recycling;
- Progressive rehabilitation of disturbed lands such that a stable, vegetated landform is achieved, minimising the area of exposed surface to erosion; and
- Regular inspections of sediment control structures and monitoring of locations known to be at risk of erosion, particularly during the wet season and following rainfall events.

4.4.3.2 Tailings Management

Tailings material at Jellinbah Coal Mine is disposed of in the Max Pit tailings dam. No changes to current tailings management practices are proposed. Current strategies will be continued for the remainder of the mine life, including the Central North Extension. Current strategies include:

- Max Pit tailings dam is operated as a Regulated Structure and as such is managed to achieve a minimum Design Storage Allowance annually by 1 November;
- If extreme weather conditions result in particularly high water levels in Max Pit, water can be pumped to the South Pit via a dedicated rising main. This allows water levels in Max Pit to be lowered at rates quicker than under normal operating conditions;
- A valved pipe connection exists to manage water inputs to the Max Pit tailings dam; and
- Bathymetric and field surveys of the Max Pit Tailings Dam are regularly conducted to define the level of stored tailings in the dam and the shape of deposited tailings below the water's surface.

4.5 LAND

A desktop assessment utilising existing information was undertaken to develop an understanding of the values of the soil and land environment of the Project site, as well as assess the risk and likely magnitude of potential impacts to these values. The following sources of information were assessed:

- *Mackenzie South: Soil and Land Suitability Survey* (AARC 2006);
- *Jellinbah Central East: Soil and Land Capability Assessment* (Ison 2007);
- *Mackenzie North: Soil and Land Suitability Assessment* (AARC 2013b);
- *Atlas of Australian Soils* (Australian Soil Resource Information System n.d.);
- *Land Systems – Lands of the Isaac-Comet Area – Central Queensland (ZDK3)* (CSIRO 1967); and
- *Jellinbah Coal Mine Topsoil Management Plan* (AARC 2014).

4.5.1 Description of Environmental Values

Predominant land uses in the region include grazing and cropping, with mining and exploration common in some areas. The existing land use surrounding the target area is low intensity cattle grazing.

4.5.1.1 Areas of Regional Interest

The *Regional Planning Interests Act 2014* provides for the identification and protection of Areas of Regional Interest, which include:

- Priority Agricultural Areas;
- Priority Living Areas;
- Strategic Environmental Areas; and
- Strategic Cropping Areas.

No Priority Agricultural Areas, Priority Living Areas or Strategic Environmental Areas occur in the vicinity of the Project area. Two small Strategic Cropping Areas (SCAs) occur in the northern-most portion of the eastern ML amounting to approximately 14.61 ha (Figure 9), as identified on the Strategic Cropping Land Trigger Map (v3.1). No impact to SCAs is proposed by the Central North Extension.

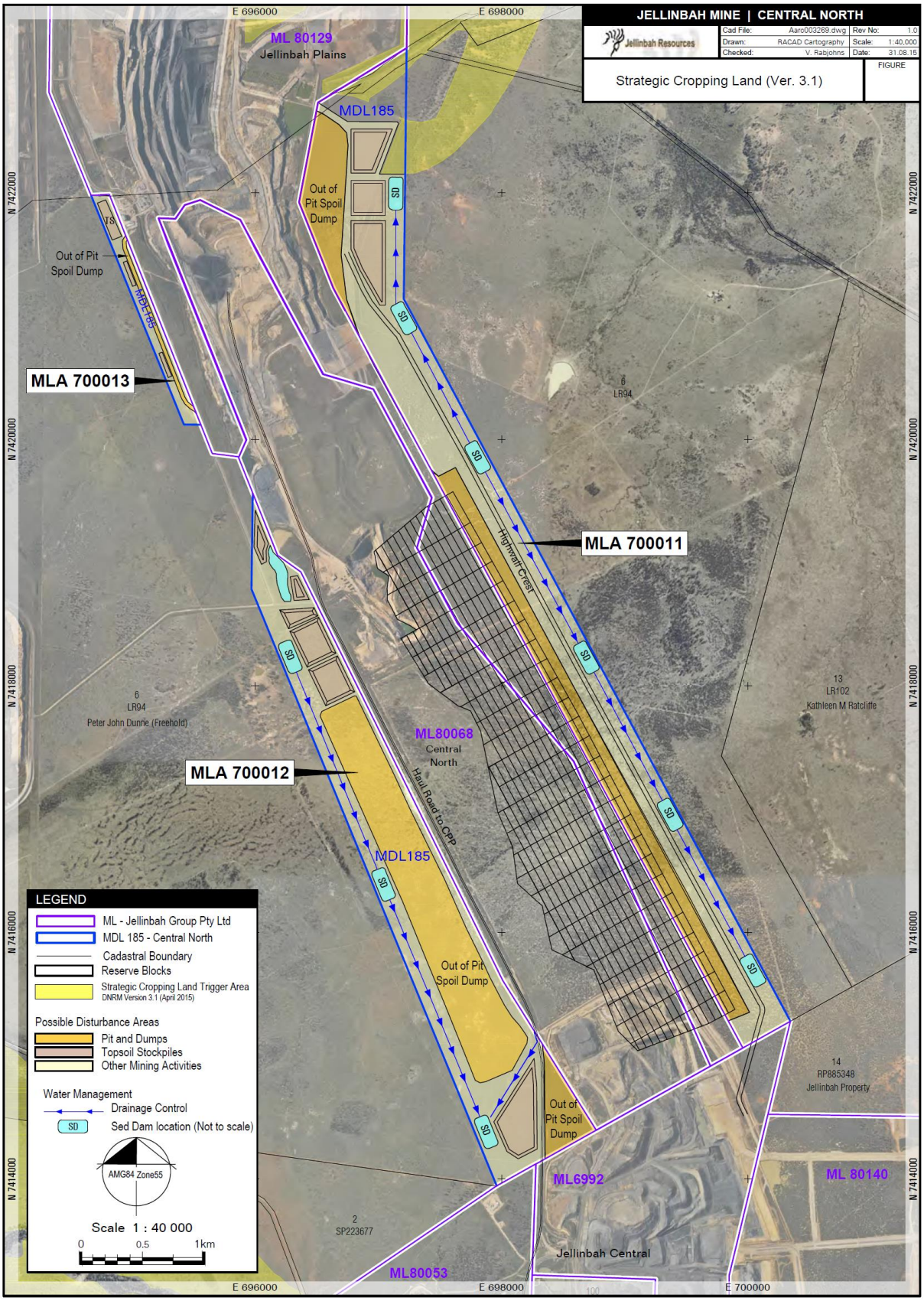

Figure 9 Strategic Cropping Areas and Project Infrastructure

4.5.1.2 Soil and Land Suitability

Existing broad-scale land and soil surveys were utilised to assess the potential soil and land systems present within the Project area. Most soils have low to moderate nutrient content and plant available water holding capacity (PAWHC) (the weighted average of the A and B horizons) of 28 – 210 mm.

The majority of the Project area is encompassed by Soil Map Unit *Va31*, shown on the Atlas of Australian Soils (Australian Soil Resource Information System n.d.) and Land System Map Unit *HU (ZDK3 484)*, shown on the Lands of the Isaac-Comet Area Map (CSIRO 1967). The most common soil profiles within the Central North MLAs are dark, loamy, duplex soils (*Dd1.33* and *Dd1.13*) and cracking clays (*Ug5.15* and *Ug5.16*) (Australian Soil Resource Information System n.d.). Land within the Project area is predominantly classed as C1 or C1/A GQAL (refer to Table 18 for classification descriptions).

Descriptions of the Soil Map Units and Land System Map Units identified on the Project site are presented in Table 16 and Table 17.

Table 16 Soil Map Units within the Project Area – Atlas of Australian Soils

Soil Map Unit	Land Description	Soils	Nutrient Status	PAWHC (mm)	Location
HG6	Alluvial plains fringing major streams; the area is inundated only by very high floods	Dominant: Dd1.33 – Dark loamy duplex soil occurring on flat low terraces.	Low	65	MLA 700011
		Subdominant: Dd1.43 – Dark loamy duplex soil occurring on flat low terraces.	Low	52	
		Subdominant: Dd1.13 – Dark loamy duplex soil occurring on flat low terraces.	Moderate	60	
		Subdominant: Ug5.15 – Cracking clay in slightly lower areas.	Moderate	210	
		Subdominant: Ug5.16 – Cracking clay in slightly lower areas.	Moderate	188	
Va31	Gentle / moderately undulating lands with some more strongly dissected marginal slopes	Dominant: Dy3.43 – Loamy-surfaced (6-8 in.)	Low	58	MLA 700011, MLA 700013, MLA 700012
		Subdominant: Dy3.33 – Loamy-surfaced (6-8 in.)	Low	28	
		Subdominant: Dy3.42 – Also occurring, more particularly on the marginal slopes, are duplex soils with deeper sandy A horizons (1-20 in.) which are often gravelly. Common forms include Dy3 .42.	Low	74	
		Subdominant: Db1.13 – Other duplex soils also occur, particularly along drainage lines. These are chiefly Db1.13, Dy2.43, Dy2.33, Dd1.13, Dd1.33, and	Low	67	

Soil Map Unit	Land Description	Soils	Nutrient Status	PAWHC (mm)	Location
		Dy4.32.			
		Subdominant: Dy2.43 – Other duplex soils also occur, particularly along drainage lines. These are chiefly Db1.13, Dy2.43, Dy2.33, Dd1.13, Dd1.33, and Dy4.32.	Low	33	
Kd13	Level flood-plains adjacent to major streams; small low levee terraces may occur locally and most areas are subject to inundation in high floods; braided distributary channels frequently occur	Dominant: Ug5.1 – See below.	Moderate	175	MLA 700013
		Subdominant: Ug5.15 – Deep dark clays.	Moderate	210	
		Subdominant: Ug5.16 – Deep dark clays.	Moderate	188	
		Subdominant: Ug5.24 – Grey clays (Ug5.24 and Ug5.25).	Moderate	167	
		Subdominant: Dd1.33 – Commonly associated on slightly higher sites are loamy duplex soils such as Dd1.33.	Low	65	

Source: Australian Soil Resource Information System (n.d.)

Table 17 Land Systems within the Project area – Land System Series (Isaac-Comet Area)

Land System Map Unit	Land Description	Agricultural Land Class	Location
FU (ZDK3 485)	Flood-plains with Coolibah along major streams and in basalt areas; cracking clay soils.	C1/A – Pasture Land – sown pastures, and native pasture on high fertility soils / Limited Crop Land	MLA 700011: Smaller portion in north MLA 700013: Small portion – northernmost area of MLA 700013
HU (ZDK3 484)	Blackbutt and Brigalow on weathered clay plains occurring in most parts of the area; texture-contrast and cracking clay soils.	C1 – Pasture Land – Sown pastures, and native pasture on high fertility soils	MLA 700011: Majority MLA 700013: Majority MLA 700012: Majority
BI (ZDK3 494)	Brigalow plains and cracking clay soils on weathered Tertiary clay and older rocks along the central axis of the area	C1 – Pasture Land – Sown pastures, and native pasture on high fertility soils	MLA 700011: Second most dominant on MLA 700011 MLA 700012: Very small portion in SE corner of MLA 700012

Source: CSIRO (1967)

Table 18 Good Quality Agricultural Land Classifications

Class	Description
Class A	**Crop Land –** Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
Class B	**Limited Crop Land –** Land that is marginal for current and potential crops due to severe limitations and suitable for pastures. Engineering and / or agronomic improvements may be required before the land is considered suitable for cropping.
Class C	**Pasture Land –** Land that is suitable only for improved (Class C1) or native pastures (Class C2) due to limitations which preclude continuous cultivation for crop production, although some areas may tolerate a short period of ground disturbance for pasture establishment. This also includes land suitable for light grazing of native pastures in inaccessible areas (Class C3).
Class D	**Non-Agricultural Land –** Land not suitable for agricultural uses due to extreme limitations. This land may be undisturbed land with significant habitat, conservation and / or catchment values or land may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

Sources: AARC 2006; Ison 2007; AARC 2013b

4.5.2 Potential Impacts, Emissions or Releases

The development of the proposed Project may result in the following impacts to soil quality and land suitability:

- Change in suitability classification of the land;
- Destabilisation of soils and increased risk of erosion;
- Impacts to the chemical and physical properties of soil due to stripping, stockpiling and handling of topsoil. This may impede a soil's ability to support vegetation;
- Contamination of surface and subsoil due to spills or seepage;
- Sedimentation of receiving waterways; and
- Loss of topsoil and beneficial plant nutrients.

4.5.2.1 Risk and Magnitude of Impacts to Environmental Values

Areas of Regional Interest

Project infrastructure has been located to ensure no impact to potential SCAs. Figure 9 (Section 4.5.1.1) illustrates the location of sediment dams, mining excavations, and spoil dumps on the Project site in relation to SCAs indicated on the Strategic Cropping Land Trigger Map. No impact to these SCAs is expected to occur.

Soil and Land Suitability

The Central North Extension proposes additional disturbance areas as the Jellinbah Coal Mine extends into new ML areas. The suitability of this land for agricultural activities will be affected by Project operations, both during the life of the Project and following decommissioning and rehabilitation.

Rehabilitation will aim to restore the land to its pre-mining land use of low-intensity cattle grazing, minimising impacts on soil and land suitability values.

Potential impacts of the Project are likely to be consistent with existing impacts experienced at the Jellinbah Coal Mine. The Topsoil Management Plan and Sediment and Erosion Control Plan have proven successful in managing these impacts. Therefore the risks to the environmental values of soil and land associated with the development and operation of the Central North Extension are likely to be minimal.

Given the small scale of the proposed Project and previous rehabilitation success at the Jellinbah Coal Mine, the risks to soil and land suitability are considered to be minor. With the implementation of appropriate management practices during the rehabilitation process, it is not foreseeable that the Central North Extension will pose significant additional risks to these environmental values.

4.5.3 Land Management Strategies

Areas of Regional Interest

The proposed Project is not anticipated to impact on SCAs indicated on the Strategic Cropping Land Trigger Map. All infrastructure is located outside of these SCAs.

Soil and Land Suitability

Topsoil Management

Jellinbah Coal Mine's Topsoil Management Plan will be updated to incorporate the Central North Extension prior to development in this area. The Topsoil Management Plan provides management strategies for the stripping and stockpiling of topsoil on areas to be affected by the proposed Project. The current Topsoil Management Plan will be updated to incorporate the Project area. Prior to this, sampling will be carried out over the Project area to identify and characterise soils.

Topsoil management strategies to be implemented at the Project site will include the following:

- Prior to the development of any new open cut pit, spoil dump or infrastructure, vegetation and topsoil will be removed from the footprint area and stockpiled;
- Large vegetation will be pushed first and windrowed alongside the area where topsoil will be stockpiled; and
- Where necessary, topsoil stockpiles will be ripped and seeded to encourage water infiltration and prevent erosion. Topsoil will be respread on surfaces to be rehabilitated as soon as possible to benefit from the viability of the topsoil seed bank.

Erosion

Erosion management strategies to be implemented at the Project area include:

- Only the minimum area of land required for the safe operation of mining activities at the Central North Extension will be cleared at any one time;
- Runoff will be directed around all topsoil stockpiles and disturbed areas. However, where runoff from disturbed areas does occur, runoff will be directed to settling ponds or sediment dams to remove suspended sediments prior to release to the receiving environment;

- Progressive rehabilitation will be undertaken to minimise the total area of disturbed land on the site at any point in time and reduce the liability of rehabilitation at the end of mine stage;

- Landform slopes will be contoured to minimise slope lengths and the velocity of runoff, thereby minimising the risk of erosion; and

- Rock armouring of drains to reduce scouring will be considered, if required.

Soil Contamination

To prevent contamination of soils at the Project, the following management strategies will be implemented:

- Water management at the Central North Extension will be integrated into the existing site water management strategy for the Jellinbah Coal Mine. Water management will facilitate the capture of potentially contaminated water, including runoff from industrial and stockpile areas, in order to prevent release to the receiving environment;

- Effluent will be treated to a quality appropriate for use as irrigation or release to evaporation trenches, in order to prevent contamination to land; and

- In accordance with the Chemical and Fuel Management Plan, spills of fuel, oil or other chemicals will be cleaned up immediately and contaminated soil will be treated regularly. Spill kits will be provided at workshops and refuelling areas.

4.6 NATURE CONSERVATION

4.6.1 Description of Environmental Values

The Project is located within the Brigalow Belt Bioregion, a region covering more than 36,400,000 ha of land between Townsville and northern New South Wales. The vegetation of the region is largely fragmented due to clearing for agricultural and pastoral activities. Remaining vegetation is dominated by Brigalow (*Acacia harpophylla*) and Eucalypt communities (Threatened Species Network 2008).

A field survey was undertaken by qualified ecologists in order to describe environmental values of the Project site, assess likely impacts and identify suitable mitigation measures.

4.6.1.1 Survey Methodology

The flora and fauna assessment, consisting of desktop evaluation and field assessment, was conducted to investigate the environmental values of the Project area. The field survey component was conducted from 16th – 20th February 2015.

Survey Methods and Locations

Flora and fauna survey locations are shown in Figure 10.

Flora

The flora survey for the Project was conducted in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al. 2012). Standard floristic survey methods were used to identify and map vegetation communities. Two vegetation survey techniques (Secondary and Quaternary plots) were utilised during the field survey.

Secondary sites consisted of a 20 metre (m) x 50 m transect, along which a complete floral assemblage was recorded. Quaternary survey sites consisted of a single observation plot at which important features were noted, such as dominant species in the characteristic layers and vegetation structure. Quaternary sites were used to ground-truth desktop assessment results and existing vegetation mapping. These sites focused on ground-truthing the relatively small and isolated patches of remnant vegetation that exist on the Project site. The condition and quality of vegetation at each survey site was also assessed. Weed presence, including presence of noxious species, was recorded.

A vegetation map of the Project area was produced following the field survey to a scale of 1:40,000. The map was developed based upon survey results, satellite images, aerial photographs, and geological maps of the Project area.

All plants encountered during the survey were identified by experienced and qualified ecologists. All REs were described and classified according to EHP's Regional Ecosystem Descriptions Database (EHP 2014). For any plant species that could not be identified in the field, a specimen was collected and sent to the Queensland Herbarium for identification.

Several flora species of conservation significance were highlighted in the desktop searches undertaken prior to the field survey. Targeted searches for species of conservation significance were conducted upon the identification of suitable habitat in the field. The targeted survey technique utilised in this study was the 'Random Meander' method. This technique involves traversing areas of suitable habitat along a meandering route whilst searching for the plant species of interest. If there was any uncertainty in identification of a species, a specimen was collected for identification by the Queensland Herbarium.

Fauna

Survey methodology was developed in accordance with the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (DSITIA 2014). Fauna detection methods included the following:

- Elliot trapping;
- Pitfall trapping;
- Funnel trapping;
- Motion detector camera trapping;
- Micro-bat surveys;
- Bird surveys;
- Habitat searching;
- Scat and track searches; and
- Incidental recordings.

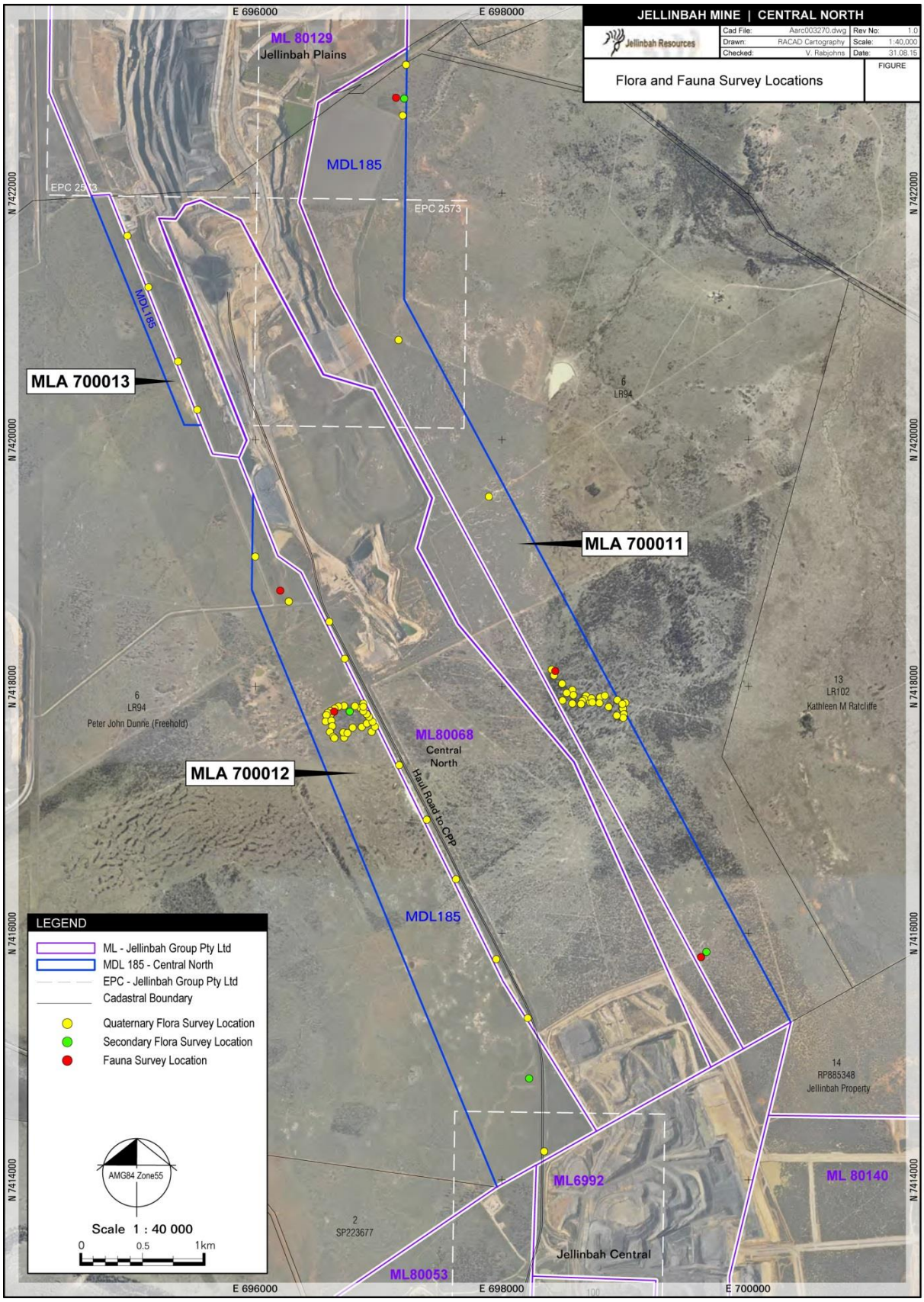

Figure 10 Flora and Fauna Survey Locations

4.6.1.2 Survey Results

Flora Results

A total of 142 flora species were recorded during the site survey. No species of conservation significance were recorded. Two vegetation communities were identified in the Project area:

- Community 1 – Dawson Gum (*Eucalyptus cambageana*) woodland to open forest with Brigalow (*Acacia harpophylla*) on Cainozoic clay plains (RE 11.4.8/11.4.8a); and
- Community 2 – Non-remnant grassland.

Vegetation communities are indicated in Figure 11 and described below in further detail.

Vegetation Communities

Community 1 – Brigalow and Dawson Gum Open Forest to Woodland

Community 1 occurs in two small patches in the central portion of the Project area. The community is characterised by Dawson Gum and Brigalow woodland and includes small areas of palustrine wetlands associated with gilgai (melonhole mounds).

Community 1 is considered to be consistent with RE 11.4.8/11.4.8a and covers an area of approximately 14.65 ha on the Project site. RE 11.4.8 is classed as Endangered under the *Vegetation Management Act 1999* (VM Act) and the Queensland Biodiversity Status. As a Brigalow co-dominant community, Community 1 is also listed as a Threatened Ecological Community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). RE 11.4.8 has been extensively cleared for pasture (EHP 2014b).

This community is subject to weed invasion and low to moderate intensity cattle grazing. Buffel Grass (*Cenchrus ciliaris*) and Sabi Grass (*Urochloa mosambicensis*) invasion has modified the ground layer, and exotic cacti are scattered throughout the ground and shrub layers. The community exhibits a variety of habitat features, including exfoliating bark, logs, fallen branches and leaf litter, suitable for supporting populations of common small reptiles. Scattered gilgai provide temporary water sources for fauna and habitat for a range of amphibians. Emergent Dawson Gum and stags provide a small amount of habitat for arboreal mammals (such as the Brushtail Possum, *Trichosurus vulpecula*) and nocturnal birds (such as the Tawny Frogmouth, *Podargus strigoides*). Swamp Wallabies (*Wallabia bicolor*) were observed in this vegetation community.

Community 2 – Non-remnant Pasture

Community 2 occurs throughout the Project area and is characterised by non-remnant grassland interspersed with Brigalow-dominant regrowth and dams / wetlands. Community 2 covers an area of approximately 788.35 ha.

The conservation value of this community is minimal due to its non-remnant status and it is not listed under State or Commonwealth legislation. Vegetation in Community 2 has been subject to substantial clearing for cattle grazing and regrowth is typically low and sparse. The ground is heavily disturbed and dominated by exotic pasture grasses. There are few habitat features in this community.

Cattle dams provide habitat for aquatic birds and amphibians. The dense ground layer provides potential habitat for small mammals. A range of small granivorous and insectivorous bird species

inhabit the shrubs and grasses of this community, providing food for raptors such as the Nankeen Kestrel (*Falco cenchroides*), which was observed in high numbers during the survey.

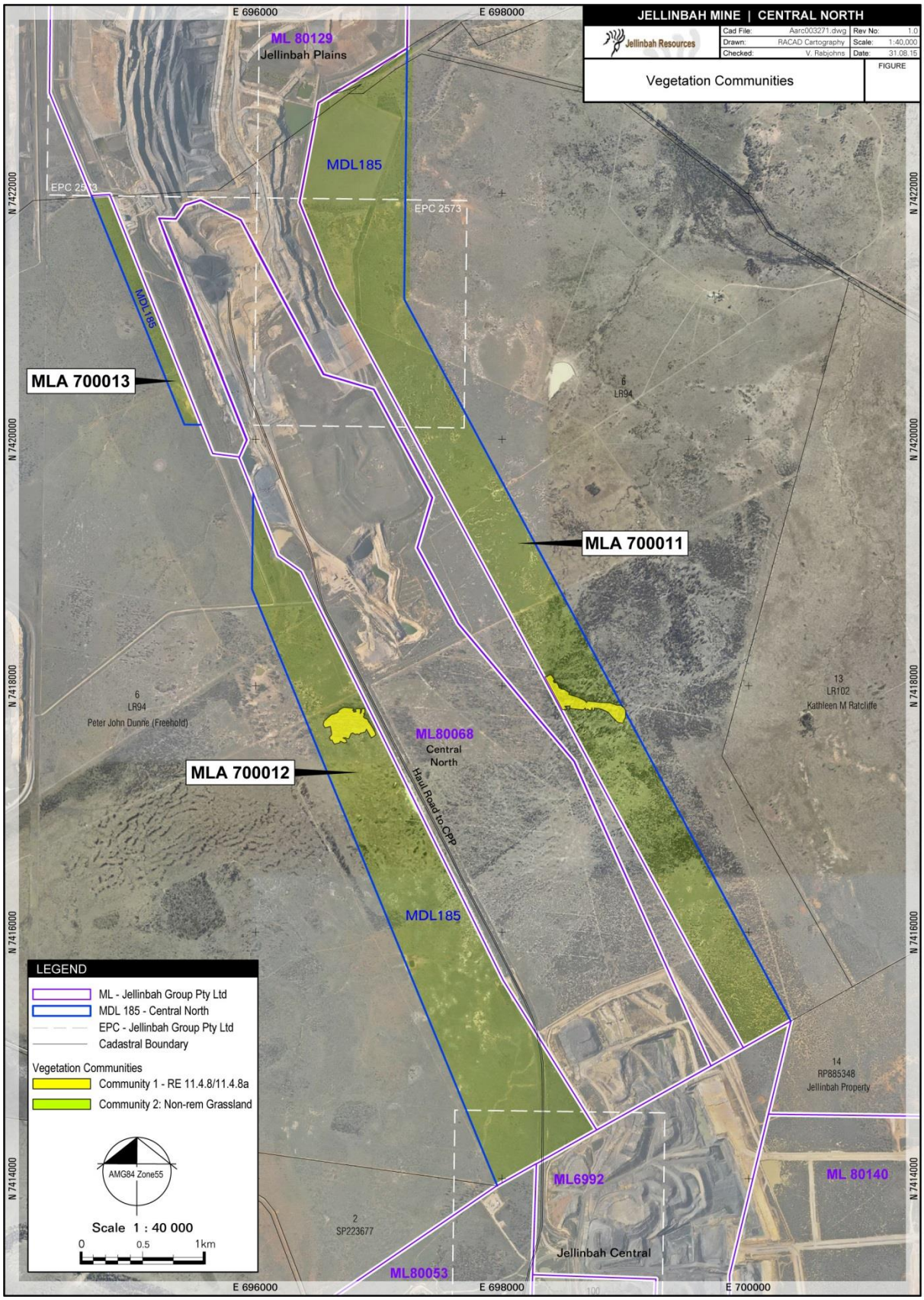

Figure 11 Vegetation Communities on the Project Site

Threatened Species and Communities

Community 1 is listed as a Threatened Ecological Community under the EPBC Act and an Endangered RE under the VM Act and Biodiversity Status. The extent of this Brigalow community in the Project area is relatively small (approximately 1.8% of the total area). Weed invasion has altered the structure and composition of this community observed during the survey.

No threatened flora species were observed during the survey period. Although potentially suitable habitat exists on the site for a small number of threatened flora species, surveys were unable to locate these species indicating they are unlikely to be present.

Weed Species

A total of 22 introduced plant species were observed in the Project area. The ground layer throughout the Project area was found to be dominated by introduced pasture grasses, predominantly Sabi Grass (*Urochloa mosambicensis*) and Buffel Grass (*Cenchrus ciliaris*). The exotic legumes Shrubby Stylo (*Stylosanthes scabra*), Siratro (*Macroptilium atropurpureum*) and Phasey Bean (*Macroptilium lathyroides*) are also present in the Project area.

Four declared weed species were noted in the Project area. Harrisia Cactus (*Harrisia martinii*) and Velvety Tree Pear (*Opuntia tomentosa*) were observed in low densities throughout the entire Project area. Small localised infestations of Parkinsonia (*Parkinsonia aculeata*) and Mother of Millions (*Bryophyllum delagoense*) were also noted. Under Queensland legislation, Harrisia Cactus, Velvety Tree Pear, Parkinsonia and Mother of Millions are Class 2 declared pest plants. Landholders are responsible for the management of declared pests on their land. Parkinsonia and Velvety Tree Pear are also recognised as Weeds of National Significance.

Fauna Results

A total of 76 fauna species were recorded in the Project area, including 11 mammals, 49 birds, 10 reptiles and six amphibians. An additional two bat species may also have been present, but their identification could not be confirmed from the available data.

Mammals

The dense grassy understorey of the Project area provides forage for large macropods and shelter for small mammals. The Swamp Wallaby (*Wallabia bicolor*) and Eastern Grey Kangaroo (*Macropus giganteus*) were observed in several portions of the Project area. Evidence of the Brush-tailed Possum (*Trichosurus vulpecula*) was also recorded in areas of remnant vegetation.

Four bat species were positively identified in the Project area:

- Little Pied Bat (*Chalinolobus picatus*);
- Gould's Wattled Bat (*Chalinolobus gouldii*);
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*); and
- Inland Forest Bat (*Vespadelus baverstocki*).

A fifth species was also detected, but could not be positively identified to species level. Two additional bat species (*Scotorepens balstoni* and *Chaerephon jobensis*) may also have been present in the Project area, but their identification could not be confirmed from the call data collected. Strong winds

experienced during the survey affected the quality of the bat call recordings, making species identification difficult.

Three introduced species of mammal were detected during the survey: European Cattle (*Bos taurus*) domestic Horses (*Equus caballus*) and Wild Dogs (*Canis familiaris*).

No mammalian species of conservation significance were recorded during the survey.

Reptiles

Ten reptile species were observed on the Project site over the survey period. High numbers of Rainbow Skinks (*Carlia* spp.) were observed throughout the Project area. Striped Snake-eyed Skinks (*Cryptoblepharus virgatus*) were also commonly encountered. Common Dwarf Skinks (*Menetia greyii*) were commonly captured in pitfall traps. Several Bynoe's Geckoes (*Heteronotia bynoei*) were captured in funnel traps. A Blind Snake (*Ramphotyphlops affinis*) was captured in a pitfall trap at FA2. A single Mulga Snake (*Pseudechis australis*) was recorded on motion detector camera at FA1.

The Project area provides a variety of suitable habitat for reptile species; areas of Brigalow vegetation contain numerous logs, dead trees, woody debris, exfoliating bark and leaf litter.

Amphibians

Six species of amphibians were recorded during the survey. An Eastern Snapping Frog (*Cyclorana novaehollandiae)* was captured in a pitfall trap at FA2. An Eastern Sedgefrog (*Litoria fallax*) was captured in a funnel trap at FA3. Cane Toads (*Rhinella marina*), a Green Tree Frog (*Litoria caerulea*) and a single Green-stripe Frog (*Cyclorana alboguttata*) were recorded on motion detector camera. The Laughing Tree Frog (*Litoria rothii*) was heard calling at a cattle dam in the southern portion of the Project area.

No amphibians of conservation significance or suitable habitat for threatened amphibians were found in the Project area.

Birds

Forty-nine bird species were observed feeding and moving through the Project area. The large pastures of the area provide habitat for a range of insectivorous birds, such as the Golden-headed Cisticola (*Cisticola exilis*), Rufous Songlark (*Cincloramphus mathewsi*), Black-faced Woodswallow (*Artamus cinereus*), and Australasian Pipit (*Anthus novaeseelandiae*). Seeding pasture grasses provide food for a range of granivorous birds, including the Zebra Finch (*Taeniopygia guttata*), Budgerigar (*Melopsittacus undulatus*), Galah (*Eolophus roseicapillus*) and Sulphur-crested Cockatoo (*Cacatua galerita*). Pasture areas provide a source of prey for the Nankeen Kestrel (*Falco cenchroides*), which was recorded in high densities. Other raptors observed in the Project area were the Wedge-tailed Eagle (*Aquila audax*), Whistling Kite (*Haliastur sphenurus*) and Black Kite (*Milvus migrans*). Australian Bustards (*Ardeotis australis*) were also observed in the pastures of the Project area.

The two woodlands on the Project area provide nesting habitat for two kookaburra species, and also support populations of Apostlebirds (*Struthidea cinerea*), Black-faced Cuckoo-shrikes (*Coracina novaehollandiae*), Pied Butcherbirds (*Cracticus nigrogularis*) and Noisy Friarbirds (*Philemon corniculatus*).

Corvids such as the Torresian Crow (*Corvus orru*) and Australian Magpie (*Cracticus tibicen*) were also recorded throughout the Project area.

Two wetland habitats were observed in the Project area, providing habitat for a range of aquatic and wetland species, such as the Australian Pelican (*Pelecanus conspicillatus*), Wandering Whistling Duck (*Dendrocygna arcuata*), Royal Spoonbill (*Platalea regia*) and several species of heron and cormorant. Pairs of Brolgas (*Grus rubicunda*) were also observed.

No bird species of conservation significance were detected during the survey. Two species listed as Migratory and Marine under the EPBC Act were recorded: the Rainbow Bee-eater (*Merops ornatus*) and the Eastern Great Egret (*Ardea modesta*). An additional 10 species of listed Marine birds were observed during the survey:

- Magpie-lark (*Grallina cyanoleuca*)
- Black-faced Cuckoo-shrike;
- Australasian Pipit;
- Wandering Whistling Duck;
- Australian Pelican;
- Dollarbird (*Eurystomus orientalis*);
- Straw-necked Ibis (*Threskiornis spinicollis*);
- Nankeen Kestrel;
- Whistling Kite; and
- Black-winged Stilt (*Himantopus himantopus*).

Pest Species

Pest species known to occur within the Project area are the Dingo and the Cane Toad. European Rabbits (*Oryctolagus cuniculus*) were sighted in close proximity to the Project area, and are considered likely to occur on site. The Dingo and European Rabbit are Class 2 declared pests under the LP Act. Land owners and managers are responsible for the control of declared pests on their land.

4.6.2 Potential Impacts, Emissions or Releases

The survey identified two vegetation communities in the Project. One of these communities (RE 11.4.8) is listed as Endangered under the VM Act, EHP Biodiversity Status, and EPBC Act. The Project area supports populations of common mammal, bird, amphibian and reptile species. Fauna habitat features of the Project area include logs, dead trees, exfoliating bark, leaf litter, woody debris, dense groundcover, gilgai and two small wetlands. However, the environmental values of the Project site are compromised by weed and pest invasion, edge effects, fragmentation and habitat connectivity.

Vegetation clearing and mining of the Project area has the potential to cause habitat loss, erosion, sedimentation, noise, dust and contaminated surface water runoff. Project works should be undertaken in accordance with Jellinbah Mining's existing environmental management practices and procedures, in order to minimise these potential impacts.

4.6.2.1 Risk and Magnitude of Impacts to Environmental Values

Potential Impacts to Flora and Vegetation Communities

The majority of the Project site is non-remnant pasture grass used for cattle grazing (refer to Figure 11) with little variation in vegetation characteristics, reducing the likelihood that significant flora species may be present.

Development of the Project will disturb approximately 803 ha of land, including clearing of approximately 14.65 ha of remnant vegetation, based on preliminary Project designs. Project development may result in the loss of two small, isolated areas of vegetation and fauna habitat, with associated potential for fauna mortality. As the survey was unable to identify any flora species of conservation significance and only a small area of remnant vegetation is proposed to be cleared, it is considered highly unlikely that the Project will impact threatened flora species.

Potential Impacts to Fauna Species of Conservation Significance

No fauna species of conservation significance were identified on the Project site during the survey. A number of species of conservation significance were identified during preliminary desktop studies and database searches, but were not identified during the field survey. An assessment of the likelihood of occurrence within the Project area and potential impacts was conducted for these species and is provided in Appendix A. The majority of the Project site is non-remnant pasture grass with little variation in vegetation characteristics, reducing the likelihood that significant fauna species may be present. The most suitable habitat for fauna species of conservation significance occurs in the relatively small and isolated patches of remnant vegetation, on which the survey was focused.

In addition, potentially suitable habitat exists on the Project site for a number of Migratory and/or Marine species not observed during the survey period. These species are considered unlikely to be impacted by Project development due to their highly mobile nature (including some species which are strictly aerial), and the presence of suitable habitat within the region.

4.6.3 Nature Conservation Management Strategies

Development and operation of the Central North Extension will be undertaken in accordance with the existing environmental management and mitigation strategies currently implemented at Jellinbah Coal Mine Site. These strategies may include:

- Areas to be disturbed must be clearly delineated and clearing restricted to the disturbance footprint;
- Sediment and erosion controls will be implemented throughout both construction and operation, as per the Erosion and Sediment Control Plan;
- Topsoil stripped during mining activities will be stockpiled for use in rehabilitation, in accordance with the Topsoil Management Plan;
- The current SWMP will be updated to include appropriate management of water and runoff at the Central North Extension area. Clean water will be diverted around the mining area into natural streams. Dirty runoff water will be diverted to detention areas for settlement of particulates;
- Dust emissions will be controlled through the use of water trucks;

- The Weed and Pest Management Plan will also apply to the proposed works, minimising impacts to the flora and fauna of the Project area; and

- An Environmental Offset Strategy has been prepared for the Project (refer to Appendix B). The Strategy identifies offset commitments and potential offset supply within the Brigalow Belt Bioregion, in accordance with the *Queensland Environmental Offsets Policy 2014 (v1.1)* (EHP 2014).

4.7 COMMUNITY

4.7.1 Description of Environmental Values

The social conditions in the region surrounding the Project are of environmental value. This includes the amenity and liveability, harmony and wellbeing, sense of community, access to recreation, and access to social and community services and infrastructure in the region surrounding the mine, including economic conditions and benefits within the affected community.

Stakeholders and other groups or individuals with an interest in Jellinbah Coal Mine include surrounding neighbours, Central Highlands Regional Council and State government departments, employees of the existing Jellinbah Coal Mine, and the residents of Queensland who all enjoy the economic benefits of the mine.

4.7.2 Potential Impacts, Emissions or Releases

Potential impacts of the proposed Project on the community are limited to direct impacts on surrounding landholders such as:

- Release of sediments or contaminants to waterways;

- Aiding the spread of weeds or pests;

- Noise emissions; and

- Dust emissions.

No changes to the magnitude of these existing impacts are anticipated as a result of the Project.

4.7.2.1 Risk and Magnitude of Impacts to Environmental Values

There are few facilities in the area. The nearest shops, hotel and service station are at Bluff, approximately 31 km by road.

With the implementation of the management strategies proposed above, as well as the existing site management plans (refer to Section 5.0), little or no impact on the amenity and liveability of the area, access to services, health and wellbeing of the community is anticipated as a result of the Project.

4.7.3 Community Management Strategies

Control strategies adopted to minimise direct impact on landholders are discussed throughout this document. Additional measures currently employed by the Jellinbah Coal Mine to address social related issues include:

- Restrictions on public access to Jellinbah Coal Mine site (including using suitable signage and fencing where necessary);
- Regular consultation with neighbours to provide information and address any concerns raised;
- Preferential use of suitable qualified local personnel for employment or work contracts;
- Maintenance of good relations with nearby neighbours; and
- Consultation with relevant government departments.

4.8 CULTURAL HERITAGE

4.8.1 Description of Environmental Values

Areas of Indigenous cultural heritage on the Jellinbah Coal Mine site may be of significance to local Indigenous people and Native Title claimants.

Jellinbah Group has conducted extensive consultation with the registered Native Title groups and will continue to do so as part of a proactive community consultation program and ongoing development of Cultural Heritage Management Plans (CHMPs) for the existing Jellinbah Coal Mine. Consultation has been planned between the registered Native Title groups and Jellinbah Group for the purpose of developing a CHMP for the proposed Central North MLs.

4.8.2 Potential Impacts, Emissions or Releases

Risks associated with the Central North Extension include the disturbance, damage and/or the destruction of Aboriginal Cultural Heritage.

4.8.2.1 Risk and Magnitude of Impacts to Environmental Values

Jellinbah Mining has conducted extensive consultation with the registered Native Title groups. Aboriginal cultural heritage surveys were conducted over the area prior to exploration drilling. Further surveys will be conducted prior to development of the Project.

4.8.3 Cultural Heritage Management Strategies

Jellinbah Mining intends to develop a CHMP encompassing the Central North Extension area and will continue to implement the CHMPs that have been developed for the mine to ensure compliance with the duty of care under the *Aboriginal Cultural Heritage Act 2003*.

5.0 WASTE MANAGEMENT

A Waste Management Plan has been prepared for the existing Jellinbah Coal Mine and will be amended to incorporate the Central North Extension. The Waste Management Plan is based on the waste hierarchy, as follows:

- Waste minimisation;
- Waste reuse / recycling;
- Waste treatment; and
- Waste disposal.

Waste will be produced during all stages of the Project, including construction, operation and decommissioning. General and regulated wastes produced through the operation of support infrastructure, such as administration buildings. Current waste streams produced at Jellinbah Coal Mine include domestic waste, sewage sludge, scrap steel, tyres, vehicle batteries, waste oil / solvents and oil and fuel drums. Treatment of each of these major waste streams is detailed in the Waste Management Plan.

No changes to the current strategies for managing general and regulated wastes are proposed for the Central North Extension. No significant changes to the quantities of general or regulated wastes are anticipated as a result of the Project.

Waste management at Jellinbah Coal Mine aims to minimise direct and indirect impacts to land, surface waters or groundwater, with particular focus on contamination prevention, maximum recovery of wastes, and clean-up of spills or contamination.

6.0 SITE MANAGEMENT PLANS

The following management plans and monitoring programs are currently in place at Jellinbah Coal Mine and will be amended to incorporate the Central North Extension prior to the commencement of activities in this area:

- Site Water Management Plan;
- Waste Management Plan;
- Erosion and Sediment Control Plan;
- Receiving Environment Monitoring Program;
- Topsoil Management Plan;
- Final Landform and Rehabilitation Management Plan;
- Contaminated Land Management Plan; and
- Chemical and Fuel Management Plan.

7.0 PROPOSED AMENDMENTS TO ENVIRONMENTAL AUTHORITY CONDITIONS

Proposed amendments relate to Schedule G: Land, specifically disturbance areas and final landforms (Table G2 and Table G5) and environmental offsets (conditions G14 and G15). In addition, a couple of administrative amendments are proposed to Table G4 and condition G9.

7.1 SCHEDULE G: LAND

Table G2: Final Land Use and Rehabilitation Approval Schedule

Tenure Identification	Disturbance Type	Projective Surface Area (ha)	Post Mining Land Description	Post Mining Land Use	Post Mining Land Suitability Classification
ML2418 ML6992 ML80018 ML80053 ML80068 ML80108 ML80129 ML80140 ML80165 ML80184 ML70445 ML70446 ML70448 ML70449 MLA700011 MLA700012 MLA700013	Infrastructure and other mining areas	837	Endemic pasture species	Low intensity cattle grazing	5
	Levee Bank	86			5
	Haul roads	218			4
	Topsoil stripped	300			3
	Spoil areas (<10% slope)	2300			4
	Spoil areas (>10% slope)	2347	Endemic pasture species	Endemic vegetation community	5
	Dams	50	Water containment	Water containment	5
		55	Pasture species	Low intensity cattle grazing	
	Final voids	744	Water containment	Water containment	5
	Topsoil Stockpiles	78	Endemic pasture species	Low intensity cattle grazing	5
	Anabranch Diversion	140	Endemic pasture species with a native species overstorey	Corridor conservation	5
	Three to Five Mile Lagoon drainage line	NA			

Table G4: Rehabilitated Slope Design

Slope Angle (%) ~~(°)~~	Vertical Height (m)	Maximum Slope Length (m)
20	10	50
15	20	133
10	22	220

Slope Angle (%) ~~(°)~~	Vertical Height (m)	Maximum Slope Length (m)
5	26	520
3	28	900

Table G5: Residual Void Design

Void Identification	Void Wall – Competent Rock Max. Slope (°)	Void Wall – Incompetent Rock Max. Slope (°)	Void Maximum Surface Area (ha)
Plains North	70°	45°	52
Plains South	70°	45°	65
Central North	70°	45°	140
Central	70°	45°	45
Central South	70°	45°	70
Max Void	70°	45°	18
South Void	70°	45°	30
Mackenzie South	70°	45°	30
Central East	70°	45°	50
Mackenzie North	70°	45°	149
Central North Extension	70°	45°	95

Environmental Offset

(G14) The holder of this EA must provide an offset for impacts on applicable prescribed environmental matters, in accordance with Queensland Environmental Offsets Policy and *Environmental Offsets Act 2014*, or alternate superseding QLD Government environmental offset policy, available at the time of offset provision. The offset must be consistent with the requirements for an offset as identified in the Offset Strategy (as per condition **G15**) and must be provided:

a) prior to impacting on prescribed environmental matters; or

b) within **12 months** of the relevant stage identified in the Environmental Offset Strategy submitted under condition **G15**.

(G15) An Environmental Offset Strategy must be developed and submitted to the administering authority within either **30 days**, or a less period agreed to by the administering authority, prior to impacting on the applicable prescribed environmental matters.

8.0 REFERENCES

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Appendix A Terrestrial Flora and Fauna Assessment

Appendix B Environmental Offset Strategy