Appendix I

Mine development agricultural impact statement

REGIS RESOURCES LTD

LFB Resources NL ABN: 90 073 478 574

McPhillamys Gold Project

Agricultural Impact Statement

Prepared by
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Agricultural Impact Statement

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SUMMARY

This Agricultural Impact Statement (AIS) forms part of the Environmental Impact Statement to support a development application for the McPhillamy's Gold Project. The AIS was prepared to address the Secretary's Environmental Assessment Requirements related to agriculture and was prepared in accordance *Strategic Agricultural Land Use Policy: Guideline for Agricultural Impact Statements* (NSW DPE 2015); and *Agricultural Impact Statement technical notes: A companion to the Agricultural Impact Statement guideline* (Department of Primary Industry 2013).

The project is planned to disturb an area of approximately 1,135 ha, which will temporarily be removed from agricultural use. The disturbance area accounts for less than 1% of the 132,592 ha used for agriculture in Blayney Local Government Area. More than half of the 2,513 ha mine development project area, comprising 1,378 ha, will remain undisturbed by the mine development during operations, with the majority of this land continuing to be used for current agricultural (grazing) purposes. In many cases this land will be leased back to the original owner/leasee and as a result agricultural practices should remain unchanged.

A detailed soil survey was carried out which identified eight major soil types in the project area. The soil types identified and their relative distribution are: Alluvium (12.5%), Manganic East (14.2%), Manganic West (18.4%), Red Soil (5.8%), Upland Centre (17.3%), Upland East (22.6%), Upland East-Aluminic (8.8%) and Sodic Discharge (0.5%).

A detailed Biophysical Strategical Agricultural Land (BSAL) assessment of the project was undertaken in accordance with the *Interim protocol for the site verification and mapping of biophysical strategic agricultural land* (NSW Government 2013). This assessment found no BSAL within the mining lease application area. A site verification certificate was issues by the Department of Planning and Environment on 18 June 2019.

An assessment of the Land and Soil Capability Classes found that 94% of the Project Area is of moderate (LSC 4 – 932 ha) to moderately-low (LSC 5 – 1,422 ha) capability. The remaining 6% of the project area is mapped as low capability land (LSC 6 – 156 ha) and very low capability (LSC 7 - 4 ha).

The project is predicted to be associated with a nett reduction of 423 ha of soil with LSC classes 4 (12 ha) and 5 (411 ha) and a nett increase of 353 ha of soil with LSC classes 6 (336 ha) and 7 (17 ha). Land where capability is reduced as a result of the project is predominantly in the footprint of the Waste Rock Emplacement and the Tailings Storage Facility. The void from the mine pit (70 ha) will have no agricultural value (LSC class 8). However, the LSC class across parts of the tailing storage facility footprint will be improved from LSC class 5 pre-mining to LSC class 4 post-rehabilitation.

Grazing of livestock on improved and unimproved pastures has been the main agricultural land use within the locality of the mine since the area was first settled in the 1820s. This historic land use is consistent with the LSC assessment of the project area.

The current land use within the project area is predominately beef cattle grazing with some grazing of sheep also occurring. It is estimated that the current capacity of land within the project area is 8.6 dse/ha and that the carrying capacity of the project area will be reduced by 10 064 dse/yr during

the life of the project and 2 362 dse/yr post mining. Based NSW DPI Inland Store Weaner Budget this equates to a reduction in gross value of agricultural production of $406 193/yr during the life of the project and $95 373 post mining. These figures respectively equate to a reduction of 1 % and 0.2 % of the $42.7M of gross value of agricultural production in the Blayney LGA in 2015/16.

Groundwater models predict that all privately-owned bores within the vicinity of the project will experience a cumulative pressure head decline of less than 2 m, which the NSW Aquifer Interference Policy defines as ‘minimal impact’.

Other potential impacts on agricultural resources and enterprises within the locality, including air quality, noise, soils, weeds, traffic and light have been assessed as having a minimal impact with appropriate mitigation programs in place.

1. INTRODUCTION

This chapter provides the background and overview to the McPhillamys Gold Project and outlines the purpose structure of this Agriculture Impact Statement.

1.1. OVERVIEW

LFB Resources NL is seeking development consent for the construction and operation of the McPhillamys Gold Project (the project), a greenfield open cut gold mine and water supply pipeline in the Central West of New South Wales (NSW). The project application area is illustrated at a regional scale in Figure 1.1. LFB Resources NL is a 100% owned subsidiary of Regis Resources Limited (herein referred to as Regis).

As shown in Figure 1.1, the McPhillamys Gold Project comprises two key components; the mine site where the ore will be extracted, processed and gold produced for distribution to the market (the mine development), and an associated water pipeline which will enable the supply of water from near Lithgow to the mine site (the pipeline development). This report presents an Agricultural Impact Statement for the mine development component of the McPhillamys Gold Project (herein referred to as the project). Potential impacts of the pipeline development on land and agricultural resources is addressed in the main report of the Environmental Impact Statement (EIS) (Volume 1, EMM 2019a). It is noted that the pipeline development is outside the boundaries of the proposed mining lease application area for the project and therefore no agricultural impact statement is required for that part of the development.

The mine development is approximately 8 km north-east of Blayney within the Blayney and Cabonne local government areas (LGAs). This locality has a long history of alluvial and hard rock mining, with exploration for gold and base metals occurring since the mid to late 19th century. The mine development project boundary (herein referred to as the project area) is illustrated in Figure 1.2 and covers the Mining Lease (ML) application area for the project as well as the parts of the project that do not require an ML.

This Agricultural Impact Statement (AIS) forms part of the EIS. It provides an assessment of the impacts of the project on agricultural industries and resources and documents initiatives built into project design to avoid and minimise agricultural impacts.

1.2. PROJECT DESCRIPTION

A full project description is provided in Chapter 2 of the EIS (EMM, 2019a). The key components of the project are as follows:

- Development and operation of an open-cut gold mine, comprising approximately one to two years of construction, approximately 10 years of mining and processing, and a closure period (including the final rehabilitation phase) of approximately three to four years, noting there may be some overlap of these phases. The total project life for which approval is sought is 15 years.

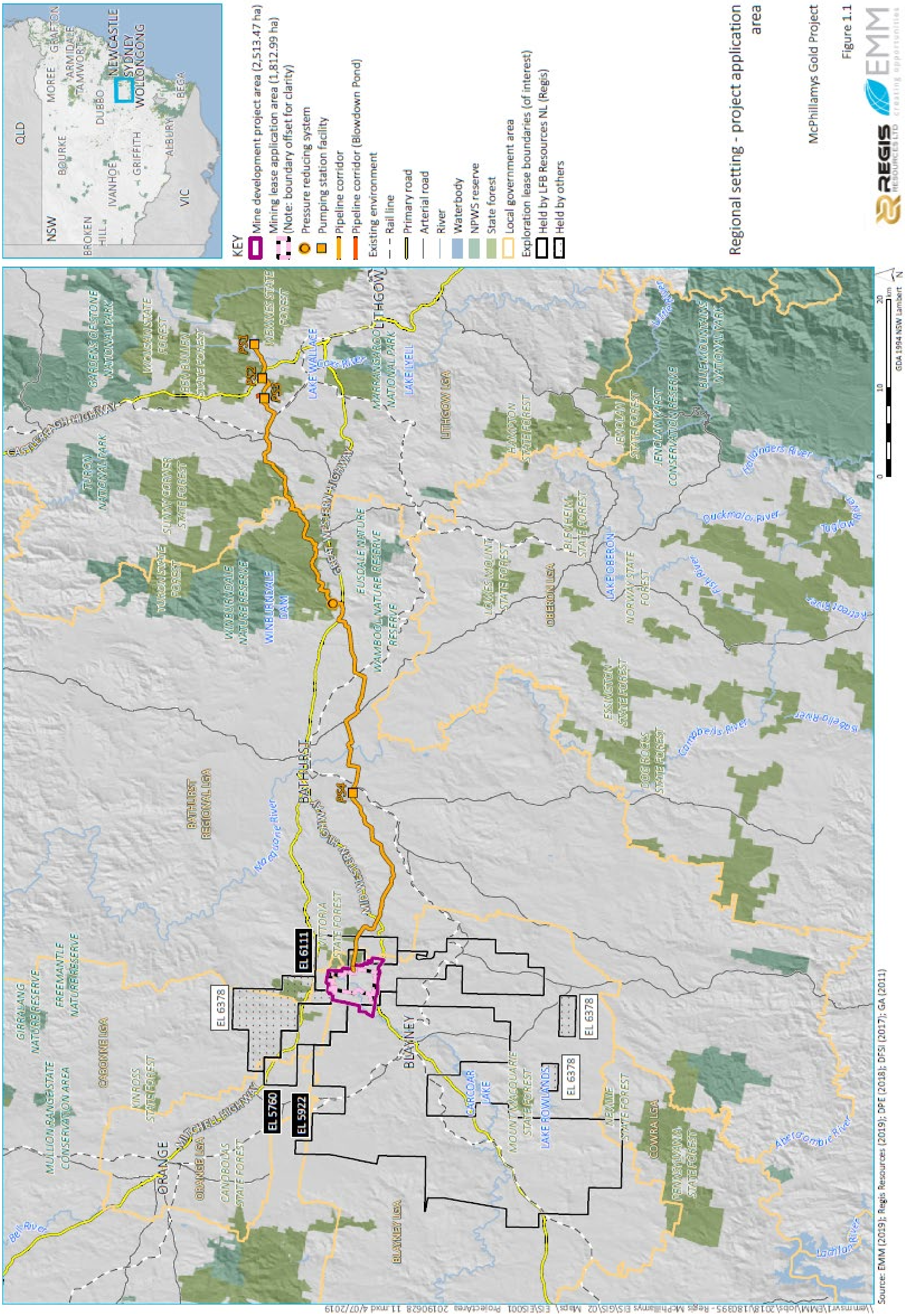


Figure 1.1. Project application area.

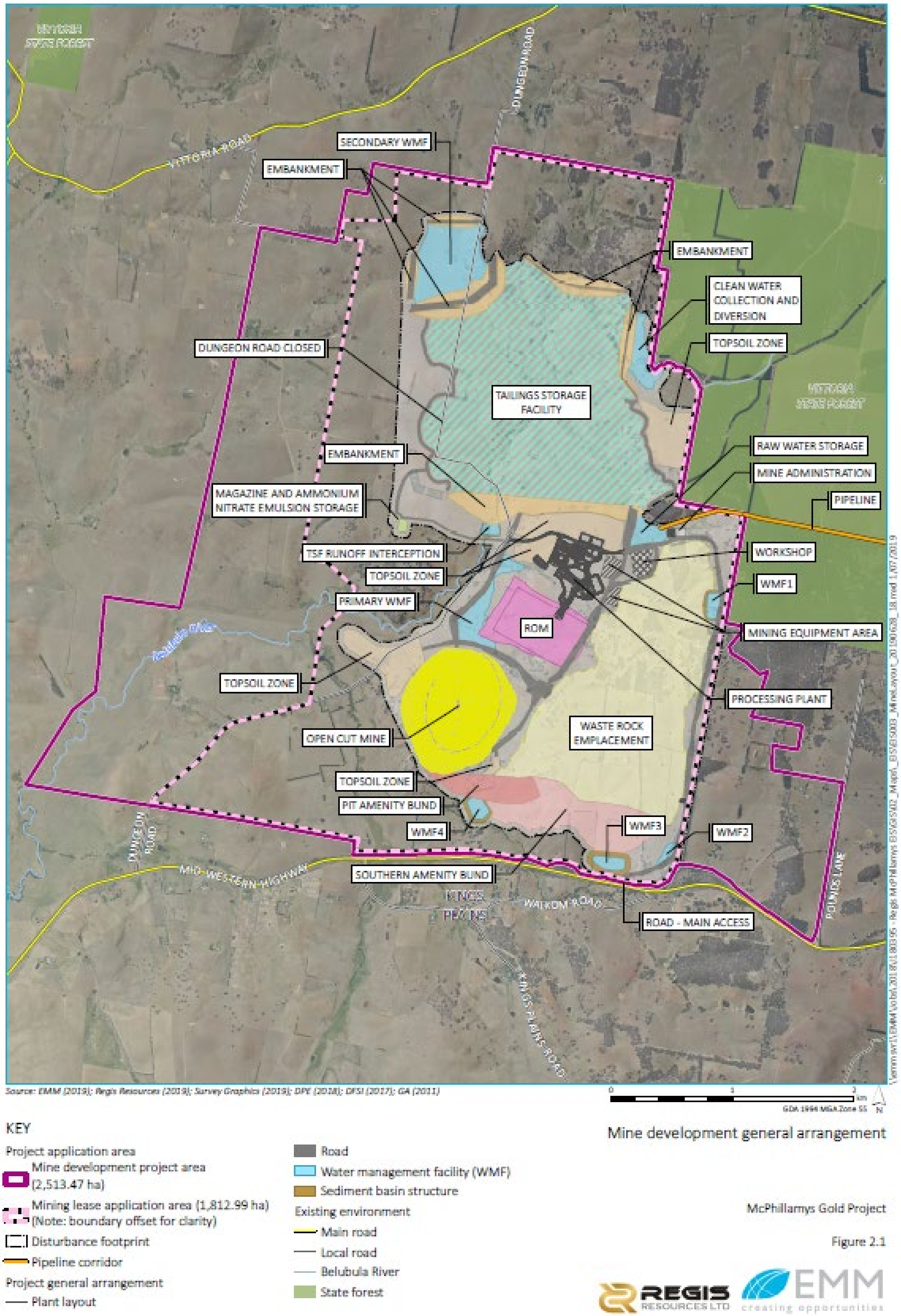


Figure 1.2 Mine development site layout.

- Development and operation of a single circular open-cut mine with a maximum diameter of approximately 1,050 metres (m) and a final depth of approximately 460 m, developed by conventional open-cut mining methods encompassing drill, blast, load and haul operations. Up to 8.5 million tonnes per annum (Mtpa) of ore will be extracted during the project life.
- Construction and use of a conventional carbon-in-leach processing facility with an approximate processing rate of 7 Mtpa to produce approximately 200,000 ounces, and up to 250,000 ounces, per annum of product gold. The processing facility will comprise a run-of-mine (ROM) pad and crushing, grinding, gravity, leaching, gold recovery, tailings thickening, cyanide destruction and tailings management circuits. Product gold will be taken off-site to customers via road transport.
- Placement of waste rock into a waste rock emplacement which will include encapsulation of material with the potential to produce a low pH leachate. A portion of the waste rock emplacement will be constructed and rehabilitated early in the project life to act as an amenity bund.
- Construction and use of an engineered tailings storage facility to store tailings material.
- Construction and operation of associated mine infrastructure, including:
    - administration buildings and bathhouse;
    - workshop and stores facilities, including associated plant parking, laydown and hardstand areas, vehicle washdown facilities, and fuel and lubricant storage;
    - internal road network;
    - explosives magazine and ammonium nitrate emulsion (ANE) storage;
    - topsoil, subsoil and capping stockpiles;
    - ancillary facilities, including fences, access roads, car parking areas and communications infrastructure; and
    - on-site laboratory.
- Establishment and use of a site access road, and an intersection with the Mid Western Highway.
- Construction and operation of water management infrastructure, including a raw water storage dam, clean water diversions and storages, and sediment control infrastructure.
- A peak construction workforce of approximately 710 full-time equivalent (FTE) workers. During operations, an average workforce of around 260 FTE employees will be required, peaking at approximately 320 FTEs in around years four and five of the project.
- Construction and operation of a water supply pipeline (approximately 90 km long) from Centennial Coal's Angus Place Colliery and Springvale Coal Services Operations, and Energy Australia's Mount Piper Power Station, near Lithgow to the mine project area. The pipeline development will include approximately four pumping station facilities, a pressure-reducing system and a communication system. Approximately 13 megalitres per day

(ML/day), up to a maximum of 15.6 ML/day, will be transferred for mining and processing operations.

- Installation and use of environmental management and monitoring equipment.
- Progressive rehabilitation throughout the mine life. At the end of mining, mine infrastructure will be decommissioned, and disturbed areas will be rehabilitated to integrate with natural landforms as far as practicable consistent with relevant land use strategies of the relevant local government areas (LGAs).

1.3. STRUCTURE OF THIS REPORT

The AIS is structured as follows

Section 1	Provides an introduction and overview of the project, and outlines the scope and structure of this report
Section 2	Provides description of the existing agricultural resources and current production within the project area. It also assesses the impact of the Project on agricultural land resources.
Section 3	Provides a description of agricultural resources within the locality (Blayney LGA)
Section 4	Identifies and assesses the impacts of the project area on agricultural resources and industries
Section 5	Describes the mitigation, management and monitoring measures to be undertaken in relation to project impacts on agricultural resources
Section 6	Describes the consultation that has been undertaken during the development of the project

1.4. AGRICULTURAL IMPACT ASSESSMENT CRITERIA

The AIS has been prepared following the appropriate guidelines, policies and industry requirements; and following consultation with stakeholders including community members and relevant government agencies.

1.4.1. Secretary's Environmental Assessment Requirements

Environmental Assessment Requirements (EARs) for the project were issued by the Department of Planning and Environment (DPE) on 24 July 2018 and revised on 19 December 2018. The EARs identify matters which must be addressed in the EIS and essentially form its terms of reference. Table 1.1 list individual EARs relevant to this AIS and where they are addressed in this report.

Table 1.1. Agricultural Impact Statement – related EARs

Requirement	Section addressed
Department of Planning and Environment	
The EIS must address the following specific issues: **Land** – including an assessment of: • the likely agricultural impacts of the development, including identification of any strategic agricultural land;	This report. Biophysical Strategic Agricultural land is discussed in Section 2.1.
• the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements of Clause 12 of State Environmental Planning Policy (*Mining, Petroleum Production and Extractive Industries) 2007*, paying particular attention to the agricultural land use in the region	This report provides an assessment of the impact of the project on agricultural land use. A discussion on the compatibility of the development in accordance with the requirements of Clause 12 of the Mining SEPP is provided in Chapter 3 of the EIS (EMM 2019)
DPI Agriculture	
The proposal is located on and adjacent to agricultural land, including mapped Biophysical Strategic Agricultural Land (BSAL). The EIS should include preparation of an Agriculture Impact Statement.	This document

1.4.2. Mining SEPP

Clause 50A of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) outlines special provisions relating to mining or petroleum development applications on strategic agricultural land.

As the project involves a mining development within the meaning of Part 4A of the Mining SEPP, Clause 50A of the EP&A Regulation requires that the development application be accompanied by either:

- a "Gateway Certificate", where the development occurs on land which meets the definition of Biophysical Strategic Agricultural Land (BSAL); or
- a "Site Verification Certificate" that certifies that the land on which the proposed development is to be carried out is not BSAL.

Detailed soil and related resource studies were completed for the project in accordance with the NSW Government's (2013) *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land*, which identified BSAL within the project boundary of an earlier design of the mine development. The footprint of the mine development and the associated area to be the subject of a mining lease application were subsequently refined to avoid impacts on the identified BSAL. As a result, there is no BSAL within the mining lease application area for the proposed development. Accordingly, a site verification certificate (SVC) was applied for and subsequently issued by the Secretary of the DPE on 18 June 2019.

Further discussion on BSAL is provided in Section 2.1.

1.4.3. Agricultural Impact Statement Guidelines and Technical Notes

In addition to the EARS, this AIS has been prepared in accordance with the relevant governmental guidelines and policy, as follows:

- *Strategic Agricultural Land Use Policy: Guideline for Agricultural Impact Statements* (NSW DPE 2015) (the AIS guidelines); and
- *Agricultural Impact Statement technical notes: A companion to the Agricultural Impact Statement guideline* (Department of Primary Industry (DPI) 2013) (the AIS technical notes).

The AIS technical notes describe the requirements for the assessment of agricultural impacts associated with all state significant development applications. All information requirements as set out in the AIS guideline and AIS technical notes have been addressed in this report and are referenced in Table 1.2. The report structure generally follows the headings in the AIS technical notes.

The purpose of this report is to assess potential impacts of the project on agricultural resources and/or industries within and surrounding the project area. The AIS technical notes define an 'agricultural resource' as land on which agriculture is dependent, and the associated water resources (quality and quantity) that are linked to that land.

Table 1.2 AIS requirements

Information which must be included in an AIS	Section addressed
Details of the site and region	
• overview of the project, and a description of the area within an agricultural context	1, 2.3
• why this is a project which will benefit the community and the state.	EIS Chapter 38 and Economic assessment (EIS Appendix DD)
Detailed assessment of the agricultural resources and agricultural production of the project area	
This section should include detailed information (including maps) on:	
• the soils, slope, land characteristics, water characteristics (availability, quality);	2.2
• BSAL needs to be verified for all land in a project including surrounding buffer zones and offset areas;	2.1
• relevant history of the agricultural enterprises from within the project area and the development's buffer and/or offset zone;	2.3
• location of areas of land to be temporarily removed from agriculture;	2.4
• location of areas of land to be returned to agricultural use post project;	2.5
• location of area of land that will not be returned to agriculture, including areas to be used in environmental plantings or biodiversity offsets; and	2.6
• agricultural enterprises to be undertaken on any buffer and/or offset zone lands for the life of the project.	2.7
Identification of the agricultural resources and current enterprises within the surrounding locality (region) of the project area	
• Agricultural resources within the project area	
– Soil characteristics – including soil types and depth	3.1.1
– Topography	3.1.2
– Key agricultural support infrastructure	3.1.3

Table 1.2 AIS requirements

Information which must be included in an AIS	Section addressed
– Water resources and extraction locations	3.1.4
– Location and type of agricultural industries	3.1.5
– Vegetation	3.1.6
– Climate conditions	3.1.7
• Current agricultural enterprises within the region	3.1.8
Assessment of impacts	
• Identification and assessment of the impacts of the project on agricultural resources or industries	
– Effects on agricultural resources	4.1.1
– Consequential productivity effects on agricultural enterprises	4.1.2
– Uncertainty associated with the predicted impacts and mitigation measures	4.1.3
– Further risks (ie weeds, wind and water erosion, subsidence, dust, noise, vibration, traffic	4.1.4
• movement of water away from agriculture	4.1.5
• Assessment of socio-economic impacts	
– Agricultural support services and processing and other value-adding industries	4.2.1
– Visual amenity, landscape values and tourism infrastructure	4.2.2
– Local and regional employment impacts	4.2.3
Mitigation measures	
• Review of project design and project alternatives	5.1
• Monitoring programs to assess predicted verses actual impacts as the project progresses	5.2
• Trigger response plans and trigger points at which operations will cease or be modified or remedial actions will occur to address impacts including a process to respond to unforeseen impacts	
– The proposed remedial actions to be taken in response to a trigger event	
– The basis for assumptions made about the extent to which remedial actions will address and respond to impacts	–
• Demonstrated capacity for the rehabilitation of disturbed lands to achieve the final land use and restore natural resources	5.3
• Demonstrated planning for progressive rehabilitation that minimises the extent of disturbance	
Consultation	
• Detail the engagement strategy	6

1.4.4. Water Management Act 2000

The *Water Management Act 2000* aims to *provide for the sustainable and integrated management of water sources.*

The mine development is within the area covered by the *Water Sharing Plan for the Lachlan Unregulated Rivers and Alluvial Groundwater Sources 2012* (the Lachlan Unregulated Rivers WSP), within the Belubula River Upstream Carcoar Dam Unregulated River Water Source (Unregulated Belubula River Water Source)

The water management system of the project has been designed to divert clean water as much as possible around the proposed disturbance areas. However, water access licences (WALs) will be required for the mine to account for water removed from the catchment by the project.

The water licensing requirements identified for the mine development are discussed in detail in Chapter 8 of the main EIS (EMM 2019). To minimise the amount of clean water used by the project, water for operational requirements will also be sourced from Centennial Coal's operations near Lithgow (namely

Angus Place Colliery and Springvale Coal Services Operations) and from Energy Australia's Mount Piper Power Station.

1.4.5. Aquifer Interference Policy

Development of the open cut mine as described in Section 1.2 will result in the rock formation immediately around the void be dewatered. The impact of this reduction in groundwater level on neighbouring groundwater users requires investigation (NSW DPI, 2012c). This subject was assessed in Chapter 8 of the EIS, and summarised below in Section 4.2.

1.5. AGRICULTURAL IMPACT ASSESSMENT METHODS

1.5.1. Land Assessed

The land was assessed at 3 levels of intensity:

- Detailed assessment at 1:25,000 scale against the Interim Biophysical Strategic Agricultural Land criteria was conducted on 1,825 ha of the Mining Lease Application Area (Figure 1.3).
- Soil Associations and Land and Soil Capability was mapped at 1:25,000 scale on 2,513 ha of the Mine Development Project Area (Figure 2.2).Great Soil Groups (Stace *et al.*, 1968) were mapped at 1:300,000 scale across the Blayney Local Government Area (LGA) (Figure 3.1). The Blayney LGA was used to represent the locality of the project to match the smallest reporting unit in the Australian Bureau of Statistics (ABS) data.

[redacted]

Figure 1.3 Regional Biophysical Strategic Agricultural Land.

1.5.2. Parts of the Environmental Assessment Providing Data for the AIS

A number of technical assessments undertaken as part of the environmental assessment of the project also inform the assessment of the potential impacts of the project on agricultural resources. The relevant assessments are listed in Table 1.3.

Table 1.3. Agricultural Impacts assessed Environmental Impact Assessment.

Topic	Environmental Impact Statement Section (EMM 2019)	Agricultural Impact Assessment Section
Water resources	8	3.1.4
Vegetation	11	3.1.6
Movement of water away from agriculture	8	4.1.5
Socioeconomic impacts	20 and 34	4.2
Mitigation Measures	36	5
Consultation	4	6

1.5.3. Landform and Soil Data Methods

Soil assessment techniques were chosen to satisfy the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government, 2013). The first step in this process is to exclude land steeper than 10% slope. This was mapped using a 5 m pixel photogrammetry surface provided by Regis. The remainder of the land was assessed as a stratigraphic survey (Hewitt *et al.*, 2008).

A stratigraphic soil survey is one in which properties at each location are assumed to be correlated to some extent with the position in the landscape and broad scale variables such as geology and slope. Soil properties between each site observed are then expected to vary with covariates such as slope, surface soil colour or geology, and these covariates are then used to map soil type boundaries. In situations where the covariates are poor predictors of soil type, an alternative is to assume that the nearest soil pit is the best predictor of soil properties.

The following steps were undertaken to complete the land and soil capability assessment over the Project Area:

- a desktop review and assessment of existing information relating to soils and landforms in the project area.
- a soil survey that consisted of field description of soil more than 150 soil properties according to NSCT (2009) at each of 124 sites. Laboratory analysis was undertaken on 0 to 5, 5 to 15, 15 to 30, 30 to 60 and 60 to 100 cm layers from 114 sites.
- assess whether each site satisfies the BSAL criteria (OEH & OASFS, 2013).
- group the 124 sites assessed into 8 soil associations based on geology of parent material, landscape position and soil morphological and chemical properties.

- estimate the Land and Soil Capability (LSC) class of each of the 124 sites assessed using the criteria of OEH (2012). Map LSC class based on the median LSC in each association.
- estimate post-mining LSC by comparing the planned soil profile after rehabilitation with Table 15 of OEH (2012) which assesses the hazard of shallow soil.
- calculate the post-mining area of each LSC from a draft site layout.

2. AGRICULTURAL RESOURCES AND CURRENT PRODUCTION WITHIN PROJECT AREA

2.1. BSAL ASSESSMENT OF PROJECT AREA

As discussed in Section 1.3.3, a soil assessment was undertaken in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH and OAFS, 2013). This assessment found no BSAL within the mining lease application area (Figure 2.1). Subsequently a Site Verification Certificate was issued by the DPE on 18 June 2019.

The mining lease application area within the project area was adjusted to avoid potential BSAL (Figure 2.1).

2.2. SOIL AND LANDSCAPE ASSESSMENT

A comprehensive soil survey of the Project area was undertaken by Sustainable Soil Management (SSM) and is contained in SSM, 2019. This section contains an overview of the soil survey assessment results.

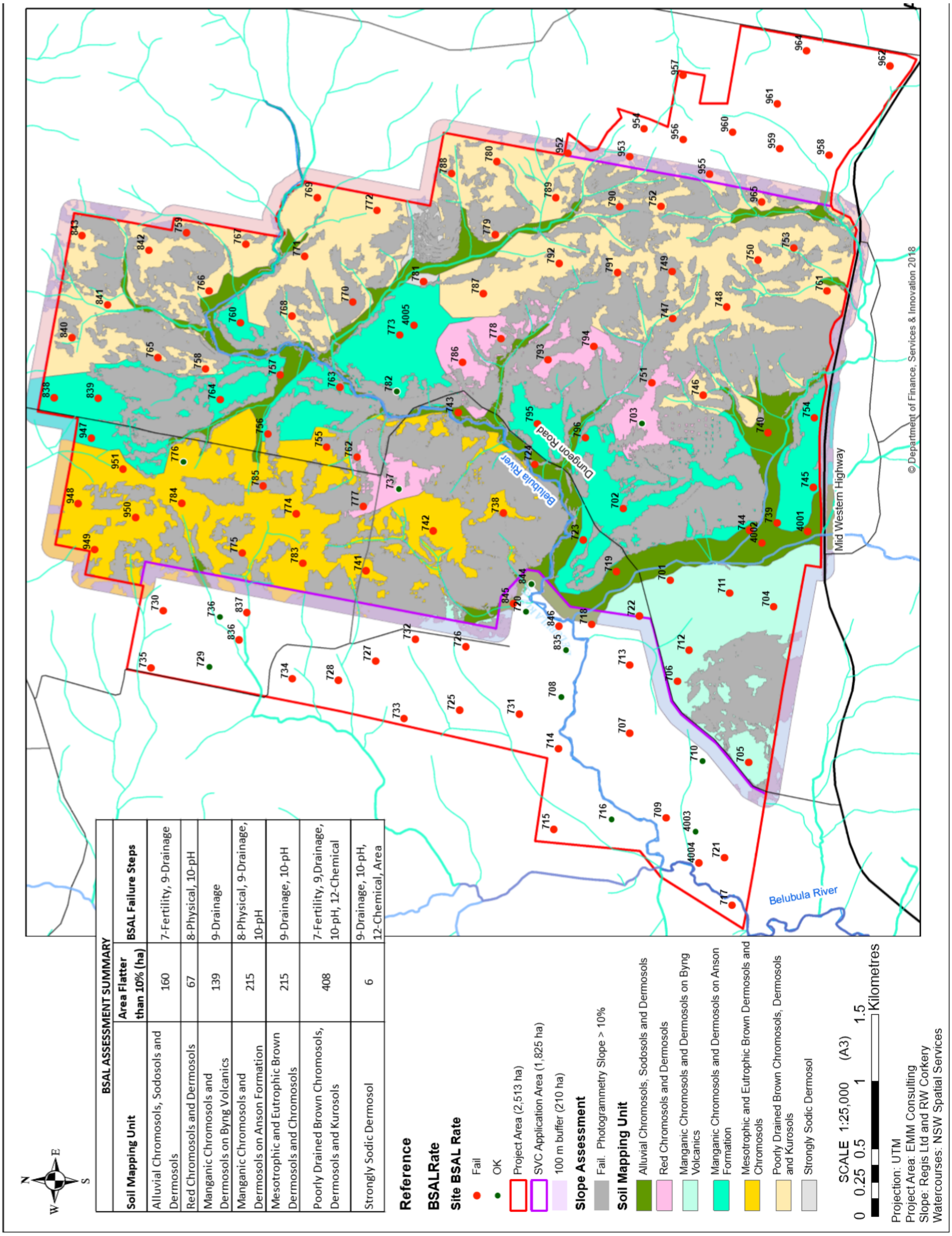
2.2.1. SOIL DISTRIBUTION

The broad division of the Project Area into an alluvium and an upland soil landscape by Kovac *et al.* (1989) was supported by this more detailed survey. The alluvial soil was generally less acidic had more saline subsoil and tended to have more sodium in the subsoil than the remainder of the Project Area except pit OM781 (Discharge Soil Association). The Alluvium Soil Association had a range of soil types from Kandosols (structureless soils) to Vertosols (cracking clays). These were scattered through the Alluvium Soil Association as expected in the narrow floodplain in the Project Area. Land above the Alluvium was mapped as seven Soil Associations based on disparate soil profile properties (Figure 2.2). These were;

Red Soil, which had red subsoil and were found on upper slopes in an arc through the centre of the Project Area. Profiles in this association generally had much better drainage than the remainder of the Project Area.

Manganic Soil in which the profiles had a manganic layer (more than 20% manganiferous or ferromanganiferous nodules). The Manganic Soil Association was divided into Manganic East and Manganic West on the basis of 2 classes of parent material. Manganic East was formed on metasediments of the Anson Formation, while Manganic West was formed on Blayney Volcanics. Soil in these associations was similar in many respects, but exchangeable calcium percentage was consistently more than 10% higher in the subsoil of Manganic West, and exchangeable magnesium percentage was consistently 10% higher in the subsoil of Manganic East.

The **Upland Soil** Associations were more elevated than the Manganic soil associations, and had poorer drainage than the Red Soil. The Upland Soil Association was divided into: strongly acidic Upland East; Upland Centre with more clayey subsoil; and, Upland Macquarie on Cunningham Formation parent material. They tended to have lower subsoil pH and higher exchangeable aluminium percentage than the remaining 4 major associations.



BSAL ASSESSMENT SUMMARY

Soil Mapping Unit	Area Flatter than 10% (ha)	BSAL Failure Steps
Alluvial Chromosols, Sodosols and Dermosols	160	7-Fertility, 9-Drainage
Red Chromosols and Dermosols	67	8-Physical, 10-pH
Manganic Chromosols and Dermosols on Byng Volcanics	139	9-Drainage
Manganic Chromosols and Dermosols on Anson Formation	215	8-Physical, 9-Drainage, 10-pH
Mesotrophic and Eutrophic Brown Dermosols and Chromosols	215	9-Drainage, 10-pH
Poorly Drained Brown Chromosols, Dermosols and Kurosols	408	7-Fertility, 9,Drainage, 10-pH, 12-Chemical
Strongly Sodic Dermosol	6	9-Drainage, 10-pH, 12-Chemical, Area

Figure 2.1. Biophysical Strategic Agricultural Land in Project Area

Pit OM781 was so different to the remaining 123 in that it was strongly alkaline and strongly sodic that it was allocated to a separate **Discharge** Soil Association.

The diagnostic soil chemical properties of the eight Soil Associations are assessed in SSM, 2019, summarised in Table 2.1 and can be described as:

- Alluvium Soil Associations – Soil pH 5 in topsoil increasing to 6 to 7 in subsoil, moderately low clay content throughout profile.
- Red Soil Association – Average profile had moderate clay content throughout, but topsoil was acidic with average 20% exchangeable aluminium. Average exchangeable calcium percentage peaked at 60 to 70% in the 15 to 60 cm zone and exchangeable aluminium percentage was desirably low below 15 cm.
- Manganic West Soil Association – Acidic topsoil over less acidic subsoil with average 10 to 15% exchangeable aluminium in topsoil and 60% exchangeable calcium and 30% exchangeable magnesium in subsoil.
- Manganic East Soil Association – Acidic topsoil over less acidic subsoil with average 10 to 15 % exchangeable aluminium in topsoil, 50% exchangeable calcium and 40% exchangeable magnesium in subsoil.
- Upland Centre Soil Association – Acidic topsoil over less acidic, clayey subsoil with average 10 to 15% exchangeable aluminium in topsoil and 40% exchangeable calcium and 50% exchangeable magnesium in subsoil.
- Upland East Soil Association – Acidic with an average pH_{CaCl2} of 4 and 20% average exchangeable aluminium through the profile. Low exchangeable calcium of 20% in 60 to 100 cm layer.
- Aluminic variant of Upland East Association was near the boundary of the Anson and Cunningham Formations, and had subsoil that was more acidic, and had elevated proportions of exchangeable aluminium and magnesium
- Discharge Soil Association – Subsoil pH 9 to 10.

The soil properties described above indicate that the soil across the Project Area could support a productive grazing system with the addition of phosphorous fertilizer and lime. The aim of applying lime is to reduce the topsoil exchangeable aluminium percentage and would be beneficial across a large proportion of the Project Area with the exception of the Alluvium Soil Association.

Profiles in the vast majority of the Project Area have indications that the topsoil becomes saturated when rainfall far exceeds evaporation. This is possible in 10% of years in each month of the year, but likely to result in prolonged waterlogging mainly during cooler autumn, winter and spring months. This duration of waterlogging is likely to restrict access required for machinery operations for cropping. This limited access, low fertility and shallow depth of fertile topsoil indicate that grazing would be a better use for the land in the Project Area than annual cropping.

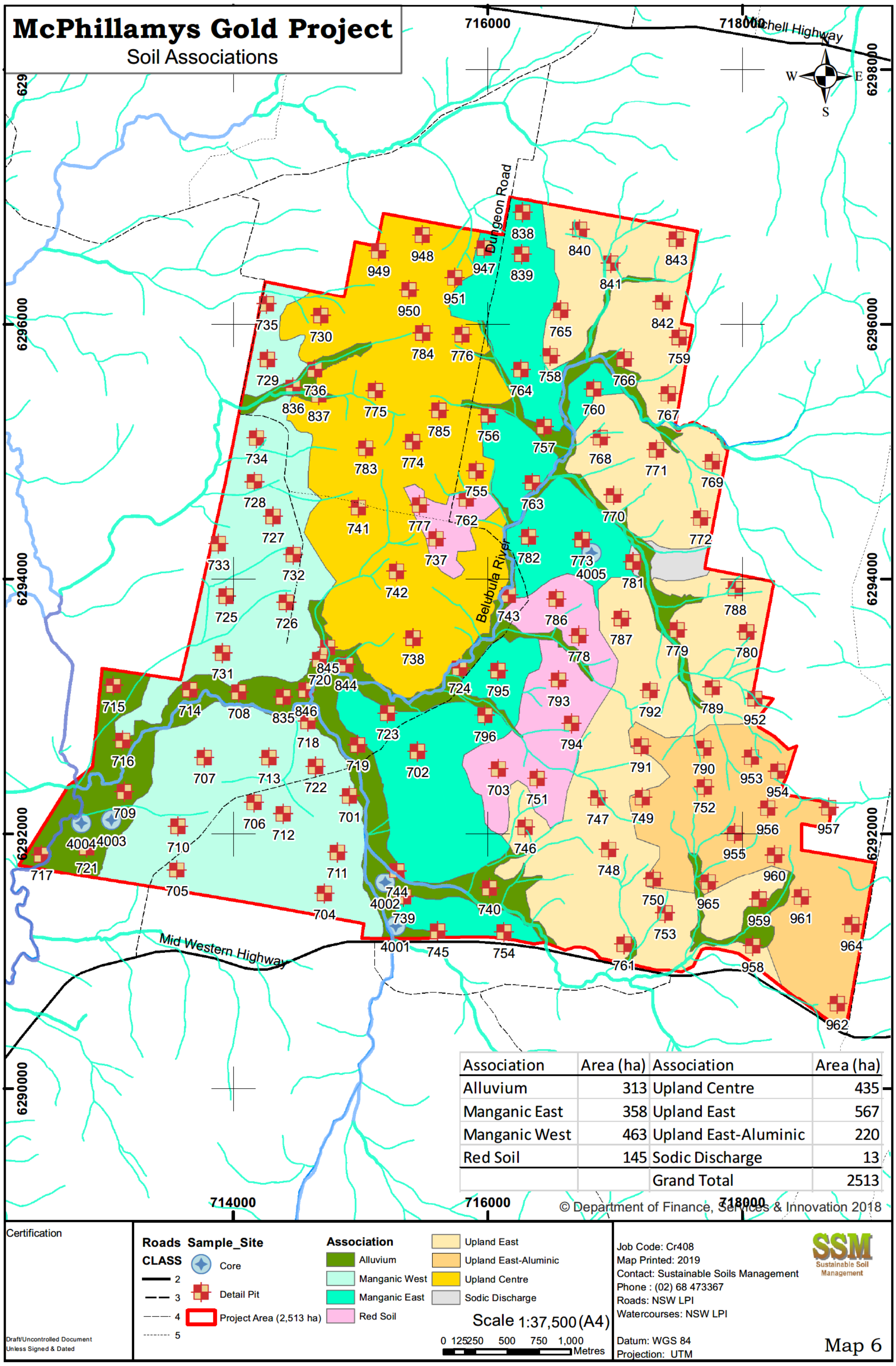


Figure 2.2. Soil Associations of Mine Development Project Area

Table 2.1. Summary of soil chemical properties of 8 Soil Associations in Mine Development Project Area

.

Association	pH_{CaCl2}	CEC	Cations	Clay	Macronutrients
Alluvium	5 in topsoil increasing to 6 to 7 in subsoil	10 meq/100 g in topsoil. Increase to 30 meq/100 g in subsoil	EAIP - generally less than 5% in topsoil and lower in subsoil. ECaP - 60% in topsoil reducing to 50% in subsoil EMgP increase from 30 to 45% with depth	Average 20 to 30% through profile	P- 19 for 0 to 5 cm 13 for 5 to 15 cm S – average 7 mg/kg
Red Soil	Less than 4.5 in topsoil increasing to 6 in subsoil	5.5 meq/100 g	EAIP – 20% in topsoil, reducing to low levels in subsoil ECaP – 50% in topsoil increasing to nearly 70% in upper subsoil falling to 55% with depth EMgP – Increasing from 16 to 40% with depth	18% to 20 cm increasing to 35% below 20 cm	P – 14 for 0 to 5 cm 6 for 5 to 15 cm S – Average 7 mg/kg
Manganic West	4.5 in topsoil increasing to 5.5 in subsoil	5 meq/100 g	EAIP – 10 to 15 % in topsoil reducing to low levels in subsoil ECaP – 50% in topsoil increasing to 65% in upper subsoil then falling to 60% EMgP – increase from 20 to 30% with depth	12% in topsoil increasing to over 25% in subsoil	P – 14 for 0 to 5 cm 7 for 5 to 15 cm S – Average 5 mg/kg
Manganic East	4.5 in topsoil increasing to 5.5 in subsoil	4.5 meq/100 g	EAIP - 10 to 15% in topsoil reducing to low levels in subsoil ECaP - 50% through profile EMgP – increased from 20 to 40% with depth	10% in topsoil increasing to 20 to 30% in subsoil	P – 12 for 0 to 5 cm 7 for 5 to 15 cm S – Average 6 mg/kg
Upland Centre	4.3 in topsoil increasing to 5 in subsoil	Less than 5 meq/100 g in topsoil, 6 meq/100 g in subsoil	EAIP – 15 to 25% in topsoil reducing to low levels in subsoil ECaP – 50% through profile EMgP – increase from 20 to 50% with depth	10% to 30 cm increasing to more than 40% below 30 cm	P – 15 for 0 to 5 cm 6 for 5 to 15 cm S – Average 6 mg/kg
Upland East	4.5 through the profile	5 meq/100 g	EAIP – 15 to 25% through profile ECaP – 50% in topsoil falling to 20% with depth EMgP – increase from 20 to 60% with depth	10% to 30 cm increasing to more than 30% below 30 cm	P – 16 for 0 to 5 cm 8 for 5 to 15 cm S – Average 5 mg/kg
Upland East – Aluminic variant	4.7 in topsoil, decreasing to 4.5 in subsoil	6 meq/100 g to 5 cm, then 4 meq/100 g to 30 cm, then 8 meq/100 g	EAIP – 8 to 35 % through profile ECaP – 60% in topsoil falling to 10% with depth EMgP – increase from 25 to 65% with depth	15% in topsoil increasing to over 40% in subsoil	P – 18 for 0 to 5 cm 9 for 5 to 15 cm S - Average 5 mg/kg
Discharge	6.5 in topsoil 8 in subsoil	5 to 10 meq/100 g through profile	EAIP - 0% ECaP – decrease from 45% to 20% with depth EMgP - Increase from 20 to 35% with depth	Not tested	P – 14 for 0 to 5 cm 7 for 5 to 15 cm S – 8 for 0 to 5 cm, 49 for 5 to 15 cm

2.2.2. LAND AND SOIL CAPABILITY ASSESSMENT

The Land and Soil Capability Class assessment found that 94% of the Project Area is of moderate (LSC 4 – 932 ha) to moderately-low (LSC 5 – 1,422 ha) capability (Figure 2.3), which is suitable for grazing or cropping with restricted cultivation (OEH, 2012). This is consistent with the historic land-use within the project area of growing naturalised pasture to support grazing by cattle and sheep.

The remaining 6% of the project area is mapped as low capability land (LSC 6 – 156 ha) and very low capability (LSC 7 - 4 ha) on the basis that the slope is steeper than 20%.

Although much of the project area has been subject to occasional cultivation the use of the land for cropping is constrained by two general patterns.

- Elevated land in the Red Soil, Manganic West, Manganic East, Upland Centre and Upland East associations would be constrained by acidic pH and associated elevated exchangeable aluminium percentage (Table 2.1). This was associated with topsoil that had limited capacity to store nutrients indicated by cation exchange capacity (CEC) around 5 meq/100 g Table 2.1). The less acidic Alluvium association is constrained by seasonal waterlogging in winter months (J. Gordon, pers comm.).

The acidic nature of the soil constrains the range of crops that can be grown without amelioration with an agent such as lime. The low CEC indicates that nutrients should generally be applied as needed rather than being applied in large doses, then using the soil as a nutrient reservoir. The seasonal waterlogging would constrain access for agronomic operations such as topdressing and weed control as well as limiting yield in the areas most affected.

Two biological factors important to plant growth in the project area were identified during this assessment. Earthworms were common in the majority of pits examined. These provide macropores to allow rapid movement of water and air into the subsoil, and provide some mixing of the soil. The presence of an active earthworm population also reduces the need for cultivation in undisturbed parts of the project area.

The second biological factor is that organic carbon was concentrated in the surface 5 cm of soil. This organic matter increases the capacity to store nutrients, indicated by consistently higher cation exchange capacity in the 0 to 5 cm layer than 5 to 30 cm layer of soil associations in elevated parts of the project area.

The organic matter in the surface 10 to 15 cm of soil in disturbed parts of the project area can be a significant resource in the successful rehabilitation of these areas.

Common indicators of waterlogging in the form of bleached horizons in duplex (loam over clay) profiles indicate that care should be taken when planning rehabilitation to provide adequate topsoil drainage to reduce waterlogging to a tolerable level. This can be provided by a combination of surface and internal (through the soil) drainage.

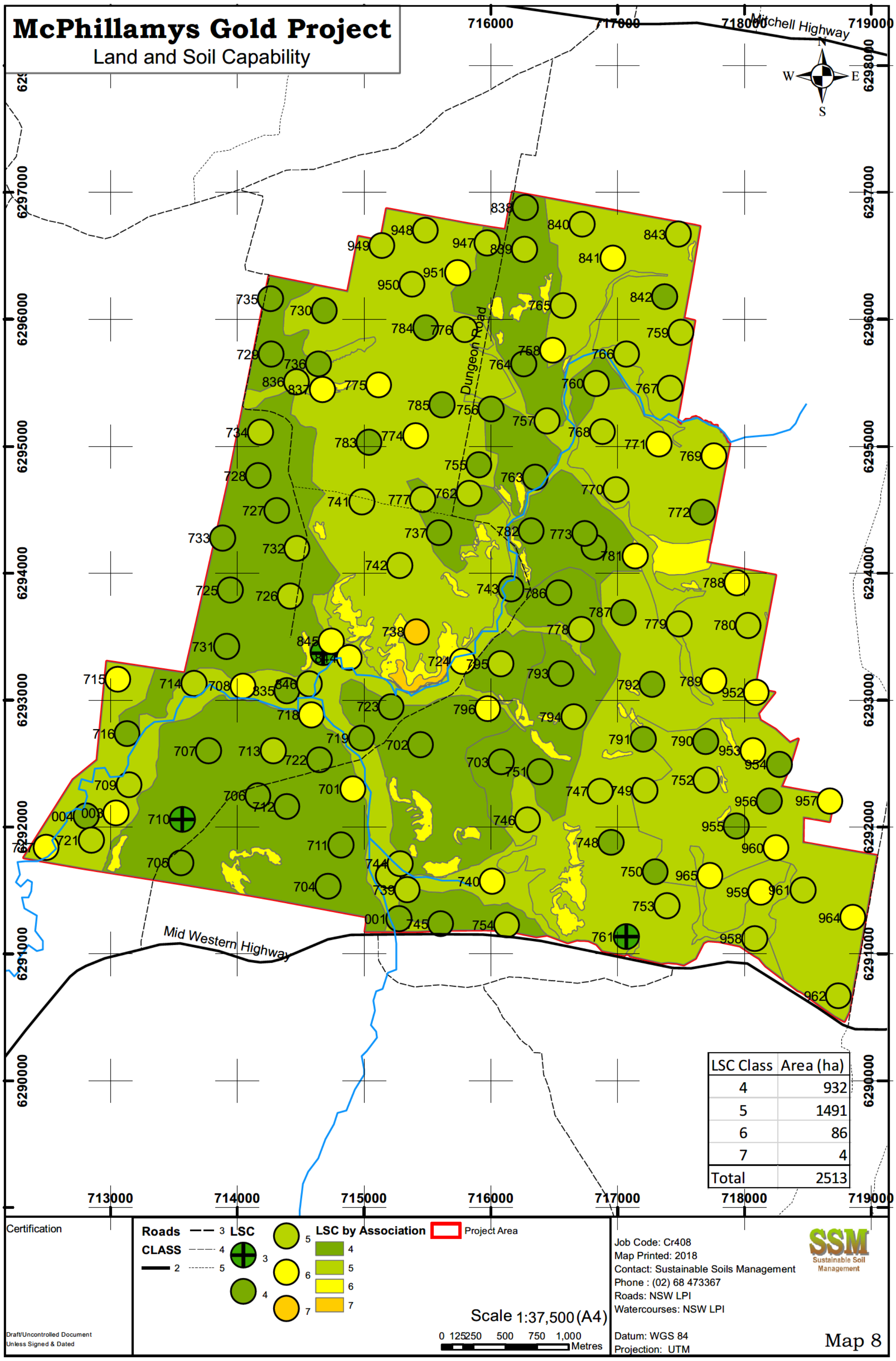


Figure 2.3. Land and Soil Capability Class in the Mine Development Area.

2.3. HISTORY OF AGRICULTURAL ENTERPRISES WITHIN PROJECT AREA

Grazing of livestock has been the main agricultural land use within the locality of the mine since the area was first settled in the 1820s (id.consulting, n.d.). This historic land use is consistent with the LSC assessment of the project area (Section 2.2.2).

All of the project area (with the exception of one property for which an option to purchase has been agreed to with the current landholder) and some adjoining land, is owned by Regis and is currently used for agriculture (refer to Figure 2.4). Based on interviews with landholders the main agriculture use of land over the last 10 years has been grazing of beef cattle on unimproved (native) pastures which have had applications of superphosphate and in some cases sub clover (Table 2.2).

Two of the properties ran sheep in addition to cattle. These two properties had established improved perennial grass/sub clover pastures and regularly grew small areas of oats for fodder. One of the properties that only ran beef cattle had established some improved pastures.

The current carrying capacity for the project area was estimated based on the information collected during the landholder interviews and presented in Table 2.3. The total reported stock numbers were converted to dry sheep equivalents (dse), using conversion factors of 17 dse for cow and calf and 1.7 dse for ewe and lamb (Millear *et al.*, 2005). Based on this information, the 2,903 ha currently owned by Regis or under option to purchase subject to development consent being obtained for the project, which covers the project area and some adjoining land, was estimated on average to support 25,085 dse at an average carry capacity of 8.6 dse/ha (Table 2.3). This figure is close to the average carrying capacity of 8 dse/ha for land in the vicinity of Blayney (pers comm Customer Service Staff, Central Tablelands Local Lands Service, May 18 2017.)

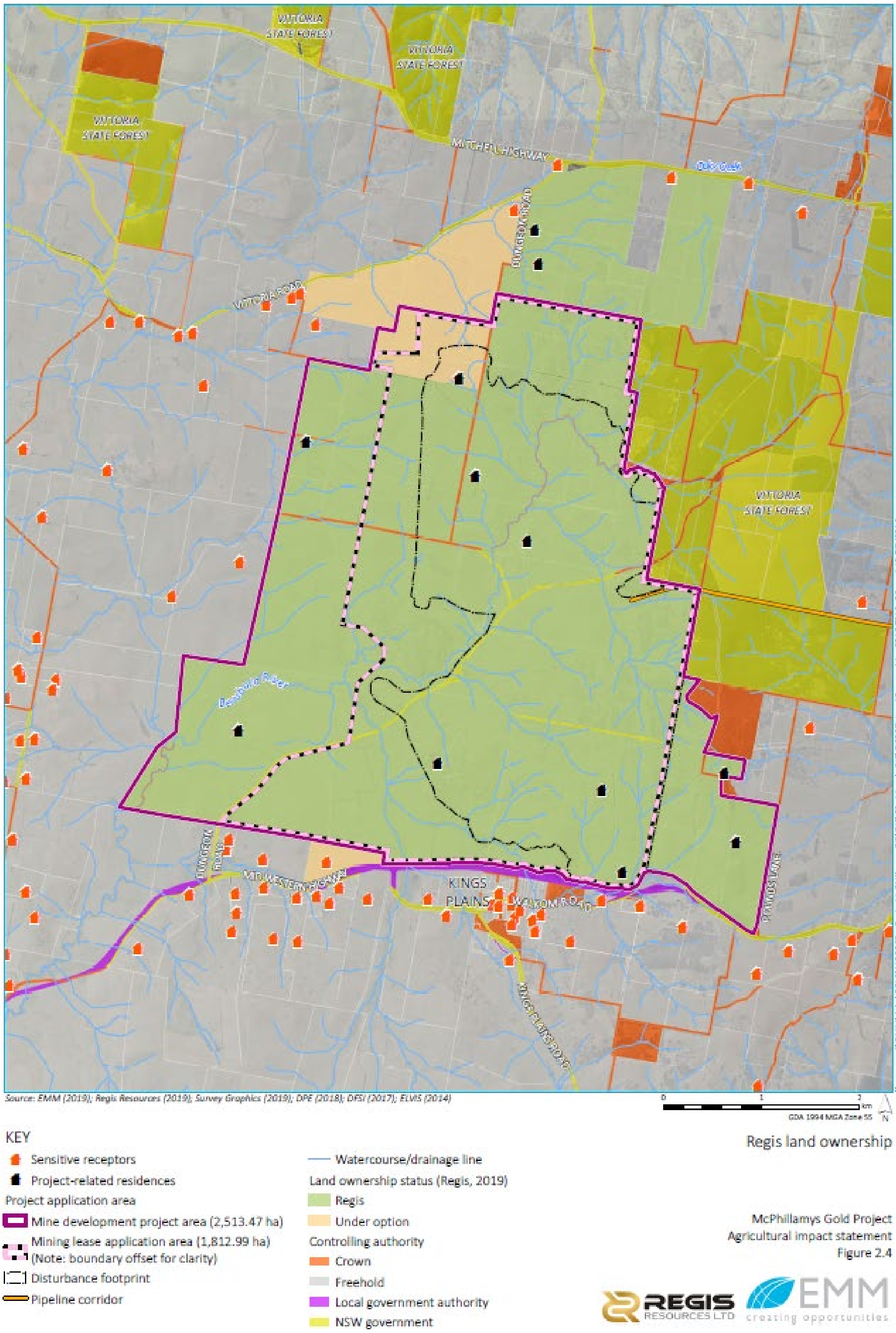


Figure 2.4. Regis land ownership

Table 2.2. Summary of agricultural use of properties owned (or under option to purchase agreements) by Regis within and adjoining the project area based on landholder interviews.

Property Id	Ownership/ leasing arrangement	Total Area (ha)	% property within disturbance area	General nature of agricultural enterprise
Stonestreet	Owned by Regis, leased by original owner	305	100	Grazing of 80 Hereford cattle and 200 cross bred ewes on improved pasture with regular superphosphate applications. Small area (10ha) of oats grown for fodder.
Wills	Owned by Regis, leased by original owner	521	80	Forms part of a network of properties in regional NSW. Used to join 600 Angus heifers which are removed prior to calving. Pastures are based on unimproved pastures with topdressing of superphosphate and sub clover
Skovgaard	Owned by Regis, leased by original owner	478	12	Grazing of 250 Hereford cows and calves on unimproved pastures
Gowing, Bishendon RTA	Owned by Regis, leased by original owner/leasee	248	90	Grazing of 160 Angus cows and calves on unimproved pastures with regular topdressing of superphosphate
Rutherford	Owned by Regis, leased by original owner	129	60	Grazing of 50 Hereford cows and calves on unimproved pastures, with topdressing of superphosphate
McPhillamy	Owned by Regis, leased by Rutherford	258	45	Grazing of 120 Hereford cows and calves, 175 ewes and lambs on unimproved pastures with regular topdressing of superphosphate
Gagen	Optioned by Regis,	228	9	Grazing of 120-150 Angus cows and calves on improved pastures
Gordon	Owned by Regis, leased by original owner	325	3	Grazing of 200 Angus cows and calves as well as 100 goats on unimproved pastures with supplementary feeding.
Hasson	Owned by Regis	49	40	Property purchased by Regis. Property has historically been used for grazing sheep and horses.
Kennedy	Optioned Regis	21	0	Only grazed occasionally to reduce fire risk
Vaughan, McIvor	Owned by Regis, leased by original owner	341	0	Grazing of 1000 self-replacing merino ewes as well as 50 cows and calves on improved pasture (cocksfoot, rye grass, sub clover mix). Small area (40 ha) of oats grown for fodder

Table 2.3. Historic carrying capacity of farms owned by Regis.

Property Id	Total area (ha)	Average historic carrying capacity (DSE)					
		Cows		Ewes		Total DSE	dse/ha
		number	dse[1]	number	dse[2]		
Stonestreet	305	80	1 360	200	340	1 700	5.6
Wills[3]	521	600	4 200	0		4 200	8.1
Skovgaard	478	250	4 250	0		4 250	8.9
Gowing, RTA Bishendon,	248	160	2 720			2 720	11.0
Rutherford	129	50	850			850	6.6
McPhillamy	258	120	2 040	175	298	2 338	9.1
Gagen	228	135	2 295			2 295	10.1
Gordon[4]	325	200	3 400	100	170	3 570	11.0
Hasson[5]	49	25	425			425	8.6
Kennedy[5]	21	11	187			187	8.6
Vaughan, McIvor	341	50	850	1000	1700	2 550	7.5
Total	**2 903**	**1 681**	**22 577**	**1475**	**2508**	**25 085**	**8.6**

Assumptions

1. A cow and calf were assumed to equal 17 dse
2. An ewe and lamb were assumed to equal 1.7 dse
3. For this property a cow was assumed to equal only 7 dse as the heifers were joined on property but removed before calving which is the period of highest feed demand
4. This property runs goats with kids. They have been assumed to have the same feed demand as ewe and lamb and so are included under the sheep numbers
5. No property management information is available for these properties. Stock figures for these properties have been based on a carrying capacity of 8.6 dse/ha which was the average carrying capacity of the other properties.

2.4. LOCATION AND AREAS OF LAND TO BE TEMPORARILY REMOVED FROM AGRICULTURE

The project is planned to disturb an area of approximately 1,135 ha, which will temporarily be removed from agricultural use. The uses to which this land will be put to during mine operation are depicted in Figure 1.2 (mine site layout). The disturbance area accounts for less than 1% of the 132,592 ha used for agriculture in Blayney LGA (ABS, 2012a). It is also noted that more than half of the 2,513 ha mine development project area, comprising 1,378 ha, will remain undisturbed by the mine development during operations, with the majority of this land to continue to be used for agricultural (grazing) purposes. In many cases this land will be leased back to the original owner/leasee (Table 2.2).

2.5. LOCATION AND AREAS OF LAND TO BE RETURNED TO AGRICULTURE POST PROJECT

The primary objective of the project's rehabilitation strategy (EMM 2019b) is to return disturbed land to a condition that is stable, non-polluting, and supports the proposed post-mining landuse, which is a mixture of grazing of improved pasture and woodland areas. The final landform shape will be integrated as much as possible into the current landform.

The Land and Soil Capability (LSC) will be constrained by changes in land shape as a result of the project. A larger proportion of the land surface will have slope steeper than 20%, and the top surface of the waste rock emplacement will be more exposed to wind than the current undulating landscape. In this project, the soil will be formed from a layer of topsoil placed over a thicker layer of subsoil over either loosened regolith or loosened waste rock.

The predicted LSC class was based on tables in *The Land and Soil Capability Assessment Scheme – second approximation* (OEH, 2012). LSC Table 15 indicates that in areas with <30% rock outcrop, shallow soil with less than 25 cm soil over weathered rock is LSC class 7, while a profile with 25 to 50 cm of soil is rated as LSC 6 and a 50 to 75 cm profile can be LSC 4. At Blayney, LSC Table 4 indicates that water erosion constrains land with slope of 20% to 33% can be LSC 6, and land with slope of 10 to 20% can be LSC 4. With the loamy topsoil at Blayney, wind erosion constrains hilltops to LSC 5, while more protected areas can be LSC 4. At Blayney, loamy topsoil constrains soil with pH_{CaCl2} between 4.0 and 4.7 to LSC 5, while soil with pH_{CaCl2} between 4.7 and 6.0 can be LSC 4. Waterlogging was a common constraint in the existing soil in the project area. The modified land shape post mining will result in a change in water relations. LSC Table 14 indicates that areas that are waterlogged for 2 to 3 months each year will be constrained to LSC 5, while areas that are waterlogged for a similar period every 2 to 3 years can be LSC 4.

The guidelines outlined above were applied to the range of disturbance types to give the outcomes listed in Table 2.4.

The project is predicted to be associated with a nett reduction of 423 ha of soil with LSC classes 4 (12 ha) and 5 (411 ha) and a nett increase of 353 ha of soil with LSC classes 6 (336 ha) and 7 (17 ha) (Table 2.5). Land where capability is reduced as a result of the project is predominantly in the footprint of the Waste Rock Emplacement and the Tailings Storage Facility (Figures 2.1 and 3.3). The void from the mine pit (70 ha) will have no agricultural value (LSC class 8). However, the LSC class across parts of the tailing storage facility footprint will be improved from LSC class 5 pre-mining to LSC class 4 post-rehabilitation. This commitment to rehabilitating the tailing storage facility to achieve an LSC class 4 across the final landform to compensate for the loss of some LSC class 4 land in the footprint of the open cut mine, ROM pad, and other infrastructure areas means that there will be only a minimal change (12 ha) in LSC class 4 land across the disturbance area as a result of the project.

Table 2.4. LSC changes during the project **Infrastructure type**	**Disturbance and Rehabilitation**	**Estimated post-mining LSC class**	**Area ha**	**LSC class before**					**LSC class after**				
				4	**5**	**6**	**7**	**8**	**4**	**5**	**6**	**7**	**8**
Mine void	Construct pit 800 to 1,000 m across and leave as void	LSC 8. No agricultural use possible	71	65	3	2							71
Waste Rock Emplacement, Amenity Bunds and Run of the Mine - top surface	Man-made landform with some undulations	LSC 5. Soil requirements include: Topsoil texture sandy loam or finer, stable topsoil structure, soil depth > 50 cm, topsoil pHCaCl$_2$ > 4.0, waterlogging occurs less often than 2 to 3 months every year, exposed to wind	71	26	43	2				71			
Waste Rock Emplacement, Amenity Bunds and Run of Mine Stockpile - batters	Waste rock with 10 cm topsoil cover and 25 cm subsoil	LSC 6. Limited by relatively long slope lengths and 1:5 batter slope	268	38	219	10					268		
Tailings Storage Facility- top surface	Tailings Storage Facility will be filled, then the tailings will be covered with 60 cm thick trafficking layer, then 90 cm thick subsoil, covered with 10 cm topsoil	LSC 4. Soil requirements include: Topsoil texture sandy loam or finer, stable topsoil structure, soil depth > 50 cm, topsoil pHCaCl$_2$ > 4.7, waterlogging occurs less often than 2 to 3 months every 2 to 3 years, medium wind exposure	277	124	141	12			277				
Tailings Storage Facility- embankments	Earthen embankments with 10 cm topsoil cover and 25 cm subsoil over a rock core	LSC 6 due to 1:5 batter slope	29	6	22	1					29		

Table 2.4. LSC changes during the project **Infrastructure type**	**Disturbance and Rehabilitation**	**Estimated post-mining LSC class**	**Area ha**	**LSC class before**					**LSC class after**				
				4	**5**	**6**	**7**	**8**	**4**	**5**	**6**	**7**	**8**
Topsoil stockpile	Topsoil will be stockpiled, then removed and respread	LSC should be the same as it was before disturbance provided some amendments are added to restart biological processes that occur in topsoil, but not subsoil	50	30	20				30	20			

Infrastructure type	Disturbance and Rehabilitation	Estimated post-mining LSC class	Area ha	LSC class before					LSC class after				
				4	5	6	7	8	4	5	6	7	8
Water storage embankments	Topsoil will be stripped, embankments constructed, remain for life of project, then be entirely removed at end of project before topsoil is replaced.	LSC should be the same as it was before disturbance provided some amendments are added to restart biological processes that occur in topsoil, but not subsoil	23	7	15	1			7	15	1		
Water storages	Storages will store water during the project, then be drained at the end of the project.	LSC should be the same as it was before disturbance provided some amendments are added to restart biological processes that occur in topsoil, but not subsoil	54	12	40	1			12	40	1		
Processing Plant and associated infrastructure and laydown yards	Large level areas will be constructed by cutting high areas and filling low areas	LSC 6. Based on 30 cm soil and loosened subgrade that can be explored by roots	27	12	15						27		
Roads	Engineered roads will be constructed by smoothing the land surface, compacting the subgrade, then placing a waterproof gravel or asphalt surface	LSC 6. Based on 30 cm soil and loosened subgrade so that it can be explored by roots	45	11	31	3					45		
Drain	Drain constructed during project closure to move water around Tailing Storage Facility	LSC 7. Based on 1:5 batter slope	17	6	8	3						17	

Table 2.5. Change in area of each LSC class over the life of the project

LSC Class	Capability	Pre-mining area (ha)	Post-mining area (ha)	Change (ha)
Land with a wide range of uses (cropping, grazing, horticulture, nature conservation)				
1	Extremely high	0	0	
2	Very high	0	0	
3	High	0	0	
Land with a variety of uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)				
4	Moderate	932	920	- 12
5	Moderate-low	1491	1080	-411
Land with a limited range of uses (grazing, forestry and nature conservation				
6	Low	86	422	336
Land generally unable to support agriculture (selective forestry and nature conservation)				
7	Very low	4	21	17
8	Extremely low	0	70	70

Soil disturbance will occur on six of the eight Soil Associations mapped over the project Area (Figure 2.2). Most disturbance will occur on the Upland East and Manganic East Associations. The project's potential impact on soil resources in the project area are associated with temporary loss of land during construction and operation of mine infrastructure, permanent loss of land in the void of the pit, and permanent reduction in LSC class in some areas.

2.6. LOCATION AND AREAS OF LAND THAT WILL NOT BE RETURNED TO AGRICULTURE

At the end of the mine life the open cut void will remain. Due to the nature of the deposit, this void is unable to be backfilled as mining progresses deeper into the void. The final void will be approximately 460m deep and is anticipated to be a sink, which means that groundwater will accumulate in the void over time until an equilibrium water level is reached. HEC (2019) modelled this level to be more than 9 m below the spill level (ie it will not spill); also finding that this equilibrium level will be reached very slowly over a period of more than 400 years. In relation to final void water quality, salinity levels in the void will increase slowly over time as a result of evapo-concentration. The final void is the area marked as LSC 8 on Figure 2.5 and covers an area of approximately 70 ha (Table 2.5).

Other land where capability is reduced as a result of the project is predominately on the batters of the waste rock emplacement and the areas that will be levelled to form foundations for buildings and roads (Figure 2.5).

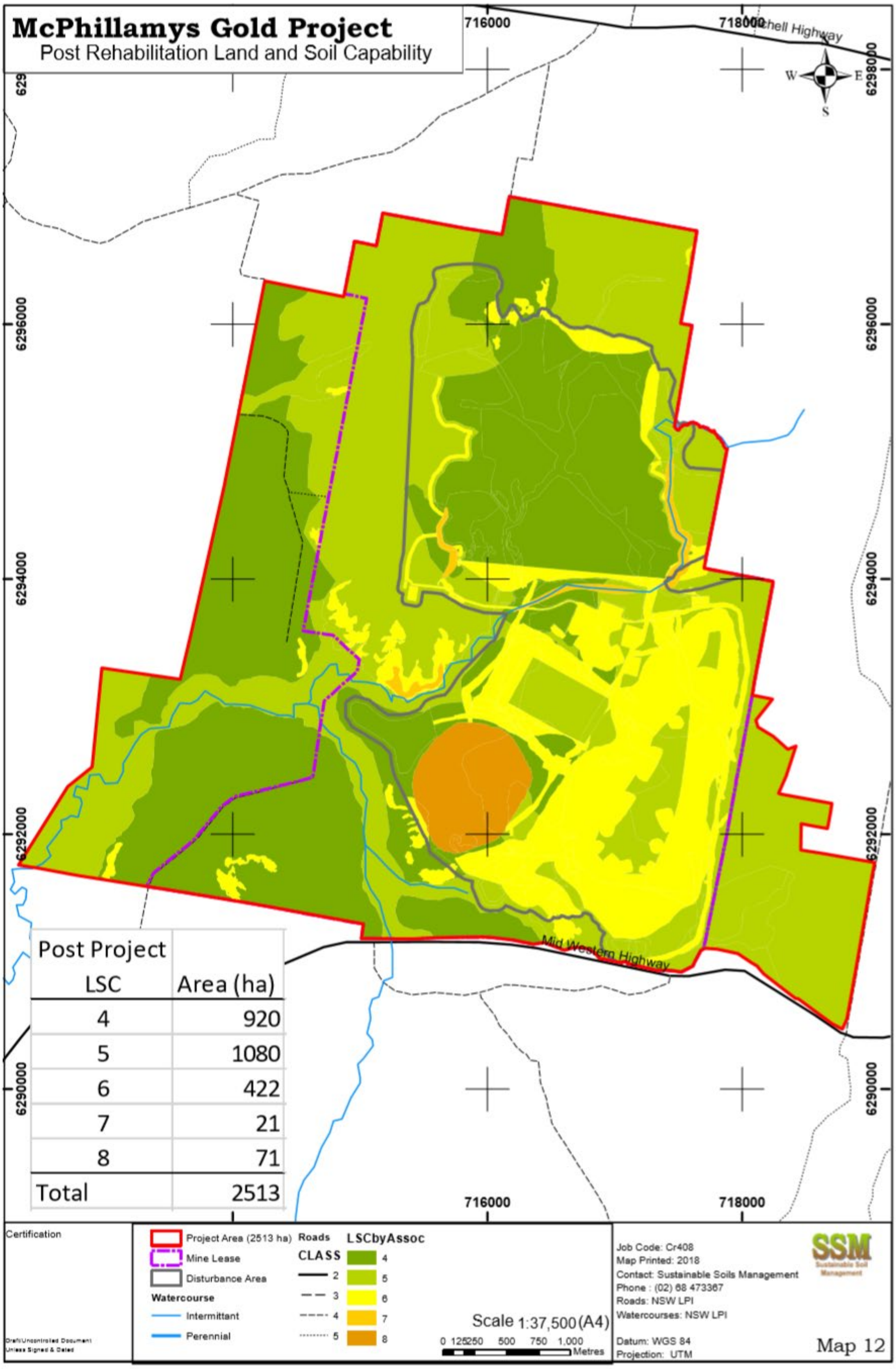
Regis has identified a potential biodiversity offset site in the locality that would meet a significant proportion of the project's ecosystem and species credit requirements. This site contains a substantial area of Box Gum woodland. The majority of the site was previously part of the Box Gum Grassy Woodland Environmental Stewardship Programme and is not currently used for agricultural purposes. Consequently, the establishment of a biodiversity offset site would not remove land from agriculture.

A detailed field assessment is required to determine the site's suitability as an offset site and the ability to meet the project's credit requirements. As part of this detailed investigation and development of the project's biodiversity offset strategy, any impacts on agricultural land would be assessed.

2.7. AGRICULTURAL ENTERPRISES TO BE UNDERTAKEN ON BUFFER OR OFFSET LAND DURING PROJECT

Land owned by Regis outside the disturbance area will be leased and continued to be used to undertake livestock grazing enterprises. In the majority of cases, the property is being leased back to the original owner (Table 2.2). As a result, the management practices during mine operation will generally be the same as when the property was privately owned.

As described above, the potential offset area identified is not currently used for agricultural purposes and therefore the establishment of a biodiversity stewardship site would not remove land from agriculture.



Post Project LSC	Area (ha)
4	920
5	1080
6	422
7	21
8	71
Total	2513

Figure 2.5. projected post-mining and Land Soil Capability Class

3. EXISTING REGIONAL AGRICULTURAL RESOURCES

3.1. AGRICULTURAL RESOURCES WITHIN THE LOCALITY

3.1.1. Soil Characteristics and Topography

The Blayney LGA was mapped by Kovac *et al.* (1989) as predominantly belonging to three Great Soil Groups (Stace *et al.*, 1968) with red subsoil (Figure 3.1). All three great soil groups tend to be acidic and have low to moderate fertility.

Approximately 8% of the LGA was mapped as Krasnozems (Table 3.1), which have friable loam to clay loam topsoil over reddish brown clay loam to light clay B horizons (Kovac *et al.*, 1990). Krasnozems predominantly occur on hillslopes over Tertiary basalt parent material. The soil is moderately fertile, and is used for orchards, pasture and for pine plantations. Krasnozems occur mostly along the northern edge of the Blayney LGA. Krasnozems are mapped to within 1.5 km of the western edge of the project area.

Table 3.1. Area of great soil groups in Blayney LGA. (Calculated from Kovac *et al.*, 1989.)

Great Soil Group	Area (ha)	Proportion (%)
Alluvial	1798	1
Euchrozem	601	0
Krasnozem	12 436	8
Non-Calcic Brown	2 846	2
Red Earth	56 287	37
Red Podzolic	62 289	41
Shallow	3 904	3
Siliceous Sand	2 257	1
Terra Rosa	543	0
Water	339	0
Yellow Podzolic	9 198	6
Total	152 498	

Approximately 37% of the Blayney LGA was mapped as Red Earths (Table 3.1), which have sandy, weakly structured topsoil, sometimes with a bleached A2 over weakly structured clay loam subsoil (Kovac *et al.*, 1990). Red Earths predominantly occur on well drained slopes and crests, mainly associated with andesite and other sedimentary and meta-sedimentary rocks. They have low to medium nutrient status and are used for native and improved pastures. Soil acidity has been noted as a problem in Red Earths under improved pastures.

The majority of the project area was mapped by Kovac *et al.* (1989) as Red Earths. However, Kovac *et al.* (1990) reported that the Vittoria-Blayney soil landscape contains a mixture of soil types, half of which are not red (Figure 3.2).

Figure 3.1. Great Soil Groups of the Blayney LGA.

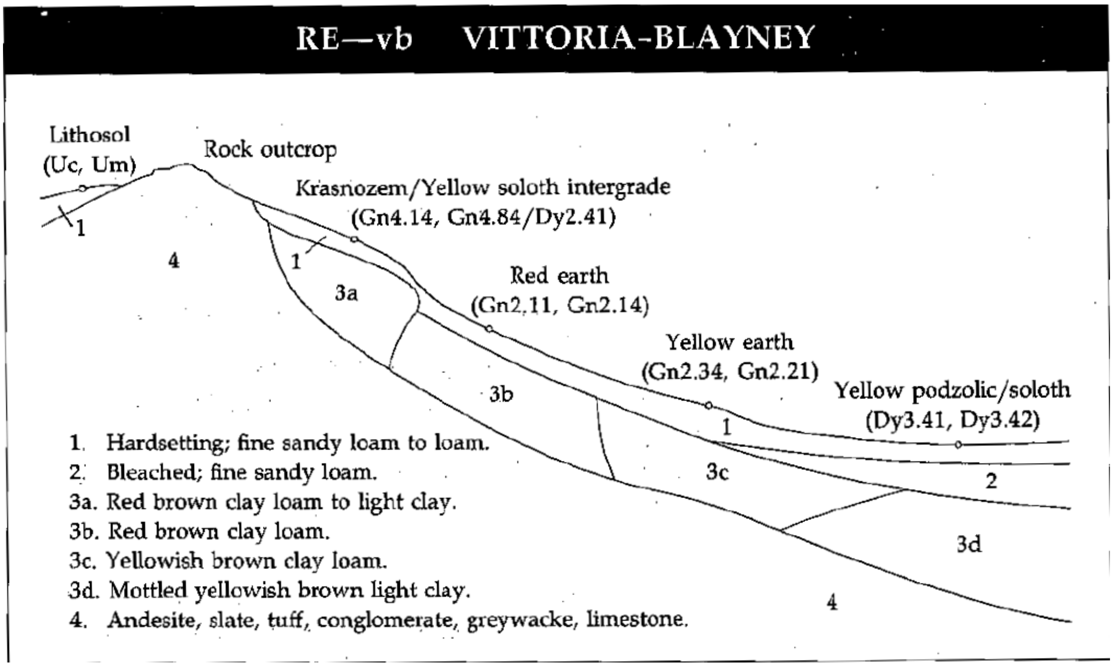


Figure 3.2. Schematic toposequence of Vittoria-Blayney Soil Landscape which covers most of the Project Area (Kovac *et al.*, 1990).

Approximately 41% of the Blayney LGA was mapped as Red Podzolic Soils, which have sandy loam topsoil, often have a bleached A2 horizon and reddish brown sandy to heavy clay subsoil (Kovac *et al.*, 1990). Red Podzolic soils occur on well drained upper to mid-slopes on a variety of landforms and parent material. They have low to moderate chemical fertility, and respond well to pasture improvement. Topsoil is often acidic and the soil becomes more acidic with depth.

3.1.2. Topography

The landform of the Blayney LGA consists of undulating hills with an average slope of 9%. There is a general fall in elevation from 1,000 m in the north east of the Blayney LGA to less than 500 m near the western end (Figure 3.3).

There is a steep drop near the south-western and southern boundaries of Blayney LGA. This drop marks the edge of the tableland that includes the Blayney LGA.

The flatter area centred on Millthorpe is over the basalt flows from Mt Canobolas, which is located near the north-western corner of the map (Figure 3.3).

The average slope across the Mine Development project area of 8% is similar to that of the whole of the Blayney LGA. Elevations across the project area range from 873 m near the southwestern corner to more than 1,000 m on a ridge through the southeastern quadrant of the Mine Development project area.

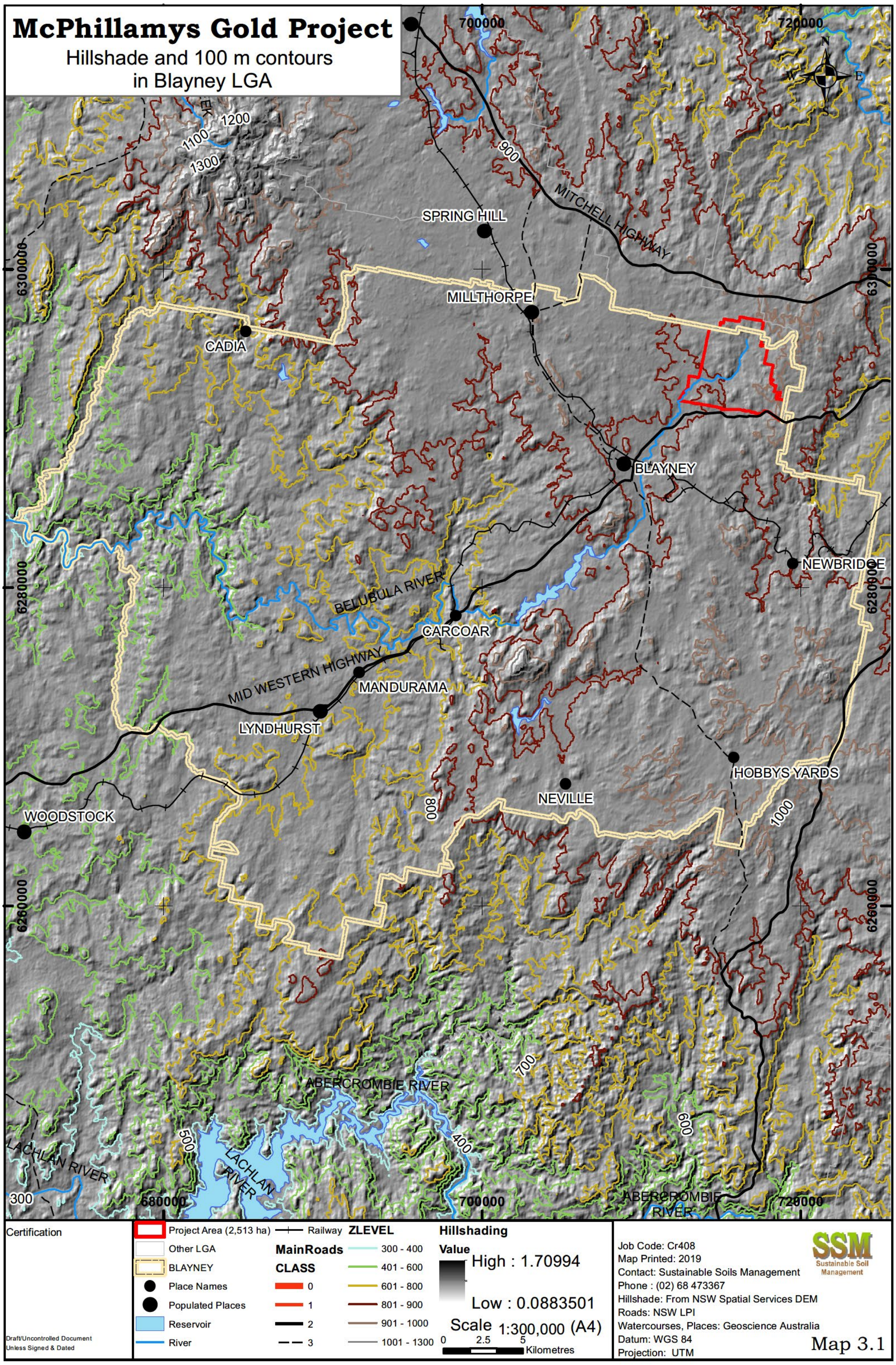


Figure 3.3. Hillshade and 100 m contours in Blayney LGA

3.1.3. Agricultural Support Infrastructure

3.1.3.1. Transport routes

The major transport routes used by agricultural producers in the region to access supporting services and to move their products include the Mid Western, and Mitchell Highways, major local roads such as the Millthorpe Road, local roads such as Guyong, Vittoria and Dungeon Roads (RMS, 2017).

3.1.3.2. General and specialist services

Agricultural industries in the locality of the project are supported by a range of general and specialist infrastructure and services.

- The Central Tablelands Livestock Exchange is located 10 km south-west of Blayney and is the main livestock selling centre for the central tablelands area of Orange, Blayney, Bathurst, Oberon, Molong, Canowindra and Cowra (Blayney Shire Council, 2018). In 2018 there were 442,868 sheep and 163,993 cattle sold through the Central Tablelands Livestock Exchange (MLA, 2019).
- Businesses in Blayney provide agricultural support services including machinery sales and service; farm supplies (animal health, seed, fertiliser, chemicals, fencing materials), stock and station agents, veterinary practices, agricultural consultants and professional services (legal and accountancy).
- Orange and Bathurst are large regional centres located within 40 km of Blayney that also provide the above support services to the locality.

3.1.4. Water Resources and Extraction Locations

A comprehensive Groundwater Assessment and Surface Water Assessment for the project has been undertaken by EMM and HEC, respectively. The Groundwater Assessment is included as Appendix K of the EIS and the Surface Water Assessment as Appendix J. The following is a summary of the existing groundwater and surface water resources.

3.1.4.1. Groundwater

The mine development is located within the Lachlan Fold Belt Murray Daring Basin Groundwater Source which is managed by the Water Sharing Plan for the *New South Wales Murray-Darling Basin Fractured Rock Groundwater Sources 2011*. This Water Sharing Plan is due for extension/replacement in July 2022.

The mine development is underlain by metasediments and volcaniclastics of the Silurian Anson Formation and Ordovician volcanics. There are minor disconnected areas of shallow Quaternary alluvium associated with watercourses and drainage lines. The hydrogeology surrounding the project area is dominated by the Palaeozoic metamorphic rocks of the eastern Lachlan Fold Belt. The water table is typically hosted in the saprock (weathered bedrock) or alluvium (where present) and is generally a subdued reflection of topography, with depth to groundwater typically within 15 m of the ground surface. There is minimal seasonal variation in the water table. The volcanics and metasediments weather to a clay-like material and where fracturing occurs, the fractures become clay filled and therefore do not act as conduits for groundwater flow. The saprock zone ranges from 5 to 80 m in thickness. Hydraulic conductivities of the saprock and fresh bedrock in the area is low. Bores yields in the metamorphic rocks and very shallow alluvium of the area are generally low (<5 L/sec).

Groundwater use in the locality around the project area is limited to stock and domestic supplies. Laboratory reported water quality indicates that groundwater is mostly suitable for livestock watering, with the exception of salinity and pH at some locations. Dissolved metals are naturally high at some locations, including copper, aluminium, cadmium, manganese, nickel, fluoride, zinc and in some bores within the volcanics, arsenic was reported above the livestock drinking water guideline value.

A search of the WaterNSW database and bore census surveys conducted by Regis identified 254 bores within a 10 km radius of the mine development project area. Groundwater abstraction within the Silurian and Ordovician formations is generally for stock and domestic purposes. The Cadia Valley operations are located 25 km west of the mine development and form the biggest groundwater user in the vicinity.

The Orange Basalt groundwater source, located 4 km north-west of the mine development, supports reliable bore yields and is accessed for irrigation, industry and town water supply.

A figure showing registered groundwater bores in the locality is provided in Figure 3.4.

3.1.4.2. Surface water

The project area is located in the headwaters of the unregulated Belubula River which flows northeast to southwest through the project area. The Belubula River is a tributary of the Lachlan River. A number of unnamed tributaries, join the Belublula River within the project area. These have been named Trib A to Trib K for the purposes of the EIS assessment (Figure 3.5). Trib A and Trib B have a combined catchment area of 24.4km^2; the Belubula River just upstream of the confluence with Trib A has a catchment area of 17.5 km^2.

Carcoar Dam is located on the Belubula River approximately 26 km downstream or to the southwest of the project area. Carcoar Dam has a catchment area of approximately 230 km^2 and a storage capacity of approximately 35.8 gigalitres (GL). Carcoar Dam is used primarily for regulated releases for licensed extraction, environmental, stock and domestic purposes.

The upper reaches of the Belubula River in the project area are ephemeral with isolated, stagnant pools, only flowing after periods of heavy rainfall. Many of the mapped streams in the catchment headwaters are simply depressions in the topography without incised channels, flow confinement or other attributes common to surface watercourses. Downstream of the mine development, the Belubula River is mostly gaining and flows most of the year. Surface water quality is generally fresh.

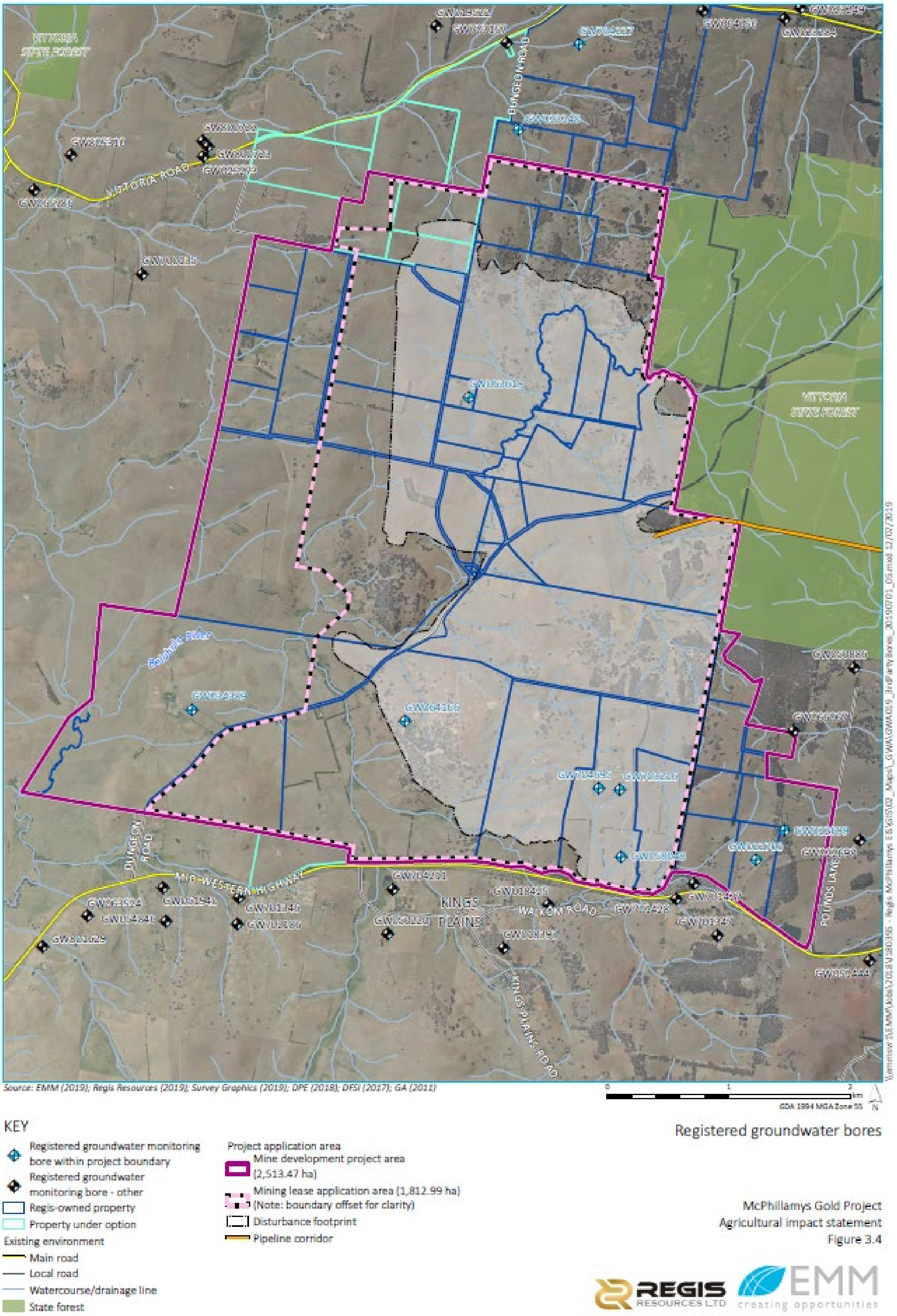


Figure 3.4. Registered groundwater bores.

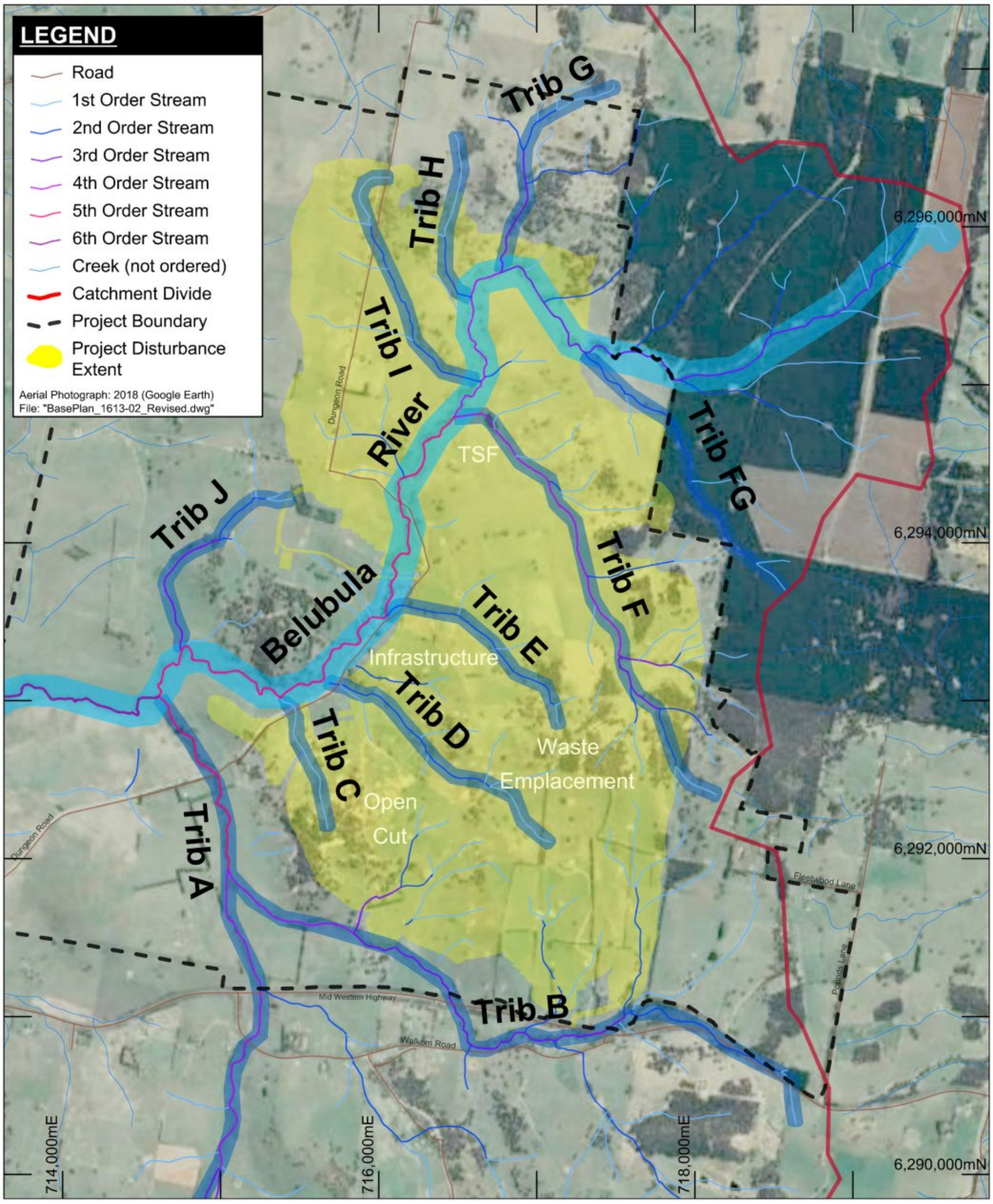


Figure 3.5. Belubula River tributaries in the project area

The mine development is in the unregulated surface water source of the Belubula River above Carcoar Dam, managed under the *Water Sharing Plan* (WSP) *for the Lachlan Unregulated and Alluvial Water Sources 2011*. Further downstream, the Belubula River is managed under the WSP for the *Belubula Regulated River Water Source 2012*. All water take that is not for basic landholder rights or exempt from requiring a licence must be authorised by a water access licence (WAL) under the Water Management Act 2000 (WM Act).

There are three WALs for the Belubula River above Carcoar Dam surface water source, with respective allocations of 22 ML (WAL36818), 50 ML (WAL31476), and 192 ML (WAL31475). Both WAL36818 and WAL31476, with a combined allocation of 72 ML, are potentially available for trading.

While WAL31475 was surrendered by the Water Administration Ministerial Corporation, it is still an active licence.

WALs are required for water intercepted and or used due to open cut mining activities within the fractured rock groundwater source and induced flow from adjacent water sources.

3.1.5.Location and Type of Agricultural Industries.

The project area is primarily located within the Blayney Local Government Area (LGA), with a small portion (approximately100 ha in the north) in the Cabonne LGA (Figure 1.1).

In 2012 NSW DPI mapped important grazing and cropping lands in the Blayney, Orange and Cabonne LGAs. This map (Figure 3.6) indicates that land in the locality of the project area is important for grazing based industries but not cropping.

As Blayney LGA only has important grazing lands and Cabonne LGA has important cropping as well as grazing lands, only the ABS statistics for Blayney LGA have been included in this report as these better reflect the agriculture production in the locality of the project area.

Blayney Shire has a total land area of 152,465 ha, and a population of 7,344. Agriculture is the main employing industry, accounting for 12.7% the 3,222 people employed in the shire (ABS, 2017).

Agriculture accounts for 132,592 ha (88%) of the land use in the Blayney Shire (ABS, 2012a). Grazing of improved pasture is the dominate agricultural land use, accounting for 95,960 ha (72 % of land used by agriculture), followed by grazing of other lands 28,778 ha (22% of land used by agriculture) (ABS, 2012a). Less than 5% of the land used by agriculture in Blayney LGA is cropped (ABS, 2012a).

More agricultural businesses run beef cattle than sheep (Table 3.2); it should be noted that some business will run both. There are a very small number of businesses involved in production of dairy cattle, wine grapes or other horticultural enterprises.

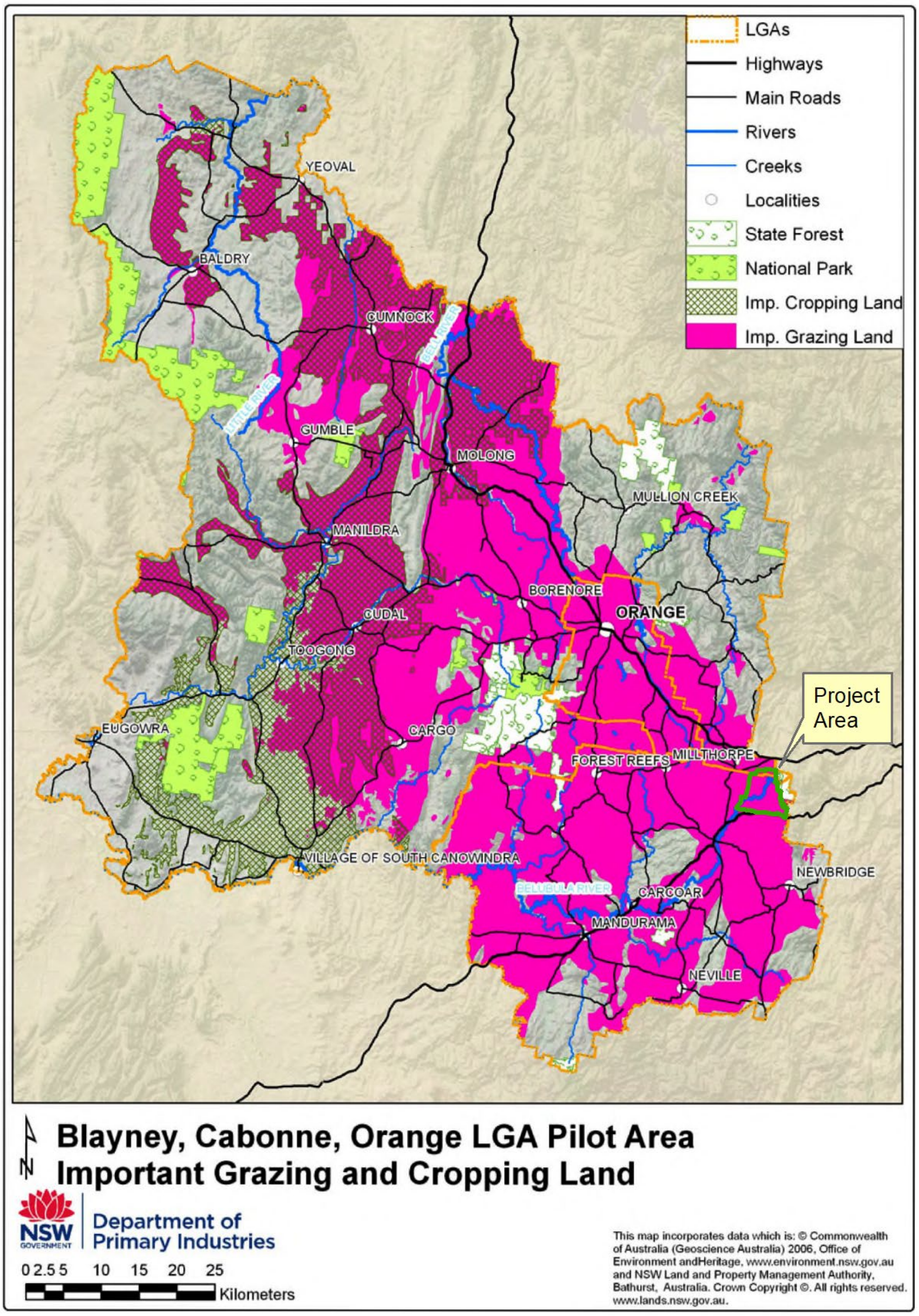


Figure 3.6. Important Grazing and Cropping Land: Blayney, Cabonne, Orange LGAs (NSW DPI, 2012a).

Table 3.2. Size of main agricultural industries, Blayney LGA 2010/11 and 2015/16.

Agricultural industry	Blayney LGA 2010/11		Blayney LGA 2015/16	
	Number of head	Number of businesses	Number of head	Number of businesses
Beef cattle	65 817	311	48 568	172
Sheep and lambs	219 986	218	173 129	139
Dairy cattle	1 021	8	2 002	4
	Area ha	Number of businesses	Area ha	Number of businesses
Cereal crops				
Wheat for grain	924	24	828	11
Oats for grain	1 246	36	3 777	30
Hay	2 443	133	5 833	101
Fruit and nuts excluding grapes			12	1
Wine grapes	272	4	217	2

Source ABS, 2012a, ABS, 2018a

In addition to grazing of sheep and cattle there are a small number of landholders who run other agricultural operations in the locality of the project area. Forestglen alpaca stud farm is located approximately 3 km north-west of the project area. Some rural residences in Kings Plains also keep horses, including a property directly south of the project area off the Mid Western Highway, that buys and sells horses to the export market. Cottesbrook Honey is located on Kellys Road approximately 2 km south-east of the project area, and Goldfields Honey is produced at the Beekeepers Inn, approximately 3 km to the north-west. There is also a small retail nursery (Drayshed nursery) located at Kings Plains. Numerous vineyards are also located on the western and southern fringes of Orange, to the north-west of the project area. Land use in the locality is illustrated in Figure 3.7.

3.1.6. Vegetation

As a result of the historical pastural use of the project area, the majority of the site is dominated by open grasslands of varying conditions and quality with some fragmented patches of timbered natural vegetation though out. The grasslands have been traditionally used for agricultural grazing and are dominated by exotic pasture species (phalaris, tall fescue, perennial rye grass, soft brome, windmill grass, creeping bent grass, prarie grass and forbs such as sub clover, white clover and) and weeds. In some areas a simplified cover of native species such as Kangaroo Grass, Red-anthered Wallaby Grass and Weeping Grass occurs. There are small patches of blackberry on the property as well as a range of other agriculture weeds including: pattersons curse, scotch thistle, saffron thistle, hawthorn and serrated tussock.

A comprehensive Biodiversity Assessment for the project has been undertaken by EMM and is presented in Appendix N of the EIS (EMM 2019a). Field surveys conducted as part of that assessment recorded four native plant community types (PCT), as shown in Figure 3.7, comprising:

- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion (PCT 1330);

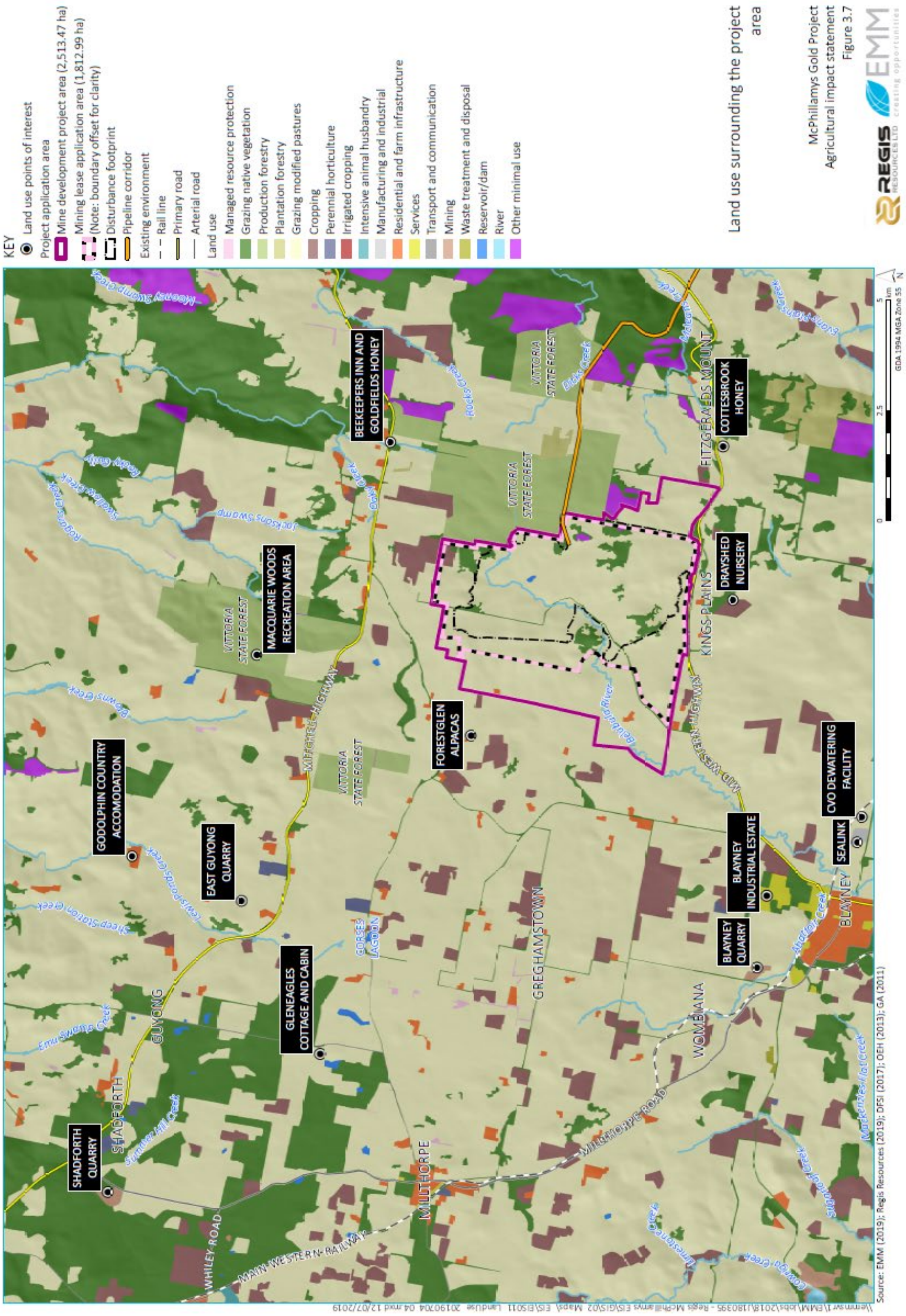
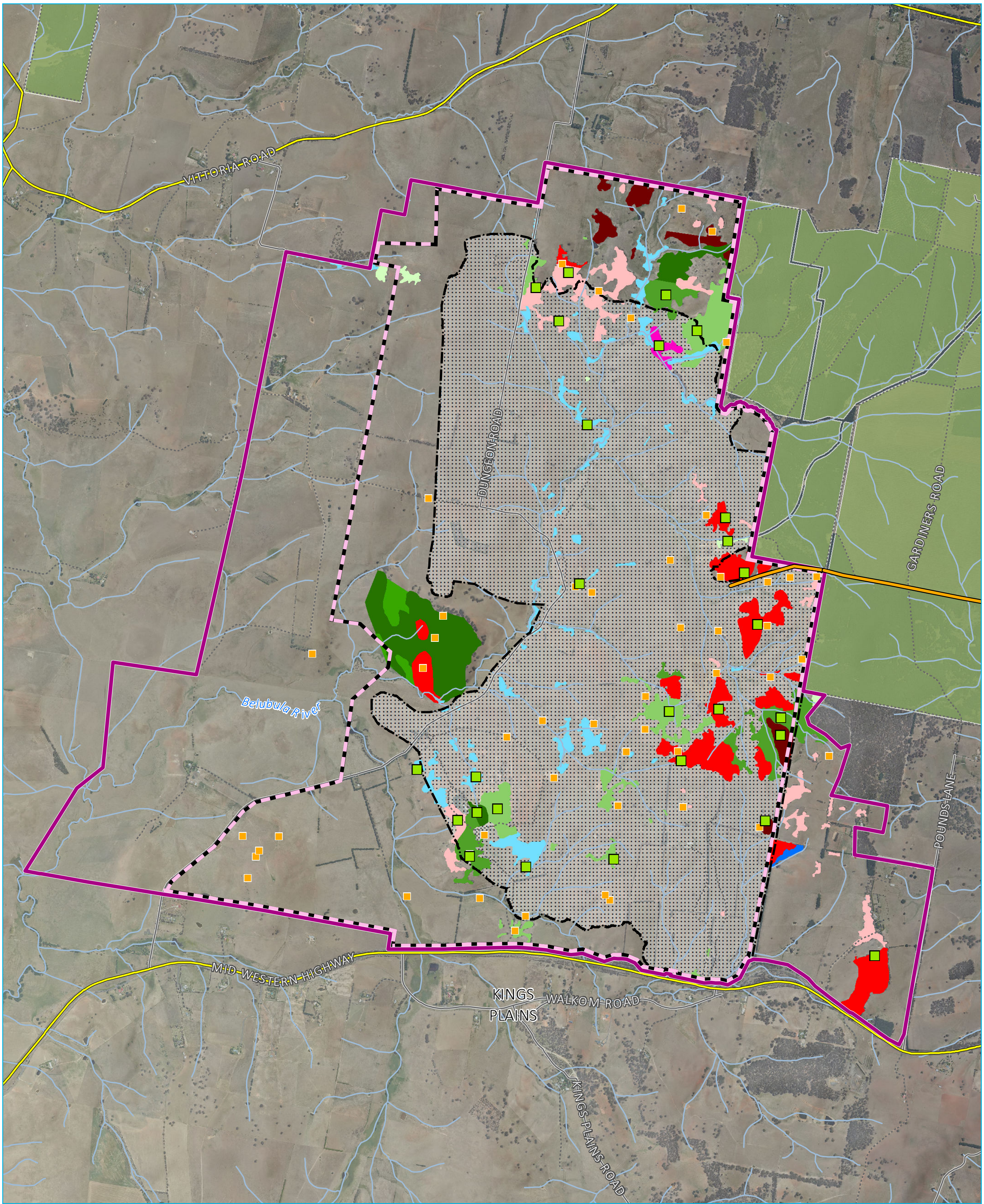


Figure 3.7. Land use surrounding the project area



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Source: EMM (2019); Regis Resources (2019); Survey Graphics (2019); EnviroKey (2017/2018); DFSI (2017); ELVIS (2014)

0 1 2 km

GDA 1994 MGA Zone 55

N

KEY

Project application area
- Mine development project area (2,513.47 ha)
- Mining lease application area (1,812.99 ha) (Note: boundary offset for clarity)
- Pipeline corridor
- Disturbance footprint

Existing environment
- Main road
- Local road
- Vehicular track
- Watercourse/drainage line
- Vittoria State Forest

- Plot location (EMM, 2019)
- Plot location (EnviroKey, 2017/2018)
- Vegetation with a site value score < 17 (1,002.38 ha)

Plant community types

727 - Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands Bioregion
- Moderate/Good (High)
- Moderate/Good (Medium)
- Moderate/Good (Poor)

766 - Carex sedgeland of the slopes and tablelands
- Moderate/Good (Poor)

951 - Mountain Gum - Manna Gum open forest of the South Eastern Highlands Bioregion
- Moderate/Good (Medium)
- Moderate/Good (Poor)

1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion
- Moderate/Good (High)
- Moderate/Good (Medium)
- Moderate/Good (Poor)
- Moderate/Good (Other)

Vegetation communities

McPhillamys Gold Project
Agricultural impact statement
Figure 3.8

REGIS RESOURCES LTD

EMM creating opportunities

- Broad-leaved Peppermint – Brittle Gum – Red Stringybark dry open forest of the South Eastern Highlands Bioregion (PCT 727);
- Mountain Gum – Manna Gum open forest of the South Eastern Highlands Bioregion (PCT 951); and
- Carex sedgeland of the slopes and tablelands (PCT 766).

3.1.7. Climate

The project area is located approximately 8 km northeast of Blayney on the Central Tablelands of NSW and has a temperate climate with a warm summer and no dry season (BOM, 2005). The average rainfall is 765 mm (DSITI, 2017) and is distributed relatively evenly throughout the year.

Average rainfall exceeds average potential plant water use for four months of year (Figure 3.9). There is substantial variation in rainfall in that upper standard deviation exceeds rainfall by around 70 mm in June and July. This would be expected to result in waterlogging of susceptible profiles in many, but not all years.

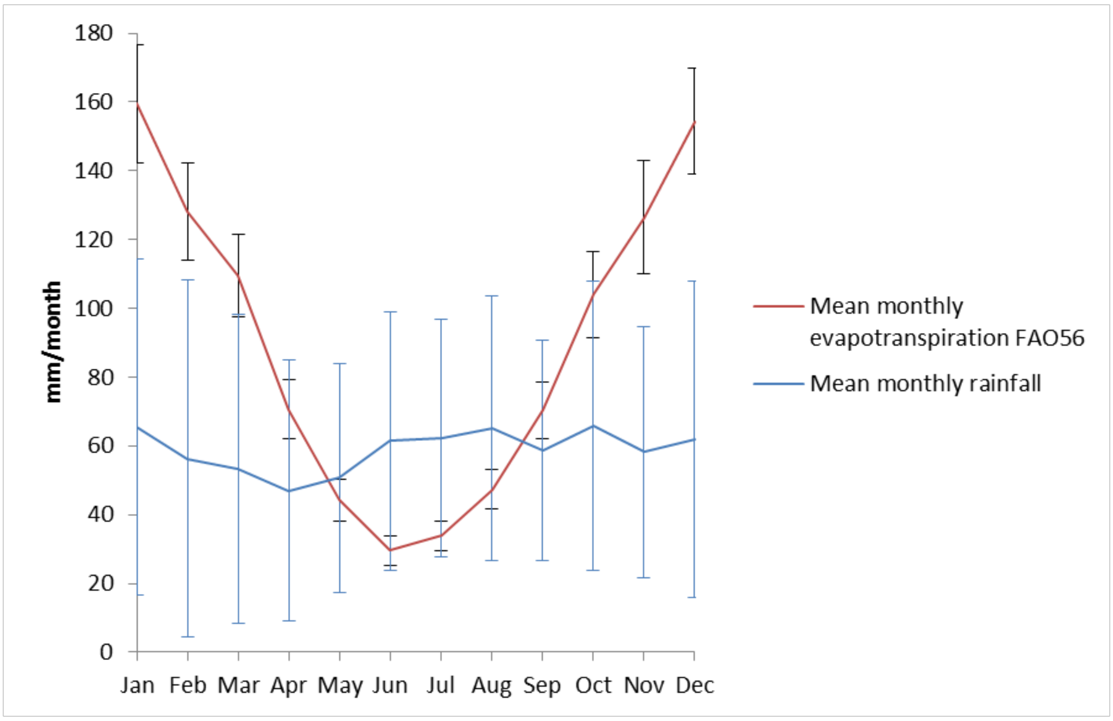

Figure 3.9. Average monthly rainfall and evapotranspiration for McPhillamys Gold Project (36°30' S, 149°18' E) from 1889 to 2016 (DSITI, 2017).

The Blayney area experiences four distinct seasons with warm summers and cool to cold winters. The annual average monthly maximum temperatures for Blayney range from 26°C in January to 10°C in July and minimum temperatures range from 1 °C in July to 12 °C in February (Figure 3.10).

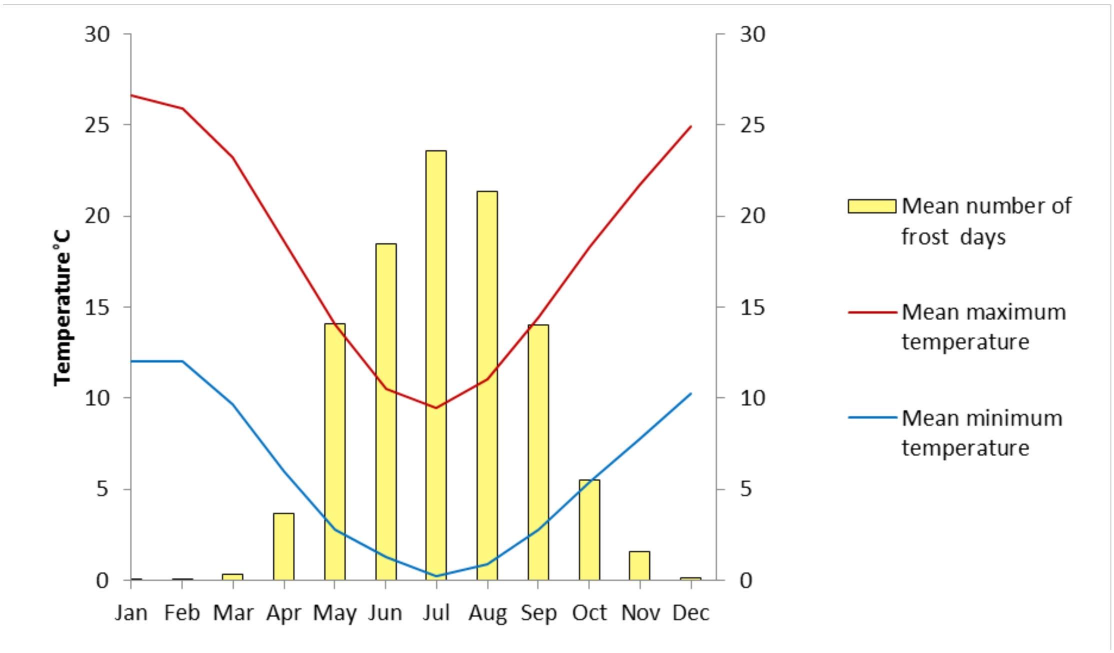

Figure 3.10. Average monthly maximum and minimum temperatures and frost days per month for McPhillamys Gold Project (36°30' S, 149°18' E) from 1889 to 2016 (DSITI, 2017).

The frequency of frosts was calculated as the number of days when the minimum temperature was estimated to be less than 2.2°C at screen level (1.2 m above ground, BOM, 2014). There are a large number of frosts during the wettest part of the year (Figure 3.10), which would be expected to restrict plant growth and water use during these wet periods.

3.1.8. Agricultural Enterprises

The gross value of agriculture production in the Blayney LGA was $47.2M in 2015/16, which represents 0.36% of the gross value of agriculture production in NSW for that period (Table 3.3). Beef cattle production is the highest value agricultural industry in the Blayney LGA and accounted for 55% ($25.9 million) of the gross value of agriculture production in 2015/16 (ABS, 2018b).

Other agricultural industries include: wool (13%, $6.3 million), sheep and lambs for meat (10%, $5.1 million), milk (6.4%, $3 million, hay production (5.7%, $2.7 million) and cereals (5.5%, $2.6 million) (ABS, 2018b). This relative contribution of the different agricultural industries to gross value of agricultural production in Blayney in 2015/16, is comparable to those achieved in 2010/11 (Table 3.3).

Table 3.3. Gross value of agricultural production in Blayney LGA in 2010/11 and 2015/16.

Product	Gross value of Agricultural Production Blayney LGA 2010/11			Gross value of Agricultural Production Blayney LGA 2015/16		
	$M	% of NSW production	% of all ag production in Blayney	$M	% NSW Production	% all ag production in Blayney
Cattle and calves - slaughtered and other disposals	18.5	1.14	48.81	25.9	1.01	54.90
Sheep and lambs- slaughtered and other disposals	5.4	0.80	14.25	5.1	0.70	10.83
Wool	6.4	0.75	16.89	6.3	0.67	13.35
Milk	2.1	0.42	5.54	3.0	0.51	6.39
Broadacre crops - cereals	1.1	0.03	2.90	2.6	0.09	5.50
Hay production	2.6	1.47	6.86	2.7	0.83	5.73
Fruit and nut – excluding grapes	0.1	0.01	0.26	0.3	0.05	0.60
Grapes – wine production	0.8	0.59	2.11	0.5	0.36	1.13
Total Value	37.9	0.32		47.2	0.36	

Source: 2010/11 (ABS, 2012b) and 2015/16 (ABS, 2018b) agricultural census data

3.1.9. Agricultural employment

Local labour sources for the mine development will be provided by workers within one hour travel time from the mine site. This area includes the Blayney, Bathurst, Cabonne, Cowra and Orange LGAs.

The agricultural industry employs 3045 people across the Blayney, Bathurst, Cabonne, Cowra and Orange LGAs which accounts for 6.1% of regional employment (ABS 2018c). In the Blayney LGA 12.6% of employees work in agriculture, 18% in Cabonne, 17.1 % in Cowra, 3.8% in Bathurst and 2.2%in Orange (Table 3.4). As is the general case for agriculture, the agricultural workforce in the region is dominated by older workers with 47% of the workforce aged over 55 years (Table 3.4). The predominate occupation of agricultural industry workers is managers (58.9%), followed by labourers (20%) and technicians and trade workers (7.2%) (Table 3.5).

Table 3.4. Regional agricultural* industry employment by age in 2016.

Age of Workers	Blayney LGA	Bathurst LGA	Cabonne LGA	Cowra LGA	Orange LGA	Regional Total	% ag workforce in age group
15-19 years	14	22	27	25	13	101	3.0
20-24 years	15	25	43	65	20	168	4.9
25-35 years	34	101	109	94	56	394	11.6
35-44 years	35	100	198	133	49	515	15.1
45-54 years	70	136	219	155	71	651	19.1
55-64 years	113	136	230	175	83	737	21.6
64-75 years	89	134	185	121	72	601	17.7
75-84 years	32	43	68	50	22	215	6.3
85 years and over	10	6	8	8	4	36	1.1
Total employed ag in LGA	407	698	1086	822	392	3405	
Total employed in LGA	3222	18165	6032	4811	17805	50035	
% LGA employed in ag	12.6	3.8	18.0	17.1	2.2	6.1	

* includes agriculture, forestry and fishing. Source: ABS 2016 population census (ABS 2018c)

Table 3.5. Regional agricultural industry employment by occupation in 2016

Occupation	Blayney LGA	Bathurst LGA	Cabonne LGA	Cowra LGA	Orange LGA	Regional Total	% regional ag workforce engaged in occupation
Managers	279	372	700	471	183	2005	58.9
Professionals	7	29	29	15	22	102	3.0
Technicians & trades workers	19	70	70	65	21	245	7.2
Community & personal service workers	4	5	0	0	3	12	0.4
Clerical & admin workers	5	37	37	33	36	148	4.3
Sales workers	0	10	7	3	11	31	0.9
Machinery operators & drivers	13	47	31	43	9	143	4.2
Labourers	65	123	209	185	101	683	20.0
Inadequately described/ not-stated	11	9	12	13	6	51	1.5
Total	407	698	1086	822	392	3405	

* includes agriculture, forestry and fishing. Source: ABS 2016 population census (ABS 2018c

4. AGRICULTURE IMPACT ASSESSMENT

This section estimates the magnitude of impacts of the project on agricultural resources within the project area. The impact assessment takes into account:

- Existing land capability and agricultural uses as outlined in Section 3.
- The area and length of time that agricultural resources will be impacted by the project.
- Proposed final landforms, land and soil capability and land uses (Section 2.5).

4.1. IDENTIFICATION AND ASSESSMENT OF THE IMPACTS OF THE PROJECT ON AGRICULTURAL RESOURCES OR INDUSTRIES

4.1.1. Assess Impact of Project on Agricultural Resources or Industries

The key impact of the project on agricultural resources will be the removal of grazing livestock from disturbed land during the life of the project, and the reduced carrying capacity of some land after the site is rehabilitated. As such, the impact assessment will focus on changes on stock numbers before, during and after the project.

4.1.1.1. Carrying capacity during the life of the project

Land owned by Regis outside the disturbance footprint will continue to be used for agriculture during the life of the mine. Much of the land will be leased back to the original owner, so it has been assumed that there will be no change to current management practice on land that will continue to be used for agriculture, and therefore no change in carrying capacity.

In contrast, it has been assumed that all land within the disturbance footprint will have zero agricultural production during the life of the mine. Although it should be noted that as the development of the waste rock emplacement and tailing storage facility will be progressive, some of these areas will be available for grazing during the first few years of the mine operation.

These assumptions have been used to estimate that the carrying capacity on Regis owned land will be reduced by 10 064 dse during the life of the mine (Table 4.1).

Table 4.1. Estimate of reduction in carrying capacity during the life of the project.

Property Id	**Total area (ha)**	**Before Project**		**Amount of property in disturbance area**		**Reduction in carrying capacity (dse)**
		Total dse	dse/ha	Proportion (%)	Area (ha)	
Stonestreet	305	1 700	5.6	100	305	1 700
Wills	521	4 200	8.1	80	417	3 360
Skovgaard	478	4 250	8.9	12	57	510
Gowing, RTA Bishendon,	248	2 720	11.0	90	223	2448
Rutherford	129	850	6.6	60	77	510
McPhillamy	258	2 338	9.1	45	116	1 052
Gagen	228	2 295	10.1	9		207
Gordon	325	3 570	11.0	3		107
Hasson	49	425	8.6	40		170
Kennedy	21	187	8.6	0		0
Vaughan, McIvor	341	2 550	7.5	0		0
Total	2 903	25 085	8.6			10 064

To estimate the loss in value of agricultural production from this change in carrying capacity, the gross margin for the predominate livestock enterprise (inland store weaners) was taken from the inland store weaner farm budgets compiled by NSW DPI (2019). The inland store weaner budgets give a gross value of production of $40.36/dse gross margin of $32.45 dse. Based on a reduction in carrying capacity of 10 064 dse, the gross value of agricultural production will decline by $406 193/yr during the life of the mine. This equates to just under 1% of the $42.7M of gross value of agriculture production in Blayney LGA in 2015/16 (ABS 2018b).

4.1.1.2. Risk matrix of agricultural impacts

The AIS guidelines require the development of a risk matrix of each possible consequence of the project and the likelihood of it happening. It follows the process outlined in the *Interim protocol for site verification and mapping of biophysical strategic agricultural land* (OEH and OASFS 2013).

The risk matrix table is reproduced in Table 4.2, risk rankings in Table 4.3 and consequence descriptors in Table 4.4.

Table 4.5 presents the unmitigated level of risk and residual level of risk following the implementation of the management and mitigation measures to agriculture from the project. Management and mitigation measures are further described in section 4.1.4

Table 4.2. Agriculture impacts risk ranking matrix.

Consequence \ PROBABILITY	A Almost Certain	B Likely	C Possible	D Unlikely	E Rare
1. Severe and/or permanent damage. Irreversible impacts	A1 high	B1 high	C1 high	D1 high	E1 medium
2. Significant and /or long term damage. Long term mgt implications. Impacts difficult or impractical to reverse.	A2 high	B2 high	C2 high	D2 medium	E2 medium
3. Moderate damage and/or medium-term impact to agricultural resources or industries. Some ongoing mgt implications which may be expensive to implement. Minor damage or impacts over the long term.	A3 high	B3 high	C3 medium	D3 medium	E3 medium
4. Minor damage and/or short-term impact to agricultural resources or industries. Can be managed as part of routine operations	A4 medium	B4 medium	C4 low	D4 low	E4 low
5. Very minor damage and minor impact to agricultural resources or industries. Can be effectively managed as part of normal operations	A5 low	B5 low	C5 low	D5 low	E5 low

where:

= low risk

= medium risk

= high risk

Source: NSW Government 2013

Table 4.3. Agricultural impact risk ranking – probability descriptors

Level	Descriptor	Description
A	Almost Certain	Common or repeating occurrence
B	Likely	Known to occur or it has happened
C	Possible	Could occur or I've heard of it happening
D	Unlikely	Could occur in some circumstances but not likely to occur
E	Rare	Practically impossible or I've never heard of it happening

Source: NSW Government 2013

Table 4.4. Agricultural impact risk ranking – consequence descriptors

Level: 1	Severe Consequences	Example of Implications
Description	Severe and/or permanent damage to agricultural resources, or industries Irreversible Severe impact on the community	Long term (eg 20 years) damage to soil or water resources Long term impacts (eg 20 years) on a cluster of agricultural industries or Important agricultural lands
Level: 2	**Major Consequences**	**Example of Implications**
Description	Significant and/or long-term impact to agricultural resources, or industries Long-term management implications Serious detrimental impact on the community	Water and / or soil impacted, possibly in the long term (eg 20 years) Long term (eg 20 years) displacement / serious impacts on agricultural industries
Level:3	**Moderate Consequences**	**Example of Implications**
Description	Moderate and/or medium-term impact to agricultural resources, or industries Some ongoing management implications Minor damage or impacts but over the long term.	Water and/ or soil known to be affected, probably in the short – medium term (eg 1-5 years) Management could include significant change of management needed to agricultural enterprises to continue.
Level: 4	**Minor Consequences**	**Example of Implications**
Description	Minor damage and/or short-term impact to agricultural resources, or industries Can be effectively managed as part of normal operations	Theoretically could affect the agricultural resource or industry in short term, but no impacts demonstrated Minor erosion, compaction or water quality impacts that can be mitigated. For example, dust and noise impacts in a 12 month period on extensive grazing enterprises.
Level: 5	**Negligible Consequences**	**Example of Implications**
Description	Very minor damage or impact to agricultural resources, or industries Can be effectively managed as part of normal operations	No measurable or identifiable impact on the agricultural resource or industry

Source: NSW Government 2013

Table 4.5. Potential risk to agriculture from the project

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
Topsoil	Insufficient topsoil resource is salvaged, impacting the ability to rehabilitate the project area to the proposed post-mining LSC classes.	3	C	Medium	Topsoil requirements determined prior to stripping; topsoil inventory prepared and extra topsoil stripped as required;	5	D	Low
	Stockpiled soil is poorly managed and /or of poor-quality impacting on the ability to rehabilitate the project area to the proposed LSC classes.	3	C	Medium	A Soil Stripping and Placement Plan will be developed for each area stripped to minimise topsoil deterioration during soil stripping, handling and stockpiling. Topsoil and subsoil will be stockpiled separately. A topsoil plan will be developed to show where stripped topsoil will be placed based on suitability for reuse.	5	C	Low
Erosion and sediment	Key erosion risks for the project are: - highly erodible dispersible and or non-cohesive subsoils - some steep and long slopes on the waste rock emplacement and pit amenity bund - duration of exposed soils Therefore, due to high erosion risk, high rainfall events cause excessive runoff from rehabilitated landforms, releasing sediment to surface water, or long-term failure of the waste rock emplacement.	2	B	High	Waste rock emplacement landform designed to minimise erosion risk. Erosion modelling undertaken of the proposed waste rock emplacement landform found a low risk of erosion (refer to the Rehabilitation Strategy for the Project (EIS Appendix U). Preparation of an erosion and sediment control plan. Implement soil erosion minimisation practices including establishment of vegetation cover on stockpiles and progressive rehabilitation of disturbed areas, particularly water	4	C	Low

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
					management facility embankments and the waste rock emplacement.			
Dust	Dust from activities associated with the project impacts on pasture quality or animal health (respiratory issues).	3	C	Medium	Air quality management plan. The use of dust suppressants in the water truck to increases effectiveness of road watering on dust control, covered conveyors and fine ore stockpile, real time weather monitoring to inform daily activities on the site so that they are appropriate for the weather conditions.	4	D	Low
Biosecurity	Potential biosecurity risk from the movement of machinery onto the site and increase in vehicle movements that could spread animal or plant material or diseases.	4	C	Low	Implement machinery washdown procedures; restrict unnecessary vehicle movement within the site; Pest and weed management plan (monitor for presence of weeds previously not found on site).	4	D	Low
Pests, weeds and disease	Pests and weeds from the project areas impact on surrounding agricultural land use.	4	C	Low	Implement pest and weed management plan, monitor for presence of weeds and implement appropriate control processes, washdown processes for high risk vehicle movements.	5	D	Low
	Pests and weeds on the rehabilitated land impact on the ability to achieve the stated post mining carrying capacity.	4	C	Low		5	D	Low
Noise	Noise from activities associated with the project impact on animal welfare (increased vehicle movements/sudden noise stress/panic livestock).	3	C	Medium	Implementation of a noise management plan. No work at night during the initial construction/site establishment phase.	4	C	Low

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
Blasting	Blasting activities impact on animal welfare (startled/panic livestock).	3	C	Medium	The maximum instantaneous charge to be used (300kg) has been calculated (refer toe Noise and Vibration Impact Assessment, Appendix L of the EIS) to ensure that vibration and overpressure levels at nearby properties from all blasts on the site are within the relevant blasting limits (which are set in consideration of health and amenity). Implementation of a blast management plan.	4	D	Low
Groundwater	Groundwater drawdown as a result of open cut mining disrupts supply to agricultural users of groundwater.	3	D	Medium	The groundwater model of the project predicts that groundwater levels at existing privately-owned bores will experience little to no change as a result of the project. “Make good” mitigation measures could be implemented if an unexpected impact occurred; however, this is not anticipated.	4	D	Low
	Seepage from tailings storage facility contaminates groundwater.	3	C	Medium	The tailings storage facility has been designed specifically to avoid adverse impacts to the surrounding environment – robust, peer reviewed design by suitably qualified engineers. Seepage interception drain, and seepage interception bores to be installed	4	D	Low

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
					downstream of the TSF to ensure that any seepage is captured early and mitigation measures can be put into place. Also, groundwater model predicts seepage from the TSF will be at a very slow rate (approximately 50m in 100 years). Even without all seepage management measures in place, any seepage that may migrate through the hydrostatic units and discharge to the Belubula River will have concentrations below the observed baseline surface water quality concentrations, ANZECC (2000) livestock drinking water and ANZECC (2000) 80% protection level for freshwater aquatic ecosystem guideline values (for analytes with elevated concentrations in the tailings liquid fraction results). Water management plans (surface and groundwater) for the construction and operational phase of the project will be developed and implemented. These will include monitoring programs with a trigger action response plan.			

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
Tailings Storage Facility	Failure of the TSF dam wall resulting in contamination of water resources downstream.	2	C	High	Robust, peer reviewed tailings storage facility designed by suitably qualified engineers. The TSF has been designed to a consequence category of 'Extreme'.	4	E	Low
Surface water	Contaminants (from rainfall run-off from the site, or overflowing water management dams) pollutes downstream water users who use the water for agricultural purposes.	3	C	Medium	Adequately and conservatively sized water management facilities, run-off containment systems, appropriate storage of fuel and other contaminants, clean water diversions. Develop and implement water management plans (surface and groundwater) for the construction and operational phase of the project. These will include monitoring programs with trigger action response plans.	4	D	Low
Traffic	Increased traffic movements on roads impacts on agricultural use of road network.	4	D	Low	Develop transport management plan.	5	D	Low
Bushfire	Risk of fire due to the storage and use of flammable substances within the project area. If fire spreads from site, it may cause damage to surrounding agricultural properties.	3	C	Medium	Transport and storage of explosives and hazardous substances in accordance with Australian Standards; bushfire management plan, adequate fire fighting facilities on site, including water carts.	4	D	Low
Stakeholders	Local people employed in agriculturally based industries are negatively impacted by the project (eg loss of jobs,	5	D	Low	Recruitment strategy, stakeholder engagement plan.	5	E	Low

Type	Potential impact on agriculture (no controls)	Consequence	Likelihood	Risk	Proposed management and mitigation (see chapter 5)	Consequence	Likelihood	Risk
	lower income) due to loss of agricultural production and related industries.							

4.1.2. Consequential Effects on Agricultural Productivity

Although the land will be rehabilitated at the end of the mine life, some areas will have a lower LSC class, hence lower potential carrying capacity after the project is completed. For this reason, there is likely to be a long-term reduction in agricultural productivity resulting from the project.

4.1.2.1. Carrying capacity post mine operation

Most of the land (96%) within the project area has a current LSC class of 4 or 5. These LSC classes are suited to grazing of improved pastures and limited cultivation. The average carrying capacity of the project area prior to the mine development was estimated at 8.6 dse/ha, so it can be assumed that this will be average carrying capacity of LSC class 4 and 5 land post-mining.

LSC class 6, generally only suited to grazing. It is assumed that LSC class 6 will have carrying capacity of 2.5 dse/ha, which is the average for a good quality native pasture on the southern tablelands (McDonald and Orchard, 2015).

LSC class 7, will have very limited agriculture value. It has been estimated it will have a carrying capacity of 1 dse/ha, which is the average for low quality native pastures on the southern tablelands (McDonald and Orchard, 2015).

LSC Class 8, has no ability to support agriculture.

Using these assumptions, it is calculated that the carrying capacity of the project area will be 2 362 dse/yr lower post mining than it was before mining (Table 4.6). Based on this change in carrying capacity and the inland store weaner budgets used in Section 4.1.1.1, the annual gross value of agriculture production from the project area will be $95 373 lower after the project than before. This equates to 0.2% of the $42.7M gross value of agriculture production in Blayney LGA in 2015/16 (ABS 2018b).

Table 4.6. Change in carrying capacity pre and post mining.

LSC Class	Capability	Before project		After project	
		area (ha)	total dse	area (ha)	total dse
Land with a wide range of uses (cropping, grazing, horticulture, nature conservation)					
1	Extremely high	0	0	0	
2	Very high	0	0	0	
3	High	0	0	0	
Land with a variety of uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)					
4	Moderate	932	8 015	920	7 912
5	Moderate-low	1 422	12 229	1 080	9 288
Land with a limited range of uses (grazing, forestry and nature conservation					
6	Low	156	390	422	9721 055
Land generally unable to support agriculture (selective forestry and nature conservation)					
7	Very low	4	4	21	21
8	Extremely low	0	0	71	0
Total			20 638[1]		18 276
Total reduction in dse post mining					2 362

[1] Note that this total dse figure is lower than that in table 4.1, as the figure in this table is just based on the mining lease area, where as the figure in table 4.1 is based on all the land owned by Regis

4.1.3. Uncertainty Associated with Predicted Impacts and Mitigation Measures

Technical experts in relevant fields have undertaken the impact assessments that form the basis of the McPhillamys Gold Project EIS (EMM 2019a), and upon which this AIS is based. A peer review of key studies has also been undertaken, including the groundwater assessment, surface water assessment, noise assessment, and the tailings storage facility design.

In addition to the peer review process, specific uncertainty analysis has been conducted on the groundwater model. The surface water model also accounts for variables relating to climate.

Each remedial action, monitoring regime, or management action proposed is based on these detailed assessments. The assumptions made and the levels of uncertainty are outlined in each of the technical assessments.

4.1.4. Further Risks

4.1.4.1. Biosecurity issues

The movement of machinery onto the project area and increase in vehicle movements present an agricultural biosecurity risk as they could spread animal or plant material or diseases.

This risk will be managed by implementing appropriate machinery and vehicle washdown procedures and restricting unnecessary vehicle movements within the project area. A part of the weed management plan the project area will regular be monitored for the presence of previously unknown weeds.

4.1.4.2. Pests and weeds

Uncontrolled pests and weeds on the project area have the potential to spread to adjacent agricultural land and impact on its productivity. The presence of pests and weed species have the potential to have a major impact on revegetation outcomes of the post mining land use of agriculture. Additionally, any significant weed species within the surrounding land has the potential to impact on the success of the rehabilitated areas. Weed management will be an important component of rehabilitation activities.

Regis monitors properties for the presence of identified problem weeds and pests and implements appropriate control measures. Therefore, it is not anticipated that the project will result in an increased risk of pests or weeds.

4.1.4.3. Erosion and sedimentation

As described in the Surface Water Assessment for the project (HEC 2019), runoff from disturbed areas and establishing rehabilitation will be managed using erosion and sediment control measures designed in accordance with Landcom (2004) and DECCW (2008). The following principles, which have been taken from the Landcom (2004) guidelines, underpin the approach to erosion and sediment control for the mine development:

- Minimising surface disturbance and restricting access to undisturbed areas.
- Progressive rehabilitation/stabilisation of mine infrastructure areas.

- Separation of runoff from disturbed and undisturbed areas where practicable.
- Construction of surface drains to control and manage surface runoff.
- Construction of sediment dams to contain runoff up to a specified design criterion.

Activities that have the potential to cause or increase erosion, and subsequently increase the generation of sediment, involve exposure of soils during construction of infrastructure (such as during vegetation clearance, soil stripping and earthworks activities) and ongoing mining activities involving clearing and stripping and stockpiling mine materials.

Temporary sediment traps and sediment filters (e.g. straw bale sediment filters, sediment fences) will be installed where necessary downslope of disturbance areas in accordance with Section 6.3.7 of Landcom (2004). These temporary erosion and sediment controls will remain in place until all earthwork activities are completed and the disturbed area is rehabilitated. An Erosion and Sediment Control Plan will be developed to detail the erosion and sediment control measures to be implemented during construction and operation of the project, including the required maintenance and monitoring regime of these controls.

4.1.4.4. Air quality

The Air Quality Assessment Report (EMM 2019c) identified the potential sources of dust associated with the project and outlined mitigation methods. Particulate matter (PM), diesel combustion and odour emissions inventories have been developed for peak construction and operational phases of the project.

The results of the modelling show that the predicted particulate matter (TSP, PM_{10}, $PM_{2.5}$) and gaseous pollutant (NO_2 and VOCs) concentrations and dust deposition levels associated with project emissions are well below applicable impact assessment criterion at neighbouring sensitive receptors and therefore represent a negligible risk to agriculture.

4.1.4.5. Noise and vibration

Blast effects resulting from the Mine Development are predicted to be, at worst for overpressure up to 115 dBZ, and for vibration between 0.1 mm/s and 1.3 mm/s (Muller Acoustic Consulting 2019, refer to EIS Appendix L). These levels are well below the regulatory criteria and considerably lower than other sources of overpressure that horses or livestock are likely to be already subjected to such as lightning strikes which are typically between 120dBZ and 130dBZ1.

4.1.4.6. Traffic

The *Traffic and Transport Assessment Report* (Constructive Solutions 2019) assessed impacts on the surrounding network. This report is contained in Appendix Q of this EIS. The report concluded that the project will not result in any significant impacts on the performance and capacity of the local road networks.

[1] Equine Health Impact Statement – Drayton South Coal Project (2015)

Access to the project area will be via a dedicated access with turning lanes, from the Mid Western Highway. Construction traffic will initially use the existing access to project site from Dungeon Road until the new access is completed. Regis has acquired all properties at the northern end of Dungeon Road whose access maybe impacted by changed traffic patterns on the road.

Project related traffic movements will peak during construction. The increase in traffic will mainly be associated with staff shift changes, so will be at limited times of the day. It is anticipated that during the construction phase the majority of works will travel to the project area in mini-buses, which will minimise the impact on the surrounding road network.

Project related traffic will result in a minor increase to traffic on the surrounding road network. This increase is within the capacity of the road networks. As there will be no transportation of ore from the project area, heavy vehicle impacts on the surrounding road network as a result of the mine development are expected to be minimal.

The majority of the increase in traffic will be associated with staff movements and so will be concentrated around shift changes at either end of the day and so wont impact on agricultural associated use of the road network during the day.

A comprehensive Transport Management Plan, including a driver's code of conduct, will be developed to control project related traffic movements and driver behaviour within the project area and on the surrounding road network. This will include identification of preferred travel routes to and from the project area.

4.1.5. Movement of water away from Agriculture

4.1.5.1. Groundwater

As described above, a comprehensive Groundwater Assessment for the project has been undertaken by EMM and is presented in Appendix K of the EIS.

During mine operation water will be principally sourced externally via a pipeline approximately 90 km long, transferring surplus water from Centennial's Angus Place Colliery and Springvale Coal Services Operations, and Energy Australia's Mt Piper Power Station near Lithgow, to the mine. The supply of water from the above locations will enable a beneficial use of otherwise surplus water from mining in the Sydney Basin, and provide this as a reliable water source for the project.

During the construction phase water will be predominately used for dust suppression. Prior to the commissioning of the pipeline, expected at the end of Year 1, construction water will be sourced from a combination of rainfall runoff captured in accordance with Regis' harvestable rights entitlement and groundwater bores. Regis have secured groundwater licences, totalling 400 shares in the Lachlan Fold Belt Murray Darling Basin Groundwater Source. Potential shortfalls will be managed by investigating alternative water supplies, such as establishing production bores or purchasing and trucking water to site, and reducing haul road dust suppression water demand by the use of dust suppression agents.

During mining, the total annual mine water inflow into the open cut is predicted to peak in mining year 2 at 890 ML/yr, with a similar rate predicted in mine year 3. In subsequent mining years (4-10), the mine water inflow rate is predicted to reduce and range between approximately 300 and 475 ML/year.

Once mining concludes, the void will gradually fill with water. The ongoing interception associated with pit inflow and evaporation loss will also require licensing. The volume of pit inflow reduces following cessation of mining and after two years has reduced to approximately 200 ML/yr. The volume of water inflowing to the pit void is predicted to remain at approximately 200 ML/yr following 100 years post mining.

Based on the above, the maximum take of groundwater which will need to be accounted for by WALs is 890 ML/yr, which occurs in mining year 2. The ongoing groundwater inflow to the pit void which will need to be accounted for by WALs post mining is 200 ML/yr.

The groundwater inflow is sourced from the Lachlan Fold Belt Murray Daring Basin Groundwater Source, with a very minor contribution over time from the overlying water source. As noted above, Regis has secured 400 shares (equivalent to 400 ML) of groundwater in the Lachlan Fold Belt Murray Darling Basin Groundwater Source as at July 2019.

The groundwater model predicts that groundwater levels at existing privately-owned bores in the vicinity of the mine will experience little to no change as a result of the project. All bores will experience a cumulative pressure head decline of less than 2 m, which the NSW Aquifer Interference Policy (DPI 2012) defines as 'minimal impact'.

The groundwater model predicts that the project will have an insignificant impact on changes to spring flows outside the project area. The models also predict, that with the implementation of the proposed management and mitigation measures the risk of the project impacting on groundwater quality is negligible.

As the project will have a minimal impact on groundwater availability at private bores and an insignificant impact on groundwater quality it will not adversely impact agricultural groundwater use in the vicinity of the project.

4.1.5.2. Surface water

As described above, a comprehensive Surface Water Assessment for the project has been undertaken by HEC and is presented in Appendix J of the EIS.

Water management infrastructure has been sized to meet the mine development water demand requirements, with the capacity to store all surplus water generated by the mine development without the need to release operational water to the Belubula River. The overarching objective of the water management system is to control the volume of poor quality water generated by the mine development by maximising its reuse and by limiting and avoiding the contamination of clean water.

The mine development will use excess water from mining and power generation operations in the Lithgow area as its primary raw water supply, enabling a beneficial use of otherwise excess water. This also means that the reliance on other sources of water, such as bores and other surface water sources is reduced, thereby minimising impacts on other agricultural water users.

A temporary reduction in the inflow to Carcoar Dam (4%) will occur as a result of construction and operation of the mine. Permanently, following mine-closure and rehabilitation, the reduction in flows will be much smaller (0.5% reduction). This level of change is expected to be within the current natural variability in catchment conditions.

4.2. SOCIOECONOMIC IMPACTS

4.2.1. Agricultural Support Services and Processing and Other Value-Adding Industries

The Central Tablelands Livestock Exchange is located 10km south-west of Blayney and is the main livestock selling centre for the central tablelands area of Orange, Blayney, Bathurst, Oberon, Molong, Canowindra and Cowra (Blayney Shire Council 2018). In 2018 there were 442,868 sheep and 163,993 cattle sold through the Central Tablelands Livestock Exchange (MLA 2019). Due to the large number of animals sold though the livestock exchange annually, the reduction in numbers sold caused by the removal of 1132 ha from agricultural grazing use, would be insignificant.

The disturbance area accounts for less than 1% of the land currently used for agriculture in Blayney LGA (section 3.5). Consequently, there will only be a minor reduction in the demand for agriculture support services available in Blayney which include: machinery sales and service; farm supplies (animal health, seed, fertiliser, chemicals, fencing materials), stock and station agents, veterinary practices, agricultural consultants and professional services (legal and accountancy).

4.2.2. Visual Amenity, Landscape Values and Tourism Infrastructure

4.2.2.1. Visual impact assessment

The project design has progressively evolved to reduce its scale and impacts, including visual impacts, particularly through the specific siting of the main mine infrastructure (processing plant, buildings etc.) such that they will be shielded from view by existing topography and vegetation.

However, the project will result in some significant changes to the landscape, particularly through the construction of the waste rock emplacement.

A visual impact assessment was carried out for the project, the results are presented in the *Visual Impact Assessment Report* (VPA 2019). The primary assessment tools for determining the significance of potential visual impact were site inspections, photographs of the views from the selected viewpoints and photomontages to determine the level of change to assess visual impacts, taking into consideration the nature of the landscape, topography, the distance between the viewpoint and the proposed installation, as well as the type of view experienced.

The visual assessment found that generally, there will be a high level of visual impact to sensitive receptors directly south of the project area, including in Kings Plains settlement, rural residences and the Mid Western Highway during the first 12 – 18 months of mine development. A number of rural residences to the east and west of the mine will also experience high levels of visual impact during the initial stages of the mine development.

Following completion of a number of strategic on-site mitigation treatments and rehabilitation establishment, visual effects will be reduced but will remain moderate to high for many components over the life of the mine operations where there are direct views onto operational components. However, this reduction will be significant in the long term as the new post mining landforms become integrated with the surrounding rural landscape character via the inclusion of micro-topographic design into the waste rock emplacement and careful rehabilitation of tree planting patterns.

4.2.2.2. Lighting

Existing sources of night lighting in the immediate vicinity of the project area are minimal due to its rural setting. The main sources are rural residential properties, farm machinery and vehicles on roads.

Australia Standard 4282 (AS4282) *Control of Obtrusive Effects of Outdoor Lighting* sets out guidelines for the control of the obtrusive effects of outdoor lighting and gives recommended limits for relevant lighting levels to contain these effects within tolerable levels.

Lighting protocols for the project will adopt the following principles:

- operational protocols for setting up of mobile lighting plant will require lighting is directed away from external private receptors;
- lighting sources will be directed below the horizontal to minimise potential light spill;
- light systems will be designed to minimise wastage;
- screening of lighting will occur where possible, for viewers internal and external to the project; and
- lighting of light-coloured surfaces, which have greater reflectivity, will be avoided.

4.2.2.3. Tourism

Tourist attractions within the township of Blayney include the Heritage Park and the historic streetscape. Other tourist destinations within the Blayney LGA include the historic villages of Carcoar, Millthorpe, Neville and Newbridge (Blayney Shire Council n.d.)

While the agricultural landscape provides an attractive backdrop there are no specific agricultural related tourist attractions within the immediate vicinity of the project area. The main agricultural related tourist attractions of the central tablelands are the vineyards and orchards which are predominately located in the vicinity of Orange.

The BeeKeepers Inn, a commercial honey factory, café and farm shop, is located approximately 3km to the north-east of the project area. It is accessed from the Mitchell Highway and is not within line of site of the project area. Due to the combination of a number of factors including distance, topography and weather conditions, no impacts relating to noise or air quality are anticipated at the Bee Keepers Inn property, therefore not impacting on the experience of tourists visiting the site.

Potential impacts to apiarian activities associated with the BeeKeepers Inn are associated with a loss of habitat on the mine project area as a result of vegetation clearance activities.

The BeeKeepers Inn keep their beehives in the Vittoria State Forest, adjacent to the mine project area. The project area contains Yellow Box trees (Box Gum Woodland) which provide pollen for the bees; some of which will be cleared for the project. The Tailings Storage Facility in the northern part of the project area has been reduced in size to avoid clearing some of the Yellow Box. Importantly, the Biodiversity Assessment Report (EIS Appendix Y) states that the mine development will result in a reduction of just 1.68% in the extent of Box Gum Woodland within a 5 km radius of the project area. In addition, Regis has raised the option of Goldfields Honey using alternate Regis owned land for their beehives, to ensure adequate access to pollen for the bees.

4.2.3. Local and Regional Employment

The project is anticipated to have a peak construction workforce of approximately 710 full-time equivalent (FTE) workers. During operations, an average workforce of around 260 FTE employees will be required, peaking at approximately 320 FTEs in around years four and five of the project. Including flow-on effects, the Economic Impact Assessment (Gillespie Economics 2019) of the project found that the project operation will contribute up to 263 regional jobs and $18M in regional net income to residents.

The Social Impact Assessment (Hansen Bailey 2019) considered the potential impacts of job creation on other sectors. There is a risk that the project could displace other economic sectors, particularly tourism, the agricultural sector, and government services, by taking up a sizeable portion of the employed and unemployed labour pool during both construction and operation, and through inflationary impacts on wages, trades and services. This impact is likely to be most significant during the construction phase due to the size of the project workforce. During this phase the project is likely to draw on the labour pool associated with a range of trades including mechanics, electricians, welders and labourers (Hansen Bailey 2019).

A *Draft Labour Market Study* (Hansen Bailey 2018) prepared for the project reported on a workforce characteristics study conducted at the nearby Cadia Valley Operations (CVO) which found that 13% of CVO staff were previously employed in the agriculture, forestry and fishing sector. The most common occupation prior to joining CVO were trades works – 31%, plant or equipment operators – 23% and general labourers – 14%.

People working in agriculture have transferable skills suitable to the mining industry and to this mine development in particular (Hansen Bailey 2018). There is the potential for the mine development to attract workers for the agricultural sector, particularly from the younger age brackets (25-45 years).

It is difficult to predict how many people currently working in other industry sectors in the Blayney LGA and the broader region will move to new occupations in the mining and resource sector as a result of the project.

The SIA referenced the example of the nearby regional centre of Mudgee as having experience dealing with the impact of tightening labour market conditions due to expansion of the local mining industry. The following trends were noted in Mudgee during a period of tight labour market conditions between 2010 and 2012:

- As the mining sector expanded, it attracted an increasing number of the existing labour force into the sector. This had the effect of driving wage competition between industry sectors within competing export industries;
- The attractiveness and relative availability of high wages in the resource sector further increased labour force participation in the Mid-Western Regional Council LGA; and
- Labour, and in particular skilled labour shortages, were evident in Mudgee during this period of growth and when combined with other pressures such as rising accommodation costs began to impact on the capabilities of businesses to benefit from the resource sector and the ability of the services industry to deliver services.

To ensure that potential adverse impacts on labour supply in the non-mining sector are minimised, Regis will monitor local labour supply and adjust local labour recruitment practices and rates accordingly. Regis will support the local provision of education and training opportunities in the non-mining sector through initiatives established under the VPA. Additional opportunities in the local area such as partnerships with NSW TAFE will be investigated as project planning progresses.

5. MITIGATION MEASURES

5.1. REVIEW OF PROJECT DESIGN AND PROJECT ALTERNATIVES

The final project design is the result of an iterative process undertaken to achieve a project design that represents leading practice in underground coal mining: one that provides efficient extraction of the resource, environmental protection and socio-economic benefits.

The key elements of the project where alternatives were considered include:

- extent of the mine project area and mining lease application area boundaries;
- site layout, including location of mine infrastructure areas and topsoil stockpile;
- waste rock emplacement, including;
    - the number and location of waste rock emplacements;
    - construction and emplacement schedule of the waste rock emplacement;
- gold extraction ore method;
- tailings storage facility, including:
    - tailings disposal method;
    - tailings detoxification method;
    - location and design of the tailings storage facility;
- location of the main site access;
- operational water management storage;
- water supply; and
- pipeline corridor alignment options.

Of particular importance to the potential impacts of the project on agricultural resources, is the fact that the site layout was amended to specifically avoid areas of potential BSAL identified in the western portion of the project area. Once identified, the site layout was changed so that the disturbance footprint avoids these BSAL areas.

5.2. MONITORING AND MANAGEMENT

To manage the potential risks identified in Section 5, the following management practices will be implemented. Monitoring programs will be used to determine the effectiveness of management and will serve to trigger any additional mitigation.

5.2.1. Pests and weeds

The spread of declared noxious weeds (and other invasive weeds that could impact revegetation success and/or plants that are undesirable to grazing stock) will be managed across the project area through a series of control measures, including:

- herbicide spraying or scalping weeds;
- rehabilitation inspections to identify potential weed infestations;
- vehicle washdown procedures; and
- post-mining use of rehabilitated areas as a working farm, with associated management practices; and

5.2.2. Water resources

The water management system will minimise the risk of contaminants from the site mixing with downstream water supplies the conservative design of a robust system. The key elements of the water management strategy for the project include:

- diverting clean water at the top of the Belubula River around the mining disturbance areas;
- retaining water that lies within disturbed areas on-site for recycling and reuse;
- designing the water management system so that storages have <1% or no spill risk;
- implementing the seepage management system at the tailings storage facility during construction and operations;
- managing waste placement to limit the duration that potentially acid forming (PAF) material is exposed;
- conditioning of water storages as part of construction to prevent loss of water (as vertical leakage).

In relation to erosion and sedimentation, the waste rock emplacement has been designed to minimise erosion risk. Erosion modelling undertaken of the proposed waste rock emplacement landform found a low risk of erosion (refer to the Rehabilitation Strategy for the project (EIS Appendix U). Further, the surface water management system for the project has been designed to include a series of sediment basin, designed in accordance with the Blue Book (Landcom, 2008), to effectively capture and treat sediment laden water from disturbed areas.

Other management measures include:

- Preparation of an erosion and sediment control plan.
- Implementation of soil erosion minimisation practices including establishment of vegetation cover on stockpiles and progressive rehabilitation of disturbed areas, particularly water management facility embankments and the waste rock emplacement.

Two main water management plans (WMPs) will be developed for the project post-approval: one for the construction phase (CWMP) and one for the operational phase (OWMP). The WMPs will be a sub-plan of the environmental management system. The WMPs will document the proposed mitigation and management measures for the approved project, and will include the surface and groundwater monitoring program, reporting requirements, spill management and response, water quality trigger levels, corrective actions, contingencies, and responsibilities for all management measures.

The WMPs will be prepared in consultation with DPI Water, EPA, WaterNSW, and the local council, and will consider concerns raised during the exhibition and approvals process for the project.

The WMPs will include details of:

- the surface water and groundwater monitoring program, including the existing monitoring network;
- monitoring frequencies;
- water quality constituents;
- physical water take and pumping volumes between water storage structures (including the open cut mine);
- trigger levels for water quality parameters to assist in early identification of water quality trends (including TSF seepage migration);
- a trigger action response plan;
- an erosion and sediment control plan;
- groundwater quality performance and early warning triggers based on statistical analysis of the reported ranges in baseline concentrations of identified analytes of concern (eg pH, salinity concentrations, and concentrations of other analytes such as As, CN (WAD and Total), S, SO_4, Se, F, and Al);
- groundwater ‘quantity’ (head) performance will be based on a combination of baseline head data for selected monitoring bores as well as comparison of observed and model predicted heads for different stages of mine development (operational and closure); and
- a program for reviewing and updating the numerical groundwater model as more data and information become available; this program will include reporting requirements.

5.2.3. Air quality

In order to control particulate matter emissions from the mine development, Regis will implement a range of mitigation measures and management practices, including the following:

- chemical dust suppressants will be applied to high traffic routes exiting the pit to the ROM pad and to the waste rock emplacement. All other unpaved transport routes (eg pit, ramps, topsoil haulage) will be controlled through water suppression;
- a road speed limit of 60 km/hr will be posted to all internal roads; however, it is noted that the average travel speed of material haul trucks is less than 40 km/h;

- the design of crushers, screens and associated transfer points at the processing circuit will include dust control, dust extraction and / or filter systems;
- all exposed conveyors at the processing circuit will be covered;
- water sprays will be utilised at the ROM pad hopper / primary crusher dump pocket;
- ROM pad operations will be controlled through the use of water carts and / or water sprays;
- the fine ore stockpile will be covered;
- in pit drill rigs will be fitted with dry filter capture devices;
- wet suppression via water carts will be applied to dozer activity areas for waste rock and topsoil operations; and
- topsoil stockpiles, waste rock dumps and TSF walls will be progressively rehabilitated through hydro mulching, hydro seeding, or something similar.

5.2.4. Noise

The project design incorporated a number of mitigation measures to minimise operational noise and vibration impacts offsite, as follows:

- noise suppression devices on mobile equipment;
- enclosure of the primary crusher in the ROM pad;
- construction of two noise barriers as quickly as possible in the initial stages of the mine development; the pit amenity bund and the southern amenity bund;
- reduced operations in Year 1 to Year 4 night and evening time periods during adverse weather conditions when the amenity bunds are being constructed; and
- dumping of waste rock behind noise barriers at all times, with the exception of bund lifts.

In addition, to the measures discussed above, Regis will install a real-time noise monitoring system to measure and report live operational noise levels. This system will enable proactive management of operations to ensure that the relevant noise criteria is met during all time periods.

The noise monitoring program will monitor both meteorological conditions and operational noise levels using a combination of unattended real time noise monitoring terminals and operator attended monitoring.

A noise management plan (NMP) will also be prepared for both the construction and operational phases of the project. The NMP will detail the noise monitoring program and also a complaint handling procedure to ensure queries relating to noise are recorded and effectively responded to.

5.3. DEMONSTRATED CAPACITY TO REHABILITATE DISTURBED LANDS

A comprehensive Rehabilitation and Landscape Management Strategy for the project has been prepared by EMM and is included as Appendix U of the EIS. A summary is provided below.

5.3.1. Rehabilitation goals

The overriding goal for the *Rehabilitation and Landscape Management Strategy* is to return disturbed land, as much as possible, to its pre-mining land use at the end of its operational life. This is grazing on improved pastures while improving the biodiversity values of the area by re-establishing endemic open woodland communities as part of the rehabilitation program.

There will be opportunities for progressive rehabilitation of areas as the mine is developed, including the pit amenity bund and waste rock emplacement. Wherever possible during operations, disturbed areas no longer required for mining activities will be progressively rehabilitated.

The rehabilitation strategy was developed in consideration of several factors including opportunities (such as proximity to remnant native vegetation areas) and constraints (such as slope, soil quality), ecological and rural land use values and existing strategic land use objectives. The rehabilitation objectives for the project are set out in Table 5.1 below:

Table 5.1. Rehabilitation objectives

Aspect	Objective
Mine site (as a whole)	• Safe, stable and non-polluting • Landforms designed to incorporate micro-relief and integrate with surrounding natural landforms • Constructed landforms that maximise surface water drainage to the natural environment (excluding final void catchments) • Minimise visual impact of final landforms as far as is reasonable and feasible
Void	• Minimise water inflows at all times to prevent risk of discharge to surface waters; and • Minimise to the greatest extent practicable the safety risk to humans, stock and fauna.
Rehabilitation areas and other vegetated land	• Establish self-sustaining native open woodland ecosystems characteristic of vegetation communities found in the project area (ie pre-mining) on the waste rock emplacement and • Establish areas of self-sustaining riparian habitat, within the diverted clean water diversion channel
Agricultural land	• Rehabilitate grassland areas so that they can support sustainable grazing activities
Clean water diversion channel(s)	• Engineered to be hydraulically and geomorphologically stable • Incorporate erosion control measures based on natural channel design principles • Revegetate with suitable native species
Surface infrastructure	• To be decommissioned and removed, unless agreed otherwise as part of the detailed closure planning process
Community	• Ensure public safety • Minimise adverse socio-economic effects associated with mine closure

5.3.2. Rehabilitation completion criteria

Rehabilitation completion criteria will be used as the basis for assessing when rehabilitation of areas disturbed by mining is complete. Indicators will be measured against the criteria, and are set for the six phases of rehabilitation, as follows:

- Phase 1 – Decommissioning (ie removal of equipment and infrastructure);
- Phase 2 – Landform Establishment (ie land shaping);
- Phase 3 – Growth Medium Development (ie soil physical and chemical properties);
- Phase 4 – Ecosystem and Land Use Establishment (ie vegetation establishment);
- Phase 5 – Ecosystem and Land Use Sustainability (ie established vegetation is supporting post-mining land use); and
- Phase 6 – Land Relinquishment.

Interim rehabilitation criteria for the project have been developed with the current knowledge of rehabilitation practices and success in similar project environments. These are based largely on experience on mine sites elsewhere in New South Wales.

Reporting on rehabilitation activities, monitoring and progress towards achieving agreed rehabilitation criteria will occur via the Annual Review (or annual environmental management report).

The interim completion criteria which have been developed are summarised in Tables 5.2, 5.3 and 5.4. The interim completion criteria will be updated during the preparation of a detailed rehabilitation plan, in consultation with relevant stakeholders.

Table 5.2 Common rehabilitation performance indicators and completion criteria

Stage of Development	**Aspect or Component**	**Completion Criteria**	**Performance Indicators**
Landform establishment and stability	Landform slope, gradient	Landform suitable for final land use and generally compatible with surrounding topography	Slope angles consistent with design
	Landform function	Landform is functional and indicative of a landscape on a trajectory towards a self-sustaining ecosystem	LFA Stability; LFA Infiltration; LFA Nutrient Cycling; and LFA Landscape Organisation
	Active erosion	Areas of active erosion are limited	Number of rills/gullies; cross-sectional area of rills/gullies; presence/absence of sheet erosion; presence/absence of tunnel erosion
Growth medium development	Soil chemical and physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH; Electrical Conductivity; Organic Matter; Phosphorus; Nitrate; Cation Exchange Capacity; and Exchangeable Sodium Percentage, Mg and Al
		Soil contaminant levels are suitable for post mine land use	TPH, metals, chemicals

Table 5.3 Grazing rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Pasture establishment	Pastures established equivalent to analogue pastures sites	Pastures contains a diversity of species comparable to analogue pastures	Native and introduced pasture species richness;
		Number of weeds species and surface area cover ≤ analogue site	Diversity and percentage cover of weed species
Pasture development	Protective ground cover	Ground layer contains protective ground cover and structure comparable to that of the local pasture analogue	Litter cover; foliage cover; annual plants; cryptogam cover; rock; log; bare ground; perennial plant cover (0.5m); total ground cover
	Ground cover diversity	Pasture contains a diversity of species per square metre comparable to that of the local remnant vegetation	Native understorey abundance; exotic understorey abundance
		Number of weeds species and surface area cover ≤ analogue site	Diversity and percentage cover of weed species
Pasture stability	Pasture health	Pasture condition is comparable to that of analogue pastures	Live plants, healthy plants, pest infestation
	Pasture productivity	Pasture productivity equivalent to analogue pastures	Carrying capacity DSE/ha Crude protein % Digestibility % Green/dry matter content

Table 5.4. Biodiversity rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Ecosystem establishment	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees; total species richness; native species richness; exotic species richness
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees; shrubs; sub-shrubs; herbs; grasses; reeds; ferns; aquatic
Ecosystem development and habitat complexity	Protective ground cover	Ground layer contains protective ground cover and structure comparable to that of the biodiversity analogue	Litter cover; foliage cover; annual plants; cryptogam cover; rock; log; bare ground; perennial plant cover (0.5m); total ground cover
	Ground cover diversity	Vegetation contains a diversity of species per square metre comparable to that of the local remnant vegetation	Native understorey abundance; exotic understorey abundance
		Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0-0.5 m in height; Shrubs and juvenile trees 0.5-1 m in height; Shrubs and juvenile trees 1-1.5 m in height; Shrubs and juvenile trees 1.5-2 m in height; Shrubs and juvenile trees >2.0 m in height

Stage of Development	**Aspect or Component**	**Completion Criteria**	**Performance Indicators**
Ecosystem stability	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5-2 m; foliage cover 2-4 m; foliage cover 4-6 m; foliage cover >6 m
	Tree diversity	Vegetation contains a diversity of maturing tree and shrub species comparable to that of the local remnant vegetation	Tree diversity
	Tree density	Vegetation contains a density of maturing tree and shrub species comparable to that of the local remnant vegetation	Tree density; average diameter at breast height
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation	Live trees; healthy trees; medium health; advanced dieback; dead trees; mistletoe; flowers/fruit (trees)

6. CONSULTATION

The AIS guidelines require information on the stakeholder engagement strategy implemented for the project. An overview is provided in this chapter.

6.1. OVERVIEW OF ENGAGEMENT

Regis has been actively engaging with stakeholders since 2012. Relevant stakeholders have been systematically identified and a comprehensive stakeholder list compiled for targeted engagement. Broad stakeholder groups identified include Commonwealth and State government agencies, ministers and local members; councils; landholders (and previous landholders) within the project area; local communities near the project area, in particular residences of Kings Plains and other near neighbours, local community members and businesses; special interest groups; Aboriginal groups; utility and service providers; existing and potential future employees and apprentices.

Community consultation has been, and will continue to be, key to mine planning and understanding the project's potential impacts on the local community and natural resources. Stakeholders will also be engaged in the closure process and involved with closure plan development which will be prepared and refined as the project progresses towards completion.

The following information is a summary of the stakeholder consultation that has been carried out to date.

6.2. CONSULTATION UNDERTAKEN

A range of consultation tools have been employed by Regis to inform stakeholders about the project. These are outlined in Table 8.1.

Table 6.1 Consultation tools

Item	Summary
Project website: https://www.mcphillamysgold.com/	Regis has a dedicated project website that provides information about the project, environmental matters and local engagement initiatives. Community information sheets, copies of media releases, CCC minutes, frequently asked questions and copies of key documents are available on the website, as well as links for people to provide feedback or subscribe to further information. The objective of the website is to make information available 24/7 in a format that is easily accessible.
Regis Resources Head office 57 Adelaide Street Blayney NSW 2799 (02) 6368 4100	Community members are able to speak directly with Regis' community liaison team or project technical staff by phone or face-to-face at the office which is located on the main street of Blayney. The office also provides access to community information sheets and other consultation materials. All consultation is documented in the project's Community consultation register (refer below).
Project email address	Regis has a dedicated email addresses that provide contact points for stakeholders: NSW_Enquiries@regisresources.com. As with verbal correspondence, all email consultation is documented in Regis' stakeholder engagement record program.

Item	Summary
Information sessions	Regis has held community information sessions during the project planning phase to provide information about the project and its environmental studies to members of the community. They were held in Blayney between 2017 and 2019. The most recent community open days involved technical air, noise, social, visual, water and TSF design specialists preparing the environmental assessments for the EIS who were available to discuss the project with community members. Community information sessions are also scheduled to occur during the EIS exhibition period. Technical specialists will also be available at these open days to answer questions regarding the respective technical assessments.
Community consultative committee	A CCC has been set up for the project (in accordance with the EARs). The CCC includes residents, community groups (including representatives from the Belubula Headwaters Protection Group), Regis Resources and the Councils of Blayney, Bathurst and Cabonne. The Committee has an independent Chairman, David Johnson, appointed by the NSW Department of Planning and Environment. The community consultation committee consists of: • six community members, including Kings Plains residents, • representative from Belubula Headwaters Protection Group; • representative from Orange and Regional Water Security Alliance Inc; and • representatives from Bathurst, Blayney and Cabonne Councils. The CCC generally meets every two months and minutes from these meeting are published in the project website.
Community meeting	Community meeting independently chaired by the CCC Chair.
Information stands	Regis has run information stands at numerous farmers markets, Blayney Show as well as the Cadia open days.
Briefing and representation	Regis has provided project briefings to interested stakeholder groups and individuals, including local businesses and industry groups, members of parliament and statutory authorities. Regis are also actively involved in the local business community, including sponsoring the Orange Business Chamber. Regis has also provided many briefings to individuals who are both supporters and non -supporters of the project.
Face to face meetings	Regis have held face to face meetings with landowners adjacent to the mine development since 2012 and landowners within or adjacent to the pipeline corridor since 2017.
Communication materials	Regis has published six community information sheets which have been distributed to the near neighbours and the broader community. Copies are made available at the Blayney office. The community information sheets are also emailed to email subscribers. The objective of the community information sheets is to ensure a flow of information to the community and provide contact details for feedback and enquiries.
Media communications	Project information has been communicated through media releases, local newspaper publications and radio segments. Regis in the lead up to the submitting the project application, has published fortnightly project updates in the Blayney Chronicle which provide project updates and respond to key community concerns regarding the project.

6.3. ISSUES RAISED

A number of issues were raised by these stakeholders during the engagement process. These issues are presented in Table 6.2 alongside where they are addressed in the main EIS (EMM 2019).

Table 6.2 Community Stakeholder issues

Issues raised	Where addressed in the EIS
Noise & blasting	
Concern roads will be closed during blasting	Chapter 10 & Appendix L
Concern regarding potential impact on horses from blasting	Chapters 8 &10 & Appendices I and L
Blasting notification	Chapter 10 & Appendix L
Noise impacts of the mine development	Chapter 10 & Appendix L
Air quality	
Potential for dust from the tailings dam	Chapter 11 & Appendix M
Dust impacts on rain water tanks	Chapter 11 & Appendix M
Potential for naturally occurring asbestos	Chapter 7 & 11
Pipeline water supply	
Water quality of pipeline water supply	Chapter 24 & Appendix X
Groundwater	
Impacts on groundwater resources (neighbouring bores)	Chapter 9 & Appendix K
Groundwater inflow to the pit	Chapter 9 & Appendix K
Impacts on springs	Chapter 9 & Appendix K
Surface water	
Impacts on surface water resources for downstream users	Chapter 9 & Appendix J
Surface water management	Chapter 9 & Appendix J
Reduced flows into Carcoar Dam	Chapter 9 & Appendix J
Tailings Dam	
TSF location on the Belubula	Chapters 2,6, 9 and Appendix D
Leakage/seepage from dam	Chapters 2,9 & Appendix D
Tailings composition	Chapter 2 & Appendix D
Overflows from TSF	Chapters 2 & 9 and Appendix D
Potential for TSF failure	Chapter 2 & Appendix D
Mining	
Waste rock characteristics	Chapter 2
Energy use	Chapter 11
Use of Cyanide	
Cyanide use and management	Chapters 2 & 18 and Appendix CC

Issues raised	Where addressed in the EIS
Landscape character and visual	
Change to rural character and amenity of Blayney township	Chapter 20 & Appendix T
Visual impacts of mine on Mid-Western Highway	Chapter 19 & Appendix S
Impacts of lighting on amenity and 'dark sky'	Chapter 19 & Appendix S
Impacts on visual amenity	Chapter 19 & Appendix S
Agriculture	
Potential impacts on local apiary industry	Chapter 8 & Appendix I
Blasting impacts on local equine industry	Chapters 8 & 10 and Appendix L & I
Potential loss of agricultural land	Chapter 8 & Appendix I
Agriculture impacts during pipeline construction	Chapter 33
Property and land use	
Concern over potential impacts to land value	Appendix T
Property acquisition for pipeline development	Chapter 2
Rehabilitation on private land following pipeline construction	Chapter 35
Social	
Concern regarding uncertainty of whether the project will proceed	Chapter 20 & Appendix T
Impact on shift work arrangements on community through reduced sport/volunteering participation	Chapter 20 & Appendix T
Impacts on community life and sense of place	Chapter 20 & Appendix T
Employment opportunities	Chapter 20 & Appendix T
Source and residential location of workers	Chapter 20 & Appendix T
Health impacts	Chapters 11 & 20 and Appendix M & T
Tourism impacts	Chapter 20 & Appendix T
Impacts on housing	Chapter 20 & Appendix T
Biodiversity	
Vegetation removal	Chapter 13 & Appendix N
Traffic	
Potential for significantly increased traffic	Chapter 17 & Appendix Q
Transport of hazardous goods	Chapter 18 & Appendix R
Closure and rehabilitation	
Legacy of mine	Chapter 22 & Appendix U

7. CONCLUSIONS

The AIS was prepared in accordance with the Environmental Assessment Requirements pertaining to agriculture issued by the Department of Planning and Environment.

Extensive technical investigations that have taken place over several years, led to a refinement of the project design to minimise the potential impact on agriculture. The findings of this AIS include:

- The project has been designed so as not to impact on any potential Biophysical Strategic Agricultural Land.
- There will be a minor reduction (<1%) in the gross value of agriculture production in the Blayney LGA during the life of the project and post mine operation reduction of 0.2%.
- The project is predicted to be associated with a net reduction of 423 ha of soil with LSC classes 4 (12 ha) and 5 (411 ha) and a net increase of 353 ha of soil with LSC classes 6 (336 ha) and 7 (17 ha). The project will result in the permanent removal of 70 ha (LSC Class 8) from agriculture (ie in the final void).
- A temporary reduction in the inflow to Carcoar Dam (4%) will occur as a result of construction and operation of the project. Permanently, following mine-closure and rehabilitation, the reduction in flows will be much smaller (0.5% reduction). This level of change is expected to be within the current natural variability in catchment conditions.
- Groundwater models predict that all privately owned bores within the vicinity of the project will experience a cumulative pressure head decline of <2 m, which the NSW Aquifer Interference Policy as 'minimal impact'

A comprehensive mitigation program will be implemented to manage potential impacts om agricultural resources. This will include monitoring and, where appropriate, establishment of triggers and appropriate responses. In addition, rehabilitation criteria will be used as basis for assessing when rehabilitation of the project is complete.

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