



NEW HOPE
GROUP

Appendix H EPBC Act Assessment





NEW HOPE
GROUP

H.1 MNES Report



Contents

1	Introduction	1-1
1.1	Revised Project Context	1-3
1.2	Matters of National Environmental Significance	1-3
2	Revised Project Description	2-1
2.1	Introduction	2-1
2.2	Revised Project Background	2-1
2.3	Revised Project Overview	2-2
2.3.1	Mine Development	2-2
2.3.2	Associated Infrastructure	2-3
2.3.3	Accommodation and Workforce	2-4
2.3.4	Environmental Management	2-4
2.4	Land Tenure and Ownership	2-6
2.4.1	Mining Tenure	2-6
2.4.2	Land Ownership	2-6
2.5	Mine Planning and Design	2-10
2.5.1	Mining Method	2-10
2.5.2	Mine Plan Schedule	2-12
2.5.3	Out-of-pit Spoil Dumps (Future Elevated Landforms)	2-22
2.5.4	Void Design and Depressed Landforms	2-23
2.5.5	Hours of Operation	2-25
2.5.6	Blasting Activities	2-25
2.5.7	Night Lighting	2-26
2.5.8	Site Access and Haul Roads	2-26
2.5.9	Road Diversions and Closures	2-29
2.5.10	Workforce Arrangements	2-32
2.6	Mine Infrastructure and Facilities	2-33
2.6.1	Overview	2-33
2.6.2	Tailings Management	2-34
2.6.3	Mine Industrial Area	2-38
2.7	Associated Infrastructure Requirements	2-41
2.7.1	Sewerage Treatment	2-41

2.7.2	Power Supply	2-41
2.7.3	Revised Project Construction Activities	2-45
2.7.4	Pre-Construction and Mine Development	2-45
2.7.5	Site Preparation	2-46
2.7.6	Civil Works	2-46
2.8	Water Management	2-47
2.8.1	Water Supply	2-47
2.8.2	Water Management	2-48
2.8.3	Groundwater Supply	2-52
2.8.4	Flood Design Criteria	2-52
2.8.5	Potable Water Treatment	2-53
2.9	Coal Transportation	2-53
2.9.1	System Overview	2-53
2.9.2	Rail Transportation	2-54
2.10	Decommissioning	2-56
2.10.1	Jondaryan Rail Loadout Facility	2-56
2.10.2	Mine and Associated Infrastructure	2-60
2.10.3	Rehabilitated Land	2-61
3	Existing environment	3-1
3.1	Land Use	3-1
3.2	Methodology	3-26
3.2.1	Threatened Ecological Community (TEC) surveys	3-26
3.2.2	Terrestrial flora surveys	3-26
3.2.3	Terrestrial fauna surveys	3-29
3.2.4	Survey adequacy	3-48
3.3	Results	3-48
3.3.1	Observed Threatened Ecological Communities (TEC)	3-57
3.3.2	Threatened Flora Species	3-59
3.3.3	Threatened Fauna Species	3-59
3.4	Fauna diversity	3-73
4	Assessment of Impacts	4-74
4.1	Clearing of vegetation	4-74
4.1.1	Brigalow community	4-74

4.1.2	Bluegrass dominant grassland community	4-75
4.1.3	Flora species	4-75
4.1.4	Fauna species	4-77
4.2	Infrastructure impacts	4-77
4.3	Indirect impacts	4-77
4.3.1	Dust	4-78
4.3.2	Habitat Fragmentation	4-79
5	Mitigation Measures	5-81
5.1	Biodiversity Offset Strategy (BOS)	5-81
5.2	Management Plans	5-82
5.2.1	Bluegrass Offset Management Plan (BOMP)	5-82
5.2.2	Conservation Zone Management Plan (CZMP)	5-82
5.2.3	Threatened Species Translocation Plan (TSTP)	5-83
5.2.4	Construction Phase Management	5-83
5.2.5	Pest and Weed Management Plan (PWMP)	5-83
5.2.6	Pest and Domestic Animal Management	5-84
6	Conclusion	6-85
7	References	7-86

This page left intentionally blank

1 Introduction

New Acland Coal Pty Ltd (NAC), which is a fully owned subsidiary of New Hope Corporation Limited, currently holds the tenements and operates the existing New Acland Coal Mine (the Mine), a 4.8 million tonne (product coal) per annum (Mtpa) open cut coal mine in southeast Queensland's Clarence-Moreton Basin, approximately 35 km north-west of Toowoomba, Queensland. Both NAC and New Hope Corporation Limited are part of the New Hope Group (NHG).

Current operations at the Mine are carried out on Mining Leases (ML) 50170 and 50216, under the approved Environmental Authority, EPML00335713 and in accordance with its approval issued under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) related to a previous expansion of the Mine, referral 2004/1885.

The NHG has a highly successful record in the development and management of world-class open cut coal operations, including the Jeebropilly and New Oakleigh mines (closed) near Ipswich, the New Acland Mine, and several exploration projects across Queensland. NHG maintains an Environmental policy as well as various Health, Safety and Community policies.

The New Acland Mine has operated successfully since 2002 and has demonstrated a clear commitment to environmental management, as evidenced by its successful rehabilitation of mined land and its proactive engagement with the community.

During the last 10 years, NAC has not been fined or prosecuted for any breach of environmental laws, further demonstrating its strong environmental record and commitment to environmental management.

Revised Project history

On 23 April 2007, a referral was made to the then Australian Government Minister for Environment and, Water Resources (the Federal Environment Minister) under the EPBC Act, for a project which, amongst other things, sought an expansion of the existing coal mine into new areas and an increase in production to 10 Mtpa (the revised Project).

On 24 April 2007 an application was made under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) to the Coordinator-General to declare the project to be a "significant project", now known as a "coordinated project", with the assumption that the Project met the criteria set down in the SDPWO Act. On 18 May 2007, the Project was declared to be a "significant project" for which an Environmental Impact Statement (EIS) was required.

On 24 May 2007, the Federal Environment Minister, determined that the Project was a controlled action due to the likelihood of significant impacts on listed threatened species and communities (sections 18 and 18A), and that the action would be assessed by an EIS undertaken through the bilateral assessment process (referral number EPBC 2007/3423).

On 25 May 2007 a Mining Lease application (MLA) 50232 was lodged together with an amendment to the Environmental Authority to include the Project.

The Final Terms of Reference (ToR) were published on 24 October 2007 and in November 2009, NAC submitted an EIS for the Project. The EIS for the Project was released for public consultation between 14 November 2009 and 3 February 2010. However, in response to feedback from both the public and government, before the EIS was assessed by the Coordinator-General, NAC sought to revise the Project.

The revised Project includes:

- a reduction in the active area to be mined within MLA 50232, from 5,069 hectares to 3,163 ha. The Revised Project proposes mining in three pits (down from four), namely Manning Vale West, Manning Vale East and Willeroo mining pits.
- a reduction in Product coal from 10 Mtpa to 7.5 Mtpa;
- the establishment of a buffer zone around Acland; and
- a commitment to not divert Lagoon Creek.

Two variations to referral EPBC 2007/3423 were lodged, one during late 2008 and one in November 2012. The Federal Environment Minister accepted these project variations respectively on 11 December 2008 and on 9 November 2012.

On 14 November 2012 the State government confirmed that, due to modifications to the original project, including reductions to its scope, the EIS process would restart at the draft terms of reference (ToR) for EIS stage. New ToR for the revised Project, were released by the Coordinator-General on 22 March 2013.

The EIS for the revised Project has been prepared. Under the ToR there is a requirement to provide the information for a decision to be made under the EPBC Act in a stand-alone document.

This report, in accordance with section 3.1 of Schedule 1 of the bilateral agreement assesses all the relevant direct and indirect impacts that the action is likely to have; provides enough information about the action and its impacts to allow the Federal Environment Minister to make an informed decision whether or not to approve the action and addresses the matters set out in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulation 2000 and with specific reference to the significant impact criteria outlined in EPBC Act Policy Statement 1.1 – Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DEWHA 2009).

Independent Expert Scientific Committee

On 13 March 2013, an amendment to the EPBC Act (the Water Trigger) was introduced into Federal Parliament to enable water resources to become a matter of national environmental significance in relation to coal seam gas and large coal mining development. The Water Trigger amendment was passed in June 2013 and is now in force, providing the Minister with the power to consider and impose conditions directly relating to impacts on a water resource itself.

The final Terms of Reference (ToR) for the revised Project were issued March 2013, prior to the Water Trigger EPBC Act amendment. The revised Project's ToR includes the requirement to provide a stand-alone document on the revised Project's potential impacts on water resources. This stand-alone

document has been prepared having regard to the Independent Expert Scientific Committee Information Guidelines for Proposals Relating to the Development of Coal Seal Gas and Large Coal Mines where there is a Significant Impact on Water Resources. The information contained within this document is largely drawn from the revised Project's EIS, with additional information to meet the IESC's Information Guidelines as required. The IESC report is in **Appendix H**.

1.1 Revised Project Context

The revised Project site is located within southeast Queensland's Darling Downs region 14 km north-northwest of Oakey, 35 km northwest of Toowoomba and 177 km west of Brisbane, Queensland's capital city. Toowoomba is the closest regional centre to the revised Project and is one of Australia's largest provincial cities with a population of 90 000.

The Darling Downs is located within the Condamine River catchment at the headwaters of the Murray-Darling Basin and is characterised by fertile soils and a long history of agricultural development. In recent times the Darling Downs, like many agricultural regions, has experienced significant change in land use activities driven by a combination of new policy initiatives, technological developments, changing commodity markets, and broader demographic and cultural shifts.

The revised Project site is located within the Lagoon Creek catchment. Lagoon Creek is the main local watercourse and is an ephemeral creek which forms a tributary of Oakey Creek, within the greater Condamine River catchment. Lagoon Creek flows roughly across the middle of the revised Project site in a northeast to southwest direction. The elevation of the surrounding area ranges from 390 m above sea level at Lagoon Creek up to 525 m above sea level on a local basaltic ridge. The revised Project site average is 420 m above sea level.

Vegetation communities and habitat of the revised Project site and surrounding area have been heavily cleared. Vegetation and habitat is now found within road reserves, hills and ridgelines and along watercourses such as Lagoon Creek.

1.2 Matters of National Environmental Significance

The EPBC Protected Matters Search Tool lists the species and threatened ecological communities in **Table 1-1** as possibly being found at the revised Project site.

Table 1-1 Matters of National Environmental Significance

Type	Name	Status
Listed Threatened Ecological Communities		
	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered
	Brigalow (<i>Acacia harpophylla</i> dominant and codominant)	Endangered
	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered
	Bluegrass (<i>Dichanthium</i> spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered

Type	Name	Status
Listed threatened species		
Birds	<i>Lathamus discolor</i> , Swift Parrot	Endangered
	<i>Neochmia ruficauda ruficauda</i> , Star Finch (eastern), Star Finch (southern)	Endangered
	<i>Poephila cincta cincta</i> , Black-throated Finch (southern)	Endangered
	<i>Xanthomyza phrygia</i> , Regent Honeyeater	Endangered
	<i>Erythrorhynchus radiatus</i> , Red Goshawk	Vulnerable
	<i>Geophaps scripta scripta</i> , Squatter Pigeon	Vulnerable
	<i>Rostratula australis</i> / <i>Rostratula benghalensis</i> (sensu lato), Australian Painted Snipe/ Painted Snipe	Vulnerable
	<i>Turnix melanogaster</i> , Black-breasted Button-quail	Vulnerable
Fish	<i>Maccullochella peelii</i> , Murray Cod	Vulnerable
Mammals	<i>Dasyurus hallucatus</i> , Northern Quoll	Endangered
	<i>Chalinolobus dwyeri</i> , Large-eared Pied Bat, Large Pied Bat	Vulnerable
	<i>Nyctophilus corbeni</i> , South-eastern Long-eared Bat	Vulnerable
	<i>Petrogale penicillata</i> , Brush-tailed Rock-wallaby	Vulnerable
	<i>Potorous tridactylus tridactylus</i> , Long-nosed Potoroo (SE mainland)	Vulnerable
	<i>Pteropus poliocephalus</i> , Grey-headed Flying-fox	Vulnerable
Plants	<i>Digitaria porrecta</i> , Finger Panic Grass	Endangered
	<i>Lepidium peregrinum</i> , Wandering Pepper-cress	Endangered
	<i>Streblus pendulinus</i> , Siah's Backbone, Sia's Backbone, Isaac Wood	Endangered
	<i>Cadellia pentastylis</i> , Ooline	Vulnerable
	<i>Clematis fawcettii</i> , Stream Clematis	Vulnerable
	<i>Dichanthium queenslandicum</i> , King Blue-grass	Vulnerable
	<i>Haloragis exalata</i> subsp. <i>velutina</i> , Tall Velvet Sea-berry	Vulnerable
	<i>Homopholis belsonii</i> , Belson's Panic	Vulnerable
	<i>Picris evae</i> , Hawkweed	Vulnerable
	<i>Rhaponticum australe</i> , Austral Cornflower, Native Thistle	Vulnerable
	<i>Sarcocylus weinthalii</i> , Blotched Sarcocylus, Weinthals Sarcanth	Vulnerable
	<i>Thesium australe</i> , Austral Toadflax, Toadflax	Vulnerable
Reptiles	<i>Tympanocryptis pinguicolla</i> , Grassland Earless Dragon	Endangered
	<i>Anomalopus mackayi</i> , Five-clawed Worm-skink, Long-legged Wormskink	Vulnerable
	<i>Delma torquata</i> , Collared Delma	Vulnerable
	<i>Egernia rugosa</i> , Yakka Skink	Vulnerable

Type	Name	Status
	<i>Furina dunmalli</i> , Dunmall's Snake	Vulnerable
	<i>Paradelma orientalis</i> , Brigalow Scaly-foot	Vulnerable

From the studies undertaken for the revised Project and previous investigations completed by NAC, the following matters of NES have been confirmed at the site:

- Threatened Ecological Communities
 - Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South);
 - Brigalow (*Acacia harpophylla* dominant and co-dominant);
 - Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions;
- Listed species
 - *Bothriochloa biloba*, *Lobed bluegrass*
 - *Digitaria porrecta*, Finger Panic Grass
 - *Homopholis belsonii*, *Belson's Panic*

Bothriochloa biloba has been confirmed within the revised Project site from field surveys. This species was not identified in desktop review of the Study area, however it is known to occur on the Darling Downs, in eucalypt forest and grassland communities, on heavy brown-black clay soils.

As the referral for the Project was submitted in 2007 and determined to be a controlled action in May 2007, the Matters of NES that applied at the time of the controlled action decision continue to apply to the assessment of the revised Project. In this case, the Bluegrass threatened ecological community was revised to form two new communities in January 2009. However, the original threatened ecological community, Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South), is the relevant community for the assessment of impacts from the revised Project. Consequently, reference is made to the Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South) community in this EIS.

The Koala was listed as a threatened species under the EPBC Act on 2 May 2012. However, as this Project was determined to be a controlled action in May 2007, the impact of the revised Project on the Koala has not been assessed, as it was not a matter of NES at the time of the referral. The assessment of impact on the Koala, for the purposes of Queensland legislation, has been included in Chapter 7 of the EIS.

2 Revised Project Description

2.1 Introduction

This Chapter describes the key elements of the revised Project throughout its construction, operation and decommissioning phases. The description for the revised Project also discusses major associated infrastructure requirements and outlines opportunities to capitalise on existing infrastructure currently used for the Mine.

2.2 Revised Project Background

NAC currently operates the Mine as a 4.8 million tonne (product coal) per annum (Mtpa) open cut coal mine on Mining Lease (ML) 50170 and ML 50216, adjacent to Mineral Development Licence (MDL) 244, operated under the existing Environmental Authority (EA) EPML00335713. The Mine has reserves that will allow current operations to continue until approximately 2017. The revised Project involves the extension of the Mine, while increasing production from 4.8 Mtpa up to 7.5 Mtpa of thermal product coal.

The revised Project is necessary to allow current operations to continue beyond 2017 and it was amended in direct response to comments and concerns raised by Government and other stakeholders during the previous EIS process to balance economic, environmental and social needs.

The revised Project involves the extension of the Mine's operating life to approximately 2029 with the inclusion and progressive development of two new resource areas within the area covered by MDL 244 and now also covered by Mining Lease Application (MLA) 50232. These resource areas are identified as the Manning Vale and Willeroo resource areas. The revised Project will include mining in three new mine pits, namely Manning Vale West, Manning Vale East and Willeroo mine pits.

The key objectives of the revised Project are to:

- establish and operate a sustainable and profitable coal mine;
- construct and operate a mine that complies with all relevant statutory obligations and continues to improve operations to ensure best practice environmental management;
- construct, design and operate a mine that does not compromise environmental and social indicators and standards;
- make efficient use of current infrastructure, with upgrades and expansions for the required capacity increase;
- reduce the disturbance to environmental values by minimising the footprint requirements for road and rail construction and the use of areas already disturbed for laydown, storage and handling facilities; and
- use similar proven strategies to those adopted at the Mine, for example:
 - salvage and stockpiling of topsoil;

- early and progressive rehabilitation of disturbed areas;
- use of recycled water as the main water supply;
- protection of water quality by appropriate management systems; and
- adoption of appropriate landform designs to ensure sustainable final land use.

In addition, key features of the revised Project include the:

- development of a suitable 'off set' strategy to satisfy State and Federal requirements for clearance of vegetation within new operational areas (i.e. extent of surface rights areas) within MLA 50232;
- preservation of historical items within Acland;
- comprehensive and progressive rehabilitation program involving continuous monitoring and reporting in line with the agreed post mining land use; and
- amendment of NAC's existing EA commensurate to the revised Project's size and scope.

The revised Project will allow the parent company, New Hope Corporation Limited (NHCL), to expand its production capacity at the Mine to meet current and future market demands for its thermal coal products. The revised Project is particularly important considering NHCL's West Moreton Operations near Ipswich will exhaust current coal reserves in the near future.

The revised Project offers an opportunity for NHCL to expand its business base, improve profitability and increase its return to shareholders. The revised Project's thermal coal products are a highly valued energy resource that possesses lower sulphur content, provides higher energy output and produces less greenhouse emissions than many alternative thermal coal sources.

The revised Project will boost economic activity within the Darling Downs region through direct and indirect employment, investment and business opportunities for the life of the revised Project and beyond.

The estimated construction/capital cost of the revised Project is \$895.6 million. Operating costs for the revised Project are approximately \$450 million per annum. The estimated expenditure is approximately \$6.6 billion over the life of the revised Project.

2.3 Revised Project Overview

An overview of the revised Project layout is shown in **Figure 2-1**. The key elements of the revised Project are outlined in the sections below.

2.3.1 Mine Development

The mine will consist of the following key components:

- continuation of existing mining activities to progressively extend to parts of the Manning Vale and Willeroo resource areas within MLA 50232, located to the south and west of current MLs 50170 and 50216;

- production of up to 7.5 Mtpa of product coal equating to approximately 14 Mtpa Run-of-Mine (RoM) coal;
- production of up to 80.4 Mt of product coal over the life of the revised Project;
- maintenance of the existing thin seam coal mining equipment, continuation of the current open cut mining techniques and expansion of the truck and loader mining fleet;
- progressive disposal of coarse rejects to cells within the overburden dumps, along with fine tailings being disposed of in In-Pit Tailings Storage Facilities (ITSFs);
- emplacement of two out-of-pit spoil dumps associated with the Manning Vale and Willeroo mine pits; and
- generation of three depressed landforms at the end of mining by backfilling and re-profiling the final mine pits.

In determining the viability of the mine's development, the revised Project reserves have been extensively tested by drilling, geophysical logging, ground geophysics, geotechnical, hydrogeological and geochemical investigations by New Hope Exploration Pty Ltd, a subsidiary of NHCL and sister company to NAC.

2.3.2 Associated Infrastructure

The key infrastructure requirements for the revised Project are outlined below:

- upgrade of the existing Coal Handling and Preparation Plant (CHPP) complex, Run of Mine (RoM) and product coal stockpile areas and supporting infrastructure on ML 50170;
- continued use of tailings disposal within ITSFs located in-pit on ML areas;
- continued use of recycled water from the Wetalla Wastewater Reclamation Facility (WWRF) supplied from Toowoomba via an approved 45 km pipeline that is currently fully operational;
- continued use of a mine surface water management system involving various water management structures staged to accommodate the progressive development of the Mine and based on the principles of diverting clean water and capturing and reusing water from disturbed areas;
- upgrades to the existing administration and heavy vehicle maintenance area on ML 50170;
- relocation and potential upgrade of the current power supply for the mine operation and the local 11kV distribution system;
- diversion of the Jondaryan-Muldu Road around the Manning Vale resource area;
- decommissioning of the Jondaryan Rail Loadout Facility (JRLF);
- construction of a new 8 km rail spur line and balloon loop from Jondaryan onto MLA 50232;
- construction of the Train Loadout Facility (TLF) within MLA 50232; and
- relocation and potential upgrade of the existing local telecommunication network (these activities will be undertaken by the telecommunication company and are not within the footprint of the referred action).

It is anticipated the construction period for associated infrastructure will occur from 2015 to 2017.

2.3.3 Accommodation and Workforce

No construction or operational camps will be located on-site during the construction and operational phases of the revised Project. Construction and operational workforces will reside in regional towns and cities. Arrival and departure times for workers will be staggered by at least half-an-hour to minimise traffic and other interactions.

2.3.4 Environmental Management

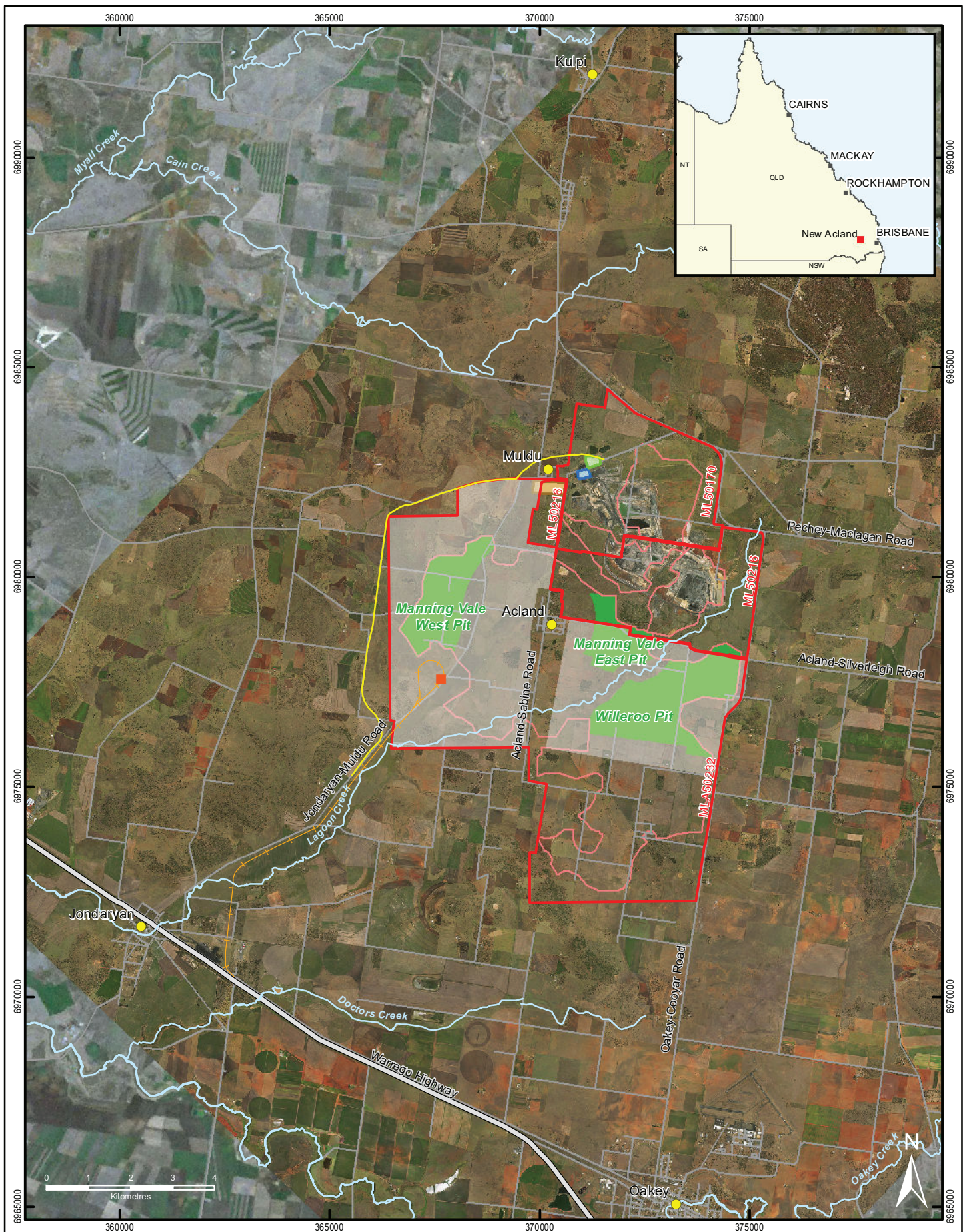
An EM Plan will be developed for the revised Project and consist of the following key components:

- environmental values likely to be affected;
- potential adverse and beneficial impacts;
- environmental protection objectives; and
- control strategies adopted to achieve these environmental protection objectives.

In particular, the EM Plan will facilitate the:

- development of a suitable 'offset' strategy to satisfy State and Federal requirements for clearance of vegetation communities within new operational areas (i.e. extent of surface rights areas); and
- development of a comprehensive progressive rehabilitation program involving continuous monitoring and reporting in line with the agreed post mining land use.

The EM Plan for the revised Project is provided in **Appendix J.19**.



LEGEND

- | | |
|--|--|
| ● Towns and Localities | Proposed Extent of Surface Rights Area |
| ■ Train Loadout Facility | Coal Resource Area |
| — Rail Spur | Mining Tenements |
| — Roads | Stage 3 Pit Areas |
| — Creeks | CHPP Precinct |
| — Jondaryan-Muldu Road Diversion | Material Handling Facility |
| | Mine Industrial Area |



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-1 - Conceptual Project Plan
Layout**

Scale 1:120,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

2.4 Land Tenure and Ownership

2.4.1 Mining Tenure

The revised Project is proposed to be developed within MLA 50232, applied for by NAC on 24 April 2007. NAC will conduct the revised Project within MLA 50232 by amending its MLA and only seeking 'surface rights' for mining over the proposed new operational footprint. These tenement areas along with the proposed new operational footprint are depicted in **Figure 2-2**.

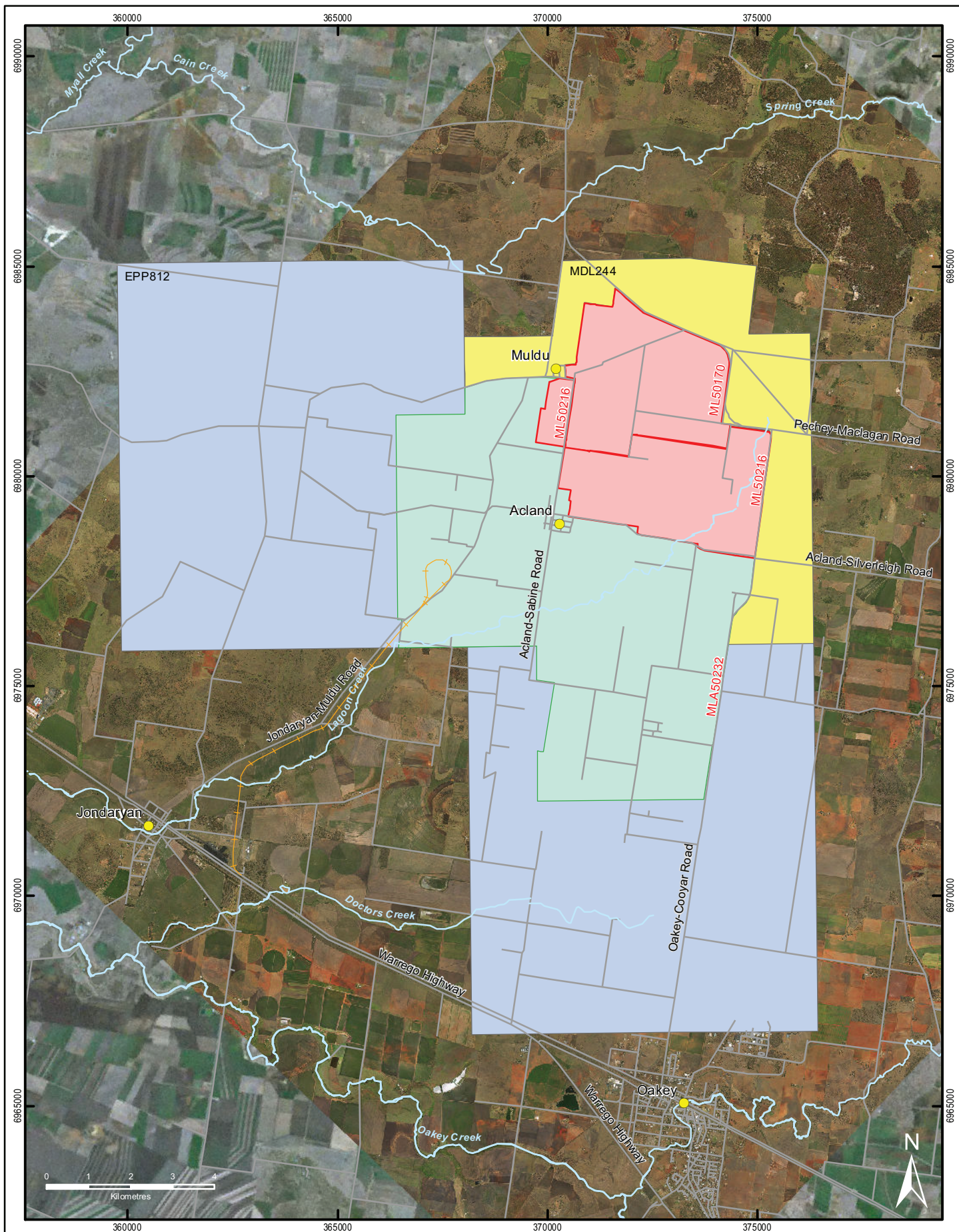
MLA 50232 covers the majority of the remaining reserves within MDL 244, including the Manning Vale and Willeroo resource areas.

2.4.2 Land Ownership

The NHG has invested significantly to secure surface rights over future development areas within MDL 244, to establish buffer zones between operations and surrounding landowners, and to secure transport corridors. Negotiations with landowners have involved several strategies including outright purchase, option to purchase and compensation agreements. The majority of landowners have opted to sell their properties outright.

Since the development of the Mine, the NHG has acquired 160 lots totalling 10,151 ha from 157 owners. The NHG owns the majority of the land within MLA 50232. The Acland Pastoral Company (APC) is responsible for the sustainable management of the NHG's Acland district landholdings, which generally involves the application of recognised agricultural practices outside the active mine areas. **Figure 2-3** depicts the extent of current NHG land ownership for the Acland district.

The real property descriptions of the background land tenure for MLA 50232 are illustrated in **Figure 2-4**.



LEGEND

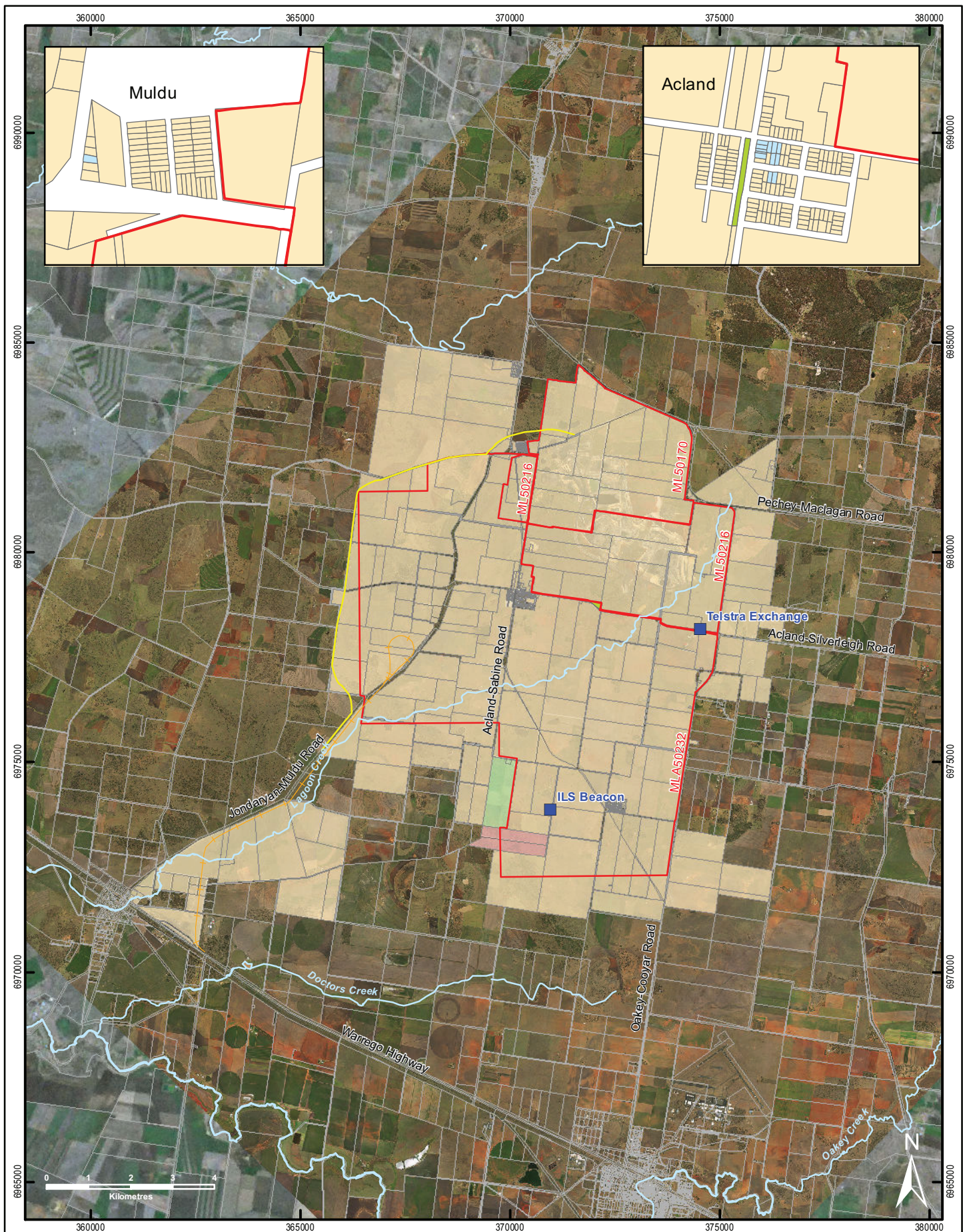
- Towns and Localities
- Rail Spur
- Roads
- Creeks
- Mining Leases
- MDL Area
- EPP Area
- MLA Area



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-2
Project Tenement Areas**

Scale 1:120,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



LEGEND

- Towns and Localities
- Rail Spur
- Jondaryan-Muldu Road Diversion
- Roads
- Creeks
- Mining Tenements

Ownership

- Acland Pastoral Company
- Private Owner
- Private Owner with Compensation Agreement
- Private Owner with Special Agreement
- Toowoomba Regional Council with Compensation Agreement
- Utilities



NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-3 - NHG Acland District Landholdings

Scale 1:120,000 on A4

Projection: Australian Geodetic Datum - Zone 56 (AGD84)

2.5 Mine Planning and Design

2.5.1 Mining Method

The mining method utilised for the revised Project is truck and excavator/loader, which is currently employed at the Mine. This has been a proven mining method that operates efficiently with the current resource geometry while offering a significant level of flexibility.

Initially, all topsoil is stripped using bulldozers, and relocated using front end loaders and trucks and is directly respread on current progressive rehabilitation areas behind the active mine pit or stockpiled for future rehabilitation purposes. Direct respread is the preferred method to minimise topsoil handling, which reduces loss of viability from damage to soil structure and propagules. Topsoil is removed primarily for the purposes of rehabilitation followed by overburden drilling and blasting.

Once topsoil removal is completed a new box-cut is initially developed with the overburden removed and dumped within an out-of-pit spoil dump or used to backfill other existing voids.

Coal mining commences once sufficient overburden is removed to expose the coal seams. This involves working a number of blocks in conjunction with one another to develop a staggered pattern in relation to the vertical coal seam horizons. The overburden and thick partings (>1.5 m) are typically mined through the use of large excavators. Thin partings (<1.5 m) and coal seams are mined by loaders with assistance from dozers to rip and stack the material in windrows which increase loader productivity.

Once the box-cut is completed, successive strips are opened to maintain consistent coal flow to the CHPP. The number of strips and blocks opened at any given time depends on the coal production schedule and equipment productivity requirements for that particular mine pit. Once enough floor area is available in the mine pit, spoil dumping then commences in-pit allowing progressive backfilling of the void as mining traverses across the resource area.

A typical cross section of an operating mine pit is shown in **Figure 2-5**.

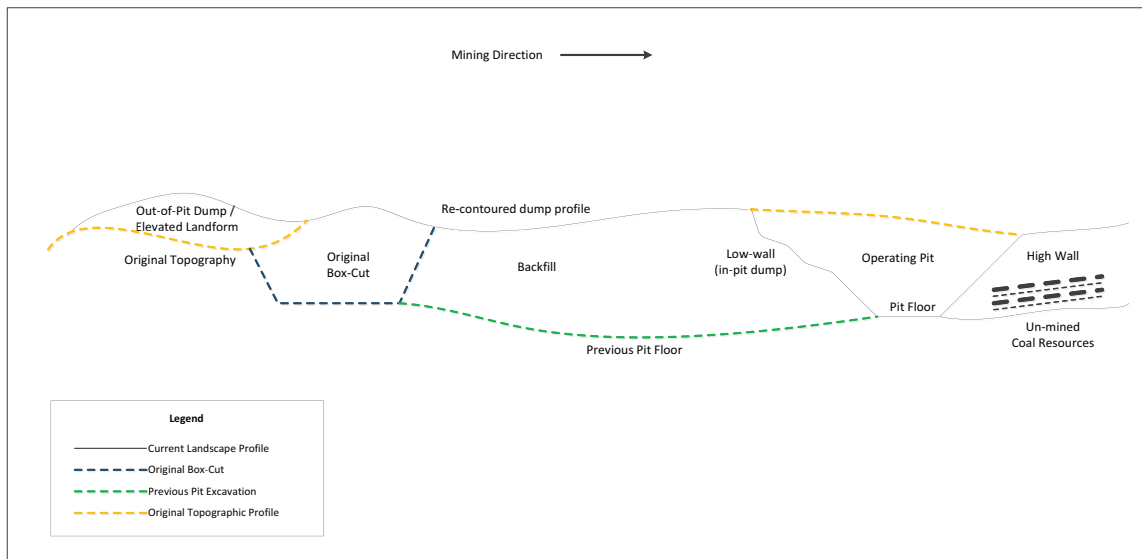


Figure 2-5 Mining Process Cross Section

A generalised representation of the mining process (from mine to customer) is presented in **Figure 2-6**. Once the raw coal has been extracted from the active mine pit it is transported to the RoM pad for delivery via conveyor to the CHPP where it is processed. Coarse rejects from the CHPP are disposed of through in-pit dumping or comingled with overburden for out-of-pit dump development while fine tailings are directed to ITSFs. The product coal is then stockpiled via conveyor and transported to the TLF for distribution to various markets.

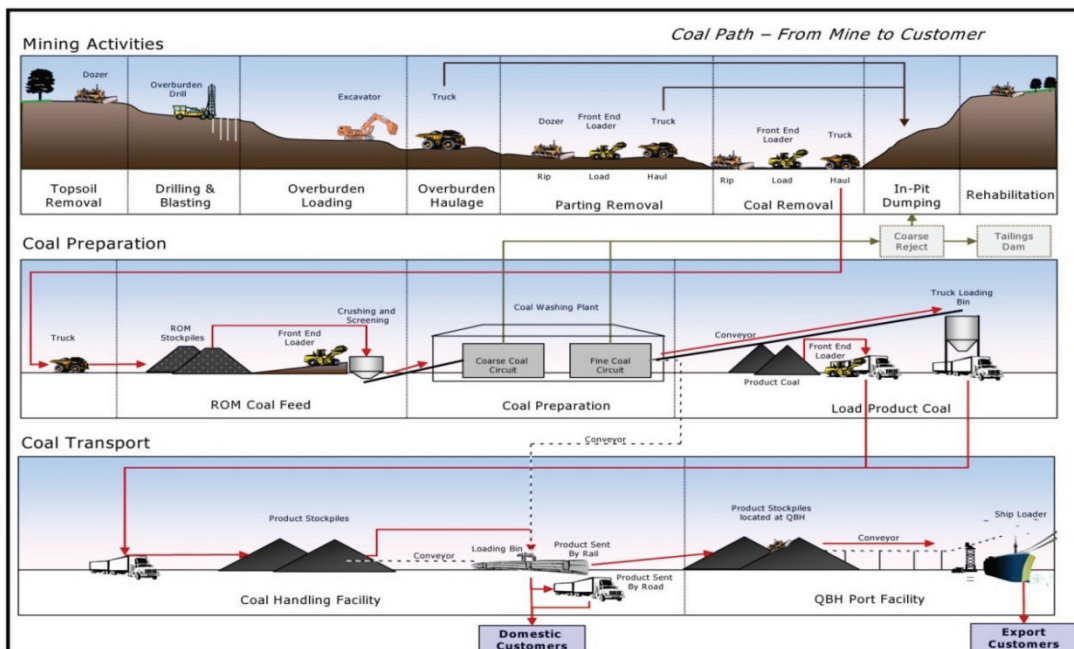


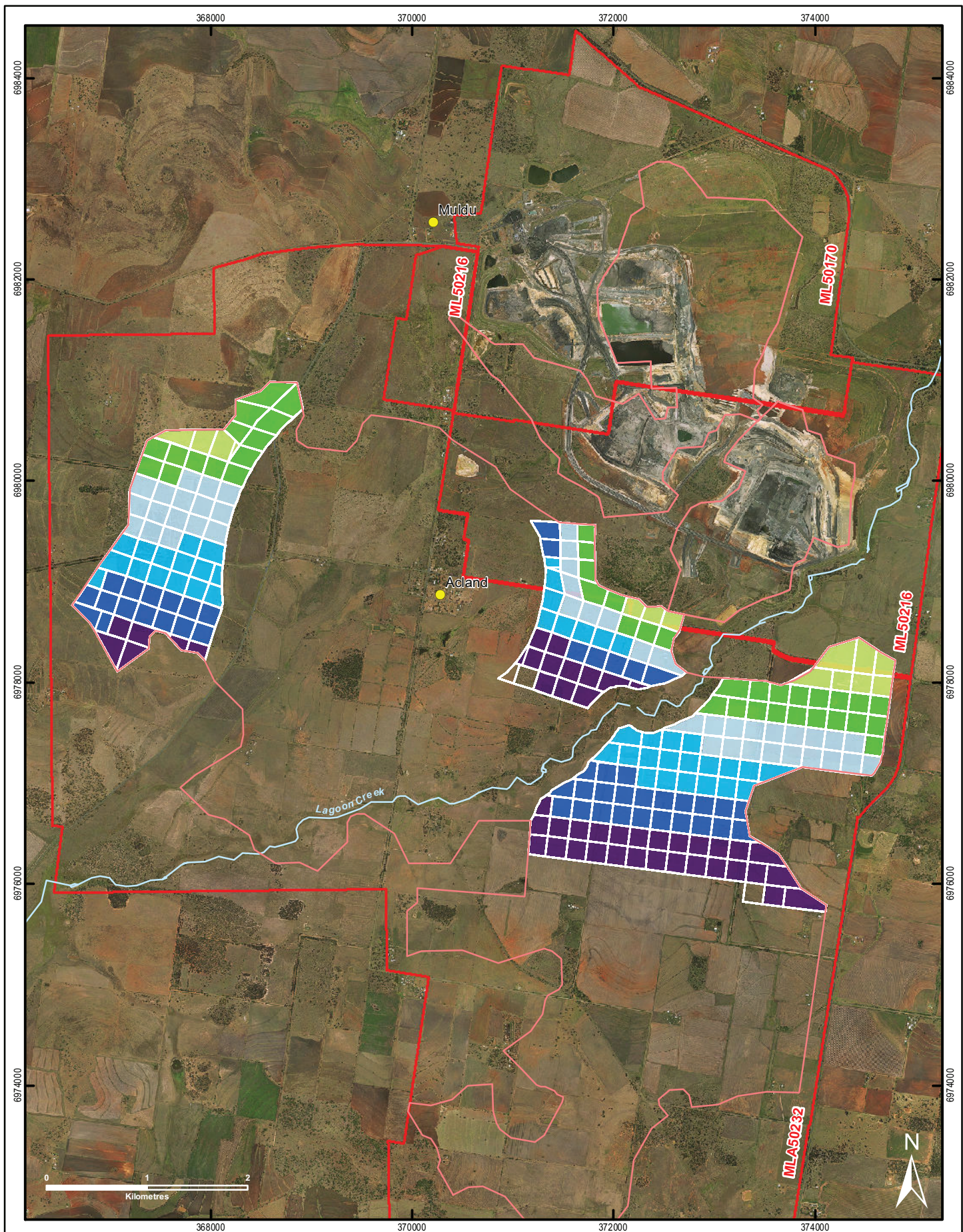
Figure 2-6 Mining Process Overview

2.5.2 Mine Plan Schedule

The revised Project involves the continued development of the Mine by the progressive commissioning of two additional resource areas within MLA 50232. The two resource areas will be developed sequentially and combined with the current operations to supply up to 7.5 Mtpa of saleable product coal for export and domestic markets until approximately 2029.

Life of Mine Schedule

The life of mine schedule is outlined in **Figure 2-7**. **Figure 2-8** to **Figure 2-14** identify the location of the mine pits and working areas over the life of the revised Project in 2015, 2017, 2019, 2021, 2023 and 2029, respectively. The life of mine schedule has been modified to allow an exclusion zone around Acland, increase the buffer distance from Oakey and to avoid disturbance of Lagoon Creek, **Figure 2-15** provides the proposed conceptual final landform including the locations of the elevated landforms (former out-of-pit spoil dumps) and the depressed landforms (former residual voids).



LEGEND

- | | | |
|------------------------|-------------|-----------|
| ● Towns and Localities | Year | |
| ■ Mining Tenements | FY2017-18 | FY2023-24 |
| ■ Coal Resource Area | FY2019-20 | FY2025-26 |
| — Creeks | FY2021-22 | FY2027-29 |

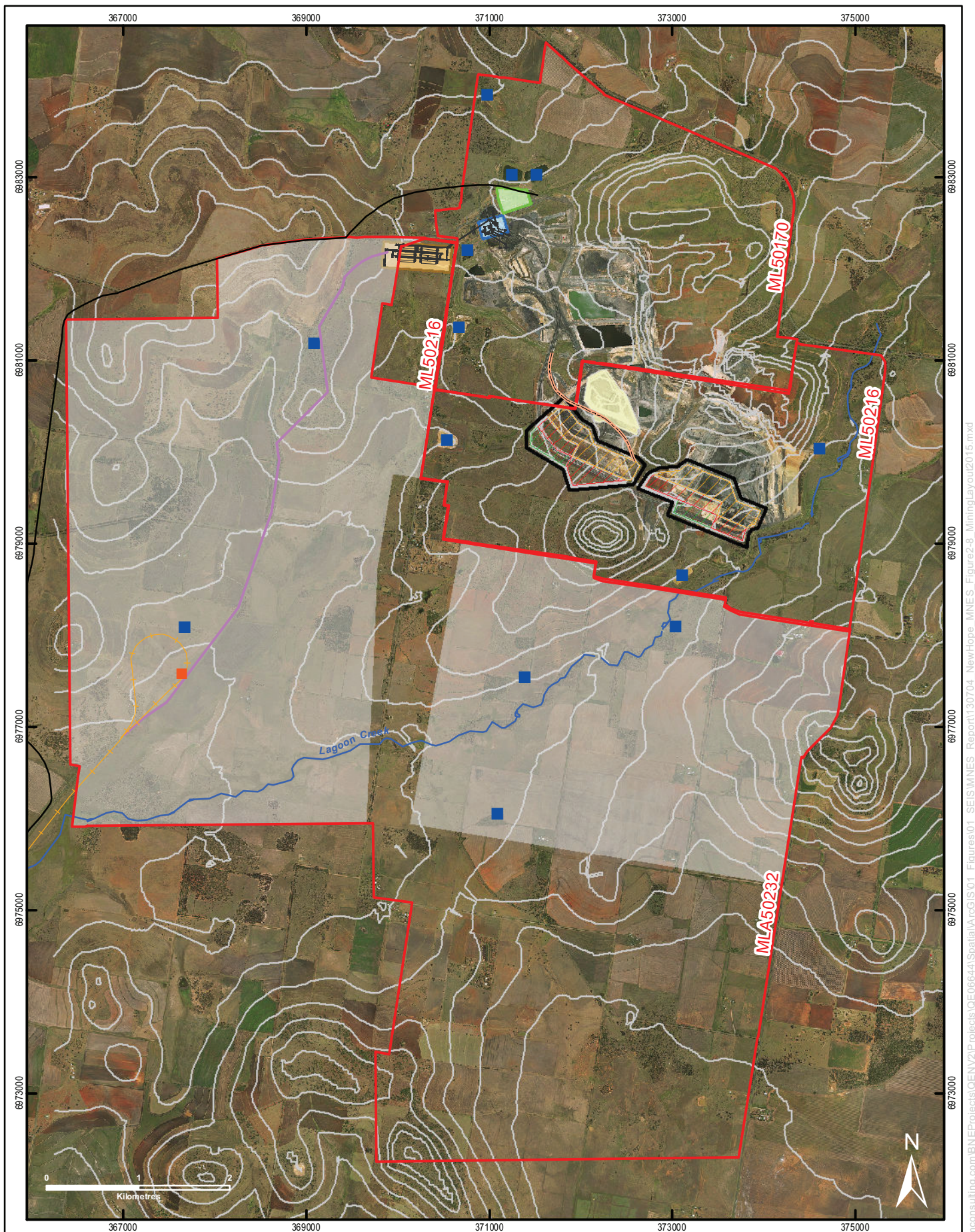
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-7 - Life of Mine Schedule

Scale 1:50,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | Name |
| ■ Dams | Mining Pit Area | ■ CHPP Precinct |
| — Rail Spur | Dumping Area | ■ Material Handling Facility |
| — Creeks | Void Area | ■ Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographic Contours (10m) | | |

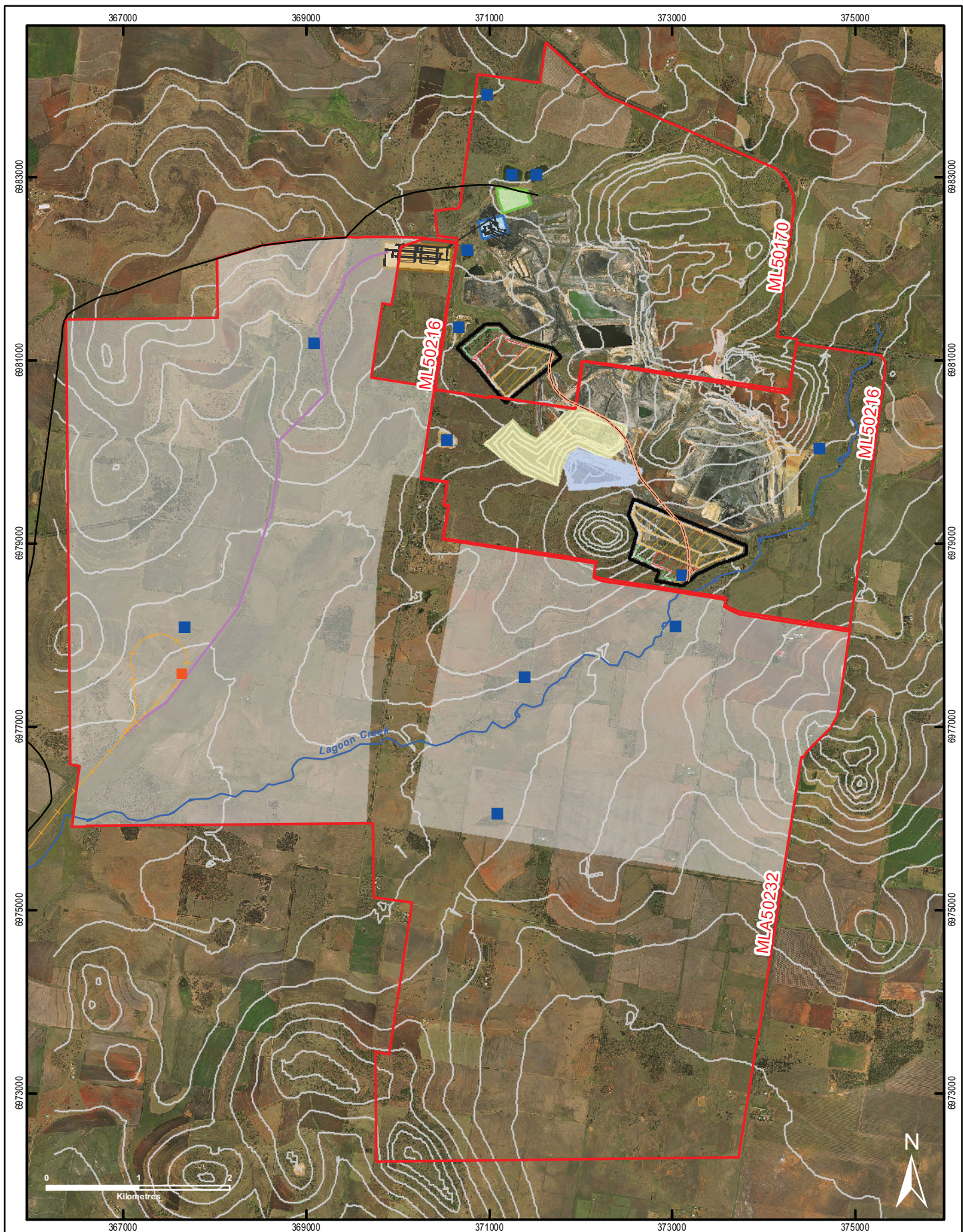
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-8 - Mining Layout 2015

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Mining Pit Area | CHPP Precinct |
| — Rail Spur | Dumping Area | Material Handling Facility |
| — Creeks | Void Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographic Contours (10m) | | |

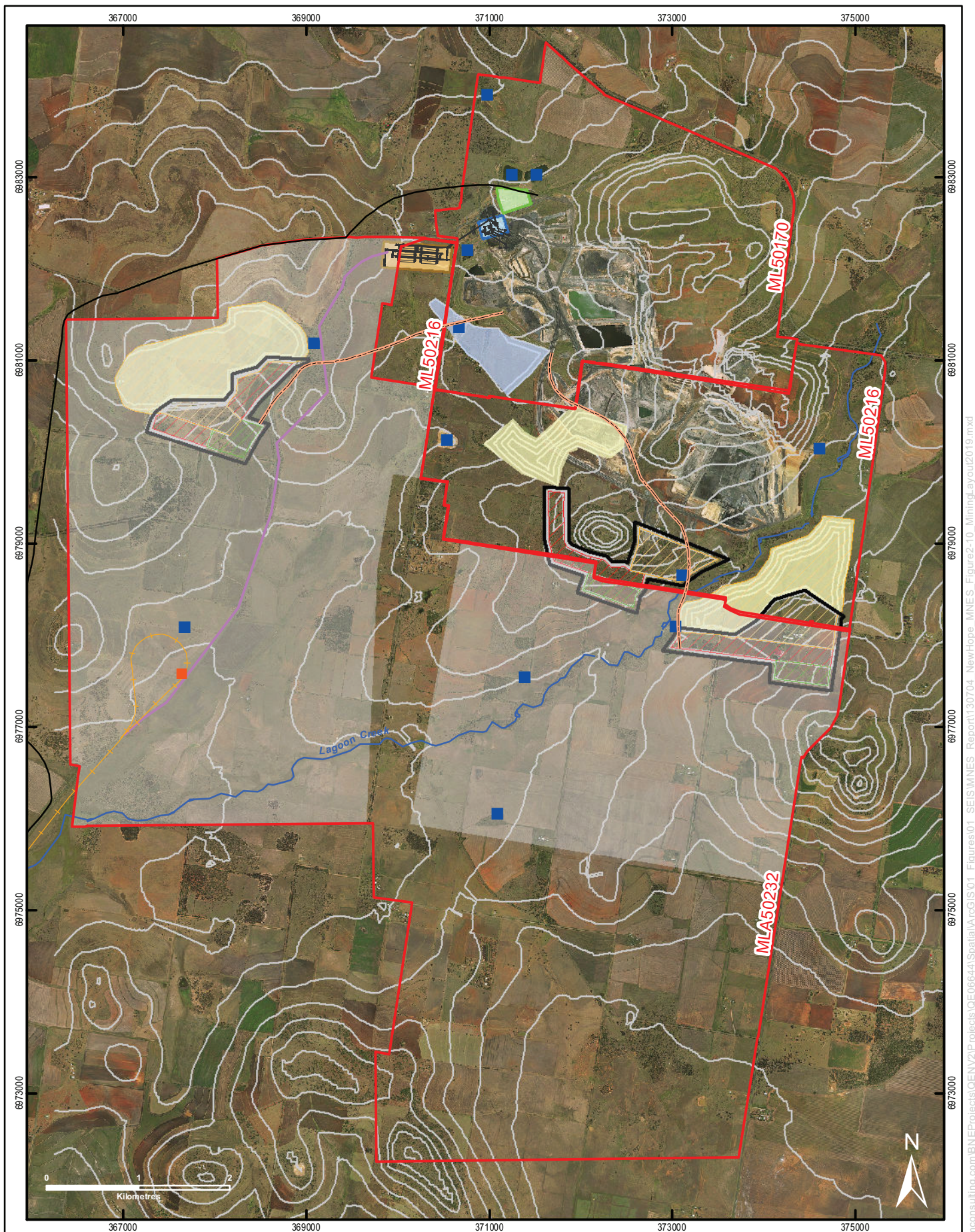
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-9 - Mining Layout 2017

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Mining Pit Area | CHPP Precinct |
| — Rail Spur | Dumping Area | Material Handling Facility |
| — Creeks | Void Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographic Contours (10m) | | |

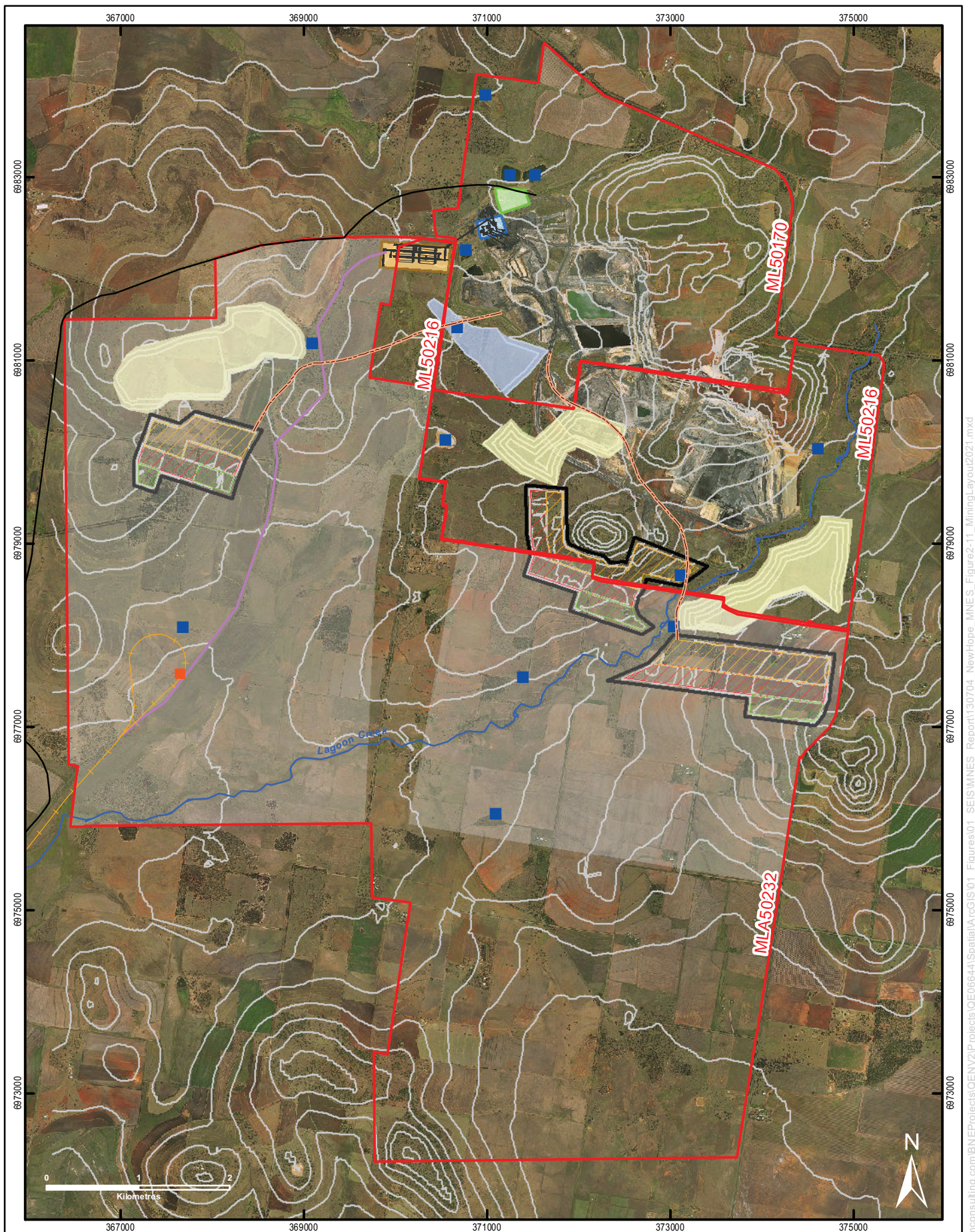
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-10 - Mining Layout 2019

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Mine Pit Area | CHPP Precinct |
| — Rail Spur | Dumping Area | Material Handling Facility |
| — Creeks | Void Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographic Contours (10m) | | |

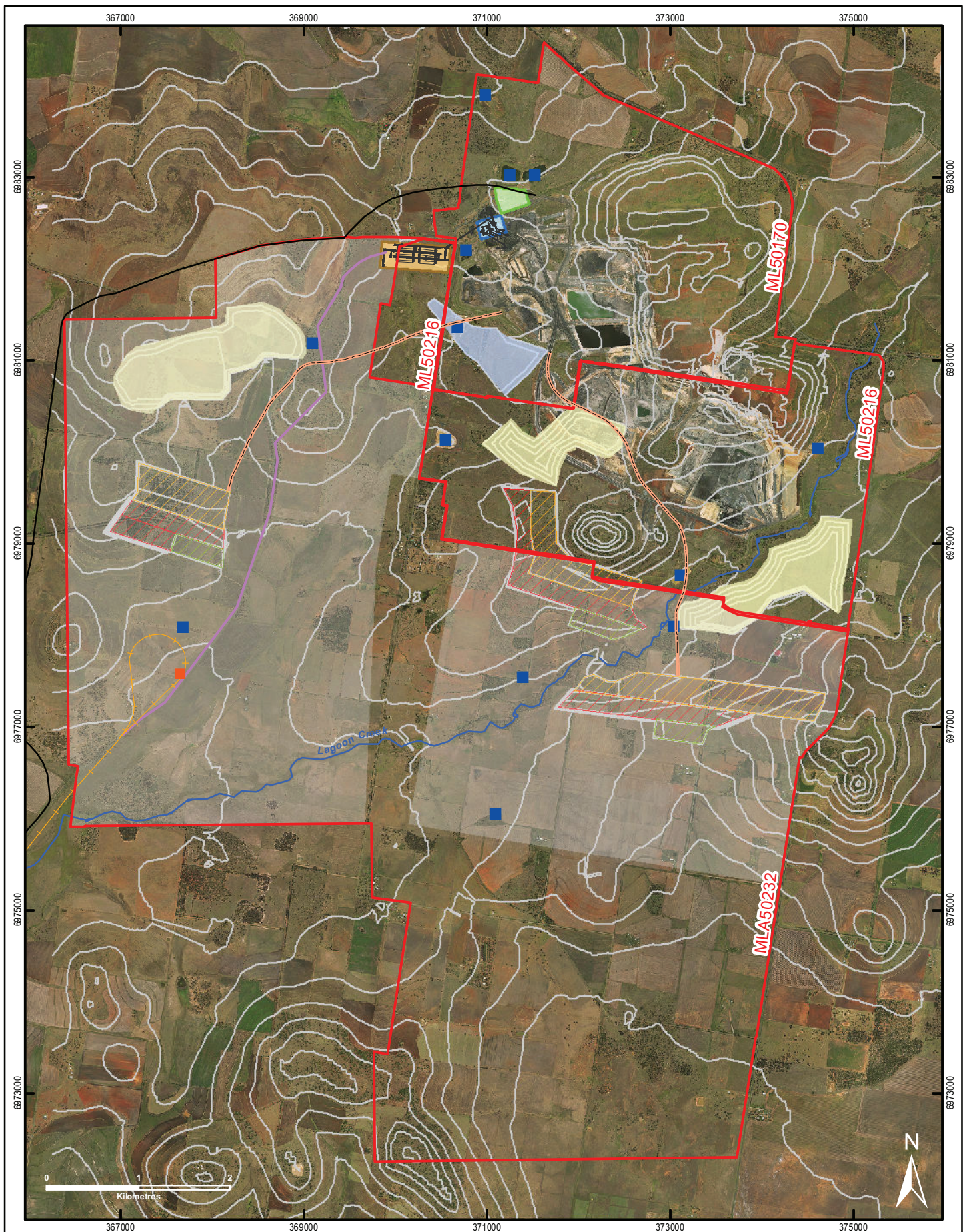
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-11 - Mining Layout 2021

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Dumping Area | CHPP Precinct |
| — Rail Spur | Void Area | Material Handling Facility |
| — Creeks | Pre-Stripping Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Out of Pit Spoil Dumps | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | | |
| — Haulage Route - Pit to ROM | | |
| — Topographical Contours (10m) | | |

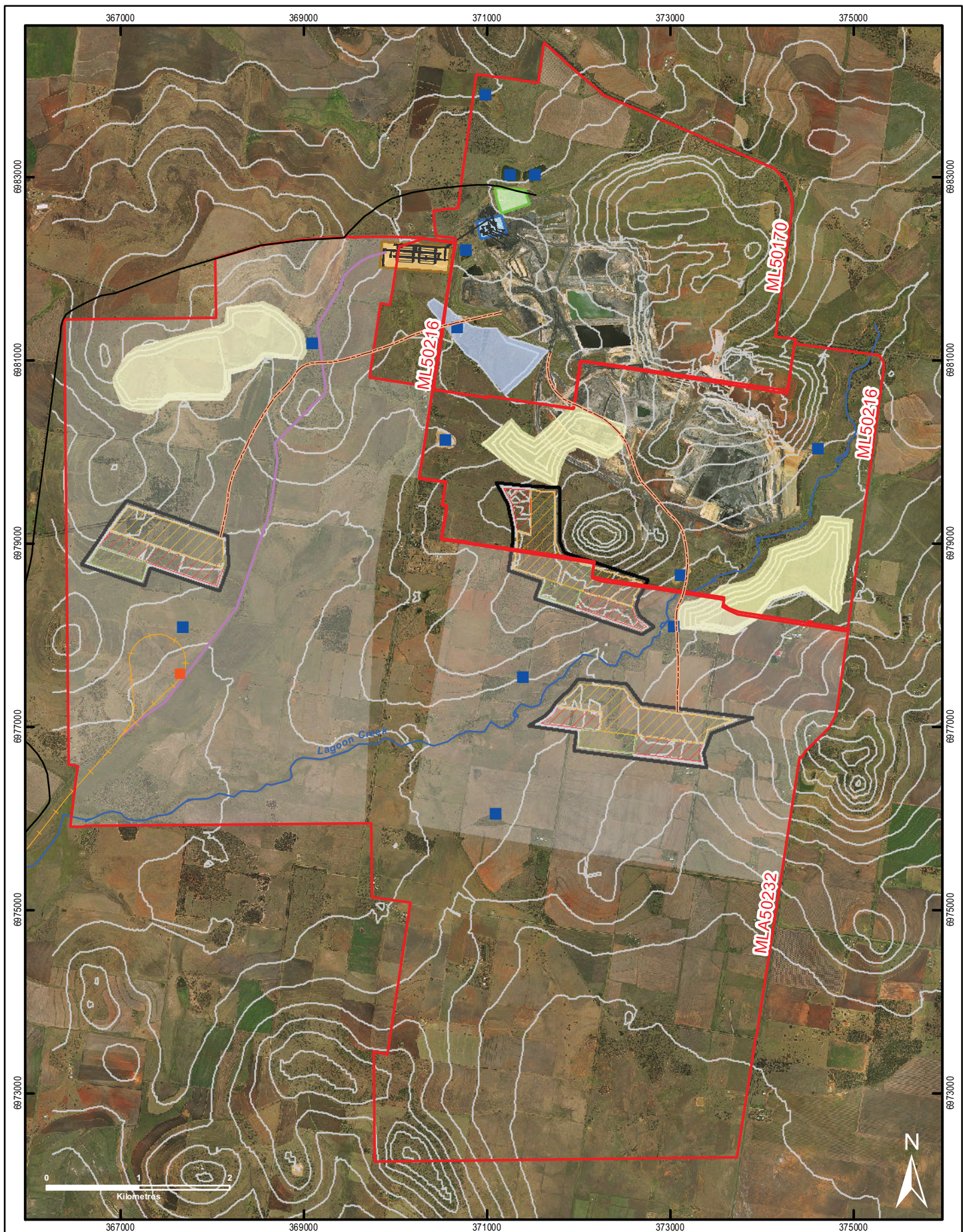
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-12 - Mining Layout 2023

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|--|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Mining Pit Area | CHPP Precinct |
| — Rail Spur | Dumping Area | Material Handling Facility |
| — Creeks | Void Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographical Contours (10m) | | |

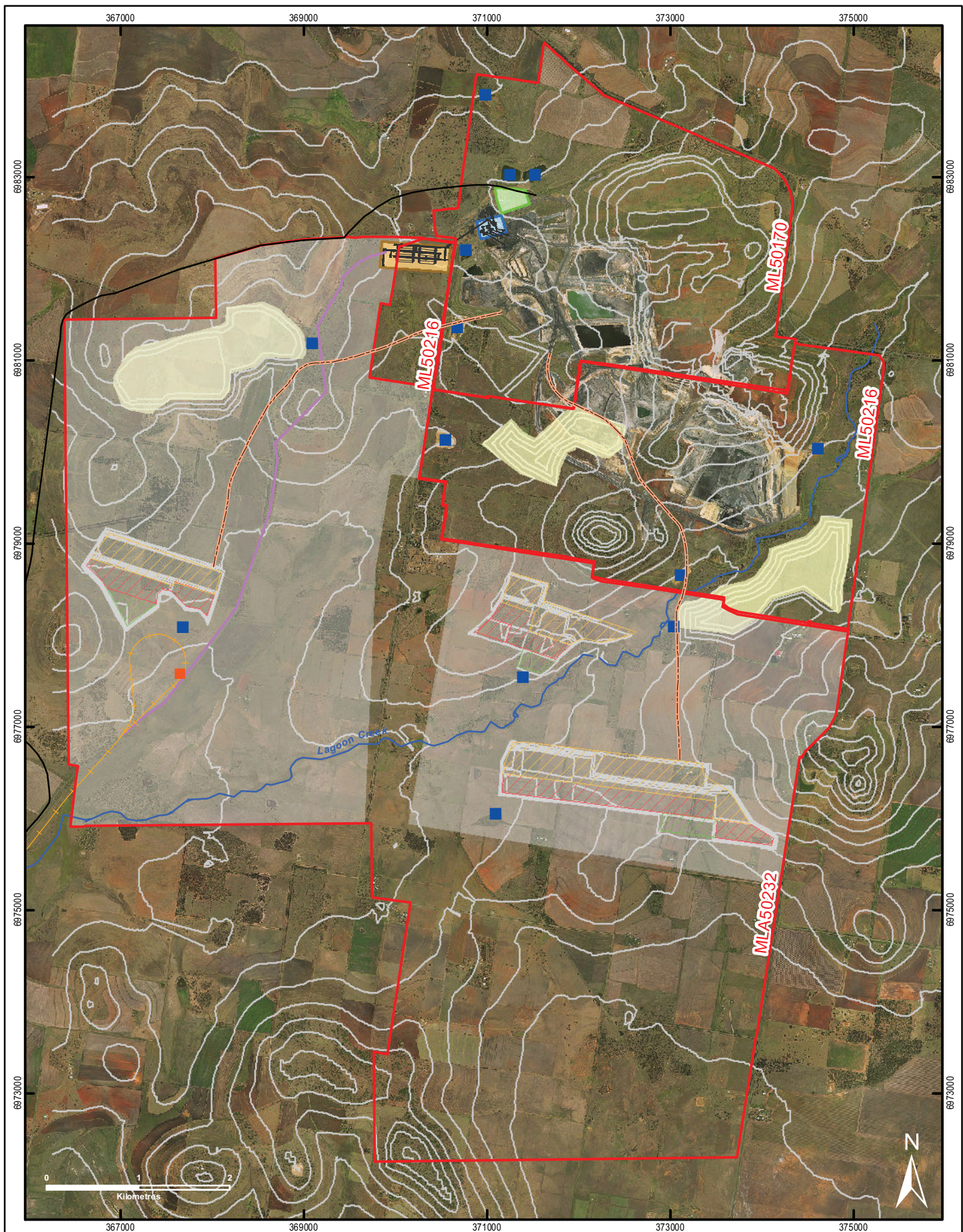
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-13 - Mining Layout 2025

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|---|---|---|
| ■ Train Loadout Facility | Mining Tenements | In-Pit Tailings Storage Facility (ITSF) |
| ■ Dams | Mine Pit Area | CHPP Precinct |
| — Rail Spur | Dumping Area | Material Handling Facility |
| — Creeks | Void Area | Mine Industrial Area |
| — Jondaryan-Muldu Road Diversion | Pre-Stripping Area | Proposed Extent of Surface Rights Area |
| — Internal Road Haulage | Out of Pit Spoil Dumps | |
| — Haulage Route - Pit to ROM | | |
| — Topographical Contours (10m) | | |

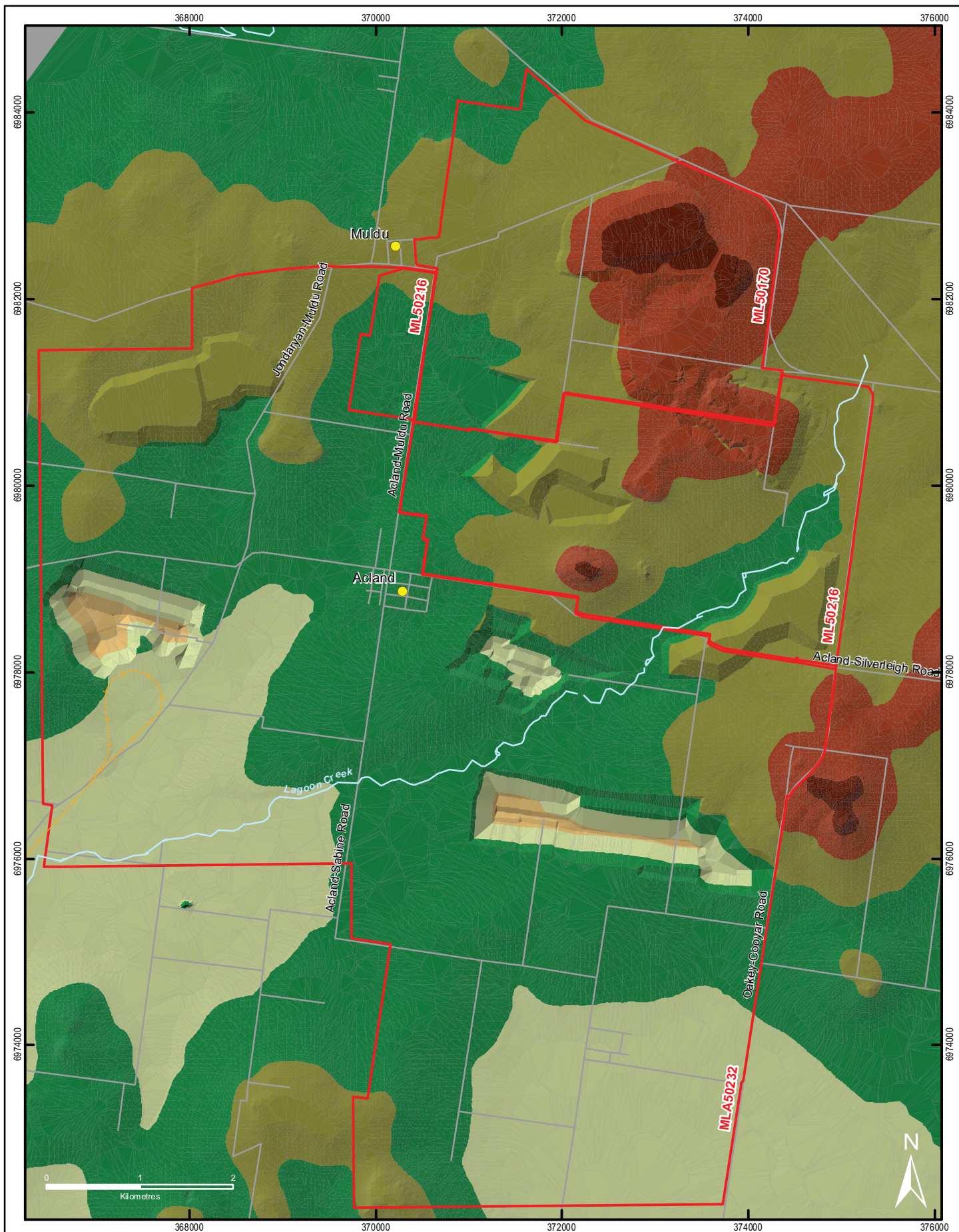
NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-14 - Mining Layout 2029

Scale 1:55,000 on A4
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



LEGEND

- | | | |
|--|--|---|
| ● Towns and Localities | Elevation | ■ 480 - 511 |
| — Rail Spur | ■ 604 - 636 | ■ 449 - 480 |
| — Roads | ■ 573 - 604 | ■ 417 - 449 |
| — Creeks | ■ 542 - 573 | ■ 386 - 417 |
| □ Mining Tenements | ■ 511 - 542 | ■ 355 |



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-15 - Conceptual Final
Landform**

Scale 1:54,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

2.5.3 Out-of-pit Spoil Dumps (Future Elevated Landforms)

The primary objective of the dumping strategy for the revised Project is to backfill voids where practical to reduce the void space remaining at end of the project life. In general, dumping is carried out in-pit. Out-of-pit dumping is kept to a practical minimum and generally only carried out when a box-cut is being developed, or when ITSFs have displaced some of the in-pit dumping volume.

The out-of-pit dumps for the revised Project have been designed based on current dump design principles using geotechnical support to back the design. Previous geotechnical analysis for the Acland operations has shown that the long term dump design should incorporate slopes of no greater than 17 degrees. This is a conservative estimate based on the material being fully saturated. Current NAC final rehabilitated dump slopes are built at 10 degrees where practical, substantially less than the geotechnical recommendations. To date, these slopes have remained stable with no evidence of failure. These rehabilitated dump slopes are being used for a successful on-going cattle grazing trial by APC.

The revised Project's two out-of-pit spoil dumps will be designed based on the following criteria:

- the final spoil dump slopes are battered to between 8.5 and 17 degrees slope angle based on geotechnical and final land use considerations, with a target of 8.5 degrees;
- a 10 m berm will be included at least every 20 m in dump height; and
- water management structures such as contour banks and rock-lined water ways will be constructed as required with respect to the slope length and catchment area of each spoil dump face to be treated.

Figure 2-16 represents a schematic diagram demonstrating the conceptual engineering design parameters for the out-of-pit spoil dumps or elevated landforms.

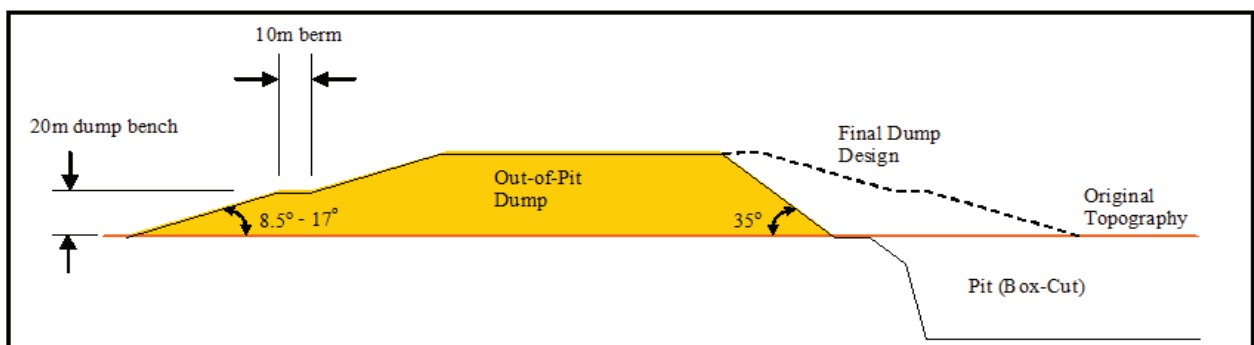


Figure 2-16 Spoil Dump Conceptual Design Plan

The revised Project's out-of-pit spoil dump volumes have been estimated based on operational demands that occur with thin seam mining and the physical parameters such as location and size of the box cuts required to open new mining areas. There are a total of three new mine pits that will be developed during the life of the revised Project and an additional ITSF, which displaces some dumping volume. The estimated volumes for each of the revised Project's box-cuts and corresponding out-of-pit spoil dumps have been estimated and are detailed in **Table 2-1**.

Table 2-1 Box Cut/Out-of-Pit Volumes

Deposit	Parameter	Volume
Manning Vale West	Strip Waste Volume	15.4 Mbcm
	Strip 2 Waste Volume x 50%	6.9 Mbcm
	Total	22.3 Mbcm
	@ 15 % Swell	25.6 Mbcm
Manning Vale East	Strip Waste Volume	14.8 Mbcm
	Strip 2 Waste Volume x 50%	5.6 Mbcm
	Total	20.4 Mbcm
	@ 15 % Swell	23.4 Mbcm
Willeroo	Strip Waste Volume	13.1 Mbcm
	Strip 2 Waste Volume x 50%	7.3 Mbcm
	Total	20.4 Mbcm
	@ 15 % Swell	23.5 Mbcm

NAC's key goal for its elevated landforms is to ensure they can support a sustainable grazing regime as the proposed final land use. NAC will use a targeted monitoring program of accepted rehabilitation success criteria and grazing trials to scientifically assess rehabilitation performance over time and to develop a body of positive evidence to support future surrender of the revised Project's mining leases. The APC and independent third parties will play a pivotal role in this process.

Figure 2-15 presents the locations of the revised Project's out-of-pit spoil dumps.

2.5.4 Void Design and Depressed Landforms

The revised Project's final landform design comprises a two staged approach initially involving the completion of mining activities which will result in a void being created in each of the three mine pits. The second stage involves the backfilling and re-shaping of the voids to create depressed landforms. These stages are described below.

Void Design

The objective of the dumping and in-pit tailings management strategies are to limit the area and quantity of voids that remain once mining has been completed. Based on the current mine design, three voids are planned to remain at the completion of mining, which correspond to the three mine pits that will be operating throughout the life of the revised Project.

The revised Project's three final void areas are planned to be backfilled and reshaped into depressed landforms. As previously explained, the void that remains from the remnants of Glen Roslyn South Pit is planned to be backfilled as part of the box-cut development of the Manning Vale East Pit, and with

coarse rejects. The Glen Roslyn Centre Pit is planned to function as an IPTSF that will eventually be capped with a sustainable cover.

The designed void space that remains at the completion of mining has been based on the following:

- the location of the void aligns with the location of the mine pit as determined by the mine schedule;
- the void area takes into account the areas associated with pre-stripping, coal mining and the adjacent strip partially being backfilled; and
- voids before being reshaped, are based on the highwall slope design of 45 degrees to the top of coal and 65 degrees to mine pit floor, and a low-wall slope design of 25 degrees (average).

In addition, the revised Project's void locations are determined by the mining sequence and the final two to three strip widths remaining as a void at the cessation of mining. The revised Project's estimated final mine pit locations and sizes prior to rehabilitation are provided in **Table 2-2**.

Table 2-2 Final Mine Pit areas before rehabilitation

Resource Area	Size (ha)
Manning Vale West	124
Manning Vale East	111
Willeroo	222
TOTAL PIT AREA	457

Depressed Landforms

To facilitate the rehabilitation of the residual voids, the highwalls and low walls of these voids will be battered down to develop safe, stable and sustainable 'depressed landforms'. The angles for the depressed landforms will be in the order of 10 degrees and match the rehabilitation design angle of the out-of-pit dumps (elevated landforms). At 10 degrees, cattle can safely graze these rehabilitated slopes and therefore, sustainable grazing practices can be employed as the final land use. The estimated rehabilitation volumes for development of the depressed landforms are presented in **Table 2-3**.

Table 2-3 Rehabilitation Volumes for the Depressed Landforms

Depressed Landform Area	Approx Rehab Cut/Fill Volume
ITSF 4 + ITSF 5	0.35 Mm ³
Manningvale West Pit	7.4 Mm ³
Manningvale East Pit	2.0 Mm ³
Willeroo Pit	10.4 Mm ³
Total	20.15 Mm ³

Final Landform

The final landform based on the development of elevated and depressed landforms as at 2029 is presented in **Figure 2-15**.

As an extensive background landowner in the region, the NHG will be commercially driven to ensure this land can support a beneficial and sustainable post-mine land use. Currently, the NHG possesses the same business imperatives for its mining operations within the West Moreton district, near Ipswich, where mine closures are imminent, and as a result, innovative and valuable post-mine land use options and ideas are being contemplated. This knowledge and experience will be a useful planning tool in the future when the revised Project approaches closure.

As a minimum, NAC's rehabilitation efforts for the out-of-pit spoil dumps and depressed landforms will ensure that these locations:

- satisfy statutory requirements for post mine land use;
- are rehabilitated so that the risks to public safety, stock and wildlife are minimised;
- are stable from an erosion perspective after the completion of mining;
- possess a suitable, self-sustaining vegetative cover that is compatible with the agreed final land use; and
- do not adversely impact the downstream receiving environment.

2.5.5 Hours of Operation

Mining activities will be conducted at the Manning Vale West and Willeroo mine pits either on a six day, 24 hr basis or a seven day, 24 hr basis depending on the mining schedule and the type of mining equipment utilised. The Manning Vale East Pit will be closely monitored and managed to satisfy noise, vibration and air quality constraints at Acland and surrounds and may include mitigation steps such as the reduction or cessation of mining operations during heightened sensitive periods. It is envisaged that the Manning Vale East pit blocks closest to Acland will operate on a daytime only basis, unless real time monitoring of key environmental constraints allow otherwise. Certain mining related activities such as blasting will only be undertaken during daylight hrs and not on public holidays and Sundays. The CHPP activities will continue to be conducted on a seven day, 24 hr basis.

2.5.6 Blasting Activities

Blasting will be used to loosen in-situ overburden/interburden to allow more efficient operation of the mining process. Blasting occurs on an ongoing basis with a permanent crew based on-site. On average, blasting will occur once or twice a week during daylight hours in each of the operational mine pits, equating to an average of two to three blasts per week when three mine pits are operating. Over the life of the revised Project, adverse geological conditions (areas of harder in-situ overburden) may be periodically experienced in each operational mine pit, and as a consequence, there may be a corresponding increase in the weekly blast rate of the impacted mine pit or mine pits until conditions improve. Overburden will be blasted at depths from 7 m to 50 m with inter-burden greater than 2 m in thickness also blasted.

2.5.7 Night Lighting

Permanent lights will be located at the CHPP and at the Train Loadout Facility (TLF). General area lighting will be required for the RoM pad and RoM dumping station, reject bin, CHPP modules, warehouse compounds, workshops, heavy vehicle hardstand, product loading and stockpile areas. Low intensity general lighting and safety lighting will be sufficient for the conveyor walkways, administration blocks, light vehicle car park, crib facilities, ablutions block and additional areas such as the water treatment plant, sewage treatment plant and pump pontoons. It is anticipated that LED lighting will be used where practical.

At the TLF, general area lighting will be required for truck discharge into the reclaim hopper and for the rail loading bin. Low intensity general lighting and safety lighting will be required for the area around the bin structures.

Lighting in the mining areas is predominantly mobile lighting plants used to illuminate active work areas, such as mine pit faces, dump areas and haul roads. A proportion of the lighting sources for mining will be situated on highwalls at ground level and mainly directed downwards into the mine pits. Other lighting in mining areas will originate from mobile lighting plants located in the mine pits below original ground level and will contribute to a general glow in the night sky. In-pit machinery and mobile equipment will also contribute to the night time glow. Mobile equipment on the surface, for example, haul trucks carrying spoil and RoM coal, will contribute to both the general glow and direct illumination.

Due to the rural landscape within and surrounding the revised Project site, night lighting is expected to create a glow in the night sky that will be visible from the surrounding region. However, as the Mine already provides some luminance in the night sky, it is unlikely that the revised Project will substantially increase the existing visual impact of night time glow. The impacts on fauna from night lighting are expected to be minimal due to the location and extent of remnant vegetation. NAC will continue to use its 24 hour contact number for near neighbours to allow quick rectification of directional lighting issues from mobile lighting units.

2.5.8 Site Access and Haul Roads

The revised Project's proposed dedicated site accesses for heavy and light vehicles and key internal haulage roads in the context of the surrounding road network are illustrated in **Figure 2-17**.

Access to the revised Project site is proposed via the following routes:

- the re-aligned Jondaryan-Muldu Road will provide access for heavy and light vehicles; and
- the Oakey-Cooyar Road will provide access for light vehicles only.

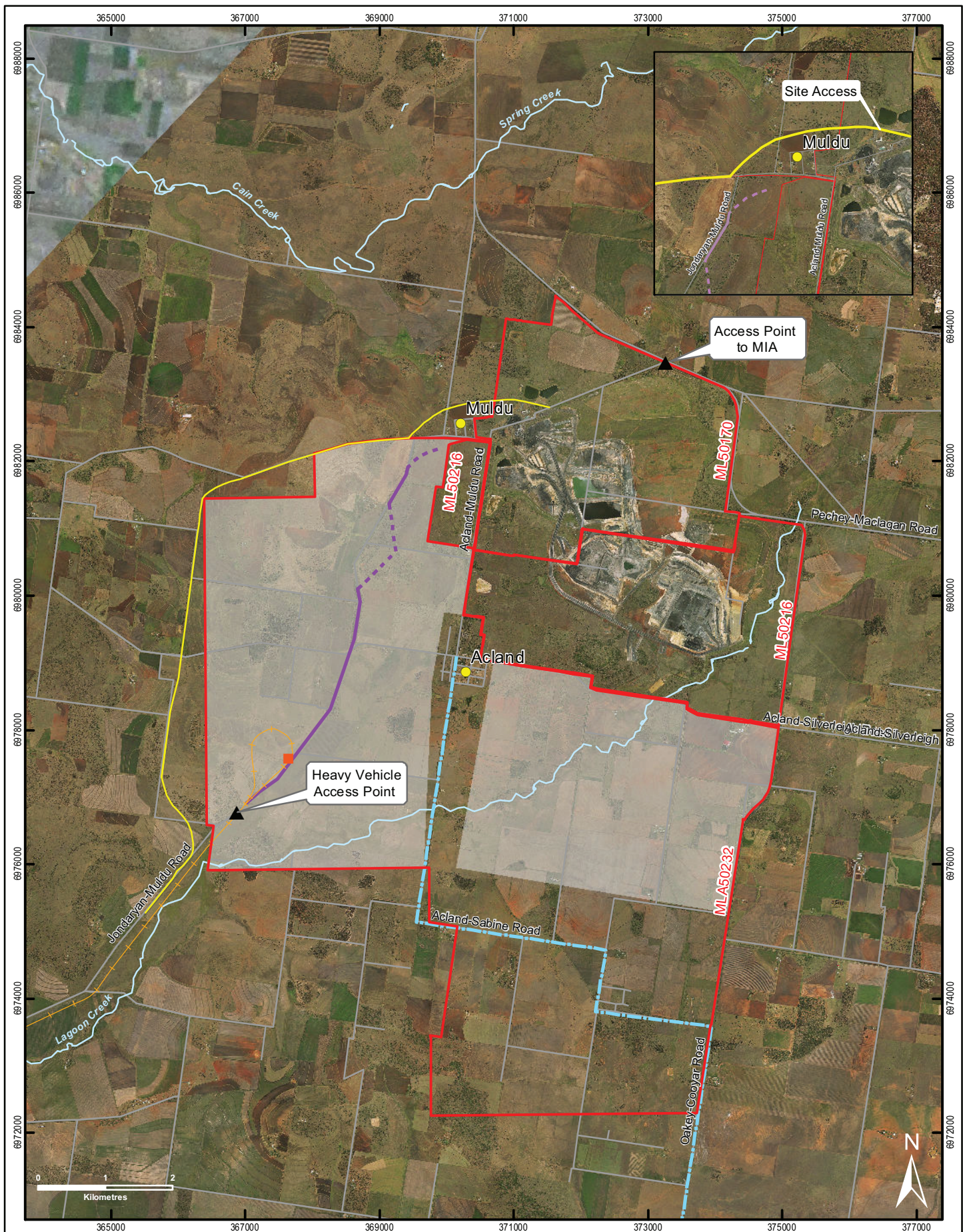
The re-aligned Jondaryan-Muldu Road as shown in **Figure 2-17** runs north-east to the west of the Manning Vale resource area. This re-aligned road will link the revised Project site at Muldu to the Warrego Highway to enable product coal transportation to local customers in southeast Queensland and to allow daily light and heavy vehicle deliveries to the revised Project site for operational purposes.

The Oakey-Cooyar Road will link the revised Project site to the local road network and Oakey and will provide the main access for light vehicles. A dedicated internal light vehicle road network will be designed and constructed to ensure minimal operational conflicts when accessing the revised Project's administration area.

Existing internal access tracks will be used for all mining operations to minimise disturbance areas. Current haul and internal service roads on MLs 50170 and 50216 will be maintained and upgraded as required to accommodate the expansion in mining operations. Access and egress through the revised Project site will be limited to controlled access points only.

The existing Jondaryan-Muldu Road that traverses to the east of the Manning Vale West resource area will be used as an internal haul road connecting the CHPP Precinct within the MIA to the TLF as shown in **Figure 2-17**. The northern section of the Jondaryan-Muldu Road at Campbells Creber Road will be re-aligned to the east of the Manning Vale West resource area to accommodate mining operations. Other new haul and internal service roads will be constructed on an as required basis and where possible will utilise existing tracks within the new mining lease area.

Mine haul roads will follow existing design criteria subject to the requirements of the CSMH Act, including a design speed of 60 km/h, at least 30 m wide and two-way lanes. The maximum grade of the haul roads outside the mine pit areas will be 10 % with a maximum cross fall of 3 %. Safety berms will be constructed in areas where required.



LEGEND

- Towns and Localities
- ▲ Access Point
- Train Loadout Facility
- Rail Spur
- Roads
- Creeks
- Internal Haulage Road Diversion
- Internal Road Haulage
- Access to Acland
- Jondaryan-Muldu Road Diversion
- Mining Tenements
- Proposed Extent of Surface Rights Area

NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-17 - Site Access and Internal Haulage Route

Scale 1:75,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

2.5.9 Road Diversions and Closures

Road Diversions

The existing alignment of the Jondaryan-Muldu Road traverses the eastern portion of the Manning Vale West resource area. Therefore, the construction of the Jondaryan-Muldu Road realignment is critical to allow NAC access to the Manning Vale West resource area under the current mine plan.

The re-aligned section of Jondaryan-Muldu Road will follow existing road reserves and traverse property owned by APC as illustrated within **Figure 2-17**. The re-aligned Jondaryan-Muldu Road will remain a public road under TRC control and will provide the primary heavy vehicle and secondary light vehicle access routes to the revised Project site.

NAC possess sufficient base materials for the construction of the proposed road diversion to support a high mass road for heavy vehicle transport. Works associated with the construction of the road re-alignment are expected to start during 2015 to coincide with the grant of MLA 50232.

The existing alignment of the former Cherrys Road runs from Oakey-Cooyar Road and traverses north of the MIA site. Currently, the former Cherrys Road intersects with the internal haulage road which provides access to the revised Project site. As a future dedicated light vehicle access route, the realignment of Cherrys Road will be independent of the internal haulage road system. The following internal access roads are proposed along the realigned Cherrys Road during the operation phase of the revised Project as shown in **Figure 2-17**:

- Car Park Access Road - provides light vehicle access to the car park facility adjacent to the MIA; and
- Service Road - provides access for services vehicles entering the MIA and CHPP Precinct.

The former Cherrys Road will be an internal access road under NAC control and will be used as the primary light vehicle access route from the Oakey-Cooyar Road to the MIA and the car park facility for the revised Project site.

Road Closures

Table 2-4 and **Figure 2-18** outlines the road closures required within MLA 50232. All road closures will be implemented on permanent basis for the life of the revised Project.

Table 2-4 Proposed Road Closures

Road	Sections	Closure reason
Acland Road	Between the re-aligned Jondaryan Muldu Road and western boundary of Acland town	Mining area
Acland Road	Between the Oakey-Cooyar Road and the eastern boundary of Acland town	Mining area
Acland-Muldu Road	Between Francis Street and Muldu Road	Mining area

Road	Sections	Closure reason
Bothams Road	Between Acland Sabine Road and Greenwood School Road	Mining area
Campbells Creber Road	Between the existing Jondaryan Muldu Road and Acland Muldu Road	Mining area
Conroys Road	Between the existing Jondaryan Muldu Road and Acland Sabine Road	Mining area
Cookes Road	Between existing Jondaryan Muldu Road and Acland Brymaroo Road	Re-alignment of Jondaryan Muldu Road
Greenwood School Road	Between Acland Road and Bothams Road	Mining area
Jondaryan–Muldu Road	North of Cookes Road to Muldu Road	Re-alignment of proposed Jondaryan Muldu Road
McLaughlins Road	Between existing Jondaryan Muldu Road and Osheas Road	Mining area
Osheas Road	Between the existing Jondaryan Muldu Road and the realigned Jondaryan Muldu Road	Re-alignment of Jondaryan Muldu Road
Willeroo Mine Road	Between Acland Sabine Road to Acland Road	Mining area
Woods Road	First section that runs West-East from the existing Jondaryan Muldu Road	Mining area

These road closures are scheduled to be implemented concurrently once the realignment of Jondaryan-Muldu Road is completed and MLA 50232 is granted.

2.5.10 Workforce Arrangements

Construction Phase

The revised Project at peak construction on-site is expecting up to require 260 construction workers at any one time. Apart from periodic peaks for major tasks, the construction workforces will fluctuate over the proposed 26 month construction phase. Construction tasks will require skilled and unskilled labour. NAC's intention is to utilise local employment options where possible, but will also require employment from outside the region for certain specialised construction jobs.

No construction camps will be located on-site during the construction phase of the revised Project. Generally, construction workers will be expected to source their own accommodation.

Mining and construction personnel will travel to and from the revised Project site based on their specific working arrangements. Importantly, the arrival and departure times for mine and construction workers will be staggered by at least half-an-hour to minimise traffic and other interactions.

Transport of personnel to and from the revised Project site will be undertaken by private vehicles, nominally from the nearby towns of Oakey, Jondaryan and Toowoomba.

Operational Phase

The revised Project at a production rate of 7.5 Mtpa will require up to 435 people. The Mine currently employs approximately 300 people. Therefore, an additional 135 people will need to be employed before the 7.5 Mtpa production rate can be achieved. Workforce numbers will steadily rise during the life of the revised Project to allow the planned production rate to be maintained while overburden removal requirements increase.

The new employees will either be sourced locally or further abroad depending on the position's skill requirements and whether job related knowledge and skills can be gained through internal training. The use of local people for employment is not expected to put an additional burden on the region's accommodation resources. The revised Project's staged ramp up in production may also help reduce the demand curve for additional accommodation.

New people moving to the region for employment by the revised Project possess the option of residing in several regional centres, such as Toowoomba, Oakey and Jondaryan. Currently, approximately 45% of the existing workforce permanently lives in Toowoomba. Therefore, it is expected that a majority of new employees will follow this trend. As a result, approximately 58 additional people are likely to take up accommodation in Toowoomba. The remaining new employees seeking permanent accommodation are likely to take up accommodation in Jondaryan, Oakey or the surrounding district. Currently, 35% of the workforce permanently resides within Jondaryan, Oakey and the surrounding district. This trend would represent approximately 45 additional people seeking permanent accommodation within Jondaryan, Oakey or the surrounding district. The remaining 20% of the workforce reside in Warwick, Goondiwindi, Kingaroy and surrounds and may reside within the TRC area during their working shifts and return to their permanent residence on their off shifts.

2.6 Mine Infrastructure and Facilities

2.6.1 Overview

The associated mine infrastructure requirements for the revised Project includes the existing infrastructure located mainly on ML 50170, a new infrastructure area on MLA 50232 and the off-site infrastructure for coal transportation.

The existing infrastructure on ML 50170 comprises an administration area, workshop and washdown bay, fuel storage area, two process water dams, two CHPP modules, RoM stockpile pad, product stockpile pad, stacking and loading facilities, access roads, a series of licensed water bores, a number of water management structures, a former out-of-pit TSF (under rehabilitation), and an operational ITSF.

The essential infrastructure required to facilitate mining for the revised Project will comprise:

- a construction period from 2015 to 2017, initially involving the construction of site access, a rail spur and balloon loop, roads (including re-alignments), water management structures and additional supporting infrastructure;
- upgrade of the existing CHPP Precinct, including a new processing module, RoM and product coal stockpile areas, RoM 1 and RoM 2 Upgrades to handle 180 t class haultrucks and supporting infrastructure on ML 50170;
- continued use of tailings disposal within ITSFs progressively located within active mine pit area;
- continued use of raw water supply from the WWRF within Toowoomba via an approved and operational 45 km pipeline;
- continued use of a mine surface water management system involving various water management structures staged to accommodate the progressive development of the Mine and based on the principles of diverting clean water and capturing and reusing dirty water from disturbed areas;
- upgrades to the existing administration and heavy vehicle maintenance area on ML 50170;
- relocation and potential upgrade of the current power supply;
- diversion of the Jondaryan-Muldu Road around the Manning Vale West resource area;
- decommissioning of the JRLF;
- construction of a new 8 km rail spur line and balloon loop from Jondaryan onto MLA 50232;
- construction of a new MHF and TLF within MLA 50232;
- relocation and potential upgrade of the existing local telecommunication network; and
- relocation of the mine 33 kV power supply and the district 11 kV power supply ring feeder power line.

The majority of the new infrastructure requirements will be located on MLA 50232 and are expected to be designed and constructed between 2015 and 2017.

An area of approximately 178 ha is required for construction and operation of the revised Project's new infrastructure on MLA 50232 such as the expanded CHPP Precinct, haulage routes, MHF, MIA,

Rail spur and balloon loop and TLF. The proposed construction site is located near the Lagoon Creek flood plain and as a result, possesses a relatively flat topography. The proposed construction site is located on a grazing and dryland cropping area and as a consequence, is relatively devoid of trees. The revised Project's planning process has not identified any significant issues that require specialised attention in relation to the earthworks requirements. Clay material and hard rock will need to be imported from other areas within the Study area for dam construction and possibly for foundation preparation.

Construction of the associated infrastructure is proposed to be conducted between 6 am to 6 pm, Monday to Saturday with Sunday available for overtime on specialist tasks. Certain critical path activities such as large concrete pours or commissioning of plant and equipment may require 24 hour operation for a short period.

2.6.2 Tailings Management

The current tailings strategy that is being utilised on-site involves progressive construction of in-pit tailings cells as part of the dump design. This approach will continue to be practised for the revised Project, with the concept of utilising out-of-pit tailings dams being unfavourable.

By constructing an ITSF, a portion of the dumping volume is displaced, and as a result, a quantity of the excavated material has to be hauled a greater distance than under an out-of-pit tailings management regime. Currently, three ITSFs have been constructed and certified within the North Pit of the Mine. These are namely ITSF 1, ITSF 2/1 and ITSF 2/2. Current estimates have identified that these storages will reach capacity in 2014 which equates to approximately 1.4 Mm³.

Work is currently progressing with a design of ITSF 3 which is planned be located at the junction between the North and Centre Pits of the Mine. Preliminary designs have shown that the likely storage capacity available for this ITSF is in the order of 3.8 Mm³. The combined storage capacity for these nominated ITSFs will have sufficient storage capacity until approximately mid-2017 at the current production rate of 4.8 Mtpa of product coal. On completion of mining within the Centre Pit, the tailings management strategy plans to backfill the Centre Pit's residual void with tailings, which possesses two distinct advantages. It provides additional tailings storage capacity without displacing dumping volume and allows partially backfilling a void which under an out-of-pit tailings management regime would have ordinarily not been backfilled. ITSF's will be operated in conjunction with each other, all with decant areas constructed to reclaim water for use in the CHPPs to ensure their operational life is as long as practically achievable.

The availability of the Centre Pit void in terms of timing is slightly beyond when additional tailings storage is required. Therefore, a fourth ITSF is likely to be required prior to the Centre Pit's residual void being available. The logical place for ITSF 4 is at the south eastern end of the Centre Pit. Currently, the progression of mining within the Centre Pit in a southerly direction using an west to east stripping orientation. Once mining reaches the southern extent of the Centre Pit, the mining strips will then be re-oriented to run strips north to south as mining progresses in a westerly direction to consume the remainder of the Centre Pit reserves. With this change in mining direction, it leaves the last southerly strip mined as a potential void. This void could partially be backfilled by the next north-south mining strip. However, this situation will conveniently create an opportunity to construct a new

ITSF. This ITSF can essentially be made as large as is required. Despite this fact, consideration will be given to the available dumping volume that exists in the immediate area for the remainder of the Centre Pit waste. The current out-of-pit dump design has taken this into consideration and the likely tailings storage volume that can appropriately be attributed to ITSF 4 is in the order of 7.9 Mm³.

The advent of ITSF 4 provides sufficient storage capacity up to mid-2023. Subsequent to this arrangement, the Centre Pit's residual void will be utilised for tailings storage. Based on the four ITSFs, combined with the use of the Centre Pit void as ITSF5, there is sufficient capacity to hold the tailings produced by the revised Project. **Table 2-5** shows the estimated volumes for tailing storage, with **Figure 2-19** showing the location of these ITSFs.



LEGEND

- Towns and Localities
- Mining Tenements
- In-pit Tailings Storage Facility
- Roads



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-19 - Location of In-Pit Tailings
Storage Facilities**

Scale 1:40,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

Table 2-5 Tailings Requirements and Storage Capacities for the revised Project

Tailings Requirements for the period 2013 to 2029*	
RoM Tonnes Washed	185 Mt
Product tonnes Produced	96 Mt
Reject Tonnes	89 Mt
Proportion of Reject that are fine tailings	30%
Tailings Tonnes Produced	26.7 Mt
Tailings Density #	1.3 t/m ³
Tailings Volume Produced	20.5 Mm ³
Tailings Storage Capacities	
Remaining tailings storage capacity ITSF 1 and 2	1.4 Mm ³
Design Capacity for ITSF 3	3.8 Mm ³
Estimated Design Capacity for ITSF 4	7.9 Mm ³
Estimated Available Volume for Centre Pit Void	8.6 Mm ³
Total Current Estimated Storage Capacity Available	21.7 Mm ³

Typical underflow densities at 25-30% solids = 1.15-1.18 t/m³. After settling and water is removed, assume 50% solids, therefore density = 1.3 t/m³.

* Note that tonnages above include coal mining and processing that will occur from 2013 until commencement of the revised Project

Water Usage

The volume of water required to be imported to the revised Project site for use for coal washing purposes and dust suppression on-site, varies depending on a range of factors including rainfall/runoff and groundwater inflow within the active mine pits. However, based on long term data, the average water usage for the revised Project is summarised in the **Table 2-6**.

Table 2-6 Site Water Usage

Type of Water Usage	Water Use (L/RoM tonnes)
Wash Plant Usage	550
Pit Dust Suppression Usage	45
Return Water + Groundwater + Rain Collection	- 375
Raw Water Requirements	220

Although, over the short term the net water imported onto the revised Project site will fluctuate, the long term water usage is approximately 220 L/RoM tonne. The revised Project will produce approximately 15 Mt of RoM coal each year. This equates to a water requirement of approximately

3.3 Gl/yr. Coal washing activities will be conducted in the order of 7,500 hrs per year. The quantity of water required for the revised Project will be via the WWRF, with current take or pay contracts available for up to 5.5 Gl/yr.

2.6.3 Mine Industrial Area

The revised Project will require the following infrastructure to be upgraded within the MIA to facilitate mining at the higher production rate.

Figure 2-20 shows a conceptual layout of the upgraded mine infrastructure area for the revised Project. The majority of the upgraded facilities are planned to be constructed and assembled on-site using masonry and prefabricated framing with some building elements being manufactured off-site.

Administration/Bathroom Building

The existing low set brick veneer building currently provides offices for approximately 40 staff and lockers and ablution facilities for 250 staff with a sealed car park adjacent to the building that caters for staff and visitors. An additional 135 staff will be required for the mine expansion of up to 7.5 Mtpa.

The office component of the building contains a reception area, offices, training rooms, crib rooms and a pre-start area. The additional staff numbers will primarily be for operations with minimal increases in administration staff. As such, expansion of the building is required to accommodate for an additional ablution and locker facilities and a training/pre-start room.

The building will be extended by approximately 300 m² to provide additional showers, toilets and clean & dirty lockers for the additional 135 operational staff. The extension to the building will be constructed in accordance with the National Construction Code of Australia 2011.

Carpark

The existing sealed car park is currently not fully utilised. An extension of the carpark will be required for an additional 60 vehicles. This will be sufficient to cater for the 80 additional vehicles expected as a result of the additional 40 person shift change over.

Heavy Vehicle Workshops

The existing Heavy Vehicle Workshop comprises a concrete slab foundation, steel portal frame construction and consists of two large vehicle bays with two overhead cranes, four small vehicle bays, welding bay, lube storage and warehousing area which incorporates a mezzanine level with offices. This current configuration services the truck and grader fleet and other mobile plant and equipment.

The fleet for the revised Project will involve the replacement over time of the smaller 180 t Rear Dump Trucks for the larger 220 t Rear Dump Trucks. The loaders will also be upgraded to the larger 900 kW Wheel Loaders. The current number of four smaller workshop bays is considered to be sufficient to cater for the 20 bulldozers and loaders required for the revised Project based on a service ratio of 1:7.

The truck fleet will be expanded to approximately 27 vehicles. The current two large workshop bays will not be sufficient to cater for the increase, and based on a service ratio of 1:7, an additional two heavy vehicle workshop bays will be required. The workshop will consist of a concrete slab foundation, steel portal frame construction with a metal roof and wall claddings, similar to the current workshop configuration. The new workshop expansion will include extra maintenance bays, overhead crane, roller doors to one side and suitable vehicle clearances. The services will be plumbed into the potable water supply, sewerage systems, power supply, fire management system and will possess appropriate storm water management controls. The building will comply with the National Construction Code of Australia 2011. A new lube storage area will also be constructed to service the new workshop bays.

Warehouse

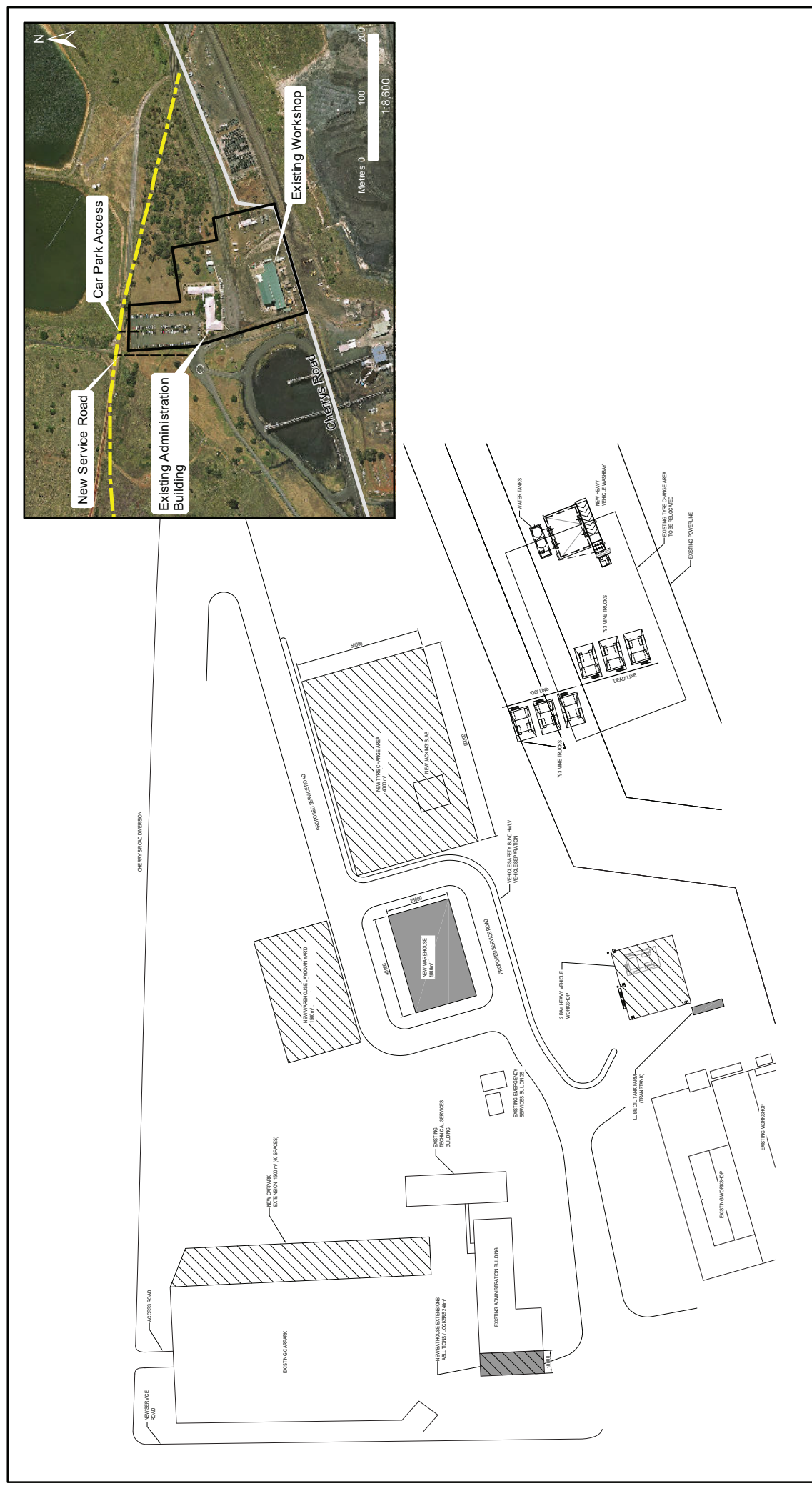
The current warehouse is not adequate to meet the needs of the revised Project. A new warehouse of approximately 1000 m² is planned to be constructed. A secure lay down area of approximately 1500 m² will be provided that is directly linked to the warehouse.

Wash Bay

A new wash bay is to be constructed to the west of the proposed new workshop (currently used as tyre storage) that can cater for 220 t class trucks. All water supply and waste water services will be provided to cater for this new facility.

Tyre Change

A new tyre change area of approximately 4,000 m² with a new concrete jacking slab will be provided to the north of the current tyre storage facility.



**NEWACLAND COAL MINE
STAGE 3 PROJECT**



Projection: Australian Geodetic Datum – Zone 56 (AGD84)

2.7 Associated Infrastructure Requirements

2.7.1 Sewerage Treatment

The existing package Sewage Treatment Plan (STP) 1 is operating at capacity to cover 460 equivalent persons and is planned to remain in operation for the Mine. Treated effluent from STP 1 drains to the existing Sediment Dam (SD) 1. NAC's current EA allows for the use of water from SD 1 for dust suppression purposes. To date, this practice has not been a common occurrence due to the minimal discharge from STP 1 and the normally low water levels of SD 1.

NAC will require construction and operation of a new STP, namely STP 2 for the revised Project. The capacity of STP 2 is expected to be up to 250 equivalent persons. Any reuse or disposal of treated sewage effluent will be authorised by the revised Project's EA to ensure protection of the health and wellbeing of people and the environment on and off the revised Project site.

2.7.2 Power Supply

Preliminary assessments indicate that the relocation and rebuilding of the existing 33 kV power line may be the most efficient option. Oakey has recently received a power upgrade and now possesses a 110 kV power line, which will facilitate the revised Project's upgraded power requirements. The preferred line route is illustrated in **Figure 2-21**.

NAC is in discussions with Ergon Energy to assess the revised Project's power requirements and NAC's future role as a 'high voltage' customer. Importantly, NAC must relocate and rebuild the existing domestic 11 kV power line which supplies Acland and the surrounding areas to ensure continuity of supply for the remaining domestic and agricultural users. The 11 kV power line is dual feed ring main.

The Mine's current power requirement is 5 MW/5.7MVA per annum. A high level design demand calculation has estimated the power demand to increase to 12.6 MVA per annum based on 7.5 Mtpa full production. During the construction phase, the CHPP Modules 1 and 2 will be the revised Project's main power consumers until the CHPP Module 3 is fully integrated into the coal production process.

The new power supply system is required to integrate with the Mine's power reticulation network. Some existing 11 kV and 33 kV lines will be removed as part of the mine expansion. The 11 kV network will be augmented so that power supply to local consumers is not affected. Underground cable will be installed in areas where the placement of an overhead line could impede traffic.

Ergon Energy Network

NAC is currently a 'low voltage customer' in terms of its network connection. As a low voltage customer, all high voltage (HV) assets are owned, operated and maintained by Ergon Energy and revenue metering is located at each main LV switchboard. The increase in load for the revised Project will require that NAC becomes a 'high voltage customer'. As part of the transition to a high voltage customer, NAC has determined that all loads will be supplied by the 33 kV system.

33kV Reticulation

All mine loads are to be fed from the 33 kV system. Any loads that are currently supplied from the 11 kV system and are still required for the revised Project will be diverted to the 33 kV system. The 33 kV Acland coal feeder line is currently owned and maintained by Ergon Energy. This feeder line originates in the Oakey Zone Substation with NAC being the only customer on the overhead line. The feeder line is predominately an overhead line for the 23.1 km route to the existing CHPP Modules 1 and 2. There is a 2.1 km section of cable for the underground traverse through the army base immediately north of Oakey.

The existing 33 kV overhead line enters MLA 50232 along the Oakey-Cooyar Road. The overhead line then traverses west along Acland Road before turning north along Acland-Muldu Road to the CHPP Modules 1 and 2.

Currently the 33 kV overhead line supplies power to substations feeding the Pond Return Pumps, and Out-of-Pit Tailings Pumps along the Acland-Muldu Road. The line then splits via two pole-mounted reclosers adjacent to CHPP Modules 1 and 2. One recloser supplies power to 33/0.433 kV substations at CHPP Modules 1 and 2 and the other recloser provides power to the workshop 33/0.433kV substation. The workshop substation supplies the MIA, the Wetalla terminal valve and controls, the truck weighbridge, as well as a number of pumps.

The 33 kV overhead line is extended from the intersection of the Acland and Oakey-Cooyar Roads, around the northern side of MLA 50232 and down the Cherry Road easement. A new OHL/cable termination pole would be installed near the existing WB14 supply transformer PE12007. The installation of underground cabling to supply the MIA will not impede any MIA traffic movement. The power cable would terminate at a new 33 kV metering point substation located near the existing CHPP Modules 1 and 2 pole-mounted reclosers. The reclosers would be removed following installation of the permanent HV metering point substation. The proposed arrangement includes a local isolation point for when Ergon Energy personnel require access to the metering unit.

The power supply would be distributed to the CHPP Precinct and the TLF area via a new 33 kV Switchroom Building located beside the new HV metering point. The building would house 33 kV switchgear and auxiliary equipment.

Power would be distributed to the TLF area via a new 11 km 33 kV overhead line installed along the realigned Jondaryan-Muldu Road. The proposed installation would use underground cable for the first 300 m from the new 33 kV switchroom so that access to any rail or other loading facilities would not be impeded by an overhead line.

A new 110 kV substation was constructed in 2009 to reinforce the Oakey power supply network. The estimated maximum 3-phase fault level is therefore not expected to exceed 2 kA. The fault level is quite low and is considered to be not a key driver for primary equipment in the proposed supply arrangements for the revised Project.

11 kV System

An Ergon Energy 11 kV overhead line installed along Acland-Muldu Road supplies several pumping loads. The Water and Sewerage Treatment Plants, Southern Borefield and the existing pumping station are all supplied by the Ergon Energy 11 kV system.

Where mining activity progresses south of this plant, decommissioning and removal of some 11 kV circuits will be required. The installation of a short extension to the overhead line will be required to maintain power supply to local consumers. It is proposed that a 1.5 km section of overhead line be installed to connect the local consumers to the Nungil Road Feeder system.

Site Reticulation Arrangements

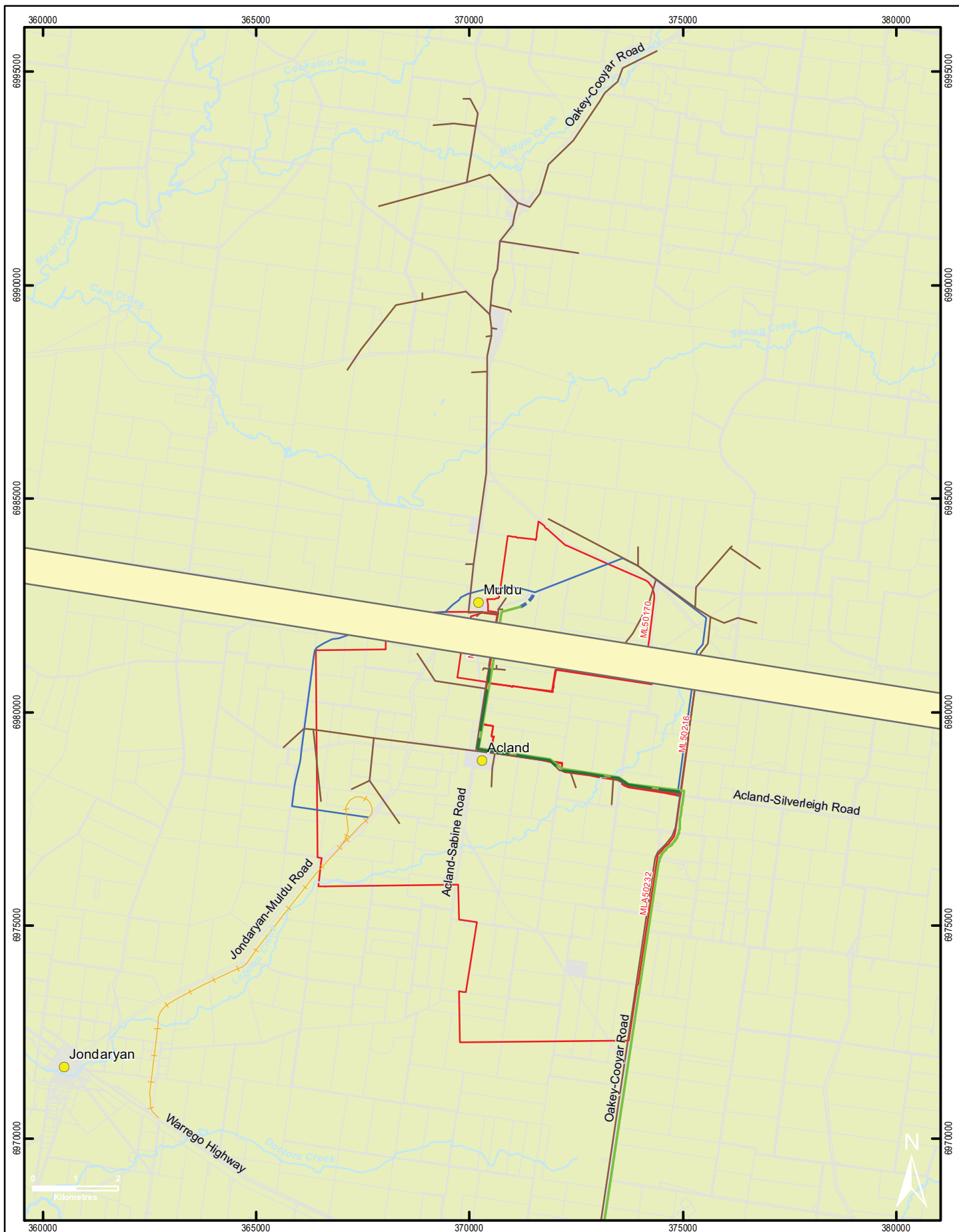
Power will be reticulated to CHPP Module 3 and the site amenities using underground cabling and a ring main unit (RMU) system. Typically, 33/0.433 kV transformers will be installed at strategic locations to supply site amenities, and low voltage power reticulated via underground cabling ducts to local distribution boards.

Minor modifications to the existing site power reticulation may include a new cable connection from the existing RMU feeding CHPP Module 2 to the new 33 kV Switchroom. This modification would create a ring feed for CHPP Modules 1 and 2 to improve the security of supply. The new workshop and additional MIA facilities will be supplied by upgrading the existing workshop transformer. This upgrade will remove the requirement for a new 33 kV substation to be established and new 33 kV reticulation system. The existing 1 MVA transformer is operating near capacity. Therefore, a replacement 2 MVA unit will be required to provide additional capacity to meet power demand of the existing and new loads.

The pumping loads along Acland-Muldu Road will be supplied via a cable connection from the new 33 kV Switchroom to the existing 33 kV overhead line. New 33 kV transformers and line fittings will be required for the Water Treatment and Sewerage Plants, and Southern Borefield, which are currently supplied at 11 kV.

Other Mine Loads

The existing mine fleet is all diesel powered. All other mine loads including crib huts, mine road lighting, telemetry and some pumps are powered by standalone diesel and/or solar generators. Additional power reticulation by new overhead line or underground cabling is not expected to be required for the revised Project.



LEGEND

- | | |
|------------------------------|---------------------|
| ● Towns and Localities | — New 33kV OHL |
| — Roads | — 33 kV Underground |
| — Rail Spur | — Mining Tenements |
| — 11kV Existing OHL | — Cadastre |
| — 33 kV Existing OHL | |
| — 33 kV OHL to be Dismantled | |
| — Removed | |



NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 2-21 - Preferred Power Supply Routes

Scale 1:118,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

2.7.3 Revised Project Construction Activities

Construction will commence following the grant of the main environmental and mining approvals. The majority of the revised Project's construction activities will focus on the:

- CHPP Precinct and materials handling facility;
- existing MIA;
- new TLF; and
- Jondaryan-Muldu Road.

Construction is planned to commence in 2015 with site setup and pre-construction activities. Construction of the CHPP Module 3, MHF, MIA, TLF and associated infrastructure will commence construction in the year 2015. The construction period is expected to be in the order of 26 months, with the majority of construction work occurring between 2015 and 2017. Construction of the associated infrastructure is proposed to be conducted between 6 am to 6 pm, Monday to Saturday with Sunday available for overtime on specialist tasks. Certain critical path activities such as large concrete pours or commissioning of plant and equipment may require 24 hour operation for a short period.

After construction, the contractors will be required to clear all construction waste and equipment. Any disturbed areas that are not proposed to be utilised during operational activities will be rehabilitated.

2.7.4 Pre-Construction and Mine Development

The pre-construction phase of the revised Project includes the collection of information required for the detailed design phase of the revised Project. Activities which will be carried out include:

- geotechnical investigations to assess ground conditions and enable detailed design of all infrastructure and structures associated with the revised Project;
- soil investigations to assess the potential for competent materials present on-site; and
- geological exploration activities, including continued drilling to further define the coal resources associated with the revised Project.

These activities will be carried out under existing approvals and managed under the NAC's Safety and Health Management System and Environmental Management System to ensure all health and safety and environmental risks are identified and managed.

Facilities and infrastructure associated with the mine includes the MHF, MIA, CHPP Module 3, water management infrastructure, road diversion and closures, a new TLF and upgrade of the power supply to the revised Project site.

In general, the construction of this infrastructure will occur in three stages:

- site preparation;
- civil works; and

- building and construction works.

To manage and facilitate the construction of the revised Project infrastructure, temporary facilities, including offices, will be constructed close to the work centres such as the MIA. The facilities will be located within the construction footprint or previously disturbed areas. Specific laydown and assembly areas will be identified in the contractor's construction management plan. Fuel used during the construction phase will be temporarily stored in bunded facilities within the construction lay down area.

2.7.5 Site Preparation

If required, the clearing of vegetation will be undertaken prior to infrastructure construction within the MHF, MIA, CHPP Module 3, TLF and rail spur and balloon loop areas. Once the vegetation has been cleared, topsoil will be stripped and stockpiled for use in rehabilitation. Site clearance will be staged to minimise the time of exposure of disturbed areas and degradation of topsoil. Plant and equipment involved in site clearance activities will include, but not be limited to excavators, dozers, graders and water carts. All site vehicles and equipment will be properly serviced and maintained. A detailed construction equipment list is provided in **Section 3.9.5**.

2.7.6 Civil Works

Civil works will generally occur early in the construction phase and will include, but not be limited to:

- civil earthworks, including piling and foundation construction;
- installation of permanent and temporary drainage and water storage structures;
- trenching and laying of reticulated services and any other underground pipelines and services;
- providing all weather pavements for all roads and vehicle parking;
- hard stand construction; and
- re-vegetating embankments, disturbed areas and open channel drains.

Hard stand areas will be constructed according to relevant design criteria, and include items such as building construction pads, hard stands for the CHPP Module 3, RoM pad, MHF, TLF, rail spur and balloon loop, car park areas, and workshop areas.

Excavations will occur during construction for most infrastructure components of the revised Project. In particular, bulk earthworks will be undertaken within the TLF, rail spur and balloon loop and CHPP Precinct. Where the excavated material has properties suitable for engineering purposes, it will be used as bulk fill, road sub-base, construction material for lay down areas and foundations. Any non-competent material will be disposed of within the in-pit spoil dumps, according to the existing overburden management practices. The industrial buildings within the MIA will be steel framed on a concrete slab with steel sheeting clad exterior.

2.8 Water Management

2.8.1 Water Supply

Water supply for the revised Project will primarily be sourced from on site storages. In the unlikely circumstance that on site storages are not able to meet the revised Project's water demands, external water supply sources will be used.

A maximum external water supply allocation to the Mine of 5,650 ML/ year is available from off site sources. The major source is via a long term contract to the year 2055 with the TRC to purchase up to 5,500 ML per annum of Class A+ recycled water from the WWRF. Class A+ is the highest class of recycled water for non-drinking purposes in Queensland. The duration of this supply contract is well beyond the projected life of the revised Project. The 45 km pipeline and infrastructure was constructed in 2009 and is fully operational. When pumping from the Wetalla pipeline, water is currently received at the rate of 340 cum/hr.

A second water source is minor and involves an agreement to receive 150 ML per annum (MLpa) from the Oakey Reverse Osmosis Plant. This water is received under a beneficial re-use of a waste product approval and is taken to assist the TRC with water management at its Oakey Reverse Osmosis Plant.

In addition to the water sources noted, an additional 1,321 MLpa of licensed capacity is available from the Helidon (Precipice) and Marburg (Hutton) aquifers via a series of groundwater bores. Current allocation from Helidon is 710 MLpa and from Marburg the allocation is 271 MLpa. This capacity is available as an emergency supply of process water, subject to successful future renewal of licenses.

Potable water originates from basalt aquifers and is sourced from licensed groundwater bores on-site and treated by a Reverse Osmosis Treatment Plant on-site. Current average consumption of potable water on site is approximately 16 KL/day, which equates to 6 MLpa. Current maximum treatment plant capacity is 22 kL/day, or 7 MLpa. Future use is projected to increase to a maximum of 50 MLpa.

Mine Water Use

The Mine's current process water demand and the revised Project's future process water demand at a production rate of 7.5 Mtpa are outlined in **Table 2-7**. The process water demand varies depending on a range of factors including rainfall/runoff and groundwater inflow within the active mine pits.

NAC will continue to recycle water from its ITSFs to supplement the CHPP Precinct's water requirements and will implement improvements in tailings processing to reduce water use by the CHPP Precinct.

The revised Project's water requirements for dust suppression will be periodically supplemented by rainfall runoff captured in water management structures, such as the sediment and environmental dams and from operational mine pit areas.

Table 2-7 Current Mine and Future Project Raw Water Demands

Water Supply Activity		Current Usage (approx) (ML/ year)	Future Usage (2021) (approx) (ML/ year)
Operation of the CHPPs	(~550 L/RoM tonne)	5 280	8 250
Wash down of machinery			
Fire suppression			
Shower and ablution use			
Dust suppression (~ 45 L/RoM tonne)		432	675
TOTAL USAGE		5 712	8 925
Estimated recovery Tailings Storage Facilities (50%)		2 860	4 125
Estimated water collected at site (rainfall runoff & groundwater inflows)		475	1 500
TOTAL NET WATER USAGE (~220 L/RoM tonne)		2 545	3 300

2.8.2 Water Management

Water Management Principles

As a minimum, the surface water management philosophy for the revised Project will involve the:

- diversion of clean water away from disturbed areas;
- capture and adequate treatment of water that may be potentially discharged off site to ensure it complies with the current Mine's water discharge limits;
- protection of infrastructure and mining areas from flooding using flood bunding;
- design and construction of all water management structures using practical hydraulic parameters based on an appropriate risk based rainfall event, catchment size, slopes, discharge design and soil types;
- preferential use of water stored in on site storages as a supplemental water source for coal washing and other activities to minimise the likelihood of offsite water discharges;
- beneficial recycling of water for activities, such as dust suppression;
- recycling of water from the ITSFs to reduce water consumption for coal washing purposes;
- temporary or permanent bunding of all significant quantities of hydrocarbon and chemical products stored on site;
- use of spill capture and retention devices for refuelling and similar areas;
- treatment of oily water areas using an oil-water separator;
- minimisation of disturbance to an operational minimum for safe operation;

- revegetation of disturbed areas no longer required for operational use to promote progressive rehabilitation; and
- sealing of high use areas to reduce degradation.

Water Management Infrastructure

Water from the WWRF is supplied to the revised Project site via a pipeline and delivered to the Process Water Dam (PWD) 1 within the Mine site. PWD1 takes water from WWTF, Oakey RO plant, some on-site bores, Environment Dam 1 and direct rainfall. Water from PWD1 gravitates to a pump station from where it is supplied to the CHPP Precinct. PWD2 acts as additional storage capacity for PWD1. The Pond Return Dam is the second source of water supply to the CHPP Precinct. The Pond Return Dam receives water recycled from the ITSFs, PWD2, Environmental Dam 2 and 4, Sediment Dam 1, and some groundwater bores. The water captured in Sediment Dam 1 consists of overflows from the CHPP Precinct area and treated effluent from the Sewerage Treatment Plants. Water from the ITSF's and Sediment Dam 2 is also pumped to PWD2, where it provides make up water to the CHPP Precinct via pumps to the Pond Return Dam and PWD1.

Runoff from infrastructure and disturbed areas is captured in the Environment Dams and Sediment Dam 2. Rainfall and groundwater that collects in the South Pit is dewatered to Sediment Dam 2. The Centre and Northern Pits are dewatered to the ITSFs. A new Sediment Dam, Sediment Dam 3 will be constructed to manage the rainfall and groundwater that collects in the new Willaroo, Manningvale East and Manningvale West Pits. Water from Sediment Dam 3 may be recycled back to the CHPP Precinct via the Pond Return Dam or alternatively used for dust suppression purposes.

Dust suppression demands are typically supplied by the In Pit water, Sediment Dams, ITSFs and the Pond Return Dam.

All Environmental Dams have the potential to overflow off-site through licensed discharge locations. To date, off-site water releases have been rare. Minor releases have occurred during recent high rainfall wet seasons. Discharge volumes have been insignificant in comparison to the volume of water flowing within Lagoon Creek at the time of release (i.e. as the receiving environment). NAC must ensure all off site water discharges comply with the Mine's prescribed statutory limits for water releases.

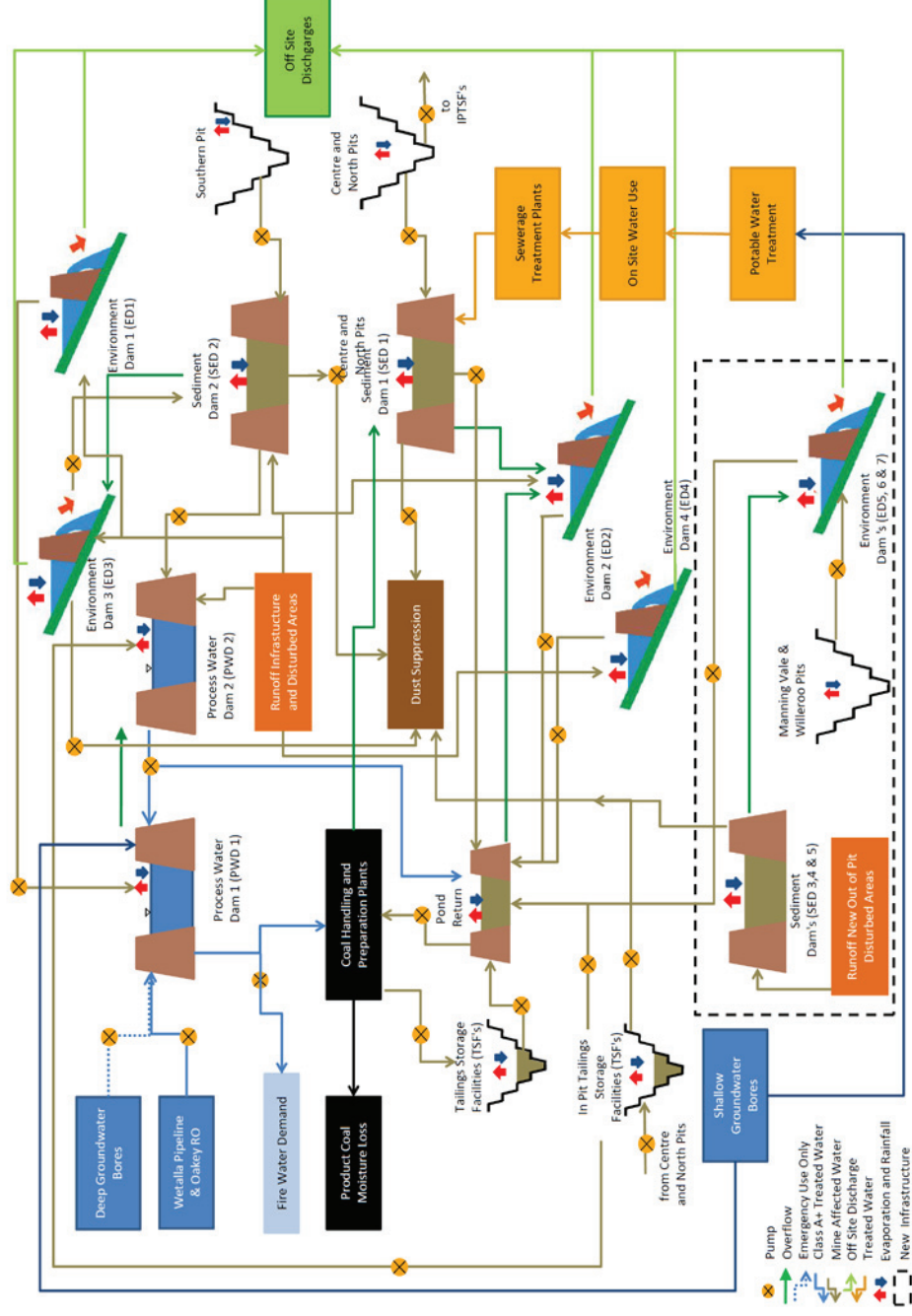
Figure 2-22 provides a schematic of the water management system. The current and future water management infrastructure is summarised in **Table 2-8**.

Table 2-8 Water Management Infrastructure

Structure	Size	Location
Existing Water Management Infrastructure		
Environmental Dam 1	126 ML	Northwest mining lease boundary area (ML 50170).
Environmental Dam 2	232 ML	Downstream of the tailings dam, southwest mining lease boundary area (ML 50170).
Environmental Dam 3	45 ML	Southern mining lease boundary (ML 50216)

Structure	Size	Location
Existing Water Management Infrastructure		
Environment Dam 4	100ML	Southwest section of mining lease (ML 50216)
Sediment Dam 1	97 ML (including 16 ML of sediment)	Near the product coal haul road exit, western mining lease boundary area (ML 50170).
Sediment Dam 2	62 ML	Near the South Pit's out-of-pit dump (ML 50216)
Process Water Dam 1	136 ML	North of the main administration area, adjacent the main access to the current Mine (ML 50170).
Process Water Dam 2	175 ML	Immediately east of Raw Water Dam 1 (ML 50170)
Tailings Dam (Out-of-pit) TSF 1 – Stage 1 & 2	2,550 ML (of tailings)	Western mining lease boundary area (south of the RoM stockpile area) (ML 50170). – Stage 1 is under rehabilitation.
Tailings Dam (In-pit) ITSF 1	2,800 ML (of tailings)	Within the North Pit (ML 50170)
Tailings Dam (In-pit) ITSF 2-1	3,320 ML (of tailings)	Within the North Pit (ML 50170)
Tailings Dam (In-pit) ITSF 2-2	3,400 ML (of tailings)	Within the North Pit (ML 50170)
Lagoon Creek Flood Bund	1:1,000 yr AEP flood protection	Between Lagoon Creek and the South Pit area (ML50216).
Additional Water Management Infrastructure		
Process Water Dam 3	100 ML	TBA
Sediment Dam 3	200 ML	TBA
Environment Dam 5	150 ML	Near the Southwest mining lease boundary (ML 50232) north east of the rail loop and spur.
Tailings Dam (In-Pit) ITSF 4	7.9 Mm ³	Within the Centre Pit (ML 50216)
Tailings Dam (In-Pit) ITSF5	8.6 Mm ³	Within the Centre Pit (ML 50216)
Lagoon Creek Flood Levees	TBA	Between Lagoon Creek and the Manning Vale East Pit area (ML 50232) and between Willeroo Pit area and Lagoon Creek.

Figure 2-22 Water Management System Schematic



NAC will update its current Water Management Plan to include management of the new mining activities and infrastructure within MLA 50232. This document will be implemented as part of the revised Project's future Plan of Operations.

NAC may utilise existing farm dams, and as required, design and construct diversion drains to ensure efficient operation of the revised Project's overall water management system. Specialised water management systems will be implemented in all areas storing significant quantities of hydrocarbons and chemicals to minimise the potential for downstream impacts.

The stockpile pad areas will include a compacted clay base to minimise infiltration and be armoured with a suitable material to maximise their longevity. Surface water runoff from these areas will be directed to a sediment dam for treatment before possible release off-site under discharge criteria outlined in the revised Project's EA.

In the design phase, the sediment dam will be over sized to reduce the risk of discharge and increase the residence time for sediment treatment. In addition, water management practices, such as the preferential use of water captured in the sediment dam, will be put in place to further minimise the risk of off-site discharge. NAC will develop other strategies to ensure all discharges are compliant with the discharge criteria outlined in the revised Project's EA.

2.8.3 Groundwater Supply

The use of the treated water from the WWRF for mining activities has discontinued NAC's current reliance on the localised groundwater resources.

However, NAC will continue to maintain the existing licensed Helidon and Marburg Sandstone bores as an emergency backup water source in the event of a failure of the WWRF pipeline. These bores will be run periodically for maintenance purposes. NAC's will maintain its two basalt water bores as a water source for the Potable Water Treatment Plant (PWTP).

2.8.4 Flood Design Criteria

All new water storages will be designed, inspected during construction and certified at completion by a Registered Professional Engineer. As a minimum, NAC will be required to demonstrate that all storages comply with the (formerly) DERM's *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, February 2012, and the new ITSF, TSF 4 and TSF5, complies with the EPA's *Code of Environmental Compliance for Environmental Authorities for High Hazard Dams containing Hazardous Waste*.

Construction of the revised Project water storages will be conducted by a qualified contractor and will require strict supervision to ensure the engineering design properties (structural and hydraulic) for the dam are achieved prior to commissioning. Sufficient clay material possessing suitable geotechnical properties for construction of the dam walls and basaltic material for armouring of spillways are available within the revised Project site. Some minor quantities of other construction materials may need to be sourced off-site. NAC has previously managed the successful construction and operation of engineered structures for the current operations such as TSF 1 for Stages 1 and 2.

A flood levee will be constructed to protect the new infrastructure and all active mine areas on MLA 50232 from Lagoon Creek flood events and will be designed and constructed to manage a Probable Maximum Flood (PMF) rainfall event. The flood bund will be a fully engineered structure and will be constructed using compacted clay lifts and top soiled and grass covered to minimise the potential for erosion. The levee will be constructed in accordance with the (formerly) DERM's *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, 2012.

All water management structures associated with the new infrastructure will be designed and constructed to manage a 1 in 10 year AEP rainfall event and will possess appropriate engineering design criteria and/or comply with the appropriate Australian Standards to ensure environmental protection, regulatory compliance and efficient operation.

2.8.5 Potable Water Treatment

The current PWTP will continue to service the existing operations at a delivery rate of 16/26 kL (average/maximum daily volume). The PWTP is supplied water from two licensed water bores tapping into basalt aquifers under a 160 ML per annum licensed allocation.

Assessments suggest that potable water is likely to involve the upgrade or duplication of the existing PWTP and reticulation to the new infrastructure on ML50170. The existing water supply bores will be adequate for the proposed PWTP upgrade.

Potable water will be regularly monitored to test the water quality. Potable water production will continue to comply with the *Australian Drinking Water Guidelines* as published by the National Health and Medical Research Council and the Agriculture and Resource Management Council of Australia and New Zealand (1996). The revised Project's potable water will be used for human use, including drinking, hygiene and sanitation.

2.9 Coal Transportation

2.9.1 System Overview

The operational phase of the revised Project will mainly involve the periodic on-site transport of general supplies such as workshop oil and fuel. The occasional transport of new and replacement mining equipment may also be required from time-to-time.

Transport off-site during the operational phase of the revised Project will mainly involve the increased haulage of product coal by rail and the removal of waste materials by licensed waste contractors. This procedure will be in accordance with an updated Waste Management Plan (WMP) for the revised Project.

NAC's planned coal production rates compared to its existing operations of 4.8 Mtpa are presented in **Table 2-9**.

The main efficiencies for the revised Project's planned scenarios for coal transport off-site are:

- the significant increase in the use of rail transport;

- the use of existing Jondaryan-Muldu Road that traverses to the east of the Manning Vale West resource area as an internal haul road; and
- the closure of the JRLF.

Table 2-9 Planned Production Destinations

Transport Method	Destination		Current Operation (Mtpa)	Revised Project (Mtpa)
Rail	Export	QBH, Brisbane	4.60	7.30
Road	Domestic	SE-Queensland and N-NSW	0.20	0.20

At full production 7.5 Mtpa will be transported to Brisbane via the Western Rail System. Queensland Bulk Handling (QBH) at the Port of Brisbane will receive up to 7.5 Mtpa for export overseas. The rail and port capacity has been selected to match the maximum production capacity of 7.5 Mtpa in the event that the domestic market retract. On average at the proposed rail tonnage, an average of 11 trains will travel to Brisbane each day.

2.9.2 Rail Transportation

The maximum number of trains per week from the Mine is 53. Currently, the main constraint on the number of trains that can be loaded at the JRLF is the turnaround rate at the facility. The design of the JRLF means that the train is taken into the siding, the locomotives are then uncoupled and taken to the other end of the train and re-coupled. In the meantime, the next train waits on the passing loop close to Oakey as there is insufficient room for the next train to stand by at the JRLF. The coal stockpiles located at the JRLF are of sufficient length to enable the whole train to be loaded without having to move forward. Generally, two or three loaders are used and the loading time is up to 60 minutes.

NAC is planning to construct a new 8 km rail spur and balloon loop for the revised Project. The will involve the total decommissioning of the JRLF to improve the efficiency and safety of coal transport off-site as the revised Project's coal delivery rates rise beyond those existing for a production rate of 4.8 Mtpa. **Figure 2-1** depicts the new rail spur and balloon configuration and alignment. The maximum number of trains per week from the revised Project will be seventy-five. Upgrades to the Western Rail Line may be required to facilitate the increase in number of trains associated with the revised Project. Discussions between NHG and Queensland Rail will continue with regard to infrastructure and logistics associated with any required upgrades.

Track Design

The preferred rail spur route branches off the Western Rail Line near the JRLF location and heads north crossing Jondaryan-Sabine, Childs and McKays Roads. The rail spur then travels along the eastern side of Jondaryan-Muldu Road to MLA 50232's southwestern boundary. The rail spur consists

of a single track to the start of the balloon loop whereby a turnout is proposed for the arrival track. Wide track centres are required to cater for the rail grading and earthwork batters.

At the main rail line junction, the track will be on a level grade from the Western Rail Line for approximately one kilometre. At this location, the rail line starts to rise to achieve a level of RL 392 m at Lagoon Creek. Lagoon Creek is an ephemeral creek and at times is subject to flooding. Therefore, the rail line is proposed to be 2 m above the existing surface level near Lagoon Creek. The radius at the junction with the Western Rail Line for the eastern connection will be a minimum of 550 m to cater for a maximum train speed of 80 km/h. The minimum radius on the rail loop and arrival track will be 300 m with a maximum speed of 25 km/h around the rail balloon loop.

The standard requirement for the rail corridor width will be a minimum of 20 m from the track centreline to the boundary fence and widened as required for earthwork batters in deep cuttings and high embankments. In some locations, the toe of the batter falls outside the 20 m offset from the track centreline to the fence. As a result, the boundary will be widened at these locations.

At this stage, there are no plans to upgrade the narrow gauge Western Rail Line to dual gauge. If the Western Rail Line is upgraded in the future to dual gauge, the rail spur and balloon loop could be upgraded to standard gauge subject to the preferred type of rolling stock. The Western Rail Line is not electrified, and therefore, there is no requirements for the rail spur and balloon loop to be electrified at this stage.



Photo 3-3 Western view along McKays Road proposed to be closed to through traffic

Photo 3-3 shows the western view and the approximate location of the proposed passive level crossing. The first power pole shows the approximate location of the proposed passive level crossing.



Photo 3-3 Western view along Jondaryan-Sabine Road.

A continuous maintenance access road will be provided alongside the rail corridor. This arrangement is to enable access to signalling and trackside equipment and for train crews to inspect their trains.

2.10 Decommissioning

2.10.1 Jondaryan Rail Loadout Facility

In February 2012, the NHG announced a commitment to move the JRLF to a location on the new ML providing approval is given for the revised Project. An assessment has been conducted for the revised Project to quantify potential impacts for the new rail spur and balloon loop and associated infrastructure.

Subject to all statutory approvals being received in 2015, the new rail spur and balloon loop, TLF and MHF will be constructed over an estimated two year period with completion in approximately 2017. Therefore, decommissioning of the JRLF will commence in 2018 and is expected to be completed in 2019. The existing JRLF site will be returned to its original land use, namely grazing. The JRLF Decommissioning Management Strategy is presented below in **Table 2-10**. The corresponding JRLF Item Number is depicted in **Figure 2-23**.

Table 2-10 JRLF Decommissioning Management Strategy

JRLF Item No.	JRLF Item	Proposed Management Strategy
1	Existing Rail Spur	This rail infrastructure will be retained in its current form. This will be used by Aurizon as a siding.
2	Coal Stockpiles	- All product coal stocks will be gradually removed. This action will be coordinated with the commissioning of the TLF at the revised Project site. - The stockpile base material (coarse rejects) will be removed and buried in-pit at the Mine or other suitable site.

JRLF Item No.	JRLF Item	Proposed Management Strategy
		- A phase one contaminated land assessment will be completed within the former stockpile area. - Topsoil or a topsoil substitute will be applied to the former stockpile area. - The former stockpile area will be ripped to treat compaction and improve infiltration. - A suitable pasture seed mix will be sown within the former stockpile area.
3	Weigh Bridge	- The weigh bridge infrastructure will be removed. - A phase one contaminated land assessment will be completed within the former weigh bridge area. - Topsoil or a topsoil substitute will be applied to the former weigh bridge area. - The former weigh bridge area will be ripped to treat compaction and improve infiltration. - A suitable pasture seed mix will be sown within the former weigh bridge area.
4	Workshops and Sheds	- The workshop infrastructure will be removed. - The concrete slabs will be removed and buried in-pit at the Mine or other suitable site. - A phase one contaminated land assessment will be completed within the former workshop area. - Topsoil or a topsoil substitute will be applied to the former workshop area. - The former workshop area will be ripped to treat compaction and improve infiltration. - A suitable pasture seed mix will be sown within the former workshop area.
5	Sediment Dam and pumps and pipes	- The sediment dam will be retained for the treatment of runoff from the rehabilitated areas. - All pumps and pipes will be retained. - The sediment dam will be de-silted as required following completion of rehabilitation. De-silted material will be disposed of in-pit at the Mine or other suitable site.
6	Water bore	Retain the bore for grazing and land management purposes
7	Crib Hut	- The crib hut infrastructure will be removed. - A phase one contaminated land assessment will be completed within the former crib hut area. - Topsoil or a topsoil substitute will be applied to the former crib hut area. - The former crib hut area will be ripped to treat compaction and improve infiltration. - A suitable pasture seed mix will be sown within the former crib hut area.
8	Diesel Tank	- The diesel tank will be removed. - A phase one contaminated land assessment will be completed within the former diesel tank area. - Topsoil or a topsoil substitute will be applied to the former diesel tank area. - The former diesel tank area will be ripped to treat compaction and improve infiltration. - A suitable pasture seed mix will be sown within the former diesel tank area.
9	Fences	Retain the fences for grazing and land management purposes

JRLF Item No.	JRLF Item	Proposed Management Strategy
10	Hardstands/Roads	▪ The sealed access road into the area will be retained. ▪ All remaining tracks and dirt roads will be removed. ▪ A phase one contaminated land assessment will be completed within the former tracks and dirt roads. ▪ Topsoil or a topsoil substitute will be applied to the former tracks and dirt roads. ▪ The former tracks and dirt roads will be ripped to treat compaction and improve infiltration. ▪ A suitable pasture seed mix will be sown within the former tracks and dirt roads.
11	Car Park	▪ The car park will be removed. ▪ A phase one contaminated land assessment will be completed within the former car park area. ▪ Topsoil or a topsoil substitute will be applied to the former car park area. ▪ The former car park area will be ripped to treat compaction and improve infiltration. ▪ A suitable pasture seed mix will be sown within the former car park area.
12	Rattle grid	▪ The rattle grid may be retained.
13	Earthen Bunds	▪ The earthen bunds will be spread and used for on-site rehabilitation purposes.
14	TEOM's	▪ The on-site TEOM will be decommissioned and recommissioned in the vicinity of the revised Project site.
15	Tree screening	▪ All tree screens will be retained.



**NEW ACLAND COAL MINE
STAGE 3 PROJECT**



NEW HOPE
GROUP



Figure 2-23 - JLRF

Scale 1:7,500 on A4

Projection: Australian Geodetic Datum - Zone 56 (AGD84)

2.10.2 Mine and Associated Infrastructure

NAC in consultation with the APC and other applicable parties will review all infrastructure assets towards the close of the revised Project and assess which structures will be retained for the APC's agribusiness activities, sold for recycling or relocation, or disposed of as general or regulated waste. Recycling and re-use of the revised Project's redundant infrastructure using local contractors will be promoted by NAC.

Transport requirements for the decommissioning phase of the revised Project will be minor compared to the other project phases and will mainly involve rehabilitation and infrastructure removal based tasks. Transport off-site during the decommissioning phase will involve the removal of infrastructure for re-sale or recycling and the removal of waste material by a licensed waste contractor.

NAC in consultation with the APC will determine which former mine roads are to be retained for on-going access purposes. All roads not retained will be rehabilitated to the required standard outlined in the final rehabilitation and decommissioning plans.

NAC in consultation with the APC will determine which of the water management structures will be retained as water sources for future agricultural activities. NAC will ensure that all water management structures agreed for retention are operating in an acceptable manner and are maintained in a good condition. NAC envisages that a majority of the active water management structures will be retained for future use. In summary, a comprehensive assessment of waste will be undertaken in line with the waste management hierarchy to identify the most appropriate measures to manage the remaining waste on the revised Project site. Site infrastructure will generally be decommissioned and demolished in the line with the post mine land use agreement.

To ensure the decommissioning of the site's infrastructure is rehabilitated to a safe and acceptable standard the following will be completed.

- 1) Removal of infrastructure and unused or unwanted equipment. This removal phase will include all structural steel from the CHPP area, conveyor belts and frames, CHPP processing equipment, electrical cabling and associated instrumentation, portable administration buildings, mobile equipment, workshops and storage facilities. Any permanent buildings that cannot be removed intact will be demolished and removed or used for backfilling.
- 2) Collection and removal of all residual hazardous substances by a licensed regulated waste transporter. This collection phase will include contaminated packaging and containers, oils, tyres, paints and resins, recyclables and general waste. Radiation density sources will be isolated and removed by the appropriate licensed contractors.
- 3) Removal of all service infrastructure inclusive of power, water, and sewerage. Special attention will be given to the removal of fuelling facilities, workshops and vehicle service/parking areas.
- 4) Protective or supporting bunds and pads for pipelines and vehicle service/parking areas will be removed. The material will be tested for contamination before being used as general fill material.

- 5) Remove, recycle or bury of all concrete slabs, footings, associated with the CHPP processing equipment, administration buildings and workshops. This material will be used in backfilling operations where it will be covered with inert material before topsoiling and rehabilitation. Concrete that has been removed from areas where there have been fuels, greases, chemicals, and other hazardous substances stored, used and handled will be treated as contaminated material.
- 6) Preventing public access by removal or closure of access roads and tracks. Access tracks no longer required by the landowner or occupier will be rehabilitated to a beneficial end use.
- 7) Tailings storage facilities will have appropriate fencing, bunding or other protection measures provided. Warning signs will be provided as required for public safety purposes. It is envisaged these facilities as 'notifiable activities' and due to their physical characteristics (size and nature) will remain on the DEHP's EMR. NAC will ensure that it addresses its statutory obligations under the EP Act for all sites that remain on the EMR.
- 8) The stability of the dams will be enhanced (where necessary) by buttressing with inert rock material to create safe final slopes that are resistant to erosion and which may then be rehabilitated in accordance with the post-mine land use agreement.
- 9) A self-sustaining vegetation cover will be grown to provide long term stabilisation. Appropriate measures to assist vegetation growth may include topsoil covering, correction of pH, incorporation of organic mulches and fertilisers to encourage plant growth, irrigation, and protection of the vegetation area by utilising wind-breaks and other suitable means.

2.10.3 Rehabilitated Land

The stability of the final landform that remains after mining operations cease is critical to the successful rehabilitation of the revised Project site. Rehabilitated land will be monitored until monitoring data confirms successful achievement of the agreed rehabilitation performance criteria. NAC will continue this monitoring regime until the total disturbed area is fully rehabilitated and relinquishment of the revised Project's MLs can be completed. Over the revised Project's life, NAC may also seek progressive 'sign-off' on successfully rehabilitated parcels of land from the DEHP. NAC's rehabilitation activities will be designed to ensure the final agreed post mining land use and surrender of the revised Project's MLs are achieved. NAC will transfer the overall management of the revised Project site to the APC.

During the decommissioning phase, NAC will ensure all 'notifiable activities' conducted within the revised Project site will be investigated for in-situ soil contamination and as required under the EP Act, will either:

- be released from the DEHP's EMR;
- be remediated, confirmed by follow-up investigation(s), and released from the DEHP's EMR; or
- remain on the DEHP's EMR with an agreed 'site management plan'.

3 Existing environment

This section describes the revised Project site in terms of terrestrial ecology, based on desktop assessment and a program of field survey conducted over the past 13 years.

A detailed list of the surveys, relevant survey guidelines that were used, the purpose of the survey, timing, hours of survey effort and findings are shown in **Appendix G.5.2**. **Figure 3-2**, **Figure 3-3** and **Figure 3-5** illustrate the location of survey sites, survey transects and the type of survey technique, to demonstrate the breadth of survey location and habitats in which surveys have been conducted.

3.1 Land Use

Land use of the New Acland Coal Mine area has been a combination of grazing and modified pastures on small farms, with small areas of urban settlement. Predominant land use patterns of the revised Project site have remained cash and forage cropping in addition to grazing of improved pastures. Much of the revised Project site has long been cleared of its original vegetation due to agricultural production, although localised areas of vegetation remain along Lagoon Creek, relic alluvial plains and upland low hills. The revised Project site has been subject to long periods of continued dry years and unreliable rainfall since the early 1990's.

Aerial photography of the revised Project site shows that large areas of vegetation and habitat have been cleared and replaced with pasture and cropping. Contour banks have been built across much of the arable land of the revised Project site. Contour banks have been built to manage runoff across the cleared landscape, in an effort to avoid erosion of farmland. Paddocks that have had contour banks built are used for cropping and in some instances grazing. The presence of contour banks demonstrates that native vegetation and habitat have been removed to accommodate farming.

Vegetation remains in small, scattered fragments along Lagoon Creek, isolated patches to the south of Acland, along a low ridgeline west of the Jondaryan – Muldu Road and in the south western corner of the revised Project site, near the rail loop. Very thin patches of vegetation are found along roadsides and fencelines across the revised Project site. A similar pattern of vegetation distribution is seen in the general Acland area, with extensive areas of cropping, contour banks and pivot irrigation.

Table 3-1 provides a number of photographs of the revised Project site. The location of these photographs is shown in **Figure 3-1**. These photographs illustrate the condition of the revised Project site and vegetation within impact areas and potential offset sites. These photographs were taken in June and August 2013. Further photos of the habitat of the revised Project are included in **Section 3.3.3**.

Table 3-1 Photographs of the revised Project site

Location Number	Description	Photo
1	Looking north from potential offset paddock near Muldu. (Photo August 2013)	
2	Looking east towards the homestead within the lot of the potential offset site. (Photo August 2013)	
3	Looking south-west from the potential offset paddock. Note the high infestation of weeds particularly Mayne's Pest. (Photo August 2013)	

Location Number	Description	Photo
4	Mapped 11.8.5 with a severe tree pear infestation. (Photo August 2013).	
5	Looking east to paddock with grazing pressures and tree pear infestation. (Photo August 2013).	
6	Looking south from a potential offset site across grazing paddocks (Photo August 2013).	

Location Number	Description	Photo
7	Area of 11.8.5 vegetation (Photo August 2013).	
8	Looking towards the end of the 11.8.11. Photo looking north. (Photo August 2013)	
9	Looking east towards vegetation occurring on the ridge lines. (Photo August 2013)	

Location Number	Description	Photo
10	Photo looking north along the vegetation adjacent to the Haul Road. This vegetation is a continuation of the 11.8.5 patch to the south. (Photo August 2013).	
11	Photo looking north-east showing non-remnant vegetation. (Photo August 2013).	
12	Photo looking south through the shrubby 11.8.5. (Photo August 2013).	

Location Number	Description	Photo
13	Power line easement that dissects the 11.8.5 – Eucalyptus orgadophila patch located to the east of the Haul Road. This easement runs through the section that is north of the road that divides the 11.8.5 patch. (Photo June 2013)	
14	North paddock of 11.8.5 (Photo August 2013).	 

Location Number	Description	Photo
14a	South paddock of 11.8.5 (Photo August 2013).	
15	Photo looking east through 11.8.5 located in the southern paddock. (Photo August 2013).	
16	Adjacent paddock looking west across to a weed infested paddock. (Photo August 2013).	

Location Number	Description	Photo
17	11.8.11 grassland (Photo August 2013).	
18	Photo in 11.8.5 looking south this patch in on the west of the haul road. (Photo June 2013).	
19	This photo is the view looking north from the road. The small patch of 11.8.5 can be seen in the background. Possible 11.3.21 paddock. (Photo June 2013).	

Location Number	Description	Photo
20	Shrub thicket located on the far western section of the revised Project site. Site is just outside disturbance footprint. (Photo August 2013)	
21	Photo looking west across previously cleared field now with high levels of regrowth vegetation and scattered trees. (Photo June 2013).	
22	Looking west across mapped grassland, photo showing regrowth vegetation. (Photo August 2013)	

Location Number	Description	Photo
23	Belah patch looking south. (Photo August 2013)	
23a	Evidence of lopped Poplar Box located with Belah patch. (Photo August 2013)	
24	This photo is looking west along the road. Seen in this photo is the dense and tall road verge vegetation consisting of large Poplar Box. (Photo June 2013).	

Location Number	Description	Photo
25	Belah and Brigalow to the south of the road (photo June 2013) photo looking east.	
26	Looking north towards Gum-topped Box dominated woodland. Area noted of having high Koala activity. (Photo August 2013)	
27	Looking across the northern edge towards the west of the 11.3.2 patch. Noted weeds Box Thorn and Prickly Pear with high levels of low shrubs. (Photo August 2013).	

Location Number	Description	Photo
28	Looking south through the 11.3.2 patch (Photo August 2013).	
29	Looking south from the southern boundary of the 11.3.2 patch showing regrowth vegetation including weeping myall. (Photo August 2013).	
30	Photo looking east showing recent cultivation activities. (Photo August 2013).	

Location Number	Description	Photo
31	Stock dam located just north of Lagoon Creek. Lots of waterbird activity. (Photo August 2013).	
32	Looking east across the 11.3.21 mapped grassland. (Photo August 2013).	
33	Looking west across the mapped 11.3.21 grassland noting shrub growth in the background. (Photo August 2013).	

Location Number	Description	Photo
34	Photo looking south to adjacent paddock from mapped grassland. Paddock was once cultivated now has high levels of weed infestation. (photo August 2013)	
35	Looking north through the stock route with 11.3.17 mapped either side. (Photo August 2013).	
36	Water hole along Lagoon Creek (Photo August 2013).	

Location Number	Description	Photo
37	Looking west across the mapped 11.3.21 grassland toward the vegetated stock route. (Photo August 2013).	
38	Photo looking east across stock route to show grazed paddock and cultivation in adjacent paddocks. (Photo August 2013).	
39	Photo looking south along the stock route mapped as 11.3.2. (Photo August 2013).	

Location Number	Description	Photo
40	Photo looking south showing the cultivation in adjacent paddock to the mapped grassland. (Photo August 2013).	
41	Photo looking south through 11.3.1 with evidence of a drill pad in the foreground. (Photo August 2013).	
42	Looking west across a site mapped as grassland. This photo shows the density of Acacia shrub grow in a previous cleared paddock. (Photo June 2013).	

Location Number	Description	Photo
43	Looking west this photo shows the high cover of shrubs in a paddock that has been previously cleared. (Photo August 2013).	
44	Looking south along the western boundary of the 11.3.1 RE showing wild infestation of cultivated species (Photo August 2013).	
45	Looking south across the 11.3.1 patch (Photo August 2013).	

Location Number	Description	Photo
46	Photo looking south along Greenwood School Road (Photo June 2013).	
47	Photo looking west from the Piggery shows the adjacent land currently being cultivated. (Photo August 2013).	
48	Photo looking south through the 11.3.1 patch. Note the Piggery observed in the background and the depression to the right is runoff from the piggery (Photo June 2013).	

Location Number	Description	Photo
49	Photo looking north across the rail alignment towards stand of vegetation on adjacent property. (Photo August 2013).	
50	Photo looking north towards remnant vegetation located within the same paddock as the potential grassland offset. (Photo August 2013).	
51	Photo looking east across potential grassland offset site located near proposed rail alignment. (Photo August 2013).	

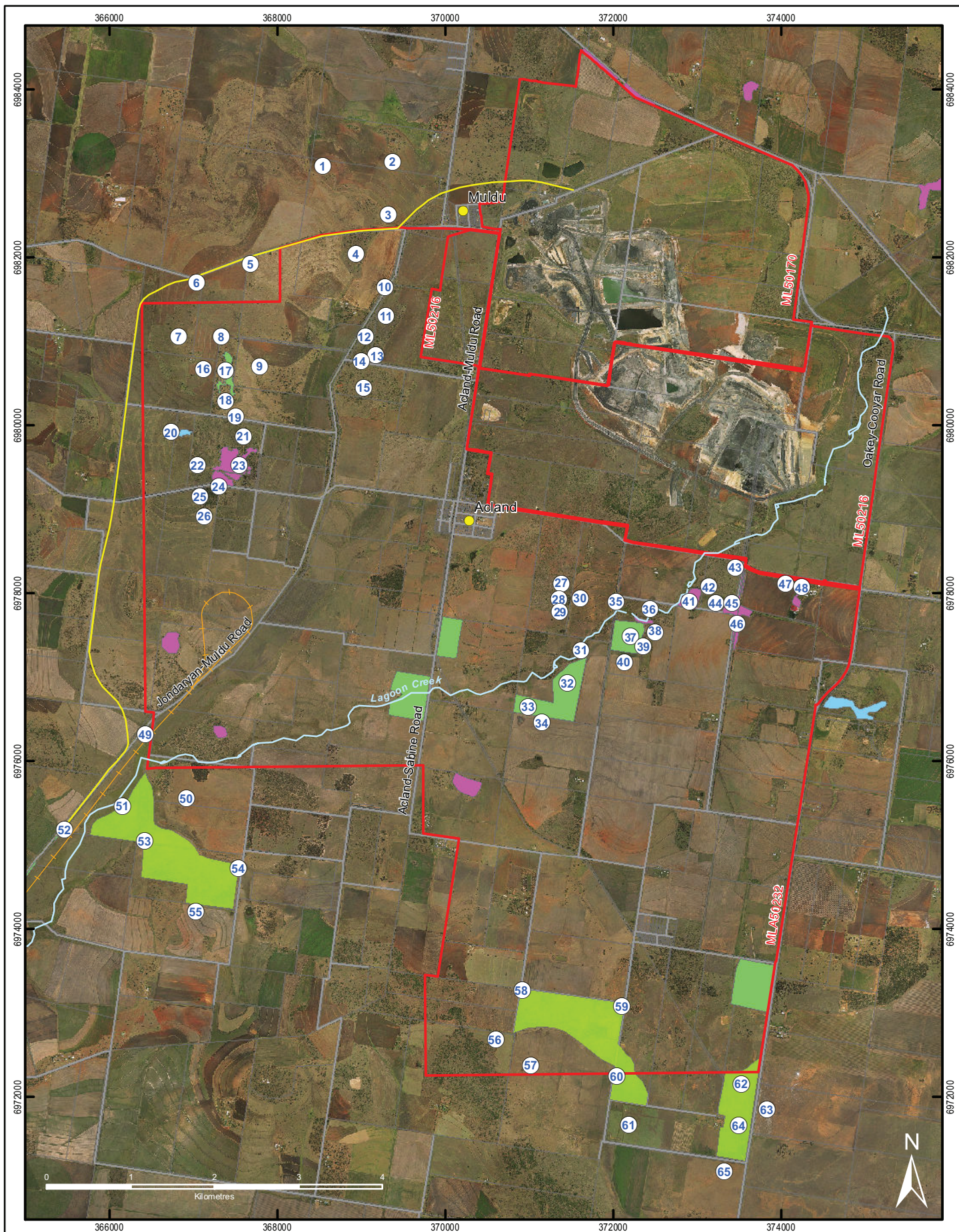
Location Number	Description	Photo
52	Photo looking west across the cattle yards to the paddock that is currently grazed on the other side of the rail alignment to the potential offset. (Photo August 2013).	
53	Photo looking south towards adjacent paddock in foreground the remnant of vegetation before clearing and in the background heavily cleared land with cultivation. (Photo August 2013)	
54	Photo looking north in potential offset paddock. The background shows a tree line associated with a depression in the landscape. (Photo June 2013).	

Location Number	Description	Photo
55	Looking south from potential offset paddock showing adjacent land use of cultivation. (Photo August 2013).	
56	Paddock monoculture of exotic creeping bluegrass (Photo June 2013)	
57	Photo looking east across the southern section of the paddock that shows high infestations of Balloon Cotton Bush and Bull Thistle. (Photo June 2013).	

Location Number	Description	Photo
58	Photo looking east across potential grassland offset site paddock (Photo August 2013)	
59	Photo looking west across the potential grassland offset site. (Photo August 2013)	
60	Showing potential grassland offset site is actually a wetland area with gilgais. Photo looking south. (Photo August 2013)	

Location Number	Description	Photo
61	Exotic grass in wetland (Photo June 2013)	
62	North paddock of the potential grassland offset area Oakey-Cooyar Rd. Photo looking north-east toward road (Photo August 2013)	
63	Looking east this photo shows a paddock that has been recently ploughed. (Photo June 2013).	

Location Number	Description	Photo
64	Looking north in the centre of the potential grassland offset site along Oakey-Cooyar Rd. (Photo August 2013)	
65	Looking south from potential grassland offset site along Oakey-Cooyar Rd to adjacent paddock. (Photo August 2013)	



LEGEND

- | | |
|--|---|
| ● Towns and Localities | Cadastre |
| Photo locations | Mining Tenements |
| — Rail Spur | Proposed Bluegrass Offset Locations |
| — Roads | Threatened Ecological Communities |
| — Creeks | Brigalow |
| — Jondaryan-Muldu Road Diversion | Bluegrass dominated grassland |
| | Semi Evergreen Vine Thicket |



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-1 - Revised Project
Site Photo Locations**

Scale 1:60,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

3.2 Methodology

3.2.1 Threatened Ecological Community (TEC) surveys

Field surveys were completed to map vegetation communities of the revised Project site and to confirm the threatened ecological communities found on the revised Project site. These surveys used the “Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland” (Neldner 2005 and Neldner 2012).

Further surveys were completed to assess the condition of the TECs. Information on the condition of the TECs has been used in the EPBC offset calculator to develop the Biodiversity Offset strategy for the revised Project. The assessment of the condition of vegetation used the method described in “BioCondition: a terrestrial vegetation condition assessment tool for biodiversity in Queensland field assessment manual” (Eyre 2008 and Eyre 2011).

Data sheets for the BioCondition assessment and vegetation surveys are included in **Appendix G.5.3** and **Appendix G.5.4**, respectively.

3.2.2 Terrestrial flora surveys

Flora and vegetation surveys were completed on six occasions between 2005 and 2013. These surveys were either conducted in association with fauna surveys or were specific surveys to confirm vegetation condition. The survey sites were located in areas of habitat suited to the listed species, including along Lagoon Creek and in areas of vegetation. **Table 3-2** lists the flora and vegetation surveys that have been completed for the revised Project.

Opportunistic flora surveys were undertaken during the October and November 2013 bird, reptile and mammal surveys.

Table 3-2 Flora and vegetation surveys

Survey date	Purpose
August 2005	General flora and vegetation survey – record species and vegetation communities
February 2007	Vegetation condition assessment of bluegrass Threatened Ecological Community
February-March 2007	General flora and vegetation survey
February 2011	Vegetation condition assessment of vegetation communities in impact area and offset sites
June 2013	Vegetation condition assessment of vegetation communities in impact area and offset sites
August 2013	Confirmation of regional ecosystems, threatened species survey

August 2005 flora survey

Vegetation types for the Stage 2 EIS were identified during field inspections conducted in 2005. In each of the habitat types, flora and fauna were investigated. Plant collections were made and fauna

sampling was performed using a combination of systematic and opportunistic survey methods over a number of days and nights.

February 2007 - Blue Grass Communities within the Stage 2 EIS Project site

In response to information requested by the DEWHA, the nature and extent of the bluegrass (*Dichanthium* spp.) dominant grasslands ecological community in the Stage 2 EIS Project site was assessed in February 2007. The survey used the following methods:

- Visual inspection of the mapped remnant area.
- Erection of a 100 m survey transect in accordance with the then Environmental Protection Agency survey methodology for assessing biocondition using:
 - a 100 m line-intercept transect;
 - 50 m x 10 m plot in which weed cover, native plant richness and fallen woody material were recorded;
 - five quadrats, 1 m x 1 m, to determine percentage cover of grasses, herbs, forbs and shrubs; and
 - an assessment of the likelihood of the mapped remnant area returning to “good native condition”.

February-March 2007 flora survey

Detailed flora field surveys were completed of an area that included the revised Project site from 26 February 2007 to 2 March 2007 and within the private haul road route on 20 November 2008. The survey concentrated primarily on areas with remnant tree cover, native grasslands and roadside easements.

Surveys involved numerous traverses on foot to observe all vegetation types present within the revised Project site. The purpose of the surveys was to identify the floristics, structure and condition of each patch of vegetation and the type and distribution of plant communities present. Vegetation plots and transects were established in individual patches of vegetation to sample species diversity and structure.

Identification of plant communities was undertaken including an assessment of the presence of threatened REs and ecological communities as listed under the VM Act and the EPBC Act respectively. Site data for each quadrat and transect was recorded in a standardised format to record information regarding species presence, species richness and vegetation community assemblages.

The methodology was generally consistent with that put forward in the publication “Methodology for Survey and Mapping of Vegetation and Regional Ecosystems in Queensland” (Neldner et al 2005). A GPS was used to record locations of specific floristic data and assist in mapping. The overall condition of the site vegetation was recorded, including the extent of modification and weed invasion.

A preliminary list of target endangered, vulnerable and rare (EVR) flora taxa was generated through database searches. Potential subject species are listed in **Appendix G.5.5**, from the Protected Matters Search Report. Targeted searches were completed for threatened flora species listed under the NC Act and the EPBC Act. Cropper (1993) suggests that a general traverse is a suitable method for detecting the presence of rare species during flora surveys. As a result, several traverses were undertaken as part of the field surveys within areas of suitable habitat.

Searches for threatened species (i.e. Belson's panic, lobed bluegrass and finger panic grass) were undertaken within areas of known and suitable habitat, such as roadside easements and less disturbed woodlands and native grasslands. Locations of any threatened species located within the revised Project site were recorded using a GPS and the approximate number of individuals present was recorded for each location.

February 2011 bluegrass dominant grassland assessments

Surveys to assess the condition of the EPBC listed threatened ecological community, bluegrass dominant grassland were completed in February 2011. These surveys were undertaken to determine the ecological condition of the grassland patches, following above average rain over the preceding summer months. Information on species, density and condition of the bluegrass dominant grassland was collected.

June 2013 biocondition survey

This survey was completed to assess the condition of vegetation communities affected by the revised Project and potential offset sites. The biocondition information was collected to devise the offset strategy for the revised Project, which will meet both Queensland and Commonwealth requirements for biodiversity offsets.

Data was collected in accordance with Eyre et al (2011), which describes the methods to assess the condition of vegetation in Queensland. Data collected included number of large trees, recruitment of canopy species, canopy height, canopy cover, shrub cover, species richness, non-native species cover, native perennial grass cover and litter cover.

Condition of vegetation to be cleared and the condition of vegetation at proposed offset sites was collected, to enable a comparison to be made of the vegetation to be lost and quality of the areas to be used for offsets.

August 2013 biocondition and vegetation community verification survey

Further bio condition assessments were undertaken of both the impact areas and the offset areas, to capture the variation in vegetation quality across the revised Project site and offset locations. The assessment was completed using Eyre (2011).

The regional ecosystems of the revised Project site were verified using Neldner (2012). Surveys were also conducted for threatened listed species thought to occur in the revised Project site.

The location of flora survey sites and transects is shown in **Figure 3-2**.

3.2.3 Terrestrial fauna surveys

Fauna surveys were completed on four occasions between 2005 and 2013. These surveys were either conducted in association with vegetation surveys or were species specific surveys. The survey sites were located in areas of habitat suited to the listed species, including along Lagoon Creek and in areas of vegetation. Trapping techniques used for mammals, reptiles and amphibians included harp traps, pits fall traps Elliott traps, Anabat detectors and camera traps. Spotlighting was used for arboreal mammals. Birds were surveyed using standardised time based counts conducted in the morning. Call play back for a range of owl species was also used, along with spotlighting. **Table 3-3** lists the surveys, the fauna groups that were surveyed and the surveyed techniques that were used.

Table 3-3 Fauna surveys, groups and techniques

Survey technique	Survey					Fauna Group						
	2005	February - March 2007	Reptiles – February 2007	August 2013	October/November 2013 (Bird, reptile and mammal survey)	Birds	Amphibians	Frogs	Reptiles	Bats	Arboreal mammal	Ground dwelling mammals
Elliott traps	x	x			x				x			x
Pitfall traps		x	x						x			x
Anabat detectors	x	x		x	x					x		
Bird surveys	x	x		x	x	x						
Ground searches	x	x	x		x		x	x	x			x
Spotlighting	x	x	x		x		x	x	x	x	x	x
Call playback		x				x						
Incidental observations	x	x			x	x	x	x	x		x	x
Scats, tracks		x			x				x		x	x
Camera traps				x	x	x						x

2005 Fauna survey

A targeted field survey concentrating on species of conservation significance was completed for the New Acland Stage 2 EIS in 2005 (Stage 2 EIS). The methodology was formulated based on the results of a literature review and gap analysis, review of relevant databases and agency consultation.

Fauna survey techniques included Elliott trapping, ANABAT II ultrasonic bat call recording, spotlighting, habitat searches, dip nets for aquatic life, and bird surveys at dusk and dawn. Opportunistic surveys were also made for fauna species.

Table 3-4 lists the survey effort associated with the 2005 fauna survey.

Table 3-4 2005 Fauna survey

2005 fauna survey	
Survey technique	Survey description
Trapping	Small mammal trapping was carried out using Elliott traps placed approximately 10 m apart and baited with a mixture of rolled oats, peanut butter, honey and a little vanilla essence. Traps were set for a minimum period of 2 consecutive nights, and checked early each morning. The Elliott trapping accounted for a total of 375 trap nights. Pitfall traps were not used because of the difficulty finding suitable sites due to rock, grazing or thick weed vegetation. The survey sites for this survey were located within the existing mine footprint and in the area of the Manning Vale West pit, where ground condition did not allow for the use pitfall traps.
Spotlighting	Spotlighting observations were conducted from a vehicle for roadside vegetation and on foot in the larger remnants for 4 hours per night to detect arboreal mammals, bats, nocturnal birds, reptiles and frogs using a 100 watt spotlight.
Bird Observation	Birds were observed at dawn and dusk at each site and identified visually or from calls heard. Other bird observations in the study area were made throughout the day as other activities were carried out.
Anabat	An Anabat II bat detector system was used to record the ultrasonic calls of insect eating bats for later computer analysis and identification of the species present at the revised Project site.
Opportunistic surveys	Searches were conducted for animals under bark, logs, rocks and leaf litter. Opportunistic observations were made of birds and other animals at all times of the day while in the area.

February-March 2007 Fauna survey

Detailed fauna field surveys were completed within the original Project site between 26 February 2007 and 2 March 2007. A combination of sampling techniques was used including diurnal and nocturnal census and opportunistic observations. Survey methods included Elliott and pit fall trapping, ultrasonic call recording of microchiropteran bats, spotlighting, frog and reptile searches, nocturnal owl call broadcast and diurnal bird census.

Aerial photographs, vegetation mapping and topographic maps were used to stratify habitat types and identify the sampling sites. At least one sampling site was surveyed per habitat type with greater effort in the larger, dominant habitats, such as the poplar box woodland. Grassland, young regrowth and aquatic habitats provided incidental data to complement the observations from the larger areas of habitat within the original Project site. Details of survey techniques, effort and localities are provided below.

Fauna surveys were conducted under Scientific Purposes Permit Number WISP04231607, Scientific User Registration No. 274 and Animal Care and Ethics Approval number AEC-CA2007/01/167.

Table 3-5 lists the survey effort associated with the February –March 2007 fauna survey.

Table 3-5 February-March 2007 Fauna survey

February – March 2007 survey	
Survey technique	Survey description
Trapping	Live-trapping of small to medium sized mammals was conducted at four trap sites targeting the larger fragments of forest and woodland, as these were expected to yield the majority of the mammal assemblage. A standardised quadrat arrangement, 100 m x 50 m, was used at each site delineated by 25 Elliott traps placed 10 m apart along the perimeter. The Elliott traps comprised 20 type A (330 mm x 100 mm x 90 mm) and 5 type B (150 mm x 160 mm x 450 mm) aluminium folding traps. All Elliott traps were baited with peanut butter, rolled oats and honey. Traps were placed in or under cover at every opportunity. Traps were opened for a three-night period of approximately 96 hours. Traps were checked in the morning and any captured animals were measured, weighed and released. The total trapping effort equated to 300 trap nights. Live-trapping of small ground-dwelling mammals was supplemented by the use of pitfall traps. A total of 20 pit traps, comprising 600 mm x 300 mm steel pipe, were established at three sites. The pits were opened for three consecutive nights and checked each morning. Drift fences consisted of 300 mm high polyurethane damp course. The total pit trapping effort equated to 60 trap nights. Targeted searches of up to two hours duration were conducted in grassland habitats to target the Grassland Earless Dragon. Live-trapping of herpetofauna was conducted using pitfall traps positioned in low-lying areas and heavy cracking clays near Lagoon Creek to target the presence of the Grey Snake (<i>Hemiaspis damelii</i>), Grassland Earless Dragon and the Five-clawed Worm Skink. A total of 20 pit traps, comprising 600 mm x 300 mm steel pipe, were established at three sites. The pits were opened for three consecutive nights and checked each morning. Drift fences consisted of 300 mm high polyurethane damp course. The total pit trapping effort equated to 60 trap nights. Pit traps sites were selected to sample grassland and woodland habitat with an open understorey. Pitfall traps were located along Lagoon Creek, where ground conditions allowed for the digging of holes of the installation of the traps.
Spotlighting	Spotlighting and dusk census for arboreal mammals was conducted at each of the seven sites, in addition to other forest fragments. Spotlighting was conducted by foot and vehicle, and comprised a general traverse across the Project site using Lightforce 50W hand-held spotlights powered by 12V batteries. Two observers conducted the survey for a minimum period of two hours per night over four nights resulting in a total survey effort by spotlight of 16 hours. All fauna heard or observed were recorded to species level. Observations of fauna were aided by the use of binoculars. Notes were taken on the location and relative abundance of observed fauna. Spotlighting was conducted briefly between calls and then following completion of the call playback series. Quiet listening for dusk calls of each owl species was also undertaken whilst conducting other field activities such as spotlight searches. Both nocturnal and diurnal herpetological surveys were conducted at each sample site. The nocturnal herpetofauna was observed during spotlighting surveys and included the survey of the margins of wet areas and farm dams for active frogs and reptiles. Nocturnal surveys for frogs were conducted using spotlights and head

February – March 2007 survey	
Survey technique	Survey description
	torches to survey along drainage lines, around wet low-lying lands and dams. Spotlighting for megachiropteran bats (<i>Pteropus</i> spp.) was conducted during spotlighting activities.
Ground searches	The diurnal component of the reptile surveys consisted of hand searches for active and resting individuals under rocks, logs, bark, leaves and timber and artificial debris when encountered. Specific reptile census was conducted for one hour at each trap site and opportunistic observations were also recorded during other survey activities.
Bird observation	Standardised time-based bird counts of 30 minute duration were conducted at each trap site during the live trapping program. Census were conducted during morning periods and centred on the trapping quadrat. All bird species heard or observed were quantified. Birds were also recorded opportunistically during all other site visits and field surveys activities. Binoculars were carried in the field at all times to assist in identification.
Call playback	Call playback of the Barking Owl (<i>Ninox connivens</i>), Masked Owl (<i>Tyto novaehollandiae</i>) and Barn Owl (<i>Tyto alba</i>) was conducted during spotlighting surveys at all sample sites. Pre-recorded owl calls were broadcast via a portable CD player and megaphone for a period of five minutes each, followed by a five minute listening period.
Anabat	Three stationary ultrasonic bat call detectors (Anabat II, Titley Electronics) were used with a storage ZCAIM unit to record bat calls at four sites: Anabat 1-4. Calls were recorded continuously between 1800 and 0500 hours on each occasion for three nights. Calls were identified to genus or species level where possible using the computer frequency analysis software, Analook v.4.0.
Opportunistic surveys	Searches were conducted for animals under bark, logs, rocks and leaf litter. Opportunistic observations were made of birds and other animals at all times of the day while in the area.

2007 Reptile Survey

A targeted reptile survey (for Dunmall's Snake (*Furnia dunmalli*), Five-clawed Worm Skink (*Anomalophus mackayi*) and the Grassland Earless Dragon (*Tympanocryptis pinguicolla*)) across the Stage 2 EIS Project site was completed in February 2007 to satisfy approval conditions imposed under EPBC Act by the Commonwealth Department of Environment, Water, Heritage and the Arts.

Table 3-6 lists the survey effort associated with the 2007 reptile survey.

Table 3-6 2007 Reptile survey

Reptile 2007 survey	
Survey technique	Survey description
Trapping	Three pitfall lines, comprising five buckets linked by drift fencing in suitable habitat, were established. Traps were open for four consecutive nights, for a total of 60 bucket nights.
Spotlighting	Two hours of road and track based survey was completed on each of four survey nights in an effort to detect snakes for a total of eight hours of search effort.
Ground searches	Ten systematic herpetofauna survey sites were established. A total of one hour of diurnal survey effort and one hour of nocturnal survey effort was expended at each site. Survey effort consisted of rolling logs and rocks, stripping loose bark from trees, spotlighting and point observations (observer remaining stationary and observing cracking clay pans with binoculars). A total of 20 hours of intensive searching was completed at systematic survey sites. Twelve active search plots to target the Grassland Earless Dragon were established. Commencing at a central point, the area within a 50 m radius was thoroughly searched for reptiles for a period of half an hour. A total of six hours of search effort was achieved.

The 9 to 14 February 2007 survey was undertaken to satisfy an EPBC approval condition for the Stage 2 project. The condition required the person taking the action to undertake an additional fauna survey of the Stage 2 project area to specifically target the presence of the listed endangered Grassland Earless Dragon and the listed vulnerable Long-legged Worm skink and the listed vulnerable Dunmall's snake. The 9 to 14 February 2007 survey was located in the Stage 2 mining lease, to the east of Acland and north of Lagoon Creek.

The fauna survey that was undertaken between 26 February and 2 March 2007 was to inform the Stage 3 EIS. This survey included trapping and survey sites along Lagoon Creek, in vegetation within the Manning Vale West Pit and in an area to the south of the revised Project site. The surveys for the Grassland Earless Dragon, the Long-legged Worm skink and the Dunmall's snake were located in areas of grassland and open woodland habitat (Brigalow and poplar box). The survey techniques used in both these surveys involved the use of pitfall traps, nocturnal and diurnal searches, active searching that involved hand searches of rocks, logs, bark, leaves, timber and artificial debris in an effort to locate the species.

2013 Koala survey

A specific survey for the Koala was undertaken of the revised Project site in March 2013. The Koala is known from the revised Project site. This survey was completed to collect specific information in the Koala's presence and habitat across the revised Project site.

The survey was informed by a review of vegetation mapping and aerial photography to determine areas to be surveyed. A five day field survey was undertaken in March 2013, to assess the quality of habitat and to search for Koalas – both direct observation or presence of scats and/or scratches on

trees. The Spot Assessment Technique (SAT) was used to determine Koala activity and use of habitat. The SAT method was completed in accordance with Philips and Callaghan (2011) and involved the following steps:

- locate and uniquely mark with flagging tape a centre tree and then the 29 nearest Koala food trees to the centre tree; and
- undertake a search for Koala faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of one metre around the base of each tree, followed (if no faecal pellets are initially detected) by a two minute inspection involving disturbance of the leaf litter and ground cover within the prescribed search area. The search is concluded once a single faecal pellet has been detected or when the maximum two minute search time has expired, whichever happens first. Where the location of faecal pellets falls within overlapping search areas due to two or more trees growing in close proximity to each other, both should be scored for pellet(s).

2013 Fauna survey

In August 2013, a scoping fauna survey was completed, to provide information to develop the survey plan for the more detailed reptile survey completed in November 2013. **Table 3-7** lists the survey effort associated with the 2013 fauna survey.

Table 3-7 2013 fauna survey

August 2013 survey	
Survey technique	Survey description
Anabat	One Anabat was setup for four nights and did detect bats within the area. The purpose of this survey was to provide an understanding of areas for future detailed fauna survey scheduled for November 2013.
Camera traps	Four camera traps were set out for four nights (16 trap nights). The locations of the camera traps were to determine appropriate sites for future detailed fauna survey scheduled for November 2013. Camera traps were baited with raw chicken frames and peanut butter and were located in areas that were determined from desktop and brief site assessment to possibly have the greatest fauna usage within the area.

2013 Bird survey

A targeted bird survey for Australian Painted Snipe, Black-breasted Button Quail, Red Goshawk and Regent Honeyeater was undertaken to within the revised Project site. The desk top analysis concentrated on ecology, habitat requirements and previous records of occurrence for each species. The desktop analysis relied on drawing information from the following existing sources:

- Aerial photography (Google 2013)
- Regional Ecosystem Mapping (Queensland Herbarium v6.1)
- Species Profile and Threats database - SPRAT (DotE 2013)

- EPBC database search tool (DotE 2013)
- Wildlife Online (DEHP 2013)

This information was applied to the revised Project site to determine the most appropriate locations for the targeted bird survey. **Figure 3-5** shows the location of the survey sites used during the targeted bird survey. Based on the habitat requirements of the target species, the vegetation (RE) present and the known condition of the vegetation; the survey effort for each patch of vegetation was established. Those patches of vegetation that were more likely to be best suited to one or more of the target species were allocated a greater survey effort. These sites were visited on consecutive days in line with the requirements for temporal variation during survey, particularly for Australian Painted Snipe, Black-breasted Button Quail and Regent Honeyeater (which require surveys over 3 – 5 days). Marginal sites were visited only once, as were areas where searches for Red Goshawk nests were undertaken. Some vegetation communities in the study area contain habitat that is not considered suitable for the targeted species (e.g. grassland communities) and these were not part of the survey.

Surveys were conducted over seven days from 28 October to 3 November 2013. During this time the weather was fine and sunny (20 – 33°C), with one afternoon storm on 30 October 2013 (3 mm rain) and some windy periods on several afternoons. The conditions on site were noted to be dry and there had been an extended dry season prior to the site visit. Some trees were in bud with open flowers present in the canopy of the Poplar Box communities (<10% of the canopy). Water was not flowing in Lagoon Creek, but many of the dams were holding water.

At each site a habitat assessment and bird survey was conducted by two experienced ecologists familiar with the revised Project site. The habitat assessment involved taking representative photographs and recording the following details about each survey site:

- location
- vegetation communities (RE)
- dominant flora species in each stratum
- geology and landscape
- presence of weeds
- condition of understorey
- presence of major disturbances (i.e. fire, storm, grazing or land clearing)
- presence of habitat trees (i.e. trees with nests or hollows) and fallen logs
- abundance of potential food resources (flowers)
- presence of water bodies / wetlands
- presence of leaf litter
- presence of rocky outcrops or logs

Bird survey techniques were varied depending on the target species and were consistent with the DotE generic survey guidelines for birds (DEWHA, 2010) and specific survey guidelines for each of the four species being surveyed (DotE, 2013). Bird watching (by two ecologists with binoculars) was used in searches for Regent Honeyeater, Red Goshawk and Australian Painted Snipe. Flushing of

understorey was used for Australian Painted Snipe and Black-breasted Button Quail. Active searches and stationery observations were conducted during dusk traverses of Lagoon Creek for Australian Painted Snipe. Searches for raptor nests were conducted for Red Goshawk. Timing of surveys varied from early morning (within 2 hours of dawn), late morning (>2 hours post dawn), early afternoon (within 3 hours of noon), late afternoon (> 3 hours past noon) and dusk (up to 1 hour past dusk). General observations were made at each site to ascertain some representation of the diversity of birds and the dominant bird species in the study area.

Suitable habitat, DotE recommended survey effort and the survey effort expended per target species is detailed in **Table 3-8**. This table shows that the survey effort has satisfied the requirements outlined in the gap analysis performed by DotE on ecological surveys conducted for the revised Project.

The DotE survey guidelines were used to devise the survey program, for these species. NAC also liaised with DotE on the specific details of the surveys to be undertaken and agreed on the effort required to meet the Department's needs. In these discussions, DotE identified the species that required further survey effort. This advice is the basis for the inclusion of these species listed in **Table 3-8**.

Table 3-8 Suitable habitat, sites and survey effort per target species

Species	Habitat requirements (DoE 2013)	Appropriate habitat within the study area	Requirements as per Guideline (DEWHA 2010)	Requirements as per Gap Analysis	Survey Effort during November 2013
Australian Painted Snipe	Mainly in shallow, often temporary freshwater wetlands or saltmarshes, generally with good cover of grasses, low scrub, lignum, open timber or samphire.	Creek line (on and offline pools) and dams on floodplain. Sites: Lagoon Creek and adjacent dams.	Area searches / transects through suitable wetlands; detection by sighting and flushing. Targeted observations at dawn and dusk of suitable foraging areas. Effort: Targeted stationary observations (10 hours over 5 days). Land-based searches or line transects (10 hours over 3 days).	Previous surveys were undertaken in drought conditions and did not include line transects and flushing. 10 hours of line transects or land-based searches (including flushing) over 3 days, undertaken in suitable conditions.	12 hrs over 3 days traversing waterway & flushing patches of appropriate habitat. At the time of survey, water was not flowing in Lagoon Creek but associated dams (online and offline) held water. This indicates appropriate conditions.
Black-breasted Button Quail	The species is restricted to rainforests and forests, mostly in areas with rainfall of 770-1200mm per annum. It prefers drier, low, closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest. There are also reports from dry forest described as bottle tree scrub (brigalow, belah and <i>Brachychiton</i> sp.) with a shrub	RE 11.8.3 & 11.3.1, 11.3.17, 11.9.5, 11.9.10 (marginal). Sites: 7, 8, 10, 17, 19, 21, 22, 23, 25, 26 (NB. site 17 and 19 included in waterway traverse).	Area searches of suitable habitat with detection of flushing birds or hearing of foraging. Search for platelets. Effort: Land-based searches (15 hours over 3 days).	Previous surveys did not include flushing for the species and did not consider shrubby brigalow/belah forest as habitat. 15 hours of line transects or land-based searches in potential habitat over 3 days.	Best sites (7 & 8) - 60 mins by 2 ecologists on 3 days (6hrs). Marginal sites - 30-60 mins by 2 ecologists over 5 days (10 hrs). Total 16 hrs. Surveys conducted during breeding season.

Species	Habitat requirements (DoE 2013)	Appropriate habitat within the study area	Requirements as per Guideline (DEWHA 2010)	Requirements as per Gap Analysis	Survey Effort during November 2013
	understorey.				
Red Goshawk	Coastal and sub-coastal tall, open forest and woodland, tropical savanna traversed by rivers lined with timber and along the edges of rainforest. Nests are located above 20m in trees >30m high. Further inland these nest sites are restricted to alongside major river banks.	RE 11.8.5, 11.3.2, 11.3.17 (marginal), tall trees on waterway, clumps of tall trees in paddock. Sites: 1-6, 9, 11-14, 17, 19, 24, 28, 29 & waterway (NB. site 17 and 19 included in waterway traverse).	Search for characteristic nests, including ground searches along river banks in areas with tallest trees. Effort: Area searches (80 hours over 10 days).	Previous surveys did not include searches for nests. Area searches to be conducted in suitable habitat until 80 hours is reached, all trees have been searched or a nest is located (whichever comes first).	All areas of suitable RE habitat searched (39.5 hrs), plus 20 hrs searching other REs, plus 12 hours traversing waterway & floodplain, plus 3 hours searching other clumps of trees. Total 74.5 hrs (all suitable habitat searched). Surveys conducted during time when young will be fledging so nests will be present.
Regent Honeyeater	Mostly occurs in box-ironbark associations. Prefers the wettest, most fertile sites within these associations such as along creek flats, broad river valleys and foothills.	RE 11.8.5, 11.3.2, 11.3.17 (marginal), areas of flowering <i>Eucalyptus</i> sp. Sites: 1-6, 9, 11-14, 17, 19, 24, 28, 29 & waterway (NB. site 17 and 19 included in waterway traverse).	Area searches in suitable habitat, preferably in the morning. Detection by call or sighting. Targeted searches of woodland with heavily flowering trees, especially near water. Effort: Area searches (20 hours over 10 days), targeted searches (20 hours over 5 days).	Previous surveys did not involve targeted survey of flowering nectar resources and occurred in unfavourable conditions. Targeted searches (20 hours over 5 days) in patches of flowering <i>Eucalyptus</i> sp.	Best sites (9, 11, 12, 24, 28) - 30 - 45 mins by 2 ecologists on 5 days (28 hrs). Marginal sites - 30 - 60 mins by 2 ecologists (11.5 hours). Plus 2 hours by 2 ecologists in wooded section of waterway (4 hours). Total 43.5 hrs. Surveys were conducted during peak breeding season. Some trees were heavily budding and approximately 10% of the canopy contained open flowers. Detectability highest in early morning.

2013 Reptile and Mammals Survey

A five day fauna survey was conducted by four ecologists from 11- to 15 November 2013. This survey was completed to survey for reptiles and mammals that were considered to possibly occur within the revised Project site and to complement the findings from earlier ecology surveys undertaken for the revised Project.

The desktop review involved the collation and review of existing information relevant to the Project area. Information was sourced from the following:

- New Acland Stage 2 EIS – Nature Conservation chapter, 2005;
- New Acland Stage 2 - Targeted Flora and Fauna Surveys, 2007;
- New Acland Stage 3 EIS – Terrestrial Ecology Report and Matters of Environmental Significance Report, 2007;
- New Acland Stage 3 Expansion Project – Ecological Assessment of the Natural Grassland on Basalt and Fine Textured Alluvial Plains. Natural Grassland Ecological Assessment;
- New Acland Coal Mine Stage 3 – Natural Grassland Re-assessment to Inform Offset Strategy;
- New Acland Stage 3 – Koala and flora survey;
- Regional Ecosystem Mapping (Queensland Herbarium v6.1);
- Species Profile and Threats database - SPRAT (DotE 2013);
- EPBC database search tool (DotE 2013); and
- Wildlife Online (DEHP 2013).

This survey targeted:

- Five-clawed Worm-Skink;
- Yakka Skink;
- Northern Quoll;
- Long-nosed Potoroo;
- Large-eared Pied-bat; and
- South-eastern Long-eared Bat.

The fauna survey included five trapping sites and 11 observational sites in line with relevant DotE fauna survey guidelines (DEWHA, 2010a, SEWPaC, 2011, SEWPaC 2011a). These survey sites were representative of the habitat types across the revised Project site. A targeted trapping program was implemented at the trapping sites. The locations of the survey sites are illustrated in **Figure 3-5**. **Table 3-9** describes the habitat found at each survey site and the fauna species targeted.

During the survey period, mornings and evenings were mild with moderately warm daytime temperatures. Thunderstorms occurred every evening. Weather information was recorded at the nearby Oakey Aerodrome. Temperatures ranged between 13°C and 32°C. A total of 16.6 mm of rain was recorded during the survey period. Winds were slight in the mornings and became blustery in the afternoons, associated with storms.

Terrestrial fauna surveys were conducted under the following permits:

- Animals Ethics Approval: CA 2012/11/643 expiry 31/12/2015; and
- Scientific Purposed Permit: WISP10848512 expiry 28/02/2017.

Table 3-9 Survey trapping sites

Site number	Site type*	Description	RE	Targeted EPBC fauna species
1	Trapping	Brigalow (<i>Acacia harpophylla</i>) and Belah (<i>Casuarina cristata</i>) open forest with limited hollows on cracking clay soils.	11.3.1	▪ Five-clawed Worm-skink ▪ Large-eared Pied-bat ▪ Long-nosed Potoroo ▪ Northern Quoll ▪ South-eastern Long-eared Bat ▪ Yakka Skink
2	Trapping	Semi-evergreen vine thicket vegetation with logs, litter and rocky substrate.	11.8.3	▪ Large-eared Pied-bat ▪ Long-nosed Potoroo ▪ Northern Quoll ▪ South-eastern Long-eared Bat
3	Trapping	Poplar Box (<i>Eucalyptus populnea</i>) and Weeping Myall (<i>Acacia pendula</i>) woodland with limited hollows and a mid-sparse shrub layer on cracking clay soils.	11.3.2	▪ Five-clawed Worm-skink ▪ Large-eared Pied-bat ▪ Long-nosed Potoroo ▪ Northern Quoll ▪ South-eastern Long-eared Bat ▪ Yakka Skink
4	Trapping	Mountain Coolabah (<i>E. orgadophila</i>) grassy open-woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	▪ Five-clawed Worm-skink ▪ Large-eared Pied-bat ▪ Long-nosed Potoroo ▪ Northern Quoll ▪ South-eastern Long-eared Bat ▪ Yakka Skink
5	Trapping	Mountain Coolabah (<i>E. orgadophila</i>) grassy open-woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	▪ Five-clawed Worm-skink ▪ Large-eared Pied-bat ▪ Long-nosed Potoroo ▪ Northern Quoll ▪ South-eastern Long-eared Bat ▪ Yakka Skink

Site number	Site type*	Description	RE	Targeted EPBC fauna species
6	Observational	Mountain Coolabah (<i>E. orgadophila</i>) grassy open-woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	- Five-clawed Worm-skink - Large-eared Pied-bat - Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink
7	Observational	Natural Queensland Bluegrass (<i>Dichanthium sericeum</i>) grassland with cracking clay soils.	11.3.21	- Five-clawed Worm-skink - Yakka Skink
8	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.	11.9.5	- Five-clawed Worm-skink - Large-eared Pied-bat - Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink
9	Observational	Brigalow and Poplar Box woodland with limited hollows and a mid-shrub layer on clay soils	11.9.10	- Five-clawed Worm-skink - Large-eared Pied-bat - Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink
10	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.	11.3.1	- Five-clawed Worm-skink - Large-eared Pied-bat - Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink
11	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.		As above
12	Observational	Natural Queensland Bluegrass grassland with cracking clay soils.	11.3.21	- Five-clawed Worm-skink - Yakka Skink
13	Observational	Mountain Coolabah grassy open-woodland with Prickly Pear on cracking clay soils.	11.8.5	- Five-clawed Worm-skink - Large-eared Pied-bat

Site number	Site type*	Description	RE	Targeted EPBC fauna species
				- Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink
Rail loop	Observational	Grazing paddock largely cleared of vegetation with cattle present. Clay soils have been heavily compacted by livestock.	11.3.21/11.3.2	- Five-clawed Worm-skink - Yakka Skink
Dam	Anabat site	Farm dam surrounded by sparse trees with heavy cattle pugging.	Non-remnant	- Large-eared Pied-bat - South-eastern Long-eared Bat
Lagoon Creek	Observational (and one camera trap)	Ephemeral creek with sparse Brigalow patches along the riparian zone. Lagoon Creek was dry at the time of survey.	Small patches of 11.3.1, 11.3.2, 11.3.17 and 11.3.21	- Five-clawed Worm-skink - Large-eared Pied-bat - Long-nosed Potoroo - Northern Quoll - South-eastern Long-eared Bat - Yakka Skink

* Site type-; Trapping- site with traps, Observational- opportunistic site targeting species preferred habitat types

The survey techniques that were used included Elliot trapping, cage trapping, camera trapping, hair funnels, harp traps, bat call detection (Anabat) and spotlight searches. The survey techniques employed during the survey are provided in **Table 3-10**. A summary of the survey techniques employed for each targeted fauna species is provided in **Table 3-11**. A summary of the survey techniques employed at each fauna site is provided in **Table 3-12**. The DotE survey guidelines were used to devise the survey program, for these species. NAC also liaised with DotE on the specific details of the surveys to be undertaken and agreed on the effort required to meet the Department's needs. In these discussions, DotE identified the species that required further survey effort. This advice is the basis for the inclusion of these species listed in **Table 3-11**.

Table 3-10 Fauna survey techniques

Survey technique	Description	Total survey effort
Active search	Diurnal searches for Five-clawed Worm-skink and Yakka Skink were conducted at 15 sites. A minimum survey effort of two person hours was conducted at each site. See Table 3-12 for a breakdown of active search effort per site.	16 hours
Habitat search	Opportunistically searching habitats for Northern Quoll and Long-nosed Potoroo including tree hollows, fallen logs, burrows, abandoned buildings and dense vegetation. An endoscope was used to inspect deep hollows and burrows when required.	Opportunistic
Tracks/scats/pellets	Opportunistic searches were conducted throughout the survey for	Opportunistic

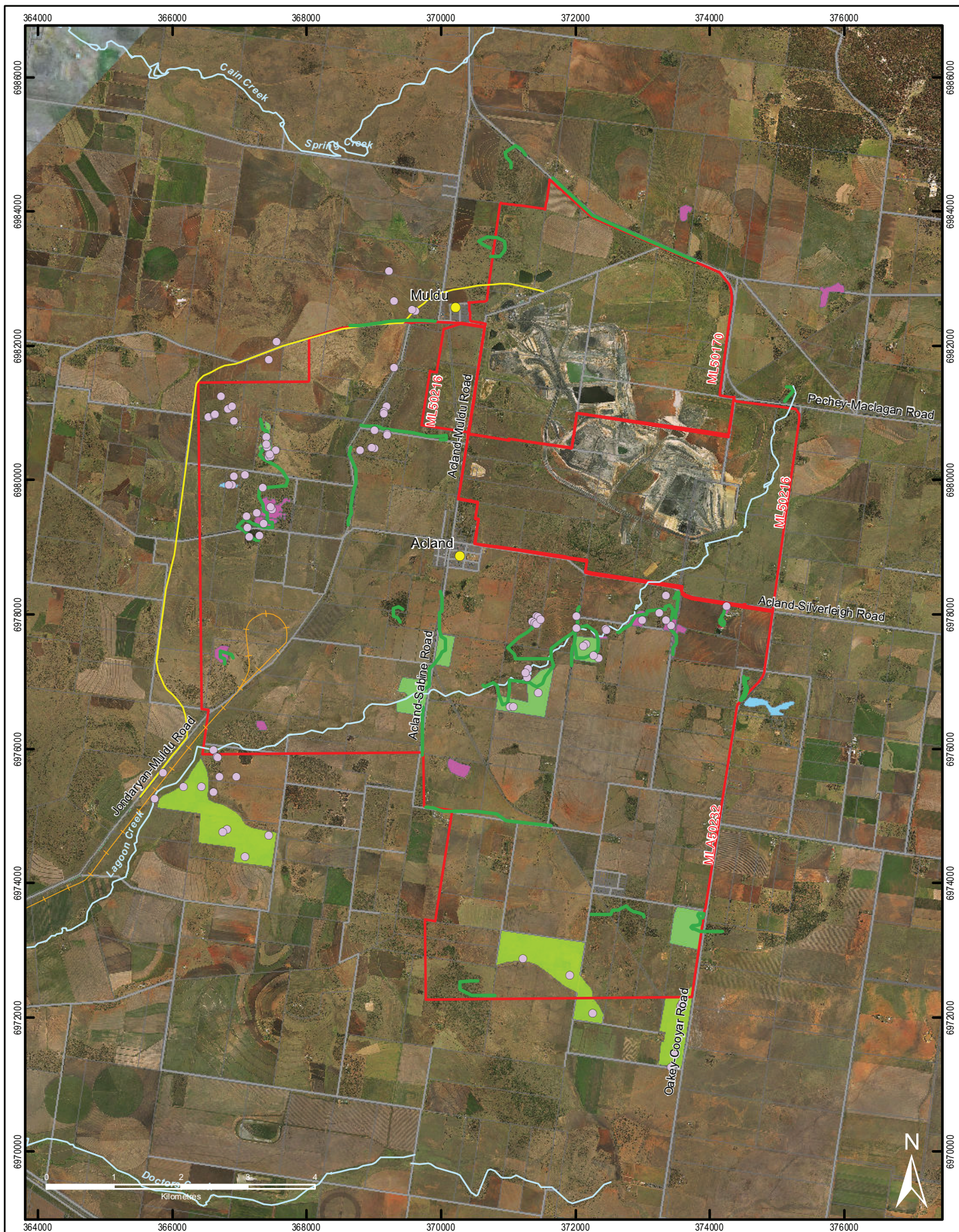
Survey technique	Description	Total survey effort
	tracks, scats and pellets of predator and target species. Predator scats were collected for analysis for hairs and bone fragments by Barbara Triggs.	
Bat detector - passive	Four nights of passive Anabat recording (using zero-crossings Anabat interface module) was conducted at a farm dam surrounded by vegetation that provided potential habitat for microchiropteran bats.	3 nights
Bat detector - active	Active Anabat recording (using zero-crossings Anabat interface module) was conducted at selected sites that provided potential habitat for microchiropteran bats.	6 hours
Harp trap	Four collapsible harp traps were deployed for four nights at sites that provided potential habitat for microchiropteran bats.	16 trap nights (four harp traps for four nights)
Camera trap	Thirty-nine baited, infra-red, motion triggered camera traps were deployed across five sites for four nights to identify Long-nosed Potoroo and Northern Quoll. Traps were baited with either a peanut butter, oat and walnut oil mixture (sites 2 and 9), targeting Long-nosed Potoroo or sardines and chicken frames (sites 4, 5, 13 and Lagoon Creek), targeting Northern Quoll. See Table 3-12 for a breakdown of cameras per site.	156 trap nights (39 camera traps for four nights)
Hair funnel	Ten and 20 hair funnels were set approximately 10 m apart along transects at sites 2 and 9, respectively. Each hair funnel was baited with a peanut butter, oat and walnut oil mixture and left on site for four nights. All hair samples obtained were sent to Barbara Triggs for identification. See Table 3-12 for a breakdown of hair funnels per site.	120 trap nights (30 hair funnels for four nights)
Elliott trap	Twenty large Elliott traps (Elliott B) were used in an attempt to capture Long-nosed Potoroo, Northern Quoll and Yakka Skink across sites 4 and 5. Traps were placed in a single transect line, at intervals of approximately 5-10 m. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with a mixture of peanut butter, oat and walnut oil, and chicken necks. See Table 3-12 for a breakdown of Elliott traps per site.	80 trap nights (20 Elliott traps for four nights)
Cage trap	Forty wire cage traps were used in an attempt to capture Long-nosed Potoroo, Northern Quoll and Yakka Skink across sites 2, 5, 4, 9 and 13. Traps were placed in a single transect line, at intervals of approximately 5-10 m. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with a mixture of peanut butter, oat and walnut oil, and chicken necks. See Table 3-12 for a breakdown of cage traps per site.	160 trap nights (40 cage traps for four nights)
Spotlighting	Spotlight searches for Long-nosed Potoroo and Northern Quoll were conducted at eight sites. The activity involved foot based searches using head torches and spotlights in areas of potential habitat for the target species. See Table 3-12 for a breakdown of spotlight hours per site.	14 hours

Table 3-11 Survey effort for target species

Species	Active search	Habitat searches	Tracks / scats / pellets	Bat detector (Passive)	Bat detector (Active)	Harp traps	Camera traps	Hair funnels	Elliott Traps	Cage traps	Spotlighting	TOTAL
Reptile												
Five-clawed Worm-skink	16 hours											16 hours active search
Yakka Skink	16 hours		None detected						80 trap nights		14 hours	16 hours active search, 80 trap nights, 14 hours spotlighting
Mammal												
Northern Quoll		Opportunistic	None detected				156 trap nights		80 trap nights	160 trap nights	14 hours	396 trap nights, 14 hours spotlighting
Long-nosed Potoroo		Opportunistic	None detected				156 trap nights	120 trap nights		160 trap nights	14 hours	436 trap nights, 14 hours spotlighting
Large-eared Pied-bat				16 hours	6 hours	16 trap nights						16 trap nights, 6 hours passive bat detection, 6 hours active bat detection
South-eastern Long-eared Bat						16 trap nights						16 trap nights

Table 3-12 Survey techniques employed at each fauna survey site

Fauna Survey Site	Active search (person hours)	Habitat search	Tracks/scats/pellets	Bat detector - passive	Bat detector - active (hours)	Harp trap	Camera trap (no. cameras)	Hair funnel (no. funnels)	Elliott trap (no. traps)	Cage trap (no. traps)	Spot-lighting (person hours)
1	2		X								
2		X	X				5	10		5	3
3			X								
4		X	X			X	10		10	10	2
5		X	X				9		10	10	2
6	2		X								
7	2		X								
8	2		X			X					1
9		X	X			X	9	20		10	1
10	2		X								
11			X								
12	2		X								
13		X	X				5			5	1
Rail loop			X		2						2
Dam			X	X							
Lagoon Creek	4		X		4	X	1				2



LEGEND

- Towns and Localities
- Vegetation
- Biocondition Sites
- Flora Transects
- Rail Spur
- Roads
- Creeks
- Jondaryan-Muldu Road Diversion

- Cadastre
- Mining Tenements

- Proposed Bluegrass Offset Locations

Threatened Ecological Communities

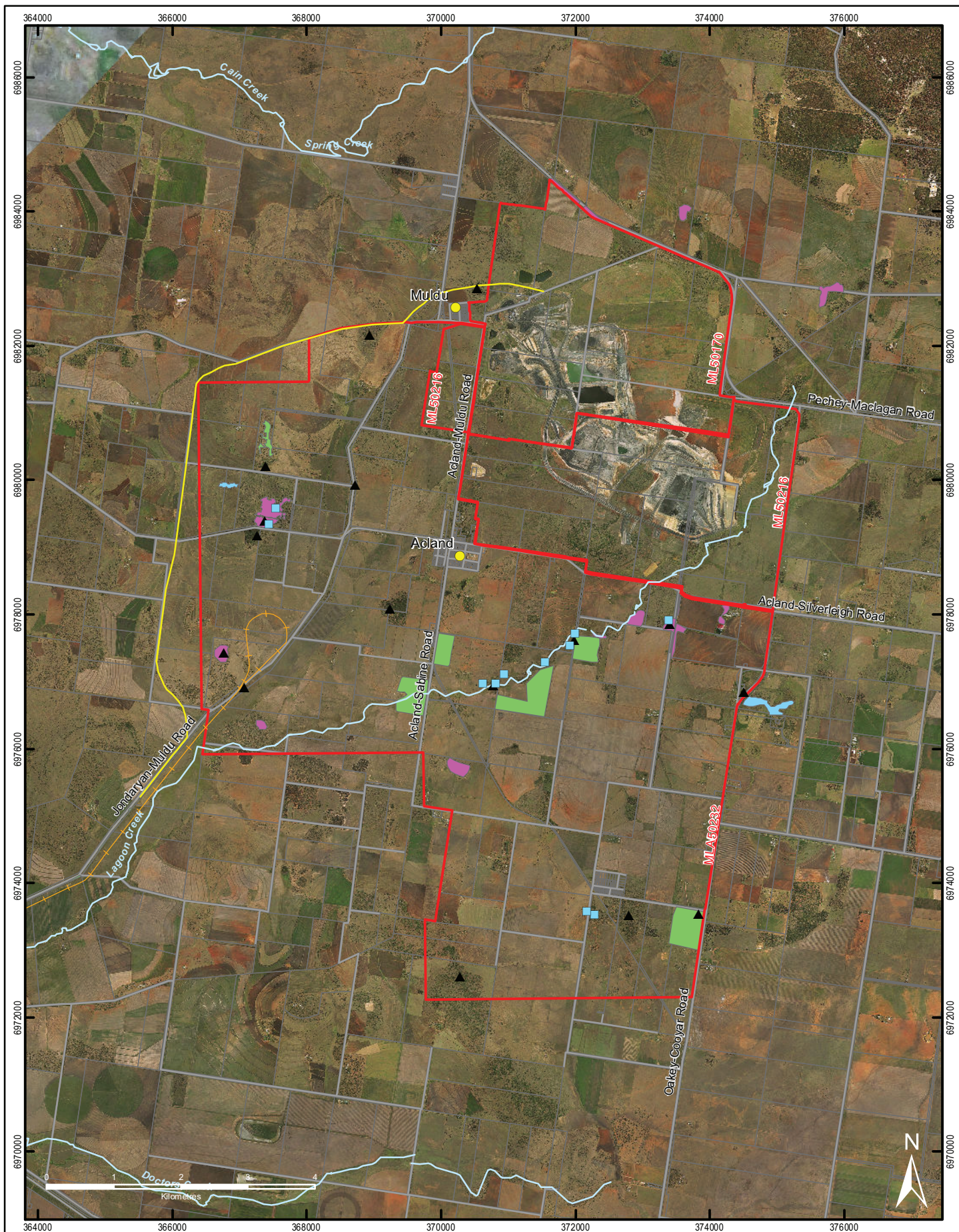
- Brigalow
- Bluegrass dominated grassland
- Semi Evergreen Vine Thicket



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-2 - Location of
Flora Survey Sites**

Scale 1:75,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



LEGEND

- Towns and Localities
- ▲ Koala Survey Locations
- Fauna Survey Sites
- Rail Spur
- Roads
- Creeks
- Jondaryan-Muldu Road Diversion

□ Cadastre

□ Mining Tenements

Threatened Ecological Communities

- Brigalow
- Bluegrass dominated grassland
- Semi Evergreen Vine Thicket

NEW HOPE
GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

Figure 3-3 - Location of Fauna Survey Sites

Scale 1:75,000 on A4

Projection: Australian Geodetic Datum – Zone 56 (AGD84)

3.2.4 Survey adequacy

Over a period of 13 years, NAC has undertaken a wide range of flora and fauna surveys of the revised Project site and other areas included in the New Acland Coal mine leases. These surveys have been described in **Section 3.2.2** and **Section 3.2.3** and the survey effort undertaken for these surveys is detailed in **Appendix G.5.2**.

Survey guidelines are available for fauna species (birds, mammals, reptiles and fish). Guidelines for flora species and ecological communities have not been published. In the absence of specific EPBC related guidelines for ecological communities, reference has been made to the listing advice for the threatened ecological communities likely to be located within the revised Project site. For flora species, standard vegetation survey methods were used, such as those published by the Queensland Department of Environment and Heritage Protection.

In summary, the survey guidelines have been satisfied for all of species and threatened ecological communities that are expected to be found in the revised Project site.

Three species of mammal were not surveyed, as the habitat for these species is not present in the area of the revised Project. These species were brush-tailed rock wallaby, long nosed potoroo and the northern quoll. These species habitat includes areas of thick heath or wet sclerophyll forest for the long nosed potoroo or broken and rocky country for the long nosed potoroo and the northern quoll. Records from the Queensland Museum and the Department of Environment and Heritage Protection do not include records of these species from the New Acland area.

One species of fish, the Murray cod was not surveyed, as Lagoon Creek that crosses the site is an ephemeral stream that does not provide any habitat for the species. Records from the Queensland Museum and the Department of Environment and Heritage Protection do not include records of these species from the New Acland area.

The EPBC survey guidelines and other recognised survey methods have been used for the conduct of the ecology surveys for the revised Project and other surveys associated with the New Acland Coal Mine. The highly disturbed condition and fragmented distribution of vegetation and habitat of the site and the general Acland area has resulted in a greatly modified landscape with very little habitat. While this is the case, the surveys have located some species and communities listed by the EPBC Act. These species and communities have been consistently observed during the surveys have been completed and on this basis, the survey effort and approach is satisfies the guidelines.

3.3 Results

The EPBC Protected Matters Search Tool identities the species listed in **Table 3-13** as possibly occurring on the revised Project site. **Table 3-13** describes the preferred habitat for these species and whether the species have been located on the revised Project site. The list includes:

- eight birds;
- one fish;
- six mammals;

- six reptiles; and
- 13 plants.

Table 3-13 Species possibly found in the vicinity of the revised Project site

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
Birds				
<i>Erythrotriorchis radiates</i>	Red Goshawk	Endangered	Occurs over woodland and forested areas in tropical and warm temperate Australia. They prefer mosaic landscapes with a large population of prey (birds) and permanent water. Preferred habit is open forest to allow for fast attacks and manoeuvring in flight.	Not present – habitat throughout the revised Project is highly disturbed and there is a lack of permanent water bodies and with very little area of forest or woodland. Species or nests have not been located following surveys consistent with DotE survey guidelines.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	Vulnerable	This species prefers open forests to sparse, open woodlands. The species forages in well drained, gravelly, sandy and loamy soils that support open forest to woodland communities.	Not present – while grasslands with surrounding woodlands observed in the vicinity of the revised Project, the species has not been recorded during the surveys completed over past 13 years. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Lathamus discolor</i>	Swift Parrot	Endangered	In Queensland known to occur in ironbark, red gum and yellow box woodlands and forests on which they feed on nectar in flowers.	Not present – species is known to have high level of site fidelity, and as no previous records of the species are known from the revised Project site, it is reasonable to conclude that this species is not present.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
<i>Neochmia ruficauda ruficauda</i>	Star Finch (eastern)	Endangered	Occurs in grassland and grassy woodland near permanent water. Population believed to be between Bowen, Winton and Wowan – north of the revised Project site.	Not present - revised Project site is outside the range of the Star Finch.
<i>Poephila cincta cincta</i>	Black-throated Finch (southern)	Endangered	Prefers grassy open woodlands and forests dominated by Eucalyptus, Corymbia and Melaleuca. Usually associated with riparian vegetation.	Not present – revised Project site is in the “may occur” part of the species modelled distribution, however the revised Project site does not encompass habitat that is likely to be inhabited by the species.
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Favours shallow fresh waterbodies inundated or waterlogged grasslands. Sites usually include rank emergent tussocks of grass sedges and rushes	Not present – areas of poor quality vegetation along Lagoon Creek Species has not been located following surveys consistent with DotE survey guidelines.
<i>Turnix melanogaster</i>	Black-breasted Button-quail	Vulnerable	Prefers vine thickets and rainforests that are periodically water-stressed.	Not present – very small area of isolated semi-evergreen vine thicket located on eastern edge of in the revised Project site. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Xanthomyza phrygia</i>	Regent Honeyeater	Endangered	They use the moister fertile sites in dry box-ironbark woodland and forests such as creekflats and river valleys.	Not present – preferred habitat not present on Project site. Species has not been located following surveys consistent with DotE survey guidelines.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
Fish				
<i>Maccullochella peelii</i>	Murray Cod	Vulnerable	Prefer habitats that have large amounts of in stream wood and overhanging vegetation on the banks. They are more common in waters that have slower velocities.	Not present – the water bodies located within the revised Project site are small isolated lagoons. Lagoon Creek is ephemeral, and does not provide suitable habitat and pools for the Murray Cod.
Mammals				
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Has been recorded in sandstone gorges in tall eucalypt forests, dry sclerophyll woodlands and forests and rainforests and wet sclerophyll forests. They prefer a combination of sandstone cliffs to provide roosting habitat that are adjacent to higher fertility areas such as box gum woodlands and river/rainforest corridors that can be used for foraging. The species also favours habitat with a canopy.	Not present –This species is highly dependent on sandstone caves for roosting, which do not occur in the revised Project site. Hollow roosting sites available in the revised Project site are only provide opportunistic habitat if the species was flying over the area.
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	Habitat includes rocky areas in eucalypt forest/woodlands, rainforest, beach scrubs. Eucalypt forests and woodland communities usually have a high level of structural diversity. Typically habitat includes some form of high relief rocky area, surrounded by vegetation for uses as dens.	Not Present – The Northern Quoll has only been recorded as far south as the Sunshine Coast, approximately 150 km to the north-east of the Project area (DSEWPaC, 2011a). Additionally, the revised Project site is highly fragmented and moderately suitable patches of denning habitat are disconnected from

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
				fauna movement corridors and subject to predation by predatory pests.
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	Vulnerable	Occurs in larger remnants with a well-developed understorey. Throughout inland Queensland, the habitat for this species is dominated by various eucalypt and bloodwood species and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer.	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with a distinct canopy and a dense cluttered shrub layer in the Project area.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Vulnerable	Prefers rock faces with large tumbled boulders, ledges and caves. Known to occur in a variety of the vegetation types such as dense rainforest wet sclerophyll forest vine thicket and dry sclerophyll forest.	Not present - no large tumbled boulders, ledges or caves located within the revised Project site. Vegetation communities are highly fragmented and of low structural diversity.
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE Mainland)	Vulnerable	Prefers dense understorey vegetation such as coastal heathlands and sclerophyll forests, with dense ground cover. Also prefers sandy soils where it is able to dig for food resources (fungi).	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with dense undergrowth in the Project area. The Project area supports high numbers of the predatory pests Foxes (<i>Vulpes vulpes</i>) and Feral Cats (<i>Felis catus</i>) which prey on this species and have contributed to its decline.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	This species feeds in a variety of habitats including rainforests, forests and woodlands communities, urban areas and gardens and orchards. It roosts in trees located near water such as lakes rivers and the coast.	Known – has been recorded in the vicinity of the revised Project site. Black Flying-fox were recorded foraging and sheltering within the revised Project site.
Reptiles				
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	Vulnerable	This species occurs in woodland and grasslands, including bluegrass grasslands, poplar box and brigalow communities. In modified areas, the species has been found sheltering under sheet metal, timber and hay bales.	– Not present - bluegrass, poplar box and brigalow communities are found within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Delma torquata</i>	Collared Delma	Vulnerable	This species is found in poplar box, lemon-scented gum and ironbark forests on stony soils and rocky ridges in southern Queensland. These communities usually have an understorey of grasses and lantana that produce thick leaf litter. The species seeks the protection of fallen timber and stones.	Not present – potentially suitable habitat in poplar box and brigalow communities. Eucalypt communities along rocky ridge lines have been recorded during surveys and these areas provide possible habitat. The species has not been recorded during the surveys completed over past 13 years.
<i>Egernia rugosa</i>	Yakka Skink	Vulnerable	The Yakka Skink is known to occur in brigalow communities, as well as poplar box woodlands. The species has been found in cavities around buried rocks stumps and logs, it also seeks refuge in hollow logs and to burrow tunnels. In cleared areas, the species is known to find shelter under	Not present – no burrow systems or latrine sites have been identified. The species has not been recorded during the surveys completed over past 13 years.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
			log piles, erosion gullies and rabbit warrens.	
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable	This species is very rare and secretive. There are few records of its occurrence. It has been recorded at sites in brigalow, cypress pine and sheoak communities, on black alluvial cracking soils. The species has been found sheltering under fallen timber and ground litter, it could make use of cracks in clay soils.	Not present – habitat occurring in brigalow communities. The species has not been recorded during the surveys completed over past 13 years.
<i>Paradelma orientalis</i>	Brigalow Scaly-foot	Vulnerable	This species has been recorded in a variety of open woodland communities and soils types. Specific habitat preferred by the species, relevant to the revised Project site includes brigalow/belah open forest and mountain coolibah open woodland. Its preferred micro habitat includes sandstone slabs, logs, fallen bark, leaf litter and grass tussocks. The species is known to be able to persist in areas that have been cleared and disturbed.	Not present – preferred habitat of brigalow/belah open forest and mountain coolibah open woodland recorded within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Tympanocryptis pinguicollis</i>	Grassland Earless Dragon	Endangered	Occurs in naturally treeless native tussock grassland on black or brown clay loams. It prefers ungrazed or lightly grazed paddocks with a slight slope dominated by wallaby grasses, spear grasses, tussocks grasses and kangaroo grasses. They are known to shelter under rocks and sometimes in insect holes. The species has been collected from Brookstead, Pittsworth and	Not present – grasslands present within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
			Toowoomba.	
Plants				
<i>Bothriochloa biloba</i>	Lobed Blue-grass	Vulnerable	This species is from the Darling Downs and northern NSW. It grows in cleared eucalypt forests and relict grassland often dominated by other grasses such as Queensland Blue-grass. It prefers heavy textured soils – black and brown clays.	Known
<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Occurs in dry rainforest, semi-evergreen vine thickets and dry sclerophyll communities.	Not present – preferred habitat is not present or in a very degraded condition within the revised Project site.
<i>Clematis fawcettii</i>	Stream Clematis	Vulnerable	Occurs on loamy soils growing in the gaps of canopies in dry rainforests near streams and semi-evergreen vine thicket, usually near watercourses.	Not present – the only semi-evergreen vine thicket doesn't occur near a stream
<i>Dichanthium queenslandicum</i>	King Blue-grass	Vulnerable	Occurs in black cracking clay in tussock grasslands mainly in association with other species of blue grass.	Possible – in blue grass grasslands throughout the revised Project site.
<i>Digitaria porrecta</i>	Finger Panic Grass	Endangered	Occurs in grassland on basaltic plains and in undulating woodlands and open forests. Usually occurs on dark and fine textured soils with some degree of seasonal cracking. It persists in disturbed locations. It is found in vegetation communities dominated by mountain coolibah and poplar box.	Known
<i>Haloragis exalata</i> subsp. <i>velutina</i>	Tall Velvet Sea-berry	Vulnerable	This species occurs in rainforest and rainforest margins, including dry rainforests. It is often found in damp areas near watercourses.	Not present – no suitable habitat at the revised Project site. Nearest record is from the Bunya Mountains.

Scientific Name	Common Name	EPBC Act Status	Preferred Habitat	Presence in revised Project site
<i>Homopholis belsonii</i>	Belson's Panic	Vulnerable	Found in poor soils in dry woodlands of belah, poplar box and sometimes brigalow. It typically prefers light to moderate shade.	Known
<i>Lepidium peregrinum</i>	Wandering Pepper-cress	Endangered	This species was thought to be extinct until recently rediscovered in near Clifton in northern NSW. Was found in open riparian forest growing in sandy alluvium.	Not present – no suitable sandy soils observed within the revised Project site.
<i>Picris evae</i>	Hawkweed	Vulnerable	Occurs in Eucalypt open woodlands with grassy understory composed of <i>Dichanthium</i> species. The species has been found growing along roadsides and in cultivated areas, on black, dark grey or red-brown soils and clay loam soils.	Not present – in grassland and brigalow communities.
<i>Rhaponticum australe</i>	Austral Cornflower	Vulnerable	Occurs in eucalypt open forest with grassy understorey on roadsides and in road reserves.	Known, has been found adjacent to the rail spur alignment, but not within the disturbance footprint of the revised Project
<i>Sarcophilus weinthalii</i>	Blotched Sarcophilus	Vulnerable	Found growing in trees of rainforests and dry scrubs.	Not present – no suitable habitat recorded within the revised Project site.
<i>Streblus pendulinus</i>	Siah's Backbone	Endangered	This species grows mainly along watercourses in well-developed rainforest, gallery forest or drier rainforests.	Not present - no suitable habitat recorded within the revised Project site.
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Occurs in grasslands and grassy woodlands. Commonly associated with kangaroo grass.	Not present – grassland and grassy woodland habitat occurs within the revised Project site.

3.3.1 Observed Threatened Ecological Communities (TEC)

Three threatened ecological communities were found in the revised Project site and are listed in **Table 3-14**. The distribution of threatened ecological communities (TEC) is mapped in **Figure 3-4**. The location and extent of the community, a general description of species and structure and an assessment of the conservation values of the community at a national, State and regional level are discussed below.

Vegetation mapping has been completed at the New Acland Coal Mine site in 2007 when the region had been experiencing prolonged drought conditions. A map of regional ecosystems was prepared based on observations made at the time of field surveys completed in February – March 2007. The vegetation mapping showed areas of bluegrass dominant grassland in several locations of the site. These were along Lagoon Creek, in the Manning Vale West pit, along the Acland-Sabine Road and the Oakey-Cooyar Road.

Vegetation surveys and revised mapping was undertaken in August 2013 to confirm the vegetation communities and distribution within the revised Project site and the mine footprint. This survey used the Queensland Herbarium regional ecosystem mapping methodology (Neldner 2012).

The vegetation mapping completed in 2013, has confirmed the presence of both Brigalow TEC and bluegrass dominant grassland TEC within the disturbance area of the revised Project. The vegetation survey also identified that the areas mapped as TECs have changed, with an increase in the area of Brigalow and a reduction in the area of bluegrass dominant grassland.

The bluegrass dominant grassland identified in the 2007 vegetation mapping were found along Lagoon Creek in three patches and also in two blocks in the Manning Vale West pit. The location of the bluegrass dominant grassland across the revised Project site coincides with areas mapped in the preclearing vegetation mapping as brigalow and poplar box communities. Specifically, these communities are mapped as 11.3.17 (*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains), 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks) and 11.9.10 (*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks). Some areas that were mapped as bluegrass dominant grassland now have woody vegetation regrowth occurring throughout the community. The woody regrowth includes *Acacia falcata*, *A. salicina*, *A. harpophylla*, *Eremophila mitchellii* and *Eucalyptus populnea*. The density of the regrowth of woody species in areas mapped as bluegrass dominant grassland is shown in Photo 29, Photo 32 and Photo 33 in **Table 3-1**. The regrowth has a height of two metres and is of a density that is dominating the site, providing shade to the understorey grasses.

These areas lack the diversity of herb and forb species, with *Dichanthium sericeum* being the dominant species, to the exclusion of other grasses, herbs and forbs.

The present condition and structure of the regrowth vegetation in areas that were mapped as bluegrass dominant grassland is consistent with a woodland community that has been extensively cleared, where pasture has been established in place of the woodland and where grazing has occurred regularly over a period of years. The woody regrowth of the revised Project site is even aged and of a consistent height. A vegetation community with such a structure is usual where the grazing

pressure has been removed and has not returned for several years, allowing the woody regrowth to become established, with the potential to replace the created pasture.

The change in grazing use of areas that are regenerating has resulted in a change to the vegetation community, with the community moving from a grassland community to regenerating brigalow and poplar box woodland.

Vegetation mapping completed in August 2013 also revised the extent and location of the Brigalow TEC. The area that has been mapped as a Brigalow community was shown as regional ecosystem 11.9.10 - *Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks. The regional ecosystem 11.9.10 does not meet the criteria for the Brigalow TEC. This community is present within the disturbance area of the revised Project, however, it is interspersed with another brigalow community – 11.9.5 - *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks. The 11.9.5 community is an artefact community that has resulted from the clearing of the overstorey *Eucalyptus populnea* from the 11.9.10 community, leaving a community of *Acacia harpophylla* and *Casuarina cristata*. The removal of the *Eucalyptus populnea* has changed the community from 11.9.10 to 11.9.5. The resulting 11.9.5 community is the Brigalow TEC.

Reassessment of the semi-evergreen vine thicket community on the eastern boundary of the pit has determined that this community does not extend into the MLA and is restricted to the eastern side of the Oakey-Cooyar Road. An additional area of the semi-evergreen vine thicket community was confirmed, outside the disturbance footprint of the revised Project, to the west of the Manning Vale West pit.

Table 3-14 EPBC Threatened Ecological Communities of the revised Project site

Threatened Ecological Community	EPBC status	Description
Brigalow (<i>Acacia harpophylla</i>) dominated and co-dominated community	Endangered	This community occurs as scattered patches along Lagoon Creek and within the Manning Vale West pit. There are small isolated patches across the southern part of the revised Project site, outside the mine footprint. This community is around 15 metres in height and comprises a canopy with <i>Acacia harpophylla</i> and <i>Casuarina cristata</i> . The understorey includes <i>Geijera parvifolia</i> and <i>Eremophila mitchellii</i> . There are moderate weed infestations present (up to 20%) in some patches, including African boxthorn and Mayne's pest and tree pear.
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered	Scattered patches of the community are located along Lagoon Creek, in the western part of the revised Project site, within the Manning Vale West Pit and along road sides.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	This community occurs in one area in the revised Project site - to the west of the Manning Vale West pit. The SEVT community does not fall within the mine footprint of the revised Project.

3.3.2 Threatened Flora Species

Three species of grasses listed as threatened under the EPBC Act have been recorded within the revised Project site as displayed in **Figure 3-4**. These species are:

- *Bothriochloa biloba* - Lobed bluegrass (Vulnerable);
- *Digitaria porrecta* - Finger panic grass (Endangered); and
- *Homopholis belsonii* - Belson's panic (Vulnerable).

Table 3-15 lists the species that have been confirmed within the revised Project footprint that are listed under the EPBC Act.

Table 3-15 EPBC Listed species of the revised Project site

Listed species	EPBC status	Description
<i>Bothriochloa biloba</i> - Lobed bluegrass	Vulnerable	One isolated occurrence in eastern part of the revised Project site, near Acland-Silverleigh Road, in the Manning Vale East Pit.
<i>Digitaria porrecta</i> - Finger panic grass	Endangered	One isolated patch in western part of the revised Project site, in the Manning Vale West Pit.
<i>Homopholis belsonii</i> - Belson's panic	Vulnerable	Twelve patches found in the bluegrass dominated grassland community and are found in the Manning Vale West Pit and the Willaroo Pit, to the south of Lagoon Creek. This species has been found in the shelter of trees in the brigalow and poplar box vegetation communities.

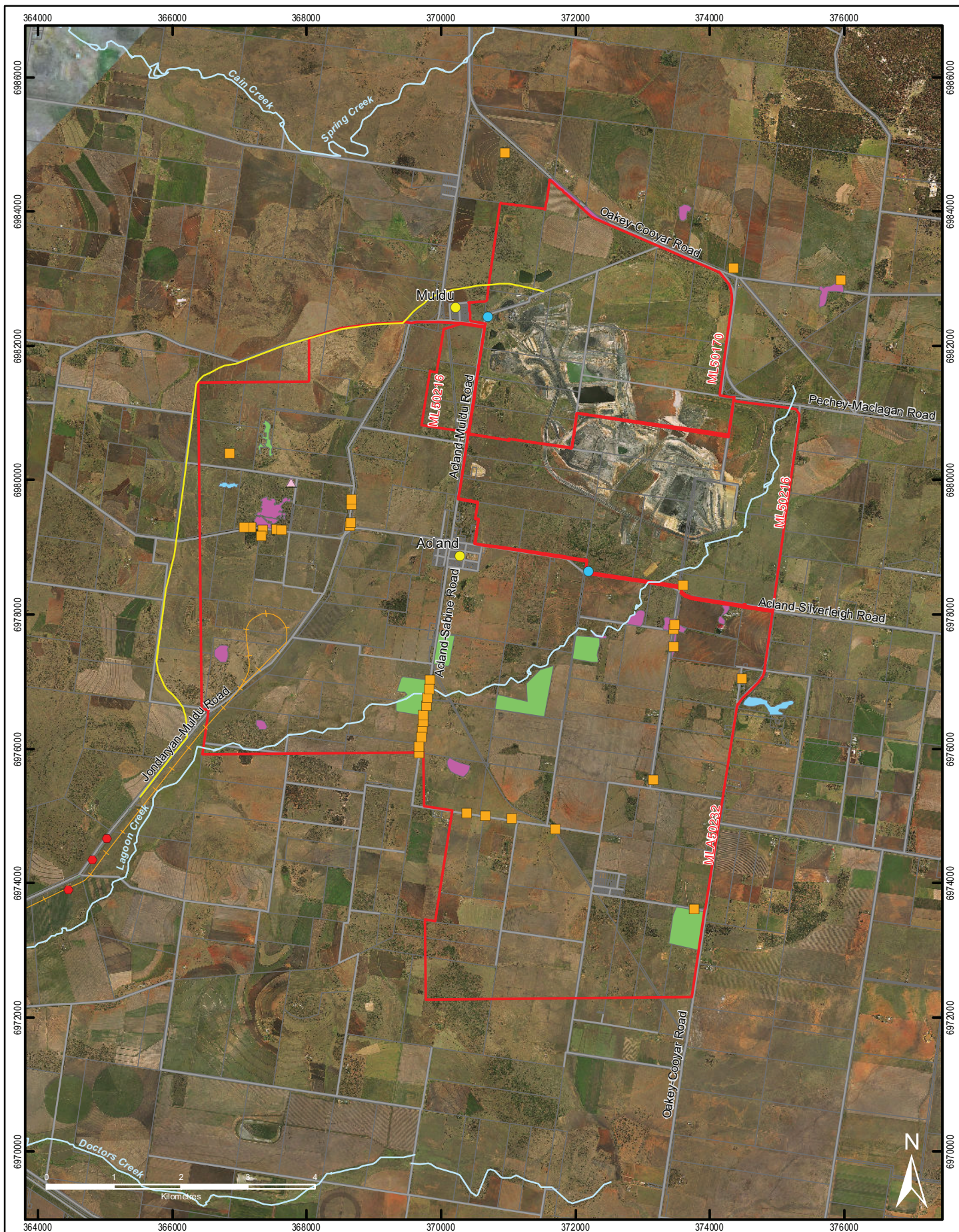
The vegetation surveys that were completed in August 2013, confirmed the presence of *H. belsonii* within the Manning Vale West pit area. This species was found growing under the Brigalow and belah communities within the Manning Vale West pit. The extent of *H. belsonii* is consistent with previous surveys.

Further occurrences of flora species listed under the EPBC Act were not found during the August 2013 vegetation survey.

3.3.3 Threatened Fauna Species

The Grey-headed flying fox has been recorded in the vicinity of the revised Project site. This is the only threatened fauna species recorded at the revised Project site.

The fauna habitat types and habitat quality of the revised Project site are possibly suitable for small mammals, Brigalow reptiles, bats and birds. These areas of habitat, particularly where suited to the Brigalow reptiles have been surveyed without any of the EPBC listed species being located. The results of the surveys completed in October and November 2013 are presented below.



LEGEND

- Towns and Localities
- Rail Spur
- Roads
- Creeks
- Jondaryan-Muldu Road Diversion
- Cadastre
- Mining Tenements

Threatened Flora

- *Bothriochloa biloba*
- ▲ *Digitaria porrecta*
- *Homopholis belsonii*
- ◆ *Rhaponticum australe*

Threatened Ecological Communities

- Brigalow
- Bluegrass dominated grassland
- Semi Evergreen Vine Thicket



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-4 - Threatened Ecological
Communities & Species Locations**

Scale 1:75,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

EPBC Birds

A total of 21 survey sites and 8km of Lagoon Creek were surveyed for the target bird species (Australian Painted Snipe, Black-breasted Button Quail, Red Goshawk and Regent Honeyeater). The target species were not located (nor were any nests belonging to the target species). All areas of potential habitat in the revised Project site are inadequate or sub-optimal for the target species due to the high levels of disturbance or a lack of essential resources. This is despite the surveys being conducted in areas of habitat that are the 'best on offer'.

The condition of the native vegetation communities and Lagoon Creek on the revised Project site varies from good to very poor, with the majority of the areas being considered to be in poor condition. The small and isolated nature of the vegetation communities has meant that the majority suffer from extensive weed invasion, significant disturbance to the understorey (through grazing) and pest invasion (particularly foxes, pigs and cats).

There were five habitat types identified within the revised Project site that possibly provide habitat for the targeted bird species. These habitats are described in detail in **Table 3-16**. The bird survey sites are shown in **Figure 3-5**.

Table 3-16 Bird habitat description

Habitat and Description	Habitat features	Description
Mountain coolibah (<i>Eucalyptus orgadophila</i>) woodland (RE11.8.5)	 Features: - Occasional to common hollow and fallen logs - Common to abundant litter and grass - No to low (<10% canopy) flower abundance - Occasional stones (20-60cm) Disturbance: - Grazing - Selective logging - Heavy weed infestation	This habitat type makes up > 30% of the vegetation on the study area. The condition is poor to good. Most occurrences are on a hilltop. The canopy is generally 16-18m high with 10 - 20% cover and the dominant species is <i>Eucalyptus orgadophila</i> with some <i>Corymbia erythrophloia</i>. The trees are remnant with little to no recruitment. The shrub layer is heavily modified and often includes <i>Opuntia tomentosa</i>* as a dominant species, with the exception of Sites 2 and 29 where <i>Geijera parviflora</i> is dominant. The ground layer is grassy and often grazed.

Habitat and Description	Habitat features	Description
	Sites: 2, 3, 4, 5, 6, 29 Target species: Red Goshawk, Regent Honeyeater	
Semi-evergreen vine thicket (RE11.8.3)	 Features: Occasional hollows and fallen logs Occasional to common decorticated bark Common fine litter Occasional to common grass Disturbance: Grazing Selective logging Moderate weed infestation Pests (i.e. fox & pig) Sites: 7 Target species: Black-breasted Button Quail	This habitat type makes up <0.1% of the vegetation on the study area. The condition is poor. It is on a hilltop. The canopy is generally 10-12m high with 5 - 10% cover and the dominant species is <i>Casuarina cristata</i>. Other softwood scrub species exist in T2, including: <i>Exocarpos latifolius</i>, <i>Flindersia sp.</i>, <i>Capparis sp.</i> The shrub layer is heavily modified and often includes <i>Lycium ferrocissimum</i>* as a dominant species, with <i>Carissa ovata</i>. These shrubs formed sporadic dense clumps. The ground layer is bare with some areas of sparse grassy cover.

Habitat and Description	Habitat features	Description
Brigalow / belah open forest with or without poplar box emergents (RE11.9.5, 11.9.10, 11.3.1, 11.3.17)	 Features: - Rare to occasional hollows and fallen logs - Common decorticating bark - Abundant litter and occasional grass - No flower abundance - Patchy understorey Disturbance: - Selective logging - Moderate weed infestation - Evidence of pests (i.e. pigs) Sites: 8, 10, 21, 22, 23, 25, 26 Target species: Black-breasted Button Quail	This habitat type makes up < 20% of the vegetation on the study area. The condition is poor to fair. The vegetation is often in a low-lying area. The canopy is generally 10-12m high with 30% cover and the dominant species is <i>Casuarina cristata</i> or <i>Acacia harpophylla</i>. Sometimes there is emergent <i>E. populnea</i>. The shrub layer is heavily modified and often includes dense regrowth <i>A. harpophylla</i>. The ground layer is bare with sparse grassy cover.
Poplar box woodland to open forest with or without vine forest understorey (RE11.3.2, 11.9.7)	 Features:	This habitat type makes up <10% of the vegetation on the study area. The condition is good to poor. It is on alluvial plains or mid-rises. The canopy is generally 10-12m high with 10 - 20% cover and the dominant species is <i>E. populnea</i>. Sometimes <i>Acacia pendula</i> is dominant as a T2 layer. The shrub layer is varied from vine forest understorey (dominated by <i>Carissa ovata</i>) like at site 9, to <i>Acacia sp.</i> (A.

Habitat and Description	Habitat features	Description
	Occasional to common hollows and fallen logs Abundant litter and grass Low flower abundance (<10 % canopy cover) Disturbance: Selective logging Grazing Moderate weed infestation Evidence of pests (i.e. pigs) Sites: 9, 11, 12, 13, 14, 24, 28 Target species: Regent Honeyeater, Red Goshawk, Black-breasted Button Quail (where vine forest understorey – Site 9)	<i>harpophylla</i>, <i>A. pendula</i>) and <i>Geijera parviflora</i> to open grassy areas. The ground layer is sparse to dense grass (depending on the density of the shrub layer).
Lagoon Creek riparian zone	 Features: Occasional remnant trees with hollows and stags Dams, occasionally with fringing vegetation Disturbance: Cleared Heavily grazed and eroded in places Pests evident (i.e. pigs and foxes) Sites: 17-19 Target species: Australian Painted Snipe, Regent Honeyeater, Red Goshawk	The creek runs across the middle of the study area from north-east to south-west. It is in poor to very poor condition. The creek ranges from shallow overland flow paths connected by dams to deeply eroded channels and pools. The condition of the riparian vegetation varies from completely cleared (particularly in the southern extents) to scattered patches of brigalow (RE11.3.1, 11.3.17), natural grasslands (RE11.3.21) and poplar box woodland (RE11.3.2).

In response to the poor quality of habitat within the revised Project site, only those native bird species that are particularly resilient to disturbance and are regularly successful in grazed areas and on habitat edges have been noted as being present and/or abundant. The following provides a summary of habitat requirements, description of available habitat and findings of the survey for each target species.

Australian Painted Snipe

The species has been recorded in wetlands in all states of Australia, but its main distribution is along the east coast of Australia. There is estimated to be up to 5,000 individuals. There is one record of the species within 10km of the study area, at Jondaryn, however the date of the record is not supplied. Other nearby (within 50km) sightings are from Dalby (1965) and Lake Broadwater (2001) (ALA 2013).

The Australian Painted Snipe was not located during the targeted survey, which focused on areas within and adjacent to Lagoon Creek. Lagoon Creek has been modified to a point where it is no longer suitable for the species. The creek is ephemeral and would have naturally contained areas of temporary wetlands suitable for the species, but grazing activity and the construction of dams along the creek have changed the local hydrology such that local flooding is reduced (and the formation of temporary wetlands is precluded) and water quality in dams is generally poor. Only some of the smaller dams retain native fringing rushes (*Juncus usitatus*), but cattle access is evident. In addition, there is a high population of foxes around the revised Project site and evidence of fox activity along Lagoon Creek.

Black-breasted Button Quail

The species is endemic to eastern Australia, primarily south-eastern Queensland and north-eastern New South Wales. There is estimated to be up to 5,000 individuals and 14 sub-populations in Queensland. The nearest records of the species are about 40km north of the study area, at Yarraman State Forest and around Crow's Nest, however, these records are from 2009 (ALA 2013). The study area is just outside the 'expert distribution' for the species (ALA 2013).

The Black-breasted button quail was not located during the targeted survey, which focused on areas of SEVT and brigalow within the revised Project site. It is likely that the available habitat has been reduced too far and modified to a point where it is no longer suitable for the species. The areas of brigalow available to the species did not contain the dense understorey required for cover. There is only one small (<2 ha) patch of SEVT remaining on the study area and it is isolated and heavily degraded by grazing and weed invasion (particularly African Boxthorn *Lycium ferocissimum*). There is an absence of a thick leaf litter layer in all available habitats in the study area, which is essential for the species for feeding and nesting. It is noteworthy to add that the average annual rainfall for the area is 620mm (BoM 2013), which is less than specified for the species.

Red Goshawk

The species is endemic to eastern Australia. It is very sparsely dispersed across approximately 15% of coastal and sub-coastal Australia, from western Kimberley Division (north of 19°S) to north-eastern NSW (north of 33°), and occasionally on continental islands. There is estimated to be up to 660 individuals. There are records of the species are about 10-15 km east of the study area, around Crow's Nest, however, these records are from 1952 and 1978 (ALA 2013).

The Red Goshawk (nor it's nest) were not located during the targeted survey, which focused on wooded areas and Lagoon Creek. The species prefers extensively wooded areas and it is likely that the study site does not provide enough remnant vegetation. The diversity and density of medium sized birds (which form its prey) was noted to be low on the study area, which could also contribute to the lack of suitable resources for Red Goshawk.

Regent Honeyeater

The species is endemic to eastern Australia, however, most sightings originate from New South Wales and Victoria. In Queensland, the Regent Honeyeater has been recorded from 15 sites. There is estimated to be up to 400 individuals. There are records of the species are about 30 km south-west of the revised Project site, around Ravensbourne National Park (1901 and 1936), about 35 km north-west in Dalby (2000 and 2001) and 40 km north in Bunya Mountains (2012) (ALA 2013).

The Regent Honeyeater was not located during the targeted survey, which focused on wooded areas particularly box forest on flood plains and street trees in Acland. The species prefers box-ironbark woodland/open forest and there are no ironbark species naturally occurring on the study area. The ironbark specimens that do occur are Mugga Ironbark that has been introduced to the revised Project site and planted as street trees around the town centre of Acland. The species is not often recorded in Queensland and existing records in the region are distant and over 45 years old, therefore it is not likely that the species would utilise the heavily fragmented vegetation or the few street trees available in the study area.

EPBC Reptiles and Mammals

The habitat within the revised Project site is significantly altered from its original state with the vast majority of the area having been cleared. Remaining habitat is restricted to small, isolated patches of remnant vegetation that is subject to weed and pest invasion and on-going cattle grazing. The revised Project site, consisting primarily of grazing paddocks, has produced a heavily disturbed landscape. The remaining remnant vegetation is heavily fragmented, isolated and provides limited habitat to native fauna. The habitat of the revised Project site relevant to the reptiles and mammals that were the target of this survey can be attributed to six habitat types, as described in **Table 3-17**. The bird survey sites are shown in **Figure 3-5**. Plates of habitat of the revised Project site are provided in **Plate 3-1** to **Plate 3-6**.

Table 3-17 Fauna habitat description

Habitat type	Key habitat features	Site(s)	Corresponding REs	Potential target species
Brigalow / Belah woodland (Plate 3-1)	Limited branch-sized hollows with a mid-sparse shrub layer provide habitat for arboreal fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	1, 8, 9, 10 and 11	11.3.1 11.9.5 11.9.10	Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
Cleared land (Plate 3-2)	Little habitat for the species of fauna targeted in this report. Cracking clay soils may provide	Rail loop	Non-remnant	Five-clawed Worm-skink Yakka Skink

Habitat type	Key habitat features	Site(s)	Corresponding REs	Potential target species
	habitat for reptiles though long term cattle grazing has resulted in soil compaction and minimal cracks are present.			
Mountain Coolabah woodland (Plate 3-3)	Abundant branch- and trunk-sized hollows with a mid-sparse shrub layer provide habitat for arboreal and terrestrial fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	4, 5, 6 and 13	11.8.5	Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
Natural grasslands (Plate 3-4)	Tussocks, fallen logs and cracking clay soils provide habitat for reptiles and macropods.	7 and 12	11.3.21	Five-clawed Worm-skink Yakka Skink
Poplar Box / Weeping Myall woodland (Plate 3-5)	Limited branch-sized hollows with a mid-sparse shrub layer provide habitat for arboreal fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	3	11.3.2	Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
Semi-evergreen vine thicket (Plate 3-6)	Trees with a mid-sparse shrub layer provide habitat for bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	2	11.8.3	Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat



Plate 3-1 Brigalow / Belah woodland



Plate 3-2 Cleared land



Plate 3-3 Mountain Coolabah woodland



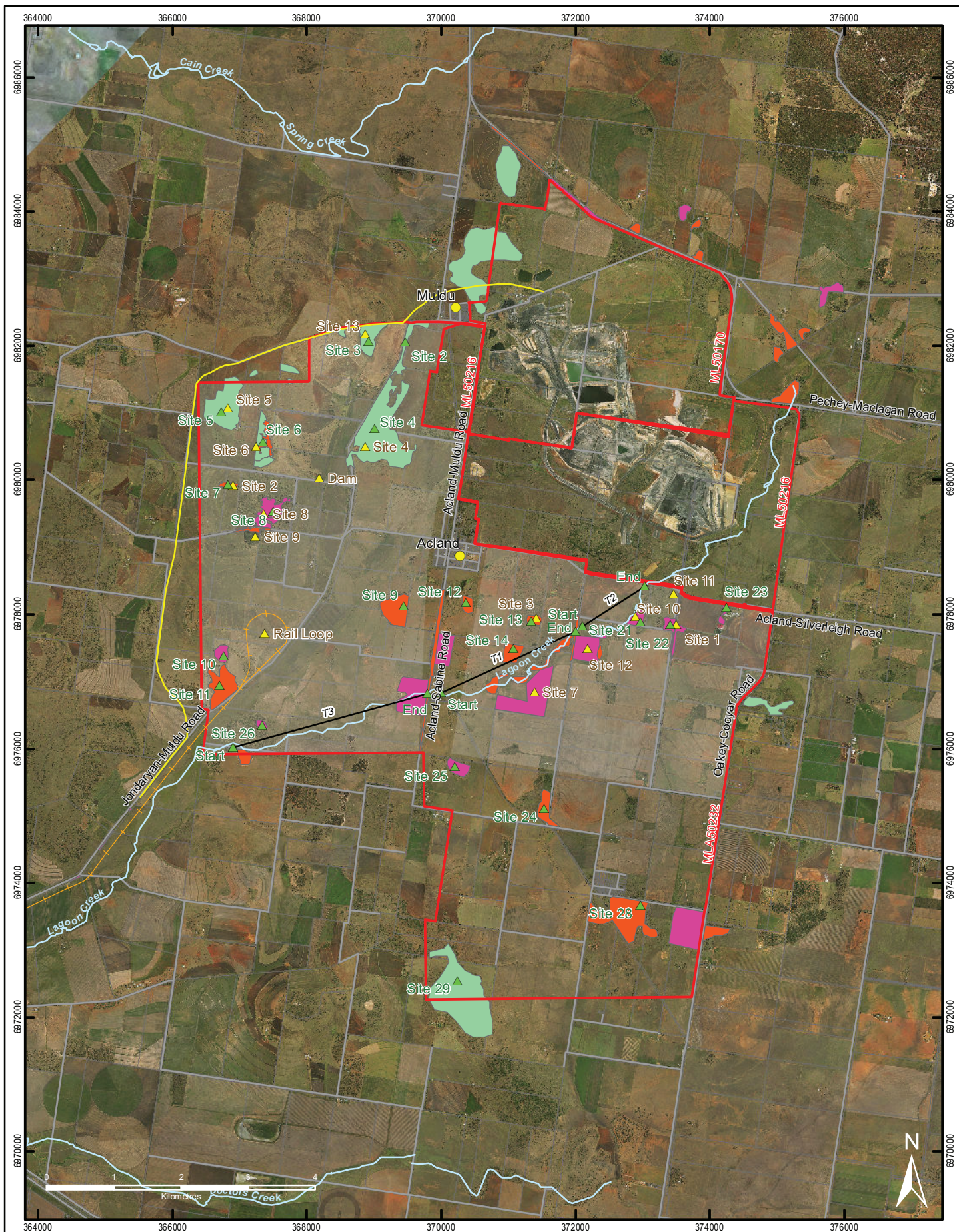
Plate 3-4 Natural grasslands



Plate 3-5 Poplar Box / Weeping Myall woodland



Plate 3-6 Semi-evergreen vine thicket



LEGEND

- Towns and Localities
- ▲ Bird Survey Sites
- ▲ Reptile / Mammal Sites
- Bird Survey Transects
- Rail Spur
- Creeks
- Jondaryan-Muldu Road Diversion
- Cadastre
- Mining Tenements
- Observed Regional Ecosystems**
- Endangered
- Of Concern
- Least Concern



NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-5 - Bird, Reptile & Mammal
Survey Sites**

Scale 1:75,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

3.4 Fauna diversity

None of the fauna species targeted in reptile and mammal survey were identified in the revised Project site. In total, 43 fauna species were observed comprising eight reptiles, 17 birds (one exotic species) and 18 mammals (including eight exotic species). These species are listed in Appendix G.5.1.

Overall, the habitat in the study area for the fauna species targeted in this report, and other native species generally, is of poor quality. The site has previously undergone significant clearing for cultivation and grazing and is heavily disturbed and mostly comprised of cleared land and access tracks. The small patches of remnant vegetation that remain are generally associated with Lagoon Creek and farm houses. As a result, these small patches are highly fragmented, isolated and subject to edge effects. Consistent with a landscape in this condition, the area is heavily invaded by introduced pest species such as the Feral Cat (*Felis catus*) and Wild Dog (*Canis familiaris*), Indian Mynas (*Acridotheres tristis*), Red Fox (*Vulpes vulpes*) and European Rabbits (*Oryctolagus cuniculus*), and weeds including Velvet Tree Pear (*Opuntia tomentosa*) and Rhodes Grass (*Chloris gayana*).

4 Assessment of Impacts

This section assesses the impact of the revised Project on the matters of NES that have been identified from the ecological surveys.

4.1 Clearing of vegetation

The revised Project will result in the clearing of 64.7 ha of two threatened ecological communities, as listed in **Table 4-1**. **Figure 4-1** shows the impact of the revised Project footprint in relation to the distribution of significant remnant vegetation communities and flora species.

Table 4-1 Area of threatened ecological communities to be cleared

Threatened Ecological Community	EPBC status	Area cleared (ha)
Brigalow (<i>Acacia harpophylla</i>) dominated and co-dominated community	Endangered	24.6
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered	40.1
Total area of TECs		64.7

4.1.1 Brigalow community

An area of 24.6 ha of Brigalow woodland is to be cleared for the revised Project. The Brigalow to be cleared is located within the Manning Vale East and Willaroo pits, north and south of Lagoon Creek, on the eastern side of the revised Project site and within the Manning Vale West pit. There will not be any Brigalow cleared for the construction of mine infrastructure.

This community comprises isolated clumps of Brigalow community within the disturbance footprint of the revised Project.

The impact of the revised Project on the Brigalow community is assessed to be a low impact, due to the small area that is to be cleared, at 24.6 ha. The placement of the rail spur and loop has been determined to avoid an area of Brigalow community in the south-western corner of the revised Project site. The considered placement of the rail spur and loop will avoid clearing 4.33 ha of Brigalow. Several small patches of the Brigalow community are located on the banks of Lagoon Creek. These small areas of the community will avoid being impacted as Lagoon Creek will not be diverted in the revised Project. The area of Brigalow along Lagoon Creek that will be not affected by the revised Project is 2.71 ha. A 100 metre wide corridor will be retained along the length of Lagoon Creek, as it runs between the Manning Vale East and Willaroo pits.

The impact of the revised Project on areas of Brigalow is as a result of the placement of the mine pits, that is a consequence on the location of the coal resource. The impact on the Brigalow community is an unavoidable outcome of the revised Project. The area of impact has been limited to the smallest possible area.

4.1.2 Bluegrass dominant grassland community

An area of 40.1 ha of the bluegrass dominant grassland community will be cleared as a result of the revised Project. The majority of the community to be cleared is located within the Manning Vale West Pit, on the western side of the revised Project site. Other areas of the community that will be cleared are parts of two patches on the southern side of Lagoon Creek, between Acland-Silverleigh Road and Acland-Sabine Road, within the Willaroo pit.

The impact of the revised Project on the bluegrass dominant grassland community is assessed to be a low impact, due to the small area that is to be cleared, at 40.1 ha and the low quality of the community within the disturbance footprint. The bluegrass dominant grassland community within the Willaroo pit is of low quality, illustrated by the low diversity of grassland species, dominance of *Dichanthium sericeum* and the moderate level of weed infestation. The quality of the community in the Manning Vale West pit is of higher quality, with a greater diversity of grassland species.

The revised Project will result in the clearing of 35.89 ha of the community along Lagoon Creek. An area of 7.15 ha of the community is outside the disturbance footprint of the revised Project, located either between the mine pit and Lagoon Creek or to the west of the Willaroo pit.

Within the Manning Vale West pit, an area of 4.21 ha of the bluegrass dominant grassland community will be impacted by the revised Project. This patch of the community is fully within the Manning Vale West pit boundary and the impact cannot be avoided.

As with the Brigalow community, the impact of the revised Project the bluegrass dominant grassland is as a result of the placement of the mine pits, that is a consequence on the location of the coal resource.

4.1.3 Flora species

Recorded species

Three flora species that are listed under either the EPBC Act have been recorded from the revised Project site and are within the disturbance footprint. The impact of the revised Project on these species is described below.

Bothriochloa biloba - Lobed bluegrass

The revised Project will result in the clearing of one patch of *Bothriochloa biloba*. This is located on Acland-Silverleigh Road in the road reserve and will fall within the Manning Vale East Pit. Habitat for the Lobed bluegrass will remain within and around the revised Project site following the construction of the revised Project, in the form of eucalypt woodland and grasslands.

***Digitaria porrecta* - Finger panic grass**

The revised Project will result in the clearing of one patch of *Digitaria porrecta*. This is located in the western part of the revised Project site and will fall within the Manning Vale West Pit. It is possible the species is also found in other areas of the revised Project site in suitable habitat. Preferred habitat of

mountain coolibah and poplar box communities are to be retained in the revised Project site, and not affected by the revised Project footprint. These communities are present across the Acland region and will continue to support the Finger panic grass.

***Homopholis belsonii* - Belson's panic**

The revised Project will result in the clearing of 12 patches of *Homopholis belsonii*. These patches of *H. belsonii* are associated with the bluegrass dominated grassland community and are found in the Manning Vale West Pit and the Willaroo Pit, to the south of Lagoon Creek. *H. belsonii* is associated with brigalow threatened ecological community and the mountain coolibah woodlands.

Habitat for Belson's panic will remain unaffected by the revised Project. The poplar box, belah and Brigalow woodlands unaffected by the revised Project are located in remnant areas. These areas of remnant include along roadsides, in vegetation adjacent to the disturbance area and remnants within the mining lease. Therefore, the impact of the revised Project on this species is low.

Species potentially found at revised Project site

There are four other flora species that may occur within the disturbance footprint of the revised Project. An assessment of the impact of the revised Project on these species is also described below.

***Dichanthium queenslandicum* - King Blue-grass**

King blue grass is known to occur on black clay soils in grassland communities. This habitat is found within the revised Project footprint and it is possible that the species could be affected, although the species has not been recorded within the revised Project site. Areas of suitable habitat will remain outside the revised Project disturbance area and, as a result the impact of the revised Project on this species is low.

***Picris evae* - Hawkweed**

Hawkweed may possibly be found in the eucalypt woodlands across the revised Project site. It is possible the species will be affected by the revised Project. While areas occupied by this species may be affected by the revised Project, there will be habitat retained outside the revised Project footprint. Vegetation suitable for hawkweed will be retained in grassland areas along Lagoon Creek, scattered areas of brigalow and grassland to the south of the Willaroo pit and to the east and west of the Manning Vale West pit. Therefore, the impact of the revised Project on this species is low.

***Rhaponticum australe* - Austral Cornflower**

This species is known from the revised Project site and has been located adjacent to the rail spur alignment. The known location of the species is outside the disturbance footprint of the revised Project. However, there is the possibility that species could occur in areas of eucalypt woodland that are to be cleared for the revised Project. Therefore, the impact of the revised Project on this species is low.

***Thesium australe* - Austral Toadflax**

Austral toadflax is known from grassland communities and it is possible that this species could be affected by the revised Project, due to the clearing of grasslands. However, there will be areas of grassland retained within the revised Project site, where the species can continue to occur. Therefore, the impact of the revised Project on this species is low.

4.1.4 Fauna species

One fauna species (*Pteropus poliocephalus* - Grey-headed Flying-fox) listed under EPBC Act has been confirmed at the revised Project site.

4.2 Infrastructure impacts

The power network will be relocated along roads and disturbed areas of the revised Project site. The new power lines will be constructed on poles, as is standard for 33kV electricity distribution networks. The underground 33kV network is located in a disturbed area of the existing mine, as shown in **Figure 2-21** and a 300m section to provide power to the rail loop.

The placement of power poles will specifically avoid areas of threatened ecological communities and listed species, as there is flexibility on the location of the poles. Lay down areas and related facilities required for the construction of the relocated power lines will also be located to avoid matters of national environmental significance.

The revised Project will require the relocation of telecommunication facilities. These facilities will be relocated by Telstra, in association with NAC. A telecommunications hut and telephone cables will need to be removed from the revised Project site. Impacts associated with the relocation of the telecommunication infrastructure will be managed by Telstra as part of their relocation of these facilities.

4.3 Indirect impacts

Dust generation from mining, blasting, conveyor systems and wind blown coal dust from stockpiles has the potential to cause an impact to matters of NES.

The main sources of dust from the revised Project are vegetation clearing, blasting and excavation, general haulage around the site, the coal handling and preparation plant, mine pits, rail transport and overburden piles. Some of these dust sources are confined to particular areas such as the excavation pits and stockpiles where as other sources of dust such as vehicle movement will occur throughout the mine and along roads.

With the prevailing easterly winds, dust will generally be blown to the west of the revised Project site. The landscape to the west is primarily cleared farming and grazing land. Detailed surveys of the revised Project site and the surrounding area show that there are no matters of NES or areas considered as having high ecological value located within the predicted dust path.

Consequently, the revised Project will not cause an impact to matters of NES from project generated dust as there are no matters within the predicted predominant dust plume.

4.3.1 Dust

Most dust from coal mines is associated with windblown dust from overburden movements, wind erosion and wheel generated dust.

A dust deposition rate of 1,000 mg/m²/day is predicted to result in measurable reductions in crop growth during overcast weather, but the effect may be more difficult to detect in sunny weather (Doley, 2003). Model calculations on a cotton crop suggest that dust deposition rates of 500 mg/m²/day are unlikely to have a detectable effect on vegetative growth (Doley, 2003). The predicted dust deposition rates from the revised Project are not likely to have a significant impact on vegetation communities or species.

As described in Section 9.4.4 of the EIS, air dispersion modelling completed for the revised Project for the years 2019, 2023 and 2029 show that daily dust deposition rates at residential receptors close to the mining lease boundary, at the maximum, are at 22% of the level identified by Doley (2003) as having an impact on crops. The dust deposition modelling shows the highest predicted level of dust deposition to be 218 mg/m²/day. This level of dust deposition is predicted to occur in 2029.

Section 9.5.1 of the EIS details the measures to be undertaken to minimise dust emissions from the revised Project. NAC proposes to implement a dust forecasting system to provide daily predictions of upcoming meteorological conditions and potential risk of air quality impacts from mining operations from the revised Project. Predictions from the dust forecasting system will allow operators to identify locations and times of potentially increased risk of dust generation and to facilitate appropriate planning to minimise or avoid potential impacts. An adaptive air quality management plan has been prepared for the revised Project.

The adaptive management measures will include the suspension or modification of operations in response to the following triggers:

- potential dust risk predictions from the dust forecasting system;
- warning or exceedance alarms from the strategic real time air quality monitoring system; and
- observation(s) of significant dust generation during visual monitoring of mining activities.

In summary, the adaptive management measures include:

- increase watering rate applied to haul roads in the Manning Vale West Pit, Manning Vale East Pit and Willaroo Pit;
- suspension of overburden/interburden blasting if meteorological conditions are unfavourable;
- suspension or modification of dozer operations on overburden dumps; and
- suspension or modification of all or selected overburden and/or coal handling activities (including excavation, loading, dumping and hauling).

Additionally, NAC will undertake veneering and profiling of the loaded coal to minimise dust emissions during the transport of coal from the Train Loadout Facility.

The application of these measures will limit the impact of dust deposition on vegetation communities and species adjacent to the Manning Vale West Pit, Train Loadout Facility and Rail Spur.

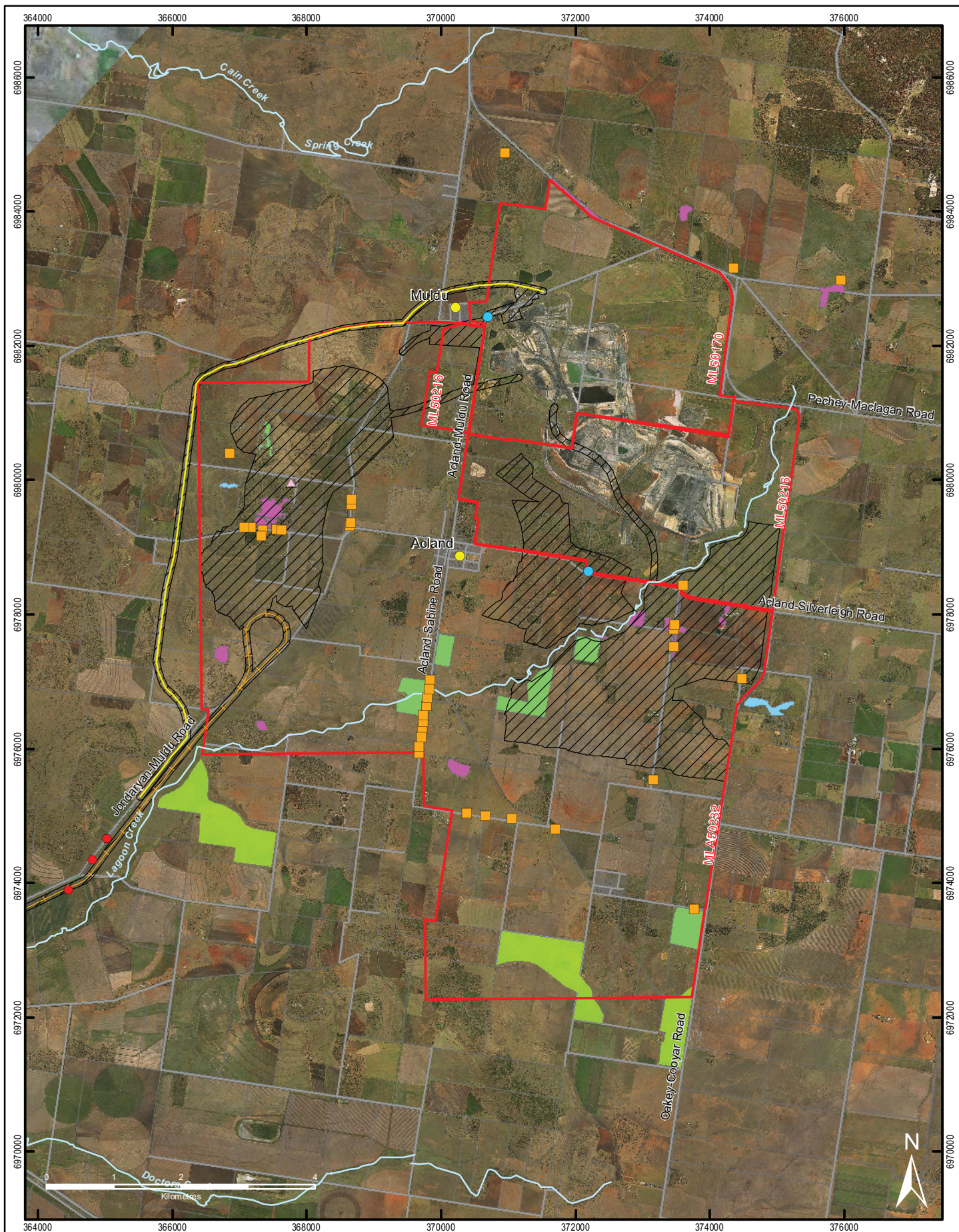
4.3.2 Habitat Fragmentation

The revised Project will result in the clearing of native vegetation and habitat. As previously described, vegetation and habitat across the revised Project site is already highly fragmented, disconnected from adjacent areas of habitat and scattered cleared farming country.

Fragmentation of vegetation and habitat will occur in patches to the west and east of the Manning Vale Pit and to habitat along Lagoon Creek.

While the revised Project will lead to clearing of 142 ha of remnant vegetation, there will be 281 ha of native vegetation and habitat unaffected by the revised Project. Vegetation along Lagoon Creek will be retained and continue to provide habitat connectivity. Lagoon Creek's riparian vegetation will be protected by a conservation zone, 50 metres either side of the creek channel. The conservation zone possesses a dedicated management plan, the Conservation Zone Management Plan (Appendix J.6), which is designed to protect and enhance the condition of the riparian vegetation.

Remnants of vegetation and habitat will be retained adjacent to the rail loop, along Acland-Sabine Road, in the north-western corner of the revised Project site and in the southern-eastern corner of revised Project site. These remnants will not be cleared by the revised Project and as a result, will not be further fragmented. **Figure 4-1** shows those areas of vegetation and habitat that will remain unaffected by fragmentation arising from the revised Project.



LEGEND

- Towns and Localities
- Rail Spur
- Roads
- Creeks
- Jondaryan-Muldu Road Diversion
- Cadastre
- Mining Tenements
- Disturbance Footprint Area

Threatened Flora

- *Bothriochloa biloba*
- ▲ *Digitaria porrecta*
- *Homopholis belsonii*
- ◆ *Rhaphiticum australe*

Proposed Bluegrass Offset Locations

- Proposed Bluegrass Offset Locations
- Threatened Ecological Communities
- Bluegrass dominated grassland
- Semi Evergreen Vine Thicket

NEW HOPE GROUP

SKM

NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 4-1 - Impact to
Vegetation and Habitat**

Scale 1:75,000 on A4
Projection: Australian Geodetic Datum – Zone 56 (AGD84)

5 Mitigation Measures

NAC proposes a number of mitigation measures to manage the impact of the revised Project on matters of NES. These mitigation measures include the implementation of a number of specific management plans and the delivery of biodiversity offsets.

5.1 Biodiversity Offset Strategy (BOS)

The Biodiversity Offset Strategy has been prepared in accordance with the EPBC Act Environmental Offsets Policy 2012. The BOS addresses the offset needs for both TECs and listed species.

NAC has prepared a Biodiversity Offset Strategy to describe how the loss of the TECs, as a consequence of the revised Project, will be offset. The BOS includes:

- a description of the TEC to be cleared, its area and location within the revised Project site;
- the location of the offset sites, both on land owned by NAC and others;
- the assessment of the condition of the TEC to be cleared and the quality of the offset site;
- management commitments to improve the quality of the offset site; and
- monitoring and reporting plans to submission to SEWPAC.

Figure 4-1 shows the location of grassland offset sites, on land owned by NAC.

The EPBC Offset calculator has been used to compare impact and proposed offset sites for the bluegrass dominant grasslands. The bluegrass offsets are intended to be located on land owned by APC (another NHG subsidiary company) which is adjacent to the revised Project site.

The brigalow offsets have not been assessed with the Offset calculator. This will be completed once there is confirmation from the third party landholder that there is agreement to enter into discussions on the establishment of an offset on their property.

Brigalow TEC Offset

The total Brigalow impact for the revised Project is 24.6 ha has been classified as the EPBC listed TEC (comprised of RE 11.3.1 and RE 11.9.5).

NAC is currently investigating several options with regard to suitable Brigalow offset areas within the Bioregion. The Brigalow TEC offset will be collocated with the State offset and will contribute to a greater environmental outcome due to the larger patch size.

Natural grasslands Offset

The bluegrass dominated natural grasslands consists of RE 11.3.21 and 11.8.11. Of this, the entire 40.1 ha is captured by the EPBC offset requirements. The proposed bluegrass offset of 247 ha has been identified on the NHG's property which should satisfy the Commonwealth offset policies. The three listed grass species that may be impacted by the revised Project have been identified as

occurring within the proposed offset area, and so will be collocated within the natural grasslands offset area.

Native Grass Species Offsets

The three listed threatened species affected by the project (*Bothriochloa biloba* - Lobed bluegrass; *Digitaria porrecta* - Finger panic grass; and *Homopholis belsonii* - Belson's panic) will be offset within the offsets provided for the natural grassland communities.

Within the revised Project site, these three species are regularly observed and are available in areas of the natural grassland and in other areas of the revised Project site. There is the possibility that these species could also be located in the Brigalow offset areas, however, this will not be known until these Brigalow offsets are inspected and assessed.

The BOS report is provided in **Appendix I**.

5.2 Management Plans

5.2.1 Bluegrass Offset Management Plan (BOMP)

NAC has prepared a BOMP that outlines the methodology for establishing and managing a *Dichanthium sericeum* dominated grassland community that will be used for the biodiversity offset that addresses the clearing of the EPBC TEC. Key aspects of the BRMP include the revegetation and management goals/objectives, trial location and area details, planned revegetation techniques (e.g. species selection, seeding methods and rates, timing, etc.), rehabilitation acceptance criteria, a monitoring and reporting regime, a maintenance regime for weeds and poor establishment and a comprehensive long term management regime.

The biodiversity offset will be located on land owned and controlled by the APC (another NHG subsidiary company).

The BOMP is provided in **Appendix J.8**.

5.2.2 Conservation Zone Management Plan (CZMP)

For the Mine and revised Project, NAC has committed to a conservation zone over Bottle Tree Hill and 50 metres either side of Lagoon Creek to protect and enhance ecologically significant areas of remnant vegetation not to be mined and to promote the restoration of the Lagoon Creek riparian zone. NAC has produced a CZMP to manage these ecologically significant areas within the Mine and revised Project site. The main components of the CZMP includes the revegetation and management goals/objectives, planned revegetation techniques (e.g. species selection, planting methods and rates, timing, etc.), rehabilitation acceptance criteria, a monitoring and reporting regime, a maintenance regime for weeds and poor establishment, and a comprehensive long term management regime.

The CZMP is provided in **Appendix J.6**.

5.2.3 Threatened Species Translocation Plan (TSTP)

A TSTP has been developed for the threatened flora species impacted by the revised Project. The TSTP aims ensure no net loss of individuals from the local population and will include:

- a discussion of known ecology and reproductive biology of the target species;
- a methodology for relocating the target species;
- a set of performance indicators to demonstrate successful relocation of the target species;
- a review of propagation potential for the target species;
- a methodology for the propagation of the target species;
- identification of suitable receiving sites for the propagated and/or relocated individuals of the target species; and
- a regime for long term monitoring and management of translocation sites.

The TSTP is provided in **Appendix J.7**.

5.2.4 Construction Phase Management

Areas to be cleared will have boundaries clearly marked by tape, pegs or other means. The demarcated boundaries will conform within the limits of design drawings and will comply with the Mine's existing clearance procedures. Particular attention will be paid to defining the boundaries of clearing where endangered ecological communities or listed species (under the EPBC Act) are present.

All vegetation clearance will be restricted to that necessary for the safe operation of mining activities. A plan for dealing with fauna during clearing and construction will be prepared to outline protocols for dealing with injured wildlife and other necessary actions relating to fauna.

All remnant vegetation that does not require clearing will be protected from further disturbance to enhance its potential for natural regeneration.

5.2.5 Pest and Weed Management Plan (PWMP)

A PWMP has been prepared for the revised Project, and details:

- management methods for declared weeds within the revised Project site in accordance with local management practice and / or agency guidelines, in particular for *Lycium ferocissimum* (African Boxthorn) and *Opuntia stricta* (Prickly Pear);
- management methods for weeds of concern within the revised Project site in accordance with the local management strategies and / or agency guidelines, in particular for *Xanthium pungens* and *X. spinosum* (Noogoora and Bathurst burrs, respectively);
- monitoring of treated areas to assess the success of declared weed management;
- monitoring of revised Project site to identify any new infestations of weeds;
- information on identifying declared weeds; and

- use of wash-down facilities for earthmoving equipment entering or leaving the revised Project site.

The PWMP is provided in **Appendix J.9**.

5.2.6 Pest and Domestic Animal Management

NAC will continue to take reasonable steps to keep the revised Project site free of Class 1 and Class 2 declared animal pests, in accordance with the requirements of the LP Act. Management of animal pests will also be consistent with any pest management plans set by the Toowoomba Regional Council. NAC undertakes periodic consultation with Toowoomba Regional Council and Agforce to keep up to date with pest management issues.

To protect native fauna within the revised Project site, Project employees, contractors or visitors will not be allowed to bring domestic animals, such as cats and dogs, onto the revised Project site.

6 Conclusion

The revised Project will impact on matters of national environmental significance, namely threatened ecological communities and listed threatened species. The TEC to be affected are Brigalow (*Acacia harpophylla* dominant and co-dominant) and Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South).

The three listed species affected by the project are *Bothriochloa biloba* - Lobed bluegrass, *Digitaria porrecta* - Finger panic grass and *Homopholis belsonii* - Belson's panic. These species are found in the grassland and brigalow communities. The greatest impact will occur in the Manning Vale West pit.

The revised Project will not have an impact on listed fauna species.

The impacts to matters of national environmental significance are unavoidable, as the clearing occurs within the mine pits that are needed to the mining of coal. The revised Project has been able to limit its impact on matters of national environmental significance by not needing to divert Lagoon Creek and placing the rail spur and loop to miss an area of brigalow in the south-west of the mining lease.

The unavoidable impact will be offset with the use of biodiversity offsets. Offsets for bluegrass dominant grasslands and listed flora species will be located on land owned by NAC, adjacent to the revised Project site. An area of 247 ha has been identified for use as offsets. NAC is also in the process of investigating the availability of an offset for the brigalow community on land within the bioregion. Preliminary investigations indicate that vegetation is available for use as an offset that could meet the brigalow offset criteria.

NAC has prepared and is committed to the implementation of a series of management plans to mitigate impacts. These plans include offset management plans, conservation zone management plan, threatened species translocation plan and pest and weed management plans.

While there is an unavoidable impact on matters of national environmental significance, the availability of offsets and the implementation of commitments in management will reduce the impact on ecosystems and species to the lowest possible level.

7 References

Atlas of Living Australia. Australian Government. Site accessed 26 November 2013:
<http://www.ala.org.au>

Bureau of Meteorology (2013), Climate averages from the Bureau of Meteorology website (Accessed from <http://www.bom.gov.au> 15 July 2013)

Bureau of Meteorology, (2013), Climatic Summary for Oakey (041359). Available at:
www.bom.gov.au.

Cropper, S.C. (1993) Management of Endangered Plants, CSIRO Publications, East, Melbourne.

Department of the Environment - 2013 - Species Profile and Threats Database (SPRAT)
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Department of Environment and Heritage Protection - 2013 - Wildnet Online database
<http://www.ehp.qld.gov.au/wildlife/wildlife-online/>

Department of the Environment, Water, Heritage and the Arts - 2009 Environmental Protection and Biodiversity Conservation Act 1999, Significant Impact Guidelines v1.1. Australian Government, Canberra.

Department of the Environment, Water, Heritage and the Arts - 2010 - Survey guidelines for Australia's threatened birds Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Department of the Environment, Water, Heritage and the Arts - 2010a - Survey guidelines for Australia's threatened bats Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Department of Sustainability, Environment, Water, Population and Communities - 2011a - Survey guidelines for Australia's threatened mammals Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.

Doley, D., 2003, Effects of mineral dusts on vegetation a review of literature and model calculations, report to Sinclair Knight Merz on the Curragh North Coal project for Wesfarmers Curragh Pty Ltd.

Eyre 2008 Eyre, T.J., Kelly, A.L, and Neldner, V.J. (2008). BioCondition: A Terrestrial Vegetation Condition Assessment Tool for Biodiversity in Queensland. Field Assessment Manual. Version 1.6. Environmental Protection Agency (EPA), Biodiversity Sciences unit, Brisbane.

Eyre et al 2011. Eyre, T.J., Kelly, A.L., and Neldner, V.J. (2011). Method for the Establishment and Survey of Reference Sites for BioCondition. Version 2.0. Department of Environment and Resource Management (DERM), Biodiversity and Ecological Sciences Unit, Brisbane.

Neldner, V.J., Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (2005) Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1. Environmental Protection Agency, Brisbane.

Neldner, VJ, Wilson, BA, Thompson, EJ and Dillewaard, HA (2005) *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*. Version 3.1. Updated September 2005. Queensland Herbarium, Environmental Protection Agency, Brisbane.

Neldner, V.J., Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (2012) Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.2. Updated August 2012. Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane. 124 pp.

Phillips, S. and Callaghan, J. 2011. The Spot Assessment Technique: a tool for determining levels of localised habitat use by Koalas *Phascolarctos cinereus*. Australian Zoologist. 35(3): 774-780.

Queensland Herbarium - 2011 - Vegetation Management Act Regional Ecosystems Vers 6.1 - Brigalow Belt and New England - Regional Ecosystem Mapping