

DARTBROOK UNDERGROUND MODIFICATION

Ecological Impact Assessment

For:

Hansen Bailey

June 2018

Final



**PO Box 2474
Carlingford Court 2118**

Report No. 17054RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Glossary of Terms

AQC	Australian Pacific Coal Limited
Authorisation Boundary	The boundary of the area encompassed by AQC's mining authorisations (under the <i>Mining Act 1992</i>), as shown in Figure 1.1
BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BC Regulation	<i>NSW Biodiversity Conservation Regulation 2017</i>
CHPP	Coal Handling and Preparation Plant
DoEE	Commonwealth Department of the Environment and Energy
EIA	Ecological Impact Assessment
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
Locality	The area within a 5 km radius of the centre of the study area
NSW	New South Wales
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
the Modification	The proposed modifications to the approved operations for the Dartbrook Underground Mine
ROM	Run of Mine
study area	The area including the subject site and adjacent areas affected by the proposal, either directly or indirectly, as shown in Figure 1.2
subject site	The area of new surface infrastructure and associated ancillary works for the proposed modification, as shown in Figure 1.2
TEC	Threatened Ecological Community
Transitional Regulation	<i>NSW Biodiversity Conservation (Savings and Transitional) Regulation 2017</i>
TSC Act	<i>NSW Threatened Species Conservation Act 1995</i> (repealed)
VIS	Vegetation Information System

Executive Summary

S1 Introduction

Australian Pacific Coal Limited (APC) is the proprietor of the Dartbrook Mine, located in the Upper Hunter Valley of NSW. Dartbrook Mine is managed in accordance with Development Consent DA 231-7-2000 granted under the EP&A Act. DA 231-7-2000 allows for longwall mining operations to be carried out. However, Dartbrook Mine has been under care and maintenance since 2006. APC is seeking to modify DA 231-7-2000 to facilitate some limited bord and pillar mining within the approved footprint for longwall mining at Dartbrook Mine. The modification application has been made under Section 75W of the EP&A Act.

The majority of the elements of the proposed modification are contained within areas of existing development and infrastructure, with the proposed underground mining activities not resulting in perceptible subsidence. Therefore no further ecological assessments are required for the area overlying the underground mine workings. However, a proposed new shaft site will be located outside of the approved footprint of Dartbrook Mine. Therefore an ecological assessment of this proposed surface infrastructure is warranted.

S2 Methodology

S2.1 Desktop Assessments

Database analysis was conducted for the locality using the OEH BioNet Atlas (OEH, 2018) and the DoEE Protected Matters Search Tool (DoEE, 2018). The locality is defined as the area within a 5 km radius of the study area. Previous ecological assessments conducted for the Dartbrook Mine Project were also reviewed.

S2.2 Field Surveys

Field surveys were undertaken by Cumberland Ecology on 2 February 2018. Surveys included:

- Vegetation mapping and photographic recording of vegetation conditions;
- a Plot-based floristic survey, in accordance with the Biodiversity Assessment Method;
- General fauna habitat assessment; and
- Incidental observations.

S3 Results

S3.1 Vegetation

Vegetation within the study area includes exotic pasture with some scattered planted trees. The study area has had a history of agricultural development which has resulted in the degradation and clearing of native vegetation. In addition to the clearing of native vegetation, previous land uses have removed or modified the fauna habitats within the study area.

S3.2 Flora

Approximately 26 flora species were recorded within the study area during field surveys, including 20 exotic species. The floral assemblage across the study area is a reflection of the previous and current land uses which have resulted in a highly disturbed landscape. No weed species of State or Regional Priority or Regional concern were recorded within the study area.

No threatened flora species were observed within the study area and none are considered likely to occur.

S3.3 Fauna Habitat

The majority of the study area is comprised of exotic grassland which has limited value for native fauna species. The scattered planted trees within the study area provide some limited foraging habitat for native fauna species, however these habitats are highly modified.

S3.4 Fauna Species

No vertebrate fauna species, including threatened species, were observed within the study area during surveys. A total of 10 highly mobile threatened or migratory fauna species known to traverse through or over the locality have been assessed as having limited potential to pass through the study area as part of a larger foraging or migratory range.

S4 Impact Assessment

S4.1 Direct Impacts

The ecological impacts of the Modification will be largely related to the direct disturbance of vegetation. Only exotic vegetation (~2.28 ha) will be removed. Fauna habitat, in the form of planted trees, will be retained.

S4.2 Indirect Impacts

The Modification will potentially result in some indirect impacts on retained vegetation and habitat from construction and operational activities such as those relating to dust, noise and light.

S4.3 Impacts to Threatened Species and Communities

No threatened ecological communities or threatened flora species occur within the study area and none are considered likely to occur. Therefore the Modification will not impact upon any threatened ecological communities or threatened flora species.

The potential occurrence of threatened fauna species is limited to fly-overs by highly mobile avifauna and bats. Assessments of Significance have been prepared for potentially occurring threatened fauna species, which concludes that the Modification is unlikely to significantly affect the potentially occurring threatened fauna species.

S5 Avoidance, Mitigation and Compensatory Measures

S5.1 Avoidance Measures

Avoidance measures have been implemented to the maximum feasible extent by siting the proposed surface infrastructure within a modified pasture and therefore avoiding clearing of any native vegetation.

S5.2 Mitigation Measures

Mitigation measures proposed for the Modification include:

- Demarcation of construction site – to ensure that works do not inadvertently impact on adjacent native vegetation or habitat;
- Inductions – to ensure site workers and visitors are aware of any ecological sensitivities;
- Weed control measures – to minimise spread of exotic species recorded within the subject site; and
- General construction and operational measures – to minimise impacts to adjoining vegetation and habitat.

S5.3 Compensatory Measures

The Modification does not involve the clearing of native vegetation or fauna habitat and will not have any significant impact upon threatened species or communities. Therefore no compensatory measures are required.

S6 Conclusion

To facilitate the proposed surface infrastructure for the Modification, a total of 2.28 ha of exotic grassland will be cleared. The Modification does not involve the clearing of native vegetation or fauna habitat and will not have any significant impact upon threatened species or communities.

The ecological investigation undertaken for this assessment of the proposed surface infrastructure indicates that threatened species issues are manageable and not significant.

Although compensatory measures are not required, a suite of mitigation measures are proposed to minimise the indirect impacts on biodiversity values.

Introduction

Cumberland Ecology was commissioned by Hansen Bailey Pty Ltd to undertake an Ecological Impact Assessment (EIA) of the proposed modification for the Dartbrook Underground Mine Project (the 'Modification'). The Modification seeks to facilitate some limited bord and pillar mining within the approved longwall mining area at Dartbrook Mine. The modification application will be made under Section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Purpose

The purpose of this report is to document the findings of ecological investigations completed across the surface infrastructure study area, which comprises parts of Lot 1 and Lot 2 DP 835733. Biodiversity values considered include threatened species and ecological communities listed under the current NSW *Biodiversity Conservation Act 2016* (BC Act) (replacing the *Threatened Species Conservation Act 1995* or TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main objective of this report is to determine whether the Project is likely to significantly affect threatened biodiversity values and to outline how the Project plans to mitigate those impacts.

Specifically, the objectives of this EIA are to:

- Document the reasons why the modification application is subject to the transitional arrangements under the BC Act and associated regulations and can be assessed using the methodologies under the TSC Act;
- Describe and map vegetation communities of the study area, identifying threatened ecological communities (TECs) listed under state and commonwealth legislation;
- Identify and map the location of threatened flora and fauna species (if present);
- Assess the likelihood as to whether threatened flora and fauna species could occur within the study area;
- Describe the types and extent of potential impacts arising from the Project; and
- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

1.2 Modification Description

Australian Pacific Coal Limited (APC) is the proprietor of the Dartbrook Mine, located in the Upper Hunter Valley of NSW. Dartbrook Mine is managed in accordance with Development Consent DA 231-7-2000 granted under the EP&A Act. DA 231-7-2000 allows for longwall mining operations to be carried out until 5 December 2022. However, Dartbrook Mine has been under care and maintenance since December 2006.

APC is seeking to modify DA 231-7-2000 to facilitate limited bord and pillar mining within the approved longwall mining area at Dartbrook Mine. The modification application has been made under Section 75W of the EP&A Act.

The Modification proposes the following:

- Bord and pillar mining in part of the Kayuga coal seam as an alternative to the already approved longwall mining activities;
- An alternative method of transferring Run of Mine (ROM) coal to the coal handling infrastructure at the East Site; and
- Extending the approval period under DA 231-7-2000 by 5 years (until 5 December 2027).

DA 231-7-2000 authorises longwall mining activities in the Wynn, Kayuga, Mt Arthur and Piercefield coal seams. The Modification proposes bord and pillar mining of the Kayuga seam, as an alternative to the approved longwall mining activities. Bord and pillar mining involves only first workings, which will not result in measureable subsidence. The proposed bord and pillar workings will be located within the Approved Kayuga Seam Mining Area. That is, the Modification will not increase the footprint of mining operations at Dartbrook Mine.

The proposed bord and pillar mining will facilitate the extraction of up to 10 Mt of ROM coal over a 10 year period. The maximum production rate that may be achieved in a single year by the proposed bord and pillar mining is 1.5 Mtpa. This is within the approved maximum production rate of 6 Mtpa.

DA 231-7-2000 allows for ROM coal to be transferred from the mine workings to the East Site via the Hunter Tunnel. The Hunter Tunnel is an underground roadway that passes beneath the Hunter River and New England Highway. The conveyors in the Hunter Tunnel were removed by the previous owners of Dartbrook Mine during the care and maintenance phase. As such, APC has developed an alternative coal clearance system for the Modification. ROM coal will be brought to the surface at the Kayuga Entry. Haul trucks will then transport ROM coal from the Kayuga Entry to a new shaft site to be located directly above the Hunter Tunnel. The new shaft site will include a materials delivery shaft for transferring ROM coal into the Hunter Tunnel. The coal will then be conveyed beneath the New England Highway to the East Site.

DA 231-7-2000 allows for mining activities to be undertaken until 5 December 2022. To enable the proposed bord and pillar mining activities to be conducted, the Modification seeks to extend the period of approval by 5 years (until 5 December 2027).

The majority of the elements of the Modification are contained within areas of existing development and infrastructure and will result in no measurable changes in subsidence compared to existing approvals. Therefore no further ecological assessments are required for the underground mine workings. However the new shaft site and associated truck turning circles comprises additional surface infrastructure outside of the approved footprint for the Dartbrook Mine. Therefore an ecological assessment of this proposed surface infrastructure is warranted.

1.3 Project Background

1.3.1 Location

Dartbrook Mine is located approximately 10 km north of Muswellbrook in the Upper Hunter Valley, NSW. Dartbrook Mine is indicated as the 'Authorisation Boundary' in **Figure 1.1**.

The proposed shaft site (hereafter referred to as the 'subject site') is located in the eastern parts of the Authorisation Boundary (**Figure 1.1**). For the purposes of this EIA, the assessment was conducted for the subject site along with adjacent areas that could be indirectly impacted by the proposed works (the 'study area') (**Figure 1.2**).

1.3.2 Current Land Use and Conditions

The Hunter Valley once supported extensive areas of grassy eucalypt woodlands and open forests. However, as the region supports highly arable land, substantial vegetated areas have historically been cleared for agricultural purposes, including dairy farming, crop farming, horse breeding, cattle and viticulture. Another major land use in the region is coal mining, and several large-scale, open cut coal mines are well established across the Hunter Valley landscape and have considerably altered the natural landform of the region.

The land uses within and adjacent to the Authorisation Boundary comprise a mix of crop farming, cattle grazing, industrial activities such as coal mining and rural residential areas.

1.3.3 Vegetation

The majority of the land within the Authorisation Boundary comprises undulating hills. The native vegetation has been disturbed by historic clearing and agricultural activities, resulting in a mosaic of exotic pasture grasses, low diversity native grassland, or native grassland derived from various woodland forms amongst patches of woody vegetation and remnant woodland communities. Some areas of native derived grassland are heavily grazed while other areas show higher levels of diversity due to lower stocking rates.

The majority of the remnant woodland vegetation occurs in the western to central parts of the Authorisation Boundary and comprises patches of open woodland generally on the mid to upper slopes.

1.3.4 Hydrology

Within the Authorisation Boundary to the east of Dartbrook Road, the landscape consists of floodplains draining into two major watercourses; the Hunter River and Dart Brook. Most of the floodplain land has been extensively cleared for agriculture and has little native vegetation remaining.

The subject site lies within the floodplain areas east of Dartbrook Road and is located within a heavily modified paddock to the north of a private road (known as the Western Access Road) (**Figure 1.2**).

1.4 Relevant Legislation

1.4.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on Matters of National Environmental Significance (MNES) (including nationally threatened ecological communities and species, and listed migratory species) must be referred to the Commonwealth Minister for the Environment. The purpose of the referral is to allow a decision to be made about whether an action requires approval under the EPBC Act. If an action is considered likely to have a significant impact on MNES, it is declared a “controlled action” and Commonwealth approval is required.

1.4.2 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, populations and ecological communities, and their habitats, as listed under the BC Act (replacing the TSC Act) and NSW *Fisheries Management Act 1994* (FM Act).

The proponent is seeking to modify the development consent under Section 75W of the EP&A Act.

1.4.3 NSW Biodiversity Conservation Act 2016 (BC Act) and Threatened Species Conservation Act (TSC Act)

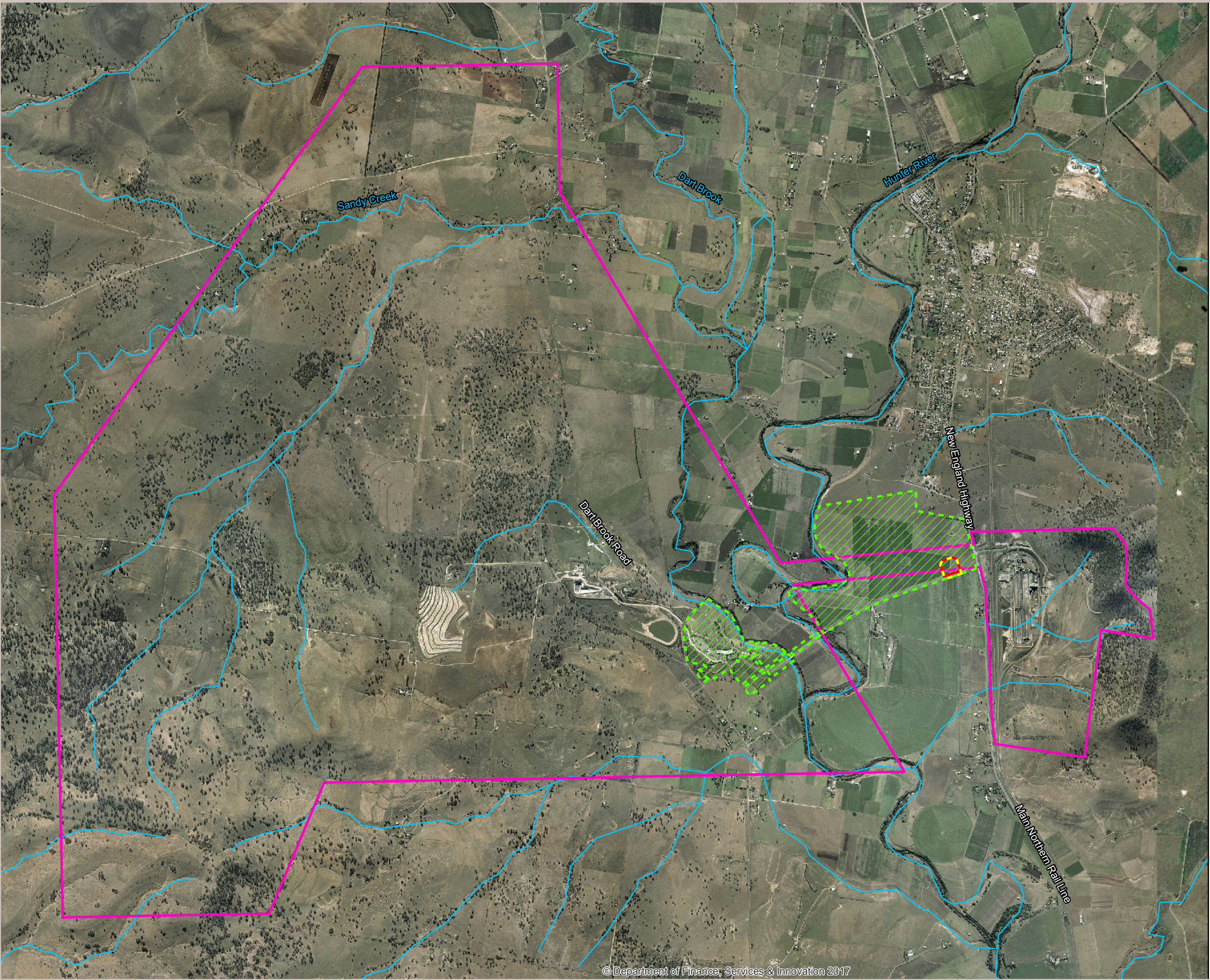
The BC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017* (BC Regulation) and the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulation). The Transitional Regulation allows

certain development applications, including modifications to existing approved developments, to be assessed using the former planning provisions.

Clause 30 of the Transitional Regulation provides that the BC Act applies to the modification of a planning approval, even if the planning approval was granted prior to the commencement of the BC Act. The term “Planning Approval” is defined under Clause 27 of the Transitional Regulation and includes development consents granted under Part 4 of the EP&A Act. DA 231-7-2000 was granted under Part 4 of the EP&A Act. Therefore, the BC Act applies to the Modification.

Section 7.17 of the BC Act states that a biodiversity development assessment report (BDAR) is required for a modification to a development consent that was granted after the commencement of the BC Act. Section 7.17 does not apply to the Modification because DA 231-7-2000 was granted prior to the BC Act. The BC Act does not prescribe any assessment requirements for modifications of development consents granted before the BC Act. Notwithstanding, this report assesses the potential impacts of the Modification on fauna, flora and ecological communities.

With the commencement of the BC Act, all state listings for threatened species and communities under the TSC Act were legally transferred to the BC Act.



Legend

- Surface Infrastructure Subject Site
- Surface Infrastructure Study Area
- Dart Brook Modification Boundary
- Authorisation Boundary
- Watercourses

Data Source:
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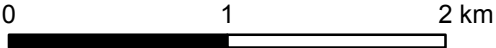


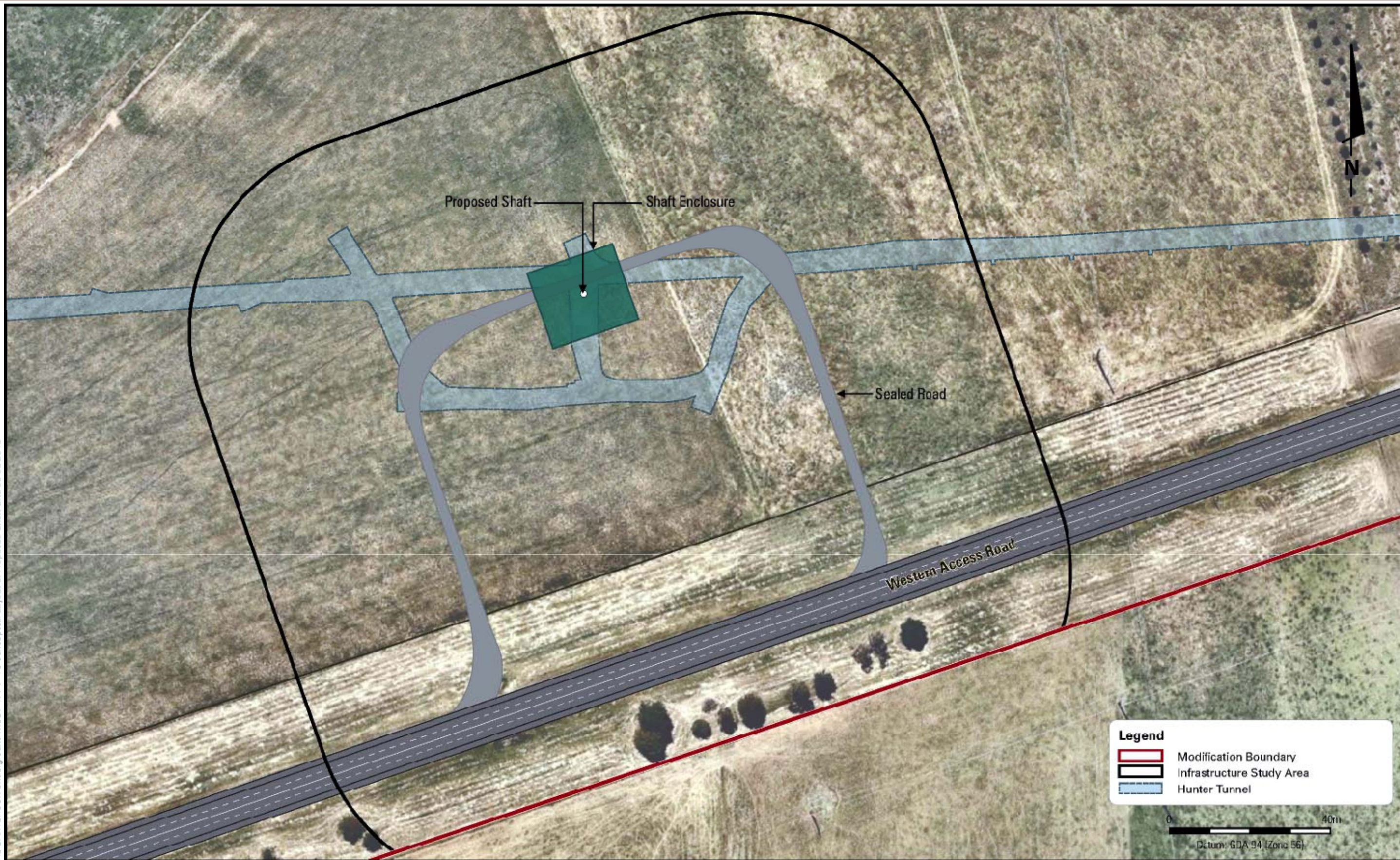
Coordinate System: MGA Zone 56 (GDA 94)



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Figure 1.1. Project Location





DARTBROOK MINE

Conceptual Layout of New Shaft Site

FIGURE 16

Image Source: Hansen Bailey (2018)

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Australian Pacific Coal

Figure 1.2. Conceptual Layout - Surface Infrastructure

Methodology

2.1 Desktop Assessments

Database analysis was conducted for the locality using the NSW Office of Environment and Heritage (OEH) BioNet Atlas (OEH, 2018) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE, 2018). The locality is defined as the area within a 5 km radius of the study area.

The BioNet Atlas search function was used to generate records of threatened flora and fauna species and populations listed under the BC Act and/or EPBC Act within the locality. The abundance, distribution and age of records generated within the search areas provided supplementary information for the assessment of likelihood of occurrence of those threatened species within the study area. The Protected Matters Search Tool generated a list of potentially occurring MNES listed under the EPBC Act within the locality of the study area.

Cumberland Ecology previously undertook ecological assessments within the Authorisation Boundary, 2012 and 2015. The results of these assessments (Cumberland Ecology, 2015) were reviewed, particularly in relation to the occurrence of threatened species and communities.

2.2 Field Surveys

Surveys of the study area and surrounds were undertaken by Cumberland Ecology on 2 February 2018. Surveys included vegetation mapping, plot-based floristic survey and fauna habitat assessment. Descriptions of these methods are provided below and the locations of surveys are shown in **Figure 2.1**.

2.2.1 *Vegetation Mapping*

Previous mapping of the study area and surrounds prepared by Cumberland Ecology (Cumberland Ecology, 2015) was reviewed prior to the survey in order to determine vegetation communities that could occur within the study area. The vegetation within the study area was ground-truthed to examine and verify the mapping including the condition and extent of the different vegetation communities. Photographs were taken to record the condition of the vegetation within the study area.

2.2.2 Plot-based Floristic Survey

A single plot-based floristic survey (20m x 20m) was undertaken in the study area within which the following data was collected:

- Stratum (and layer): stratum and layer in which each species occurs;
- Growth form: growth form for each recorded species;
- Species name: scientific name and common name;
- Cover: a measure or estimate of the appropriate cover measure for each recorded species; recorded from 0.1-0.9%, 1–5% and then to the nearest 5%; and
- Abundance rating: a relative measure of the number of individuals or shoots of a species within the plot using the following intervals; numbers above about 20 are estimates only: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20,....100, 200....1,000.

All vascular plants recorded or collected were identified using keys and nomenclature provided in *PlantNET* (Botanic Gardens Trust, 2018).

2.2.3 Fauna Habitat Assessment

A general fauna habitat assessment was undertaken within the study area during field surveys. This assessment included consideration of important indicators of habitat conditions and complexity as well as the occurrence of micro-habitats such as tree hollows, fallen logs and riparian areas. An assessment of the structural complexity of the vegetation, the age structure of the remnant vegetation and the nature and extent of human disturbance was also undertaken.

2.2.4 Incidental Observations

Any incidental vertebrate fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for the study area.

2.2.5 Limitations

The flora and fauna of the locality is well known based upon a sizeable database of past records and various published reports. The field survey undertaken by Cumberland Ecology added to this existing database and has helped to provide an indication of the likelihood that various species occur, or are likely to occur within the study area. The data obtained from database assessment and surveys of the study area furnished an appropriate level of information to support this assessment.

No threatened flora searches were undertaken within the study area due to the lack of suitable habitat for the threatened flora species known from the locality. The assessment of habitat was based on the study area comprising a heavily grazed pasture (without trees) and disturbed top soil.

It is considered that the species of conservation value have been adequately assessed to enable this EIA to be prepared. A range of threatened flora and fauna are known to occur in the Authorisation Boundary and wider locality, however based on ground conditions within the study area, a number of these species are unlikely to occur in the study area. The field surveys were supplemented by literature review, database analysis and a fauna habitat assessment. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened species within the subject site and study area.



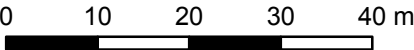
- Legend**
- Surface Infrastructure Subject Site
 - Surface Infrastructure Study Area
 - Dart Brook Modification Boundary
 - Authorisation Boundary
 - Watercourses
- Flora Survey Location**
- Flora Trasect Location
 - Flora Plot Location
 - Photopoint 1

Data Source:
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Coordinate System: MGA Zone 56 (GDA 94)

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Figure 2.1. Survey Locations within the Study Area



Results

3.1 Vegetation Communities

The study area has been subject to agricultural development which has resulted in the degradation and clearing of the vast majority of native vegetation. The vegetation remaining within the study area is dominated by exotic species and does not conform to the description of any native vegetation community. The following vegetation communities have been recorded within the study area:

- Exotic Grassland; and
- Planted Vegetation.

The distribution of these communities within the study area is shown in **Figure 3.1**.

The study area comprises multiple paddocks and parts of a private access road. The paddocks comprise improved pastures and are heavily grazed (**Photograph 3.1**). Grassland within the paddocks was dominated by exotic species such as *Bromus catharticus* (Prairie Grass), *Urochloa* spp. and *Lolium rigidum* (Ryegrass). Native grass is limited to the potentially introduced *Cynodon dactylon* which is commonly used for improved pastures. Native forbs were limited to scattered and isolated occurrences of *Einadia trigonos* (Fishweed), *Sida corrugata* (Corrugated Sida) and *Portulaca oleracea* (Pigweed).

The presence of trees in the study area is largely limited to planted Eucalypts and *Casuarina cunninghamiana* along the southern verge of the Western Access Road (**Photograph 3.2**). There are no trees present within the paddocks in the study area.



Photograph 3.1 Heavily grazed pasture in the study area (facing north-west from photopoint)



Photograph 3.2 Heavily grazed pasture with scattered trees along southern road verge (facing west – southwest from photopoint)

3.2 Flora

3.2.1 General Species

A total of 26 flora species were recorded within the study area during field surveys, including 20 exotic species. The floral assemblage across the study area is a reflection of the previous and current land uses which have resulted in a highly disturbed landscape. A total species list for the study area is provided in **Appendix A**.

None of the exotic species recorded within the study area are listed as State Priority Weeds or Regional Priority Weeds under the Greater Hunter Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Hunter, 2017) and therefore fall under the General Biosecurity Duty requirements of the *Biosecurity Act 2015* only.

3.2.2 Threatened Species

Three threatened flora species have previously been recorded within the Authorisation Boundary (**Figure 3.2**). However none of these species have been observed or are considered likely to occur within the study area. An analysis of the likelihood of occurrence within the study area for all threatened flora species recorded within the locality or that have the potential to occur due to the presence of suitable habitat is provided in **Appendix B**.

3.3 Fauna

3.3.1 Fauna Habitat and Corridors

The majority of the study area is comprised of Exotic Grassland which has limited value for native fauna species. Potential foraging habitat for fauna within the study area is limited to the Planted Vegetation on the southern side of the Western Access Road. These trees are unlikely to provide roosting or breeding habitat for arboreal or hollow-dwelling fauna as they lack hollows.

No ground-level habitat features such as logs, bush-rock, soaks or dams that can support vertebrate fauna are present within the subject site and study area.

No wildlife corridors are present within the study area.

3.3.2 General Species

No fauna species were observed within the study area during field surveys.

3.3.3 Threatened Species

Ten threatened fauna species have previously been recorded within the wider Authorisation Boundary (**Figure 3.2**) and a further six species are considered likely to occur within the Authorisation Boundary. These threatened fauna species comprise highly mobile avifauna and bats which are considered unlikely to occur within the subject site and wider study area due to a lack of habitat. Any potential occurrences of these species would be limited to fly-

overs by raptors or bats which can occur in cleared areas as part of a wider foraging or migratory range. An analysis of the likelihood of occurrence within the study area for all threatened fauna species recorded within the locality or that have the potential to occur due to the presence of suitable habitat is provided in **Appendix B**.



Legend

-  Surface Infrastructure Subject Site
-  Surface Infrastructure Study Area
- Vegetation Community**
 -  Planted Tress
 -  Cleared/Exotic Areas

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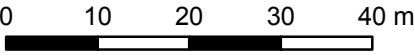


Coordinate System: MGA Zone 56 (GDA 94)



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Figure 3.1. Vegetation of the Study Area



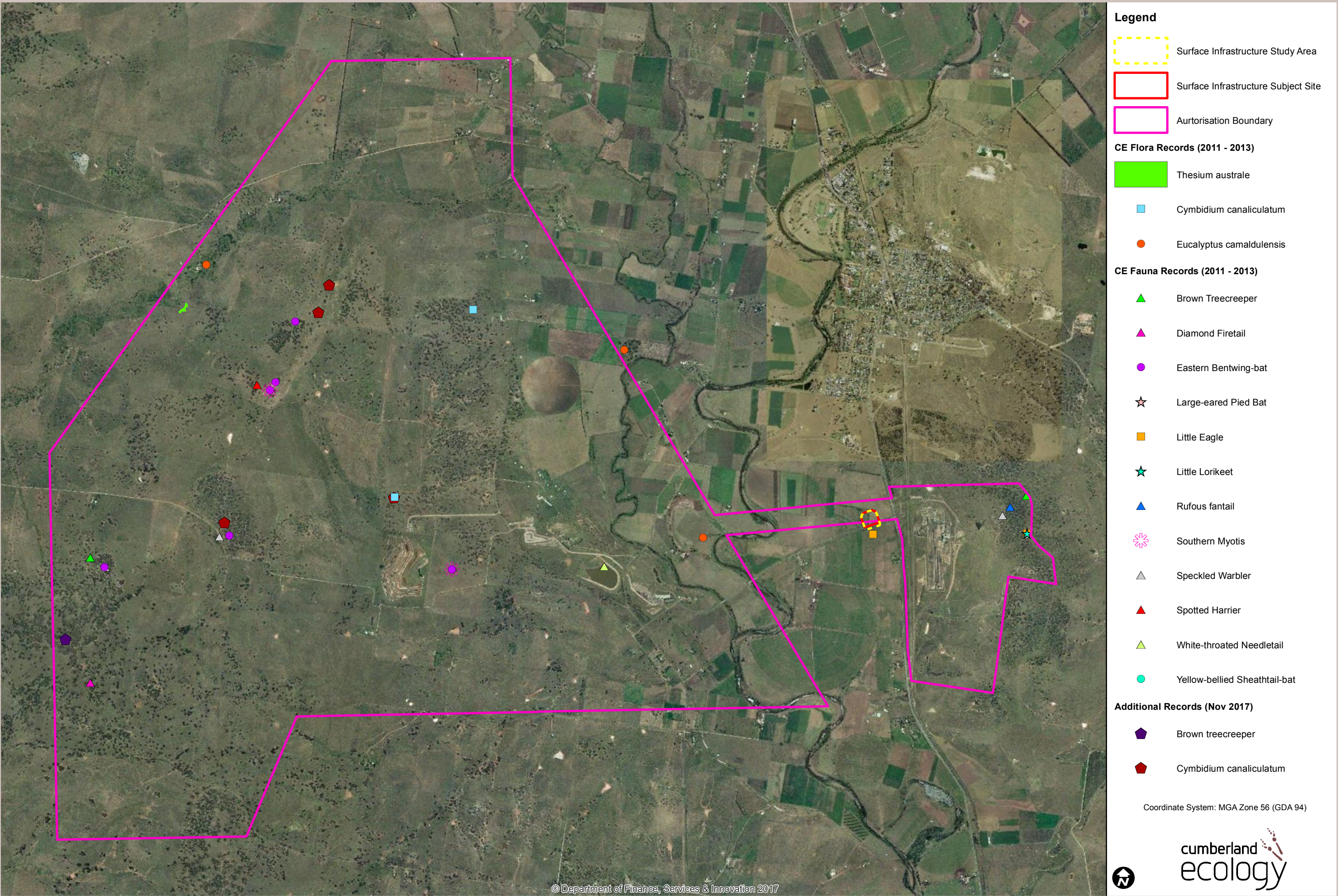


Figure 3.2. Threatened and Migratory Species Locations

I:\...17054\Figures\RP1\20180507\Figure 3.2. Threatened and Migratory Species Locations

Impact Assessment

4.1 Direct Impacts

4.1.1 *Vegetation*

A total of approximately 2.28 ha of Exotic Grassland will be cleared from the subject site for the surface infrastructure.

4.1.2 *Habitat Features and Corridors*

Clearing of vegetation is limited to the paddocks north of the Western Access Road and all planted trees along the southern edge of the road will be retained. Therefore the Modification will not result in the removal of any habitat features.

As the subject site is located within a cleared paddock, no wildlife corridors will be severed. The vegetation in the study area is not part of an important wildlife corridor and isolated patches of treed vegetation and scattered paddock trees that provide stepping stone habitat on a local scale will be retained.

Therefore, the Modification is unlikely to have any significant effect on connectivity or wildlife corridors in the wider locality.

4.1.3 *Threatened Species and Communities*

No threatened flora species or TECs, listed under the BC and/or EPBC Act were recorded or are considered to have potential to occur within the study area. The proposed development, therefore, will have no significant impacts upon threatened flora species or TECs.

Threatened and migratory fauna species are known to occur or have the potential to occur within the Authorisation Boundary. However, these species are considered unlikely to occur within the study area, except for potential fly-overs by raptors or bats as part of a wider foraging or migratory range.

A precautionary approach has been adopted and an assessment of significance has been conducted for potential fly-overs by threatened fauna species. This assessment is provided in **Appendix C** and concludes that the Modification is unlikely to significantly affect the potentially occurring threatened fauna species (fly-overs only).

4.2 Indirect Impacts

As the surface infrastructure will be located in a highly modified and cleared landscape, the Modification is considered unlikely to result in indirect impacts on the ecological values of remaining vegetation and habitat within the study area such as fragmentation, edge effects and alteration to hydrological regimes.

However, a number of construction and operational impacts, such as those relating to dust, noise and light emissions may impact the remaining vegetation and habitat and are considered in more detail below.

4.2.1 *Dust*

Construction and operational activities have the ability to generate dust, which may impact on the remaining ecological values of the study area beyond the area directly disturbed by the Modification. Dust that settles can accumulate on leaf surfaces and reduce essential physiological processes including photosynthesis, respiration, and transpiration (Farmer, 1993). The effect of dust deposition also affects animals that use plants, either as a source of food or habitat.

Without appropriate controls, short-term dust emissions from vehicles during ingress and egress are likely during construction works. Again, without appropriate controls, dust emissions are also likely during the operational activities as ROM coal is hauled (by road registered trucks) from the Kayuga Entry to the new shaft site. Although the subject site is located in a highly modified area and is subject to air pollution (dust), dust generated by the Modification could increase the impact on the planted vegetation at the southern extent of the study area as well as along the road verges of the Western Access Road and New England Highway beyond current levels thus reducing health of some tree species and impacting upon potential, albeit limited, foraging resources for wildlife.

Dust controls such as sealing the truck turning bay, street sweepers along the Western Access Road and use of water sprays for dust suppression will be implemented. With the implementation of these dust management actions for dust suppression, the proposed works are unlikely to result in any significant increases in dust levels beyond existing conditions of the modified landscape.

4.2.2 *Noise*

The extant noise level is dominated by ambient noise from adjoining developments, predominantly the New England Highway. Nonetheless, noise levels will be increased during the construction phase and to a lesser extent during the operational phase of the Modification.

Noise can affect animal physiology and behaviour, and if it becomes an ongoing stress, it can be injurious to an animal's energy budget, reproductive success and long-term survival (AMEC, 2005). However, as the subject site is located in a highly disturbed area, adjacent to the New England Highway, the Modification is unlikely to exacerbate noise impacts significantly above current background levels as the proposed works will continue to comply

with regulatory standards. Furthermore, the impacts from noise emissions are likely to be localised and are not likely to have a significant, long-term, impact on wildlife populations given the relative lack of suitable habitat within the study area.

4.2.3 Light

The Project has the potential to increase the level of artificial light around the subject site. Increased light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Saleh, 2007; Longcore and Rich, 2010).

While the construction and operational phases of the Modification will have some effect on the surrounding environment, the impacts from light pollution are likely to remain close to the subject site, with only limited glare into the surrounding area. Native fauna are unlikely to reside within the area subject to the increased illumination due to lack of habitat.

As the study area largely lacks suitable habitat for fauna, light pollution from the Modification is unlikely to have a significant or long-term impact on any fauna species

4.2.4 Subsidence

The current approval (DA 231-7-2000) authorises longwall mining activities in the Wynn, Kayuga, Mt Arthur and Piercefield coal seams. The Modification will utilise bord and pillar mining of the Kayuga seam as an alternative to the approved longwall mining activities. As the bord and pillar mining involves only first workings, no measureable subsidence (<20mm) is anticipated.

Avoidance and Mitigation Strategies

The Modification will not have any significant impacts on BC Act and/or EPBC Act listed threatened species or communities within the study area or wider locality. However, as development procedures in general can have detrimental effects on ecological values in the surrounding areas, there is a need to implement measures to minimise these impacts.

The impact reduction measures should follow the following hierarchy of principles:

- Avoid - to the extent possible, works should be designed to avoid or minimise ecological impacts;
- Mitigate - where certain impacts are unavoidable through design changes, mitigation measures should be implemented to ameliorate the ecological impacts; and
- Compensate - the residual impacts, following the implementation of mitigation measures, should be compensated to offset what would otherwise be a net loss of habitat.

5.1 Avoidance Measures

Avoidance measures have been implemented to the maximum extent possible as the proposed surface infrastructure has been sited in a cleared paddock and will not require clearing of native vegetation or fauna habitat features.

5.2 Mitigation Measures

5.2.1 *Demarcation of Clearing Areas*

To avoid unnecessary removal or damage to trees to be retained within the study area, the clearing limits should be clearly demarcated and signed to ensure no vegetation beyond these boundaries is removed. Equipment should be excluded from areas outside the clearing area.

5.2.2 *Inductions*

Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of ecological values associated with the wider study area and Authorisation Boundary.

5.2.3 Weed Control Measures

Weed species occurring within the subject site should be managed in accordance with General Biosecurity duties. As vegetation to be cleared is dominated by exotic species, it is recommended that all vegetation removed is disposed of appropriately and not utilised for mulch.

5.2.4 General Construction and Operational Measures

A number of mitigation measures for construction and operational activities are to be implemented, in accordance with best practice guidelines. These include:

- Dust minimisation – reduces the indirect impacts on vegetation condition and the habitat quality;
- Noise minimisation – reduces the indirect impacts on fauna species in habitat surrounding the subject site; and
- Lighting management – reduces the indirect impacts on fauna species in habitat surrounding the subject site.

5.3 Compensate

As detailed in Chapter 4, the Modification does not involve clearing of native vegetation or fauna habitat. Therefore, no compensatory measures are proposed for the Modification.

Conclusion

Previous and current land use of the study area and surrounds has entailed clearing and modification of the majority of pre-existing native vegetation. The direct disturbance required for the Modification will be limited to the removal of some exotic vegetation.

No TECs or threatened flora and fauna species listed under the BC Act and/or the EPBC Act were detected in the study area during field surveys. Some threatened species have been recorded from the wider locality, however suitable habitat for these threatened species is absent from the subject site and the study area. Assessments of the likelihood of occurrence for potentially occurring threatened species have determined that no threatened flora species are likely to occur within the subject site and study area. Occurrences of threatened and/or migratory fauna species is expected to be limited to the incidental fly-overs of highly mobile avifauna or bats as part of a wider foraging or migratory range. An assessment of significance was conducted for potential fly-overs by highly mobile threatened species and concluded that the Modification will not have any significant impacts on threatened fauna species.

A range of mitigation measures are proposed to prevent further degradation of the remnant vegetation and protect the ecological values of the study area and surrounding areas.

No significant impacts to threatened species or TECs are expected to occur as a result of the Modification. Therefore further detailed assessments under the EP&A Act are not warranted.

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Appendix A

Likelihood of Occurrence

Table A.1 Likelihood of Occurrence of Threatened Flora Species

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Acacia pendula</i>	Acacia pendula population in the Hunter catchment	EP		2	Within the Hunter catchment the species typically occurs on heavy soils, sometimes on the margins of small floodplains, but also in more undulating locations.	Low likelihood of occurrence. The study area is heavily grazed and the understorey vegetation has been disturbed.	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses
<i>Eucalyptus camaldulensis</i>	Eucalyptus camaldulensis population in the Hunter catchment	EP		519	The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. It has been recorded in the local government areas of Lithgow, Maitland, Mid-Western Regional, Muswellbrook, Port Stephens, Singleton and Upper Hunter. May occur with <i>Eucalyptus tereticornis</i> , <i>Eucalyptus melliodora</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> and <i>Angophora floribunda</i> . Most of the occurrences are on private land and there are no known occurrences in conservation reserves.	Known to occur. Mature individuals were observed in the alluvial floodplain. A number of embankments in the eastern parts of the Authorisation Boundary have planted <i>Eucalyptus camaldulensis</i> .	Unlikely. The study area is heavily modified/grazed and lacks any trees or saplings

Table A.1 Likelihood of Occurrence of Threatened Flora Species

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Cymbidium canaliculatum</i>	Cymbidium canaliculatum population in the Hunter Catchment	EP		6	Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from the ground.	Known to occur. Individuals occur in the western and central portions of the Authorisation Boundary	Unlikely. The study area is heavily modified/grazed and lacks any trees or saplings
<i>Thesium australe</i>	Austral Toadflax	V	V	1	Found in very small populations scattered across eastern NSW. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda triandra</i>).	Known to occur. Individuals have been previously recorded in the western parts of the Authorisation Boundary. The associated species <i>Themeda triandra</i> is also present within derived native grasslands within the Authorisation Boundary	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses
<i>Androcalva procumbens</i>			V	0	Grows in sandy sites, often along roadsides, mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. Recorded in <i>Eucalyptus dealbata</i> and <i>Eucalyptus</i>	Unlikely. No records have been found in the locality which is largely outside of the known areas of occurrence. Associated	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses

Table A.1 Likelihood of Occurrence of Threatened Flora Species

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					sideroxylon communities, Melaleuca uncinata scrub, under mallee eucalypts with a Calytrix tetragona understorey, and in a recently burnt Ironbark and Callitris area	species/communities are also largely absent within the Authorisation Boundary	
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	0	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honeymyrtle <i>Melaleuca armillaris</i> scrub to open scrub	Unlikely. No records have been found in the locality and suitable habitat (i.e. dry rainforest vegetation) is absent within the Authorisation Boundary	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses
<i>Dichanthium setosum</i>	bluegrass	V	V	0	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Associated species include <i>Eucalyptus albens</i> , <i>Eucalyptus melliodora</i> , <i>Eucalyptus</i>	Unlikely. No records have been found in the locality. Although some associated species are present within the Authorisation Boundary, appropriate soils for this species are not present.	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses

Table A.1 Likelihood of Occurrence of Threatened Flora Species

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Euphrasia arguta</i>		CE	CE	0	viminalis, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia and Psoralea species Euphrasia arguta has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. Records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'	Unlikely. No records have been found in the locality which is outside of the known areas of occurrence. Known habitats are absent within the Authorisation Boundary	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses
<i>Prasophyllum sp.</i> <i>Wybong</i>	a leek-orchid		CE	0	Known from seven populations in open eucalypt woodland and grassland in New South Wales. The distribution of this species overlaps with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community	Low potential to occur. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland occurs within the Authorisation Boundary but no records are present for the locality	Unlikely. The study area is heavily modified/grazed and top soil is disturbed from historic and current land uses
<i>Pterostylis gibbosa</i>	Pouched Greenhood	E	E	0	Known from a small number of populations in the Hunter region (Milbrodale), the	Low potential to occur. Associated	Unlikely. The study area is heavily modified/grazed

Table A.1 Likelihood of Occurrence of Threatened Flora Species

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). Grows in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark, Forest Red Gum and Black Cypress Pine	species/communities occur within the Authorisation Boundary but no records are present for the locality	and top soil is disturbed from historic and current land uses

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
Amphibians							
<i>Litoria booroolongensis</i>	Booroolong Frog	E	E	0	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock are absent structures within stream margins	Unlikely. Suitable habitat with appropriate vegetation and structures	Unlikely. Suitable habitat is absent
Aves							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	0	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak, that have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany	Low. Some key species are present but vegetation largely lacks the requisite mature trees and mistletoe. No records in the locality	Unlikely. Suitable habitat is absent and there are no records of this species in the locality
<i>Botaurus poeciloptilus</i>	Australasian Bittern	E	E	0	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and present	Unlikely. No suitable wetland habitat is	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE	0	spikerushes (<i>Eleocharis</i> spp.) Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Inland records in wetland and estuaries are likely of birds pausing during migration	Unlikely. Estuarine, littoral and intertidal habitats are absent	Unlikely. Suitable habitat is absent
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		1	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m ASL in which stands of She-Oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur.	Low. No significant stands of <i>Allocasuarina</i> spp. occur	Unlikely. Suitable habitat is absent and there are very few records for this species in the locality
<i>Chthonicola sagittata</i>	Speckled Warbler	V		9	The species is distributed from south-eastern Queensland through central and eastern NSW to Victoria. In NSW it occurs in eucalypt and cypress woodlands, generally to the west of the	Known to occur. Individuals have previously been recorded within the Authorisation Boundary	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					great diving range, though populations extend into drier coastal areas such as the Cumberland Plain and the Hunter and Snowy River valleys. Woodlands inhabited have a grassy understorey, and are often on ridges or in in gullies. It forages in the ground layer and in the understorey for insects and seeds. Large, relatively undisturbed woodland remnants are required for the species to persist in an area.		
<i>Circus assimilis</i>	Spotted Harrier	V		-	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Known to occur. One passing individual has previously been observed by Cumberland Ecology within the Authorisation Boundary	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		5	Endemic to eastern Australia and occurs in grassy eucalypt forests and	Known to occur. Individuals have	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					woodlands. Mostly occurs on inland plains and slopes of the Great Dividing Range, though less commonly occurs on coastal plains and ranges. Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts. Usually not found in areas with a dense shrub layer. Fallen timber is an important habitat component for foraging. Species foraged in trees or across fallen logs, pecking and probing for insects and other invertebrates. It requires tree hollows for nesting.	previously been recorded within the Authorisation Boundary	
<i>Erythroriorchis radiatus</i>	Red Goshawk	CE	V	0	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water. Are often found in riparian habitats along or near watercourses or wetlands. Preferred habitats in NSW include mixed subtropical rainforest, Melaleuca	Low. Suitable habitat for this species is largely absent and there are no records for the locality	Unlikely. Suitable habitat is absent and there are no records of this species in the locality

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Falco subniger</i>	Black Falcon	V		1	swamp forest and riparian Eucalyptus forest of coastal rivers This species is widely distributed across Australia and is associated with a number of different vegetation communities. Commonly utilises wooded watercourses, and it is usually associated with wetlands and streams. The species generally nests in intact, riparian woodland remnants with a diverse array of avian prey.	Low. The river systems in the Authorisation Boundary do not have significant riparian woodland remnants and suitable habitat is limited.	Unlikely. Suitable habitat is absent and there are very few records for this species in the locality
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		-	Forages mostly in the canopy of open Eucalyptus forest and woodland, on Eucalypt species, and species of Angophora, Melaleuca, and other trees. Riparian habitats are ideal for the species due to higher productivity of flowering feed species. Isolated trees in paddocks and roadside remnants, along with urban trees can help sustain populations of the species. The species	Known to occur. Individuals have previously been recorded within the Authorisation Boundary	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					roosts in tree tops, often some distance from food trees, though prefers to nest in close proximity to feed areas. The species nests in hollows with a small entrance (3 cm) and at a height of between two and fifteen metres. Often nest trees are in riparian areas, and include trees of species like <i>Allocasuarina</i> spp.		
<i>Grantiella picta</i>	Painted Honeyeater	V	V	0	Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes with a preference for the genus <i>Amyema</i>	Low. Some habitat present but vegetation largely lacks the requisite mature trees and mistletoe. No records in the locality	Unlikely. Suitable habitat is absent and there are no records of this species in the locality
<i>Hieraaetus morphnoides</i>	Little Eagle	V		1	Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW also used. Nests in tall living trees within a	Known to occur. Individuals have previously been recorded within the Authorisation Boundary	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.		as part of a wider foraging or migratory range
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	0	Is almost exclusively aerial in Australia. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest and less commonly recorded above woodland	Known to occur. Individuals have previously been recorded within the Authorisation Boundary	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Lathamus discolor</i>	Swift Parrot	E	CE	0	Occur in mainland areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Eucalyptus robusta, Corymbia maculata, C. gummiifera, E. sideroxylon, and E.	Low. Some favoured feed trees present but no records in the locality	Unlikely. Suitable habitat is absent and there are no records of this species in the locality

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Melithreptus gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		1	albens. Commonly used lerp infested trees include <i>E. microcarpa</i>, <i>E. moluccana</i> and <i>E. pilularis</i>. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>).	Low. Some key species are present but only one record in the locality	Unlikely. Suitable habitat is absent and there are very few records for this species in the locality
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	0	Mainly occurs in rainforest ecosystems, including regrowth rainforest. Sometimes found in nearby open eucalypt forests (mainly wet sclerophyll forests) especially in gullies.	Low. Preferred habitat is absent but may pass through the Authorisation Boundary as part of a wider migratory range	Unlikely. Suitable habitat is absent and there are no records of this species in the locality
<i>Motacilla flava</i>	Yellow Wagtail		M	0	Found in well-watered open grasslands and the fringes of wetlands. Roosts in	Low. Preferred habitat is absent but may pass	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					mangroves and other dense vegetation	through the Authorisation Boundary as part of a wider migratory range	and there are no records of this species in the locality
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	0	Particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration the species is recorded in most wooded habitats	Low. Preferred habitat is absent but may pass through the Authorisation Boundary as part of a wider migratory range	Unlikely. Suitable habitat is absent and there are no records of this species in the locality
<i>Numenius madagascariensis</i>	Eastern Curlew		CE	0	Has a primarily coastal distribution across all states but is curlews are rarely recorded inland.	Unlikely. Suitable habitat is absent.	Unlikely. Suitable habitat is absent
<i>Petroica phoenicea</i>	Flame Robin	V		1	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. Ground layer of the breeding habitat is dominated by native grasses with shrub layer either sparse or dense. Often nests near the	Unlikely. Preferred habitat (moist forests) are absent.	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					ground and are built in sheltered sites e.g. shallow cavities in trees, stumps or banks.		
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		3	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	Possible. Appropriate habitat exists within the Authorisation Boundary and this species has been recorded in the locality.	Unlikely. Suitable habitat is absent
<i>Myiagra cyanoleuca</i>	Rufous Fantail		M	0	Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands	Low. Preferred habitat is absent but may pass through the Authorisation Boundary as part of a wider migratory range	Unlikely. Suitable habitat is absent and there are no records of this species in the locality
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	0	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Forages nocturnally on	Unlikely. Suitable habitat is absent.	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Stagonopleura guttata</i>	Diamond Firetail	V		3	mud-flats and in shallow water Found predominately in grassy eucalypt woodlands including Box-Gum Woodlands, but also occurs in open forest and grasslands, including those derived from clearing of woodland communities. It is often associated with riparian areas.	Possible. Appropriate habitat exists within the Authorisation Boundary and this species has been recorded in the locality.	Unlikely. Suitable habitat is absent
Mammalia							
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	4	Occurs in wide variety of habitats; rainforest, open forest, woodland, coastal heath and riparian forest. Uses hollows in trees, logs and rock crevasses as den sites.	Low. Although woodland habitats are present, the distribution is fragmented and no continuous tracts of woody vegetation are present	Unlikely. Suitable habitat is absent and there are very few records for this species in the locality
<i>Petauroides volans</i>	Greater Glider		V	0	Is typically found in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows	Unlikely. Suitable habitat is absent and there are no records in the locality	Unlikely. Suitable habitat is absent
<i>Petaurus australis</i>	Yellow-bellied Glider	V		1	Occurs in tall, mature eucalypt forest,	Unlikely. Suitable habitat	Unlikely. Suitable

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					mostly in areas with high rainfall and soil nutrients. Forest types include mixed coastal forests, dry escarpment forests, moist coastal gullies and creek flats, to tall montane forests. Feeds primarily on plant and insect exudates, including nectar, sap, honeydew, and manna, supplemented with insects to provide protein. The species dens in family groups, in hollows in large trees.	is absent within the Authorisation Boundary	habitat is absent
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		3	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas	Unlikely. Suitable habitat is absent within the Authorisation Boundary	Unlikely. Suitable habitat is absent
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	0	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs	Unlikely. Suitable habitat is absent within the Authorisation Boundary	Unlikely. Suitable habitat is absent

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Phascolarctos cinereus</i>	Koala	V	V	1	Inhabits eucalypt woodlands and forests, feeding on the leaves of Eucalyptus species. They feed on the foliage of more than 70 Eucalypt species and 30 non-eucalypt species.	Low. Although known feed trees are present, the distribution is fragmented and no continuous tracts of woody vegetation are present	Unlikely. Suitable habitat is absent and there are very few records for this species in the locality
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	1	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Commonly found in gullies, close to water, in vegetation with a dense canopy.	Moderate. No known roosting camps are present but the species may pass through the subject site as part of a wider foraging range	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	-	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin. Found in well-timbered areas containing gullies.	Moderate. Possible ultrasonic recordings of this species have previously been made to the east of the	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
<i>Miniopterus australis</i>	Little Bentwing-bat	V		1	Inhabits moist eucalypt forest, rainforest, wet and dry sclerophyll forest, melaleuca swamps, dense coastal forests and banksia scrub, preferring well timbered areas. Species roosts in caves, tunnels, tree hollows, stormwater drains, culverts, bridges and sometimes in buildings.	Possible. Appropriate habitat exists within the Authorisation Boundary and this species has been recorded in the locality.	as part of a wider foraging or migratory range Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		2	Roosts mainly in caves but also in tunnels, mines or buildings. Non-breeding populations disperse within a 300 km range of maternity caves. Hunting for moths and other insects takes place in forested areas above the canopy.	Known to occur. Individuals have previously been recorded within the Authorisation Boundary	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Myotis macropus</i>	Southern Myotis	V		1	Roosts close to water in caves, hollow-	Known to occur.	Low. No suitable

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish. Known from a range of habitats close to water from lakes, small creeks to large lakes and mangrove lined estuaries	Individuals have previously been recorded within the Authorisation Boundary	habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	0	Inhabits a variety of vegetation types, including mallee, bullock Allocasuarina luehmannii and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW. Roosts in tree hollows, crevices, and under loose bark. The species' stronghold is in the Pilliga Scrub region of the Murray-Darling Basin	Unlikely. Although some marginal habitat is present, there are no records in the locality and the Authorisation Boundary lies outside the known stronghold for this species.	Unlikely. Suitable habitat is absent and there are no records for this species in the locality
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		1	Roosts singly or in groups of up to six, in tree hollows and buildings; in	Known to occur. Individuals have	Low. No suitable habitat is present.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Scientific Name	Common name	TSC Act Status	EPBC Act Status	# records (5km locality)	Habitat Requirements	Likelihood of Occurrence within Authorisation Boundary	Likelihood of Occurrence in Surface Infrastructure Study Area
					treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	previously been recorded within the Authorisation Boundary	Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range
Scoteanax rueppellii	Greater Broad-nosed Bat	V		1	Found mainly in the gullies and river systems that drain the Great Dividing Range. Usually roosts in tree hollows and buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. Species is not known to occur in areas of high urban density.	Possible. Appropriate habitat exists within the Authorisation Boundary and this species has been recorded in the locality.	Low. No suitable habitat is present. Occurrence, if any, is limited to incidental fly-over as part of a wider foraging or migratory range

Appendix B

Flora Species List

Table B.1 **Flora species recorded within Study Area**

Species Name	Status	Flora plot		Incidental observations
		Cover	Abundance	
<i>Avena sativa</i>	E	0.1	100	
<i>Boerhavia dominii</i>	N	0.1	3	
<i>Bromus catharticus</i>	E	15		
<i>Chenopodium album</i>	E	0.1	2	
<i>Cirsium vulgare</i>	E	0.1	2	
<i>Citrullus lanatus</i> var. <i>lanatus</i>	E	0.1	3	
<i>Cynodon dactylon</i>	N (P)	1	1000	
<i>Cyperus</i> spp.	N	0.1	100	
<i>Einadia trigonos</i>	N	0.1	2	
<i>Euphorbia</i>	E	0.1	3	
<i>Hordeum vulgare</i>	E	0.1	100	
<i>Lepidium africanum</i>	E	0.1	5	
<i>Lolium rigidum</i>	E	5		
<i>Medicago sativa</i>	E	0.1	10	
<i>Paspalum dilatatum</i>	N	1	200	
<i>Plantago lanceolata</i>	E	0.1	10	
<i>Portulaca oleracea</i>	E	0.1	2	
<i>Sida corrugata</i>	N	0.1	1	
<i>Sida rhombifolia</i>	N	0.1	1	
<i>Sida spinosa</i>	E	0.2	100	
<i>Taraxacum officinale</i>	E	0.1	2	
<i>Tribulus terrestris</i>	E	0.1	100	
<i>Trifolium repens</i>	E	0.1	3	
<i>Urochloa</i> spp.	E	6		
<i>Verbena bonariensis</i>	E	0.1	2	
<i>Xanthium spinosum</i>	E	2	500	
<i>Casuarina cunninghamiana</i>	N (P)	-	-	X
<i>Eucalyptus</i> sp	N (P)			X

Key: E = exotic, N = native, N (P) = native planted

Appendix C

Assessment of Significance

C.1 Assessment of Significance

This appendix contains the formal Assessment of Significance required under the former Part 5A of the EP&A Act. The Assessment of Significance has been conducted for the following threatened fauna species with potential to fly-over the subject site and study area:

- Spotted Harrier;
- Little Eagle;
- Grey-headed Flying Fox;
- Large-eared Pied Bat;
- Little Bentwing-bat;
- Eastern Bentwing-bat;
- Southern Myotis;
- Yellow-bellied Sheath-tail-bat: and
- Greater Broad-nosed bat.

Assessment of Significance

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Modification will not clear any known or potential foraging and breeding habitat for these species. These species are highly mobile with large foraging ranges and have the capacity to access resources from a wide area and may fly over the subject site and study area as part of a wider foraging range only. Large areas of habitat will remain in the wider locality and the clearing of exotic grassland is not considered likely to place a viable local population of these species at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable to threatened species.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The Modification will clear approximately 2.88 ha of exotic grassland vegetation that does not provide any habitat for these species. No areas of habitat will become isolated or fragmented as a result of the proposal. These are highly mobile species that are able to fly over disturbed areas to access areas of habitat and occurrence is limited to fly-overs.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No declared areas of outstanding biodiversity value have been identified in the locality of the subject site.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process

The action proposed is not part of any key threatening process as no native vegetation or fauna habitat will be cleared, no weeds or pest species are likely to be introduced and no subsidence from mining is predicted.

Conclusion

The Modification is expected to impact on approximately 2.28 ha of exotic grassland which does not provide any suitable habitat for these species. No areas of habitat will be subject to subsidence and woodland and forest habitat will remain in the surrounding locality. It is expected that these species will remain viable in the locality and no significant impact is predicted to occur to these species as a result of the Modification.