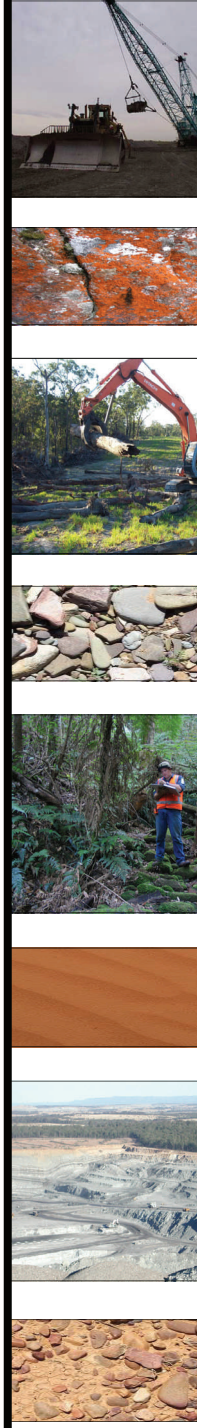
ECOLOGY IMPACT ASSESSMENT



APPENDIX 11

Centennial Coal

Awaba Colliery Mining Project

Part 3A Application Ecology Assessment

HUNTER ECO

FUTURE POWER | Centennial Coal

Centennial Coal

Awaba Colliery Mining Project

Part 3A Application Ecology Assessment

HUNTER ECO

Colin Driscoll
Environmental Biologist
NPWS Scientific Licence S10565

April 2010

Executive Summary

The proposed Project is currently anticipated to recover approximately 2.0 million tonnes of coal which will be extracted from those areas depicted in Study Area 2 and Study Area 3 over a period of approximately five years or more, depending on actual mining conditions and relevant market drivers.

No changes are proposed to the current coal handling, preparation or stockpile procedures to the existing operations. Minimal changes are proposed to existing surface operations, with a proposed additional surface disturbance within a disturbed area relating to increased Pollution Control Dam (PCD) capacity. Awaba Colliery is seeking an approval from the Minister of Planning under the provisions of Part 3A of the EP&A Act to:

- Continue bord and pillar development and pillar extraction by continuous miners within the "Main South Area" (being the remaining sections of Stage 2 and Revised Stage 3, refer **Study Area 2**);
- Extend bord and pillar development and pillar extraction by continuous miners into the "East B" Area (refer **Study Area 3**);
- Produce, handle and distribute up to 880,000 tonnes of Run of Mine coal per annum (financial year) using existing surface facilities;
- Continue to utilise existing ancillary surface facilities (all **Study Areas**);
- Expand the existing final Pollution Control Dam (refer **Study Area 1**);
- Continue the delivery of coal to the Newstan Colliery and/or the Eraring Power Station using the existing private haul road/transport facilities (refer **Study Area 4**).

All existing ancillary surface facilities, supporting infrastructure, workings and their associated uses will continue to be relied upon by the Awaba Colliery (no significant change). These aspects of the Project will continue to be used until such time as the Awaba Colliery is placed on care and maintenance, and thereafter throughout that phase also.

The end result of the mining will be 44 voids of varying dimensions spanned by conglomerate rock. As the spanning conglomerate, supporting pillars and floor take up the load it is estimated that surface subsidence will be a maximum of 200 mm and this subsidence would be the main source of any ecological impact. An extreme event would be if the spanning conglomerate failed, an event termed 'plug failure', which would result in a 2 m deep hole in the ground the width and length of the original void.

Five vegetation communities were mapped across the mined area with one being a listed Endangered Ecological Community (EEC). The EEC, *Swamp Sclerophyll Forest on Coastal Floodplains*, would also be classed as a groundwater dependent ecosystem (GDE). The threatened plant *Tetratheca juncea* has been recorded in some of the subsidence areas. There were no records for *Grevillea parviflora* subsp *parviflora* or *Cryptostylis hunteriana* although suitable habitat for these species was present. A desktop review indicated that the area could be used by several species of threatened fauna.

It was determined that there would be no impact on threatened species or downstream GDE's as a consequence of the predicted amount of subsidence even in the unlikely worst case scenario of a total collapse of the spanning conglomerate.

TABLE OF CONTENTS

FIGURES

TABLES

DOCUMENT DETAILS

Name:	Awaba Mining Project - Ecology
Author:	Colin Driscoll – HUNTER ECO
Reference:	
Revision No.:	
Document Status	Final

APPROVAL DETAILS

Revision No.	Date Sent	Details of Approval	Approved By	Approval Date
0	9 July 2010			
1	23 July 2010			
2	6 September 2010			
3	9 September 2010			

CIRCULATION DETAILS

Name	Department	No of Final Approved Copies

Centennial Coal

Awaba Colliery Mining Project

Part 3A Application Ecology Assessment

1.0 Introduction

1.1 Background

Awaba Colliery is a small underground coal mine operated by Centennial Newstan Pty Ltd (Newstan), a wholly owned subsidiary of Centennial Coal Company Ltd (Centennial). The mine entry and primary surface facilities are located approximately one kilometre south of the Awaba village and 5.5 kilometres (km) south west of Toronto on the western side of Lake Macquarie, near Newcastle NSW.

Awaba Colliery has been producing coal by bord and pillar method since 1947. The site is situated on crown land under lease to Centennial for the purpose of mining under Consolidated Coal Lease CCL746, and is adjacent to the Newstan-Eraring haul road owned by Eraring Energy. The locality of the mine is illustrated on **Figure 1**.

Awaba Colliery is a small operation with approximately 100 employees and contractors, historically producing around 800,000 tonnes of thermal coal annually. Since commencing mining operations in 1947, over 30 million tonnes of coal has been won from the Great Northern Seam using a combination of first workings development, pillar extraction, pillar quartering, and pillar stripping.

A form of pillar extraction of narrow panels is used to recover coal in pillars developed previously by bord and pillar methods. Development of bords (roadways) and pillars is ongoing but in some areas were developed many years ago. This mining method currently utilises continuous miners. Mine planning ensures panels are not extracted where depth of cover or surface constraints preclude total extraction. This mining method has been developed in consultation with the Department of Primary Industries – Mineral Resources (now known as Industry and Investment, NSW (I&I)) and has been used successfully to date, and is proposed to be continued for the Project.

Mining operations commenced at the Awaba Colliery in 1947, prior to the commencement of any planning controls, and have continued without abandonment since that time. Consequently, the Awaba Colliery presently operates pursuant to section 109(1) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and clause 6B(1) of the *State Environmental Planning Policy (Major Development) 2005*. An application for a Part 3A Project Approval has been lodged by Centennial for the ***Awaba Colliery Mining Project (the "Project")***, which seeks approval from the Minister of Planning to allow an extension of underground mining and the ongoing use of associated surface operations. A detailed description of the Project and the **Project Application Area (*the "Application Area"*)** (including focus study areas) is detailed further in **Sections 1.2 and 1.3** below.

Minimal changes are proposed to existing surface operations, with one proposed additional surface disturbance relating to increased pollution control

dam capacity located in a previously disturbed area. No significant changes to coal handling are proposed. Underground mining areas requiring approval to allow continued mine operations and production are outlined in **Sections 1.2** and **1.3** below.

At present, it is anticipated that the Project will recover approximately 2.0 million tonnes of coal which will be extracted from those areas depicted in Study Area 2 and Study Area 3 (refer **Section 1.2.1**) over a period of approximately five years or more, depending on actual mining conditions and relevant market drivers.

The application for the proposed Project is supported by an Environmental Assessment ("EA").

1.2 Project application area

The **Project Application Area** (the "Application Area") is illustrated on **Figure 1**. The Application Area has been identified as the footprint of the proposed Project including proposed mining areas and related surface operations that are considered relevant to the continuation of Awaba Collieries operations, as well as, the existing workings areas that will continue to be relied upon for ventilation and other mining related purposes, access to proposed mining areas or for any required emergency evacuation.

The Application Area has been broken into a number of Study Areas based on the types of activities to be undertaken for the Project. These Study Areas are outlined below in **Section 1.2.1**. The extent of the existing workings has not been included as a Study Area as it is considered inappropriate to obtain retrospective approval for historical operations. Additionally, there are no activities proposed in these areas for the Project and ongoing management of these areas is covered by the existing Awaba Colliery Mining Lease conditions.

1.2.1 Study areas

The Study Areas that have been assessed as part of this EA are shown on **Figure 2** and include the following:

- **Study Area 1 – Surface Facilities and Ancillary Infrastructure** – This area includes the colliery pit top facilities (including office and amenities buildings, existing coal crushing plant, workshop and storage areas) ventilation shafts, an existing quarry and mine dewatering bore (10 South Bore).
- **Study Area 2 – Continued Mining within Existing Main South Area staged SMP Approval Areas (including the Remaining Coal to be Mined within Stage 2 and the Revised Stage 3)** – The impacts associated with mining in these areas have previously been assessed in Subsidence Management Plan (SMP) Applications. The Stage 2 Area application was approved by Industry and Investment in September 2008, with the SMP Application for the Revised Stage 3 Area submitted to I&I in December 2009 awaiting approval. These areas are defined by a 26.5 degree angle of draw (as per DPI-MR SMP Guidelines, 2003). The outcomes from the SMP assessment will be summarised along with any impacts that are not considered to have been adequately addressed for this EA. It is important to note that, in relation to Stage 2 Area, only the coal remaining from the 1st of August will require approval for this Project (this boundary has been indicated on **Figure 2**); and

- **Study Area 3 – Proposed Project Mining Areas** - Consideration of the proposed Mining Area (East B Area) defined as the proposed workings plus 26.5 degree angle of draw (i.e. as per DPI-MR SMP Guidelines, 2003);
- **Study Area 4 – Existing Internal Private Haul Road** – This haul road will be utilised for transporting coal from the Awaba Colliery operations to Newstan Collieries existing Run of Mine Stockpile or Rail Loop and subsequently transported to the Port of Newcastle or Port Kembla for shipping to export markets (to be undertaken in accordance with the Newstan Colliery development consent) and also to the Eraring Power Station. It is noted that a modification to the Newstan Colliery development consent (DA 73-11-98) will be applied for under Section 96(1A) of the EP&A Act to allow for the preparation of coal sourced from the Awaba Colliery using the existing Newstan Colliery infrastructure.

In general, potential environmental impacts associated with mine access, ventilation and other services provided through the existing workings areas to the active and proposed mining areas will also be addressed in the EA.

1.3 Project description

Awaba Colliery is seeking an approval from the Minister of Planning under the provisions of Part 3A of the EP&A Act to:

- Continue bord and pillar development and pillar extraction by continuous miners within the "Main South Area" (being the remaining sections of Stage 2 and Revised Stage 3, refer **Study Area 2**);
- Extend bord and pillar development and pillar extraction by continuous miners into the "East B" Area (refer **Study Area 3**);
- Produce, handle and distribute up to 880,000 tonnes of Run of Mine coal per annum (financial year) using existing surface facilities;
- Continue to utilise existing ancillary surface facilities (all **Study Areas**);
- Expand the existing final Pollution Control Dam (refer **Study Area 1**);
- Continue the delivery of coal to the Newstan Colliery and/or the Eraring Power Station using the existing private haul road/transport facilities (refer **Study Area 4**).

The proposed East B Area contains a proportion of coal that extends beyond the existing footprint of mining at Awaba Colliery and includes areas of both existing workings and areas requiring new workings to be developed. Subsequently, areas of new workings are lateral extensions to the mine footprint which will require new development approval (being sought under the current Part 3A application). The East B area is located to the east of the Main South Stage 2 Area. The overlying surface in the East B Area is predominantly bush land on crown land leased to Centennial Newstan and contains no significant surface infrastructure. This area forms ***Study Area 3*** for the Project, as illustrated on **Figures 2**.

Mining will also be continued at Awaba Colliery in two (2) separate areas, these have been outlined below and illustrated as ***Study Area 2*** on **Figures 2**:

- **Remaining sections of Stage 2 of the Main South Area** (currently being mined) – this area was approved by I&I in September 2008 following an SMP application (as modified) under the NSW *Mining Act, 1992*.
- **Revised Stage 3 Area** (of Main South Area) – this area has recently undergone a number of specialist surveys relating to a SMP application submitted in December 2009 (approval currently awaited from I&I prior to December 2010).

At present, it is anticipated that the Project will recover approximately 2.0 million tonnes of coal which will be extracted from those areas depicted in Study Area 2 and Study Area 3 (see Figure 2.1b) over a period of approximately five years or more, depending on actual mining conditions and relevant market drivers.

All existing ancillary surface facilities, supporting infrastructure, workings and their associated uses will continue to be relied upon by the Awaba Colliery (no significant change) as outlined further below. These aspects of the Project will continue to be used until such time as the Awaba Colliery is placed on care and maintenance, and thereafter throughout that phase also. When the Awaba Colliery is placed on care and maintenance, this will be done in accordance with the Life of Mine Plan approved by I&I NSW in 2009, until such time that a final Detailed Life of Mine Strategy has been developed.

Annual production, handling and distribution of approximately 880,000 tonnes per financial year is required.

Awaba Colliery requires approval to deliver coal via the private haul road to the Newstan Colliery ROM coal stockpile (in addition to the Rail Loop stockpile). This is assessed within **Study Area 4**. Newstan Colliery has submitted an application to modify its development consent in order to process coal received from the Awaba Colliery. Existing mining areas will continue to be utilised for ongoing mining operations including (but not limited to) mine access, emergency management and underground services and infrastructure.

Continuing Mine Operations:
For the purposes of environmental assessment, further to the information above regarding continued mining areas, it is noted that the following aspects of mine operations are proposed to continue and remain unchanged. Existing mining operations are presented in detail in Section 3 of the *Environmental Assessment (EA)* and, where relevant, components are discussed further in this specialist report.

- **Coal Handling, preparation and stockpiles** – No changes are proposed to the current coal handling, preparation or stockpile procedures to the existing operations;

- **Mine support facilities and site access** – No changes are proposed to the current infrastructure and facilities, with the only exclusion being the expansion of the Pollution Control Dam (PCD) mentioned earlier above, with related water management considerations. Mine access from Wilton Road will continue to be utilised and no significant change is anticipated from current use;

- **Plant and equipment** – No changes are proposed to the typical plant and equipment used at the Awaba Colliery;

- **Transportation procedures** – No changes are proposed to the current transport procedures. The Project will continue to use the Newstan-Eraring private haul road to transport coal from the operations to Newstan and Eraring;

- **Mining methodology** – There will be no significant changes to current mining methods for the Project. This includes predicted subsidence levels and operational structure. Production rates may be slightly increased from approximately 800,000 to 880,000 tonnes per annum (financial year), depending on mining efficiency and market demands;

- **Operational water management** – the domestic wastewater generation rate from the Pit Top facilities will be similar to that which currently exists as there is no plan for an increase or significant change in staff numbers. Disposal of the domestic wastewater will remain as currently exists at site;

- **Mine dewatering procedures** – the10 South Bore will continue to be used for groundwater management and dewatering during both continued operation and care and maintenance conditions.

1.4 Scope and objectives of this report

This ecological report has been prepared according to the Draft Guidelines for Threatened Species Assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (DECC & DoP 2005). The investigation is specifically targeted at the land that would be subject to subsidence, this being the only event having the potential for ecological impact.

1.5 General impact area description

The area over which subsidence would occur is about 90 ha of fully vegetated forest with a well-developed shrub and ground layer. The proposed workings lie under a system of ridges of elevation around 50 - 90 m AHD. The primary catchment is that of Stony Creek which flows north, ultimately into Lake Macquarie (**Figure 3**). The Stony Creek catchment is about 220 ha and originates to the south of the mining areas. A mining buffer has been set from creek centreline of 50 m for 3rd order streams and 30 m for 2nd order streams (**Figure 2**). Mining has also been excluded from areas having cover (depth from surface to coal seam) of 25 m or less.

The soils are predominantly the Awaba Associated Landscape derived from the Narrabeen Group - Munmorah Conglomerate Formation. These soils are characterised by high levels of stoniness, high permeability, high erodability and low fertility (Matthei 1995).

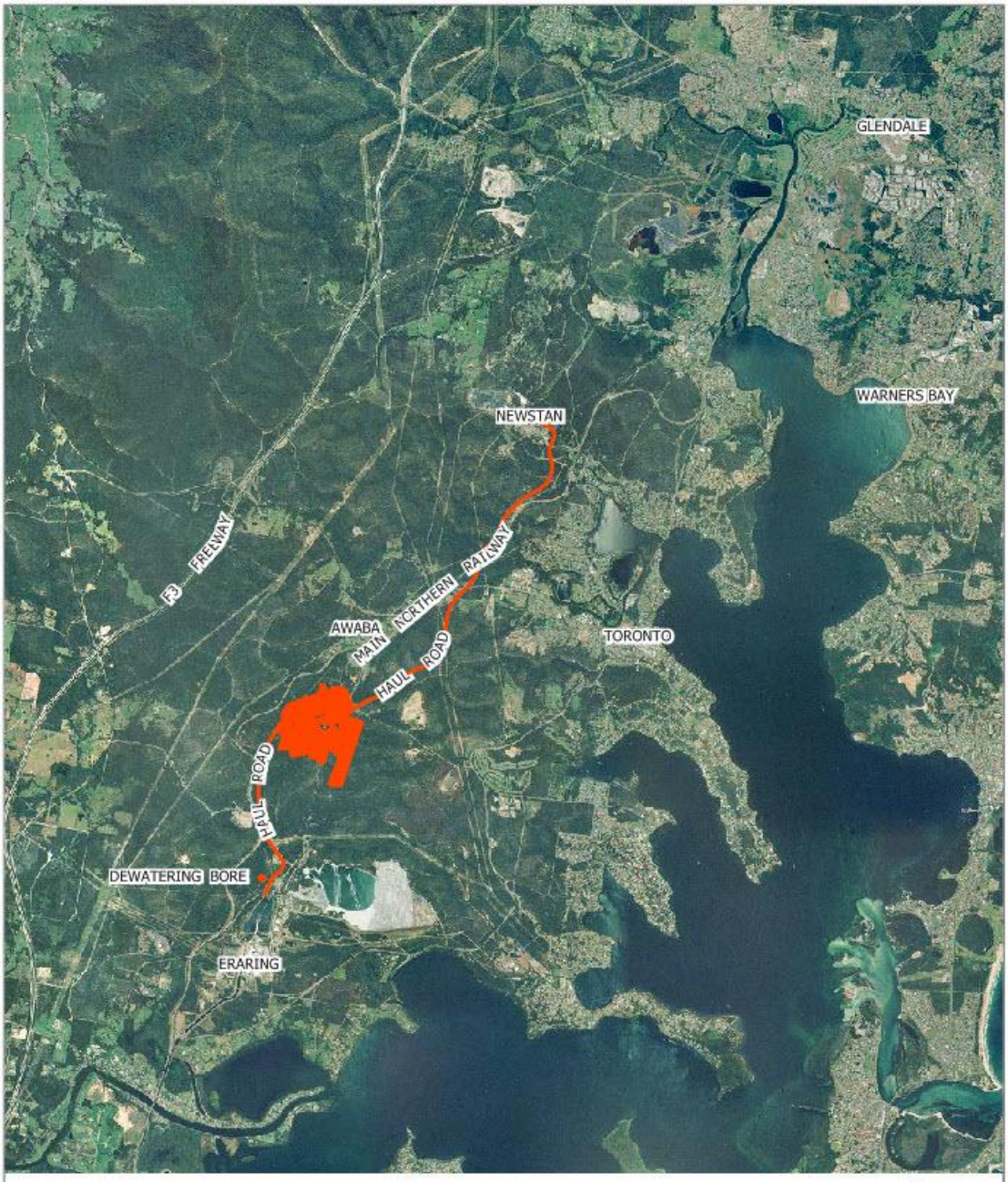


FIGURE 1

The application area (red) in a regional context

HUNTER ECO

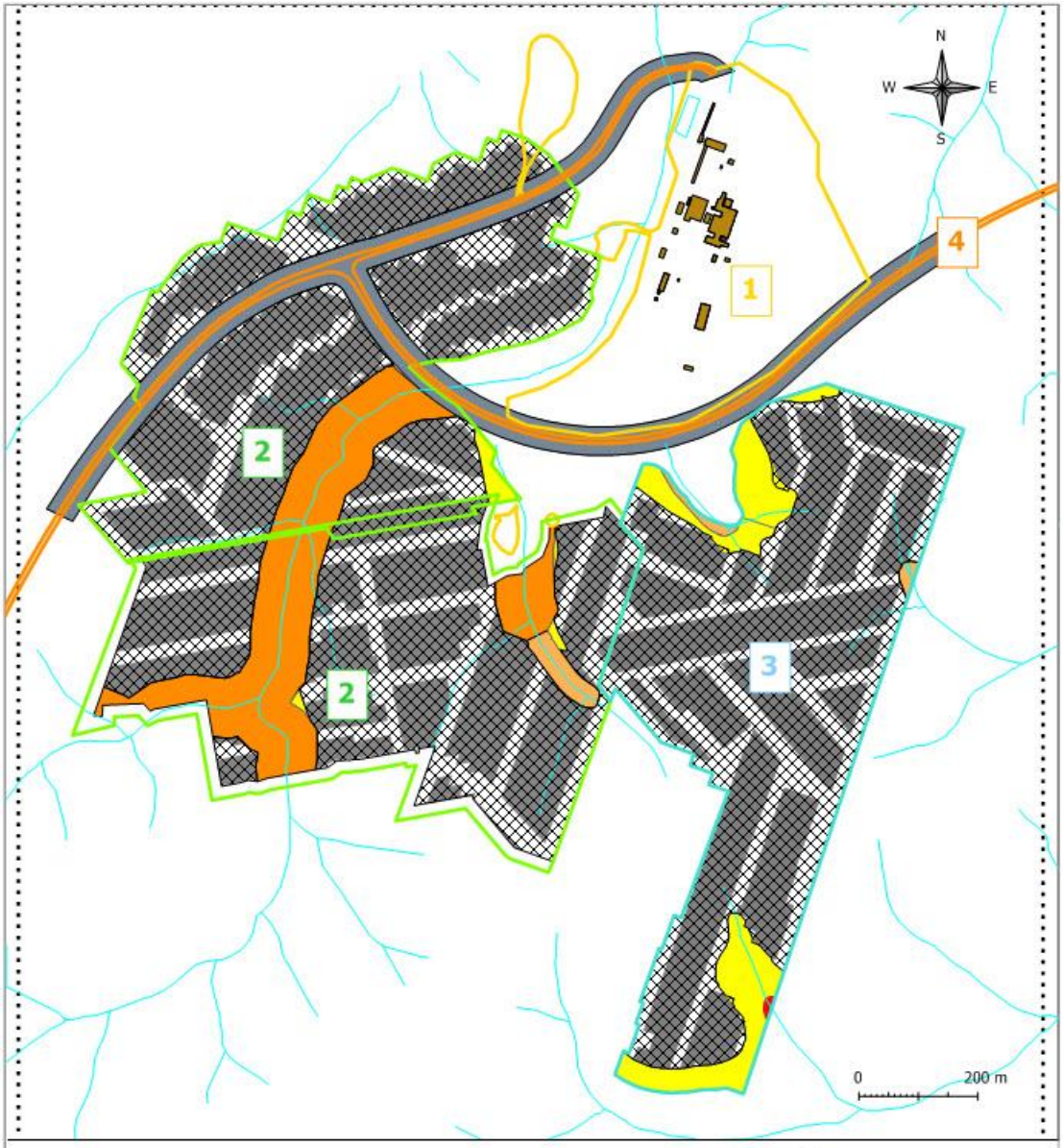
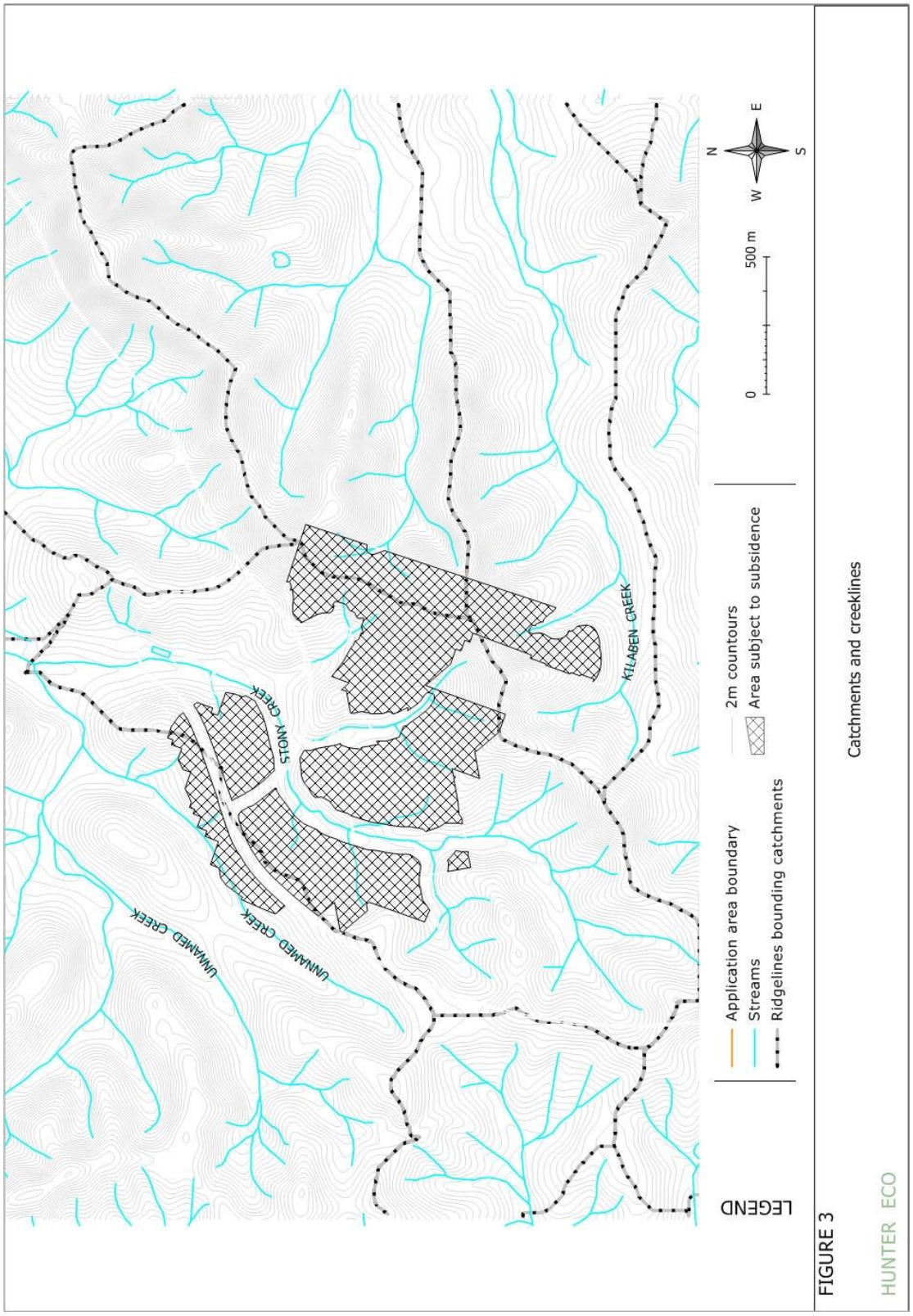


FIGURE 2

Components of the project and study areas

HUNTER ECO


KILABEN CREEK
STONY CREEK
UNNAMED CREEK
UNNAMED CREEK
N
E
S
W
0
500 m
LEGEND
Application area boundary
Streams
Ridgelines bounding catchments
2m countours
Area subject to subsidence
FIGURE 3
Catchments and creeklines
HUNTER ECO

2.0 Methods

In order to assess the potential for ecological impacts by the subsidence, vegetation communities were classified and mapped across the subsidence area which was included within a wider ecology investigation area (**Figure 2**). Any threatened species of flora or fauna were recorded during the field work. Using the vegetation communities as habitat surrogates, the potential threatened flora and fauna species occurring were determined based on current available knowledge of their habitat requirements.

Given that there would be no habitat clearing and that the only impact would be surface deformation up to a maximum predicted of 200 mm, no fauna trapping or targeted field searches for fauna were conducted. For the purposes of an impact assessment, all fauna species that would be likely to occur in the surface habitat types were assumed to be present.

2.1 Vegetation community mapping

Recent ground-truthed vegetation mapping of the area and threatened flora records (Hunter Eco 2008) were used for this project. The vegetation community map was prepared using the ground-truthing methods described in DECC (2008a). In principle the method involves recording the dominant species in the canopy, shrub and ground structural layers at a number of locations across an area. These data points are termed Rapid Data Points (RDP). This data is then given a community code that matches the classification found in the NPWS (2000) model, commonly referred to as the REMS or HCCREMS data. The RDP data is then extrapolated across the investigation area in a GIS and the polygons refined using aerial photographic interpretation all the while remaining true to the RDP ground-truthed data.

In order to better define the location of the Stony Creek riparian communities the path of the drainage line was walked and plotted using a hand-held GPS.

2.2 Threatened species and communities - NSW State

Threatened species and communities considered here were those listed in the NSW *Threatened Species Conservation Act 1995* (TSC ACT).

The threatened species present in any area are dependant on the habitat types represented. As a guide to the threatened species that might be present in the investigation area data was obtained from the NPWS Atlas of NSW Wildlife for an area within 10 km of the investigation area boundary.

The species listed in the 10 km data were assessed against their known habitat preferences (DECC 2008b) and the habitat found to be present as a result of the vegetation mapping. The location of any threatened species observed during the field work was recorded.

2.3 Threatened species and communities - Commonwealth

Threatened species and communities considered here were those listed in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Potential Commonwealth listed threatened species for the application area were extracted using the protected matters research tool (http://www.environment.gov.au/erin/ert/epbc/index.html) for a 10 km bounding box centred on the application area.

3.0 Threatened species assessment results

3.1 Probable threatened species – NSW State

Table 1 lists the species of threatened flora recorded in the Atlas of NSW Wildlife from within a 10 km radius of the subject site. The likelihood of occurrence on the subject site, given the habitat types present, is evaluated.

Table 1 Threatened species from the Atlas of NSW Wildlife

Common Name	Scientific Name	Likelihood of presence
	FLORA	
Bynoe's Wattle	*Acacia bynoeana*	Marginal habitat
Charmhaven Apple	*Angophora inopina*	Unsuitable habitat
Netted Bottle Brush	*Callistemon linearifolius*	Grows in dry sclerophyll forest
Leafless Tongue Orchid	*Cryptostylis hunteriana*	Suitable habitat
Small-flowered Grevillea	*Grevillea parviflora subsp. parviflora*	Suitable habitat
Biconvex Paperbark	*Melaleuca biconvexa*	Suitable habitat
Heath Wrinklewort	*Rutidosis heterogama*	Grows in heath on sandy soils and moist open forest areas
Black-eyed Susan	***Tetratheca juncea***	**Suitable habitat (Recorded present)**
	AMPHIBIANS	
Wallum Froglet	*Crinia tinnula*	No suitable habitat
Giant Burrowing Frog	*Heleioporus australiacus*	Needs heath or open forest in sandy soils, no suitable habitat
Green And Golden Bell Frog	*Litoria aurea*	Inhabit marches, dams, streams having rushes and open water, no suitable habitat
Green-thighed Frog	*Litoria brevipalmata*	Need flood-prone grassy areas & grassy semi-permanent ponds, no suitable habitat
Stuttering Barred Frog	*Mixophyes balbus*	Inhabits rainforest & wet tall open forest, no suitable habitat
Giant Barred Frog	*Mixophyes iteratus*	Inhabit rainforest, moist forest having flowing rocky streams, no suitable habitat
Red-crowned Toadlet	*Pseudophryne australis*	Occur in open forests on Hawkesbury or Narrabeen sandstone, no suitable habitat
	REPTILES	
Pale-headed Snake	*Hoplocephalus bitorquatus*	Dry eucalypt forest and woodland. Suitable habitat present.
Stephen's Banded Snake	*Hoplocephalus Stephensii*	Eucalypt forest, possible suitable habitat
Rosenberg's Goanna	*Varanus rosenbergi*	Inhabits heath and open forest. Termite mounds are a critical component of habitat. No suitable habitat

	BIRDS	
Australian Bittern	*Botaurus poiciloptilus*	A wetland bird, no suitable habitat
Bush Stone-curlew	*Burhinus grallarius*	Inhabits open forest/woodland with sparse groundcover, no suitable habitat
Gang-gang Cockatoo	*Callocephalon fimbriatum*	A possible winter migrant from tall mountain forests and woodlands.
Glossy Black Cockatoo	*Calyptorhynchus lathami*	Suitable foraging habitat in the *Allocasuarina* species.
Brown Treecreeper	*Climacteris picumnus ssp. victoriae*	Generally unsuitable habitat with the shrub and ground layers too dense.
Varied Sittella	*Daphoenositta chrysoptera*	Suitable habitat
Black-necked Stork	*Ephippiorhynchus asiaticus*	A wetland bird, no suitable habitat
Little Lorikeet	*Glossopsitta pusilla*	Suitable foraging habitat in flowering eucalypts and bloodwoods
Black Bittern	*Ixobrychus flavicollis*	A wetland bird, no suitable habitat
Comb-crested Jacana	*Irediparra gallinacea*	A wetland bird, no suitable habitat
Swift Parrot	*Lathamus discolor*	Suitable foraging habitat in flowering Swamp Mahogany
Square-tailed Kite	*Lophoictinia isura*	A preference for timbered watercourses, no suitable habitat
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis ssp. gularis*	Prefers Box/Ironbark woodlands, generally unsuitable habitat
Powerful Owl	*Ninox strenua*	Suitable foraging habitat throughout; possibility of breeding hollows in some large trees.
Osprey	*Pandion haliaetus*	Possible use of large trees for nesting purposes.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis ssp. temporalis*	Inhabits open forest/woodland with sparse groundcover, no suitable habitat
Superb Fruit-dove	*Ptilinopus superbus*	A rainforest species, no suitable habitat
Speckled Warbler	*Pyrrholaemus saggitatus*	Inhabits open forest/woodland with sparse groundcover, no suitable habitat
Masked Owl	*Tyto novaehollandiae*	Suitable habitat in the open woodlands of the MU30 and MU31 communities along with suitable breeding hollows.
Sooty Owl	*Tyto tenebricosa*	Generally unsuitable habitat with the bird preferring dense mesic gullies.
Regent Honeyeater	*Xanthomyza phrygia*	Suitable foraging habitat in flowering Swamp Mahogany
	MAMMALS	
Eastern Pygmy-possum	*Cercartetus nanus*	Prefers heathy woodlands, possible suitable habitat in the Scribbly Gum woodland
Large-eared Pied Bat	*Chalinolobus dwyeri*	Well-timbered habitat containing gullies. Generally unsuitable habitat.
Spotted-tailed Quoll	*Dasyurus maculatus*	Probable foraging habitat.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Moist habitat with trees >20m tall. Marginal habitat
Golden-tipped Bat	*Kerivoula papuensis*	Inhabits rainforest and adjacent forest. No suitable habitat
Parma Wallaby	*Macropus parma*	Moist dense shrubby forest adjoining grassy areas. No suitable habitat.
Little Bentwing-bat	*Miniopterus australis*	Moist forest, rainforest, dense coastal banksia scrub. No suitable habitat
Eastern Bent-wing Bat	*Miniopterus schreibersii subsp. oceanensis*	Forested areas. Suitable habitat.
Eastern Freetail bat	*Mormopterus*	A variety of forest types. Suitable habitat

	norfolkensis	present.
Large-footed Myotis	*Myotis adversus*	The Fishing Bat and needs forested habitat close to water. No suitable habitat.
Squirrel Glider	*Petaurus norfolcensis*	Suitable habitat
Koala	*Phascolarctos cinereus*	Marginal habitat, very few eucalypt feed tree species
Yellow-bellied Glider	*Petaurus australis*	Prefers tall mature eucalypt forests in nutrient rich soils, no suitable habitat
Brush-tailed Rock-wallaby	*Petrogale penicillata*	Needs rocky escarpments, no suitable habitat
Long-nosed Potoroo	*Potorous tridactylus*	A variety of forest types. Suitable habitat present.
Grey-headed Flying-fox	*Pteropus poliocephalus*	Foraging habitat wherever eucalypts or bloodwoods blossom across the subject site.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	A variety of forest types. Suitable habitat present.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	A variety of forest types. Suitable habitat present.
Eastern Cave Bat	*Vespadelus troughtoni*	A variety of forest types. Suitable habitat present.

3.2 Probable threatened species – Commonwealth

Table 2 lists the species of threatened flora obtained from the protected matters search tool for the area within 5 km of the application area.

Table 2 Commonwealth listed species from the protected matters search tool (extracted 31/3/10)

Species	Common Name	Status	Likelihood of presence
	FLORA		
Acacia bynoeana	Bynoe's Wattle	V	Present locally
Angophora inopina	Charmhaven Apple	V	Present locally
Cryptostylis hunteriana	Leafless Tongue-orchid	V	Suitable habitat
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	Present in subject site
Melaleuca biconvexa	Biconvex Paperbark	V	Limited suitable habitat in Swamp Sclerophyll forest
Rhizanthella slateri	Eastern Underground Orchid	E	No suitable habitat. Nearest records are 60 km away
Syzygium paniculatum	Magenta Lilly Pilly	V	Limited suitable habitat
Tetratheca juncea	Black-eyed Susan	V	Present in subject site
	BIRDS		
Rostratula australis	Australian Painted Snipe	E	No suitable habitat – a wetland species
Anthochaera phrygia	Regent Honeyeater	V	Suitable foraging habitat in flowering Swamp Mahogany
Lathamus discolor	Swift Parrot	E	Suitable foraging habitat in flowering Swamp Mahogany
	MARSUPIALS		
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E	Suitable habitat
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	V	Suitable habitat
Petrogale penicillata	Brush-tailed Rock-wallaby	V	No suitable habitat. Needs rocky escarpments

	MEGACHIROPTERAN BATS		
Pteropus poliocephalus	Grey-headed Flying-fox	V	Foraging habitat wherever eucalypts or bloodwoods blossom across the subject site.
	MICROCHIROPTERAN BATS		
Chalinolobus dwyeri	Large-eared Pied Bat	V	Suitable habitat
	AMPHIBIANS		
Heleioporus australiacus	Giant Burrowing Frog	V	No suitable habitat – needs heath or open forest in sandy soils
Litoria aurea	Green and Golden Bell Frog	V	No suitable habitat – needs open reedy swamps/dams
Litoria littlejohni	Littlejohn's Tree Frog	V	No suitable habitat – needs sandstone woodland & heath habitat at higher altitudes
Mixophyes iteratus	Giant Barred Frog	E	No suitable habitat – needs deep damp leaf litter in wet forest

3.3 Migratory species – Commonwealth

In addition to listed threatened species, migratory birds is also a matter of Commonwealth significance. **Table 3** lists the migratory species, all birds, obtained from the protected matters search tool for a 10 km area centred on the subject site.

Table 3 Commonwealth listed migratory species from the protected matters search tool (extracted 31/3/10)

Scientific Name	Common Name	Likelihood of occurrence
Anthochaera phrygia	Regent Honeyeater	Suitable foraging habitat in flowering Swamp Mahogany
Haliaeetus leucogaster	White-bellied Sea-Eagle	Forages along lakes and waterways but could be suitable nesting habitat in tall eucalypts
Hirundapus caudacutus	White-throated Needletail	An aerial forager not coming to ground
Merops ornatus	Rainbow Bee-eater	No suitable habitat. Needs sandy eroded banks for nesting and forages in open woodland
Monarcha melanopsis	Black-faced Monarch	Suitable habitat particularly in riparian areas
Myiagra cyanoleuca	Satin Flycatcher	Suitable habitat
Rhipidura rufifrons	Rufous Fantail	Suitable habitat

4.0 Field survey results

4.1 Vegetation communities

Five vegetation communities were present on the subject site (**Figure 3**). **Table 4** lists these communities and their areas.

Table 4 Vegetation communities mapped across the subject site

Community	Impact area (ha)	Investigation area (ha)
MU15 Coastal Foothills Spotted Gum – Ironbark Forest	10	29
MU30 Coastal Plains Smooth-barked Apple Woodland	48	167
MU31 Coastal Plains Scribbly Gum Woodland	19	70
MU37 Swamp Mahogany Paperbark Forest (EEC)	0	1
Undefined riparian forest	2	30
Disturbed	2	8

MU15 Coastal Foothills Spotted Gum – Ironbark Forest

Canopy: dominated by *Corymbia maculata* and *Eucalyptus globoidea* along with locally abundant *Eucalyptus piperita, Eucalyptus umbra, Eucalyptus paniculata* or *Eucalyptus punctata*.

Shrubs: varying proportions of *Dodonaea triquetra, Doryanthes excelsa, Pultenaea villosa, Acacia ulicifolia, Acacia terminalis,* and *Podolobium ilicifolium*.

Ground: dominated by *Entolasia stricta, Themeda australis* and *Imperata cylindrica*.

MU30 Coastal Plains Smooth-barked Apple Woodland

Canopy: dominated by *Angophora costata, Eucalyptus capitellata* and *Corymbia gummifera* along with locally abundant *Eucalyptus piperita, Eucalyptus umbra, Eucalyptus resinifera* and *Allocasuarina torulosa*. Disturbance areas frequently had a dense midstorey of *Allocasuarina littoralis*.

Shrubs: the shrub content varied with position in the landscape with elevated drier areas being dominated by *Banksia spinulosa, Dillwynia retorta, Pultenaea retusa, Lambertia formosa* and *Podolobium ilicifolium*. On the sheltered lower slopes the dominant shrubs were *Leptospermum trinervium, Leptospermum polygalifolium* and *Doryanthes excelsa*.

Ground: dominated in varying proportions by *Entolasia stricta, Themeda australis, Joycea pallida* and *Xanthorrhoea latifolia*.

MU31 Coastal Plains Scribbly Gum Woodland

Canopy: dominated by *Eucalyptus haemastoma, Eucalyptus capitellata* and *Corymbia gummifera*. One small area located on a ridge in the northeast of the subject site contained *Eucalyptus racemosa* as the scribbly gum component and another area on the eastern side contained the threatened *Angophora inopina*. Disturbance areas frequently had a dense midstorey of *Allocasuarina littoralis*.

Shrub: The shrub content varied with position in the landscape with elevated drier areas being dominated in varying proportions by *Banksia spinulosa, Banksia obtusifolia* and *Lambertia formosa*. Along with *Isopogon anemonifolius, Hakea laevipes, Persoonia levis* and *Bossiaea obcordata*. On sheltered lower slopes, upper drainage lines and drainage basins dominant species were *Hakea bakeriana*, *Leptospermum trinervium, Leptospermum polygalifolium, Leptospermum juniperinum, Melaleuca sieberi* and *Gahnia clarkei*.

Ground: dominated in varying proportions by *Entolasia stricta, Themeda australis, Ptilothryx deusta*, *Xanthorrhoea latifolia*, *Joycea pallida* and *Anisopogon avenaceus*.

MU37 Swamp Mahogany – Paperbark Forest (EEC)
The composition of this community is consistent with the listed EEC *Swamp Sclerophyll Forest on Coastal Floodplains*. Winning (2008) conducted a detailed assessment of the vegetation of Stony Creek and drew the same conclusion.

Canopy: Scattered *Eucalyptus robusta* with a mid-canopy of *Melaleuca linariifolia, Melaleuca styphelioides, Melaleuca sieberi* and in places mesic species such as *Syzygium oleosum, Acmena smithii* and *Glochidion ferdinandi*.
Shrub: dominated by *Leptospermum polygalifolium, Leptospermum juniperinum* and *Gahnia clarkei* and *Prostanthera incisa*.
Ground: ground cover was generally sparse due to the dense shrub and canopy layers however sedges such as *Empodisma minus* were present in some areas.

Undefined Riparian
This is a community of the lower slopes and upper drainage lines. It is described as undefined because there is no equivalent in the NPWS (2000) classification.
Canopy: dominated in varying proportions by *Eucalyptus piperita, Eucalyptus resinifera* and *Angophora costata*. A mid canopy of the paperbarks *Melaleuca linariifolia* and *Melaleuca styphelioides* was also present in wetter areas.
Shrub: dominated in varying proportions by *Acacia longifolia, Callicoma serratifolia*, *Leptospermum polygalifolium, Leptospermum juniperinum* and *Gahnia clarkei*.
Ground: dominated by *Themeda australis* and *Entolasia stricta* and in more moist areas a variety of sedges.

4.2 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDE), as the name implies, are specialised ecosystems that rely on the persistence of groundwater. Australasian Groundwater & Environmental Consultants conducted a survey of the Stony Creek alluvium (AGEC 2008) and found that an unconfined groundwater aquifer existed in the alluvial bed of Stony Creek along the strip that contains riparian vegetation (**Figure 4**). The aquifer is recharged by infiltration from direct rainfall and appears to be intermittent along the length of Stony Creek, being intersected by less permeable clayey sequences. However, the vegetation along this part of Stony Creek is representative of a GDE and progressively develops downstream and off site as water accumulates.

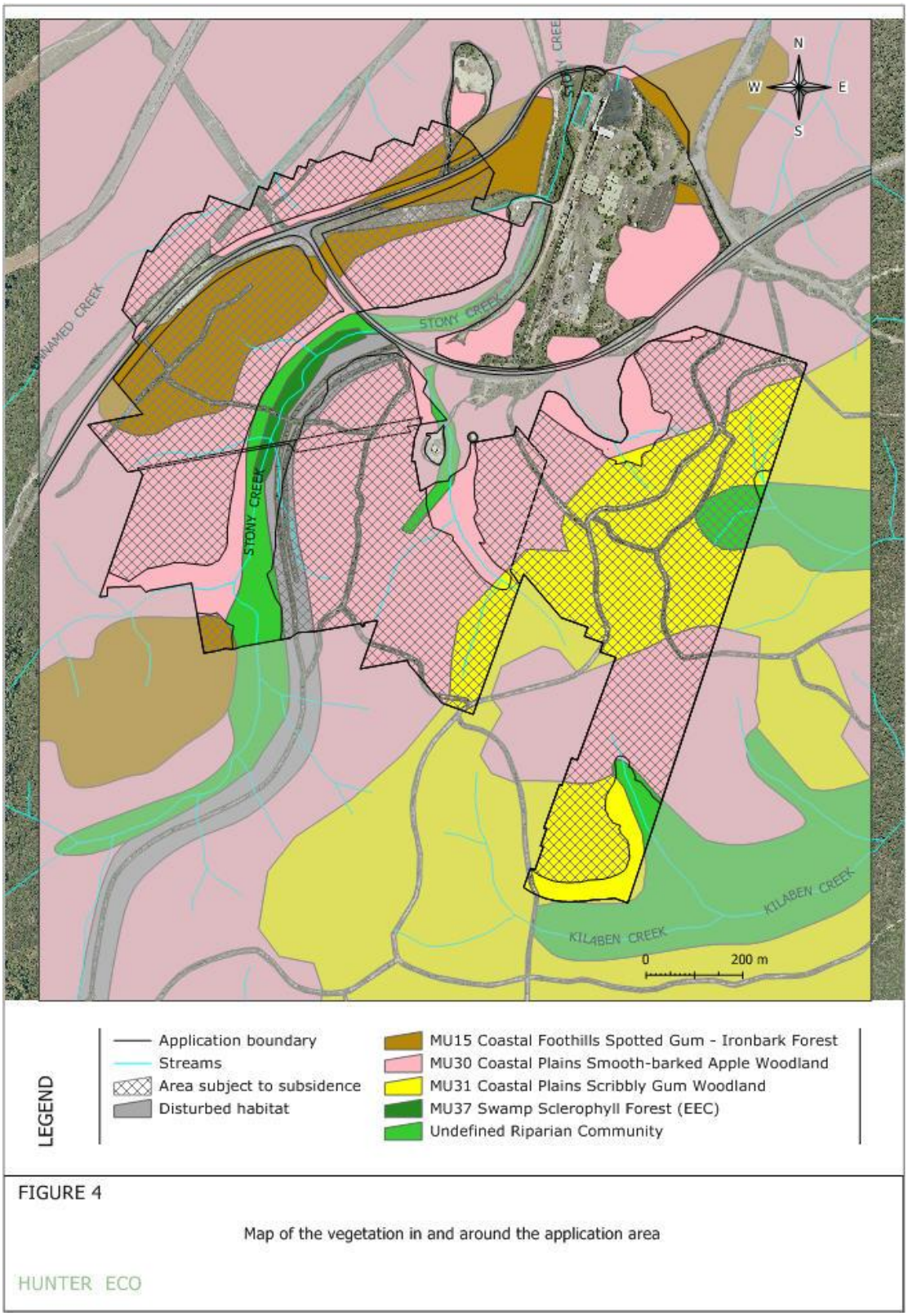


FIGURE 4

Map of the vegetation in and around the application area

HUNTER ECO

4.3 Threatened flora

Both *Tetratheca juncea* and *Grevillea parviflora* subsp. *parviflora* have been recorded within the subsidence area or in surrounding areas (**Figure 5**). No *Cryptostylis hunteriana, Angophora inopina*, *Melaleuca biconvexa* or *Acacia bynoeana* were recorded during field surveys although the latter has been recorded in several areas to the east of the application area.

4.4 Threatened fauna

Two threatened fauna species, Glossy Black-Cockatoo and Little Lorikeet have been recorded just to the south of the main application areas (**Figure 5**). No species of threatened fauna were recorded on the subject site during field surveys. However the available habitat types suggest that several threatened species in addition to the two mentioned above, could use the site as part of a foraging area or home range. The most likely species would be insectivorous bats, Squirrel Glider and one or more of the large forest owls.

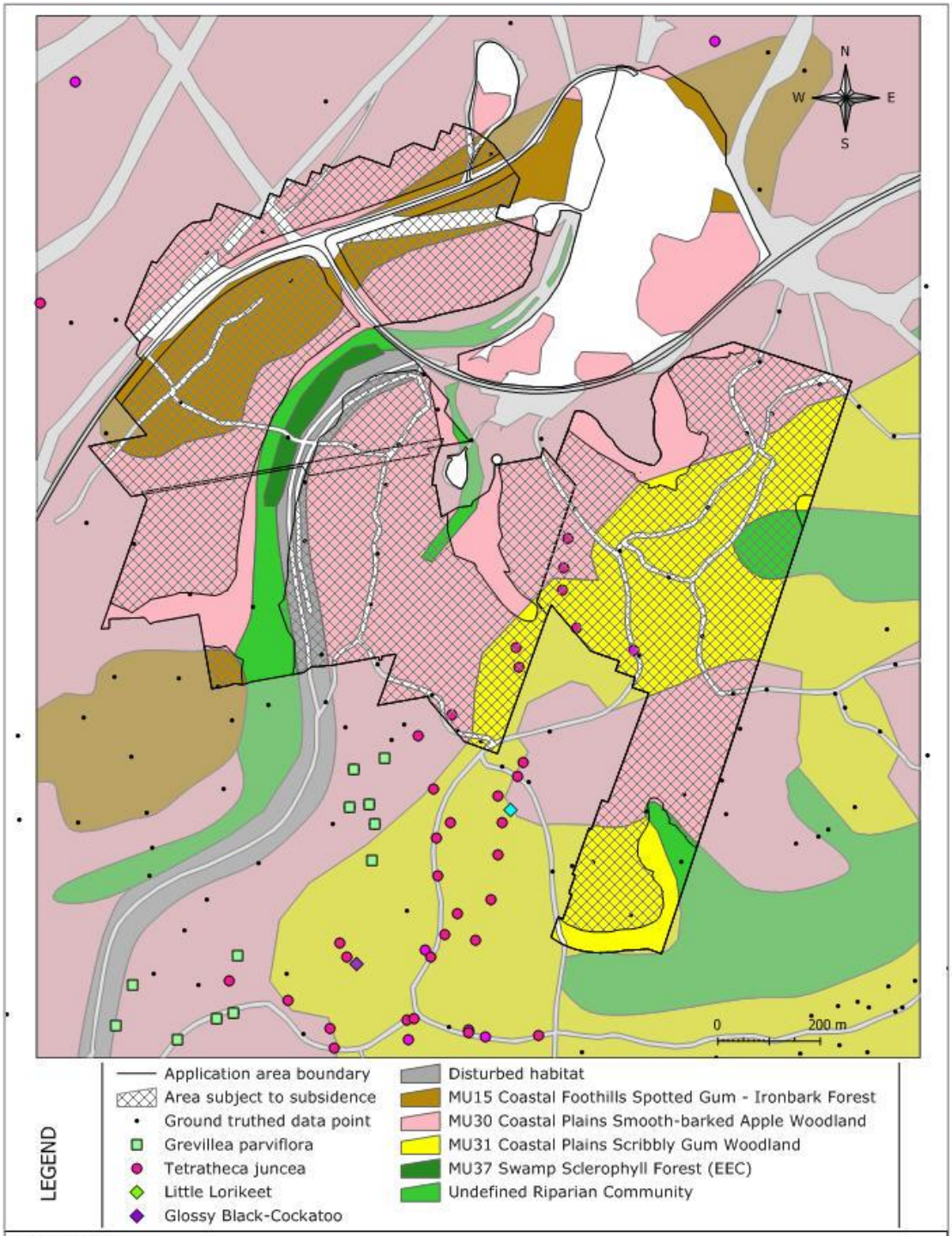


FIGURE 5

Threatened species records in and around the application area

HUNTER ECO

5.0 Subsidence impact – expected scenario

Subsidence would need to result in major changes to the surface hydrology of an area for there to be a significant impact on ecosystems. Such impacts are generally associated with subsidence from long-wall mining (not used at Awaba Colliery) where subsidence in the order of metres can occur with bed cracking often occurring as a result of tilts and strains. The mine plan has been developed conservatively so that the majority of subsidence across the subject site would be a maximum of 200 mm comprising of surface deformation only (no cracking).

Detailed assessment of the impact of the expected levels of subsidence on specific threatened species can be found in Appendix 1, NSW listed threatened species, and Appendix 2, Commonwealth listed threatened species.

5.1 Vegetation communities

The three main vegetation communities MU15, MU30 and MU31 are hardy, dry sclerophyll vegetation and a small change in the surface would have no impact on their viability.

Groundwater dependent ecosystems (GDE) and riparian vegetation can be impacted to varying degrees by subsidence where stream flow is altered through bed cracking or ponding. *Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands* is a key threatening process listed in schedule 3 of the NSW TSC Act.

The riparian vegetation would be dependent on both stormwater flow along the drainage line as well as basal flow originating from shallow groundwater seeping down the ridges to the drainage lines. This vegetation would be groundwater dependent.

Downstream (off site) impacts should also be considered as GDE's develop as a result of the cumulative increase in groundwater water availability. The overall slopes on the subject site are such that subsidence of the range predicted would not result in any diversion of water from the existing drainage lines meaning that there would be no impact on downstream GDE's.

5.2 Threatened flora

The Smooth-barked Apple and Scribbly Gum vegetation are preferred habitat for *Tetratheca juncea* (Driscoll 2003) and it is quite possible that the species is present in this habitat in addition to the recorded locations. *Grevillea parviflora* subsp *parviflora* can be found in a variety of habitats and could also be present elsewhere, additional to the recorded locations. Both species are hardy and the small expected surface deviation would not threaten any local population with extinction. For example, both species can be found in regularly slashed powerline easements or immediately beside forest trails.

5.3 Threatened fauna

The threatened fauna species likely to be using the subject site are highly mobile and would not be impacted on by small surface changes that would not result in significant habitat changes.

5.4 Habitat connectivity

As there would be no vegetation clearing there would be no change to habitat connectivity as a consequence of the underground mining and associated small level of surface deformation.

6.0 Subsidence impact – worst case scenario

As previously described, at the completion of mining voids will remain which are supported by pillars of coal and are spanned by a layer of conglomerate rock, on top of which sits the surface soil and vegetation. These voids will range in size from 45 – 96 m wide and 80 – 580 m long with the longer voids being of narrower width. The subsidence at the surface results from the spanning conglomerate taking up the strain across the void and by the supporting pillars being compressed into the material on which they are standing.

The mining plan has been designed to take into account both past experience and sensitive areas. Historically, serious levels of subsidence have only occurred where cover depths were less than 15 m and, allowing a safety margin, mining will not be carried out under areas where the depth of cover is below 25 m. Buffers have been provided along 2nd and 3rd order creeks to eliminate the possibility of subsidence of any magnitude impacting directly on the flow in these creeks (See **Figure 2** above).

A Strata Failure Management Plan has been prepared that provides strategies for checking the strength of the roof and floor to make sure that they fit within the mine design guidelines. A Watercourse Management Plan and a Public Safety Management Plan have been prepared that detail the appropriate responses to any significant surface changes.

While the mine plan has been designed such that the probability of such an event is low, it is possible that the spanning conglomerate can fail to hold the load. The point of failure would be at the edges of the void and is catastrophic resulting in the entire piece of spanning conglomerate shearing and falling into the void. This is known as a 'plug failure' and occurs without warning and takes about 2 seconds. The end result is an approximately 2 m hole in the ground with sheer sides and with the original surface vegetation at the bottom of the hole.

There would be several ecological consequences of unremediated plug failure:

- Changes to the micro-environment could result in the loss of any individual threatened species;
- The sheer-sided cavities would become a potential pit trap for terrestrial fauna species;
- The hydrology of the surface would be altered with rainfall flowing into the cavity and flowing into the underground mine workings. This would have both local impacts as well as downstream impacts.

At this point in time it is not possible to be specific about remediation or impacts. Options for remediation would involve the cavities being filled back to the original surface or cavity edges being sealed and battered leaving a sunken area. Stormwater diversion channels could be cut above the affected area to divert water from soaking through into the old workings. This could result in the loss of any threatened flora species growing in the original habitat. There would also be the possibility of trees with habitat hollows being lost along with any occupants.

The odds of all 44 voids failing together are so low as to make the event virtually improbable. For this assessment the single void having the worst-case impact on

ecology or hydrology was selected and **Figure 6** shows the selected voids. There was no engineering evaluation as to which of the 44 voids would have the highest failure risk.

6.1 Ecology

The void selected as likely to have the greatest ecological impact was the one with the largest surface area being 3.74 ha.

The two vegetation communities which would be impacted by plug failure would be *Coastal Plains Smooth-barked Apple Woodland* and *Coastal Plains Scribbly Gum Woodland*. *Tetratheca juncea* is known to occur in the area above this void and it is also possible for *Grevillea parviflora* subsp *parviflora* and *Cryptostylis hunteriana* to occur.

The mobility of threatened fauna means that they would not be impacted directly by a plug failure.

6.2 Hydrology

The hydrological (or water) cycle consists of inputs:

- Precipitation, generally rainfall although under the right circumstances mist condensing on foliage also contributes;
- Infiltration, the fallen rain moves into the surface. The infiltration rate is dependent on a number of factors such as the vegetation structure and density, soil type, the level of soil saturation, time since last wetting, rainfall intensity. Overland flow will occur when input exceeds the infiltration rate;
- Percolation, the water moves down through the substrate by way of capillary action and breaks in the physical structure. Factors involved here are particle size, contraction cracking, plant root action, soil fauna activity; and,
- Groundwater flow, finally the water accumulates against an impermeable barrier such as bedrock and if unconstrained, flows along a gravity gradient.

And losses:

- Transpiration, water being released back into the atmosphere through plant respiration processes; and,
- Evaporation, direct evaporation back into the atmosphere. This can occur from the canopy and from the ground.

The vegetation in any area is in part the product of the net hydrological cycle for that area; of course there are other factors such as soil type that influence composition of species. If the hydrology is altered substantially, over a long enough time period, then there is the possibility that the vegetation will change in composition to species more suited to the new conditions. Examples would be where groundwater is depleted and groundwater dependent species are gradually replaced by species more tolerant of dry conditions or where water accumulates and more water dependent vegetation develops.

Australian vegetation is adapted to extreme conditions and any change in conditions needs to become permanent for a change in vegetation type to become established. Even periodic replenishment can be sufficient to maintain a particular community such as a GDE.

Unless quantitative values can be provided for the elements of the hydrological cycle it is not possible to determine the quantitative impact of an interruption in the cycle. However it is possible to determine the net impact of alterations to the

cycle by using streamflow analysis. In the case where a catastrophic plug failure occurs, the water cycle is impacted by the loss of flow from the area of subsided surface into the mine workings. In addition to the subsided surface, water is also lost from any areas of unsubsided surface that are upstream from the subsided areas as water from these areas will flow into the subsided areas.

The void which would have the greatest impact on flow in Stony Creek (**Figure 6**) would result in the loss of 4% of flow into the downstream EEC; there would be no impact on the smaller upstream patch of EEC.

6.3 The impact of plug failure

It is difficult to be precise about the impact of plug failure in advance of the event. However, the preceding information shows that the maximum impact of a sustained failure would be low both on the hydrology and ecology of the affected areas. In fact a failure would need to be remediated primarily for safety reasons and so the event would not result in a sustained impact.

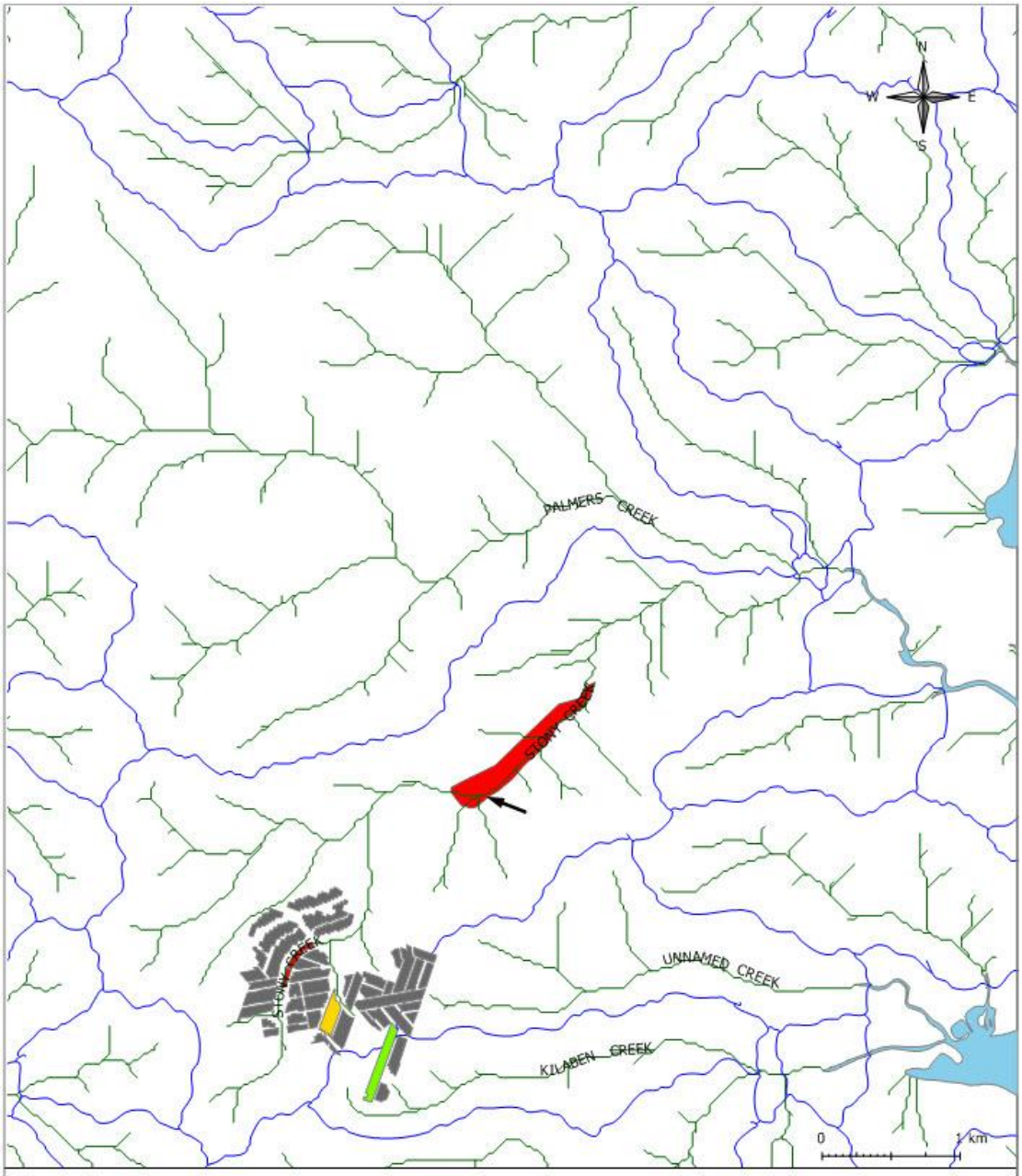


FIGURE 6

The components of the plug failure impact analysis

HUNTER ECO

7.0 References

AGEC (2008) *Definition of the Stoney Creek Alluvium, Awaba Colliery*. A report prepared by Australasian Groundwater & Environmental Consultants Pty Ltd. Project No. G1427 May 2008

DEC (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.

DECC (2008a) *Vegetation of the Cessnock-Kurri Region, Survey, Classification & Mapping, Cessnock LGA, New South Wales*, Department of Environment and Climate Change (NSW), Sydney.

DECC (2008b) http://threatenedspecies.environment.nsw.gov.au/tsprofile/

DECC & DoP (2005) Draft Guidelines for Threatened Species Assessment under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Driscoll C. (2003) The pollination ecology of *Tetratheca juncea* Smith (Tremandraceae): finding the pollinators. *Cunninghamia* 9(1) 133-140.

EPBC (2006) EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Matters of National Environmental Significance. May 2006.

Hunter Eco (2008) *Centennial Coal, Awaba East Exploratory Drilling Program REF, Ecology*. A report prepared for Centennial Coal June 2008.

Matthei L.E. (1995) *Soil Landscapes of the Newcastle 1:100 000 Sheet* Report, Department of Land and Water Conservation, Sydney.

NPWS (2000) *Vegetation Survey, Classification and Mapping Lower Hunter and Central Coast Region.* Version1.2. A project undertaken for The Lower Hunter and Central Coast Regional Environment Management Strategy CRA Unit Sydney Zone National Parks and Wildlife Service

Winning G (2008) *Baseline ecological description of riparian vegetation along Stony Creek at Awaba*, report to Centennial Newstan by HWR Pty Ltd.

Seedsman Geotechnics (2009) *Subsidence assessment for Awaba Stage 3*. A letter to Centennial Coal Awaba, November 2009.

Appendix 1 Species and communities, impact assessments

NSW State assessment

The disturbance

Maximum predicted subsidence across the subject site of 200 mm comprising of surface deformation only (no cracking).

Impact assessment

This section examines the possible impact of the predicted level of subsidence on threatened species and endangered communities. An impact assessment is conducted as provided for in the Draft Guidelines for Threatened Species Assessment (DECC & DPI 2005).

A review of threatened species profiles (DECC 2008b) shows that there were threatened species that could be found on the subject site under different conditions to those prevailing at the time of this investigation or could be found in similar habitat in the immediate region. An impact assessment was applied to these species.

FLORA

Tetratheca juncea

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No threatened populations were present.

To affect the lifecycle of a plant species, an impact would need to significantly adversely impact on growing conditions, lower pollinator population and activity or restrict dispersal vectors. The expected level of subsidence would not result in alteration to overall habitat attributes and in turn, there would be no affect on the lifecycle of *Tetratheca juncea*.

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The expected level of subsidence would not result in alteration to overall habitat attributes.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Tetratheca juncea is not at the limit of its distribution at this location. The species is found from Wyong to Bulahdelah.

d) How is the proposal likely to affect current disturbance regimes?

There would be no alteration to current disturbance regimes as no habitat clearing would be involved and the expected level of subsidence would not alter the existing habitat.

e) How is the proposal likely to affect habitat connectivity?

The existing connectivity would be maintained.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

Acacia bynoeana

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No threatened populations were present.

To affect the lifecycle of a plant species, an impact would need to significantly adversely impact on growing conditions, lower pollinator population and activity or restrict dispersal vectors. The expected level of subsidence would not result in alteration to overall habitat attributes and in turn, there would be no affect on the lifecycle of *Acacia bynoeana*.

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The expected level of subsidence would not result in alteration to overall habitat attributes.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Acacia bynoeana is not at the limit of its distribution at this location. The species is found from Nowra to North Rothbury and west to Lithgow.

d) How is the proposal likely to affect current disturbance regimes?

There would be no alteration to current disturbance regimes as no habitat clearing would be involved and the expected level of subsidence would not alter the existing habitat.

e) How is the proposal likely to affect habitat connectivity?

The existing connectivity would be maintained.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

Cryptostylis hunteriana

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No threatened populations were present.

To affect the lifecycle of a plant species, an impact would need to significantly adversely impact on growing conditions, lower pollinator population and activity or restrict dispersal vectors. The expected level of subsidence would not result in alteration to overall habitat attributes and in turn, there would be no affect on the lifecycle of *Cryptostylis hunteriana*.

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The expected level of subsidence would not result in alteration to overall habitat attributes.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Cryptostylis hunteriana is not at the limit of its distribution at this location. The species is found from Victoria to Queensland.

d) How is the proposal likely to affect current disturbance regimes?

There would be no alteration to current disturbance regimes as no habitat clearing would be involved and the expected level of subsidence would not alter the existing habitat.

e) How is the proposal likely to affect habitat connectivity?

The existing connectivity would be maintained.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

Grevillea parviflora subsp parviflora

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No threatened populations were present.

To affect the lifecycle of a plant species, an impact would need to significantly adversely impact on growing conditions, lower pollinator population and activity or restrict dispersal vectors. The expected level of subsidence would not result in alteration to overall habitat attributes and in turn, there would be no affect on the lifecycle of *Grevillea parviflora* subsp *parviflora.*

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The expected level of subsidence would not result in alteration to overall habitat attributes.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Grevillea parviflora subsp *parviflora* is not at the limit of its distribution at this location. The species is found from south of Sydney to the Port Stephens area.

d) How is the proposal likely to affect current disturbance regimes?

There would be no alteration to current disturbance regimes as no habitat clearing would be involved and the expected level of subsidence would not alter the existing habitat.

e) How is the proposal likely to affect habitat connectivity?

The existing connectivity would be maintained.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

ENDANGERED ECOLOGICAL COMMUNITIES

Swamp Sclerophyll Forest on Coastal Floodplains

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Not applicable

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The SSFCF community is totally dependent on the shallow groundwater in the Stony Creek drainage line. The mine plan has been designed to provide a 50 m buffer either side of the creek centreline so that there will be no subsidence in the creek bed itself and so no risk of bed cracking and subsequent loss of water. There will be subsidence in a part of the Stony Creek catchment however the small scale of this subsidence will not reduce the amount of water flowing from rain events or subsurface base flow.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Not applicable.

d) How is the proposal likely to affect current disturbance regimes?

There would be no alteration to current disturbance regimes.

e) How is the proposal likely to affect habitat connectivity?

Habitat connectivity would not be altered.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

FAUNA

A generic test has been prepared for the following fauna species that were considered as occurring or likely to occur across the subsidence area:

Birds
Gang-gang Cockatoo
Glossy Black-Cockatoo
Little Lorikeet
Masked Owl
Osprey
Powerful Owl
Regent Honeyeater
Swift Parrot
Varied Sittella
Marsupials
Spotted-tailed Quoll
Squirrel Glider
Megachiropteran Bats
Grey-headed Flying-fox
Microchiropteran Bats
Eastern Freetail-bat
Eastern Bentwing-bat
Eastern False Pipistrelle
Greater Broad-nosed Bat
Little Bentwing-bat

These species are highly mobile, have large home ranges or are itinerant opportunists.

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No threatened populations were present.

In order to significantly impact on the lifecycle of any of these species there would need to be a substantial loss of habitat or habitat quality such that foraging resources were reduced, roosting or denning habitat was lost or exposure to predators was increased. The level of expected subsidence would not impact negatively on any of these necessary habitat attributes to the extent of affecting the lifecycle of these species.

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

There would be no alteration to the habitat for any of these threatened species.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

None of these species would be at the limit of their known distribution.

d) How is the proposal likely to affect current disturbance regimes?

Current disturbance regimes would not be altered.

e) How is the proposal likely to affect habitat connectivity?

Habitat connectivity would not be altered.

f) How is the proposal likely to affect critical habitat?

No critical habitat was present.

Appendix 2 Species and communities, impact assessments

Commonwealth assessment

The disturbance

Maximum predicted subsidence across the subject site of 200 mm comprising of surface deformation only (no cracking).

Impact assessment

This section examines the possible impact of the predicted level of subsidence on threatened species and endangered communities. Matters of national significance protected under the EPBC Act 1999 are as follows:

- World Heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)

There are two relevant matters of national significance for the Awaba project: Threatened species (there are no nationally listed EEC's present); and, Migratory species.

Impact assessment criteria are provided in EPBC Act Policy Statement 1.1 (EPBC 2006).

FLORA

Vulnerable species

The following vulnerable species were considered as possibly occurring in the application area:

Acacia bynoeana
Angophora inopina
Cryptostylis hunteriana
**Grevillea parviflora subsp. parviflora*
Melaleuca biconvexa
Syzygium paniculatum
**Tetratheca juncea*
*Known to occur

Significant impact criteria

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

- **lead to a long-term decrease in the size of an important population of a species;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a long-term decrease in the population size of these species.

- **reduce the area of occupancy of an important population;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a reduction in the area of occupancy of these species.

- **fragment an existing important population into two or more populations;**

No habitat clearing is involved so no population fragmentation would occur.

- **adversely affect habitat critical to the survival of a species;**

There would be no impact on habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population;**

The breeding cycles of these species would not be disrupted by the subsidence.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

There would be no alteration to habitat resulting from the expected level of subsidence.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

There would be no habitat alteration resulting from the expected level of subsidence that would result in invasive species becoming established.

- **introduce disease that may cause the species to decline; or**

No diseases would be introduced.

- **interfere substantially with the recovery of the species.**

The expected level of subsidence would not interfere with the recovery of the species.

FAUNA

Critically endangered and endangered species

Two endangered species were considered as possibly occurring in the application area:

Swift Parrot
Spotted-tailed Quoll

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a long-term decrease in the population size of these species.

- **reduce the area of occupancy of the species;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a reduction in the area of occupancy of these species.

- **fragment an existing population into two or more populations;**

No habitat clearing is involved so no population fragmentation would occur.

- **adversely affect habitat critical to the survival of a species;**

There would be no impact on habitat critical to the survival of the species.

- **disrupt the breeding cycle of a population;**

The breeding cycles of these species would not be disrupted by the subsidence.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

There would be no alteration to habitat resulting from the expected level of subsidence.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

There would be no habitat alteration resulting from the expected level of subsidence that would result in invasive species becoming established.

- **introduce disease that may cause the species to decline; or**

No diseases would be introduced.

- **interfere with the recovery of the species.**

The expected level of subsidence would not interfere with the recovery of the species.

Vulnerable species

Three vulnerable species were considered as possibly occurring in the application area:

Regent Honeyeater
Grey-headed Flying-fox
Large-eared Pied Bat

Significant impact criteria

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

- **lead to a long-term decrease in the size of an important population of a species;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a long-term decrease in the population size of these species.

- **reduce the area of occupancy of an important population;**

The expected level of subsidence would not have any impact on habitat or foraging resources that would lead to a reduction in the area of occupancy of these species.

- **fragment an existing important population into two or more populations;**

No habitat clearing is involved so no population fragmentation would occur.

- **adversely affect habitat critical to the survival of a species;**

There would be no impact on habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population;**

The breeding cycles of these species would not be disrupted by the subsidence.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

There would be no alteration to habitat resulting from the expected level of subsidence.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

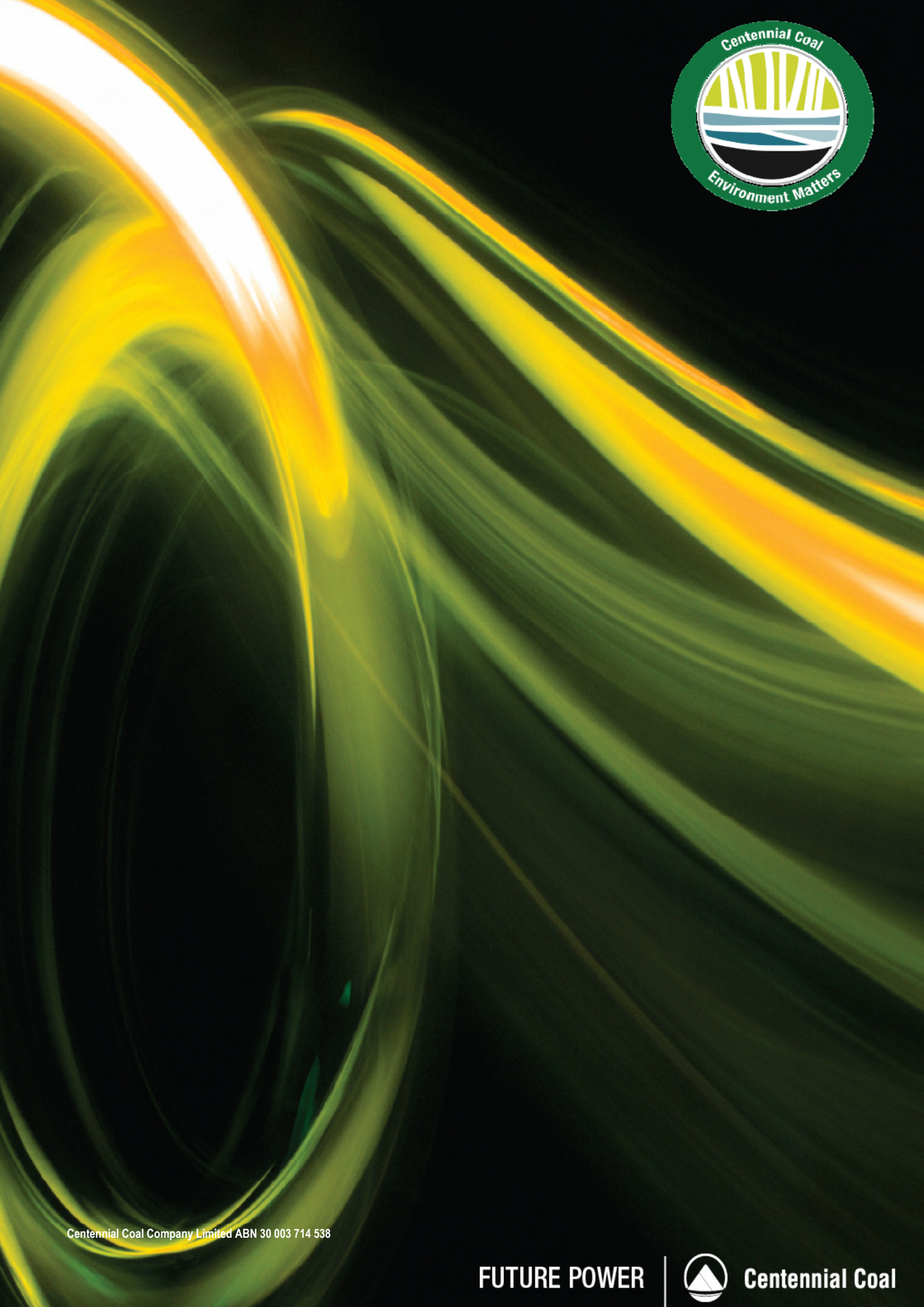
There would be no habitat alteration resulting from the expected level of subsidence that would result in invasive species becoming established.

- **introduce disease that may cause the species to decline; or**

No diseases would be introduced.

- **interfere substantially with the recovery of the species.**

The expected level of subsidence would not interfere with the recovery of the species.



Centennial Coal Company Limited ABN 30 003 714 538

FUTURE POWER | Centennial Coal