



Bushfire Risk Assessment – Northern Coal Logistics



Centennial Coal

State Significant Development Application
Number 5145T

18 March 2014

Bushfire Risk Assessment – Northern Coal Logistics

State Significant Development Application Number 5145T

Kleinfelder Report Number: WB13R_89284-134678

Copyright 2013 Kleinfelder

All Rights Reserved

Prepared for:

CENTENNIAL COAL
NORTHERN COAL SERVICES
FASSIFERN NSW

Only Centennial Coal, its designated representatives or relevant statutory authorities may use this document and only for the specific project for which this report was prepared. It should not be otherwise referenced without permission.

Document Control:

Version	Date	Author	Technical Reviewer	Peer Reviewer
1.0	Dec 2012	Dan Pedersen	Chelayne Evans	
2.0	Jan 2013	Dan Pedersen		
3.0	Sep 2013	Gayle Joyce		
4.0	Mar 2014	Dan Pedersen		Jaimie Bisson

Kleinfelder Australia Pty Ltd

64 Medcalf Street
Warners Bay, NSW 2282
Phone: 1300 881 869
Fax: 1300 881 035

ABN: 23 146 082 500

EXECUTIVE SUMMARY

The following Bush Fire Risk Assessment has been undertaken on behalf of Centennial's Northern Coal Services Pty Limited (Northern Coal Services) as part of the Environmental Impact Statement (EIS) to accompany an application (SSD -5145) for the Northern Coal Logistics Project (the Project). In summary, this Project comprises both a continuation of existing operations and an upgrade to the surface infrastructure for coal processing, handling and delivery operations at Newstan Colliery Surface Site and the Mandalong Mine - Cooranbong Entry Site (Cooranbong Entry Site), along with existing private haul roads and rail loading infrastructure. Of particular note, it includes the re-development and upgrade of the existing coal preparation and handling infrastructure at the Newstan Colliery Surface Site to enable receipt, handling and processing of an increased volume of coal of up to 8 million tonnes per annum (Mtpa).

For the purposes of this Bushfire Risk Assessment, the Project covers 4 sites (considered as Newstan Colliery Surface Site, Cooranbong Entry Site, Hawkmount Quarry and Private Haul Roads).

The Director-General's Requirements (DGRs) issued for this Project identify bushfire hazard as a key issue, in particular public safety which must be considered and addressed as part of the EIS.

The forest vegetation surrounding the Project sites has the potential to support maximum fire intensity and to put at risk the safety of staff and attending emergency personnel, as well as the potential to damage the integrity of the constructions. Further to minimising the impact from bushfire, this assessment also aims to lessen the risk of any potential bushfire originating from the Project and associated construction stages.

Recommendations have been provided to mitigate bushfire risk pertaining to the Project and its associated works, such that the development would provide protection to human life and minimise impacts on assets from the threat of bush fire. The objectives have been achieved through:

- Provision of a recommended Asset Protection Zone (APZ) to the infrastructure at the bushland interface, which would provide a defensible space around the structures and avoid flame contact and radiant heat exceeding 40kW/m²;

- Provide APZ maintenance recommendations;
- Identifying the safe operational access and egress for emergency services and evacuating staff;
- Identify the provisions of water supplies and access services for fire-fighters;
- Recommendations designed to be incorporated into the existing and future emergency management planning and Emergency Management Systems (EMS).

Overall, the project proposal has considered the impact of bushfire and towards assets and the community. The exiting fire management procedures will include the new proposed infrastructure.

Contents

EXECUTIVE SUMMARY	II
ABBREVIATIONS	VII
1. INTRODUCTION	1
1.1 SCOPE OF ASSESSMENT	1
1.2 PROJECT DESCRIPTION	1
1.3 PROJECT APPLICATION AREA	3
1.4 LEGISLATION.....	6
1.5 ASSESSMENT METHODOLOGY	7
2. SITE DESCRIPTION	9
2.1 BUSHFIRE HAZARD	9
2.1.1 Vegetation	9
2.1.2 Slopes and Terrain	10
2.1.3 Ignition Sources	11
2.2 ASSETS.....	12
2.2.1 Public Safety and Human Life	12
2.2.2 Infrastructure and Economic	13
2.2.3 Environmental and Cultural Heritage	17
3. RISK ASSESSMENT	19
3.1 PUBLIC SAFETY AND HUMAN LIFE	19
3.2 INFRASTRUCTURE AND ECONOMICS	20
3.3 ENVIRONMENTAL AND CULTURAL HERITAGE	22
3.3.1 Bushfire Treatment Impacts	22
4. RISK ASSESSMENT	24
4.1 LIFE SAFETY – EMERGENCY MANAGEMENT.....	24
4.2 INFRASTRUCTURE PROTECTION	24
4.2.1 Bushfire Management Actions	25
5. COMMUNICATION AND MONITORING	27
5.1 COMMUNICATE	27
5.2 CONSULTATION	27
5.3 MONITORING.....	28
6. RECOMMENDATIONS	29

Tables

Table 1:	Fire threshold for vegetation types determined as potential hazard.....	10
Table 2:	Standard separation distances from associated vegetation types/slopes to avoid Flame Zone.	11
Table 3:	Assets associated with the Newstan Colliery Surfaces Site.	21
Table 4:	Asset associated with the Cooranbong Entry Site and Hawkmount Quarry Materials and Methods.....	21
Table 5:	Bushfire management recommendations.....	29

Figures

Figure 1:	Details the Project locality and the specific study area for this Bushfire Risk Assessment.	5
-----------	--	---

Appendices

Appendix 1.	Figures
-------------	---------

ABBREVIATIONS

APZ	Asset Protection Zone	APZ are buffer zones that help to ensure that a progressive reduction in fuel occurs between the bushfire hazard and building site. This area aims to provide a defensible space and manage heat intensities at the building surface. APZ incorporate two main areas: an Inner Protection Area (IPA) and an Outer Protection Area (OPA).
BAL	Bushfire Attack Level	
BCA	Building Code of Australia	
BFEAC	Bushfire Environmental Assessment Code	
BRA	Bushfire Risk Assessment	
CHP	Coal Handling Plan	
CPP	Coal Preparation Plan	
DP&I	NSW Department of Planning and Infrastructure	
EEC	Endangered Ecological Communities	
EIS	Environmental Impact Assessment	
EPL	Environmental Protection Licences	
EMS	Emergency Management System	
FDI	Fire Danger Index	
HWC	Hunter Water Corporation	
IPA	Inner Protection Area	The IPA is an area where fuels, which could become involved in a fire, are minimised, therefore reducing the impact of direct flame contact and radiant heat. An IPA should provide a tree canopy cover less than 15% and be located greater than 2 m from any part of the roofline of a dwelling. Gardens of flammable vegetation are not to be kept under trees and should be no closer than 10 m from exposed windows or doors. Trees should have lower limbs removed up to a height of 2 m above ground level.

LEP	Local Environment Plan	
LGA	Local Government Area	
LMZ	Land Management Zone	
Mtpa	Million tonnes per annum	
NREA	Northern Reject Emplacement Area	
OPA	Outer Protection Area	The OPA is adjacent to the hazard and is managed by reducing the fuel loadings. An OPA should provide a tree canopy of less than 30% and should have the understorey managed (mowed) on an annual basis in advance of the fire season. The aim is to reduce the fires' rate of spread and the likelihood of crown fire, while the remaining canopy filters embers.
PBP	Planning for Bushfire Protection	Guidelines for construction in bushfire prone areas prepared by the NSW RFS (2006).
Project	Northern Coal Logistics Project	
REA	Reject Emplacement Area	
RFS	Rural Fire Service	
ROM	Run of mine	
SEMC	State Emergency Management Committee	
SFAZ	Strategic Fire Advantage Zone	
SREA	Southern Reject Emplacement Zone	
SSD	State Significant Developments	
t/ha	Tonnes per hectare	
Tpa	Tonnes per annum	

1. INTRODUCTION

The following Bushfire Risk Assessment has been undertaken on behalf of Northern Coal Services Pty Limited (Northern Coal Services) as part of the Environmental Impact Statement (EIS) to accompany an application (SSD-5145) for the Northern Coal logistics Project (the Project). The scope of the Project is outlined below in Section 1.2. The Director- General's Requirements (DGRs) issued for this Project identify bushfire hazard as a key issue, in particular public safety that must be considered and addressed as part of the EIS.

1.1 SCOPE OF ASSESSMENT

To provide Northern Coal Services and the relevant government agencies, including the NSW Department of Planning and Infrastructure (DP&I), NSW Rural Fire Service (RFS) and Lake Macquarie City Council, with a concise determination of the potential bushfire risk associated with the Project for the purposes of asset protection and public safety.

1.2 PROJECT DESCRIPTION

The Project, in conjunction with Centennial's Newstan Extension of Mining Project and Mandalong Southern Extension Project, stems from the long-term strategy Centennial has developed for its future operations in the Newcastle Coalfield to provide the infrastructure and flexibility required to meet future opportunities in both the domestic and export coal markets.

The Project comprises both a continuation of existing operations and an upgrade to the surface infrastructure at the Newstan Colliery Surface Site and the Mandalong Mine - Cooranbong Entry Site (Cooranbong Entry Site), along with the existing private haul roads and rail loading infrastructure. These facilities are integral to the on-going handling, processing and transport of coal from the underground workings of Newstan Colliery and Mandalong Mine (including the proposed Newstan Colliery Extension of Mining Project and Mandalong Southern Extension Project) into domestic and export markets.

The Project will allow for improved and flexible coal handling arrangements across Newstan Colliery and Mandalong Mine to deliver the range of coal products required to meet domestic and export markets demands.

In summary, the Northern Coal Logistics Project proposes to:

- Re-develop and upgrade the existing coal preparation and handling infrastructure at the Newstan Colliery Surface Site to enable continued utilisation for the receipt, handling and processing of up to 8 Mtpa of ROM coal from the Newstan Colliery (up to 4.5 Mtpa), Awaba Colliery (up to 0.88 Mtpa) and Mandalong Mine (up to 6 Mtpa);
- Continue to utilise the existing coal handling infrastructure at the Cooranbong Entry Site to enable the receipt, handling and processing of up to 6 Mtpa of ROM coal from Mandalong Mine;
- Increase the volume of coal transported from the Cooranbong Entry Site to Newstan Colliery Surface Site, via truck using existing private haul roads, from 4 Mtpa to up to 6 Mtpa;
- Increase the volume of coal transported from the Cooranbong Entry Site to Eraring Power Station, using an existing dedicated overland conveyor, from 4 Mtpa to up to 6 Mtpa;
- Increase the volume of coal transported from the Newstan Colliery Surface Site to Eraring Power Station, via truck using existing private haul roads, from 2 Mtpa to up to 4.5 Mtpa;
- Increase the volume of coal transported from the Newstan Colliery Surface Site rail loading facilities by train to the Port of Newcastle and/or Port Kembla (for export) and/or Vales Point Power Station from 3 Mtpa to up to 8 Mtpa;
- Continue to transport up to 0.5 Mtpa of middlings by truck via private haul roads from Newstan Colliery Surface Site to Cooranbong Entry Site for subsequent supply to the Eraring Power Station via a dedicated overland conveyor
- Continue to transport up to 0.88 Mtpa of material (including coal and stone from construction activities undertaken as part of the Newstan Colliery Extension of Mining Project) by truck via private haul roads from the Awaba Colliery Surface Site to the reject emplacement areas at the Newstan Colliery Surface Site;

- Transport reject material from the Newstan Colliery Surface Site to the Newstan Colliery Northern Reject Emplacement Area (NREA), the Newstan Colliery Southern Reject Emplacement Area (SREA) and/or Hawkmount Quarry via existing private haul roads;
- Increase the volume of water discharge via licensed discharge points at the Newstan Colliery Surface Site and Cooranbong Entry Site;
- Provide employment for up to 120 full-time personnel;
- Provide a life of operation of 30 years from the granting of development consent; and
- Operate 24 hours per day, seven days per week.

1.3 PROJECT APPLICATION AREA

The application area for Northern Coal Logistics Project is on the western side of Lake Macquarie within the Lake Macquarie Local Government Area (LGA). The Project Application Area includes:

- The existing Newstan Colliery Surface Site, encompassing the coal preparation and handling infrastructure, reject emplacement areas, water management infrastructure and rail loading infrastructure, near Fassifern. The exceptions to this are the mine ventilation shafts and ventilation fans, which form part of the Newstan Extension of Mining Project;
- The proposed extension to the Newstan Colliery Surface Site to accommodate new coal handling and processing infrastructure;
- The existing surface infrastructure at the Cooranbong Entry Site near Dora Creek, encompassing a coal handling plant (CHP), coal stockpiles, workshop building and water management infrastructure. The exceptions to this are the mine ventilation shaft, ventilation fan and the Borehole Dam, which form part of the Mandalong Southern Extension Project;
- The existing Hawkmount Quarry comprising a disused quarry located immediately to the east of the Cooranbong Private Haul Road between Newstan Colliery Surface Site and Cooranbong Entry Site; and

- The existing Cooranbong Private Haul Road, the Awaba Private Haul Road and the Newstan-Eraring Private Haul Road.

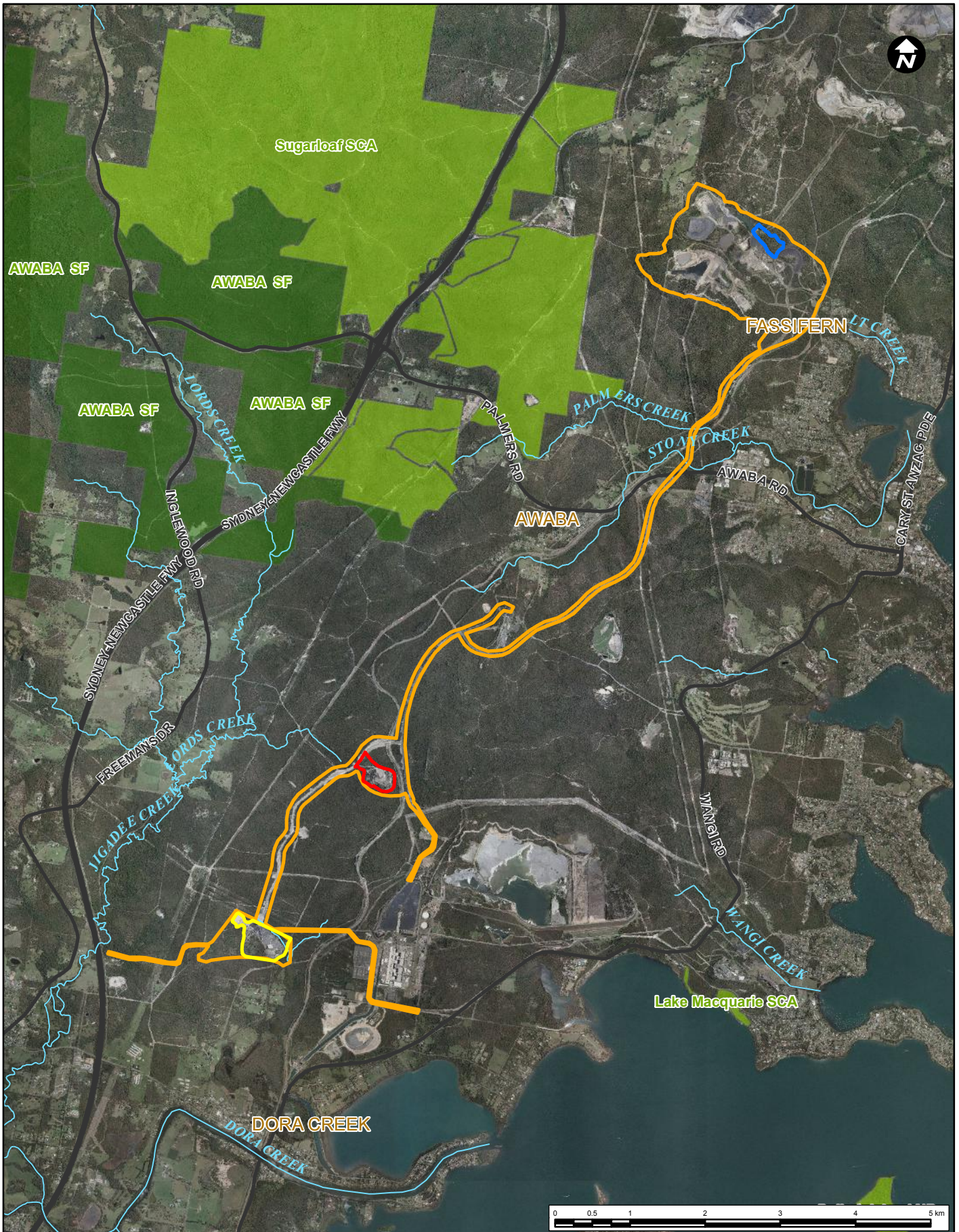


Figure 1: Locality Map

Legend

- Project Application Area
- Coorabong Entry Site Study Area
- Hawkmount Quarry Study Area
- Newstan Colliery Surface Site Study Area



Map Projection:

GDA 1994 MGA Zone 56

Data Sources:

- LPI - 2011
- OEH - 2012
- Centennial Coal - 2012
- GSS Environmental - 2012
- Kleinfelder/ecobiological - 2012

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

Project Ref:	130-1106
Plot Date:	6/09/2013 11:09
Revision:	002 (gjoyce)

1.4 LEGISLATION

This assessment has been undertaken in accordance with all relevant legislation and guidelines, with specific consideration of the following:

- Rural Fires Act 1997, which provides for:
 - Prevention, mitigation and suppression of bushfires in local government areas;
 - Coordination of bushfire fighting and bushfire prevention throughout NSW;
 - Protection of life, property and the environment from damage arising from fires;
 - Protection of the environment by requiring that activities have regard to the principles of ecologically sustainable development.
- The State Emergency and Rescue Management Act 1989 (as Amended) provide the legislative basis for co-ordination of emergency preparedness, response and recovery operations. The Act provides for:
 - The preparation of a NSW State Disaster Plan (Displan) and subordinate plans to ensure a co-ordinated response for necessary operations;
 - The establishment of Emergency Management Committees at State, District and Local Government levels; and
 - Arrangements for controlling emergency operations.
- New South Wales (NSW) State Bushfire Plan.
 - The arrangements for the control and coordination of the response to Class 2 and 3 bushfires, including those managed under the provisions of section 44 of the Rural Fires Act 1997, and the provisions for emergency warnings at all classes of fire. These arrangements ensure that the two combat agencies are able to manage bushfires, utilising assistance from supporting agencies in an effective and responsive manner.
 - This has been prepared by the NSW Rural Fire Service (NSW RFS) at the direction of the NSW State Emergency Management Committee (SEMC) as

a sub-plan of the NSW Displan, under the provisions of clause 201 of NSW Displan.

- Ecologically Sustainable Development – requires the effective integration of economic and environmental considerations in decision-making processes (Section 6 Protection of the Environment Administration Act 1991). An ‘environmental asset’ is any natural feature, for example, landscape or catchment area, or native flora and fauna species and their associated communities, which is valued by the community.
- NSW RFS Guidelines Planning for Bushfire Protection 2006 (PBP 2006) and Addendum: Appendix 3 (2010). This document details the planning arrangements for developments in bushfire prone areas and delivers a suitable methodology to survey the sites to describe the potential bushfire behaviour.

1.5 ASSESSMENT METHODOLOGY

The bushfire risk assessment for the Project development involved:

- Review of the Project Description and Briefing Paper;
- Review of existing Bushfire Management Plans and Emergency Management Systems (EMS) applicable within the Project Application Area;
- Desk top analysis based on information recalled from approvals and studies including emergency plans, infrastructure and development, ecology, archaeology and observable community assets;
- Desk top analysis of bushfire history for the area;
- Desk top analysis of roads and access infrastructure (emergency response);
- Assessment of bushfire risk to development and alternative hazard reduction and mitigation techniques to minimise risk.

The risk assessment included a site inspection to clarify:

- Mapping of the broad vegetation structural types on and surrounding study areas;
- Description of the landform, terrain, land surface and vegetation attributes of the study areas;
- Calculation and mapping of potential bushfire behaviour;

- Assessment of the bushfire risk for significant assets (life, environmental, and structural assets) in the locality;
- An assessment of suitable bushfire protection actions toward these assets;
- Assessment of roads and access adequacy for emergency response.

The risk assessment has produced a detailed map identifying the location of assets and levels of bushfire risk and recommended extent of mitigation actions (**Appendix 1**).

2. SITE DESCRIPTION

The Project Application Area (described in Section 1.3 and shown in Figure 1) is located in the Greater Hunter NSW Bushfire Region and has a Fire Danger Index (FDI) rating set at 100. The Project Application Area is located within the Lake Macquarie Local Government Area (LGA).

The bushfire season within this region is generally restricted to the warmer months of the year - August to May, however it is recognised that seasonal and climatic variations could support a significant bushfire at any month of year.

A site inspection was conducted on 19 September 2012.

2.1 BUSHFIRE HAZARD

The bushfire hazard is assessed through the identification of the following:

- Vegetation type, structure and fuel loading;
- Slope or terrain the vegetation is upon; and
- Ignition potential and sources.

2.1.1 Vegetation

The predominant vegetation surrounding the Study Areas (see Figure 1) for this bushfire assessment is determined as Open Dry Sclerophyll Shrubby Forest. Estimated fuel loading is up to 35t/ha.

Some parts north of the Cooranbong Entry Site have been cleared for power line infrastructure and the vegetation is managed grassland.

Rehabilitated areas west of the Newstan Colliery Surface Site have large non-vegetated patches and low to sparse revegetated patches.

Fire thresholds are the upper and lower time limits or range of fire intervals recommended to support ecologically sustainable fire management sourced from Guidelines for Ecologically Sustainable Fire Management (NPWS 2004). **Table 1** lists the fire threshold for Open Dry Sclerophyll Shrubby Forest types. Any bushfire or hazard reduction burn around any of these sites should be recorded and details determining whether area of vegetation have a fire regime within designated thresholds as detailed in **Table 1**. A vegetation structure map has been detailed in **Figure 2 (Appendix 1)**.

Table 1: Fire threshold for vegetation types determined as potential hazard.

Vegetation Type	Minimum Threshold	Maximum Threshold	Note
Dry Sclerophyll Shrub Forest	7 Years	30 Years	Occasional intervals greater than 25 years may be desirable

2.1.2 Slopes and Terrain

The terrain in the local area has undulating wooded slopes. These slopes affect the bushfire behaviour and are shown in **Figure 2a** and **2b (Appendix 1)**.

Newstan Colliery Surface Site: Existing infrastructure eliminates effective slopes to the south, east and southwest of the Project Application Area. The slopes to the west of the rail loop would be upslope, and north 7.5 degrees downslope. To the northwest, the slopes are considered downslope to flat.

Cooranbong Entry Site: Located on low laying land, with upslope north and south 0-5 degrees and relatively flat east and west.

Hawkmount Quarry: This was a former low rise and has been excavated. Slopes calculated as 6.5 degrees upslope to the north and relatively flat to the south, east and west.

Private Haul Roads: varying slopes and terrain, not exceeding 10 degrees

Table 2 details the expected distance to avoid flame zone for vegetation types on slope ranges (from AS3959-2009).

Table 2: Standard separation distances from associated vegetation types/slopes to avoid Flame Zone.

Vegetation Type	Flat or Upslope	0-5 degrees	5-10 degrees	10-15 degrees	>15 degrees
Dry Sclerophyll Shrub Forest	19m-25m	25m-32m	32m-39m	40m-49m	>50m

2.1.3 Ignition Sources

The following are considered likely sources of ignition:

- **Construction/Operation and Associated Activities**

The most common form of ignition in the area would be sparks generated from hot works and plant/equipment used in construction activities (e.g. exhausts and sparks of vehicles, maintenance works such as welding or landscape management). Actions of employees and contractors and malfunctioning equipment and motors may also result in fire ignition.

- **External Sources**

Bushfire may enter from adjoining properties and transport corridors adjacent to the Project Application Area, and from management works on neighbouring lands.

Any local or neighbouring hazard reduction operations should also be considered for potential ignition, particularly under conditions of hot, dry summer winds. Legal burning off in rural areas is mainly undertaken in autumn through to spring.

Arson is also a potential ignition source, however is likely to be limited to the main road areas.

- **Electricity Transmission Lines**

Under hot and windy conditions, electricity transmission lines may sag, come in contact with each other and arc. This can generate sparks which have the potential to cause fire

Power line easement management is the responsibility of the service provider. Any significant hazard reduction requirements should be made in consultation with the electricity provider. This may include slashing and pruning of tree branches, and the maintenance of a clearance zone where sapling trees with a significant mature height potential are completely excluded.

- **Lightning**

Lightning strikes are a common cause of fire ignition. The potential for lightning strike is not predictable, however if the conditions are suitable (dry vegetation, hot and windy) the risk is significant.

2.2 ASSETS

Assets are considered as life, economic, cultural heritage and environment. **Figure 3a** and **3b (Appendix 1)** details the identified asset locations.

2.2.1 Public Safety and Human Life

Emergency services personnel would be likely to attend any emergency at these sites. As indicated above, no public access would be available to these sites and subsequently no direct risk to the public is expected.

Newstan Colliery Surface Site: The re-development and upgrade of the surface infrastructure at the Newstan Colliery Surface Site will have a contracted workforce for the construction activities. There is expected to be up to 120 operational employees and contractors working full-time or based at the site.

Cooranbong Entry Site: No construction activities are proposed at the Cooranbong Entry Site and no higher personnel loading are expected. Currently only 4-8 people (contractors) are operating the site at any given time, with coal deliveries, cleaning and maintenance contractors potentially attending site regularly. There is the potential for up to 20 people to be at the site during any potential bushfire event. No public access is provided.

Hawkmount Quarry: The quarry will be absent of personnel for a majority of the time. Plant operators and trucks would be present at required intervals. It is estimated that in any potential bushfire event, 1-3 people could be impacted. No public access is provided.

Private Haul Roads: There will be no construction and no change to existing haul roads. No public access is provided.

Access is recognised as the highest risk characteristic to public safety and human life. The project sites are within bushland areas, and have existing access provisions via formed and sealed roads. Each site has alternate egress provisions that would be suitable for emergency access.

None of the sites within the Project Application Area are open to the public and access/egress from the sites is managed within the existing EMS procedures.

2.2.2 Infrastructure and Economic

2.2.2.1 Newstan Colliery Surface Site

The re-development and upgrade of the Newstan Colliery Surface Site will have a contracted workforce for the construction phase. All construction infrastructures would be protected from bushfire impact within a cleared zone.

Coal Handling Plant (CHP) and Coal Preparation Plant (CPP)

Coal will continue to be delivered from the underground workings of Newstan Colliery to the surface at Newstan Colliery Surface Site via the drift conveyor and drive house. The new CHP will include the installation of a new road receivable facility, transfer and sizing stations, transfer conveyors, a radial arm stacker, new coal stockpile areas, extension of the existing ROM coal stockpile, a new ROM coal reclaim tunnel and ROM coal surge bin and an automated train loading system. The new CHP will allow simultaneous production and dispatch of coal products from both the existing and proposed new CPP modules to either of the product coal stockpiles; simultaneously or for dispatch to Eraring Power Station via road through the product coal bin.

The existing CPP will continue to operate in its current configuration, with some upgrades. The new CPP module will include the installation of new coal preparation equipment, including large, fine and ultra-fine circuits, that has been designed to maximise recovery of semi soft coal product in all size fractions and minimise the production of tailings.

Reject Emplacement Areas (REA)

The Northern Coal Logistics Project's production waste management strategy incorporates the emplacement of coarse rejects at the existing Northern REA, the existing

Southern REA and the Hawkmount Quarry. It also incorporates the continued disposal of tailings within the existing tailings dam at the Southern REA.

Mechanical Workshops and Service Buildings

The mechanical workshops and service buildings will continue to be utilised for maintenance work (major maintenance and rebuilding activities to be undertaken on a contract basis off- site). Spillage and runoff from these facilities will continue to be managed by a sump and oil separator.

Administration Buildings and Bathhouse

Personnel will continue to utilise the existing administration buildings and bathhouse facilities, which are capable of catering for the current and proposed manning levels.

Car Park

Personnel, contractors and visitors will continue to utilise the existing sealed car parking area, which is accessed off the adjoining Miller Road and provides approximately 300 parking spaces. An additional onsite area provides approximately 40 car parking spaces for the heavy vehicle transport contracting company.

Other items of infrastructure at the Newstan Colliery Surface Site include the following:

- Mine ventilation infrastructure;
- Control room;
- Equipment and materials laydown areas;
- Diesel refuelling station and hydrocarbon storage;
- Material storage sheds;
- Machinery wash down bay and oil separators;
- Fire fighting and emergency equipment store;
- Solcenic tanks;
- Compressor shed;
- Water management infrastructure;

- Electrical sub-stations and switch room; and
- Emergency services helipad.

Servicing

The Newstan Colliery Surface Site will continue to be serviced via the existing connections to Hunter Water Corporation's (HWC) reticulated potable water system, Ausgrid's reticulated electricity and Telstra's reticulated telecommunications networks.

Sewage generated by on-site staff amenities at Newstan Colliery Surface Site is pumped to an onsite wastewater treatment plant, which pumps the treated effluent to the Maturation Dam. There is potential that the site will be connected to HWC's reticulated sewer system (subject to consultation with HWC and funding).

2.2.2.2 Cooranbong Entry Site

The Northern Coal Logistics Project proposes the continued use of the coal handling infrastructure at the Cooranbong Entry Site.

The primary items of existing infrastructure proposed for continued use and where necessary upgrade at the Cooranbong Entry Site are summarised below.

Coal Handling Plant

Coal will continue to be delivered from the underground workings of Mandalong Mine to the surface at the Cooranbong Entry Site via the south drift conveyor. ROM coal delivered to the Cooranbong Entry Site from Mandalong Mine will continue to be handled and processed through the CHP, which comprises aerial conveyor systems, a rotary breaker and sizer, a crushing plant, coal bins and coal stockpiles.

Mechanical Workshops and Service Buildings

The mechanical workshops and service buildings will continue to be utilised for maintenance work (major maintenance and rebuilding activities to be undertaken on a contract basis off-site). Spillage and runoff from the workshop will continue to be managed by a sump and oil separator.

Administration Buildings and Bathhouse

Personnel will continue to utilise the existing administration buildings and bathhouse facilities, which are capable of catering for the current and proposed manning levels.

Car Park

Personnel and visitors will continue to utilise the existing sealed car parking area, which is accessed off the adjoining Gradwells Road and provides around 200 parking spaces.

Other Infrastructure Items

Other items of infrastructure at the Cooranbong Entry Site proposed for continued use include the following:

- Fuel and hydrocarbon storage;
- Mine ventilation infrastructure;
- Equipment and materials storage areas;
- Machinery wash down bay;
- Fire fighting and emergency equipment store;
- Compressor building;
- Electrical sub-station;
- Water management infrastructure; and
- Emergency services helipad.

Servicing

The Cooranbong Entry Site will continue to be serviced via the existing connections to HWC's reticulated potable water system, Ausgrid's reticulated electricity and Telstra's reticulated telecommunications networks. Sewage generated by on-site staff amenities at the Cooranbong Entry Site will continue to be collected (pump out system) on a regular basis by a licensed contractor for offsite disposal.

2.2.2.3 Hawkmount Quarry

The Northern Coal Logistics Project's production waste management strategy incorporates the emplacement of coarse rejects at the existing Hawkmount Quarry, which is Crown land currently under a permissive occupancy held by Lake Macquarie City Council. The quarry has not been used for extraction purposes for several years, and there is no evidence of any closure or rehabilitation activities.

Hawkmount Quarry is located adjacent to and accessed from the Cooranbong Private Haul Road owned by Centennial Mandalong Pty Limited (Centennial Mandalong). It is estimated it will provide an additional 400,000 cubic metres of capacity for coarse rejects emplacement.

The quarry will be absent of personnel for a majority of the time. Plant operators and trucks would be present at required intervals. It is estimated that in any potential bushfire event, 1-3 people could be impacted. No public access is provided.

2.2.2.4 Private Haul Roads

The private haul roads are an important asset used by personnel and form part of the Project Application Area. These roads are bushfire resilient, but would form a significant bushfire access provision, and if compromised, would potentially impact production.

2.2.3 Environmental and Cultural Heritage

Ecological and cultural heritage assets will require protection from a bushfire and/or from bushfire mitigation treatments. The impact of slashing, tittering and ground disturbance as a result of bushfire mitigation will need to consider the location and resilience of any of these assets and will avoid direct impact.

Newstan Colliery Surface Site: The required clearing for the Newstan Colliery Surface Site will not impact any specific cultural heritage items (RPS 2014 Heritage Impact Assessment). Threatened flora and fauna species have been located within and adjacent to the proposed disturbance area, particularly threatened micro chiropteran bats and their roost habitat at Bat Alley (RPS 2014 Ecological Assessment). These bats and habitat have been afforded suitable protection from development. The Project does propose to remove 376 clumps of *Tetralochea juncea* (Black-eyed Susan) (threatened flora species) at the Newstan Colliery Surface Site.

Cooranbong Entry Site: No additional construction or clearing for APZ will be required for this site. No impact on flora, fauna, endangered ecological communities (EEC) or heritage items are expected.

Hawkmount Quarry: This site will be development for the purposes of reject emplacement. Northern Coal Services has committed to undertaking all appropriate measures to protect the scarred tree from the development works and, as such, the Project does not pose a risk of

harm to this scarred tree (RPS 2014 Heritage Impact Assessment). One stem of *Grevillea parviflora* subsp. *parviflora* (threatened flora species) will be removed at Hawkmount Quarry.

Any bushfire mitigation works will consider potential impact on these assets, along with additional stems of *Grevillea parviflora* subsp. *Parviflora* and clumps of *Tetratheca juncea* within the surrounding area.

Private Haul Roads: No additional construction or clearing for APZ will be required for this site. No impact on flora, fauna, EEC or heritage items is expected.

3. RISK ASSESSMENT

The potential bushfire risks to and from this Project are:

- Cause danger to lives and damage to property from radiant heat, flame, smoke and embers;
- Stalling production and damage to infrastructure assets, financially impacting Northern Coal Services and local and regional commercial operations; and
- Negative impact to native fauna and flora, including threatened species.

3.1 PUBLIC SAFETY AND HUMAN LIFE

The bushfire risk to public safety is significant with regards to awareness and evacuation provisions. Early detection and emergency evacuation is a key mitigation strategy to protect life of employees and contractors.

The existing Newstan Colliery EMS and Mandalong Mine EMS (including bushfire management plans) should be re-developed into single consolidated EMS for the Northern Coal Logistics Project, including updated specific bushfire awareness procedures. All employees, contractors and visitors should be made aware of the necessary response to an emergency situation as detailed in the EMS' Evacuation Procedure. This procedure includes the emergency contact phone numbers; muster areas and external emergency services.

The protection of attending fire fighting and other emergency personnel is included in the risk assessment.

Newstan Colliery Surface Site: Up to 200 staff could be based at this site at any one time (this includes the Newstan Colliery workforce until relocation to Awaba Colliery Surface Site as part of the Newstan Colliery Extension Project). The site has two egress paths onto Miller Road, along with a third egress opportunity onto the Newstan-Eraring Private Haul Road. The bushfire setbacks are extensive to infrastructure and the provision of bushfire treatments, including APZ and landscape management and suitable access and

water supplies (e.g. dust suppression watering systems) will assist in the protection of life. The risk of a local bushfire adversely impacting persons on site is considered to be low.

Cooranbong Entry Site: It is estimated that between 4-20 people could be at the site at any one time. The risk of a local bushfire adversely impacting persons on site is considered to be low due to the extensive cleared areas and central location of buildings. Access provisions are good, leading north on the Cooranbong Private Haul Road and leading south on Gradwells Road.

Hawkmount Quarry: Few staff would be operating in this area. The site has setbacks to bushland areas and will have good egress onto the Cooranbong Private Haul Road, north and south. The risk of a local bushfire adversely impacting persons on site is considered to be low.

Private Haul Roads: Haul road may offer an alternate egress route.

3.2 INFRASTRUCTURE AND ECONOMICS

Although industrial infrastructure is generally resilient, components of the construction could be damaged through exposure to direct flame, radiant heat, smoke or ember. Consequently the overall structure or function could be compromised. This risk could prevent or delay coal handling/processing, along with mining and production in the Newstan Colliery and Mandalong Mine due to critical infrastructure failure (e.g. ventilation system failure). Any asset that is damaged for a prolonged period may have significant impacts on economic output for the mining operations and associated State significant power supply facilities.

The varying levels of priority for infrastructure requiring bushfire protection have been assessed and determined (**Table 3** and **Table 4**). The priority identification would assist emergency operations and bushfire mitigation efforts to prioritise efforts and minimise potential bushfire impact.

Table 3 lists the primary assets at the Newstan Colliery Surface Site and **Table 4** list the primary assets at the Cooranbong Entry Site and the Hawkmount Quarry. The priority levels have been determined on the basis of distance from the hazard (direct impact) and consequences if infrastructure is damaged and non-functional (lost production).

Table 3: Assets associated with the Newstan Colliery Surfaces Site.

Infrastructure Assets	Human Risk	Commercial Risk	Environmental Archaeology Risk	Priority
CPP	Low	High	Low	1
CHP	Low	High	Low	1
PHF	Low	High	Low	1
Reject Emplacement Areas	Low	Moderate	Low	2
Workshops and Service Buildings	Low	High	Low	2
Administration Buildings and Bathhouse	Low	High	Low	2
Car Park	Low	Moderate	Low	3
Other Infrastructure Items	Low	High	Low	2
Services	Low	High	Low	2
Access Road	Moderate	Low	Low	3
Threatened Species	Low	Moderate	Moderate	2
Private Haul Road	Low	High	Low	1

Priority 1 – Critical infrastructure or high financial impact if function is compromised.

Priority 2 – Lower impact, partially resilient or easy to replace.

Priority 3 – Resilient, lowest priority.

Table 4: Asset associated with the Cooranbong Entry Site and Hawkmount Quarry Materials and Methods

Infrastructure Asset	Human Risk	Commercial Risk	Environmental Archaeology Risk	Priority
Access Road (Gradwells Road and Haul Road)	High	High	Low	3
CHP	Low	High	Low	1
Workshops and Service Buildings	Low	High	Low	2
Administration Buildings and Bathhouse	Low	High	Low	2
Car Park	Low	Moderate	Low	3
Other Infrastructure Items	Low	High	Low	2
Services	Low	High	Low	2
Mobile Plant at	Low	Low	Low	2

Hawkmount Quarry				
Threatened Flora	Low	Moderate	Moderate	2
Scarred Tree	Low	Low	High	2

Priority 1 – Critical infrastructure or high financial impact if function is compromised.

Priority 2 – Lower impact, partially resilient or easy to replace.

Priority 3 – Resilient, lowest priority.

3.3 ENVIRONMENTAL AND CULTURAL HERITAGE

Threatened flora, fauna and EEC have some resilience to bushfire impact; however a high intensity and widespread fire could have significant impact. No threatened flora and fauna and/or EEC will be disturbed at the Cooranbong Entry Site or along the private haul roads.

The Newstan Colliery Surface Site has a significant cave dwelling bat roost site. This is an important ecological asset and will be protected from development. Subsequently, the APZ provided for the development and the locations and resilience of the Bat roost cave would have a low risk of bushfire impact. The Project does propose to remove 376 clumps of *Tetratheca juncea* (Black-eyed Susan) (threatened flora species) at the Newstan Colliery Surface Site. The APZ and land management associated with bushfire mitigation will avoid any additional clumps of *Tetratheca juncea* surrounding the Newstan Colliery Surface Site.

In the vicinity of the Hawkmount Quarry are threatened flora (*Tetratheca juncea* and *Grevillea parviflora*) and a scarred tree (Aboriginal heritage site). These assets have been mapped (**Figure 3a**), and future mitigation works will avoid impact on these assets.

3.3.1 Bushfire Treatment Impacts

Newstan Colliery Surface Site: The Newstan Colliery Bushfire Management Plan details the bushfire management areas (APZ), Strategic Fire Advantage Zone (SFAZ), Land management Zone (LMZ). This plan should remain as the overall fuel management strategy, with amendments made to include the new facilities. No change to the LMZ north are required, as the vegetation is separated from any infrastructure and located on a ridge above.

Cooranbong Entry Site: This site has APZ and clearance setbacks. No environmental or cultural heritage sites would be directly impacted from the bushfire treatments recommended in this bushfire risk assessment.

Hawkmount Quarry: No additional clearing is required and no environmental or cultural heritage sites would be directly impacted from the bushfire treatments recommended in this bushfire risk assessment.

Private Haul Roads: This site has existing APZ and clearance setbacks. No environmental or cultural heritage sites would be directly impacted from the bushfire treatments recommended in this bushfire risk assessment

.

4. RISK ASSESSMENT

The assets have been identified, prioritised according to consequence relating to bushfire impact and analysed. This section details the treatment required to minimise bushfire risk to these assets.

4.1 LIFE SAFETY – EMERGENCY MANAGEMENT

In the case of a bushfire, the optimal bushfire mitigation response to protect human life is evacuation. Therefore the emergency response arrangement for the Project must include an Evacuation Procedure, including continual awareness and training in preparation for response to an emergency. Emergency evacuation needs to clarify a safe route and an understanding of the extent/spread of local fires before allowing the evacuating persons to leave the site.

Further to evacuation, emergency management includes access for emergency services to assets and bushfire control lines. This is generally access road and fire trail suitability. All roads that are listed in this bushfire risk assessment for the Project must be visually inspected annually and management actions undertaken if tracks are determined as unsuitable for emergency vehicles passage (i.e. inaccessible due to erosion, fallen timber, locked gates, dead end tracks).

- Evacuation response: The EMS for the Project should be prepared to include specific bushfire awareness and evacuation response procedures for bushfire events. The recognition of Very High or greater Fire Danger Days should determine peoples movements in bushland areas and trigger a requirement to view the Current Fires and Incidents page on the RFS' website:

http://www.rfs.nsw.gov.au/dsp_content.cfm?cat_id=683

4.2 INFRASTRUCTURE PROTECTION

Industrial infrastructure is generally fire resilient, however potential for component failure can be minimised through landscape management and bushfire mitigation strategies.

4.2.1 Bushfire Management Actions

The following steps are recommended to provide a higher level of safety to persons and protection of assets in the local area. **Figure 4a** and **4b (Appendix 1)** details the basic bushfire management actions for the Project.

Newstan Colliery Surface Site:

- Newstan Colliery has a current Bushfire Management Plan (N-BMP-001). This plan details the required management of APZ, SFAZ and LMZ. The proposed site re-development and upgrade will extend north into the current LMZ 10. Subsequently, the existing Newstan Colliery Bushfire Management Plan (N-BMP-001) should be modified to show the proposed APZ extent provided in Figure 4b of this bushfire risk assessment (Appendix 1). A Bushfire Management Plan should continue to be used as the land management tool at this site for fire management.
- **Access:** The existing site access provisions will be suitable for evacuation and access. These routes should be detailed on any emergency operation map and integrated within the EMS. All access should provide a trafficable and maintained road, with minimum 6m wide path and carrying capacity exceeding 15 tonne.
- **Building:** The Building Code of Australia (BCA) does not provide for any bushfire specific performance requirements for Class 5 to 8 and 10 buildings (e.g. offices, factories, warehouses, public car parks and other commercial or industrial facilities). Buildings such as these have general fire safety construction provisions (i.e. Structural materials for building) that are deemed acceptable solutions. Specific to bushfire protection, Class 5 to 8 and 10 buildings need to provide suitable emergency access, water supplies and services, emergency planning and vegetation or bushfire fuels management. These mitigation provisions have been provided in the existing and proposed developments.
- The Newstan Colliery Surface Site has five (5) water tanks on the surface with a total maximum volume of approximately 1.5 million litres that can be used in the event of an emergency for fire fighting purposes. Water is reticulated across the site (both surface and underground) via either 6" or 4" steel pipes. The location of these pipes is indicated in the Fire Services Plan – NS1680.
- Fit-for-purpose trailer-mounted diesel powered pumps are available on the surface for use in case of an emergency.

The options for bushfire treatments at the Cooranbong Entry Site and Hawkmount Quarry are existing (i.e. currently managed in Centennial property management works) and minimum extent shown in **Figure 4a Appendix 1**. Minimum APZ management for Cooranbong Entry Site and Hawkmount Quarry should include:

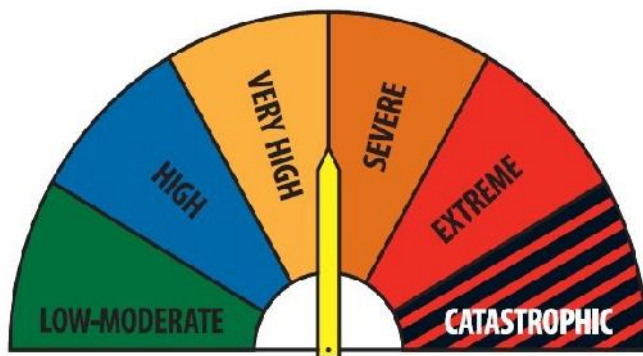
- Manual fuel removal (APZ): slashing or trittering the ground vegetation, tree and shrub removal. This should be out to a designated distance (20m) from assets and frequency should be guided by any APZ or landscape/vegetation management plan.
- Access: includes persons evacuating a site and emergency services attending simultaneously. This is considered for both the sites. The existing and proposed site access provisions will be suitable for evacuation and access. These routes should be detailed on any emergency operation map and integrated within the EMS. All access should provide a trafficable and maintained road, with minimum 6m wide path and carrying capacity exceeding 15 tonne.
- Building: No new buildings to be constructed at these sites. Specific to bushfire protection, the sites will need to provide suitable emergency access and emergency planning.
- Water Supplies and Utilities: Northern Coal Services has responsibility to prevent and manage any bushfire that may occur within the Cooranbong Entry Site or Hawkmount Quarry site. Existing water supplies at the surface facility sites are considered adequate. Any tank water supply for emergency operations should be dedicated and not used for any other purpose

5. COMMUNICATION AND MONITORING

5.1 COMMUNICATE

Training is the key form of communication and is detailed and directed within the existing Newstan EMS and Mandalong EMS. These documents should be re-developed into a single consolidated EMS for the Project and be used to inform all persons of the appropriate emergency procedures.

To inform the Northern Coal Services operations of any bushfire in the locality that could impact operations and/or pose risks to human life, a trigger action should be developed and implemented. The recognition of Very High (or greater) Fire Danger Days should inform people's movements in bushland areas and trigger a requirement in the EMS to view the Current Fires and Incidents page on the RFS' website: http://www.rfs.nsw.gov.au/dsp_content.cfm?cat_id=683



5.2 CONSULTATION

For the purpose of bushfire safety, consultation with the NSW RFS should be consulted on a frequency not exceeding 12 months and preferably prior to and during the typical bushfire season running between August and May. Consultation should include:

- Identification of any previous bushfire impacts within the locality;
- Description of emergency procedures relating to access and evacuation for emergency vehicles and persons during a bushfire emergency; and
- Suitability of access roads, APZ areas, water resources and location of any designated safe areas.

5.3 MONITORING

All asset protection actions will be monitored on an opportunistic basis or a frequency not exceeding 3 years. This requirement is consistent with the existing EMSs.

6. RECOMMENDATIONS

The recommendations of this BRA are detailed in **Table 5**.

Table 5: Bushfire management recommendations

Strategy	Method	Action Attended
Landscape and bushfire fuel management		
Existing APZ	The Cooranbong Entry Site has suitable APZ setback to all infrastructure. APZ maintenance should be applied immediately as some areas have significant vegetation regrowth. These areas are identified in Figure 4a (Appendix 1). The designated areas will require clearing to Inner Protection Area (IPA) standards	
	The Newstan Colliery Surface Site should maintain the existing APZ as detailed in the Bushfire Management Plan (N-BMP-001). These are considered acceptable to achieve the desired setbacks for flame and radiant heat protection.	
Proposed APZ	Hawkmount Quarry would not require external APZ. The existing track extending from east and around to the south should be maintained and would serve to maintain this inherent setback.	
	The new infrastructure for the Newstan Colliery Surface Site should establish minimum 45 m APZ. The APZ can be established through perimeter or roads, excavated walls and bushland management areas (Figure 4b).	
Existing APZ Fuel Reduction	Mechanical: slashing of grass to less than 10 cm. Manual: fuel removal (control weeds, reduce canopy trees to less than 30% canopy cover, lopping trees branches to greater than 3 m from ground fuels, reducing shrub layer density to less than 20% foliage cover, remove timber piles or combustible materials from APZ).	
Proposed APZ Fuel Reductions	Construction contours and batters are likely to provide sufficient setbacks. The ground cover should be retained where possible. The removal of trees and shrubs would reduce fuel loads as detailed for existing APZ and thereafter should be slashed at least once annually, prior to bushfire season	
Water Supplies and Utilities		
Existing Water Supplies	Existing water supplies at the Cooranbong Entry Site and Newstan Colliery Surface Site are considered adequate	
Proposed Water Supplies	Hawkmount Quarry would not require a static water supply. The reticulated water supply should be extended to the proposed development area at the Newstan Colliery Surface Site, and a similar hydrant access as for the existing infrastructure established.	
Building and Constructions		

All External Building Facades	The site has suitable APZ to separate radiant heat and flame contact. The potential for ember impingement remains. The proposed infrastructure will be resilient to ember attack.	
Emergency Management Arrangements		
Bushfire Season Preparedness	Fire fuel reduction actions completed	
	Track and access road monitored and maintained	
	Monitor water supplies (including tanks) and commissioning pumps, hydrants and pipelines.	
	Emergency planning and communication integrated with EMS.	
Emergency Planning	Integrate the bushfire treatment and management actions into the EMS and Bushfire Management Plan.	
	Integrate the bushfire treatment actions into any existing landscape management works program.	
	Communicate the procedures for bushfire response with all staff.	
	Consultation with NSW RFS.	
Emergency Procedure	<p>A trigger requirement should be identified in the EMS stating that on Very High (or greater) Fire Danger Days, a designated person will view.</p> <p>The Current Fires and Incidents page on the RFS's website: http://www.rfs.nsw.gov.au/dsp_content.cfm?cat_id=683</p> <p>A designated person should be well informed of current fire activity by monitoring local media and regularly checking for updates on the RFS website or Information Line.</p>	
Communications	<p>Consultation with the NSW RFS prior to bushfire season should detail any previous bushfire impacts within the locality; description of emergency procedures relating to access and evacuation for emergency vehicles and persons during a bushfire emergency; and Suitability of access roads, APZ areas, water resources and location of any designated safe areas.</p> <p>Communicate the local fire and road conditions to evacuating persons, as a part of the EMS procedures</p>	
Access Provisions		
Access for person evacuating and emergency services attending during the construction and the operation stages	The existing access provisions to the Cooranbong Entry Site and Newstan Colliery Surface Site are considered suitable for evacuation and access purposes. These routes should be detailed on an emergency operation map and integrated into the EMS.	
	The proposed access provisions for Hawkmount Quarry are considered suitable for evacuation and access purposes. This route will be detailed on an emergency operation map and integrated into the EMS.	
Perimeter access and Alternate Egress routes	<p>All access roads should provide a trafficable path up to 4m wide with 1 m shoulders either side (total 6 m), with a carrying capacity exceeding 15 tonne, capable for emergency vehicles traverse and to operate from.</p> <p>Track maintenance would be required on all roads and a formal system provided and managed within the EMS to ensure roads are not compromised in any potential emergency situation. This should be done annually and after any extreme weather event. Information regarding track condition should be provided to the NSW RFS.</p>	



APPENDIX 1. FIGURES

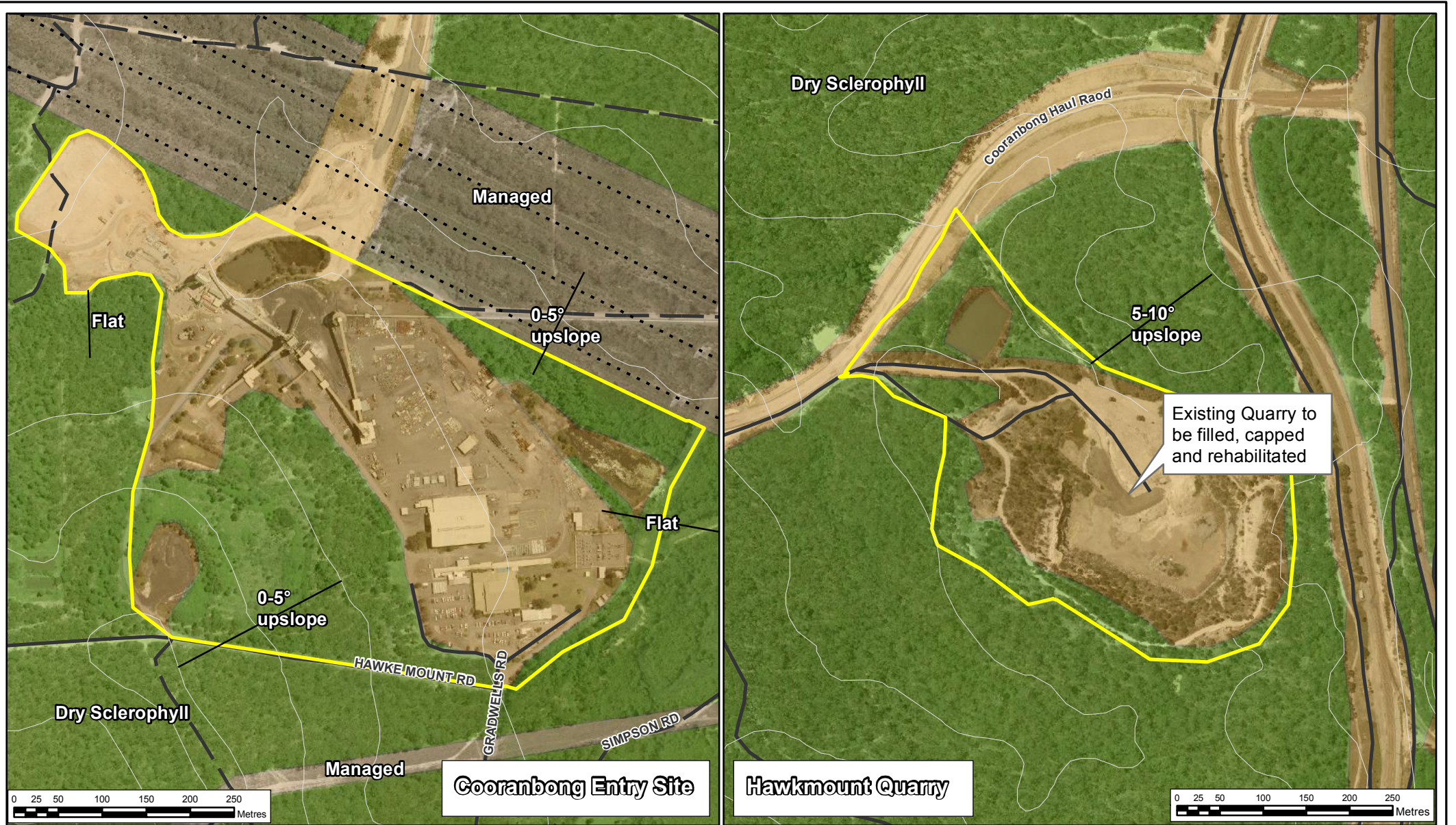


Figure 2a: Bushfire Behaviour

Legend

- Study Sites
- Roads/Tracks
- High Voltage Powerline
- Contours (10m)



Coordinate System:

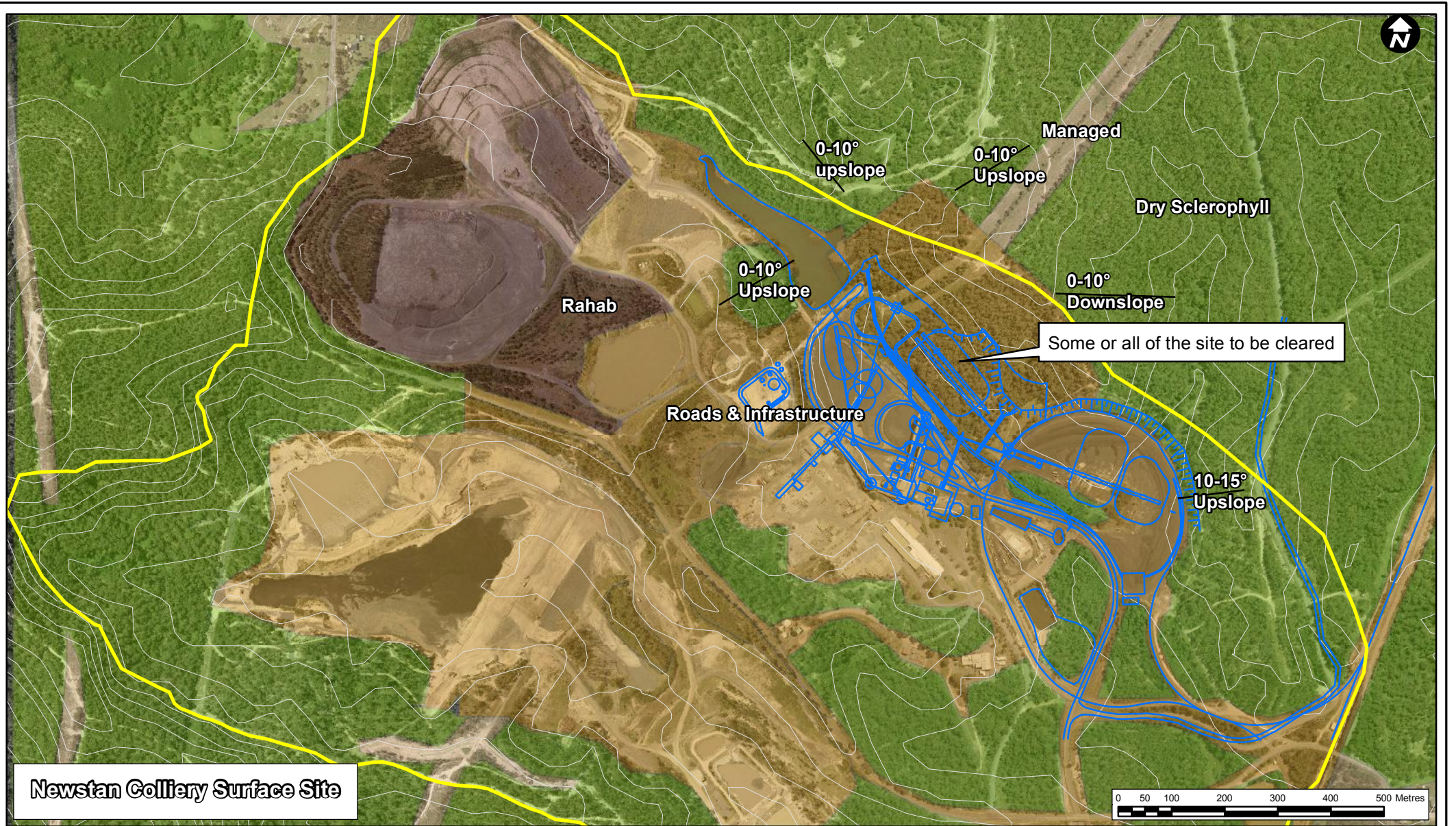
GDA 1994 MGA Zone 56

Data Sources:

- LPO - 2011
- GSS Environmental - 2012
- Centennial Coal - 2012
- Kleinfelder/ecobiological - 2012

Project Ref:	130-1106
Plot Date:	12/03/2014 09:24
Revision:	003 (gjoyce)

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.



Newstan Colliery Surface Site

Figure 2b: Bushfire Behaviour

Legend

- Study Site
- Existing & Proposed Infrastructure
- Contours (10m)



Coordinate System:

GDA 1994 MGA Zone 56

Data Sources:

- LPO - 2011
- GSS Environmental - 2012
- Centennial Coal - 2012
- Kleinfelder/ecobiological - 2012

Project Ref:	130-1106
Plot Date:	11/03/2014 16:58
Revision:	003 (gjoyce)

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

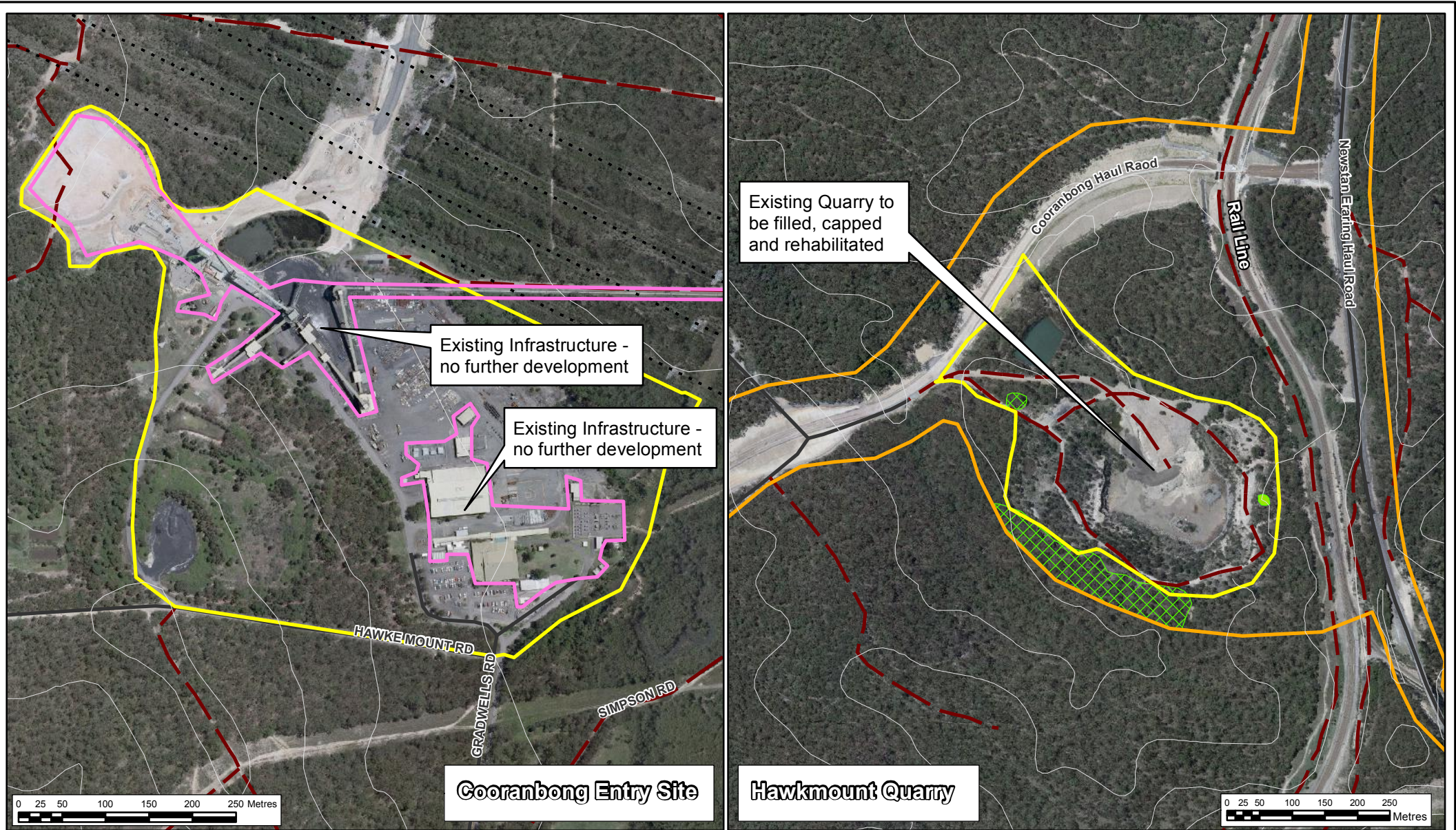


Figure 3a: Assets

Legend

- Study Sites
- Existing Infrastructure Assets
- Scar Tree
- Threatened Flora
- Roads
- Tracks
- High Voltage Powerline
- Contours (10m)



Coordinate System:

GDA 1994 MGA Zone 56

Data Sources:

LPO - 2011
GSS Environmental - 2012
Centennial Coal - 2012
Kleinfelder/ecobiological - 2012

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

Project Ref: 130-1106

Plot Date: 12/03/2014 09:18

Revision: 003 (gjoyce)

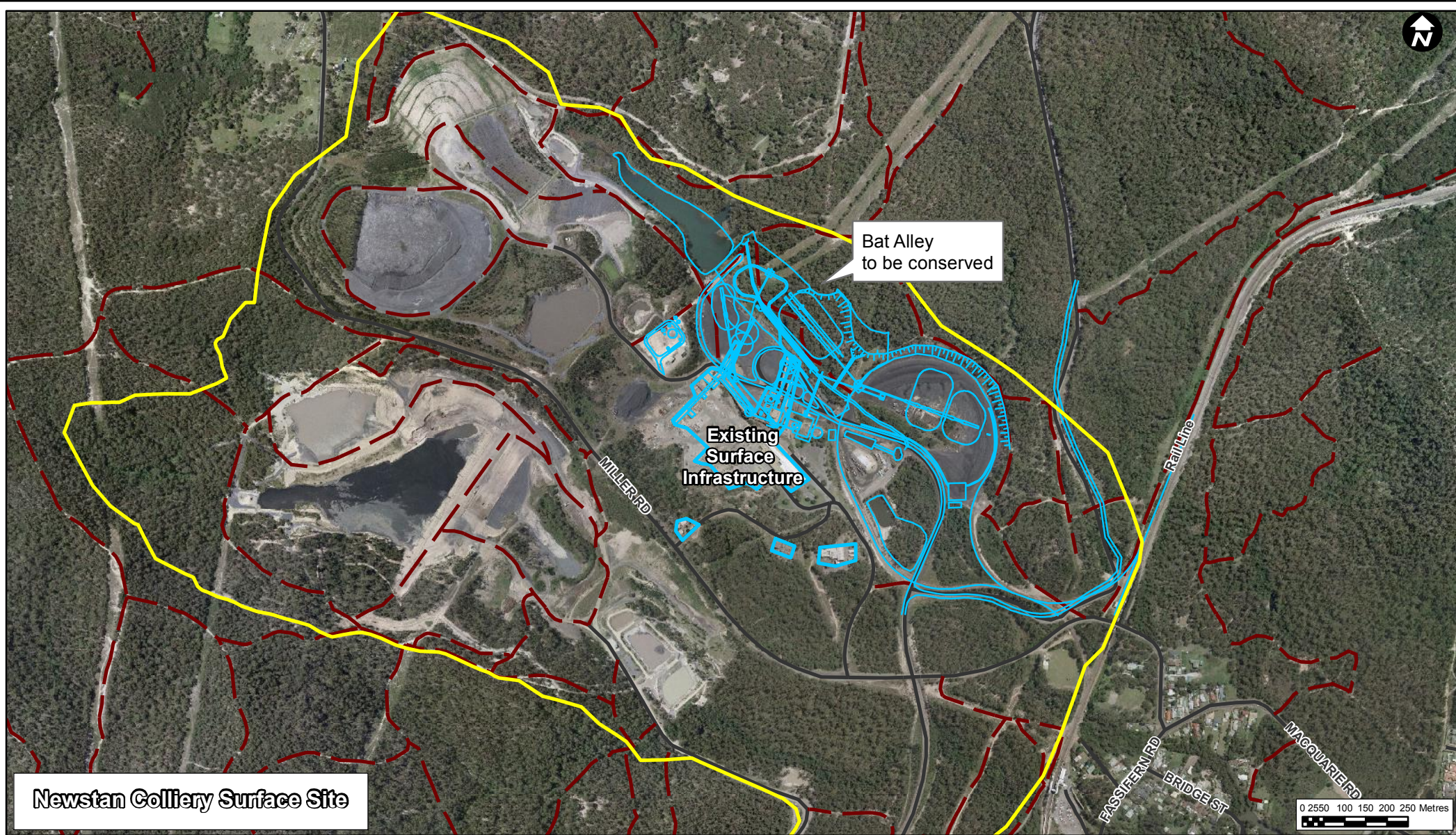


Figure 3b: Assets

Legend

- Study Site
- Existing & Proposed Infrastructure
- Roads
- Tracks



Coordinate System:

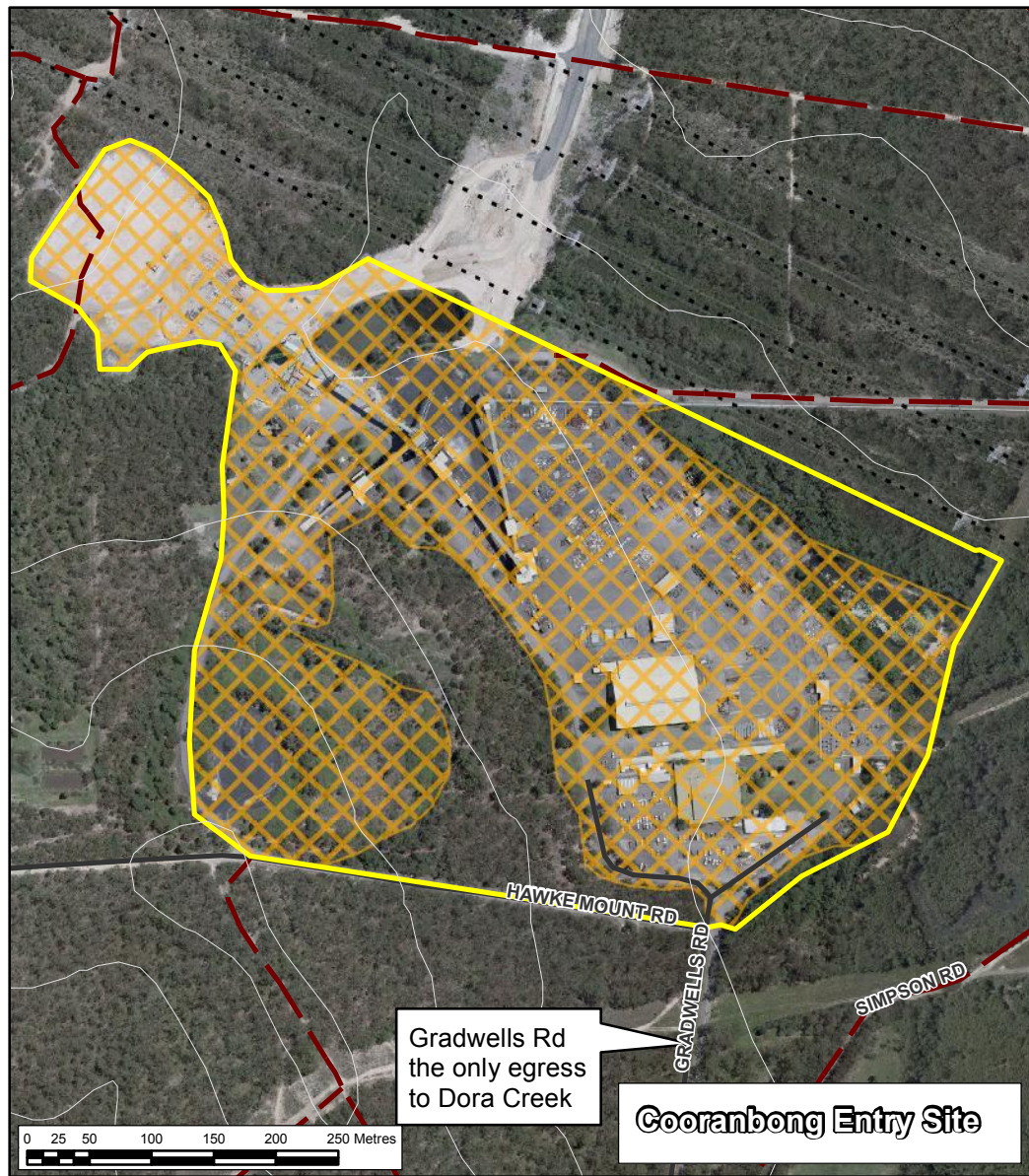
GDA 1994 MGA Zone 56

Data Sources:

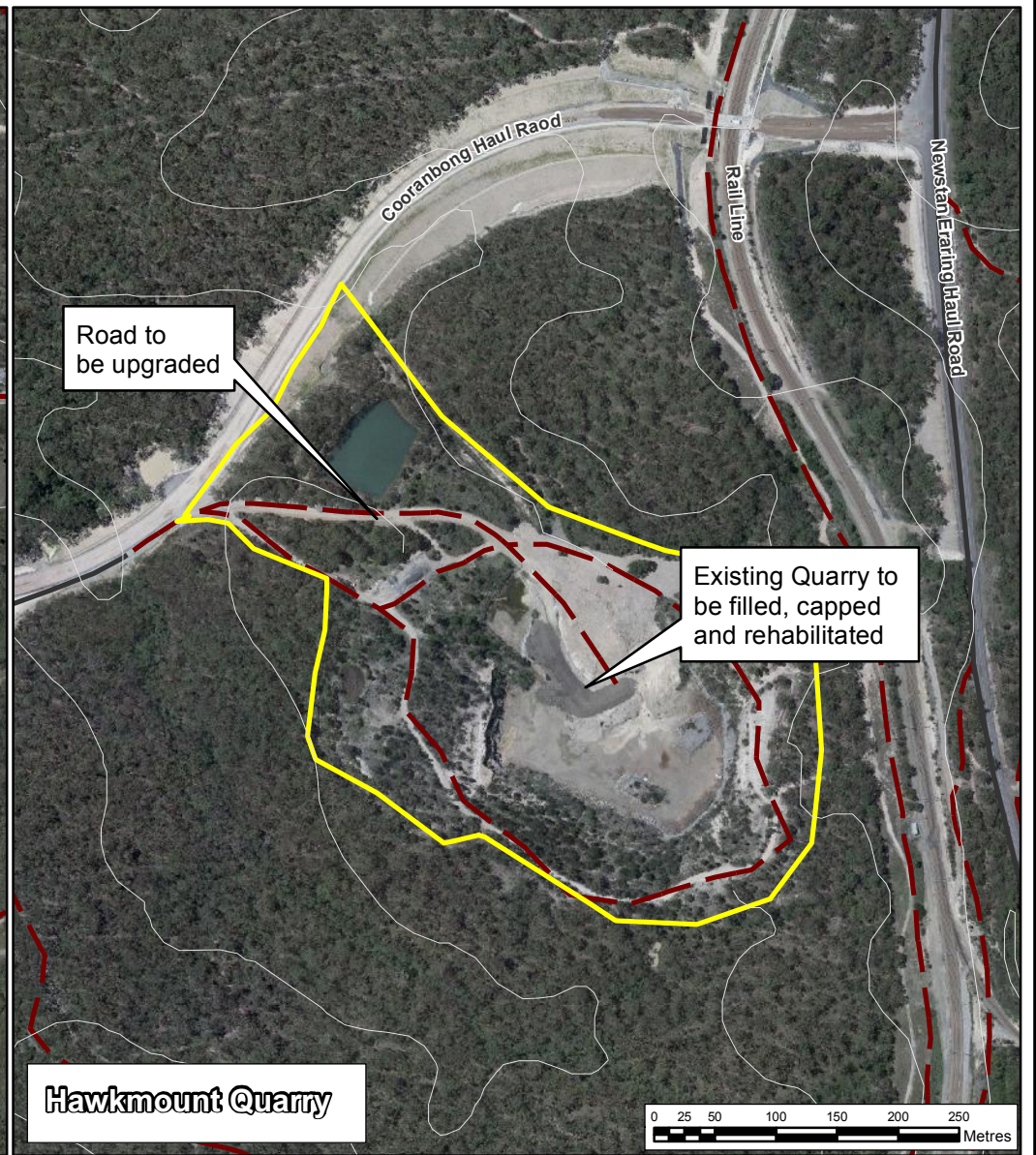
LPO - 2011
 GSS Environmental - 2012
 Centennial Coal - 2012
 Kleinfelder/ecobiological - 2012

Project Ref:	130-1106
Plot Date:	11/03/2014 17:02
Revision:	003 (gjoyce)

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.



Cooranbong Entry Site



Hawkmount Quarry

Figure 4a: Management Actions

Legend

- Study Sites
- Existing APZ
- Roads
- Tracks
- High Voltage Powerline
- Contours (10m)



Coordinate System:

GDA 1994 MGA Zone 56

Data Sources:

- LPO - 2011
- GSS Environmental - 2012
- Centennial Coal - 2012
- Kleinfelder/ecobiological - 2012

Project Ref: 130-1106

Plot Date: 12/03/2014 09:16

Revision: 003 (gjoyce)

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

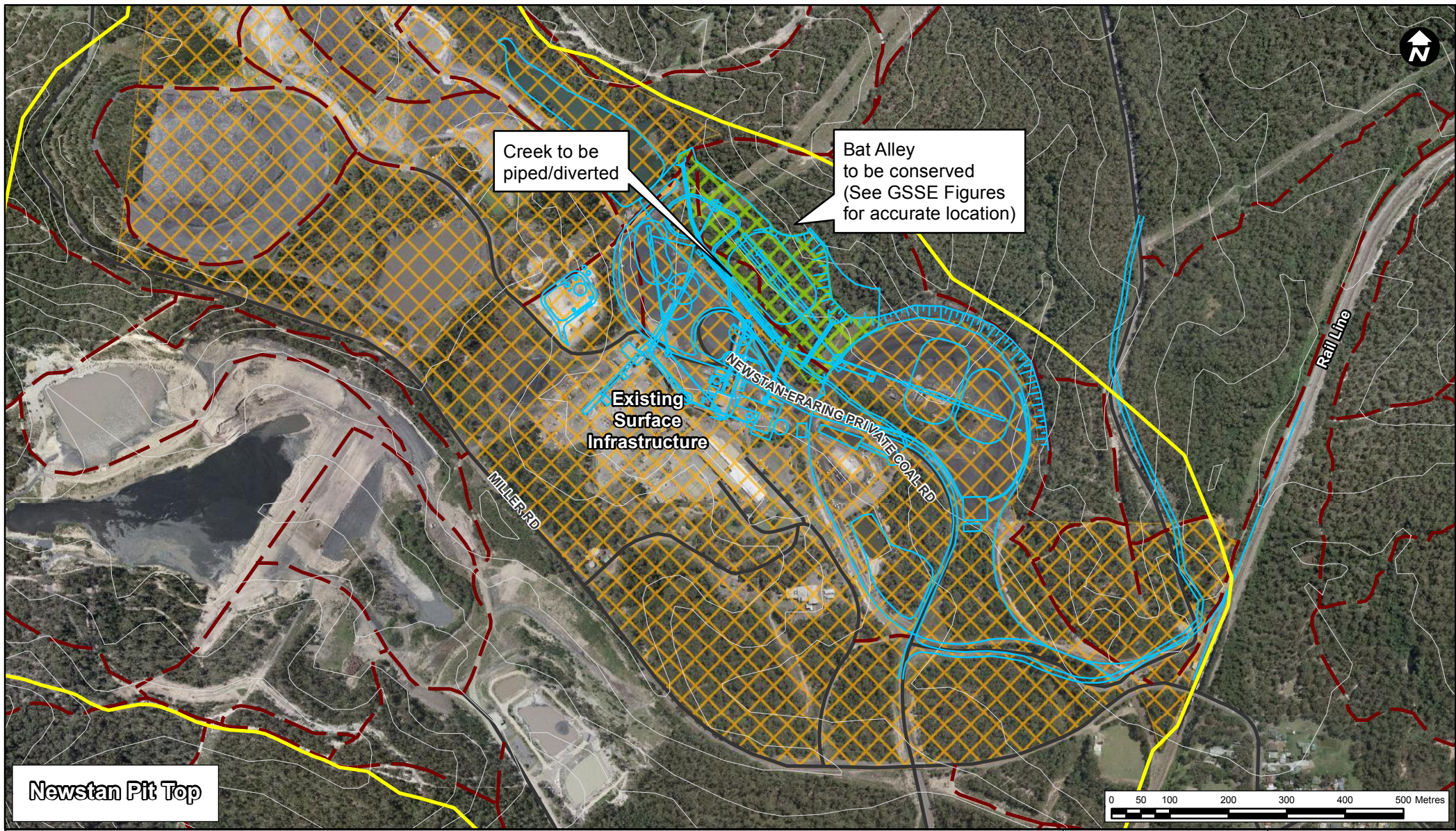


Figure 4b: Management Actions

Legend

- Existing & Proposed Infrastructure
- Study Site
- Existing APZ as per BMP
- Proposed APZ
- Contours (10m)



Coordinate System:
GDA 1994 MGA Zone 56

Data Sources:
LPO - 2011
GSS Environmental - 2012
Centennial Coal - 2012
Kleinfelder/ecobiological - 2012

Project Ref:	130-1106
Plot Date:	12/03/2014 09:20
Revision:	003 (gjoyce)

Disclaimer: This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.