Proposed Boreholes, Airly Mine, Capertee, NSW

Review of Environmental Factors

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Name	Signature	Date
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Overview

Airly Mine is an underground coal mine located on the northern fringe of the western coal fields of New South Wales, approximately 40 kilometres northwest of Lithgow and approximately three kilometres north east of Capertee. Airly Mine is owned and operated by Airly Coal Pty Ltd (Centennial Airly), a fully owned subsidiary of Centennial Coal Company Limited.

Centennial Airly proposes to drill up to five exploration boreholes at Airly Mine, within Authorisation Area 232 (A232). The purpose of the proposed activity is to provide geological information for the mine's geological model and, once this has been obtained, to undertake groundwater monitoring.

The site, referred to as the project area, is to the east of Airly Mine and is approximately eight kilometres north east of Capertee. It is accessed via existing tracks from the Glen Davis Road, which is approximately two kilometres to the south west of the project area.

Under State Environmental Planning Policy (SEPP) (Mining, Petroleum Production and Extractive Industries) 2007 (the Mining SEPP) development for the purposes of mineral exploration may be carried out without development consent. The proposed activity is to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This Review of Environmental Factors (REF) has been completed to address the requirements of Part 5 of the EP&A Act and to:

- Assist NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) with their consideration of the conditions of A232.
- Provide supplementary documentation for a Conservation Risk Assessment, required under the *National Parks & Wildlife Act 1974* (NP&W Act) due to the project area being within a State Conservation Area (SCA).
- Accompany a surface disturbance notice to DTIRIS.

Proposed activity

The proposed activity comprises:

- Site preparation and drilling of five boreholes, ARP06, ARP07, ARP08, ARP09 and ARP10 within borehole compounds of approximately 30 by 30 metres.
- Vegetation clearance along the existing overgrown track to ARP06 and ARP10 and upgrading of parts of the existing track to ARP07, ARP08 and ARP09 to enable vehicular access to the borehole compounds.
- Collection of geotechnical data.
- Partial rehabilitation, following the collection of geotechnical data.
- Installation of piezometers for groundwater monitoring.
- Collection of groundwater monitoring data over an anticipated duration of approximately 20 years.
- Decommissioning and full rehabilitation following the useful life of the groundwater monitoring bores.

Borehole locations were chosen to minimise land disturbance and vegetation clearance. As a result minimal soil disturbance and vegetation clearance is required for the compounds.

The project area is within the Mugii Murum-ban SCA SCA.

Justification

The objectives of the proposed activity are:

- To determine the position, quality, thickness and extent of the coal resource for inclusion in the mines geological model for the purposes of mine planning.
- To obtain geotechnical data on the strata associated with the coal seam for mine design purposes.
- To obtain baseline data and continue monitoring groundwater as part of Airly Mine's water monitoring program.

The project is necessary to determine the potential coal resource in the area and to provide sufficient baseline groundwater data to inform any future applications by Centennial Airly.

Key potential environmental impacts

Soil

- There is potential for soil erosion from wind and from run off water. However, the area of disturbance is small and there would be a very small gradiant/slope of the terrain.
- Fuels and oil would be used during the proposed activity. Any drilling muds used would be biodegradable to avoid the risk of soil (and water) contamination. Mitigation measures to minimise and manage the risk of spills are identified.
- Soil would be removed during excavations and mitigation measures to ensure its re-use for rehabilitation are identified.
- Impacts associated with soil profile inversion and soil compaction would be mitigated.

Surface and groundwater

- Cross contamination of aquifers would be avoided through the proposed drilling methodology and mitigation measures.
- Changes to groundwater levels are not expected.
- Biodegradable drilling mud and fuels and oils would be used during the proposed activity. The risk of seepage of drilling fluids or hydrocarbons to water resources would be managed.

Hazardous substances

- Risks associated with transport, use and storage of hazardous substances will be managed.

Waste

- The management of wastes, including its transport will comply with relevant legislation and guidelines.

Air quality

- There are three residential properties within proximity of the project area, two of which are owned by Centennial. These could potentially be affected by dust during the construction process. Dust also has potential to affect the environment of the SCA and those using the immediate area for recreation. During construction, dust would be minimised.
- Emissions from vehicle and plant exhausts would be very low.
- Any odour emissions are likely to be minor.

Noise

- Potential construction noise impacts to three residential properties and those using the immediate area

for recreation would be managed through mitigation measures such as prior notification of the residents of the two properties, best practice measures and a complaints handling procedure.

Flora and fauna

- Whilst the proposed borehole compounds have been selected to minimise vegetation impacts, there would be potential losses of:
  - approximately 0.45 hectares native vegetation due to the borehole compounds and small areas associated with track upgrading.
  - A small number of *Prostanthera stricta* (Mount Vincent Mintbush) plants listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999 (*EPBC) Acts as Vulnerable.
  - Two hollow bearing trees.
  - *Allocasuarina littoralis* (Black She-oak) a tree species which is favoured by the Glossy Black-Cockatoo.

  Vegetation disturbance would be minimised and the project area would be rehabilitated.
- Vegetation removal will be avoided where possible. Where vegetation removal is unavoidable, it will be kept to a minimum. The avoidance of Mount Vincent Mintbush, *Prostanthera stricta,* that will be marked with flagging tape, and also hollow bearing trees and mature trees will be prioritised.
- There would not be a significant impact upon any listed threatened ecological communities or any listed threatened species.
- The potential risk of vehicles and machinery bringing materials onto the sites that may cause the distribution of weed species or introduce pathogens would be managed.

Community

- Minor increases in traffic along Glen Davis Road and on the tracks to the project area are unlikely to result in traffic delays or road safety issues.
- During construction, there are potential impacts on those using this part of the SCA for recreation such as noise, dust, traffic, visual effects and the introduction of a hazard.
- During construction, there would be temporary impacts associated with the recreational, heritage and conservation values of the SCA.

Economic

- Provision of temporary construction work for approximately five contractors (in addition to existing Centennial staff) and purchasing of material supplies.

Public safety

- Potential hazards to recreational users of this part of the Mugii Murum-ban SCA will be managed.
- There is a risk of bushfire and this risk will be managed.

Visual or scenic landscape

- During construction, the works would be visible within the Mugii Murum-ban SCA. This may temporarily detract from the scenic qualities of the land.

Natural resources

- Quantities of fuel would not be significant.

- The proposed activity is not likely to involve the significant use, wastage, destruction or depletion of natural resources.

Agriculture

- The project area is not within land used for agricultural purposes. No reduction in agricultural land.
- Very low traffic generation is unlikely to cause impacts on agricultural businesses from delays on Glen Davis Road.
- No impact on any water supply services or processing facilities required for agricultural enterprises.
- Risks associated with spills of fuels and oils and potentially contaminating water and soil would be mitigated.

Aboriginal heritage

- No Aboriginal objects, sites or culturally modified trees were identified within the borehole compounds. One Aboriginal site borders the access track and mitigation would be implemented for its protection.
- In the event of Aboriginal objects being identified during the proposed activity, mitigation measures are identified.

Historic cultural heritage

- No non-Aboriginal heritage items and places were recorded within or in close proximity to the project area.
- In the event of non-Aboriginal heritage material being identified during the proposed activity, mitigation measures would be implemented.

Cultural landscape

- The project area is within an SCA and beyond this, the nearest cultural landscape is the Greater Blue Mountains Area. Impacts to this area are not likely to be significant due to the distance and scale of the activity.

Cumulative effects

- There are existing monitoring bores at Airly Mine and both projects would contribute to the collection of groundwater data to inform any future mining related development in the area.
- Community concern about environmental impacts and employment associated with the general increase in mining related activities in the wider area. This would be addressed through ongoing community consultation.

Conclusion

The proposed activity is minor in scale and potential impacts are mainly associated with the construction stage that would be temporary lasting approximately two months (weather permitting). The groundwater monitoring bores would be operational for approximately 20 years however only the top of the piezometers would be retained following completion of drilling, geotechnical testing and partial rehabilitation. The project area is within an SCA and the borehole compounds were selected to minimise vegetation and land impacts. On balance the potential impacts would be low provided the mitigation measures identified in this REF are implemented.

1.0 Introduction

1.1 Background

Airly Mine is an underground coal mine located on the northern fringe of the western coal fields of New South Wales, approximately 40 kilometres northwest of Lithgow and approximately three kilometres north east of Capertee (figure 1.1). Airly Mine is owned and operated by Airly Coal Pty Ltd (Centennial Airly), a fully owned subsidiary of Centennial Coal Company Limited.

Centennial Airly proposes to drill up to five exploration boreholes at Airly Mine, within A232 (the A232 area is shown on figure 1.2). The purpose of the proposed activity is to provide geological information for the mine's geological model and, once this has been obtained, to undertake groundwater monitoring. RPS has been engaged by Centennial Coal Airly to prepare a REF to assess the potential environmental impacts of the proposed activity.

Centennial Coal Company Limited operates several coal mines in NSW. It supplies thermal and coking coal to both domestic and export markets. Approximately 60% of Centennial Coal Company's coal is supplied to the domestic market, accounting for 40% of NSW's coal fired electricity.

Under the Mining SEPP development for the purposes of mineral exploration may be carried out without development consent. The proposed activity is a Category 3 activity under A232. Therefore, it is to be assessed under Part 5 of the EP&A Act and such activities require an REF prepared in accordance with Department guidelines. This REF has been prepared in accordance with ESG2: Environmental Impact Assessment Guidelines, for exploration, mining and petroleum activities subject to Part 5 of the EP&A Act (DTIRIS, 2012).

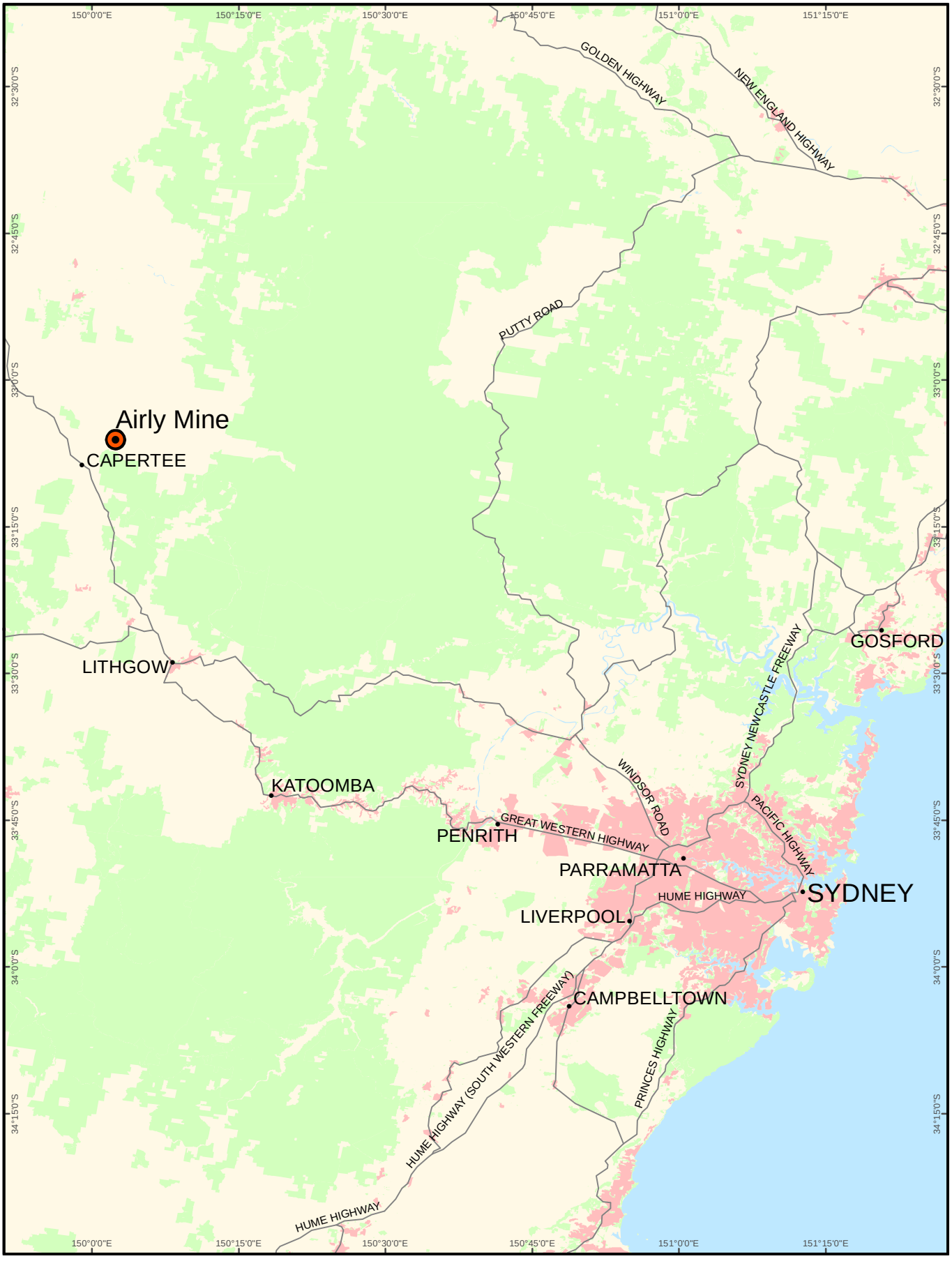
This REF has also been completed to:

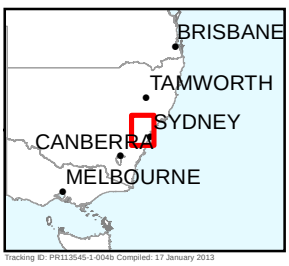
- Assist DTIRIS with their consideration of the conditions of A232.
- Provide supplementary documentation for a Conservation Risk Assessment, required under the NP&W Act due to the project area being within an SCA.
- Accompany a surface disturbance notice to DTIRIS.

1.2 Structure of REF

The structure of the REF is as follows:

- **Section 1** Introduces the proposed activity.
- **Section 2** Describes the proposed activity, consultation undertaken, justification of the activity, alternatives and the mitigation strategy.
- **Section 3** Describes the site.
- **Section 4** Describes the existing environment.
- **Section 5** Discusses the relevant planning legislation.
- **Section 6** Assesses the potential environmental impacts of the proposed activity and identifies mitigation measures.
- **Section 7** Provides a summary of the impacts.
- **Section 8** Concludes the REF.
- **Section 9** Statement of commitments.





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N

10 0 10 20

Kilometres

APPROX SCALE 1,000,000 @ A4

GDA 1994

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

DATA SOURCES

Base topographic data © Commonwealth of Australia (Geoscience Australia) 2006. NSW Estates, NSW Government (OEH), 2012

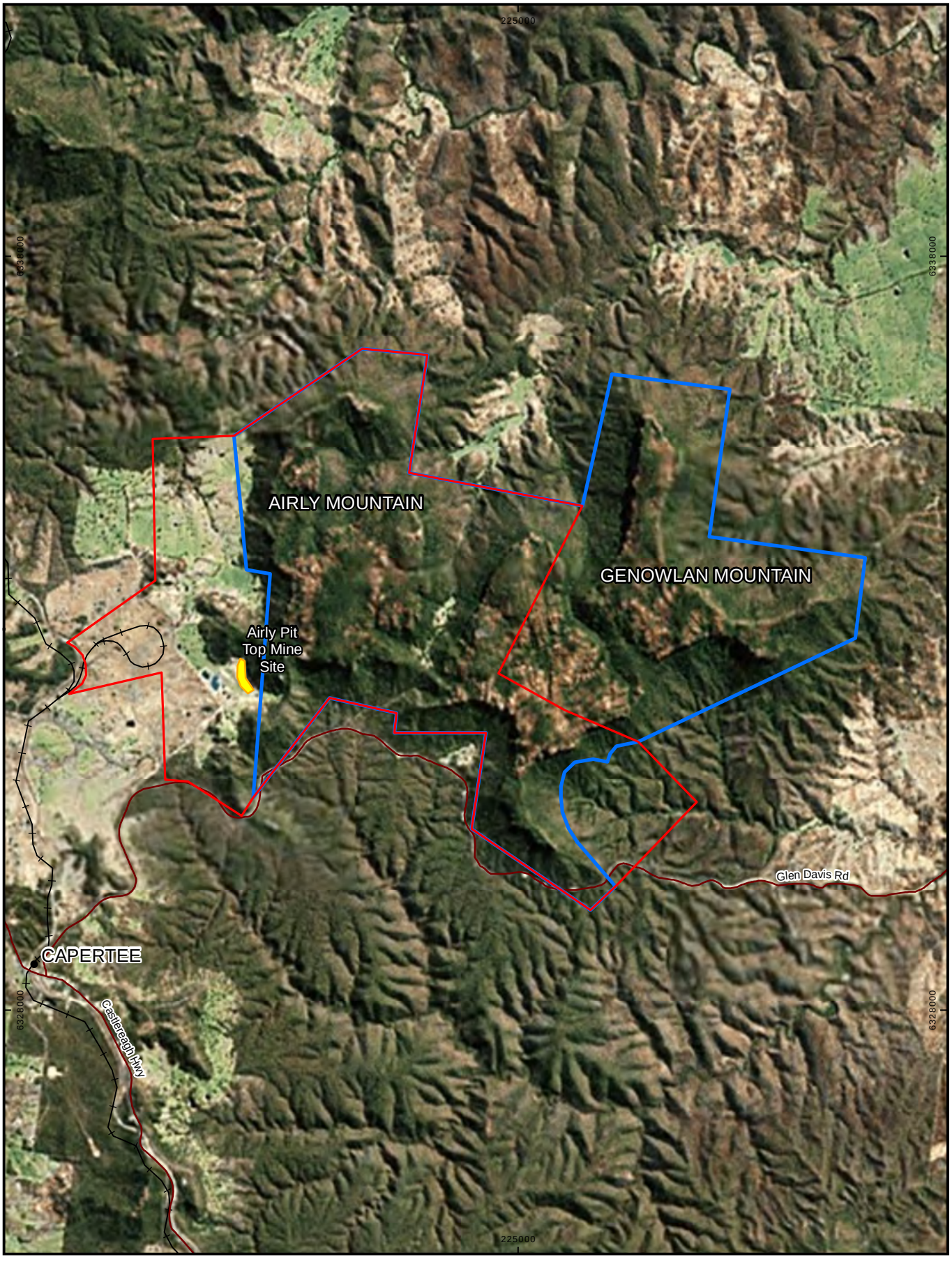
LEGEND

- City / Town
- Airly Mine
- Road
- Built Up Area
- State Forest / Reserve / Park
- Ocean / Watercourse

RPS

FIGURE 1-1

Regional Location Map



Tracking ID: PR113545-1-004b Compiled: 16 January 2013

N

500 0 500 1,000

Metres

APPROX SCALE 70,000 @ A4

GDA 1994 MGA Zone 56

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DATA SOURCES

Base topographic data © Commonwealth of Australia (Geoscience Australia) 2006. NSW Estates, NSW Government (OEH), 2012

LEGEND

- Town
- Main Road
- Railway
- ML 1331 Boundary
- A232 Boundary
- Pit Top

RPS

FIGURE 1-2

Airly Mine

2.0 The Proposed Activity

2.1 Summary of the activity

Details of the proposed activity are provided in Table 2.1.

Table 2-1 Details of the proposed activity

Item	Details
Authorisation/title number	A232
Titleholder	Centennial Airly Pty Ltd
Proponent and Operator	Centennial Coal Airly Pty Ltd
Activity type	Coal exploration and groundwater monitoring boreholes
Activity scope	Construction of up to five boreholes (ARP06, ARP07, ARP08, ARP09 and ARP10) for geotechnical investigation of the potential coal resource and groundwater monitoring. Clearance of vegetation regrowth along the currently overgrown track to ARP06 and ARP10. Potential upgrade of small sections of the existing track to ARP07, ARP08 and ARP09. Five borehole compounds of a maximum of 30 metres by 30 metres represents approximately 0.45 hectares of potential ground disturbance. Vegetation clearance of approximately 0.3 hectares along the existing overgrown track to ARP06 and ARP10 and small areas for any required for upgrades to existing track to ARP07, ARP08 and ARP09. Geotechnical sampling followed by partial rehabilitation of the borehole compounds. Installation of piezometers and undertaking of groundwater monitoring over an anticipated 20 year period. Decommissioning and full rehabilitation.
Activity location	Airly Mine, NSW Lot 7002 DP 1058210
Activity duration	Two months for the construction of the boreholes and partial rehabilitation. Approximately 20 years for the operation of the piezometers for groundwater monitoring.
Type of approval being sought	EP&A Act, Part 5

2.1.1 The project area

References to 'the project area' mean the five borehole compounds, the track to ARP6 and ARP10 to be subject to vegetation trimming and the track to ARP07 and ARP08 that may be subject to upgrades to enable vehicular access to the borehole compounds. These are shown on figure 2.1.

2.2 Regional location

As stated in section 1.1 and with reference to figure 1.1 and figure 1.2, Airly Mine is located approximately three kilometres north east of Capertee. The project area is located within A232. The majority of the project area is also within Mining Lease ML1331 although ARP09 is outside the ML1331 area. It is within the Lithgow Local Government Area (LGA).

The project area is within the Mugii Murum-ban SCA.

2.3 Stakeholder consultation

2.3.1 Community consultation

Three community information sessions have been held by Centennial for the future Airly Mine Extension Project. This would be subject to a separate application for approval and an associated Environmental Impact Statement (EIS). One of the purposes of the proposed boreholes (the subject of this REF) is to provide groundwater data for this future application for the Airly Mine Extension Project.

The community information sessions were advertised in the Lithgow Mercury and the Mudgee Guardian and local residents were informed via a letterbox drop in Capertee, Glen Alice and Glen Davis comprising Centennial Coal's newsletter. The sessions were held as follows:

- Saturday 3 November 2012, 9am to 1pm at the Capertee Hall, Capertee
- Saturday 10 November 2012, 9am to 1pm at the Glen Alice Hall, Glen Alice
- Saturday 17 November 2012, 9am to 1pm at the Wallerawang Country Women's Association Hall, Wallerawang

Attendees included councillors from Mid Western Regional Council and Lithgow City Council, neighbouring landholders, local Aboriginal community representatives and local residents.

Ten feedback forms were completed by attendees of the community information sessions. The forms requested feedback on the principal issues of concern in relation to the Airly Mine Extension Project and the design considerations that Airly Mine should address. Feedback of relevance to the proposed activity includes:

- Groundwater was identified most frequently (six responses) as a principal issue of concern.
- Other principal issues of concern included surface water (four responses), heritage (four responses), ecology (three responses), soils (two responses), noise (one response), dust (one response) and all environmental issues (one response).
- Design considerations that Airly Mine should address include:
  - Keeping the SCA open to the public.
  - Preservation of non-Aboriginal and Aboriginal heritage.
  - Ecology in conservation areas.
  - Groundwater and surface water quality, quantity and management.
  - Avoid changes to surface and groundwater flows.

It is notable that groundwater was identified most frequently as a principal issue of concern and referred to in relation to design issues for the separate Airly Mine Extension Project. The proposed activity would address this issue by enabling the collection of groundwater baseline data to effectively inform the future work associated with the Airly Mine Extension Project.

A Capertee Progress Association meeting was held in November. This was attended by community representatives. Centennial Coal's newsletter was tabled and attendees were advised that an REF was being prepared for proposed boreholes on Genowlan Mountain.

2.3.2 Government consultation

Government consultation undertaken is identified in Table 2.2.

Table 2-2 Government consultation

Government department	Date consulted	Method	Purpose	Feedback received
DTIRIS, Division of Resources and Energy	November 2012	Telephone conversation	Centennial advised that an REF was being prepared for proposed boreholes on Genowlan Mountain.	No issues raised.
NSW National Parks and Wildlife Services (NPWS)	May 2012	Email correspondence about access issues at Genowlan Mountain.	Centennial advised that NPWS tracks may need to be used to undertake general groundwater monitoring.	No issues raised.

2.4 Justification of activity

The objectives of the proposed activity are:

- To determine the position, quality, thickness and extent of the coal resource for inclusion in the mines geological model for the purposes of mine planning.
- To obtain geotechnical data on the strata associated with the coal seam for mine design purposes.
- To obtain baseline data on and continue monitoring groundwater as part of Airly Mine's water monitoring program.

The project is necessary to determine the potential coal resource in the area and to provide sufficient baseline groundwater data to inform any future applications by Centennial Airly.

2.5 Analysis of alternatives

The following types of alternatives were considered:

- Alternative methods of obtaining data.
- Alternative locations.
- Alternative sites.

2.5.1 Alternative methods of obtaining data

In order to obtain the geotechnical and groundwater data sought there are no other feasible methods.

2.5.2 Alternative locations

The boreholes need to be located to target potential aquifer recharge areas of the Grotto and Genowlan Creek therefore alternative locations were not considered further.

2.5.3 Alternative sites

The boreholes need to be located in a manner that is sufficiently spaced in order to monitor the different areas within the lease and authorisation area. Potentially suitable sites that would require a high proportion of disturbance to vegetation and soil were rejected in favour of those that would minimise such disturbance. The proposed borehole compounds are located off existing tracks and on areas with minimal vegetation.

2.6 Description of the activity

2.6.1 Borehole locations

The locations of the five proposed boreholes are identified on figure 2.1.

The boreholes would be drilled in stages. Initially, two deep boreholes and one shallow borehole (ARP09) would be drilled. Depending on the results of the drilling, a second stage would comprise the drilling of one or both of the remaining two boreholes.

Once the geotechnical data has been obtained, piezometers for groundwater monitoring would be installed and the types of piezometers and their targeted aquifers are also identified in Table 2.3.

Table 2-3 Proposed boreholes (source: RPS Aquaterra, 2013)

Borehole	Easting	Northing	Depth (m)	Piezometer Type	Targeted aquifers
ARP06	225326	6331810	300	Vibrating wire	Narabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP07	224692	6332554	300	Vibrating wire	Narabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP08	224967	6333826	300	Vibrating wire	Narabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP09	225359	6332766	20	Standpipe	Quaternary Alluvium
ARP10	225139	6332116	300	Vibrating wire	Narabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams

2.6.2 Site preparation

The project area would be accessed via existing tracks leading from Glen Davis Road. The borehole compounds for ARP07, ARP08 and ARP09 are located beside an existing track. This track may need to be upgraded to enable vehicular access. This upgrading may comprise clearing of regrowth, trimming of existing trees and regrading of the track. In particular, rough sections of track and berms along the track may need to be regraded. Boreholes ARP06 and ARP10 are located approximately 500 metres to 1000 metres along a currently overgrown track. The vegetation growth along this track would need to be cut back to provide a clear track width of up to three metres to enable vehicle access. Therefore, this could lead to an area of approximately 3,000 square metres (0.3 hectares). Therefore this track upgrading work would need to be undertaken prior to the construction of the boreholes to enable vehicular access.

The compound for each of the five boreholes would have a maximum area of 30 metres by 30 metres. This comprises a total area of approximately 0.45 hectares. Locations for boreholes have been selected so that they have minimal slope and therefore surface run off is not expected. Where necessary, drainage would be implemented to ensure the working area remains free of excess water. Above ground tanks to capture and recirculate water and drilling mud (refer section 2.6.4) would be installed where required and fully lined to protect the underlying aquifers.

As borehole locations were chosen to minimise land disturbance and vegetation clearance minimal soil disturbance and vegetation clearance is required for the borehole compounds.

2.6.3 Drilling rig and equipment

The main plant and equipment to be used during drilling activities would be:

- Track mounted drill rig.
- Track mounted drill rig carrier.
- Track mounted water carrier.
- Light vehicles.
- Bulldozer.
- Grader.

2.6.4 Drilling methodology

One borehole would be drilled at each borehole compound. From the ground surface to a depth of 15 metres the width of the boreholes would be 125 millimetres. Below a depth of 15 metres the width of the boreholes would be 100 millimetres.

In the event that drilling mud is required to stabilise the boreholes, only biodegradable additives would be used. These typically comprise bentonite which is a naturally occurring matter.

Above ground tanks would be used for the collection and circulation of drilling mud and water. The cuttings would be brought to the surface during drilling and would be deposited in a tub adjacent to the drill rig. The drilling mud would then be pumped to a tank that would overflow into adjacent tanks to drop coarse and fine sediments out of the solution. The drilling mud would then be recycled and pumped back down the borehole. The sediments would be removed via a suction pump and placed into a 1000 litre intermediate bulk container (IBC). The IBC would be transported to the Airly Mine site for storage until it is collected by the mine site waste management contractor. The drilling mud and cuttings would be stored in a bunded area within the borehole compounds. Two poly tanks would be located at the borehole compounds to store water for drilling purposes. A typical layout of a borehole compound is shown in figure 2.2.

There would be two sediment fences located downslope of the borehole as shown on figure 2.2.

Each borehole would be flushed at the completion of drilling, but prior to geophysical logging, to remove any remaining drilling mud from the walls of the borehole. At the completion of drilling and flushing each borehole, the borehole would be geophysically logged.

Following the geophysical logging, the piezometers would be installed. Vibrating wire piezometers would be installed at boreholes ARP06, ARP07, ARP08 and ARP10 as soon as practicably possible after drilling is completed. Wires are set adjacent to the aquifers to be monitored and are grouted into place. The boreholes would be fully grouted with a bentonite-cement mixture (except at those horizons that would be monitored with vibrating wire piezometers) to ensure a complete seal. Due to the grouting of the boreholes there would be no risk from aquifer draining, cross contamination of aquifers or gas emission at the surface. Borehole ARP09 would be installed as a standpipe piezometer and would be shallow. It would be sealed with bentonite above a gravel pack to provide a barrier to the vertical migration of water to/from the target aquifer.

A locked monument box containing monitoring data loggers would be installed over each borehole.

2.6.5 Site water requirements

The quantity of water anticipated to be used for drilling is approximately 200,000 litres per borehole. In the event that all five proposed boreholes are drilled this would therefore be approximately 1,000,000 litres. Water sources are anticipated to be one or more of the following:

- an existing dam located adjacent to the Nissan Hut at the former diamond mine site on top of Genowlan Mountain (refer figure 2.3).
- an existing dam located near a residential property at the base of Genowlan Mountain (refer figure 2.3).
- a bore on Centennial property (refer figure 2.3).
- The existing water supply for process water at Airly Mine.

Centennial Airly would need to apply for the appropriate licenses once the water source has been determined and prior to utilising these sources. Water for drilling purposes would either be delivered by vehicle to each borehole compound or pumped to each borehole compound. If the water is pumped a poly tank to store water would also be installed on the Centennial property that provides access to Genowlan Mountain. A pump would be installed at the tank and a poly pipeline (approximately100mm diameter) would be laid along one of the track shoulders of the existing vehicle track to a second poly tank located on a wide section of track shoulder at the top of Genowlan Mountain. A pump would also be located at this tank and poly pipe would be laid along one of the track shoulders of the existing vehicle track to each borehole compound.

2.6.6 Borehole completion and rehabilitation

Once the piezometers have been installed, the rest of the drill pad would be partially rehabilitated to their pre-operational state. Drilling fluids would be removed from the borehole compounds and pits would be infilled. Rehabilitation would follow best practice management principles and may include grading, replacing topsoil, reseeding disturbed ground and controlling weeds.

Any berms that needed to be regraded along the track to boreholes ARP07 and APR08 would be reinstated to their original grades.

The heads of the piezometers would remain in place during their useful life (refer section 2.6.9). Decommissioning and full rehabilitation would be undertaken following the completion of the useful life of the piezometers. This would comprise the removal of the locked monuments.

2.6.7 Sampling and testing

The purpose of the activity is to drill boreholes to first obtain information about the potential coal resources and then use the boreholes as groundwater monitoring bores.

Groundwater would not be extracted.

The data loggers would need to be downloaded from each piezometer periodically (it is currently anticipated that data would be downloaded every two to three months). This would involve a member of staff driving to each to take the reading. A site inspection for each borehole site would be undertaken approximately once a month for rehabilitation monitoring purposes.

2.6.8 Staff and working hours

Up to ten workers would be required for the construction of the boreholes. The hours of construction would be:

- 7.00am to 7.00pm Monday to Sunday.

During operation of the piezometers, members of staff would travel to the piezometers to take readings and/or inspect the sites as described in section 2.6.7.

2.6.9 Timing and duration

Activities are anticipated to commence in quarter 1 of 2013. Drilling of the boreholes would take approximately two weeks each once the drill sites have been prepared. All the proposed boreholes would be constructed and partially rehabilitated within two months (weather permitting).

The boreholes are currently anticipated to be operational for groundwater monitoring for approximately 20 years.

Whilst most of the borehole site rehabilitation would be undertaken following completion of construction of the boreholes, full rehabilitation would be undertaken following the useful life of the piezometers.

2.7 Mitigation strategy

Centennial has a Pollution Incident Response Management Plan that is implemented for Airly Mine. This identifies the key actions to minimise the occurrence of a pollution incident and manage a pollution incident if one occurs.

The proposed activity would be carried out in accordance with the mitigation measures and statement of commitments provided in sections 6 and 8 of this REF.

Strategies for the protection of water sources, managing wastes and noise are identified in section 6.

2.8 Access arrangements

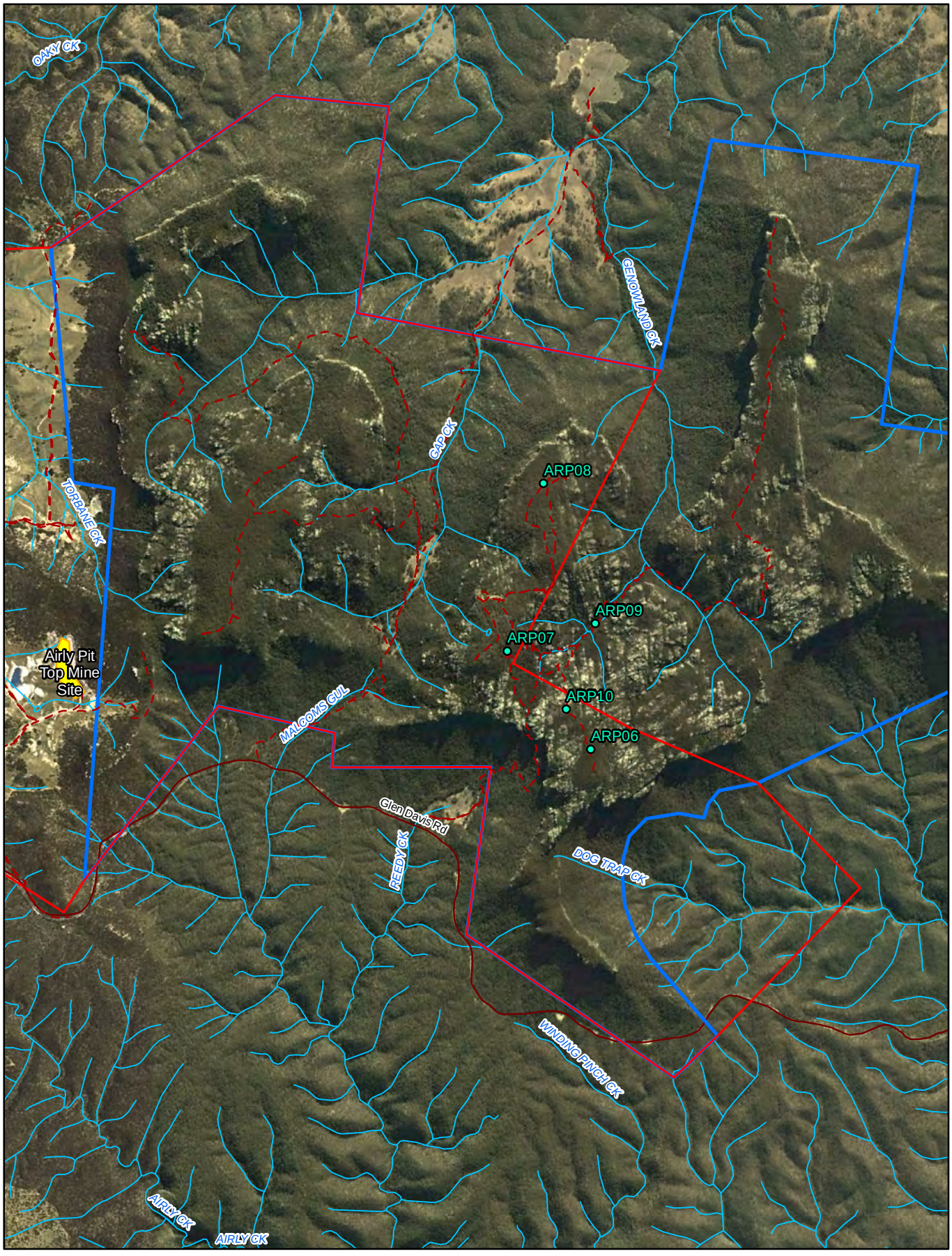
Under the *Mining Act 1992* (Mining Act), access arrangements are to be agreed in writing between the title holder and each landholder (refer section 5.1). The landholder is the NPWS. Access arrangements will be agreed with the NPWS prior to the commencement of the proposed activity.

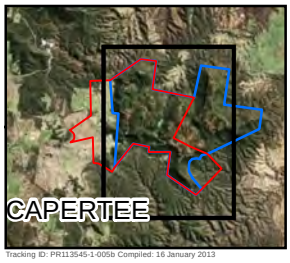
2.9 Other approval requirements

The need for other approvals, licenses and further assessments and documentation is outlined in section 5.

The following would be required:

- Prior to drilling, a monitoring bore licence application would need to be lodged with the NSW Office of Water under Part 5 of the *Water Act 1912*.
- Water access licenses as appropriate.
- Conservation Risk Assessment under the NP&A Act.
- Surface Disturbance Notice form under A232.





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Metres

APPROX SCALE 40,000 @ A4

GDA 1994 MGA Zone 56

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DATA SOURCES

Base topographic data © Commonwealth of Australia (Geoscience Australia) 2006. NSW Estates, NSW Government (OEH), 2012

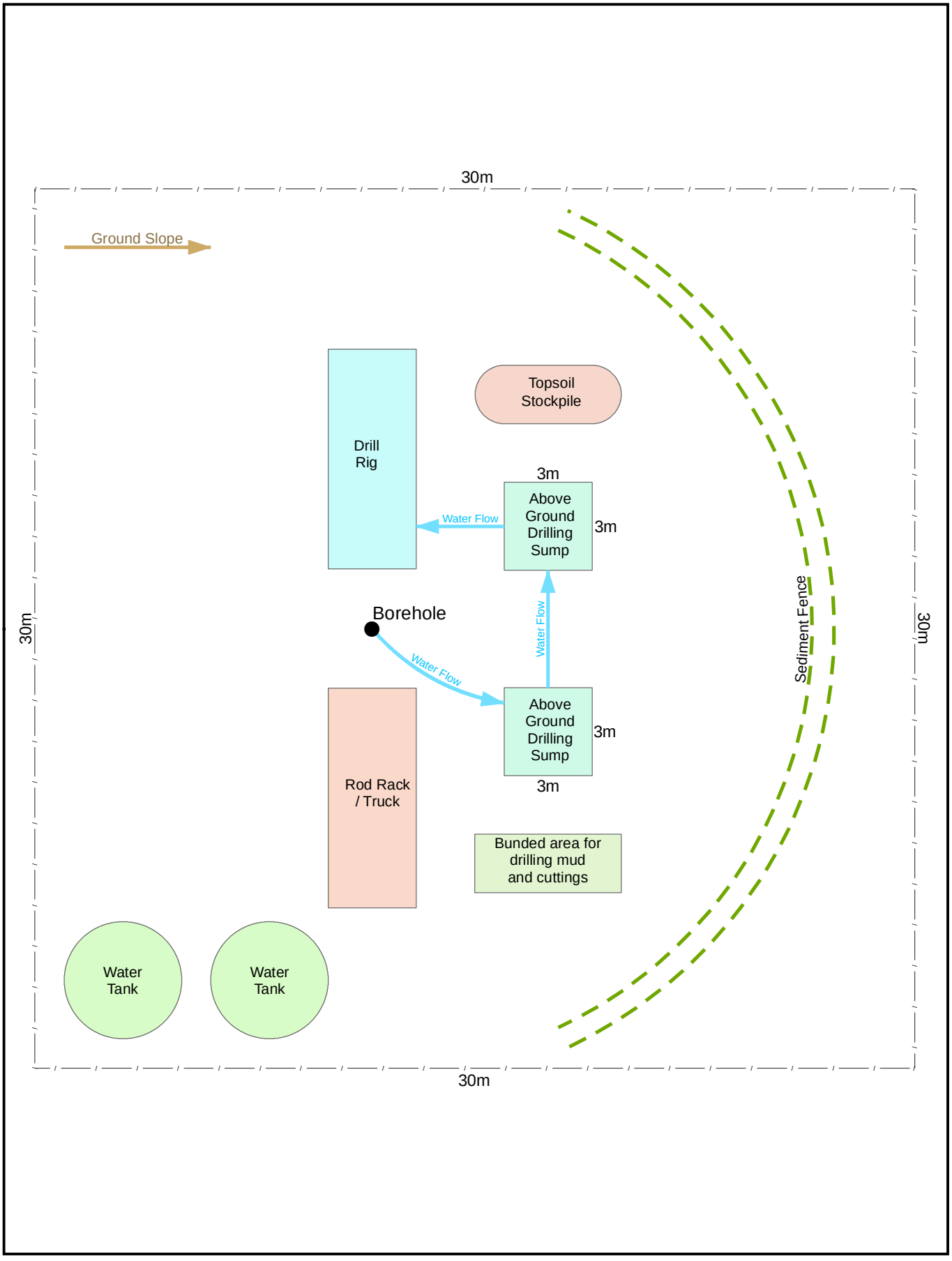
LEGEND

- Proposed Borehole
- Main Road
- Track / Unformed Road
- Railway
- ML 1331 Boundary
- A232 Boundary
- Pit Top

RPS

FIGURE 2-1

Project Area



1 0 1 2
Metres

APPROX SCALE 180 @ A4

LEGEND

- Borehole
- Fence
- Sediment Fence

RPS

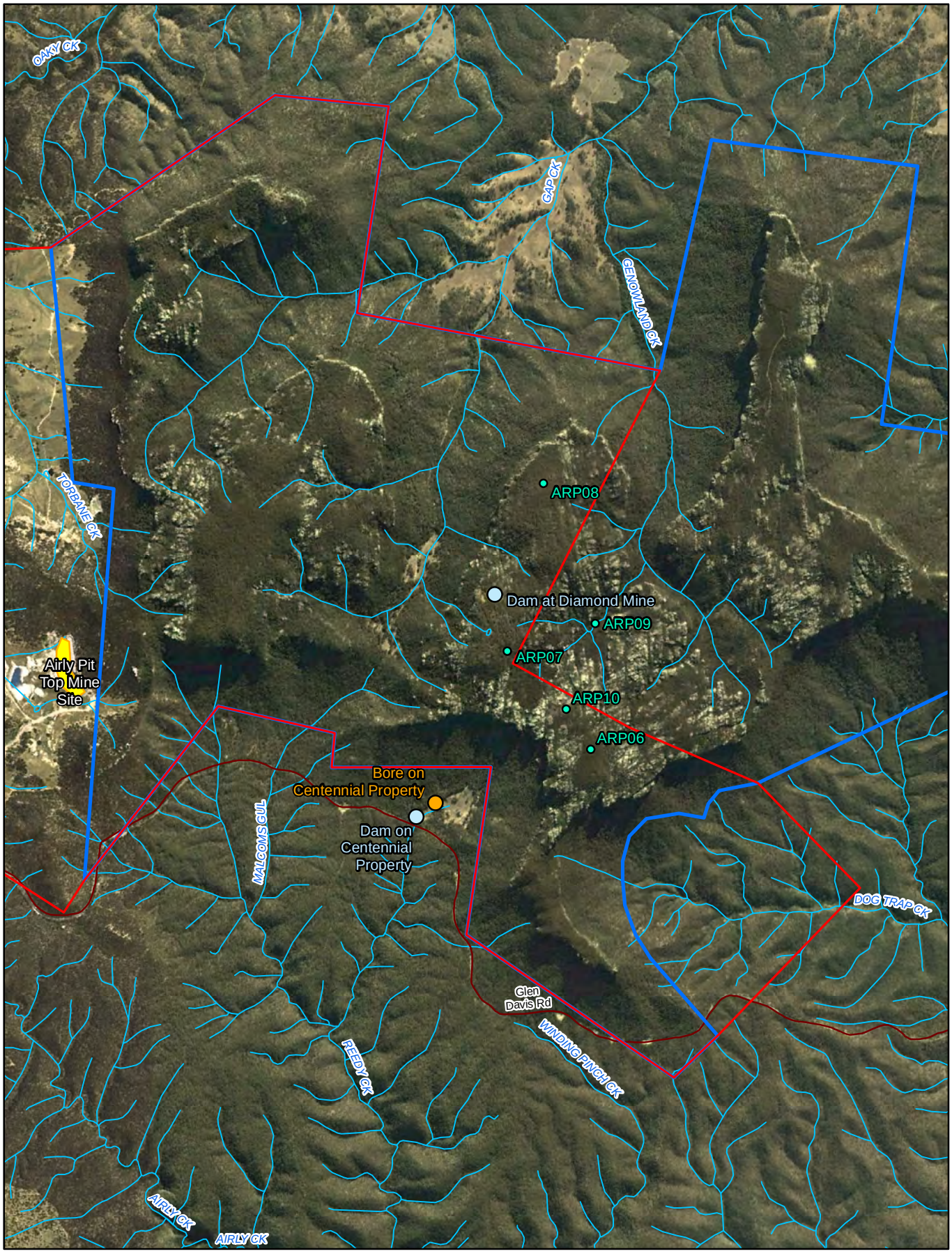
FIGURE 2-2

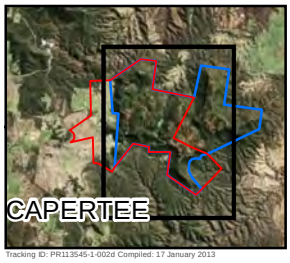
Typical Borehole Compound Layout

DATA SOURCES

RPS 2012.

Tracking ID: PR113545-1-003c Compiled: 16 January 2013





Tracking ID: PR113545-1-002d Compiled: 17 January 2013

N

500 0 500 1,000

Metres

APPROX SCALE 40,000 @ A4

GDA 1994 MGA Zone 56

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DATA SOURCES

Base topographic data © Commonwealth of Australia (Geoscience Australia) 2006. NSW Estates, NSW Government (OEH), 2012

LEGEND

- Proposed Borehole
- Existing Borehole
- Dam
- Local Road
- Main Road
- Railway
- Watercourse
- ML 1331 Boundary
- A232 Boundary
- Pit Top

RPS

FIGURE 2-3

Water Sources

3.0 The Site

3.1 Site description

Airly Mine is located in the Lithgow LGA approximately three kilometres north east of the township of Capertee (figure 1.1).

The project area comprises compounds within which the bores would be located and the area of existing track linking to APR06 and ARP10 that may require vegetation trimming and the track to ARP07 and ARP08 that may require upgrading to enable vehicular access. Coordinates of the boreholes are provided in table 2.3.

Site photographs are provided in plates 3.1 to 3.5.

Plate 3.1: View of proposed borehole location ARP06 facing south

Plate 3.2: View of proposed borehole location ARP07 facing south

Plate 3.3: View of proposed borehole location ARP08 facing south

Plate 3.4: View of proposed borehole location ARP09 facing north

Plate 3.5: View of proposed borehole location ARP010 facing north

3.2 Site plan

A plan identifying the project area is provided in figure 2-1.

4.0 The Existing Environment

4.1 General description

4.1.1 Climate and weather

The Bureau of Meteorology (BoM) weather station considered to be most representative of the project area is Running Stream (Brooklyn) for rainfall and Lithgow (Cooerwull) for temperature. As shown in Table 4.1 the highest rainfall is during the summer months. Based on maximum and minimum mean temperature records the warmest month is January and the coolest month is June.

Table 4-1 Climate Data (Source: BoM)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Max Temp (°C)	27.8	25.4	23	19.2	16.4	12.4	10.9	14.2	18	21.8	26	25.9
Mean Min Temp (°C)	12.1	12.1	8.3	5.5	0.7	-0.7	-0.4	-0.2	3.3	5.4	8.6	9.9
Mean Rainfall (mm)	82.3	80.2	69.5	60.3	62	69.3	69.1	70.6	62.4	72.7	76.4	78.9

4.1.2 Topography

The region is rich in natural resources, especially coal and limestone. The regional topography comprises the Hawkesbury Napean River catchment. Within this area the northern valleys include the sandstone valleys of the Capertee and Wolgan rivers.

The Capertee and adjacent Wolgan and Lithgow Valleys are dominated by gently undulating to rolling hills on Permian and Devonian sedimentary sequences and minor Carboniferous granites. There are sandstone cliffs and small isolated mesa-like landforms comprised of Narrabeen Group sandstones (King, 1993).

The project area is located on elevated ground on Genowlan Mountain.

4.1.3 Vegetation

The proposed activity would be within Mugii Murum-ban SCA. This is part of an area of continuous forested bushland that is associated with Airly State Forest, approximately 5.9 kilometres to the north-east and the Gardens of Stone National Park, over one kilometre to the south.

The borehole compounds are located in previously cleared areas adjacent to existing or disused tracks to minimise the removal of vegetation.

A flora and fauna assessment has been undertaken for the proposed activity (Appendix 1). The following vegetation communities are identified.

Table 4-2 Vegetation community mapping

Location	Vegetation community
ARP09	MU 4 Sheltered Gully Brown Barrel Ferny Forest
ARP07 and 08	MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest
ARP06	MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest
ARP010	MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath

None of these communities are listed as being threatened under the TSC Act or the EPBC Act.

4.1.4 Soil

The project area is located within the Cullen Bullen Soil Landscape which is dominated by dark reddish brown sandy loam material overlying hard-setting, bleached and massive fine sandy clay loam subsoil (King, 1993). The soils data implies that Sodosols exist within the area due to contrasts in texture and poorly structured subsoils.

Strategic Agricultural Land (SAL) is highly productive land that has both unique natural resource characteristics as well as socio-economic value. The site is not mapped as SAL.

According to the Land Capability Mapping prepared by DECCW (1989), the project area is classified as cliffs, lakes or swamps and land unsuitable for agricultural and pastoral production.

4.1.5 Existing land uses

Protected areas in the vicinity of the project area are identified in figure 4.1.

Environmentally sensitive areas of state significance are defined under the Mining SEPP. Table 4.3 below identifies that the project area is within the Mugii Murum-ban SCA and is therefore within an environmentally sensitive area. The Mugii Murum-ban SCA was created in 2011 and comprises 3,650 hectares.

SCAs are lands reserved to protect and conserve significant or representative ecosystems, landforms, natural phenomena or places of cultural significance while providing opportunities for sustainable visitation, enjoyment, use of buildings and research. A key difference between the management, objectives and principles of national parks and SCAs is that mineral exploration and mining may be permitted in SCAs (Office of Environment and Heritage (OEH), 2012).

The Gardens of Stone National Park is located over one kilometre to the south of the project area and Capertee National Park is located approximately three kilometres to the north west. However, the project area is not within a national park.

Table 4-3 Environmentally sensitive areas

Is the proposed activity located on or within any of the following:	Yes/No
Coastal waters of the State?	No
Lands protected under SEPP14 – Coastal Wetlands?	No
Lands protected under SEPP26 – Littoral Rainforests?	No
Aquatic reserves dedicated under the *Fisheries Management Act 1994* or a marine park under the *Marine Parks Act 1997*?	No
Wetland areas dedicated under the Ramsar Wetlands Convention?	No
A World Heritage Area declared under the World Heritage Convention?	No
Land identified in an environmental planning instrument as being of high Aboriginal cultural significance?	No
An area reserved or dedicated under the *National Parks and Wildlife Act 1974*?	Yes
Land, places, buildings or structures listed on the State Heritage Register?	No
Is the proposed activity located within land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for preservation of flora, fauna, geological formations or for other environmental protection purposes?	Yes
Land identified as being critical habitat under the *Threatened Species Conservation Act 1995* or Part 7A of the *Fisheries Management Act 1994*?	No

4.1.6 Availability of services

No services are required for the proposed works.

4.2 Description of surface and groundwater sources

4.2.1 Surface water

Airly Mine is located in the Hawkesbury-Nepean river system catchment. The confluence of Genowlan Creek with Capertee River is located 15 kilometres to the north east. The Capertee River flows in an easterly direction, discharging into Hawkesbury–Nepean river system, which discharges to the east coast.

A number of tributaries from higher altitudes on the eastern slopes of the Great Dividing Range join the Capertee River. This flows through mostly steep forested areas and cleared farmland. The upper reaches of the Capertee River are characterised by rock and gravel bottom with considerable sedimentation.

Genowlan Creek is a tributary of the Capertee River and runs from west to east. The creek originates as the spring at a location called the Grotto close to the top of Genowlan Mountain. At the location called The Oasis, 300 metres downstream, the anecdotal evidence indicates that the flow is on average 2.2L/s while in drought periods the flow decreases to around 1L/s. The flow at this location is persistent and not known to cease.

Further information about surface water is provided in the surface and groundwater assessment (Appendix 2).

4.2.2 Groundwater

There are five main hydrogeological units in the project area:

- Minor Quaternary alluvial aquifers associated with ephemeral creeks.
- Triassic Sandstone of the Narrabeen Group (overburden sediments).
- Coal seams within the Permian Illawarra Coal Measures – namely Middle River, Irondale, Lidsdale and Lithgow.
- Permian interburden sediments (shale, claystone, siltstone and sandstone layers between the coal seams).
- Shoalhaven Group.

Further information about groundwater is provided in the surface and groundwater assessment (Appendix 2).

4.2.3 Water sources

Currently surface water and groundwater within the project area potentially affected by drilling is not used for any purpose. Records of the registered groundwater use from bores in the area surrounding the Airly Mine were sourced from the NSW Office of Water (NOW) register. The database contains records for 32 registered bores within 10 kilometres radius from the Airly Mine. The area is remote and the closest groundwater user (GW035684 stock and domestic) is located five kilometres to the east of the project area.

The following Water Sharing Plans under the *Water Management Act 2000* (WMA) are as follows:

- Water Sharing Plan for Greater metropolitan region unregulated river water sources.
- Water Sharing Plan for Greater metropolitan region groundwater sources.

Further information is provided in Section 5.10.

Under the groundwater plan, any groundwater within the Capertee area falls under the Sydney Basin North Groundwater source. The area is bounded by the Colo and Hawkesbury River to the south, Kulnura-Mangrove Mountain to the east, the Hunter Range to the north and Great Dividing Range to the west.

There are no known surface water users within the area that would be affected by the proposed drilling activity.

4.3 Description of threatened species, populations and ecological communities

4.3.1 Flora

Flora surveys were undertaken as part of the flora and fauna assessment (Appendix 1).

One threatened flora species, *Prostanthera stricta* (Mount Vincent Mintbush), was observed within or in the vicinity of borehole compounds ARP06, ARP07 and ARP08. *Prostanthera stricta* is listed as Vulnerable under the TSC Act and EPBC Act. This species was observed at a large number of locations from approximately 300 metres south of ARP07 to approximately 150 metres north of ARP08. The observed extent of this species was approximately 1.5 kilometres north to south and approximately 400 metres east to west. The population in this area was in excess of 3,000 individuals and the full extent of this population is expected to be much larger. This species has been assessed with a seven part test (Appendix 1).

Pultenaea sp. Genowlan Point has also been subject to a seven part test (Appendix 1). Whilst this species has the potential to occur within the wider locality, it was not observed within the borehole compounds or along any of the tracks which may need vegetation clearance or upgrading. The proposal is located outside the known Genowlan Point distribution of this species.

4.3.2 Fauna

4.3.2.1 Fauna habitat

Fauna habitat is identified in the flora and fauna assessment (Appendix 1).

Habitat occurring at each of the borehole compounds varied from a low, rocky heath at ARP10 to a dry sclerophyll, open forest habitat at ARP06, ARP07 and ARP08 and a more sheltered, wet sclerophyll forest habitat at ARP09. Forested areas at ARP06, ARP07, ARP08 and ARP09 may provide potential habitat in the form of hollow bearing trees for hollow-dependant fauna species including arboreal mammals and microchiropteran bats, however a very sparse tree layer within the dry and exposed rocky heath community limits its habitat value for arboreal fauna species. Two hollow bearing trees were observed in the vicinity of APR08. One was a Dead Stag and the other was a *Eucalyptus mannifera* with a diameter at breast height of 30 centimetres. Each of these trees contained a single small hollow of two to four centimetres which is considered to be suitable for microchiropteran bat species.

Suitable habitat occurs across forested areas for ground-dwelling mammals including the threatened Spotted-tailed Quoll (*Dasyurus maculatus*) as well as threatened woodland bird species including the Scarlet Robin (*Petroica boodang*), Black-chinned Honeyeater (*Melithreptus gularis gularis*) and Swift Parrot (*Lathamus discolor*). The prominence of *Allocasuarina littoralis* (Black She-oak) within the canopy layer at ARP06 and evidence of previous foraging activity suggests that this area has been utilised as foraging habitat by the threatened Glossy Black-Cockatoo (*Calyptorhynchus lathami*).

One preferred Koala feed tree species (*Eucalyptus punctata*) occurs within the vegetation community at ARP06, however the density of this species (<15% of the canopy layer) prevents it from being listed as potential habitat for the Koala as defined in State Environmental Planning Policy 44 Koala Habitat Protection (SEPP44) (refer section 5.12).

APR09 is located adjacent to a permanent water source and therefore may contain suitable habitat for threatened frog species, the Booroolong Frog (*Litoria booroolongensis)*. Additionally, the exposed rocky sandstone habitat favoured by threatened reptile species, the Broad-headed Snake (*Hoplocephalus bungaroides)* was encountered adjacent to ARP010.

The favoured food plant of the Bathurst Copper Butterfly larvae (*Bursaria spinosa)* was recorded within the shrub layer at ARP07. However, the Bathurst Copper Butterfly has not been previously recorded within 10 kilometres of the project area. A seven part test was undertaken for *Paralucia spinifera* Bathurst copper Butterfly (Appendix 1).

4.3.2.2 Fauna species

Fauna species are identified in the flora and fauna assessment (Appendix 1).

There is potential for threatened mammal species to occur within the dense understory at ARP09, where the accumulation of forest debris and litter presents foraging and shelter opportunities for small mammals and their prey. A mature canopy and shrub layer at ARP09 also represents good foraging and shelter habitat for arboreal mammal species and insectivorous bats. However this potential is diminished within the more open forest of ARP06, ARP07 and ARP08 whilst the rocky heath at ARP10 presents little opportunities for threatened mammal species known to occur within the region. A seven part test was undertaken for threatened Microchiropteran bat species.

The wet sclerophyll forest at ARP09 provides favoured summer habitat for the threatened Gang-gang Cockatoo (*Callocephalon fimbriatum*), whilst the forested areas at ARP06, ARP07 and ARP08 provide potential habitat for threatened woodland species including the Scarlet Robin (*Petroica boodang*) and Black-chinned Honeyeater (*Melithreptus gularis gularis*). Mature, hollow-bearing trees within these areas may provide roosting and nesting habitat for threatened owl species and the arboreal mammals that largely constitute their prey, including the Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*).

The canopy layer at ARP06 was predominantly comprised of *Allocasuarina littoralis* (Black She-oak), a favoured feed tree of the threatened Glossy Black Cockatoo (*Calyptorhynchus lathami*). The discovery of chewed *Allocasuarina littoralis* cones within the groundcover provides evidence of previous foraging activity at ARP06 by the Glossy Black Cockatoo. Although this species was not directly identified at the borehole compound, previous surveys conducted by RPS have returned several records of the Glossy Black Cockatoo within the Airly Colliery exploration area. Seven part tests have been undertaken for *Calyptorhynchus lathami* Glossy Black-Cockatoo and *Callocephalon fimbriatum* Gang-gang Cockatoo

Opportunistic surveys were conducted for amphibian and reptiles within the borehole compounds, but no species were noted. Favourable habitat exists for reptiles both within the dense groundcover of ARP09 and the rocky heath that surrounds ARP10, however a lack of permanent stream habitat at the borehole compounds limits the habitat available for threatened amphibian species.

4.4 Description of Aboriginal cultural heritage values

An Aboriginal archaeological due diligence investigation has been undertaken for the proposed activity in accordance with the Due Diligence Code of Practice for the protection of Aboriginal Objects in New South Wales 2010 (refer to Appendix 3). This investigation included a desktop review of the environmental and archaeological contexts of the site and surrounding area, a search of the Aboriginal Heritage Information Management Systems (AHIMS) database maintained by OEH and a visual inspection on 22 and 23 August 2012.

The AHIMS search identified five previously recorded Aboriginal sites which are three artefact scatters, one scarred tree (over six kilometres to the west of the borehole compounds) and one rockshelter with deposit

(approximately 125 metres to the north east of ARP09). There is one recorded Aboriginal site (artefact scatter) bordering the track leading northwards from Glen Davis Road that would be used to access the proposed boreholes (refer figure 3 of Appendix 3). There are no identified Aboriginal objects or sites within the borehole compounds.

4.5 Native title claims, indigenous land use agreements and joint management arrangements

A search of the National Native Title Tribunal registers showed no applications or determinations of native title covering the project area. There are also no registered Indigenous Land Use Agreements or Joint Management arrangements over the project area.

4.6 Description of historic cultural or natural heritage values

Non-Indigenous heritage items and places are recorded in a number of ways including statutory and non-statutory registers. Federal designations include the National Heritage List and the Commonwealth Heritage List (CHL), both of which are maintained by the Department of Sustainability, Environment, Water, Population and Communities and are available to an online database, the Australian Heritage Database. Places of state significance are included on the State Heritage Register (SHR) maintained by the Heritage Branch and available on an online database, the NSW Heritage Inventory. Places of local significance are included in heritage schedules in local environmental plans (LEPs).

4.6.1 National Heritage

The National Heritage List is the lead statutory document for the protection of heritage places considered to have national importance. This list comprises Aboriginal, natural and historic places that are of outstanding national heritage significance to Australia. Listed places are protected under the EPBC Act.

A search of the National Heritage List undertaken on 24 October 2012 indicates that there is one item within the Lithgow LGA on the National Heritage List, being “The Greater Blue Mountains Area – Additional Values” as a place of national natural heritage. It includes the Wollemi, Blue Mountains, Yengo, Nattai, Kanangra-Boyd, Gardens of Stone and Thirlmere Lakes National Parks and the Jenolan Caves Karst Reserve. There are no items in the project area on the National Heritage List.

Previously the Register of the National Estate was the primary register for listing nationally significant heritage places. While the Register of the National Estate still exists in archival form, items can no longer be registered. Since February 2012 the Register no longer has statutory status. However, the Minister is still required to consider the Register when making some decisions under the EPBC Act. The Register of the National Estate was searched on 24 October 2012 and the results contain 11 heritage sites within the Lithgow LGA, however, no items are within the project area. The closest item on the Register of National Estate is the Bernina Private Cemetery located approximately three kilometres to the west of the project area.

4.6.2 State Heritage

Heritage items in NSW may be registered as significant at the state or local level. The Heritage Council has developed a set of seven criteria to help determine whether a heritage item is of State or local significance to the people of NSW. Items are assessed by the Heritage Council of NSW and if deemed eligible for listing i.e. are State significant, they are referred to the Minister for Heritage for Listing on the SHR, a statutory register of heritage items created by the NSW *Heritage Act 1977*.

Some heritage places and items that do not reach the threshold for listing on the State Heritage Register may be of heritage significance within a local government area. These places are listed by local council under their LEP and would be included on the NSW Heritage Inventory database.

The NSW Heritage Inventory database is maintained by the NSW Heritage Branch and lists items that have been identified as of State and local heritage value throughout NSW.

A search of the State Heritage Register on 24 October 2012 revealed no items of State Heritage Significance in the vicinity of the project area.

4.6.3 Section 170 Registers

Under s170 of the *Heritage Act 1977,* State Government Agencies are required to keep a list of heritage items maintained by that agency. These are known as s170 Registers. Searches of these registers were undertaken on 23 October 2012, with two items identified in the vicinity of the project area (see Table 4.4 below). The proposals would not impact on the heritage significance of the items listed below.

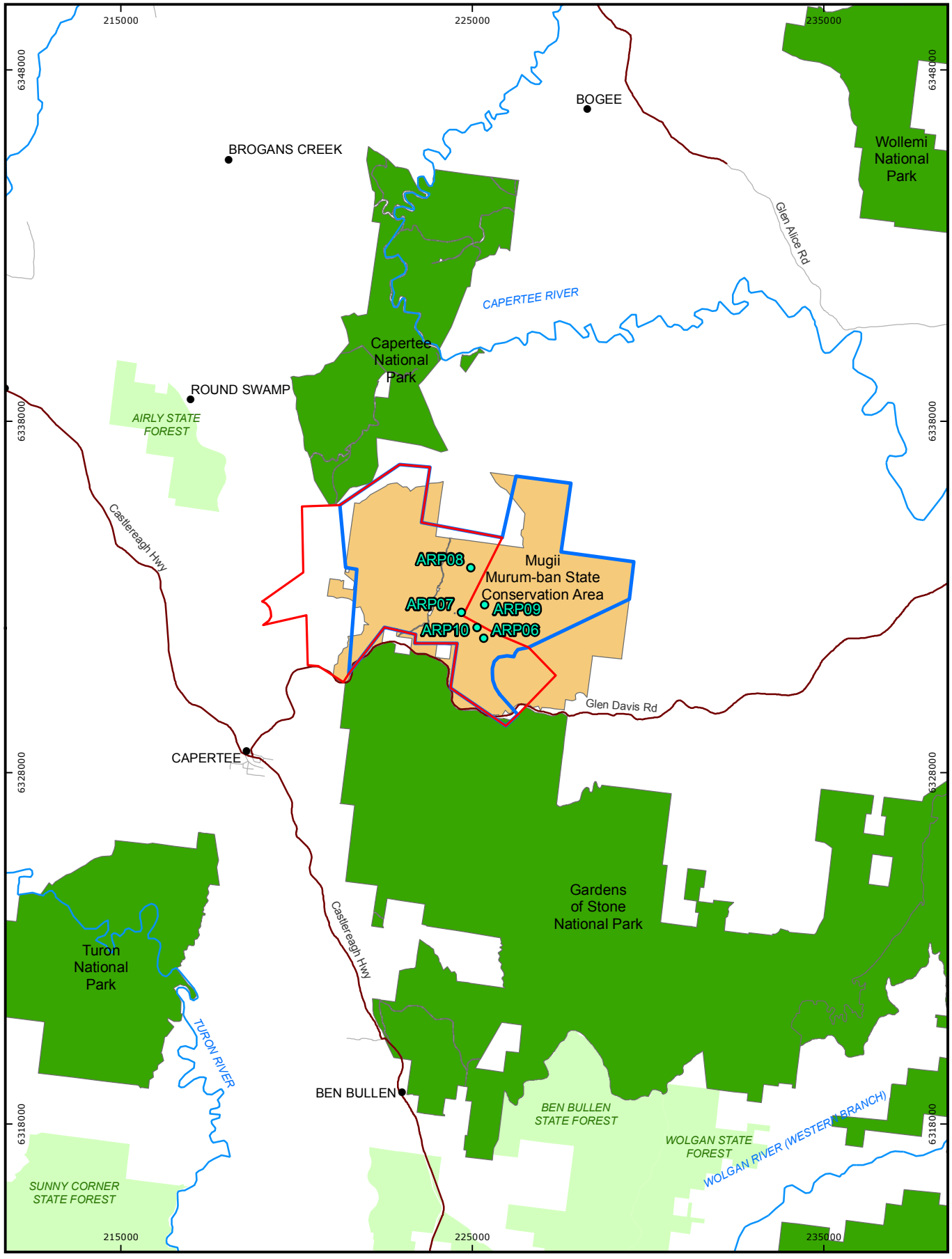
Table 4-4 Items on the s170 Register within the vicinity of the project area

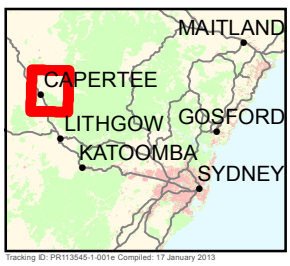
Item	Address	Relevant Agency	Significance
Capertee Police Station	Mudgee Road, Captertee	NSW Police Service	State
Capertee Railway station	Capertee	Australian Rail Track Corporation	State

Source: State Heritage Inventory

4.6.4 Local Heritage

Searches of the Heritage Branch, OEH State Heritage Inventory, and the Lithgow LEP revealed no local heritage items within the vicinity of the project area.





Tracking ID: PR113545-1-001e Compiled: 17 January 2013

N

1 0 1 2

Kilometres

APPROX SCALE 150,000 @ A4

GDA 1994 MGA Zone 56

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DATA SOURCES

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LEGEND

- Proposed Borehole
- Town
- Main Road
- Local Road
- Watercourse
- ML 1331 Boundary
- A232 Boundary
- National Park
- State Conservation Area
- State Forest

RPS

FIGURE 4-1

Protected Areas

5.0 Planning Context

5.1 Mining Act 1992

The objects of the Mining Act are (clause 3A):

'*To recognise and foster the significant social and economic benefits to New South Wales that result from the efficient development of mineral resources, and*

To provide an integrated framework for the effective regulation of authorisations for prospecting and mining operations, and

To provide a framework for compensation to landholders for loss or damage resulting from such operations, and

To ensure an appropriate return to the State from mineral resources, and

To require the payment of security to provide for the rehabilitation of mine sites, and

To ensure effective rehabilitation of disturbed land and water, and

To ensure mineral resources are identified and developed in ways that minimise impacts on the environment.'

The proposed activity would be undertaken within A232 granted under the Mining Act. The proposed activity falls under Category 3. This is because the activity would involve non-intensive drilling involving no more than moderate site preparation and is within or adjacent to a Sensitive Area (Mugii Murum-ban SCA).

Condition 2 of A232 states that prospecting operations listed as categories 2 or 3 or surface disturbing prospecting operations not listed in categories 1, 2 or 3 require prior notification on a Surface Disturbance Notice form to DTIRIS. Approval by DTIRIS requires assessment and determination under Part 5 of the EP&A Act. For Category 3 activities an REF must be prepared and must accompany the Surface Disturbance Notice. An REF is to be prepared in accordance with DTIRIS guidelines.

Other conditions specified in A232 include those relating to the preparation of Environmental Management Plans, heritage, flora and fauna, water, drilling methodology and rehabilitation. The proposed activities would need to comply with the conditions of A232.

Under clause 140, the holder of a prospecting title must not carry out prospecting operations except in accordance with an access arrangement to be agreed in writing between the title holder and each landholder. The landholder is the NPWS and whilst NPWS has been notified of the proposed activity (section 2.3.2), access arrangements agreed in writing will be obtained by Centennial Airly prior to the commencement of activities.

5.2 Environmental Planning and Assessment Act 1979

The EP&A Act provides the legislation relating to planning and development in NSW. Development is assessed under Part 5 if the relevant environmental instruments provide that the development does not require development consent and is not exempt development and the development is either carried out by a determining authority or requires the approval of the determining authority. Under Part 5, Clause 111 – Duty to consider environmental impact, '*a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made*

under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.'

Additionally, Clause 228 of the Environmental Planning and Assessment Regulation 2000 provides details of supplementary factors that must be taken into account concerning the impact of an activity on the environment. These include specific or general guidelines for the activity or if no guidelines exist, the Regulation lists a general set of factors to consider. Clause 228 factors are addressed in section 7.2.

The proposed activity falls within the Lithgow LGA. The site is zoned rural under the Lithgow LEP 1994 (refer Section 5.11). The proposed activity is permissible with development consent under the LEP however the Mining SEPP removes the requirement for development consent from the LGA. Clause 6 of the Mining SEPP provides that development for the purposes of mineral exploration may be carried out without development consent. This has the effect that the proposed activity is required to be assessed under Part 5 of the EP&A Act.

A determining authority, for the purposes of this activity, is defined in Part 5 to include a public authority whose approval is required before an activity may be carried out. DTIRIS is the determining authority for the proposed activity for the purposes of Part 5 of the EP&A Act.

Under Part 5 of the EP&A Act, a determining authority is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The determining authority must consider whether the proposed activity is likely to significantly affect the environment or threatened species, populations or ecological communities, or their habitats to determine whether an EIS or Species Impact Statement (SIS) is required. In deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats, section 5A of the EP&A Act requires the following factors to be taken into account (the 'seven part' test of significance):

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

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

(d) in relation to the habitat of a threatened species, population or ecological community:

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

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

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

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

This REF has been prepared to assist the determining authority in meeting the obligations of section 111 of the EP&A Act. The proposed activity is not likely to significantly affect the environment or threatened species, populations or ecological communities or their habitats.

5.3 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The Mining SEPP applies to the proposed activity. In recognition of the importance to NSW of mining, petroleum production and extractive industries, the Mining SEPP aims to:

- provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and
- facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and
- to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.

As referred to in section 5.2, Clause 6 of the Mining SEPP provides that development for the purposes of mineral exploration may be carried out without development consent.

Clause 10 of the Mining SEPP lists development that is exempt from approval under the EP&A Act.

Clause 10(1) applies to development that is on land that:

(a) is not within an environmentally sensitive area of State significance, or

(b) is within a state conservation area but is not land referred to in paragraphs (a)–(e) or (g)–(i) of the definition of environmentally sensitive area of State significance.

The project area is within an SCA, however, none of the land subject to the activity is land that is referred to in the above paragraphs and therefore the proposed activity meets this criterion for exempt development.

Clause 10(2) states:

Development for any of the following purposes is exempt development if it is of minimal environmental impact:

(a) the construction, maintenance and use of equipment for the monitoring of weather, noise, air, groundwater or subsidence

(b) *low intensity activities associated with mineral exploration or petroleum exploration, including the following:*

i geological mapping and airbourne surveying

ii sampling and coring using hand-held equipment

iii geophysical (but not seismic) surveying and downhole logging

iv accessing of areas by vehicle that does not involve the construction of an access way such as a track or road.

The activity comprises drilling five boreholes with a hydraulic drill and is not considered to meet the definition of exempt development under the provisions of the Mining SEPP 2007. Therefore, it is not exempt for approval under the EP&A Act.

5.4 State Environmental Planning Policy (State and Regional Development) 2011

Under the State and Regional Development SEPP, development is considered to be State significant development under the EP&A Act if:

(a) The development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and

(b) The development is specified in Schedule 1 or 2.

Schedule 1 identifies the types of projects that are State Significant Development (SSD). This includes Mining (Schedule 1, 5):

(1) Development for the purpose of mining that:

a. Is coal or mineral sands mining, or

b. Is in an environmentally sensitive area of State significance, or

c. Has a capital investment value of more than $30 million.

(2) Extracting a bulk sample as part of resource appraisal of more than 20,000 tonnes of coal or any mineral ore.

(3) Development for the purpose of mining related works (including primary processing plants or facilities for storage, loading or transporting any mineral, ore or waste material) that:

a. Is ancillary to or an extension of another State significant development project, or

b. Has a capital investment value of more than $30 million.

(4) Development for the purpose of underground coal gasification.

The Mining SEPP, provides that development for the purpose of mineral exploration may be carried out without development consent (refer section 5.3). In Schedule 1 of the State and Regional Development SEPP, in relation to (1), the proposed activity comprises exploration and groundwater monitoring only and does not constitute 'development for the purpose of mining'. In relation to (2), less than 20,000 tonnes of coal would be extracted during the exploration. In relation to (3), the proposed activity does not constitute

development for the purpose of mining related works that is ancillary to another State significant development or has a capital investment value of more than $30 million. Therefore the proposed activity is not SSD.

5.5 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act identifies Matters of National Environmental Significance (MNES) and contains schedules of threatened species and Ecologically Endangered Communities (EECs) to which it affords protection. The EPBC Act requires the Commonwealth Minister for the Environment to approve actions which may have an impact on matters of national environmental significance. MNES include:

- World heritage areas
- National heritage places
- Wetlands of national importance
- Commonwealth listed threatened species
- Commonwealth listed migratory birds
- Commonwealth marine area
- Commonwealth land

MNES may be referred to the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) by a proponent for consideration if any threatened species or EECs are potentially going to be impacted by the proposed activity. Impacts constituting a controlled action upon any MNES that have not been referred to SEWPAC may be referred by a third party and may be subject to prosecution where the proposed action has not been previously assessed by SEWPAC.

An EPBC Act protected matters search has been undertaken and the results are reported in section 6 of Appendix 1.

The proposed activity is not expected to have any significant impact on any MNES provided the mitigation measures set out in Section 6.3 and the flora and fauna assessment in Appendix 1 are implemented. Therefore a referral under the provisions of the EPBC Act is not necessary for this proposal.

5.6 Threatened Species Conservation Act 1995 and Fisheries Management Act 1994

The TSC Act and *Fisheries Management Act 1994* are NSW environmental legislative instruments that contain schedules of species and EECs, which are afforded threatened status and require consideration with regard to possible impacts as a consequence of a proposed action. Under the current legislative requirements of Section 5A of the EP&A Act each threatened species or EEC that may be affected by a proposed action is subject to the seven-part test of significance.

A flora and fauna assessment was undertaken for the proposal (Appendix 1). One threatened flora species, *Prostanthera stricta* (Mount Vincent Mintbush) was recorded within the vicinity of the boreholes ARP06, ARP07 and ARP08 and also occurs in large numbers along the access track leading to ARP07 and 08. This is listed as Vulnerable under the TSC Act (and under the EPBC Act). The flora and fauna assessment addresses the potential for threatened flora and fauna species and EECs to occur at the project area and the likely level of impact. Seven-part tests were undertaken for the following:

- *Prostanthera stricta*
- *Pultenaea*

- *Callocephalon fimbriatum* (Gang Gang Cockatoo)
- *Calyptorhynchus lathami* (Glossy Black-cockatoo)
- Microchiropteran Bats

The proposed activity is unlikely to significantly impact on any of the identified species or communities listed under the TSC Act.

5.7 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect and reduce degradation of the environment. The POEO Act examines issues such as air quality, pollution, waste, water quality and noise. The Act also prescribes 'activities' in which a license must be issued by OEH. These 'activities' include certain size industrial, mining and agricultural developments.

Clause 5 and Schedule 1 of this Act pertain to works that are identified as 'scheduled activity'. The proposed exploration and monitoring is not identified as a 'scheduled activity' and therefore the proposal does not require an environmental protection license.

Due to the small areas to be disturbed within the proposed works areas, as well as the low level of disturbance to habitats, the proposed works are considered highly unlikely to result in adverse impacts upon locally occurring threatened species or communities.

5.8 National Parks & Wildlife Act 1974

Aboriginal heritage (places, sites and objects) within NSW are protected by the NP&W Act. Although there are other Acts protecting and managing cultural heritage in NSW, the due diligence procedure is only available to projects applicable under this Act. Further detail is provided in the Aboriginal due diligence assessment in Appendix 3.

One of the benefits of the due diligence provisions are that they provide a simplified process for investigating the Aboriginal archaeological context of an area without the need for an Aboriginal Heritage Impact Permit (AHIP). Aboriginal consultation is also not required for an investigation under due diligence. However, if the due diligence investigation shows that the activities proposed for the area are likely to harm objects or likely objects within the landscape, then an AHIP will be required with full consultation.

There are five Aboriginal objects or Aboriginal places in the vicinity of the proposed boreholes including one that is located within 150 metres of the compound for borehole APR09. In order to limit potential impact on these and any unknown Aboriginal sites or objects, mitigation measures are identified (Appendix 3).

For those sites located in an SCA, a Conservation Risk Assessment is required. This REF will be provided to the authority as supporting documentation to the Conservation Risk Assessment.

Section 30G of the NP&W Act sets out management principles in relation to an SCA and sub clause (2)(c) provides for the undertaking of uses permitted under other provisions of the NP&W Act including mining permitted under Section 47J.

Section 47J, together with Section 47H provide for the existing mining interests subject to A232 which predates the declaration of this land as an SCA in March 2011.

5.9 Heritage Act 1977

The *Heritage Act 1997* main objective is to conserve the environmental heritage of the State of NSW. "Environmental heritage" is defined to include places, buildings, works, artefacts, moveable objects, and

precincts, of State or local heritage significance. Under the Act, it is an offence to disturb an item of heritage significance without the consent of the Heritage Council.

There are no items of environmental heritage within the vicinity of the proposed activity and the proposal would therefore have no environmental heritage impact.

5.10 Water Act 1912 and Water Management Act 2000

The *Water Act 1912* (Water Act) and WMA are the key pieces of legislation regulating access and impacts to surface and groundwater resources in NSW. Where a water sharing plan is in place, the WMA governs the issuing of water access licences (WALs) and water management and activity approvals. The following Water Sharing Plans under the WMA applicable to the project area are:

- Water Sharing Plan for Greater metropolitan region unregulated river water sources.
- Water Sharing Plan for Greater metropolitan region groundwater sources.

Under part 5 of the Water Act, a monitoring bore license application will need to be lodged with the NSW Office of Water prior to the commencement of drilling. This would cover the, groundwater that would be pumped to the surface at ARP09 (standpipe).

Water may potentially be extracted from two dams and a bore (as well as from process water from Airly Mine). A water licence is required to extract surface water and if these sources are to be used, Centennial Airly will obtain the appropriate licences prior to any water extraction.

5.11 Aquifer Interference Policy

Under the recent Aquifer Interference Policy (NOW, 2012), the drilling of monitoring bores and wells that are required by a development consent under Part 4 or an approval under Part 5.1 of the EP&A Act are defined as minimal impact aquifer interference activities and do not require licensing (Appendix 2). This assumes that the boreholes are constructed and decommissioned in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia (this is identified as a mitigation measure at section 6.2.2.2). Specific details are required to be recorded and provided on request by NOW (refer Appendix 2).

5.12 State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP 44 aims '*to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline'*.

The project area is located within Greater Lithgow LGA which is listed within Schedule 1 of SEPP 44 – 'Koala Habitat Protection'. Therefore SEPP 44 applies to the land.

SEPP 44 requires that before granting development consent under Part 4 of the EP&A Act for development on land over 1 hectare in area, a consent authority must form a view as to whether the land is "potential"' or "core" koala habitat. Potential koala habitat is defined as:

> *'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.'*

Core koala habitat is defined as:

> *'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.'*

Where core koala habitat is found to occur, SEPP 44 requires that a site-specific koala plan of management be prepared.

Schedule 2 of SEPP 44 lists ten tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'.

The flora and fauna assessment (Appendix 1) reports that one Schedule 2 feed tree species (*Eucalyptus punctata*) was recorded at ARP06. However this was at a density of less than 5%. Therefore this does not constitute Potential Koala Habitat. Additionally, there are no records of Koalas within 10 kilometres of the proposed activity and no observations of Koalas or their traces were observed in the area. Therefore the project area does not constitute Core Koala Habitat.

5.13 Zoning

The Airly Mine is on land zoned Rural 1(a) under the Lithgow LEP 1994. The objectives of zone are as follows:

To promote the proper management and utilisation of natural resources by:

(a) protecting, enhancing and conserving:

- *(i) rural land, in particular prime crop and pasture land, in a manner which sustains its efficient and effective agricultural production potential,*
- *(ii) soil, by controlling and locating development in accordance with soil capability,*
- *(iii) forests of existing and potential commercial value for timber production,*
- *(iv) valuable deposits of minerals, coal and extractive materials, by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,*
- *(v) trees and other vegetation in environmentally sensitive areas, where the conservation of the vegetation is significant for scenic amenity or natural wildlife habitat or is likely to control land degradation,*
- *(vi) water resources for use in the public interest, preventing the pollution of water supply catchment and major water storages,*
- *(vii) localities of significance for nature conservation, including places with rare plants, wetlands and significant wildlife habitat, and*
- *(viii) items of heritage significance,*

(b) preventing the unjustified development of prime crop and pasture land for purposes other than agriculture,

(c) facilitating farm adjustments,

(d) minimising the cost to the community of:

- *(i) fragmented and isolated development of rural land, and*
- *(ii) providing, extending and maintaining public amenities and services,*

(e) providing land for other non-agricultural purposes, in accordance with the need for that development, and

(f) providing for the separation of conflicting land uses.

Whilst under the Mining SEPP, the LEP does not apply to the proposed activity, consideration has been given to the zoning under the LEP. The siting of the boreholes and identified mitigation measures would minimise impacts to soil, trees, vegetation, water resources, nature conservation and heritage.

5.14 Licenses and Approvals Required

This REF has been prepared to assess the potential impacts of the proposed activity to address the requirements of Part 5 of the EP&A Act and assist DTIRIS in their consideration of the proposal's compliance with the conditions of A232 (refer Section 5.1 *Mining Act 1992*).

The REF would also be provided as supporting documentation to the Conservation Risk Assessment required under the NP&W Act as the project area is within Mugii Murum-ban SCA and a Surface Disturbance Notice form under Condition 2 of A232 (refer Section 5.1).

A monitoring bore licence is required under the *Water Act 1912* (section 5.10). Appropriate water licensing for the extraction of water from the dams would also need to be obtained by Centennial Airly prior to any water extraction.

Under the Mining Act, access arrangement agreed in writing with the NPWS will be obtained by Centennial Airly prior to the commencement of activities.

There are a number of conditions specified within A232. Those environmental conditions of relevance to the proposed activity are addressed within this REF in section 6 and the conditions that relate to the approach to drilling would be addressed as follows:

To comply with condition 23 and 24 of A232 the following additional measures to those identified elsewhere in this REF are:

- All boreholes will be constructed and/or sealed to prevent the collapse of the surrounding surface.
- If any borehole meets natural or noxious gases it will be plugged or sealed to prevent their escape.
- If any borehole meets an artesian or sub-artesian flow it will be effectively sealed to prevent contamination or cross contamination of aquifers and will be permanently sealed with cement plugs to prevent surface discharge to groundwater.
- If any potentially hazardous tools or logging equipment is dropped into the boreholes and is unable to be recovered, this will be reported to the Regional Inspector of Mines in accordance with condition 23 of A232.
- Waters flowing from the boreholes will be managed and contained and disposed of in accordance with the ANZECC 2000 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines'.
- An assessment of the risk of gas blowouts will be undertaken prior to the commencement of drilling in accordance with condition 24, (a) of A232.
- All over pressure gas occurrences that occur during drilling will be reported in accordance with condition 24 (b) of A232.
- If directed by the Department, analyses and tests on any coal seams intersected by the drill holes that may be economically mineable will be undertaken.
- Boreholes will be decommissioned once they cease to be used in accordance with condition 24 (d) of A232.

To comply with condition 26 of A232:

- All boreholes maintained in an open condition will be cased to prevent collapse and fitted with a removable cap to ensure safety.

To comply with condition 38 of A232:

- Core samples will be collected in accordance with condition 38 of A232.

To comply with condition 15 of A232:

- Consent is required from the landholder for the licence holder to fell trees. The landholder is entitled to use the timber.

To comply with condition 23 of A232:

- A NOW hydrologist must be at least 28 days prior to the commencement of drilling operations.

Conditions under ML1331 would need to be complied with.

6.0 Impact Assessment

6.1 Introduction

This section of the REF addresses the potential environmental impacts from the proposed activity and identifies mitigation measures. It addresses the types of impacts identified in the ESG2 guidelines and categorises them, by taking into account the guidance, as follows:

- Negligible
- Low adverse
- Medium adverse
- High adverse
- Positive

6.2 Assessment of physical and chemical impacts

6.2.1 Is the proposed activity likely to impact on soil quality or soil stability?

6.2.1.1 Potential impacts

During the establishment of the borehole compounds and upgrading of the access tracks there is potential for adverse impacts to the soil resources due to:

- Soil erosion.
- Chemical spills (such as diesel spill during refuelling plant).
- Soil removal.
- Soil profile inversion.
- Soil compaction.

Soils would be exposed within the areas of ground disturbance that could lead to erosion from wind. Bare soil allows the velocity of run-off waters to increase also leading to erosion. Given the small area of disturbance and the very small gradiant/slope of the terrain the impacts are likely to be negligible.

Fuels and oil would be used during the proposed activity. Any drilling muds used would be biodegradable to avoid the risk of soil (and water) contamination. Mitigation measures to minimise and manage the risk of spills are identified in section 6.2.1.2.

Soil would be removed during excavations and measures to ensure its re-use for rehabilitation are identified below.

Soil profile inversion and soil compaction may occur as a result of the proposed activity.

The risk of adverse impact to the soil resource is considered low with the implementation of standard construction site environmental and engineering controls which are identified in section 6.2.1.2.

6.2.1.2 Mitigation

Mitigation measures involving the employment of good drilling practises in accordance with Construction Requirements for Water Bores in Australia (ADIA, 2012) are identified in Section 6.2.2.2. In addition, the following measures are identified:

- Excess soil generated during site preparation activities will be stockpiled at each borehole compound and used as backfill for rehabilitation.
- Topsoil and other soil horizons will be stripped, handled and stockpiled separately during site preparation activities.
- No soil will be removed from the project area unless it is contaminated in which case it would be taken to a suitably licensed waste facility.
- Erosion and sediment controls will be implemented where necessary during site preparation, including the borehole compounds and track upgrades, in accordance with best management practises (such as the Managing Urban Stormwater: Soils and Construction (Landcom 2004) ('the Blue Book') or the Best Practise Erosion and Sediment Control Guidelines (IECA 2008).
- The quantity of chemicals, fuels and oils stored at the project area will be minimised where practicable.
- All chemicals, fuels and oils stored at the project area will be kept in appropriately secured, bunded storage in accordance with the relevant Materials Safety Data Sheets (MSDS).
- An MSDS register of all chemicals used or stored at the project area will be maintained.
- Maintenance of vehicles, plant and equipment will occur off site at an appropriately licensed facility unless considered appropriate to conduct such maintenance at the project area. Refuelling will be undertaken off site in a designated bunded area.
- A spill kit will be provided and site workers/contractors trained in its use. Any spills or leaks will be contained and cleaned up immediately using the spill kit. Contaminated material such as soil or absorbent materials will be placed in a bag and removed from the project area for disposal at a suitably licensed waste facility.
- Plant and equipment will be maintained and inspected on a daily basis.
- Drilling fluids will be contained in over ground tanks that have overflow capacity in case of heavy rain. These will be inspected regularly and maintained.
- All chemicals, fuels and oils will be removed at the completion of drilling.
- Disturbed areas will be rehabilitated in accordance with condition 27 of A232. Partial rehabilitation will be undertaken following drilling and once the geotechnical testing has been undertaken and full rehabilitation once the groundwater monitoring bores have completed their useful life.

6.2.1.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be negligible to low adverse.

6.2.2 Is the activity likely to affect a waterbody, watercourse or wetland or natural drainage system?

A surface and groundwater assessment has been undertaken by RPS Aquaterra. The full report is provided in Appendix 2.

6.2.2.1 Potential impacts

It is unlikely that any significant quantities of groundwater would enter the boreholes during drilling because of the relatively low permeability of the strata. The potential for cross contamination of aquifers would be negligible. The drilling would involve the use of biodegradable drilling muds and clean water for the circulation thereby avoiding the contamination of aquifers from other types of drilling fluids.

A potential loss of water from aquifers would be prevented by filling the boreholes with water during drilling that creates pressure on the borehole walls. This in addition to the relatively low permeabilities of the local aquifers mean that changes in groundwater levels are not expected.

At ARP09 (standpipe), groundwater would be pumped to the surface. This would be contained and removed from the compound to avoid impacts to water resources.

During the drilling process water forms a thin layer of mud on the wall of the borehole which reduces seepage loss.

The low permeability of the surface geology would provide some protection against any potentially occurring seepage of drilling fluid/mud and hydrocarbons such as oils, fuel, lubricants. To manage the risk of any seepage of such fluids, mitigation measures involve the preparation of a risk assessment to consider the nature of drilling fluids and the permeability of the surface geology. The management of risks associated with hydrocarbons and other hazardous substances would be addressed in an Environmental Management Plan (EMP) as identified at section 6.2.2.2.

There are no surface water features or drainage lines within the vicinity of boreholes ARP010, ARP06 and ARP08 and therefore there would be negligible potential for contamination, increased surface water run off or flooding. Borehole ARP09 is in the vicinity of Genowlan Creek. The impermeable cement-bentonite grout would prevent any ingress of surface water into the borehole. Borehole ARP07 is in the vicinity of a minor drainage line. This was dry at the time of the inspection by RPS Aquaterra. The borehole would be located on a slope and there would be no impact.

The boreholes are in elevated locations at the top of a ridge. The proposed activity is not likely to change the flood regime not would it be affected by flooding.

Extraction of water for drilling from the two dams and a bore identified in section 2.6.5 would require appropriate licensing as identified in section 5.10.

As there is no known current surface or groundwater use in the area there would be no impact on water users.

6.2.2.2 Mitigation measures

- Drilling and decommissioning will be undertaken in accordance with the Minimum Construction Requirements for Water Bores in Australia (ADAI, 2012) and as set out in the surface and groundwater assessment for the proposed activity.
- Good drilling practises will include above ground tanks, casing the top 3-6 metres and installation of sediment fences to minimise the risk of contamination of surface or groundwater.
- Drilling at steep gradients will be avoided to minimise the risk of contaminants migrating towards surface water courses in the event of a spill.
- Drilling will be undertaken as close to the access tracks as possible and as far from Genowlan Creek and drainage lines as practicable. All boreholes will avoid drainage channels and surface water features.
- Only clean, fresh water and biodegradable drilling additives will be used for the drilling fluid. In the event that any non-biodegradable drilling muds/additives are to be used this will be subject to further assessment.
- Pre-work checks of each drill rig, associated equipment and drill site will be undertaken to avoid the contamination of aquifers. This will examine site conditions prior to drilling and record any indications of visible contamination, disturbed or discoloured soil, disturbed or affected vegetation, proximity to surface water features and drainage lines, ponding and pooling of water.

- A hydraulic drill will be used.
- Water will be circulated through above ground settling pits or containers.
- The drill hole will be filled with water during drilling to create pressure on the borehole walls and prevent any potential loss from the aquifers.
- Water will naturally form a thin layer of mud on the borehole walls, reducing seepage loss.
- Surface casing will be installed where required to stabilise the upper part of the borehole and protect against contamination from surface water ingress.
- Industry standard construction materials will be used.
- Impermeable cement-bentonite grout will be used to prevent any ingress of surface water into the bore and mixing of groundwater.
- A risk assessment will be undertaken prior to any discharge of water to the environment. This is to avoid groundwater discharging to the surface that may cause flooding or contamination.
- Discharged water will be contained and removed.
- Features associated with surface water drainage and/or groundwater seepage will be avoided by locating the boreholes at an appropriate distance.
- Drilling fluids will be removed from the borehole compounds following drilling.
- An EMP will be prepared to manage the use of hazardous substances to include:
  - » Double bunded fuel tanks and storage / decanting of hazardous substances in designated areas where any spillage will be contained.
  - » Spill kits will be provided on site and all personnel trained in their use to ensure the effective management of any spill and the minimisation of contamination risk.
- Surface casing will be used where seepage of drilling fluids/muds, hydrocarbons or presence of other contaminants are indicated.
- Good site housekeeping and good drilling practices will be implemented.
- Drilling will be avoided during wet weather conditions.
- Drainage line crossings will be perpendicular to access routes.

To avoid changes to drainage leading to flooding caused by construction of drill pads:

- Surface water catchment and drainage line crossings will be minimised.
- Effective drainage to control surface runoff and minimise erosion will be implemented.
- In the event that a perched water table is intersected, drilling will cease or the surface casing will be used to seal off any shallow groundwater bearing formations dependent on the volume of groundwater and site conditions.
- Vegetation will be replaced as part of the rehabilitation to avoid increased erosion.

6.2.2.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be negligible to low adverse due to the minor residual risk of seepage of drilling fluids or hydrocarbons.

6.2.3 Is the activity likely to affect coastal processes and coastal hazards, including those under projected climate change conditions?

The project area is not near the coast or likely to affect coastal processes.

6.2.4 Does the proposed activity involve the use, storage or transport of hazardous substances or the use or generation of chemicals which may build up residues in the environment?

6.2.4.1 Potential impacts

Chemicals (such as oils and lubricants) and hazardous substances may be used and stored at the borehole compounds during drilling activities and transported to and from the project area.

6.2.4.2 Mitigation measures

Mitigation measures comprising the management of chemicals, hydrocarbons and other hazardous substances are addressed in Section 6.2.1.2 in addition:

- Chemicals and potentially hazardous substances will be used and stored according to regulatory requirements including the *Work Health and Safety Act 2011*.
- Any dangerous goods will be transported according to regulatory requirements under the *Dangerous Goods (Road and Rail Transport) Act 2008*.

6.2.4.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be negligible to low adverse.

6.2.5 Does the activity involve the generation or disposal of gaseous, liquid or solid wastes or emissions?

6.2.5.1 Potential impacts

The following waste streams may be generated by the proposed activities:

- Materials from the upgrading of tracks.
- Vegetation.
- Drilling mud (biodegradable).
- Chemical, fuels and oil containers.
- General site waste such as packaging materials.
- Domestic wastes.
- Contaminated soil and materials (such as soil that has been subject to a spill and any absorbent materials used for a spill).

Potential impacts associated with the generation and disposal of these wastes include:

- Odours caused by improper storage or treatment of putrescibles waste.
- Leaching of pollutants into groundwater, surface water and soil.
- Pollution or contamination of water or land due to illegal dumping of waste and/or a lack of suitable containment of waste.
- Littering of the area due to a lack of suitable containment of waste.

Emissions of dust and greenhouse gases are addressed in section 6.2.6.

6.2.5.2 Mitigation measures

- Drilling mud will be removed from the borehole compounds, at the completion of drilling, by a contractor licensed under the POEO Act to transport trackable wastes, with the appropriate waste transport certificates.
- Drill cuttings will be tested for their suitability for reuse on site for rehabilitation. Testing will be in accordance with Australian Standard 1141 Methods of Sampling and Testing Aggregates. Drill cuttings that qualify as excavated natural material will be reused on site for rehabilitation. Those that exceed the limits set by the excavated material exemption will be transported and disposed of as for the drilling muds specified above.
- The management of waste, including its transport will comply with the POEO Act and POEO (Waste) Regulation.
- Appropriate waste receptacles will be provided at the borehole compounds and track upgrading areas for the disposal of domestic wastes.
- Waste materials will be separated, classified and managed in accordance with the Waste Classification Guidelines Part 1: Classifying Waste (DECCW 2009).
- All wastes will be removed from the borehole compounds and the track upgrading areas at the completion of drilling for disposal at an appropriately licensed waste management facility.
- All staff and contractors will be made aware of waste management procedures.
- Chemical, fuel and oil containers will be managed according to the MSDS or manufacturers' directions to avoid potential impacts to the environment or human health.

6.2.5.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be negligible to low adverse.

6.2.6 Will the activity involve the emission of dust, odours, noise, vibration, or radiation in the proximity of residential/urban areas or other sensitive locations?

6.2.6.1 Potential air impacts

There are three residential properties within proximity of the project area as shown on Figure 6.1. The property identified as R1 is privately owned and is approximately 820 metres from ARP07. Two properties are owned by Centennial. Property R2 is approximately 970m from ARP07. Property R3 is approximately one kilometre from ARP06. The proposed activity would be located within an SCA and is therefore an environmentally sensitive location.

The proposed activities may generate dust from site preparation activities, drilling and from vehicles driving along the tracks. This has potential to affect residential properties and the values of the SCA. Dust emissions to residential properties are anticipated to be negligible due to the area of ground disturbance, the distance and the intervening vegetation. Dust emissions within the SCA may enter watercourses or affect those using the immediate area for recreation. Such emissions would be minimised with the measures identified in section 6.2.6.3.

Emissions to air from vehicle and equipment exhausts include fine particulates, carbon monoxide, oxides of nitrogen, carbon dioxide and hydrocarbons. Due to the distance to sensitive receptors and the small scale of the works such emissions are likely to be negligible.

Exhausts from plant and machinery comprise potential Scope 1 (direct) greenhouse gas emissions. Given the small scale of the emissions and the temporary timescale impacts on State or National greenhouse gas levels are likely to be negligible.

Gas levels are monitored at Airly Mine and the coal seam in the area is not known to be particularly gassy. In the event that any odour is released during construction of the boreholes, this may be noticeable in the immediate vicinity although vegetation is likely to act as a buffer, reducing wind speeds and therefore dispersal. Condition 23, b, ii of A232 requires that if any drill hole meets natural or noxious gases it must be plugged or sealed to prevent their escape and this is identified as a mitigation measure in section 6.2.6.3.

6.2.6.2 Potential noise impacts

The site preparation and drilling activities would generate noise. The noise limit criteria for the type of rig anticipated to be used, a hydraulic drill rig, Hanjin D&B – 35 Multi, is 80dB or less. The noise from drilling would occur for up to two weeks at each of the borehole compounds plus some noise associated with site preparation and track upgrading within a total duration of two months. Works would be undertaken seven days a week between the hours of 7am to 7pm.

As stated above, there are three residential properties, within proximity of the project area. There would be noise impacts to three residential properties, particularly during the two weeks of drilling at each of the borehole compounds nearest those properties (ARP07, ARP06 and ARP10). There would also be noise from vehicles passing R3. Impacts to the three residential properties, two of which are owned by Centennial, would be transient, as the proposed activities move to the different borehole compounds, short term and managed with the measures identified in section 6.2.6.3.

There may also be recreational users of the Mugii Murum-ban SCA in the vicinity of the proposed activity. Noise impacts to those using the immediate area for recreation would be transient and short term and managed with the measures identified in section 6.2.6.3.

The Interim Construction Noise Guidelines (ICNG) (DECC 2009) identifies recommended standard hours as Monday to Friday 7am to 6pm and Saturday 8am to 1pm. The proposed activity would be partly outside recommended standard hours as it would be undertaken from 7am to 7pm seven days a week. This is considered to be justified because it would shorten the duration of the proposed activity and drilling personnel would be present for longer periods to aid public safety .

6.2.6.3 Mitigation measures

A measure to ensure vehicles would be driving at low speeds in section 6.4.4.2. Additional measures for air are:

- Dust generated during site preparation, drilling and rehabilitation will be suppressed by spraying water at each borehole compound if required.
- Land disturbance areas will be minimised.
- Vehicles, plant and machinery will be regularly maintained to ensure they are in good working condition and will be turned off when not in use.
- In the event that any drill hole meets natural or noxious gases it will be plugged or sealed to prevent their escape.

Measures for noise:

- The three nearest residential properties will be notified of the works at least two weeks prior to the commencement of works.
- Best practice measures such as those identified in the ICNG will be implemented where practicable to

minimise noise levels.

- In the event of a noise complaint, the effectiveness of noise mitigation measures will be assessed and additional feasible and reasonable measures will be implemented where necessary.
- Signage will be installed at the works areas during the construction of the boreholes including contact details for complaints.

6.2.6.4 Potential impact category

With the implementation of the mitigation measures identified, potential impacts associated with air quality are likely to be negligible to low adverse and those for noise are likely to be low to medium adverse.

6.3 Assessment of biological impacts

6.3.1 Is any vegetation to be cleared or modified (including vegetation of conservation significance)? Is the activity likely to have a significant effect on threatened flora or fauna species, populations, or their habitats, or critical habitat or an endangered ecological community or its habitat?

6.3.1.1 Potential impacts

A flora and fauna assessment has been prepared for the proposed activity and is provided in Appendix 1.

The borehole compounds were selected to utilise previously disturbed areas and therefore minimise vegetation clearance. As a result, the proposed activity would cause the removal of approximately 0.45ha of native vegetation from the borehole compounds and minimal vegetation removal for the tracks. The proposed activity would potentially lead to the removal of a small number of *Prostanthera stricta* (Mount Vincent Mintbush) plants. This flora species is listed under the TSC and EPBC Acts as Vulnerable. Nine individuals were discovered within the 50 metre by 50 metre search area of ARP07, whilst two individuals were found within the 50 metre by 50 metre search area of ARP08. This species was also recorded near to ARP06. No *Prostanthera stricta* individuals were recorded within a 25 metre radius at other proposed borehole compounds. The track leading to ARP07 and ARP08 is bordered by a large population of *Prostanthera stricta*. The majority of this population exists to the east of the track, however individuals have also encroached onto the track itself, particularly within the gravel drain.

An assessment using the Commonwealth of Australia's Significant Impact Guidelines has been undertaken and is documented in Appendix 1. Vegetation removal would be minimal and the local population is large. With the effective implementation of recommendations outlined in section 6.3.1.2 there is unlikely to be a significant impact on this species. Mitigation measures in section 6.3.1.2 include avoiding vegetation and keeping its removal to a minimum. In particular, *Prostanthera stricta* would be marked with flagging tape and avoided.

The vegetation within the compound for ARP06 and the track leading to it was found to contain low to moderate numbers of *Allocasuarina littoralis* (Black She-oak) a tree species which is favoured by the Glossy Black-Cockatoo. The discovery of chewed *Allocasuarina littoralis* cones within the groundcover provides evidence of previous foraging activity by the Glossy Black Cockatoo. The proposed activity would potentially lead to the removal of these feed tree species. This feeding resource is however in high abundance locally and the portion within APR06 and along the access track is a very small quantity. Mitigation measures in section 6.3.1.2 include avoiding vegetation and keeping its removal to a minimum.

Two hollow bearing trees were observed in the vicinity of APR08. One was a Dead Stag and the other was a *Eucalyptus mannifera.* Each of these trees contained a single small hollow of two to four centimetres which is considered to be suitable for microchiropteran bat species. Mitigation measures are identified in section 6.3.1.2 to avoid these trees.

One threatened ecological community listed under the EPBC Act has potential to occur within the proximate region of the proposed activity, White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and Derived Native Grassland. A total of 31 threatened flora and fauna species listed under the EPBC Act have potential to occur within the proximate region of the project area.

The potential for the proposed activity to significantly impact on the above community has been assessed under the provisions of the TSC Act (Appendix 1). This assessment concluded that there would not be any significant impact upon any listed threatened ecological communities or any listed threatened species as a result of the proposed activity.

Therefore, the proposed activity is unlikely to result in adverse impacts upon locally occurring threatened species or communities provided the mitigation measures in section 6.3.1.2 are implemented.

There is a risk of vehicles and machinery bringing materials (soils, weeds or pathogens etc.) onto the sites that may cause the distribution of weed species or introduce pathogens such as *Phytopthera.* Management measures are identified in section 6.3.1.2.

6.3.1.2 Mitigation measures

- The drilling vehicle and other vehicles will avoid damaging or removing native vegetation wherever possible by carefully driving around all trees and shrubs to minimise any impacts on native vegetation.
- Vegetation removal will be avoided where possible. Where vegetation removal is unavoidable, it will be kept to a minimum and the avoidance of the following will be prioritised:
  - Mount Vincent Mintbush, *Prostanthera stricta,* that will be marked with flagging tape.
  - Hollow bearing trees including those identified on figure 2 of the flora and fauna assessment for the proposed activity.
  - Mature trees.
- All removed vegetation will remain within close proximity to the project area, with mature trees gently placed in surrounding areas to allow for the survival and dispersal of any displaced fauna currently utilising these trees.
- Water management strategies will be implemented to prevent the movement of sediments or contaminated waters / liquids into surrounding habitats, including potential down-slope waterways or drainage lines.
- Topsoil management will be implemented at each of the borehole compounds to ensure that current seed banks in top soil be returned to the sites for rehabilitation.
- Appropriate measures such as vehicle and machinery cleaning protocols will be employed to ensure that vehicles and machinery working within the project area do not bring materials (soils, weeds or pathogens etc.) onto the sites that may cause the distribution of weed species or introduce pathogens such as *Phytopthera cinnamomi.*

6.3.1.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be low to medium adverse.

6.3.2 Does the activity constitute or is part of a key threatening process?

6.3.2.1 Potential impacts

Key threatening processes (KTPs) are listed in Schedule 3 of the TSC Act. Five KTPs have the potential to affect the site as a consequence of the proposed activity as follows:

- Anthropogenic climate change.
- Clearing of native vegetation.
- Infection of native plants by *Phytophthora cinnamomi.*
- Invasion of native plant communities by exotic perennial grasses.
- Loss of hollow-bearing trees.

6.3.2.2 Anthropogenic climate change

The proposed activity has potential to impact upon the Sooty Owl, a species that may utilise the project area for foraging and/or roosting. The proposed activity contributes to this KTP due to the potential removal of a small amount (approximately 0.45 hectares) of vegetation. The extent to which the proposed activity contributes to this process is considered very low as the vegetation is likely to regenerate to pre-drilling condition after the completion of drilling of the boreholes.

6.3.2.3 Clearing of native vegetation

The proposed activity would contribute to this KTP through the removal of a very small amount of native vegetation, totalling approximately 0.45 hectares. This has the potential to impact upon a range of threatened fauna species particularly the Glossy Black-Cockatoo given the identification of foraging habitat within one of the borehole compounds. The proposed activity would be located to minimise the removal of native vegetation and are therefore unlikely to significantly contribute to this KTP.

6.3.2.4 Infection of native plants by *Phytophthora cinnamomi*

The proposed activity has the potential to result in the importation of this pathogen, which has the potential to impact upon a broad range of threatened plant species. The proposed activity would not significantly contribute to this KTP provided that the correct hygiene protocols are established and implemented as identified in section 6.3.1.2.

6.3.2.5 Invasion of native plant communities by exotic perennial grasses

Due to the soil disturbance at some borehole compounds, there is the potential for these areas to be colonised by exotic perennial grasses at the conclusion of activities. If introduced, exotic perennial grasses typically dominate such areas, incrementally contributing to this KTP. Effective machinery and vehicle cleaning procedures prior to commencing work would reduce the potential for this KTP to occur.

6.3.2.6 Loss of hollow bearing trees

The activity has potential to remove of one or more mature trees that support small hollows and subsequently contribute to this KTP. This may potentially impact upon small hollow-dependant fauna including the threatened Little Lorikeet, Eastern False Pipistrelle and South-eastern Long-eared Bat. The removal of a very small amount of native vegetation (approximately 0.45 hectares) and the implementation of procedures to prioritise the avoidance of mature tree removal would prevent the proposed activity from significantly contributing to this KTP.

6.3.2.7 Mitigation measures

No further measures to those identified in section 6.3.1.2.

6.3.2.8 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be low adverse.

6.3.3 Does the activity have the potential to endanger, displace or disturb fauna (including fauna of conservation significance) or create a barrier to their movement?

6.3.3.1 Potential impacts

Fauna observed within the project area were limited to common avian woodland species, common reptiles and numerous traces such as scats and tracks of other mammals such as goats and macropods.

There is potential for loss of feed tree species for the Glossy Black-Cockatoo and the potential removal of two hollow bearing trees, with hollows of a size suitable for microchiropteran bats. The mitigation measures in section 6.3.1.2 include the minimisation of vegetation disturbance and avoidance of hollow bearing trees.

Assessment via a seven-part test found that the proposal was unlikely to significantly impact on any of the identified species listed in the TSC Act. Assessment under the EPBC Act found that the proposal was unlikely to significantly impact on any of the identified species listed on the EPBC Act.

Due to the approach to site selection and the retention of the native vegetation wherever possible within the area there would not be a detrimental effect on the corridors and habitat linkages required for the movements of the local fauna and the proposed activity is highly unlikely to result in fragmentation or isolation of potential habitat for locally occurring threatened species.

6.3.3.2 Mitigation measures

No further measures beyond those identified in sections 6.3.1.2.

6.3.3.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be low adverse.

6.3.4 Is the activity likely to impact on an ecological community of conservation significance? Is the activity likely to cause a threat to the biological diversity or ecological integrity of an ecological community?

6.3.4.1 Potential impacts

As stated above, the proposal is unlikely to significantly impact on any ecological communities listed under the TSC Act or EPBC Act.

6.3.4.2 Mitigation measures

No further measures beyond those identified in section 6.3.1.2.

6.3.4.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be negligible.

6.4 Assessment of Community Impacts

6.4.1 Is the activity likely to affect existing community services or infrastructure?

6.4.1.1 Potential impacts

Minor increases in traffic may occur along Glen Davis Road and on the tracks from this road to the borehole compounds. However, this is unlikely to result in traffic delays or road safety issues.

The track upgrade and works at the borehole compounds have potential to cause public inconvenience in the event that tracks are blocked with vehicles and equipment. This can be minimised by keeping vehicles and equipment off the tracks where possible and the provision of signage. A232 includes a condition stating that operations must not affect the public's normal use of any road or track without prior permission from the department.

The proposed activity is unlikely to significantly impact on any community services and infrastructure.

6.4.1.2 Mitigation measures

- Public inconvenience will be minimised during the proposed activities, such as by keeping the existing tracks as clear and accessible as possible and the provision of signage.
- In the event of normal public use of any road or track being affected, prior written approval from DTIRIS will be obtained.
- The use of tracks during wet weather will be restricted to prevent damage.
- Activities will not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other public utility.

6.4.1.3 Potential impact category

Potential impacts would be negligible.

6.4.2 Does the activity affect sites of importance to the local or broader community for their recreational or other values or access to these sites?

6.4.2.1 Potential impacts

The proposed activity is located within the Mugii Murum-ban SCA and therefore has recreational, heritage and conservation value to the community. Impacts on heritage are addressed in section 6.7 to 6.8 and impacts on flora and fauna are addressed in section 6.3.

Potential impacts on recreational users within this part of the Mugii Murum-ban SCA would comprise noise, dust, traffic, visual effects and the introduction of a hazard. This would be temporary and it is anticipated that recreational users would go to other parts of the SCA during this short time period.

Potential traffic impacts are addressed in section 6.4 and are negligible. Visual impacts are addressed in section 6.4.5 and are negligible to low adverse.

6.4.2.2 Mitigation measures

Mitigation for dust and noise including site signage and complaints handling is identified in section 6.2.6.3, and mitigation for the introduction of a hazard in section 6.4.4.2 of this REF.

6.4.2.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be low adverse.

6.4.3 Is the activity likely to affect economic factors?

6.4.3.1 Potential impacts

The proposed activity is anticipated to provide temporary construction work for around five contractors and comprise the purchasing of material supplies.

6.4.3.2 Mitigation measures

No further measures are proposed for economic factors.

6.4.3.3 Potential impact category

Potential impacts are likely to be negligible to low beneficial.

6.4.4 Is the activity likely to have an impact on the safety of the community? Is the activity likely to cause a bushfire risk?

6.4.4.1 Potential impacts

The proposed activity would introduce a potential hazard comprising:

- Unauthorised access to the boreholes sites and their construction equipment.
- Moving vehicles.
- Fuels and oils.
- Operation of machinery.

These could have safety implications for recreational users of this part of the Mugii Murum-ban SCA. Unauthorised access to the construction sites may occur that could result in injury. Moving vehicles may present a safety risk.

The proposed activity is located within the bushfire zone identified on the Lithgow LEP map. Flammable substances such as fuels and oils would be used in the project area. Vehicles and machinery would be used and there is potential for ignition. Therefore there are potential safety implications associated with the risk of bushfire for local residents, users of the Mugii Murum-ban SCA and staff/contractors and management measures are identified in section 6.4.4.2.

Impacts associated with spills of fuels and oils are addressed in section 6.2.1.2.

6.4.4.2 Mitigation measures

In addition to measures addressing the storage and use of potentially flammable substances, their removal following drilling and locations for refuelling vehicles and equipment identified in section 6.2.1.2:

- During construction of each borehole, compounds will be fenced for safety reasons.
- Vehicles will travel at low speeds.
- Site safety protocols, incident management and emergency procedures, including those to manage bushfire risk, will be implemented during site preparation, construction, operation and rehabilitation.
- During site preparation, construction and rehabilitation, a water source will be made available at each works area for fire fighting.
- Availability of existing roads and land for use for fire fighting will not be affected.
- Hazard control measures will be implemented in compliance with the *Mine Health and Safety Act 2004* and *Mine Health and Safety Regulation 2007*.

6.4.4.3 Potential impact category

With the implementation of the mitigation measures identified, potential impacts are likely to be low adverse.

6.4.5 Is the activity likely to cause impacts on the visual or scenic landscape?

6.4.5.1 Potential impacts

The project area is not highly visible from any residence due to intervening vegetation and the scale of the proposed activity. However, it is within the Mugii Murum-ban SCA and the works would be visible from tracks along which the boreholes would be located. The proposal may detract from the scenic qualities of the land during temporary construction of the boreholes due to the presence of plant and equipment and to a lesser extent for the duration of the groundwater monitoring during which the compounds would have been mainly rehabilitated. Following decommissioning of the monitoring bores the sites would be completely rehabilitated.

6.4.5.2 Mitigation

- The project area will be kept in a clean and tidy condition during site preparation, drilling activities and the operation of the monitoring bores.

6.4.5.3 Potential impact category

Due to the high sensitivity of the location and the small scale and temporary nature of the construction works, a low adverse impact is expected.

6.5 Assessment of natural resource impacts

6.5.1 Is the activity likely to result in the degradation of an area reserved for conservation purposes?

6.5.1.1 Potential impacts

The project area is within the Mugii Murum-ban SCA. The locations for the proposed boreholes have been selected to minimise disturbance to land and vegetation. Assessments have been undertaken for flora and fauna and Aboriginal heritage (refer Appendices A and B) and significant impacts are not likely as long as the identified mitigation measures are implemented. The proposed activities would be both minor in scale and temporary and the borehole compounds would be fully rehabilitated

6.5.1.2 Mitigation

Mitigation measures for flora and fauna are provided in section 6.3.1.2 and for heritage in sections 6.7.1.2 and 6.8.1.2. No additional specific measures for conservation are identified.

6.5.1.3 Potential impact category

In the context of the total area of the Mugii Murum-ban SCA , the temporary and minor degradation of this land is considered to be low adverse.

6.5.2 Is the activity likely to affect the use of, or the community's ability to use, natural resources? Is the activity likely to involve the use, wastage, destruction or depletion of natural resources including water, fuels, timber, or extractive materials?

6.5.2.1 Potential impacts

The proposed activity would require the use of fuels to operate vehicles and plant. Quantities of fuel would not be significant.

The proposed activity is not likely to involve the significant use, wastage, destruction or depletion of natural resources.

Agriculture is addressed in section 6.6.

6.5.2.2 Mitigation measures

Measures for rehabilitation are provided in section 6.2.1.2, measures for water resources are in section 6.2.2.2. Additional measures are:

- Fuel will be used as efficiently as possible.

6.5.2.3 Potential impact category

With the implementation of mitigation measures, impacts on natural resources are likely to be negligible.

6.6 Agriculture

6.6.1 Agricultural impact statement

The Strategic Regional Land Use Policy was released in September 2012. It sets out a range of initiatives to balance growth in the mining and coal seam gas industries with a need to protect important agricultural land and water resources. An Agricultural Impact Statement (AIS) is required for mineral exploration activities. DTIRIS issued guidelines for AISs at the exploration stage in November 2012 (the AIS guidelines) and this has been taken into account for this REF. Information specified in section A of the AIS guidelines is provided below. This is required for all exploration activities to determine the level of risk and whether further assessment is required.

6.6.1.1 Nature, location, intensity and duration of the proposed activity

The proposed activity is described in section 2 and the key characteristics are:

- The project area is located on Genowlan Mountain, approximately eight kilometres north east of Capertee, within the Lithgow LGA and within A232.
- The project area is within the Mugii Murum-ban SCA.
- Five boreholes would be drilled to obtain geotechnical information about the coal resource and to undertake groundwater monitoring.
- Trimming of overgrown vegetation may be required for the existing overgrown track to borehole site ARP06 and 10.
- The existing track to ARP07 and 08 may need to be widened.
- The boreholes have been located to minimise land disturbance and vegetation clearance.
- Activities are anticipated to commence in quarter 1 of 2013. Following site preparation, drilling of the boreholes would take approximately two weeks each. All the proposed boreholes will be constructed within two months.
- The quantity of water anticipated to be used for drilling is approximately 200,000 litres per borehole. In the event that all five proposed boreholes are drilled this would therefore be approximately 1,000,000 litres.. Water sources are as follows (refer figure 2.3):
  - » an existing dam located adjacent to the Nissan Hut at the former diamond mine site on top of Genowlan Mountain.
  - » an existing dam located near a residential property at the base of Genowlan Mountain on Centennial property.
  - » a bore on Centennial property.
  - » water supply for process water at Airly Mine site.

- At the completion of drilling the boreholes would be installed with piezometers for the purpose of monitoring groundwater and the rest of the drill pad would be rehabilitated to their pre-operational state.
- The groundwater monitoring bores are currently anticipated to be operational for approximately 20 years.
- Full rehabilitation would be undertaken following the completion of the useful life of the piezometers.

6.6.1.2 Nature of agricultural resources and industries

Under the Strategic Regional Land Use Policy there are two land use plans at the time of writing. These are for New England and the Upper Hunter. The project area is not within the areas addressed by either of these plans and is therefore also not within biophysical SAL or a critical industry cluster (CIC) identified within these plans.

The soil assessment (section 6.2.1.1) shows that the project area is not considered highly valuable agricultural land.

Agriculture in the Lithgow LGA is a contributor to the local economy although not to the extent of other surrounding regions. Land zoned within the LGA which permits agricultural activities without development consent is mainly fragmented with only just over half of it being capable of productive agriculture (Lithgow City Council, 2007). In 2006-07 the gross regional product for Lithgow LGA was $723.8 million. Of this, the agriculture, forestry and fishing sector contributed 3% (Lithgow City Council, 2010).

Agriculture in the LGA comprises a small number of large hectare pastoral land holdings and many small hectare rural lifestyle blocks. The key primary agricultural products are cattle and sheep production and some poultry. There are also a number of forest plantations. Small primary industry enterprises include goat cheese making, alpaca and lambs wool products, olives, fruit, viticulture, specialist cattle and sheep farms and other home grown products (Lithgow City Council, 2010).

There are no agricultural enterprises within the project area or the immediate vicinity.

Agricultural support infrastructure includes roads. Vehicles for the proposed activity would access the area via Glen Davis Road. There are no known agricultural activities within the project area or in the immediate vicinity therefore agricultural activities are not likely to use the tracks that would be either used or upgraded by the proposed activity.

Impacts on water resources are identified in section 6.2.2. There are no water users that would be impacted by the proposed activities and therefore no resources depended upon by agricultural enterprises. The area is remote and the closest groundwater user is GW035684 stock and domestic approximately five kilometres to the east of the project area.

Water would be sourced from the range of sources identified at 6.6.1.1. Neither of the dams or the bore are known to be used for agricultural purposes.

6.6.1.3 Impacts on agricultural resources and industries

The proposed activity would not impact on any biophysical SAL or CIC defined under a strategic regional land use plan.

The project area is within the Mugii Murum-ban SCA, is on a mountain and not within land used for agricultural purposes. No land currently used for agricultural purposes would be required. Therefore, there would be no reduction in agricultural land as a result of the proposed activity.

The traffic generation associated with the proposed activity is very low (section 6.4.1) and temporary. Impacts on agricultural businesses from delays associated with this additional traffic would be negligible.

The proposed activity would not impact on any water supply services or processing facilities required for agricultural enterprises. Water impacts are identified in section 6.2.2. Whilst there is a risk of spills of fuels and oils, that have the potential to impact water resources, mitigation measures are identified. No other impacts to water resources, and therefore agricultural users of water resources, are anticipated.

Neither the dams nor the bore identified as the sources of water for drilling are currently used for agricultural purposes. Therefore, there would be no impact on agricultural resources with respect to the use of a water resource.

No existing agricultural jobs would be lost as a direct result of the proposed activity.

Whilst the proposed activity may provide employment for a small number of contractors and there is likely to be some direct and indirect spending, the positive impact on the agricultural economy is likely to be negligible.

6.6.1.4 Mitigation measures

The mitigation measures specified in sections 6.2.1.2 and 6.2.2.2 would be implemented to minimise impacts on soils, surface water and groundwater respectively.

6.6.1.5 Agricultural impact risk ranking

The AIS guidelines provide guidance on the determination of the level of risk of agricultural impacts.

Table 6.1 identifies the risks to agriculture taking into account the mitigation measures specified in this REF.

Table 6-1 Agricultural impact risk ranking

Impact	Probability	Consequence	Risk
Traffic generation on Glen Davis Road may cause delay. Traffic generated would be very minor and would be temporary.	Possible	Negligible	Low
Spills of fuels and oils may pollute water and soil and this risk would be managed through the mitigation measures identified in this REF.	Possible	Minor	Low

The AIS guidelines provide examples of low risk activities. The proposed activity reflects these examples as follows:

- The proposed activity is not located on land used for agriculture and no intensive agricultural activities are being undertaken in the immediate vicinity.
- The duration of the construction activity is short term.
- Whilst the project is part of Airly Mine's exploration and groundwater monitoring program the proposed project is not likely to contribute to any cumulative effects on agriculture.
- All surface disturbance would be rehabilitated.
- The proposed activity would not result in permanent impacts on land or water resources.

The proposed activity, with the implementation of the identified mitigation measures, is expected to result in low risk agricultural impacts. Therefore, no further assessment is required.

6.7 Assessment of Aboriginal cultural heritage impacts

6.7.1 Will the activity disturb the ground surface or any culturally modified trees (e.g. a scarred tree)? Does the activity affect known Aboriginal objects or Aboriginal places? Can harm to objects or disturbance of landscape features be avoided?

6.7.1.1 Potential impacts

The activity would disturb the ground surface.

An Aboriginal archaeological due diligence assessment was undertaken by RPS and the report is provided in Appendix 3.

The results of the AHIMS search and the visual inspection indicate that there are no identified Aboriginal objects or sites at the borehole compounds. However, one previously recorded Aboriginal site (AHIMS#45-1-0127) borders the main access track on to a residential property (shown as R3 on figure 6.1). Aboriginal objects (stone artefacts) are distributed along a ridge spur and toe slope which runs northeast to south west. Sheet wash erosion has been noted on the toe slope (southwest portion of the site) adjacent to the track. In order to prevent artefacts eroding on to the track, sediment control measures are identified as mitigation in section 6.7.1.2. Also, it is important that vehicles adhere to the existing access track (due to the close proximity of the site to the track) therefore mitigation measures comprising vehicles adhering to the demarcated track are also identified in section 6.7.1.2.

6.7.1.2 Mitigation measures

As no Aboriginal objects or places have been identified within the project area therefore an AHIP is not required for the proposed activity.

Mitigation measures are as follows:

- In order to prevent harm to Artefact Scatter AHIMS #45-1-0127, sediment control measures will be installed where there is risk of erosion (as shown on Figure 3 of the Aboriginal archaeological due diligence report for the proposed activity) and visual markers will be installed along relevant portions of the track (as shown on Figure 3 of the Aboriginal archaeological due diligence report for the proposed activity) so that Centennial personnel are aware that vehicles must adhere to the demarcated track.
- All relevant Centennial Airly staff and contractors will be made aware of their statutory obligations for heritage under NSW NP&W Act (1974) and the NSW Heritage Act (1977), which may be implemented as a heritage induction.
- The Aboriginal archaeological due diligence report for the proposed activity will be kept by Centennial Airly so that it can be presented, if needed, as a defence from prosecution.
- If Aboriginal object/s are identified in the project area during works, then all works in the immediate area will cease and the area cordoned off. OEH will be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.
- In the event that skeletal remains are uncovered, work will cease immediately in that area and the area cordoned off. Centennial Airly will contact the NSW Police with no further action taken until written advice is provided by the Police. If determined to be Aboriginal, OEH will be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing will be developed in consultation with the relevant Aboriginal stakeholders.

6.7.1.3 Potential impact category

Mitigation measures identified above will be implemented to protect the identified Aboriginal site and in the event of Aboriginal objects being identified during the proposed activity. Therefore, with the implementation of these measures, impacts to Aboriginal cultural heritage would be negligible.

6.7.2 Does the proposed activity affect areas subject to native title claims, indigenous land use agreements or joint management?

There are no applications or determinations of native title covering the project area. There are also no registered Indigenous Land Use Agreements or Joint Management arrangements over the project area. Therefore, there would not be any impacts on such areas from the proposed activity.

6.8 Assessment of historic cultural or natural heritage impacts

6.8.1 What is the impact on places, buildings, landscapes or moveable historic heritage items?

6.8.1.1 Potential impacts

There are no non-Aboriginal heritage items and places recorded within or in close proximity to the project area.

6.8.1.2 Mitigation measures

- If, during the course of development works, suspected non-Aboriginal cultural heritage material is uncovered, work will cease in that area immediately. The NSW Heritage Branch (Enviroline 131 555) will be notified and works only recommence when an approved management strategy has been developed.

6.8.1.3 Potential impact category

Impacts to non-Aboriginal heritage are unlikely. In the event of finding materials of non-Aboriginal heritage during the proposed works, the mitigation measures identified above would be implemented.

6.8.2 Is any vegetation of cultural landscape value likely to be affected (e.g. gardens and settings, introduced exotic species, or evidence of broader remnant land uses)?

6.8.2.1 Potential impacts

"The Greater Blue Mountains Area – Additional Values" is identified on the National Heritage List as a place of national natural heritage. It includes the Wollemi, Blue Mountains, Yengo, Nattai, Kanangra-Boyd, Gardens of Stone and Thirlmere Lakes National Parks and the Jenolan Caves Karst Reserve. The closest part of the Greater Blue Mountains Area is the Gardens of Stone National Park at over one kilometre to the south of the project area. The Greater Blue Mountains Area does not include the project area and due to the distance from this area and the scale of the proposed activity is unlikely to significantly impact on this place of national natural heritage.

The Mugii Murum-ban SCA within which the project area is located contains items of heritage value. An Aboriginal due diligence study (including site survey) has been undertaken for the proposed activity and mitigation measures identified (section 6.7.12 and Appendix 3).

6.8.2.2 Mitigation measures

No further measures in addition to those identified in this REF.

6.8.2.3 Potential impact category

The impact would be negligible.

6.9 Is the proposed activity likely to impact on matters of national environmental significance under the Environmental Protection and Biodiversity Conservation Act 1999?

As discussed in section 5.5, an EPBC Act protected matters search has been undertaken and the results are reported in section 6 of Appendix 1.

The proposed activity is not expected to have any significant impact on any MNES provided the mitigation measures set out in Section 6.3.1.2 and the flora and fauna assessment in Appendix 1 are implemented.

6.10 Assessment of cumulative impacts

6.10.1 Potential impacts

There are already existing monitoring bores at Genowlan Mountain. These were the subject of a separate REF and have since been approved and constructed. Both the approved and proposed bores are subject to mitigation measures to minimise environmental impacts. Both projects would contribute to the collection of groundwater data to inform any future mining related development in the area.

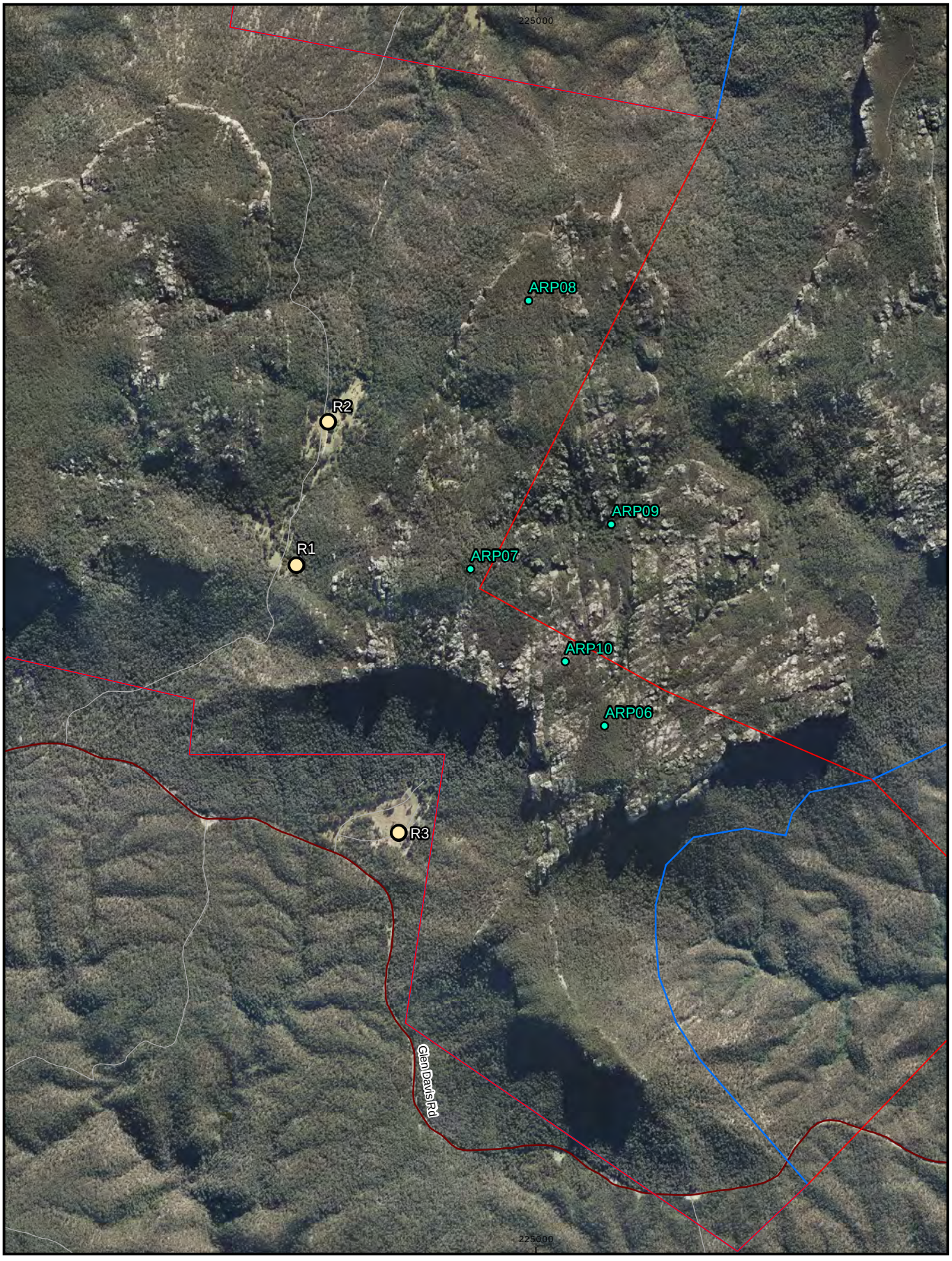
There are other mining related projects within the wider region. There may be community concern associated with the general increase in mining related activities in the region. This may be associated with beneficial effects relating to employment and adverse effects associated with environmental impacts. This would be addressed through ongoing community consultation.

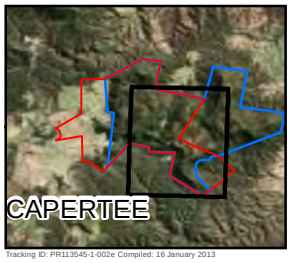
6.10.2 Mitigation measures

- Centennial will implement ongoing community consultation about their activities at Airly Mine and in the region.

6.10.3 Potential impact category

Cumulative impacts associated with community concern about environmental impacts associated with the general increase in mining related activities in the wider area could be low to medium adverse. Cumulative impacts associated with community concern about employment impacts associated with the general increase in mining related activities in the wider area could be negligible to low beneficial.





Tracking ID: PR113545-1-002e Compiled: 16 January 2013

N

250 0 250 500

Metres

APPROX SCALE 25,000 @ A4

GDA 1994 MGA Zone 56

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

DATA SOURCES

Base topographic data © Commonwealth of Australia (Geoscience Australia) 2006. NSW Estates, NSW Government (OEH), 2012

LEGEND

- Residential Property
- Proposed Borehole
- Local Road
- Main Road
- ML 1331 Boundary
- A232 Boundary

RPS

FIGURE 6-1

Locations of Nearest Residential Properties

7.0 Summary of potential impacts

7.1 Introduction

The potential impacts associated with the proposed activity are summarised in Table 7.1.

Table 7-1 Summary of potential impacts

Aspect	Potential impacts	Potential impact category (with mitigation measures)
Soil	There is potential for soil erosion from wind and from run off water. However, the area of disturbance is small there would be a very small gradiant/slope of the terrain.	Negligible
Soil	Fuels and oil would be used during the proposed activity. Any drilling muds used would be biodegradable to avoid the risk of soil (and water) contamination. Mitigation measures to minimise and manage the risk of spills are identified.	Low adverse
Soil	Soil would be removed during excavations and mitigation measures to ensure its re-use for rehabilitation are identified.	Negligible
Soil	Impacts associated with soil profile inversion and soil compaction would be mitigated.	Negligible
Water	Cross contamination of aquifers will be avoided through design and mitigation measures.	Negligible
Water	Changes to groundwater levels are not expected.	Negligible
Water	Risk of seepage of drilling fluids or hydrocarbons will be managed.	Negligible to low adverse
Hazardous substances	Risks associated with transport, use and storage of hazardous substances will be managed.	Negligible to low adverse
Waste	Odours caused by improper storage or treatment of putrescibles waste will be avoided through the mitigation measures.	Negligible
Waste	The risks of leaching of pollutants into groundwater, surface water and soil will be minimised through the mitigation measures.	Negligible to low adverse
Waste	The risks of pollution or contamination of water or land due to illegal dumping of waste and/or a lack of suitable containment of waste will be avoided through the mitigation measures.	Negligible
Waste	Littering of the area due to a lack of suitable containment of waste will be avoided through the mitigation measures.	Negligible
Air quality	Dust impacts to residential properties will be minimised through the mitigation measures.	Negligible
Air quality	Dust impacts to the Mugii Murum-ban SCA affecting the environment and those using the immediate area for recreation will be minimised through the mitigation measures.	Negligible to low adverse
Air quality	Emissions from vehicle and plant exhausts will be very low.	Negligible
Air quality	Whilst the area is not particularly gassy, odour emissions are possible.	Negligible to low adverse
Noise	Noise impacts to three residential properties will be managed through the mitigation measures.	Low to medium adverse
Noise	Noise impacts to those using the immediate area for recreation will be short term and managed through the mitigation measures.	Low to medium adverse
Flora and fauna	The potential loss of approximately 0.45 hectares native vegetation and small areas associated with the track upgrades comprising a small number of *Prostanthera stricta* (Mount Vincent Mintbush) plants listed under the TSC and EPBC Acts as Vulnerable, two hollow bearing trees	Low to medium adverse

Aspect	Potential impacts	Potential impact category (with mitigation measures)
	and mature trees. Mitigation measures are identified.	
Flora and fauna	No significant impact upon any listed threatened ecological communities or any listed threatened species.	Negligible
Flora and fauna	The risk of vehicles and machinery bringing materials onto the sites that may cause the distribution of weed species or introduce pathogens will be managed through the mitigation measures.	Negligible
Community services, infrastructure and sites of importance	Minor increases in traffic along Glen Davis Road and on the tracks to the project area are unlikely to result in traffic delays or road safety issues.	Negligible
Community services, infrastructure and sites of importance	Impacts associated with the recreational, heritage and conservation values of the Mugii Murum-ban SCA to the community would be short term and are addressed flora and fauna above and heritage below.	Low adverse
Community services, infrastructure and sites of importance	Potential short term impacts on recreational users within this part of the Mugii Murum-ban SCA from noise, dust, traffic, visual effects and the introduction of a hazard.	Low adverse
Economic issues	Provision of temporary construction work for around five contractors and purchasing of material supplies.	Negligible to low beneficial
Public safety	Potential hazards to recreational users of this part of the Mugii Murum-ban SCA will be managed through the mitigation measures.	Low adverse
Public safety	There is a risk of bushfire and mitigation includes site safety protocols, incident management and emergency procedures and the provision of a water source for fire fighting.	Low adverse
Visual or scenic landscape	During construction the works, within the Mugii Murum-ban SCA, would be visible. This may temporarily detract from the scenic qualities of the land.	Low adverse
Natural resources	The project area is within the Mugii Murum-ban SCA. The locations for the proposed boreholes have been selected to minimise disturbance to land and vegetation and the areas would be rehabilitated.	Low adverse
Natural resources	Quantities of fuel would not be significant.	Negligible
Natural resources	The proposed activity is not likely to involve the significant use, wastage, destruction or depletion of natural resources.	Negligible
Agriculture	No reduction in agricultural land as a result of the proposed activity.	-
Agriculture	Impacts on agricultural businesses from delays on Glen Davis Road caused by very low traffic generation.	Negligible
Agriculture	No impact on any water supply services or processing facilities required for agricultural enterprises.	-
Agriculture	Risks associated with spills of fuels and oils and potentially contaminating water and soil would be mitigated.	Negligible to low adverse
Aboriginal cultural heritage	No Aboriginal objects, sites or culturally modified trees were identified within the borehole compounds. One Aboriginal site borders the access track and measures for it protection are identified as mitigation.	Negligible
Aboriginal cultural heritage	In the event of Aboriginal objects being identified during the proposed activity, mitigation measures are identified.	Negligible
Historic cultural heritage	No non-Aboriginal heritage items and places recorded within or in close proximity to the project area.	-

Aspect	Potential impacts	Potential impact category (with mitigation measures)
Historic cultural heritage	In the event of non-Aboriginal heritage material being identified during the proposed activity, mitigation measures are identified.	Negligible
Cultural landscape	Impacts to the Greater Blue Mountains Area are not likely due to the distance and scale of the activity.	Negligible
Cumulative	There are existing monitoring bores at Airly Mine and both projects would contribute to the collection of groundwater data to inform any future mining related development in the area.	Negligible
Cumulative	Community concern about environmental impacts associated with the general increase in mining related activities in the wider area. This would be addressed through ongoing community consultation.	Low to medium adverse
	Community concern about employment impacts associated with the general increase in mining related activities in the wider area. This would be addressed through ongoing community consultation.	Negligible to low beneficial

On balance, with the implementation of the identified mitigation measures within this REF, the proposed activity would have a low adverse impact on the environment. These impacts would be confined mainly to the construction period and would be temporary (approximately two months) and of a small scale.

7.2 Clause 228 factors

Clause 228 of the Environmental Planning and assessment Regulation 2000 outlines a number of factors that must be taken into account in assessing an activity under Part 5 of the EP&A Act. Table 7.2 provides an assessment of the clause 228 factors.

Table 7-2 Clause 228 factors

Factor	Impact
Any environmental impact on a community	There are three residential properties within proximity of the project area. Two are owned by Centennial and one is privately owned. There is potential for noise during a temporary period and mitigation measures are identified in this REF. Traffic generation is likely to be insignificant. There may be combined noise, dust, visual, traffic and hazard impacts to those members of the community using this part of the Mugii Murum-ban SCA for recreational purposes. Recreational users may prefer to use other parts of the Mugii Murum-ban SCA during the temporary construction period. Mitigation measures are identified in this REF. Impacts associated with the proposed activity would be virtually imperceptible to the wider community.
Any transformation of a locality	There would be a localised and temporary visual impact within the Mugii Murum-ban SCA in the immediate vicinity of the boreholes during construction. Following construction and geotechnical logging the compounds would be mainly rehabilitated whilst leaving the piezometers in place during monitoring. The project area would be completely rehabilitated following decommissioning of the monitoring bores.
Any environmental impact on the ecosystems of the locality	The proposed activity involves the removal of approximately 0.45 hectares of native vegetation and a minor amount for track upgrading. The proposed activity would potentially lead to the removal of a small number of *Prostanthera stricta* (Mount Vincent Mintbush) plants. This flora species is listed under the TSC and EPBC Acts as Vulnerable. With the implementation of identified mitigation measures, it is considered unlikely that the works would results in an adverse effect on this species such that a viable population of the species is likely to be placed at risk of extinction. Two identified hollow bearing trees would be avoided.
Any reduction of the aesthetic, recreational, scientific or other	The proposed activity would reduce the aesthetic values of the land proposed for the borehole compounds on a temporary basis during the construction

Factor	Impact
environmental quality or value of a locality	period. There would be a temporary impact on those using the Mugii Murum-ban SCA for recreational purposes.
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations	There would be a temporary impact on the Mugii Murum-ban SCA although this would be small scale within the context of the Mugii Murum-ban SCA and of a temporary nature.
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)	The project area provides potential habitat for a range of protected fauna. A small amount of vegetation would be removed and therefore the impact would be minor as there is alternative habitat within the wider area. The project area would be rehabilitated.
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air	The proposed activity would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air
Any long-term effects on the environment	The proposed activity would have no long term effects on the environment.
Any degradation of the quality of the environment	There is potential for minor short term degradation due to noise emissions and visual impacts or from the accidental release of contaminants during construction.
Any risk to the safety of the environment	There are potential short term risks to the environment associated with incidents and spills. There is also a risk of bushfire. Mitigation measures are identified.
Any reduction in the range of beneficial uses of the environment	There would be potential impacts on the amenity and recreational value of the area in the vicinity of the proposed activity. This would be temporary.
Any pollution of the environment	There is a potential short term risk associated with air emissions, incidents and spills. Mitigation measures are identified.
Any environmental problems associated with the disposal of waste	All wastes would be collected, classified and removed from the project area in accordance with relevant legislation and guidelines.
Any increase demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The types of resources required for the proposed activity are not in short supply.

8.0 Conclusion

This REF has been prepared to assess the potential impacts of the installation of five boreholes to identify the potential coal resources and undertake groundwater monitoring within A232.

A flora and fauna assessment, Aboriginal due diligence assessment, agricultural impact statement and surface and groundwater assessment has been prepared to inform this REF.

The locations for the proposed borehole compounds were selected to minimise vegetation clearance and ground disturbance and are situated beside existing tracks.

The project area is within the Mugii Murum-ban SCA. Impacts are mainly associated with the construction period, following which the project area would be partially rehabilitated (the heads of the piezometers would remain). Following the useful life of the groundwater monitoring, anticipated to be around 20 years, the boreholes would be decommissioned and completely rehabilitated.

Impacts range from low beneficial to negligible to medium adverse. The assessment concludes that, on balance, the proposed activities impacts categorised in accordance with ESG2 as low adverse, provided the mitigation measures identified in this REF are implemented. These potential impacts are predominantly associated with the construction stage that would last for a short duration, approximately two months (weather permitting) and the proposed activity is of a minor scale. The proposed activity is not likely to significantly affect the environment or any threatened species, populations or ecological communities, their habitat or critical habitat. The proposed activity does not require preparation of an EIS or SIS.

This REF has been prepared under Part 5 of the EP&A Act, and to assist DTIRIS in their consideration of the conditions of A232, to accompany a surface disturbance notice and as supporting documentation to the Conservation Risk Assessment required under the NP&W Act as the proposed sites are within Mugii Murum-ban SCA.

9.0 Statement of commitments

Table 9.1 below sets out the mitigation measures identified in section 6 together with other commitments made in other parts of the REF including the description of the proposed activity in section 2, approvals identified in section 5 and conditions relating to A232 and ML1331.

Table 9-1 Statement of commitments

Item	Commitment
Activity type and location	▪ The proposed activity will be carried out on Genowlan Mountain and at the locations identified in the REF and will include: » Drilling of up to five boreholes (ARP06 to 10) for the purposes of obtaining geotechnical information about the potential coal resource and groundwater monitoring. » Potential upgrading of parts of the existing track leading to boreholes ARP07 and ARP08. » Minor vegetation clearance to enable access to boreholes ARP06 and ARP10. » Sampling and monitoring. » Partial rehabilitation following geotechnical testing and full rehabilitation following completion of the groundwater monitoring bores useful life (currently anticipated to be approximately 20 years).
Hours of operation	▪ Construction would occur 7.00am to 7.00pm Monday to Sunday. ▪ During operation of the piezometers, members of staff will travel to the piezometers to take readings and/or inspect the site.
Activity duration	▪ Drilling of the boreholes will take approximately two weeks each. All the proposed boreholes will be constructed and partially rehabilitated within two months (weather permitting). ▪ The boreholes are currently anticipated to be operational for approximately 20 years.
Proposed commencement date	▪ Quarter 1 of 2013
Drilling methodology	▪ As described in section 2 of the REF and in accordance with Minimum Construction Requirements for Water Bores in Australia (ADAI, 2012).
Maximum area of disturbance	▪ 0.45 hectares for the borehole compounds, 0.3 hectares for vegetation clearance along the existing overgrown track to ARP06 and ARP10 and small areas for upgrades to the existing track to ARP07, ARP08 and ARP09.
Community consultation	▪ Community consultation will be ongoing.
Access	▪ Under the *Mining Act 1992*, an access arrangement agreed in writing with the NPWS will be obtained by Centennial Airly prior to the commencement of activities.
Other regulatory approvals required	▪ Prior to drilling, a monitoring bore licence application will be lodged with the NSW Office of Water under Part 5 of the *Water Act 1912*. ▪ Appropriate water licensing for the extraction of water from the dams and bore identified in this REF will be obtained prior to any water extraction. ▪ Conservation Risk Assessment under the NP&W Act.
A232 conditions (in relation to approvals and methodology)	The relevant conditions of A232 will be complied with including: ▪ Surface Disturbance Notice form. To comply with condition 23 and 24 of A232 the following additional measures to those identified elsewhere in this REF are: ▪ All boreholes will be constructed and/or sealed to prevent the collapse of the surrounding surface. ▪ If any borehole meets natural or noxious gases it will be plugged or sealed to prevent

Item	Commitment
	their escape. ▪ If any borehole meets an artesian or sub-artesian flow it will be effectively sealed to prevent contamination or cross contamination of aquifers and will be permanently sealed with cement plugs to prevent surface discharge to groundwater. ▪ If any potentially hazardous tools or logging equipment is dropped into the boreholes and is unable to be recovered, this will be reported to the Regional Inspector of Mines in accordance with condition 23 of A232. ▪ Waters flowing from the boreholes will be managed and contained and disposed of in accordance with the ANZECC 2000 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines'. ▪ An assessment of the risk of gas blowouts will be undertaken prior to the commencement of drilling in accordance with condition 24, (a) of A232. ▪ All over pressure gas occurrences that occur during drilling will be reported in accordance with condition 24 (b) of A232. ▪ If directed by the Department, analyses and tests on any coal seams intersected by the drill holes that may be economically mineable will be undertaken. ▪ Boreholes will be decommissioned once they cease to be used in accordance with condition 24 (d) of A232. To comply with condition 26 of A232: ▪ All boreholes maintained in an open condition will be cased to prevent collapse and fitted with a removable cap to ensure safety. To comply with condition 38 of A232: ▪ Core samples will be collected in accordance with condition 38 of A232. To comply with condition 15 of A232: ▪ Consent is required from the landholder for the licence holder to fell trees. The landholder is entitled to use the timber. To comply with condition 23 of A232: ▪ A NOW hydrologist must be at least 28 days prior to the commencement of drilling operations.
ML1331 conditions	▪ Relevant conditions under ML1331 will be complied with.
Soils	In addition to measures identified for 'surface and groundwater' below: ▪ Excess soil generated during site preparation activities will be stockpiled at each borehole compound and used as backfill for rehabilitation. ▪ Topsoil and other soil horizons will be stripped, handled and stockpiled separately during site preparation activities. ▪ No soil will be removed from the project area unless it is contaminated in which case it would be taken to a suitably licensed waste facility. ▪ Erosion and sediment controls will be implemented where necessary during site preparation, including the borehole compounds and track upgrades, in accordance with best management practises (such as the Managing Urban Stormwater: Soils and Construction (Landcom 2004) ('the Blue Book') or the Best Practise Erosion and Sediment Control Guidelines (IECA 2008). ▪ The quantity of chemicals, fuels and oils stored at the project area will be minimised where practicable. ▪ All chemicals, fuels and oils stored at the project area will be kept in appropriately secured, bunded storage in accordance with the relevant Materials Safety Data Sheets (MSDS). ▪ An MSDS register of all chemicals used or stored at the project area will be maintained. ▪ Maintenance of vehicles, plant and equipment will occur off site at an appropriately licensed facility unless considered appropriate to conduct such maintenance at the project area. Refuelling will be undertaken off site in a designated bunded area. ▪ A spill kit will be provided and site workers/contractors trained in its use. Any spills or leaks will be contained and cleaned up immediately using the spill kit. Contaminated material such as soil or absorbent materials will be placed in a bag and removed from

Item	Commitment
	the project area for disposal at a suitably licensed waste facility. ▪ Plant and equipment will be maintained and inspected on a daily basis. ▪ Drilling fluids will be contained in over ground tanks that have overflow capacity in case of heavy rain. These will be inspected regularly and maintained. ▪ All chemicals, fuels and oils will be removed at the completion of drilling. ▪ Disturbed areas will be rehabilitated in accordance with condition 27 of A232. Partial rehabilitation will be undertaken following drilling and once the geotechnical testing has been undertaken and full rehabilitation once the groundwater monitoring bores have completed their useful life.
Surface and groundwater	▪ Drilling and decommissioning will be undertaken in accordance with the Minimum Construction Requirements for Water Bores in Australia (ADAI, 2012) and as set out in the surface and groundwater assessment for the proposed activity. ▪ Good drilling practises will include above ground tanks, casing the top 3-6 metres and installation of sediment fences to minimise the risk of contamination of surface or groundwater. ▪ Drilling at steep gradients will be avoided to minimise the risk of contaminants migrating towards surface water courses in the event of a spill. ▪ Drilling will be undertaken as close to the access tracks as possible and as far from Genowlan Creek and drainage lines as practicable. All boreholes will avoid drainage channels and surface water features. ▪ Only clean, fresh water and biodegradable drilling additives will be used for the drilling fluid. In the event that any non-biodegradable drilling muds/additives are to be used this will be subject to further assessment. ▪ Pre-work checks of each drill rig, associated equipment and drill site will be undertaken to avoid the contamination of aquifers. This will examine site conditions prior to drilling and record any indications of visible contamination, disturbed or discoloured soil, disturbed or affected vegetation, proximity to surface water features and drainage lines, ponding and pooling of water. ▪ A hydraulic drill will be used. ▪ Water will be circulated through above ground settling pits or containers. ▪ The drill hole will be filled with water during drilling to create pressure on the borehole walls and prevent any potential loss from the aquifers. ▪ Water will naturally form a thin layer of mud on the borehole walls, reducing seepage loss. ▪ Surface casing will be installed where required to stabilise the upper part of the borehole and protect against contamination from surface water ingress. ▪ Industry standard construction materials will be used. ▪ Impermeable cement-bentonite grout will be used to prevent any ingress of surface water into the bore and mixing of groundwater. ▪ A risk assessment will be undertaken prior to any discharge of water to the environment. This is to avoid groundwater discharging to the surface that may cause flooding or contamination. ▪ Discharged water will be contained and removed. ▪ Features associated with surface water drainage and/or groundwater seepage will be avoided by locating the boreholes at an appropriate distance. ▪ Drilling fluids will be removed from the borehole compounds following drilling. ▪ An EMP will be prepared to manage the use of hazardous substances to include: ▪ Double bunded fuel tanks and storage / decanting of hazardous substances in designated areas where any spillage will be contained. ▪ Spill kits will be provided on site and all personnel trained in their use to ensure the effective management of any spill and the minimisation of contamination risk. ▪ Surface casing will be used where seepage of drilling fluids/muds, hydrocarbons or presence of other contaminants are indicated. ▪ Good site housekeeping and good drilling practices will be implemented. ▪ Drilling will be avoided during wet weather conditions.

Item	Commitment
	▪ Drainage line crossings will be perpendicular to access routes. ▪ To avoid changes to drainage leading to flooding caused by construction of drill pads: ▪ Surface water catchment and drainage line crossings will be minimised. ▪ Effective drainage to control surface runoff and minimise erosion will be implemented. ▪ In the event that a perched water table is intersected, drilling will cease or the surface casing will be used to seal off any shallow groundwater bearing formations dependent on the volume of groundwater and site conditions. ▪ Vegetation will be replaced as part of the rehabilitation to avoid increased erosion.
Hazardous substances	In addition to measures comprising the management of chemicals, hydrocarbons and other hazardous substances identified for 'soils' above: ▪ Chemicals and potentially hazardous substances will be used and stored according to regulatory requirements including the *Work Health and Safety Act 2011*. ▪ Any dangerous goods will be transported according to regulatory requirements under the *Dangerous Goods (Road and Rail Transport) Act 2008*.
Waste	▪ Drilling mud will be removed from the borehole compounds, at the completion of drilling, by a contractor licensed under the POEO Act to transport trackable wastes, with the appropriate waste transport certificates. ▪ Drill cuttings will be tested for their suitability for reuse on site for rehabilitation. Testing will be in accordance with Australian Standard 1141 Methods of Sampling and Testing Aggregates. Drill cuttings that qualify as excavated natural material will be reused on site for rehabilitation. Those that exceed the limits set by the excavated material exemption will be transported and disposed of as for the drilling muds specified above. ▪ The management of waste, including its transport will comply with the POEO Act and POEO (Waste) Regulation. ▪ Appropriate waste receptacles will be provided at the borehole compounds and track upgrading areas for the disposal of domestic wastes. ▪ Waste materials will be separated, classified and managed in accordance with the Waste Classification Guidelines Part 1: Classifying Waste (DECCW 2009). ▪ All wastes will be removed from the borehole compounds and the track upgrading areas at the completion of drilling for disposal at an appropriately licensed waste management facility. ▪ All staff and contractors will be made aware of waste management procedures. ▪ Chemical, fuel and oil containers will be managed according to the MSDS or manufacturers' directions to avoid potential impacts to the environment or human health.
Air quality	In addition to a measure to ensure vehicles drive at low speeds for 'community' below: ▪ Dust generated during site preparation, drilling and rehabilitation will be suppressed by spraying water at each borehole compound if required. ▪ Land disturbance areas will be minimised. ▪ Vehicles, plant and machinery will be regularly maintained to ensure they are in good working condition and will be turned off when not in use. ▪ In the event that any drill hole meets natural or noxious gases it will be plugged or sealed to prevent their escape.
Noise	▪ The three nearest residential properties will be notified of the works at least two weeks prior to the commencement of works. ▪ Best practice measures such as those identified in the ICNG will be implemented where practicable to minimise noise levels. ▪ In the event of a noise complaint, the effectiveness of noise mitigation measures will be assessed and additional feasible and reasonable measures will be implemented where necessary. ▪ Signage will be installed at the works areas during the construction of the boreholes including contact details for complaints.

Item	Commitment
Flora and fauna	▪ The drilling vehicle and other vehicles will avoid damaging or removing native vegetation wherever possible by carefully driving around all trees and shrubs to minimise any impacts on native vegetation. ▪ Vegetation removal will be avoided where possible. Where vegetation removal is unavoidable, it will be kept to a minimum and the avoidance of the following will be prioritised: » Mount Vincent Mintbush, *Prostanthera stricta,* that will be marked with flagging tape. » Hollow bearing trees including those identified on figure 2 of the flora and fauna assessment for the proposed activity. » Mature trees. ▪ All removed vegetation will remain within close proximity to the project area, with mature trees gently placed in surrounding areas to allow for the survival and dispersal of any displaced fauna currently utilising these trees. ▪ Water management strategies will be implemented to prevent the movement of sediments or contaminated waters / liquids into surrounding habitats, including potential down-slope waterways or drainage lines. ▪ Topsoil management will be implemented at each of the borehole compounds to ensure that current seed banks in top soil be returned to the sites for rehabilitation. ▪ Appropriate measures such as vehicle and machinery cleaning protocols will be employed to ensure that vehicles and machinery working within the project area do not bring materials (soils, weeds or pathogens etc.) onto the sites that may cause the distribution of weed species or introduce pathogens such as *Phytopthera cinnamomi.*
Community services and infrastructure	▪ Public inconvenience will be minimised during the proposed activities, such as by keeping the existing tracks as clear and accessible as possible and the provision of signage. ▪ In the event of normal public use of any road or track being affected, prior written approval from DTIRIS will be obtained. ▪ The use of tracks during wet weather will be restricted to prevent damage. ▪ Activities will not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other public utility.
Safety and bushfire risk	In addition to measures addressing the storage and use of potentially flammable substances, their removal following drilling and locations for refuelling vehicles and equipment identified in ‘soils’ above: ▪ During construction of each borehole, compounds will be fenced for safety reasons. ▪ Vehicles will travel at low speeds. ▪ Site safety protocols, incident management and emergency procedures, including those to manage bushfire risk, will be implemented during site preparation, construction, operation and rehabilitation. ▪ During site preparation, construction and rehabilitation, a water source will be made available at each works area for fire fighting. ▪ Availability of existing roads and land for use for fire fighting will not be affected. ▪ Hazard control measures will be implemented in compliance with the *Mine Health and Safety Act 2004* and *Mine Health and Safety Regulation 2007*.
Visual	▪ The project area will be kept in a clean and tidy condition during site preparation, drilling activities and the operation of the monitoring bores.
Natural resources	In addition to measures identified for ‘flora and fauna’, ‘Aboriginal cultural heritage’, ‘Non-Aboriginal cultural heritage’, ‘soils’ and ‘surface and groundwater’: ▪ Fuel will be used as efficiently as possible.
Aboriginal cultural heritage	▪ In order to prevent harm to Artefact Scatter AHIMS #45-1-0127, sediment control measures will be installed where there is risk of erosion (as shown on Figure 3 of the Aboriginal archaeological due diligence report for the proposed activity) and visual markers will be installed along relevant portions of the track (as shown on Figure 3 of the Aboriginal archaeological due diligence report for the proposed activity) so that Centennial personnel are aware that vehicles must adhere to the demarcated track.

Item	Commitment
	▪ All relevant Centennial Airly staff and contractors will be made aware of their statutory obligations for heritage under NSW NP&W Act (1974) and the NSW Heritage Act (1977), which may be implemented as a heritage induction. ▪ The Aboriginal archaeological due diligence report for the proposed activity will be kept by Centennial Airly so that it can be presented, if needed, as a defence from prosecution. ▪ If Aboriginal object/s are identified in the project area during works, then all works in the immediate area will cease and the area cordoned off. OEH will be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed. ▪ In the event that skeletal remains are uncovered, work will cease immediately in that area and the area cordoned off. Centennial Airly will contact the NSW Police with no further action taken until written advice is provided by the Police. If determined to be Aboriginal, OEH will be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing will be developed in consultation with the relevant Aboriginal stakeholders.
Non-Aboriginal cultural heritage	▪ If, during the course of development works, suspected non-Aboriginal cultural heritage material is uncovered, work will cease in that area immediately. The NSW Heritage Branch (Enviroline 131 555) will be notified and works only recommence when an approved management strategy has been developed.
Cumulative	▪ Centennial will implement ongoing community consultation about their activities at Airly Mine and in the region.

10.0 References

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Novacoal Australia (1991) Airly Coal Project Environmental Impact Statement

NSW Office of Water (NOW) (2012) NSW Aquifer Interference Policy

NSW Resources and Energy (2012) ESG2: Environmental Impact Assessment Guidelines

11.0 Abbreviations

Abbreviation	Meaning
A232	Authorisation Area 232
AHIMS	Aboriginal Heritage Information Management Systems
AHIP	Aboriginal Heritage Impact Permit
AIS	Agricultural Impact Statement
BoM	Bureau of Meteorology
CIC	Critical industry cluster
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services
EEC	Ecologically Endangered Communities
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EMP	Environmental Management Plan
IBC	Intermediate bulk container
ICNG	Interim Construction Noise Guidelines (DECC 2009)
LEP	Local Environmental Plan
LGA	Local government area
KTP	Key threatening processes
ML	Mining lease
OEH	NSW Office of Environment and Heritage
MNES	Matters of National Environmental Significance
MSDS	Materials Safety Data Sheets
NP&W Act	*National Parks & Wildlife Act 1974*
NOW	NSW Office of Water
NPWS	NSW National Parks and Wildlife Services
REF	Review of Environmental Factors
SAL	Strategic agricultural land
SCA	State Conservation Area
SEPP	State Environmental Planning Policy
SEWPAC	Department of Sustainability, Environment, Water, Population and Communities
SHR	State Heritage Register
SIS	Species Impact Statement
SSD	State Significant Development
TSC Act	*Threatened Species Conservation Act 1995*
WMA	*Water Management Act 2000*

Appendix 1

Flora and Fauna Assessment, prepared by RPS

Flora and Fauna Assessment

Proposed Boreholes at Airly Colliery, Airly

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Approval for Issue

Name	Signature	Date
Paul Hillier		15/01/2013

Executive Summary

RPS Australia East Pty Ltd (RPS) was engaged by Centennial Airly Pty Ltd to undertake a Flora and Fauna Assessment for five proposed geotechnical and water monitoring bore sites. This report was undertaken over lands encompassed by the existing Authorisation Area A232. The report relates to a proposed activity to determine the quality of the coal resource, obtain geotechnical data on the strata associated with the coal seam and to monitor groundwater levels. This includes geotechnical investigations regarding coal measures contained within the Airly Colliery coal mining exploration area. The construction works will take approximately two months in total. Once the boreholes have been constructed and coal resources tested the bore sites will be mostly rehabilitated but will leave the piezos in place for approximately 20 years. Then the piezos will be decommissioned and the bore sites completely rehabilitated. Five proposed exploration sites, including the access track were investigated in order to assess their potential for supporting threatened species, populations and ecological communities known to occur within the region.

This assessment aims to examine the likelihood of the proposed exploration program to have a significant effect on any threatened species, populations or ecological communities listed within the NSW *Threatened Species Conservation Act 1995* (TSC Act 1995). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act 1997). Assessment is also made with regard to those threatened entities listed federally under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

VEGETATION

Consultation with regional mapping – "Vegetation of the Western Blue Mountains" (VWBM) (DEC 2006) in conjunction with ground-truthing identified four vegetation assemblages associated with the proposed exploration sites as follows:

- MU 4 Sheltered Gully Brown Barrel Ferny Forest (DEC 2006), a community that occurred at exploration Site 9;
- MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest (DEC 2006), a community that occurred at exploration Sites 7 and 8;
- MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest (DEC 2006), a community that occurred at exploration Site 6; and
- MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath (DEC 2006), a community that occurred at exploration Site10.

Investigations were also conducted to determine if there was potential for regionally occurring threatened ecological communities (EECs) to occur within the sites, in particular, MU 47 'Genowlan Point Dwarf Sheoak Heathland' which is listed as the EEC 'Genowlan Point *Allocasuarina nana* Heathland' under the TSC Act 1995. This EEC (or any others) was not found to occur within or in the vicinity of the proposed exploration sites.

Significant Flora

A number of threatened flora species were targeted during flora investigations, due to the presence of existing records from the wider locality, including, *Prostanthera stricta* (Mount Vincent Mintbush), *Pultenaea* sp. Genowlan Point, *Pultenaea* sp. *Olinda, Eucalyptus cannonii* (Capertee Stringybark), *Grevillea evansiana* (Evans Grevillea), *Grevillea obtusiflora, Persoonia marginata* (Clandulla Geebung) and *Euphrasia arguta*.

One threatened flora species, *P. stricta*, was recorded within the vicinity of bore holes ARP06, ARP07 and ARP08. This species also occurred in large numbers along the access track leading to ARP07 and ARP08.*Prostanthera stricta* is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999.

HABITAT

Habitat within the site was assessed for its potential to support native fauna species including threatened fauna for which records occur within the wider locality. All of the proposed exploration sites are characterised by open forest habitat with a sparse shrub layer and a short mostly grassy groundlayer. Minor differences occur with respect to the dominant species in the canopy, shrub and ground layers. Other habitat attributes such as rocks/boulders, watercourses and a slightly denser shrub layer are present in close proximity to some of the proposed boreholes.

Flora Habitat

The vegetation communities throughout the proposed borehole areas are characterised by ridge top sandy soil substrates derived from erosional processes acting upon underlying sandstones offering habitat for a range of common local plant species.

- MU 4 Sheltered Gully Brown Barrel Ferny Forest, a community that occurred at exploration site 9. The extent of this vegetation is listed as 303ha (DEC 2006). This vegetation type is tall with a high level of soils moisture;
- MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest, a community that occurred at exploration sites 7 and 8. The extent of this vegetation is listed as 142ha (DEC 2006). This vegetation type is open. It is known to provide habitat for threatened species such as *Eucalyptus cannonii* and *Prostanthera stricta*;
- MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest (DEC 2006), a community that occurred at exploration site 6. The extent of this vegetation is listed as 1038ha (DEC 2006). This vegetation type is moderately dry and exposed. It is known to provide habitat for threatened species such as *Apatophyllum constablei*, *Pultenaea* sp Glenowlan Point, *Eucalyptus cannonii* and *Prostanthera stricta*; and
- MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath, a community that occurred at exploration site 10. The extent of this vegetation is listed as 1054ha (DEC 2006). This vegetation type is moderately dry and exposed. It is known to provide habitat for threatened species such as *Acacia flocktoniae*, *Darwinia peduncularis*, *Euphrasia bowdeniae*, *Grevillea evansiana*, *Leionema sympetalum*, *Leucopogon fletcheri*, *Prostanthera stricta* and *Prostanthera cryptandroides*.

Several locally occurring threatened flora species are known to occur within local sclerophyll forests on sandstone substrates. However, only *P. stricta* was recorded at or in the vicinity of any of the five proposed exploration sites.

Fauna Habitat

Open Forest habitat occurred at all of the proposed exploration sites. Associated habitat was found to be a low to moderate density of hollow-bearing trees and occasional rock outcrops with some cracks and crevices and some small perennial watercourses. The presence of mostly small to medium sized hollows within the surrounding areas provides suitable habitat in the vicinity of the sites and represents potential breeding habitat for hollow dependent woodland birds, such as treecreepers and also provides a capacity to provide shelter for arboreal mammals and hollow-dwelling microchiropteran bats. Two hollow-bearing trees, with hollow sizes potentially suitable for microchiropteran bats was recorded at ARP08.

The site provides nectar producing plant species in low abundance that is highly seasonal in nature and might otherwise be suited to the foraging habits of a variety of migratory or vagrant avifauna. The vegetation within the sites was found to contain low to moderate numbers of *Allocasuarina* tree species which is favoured by the Glossy Black-Cockatoo, while surrounding forested areas provide moderate foraging resources for the Gang-gang Cockatoo. *Allocasuarina* tree species was found recorded in high numbers at ARP06, as well as along the track leading to ARP06. Evidence of Glossy Black-Cockatoo feeding activity, in the form of chewed *Allocasuarina* cones was also recorded. Feeding habitat for the Glossy Black-Cockatoo will therefore be required to be removed by the proposal. This feeding resource is however in high abundance locally and the portion within ARP06 and along the access track is comparatively a very small amount.

CORRIDORS AND HABITAT LINKAGES

The proposed exploration sites occur within contiguous wooded habitats. The proposed exploration program has been designed to minimise the impact on native vegetation by generally avoiding damage to vegetation by drilling the bores immediately adjacent to the existing track, or where the track does not exist by driving between the trees and drilling in small existing clearings as they provide sufficient room to do so. It is expected that the proposed exploration program will have a low impact through the retention of native vegetation in its current state wherever possible. It is considered that this low impact approach and the retention of the native vegetation wherever possible within the area will not have a detrimental effect on the corridors and habitat linkages required for the movements of the local fauna and the proposed works are highly unlikely to result in fragmentation or isolation of potential habitat for locally occurring threatened species.

FAUNA

Fauna observed within the sites were limited to common avian woodland species, common reptiles and numerous traces such as scats and tracks of other mammals such as goats and macropods.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The main ecological impacts associated with the proposed installation of five proposed exploration sites, including the access track were investigated in order to assess their potential for supporting threatened species, populations and ecological communities known to occur within the region. The main ecological impacts identified by the proposal is the possible removal of a small number of *P. stricta*, removal of feed tree species for the Glossy Black-Cockatoo and the possible removal of two hollow-bearing trees, with hollows of a size suitable for microchiropteran bats.

Nine *P. stricta* plants is the expected maximum loss to be experienced by the drilling itself, however a number of these plants are expected to be avoided. Additional plants, which are encroaching along an existing track, are also expected to be removed for track upgrades to access ARP07 and ARP08. The track where these species were recorded provides access to a communications tower. Future maintenance of these tracks to maintain access, requiring the removal of the encroaching *P. stricta*, would therefore be likely in the future anyway, in the absence of the proposed boreholes.

No other threatened species or populations were detected on the site during field surveys. No EECs were recorded within the vicinity of the sites or the access tracks. Assessment via a seven-part test found that the proposal was unlikely to significantly impact on any of the identified species or communities listed in the TSC Act 1995. Assessment under the EPBC Act 1999 found that the proposal was unlikely to significantly impact on any of the identified species or communities listed on the EPBC Act 1999. In conclusion, the proposal is

unlikely to significantly impact on any species, populations or ecological communities listed under the TSC Act 1995 or EPBC Act 1999.

Recommendations

The following recommendations have been outlined to provide ecological guidelines and site management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed exploration sites.

- The drilling and other vehicles are to avoid damaging or removing native vegetation by wherever possible carefully driving around all trees and shrubs to minimise any impacts on native vegetation. This will ameliorate the Key Threatening Processes '*Removal of Native Vegetation'* and *'Loss of Hollow-bearing Trees*;
- Where vegetation removal is unavoidable, it shall be kept to a minimum. Particular effort should be made to avoid disturbing *Prostanthera stricta* (marked with flagging tape), mature trees and hollow bearing trees;
- All removed vegetation shall remain within close proximity to the site, with mature trees gently placed in surrounding areas to allow for the survival and dispersal of any displaced fauna currently utilising these trees;
- It is recommended that water management strategies be implemented at the proposed exploration sites to prevent the movement of sediments or contaminated waters / liquids into surrounding habitats, including potential down-slope waterways or drainage lines;
- It is recommended that appropriate measures such as vehicle cleaning protocols be employed to ensure that machinery working within the site do not bring materials (soils, weeds or pathogens etc.) onto the sites that may cause the distribution of weed species or introduce pathogens such as *Phytopthera.* This will ameliorate the Key Threatening Processes '*Weed Invasion by Exotic Perennial Grasses'* and '*Infection of Native Plants by Phytopthera cinnamomi'*; and
- That topsoil management be implemented at each of the sites to ensure that current seed banks in top soil be returned to the site after cessation of geotechnical investigations.

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Terms and Abbreviations

Abbreviation	Description
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
DEWHA (now SEWPaC)	Commonwealth Department of the Environment, Water, Heritage and the Arts
DoP	NSW Department of Planning
EEC	Endangered Ecological Community
EP&AA Act 1997	Environmental Planning and Assessment Amendment Act 1997
EPBC Act 1999	Commonwealth *Environment Protection Biodiversity Conservation Act 1999*
ha	Hectare
OEH	NSW Office of Environment and Heritage
RPS Australia East Pty Ltd	RPS
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
TSC Act 1995	NSW *Threatened Species Conservation Act 1995*

1.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Centennial Airly Pty Ltd to undertake a Flora and Fauna Assessment on five proposed geotechnical exploration and groundwater monitoring bores. This report was undertaken over lands encompassed by the existing Authorisation Area A232. This is important for determination of the quality of the coal resource, to obtain geotechnical data on the strata associated with the coal seam and to monitor groundwater levels. The construction and drilling works will take approx 2 months in total. Once the boreholes have been constructed and coal resources tested the bore sites will be mostly rehabilitated but will leave the piezos in place for approximately 20 years. Then the piezos will be decommissioned and the bore sites completely rehabilitated. Five proposed exploration sites, located adjacent to the existing or the disused access tracks were investigated in order to assess their potential for supporting threatened species, populations and ecological communities known or likely to occur within the region.

This assessment aims to examine the likelihood of the proposed exploration program to have a significant effect on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act 1995). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act 1997). Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Figure 1 shows the locations of the tracks and proposed exploration and groundwater monitoring borehole sites.

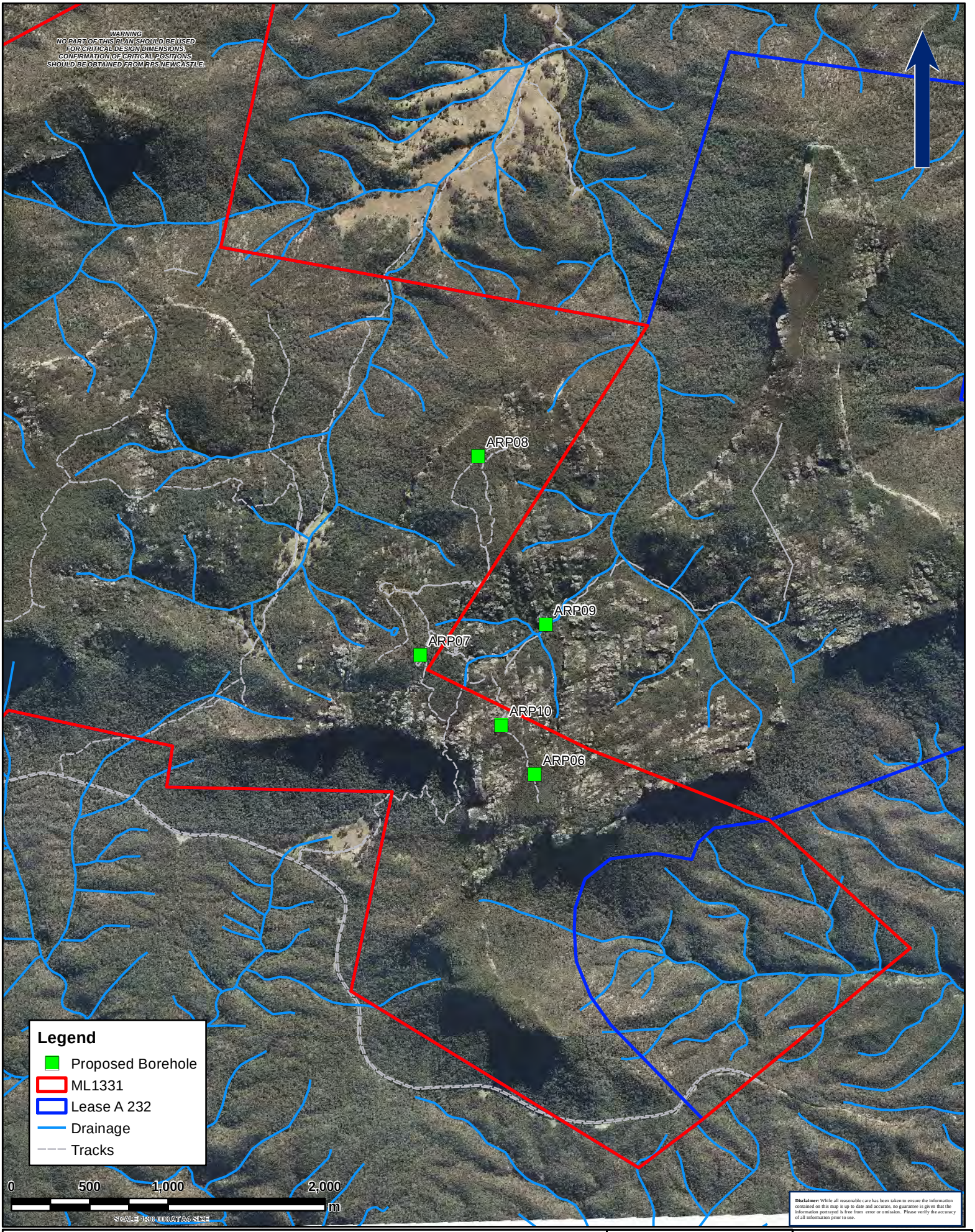

Figure 1: Proposed Borehole Locations

LOCATION: **AIRLY**		DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: 114490 PURPOSE: Flora and Fauna Assessment Technician: Natalie.Wood Date: 16/01/2013		Data Sources: Bing Maps 2011

CLIENT: Centennial Airly

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RPS

Path: J:\JOBS\Centennial\All Jobs\114490 Airly Coal Boreholes\10- Drafting\ArcGIS_Map_documents\114490_Airly_Boreholes_Figure1_A4P_20120903.mxd

1.2 Site Particulars

Locality – Airly Colliery, Airly NSW.

LGA – City of Lithgow Council.

Area - The survey areas, incorporating the proposed exploration sites are approximately 50m x 50m, which represents 0.09ha each, or 0.45ha in total. The flora and fauna field assessment reviewed the areas of 50 x 50m taking into account surrounding habitats at each exploration site location.

Boundaries - The sites are wholly within the Airly Colliery exploration area, which is partly contained within the Mugii Murum-ban State Conservation Area.

Current Land Use – The undeveloped lands contain native vegetation.

Topography - The sites are situated on the upper slopes or ridgeline.

Vegetation - The vegetation within the exploration sites along the existing track has already been disturbed and/or previously cleared in association with existing or disused tracks and associated infrastructure such as rollovers and table-drains. Proposed exploration Site 10 is characterised by MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath, Site 6 is characterised by MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest, Sites 7 and 8 by MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest, and Site 9 by MU 4 Sheltered Gully Brown Barrel Ferny Forest.

Exploration Bore Locations - The following table provides MGA-56 coordinates for the five geotechnical exploration and groundwater monitoring boreholes (ARP 06, 07, 08, 09 and 10) and one alternative bore hole (ARP010).

Bore No.	Description	
	Easting	Northing
ARP06	225326	6331811
ARP07	224692	6332554
ARP08	224967	6333826
ARP09	225359	6332766
ARP10	225139	6332116

1.3 Description of the Proposal

The proposed exploration program primarily consists of constructing fivebore holes (ARP 06, 07, 08, 09 and10) to investigate the location, depth, quality and thickness of the coal seam within the Authorisation Area A232. These boreholes will subsequently be equipped with piezos and used to monitor groundwater over the next 20 years, after which they will be decommissioned and the bore sites wholly rehabilitated.. There may be a requirement to widen certain parts of the access tracks or remove tree limbs along the tracks to ARP07 and ARP08. Access to ARP06 has been identified as requiring widening, due to the regrowth dense vegetation that is present. There may also be a requirement to regrade rough sections of track and existing berms along the tracks to allow equipment to travel along the tracks, the berms will be reinstated to the original grades at completion of the works.

A low level of impact is expected due to the methodology used for accessing and drilling the proposed bores. The bore holes will be drilled by a truck mounted drill rig. The proposed bores are located within previously cleared areas adjacent to existing or disused tracks to minimise removal of vegetation. In addition, where necessary the drill rig will be guided around any trees or vegetation in order to access the proposed bore sites. This will further minimise the impacts to local vegetation and the habitats within.

1.4 Scope of the Study

The scope of this flora, fauna and ecological constraints assessment report is to:

- Identify vascular plant species found within the five exploration sites;
- Identify existing vegetation communities within each exploration site;
- Assess the status of identified plant species and vegetation communities under relevant legislation;
- Identify existing habitat types within the sites and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- Through preliminary research, identify threatened fauna potentially using resources within the sites;
- Employ targeted habitat survey techniques to identify fauna, in particular threatened species potentially using the sites; and
- Assess the potential of the proposed exploration sites to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the site.

Whilst survey work has been undertaken wholly within the bounds of the site, consideration has been afforded to areas off the site in order to appreciate the environmental context of the sites. This has included assessment of potential indirect impacts.

The purpose of this report is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site; and
- Provide information to enable compliance with applicable assessment requirements contained within the NSW TSC Act 1995 and EP&A Act 1979, and the Commonwealth EPBC Act 1999, and any other relevant state, regional and local environmental planning instruments.

1.5 Qualifications and Licensing

1.5.1 Qualifications

This report was written by Joel Stibbard BSc and Paul Hillier BEnvSc of RPS.

1.5.2 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2013);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and

Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2014).

1.6 Certification

As the principal author, I, Paul Hillier make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site; and
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Paul Hillier
Ecology Manager - Newcastle
RPS Australia East Pty Ltd
January 2013

2.0 Methodology

Field surveys were undertaken by one ecologist on 22 August and 23 August 2012. A site revisit was undertaken on 19 October 2012 to target threatened flora along the proposed access tracks. A variety of field survey techniques were employed over the course of fieldwork for this assessment to record the suites of flora species and the fauna guilds likely to occur across the bore sites.

RPS has undertaken numerous assessments of this nature within the region and wider NSW. Considerable local knowledge and experience supports an excellent understanding of the key ecological issues for this locality, and in particular the management strategies required to appropriately address and accommodate these issues in accordance with the requirements of determining authorities. Our extensive portfolio coupled with Commonwealth, State and Local Government policies and guidelines form the basis for our adopted project methodology.

Trapping and other intensive survey techniques were not conducted due to the relatively small sizes of the sites and limited likely disturbance. Targeted habitat searches and assessment of previous surveys were used to assess the site in place of trapping surveys.

2.1 Flora Survey

2.1.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out on the site has been undertaken as follows.

Review of previous ecological works in the area:

- DEC (2006) *The Vegetation of the Western Blue Mountains*. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville; and
- Roger Lembit (1991) *Flora Survey for Proposed Airly Colliery* report prepared for Novacoal Australia Pty Ltd.

Vegetation survey:

- This survey required confirmation of the community type(s) present (based on dominant species) by undertaking flora surveys and community identification at the locations of the proposed exploration sites;
- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' (EECs) as listed within the TSC Act 1995;
- Flora surveys were carried out at each of the proposed exploration site locations, with an emphasis on potentially significant species, as outlined below. The flora survey also included the consideration of the site in line with methodology such as the "Random Meander Technique" described by Cropper (1993); and
- Describe the type and general extent of the vegetation communities present into definable map units where appropriate. Standardised Map Units described in DEC (2006) were used.

2.1.2 Survey Limitations

Timing limitations are often encountered during ecological surveys due to the seasonality of activity and detectability for a number of flora and fauna species being studied. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small 'window' of effective detectability. In addition, the seasonality of surveys also places limits on the number of flora species identified in the site.

Therefore, some threatened species not detected cannot be discounted off-hand due to seasonality and other factors, and are therefore addressed in terms of their potential for occurrence within the site based on ecological factors. As such, the precautionary principle is applied and for some species, where appropriate, assumed presence is made for assessment purposes.

2.1.3 Significant Flora Survey

A list of potentially occurring significant flora species from the locality (10km radius) was compiled, which included threatened species, populations and ecological communities listed under the TSC Act 1995 and EPBC Act 1999, as well as any other species deemed to be of local importance. Targeted surveys and habitat assessments were then undertaken over each bore site to determine their presence or likely presence. The positions of any threatened flora encountered were recorded using a Differential GPS system, capable of sub-metre accuracy.

2.2 Habitat Survey

An assessment of the relative value of the habitats present at each site was carried out. This assessment focused primarily on the identification of specific habitat types and resources on each site favoured by known threatened species from the region. The assessment also considered the potential value of each site (and immediate surrounds) for all major guilds of native flora and fauna.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.3 Fauna Survey

The fauna survey methodology initially consisted of the production of an Expected Fauna Species List for the area (Appendix 3) and an assessment of the potential use of the site by threatened fauna species (as listed under the TSC Act 1995 and the EPBC Act 1999) identified from the vicinity of the site. This was achieved by undertaking literature and database reviews followed by confirmation through field surveys and any additional species observed were noted on the list. Opportunistic sightings of scratches, scats, skeletal remains, diggings and tracks as detailed within Triggs (2004) were also recorded to provide secondary indications of fauna habitat utilisation around each site.

3.0 Results

The prevailing weather conditions during the survey period are presented in Table 1 below.

Table 1 Prevailing Weather Conditions

	DATE	
	Wed 22 Aug 2012	**Thur 23 Aug 2012**
Temperature	-0.2–17.7 ^{O}C	10.1– 18.2 ^{O}C
Wind	Moderate	Calm
Cloud	20–50%	50–100%
Rain (24 hrs)	0	1.4
Sun Rise	06:30	06:28
Set	17:35	17:36

3.2 Flora Survey

3.2.1 Vegetation Community Mapping

A report "*The Vegetation of the Western Blue Mountains including the Capertee, Coxs, Jenolan and Gurnang Areas*" was prepared by the Department of Environment and Conservation in November 2005 (DEC 2006). The locations of proposed bore sites occur within the area covered by that report.

Previous local vegetation mapping in the region in conjunction with ground-truthing of the proposed exploration sites identified four vegetation communities within the area. According to DEC 2006 these vegetation communities occur within the sites as follows:

- MU 4 Sheltered Gully Brown Barrel Ferny Forest, a community that occurred at exploration Site 9;
- MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest, a community that occurred at exploration Sites 7 and 8;
- MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest (DEC 2006), a community that occurred at exploration Site 6; and
- MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath, a community that occurred at exploration Site10.

Below is a description of the vegetation communities that occurred in each bore site.

MU 4 Sheltered Gully Brown Barrel Ferny Forest

Proposed Exploration Site 9

This vegetation community was found to be dominated by *Eucalyptus fastigata* (Brown Barrel) and *E. cypellocarpa* (Mountain Grey Gum). Midstratum included *Cyathea australis* (Black Tree-fern), *Acacia obtusifolia* and *Leptospermum polygalifolium* (Tantoon). The groundcover stratum is dominated by tall ferns including *Calochlaena dubia* (Soft Bracken Ferns) and *Blechnum nudum* (Fishbone Water Fern).

Plate 1 Site 9

MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest

Proposed Exploration Sites 7 and 8

The main trees are *Eucalyptus mannifera* (Brittle Gum), *E. macrorhyncha* (Red Stringybark) and *E. cypellocarpa*. The shrubs are dominated by *Indigofera australis* (Native Indigo), *Cassinia aculeata* (Dolly Bush) and *Melichrus urceolatus* (Urn-heath). The groundcover was dominated by *Poa seiberiana* (Tussock Grass), interspersed with *Lomandra longifolia* (Spiky-headed Mat-rush), *Lomandra filiformis* (Wattle Mat-rush) and *Asperula scoparia* (Prickly Woodruff).

Plate 2 Site 7

Plate 2 Site 8

MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest

Proposed Exploration Sites 6

This vegetation community was identified by the dominance of *E. sparsifolia* (Narrow Leaved Stringybark) and *Allocasuarina littoralis* (Black She-oak) with an association of *E. punctata* (Grey Gum) in the canopy. The most common shrub species are *A. obtusifolia*, *Leptospermum arachnoides* and *Podolobium ilicifolium* (Native Holly). Due to the thick leaf litter from the *A. littoralis*, the ground cover species were generally absent.

Plate 3 Site 6

MU 44 Sandstone Plateau Tea Tree – Dwarf She-oak – *Banksia* Rocky Heath

Proposed Sites 10

This vegetation community was dominated by *Allocasuarina nana* (Dwark She-oak), *Banksia ericifolia* (Heath-leaved Banksia), *Leptospermum arachnoides* and *Monotoca elliptica* (Tree Broom-heath). The groundcover is rarely more than localised in nature, with sedges (particularly *Lepidosperma*).

Plate 4 Site 10

None of the vegetation communities described above have been listed under the TSC Act 1995 or EPBC Act 1999. Additionally, borehole locations within each vegetation community have been strategically positioned to be within previously cleared areas and/or adjacent to existing or disused tracks to limit vegetation disturbance. Where necessary, the drill rig will be guided around any trees or vegetation in order to access the proposed bore sites. This will further minimise the impacts to vegetation within these communities.

All flora species recorded at the five proposed exploration sites are listed in Appendix 2.

3.2.2 Significant Flora

A list of potentially occurring significant flora species from the locality (10km radius) and those that were deemed to have potential to occur within the site due to habitat attributes, was compiled, which included threatened species and ecological communities listed under the TSC Act 1995, along with those species listed on the EPBC Act 1999 and any other species deemed to be of local importance. Where suitable habitat for potentially occurring significant flora species was found on some of the sites (these species are included in Table 2), targeted surveys were conducted during field surveys.

One threatened flora species, *Prostanthera stricta* (Mount Vincent Mintbush), was observed within or in the vicinity of bore holes ARP06, ARP07 and ARP08. *Prostanthera stricta* is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999. Nine individuals were discovered within the 50m x 50m search area of site ARP07, whilst two individuals were found within the 50m x 50m search area of site ARP08. The location of each individual was recorded using a GPS. No *P. stricta* individuals were recorded within a 25m radius at other proposed bore sites.

The *Prostanthera stricta* was observed at several locations in the area, often in large patches. This species was observed at a large number of locations from approximately 300 metres south of ARP07 to approximately 150 metres north of ARP08. The observed extent of this species was approximately 1.5 km North to South and approximately 400 metres East to West. The actual extent of this population is expected to be much larger. The population in this area was in excess of 3,000 individuals.

The track leading to sites ARP07 and ARP08 was noted as being bordered by a large population of *P. stricta*. The majority of this population exists to the east of the track, however individuals have also encroached onto the track itself, particularly within the gravel drain.

Plate 5 Large population of *Prostanthera stricta* (mauve flowered shrubs) located beside a track

Plate 6 Typical occurrence of *Prostanthera stricta* on previously disturbed track edge

3.2.3 Habitat Survey

Habitat within the study area was assessed for its potential to support native flora and fauna species including threatened flora and fauna species for which records occur within the wider locality.

3.2.3.1 Flora Habitat

The vegetation communities throughout the proposed borehole areas are characterised by ridge top sandy soil substrates derived from erosional processes acting upon underlying sandstones, offering habitat for a range of common local plant species.

- MU 4 Sheltered Gully Brown Barrel Ferny Forest, a community that occurred at exploration site 9. The extent of this vegetation is listed as 303ha (DEC 2006). This vegetation type is tall with a high level of soil moisture;
- MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest, a community that occurred at exploration sites 7 and 8. The extent of this vegetation is listed as 142ha (DEC 2006). This vegetation type is open. It is known to provide habitat for threatened species such as *Eucalyptus cannonii* and *Prostanthera stricta*;
- MU 27 Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest (DEC 2006), a community that occurred at exploration site 6. The extent of this vegetation is listed as 1038ha (DEC 2006). This vegetation type is moderately dry and exposed. It is known to provide habitat for threatened species such as *Apatophyllum constablei*, *Pultenaea* sp Glenowlan Point, *Eucalyptus cannonii* and *Prostanthera stricta*; and
- MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath, a community that occurred at exploration site10. The extent of this vegetation is listed as 1054ha (DEC 2006). This vegetation type is moderately dry and exposed. It is known to provide habitat for threatened species such as *Acacia flocktoniae*, *Darwinia peduncularis*, *Euphrasia bowdeniae*, *Grevillea evansiana*, *Leionema sympetalum*, *Leucopogon fletcheri*, *Prostanthera stricta* and *Prostanthera cryptandroides*.

Several locally occurring threatened flora species are known to occur within local sclerophyll forests on sandstone substrates. However, only *Prostanthera stricta* (Mount Vincent Mintbush) was recorded at or in the vicinity of any of the five proposed exploration sites.

3.2.3.2 Fauna Habitat

Habitat occurring at each of the proposed exploration sites varied from a low, rocky heath (site10) to a dry sclerophyll, open forest habitat (sites 6, 7 and 8) and a more sheltered, wet sclerophyll forest habitat (site 9). Forested areas at sites 6, 7, 8 and 9 may provide potential habitat in the form of hollow bearing trees for hollow-dependant fauna species including arboreal mammals and microchiropteran bats, however a very sparse tree layer within the dry and exposed rocky heath community limits its habitat value for arboreal fauna species. Two hollow bearing trees were observed in the vicinity of ARP08. One was a Dead Stag and the other was a *Eucalyptus mannifera* with a DBH of 30 cm. Each of these trees contained a single small hollow of 2 to 4cm which is considered to be suitable for microchiropteran bat species. Within the bore sites themselves, no hollow of sufficient size to accommodate arboreal mammals, or hollow-dependent birds were noted. Whilst also not noted, some more inconspicuous small holes or fissures may be present in trees, which may be suitable for small Microchiropteran bat species.

Suitable habitat occurs across forested areas for ground-dwelling mammals including the threatened Spotted-tailed Quoll (*Dasyurus maculatus*) as well as threatened woodland bird species including the Scarlet Robin (*Petroica boodang*), Black-chinned Honeyeater (*Melithreptus gularis gularis*) and Swift Parrot (*Lathamus discolor*). The prominence of *Allocasuarina littoralis* (Black She-oak) within the canopy layer at

site 6 and evidence of previous foraging activity (Plate 8) suggests that this area has been utilised as foraging habitat by the threatened Glossy Black-Cockatoo (*Calyptorhynchus lathami*).

Plate 7 Chewed *Allocasuarina littoralis* cones at Site 6 typically discarded by Glossy-Black Cockatoos

One preferred Koala feed tree species (*Eucalyptus punctata*) occurs within the vegetation community at site 6, however the density of this species (<15% of the canopy layer) prevents it from being listed as potential habitat for the Koala as defined in SEPP 44. In addition, no records of Koalas exist within 10km of the subject site (NPWS 2012) and no observations of Koalas or their traces (such as scats or scratches) were observed in the area. Subsequently, the subject site does not constitute Core Koala Habitat as defined in SEPP 44.

One of the proposed exploration sites (ARP09) was located adjacent to a permanent water source and therefore may contain suitable habitat for threatened frog species (namely the Booroolong Frog; *Litoria booroolongensis*). Additionally, the exposed rocky sandstone habitat favoured by threatened reptile species (namely the Broad-headed Snake; *Hoplocephalus bungaroides*) was encountered adjacent to ARP10.

The favoured food plant of the Bathurst Copper Butterfly larvae, *Bursaria spinosa*, was recorded within the shrub layer at site 7; however the Bathurst Copper Butterfly has not been previously recorded within 10km of the site (NPWS 2012).

3.2.3.3 Corridors and Habitat Linkages

The proposed exploration sites occur within areas of contiguous native vegetation and comprise a small part of the larger Mugii Murum-ban State Conservation Area. The proposed exploration program has been designed to minimise the impact on native vegetation by drilling the bores in areas previously exposed to disturbance and/or within close proximity to existing or disused tracks. It is expected that the proposed exploration program will retain the native vegetation in its current state by minimising the removal of any vegetation apart from that regenerating on already disturbed areas.

It is considered that this low impact approach and the retention of the native vegetation within the area will not have a detrimental effect on the corridors and habitat linkages required for the movements of the local fauna. It is considered that the proposed works are unlikely to result in fragmentation or isolation of potential habitat for locally occurring threatened species.

3.3 Fauna Survey

3.3.1 Mammal Species

No mammal species were recorded within the proposed exploration sites, although it is most likely that the proposed exploration sites represent part of the home range of a larger number of common mammal species.

There is potential for threatened mammal species to occur within the dense understory at site 9, where the accumulation of forest debris and litter presents foraging and shelter opportunities for small mammals and their prey. A mature canopy and shrub layer at this site also represents good foraging and shelter habitat for arboreal mammal species and insectivorous bats. However this potential is diminished within the more open forest of sites 6, 7 and 8 whilst the rocky heath at site 10 presents little opportunities for threatened mammal species known to occur within the region.

3.3.2 Avifauna Survey

Bird species recorded within the vicinity of the proposed exploration sites were limited to common woodland and forest species.

The wet sclerophyll forest at site 9 provides favoured summer habitat for the threatened Gang-gang Cockatoo (*Callocephalon fimbriatum*), whilst the forested areas at sites 6, 7 and 8 provide potential habitat for threatened woodland species including the Scarlet Robin (*Petroica boodang*) and Black-chinned Honeyeater (*Melithreptus gularis gularis*). Mature, hollow-bearing trees within these areas may provide roosting and nesting habitat for threatened owl species and the arboreal mammals that largely constitute their prey, including the Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*), however the large hollows required by these owls (Gibbons and Lindenmayer, 2002) limits potential habitat at forested sites.

The canopy layer at site 6 was predominantly comprised of *Allocasuarina littoralis* (Black She-oak), a favoured feed tree of the threatened Glossy Black Cockatoo (*Calyptorhynchus lathami*). The discovery of chewed *A. littoralis* cones within the groundcover provides evidence of previous foraging activity at the site by the Glossy Black Cockatoo. Although this species was not directly identified at the borehole site, previous surveys conducted by RPS have returned several records of the Glossy Black Cockatoo within the Airly Colliery exploration area (RPS 2012).

3.3.3 Herpetofauna Survey

Opportunistic surveys were conducted for amphibian and reptiles within the proposed exploration sites, but no species were noted. Favourable habitat exists for reptiles both within the dense groundcover of site 9 and the rocky heath that surrounds site10, however a lack of permanent stream habitat at proposed borehole sites limits the habitat available for threatened amphibian species. No threatened herpetofauna species have been recorded in previous surveys of the Airly Colliery exploration area (University of Queensland, 2012).

3.3.4 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, skeletal remains, diggings, tracks etc.) provided evidence for the presence of common mammal species in the vicinity of the proposed borehole locations. Scats and tunnels of the Common Wombat (*Vombatus ursinus*) were identified along with scats of

macropod species common to the area including the Black Wallaby (*Wallabia bicolor*) and the introduced European Rabbit (*Oryctolagus cuniculus*).

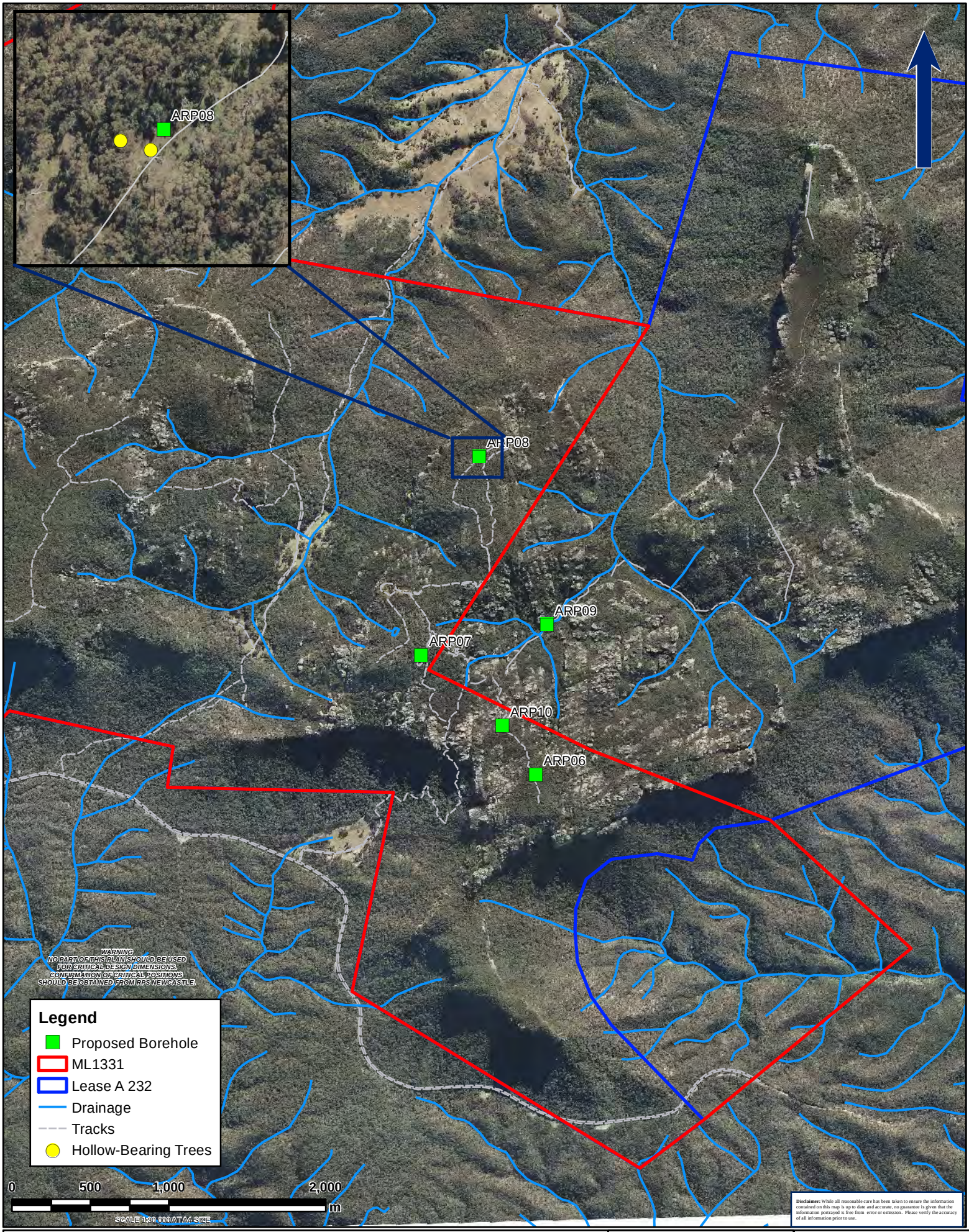

Figure 2: Location of Hollow Bearing Trees at APR08

LOCATION: AIRLY	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: 114490 PURPOSE: Flora and Fauna Assessment Technician: Natalie.Wood Date: 16/01/2013	Data Sources: Bing Maps 2011

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Path: J:\JOBS\Centennial\All Jobs\114490 Airly Coal Boreholes\10- Drafting\ArcGIS_Map_documents\114490_Airly_Boreholes_Figure2_A4P_20121108.mxd

4.0 Threatened Species and Communities Assessment

4.1 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the TSC Act 1995 and/or the EPBC Act 1999) that have been gazetted and recorded within a 10 km radius of the site have been considered within this assessment. Endangered Ecological Communities (EECs) known from the broader area have also been addressed. Each species / community is considered for its potential to occur on the site and the likely level of impact as a result of the proposal. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the proposal.

Those species / communities that have been identified as having a greater than low chance of being impacted upon within the site or that have been recorded on site or its near vicinity during field investigations are subject to 7-part tests of significance and are assessed in Appendix 1.

This assessment deals with the following heads of consideration in tabulated form (refer to Table 2):

'Species / Community'/ Population – Lists each threatened species / EECs known from the vicinity. The status of each threatened species under the NSW TSC Act 1995 and the Commonwealth EPBC Act 1999 are also provided.

'Habitat Description' – Provides a brief account of the species / community/ population and the preferred habitat attributes required for the existence / survival of each species / community.

'Chance of Occurrence on Site' – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as Atlas of NSW Wildlife etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Likely Level of Impacts from Proposal' – Assesses the likely level / significance of impacts to each species / community/ population that would result from the proposed development, taking into account both short and long-term impacts. This assessment is largely based on the chance of occurrence of each species / community on site with due recognition to other parameters such as home range, habitat utilisation, connectivity etc. It also considers the scope of the proposal, including the likely extent of disturbance, duration of construction works etc. The 'subject species / communities' are identified within this part of the assessment process and have been recommended where necessary for the application of the seven-part test of significance in Appendix 1.

Table 2 Threatened Species, Populations or Communities Considered and Assessment of Potential Impacts

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Plants			
Acacia flocktoniae Flockton Wattle (V, V*)	Grows in dry sclerophyll forest on low nutrient soils derived from sandstone. Associated species include *Acacia stricta* and *Podolobium ilicifolium*. Altitude is 500-1000 m asl, average annual rainfall is 800-1200 mm.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Asterolasia elegans (E, E*)	Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the absence of appropriate soil conditions and vegetation type within the sites. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Astrotricha crassifolia Thick-leaf Star-hair (V, V*)	Occurs in dry sclerophyll woodland on sandstone. There are local records near Glen Davis.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Baeckea kandos (E, E*)	Known from one small (<100) population within Wollemi National Park. Occurs in heathland on skeletal sandstone soils.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to site not being close to the Wollemi National Park. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Darwinia peduncularis (V)	Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Derwentia blakelyi (V)	Occurs in eucalypt forest, often in moist areas.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered to have the **potential** to occur.	Due to the lack of individuals recorded within the proposed works areas, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Eucalyptus alligatrix subsp. *miscella* (V, V*)	Grows in sclerophyll woodland on shallow relatively infertile soils (grey brown loam with ironstone). It may have been part of a more-extensive open woodland community prior to the commencement of clearing and grazing. The population is confined to an area of about 10 hectares where an estimated 1000 to 1500 trees survive. Most of the population consists of moderately dense regenerating stands following previous clearing, but there are also larger scattered paddock trees, probably pre-dating European settlement.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Eucalyptus cannonii (Capertee Stringybark) (V, V*)	Tree to 15 m high; bark persistent throughout, grey to red-brown, stringy. Locally frequent but restricted, in sclerophyll woodland on shallow soil on rises; Rylstone to upper Wolgan Valley.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Eucalyptus corticosa (V)	Occurs in sclerophyll woodland on shallow infertile soils on sandstone ridges associated with the upper reaches of the Cudgegong River. It may be locally frequent, and is often associated with *Eucalyptus rossii*.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Furthermore, habitat for this species is considered unlikely due to site not being close to the Cudgegong River. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Euphrasia arguta (CE, CE*)	An erect annual herb 20-35 cm high, branches densely hairy with recurved stiff non-glandular hairs. Upper stem leaves ovate to elliptic, often broadly so, 6-14 mm long, 3.5-13 mm wide, margins ± deeply lobed, usually with 2-4 pairs of teeth. Flowers are produced October to January and are 10-14 mm long, white to lilac with yellow markings. Recently re-discovered in the Nundle area in 2008. Historically, habitat has been noted as: 'open forest country around Bathurst in subhumid places', 'on the grassy country near Bathurst' and 'in meadows near rivers'.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Grevillea evansiana Evans Grevillea (V, V*)	Restricted to a small area east of Rylstone on the Central Tablelands. Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone.	This species was not observed within the surveyed bore sites or along any of the tracks which may need widening. Furthermore, habitat for this species is considered unlikely due to site not being close to Rylstone. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Grevillea obtusiflora (E, E*)	Grows in sandy loam soils in open low scrub beneath dry sclerophyll forest in the Kandos area. Flowers spring and Summer.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Leionema sympetalum Rylstone Bell (V, V*)	Restricted to four sites within Wollemi National Park, at Currant Mountain Gap, Cyril's Rocks, Coorongooba Creek and on clifflines north of Glen Davis. Restricted to exposed rocky sandstone formations known as pagodas. The species occurs in dry sclerophyll forest and probably also occurs in open or closed heathland communities.	This species was not observed within the surveyed bore sites or along any of the tracks which may need widening. Furthermore, habitat for this species is considered unlikely due to site not being close to the known occurrences in Wollemi National Park. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Leucopogon fletcheri subsp. fletcheri (E)	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the absence of appropriate soil conditions within the sites. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Pelargonium sp. Striatellum (G.W.Carr 103456) (E, E*)	It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of suitable wetland or lake features within the site. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Persoonia marginata (Clandulla Geebung) (V, V*)	A spreading to decumbent shrub, young branchlets moderately to densely hairy. It grows in dry sclerophyll forest on sandstone; restricted to the Capertee district.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening.Therefore, this species is considered to be **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Phebalium bifidum (E)	*Phebalium bifidum* is restricted to the Capertee Valley, south east of Kandos. Occurs in dry sclerophyll woodland or heath on structured loam soil; in most instances plants have been found on relatively flat ground on broad ridges and hill crests.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Philotheca ericifolia (V*)	Favours damp sites on sandy flats or gullies within dry sclerophyll forest and heath. Species known to be associated include *Melaleuca uncinata* (Broombrush), *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. rossii* (White Gum), *E. punctata* (Grey Gum), *Corymbia trachyphloia* (Brown Bloodwood), *Acacia triptera* (Spurwing Wattle), *A. burrowii* (Wattle), *Beyeria viscosa* (Pinkwood), *Philotheca australis, Leucopogon muticus* (Blunt Beard-heath) and *Calytrix tetragona* (Common Fringe Myrtle). Recorded from the upper Hunter Valley at Wingen Maid NR and Denman, its range spreads spasmodically west to the Pilliga and south to West Wyalong. It flowers in spring and population sizes range from several plants to 200.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. In addition, the vegetation species associated with P. ericifolia were absent. Therefore, this species is considered **unlikely** to occur.	Due to the lack of suitable habitat within the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Pomaderris brunnea Rufous Pomaderris (V, V*)	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. The species has been found in association with *Eucalyptus amplifolia*, *Angophora floribunda*, *Acacia parramattensis*, *Bursaria spinosa* and *Kunzea ambigua*.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the absence of appropriate clayey and alluvial soil conditions within the sites. Therefore, this species is considered **unlikely** to occur.	Due to the lack of suitable habitat within the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Prasophyllum petilum Tarengo Leek Orchid (E, E*)	Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the site not being close to any known population. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals, location outside the known distribution as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Prasophyllum sp. Wybong (C. Phelps ORG 5269) a leek-orchid (CE*)	This species is a terrestrial orchid that grows to approximately 30cm high. It is generally found in shrubby and grassy habitats in dry to wet soil and is known to occur in open eucalypt woodland and grassland. It has a single, tubular, fleshy dull green leaf and a single flower spike with numerous fragrant flowers. It appears as a single leaf over winter and spring. It is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Prostanthera cryptandroides subsp. cryptandroides Wollemi Mint-bush (V, V*)	At Glen Davis, occurs in open forest dominated by *Eucalyptus fibrosa*. Other eucalypt species may be present as sub-dominants.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. In addition, the associated *E. fibrosa* was not observed on site. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Prostanthera stricta Mount Vincent Mintbush (V, V*)	It is often a locally dominant undershrub in heath or scrub communities along cliff edges, or as an understorey species within a range of open forest or tall open forest types, or in adjacent transitional communities.	Was **recorded** adjacent to the track and borehole sites.	As this species occurred within the site, there is the **potential** for it to be impacted. *Therefore, this species has been assessed further with a 7-part test.*
Pultenaea glabra Smooth Bush-pea (V, V*)	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Pultenaea sp. Genowlan Point (CE, CE*)	Closely related to *Pultenaea glabra*, but smaller in size, exhibiting red keel petals and inflorescences growing into a leafy shoot in contrast to dormant. Likely to be fire sensitive, with recruitment occurring from a persistent soil stored seed bank following fire. Occurs on well drained stony soil near cliff edges. Known from a single population at Genowlan Point in the Capertee Valley within the Rylstone Local Government Area. The population is restricted to a very small area of only 250 square metres on Crown Land.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. The proposal is located outside the known Glenowlan Point distribution of this species. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal. *Nonetheless, this species has been assessed further with a 7-part test.*
Pultenaea sp. Olinda (E)	Has been found only in a very limited area of pagoda rock formation east of Rylstone.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the site not being close to any known population. Therefore, this species is considered **unlikely** to occur.	Due to the separation of the site from the known population, the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Swainsona recta Small Purple-pea (E, E*)	Grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, *Poa* spp. tussocks and spear-grasses *Austrostipa* spp. Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. The vegetation type associated with this species was not present within the site. Therefore, this species is considered **unlikely** to occur.	Due to the lack of suitable habitat or individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Swainsona sericea Silky Swainsona-pea (V)	Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines *Callitris* spp.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. The vegetation type associated with this species was not present within the site. Therefore, this species is considered **unlikely** to occur	Due to the lack of suitable habitat or individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Thesium australe Austral Toadflax (V, V*)	A root parasite that grows in grassy woodland and grassland in moist sites, usually in association with Kangaroo Grass *Themeda australis* of which it parasitises.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to the absence of any Kangaroo Grass *Themeda australis* within the sites. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Herpetofauna			
Hoplocephalus bungaroides Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering by day in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. In summer it is known to become semi-arboreal in its search for prey including geckos and skinks, and will shelter in hollows in large trees within 200 m of rocky escarpments. The Broad-headed Snake is regarded as potentially dangerous, although it has not been attributed to any human fatalities. Destruction of habitat, particularly the removal of sandstone slabs has lead to a decline in numbers.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed within the proposed sites and access tracks, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Litoria booroolongensis Booroolong Frog (E, E*)	The species is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Most recent records are from the south-west slopes of NSW. It is found along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of permanent stream habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Avifauna			
Pyrrholaemus sagittatus Speckled Warbler (V)	Occupies Eucalypt and Cypress woodlands in drier coastal areas and on the western slopes of the Great Dividing Range. Appears unable to persist in districts where no forested fragments larger than 100ha remain. Occurs in the central to southern tablelands and slopes where suitable habitat exists. More commonly found on the western slopes. Associated with extensive stands of Bursaria spinosa in some areas (RPS pers. obs.).	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Daphoenositta chrysoptera Varied Sittella (V)	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Hieraaetus morphnoides Little Eagle (V)	Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered to **potentially** occur.	Due to the low levels of impact expected from the proposal, and the retention of large tracts of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Lophoictinia isura Square-tailed Kite (V)	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the low levels of impact expected from the proposal, and the retention of large tracts of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Callocephalon fimbriatum Gang-gang Cockatoo (V)	Found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas in some districts.	This species was **recorded** foraging adjacent to the site during field surveys.	Due to the low levels of impact expected from the proposal, and the retention of large tracts of suitable habitat in the locality, this species is **unlikely** to be significantly affected by the proposal. *Nonetheless, this species has been assessed further with a 7-part test.*
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.	Evidence of foraging by this species (chewed *Allocasuarina* cones) was **recorded** adjacent to the site during field surveys.	Due to the low levels of impact expected from the proposal, and the retention of large tracts of suitable habitat in the locality, this species is **unlikely** to be significantly affected by the proposal. *Nonetheless, this species has been assessed further with a 7-part test.*
Climacteris picumnus victoriae Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200ha.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Stagonopleura guttata Diamond Firetail (V)	*Stagonopleura guttata* occupies open woodlands / forests and associated habitats with grassy understorey. Eucalypt woodlands, Box-Ironbark woodlands and Snow Gum woodlands are favoured. Other areas where they are found include open forests, mallee and natural temperate grassland. Often found in riparian areas. Feeds on grass seeds, insects, partly ripe grass and leaves. Generally found west of the Divide or in drier semi-coastal areas such as the upper Hunter Valley. Appears unable to persist in remnants less than 200ha.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland habitat containing Box-ironbark or Snow-gum. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Petroica boodang Scarlet Robin (V)	In NSW this species occupies open forests and woodlands from the coast to the inland slopes. Some dispersing birds may appear in autumn or winter on the eastern fringe of the inland plains. The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. However, habitat for this species occurs within the locality. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Petroica phoenicea Flame Robin (V)	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	This species was not observed during field surveys. However, habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Melanodryas cucullata cucullata Hooded Robin (south-eastern form) (V)	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of suitable habitat, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies) (V)	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open woodland plains habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Melithreptus gularis gularis Black-chinned Honeyeater (V)	In NSW this species occurs in eastern Australia, along the inland slopes of the Great Dividing Range, extending to the coast between Sydney and Newcastle NSW, Occupies dry Eucalypt woodland within an annual rainfall range between 400-700 mm, particularly within associations containing Ironbark and Box species (Garnett et al, 2000). It is estimated that the Black-chinned Honeyeater spends 60% of its time searching foliage for such food as insects, nectar and lerp.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the lack of individuals recorded, the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Ninox strenua Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also preys on birds). Requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.	This species was not observed during field surveys. However, habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Ninox connivens Barking Owl (V)	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Tyto tenebricosa Sooty Owl (V)	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Rostratula australis Australian Painted Snipe (E, V*)	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open freshwater habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Swift Parrots are dependent on habitats that provide winter foraging resources such as nectar and lerps (sugary exudates from leaf insects). Within these habitats, Swift Parrots prefer foraging in mature trees that provide a higher quality and quantity of nectar than regrowth trees.	This species was not observed within the surveyed bore sites or along any of the tracks which may need widening. However, foraging habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Neophema pulchella Turquoise Parrot (V)	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open or creekline habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Glossopsitta pusilla Little Lorikeet (V)	Forages primarily in the canopy of open *Eucalyptus* forest and woodland, yet also finds food in *Angophora, Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Nests are typically created within hollows of the limb or trunk of smooth-barked Eucalypts.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Polytelis swainsonii Superb Parrot (V, V*)	The Superb Parrot is a distinctive large, bright grass-green parrot with a long, narrow tail and sharply back-angled wings in flight. The Superb Parrot is found throughout eastern inland NSW from Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac to the upper Namoi and Gwydir catchments. Inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. They nest in the hollows of large trees in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. They feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Due to the lack of suitable Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest habitat within the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Anthochaera phrygia Regent Honeyeater (CE, E*)	Occurs in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of Eucalyptus sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts. They also forage on mistletoe and Banksia flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Leipoa ocellata Malleefowl (E, V*)	The Malleefowl occurs in semi-arid and arid zones of temperate Australia, where it occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine Callitris woodlands, acacia shrublands, Broombush Melaleuca uncinata vegetation or coastal heathlands.	This species was not observed during field surveys. Furthermore, habitat for this species is considered unlikely due to lack of open semi-arid habitat. Therefore, this species is considered **unlikely** to occur.	Due to the lack of individuals and preferred habitat observed on the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Mammals			
Dasyurus maculatus Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. This species has been recorded only once within 10km of the subject site (NPWS 2012). It is an opportunistic hunter of a variety of prey.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. This species is considered to **potentially** occur.	Due to the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Petaurus norfolcensis Squirrel Glider (V)	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. , This species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Phascogale tapoatafa Brush-tailed Phascogale (V)	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	Whilst this species has the potential to occur within the wider locality, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Phascolarcos cinereus Koala (V, V*)	Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus *Eucalyptus.*	Whilst this species has the potential to occur within the wider locality due to the presence of *E. punctata* a Koala feed tree species with a density of approximately 5%, it was not observed within the surveyed bore sites or along any of the tracks which may need widening. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of low quality (<15% *E. punctata*) habitat in the locality, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Occurs across subtropical and temperate forest, sclerophyll forest and woodlands, heaths, swamps, urban gardens and cultivated crops. Frequently observed to forage in flowering Eucalypts. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. These camps are usually located within 20km's of their food source. Frequently observed to forage in flowering Eucalypts.	This species was not observed during field surveys. However, habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Petrogale penicillata Brush-tailed Rock-wallaby (E, V*)	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with suitable caves and rocky overhangs for shelter that are proximate to grazing opportunities. No such habitat occurs within the proposed exploration sites, however, rocky overhangs do occur in the vicinity.	This species was not observed during field surveys. However, habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Potorous tridactylus tridactylus Long-nosed Potoroo (V, V*)	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature	This species was not observed during field surveys. However, habitat for this species occurs within the sites. Therefore, this species is considered to **potentially** occur.	Due to the lack of individuals recorded, as well as the low levels of impact expected from the proposal and the retention of large areas of suitable habitat in the locality, this species is **unlikely** to be affected by the proposal.
Pseudomys novaehollandiae New Holland Mouse (-, V*)	Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species, including the red fox (Vulpes vulpes), cat (Felis catus) and dog (Canis familiaris).	Due to the lack of suitable habitat such as open heathlands, open woodlands with a heathland understorey and vegetated sand dunes, this species is **unlikely** to occur within the site.	Due to the lack of suitable habitat within the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Miniopterus australis Little Bentwing Bat (V) *Chalinolobus dwyeri* Large-eared Pied Bat (V, V*) *Falsistrellus tasmaniensis* Eastern False Pipistrelle (V) *Nyctophilus corbeni* South-eastern Long-eared Bat (V, V*)	These threatened Microchiropteran bat species are highly mobile species with a range of habitat preferences that overlap and utilise a range of different habitat niches. They encompass two main sheltering habits; those that dwell in caves, and, due to similar characteristics, sometimes manmade structures, and those that dwell in tree hollows. One species, Myotis adversus is known to hunt over water ways although it is not entirely limited to this habitat, while all others forage within or above wooded habitats.	These species have the potential to occur within the wider locality, due to the presence of suitable foraging and nesting / breeding habitat in the region. Therefore, these species are considered to **potentially** occur.	As this species could potentially occur within the site, there is the **potential** for it to be impacted. *Therefore, these species have been assessed further with a 7-part test.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Insects			
Paralucia spinifera Bathurst copper Butterfly (E, V*)	It is only known to occur in areas above 900 m and where native Blackthorn (*Bursaria spinosa subsp. lasiophylla*) occurs. Most population sites are also exposed to full sun for a large portion of the day	This species was not observed during field surveys. Whist some B. spinosa was recorded at specific location, the exposed mountain top habitat is unlikely to be inhabited by this species. Therefore this species is considered unlikely to occur.	Due to the lack of suitable habitat within the sites, as well as the low levels of impact expected from the proposal, this species is **unlikely** to be affected by the proposal.
Endangered Ecological Communities			
Genowlan Point *Allocasuarina nana* Heathland (E)	Occupies part of the summit of a mesa and is bounded to the west by a vertical cliff up to 300 metres high. Within this community, *Allocasuarina nana* is close to its northern limit of distribution, and *Xanthorrhoea johnsonii* close to its southern limit. A number of other species in the community are close to distributional limits. The dwarf heath community is presumably present due to a massive ironstone band that prevents tree growth.	None of the vegetation communities located adjacent to the proposed boreholes were commensurate with this ecological community. Therefore, this ecological community was considered **unlikely** to occur within or near the borehole sites.	Due to the lack of species that define the occurrence of this ecological community on the sites, as well as the low levels of impact expected from the proposal, this ecological community is **unlikely** to be affected by the proposal.
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (E, E*)	The Montane Peatlands community is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaux, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite.	None of the vegetation communities located adjacent to the proposed boreholes were commensurate with this ecological community. Therefore, this ecological community was considered **unlikely** to occur within or near the borehole sites.	Due to the lack of species that define the occurrence of this ecological community on the sites, as well as the low levels of impact expected from the proposal, this ecological community is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
White Box Yellow Box Blakely's Red Gum Woodland (E) White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and derived native Grassland (CE*)	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum). Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare. Modified sites include the following: 1. areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the groundlayer is predominantly composed of exotic species; and 2. sites where the trees have been removed and only the grassy groundlayer and some herbs remain.	None of the vegetation communities located adjacent to the proposed boreholes were commensurate with this ecological community. Therefore, this ecological community was considered **unlikely** to occur within or near the borehole sites.	Due to the lack of species that define the occurrence of this ecological community on the sites, as well as the low levels of impact expected from the proposal, this ecological community is **unlikely** to be affected by the proposal.
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions. (E*) Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South East Australia (E*)	This community can be found on the western slopes and plains on relatively fertile soils. Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, *Eucalyptus microcarpa* (Grey Box) is often found in association with *E. populnea* subsp. *bimbil* (Bimbil Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton poulneus* (Kurrajong), *Allocasuarina leuhmannii* (Buloke) or *E. melliodora* (Yellow Box) and sometimes with *E. albens* (White Box) (DEC 2008). Inland Grey Box Woodland can, in some regions, be differentiated from *E. albens-E.melliodora* communities by grass species. *Themedia australis* (Kangaroo Grass) and *Poa sieberiana* (Grey Tussock Grass) characterise the latter community where as *Austrostipa scabra* (Speargrass), *Austrodanthonia* spp. and *Enteropogon* spp. are more typically associated with *E. macrocarpa*.	None of the vegetation communities located adjacent to the proposed boreholes were commensurate with this ecological community. Therefore, this ecological community was considered **unlikely** to occur within or near the borehole sites.	Due to the lack of species that define the occurrence of this ecological community on the sites, as well as the low levels of impact expected from the proposal, this ecological community is **unlikely** to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (E)	Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats.	None of the vegetation communities located adjacent to the proposed boreholes were commensurate with this ecological community. Therefore, this ecological community was considered **unlikely** to occur within or near the borehole sites.	Due to the lack of species that define the occurrence of this ecological community on the sites, as well as the low levels of impact expected from the proposal, this ecological community is **unlikely** to be affected by the proposal.

Key: **(V)** = Vulnerable Species listed under Threatened Species Conservation Act 1995 (TSC Act 1995).
(E) = Endangered Species listed under TSC Act 1995.
(V*) = Vulnerable Species listed under Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).
(E*) = Endangered Species listed under EPBC Act 1999.
(CE*) = Critically Endangered Species listed under EPBC Act 1999
(M*) = Listed as a Migratory species under the EPBC Act 1999
(EP) = Listed as an Endangered Population under the TSC Act 1995

4.2 Key Threatening Processes

A Key Threatening Process (KTP) is defined in the TSC Act 1995 as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Something can be a threat if it:

- adversely affects two or more threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

KTP's are listed in Schedule 3 of the TSC Act 1995. Five KTP's have the potential to affect the site as a consequence of the proposed exploration sites, being:

- Anthropogenic climate change;
- Clearing of native vegetation;
- Infection of native plants by *Phytophthora cinnamomi*;
- Invasion of native plant communities by exotic perennial grasses; and
- Loss of hollow-bearing trees.

No other KTP's are believed to be likely as a consequence of the proposed exploration program.

"Anthropogenic climate change"

The activity is likely to contribute to the Key Threatening Process "Anthropogenic climate change" which has the potential to impact upon the Sooty Owl (DEC 2000), a species that may utilise the sites for foraging and/or roosting. The proposed exploration works contribute to this KTP as a result of the removal of a small amount (approximately 0.45ha) of vegetation. The extent to which the proposed works contribute to this process is considered very low as the vegetation is likely to regenerate to pre-drilling condition after the completion of the bores.

"Clearing of native vegetation"

This project will contribute to this KTP through the removal of a very small amount of native vegetation, totalling approximately 0.45ha. This has the potential to impact upon a range of threatened fauna species (DEC 2001) particularly the Glossy Black-Cockatoo given the identification of foraging habitat within one of the sites. However, the proposed boreholes will be drilled using a mobile drilling rig which for the most part will be able to navigate through the vegetation without requiring the removal of vegetation. Additionally, the majority of the proposed exploration sites are located within existing clearings. The proposed borehole sites will be located in such a manner as to minimise the removal of native vegetation and are therefore unlikely to significantly contribute to this KTP.

"Infection of native plants by *Phytophthora cinnamomi*"

The activity has the potential to result in the importation of this pathogen, which has the potential to impact upon a broad range of threatened plant species (DEC 2002). It is considered that the proposed works will not significantly contribute to this KTP provided that the correct hygiene protocols are established and implemented.

"Invasion of native plant communities by exotic perennial grasses"

Due to the creation of soil disturbance at some borehole sites, there is the potential for these areas to be colonised by exotic perennial grasses at the conclusion of exploration activities. If introduced, exotic perennial grasses typically dominate such areas (DEC 2003), incrementally contributing to this KTP. Effective machinery and vehicle cleaning procedures prior to commencing work will reduce the potential for this KTP to occur.

"Loss of hollow bearing trees"

The activity may require the removal of one or more mature trees that support small hollows and subsequently contribute to this KTP. This may potentially impact upon small hollow-dependant fauna including the threatened Little Lorikeet, Eastern False Pipistrelle and South-eastern Long-eared Bat (DEC 2007). The removal of a very small amount of native vegetation (approximately 0.45 ha) and the implementation of procedures to avoid mature tree removal wherever possible will prevent the proposed works from significantly contributing to this KTP.

5.0 Considerations Under SEPP 44 – 'Koala Habitat Protection'

5.1 First Consideration – Is the Land 'Potential Koala Habitat'?

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

One tree species (*Eucalyptus punctata*) listed in Schedule 2 of SEPP No. 44 – 'Koala Habitat Protection' occurs in the vicinity of the proposed exploration borehole ARP06, however it occurs at a density of less than 5%. Therefore, the site is not considered to constitute 'Potential Koala Habitat' as defined by SEPP 44.

5.2 Second Consideration - Is the land 'Core Koala Habitat'?

State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' states that Core Koala Habitat is defined as:

> *"an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population."*

There are no records of the Koala within 10km of the subject site (NPWS 2012).

There were no koalas or traces of koalas such as scats or scratches observed within the subject site. Therefore the subject site does not constitute 'Core Koala Habitat' as defined by SEPP 44.

6.0 Considerations Under the EPBC Act 1999

Considerations have been made under the Commonwealth EPBC Act 1999. An EPBC Act Protected Matters Search was undertaken within the Department of the Environment, Water, Heritage and the Arts (DEWHA now SEWPaC) on-line database to generate a list those matters of national environmental significance which may have the potential to occur within the site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed on the site will have, or is likely to have a significant impact upon a matter of National Environmental Significance (NES), or on the environment of Commonwealth land*.

> **The site is not land owned by the Commonwealth, and hence this portion of the Act is not applicable. The matters of NES and site-specific responses are listed below.*

6.1 World Heritage Areas

The site is close to The Greater Blue World Heritage area. However, due to the low level of impact and large distance from the area, no impact is expected to occur to this area.

6.2 National Heritage Places

The site is close to The Greater Blue Mountains World Heritage area. However, due to the low level of impact and large distance from the area, no impact is expected to occur to this area.

6.3 Wetlands of International Importance (the Ramsar convention)

The site is not part of any Ramsar Wetland area, and is not in proximity to any such area.

6.4 Great Barrier Reef Marine Park

This site is not part of nor is within close proximity to the Great Barrier Reef Marine Park.

6.5 Commonwealth Marine Area

This site is not part of nor is within close proximity to a Commonwealth Marine Area.

6.6 Nationally listed Threatened Ecological Communities

A total of 1 threatened ecological community listed under the *EPBC Act 1999* has potential to occur within the proximate region of the site:

- White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and Derived Native Grassland

The potential for the proposed exploration program to significantly impact on the above community has been assessed under the provisions of the TSC Act 1995. This assessment concluded that there will not be any significant impact upon any listed threatened ecological communities during the proposed geotechnical investigations.

6.7 Nationally listed Threatened Species

A number of threatened species nationally listed under *the EPBC Act 1999* have been recorded within a 10 km radius of the site. Due to the absence of marine and foreshore environments the species associated with them have been omitted from this assessment. Those terrestrial fauna and flora under consideration are listed as follows:

Threatened Species

Flora

▪ *Acacia flocktoniae*	Flockton Wattle
▪ *Asterolasia elegans*	
▪ *Eucalyptus alligatrix* subsp. *miscella*	
▪ *Eucalyptus macrorhyncha* subsp *cannonii*	Cannon's Stringybark
▪ *Euphrasia arguta*	
▪ *Grevillea obtusiflora*	
▪ *Pelargonium sp. Striatellum (G.W.Carr 10345)*	Omeo Stork's-bill
▪ *Persoonia marginata*	
▪ *Ptilotheca ericifolia*	
▪ *Pomaderris brunnea*	Rufous Pomaderris
▪ *Prasophyllum* sp. Wybong	a leek-orchid
▪ *Prostanthera Stricta*	Mount Vincent Mintbush
▪ *Pultenaea glabra*	Smooth Bush-pea
▪ *Pultenaea* sp. Glenowlan Point	Genowlan Point Pultenaea
▪ *Thesium australe*	Austral Toadflax

Fauna

▪ *Anthochaera phrygia*	Regent Honeyeater
▪ *Lathamus discolor*	Swift Parrot
▪ *Leipoa ocellata*	Malleefowl
▪ *Polytelis swainsonii*	Superb Parrot
▪ *Rostratula australis*	Australian Painted Snipe
▪ *Litoria booroolongensis*	Booroolong Frog
▪ *Paralucia spinifera*	Bathurst Copper Butterfly
▪ *Chalinolobus dwyeri*	Large-eared Pied Bat
▪ *Dasyurus maculatus maculatus*	Spotted-tailed Quoll
▪ *Nyctophilus corbeni*	South-eastern Long-eared Bat
▪ *Petrogale penicillata*	Brush-tailed Rock Wallaby
▪ *Phascolarctos cinereus*	Koala
▪ *Potorous tridactylus*	Long-nosed Potoroo (SE mainland)
▪ *Pseudomys novaehollandiae*	New Holland Mouse
▪ *Pteropus poliocephalus*	Grey-headed Flying Fox
▪ *Hoplocephalus bungaroides*	Broad-headed Snake

From the protected matters search, a total of 31 threatened species listed under the *EPBC Act 1999* have

potential to occur within the proximate region of the site. One threatened flora species (*P. stricta*) was recorded within the search areas of Site 7 and Site 8, as well as near to site 6. As this species has potential to be affected by the proposal, further consideration is herewith afforded to the potential impacts that may be associated with this activity.

P. stricta is listed as Vulnerable under the EPBC Act 1999. Reference is made to the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2009). For an EPBC Act 1999 listed Vulnerable species, in deciding whether an action may have a significant impact, first it must be determined whether the assessed population of the species is an 'important population. An important population is defined by the guidelines as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal populations;
- that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

No recovery plan has been prepared for this species. The local population that is recorded within the vicinity of the bore holes is very large, which may be important for maintaining the genetic diversity of the species. Additionally, the Mount Genowlan populations are near to the southern limit of this species range. Therefore, as a precautionary approach, the individual plants that may be removed by the proposal has been considered as part of an important population.

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 proposal will not lead to a long term decrease in the population, as the proposed use is regarded as a temporary use.

- reduce the area of occupancy of an important population;

The proposal may reduce the area of occupancy of *P. stricta*, however the surrounding occupied areas are comparatively large. In addition any reduction in occupied area is considered temporary.

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

The proposal covers too small an area to have the effect of fragmenting the existing population.

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

The habitat proposed to be affected is not considered critical to the survival of the species as the surrounding population was recorded to be very extensive, both in number and coverage.

- disrupt the breeding cycle of an important population;

The proposal is considered too small to have the potential to disrupt the breeding cycle of the species as it will not inhibit movement of pollinators or seed dispersal.

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

Apart from the small number of individuals that may require removal to accommodate the drilling equipment and upgrade the access tracks, the proposal will not cause further decline to this species.

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

Recommendations have been made to ensure that the activities do not result in invasive species becoming established, which may compete with *P. stricta*.

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

The proposal will not introduce disease that may cause the species to decline.

- interfere substantially with the recovery of the species.

The proposal is not considered to interfere substantially with the recovery of the species.

In addition to the above assessment, it is noted herewith that the proposed location of the bore sites have been decided with regard to the ecology of the surrounding area. All bore sites have been located along existing tracks. Site 7, which has been found to have the greatest number of *P. stricta* occurs at the entrance to a disused mine shaft, with past disturbance notable in this location. The densities of *P. stricta* surrounding this bore site is much higher. All other bore sites are able to be placed to avoid any loss of *P. stricta*. A small number of individuals may be removed along existing tracks, however due to the presence of a communications tower at this location, track upgrades would still be inevitable in the absence of this proposal. Therefore it has been determined that necessary and practical avoidance measures have been put in place. The potential for the proposed exploration program to significantly impact on individuals or local populations for the above species has also been assessed under the provisions of the TSC Act 1995. This assessment concluded that there will not be any significant impact upon any listed threatened species during the proposed geotechnical investigations.

6.8 Nationally listed Migratory Species

No nationally listed migratory species were observed throughout the survey period; nevertheless a number of species are likely to fly over the site or through the sites on an intermittent basis, those being the White-throated Needletail (*Hirundapus caudacutus*), Rainbow Bee-eater (*Merops ornatus*) and Rufous Fantail (*Rhipidura rufifrons*). In addition to these terrestrial migratory species one marine migratory species is considered to have a moderate or greater chance of occurring within the site, being the Swift Parrot (*Lathamus discolor*).

6.9 Summary Statement

Based on the above, it is considered the current proposed exploration program will not have a significant impact on any matters of NES under the EPBC Act 1999; hence referral to the SEWPaC should not be necessary.

7.0 Conclusion and Recommendations

Conclusion

RPS was engaged to undertake a Flora and Fauna Assessment over proposed geotechnical exploration sites (exploration sites) to the north of the existing Airly Colliery. Four locally common vegetation communities were identified as occurring within the sites. Proposed exploration site ARP06 is characterised by MU 27 – Mount Airly Sydney Peppermint- Narrow Leaved Stringybark- Grey Gum Shrubby Open Forest, site ARP10 is characterised by MU 44 Sandstone Plateau Tea Tree – Dwarf Sheoak – *Banksia* Rocky Heath, sites ARP07 and ARP08 are characterised by MU 10 Capertee Residual Basalt Brittle Gum – Stringybark Layered Open Forest, and site ARP09 MU 4 Sheltered Gully Brown Barrel Ferny Forest as described by DEC (2006).

Fauna recorded within the sites were limited to common bird and mammal species; however other guilds of fauna including reptiles and microchiropteran bats are likely to occur within the sites and wider locality. Some potential exists for a number of locally occurring threatened species to occur within the sites on at least an intermittent basis. However, the removal of vegetation associated with the proposed works is minimal as a result of the small area required for the borehole sites approximately 0.45ha), the selection of previously disturbed areas for the bores and the minimal vegetation removal for the existing access tracks. This suggests that these works are unlikely to result in adverse impacts upon locally occurring threatened species or communities provided the recommendations contained below are implemented.

Recommendations

The following recommendations have been outlined to provide ecological guidelines and site management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed exploration sites.

- The drilling and other vehicles are to avoid damaging or removing native vegetation wherever possible by carefully driving around all trees and shrubs to minimise any impacts on native vegetation This will ameliorate the Key Threatening Processes '*Removal of Native Vegetation'* and '*Loss of Hollow-bearing Trees'*;
- Where vegetation removal is unavoidable it shall be kept to a minimum , with the avoidance of *Prostanthera stricta* (marked with flagging tape) and hollow bearing trees and mature trees be prioritised;
- All removed vegetation shall remain within close proximity to the site, with mature trees gently placed in surrounding areas to allow for the survival and dispersal of any displaced fauna currently utilising these trees;
- It is recommended that water management strategies be implemented at the proposed exploration sites to prevent the movement of sediments or contaminated waters / liquids into surrounding habitats, including potential down-slope waterways or drainage lines;
- It is recommended that appropriate measures such as vehicle cleaning protocols be employed to ensure that machinery working within the site do not bring materials (soils, weeds or pathogens etc.) onto the sites that may cause the distribution of weed species or introduce pathogens such as *Phytopthera.* This will ameliorate the Key Threatening Processes '*Weed Invasion by Exotic Perennial Grasses'* and 'Infection of Native Plants by *Phytopthera cinnamomi'*; and
- That topsoil management be implemented at each of the sites to ensure that current seed banks in top soil be returned to the site after cessation of exploration investigations.

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Appendix 1

Seven-Part Test

Consideration Under Section 5A of the Environmental Planning and Assessment Act 1979

Considerations of the effects of the proposed geotechnical sites under the guidelines of Section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979) for the concerned threatened species / populations / ecological communities are given below.

The majority of information used for the assessment has been sourced from OEH Threatened Species Information and Environmental Impact Assessment Guidelines, OEH Atlas of NSW Wildlife and other published or widely available literature sources such as scientific journals and reports. For the purposes of the Seven-Part Test, threatened species have been grouped into 'guilds', that is, species sharing similar habitat or ecological requirements have been grouped and assessed together.

No species is likely to be significantly impacted upon due to the very low level of impact expected from the proposed action. These low levels of impact are achievable due to the following factors:

- The proposed bores 6-10are to be located in close proximity to the existing vehicular track;
- Manoeuvring the drill rig to each site is to be carried out by avoiding trees and shrubs and minimising the impacts on the environment and soil surface;
- Where vegetation removal is unavoidable, it is to be undertaken in such a manner as to remove as little vegetation as possible; and
- All mitigating strategies regarding topsoil/seedbank replacement and sediment controls are to be implemented.

Seven Part Tests

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

Threatened species that are potentially impacted upon by the proposed works based on available habitat and previous records include:

Flora

- *Prostanthera stricta*

Fauna

- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Little Bentwing Bat
- Large-eared Pied Bat
- Eastern False Pipistrelle
- South-eastern Long-eared Bat

Prostanthera stricta

Prostanthera stricta is an erect shrub occurring from Mount Vincent to Genowlan Mountain in the Central Tablelands. A large population (estimated >3,000) of this species were observed beside the access track

from south of ARP07 to just north of ARP08. It is estimated that the area occupied by this species is approximately 1.5 km north to south and approximately 400 metres east to west.

The track leading to sites ARP07 and ARP08 was noted as being bordered by a large population of *P. stricta*. The majority of this population exists to the east of the track, however individuals have also encroached onto the track itself, particularly within the gravel drain. Therefore, it is possible that several individuals may be required to be removed as a result of track upgrades. It is also noted that track maintenance would need to have to occur in the absence of this proposal in order to service the nearby tower.

Nine individuals were discovered within the 50m x 50m search area of site ARP07, whilst two individuals were found within the 50m x 50m search area of site ARP08. The location of each individual was recorded using a GPS. No *P. stricta* individuals were recorded within a 25m radius at other proposed bore sites.

At the time of drilling, consideration will be afforded to positioning of equipment to attempt to avoid as many *P. stricta*. The two individuals at site ARP08 should be practically avoided. Therefore, nine plants is the expected maximum loss to be experienced by the drilling itself, however this is expected to be less.

All bore sites have been located along existing tracks. Site 7, which has been found to have the greatest number of *P. stricta* occurs at the entrance to a disused mine shaft, with past disturbance notable in this location. The densities of *P. stricta* surrounding this bore site is much higher. All other bore sites are able to be placed to avoid any loss of *P. stricta*. A small number of individuals may be removed along existing tracks, however due to the presence of a communications tower at this location, track upgrades were inevitable in the absence of this proposal. Therefore it has been determined that necessary and practical avoidance measures have been put in place.

Due to the relative small number of plants to be removed and with the effective implementation of recommendations outlined in Section 7 of this report, it is considered unlikely that the exploration works will results in an adverse effect on *P. stricta* as such that a viable population of the species is likely to be placed at risk of extinction.

Callocephalon fimbriatum (Gang Gang Cockatoo)

This species is found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter it may occur at lower altitudes in drier more open Eucalypt forests and woodlands and is often found in urban areas in some districts. This species forages in trees for nectar and possibly lerps. The proposal will remove very few trees and will not remove any hollow bearing trees which would be suitable for nesting by the species. Therefore no significant habitat for this species is to be removed. In addition, large areas of good quality habitat exist in the locality. Therefore it is considered that the proposal will not result in an adverse effect on *this species* such that a viable population of the species is likely to be placed at risk of extinction.

Calyptorhynchus lathami (Glossy Black-cockatoo)

This species occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Favoured species include *Allocasuarina littoralis* (Black She-oak), *A. torulosa* (Forest She-oak) and *A. verticillata* (Drooping She-oak. In the Riverina area inhabits *Casuarina cristata* stands (Belah) Requires large Eucalypt tree hollows for nesting. Chewed *Allocasuarina littoralis* cones characteristic of the feeding habits of this species were observed in the vicinity of the proposed works. The removal of trees is to be avoided wherever possible for this project. There are large tracts of vegetation in the locality that provides similar habitat for this species. Therefore the habitat for this species in the local area is to be retained. Therefore it is considered that the proposal will not result in an adverse effect on this species such that a viable population of the species is likely to be placed at risk of extinction.

Microchiropteran Bats
Miniopterus australis (Little Bentwing Bat)
Chalinolobus dwyeri (Large-eared Pied Bat)
*Falsistrellus tasmaniensis (*Eastern False Pipistrelle)
Nyctophilus corbeni (South-eastern Long-eared Bat)

These threatened Microchiropteran bat species are highly mobile species with a range of habitat preferences that overlap and utilise a range of different habitat niches. They encompass two main sheltering habits; those that dwell in caves, and, due to similar characteristics, sometimes manmade structures, and those that dwell in tree hollows. These species have the potential to occur within the proposed works area, however the proposal will have a low impact through the strategies of siting the bores within clearings or already disturbed areas, avoiding the felling of trees wherever possible and reducing the removal or lopping of vegetation to an absolute minimum required to allow the drill rig to traverse the access tracks. Two tree with hollows of a suitable size to accommodate the Eastern False Pipistrelle and South-eastern Long-eared Bat were recorded within ARP08. These two trees have the potential to be removed, however these trees are considered to have a marginal chance of actually containing these species as the hollows did not look deep or well advanced. More suitable roosting trees for these species are likely to exist in the locality. Therefore, it is considered that the proposal will not result in an adverse effect on these species such that a viable population of these species is likely to be placed at risk of extinction.

(b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No endangered populations were identified within the subject site or surrounding area.

(c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

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

No endangered ecological communities are present or will be affected by the proposed exploration works.

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

No endangered ecological communities are present or will be affected by the proposed exploration works.

(d) *in relation to the habitat of a threatened species, population or ecological community:*

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

Exploration operations will be undertaken upon very small areas (approximately 0.45ha) predominantly located in areas of previously cleared or disturbed habitat and adjacent to existing or disused access tracks. This habitat will be rehabilitated with pre-existing surface soil after the works have been completed. A small amount (approximately 0.09ha) of Glossy Black-Cockatoo foraging habitat in the form of *Allocasuarina littoralis* feed trees may be removed from one site, whilst a small amount habitat for small hollow-dependant fauna including Little Lorikeet, Eastern False Pipistrelle and South-eastern Long-eared Bat may be modified with the possible removal of two hollow-bearing trees.

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

Operations at the proposed exploration sites will not substantially or significantly fragment or isolate the locally occurring habitat from the extensive areas of similar adjoining habitat.

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

A very small area (approximately 30m x 30m) of habitat may be subject to removal at some of the proposed exploration sites, totalling approximately 0.45ha for the entire proposal. This may include the removal of a low number of small shrubs or saplings to establish a work pad or trimming of tree branches to facilitate the passage of the drill rig along the access track, however removal of vegetation will be kept to an absolute minimum. It is considered that the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of any species, population or ecological community in the locality is low.

(e) *whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

Operations at the proposed exploration sites will not affect critical habitat either directly or indirectly.

(f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

Recovery Plans exist for a number of species. However none have the potential to be impacted upon by the proposed exploration works:

The impact of the proposed works is minimal as a result of the small area required for the borehole sites (approximately 0.45ha), the selection of previously disturbed areas for the borehole sites and the strategy of avoiding the removal of trees and other vegetation. Furthermore, any required habitat removal or modification will not impact upon the habitat required for the above species due to the large areas of similar habitat in the locality that is to be retained. The proposed actions are therefore consistent with the objectives or actions stated within the Recovery Plans.

(g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A total of five different KTPs have been identified as having potential to affect the site as a consequence of the proposed exploration sites, being:

- Anthropogenic climate change;
- Clearing of native vegetation;
- Infection of native plants by *Phytophthora cinnamomi;*
- Invasion of native plant communities by exotic perennial grasses; and
- Loss of hollow-bearing trees.

Due to the small size of each exploration borehole site and the selection of previously disturbed areas adjacent to existing or disused tracks, along with the use of adequate hygiene protocols for machinery and vehicles, the potential contribution of each KTP has been minimised. The possible loss of two hollow-bearing trees, whilst contributing to the KTP, is a small effect in comparison to the wide availability of this habitat attribute present locally.

Appendix 2

Flora Species List

Flora Species List

The following list includes all species of vascular plants observed within the proposed fiveexploration sites during fieldwork. It should be noted that such a list couldn't be considered comprehensive, but rather indicative of the flora present on the site during threatened species searches. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation "sp.", indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark ("?") placed in front of the generic, which is followed by the abbreviation "sp." and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a ("?") placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

Harden, G. (ed) (1992). *Flora of New South Wales, Volume 3.* UNSW, Kensington, NSW.

Harden, G. (ed) (1993). *Flora of New South Wales, Volume 4*. UNSW, Kensington, NSW.

Harden, G. (ed) (2000). *Flora of New South Wales, Volume 1*. Revised edition. UNSW, Kensington, NSW.

Harden, G. (ed) (2002). *Flora of New South Wales, Volume 2*. Revised edition. UNSW, Kensington, NSW.

Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk "*".

Threatened species listed under the *Threatened Species Conservation Act 1995* (TSC Act 1995) or *the Environmental Protection of Biodiversity and Conservation* (EPBC Act 1999) and / or Rare or Threatened Australian Plant (ROTAP) listed species are indicated in **bold font** and marked as:

(V) = Vulnerable Species listed under the TSC Act
(E) = Endangered Species listed under the TSC Act
(EE) = Species listed under the Commonwealth EPBC Act 1999 as Endangered
(EV) = Species listed under the Commonwealth EPBC Act 1999 as Vulnerable
(R) = ROTAP as per Briggs and Leigh (1996)

The following standard abbreviations are used to indicate subspecific taxa:

ssp. - subspecies
var.- variety
agg. Aggregate

Family	Scientific name	Common name	TSC Act	EPBC Act	ARP010	ARP06	ARP07	ARP08	ARP09
Tree									
Casuarinaceae	*Allocasuarina nana*	Dwarf She-oak			✓				
	Allocasuarina littoralis	Black She-oak	-	-		✓			
Myrtaceae	*Eucalyptus cypellocarpa*	Mountain Grey Gum	-	-			✓		✓
	Eucalyptus fastigata	Brown Barrel	-	-					✓
	Eucalyptus macrorhyncha	Red Stringybark	-	-			✓	✓	
	Eucalyptus mannifera subsp. *mannifera*	Red-spotted Gum	-	-				✓	
	Eucalyptus punctata	Grey Gum	-	-		✓			
	Eucalyptus sparsifolia	Narrow-leaved Stringybark	-	-		✓			
Shrub									
Asteraceae	*Cassinia aculeata*	Dolly Bush	-	-				✓	
Cyatheaceae	*Cyathea australis*	Black Tree-fern							✓
Epacridaceae	*Leucopogon muticus*	Blunt Beard-heath	-	-	✓				
	Melichrus urceolatus	Urn Heath	-	-			✓	✓	
Fabaceae	*Indigofera australis*	Native Indigo	-	-			✓	✓	
	Oxylobium ilicifolium (now Podolobium ilicifolium)	Native Holly	-	-		✓			
	Acacia asparagoides	-	-	-	✓				
	Acacia obtusifolia	Blunt-leaf Wattle	-	-		✓	✓		✓
	Acacia terminalis	Sunshine Wattle	-	-	✓				
Lamiaceae	***Prostanthera stricta***	**Mount Vincent Mintbush**	**V**	**V**		✓		✓	
Myrtaceae	*Baeckea brevifolia*	Weeping Baeckea	-	-	✓				
	Leptospermum arachnoides	-	-	-	✓				
	Leptospermum polygalifolium	Tantoon	-	-					✓
	Leptospermum trinervium	Slender Tea-tree	-	-	✓				
Pittosporaceae	*Bursaria spinosa* var. *spinosa*	Blackthorn	-	-			✓		
Proteaceae	*Banksia ericifolia*	Heath-leaved Banksia				✓			
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	-	-		✓			
Rhamnaceae	*Cryptandra ericoides*	Heathy Cryptandra	-	-	✓				
Groundcover									
Blechnaceae	*Blechnum nudum*	Fishbone Water Fern							✓
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	-	-					✓
Epacridaceae	*Stypandra glauca*	Nodding Blue Lily	-	-					✓
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	-	-			✓	✓	
Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush						✓	
Poaceae	*Poa seiberiana*	Tussock Grass	-	-		✓	✓	✓	
Sinopteridaceae	*Cheilanthes sieberi*	Mulga Fern	-	-			✓		
Rubiaceae	*Asperula scoparia*	Prickly Woodruff						✓	

Appendix 3

Personnel Involved in the Project

Curriculum Vitae

PAUL HILLIER

Ecology Manager - Newcastle

Newcastle, NSW

Bachelor of Environmental Science (Environmental Management)

NSW Driver's Licence (Class C)

OH&S Induction Training (White Card)

Senior First Aid

AREAS OF EXPERTISE:

Paul has broad range of Ecological Assessment reporting and project management experience from 9 years of professional ecological work both in Australia and abroad. Project experience has primarily included a range of flora and fauna assessment disciplines as required by a wide range of corporate and domestic client requirements. Paul has been employed both within the private and public sector, providing a strong knowledge and understanding of the role of both developers and government in legislation and planning.

Paul has the majority of his experience within the consultancy industry, primarily focussing on the preparation of Flora and Fauna Assessments, Environmental Assessments, Environmental Impact Statements, Review of Environmental Factors and Statement of Environmental Effects. Paul has experience with targeted threatened flora and fauna surveys, including a strong knowledge of Geographic Information Systems mapping and analyses.

SELECTED PROJECT EXPERIENCE:

Ecology

- Ecological Constraints Master Plan – Huntlee, Singleton and Cessnock, NSW (2007-2010)
- Ecosystem Function Analysis – Wambo Coal, Singleton NSW (2010).
- Ecological Assessment Report – White Rock Wind Farm, Glen Innes, NSW (2011).

PREVIOUS EXPERIENCE:

Ecological Records Officer – West Yorkshire Ecology (2007-2009)
Duties included collection and collation of ecological records from across West Yorkshire, United Kingdom; Preparation of fee proposals for ecological services; GIS/ spatial analysis and database management; Database searches and reporting; Liaison with client, stakeholder groups, state and local governing bodies; Review of local planning applications and consequent consultations to local councils.

Ecologist – Harper Somers O'Sullivan (2004-2006)
Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; liaison with both the private sector and federal, state and local government department.

MEMBERSHIPS & ACHIEVEMENTS:

For Australian Wildlife Needing Aid (FAWNA), NSW Australia

Curriculum Vitae

JOEL STIBBARD

Field Ecologist

Newcastle, New South Wales

Masters of Environmental Management, University of Queensland, 2009 - Present

Bachelor of Science, University of Queensland, 2001 - 2004

AREAS OF EXPERTISE:

I have had over five years of ecological experience around the world in both aquatic and terrestrial environments. I have spent the last 12 months working as an ecologist in Queensland, focussing on botany, vegetation mapping and environmental legislation.

SELECTED PROJECT EXPERIENCE:

Resource Sector

- **Northern Energy Corporation: Elimatta Project** – This project is located 30km west of Wandoan in Queensland and is the site of a large resource of thermal coal. I was involved in the ecological surveys, GIS work and flora and fauna assessment reporting of this project as part of the Environmental Impact Assessment process.
- **Hancock Coal Pty Ltd: Alpha Coal Project** – The site of a well known thermal coal deposit in the Galilee Basin of Queensland, I was involved in terrestrial and aquatic flora and fauna surveys, habitat assessments and reporting.
- **Hancock Coal Pty Ltd: Kevins Corner Project** – Situated to the north of the Alpha Coal Project, I was involved in flora and fauna surveys as well as ecological assessment reporting.
- **Perilya – Mount Oxide** – A copper mine is to be developed on this site; 140km northwest of Mount Isa in Queensland. I was part of a four-man ecology team employed to investigate local flora and fauna as part of the Environmental Impact Assessment process

Ecological Sector

- **Kalahari Meerkat Project** – This project was collaboratively run by the University of Cambridge in the UK and the University of Zurich in Switzerland. I was an ecological researcher on this project in the Northern Cape of South Africa for 1.5 years, assessing the behavioural and reproductive ecology of the Meerkat *Suricatta suricatta*.
- **Great Barrier Reef Monitoring Program** – I was a Project Officer for Reef Check Australia in Townsville throughout 2009. I was primarily responsible for organising and implementing monitoring surveys, data collection and reporting to the Great Barrier Reef Marine Park Authority on the health of reefs across the entire GBR.
- **Meso-American Barrier Reef Monitoring Program** – I was a volunteer surveyor for Global Vision International in the Yucatan Peninsula of Mexico during 2008, primarily involved in dive surveys, data collection and ecotourism as a part of a long-term monitoring program.

PREVIOUS EXPERIENCE:

Ecologist – Australasian Resource Consultants **1 year**

I was employed at AARC as an ecologist at the beginning of 2011. My role primarily involved ecological field surveys, EIA reporting and GIS mapping within a consultancy role that required initiative, efficiency and innovation. A valued member of the team, I left AARC to pursue a similar role with RPS in my hometown of Newcastle.

Lab Technician – Fisheries Resource Consultants **0.5 years**

My role in the laboratory for FRC in 2010 involved the sorting and identification of macro-invertebrates as an indication of aquatic waterway health. This was a casual position that ended upon gaining employment full-time at AARC.

Ecologist – Environmental, Ground & Water Consultants **0.5 years**

I was employed at EGC whilst completing my Masters at the University of Queensland in 2010. This was a project-based role on Curtis Island off of Gladstone in Central Queensland. My role involved ecological surveys, identification of fauna habitat and assessment reporting prior to the development of the QCG LNG plant on Curtis Island.

MEMBERSHIPS & ACHIEVEMENTS:

Deans' Commendation for High Achievement – University of Queensland (2009 -2010)

Appendix 2

Surface and Groundwater Assessment, prepared by RPS Aquaterra

RPS Aquaterra

AIRLY MINE – SURFACE AND GROUNDWATER ASSESSMENT

AIRLY MINE – SURFACE AND GROUNDWATER ASSESSMENT

Prepared by:

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Our ref: S102/064b
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	Name	Position	Signature	Date
Author	Ulrike Krause	Senior Hydrogeologist		29/10/2012
Reviewer	Katarina David	Principal Hydrogeologist	pp	29/10/2012

EXECUTIVE SUMMARY

Centennial Airly is planning to drill five exploration bores within the existing mine lease which will be converted into groundwater monitoring bores. The monitoring bores will be installed for the purpose of preparing the future groundwater assessment for the Environmental Impact Statement.

Five potential drilling sites have been identified and the following report is part of a Review of Environmental Factors (REF) prepared as part of the approvals process for the planned drilling. The identified locations of the proposed bores are shown in Figure 1 and Figure 2. Potential environmental impacts to ground and surface waters have been addressed. The findings are summarised in the following table.

This document has been prepared in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia and Environmental Impact Assessment Guidelines (EIAG) (NSW Trade and Investment, May, 2012).

Potential Groundwater and Surface Water Impacts and Mitigation Measures

Potential Impacts	Mitigation Measures
Possibility of cross contamination of aquifers during or after drilling Possibility of contamination of the aquifers by drilling muds/fluids or ingress of contaminants from the surface	• Pre-work check of site conditions at drill site, drill rig and associated equipment. • Drill method hydraulic drill. • Use of clean, fresh water or biodegradable muds as drilling fluid. • Water will be circulated through above ground settling pits or containers. • Drill holes will be filled with water during drilling to create pressure on the borehole walls and thereby prevent any potential loss from the aquifers. • Water naturally forms a thin layer of mud on the wall of the borehole which reduces seepage loss. • Low permeability of the local aquifers. • Installation of surface casing where required, to stabilise the boreholes and protect against contamination from surface water ingress. • Use of industry standard construction materials. • Impermeable cement-bentonite grout prevents any ingress of surface water into the monitoring bore and mixing of groundwater. • The boreholes will be constructed and decommissioned in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia, Edition 3, February 2012.
Groundwater discharging to the surface, which might cause flooding or contamination	• A risk assessment will be undertaken prior to any discharge of water to the environment. • Containment and removal of discharged water as required. • Avoid any features associated with surface water drainage and/or groundwater seepage in the course of drill site selection.
Seepage of drilling muds/fluids, drilling additives and/or hydrocarbons (oils/lubricants etc) to shallow groundwater beneath the rig and well site	• Pre-work checks of site conditions at drill site, drill rig and associated equipment. • Use of clean, fresh water or biodegradable muds as drilling fluid. • Water is circulated through above ground settling pits or containers. • Removal of drilling fluids off-site following drilling. • Low permeability surface geology at drill site locations. • Double-bunded fuel tanks. • Spill kits on drill site. • Personnel on site trained in use of spill kit. • EMP to manage the use of hazardous substances. • Surface casing where seepage of drilling fluids/muds, hydrocarbons or presence of other contaminants are indicated. • Good drilling practices and site housekeeping according to the Minimum Construction Requirements for Water Bores in Australia, Edition 3, February 2012. • Avoid any features associated with surface water drainage and/or

Potential Impacts	Mitigation Measures
	groundwater seepage in the course of drill site selection. • Avoid drilling during wet weather conditions.
Flooding and/or contamination of surface waters during drilling	• Containment and removal of all discharged water during drilling and bore development. • Avoid any features associated with surface water drainage and/or groundwater seepage in the course of drill site selection. • Avoid steep surface gradients. • Negligible risk at five borehole locations due to absence of surface waters at proposed drilling sites. • Avoid drilling during wet weather conditions.
Drill pad and access road construction affecting land drainage leading to flooding	• The minimization of surface water catchment and drainage line crossings in the course of drill site selection. • The orientation of the access routes, such that drainage line crossings are perpendicular to the routes. • Effective drainage of the drill site to control surface runoff and minimize erosion. • Avoidance (where practicable) of perched water tables or use of surface casing. • Avoid drilling during wet weather conditions.
Vegetation removal leading to increased erosion and a decrease in the uptake of rainfall	• Replace vegetation where necessary and practicable during site reinstatement.

The overall risk to the environment of the proposed drilling is considered negligible if risk assessments are carried out and the drilling methods and work practices employed at the site are appropriate. Water will not be affected as the activities will not pollute water, or use water contained in it, it will not interfere with the natural movement of water as the drilling pads will be located away from the drainage line, and will not involve the storage of water.

No prior disturbance is present, as the area is remote. As a result of implementing the mitigation measures and good drilling practices in accordance with the Construction Requirements for Water Bores in Australia it is not likely that the impact will occur to groundwater, surface water, land and soils as a result of the proposed activity.

The methodology of this project has been designed and will be carried out with consideration of environmental impact and mitigation at every stage.

Site selection has been done with a focus on minimising disturbance to vegetation and steep gradients will be avoided where possible to minimise the risk of mobilising contaminants towards surface watercourses. The borehole construction and completion will be done in accordance with industry standard practices and the site reinstated as far as is practicable to ensure there are no residual impacts following drilling.

It is recommended to avoid wet weather conditions during drilling.

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TABLES

FIGURES (compiled at end of report)

1. BACKGROUND

The existing Airly Mine is owned by Centennial Coal, and is located approximately 40km north-northwest of the town of Lithgow, around 3km north-east of Capertee. The Airly Mine is situated on Mining Lease 1331 and Authorisation area A232, and the coal is recovered from the Lithgow coal seam. Centennial Airly proposes to undertake a drilling program within the existing mining lease as shown in Figure 1. The purpose of drilling is to provide geological information for inclusion in the mine's geological model and groundwater information for the purpose of preparing the future groundwater assessment for the Environmental Impact Statement. Five proposed boreholes will be converted into groundwater monitoring bores on completion of exploration activities. Five potential drilling sites have been identified and are shown in Figure 2 along with the surface geology.

The following report is part of a Review of Environmental Factors (REF) prepared as part of the approval process for the planned drilling and installation of monitoring bores. The potential environmental impacts to ground and surface waters haven been addressed. This document has been prepared in accordance with the Environmental Impact Assessment Guidelines (EIAG) (NSW Trade and Investment, May 2012) and standards in accordance with the Minimum Construction Requirements for Water Bores in Australia.

1.1 Surface and groundwater licensing

The main NSW legislation and policies related to use of surface water and groundwater in the proposed drilling and monitoring bore installation area including dewatering, bore licensing and groundwater extraction impacts is the Water Management Act 2000. The Water Sharing Plans under the Act are administered by the NSW Office of Water.

The Water Sharing Plan for Greater Metropolitan Region unregulated river water sources commenced in July 2011. In terms of Capertee catchment, this water sharing plan regulates the surface water use and any licensing conditions after July 2011.

The Water Sharing Plan for Greater Metropolitan Region groundwater sources commenced in July 2011. Under this Plan any groundwater (alluvial aquifers or porous and fractured rock aquifers) within the Capertee area falls under Sydney Basin North Groundwater source. The area is bounded by the Colo and Hawkesbury River to the south, Kulnura-Mangrove Mountain to the east, the Hunter Range to the north and Great Dividing Range to the west.

Under recently finalised Aquifer Interference Policy (NSW Office of Water, 2012), the drilling of monitoring bores and wells that are required by a development consent under Part 4 or an approval under Part 5.1 of the Environmental Planning and Assessment Act 1979 are defined as minimal impact aquifer interference activities and do not require licensing. This assumes that the bores are constructed and decommissioned in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia. It is required that all bore construction, geology, water bearing zones, water entry design, backfilling, well design, development details, hydraulic testing details, disinfection if applicable and all information on water levels and groundwater quality is recorded and provided on request from the NSW Office of Water.

1.2 Geology

1.2.1 Regional Geology

The Project Site lies within the Western Coalfields of NSW. The stratigraphically highest geological unit across the area is the Early Triassic Narrabeen Group comprising lithic and quartz sandstones, conglomerates, siltstones and shale of freshwater origin of the Caley Formation and Grose Sub-Group.

Stratigraphically below Narrabeen Group are the Permian Illawarra Coal Measures consisting of coal seams, sandstone, conglomerates, siltstones, claystones and shale.

The Illawarra Coal Measures are underlain by the Shoalhaven Group the oldest member of the three geological units. Shoalhaven group comprises siltstone, sandstone, conglomerate and shale.

The basement rocks of the region consist of early to mid Devonian quartzites, limestones and shales that have been locally intruded by carboniferous granites.

1.2.2 Local Geology

The stratigraphic sequence in the vicinity of the mine follows the regional geology discussed above. The Illawarra Coal Measures at the mine site contain four main coal seams as outlines below:

- Middle River Seam;
- Irondale Seam;
- Lidsdale Seam and
- Lithgow Seam.

The high elevated mesas that form Genowlan and Airly Mountain are incised by deep valleys which isolate the Narrabeen Sandstone units.

1.3 Surface Water Features

1.3.1 Regional

The Airly site is located in the catchment of Hawkesbury-Nepean river system. The confluence of the Genowlan creek with Capertee River is located 15km north east of the Airly mine. The Capertee River flows in an easterly direction, discharging into Hawkesbury–Nepean river system, which discharges to the east coast.

A number of tributaries from higher altitudes on the eastern slopes of the Great Dividing Range join the Capertee River, which flows through mostly steep forested areas, and cleared farmland. The upper reaches of the Capertee River are characterised by rock and gravel bottom with considerable sedimentation.

1.3.2 Genowlan Creek

Genowlan Creek is the tributary to Capertee River and runs from west to east. The creek originates as the spring at a location called the Grotto close to the top of Genowlan Mountain. At the location called The Oasis, 300m downstream, the anecdotal evidence indicates that the flow is on average 2.2L/s while in drought periods the flow decreases to around 1L/s. The flow at this location is persistent and not known to cease.

1.4 Hydrogeology

There are five main hydrogeological units in the Project area:

- Minor Quaternary alluvial aquifers associated with ephemeral creeks;
- Triassic Sandstone of the Narrabeen Group (overburden sediments);
- Coal seams within the Permian Illawarra Coal Measures – namely Middle River, Irondale, Lidsdale and Lithgow;
- Permian interburden sediments (shale, claystone, siltstone and sandstone layers between the coal seams); and
- Shoalhaven Group.

1.4.1 Alluvial Aquifers

The Airly site is located in the catchment of the Hawkesbury-Nepean river system. Quaternary alluvium is present in the valley floors and along creek lines. Gap Creek flows from south to north and is a minor tributary of Genowlan Creek. Genowlan Creek flows from west to east and is the tributary to Capertee River. The confluence of Genowlan Creek with Capertee River is located 15km northeast of the Airly Mine. Torbane Creek flows along the western area of the Project site.

Minor alluvial aquifers exist in highland valleys and along creek lines, which would be typically recharged by rainfall infiltration and seepage from creeks. At source, the Gap Creek channel is

approximately 0.4m wide and located within banks up to 1m high. Downstream, the creek bed widens and the thickness of the gravely creek bed increases. Visual observations confirmed that only parts of the creek bed fall seasonally dry. Hence, it is anticipated that alluvium remains saturated.

Genowlan Creek originates in a location called 'The Grotto' close to the top of Genowlan Mountain. At a location called 'The Oasis', 300m downstream, anecdotal evidence indicate that the flow is persistent during the hydrological year and decreases only in drought periods.

1.4.2 Narrabeen Group

The Narrabeen Sandstone outcrops at the site and receives recharge via rainfall. Recharge by direct infiltration of precipitation occurs on the upper slopes and the tops of the mountains. Discharge via seepage takes place on the break of slopes, occurring as springs and locally into the surface streams, providing base flow for the regional creeks and rivers.

The groundwater systems within this group of sediments are complex with perched water tables and semi-confined leaky aquifers separated by relatively impermeable claystone layers (Bish, 1999). Interstratified shales, claystones and siltstones act as aquitards and aquicludes. Groundwater occurs in all these units, and may form local aquifers where sufficient permeabilities exist. The flow system in Narrabeen Group can be characterised as a local flow system. The water bearing units in the Narrabeen Group have a reported low flow inter-granular primary porosity and a greater secondary porosity provided by fractures, fissures, bedding planes and faults within the strata.

The proposed drilling sites are located within the outcrop of the Narrabeen Group.

1.4.3 Permian Sediments

The coal measures comprise strata of varying permeability with the coals seams, namely Middle River, Irondale, Lidsdale and Lithgow, being the principal aquifers. The interstratified shales, claystones and siltstones generally act as aquitards/aquicludes. The coal measures are at outcrop on the slopes around the top of the mountain where the proposed drill sites are located.

The regional groundwater flow direction within the Illawarra Coal Measures is from the southwest towards northeast, and generally horizontally through the coal measures in the direction of the dip of the coal seams (Bish, 1999).

1.4.4 Shoalhaven Group

Limited groundwater movement may occur within the Shoalhaven group via fracture flow and inter granular flow within the matrix of the rock.

1.5 Surface water and Groundwater use

Currently surface water and groundwater within the proposed area affected by drilling is not used for any purpose. The records of the registered groundwater use from bores in the area surrounding the Airly mine were extracted from the NSW Office of Water (NOW) register. The database contains records for 32 registered bores within 10 km radius from the Airly mine. The area is remote and the closest groundwater user (GW035684 stock and domestic) is located 5km to the east of the site.

There are no known surface water users within the area that will be affected by drilling activity.

2. PROJECT DESCRIPTION

Centennial Airly proposes to undertake a drilling program for exploration purposes. Four boreholes will be converted into monitoring bores on completion of exploration activities. Five potential drilling sites have been identified and are shown in Figure 1 and Figure 2.

2.1 Bore Locations

Location, targeted aquifers and installation details of the proposed boreholes are listed in Table 2.1.

Table 2.1: Proposed Borehole Parameters

Borehole	Easting	Northing	Depth (m)	Piezometer Type	Targeted Aquifers
ARP06	225326	6331810	300	Vibrating Wire	Narrabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP07	224692	6332554	300	Vibrating Wire	Narrabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP08	224967	6333826	300	Vibrating Wire	Narrabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams
ARP09	225359	6332766	20	Standpipe	Quaternary Alluvium
ARP10	225139	6332116	300	Vibrating Wire	Narrabeen Sandstone, Middle River, Irondale and Lithgow Coal Seams

2.2 Site Access

To minimise environmental impacts, the proposed bore locations have been selected as close as possible to existing roads and tracks. This minimizes land disturbance and clearing requirements.

2.3 Drilling Site Preparation

The proposed bore locations have been deliberately selected so as to utilize existing access tracks and to minimize the need to clear vegetation and at locations with minimal slope. Site preparation would involve positioning of equipment. Drainage will be emplaced where necessary to ensure the working area remains free of excess water. Surface run-off of excess water is not expected as the terrain of the drilling locations is either flat or slopes very gently. Above ground tanks or pits to capture and recirculate water will be installed where required and fully lined to offer protection to the underlying aquifers. Table 2.2 summarizes the conditions at the selected drilling locations.

Table 2.2: Site Conditions at Proposed Borehole Locations

Borehole	Location	Slope	Surface Water Features/Drainage	Seepage	Vegetation
ARP06	Located next to track in forested area	Gently sloping terrain to the west	No surface water features or drainage lines observed. Area was dry at time of inspection.	No seepage observed.	Clear of vegetation
ARP07	Located next to the road	Gently sloping terrain to the east	One minor drainage line identified. Site was dry at time of inspection. Drainage expected after rainfall events.	No exposed sandstone present. No seepage observed.	Grassed area, clear of other vegetation
ARP08	Located next to the track on top of the ridge near point Hatteras on basalt outcrop.	Flat	No surface water features or drainage lines observed. Area was dry at time of inspection.	No exposed sandstone present and no seepage identified.	Grassed area. Clear of other vegetation.
ARP09	Located next to track and Genowlan Creek, close to rock outcrop.	Gently sloping terrain.	Minor flow in Genowlan Creek observed. Identified water accumulated mainly in pools.	Seepage from overhanging sandstone cliffs observed.	Access track is clear of vegetation. On both sides of track lush vegetation.
ARP10	Located next to track at sandstone outcrop on top of the ridge	Gently sloping terrain	No surface water features or drainage lines observed	No seepage from sandstone pagodas observed	Small shrubs, partially cleared

2.3.1 ARP06

The proposed drilling site is located close to an existing access track. Some drill pad preparation and vegetation clearance may be required at this location. Plate 1 and Plate 2 show the access track and the proposed borehole location.

2.3.2 ARP07

The bore location is clear of vegetation and located beside an existing track. The ground is stable and slopes gently to the east. Special drill pad preparations may be required. The access track and proposed drill location are shown in Plate 3 and Plate 4.

2.3.3 ARP08

The drilling site is clear of vegetation and located close to an existing track. The terrain is flat and stable. Some vegetation clearance or soil disturbance may be required. The proposed bore location is illustrated in Plate 6. The access track to the drill location is shown in Plate 5.

2.3.4 ARP09

The access track is clear of vegetation. On both sides of the track lush vegetation consisting of ferns and small bushes is present. To provide sufficient space for drilling and enable vehicle access vegetation needs to be partially cleared on at least one side of the track. Plate 7 shows the access track and the proposed bore location.

2.3.5 ARP10

Preparation for drill location would involve minor trimming of vegetation comprising small shrubs. Some soil disturbance may be required in the preparation of the drill pad and to enable vehicle access. Plate 8 and Plate 9 show the proposed drill location and access track.

2.4 Borehole Drilling and Construction

The drilling method will be hydraulic drilling since the strata at the proposed site is known to be consolidated and sufficiently stable. The drilling will involve the use of clean, fresh water for circulation. The water is circulated down the drilling rods to lubricate the drilling bit and up the inside of the borehole to remove the drill cuttings. The strata that will be drilled includes hard rock, mostly sandstone, claystone, siltstone, shale, coal seams and conglomerates. If drilling mud is required, biodegradable mud will be used.

Should site conditions require the use of drilling mud to stabilize the borehole, a biodegradable product will be used. Biodegradable drilling fluids are typically based on bentonite which is naturally occurring material. Material Safety Data Sheets (MSDS) provide information about composition, associated risks and manufacturer's recommendations and should be available on the drill site for all drilling fluids and products used.

The water for drilling purposes will be sourced by the Proponent. It is assumed that approximately 200,000 litres of water per borehole would be required for drilling related activities. Potential water sources are:

- An existing dam located adjacent to the Nissan Hut at the former diamond mine site on top of the Genowlan Mountain;
- An existing dam located near a residential property at the base of Genowlan Mountain;
- A bore on the Centennial Property, and
- The existing water supply for process water at Airly Mine.

At the surface, water and drill cuttings will be channeled into settling pits or metal containers to allow the tailings to settle. Clean water is then picked up by the pump and is recirculated down the drilling rods. Clean water will be transported on site by the drilling contractor in an above ground tank. The necessary volume will be determined by the drilling contractor. Dirty water will be contained and removed off site.

If the borehole is producing significant groundwater inflow during drilling then casing or grouting may be required to prevent the cross contamination of groundwater as the drilling penetrates different groundwater bearing units.

The use of metal above ground containers or above ground settling pits for the purpose of tailings settlement will be organized prior to drilling and will be dependent on the nature of the ground and the potential for contamination (discussed in Section 3) via seepage.

Wider diameter surface casing is often placed within the top 6 – 12m to provide stability to the borehole across unconsolidated on instable formations during the rest of the drilling and offer protection against contamination from surface water ingress throughout the life of the borehole. Surface casing can be removed after completion or can be cemented into the ground if contamination from surface water ingress persists.

Following drilling, the holes will be flushed and the vibrating wire piezometers installed in the clean holes. Boreholes ARP06, ARP07, ARP08 and ARP10 will be constructed as multi-level vibrating wire (VW) piezometers, which will involve the installation of a series of probes at various depths to measure the pore pressure (groundwater level) in various strata. Installation depths will be advised by RPS Aquaterra staff.

The installation is likely to occur immediately or as soon as practicable depending on when drilling operations are finished, the holes have been geophysically logged and on weather conditions. The piezometers are lowered into the hole so that the wires are set adjacent to the aquifers to be monitored. Then the wires are grouted in place using a trammie pipe. The grout is prepared at the surface using cement and bentonite in prescribed ratio. These bores are fully grouted with a bentonite-cement mixture to ensure the complete sealing of the installed piezometers. This will prevent any potential cross contamination between the aquifers.

For installation at depths exceeding 200m the grouting is undertaken in stages to prevent over pressurisation of the deep installations and two grout tubes may be required. NSW coal mining regulations limit grouting to maximum 200m intervals, which requires accurate volume calculations.

The composition of the impermeable cement-bentonite grout to be employed for the vibrating wire installation will be specified by RPS Aquaterra hydrogeologists. The vibrating wire piezometers would then be completed with steel monuments with lockable caps and concreted into the ground.

A readout device situated on the surface processes the signal, and displays a reading in the engineering unit. Readings can either be instantaneous and be read manually, or stored on a data logger at a pre-determined time interval. The data is then available for download by connecting a laptop to the readout device.

Borehole ARP09 will be constructed as a standpipe piezometer. The hole will be flushed to clean the hole and installation will start immediately or as soon as practicable after the drilling and bore development are completed and dependent on weather conditions. Installation will comprise 50mm Class 18 PVC perforated casing (screen) throughout the target aquifer and 50mm plain Class 18 casing throughout all other strata.

A gravel pack will be emplaced within the annulus between the screen and the borehole wall to ensure that fine grained material does not enter the borehole. An impermeable bentonite seal will be installed on top of the gravel pack to provide an impermeable barrier to prevent the vertical migration of water to/from the target aquifer.

The remainder of the annulus will either be backfilled with spoil, cement or bentonite. The exact well design will be specified by RPS Aquaterra staff. Following installation, the piezometer will be developed with water or air. The groundwater monitoring bore would then be completed with a steel monument with lockable cap and concreted into the ground around the PVC bore casing.

2.5 Site Reinstatement

Following drilling the site will be reinstated as far as is practicable. Recommendations for reinstatement should include:

- Management of drilling fluids by removal of site;
- Grading of the site to provide safe access and to facilitate the recovery of the site if any disturbance to vegetation has occurred; and
- Placement of clean fill to repair erosion scours at the drilling location and access tracks to the sites to provide safe access and to facilitate the recovery of the site where disturbance to vegetation has occurred.

2.6 Licensing

Prior to any drilling where monitoring bores will be installed, a monitoring bore license application will need to be lodged with NSW Office of Water under Part 5 of the Water Act 1912.

Licensing requirements will apply dependent on the selected water source. Depending on the water source water quality testing may be required prior to drilling.

Transportation and use of clean water to the site and the removal of excess/discharged water doesn't require licensing.

2.7 Groundwater Extraction

There will be no groundwater extraction as part of the drilling and monitoring bore installation activities.

3. POTENTIAL IMPACTS AND MITIGATION

The following Section outlines the potential environmental factors that are relevant to this drilling project.

3.1 Potential Groundwater Impacts and Mitigation

The potential groundwater impacts of the installation and use of a borehole in mixed multi-aquifer systems relate to:

- The possibility of cross contamination of aquifers (e.g. brackish or saline water being introduced to a fresh water aquifer via the well and/or drilling process);
- The possibility of contamination of the aquifers by drilling fluids or ingress of contaminants from the surface;
- Groundwater discharging to the surface, which might cause impact on surface water quality depending on the quality of discharged and receiving waters; and
- Seepage of drilling fluids, drilling additives and/or hydrocarbons (oils/lubricants etc) to shallow groundwater beneath the rig and well site.

3.1.1 Drilling Phase

The exact nature of the risks and details of mitigation measures during drilling are as follows:

Aquifer Contamination

The first two potential impacts mentioned above relate to aquifer contamination and will be mitigated through the drilling method.

The potential for cross contamination at the proposed drilling sites is considered negligible because it is unlikely that any significant quantities of groundwater will be entering the borehole during drilling due to the relatively low permeability of the strata.

The drilling will involve the use of clean and fresh water for circulation thereby avoiding the contamination of aquifers.

The drill holes will be filled with water during drilling to create pressure on the borehole walls and thereby prevents any potential loss from the aquifers. This will impede any impacts with regards to potential decline of water levels in aquifers. In addition, the local aquifers have relatively low permeabilities so that changes in groundwater levels are not expected.

If groundwater inflows are found to be significant during drilling then casing can be installed to prevent the groundwater from entering the borehole and protect against the risks of cross contamination of aquifers.

Groundwater Discharge to the Surface

Following drilling it will be necessary to develop monitoring bore ARP09 since this bore will be converted into a standpipe piezometer for the purpose of collecting groundwater samples. The purpose of the well development is to remove fine grained material from the formation so it doesn't enter and settle in the borehole, and block the screen in the future. During well development groundwater is pumped to the surface. This water can be managed by a variety of methods depending on which is most appropriate at the particular site. At ARP09 the pumped groundwater will be contained and removed from the site to ensure that no adverse environmental impacts occur. After development groundwater samples will be collected from groundwater monitoring bore ARP09.

Bores ARP06, ARP07, ARP08 and ARP10 will be flushed before the vibrating wire piezometers can be installed at depths that will be specified by RPS Aquaterra hydrogeologists. Excess water will be contained and removed from site to avoid any adverse environmental impacts.

Rapid changes in groundwater pressures can be encountered if drilling intercepts a confined aquifer where the groundwater is under pressure. If artesian pressures are encountered there is

the potential for groundwater to reach the surface and contaminate surface waters; however such conditions are not expected at the proposed drilling sites.

Seepage of Contaminants to Shallow Groundwater

In order to manage the risk of any seepage of drilling fluids, hydrocarbons from the drill rig or any other chemicals (such as drilling lubricants and oils) being present at the drill site to shallow groundwater it is generally recommended that a risk assessment be carried to consider the drilling fluids and good site housekeeping . The risk assessment is generally carried out by client in consultation with the drilling subcontractor prior to the activity. In addition, toolbox meetings are undertaken every day at the start of the shift, where the risks to people safety and environment are reviewed and addressed if needed. .

Fresh and clean water will be used as drilling fluid as first option. The drilling fluid water will be circulated through ground pits or containers, thereby preventing any potential contamination. If site conditions require the use of drilling mud, biodegradable fluids will be used. Also the selection of the drilling sites away from surface water features is an important mitigation measure. However, it is recommended that good housekeeping on site is always undertaken and that the shallow strata be cased off to prevent any impact to shallow aquifer if any seepage of drilling fluids, hydrocarbons from the drill rig or presence of chemicals at the drill site are indicated.

The management of the risks associated with chemicals, hydrocarbons and other hazardous substances will be addressed in the risk assessment prepared by the drilling company. This risk assessment discusses potential impacts on surface and groundwater caused by drilling operations and identifies relevant mitigation measures that should be taken. Mitigation measures include also pre-work checks of site conditions, on all equipment, double bunded fuel tanks and storage / decanting of hazardous substances in designated areas where any spillage will be contained. In the event of any unforeseen spillage then spill kits will be on site and all personnel trained in their use to ensure the effective management of any spill and the minimization of contamination risk.

3.1.2 Installation and Operational Phase

The construction of the borehole following drilling is designed and implemented to not only ensure that the borehole is fit for purpose but to provide ongoing mitigation against the cross contamination of groundwater of different groundwater bearing formations, the ingress of contaminants from the surface and groundwater discharging to the surface.

During drilling, the surface casing will protect the ingress of any contaminants from the surface, this may or may not be left in the hole following drilling. At the installation phase, the vibrating wire piezometers are fully grouted with an impermeable bentonite-cement mixture to ensure the complete sealing of the installed piezometers and prevent any ingress of surface water into the monitoring bore, potential groundwater migration or cross contamination between the aquifers. The fully grouted borehole construction will prevent any leakage within the borehole and water from groundwater bearing formations from entering. This is achieved through the use of low permeability materials.

For standpipe piezometer installation, surface casing is often placed within the top 6 – 12m, which provides additional protection against contamination from surface water ingress. Perforated casing, or screen, is used throughout the target aquifer and solid or plain casing is used throughout the non-target strata. Impermeable bentonite seals are used to prevent the movement of groundwater within the annulus between casing/screen and the borehole wall.

The borehole construction and completion will be done in accordance with industry standard practices. Industry standard construction materials will be used.

The basic requirements of good industry practice are described, as follows. Further details on the drilling and construction requirements in the context of best industry practice are provided in the *Minimum Construction Requirements for Water Bores in Australia*, Edition 3, February 2012.

- Use of appropriate drilling method and techniques;
- Only drillers licensed for the class of work proposed and endorsed for the drilling method to be used shall carry out work on a water bore unless state or territory legislation provides an

exemption;

- Fresh non-polluted water should be used as base fluid. Conductivity and pH values should be measured and recorded;
- Material Safety Data Sheets (MSDS) and manufacturer's recommendations should be available on the drill site for all drilling fluid and products used.;
- Bores should be sufficiently plumb and straight to ensure that there will be no interference with the installation, alignment or long-term operations. This includes periodic checks of the plumbness of the bore by the drillers;
- Choice of appropriate casing, slotted casing/screen material depending on type of geological formation, particular bore design, method of drilling, construction techniques, desired bore yield, bore permit requirements, strength requirements, required corrosion and contaminant resistance, ease of handling and costs.;
- Gravel pack should consist of washed, well-rounded gravel of selected grain-size and gradation. It should be uniformly placed in the annular space between screen and the borehole wall. The gravel pack shall be developed after installation. The development of a bore should not be concluded before a continuous clean, silt-free, sand-free supply of water is obtainable at full flow capacity of the bore; and
- All aquifers and permeable zones, other than the intended production zone, should be adequately sealed off to prevent interconnection between zones of differing water pressures or water quality. The range of methods and materials comprise cement grout, concrete and bentonite. Mandatory requirements are provided in the *Minimum Construction Requirements for Water Bores in Australia*, Edition 3, February 2012.

Further details on the drilling and construction requirements in the context of best industry practice are provided *Minimum Construction Requirements for Water Bores in Australia*, Edition 3, February 2012.

3.2 Potential Surface Water Impacts and Mitigation

There is no evidence of surface water features or drainage lines in the vicinity of the proposed drill locations ARP06, ARP08 and ARP10 so there is a negligible potential for contamination, increased surface water run-off or flooding.

Proposed borehole ARP09 is located in the vicinity of Genowlan Creek, close to the rock outcrop. ARP09 would be converted into a standpipe piezometer. The impermeable cement-bentonite grout prevents any ingress of surface water into the monitoring bore.

In the vicinity of proposed borehole ARP07 a minor drainage line was identified which was dry during time of inspection. It is expected that water flows only during or after significant rainfall events. There will be no impacts to flooding as the site is located on the slope, and the water drains further down the Genowlan Creek.

Evidence of surface water drainage or groundwater seepage should be taken into consideration during the actual drilling site selection. It is recommended that such features are avoided where possible because they will facilitate the mobilization of contaminants. Where the proposed site cannot be moved, casing advancement is recommended as required to prevent any loss to potential aquifer or leakage of drilling fluids into the aquifer.

Based on the elevated location of the proposed boreholes (top of the ridge), the activity is not likely to change any flood regime, nor will it be affected by flooding.

It is recommended to limit drilling to low rainfall conditions where practicable.

3.3 Impact to Community

The impact of the proposed activity to groundwater and surface will be negligible as a result of implementing the described mitigation measures. There will be no impact on water users in the community as there is no known current surface or groundwater use in the area of the proposed activity.

3.4 Potential Land Stability and Soil Impacts and Mitigation

The potential to impact the land and soils during and after drilling relate to:

- Drill pad and access road construction affecting land drainage leading to flooding; and
- Vegetation removal leading to increased erosion and a decrease in the uptake of rainfall.

Generally the construction of access tracks/roads, the grading of drilling pads and removal of vegetation have the potential to impact land drainage, increase erosion and decrease the amount of rainfall taken up by the vegetation.

The extent of the proposed disturbance in terms of area will be minimal, with proposed drill pads not exceeding 30m by 30m area. No prior disturbance is present, as the area is remote. As a result of implementing the mitigation measures and good drilling practices in accordance with the Construction Requirements for Water Bores in Australia it is not likely that the impact to land or soils will occur in an area.

Since all sites are located on elevated areas on the mountain ridges, there is no potential on site from flooding.

The drilling disturbance footprint exposes soils and can lead to an increase in erosion from wind and hence an increase in wind borne dust. The bare soil allows the velocity of run-off waters to increase, which leads to further erosion and an increase in the sediment loading of receiving waters. Given the small drilling disturbance footprint at the drill sites and the very small gradient/slope of the terrain the impacts are considered to be negligible.

Affected Land Drainage

If drilling pads or access tracks are positioned on or across drainage channels then there is the potential to disrupt the natural drainage of the land.

To mitigate against these risks the design and route selection of access tracks needs to be undertaken with careful consideration of surface hydrology and drainage. During the route selection and design stages the following items should be considered;

- Minimization of surface water catchment and drainage line crossings;
- Orientation of the route, such that drainage line crossings are perpendicular;
- Bore locations will be accessed via existing tracks;
- Effective drainage to control surface runoff and minimise erosion; and
- Avoidance (where practicable) of perched water tables.

The drainage line crossings are minimized by the selection of access tracks and bore sites. Potential drill locations ARP06, ARP08 and ARP10 were dry at time of inspection and no surface water features or drainage lines were observed.

Proposed borehole ARP09 is located next to Genowlan Creek. A minor drainage line at bore location ARP07 runs perpendicular to the access track. But it's expected that it only transports water during/after rainfall events.

Water will not be affected as the activity will not pollute water, or use water contained in it, it will not interfere with the natural movement of water as the drilling pads will be located away from the drainage line.

Where drainage line crossings or drilling in the vicinity of surface water features are required, the drill site should be selected such that drilling will cause minimal disturbance to the creek bed and bank, minimal obstructions to flow and ensure the long term stability of the structure. The perpendicular orientation of the road to drainage lines is usually an effective method of achieving this by minimizing bridge span.

Vegetation Removal

A separate flora and fauna assessment have been undertaken by RPS as part of the Review of Environmental Factors (REF) with regards to the requirement for and impacts of vegetation removal. If adverse impacts are identified then vegetation should be replaced where necessary and practicable.

4. DRILLING SITE RECOMMENDATIONS

There is no evidence of nearby drainage channels or surface water courses at the potential borehole locations ARP06, ARP08 and ARP10, which would facilitate the mobilization of contaminants.

Next to ARP07 one minor drainage line was identified which probably drains the area during significant rainfall events. ARP09 is located next to Genowlan Creek. On this basis it is therefore recommended that drilling site selection is focused on minimizing environmental impacts by drilling as close to the access tracks as practicable to avoid damage to vegetation and as far away from drainage lines as practicable. Also, good drilling practices, use of above ground tanks, casing the top 3-6m and installation of sediment fences will minimize the risk of any contamination to groundwater or surface water.

It is also recommended that steep gradients are avoided to minimize the risk of contaminants migrating towards surface water courses should a spillage occur.

Drilling operations should be limited to dry weather conditions where possible.

The provided risk assessment and recommended mitigation measures should minimize any potential harm to aquifers and the environment.

It is recommended that a separate flora and fauna assessment is carried out as part of the Review of Environmental Factors (REF) with regards to the requirement for and impacts of vegetation removal. If adverse impacts are identified then vegetation should be replaced where necessary and practicable.

With regard to the potential risk of impact to archaeological and cultural heritage sites and to potentially effected fauna and flora, these are addressed in other REF chapters.

5. SUMMARY AND CONCLUSIONS

A summary of the potential impacts and mitigation measures is provided in Table 5.1.

Table 5.1: Potential Groundwater and Surface Water Impacts and Mitigation Measures

Potential Impacts	Mitigation Measures
Possibility of cross contamination of aquifers during or after drilling The possibility of contamination of the aquifers by drilling muds/fluids or ingress of contaminants from the surface	• Pre-work check of site conditions at drill site, drill rig and associated equipment. • Drill method hydraulic drill. • Use of clean, fresh water or biodegradable muds as drilling fluid. • Water will be circulated through above ground settling pits or containers. • Drill holes will be filled with water during drilling to create pressure on the borehole walls and thereby prevent any potential loss from the aquifers. • Water naturally forms a thin layer of mud on the wall of the borehole which reduces seepage loss. • Low permeability of the local aquifers. • Installation of surface casing where required, to stabilise the boreholes and protect against contamination from surface water ingress. • Use of industry standard construction materials. • Impermeable cement-bentonite grout prevents any ingress of surface water into the monitoring bore and mixing of groundwater. • The boreholes will be constructed and decommissioned in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia, Edition 3, February 2012.
Groundwater discharging to the surface, which might cause flooding or contamination	• A risk assessment will be undertaken prior to any discharge of water to the environment. • Containment and removal of discharged water as required. • Avoid any features associated with surface water drainage and/or groundwater seepage in the course of drill site selection.
Seepage of drilling muds/fluids, drilling additives and/or hydrocarbons (oils/lubricants etc) to shallow groundwater beneath the rig and well site	• Pre-work checks of site conditions at drill site, drill rig and associated equipment. • Use of clean, fresh water or biodegradable muds as drilling fluid. • Water is circulated through above ground settling pits or containers. • Removal of drilling fluids off-site following drilling. • Low permeability surface geology at drill site locations. • Double-bunded fuel tanks. • Spill kits on drill site. • Personnel on site trained in use of spill kit. • EMP to manage the use of hazardous substances. • Surface casing where seepage of drilling fluids/muds, hydrocarbons or presence of other contaminants are indicated. • Good drilling practices and site housekeeping according to the Minimum Construction Requirements for Water Bores in Australia, Edition 3, February 2012. • Avoid any features associated with surface water drainage and/or groundwater seepage in the course of drill site selection. • Avoid drilling during wet weather conditions.
Flooding and/or contamination of surface waters during drilling	• Containment and removal of all discharged water during drilling and bore development. • Avoid any features associated with surface water drainage and/or groundwater seepage in the course of drill site selection. • Avoid steep surface gradients. • Negligible risk at five borehole locations due to absence of surface waters at proposed drilling sites. • Avoid drilling during wet weather conditions.
Drill pad and access road construction affecting land drainage leading to flooding	• The minimization of surface water catchment and drainage line crossings in the course of drill site selection. • The orientation of the access routes, such that drainage line crossings are perpendicular to the routes. • Effective drainage of the drill site to control surface runoff and minimize erosion.

Potential Impacts	Mitigation Measures
	• Avoidance (where practicable) of perched water tables or use of surface casing. • Avoid drilling during wet weather conditions.
Vegetation removal leading to increased erosion and a decrease in the uptake of rainfall	• Replace vegetation where necessary and practicable during site reinstatement.

The overall risk to the environment of the proposed drilling is considered negligible if risk assessments are carried out and the drilling methods and work practices employed at the site are appropriate. Water will not be affected as the activities will not pollute water, or use water contained in it, it will not interfere with the natural movement of water as the drilling pads will be located away from the drainage line, and will not involve the storage of water.

No prior disturbance is present, as the area is remote. As a result of implementing the mitigation measures and good drilling practices in accordance with the Construction Requirements for Water Bores in Australia it is not likely that the impact will occur to groundwater, surface water, land and soils as a result of the proposed activity.

The methodology of this project has been designed and will be carried out with consideration of environmental impact and mitigation at every stage.

Site selection has been done with a focus on minimising disturbance to vegetation and steep gradients will be avoided where possible to minimise the risk of mobilising contaminants towards surface watercourses. The borehole construction and completion will be done in accordance with industry standard practices and the site reinstated as far as is practicable to ensure there are no residual impacts following drilling.

It is recommended to avoid wet weather conditions during drilling.

6. REFERENCES

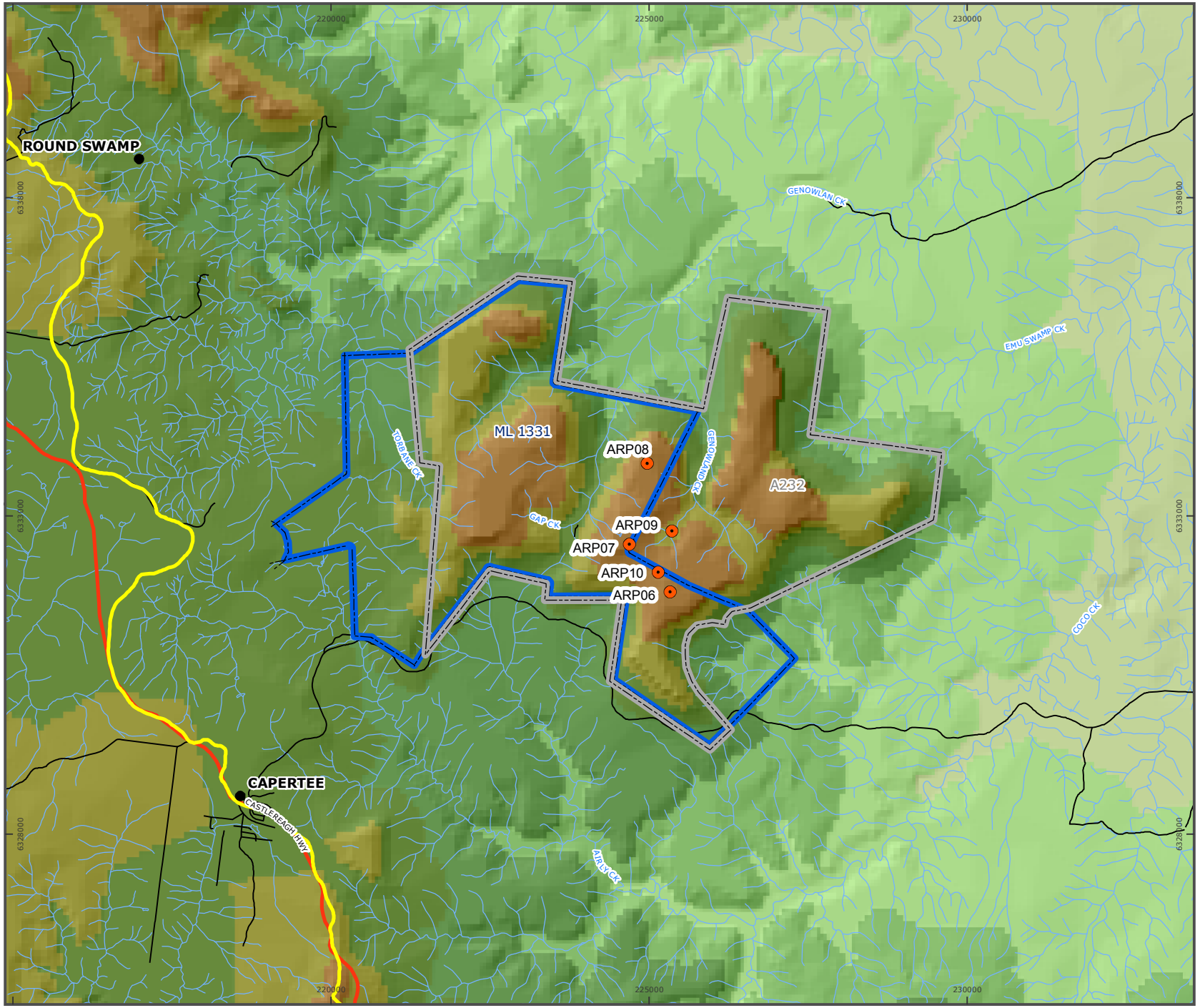
ADIA(2012) Minimum Construction Requirements for Water Bores in Australia (edition 3)

NSW Trade and Investment-Mineral Resources Environmental Sustainability Unit (2012) ESG2: Environmental Impact Assessment Guidelines

NSW Office of Water (2011) Water Sharing Plan for Greater Metropolitan Region Groundwater Sources

NSW Office of Water (2011) Water Sharing Plan for Greater Metropolitan Region Unregulated River Water Sources

FIGURES



LEGEND

- Proposed Borehole Locations
- Localities
- Highways
- Roads
- Rivers & Creeks
- Sydney Basin North GMA

Mining Lease Boundary

- Authorisation Area A232
- ML 1331

Elevation (m)

- 300
- 300 - 400
- 400 - 500
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1,000
- 1,000 - 1,100
- 1,100 - 1,200

0 1,000 2,000 4,000

Metres

SCALE 1:85,000 @ A4

GDA 1994 MGA Zone 56

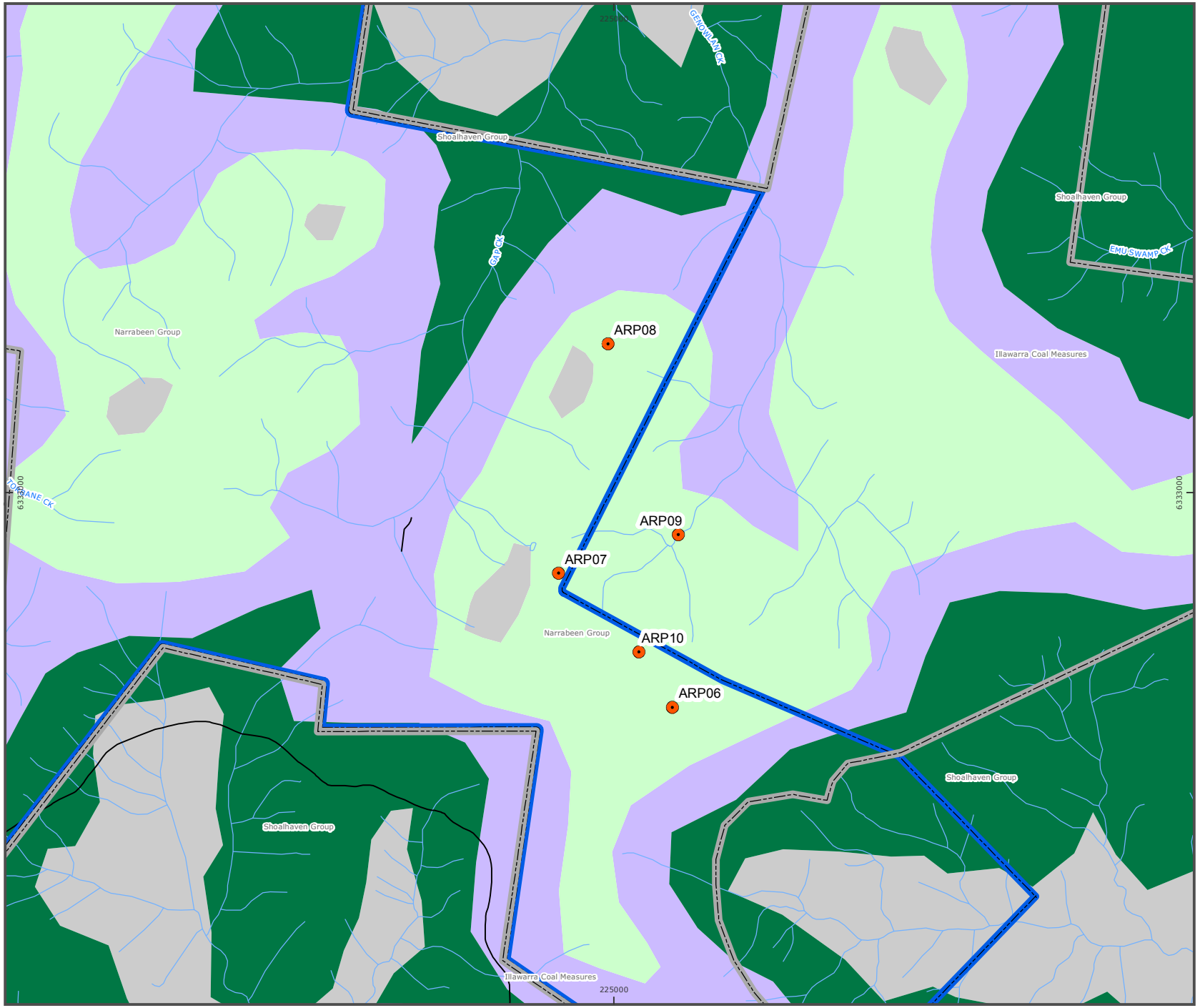
DATA SOURCES
GSA
RPSAquaterra

RPS Aquaterra

FIGURE 1

Proposed Borehole Location Plan

AUTHOR	UK	REPORT NO	S102F
DRAWN	HZ	REVISION	B
DATE	15/01/2013	DRAWING NO.	104



LEGEND

- Proposed Borehole Locations
- Localities
- Roads
- Rivers & Creeks
- Authorisation Area A232
- ML 1331

Geology 250K

- Narrabeen Group
- Illawarra Coal Measures
- Shoalhaven Group
- Unknown

N

0 250 500 1,000

Metres

SCALE 1:30,000 @ A4

GDA 1994 MGA Zone 56

DATA SOURCES
GSA
RPSAquaterra

RPS Aquaterra

FIGURE 2

Geology Map

AUTHOR	UK	REPORT NO	S102F
DRAWN	HZ	REVISION	B
DATE	15/01/2013	DRAWING NO.	103

PLATES

Access Track to Borehole Location ARP06 **Plate 1**

Location of Proposed Borehole ARP06 **Plate 2**

Access Track to Borehole Location ARP07 **Plate 3**

Location of Proposed Borehole ARP07 **Plate 4**

Access Track to Borehole Location ARP08 **Plate 5**

Location of Proposed Borehole ARP08 **Plate 6**

Location of Proposed Borehole ARP09 and Access Track **Plate 7**

Access Track to Borehole Location ARP10 **Plate 8**

Location of Proposed Borehole ARP10 **Plate 9**

Appendix 3

Aboriginal Archaeological Due Diligence Report, prepared by RPS

Aboriginal Archaeological Due Diligence Report

Five Proposed Borehole Locations (ARP06, ARP07, ARP08, ARP09, ARP10), Airly Coal Mine, NSW

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Report Number: PR 112619-3
Version / Date: Final/January 2013

Document Status

Version	Purpose of Document	Orig	Review	Review Date	Approval for Issue	Date Issued
Draft	Due Diligence Report	KV	TBM	6.9.2012	T.Boer-Mah	7.9.2012
Final	Due Diligence Report	KV	TBM	7.1.2013	T. Boer-Mah	8.1.2013

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Executive Summary

RPS has been engaged by Centennial Coal Airly Pty Ltd to prepare an Aboriginal Archaeological Due Diligence Assessment for five proposed borehole locations at the Airly Coal Mine in the Lithgow Local Government Authority (LGA). The five proposed borehole locations ('herein referred to as the 'Study Areas') are located between 6.5 and 8.5 kilometres northeast of Capertee.

This assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects* (DECCW 2010) and the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (Minerals Council 2010) which requires reasonable and practicable steps be taken to: identify whether or not Aboriginal objects are, or are likely to be, present in an area; determine whether or not their activities are likely to harm Aboriginal objects (if present); and determine if an Aboriginal Heritage Impact Assessment is required (DECCW 2010:2, Minerals Council 2010:5)

Investigations under the code have included the following:

- a search of the Aboriginal Heritage Information Management System (AHIMS) database identified that there were 5 Aboriginal objects or Aboriginal places in the vicinity of the Study Areas, and that one of these (45-1-0167) is located within 150 metres of proposed borehole APR09.
- a consideration of archaeologically sensitive landscape features and whether or not the proposed activity will occur: within 200 metres of water; within dune systems; on ridge tops and headlands; immediately above or below cliff faces and/or rockshelters/caves.. These landforms were all identified in the vicinity of the Study Areas with the exception of dune systems.
- a desktop assessment including a review of previous archaeological and heritage studies in the vicinity of the Study Areas; and
- a visual inspection of the Study Areas was undertaken and no Aboriginal objects were identified.

RECOMMENDATIONS

The seven recommendations (below) must be followed for undertaking the proposed activity.

Recommendation 1

No Aboriginal objects or places have been identified within the Study Areas and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity.

Recommendation 2

In order to prevent harm to Artefact Scatter AHIMS #45-1-0127, sediment control measures must be installed where there is risk of erosion (Figure 3) and visual markers must be installed along relevant portions of the track (Figure 3) so that Centennial personnel are aware that vehicles must adhere to the demarcated track.

Recommendation 3

All relevant Centennial Coal Airly staff and contractors should be made aware of their statutory obligations for heritage under NSW NPW Act (1974) and the NSW Heritage Act (1977), which may be implemented as a heritage induction.

Recommendation 4

This due diligence report must be kept by Centennial Coal Airly so that it can be presented, if needed, as a defence from prosecution.

Recommendation 5

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. OEH must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation 6

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Centennial Coal Airly must contact the NSW Police with no further action taken until written advice is provided by the Police. If determined to be Aboriginal, OEH must be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing must be developed in consultation with the relevant Aboriginal stakeholders.

Recommendation 7

If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The NSW Heritage Branch (Enviroline 131 555) should be notified and works only recommence when an approved management strategy has been developed.

1.0 Introduction

RPS has been engaged by Centennial Coal Airly Pty Ltd (the proponent) to prepare an Aboriginal archaeological Due Diligence Report. The purpose of a due diligence report is to demonstrate that reasonable and practicable measures were taken to prevent harm to an Aboriginal object or place and has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010) ("Due Diligence Code") and the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (Minerals Council 2010) ("Minerals Due Diligence Code").

This report has considered the relevant environmental and archaeological information, landforms, disturbances and the nature of the proposed activity in addition to formulating appropriate recommendations.

1.1 The Study Areas

This due diligence report has been prepared for the area subject to the proposed activity. Individual areas of proposed activity and construction are herein referred to as "Study Areas". The Study Areas are located within the Airly Coal Mine lease area in the Lithgow Local Government Area (LGA), between 6.5 and 8.5 kilometres northeast of Capertee. The five Study Areas (proposed borehole locations APR06, APR07, APR08, APR09 and ARP10) (Figure 1) will each have an individual impact area of approximately 30m². For the purposes of this Due Diligence Assessment and to ensure adequate coverage, an area of approximately 50m² was inspected at each Study Area.

1.2 The Proposed Activity

The proposed activity is the drilling of five exploration boreholes to be undertaken at the Study Areas. This will require vegetation clearance along the proposed access tracks for ARP06 and ARP10, and the widening of the proposed access tracks for ARP07 and ARP08. This will necessitate ground disturbance works, vegetation clearance, and sub-surface disturbance. A Due Diligence Assessment is therefore required under S1 and S2a of the Due Diligence Code (DECCW 2010:11).

1.3 Authorship and Acknowledgements

This report was prepared by RPS Graduate Archaeologist Karyn Virgin. The report was reviewed by RPS Senior Archaeologist Tessa Boer-Mah.

2.0 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Although there are a number of Acts protecting and managing cultural heritage in New South Wales (see Appendix 1); the primary ones which apply to this report include:

- *National Parks & Wildlife Act 1974*
- *National Parks & Wildlife Regulation 2009*

In brief, the *National Parks & Wildlife Act 1974* protects Aboriginal heritage (places, sites and objects) within NSW; the National Parks and Wildlife Regulation 2009 provides a framework for undertaking activities and exercising due diligence.

2.1 *National Parks & Wildlife Act 1974*

The *National Parks & Wildlife Act 1974* (NPW Act) protects Aboriginal heritage (places, sites and objects) within NSW. Protection of Aboriginal heritage is outlined in s86 of the Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1),
- "A person must not harm an Aboriginal object" s86(2)
- "A person must not harm or desecrate an Aboriginal place" s86(4).

Penalties apply for harming an Aboriginal object or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to $550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to $1.1 million. The penalty for a strict liability offence (s86[2]) is up to $110,000 for an individual and $220,000 for a corporation.

Harm under the NPW Act is defined as any act that; destroys defaces or damages the object, moves the object from the land on which it has been situated, causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate 1) that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed), or 2) that the proponent exercised due diligence in respect to Aboriginal heritage. The **'due diligence' defence (s87(2))**, states that if a person or company has exercised due diligence to ascertain that no Aboriginal object was likely to be harmed as a result of the activities proposed for the Project Area/Study Area (subject area of the proposed activity); then liability from prosecution under the NPW Act will be removed or mitigated if it later transpires that an Aboriginal object was harmed.

Notification of Aboriginal Objects

Under section 89A of the NPW Act Aboriginal objects (and sites) must be reported to the Director-General (now Chief Executive) of OEH within a reasonable time (unless it has previously been recorded and submitted to AHIMS). Penalties of $11,000 for an individual and $22,000 for a corporation may apply for each object not reported.

2.2 *National Parks and Wildlife Regulation 2009*

The *National Parks and Wildlife Regulation 2009* ("NPW Regulation") provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The NPW Regulation 2009 outlines the recognised due diligence codes of practice which are relevant to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs); amongst other regulatory processes.

2.3 Due Diligence and Codes of Practice

The **advantage of a Due Diligence** assessment is that:

- it assists in avoiding unintended harm to Aboriginal objects;
- provides certainty to land managers and developers about appropriate measures for them to take;
- encourages a precautionary approach;
- provides a defence against prosecution if the process is followed; and
- results in more effective conservation outcomes for Aboriginal cultural heritage.

One of the benefits of the due diligence provisions are that they provide a simplified process of investigating the Aboriginal archaeological context of an area to determine if an Aboriginal Heritage Impact Permit (AHIP) is required.

Under the s80A *National Parks & Wildlife Regulation* 2009 ("NPW Regulation") the following due diligence codes are recognised:

(a) the Due Diligence Code published by the Department of Environment, Climate Change and Water and dated 13 September 2010,

(b) the Plantations and Reafforestation Code (being the Appendix to the *Plantations & Reafforestation (Code) Regulation 2001*) as in force on 15 June 2010,

(c) *the Private Native Forestry Code of Practice* approved by the Minister for Climate Change, Environment and Water and published in the Gazette on 8 February 2008,

(d) the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* published by NSW Minerals Council Ltd and dated 13 September 2010,

(e) *the Aboriginal Objects Due Diligence Code for Plantation Officers Administering the Plantations and Reafforestation (Code) Regulation 2001* published by the Department of Industry and Investment and dated 13 September 2010,

(f) the *Operational Guidelines for Aboriginal Cultural Heritage Management* published by Forests NSW and dated 13 September 2010.

This report has been written to meet the Due Diligence Code (DECCW 2010).

2.3.1 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010)

This publication sets out a minimum benchmark for acceptable due diligence investigations to be followed. The purpose of the code is set out reasonable and practical steps in order to:

(1) identify whether or not Aboriginal objects (and places) are, or are likely to be, present in an area

(2) determine whether or not their activities are likely to harm Aboriginal objects (if present)

(3) determine whether an AHIP application is required. (DECCW 2010:2)

Investigations under the code include the following:

- A search of the Aboriginal Heritage Information Management System (AHIMS) database to identify if there are previously recorded Aboriginal objects or places in the Study Areas,
- Identification of landscape features including, land within 200 metres of water, dune systems, ridgetops, headlands, land immediately above or below cliff faces and/or rockshelters/caves,
- Desktop assessment including a review of previous archaeological and heritage studies and any other relevant material,
- Visual inspection of the Study Areas to identify if there are Aboriginal objects present, and
- Assessment as to whether an AHIP is required.

This report has complied with the requirements of the code listed above. Other requirements under the code are outlined below.

Aboriginal consultation is not required for an investigation under the due diligence code (DECCW 2010:3). However, if the due diligence investigation shows that the activities proposed for the area are likely to harm objects or likely objects within the landscape, then an Aboriginal Heritage Impact Permit will be required with full consultation.

A record of the due diligence procedure followed must be kept to ensure it can be used as a defence from prosecution (DECCW 2010:15).

Following a due diligence assessment (where an AHIP application was not required), an activity must proceed with caution. If any Aboriginal objects are identified during the activity, then works should cease in that area and OEH notified (DECCW 2010:13). The due diligence defence does not authorise continuing harm.

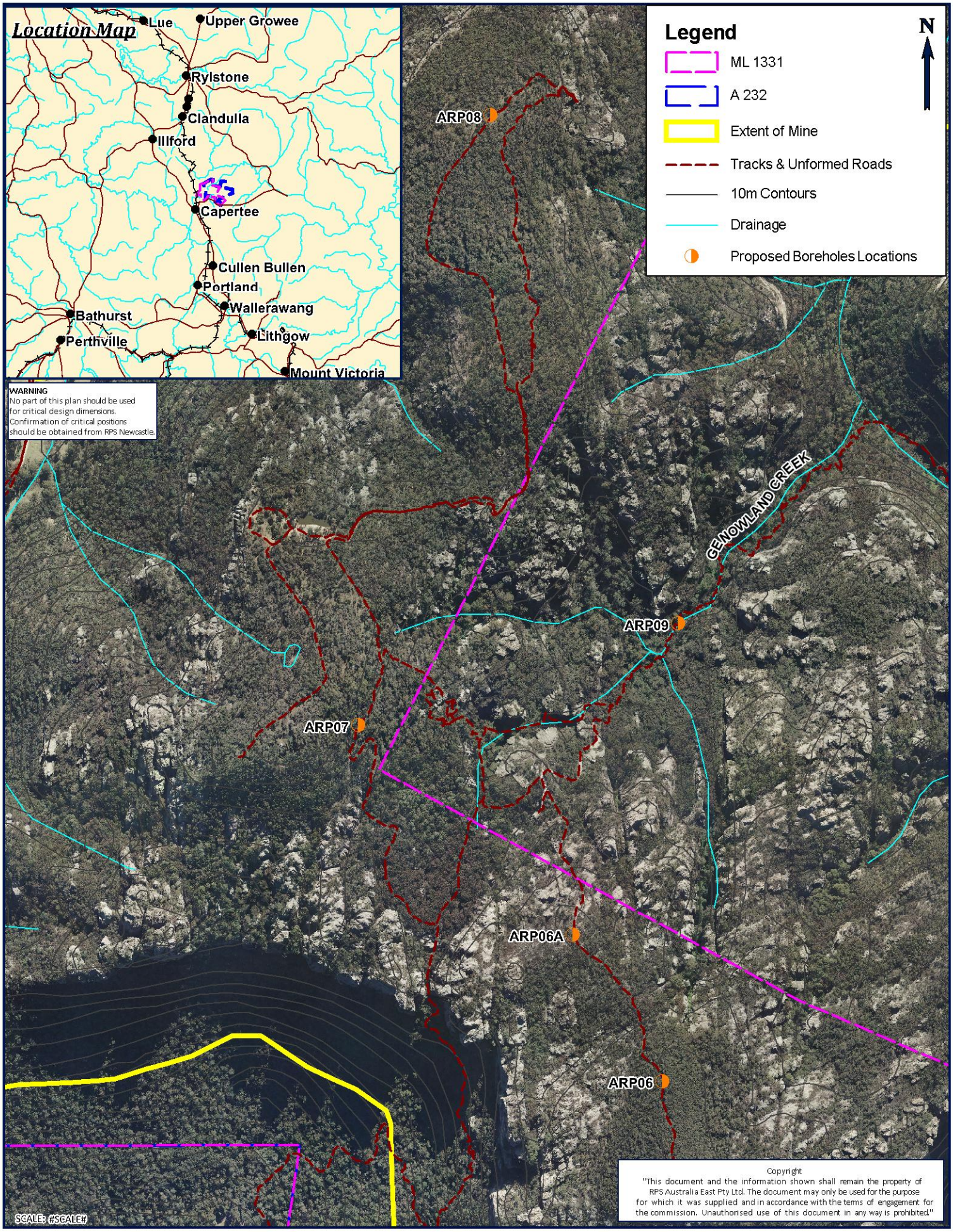
2.3.2 *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (Minerals Council 2010)

The fundamental requirements of this the Minerals Due Diligence Code are the same as the Due Diligence Code (DECCW 2010). Although the requirements are the same the Minerals Due Diligence Code also suggests that Aboriginal consultation be considered (although not a formal requirement) (Minerals Council:7) and that "company personnel should be trained in cultural heritage in case Aboriginal objects are discovered during field activities" (Minerals Council 2010:11). The Minerals Due Diligence Code also provides examples of common activities which are undertaken in relation to mining and how they can be managed in accordance with the due diligence codes and the relevant legislation (Minerals Council 2010:20-22).

2.4 Aboriginal Community Consultation

Aboriginal community consultation is not a formal requirement of the due diligence process (DECCW 2010:3, Minerals Council: 7); therefore the proponent is not obliged to undertake Aboriginal community consultation.

Aboriginal community consultation was not undertaken for this Due Diligence Report.



TITLE: FIGURE1: PROJECT AREA LOCATION

LOCATION: AIRLY

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 31/8/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\112619 Airly REA\10 - Drafting\MapInfo Workspaces\Arch 112619-3
VERSION (PLAN BY): A4 (KV-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 112619-3

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3.0 Environmental and Heritage Context

Aboriginal heritage due diligence requires that available knowledge and information is considered and forms part of the desktop assessment required in S4 of the Due Diligence Code (DECCW 2010:12-13). The purpose of reviewing the relevant environmental and heritage information is to assist in identifying whether Aboriginal objects or places are present within the Study Areas.

3.1 Local Environment

3.1.1 Geology and Soils

The dominant geological groups found in the area are the Permian Illawarra Coal Measures and the Triassic Narrabeen Group. These groups comprise red, green and grey shale, siltstone, conglomerate, claystone, and quartz-lithic and quartz sandstones (King 1992: 53-56). Sandstone outcrops sometimes provided suitable locations for habitation in the form of rockshelters, and sandstone sheets were also often used for sharpening hatchets; this process results in depressions in the sandstone identified as 'grinding grooves' (Attenbrow 2003: 120-122). Proposed boreholes APR06, APR07, and APR08 are located on or in close proximity to Post Triassic geological formations, which are characterised by olivine basalt with underlying gravels.

The Study Areas are situated across four soil landscapes; the Wollongambe soil landscape (APR06), Warragamba soil landscape (APR07, APR010), Mount Tomah soil landscape (APR08), and Hassans Walls soil landscape (APR09). The Mount Tomah soil landscape is associated with crests, and is characterised by a clay loam or sandy clay topsoil that is approximately 40 centimetres deep. Aboriginal artefacts are unlikely to be present in clayey soils and therefore the potential for archaeological deposits to be present in this soil landscape is limited. If present, however, archaeological deposits are likely to be limited to the upper 40 centimetres of this soil landscape (King 1994: 53-56).

The Wollongambe soil landscape is characterised by single-grained, loamy sand topsoil that reaches an approximate depth of 30 centimetres on narrow crests and ridges, or 40 centimetres on sideslopes. This topsoil overlies 40 to 70 centimetres of either a red clayey sand or bright yellowish brown clayey sand topsoil/subsoil (King 1994: 105-108). In the Warragamba soil landscape, up to 50 centimetres of single-grained loamy sand topsoil overlies bedrock on crests and ridges. On sideslopes, up to 35 centimetres of dark reddish brown clayey sand overlies brown pedal clay subsoil (King 1992: 63-65). As Aboriginal artefacts are unlikely to be present in clayey subsoils, potential archaeological deposits, if present, are likely to be limited to the upper 30-50 centimetres of these soil landscapes.

The Hassans Walls soil landscape is characterised by brownish black loamy sand or greyish yellow brown sand topsoil that reaches an approximate depth of 30 centimetres on cliffs, up to 100 centimetres on upper slopes, and up to 60 centimetres on lower slopes. Potential archaeological deposits, if present, may therefore be present up to a depth of 100 centimetres in this soil landscape (King 1994: 53-56).

3.1.2 Topography and Hydrology

The topography surrounding the Study Areas is characterised by rugged, rolling to very steep hills with narrow valleys skirted by high ridgelines. Rounded crests and moderately to steeply inclined sideslopes, narrow crests, and localised rock outcrops in the form of small benches, cliffs and low broken scarps are typical in the area. Precipitous sandstone cliffs above steep to very steep colluvial sidelopes are also common. Limitations associated with these landforms include high levels of water erosion, shallow soils, steep slopes, and the potential for mass movement and localised surface movement (King 1994: 53-56, 105-108).

Previous disturbances that may have impacted the landscape in the vicinity of the Study Areas include the installation of local infrastructure such as Glen Davies Road, which is situated less than 1 kilometre from the south of the Study Areas. A number of vehicle and pedestrian tracks, some of which have been graded, are also present in and around the Study Areas.

Several water sources, both permanent and ephemeral, are present in the vicinity of the Study Areas. Genowlan Creek runs within 1 kilometre of the proposed borehole locations along the north and east boundaries and Gap Creek runs within 1 kilometre of the proposed borehole locations along the northwest and west boundaries.

Elevation ranges from 600 to 1000 metres AHD (Australian Height Datum) across the surrounding landscape (Topographic Map Sheet Upper Turon 88311N; Sydney Department of Lands 2006) and from 900 to 1040 metres AHD within the Study Areas (Topographic Map Sheet Glen Alice 89314N;Sydney Department of Lands 2006). The most prominent topographic feature in the vicinity is Mount Airly, which is approximately 2 kilometres to the west of the Study Areas and has a maximum elevation of 1000 metres AHD. Genowlan Mountain and Genowlan Point are situated approximately 2.5 kilometres to the north east of the Study Areas and have a maximum elevation of 1000 metres AHD.

3.1.3 Flora and Fauna

The purpose of this section is to provide an indication of the types of flora and fauna resources which were likely to have been available to Aboriginal people in the past. It is based on broad scale vegetation mapping for NSW (Keith 2006) and does not replace more detailed studies undertaken for the Study Areas.

The Study Areas are situated within an area of Western Slopes Dry Sclerophyll Forest. It is characterised by ironbark eucalypts and cypress pines approximately 10 to 25 metres tall. Sclerophyll shrubs grow in prominence while grasses are relatively scarce, placing this class in the shrubby subformation of the dry sclerophyll forests. Indicative species of tree include tumbledown red gum, mugga, black cypress pine, white cypress pine, dirty gum, narrow-leaved ironbark and blue-leaved ironbark. Shrub species commonly present include several species of wattle, heath and myrtle, as well as hakea, grevillea and grass trees (Keith 2006:166-167). This vegetation community provides habitats for a variety of animals and would have also provided potential food and raw material sources for Aboriginal people. Grass trees, for example, were used by Aboriginal people to manufacture spears and resin, and also as a food source (Nash 2004: 5). Eucalyptus trees were a particularly important resource; leaves were crushed and soaked for medicinal purposes, bowls, dishes, and canoes were made from the bark, and spears, boomerangs and shields were crafted from the hard wood (Nash 2004: 4-8).

Typical animals which may have been harvested by Aboriginal people include kangaroos, wallabies, sugar gliders, possums, echidnas, a variety of lizards and snakes, birds, as well as rats and mice. The bones of such animals have been recovered from Aboriginal sites excavated in the Sydney region suggesting that they were sources of food (Attenbrow 2003:70-76), although the hides, bones and teeth of some of the larger mammals may have been used for Aboriginal clothing, ornamentation, or other implements.

3.2 Aboriginal Heritage Information Management System (AHIMS)

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) on 9 May 2012 in accordance with the Due Diligence Code (DECCW 2010:11). The co-ordinates searched for the Study Areas were GDA Zone 56, Eastings 220055 to 230549 and Northings 6329044 to 6337081.

The search revealed that there are five previously recorded Aboriginal sites within these co-ordinates including three artefact scatters, a scarred tree, and a rock shelter containing an archaeological deposit (Table 1). Of these five sites, one is located within one kilometre of the Study Areas (Figure 2); AHIMS site

#45-1-0167, a rock shelter with deposit, is located approximately 125 metres due south of proposed borehole ARP09.

Table 1 : Summary of AHIMS sites within the searched co-ordinates

SITES	FREQUENCY	PERCENT
Artefact Scatter	3	60
Scarred Tree	1	20
Rockshelter with Deposit	1	20
Total	**5**	**100**

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle.

Legend

- ML1331
- A232
- Tracks & Unformed roads
- Extent of Mine
- Proposed Boreholes

AHIMS

- Artefact Scatter
- Scarred Tree
- Shelter with Deposit
- Drainage
- 10m Contours

N

TORBANE CK
GAP CREEK
MALCOMS GUL
GENOWLAND CREEK

ARP08
ARP09
ARP07
ARP06A
ARP06

45-1-0167
45-1-2544
45-1-0252
45-1-0127
45-1-0168
44-3-0149

0 1 2km
SCALE: 1:31,000 AT A3 SIZE

TITLE: FIGURE 2: PROJECT AREA WITH AHIMS
LOCATION: AIRLY
DATUM: (GDA 94)
PROJECTION: MGA ZONE 56
DATE: 31/8/2012
PURPOSE: HERITAGE
LAYOUT REF: J:\JOBS\Centennial\All Jobs\112619 Airly REA\10 - Drafting\MapInfo Workspaces\Arch 112619-3
VERSION (PLAN BY): A A3 (KV-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 112619-3

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3.3 Archaeological and Heritage Literature Review

A review of previous archaeological and heritage reports is required as part of the desktop assessment and has been undertaken in accordance with the code (DECCW 2010:13).

McDonald, 1990, Airly Environmental Impact Statement

McDonald (1990) conducted an archaeological assessment at the Airly Coal Mine (Authorisation Area A232) as part of an Environmental Impact Statement (EIS). The survey targeted areas that were likely to be impacted by subsidence and disturbed by ground surface infrastructure. The survey was conducted over three days by two archaeologists. No Aboriginal representatives were present. The survey covered sections of Mount Airly, Genowlan Mountain, and areas of associated floodplain.

During the survey an artefact scatter was located on a spur on an east-west axis, and contained flakes of fine-grained white quartz and chert. Microlith blade flakes and cores, including Bondi points, were also identified. A possible rock shelter 'site' identified by an environmental consultant was not investigated by Brayshaw, but was noted in the EIS and considered to have the potential to contain archaeological deposits and rock art.

The report concluded that the mountains would have been too steep to be occupied, and the area was most likely to have been used for 'short-term sporadic hunting' (McDonald 1990:11), possibly during travel to other areas. It was postulated that the present Glen Davis Road was likely to have been the main travelling route for Aboriginal groups that moved through the area in the past.

Brayshaw, 1991, Airly Environmental Impact Statement

This report details the results of a further survey by Brayshaw (1991) which was conducted in the same area as the previous study. The purpose of the survey was to re-investigate areas of potential impact following changes to the Airly Coal Mine plans. The rock shelter 'site' identified in the previous report was investigated, and surface artefacts were identified. This rock shelter was recorded as Genowlan Creek 1. An additional rock shelter was identified nearby at Dog Trap Creek, and recorded as a PAD.

RPS (HSO), 2008, Archaeological Investigations for a Proposed Railway Loop, Airly Coal

RPS (HSO) (2008) was engaged by Centennial Coal to conduct a due diligence inspection of two areas for the emplacement of infrastructure associated with the Airly Coal Mine. The proposed works include the emplacement of a rail loop link into the existing rail line, and the installation of a conveyor. The study was located within the Airly Coal Mine lease area, approximately 40 kilometres north of Lithgow on the western side of the Blue Mountains.

Field survey of the study area was conducted on foot, an encompassed both the proposed conveyor route and the area to be affected by the proposed rail loop construction. No known or predicted Aboriginal sites were located in either of these areas. Both areas were considered to be highly susceptible to the loss of soil due to ground disturbances such as vegetation clearance, pastoral activities, and mining activities. No historical heritage items were located in either area.

RPS (HSO), 2009, Archaeological Assessment for a Proposed Powerline at Airly Coal Mine

RPS HSO (2009) was engaged by Airly Coal Pty Ltd to undertake an archaeological assessment over land holdings at Airly in the Capertee Valley, within the Lithgow LGA in NSW. The purpose of the archaeological assessment was to investigate a range of options for a proposed powerline route (and associated

infrastructure) to connect the Airly Coal Mine (Airly) to the existing Integral Energy power supply, and to undertake a detailed assessment for the preferred powerline route.

The archaeological study covered both European and Aboriginal archaeological potential. The field investigations identified an Aboriginal site within the study area; Airly 1, an artefact scatter of predominantly quartz and quartzite flakes covering an area of approximately 0.63 hectares, was situated in a saddle atop a ridge on flat ground. The reported concluded that the proposed powerline route would not impact Airly 1, and therefore permitted work to commence within the planned timeframe and recommended conservation of the abovementioned Aboriginal site from the proposed works.

3.4 Synthesis of Environmental and Archaeological Context

A review of the AHIMS data and previous archaeological work in the area suggests that the Study Areas have the potential to contain Aboriginal sites and objects. They are located close to and encompass multiple water sources, and resources such as grass trees, claystone, quartz and sandstone are available in the area. Rock shelters may have also provided suitable temporary shelter. Archaeological sites have been previously recorded in the vicinity of the Study Areas, and five of these are registered with AHIMS.

However, the Study Areas and their surrounds are characterised topographically by steep slopes, narrow valleys, high ridgelines and precipitous sandstone cliffs, which would not have been suitable for occupation and may have hindered accessibility and movement through the area. Landscape limitations such as generally shallow soils, mass movement potential, colluvial slopes, and previous disturbances also inhibit the likelihood that intact subsurface archaeological deposits will be present in and around the Study Areas.

4.0 Visual Inspection and Field Results

A visual inspection of the Study Areas was undertaken to identify whether Aboriginal objects are present on the ground surface or are likely to be present below the ground surface. In accordance with the due diligence codes a qualified archaeologist undertook the visual inspection (DECCW 2010:12-13; Minerals Council 2010:17-18).

4.1 Visual Inspection

The visual inspection of the Study Areas was conducted on the 22nd and 23rd of August 2012 by RPS Graduate Archaeologist Karyn Virgin, together with RPS Senior Ecologist Paul Hillier. The visual inspection was conducted on foot (pedestrian). At each of the proposed borehole locations, an area of approximately 50m² was inspected to account for the proposed 30m² impact area.

Proposed Borehole ARP06

Proposed borehole ARP06 was located on a crest (elevation of 1000 metres AHD) along a partially graded but infrequently used vehicle track, which runs in a north-south direction (Plate 1). Surrounding vegetation comprised an open forest community, which was dominated by a large number of mature she-oak trees. A number of mature eucalypt trees, including grey gum and stringybark species, were also present, as was a moderately thick shrub layer (Plate 2). Due to the large number of she-oak trees, the ground surface was covered in a thick (5 - 10 centimetres) layer of she-oak needles and leaf litter.

Sandstone bedrock was visible in various places along the graded track. In vegetated areas, up to 20 centimetres of loose hummic soil mixed with leaf litter was present. The depth of the underlying sub-surface soil was approximately 15 centimetres. Lithology in the Study Area consisted exclusively of a large amount of fragmented shale, which ranged in size from 1 to 15 centimetres in diameter.

Due to the thick layer of hummic soil and leaf litter, ground surface visibility was low (less than 5%). There were no discernible areas of exposure in the inspected area (Plate 2).

Proposed Borehole ARP07

Proposed borehole ARP07 is located on a graded and frequently used track, in an area that has been extensively disturbed by vehicle movement (Plate 3). Vegetation in the area was open forest, and featured scattered mature eucalypt trees, including stringybark species, and a moderately thick shrub layer (Plate 4). There was also a moderately dense ground cover of grass.

Exposed soil profiles along the graded track were closely inspected; soil deposits in the area comprised up to 20 centimetres of brown orange soil, which contained a large number of gravel inclusions. Underlying this deposit was sandstone bedrock (Plate 5). Exposed sandstone bedrock was also visible on the floor of the track.

The lithology in the area featured large (20-30 centimetres diameter) and medium (5-20 centimetres diameter) pieces of sandstone and basalt, as well as some smaller (3-5 centimetres diameter) pieces of quartzite. A large number of quartz pebbles (1-2 centimetres diameter) were also present. Much of this was fragmentary due to previous disturbances and frequent use of the track.

Ground surface visibility along the track was high (90-100%), with extensive areas of exposure. In other inspected areas, ground surface visibility was lower (20-30%) due to grass cover and leaf litter, and areas of exposure were small and infrequent.

Proposed Borehole ARP08

Proposed borehole ARP08 was located on a crest (elevation of 1000 metres AHD) along a partially graded but infrequently used vehicle track (Plate 6). The area featured open forest vegetation, in which a large number of mature eucalypt and acacia trees were present (Plate 7). Shrubbery, although present, was sparse. There was also a dense ground cover of thin bladed grass.

The depth of sub-surface soils in the Study Area was at least 25 centimetres. Lithology in the area exclusively featured basalt boulders, rocks and pebbles that ranged in size from 1-30 centimetres in diameter.

Ground surface visibility was generally low (30%) due to grass cover and leaf litter. Areas of exposure were present, and were concentrated around the bases of mature trees. Ground surface visibility in these exposed areas was high (80-90%) (Plate 8).

Proposed (Shallow) Borehole ARP09

Proposed borehole ARP09 is located along a graded track in a highly disturbed area (Plate 9). Refuse from the track grading that was visible in the vicinity includes large amounts of pushed soil/fill, and broken trees and branches. The proposed borehole is also located within 5 metres of a permanently active stream, which is approximately 3 metres wide and up to 1 metre deep (Plate 10). Areas of this stream have been severely affected by a spongy growth (mould/fungus) and oxidisation/rust (red colouring visible in the water), possibly as a result of the track grading (Plate 11).

To the west of APR09 and the stream are sheer sandstone cliff faces. To the east of ARP09 and the track is a steep ascending slope with large outcrops of sandstone. Also present to the east were several sandstone rockshelters. None of these were suitable for habitation or use by past Aboriginal people due to a lack of floor surface, extensive ceiling and wall erosion, and high levels of moisture (Plate 12).

Vegetation in the area was open forest, and was densely populated with shrubs. Mature eucalypts were present, and ferns were dominant. A dense layer of leaf litter was also present. Along the graded track sandstone bedrock was covered by a thin layer of soil (less than 2 centimetres). Along the stream and on the eastern slope, the depth of soil deposit was at least 40 centimetres.

Lithology in the area comprised sandstone rocks and boulders of between 5 and 30 centimetres diameter, as well as large amounts of sandstone-quartz conglomerate and isolated pieces of indurated mudstone. Quartz pebbles and gravel were also present, but were fragmented by use of the track by vehicles.

Ground surface visibility along the track was high (90%), and areas of exposure frequent. Along the stream and on the eastern slope ground surface visibility was low due to leaf litter and thick vegetation (less than 20%), and areas of exposure were restricted to the floors of rockshelters and the bases of sandstone outcrops.

Proposed Borehole ARP10

Proposed borehole location ARP10 was situated along a partially graded but infrequently used vehicle track, which ran in a roughly north-south direction (Plate 13). Approximately 200 metres to the west of the proposed borehole location is a sheer drop-off. To the east are a number of sandstone pagodas. There are also several large areas of exposed sandstone bedrock, particularly along the track (Plate 14).

Vegetation in the vicinity was open heath forest, though a small number of mature scribbly gums were also present. There was also moderate to thick cover of leaf litter and a large number of fallen trees and branches. Where soil was present, the total depth of deposit measured no more than 5 centimetres.

Lithology in the vicinity of the Study Area was dominated by large amounts of sandstone-quartz conglomerate. A large number of quartz pebbles, approximately 1 – 2 centimetres in diameter, were also noted.

Ground surface visibility varied across the Study Area and the immediate surrounds; in vegetated areas, ground surface visibility was low (around 30%), while in areas of exposed bedrock and around the bases of the pagodas, ground surface visibility increased markedly (up to 100%) (Plate 14).

Owing to high elevation and the lack of mature trees, the area of proposed borehole ARP10 is highly exposed to wind and other natural elements.

Access Track

During recent inspections it was identified that a previously recorded AHIMS Aboriginal site (#45-1-0127) is immediately adjacent to the main track that leads in to the residential property via which the Study Areas will be accessed (near Glen Davis Road, Lot 11 DP 755757). This site needs management prior to the commencement of drilling and is detailed in Section 5.

4.2 Visual Inspection Field Results and Summary

At each of the five Study Areas, all areas of exposure and areas in close proximity to sensitive landforms (such as rockshelters and water sources) were closely inspected for Aboriginal sites or objects. Mature trees were also closely inspected for evidence of cultural modification and/or scarring.

Suitable raw materials for the production of stone tools, such as basalt, quartzite, and quartz, were identified in the Study Areas (Holdaway and Stern 2004: 22-24). There was not, however, any evidence of these materials having been worked or modified, and no stone artefacts were found. Other raw materials present in the Study Areas such as shale, the smaller quartz pebbles, and sandstone-quartz conglomerate, would not have been suitable for working.

Slabs of sandstone bedrock, sandstone outcrops, and sandstone rockshelters were also present in the Study Areas. There was no evidence of grinding grooves on the inspected sandstone, and identified rockshelters were not suitable for occupation or use.

Tree species such as stringybark, she-oak, and acacia were used by Aboriginal people in the past to manufacture weapons, canoes, and other tools (Nash 2004). These species were present in the Study Areas, and inspected closely, but none exhibited any evidence of cultural modification or scarring.

Creeks and their tributaries were often used by Aboriginal people in the past as suitable areas for camping and food and resource procurement (Attenbrow 2003: 49), and are therefore considered to be archaeologically sensitive (DECCW 2010: 12). The stream located within 5 metres of proposed borehole ARP09 was inspected closely for evidence of Aboriginal sites and/or objects including artefacts and grinding grooves, and none were identified.

The five Study Areas have all been previously disturbed to varying degrees by track grading and vehicle movement. Additionally, sub-surface soils were generally shallow, with sandstone bedrock visible in many areas. Consequently, it is unlikely that intact sub-surface archaeological deposits will be present in the Study Areas.

No Aboriginal objects were identified at the proposed drilling locations; however, one previously recorded Aboriginal site (AHIMS#45-1-0127) borders the main access track in to the residential property (Lot 11 DP 755757), mitigation measures are provided in the following section.

5.0 Impact Assessment

The purpose of a due diligence report is to identify whether Aboriginal objects are present, or likely to be present, in the Study Areas; to determine whether proposed activities are likely to harm Aboriginal objects (if present) and to determine whether an Aboriginal Heritage Impact Permit (AHIP) is required.

The proposed activity is the construction of five exploration boreholes necessitating ground disturbing works. The impact area for each of these exploration boreholes is approximately 30m².

NO SITES PRESENT

The results of the AHIMS search and the visual inspection indicate that there are no identified Aboriginal objects or sites at the drilling locations; however, one previously recorded Aboriginal site (AHIMS#45-1-0127) borders the main access track in to the residential property via which the Study Areas will be accessed (Lot 11 DP 755757). Aboriginal objects (stone artefacts) are distributed along a ridge spur and toe slope which runs northeast to south west. Sheet wash erosion has been noted on the toe slope (southwest portion of the site) adjacent to the track. In order to prevent artefacts eroding on to the track sediment control measures must be installed along the relevant portion of the track (Figure 3).

It is also important that vehicles adhere to the existing access track (due to the close proximity of the site to the track). In order to prevent harm to the site, it is recommended that visual markers be installed along relevant portions of the track (Figure 3) so that Centennial personnel are aware that vehicles must adhere to the demarcated track in this area.

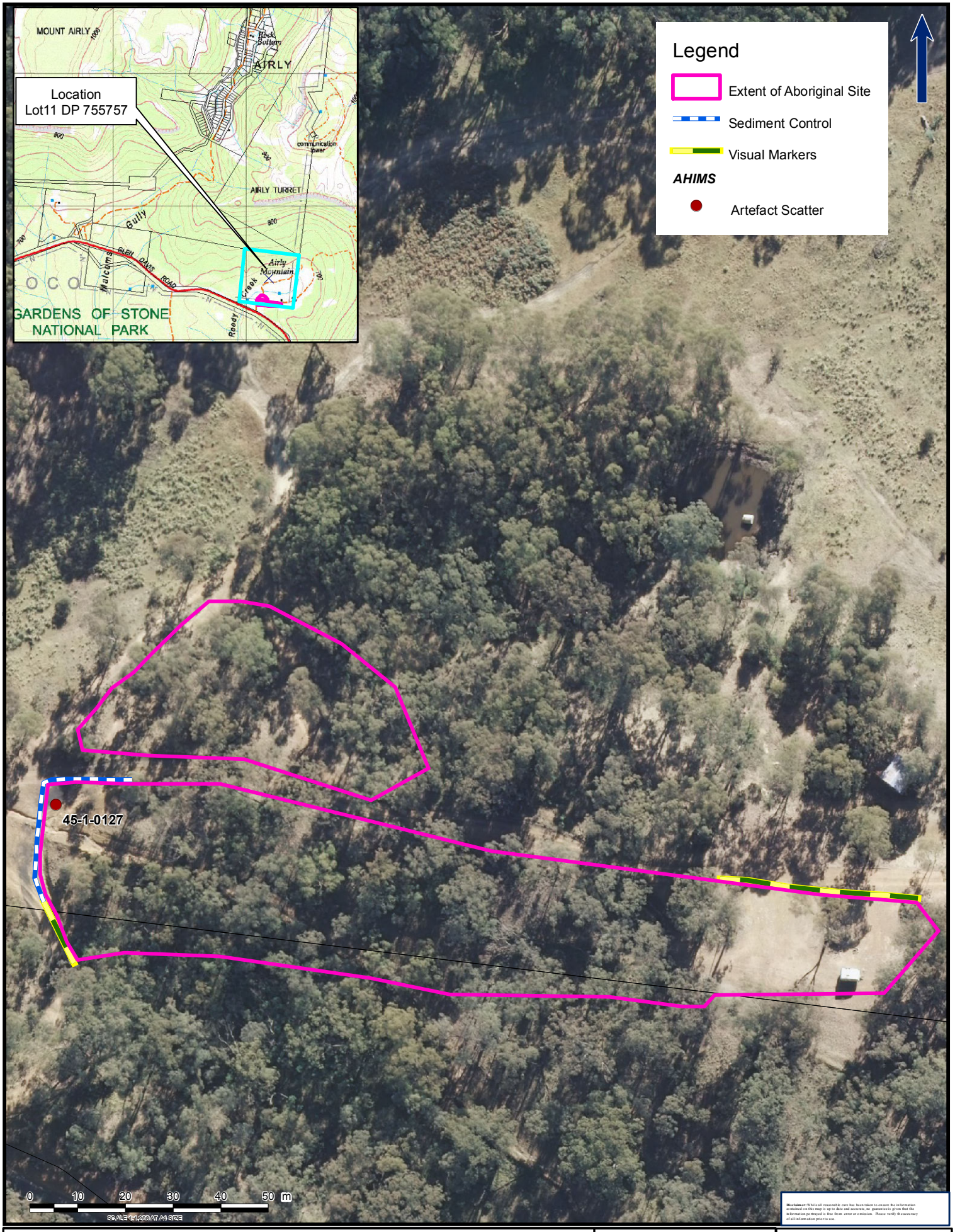

Figure 3: Archaeological Sensitive Area Protective Fencing

LOCATION: Airly	DATUM: GDA94 PROJECTION: MGA Zone 56
JOB NO.: 105601-2 PURPOSE: HERITAGE Technician: Natalie.Wood Date: 18/01/2013	Data Sources: Client supplied and GPS Data

CLIENT: Centennial Coal

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
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RPS

Path: J:\JOBS\Centennial\All Jobs\105601 Airly Cultural Heritage\10- Drafting\Archaeology Drafting\ArcGIS_map_documents\105601_AHIMS_Fencing_20120827.mxd

6.0 Recommendations

This report has considered the available environmental and archaeological information for the Study Areas, the land condition, as well as the nature of the proposed activities. The seven recommendations (below) must be followed for undertaking the proposed activity.

Recommendation 1

No Aboriginal objects or places have been identified within the Study Areas and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity.

Recommendation 2

In order to prevent harm to Artefact Scatter AHIMS #45-1-0127, sediment control measures must be installed where there is risk of erosion (Figure 3) and visual markers must be installed along relevant portions of the track (Figure 3) so that Centennial personnel are aware that vehicles must adhere to the demarcated track.

Recommendation 3

All relevant Centennial Coal Airly staff and contractors should be made aware of their statutory obligations for heritage under NSW NPW Act (1974) and the NSW Heritage Act (1977), which may be implemented as a heritage induction.

Recommendation 4

This due diligence report must be kept by Centennial Coal Airly so that it can be presented, if needed, as a defence from prosecution.

Recommendation 5

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. OEH must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation 6

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Centennial Coal Airly must contact the NSW Police with no further action taken until written advice is provided by the Police. If determined to be Aboriginal, OEH must be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing must be developed in consultation with the relevant Aboriginal stakeholders.

Recommendation 7

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The NSW Heritage Branch (Enviroline 131 555) should be notified and works only recommence when an approved management strategy has been developed.

7.0 References

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8.0 Plates

Plate 1: View of proposed borehole location ARP06, facing south

Plate 2: Vegetation and ground surface visibility at proposed borehole location ARP06

Plate 3: View of proposed borehole location ARP07 facing south

Plate 4: Vegetation and ground surface visibility at proposed borehole location ARP07

Plate 5: Exposed soil profile and bedrock at proposed borehole location ARP07

Plate 6: View of proposed borehole location ARP08 facing south

Plate 7: Vegetation at proposed borehole location ARP08

Plate 8: Ground surface visibility and areas of exposure at proposed borehole location ARP08

Plate 9: View of proposed borehole location ARP09 facing north. Note the stream on the left

Plate 10: View of the stream at proposed borehole location ARP09, facing north

Plate 11: Stream at proposed borehole location ARP09

Plate 12: Example of sandstone outcrop/ rockshelter at proposed borehole location ARP09

Plate 13: View of proposed borehole location ARP10, facing north

Plate 14: Vegetation and ground surface visibility at proposed borehole location ARP10

Plate 15: Example of protective hazard (left of frame) and silt (right of frame) fencing

9.0 Terms, Definitions, and Abbreviations

Abbreviation/ Term	Meaning
Aboriginal Object	"any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains" (DECCW 2010:18).
Aboriginal Place	"a place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture" (DECCW 2010:18). Aboriginal places have been gazetted by the minister.
Aboriginal Culturally Modified Tree	"means a tree that, before or concurrent with (or both) the occupation of the area in which the tree is located by persons of non-Aboriginal extraction, has been scarred, carved or modified by an Aboriginal person by: (a) the deliberate removal, by traditional methods, of bark or wood from the tree, or (b) the deliberate modification, by traditional methods, of the wood of the tree" NPW Regulation 80B (3). Culturally Modified trees are sometimes referred to as scarred trees
Study	A project, development, or work (this term is used in its ordinary meaning and is not restricted to an activity as defined by Part 5 EP&A Act 1979).
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
DECCW	Department of Environment, Climate Change and Water (is now the Office of Environment and Heritage – OEH)
Disturbed Land	"Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable." (DECCW 2010:18).
Due Diligence	"taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm" (DECCW 2010:18)
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW)*
GDA	Geodetic Datum Australia
Harm	"destroy, deface, damage an object, move an object from the land on which it is situated, cause or permit an object to be harmed." (DECCW 2010:18)
NPWS	National Parks and Wildlife Service
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPW Regulation	*National Parks and Wildlife Regulation 2009* (NSW)
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
Project Area	Project Area is the area subject to the proposed activity

Appendix 1

Legislative Requirements

Summary of Statutory Controls

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

COMMONWEALTH

Aboriginal & Torres Strait Islander Heritage Protection Act 1984 (ATSIHIP Act)

The purpose of this Act is to preserve and protect all heritage places of particular significance to Aboriginal and Torres Strait Islander people. This Act applies to all sites and objects across Australia and in Australian waters (s4).

It would appear that the intention of this Act is to provide national baseline protection for Aboriginal places and objects where Stage legislation is absent. It is not to exclude or limit State laws (s7(1)). Should State legislation cover a matter already covered in the Commonwealth legislation, and a person contravenes that matter, that person may be prosecuted under either Act, but not both (s7(3)).

The Act provides for the preservation and protection of all Aboriginal objects and places from injury and/or desecration. A place is construed to be injured or desecrated if it is not treated consistently with the manner of Aboriginal tradition or is or likely to be adversely affected (s3).

Australian Heritage Commission Act 1975

The *Australian Heritage Commission Act (1975)* established the Australian Heritage Commission which assesses places to be included in the National Estate and maintains a register of those places. Places maintained in the register are those which are significant in terms of their association with particular community or social groups and they may be included for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

The *Australian Heritage Council Act 2003,* together with the *Environment Protection & Biodiversity Conservation Act 1999,* includes a National Heritage List of places of National heritage significance, maintains a Commonwealth Heritage List of heritage places owned or managed by the Commonwealth and ongoing management of the Register of the National Estate.

STATE

It is incumbent on any land manager to adhere to state legislative requirements that protect Aboriginal Cultural heritage. The relevant legislation is NSW includes but is not limited to the summary below.

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all Aboriginal heritage, places and objects (not being a handicraft made for sale), with penalties levied for breaches of the Act. This legislation is overseen by the Office of Environment and Heritage (OEH), and specifically the Chief Executive (formerly the Director-General) of OEH. Part 6 of this Act is the relevant part concerned with Aboriginal objects and places, with Section 86 and Section 90 being the most pertinent. In 2010, this Act was substantially amended, particularly with respect to Aboriginal cultural heritage requirements. Relevant sections include:

Section 86

This section now lists four major offences:

(4) A person must not harm an object that the person knows is an Aboriginal object;

(5) A person must not harm and Aboriginal object;

(6) For the purposes of s86, "circumstances of aggravation" include:

  (g) The offence being committed during the course of a commercial activity; or

  (h) That the offence was the second or subsequent offence committed by the person;

(7) A person must not harm or desecrate an Aboriginal place.

Offences under s86 (2) and (4) are now strict liability offences, ie, knowledge that the object or place harmed was an Aboriginal object or place needs to be proven. Penalties for all offences under Part 6 of this Act have also been substantially increased, depending on the nature and severity of the offence.

Section 87

This section now provides defences to the offences of s86. These offences chiefly consist of having an appropriate Aboriginal Heritage Impact Permit (AHIP), not contravening the conditions of the AHIP or demonstrating that due diligence was exercised prior to the alleged offence.

Section 87A & 87B

These sections provide exemptions from the operation of s86; Section 87A for authorities such as the Rural Fire Service, State Emergency Services and officers of the National Parks & Wildlife Service in the performance of their duties, and s87B for Aboriginal people performing traditional activities.

Section 89A

If a person knows of the location of an Aboriginal object or place that has not been previously registered and does not advise the Director-General (now Chief Executive) of that object or place within a reasonable period of time, then that person is guilty of an offence under this Section of the Act.

Section 90

This section authorises the Director-General (now Chief Executive) to issue and AHIP.

Section 90A-90R

These sections govern the requirements relating to applying for an AHIP. In addition to the amendments to the Act, OEH have issued three new policy documents clarifying OEH's requirements with regards to Aboriginal archaeological investigations: *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW and Code of Practice for Archaeological Investigations in NSW*. The Consultation Requirements formalise the consultation with Aboriginal community groups into four main stages, and includes details regarding the parties required to be consulted, advertisements inviting Aboriginal community groups to participate in the consultation process, requirements regarding the provision of methodologies, draft and final reports to the Aboriginal stakeholders and timetables for the four stages. The Due Diligence Code of Practice sets out the minimum requirements for investigation, with particular regard as to whether an AHIP is required. The Code of Practice for Archaeological Investigation sets out the minimum requirements for archaeological investigation of Aboriginal sites.

Aboriginal Heritage Impact Permits (AHIP)

OEH encourages consultation with relevant Aboriginal stakeholders for all Aboriginal Heritage Assessments. However, if an Aboriginal Heritage Impact Permit (AHIP) is required for an Aboriginal site, then specific OEH guidelines are triggered for Aboriginal consultation.

Aboriginal Cultural Heritage Consultation Requirements for Proponents

In 2010, the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCR's) were issued by OEH (12th April 2010). These consultation requirements replace the previously issued Interim Community Consultation Requirements (ICCR) for Applicants (Dec 2004). These guidelines apply to all AHIP applications prepared after 12th April 2010; for projects commenced prior to 12th April 2010, transitional arrangements have been stipulated in a supporting document, Questions and Answers 2: Transitional Arrangements.

The ACHCR's 2010 include a four stage Aboriginal consultation process and stipulate specific timeframes for each state. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. Stage 1 includes the identification of Aboriginal people who may have an interest in the Project Area and hold information relevant to determining the cultural significance of Aboriginal objects or places. This identification process should draw on reasonable sources of information including: the relevant OEH EPRG regional office, the relevant Local Aboriginal Land Council(s), the Registrar of Aboriginal Owners, Aboriginal Land Rights Act (1983), the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s), and the relevant catchment management authority. The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the Project Area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of inters (EoI) for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the EoI's, they need to be consulted in accordance with ACHCR's Stages 2, 3 and 4.

Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for New South Wales. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Within the EP&A Act, Parts 3, 4 and 5 relate to Aboriginal heritage.

Part 3 regulates the preparation of planning policies and plans. Part 4 governs the manner in which consent authorities determine development applications and outlines those that require an environmental impact statement. Part 5 regulates government agencies that act as determining authorities for activities conducted by that agency or by authority from the agency. The National Parks & Wildlife Service is a Part 5 authority under the EP&A Act.

In brief, the NPW Act provides protection for Aboriginal objects or places, while the EP&A Act ensures that Aboriginal cultural heritage is properly assessed in land use planning and development.

Heritage Act 1977

This Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. Although Aboriginal heritage sites and objects are primarily protected by the *National Parks & Wildlife Act 1974*, if an Aboriginal site, object or place is of great significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council.

Other legislation of relevance to Aboriginal cultural heritage in NSW includes the *NSW Local Government Act 1993*. Local planning instruments also contain provisions relating to indigenous heritage and development conditions of consent.

Appendix 2

AHIMS

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : PR112619-1

Client Service ID : 69610

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-1-2544	Carinya (C-ST-1);Hillcroft;	AGD	56	220840	6332250	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	Robynne Mills					**Permits**		
45-1-0167	Genowlan Creek 1	AGD	56	225360	6332640	Closed site	Valid	Artefact : -	Shelter with Deposit	2193
	Contact	**Recorders**	Helen Brayshaw,Mary Dallas Consulting Archaeologists,John Bugg					**Permits**		
45-1-0168	Dog Trap Creek;	AGD	56	226000	6329950	Open site	Valid	Artefact : -	Open Camp Site	2193
	Contact	**Recorders**	Helen Brayshaw,Mary Dallas Consulting Archaeologists,John Bugg					**Permits**		
45-1-0127	Airly Mountain	AGD	56	224060	6331080	Open site	Valid	Artefact : -	Open Camp Site	1947
	Contact	**Recorders**	Helen Brayshaw,Mary Dallas Consulting Archaeologists					**Permits**		
45-1-0252	AC-OC-1;"Airly";	AGD	56	220110	6331040	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Robynne Mills					**Permits**		

Report generated by AHIMS Web Service on 09/05/2012 for Jeremy Hill for the following area at Datum :GDA, Zone : 56, Eastings : 220055 - 230549, Northings : 6329044 - 6337081 with a Buffer of 50 meters.Additional Info : REA. Number of Aboriginal sites and Aboriginal objects found is 5

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : PR112619-1

Client Service ID : 69611

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
44-3-0149	Airly 1	GDA	56	219208	6330113	Open site	Valid	Artefact : 3		

Contact **Recorders** RPS Australia East Pty Ltd -Hamilton **Permits**

Report generated by AHIMS Web Service on 09/05/2012 for Jeremy Hill for the following area at Datum :GDA, Zone : 55, Eastings : 777952 - 779846, Northings : 6329082 - 6337205 with a Buffer of 50 meters.Additional Info : REA. Number of Aboriginal sites and Aboriginal objects found is 1