HUMECOAL
PROJECT

VOLUME 1

Hume Coal Project

Environmental Impact Statement

Main Report

Prepared for Hume Coal Pty Limited
March 2017

EMM

DECLARATION

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979*

EIS prepared by

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Proposed development

Hume Coal Project

Refer to Chapter 2 of this EIS for a description of the proposed development

Land to be developed

Refer to Appendix A of EIS

Declaration

We confirm that we have prepared this EIS in accordance with the Secretary's environmental assessment requirements issued for the Hume Coal Project on 20 August 2015 and supplementary Secretary's environmental assessment requirements issued 18 January 2016 and that the:

- EIS has been prepared in accordance with Schedule 2 of the EP&A Regulation 2000;
- EIS contains all available information that is relevant to the environmental assessment of the proposed development; and
- information in the EIS is neither false or misleading.

Paul Mitchell
8 March 2017

Nicole Armit
8 March 2017

Mark Roberts
8 March 2017

Hume Coal Project

Environmental Impact Statement

Prepared for Hume Coal Pty Limited | 8 March 2017

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Hume Coal Project

Final

Report J12055RP1 | Prepared for Hume Coal Pty Limited | 8 March 2017

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Date	8 March 2017	8 March 2017		Date	8 March 2017

Document Control

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1	18 November 2016	Mark Roberts and Nicole Armit	Paul Mitchell
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Executive summary

Executive Summary

ES1 Introduction

Hume Coal Pty Limited (Hume Coal) is seeking development consent for a State significant development project (SSD 7172) - the construction and operation of the Hume Coal Project (the project), an underground coal mine and associated mine infrastructure in the Southern Coalfield of New South Wales (NSW). The mine will produce metallurgical coal with a secondary thermal coal product. Around 50 million tonnes (Mt) of run-of-mine coal will be extracted from the Wongawilli Seam, resulting in approximately 39 Mt of saleable coal over a project life of 23 years. The product split will be about 55% metallurgical coal and 45% thermal coal.

Hume Coal is a wholly-owned subsidiary of POSCO Australia (POSA), the Australian subsidiary of POSCO. POSCO is a leading multinational steel manufacturer and one of the largest buyers of Australian coal and iron ore. Hume Coal acquired Authorisation 349 (A349) in December 2010, and began exploration drilling in May 2011. Since then the project has evolved progressively following detailed geological, engineering, environmental, financial and other technical investigations to define the mineable resource; and to address identified environmental and technical constraints. The project has been designed to extract coal efficiently within identified environmental constraints, while minimising adverse environmental impacts. The large investment proposed to construct and operate the project will provide substantial economic stimulus and benefits to the Australian, NSW and local economies.

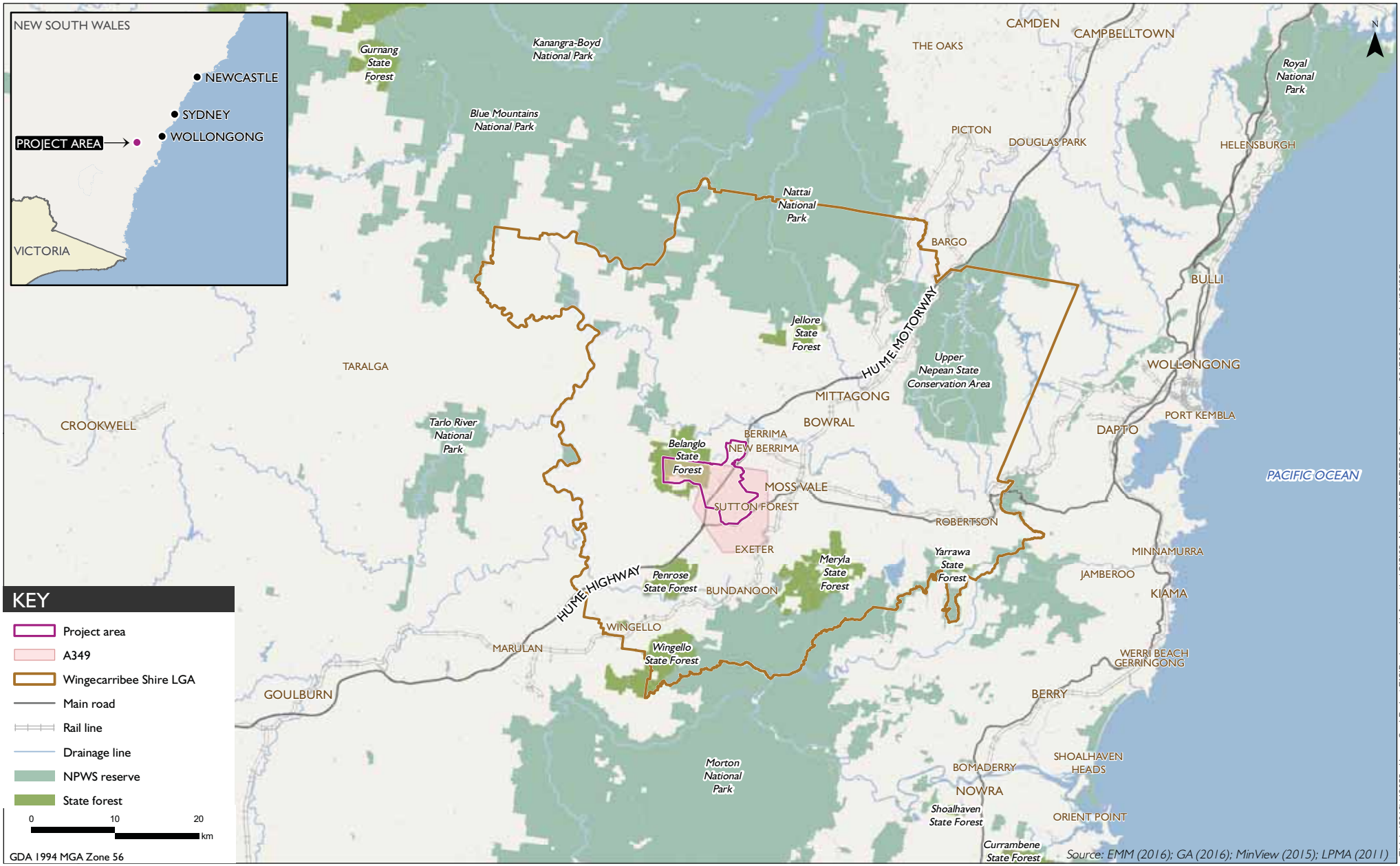
In designing the project particular attention has been given to avoiding potential environmental impacts wherever possible, or otherwise minimising them. A low impact, first workings mining system will be used that will leave pillars of coal in place so that the overlying strata are supported, rather than collapsing into the mined-out void. Therefore surface subsidence impacts will be negligible. By minimising disruption to the overlying strata, associated groundwater impacts will also be minimised. The surface facilities and infrastructure have been designed specifically to avoid areas of environmental value, and to minimise off-site impacts as far as practicable.

Product coal will be transported by rail, mainly to Port Kembla Coal Terminal for export, and possibly to domestic customers depending on market demand. Rail works, including construction and use of a new rail loop and rail line connected to the existing Berrima Branch Line, form a separate development application (the Berrima Rail Project, SSD 7171).

ES2 Project area

The project area is in the Southern Highlands region of NSW, approximately 100 kilometres (km) south-west of Sydney in the Wingecarribee Local Government Area (LGA). The mine surface infrastructure area will be around 7 km north-west of the Moss Vale town centre (see Figure ES1). The project is also located in the Southern Coalfield which is one of the Sydney-Gunnedah Basin's five major coalfields. The Southern Coalfield is the only coalfield in NSW which is a major source of hard metallurgical (or coking) coal used in steel production (Department of Planning 2008).

The project area, comprising the surface infrastructure area and underground mine footprint, covers approximately 5,051 ha. The vast majority of this is freehold land, covering around 5,039 ha, of which 1,253 ha is owned by Hume Coal and its subsidiaries. Hume Coal's total landholding within the local area is approximately 1,765 ha, some of which is outside the project area. The north-western portion of the project area is in the Belanglo State Forest, which includes both plantation radiata pine and native forest and is controlled by the Forestry Corporation of NSW. Belanglo State Forest covers approximately 1,296 ha within the project area (see Figure ES2). Over half of the project area comprises cleared freehold land that is, and will continue to be, used for livestock production, cropping and small-scale farm businesses.

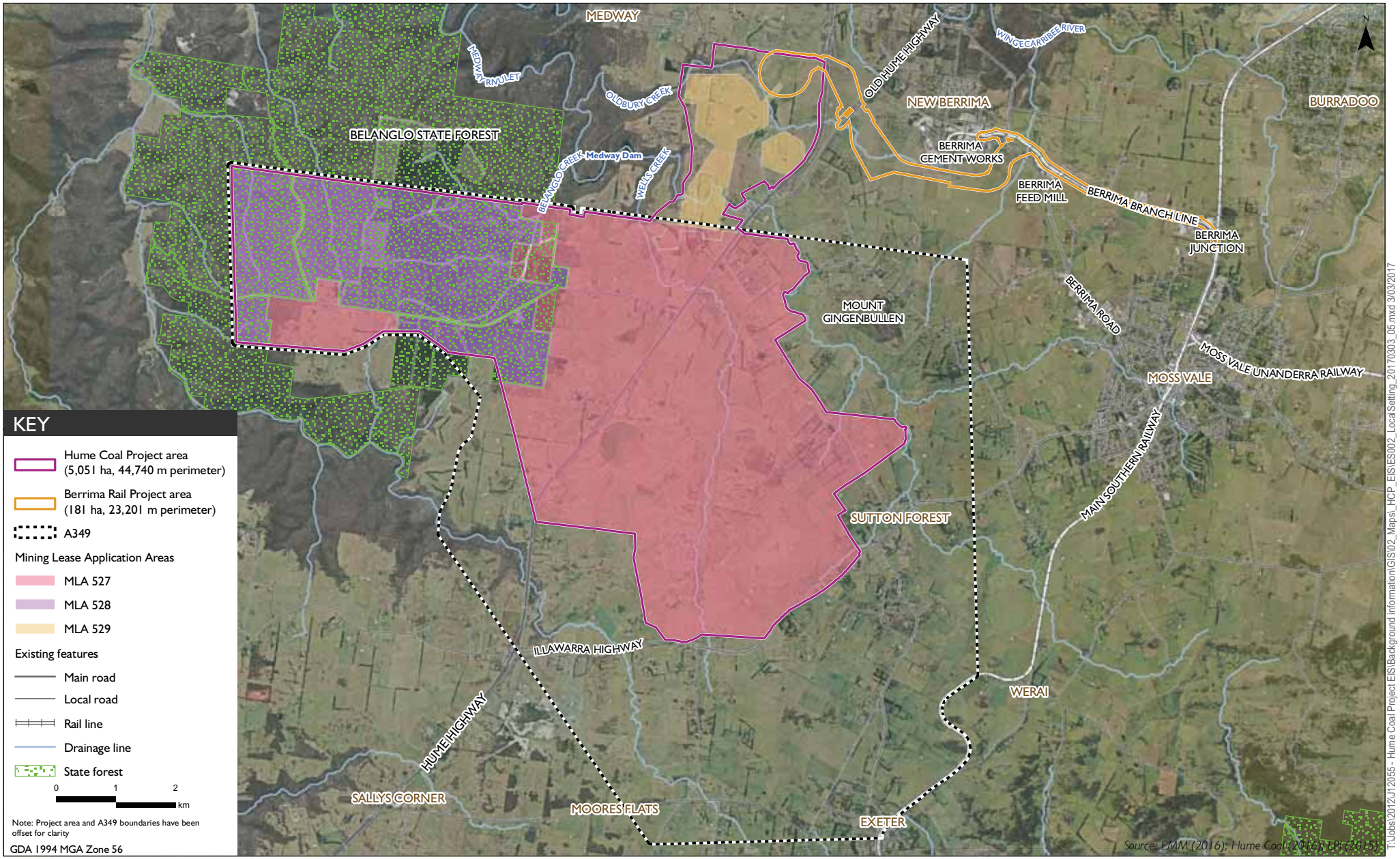


Regional context

Hume Coal Project

Environmental Impact Statement

Figure ES1



Local context

Hume Coal Project

Environmental Impact Statement

Figure ES2

Approximately 117 ha, or 2%, of the project area will be occupied by the mine surface infrastructure area and associated facilities, on land owned by Hume Coal. The proposed location of the surface infrastructure area was carefully chosen following evaluation of a number of alternatives. The surface infrastructure is located on mainly cleared land, and was sited where the topography will shield much of the infrastructure from public view insofar as is possible. Above the underground mine, the only material surface disturbance will be drilling sites, ventilation infrastructure, mine access points and access tracks linking various facilities. These will generally be on Hume Coal owned or controlled land, or land where an access agreement is in place with the landowner.

ES3 Project overview

The key aspects of the project are summarised below.

- Ongoing resource definition activities, along with geotechnical and engineering testing and other fieldwork to enable detailed design.
- Establishment of temporary construction offices and a temporary construction accommodation village.
- Development and operation of an underground coal mine, involving approximately two years of construction and 19 years of mining, followed by closure and rehabilitation occupying up to two years, leading to a total project life of 23 years. Some coal extraction will commence during the second year of construction and hence there will be some overlap between the construction and operational phases.
- Extraction of approximately 50 Mt of run-of-mine (ROM) coal from the Wongawilli Seam, at a rate of up to 3.5 million tonnes per annum (Mtpa). Low impact mining methods will be used resulting in negligible subsidence impacts.
- Following processing of ROM coal in the coal preparation plant (CPP), production of up to 3 Mtpa of metallurgical and thermal coal for sale to international and domestic markets.
- Construction and operation of associated mine infrastructure, mostly on cleared land, including:
    - one personnel and materials drift access and one conveyor drift access from the surface to the coal seam;
    - ventilation shafts, comprising one upcast ventilation shaft and fans, and up to two downcast shafts installed over the life of the mine, depending on ventilation requirements as the mine progresses;
    - a surface infrastructure area, including administration, bathhouse, washdown and workshop facilities, fuel and lubrication storage, warehouses, laydown areas, and other facilities. The surface infrastructure area will also include the CPP and ROM and product coal stockpiles, and coal reject handling infrastructure and a temporary (emergency) reject stockpile;
    - surface and groundwater management and treatment facilities, including storages, pipelines, pumps and associated infrastructure;
    - overland conveyors;
    - rail load-out facilities;
    - a small explosives magazine;
    - ancillary facilities, including fences, access roads, car parking areas, helipad and communications infrastructure; and
    - environmental management and monitoring equipment.

- Establishment of site access from Mereworth Road, and construction of minor internal roads.
- Relocation of some existing utilities.
- Coal reject emplacement underground in the mined-out voids.
- Peak workforces of approximately 414 full-time equivalent employees during construction and approximately 300 full-time equivalent employees during operations.
- Decommissioning of mine infrastructure and rehabilitating the area once mining is complete, so that it can support land uses similar to current ones.

Three separate approvals will be required under the EP&A Act for the Hume Coal mine to operate. Hume Coal is therefore seeking:

- development consent for the mine and associated facilities (SSD 7172, the project the subject of this EIS) under Part 4, Division 4.1 of the EP&A Act;
- development consent for the construction and use of a new rail spur and loop (the Berrima Rail Project, the subject of a separate development application (SSD 7171) under Part 4, Division 4.1 of the EP&A Act; and
- an activity approval for proposed electricity supply works under Part 5 of the EP&A Act from Endeavour Energy.

Therefore, in addition to the application for the Hume Coal Project, separate applications will be made by Hume Coal under Part 4 of the EP&A Act for the rail works, which are broadly described in Section 2.9, and under Part 5 of the EP&A Act for the electricity supply works, which are broadly described in Section 2.12.

All three projects are inextricably linked, in that one will not be developed without the other two. Approval for the three projects is being sought separately and in parallel, and construction will occur concurrently.

Separate development consent is being sought for the Hume Coal Project and the Berrima Rail Project because the rail infrastructure will be used by others in addition to Hume Coal. The Berrima Branch Line, to which the Hume Coal rail line will be connected as part of the Berrima Rail Project, is owned by Boral Cement Ltd (Boral) and is currently used by Boral to transport material to and from the Berrima Cement Works. It is also used by Inghams Enterprises Pty Limited (Inghams) to carry goods to its feed mill east of the cement works, and by Omya (Australia) Pty Ltd (Omya) to haul material to their Moss Vale plant at the Berrima Junction. The rail project has therefore been separated from the Hume Coal Project so that the Hume Coal mine development consent, if granted, will not apply to the rail line.

ES4 Impact assessment

Thorough assessments of all potential environmental impacts associated with the project have been undertaken and where material impacts were identified the project design was amended to address them. Consequently, it is not anticipated that the proposed project will cause any significant adverse impacts to the local environment or community. The findings of the detailed environmental assessments are given in the body of this EIS and the appendices. The following sub-sections provide an overview of the main findings; however, to gain a proper understanding of the project, the detailed assessments should be read in their entirety.

ES4.1 Water resources

Water-related technical studies included development of a water balance and numerical groundwater model for the project, and assessments of surface water quality, surface water flow and geomorphology, flooding, groundwater and hydrogeochemistry.

An iterative process was adopted for the design of the project's water management system, which meant it periodically incorporated new information from baseline monitoring and early model outputs, along with results of surface water and groundwater modelling. Two water sharing plans (WSPs) apply to the project area; the *Water Sharing Plan for the Greater Metropolitan Region, Unregulated River Water Sources 2011* (Metropolitan surface water WSP), and the *Water Sharing Plan for the Greater Metropolitan Region, Groundwater Sources 2011* (Metropolitan groundwater WSP). Relevant provisions of these WSPs have been incorporated into the project's water management system.

The resulting mine design and associated water management system will minimise water take, conserve and reuse water, minimise evaporation losses, and minimise the potential for managed release of water to surface water systems. The system is based on diverting clean water around the surface disturbance areas, retaining water that falls within disturbed areas on site for recycling and reuse, and injecting groundwater into sealed voids after coal extraction is complete enabling a faster groundwater recovery rate and reduced drawdown. The water management system also minimises evaporation losses by storing excess water in underground voids to accelerate the groundwater recovery time and/or for use in operations.

An extensive baseline data set informed the assessment of project related surface water and groundwater impacts. A surface water quality and flow monitoring network was established in and around the project area, providing baseline data over four years (2012 – 2016, inclusive). Installation of the groundwater monitoring network occurred between September 2011 and October 2014, and includes 54 groundwater monitoring bores at 22 locations, 11 vibrating wire sensors within three piezometers, and three landholder bores.

ES4.1.1 Surface water

The project area is located mostly within the catchment of the Wingecarribee River which is part of the Upper Nepean and Upstream Warragamba Water Source.

The primary objectives of the project's water management system will be to reuse water and minimise the potential for managed releases to surface waters. The water management system has been designed to reuse as much mine water as possible, with it first being used to meet operational demands. If demand cannot be fully met from water handled by the mine's water management system, supplies will be supplemented by groundwater from the sealed underground mine voids. Surface water runoff from areas of the site in direct contact with coal will be fully contained to prevent discharge of this water to local waterways.

During the construction phase, sediment dams will be constructed based on the recommended criteria in the guidelines *Managing Urban Stormwater - Soils and Construction - Volume 2E Mines and Quarries* (Landcom 2004), and will be managed to achieve a neutral or beneficial effect (NorBE) on the receiving environment.

During operations, the overarching water management philosophy involves the following:

- Runoff from undisturbed areas will be diverted around or away from the infrastructure into natural watercourses via clean water diversion drains.
- Runoff from disturbed areas within the mine infrastructure footprint will be directed to stormwater basins (SBs), mine water dams (MWDs) and the primary water dam (PWD) for storage and reuse.
- Runoff from areas where there is a low risk of coal contact (ie runoff from areas that do not contain coal stockpiles or processing plant but that could contain small amounts of coal due to mine vehicle traffic) may be discharged to local creeks but only after the "first flush" has been diverted into storage and reuse dams, and monitoring shows that post first flush runoff is of an acceptable quality to discharge.
- Runoff from areas where there is a low risk of coal contact that does not meet the adopted first flush criteria will be transferred to the PWD for storage.

- Sewage from the administration and workshop area will be treated and reused on site. Grey water will be subject to primary treatment and used for drip irrigation of landscaped areas. Black water will be subject to tertiary treatment and harvested for reuse in the CPP.

Strategies for managing surplus water are as follows:

- releases from areas where there is a low risk of coal contact (captured by stormwater basins) to Oldbury Creek after first flush runoff collection and water quality monitoring parameters are met;
- pumping to underground sealed panels; and
- storage in the primary water dam.

Treatment and release to Oldbury Creek was also considerd as an option for managing surplus water, although water balance modelling demonstrates this strategy will not be required. However, if climatic conditions (rainfall) increase beyond the range of conditions experienced over the last 117 years, treatment and release to Oldbury Creek may be required for those years where surpluses occur.

The project's impacts on surface water resources will be minimal. All potential impacts to surface water users and stream environments have been assessed as insignificant in accordance with the *Significant impact guidelines* (DoE 2013).

There will be a minimal reduction, of approximately 94.2 ha (0.8%), of the total catchment of Medway Rivulet (including Oldbury Creek) in which the surface infrastructure area will be located. This reduction in catchment area will have almost imperceptible consequences.

During both construction and operations, the potential concentrations of water quality parameters in Oldbury Creek, including total suspended solids and nutrient loads, show discharge from sediment basins, stormwater basins and other sediment control measures will be consistent with the Sydney Catchment Authority's Neutral or Beneficial Effect (NorBE) criteria.

Changes in flood levels as a result of the project on land not owned by Hume Coal are minor or negligible, and will be acceptable with reference to applicable criteria in the NSW Floodplain Development manual (the Floodplain Manual DIPNR 2005). Similarly, changes to flood peak velocities will be acceptable when compared to criteria in the Floodplain Manual.

ES4.1.2 Groundwater

A regional numerical groundwater flow model was prepared using MODFLOW-SURFACT Version 3 (Hydrogeologic) as a basis for assessment ofpotential impacts. The model was independently reviewed by two pre-eminent hydrogeologists (Dr Noel Merrick and Dr Frans Kalf). The peer reviewers agreed that the model objectives have been satisfied, the model calibration is satisfactory, the model predictions conform to leading practice and the model is fit for purpose.

Groundwater inflows to the mine will occur during its operational life and for three years after coal extraction ceases (ie for approximately 22 years' duration in total). This will lower the groundwater level - called a "drawdown'- and it is predicted that 93 private landholder bores on 71 properties will experience a drawdown of 2 m or more due to the project. The average duration of drawdown on the 93 affected bores is predicted to be 36 years, with the maximum duration being 65 years. However, most of the recovery will occur in a far shorter time period; on average, a bore will recover by 75% within 23 years after it is first impacted.

A “make good” assessment was conducted in accordance with the *Aquifer Interference Policy* (AIP) (NOW 2012b) to identify potential measures to mitigate unavoidable project impacts on the 93 bores. All bores drawn-down by more than 2 m due to the project will be eligible for compensation (financial or otherwise). Around a third of the affected bores will experience increased pumping costs but no other capital works or supplementary measures are expected to be necessary to maintain their proper functioning. Another third of the bores have been assessed as potentially needing their submersible pump intake depths repositioned for certain periods of time, and the final third may need redrilling, or repositioning to maintain water supply; typically these bores are either shallow, or screened in, or below the coal seam itself, or within close proximity to the top of the seam.

Predicted impacts to other groundwater users (including groundwater dependant ecosystems, watercourses, drainage lines, and swamps that receive baseflow) have been assessed as insignificant.

As to the groundwater quality requirements of the AIP, it is not anticipated the project will reduce the beneficial use category of the groundwater source. Also, it is not anticipated that cumulative water quality impacts will occur as a result of the project and other mining activities using the AIP criteria as a reference point.

ES4.1.3 Water licensing

Hume Coal will need to obtain water licences under the *Water Management Act 2000* for both surface water and groundwater “taken”’ by the proposed development. Hume Coal will acquire the water licence volumes required to cover not only the water handled by the mine’s water management system, but also the water that remains in the sealed areas of the mine, in voids. This water remains in the groundwater source and will account for about two thirds of the total volume of water inflow to the mine workings.

The peak volume of water required to be licensed will be 2,290.5 ML/yr in year 15. Hume Coal has already secured in excess of approximately 60% of the peak water licence requirement for the project, and has a clear pathway for how the remaining licence volume will be secured so that all groundwater is adequately licensed.

Most of the remaining licence volume will be acquired via market trading. The majority of the volume required will be secured from Nepean Management Zone 1. The small licence volumes required from Nepean Management Zone 2 of the Sydney Basin Nepean Groundwater Source and from the Sydney Basin South Groundwater Source are likely to be sourced during a controlled allocation process. Trading of the small licence volume required from the Medway Rivulet Zone of the Upper Nepean and Upstream Warragamba Unregulated River Water Source is proposed to secure the remaining required licence volume for surface water.

ES4.2 Soil and land resources

The soil and land assessment included a desktop review of existing information, a detailed soil survey with laboratory analysis of collected soil samples, and both a biophysical strategic agricultural land (BSAL) and land and soil capability (LSC) assessment of the project area and its surrounds.

The BSAL assessment was undertaken in accordance with the requirements of the *Interim protocol for site verification and mapping of biophysical strategic agricultural land* (NSWG 2013) (the interim protocol). No BSAL was found to be present in the project area, and a Site Verification Certificate (SVC) confirming this was issued for the project by the Department of Planning and Environment (DP&E) on 22 April 2016.

Given the underground nature of the project and the first workings mining method with negligible associated subsidence, impacts on soil resources will be limited to the surface disturbance footprint, covering around 2% of the project area. The LSC class for the vast majority of the project area (ie 4,993 ha or 99%) will remain unchanged post mining.

When mining has finished, all surface infrastructure will be removed and the area rehabilitated to a condition that is stable and supports the proposed post-mining land use, which is grazing with improved pasture, consistent with the existing land use. Some 94% of the soil to be stripped in the disturbance footprint is a Dystrophic Yellow Kandosol, which will be the most useful soil for rehabilitation due to its structure and depth. This soil is most suited for grazing and occasional cultivation as long as suitable soil conservation measures are implemented.

When mining ceases there will be a change to the LSC class over 58 ha of land disturbed within the former surface infrastructure area. The original land classes in this area (3 ha of Class 3, 37 ha of Class 4 and 18 ha of Class 5) will change to Class 6 largely due to a change in soil depth. However, Class 6 land will still be suitable for grazing and improved pasture, allowing reinstatement of agricultural uses similar to those present prior to mining.

ES4.3 Agricultural resources

The agricultural impact statement assessed potential impacts of the project on agricultural resources and/or industries within and surrounding the project area. It included detailed database searches and mapping review, consultation with relevant specialists and reviews of other relevant assessments made as part of the EIS.

All identified potential risks to agricultural resources were assessed as being low provided the specified mitigation measures are implemented. Potential disturbance of agricultural land will be limited to the surface infrastructure area which, with the exception of the downcast ventilation shaft location in the Belanglo State Forest, is on land owned by Hume Coal. After mining is complete and the land rehabilitated, it will be returned to agricultural use for livestock production on improved pasture.

There will be some agricultural production losses during the construction and operation of the project, estimated at approximately $2 million in net present value over the 23 year life of the project. These losses will be somewhat offset by the increase in productivity on other properties Hume Coal owns by the application of leading practice management techniques by the licensee, Princess Pastoral, when compared to the previous management regime.

The highest potential risk to agriculture was identified as the potential loss of groundwater for agricultural users, resulting from groundwater drawdown. However, Hume Coal will implement the necessary 'make good' arrangements with reference to the AIP to effectively compensate landholders for drawdown related impacts. Therefore, no uncompensated (financial or otherwise) loss of water availability for agriculture will occur, and the residual level of risk was assessed as low.

ES4.4 Biodiversity

The biodiversity assessment included a detailed literature review, database searches and hundreds of hours of ecological surveys mainly targeted at detecting the presence of threatened or endangered species. Potential impacts to groundwater dependent ecosystems (GDEs) were also assessed using the results of the ecological, surface water and groundwater studies. This resulted in a dynamic and accurate assessment of the project's impacts on GDEs at several stages of its life.

Impacts on biodiversity from an underground mining project can occur as a result of vegetation clearance for surface infrastructure, subsidence-related impacts, and groundwater drawdown. The first workings method with negligible associated subsidence means that subsidence related impacts on biodiversity will be negligible. The primary direct impact from the project is clearing vegetation to construct surface infrastructure. Careful placement of surface infrastructure has largely avoided the need to clear native vegetation, resulting in only a small amount being affected. Assessments of significance were completed for threatened species and communities. The project is not expected to cause any significant impacts on any of these species and communities.

Residual or unavoidable impacts include the removal of 64 paddock trees which may provide habitat for some threatened species. Offset calculations have been made using the BioBanking Calculator to determine the number of credits required to compensate for the project's residual surface impacts. A total of 582 species credits and 101 ecosystem credits will be required to compensate for the removal of vegetation and habitats. A biodiversity offset strategy has been proposed to source offset areas containing the required ecosystem and species credits, and will be drafted into a biodiversity offset package to be submitted to the DP&E within 12 months of development consent. Implementation of the biodiversity strategy will result in a net positive effect on biodiversity.

Areas of terrestrial vegetation along Belanglo Creek and Wells Creek were identified as having some vulnerability to drawdown impacts from underground mining. However, these areas have a facultative (opportunistic) dependence on groundwater, and will be able to respond to changes in the water table apart from during periods of prolonged drought. As a mitigation measure, monitoring of this vegetation will be undertaken during prolonged drought periods and an appropriate response will be determined if the condition of EECs along the creeks is observed to decline, and the decline is attributable to mining.

ES4.5 Noise

The noise and vibration assessment considered 74 potentially noise sensitive receivers or 75 dwellings (location 14 was identified as having two dwellings on the property) surrounding the project area, and, in particular, around the proposed surface infrastructure site. Noise was monitored using both "attended" and "unattended" techniques to establish representative ambient or background noise levels.

The operational noise assessment identified that during adverse weather conditions and with all feasible and reasonable mitigation applied:

- eight assessment locations (nine dwellings) are predicted to experience residual noise levels of between 3 dB and 5 dB above project-specific noise levels (PSNL) and are therefore entitled to voluntary mitigation upon request; and

- two assessment locations are predicted to experience residual noise levels greater than 5 dB above PSNLs and are therefore entitled to voluntary acquisition upon request.

Hume Coal will either comply with the above mitigation measures (upon request by landowners) or will enter into amenity agreements with the affected landholders.

No privately owned land parcels are predicted to exceed the 25% area voluntary land acquisition criteria as defined in the *Voluntary Land Acquisition and Mitigation Policy* (NSW Government 2014b).

The noise assessment also concluded that the predicted internal noise levels at relevant locations will be well below those likely to cause sleep disturbance.

During construction, some noise will be above relevant noise management levels (NMLs). This will be confined to properties to the north-west of the project area and will mostly be from 1 dB to 3 dB above NMLs. This is not uncommon for construction projects, and it is important to note that an NML is not an acceptability criterion (as are operational noise limits), but a trigger for when construction noise management measures warrant consideration. The key management measure that will be adopted is generally limiting construction activities to standard working hours (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm and no work on Sundays or public holidays). This will be with the exception of drift and shaft construction, work inside enclosed buildings/structures, and the construction of the accommodation village, which will all occur 24 hours a day, 7 days a week.

The 'highly affected' NML of 75 dB will not occur at any assessment location. The construction noise management methods will be detailed in the project's construction environmental management plan (CEMP). Construction noise levels from proposed out-of-hours activity are predicted to satisfy the evening and night NML at all assessment locations, with mitigation in place.

Road traffic noise has been assessed for all public roads that may be used for the operation and construction phases of the project. All roads that will be used to access the project area where nearby assessment locations exist will experience zero to negligible (1–2 dB) noise level increases, which satisfies the *Road Noise Policy* (EPA 2013) requirements.

ES4.6 Vibration

Underground mining is the primary potential source of vibration impacts. Mining will occur at depths greater than approximately 110 m under the Hume Highway. Based on the structural vibration screening criterion of 7.5 mm/s and the identified vibration levels from similar activities (typically 0.1 mm/s or less at such distances), it is highly unlikely vibration levels will cause structural vibration impacts to the highway.

The assessment demonstrates that no other structures will be affected by potentially damaging sources of vibration and that vibration levels are likely to be well below the level of human perception.

ES4.7 Air quality

A network of air quality and meteorological monitoring equipment is in place within and around the project area and includes real-time measurements of meteorological conditions and particulate matter concentrations (PM_{10} and $PM_{2.5}$). Equipment owned by Hume Coal will form the basis for air quality monitoring during the life of the project.

The underground nature of the project is a significant avoidance measure in relation to potential air quality impacts as most of the major emissions sources normally associated with mining projects will not be present. The highest potential sources of total suspended particulates (TSP), PM_{10} and $PM_{2.5}$ emissions from the project have been identified as:

- wind erosion from coal stockpiles;
- ventilation shaft emissions from underground operations, incorporating both fugitive emissions from coal extraction and transportation, and diesel fuel combustion;
- conveyor belt and transfer stations, from both wind erosion and coal transfer emissions; and
- stacking and reclaiming coal.

Including all of the project and neighbouring emission sources added to ambient background levels, the potential for an exceedance of applicable NSW EPA impact assessment criteria to occur due to the project is negligible. The criteria would be more likely to be exceeded because of other events not associated with the project, particularly bushfires and dust storms.

A review of the proposed project dust control measures found that they are consistent with or above accepted industry leading practices. Proposed mitigation measures will effectively control emissions to minimise impacts on the surrounding environment, and to levels that are well below the applicable criteria.

The construction phase of the project will generally generate higher impacts in the immediate surrounding environment than its operational phase because most surface earthworks and truck transportation of soil and other construction materials will occur then. Appropriate dust control measures will be outlined in the project's CEMP.

ES4.8 Greenhouse gases

The likely greenhouse gas (GHG) emissions from the project will be minimal, only making minor contributions to the total GHG emissions from NSW and Australia.

A total of 1,795,965 t $CO_{2\text{-}e}$ (scope 1 and 2) GHG emissions will be emitted over the life of the project. The annual average scope 1, 2 and 3 emissions (excluding the end use of coal) from the project represent approximately 0.068% and 0.017% of total GHG emissions for NSW and Australia, respectively, based on the latest available National Greenhouse Gas Inventory being that for 2014.

ES4.9 Subsidence

The proposed first workings mining method will offer a significant level of protection to both existing surface features andthe groundwater system, by preventing overburden caving and its associated mining-induced fracturing of the overlying Hawkesbury Sandstone. This mining method and the associated mine layout will reduce the levels of surface and sub-surface subsidence to the lowest practical impact level, whilst still allowing economic recovery of the coal resource. The predicted maximum level of subsidence is so low that subsidence related impacts on surface features will be imperceptible. Further, with maximum surface settlement across the project area predicted to be less than 20 mm (and significantly less in many areas), the potential for significant three-dimensional horizontal shear effects to occur as a direct result of mining subsidence is also negligible.

As the coal seam is hydraulically connected to the overlying Hawkesbury Sandstone, some level of drawdown due to depressurisation of the target coal seam will occur. However, once again, surface settlements will be negligible.

The design principles and stability criteria used in developing the mine plan are consistent with the need for long-term stability based on a suitably low probability of failure. In addition to the mine layout and the design of the coal pillars being left in place, stability will be further enhanced by the emplacement of rejects back into the mined-out voids, and the post-mining flooding of the mined workings and associated re-establishment of full hydrostatic water pressures. Whilst these factors should each have a positive effect on stability, they have not been relied upon to achieve suitably low probabilities of failure of the coal pillar system.

Survey verification of mine workings, monitoring and surface feature-specific subsidence management and monitoring will be implemented as part of ongoing subsidence management strategies.

ES4.10 Traffic and transport

The traffic assessment examined the project's potential impacts on the safety and efficiency of the local and regional road network. It identified no significant adverse traffic impacts as a result of traffic movements to be generated by the project during both the construction and operation phases.

During construction, all non-local employees and contractors will live in the on-site accommodation village and will travel to and from the worksites in mini-buses or other pooled vehicles, thus mitigating the risk of significant impacts on the local road network. During operations, it is anticipated that around 85% of the workforce will live in the Wingecarribee LGA, with a maximum commute time of 45 minutes imposed to reduce the risk of fatigue-related accidents.

All vehicles will normally access the mine site via Mereworth Road during construction and operation, which will be upgraded to accommodate the project-related traffic volumes. The intersection at the Mereworth Road/Hume Highway northbound off-ramp will be reconfigured to realign the future traffic priority to Mereworth Road, due to the increased traffic volumes travelling along Mereworth Road to the mine site. This will make the intersection more intuitive for drivers as it will function as a normal “T” intersection, rather than a right turn priority as it does currently. No other road or intersection upgrades will be required.

With the exception of the intersections along Argyle Street in Moss Vale, all assessed intersections to be used by project-related traffic will remain operating at a high level of service, that is either A or B (the two highest levels). Although the traffic assessment found that the future peak hourly intersection traffic conditions at the two Argyle Street intersections will be congested (in particular at the Lackey Road intersection), as they are now, there will be no significant worsening of intersection traffic operations at these intersections in Moss Vale with the addition of project-related traffic.

ES4.11 Visual amenity

Being an underground mine, the potential for visual impact is limited to the surface infrastructure area. No significant new landforms, such as permanent surface coal reject waste emplacements, form part of the project.

The project will not have significant adverse visual impacts on the locality. Due to existing mature vegetation in the locality and the area's topography, most components of the project will be shielded or partially shielded from view. The project will cause some changes to the landscape, especially in the early stages before the tree screens around the surface infrastructure area - already planted by Hume Coal - mature. During the early period such changes will be noticeable to viewers from certain viewpoints surrounding the project area, particularly from Medway Road.

Two viewpoints, viewpoint 3 (private residence along Medway Road) and viewpoint 4 (also along Medway Road), were assessed as having the potential to experience a moderate to high visual impact from the project assuming no mitigation actions were taken. However, once the tree screens that have been planted mature, visual impacts will be reduced to moderate, and moderate to low, respectively.

Elsewhere, measures have been proposed to reduce the exposure of project elements at viewer locations, and/or minimise the contrast between the element concerned and the surrounding landscape. Some of these measures, particularly vegetation screening, will take time to become established and be fully effective but, once established, the measures will mitigate visual impacts for both local residents and motorists.

ES4.12 Closure and rehabilitation

The project's rehabilitation and closure strategy's overarching objective is to restore the land to its pre-mining land use, that is, agriculture for livestock production on improved pasture. Being an underground mine, there will be limited need for progressive rehabilitation during the operational phase. However, wherever possible, disturbed areas no longer required for mining activities, such as drill pads and access tracks, will be progressively rehabilitated. In addition, areas disturbed during the construction phase that are not required during mining, such as the temporary construction accommodation village, will be dismantled and the land rehabilitated when no longer in use.

Underground voids will be progressively partially backfilled as mining progresses. This will help with groundwater recovery, as well as eliminate the need for large surface reject emplacements that would otherwise require rehabilitation at mine closure. As coal extraction will be limited to first workings only, no noticeable subsidence will occur and thus no land above underground workings is expected to require rehabilitation.

Final rehabilitation and project closure requirements will be devised and documented as part of a detailed mine closure plan, which will be produced within five years of when closure begins, and will take into account input from government agencies and relevant stakeholders at the time.

ES4.13 Hazards and risks

The hazard and risk assessment considered if the project will be a hazardous or offensive development under the *State Environmental Planning Policy No 33 (Hazardous and Offensive Development* (SEPP 33).

It determined that the project will not involve transport, storage and use of hazardous materials in sufficient quantities and/or proximity to publicly accessible areas to qualify it as hazardous industry under SEPP 33. It also determined that the project will not qualify as offensive industry under SEPP 33 as it is likely the project will be granted an environment protection licence and all licence requirements complied with.

ES4.14 Economics

BAEconomics assessed the project's net benefit to both the NSW and local communities. In general, a project is economically beneficial if its benefits exceed its costs measured in today's values (known as net present value - NPV). The cost benefit analysis determined that the project's total net direct and indirect economic benefit to NSW will be $368 million in NPV terms.

In terms of direct economic benefits, the project is expected to generate $316 million for NSW, comprising:

- royalty payments, which are estimated at $114 million in NPV terms;
- net employment benefits being the additional disposable income that NSW residents will receive, as well as the shares of personal and company income taxes that will go to NSW, that is:
    - $134 million of net disposable income benefits; and
    - $48 million of the NSW share of personal and company income taxes.
- incremental payroll taxes, council rates and various levies, amounting to around $20 million.

To determine the net direct economic benefit, costs associated with GHG emissions and the foregone agricultural value added due to land being removed from agricultural production, collectively estimated at $21 million, were deducted. This reduces the net direct benefits to $295 million.

A number of indirect (or flow-on) effects will also occur as a result of the project's capital and operating expenditure, and job creation. At the NSW level at least $73 million in additional value added, discounted at 7%, will occur as an indirect benefit. There will also be an average indirect benefit of 62 full-time jobs added in each year of the life of the project.

A 'local effects analysis' was also undertaken in accordance with the requirements of the NSW government's "Guidelines for the economic assessment of mining and coal seam gas projects".

Local economic effects were considered to be those that will occur in the Southern Highlands SA3 statistical area structure, which closely aligns with the Wingecarribee LGA. Here the net direct benefits of the project are expected to amount to approximately $84 million in NPV terms.

Locally, at the Wingecarribee LGA level, indirect benefits of at least $44 million in disposal income and an average 34 FTE jobs each year will be added, bringing the total direct and indirect benefits of $128 million for the local area.

ES4.15 Social impacts

The social impact assessment examined changes that are likely to occur as a result of the project. The assessment considered measures to enhance social opportunities from the project as well as measures to mitigate negative impacts during all its phases. During the planning phase, the project will create a modest increase in job opportunities and contribute to strengthening the skills base of the local workforce as a result of Hume Coal's apprenticeship and traineeship program. Investment generated from Hume Coal's Charitable Foundation will also result in improvements to community facilities and services.

The project's construction phase will provide numerous job opportunities. The potential for negative social impacts during construction will be largely eliminated by the provision of a well-managed accommodation village, which will house non-local construction workers.

The principal social consequences of the project's operations phase will be the creation of approximately 300 long-term employment positions, most of which will be filled by locals, and a substantial economic stimulus to the area from greater local expenditure. Other benefits will be skills improvements through training and continued investments in community facilities through a Voluntary Planning Agreement. During operations the project area will experience noticeable change but no impacts will be of a level that will be unacceptable, and substantial social benefits will occur.

The final closure and decommissioning phase will have net social costs. It will result in a loss of jobs and a consequent decline in economic activity. Despite this, benefits will continue as disturbed land will be rehabilitated and there will be an ongoing legacy from the project's contribution to the community during the life of the project through a Voluntary Planning Agreement.

A set of mitigation and management measures will be put in place that have been designed to address specific impacts that will coincide with each phase of the project. All of the measures will be developed and detailed in a social impact management plan, which will include periodic monitoring of the effectiveness of measures and will be revised as necessary throughout the life of the project.

The overall net outcome is that the project will be socially beneficial.

ES4.16 Aboriginal heritage

An Aboriginal cultural heritage assessment found the project's impact on Aboriginal cultural heritage values at a landscape level will be relatively small. Of the 206 sites identified in the project area, 20 sites will be disturbed to some degree by the surface infrastructure area, comprising:

- six sites of moderate significance, two of which are of higher moderate significance (HC_135 and HC_151); and
- 14 sites of low significance.

No sites of high significance will be directly impacted by the project.

Of the 20 sites to be disturbed, three will be totally disturbed, 10 partially lost and seven totally lost. Taking the negligible risk of subsidence impacts into account, it is very likely that the rest of the sites in the project area assessed as part of the Aboriginal heritage assessment will not be impacted.

The surface infrastructure facilities have been specifically designed to avoid the areas of highest archaeological sensitivity and linear project elements will only partially impact the more significant deposits. The archaeological deposits present are generally disturbed to some degree from the historic agricultural land use.

Mitigation measures have been identified to mitigate impacts to the Aboriginal sites identified within the surface infrastructure footprint of the project, including test excavation and artefact collection.

An Aboriginal Cultural Heritage Management Plan will be developed in consultation with the DP&E and the registered Aboriginal parties. It will detail the management measures for the project, including provisions for the active and passive management of Aboriginal sites, ongoing monitoring requirements and site salvage procedures.

ES4.17 Historic heritage

A total of eight historic heritage items scheduled in the Wingecarribee LEP are located, either wholly or partially, in the project area. One scheduled property occurs within the surface infrastructure area but the listed item itself (*Mereworth house and garden)* will not be directly affected and is owned by Hume Coal. The other seven items are over the underground mining area and will not be affected because only negligible subsidence will occur. In addition to the listed heritage items, there are two potential archaeological sites that (if present) may reach the threshold of "relics" (HC_127 and Mereworth 1).

The existing house at *Mereworth* was built in 1965. It is a two-storey brick building with outbuildings, and is accessed by a long driveway lined with conifers and golden elms ending at a porte-cochere. The house was not fit for occupation at time of its purchase by Hume Coal due to its state of disrepair, and remains so, although ongoing repairs and maintenance are now being made. The house is vacant and the gardens are being maintained by professional horticulturalists engaged by Hume Coal.

The design of the project avoids physical impacts to the majority of the heritage items, with the exception of part of the broader property of Mereworth, where the main surface infrastructure area will be located. However, the actual house and garden of Mereworth will not be subject to physical impacts, nor will any significant heritage structures in the project area be affected.

A conservation management plan will be prepared and implemented for *Mereworth House and Garden*. The plan will record the significance of the house site in more detail than is presently available and will identify areas that require immediate repairs which will guide maintenance and management of the property, leading to a positive transformation.

ES5 Justification and conclusion

The project is justified on economic, social and environmental grounds. This is demonstrated by its consistency with key objects of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project will enable development of a valuable, publically owned natural resource – the Wongawilli Seam coal. At the same time, valuable environmental and cultural resources will be managed effectively and protected. When the economic and social benefits of the project are also taken into account, it is evident that community welfare will increase. This means the project will achieve "proper management, development and conservation of resources ... and promote social and economic welfare", in accordance with the first object of the EP&A Act.

The mine will produce both metallurgical and thermal coal, extracting around 50 Mt of run-of-mine coal over its life and approximately 39 Mt of saleable coal. Metallurgical coal is one of the two primary ingredients used to make iron for steel, the other being iron ore. Steel is an essential engineering and construction material used in most industry sectors and is a basic component of many materials and structures people use everywhere and every day. The global demand for steel has grown substantially and is forecast to increase even further in the future. The World Steel Association estimates that demand will grow by 50% above current levels by 2050 (World Steel Association 2015). Global annual per capita steel use increased from 150 kg in 2001 to 217 kg in 2014. This occurred despite the development of stronger steel alloys that reduced the volume of steel needed to manufacture individual structures.Thermal coal is used to generate electricity. Electricity is fundamental for peoples' daily lives as their main source of energy for heating, cooling, lighting, mobility, communications and industry.

The project's design adopts leading practice and avoids most potential environmental impacts. Where unavoidable (or residual) impacts occur, they will be effectively managed to meet the applicable regulatory standards. The project's design and proposed management procedures are based on a comprehensive understanding of environmental conditions in and around the project area, substantiated by the results of baseline monitoring undertaken since 2011. The design avoids threats of serious or irreversible environmental damage. The project will also achieve inter-generational equity by transforming natural capital (coal) into economic and social capital, in the form of greater income and employment, and material capital, in the form of steel and other products that are essential for everyday life. The project is, therefore, consistent with the principles of ecologically sustainable development.

For the reasons given above the project will serve the public interest.

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Part A

The Project

1 Introduction

1.1 Background

Hume Coal Pty Limited (Hume Coal) is seeking development consent to construct and operate the Hume Coal Project (the project), an underground coal mine and associated mine infrastructure in the Southern Coalfield of New South Wales (NSW). Figure 1.1 illustrates the location of the project at a regional scale.

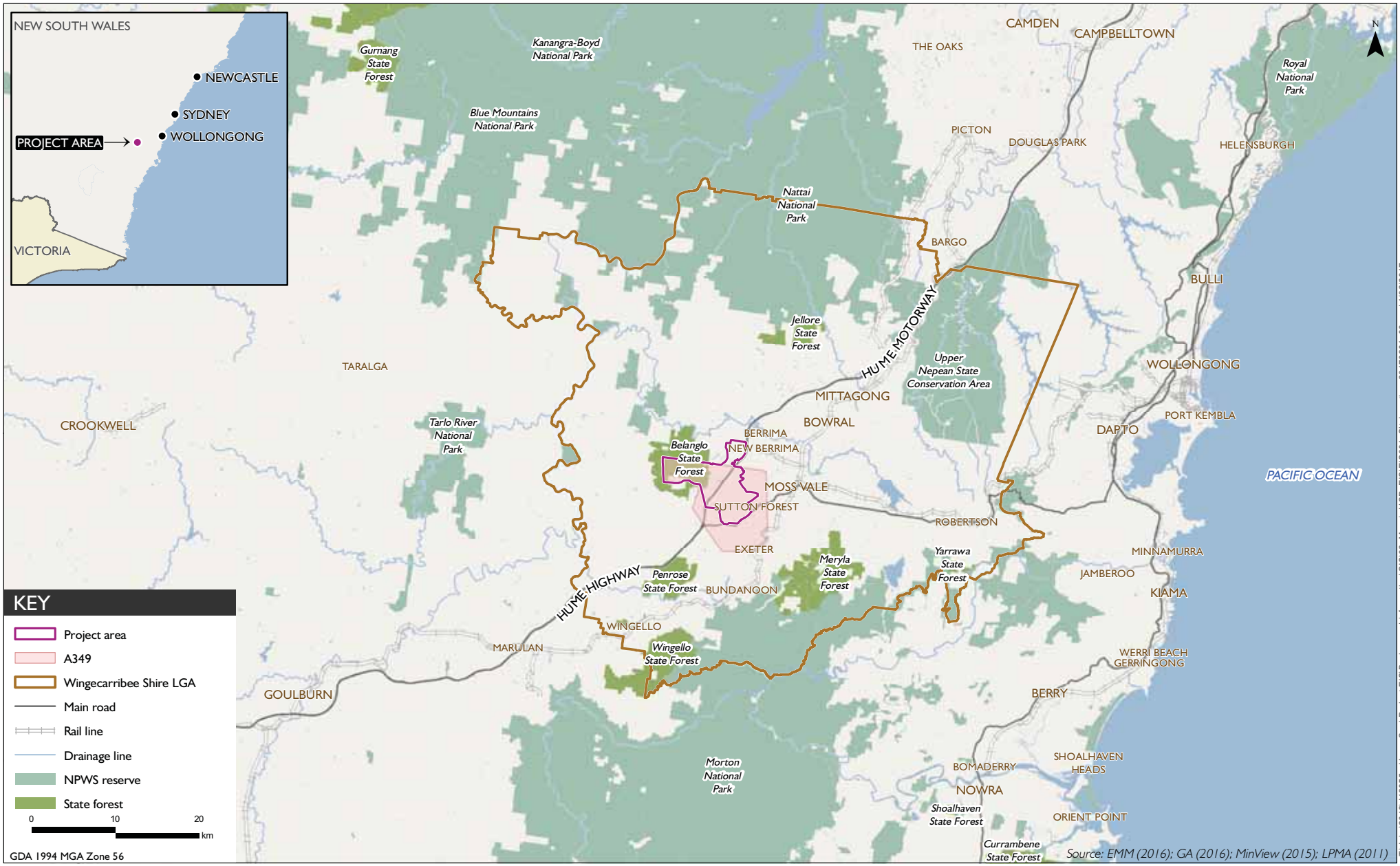
Hume Coal holds exploration Authorisation 349 (A349) located to the west of Moss Vale, in the Wingecarribee local government area (LGA). A349 covers approximately 8,900 hectares (ha), although mining is not proposed across its full extent. The proposed underground mining area is approximately 3,474 ha. The project area boundary is illustrated in Figure 1.2, and covers the combined Mining Lease Application (MLA) areas for the project that have been submitted under the NSW *Mining Act 1992*, (MLA 527, MLA 528 and MLA 529), as well as the parts of the project that do not require a mining lease. The project area is therefore larger than the combined MLA area.

The Southern Highlands has a long history of coal mining, with coal exploration and mining occurring since the 19th century. There are two short adits in the north western part of A349, in the valley of Longacre Creek, indicating historical mining activity there. Murrimba Colliery and Belanglo Extended Colliery operated from adits near Black Bobs Creek just to the west of A349, with Murrimba Colliery closing in the 1970s. The Southern Colliery also operated in the 1950s and 1960s near Canyonleigh, south-west of A349. To the north, the Wongawilli Seam was mined at Loch Catherine from 1923 until the 1950s, and the Wongawilli Seam was mined at Berrima Colliery until 2013. The Berrima Colliery mining lease (CCL748) lies immediately north of A349.

Today, the mining leases associated with Dendrobium and Wongawilli Collieries extend into the north-west of the Wingecarribee LGA, with Dendrobium extracting longwall panels within the shire.

Hume Coal acquired A349 from Anglo Coal in December 2010, and commenced exploration drilling in May 2011. Since this time the project has been developed following detailed geological, engineering, environmental, financial and other technical investigations to define the reserve and resource and to identify and address environmental and other constraints. Numerous alternative designs have been prepared and evaluated, as discussed in detail in Chapter 6. This process has allowed a well-considered, practical and economic project to be designed that will efficiently recover resources, while minimising environmental impacts and potential land use conflicts, and delivering socio-economic benefits to the local and broader communities.

The project incorporates leading practice innovations, some of which set a new benchmark for underground coal mining in NSW. For example, the rail wagons that will transport product coal will be covered, both when full of coal and on the return route when empty. All coal reject material (the stone that is separated out of the coal during processing) will be returned underground to partially backfill the mined-out void, reducing potential visual and other environmental impacts that could be associated with a permanent surface emplacement area. A first-workings mining system will be used which leaves pillars of coal in place so that the overlying strata is supported, rather than collapsing into the mined-out void, and therefore surface subsidence impacts will be negligible. By minimising disruption to the overlying strata, associated groundwater impacts will also be minimised.



Regional context

Hume Coal Project

Environmental Impact Statement

Figure 1.1