BENGALLA Mining Company

Continuation of Bengalla Mine

Environmental Impact Statement

September 2013

Volume 1 Main Report

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

BENGALLA

BENGALLA Mining Company

Continuation of Bengalla Mine
Environmental Impact Statement

September 2013

1

Volume 1
- EIS Statement
- Executive Summary
- Tables of Contents
- 1 Introduction
- 2 Existing Environment
- 3 Approved Operations
- 4 The Project
- 5 Regulatory Framework
- 6 Stakeholder Engagement
- 7 Risk Assessment
- 8 Impacts, Management and Mitigation
- 9 Management and Monitoring Summary
- 10 Project Justification
- 11 Abbreviations
- 12 References
- 13 Study Team

Volume 2
- A Existing Development Consent
- B Schedule of Land to which this EIS Applies
- C Detailed Design Drawings
- D Regulatory Correspondence
- E Stakeholder Engagement
- F Revised Environmental Risk Assessment
- G Air Quality and Greenhouse Gas Impact Assessment

Volume 3
- H Acoustic Impact Assessment
- I Visual Impact Assessment
- J Surface Water Impact Assessment
- K Groundwater Impact Assessment

Volume 4
- L Geochemical Impact Assessment
- M Aboriginal Archaeology and Cultural Heritage Impact Assessment
- N Historic Heritage Impact Assessment

Volume 5
- O Ecological Impact Assessment

Volume 6
- P Stygofauna Assessment
- Q Traffic and Transport Impact Assessment
- R Social Impact Assessment
- S Economic Impact Assessment
- T Preliminary Hazards Analysis
- U Contamination Assessment
- V Soils and Land Capability Impact Assessment
- W Agricultural Impact Statement
- X Dry Creek Interim Management System and Conceptual Re-instatement Study

BENGALLA Mining Company

EIS Statement

EIS Statement

Submission of Environmental Impact Statement (EIS)
Under Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

EIS Prepared by	
Name	James Bailey
Qualifications	B. Natural Resources, MBA
Address	Hansen Bailey PO Box 473 SINGLETON NSW 2330
In Respect of	Continuation of Bengalla Mine Project
Proponent Name	Bengalla Mining Company Pty Limited
Proponent Address	LMB 5 MUSWELLBROOK NSW 2333
Land to be Developed	See **Appendix B** of this EIS.
Proposed Development	Development and operation of the Continuation of Bengalla Mine Project and associated activities as outlined in **Section 4** of this EIS.
Environmental Impact Statement	An Environmental Impact Statement for the Project is attached.
Certification	I certify that I have read and am aware of the terms of the Expert Witness Code of the Land and Environment Court of NSW. I further certify that I have prepared the contents of this EIS and to the best of my knowledge: • It is in accordance with Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*; • Meets the form and content requirements of Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*; • It contains all available information that is relevant to this EIS for the activity to which the Statement relates; and • The information contained in the statement is neither false nor misleading.
Signature	
Name	James Bailey, Director
Date	September 2013

BENGALLA Mining Company

Executive Summary

Executive Summary

Introduction

Bengalla Mining Company operates the existing Bengalla Mine. Bengalla Mine is generally bounded by Wybong Road to the north, Roxburgh Road to the west, Overton Road to the east, and the Muswellbrook-Ulan Rail Line to the south.

Bengalla Mining Company was granted Development Consent (DA 211/93) in 1995 by the then Minister for Urban Affairs and Planning. This consent authorised the construction and operation of a surface coal mine, coal preparation plant, rail loop, loading facilities and other associated infrastructure. The application for DA 211/93 was supported by the *Environmental Impact Statement for Bengalla Coal Mine (1997)* under which mining operations commenced in 1998.

The original consent allowed Bengalla Mining Company to extract up to 8.7 million tonnes per annum of Run of Mine coal for a period of 21 years. The *Environmental Impact Statement for Bengalla Coal Mine* recognised that significant coal reserves continued west beyond the 21 year mining extent:

> "The coal reserves continue to the west of the limit of excavation, and beyond the edge of the Authorisation area. It is anticipated that these reserves will be mined by open cut methods in the future, subject to appropriate approvals".

As part of its ongoing commitment to future operations at Bengalla Mine and long term investment in the Upper Hunter region, Bengalla Mining Company has completed detailed scoping and feasibility studies to facilitate the continuation of mining to the west of the existing operations.

Additional resources are known to occur to the west of the area assessed in this Environmental Impact Statement and it is Bengalla Mining Company's intention to seek further approvals in this regard in the future subject to additional approvals and favourable market conditions.

Bengalla Mining Company is seeking a new Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* to enable mining to continue for an additional 24 years at a maximum production rate up to 15 Million tonnes per annum of Run of Mine coal to a total of 316 Million tonnes Run of Mine coal (the Project). Under the Project, mining would continue in a westerly direction, but will remain on lands within mining authorisations (currently held by Bengalla Mining Company or another mining company to be transferred).

This Project will ensure the ongoing employment of the existing workforce for up to a further 24 years while maximising the recovery of a high quality, and well known, coal resource. The Project will provide a significant financial contribution to the Commonwealth and New South Wales State Government in the form of company taxes and royalties.

Existing Environment

Regional Setting

The Project is located within the Muswellbrook Local Government Area in the Upper Hunter region of New South Wales. The dominant land uses in the region are coal mining, power generation and agriculture. The Hunter River is the major watercourse in the area and performs an important role in supporting the region's populations and industries.

Located 4 kilometres to the east of the Project is the township of Muswellbrook. To the north of the Project are the approved Mount Pleasant Project and the Dartbrook Mine. Neither of these developments are currently operational.

To the south-east are the operational Mt Arthur Coal Mine, Drayton Mine and Bayswater Power Station. The township of Denman is located approximately 15 kilometres to the south-west. To the west of the Project is the Xstrata Mangoola Coal Mine along with rural residential and rural properties.

Topography

The land within the Project Boundary is generally undulating and slopes downwards towards the Hunter River to the south. The Hunter River alluvial floodplain is situated within the eastern and southern extents of the Project Boundary largely adjacent to the existing rail loop.

In the eastern part of the Project Boundary, the Overton Ridge naturally reaches an elevation of 188 metres Australian Height Datum. To the south of Overton Ridge are the lower hillslopes, which range in elevation from 250 metres Australian Height Datum to 134 metres Australian Height Datum near the Hunter River. The area within the Project Boundary predominantly contains slopes of gentle gradients.

Catchments

The Project is located within the Hunter River catchment, which has a total area of approximately 4,300 square kilometres to Muswellbrook. The main channel of the Hunter River varies in width from 50 metres to 100 metres, whereas the alluvial floodplain is approximately 2 kilometres wide and passes directly to the south of the existing Bengalla Mine. Consequently, the catchment within the Project Boundary drains in a south and south-easterly direction. The local drainage network generally consists of relatively steep gullies draining from the surrounding hills into flat, meandering tributaries across the Hunter River floodplain.

Located within the Project Boundary is the 3rd order ephemeral stream, Dry Creek. Dry Creek flows generally southwards through the central portion of the Project Boundary before joining into the Hunter River to the south-west of Bengalla Mine. Due to its relatively small catchment area of approximately 18 square kilometres, Dry Creek often maintains zero flow which is interrupted sporadically by short periods of discharge during prolonged or heavy rainfall.

Land Use

The Upper Hunter region has a long history of rural land use for a variety of agricultural and industrial activities, predominantly grazing and coal mining. The dominant land uses within and immediately adjacent to the Project Boundary include open cut coal mining and industrial activities, agriculture, rural residential and rural areas. The Hunter River is south of the Project Boundary and plays an important role in the region's mining, power generation and agricultural enterprises. Bengalla Mining Company owns 3,200 hectares of land within and surrounding the Project Boundary of which the Approved Bengalla Mine accounts for 974 hectares. The remainder of Bengalla Mining Company's land is licensed to operators for a variety of agricultural enterprises. The agricultural land within the Project Boundary currently is used primarily for cattle grazing. Bengalla Mining Company's landholdings outside of the Project Boundary are used for dairying, thoroughbred breeding, cattle grazing and lucerne hay production.

The Mount Pleasant Project is wholly owned by Coal & Allied and located to the immediate north of the Project Boundary. The Mount Pleasant Project has approval for the construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities at a production rate of up to 10.5 Million tonnes per annum of Run of Mine coal to 2020. No coal mining has occurred at the site to date.

Approximately 2 kilometres to the south, BHP Billiton's Mt Arthur Coal Mine operates an approved open cut and underground coal mine at up to 36 Million tonnes per annum Run of Mine from the Mt Arthur Complex. Open cut and underground operations are approved to continue until 2022 and 2030 respectively. The Xstrata Mangoola Coal Mine is located 6 kilometres west of the Project. Xstrata Mangoola Coal Mine was granted approval in June 2007 for the construction of an open cut coal mine and associated infrastructure to 2029.

Various potential interactions may occur between the Project and other coal mining operations including operational controls and water management infrastructure. In order to address potential cumulative issues associated with the Project and adjacent operations, it has been assumed that further approvals will be granted to enable operations to continue beyond current approval limits. This assumption is intended to represent a potential 'worst case' scenario with consideration of potential cumulative environmental impacts in relation to (at least) air quality, noise and traffic impacts.

Bengalla Mining Company has consulted with neighbouring operations with a potential for cumulative impacts with the Project and incorporated findings in this Environmental Impact Statement.

The Project is located within lands that have been largely disturbed by previous agricultural activities, particularly cultivation and grazing. Agriculture has been conducted in the vicinity of the Project since European settlement of the Muswellbrook area in 1824. As a result of extensive agriculture, the landscape in the area typically consists of grassland interspersed with small woodland remnants.

Bengalla Mining Company has operated adjacent to neighbouring agricultural enterprises since its approval in 1995. Approximately 2,200 hectares of the land not required for mining is currently being used for agricultural purposes including dairying, cattle production and horse stud industries. Bengalla Mining Company has made a commitment to maintain the agricultural productivity of its land holdings which it has done since 1995. Bengalla Mining Company has established lease agreements with third parties for the management of three dairy farms and the Bengalla Stud. There are also a variety of agricultural enterprises adjacent to the Project Boundary including grazing, dairying, equine industries, viticulture and olive groves.

There are no State Forests within 50 kilometres of the Project. There are no National Parks in close proximity to Bengalla Mine, with the closest being 22 kilometres east of the Project.

Land Ownership

The land surrounding the Project is largely dominated by mine owned land for various current or proposed mining operations. All of the land within the Project Boundary is owned by Bengalla Mining Company, with the exception of three lots owned by Coal & Allied (for the Mount Pleasant Project). Coal & Allied also owns a large area of land to the north of Bengalla Mine. The land to the south of the Hunter River is held by BHP Billiton for the Mt Arthur Coal Complex.

Xstrata Mangoola Coal Mine occupies a significant area of land to the west of the Project. Located between the Project Boundary and the Xstrata Mangoola Coal Mine is Idemitsu Australia Resources Pty Ltd Assessment Lease 19 associated with the West Muswellbrook Project. Several lots within the Assessment Lease 19 are owned by Idemitsu Australia Resources Pty Ltd.

The land between Bengalla Mine and Xstrata Mangoola Coal Mine is comprised of privately owned rural residential properties. Private landholders in the vicinity of the Project are generally concentrated along Roxburgh Road and Wybong Road. Additional private residences are located on Denman Road to the south-west and east of the Project Boundary area, near the Muswellbrook Racecourse area.

Climate

The Upper Hunter region experiences a warm temperate climate, characterised by seasonal variations of hot, wet summers and mild, dry winters. In the winter months, high pressure systems alternate with cold fronts, combining to produce cool, dry conditions. Frosts and fog are prevalent in the cooler, drier months from mid-autumn to late spring. The warm and dry conditions during the summer months are produced by synoptic high pressure systems over the Great Australian Bight. Synoptic low pressure systems occur intermittently during summer, resulting in periods of heavy rain and thunderstorms.

The temperatures recorded at Jerrys Plains establish that the Upper Hunter region experiences warm temperatures during the summer and very cool temperatures during the winter. January is the warmest month, averaging a daily maximum temperature of 31.7 degress Celsius July is the coolest month of the year, with a mean daily maximum temperature of 17.4 degress Celsius and a mean daily minimum temperature of 3.8 degress Celsius.

In the Upper Hunter region, rainfall is substantially higher in the summer than in the winter. The monthly rainfall measured at Jerrys Plains varies from 36.5 mm in August to 76.8 mm in January.

A direct correlation exists between higher temperatures, afternoon winds and evaporation. Accordingly, evaporation rates are highest in the summer. In the Upper Hunter region, the evaporation rate substantially exceeds the rainfall.

The wind directions have remained consistent in recent years, with winds prevailing from the south-east during summer and from the north-west during winter. Maximum wind speeds are generally greater in the summer than in the winter. In 2011, February and September recorded the strongest winds, with a mean maximum wind speed of 11 metres per second.

Geology

Bengalla Mine is situated in the north-west of the Hunter Coalfield, a division of the Sydney Basin on the western limb of the north-south trending Muswellbrook Anticline. As a result, coal seams subcrop near the eastern extent of the Project Boundary and dip to the west at approximately 8 degrees near subcrop, decreasing to 2-3 degrees at greater depths.

The stratigraphic sequence across the site is comprised of the late Permian Whittingham Coal Measures. The Whittingham Coal Measures are up to 800 metres thick and consist of sandstone, siltstone, claystone, conglomerate and tuff, within which intermittent coal seams exist. The target coal seams for the Project are located within the Jerrys Plains and Vane Subgroups of the Whittingham Coal Measures. The Permian coal measures are overlain by thin Quaternary alluvial deposits. Quaternary alluvial deposits consist of sand and gravel along creek valleys and in the alluvial floodplain of the Hunter River.

Exploration

Since the grant of Authorisation 438 in February 1991, Bengalla Mining Company has undertaken numerous exploration programs to define the coal deposit at Bengalla Mine. Detailed exploration drilling was conducted from May 1991 to October 1992 to obtain structural, lithological and coal quality data. Partially cored holes were drilled to obtain a sample for pilot-scale washing and combustion testing with extensive drilling of shallow open holes in 1996-1997 and 2002 to define the limits of oxidation for the coal seams and further define the Warkworth and Piercefield seams. Cored holes were drilled to obtain samples for spontaneous combustion testing in 2007. Samples of fresh and oxidised coal were collected for the testing.

Recent exploration drilling during 2011 and 2012 has been conducted for the purpose of defining seam geology, structure and quality within Assessment Lease 13 immediately to the west of the Approved Bengalla Mine. The Assessment Lease 13 exploration drilling program comprised of 25 boreholes totalling 5,683 metres with an additional five fully cored diamond drilled boreholes totalling 1,206 metres. All boreholes targeted the Edderton seam, which occurs at a depth of approximately 220-250 metres and is the basal seam (in sections) for the Project.

Faulting and igneous intrusions have not had a significant influence on Bengalla Mine's design, although they do have localised impacts on scheduling, wall stability, groundwater and coal quality. Most faults are high angle normal faults trending in a westerly to north-westerly direction. Narrow, north north-westerly trending dykes have previously been encountered within the Project Boundary.

Deposit Utilisation

Exploration drilling and preliminary studies have identified a significant quantity of in situ coal that is amenable to open cut mining. From this inventory, mine planning has indicated the potential for extraction of 316 Million tonnes of ROM coal associated with the Project mine plans. The primary seams that may be mined are the Warkworth, Mt Arthur, Piercefield, Vaux, Broonie, Bayswater, Wynn and Edderton seams. An additional 63 Million tonnes of Run of Mine coal is present within the Edinglassie seam, which underlies the Edderton seam. The Edinglassie seam is currently not economic to mine by open cut methods and has therefore been excluded from the open cut mine plan for the Project.

Approved Operations

Bengalla Mining Company operates the Bengalla Mine in accordance with DA 211/93 (as modified) which extracts up to 10.7 Million tonnes per year of Run of Mine coal generally progressing from east to west with approval to operate to 2017.

The dragline and excavator mining method is supported by a truck fleet and full time equivalent workforce of 400. Progressive rehabilitation occurs generally from east to west to an approved overburden emplacement height of Reduced Level 270 metres.

Coal is processed via the existing Coal Handling and Preparation Plant which utilises two-stage washing with rejects co-disposed in overburden emplacement areas. Product is transported predominantly to the export market via the dedicated rail loop and loading facilities. Bathhouse and administration buildings and other coal mining related facilities also exist at the site. Bengalla Mining Company also constructed the Bengalla Link Road.

Bengalla Mining Company holds various licences and leases additional to DA 211/93 under which Bengalla Mine is operated. An industry leading and comprehensive Real Time Environmental Monitoring System and static monitoring system has been in place at Bengalla Mine since 1999 which includes surface water, groundwater, blast, air quality and noise.

Operations at Bengalla Mine are conducted in accordance with the Bengalla Environmental Management System, which is certified to International Standards Organisation 14001 standards. The Bengalla Environmental Management System was certified in 1997, making Bengalla Mine the first coal mining operation in the world to achieve this level of accreditation.

Bengalla Mining Company also operates in accordance with the Rio Tinto Coal Australia Health, Safety, Environment and Quality Management System which provides a framework for health, safety and environment standards and quality reporting requirements. This system ensures all operations work uniformly within internationally recognised frameworks, such as International Standards Organisation 14001, Australian Standard 4801 and meet various certifications, as well as internal and external reporting requirements.

The Project

Bengalla Mining Company is seeking Development Consent to facilitate the continuation of open cut coal mining for 24 years largely within current mining authorities and within the Project Boundary to facilitate:

- Open cut mining towards the west at a rate of up to 15 Million tonnes per annum to a total of 316 Million tonnes Run of Mine coal;
- Continued use of the existing dragline, truck fleet and excavator fleet (with progressive replacement or substitution with equivalent equipment);
- An out of mining area Overburden Emplacement Area to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining;
- Continued use, extension or relocation to existing infrastructure, including administration and parking facilities, in-mining area facilities (including dragline shut down and erection pad), helipad, tyre laydown area, explosives and reload storage facility, core shed workshop, roads, reject bin, Run of Mine Hopper, stockpiles, conveyors, water management infrastructure, supporting power infrastructure rail and rail loading infrastructure and ancillary infrastructure;
- Construction and use of various items of new infrastructure (including radio tower, extensions to the Main Infrastructure Area and associated water reticulation infrastructure, additional Raw coal stockpile and upgrade to the Run of Mine coal stockpile (along with associated conveyor network) generally as shown on the infrastructure plans and construction of the Mount Pleasant Staged Discharge Dam;
- Processing, handling and transportation of coal via the (upgraded) Coal Handling and Preparation Plant and rail loop for export and domestic sale;
- Continued rejects and tailings co-disposal in the Main Overburden Emplacement Area and temporary in mining area reject emplacement;
- Relocation of a 6 kilometre section of Bengalla Link Road at approximately Year 15 near the existing mine access road to facilitate coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Staged Discharge Dam and raw water dam); and
- A workforce of approximately 900 full time equivalent personnel (plus contractors) at peak production.

Regulatory Framework

The Project is defined as development "for the purpose of mining that is 'coal mining'", as listed under Clause 5 of Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011*. Development for the purposes of mining is not permissible without Development Consent on the land within the Project Boundary. As such, the Project is declared a State Significant Development and will be subject to the provisions of Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979*.

The Project is located entirely within the Muswellbrook Local Government Area. The majority (66 percent) of the land within the Project Boundary is zoned as "RU1 Primary Production" under the *Muswellbrook Local Environment Plan 2009*. The majority of the remaining land is zoned as "E3 Environmental Management" with lesser amount of land zoned "SP2 Rail Infrastructure Facilities". Clause 5 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)* 2007 states that where there is an inconsistency with another environmental planning instrument, the provisions of the State Environmental Planning Policy will prevail. As such, the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* overrides the *Muswellbrook Local Environment Plan 2009*, which results in mining and associated activities being permissible in Zone E3 (Environmental Management) and therefore on all land within the Project Boundary.

In accordance with Clause 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, Bengalla Mining Company made a request for Director-General's Requirements on 17 February 2012. Following consultation with the relevant government agencies, the Director-General of the Department of Planning and Infrastructure issued Director-General's Requirements for the Project on 13 March 2012.

The Project will seek as required, relevant approvals under New South Wales legislation not exempt by Section 89J under Division 4.1 of Part 4 of the *Environmental Planning & Assessment Act 1979*.

The Project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities on 31 March 2012. The Minister for Sustainability, Environment, Water, Population and Communities declared the Project to be a 'controlled action' on 7 June 2012 due to its potential impact on threatened species and communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*. As such, the Project will subsequently require assessment under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Department of Sustainability, Environment, Water, Population and Communities accredited the assessment process under the *Environmental Planning and Assessment Act 1979*. The Department of Sustainability, Environment, Water, Population and Communities's assessment requirements were provided to the Director-General of the Department of Planning and Infrastructure who included them in the supplementary Director-General's Requirements for the Project which were subsequently received on 12 July 2012.

Stakeholder Engagement

Bengalla Mining Company has conducted effective stakeholder engagement programs for Bengalla Mine since its initial exploration licence was granted in 1991. Since the approval of Bengalla Mine, Bengalla Mining Company has continued to enhance its stakeholder engagement program. The Bengalla Mining Company Community Consultative Committee meets at least quarterly to provide a forum for open discussion between the community, Muswellbrook Shire Council, relevant government agencies and Bengalla Mining Company representatives.

Bengalla Mining Company recognises the importance of the Upper Hunter community to its mining operation and values the relationship it has developed. This relationship has been strengthened throughout the years due to Bengalla Mining Company's efforts to be more than just a major source of local employment and economic growth.

Bengalla Mining Company has worked in partnership with the local community contributing to provide positive long term outcomes for the Hunter Valley region. Since operations commenced in 1998, Bengalla Mining Company has directly contributed over $700,000 to community based sponsorship programs.

Bengalla Mining Company has provided significant annual funding and employment commitments as part of the existing Voluntary Planning Agreement with Muswellbrook Shire Council which provides annual funding of $400,000 for the Bengalla Coal Community Fund, $125,000 for Council Roads Maintenance Fund, $15,000 for Council Environmental Officer and the engagement of four apprentices.

Bengalla Mining Company will also contribute $50,000 to Muswellbrook Shire Council's revised 'Mine Affected Roads Strategy' which shall review the effectiveness of the road network in consideration of other industry in the vicinity of Bengalla Mine.

Bengalla Mining Company also participates in the Coal & Allied Community Development Fund to support communities in the Hunter Valley to build community capacity, address development challenges and take advantage of emerging opportunities.

In partnership with the Upper Hunter Valley Aboriginal Community, as part of Coal & Allied, Bengalla Mining Company contributes to the Coal & Allied Aboriginal Community Development Fund investing more than $3.05 Million in education, training, community and business development projects benefiting the Hunter Valley Aboriginal community since its inception.

A range of stakeholders were identified to be consulted in relation to the Project based on Bengalla Mining Company's existing stakeholder relationships and a review of existing databases developed during the preparation of previous modifications. Consultation occurred with various Local, State and Commonwealth government agencies to provide an understanding of the Project and some key findings of the technical studies.

Environmental Impact Statement Project briefings were offered to neighbouring land owners and the wider local community via telephone, personal letters (for neighbouring land owners) and community newsletters. Near neighbours were provided a personal letter outlining the details of the Project and extending an invitation to attend one of the upcoming Project community information sessions. Advertised, specific community information sessions were in Muswellbrook each Thursday in March 2012. The information sessions were designed to provide a Project Team member to which members of the community would find more readily accessible to meet and discuss the Project. In total, nine people attended the information sessions where they had the opportunity to meet and discuss potential concerns with Project personnel.

Six newsletters were distributed in relation to the Project from November 2011 to May 2013 to near neighbours, regulators and other interest parties, with two distributed to over 8,500 residents in the Muswellbrook area. On 27 October 2012, Bengalla Mining Company conducted the biannual Bengalla Community Open Day. Members from the Project Team were present on the day and established an information stall to present the key components of the Project to interested community members including the Project description, Environmental Impact Statement preparation and timing along with potential environmental, social and economic impacts of the Project.

Aboriginal community consultation for the Project was conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* with 30 Aboriginal organisations registering an interest and participating throughout the process.

Impacts, Management and Mitigation

A risk assessment was undertaken to identify potential environmental and socio-economic issues associated with the Project. The purpose of the risk assessment process was to prioritise and focus the required assessments for the Project in consideration of the Director-General's Requirements and the findings from the stakeholder engagement program. Key findings from the environmental and socio-economic impact assessments are discussed below.

Air Quality

An Air Quality Impact Assessment was undertaken by Todoroski Air Sciences to predict the air quality impacts on receptors in the vicinity of the Project and to recommend measures to account for these impacts. In total, the Project is predicted to impact four private receptors (Receptors 106, 110S, 110N and 156S) and five private properties (109 and 245/246/249/250) above relevant air quality criteria excluding those that are currently entitled to acquisition by other mining companies.

The cumulative annual average Particulate Matter up to 10 micrometers in size criterion (30 micrometers per metre cubed) is predicted to be exceeded at three privately owned receptors 106, 110N and 110S (in addition to 13 currently entitled to acquisition by other mining companies). In addition, there are six properties owned by three landholders which do not have a residence (111, 109 and 245/246/249/250) where more than 25 percent of the property area is predicted to experience exceedances of relevant criterion.

The maximum 24-hour average Particulate Matter up to 10 micrometers in size criterion (50 micrometers per metre cubed) is predicted to exceed relevant criteria at least one day per year under worst case weather conditions at six private receptors (29, 156S, 161, 222, 230 and 286) in addition to those which are currently entitled to acquisition by other mining companies. Of these six receivers, only receptor 156S is expected to experience Project alone exceedances on more than five days in any year.

There are not predicted to be any exceedances of the annual average total suspended particulates and dust deposition criteria at private receiver, excluding receptors which currently have a right to acquisition upon request. Similarly, there are not predicted to be any exceedances of the advisory reporting standards for Particulate Matter less than 2.5 micrometres in size.

The assessment determined that air quality impacts caused by construction activities would be short and sporadic, and that the total dust generated by construction is minor compared to operational dust emissions. As a result, construction activities are not expected to cause any discernible impacts above the predicted operational impacts.

Impacts arising from the transportation of coal by rail were assessed by predicting Total Suspended Particulates and Particulate Matter up to 10 micrometers in size concentrations at a distance of 50 metres from the rail line. In rural areas and urban areas, the 24-hour average Total Suspended Particulates and Particulate Matter up to 10 micrometers in size concentrations are predicted to be well below levels known to cause adverse impacts on human health and amenity.

A cumulative sensitivity analysis was completed to consider the Mt Arthur Coal and Xstrata Mangoola Coal Mine's recently submitted modifications to their respective approvals. This analysis confirmed that there are no additional private receptors predicted to be impacted as a result of the Project and currently proposed modifications beyond New South Wales Government amenity guidelines (that are not already located within an existing zone of affectation).

The New South Wales Office of Environment and Heritage's contemporaneous assessment method was applied to examine the potential maximum total (cumulative) 24-hour average Particulate Matter up to 10 micrometers in size impacts for the Project. The results indicate that systemic exceedances (greater than five days of exceedance per year) of the maximum 24-hour average Particulate Matter up to 10 micrometers in size criterion are predicted to occur at one private additional receptor in Year 24 of the Project.

There are currently no criteria applicable for Particulate Matter less than 2.5 micrometres in size particulate impact assessment in New South Wales, however there are National Environmental Protection Measure advisory reporting standards that apply to the exposure of the population as a whole, as assessed by monitoring at suitable 'National Environmental Protection Measure' performance monitoring sites. An assessment of approximate levels of Particulate Matter less than 2.5 micrometres in size that are predicted to occur as a result of the Project has been determined. An examination of the predicted Particulate Matter less than 2.5 micrometres in size levels for the Project shows the total predicted contributions from the Project are predicted to be within the National Environmental Protection Measure reporting standards.

Bengalla Mining Company will update the existing Air Quality and Greenhouse Gas Management Plan in consultation with the relevant regulators and shall include all reasonable and feasible mitigation measures to minimise air quality impacts. Bengalla Mining Company will continue to operate its air quality monitoring network, including real time dust monitors and a meteorology station. The existing dust and blast management systems will be upgraded with a real time air quality management system combined with predictive meteorological forecasting

Greenhouse Gas

Todoroski Air Sciences conducted a Greenhouse Gas Impact Assessment, which identified the main sources of greenhouse gas emissions. The main sources include diesel usage, explosives usage, electricity consumption, fugitive emissions of carbon dioxide and methane, and the transportation and end use of product coal.

The Project is predicted to generate an average of 0.77 Million tonnes Carbon Dioxide equivalent of Scope 1 and Scope 2 emissions per year. In 2010, the greenhouse gas emissions for Australia totalled an estimated 543 Million tonnes Carbon Dioxide equivalent. The Scope 1 and Scope 2 emissions for the Project represent approximately 0.14 percent of Australia's total greenhouse gas emissions as at 2010.

The Australian Government has proposed the implementation of carbon pricing mechanisms, which will impose a fixed price on greenhouse gas emissions. The mechanism will not impose a cap on greenhouse gas emissions from individual facilities or from Australia as a whole. It is expected that the Project will exceed the threshold of 25,000 tonnes CO_{2-e} per year. As a result, the predicted annual average Scope 1 greenhouse gas emissions from the Project of 693,715 tonnes Carbon Dioxide equivalent will be subject to the carbon pricing mechanism.

Bengalla Mining Company will implement all reasonable and feasible measures to reduce fuel and electricity usage. These measures will be included in the updated Air Quality and Greenhouse Gas Management Plan.

Noise

An Acoustic Impact Assessment was undertaken by Bridges Acoustics. It included an assessment of the noise impacts resulting from the Project. The noise levels generated by the Project during the operational phase were assessed using the intrusiveness criteria.

Significant noise impacts (greater than 5 decibels above the intrusive criteria) are predicted to occur at six private receptors (110N, 152, 153, 154, 156E and 156S) owned by five landowners that are not currently subject to acquisition by other mining companies, upon the request of the landowner.

An additional 11 private receptors (105, 106, 108, 110S, 126N, 146, 156W, 161, 186N, 180 and 184) owned by nine landowners would be moderately affected (between 2 and 5 decibels above the intrusive criteria) by the Project under a worst-case noise modeling scenario. In total, 12 private receptors have been predicted to experience mild noise impacts (between 1 and 2 decibels above the intrusive criteria) from the Project.

Cumulative noise levels generated by the Project and other sources were assessed to the amenity criteria. Although the Project will contribute to cumulative noise impacts at some receivers, there are not predicted to be any cumulative exceedances of the amenity criteria at any private receiver.

There are two additional properties (111 and 211) predicted to experience a significant noise impact from the Project in one or more modelled years over more than 25 percent of vacant land in contiguous landownership that are not currently subject to acquisition by another mining company on request.

An additional four properties (receptor 109, 121/125 and 167) owned by three landholders would also be moderately affected by noise over more than 25 percent in contiguous landownership. A further three properties (99/100 and 101) owned by two landholders are predicted to be mildly affected by noise over more than 25 percent of contiguous landownership. All other private receptors and properties are predicted to receive noise levels within intrusive criteria.

The modeled noise contours for construction activities indicate there are no additional receptors significantly or moderately affected by construction noise levels more than 10 dBA above the noise criteria under prevailing weather conditions.

The existing background road traffic noise levels along Denman Road (including within the township of Muswellbrook) are presently above relevant criteria at some residences and will not increase materially as a result of the Project. The maximum predicted increase in road traffic noise is 1.8 decibel (A-weighted) during the construction phase and 1.5 decibel (A-weighted) during the operational phase of the Project.

The rail traffic noise criteria are predicted to continue to continue to exceed relevant criteria at various locations near Muswellbrook, along both the Main Northern Railway Line and the Ulan Railway Line. Additional train movements associated with the Project are predicted to increase noise levels by approximately 0.7 decibel (A-weighted) near the Ulan Railway Line between the Project and Muswellbrook and by approximately 0.5 decibel (A-weighted) at residences near the Main Northern Railway Line south-east of the Ulan Line junction.

Bengalla Mining Company will continue to implement engineering controls to minimise the noise levels generated by heavy mobile equipment and coal processing facilities. These controls will be incorporated into the Noise Management Plan which will be updated in consultation with the relevant regulators to include feasible and reasonable noise management measures to minimise construction and operational noise levels associated with the Project. Bengalla Mining Company will upgrade the existing real time noise monitoring program to include a predictive system to reduce impacts at private receivers.

Blasting

An Acoustic Impact Assessment was undertaken by Bridges Acoustics and included an assessment of the blasting impacts resulting from the Project.

All residences within 1,500 metres of active mining areas are owned by mining companies or entitled to acquisition by mining companies. Exceedances of the overpressure and ground vibration criteria are not predicted to occur at distances of more than 1,500 metres from mining areas. Therefore, the blasting associated with the Project will not impact any privately owned receptors that are not currently entitled to acquisition by mining companies.

Blasting impacts on heritage structures and communications masts are predicted to be within acceptable levels. Blasting will continue to be undertaken within 500 metres of the Muswellbrook-Ulan Railway Line in the early years of the Project and Bengalla Mining Company will continue to consult with the Australian Rail Track Corporation to ensure that there are no impacts on passing trains. Impacts can be avoided by either delaying the blast or temporarily closing the rail line consistent with current procedures.

Bengalla Mining Company will update the Blast Management Plan in consultation with the relevant regulators. In addition a real time blast fume management system combined with predictive meteorological forecasting capabilities will be implemented for the Project and will outline measures to ensure that the blasting criteria are not exceeded at sensitive private receivers, heritage structures or public infrastructure.

Visual

A Visual Impact Assessment was undertaken by JVP Planning and Design to identify the potential visual and lighting impacts caused by the Project.

Most locations in Muswellbrook will be shielded from the Project by the rehabilitated eastern areas at the existing Bengalla Mine. However, some locations in South Muswellbrook will experience limited views of the mining area. Although these locations are sensitive, the visual impact will be low as the visible component of the mining area represents only a small percentage of the view.

The Project is not visible from Aberdeen due to the screening provided by the rehabilitated areas. The township of Denman will also be shielded from the Project. The visual sensitivity of these locations is low due to the significant distance from Denman to the Project. As a result, the visual impact on Denman will be low.

The Project is screened from sensitive locations on the Mt Arthur Coal owned Pukara Estate by olive trees, resulting in low visual impact. However, there will be high visual impacts at the working areas at Pukara Estate. These working areas are generally not accessed by the public.

The nearest privately owned vineyard is located approximately 12 kilometres south-west of the Project Boundary. Due to the significant distance from the Project the visual impact is predicted to be low.

There are not expected to be any significant impacts on rural residences to the north and east of the Project. Views from these locations will be screened by the rehabilitated areas at the existing Bengalla Mine.

Rural residences to the south and south-west are subject to views of the existing Bengalla Mine. These locations will continue to experience views of the Overburden Emplacement Area and active face. To the west of the Project, the rural residences that are currently impacted will continue to experience moderate to high visual impacts from the active face.

The lighting effects produced by the Project will be similar to the effects generated by the existing Bengalla Mine. Since mining will progress to the west, lighting impacts are expected to decrease for receptors to the east and increase for receptors to the west.

In order to reduce visual impacts, progressive rehabilitation of the Overburden Emplacement Areas will continue to be undertaken. This will reduce the contrast between the components of the Project and the surrounding landscape. Landscape plans will ensure that rehabilitated areas emulate the surrounding pasture land and open woodland.

Bengalla Mining Company will continue to establish tree screens and plantings at some offsite locations. The existing Rehabilitation Management Plan and Landscape Management Plan will be updated in consultation with the relevant regulators to incorporate the commitments in this Environmental Impact Statement.

Surface Water

A Surface Water Impact Assessment was undertaken by WRM Water and Environment. The assessment identified the potential impacts to surface water resources and recommended measures to account for these impacts. A geomorphic assessment of Dry Creek within the Project Boundary was also completed to confirm its existing physical characteristics.

During the Project life, the catchment area draining to Dry Creek will be reduced by 983 hectares. The final landform will reduce the Dry Creek catchment by 22 percent compared to the pre-mining catchment. The reduction in the Hunter River catchment both during and after mining will be negligible at around 0.1 percent.

The reduction in catchment areas will result in reduced flow volumes in the Hunter River and Dry Creek. Flow volumes in the Hunter River will be reduced by between 458 megalitres/year to 923 megalitres/year during mining and by 423 megalitres/year after mining which represents approximately a 0.2 percent reduction in the Hunter River's flow volume (as at Denman). Bengalla Mining Company will hold all relevant licences, share component and allocation required to comply with the *Water Management Act 2000* and *Water Act 1912* requirements.

A water balance was undertaken to determine the volumes of water that will need to be extracted from and/or discharged into the Hunter River. Raw water will need to continue to be extracted from the Hunter River to meet operational water demands. The median external water requirement is predicted to be 1,500 megalitres/year. The 99th percentile water requirement which occurs under very dry conditions is predicted to be 2,200 megalitres/year. Bengalla Mining Company holds share components totalling 6,011 units for the Hunter Regulated River Water Source comprising 1,449 High Security Units and 4,562 General Security Units to account for any potential impacts.

Excess water accumulated on site will continue to be discharged into the Hunter River in accordance with the rules of the Hunter River Salinity Trading Scheme. Under average rainfall conditions, the Project will not need to discharge any water. The Project will need to discharge approximately 350 megalitres/year under 99th percentile wet conditions. The rules of the Hunter River Salinity Trading Scheme ensure that the salinity of the Hunter River is not materially impacted.

All components of the Project are located outside of the 1 in 100 year flood extent of the Hunter River as the Project mines further away to the north-west from the Hunter River than the existing Bengalla Mine. Therefore, the Project is not expected to impact the flood behaviour of the Hunter River.

The Bengalla Water Management System has been designed to minimise impacts on flow volumes in the Hunter River, avoid uncontrolled releases of contaminated water and minimise raw water usage. The existing Water Management Plan will be updated to address the predicted impacts of the Project. Bengalla Mining Company will continue to conduct monitoring of water quality and quantity in onsite storages, Dry Creek and the Hunter River.

Groundwater

A Groundwater Impact Assessment was undertaken by Australasian Groundwater and Environmental Consultants. This assessment characterised the local groundwater regime and determined the potential impacts to groundwater systems.

The only significant aquifer in the vicinity of the Project is the Hunter River alluvial aquifer. Mining occurs closest to the Hunter River alluvium at the beginning of the Project, and further away than the currently Approved Bengalla Mine. In Year 1, the Hunter River alluvial aquifer in the immediate vicinity of the Project will continue to experience a drawdown of less than 2 metres. The drawdown of the alluvial aquifer will reduce as mining progresses towards the north-west. This water take will be accounted for by allocation attached to relevant licences which area already held.

Under pre-mining conditions groundwater flows from the permian to the alluvium. The Project will cause Permian groundwater to flow to the open cut mining areas thereby reducing flow to the alluvium. The maximum reduction in flow to the alluvium is approximately 0.63 megalitres/day at the beginning of Year 1. The maximum annual reduction in flow to the alluvium is approximately 220 megalitres/year in Year 1. As mining moves away from the alluvium, the reduction in flow decreases to approximately 0.25 megalitres/day in the later years of the Project life.

Bengalla Mining Company holds 442 units for the Hunter Regulated River Alluvial Water Source to account for these potential impacts.

The volume of groundwater inflows into the mining area is predicted to average 110 megalitres/year. Maximum groundwater inflow rate is predicted to be 365 megalitres/year.

There are a number of registered mine-owned bores within the zone of depressurisation. However, only one impacted registered bore is located on privately owned land and the drawdown at this bore is predicted to be less than 2 metres. This is the same as the minimal impact requirement under the Aquifer Interference Policy.

Water will accumulate in the final void following mine closure. The water level of the final void is predicted to reach up to Reduced Level 37 metres. This water level is significantly below the crest of the final void, making it very unlikely that the final void will overflow.

The final void will behave as a groundwater "sink", which prevents saline water in the void from migrating into the surrounding groundwater systems.

The Surface Water Impact Assessment also assessed the rate of water level recovery in the final void using the OPSIM modelling software. The water balance methodology used by this method estimated that the long term water level would vary between RL 64 metres and 71 metres. Differences in final void levels between the two methods can be attributed to slight differences in input data sets and the method in which the void is simulated.

Both the groundwater model and the OPSIM model indicate that the water level in the final void will stabilise well below the crest of the final void. Therefore spillage of water into the environment will not occur. The final void will act as a sink for groundwater which will prevent any poor quality water that develops within the mining area from migrating into the surrounding groundwater system.

Bengalla Mining Company will update the Water Management Plan to address the impacts of the Project on groundwater systems and will continue to monitor groundwater inflows and water quality and quantity in regional and local groundwater systems.

A peer review of the Groundwater Impact Assessment was undertaken by Kalf and Associates. The peer review concluded that the groundwater model was fit for purpose and that the impacts predicted by the model were reasonable.

Geochemistry

A Geochemical Impact Assessment was undertaken by RGS Environmental. The purpose of the assessment was to determine the geochemistry of the overburden and coal reject materials associated with mining operations.

All overburden material (except Archerfield Sandstone) is likely to be Non-acid Forming and have a negligible (≤1 percent) total sulphur or sulphide sulphur content. Most overburden materials are likely to have excess acid buffering capacity and should compensate for any acid that could theoretically be generated from these materials.

The Archerfield Sandstone interburden material is likely to be Potentially Acid Forming. This material has a lower pH, higher salinity and higher sulphur content compared to the other overburden materials. If Archerfield Sandstone interburden materials were exposed to atmospheric conditions for a significant period of time, it is likely that the sulphate concentration of surface runoff/seepage would increase over time.

The total metal concentrations of the overburden samples were well below the National Environment Protection Council's criteria for soils (parks, recreation open spaces and playing fields). Hence, the overburden materials are unlikely to pose a significant risk to the environment due to total metal concentrations in solids or revegetation and rehabilitation.

Overburden materials are likely to be sodic and therefore prone to dispersion and erosion. Overburden materials that report to the emplacement area may have structural stability problems. Some lithologies are less sodic than others and may be more suitable for revegetation and rehabilitation activities.

The coal reject samples from the Wynn seam were determined to be Potentially Acid Forming. Coal rejects from the Vaux and Bayswater seams presented a lower risk of acid generation. The average acid neutralising capacity of the reject materials is estimated to be 1.5 times greater than the maximum potential acidity. The overburden and coal reject materials as a whole are expected to be Non-acid Forming.

Runoff and seepage from Wynn seam coal rejects would be acidic, saline and containing elevated sulphate levels. This can impact upon vegetation growth and water quality. It is also expected that reject materials from the Wynn seam would generate elevated concentrations of several trace metals if exposed to oxidising conditions.

The internal Acid Mine Drainage Management Plan will be revised for the Project.. Bengalla Mining Company will continue to implement measures to prevent impacts arising from Potentially Acid Forming materials. Archerfield Sandstone will be covered by at least 5 metres of acid neutralising and inert overburden. Similarly, Wynn seam coal rejects will be covered using Non-acid Forming overburden.

Aboriginal Archaeology and Cultural Heritage

An Aboriginal Archaeology and Cultural Heritage Impact Assessment was undertaken by AECOM Australia. The purpose of the assessment was to identify the archaeological resource within the Project Boundary. This was achieved through a search of the Aboriginal Heritage Information Management System database and an archaeological field survey.

An archaeological field survey was conducted over 15 days by AECOM archaeologists and 28 registered Aboriginal parties. The survey covered all of the land within the Study Area (i.e. the Project Boundary excluding the existing Approved Bengalla Mine).

A total of 289 Aboriginal sites were identified within the Study Area. The Project will impact 263 of these sites, comprised of 259 artefact scatters or isolated artefacts, one stone quarry and three potential scarred trees. The stone quarry is considered to be of high archaeological significance. The three scarred trees and two of the artefact scatters are considered to be of moderate archaeological significance. The remaining artefact scatters and isolated artefacts are of low archaeological significance.

The archaeological survey for the Project identified a rich landscape of past Aboriginal activity as evidenced from the numbers of stone artefacts recorded over the Study Area. Surface artefacts, which form Aboriginal archaeological and cultural sites, were recorded over the entire landscape but most intensely associated with creek lines and drainage lines, including Dry Creek.

While having varying degrees of scientific significance, these stone artefacts are of cultural importance to Aboriginal people as they attest to the occupation and use of the Study Area by Aboriginal people in the past and provide an important tangible link to their heritage.

The identification of stone artefacts and archaeological sites notwithstanding, Aboriginal stakeholders involved in the assessment process have not disclosed any specific knowledge related these artefacts or sites. However, during the archaeological survey, Aboriginal stakeholders noted the importance of B10 quarry site for its rarity in the Hunter Region, being one of only a handful of these site types found locally. In addition, Aboriginal stakeholders highlighted several key landscape features as important on the basis of their associated archaeological record. Dry Creek was highlighted by Aboriginal stakeholders as a focal point for past Aboriginal activity due to higher artefact numbers identified in association with it. Aboriginal stakeholders expressed interest at finding artefact scatter BM-AS26-12 on the crest of a hill on the western boundary of the Study Area. This highlighted the importance of vantage points in Aboriginal site selection.

Wanaruah Local Aboriginal Land Council stated that the Study Area was important to Aboriginal people due to its proximity to an Aboriginal song line, with Mt Arthur being one of the guiding landmarks. In addition, Wanaruah Local Aboriginal Land Council noted the Study Area is important as it is within walking distance to a number of known ceremonial areas (not identified).

There are 26 sites that are located within the Project Boundary but outside of the Disturbance Boundary. These sites will not be impacted by the Project.

In order to account for the impacts to Aboriginal cultural heritage, the existing Aboriginal Cultural Heritage Management Plan will be revised in consultation with registered Aboriginal parties and the relevant regulators. The Aboriginal Cultural Heritage Management Plan will outline mitigation measures, including surface collection of artefacts, scarred tree investigation and removal and fencing of sites that are not impacted by the Project. The management plan will also include procedures for the care and control of salvaged artefacts.

Historic Heritage

A Historic Heritage Impact Assessment was undertaken by AECOM Australia. The purpose of the assessment was to identify historic heritage sites in the vicinity of the Project and to assess the impacts to these sites.

The assessment identified five historic sites within the Project Boundary. The Project will directly impact three historic sites: House Site 1, House Site 2 and the Stockyard with only the Stockyard determined to be of local significance. House Site 3 is located within the Project Boundary but will not be impacted by the Project.

The Bengalla Homestead is listed as a heritage item under the *Muswellbrook Local Environmental Plan 2009* and is located within the Project Boundary. There are also six listed heritage items in close proximity to the Project: Dalama Stud, Overdene, Blunt's Butter Factory, Keys Family Private Cemetery, Edinglassie Homestead and Rous Lench Homestead. The Project will not directly impact any of these listed heritage items.

Due to the air quality and noise impacts of the Project, the Bengalla and Overdene homesteads will continue to remain vacant. The visual impacts of the Project on the Bengalla, Overdene, Edinglassie and Rous Lench homesteads will be similar to the impacts currently experienced. Therefore, the Project will continue to indirectly impact these homesteads. There are not expected to be any indirect impacts on House Site 3, Dalama Stud, Blunt's Butter Factory or the Keys Family Private Cemetery.

Impacts on historic heritage items will be managed in accordance with the European Heritage Management Plan, which will be revised in consultation with the relevant regulators. The European Heritage Management Plan includes Conservation Management Plans for the Bengalla and Overdene homesteads, which outline the maintenance works for these homesteads. An archival recording for the Stockyard will be prepared prior to the disturbance of the site.

Ecology

An Ecological Impact Assessment was undertaken by Cumberland Ecology to determine the impacts of the Project on current biodiversity values, including threatened species, populations and ecological communities. This assessment involved a review of previous ecological studies and detailed flora and fauna surveys.

The Project will result in the disturbance of approximately 881 hectares of native vegetation, including forest and woodland communities and large areas of open grassland and scattered trees. An additional 69 hectares of non-native vegetation will be removed, including tree and shrub plantations, exotic grasslands and Low Diversity Derived Native Grassland / Exotic Pasture.

The Project will remove approximately 554 hectares of Threatened Ecological Communities including 535 hectares of critically endangered Box Gum Woodland. The area of Box Gum Woodland to be impacted represents 9 percent of the community in the Hunter Region and 0.2 percent in the community in New South Wales.

Two threatened flora species were identified within the Project Boundary: Lobed Blue Grass and Tiger Orchid. The Lobed Blue Grass is listed as 'Vulnerable' under the *Environment Protection and Biodiversity Conservation Act 1999*, but is no longer listed under the *Threatened Species Conservation Act 1995*. The Tiger Orchid is listed as an endangered population under the *Threatened Species Conservation Act 1995.*

Nine species of threatened fauna were identified within the Project Boundary, consisting of four woodland bird species, four microbat species and the Squirrel Glider. An additional 12 species have the potential to occur in this area. The Project will impact threatened flora and fauna by removing potential habitat for these species. The Project will disturb approximately 259 hectares of potential habitat for the Tiger Orchid and 881 hectares of potential habitat for Lobed Blue Grass. All of the native vegetation within the Project Boundary is considered suitable habitat for the threatened fauna species that have the potential to occur in this area. Therefore, the Project will remove approximately 881 hectares of potential habitat for threatened fauna species.

The Study Area is essentially dry and lacks aquatic habitats other than a sparse series of ephemeral pools along what is appropriately called Dry Creek. This small ephemeral stream is dry for most of its length and lacks flowing water. After heavy rains it carries some shallow pools but the stream bed has been extensively eroded and channelised as a result of historic clearing of the catchment. Consequently, Dry Creek supports very little in the way of aquatic habitat and does not support major occurrences of macrophytes, or fish habitat.

Some farm dams have been created by enlarging and damming some points along Dry Creek and its tributaries. These support water birds on occasion and are expected to support common freshwater invertebrates. However, fish habitats are generally lacking from the Study Area. At most, the pools in the creek may support eels, tortoises and possibly Mosquito Fish. No threatened aquatic species are considered likely to occur within the Study Area.

The occurrence of groundwater dependent ecosystems in the Study Area is represented by terrestrial vegetation and by cave and aquifer ecosystems. The Terrestrial Vegetation groundwater dependent ecosystem comprises areas of Hunter Floodplain Red Gum Woodland that occur along Dry Creek and its tributaries. Hunter Floodplain Red Gum Woodland is likely to have a partial reliance, but not a total dependence on groundwater. Aquifer ecosystems have the potential to act as habitat for stygofauna.

The Project will result in the clearance of approximately 9.4 hectares of Hunter Floodplain Red Gum Woodland. The drawdown of the Hunter River alluvial aquifer has the potential to impact terrestrial groundwater dependent ecosystems in the floodplain. However, the Project is not considered likely to pose a direct threat to any stygofauna community that may be present in the groundwater.

A Biodiversity Management Plan will be prepared for the Project in consultation with the relevant regulators. The Biodiversity Management Plan will include procedures for managing ground disturbance, relocating fauna and key habitat features, and rehabilitation of disturbed areas. The aim of rehabilitation will be to re-establish agricultural land with at least 10 percent open woodland corridors across all disturbed areas with the exception of the eastern face of the overburden emplacement area. The eastern face of the overburden emplacement area will be rehabilitated to contain a higher density woodland community, to assist in further mitigating the visual impacts of the Project. There will be an emphasis on restoring Box Gum Woodland and Derived Native Grassland.

Bengalla Mining Company will also enhance the areas of Dry Creek to be retained to the south of the Project and north of the Bengalla Link Road and also adjacent to the Hunter River and will include the planting of the regionally endangered population *Eucalyptus camaldulensis* (River Red Gum).

In addition, Bengalla Mining Company will undertake biodiversity offsetting in accordance with the proposed 'Upper Hunter Strategic Assessment' process. Bengalla Mining Company will provide a financial contribution to the 'Upper Hunter Offset Fund' to compensate for the removal of 950 hectares of vegetation, including 881 hectares of native vegetation.

The offset funding will satisfy State and Commonwealth ecological objectives by conserving offset land in perpetuity, managing strategically located land to high ecological standards and restoring the condition and extent of habitats to ensure that the Project maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term.

Preliminary total credits (ecosystem credits and species credits) required to offset the Project's vegetation within the Disturbance Boundary have been calculated. The current version of the Biodiversity Certification Assessment Methodology is undergoing further revision at the time of drafting this document, which when recalculated, will alter the final credit requirements. The process of credit and offset calculation will be completed in 2014 when the Upper Hunter Biodiversity Plan is finalised.

Upon finalisation of an acceptable 'Upper Hunter Strategic Assessment' process, Bengalla Mining Company will recalculate the credit requirements for the Project in consultation with relevant regulators and contribute the commensurate financial contribution to the 'Upper Hunter Offset Fund'. In the unlikely event that the 'Upper Hunter Strategic Assessment' process is not implemented or is not acceptable to Bengalla Mining Company, its representatives will consult with the relevant regulators to determine an alternative offset strategy for the Project within two years of the granting of Development Consent.

Stygofauna

A Stygofauna Impact Assessment was undertaken by Eco Logical Australia. The existence of stygofauna was confirmed through a review of previous stygofauna studies and a two-stage sampling program. Samples were collected from 13 bores in the vicinity of the Project. Stygofauna was present at 10 of these sites, of which nine were located within the Hunter River alluvium. The drawdown of the Hunter River alluvial aquifer has the potential to impact stygofauna communities. The high numbers of stygofauna and the presence of six taxa indicate that the drawdown induced by mining at Bengalla Mine has had a minimal impact on the stygofauna community. The drawdown induced by the Project is not predicted to exceed the drawdown induced by existing mining operations. Drawdown will decrease as mining progresses to the west, allowing stygofauna to recolonise the currently dewatered sediments. As such, no mitigation is required for stygofauna.

Traffic and Transport

A Traffic and Transport Impact Assessment was undertaken by DC Traffic Engineering. The purpose of the assessment was to quantify the additional vehicle and train movements generated by the Project and to assess the resulting impacts on the road and rail network.

All access to the Project will be via the Bengalla Link Road and Bengalla Mine Access Road. The Bengalla Link Road will be realigned in approximately Year 15 to allow mining to progress to the west.

Modelling was undertaken to assess the performance of three key intersections during the peak construction and operational periods: Denman Road / Bengalla Link Road, Denman Road / Thomas Mitchell Drive and New England Highway / Thomas Mitchell Drive. The performance of each intersection was assessed based on the level of service, degree of saturation, average delay and maximum queue length.

The Denman Road / Bengalla Link Road and Denman Road / Thomas Mitchell Drive intersections were found to be performing satisfactorily under existing traffic conditions. However, the New England Highway / Thomas Mitchell Drive intersection is currently performing poorly during the AM peak (6:00 am – 7:00 am). Mt Arthur Coal Mine is currently upgrading this intersection to a seagull configuration. Mt Arthur Coal Mine is also obligated to upgrade the Denman Road / Thomas Mitchell Drive intersection to a seagull configuration by 2019.

The upgrade of the New England Highway / Thomas Mitchell Drive intersection will have been completed before the construction phase for the Project. The traffic modelling for the peak construction period has accounted for the upgrade to this intersection. All of the key intersections are expected to perform at a good or acceptable level of service during the construction phase.

The Denman Road / Thomas Mitchell Drive intersection will have been upgraded before the peak operational period (approximately Year 4). The traffic modelling for the peak operational period has accounted for both intersection upgrades. The modelling predicts that all of the key intersections will perform at a satisfactory level of service (or better).

The model results establish that the Mt Arthur Coal's required intersection upgrades will adequately address the traffic impacts caused by mining operations in the locality. Therefore, no additional mitigation measures are required from Bengalla Mining Company.

The realignment of the Bengalla Link Road will increase the length of this travel route by approximately 900 metres. Assuming a travel speed of 90 kilometres/h this means that travel times will increase by 36 seconds.

The Project is predicted to increase the product coal output of the Bengalla Mine to approximately 12.3 Million tonnes per annum. As a result, the number of loaded train movements per year will increase to 1,435, however this remains within existing approved levels. The number of daily train movements associated with Bengalla Mine will increase to 10 (including unloaded inbound trains). The commencement of mining operations at the Mount Pleasant Project will generate an additional six train movements per day.

An assessment of the Project impacts to the existing rail network was also undertaken. Generally, a development is considered to have a potentially significant impact over those parts of the rail network where traffic associated with that development makes up 10 percent of more of the overall traffic volume. When assessed against rail traffic forecast for the Muswellbrook Junction in 2016, rail traffic associated with the haulage of product coal from the Project will make up 9.8 percent of the total volume of coal trains only. The area of significant influence of the Project on the wider rail network is therefore not significant, being considered to extend from Bengalla Mine rail loop to the Muswellbrook Junction.

Bengalla Mining Company will update its existing Road Closure Management Plan (as a component of the Blast Management Plan) in consultation with the relevant regulators. The new section of Bengalla Link Road will be constructed to the relevant required standard and dedicated by Bengalla Mining Company as a public road in around Year 15. The design will include a 'like for like' replacement of the current Bengalla Mine Access Road intersection approximately 900 metres south. The intersection will consist of a channelised right turn with a minimum 160 metres right turn lane with a slight uphill grade.

Bengalla Mining Company will also construct an intersection from the existing Roxburgh Road onto the realigned section of the Bengalla Link Road. This intersection will require Roxburgh Road to be altered to allow a 90 degree angle of intersection.

Bengalla Mining Company will remain responsible for the life of the Project for the costs of the maintenance of the Bengalla Link Road to the intersection with the Bengalla Mine Access Road as agreed with Muswelbrook western limit of the 1 in 100 year flood level as agreed with Muswellbrook Shire Council. Muswellbrook Shire Council is undertaking a Mine Affected Road Study with the view to revisiting the Western Roads Strategy originally prepared in 1997.

Whilst this document has not yet been released Bengalla Mining Company remain committed to liaising with Muswellbrook Shire Council and the Roads and Maritime Service regarding any future realignment of the Bengalla Link Road and ongoing management of the surrounding road network. The realigned section of the Bengalla Link Road and intersection design will be constructed in accordance with the relevant guidelines and will be developed in consultation with Muswellbrook Shire Council.

Social

A Social Impact Assessment was undertaken by Martin & Associates. The purpose of the assessment was to develop a profile of the local area, which primarily encompasses the Primary Study Area (Muswellbrook Local Government Area) and the Secondary Study Areas (Muswellbrook, Singleton and Upper Hunter Local Government Areas) and identify any future social impacts which may result from both the construction and operation of the Project.

Two workforce scenarios were used in order to identify and appropriately assess potential social impacts associated with the Project. Scenario 1 ('Expected Case') and Scenario 2 ('Alternative Case') were designed to test the sensitivity of the assumptions utilised for Scenario 1. Both Scenarios assume that there will be some non-local portion of the workforce which will relocate to the Primary Study Area. The key differing factor between scenarios is the extent of the share of commuters and non-locals expected to relocate into the Primary Study Area.

The 2011 Census showed that the most significant industries in terms of employment in the Muswellbrook Local Government Area were mining (employing 21.3 percent of employed people over 15 years of age), retail trade (9.2 percent), agriculture, forestry and fishing (7.1 percent), health care and social assistance (6.9 percent), accommodation and food services (6.9 percent) and construction (6.7 percent). A similar employment structure was apparent in the Secondary Study Area.

A significant shift in the unemployment rate in the Muswellbrook Local Government Area has occurred over the 12 months to June 2013, associated with the recent downturn in the coal mining industry. In June 2012, the unemployment rate for the Muswellbrook Local Government Area was 2.8 percent (233 people) which was slightly higher compared to the Singleton and Upper Hunter Local Government Areas, which were 1.2 percent and 1.3 percent respectively although significantly lower than New South Wales (5.2 percent).

In contrast, the unemployment rate in December 2012 in the Muswellbrook Local Government Area was 4.7 percent (412 people). These figures have been trending upward consistent with the Secondary Study Area where unemployment levels have returned to similar levels as in 2008 with almost 1,000 persons being unemployed. This is in marked contrast to the situation in June 2012 when it was considered that the local economy was enjoying very close to full employment with any remaining unemployment considered to represent long term unemployed or structural unemployment. The current unemployment numbers suggest that there are unemployed people available with appropriate skills to support the Project (as at 2013).

The assessment identified that approximately 90 semi-permanent and / or short term households / units will be required as a result of the direct construction workforce. The total population increase to the Muswellbrook Local Government Areas during peak construction was estimated at 349. As a significant portion of the Project construction workforce will be commuting on a daily basis and on a work week basis, limited impacts are anticipated on the various elements of community infrastructure. There may be slight impacts on the outpatient health services facilities at Muswellbrook hospital and at the two General Practitioner community health centres due to servicing of the normal needs of the construction workforce on a daily basis but these impacts are considered to be manageable within the normal facility planning assumptions. Demand for schooling and childcare facilities of these employees would not exceed 10 school students and childcare places at the peak of construction which is considered to be well within current planning assumptions.

Impacts of the operational phase of the Project were assessed under workforce Scenarios 1 and 2. Results indicated that the initial determined that the initial and flow on employment expected to be generated by the operations phase of the Project under the two workforce scenarios and the predicted increase in population and consequent housing requirements associated with the non-local hires that will either relocate to the area or be weekly commuters in the operations phase.

The operations phase is expected to generate a total of approximately 1,164 jobs, 491 being direct and an additional 673 being flow-on jobs. Both scenarios will result in 118 jobs being generated for local workers and an additional 862 being generated for non-local workers (residing outside the Secondary Study Area).

Results from the 'Expected Case' indicate a total population increase of 952 and the need for 403 residential units of which 243 would be for families and/or couples and the remaining 163 to accommodate the needs of singles and work week commuters.

Scenario 2 would result in a total population increase of 1,404 and the need for 583 residential units of which 398 would suitable for families and couples and the remaining 185 suitable for singles and work week commuters.

The assessment of the operational phase concluded under Scenario 1- the 'Expected Case' is sustainable within the current mine plan with a new workforce scheduled to build-up over a period of 4-5 years, provided that there are no cumulative pressures from other new proposals which require significant numbers of new housing. Scenario 2 would be difficult to achieve without extending the current scheduled build-up of the workforce.

A cumulative assessment also determined that with consideration of existing operating mines and approved projects operating at their maximum approved impacts there would be a cumulative social impact. However, a recent downturn in the 'mining boom' indicates that the assessment represents a significant worst-case base, in the current economic climate. The potential cumulative impacts were identified included a potential shortage in local construction workforce, additional stress on temporary accommodation and dwellings along with exacerbated impacts on community infrastructure.

A review of the employment trends in both the agricultural and mining industries over the past 15 years, suggest that employment recruited from the agriculture sector to the Project will be limited. Bengalla Mining Company will also provide relevant information on its workforce to Muswellbrook Shire Council to ensure it has adequate information to assist in its future infrastructure and development planning.

Bengalla Mining Company will also continue to utilise its already long running procedures (revised as necessary) in relation to social components of the operation. These procedures will ensure that Bengalla Mining Company continues to assist in managing issues associated with employee relocations to the Muswellbrook Local Government Area (including housing and general assistance), ensuring ongoing Aboriginal employment positions are available for the Project and providing a robust framework for managing fatigue issues (primarily associated with shift work).

In addition, Bengalla Mining Company has commenced initial proceedings to revise its existing Voluntary Planning Agreement with Muswellbrook Shire Council to provide in kind and monetary contributions to ensure any potential social effects of the Project are accounted for.

Economics

An Economic Impact Assessment was undertaken by Gillespie Economics, which aimed to determine both the economic efficiency and economic impacts of the Project.

A Benefit Cost Analysis confirms that when production costs (acquisition costs for affected land, opportunity cost of land, operating costs, decommissioning costs, etc.) and production benefits (revenues from production, residual values of land, etc.) are considered, the Project will have net production benefits to Australia of $1,790 Million.

This net production benefit is distributed amongst a range of stakeholders including the regional community, Bengalla Mining Company, its shareholders and government.

In summary, the Project will result in the following economic benefits to the New South Wales economy:

- $2,408 Million in annual direct and indirect regional output or business turnover;
- $1,223 Million in annual direct and indirect regional value added;
- $441 Million in annual indirect household income; and
- 4,868 indirect jobs. The Project will result in the following economic benefits to the regional economy (Muswellbrook, Singleton and Upper Hunter Local Government Areas):
- $1,486 Million in annual direct and indirect regional output or business turnover;
- $789 Million in annual direct and indirect regional value added;
- $155 Million in annual direct and indirect household income; and
- 1,745 direct and indirect jobs.

Based on the above, the Project is considered desirable and justified from an economic efficiency perspective.

The cessation of Bengalla Mine under the existing approval would lead to a reduction in economic activity in the region. Given the current uncertainty in the coal mining sector, it is important for government to continue to effectively utilise the economic benefits, skills and expertise generated by Bengalla Mine to further strengthen and broaden the region's economic base.

Hazard Analysis

Hansen Bailey conducted a Preliminary Hazards Analysis for the Project, as required by *State Environmental Planning Policy 33 – Hazardous and Offensive Development*. The purpose of the analysis was to identify potential hazards, assess the significance of these hazards and develop potential management and control procedures.

The key hazardous materials required for the Project include explosives, hydrocarbons and other hazardous chemicals. The key hazardous chemicals include diesel and petrol fuels, oils, degreasers, kerosene, greases and explosives. Hazardous materials and chemicals are stored and handled in accordance with the relevant licenses, guidelines and Australian Standards.

A qualitative risk assessment presented was completed for the Preliminary Hazard Analysis to identify potential hazards associated with the Project and ensures that adequate risk mitigation and response measures will be implemented. This risk assessment has confirmed that the Project will not impose an unacceptable level of risk, with appropriate management.

All bulk materials will continue to be transported to site by a licensed contractor in accordance with the relevant transport codes and standards. Bengalla Mining Company has developed emergency response procedures for addressing spills or leakages or hazardous materials.

The Hazard Analysis has confirmed that the Project will not impose any unacceptable level of risk and is therefore not considered hazardous or offensive. Bengalla Mining Company will revise its internal procedure, Major Hazard Management Plan and Explosives Management Plan which will outline the procedures for transport and storage of substances, storage locations, material quantities and emergency response procedures.

Waste

Bengalla Mining Company implements a comprehensive waste management system to manage the disposal, tracking and reporting of waste at Bengalla. In addition, waste is managed in accordance with a number of Coal & Allied and Rio Tinto Environmental Performance Standards.

The volume of general waste generated by the operation is expected to increase as a result of the Project due to the increase in production and workforce. General waste volumes will be minimised by implementing strategies for the reuse or recycling of waste.

Coal reject materials will continue to be managed by way of co-disposal. Sewage will continue to be treated at the onsite waste water treatment plant, which will be managed in accordance with the relevant Australian Standards. Contaminated materials such as grease and oil will be retained in storage tanks in a bunded area, prior to removal by a licensed contractor.

Contamination

A Preliminary Contamination Analysis was undertaken by Hansen Bailey to identify potential contamination sources within the Project Boundary. This analysis was undertaken in accordance with *State Environmental Planning Policy 55 – Remediation of Land.*

The sources of potential contamination identified within the Project Boundary were the historic heritage sites as these structures are associated with past agricultural land uses. The results of the preliminary contamination assessment identified the need for an additional investigation to assess the extent of contamination within the Disturbance Boundary prior to disturbance.

A detailed contamination investigation will be undertaken by a licensed contractor to assess the extent of contamination associated with current and former rural residence sites. Following this investigation, a remediation action plan will be prepared and implemented for the Project if required.

Soils and Land Capability

A Soils and Land Capability Impact Assessment was undertaken by GSS Environmental. The purpose of the assessment was to identify the soil types and land capability classes within the Project Boundary.

Seven different soil types were identified within the Project Boundary, with the dominant soil types being Brown Chromosol, Red Chromosol, Brown Vertosol and Rudosol. The predominant soil type in Dry Creek is a deep Brown Chromosol. All of the soil types are suitable for use as topdressing material, with the exception of Rudosol. Approximately 1.5 Million meters cubed of topdressing material will be available for use in rehabilitation. All of the soil types within the Project Boundary are classified as being of low to moderate fertility (under the *'Draft Inherent Soil Fertility of New South Wales'*). Acid sulphate soils are unlikely to be present within the Project Boundary.

The majority of the land within the Project Boundary (60 percent) falls within Land Capability Class V. There are smaller areas of Class II (4 percent), Class IV (12 percent), Class VI (12 percent) and Class VII (16 percent) land. The Land Capability Class determines the agricultural suitability of the land. The majority of the land constitutes Agricultural Suitability Class 3 land (68 percent). The remaining land falls under Class 2 (4 percent) and Class 4 (28 percent).

This assessment considered the potential impacts of the Project on Strategic Agricultural Land. There are approximately 28 hectares of mapped Biophysical Strategic Agricultural Land within the Project Boundary. However, only 1 hectare occurs within the Disturbance Boundary associated with the relocation of the Bengalla Link Road not as a result of mining related activities.

Bengalla Mining Company will undertake rehabilitation in accordance with its Rehabilitation Management Plan, which will be updated in consultation with the relevant regulators. The Rehabilitation Management Plan will outline the procedures for topsoil stripping, stockpiling and re-spreading.

Agriculture

Scott Barnett & Associates prepared an Agricultural Impact Statement which assessed the impacts of the Project on agriculture through disturbance of agricultural land and reduced access to water resources. All land within the Study Area is owned by Bengalla Mining Company or another mine.

The land within the Study Area is predominantly used for beef cattle breeding for the weaner and domestic market. The current beef cattle production amounts to a gross value of $0.2 Million per year and a net value of $0.1 Million per year. With improvements to the land, this could increase to a gross value of $0.3 Million per year and a net value of $0.2 Million per year.

The agricultural production from the land within the Disturbance Boundary will be foregone as a result of the Project. It has been conservatively assumed that all agricultural production within the Project Boundary will be foregone. The represents approximately 0.06 percent of the total regional agricultural production, 0.002 percent of the total state production and 0.0005 percent of the total national production.

The Project will also reduce the availability of water for agricultural purposes. Surface water taken by the Project could otherwise be used for lucerne hay and maize production. The maximum water requirement for the Project 2,200 megalitres is sufficient for irrigating 283 hectares of land. The crop production from this land amounts to a gross value of $1.2 Million per year and a net value of $0.3 Million per year.

The groundwater taken from the Hunter River alluvial aquifer could also have been used for lucerne hay and maize production. The 220 megalitres/year estimated to be taken by the Project is sufficient for irrigating 28 hectares of land, which can generate production with a gross value of $0.1 Million and net value of $0.02 Million.

The Project will disturb approximately 1 hectare of Biophysical Strategic Agricultural Land on land owned by Bengalla Mining Company.

The Project Boundary also contains 35 hectares of land mapped as being within the Equine Critical Industry Cluster. No existing studs occur in this area. Additionally, the Project will not disturb any of this land.

The Project Boundary also contains land mapped as being within the Viticulture Critical Industry Cluster. Approximately 494 hectares of this land was verified as being Viticulture Critical Industry Cluster land, of which 369 hectares will be disturbed by the Project. No viticulture industry occurs within the Project Boundary and the nearest winery being 6 kilometres south-west at the Mt Arthur Coal owned Rosemount Vineyard. The closest privately owned vineyard is 12 kilometres to the south-west of the Project Boundary.

The land within the Disturbance Boundary will be maintained as agricultural land for as long as practicable. Following mining, disturbed areas will be rehabilitated to Agricultural Suitability Class 3 and Class 4 land generally consistent with land in the Disturbance Boundary. Agriculture will be re-introduced into safe and stable rehabilitated areas as soon as practicable.

Bengalla Mining Company will update the Rehabilitation Management Plan and Landscape Management Plan in consultation with the relevant regulators which shall include a plan for weed and pest management.

Rehabilitation and Mine Closure

Rehabilitation at Bengalla Mine is undertaken in accordance with the Rehabilitation Management Plan, the objectives of which are to:

- Achieve an acceptable post-mining land use suitability;
- Develop a landform that is free draining and stable, with pasture cover;
- to Provide for the growth of vegetation, establishment of pasture or habitat;
- Preserve the quality of downstream waters;
- Control all hazards associated with the final highwall and low wall; and
- Ensure that the final low wall is shaped, stable and maintains pasture cover.

As mining operations progresses to the west, overburden emplacement areas will be established to the east of active mining areas. Once established, the overburden emplacement areas will be shaped for progressive rehabilitation as soon as practicable. Rehabilitation development will include a range of measures, including topsoil management and relocation, establishment of erosion and sediment controls, habitat reinstatement and revegetation works.

Topsoil resources will be stripped to the recommended depth and stockpiled for later use. Topsoil material is used in available rehabilitation areas as soon as practicable after stripping to preserve native seed banks and soil microflora. If topsoil needs to be stored for more than three months, stockpiles will be revegetated prior to respreading.

Bengalla Mining Company will continue to revegetate rehabilitated areas using specific seed mixes for pastoral and native vegetation areas, which contain native species and have proven successful in previous use. To promote effective links between site rehabilitation and remnant vegetation, a series of native vegetation corridors will be established across the site.

Rehabilitated areas will continue to be monitored on a regular basis to ensure that rehabilitation objectives are being met and that revegetation and long term landform sustainability is achieved. Maintenance and management works in rehabilitation areas will be undertaken to address any issues or recommendations identified during monitoring.

Should further approvals not be sought and granted at Bengalla Mine, a preliminary final landform has been designed to result in a generally undulating landscape with slopes generally to 10 degrees and up to a maximum of 21 degrees on the low wall. Progressive rehabilitation of disturbed areas will incorporate the construction of erosion and sediment control and water management structures. It is anticipated that the landform will be predominately rehabilitated to grazing pasture, comparable to pre-mining land use with plantings of native woodland vegetation to achieve a minimum of 10 percent tree cover. Higher density tree coverage will occur of the eastern face of the overburden emplacement area.

A number of final void options were considered in the design of the most relevant final landform. The Blast and Doze method was determined to be the most suitable option which will result in a final void with a battered low wall.

Following consultation with community stakeholders and in consideration of pre-mining land use, consistent with rehabilitation conducted since 1998, a mixture of native bushland and cattle grazing was determined to be the most suitable post-mining land use. This combination of agricultural (cattle grazing) and conservation land use remains the preferred option for mine closure for the Project. In the event that further approvals are not sought or granted, Bengalla Mining Company will prepare a Mine Closure Plan within five years of the end of the Project.

Management and Monitoring

Bengalla Mining Company has identified and commits to the operational controls outlined in the Management and Monitoring Summary of this Environmental Impact Statement for all activities associated with the Project.

The aim of the Management and Monitoring Summary is to ensure that any potential environmental and socio-economic impacts resulting from the Project as identified in this Environmental Impact Statement are managed and monitored appropriately.

Project Justification

Bengalla Mine is arguably one of the most technically advanced and productive coal mining operations in New South Wales. Bengalla Mine has utilised real time noise and air monitoring systems since 1999 and was the first coal mine in Australia to gain accreditation to ISO14001 Standards for its Environmental Management System.

During its operation, Bengalla Mining Company has been a major employer of the local community, employing 358 full time equivalent workers as at September 2011 of which approximately 46 percent are currently residing in the Muswellbrook LGA; and 89 percent within the combined Muswellbrook, Upper Hunter and Singleton Local Government Areas. A large proportion of the existing Bengalla Mine workforce were employed as 'clean-skins' (workers without coal mining experience which Bengalla Mining Company has trained).

Bengalla Mining Company has maintained a commitment to coexist within neighbouring agricultural enterprises since its approval in 1995. Approximately 2,200 hectares of the land not required for mining is used for agricultural purposes including dairying, cattle production and horse stud industries. Bengalla Mining Company has made a commitment to maintain the agricultural productivity of its land holdings which it has done since 1995. There are also a variety of agricultural enterprises present adjacent to the Project Boundary including grazing, dairying, equine industries, viticulture and an olive grove.

Approval of the Project will allow up to 316 Million tonnes of Run of Mine coal to continue to be mined at Bengalla Mine, ensuring security of employment for the existing workforce and continuity of the socio-economic benefits currently experienced in the Hunter region, New South Wales and Australia. The Project will facilitate the recovery of a valuable coal resource in an area that has long been set aside for mining by the New South Wales Government on land acquired by Bengalla Mining Company for the specific purpose of the continuation of coal mining.

The Project will facilitate the recovery of a valuable, export quality thermal coal. Thermal coal remains a highly sought after energy source in Asian countries, including Japan, Korea, Taiwan, China and India. These countries continue to be the world's largest coal importers, and will largely account for an approximately 70 percent growth in total coal imports from 2009 to 2035. This increasing demand supports the need for the Project and justifies further investment in the thermal coal mining industry.

To this end the Project will enable Bengalla Mine to continue to:

- Assist Australia to continue to meet the international demand for thermal coal for at least the next 24 years, during which time it is expected that there will continue to be a strong world demand for coal for the purposes of generating electricity;
- Support Australia in maintaining its reputation as a consistent and reliable supplier of thermal coal to its existing and expanding markets; and
- Contribute materially to sustaining the Australian economy and maintaining the economic stability of New South Wales and the Hunter region.

The Project has been rigorously environmentally assessed in accordance with the *Environmental Planning and Assessment Act 1979*, its 'objects', including the principles of Ecologically Sustainable Development and by processes and in the manner required by the Director General's Requirements. This assessment has concluded that the Project should be approved under the *Environmental Planning and Assessment Act 1979*.

There are environmental costs which have been identified and which are capable of being acceptably managed by operational controls, land acquisition and management plans that would be established and adopted as approved by the Director-General of Planning and Infrastructure and other appropriate Government agencies and authorities. Ecological and long term costs have been minimised and will be accounted for by management strategies to maintain and improve vegetation and ecological values in the long term.

The Project will maximise the economic and social value from the remaining coal resource by a mine plan that will appropriately address the environmental and socio-economic constraints and the objects of the *Environmental Planning and Assessment Act 1979*, including the principles of Ecologically Sustainable Development.

The Project will provide net production benefits of $1,790 Million over the 24 year Project life and will:

- Maximise the recovery of a high quality, thermal coal resource for which there is an increasing global demand;
- Create approximately 1,822 direct and indirect jobs in the local economy;
- Create approximately 4,868 direct and indirect jobs in New South Wales;
- Continue and extend financial support to the region, New South Wales and Australia with taxation and royalty benefits of $1,278 Million over the Project life; and
- Achieve the most efficient economic use of the land.

It has been demonstrated that the Project represents a low strip ratio, low ash content product which will continue to provide thermal coal for current and future generations and will generate significant economic benefits in the process. The Project's social and environmental impacts have been minimised as far as practicable by implementing all reasonable and feasible management and mitigation measures.

As a consequence, the socio-economic benefits of the Project will outweigh its social and environmental costs. Therefore, the Project is in the public interest.

BENGALLA Mining Company

Table of Contents

Table of Contents

List of Figures

List of Tables

List of Plates

List of Appendices

Volume 2

Volume 3

Volume 4

Volume 5

Volume 6

Table of Contents

1

Introduction

Introduction 1

This section provides an introduction to the Environmental Impact Statement (EIS) for the Bengalla Continuation of Mining Project. It describes the background and context of the Bengalla Continuation of Mining Project, introduces the proponent and outlines the purpose and structure of the EIS.

1.1 Background

Bengalla Mining Company Pty Limited (BMC) operates the Bengalla Mine (Bengalla) in the Upper Hunter Valley of NSW. Bengalla is situated approximately 130 kilometres (km) north-west of Newcastle and 4 km west of the township of Muswellbrook (see **Figure 1**). It is generally bounded by Wybong Road to the north, Roxburgh Road to the west, Overton Road to the east and the Bengalla Link Road and Muswellbrook-Ulan Rail Line to the south.

On 7 August 1995, BMC was granted Development Consent (Development Application (DA) 211/93) (**Appendix A**) by the then Minister for Urban Affairs and Planning. This consent authorised the construction and operation of a surface coal mine, coal preparation plant, rail loop, loading facilities and other associated infrastructure. The application for development consent was supported by the *Environmental Impact Statement for Bengalla Coal Mine* (Bengalla 1993 EIS) (Envirosciences, 1993).

The original consent allowed the extraction of up to 8.7 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for a period of 21 years from Bengalla. The Bengalla 1993 EIS recognised that significant coal reserves continued west beyond the 21 year mining extent:

"The coal reserves continue to the west of the limit of excavation and beyond the edge of the Authorisation area. It is anticipated that these reserves will be mined by open cut methods in the future, subject to appropriate approvals" (Bengalla 1993 EIS).

There have since been four approved modifications to DA 211/93. Bengalla is now approved to produce up to 10.7 Mtpa of ROM coal. A detailed account of Bengalla's approvals history is provided in **Section 3**. Approximately 7 Million tonnes (Mt) and 8.5 Mt of ROM was extracted in 2011 and 2012 which yielded approximately 5.4 Mt and 7 Mt of saleable coal respectively (BMC, 2012a).

BMC was granted Mining Lease 1397 in 1996 and mining operations subsequently commenced in 1998. As part of its ongoing commitment to future operations at Bengalla and long term investment in the Upper Hunter region, BMC has completed detailed scoping and feasibility studies to facilitate the continuation of mining to the west of the existing operations.

BMC is seeking a new Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable mining to continue for an additional 24 years at a maximum production rate of 15 Mtpa of ROM coal (the Project). Under the Project, mining would continue in a westerly direction, but will remain predominantly on lands within the mining authorisations currently held by BMC.

The Project will largely rely upon the currently approved and constructed mine site infrastructure, including the Coal Handling and Preparation Plant (CHPP), rail loop and loading facility, workshop and administrative buildings. Some of this infrastructure will need to be upgraded or relocated to accommodate the proposed increase in production from 10.7 Mtpa to 15.0 Mtpa and extension of mining.

BENGALLA MINE

Locality Plan

FIGURE 1

Hansen Bailey

1.2 Project Overview

BMC is seeking Development Consent under Part 4 of Division 4.1 of the EP&A Act to facilitate the continuation of open cut coal mining largely within current Mining Leases and within the Project Boundary as shown on **Figure 2** on the land listed in **Appendix B**.

An indicative layout of the Project is provided in **Figure 3** and is generally comprised of the following:

- Open cut coal mining at up to 15 Mtpa ROM coal of a total resource of 316 Mt for up to 24 years continuing to utilise a dragline and truck / excavator fleet;
- Continue mining to the west of current operations;
- An additional Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess overburden material until it is intercepted by mining;
- Processing, handling and transportation of coal via the existing CHPP (to be upgraded) and rail loop for export and domestic sale;
- An additional CHPP stockpile and ROM coal stockpile;
- Continued use, expansion and upgrades to existing and new infrastructure;
- Construction of a radio tower;
- Relocation of the Explosives Magazine and Reload Facility;
- Relocation of a section of Bengalla Link Road near the existing mine access road to enable coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent re-alignment of Dry Creek through rehabilitation areas once stability is established;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the staged discharge dam);
- Construction of raw water dams and a clean water dam;
- A gradual increase in the approved workforce from 400 up to approximately 900 full time equivalent personnel (plus contractors) at peak production; and
- Supporting power reticulation infrastructure.

The 900 full time equivalent personnel includes contractors that work at Bengalla on a regular basis for various activities including but not limited to electrical works, plant and equipment maintenance, engineering and other ongoing purposes. An additional contractor base workforce of up to approximately 315 personnel will be required during the peak construction phase. Further discussion in relation to the construction workforce and schedule is presented in **Section 4.11**.

The Project will generally be undertaken within the Disturbance Boundary as illustrated on **Figure 3**. Minor additional disturbance associated with ancillary works including the Dry Creek pipeline and associated power supply, fencing, firebreaks, water diversion structures, minor contour banks, tracks along pipelines, powerlines, topsoil storage areas, temporary construction areas and sediment control structures will also be required. Any additional disturbance located outside the Disturbance Boundary (but within the Project Boundary) will be subject to the relevant BMC approvals including the completion of a Ground Disturbance Permit (GDP) as discussed in **Section 3.13**.

Upon the granting of the new Development Consent, DA 211/93 (as modified) and DA 273/2006 will be surrendered at a mutually agreeable time between BMC and the Department of Planning and Infrastructure (DP&I).

1.3 Proponent

The proponent for the Project is BMC which is owned by the Bengalla Joint Venture. The Bengalla Joint Venture is constituted by:

- CNA Bengalla Investments Pty Limited (a subsidiary of Coal & Allied Industries Limited, a Rio Tinto Group company) 40%;
- Wesfarmers Bengalla Limited (a wholly owned subsidiary of Wesfarmers Limited) 40%;
- Taipower Bengalla Pty Limited (a wholly owned subsidiary of Taiwan Power Company) 10%; and
- Mitsui Bengalla Investment Pty Limited (a wholly owned subsidiary of Mitsui Coal Holdings Pty Limited) 10%.

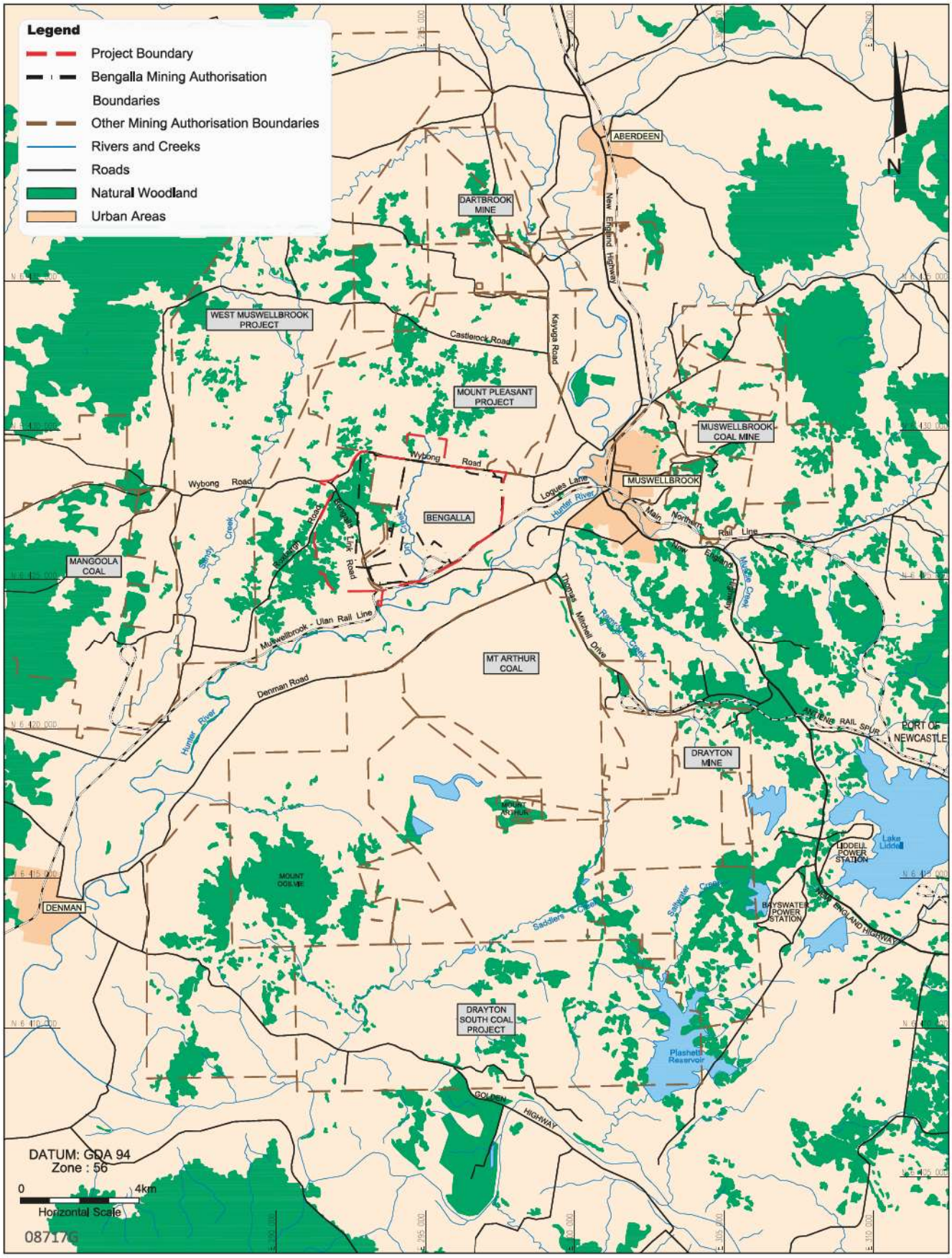
The contact details for BMC are:

Bengalla Mining Company Pty Limited
LMB 5
MUSWELLBROOK NSW 2333

Phone: 02 6542 9500

Fax: 02 6542 9599

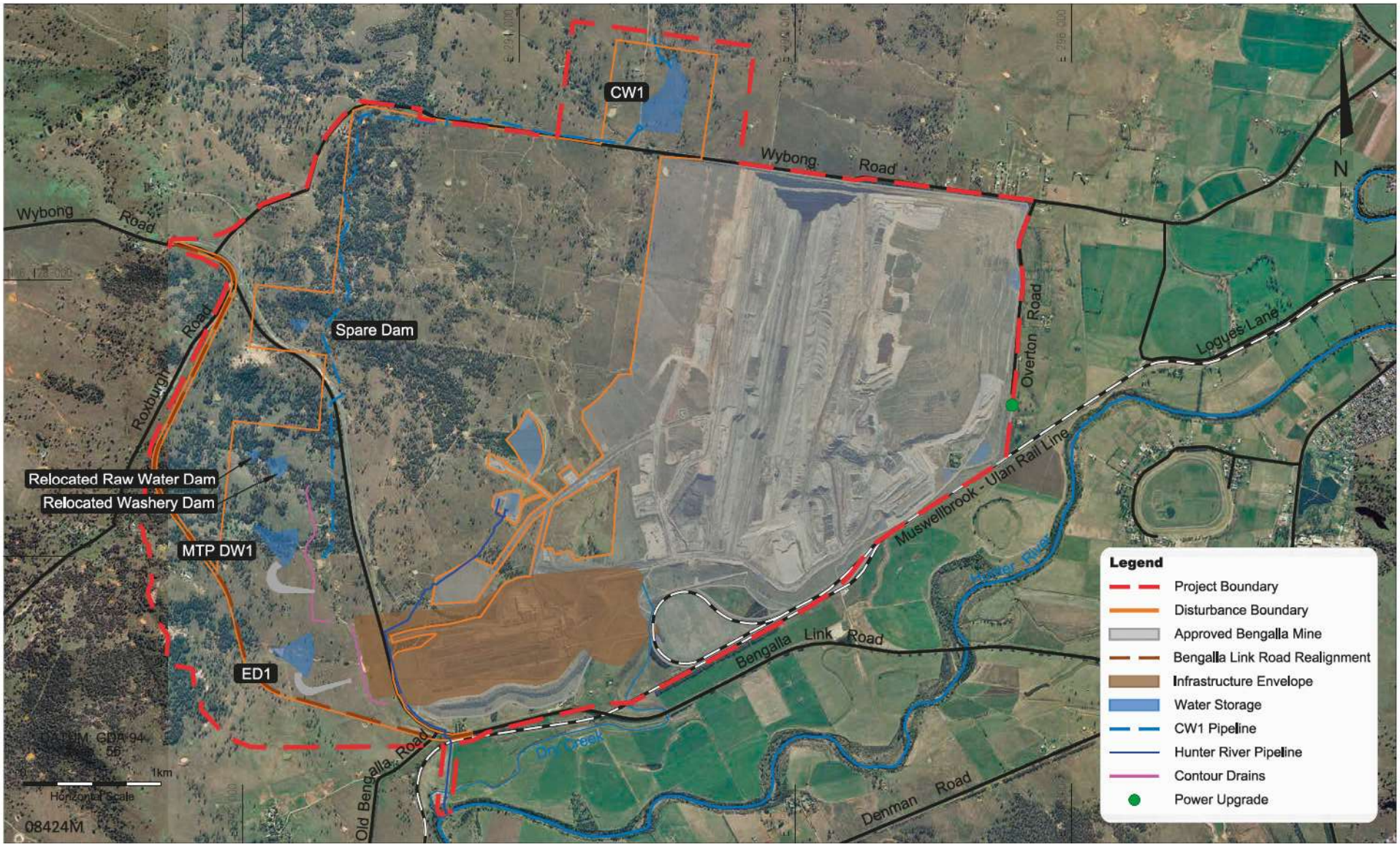
Website: http://www.riotintocoalaustralia.com.au/



BENGALLA MINE

Regional Locality

FIGURE 2



BENGALLA MINE

Conceptual Project Layout

FIGURE 3

1.4 Document Purpose

BMC seeks a Development Consent under Part 4 of Division 4.1 of the EP&A Act to enable coal mining and associated activities to continue at Bengalla. The Project will facilitate the extraction of up to a maximum of 316 Mt of ROM coal at a rate of up to 15 Mtpa for up to 24 years.

A request for Director-General's Environmental Assessment Requirements (DGRs), supported by a Background Document was made to DP&I on 17 February 2012, in accordance with clause 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). DGRs were subsequently issued by DP&I on 13 March 2012.

A table listing all DGRs and where they have been addressed in this EIS is included in **Section 6**. This section also addresses all other regulators submissions to the DGRs. Supplementary DGRs were issued on 12 July 2012 to specify additional matters for assessment.

This EIS has been prepared by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of BMC to support the application for Development Consent. Under Section 78A(8A) of the EP&A Act, a development application for State Significant Development (SSD) must be accompanied by an EIS. This EIS has been prepared in accordance with the form and content requirements prescribed by clauses 6 and 7 of Schedule 2 of the EP&A Regulation. The Project Boundary to which this EIS applies is illustrated in **Figure 3**. The schedule of land to which this EIS applies (all land located either wholly or partly within the Project Boundary) is provided in **Appendix B**.

This EIS also supports an application to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC) for approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This EIS includes a consideration of all issues raised during the extensive stakeholder engagement process undertaken for the Project. It also addresses the DGRs by assessing the social, economic and environmental impacts of the Project to enable the Minister for Planning and Infrastructure to determine the development application. A summary of stakeholder issues raised in relation to the Project and a checklist of the DGRs and where these have been addressed is presented in **Section 6.4.1**.

1.5 Document Structure

This EIS consists of six volumes. This volume (Volume 1) includes the main EIS report prepared by Hansen Bailey and presents a Project description, summary of associated environmental, social and economic impacts and the mitigation and management measures proposed. Volume 1 is structured as follows:

- **Section 2** provides relevant information on the existing environmental setting including land use;
- **Section 3** describes the existing approved mining operations at Bengalla, environmental management system and existing environmental commitments;
- **Section 4** provides a detailed description of the Project;
- **Section 5** outlines the regulatory framework applicable to the Project;
- **Section 6** details the stakeholder engagement undertaken for the Project and discusses the issues raised. Specifically, this section lists the DGRs and identifies where these matters are addressed in this EIS;
- **Section 7** provides a summary of the risk assessment process adopted to rank all identified environmental and social issues to assist in directing the focus of this EIS;
- **Section 8** assesses the potential environmental and social impacts of the Project and outlines the proposed management and mitigation measures;
- **Section 9** provides a summary of the management and mitigation measures committed to;
- **Section 10** provides a detailed Project justification and conclusion;
- **Section 11** defines the abbreviations used throughout this EIS;
- **Section 12** provides a list of all materials referenced in this EIS; and
- **Section 13** presents the study team involved in the compilation of this EIS.

Volumes 2 to 6 contains the schedule of land to which this EIS applies, existing planning approvals, regulatory correspondence, stakeholder engagement materials and the revised environmental risk assessment undertaken for the Project. In addition, the specialists technical assessments in full and support the main volume of this EIS.

BENGALLA Mining Company

2

Existing Environment

Existing Environment 2

This section provides an overview of the regional setting, topography, catchments, climate, geology and land use for the areas within and surrounding the Project Boundary. The ownership of land relevant to the Project is also discussed.

2.1 Regional Setting

The Project is located within the Muswellbrook Local Government Area (LGA) in the Upper Hunter region of NSW. The dominant land uses in the region are coal mining, power generation and agriculture. The Hunter River is the major watercourse in the region and performs an important role in supporting the region's populations and industries.

Located 4 km to the east of the Project is the township of Muswellbrook. The New England Highway and the Main Northern Railway Line both pass through Muswellbrook. To the north of the Project are the Mount Pleasant Project and the Dartbrook Mine. Neither of these developments is currently operational. The Hunter River and the Muswellbrook-Ulan Rail Line pass immediately to the south of the Project. To the south-east are the Mt Arthur Coal Mine, Drayton Mine and Macquarie Generation Power Stations (see **Figure 4**). The township of Denman is located approximately 15 km to the south-west. To the west of the Project is the Mangoola Coal Mine and rural residential and rural properties.

2.2 Topography

The land within the Project Boundary is generally undulating and slopes downwards towards the Hunter River to the south. The Hunter River alluvial flats are situated within the eastern and southern extents of the Project Boundary.

In the eastern part of the Project Boundary, the Overton Ridge naturally reaches an elevation of 188 metres (m) Australian Height Datum (AHD). To the south of Overton Ridge are the lower hillslopes of the Hunter Valley, which range in elevation from 250 m AHD to 134 m AHD near the Hunter River (Enviroscienes, 2003).

The area within the Project Boundary predominantly contains slopes of gentle gradients (less than 5 degrees). The gullies in the lower reaches of ephemeral streams draining into the Hunter River generally have slopes of less than 2.5 degrees. Ridgetops also generally have a gradient of less than 2.5 degrees. The Hunter River alluvial floodplain generally has a gradient of less than 1 degree.

Landscape features present within the Project Boundary include:

- Active mining areas within the Approved Bengalla Mine;
- Completed mining areas that are awaiting or in the process of being rehabilitated;
- Rehabilitated areas;
- Bengalla Mine infrastructure; and
- Open paddock grazing land with stands of remnant forest and regrowth woodland.

Prior to mining at Bengalla, the land within the Project Boundary was used for agricultural purposes. As a result, the land to the west of the Approved Bengalla Mine has been substantially cleared and contains only remnant woodland.

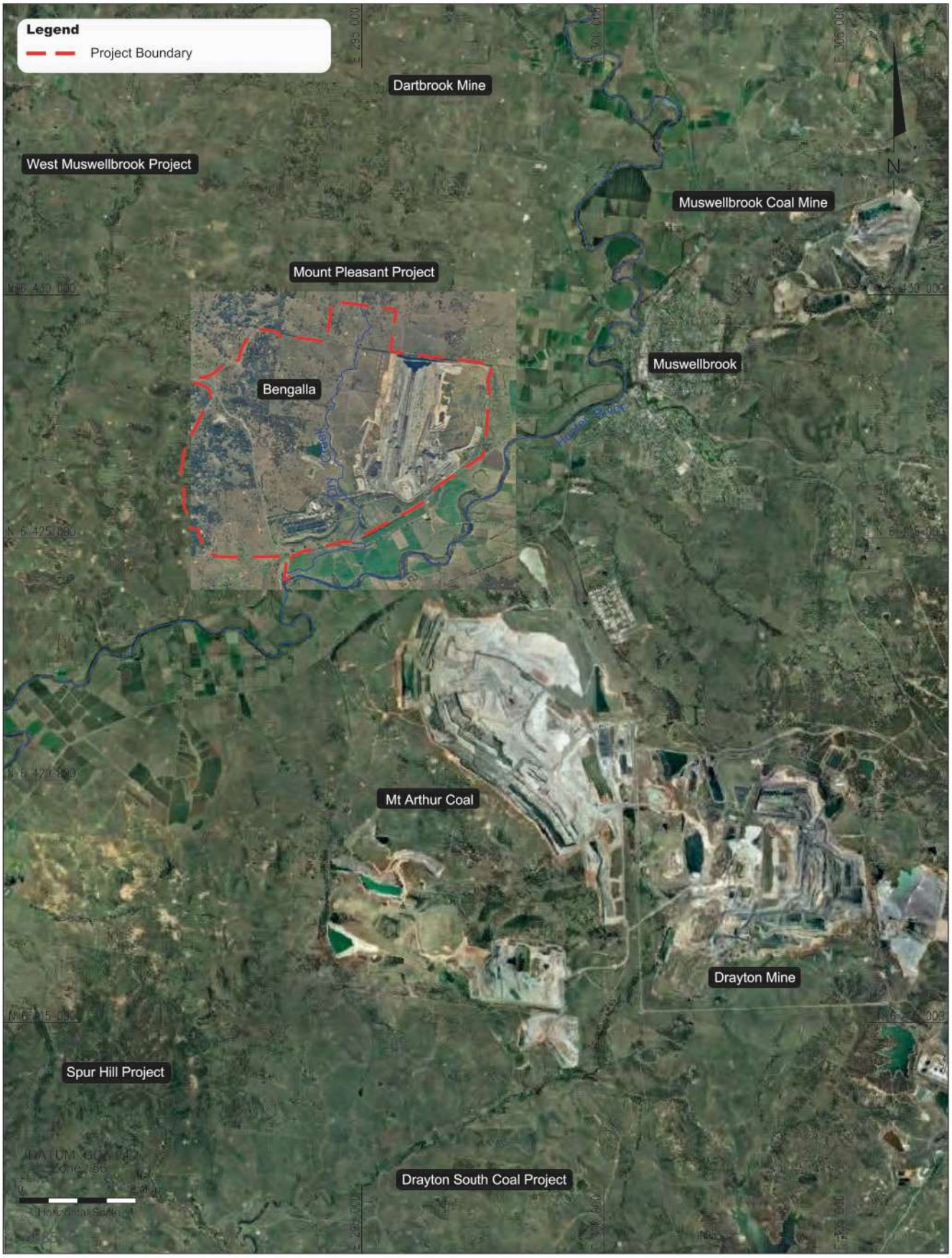
Wollemi National Park is located approximately 22 km to the south of the Project. This encompasses an area of 501,000 ha and consists of open eucalyptus forest, closed forest, woodland and rainforest (NPWS, 2005).

2.3 Catchments

The Project is located within the Hunter River catchment, which has a total area of approximately 4,300 km^2 to Muswellbrook. The main channel of the Hunter River varies in width from 50 m to 100 m, whereas the alluvial floodplain is up to approximately 2 km wide.

The Hunter River passes directly to the south of Bengalla. Consequently, the catchment within the Project Boundary drains in a south and south-easterly direction. The local drainage network generally consists of relatively steep gullies draining from the surrounding hills into flat, meandering tributaries across the Hunter River floodplain. Bengalla Mine is located adjacent to the Hunter River floodplain with the eastern and southern limits of the Project Boundary located within the Hunter River alluvium.

Dry Creek drains the western portion of the land within the Project Boundary. The creek flows southwards through the site and discharges into the Hunter River to the south-west of Bengalla. Dry Creek is ephemeral and has a total catchment area of approximately 18 km^2. The other watercourses in the vicinity of the Project are also ephemeral. Long periods of zero flow are interrupted by short periods of discharge during periods of prolonged and/or heavy rainfall.



BENGALLA MINE

Existing Environment

FIGURE 4

In accordance with the Strahler stream classification, Dry Creek is a third order stream.

A baseline photographic record and visual fly through of the Dry Creek alignment within the Project Boundary was completed for the Project. **Plate 1** provides a representative example of Dry Creek from within the Project Boundary. Additional detail regarding baseline conditions of Dry Creek is discussed in **Section 8.6**.

The Hunter River is regulated upstream of Bengalla by Glenbawn Dam, with a catchment area of 1,300 km^2. Under current catchment conditions the Hunter River is perennial, with a minimum flow rate of approximately 10 Megalitres/day (ML/d). The median (50th percentile) flow rate is about 380 ML/day and the fifth percentile flow rate is greater than 100 ML/day. It is likely that regulation has increased the frequency of low flows and moderately reduced the frequency of high flows (See **Section 8.6**).

2.4 Land Use

The Upper Hunter region has a long history of rural land use for a variety of agricultural and industrial activities, predominantly grazing and coal mining. The dominant land uses within and adjacent to the Project Boundary include open cut coal mining and industrial activities, agriculture, rural residential and rural areas. The Hunter River is south of the Project Boundary and plays an important role in the region's mining, power generation and agricultural enterprises. **Figure 5** provides an indication of the proximity of industries in relation to Bengalla.

BMC currently owns 3,203 hectares (ha) of land within and surrounding the Project Boundary. The Approved Bengalla Mine accounts for 974 ha of this area. The remainder of BMC's land is licensed to agricultural operators for a variety of agricultural enterprises, primarily for cattle grazing (see **Plate 2**). BMC's landholdings outside of the Project Boundary are used for dairying, thoroughbred breeding, cattle grazing, lucerne hay production and hemp production.

Each of the key surrounding land uses in relation to agriculture, power generation and industry, coal mining, rural and residential developments and National Parks and State Forests are discussed further below.

The Bengalla Link Road is a dedicated public road constructed under Development Consent (DA 211/93).

2.4.1 Coal Mining

The Upper Hunter region has a long history of coal mining development. Coal mining in the region commenced in 1906 with the establishment of the Muswellbrook Colliery (see **Figure 4**). Mining in the region has since expanded significantly, particularly in the vicinity of the Project. Coal mining contributes significantly to the economy of the Upper Hunter region. According to the *Upper Hunter Economic Diversification Project* (Buchan Consulting, 2011), the mining industry in the region generated an estimated $6.2 Billion in revenue in 2010. In addition, mining employs 19.3% of persons in the Muswellbrook LGA, which is substantially more than any other sector (Buchan Consulting, 2011).

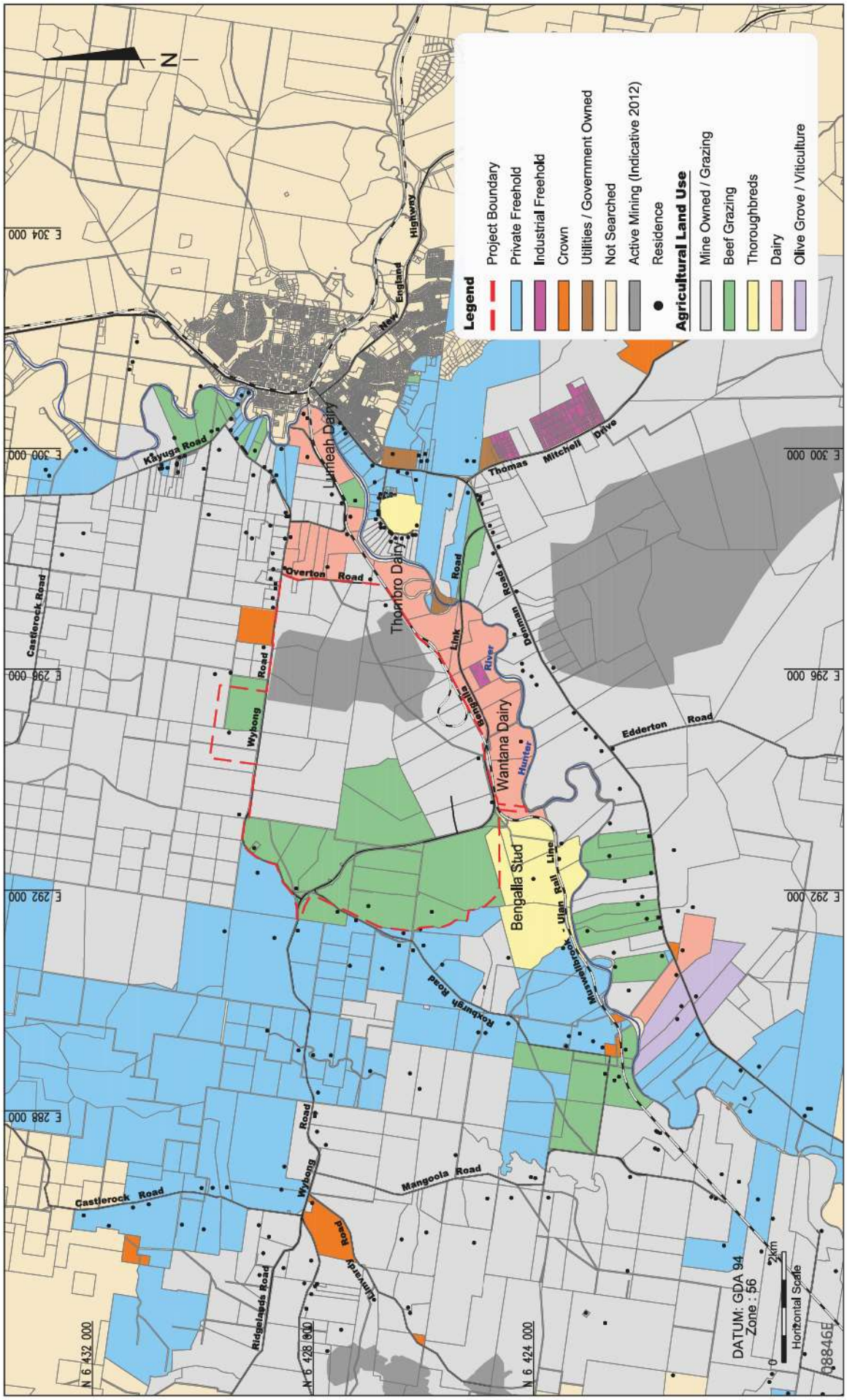
Table 1 and **Figure 4** identify the existing and approved mining operations within 10 km of the Project. These Projects have been considered in the assessment of cumulative environmental impacts, where applicable. The key interactions between the Project and other approved mining developments in close proximity are described in further detail below.

Mount Pleasant Project

The Mount Pleasant Project is wholly owned by Coal & Allied, subsidiary of Rio Tinto Coal Australia (RTCA). It is located to the immediate north of the Project Boundary. The Mount Pleasant Project was granted development consent (DA 92/97) in 1999, which was supported by the *Mount Pleasant Mine Environmental Impact Statement* (Mount Pleasant EIS) (ERM Mitchell McCotter, 1997). The Mount Pleasant Project has approval for the construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities at a production rate of up to 10.5 Mtpa ROM coal.

Plate 1 Typical Dry Creek Section

Plate 2 Existing Land Use



BENGALLA MINE

Indicative Land Use

FIGURE 5

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

BENGALLA

Table 1 Coal Mining Operations in Proximity to Project

Mine	Distance from the Project	Description	Status
Mount Pleasant Project	<1km north	Open cut coal mine approved to extract up to 10.5 Mtpa of ROM coal for a period of 21 years. Development commenced in 2004 with the construction of Environmental Dam 1. This project has not yet commenced coal extraction operations at this time.	Approved until 22/12/2020
Mt Arthur Coal Mine	2 km south	Currently operating open cut and underground coal mine to extract from Mt Arthur Coal Complex up to 36 Mtpa ROM coal. The operator has also recently submitted a Modification to Project Approval 06_0091, to facilitate a four year continuation of the open cut mine life from 2022 to 2026 at the currently approved maximum rate of 32 Mtpa with an additional footprint of 400 ha along with other infrastructure changes.	Open cut until 2022 (2026 if modification granted). Underground until 2030
Mangoola Coal Mine	8 km west	Currently operating open cut coal mine extracting and processing up to 10.5 Mtpa of ROM coal for a period of 21 years. Project Approval 06_0014 has been modified five times. The operator has also recently submitted a Modification to its Project Approval, to facilitate an increase in production rates 13.5 Mtpa along with other associated infrastructure changes. No amendment to the approved project disturbance boundary is being sought.	Approved until 20/11/2029
Muswellbrook Coal Mine	6 km east	Currently operating open cut coal mine extracting and processing up to 2 Mtpa of ROM coal.	Approved until 01/09/2015
Drayton Mine	8 km south-east	Open cut coal mine extracting up to 8 Mtpa of ROM coal.	Approved until 31/12/2017
Drayton South Coal Project	16 km south	Proposed open cut and highwall mining processing up to 7 Mtpa for ROM coal for a period of 27 years within the Drayton South area while continuing to utilise Drayton Mine's existing infrastructure and equipment.	DP&I Assessment Process
Dartbrook Mine	9 km north-east	Underground mine extracting up to 6 Mtpa of ROM coal for a period of 21 years. Mining was suspended due to operational and geological issues. Dartbrook has been under care and maintenance since 2007.	Approved until 05/12/2022
West Muswellbrook Project	4 km west	Explorations activities currently ongoing within Assessment Lease 19 granted to 9 September 2014.	Exploration
Spur Hill Project	8 km south-west	Exploration activities within Exploration Licence 7429.	Exploration

The Mount Pleasant Project physically commenced in 2004 with the construction of Environmental Dam 1 (ED1). No other construction or coal mining has occurred to date.

In 2011, a modification to DA 92/97 was approved, supported by the 'Mount Pleasant Project Modification Environmental Assessment Report' (Mount Pleasant 2010 EA) (EMGA Mitchell McLennan, 2010). This modification allowed the mine infrastructure to be sited within an infrastructure envelope, as opposed to the specific locations specified in the Mount Pleasant EIS. The modification also provided the option of a conveyor / service corridor as an alternative to the approved rail facilities. The conveyor / service corridor passes through the Project Boundary.

In order to address potential cumulative issues associated with the Project and the Mount Pleasant Project, it has been assumed that further approvals will be granted to enable operations to continue beyond 2020. This assumption is intended to represent a potential 'worst case' scenario with consideration of potential cumulative environmental impacts. An assessment of the cumulative air quality, noise and traffic impacts associated with this potential worst case scenario has been applied to this EIS and is discussed in **Section 8**. Key Project interactions with the Mount Pleasant Project are discussed in detail in **Section 4.12**.

Coal & Allied and BMC have a protocol in place that will facilitate open cut coal mining by BMC to the south of Wybong Road within Mount Pleasant Project Mining Lease 1645. Consultation with Coal & Allied in relation to the Mount Pleasant Project is discussed in **Section 6**.

Mt Arthur Coal Mine

Hunter Valley Energy Coal's (HVEC) Mt Arthur Coal Mine is located approximately 2 km south of the Project. Mt Arthur Coal Mine operates an approved open cut and underground coal mine (in accordance with Project Approval 06_0091) to extract up to 36 Mtpa ROM coal. Open cut and underground operations are approved to continue until 2022 and 2030 respectively.

HVEC is seeking a Modification to Project Approval 06_0091 to facilitate:

- A four year continuation of the open cut mine life from 2022 to 2026 at the currently approved open cut mining maximum rate of 32 Mtpa;
- Increase in open cut disturbance areas of approximately 400 ha;
- Use of the existing conveyor corridor for overburden emplacement;
- Various infrastructure changes; and
- Increasing the maximum number of train movements per day to 19.

In order to address potential cumulative issues associated with the Project and Mt Arthur Coal Mine, it has been assumed that approval for the above modification is granted and in addition further approvals will be sought and granted to enable the continuation of mining westwards beyond 2026. This assumption is intended to represent a potential 'worst case' scenario with consideration of potential cumulative environmental impacts. An assessment of the cumulative air quality, noise and traffic impacts associated with this potential worst case scenario has been applied to this EIS and is discussed in **Section 8**.

Mangoola Coal Mine

Xstrata Mangoola Pty Ltd (Xstrata Mangoola) operates the Mangoola Coal Mine (Mangoola) located 6 km west of the Project. Xstrata Mangoola was granted Project Approval 06_0014 in June 2007 for the construction of an open cut coal mine and associated infrastructure to 20 November 2029. Since this time, five modifications to the original Project Approval 06_0014 have been granted for the following:

- Modification 1 – 'Early Works' granted on 22 July 2008;
- Modification 2 – 'Pipeline Modification' granted on 23 June 2009;
- Modification 3 – 'Mining Infrastructure Area and CHPP' granted on 4 November 2009;
- Modification 4 – 'Modifications to Mine Plans' granted on 22 June 2012; and
- Modification 5 – 'Night Time Works' granted on 23 February 2010.

Access to Mangoola is primarily via the Bengalla Link Road and Wybong Road. Any changes to the Bengalla Link Road alignment associated with the Project have considered currently approved traffic levels at Mangoola (see **Section 8.13**). BMC will continue to consult with Xstrata Mangoola in relation to the construction of the realignment of the Bengalla Link Road in approximately Year 15.

Xstrata Mangoola is currently seeking a modification to Project Approval 06_0014 to facilitate:

- Increase in the maximum rate of extraction from 10.5 Mtpa ROM coal to 13.5 Mtpa ROM coal;
- Increase in equipment numbers to support increased mining intensity;
- Increase in employee numbers to support additional equipment and operational needs and requirements;
- Increase frequency of blasting from five blasts per week to six blasts per week;
- Relocation of one temporary ROM stockpile to a permanent ROM stockpile location;
- Utilisation of up to 50,000 tonnes per annum (tpa) of suitable mined waste rock for onsite gravel production; and
- Discharge of saline water to the Hunter River under the rules and regulations of the Hunter River Salinity Trading Scheme (HRSTS).

No increase or extension to the approved project disturbance boundary is sought.

2.4.2 Agriculture

The Project is located within lands that have been largely disturbed by previous agricultural activities, particularly cultivation and grazing. Agriculture has been conducted in the vicinity of the Project since European settlement of the Muswellbrook area in 1824. As a result of extensive agriculture, the landscape in the area typically consists of grassland interspersed with small woodland remnants.

The Hunter River meanders south from Glenbawn Dam (east of Scone) and passes to the south of the Project before flowing east towards Newcastle. The Hunter River and its alluvial floodplain support agricultural activities including viticulture, grazing, dairying, lucerne hay production, horse studs and olive groves. In 2009, agricultural production in the region amounted to $248 Million (M). The viticulture and thoroughbred breeding industries generated revenues of $45 to 55 M and $100 M respectively (Buchan Consulting, 2011).

BMC has operated adjacent to neighbouring agricultural enterprises since its approval in 1995. Approximately 2,200 ha of the land not required for mining is used for agricultural purposes including dairying, cattle production and equine industries.

BMC has made a commitment to maintain the agricultural productivity of its land holdings, which it has done since 1995. BMC has established lease agreements with third parties for the management of three dairy farms and the Bengalla Stud.

There are also a variety of agricultural enterprises adjacent to the Project Boundary including grazing, dairying, equine industries, viticulture and an olive grove. A full discussion of agricultural impacts associated with the Project is provided in **Section 8.20**. **Figure 5** presents the Project in context of the surrounding land uses. A description of each is provided below.

Grazing

Other than mining, small-medium scale, semi-rural grazing properties are a frequent land use surrounding the Project primarily to the east and west.

Dairying

From 1995 to 2004, the Bengalla Agricultural Company managed three dairy farms in the vicinity of Bengalla: Thornbro, Wantana and Lumeah. The management of these dairy farms was transferred to private operators in 2004. These farms remain under the management of licensees and currently produce approximately 4.7 M litres of milk annually.

The closest privately owned dairy farm is located approximately 3 km south-west of the Project Boundary.

Viticulture

The Upper Hunter region contains several wineries and vineyards with Cruickshank's Callatoota Vineyard being closest, located approximately 12 km to the south-west of the Project Boundary on Denman Road. Roxburgh Vineyard is owned by HVEC in conjunction with the operation of Mt Arthur Coal Mine.

Equine

In addition to Bengalla Stud, there are several horse enterprises in the Hunter Valley, however the nearest privately owned horse stud is located 3.5 km south-west of the Project Boundary. There are existing thoroughbred racing and training facilities located on Racecourse Road, to the south-east of Bengalla.

Woodlands and Coolmore Studs are located approximately 16 km and 18 km south, respectively, from the Project Boundary with various other mining operations and projects located in between, including Mt Arthur Coal Mine, Drayton Mine and the proposed Drayton South Coal Project.

Olive Groves

Pukara Olives is an 80 ha olive grove located on Denman Road approximately 4.5 km south-west of the Project Boundary. Pukara Olives was established in 1999 and has coexisted within proximity to Bengalla since this time. Pukara Olives is owned by HVEC in conjunction with the operation of Mt Arthur Coal Mine.

2.4.3 Power Generation and Other Industry

The Bayswater and Liddell Power Stations, both owned by Macquarie Generation, are located approximately 16 km to the south-east of Bengalla. Bayswater Power Station utilises four 660 megawatt (MW) generating units to produce approximately 16,000 Gigawatt hours (GWh) of electricity per year. Liddell Power Station is comprised of four 500 MW generating units, which produce approximately 10,000 GWh of electricity annually. The Liddell and Bayswater Power Stations were commissioned in 1971 and 1985, respectively.

Macquarie Generation's operations in the Hunter Valley supply approximately 13% of the electricity consumed by eastern Australia (Queensland to South Australia) and 40% of the electricity consumption in NSW. Macquarie Generation is one of Australia's largest electricity providers. On 12 January 2010, the then Department of Planning granted approval for a concept plan for the Bayswater B Power Station. This is a proposed gas or coal fired power station to be constructed near the existing Bayswater Power Station.

The Muswellbrook Industrial Estate is located on Thomas Mitchell Drive to the south-east of Bengalla (see **Figure 5**). Muswellbrook Industrial Estate is comprised of a variety of businesses that largely provide support services to the mining industry.

2.4.4 Rural and Residential Developments

The township of Muswellbrook is located approximately 4 km east of Bengalla. Muswellbrook is situated on the New England Highway, approximately 25 km south of Scone and 50 km north-west of Singleton. The town has a population of approximately 10,500 (MSC, 2011a).

The rural township of Denman is located approximately 15 km south-west of Bengalla. Denman has a population of approximately 1,500 (MSC, 2011a). The townships of Muswellbrook and Denman are both situated in the Muswellbrook LGA, which is estimated to have a population of 16,098 (ABS, 2012a). There are several privately owned rural properties located to the west and south-west of the Project Boundary.

2.4.5 National Parks and State Forests

There are no State Forests within 50 km of the Project. There are no substantial National Parks in close proximity to Bengalla Mine. The closest National Parks are Wollemi National Park situated approximately 22 km to the south and Goulburn River National Park situated approximately 30 km west of Bengalla.

2.5 Land Ownership

The ownership of land within and surrounding the Project Boundary is shown in **Figure 6**. All of the land within the Project Boundary is owned by BMC, with the exception of three lots owned by Coal & Allied (for the Mount Pleasant Project). Coal & Allied also owns a large area of land to the north of Bengalla. The land to the south of the Project Boundary is held by HVEC for the Mt Arthur Coal Mine.

Xstrata Mangoola occupies a significant area of land to the west of the Project. The land between Bengalla and Mangoola is comprised of privately owned rural residential properties. Much of this land is situated within the West Muswellbrook Project's Assessment Lease (AL) 19 (see **Figure 6**).

Other private landholdings occur to the east of Bengalla, near the Muswellbrook Racecourse. Potential impacts to mine owned properties and receptors are discussed in **Section 8.1** and **Section 8.3**.

Table 2 lists the properties in the vicinity of the Project that remain under private ownership. This table allocates a unique identifier to each individual lot of land in the area and should be read in conjunction with **Figure 6**.

For the purpose of this EIS individual households will be referred to as receptors. Where properties are currently entitled to acquisition upon written request by a coal mine, being within a Zone of Affectation (ZOA) it is indicated with explanatory notes at the bottom of the table.

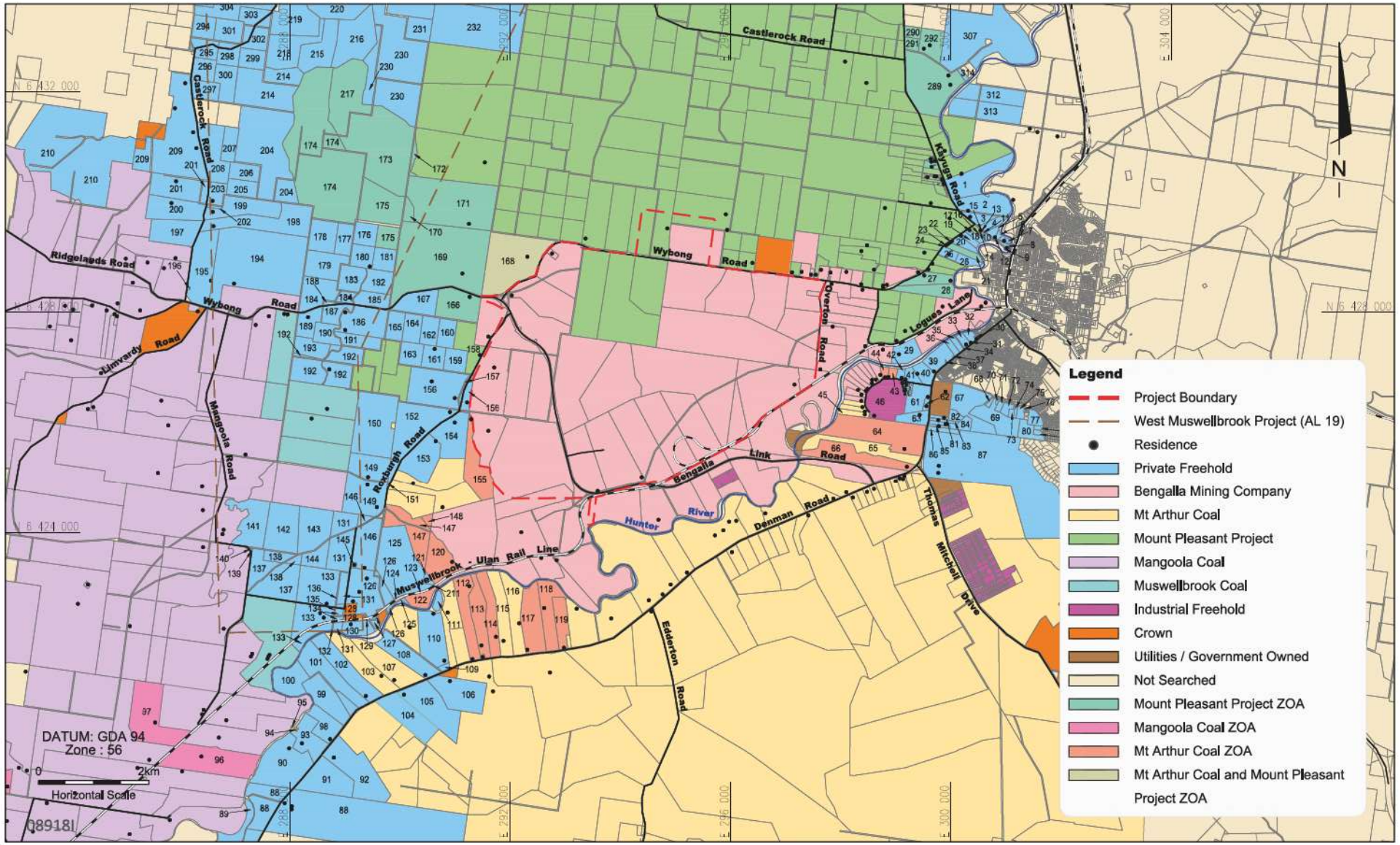
Table 2 Non-Mine Land Ownership

ID	Name	ID	Name	ID	Name
1	Cowtime Investments Pty Ltd	28	C Horne*	56	NJ Keevers
2	Cowtime Investments Pty Ltd	29	Jabetin Pty Limited	57	AC Good
3	Cowtime Investments Pty Ltd	30	Telstra Corporation Limited	58	RS & JT Cridland
4	Cowtime Investments Pty Ltd	31	The Council of the Municipality of Muswellbrook	59	Englebrecht Racing Stables
5	Cowtime Investments Pty Ltd	32	YS Boyle	60	RH Englebrecht
6	LG & CM Kelman	33	NSW Greyhound Breeders Owners & Trainers	61	JR Gleeson & MR Cranfield
7	LG & CM Kelman	34	NSW Land And Housing Corporation	62	DR & CJ Tubb
8	CK Birch	35	WJ Hardes	63	JP Drake
9	CK Birch	36	WJ Hardes	64	MJ Drake^
10	WJ Adnum	37	NSW Land and Housing Corporation	66	JR Scriven^
11	WJ & DW Adnum	38	NSW Land and Housing Corporation	67	PM & FP Farrell & HG & MG Cope
12	WJ Pitman	39	WJ Hardes	68	JT & SE Bancroft
13	WJ Adnum	40	SW & KL Barkley	69	G Gillfeather
14	DL & FR Wicks	41	FK & WDG Almond & PW Hume	70	GJ Meyer
15	DL & FR Wicks	42	DP Englebrecht^	71	AR Masters
16	DL & FR Wicks	43	KB & JA Barnett^	72	RJD & DA Osborn
17	LJ Purser	44	MJ McGoldrick	73	RJD & DA Osborn
18	DM Purser	46	Muswellbrook Race Club Limited	74	JR Hall
19	RK & NV Googe	47	DL Robinson	75	Talbot & Jazipa Pty Ltd
20	RK & NV Googe	48	MC & LI Dobie	76	JA & DJ Forder
21	RK & NV Googe*	49	ML & EA Sweeney	77	MSC
22	N & M Sormaz	50	TD Barron	78	Christian Outreach Centre
23	RB Parkinson	51	RA Byrnes & MA Moller	79	Christian Outreach Centre
24	JM Simpson	52	GL & IL Andrews	80	MSC
25	RK & NV Googe	53	SY Johnson	81	JR & JA Buckley
26	RK & NV Googe	54	JR Gleeson & MR Cranfield	82	JR & JA Buckley
27	C Horne*	55	SM Bredden	83	JR & JA Buckley

ID	Name	ID	Name	ID	Name
84	SRP & RF Ray	120	TW Roots^	155	PG & CM Lane^
85	Hallett & Campbell & Anderson	121	MR & M Peel	156	NJ & RY Ellis
86	Hallett & Campbell & Anderson	122	TW Roots	157	NJ & RY Ellis
87	F & IR Webber	123	Commissioner for Railways	158	HVEC (formerly RR & JM Hamilton)
88	PR & M Burgmann	124	Commissioner for Railways	159	RB & SA Parkinson
89	GW & HM Blake	125	MR & M Peel	160	RB & SA Parkinson
90	RW Jones	126	JDM Markham**	161	RB & SA Parkinson
91	TR & KM Paulsen	127	AA & BT Meyer	162	RB & SA Parkinson
92	TR & KM Paulsen	128	State Rail Authority of NSW	163	RB & SA Parkinson
93	DJ Phillips	129	State Rail Authority of NSW	164	RB & SA Parkinson
94	Public Works NSW	130	AA & BT Meyer**	165	RB & SA Parkinson
95	Minister for Public Works NSW	132	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	166	BA & TE Strachan*
96	RJ & AM Hordern	133	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	167	RJ & SA Lane
97	GR Cole	134	Minister for Public Works**	168	JB Moore*^
98	RL Wilks	135	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	169	JB Moore*/**
99	HR & BC Grugeon	136	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	170	JB Moore*/**
100	HR & BC Grugeon	137	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	171	BL & ML Bates*/**
101	FYP Zhu & HM Weng	138	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	172	BL & ML Bates*/**
102	LA & CA Macpherson	139	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	173	BL & ML Bates*/**
103	HVEC (formerly Eglington & Fuller & Goodchild)	140	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	174	JB Moore*
104	RW Turner	141	FN Googe**	175	JB Moore*/**
105	RW Turner	142	FN Googe**	176	JE & JL Lonergan**
106	MJ & MJ Duncan	143	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	177	JE & JL Lonergan**
107	HVEC (formerly BD Eglington & SR & L Fuller & SM & RD Goodchild)	144	S.R. & J. W. Lawson (Lindisfarne) Pty Limited**	178	JE & JL Lonergan**
108	MJ & MJ Duncan	145	PJ Brown	179	JE & JL Lonergan**
109	EJ & CA Denton	146	JJ & PJ Brown	180	JE & JL Lonergan
110	GR & MK Walsh	147	TW Roots	181	JE & JL Lonergan**
111	GR & MK Walsh	148	TW Roots	182	JE & JL Lonergan**
112	MG & LI Latham^	149	RM & KF Merrick**	183	JL Smith & KL Balmer**
113	MG & LI Latham^	150	RM & KF Merrick**	184	JL Smith & KL Balmer**
114	JM Wild^	151	DT Gilder	185	JE & JL Lonergan**
117	E Rankin^	152	MR Peel	186	RB & SA Parkinson**
118	E & WJ Rankin^	153	PR Ellis	187	RB & SA Parkinson**
119	E & WJ Rankin^	154	PSJ Murray	188	JL Smith & KL Balmer**

ID	Name	ID	Name	ID	Name
189	FN & WL Googe**	219	HJ & RA Wright**	272	JS & NM Lonergan
190	RB & SA Parkinson**	220	AJ & LL Martin**	273	DR Bluford
191	RB & SA Parkinson**	221	CW Hutchinson	275	WE White & J Hutchinson
192	GT McNeill**	222	JD Vandenbergh	279	Coal & Allied Operations (formerly D Small)
193	FN & WL Googe**	224	DB & RJ Wright	286	IJ & CM Richards
194	DMA Carey**	225	GC Sparre	288	DS MacDonald & DE Kilgannon
195	AH & JA Thiecke**	226	GC Sparre	289	KJ & GM Yore*
196	Church Property for the Diocese of Newcastle	227	GC Sparre	290	DHH Macintyre*
197	G & JM Jackson	228	GC Sparre	291	DHH Macintyre*
198	IV & CA Ingold**	229	GC Sparre	292	DHH Macintyre*
199	SH Jennar**	230	GC Sparre**	294	AM Pratt**
200	MA Perkins	231	GC Sparre**	295	AM Pratt**
201	DG Peace	232	GC Sparre**	296	AM Pratt**
202	SH Jennar**	233	GC Sparre	297	AM Pratt**
203	RG Gowing**	245	JS & NM Lonergan	298	AM Pratt**
204	RG Gowing**	246	JS & NM Lonergan	299	AM Pratt**
205	RG Gowing**	247	GM Casey	300	AM Pratt**
206	RG Gowing**	248	GM Casey	301	AM Pratt**
207	RG Gowing**	249	JS & NM Lonergan	302	AM Pratt**
208	RG Gowing**	250	JS & NM Lonergan	303	AM Pratt**
209	RG Gowing	251	GM Casey	304	GT Keast**
210	MJ & CA Le Breton	252	GM Casey	305	JE Lonergan
211	TM Peel	253	GM Casey	307	Dapkos Pty Limited
214	RG Gowing**	256	GM Casey	308	AP & PE McManus
215	JH & CM Almond**	259	GM Casey	309	GT Keast
216	JH & CM Almond**	260	GM Casey	312	Dapkos Pty Limited
217	BL & ML Bates*/**	263	GM Casey	313	Dapkos Pty Limited
218	TP & DP Reading**	264	GM Casey	314	S Yore

**Entitled to acquisition as a result of the Mount Pleasant Project ^Entitled to acquisition by Mt Arthur Coal Mine*
***Located within West Muswellbrook Project's AL19*



BENGALLA MINE

Land Ownership

FIGURE 6

2.6 Climate

The Upper Hunter region experiences a warm temperate climate, characterised by seasonal variations of hot, wet summers and mild, dry winters. In the winter months, high pressure systems alternate with cold fronts, combining to produce cool, dry conditions. Frosts and fog are prevalent in the cooler, drier months from mid-autumn to late spring. The warm and dry conditions during the summer months are produced by synoptic high pressure systems over the Great Australian Bight. Synoptic low pressure systems occur intermittently during summer, resulting in periods of heavy rain and thunderstorms.

The meteorological data used in the preparation of this EIS has been sourced from the Bengalla meteorological station at Logues Lane and the Bureau of Meteorology (BoM) monitoring stations at Jerrys Plains and Scone. The recording periods for these stations and their locations relative to Bengalla are provided in **Table 3**. Long term meteorological data is summarised in **Table 4** and discussed below.

2.6.1 Temperature and Humidity

The temperatures recorded at Jerrys Plains establish that the Upper Hunter region experiences warm temperatures during the summer and very cool temperatures during the winter. January is the warmest month, averaging a daily maximum temperature of 31.7°C. July is the coolest month of the year, with a mean daily maximum temperature of 17.4°C and a mean daily minimum temperature of 3.8°C.

Table 3 Regional Meteorological Stations

Name	Operator	Station No.	Location	Period Record
Jerrys Plains Post Office	BoM	061086	25 km south-east of Project Boundary	1884 – current
Scone SCS	BoM	061089	24 km north-east of Project Boundary	1950 – current
Bengalla Meteorological Station	BMC	N/A	Near Logues Lane to the east of Project Boundary	1991 – current

Table 4 Long Term Meteorological Data Summary

Month	Mean Daily Temperature (°C)				Mean Monthly Rainfall (mm)		Mean Monthly Rain Days		Mean Monthly Humidity (%)		Mean Monthly Evaporation (mm)
	Jerrys Plains		Scone		Jerrys Plains	Scone	Jerrys Plains	Scone	Scone		
	Min	Max	Min	Max					9:00 am	3:00 pm	Scone
Jan	17.2	31.7	16.9	31.1	76.8	81.3	6.5	6.5	67	43	220.1
Feb	17.1	30.9	16.9	29.9	72.8	77.3	6.0	5.9	73	47	175.2
Mar	15.0	28.9	14.6	27.9	58.8	51.7	5.8	5.1	73	47	155.0
Apr	11.0	25.3	11.3	24.5	44.3	39.4	4.9	4.4	71	47	105.0
May	7.4	21.3	8.1	20.1	40.8	46.9	4.9	5.3	76	56	68.2
Jun	5.3	18.0	6.0	16.9	48.0	45.2	5.5	6.0	78	58	48.0
Jul	3.8	17.4	4.7	16.3	43.6	36.6	5.2	5.1	75	54	55.8
Aug	4.4	19.4	5.6	18.3	36.5	39.2	5.3	5.3	67	46	83.7
Sep	7.0	22.9	7.9	21.4	42.0	39.2	5.2	5.3	62	43	117.0
Oct	10.3	26.2	10.9	24.8	52.2	59.4	5.9	6.3	59	42	155.0
Nov	13.2	29.1	13.3	27.6	61.1	61.7	6.2	6.5	62	41	183.0
Dec	15.7	31.3	15.7	30.2	67.9	68.4	6.4	6.7	61	39	220.1
Mean	**10.6**	**25.2**	**11.0**	**24.1**	**53.7**	**53.9**	**5.6**	**5.7**	**68.7**	**46.9**	**132.2**
Total	-	-	-	-	**644.8**	**646.3**	**67.8**	**68.4**	-	-	**1,586.1**

Humidity data was sourced from the BoM meteorology station at Scone. Humidity levels exhibit variability and seasonal flux throughout the year. Mean morning humidity levels (at 9:00 am) range from 59% to 78%. Mean afternoon humidity levels (at 3:00 pm) range from 39% to 58%. The spring months generally experience lower humidity than rest of the year.

2.6.2 Rainfall

In the Upper Hunter region, rainfall is substantially higher in the summer than in the winter. The monthly rainfall measured at Jerrys Plains varies from 36.5 millimetres (mm) in August to 76.8 mm in January. In 2011, Bengalla received 777 mm of rain, falling over 138 rain days. This was similar to the previous year, where the annual rainfall was 722 mm, distributed over 132 rain days (BMC, 2012b).

In summer, rainfall is generally due to low pressure troughs and an increased maritime influence, with onshore winds penetrating as far inland as Muswellbrook. This generates intense thunderstorms, accounting for the higher and more intense rainfall experienced in the summer months. The rainfall patterns in the Upper Hunter region have been considered for the purposes of the Surface Water Impact Assessment and Groundwater Impact Assessment (see **Section 8.6** and **Section 8.7** respectively).

2.6.3 Evaporation

Evaporation data for the region was sourced from the BoM meteorological station at Scone. A direct correlation exists between higher temperatures, afternoon winds and evaporation. Accordingly, evaporation rates are highest in the summer. The mean monthly pan evaporation rate ranges from 48 mm in June to 220 mm in January. In the Upper Hunter region, the evaporation rate substantially exceeds the rainfall. These evaporations rates have been adopted for the Surface Water Impact Assessment and Groundwater Impact Assessment (see **Section 8.6** and **Section 8.7** respectively).

2.6.4 Wind Speed and Direction

The windroses in **Figure 7** depict the wind speeds and directions experienced at Bengalla. The wind directions have remained consistent in recent years, with winds prevailing from the south-east during summer and from the north-west during winter (BMC, 2012b).

Maximum wind speeds are generally greater in the summer than in the winter. In 2011, the February and September recorded the strongest winds, with a mean maximum wind speed of 11.0 meters per second (m/s). The lowest monthly mean maximum wind speed of 7.9 m/s was recorded in May (BMC, 2012b). Wind speeds and directions have been considered in the Air Quality Impact Assessment and Acoustic Impact Assessment (see **Section 8.1** and **Section 8.3** respectively).

2.7 Geology

2.7.1 Stratigraphy

Bengalla is situated in the north-west of the Hunter Coalfield, a division of the Sydney Basin. Bengalla is located on the western limb of the north-south trending Muswellbrook Anticline. As a result, coal seams subcrop near the eastern extent of the Project Boundary and dip to the west. The dip is approximately 8 degrees near subcrop, decreasing to 2 to 3 degrees at greater depths.

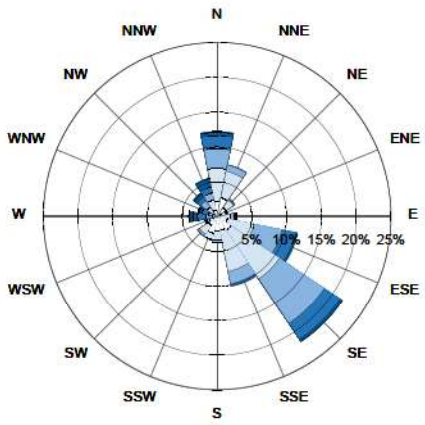
The stratigraphic sequence across the site is comprised of the late Permian Whittingham Coal Measures. The Whittingham Coal Measures are up to 800 m thick and consist of sandstone, siltstone, claystone, conglomerate and tuff, within which intermittent coal seams exist. The target coal seams for the Project are located within the Jerrys Plains and Vane Subgroups of the Whittingham Coal Measures and extend from the Warkworth to the Edderton seam. An indicative stratigraphic column showing the target seams for the Project is provided in **Figure 8**.

The Permian coal measures are overlain by thin Quaternary alluvial deposits. Quaternary alluvial deposits consist of sand and gravel along creek valleys and in the alluvial floodplain of the Hunter River.

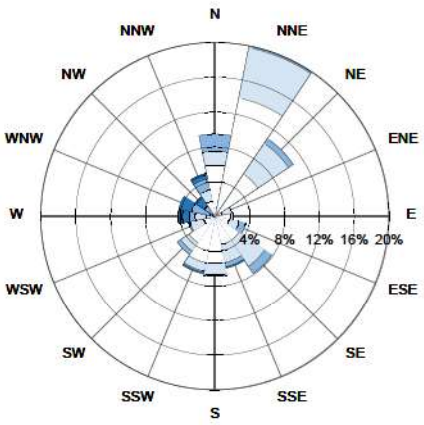
2.7.2 Exploration

Since the grant of A 438 in February 1991, BMC has undertaken numerous exploration programs to define the coal deposit at Bengalla. Detailed exploration drilling was conducted from May 1991 to October 1992 to obtain structural, lithological and coal quality data. From September to November 1993, partially cored holes were drilled to obtain a sample for pilot-scale washing and combustion testing.

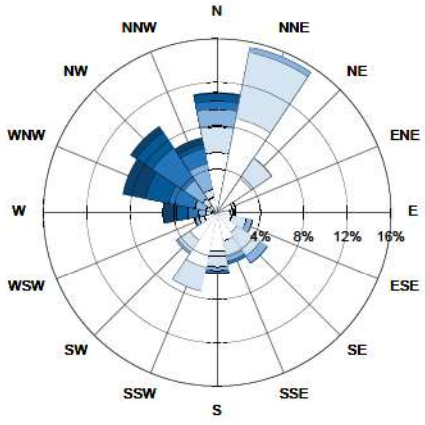
Extensive drilling of shallow open holes was conducted between December 1996 and May 1997 to define the limits of oxidation (LOX) for the coal seams within the authorisation boundary. Further LOX drilling was undertaken from February to April 2002 consisting of over 170 boreholes aimed to further define the Warkworth and Piercefield seams. In May and October 2007, cored holes were drilled to obtain samples for spontaneous combustion testing. Samples of fresh and oxidised coal were collected for testing.



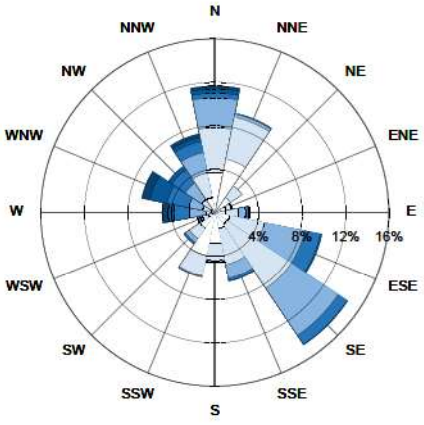
Summer



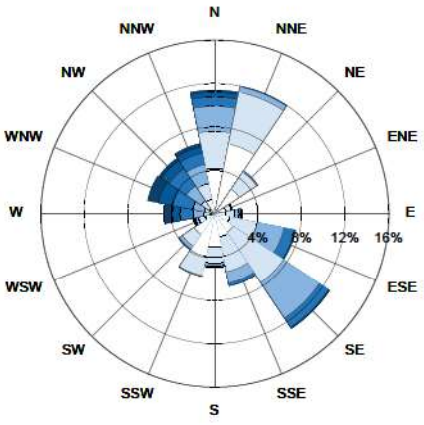
Autumn



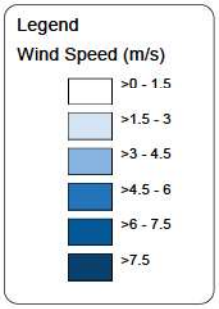
Winter



Spring



Annual



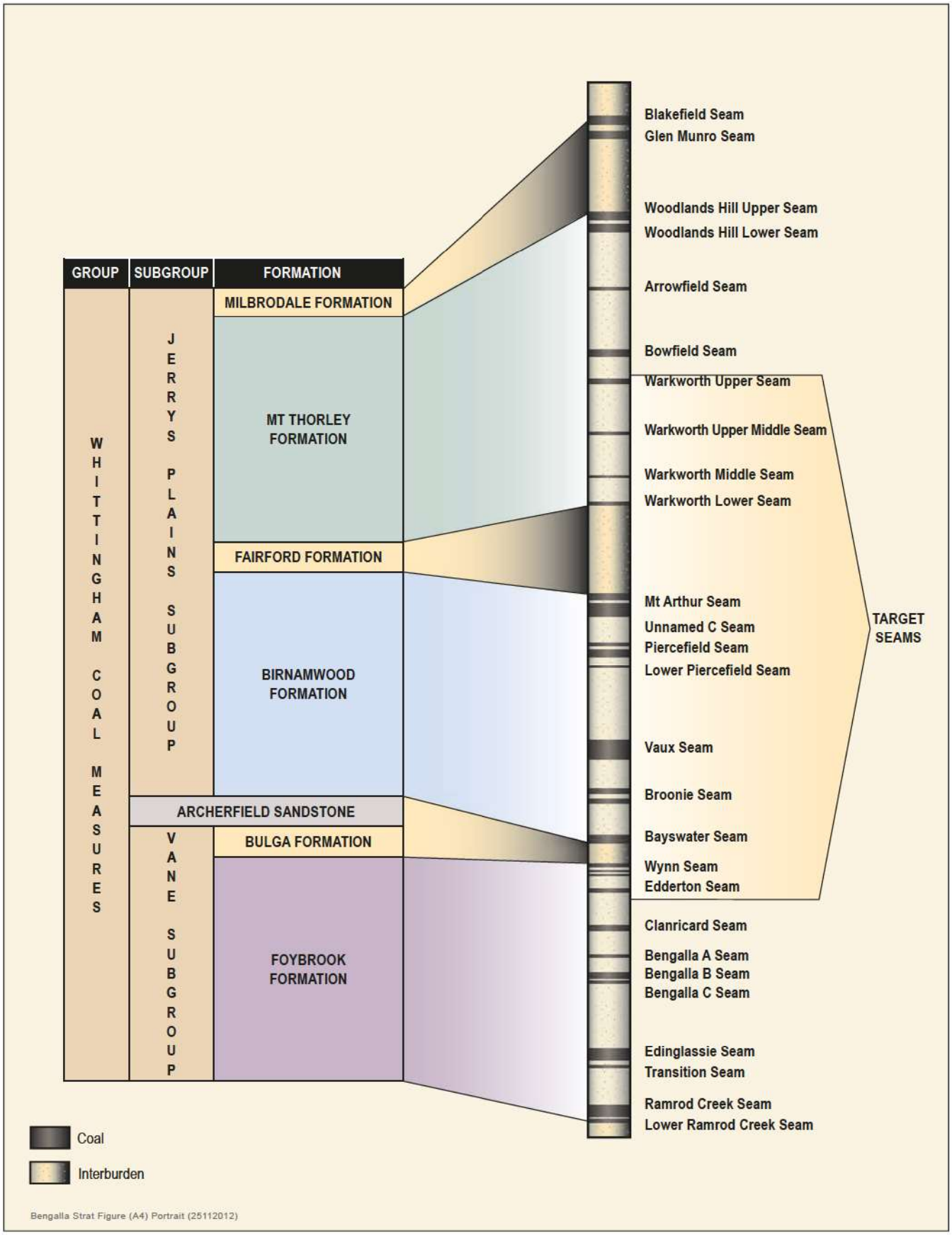
0984 (F06) Bengalla Mine Annual and Seasonal Windroses.ai

Source: Todoroski Air Sciences (2012)

BENGALLA MINE

Annual and Seasonal Windroses

FIGURE 7



BENGALLA MINE

Indicative Stratigraphic Column

FIGURE 8

Recent exploration drilling during 2011 and 2012 has been conducted for the purpose of defining seam geology, structure and quality within AL13 immediately to the west of the Approved Bengalla Mine. The AL13 exploration drilling program was completed and comprised 25 boreholes totalling 5,683 m with an additional five fully cored diamond drilled boreholes totalling 1,206 m. All boreholes targeted the Edderton Seam which occurs at a depth of approximately 220 m to 250 m. Faulting and igneous intrusions have not had a significant influence on Bengalla's design, although they do have localised impacts on scheduling, wall stability, groundwater and coal quality. Most faults are high angle normal faults trending in a westerly to north-westerly direction. Narrow, north north-westerly trending dykes have previously been encountered within the Project Boundary.

2.7.3 Deposit Utilisation

Exploration drilling and preliminary studies have identified a significant quantity of in situ coal that is amenable to open cut mining. From this inventory, mine planning has indicated the potential for extraction of 316 Mt of ROM coal associated with the Project mine plans (see **Section 4**). The primary seams that may be mined are the Warkworth, Mt Arthur, Piercefield, Vaux, Broonie, Bayswater, Wynn and Edderton seams. An additional 63 Mt of ROM coal is present within the Edinglassie seam, which underlies the Edderton seam. The Edinglassie seam is currently not economic to mine by open cut methods and has therefore been excluded from the open cut mine plan for the Project.

Quantities of in situ coal and potential ROM coal quoted here are not as yet compliant with the requirements of the JORC Code 2004 and do not constitute the official statement of coal reserves and coal resources for Bengalla. It is expected that further evaluation work will allow the quantities of coal quoted here to be converted to JORC compliant reserves and resources in the near future.

BENGALLA Mining Company

3

Approved Operations

Approved Operations 3

This section provides a detailed description of the approved operations at Bengalla including the existing approvals and licensing regime. All aspects of the operations are discussed, including mining, infrastructure, coal processing, handling and other associated activities. This section also provides a description of the existing environmental management system used to manage environmental issues at Bengalla.

3.1 Planning Approvals

3.1.1 Original Approval

In 1990, the State government invited expressions of interests from mining companies for the development of the in situ coal reserves at Bengalla. On 7 August 1995, BMC was granted development consent DA 211/93, which allowed for the "Construction and operation of a surface coal mine, coal preparation plant, rail loop, loading facilities and associated facilities". DA 211/93 authorised the following:

- Extraction of coal within the 21 year coal extraction limit until 2017;
- Maximum ROM coal production of 8.7 Mtpa;
- Maximum reserve of 147 Mt of ROM coal;
- Coal mining using dragline, excavator / shovel mining methods and a truck fleet;
- Open cut strip mining progressing from east to west;
- OEA to a maximum height of Reduced Level (RL) 240 m AHD;
- Construction workforce of approximately 510 employees;
- Permanent workforce of approximately 300 employees; and
- Construction and operation of the CHPP and associated facilities, rail loop and loading facilities, bathhouse and administration buildings and other coal mining related facilities.

The original DA 211/93 was supported by the Bengalla 1993 EIS.

3.1.2 Modification 1

On 9 November 2006, DA 211/93 (Modification 1) was granted, providing approval for the following modifications to Bengalla:

- Increase in the maximum height of the final landform height from RL 240 m to RL 270 m;
- Relocation of the overland conveyor, ROM hopper and associated emergency coal stockpile;
- Modifications to the CHPP to facilitate two-stage washing and an extension of the ROM and product coal stockpile;
- Construction of two permanent tailings drying areas to be used for the placement of tailings on a temporary basis; and
- Increase in the maximum allowable annual production 10.7 Mtpa of ROM coal.

The document supporting DA 211/93 (Modification 1) was the *Statement of Environmental Effects Modification to Mining Operations* (Bengalla 2006 SEE) (Hansen Consulting, 2006a).

3.1.3 Modification 2

On 6 December 2007, DA 211/93 (Modification 2) was granted, providing approval for the following modifications to Bengalla:

- Wantana Extension:
  - Extending open cut coal mining operations to the south of Bengalla to include an additional coal extraction area of 32 ha (within the existing Mining Lease and DA boundaries); and
  - Construction of associated water management infrastructure.
- Infrastructure Modifications:
  - Minor extensions to the administration, bathhouse and workshop buildings;
  - Extensions to car parking facilities; and
  - Relocation of existing facilities within the workshop hardstand area.
- In-mining area facilities:
  - Relocation and upgrade of an in-mining area refuelling facility;
  - Construction of a laydown area and associated infrastructure; and
  - Relocation of existing in-mining area infrastructure that will be consumed by mining operations in the future.

The document supporting DA 211/93 (Modification 2) was the *Wantana Extension Statement of Environmental Effects* (Hansen Bailey 2007a).

3.1.4 Modification 3

On 22 July 2008, DA 211/93 (Modification 3) was granted, providing approval for the following modifications to Bengalla:

- Construction of the Bengalla Link Road Stage 2 on an alternative alignment to that originally approved; and
- Deferral of the relocation of the ROM hopper and associated facilities from their existing location to a site adjacent to the CHPP.

The document supporting DA 211/93 (Modification 3) was the *Bengalla Mine Development Consent Modification Environmental Assessment* (Bengalla 2008 EA) (Hansen Bailey, 2008).

3.1.5 Modification 4

On 7 October 2011, DA 211/93 (Modification 4) was granted, providing approval for the following modifications to Bengalla:

- Acceleration of mining operations in the Wantana Extensions to align these with existing operations in the remainder of Bengalla; and
- Implementation of an overburden emplacement strategy to resolve the overburden emplacement capacity issues experienced at Bengalla.

The document supporting DA 211/93 (Modification 4) was the *Bengalla Mine Development Consent Modification Environmental Assessment* (Bengalla 2010 EA) (Hansen Bailey, 2010).

3.2 Other Licences and Leases

In addition to its planning approvals, Bengalla operates under a number of mining authorities and various other licences. **Table 5** lists all approvals, licences, leases and other authorities held by BMC.

3.3 Environmental Record

BMC has a proven history of best practice environmental management, which will continue to be implemented for the Project. Bengalla is operated in accordance with the Coal & Allied EMS, accredited to the International Standards Organisation (ISO) 14001.

The EMS relies upon an environmental policy, a series of regulatory required management plans, a monitoring program and environmental standards and procedures. The Environmental Policy directs planning which in turn affects implementation and operation, management measures and a continuous review and improvement process. The EMS is designed so that BMC can effectively manage its environmental issues, ensure compliance with regulatory requirements, continually improve its environmental performance and satisfy the expectations of stakeholders.

An Annual Review is produced each calendar year in accordance with the existing consent conditions. Bengalla's environmental performance with respect to the relevant monitoring requirements is documented in the Annual Review, and made available to the community on their website.

BMC has maintained a good record of environmental performance. BMC has not been subject to any proceedings under a Commonwealth or State law for the protection of the environment or the conservation and sustainable use of natural resources. All exploration activities have been undertaken in accordance with the conditions of BMC's mining authorities and Development Consent.

3.4 Mine Plan and Mining Method

Bengalla is an open cut coal mining operation where mining advances in a westerly direction based on dragline strips approximately 60 m in width. Overburden is removed by two methods; a truck and excavator operation and through the use of a dragline. Coaling is undertaken by a truck and excavator operation.

Mining operations at Bengalla commenced in October 1998 with the first coal exported in April 1999. A total of 31 strips will be mined within the DA Boundary as described in the Bengalla 2006 SEE as illustrated in **Figure 9**. By August 2012, strip 21 had been completed with work commencing on strip 22. Mining operations within the Wantana Extension area commenced during early 2010 (BMC, 2012b).

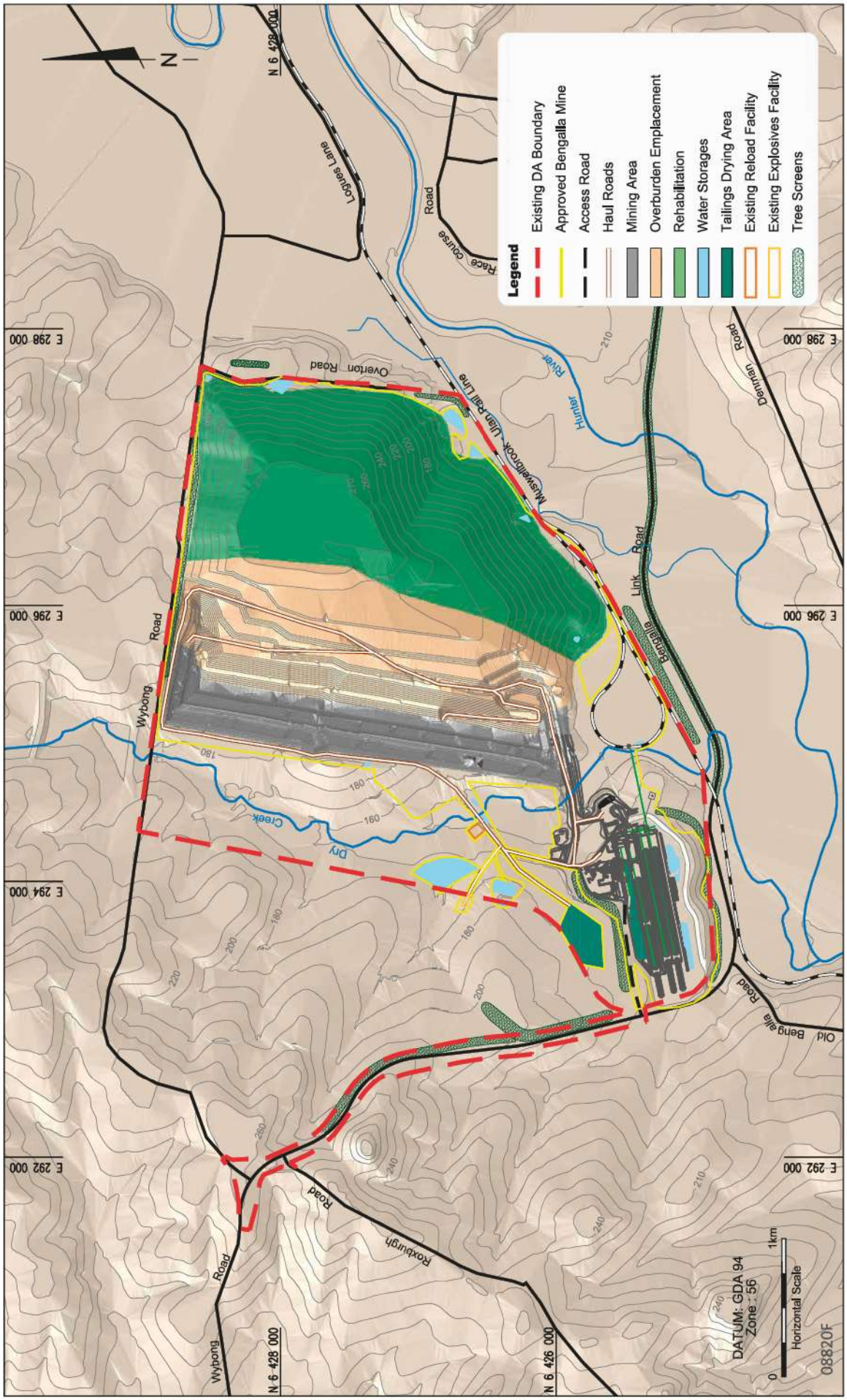
The approved mining area contains a multi-seam coal deposit consisting of eight economically viable open cut mineable coal seams. BMC extracts coal from the Warkworth seam to the Edderton seam, which form part of the Whittingham Coal Measures (Hansen Bailey, 2010). Bengalla is situated on the western limb of the Muswellbrook Anticline with the coal seams generally dipping to the west at approximately 5 degrees. The average strip ratio at Bengalla is approximately 3.5 bank cubic metres (bcm) of overburden to each ROM tonne (t) of coal recovered.

Mining operations are conducted by up to 400 full time permanent employees 24 hours a day, 7 days a week utilising an equipment fleet consisting of a dragline, loading units, a fleet of trucks and other ancillary open cut mining equipment. Topsoil is initially stripped using dozers, loaders and trucks and either stockpiled in a designated area; or where possible, spread onto shaped overburden prior to rehabilitation. Pre-stripped overburden is removed by loader and / or excavator and trucks in advance of the dragline operation and subsequent coaling.

Table 5 Approvals, Leases and Licences

Approval	Description	Duration	Authority
DA 211/93	Development Consent	07/08/95–07/08/17	DP&I
DA 211/93 (Modification 1)	Development Consent – Modification 1	09/11/06–07/08/17	DP&I
DA 211/93 (Modification 2)	Development Consent – Modification 2	06/12/07–07/08/17	DP&I
DA 211/93 (Modification 3)	Development Consent – Modification 3	22/07/08–07/08/17	DP&I
DA 211/93 (Modification 4)	Development Consent – Modification 4	07/11/11–07/08/17	DP&I
DA 273/2006	Development Consent Explosives facility	06/09/06–Perpetuity	MSC
Mining Lease 1397	Mining Lease	27/06/96–27/06/17	DTIRIS – DRE
Mining Lease 1450	Mining Lease	11/06/99–11/06/20	DTIRIS – DRE
Mining Lease 1469	Mining Lease	05/06/00–05/06/21	DTIRIS – DRE
Mining Lease 1592	Mining Lease	19/04/07–19/04/28	DTIRIS – DRE
AL 13	Assessment Lease	20/12/06–19/12/11*	DTIRIS – DRE
A 438	Exploration Licence	18/08/09–07/05/14	DTIRIS – DRE
EPL 6538	Environmental Protection Licence	11 September (anniversary)	NSW Office of Environment and Heritage (OEH)
C 98/2152	Bengalla Mine Operations Plan	01/01/13– 26/06/15	DTIRIS – DRE
20BL169798	Groundwater Extraction Licence	Expiry date: 31/10/15	NSW Office of Water (NOW)
20BL172091 20BL172092 20BL172093	Bore Licences for Wantana	04/02/09 – Perpetuity	NOW
20BL172488	Monitoring bore	17/05/10 – Perpetuity	NOW
Various Water Access Licences	Hunter River Water Access Licence 1,449 High Security Units and an additional 4,562 units of General Security Units	Perpetuity	NOW
Various Water Access Licences	Alluvial Groundwater Licences	Perpetuity	NOW
20PE001354	Hunter River Pump	01/05/97 (Annual Review)	NOW
07-100151-001	Licence to Store	Expiry date: 10/01/18	OEH
27484	Licence to Sell / Possess	Expiry date: 18/12/13	OEH
23150	Radiation Licence	Expiry date: 26/04/14	OEH
1320	Radiation Licence	Expiry date: 09/04/13^	OEH
1321	Radiation Licence	Expiry date: 09/04/13^	OEH
1322	Radiation Licence	Expiry date: 09/04/13^	OEH
7285	Radiation Licence	Expiry date: 21/01/14	OEH
7286	Radiation Licence	Expiry date: 21/04/14	OEH

** Application lodged and renewal pending. ^Renewal lodged.*



BENGALLA MINE

Existing Approved Operations

FIGURE 9

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Overburden is emplaced within the Main OEA located to the east of active mining operations. The Main OEA is approved up to a height of RL 270 m within the Approved Bengalla Mine (see **Figure 9**). The northern face of the existing OEA has been developed at the angle of repose in order to maximise coal extraction within the northern part of the DA Boundary and will be sloped to 10 degrees prior to final rehabilitation.

Bengalla is approved to mine at a rate of up to 10.7 Mtpa ROM coal. The maximum production levels have not yet been reached. During the 2011 and 2012 calendar years, Bengalla produced approximately 7 Mt and 8.4 Mt of ROM coal respectively.

3.5 Blasting

Blast criteria at Bengalla are generally consistent with the Australian and New Zealand Environment and Conservation Council's (ANZECC) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC, 1990)* (ANZECC Guidelines) with the exception that BMC blasts from 7:00 am to 5:00 pm under strict procedural controls (see **Section 3.14**). Blasting is conducted at Bengalla to loosen overburden at the rate of up to two blast events per day and four blast events per week on average over a 12 month period.

BMC monitors ground vibration and overpressure levels of each blast event at a number of representative locations surrounding Bengalla (see **Figure 11** and **Section 3.14.4**). A review of previous blast monitoring data has confirmed that blasting activities at Bengalla have generally remained within the recommended criteria.

3.6 Coal Handling and Processing

3.6.1 Transport and Storage

Coal is transported via haul trucks to the ROM hopper, where it is fed into the CHPP for processing. The ROM hopper and associated facilities were relocated adjacent to the CHPP in June 2009. The relocation of the ROM hopper and associated facilities, subsequently allowed mining operations to enter into the Wantana Extension area.

The first stage of coal processing involves crushing ROM coal to less than 250 mm in size. The crushed coal is then transported along a 300 m conveyor to a secondary crushing station where it is reduced in size to less than 50 mm. All conveyors are enclosed, where practicable, to reduce both noise and dust emissions. After it is crushed, coal can be bypassed to product, direct fed into the CHPP, or transported and stockpiled on the raw coal stockpile. All stockpiles employ dust suppression and process strategies to minimise dust emissions.

3.6.2 Coal Handling and Preparation Plant

The Bengalla CHPP utilises dense medium cyclones and single stage belt press filters to process coal to meet customers' product specifications. The dense medium cyclones treat the coarse material (-50 mm +1.4 mm) and passes the reject material through the reject screen. The spirals treat the fine material (-1.4 mm +0.125 mm), producing fine coal and reject material. The extra fine material (-0.125 mm) is not beneficiated and is treated as reject material.

The CHPP was designed to maximise resource recovery from the ROM coal. In 2010, the Bengalla CHPP yielded 76% product coal from the ROM coal processed. This was an improvement on 76% in 2009 and 74% in 2008 (BMC, 2010). The CHPP contains two washery modules, each with a capacity of 850 tonnes per hour (tph). Each module uses a dense medium cyclone and spirals to separate mineral contaminants. After processing, the product coal is centrifuged to reduce moisture before being conveyed to a coal stockpile for storage.

Bengalla's CHPP utilises a ROM coal stockpile and two product coal stockpiles as part of its handling and preparation process (see **Figure 9**) with a total approved capacity of 1,035,000 t. The CHPP and stockpiles are surrounded by earth bunds to account for the visual and noise impacts on surrounding areas. Dust from stockpile areas is managed by an industry first automated sequential spray system, which is triggered when wind speeds exceed 5.6 m/s.

3.7 Product Transport

After processing is completed, product coal is reclaimed using twin boom portal type reclaimers and conveyed to the rail load out facility. This facility is fully automated and loads an average of 3,500 tph. The rail load out facility is located immediately to the south of Bengalla and is operated out of the CHPP control room in the main administration complex.

Bengalla produces a thermal coal for both the export market (low ash export grade between 12% to 13% ash content) and domestic market (higher ash domestic coal product usually below 27% ash). Most of the product coal is transported to the Port Waratah Coal Loader at Newcastle for export. BMC's key export markets currently include Japan, Korea, Taiwan and China. Lesser amounts are infrequently railed directly to the Macquarie Generation power stations for domestic power generation.

3.8 Waste Management

3.8.1 Tailings and Coarse Reject

Bengalla does not have any tailings dams to store reject material. Two waste streams from the CHPP process, tailings and coarse reject are combined and stored in a reject bin before being hauled back to be co-disposed in the Main OEA where it is dried in cells, buried within the Main OEA and capped with a minimum of 5 m of inert overburden material.

3.8.2 Overburden

Overburden is emplaced within the existing Main OEA located to the east of active mining operations. The Main OEA is approved up to a height of RL 270 m within the Approved Bengalla Mine. The northern face of the Main OEA has been developed at the angle of repose in order to maximise coal extraction within the northern part of the DA Boundary.

The Southern OEA Extension involves the development of the existing Main OEA further towards the south-east and will generate approximately 10 Million loose cubic metres (Mlcm) of additional overburden emplacement capacity at Bengalla. This landform will extend from the old conveyor belt road at around 10 degrees towards the north-west to the maximum approved OEA height of RL 270 m. The Southern OEA Extension has been designed to blend in with the currently approved mine plan, with some minor adjustments to create a free draining final landform. Construction of the Southern OEA Extension is scheduled to be completed in 2013.

The temporary Western OEA as described in the Bengalla 2010 EA has not yet been constructed in its currently approved location. The Western OEA is approved to be constructed to a maximum height of RL 210 m, which will complement the natural topography. The Western OEA will provide for an additional 6.6 Mlcm of overburden emplacement capacity and cover a total area of approximately 25 ha.

BMC will utilise the Western OEA for emplacing overburden material in order to reduce the amount of land disturbance and the impacts associated with the rehandling of this material at a later date in an overburden constrained situation only. Should the Western OEA be required, it is planned to be constructed in stages. The temporary rehabilitation of the Western OEA will be undertaken as each stage is developed to ensure the area of open overburden is minimised. The northern face of the existing OEA has been temporarily steepened to accommodate additional overburden capacity. It is planned to be reshaped to a 10 degree slope in preparation for final rehabilitation by 2016.

3.8.3 Hydrocarbons

Bengalla operates a bioremediation facility where any soil that is found to be contaminated with hydrocarbons is placed for remediation. The bioremediation facility consists of active cells where the bioremediation process occurs. The cells are (optionally) fitted with an automated irrigation system and soil moisture probes to ensure soil conditions are suitable for beneficial bacteria and microbes to aid the remediation process.

To reduce the duration of the bioremediation process, BMC adds a microbial powder to the soil to increase the hydrocarbon breakdown process and reduce the time required to treat the soil, as required. Samples are regularly taken to confirm hydrocarbons levels, and when the soil meets specific land use criteria, it is appropriately placed in the Main OEA.

3.9 Infrastructure

The main administration building is the primary planning, maintenance and administration centre for Bengalla. In-house training and inductions are provided in the two training rooms within the office area. The administration building is on the northern side of the Bengalla Mine Access Road and is the entrance for visitors to the mine. The main car parking areas are adjacent to the administration building and on the other side of the mine access road. An additional parking area is located immediately to the north of the administration building.

The workshop area is situated immediately west of the administration building. The workshop consists of heavy vehicle bays, light vehicle bays, tyre change facilities and a work shed. The workshop area is where maintenance and major repairs are performed on the mobile plant and equipment used on site. Materials and parts are housed in the supply area of the workshop. The vehicle wash bays are located to the north of the workshop area. A bulk oil and diesel storage facility is located in the western portion of the Mine Infrastructure Area (MIA). The administration and workshop areas are illustrated in **Figure 9**. Access to the Bengalla administration area is via the Bengalla Link Road and Bengalla Access Road.

3.10 Workforce and Hours of Operation

BMC has approval to employ up to 400 full time equivalent personnel. Maintenance activities, deliveries, coal processing, coal transport and mining operations occur 24 hours a day, seven days a week.

3.11 Rehabilitation

Rehabilitation at Bengalla is currently undertaken in accordance with DA 211/93 and the approved Mining Operations Plan (MOP) (BMC, 2012c) and the approved Rehabilitation Management Plan required under DA 211/93 and relevant standards provided by the Bengalla EMS. The main objective of rehabilitation at Bengalla is to develop an undulating, free-draining landform with an optimum land capability which supports the original agricultural land use for predominately cattle grazing. Rehabilitation is undertaken progressively at Bengalla as an integral component of operations. An example of BMC's successful rehabilitation (with the Muswellbrook township visible in the background) is provided on **Plate 3**.

3.12 Water Management

BMC's water management system was designed so that the use of fresh water from the Hunter River was minimised. This is achieved by maximising the recycling of CHPP process water. Secondary quality water resulting from the dewatering of rejects is reused on site. In addition, saline mine water and treated sewage water are used for coal processing and dust suppression wherever possible.

Dams, pipelines and associated drainage structures have been designed so that water from catchments in undisturbed areas is diverted, where possible, away from disturbed areas and sediment laden mine water. Controls have been implemented to ensure that stormwater and groundwater from mining areas is diverted to either mine water dams or the mining area void, with discharge offsite a final option.

Under the HRSTS, excess water from Bengalla can be discharged into the Hunter River during periods of 'high' or 'flood' flows. Discharges are conducted strictly in accordance with the HRSTS and Bengalla's Environmental Protection Licence (EPL) 6538. All discharges are released from the main Bengalla water storage (Staged Discharge Dam) and additional surface water monitoring undertaken during discharge events. Bengalla generally operates with a net water deficit and rarely discharges mine water under the HRSTS.

Historical discharges from Bengalla have included:

- 109 ML in 2001;
- 205 ML in 2007;
- 64 ML in 2008;
- 49 ML in 2010;
- 109 ML 2011; and
- Nil in 2012.

The HRSTS was introduced by the NSW government to reduce salinity levels in the Hunter River and permits control of mine water discharges into the Hunter River. The HRSTS is governed by the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.

BMC optimises its water balance using its Real Time Environmental Monitoring Systems (RTEMS). The RTEMS is the framework used to monitor Bengalla's fully automated water management system. It provides Bengalla personnel with information on water movement and usage across the site. The RTEMS also contains a range of alarms and safeguards to detect any potential discharges, leaks or water related incidents.

Plate 3 Main OEA Rehabilitation Overlooking Muswellbrook Township

As an added precaution, inspections of water and sedimentation dams are conducted on a regular basis. Further detail on monitoring is provided in **Section 3.14**. The existing water management system implemented at Bengalla is illustrated in **Figure 10**.

The demand for drinking water throughout the office and workshop complex is currently met by water transported by truck from Muswellbrook; however an existing water treatment plant is located onsite and is used intermittently.

3.13 Environmental Management System

Operations at Bengalla are conducted in accordance with the Bengalla EMS, which is certified to ISO 14001 standards. The Bengalla EMS was certified in 1997, making Bengalla the first coal mining operation in the world to achieve this level of accreditation.

The EMS relies upon an Environmental Policy, a series of regulatory required management plans as described in **Table 6**, a comprehensive monitoring program (described in **Section 3.14**) and environmental standards and procedures as shown in **Table 7**. The Environmental Policy (see http://www.riotintocoalaustralia.com.au) directs planning which in turn affects implementation and operation, management measures and a continuous review and improvement process.

The EMS is designed so that BMC can effectively manage its environmental issues, ensure compliance with regulatory requirements, continually improve its environmental performance and satisfy the expectations of stakeholders.

As part of the EMS, BMC also has in place an Aspects and Impacts Register, which systematically identifies all activities related to the mine that could cause environmental harm and applies a risk ranking of these aspects. Those aspects which are subsequently identified with a critical or high level of risk are prioritised within Departmental Environmental Action Plans so that they are appropriately managed.

Table 6 BMC Existing Environmental Management Plans

Management Plan	DA 211/93 Consent Condition
Noise Management Plan	Schedule 3, Condition 8
Blast Management Plan	Schedule 3, Condition 16
Air Quality and Greenhouse Gas Management Plan	Schedule 3, Condition 23
Water Management Plan	Schedule 3, Condition 28
Cultural Heritage Management Plan (Aboriginal and European)	Schedule 3, Condition 29
Landscape Management Plan	Schedule 3, Condition 35
Rehabilitation Management Plan	Schedule 3, Condition 41
Environmental Management Strategy	Schedule 5, Condition 1

To drive the operation's performance, each department has in place a documented Health, Safety and Environmental Action Plan, which outlines projects that will aid in achieving the mine's environmental objectives and targets.

In addition, the EMS describes objectives and performance outcomes for rehabilitation, flora and fauna, spontaneous combustion, acid rock drainage and contaminated sites. The EMS also describes measures involved in auditing, reviews, reporting, calibration, maintenance and accountabilities.

3.14 Environmental Monitoring Program

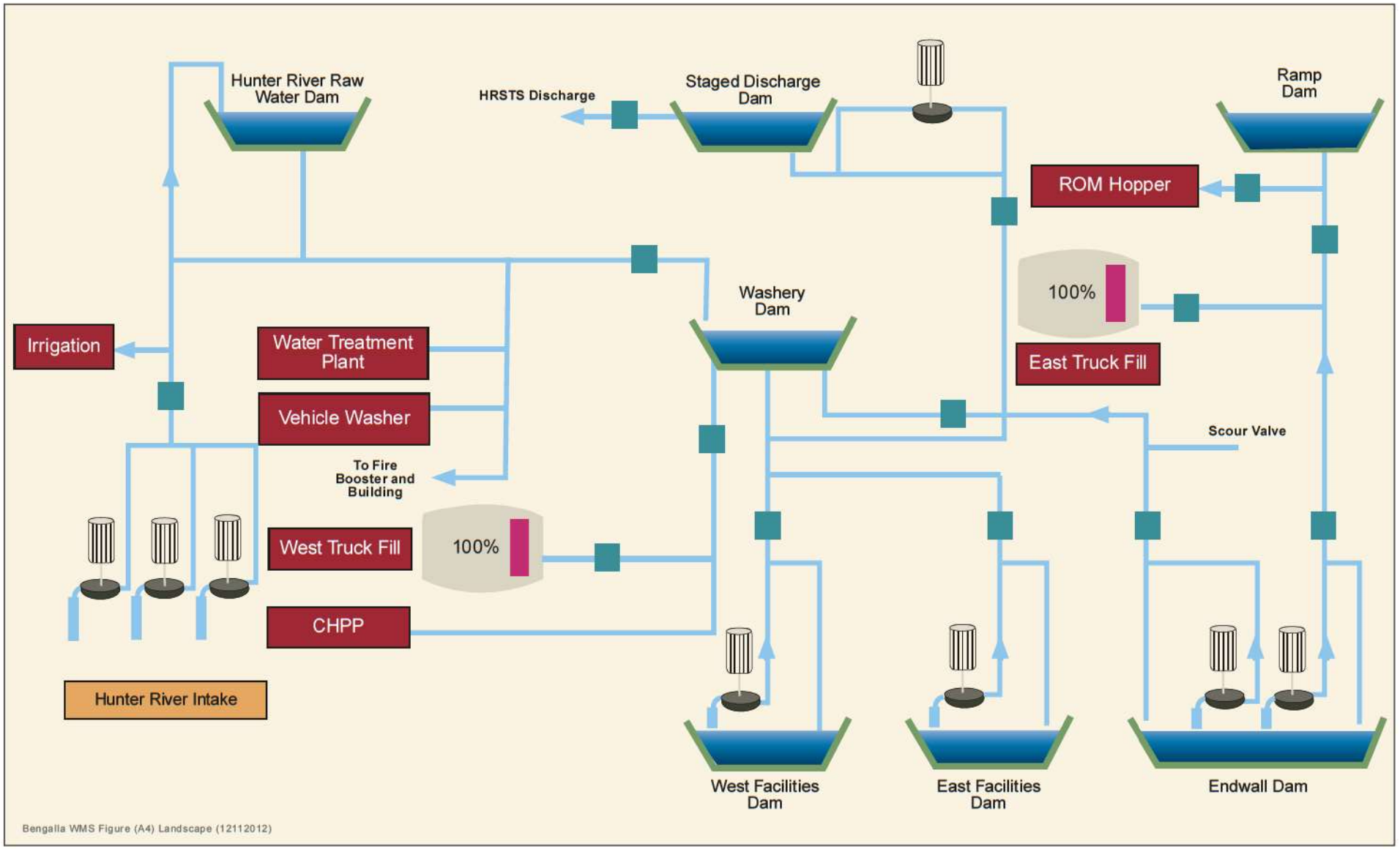
A key component of the EMS is the Bengalla EMP. The EMP includes a comprehensive monitoring program, which is outlined in **Table 8** and details procedures for BMC to effectively monitor the environmental performance of its operations. The EMP has been developed in accordance with Bengalla's EPL 6538 and conditions associated with existing DA 211/93. The monitoring network has been expanded over time and is presented on **Figure 11** and **Figure 12**. Existing practices in relation to environmental monitoring are discussed further below.

3.14.1 Air Quality

A range of dust monitoring technologies are utilised at Bengalla to ensure the accurate and reliable monitoring of air quality impacts on the surrounding environment. The combination of collected data and real time dust monitoring provides the information needed for Bengalla to proactively and effectively implement operational controls to reduce or minimise dust emissions. The air quality monitoring network is operated in accordance with the requirements of the *Approved Methods for Sampling of Air Pollutants in New South Wales* (DEC, 2005). This network includes:

- Four real time monitors, which operate as part of the Bengalla RTEMS;
- Nine High Volume Air Samplers (HVAS) which monitor Total Suspended Particles (TSP) and particulate matter less than 10 microns in diameter (PM_{10}); and
- 29 Depositional Dust Gauges.

The BMC air quality monitoring network implements best practice monitoring methods beyond current regulatory requirements. BMC contracts an independent qualified consultant to undertake the air quality monitoring. The four real time monitoring sites utilise E-Bam monitors, which have been installed to allow continuous PM_{10} measurements. This is a proactive approach to managing environmental impacts of the operations.

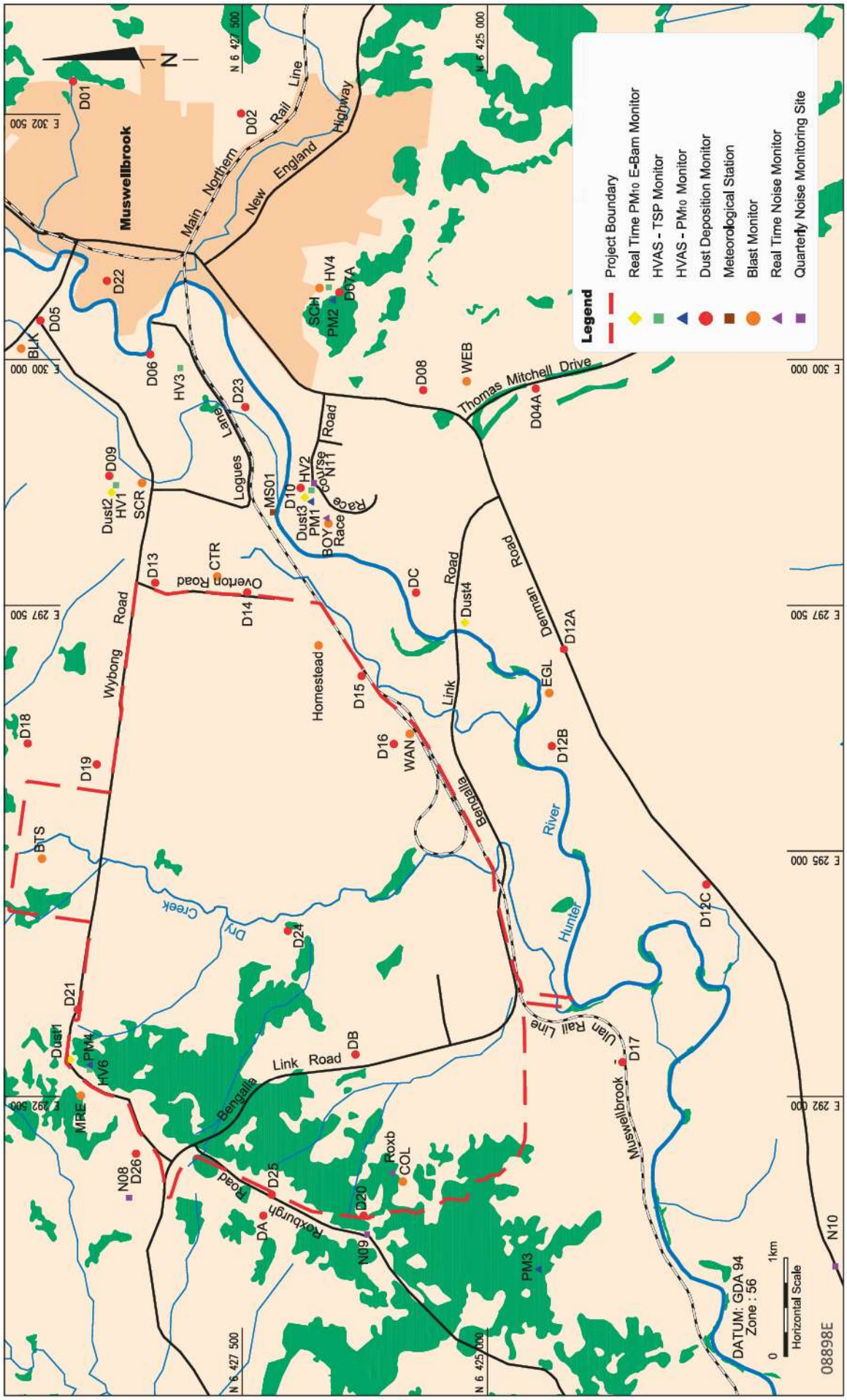


Water Supply/Source
Water Demand
Flow Direction
Flow Meter
Pump

BENGALLA MINE

Existing Water Management System

FIGURE 10



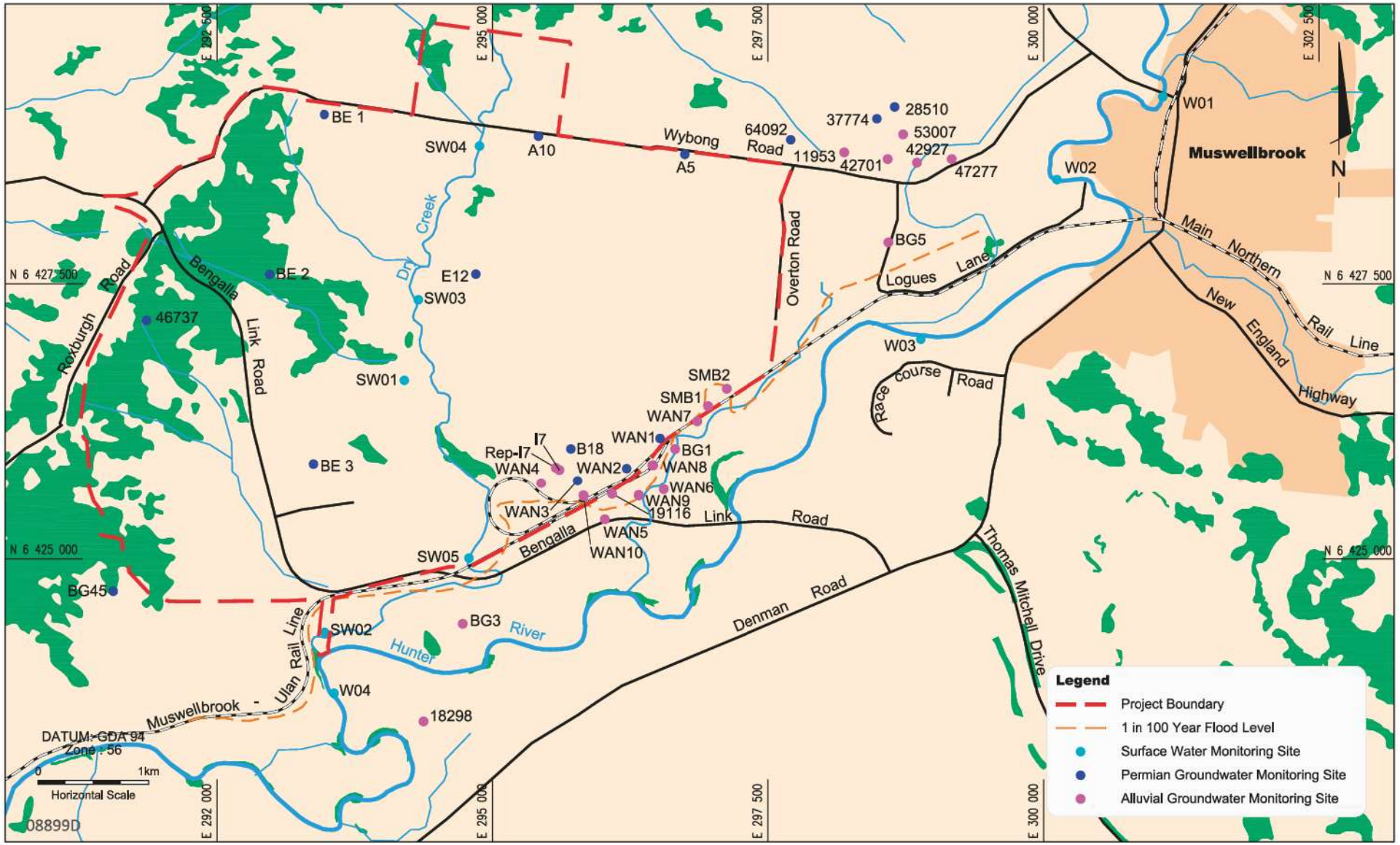
BENGALLA MINE

Existing Air Quality, Noise and Blast Monitoring Network

FIGURE 11

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

BENGALLA



BENGALLA MINE

Existing Surface Water and Groundwater Monitoring Network

FIGURE 12

Table 7 Environmental Management Systems, Standards and Procedures

RTCA HSEQ System – Management Standards	EMS Procedures
1 Policy	1.1 Aspects and Impacts
2 Legal and Other	1.2 Objectives and Targets
3 Hazard Identification and Risk	1.3 Risk Assessment
4 HSEQ Management Improvement Planning	1.4 Environmental Audits, Inspections and Non-conformance Management
5 Organisation, Accountability and Responsibility	1.5 Environmental Legislative Compliance
6 Training, Competency and Awareness	1.6 Environmental Training
7 Contractor Management	1.7 Environmental Reporting
8 Document Control	1.8 Incident Reporting
9 Communication and Consultation	1.9 Communications (includes community and complaints management)
10 Operational Control	1.10 Monitoring and Management
11 Management of Change	1.11 Annual Management Reviews of the EMS
12 Disaster Management and Recovery	1.12 Document Control
13 Measuring and Monitoring	3.1 Property Transactions Guidelines (Rio Tinto)
14 Non-conformance Incident and Action Management	4.1 Closure Planning Guidelines
15 Data and Records Management	5.1 Rehabilitation
16 Performance Assessment and Auditing	6.1 Waste Management
17 Management Review	6.2 Coarse Rejects and Tailings Disposal
Rio Tinto Environmental Performance Standards	7.1 Water Management
E1 Environmental Management System	7.2 Water Discharge
E2 Air Quality Control	8.1 Dust Management CPP
E3 Acid Rock Drainage Prediction and Control	8.2 Air Quality – Mobile Equipment
E4 Greenhouse Gas Emission	8.3 Air Quality – Spontaneous Combustion
E5 Hazardous Materials and Contamination Control	9.1 Noise
E6 Noise and Vibration Control	9.2 Blasting (includes air quality and vibration)
E7 Non Mineral Waste Management	10.1 Visual Management (includes infrastructure design and lighting management)
E8 Mineral Waste Management	10.2 Flora and Fauna
E10 Water Use and Quality Control	10.3 Ground Disturbance Permit
	12.1 Acid Mine Drainage Prevention and Control
	13.1 Site Contamination Prevention and Control

Table 8 Existing Environmental Monitoring Program

Category	Parameter	Program
Air Quality	TSP	5 HVAS
	PM_{10}	4 HVAS
	Dust Deposition	29 Depositional Dust Gauges
	Real Time Air Quality Monitors	4 Locations
Meteorological Monitoring	Meteorological Station	1 Location
	Temperature Inversion Tower	1 Location
Noise Monitoring	Attended Noise Monitoring	4 Locations
Blast Monitoring	Fixed Blast Monitor	11 Locations
Water Quality	Surface Water	9 Locations
	Groundwater	35 Locations

BMC also calculates greenhouse gas emissions generated by Bengalla. A monthly greenhouse gas emission inventory is calculated by converting emissions to a carbon dioxide equivalent (CO_{2-e}) tonnage based on National Pollutant Inventory and Australian Greenhouse Office calculation standards. Specific inputs include electricity usage, diesel usage and methane production (determined from the monthly coal tonnage extracted).

3.14.2 Meteorology

BMC operates a meteorological site in accordance with the requirements of the *'Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales'* (DEC, 2007) and the Australian Standard (AS) *'2922-1987 Ambient Air – Guide to the Siting of Sampling Units'*. The existing meteorological station monitors a range of parameters including:

- Wind speed (m/sec) monitored continuously;
- Wind direction (degrees) monitored continuous;
- Air temperature (°C) monitored continuously;
- Rainfall (mm) monitored daily;
- Relative humidity (%) monitored daily; and
- Solar Radiation watts per meter square (W/m^2) monitored daily.

An inversion tower is also used to monitor temperature, wind speed and direction, incorporated as part of the RTEMS, to ensure best practice environmental management is achieved. Monitoring undertaken at the meteorological station and inversion tower is used to assist in the planning of activities and interpretation of blast, noise, air quality and water monitoring data.

3.14.3 Noise

Noise monitoring at Bengalla is conducted in accordance with the *NSW Industrial Noise Policy* (INP) (DEC, 2000) to ensure comprehensive and effective monitoring of any impacts to the surrounding environment. Noise is measured on a quarterly basis, during optimal meteorological conditions, by an independent qualified consultant employing best practice monitoring techniques. Monitoring is conducted at the most affected receptor to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits. Noise is also measured 1 m from any required dwelling to determine compliance with the $L_{A1(1\ minute)}$ noise limits, where practical.

Bengalla's noise monitoring system includes:

- Two real time noise monitors which operate as part of the RTEMS; and
- Four attended noise monitoring locations.

The two real time noise monitors, which are linked to the RTEMS, provide continuous measurement and relay of noise levels surrounding Bengalla. This allows the planning of activities to occur during optimal conditions and effective onsite proactive management of noise impacts.

3.14.4 Blast

BMC monitors blasting activities at Bengalla in accordance with the *AS 2187.2-2006 – Explosives – Transport Storage and Use – Part 2: Use of Explosives*. Monitoring utilises 10 real time blast monitors ensuring any blast event which triggers threshold criteria. For each blast event the parameters recorded include:

- Location of blast monitoring site;
- Time and date of monitoring;
- Blast location and name;
- Peak vector sum (PVS) – (mm/s); and
- Air overpressure peak (dBL_{in} Peak).

3.14.5 Water

Surface Water

All surface water quality monitoring at Bengalla is conducted in accordance with the requirements provided in *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales* (DEC, 2004) and *AS 5667:1-1998*. Four onsite water management structures are included in the quarterly surface water monitoring program and two points on ephemeral Dry Creek monitored following a high rainfall event.

BMC's surface water monitoring program includes:

- Six monitoring locations to monitor surface water flows and quality upstream and downstream of the mine; and
- Three monitoring locations are utilised to monitor the volume and quality of water discharged from the site under the HRSTS.

During discharge of saline water from site, all monitoring is conducted in accordance with the methods specified in EPL 6538. Representative samples are collected to measure Total Suspended Solids (TSS) and pH. Monitoring also incorporates an Electrical Conductivity (EC) probe designed to measure from 0 to 10,000 microsiemens (µS)/(cm). In addition, to assist with the internal management of water quality on site, all dams which are part of the closed water management system, are sampled annually for pH, EC and TSS.

Groundwater

BMC operates an extensive groundwater monitoring program in the vicinity of Bengalla to adequately assess groundwater quality and quantity, conducted in accordance with *AS 5667.1- 1998, Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples* and *AS 5667.11-1998, Guidance on Sampling of Groundwaters*. The monitoring program currently consists of 35 groundwater monitoring points (see **Section 8.7**). The alluvium, shallow hardrock and deep hardrock bores are all sampled for Standing Water Level, pH, EC, Total Dissolved Solids (TDS) at various frequencies with full chemical analysis undertaken annually.

Monitoring is undertaken in the vicinity of the alluvial fringe of the Hunter River floodplain, positioned within both the alluvial aquifer and underlying coal seam aquifers surrounding the alluvium. This allows BMC to assess any relationship between the depressurisation of the coal seam aquifers with any variations to groundwater levels. Groundwater inflow is calculated by determining and quantifying contributing components including mining area water, data on rainfall and mining area catchment area.

3.15 Auditing and Reporting

The results of Bengalla's EMP are published in the Annual Review (formerly the Annual Environmental Management Report). This is distributed to employees, relevant government agencies and the Bengalla Coal Mine Community Consultative Committee (CCC). The Annual Review is made publicly available on the Coal & Allied website and at the Muswellbrook local library and MSC. In addition any non-compliance with the Bengalla assessment criteria is reported to the relevant agency within seven days of the incident occurring, which includes a description of the exceedance or incident, the likely cause and any actions undertaken or proposed to be undertaken by BMC to address the incident.

Regular independent audits are commissioned by BMC to ensure operations are environmentally compliant with the relevant statutory requirements, development approvals, licences, management plans, procedures and standards. BMC commissions an independent environmental audit every three years, which is then supplied to any relevant regulatory authorities and made publically available on the Coal & Allied website.

3.16 Existing Restoration and Research Projects

3.16.1 Upper Hunter Rehabilitation Initiative Project

BMC supported the Upper Hunter River Rehabilitation Initiative (UHRRI) Project together with BHP Billiton between 2003 and 2008. This support was voluntary and not a requirement of any development consent condition. The UHRRI Project aimed to create habitat for native plants and animals, improve the ecological health of the river and contributed to academic knowledge of environmental degradation to ultimately improve the effectiveness of rehabilitation (Upper Hunter Rehabilitation Initiative, 2013).

The Project was managed by Macquarie University and the Upper Hunter Catchment Management Authority (UHCMA) and was undertaken on a 10 km reach of the Hunter River, south of Muswellbrook. The primary aims of the five-year project were to research the effects on the river of installing 32 engineered log structures along the edges of the Hunter River and planting over 60,000 individual plants. A range of native plant species were planted along the riverbanks to help restore native biodiversity and enhance the riparian zone to areas that had become overgrown by exotic weed species.

The joint environmental initiative supported various academic works and in 2003 BMC and BHP Billiton together won the Hunter Coal Industry Environmental Management Award. The UHCMA presented the Hunter Coal Industry Environmental Management Awards to promote excellence in the industry and encourage mining companies to go beyond legislated requirements.

Various research programs were undertaken by scientists and postgraduate students from Macquarie University, Griffith University, the University of New England and NSW Fisheries. The successful academic outcomes from the project supported research studies including over 24 referred papers, two books, 13 book chapters, 13 conference papers and seven other works (Upper Hunter Rehabilitation Initiative, 2013).

3.16.2 Soil Carbon Sequestration Project

BMC is currently undertaking a Soil Carbon Sequestration Project investigating the potential to increase productivity and profitability for Hunter Valley farmers through improved soil fertility and the storing of carbon. The project will run over four years and aims to increase soil carbon sequestration, the removal of carbon from the atmosphere by storing it in soil.

In addition to improving agricultural yields and reducing greenhouse gas emissions, the project also has the potential to provide landowners with additional income, by trading sequestered carbon under the federal government's Carbon Farming Initiative. A significant component of the Soil Carbon Sequestration Project is research into the effects of biochar application on soil properties of the region. The project is being undertaken in partnership the University of Newcastle, UHCMA and up to 20 regional landowners.

3.17 Mine Health & Safety

BMC operates in accordance with the RTCA Health, Safety, Environment and Quality (HSEQ) management system which provides a framework for health, safety and environment standards and quality reporting requirements. This group-wide system ensures all Rio Tinto operations work uniformly within internationally recognised health, safety and environment frameworks, such as ISO 14001, AS 4801 and meet various certifications, as well as internal and external reporting requirements.

The HSEQ management system outlines an approach for sound hazard and risk identification, evaluation and management, ongoing verification and review of performance. Mandatory safety standards cover our principal safety hazards:

- Isolation;
- Electrical safety;
- Vehicles and driving;
- Working at heights;
- Confined spaces;
- Management of mining area slopes, stockpiles, spoils and waste dumps;
- Cranes and lifting equipment;
- Aviation; and
- Underground.

Ensuring all employees and contractors work in a healthy and safe environment is achieved through the implementation of systems and standards by dedicated health and safety professionals at BMC. BMC's mandatory occupational health standards apply to all employees and contractors and are regularly audited, providing the opportunity for continual improvement in performance. BMC's leadership team is accountable for performance against the health and safety standards. They are supported by competent and trained personnel whose responsibilities include implementing health systems and monitoring workplace conditions to control exposure to health hazards.

Health and safety team members manage risk registers, conduct personal monitoring for dust, noise, thermal stress and audiometric testing, as well as educate and inform operational teams of health findings and initiatives. The implementation and business performance against health and safety standards is checked through an independent audit process. BMC uses a range of tools and programs to ensure that health and safety remains foremost in the minds of employees and leaders.

3.17.1 Health Performance

During 2011, BMC participated in a voluntary Health and Wellbeing Program to continually improve performance against the RTCA health standards and embed the health and wellness program 'Achieve Health' launched in 2008. Achieve Health is designed to raise awareness and improve the health and wellbeing of employees by offering health related initiatives and encourage participation in a range of activities.

This voluntary program is supported by an external health service provider and is closely linked to Rio Tinto's health target of achieving 70% participation in Health Risk Assessments by the end of 2013. Achieve Health delivers programs such as skin cancer checks, health assessments, personal fitness and wellbeing plans for employees. In addition, BMC implement the RTCA Fatigue Management Framework implemented to reduce the risk of fatigue-related incidents occurring.

3.17.2 Safety Performance

BMC has developed a range of programs to drive continual improvement with regards to safety including:

- Continuing to embed the Safety Semi Quantitative Risk Assessment process which began in September 2011. Quantitative risk analysis is the highest level of analysis within the Rio Tinto HSEQ risk management framework and applies the most rigorous and deductive methodologies. Typically, this involves numerical estimates of risk, by combining a detailed analysis of potential consequences and the frequency of occurrence; and
- Continuing the implementation of the Site Safety Acceleration Program. This is a behavioural based safety program which allows us to review and assess current safety performance and design and execute improvements and sustain improved behaviours.

To achieve reductions in vehicle incidents, in-vehicle driving monitoring systems have been installed on a variety of equipment to ensure an ongoing high level of safety is achieved.

3 Approved Operations

BENGALLA Mining Company

4

The Project

The Project 4

This section provides a detailed description of the Project including the conceptual 24 year mine plan staging, indicative equipment, infrastructure and manning requirements, waste and water management, proposed conceptual construction program and key interactions with neighbouring industry. It also includes a discussion on the need for the Project and the alternatives considered.

4.1 Project Overview

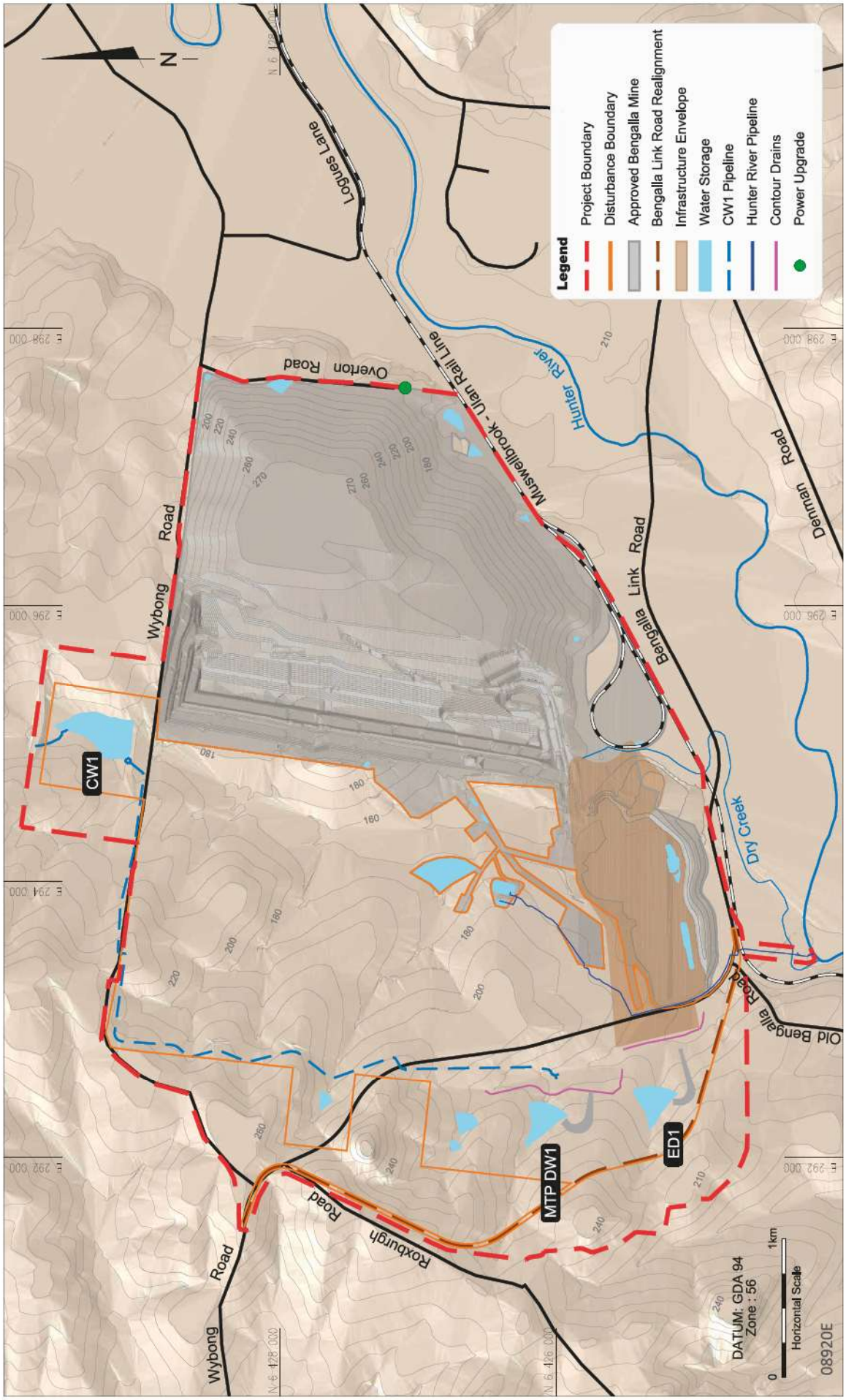
BMC is seeking Development Consent under Division 4.1 of Part 4 of the EP&A Act to facilitate the continuation of open cut coal mining largely within current mining authorities within the Project Boundary as shown on **Figure 13** and listed in **Appendix B**.

An indicative layout of the Project is provided in **Figure 13** and is generally comprised of:

- Open cut mining towards the west at a rate of up to 15 Mtpa ROM coal for 24 years to a total of 316 Mt;
- Continued use of the existing dragline, truck fleet and excavator fleet (with progressive replacement or substitution with equivalent);

- An out of mining area OEA to the west of Dry Creek, which may be utilised for excess overburden material until it is intercepted by mining;
- Continued use, extension or relocation to existing and new infrastructure, including administration and parking facilities, in-mining area facilities (including dragline shut down and erection pad), helipad, tyre laydown area, explosives and reload storage facility, core shed workshop, roads, reject bin, ROM hopper, stockpiles, conveyors, water management infrastructure, bioremediation area, supporting power infrastructure, rail and rail loading infrastructure and ancillary infrastructure;
- Construction and use of various items of new infrastructure (including radio tower, extensions to the MIA, additional raw coal stockpile and upgrade to the ROM coal stockpile (along with associated conveyor network) generally as shown on the infrastructure plans and construction of the Mount Pleasant Staged Discharge Dam and associated water reticulation infrastructure;
- Processing, handling and transportation of coal via the (upgraded) CHPP and rail loop for export and domestic sale;
- Continued rejects and tailings co-disposal in the Main OEA and in the temporary in-mining area reject emplacement;
- Relocation of a 6 km section of Bengalla Link Road at approximately Year 15 near the existing mine access road to facilitate coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Staged Discharge Dam and raw water dam); and
- A workforce of up to 900 full time equivalent personnel (plus contractors) at peak production.

The Project will generally be undertaken within the Disturbance Boundary as illustrated on **Figure 13**. The fixed (permanent) infrastructure will be located within the Infrastructure Envelope shown on **Figure 13**. This may be aligned or located differently to what is depicted on the detailed infrastructure plans but will be within the Infrastructure Envelope.



BENGALLA MINE

Conceptual Project Layout

FIGURE 13

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

4.2 Comparison of the Approved Operations to the Project

Table 9 provides a summary of key Project components and comparison with the Approved Bengalla Mine.

Table 9 Key Project Components and Comparison with the Approved Bengalla Mine

Component	Approved Bengalla Mine	Project
Planning Approval and Supporting Documents	• DA 211/93 (as modified) – Bengalla 1993 EIS – Bengalla 2006 SEE – Wantana 2007 SEE – Bengalla 2008 EA – Bengalla 2010 EA • DA 273/2006 for the Explosives Storage Facility – Bengalla Explosives Storage Facility SEE (Hansen Consulting, 2006b)	• New Development Consent – This EIS
Life of Mine	27 June 2017	24 years from the grant of Development Consent
Deposit	178.5 Mt ROM coal within the currently approved coal extraction limit	Additional 316 Mt ROM coal within the mining areas shown on **Figure 14** to **Figure 18**
Mining Method	Open cut - dragline, truck and excavator	No change to general mining method – dragline, truck and excavator (machinery will be progressively upgraded)
Production	Up to 10.7 Mtpa ROM coal	Up to 15.0 Mtpa ROM coal
Operational Hours	Mining operations and coal processing 24 hours per day, seven days per week	No change to operational hours
Workforce	Approximately 400 full time personnel	• Up to 900 full time equivalent personnel (plus contractors) • Up to 315 additional contractors required during the construction period between Year 1 to Year 4
Blasting	• Maximum of two blast events per day and four blast events per week averaged over a calendar year • Blasting between 7:00 am and 5:00 pm Monday to Saturday, inclusive	• Maximum of four blast events per day and 12 blast events per week averaged over a calendar year • Blasting generally between 7:00 am and 5:00 pm Monday to Saturday. • Blasting on Sundays between 10:00 am and 3:00 pm will be undertaken at up to one blast event per day when within 500 m of the infrastructure areas in accordance with Blast Management Plan (see **Section 4.3.3**)
Infrastructure	Infrastructure: • Administration and parking facilities • Relocatable facilities including dragline maintenance pad, helipad, crib and amenity facilities, fuel farm, truck park-up and maintenance construction pad), bioremediation farm, substation pads and topsoil stockpiles • Explosives and reload storage facility • Core shed • Roads • Wash Bay • Water management infrastructure • Roads • Wash Bay • Radio tower • Power infrastructure • Fuel and lubricant facility • Ancillary infrastructure	Continued use of existing (relocated) or upgraded infrastructure: • Administration and parking facilities • Relocatable facilities including dragline maintenance pad, helipad, crib and amenity facilities, fuel farm, truck park-up and maintenance construction pad, bioremediation farm, substation pads and topsoil stockpiles • Explosives and reload storage facility • Core shed Workshop and administration buildings • Water management infrastructure • Roads • Wash Bay • Radio tower • Power infrastructure • Fuel and lubricant facility • Ancillary infrastructure

Component	Approved Bengalla Mine	Project
Coal Processing Infrastructure	• ROM hopper processing rates of up to 2,100 tph • CHPP processing rates up to 1,700 tph • Surge bin capacity of 600 t • Total CHPP coal stockpile capacity of 1,035,000 t • Emergency ROM coal stockpile • Stacking and reclaiming system • Rejects thickener	• ROM hopper upgrade to approximately 2,600 tph • CHPP processing rates up to 2,600 tph • Additional approximately 450 t surge bin • An increase in the size of coal CHPP stockpiles to approximately 1,215,000 t • Additional processing module • Emergency ROM coal stockpile upgrade (and relocation with the ROM hopper) • Relocated ROM hopper established on or after Year 4 • Upgrades to the stacking and reclaiming system • Additional rejects thickener
Rejects Management	• Reject material is stored in a 700 t reject bin before being dried in cells and in temporary emplacements in the mining area and buried within the overburden area and capped with a minimum of 5 m of inert overburden material	• No change to method of reject disposal • Reject bin relocated and constructed after Year 2
Coal Transport	• 3,500 tph rail load out facility • All product coal by rail (no road transport) • Product coal to Port of Newcastle • Up to 16 laden train movements per day • Small amounts of product coal to NSW power stations	• 5,000 tph rail load out facility • No other changes to transport methods, number of train movements or destination
Public Roads	• Construction of Bengalla Link Road	• Relocation of an approximately 6 km section of Bengalla Link Road around Year 15 near the mine access road
Landform	• Maximum 270 RL development of OEA	• No increase to maximum RL of landform
Water Management	Water Management System comprised generally of: • Mine water dams and clean water dams • Discharge dam and point • Hunter River intake	• Additional dam (CW1) north of Wybong Road and associated Infrastructure • Relocation of existing water management system (including the Staged Discharge Dam) as mining advances • Diversion of Dry Creek (temporary via pipeline, longer term reinstated through the Main OEA) • Continued use of Hunter River Intake • Construction of the Mount Pleasant Discharge Dam and associated pipeline linking the Mount Pleasant Project with the Mount Pleasant Discharge Dam • Additional dams to the west of mining area as shown in **Figure 3**

4.3 Conceptual Mine Plan

4.3.1 Mine Plan Layout

The Project will extract the open cut coal reserves from the Warkworth to the Edderton coal seams (under current market conditions) within the Whittingham Coal Measures, focusing on parts of the Jerrys Plains and Vane subgroups. Approximately 1,200 Million bank cubic meters (Mbcm) of overburden material will be moved and approximately 70 Mt of coal reject will be produced from the processing of the ROM coal over the Project life.

Figure 14 to **Figure 18** illustrates the conceptual mine plan layouts for Years 1, 4, 8, 15 and 24 respectively. The staged mine plans have been selected for modelling as they represent a combination of mining at the extremities of the Project life at the greatest intensities of mining. Mining operations will continue Bengalla's progress in a general westerly direction. Additional coal resource is known to occur beyond the Disturbance Boundary however, is not proposed to be extracted as part of the Project. It is anticipated that subject to market factors and resource confirmation, BMC will seek the relevant approval for the extraction of these resources in the future.

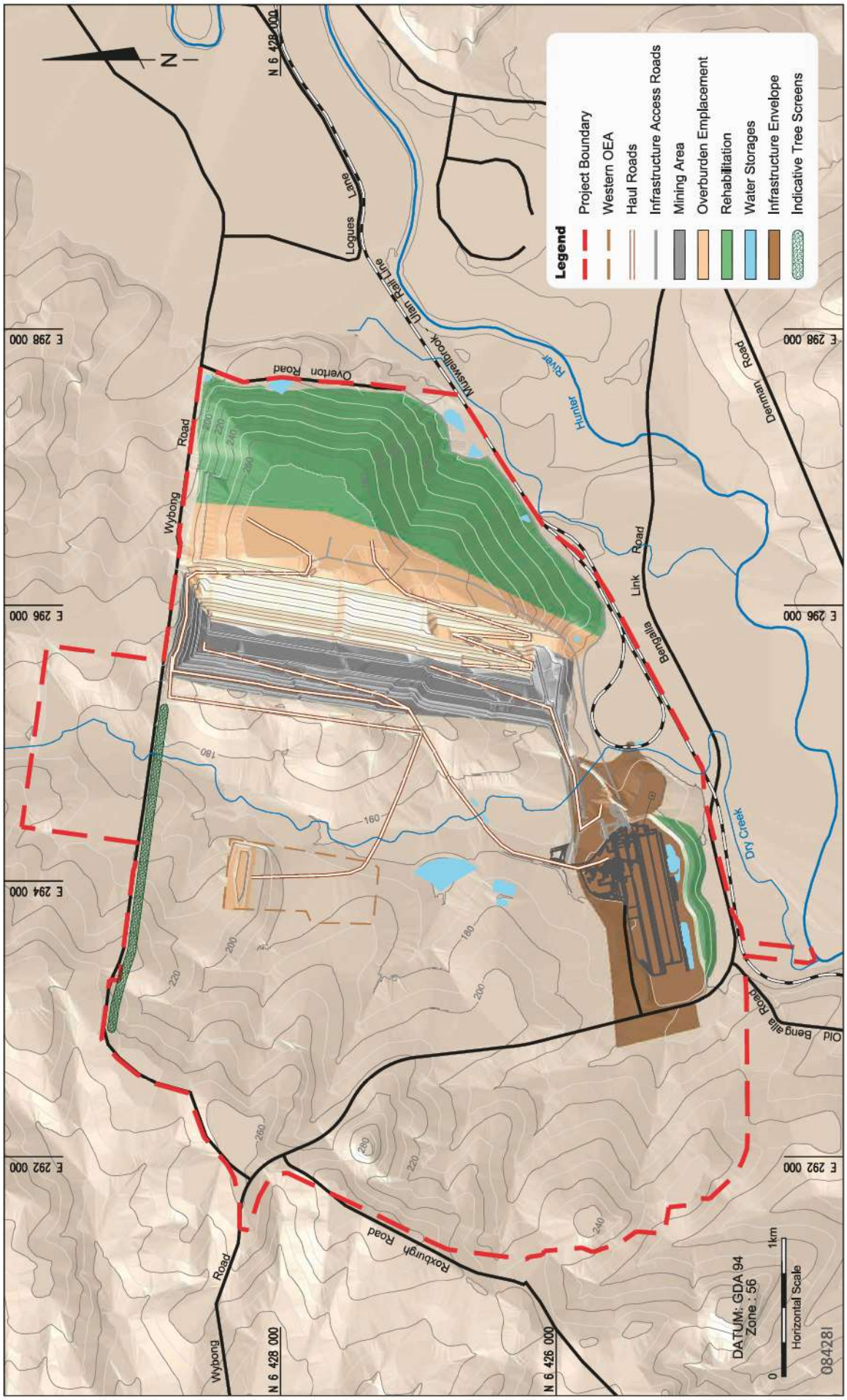
The mine plans allow for the establishment of a satellite extraction area (i.e. individual mining area in advance of the main extraction area) from Year 2 of the Project to assist with coal quality management and to maximise resource extraction efficiency. This satellite extraction area will be contained within the maximum footprint of the mining operations area and will be mined through with the westerly progression of the mine plan. No additional equipment fleet is required for the development of the satellite extraction area with equipment transferred from the main extraction area as required. The dragline will not be utilised within the satellite extraction area.

The mine plan incorporates a Western OEA to provide flexibility for overburden to be emplaced from the main mining area or may be required during the construction of CW1. Given the generally westerly sloping topography within the Project Boundary, this location will enable the operations to progress far enough west to naturally alleviate the overburden capacity issues currently experienced by the time the Western OEA is intercepted around Year 7. The Western OEA will provide BMC with the flexibility for an additional approximately 12 Mbcm of overburden emplacement capacity. The limit of the temporary Western OEA will be defined by its construction to a maximum height of RL 220 m.

The Project will not result in any increase to the approved maximum height of the OEA of RL 270 m. As Bengalla progresses in a westerly direction, the natural topography also dips to the west and as a result, from approximately Year 8 to Year 24 the landform will gradually slope down from RL 270 m (see **Figure 16** to **Figure 18**). This reduction in the height of the OEA will result in mining activities being further shielded from sensitive receptors located in the east. The northern portion of the Main OEA will remain steepened until approximately Year 4 to accommodate additional overburden capacity and to maximise coal recovery.

Once mining activities have progressed sufficiently, overburden will be shaped generally consistently with the conceptual landform designs presented on **Figure 14** to **Figure 18**. Topsoil will then be respread on the shaped areas to a minimum depth of 100 mm. Contour banks will be constructed at regular intervals down the slope of the rehabilitation area. The area is then raked to generally remove rocks greater than 200 mm in diameter. Areas are then scarified along the contour to assist in seed germination and water infiltration.

Revegetation will be undertaken progressively after the completion of surface preparation with inert capping material and topsoil spread over areas to be rehabilitated. This will occur as soon as possible to maintain topsoil quality and take advantage of native seed banks if present. Seeding of a rehabilitation area will commence as soon as practical. A conceptual final landform for the Project has been developed in the event that a future approval for the continuation of mining beyond the mine plan is not sought or granted and is described in detail in **Section 8.21**.



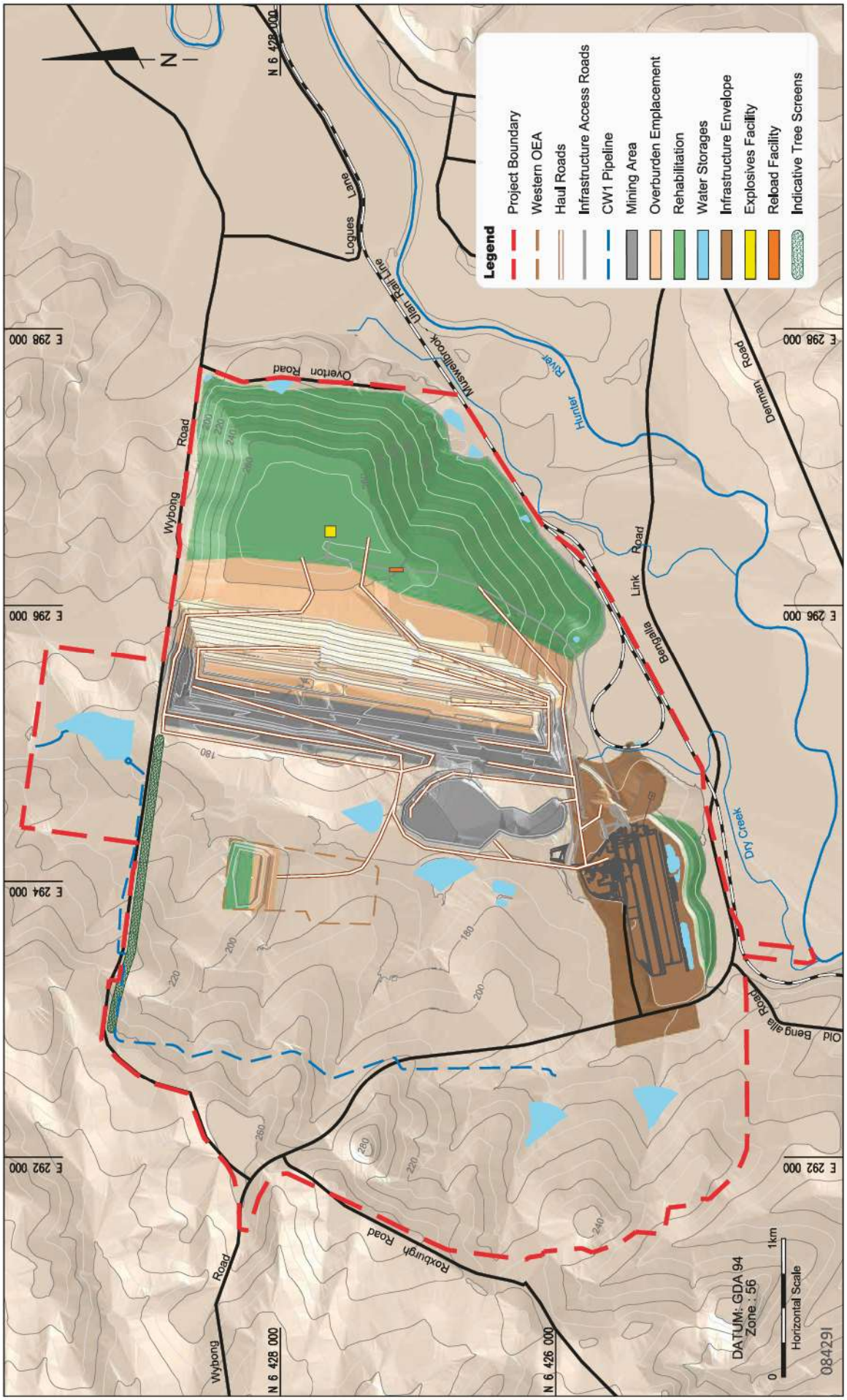
BENGALLA MINE

Conceptual Year 1 Mine Plan

FIGURE 14

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

BENGALLA

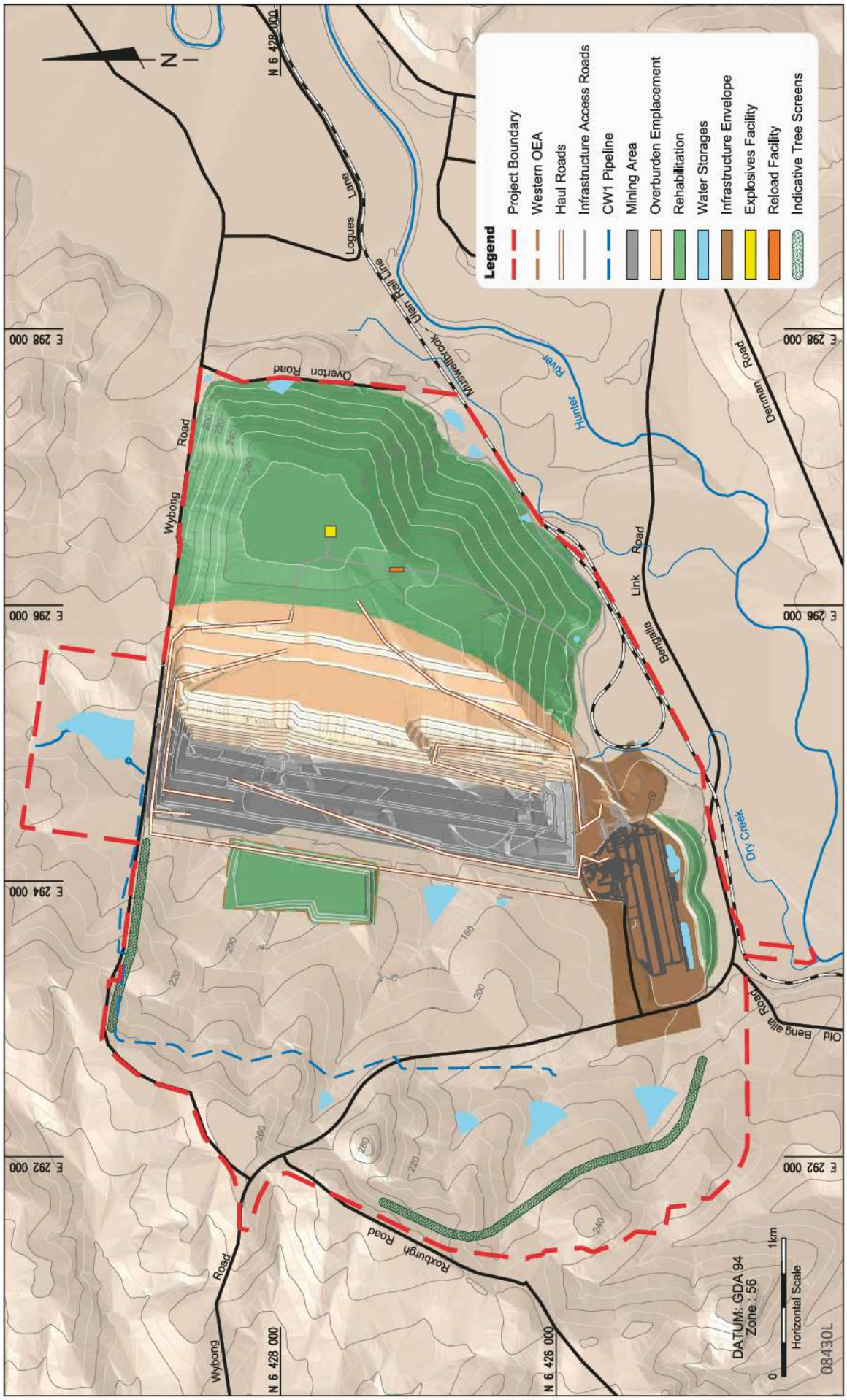


BENGALLA MINE

Conceptual Year 4 Mine Plan

FIGURE 15

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

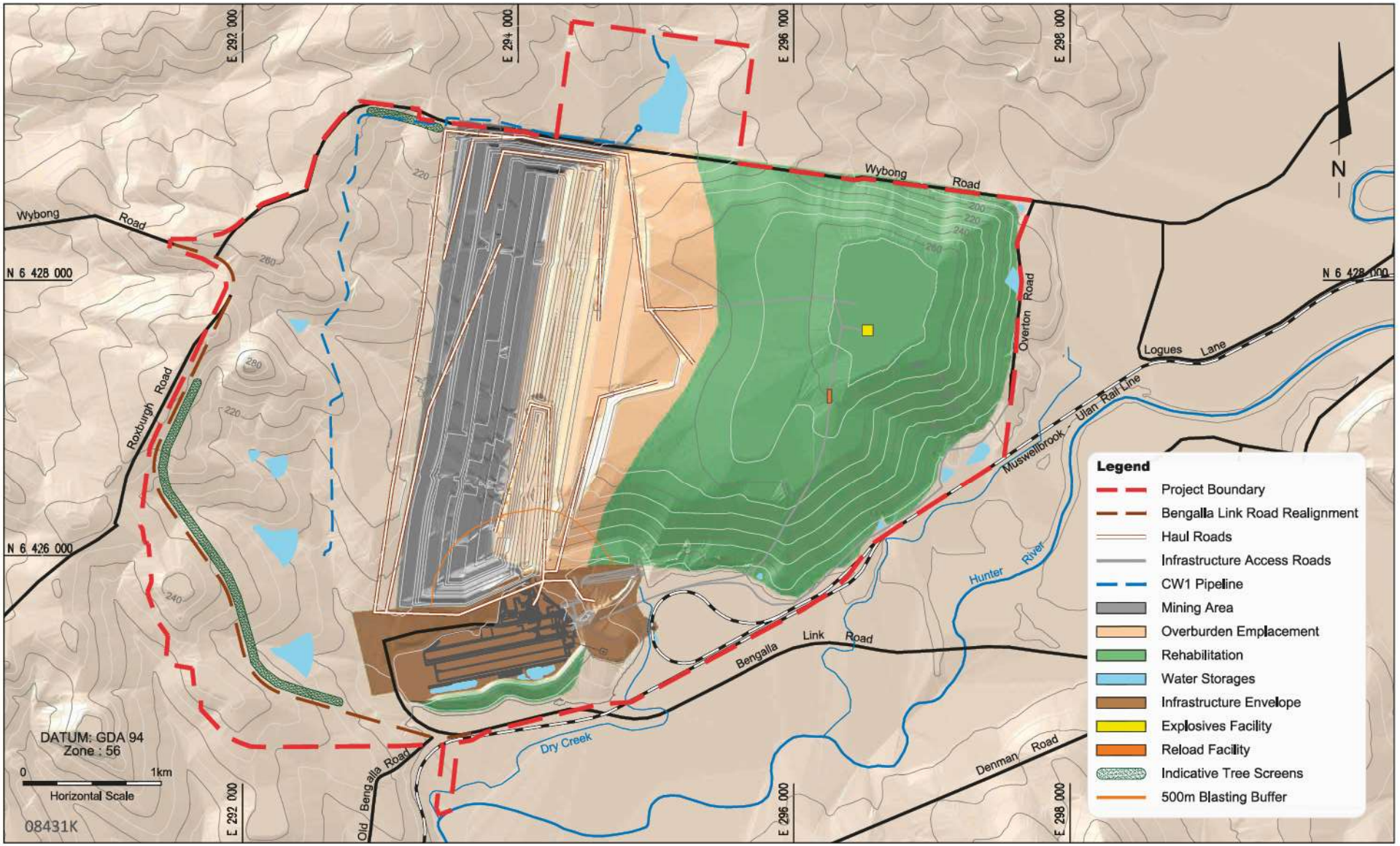


BENGALLA MINE

Conceptual Year 8 Mine Plan

FIGURE 16

Hansen Bailey
ENVIRONMENTAL CONSULTANTS



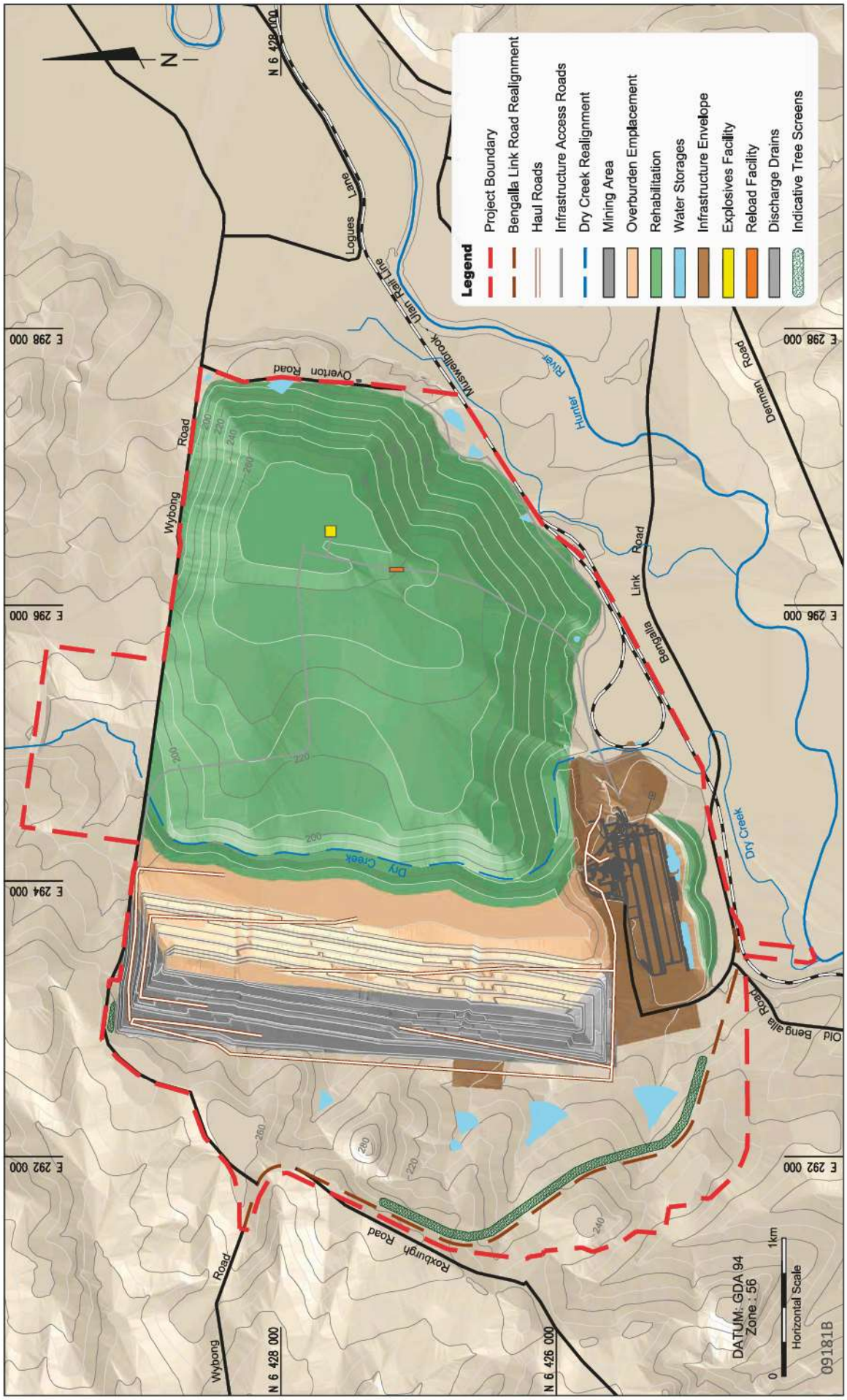
BENGALLA MINE

Conceptual Year 15 Mine Plan

FIGURE 17

BENGALLA

Hansen Bailey
ENVIRONMENTAL CONSULTANTS



BENGALLA MINE

Conceptual Year 24 Mine Plan

FIGURE 18

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

4.3.2 Mining Schedule and Methods

Year 1 of the Project is scheduled to produce up to 10.7 Mt ROM coal (consistent with existing approvals) with production gradually increasing to 15 Mt ROM coal by Year 4. An indicative production schedule for the conceptual staged years which has been conservatively utilised in relevant assessments is provided in **Table 10**.

The Project will continue to utilise its dragline and excavators operation supported by a fleet of haul trucks to transport coal to the ROM hopper for processing or overburden to emplacement areas. Open cut strip coal mining will advance to the west based on dragline strips of approximately 60 m in width subject to operational and mining conditions. The Project will require approximately 43 dragline strips subject to operational and mining conditions. **Figure 19** provides an illustration of the open cut coal mining process at Bengalla as further described below.

Typical of a dragline operation supported by a trucks and excavators, topsoil is initially stripped from the mining area and either utilised on available rehabilitation areas and / or stockpiled for later use. Prestrip mining of both overburden and ROM coal then occurs down to the Piercefield seam with access to the prestrip areas via highwall ramps. During this stage, overburden is blasted prior to being removed by loader or excavator and trucks to uncover the coal. The Project fleet then progresses through the formation to uncover each coal seam to be extracted in the mining sequence prior to the implementation of the dragline.

BMC's P&H 9020 dragline is the primary piece of equipment for interburden removal between the Vaux to the Edderton seams, although historically it has been used outside this horizon which may occur again in the future. The nominal strip width is 60 m to optimise the dragline operation and provide sufficient width for coal recovery.

The dragline has an operating radius of 105 m and a nominal digging depth and a dumping height subject to operational and mining conditions.

The dragline currently works in four passes. The first pass removes the interburden down to the Vaux seam and the interburden to the Broonie / Bayswater seams is removed in the second pass. This may change as higher production levels are achieved. The Broonie / Bayswater interburden is blasted in generally 60 m wide strips and excavated with a dragline to an overall slope to meet geotechnical requirements. The Broonie / Bayswater coal section is blasted and cut to an overall slope meeting geotechnical requirements.

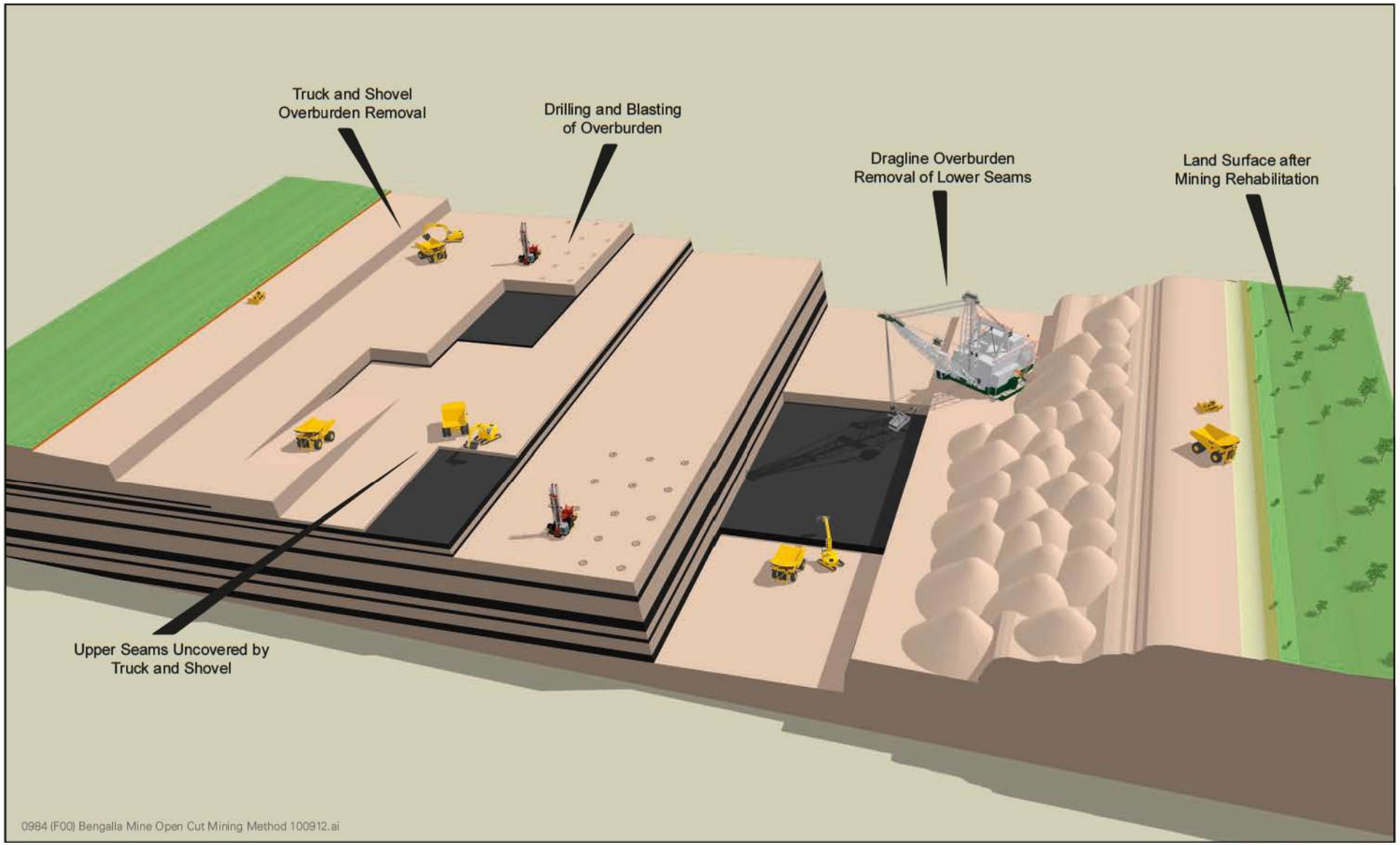
The dragline then removes the interburden to the Wynn seam and in the fourth pass, the interburden to the Edderton seam. Interburden is dragline dumped at an angle of repose in the order of 37 degrees with the lowermost pad undercut to approximately 45 degrees. Mining methods will generally follow the above description. However, there may be variations to dimensions, timings, orders of events and other elements of the mining method where conditions dictate.

4.3.3 Blasting

The hard rock overburden materials in the mining sequence typically require blasting to achieve suitable fracturing and fragmentation to enable efficient removal of these materials. Exploration drilling has indicated that the Project overburden materials are generally consistent with material currently encountered by existing operations (east of the Project). A review of the material to be mined has confirmed that the desired powder factor for blasting is likely to be approximately 0.6 kilogram (kg) of explosive per bcm of material. The ultimate powder factor utilised for the Project will be refined throughout the mine life to maximise efficiency.

Table 10 Modelled Production Schedule

Year	Total Overburden (Mbcm)	ROM Coal (Mtpa)	Product Coal (Mtpa)	Forecast Number of Train Movements (per annum)	Reject Material (Mtpa)
1	43.2	10.7	8.7	1,012	2.0
4	55.0	15.0	12.3	1,435	2.7
8	55.0	15.0	12.3	1,435	2.7
15	65.0	15.0	12.3	1,435	2.7
24	75.0	15.0	12.3	1,435	2.7



BENGALLA MINE

Open Cut Mining Method

FIGURE 19

Mine planning has predicted approximately 575 blast events per year (or up to an average of 12 blast events per week) will be required. This flexibility is required to enable BMC to facilitate appropriate management of blasting and environmental impacts as determined by site technical and environmental requirements.

Blasting will largely continue to be undertaken during the hours 7:00 am to 5:00 pm Monday to Saturday. As a result of the Project and in order to maintain safety of all onsite personnel, it will be necessary to temporarily evacuate relevant personnel when a scheduled blast is within 500 m of the infrastructure area (or approved but not yet constructed Mount Pleasant Project infrastructure area) to a suitable location situated a safe distance away from the scheduled blast. To facilitate this, limited blasting may also be conducted on Sundays between the hours of 10:00 am and 3:00 pm when the scheduled blast is located within 500 m of the infrastructure area. Specific details and procedures associated with blasting within 500 m of the infrastructure area including notification processes are included in **Section 8.4**.

The Project will require the storage of explosives and other related materials within the existing explosives storage facility. The explosives storage facility will be required to be relocated to the general location presented on **Figure 14** and will be designed in accordance with the relevant standards and guidelines (AS2187.2-2006 – Explosives – Storage, Transport and Use. Part 2: Use of Explosives).

4.3.4 Equipment Fleet

An indicative equipment fleet to accommodate maximum production levels for the Project is listed in **Table 11**. These are operational numbers at any given time and do not include units out of service such as in the workshop (under repair or service). Actual makes and models of equipment for the Project may vary, however operations will be undertaken to ensure that noise levels meet the noise predictions within this EIS.

All equipment required for the Project will be mobilised on site on a progressive basis consistently with the scheduled mining production levels. Various ancillary and other items of equipment will be required, including but not limited to water pumps, light plants, generators, service trucks, mobile cranes, delivery trucks, light vehicles and fuel oil trucks. It is anticipated that with technological development, new pieces of equipment may be employed within the mining industry. BMC will take advantage of this new technology provided environmental impacts from the use of this equipment satisfy the noise and dust emissions limits set by the Development Consent.

Table 11 Indicative Mobile Equipment Fleet

Equipment Type		Project Fleet
Dragline	P&H 9020	1
Excavators / Loaders	Hitachi EX5500 (or equivalent)	7
	Hitachi EX3600 (or equivalent)	2
	LeTourneau 1800 Loader (or equivalent)	2
Haul Trucks	Komatsu 830 E AC (240 t) (or equivalent)	53
	Hitachi EH4500 (253 t) (or equivalent)	
	Caterpillar 789 (190 t) (or equivalent)	
Dozers	Caterpillar D11 (or equivalent)	14
	Caterpillar D10 (or equivalent)	2
	Caterpillar 854G (Rubber Tyred Dozer) (or equivalent)	3
Drill	SK50 (or equivalent)	7
Graders	Caterpillar 16 M (or equivalent)	6
	Caterpillar 24 M (or equivalent)	2
Water carts	Euclid R 90 (80 KL) (or equivalent)	7
Other ancillary equipment (e.g. water pumps, lighting plants, mobile cranes, etc)	Various	Various

4.4 Coal Handling and Preparation Facilities

4.4.1 ROM Coal Handling

ROM coal will be unloaded from rear dump trucks into the existing ROM hopper where the primary coal sizing plant will reduce the size of the coal to a diameter of less than 250 mm. Where scheduling or operational reasons dictate, ROM coal may be temporarily located in mining area before being transported to the primary coal sizing plant. **Figure 20** provides an illustration of the coal handling process at Bengalla as further described below.

To accommodate the increased production levels, the existing ROM hopper and primary sizer will be upgraded to achieve a ROM coal feed rate of approximately 2,600 tph. This upgrade to the existing ROM hopper will be conducted around Year 3 of the Project.

In order to minimise haul road lengths and improve coal handling efficiency, a relocated ROM coal hopper will also be required to be established west of the infrastructure area. Following its construction, a 40,000 t ROM coal stockpile will also be relocated within the Infrastructure Envelope adjacent to the relocated ROM coal hopper.

The crushed coal will then be transported along a conveyor to a secondary crushing station (including secondary sizer, roller screen and tertiary sizer) where it will be reduced to a nominal diameter of less than 50 mm. The secondary crushing station will also require an upgrade to accommodate the additional throughput of up to 2,600 tph. After crushing, coal will be bypassed to product, direct fed into the CHPP or stockpiled on the raw coal stockpile.

The existing 200,000 t raw coal stockpile will continue to operate. An additional raw coal stockpile of approximately 180,000 t will be constructed. An additional stacker and reclaimer capable of processing 2,600 tph will also be used to service the additional raw coal stockpile. In order to meet the Project CHPP processing needs, the existing and additional raw coal reclaiming system will operate simultaneously. The existing raw coal stockpile process capacity may also be upgraded to match the new stockpile.

The existing raw coal bypass system will be upgraded to permit all raw coal to be directed to either of the raw coal stockpiles. Materials testing will be done to accurately determine coal quality prior to the determination of coal processing requirements. Raw coal can then either be bypassed directly to the product coal stockpile or reclaimed for processing in the CHPP.

An extension to the existing emergency ROM coal stockpile will be required to be used in the event that there is a failure, delay in the offsite coal chain to the Port of Newcastle or other operational reasons. ROM coal may also be temporarily stockpiled within the confines of the mining area from time to time where operational efficiencies so require. The maximum ROM coal stockpile capacity on site will be up to 350,000 t.

The Project coal handling system is shown in **Figure 20**.

4.4.2 Coal Handing and Preparation Plant

The Project involves an upgrade to the existing Bengalla CHPP to enable the handling and processing of up to 15 Mtpa ROM coal. Reclaimed ROM coal will be fed into a surge bin of approximately 800 t capacity from where it will be withdrawn at a controlled rate for processing in the CHPP. A new additional approximately 450 t raw coal surge bin will be constructed north of the existing surge bin to feed the third CHPP module which shall accommodate a ROM coal feed rate in the order of 2,600 tph.

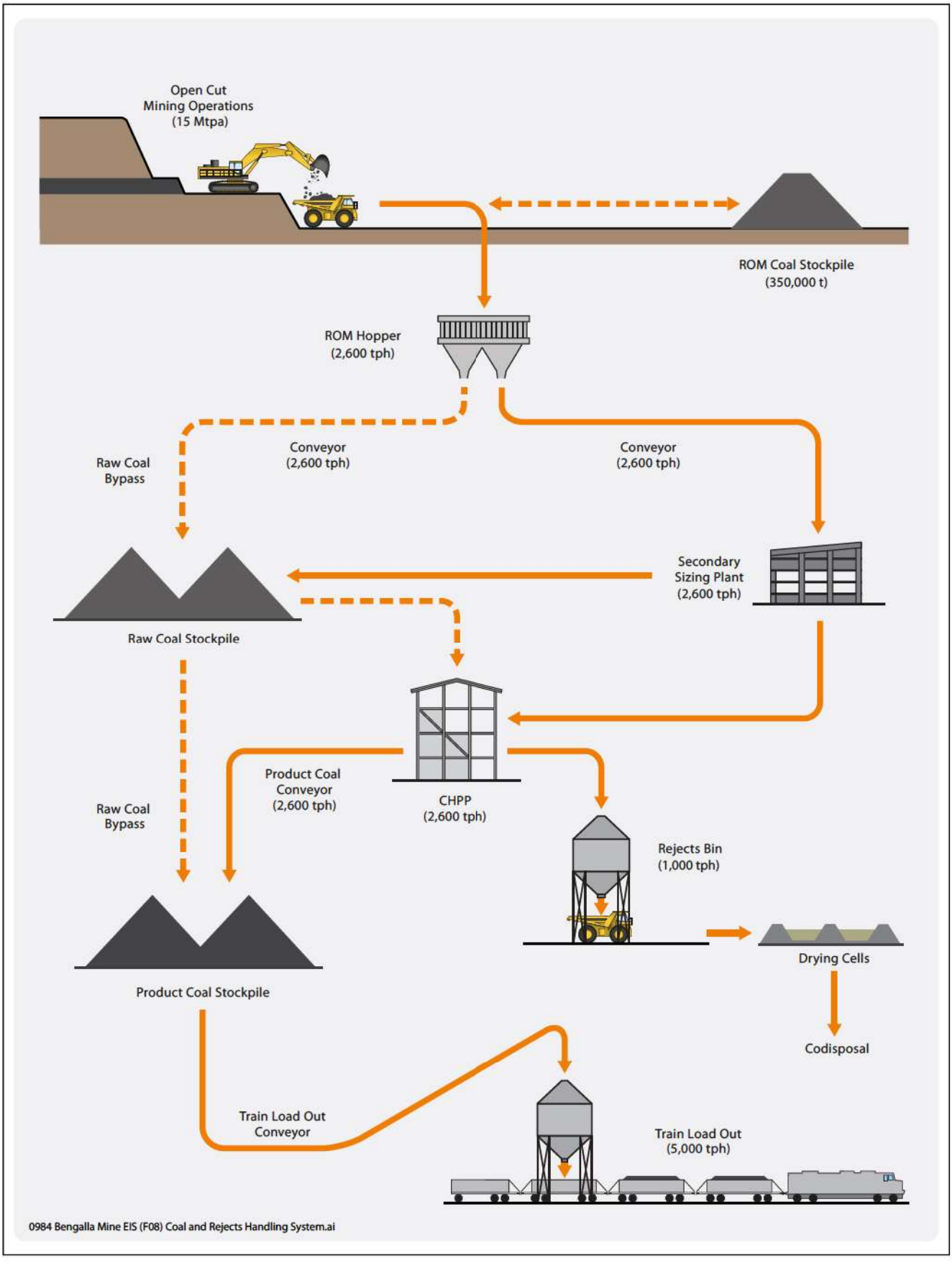
The Project will include an additional coarse module similar to those currently in operation and an upgrade to the common fines circuit and other circuits. All fine coal will be processed through a common fines module. Each module utilises dense medium cyclones and spirals to process the various size coal fines.

The indicative layout of the CHPP and other associated facilities is illustrated on **Figure 21**. Additional detailed conceptual plans of key infrastructure upgrades to meet Schedule 1 of EP&A Regulation) are provided in **Appendix C**. This design will be revised and finalised upon the determination of Development Consent in accordance with any required conditions of approval.

4.4.3 Product Coal Handling

All product coal is dewatered by centrifuges before the product is placed on the plant product conveyors (along with any raw coal from the bypass system) and fed onto the product coal stockpiles or directed to the train load out facility.

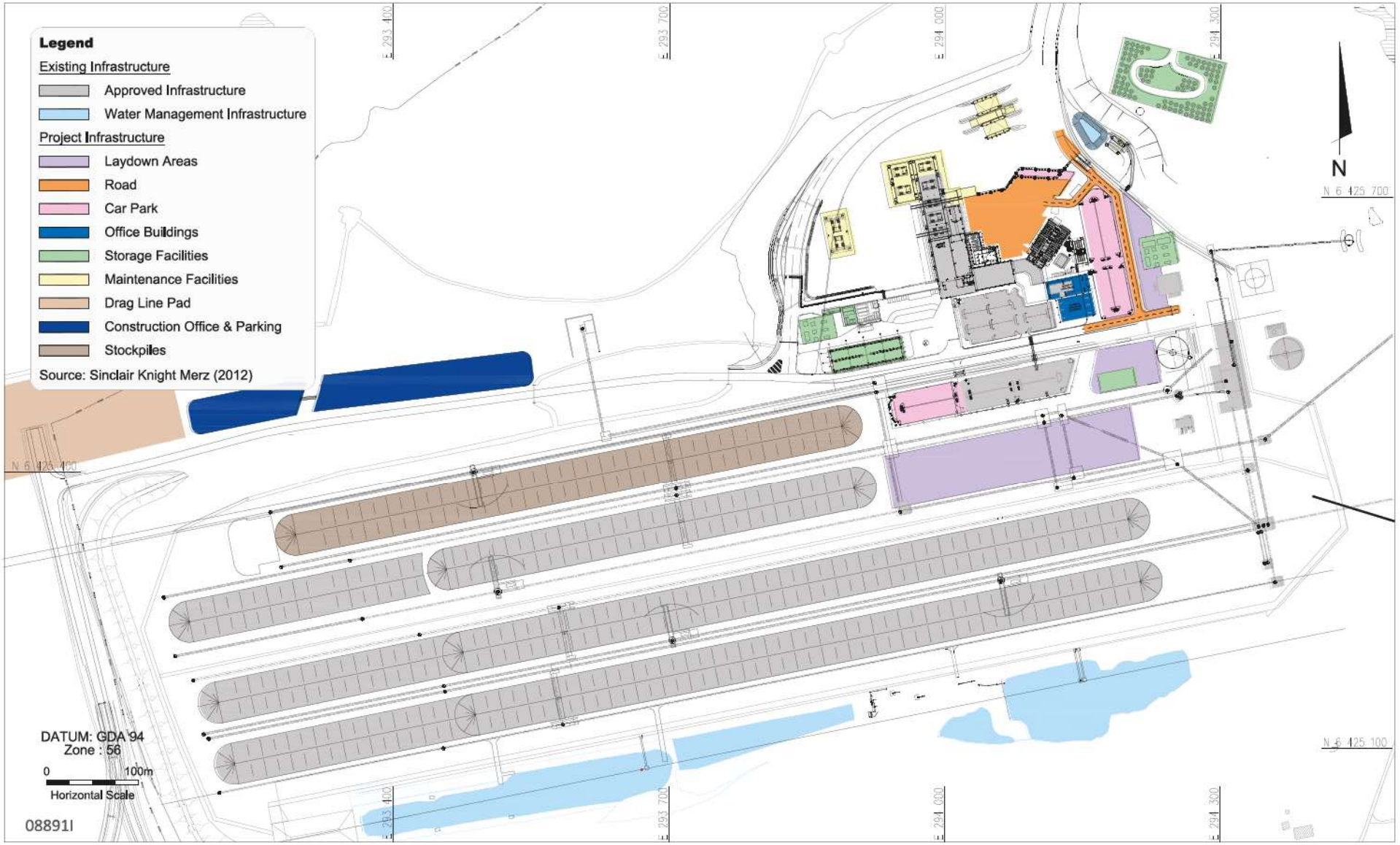
The Project will not require an increase to the approved configuration of the product coal stockpiles. The quality of the coal from the Project is sampled and analysed before being placed on the stockpiles. Different coal products are stored in designated sections of the product stockpile to meet market needs.



BENGALLA MINE

Coal Handling Process

FIGURE 20



BENGALLA MINE

Infrastructure and Upgrade Layout - CHPP Area

FIGURE 21

4.4.4 Product Transport

The Project will involve the transport of product coal by rail nominally to the Port of Newcastle for sale to the export market with lesser amounts railed directly to NSW power stations. Product coal will be conveyed from the product stockpiles to the Bengalla Rail Loop and associated automated train load out facility (see **Figure 13**).

The existing Bengalla Rail Loop has sufficient capacity for the Project's planned increase in coal production up to 15 Mtpa. Forecast train movements to accommodate the Project will require up to 1,435 train movements per year and will not require any increase from approved levels (see **Table 9**). The Project will continue to facilitate coal from the Mount Pleasant Project via a conveyor upon its construction (or another approved method) to Bengalla Mine.

4.5 Reject Material and Overburden Waste

Bengalla does not require the use of an out of mining area tailings dam. Tailings are and will be managed through drying and co-disposal in the Main OEA. Ultrafine material (smaller than 0.125 mm) is thickened, dewatered on belt press filters and then combined with other reject streams for final disposal back into the overburden. A second rejects thickener may be installed for the Project.

Reject material is stored in the 700 t reject bin before being transported back to the extraction area where it is dried in cells located within the areas for overburden re-emplacement, buried within the Main OEA and finally capped with a minimum of 5 m of inert material.

To accommodate the additional production levels, the reject bin may be relocated generally adjacent to the exit route from the existing ROM bin to make use of mine trucks exiting the ROM pad for the collection and transport of reject material. In addition, the reject bin may also be upgraded to approximately 1,000 t capacity. The location of the relocated reject bin is presented on **Figure 21**.

Following the construction of the relocated ROM coal hopper, the rejects bin may also be required to be relocated within the Infrastructure Envelope adjacent to the relocated ROM coal hopper.

Bengalla will continue to operate a bioremediation facility where any soil contaminated with hydrocarbons is placed for remediation and progressively relocated within the Disturbance Boundary as required. When the soil meets specific land use criteria, it will continue to be appropriately placed in the Main OEA.

4.6 Mine Infrastructure

The Project will utilise the existing Bengalla infrastructure described in **Section 3**. Key items that may need to be upgraded or relocated to facilitate mining as part of the Project (but not limited to) include:

- Workshop and administration buildings;
- Explosives storage and reload facility;
- Water management infrastructure;
- Helipad;
- Dragline maintenance pad;
- Generator compound;
- Mine Access Road; and
- Ancillary infrastructure.

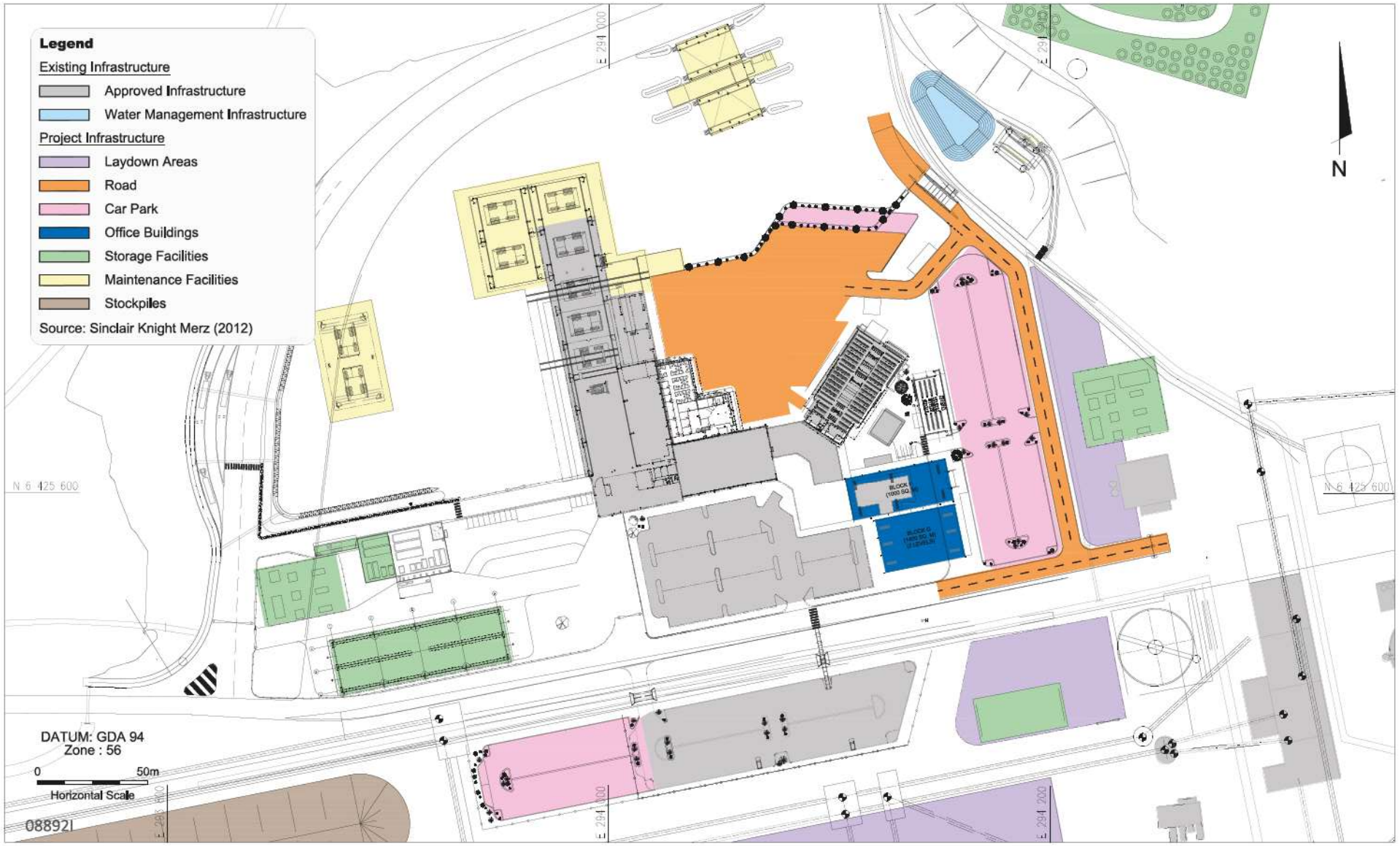
A general indicative arrangement of the MIA is shown on **Figure 21** and each of these described below. The elements of the MIA will be located within the Infrastructure Envelope shown on **Figure 22**. Their exact layout may be different from the detailed plans of the infrastructure but all elements will be within the Infrastructure Envelope.

4.6.1 Workshops and Administration

The Project will require the construction of additional workshops and administration area infrastructure to accommodate the Project workforce. It will generally be contained within the Infrastructure Envelope within the Project Boundary. Upgrades to the existing workshop and administration are anticipated to contain (but may not be limited to) the following items:

- Additional parking for heavy and light vehicles;
- Additional heavy and light vehicle maintenance workshop and laydown areas with supporting services;
- Fuel and lubricant facilities;
- Light and heavy vehicle wash station incorporating a catch dam, sediment control dam and oil separator; and
- Crib hut and bathhouse buildings.

Further detail in relation to each of the above items is discussed below.



BENGALLA MINE

Infrastructure and Upgrade Layout - Administration and Workshop Area

FIGURE 22

Parking

The Project will require the construction of an additional, sealed parking area consisting of approximately 50 spaces located within the Infrastructure Envelope. Additional areas of car parking will be constructed within the Infrastructure Envelope to accommodate approximately 250 additional car parking spaces.

The existing two lane heavy vehicle marshalling area and parking facility will also be relocated and upgraded to facilitate the Project. Additional temporary parking will also be required during construction periods within the Disturbance Boundary. Temporary parking will be located at appropriate locations within the Disturbance Boundary from time to time.

Office Facilities

The Project will include the construction of additional office capacity to accommodate the additional workforce and provide for further training and conference facilities. Two new office blocks will be constructed as production levels increase for the Project. A new 1,000 m^2 single story office block with a further double storey 1,400 m^2 office block will be constructed within the Infrastructure Envelope. The layout may vary from the detailed plans but the office facilities will be within the Infrastructure Envelope.

Vehicle Maintenance Workshop and Support Services

The Project will require the construction of an additional four bay extension to the existing heavy vehicle workshop including a separation bay. A new three bay light vehicle workshop will also be constructed adjacent to the existing heavy vehicle workshop.

A two bay heavy vehicle tyre changing facility will be constructed west of the current workshop area. Expired tyres will then be stored in the new tyre storage area until disposal.

Four new laydown areas of various sizes will be constructed throughout the MIA. In addition, two new covered storage sheds constructed within the new laydown areas will also provide for additional storage capacity.

Fuel and Lubricant Facilities

The fuel and lubricant storage facilities will require a total maximum storage volume of 1,320,000 Litre (L). All diesel storages will be above ground, self bunded storage tanks, constructed in accordance with relevant Australian Standards, including but not limited to 'AS 1940 The Storage and Handling of Flammable and Combustible Liquids'.

Additional upgrades to storage tanks associated with petroleum products, concentrated engine coolant and diesel will also be required for the Project. The facility will also provide for the reclaiming and storage of waste oil and waste coolant resulting from vehicle and servicing repair.

The mining vehicle fleet will generally be refuelled by the service vehicles at temporary, designated locations around the mine site relocated appropriately from time to time. Fuel and bulk lubricant will be delivered by trucks to the unloading area, which will be designed for the containment of spillage. Diesel will be delivered on a daily basis with up to six B-Double (50,000 L) trucks per day. All storm water from the facility will be collected at a common collection point and pumped into a designated contained storage area for oil separation and treatment, located at the heavy vehicle wash.

The fuel and lubricant facilities will be relocated from time to time within the Disturbance Boundary as described in **Section 4.6.3**.

Wash Station

A new two bay heavy vehicle washdown bay will be constructed within the Infrastructure Envelope to accommodate additional Project fleet (precise layout and location may vary from detailed plans but within the Infrastructure Envelope). The heavy vehicle washdown bay will accommodate haul trucks (both overburden and coal haulage), dozers, graders and loaders and will prepare heavy vehicles for entry to the workshop.

A new light vehicle washdown bay will be constructed on the entrance road to the light vehicle car park.

A new solid removal system and hydrocarbon treatment area will also be constructed for the new heavy and light vehicle washdown bays. Muds and greases / oils removed from both the heavy and light vehicles will be collected in the drive in sump capable of being cleaned out by a front end loader. Waste water will be pumped into an oil separator prior to reticulation into the existing water management system.

Crib Hut and Bathhouse

The existing crib hut and bathhouse will be required to be upgraded by Year 4 to accommodate the additional Project personnel requirements. A modification to the existing male bathhouse will provide for up to 650 personnel. A new female bathhouse will be constructed to provide for up to 140 personnel.

4.6.2 Explosives and Reload Facility

The relocation of the explosive storage and reload facility will be required prior to Year 4 and will be constructed in accordance with *AS 2187:1998 Explosives - Storage, Transport and Use – Storage (1998)* and relevant NSW Occupational Health and Safety (OH&S) regulations.

The relocated facility will be sited in a fully bunded position on the existing OEA as identified on **Figure 13** which is located a sufficient distance from onsite facilities, such as offices, within the Project Boundary to ensure safety. The relocated position will require the construction of an all-weather access road to enable access for heavy vehicles. The access road will permit access from both the northern and southern portion of the Project as presented on **Figure 13**.

4.6.3 Relocatable Facilities

The dragline maintenance pad necessary for the maintenance of the dragline pad including parking services, crib rooms and associated facilities (relocatable facilities) will be relocated throughout the duration of the Project to facilitate the natural progression of mining. A dragline maintenance pad(s) will initially be constructed generally to the north of the infrastructure area.

In order to facilitate access in the event of an emergency, BMC will continue to maintain the existing helipad to the west of the highwall.

Key additional infrastructure items that may be required to be relocated to facilitate the progression of mining include in-pit facilities (crib and amenity facilities, fuel farm, truck park-up, and maintenance construction pad), bioremediation farm, substation pads, and stemming gravel and topsoil stockpiles. All relocated infrastructure items will be located (and relocated as required) at suitable locations within the Disturbance Boundary.

4.6.4 Power Supply Infrastructure

It is intended that the Project will require the upgrade of the existing power supply. The upgrades are primarily required to support water management infrastructure along with onsite operational needs if necessary. It is anticipated that BMC will either establish mains power to CW1 via connections to existing infrastructure with two generators located in the infrastructure area or at CW1 adjacent to Wybong Road to supplement this source in the event of power loss.

As an alternative to the above, three generators would be commissioned in order to provide sufficient power without the requirement for an external power supply source. The generator storage compound will be constructed for the Project and will be required to contain up to three 1,250 Kilovolt-ampere (kVA) powered diesel generators (of which two will operate at any time) and associated 55,000 L diesel storage capacity.

All necessary power supply works will be undertaken in consultation with the relevant power authority as required and will be located within the Project Boundary; with the exception of the power upgrade of existing power lines or duplication of the switch yard which will be located generally as shown on **Figure 3** within the Project Boundary.

4.6.5 Ancillary Infrastructure

Minor additional disturbance associated with ancillary works including Dry Creek pipeline, Mount Pleasant Discharge Dam pipeline and associated power supplies, fencing, firebreaks, water diversion structures, minor contour banks, tracks along pipelines, powerlines, temporary service areas, core shed and portable buildings, temporary construction, heavy vechicle park up areas and sediment control structures may be required. These will generally be located within the Disturbance Boundary.

Any elements of the Project or disturbance located outside the Disturbance Boundary but within the Project Boundary will be subject to internal BMC approvals including the completion of a comprehensive GDP and as described in **Section 3.13**. The Project will require alignment modifications to the internal power reticulation network to facilitate the staged progression of mining operations within the Project Boundary.

4.7 Mine Access

All access to the Project will remain via the existing Bengalla Mine Access Road off the Bengalla Link Road. An alternative site access road may be required to accommodate relocated infrastructure and would be located within the Infrastructure Area shown on **Figure 22**. Additional road networks or extensions to existing internal roads will also be constructed in order to provide access to the various new and upgraded infrastructure elements. The existing Bengalla Mine Access Roadwill also be utilised as the primary emergency entry and exit route.

Mining activities will intersect a 2 km section of the Bengalla Link Road. However, to provide the best alignment for traffic, BMC is proposing to realign a section of the Bengalla Link Road (approximately 6 km in length) to the west of its current alignment. The new road section will replicate the existing two lane, two way rural road with a nominal speed limit of 100 km/hour that was constructed by BMC in 2009 (see **Figure 23**). The existing section of Bengalla Link Road will be closed (and purchased by BMC if possible) and the new section of Bengalla Link Road will be constructed to the relevant required standard and dedicated by BMC as a public road. BMC is the landowner of all the land proposed for the new section of the realigned Bengalla Link Road.

The design will include a 'like for like' replacement of the current Bengalla Mine Access Road intersection approximately 900 m south. The intersection will consist of a channelised right turn with a minimum 160 m right turn lane with a slight uphill grade (see **Figure 24**).

BMC will also construct an intersection from the existing Roxburgh Road onto the realigned section of the Bengalla Link Road. This intersection will require Roxburgh Road to be altered to allow a 90 degree angle of intersection (see **Figure 24**). Impacts associated with the relocation of the Bengalla Link Road are discussed in **Section 8.13**.

The realigned section of the Bengalla Link Road and intersection design will be constructed in accordance with the 'Guide to Road Design Part 4A – Signalised and Unsignalised Intersections' (Austroads, 2009) and will be developed in consultation with MSC.

BMC will remain responsible for the life of the Project for the costs of the maintenance of the Bengalla Link Road to the Bengalla Mine Access Road (subject to MSC's responsibilities as the roads authority under the Roads Act 1993 (Roads Act)).

4.8 Water Management

4.8.1 Mine Water Management System

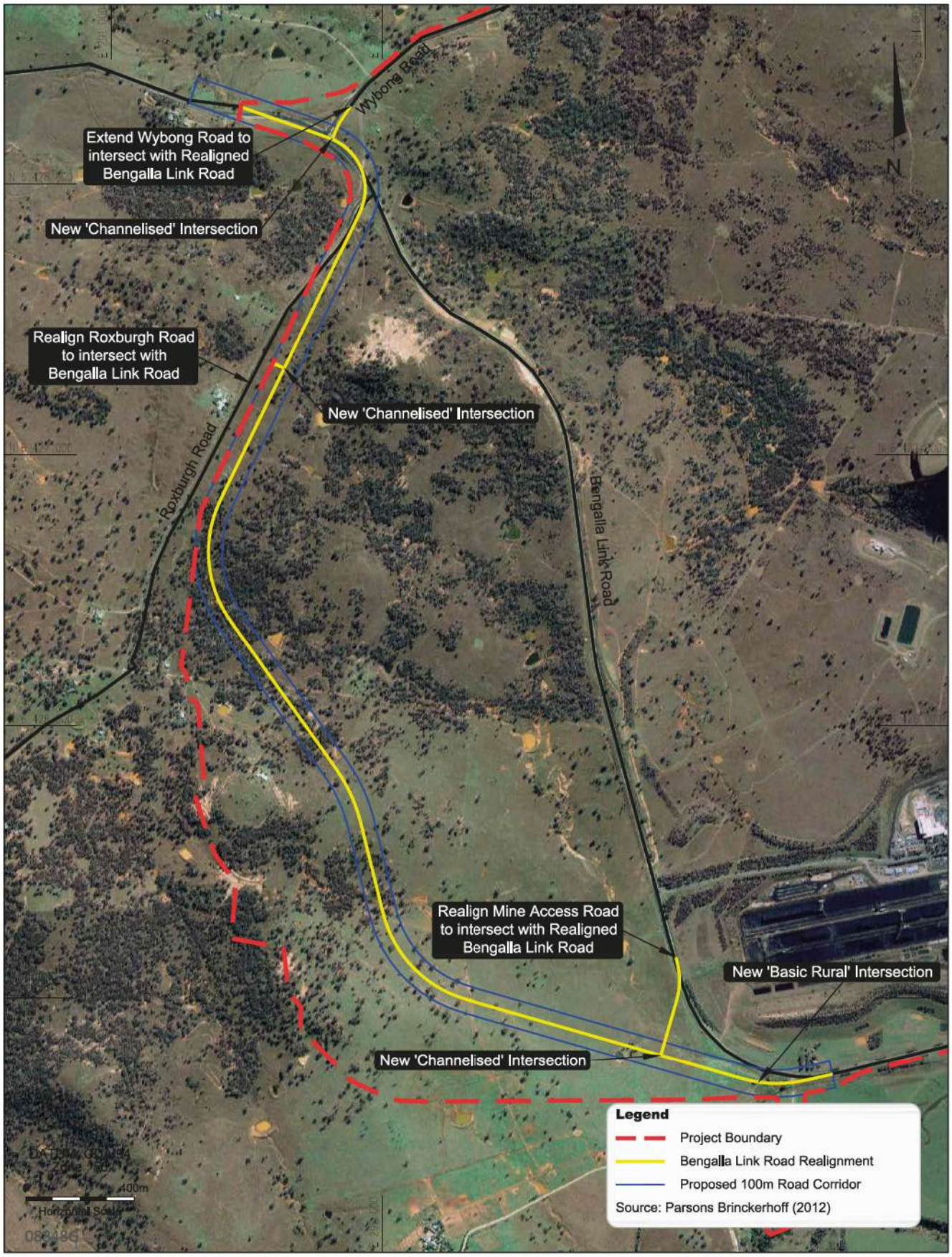
The water management system required for the Project will be integrated with the existing water management system to enable optimal collection, use, recovery and recycling of water within the Project Boundary.

Figure 14 to **Figure 18** illustrate the indicative water management system for the Project as mining activities progress, opening and creating new catchments.

The initial catchment areas above the mining area will require a system of catch dams, bunds, piped transfers and diversion drains to ensure that the water upstream does not inundate the mining area during large rainfall events. Clean water runoff will be collected in surface drainage channels and diverted away from the mine area into their natural flow or will enter into the water management system. Surface water from disturbed areas will enter into one of the various existing sedimentation dams or those proposed for the Project for treatment in the water management system. All sediment dams for the Project will be designed consistently with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source.

BMC currently holds Water Access Licence (WAL) 001106 which has high security share component from the Hunter River of up to 1,449 units attached. Additionally, BMC hold WALs for the Hunter River with a further 4,562 general security units. Allocation from these licences will supply necessary supplements to the existing site water largely for use in the CHPP and for dust suppression. The existing pump and associated water pipeline (see **Figure 14**) will continue to be used to transfer water from the Hunter River for use in the water management system. BMC holds various other water licences which are detailed in **Section 5**.

Water recovered from mining operations will be pumped into the Main Water Dam where it can then be transferred to other areas within the mine as required largely for use in the CHPP or for dust suppression. During periods of high rainfall, excess water from the Project can also be discharged into the Hunter River under the HRSTS during periods of 'high' or 'flood' flows. Discharges will be conducted in accordance with BMC's EPL 6538 and the *Hunter River Salinity Trading Scheme Regulation 2002*. All discharges will be released from the Staged Discharge Dam with additional surface water monitoring undertaken during any such discharge event. Discharge requirements for the Project are further described in **Section 8.6**.



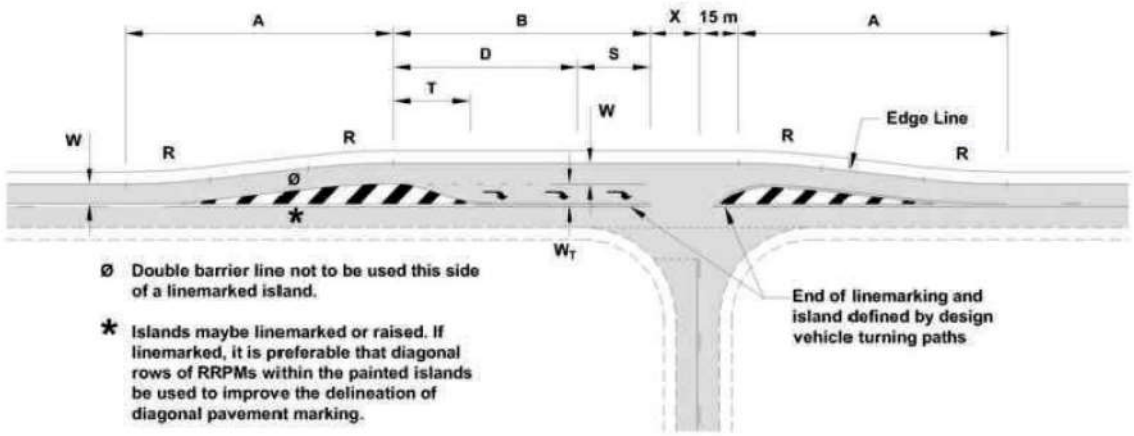
BENGALLA MINE

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

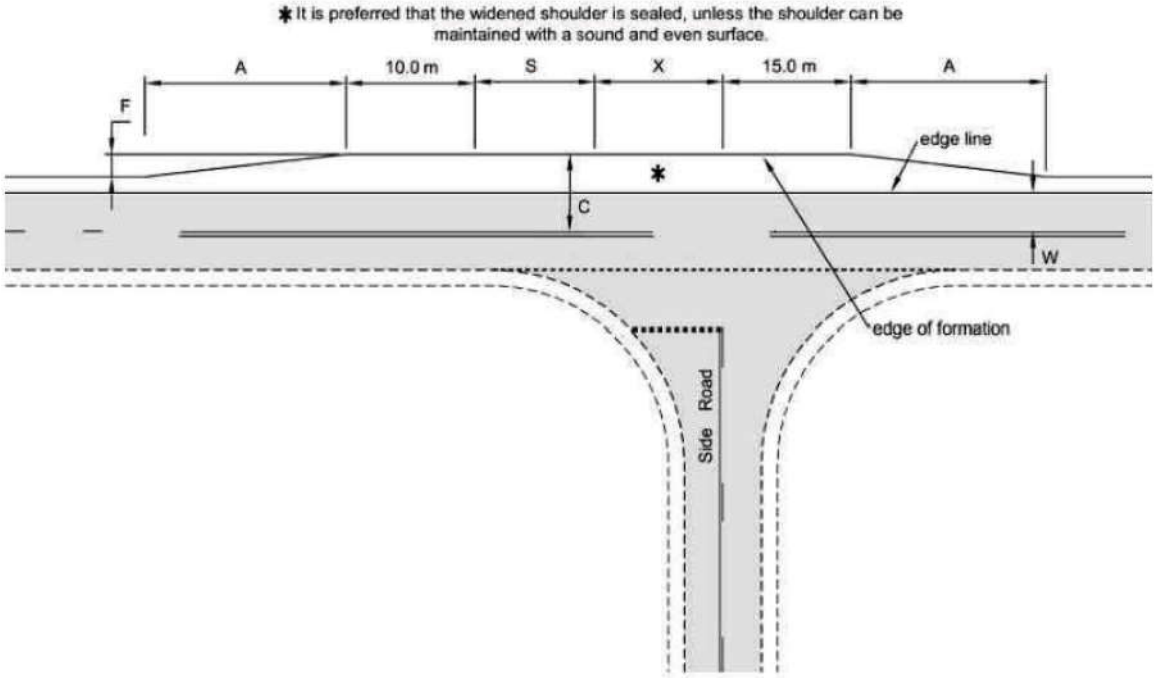
Conceptual Bengalla Link Road Realignment

FIGURE 23

Channelised Intersection



Basic Rural Intersection



08947D

Source: Austroads Guide to Road Design

BENGALLA MINE

Indicative Intersection Design

FIGURE 24

4.9 Dry Creek

4.9.1 Interim Diversion

Dry Creek is an ephemeral gully line that often maintains zero flow which is interrupted sporadically by short periods of flow during prolonged and / or heavy rainfall (see **Section 8.6**). Dry Creek commences north of Wybong Road within the Mount Pleasant Project Mining Lease 1645 and drains from north to south to the Hunter River, which is located approximately 1 km south of the Project Boundary (see **Figure 14**).

BMC engaged Parsons Brinckerhoff to undertake an interim management system and conceptual Dry Creek re-establishment study that will allow mining operations to continue west for the Project. The overall Dry Creek relocation design has been prefaced by and informed by studies completed from conceptual and prefeasibility through to feasibility phases from 2007 to 2012, to determine the preferred option for the Project. A discussion in relation to the alternatives considered is provided in **Section 4.13.9**.

The Dry Creek catchment north of CW1 maintains a 665 ha total catchment area. The dam would capture the runoff generated from a 1 in 200 year Average Recurrence Interval (ARI), 72 hour storm prior to passing under Wybong Road and onto BMC land. Noting that this dam is essentially all surcharge capacity, CW1 has a surcharge capacity of 900 ML to reduce the potential for runoff entering BMC's void.

To minimise footprint of CW1 the removal of approximately 300,000 bcm of material from within the current footprint as depicted on **Figure 14** is required. The material will be transported across Wybong Road for emplacement within the Main OEA in or in the Western OEA in consultation with relevant regulators and in accordance with the protocol described in **Section 4.9.4**. Should this material be required for use as part of the Mount Pleasant Project (in accordance with relevant approvals), this material would be used as described in that approval.

As mining progresses to the west, it is anticipated that Dry Creek will be impacted from mid-way through Year 2 of mining operations. As such, the construction of CW1 north of Wybong Road will be required to commence in Year 1. CW1 will provide for the catchment of all water upstream of its location and will be constructed in accordance with Landcom (2004) and has been designed to be capable of containing a 1 in 200 year rainfall event.

4.9.2 Temporary Diversion and Hardware

To maintain safe operating levels, clean water from CW1 will have a design flow of 1,085 L/s into a pipe to divert clean water around mining operations until Dry Creek is reinstated after Year 15. The pipeline will be approximately 5.4 km long and will facilitate water to be transported to a discharge point west of the current Mine Access Road. An energy dissipating structure would be constructed at the end of the pipeline to minimise erosion potential from the water re-entering the existing drainage line. An indicative pipeline alignment is presented on **Figure 18**.

It will be necessary for the pipes to be placed under the surface of both Wybong Road and the Bengalla Link Road. BMC will consult with MSC in relation to any potential short term traffic implications.

In order to provide for sufficient pumping capacity of CW1, three pumps are required to be commissioned and installed adjacent to CW1.

To facilitate the pumps required for the diversion, additional power supply requirements will be necessary as discussed in **Section 4.6.4**. Both the mains power and generators options will be capable of producing for sufficient electricity capacity to power both pumps for 100% of the time if required.

The generators will be located within the Mine Infrastructure Area and as a result will require power to be directed along internal power reticulation network to the pumps located adjacent to CW1. It is anticipated that the existing transmission lines will be progressively relocated to facilitate mining however will be contained within the Project Boundary.

The generators will also have the ability to synchronise to the site network power. This is required to reduce the risk associated with possible delays with a future Ausgrid application to upgrade supply to the mine site should it be deemed necessary which may result in the duplication of the existing switch yard and upgrading external reticulation power supply.

4.9.3 Dry Creek Reinstatement

After Year 15 and prior to Year 24, a permanent realignment of Dry Creek will be constructed using best practice initiatives to ensure its successful stabilisation. Further detailed discussion in relation to the final location and conceptual rehabilitation design for Dry Creek is provided in **Section 8.21**.

A discussion of the alternatives considered for the reinstatement of Dry Creek is included in **Section 8.21**.

4.9.4 Mount Pleasant Project Discharge

Section 6.4.3 (v) of the Mount Pleasant 1997 EIS permits the following in relation to water discharge:

> "Surplus water will be discharged from the main storage dam (RW1) to the natural watercourse and into the Hunter River via the major drainage line west of the Bengalla Mine. Water will mainly be released during high rainfall periods in compliance with the Hunter Salinity Trading Scheme. Some lower flow releases may also be required during the later years of mining."

Inferred from the above statement is that the Mount Pleasant Project is permitted to discharge mine water from RW1 into the existing Dry Creek in accordance with an appropriate EPL and the HRSTS. In order to mitigate the Project interrupting the Mount Pleasant Project's currently approved discharge route (via RW1 into Dry Creek) it is proposed that BMC, as part of the Project, will construct a 300 ML Mount Pleasant Discharge Dam 1 (Mount Pleasant DW1) and associated pipeline (located generally adjacent to CW1 (see **Appendix X**)) in accordance with relevant guidelines and standards. Following the receipt of Development Consent, if granted, BMC will construct Mount Pleasant DW1 within a mutually agreeable timeframe, but prior to the commencement of mining operations associated with the Mount Pleasant Project. Mount Pleasant DW1 will not be utilised in the Project water management system but rather, will be available to the Mount Pleasant Project, subject to appropriate approvals.

Mount Pleasant DW1 will be constructed by BMC for the Project however; Coal & Allied would seek any additional required approvals under the EP&A Act or other relevant legislation to facilitate its use.

Further discussion in relation to interactions with the Mount Pleasant Project is provided in **Section 4.12**.

4.10 Hours of Operation and Employment

The Project will require up to approximately 900 full time equivalent personnel.

Maintenance activities, deliveries, coal processing, coal transport and mining operations will be conducted 24 hours a day, seven days per week.

Construction activities to be undertaken for the Project will require up to an additional 315 employees. Construction activities as described in **Section 4.11** will be required to be undertaken 24 hours per day, seven days per week.

4.11 Construction

To facilitate the practicalities associated with increasing production levels to 15 Mtpa a two staged approach to infrastructure is required. Temporary construction project offices and car park area will be required to be utilised for the duration of the proposed construction program to develop the appropriate infrastructure to achieve the Project production levels. The temporary construction project offices and other relevant infrastructure will be located north of the existing Bengalla Mine Access Road within the Disturbance Boundary.

An overview of the indicative construction schedule is provided below.

4.11.1 Stage 1 – Upgrade to 13 Mtpa

Stage 1 additional infrastructure or upgrades to facilitate 13 Mtpa ROM coal production are anticipated to be completed by mid-Year 2. The indicative construction schedule to accommodate Stage 1 construction is presented in **Table 12**. The commencement of stages may be delayed due to market forces or other matters beyond the reasonable control of BMC.

4.11.2 Stage 2 – Upgrade to 15 Mtpa

Stage 2 additional infrastructure or upgrades to facilitate 15 Mtpa ROM coal production are anticipated to be completed by the end of Year 3. The indicative construction schedule to accommodate Stage 2 construction is presented in **Table 12**.

4.11.3 Other Construction Works

Additional infrastructure components not directly associated with the CHPP or MIA however necessary for facilitating increased production will also be required to be constructed by the end of Year 3. These items include various activities associated with the interim diversion of Dry Creek, additional fuelling, storage and maintenance locations. The indicative construction schedule to accommodate the construction of these activities is presented in **Table 13**.

Additional infrastructure requirements will also be constructed throughout the duration of the Project to accommodate the progression of mining in appropriate locations within the Disturbance Boundary and will include, but not be limited to the following: Dry Creek diversion and associated works including CW1 construction, pipeline establishment, pump commissioning, power reticulation and associated earthworks; Dry Creek reinstatement; Bengalla Link Road realignment; water management infrastructure and other ancillary works.

Table 12 Indicative Mine Infrastructure Construction Schedule

Infrastructure Construction Component	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Stage 1 - Upgrade to Mine Infrastructure (13 Mtpa)												
Temporary construction administration area												
Existing car park extension												
Covered stores building												
Modification to existing bathhouse												
Construction of new light vehicle workshop												
Earthworks, drainage and water management												
Office Extension (Block F)												
Stage 1 & 2 Upgrade to CHPP (13 Mtpa and 15 Mtpa)												
Relocation of reject bin and associated conveyors												
Conveyor and transfer station civil works												
Installation of stockpile stacker and reclaimer												
Construction of CHPP module 3												
Construction of additional filter house												
Upgrade of existing and construction of new conveyor and transfer stations												
CHPP commissioning and verification												
Earthworks, drainage and water management												
Excavation and civil works for new conveyor slot												
New bridge and road realignment												
Establishment of the ROM bin, primary crusher station and associated earthworks												
Installation of new ROM conveyors and transfer stations												
Installation of new sizing and screening station												
Stage 2 - Upgrade to Mine Infrastructure (15 Mtpa)												
Hydrocarbon storage area upgrade												
Eastern public car park and light vehicle car park extension												
New tyre change facility												
Modification to existing and construction of new bathhouse												
Office Block (Block G)												
Construction of generator compound												
Workshop extension												
Earthworks, drainage and water management												
Other Works												
Refuelling upgrade to 550,000 L												
New tyre storage facility												
Dragline maintenance pad												
Refuelling upgrade to 880,000 L												

Infrastructure Construction Component	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Dry Creek Diversion (including CW1 construction, pipeline establishment, pump commissioning, power reticulation and associated earthworks)												
Relocation of the explosives and reload facility												
Indicative Construction Manning Required	-	-	85	195	315	245	160	150	45	85	125	150

Table 13 Indicative Project Construction Schedule

Infrastructure Construction Component	Project Timing	Indicative Construction Manning Required
Bengalla Link Road Realignment	Approximately Year 13	Up to 50 contract personnel for 1 year
Dry Creek Reinstatement	After Year 15	Up to 30 contract personnel for 1 year
Erosion and sediment control structures and water management earthworks	Ongoing to facilitate Project progression	Limited contract personnel

4.12 Interaction with the Mount Pleasant Project

The Mount Pleasant Project is wholly owned by RTCA. It is located to the immediate north of the Project Boundary. The Mount Pleasant Project holds DA 92/97, which is supported by the Mount Pleasant 1997 EIS. The Mount Pleasant Project is approved for the construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities at a production rate of up to 10.5 Mtpa ROM coal. Though mining has not yet commenced the development has been activated with the construction of a dam.

A modification was granted to DA 92/97, supported by the Mount Pleasant 2010 EA which permitted an infrastructure envelope for siting mine infrastructure (in place of the specific locations presented in the EIS) and the provision of an optional conveyor / service corridor between the Mount Pleasant Project area and Bengalla as an alternative to the approved rail facilities.

Table 14 presents a list of interactions between Mount Pleasant Project and the Project. These interactions are also presented conceptually on Figure 25. Consultation with Coal & Allied in relation to the Mount Pleasant Project is discussed in Section 6. BMC will continue to explore synergies with the adjacent Mount Pleasant Project which will include any future opportunities to share infrastructure.

Additional detail regarding the construction of Project water management infrastructure associated with the Mount Pleasant Project is provided in Section 4.9.4.

4.13 Project Alternatives

A number of project alternatives have been investigated. A primary objective of these investigations was to develop a mine plan that considered the principles of Ecologically Sustainable Development (ESD) whilst providing the best practical environmental, social, physical and economic outcomes for the Project.

Each of the alternatives investigated were refined according to the environmental impacts, the approvals required, operational practicality, timing and economic limitations. The various Project alternatives that were considered during this process are described below.

4.13.1 Option 1 – Do Nothing Approach

Under Option 1, Bengalla would cease operations in 2017. This would result locally in the loss of approximately 400 jobs and 900 potential future employment opportunities.

It would also lead to the loss of local socio-economic benefits created by Bengalla in addition to the loss of ongoing benefits and royalties and other payments to both the NSW State and Federal governments and significant economic benefits flowing from the gross annual revenues from the Project.

It would leave approximately 964 ha of land available for the best agricultural use which would be grazing of livestock. The land would generate a maximum of $1.1 M per annum and employ only one person (see Section 8.20).

Table 14 Mount Pleasant Project Potential Interactions

Mount Pleasant Project	Interaction with the Project
Mining of the Mount Pleasant Project • Open cut coal mine to extract approximately 197 Mt of ROM coal over a period of 21 years • Maximum rate of up to 10.5 Mtpa • Approval valid until 22 December 2020	• The Mount Pleasant Project has been assessed in this EIS for cumulative purposes on the assumption that construction of the Mount Pleasant Project commences in Year 4 of the Project • Mount Pleasant Project is consistent with that described in the Mount Pleasant EIS and Mount Pleasant EA and associated approval DA 92/97 (as modified) • The Mount Pleasant Project obtains the relevant approval to continue mining in accordance with the above beyond 2020 at the same rate as currently approved
Water Discharge • Discharge mine water from RW1 into the existing Dry Creek in accordance with the HRSTS	• BMC will construct a 300 ML Mount Pleasant Discharge Dam 1 (Mount Pleasant DW1) and associated pipeline (see **Figure 13**) in accordance with relevant guidelines and standards • BMC will construct Mount Pleasant DW1 within a mutually agreeable timeframe prior to the commencement of mining operations associated with the Mount Pleasant Project. • Mount Pleasant DW1 will not be utilised in the Project water management system • Coal & Allied would seek any other required approvals separately for the use of the facility, as required
Mining Authorisations	• Mining Lease 1645 (North of Wybong Road) application for Part transfer (surface down 40 m below) to facilitate CW1 dam construction • Mining Lease 1645 (South of Wybong Road) application for part transfer to facilitate surface mining
Rail and Service Corridor • Rail alignment as presented in the MTP 1997 EIS and MTP 2010 EA • Service corridor as presented in the MTP 2010 EA • Transport of coal from site by either (but not both) conveyor to Bengalla or rail via an onsite rail loop	• Mount Pleasant Project will enter into an agreement with the Minister for Mineral Resources, in consultation with BMC to facilitate the relocation of the Mount Pleasant rail loop or the conveyor / service corridor • If the Mount Pleasant Project requires the use of the Bengalla rail loop then BMC will negotiate in relation to its future use
Infrastructure Area • As presented in the MTP 2010 EA	• The Project will require the construction of CW1 north of Wybong Road to facilitate the diversion of Dry Creek (see **Figure 13**). CW1 is partially located within the Mount Pleasant Project Infrastructure Envelope • A protocol between Coal & Allied and BMC is currently under negotiation facilitating the siting of CW1 within the Disturbance Boundary
Land Access	• A protocol between Coal & Allied and BMC is currently under negotiation to enable the Project to progress through Coal & Allied owned land within the Disturbance Boundary

The do nothing approach would result in the Project coal resource to remain within the ground and would fail to respond to the need for the Project as described in **Section 10**. This failure to respond to the Project need would be in the context that the Project as proposed is capable of being conducted in accordance with the objects of the EP&A Act and is also well justified in socio-economic, environmental and planning terms.

The surrounding area has previously been designated as an area for coal mining by the State government with the issuance of numerous existing mining authorities as can be seen on **Figure 2**. This is further demonstrated by the number of successfully operating mines and other approved Projects within proximity to Bengalla including Mt Arthur Coal Mine and Xstrata Mangoola, along with future projects including the Mount Pleasant Project, West Muswellbrook and Dartbrook Mine (see **Table 1**).

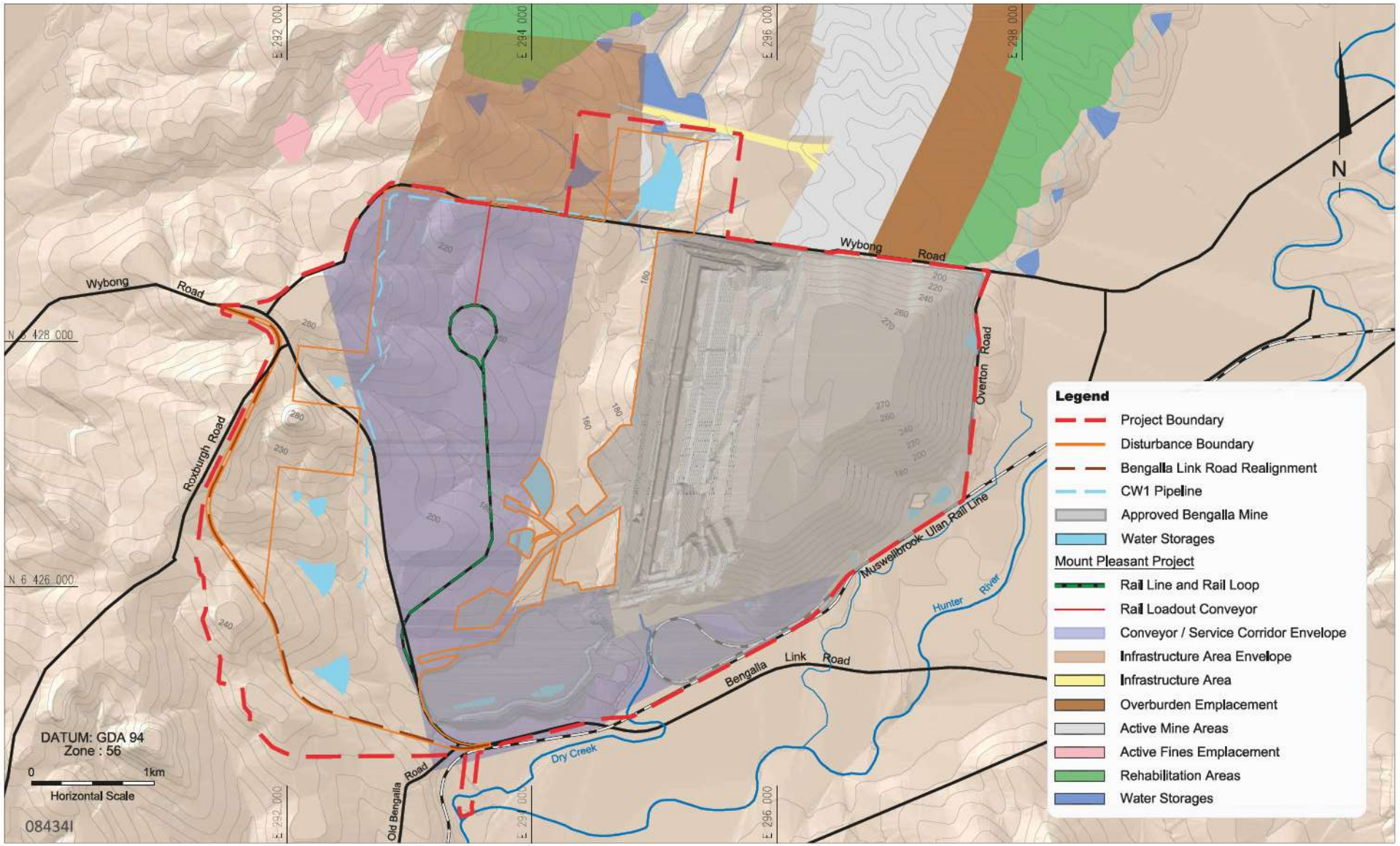
Failure to recover the coal resource when it can be recovered in accordance with applicable environmental planning objectives and social and environmental requirements would be contrary to the planning objectives for the region and the State of NSW.

This option was rejected on the basis of the success of the existing operation along with current market conditions and the significance of this internationally sought after coal resource.

4.13.2 Option 2 – 24 Years at 10.7 Mtpa

Option 2 includes continuation of mining for a further 24 years at a maximum already approved ROM coal production rate of up to 10.7 Mtpa.

An assessment of both the air quality and noise impacts associated with this option were considered. It was determined that an increase in production would not significantly increase impacts to private receptors from dust and noise (see **Appendix G** and **Appendix H**) and indicated that the socio-economic benefits of the higher production rates far outweigh the costs in relation to land affectation, other external costs and environmental considerations.



BENGALLA MINE

Interactions with Mount Pleasant Project

FIGURE 25

This option would result in no additional increase in employment numbers and hence reduced economic and social flow on effects when compared to 15 Mtpa (Option 3). In addition, this option would result in the loss of revenues associated with not extracting the additional 59 Mt of ROM coal available throughout the duration of the Project.

This option was rejected on the basis of the speed at which mining operations would progress west away from Muswellbrook would be reduced when compared to Option 3 slowing rehabilitation of the visible areas. In addition, the rate of extraction (when compared to Option 3) would decrease the recovery of the state's mineral resource in terms of Clause 15 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2011 (Mining SEPP) (see **Section 5.3.1**).

4.13.3 Option 3 – 24 Years at 15 Mtpa down to the Basal Seam

Option 3 includes continuation of mining for a further 24 years at a maximum ROM coal production rate of up to 15 Mtpa with mining of the entire coal resource down to the Ramrod Creek seam. This option would involve mining to a greater depth and would require the subsequent increase in height of the existing OEA above the current RL 270 m. Detailed mine planning has indicated that there are currently no economically viable coal seams available for extraction via open cut methods as proposed by the Project beyond the Edderton seam.

This option was rejected due to the following:

- Economically unviable due to unacceptable overburden to ROM coal stripping ratios;
- Depth of mining and potential final void limitations;
- Additional equipment fleet requirement;
- Coal quality limitations;
- Geological constraints associated with mining through difficult underlying interburden layers; and
- Unacceptable environmental impacts.

4.13.4 Option 4 – Continuation of Mining Retaining the Existing Bengalla Link Road

Development of a viable mine plan that does not impact on the Bengalla Link Road would result in the sterilisation of approximately 8 Mt of coal reserves and would impede the efficiency of the dragline strip operation with consequential negative impacts on the efficiency of the recovery of the state's mineral resource. The traffic impacts to adopt this option are described in **Section 8.13** and in summary indicated for an adopted average travel speed of 90 km/h an additional 36 seconds of travel time would be a result of the realigned road. As such, this option was rejected.

4.13.5 Option 5 – Underground Operation

Rio Tinto Coal Australia (on behalf of BMC) has undertaken an Order of Magnitude study into the potential development of an underground operation at Bengalla.

The potential methods of mining the coal resources in the Project Boundary include open cut and underground extraction. Bengalla is located in the Hunter Coalfield in the northern part of the Sydney Basin and the seams within the Project Boundary belong to the Whittingham Coal Measures.

Underground mining, either bord and pillar or longwall is applied widely throughout coal seams internationally. Longwall mining methods are being utilised by the industry because this type of mineral extraction provides greater safety and higher resource recovery and productivity compared with other underground methods. However, longwall coal extraction needs to be determined on a site specific basis.

Due to the nature and close proximity of numerous coal seams in the Whittingham Coal Measures, open cut mines operating in an environmentally acceptable manner have dominated Hunter Valley coal production in the past decades to ensure coal seams are not sterilised and maximum value is obtained from each resource mined. On the basis of proven technology together with a management commitment to minimise environmental risk, open cut mining utilising a large walking dragline supported by a pre-strip fleet of excavators and shovels is the preferred option for the Project.

For optimum economic working by longwall panel underground methods the coal seams should be as follows (BMC, 2012):

- Of a working section thickness to support long wall operations (i.e. between 2.0 m and 4.5 m as face cutting heights generally range from 2.8 m to 3.0 m);
- Not contain significant splitting of coal plys;
- Not contain partings or stone bands within a seam greater than 1 m;
- Depth of cover below original topography surface should be more than 60 m; and
- Vertical seam separation of greater than 20 m is required.

Exploration drilling, resource and reserve modelling have established that the Project deposit consists of a number of thin seams with stone parting bands that split as the deposit moves to the west through the lease areas. Mining any seams by underground methods from the surface to the Edderton seam will sterilise existing coal reserves and reduce the viability of the deposit.

The Warkworth and Mount Arthur Seams occur within 60 m of the original topography, are less than 2 m thick and are therefore not viewed as mineable under longwall conditions.

The remaining seams from the Piercefield to the Edderton have adequate depth below natural surface to be mineable but the variance in the coal thickness, splitting seam plies and stone parting bands greater than 1 m as the deposit moves west also discounts these seams as suitable for underground mining. Mining any seams by underground methods from the Warkworth to the Edderton seams would sterilise the adjacent seam coal reserves and reduce the viability of the deposit.

Open cut mining will allow recovery of the resource to the Edderton seam, whereas underground mining would only allow recovery of the thicker deeper seams, such as the Edinglassie seam. The faulting detected in the deposit would also reduce the viability of longwall mining. These constraints considerably reduce the quantity of coal that can be economically worked from this resource by underground methods.

Open cut mining will not exclude mining of the deeper seams by underground methods at some time in the future. The Edderton Seam has been chosen as the floor of the mining area for economic and environmental reasons. The Order of Magnitude study has confirmed that the Edinglassie seam is the only seam currently capable of supporting a large scale longwall operation (due to being of adequate thickness to support a longwall miner). The Edinglassie seam is not currently mined by the existing open cut operation nor proposed to be mined for the Project and lies underneath the open cut mine shell. The resource is contained within the existing authorities including ML 1397, ML 1450 and ML 1469.

Recovery of the Edinglassie seam by underground methods would not only be uneconomical, with a mineable resources of only 33 Mt (within the same footprint as the Project), but would also sterilise the 316 Mt of coal proposed to be extracted for the Project. The result of the study concluded that the Edinglassie seam could not support a standalone underground operation at Bengalla and would result in the loss of 283 Mt of coal thus reducing the efficiency of the recovery of the State's coal reserves.

4.13.6 Option 6 – Production Levels Greater than 15 Mtpa

Option 6 considered the development of a production levels greater than 15 Mtpa from Bengalla. High level studies revealed that the mining area is too confined to enable efficient operations and resource extraction to occur and as a result was not considered further.

4.13.7 Option 7 – The Project

Option 7 represents the mine plan for which Development Consent is sought as presented and assessed within this EIS (see **Figure 14** to **Figure 18**). It has been developed through a series of mine planning options analysis workshops, environmental constraints analyses and scenarios completed since 2008 and as briefly described above. The primary aim of these workshops was to develop a mine plan that minimises environmental and social impacts while maximising resource recovery, operational efficiency and compliance with the objects of the EP&A Act and relevant environmental planning instruments (see **Section 5.2**).

The Project mine plan layout has been developed to minimise the disturbance footprint at any one time to reduce environmental impacts. The final siting of the infrastructure area has been designed to be concentrated and adjoins or builds onto existing infrastructure.

The Project as described in **Section 4.1** represents the most logical and efficient method of resource extraction for a period of 24 years at a maximum ROM coal production rate of up to 15 Mtpa achieved from Year 4 onwards. The consistent nature of the coal resource, the continued use of current mining methods and the extensive mining experience gained by BMC under the current consent, facilitates the higher extraction rates as proposed without resulting in any substantial increase in noise and air quality emissions from the Project.

Detailed mine planning for the Project has involved the development of scenarios that address the following:

- Maximising coal recovery;
- Providing for an optimal mine plan footprint and sequencing based on the structure of the coal resource that continues and ties in with the existing operations;
- Coal recovery depths, including investigations in relation to increasing the mining to varying coal mining horizons;
- Consideration of the construction and infrastructure facilities that largely adjoin or build onto existing infrastructure in an effort to minimise disturbance;
- Consideration of the approved Mount Pleasant Project and potential interactions (see **Section 4.12**); and
- Maximising the efficiency of the dragline strip operation by mining the additional 8 Mt of ROM coal west of the Bengalla Link Road.

The environmental impact assessments undertaken within this EIS have confirmed that the proposed mine plan and associated production rates can be undertaken in the absence of any unacceptable environmental consequences that cannot be accounted for or offset and will enable BMC to continue to be a competitive player within the export coal market.

4.13.8 Project Amendments Resulting from Stakeholder Consultation

Significant effort has been placed on conducting effective consultation with both regulatory and community stakeholders throughout the preparation of the EIS (see **Section 6**). As a result of the consultation program several key considerations have been built into the Project. These include:

- Amendments have been made to the Project mine plan to ensure coal extraction is conducted entirely within BMC's existing mining authorisations (see **Section 5.4.1**);
- Commitment to BMC rehabilitating the eastern face of the OEA with woody native vegetation to achieve higher density tree plantings (see **Section 8.21**);
- Commitment to work with MSC throughout the preparation of the Mine Affected Road Strategy to assist in guiding the location for the final alignment of the Bengalla Link Road (see **Section 8.13**);
- Significant work was undertaken in relation to developing additional information in the Ecological Impact Assessment to address the Upper Hunter Strategic Assessment (see **Section 8.11**); and
- Commitment to continue to consult with MSC and DRE regarding the final surface relief across the Main OEA (see **Section 8.21**).

4.13.9 Dry Creek Alternatives

Seven detailed options and alternatives have been investigated for the final alignment of Dry Creek in order to obtain the best possible environmental outcome with considerations of mining practicalities. Alternatives considered included:

- Establishment of a storage dam located in the northern portion of the existing Project Boundary south of Wybong Road along with a creek alignment that would marry into a diversion created halfway along the final landform. This option would result in the sterilisation of an estimated 30 Mt of ROM coal necessary to create stable batters and suitable buffers from the storage dam and would shorten dragline strips and affect access into the lower sections of the mine. In addition, approximately 115 Mbcm of overburden capacity would be lost;
- Reinstatement of Dry Creek along its natural alignment complete with 10 degree slopes through the OEAs once mining has progressed sufficiently. This option would not require an increase to the approved maximum height of the OEA however, would result in an unnatural stream configuration;
- Reinstate Dry Creek to flow into the final void which would allow equilibrium to be achieved in a shorter timeframe. This option would prevent runoff to infiltrate into the Hunter River during rainfall events that may potentially degrade the quality of the water;
- Reinstate Dry Creek to flow to the east around the OEA to connect with the Hunter River (e.g. at a point where the Hunter River moves in close proximity to the Muswellbrook to Ulan Rail Line east of the OEA). This option was not considered appropriate as it would increase Dry Creek's natural length by several hundred metres and require a large amount of material movement;
- Reinstate Dry Creek by installing a tunnel which would transport runoff underneath the OEA. This would restrict any riparian vegetation from being established along the Dry Creek Diversion;
- Reinstate Dry Creek to flow along its original alignment with banks at steep angles. This would create an unnatural bank structure and associated riparian corridor. This option would also encourage erosion and sedimentation issues; and
- Retain Dry Creek in present location. This option was considered not a feasible alternative. This would also create major mine planning obstacles of instability to overcome if mining continued around Dry Creek.

The preferred option is presented on **Figure 18**. It includes the establishment of CW1 north of Wybong Road (in consultation with Coal & Allied) along with a creek alignment that would meander south (between the final void and the Main OEA) before heading east around the northern part of the CHPP and south along its original alignment towards the Hunter River. This option was sought for the Project due to:

- Provision of the most natural alignment of the creek that fits in with the Project mine plans and create the most natural meandering flow, consistent with existing conditions necessary to ensure the design grade parameters between 0.5% and 1.5%. Other options considered require the construction of steeper slopes that were less compatible with the final shaped overburden surface;
- The requirement for the least amount of overburden removal as it can be constructed as part of the normal sequence of overburden removal;
- No requirement to sterilise any of the Project coal resource;
- Not incurring additional rehabilitation costs; and
- Having the lowest associated development cost.