AngloAmerican

DRAYTON SOUTH COAL PROJECT

Environmental Assessment

November 2012

Main Report

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Environmental Assessment Statement

Submission of Environmental Assessment
Under Section 75H of the *Environmental Planning and Assessment Act 1979*

EA Prepared by	
Name	James Bailey
Qualifications	B. Natural Resources, MBA
Address	**Hansen Bailey** 6/127-129 John Street SINGLETON NSW 2330
In Respect of	Drayton South Coal Project
Proponent Name	Anglo American Metallurgical Coal Pty Ltd
Proponent Address	201 Charlotte Street Brisbane QLD 4000
Land to be Developed	See **Appendix A** of this Environmental Assessment.
Proposed Development	Development and operation of the Project and associated activities as outlined in **Section 4.0** of this Environmental Assessment.
Environmental Assessment	An Environmental Assessment 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 & Environment Court of NSW. I further certify that I have prepared the contents of this Environmental Assessment, and to the best of my knowledge: • It is in accordance with Section 75E and 75F of the *Environmental Planning and Assessment Act 1979*; • It contains all available information that is relevant to this Environmental Assessment 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	November 2012

DRAYTON SOUTH

Executive Summary

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Introduction

Drayton Mine commenced production in 1983. It is managed by Anglo American Metallurgical Coal Pty Ltd (Anglo American), the controlling partner of the Drayton Joint Venture. Other partners include Mitsui Coal Development (Australia) Pty Limited, Mitsui Mining Australia Pty Limited, Hyundai Australia Pty Limited and Daesung Australia Limited.

Drayton Mine currently operates under Project Approval 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum of Run of Mine coal. Project Approval 06_0202 expires in 2017.

The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export coal to the Port of Newcastle via the Main Northern Railway Line.

Drayton Mine has operated continuously for the past 29 years and in that time has produced a total of 117 Million tonnes of product thermal coal, of which 32 Million tonnes has been delivered to the adjoining Liddell and Bayswater Power Stations now operated by Macquarie Generation and 85 Million tonnes delivered to the Port of Newcastle for export. The coal delivered for domestic electricity production and for export to date has an estimated present value of $700 Million and $8,500 Million, respectively.

During its operation, Drayton Mine has been a major employer of the local community, currently employing 530 full time equivalent workers.

The Drayton South area was previously owned by Mount Arthur South Coal Limited which held planning approval (granted in 1986) and a Mining Lease (granted in 1989) for the development and operation of an open cut coal mine. Not having proceeded with the development the planning approval lapsed in 1991 as did, consequently, the Mining Lease.

With a view to secure the future prospects for its operations, Drayton Mine sought to obtain Exploration Licence 5460 over the Drayton South area which was issued by the Minister for Mineral Resources in 1998. Subsequently, an extensive exploration program has been completed within Exploration Licence 5460 by Anglo American at a total cost of $23 Million. Over this time, Drayton Mine also acquired all of the required land within the Drayton South area in

preparation for the development of mining operations as planned.

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area which is located within Exploration Licence 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex).

The Drayton Complex is located approximately 10 kilometres north-west of the village of Jerrys Plains and approximately 13 kilometres south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales. The Drayton Complex is predominately situated within the Muswellbrook Local Government Area, with a small section of the south-west portion falling within the Singleton Local Government Area. The Project is situated within close proximity to Arrowfield Estate, two thoroughbred horse studs (Coolmore Stud and Woodlands Stud), two power stations (Bayswater and Liddell Power Stations) and existing coal mining operations.

Existing Environment

Natural Environment

The topography surrounding Drayton Mine generally ranges from gently undulating to hilly landscapes, with Mt Arthur located to the south-west. The Drayton South area consists of moderate undulating foothills to steeply sloping hills over open paddock grazing land. The topographic elevation ranges from approximately Reduced Level 100 metres near the Hunter River to above Reduced Level 200 metres at the distinct ridgeline that dissects the Drayton South area in a north-east and south-west trend.

The land within the Drayton South area is primarily cleared, open paddock grazing land, with some areas of remnant forest and open woodland. Extensive erosion has occurred across much of this area due to past agricultural practices. The land adjacent to Saddlers Creek is typically flat, however, further from the creek line the topography becomes undulating to hilly, with slopes between 20% and 30%.

Land Use

The Drayton Complex is located between the town centres of Muswellbrook, Jerrys Plains, Denman and Singleton, within the larger area generally described as the Upper Hunter region. This region has a long history of relatively intensive land use for a variety of agricultural and industrial activities, predominantly grazing, coal mining and power generation. The current dominant land uses within and adjacent to the Project Boundary include open cut coal mining, power generation, industrial activities, thoroughbred horse breeding, viticulture, agriculture, rural residential and urban residential areas.

Land Ownership

All of the land required for the Project is currently owned by Anglo American, with the exception of a parcel of land required for the proposed realignment of Edderton Road. This land is owned by Hunter Valley Energy Coal who also owns the majority of land to the immediate north of the Project, including Mt Arthur Coal Mine. A number of private residential properties are also situated within the Antiene Estate area to the immediate north of the existing Drayton Mine.

Darley Australia and Coolmore Australia have considerable land holdings to the south of the Project Boundary. Arrowfield Estate, which is also situated to the south of the Project Boundary has recently been purchased by Hollydene Estate. Land to the east is owned by Macquarie Generation and extensive land to the west and south-west is held by the Wolfgang family.

Climate

The Upper Hunter region experiences a warm temperate climate, characterised by seasonal variations between 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.

Geology

Prior to Anglo American's involvement, four main phases of exploration were conducted in the Drayton South area:

- Drilling by the Bureau of Mineral Resources in the 1940s and 1950s;
- Regional drilling by the Joint Coal Board, the Electricity Commission and Department of Mines from 1968 to 1976;
- Drilling for the Mount Arthur South Coal Project between 1978 and 1982; and
- Drilling of over 130 boreholes by Carpentaria ex / Mount Isa Mines Limited in the course of mining and feasibility studies between 1975 and 1993.

Following the lease acquisition in 1998, Anglo American commenced exploration activities over the Drayton South area. The objective of these combined exploration programs has been to assess the quantity, quality and overall extent of the coal resource.

Exploration drilling and pre-feasibility studies have identified an estimated in situ coal resource of 556 Million tonnes within Exploration Licence 5460, of which 119 Million tonnes is planned to be recovered using open cut and highwall mining methods as part of the Project.

As part of the Project planning phase 53 Million tonnes of coal was removed from the Project mine plan and effectively sterilised to address potential environmental issues and stakeholder concerns.

Approved Operations

Drayton Mine commenced production in 1983 and currently operates under Project Approval 06_0202 granted on 1 February 2008. The mine predominately produces steaming coal for the export market at a maximum of 8 Million tonnes per annum of Run of Mine coal.

The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway Line. Project Approval 06_0202 expires in 2017 and Development Consent 106-04-00 expires in 2025.

Drayton Mine is an open cut operation where mining advances based on dragline strips. Pre-stripped overburden is removed by a loader and/or excavator and trucks ahead of the dragline operation. Loaders and/or excavators are utilised for coal extraction supported by a fleet of haul trucks, which transport Run of Mine coal to the Coal Handling and Preparation Plant for processing. Mining activities occur up to 24 hours per day, seven days a week facilitated by a workforce of 530 employees and full time equivalent contractors.

The approved operations at Drayton Mine are supported by a range of surface infrastructure, including:

- Administration building;
- Operations building, including bath house facilities;
- Workshop and storage complex, including explosives storage;
- Heavy and light vehicle wash station facilities;
- Bulk fuel and lubricant storage and dispensing facilities;
- Waste management systems, including sewage treatment facility supported by septic tanks and offsite domestic waste transfer arrangements; and
- Parking facilities.

Drayton Mine operates under a Safety, Health, Environment and Community Management System which is accredited to International Standards Organisation 14001 standards. A key component of this management system is Drayton Mine's Environmental Monitoring Program.

An Environmental Monitoring Program for the Drayton South area was established in 1998 for the purposes of securing background data and to satisfy the requirements of Exploration Licence 5460.

Project Description

Anglo American is seeking Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for the continuation of the existing Drayton Mine through the extraction of coal by both open cut and highwall mining operations in the Drayton South area. The Project will maintain ongoing use of the Antiene Rail Spur, for the transport of coal to the Port at Newcastle.

The Project involves:

- The continuation of operations at Drayton Mine as presently approved with minor additional mining areas within the East, North and South Pits;
- The development of an open cut and highwall mining operation extracting up to 7 Million tonnes per annum of Run of Mine coal over a period of 27 years within the Drayton South area;
- The utilisation of the existing Drayton Mine equipment fleet with the addition of a highwall miner and coal haulage fleet;
- The continuation of the existing workforce of up to 530 employees and contractors;
- The use of Drayton Mine's final landform voids for rejects and tailings disposal and water storage;
- The utilisation of the existing Drayton Mine infrastructure including the Coal Handling and Preparation Plant, rail loop and associated loading infrastructure, workshops, bath houses and administration offices;
- The construction of a transport corridor between the Drayton South mining area and the existing Drayton Mine;
- The continued utilisation of the Antiene Rail Spur off the Main Northern Railway to transport product coal to the Port of Newcastle for export;
- The realignment of a section of Edderton Road; and
- The installation of further water management and power reticulation infrastructure to support mining in the Drayton South area.

A contractor based workforce of approximately 369 personnel will be required during the peak construction phase.

Following construction within the Drayton South area, there will be a period when mining will occur at the existing approved Drayton Mine and within the Drayton South area concurrently as mining activities are transitioned. During this period, personnel and equipment will be progressively transferred from Drayton Mine to the Drayton South area. This will continue until mining operations are completed at Drayton Mine.

Once a new Project Approval is granted for the Drayton Complex, the existing approval for Drayton Mine and the Antiene Rail Spur will be surrendered.

Regulatory Framework

The Project is development "*for the purpose of mining that is 'coal mining'*", as listed in Schedule 1 of the *Environmental Planning and Assessment Act 1979* and accordingly is declared to be a Project to which Part 3A of the Act applies.

In October 2011 Part 3A of the *Environmental Planning and Assessment Act 1979* was repealed. However, the Project has been granted the benefit of transitional provisions and despite the recent repeal is a development to which Part 3A applies.

On 3 August 2011 the Director-General of the Department of Planning and Infrastructure issued his Environmental Assessment Requirements for the Project. Following this on 30 April 2012 supplementary Environmental Assessment Requirements were issued requiring that the EA include *"an Agricultural Impact Statement that includes a specific focussed assessment of the impacts of the proposal on strategic agricultural land, having regard to the draft gateway criteria in the draft Upper Hunter Strategic Regional Land Use Plan".*

On 11 September 2012, following the exhibition of and public submissions on the draft *Strategic Regional Land Use Plan – Upper Hunter,* the NSW government released its *Strategic Regional Land Use Policy and the Strategic Regional Land Use Plan – Upper Hunter* superseding the draft.

The *Strategic Regional Land Use Plan – Upper Hunter* is a component of the broader Strategic Regional *Land Use Policy,* which consists of various initiatives to manage land use conflicts in regional areas, in relation to agriculture, coal mining and coal seam gas. The plan defines areas of Biophysical Strategic Agricultural Land and Critical Industry Clusters, including clusters for the equine and viticulture industries.

The Project is not situated on Biophysical Strategic Agricultural Land or land operated by thoroughbred breeding or viticulture enterprises; however, it does fall within the proposed Equine and Viticulture Critical Industry Clusters as mapped in the *Strategic Regional Land Use Plan – Upper Hunter.* As such an assessment has been conducted against the gateway criteria for the Equine and Viticulture Critical Industry Clusters as provided in the plan to determine whether the Project would lead to a significant impact.

The Project will seek as required, relevant approvals under New South Wales legislation not exempted by Section 75U or granted consistent with Section 75V of the *Environmental Planning and Assessment Act 1979.*

The Commonwealth Minister for Sustainability, Environment, Water, Population and Communities has declared the development to be a *'controlled action'* which renders necessary the approval of the Minister under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* following an Environmental Assessment.

The Commonwealth Environment Minister's Department determined on 12 May 2011 that *"The project will be assessed by accredited assessment under the Environmental Planning and Assessment Act 1979"* and has provided its assessment requirements to the Director-General of the Department of Planning and Infrastructure who has included them in his Environmental Assessment Requirements for the Project.

Stakeholder Engagement

The stakeholder engagement program included consultation with Local, State and Commonwealth government agencies, neighbouring land owners and industries, and the Aboriginal and wider local community.

A number of briefings and presentations have been provided to Local, State and Commonwealth government agencies throughout the preparation of this Environmental Assessment including a Planning Focus Meeting which was held on 1 June 2011. Such consultation efforts have provided regulators with an understanding of the Project, some of the key findings from the technical studies and an overview of community stakeholder issues raised.

Project briefings were offered to neighbouring land owners and the wider local community via telephone, email and community newsletters. During the planning phase and preparation of this Environmental Assessment, 10 community stakeholders, including Coolmore Australia and Darley Australia, accepted the opportunity to be briefed on the Project.

Several working groups have been established with neighbouring enterprises and industries, including Coolmore Australia, Darley Australia, Mt Arthur Coal Mine and Macquarie Generation to address key issues and interactions, and to further develop cooperative land owner relationships. These working groups have facilitated ongoing communication between parties and provided stakeholders with the opportunity to input into the planning of the Project and the preparation of this Environmental Assessment.

Following completion of the issue scoping phase, responses were provided for all issues raised by stakeholders in relation to the Project. Strategies for the management and mitigation of these issues were developed and are detailed in this Environmental Assessment. Where possible, specific issues raised in relation to the Project were addressed with the relevant stakeholders.

Impacts, Management and Mitigation

A risk assessment was undertaken to identify potential environmental and social issues associated with the Project. The purpose of the risk assessment process was to prioritise and focus the required environmental assessments for the Project in consideration of the Director-General's Environmental Assessment Requirements and the findings from stakeholder engagement.

Key findings from the environmental, social and economic impact assessments are discussed below.

Air Quality

An air quality impact assessment was undertaken by PAEHolmes in order to predict the Project's air quality impacts, including dust, on receivers in the vicinity of the Drayton Complex, and to recommend measures to mitigate and manage these impacts.

To assess the effect that dust emissions will have on existing air quality, the dispersion model predictions from the indicative worst case modelled years (Year 3A (start of Year 3), 3B (end of Year 3), 5, 10, 15, 20 and 27) have been compared with relevant air quality criteria. Several iterations of mine plans were modelled throughout the planning phase to incorporate all reasonable and feasible measures for the Project in order to reduce environmental and social impacts.

The results from the dispersion modelling indicate that the Project is predicted to contribute to some exceedances of the relevant criteria for cumulative annual average PM_{10} and total suspended particulate matter at one receiver. The same receiver is also predicted to experience exeedances of the relevant criteria for 24-hour average PM_{10} from the Project alone for up to 23 days in a modelled year.

Minor exceedances of the relevant criteria for 24-hour average PM_{10} from the Project alone have also been predicted for another two receivers although the exceedances are only predicted for one day in each of the modelled Years 10 and 15. These maximum impacts predicted for the 24-hour average PM_{10} represent the Project's operations under adverse prevailing weather conditions. It is expected that the proactive management of operations would allow effective modifications to activities so that these impacts would not be experienced by receivers.

Cumulative modelling for 24-hour average PM_{10} was undertaken using a Monte Carlo Simulation for Year 10 as this modelled year has the largest predicted impacts for the Project alone. The results show that nine private receivers are predicted to experience exceedances of the assessment criterion (50 µg/m^3) while one private receiver is predicted to experience an exceedance of the acquisition criteria (150 µg/m^3) over the life of the Project.

It should be noted that the actual number of exceedances per year both as a result of the Project alone and cumulatively cannot be predicted precisely and will depend on actual Project activities, weather conditions, implementation of real time controls and predictive meteorological forecasting and background levels in the future. It is expected that the proactive management of operations would allow effective modifications to activities so that these impacts would not be experienced at the suggested receivers.

No exceedances of the relevant criteria have been predicted at all other private receivers including those in the vicinity of the existing Drayton Mine.

Air quality management and minimisation practices will be implemented to ensure that the Project does not exceed the relevant criteria at all other privately owned receivers.

Anglo American will revise the existing Drayton Mine air quality management plan to include construction and operation of the Project. The revised air quality management plan will incorporate leading practice dust minimisation management measures. Anglo American will also develop a leading practice air quality monitoring network surrounding the Drayton Complex in consultation with neighbouring landowners. This will include a real time meteorological monitoring station with predictive software capabilities and a network of real time air quality monitors.

Greenhouse Gas

PAEHolmes completed a greenhouse gas impact assessment for the Project.

The main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, fugitive emissions of carbon dioxide and

methane, diesel usage, explosives usage, and the transport and end use of the product coal.

Scope 1, scope 2 and scope 3 emissions were considered in the assessment of carbon dioxide, methane, nitrous oxide and relevant synthetic gases.

The greenhouse gas emissions from the Project (0.31 Mega tonnes of CO_2 equivalent per annum), including the mining, transportation of the coal to the Port of Newcastle and end usage of the coal represents approximately 0.052% of Australia's commitment under the Kyoto Protocol (591.5 Mt CO_2-e) and a very small portion of global greenhouse emissions.

The emissions estimated to result from the Project will not individually have any significant impact on global warming. Applying the principles of Ecological Sustainable Development, it is considered that there will be no increase or measureable impact on climate change as a result of the Project.

It is noted that Anglo American will implement all feasible and reasonable measures onsite to minimise the greenhouse gas emissions of the Project and ensure it is energy efficient.

Noise

An acoustics impact assessment was undertaken by Bridges Acoustics in order to predict the Project's noise impacts on receivers in the vicinity of the Drayton Complex, and to recommend measures to mitigate and manage these impacts.

Predicted noise levels for the Project were modelled at sensitive receivers for indicative worst case scenarios for Year 3A, 3B, 5, 10, 15, 20 and 27. Assessments were undertaken for both prevailing and neutral weather conditions. Additional model scenarios were undertaken to determine construction and sleep disturbance noise levels from the Project to ensure these issues were comprehensively assessed against relevant criteria.

Predicted noise levels for both construction and operational activities include all feasible and reasonable noise management and mitigation measures. An analysis was undertaken to investigate various noise management measures to be applied to the Project which showed that those measures proposed in this Environmental Assessment are feasible and reasonable.

For the purpose of the assessment the receivers surrounding the Drayton Complex were divided into two groups being the Drayton Mine receivers (located to the north) and the Drayton South area receivers (located to the south).

No receivers are predicted to experience significant noise levels of 5 dBA above the intrusive criteria as a result of the Project. Further to this there are no exceedances of the intrusive criteria for any Drayton South area receivers.

If the predicted operational noise level exceeds the intrusive criteria by 2 to 5 dBA, the receiver is deemed to experience moderate noise impacts. There are seven Drayton Mine receivers (390, 398, 401, 402, 403, 411 and 418) that will experience moderate noise impacts at residences. There are a further four Drayton Mine receivers (382, 419, 420 and 421) that will be subject to moderate noise impacts over an area greater than 25% of the property, however, lesser impacts are anticipated at residences.

A receiver is deemed to experience a mild noise impact if the intrusive criteria are exceeded by less than 2 dBA. There are nine Drayton Mine receivers (399, 400, 419, 420, 421, 423, 424 and 425) that will experience mild noise impacts at residences and one receiver (386) that will experience mild noise impacts over an area greater than 25% of the property. Five of these receivers (399, 400, 423, 424 and 425) will also be subject to moderate noise impacts over an area greater than 25% of the property.

Predicted noise levels will generally be slightly lower than the predicted noise levels reported in the Drayton Mine Extension Environmental Assessment for Drayton Mine receivers, as additional noise control measures have been proposed since the 2007 Environmental Assessment was prepared and subsequently included in the noise modelling for the Project.

The predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton Mine receivers. However, it will exceed the night time criteria in the absence of noise mitigation measures and impact on a number of Drayton Mine receivers. This exceedance is primarily associated with upgrades to the Coal Handling and Preparation Plant. As such the existing Drayton Mine noise management plan will be revised to incorporate construction noise criteria and controls during the Coal Handling and Preparation Plant upgrade activities to ensure the relevant criteria is not exceeded.

Similarly, the predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton South area receivers with exception to residences at receivers 240 and 250. Intermittent exceedances of the criteria at receivers 240 and 250 are predominantly associated with the construction of the Edderton Road realignment. Construction noise levels of 35 to 38 dBA will be experienced by these receivers during an approximate three month period. Construction noise associated with the Edderton Road realignment is not likely to be unacceptable as this work will only be undertaken during the day. This noise will be masked to a certain extent by traffic noise on the Golden Highway and the existing Edderton Road.

Anglo American will revise the existing Drayton Mine noise management plan for the Project. Ongoing monitoring will also be undertaken to confirm the predicted noise levels of the assessment. This will include the establishment of real time noise monitoring at representative receiver areas surrounding the Drayton Complex to enable ongoing noise management.

Blasting

A blasting impact assessment was undertaken by Bridges Acoustics.

The Project is likely to require an average of up to five blast events per week during daylight hours to prepare overburden for removal and for coal recovery.

The assessment found that blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences and structures with the exception of receiver 226 where it is predicted that the relevant criteria would be exceeded if the Maximum Instantaneous Charge is above 500 kilograms.

Anglo American will update the existing blasting management plan to include appropriate management and mitigation measures to ensure that the relevant criteria are met for all privately owned residences, heritage structures and infrastructure.

Equine Health

An equine health impact assessment was undertaken by Doctor Nicholas Kannegieter, Specialist Equine Surgeon, in order to determine whether the air quality, noise and blasting impacts of the Project will have any adverse impacts on the health of thoroughbred horses.

In order to determine whether thoroughbred horses will be adversely affected by these impacts, it was necessary to ascertain the thresholds at which equine health will be impacted. As such a detailed literature review with regard to the effects of dust, noise and vibration on horses was undertaken. The findings of the literature review were relied

upon to develop suitable dust, noise and vibration thresholds for equine health. The predicted impacts of the Project were then compared against these indicative thresholds in order to determine whether there will be any detrimental impacts.

The published studies indicate that thoroughbred horses are exposed to high levels of dust as part of their normal progression from stud farm to racing stable, with the dominant sources of dust being bedding, hay and feed. Cargill (1999) recommends a maximum inspirable dust concentration of 2,500 to 3,000 µg/m^3, a maximum respirable dust concentration of 230 µg/m^3 in stables and levels of 80 to 170 µg/m^3 for paddocks.

The air quality impact assessment found that the annual average cumulative PM_{10} concentrations resulting from the Project will meet the regulatory criteria of 30 µg/m^3 at all locations on Woodlands Stud and Coolmore Stud. Even under a worst case scenario when considering the maximum predicted 24-hour average PM_{10} concentrations, the predicted levels will reach 52 µg/m^3 for one day in Year 10 at Coolmore Stud. The PM_{10} levels generated by the Project are well below the limit of 230 µg/m^3 recommended by Cargill (1999) and the range considered normal for a paddock. As a result, the dust produced by the Project will not pose a risk to equine health, including adults and foals.

Further it has been demonstrated through the literature review that short term increases in dust levels well above those predicted would be well handled by the equine population on the studs and any dust that is inhaled should be rapidly cleared with no adverse effects. This would apply to horses permanently residing on the properties and those visiting temporarily.

The literature review revealed that health issues associated with dust are caused by endotoxins attached to the particulate matter, rather than the inorganic particles themselves. Endotoxins are bacterial structural components that cause a pyrogenic response (rise in body temperature). If inhaled, endotoxins can induce an inflammatory response, which can lead to diseases of the Lower Respiratory Tract. As such it was deemed necessary to test the soil in the Drayton South area for endotoxins.

Horses possess a highly refined respiratory tract that provides good protection against contamination of the Lower Respiratory Tract, and mucocilliary clearance mechanisms that can easily expel particulate matter from their bodies. As a result, particulate matter in the absence of endotoxins is merely an irritant.

The results of the endotoxin testing undertaken for the soil within the Drayton South area indicate that the dust generated by the Project will not increase the incidence of

Lower Respiratory Tract diseases or cause negative impacts to equine health. The levels present are substantially lower than the 20 ng/m^3 threshold recommended.

With regard to noise it was determined from the literature review that horses exposed to noise levels in the range of 54 to 70 dBA would be unlikely to exhibit signs of distress particularly in the absence of a visual stimuli or threat. Further it was found that horses are known to demonstrate habituation. This is the ability to become accustomed to certain stimuli. If a noise becomes familiar to the horse and it is not associated with danger it will not be startled by the noise.

The acoustics impact assessment determined that noise levels will not exceed 40 dBA on any part of Coolmore Stud or Woodlands Stud. For the majority of these properties noise levels of 30 to 33 dBA are predicted, which is comparable to the measured background noise level. Given the noise exposures experienced by thoroughbred horses in stables and the habituation ability of horses, the operational noise of the Project is unlikely to have any adverse impacts on equine health.

Foals born during the duration of the Project will be accustomed to any noise from the Project as they mature. Mares and foals visiting the properties temporarily will have been exposed in transit to noise levels much higher than are predicted to arise from the Project and should not be affected by any slight increase in noise.

Overpressure levels from blasting (when closest to the receiver) are predicted in the range of 93 to 109 dBL for indicative locations on Coolmore Stud and Woodlands Stud. Mining within the Drayton South area will occur in a north to south direction. As a result, the distance from blasting to the horse studs will be greatest at the beginning of the Project when overpressure levels will be significantly lower. This provides the horses with an opportunity to become accustomed to noise and overpressure associated with the Project. As mining progresses southwards it is likely that horses will have developed an increased tolerance to blasting due to habituation.

It is also noted that the vibration levels produced by blasting would be far lower than the levels experienced by horses during road and air transportation.

Although there is little scientific research into the impacts of transportation on animal health, anecdotal evidence shows that horses do not suffer any ill effects from the vibrations experienced during transportation. There is also anecdotal evidence indicating that horses at the Muswellbrook racecourse and stables are not startled by blasting at the neighbouring Bengalla Mine. Therefore, the ground vibration and overpressure caused by blasting is not expected to have any negative impacts on equine health.

Provided that the mitigation and management measures recommended for air quality, noise and blasting are complied with, the Project is not expected to have any material adverse impacts on equine health.

Anglo American will conduct real time air quality monitoring so that potential exceedances can be identified and avoided. Anglo American will also regularly consult with Darley Australia and Coolmore Australia throughout the operation of the Project.

Visual

A visual impact assessment was undertaken by JVP Visual Planning and Design. This assessment was undertaken to identify the character of the surrounding visual landscape and provide management and mitigation measures for visual impacts associated with the Project.

It involved the development of a 3D model and photomontages of the Project from select viewing locations during Year 3A, 3B, 10 and 27 as representative phases of the Project mine life. The assessment also included a consideration of night lighting impacts.

The visual impacts of the Project were assessed by considering the sensitivity of identified visual receptors and the visual effect of the Project. Visual effects were determined based on an analysis of the 3D model and photomontages.

The assessment concluded that the visual impact on surrounding receivers will be limited for the majority of the mine life. This is because the operational areas of the Project have been designed to remain behind existing topography in order to conceal them from views at the most sensitive locations to the south.

The exception is the views that will be available to the Houston visual bund while it is being constructed. The Houston visual bund is required to ensure that longer term views to the operational areas of the Project are screened from view. Receivers located to the south of the Project including residences within Jerrys Plains, parts of Coolmore Stud and motorists on the Golden Highway would experience views of the Houston visual bund while it is being constructed. During this time (estimated 16 months) the visual impacts for these areas would be high. These impacts would be reduced as rehabilitation is completed. This is likely to be no more than three to five months following completion of the final stage lift of construction. After this, the visual impact will be reduced to moderate and then low for the remainder of the Project reflecting decreasing visual effect levels.

The majority of lighting utilised at a mine site is associated with the Coal Handling and Preparation Plant, workshops and load out infrastructure, all of which are located at the existing Drayton Mine. Lighting impacts within the Drayton South area will predominantly be caused by lights fitted to mobile equipment operating outside of active mining areas. In most cases, direct light effects will be limited as a result of existing topography and vegetation.

Since the dominant sources of light are located at the existing Drayton Mine, mobile equipment operating within the Drayton

South area will not significantly increase the overall diffuse light effect.

Numerous mitigation measures have been incorporated into the design and operating plans for the Project that will reduce the visual effect and mitigate the visual impact of the Project on sensitive viewing locations. Anglo American will also conduct ongoing consultation with stakeholders surrounding the site over the life of the Project. Should any issues arise in relation to visual impacts on surrounding sensitive viewing locations, these will be addressed through consultation with the relevant parties.

Ecology

An ecology impact assessment was undertaken by Cumberland Ecology. This assessment was undertaken to characterise the terrestrial and aquatic flora and fauna within the proposed disturbance footprint in order to assess the impacts of the Project on biodiversity values and recommend measures to mitigate and manage these impacts. The assessment included a detailed desktop review of previous studies and a comprehensive field study of the Drayton South area and associated areas within Drayton Mine.

A high proportion of the Drayton South area is dominated by extensive areas of native perennial grassland of various diversity and floristic composition that has been derived from the clearing of the original woodland and forest communities. Remnant forest and woodland exist as scattered patches, particularly along riparian corridors and in steeper areas across the Drayton South area. The majority of the remnant forest and woodland within the Drayton South area is dominated by *Eucalyptus moluccana* (Grey Box), which conforms to the Central Hunter Box-Ironbark Woodland. The remainder of the area is occupied by smaller patches of other threatened and non-threatened communities.

More than 175 fauna species were recorded within the Drayton South area. A large proportion of the recorded species are represented by avifauna and microbats, which are highly mobile. Conversely, reptiles, arboreal mammals and terrestrial mammals do not possess the ability to disperse as freely and as such are not as well represented. Many of the mammals recorded in the survey are represented by stock and exotic species such as cattle, horses, rabbits and mice.

An assessment of the Hunter River identified a total of 23 vertebrate species in the catchment of which 18 were

native freshwater fish species and five were alien species. Saddlers Creek was also surveyed and is unlikely to support significant freshwater fish communities but potentially provides some degree of refuge for aquatic fauna during periods of higher flow.

The Project will result in the disturbance of 1,928 hectares of vegetation, including 107 hectares of Box-Gum Woodland derived native grassland and 389 hectares of other native forest, woodland and shrubland, progressively over 27 years. It is unlikely to result in significant or long term adverse impacts to Saddlers Creek, the Hunter River or the wider catchment.

Anglo American will develop and implement a biodiversity action plan, which will form a component of the existing Drayton Mine flora and fauna management plan. The plan will guide all facets of biodiversity management and mitigation for the Project, including staged disturbance, restoration and rehabilitation activities.

Biodiversity Offset Strategy

A biodiversity offset strategy has been developed to compensate for the loss of Box-Gum Woodland and other native vegetation as a result of the Project.

The biodiversity offset strategy for the Project adopts a *'maintain and improve'* approach and aims to offset the impacts on threatened ecological communities and habitat for threatened fauna firstly on site within the Drayton South area. Any residual impacts that cannot be offset on site will be compensated through the acquisition of suitable land holdings.

The onsite component of the biodiversity offset strategy comprises of:

- The conservation of existing threatened ecological communities within the Project Boundary;
- The rehabilitation of the Drayton South disturbance footprint with woodland communities; and
- The restoration of a significant portion of Saddlers Creek in conjunction with the Catchment Management Authority.

The onsite offsets have been developed to maximise the opportunities for conservation, rehabilitation and restoration in situ, which will address a significant proportion of the Project's offsetting commitments. However, there is little opportunity to expand on Drayton Mine's current offsetting commitments, including the Drayton Wildlife Refuge. Therefore to compensate for the residual impacts, offsite offsets will form another component of the biodiversity offset strategy to complement the onsite offsets proposed. With the assistance of Cumberland Ecology, Anglo American have identified and secured an offsite biodiversity offset property to ensure that the Project will not result in a net loss in biodiversity.

The Project will result in the disturbance of 1,928 hectares of vegetation within the Drayton South area, including 107 hectares of Box-Gum Woodland derived native grassland and 389 hectares of other native forest, woodland and shrub land, progressively over 27 years.

The biodiversity offset strategy as a whole will address the predicted loss of vegetation by provision of 3,653 hectares of vegetation, including 1,754 hectares of Box-Gum Woodland, 1,457 hectares of other endangered forest and woodland communities, and 442 hectares of non-threatened forest and woodland. The biodiversity offset strategy will also provide large areas of habitat for all of the threatened species that will be impacted by the Project.

Aboriginal Archaeological and Cultural Heritage

An Aboriginal archaeological and cultural heritage impact assessment was undertaken by AECOM Australia. The assessment included a detailed desktop review of previous studies, search of the Office of Environment and Heritage's Aboriginal Heritage Information Management System and a comprehensive field survey of the Drayton South area undertaken over a total of 26 days, with members of the

Aboriginal community.

The archaeological resource within the Project Boundary is comprised of the 208 previously recorded sites as per the Aboriginal Heritage Information Management System database. Of these sites located within the Project Boundary, 85 sites are situated within an area of 2,267 hectares within the Drayton South area (study area). In addition to the previously recorded Aboriginal Heritage Information Management System sites, 160 new archaeological sites were identified and recorded within the study area.

As a result of the Project, a total of 175 archaeological sites will be directly impacted. To manage these impacts the existing Drayton Mine Aboriginal and cultural heritage management

plan will be revised in consultation with registered Aboriginal stakeholders. The revised plan will include detailed salvage methodologies to be carried out prior to commencement of the Project and protection and conservation of archaeological sites that are not impacted by the Project.

Non-Aboriginal Heritage

A non-Aboriginal heritage impact assessment was undertaken by AECOM Australia. This assessment identified two items of local historical significance that will be directly impacted by the Project being a fence and Nissan hut with stockyard. Other items including a range of historic homesteads were located outside of the Project Boundary and will not be significantly impacted.

With regard to the fence and Nissan hut with stockyard it is recommended that given their age and limited historical significance, a photographic archival recording and scaled drawings of both items be undertaken prior to destruction.

The management of heritage items within the Project Boundary will be undertaken through a non-Aboriginal heritage management plan.

Surface Water

A surface water impact assessment was undertaken by WRM Water & Environment. The purpose of the assessment was to characterise the existing catchments, develop a water balance for the Drayton Complex with consideration of the proposed water management system, determine the impacts to surface water and recommend measures to mitigate and manage these impacts.

A computer-based simulation model was used to assess the dynamics of the water balance under varying rainfall and catchment conditions. The model has been configured to simulate the operations of all major components in the water management system including both the existing components at Drayton Mine and those proposed to be constructed at Drayton South as part of the Project.

Flood modelling undertaken for the Project determined that the conceptual mine plan and all related infrastructure is located outside of the 100 year Average Recurrence Interval flood extent of Saddlers Creek. Further to this, the operational mining areas associated with the Project are more than 1.5 kilometres from the Hunter River and are located on the other side of a significant ridgeline. As such no impacts on the Project are expected as a result of flooding from Saddlers Creek or the Hunter River.

Under the proposed water management system, runoff from the Drayton Mine catchments and dewatered groundwater can supply all of the water requirements of the Drayton Complex over the life of the Project (unless conditions were drier than the 99th percentile conditions). Offsite water supplies would not be required, unless conditions are drier than the 99th percentile conditions.

It is more likely that the water management system will accumulate water and as such it is proposed to obtain 50 credits under the Hunter River Salinity Trading Scheme to allow controlled discharge of mine affected water. This will be undertaken via the Houston Dam. The modelling suggests that there is a 50% chance that releases will exceed 740 Mega litres per year on average and a 10% chance they will exceed 1,140 Mega litres per year on average. Average releases per release day will be between 25 Mega litres and 31 Mega litres.

The surface water impact assessment concluded that by implementing an effective water management system as proposed, the Project will not impact on the quality of receiving waters or on the adjoining Plashett Dam.

The Project will reduce the Saddlers Creek catchment by up to 14% and the Saltwater Creek catchment will reduce by 11% over the life of the Project. At the completion of mining, the proposed Blakefield, Houston and Transfer Dams will be removed and the final void catchments will be minimised, in order to restore catchment resulting in a total 10% and 4% loss of catchment area of Saddlers Creek and Saltwater Creek, respectively.

To mitigate the impact of the loss of catchment flows, a comprehensive rehabilitation program is proposed for Saddlers Creek including an extensive restoration program.

The Saltwater Creek channel is already highly modified as a result of Plashett Dam. The loss of additional catchment resulting from the construction of Houston Dam is not expected to have a significant impact on Saltwater Creek.

The Project will have an insignificant impact on the Hunter River flows. Under mining conditions, the Project will reduce the catchment draining to the Hunter River at Liddell by a maximum of 0.14%.

A revision of the existing Drayton Mine water management system and management plan will be undertaken to encompass the new components, procedures and targets required for the Project. This will include a surface water monitoring program for onsite water sources.

Groundwater

A groundwater impact assessment was undertaken by Australasian Groundwater and Environmental Consultants. The purpose of the assessment was to characterise existing groundwater regimes, assess the impacts of the Project on these groundwater sources and other water users, quantify predicted inflows into the mining areas throughout the life of the Project and recommend measures to mitigate and manage these impacts.

The regional groundwater system within the vicinity of the Drayton South area consists broadly of three aquifer systems including:

- Alluvium along the Hunter River, Saddlers Creek and Saltwater Creek;
- Weathered bedrock (regolith); and
- The coal seams of the Permian Wittingham Coal Measures.

A numerical model was developed using hydrology, hydrogeology and geological structure data. Conservative parameters and values were adopted to represent the worst case scenario for potential groundwater impacts. The model was then used to simulate the Project's impacts on the existing groundwater regime over time.

Seepage of groundwater from the aquifers intersected during mining will reduce groundwater pressures in the coal seams and overburden / interburden aquifers around the mining areas. This will lower the water table of an unconfined aquifer or depressurise a confined aquifer.

The zone of influence for the shallow regolith / alluvium is predicted to be restricted to the immediate vicinity surrounding the mining areas. This is a maximum distance of approximately 600 metres to the west and south of the mining areas in Year 27. The zone of influence within the shallow regolith / alluvium is not predicted to extend into the Hunter River alluvial aquifer; however, it is predicted to extend marginally into the Saddlers Creek alluvium.

The zone of influence for the Permian coal measures is predicted to be restricted to a maximum distance of approximately 1 kilometre to the west and south of the mining areas at Year 27 and extend under Saddlers Creek alluvium. The zone of influence within the coal measures is not predicted to extend beneath the Hunter River alluvium at the end of mining.

The zone of influence migrates southwards towards the Hunter River over time, but not measurably beneath these alluvial

lands. Consequently, the Project is predicted to have only very limited leakage impacts on the alluvial lands associated with the Hunter River.

The vertical leakage fluxes between the alluvial deposits associated with Saddlers Creek and the underlying coal measures will be affected due to the proximity of the Project. The pre-mining net upward seepage flux to the Saddlers Creek alluvium is in the order of 0.31 Mega litres per day. Operations at Mt Arthur Coal Mine are predicted to result in a maximum reduction in net flux to the Saddlers Creek alluvium of 0.19 Mega litres per day (at the end of mining). The remaining influx to the Saddlers Creek alluvium of approximately 0.12 Mega litres per day may therefore be reduced to zero as a result of the Project.

The groundwater quality may improve in the Saddlers Creek alluvium as discharge of higher salinity groundwater from the coal measures into the alluvium is predicted to be reduced. This may result in a freshening of groundwater resulting from downward migration of rainfall recharge and creek recharge. The groundwater quality within the Hunter River alluvium is not expected to measurably change as a result of the Project.

A total of two registered groundwater bores are located within the zone of influence at Year 27. Both of these groundwater bores are located on land owned by Anglo American, and will be intercepted by mining. No other registered bores are located within the predicted zone of influence at the end of mining.

The final void within the Drayton South area will collect and accumulate water from a number of sources. The post-mining equilibrium water level is predicted to reach Reduced Level 117 metres after approximately 1,000 years. The depression of the potentiometric surface around the final void will act as a '*sink*', which prevents water from flowing outwards into the regional system.

It is proposed that rejects and tailings generated at the Coal Handling and Preparation Plant from the Drayton South operation will be deposited in the remaining voids at Drayton Mine. The availability of the voids will depend upon the circumstances that exist at the relevant time with Macquarie Generation. As such, three scenarios have been established for rejects and tailings disposal.

Under all scenarios for disposal of tailings in the East Void at Drayton Mine, the cone of depression will be retained and the water table within the void remains below the surrounding groundwater level, therefore it is unlikely that leachate will migrate out of the void.

The tailings and reject disposal designs for the North Void do not provide conditions which will promote the development of a long-term cone of depression. This may lead to the movement of leachate away from the void and towards the catchment of Ramrod Creek.

A revision of the existing Drayton Mine water management plan will be undertaken to encompass the new procedures and targets required for the Project to avoid impacting on groundwater and the receiving environment. This will include a groundwater monitoring program with a key focus on the management of leachate associated with the tailings and rejects.

Geochemistry

A geochemistry impact assessment was undertaken by RGS. The purpose of the assessment was to characterise the geochemistry of the overburden and coal reject materials associated with the mining operations.

Overburden and most coal reject materials are expected to have very low oxidisable sulfur content and significant excess acid neutralising capacity. These characteristics indicate that the materials are non acid forming and likely to have a high factor of safety with respect to potential acid generation.

The concentration of total metals detected in overburden

materials are well below applied guideline criteria for soils and is unlikely to present any environmental issues associated with revegetation and rehabilitation or have any significant impacts to surface water and groundwater quality.

Some overburden and most coal reject materials have potential sodic properties, which could lead to structural stability issues, including dispersion and erosion. There is also a low probability of spontaneous combustion either in situ or for coal, overburden and coal reject materials generated within the Drayton South area.

Soil and Land Capability

A soil and land capability impact assessment was undertaken by Environmental Earth Sciences.

Four soil types were identified within the Project Boundary all of which were deemed to be suitable for future reuse as top dress materials with available areas proposed to be disturbed within the Project Boundary equal to 4.15 Million cubic metres.

The current land capability classification within the Drayton South area ranges from Class IV to Class VII, with Classes VI and VII dominating the existing landscape. Impacts to the land as a result of the Project will remain within the Drayton South disturbance footprint. Areas outside this are expected to maintain its existing pre-mining class.

The Drayton South area has been assessed against the mapping and criteria outlined in the *Strategic Regional Land Use Plan – Upper Hunter* and validated as part of the soil and land capability impact assessment to gain an appreciation of the extent and likely impact of the Project on potential Biophysical Strategic Agricultural Land.

In accordance with the mapping illustrated in the *Strategic Regional Land Use Plan – Upper Hunter*, the Drayton South disturbance footprint is not situated on Biophysical Strategic Agricultural Land. Furthermore, the soils and land capability impact assessment validates that the Drayton South area, which includes the Drayton South disturbance footprint, does not trigger all relevant criteria required to represent Biophysical Strategic Agricultural Land. As such, the Project will not impact on Biophysical Strategic Agricultural Land and is not required to be assessed against the relevant gateway criteria in this regard.

Following the completion of mining, land capability classes within the Drayton South disturbance footprint are predicted to range from Class VI to Class VIII.

The existing Drayton Mine land management plan will be revised to incorporate relevant mitigation and management measures for the soil resources within the Drayton South area.

Agriculture

An Agricultural Impact Statement was undertaken by Scott Barnett & Associates.

The predominant agricultural land use within the Drayton South area is extensive beef cattle grazing with the major enterprise being beef cattle breeding for the weaner and domestic market. Several other agricultural enterprises operate within the locality of the Drayton South area, including:

- Seven thoroughbred horse studs, including Coolmore Stud and Woodlands Stud (part of the Equine Critical Industry Cluster);
- 11 dairies;
- Four vineyards (three with wineries), including Arrowfield Estate to the immediate south (part of the Viticulture Critical Industry Cluster); and
- An olive grove and olive processing plant.

The significant agricultural resources in the locality of the Drayton South area include the Hunter Regulated River Water Source and Hunter Alluvial soil landscape grouping. Together these resources contribute to the Biophysical Strategic Agricultural Land.

The vast majority of the Drayton South area is composed of land which is suited to grazing by beef cows for weaner production. The gross value of current agricultural production within the Drayton South area is $701,208 per annum and the net value is $432,479 per annum.

The offsite biodiversity offset property is primarily composed of land which is suited to extensive grazing by sheep for breeding and wool. The gross value of agriculture on the offsite biodiversity offset property is $500,828 per annum and the net value is $223,484 per annum.

Any agricultural land that is situated within the Drayton South disturbance footprint and the offsite biodiversity offset property will be removed from production and reserved in perpetuity as a biodiversity offset for the Project.

The combined gross value of production foregone from the Drayton South disturbance footprint and the offsite biodiversity offset property is $0.8 Million per annum. This value is 0.26% of the total agricultural production of the Hunter Region, 0.01% of New South Wales and 0.002% of Australia. The total foregone net agricultural production from agricultural land resources required for the Project is estimated at $5.6 Million present value. This is significantly less than the present value of net production benefits of the Project to Australia, which is estimated at $490 Million.

The Project is not anticipated to have significant impacts on:

- Availability of land for agricultural purposes including land utilised by the thoroughbred horse breeding industry and Biophysical Strategic Agricultural Land;
- Water supply (including highly productive groundwater);
- Surrounding enterprises as a result of excessive dust or noise;
- Traffic regimes along support infrastructure routes associated with neighbouring agricultural enterprises;
- Long term visual amenity of surrounding enterprises;
- Labour supply to agricultural enterprises; and
- Support services directly employed by agricultural enterprises.

Rehabilitation, Final Landform and Mine Closure

A rehabilitation and mine closure strategic framework and conceptual final landform plan has been developed for the Project. The rehabilitation strategy for the Project will focus on biodiversity, including the establishment of threatened vegetation communities local to the area and the restoration of Saddlers Creek. Rehabilitation will be guided by:

- The existing Drayton Mine rehabilitation and offset management plan;
- The *Mine Rehabilitation* handbook;
- The *Draft National Recovery Plan for Box-Gum Woodland* and *Derived Native Grassland*; and
- The requirements of the collaborative agreement between Anglo American and the Hunter-Central Rivers Catchment Management Authority for the restoration of Saddlers Creek.

The Drayton South and Drayton Mine disturbance footprints, excluding the final voids at Drayton Mine, will be progressively rehabilitated as mining advances or concludes. A suite of measures will be applied during the rehabilitation program, including erosion and sediment controls, topsoil management and translocation, weed and feral animal controls, and revegetation. The success of rehabilitation efforts will be measured against the completion criteria developed for the Project.

Rehabilitated land within the Drayton South area will achieve a standard whereby vegetation communities are stable and self-sustaining and can be classified as an onsite offset in perpetuity as part of the biodiversity offset strategy for the Project.

A conceptual final landform has been designed for the Project assuming mining will not continue beyond the 27 year approval period. The final landform at Drayton Mine, excluding the voids, will be shaped to integrate with the surrounding landscape. Anglo American will maximise opportunities to use the final voids for storage of water, and rejects and tailings generated from the Drayton South mining areas. All existing mine site facilities and infrastructure at Drayton Mine will be decommissioned and rehabilitated, where necessary, at the time of closure.

The final landform for the Drayton South area will be shaped to be consistent with the surrounding landscape and free draining, as far as practical. It is planned that the final void will have the majority of the highwall blasted back and low wall graded to improve the safety and stability. Surface water runoff and groundwater seepage will settle in the remaining void, creating a final void lake at approximately Reduced Level 117 metres. All existing Drayton South mine site facilities will be decommissioned and rehabilitated, where necessary, at the time of closure.

The existing mine closure plan for Drayton Mine will be revised, to incorporate the new components of the Project, within five years of closure. The plan will be guided by the *Mine Closure and Completion* handbook and the *Strategic Framework for Mine Closure* and shall reflect contemporary expectations, including changes to the final mine plan, regulatory requirements, new technologies and stakeholder expectations.

Traffic and Transport

A traffic and transport impact assessment was undertaken by DC Traffic Engineering.

The assessment concluded that there are not anticipated to be any significant increases in traffic as a result of the Project. This is largely due to the fact that the existing operations workforce will continue to be utilised by the Project and that mine access during the operations phase will continue to be via the existing Drayton Mine Access Road off Thomas Mitchell Drive.

However, traffic modelling shows that when considering future proposed projects that the current configuration of the Denman Road / Thomas Mitchell Drive intersection and the Thomas Mitchell Drive / New England Highway intersection would perform at a poor Level of Service during the peak construction and operations phase. However, Mt Arthur Coal Mine has committed to upgrade these intersections as part of their current Project Approval. With the planned upgrades this will resolve the predicted traffic issues that would have been otherwise experienced at these intersections during the peak construction and operations phase.

The intersection of Thomas Mitchell Drive and the Mine Access Road will continue to perform at either a good or acceptable Level of Service.

Construction works for the Edderton Road realignment are not expected to significantly disrupt traffic. The existing Edderton Road will remain operational throughout the construction period, it will only be closed once the new alignment has been completed.

The realignment of Edderton Road will move the intersection with the Golden Highway to the west by approximately 5 kilometres. As a result, the journey east from Edderton Road and the Golden Highway will be lengthened by 5 kilometres. Conversely, vehicles travelling west from Edderton Road and the Golden Highway will travel 5 kilometres less. This will increase or decrease the travel time by three to four minutes.

The improved conditions in the realigned section of the road will make the road more conducive to travel at 100 kilometres per hour. As a result, there will only be minimal impacts (in some cases a positive impact) on travel times.

As part of the traffic and transport impact assessment the potential impacts on rail traffic were assessed. During peak production the Project will require a total of 308 trains to transport product coal to Newcastle. This equates to two

trains per day which is in line with Drayton Mine's existing approval. As such the Project will not result in any additional trains on the Antiene Rail Spur or Main Northern Railway.

Based on Mt Arthur Coal Mine's current approval it is forecast that there will be a total between the two operations of up to 14 trains per day on the Antiene Rail Spur making the Project's contribution 14%. If Mt Arthur Coal Mine increases the number of trains they put down the Antiene Rail Spur from 12 to 19 per day as proposed in their current modification then the Project's contribution will be approximately 9.5%.

Social

A social impact assessment was undertaken by Hansen Bailey. The purpose of the assessment was to develop a profile of the local area, which primarily encompasses the Muswellbrook and Singleton Local Government Areas, and identify any future social impacts which may result from the Project.

The assessment concluded that given the Project is a continuation of the existing Drayton Mine and that the current workforce will continue to be utilised it is considered unlikely to place an unreasonable strain on existing infrastructure, services or the local community.

Anglo American has made an offer to enter into a Voluntary Planning Agreement with Muswellbrook Shire Council to provide in kind and monetary contributions to ensure any potential social effects of the Project are mitigated. Discussions are progressing with Muswellbrook Shire Council to reach an agreement as to the terms of the Voluntary Planning Agreement.

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 of $887 Million with a minimum of $490 Million of these net production benefits accruing to Australia. This net production benefit is distributed amongst a range of stakeholders including the local community, Anglo American, its shareholders and government.

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

- $930 Million in annual direct and indirect regional output or business turnover;
- $443 Million in annual direct and indirect regional value added;
- $195 Million in annual direct and indirect household income; and
- 2,089 direct and indirect jobs.

In summary, the Project will result in the following economic benefits to the Upper Hunter economy:

- $588 Million in annual direct and indirect regional output or business turnover;
- $264 Million in annual direct and indirect regional value added;
- $86 Million in annual direct and indirect household income; and
- 785 direct and indirect jobs.

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

Cessation of the Project operation may lead to a reduction in economic activity. Given the uncertain circumstances at the time of Project cessation, it is important for government to effectively utilise the economic benefits, skills and expertise generated by the Project to further strengthen and broaden the region's economic base.

Statement of Commitments

In addition to the conditions of Project Approval, Anglo American has identified and commits to the operational controls summarised in the Statement of Commitments in this Environmental Assessment for all activities associated with the Project.

The aim of the Statement of Commitments is to ensure that any potential environmental and social impacts resulting from the Project as identified in this Environmental Assessment are minimised and managed by implementing relevant environmental and social management, mitigation and monitoring strategies.

Project Justification

Approved mining operations at Drayton Mine are scheduled to continue until the expiry of the current Project Approval in 2017. The Project will allow mining to continue at Drayton Mine, ensuring security of employment for the existing workforce and continuity of socio-economic benefits for the Hunter region, New South Wales and Australia. The Project will facilitate the continuing recovery of a valuable coal resource in an area that has long been set aside for mining by the New South Wales government and acquired by Anglo American for the specific purpose of facilitating the continuation of Drayton Mine.

The Drayton South coal resource was identified in the early 1900s with prospecting activities commencing in the late 1940s. Exploration intensified from the 1960s onwards, culminating in the granting of a Development Consent for the Mt Arthur South Coal Project in 1986. Subsequently, a Mining Lease over this area was granted in 1989.

The Development Consent and Mining Lease expired in 1991 and 1994, respectively, due to failure to physically commence the development.

To secure the continuity of mining at Drayton Mine, Exploration Licence 5460 over the Drayton South area was acquired by Anglo American in 1998 with the required land assets secured shortly afterwards.

The Project maximises resource recovery and economic returns from capital already invested in Drayton Mine and minimises environmental costs by utilising the existing infrastructure and the final landform at Drayton Mine. The Project provides continuity for the existing workforce, services and supply contracts, and maintains the beneficial social and economic interactions between Drayton Mine and the local community. The Project will not cause the community disruption and the environmental costs that would otherwise be associated with the establishment of a new mine.

The Project will facilitate the recovery of a valuable, export steaming coal. Thermal coal remains a highly sought after energy source in Asian countries, including Japan, China and India. These countries continue to be the world's largest coal importers, and will largely account for an estimated 70% growth in total coal imports from 2009 to 2035 (U.S. EIA, 2011). This increasing demand supports

the need for the Project and justifies further investment in the industry.

Exports of product coal generated by the Project will also provide net economic benefits to local communities, State and Commonwealth governments in the order of $443 Million to $741 Million. Royalties for the New South Wales government are expected to total $320 Million (present value).

The Project will also offer employment opportunities for a total of 899 personnel across the construction and operation phases of the Project, of which 530 personnel will be directly associated with the production of up to 7 Million tonnes per annum of Run of Mine coal from the Drayton Complex.

The Project has been assessed on a *'worst case'* environmental impact basis, assuming the Project will operate at a maximum coal production rate of 7 Million tonnes per annum, with all feasible and reasonable management and mitigation measures being applied. Anglo American confirms its commitment to best environmental outcomes by making the operational *'commitments'* through the Environmental Assessment.

The Anglo American commitment to the community to compensate for the socio-economic costs of the Project and to ensure that the benefits from it flow to the local community is manifested in the offer of a Voluntary Planning Agreement to Muswellbrook Shire Council.

It has been demonstrated that the Project will serve the essential purpose of providing 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 far outweigh its social and environmental costs. Therefore, the Project is in the public interest.

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Introduction 1

This section provides an introduction to the Environmental Assessment (EA) for the Drayton South Coal Project (the Project). It describes the background and context of the Project, introduces the proponent and explains the purpose of the EA. It also outlines the structure of the EA and presents the EA study team.

1.1 Background

1.1.1 Drayton Mine

Drayton Mine commenced production in 1983 and is managed by Anglo American Metallurgical Coal Pty Ltd (Anglo American), the controlling partner (88.17%) of the Drayton Joint Venture. Other partners include Mitsui Coal Development (Australia) Pty Limited (3.83%), Mitsui Mining Australia Pty Limited (3.0%), Hyundai Australia Pty Limited (2.5%) and Daesung Australia Limited (2.5%).

Drayton Mine currently operates under Project Approval (PA) 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. The Antiene Rail Spur (approved under Development Consent (DC) 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. PA 06_0202 expires in 2017 at which time operations will cease.

Drayton Mine has operated continuously for the past 29 years and in that time has produced a total of 117 Million tonnes (Mt) of product thermal coal, of which 32 Mt has been delivered to the adjoining Liddell and Bayswater Power Stations now operated by Macquarie Generation and 85 Mt delivered to the Port of Newcastle for export. The coal delivered for domestic electricity production and for export has an estimated present value of $700 million (M) and $8,500 M, respectively.

During its operation, Drayton Mine has been a major employer of the local community, currently employing 530 full time equivalent workers of which approximately 32% reside in the Muswellbrook Local Government Area (LGA), while 25% and 16% reside in the neighbouring LGAs of Singleton and the Upper Hunter, respectively.

The estimated total wage payments (present value) over the 29 years of operation are in excess of $1,500 M with current wage payments in the order of $89 M per year. Further to these benefits, total royalties (actual dollars) paid to the New South Wales (NSW) government during the life of Drayton Mine are in excess of $350 M and currently paid at a rate in the order of $33 M per year. These payments represent a significant contribution to the local, regional and State economies.

1.1.2 Drayton South Area

The Drayton South area was previously owned by Mount Arthur South Coal Limited (MASCL) which held planning approval (granted in 1986) and a Mining Lease (granted in 1989) for the development and operation of an open cut coal mine. Not having proceeded with the development the planning approval lapsed in 1991 as did, consequently, the Mining Lease.

With a view to secure the future prospects for its operations, Drayton Mine sought to obtain Exploration Licence (EL) 5460 over the Drayton South area which was issued by the Minister for Mineral Resources in 1998. Subsequently, an extensive exploration program was completed within EL 5460 by Anglo American at a total cost of $23 M. Over this time, Drayton Mine also acquired all of the required land within the Drayton South area in preparation for the development of mining operations as planned.

In 2000, Drayton Mine and Mt Arthur Coal Mine (owned by Hunter Valley Energy Coal Pty Ltd (HVEC)) both made separate applications for the approval and use of the Antiene Rail Spur to transport coal to the Port of Newcastle. These applications were supported by an Environmental Impact Statement (EIS), which not only assessed the transport of coal from the two named mining operations but also considered and sought approval for the transport of coal anticipated to be recovered from the Drayton South area (then referred to as the Saddlers Creek Project).

1.2 Continuation of Drayton Mine

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area which is located within EL 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex).

The Drayton Complex is located approximately 10 km north-west of the village of Jerrys Plains and approximately

13 km south of the township of Muswellbrook in the Upper Hunter Valley of NSW. The Drayton Complex is predominately situated within the Muswellbrook LGA, with a small section of the south-west portion falling within the Singleton LGA. The Project is situated within close proximity to Arrowfield Estate, two thoroughbred horse studs (Coolmore Stud and Woodlands Stud), two power stations (Bayswater and Liddell Power Stations) and existing coal mining operations. Figure 1 illustrates the location of the Project.

The continuation of mining operations at the Drayton Complex is key to:

- The implementation of mining operations within the Drayton South area, extending operations by a further 27 years and ensuring the continuity of employment for Drayton Mine's existing workforce;
- The realisation of the assets acquired for the long term business plan of the Drayton Complex including the existing surface infrastructure capital assets, land and property and the remaining mine voids at Drayton Mine;
- The continuation of contributions to the local and State economies;
- The continuation of existing social connections between Drayton Mine and the community;
- The continuity of mutually beneficial arrangements with neighbours Macquarie Generation and Mt Arthur Coal Mine;
- The maximisation of the economic benefits from the recovery of coal resources within the Drayton South area;
- The optimisation of the final landform at Drayton Mine through engagement with neighbours Macquarie Generation and Mt Arthur Coal Mine; and
- The systematic and efficient closure of Drayton Mine.

1.3 The Proponent

The proponent for the Project is Anglo American for which the contact details are:

Anglo American Metallurgical Coal Pty Ltd
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1.4 Document Purpose

A major project application and supporting Preliminary Environmental Assessment (PEA) was submitted to the Department of Planning and Infrastructure (DP&I) in March 2011 under section 75E, Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Subsequently, the Director-General's Environmental Assessment Requirements (EARs) were issued by DP&I on 3 August 2011.

This EA has been prepared by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American to support an application for PA under section 75E, Part 3A of the EP&A Act.

The Project Application Boundary (Project Boundary) is illustrated on Figure 1. The area within the Project Boundary is referred to as the Drayton Complex and includes the existing Drayton Mine, Drayton South area and the transport corridor. The schedule of lands to which this EA applies is provided in Appendix A.

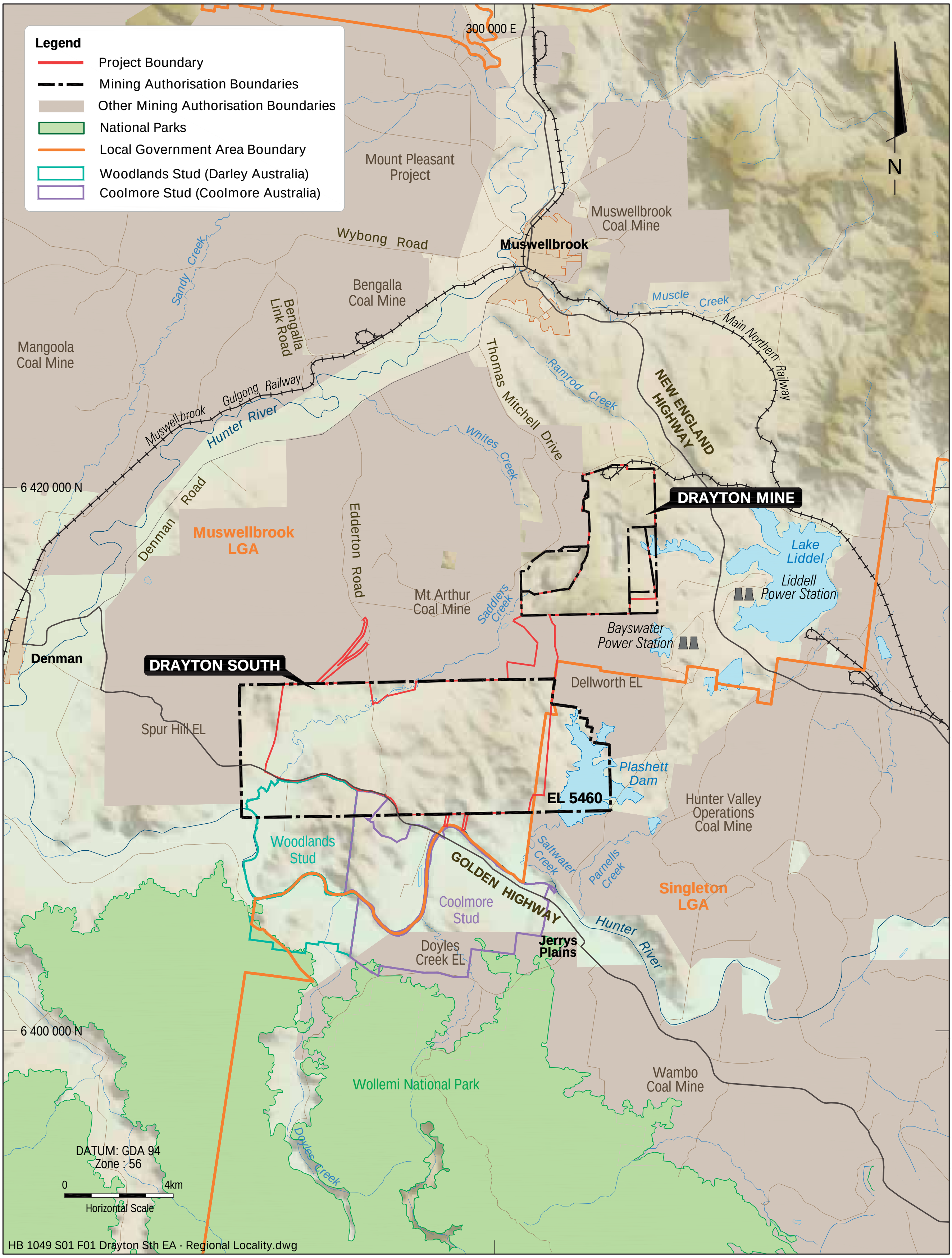
This EA includes consideration of all issues raised during the extensive stakeholder consultation program and fulfils the requirements of the Director-General's EARs by adequately assessing the environmental, social and economic impacts of the Project to enable the Planning Assessment Commission (PAC) to determine the PA as sought.

1.5 Document Structure

The EA consists of seven volumes. Volume 1 encompasses the main report and presents a description of the Project, a summary of the associated environmental and social impacts and proposed management and mitigation measures. Volume 1 is structured as follows:

- Section 2 provides information relating to the existing environmental setting;
- Section 3 provides information relating to Drayton Mine as currently approved;
- Section 4 provides a detailed description of the Project;
- Section 5 describes the regulatory framework relevant to the Project;
- Section 6 details the extensive stakeholder engagement program that has been undertaken for the Project and discusses issues raised. Specifically, this section lists the Director-General's EARs and identifies where these matters are addressed in the EA;
- Section 7 outlines the risk assessment process adopted to rank all identified environmental and social issues to assist in directing the EA focus;
- Section 8 assesses the predicted environmental and social impacts and outlines the management and mitigation measures proposed for the Project;
- Section 9 presents Anglo American's statement of commitments for the Project;
- Section 10 provides a detailed justification for the Project;
- Section 11 lists abbreviations used throughout the EA; and
- Section 12 provides a list of all materials referenced within the EA.

Volumes 2 to 7 provide complete copies of all detailed technical impact assessments that form appendices to Volume 1 and support this EA.



DRAYTON SOUTH COAL PROJECT

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Regional Locality Plan

FIGURE 1

1.6 Study Team

Table 1 lists the persons involved in the preparation of this EA.

Table 1 Environmental Assessment Study Team

EA Role	Team Member and Company	
EA Management		
Project Director	James Bailey	Hansen Bailey
Project Manager	Daniel Sullivan	
Project Coordinator	Chelsea Kavanagh	
Project Support	Andrew Wu	
Stakeholder Consultation		
	James Bailey	Hansen Bailey
	Daniel Sullivan	
	Chelsea Kavanagh	
	Rick Fairhurst	Anglo American
	Matt Frodsham	
	Jason Fittler	
	Karl Jones	
	Bryn Bricknell	
Technical Studies		
Air Quality and Greenhouse Gas Impact Assessment	Judith Cox	PAE Holmes
Acoustics Impact Assessment	Mark Bridges	Bridges Acoustics
Equine Health Impact Assessment	Dr Nick Kannegieter	Specialist Equine Surgeon
Visual Impact Assessment	John van Pelt	JVP Visual Planning and Design
	David Patrick	Greenpond TSG
Ecology Impact Assessment	Dr David Robertson	Cumberland Ecology Pty Ltd
Aboriginal Archaeological and Cultural Heritage Impact Assessment	Geordie Oakes	AECOM Australia Pty Limited
Non-Aboriginal Heritage Impact Assessment	Susan Lampard	AECOM Australia Pty Limited
Surface Water Impact Assessment	Greg Roads	WRM Water and Environment
Groundwater Impact Assessment	Tim Armstrong	Australasian Groundwater and Environmental Consultants
Stygofauna Impact Assessment	Peter Hancock	Eco Logical Australia Pty Ltd
Geochemistry Impact Assessment	Dr Alan Robertson	RGS Environmental
Soil and Land Capability Impact Assessment	Jon Hilliard	Environmental Earth Sciences
Agricultural Impact Statement	Scott Barnett	Scott Barnett & Associates Pty Ltd
Traffic and Transport Impact Assessment	Damien Chee	DC Traffic Engineering
Social Impact Assessment	Belinda Hale	Hansen Bailey
Economic Impact Assessment	Robert Gillespie	Gillespie Economics
Drafting and Graphic Design	Paul Callaghan	Hansen Bailey
	Bree Dansie	
	Martin Sharp	

Existing Environment

2

Existing Environment 2

This section provides a discussion on the natural features, geology, land use, land ownership and the existing climate within and surrounding the Project Boundary.

2.1 Topography and Natural Features

The existing Drayton Mine landform comprises of:

- Areas currently being mined by Drayton Mine under existing approvals;
- Areas of completed mining which are awaiting or in the process of being rehabilitated in accordance with the approved mining operations plan (MOP);
- Surface facilities of the existing and continuing operations of Drayton Mine; and
- The Drayton Wildlife Refuge.

The topography surrounding Drayton Mine generally ranges from gently undulating to hilly landscapes, with Mt Arthur located to the south-west. The Drayton South area consists of moderate undulating foothills to steeply sloping hills over open paddock grazing land. The topographic elevation ranges from approximately Reduced Level (RL) 100 m near the Hunter River to above RL 200 m at the distinct ridgeline that dissects the Drayton South area in a north-east and south-west trend.

Wollemi National Park is located approximately 6 km south of the Project Boundary and encompasses an area of over 501,000 ha. Approximately 90% of Wollemi National Park is open eucalyptus forest, with the remainder of the land covered by woodlands, closed forest and rainforest (NPWS, 2005).

The land within the Drayton South area is primarily cleared, open paddock grazing land, with some areas of remnant forest and open woodland. Extensive erosion has occurred across much of this area due to past agricultural practices. The land adjacent to Saddlers Creek is typically flat, however, further from the creek line topography becomes undulating to hilly, with slopes between 20% and 30%.

Collectively, the Drayton Complex is at the headwaters of a group of first and second order ephemeral creeks (see **Figure 1**), including:

- Ramrod Creek, flows north-east and north-west to the Hunter River in two separate tributaries;
- Saddlers Creek, flows south-west to the Hunter River;
- Bayswater Creek, flows south-east to Lake Liddell and the Liddell Ash Dam; and
- Saltwater Creek, flows south to Plashett Dam.

Rainfall runoff from undisturbed areas within the Drayton South area generally flows north-west into Saddlers Creek before travelling south-west and entering the Hunter River.

2.2 Land Use

The Drayton Complex is located between the town centres of Muswellbrook, Jerrys Plains, Denman and Singleton, within the larger area generally described as the Upper Hunter region. This region has a long history of rural land use for a variety of agricultural and industrial activities, predominantly grazing and coal mining. The current dominant land uses within and adjacent to the Project Boundary include open cut coal mining, power generation, industrial activities, thoroughbred horse breeding, viticulture, agriculture, rural residential and urban residential areas. Each of these is discussed further below in relation to the Drayton Complex.

2.2.1 History of Settlement and Development

The Upper Hunter region was first settled in the early 1800s by agriculturalists that extensively cleared native vegetation for grazing and farming. This quickly expanded to satisfy the need for agricultural produce. At the time, coal had been mined at and around Newcastle and was found to also occur in the Upper Hunter with some small attempts at recovery from the early 19th century. The first material coal mining commenced at the Muswellbrook Colliery in 1906. Since then and particularly from the 1980s, coal mining in the area has significantly intensified to meet the growth and the industrialisation of NSW and Asia.

Prior to the 1960s, land use in the Project Boundary and its surrounds was dominated by rural activity focussed on dairy farming and intensive agriculture along the alluvial flats of the Hunter River and its tributary streams. The more fertile, ephemeral, low rolling hills were utilised typically for broad scale farming, cropping and horse breeding which then extended to larger areas of less fertile and steeper country suitable for cattle and sheep grazing.

From the 1960s, land ownership intensified into smaller holdings and the population of settlements began to grow. During the 1980s, large areas of land, including the Drayton

South area, were identified as having significant in situ coal resources and were acquired for mining purposes.

Since the establishment of the Liddell Power Station in the late 1960s and the Bayswater Power Station in the 1980s, coal mining and electricity generation have been a significant land use and dominant contributor to the economy of the Upper Hunter region.

During the industrialisation of NSW, the intensified demand for electricity and thereby coal resulted in a rapid increase in coal mining. This was governed by the then Electricity Commission of NSW taking up coal areas itself, one of which was the Drayton South area.

2.2.2 Mining

Coal mining makes an important contribution to the economy of the Upper Hunter region. According to the *Upper Hunter Economic Diversification Report* (Buchan Consulting, 2011), the coal 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 significantly more than any other sector (Buchan Consulting, 2011).

As described in **Section 2.2.1**, coal mining commenced in the Upper Hunter region in 1906 with the establishment of the Muswellbrook Colliery. Since then mining activities have significantly expanded within the region, particularly in the vicinity of the Project.

The Drayton South area, which has previously been referred to as Mount Arthur South and later Saddlers Creek, has long been identified as a viable coal resource area.

Exploration of the Drayton South area was initially undertaken during the late 1940s and early 1950s by the then Bureau of Mineral Resources. Further exploratory drilling work was undertaken by the Joint Coal Board, the Electricity Commission of NSW and the Department of Mines during the 1960s and 70s.

A more targeted drilling program was undertaken by MASCL during the late 1970s and early 80s as part of the Mount Arthur South Coal Project. Following this in 1982, MASCL submitted an application for planning approval for coal mining within the same area as the Project. A DC was granted by the then Minister for Planning on 22 September 1986 followed by a subsequent Mining Lease in 1989. The DC and Mining Lease lapsed in 1991 and 1994, respectively, due to failure to physically commence the project. In 1998, Anglo American was granted EL 5460 over the Drayton South area.

Table 2 identifies existing approved coal mining operations in the vicinity of the Project.

There are also a number of prospecting projects located within the vicinity of the Drayton South area (see **Table 3**).

Table 2 Approved Coal Mining Operations

Mine	Distance and Location Relative to Project	Description of Operation	Approval Expiration
Drayton Mine	North	Open cut of up to 8 Mtpa ROM coal	2017
Mt Arthur Coal Mine	North-west	Open cut and underground of up to 36 Mtpa ROM coal	2022
Hunter Valley Operations Coal Mine	5 km west	Open cut of up to 38 Mtpa ROM coal	2030
Muswellbrook Coal Mine	7 km north	Open cut of up to 2 Mtpa ROM coal	2015
Mangoola Coal Mine	8 km north-west	Open cut of up to 10.5 Mtpa ROM coal	2029
Bengalla Coal Mine	8 km north-west	Open cut of up to 10.7 Mtpa of ROM coal. Application to increase to 15 Mtpa ROM coal (pending)	2017
Mount Pleasant Project	9 km north	Open cut of up to 10.5 Mtpa (not operating)	2020

Table 3 Prospecting Projects

Project	Mining Authorities	Location Relative to Project	Description of Project
Dellworth	EL 6812 and EL 6594	East	Exploration drilling commenced
Spur Hill	EL 7429	West	Exploration drilling and project planning
Doyles Creek	EL 7270	4 km south	Proposed underground of up to 8 Mtpa
West Muswellbrook	AL 19	7 km north-west	Exploration drilling commenced

2.2.3 Power Generation and Other Industries

The Liddell and Bayswater Power Stations, both owned by Macquarie Generation, are located a short distance to the east of the Drayton Complex. The Bayswater Power Station, commissioned in 1985, utilises four 660 megawatt (MW) generating units to produce approximately 16,000 gigawatt hours (GWh) of electricity annually. The Liddell Power Station, commissioned in 1969, contains four 500 MW generating units producing approximately 10,000 GWh of electricity annually.

Each year Macquarie Generation produces approximately 13% of the electricity demand for eastern Australia, from South Australia through to Northern Queensland. This is equivalent to 40% of the electricity demand of NSW, making Macquarie Generation's Hunter Valley based operations among Australia's largest electricity providers.

The land to the immediate east of the Drayton Complex is owned by Macquarie Generation and forms part of the buffer lands for their power stations. This land includes Plashett Dam, a 65,000 megalitre (ML) storage, which is one of Macquarie Generation's primary sources of water. It captures water from much of the Saltwater Creek catchment and also receives pumped inflows from the Hunter River.

On 12 January 2010, the Department of Planning granted Concept Approval for the Bayswater B Power Station. This is a proposed coal or gas fired power station to be constructed on Macquarie Generation's landholdings to the immediate east of the Project Boundary.

The Muswellbrook Industrial Estate is located on Thomas Mitchell Drive to the immediate north of the Project Boundary near Drayton Mine. This estate is comprised of a variety of businesses that provide support services to the mining sector and other industries.

2.2.4 Thoroughbred Breeding

Two of the premier thoroughbred horse studs in NSW, Woodlands Stud and Coolmore Stud, are located to the immediate south of the Project Boundary. These studs are currently owned and operated by Darley Australia and Coolmore Australia, respectively.

The Woodlands property was first developed as a horse stud in 1908. Following the purchase of the property by Lord Derby in 1971, Woodlands was developed into a major private racing enterprise. The Ingham brothers conducted large scale thoroughbred breeding operations on the property until 2008, when Woodlands Stud was purchased by Darley Australia. By this time, the DC and Mining Lease for the Mount Arthur South Coal Project had lapsed. However, EL 5460 had been granted over the land comprising the Drayton South area in 1998, which included a portion of the Woodlands property.

Coolmore Stud is situated on the former Arrowfield, Strowan and Oak Range properties.

The Bowman family originally used the Arrowfield property for farming and grazing in conjunction with thoroughbred breeding from 1912 to 1924. In the 1970s, the property was acquired by WR Carpenter Holdings Limited. This enterprise was operational at the time MASCL was granted DC and a Mining Lease for the Mt Arthur South Coal Project. The Bowman family also operated a Clydesdale Stud on the Strowan property.

In 1986, the Arrowfield, Strowan and Oak Range properties were purchased by Australian Racing and Breeding Stables Ltd, which later changed its name to the Arrowfield Group. They removed all but about 150 acres of the grape vines and established a horse stud. Coolmore Australia purchased these properties from the Arrowfield Group in 1991 and has since acquired a number of other adjoining properties, many of which operated as existing dairies, to extend their horse breeding enterprise. Coolmore Australia established Coolmore Stud in 1991 at which time, MASCL held a valid DC and Mining Lease over Mt Arthur South (now known as the Drayton South area).

Prior to the emergence of Coolmore Australia and Darley Australia in the region, there were existing coal mining operations at Drayton Mine, Mt Arthur Coal Mine, Hunter Valley Operations Coal Mine and Wambo Coal Mine, as well as operations at the Bayswater and Liddell Power Stations.

According to the *Upper Hunter Economic Diversification Project Report* (Buchan Consulting, 2011), it is estimated that thoroughbred breeding within the Upper Hunter region generated revenues of approximately $100 M.

The Strategic Regional Land Use Plan – Upper Hunter (SRLUP) (DP&I, September 2012) identifies a Critical Industry Cluster

(CIC) for thoroughbred breeding both within parts of the Project Boundary and its vicinity. Coolmore Stud and Woodlands Stud form the core of this cluster and are located to the south of the Project. The SRLUP is discussed further in Section 5.

2.2.5 Agriculture and Viticulture

The Project is located on lands that have been largely disturbed by previous agricultural activities, particularly cultivation and grazing. Agriculture has been conducted in the region since the Muswellbrook area was first inhabited by European settlers in 1824. As a result of extensive agriculture, the land within the Project Boundary largely consists of grassland interspersed with small woodland remnants.

The Hunter River meanders south from Glenbawn Dam to Denman and then east towards Newcastle. The Hunter River passes immediately to the south of the Project Boundary. The Hunter River and its alluvial floodplain support a wide range of agricultural activities including grazing, dairy farming, lucerne hay production and in the past viticulture.

There are various dairy and lucerne farms located along the Golden Highway, to the south-east and west of the Project Boundary.

The former Arrowfield Estate winery is located to the immediate south of the Project Boundary. In the 1970s the Arrowfield property was acquired by WR Carpenter Holdings Limited who established a 1,000 acre vineyard and winery on the site. Following acquisition in 1986 by Australian Racing and Breeding Stables Ltd (now known as the Arrowfield Group), all but about 150 acres of the grape vines were removed.

In 2010, Arrowfield Estate was closed down and wine making infrastructure was removed. The property has recently been acquired by Hollydene Estate and does not currently operate as a vineyard or winemaking enterprise.

According to the *Upper Hunter Economic Diversification Project Report* (Buchan Consulting, 2011), it is estimated that agricultural production in the Upper Hunter region generated revenues of up to $248 M in 2009 with viticulture generating revenues of $45 to $55 M.

The SRLUP identifies a CIC for viticulture both within parts of the Project Boundary and its vicinity. The former Arrowfield Estate winery is the only existing winery in the immediate vicinity of the Project. The SRLUP is discussed further in Section 5.

2.2.6 Rural and Residential Developments

The township of Muswellbrook is located approximately 13 km to the north of the Drayton Complex. Muswellbrook is situated on the New England Highway approximately 25 km south of Scone and 50 km north-west of Singleton. The rural township of Denman is located approximately 10 km west of the Drayton Complex. Denman has a population of approximately 1,500 (MSC, 2012). Both townships of Muswellbrook and Denman are situated in the Muswellbrook LGA, which is estimated to have a population of 16,676 (Australian Bureau of Statistics, 2011).

The small rural township of Jerrys Plains is situated approximately 10 km to the south-east of the Drayton Complex. Jerrys Plains falls within the Singleton LGA.

There are private landholdings to the north of the Project Boundary near the existing Drayton Mine, including the Antiene Estate, and rural-residential properties to the south-east and south-west of the Project Boundary near the Drayton South area. The Wolfgang family whom are prominent graziers in the LGA own several rural properties adjacent to the western extent of the Project Boundary.

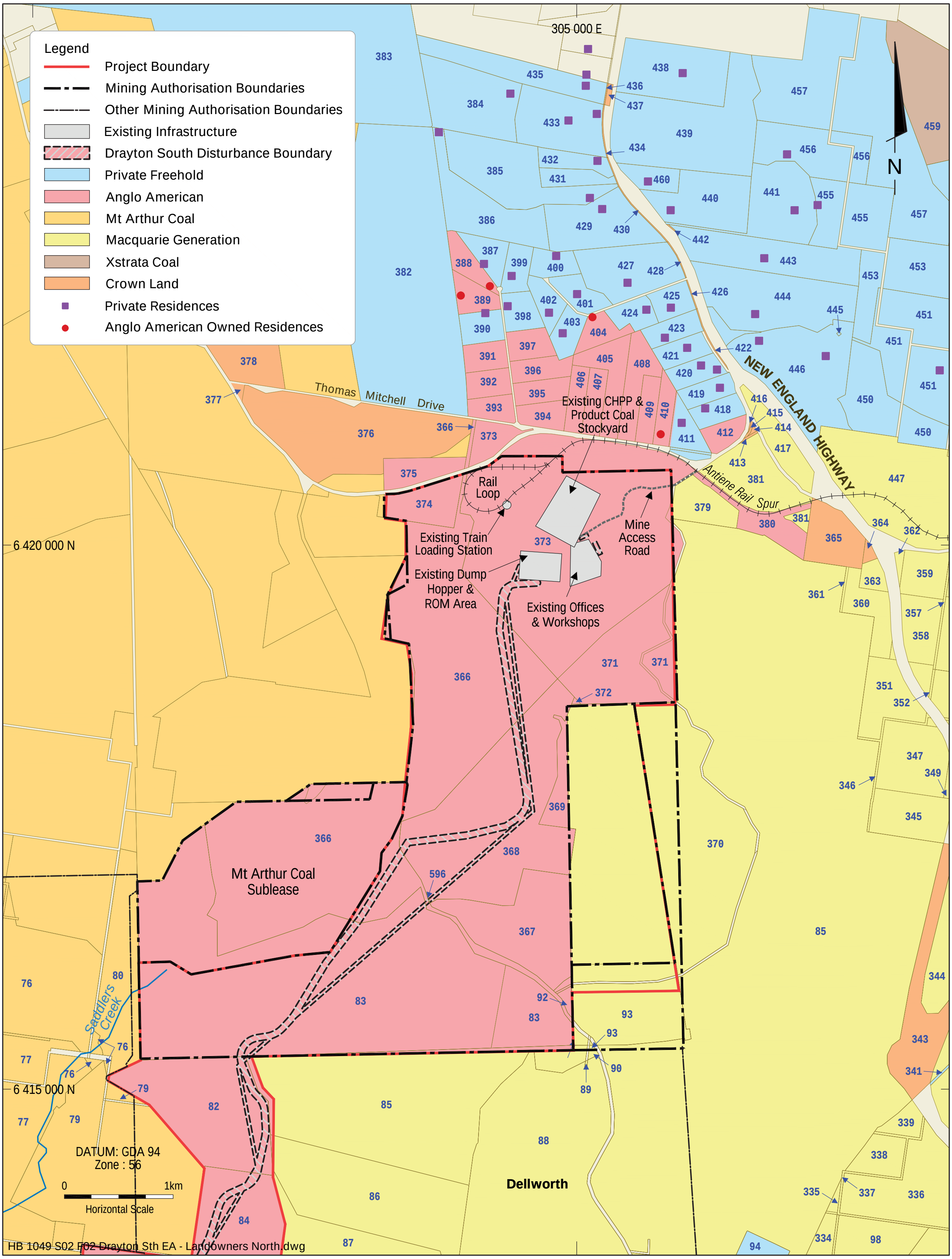
2.2.7 National Parks

Wollemi National Park is located approximately 6 km to the south of the Project Boundary. The next closest national park is Goulburn River National Park, which is situated approximately 22 km to the north-west.

2.3 Land Ownership

Land ownership within and surrounding the Project Boundary is shown on Figure 2 and Figure 3. All of the land required for the Project is currently owned by Anglo American, with the exception of a parcel of land required for the proposed realignment of Edderton Road. This land is owned by HVEC who also owns the majority of land to the immediate north of the Project, including Mt Arthur Coal Mine.

Darley Australia and Coolmore Australia have considerable land holdings to the south of the Project Boundary. Arrowfield Estate, which is also situated to the south of the Project Boundary has recently been purchased by Hollydene Estate. Land to the east is owned by Macquarie Generation and extensive land to the west and south-west is held by the Wolfgang family.



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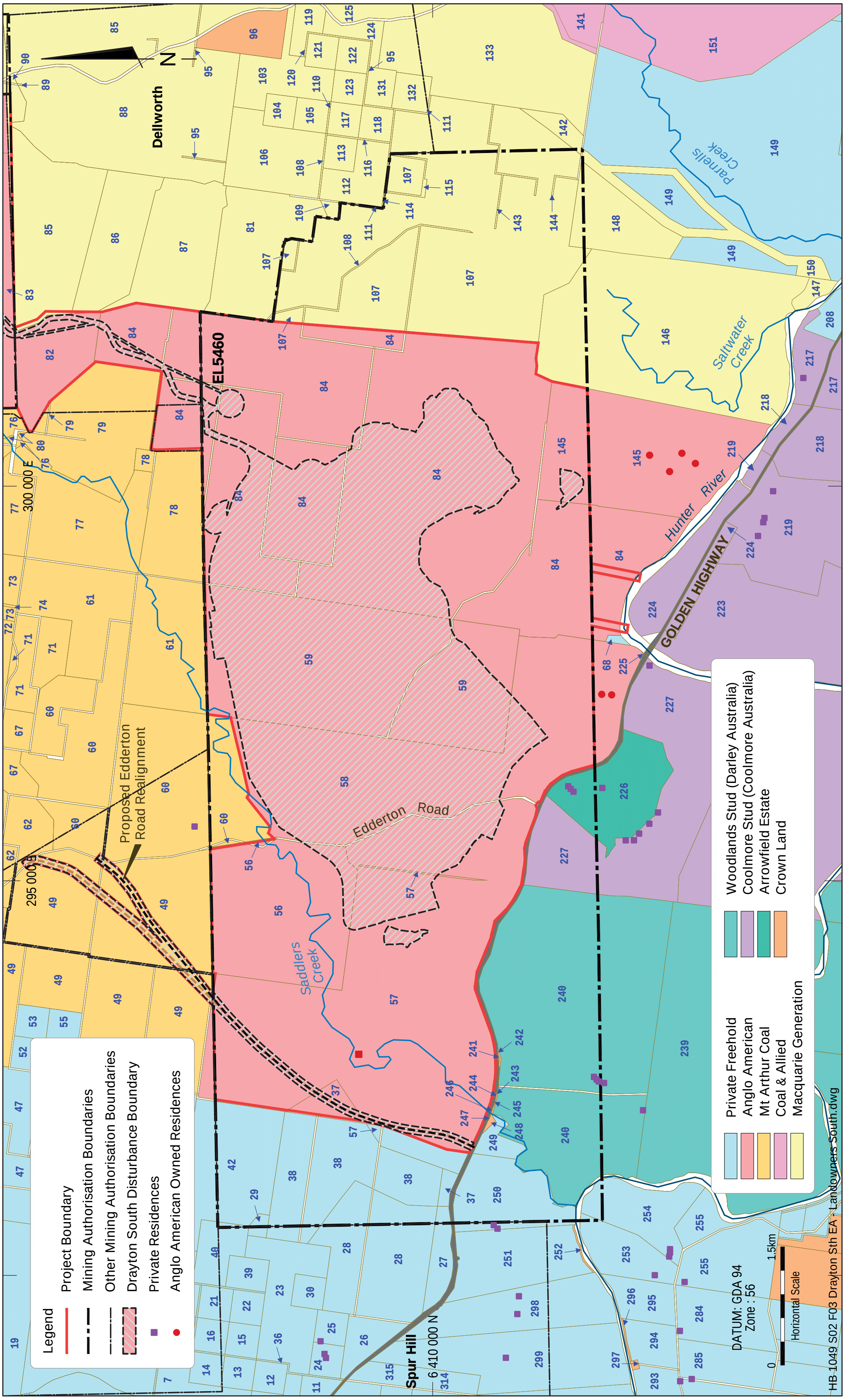
Land Ownership (North)

FIGURE 2



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Land Ownership (South)

FIGURE 3

AngloAmerican

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

2.4 Climate

The Upper Hunter region experiences a warm temperate climate, characterised by seasonal variations between 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.

In addition to data sourced from Anglo American's Drayton Mine and Drayton South meteorological stations, data from the Bureau of Meteorology's (BoM) monitoring stations at Jerrys Plains and Scone have been relied upon during the preparation of this EA. The locations of these stations relative to the Drayton Complex and their recording periods are outlined in Table 4. Meteorological data is summarised in Table 5 and discussed below.

2.4.1 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 (see Table 5). January is the warmest month, with a mean 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. Based on studies of noise enhancing conditions for nearby mining projects, it is common for temperature inversions to occur in the Upper Hunter region under these conditions.

Humidity levels vary throughout the year and are dependent on seasonal variations. Mean morning humidity levels (at 9:00 am) range from 59% to 80%. Mean afternoon humidity levels (at 3:00 pm) range from 42% to 54%. The spring months generally experience lower humidity than rest of the year. A summary of temperature and humidity data is provided in Table 5.

2.4.2 Rainfall

Rainfall in the Upper Hunter region is summer dominant, with falls peaking in summer and declining in winter. The mean monthly rainfall measured at Jerrys Plains varies from 36.5 mm in August to 77.0 mm in January with the mean annual rainfall being 644.7 mm, falling over 67 rain days. A summary of the rainfall data for the region is provided in Table 5. Rainfall within the Drayton South area has recently been significantly lower than the regional mean, with a mean annual rainfall of 521.6 mm.

In summer, rainfall is generally due to low pressure troughs and an increased maritime influence, with onshore winds extending as far inland as Muswellbrook. This generates intense thunderstorms, accounting for the higher and more intense rainfall. The variation in rainfall patterns across the Upper Hunter region have been considered when preparing the surface water and groundwater impact assessments for the Project.

2.4.3 Evaporation

Data from the BoM's Scone Meteorological Station was used to assess evaporation trends for the Upper Hunter region (see Table 5) as the Jerrys Plains and Drayton South meteorological stations are unable to record evaporation data.

A direct correlation exists between higher evaporation and higher temperatures and afternoon winds. As a result, evaporation rates are highest in the summer.

The mean monthly pan evaporation rate ranges from 48 mm in June to 220.1 mm in January and December (see Table 5). In the Upper Hunter region, the evaporation rate exceeds the rainfall.

2.4.4 Wind Speed and Direction

The annual and seasonal windroses provided in Figure 4 depict the wind speeds experienced within the Drayton South area. These windroses were prepared using data from the Drayton South meteorological station. These show that the Drayton South area predominately receives winds from the south-east during summer and from the north-west during winter. Autumn and spring months experience a combination of these wind conditions.

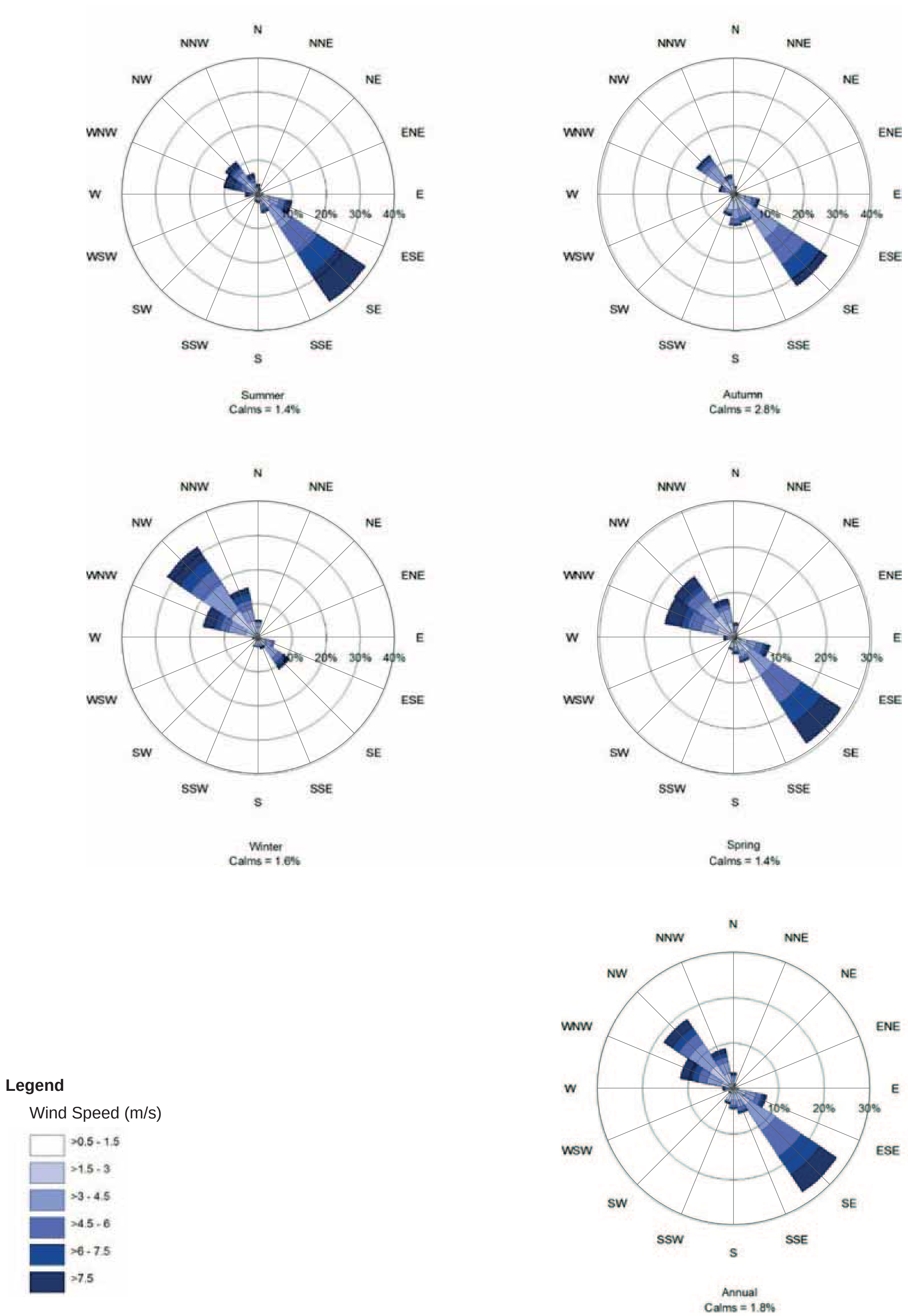
Table 4 Meteorological Stations

Name	Operator	Station No.	Location	Period of Record
Jerrys Plains	BoM	061086	Approximately 6 km south-east of Project Boundary	1884 – current
Scone	BoM	061089	Approximately 21 km north of Project Boundary	1950 – current
Drayton Mine	Anglo American	N/A	Near north-eastern section of the Drayton Complex	1981 – current
Drayton South	Anglo American	N/A	Near southern section of the Drayton Complex	1998 – current

Table 5 Meteorological Data Summary

Month	Mean Daily Temperature (°C) Jerrys Plains Min.	Drayton South Max.	Jerrys Plains Min.	Drayton South Max.	Mean Monthly Rainfall (mm) Jerrys Plains	Drayton South	Mean Monthly Rain Days Jerrys Plains	Drayton South	Mean Monthly Relative Humidity (%)* 9 am	3 pm	Mean Monthly Evaporation (mm)*
Jan.	17.1	31.7	17.8	29.6	77.0	52.7	6.4	4.6	67	47	220.1
Feb.	17.1	30.9	17.4	28.9	72.4	87.0	5.9	6.1	72	50	175.2
Mar.	15.0	28.9	15.0	25.7	58.3	40.3	5.7	5.4	72	49	155.0
Apr.	11.0	25.3	11.7	22.5	44.5	27.5	4.9	4.1	72	49	105.0
May	7.5	21.3	8.0	19.3	40.9	26.4	4.9	3.9	77	52	68.2
June	5.3	18.0	6.4	15.9	48.1	57.8	5.5	6.5	80	54	48.0
July	3.8	17.4	6.4	15.3	43.5	26.2	5.2	4.2	78	51	55.8
Aug.	4.4	19.4	6.0	17.6	36.5	33.4	5.2	4.3	71	45	83.7
Sept.	7.0	22.9	8.7	20.7	42.0	31.7	5.2	4.5	65	43	117.0
Oct.	10.3	26.2	12.0	24.6	52.1	33.3	5.9	3.7	59	42	155.0
Nov.	13.2	29.1	13.8	25.8	61.1	58.5	6.2	7.5	60	42	183.0
Dec.	15.7	31.3	15.8	28.3	67.9	46.8	6.4	6.3	61	42	220.1
Annual Mean	10.6	25.2	11.5	22.8	644.7	521.6	67.4	61.1	70	47	1586.1

*Scone Meteorological Station Source: BoM, 2011



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Windroses within the Drayton South Area

FIGURE 4

2.5 Geology

2.5.1 Exploration

Prior to Anglo American's involvement, four main phases of exploration were conducted in the Drayton South area:

- Drilling by the Bureau of Mineral Resources in the 1940s and 1950s;
- Regional drilling by the Joint Coal Board, the Electricity Commission and Department of Mines from 1968 to 1976;
- Drilling for the Mount Arthur South Coal Project between 1978 and 1982; and
- Drilling of over 130 boreholes by Carpentaria ex / Mount Isa Mines Limited in the course of mining and feasibility studies between 1975 and 1993.

Following the lease acquisition in 1998, Anglo American commenced exploration activities over the Drayton South area. The objective of these combined exploration programs has been to assess the quantity, quality and overall extent of the coal resource. Recent geological data has been acquired through a combination of methods including:

- Core and rotary drilling (including down-hole geophysics, geotechnical and quality testing);
- Large diameter drilling;
- Aerial and ground magnetic and radiometric surveys; and
- 2D and 3D seismic surveys.

Further detailed exploration for targeted resource definition and detailed design will be conducted within EL 5460 prior to the commencement of mining operations.

2.5.2 Stratigraphy

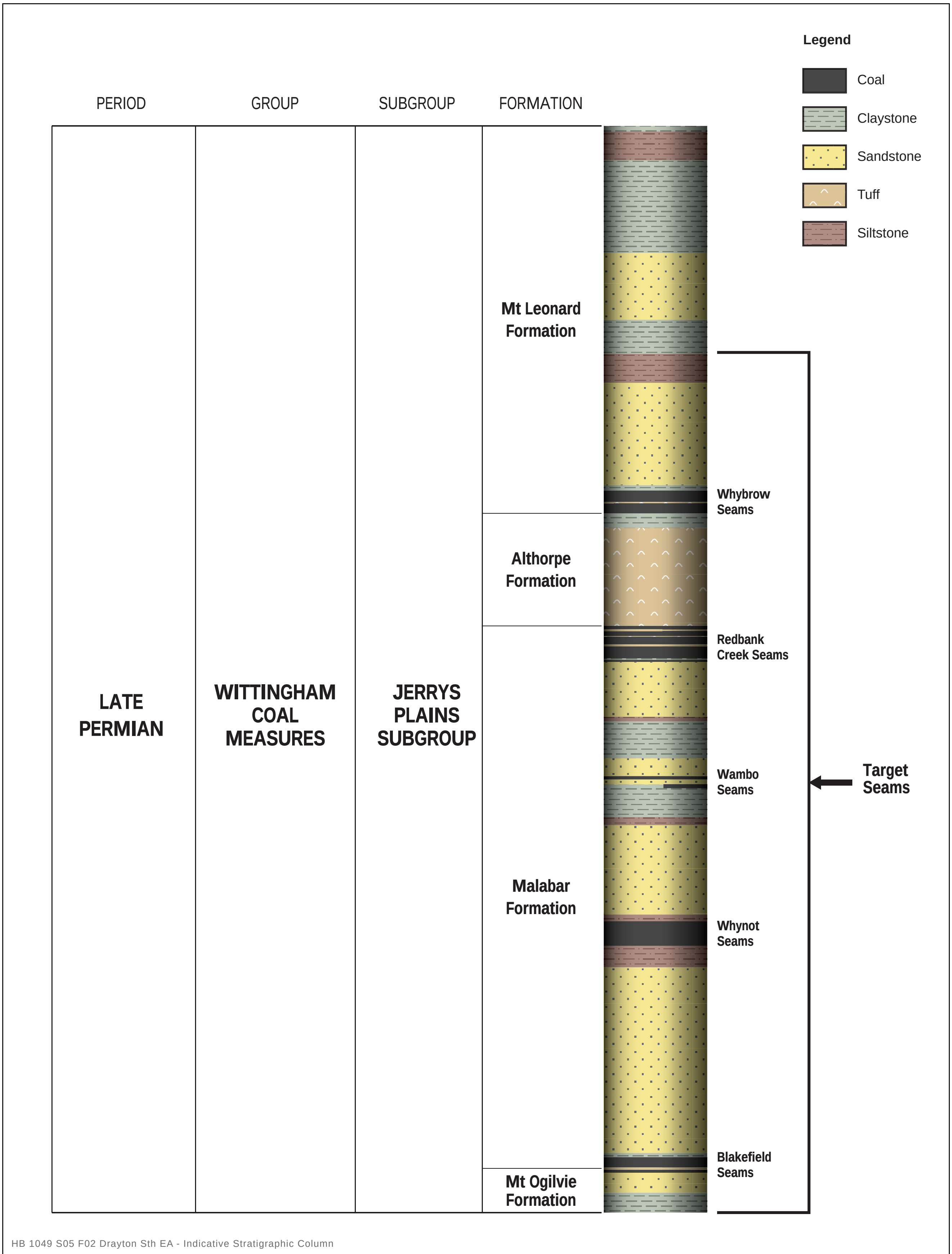
The Drayton South area is located in the northern Hunter Coalfield on the western side of the Muswellbrook Anticline. Strata of the late-Permian Wittingham Coal Measures outcrop through the north-east of the area and generally dip gently to the south-west. The five target seam sequences sought after by the Project are contained within the Jerrys Plains subgroup, where interbedding typically consists of lithic sandstones, shales, siltstones and claystones. A typical stratigraphic column within the Drayton South area is shown in Figure 5.

The Permian stratigraphy is unconformably overlain by Tertiary and Quaternary alluvial and colluvial deposits, visible along parts of Saddlers Creek and Saltwater Creek.

2.5.3 Reserves and Resource Utilisation

Exploration drilling and pre-feasibility studies have identified an estimated in situ coal resource of 556 Mt within EL 5460, of which 119 Mt is planned to be recovered using open cut and highwall mining methods as part of the Project.

As part of the Project planning phase 53 Mt of coal was removed from the Project mine plan and effectively sterilised to address potential environmental issues and stakeholder concerns (further details are provided in Section 4 and 6). Significant additional coal resources exist within EL 5460 below the proposed open cut that may facilitate an underground mining development in the future.



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Indicative Stratigraphic Column

FIGURE 5

Approved Operations

3

Approved Operations 3

This section describes the approved operations at Drayton Mine, including a description of the current mining activities, coal handling and processing and infrastructure. It also provides a description of the existing environmental monitoring program (EMP) that conforms to the Anglo American Safety, Health, Environment and Community Management System (SHECMS) accredited to International Standards Organisation (ISO) 14001 standards.

3.1 Background

Drayton Mine commenced production in 1983 and currently operates under PA 06_0202 granted on 1 February 2008. The mine predominately produces steaming coal for the export market at a maximum of 8 Mtpa of ROM coal. The Antiene Rail Spur (approved under DC 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. PA 06_0202 expires in 2017 and DC 106-04-00 expires on 2 November 2025.

A modification (MOD 1) to PA 06_0202 was granted by the then Minister for Planning on 16 October 2009 to allow an 8 ha extension of the approved mining disturbance footprint to the north and the establishment of a new conservation area to provide an appropriate offset for this additional disturbance.

A second modification (MOD 2) to PA 06_0202 was granted by the Minister for Planning and Infrastructure on 17 February 2012 to facilitate the development of an explosives storage facility and the disposal of raw tailings within the East Void, rather than the co-disposal of dry product as previously approved.

3.2 Coal Mining

Mining operations at Drayton Mine currently occur within three mining authorities; Mining Lease 1531, Coal Lease (CL) 229 and CL 395. Five key coal seams are targeted in the operation, including the Broughams, Grasstrees, Thiess, Puxtrees and Balmoral seams, which are situated in the Rowan Formation of the Greta Coal Measures.

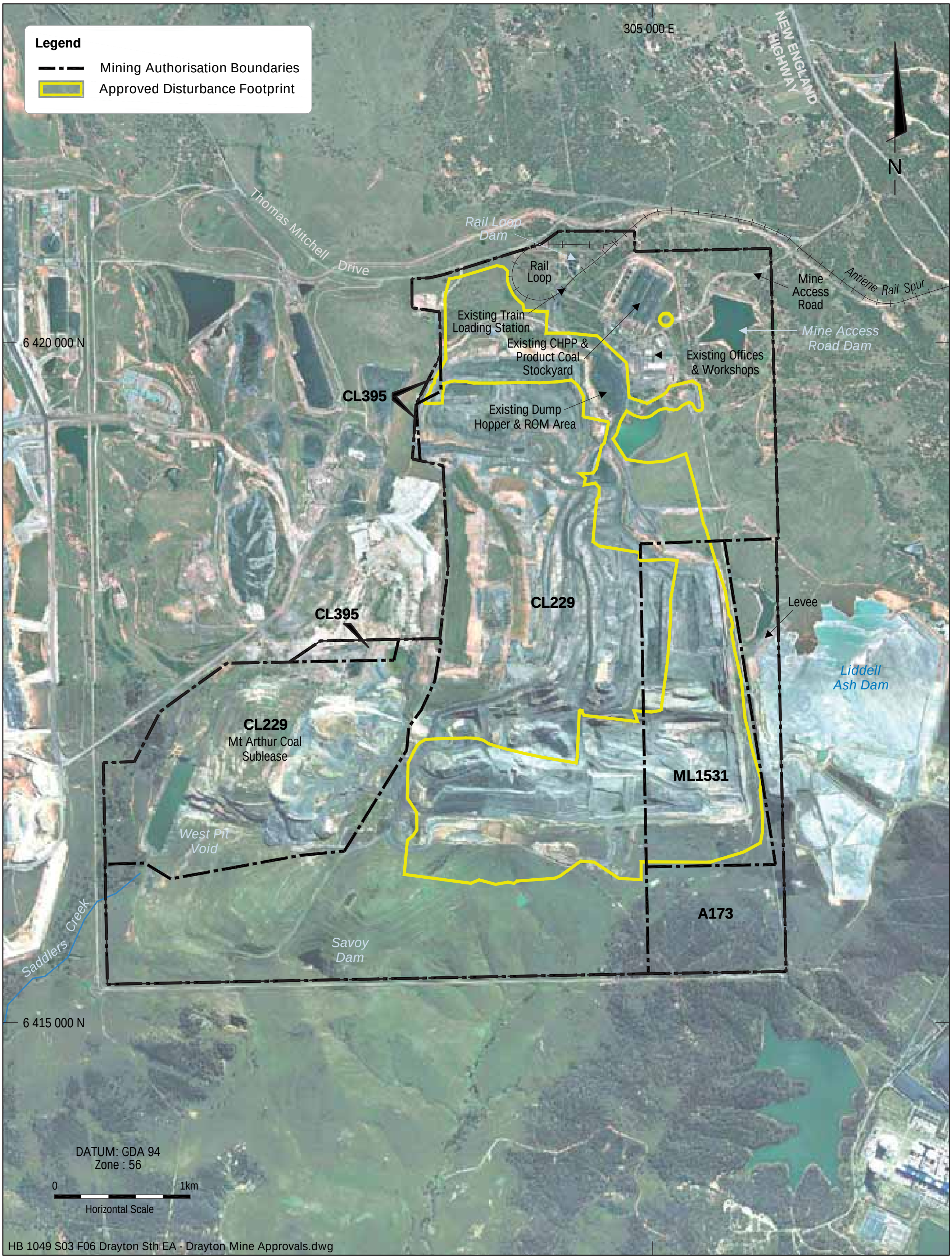
Drayton Mine is an open cut operation where mining advances based on dragline strips. Pre-stripped overburden is removed by a loader and/or excavator and trucks ahead of the dragline operation. Loaders and/or excavators are utilised for coal extraction supported by a fleet of haul trucks, which transport ROM coal to the Coal Handling and Preparation Plant (CHPP) for processing. Mining activities occur up to 24 hours per day, seven days a week facilitated by a workforce of 530 employees and full time equivalent contractors.

The mining disturbance footprint as currently approved is shown on Figure 6.

3.3 Coal Handling, Processing and Transport

Coal handling and processing occurs at the Drayton Mine CHPP located adjacent to coal loading and mine site facilities as shown in Figure 7. The Coal Handling Plant has the capacity to process up to 2,000 tonnes per hour (tph) of ROM coal via a three stage crushing and screening process.

Trucks deliver ROM coal directly from the open cut mining areas to the ROM hopper, which feeds the primary sizer. ROM coal may also be temporarily stored at the raw coal stockpile for rehandling into the ROM hopper at a later stage by a front end loader. Once placed into the ROM hopper, the ROM coal



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Drayton Mine Approved Operations

FIGURE 6

is fed through a primary sizing station, which crushes and reduces the size of the material. A pass through the secondary sizing station further reduces the size of the ROM coal before passing over a vibrating screen where material less than 50 mm falls through. Residual material is further reduced in size by a tertiary crusher to ensure all ROM coal is at 50 mm.

Crushed coal can be directed to the Coal Preparation Plant (CPP) or by-passed direct to the product coal stockpiles. The CPP washes a portion of the coal to remove coarse rock and fine tailings material, which typically is composed of coal-affected water, mineral matter, carbonaceous shale and misplaced coal. This material represents the waste products of the coal preparation process prior to the coal being conveyed to the product coal stockpiles.

After being fed through or by-passing the CHPP, the coal is delivered to one of four product coal stockpiles using a chevron stacking method. The product coal is arranged in layers on top of each other in a longitudinal direction as the stacker moves back and forth over the centre line of the stockpile. This method causes size segregation of the coal with fine material in the central section of the stockpile and coarse material on the surface and moving out towards the base. Each stockpile has a capacity of approximately 80,000 t.

The product coal is blended using a reclaimer working from the face of the stockpile across the entire cross section. Product coal is reclaimed by three bridge bucket-wheel type reclaimers, which have a combined capacity of up to 4,000 tph. One reclaimer is located permanently on stockpile 4 whereas the other two reclaimers can be relocated across stockpiles 1 to 3 as required.

Product coal is delivered via a conveyor to the rail load out facility, where export coal is transported to the Port of Newcastle via the Antiene Rail Spur and Main Northern Railway. The rail load out facility has two 1,700 t capacity bins capable of a combined train loading rate of 3,500 tph.

3.4 Rejects and Tailings Disposal

Rejects are transferred to a rejects bin via a conveyor system from the CPP. This material is then loaded onto haul trucks and transported to the East (North) Pit for blending with overburden. Tailings are pumped directly from the CPP to the East (South) Void to the approved level of RL 104 m, which is forecast to occur in 2017. This area will then be capped at RL 106 m as per arrangements with Macquarie Generation. Water is decanted during the transfer and recycled via the mine's water management system.

3.5 Supporting Infrastructure

The approved operations at Drayton Mine are supported by a range of surface infrastructure (see Figure 7), including:

- Administration building;
- Operations building, including bath house facilities;
- Workshop and storage complex, including explosives storage;
- Heavy and light vehicle wash station facilities;
- Bulk fuel and lubricant storage and dispensing facilities;
- Waste management systems, including sewage treatment facility supported by septic tanks and offsite domestic waste transfer arrangements; and
- Parking facilities.

3.6 Existing Biodiversity Offsets

Drayton Mine established the Drayton Wildlife Refuge in 1987 under section 68 of the *National Parks and Wildlife Act 1974* (NPW Act). The refuge designates specific areas for wildlife conservation while reserving other areas for mining and grazing purposes. Following the approval of MOD1 in 2009, two additional offset areas were created; the Modification Offset Area and the Southern Offset Area. Both offset areas have been incorporated into and managed in accordance with the Drayton Wildlife Refuge (see Figure 8).

Further areas of natural remnant vegetation, also referred to as the *'Natural Zone'*, are also managed to improve the condition and enhance connectivity of native flora and fauna.

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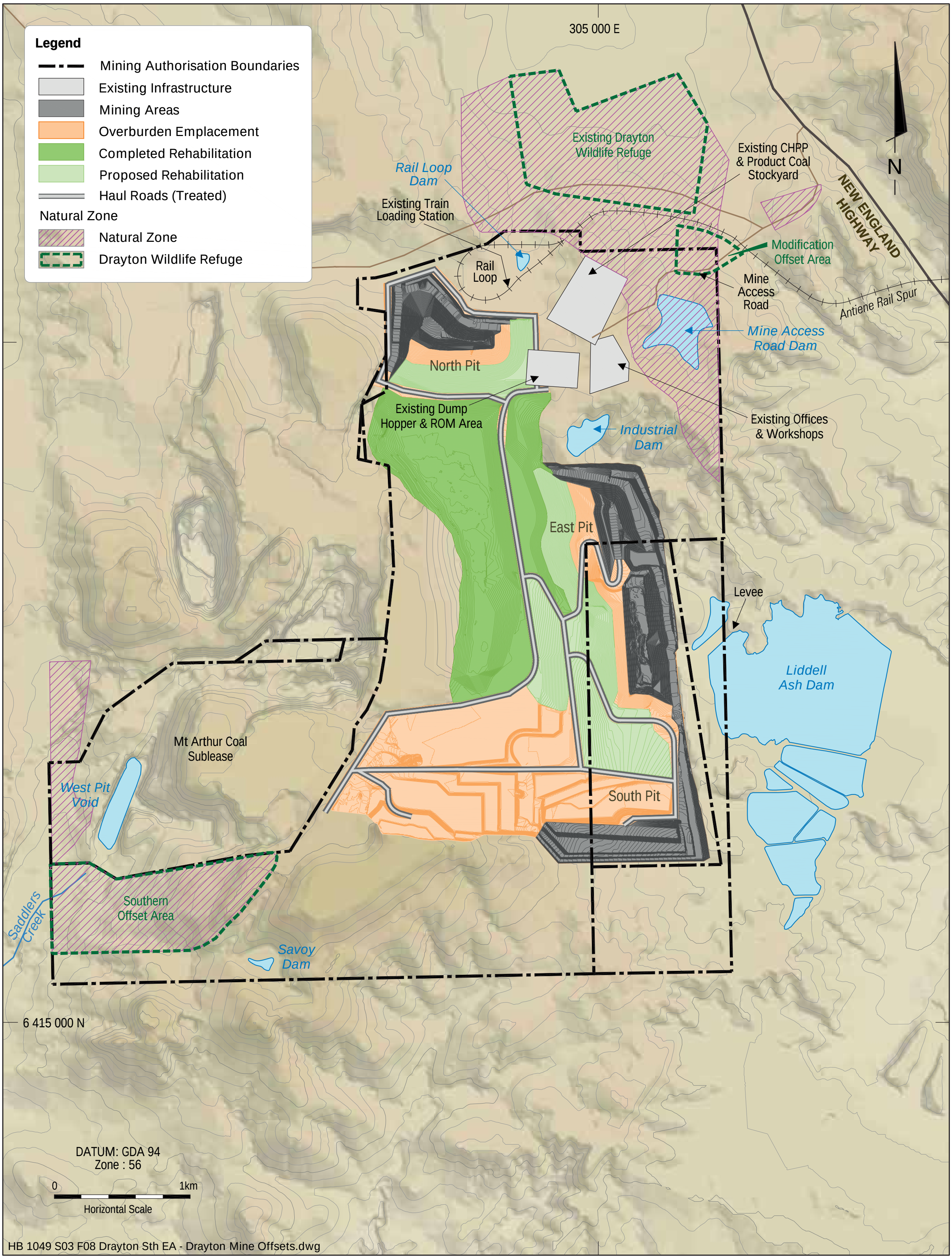
Drayton Mine Existing Mine Site Facilities

FIGURE 7



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Drayton Mine Existing Biodiversity Offsets

FIGURE 8

3.7 Existing Regulatory Approvals

The existing approvals at Drayton Mine and within the Drayton South area are described in Section 3.7.1 and 3.7.2, respectively.

3.7.1 Drayton Mine

Operations at Drayton Mine are approved under a number of separate planning approvals, mining authorisations and other permits and licences.

Table 6 outlines the status of licences and approvals relevant to the existing Drayton Mine.

3.7.2 Drayton South Area

The Drayton South area, which has previously been known as Mount Arthur South and Saddlers Creek, has long been identified as having a significant in situ coal resource. Prospecting for coal within the Drayton South area commenced in the late 1940s with exploration intensifying during the 1960s and 1970s. In 1979, the NSW government issued a prospecting authority for coal (Authority 169) to the Electricity Commission of NSW with respect to the Drayton South area.

In 1982, MASCL submitted an application for planning approval for coal mining in the Mt Arthur South area. A DC was granted by the Minister for Planning on 22 September 1986 followed by a Mining Lease on 22 August 1989. The DC and Mining Lease lapsed in 1991 and 1994, respectively, due to failure to commence the project.

Table 6 Drayton Mine Existing Licences and Approvals

Ref.	Approval Number	Approval Document	Approval Authority	Approval Term
1	PA 06_0202	Drayton Mine Extension	Minister for Planning	01/02/2008 - 31/12/2017
2	PA 06_0202 MOD1	Drayton Mine Modification 1	Minister for Planning	16/10/2009 - 31/12/2017
3	PA 06_0202 MOD2	Drayton Mine Modification 2	Minister for Planning	17/02/2012 – 31/12/2017
4	DC 106-04-00	Antiene Joint User Rail Facility	Minister for Planning	02/11/2000 - 02/11/2025
5	ML 1531	Mining Lease 1531	Minister for Minerals	26/02/2003 - 25/02/2024
6	CL 229	CL229	Minister for Minerals	03/02/1982 - 02/02/2024
7	CL 395	CL395	Minister for Minerals	23/06/1992 - 21/01/2029
8	A 173	Authorisation 173	Minister for Minerals	31/08/1979 - 31/08/2013
9	20BL171953	Groundwater Bore Licence	NOW	27/08/2008 – Perpetuity
10	20BL171954	Groundwater Bore Licence	NOW	27/08/2008 – Perpetuity
11	20BL171955	Groundwater Bore Licence	NOW	27/08/2008 – Perpetuity
12	20BL171956	Groundwater Bore Licence	NOW	27/08/2008 – Perpetuity
13	20BL171957	Groundwater Bore Licence	NOW	27/08/2008 – Perpetuity
14	20BL171958	Groundwater Bore Licence	NOW	23/02/2010 – 22/02/2015
15	10952	Fixed Radiation Gauge Registration	Office of Environment and Heritage	20/06/2011 – 30/06/2013
16	939	Fixed Radiation Gauge Registration	Office of Environment and Heritage	02/02/2010 – 02/02/2014
17	31157	Licence to Sell / Possess Radioactive Substances	Office of Environment and Heritage	29/02/2008 – 10/03/2014
18	1323	Environmental Protection Licence	Office of Environment and Heritage	21/12/2011 – 21/12/2016
19	35/019387	Dangerous Goods Notification	WorkCover NSW	Expires 18/03/2012*
20	07-100017-001	Dangerous Goods Licence to Store	WorkCover NSW	Expires 08/05/2016
21	317541026001	Emplacement Area Approval	Department of Trade and Investment, Regional Infrastructure and Services	23/04/2007 – 2017

**Renewal application submitted on 06/03/2012*

Anglo American was granted EL 5460 in 1998, the status of which is shown in Table 7. Since then, exploration activities have been undertaken to determine the extent and economic value of the coal resource.

Anglo American currently hold two general security Water Access Licences (WAL) under the Water Sharing Plan (WSP) for the Hunter Regulated River Water Source (WAL 491 and 1066), which provide an allocated share of 99 units each (198 units combined) for irrigation purposes.

Drayton South also holds a number of other ancillary environmental licences and approvals to conduct monitoring and associated activities (see Table 7).

3.8 Safety, Health, Environment and Community Management System

Drayton Mine operates under a SHECMS which is accredited to ISO 14001 standards. The SHECMS is designed to enable Drayton Mine to:

- Effectively manage its environmental issues;
- Ensure compliance with regulatory requirements;
- Continually improve its environmental performance through review and auditing; and
- Satisfy the expectations of stakeholders.

Table 7 Drayton South Existing Licences and Approvals

Ref.	Approval Number	Approval Document	Approval Authority	Approval Term
1	EL 5460	Exploration Licence	Minister for Minerals	August 1998 - 1 April 2013
2	WAL 491	Water Access Licence	NOW	23/03/2005 – Perpetuity
3	WAL 1066	Water Access Licence	NOW	31/03/2005 – Perpetuity
4	20BL106334	Groundwater Bore Licence	NOW	12/04/1977 – Perpetuity
5	20BL172532	Groundwater Bore Licence	NOW	11/08/2010 – Perpetuity
6	20BL172533	Groundwater Bore Licence	NOW	11/08/2010 – Perpetuity
7	20BL172864	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
8	20BL172865	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
9	20BL172866	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
10	20BL172867	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
11	20BL172868	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
12	20BL172869	Groundwater Bore Licence	NOW	10/06/2011 – Perpetuity
13	20BL173109	Groundwater Bore Licence	NOW	06/02/2012 – Perpetuity
14	20BL173110	Groundwater Bore Licence	NOW	06/02/2012 – Perpetuity
15	20AL200073	Basic Rights Licence	NOW	01/07/2004 – Perpetuity
16	20AL201488	Basic Rights Licence	NOW	01/07/2004 – Perpetuity
17	20CA200074	Water Supply Works and Water Use Licence	NOW	01/07/2004 – 19/12/2017
18	20CA201489	Water Supply Works and Water Use Licence	NOW	01/07/2004 – 30/06/2017
19	20CA211134	Water Supply Works and Water Use Licence	NOW	20/10/2010 – 19/10/2020
20	20WA211199	Water Access Licence	NOW	17/09/2010 – Perpetuity
21	20WA211200	Water Access Licence	NOW	01/10/2010 – Perpetuity
22	20WA211203	Water Access Licence	NOW	08/10/2010 – Perpetuity

The SHECMS is based on a suite of legislative requirements, procedures and standards, which have been prepared to ensure that operational activities, objectives and targets avoid or have minimal impact to the environment. Under the system, all employees and contractors are accountable for environmental performance.

Drayton Mine's environmental performance is measured against the SHECMS by regular auditing (internal and external), reporting and review. Drayton Mine is also actively involved in communicating its environmental performance to its employees, regulators, near neighbours, visitors and the broader community through:

- Engagement with the Drayton Mine Community Consultative Committee (Drayton CCC);
- Community Newsletters;
- Annual Environmental Management Report (Annual Review);
- The Anglo American website;
- Mine open days and tours; and
- Participation in local show days and community events.

3.8.1 Environmental Management

Drayton Mine is committed to its operations being undertaken in an environmentally responsible manner, ensuring that the regulatory compliance and stakeholder expectations are met. As a component of the SHECMS, a number of environmental management plans have been enforced. These plans cover a broad range of environmental aspects and outline operating procedures, standards and requirements under which Drayton Mine's performance is reviewed and audited against. The existing environmental management plans include:

- Air quality management plan;
- Greenhouse and energy efficiency management plan;
- Spontaneous combustion management plan;
- Noise management plan;
- Blasting management plan;
- Flora fauna management plan;
- Offset strategy;
- Land management plan;
- Aboriginal and cultural heritage management plan;
- Water management plan;
- Rehabilitation and offset management plan;
- Final void management plan;
- Mine closure plan;
- Bushfire management plan;
- Waste management plan;
- Tailings management plan;
- Safety, Health, Environment and Community (SHEC) calibration plan;
- Environmental monitoring plan;
- Environmental audit procedure;
- Environmental management strategy;
- Joint acquisition management plan;
- Enquiries and complaints procedure; and
- Permit to disturb procedure.

3.8.2 Environmental Monitoring

Drayton Mine

A key component of the SHECMS is Drayton Mine's EMP.

This program ensures Drayton Mine meets regulatory expectations and allows identification and management of environmental risks. Drayton Mine's existing environmental monitoring network is described in Table 8 and illustrated in Figure 9 and includes:

- One meteorology monitoring station;
- 19 air quality monitoring stations, consisting of:
  - One Tapered Element Oscillating Microbalance (TEOM);
  - Two High Volume Air Samplers (HVAS) (one Total Suspended Particulate (TSP) matter samplers less than 50 micrograms (µg) and one Particulate Matter less than 10 microns in diameter (PM_{10}) monitor); and
  - 16 depositional dust gauges.
- One noise monitoring station;
- Four blast monitoring stations;
- Nine surface water monitoring stations; and
- 11 groundwater monitoring stations.

The EMP results are published in the Drayton Mine Annual Review.

An additional TEOM and noise monitoring station will be installed within the Antiene Estate area by the end of 2012 to ensure that dust and noise levels generated by Drayton Mine do not exceed governed criteria.

Drayton Mine is also currently preparing to install and implement real time meteorological monitoring with predictive software capabilities which will enable meteorological forecasts to be made for upcoming days. This information can be utilised in a predictive dispersion model representing the site's operations and highlight activities with the potential to generate excessive dust in advance of it occurring to enable proactive management.

Table 8 Drayton Mine Environmental Monitoring Network

Aspect	Monitor Type	Monitoring Location	Parameters Monitored
Meteorology	Meteorology monitoring site	Mine Access Road — Met. Station	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction and deviation of wind direction
Air Quality	TEOM	Lot 9 Antiene	TSP ($\mu g/m^3$) and PM_{10} and $_{2.5}$ ($\mu g/m^3$)
	Dust deposition gauge	Antiene — 2130, 2175, 2197, 2208, 2230, 2247	Depositional dust (g/m^2/month)
		Ash Dam — 1651, 1900	
		De Boer — 2235	
		Liddell Ash Dam — 1890	
		Pringles — 1680	
		Savoy Dam — 1588, 1589	
		South Pit — 1608	
		Southern Offset Area — 1628	
		Thomas Mitchell Drive — 2157	
	HVAS	Lot 22 Antiene	TSP ($\mu g/m^3$) and PM_{10} ($\mu g/m^3$)
		Mine Access Road — Met. Station	
Noise	Noise monitoring site	Lot 9 Antiene	dB(A) (L_{Aeq}, L_{A1}, L_{A10}, L_{A90})
Blasting	Blast monitoring site	Antiene	Particle velocity (dB) and overpressure (Pa, dB)
		De Boer	
		Liddell Ash Dam — DC2	
		Sharman	
Surface Water	Surface water monitoring site	Access Road Dam — 2081	Electrical conductivity, pH, total dissolved solids, and total suspended solids
		Antiene — 2221	
		Drayton Mine Rail Loop — 2109, 2114	
		Industrial Dam — 1969	
		Liddell Ash Dam — 1895	
		North Pit — 2090	
		Savoy Dam — 1609	
		West Void — SW13	
Groundwater	Groundwater monitoring site	Access Road Dam — F1024	Electrical conductivity, pH, total dissolved solids, depth, and water level
		Antiene — F1167	
		Drayton Mine Rail Loop — F1162	
		Drayton Mine Rail Loop — F1164	
		Drayton Mine Rail Loop — F1168	
		South Pit — R4220, R4224, R4241, R4243	
		Saddlers Creek — F1163, W1102	

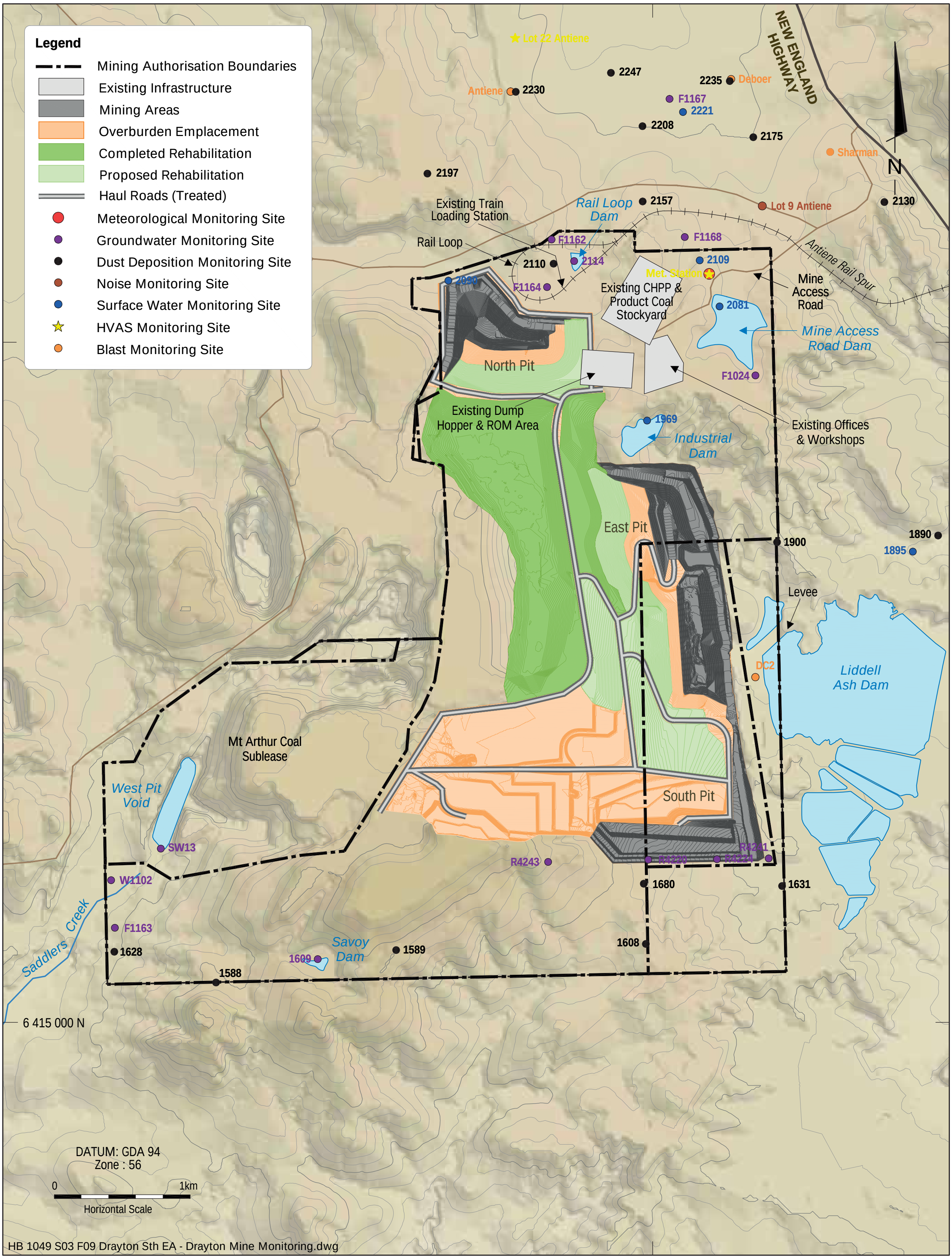
Drayton South Area

An EMP for the Drayton South area was established in 1998 for the purposes of securing background data and to satisfy the requirements of EL 5460. Drayton South's existing environmental monitoring network is described in Table 9 and illustrated in Figure 10 and includes:

- One meteorology monitoring site;
- Seven air quality monitoring sites, consisting of:
  - Three HVAS; and
  - Four depositional dust gauges.
- Four noise monitoring sites;
- Six surface water monitoring sites, including two storm event monitoring sites; and
- 28 groundwater monitoring sites.

Table 9 Drayton South Environmental Monitoring Network

Aspect	Monitor Type	Monitoring Location	Parameters Monitored
Meteorology	Meteorology monitoring site	Plashett — MS	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction and deviation of wind direction
Air Quality	Dust deposition gauge	Drayton Mine — D9	Depositional dust (g/m^2/month)
		Edderton — D8	
		Jerrys Plains — D10	
		Randwick Park — D12	
	HVAS	Edderton — HV4	TSP (µg/m^3) and PM_{10} (µg/m^3)
		Jerrys Plains — HV5	
		Plashett — HVAS Plashett	
Noise	Noise monitoring site (unattended) and surveys (attended)	Arrowfield Estate — N1	dB(A) (L_{Aeq}, L_{A1}, L_{A10}, L_{A90})
		Jerrys Plains — N6	
		Llanillo — N2a	
		Randwick Park — N2	
Surface Water	Surface water monitoring site	Saddlers Creek — W1, W2, W3, W4	Electrical conductivity, pH, total dissolved solids, and total suspended solids
	Storm event monitoring site	Hunter River Tributary — S1, S2	
Groundwater	Groundwater monitoring site	Drayton South — BLK6R12, DD100, DD1005, DD1014, DD1016, DD102, DD1027, DD1041, DD1043, DD1052, DD1057, RBD1, RD1189, RD1192, Bowfield Well, Bowfield House Well, Shearer's Well, Shearer's Well Bore, WND16, WND26	Electrical conductivity, pH, total dissolved solids, depth, and water level
		Hunter River — MB1_Alluvial, Redbank and Whybrow, VWP1, MB4_Alluvial and Regolith	
		Plashett — DD1030, Plashett Well	
		Saddlers Creek — DD1032, MB2_Alluvial and Regolith, MB3_Alluvial, MB3_Regolith	



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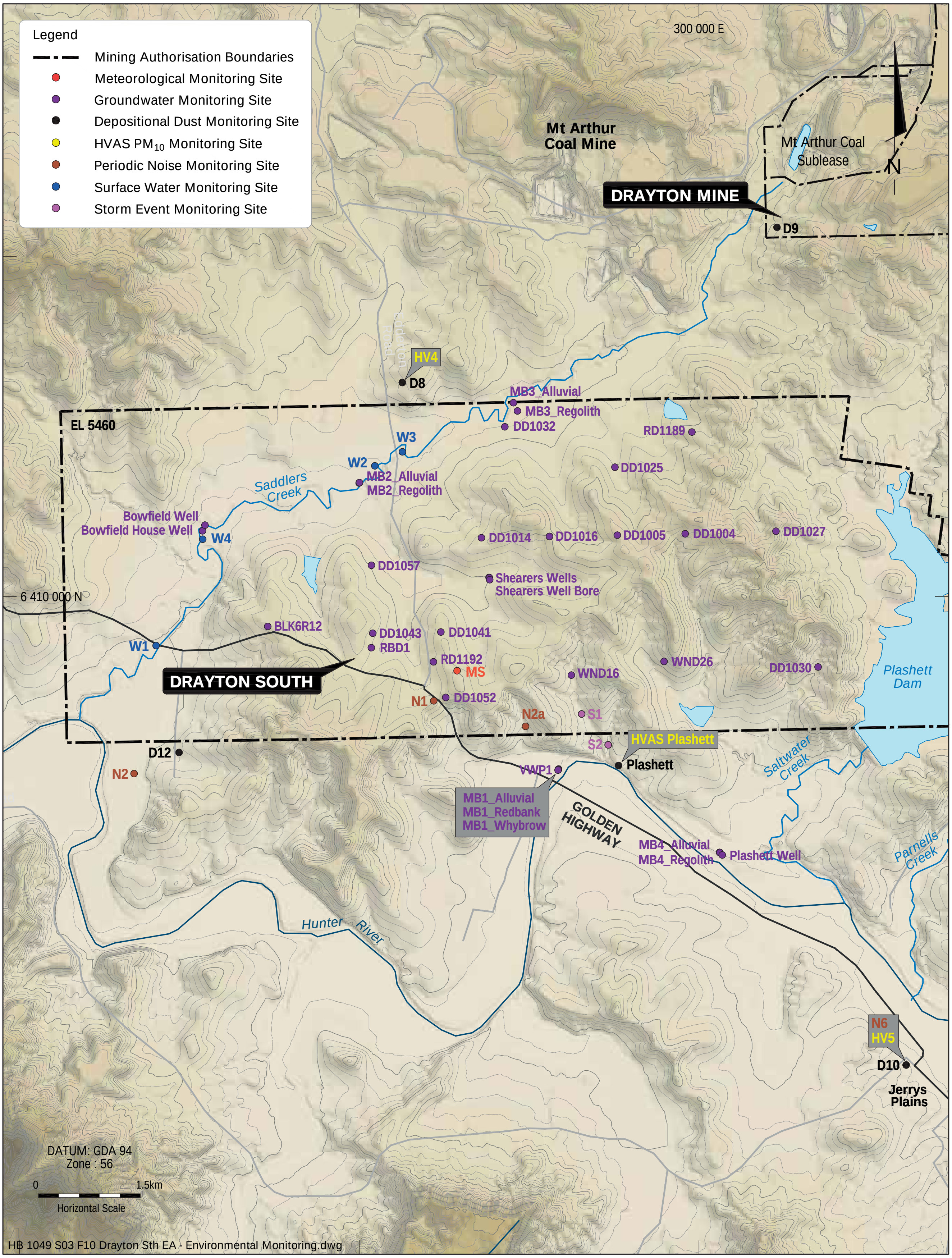
Drayton Mine Environmental Monitoring Program

FIGURE 9



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Drayton South
Environmental Monitoring Program

FIGURE 10

DRAYTON SOUTH

Project Description

4

Project Description

4

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

4.1 Introduction

Anglo American is seeking PA under Part 3A of the EP&A Act for the continuation of the existing Drayton Mine through the extraction of coal by both open cut and highwall mining operations in the Drayton South area. The Project will maintain ongoing use of the Antiene Rail Spur for the transport of coal to the Port at Newcastle. The land on which the Antiene Rail Spur is constructed is shown on Figure 2. Additionally the land on which the Project applies is shown on Figure 2 and Figure 3, and listed in Appendix A (including land for the Antiene Rail Spur).

The Project involves:

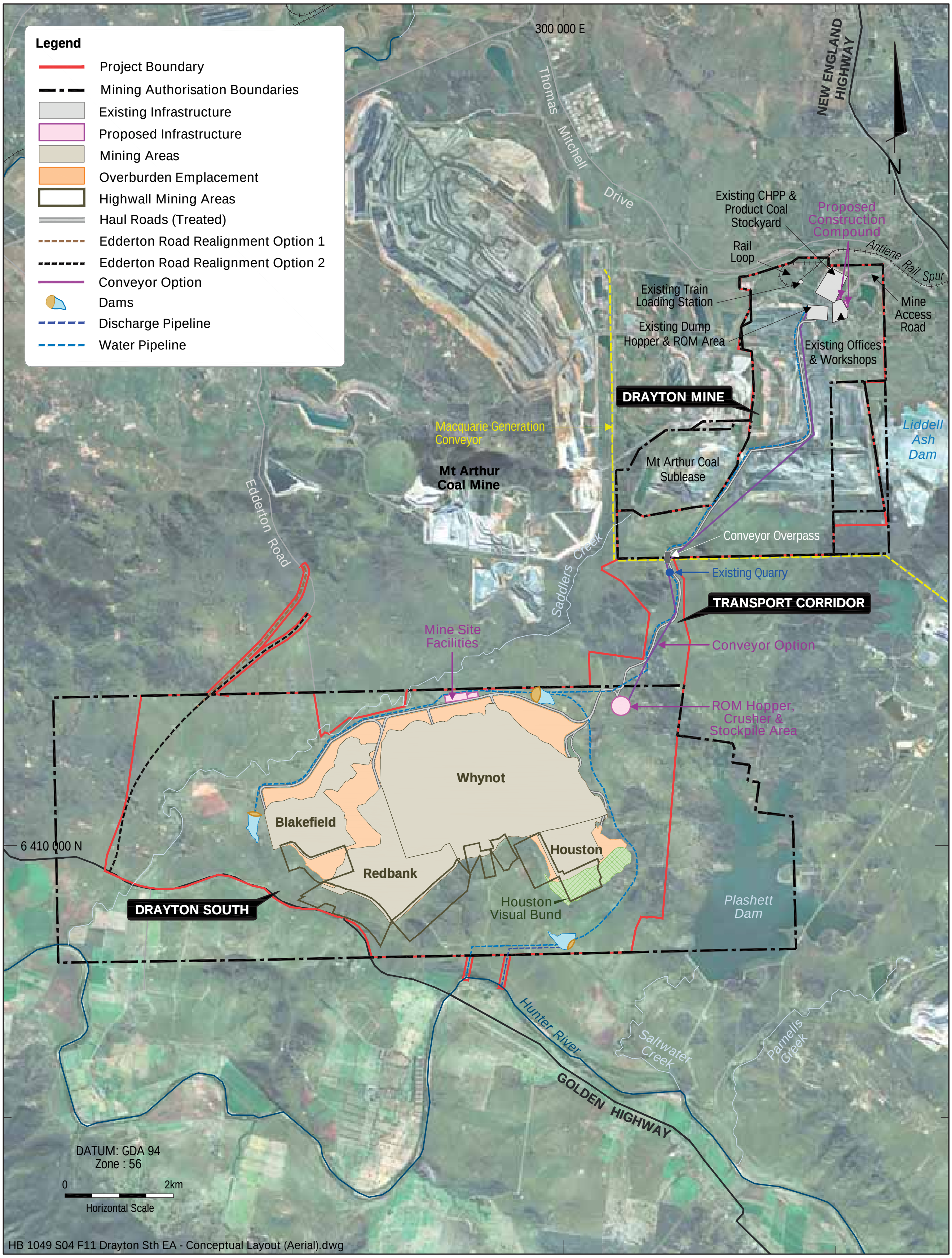
- The continuation of operations at Drayton Mine as presently approved with minor additional mining areas within the East, North and South Pits;
- The development of an open cut and highwall mining operation extracting up to 7 Mtpa of ROM coal over a period of 27 years within the Drayton South area;
- The utilisation of the existing Drayton Mine equipment fleet with the addition of a highwall miner and coal haulage fleet;
- The continuation of the existing workforce of up to 530 employees and contractors;
- The use of Drayton Mine's final landform voids for rejects and tailings disposal and water storage;
- The utilisation of the existing Drayton Mine infrastructure, including the CHPP, rail loop and associated loading infrastructure, workshops, bath houses and administration offices;
- The construction of a transport corridor between the Drayton South mining area and the existing Drayton Mine;
- The continued utilisation of the Antiene Rail Spur off the Main Northern Railway to transport product coal to the Port of Newcastle for export;
- The realignment of a section of Edderton Road; and
- The installation of further water management and power reticulation infrastructure to support mining in the Drayton South area.

A contractor based workforce of approximately 369 personnel will be required during the peak construction phase.

Following construction within the Drayton South area, there will be a period when mining will occur at the existing approved Drayton Mine and within the Drayton South area concurrently as mining activities are transitioned. During this period, personnel and equipment will be progressively transferred from Drayton Mine to the Drayton South area. This will continue until mining operations are completed at Drayton Mine.

Once a new PA is granted for the Drayton Complex, the existing approval for Drayton Mine (PA 06_0202) and DC for the use of the Antiene Rail Spur (DC 106-04-00) will be surrendered.

The conceptual layout of the Project is illustrated in Figure 11 and Figure 12.



DRAYTON SOUTH COAL PROJECT

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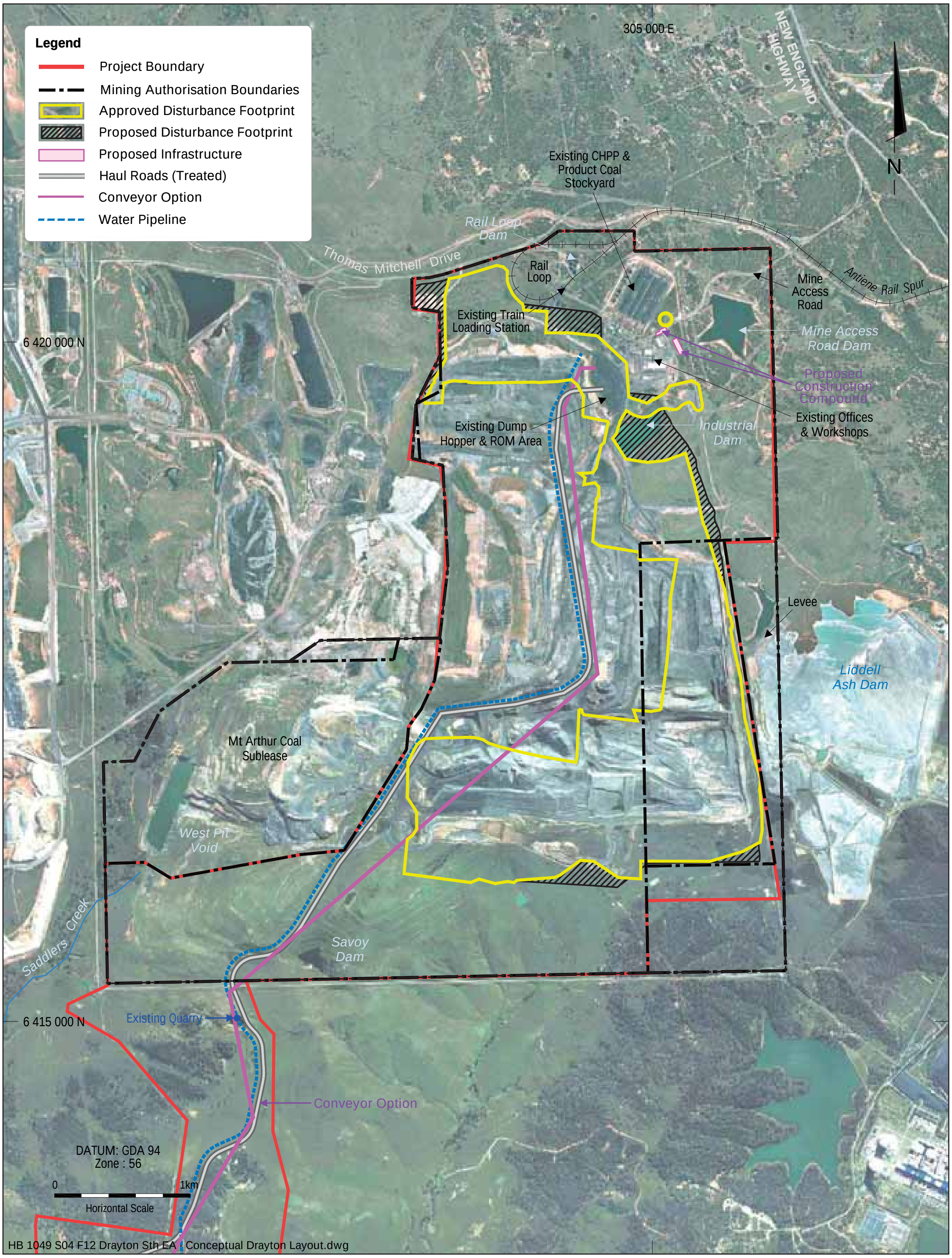
Conceptual Project Layout

FIGURE 11



DRAYTON SOUTH COAL PROJECT

Conceptual Project Layout (Drayton Mine)

FIGURE 12

4.2 Conceptual Mine Plan

4.2.1 Mine Plan Layout

The Project seeks to recover coal resources at the existing Drayton Mine and within the Drayton South area.

An additional 1.4 Mt of ROM coal will be extracted at Drayton Mine outside the current approved disturbance footprint. The additional coal recovery largely involves the extension of the East Pit by approximately 20.3 ha, which includes mining through the Industrial Dam and previous mine rehabilitation. It is proposed to shift the current functions of the Industrial Dam to the Access Road Dam. Any water remaining in the Industrial Dam at the time of decommissioning will be pumped to other storages, in particular the South Void. Minor extensions of the North Pit (8.8 ha) and South Pit (7.4 ha) will also occur to allow for the development of a more sustainable landform and a safer highwall in these areas (see Figure 12). It is worth noting that all overburden and waste associated with this additional mining will be disposed of either in the remaining voids or within existing approved overburden emplacement areas (OEAs) at Drayton Mine. This additional mining is anticipated to be completed by the end of 2017.

Further to these minor additional mining areas at Drayton Mine, approximately 119 Mt of ROM coal from the Drayton South area will be recovered over a period of 27 years. Five main coal seams will be targeted, including the Whybrow, Redbank Creek, Wambo, Whynot and Blakefield seams. The typical stratigraphic profile of the Drayton South area, as indicated from the geological model, is shown in Figure 5.

The mine plan for the Drayton South area has been developed with consideration to the existing environment and key local stakeholders seeking to minimise, as far as practical, the visibility of the mine from neighbouring properties. This involves maintaining the southern ridgeline and ensuring that all OEAs are developed and shaped so that they remain shielded behind this ridgeline from receivers in the south.

Figure 13 to Figure 20 illustrate the conceptual mine plan layout for the Drayton Complex in Year 3 (representative year of transition), and for the Drayton South mining area in Years 3A, 3B, 5, 10, 15, 20 and 27, respectively. These years have been selected for modelling as they represent a combination of mining at the extremities of the Project life and the greatest intensities of mining. Year 3 has been separated into 3A (the start of Year 3) and 3B (the end of Year 3) in order to model operations before and after construction of the Houston visual bund. The Year 3A scenario considers the initial Houston visual bund construction, with equipment on the bund at a low elevation and very little shielding of mining equipment behind the bund. The Year 3B scenario considers construction of the near completed Houston visual bund, with equipment on the bund at a high elevation and well shielded mining equipment behind the bund. Both scenarios were considered to ensure that the worst case was modelled for receivers. The progression of mining on these plans is indicative only and may vary due to the ultimate production profile achieved.

Mining operations will initially commence in the Whynot, Redbank and Blakefield mining areas and generally progress in a north to south sequence. At the start of Year 3 (3A), construction of the Houston visual bund will begin to shield views into the Houston and Whynot mining areas. During this period, mining activities will continue in the Whynot, Redbank and Blakefield mining areas. By the end of Year 3 (3B), initial mining associated with the Houston mining area box cut will have commenced. By Year 5, the construction and rehabilitation of the Houston visual bund will be complete and integrated with the surrounding landscape.

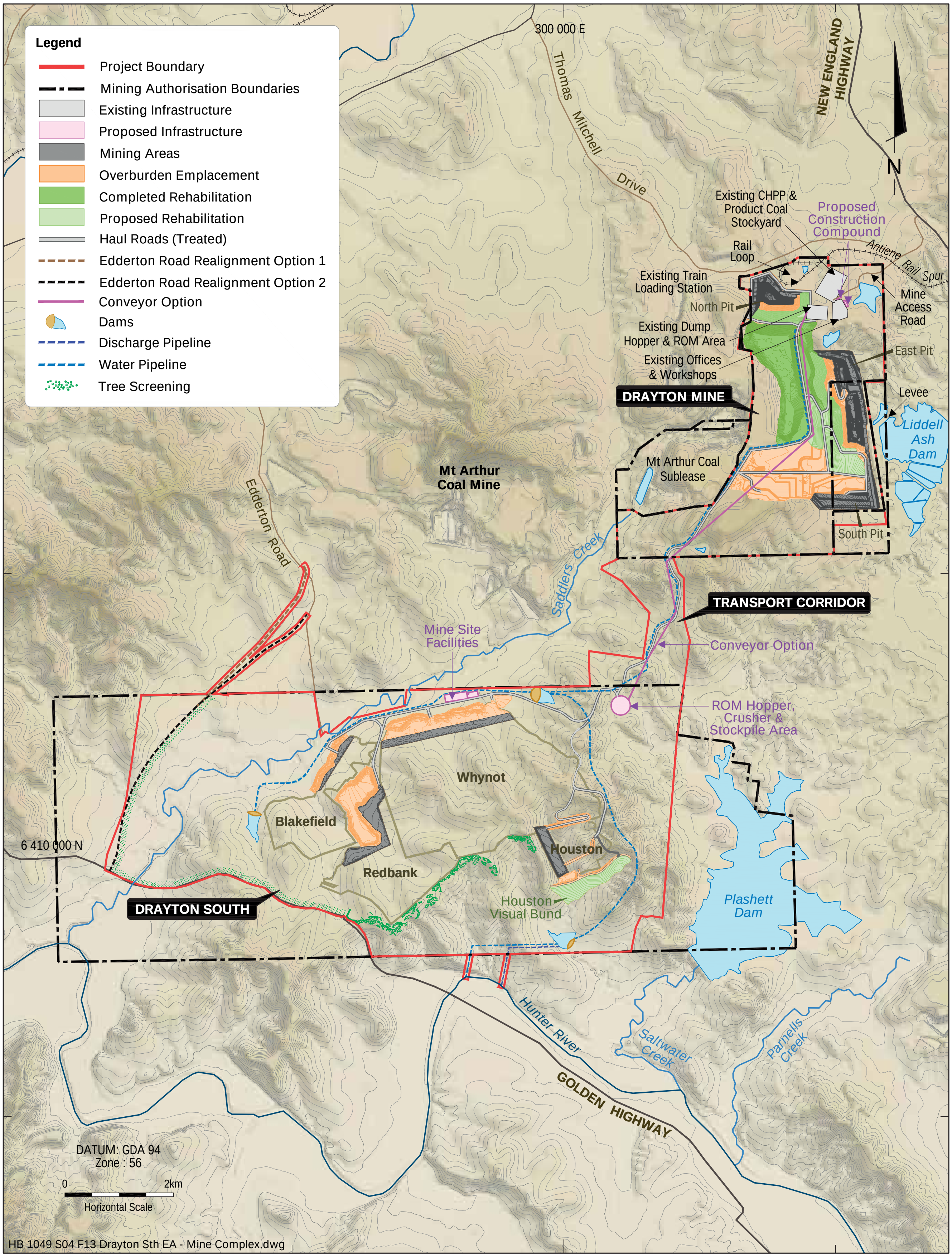
From Year 10 onwards, the haulage fleet will be transitioned from the existing fleet of 180 t trucks to 220 t trucks as outlined in Table 11. This has been considered and included in the air quality and greenhouse gas impact assessment for the Project (see Section 8.1).

OEAs will typically be developed in the northern reaches of each mining area followed by the establishment of progressive rehabilitation. No overburden is planned to be hauled from Drayton South for placement in the existing Drayton Mine voids. Additional leading practice controls will be implemented for exposed surfaces to minimise dust emissions. The application of dust controls for the Project is discussed in further detail in Section 8.1.

Highwall mining will be undertaken at various stages during the operations phase of the Project within each of the mining areas to maximise coal recovery. Open cut mining and progressive rehabilitation continues throughout the life of the operation. The majority of the Redbank and Blakefield mining areas will be rehabilitated by Year 20 with the remainder progressively completed to final landform following Year 27 (final year of mining).

A conceptual final landform design has been developed for the Project in preparation for the completion of mining activities in Year 27, whereby an orderly closure of the Project would then be achieved (see Figure 21).

To minimise surface water catchment as far as practical, the final landform has been designed with the inclusion of diversion drains and contour banks to redirect surface water runoff away from low lying areas. As part of the final landform it is planned that the final void will have the majority of the highwall blasted back and low wall graded to improve the safety and stability of the final void. A discussion on the conceptual post-mining land use and management of the final landform is provided in Section 8.17.4.



DRAYTON SOUTH COAL PROJECT

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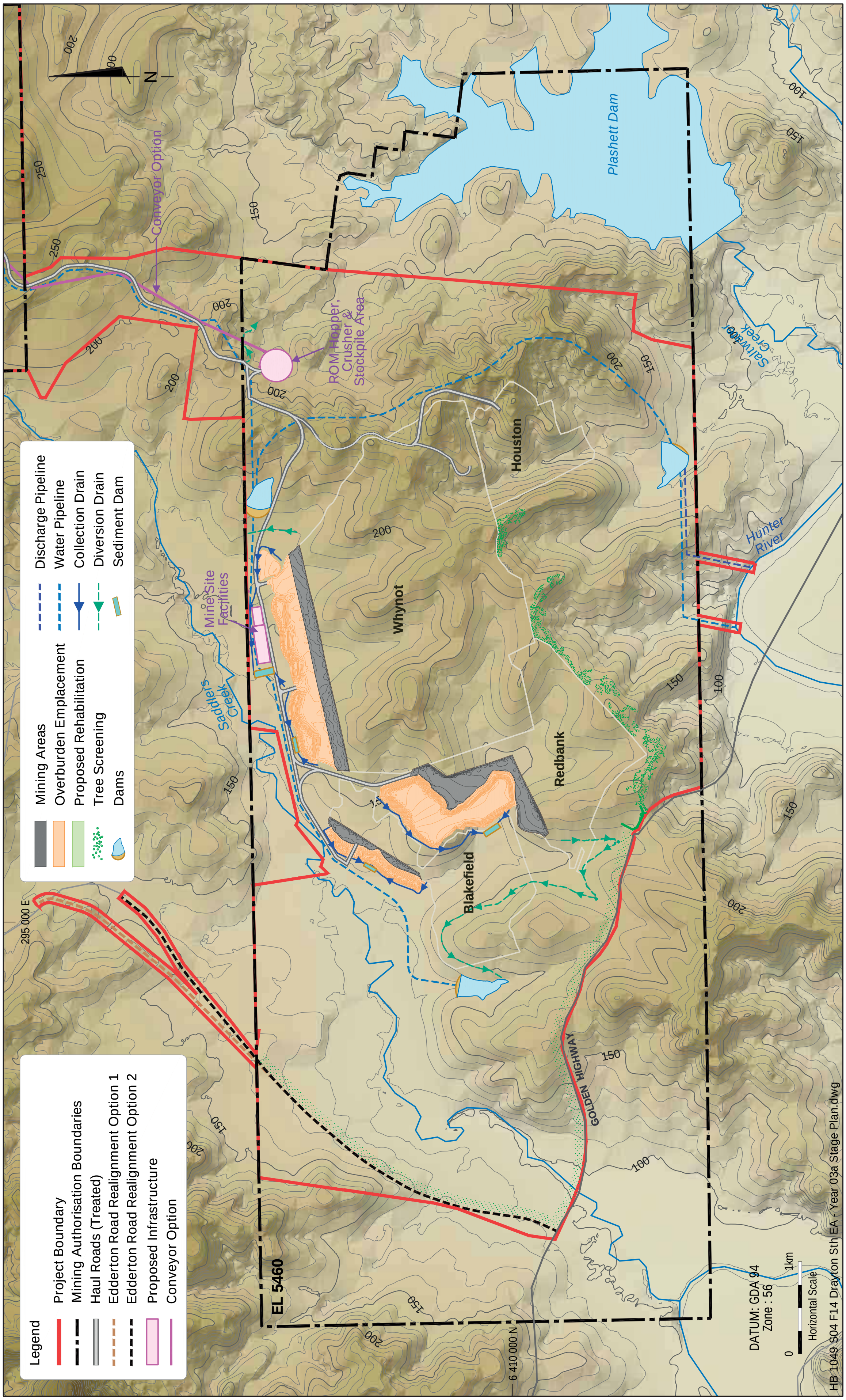
Conceptual Year 3 Drayton Mine Complex

FIGURE 13



DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 3A Mine Plan

FIGURE 14

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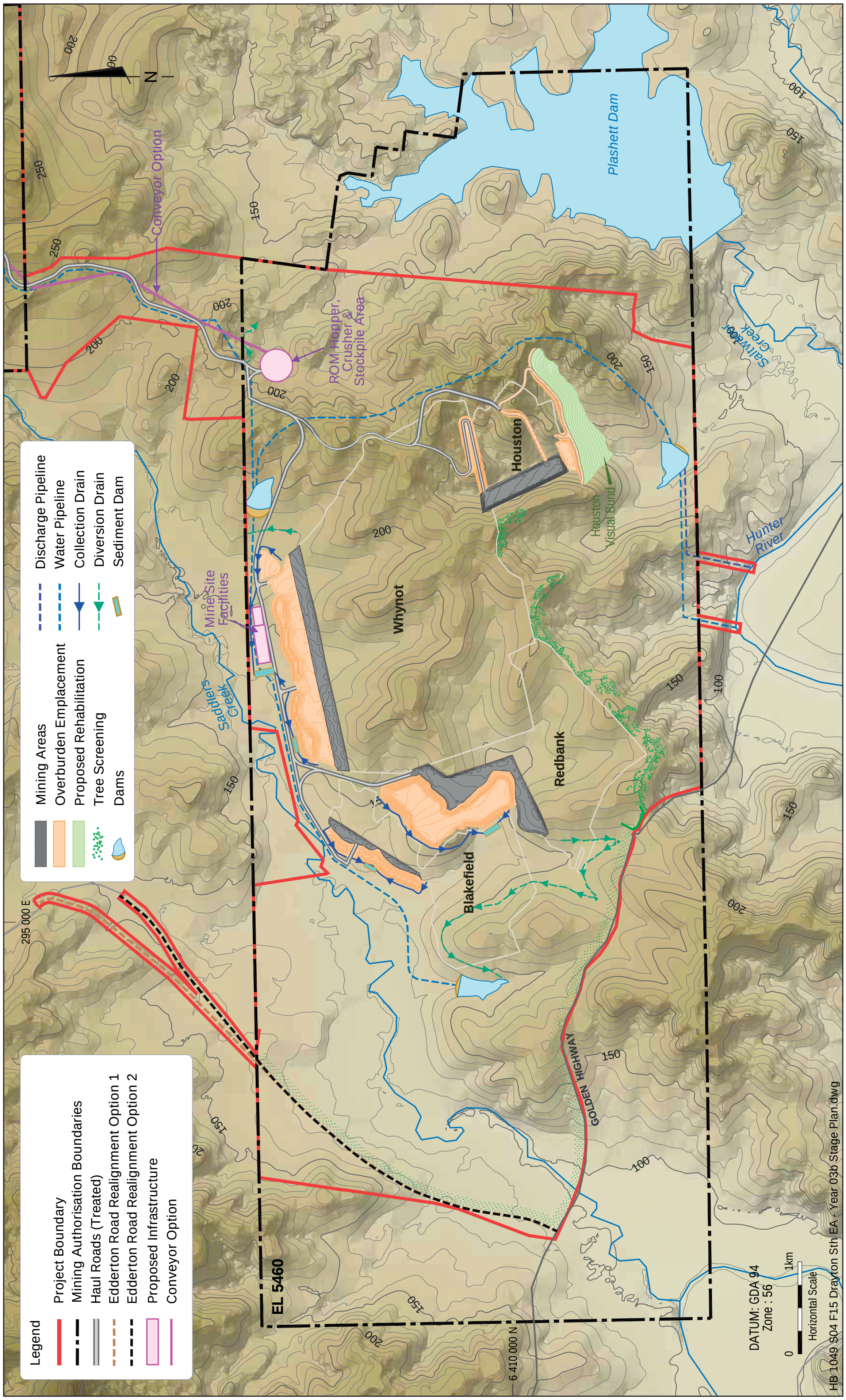

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 3B Mine Plan

FIGURE 15

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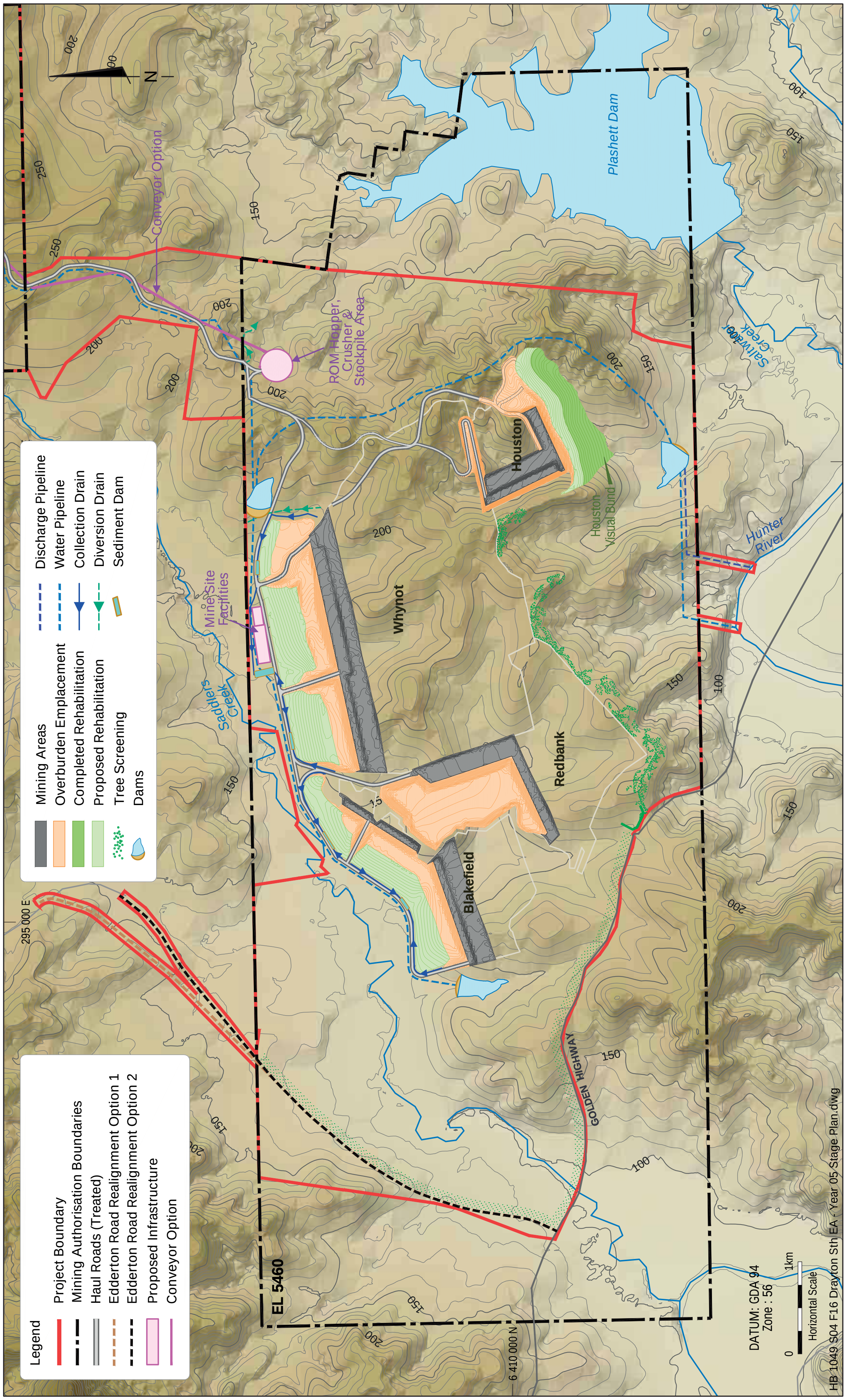

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 5 Mine Plan

FIGURE 16

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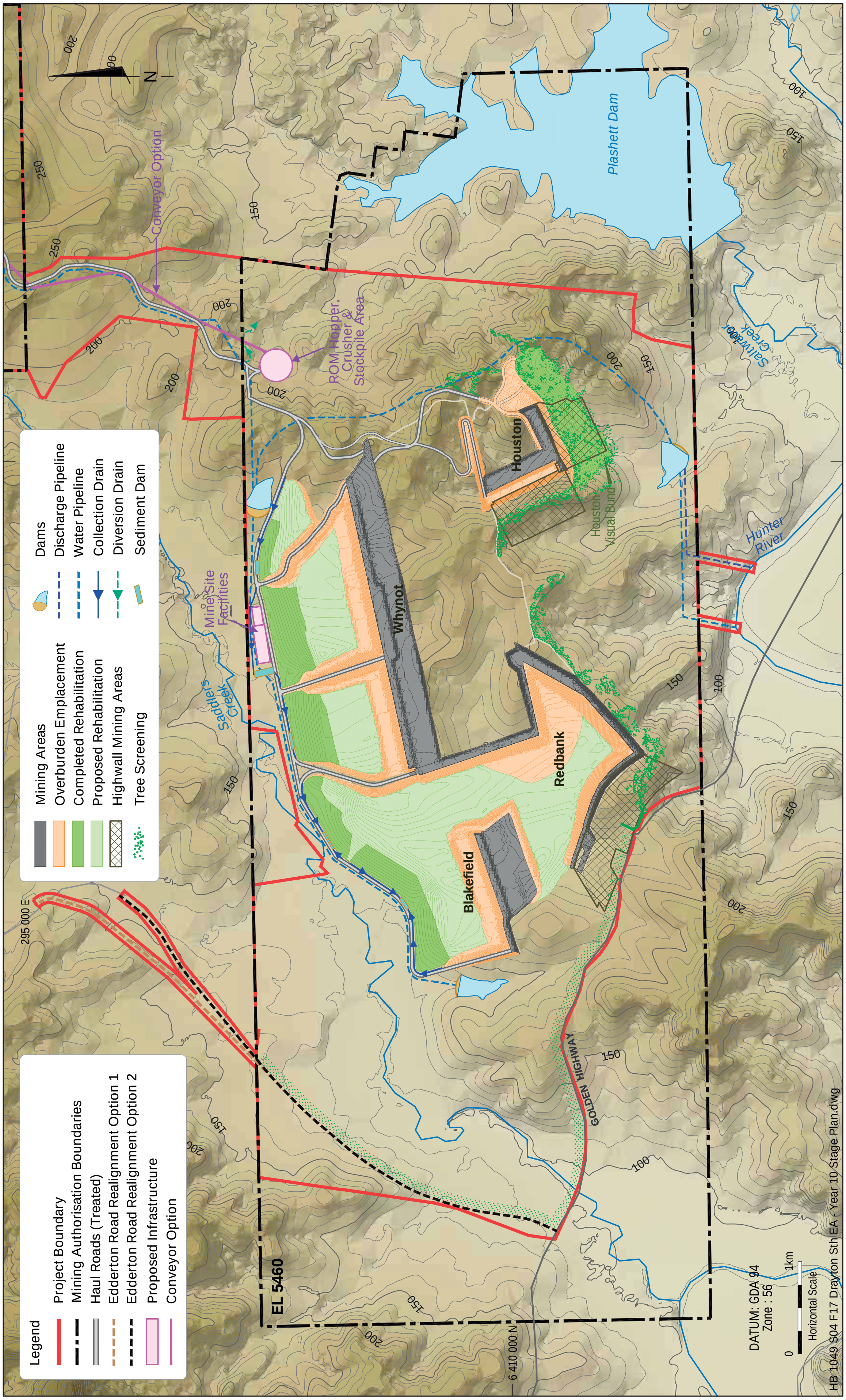

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 10 Mine Plan

FIGURE 17

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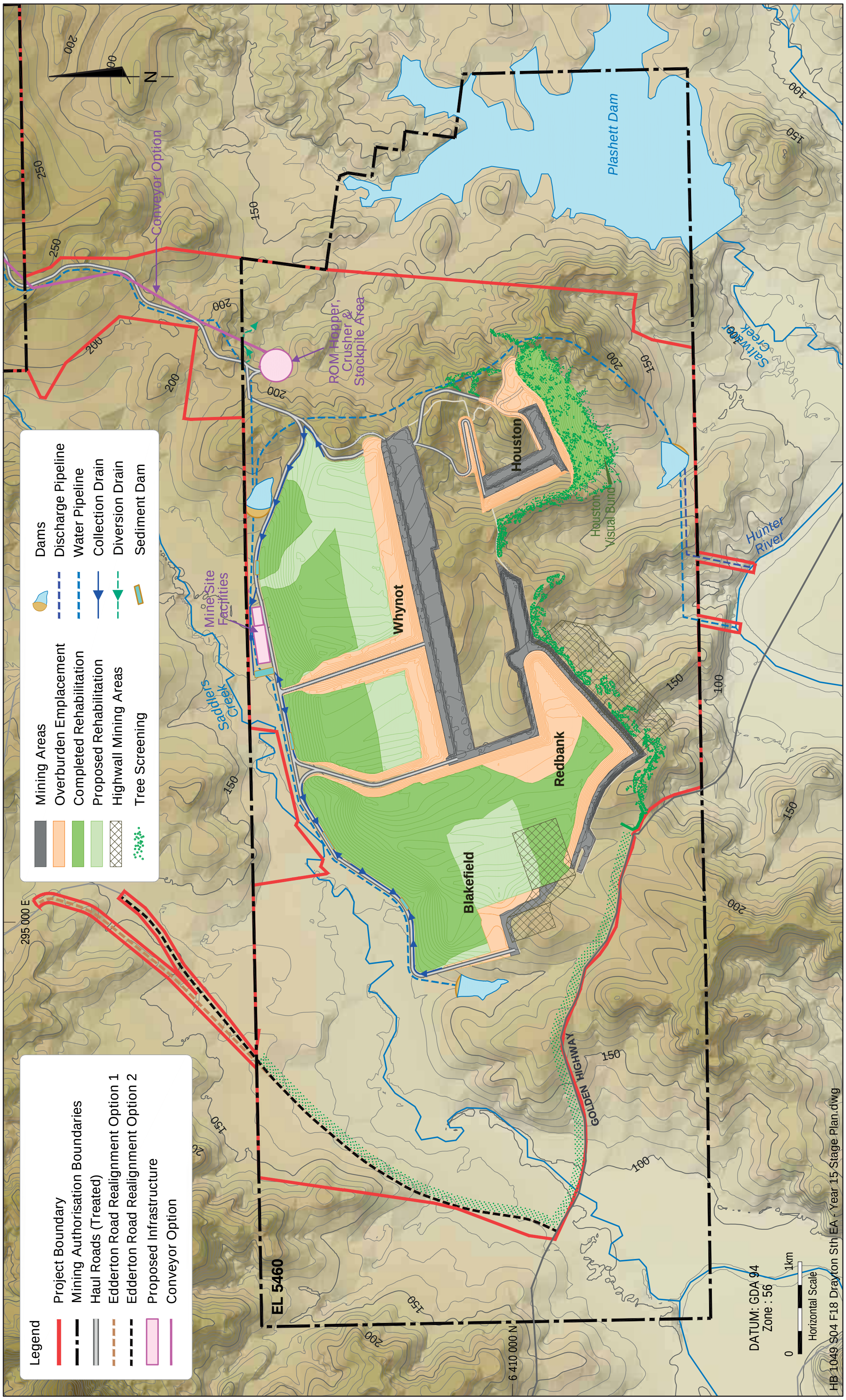

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 15 Mine Plan

FIGURE 18

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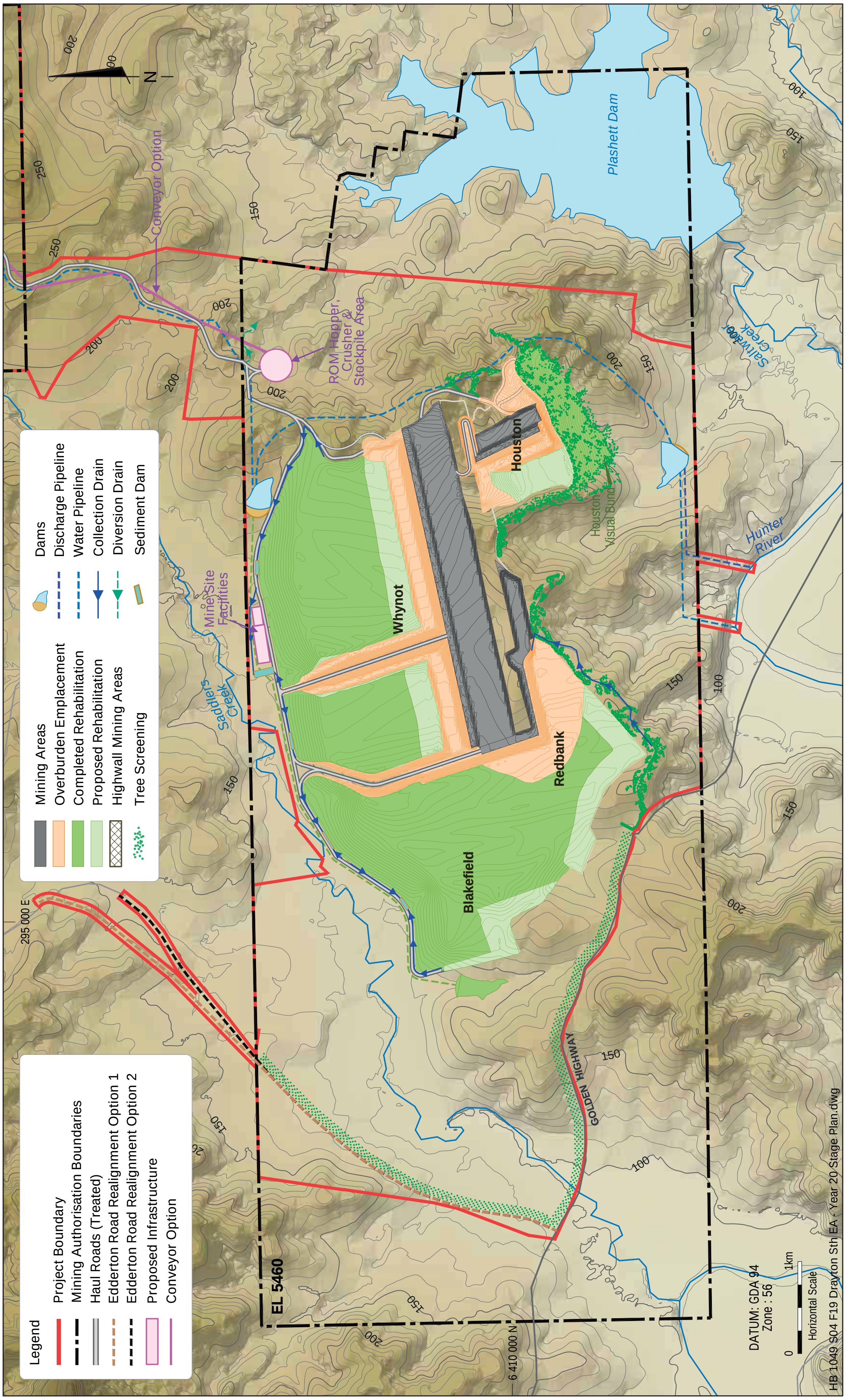

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 20 Mine Plan

FIGURE 19

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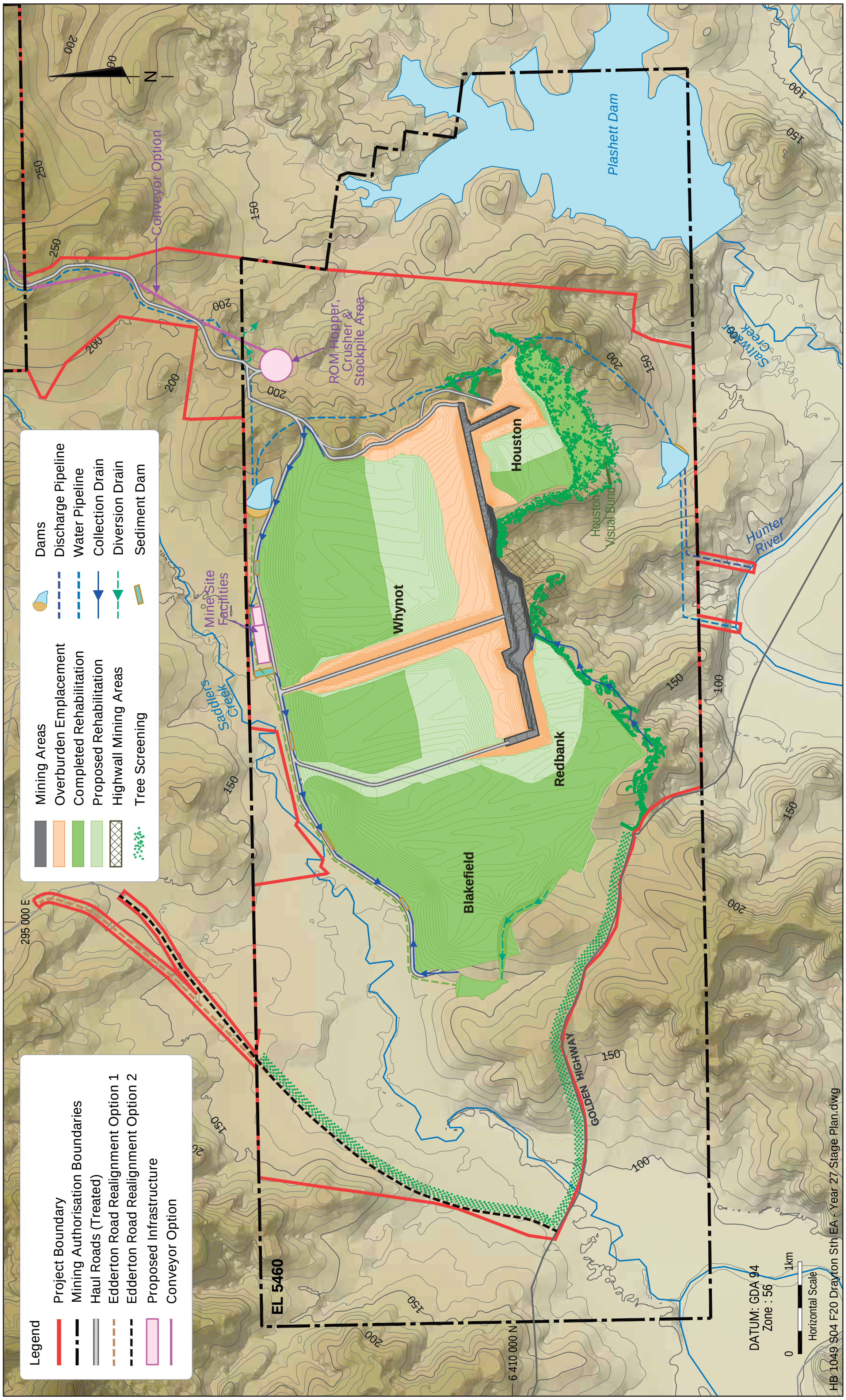
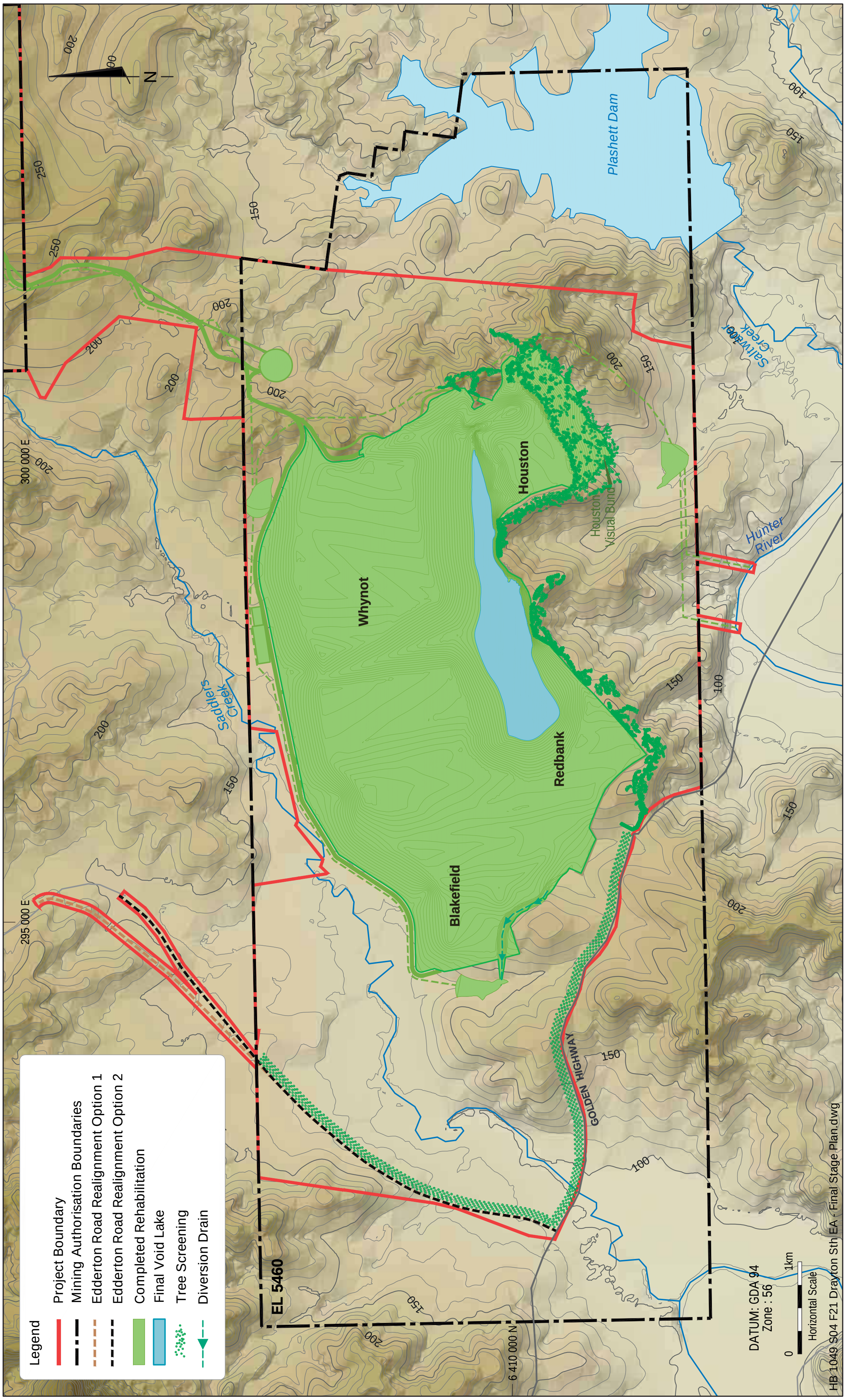


DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Year 27 Mine Plan

FIGURE 20



DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Final Landform

FIGURE 21

AngloAmerican

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4.2.2 Mining Schedule and Techniques

From the commencement of operations within the Drayton South area up until Year 4, mining at the existing Drayton Mine and in the Drayton South area will have the combined capacity to produce a maximum of 7 Mtpa ROM coal. An indicative production schedule for the conceptual mine plan is provided in Table 10.

Mining operations in the Drayton South area will continue as a contemporary dragline and excavator operation supported by a dozer and haulage fleet as is presently undertaken at Drayton Mine. These mining methods require blasting to break up the hard rock overburden encountered in the mining sequence. Highwall mining will also be conducted to increase coal recovery and limit sterilisation of resources. Each of these activities is described in further detail below.

Dragline

In a typical dragline operation, topsoil is initially stripped and stored, and the overburden is blasted. This is then followed by the scheduling of dozers to form the dragline pad near the highwall. The first pass involves the dragline bucket being pulled along the surface of the overburden to expose the upper coal seam. The bucket is then hoisted and swung to the emplacement area where the overburden material is released. Once the upper coal seam is exposed, mining and haulage of coal occurs. A second pass of the dragline is then typically undertaken near the low wall with the assistance of a dozer to expose and recover the next lowest coal seam. The process is then repeated to recover additional basal seams.

Both single seam and multiple seam dragline extraction techniques will occur in the Whynot, Houston and Blakefield mining areas.

Excavator and Trucks

Typical of a standard excavator mining technique, topsoil is initially stripped from the mining area and either utilised on available rehabilitation areas and/or stockpiled for later application. Overburden is then blasted prior to being removed by the excavator and supporting truck fleet, allowing each coal seam to be uncovered and extracted within the mining sequence. The Redbank mining area is an excavator and truck only operation (no dragline). Excavators and trucks will also be utilised in the Whynot, Houston and Blakefield mining areas in sequence with the dragline. In these mining areas, the excavators and trucks will be predominately used for pre-stripping operations with the dragline undertaking most of the bulk material movement and placement.

Blasting

The hard rock overburden encountered in the mining sequence, typically requires some blasting to achieve suitable fracturing and fragmentation to enable efficient and safe removal. Exploration drilling has confirmed that the overburden materials within the mining limit are composed of sandstone, conglomerate, siltstone and minor claystone.

Mine planning has predicted on average five blast events per week will be required once a stable production rate is achieved. Blasting will only be undertaken during the hours of 9:00 am to 5:00 pm Monday to Saturday, excluding Sundays and public holidays unless granted prior approval from the Office of Environment and Heritage (OEH).

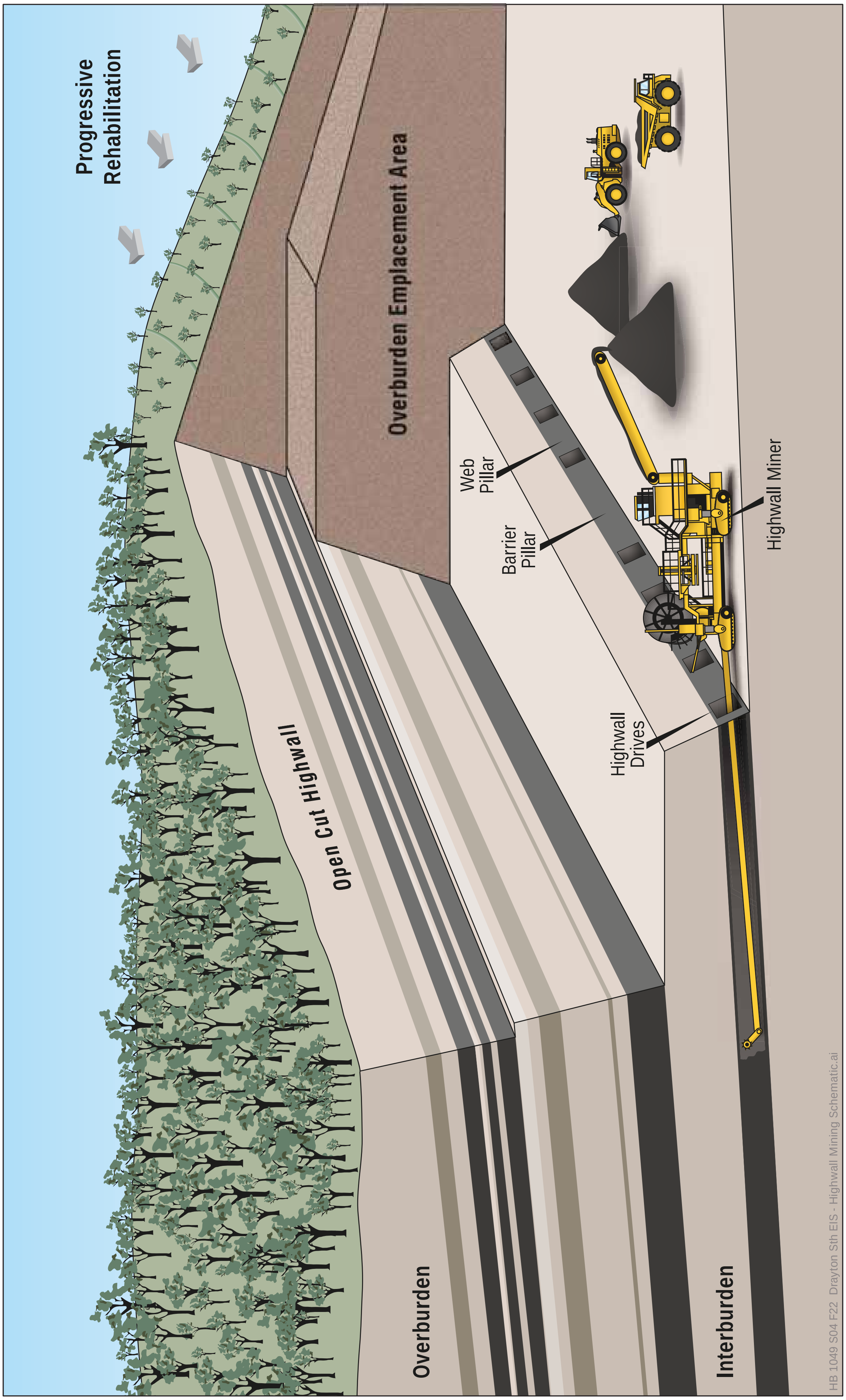
Storage and handling of explosives and other related materials will be undertaken in accordance with the existing hazardous material management system via the SHECMS which ensures compliance with all relevant guidelines and legislation (see Section 8.21).

Highwall Mining

In addition to the dragline and excavator operation, a highwall miner will be employed to increase productivity, reduce environmental impacts and access resources that would otherwise not be recoverable due to the self-imposed restrictions placed on the open cut mine plan to address stakeholders concerns (i.e. remaining behind the ridgeline to the south, see Section 6). Highwall mining is a remotely operated system, which involves the extraction of coal via a series of parallel unsupported entries into exposed coal seams of the final highwall (see Figure 22).

Table 10 Indicative Production Schedule

Year	Overburden (000 bcm)	ROM Coal (Mtpa)	Product Coal (Mtpa)	Rejects (000 tpa)	Tailings (000 tpa)
3 (2016)	52,779	7.0	5.4	764	614
5 (2018)	36,895	5.2	3.9	1,129	907
10 (2023)	34,750	4.9	3.7	645	518
15 (2028)	34,503	4.6	3.5	608	488
20 (2033)	34,501	5.8	4.4	798	641
27 (2040)	14,915	1.2	1.0	151	121
Total	**828,139**	**119**	**91**	**16,889**	**13,568**



DRAYTON SOUTH COAL PROJECT

Highwall Mining Schematic

FIGURE 22

The highwall miner, which is a form of continuous miner, horizontally penetrates up to 500 m into the coal seam. The coal is extracted as a result of a shearing and sumping action of the highwall miner cutter module and transferred to the entry via an *'Addcar'* conveyor system. The coal will be stockpiled and transported from the Drayton South mining areas using the haulage fleet to the ROM hopper at Drayton Mine.

The highwall mining design will be consistent with the guidelines outlined in the Australian Coal Association Research Program report *Optimal Design and Monitoring for Highwall Mining* (CSIRO, 2001). The design of the pillars between the entries ensures that the mining technique results in no noticeable subsidence or surface disturbance as defined by NSW Department of Mineral Resources *Guidelines for Applications for Subsidence Management Approvals* (DMR, 2003).

4.3 Indicative Equipment Fleet

The Project will require mobile equipment in addition to the existing currently approved Drayton Mine fleet to accommodate the activities within the Drayton South area. Ancillary equipment will also be required, including but not limited to lighting plants, generators, water pumps, mobile cranes, delivery trucks and light vehicles.

The indicative equipment fleet for Year 3, 5, 10, 15, 20 and 27 of the Project is shown in Table 11. This has been adopted in the assumptions utilised for modelling purposes, including the transition from 180 t trucks to 220 t trucks in Year 10 as outlined below. Actual equipment utilised for the Project may vary.

Operations will be undertaken in accordance with this EA. The indicative equipment fleet includes a representative integration year (Year 3) in which there will be a split of operations between Drayton Mine (as it winds down) and Drayton South (as it ramps up).

4.4 Coal Handling and Processing

ROM coal extracted from the Drayton South area will be transported by trucks to the ROM hopper at Drayton Mine, which feeds into the CHPP for processing in accordance with the practices described in Section 3.3.

The CHPP will undergo minor modification to allow for washing at an average rate of 800 tph, which is an increase of 100 tph. The existing coal handling stockpiles will require modification to manage the scheduled coal throughput.

One of the four existing product stockpiles will be modified into a raw coal stockpile, which is required to manage raw coal variability and to provide a blending capability prior to feeding the CHPP. The remaining three product stockpiles will continue to accommodate the scheduled production profile.

A new conveyor and stacker system will be constructed to manage the raw coal feed to the raw coal stockpile. One of the existing reclaimers will be dedicated to the raw coal stockpile whilst the other reclaimer, augmented with an additional new reclaimer will service the remaining three product stockpiles. The revised coal stockpile layout also provides for the installation of a surge bin between the raw coal stockpile and the CHPP.

During the transition period where mining at Drayton Mine and the Drayton South area operate concurrently, raw coal and product coal will undergo blending, as required, to produce the required product from the two coal sources.

All product will be railed to the Port of Newcastle for export via the Antiene Rail Spur and then the Main Northern Railway.

4.4.1 Rejects and Tailings Disposal

On completion of coal mining operations at Drayton Mine, three voids will remain including the North, East and South Voids (see Figure 23). It is proposed that rejects and tailings generated at the CHPP from the processing of Drayton South coal will be deposited in two of these voids, with the third void being dedicated to water storage.

Rejects will be trucked from the CHPP whilst tailings will be pumped via a pipeline and deposited within the relevant void. Decant water recovered in this process will be recycled within the site water management system.

The availability of the voids in each of the scenarios described below will depend upon the circumstances that exist at the relevant time with Macquarie Generation as part of the East and South Voids are located on land they own.

Under each scenario, Drayton Mine will dispose of tailings in the East (South) Void as currently approved to a level of RL 104 m, which is forecast to occur in 2017. This area will then be capped and rehabilitated by Drayton Mine at RL 106 m in accordance with the existing arrangements with Macquarie Generation.

Scenario 1

In Scenario One, occupation of the East (South) Void would revert to Macquarie Generation (the land owner) following capping and rehabilitation by Drayton Mine in 2017. This void will then be controlled, managed and used by Macquarie Generation as it may elect.

Future use of the void will be subject to Macquarie Generation securing the necessary planning, environmental and other approvals and meeting the requirements of the relevant authorities, including Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) with regard to

Table 11 Indicative Mobile Equipment Fleet

Indicative Equipment	Year 3	Year 5	Year 10	Year 15	Year 20	Year 27
Drayton Mine						
Le Tourneau L1350 Front End Loader	1	-	-	-	-	-
Hitachi EX5500 Excavator (500 t)	1	-	-	-	-	-
Hitachi EX3500 Excavator (300 t)	1	-	-	-	-	-
Tiger 690 / Cat 854 Rubber Tyre Dozer	2	-	-	-	-	-
D11 Dozer	3	-	-	-	-	-
D10 Dozer	1	-	-	-	-	-
Cat 789 Truck (180t)	17	-	-	-	-	-
Cat 773B Water Truck	1	-	-	-	-	-
Cat 16H Grader	1	-	-	-	-	-
Drilltech 90KS / SK60 Overburden Drills	1	-	-	-	-	-
Drayton South						
BE 1370W Dragline	1	1	1	1	1	1
Cat 992C Front End Loader	1	1	1	1	1	1
Le Tourneau L1350 Front End Loader	2	2	2	2	2	2
Hitachi EX5500 Excavator (500 t)	2	2	2	2	2	-
Tiger 690 / Cat 854 Rubber Tyre Dozer	1	2	3	2	2	1
D11 Dozer	8	9	9	9	9	6
D10 Dozer	3	5	5	5	5	3
Cat 789 Truck (180t)	11	17	-	-	-	-
Komatsu 830E Truck (220t)	-	-	12	12	13	3
Mack Titan Road Haul Truck (70t)	13	13	14	13	11	5
Cat 777D Water Truck	2	2	2	2	2	2
Cat 773B Water Truck	-	1	1	1	1	1
Cat 16H Grader	2	3	3	3	3	3
Ingersoll Rand DM45 Coal Drill	1	1	1	1	1	1
Svedala SKF50 Medium Drill	1	2	2	2	2	2
Drilltech 90KS / SK60 Overburden Drills	1	2	2	2	2	1
Addcar Highwall Miner	-	-	1	1	1	1
Street Sweeper	1	1	1	1	1	1

the void and its rehabilitation. It is envisaged that possible use of the void would be for the deposition of power station ash.

The North Void, which is situated on land owned by Anglo American, will be utilised as a co-disposal emplacement area for rejects and tailings. The North Void will be separated into two cells for emplacement of each coal waste stream then filled, graded to be free draining, capped and rehabilitated at RL 202 m. Some rejects will also be trucked to the southern side of the North Void and blended with the final landform to assist with infill of existing ramps and roads in this area.

The South Void, which is substantially within land owned by Macquarie Generation, will be utilised as a water storage area for the life of the Project. Currently Drayton Mine has the right to utilise the South Void until 1 January 2023. Anglo American will consult further with Macquarie Generation regarding the utilisation of the South Void following this date.

The utilisation of the voids at Drayton Mine under Scenario 1 is illustrated in Figure 24 with a relevant cross section of the proposed final landform shown in Figure 25.

Scenario 2

It is understood that Macquarie Generation is contemplating new proposals for the disposal of power station ash that does not involve the use of the East (South) Void.

Should this occur the existing arrangements would not be exercised. This scenario assumes that Macquarie Generation does not elect to occupy the East (South) Void and is granted planning approval to raise their current ash dam wall to increase its storage capacity or make other arrangements for the disposal of ash.

In Scenario 2, the East Void will be utilised for tailings disposal during the life of the Project and capped and rehabilitated at RL 140 m. As the East (South) Void is located on land owned by Macquarie Generation, Anglo American will enter into new commercial arrangements for the Project to occupy this void until closure of operations. Anglo American will be responsible for the rehabilitation of East (South) Void under Scenario 2.

Under Scenario 2 the North Void, which is situated on land owned by Anglo American, will be utilised as a rejects emplacement area and capped and rehabilitated at RL 181 m.

The South Void, which is substantially within land owned by Macquarie Generation, will be utilised as a water storage area for the life of the Project. Currently Drayton Mine has the right to utilise the South Void until 1 January 2023. Anglo American will consult further with Macquarie Generation regarding the utilisation of the South Void following this date.

The utilisation of the voids at Drayton Mine under Scenario 2 is illustrated in Figure 26 with a relevant cross section of the proposed final landform shown in Figure 27.

Scenario 3

Scenario 3 assumes that Macquarie Generation elects under the terms of its arrangement with Drayton Mine to utilise both the East (South) and South Voids which are located on its land. Drayton Mine will store water in the South Void until 1 January 2023 under the terms of the existing arrangement. Occupation of the East (South) and South Voids would then be reverted to Macquarie Generation.

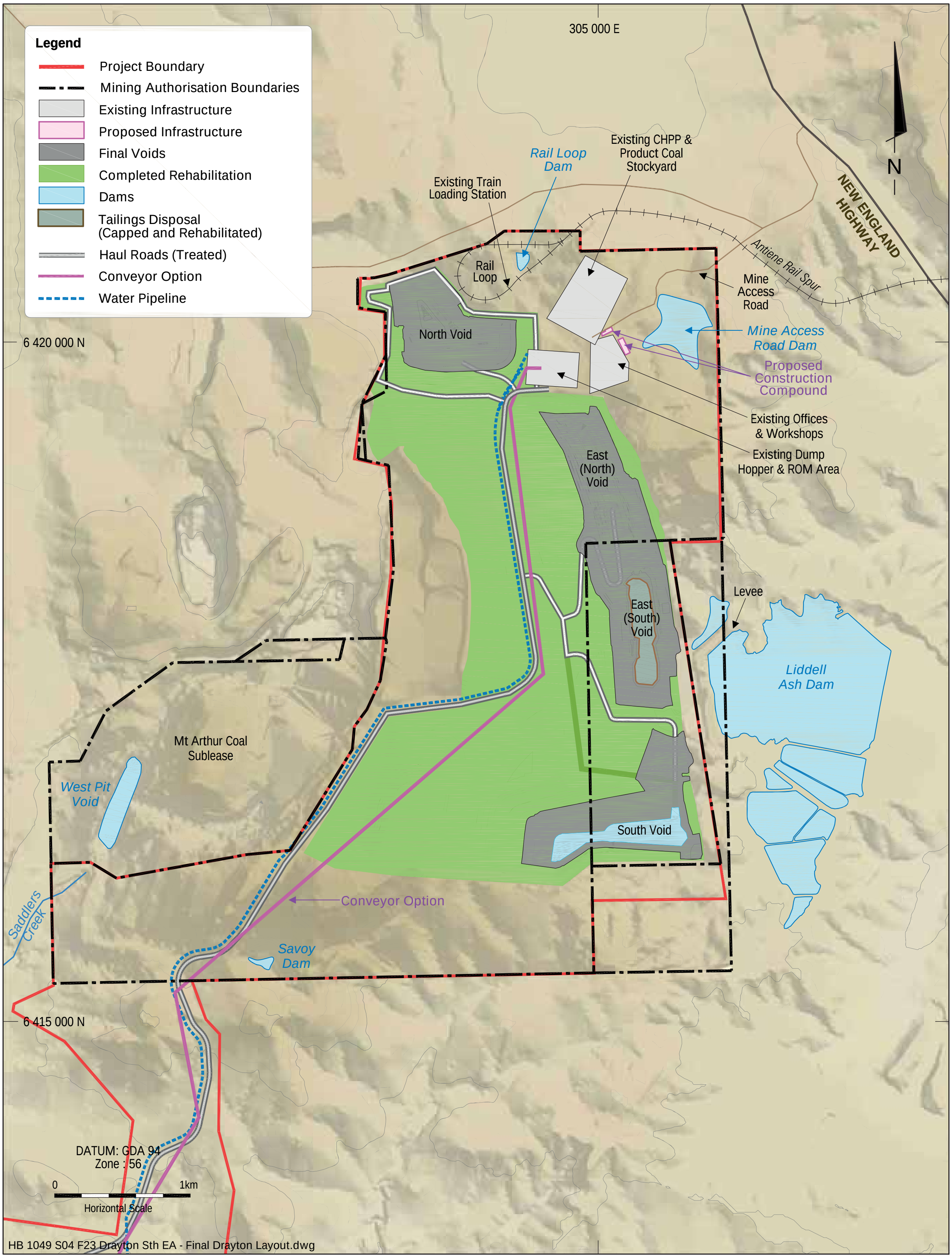
Future use of the voids will be subject to Macquarie Generation securing the necessary planning, environmental and other approvals and meeting the requirements of the relevant authorities, including DTIRIS with regard to the voids and their rehabilitation. It is envisaged that possible use of the voids would be for the deposition of power station ash.

From 2023 water for the Drayton Complex will be stored in East (North) Void to RL 100 m and within the Drayton South area.

The North Void, which is situated on land owned by Anglo American, will be a co-disposal emplacement area for rejects and tailings generated from the Drayton South mining areas. The North Void will be separated into two cells for emplacement of each coal waste material and then filled, graded to be free draining, capped and rehabilitated at RL 202 m. Some rejects will also be trucked to the southern side of the North Void and blended with the final landform to assist with infill of existing ramps and roads in this area.

The utilisation of the voids at Drayton Mine under Scenario 3 is illustrated in Figure 28 with a relevant cross section of the proposed final landform shown in Figure 29.

Section 4.14.2 describes the interactions with Macquarie Generation in further detail.



DRAYTON SOUTH COAL PROJECT

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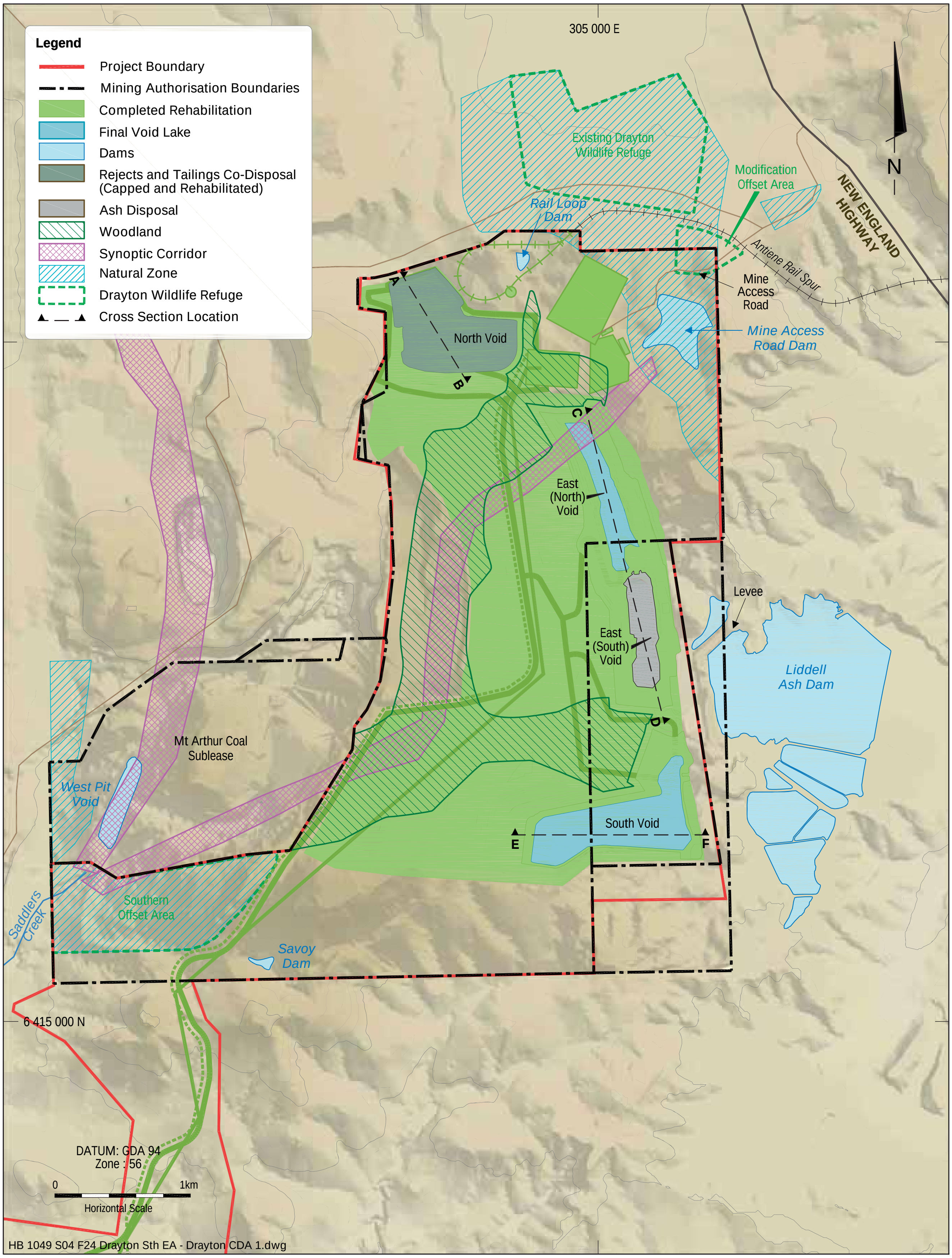
Conceptual Drayton Mine Landform (2017)

FIGURE 23



DRAYTON SOUTH COAL PROJECT

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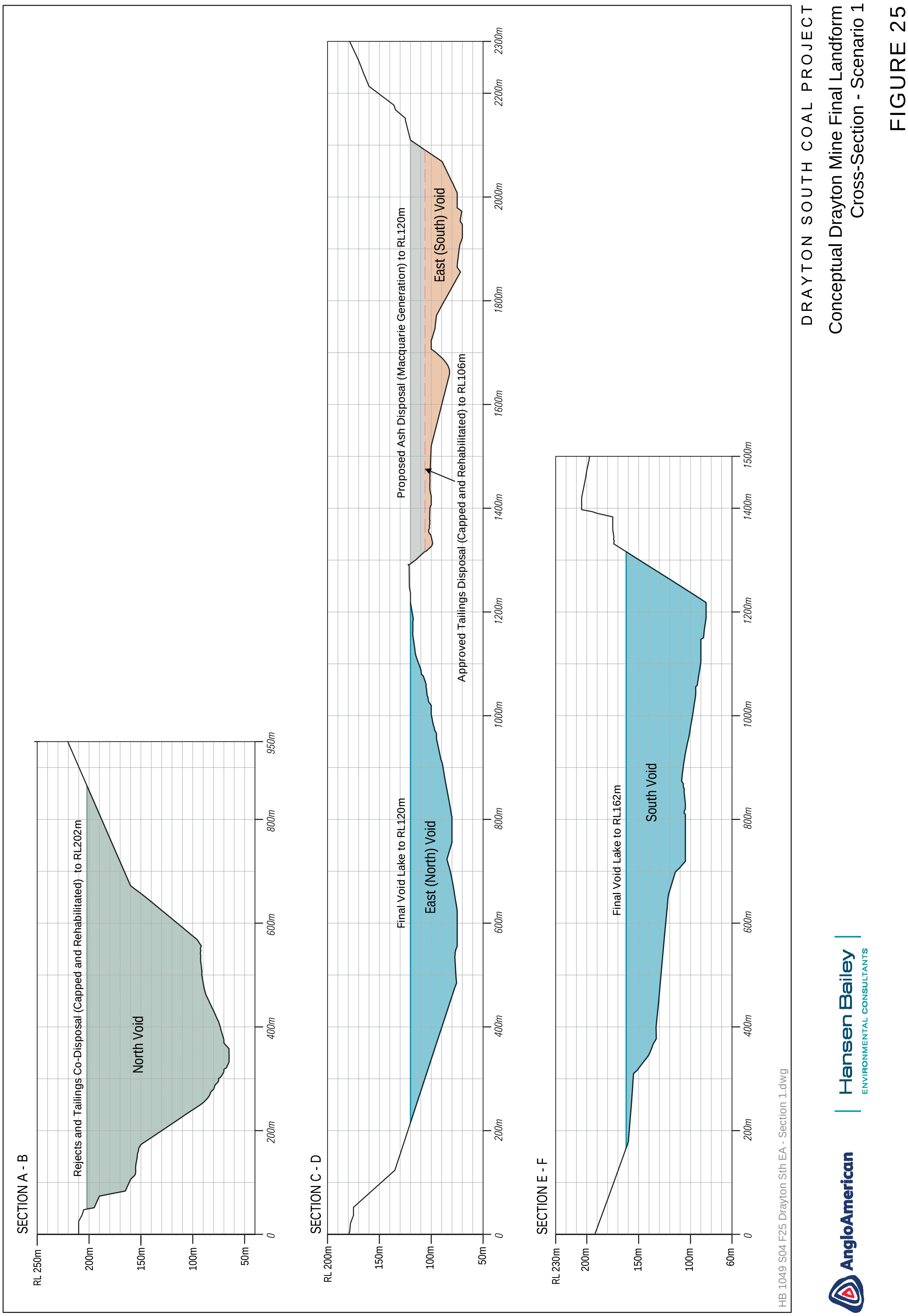
Conceptual Drayton Mine Final Landform (Mine Closure, 2040) - Scenario 1

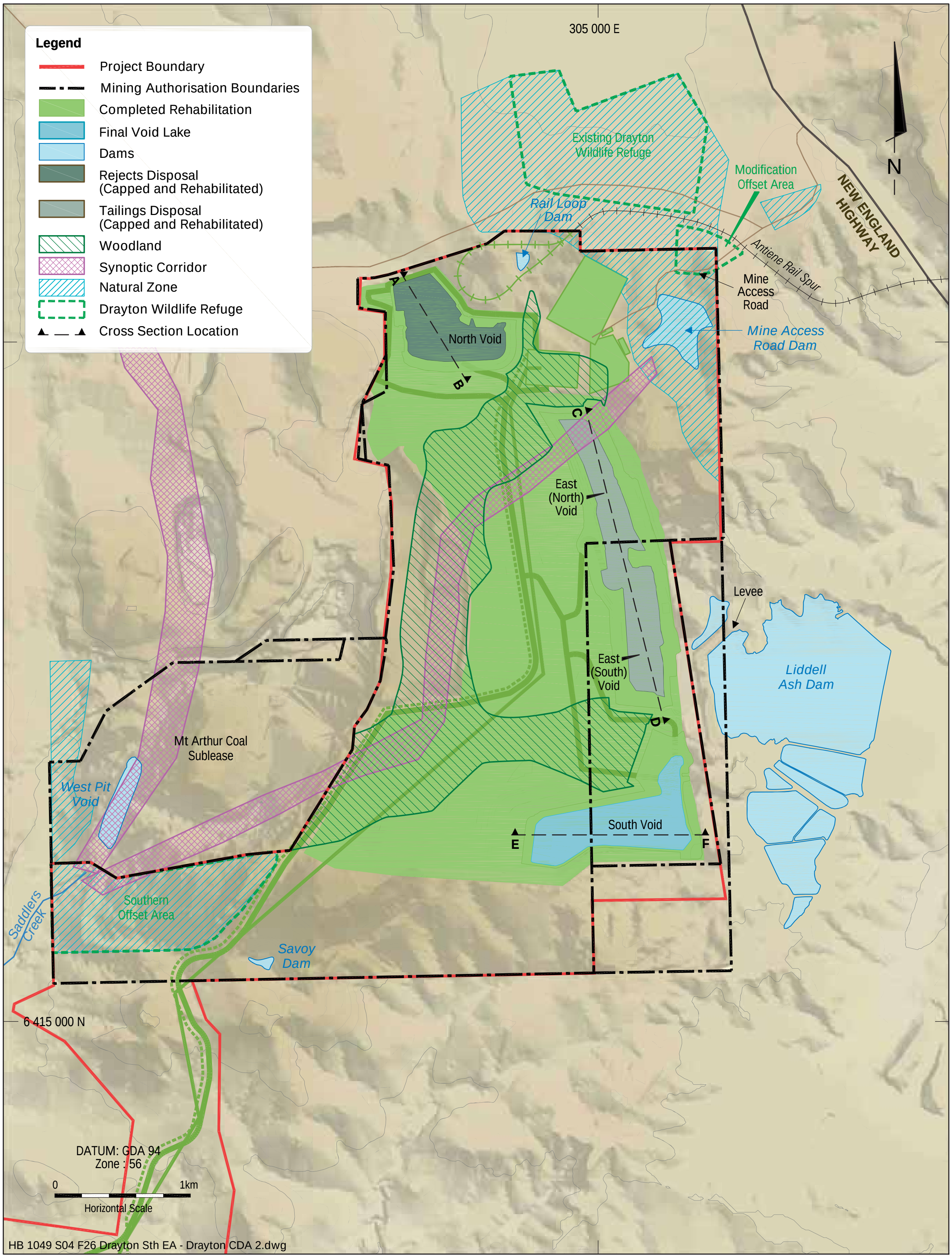
FIGURE 24



DRAYTON SOUTH COAL PROJECT

Conceptual Drayton Mine Final Landform Cross-Section - Scenario 1

FIGURE 25



DRAYTON SOUTH COAL PROJECT

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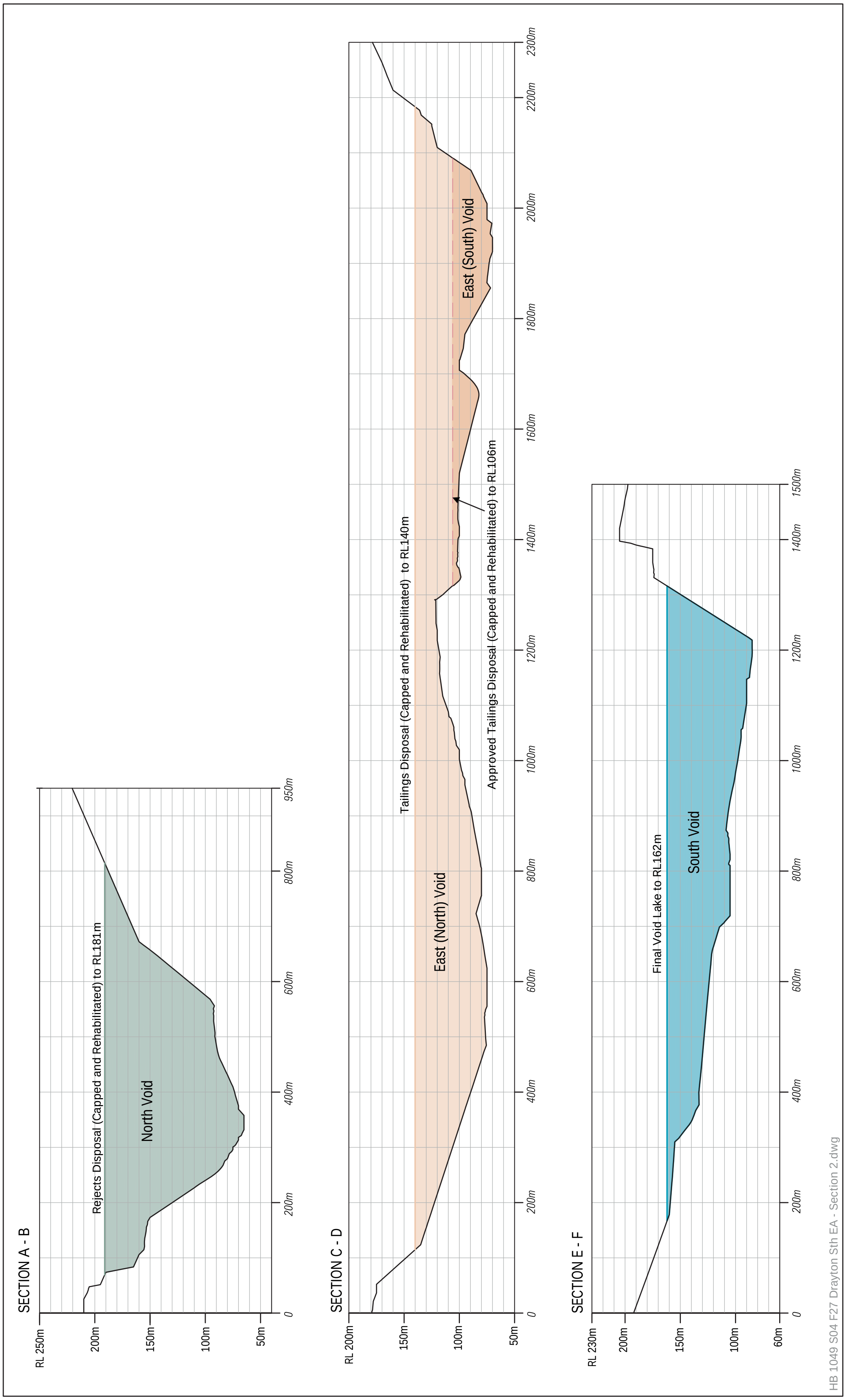
Conceptual Drayton Mine Final Landform (Mine Closure, 2040) - Scenario 2

FIGURE 26



DRAYTON SOUTH COAL PROJECT

Conceptual Drayton Mine Final Landform Cross-Section - Scenario 2

FIGURE 27

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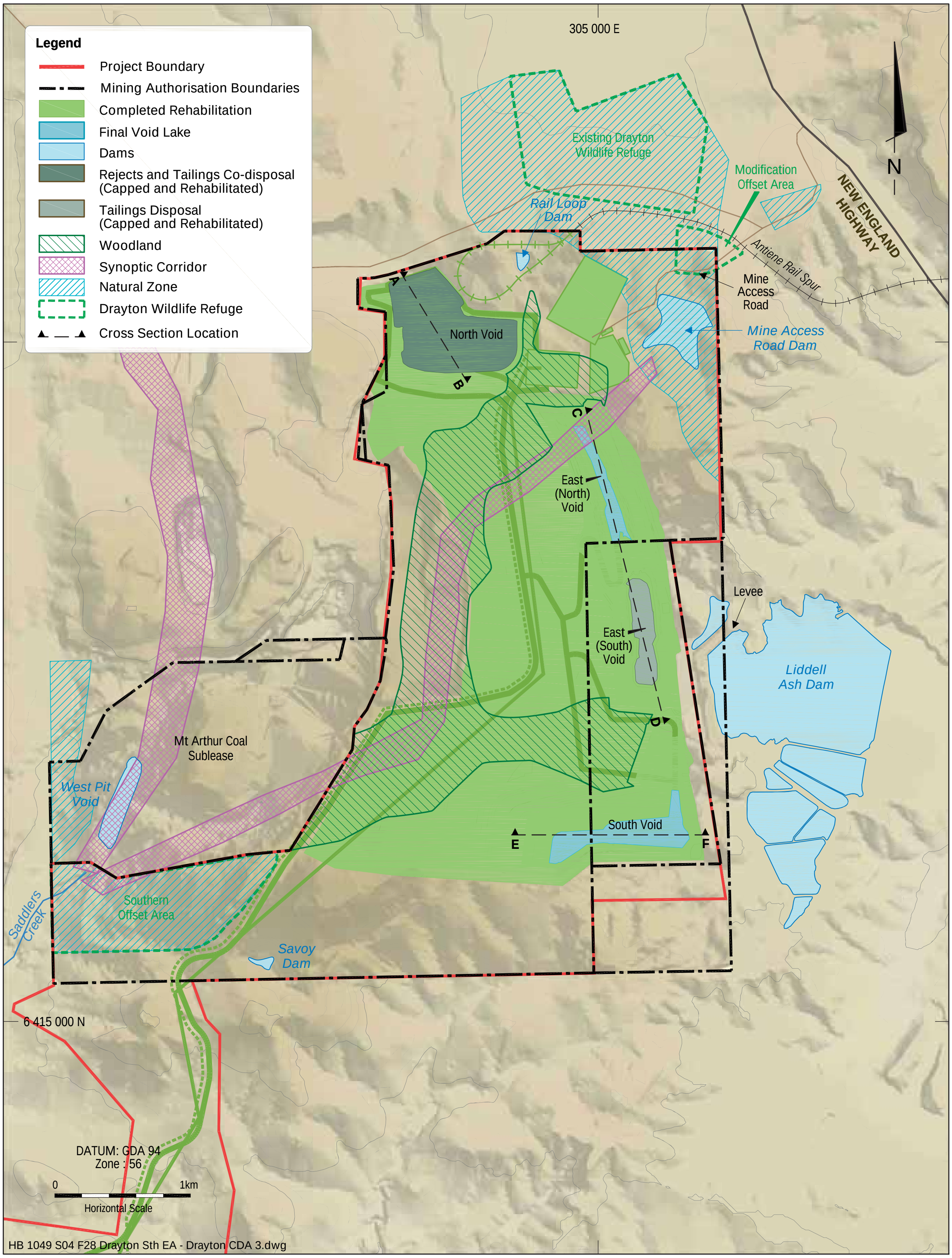

DRAYTON SOUTH COAL PROJECT

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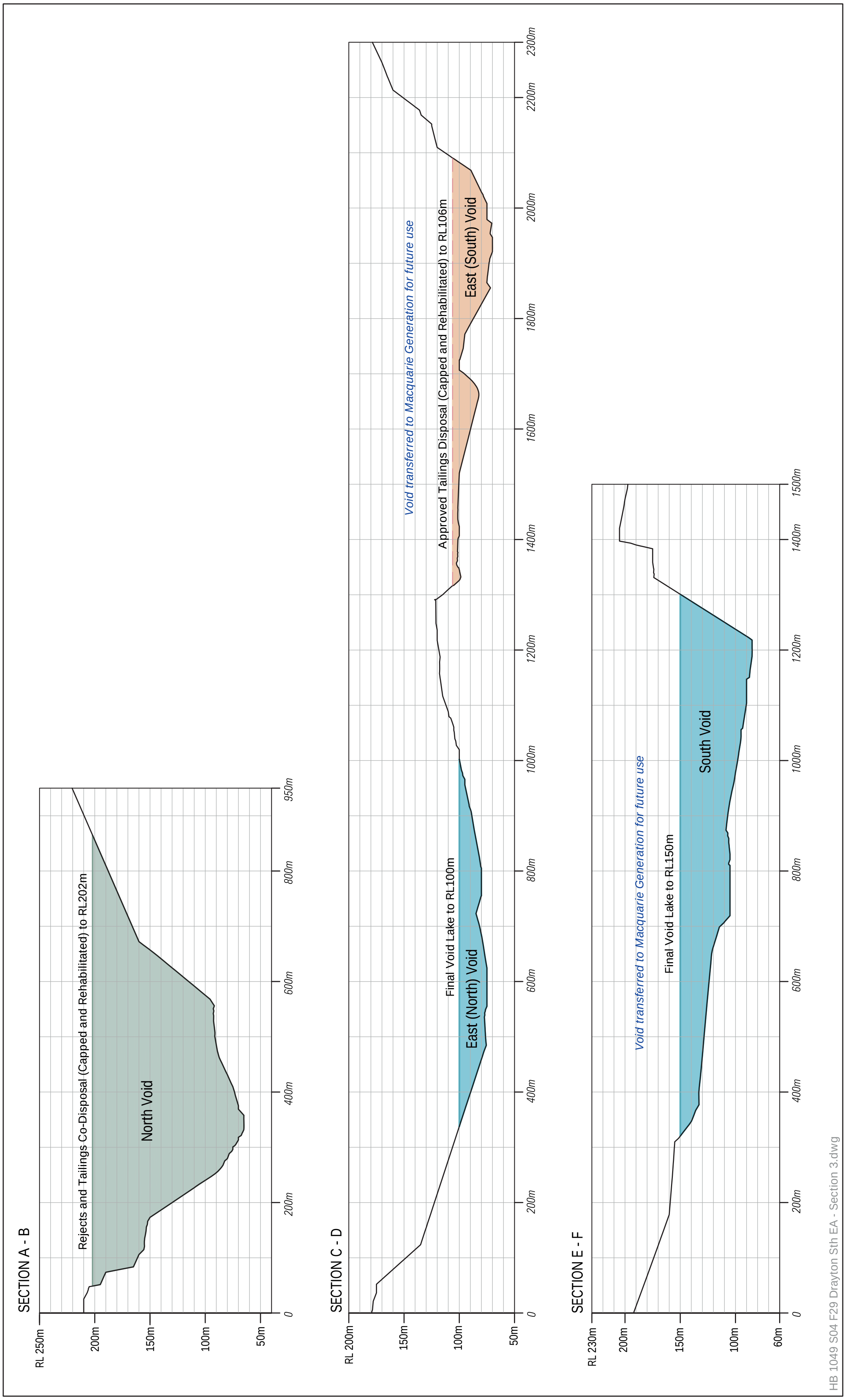
Conceptual Drayton Mine Final Landform (Mine Closure, 2040) - Scenario 3

FIGURE 28



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DRAYTON SOUTH COAL PROJECT

Conceptual Drayton Mine Final Landform Cross-Section - Scenario 3

FIGURE 29

4.5 Antiene Rail Spur

The Antiene Rail Spur is owned by the Antiene Joint Venture which is managed by Anglo American (see Figure 2). It is relied upon by Drayton Mine to transport product coal onto the Main Northern Railway and to the Port of Newcastle for export until November 2025 as approved under DC 106-04-00.

DC 106-04-00 authorises the transportation of up to 20 Mtpa of product coal per annum and a maximum of 30 train movements per day along the Antiene Rail Spur. This consists of a maximum of 7 Mtpa from Drayton Mine with up to 12 train movements per day and 13 Mtpa from Mt Arthur Coal Mine with up to 18 train movements per day.

There will be no change to coal transport or tonnage on the Antiene Rail Spur as a result of the Project. Ongoing access to the Antiene Rail Spur will be maintained in order to undertake required maintenance.

DC 106-04-00 requires the preparation and regular revision of an Environmental Management Strategy and various environmental management plans. DC 106-04-00 also specifies an affectation criterion for private freehold residences of 43 dBA $L_{eq(15\ minute)}$.

As part of the Project, Anglo American will be consolidating planning approvals and as such once a new PA is granted to include the use of the Antiene Rail Spur, DC 106-04-00 will be surrendered. Accordingly, Anglo American will consolidate all management plans and environmental monitoring requirements of DC 106-04-00 with the revised plans for the Drayton Complex once a new PA is granted. Further, the operational noise criteria for the Project (see Section 8.3) will supersede the noise criteria specified in DC 106-04-00.

4.6 Proposed Additional Infrastructure

The continuation of Drayton Mine through proposed mining operations in the Drayton South area provides environmental and economic benefits of being able to utilise the existing Drayton Mine infrastructure for the Project. The existing infrastructure that will be relied upon for the continuing operations of Drayton Mine is described in Section 3. The additional supporting infrastructure that will be required is described below.

4.6.1 Transport Corridor

A transport corridor will be constructed between the existing Drayton Mine and Drayton South mining areas to provide access for the transfer of coal to the existing CHPP facilities. This will include the construction of a dedicated haul road to enable heavy and light vehicle access between the two operational areas. Approval is also sought for an option to install an overland conveyor for the transfer of coal should this become economically feasible in the future. The haul road required to be constructed and the conveyor option are discussed in further detail below.

Haul Road

A dedicated two-way heavy vehicle haul road will extend approximately 12.6 km from the existing CHPP facilities to the Drayton South mine site facilities (see Figure 11). The haul road will be constructed and treated with a heavy duty bonding agent, such as Dust-A-Side or Dust-Bloc, which suppresses dust generation. A light vehicle access road will generally run parallel to the haul road to allow safe separation between heavy and light vehicles. This road will also be treated with a dust suppressant to minimise dust emissions and reduce the hazards associated with loose pavement surfaces. An overpass across the existing Macquarie Generation overland conveyor, which supplies coal to Bayswater Power Station from Mt Arthur Coal Mine, will be required to facilitate the haul road and light vehicle access road. This overpass will also assist with relocating the dragline from Drayton Mine to the Drayton South mining areas. Discussions have commenced with Macquarie Generation regarding the design of this overpass.

Conveyor

The haul road is required to be constructed at the commencement of operations in the Drayton South area and will be utilised for site access and haulage of coal from the Drayton South area to the existing Drayton Mine CHPP facilities. If it is considered economically feasible, an overland conveyor may be constructed to transfer coal from the Drayton South area to Drayton Mine (see Figure 11). At this stage there is no definitive proposal or indicative timing to construct this. Should the conveyor be deemed feasible, ROM coal from the mining areas would be hauled to a stockpile area and ROM hopper facility near the Drayton South mine site facilities and then conveyed to the existing CHPP facilities at Drayton Mine. Subsequently this option has been assessed in the air quality and noise modelling undertaken for the Project in comparison to indicative worst case years for the haul road with the results discussed in Sections 8.1 and 8.3 respectively.

4.6.2 Supporting Mine Site Facilities

The following new mine site facilities within the Drayton South area will be required to support operations:

- Parking facilities for heavy and light vehicles;
- Remote maintenance workshop with supporting services;
- Fuel and lubricant facilities;
- Operations building, including offices, training and crib room and amenities;
- Heavy and light vehicle wash station facilities;

- Dragline and equipment laydown area;
- Fire systems, including raw and fire water tanks;
- Waste management systems, including sewage treatment facility and offsite domestic waste transfer arrangements; and
- A helicopter pad.

A temporary construction compound will also be established at Drayton Mine site within a disturbed area adjacent to the existing offices and workshop complex.

The proposed location and layout of the Drayton South mine site facilities is shown in Figure 30 and are described further below.

Parking Facilities

A multipurpose parking facility will be constructed and will allow for parking and access to remote mine site facilities.

Remote Maintenance Workshop

A remote workshop will be constructed to facilitate minor equipment repairs and services. The remote workshop will consist of two service bays and a store. This will reduce the frequency of equipment being transferred to and from the main Drayton Mine workshop.

Fuel and Lubricant Facilities

For heavy vehicles that will not be regularly transported to Drayton Mine, fuel and lubricant facilities will be constructed adjacent to the remote workshop. Diesel will be stored in self-bunded tanks and relocated as required.

Operations Building

An operations building containing the following facilities will be constructed to cater for the employees and contractors based at the Drayton South mining areas:

- Air-conditioned office facilities;
- Workstations;
- Meeting room;
- First-aid room;
- Training room;
- Crib room;
- Compactus; and
- Male and female toilets with shower facilities.

Vehicle Wash Station Facilities

A heavy and light vehicle wash station will be constructed at the entrance approaching the Drayton South mine site facilities. The facility design will be similar to the specifications and systems of the existing vehicle wash station at Drayton Mine

Dragline and Equipment Laydown Area

Once the dragline is relocated from Drayton Mine, a dedicated pad will be established adjacent to the mine site facilities within the Drayton South area to accommodate refurbishment activities. This area will be approximately 200 m long by 90 m wide, with a suitable level area for the tub to be located during repairs. This area will also be used throughout the operations of the Project as an equipment laydown area.

Fire Systems

Fire fighting systems will be established at the Drayton South mine site facilities to support activities in the event of an emergency. Precautionary measures will include fire detection in buildings and switch rooms, fire suppression for substations, a fire water system and fire extinguishers.

The fire water system will comprise of a dedicated fire water tank and raw water tank, which will serve as a secondary support to the fire water tank.

Waste Management Facilities

A sewage treatment facility will be constructed adjacent to the mine site facilities within the Drayton South area to treat waste water generated from the following sources:

- Toilets;
- Hand basins;
- Kitchen sinks;
- Showers; and
- Floor wash-down (excluding workshops and garages).

The sewage treatment facility will have a capacity of approximately 20 kilolitres per day (kL/day) and will be designed in accordance with the relevant Australian Standards and various regulatory requirements.

The effluent from the sewage treatment facility will be of a suitable standard to be used as irrigation water in accordance with the *Environmental Guideline for the Use of Effluent by Irrigation* (DEC, 2003).

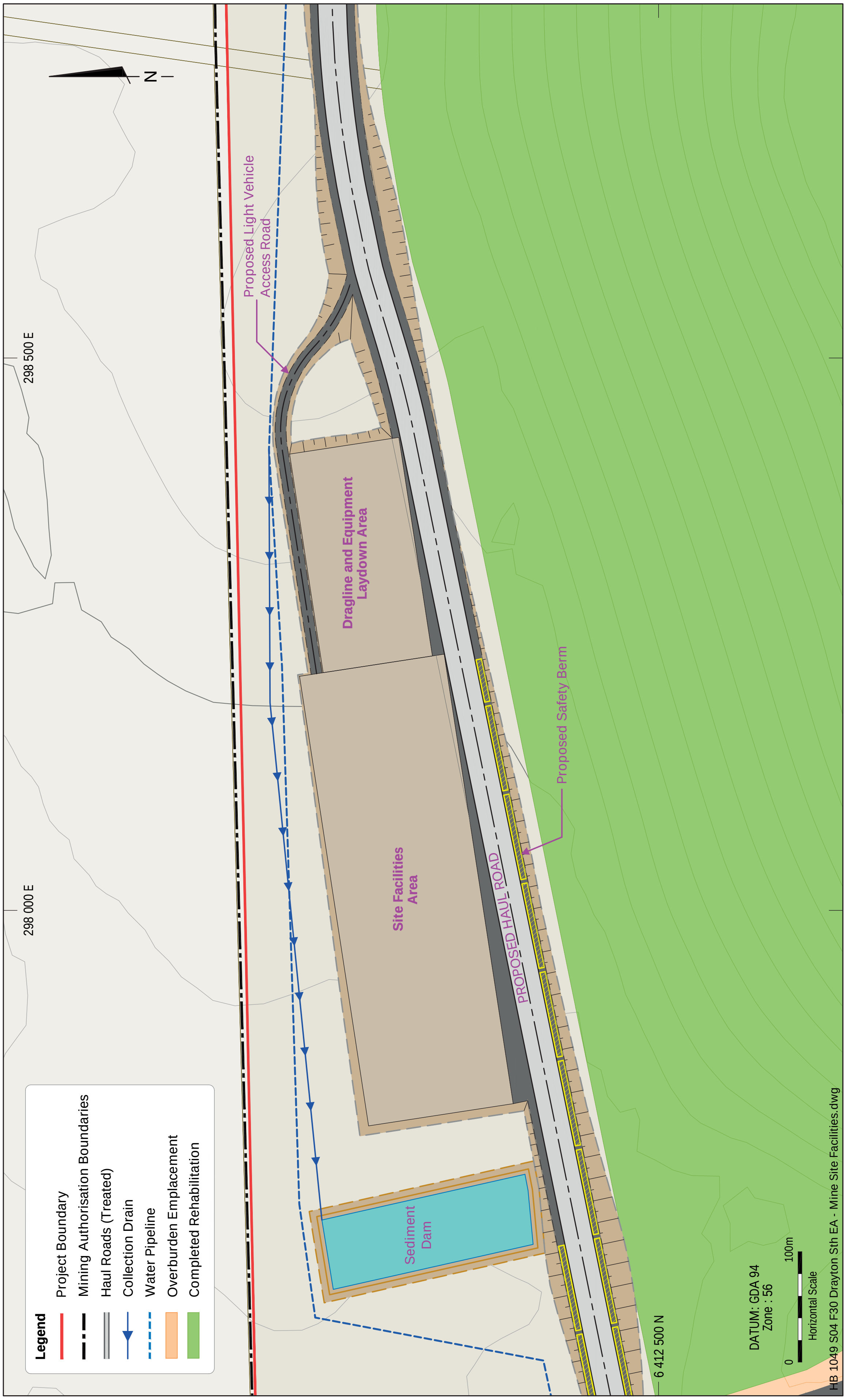
All domestic waste generated within the Drayton South area will be transported off site using an independent waste contractor. Current waste management and disposal procedures at Drayton Mine will be implemented (see Section 8.20).

Helicopter Pad

A helicopter pad will be constructed to largely facilitate emergency transfers. The helicopter pad will be located adjacent to the Drayton South mine site facilities.

Construction Compound

A temporary construction compound will be assembled at Drayton Mine to allow for the storage of site deliveries. Materials will be transported to the Drayton South mine site facilities as required.



DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South Mine Site Facilities

FIGURE 30

4.7 Houston Visual Bund and Screening

A visual bund will be constructed in the foreground of the Houston mining area to shield views of operations in the Houston and Whynot mining areas from receivers to the south (see Figure 11). The Houston visual bund has been designed in consideration of feedback received as part of consultation with neighbouring stakeholders, particularly Coolmore Australia, through a series of working group meetings that have been ongoing in the planning phase of the Project. Consultation with neighbouring stakeholders is described in Section 6.

The Houston visual bund will involve an eight stage construction program (see Table 12) from Year 3 for a period of approximately 16 months. It will be situated approximately 2.8 km from the nearest receiver in the south. Approximately 16.6 Million loose cubic metres (Mlcm) of overburden material from mining activities will be required for its construction. The design provides for a maximum batter height of 77 m, a crest length of 1,750 m and a slope of approximately 11 degrees. Once constructed the bund has been designed to align with the existing topography and landscape. Throughout stage 1, 3, 6 and 8, a dozer (D11) and trucks (789) will be supporting construction activities on the southern face of the visual bund. All other stages of the construction of the visual bund have been designed to remain shielded behind the previous lifts.

Initially the Houston visual bund will be constructed during daylight hours until the Houston mining area reaches a depth of 12 m and the bund in front of the mining area reaches 15 m. From this point onwards the construction hours will be 24 hours per day 7 days a week in order to establish and rehabilitate the bund as soon as practical in accordance with stakeholder expectations.

The Houston visual bund will be progressively covered with available topsoil and rehabilitated with a crop of pasture grass and/or sterile cover crops to minimise exposed areas. Tree screens, composed of native species, will be established on the visual bund to restore visual amenity.

Alternatives considered during the design of the Houston visual bund are described further in Section 4.16.6.

Tree screens have been established on the Golden Highway and will be planted along the ridgeline adjoining the Houston visual bund and the Edderton Road realignment to minimise views of the Project from various vantage points. These tree screens will be planted prior to and during the construction phase to allow for substantial growth and to maximise the opportunity for establishment.

4.8 Water Management System

The Drayton South water management system will be integrated with the existing Drayton Mine water management system and infrastructure to enable optimal collection, recycling and reuse of water within the Drayton Complex.

There are five dams integrated in the existing Drayton Mine water management system, including the Mine Access Road Dam, Industrial Dam, Rail Loop Dam, Savoy Dam and West Void. The dams are connected via a network of pipes, which enables the transfer of water according to mine operational requirements.

The West Void, within the area previously subleased to Mt Arthur Coal Mine, is currently used as a repository for excess

Table 12 Visual Bund Construction Program

Stage	Construction Activity	Volume (Mlcm)	Time (Months)	Anticipated Visibility (Months)
1	Lift to RL 175 m	2.2	2.1	2.1
2	Backfill to RL 170 m	1.5	1.5	-
3	Lift to RL 200 m and 4% grade to RL 225 m (East End)	4.5	4.3	4.3
4	Backfill to RL 195 m	1.6	1.5	-
5	Backfill to 4% grade (East End)	1.1	1.0	-
6	Lift to RL 225 m and crest line (West End)	2.2	2.1	2.1
7	Backfill to RL 220 m	0.7	0.6	-
8	Lift to crest line (RL 270 m) and final shaping	2.8	2.7	2.7
Total		**16.6**	**16**	**11.3**

water. The agreement between Drayton Mine and Mt Arthur Coal Mine allows Drayton Mine to store water within the West Void until January 2017, upon which time any stored water will be pumped back into the Drayton Mine water management system.

As described in Section 4.2.1 additional mining in the East Pit will result in the extraction of approximately 1.4 Mt of remnant coal beneath the existing mine-water Industrial Dam. It is proposed to shift the current functions of the Industrial Dam to the Access Road Dam. Any water remaining in the Industrial Dam at the time of decommissioning will be pumped to other storages, in particular the South Void. Any potential contaminated materials (i.e. hydrocarbons) will be appropriately removed and treated.

With the development of the Drayton South area, water inundating active mining areas and runoff from OEAs, industrial areas and natural catchments, will be controlled on site by a system of catch dams, bunds, piped transfers, diversion drains and the existing voids at Drayton Mine. Figure 14 to Figure 20 illustrates the indicative water management infrastructure for the Drayton South area as mining activities progress, opening and creating new catchments.

Three main catch dams (Blakefield Dam, Transfer Dam and Houston Dam) and a network of water pipelines, which link to Drayton Mine, will be constructed. Should the conveyor option be adopted for the haulage of coal from the Drayton South area to the Drayton Mine CHPP (as described in Section 4.6.1), an additional dam (ROM Dam) will be constructed to collect runoff from the Drayton South coal stockpile area.

Clean water runoff will be collected in a series of highwall dams and surface drainage channels and diverted away from the mining areas to their natural flow. Alternatively this water will be captured in the Blakefield Dam, which is required to manage the release of the clean highwall dam water into Saddlers Creek. Coal affected water associated with active mining areas will be pumped to the Transfer Dam, Houston Dam and/or approved water storages at Drayton Mine (South Void or East (North) Void).

Water recovered from mining operations will initially be pumped to the Transfer Dam. From here it will either be reused for operations within the Drayton South area or be pumped to and stored in the approved water storages at Drayton Mine. From here water will be transferred to other areas within the mine (e.g. Mine Access Road Dam and Transfer Dam), for reuse at the CHPP and for dust suppression.

During abnormally wet periods, where water is in excess of that required to ensure water supply security, water will be transferred to the Houston Dam for discharge. Controlled releases of water will be discharged via a newly constructed pipeline into the Hunter River in accordance with the Hunter River Salinity Trading Scheme (HRSTS) (see Figure 11). The pipeline outlet will be designed in accordance with relevant standards, average discharge rates and following consultation with the NSW Office of Water (NOW).

Under very dry conditions where additional water is required in the water management system to supply operations, the Project will hold the necessary WALs to draw water from the Hunter River. In this circumstance, a water pipeline and associated electric pump station will be constructed to enable water to be transferred from the Hunter River to the Houston Dam for circulation in the water management system. The pump station will be located on the high bank of the Hunter River and the inlet will be designed in accordance with set standards and in consultation with NOW.

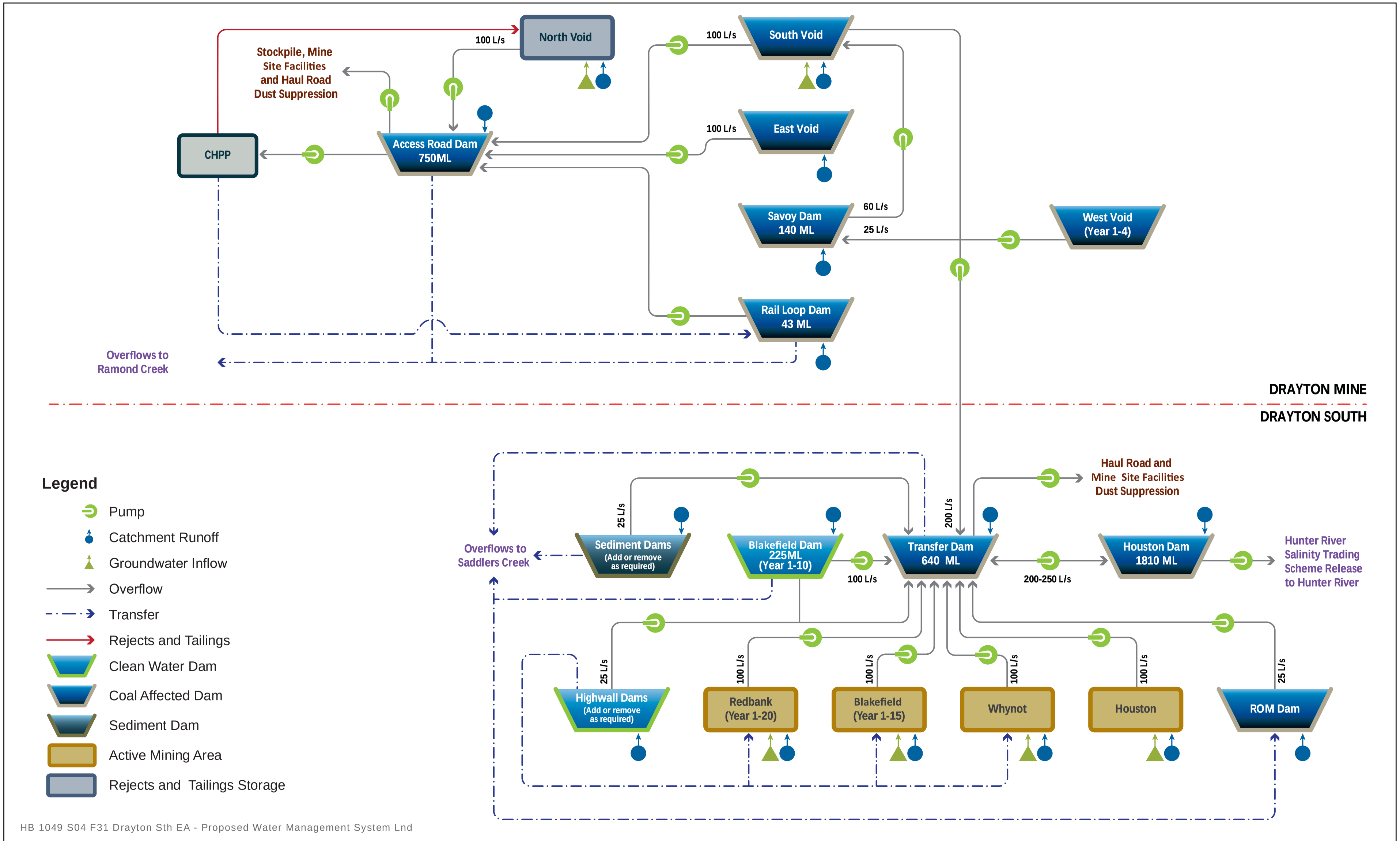
The catch dams will be supported by a suite of sediment dams required predominantly along the northern face of the Whynot and Blakefield mining areas. Sediment dams will be designed in accordance with *Managing Urban Stormwater Guidelines* (Landcom, 2004). As the mining sequence progresses, highwall dams will be established to reduce inflows and velocity of associated catchments and to capture clean water runoff from entering the mining areas.

Surface runoff from industrial areas, which may contain high levels of suspended sediment, detergents, oil and other chemicals will be captured in storage dams and treated prior to being reused in the water management system. Runoff and drainage from all site haul roads within the Drayton Complex, including along the length of the transport corridor, will be captured utilising a series of diversion drains, bunds and sediment dams. Similarly runoff and drainage will be pumped out for reuse in the water management system or released off site if relevant water quality criteria can be achieved.

Surface water runoff from rehabilitated areas will be directed to storage or sediment dams prior to being released into local drainage lines. These areas will be allowed to free drain as the landform approaches the end of the mine life.

The proposed water management system for the Drayton Complex is illustrated in Figure 31.

A set of alternatives for rejects and tailings disposal is described further in Section 4.4.1. An analysis of the performance of the proposed water management system for the Drayton Complex is provided in Section 8.11.



DRAYTON SOUTH COAL PROJECT

Proposed Water Management System

FIGURE 31

4.9 Electricity and Communication Services

The feasibility of extending the existing 33 kilovolt transmission line network from Drayton Mine to serve the Drayton South area is being assessed as part of detailed design for the Project. If this proves to be inadequate, the Project will access electricity from the existing Ausgrid network via:

- A connection to an existing 66 kV transmission line on the Mitchell line; or
- The establishment of a new 66 kV transmission line from the existing Drayton Mine switchyard.

The transmission line will extend to a newly constructed switchyard within the Drayton South area. This service will supply electricity to power the Drayton South mine site facilities and operations associated with the mining areas.

An existing 132 and 500 kV transmission line extends across the Project Boundary in the vicinity of the transport corridor. As part of detailed design for the construction of the haul road and the relocation of the dragline the location of these lines have been factored in to ensure that adequate clearances are provided. These works will be undertaken in close consultation with Ausgrid.

An existing rural 11 kV transmission line, which runs parallel to the existing Edderton Road will need to be relocated to facilitate operations in the Blakefield mining area. Anglo American has consulted with Mt Arthur Coal Mine and Ausgrid regarding the realignment of the transmission lines and conceptual routes. Section 4.14.1 describes the interaction with Mt Arthur Coal Mine in further detail.

It is also proposed to construct a temporary link to this 11kV transmission line to provide electricity supply to the Drayton South area during the construction phase. This will be decommissioned once construction is completed and the operational power supply has been connected.

A plant control system will be established within the Drayton South mine site facilities, which will regulate networking and communications. This system will be integrated into the existing facilities at Drayton Mine via a fibre link situated within the transport corridor. Telemetry links will also be installed to network with remote mine site facilities from the plant control system within the Drayton South area. This system will be supported by the construction of a new radio communications tower, which will extend the existing Ultra-High Frequency radio services.

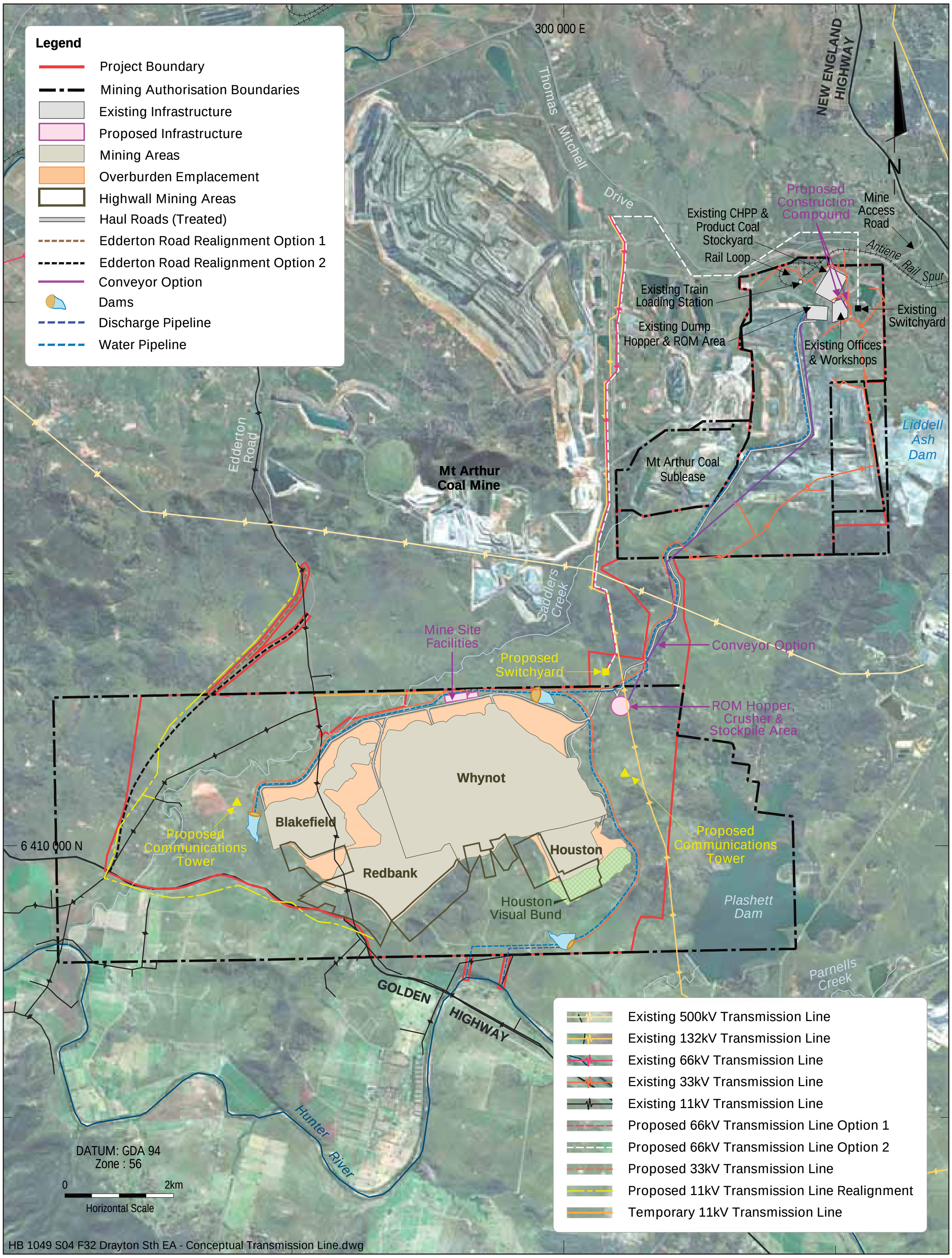
While the majority of the proposed electricity and communications corridors in the vicinity of the proposed disturbance footprint have been assessed there remain parts of the proposed realignments that are more remote from the site that were not able to be surveyed for ecology and Aboriginal archaeology. As such a due diligence assessment for these aspects will be undertaken following detailed design and prior to construction of the proposed electricity and communications infrastructure. Where necessary, the location of this infrastructure will be revised to avoid impacts on threatened ecological communities and Aboriginal archaeology. The conceptual layout of the overhead transmission lines, communication tower and switchyard are indicated on Figure 32.

4.10 Workforce and Operation Hours

During the operations phase, up to 530 employees and contractors will be required. Coal mining operations and associated activities will continue to be undertaken up to 24 hours per day, seven days a week.

Some activities, including blasting and the operation of particular equipment on exposed surfaces will be constrained to daylight hours to avoid adverse noise and vibration impacts as required (see Section 8.3 and 8.4). Blasting in particular will only be undertaken during the hours of 9:00 am to 5:00 pm Monday to Saturday inclusive, excluding Sundays and public holidays unless granted prior approval from OEH.

In order to ensure that any potential health impacts to the workforce as a result of the Project are appropriately managed, Anglo American will continue to conduct operations within the Drayton Complex in accordance with the existing SHECMS, the requirements of the *Coal Mine Health and Safety Act 2002* (CMHS Act) and the *Work Health and Safety Act 2011*. Impacts as a result of the Project on the community are discussed in Section 8.



DRAYTON SOUTH COAL PROJECT

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Conceptual Electricity and Communications Infrastructure

FIGURE 32

4.11 Mine Access

Mine access will continue to be via the existing Drayton Mine Access Road off Thomas Mitchell Drive with the exception of construction activities associated with realignment of Edderton Road and other minor civil works in this area. Employees and contractors will travel between the existing Drayton Mine and the Drayton South area via the transport corridor. An emergency entry / exit will be developed and maintained off Edderton Road for emergency health and safety purposes only.

4.12 Construction Phase

The Project will continue to utilise the existing Drayton Mine infrastructure. However, to support the continuation of operations, the following construction activities will be required:

- Modifications to the existing CHPP, ROM hopper, raw coal stockpiles and rail loading facility;
- Construction of the supporting Drayton South mine site facilities;
- Establishment of haul roads and light vehicle access roads;
- Connection of electricity and communication services;
- Installation of water management facilities; and
- Construction of the Edderton Road realignment.

The construction phase is scheduled to continue for a period of approximately 29 months. The indicative construction schedule is illustrated in **Table 13**. Construction activities, with the exception of the Edderton Road realignment, will be conducted up to 24 hours per day, seven days a week. The proposed construction hours for the realignment of Edderton Road are 7:00 am to 5:00 pm Monday to Saturday inclusive.

Construction activities will be facilitated by a workforce of up to 369 employees and contractors.

The Project is seeking approval to utilise an existing quarry within the transport corridor located on land owned by Anglo American to source materials for the construction of haul roads and light vehicle access roads (see **Figure 11**). Limited blasting and crushing will be required for the production of material in the quarry. Blasting in this regard will only require relatively small charges in the order of a Maximum Instantaneous Charge (MIC) of 100 kg. Operations within the quarry will be during daylight hours only during the initial construction phase. Water carts will operate within the quarry and on the surrounding roads in order to minimise dust emissions. The area surrounding the quarry has been included in surveys for ecology and Aboriginal archaeology. The nearest sensitive receptor to the quarry is Bayswater Power Station located

Table 13 Indicative Construction Schedule

Activity	Month																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Site Establishment	■	■	■	■	■	■	■	■																					
Site Services		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												
Haul Road and Light Vehicle Road				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■											
Mine Site Facilities								■	■	■	■	■	■	■	■	■	■												
Dams								■	■	■	■	■	■																
Open Cut Mining Preparation													■	■	■	■	■												
Equipment Retrofitting and Assembly										■	■	■	■	■	■	■	■	■	■	■									
CHPP			■	■	■	■	■	■	■	■	■	■	■																
Edderton Road		■	■	■	■	■	■	■	■	■	■																		
Dragline Relocation																					■	■	■	■	■	■	■	■	■

over 4.5 km to the east followed by Edderton Homestead located 6.5 km to the south-west.

Discussions have occurred between Anglo American and Muswellbrook Shire Council (MSC) over the realignment of Edderton Road which is required by quarter 1, 2015 to enable mining operations to commence within the Blakefield mining area.

4.13 Edderton Road Realignment

To allow for coal extraction in the Blakefield mining area, the southern portion of Edderton Road will need to be realigned further to the west within the Project Boundary (see Figure 11). This is required to occur within Year 1 of the Project and would take approximately 10 months to complete. Two options for the realignment have been proposed. Both options follow a single route from the redesigned intersection with the Golden Highway (see Figure 33) for approximately 3.9 km within the Project Boundary on land owned by Anglo American. Once intercepting land owned by HVEC, both options diverge.

Option 1 and Option 2 continue for approximately 3 km and 2.3 km, respectively. The realignment will then connect with the existing Edderton Road north of the Project Boundary. The preferred option will be selected as part of detailed design.

The realigned portion of Edderton Road will be designed to upgrade its standard in accordance with the Roads and Traffic Authority (now known as Roads and Maritime Services (RMS)) *Road Design Guide* (RTA, 2000) for a typical two-lane, two-way rural road with a nominal speed limit of 100 km per hour. Multiple culverts will also be installed under the road at low points as required, particularly near the Saddlers Creek crossing, to satisfy surface hydrology requirements and to reduce the occurrence of road flooding. It will also include an underpass for farming equipment and livestock movements as well as access points for existing properties along the realigned portion of road. Edderton Road will not be closed during the construction phase.

4.14 Interactions with Neighbouring Industry

There will be a number of working interactions with neighbouring industries. These include Mt Arthur Coal Mine to the north-west, Macquarie Generation to the east and NuCoal Resources Ltd (NuCoal) to the south-east.

4.14.1 Mt Arthur Coal Mine

The interactions with Mt Arthur Coal Mine include the following:

- Operations by Mt Arthur Coal Mine within part of CL 229;
- Joint use of the Anglo American owned Antiene Rail Spur;
- Realignment of Edderton Road;
- Realignment of existing transmission lines;
- Restoration of Saddlers Creek; and
- Modification to Project Approval.

Each interaction is discussed in further detail below.

Mt Arthur Coal Mine within Part of CL 229

In 2006, Drayton Mine granted a sublease over part of CL 229 to HVEC for use as part of the operations of Mt Arthur Coal Mine specifically for the purposes of depositing overburden, tailings or other material in accordance with current approvals held. This area is shown on Figure 11 and Figure 12 as the Mt Arthur sublease area. The coal resource within this area has been exhausted and is to be rehabilitated Mt Arthur Coal Mine.

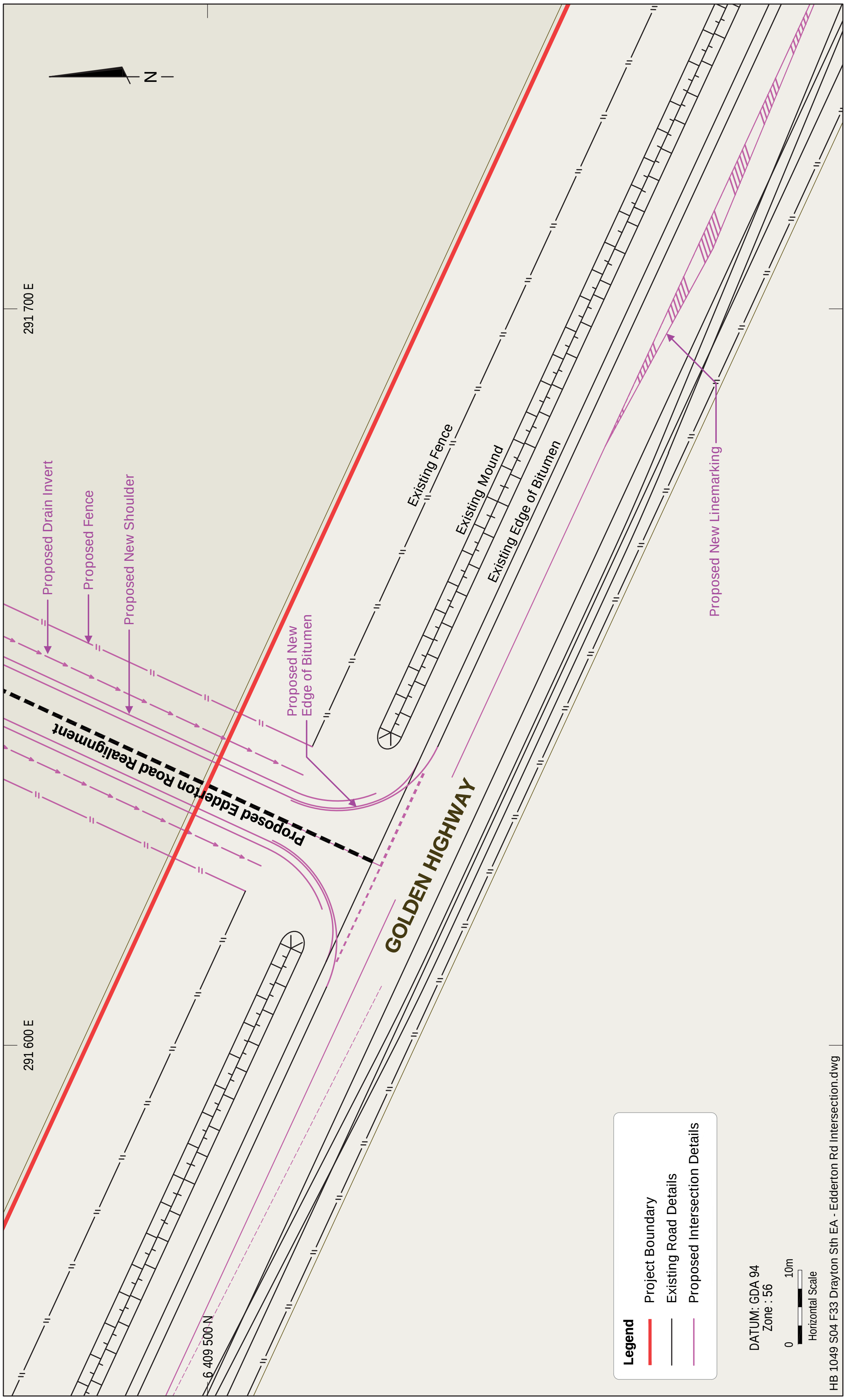
The sublease was registered by DTIRIS – Division of Resources and Energy (DTIRIS – DRE) on 17 December 2008 and the Mt Arthur sublease area was moved from the Drayton Mine colliery holding to the HVEC colliery holding. On 15 November 2010, amendments to the *Mining Act 1992* (Mining Act), under the *Mining Amendment Act 2008*, came into force. The applicability of section 83A and section 163A of the Mining Act resulted in the sublease being terminated.

On 12 June 2012 DTIRIS – DRE wrote to Anglo American informing them that the sublease held by HVEC had ceased to be registered and that the Mt Arthur sublease area had been returned to the Drayton Mine colliery holding.

Discussions are underway between Drayton Mine, HVEC and DTIRIS-DRE to put in place the appropriate authorities for the continuation of spoil emplacement by HVEC in the Mt Arthur sublease area.

Antiene Rail Spur

The Antiene Rail Spur is relied upon by both Drayton Mine and Mt Arthur Coal Mine to transport coal from their operations on to the Main Northern Railway and to the Port of Newcastle for export. The Antiene Rail Spur is owned by the Antiene Joint Venture which is managed by Anglo American and shown on Figure 2.



DRAYTON SOUTH COAL PROJECT

Conceptual Edderton Road / Golden Highway Intersection Design

FIGURE 33

The joint use of the Antiene Rail Spur is governed by the Antiene Rail Spur Access Agreement dated 8 September 2009, which establishes the commercial and operational arrangements and the terms and conditions on which Anglo American agrees to Mt Arthur Coal Mine's use of the Antiene Rail Spur for the transport of coal from the Bayswater Rail Loop onto the Main Northern Railway.

Initially the use of the Antiene Rail Spur was governed by two separate planning approvals granted individually to Drayton Mine and Mt Arthur Coal Mine on 2 November 2000. These were DA 106-04-00 (Drayton 2000 Antiene Rail Spur Consent) and DA 105-04-00 (Mt Arthur Coal 2000 Antiene Rail Spur Consent). The two approvals had complimentary provisions and interacting obligations that were supported by one EIS jointly assessing the use of the Antiene Rail Spur by Drayton Mine and Mt Arthur Coal Mine.

Under the two complementary approvals, Drayton Mine and Mt Arthur Coal Mine were required to (and did) enter into a joint acquisition management plan in January 2001 to manage cumulative impacts between the respective mining operations and the joint use of the Antiene Rail Spur.

The joint acquisition management plan provides a means for both companies to cooperate in the management of cumulative dust and noise impacts caused by the operation of the Antiene Rail Spur and mining on privately owned properties. This is achieved by working together to ameliorate impacts, and where possible, reduce emissions and/or agree to purchase properties where necessary if cumulative impacts exceed governed criteria.

In 2010, Mt Arthur Coal Mine consolidated a number of their existing planning approvals and subsequently the Mt Arthur Coal 2000 Antiene Rail Spur Consent was surrendered. For consistency Anglo American is now applying to consolidate their existing planning approvals and surrender the Drayton 2000 Antiene Rail Spur Consent.

The consolidation of Mt Arthur Coal Mine's approvals in 2010, affected the operation of the joint acquisition management plan and resulted in a variation to the Antiene Spur Access Agreement, in which the parties agreed to implement a new joint acquisition management plan setting down the principles that would be applied. Anglo American has commenced discussions with Mt Arthur Coal Mine to settle the new joint acquisition management plan.

Edderton Road

Anglo American proposes the realignment and upgrade of the southern portion of Edderton Road further to the west as shown in Figure 11 to facilitate operations in the Blakefield and Redbank mining areas. Similarly, Mt Arthur Coal Mine has approval to realign and upgrade the northern portion of Edderton Road to allow for future mining operations. This results in a portion of the existing road between the two realignments being excluded from road work upgrades.

To ensure the construction standards of Edderton Road are consistent and to allow for the best outcome for stakeholders, Anglo American has entered into discussions with Mt Arthur Coal Mine on the required realignments and commitments to enable the upgrade of the remaining section of the existing road.

Transmission Lines

As part of the Project, approval is being sought to relocate two transmission lines that fall within the proposed Drayton South disturbance footprint. Anglo American has been in consultation with Mt Arthur Coal Mine and Ausgrid regarding the realignment of the transmission lines and conceptual routes have been proposed. This will allow all parties to proceed with future operations without conflict.

Restoration of Saddlers Creek

The headwaters of Saddlers Creek originate on and flow through land owned by HVEC before passing through the Project Boundary.

As part of their existing operations, Mt Arthur Coal Mine have committed to the preservation of Saddlers Creek and the riparian vegetation associated with it as part of their offsets strategy. Anglo American will build onto this and has committed to undertake restoration works on the portion of Saddlers Creek on its land.

Restoration work will be completed in partnership with the Hunter-Central Rivers Catchment Management Authority (CMA) and will include restoration of the creek line and riparian vegetation. Further details about the restoration works that are proposed by the Project are provide in Section 8.8 and 8.17.3. Anglo American will continue to liaise with Mt Arthur Coal Mine about the work they have undertaken to ensure that the two offsets strategies are aligned to achieve the desired outcome for the improved condition and ecological function of Saddlers Creek.

Modification to Project Approval

Mt Arthur Coal Mine has made an application for a modification to its approved Mt Arthur Coal Consolidation Project (PA 09_0062) to facilitate an extension to the approved Mt Arthur Coal open cut. The modification includes:

- A four year continuation of the open cut mine life from 2022 to 2026;
- Increased open cut disturbance area of approximately 400 ha;
- Duplication of the existing rail loop and increasing the maximum number of train movements from 12 to 19 per day;

- Use of the existing conveyor corridor for overburden emplacement;
- Relocation of conveyor infrastructure and explosives storage facility;
- Construction of additional offices and control room; and
- Extension of the ROM coal stockpile.

This EA has relevantly considered the above modification. Specifically the proposed extension to mine life has been included in the cumulative air quality modelling. The additional train movements have also been noted in the rail traffic assessment.

4.14.2 Macquarie Generation

The interactions with Macquarie Generation include the following:

- End use, treatment and ownership of select final voids at Drayton Mine;
- Transport corridor; and
- Bayswater B Power Station for which concept approval has been granted.

Occupation of Final Voids

Macquarie Generation granted Drayton Mine a lease to occupy its land within Mining Lease 1531 to facilitate mining activities.

Under the existing arrangement, Macquarie Generation has the right to take the identified final voids by means of a transfer of Mining Lease 1531 and seek planning and other required approvals to authorise disposal of ash from its power stations. In this scenario, Macquarie Generation will assume responsibility for the final rehabilitation of the part transferred area, which would be released from the Drayton Mine Mining Lease 1531. Macquarie Generation is required to make its election prior to 1 January 2023 when Mining Lease 1531 expires.

Discussions with Macquarie Generation will continue until a determination is reached. In the event Macquarie Generation does not elect to use of any of the voids that remain within Mining Lease 1531, Drayton Mine will continue to be responsible for the final rehabilitation of the subject area under the Mining Act and the existing arrangements with Macquarie Generation.

Transport Corridor Interactions

An overpass across the existing Macquarie Generation owned conveyor, which transports coal from Mt Arthur Coal Mine to Bayswater Power Station, is required to facilitate the construction of the transport corridor for the Project. The conveyor overpass has been designed in consultation with Macquarie Generation to avoid interfering with existing operations. Anglo American has presented these design details to Macquarie Generation and is in ongoing discussions regarding them.

Bayswater B Power Station

Macquarie Generation has a Concept Approval under section 750 of the former Part 3A of the EP&A Act for the development of a second coal or gas fired power station within the Bayswater-Liddell power generation complex (also known as Bayswater B Power Station). Anglo American will continue to consult with Macquarie Generation regarding Bayswater B Power Station as more detailed plans are developed.

The conceptual project plans currently indicate there are no foreseen conflicts between the Bayswater B Power Station concept and the future operation of the Drayton Complex.

4.14.3 NuCoal

NuCoal manages the exploration program within EL 6812 held in the name of Dellworth, which is situated to the south-east of the Project Boundary and which overlays land owned by Anglo American and the transport corridor. Anglo American has established an agreement and granted NuCoal access to their land for prospecting.

NuCoal has advised that it has no objection to the Project and Anglo American utilising the relevant land for the transport corridor and associated infrastructure.

On 28 February 2012, NuCoal submitted a Project Application under section 78A of the EP&A Act for the Doyles Creek Coal Project which is proposed to the south of the Project near Jerrys Plains. Anglo American will continue to consult with NuCoal as necessary with regard to the Project and any potential interactions with the proposed Doyles Creek Coal Project.

4.14.4 Spur Hill

Spur Hill holds EL 7429 to the immediate west of the Project Boundary. There are no interactions with Spur Hill.

4.15 Project Need

4.15.1 World Need

There is general acceptance, including from the United Nations sponsored International Energy Agency (2011), that there will be a continuing need for coal to meet the world's electricity demands. Current predictions indicate that the world's coal consumption is set to increase by an average of 1.5% per year from 2008 to 2035 as a result of rapid economic growth and high energy demands from key countries, including Japan, China and India. This trend is expected to bring an increase in trade for both steaming and coking coal, and competition and diversity between suppliers (U.S. EIA, 2011).

The majority of the world's coal trade is based on steaming coal, which accounts for approximately 72% of total coal exports. Australia is one of the world's top exporters of steaming coal and is projected to be the leading international supplier of coal through to 2035 (U.S. EIA, 2011).

Coal remains the largest source of electricity, with coal-fired electricity accounting for approximately 43% of the world's energy generation (Geoscience Australia, 2010). Global coal consumption is expected to increase by 56% from 2007 to 2035 (IEA, 2011). Coal is also an essential reductant used in the metallurgical industry and is used in approximately 70% of the world's steel production.

Greenhouse and anthropogenic climate change is a global issue. It has become widely accepted that climate change can only be overcome through a reduction in greenhouse gas emissions. The 2009 Copenhagen Climate Conference recognised that achieving a material reduction in carbon based energy is a challenge and will take some time.

Different countries have adopted different approaches to reducing reliance on carbon based energy. Such approaches generally involve making carbon more expensive and developing alternative sources of energy such as wind, solar and geothermal. Although there is progress in the development of these alternative sources of energy, there is no alternate source that has been developed sufficiently to replace carbon based energy entirely as a source of base load electricity (IEA, 2011). There will continue to be a need for good quality, low cost thermal coal to satisfy the world's energy demands. The Project will supply the necessary thermal coal for the global base load electricity supply.

4.15.2 Australian Need

As of 2009, Australia had an estimated 44 billion tonnes of economically recoverable black coal. This equates to 7% of the world's coal resources, making Australia the fifth largest producer of coal in the world.

Over 80% of all black coal recovered in Australia is exported to international markets. During 2009 and 2010, approximately 292 Mt of coal was exported to 33 different countries (ACA, 2012a). The main destinations for Australia's coal are Japan (39%), China (14%), South Korea (14%), India (11%), and Taiwan (9%) (ACA, 2011).

In 2010, coal exports generated $43 billion dollars in revenue, making coal the second largest export in Australia (DFAT, 2011).

The coal mining industry is a major provider of revenue for governments. During 2008 to 2009, the coal mining industry generated approximately $3.1 billion in royalties for the Queensland government and $1.3 billion in royalties for the NSW government (ACA, 2012b). This demonstrates that Australia's coal resource is not only an important natural resource demanded by others but also a significant economic asset to the nation.

The coal mining industry provides significant employment for Australians. In June 2010, approximately 42,259 people were directly employed in the coal industry, with the majority situated in Queensland (52%) and NSW (45%) (Coal Services Pty Ltd, 2010). The mining industry also generates a significant number of jobs in other sectors that support the mining industry. The coal industry indirectly employs an estimated 100,000 persons across Australia (ACA, 2012b).

In addition, coal is a key resource for domestic electricity generation and steel construction, with approximately 64.5 Mt of coal consumed in Australia during 2010 (IEA, 2011).

Australia, and particularly NSW, is a long term supplier of coal to Asia. Partnership agreements between Australian operators and Asian coal purchasers will ensure that trade between Australia and Asia continues into the future.

The Project will generate an estimated $170 M (present value) for the Commonwealth government in the form of company tax. This revenue is used to fund the provision of government infrastructure and services across Australia.

4.15.3 New South Wales Need

In 2010 to 2011, NSW produced 156 Mt of saleable coal, which amounts to a net value of $16 billion. Of this amount, 121 Mt was exported to foreign markets, generating $11 billion in revenue (NSW Minerals Council, 2011).

As of June 2011, the mining industry in NSW employed approximately 39,000 persons. Of this amount, 21,000 persons were employed in coal mining, which represents an increase of 11% from the previous year (NSW Minerals Council, 2011).

The Project will generate an estimated $320 M (present value) in royalties for the NSW government. These royalties are used by the State government to fund infrastructure projects and community services across NSW.

4.15.4 Upper Hunter Region Need

The mining approved at the existing Drayton Mine is expected to be completed by 2017, upon the expiry of PA 06_0202. The Project will facilitate the continuation of operations at Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area.

Economic Value of Resource

The existence of the coal resource in the Drayton South area has been known for a considerable period of time. The ability for this resource to be mined in an economic and environmentally acceptable manner was validated when a DC for the Mt Arthur South Coal Project was granted in 1986. The suitability of this resource for mining was further affirmed when a Mining Lease over this area was issued in 1989. The Mt Arthur South Coal Project was approved to mine the same seams as those targeted by the Project.

Improvements in mining technology since the 1980s will allow the coal to be extracted more economically, and improvements in environmental mitigation and management will allow the Project's environmental impacts to be further reduced.

The coal resource within the Drayton South area has a material value to the Regional, State and Australian communities, which would be lost without its recovery.

Employment

The mining industry employs 16% of persons in the Muswellbrook LGA and 20% of persons in the Singleton LGA (ABS, 2006). In both LGAs, mining employs more persons than any other sector. Drayton Mine currently employs 530 full time personnel.

The Project will secure the long term employment of 530 persons, preserving the socio-economic benefits of a low unemployment rate, as is currently experienced throughout the Upper Hunter region. The Project will also provide employment for up to 369 construction personnel during the 29 month construction program for the Project.

Optimisation of Costs

The capital represented by the existing surface facilities and infrastructure at Drayton Mine has already been invested and environmental costs already incurred at least for the proposed life of the Project. The use of these existing facilities and infrastructure in recovering the coal resource within the Drayton South area maximises the social and economic benefits which flow from its recovery by optimising the return from the capital already expended and the environmental costs already incurred.

Synergies

As described in Section 4.14 there are numerous interactions between the existing Drayton Mine and the adjoining Mt Arthur Coal Mine and Macquarie Generation power stations. Each of the developments has approval to operate beyond the life of the existing Drayton Mine for operations that interact with the existing mining areas as well as the Project. When appropriately implemented, these interactions will enhance the effectiveness and efficiency of operations at Mt Arthur Coal Mine and Macquarie Generation, and thereby the social and economic benefits to the community.

Continued mining at the Drayton Complex, as proposed by the Project, will facilitate the realisation of these benefits as well as enable the most appropriate mine development and systematic closure and rehabilitation of the existing Drayton Mine.

Continuity

Drayton Mine is a long term member and part of the social fabric of the communities of Muswellbrook and the broader Upper Hunter region both socially and economically. The Project is needed to ensure that there is no disruption to or loss of the social and economic contributions that have now been made by Drayton Mine for the past 29 years.

Ongoing mining operations will also continue to provide major benefits for regional communities through the enhancement of infrastructure and services, funding of community projects, and employment and education opportunities.

4.15.5 Conclusion on Need

The net benefit of open cut mining within the Drayton South area has previously been recognised by the NSW government, by the provision of a DC and Mining Lease for the Mt Arthur South Coal Project in the 1980s (see Section 3.7.2). The Project represents a logical progression from operations at the existing Drayton Mine to the recovery of the known coal resources within the Project Boundary of the Drayton South area.

The existing infrastructure established at Drayton Mine, provides the Project with the opportunity to continue to process and produce saleable coal with minimal additional expenditure on fixed plant and equipment. It also avoids the environmental impacts that would be incurred through the development of such facilities. The Project will ultimately also facilitate the consolidation of operations and approvals with the Drayton South area and Drayton Mine. This will ensure effective management and monitoring of environmental factors across the Drayton Complex.

The Project will facilitate the recovery of a valuable, export steaming coal with low to moderate ash content (less than 14%). Thermal coal remains a highly demanded energy source in Asian countries, including Japan, China and India. These countries continue to be the world's largest coal importers,

and will largely account for an approximate 70% growth in total coal imports from 2009 to 2035 (U.S. EIA, 2011). This increasing demand supports the need for the Project and justifies further investment in the industry.

Exports of product coal generated by the Project will also provide net economic benefits to local communities, State and Commonwealth governments in the order of $443 M and $741 M. Royalties for the NSW government are expected to total $320 M (present value).

The Project will also offer employment opportunities for a total of 899 personnel across the construction and operation phases of the Project, of which 530 personnel will be directly attributable to the production of up to 7 Mtpa of ROM coal from the Drayton Complex.

4.16 Project Alternatives

Anglo American has undertaken a comprehensive pre-feasibility study for the Project, which included the assessment of various mine plans and operating scenarios. These alternatives were considered having regard to the social, economic and environmental impacts as well as the principles of Ecological Sustainable Development (ESD) and the objects of the EP&A Act. The alternatives considered for the Project are described in further detail below.

4.16.1 Alternative 1 – Closure of Drayton Mine

The existing Drayton Mine is scheduled to exhaust resources and surrender PA 06_0202 in 2017. Should no development occur within the Drayton South area, Drayton Mine would close. This would sterilise a significant in situ, multiple seam coal resource (approximately 119 Mt) capable of hosting a large open cut coal mining operation.

The closure of Drayton Mine would result in the retrenchment of approximately 530 local jobs. It would also lead to the loss of local socio-economic benefits that are created by the mine in addition to the ongoing benefits, royalties and other payments to both the State and Commonwealth governments.

Ceasing Drayton Mine's operations prematurely, will also lead to the loss of the economic benefits that would result from the continued utilisation of the existing coal processing, handling, loading and other surface infrastructure. In the event of closure, this infrastructure would be decommissioned and the area rehabilitated without receiving the total benefits from the recovery of the available coal resources achieved through proposed mining within the Drayton South area.

Given the significant loss of socio-economic benefits through the closure of Drayton Mine in 2017, this alternative was rejected.

4.16.2 Alternative 2 – Underground Mining Shallow Seams

After the grant of EL 5460 in 1998, Anglo American commissioned a study to evaluate the potential to mine the target seams within the Drayton South area using underground mining methods. The study indicated that the maximum recoverable resource from the target seams was approximately 40 Mt of ROM coal based on a 60% and 70% recovery rate for bord and pillar, and longwall mining techniques, respectively. The production schedule for underground mining would reach a peak of 4 Mtpa ROM coal and an average of 3.5 Mtpa for the first 12 years of the mine life. Following this, production would reduce to 1 Mtpa ROM coal until mine closure.

Mining the target seams using underground mining techniques would sterilise significant quantities of the non-renewable coal resource (approximately 77 Mt) for future generations, without the benefits of extracting the coal reserves by open cut mining techniques.

The inherent geology through the overlying shallow seams at Drayton South also poses potential hazards for underground mining operations, making the resultant design, economics and overall resource recovery unattractive in comparison to open cut recovery.

4.16.3 Alternative 3 – Underground Mining Deep Seams

Significant in situ deep coal seams within the Drayton South area underlie the coal seams targeted by the Project. These seams have the potential to be extracted through conventional underground mining methods.

To obtain optimal recovery of the deeper underground targets, the open cut seams should be extracted prior to the development of underground operations. By removing the shallow resource prior to underground mining, many potential hazards, including surface subsidence, cracking and seam gas, can be avoided. Attempting to conduct open cut mining after underground extraction would incur more risk and yield a lower recovery. By completing mining of the open cut targets prior to commencing underground workings, both resources would be maximised.

As a result, initial underground mining of deep coal seams at Drayton South was rejected.

In the event that coal resources in the shallow seams are extracted by open cut methods, underground mining of the deep coal seams within the Drayton South area may be viable in the future.

4.16.4 Alternative 4 – Maximum Resource Recovery

Drayton South retains a significant multiple seam coal resource. Development of the area for maximum open cut resource recovery would involve the extraction of approximately 172 Mt of ROM coal over a period of 38 years. This mine design maximises the coal resource by developing all areas that are technically and economically feasible to mine. The maximum recovery footprint for the Project would involve mining almost entirely to the Golden Highway and through the ridgeline (see Figure 35). Essentially, the maximum resource recovery is only achieved in the absence of environmental and stakeholder amenity constraints.

The implementation of the maximum resource recovery option would result in neighbouring stakeholders experiencing excessive environmental and social impacts, particularly with regard to air quality, noise and visual amenity.

Due to the proximity and sensitivity of receivers adjacent to the Drayton South area, maximum resource recovery prospects were rejected.

4.16.5 Alternative 5 – The Project

The Project as proposed and assessed in this EA was developed with reference to the constraints identified as part of the pre-feasibility study and review of the alternatives described above. The primary objective was to develop a mine plan that minimised potential environmental and social impacts whilst maximising resource recovery and operational efficiency. This involves the continuation of the existing Drayton Mine via the development of an open cut and highwall mining operation, producing up to 7 Mtpa of ROM coal for 27 years.

The Project maximises the opportunity to secure the social and economic benefits that would result from the continued utilisation of the existing Drayton Mine infrastructure and employment for the existing workforce.

As part of the Project planning phase and studies undertaken for the EA a number of additional environmental constraints were identified. In order to adequately address these Anglo American made necessary refinements and changes to the mine plans for the Project. These are described below with further details provided in Appendix B.

The environmental constraints incorporated into the conceptual mine plan for the Project include:

- Significantly reducing the footprint of the Blakefield and Redbank mining areas so that they are situated entirely to the north of the ridgeline;
- Utilisation of highwall mining to maximise coal recovery while maintaining the existing ridgeline as a buffer between the operational areas of the Project and the receptors to the south;
- Revised design and location of the Houston visual bund;
- Incorporation of extensive tree screening into the Project Mine Plan to limit views to the operational areas of the Project and improve the amenity of the surrounding area;
- Limiting the intensity of excavator operations in the Redbank mining area in Year 10 to 15;
- Replacing the existing truck fleet with larger trucks in Year 10 to reduce dust generation;
- Design of all permanent haul roads to be treated with a dust suppressant to minimise dust emissions associated with vehicle movements;
- Implementations of additional controls for reducing adverse noise levels from mobile plant and conveyors at the CHPP;
- Design of the mine plan to ensure sufficient buffer zones are maintained for both the Hunter River alluvium and the Saddlers Creek stream bank; and
- Avoidance of the stone quarry archaeological site when realigning Edderton Road.

These constraints and the necessary changes made are described in greater detail below.

Visual Considerations

The aesthetic value of the landscape is of importance to Woodlands Stud, Coolmore Stud and Arrowfield Estate. The mining areas proposed by Alternative 4 (Maximum Resource Recovery) would be substantially visible from these receivers. Under the mine plan for the Project, the Blakefield mining area is limited in its extent to the west. As a result, the distance to the Woodlands Stud is substantially increased. More importantly, the entire Blakefield mining area is situated to the north of the large ridgeline trending through the Drayton South area.

The mine plan for the Project also limits the Redbank mining area to north of the ridgeline. As a result, the active mining areas are hidden behind the existing topography. In addition, the maximum heights of the OEAs have been maintained below the elevation of the ridgeline so that they are also concealed by the topography.

There are locations on Coolmore Stud where the ridgeline does not completely screen views of the Project. Anglo American designed the Houston visual bund to remedy the *'gaps'* in the ridgeline. Once completed, the Houston visual bund will eliminate views of the mining areas that otherwise would have been possible from receivers on Coolmore Stud.

The design of the visual bund was developed in consideration of feedback received from Coolmore Australia. Three different locations and designs for the Houston visual bund were considered. These alternatives are discussed further in Section 4.16.6.

Air Quality

Preliminary air quality modelling during the preparation of this EA indicated that excessive dust emissions were being generated by operations in the Redbank mining area between Year 10 and 15 of the mine life. In order to reduce dust emissions, mining intensity in the Redbank mining area has been significantly reduced through the utilisation of only one of the two Hitachi EX5500 excavators and its associated fleet during this period of the operation.

In addition, the Cat 789 haul trucks currently in use at Drayton Mine will be progressively replaced by the larger Komatsu 830E trucks from Year 10 of the mine life. The larger trucks will generate approximately 10% less dust. Further as described in Section 4.6.1, the Project has been designed to ensure that all permanent haul roads outside of the main mining areas will be treated with a heavy duty bonding agent, such as Dust-A-Side or Dust-bloc, that suppresses dust generation on surfaces. This will significantly minimise dust emissions associated with vehicle movements.

These measures will allow the Project to operate without exceeding the assessment air quality criteria at most receivers, particularly Coolmore Stud and Woodlands Stud.

Noise

The Project has been designed to alleviate noise and blasting impacts by increasing the distance from the mining areas to the sensitive receivers in the south. This is achieved by limiting the extent of the Redbank and Blakefield mining areas when compared to that Alternative 4 (Maximum Resource Recovery). As part of the mine plan for the Project both the Blakefield and Redbank mining areas are situated entirely to the north of the ridgeline. This ridgeline provides acoustic shielding for receivers located to the south.

Further to this the following controls will be implemented in order to reduce adverse noise levels from mobile plant and conveyors at the CHPP:

- Limiting the operation of particular equipment on exposed surfaces to daylight hours during select years and initial construction of the Houston mining area utilising the double benching method to avoid adverse noise; and
- Fitting low noise idlers to select conveyors at the CHPP and fitting mobile plant with leading practice exhaust silencers and sound attenuation devices.

Preliminary noise modelling indicated that the construction of the initial box cut in the Houston mining area in Year 3A had the potential to generate excessive noise, particularly during night conditions. In order to avoid exceedances of the intrusiveness criteria at sensitive receivers to the south, particularly Coolmore Australia, the box cut will be constructed using the double benching method. This method allows the equipment to work on a bench below the surface topography, thereby reducing the amount of time that the equipment is exposed on the surface.

As a result of the constraints imposed on the mine plan for the Project noise generated by mining operations will remain within acceptable limits.

Watercourses

DP&I prepared the *Management of Stream / Aquifer Systems in Coal Mining Developments, Hunter Region* guidelines (DIPNR, 2005), which prescribe buffer zones between mining operations and streams. The two streams in close proximity to the Project are Saddlers Creek and the Hunter River. The required buffer is determined by the magnitude of the stream:

- 40 m for significant stream systems (Schedule 2 streams); and
- 150 m for primary rivers (Schedule 3 streams).

There is no prescribed buffer zone for minor stream systems (Schedule 1 streams). For Schedule 1 streams, the only requirement is that the geomorphic integrity of the stream be preserved during mining.

The Hunter River is a Schedule 3 stream, and requires a 150 m buffer between the mining areas and the alluvium of the stream. Saddlers Creek has been conservatively classified as a Schedule 2 stream, and as such, requires a buffer of 40 m from the mining area to the bank of the stream. The mine plan for the Project provides the necessary buffer zones for both the Hunter River alluvium and the Saddlers Creek stream bank (see Figure 34).

Aboriginal Archaeology

In order for mining to occur in the Blakefield and Redbank mining areas, the existing Edderton Road will need to be realigned to the west. The new alignment will pass to the west of Saddlers Creek to avoid intersecting the creek. There is a significant stone quarry site immediately to the west of Saddlers Creek. This site has been assessed as being of high archaeological significance and is one of the largest stone quarry sites of its kind in the Hunter Valley.

As such the alignment of Edderton Road has been designed so that it avoids this site. This involved arranging a land swap with an adjoining property owner to ensure that the road could be designed to sufficiently avoid this site to the west, as the location Saddlers Creek posed a constraint to the east.

4.16.6 Houston Visual Bund

As described in Section 4.7, one of Anglo American's key objectives when developing the mine plan for the Project was to reduce the visual impacts of the mine on sensitive receivers located to the immediate south including Coolmore Stud, Woodlands Stud, the existing Arrowfield Estate and the village of Jerrys Plains.

The visual impact assessment has determined that views to the Project are largely screened from the surrounding areas due to existing natural topography, remanent vegetation and the establishment of tree screening. The exception is the views that will be available through an existing valley to the Houston and Whynot mining areas.

To alleviate potential long term views of the Project, a visual bund will be constructed. Engineering and design works have been undertaken on various visual bund options as part of the consultation process and ongoing working group participation with neighbouring stakeholders. From such efforts, the preferred location and design of the visual bund (as described in Section 4.7) was then developed following consideration of stakeholder feedback (described in Section 6).

The following sections describe the alternatives that were considered during the design of the Houston visual bund.

Visual Bund – Option 1

The visual bund design for Option 1 is located approximately 2.4 km from the nearest receiver to the south. Approximately 18.8 Mlcm of overburden material from mining activities would be required during a staged construction over 18 months. The design allows for a maximum batter height of 100 m and crest length of 1,500 m, and aligns with the existing topography once fully constructed (see Figure 36).

The advantages with Option 1 for efficiency of mining in Houston is that it provides an optimal strike length for the dragline which improves operability and scheduling of operations in the later years of the Project. It also provides greater access for machinery to operate in behind the bund alleviating vehicle interaction risks (particularly during construction) and provides additional room behind the bund for overburden storage when mining in Houston intensifies from Year 10.

Option 1 was initially proposed by Anglo American for consideration in the Project mine plan. This was then presented to neighbouring stakeholders, particularly Coolmore Australia, for discussion. The response from Coolmore Australia was that the size and the position of the visual bund so low down in the valley was a key concern. Following this response, Anglo American commissioned the investigation of alternative visual bund locations and design specifications.

Visual Bund – Option 2

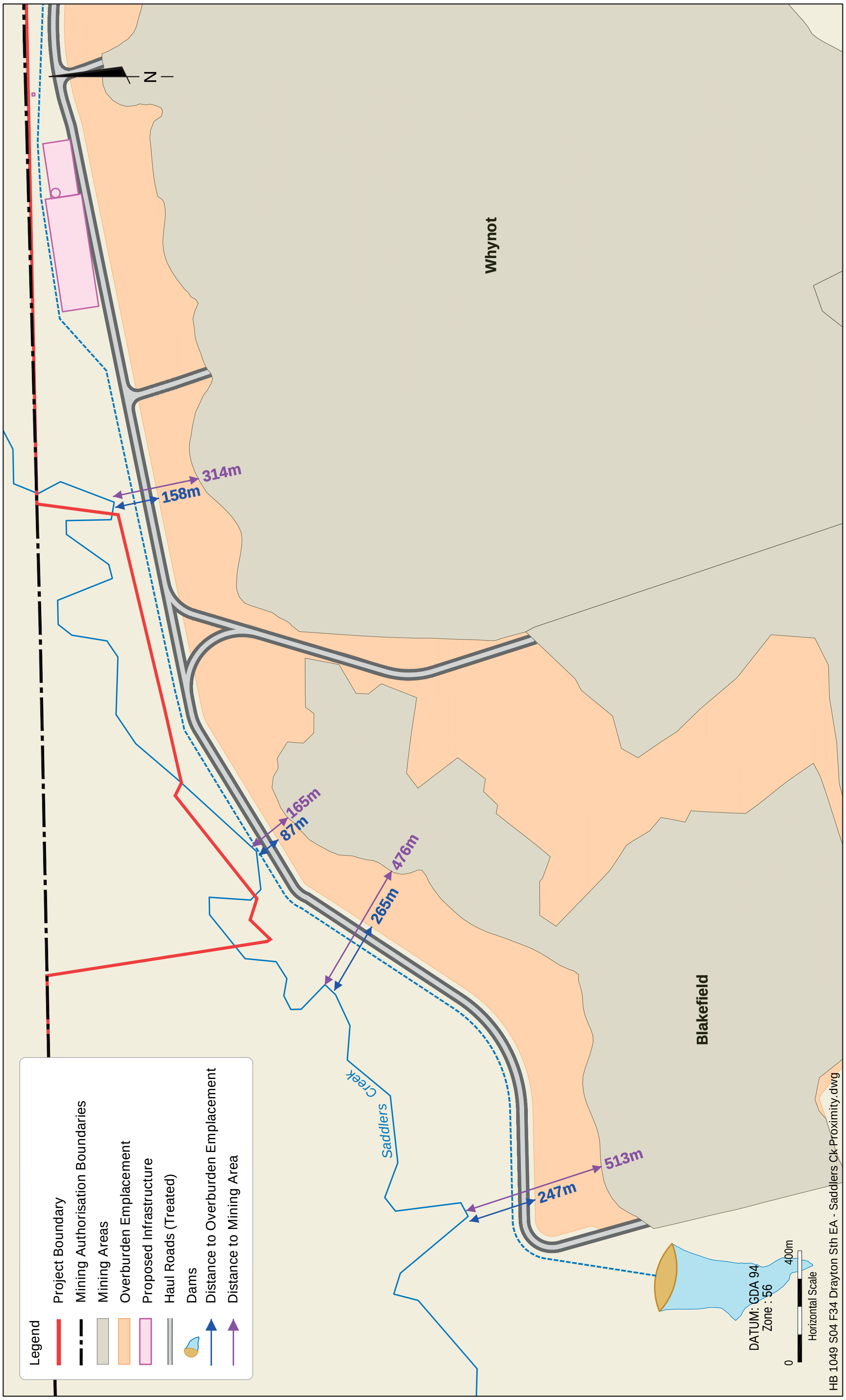
The visual bund design for Option 2 is located approximately 4.5 km to the nearest receiver to the south. Approximately 8.1 Mlcm of overburden material from mining activities would be required during a staged construction over 10 months. The design allows for a maximum batter height of 70 m and crest length of 1,600 m, and aligns with the existing topography once fully constructed (see Figure 36).

The location of Option 2 was initially proposed by Coolmore Australia for consideration in the Project mine plan. A conceptual design was then developed by Anglo American so that mine planning and bund construction issues could be fully understood in order to make a decision on the practicality and feasibility of the option.

Option 2 impacts operations of the Houston mining area due to a significant reduction in the strike length that is needed for the dragline. As a result, it is not viable to operate the dragline within the Houston mining area under this option. This change would reduce the productivity of the overall Project mining schedule and thereby have implications for costs and equipment utilisation. This would render the lower seams within the Houston mining area uneconomic. When the loss of these lower seams is added to the loss of the overall mining area, this would result in the sterilisation of 7.1 Mt of coal.

Visual Bund – Option 3

To minimise operational impacts on the Project and visual impacts to neighbouring stakeholders, Anglo American investigated a third visual bund location which attempted to find a compromise between Option 1 and Option 2. Option 3 is a greater distance from receivers in the south than Option 1, but still provides a sufficient strike length for the efficient and safe operation of a dragline and associated equipment. The amount of coal predicted to the sterilised as a result of the change from Option 1 to Option 3 is 2.2 Mt of coal. Option 3 (see Figure 36) is the visual bund design that has been adopted by the Project and is discussed in detail in Section 4.7. As part of the visual impact assessment a comparison of the potential visual impacts associated with the construction of each of the alternative visual bunds was undertaken. A summary of this is provided in Section 8.6.



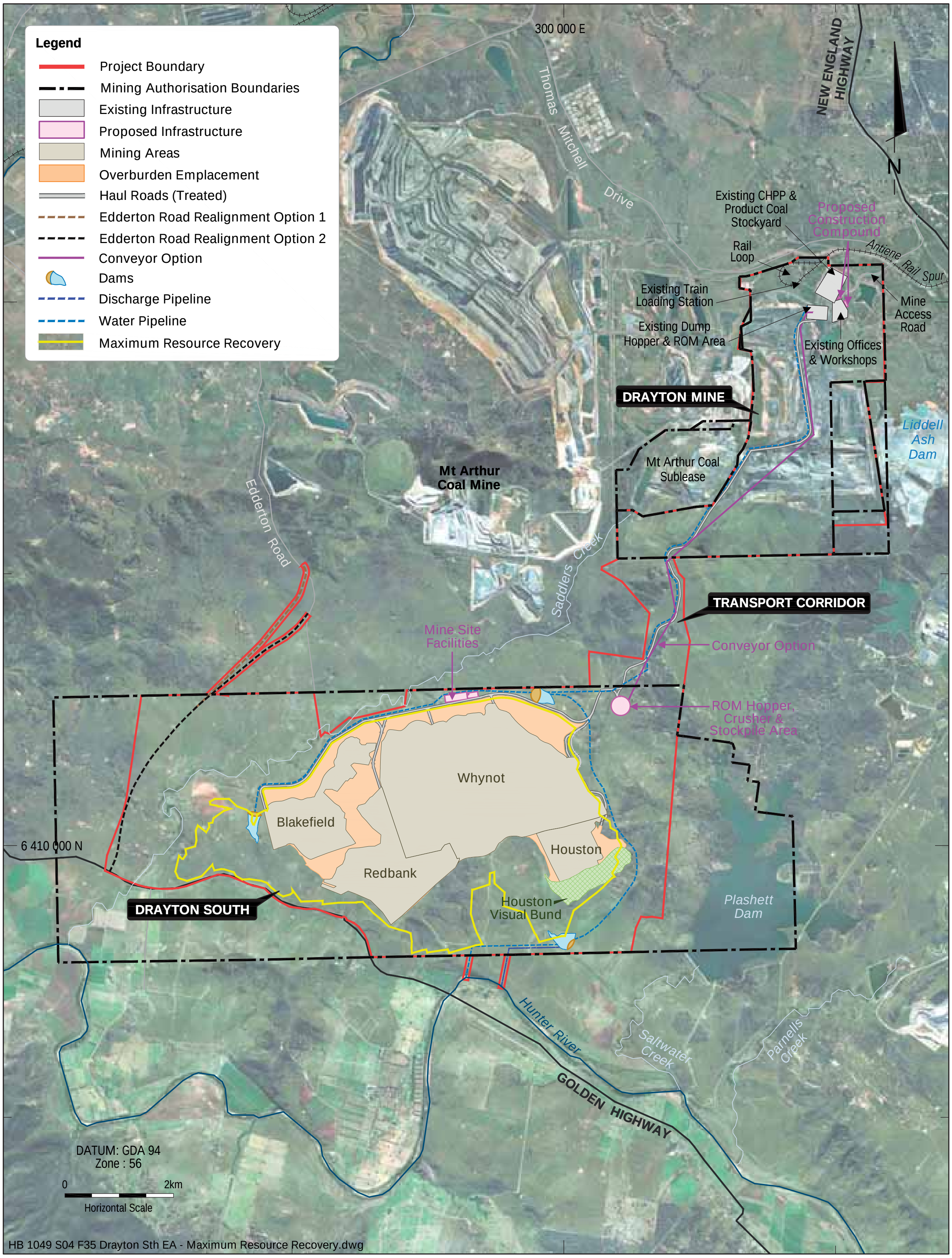
DRAYTON SOUTH COAL PROJECT

Project Proximity to Saddlers Creek

FIGURE 34

Hansen Bailey ENVIRONMENTAL CONSULTANTS

AngloAmerican



DRAYTON SOUTH COAL PROJECT

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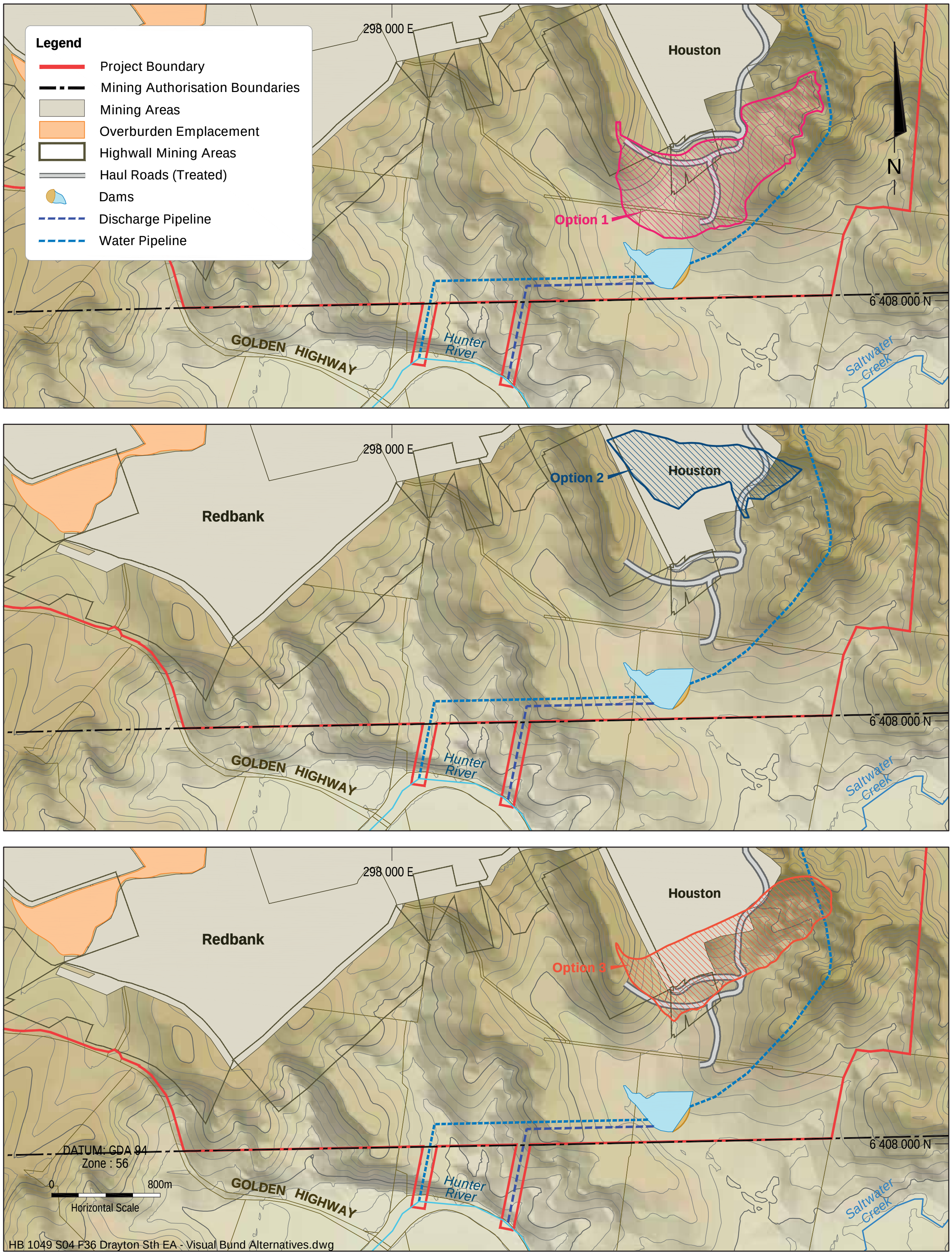
Maximum Resource Recovery

FIGURE 35



DRAYTON SOUTH COAL PROJECT

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Houston Visual Bund Alternatives

FIGURE 36

4.16.7 Conclusion

Of the five alternatives considered, the Project is the most environmentally sensitive and economically efficient alternative for all stakeholders. It will maximise the social and economic benefits associated with the Project and ensure that a significant coal resource is not sterilised in an area that has been set aside for mining since the late 1970s.

The costs and benefits associated with adopting Alternative 5 – the Project is outlined in Table 14.

Table 14 Costs and Benefits of Alternative 5 – The Project

Description	Environmental Benefits	Socio-economic Costs
Reduction in open cut mining areas	• Reduced noise levels at receivers to the south of the Project • Reduced dust levels at receivers to the south of the Project • Eliminating views of the Project from the south by restricting mining to areas north of the ridgeline • Lower disturbance to endangered box-gum woodland • Creating a 500 m buffer zone between mining and the Golden Highway, thereby reducing blasting impacts on traffic	• Total coal sterilised: 53 Mt • Total loss of direct revenue: $ 5.3 billion
Reduced mining intensity in Redbank mining area	• No exceedances of the PM_{10} annual criteria at residences on the Coolmore Stud • Number of days exceeding the PM_{10} 24-hour criteria at Coolmore Stud office was reduced from 31 to 1	• Total loss of revenue: Minimal
Upgrading truck fleet in Year 10	• No exceedances of the PM_{10} annual criteria at residences on the Coolmore Stud • Number of days exceeding the PM_{10} 24-hour criteria at Coolmore Stud office was reduced from 31 to 1	• Total cost of upgrades: Minimal
Treating haul roads and infrastructure areas with a dust suppressant agent	• Significantly lower dust levels generated by the Project • Very low probability (1%) of requiring offsite water supplies during the life of the mine	• Total cost: $141 M
Fitting conveyors with low noise idlers	• Number of receivers within the zone of affectation for noise reduced from 21 to 17 • Number of significantly impacted receivers reduced from 3 to nil	• Total cost of upgrades: $3.5 M
Houston visual bund	• Eliminates views of the Whynot and Houston mining areas from sensitive locations on the Coolmore Stud • Visual bund option 3 is further from Coolmore Stud receivers than option 1, but allows the Houston mining area to be mined economically	• Cost of construction: Minimal • Coal sterilised by Option 3 visual bund: 1.3 Mt open cut, 0.9 Mt highwall • Total loss of direct revenue: $261 M
Double benching method	• Avoids exceeding the intrusiveness criteria at sensitive receivers in the south, particularly Coolmore Stud	• Cost: Minimal

Regulatory Framework

5

Regulatory Framework 5

This section sets out the legislative and regulatory framework that applies to the environmental planning assessment of the Project under NSW and Commonwealth legislation. In particular, it reports on the:

- *Legal regime and process for the environmental planning assessment of the Project under the NSW EP&A Act;*
- *Environmental planning instruments that the Minister may (but is not obliged to) consider;*
- *Approvals required for the operation of the Project;*
- *Approvals rendered unnecessary by the grant of a Project Approval; and*
- *Approvals which must be issued following Project Approval.*

Figure 37 shows the Planning Approval and stakeholder consultation process that applies to the Project.

5.1 Applicability of Part 3A

On 2 March 2011, Anglo American made an application under section 75E of the EP&A Act for major project approval of the Project under Part 3A of the EP&A Act. Accompanying the application for major project approval was a PEA for the Project.

Clause 6 of *State Environmental Planning Policy* (Major Development) 2005 (SEPP Major Development) states that *"development that is in the opinion of the Minister of a kind listed in Schedule 1 or 2 is declared to be a project to which Part 3A of the EP&A Act applies"*.

On 9 March 2011, the Director-General as delegate for the Minister for Planning, advised that he had formed the opinion, for the purposes of clause 6(1) of the SEPP Major Development, that the Project is development *"for the purpose of mining that is 'coal mining'"*, as listed in Schedule 1 and accordingly is declared to be a Project to which Part 3A of the EP&A Act applies for the purposes of section 75B of the EP&A Act.

On 3 August 2011, the Director-General of DP&I issued his EARs for the Project (see **Appendix C**).

On 1 October 2011 Part 3A of the EP&A Act was repealed.

Savings and transitional provisions were provided in Schedule 6A of the EP&A Act, section 2(1)(b) of which states that a Project is a *"transitional Part 3A project" "if its EARs were issued within two years of the repeal date"*.

As the EARs for the Project were issued to Anglo American on 3 August 2011, the Project is a *"transitional Part 3A project"* to which the provisions of Part 3A (as in force immediately prior to its repeal or as amended by Regulation) will apply.

Section 75D of the EP&A Act states that a person is not to carry out a development to which Part 3A applies unless the Minister has approved of the carrying out of the Project under that Part, which results in the Minister for Planning and Infrastructure being the consent authority for the Project.

On 14 September 2011, with effect from 1 October 2011, the Minister delegated various functions under the EP&A Act including the power to determine applications made for approval under section 75E of transitional Part 3A projects to the PAC.

5.2 Permissibility Of Mining

Under section 75J(3) of the EP&A Act and clause 8O of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) approval for the carrying out of the Project may not be given under Part 3A if it is prohibited by an environmental planning instrument.

The Project is predominantly located on land falling within the Muswellbrook LGA, with some land in the east of the Drayton Complex within the Singleton LGA (see **Figure 38**). Mining as proposed is situated entirely on land within zone RU1 under the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP). Mining is permissible within zone RU1 with DC.

A small portion of the required Edderton Road realignment is located on land within Zone E3 (Environmental Management) under the Muswellbrook LEP. Development for the purposes of a *"road"* is permissible with DC in Zone E3 under the Muswellbrook LEP.

5.3 Controlled Action

The Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC) has declared the Project to be a *'controlled action'* (see **Appendix C**), which renders necessary the approval of the Minister under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) following an EA.

SEWPaC determined on 12 May 2011 that *"The project will be assessed by accredited assessment under the Environmental Planning and Assessment Act 1979 (NSW)"* (see **Appendix C**) and has provided its assessment requirements to the Director-General of the NSW DP&I who has included them in his EARs for the Project.

Following the *"National Partnership Agreement on Coal Seam and Large Coal Mining Development"* the Project will be referred by SEWPaC to the *"Interim Independent Expert Scientific Committee on Coal Seam Gas and Coal Mining"* of the Commonwealth for advice.

5.4 Environmental Assessment Requirements

Section 75H of the EP&A Act requires an EA to be prepared addressing the Director-General's EARs, which he is required to provide under section 75F(2).

The Director-General consulted with the relevant NSW government agencies and SEWPaC and issued his EARs for the Project on 3 August 2011, which included the requirements of the various agencies and SEWPaC in accordance with government and agency policies (see **Appendix C**).

By letter dated 30 April 2012, the Director-General, under section 75F of the EP&A Act, notified Anglo American of the following supplementary EAR (see **Appendix C**) requiring that the EA include:

> *"an Agricultural Impact Statement that includes a specific focussed assessment of the impacts of the proposal on strategic agricultural land, having regard to the draft gateway criteria in the draft Upper Hunter Strategic Regional Land Use Plan"*.

On 11 September 2012, following the exhibition of and public submissions on the *Draft Strategic Regional Land Use Plan – Upper Hunter* (Draft SRLUP) (DP&I, March 2012), the NSW government released its *Strategic Regional Land Use Policy* and the SRLUP superseding the Draft SRLUP.

5.5 Strategic Regional Land Use Plan – Upper Hunter

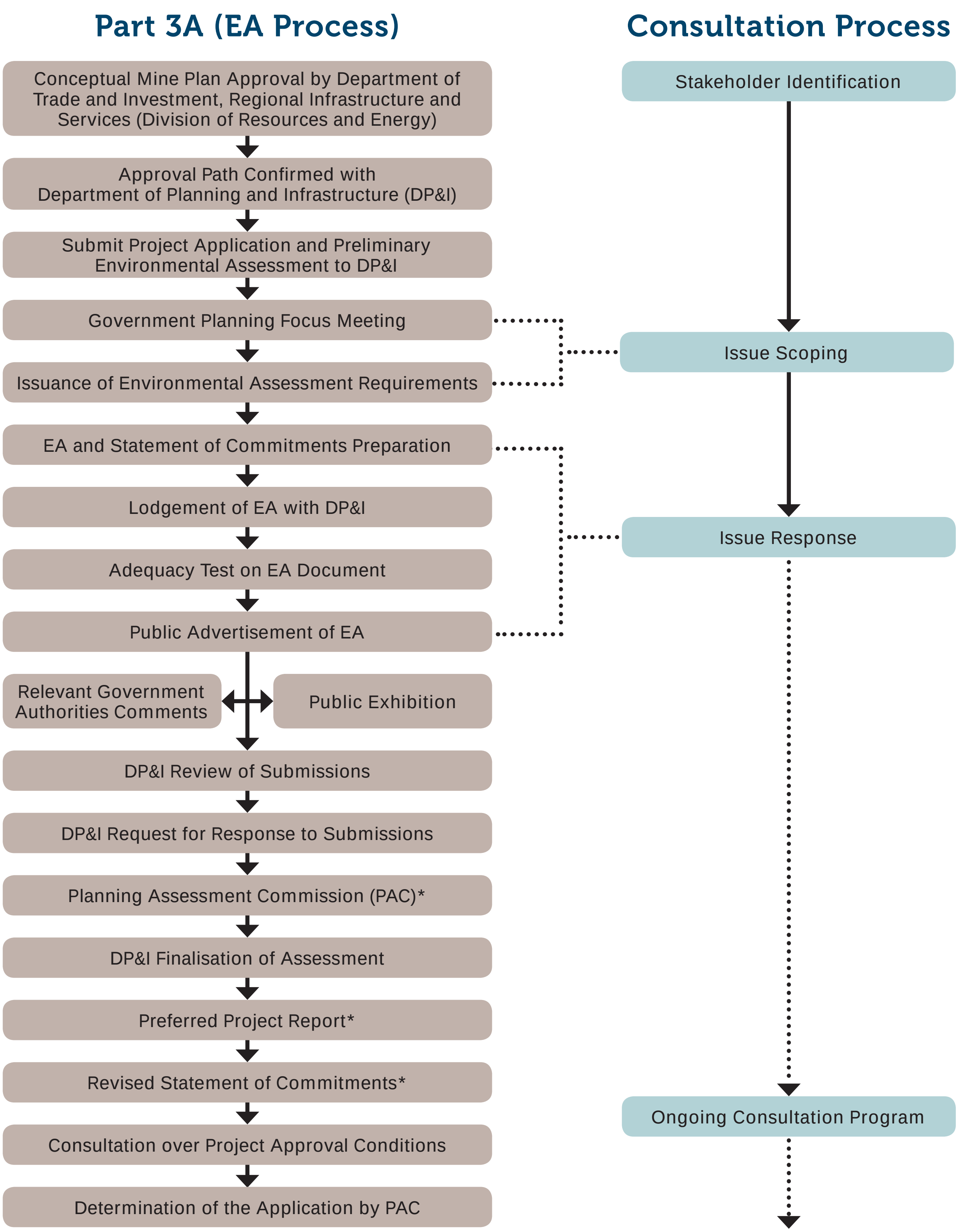
The SRLUP provides for a *"Gateway"* process as a pre-requisite to making a development application for State Significant developments of the same nature as the Project (although the Project is a *'transitional Part 3A Project'*) being a scientific assessment of the impacts of a State Significant mining development on *'strategic agricultural land'* (SAL). The Gateway process occurs prior to a development application being lodged under the EP&A Act involving the verification of the existence of SAL, and if it exists, the assessment by an independent panel of experts, known as the *'Gateway Panel'*, against the *'criteria'* of the SRLUP following which the Gateway Panel issues an *'unconditional'* or *'conditional' 'Gateway certificate'* for the development.

5.5.1 Environmental Assessment Requirements and the Strategic Regional Land Use Plan – Upper Hunter

The SRLUP has not yet been commenced, and will be brought into operation by amendments to the Mining SEPP, and such other regulatory or statutory change as is necessary, at some time in the future. Consequently the Gateway process foreshadowed in the SRLUP does not apply to the Project.

The SRLUP is relevant to the assessment of the Project due to the supplementary EAR issued on 30 April 2012 requiring an AIS, which includes a specific focussed assessment of the impacts of the Project on SAL, having *"regard to the draft gateway criteria"* in the Draft SRLUP which is replaced by the SRLUP.

Consequently the EARs for the Project require that the AIS includes a specific focussed assessment of the impacts of the Project on any SAL having regard to the gateway criteria of the SRLUP.



* Avenue available to the Minister

HB 1049 S05 F37 Drayton Sth EA - Planning Approvals and Consultation

DRAYTON SOUTH COAL PROJECT

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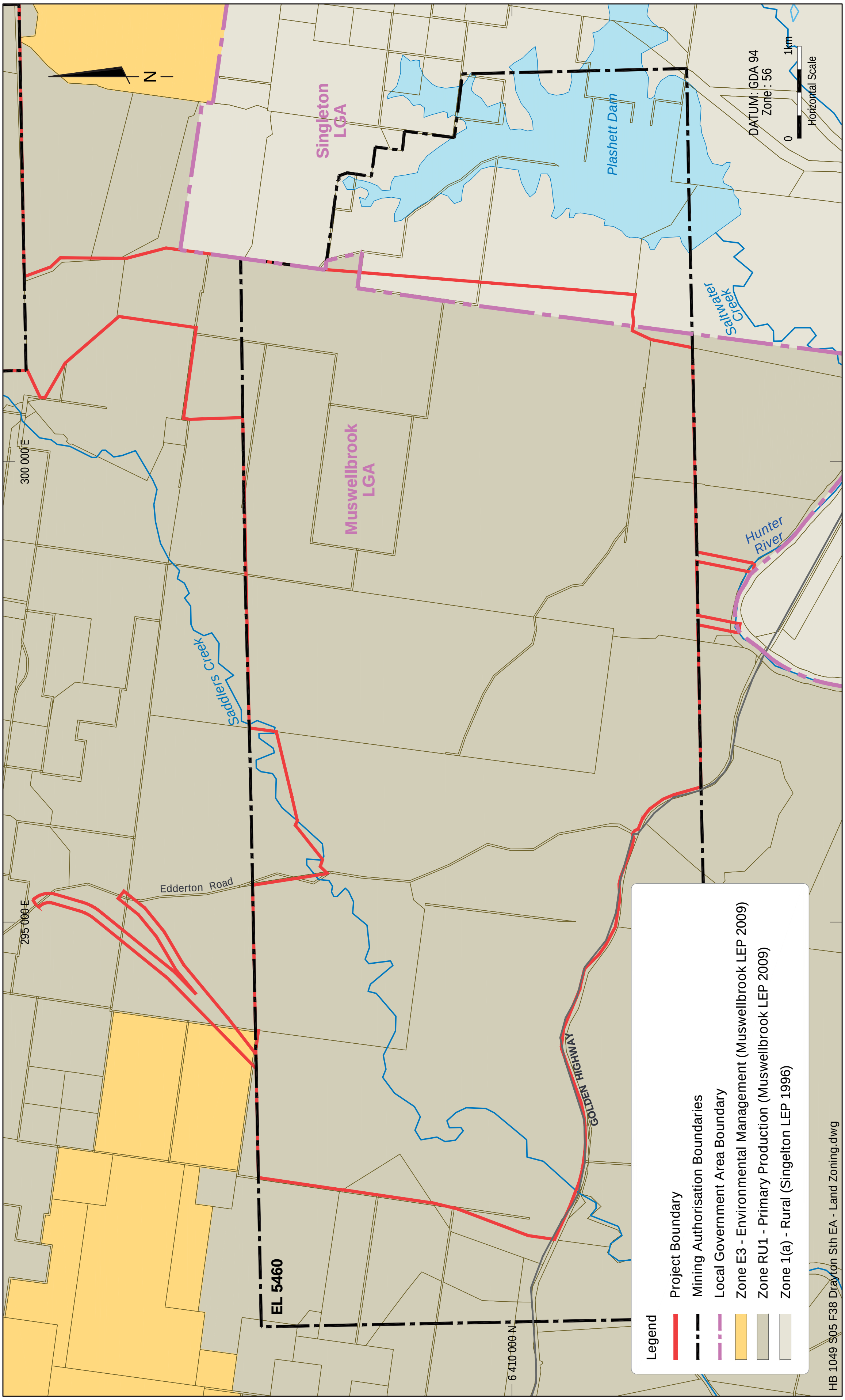
Planning Approvals and Consultation

FIGURE 37



DRAYTON SOUTH COAL PROJECT

Land Zoning

FIGURE 38

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5.5.2 Strategic Agricultural Land

There are two categories of SAL, being *"Biophysical Strategic Agricultural Land"* (BSAL) and CIC. Map 6 of the SRLUP, which has been reproduced relevant to the Project on **Figure 39**, indicatively identifies SAL and whether it is BSAL or CIC.

There is no BSAL indicated in Map 6 as being within the Project Boundary but Map 6 does indicate the existence of an Equine CIC and a Viticulture CIC. CIC land is defined within the SRLUP as an area where there is a *"localised concentration of interrelated productive industries based on an agricultural product that supplies significant employment opportunities and contributes to the identity of the region."* The *'criteria'* to verify CIC are listed in Table 1of the SRLUP. Land only constitutes SAL if all of the relevant *'criteria'*, relevantly to the Project for CIC are satisfied. Table 1 of the SRLUP is reproduced in **Table 15**.

Verification Process

In Chapter 11 of the SRLUP it is noted that *"Due to the regional scale of the strategic agricultural land maps in the plan it is important that appropriate processes are in place to provide for site-specific verification that the particular sites do in fact meet the strategic agricultural land criteria."* The AIS is to consider whether the mapped land does or does not meet the criteria, relevantly to the Project, for an Equine CIC and/ or a Viticulture CIC.

Table 15 Identification of Strategic Agricultural Land

Value	Criteria	Trigger	EA Section
Biophysical Strategic Agricultural Land	Land that falls under soil fertility classes 'high' or 'moderately high' under the *Draft Inherent General Fertility of NSW* (OEH), and	Criterion not triggered	**Section 8.15**
	Land capability classes I, II or III under the Land and Soil Capability Mapping of NSW (OEH), and	Criterion not triggered	**Section 8.15**
	Reliable water of suitable quality, characterised by having rainfall of 350 mm or more per annum (9 out of 10 years); or Properties within 150 m of a regulated river, or unregulated rivers where there are flows for at least 95% of the time (i.e. the 95th percentile flow of each month of the year is greater than zero) or 5th order and higher rivers; or Groundwater aquifers (excluding miscellaneous alluvial aquifers, also known as small storage aquifers) which have a yield rate greater than 5L/s and total dissolved solids of less than 1,500 mg/L	Criterion for available rainfall is triggered. Other criteria not triggered.	**Section 8.11 and 8.12**
	or		
	Land that falls under soil fertility classes 'moderate' under the *Draft Inherent General Fertility of NSW* (OEH), and	Criterion triggered	**Section 8.15**
	Land Capability classes I or II under the Land and Soil Capability Mapping of NSW (OEH), and	Criterion not triggered	**Section 8.15**
	Reliable water of suitable quality, characterised by having rainfall of 350 mm or more per annum (9 out of 10 years); or Properties within 150 m of a regulated river, or unregulated rivers where there are flows for at least 95% of the time (i.e. the 95th percentile flow of each month of the year is greater than zero) or 5th order and higher rivers; or Groundwater aquifers (excluding miscellaneous alluvial aquifers, also known as small storage aquifers) which have a yield rate greater than 5L/s and total dissolved solids or less than 1,500 mg/L	Criterion for available rainfall is triggered. Other criteria not triggered.	**Section 8.11 and 8.12**
Critical Industry Cluster	Industry clusters that meet the following criteria: • There is a concentration of enterprises that provides clear development and marketing advantages and is based on an agricultural product; • The productive industries are interrelated; • It consists of a unique combination of factors such as location, infrastructure, heritage and natural resources; • It is of national and/or international importance; • It is an iconic industry that contributes to the region's identity; and • It is potentially substantially impacted by coal seam gas or mining proposals	Criterion triggered. Mapped areas within Project Boundary. Validation required.	**Section 8.16**

The first phase of the Gateway process is site verification to determine whether or not the land actually constitutes, relevantly to the Project, CIC. Site verification involves assessing the land against the criteria listed in Table 1 of the SRLUP. The land is only verified as being CIC if the criteria in the relevant part of Table 1 are satisfied.

Under the SRLUP if a mining proposal is located on land that has been confirmed as SAL, the proposal will be assessed by the Gateway Panel against the criteria listed in Table 2 of the SRLUP. The assessment criteria are reproduced at Table 16.

Under the supplementary EAR, these criteria must be addressed in the assessment of the Project in the AIS and under the EP&A Act. The Gateway Panel will also consider the advice of the Commonwealth Independent Expert Scientific Committee.

As there is no mapped BSAL within the Project Boundary and only mapped Equine CIC and Viticulture CIC, the AIS, and this EA, is only required to assess the Project against the assessment requirements in the CIC section of Table 16.

Consultation

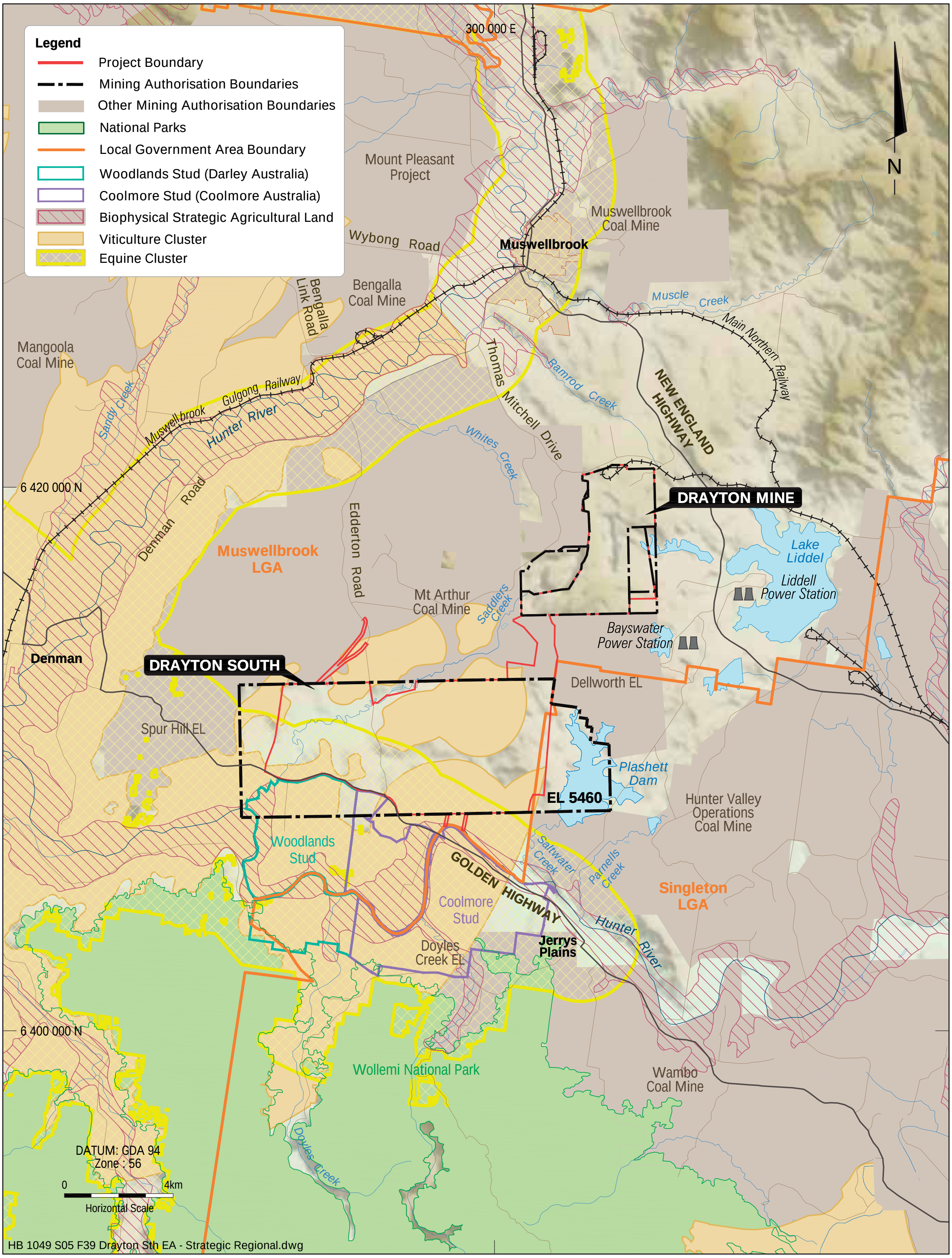
As indicated in Table 2 of the SRLUP (Table 16) it will be necessary to take into account *"Any advice on water impacts received from the Commonwealth Independent Expert Scientific Committee on Coal seam Gas and Large Coal Mining Development"* in the assessment of the Project against the *'criteria'* of the SRLUP and this will be done during the assessment process.

Consultation has been conducted as required by the EARs and particularly as to the *'criteria'* of the SRLUP, including the stakeholders within the region.

Table 16 Strategic Agricultural Land Verification Process

Value	Criteria	EA Section
Biophysical Strategic Agricultural Land	Whether the proposal would significantly reduce the agricultural productivity of the land based on a consideration of:	
	(a) Impacts on the land through surface area disturbance and subsidence;	N/A
	(b) Impacts on: (i) Soil fertility (ii) Rooting depth, or (iii) Soil profile materials and thickness	N/A
	(c) Increases in land surface microrelief or soil salinity, or significant changes to soil pH, and	N/A
	(d) Impacts on Highly Productive Groundwater, including the provisions of the Aquifer Interference Policy and the advice of the Minister for Primary Industries (note that the Minister for Primary Industries must take into account the advice of the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development in providing advice in this stage)	N/A
Critical Industry Cluster	Whether the proposal would lead to significant impacts on the critical industry cluster through:	
	(a) Surface area disturbance	N/A
	(b) Subsidence	N/A
	(c) Reduced access to agricultural resources	Section 8.16
	(d) Reduced access to support services and infrastructure	Section 8.16
	(e) Reduced access to transport routes, or	Section 8.16 and 8.18
	(f) Loss of scenic and landscape values	Section 8.6 and 8.16
Consultation	Any advice on water impacts received from the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development	No advice received

N/A Not Applicable



DRAYTON SOUTH COAL PROJECT

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Strategic Regional Land Use Plan

FIGURE 39

Section 6 summarises both the methodology and findings from consultation over the Project. Specific details of consultation relevant to the AIS are also provided in **Appendix R**.

Methodology

Addressing the supplementary EAR requires the provision of an AIS (**Appendix R**) addressing the gateway *'criteria'* which requires expert reports in a number of disciplines including air quality (**Appendix F**), acoustics (**Appendix G**), equine health (**Appendix H**), visual (**Appendix I**), surface water (**Appendix M**), groundwater (**Appendix N**), soils and land capability (**Appendix Q**), traffic and transport (**Appendix S**) and economics (**Appendix U**), which brings forward from the other identified reports the relevant opinions and conclusions to constitute the AIS required by the supplementary EAR.

A check list of issues required to be addressed as to the gateway criteria by the supplementary EAR and the AIS policy requirements is provided at **Appendix R**.

5.5.3 The Project, Gateway Criteria and Strategic Agricultural Land

The Gateway processes of the SRLUP do not apply to the Project. However, as required by the supplementary EAR, the *'criteria'* for the Gateway process are to be considered in the AIS and by this EA.

Map 6 indicates an Equine CIC and Viticulture CIC within the Project Boundary but that there is no BSAL. As Map 6 of the SRLUP does indicate that the Project is located in areas mapped as Equine CIC and Viticulture CIC the *'Gateway criteria'* related to them must, in accordance with the supplementary EAR, be considered in the AIS and this EA.

That consideration is required to be as to the Gateway *'criteria'* in respect of the land in the Project Boundary mapped as Equine CIC and Viticulture CIC as specified in Table 1 to verify that it is, in fact, CIC and then, should that be the case, in the context of the Equine and Viticulture CICs (as specified in Table 2), as to whether:

> *"the* (Project) *…would lead to significant impacts on the critical industry cluster through:*
>
> *(a) Surface area disturbance,*
>
> *(b) Subsidence,*
>
> *(c) Cost Benefit Reduced access to agricultural resources,*
>
> *(d) Reduced access to support services and infrastructure,*
>
> *(e) Reduced access to transport routes, or*
>
> *(f) Loss of scenic and landscape values."*

This EA considers the impacts of the Project on Equine CIC and Viticulture CIC in the vicinity of the Project under the assessment criteria set out in the SRLUP.

5.6 Director-General's Assessment Report

Following the completion of the steps required by section 75H, section 75I of the EP&A Act requires the Director-General of DP&I to provide a report on the Project to *"the Minister for the purposes of the Minister's consideration of the application for approval to carry out the Project"*. Section 75I states that the Director-General's report must contain the following:

> *(a) "a copy of the proponent's environmental assessment and any preferred project report, and*
>
> *(b) any advice provided by public authorities on the project, and*
>
> *(c) a copy of any report of the Planning Assessment Commission in respect of the project, and*
>
> *(d) a copy of or reference to the provisions of any State Environmental Planning Policy that substantially govern the carrying out of the project, and*
>
> *(e) except in the case of a critical infrastructure project—a copy of or reference to the provisions of any environmental planning instrument that would (but for this Part) substantially govern the carrying out of the project and that have been taken into consideration in the environmental assessment of the project under this Division, and*
>
> *(f) any environmental assessment undertaken by the Director-General or other matter the Director-General considers appropriate, and*
>
> *(g) a statement relating to compliance with the environmental assessment requirements under this Division with respect to the project."*

Under section 75J(2) of the EP&A Act, the Minister has an obligation to consider the Director-General's Assessment Report when determining the Project Application the process for, which is discussed further within **Section 5.7**, with particular regard to the reference of the application to the PAC and the delegation of the Minister's determination power to the PAC.

5.7 Planning Assessment Commission

Section 23D of the EP&A Act states that:

"(1) The Commission has the following functions:

(a) to determine applications for the approval of projects and concept plans under Part 3A, if those matters are delegated to it by the Minister,

(b) if requested to do so by the Minister:

(i) to advise the Minister as to planning or development matters, environmental planning instruments or the administration or implementation of the provisions of this Act, or any related matter, and

(ii) to review any aspect of a project, or a concept plan, under Part 3A, and

(iii) to review all or any of the environmental aspects of proposed development the subject of a development application (whether or not it is designated development), or a part of any such proposed development, and

(iv) to review all or any of the environmental aspects of an activity referred to in section 112 (1), or of a part of any such activity, and

(v) to review a proposal to constitute, alter or abolish a development area under section 132 or 133,"

Following the receipt by the Minister of the Director-General's report to the Minister following the exhibition of the Project EA, it is the practice of the Minister to refer the Project to the PAC for its review and report to the Minister.

The Minister may in referring the Project to the PAC for review require the PAC to hold a *'public hearing'*. If this is done, the provisions of section 23F (2) of the EP&A Act will apply, which states that *"An appeal under this Act may not be made in respect of a decision of the Commission in exercising a function conferred on the Commission by or under this Act (including a function delegated to it under this Act) if the decision was made by the Commission after a public hearing."*

5.8 Determination and Appeals

Section 75J of the EP&A Act gives the Minister the power to determine the application for the Project stating that:

"(1) If:

(a) the proponent makes an application for the approval of the Minister under this Part to carry out a project, and

(b) the Director-General has given his or her report on the project to the Minister, the Minister may approve or disapprove of the carrying out of the project.

(2) The Minister, when deciding whether or not to approve the carrying out of a project, is to consider:

(a) the Director-General's report on the project and the reports, advice and recommendations (and the statement relating to compliance with environmental assessment requirements) contained in the report, and

(b) if the proponent is a public authority—any advice provided by the Minister having portfolio responsibility for the proponent…"

Section 75K provides for an appeal by Anglo American against the determination of the Minister stating that:

"(1) This section applies to a project if:

(a) the project is not a critical infrastructure project, and

(b) the proponent is not a public authority, and

(c) the project has not been the subject of a review by the Planning Assessment Commission, and

(d) but for this Part, the provisions of Part 4 would apply to the project.

(2) A proponent who is dissatisfied with the determination of the Minister with respect to an application by the proponent under this Division may appeal to the Court within 3 months after:

(a) the date on which the proponent received notice of the determination of the application in accordance with the regulations, or

(b) the date on which the regulations provide that a pending application is taken to have been refused for the purposes only of this section.

(3) If any such appeal is made, each objector to the application referred to in section 75L is to be given notice by the Minister of that appeal and is, on application made to the Court in accordance with rules of court within 28 days after the date of the notice, entitled to be heard at the hearing of the appeal as if the objector were a party to the appeal."

Section 75L provides for an appeal by an objector against the determination of the Minister stating that:

"(1) This section applies to a project if:

(a) it is not a critical infrastructure project, and

(b) there has been no approval of a concept plan for the project under Division 3, and

(c) the project has not been the subject of a review by the Planning Assessment Commission, and

(d) but for this Part, the project would be designated development to which the provisions of Part 4 would apply.

(2) For the purposes of this section, an objector is a person who has made a submission under section 75H by way of objection to an application for approval under this Division to carry out a project.

(3) An objector who is dissatisfied with the determination of the Minister under this Division to give approval to carry out a project may appeal to the Court within 28 days after the date on which notice of the determination was given in accordance with the regulations.

(4) If such an appeal is made, the proponent and the Minister are to be given notice of the appeal, in accordance with rules of court, and are entitled to be heard at the hearing of the appeal as parties to the appeal."

In summary the appeal rights given by sections 75K and 75L are removed if the Minister has requested and the PAC has conducted a *'review'* of the Project involving a *'public hearing'*.

As noted, it is expected that the Minister will refer the determination of the application for the Project to the PAC pursuant to his delegation of his approval power as reported.

Should this occur, as is expected to be the case, the provisions of section 23F(2) of the EP&A Act will apply and the appeal rights under Sections 75K and 75L will not apply.

5.9 Contributions

As the result of section 75R(4), Divisions 6 and 6A of Part 4 of the EP&A Act apply to the determination of the Project and conditions may be imposed by the Minister under sections 94, 94A, 94EF or 94F requiring Anglo American to make development contributions to recompense a public authority (including and normally the Council) for moneys it has or is required to expend relating to an added need for services related to the Project. The development contribution required can be satisfied by the dedication of land (free of or at reduced cost), a monetary contribution, or both.

Section 93F of the EP&A Act enables the proponent and the local council to enter into a planning agreement referred to as a Voluntary Planning Agreement (VPA). Section 93F(3A) of the EP&A Act provides that if the consent authority is a party to the VPA, the agreement can preclude the Minister from imposing a condition requiring a contribution under section 94 of the EP&A Act.

Anglo American has made an offer to enter into a VPA with MSC. Discussions are progressing with MSC to reach an agreement as to the terms of the VPA. Further details are provided in Section 8.22.

5.10 Project Approvals

Numerous approvals are required for the development and operation of the Project and they are listed in Table 17. The principal approval is a major project approval, which has the result of rendering some approvals unnecessary and others required to be issued in terms consistent with the approval.

Section 75U of the EP&A Act states (relevantly) that:

"(1) The following authorisations are not required for an approved project (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply):

(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,

(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,

(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,

(d) an Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974,

(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation or State protected land,

(f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,

(g) a bush fire safety authority under section 100B of the Rural Fires Act 1997,

(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the Water Management Act 2000.

(2) Division 8 of Part 6 of the Heritage Act 1977 does not apply to prevent or interfere with the carrying out of an approved project.

(3) …

(4) *A reference in this section to an approved project includes a reference to any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with an application for approval to carry out the project or of a concept plan for the project."*

Section 75V of the EP& A Act states that:

"(1) An authorisation of the following kind cannot be refused if it is necessary for carrying out an approved project and is to be substantially consistent with the approval under this Part:

(a) an aquaculture permit under section 144 of the Fisheries Management Act 1994,

(b) an approval under section 15 of the Mine Subsidence Compensation Act 1961,

(c) a mining lease under the Mining Act 1992,

(d) a production lease under the Petroleum (Onshore) Act 1991,

(e) an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act),

(f) a consent under section 138 of the Roads Act 1993,

(g) a licence under the Pipelines Act 1967.

(2) …

(3) This section does not apply to or in respect of:

(a) an application for the renewal of an authorisation or a renewed authorisation, or

(b) an application for a further authorisation or a further authorisation following the expiry or lapsing of an authorisation, or

(c) in the case of an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997—any period after the first review of the licence under section 78 of that Act.

(4) A reference in this section to an authorisation or approval includes a reference to any conditions of the authorisation or approval.

Table 17 Licences and Approvals Required for the Project

Approval	Legislation	Authority	Comment
Project Approval for the continuation of Drayton Mine via the development of open cut and highwall mining operations within the Drayton South area	Section 75J of Part 3A of the EP&A Act provides the Minister for Planning and Infrastructure the power to grant a Project Approval	Minister for Planning and Infrastructure	The Minister has delegated his powers to grant a PA to the PAC
Grant of a Mining Lease over part of EL 5460 required for the Project (area of Project Boundary that falls within EL 5460)	Part 5, Division 3, section 63 of the Mining Act provides the Minister for Resources and Energy the power to grant or not grant a Mining Lease	Minister for Resources and Energy	Section 75V EP&A Act provides the granting of a Mining Lease must be approved substantially consistent with the Part 3A approval
MOP	Condition of a Mining Lease issued under the Mining Act	DTIRIS	Separate approval. Revision of the Drayton Mine MOP to include operations within the Drayton South area
Approval for the carrying out of a *"Controlled Action"*	EPBC Act	SEWPaC	Separate approval, adopting Part 3A assessment process as decided by SEWPaC under section 87 of the EPBC Act
EPL	Chapter 3 of the Protection of the *Environment Operations Act 1997*	OEH	Section 75V EP&A Act provides the granting of this approval must be approved substantially consistent with the Part 3A approval. Existing Drayton Mine EPL to be revised to incorporate Drayton South
Section 90 Aboriginal Heritage Impact Permit	Section 90 of the NPW Act	OEH	Section 75U EP&A Act provides that an approval of this type is not required for an approved project
DC to clear Native Vegetation	Section 12 of the *Native Vegetation Act 2003*	OEH	Section 75U EP&A Act provides that an approval of this type is not required for an approved project

Approval	Legislation	Authority	Comment
Water Use Approval	Section 89 of the *Water Management Act 2000*	NOW	Section 75U EP&A Act provides that an approval of this type is not required for an approved project
Water Management Work Approval	Section 90 of the *Water Management Act 2000*	NOW	Section 75U EP&A Act provides that an approval of this type is not required for an approved project
Controlled Activity Approval	Section 91 of the *Water Management Act 2000*	NOW	Section 75U EP&A Act provides that an approval of this type is not required for an approved project
WAL(s)	Parts 2 and 3 of Chapter 3 of the *Water Management Act 2000*	NOW	Separate approval
Bore Licence	Part 5 of the *Water Act 1912*	NOW	Licence to be separately acquired
Licence Under Threatened Species Act	NPW Act	OEH	Exemption under section 118A and 118C of the NPW Act
Consent to carry out a work in on or over a public road	Section 138 of the *Roads Act 1993*	RMS	Section 75V EP&A Act provides the granting of this approval must be approved substantially consistent with the Part 3A approval
Construction Certificates	EP&A Act	MSC	Separate approval
Approval for works over Crown land	*Crown Lands Act 1989*	Department of Land	Separate approval
Notification of Dangerous Goods	*Work Health and Safety Regulation 2011*	WorkCover	Separate approval
Approval for Emplacement Area	CMH&S Act	DTIRIS	Separate approval
Radiation Licences	*Radiation Control Act 1990*	OEH	Separate approval
Environment Management Plans	*Conditions of Project Approval*	DP&I	Separate approval

(5) This section applies to a person, court or tribunal that deals with an objection, appeal or review conferred on a person in relation to an authorisation in the same way as it applies to the person giving the authorisation."

5.11 Water

5.11.1 Overview

Until 2000 water was managed under the *Water Act 1912* (Water Act). The *Water Management Act 2000* (WM Act) commenced in December 2000. Different parts of the Act have been progressively commenced with the objective being to replace the previous but currently still partially applying Water Act.

The WM Act applies to a water source that is subject to a WSP. The Water Act continues to apply to water sources that are not subject to a WSP. Presently the Water Act still applies to some water resources, being those in respect of which the WM Act have not been turned on, being those water resources in respect of which a WSP has not been adopted.

To consider the law applicable to water in the Drayton Complex it is necessary to identify the different water resources in and around the Project and determine whether there is, or is not, a WSP and which WSP applies to the different water resources.

In respect of the water resources for which there is a WSP, the relevant water law regime will be the WM Act and the WSP. To the extent that there is not a WSP, the relevant water law will be, in different contexts, the Water Act and the WM Act.

Because the Project is a transitional Part 3A Project under Schedule 6A of the EP&A Act, section 75U of that Act (as it was) removes any need for the Project to obtain an aquifer interference approval if project approval is granted.

5.11.2 Water Sharing Plans and the Project

The Project lies within the Hunter-Central Rivers Catchment of NSW.

There are two WSPs that apply to the Project:

- The *Hunter Regulated River Water Source 2003*; and
- The *Hunter Unregulated and Alluvial Water Sources 2009*.

The area to the south and to the east of the Project, in which there is BSAL, Equine CIC and Viticulture CIC, is subject to the same WSPs and the same legal water management framework as within the Project Boundary.

The aspects of the Project that are within a WSP will be subject to the approvals and licensing provisions of the WM Act. The aspects of the Project that are outside of a WSP will be governed by the Water Act.

Section 91A of the WM Act establishes that it is an offence to use water from a water source without a water use approval under section 89.

Section 90 of the WM Act provides that water management works approvals are required for the construction and operation of any water supply works, drainage works or flood works. It is an offence to undertake any of these works without an approval under section 90.

Section 91 of the WM Act requires a proponent to obtain an activity approval for any *'controlled activities' or 'aquifer interference activities'* (as defined).

By virtue of section 75U(1)(h) of the EP&A Act, approvals under section 89, 90 and 91 of the WM Act are not required where a PA has been granted under Part 3A of the EP&A Act.

5.11.3 Water Access Licences

Division 1A of Part 2 of Chapter 3 of the WM Act provides that it is an offence to take water from a water source without obtaining a WAL, complying with the conditions of that licence and having sufficient water allocation in the water account, which attaches to that licence. Anglo American currently hold two general security WAL (WAL 491 and 1066) which provide an allocated share of 99 units each (198 units combined).

The requirements for the Project to obtain any further WALs, in addition to those already held, are addressed in Section 8.11 and 8.12.

5.12 NSW Environmental Planning Instruments

The following sections provide a review of the Environmental Planning Instruments (EPIs) that are relevant to the Project. Under section 75J(3) of the EP&A Act, the Minister for Planning *"may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved"*.

A number of State Environmental Planning Policies (SEPP) were amended following the repeal of Part 3A of the EP&A Act. Section 3(2) in Schedule 6A of the EP&A Act provides that *"any State environmental planning policy or other instrument made under or for the purposes of Part 3A, as in force on the repeal of that Part and as amended after that repeal, continues to apply to and in respect of a transitional Part 3A project"*.

Consequently provisions of SEPPs that have since been repealed will continue to apply to the Project, provided that they were in force immediately prior to the repeal of Part 3A.

5.12.1 State Environmental Planning Policy (Major Developments) 2005

The SEPP Major Development identifies developments to which the assessment and approval process under Part 3A of the EP&A Act will apply. Clause 6 of the SEPP Major Development, as it was immediately prior to the repeal of Part 3A, stated that any development of a kind that is listed under Schedule 1 or 2 of the SEPP is a project to which Part 3A of the Act applies. Coal mining is listed under clause 5 of Schedule 1 of the SEPP Major Development. Therefore, the Project will be assessed under Part 3A of the EP&A Act.

Clause 6 of the SEPP Major Development was repealed following the repeal of Part 3A of the EP&A Act. However, this clause still applies to the Project by virtue of section 3(2) in Schedule 6A of the EP&A Act.

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

SEPP (Mining Petroleum Production and Extractive Industries) 2007 (SEPP Mining) was gazetted on 16 February 2007. Under clause 7(1)(b) of the SEPP Mining, mining is permissible with DC:

> *"(i) On land where development for the purposes of agriculture or industry may be carried out (with or without development consent); or*
>
> *(ii) On land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act."*

The Project is predominantly located on land falling within the Muswellbrook LGA, with only a small part of the Drayton Complex falling within the Singleton LGA. All land on which mining will be carried out is zoned RU1 under the Muswellbrook LEP. The land use table in the Muswellbrook LEP provides that agriculture and various industries are permissible within Zone RU1. Mining is therefore permissible on this land within the Muswellbrook LGA by virtue of clause 7(1)(b) of the SEPP Mining.

The proposed realignment of Edderton Road, which is required as a result of the Project, will occur on land that is zoned E3 (Environmental Management) under the Muswellbrook LEP. Agriculture is permitted within Zone E3. Under clause 7(1)(b) of the SEPP Mining, development for the purposes of mining is permissible with DC on land where development for the purposes of agriculture may be carried out (with or without consent).

All land within the Project Boundary within the Singleton LGA is zoned 1(a) (Rural Zone) under the Singleton LEP. The land use table provides that agriculture is permissible without consent in Zone 1(a). As a result, mining is also permissible with consent by operation of clause 7(1)(b) of the SEPP Mining.

Under clause 7(1)(d) of the SEPP Mining, facilities for the processing or transportation of minerals are permissible with DC on lands were mining is permissible, provided that the minerals were mined from that land or adjoining land.

Clause 12 of the SEPP Mining provides that *"Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:*

> *(a) consider:*
>
> > *(i) the existing uses and approved uses of land in the vicinity of the development, and*
> >
> > *(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and*
> >
> > *(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and*
>
> *(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and*
>
> *(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii)."*

Land uses in the vicinity of the Project Boundary are described in Section 2.2. The Project's potential impacts on adjoining land uses and any potential incompatibility must be examined and analysed in this EA. The EA must also describe and evaluate proposed measures to avoid or alleviate any land use incompatibilities.

5.12.3 State Environmental Planning Policy 33 – Hazardous and Offensive Development

State Environmental Planning Policy 33 – Hazardous & Offensive Development (SEPP 33) governs the assessment of development applications for the purposes of a potentially hazardous industry or a potentially offensive industry.

The Project is a potentially hazardous industry as it could pose a significant risk to human health and the biophysical environment if mitigation measures were not implemented. Clause 12 of SEPP 33 provides that a preliminary hazard analysis must be prepared for any development application that is for the purposes of a potentially hazardous industry. In accordance with this clause, a relevant preliminary hazard analysis has been included in this EA at Section 8.21.

The Project is also a potentially offensive industry for the purpose of SEPP 33. Clause 13 of SEPP 33 requires the consent authority to consider the following:

> *"(a) Current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and*
>
> *(b) Whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and*
>
> *(c) In the case of development for the purpose of a potentially hazardous industry – a preliminary hazard analysis prepared by or on behalf of the applicant, and*
>
> *(d) Any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and*
>
> *(e) any likely future use of the land surrounding the development."*

A relevant hazard analysis for the Project was undertaken by Hansen Bailey and is provided in Section 8.21.

5.12.4 State Environmental Planning Policy 44 – Koala Habitat Protection

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation areas to ensure that there is ongoing protection of Koalas and their habitat.

Clause 9 of SEPP 44 requires the preparation of a plan of management where a development is proposed to be carried out on lands that constitute *'core Koala habitat'*.

Clause 5 of SEPP 44 provides that the SEPP only applies to lands within the LGAs listed in Schedule 1. Both Singleton and Muswellbrook LGAs are listed under Schedule 1 of the SEPP.

The ecology surveys conducted for this EA did not identify the Koala or any evidence of the species (such as scats and claw marks) within the Project Boundary. There also are no historical records of Koalas within the Project Boundary. Therefore, the land on which the Project will be carried out is not *'core Koala habitat'* and no plan of management is required.

5.12.5 Muswellbrook Local Environment Plan 2009

The Project is predominantly located on land zoned as RU1 (Primary Production) under the Muswellbrook LEP. Part of the Project Boundary required for the realignment of Edderton Road is also within Zone E3 (Environmental Management) under the Muswellbrook LEP (see **Figure 38**).

Zone RU1 (Primary Production)

As shown in **Figure 38**, most of the proposed works will occur within zone RU1. The land use table in the Muswellbrook LEP provides that mining within zone RU1 is permissible with consent.

The objectives of the zone include:

- *"To encourage sustainable primary industry production by maintaining and enhancing the natural resource base;*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area;*
- *To minimise the fragmentation and alienation of resource lands;*
- *To minimise conflict between land uses within the zone and land uses within adjoining zones;*
- *To protect the agricultural potential of rural land not identified for alternative land use, and to minimise the cost to the community of providing, extending and maintaining public amenities and services;*
- *To maintain the rural landscape character of the land in the long term;*
- *To ensure that development for the purpose of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the floodplain), will not:*
  - *(a) Destroy or impair the agricultural production potential of the land or, in the case of underground mining, unreasonably restrict or otherwise affect any other development on the surface, or*
  - *(b) Detrimentally affect in any way the quantity, flow and quality of water in either subterranean or surface water systems, or*
  - *(c) Visually intrude into its surroundings, except by way of suitable screening.*
- *To protect or conserve (or both):*
  - *(a) Soil stability by controlling development in accordance with land capability, and*
  - *(b) Trees and other vegetation, and*
  - *(c) Water resources, water quality and wetland areas, and their catchments and buffer areas, and*
  - *(d) Valuable deposits of minerals and extractive materials by restricting development that would compromise the efficient extraction of those deposits."*

Zone E3 (Environmental Management)

A small portion of the required Edderton Road realignment is located on land within Zone E3 (Environmental Management) under the Muswellbrook LEP. The objectives of the zone are as listed in the land use table:

- *"To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values;*
- *To provide for a limited range of development that does not have an adverse effect on those values;*
- *To maintain, or improve in the long term, the ecological values of existing remnant vegetation of significance including wooded hilltops, river valley systems, major scenic corridors and other local features of scenic attraction;*
- *To limit development that is visually intrusive and ensure compatibility with the existing landscape character;*
- *To allow agricultural activities that will not have an adverse impact on the environmental and scenic quality of the existing landscape;*
- *To promote ecologically sustainable development; and*
- *To ensure that development in this zone on land that adjoins land in the land zoned E1 National Parks and Nature Reserves is compatible with the objectives for that zone."*

The land use table for the Muswellbrook LEP provides that development of a road is permissible in zone E3.

5.12.6 Singleton Local Environment Plan 1996

The easternmost portion of the Project Boundary is located within the Singleton LGA. No disturbance associated with the Project is situated within the Singleton LGA. This land falls within Zone 1(a) (Rural Zone) of the Singleton LEP (see **Figure 38**). The objectives of Zone 1(a) are as follows:

- *"To protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use;*
- *To promote the protection and preservation of natural ecological systems and processes;*
- *To allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining;*
- *To maintain the scenic amenity and landscape quality of the area;*
- *To provide for the proper and co-ordinated use of rivers and water catchment areas; and*
- *To promote provision of roads that are compatible with the nature and intensity of development and the character of the area."*

The land use table in the Singleton LEP provides that mining is permissible with consent in Zone 1(a).

5.13 Other NSW Legislation

The approvals required for the construction and operation of the Project are governed by NSW legislation. The application of the legislation is, as observed at **Section 5.10**, removed or restricted by the effect of section 75U of the EP&A Act being (relevantly) the:

- *Fisheries Management Act 1994* (Fisheries Management Act);
- *Heritage Act 1977*;
- NPW Act;
- *Native Vegetation Act 2003*;
- *Rivers and Foreshores Improvement Act 1948*; and
- WM Act as to Sections 89, 90 and 91.

The issue of approvals under further NSW legislation is, by virtue of section 75V of the EP&A Act, required to be issued in terms consistent with any planning approval for the Project being (relevantly) the:

- Fisheries Management Act as to section 144;
- *Mine Subsidence Compensation Act 1961* as section 15;
- Mining Act;
- *Protection of the Environment Operations Act 1997* (POEO Act) as Chapter 3; and
- *Roads Act 1993* as to section 138.

In providing his EARs for the environmental planning assessment of the Project, the Director-General consults with the relevant authorities under that legislation and includes relevant considerations in the EARs.

This section identifies other relevant legislation for the Project.

5.13.1 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) lists and defines threatened species, populations and ecological communities, and critical habitat within NSW. The TSC Act also provides a framework for the assessment of a development's impacts on threatened species.

Although the compliance provisions of the TSC Act do not apply to the Project by virtue of section 75U of the EP&A Act, there remains a requirement to consider and assess any impacts on any threatened species located within the Project Boundary.

A threatened species impact assessment must be undertaken for the Project (see **Section 8.7**).

5.13.2 Water Management System / Sediment Dams

Clause 18(1) of the *Water Management (General) Regulation 2011* (WM Regulation) provides that there is no requirement for a WAL when taking water by means of an *'excluded work'*.

Excluded works are described in Schedule 5 (and 1) of the WM Regulation and include:

> *"Dams solely for the capture, containment and recirculation of drainage and / or effluent, consistent with best management practice for required by a public authority (…) to prevent the contamination of a water source, provided such dams are located on a minor stream."*

The requirement for a water supply works approvals and water use approvals are also subject to section 75U of the EP&A Act. These provisions apply to all of the dams and water management structures which receive water from disturbed areas (and upstream catchment dams for diversion) within the active mining and mine related areas.

If the Project results in a reduction of the local catchment area and its associated water sources that is not otherwise covered by an exemption, then that take of water will require a WAL with a sufficient share component.

5.13.3 Dams Safety Act 1978

The *Dams Safety Act 1978* (Dams Safety Act) requires the NSW Dams Safety Committee (DSC) to *"formulate measures to ensure the safety of dams"* and to *"maintain a surveillance of prescribed dams"*. A *'prescribed dam'* is any dam listed under Schedule 1 of the Dams Safety Act.

There are currently two prescribed dams within the Drayton Complex – the Drayton In-pit Long Term Tailings Storage Facility and the Drayton In-pit Temporary Tailings Storage Facility.

Plashett Dam which is owned by Macquarie Generation and located to the east of the Project Boundary is also a prescribed dam under the Dams Safety Act. The Project is outside of the *'notification area'* for Plashett Dam. The proposal to construct additional water dams at Drayton South as part of the Project will be referred to the DSC as part of the Part 3A process. Some of the dams within the Project may become prescribed dams and therefore subject to the Dams Safety Act and the oversight of the DSC constituted under that Act.

5.13.4 Coal Mines Health and Safety Act 2002

The primary objective of the CMHS Act is to assist in achieving the objectives of the *Work Health and Safety Act 2011* relating to coal mines. The CMHS Act imposes requirements necessary for the management of particular risks arising from the mining of coal.

Of particular relevance are the provisions about tailings emplacement areas. Under section 100 of the CMHS Act, emplacement areas can only be established with the approval of the Minister.

Anglo American holds a Ministerial approval for the tailings emplacement area at Drayton Mine (see Section 3). This approval was granted under the *Coal Mines Regulation Act 1982* (the predecessor to the CMHS Act), but continues to apply by virtue of transitional provisions.

5.13.5 Disclosure of Reportable Political Donations and Gifts

Section 147 of the EP&A Act states that reportable political donations and gifts must be disclosed when planning applications are made. The requirement to disclose applies to all applications for DC or PA, as well as any submissions objecting to or supporting a planning application or the development that is the subject of the application.

This disclosure requirement applies to all relevant planning applications or submissions made on or after 1 October 2008. In certain circumstances, the making of political donations or gifts can limit the Minister's power to determine an application for PA.

The proponent has provided a statutory declaration to the DP&I affirming that no such reportable donations or gifts have been made. As a result, the Minister (or one of his delegates) has the authority to determine the Project Application.

DRAYTON SOUTH

Stakeholder Engagement

6

Stakeholder Engagement 6

This section provides a summary of the stakeholder engagement undertaken for the Project by Anglo American and Hansen Bailey. The stakeholder engagement program included consultation with Local, State and Commonwealth government agencies, neighbouring land owners and industries, and the Aboriginal and wider local community. This section describes the objectives and phases of the stakeholder engagement program, the consultation activities undertaken, and the outcomes of the engagement.

6.1 Stakeholder Identification

A range of stakeholders were identified for the Project based on the analysis of land ownership information, Anglo American's records, and background research into the local area. The key stakeholders identified for the Project and consultation activities undertaken for each are summarised in Table 18.

Table 18 Stakeholder and Consultation Methods

Stakeholder	Consultation
Community Stakeholders	
Neighbouring Land Owners	• Initial consultation (Preliminary Mine Plan Design) – Coolmore Australia (2005 to 2006) • Initial consultation (Pre-Feasibility Study) – Coolmore Australia (October and November 2009, and May, June and October 2010) – Darley Australia (October and November 2009, and May and June 2010) • EA Project briefing – Coolmore Australia (28 October 2010) – Darley Australia (7 January 2011) – Robin Wolfgang (7 April 2011) – Mark, Peter and Robin Wolfgang (5 May 2011) – Jeff Wolfgang (9 May 2011) – Gee family (9 May 2011) – Arrowfield Estate (29 September 2011) • Working groups (Darley Australia and Coolmore Australia) • Project newsletters (April and October 2011) • Regular telephone and email communications
Neighbouring Industry	• EA Project briefing – Mt Arthur Coal (2 March 2011) – Macquarie Generation (30 May 2011) • Working groups (Mt Arthur Coal and Macquarie Generation) • Project newsletters (April and October 2011)
Jerrys Plains, Antiene Estate and Wider Local Community	• EA Project briefing (offered and upon request) – M. Richards (7 April 2011) – A. and H. Holt (29 April 2011) – F. and N. Almond (9 May2011) – R. Halloran (1 November 2011) – A. Healey, Jerrys Plains School (23 February 2012) • Project newsletters (April and October 2011) • Presentation to Drayton CCC (19 May 2011) • Regular Project updates provided to Drayton CCC
Aboriginal Community	• Public notice advertised in the Singleton Argus and Muswellbrook Chronicle (4 March 2011) • Planning meeting (8 April 2011) • Field assessment (2 May to 4 June and 10 to 11 October 2011) • Field assessment summary (2 May to 4 June 2011) • Close out meeting (10 June 2011) • Cultural heritage exchange sessions – Wonnarua Nation Aboriginal Corporation (18 August 2011) – Upper Hunter Wonnarua Council Inc. (18 August 2011) • Draft Aboriginal cultural heritage impact assessment review (1 to 29 February 2012) • Project newsletters (April and October 2011)
Other Industry	• Power supply for the Project and interactions with existing transmission lines – Ausgrid (17 November 2011, 13 February, 2 April, 14 May and 5 June 2012)

Stakeholder	Consultation
Regulatory Stakeholders	
SEWPaC	• EA Project briefing note (8 March 2011) • EA Project briefing (18 March 2011 – Canberra) • Drayton and Drayton South tour (12 May 2011) • Correspondence regarding minor change to Project Boundary (December 2011 and January 2012) • Project newsletters (April and October 2011)
DP&I	• EA Project briefing note (31 January 2011) • Planning Focus Meeting (1 June 2011) • Project update meeting (29 November 2011 and 6 February 2012) • Project newsletters (April and October 2011)
OEH	• Planning Focus Meeting (1 June 2011) • EA Project briefing (29 November, 7 December 2011 and 20 January 2012) • Presentation regarding proposed offset strategy (29 November 2011 and 20 January 2012) • Project newsletters (April and October 2011)
NOW	• Project newsletters (April and October 2011)
DTIRIS-DRE	• Briefing note (25 January 2011) • Presentation regarding the Conceptual Project Development Plan (14 February 2011) • Letter regarding addition resource information (21 February 2011) • Planning Focus Meeting (1 June 2011) • Project newsletters (April and October 2011)
DTIRIS – Primary Industries	• Planning Focus Meeting (1 June 2011) • EA Project briefing and review AIS Structure (26 June 2012) • Project newsletters (April and October 2011)
MSC	• Initial consultation (Pre-Feasibility Study) (10 November and 21 December 2009) • EA Project briefing (1 March and 7 June 2011) • Planning Focus Meeting (1 June 2011) • Project update meeting (17 April 2012) • Project meeting regarding VPA (14 November 2011, 17 April, 8 June and 5 July 2012) • Adequacy review meeting (28 August 2012) • Project newsletters (April and October 2011)
Singleton Shire Council	• Initial consultation (Pre-Feasibility Study) (9 April 2010) • EA Project briefing (2 March 2011) • Project update meeting (23 February 2012) • Project newsletters (April and October 2011)
DSC	• Project newsletters (April and October 2011) • EA Project briefing (19 July 2012)
CMA	• Planning Focus Meeting (1 June 2011) • Project newsletters (April and October 2011) • Ongoing correspondence regarding the partnership agreement for the Saddlers Creek Property Planning and Land Rehabilitation Project (from February 2011)
RMS	• EA Project briefing (23 November 2011) • Project meeting regarding Edderton Road / Golden Highway intersection design (23 November 2011) • Correspondence regarding Edderton Road / Golden Highway intersection design (December 2011) • Project newsletters (April and October 2011)
National Parks and Wildlife Services (Scone)	• EA Project briefing and identification of proposed offsite biodiversity offset property (11 April 2012)

6.2 Issue Scoping

Stakeholder consultation was undertaken in accordance with the stakeholder engagement plan developed for the Project, which includes the following key objectives:

- Adequately inform stakeholders of the Project;
- Consult proactively with stakeholders using clear and consistent key messages;
- Engage with key stakeholders to identify potential issues and opportunities regarding the Project;
- Facilitate the development and implementation of response and feedback strategies to address identified stakeholder issues;
- Enable stakeholders to have input into Project planning and the preparation of the EA;
- Manage current community awareness and expectations of the Project; and
- Maintain and further develop cooperative land owner and community relationships.

As indicated in Table 18, various consultation methods were adopted to identify stakeholder issues. These consultation methods are described in further detail below.

The outcomes of the stakeholder consultation were incorporated into the risk assessment conducted for the Project. This risk assessment is discussed further in Section 7.

6.2.1 Community Engagement

EA Project Briefings

EA Project briefings were offered to neighbouring land owners and the wider local community via telephone, email and community newsletters. During the planning phase and preparation of this EA, 10 community stakeholders, including Coolmore Australia and Darley Australia, accepted the opportunity to be briefed on the Project.

Table 21 outlines the community stakeholder issues raised and the section of the EA where each issue is addressed.

Table 22 and Table 23 outline the issues raised by Coolmore Australia and Darley Australia, respectively, and the section of the EA where each issue is addressed.

Community Newsletters

Community newsletters were developed to familiarise stakeholders with the Project, whilst also providing information regarding technical assessments, Project timeframes, and the stakeholder consultation process.

To date, two community newsletters have been distributed to local, State and Commonwealth government agencies, neighbouring land owners and industries, and the Aboriginal and wider local community, including residents in Jerrys Plains and the Antiene Estate (see Appendix D).

Community newsletter 1 was distributed in April 2011 and provided background information regarding the existing operations at Drayton Mine followed by an introduction to the Project. The newsletter also outlined the EA and consultation process and provided contact details for obtaining further information on the Project.

Community newsletter 2 was distributed in October 2011 and provided a recap of the Project and an account of the stakeholder consultation undertaken since the circulation of community newsletter 1. The newsletter also outlined the key issues raised by community stakeholders and actions proposed to be undertaken as part of the EA to address those issues.

A third community newsletter will be distributed prior to the public exhibition of this EA. This edition will outline the key findings of the EA and provide details of the public exhibition period and process, including where the document can be viewed.

6.2.2 Working Groups

Several working groups have been established with neighbouring land owners and industries to address key issues and interactions, and to further develop cooperative land owner relationships. These working groups have facilitated ongoing communication between parties and provided stakeholders with the opportunity to input into the planning of the Project and the preparation of this EA.

Coolmore Australia

Coolmore Australia owns and operates Coolmore Stud which is one of the premier thoroughbred breeding operations in the Hunter Valley. Coolmore Stud is located to the immediate south of the Project.

To date, 14 working group meetings have been held with Coolmore Australia. In addition to these several technical meetings have also been held with consultants and technical advisors working on Coolmore Australia's behalf. As part of these meetings, the following mechanisms have been used to brief Coolmore Australia on the various technical aspects of the Project, including:

- Project presentations;
- Preparation of a range of visual materials, including photomontages, cross sections, figures, and drive by and helicopter videos;
- Tours and field visits; and
- Discussions with technical specialists on EA related studies.

The working group meetings have been ongoing since 2009 and have been instrumental in providing input into the design of the mine plan and Houston visual bund, and scoping the technical assessments required for the EA, in particular the visual impact assessment (Appendix I).

Table 22 outlines the issues raised by Coolmore Australia and the section of the EA where these have been addressed.

Darley Australia

Darley Australia owns and operates Woodlands Stud, which alongside Coolmore Stud, is one of the premier thoroughbred breeding operations in the Hunter Valley. Woodlands Stud is located to the immediate south-west of the Project. To date, six working group meetings have been held with Darley Australia. As part of these meetings, various mechanisms were used to brief them on the technical aspects of the Project, including:

- Project presentations;
- Visual materials, including photomontages, figures, and drive by videos;
- Tours and field visits; and
- Discussions with technical specialists on EA related studies.

The working group meetings have actively contributed to scoping the equine health impact assessment and visual impact assessment (Appendix H and I).

Table 23 outlines the issues raised by Darley Australia and the section of the EA where these have been addressed.

Mt Arthur Coal Mine

There are a number of key interactions between Anglo American and Mt Arthur Coal Mine including:

- Operations within the Mt Arthur Coal Mine within CL 229;
- Use of the Antiene Rail Spur;
- Realignment of Edderton Road;
- Realignment of existing transmission lines; and
- Restoration of Saddlers Creek.

The details of each interaction are described further in Section 4.14.1.

To date, four working group meetings have been held. These meetings have allowed both parties to work towards developing collaborative plans that can be accommodated under current and proposed operations. Working group meetings will continue between Anglo American and Mt Arthur Coal Mine to maintain land owner relationships and to ensure current and future interactions are progressed in consultation with one another.

Macquarie Generation

There are a number of key interactions between Anglo American and Macquarie Generation including:

- Use of the final voids at Drayton Mine;
- Transport corridor interactions; and
- Bayswater B Power Station for which concept approval has been granted.

The details of each interaction are described further in Section 4.14.2.

To date, six working group meetings have been held. These meetings have allowed both parties to work towards developing collaborative plans that can be accommodated under current and proposed operations. Working group meetings will continue between Anglo American and Macquarie Generation to maintain land owner relationships and to ensure current and future interactions are progressed in consultation with one another.

6.2.3 Regulator Engagement

Briefings and Presentations

As indicated in Table 18, a number of briefings and presentations have been provided to Local, State and Commonwealth government agencies throughout the planning and preparation of this EA. Such consultation efforts have provided regulators with an understanding of the Project, some of the key findings from the technical studies and an overview of community stakeholder issues raised.

Planning Focus Meeting

The Planning Focus Meeting was held at Drayton Mine on 1 June 2011. Twenty one representatives from Local and State government, and neighbouring industry attended the meeting, including DP&I, DTIRIS – DRE, DTIRIS – Primary Industry (DTIRIS – PI), OEH, MSC, CMA and Macquarie Generation. Representatives from NOW, RMS and DSC were invited, however, were unable to attend.

At the meeting, discussions were raised regarding the Project, potential environmental and social impacts, the proposed impact assessment methodologies, and preliminary management and mitigation measures. Representatives were then given the opportunity to raise key issues and information requirements, which would later be considered in the preparation of the Project's Director-General's EARs and this EA (see Section 6.3.1). This was followed by a site tour of the Drayton South area.

6.3 Issue Response

Following completion of the issue scoping phase, responses were provided for all issues raised by stakeholders in relation to the Project. Strategies for the management and mitigation of these issues were developed and are detailed in this EA. Where possible, specific issues raised in relation to the Project were addressed with the relevant stakeholders.

6.3.1 Director-General's Environmental Assessment Requirements

In response to the regulatory consultation undertaken for the Project and the Major Project Application, DP&I issued the Director-General's EARs on 3 August 2011. On 30 April 2012 a supplementary requirement was issued by the Director-General under section 75F(3) of the EP&A Act requiring the preparation of an AIS that includes a specific focused assessment of the impacts of the Project on SAL, having regard to the gateway criteria in the SRLUP.

Table 19 outlines the Director-General's EARs and the section of the EA which corresponds to each requirement. The Director-General's EARs are provided in full in Appendix C.

Table 19 Director-General's Environmental Assessment Requirements

Issue	Description	EA Section
General Requirements	The EA of the project must include: • An executive summary	**Executive Summary**
	• A detailed description of: – existing and approved mining operations in the vicinity of the site; – historical mining operations on the site; – existing and approved mining operations and infrastructure on the site, including a copy of all relevant statutory approvals; – any existing and/or approved biodiversity and heritage offset areas relating to these operations; and – the existing environmental management regimes for these operations	**Section 2, Section 3** and **Appendix C**
	• A detailed description of the project, including the: – need for the project; – alternatives considered, including justification for the proposed mine plan; – likely staging of the project; – likely interactions between the project and existing and approved mining operations and mining titles; – likely interactions between the project and the nearby Bayswater and Liddell Power Stations and associated infrastructure; and – status of existing infrastructure and any proposed upgrades or building works	**Section 4** and **Appendix B**
	• A risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment	**Section 7** and **Appendix E**
	• A detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: – a description of the existing environment, using sufficient baseline data; – an assessment of the potential impacts of all stages of the project on this environment, including any cumulative impacts associated with the concurrent operation of the project and existing Drayton Coal Mine and any other approved or proposed mining operations in the region, taking into consideration any relevant laws, policies, guidelines and plans; – a description of the measures that would be implemented to avoid, minimise, and if necessary offset the potential impacts of the project, including evidence that all relevant prevention and mitigation measures would be applied where reasonable and feasible; and – detailed contingency plans for managing any significant risks to the environment	**Section 2** and **Section 8**
	• A statement of commitments, outlining the proposed environmental management and monitoring measures	**Section 9**
	• A conclusion justifying the project, taking into consideration: – the suitability of the site; – the economic, social and environmental impacts of the project as a whole; and – whether the project is consistent with the objects of the *Environmental Planning & Assessment Act 1979*	**Section 10**
	• A signed statement from the author of the EA, certifying that the information contained within the document is neither false nor misleading	**Page i**
	• The EA of the project must also be prepared in accordance with the requirements set out in Appendix A	**Section 8.7** and **8.8,** Appendix M of **Appendix J**
Key Issues	• Air Quality – including a quantitative assessment of the potential air quality and odour impacts of the project on both on people and livestock	**Section 8.1**
	• Noise and Blasting – including a quantitative assessment of the potential: – construction, operational and transport noise impacts; – offsite noise impacts; and – blasting impacts on people, livestock and property	**Section 8.3** and **8.4**

<table>
<tr><th>Issue</th><th>Description</th><th>EA Section</th></tr>
<tr><td rowspan="6">Key Issues</td><td>• Water – including:
– a detailed site water balance for the Drayton complex as proposed, including a description of site water demands (including access to any flows within the Hunter Regulated River source), water disposal methods, water supply infrastructure and water storage structures;
– detailed modelling and assessment of the potential impacts of the project on:
◦ the quantity and quality of existing surface and ground water resources;
◦ affected licensed water users and basic landholder rights;
◦ the riparian, ecological, geomorphological and hydrological values of watercourses both on site and downstream of the project;
◦ environmental flows;
◦ flooding; and
◦ agriculture
– a detailed description of the proposed water management system for the Drayton complex as proposed (including all infrastructure and storages);
– a detailed description of measures to minimise all water discharges; and
– a detailed description of measures to mitigate surface water and groundwater impacts (including a comprehensive rehabilitation plan for Saddlers Creek)</td><td>Section 8.11, 8.12 and 8.16</td></tr>
<tr><td>• Biodiversity – including:
– accurate estimates of any vegetation clearing associated with the project;
– a detailed assessment of the potential impacts of the project on any terrestrial and aquatic threatened species or populations and their habitats, endangered ecological communities or groundwater dependent ecosystems;
– a detailed description of the measures that would be implemented to avoid or mitigate impacts to biodiversity;
– an offset strategy to ensure that the project maintains or improves the biodiversity values of the region in the medium to long term (in accordance with NSW and Commonwealth policies), paying particular attention to the existing Saddlers Creek Conservation Area and Mt Arthur Coal's biodiversity offset areas; and
– a detailed assessment of the impacts to Matters of National Environmental Significance; in accordance with the assessment requirements detailed in Appendix A</td><td>Section 8.7, 8.8, 8.13 and Appendix J</td></tr>
<tr><td>• Traffic and Transport – including:
– accurate predictions of the road and rail traffic generated by the project; and
– a detailed assessment of the potential impacts of the project (paying particular attention to the proposed relocation of Edderton Road) on the capacity, efficiency, and safety of the road and rail networks</td><td>Section 8.18</td></tr>
<tr><td>• Heritage – both Aboriginal and non-Aboriginal, including:
– assessment of potential impacts on non-Aboriginal heritage values of the locality related to its settlement by Europeans and its pastoral history;
– description of the Aboriginal objects and declared Aboriginal places located within the proposed development, their cultural value and the significance of these values for Aboriginal people; and
– description of how the requirements for consultation with Aboriginal people have been met and details of the views of the Aboriginal people regarding the likely impact of the project</td><td>Section 8.9 and 8.10</td></tr>
<tr><td>• Visual – including:
– analysis of the costs and benefits of potential alternative locations for the proposed Houston visual bund, and detailed specifications and construction timeframes for the preferred alternative; and
– assessment of visual impacts on the thoroughbred breeding industry, residents, tourists and other road users</td><td>Section 8.6, 4.7 and 4.16.6</td></tr>
<tr><td>• Agricultural Productivity – including:
– a description of the agricultural resources (especially soils and water resources used or capable of being used for agriculture) and agricultural enterprises in the locality;
– identification of any regionally or state significant agricultural resources in the locality, with particular reference to the thoroughbred breeding industry;
– a detailed assessment of the potential impacts of the project on agricultural resources and agricultural enterprises on the site and in the locality, with particular reference to the thoroughbred breeding industry;
– management measures to avoid, reduce or mitigate impacts on agricultural resources and enterprises, with particular reference to the thoroughbred breeding industry; and
– justification for significant long term changes to agricultural resources and post-mining agricultural land use options, particularly if highly productive agricultural resources (e.g. thoroughbred horse studs and alluvial lands) are proposed to be affected by the project</td><td>Section 8.16</td></tr>
</table>

Issue	Description	EA Section
Key Issues	• Greenhouse Gas – including: – a quantitative assessment of the potential scope 1, 2 and 3 greenhouse gas emissions of the project; – a qualitative assessment of the potential impacts of these emissions on the environment; and – an assessment of all reasonable and feasible measures that could be implemented on site to minimise the greenhouse gas emissions of the project and ensure it is energy efficient	**Section 8.2**
	• Waste – including: – accurate estimates of the quantity and nature of the potential waste streams of the project, including tailings and coarse reject; and – a detailed description of the measures that would be implemented to minimise the production of waste on site, and ensure that any waste produced is appropriately handled and disposed of	**Section 8.20**
	• Rehabilitation and Final Landform – for the Drayton complex, including: – a justification of the final landform and any changes to the land use for the site; – a detailed description of how the site would be progressively rehabilitated and integrated with the final landform of the Drayton Coal Project; – a detailed description of the proposed rehabilitation and mine closure strategies for the project, having regard to the key principles in *Strategic Framework for Mine Closure*, and the: ∘ rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; ∘ decommissioning and management of surface infrastructure; ∘ nominated final land uses, having regard to any relevant strategic land use planning or resource management plans or policies; and ∘ potential for integrating the rehabilitation strategy with any other offset strategies in the region – the measures which would be put in place for the long term protection and management of: ∘ the site following the cessation of mining; and ∘ any biodiversity offset areas	**Section 8.17**
	• Social and Economic – including: – a detailed assessment of the potential impacts of the project on the local and regional community, paying particular attention to the thoroughbred breeding industry and the demand it may generate for the provision of additional infrastructure and services; and – a detailed assessment of the costs and benefits of the project as a whole, and whether it would result in a net benefit for the NSW community	**Section 8.22** and **8.23**
References	The EA of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the EA of this project	**Section 12**
	During the preparation of the EA, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected land owners. In particular you must consult with the: • Office of Environment and Heritage; • NSW Office of Water • Division of Resources and Energy, within the Department of Trade & Investment, Regional Infrastructure & Services; • Department of Primary Industries; • Hunter-Central Rivers Catchment Management Authority; • Dam Safety Committee; • Roads and Traffic Authority; • Muswellbrook Council; and • relevant Aboriginal groups The consultation process, and the issues raised during this process, must be described in the EA	**Section 6**
Supplementary EARs*	An Agricultural Impact Statement that includes a specific focused assessment of the impacts of the proposal on strategic agricultural land, having regard to the draft gateway criteria in the draft Upper Hunter Strategic Regional Land Use Plan*	**Section 8.16** and **Appendix R**

** Supplementary requirement issued by the Director-General on 30 April 2012.*

6.3.2 Regulatory Responses

Following the completion of the initial regulatory stakeholder consultation, all issues raised were addressed by Anglo American or the relevant technical specialist and incorporated in the impact assessments undertaken as part of this EA.

Table 20 outlines the regulatory stakeholder issues raised and the section of the EA where each is addressed.

Table 20 Regulatory Stakeholder Issues

Ref.	Issue Raised	Regulator	EA Section
1	**Air Quality and Greenhouse Gas**		
a	Identify and describe all processes that could contribute to air emissions	OEH	**Section 8.1**
b	Describe emission control techniques or practices that will be implemented and demonstrate compliance with the relevant regulatory framework	OEH	**Section 8.1.4**
c	Assess air quality impacts (including cumulative impacts)	OEH	**Section 8.1**
d	Assess air quality impacts, including PM_{10}, $PM_{2.5}$, NO_x and SO_x	MSC	**Section 8.1**
e	Assess the risk and impacts of fugitive and point source emissions	OEH	**Section 8.1** and **8.2**
f	Estimate and assess the impacts of greenhouse gas emissions	OEH	**Section 8.2**
2	**Noise and Vibration**		
a	Describe noise control and blasting techniques or practices that will be implemented and demonstrate compliance with the relevant regulatory framework	OEH	**Section 8.3.4**
b	Assess noise impacts (including cumulative impacts) associated with construction, operation and train movements on the Antiene Rail Spur	OEH, MSC	**Section 8.3**
c	Assess vibration impacts associated with construction and operation	OEH	**Section 8.4**
3	**Surface Water**		
a	Specifications of water management structures	NOW	**Section 4.8** and **8.11**
b	Assess impacts on local watercourses, including Saddlers Creek and the Hunter River	DTIRIS - DRE, MSC, NOW	**Section 8.11**
c	Assess the feasibility of relocating the water discharge point from the Hunter River to Saddlers Creek	DTIRIS - DRE	**Section 8.11.1**
d	Development of a run off and stormwater management plan	NOW	**Section 8.11**
4	**Groundwater**		
a	Describe the existing groundwater regime	NOW	**Section 8.12.1**
b	Details of works likely to intersect groundwater	NOW	**Section 4.2** and **8.12.3**
c	Details of groundwater extraction	NOW	**Section 8.12.3**
d	Assess groundwater impacts, including potential for contamination and draw down on the Saddlers Creek and Hunter River groundwater aquifers	NOW	**Section 8.12**
e	Determine critical thresholds for negligible impacts to groundwater	NOW	**Section 8.12**
f	Identify and assess impacts on existing groundwater users	NOW	**Section 8.12.3**
g	Details of monitoring programs, remedial measures or contingency plans to be implemented	NOW	**Section 8.12.4**
5	**Ecology**		
a	Development of an offset package and management plan	DTIRIS - DRE, OEH, CMA	**Section 8.8**

Ref.	Issue Raised	Regulator	EA Section
b	Avoid revegetation as a replacement for '*like for like*' outcomes as a component of the offset package	CMA	**Section 8.8**
c	Identify and assess impacts on State and Commonwealth listed threatened flora and fauna know to occur or likely to occur, including aquatic ecology	DTIRIS - DRE, OEH	**Section 8.7**
d	Outline avoidance, mitigation and management measures that will be implemented to avoid or minimise impacts on State and Commonwealth listed threatened flora and fauna	OEH	**Section 8.7.5**
e	Identify and assess the impacts on groundwater dependent ecosystems	NOW	**Section 8.7.4**
f	Outline avoidance, mitigation and management measures that will be implemented to avoid or minimise impacts on groundwater dependent ecosystems	NOW	**Section 8.8.3**
6	**Aboriginal Heritage**		
a	Identification and assessment of impacts on Aboriginal objects and places	OEH, CMA	**Section 8.9**
b	Outline measures that may be undertaken to avoid, mitigate or manage harm to Aboriginal objects and places	OEH, CMA	**Section 8.9.4**
c	Demonstrate consultation with the local Aboriginal community in accordance with relevant guidelines	OEH	**Section 6.4**
7	**Agricultural Land Use**		
a	Identify and assess potential agricultural land use conflicts	DTIRIS - DRE	**Section 8.16**
b	Assess impacts on agricultural resources and enterprises and proposed avoidance or mitigation strategies	DTIRIS - DRE	**Section 8.16**
8	**Final Landform and Rehabilitation**		
a	Details of the Saddlers Creek Planning and Land Rehabilitation Project and associated activities	DTIRIS - DRE, CMA, NOW	**Section 8.8** and **8.17**
b	Management of sodic soils and use of stabilising materials in revegetation programs	CMA	**Section 8.15** and **8.17.3**
c	Development of a rehabilitation management plan	DTIRIS - DRE, MSC	**Section 8.17**
d	Describe post-mining land uses	DTIRIS - DRE	**Section 8.8.3, 8.8.4** and **8.16.4**
e	Details of the conceptual final landform design	DTIRIS - DRE, NOW	**Section 4.2.1** and **8.17.4**
9	**Waste, Chemicals and Hazardous Materials**		
a	Details of the quantity, type and specifications of waste, chemicals and hazardous materials generated, handled, processed or disposed	OEH	**Section 8.20** and **8.21**
b	Describe the waste, chemical and hazardous material handling procedures and management practices to be implemented	OEH	**Section 8.20** and **8.21**
c	Describe end uses for waste	OEH	**Section 8.20**
10	**Traffic**		
a	Assess traffic impacts (including cumulative impacts) on the local road network, including Edderton Road and Thomas Mitchell Drive	MSC	**Section 8.18**
11	**Social**		
a	Assess impacts on the local skills base	MSC	**Section 8.22**
b	Assess impacts on housing affordability and demand	MSC	**Section 8.22**
c	Outline employment opportunities for local residents	MSC	**Section 8.22.5**
d	Assess impacts (including cumulative impacts) on social infrastructure	MSC	**Section 8.22**
e	Assess health impacts on the community and workforce	MSC	**Section 4.10**
f	Offer a VPA to MSC	MSC	**Section 8.22.5** and **9**

6.3.3 Community Responses

A range of environmental and social issues were raised by neighbouring land owners and the wider local community during the stakeholder engagement program. The issues that were most commonly raised related to:

- Air quality;
- Noise and vibration;
- Visual amenity; and
- Water quality.

Table 21 outlines the community stakeholder issues raised and the section of the EA where each is addressed.

Table 21 Community Stakeholder Issues

Ref.	Issue Raised	EA Section
1	**Air Quality**	
a	Assessment of $PM_{2.5}$	**Section 8.1.2**
b	Cumulative air quality impacts	**Section 8.1.2** and **8.1.3**
c	Dust mitigation during adverse weather conditions	**Section 8.1.4**
d	Dust suppression	**Section 8.1.4**
e	Air quality monitoring	**Section 8.1.2** and **8.1.4**
f	Gas emissions	**Section 8.2**
2	**Noise and Vibration**	
a	Noise controls for mobile equipment	**Section 8.3.4**
b	Noise impacts at neighbouring residences	**Section 8.3.3**
c	Noise impacts associated with train movements	**Section 8.3.3**
d	Cumulative noise impacts	**Section 8.3.3**
e	Blasting impacts on residential structures	**Section 8.4.3**
f	Blasting schedules and notifications	**Section 8.4.4**
3	**Surface Water**	
a	Impacts on surface water quality	**Section 8.11.3**
b	Extraction of water from the Hunter River	**Section 8.11.3**
c	Discharges into the Hunter River	**Section 8.11.1** and **8.11.3**
d	Impacts on Saddlers Creek	**Section 8.11.3**
4	**Groundwater**	
a	Impacts on groundwater quality	**Section 8.12.3**
b	Impacts on existing groundwater bores	**Section 8.12.3**
c	Draw down on groundwater aquifers	**Section 8.12.3**
5	**Visual Amenity**	
a	Impacts to the visual amenity of the surrounding landscape	**Section 8.6.4**
b	Lighting impacts at neighbouring residences	**Section 8.6.4**
6	**Traffic and Transport**	
a	Increases in traffic volumes	**Section 8.18.3**

Ref.	Issue Raised	EA Section
b	Impact on travel time associated with the Edderton Road realignment	**Section 8.18.3**
c	Access during the construction phase of the Edderton Road realignment	**Section 8.18.3**
7	**Final Landform and Rehabilitation**	
a	Rehabilitation of the Drayton South footprint with native and local vegetation communities	**Section 8.8.3, 8.8.4** and **8.17.3**
b	Suitability of the land for agriculture	**Section 8.16.3** and **8.16.4**
c	Final void design and interface with the existing landform	**Section 4.2.1** and **8.17.4**
d	Weed management	**Section 8.16.4** and **8.17.3**
8	**Social**	
a	Property devaluation in the local area	**Section 8.23.3**

6.3.4 Working Group Responses

A variety of issues were raised by Coolmore Australia and Darley Australia. These issues were discussed in the working group meetings and assisted in the design of the mine plan and Houston visual bund, scoping the technical studies and preparing the EA.

Coolmore Australia and Darley Australia have raised concern regarding the potential for mine creep further to the south and west of the current mine plan. Any future attempts to mine further to the south will not be economically or structurally feasible due to the highwall mining technique being utilised for the Project. Anglo American also has no current plans to mine further to the west or beyond the extent shown on **Figure 14** to **Figure 20**. Any future proposals will be subject to a comprehensive EA and consultation process under the legislative requirements dictated at the time.

Table 22 and **Table 23** outline the issues raised by Coolmore Australia and Darley Australia, respectively, and the section of the EA which corresponds to each issue.

Table 22 Coolmore Australia Issues

Ref.	Issue Raised	EA Section
1	**Visual Amenity**	
a	Visual impacts on sensitive receivers at Coolmore Stud	**Section 8.6.4**
b	Visibility of the Project from public roads, including the Golden Highway	**Section 8.6.4**
c	Impacts to the visual amenity of the surrounding landscape	**Section 8.6.4**
d	Onsite screening to conceal construction and operation activities	**Section 8.6.5**
e	Equipment visible on the face of the Houston visual bund during construction and rehabilitation	**Section 4.7**
f	Houston visual bund design, location and alternatives. Preference for the visual bund to be located as far up the valley as possible	**Section 4.7, 4.16.6** and **8.6.4**
g	Construction and scheduling of the Houston visual bund	**Section 4.7**
2	**Mine Plan**	
a	Ensure mining does not encroach on the southern ridgeline	**Section 6.3.4** and **8.6.5**
b	Design OEAs so they cannot be seen over the southern ridgeline	**Section 6.3.4** and **8.6.5**
c	Houston visual bund to be constructed in as shorter timeframe as possible with progressive rehabilitation to limit the duration disturbance is visible	**Section 4.7** and **8.6.5**
3	**Air Quality**	
a	Monitoring and assessment of $PM_{2.5}$	**Section 8.1.2**
b	Real time air quality monitoring	**Section 8.1.4**
c	Dust suppression	**Section 8.1.4**

Ref.	Issue Raised	EA Section
d	Cumulative air quality impacts	**Section 8.1.2** and **8.1.3**
e	Impacts of dust on equine health	**Section 8.5.3** and **8.5.4**
4	**Noise and Vibration**	
a	Noise impacts at residences on Coolmore Stud	**Section 8.3.3**
b	Cumulative noise impacts	**Section 8.3.3**
c	Blasting impacts on property and livestock, including Strowan Homestead which is heritage listed	**Section 8.4.3, 8.5.3** and **8.5.4**
5	**Surface Water**	
a	Impacts on the Hunter River	**Section 8.11.3**
b	Contamination of the Hunter River from discharge events	**Section 8.11.3**
c	Location of discharge pipeline upstream of Coolmore Stud's water intake facilities	**Section 8.11.3**
6	**Groundwater**	
a	Impacts on groundwater aquifers	**Section 8.12.3**
b	Groundwater contamination resulting from tailings and reject storage in existing voids	**Section 8.12.3**
c	Impacts on Coolmore Stud's groundwater bores	**Section 8.12.3**
7	**Traffic and Transport**	
a	Impact on travel time associated with the Edderton Road realignment	**Section 8.18.3**
b	Access during the construction phase of the Edderton Road realignment	**Section 8.18.3**
8	**Final Landform and Rehabilitation**	
a	Commitment to rehabilitate the Drayton South footprint	**Section 8.8.3, 8.8.4, 8.17.3** and **9**
9	**Economics**	
a	Consideration of the economic contributions provided by the Hunter Valley thoroughbred breeding industry	**Section 2.2.4**
10	**Other**	
a	Managing future mine creep to the south of the Drayton South disturbance footprint	**Section 6.3.4**

Table 23 Darley Australia Issues

Ref.	Issue Raised	EA Section
1	**Visual Amenity**	
a	Visual impacts on sensitive receivers at Woodlands Stud	**Section 8.6.4**
b	Impacts to the visual amenity of the surrounding landscape	**Section 8.6.4**
c	Onsite screening to conceal construction and operation activities	**Section 8.6.5**
2	**Air Quality**	
a	Impacts of dust on equine health	**Section 8.5.3** and **8.5.4**
b	Adoption of human criteria versus other criteria to assess the impacts of dust on equine health	**Section 8.5.2**
3	**Noise and Vibration**	
a	Impacts of noise and vibration on equine health	**Section 8.5.3** and **8.5.4**
b	Blasting impacts on property, including Woodlands and Randwick Homesteads	**Section 8.4.3**

Ref.	Issue Raised	EA Section
4	**Surface Water**	
a	Extraction requirements from the Hunter River	**Section 8.11.3**
b	Contamination of the Hunter River from discharge events	**Section 8.11.3**
5	**Groundwater**	
a	Impacts on groundwater aquifers, including effects on flow of the Hunter River	**Section 8.12.3**
b	Impacts on Woodlands Stud's groundwater bores	**Section 8.12.3**
6	**Traffic and Transport**	
a	Impact on travel time associated with the Edderton Road realignment	**Section 8.18.3**
b	Access during the construction phase of the Edderton Road realignment	**Section 8.18.3**
c	Increased traffic volumes passing Woodlands Stud's and associated safety issues	**Section 8.18.3**
7	**Final Landform and Rehabilitation**	
a	Final land use, including biodiversity offsets, within EL 5460 and the Project Boundary	**Section 8.8.3, 8.8.4, 8.16.4, 8.17.3** and **8.17.6**
8	**Social**	
a	Construction workforce accommodation	**Section 8.22.4**
b	Changes to operations workforce	**Section 8.22.4**
9	**Other**	
a	Extent of Drayton South footprint	**Section 4.2.1**
b	Managing mine creep to the south of the existing ridgeline and west of the Drayton South disturbance footprint as proposed	**Section 6.3.4**
c	Viability of underground mining within EL 5460 and the Project Boundary	**Section 4.16.2** and **4.16.3**

6.4 Aboriginal Community Engagement

The Aboriginal community consultation for the Project was conducted by Hansen Bailey in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a) (Aboriginal Consultation Guidelines).

Further details regarding the consultation undertaken with the local Aboriginal community are described in the Aboriginal cultural heritage impact assessment (Appendix K).

6.4.1 Notification and Registration

In accordance with section 4.1.2 of the Aboriginal Consultation Guidelines, the following agencies were notified of the Project on the 4 March 2011:

- OEH Newcastle; Wanaruah Local Aboriginal Land Council (WLALC);
- NSW Department of Aboriginal Affairs – Office of the Registrar;
- National Native Title Tribunal;
- Native Title Services Corporation Limited;
- Singleton Shire Council (SSC);
- MSC; and
- CMA.

These agencies were asked to assist in identifying and notifying Aboriginal persons who may possess the cultural knowledge needed for determining the cultural significance of Aboriginal objects or places associated with the Drayton South area. Requests for expression of interest were then mailed to all of the Aboriginal persons / groups that were identified by the above agencies inviting them to register their interest.

A public notice of the Project was published on 4 March 2011 in the local newspapers; the Singleton Argus and the Muswellbrook Chronicle. This notice invited Aboriginal stakeholders to register their interest to be consulted during the preparation of the Aboriginal cultural heritage impact assessment.

A full list of Aboriginal stakeholder groups that were involved in the consultation for the Project is outlined in Table 24.

Table 24 Aboriginal Stakeholder Groups

Ref.	Group Name	Primary Contact
1	Aboriginal Native Title Consultants (ANTC)	Margaret Matthews
2	Buddang	Larry Foley
3	Bullen Bullen Consultants (BBC)	Lloyd Matthews
4	Cacatua Culture Consultants (CCC)	Donna Sampson
5	Claimants for the Plains Clan of the Wonnarua (CPCW)	Scott Franks
6	Culturally Aware (CA)	Tracey Skene
7	Gidawaa Walang Cultural Heritage Consultancy (GWCHC)	Annie Hickey
8	Hunter Traditional Owners (HTO)	Paulette Ryan
9	Hunter Valley Aboriginal Corporation (HVAC)	Rhonda Griffiths
10	Hunter Valley Cultural Surveying (HVCS)	Luke Hickey
11	Hunter Valley Natural and Cultural Resources Management (HVNCRM)	David French
12	Kayaway Eco Cultural and Heritage Services (KECHS)	Mark Hickey
13	Lower Hunter Wonnarua Council Inc. (LHWCI)	Tom Miller
14	Murong Gialinga Aboriginal and Torres Strait Islander Corporation (MGATSIC)	Debbie Foley
15	Ungooroo Aboriginal Corporation (UAC)	Allen Paget
16	Ungooroo Cultural and Community Services (UCCS)	Rhonda Ward
17	Upper Hunter Heritage Culture Consultants (UHHCC)	Darrel Matthews
18	Upper Hunter Wonnarua Council Inc. (UHWCI)	Rhoda Perry
19	Wanaruah Custodians (WC)	Barbara Foot / David Foot
20	Wanaruah Local Aboriginal Land Council (WLALC)	Suzie Worth
21	Wattaka Wonnarua Traditional Owners (WWTO)	Des Hickey
22	Wonn 1 Contracting (W1C)	Arthur Fletcher
23	Wonnarua Nation Aboriginal Corporation (WNAC)	Laurie Perry
24	Yarrawalk	Scott Franks / Barry McTaggart
25	Yinarr Cultural Services (YCS)	Kathleen Steward-Kinchella

In accordance with section 4.1.6 of the Aboriginal Consultation Guidelines, a copy of the following documentation was provided to OEH and the WLALC on 6 April 2011:

- A copy of the public notice advertised in the Muswellbrook Chronicle and Singleton Argus on 4 March 2011;
- A copy of the letter issued to all identified Aboriginal groups providing notification of the assessment for the Project; and
- A record of registered Aboriginal groups that have expressed an interest in the Project.

As a result of additional Aboriginal groups registering their interest in the Project after 6 April 2011, a revised record of stakeholders was issued to OEH and the WLALC on 21 July 2011.

As specified in section 4.1.5 of the Aboriginal Consultation Guidelines, each of the registered Aboriginal stakeholder groups were given the opportunity to withhold their information from being provided to OEH and the WLALC. No groups made such request.

6.4.2 Field Assessment Strategy and Cultural Heritage Values

Planning Meeting

In accordance with section 4.2.1 of the Aboriginal Consultation Guidelines, a planning meeting was held at The John Hunter Motel on 8 April 2011. In total, 16 Aboriginal stakeholders representing 15 of the 25 registered groups attended this meeting. A representative from OEH was also present. At the meeting, information was provided on the various aspects of the Project, including the consultation program, draft archaeological field assessment methodology and participation in the survey work and cultural heritage exchange sessions.

Archaeological Field Assessment Methodology

On 18 March 2011, all registered Aboriginal groups at the time were issued a hard copy of the draft archaeological field assessment methodology developed by AECOM Australia Pty Limited (AECOM). The letter provided a description of the Project, the draft methodology and other requirements. Aboriginal stakeholders from each group were encouraged to comment on and raise concerns about the Project, the draft methodology or cultural heritage issues more generally.

Summary of Responses to Methodology

Five written responses and acceptances of the draft archaeological field assessment methodology were received from the registered Aboriginal groups. All written responses and acceptances of the draft methodology are provided in Appendix K.

All groups that responded agreed with the draft methodology. Buddang emphasised that the Drayton South area is a place rich in Aboriginal cultural heritage and a potential pathway between local areas. MGATSIC expressed concern regarding the protection of Aboriginal artefacts found at the entrance to the study area (as defined in Section 8.9) off Edderton Road and the timeframe for the archaeological field assessment.

MGATSIC also requested further clarification regarding strategies to direct traffic away from Aboriginal artefacts and the due diligence assessment associated with onsite drilling. KECHS requested that a culturally-based and scientific approach be adopted for the field assessment in addition to 100% survey coverage of the study area. KECHS recommended subsurface investigations be performed following the field assessment prior to construction.

In response to the issues raised by MGATSIC, tracks within the study area were surveyed first. Stone artefacts were identified on the majority of vehicle tracks within the study area, though none were assessed as being of high significance. Given the virtual continuum of artefactual material across the area surveyed, directing traffic away from existing tracks into undisturbed areas was not practiced.

Issues concerning the field assessment timeframe were clarified at the planning meeting and in the field. The field assessment was initially scheduled as a four week program; but was contingent upon the survey coverage.

As requested by KECHS and as a component of the adopted methodology, the study area was assessed in its entirety with the exception of areas with steep terrain and limited visibility. Issues raised regarding subsurface investigations are discussed as part of Aboriginal cultural heritage impact assessment (Appendix K) and will be detailed in the revision of the existing Drayton Mine Aboriginal and cultural heritage management plan applicable for the Project.

Archaeological Field Assessment

Aboriginal groups that had registered by 8 April 2011 were given the opportunity to participate in the archaeological field assessment. Of the 25 Aboriginal groups registered for the consultation program, 23 groups participated (see Table 25). Each Aboriginal group was personally contacted by phone and / or email from 21 April 2011 to confirm dates that their representatives were required in the field, request insurances and to provide other logistics. From this, a roster was developed for the field assessment.

The field assessment was originally scheduled to be completed over 20 business days from 2 to 27 May 2011. All Aboriginal groups involved provided valid insurances and attended an Anglo American induction prior to commencing work.

The field assessment was divided equally between the eligible groups, with each group participating for five days on a rotating roster (pending weather conditions).

Table 25 Archaeological Field Survey Participants

Fieldwork	Aboriginal Stakeholder Group	Representative
Group 1 02/05/11 to 06/05/11	Buddang	Larry Foley
	MGATSIC	Shannon Foley
	HVAC	Delilah Williams
		Rhonda Griffiths
		Deidre Perkins
	W1C	Arthur Fletcher
Group 2 09/05/11 to 13/05/11	Yarrawalk	Barry French
	HVNCRM	David French
	UCCS	Colleen Stair
		Luke Hickey
	GWCHC	Annie Hickey
	WNAC	Maree Waugh
	CA	Tony Waugh

Fieldwork	Aboriginal Stakeholder Group	Representative
Group 3 16/05/11 to 20/5/11	UHHCC	Darrel Matthews
	ANTC	Melissa Matthews
	BBC	Lloyd Matthews
	YCS	Adam Sampson
		Deidre Perkins
		Steve Sampson
	CCC	George Sampson
	UAC	Allen Paget
Group 4 23/05/11 to 27/05/11	HVCS	Luke Hickey
		David French
	KECHS	Mark Hickey
	WWTO	Katrina Kavanagh
	WLALC	Wayne French
	UHWCI	Georgina Berry
	HTO	Aaron Slater
Group 5 30/05/11 to 04/06/11	Yarrawalk	Barry French
	GWCHC	Annie Hickey
	CCC	George Sampson
		Adam Sampson
		Deidre Perkins
	UAC	Allen Paget
	HVCS	Luke Hickey
	WLALC	Wayne French
Group 6 10/10/11 to 11/10/11	WNAC	Maree Waugh
	CA	Jeffrey Waugh

Hansen Bailey was later advised by AECOM, following further consultation with the Aboriginal groups, that an additional week of survey work was required to complete the field assessment. To maintain the efficiency of the field assessment, six registered groups were randomly selected to participate in the final week of the survey from 30 May to 4 June 2011. On 24 May 2011, correspondence was provided to registered Aboriginal stakeholders to inform them of whether or not they were required to participate in the remaining portion of the field assessment.

At the completion of each week, AECOM prepared a brief field summary outlining the progress and key findings from the survey. This field summary was distributed to all registered Aboriginal groups.

Correspondence was issued to all registered Aboriginal groups on 31 May 2011, inviting stakeholders to attend a close out meeting to discuss the findings from the field assessment.

The close out meeting was held at The John Hunter Motel on 10 June 2011. A copy of the presentation was provided to all registered Aboriginal groups on 15 June 2011.

The survey of the entire study area was scheduled to be completed during the initial program. However, access to the land where Edderton Road is to be realigned, which is owned by HVEC, was not able to be arranged within the original field assessment timeframe. Therefore, a supplementary survey was conducted on 10 and 11 October 2011 in accordance with the methodology developed by AECOM. Six registered groups were randomly selected to participate in this survey. This selection followed the roster system that had been employed for the Project. On 4 October 2011, correspondence was provided to registered Aboriginal stakeholders to inform them of whether or not they were required to participate in the remaining portion of the field assessment.

Cultural Heritage Exchange Sessions

As a component of the consultation program, Hansen Bailey offered and arranged cultural heritage exchange sessions for the Aboriginal community to share their views and cultural knowledge regarding the sites within and surrounding the study area.

At the close out meeting on 10 June 2011, and in correspondence issued on 31 May and 15 June 2011, all registered Aboriginal groups were invited to attend these cultural heritage exchange sessions. Of the 25 registered groups, two participated in these sessions (WNAC and UPWCI).

Both groups advised Hansen Bailey that the study area and its immediate surroundings was a corridor between locales, and retained significant archaeological evidence of past Aboriginal utilisation. From further discussions, it was able to be concluded that no specific features or places of Aboriginal cultural heritage were known to occur within the study area.

Community Review of Draft Aboriginal Cultural Heritage Impact Assessment Report

In accordance with section 4.4 of the Aboriginal Consultation Guidelines, the draft Aboriginal cultural heritage impact assessment was issued to all Aboriginal stakeholders on the 1 February 2012 for a period of 28 days.

Responses were received from 23 Aboriginal stakeholder groups, which were then considered and incorporated into the final Aboriginal cultural heritage impact assessment as described in Section 8.9.

A final copy of the Aboriginal cultural heritage impact assessment will be provided to all Aboriginal stakeholders upon finalisation of the report.

6.5 Ongoing Stakeholder Engagement

Anglo American is committed to the continuation of the stakeholder engagement plan developed for the Project and is seeking to achieve the best possible outcomes for all Project stakeholders.

Various mechanisms will be implemented to ensure the effective ongoing engagement with Project stakeholders, including:

- Regular consultation with neighbouring land owners;
- Ongoing regular working group meetings with Coolmore Australia, Darley Australia, Mt Arthur Coal Mine and Macquarie Generation;
- Project updates to the Drayton CCC;
- Distribution of regular community newsletters; and
- Provision of management plans and monitoring data via the Anglo American website.

An Annual Review will continue to be prepared for all operations at the Drayton Complex, including activities undertaken within the Drayton South area. This document will summarise company activities and performance in the areas of health, safety, environment and community. A copy of the Annual Review will be made available to the public in hard copy upon request or via the Anglo American website.

Risk Assessment

7

Risk Assessment 7

As part of the PEA, a preliminary risk assessment was undertaken to identify potential environmental and social issues associated with the Project. These potential issues were categorised according to their level of risk. The primary objective of the risk assessment was to prioritise issues in order to focus the EA on the more critical aspects of the Project.

Under the Anglo American Risk Matrix, potential environmental and social issues are given one of four possible risk ratings: low, medium, significant and high. The risk rating allocated to an impact is dependent upon the probability of the impact occurring and the potential consequences should the impact materialise.

Following stakeholder engagement and the receipt of the EARs, the preliminary risk assessment was updated to incorporate additional requirements. The risk ratings for the various aspects of the Project were also updated to reflect the outcomes of the stakeholder engagement program. The revised risk assessment for the Project is presented in full in **Appendix E**.

The revised risk assessment revealed that most of the environmental and social issues identified posed a low to medium risk. However, there were also a number of issues that posed a significant risk if appropriate controls were not implemented. None of the issues identified were rated as being high risk. The risk ratings for the Project's potential environmental issues are shown in **Table 26**.

All environmental issues identified during the risk assessment process have been assessed as part of this EA. This EA has addressed each of the Project's potential environmental and social impacts and where applicable, described the management and mitigation measures that have been developed to alleviate these risks.

Table 26 Revised Risk Rating

Risk Rating	Issues
High	None
Significant	Air Quality, Ecology and Aboriginal Archaeological and Cultural Heritage
Medium	Greenhouse Gases, Noise, Blasting, Equine Health, Visual, Surface Water, Groundwater, Agriculture and Traffic and Transport
Low	Non-Aboriginal Heritage, Stygofauna, Geochemistry, Soils and Land Capability, Rehabilitation and Final Landform, Waste Management, Hazardous Materials, Social and Economics

DRAYTON SOUTH

Impacts, Management and Mitigation

8

This section describes the environmental and social impacts of the Project and the measures that will be implemented to mitigate and manage these impacts. The impacts have been prioritised in accordance with the Director-General's EARs, the risk assessment and outcomes of the stakeholder engagement program. This section also describes the Project's biodiversity offsets, rehabilitation and mine closure strategies.

8.1 Air Quality

8.1.1 Background

An air quality and greenhouse gas impact assessment was undertaken by PAEHolmes and is provided in Appendix F. The purpose of the assessment, in part, was to predict the Project's air quality impacts, including dust, on receivers in the vicinity of the existing Drayton Mine and Drayton South area, and to recommend measures to mitigate and manage these impacts.

8.1.2 Methodology

Meteorological Data

Meteorological data were examined from meteorological monitoring stations located within the Drayton South area, at Drayton Mine and Macleans Hill, which is situated on land owned by HVEC. Data from these sources in addition to data from four BoM sites were compiled for use in a meteorological modelling program known as CALMET. Further detail on the methodology applied is provided in Appendix F.

Background Air Quality

Anglo American undertakes air quality monitoring at the locations shown on Figure 9 and Figure 10. The air quality monitoring network within the vicinity of the Project Boundary includes:

- 26 air quality monitoring stations, consisting of:
  - One TEOM;
  - Five HVAS; and
  - 20 depositional dust gauges.

A detailed review of all available monitoring data was completed for the Project and is provided in Appendix F. At the time of data collection, the effects of existing operations from other mines in the surrounding area as well as all other sources of particulate matter (e.g. traffic and emissions from industrial, agricultural and domestic activities) were captured. The review concluded that:

- 24-hour average PM_{10} concentrations generally remain well below the air quality criterion of 50 µg/m^3; and
- Annual average PM_{10} concentrations generally remain below the OEH criterion of 30 µg/m^3.

Assessment Criteria

Table 27 and Table 28 summarise the air quality assessment criteria from the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) that are relevant to the Project. Generally these air quality criteria relate to the total dust burden in the air not only the dust generated by the Project. As such, consideration of background levels need to be made when using these criteria to assess impacts.

In addition to the consideration of possible health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces. Table 28 shows the maximum acceptable increase in dust deposition over background dust levels. The criteria for dust fallout levels are set to protect against nuisance impacts on a cumulative basis from all dust sources (DEC, 2005).

The Approved Methods criteria are typically consistent with the *National Environment Protection Measures for Ambient Air Quality* (Ambient Air-NEPM) (NEPC, 1998). In May 2003, the Ambient Air-NEPM was amended to include advisory reporting standards for particulate matter with an equivalent aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$). The purpose

Table 27 Particulate Matter Assessment Criteria

Pollutant	Averaging Period	Criteria (µg/m^3)	Agency
TSP	Annual mean	90	National Health and Medical Research Council
PM_{10}	24-hour maximum*	50	OEH
	Annual mean	30	OEH

Source: DEC, 2005.
** Applies for each of i) Project alone and ii) cumulative, provided the Project is implementing leading practice dust controls.*

Table 28 Dust Deposition Assessment Criteria

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Levels (g/m^2/month)	Maximum Total Deposited Dust Levels (g/m^2/month)
Deposited Dust	Annual mean	2	4

Source: DEC, 2005.

Table 29 Environment Protection Authority Advisory Reporting Standards for $PM_{2.5}$

Pollutant	Averaging Period	Standard / Goal ($\mu g/m^3$)	Agency
$PM_{2.5}$	Annual mean	8	Ambient Air NEPM Advisory Reporting Standard
	24-hour average	25	

of the amendment was to gather sufficient data nationally to facilitate the review of the Ambient Air NEPM, which is currently underway. The Ambient Air NEPM $PM_{2.5}$ advisory reporting standards are not impact assessment criteria (see Table 29).

Air Quality Modelling

Air quality dispersion modelling and the assessment of air pollution sources has been undertaken in accordance with the Approved Methods (DEC, 2005).

The air dispersion modelling completed for the assessment is based on an advanced system of models, including TAPM and CALMET / CALPUFF. Modelling was undertaken for Year 3A, 3B, 5, 10, 15, 20 and 27 of the Project life to determine the potential air quality impacts on nearby receivers in those years. These representative years were identified as the periods most likely to contain the worst case dust levels from a range of mining activities in various locations within the Project Boundary. The operations modelled in these years included coal mining activities, coal handling and processing, and coal loading.

The conceptual staged mine plans and the operational description for the Project have been used to determine haul road distances and routes, the location of stockpile and mining areas, activity operating hours, truck sizes and other details that are necessary to predict dust emissions for each year. Several iterations of mine plans were modelled throughout the planning phase to incorporate all reasonable and feasible measures for the Project in order to reduce environmental and social impacts. One such measure included transitioning from smaller trucks (180 t) to larger trucks (220 t) in Year 10. This has been incorporated into the modelling for the Project.

A full inventory of emission sources is outlined in Appendix F.

Cumulative air quality impacts were modelled for concurrent operations at the Project, Mt Arthur Coal Mine, Hunter Valley Operations Coal Mine, Bengalla Coal Mine, Mangoola Coal Mine and the Mount Pleasant Project. The modelling exercise assumed the cumulative impacts of approved neighbouring mining operations as they advance towards the Project. The mining operations included and the data sources used are shown in Table 30. These represent the most recent publicly available data for each of the operations listed. It is understood that Mt Arthur Coal Mine are also preparing a modification to their latest PA and that this includes an extension to the mine's life from 2022 to 2026. As such the cumulative modelling for the Project assumes that Mt Arthur Coal Mine is operational until 2026.

The Bayswater and Liddell Power Stations are located within 6 km of the Drayton Complex. The particulate matter emitted from these power stations are captured by the current monitoring network used in this assessment. A new 2,000 MW power station (Bayswater B or B2) was conceptually approved in January 2010. The air quality impact assessment (Katestone, 2009) predicted that the maximum 24-hour average PM_{10} concentrations at sensitive receivers was 0.13 $\mu g/m^3$, that is, less than 0.5% of the OEH assessment criteria of 50 $\mu g/m^3$. Maximum predicted annual average PM_{10} concentrations at sensitive receivers was 0.004 $\mu g/m^3$; approximately 0.01% of the OEH assessment criteria of 30 $\mu g/m^3$. Given the extremely low predicted impacts from the operation of Bayswater B, it was not considered necessary to include this in the cumulative assessment.

Table 30 Cumulative Air Quality Sources

Mine	Data Source
Mt Arthur Coal Mine	PAEHolmes, 2009
Hunter Valley Operations Coal Mine	PAEHolmes, 2010a
Mangoola Coal Mine	Holmes Air Sciences, 2006
Bengalla Coal Mine	PAEHolmes, 2010b
Mount Pleasant Project	ERM Mitchell McCotter, 1997

8.1.3 Impact Assessment

Air Quality Predictions

Figure 40 to Figure 43 illustrates the air quality contours for predicted annual average TSP, annual average PM_{10}, 24-hour average PM_{10} and annual average dust deposition concentrations in relation to neighbouring private receivers for Year 3 at Drayton Mine and Year 5 to 15 within the Drayton South area. These represent the worst case years.

The results from the dispersion modelling indicate that the Project considered alone (and cumulatively with other sources) is predicted to contribute to exceedances of the annual PM_{10} and TSP air quality criteria at the receivers summarised in Table 31.

The 24-hour average PM_{10} concentrations present the maximum air quality levels predicted from the operation of the Project at any location. The private receivers that are predicted to experience exceedances of the assessment criterion (50 µg/m³) over the life of the Project are shown in Table 31.

The modelling of the maximum 24-hour average PM_{10} concentrations has shown that with the exception of receiver 226 the other receivers presented in Table 31 are only predicted to experience exceedances for up to one day in a modelled year. These maximum impacts represent the Project's operations under adverse prevailing weather conditions. It is expected that the proactive management of operations would allow effective modifications to activities so that these impacts would not be experienced at suggested receivers.

There are no private receivers predicted to experience air quality levels that exceed the assessment criterion for annual average dust deposition levels (Project alone or cumulative).

No exceedances of the relevant criteria have been predicted at all other private receivers including those in the vicinity of the existing Drayton Mine. Further consideration of the 25% rule for impacts to contiguous blocks of land confirms that with the exception of receiver 226 there are no other impacted properties.

Cumulative modelling for 24-hour average PM_{10} was undertaken using a Monte Carlo Simulation for Year 10 as this modelled year has the largest predicted impacts for the Project alone. The private receivers that are predicted to experience exceedances of the assessment criterion (50 µg/m³) and acquisition criteria (150 µg/m³) over the life of the Project are shown in Table 32.

It should be noted that the actual number of exceedances per year cannot be predicted precisely and will depend on actual Project activities, weather conditions, implementation of real time controls and predictive meteorological forecasting and background levels in the future. It is expected that the proactive management of operations would allow effective modifications to activities so that these impacts would not be experienced at suggested receivers. Further details with regard to mitigation and management measures that will be implemented to control potential 24-hour exceedances are detailed in Section 8.1.4.

Whilst there are currently no impact assessment criteria for $PM_{2.5}$, the air quality impact assessment undertaken for the Project provides an assessment compared with the advisory reporting standard (see Appendix F). This assessment determined that there are no privately owned residences that are predicted to experience annual average $PM_{2.5}$ concentrations, due to emissions from the Project alone, above the NEPM standard (8 µg/m³). Similarly no residences are predicted to experience 24-hour average $PM_{2.5}$ levels above the NEPM standard of 25 µg/m³ as a result of the Project.

The impacts of the predicted fugitive dust emissions for the Project on equine health are discussed in Section 8.5.

Conveyor Option

The conveyor transport option was modelled as part of the air quality impact assessment. The assessment found that this

Table 31 Summary of Predicted Air Quality Exceedances

Averaging Period	PM_{10} 24-hour Average	PM_{10} Annual	TSP Annual
	Project and Other Sources	Project and Other Sources	Project and Other Sources
Criteria	50 µg/m³	30 µg/m³	90 µg/m³
Residence	(Days per Year Above Criteria and Maximum Predicted Level)		
226	Year 5 - 1 day (58 µg/m³) Year 10 - 23 days (106 µg/m³) Year 15 - 19 days (102 µg/m³)	Year 10 - 36 µg/m³ Year 15 - 32 µg/m³	Year 10 - 99 µg/m³
227F	Year 10 - 1 day (52 µg/m³) Year 15 - 1 day (55 µg/m³)	-	-
228M	Year 10 - 1 day (54 µg/m³)	-	-

Table 32 Summary of Cumulative 24-hour Average PM_{10} Exceedances

Residence	Maximum Predicted PM_{10} 24-hour Average	Predicted Number of Days Exceeding Cumulative Criteria		Predicted Number of Days Exceeding Acquisition Criteria
	Project Alone	Project Alone	Cumulative	Cumulative
Criteria		50 µg/m³		150 µg/m³
226B	106 µg/m³	23	102	1
226D	72 µg/m³	3	50	0
227A	43 µg/m³	0	30	0
227F	52 µg/m³	1	53	0
240A	26 µg/m³	0	26	0
250A	30 µg/m³	0	28	0
209	21 µg/m³	0	10	0
217A	27 µg/m³	0	12	0
411	23 µg/m³	0	11	0

option, should it be deemed feasible in the future, would likely reduce dust emissions in the area across the transport corridor and around the Drayton Mine CHPP. It is noted that the land over which these emissions would be improved largely form part of the existing Drayton Mine, Mt Arthur Coal Mine and Macquarie Generation owned buffer lands. As such when compared with truck haulage as proposed there would only be marginal benefits if anything for private land owners should the future decision be made to implement the conveyor option. It is worth noting that there are no impacts to privately owned residences or property as a result of the emissions generated from the haul road along the transport corridor.

Construction Activities

Construction activities associated with the Project (including the realignment of Edderton Road) were considered within the air quality impact assessment.

The assessment found that with utilisation of standard operational management and mitigation techniques, the construction phase of the Project will have negligible impacts on air quality. Further, these activities will remain within the air quality predictions for the operation of the Project.

Spontaneous Combustion

Spontaneous combustion in coal and other carbonaceous materials is the result of self-heating, which can occur from an exothermic reaction such as oxidisation. Spontaneous combustion can result in the release of toxic and/or odorous gases, such as nitrogen dioxide (NO_2) and sulphur dioxide (SO_2).

Spontaneous combustion is not anticipated to occur in the target coal seams within the Drayton South area; however the spontaneous combustion management plan in place at Drayton Mine will be implemented should it occur. Due to the unlikelihood of spontaneous combustion, NO_2 and SO_2 emissions are not predicted to occur. For further details refer to the geochemistry impact assessment completed for the Project, which is summarised in Section 8.14 and provided in Appendix P.

Diesel Combustion

Combustion engines of generators and vehicles release emissions through engine exhausts, including very minor quantities of SO_2 and NO_2. Due to the combination of low sulphur content in Australian diesel and the wide distribution of mining equipment on site, SO_2 goals would not be exceeded. Similarly, NO_2 emissions from mining activities are limited and too widely dispersed to require a detailed modelling assessment. As such, the emissions from these sources have not been assessed.

8.1.4 Mitigation and Management

Anglo American will revise the existing Drayton Mine air quality management plan to include construction and operation of the Project.

A number of control measures have already been incorporated into the Project design based on the existing air quality management measures at Drayton Mine and recommendations of the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al., 2011) (the Best Practice Report), a study that was commissioned by OEH. These include:

- Implement available measures to keep visible dust as low as possible from offsite at all times;

- In known or suspected high dust areas, production processes will be modified to ensure effective management of visible dust levels;
- Topsoil clearing restricted to a single strip ahead of mining, where practical and water spraying applied;
- Water tankers and road sweepers to be utilised at all times to minimise dust emissions from roads and work areas;
- Blasting is carried out using gravel stemming or crushed coal, which contains blast within the ground and minimises dust;
- Rehabilitation of mined areas is progressively achieved;
- Out-of-pit haul roads to be maintained with chemical dust suppressant (Dust-A-Side, Dust Block or similar); and
- Real time monitoring of air quality emissions.

The following measures have been implemented to control emissions associated with overburden:

- Overburden drills are equipped with equipment to minimise dust generation (water injections facilities or dust collection facilities);
- Dragline operations are completed to minimise dumping height so there is minimal free-fall of material;
- Overburden is dumped in low level lifts, with outer berms maintained by dozers; and
- Water application on haul circuits when dumping overburden from trucks.

The following measures have been implemented to control emissions associated with coal:

- Three-sided enclosure for ROM bin;
- The CHPP is operated with dust suppression sprays at the dump hopper and transfer points as well as coal stockpiles;
- Vegetative wind breaks for coal stockpiles; and
- All conveyors will be enclosed with walls and water sprays used at transfer points.

All of the mitigation and management measures listed above have been incorporated into the mine plan for the Project and thus considered in the impact assessment process. Each measure will be implemented by the Project.

Further to the above it was identified during preliminary air quality investigations that road haulage activities generated the greatest emissions. As a result, Anglo American has committed to progressively replacing the existing haul truck fleet with larger vehicles at the time the current equipment is retired (assumed by Year 10). They will also implement a greater level of haul road control to operations to ensure that impacts to neighbouring receivers are controlled to the maximum extent achievable. This mitigation measure will reduce the short term air quality impacts surrounding the operation with the larger trucks further assisting in the medium term.

Other mitigation measures that will be implemented include:

- A real time meteorological monitoring station with predictive software capabilities; and
- A network of real time monitors recording PM_{10} and $PM_{2.5}$ (including a TEOM unit(s)) along with TSP units and dust deposition gauges.

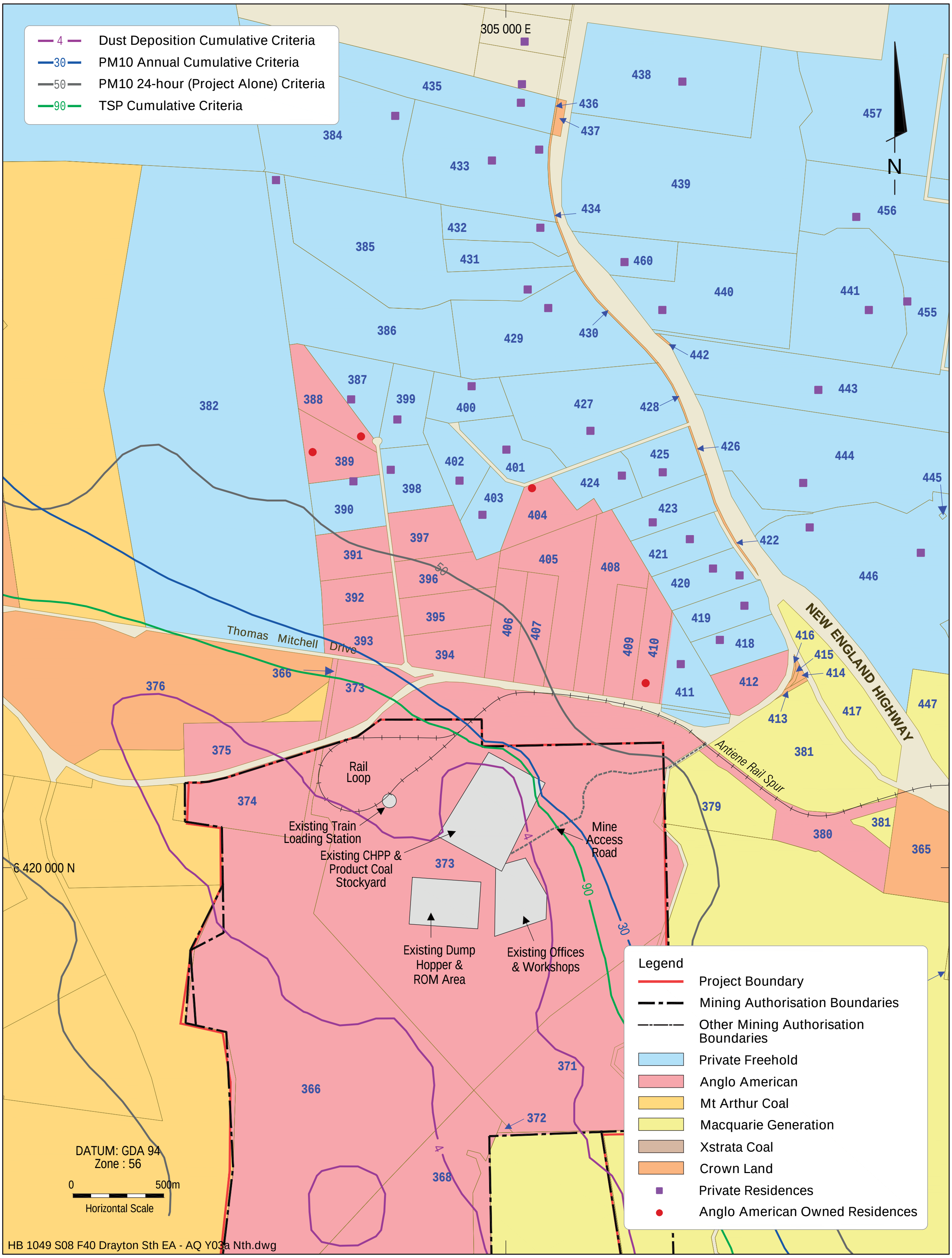
A real time meteorological monitoring station with predictive software capabilities enables meteorological forecasts to be made for upcoming days. These predictions can be utilised in a predictive dispersion model representing the proposed operations and highlight activities with the potential to generate excessive dust. This provides the accountable personnel with the information required to implement appropriate mitigation and management controls to keep emissions to an acceptable level. These management controls may include relocating equipment from exposed locations and shutting down certain activities during certain weather conditions.

The continuous real time monitors will be connected to a modem, which would allow recorded concentrations to be relayed, in (near) real time, to an IP address where the data would be stored in a customised database. The results can also be presented graphically to enable the dust emissions from the site to be visually assessed on a continuous basis.

All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan and the Annual Review.

Response levels (i.e. investigation and action levels) and associated trigger levels will be defined, which will determine the course of action required to be taken. These levels and actions will be outlined in a Trigger Action Response Plan (TARP), which will form part of the revised Drayton Mine air quality management plan for the Project.

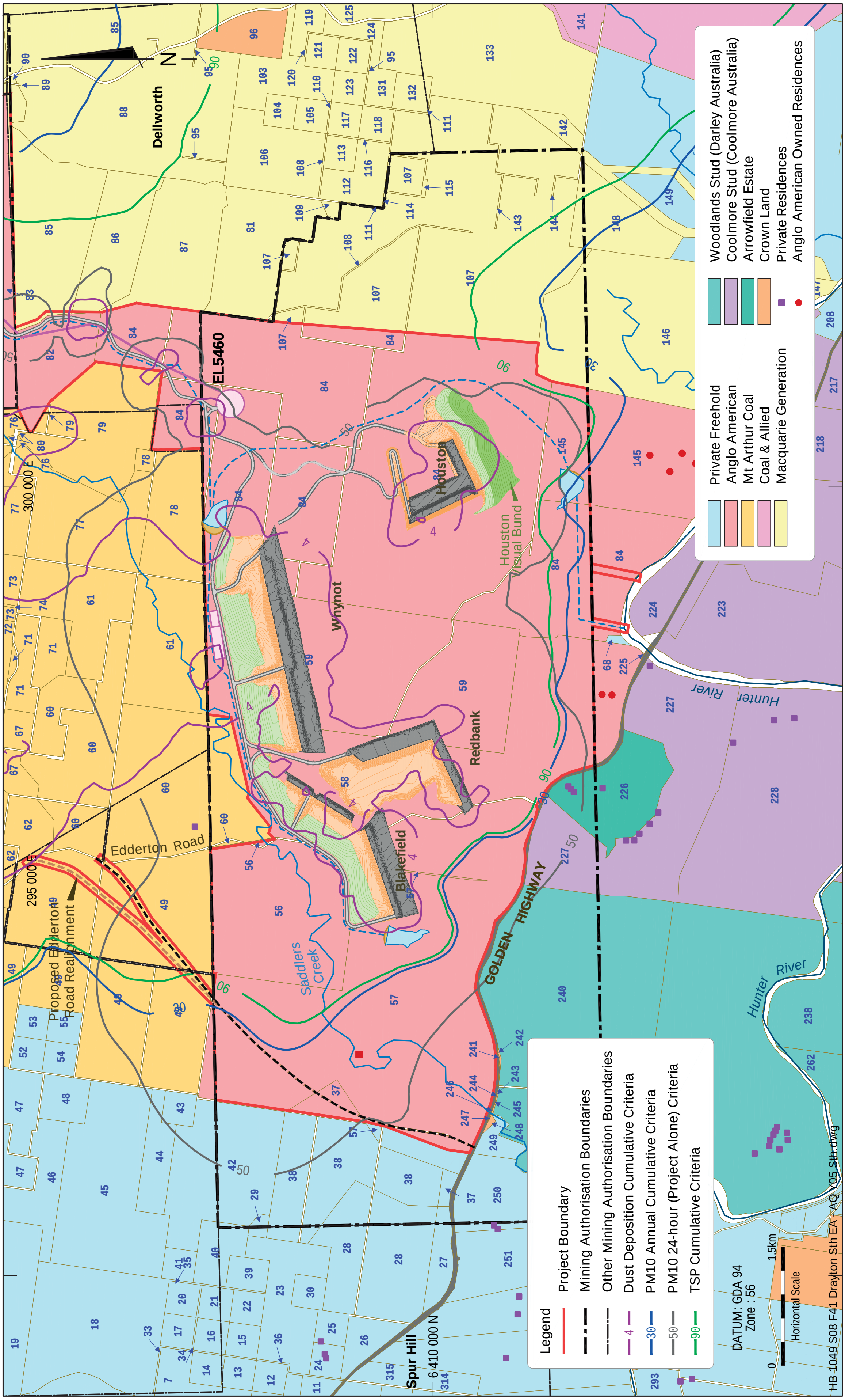
Air quality management and minimisation practices will be implemented to ensure that the Project does not exceed the relevant criteria at all other privately owned receivers (other than those listed in Table 31).



DRAYTON SOUTH COAL PROJECT

Indicative Drayton Mine
Air Quality Contours - Year 3

FIGURE 40

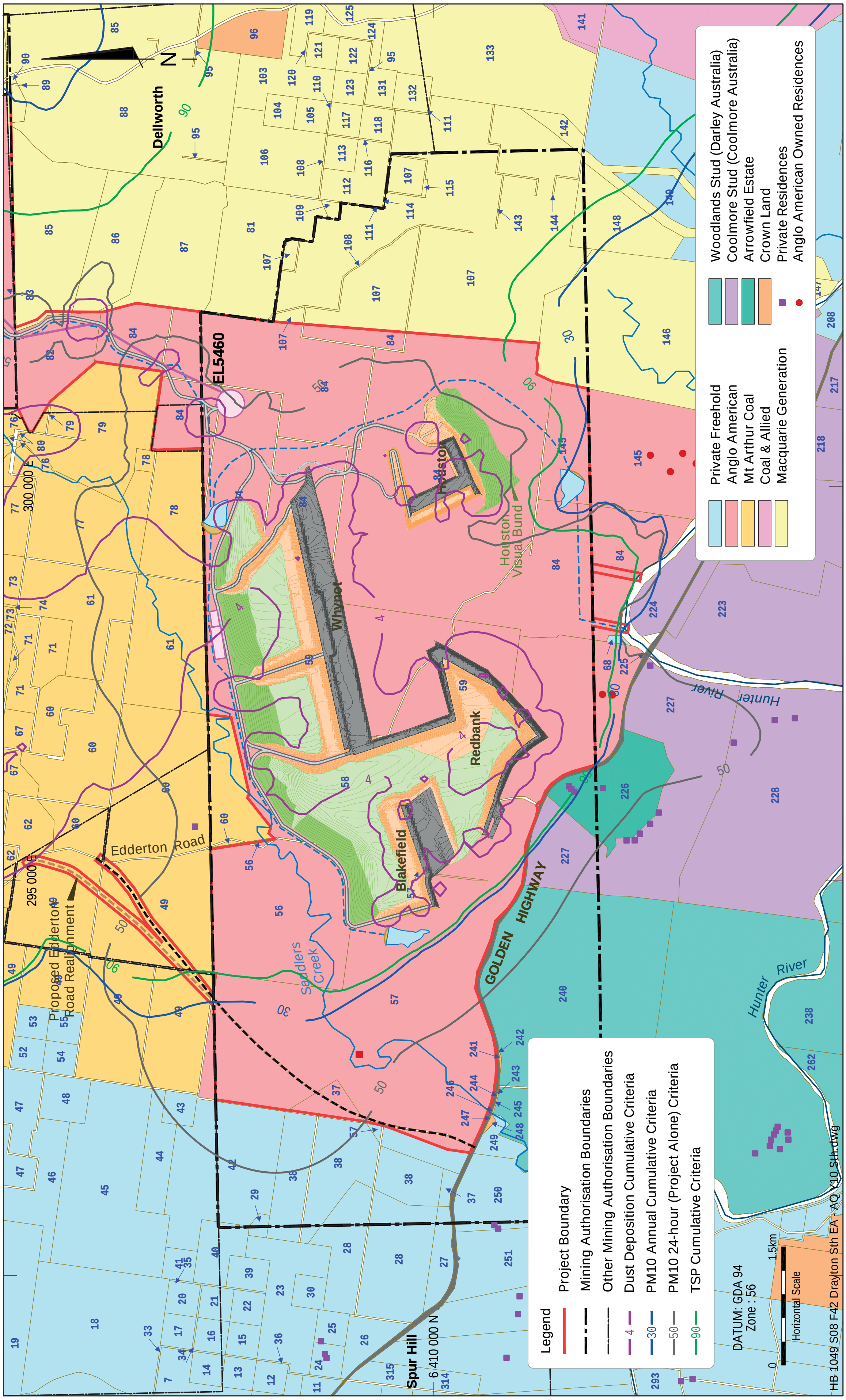


DRAYTON SOUTH COAL PROJECT

Indicative Drayton South Air Quality Contours - Year 5

FIGURE 41

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

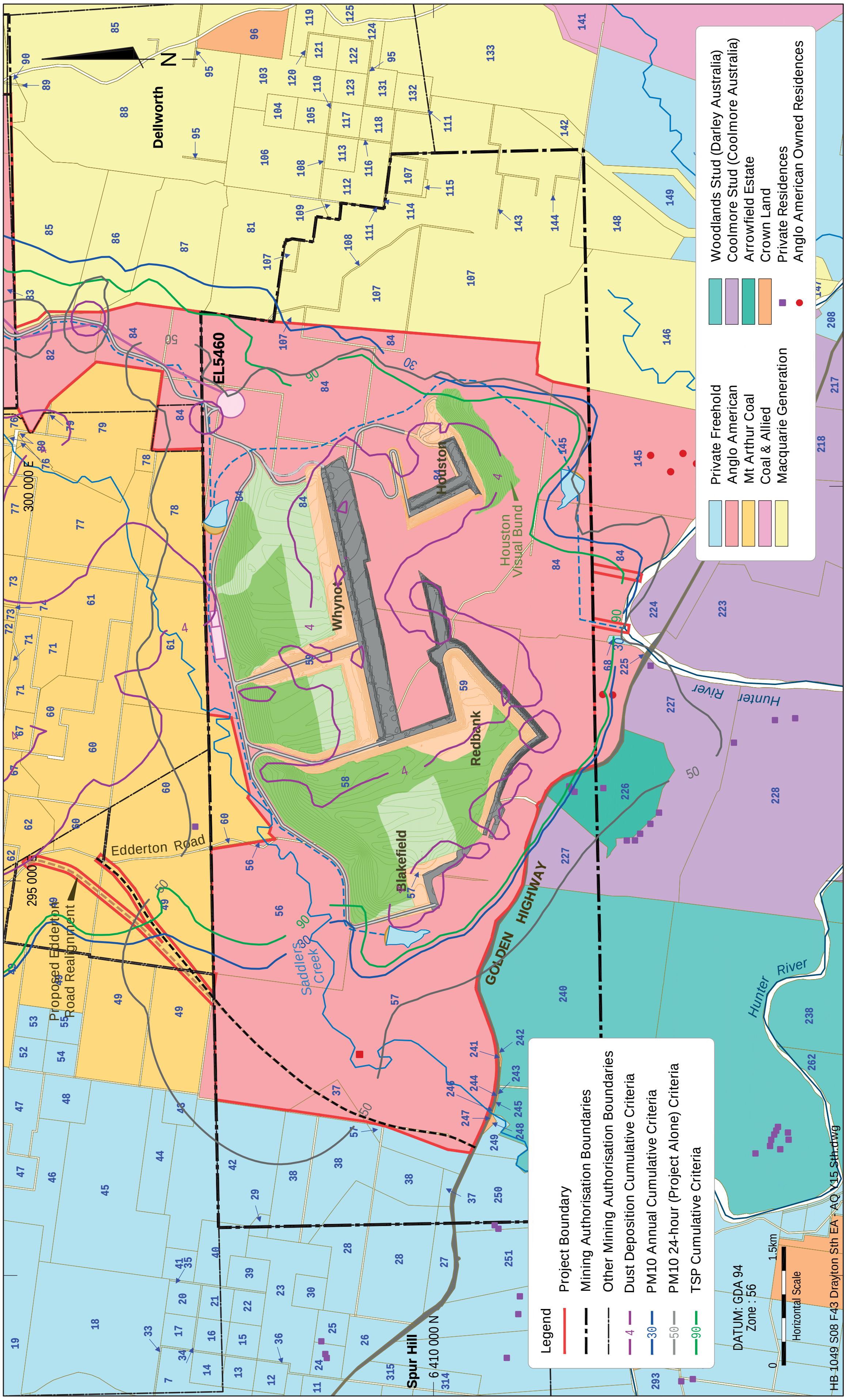


DRAYTON SOUTH COAL PROJECT

Indicative Drayton South Air Quality Contours - Year 10

FIGURE 42

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS



DRAYTON SOUTH COAL PROJECT

Indicative Drayton South Air Quality Contours - Year 15

FIGURE 43

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

8.2 Greenhouse Gas

8.2.1 Background

An air quality and greenhouse gas impact assessment was undertaken by PAEHolmes and is provided in Appendix F. The purpose of the assessment, in part, was to estimate the greenhouse gas emissions generated by the Project and recommend measures to mitigate and manage these emissions.

8.2.2 Methodology

The greenhouse gas assessment has been based upon the methods outlined in the following documents:

- The World Resources Institute / World Business Council for Sustainable Development *Greenhouse Gas Protocol*;
- *National Greenhouse and Energy Reporting (Measurement) Determination 2008*; and
- The Australian Government Department of Climate Change and Energy Efficiency (DCCEE) *National Greenhouse Accounts Factors 2010*.

Consideration was also given to the *Guidelines for Energy Savings Action Plans* (DEUS, 2005).

Three *'scopes'* of emissions (scope 1, scope 2 and scope 3) are defined for greenhouse gas accounting and reporting purposes and have been considered in this assessment for the following gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Oxides of nitrogen (NO_x); and
- Synthetic gases (HFC_s, SF_6, CF_4, C_2F_6).

Emission factors are standardised and expressed as a carbon dioxide equivalent (CO_2-e) which is calculated by multiplying the individual gas emission factor by its respective Global Warming Potential.

8.2.3 Impact Assessment

The main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, fugitive emissions of CO_2 and CH_4, diesel usage, explosives usage, and the transport and end use of the product coal. The average annual emissions from these sources are summarised in Table 33.

The greenhouse gas emissions from the Project (0.31 Mega t of CO_2-e per annum), including the mining, transportation of the coal to the Port of Newcastle and end usage of the coal represents approximately 0.052% of Australia's commitment under the Kyoto Protocol (591.5 Mt CO_2-e) and a very small portion of global greenhouse emissions.

The emissions estimated to result from the Project will not individually have any significant impact on global warming. Applying the principles of ESD, it is considered that there will be no increase or measureable impact on climate change as a result of the Project.

The commitment from the Australian government to reduce greenhouse gas emissions is proposed to be achieved through the introduction of the Australian government's carbon pricing mechanisms (carbon tax). The carbon tax came into effect on 1 July 2012 and involves a fixed price on greenhouse gas emissions, with no cap on Australia's greenhouse gas emissions, or emissions from individual facilities (Commonwealth of Australia, 2011).

8.2.4 Mitigation and Management

Feasible and reasonable measures that will be implemented on site to minimise the greenhouse gas emissions of the Project to ensure it is energy efficient include:

- Greenhouse gas emissions and energy use are monitored and reviewed on a monthly basis and considered in the internal business planning and key performance indicators;
- Set energy efficiency and greenhouse gas emission targets across all operations; and

Table 33 Total Greenhouse Gas Emission Predictions and Carbon Pollution Reduction Scheme Applicability

Activity	Emissions (t CO_2-e)	Carbon Pollution Reduction Scheme Applicability *
Diesel usage	94,350	Yes
Electricity consumption	97,198	No
Explosives use	3,387	No
Fugitive methane	219,275	Yes
Transport of coal (rail)	11,899	No
End use of coal	8,883,833	No
Total	**9,309,941**	**-**

** Scope 1 emissions are covered by the Commonwealth Government's Carbon Pricing Mechanism (Commonwealth of Australia, 2011)*

- Inclusion of electricity meters for key equipment and processes.

These measures will be incorporated in the revision of the existing Drayton Mine greenhouse and energy efficiency management plan for the Project. Monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

8.3 Noise

8.3.1 Background

An acoustics impact assessment was undertaken by Bridges Acoustics and is provided in **Appendix G**. The purpose of the assessment, in part, was to predict the Project's noise impacts on receivers in the vicinity of the existing Drayton Mine and Drayton South area, and to recommend measures to mitigate and manage these impacts.

The assessment was conducted in accordance with the following policies and guidelines:

- The *NSW Industrial Noise Policy* (INP) (EPA, 2000) for operational and construction noise criteria;
- The *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) for assessing construction noise;
- The *NSW Road Noise Policy* (RNP) (DECCW, 2011) for road traffic noise criteria and assessment procedures;
- *The Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (Interim Rail Noise Guideline) (DECC, 2007) for criteria and assessment procedures regarding noise from rail movements on the Main Northern Railway;
- *The Draft Rail Infrastructure Noise Guideline* (Draft RING) (OEH, 2012b) for criteria and assessment procedures regarding noise from rail movements on the Main Northern Railway; and
- The *Environmental Noise Control Manual* (ENCM) (EPA, 1985) for sleep disturbance criteria.

8.3.2 Methodology

Noise Modelling

Predicted noise levels at Drayton Mine and the Drayton South area receivers were modelled using NSW Roads and Traffic Authority (RTA) Technology's Environmental Noise Model (ENM) software. ENM is considered to be the most appropriate model for assessing situations where there is complex topography and a large number of individual noise sources. It considers the impact of meteorological conditions on noise propagation. The model has previously been endorsed by OEH for assessing noise from projects of this nature, including the Drayton Mine Extension Project EA (Hansen Bailey, 2007).

Modelling was undertaken for Year 3A, 3B, 5, 10, 15, 20 and 27 of the Project life to determine the potential noise impacts on nearby receivers in those years. These representative years were identified as the periods most likely to contain the worst case noise levels. The operations modelled in these years included coal mining activities, coal handling and processing, and coal loading and transportation along the Antiene Rail Spur. Additional model scenarios were used to determine construction and sleep disturbance noise levels to ensure these issues were comprehensively assessed.

The modelling also takes into account the noise mitigation and management measures incorporated into the Project design (see **Section 8.3.4**).

Background Noise Levels

In order to define the intrusive criteria prescribed by the INP, it was necessary to determine the background noise levels for the Project's receivers. Background noise levels were determined through a desktop review of environmental assessments for neighbouring developments, as well as both unattended and attended noise surveys.

The Project is situated in close proximity to a number of existing coal mining and power generation operations. Industrial background noise levels for the Antiene area have previously been measured for the purposes of environmental assessments associated with the Mt Arthur Coal Mine and the existing Drayton Mine. Following a desktop review of these assessments, a Rating Background Level (RBL) of 32 dBA was adopted for receivers in the western Antiene area and near the New England Highway. A RBL of 30 dBA was adopted for receivers in eastern and central Antiene area.

A long term noise survey (unattended) was conducted between 10 and 20 June 2011 to measure background noise levels for Drayton South area receivers. Monitoring was undertaken at four locations, including:

- Location M1: eastern corner of Pagan Street and Pearse Street in Jerrys Plains, to the south-east of the Drayton South area;
- Location M2: adjacent to Strowan Homestead on Coolmore Stud, to the south of the Drayton South area;
- Location M3: adjacent to a residence on Woodlands Stud, to the south-west of the Drayton South area; and
- Location M4: approximately 300 m to the west of Edderton Road, to the north-west of the Drayton South area.

A short term noise survey (attended) was undertaken to supplement the findings of the long term noise survey. This survey was conducted at the same locations as the long term noise survey and consisted of a series of noise measurements over 15 minute periods. The attended survey allowed the sources of the background noise to be identified.

The RBLs adopted for the Project's receivers are listed in Table 34.

With regard to the Drayton South area receivers the dominant influence on background noise levels is traffic on the Golden Highway. The undulating terrain near Woodlands and other private properties located further west tend to shield a significant length of the highway, which reduces noise levels. Most importantly, individual vehicles are audible at Jerrys Plains and Coolmore Stud for a greater length of time, which minimises quiet gaps between vehicles and maintains a higher background noise level.

Using the adopted RBLs, the operational noise criteria and sleep disturbance criteria for the Project were calculated. These criteria are presented in Table 37 and Table 38, respectively.

Meteorology

Atmospheric conditions including temperature, relative humidity, wind speed, wind direction and vertical temperature gradient can all affect noise propagation and received noise levels at some distance from a source. The INP recommends that noise enhancing winds or temperature inversions that occur for at least 30% of the time in any season or time period should be considered when predicting noise levels.

Meteorological data for 2005, which is the most recent year for which there is high quality data, were processed in accordance with the INP to determine the prevailing weather conditions. Data was sourced from the weather stations at the existing Drayton Mine and within the Drayton South area. The meteorological conditions adopted are outlined in Table 35 and Table 36.

Table 34 Rating Background Levels for Receivers

Receiver Group		RBL, $L_{A90,15min}$		
		Day	Evening	Night
Drayton Mine Receivers				
A	Antiene (west and near the New England Highway)	32	32	32
B	Antiene (east and central)	30	30	30
Drayton South Area Receivers				
C	Jerrys Plains (M1), Coolmore Stud (M2)	35	33	33
D	Woodlands Stud (M3), Private properties (west and north-west of Drayton South) (M4)	30	30	30

Table 35 Modelled Meteorological Conditions – Drayton Mine

Atmospheric Parameter	Day	Evening			Night
	Neutral	Neutral	SE Wind	NW Wind	Inversion
Temperature (°C)	20	15			10
Relative Humidity (%)	70	80			90
Wind Speed (m/s)	0	0	3	3	0
Wind Direction	-	-	135	315	-
Temperature Gradient (°C/100 m)	-2	-1			3
Effective Inversion (°C/100 m)	-2	-1	6.5	6.5	3

Table 36 Modelled Meteorological Conditions – Drayton South Area

Atmospheric Parameter	Day	Evening /Night		
	Neutral	SSE Wind	NW Wind	Inversion
Temperature (°C)	20	10		
Relative Humidity (%)	70	90		
Wind Speed (m/s)	0	3	3	0
Wind Direction	-	157	315	-
Temperature Gradient (°C/100 m)	-2	0	0	3
Effective Inversion (°C/100 m)	-2	7.5	7.5	3

Operational Noise Criteria

The INP prescribes two criteria which apply to noise during the operations phase of the Project; intrusive criteria and amenity criteria. The intrusive criteria are 5 dBA above the background noise levels for the day, evening and night periods. The intrusive criteria are designed to limit the audibility of an industrial noise source above other noise sources. Consequently, the criterion applies to noise from the Project alone.

The amenity criteria impose a limit on the total cumulative noise produced by industrial developments in an area. The amenity criteria are determined by the nature of the area in which the receiver is located, and the level of existing industrial noise. All of the Project's receivers have been conservatively assigned to the *'rural residence'* amenity category. The amenity criteria are generally 50 dBA for the day period, 45 dBA for the evening period, and 40 dBA for the night period. However, a modifying factor is applied if the existing industrial noise level is within 6 dBA of the criteria (as defined in Table 2.2 of the INP). As a result, a modifying factor was applied to the criteria for Group A receivers.

The noise criteria for the operations phase of the Project are listed in Table 37.

Cumulative Operational Noise

Cumulative noise impacts may potentially be caused by concurrent operations at the Project, Mt Arthur Coal Mine, Hunter Valley Operations Coal Mine, and Macquarie Generation's power stations and Hunter River pump station. Cumulative operational noise is regulated by the amenity criteria, with the night period being the most critical. The night amenity criteria are measured in terms of $L_{Aeq\ (period)}$, which means that the average noise level over that period (day, evening, night) must not exceed the criteria. For the 9-hour night period, the $L_{Aeq\ (9\ hr)}$ is typically 3 to 5 dBA lower than the $L_{Aeq\ (15\ min)}$ level, taking into account the operating and meteorological conditions. For this assessment, the cumulative operational noise levels have been conservatively determined to be 3 dBA lower than the $L_{Aeq\ (15\ min)}$ level.

The cumulative noise assessment considered predicted noise levels for other mining developments advancing towards the Project using publicly available information as described in the most recent noise assessments for each development. However, the most recent Mt Arthur Coal Mine assessment did not include predicted noise levels at some receivers to the distant south of their operation (most notably Woodlands Stud located south of the Golden Highway) as this was beyond the boundary of their anticipated impacts. As such an alternative strategy (based on noise monitoring) was adopted for these receivers to ensure the Project assessed any potential cumulative impacts at these locations (M3 and M4) within Receiver Group D (see Table 34 and Figure 10).

Construction Noise

Construction noise levels for developments are generally assessed in accordance with the ICNG. However, section 1.2 of the ICNG states that the guidelines do not apply to construction activities associated with mining. Instead, the ICNG stipulates that the INP applies to construction activities for the purposes of mining. Section 1.3 of the INP, however, specifically excludes construction noise. This inconsistency is expected to be remedied when the INP is revised in the future. As the ICNG is the most recent policy document, noise criteria for the purposes of this assessment have been sourced from the INP. As a result, the criteria for construction noise are the same as the criteria for operational noise (see Table 37). Conservatively the Edderton Road realignment has also been assessed under the INP.

Sleep Disturbance

Sleep disturbance can occur when a short, sharp noise is noticeably louder than the background noise level. The ENCM recommends a sleep disturbance criterion of 15 dBA above the background noise level for the night period. The sleep disturbance criterion applies at a point 1 m outside a bedroom window during the night period. The sleep disturbance criteria for the Project are provided in Table 38.

The RNP also contains guidance on noise induced sleep disturbance. The RNP states that:

- Maximum internal noise levels below 50 to 55 dBA are unlikely to awaken people from sleep; and

Table 37 Operational Noise Criteria

Receiver Group	Noise Criteria (Day / Evening / Night)			
	A/Antiene	B/Antiene	C/South	D/West
Rating Background level $L_{A90,15min}$	32/32/32	30/30/30	35/33/33	30/30/30
Intrusive criteria $L_{Aeq,15min}$ (LA_{90} + 5)	37/37/37	35/35/35	40/38/38	35/35/35
Amenity limit $L_{Aeq,period}$ (INP, rural)	50/45/40	50/45/40	50/45/40	50/45/40
Existing industrial level	35/35/35	33/33/33	26/26/26	27/27/27
Amenity criteria $L_{Aeq,period}$ (INP Table 2.2)	50/45/38	50/45/40	50/45/40	50/45/40

Note: Day (7am to 6pm), Evening (6pm to 10pm) and Night (10pm to 7am). Night ends, and day begins, at 8am on Sundays and public holidays.

- One or two noise events per night, with maximum internal noise levels of 65 to 70 dBA are not likely to significantly affect health and wellbeing.

The RNP awakening criteria of 50 to 55 dBA is the noise level inside a bedroom, and is equivalent to an external noise level of 60 to 65 dBA, assuming that bedroom windows are partially opened for ventilation. Similarly, the RNP health criteria of 65 to 70 dBA are equivalent to an external noise level of 75 to 80 dBA.

Road Traffic Noise

Provided that all vehicle access will continue to be via the Drayton Mine Access Road off Thomas Mitchell Drive only Drayton Mine receivers (Group A and B) have been included in the road traffic noise assessment.

Criteria for road traffic noise are provided by the RNP. Since receivers in Group A and B currently experience noise from traffic on the New England Highway and Thomas Mitchell Drive, the criteria that applies are *"Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments"* (Situation 3 under the RNP). As a result, the relevant criteria are 60 $L_{Aeq\ (15hr)}$ for the day period and 55 $L_{Aeq\ (9hr)}$ for the night period. This means that the average noise level over the 15 hour day period must not exceed 60 dBA, and the average noise level over the 9 hour night period must not exceed 55 dBA.

The noise criteria under the RNP apply primarily to traffic during the operation phase of the Project. These noise criteria apply to the cumulative noise generated by both traffic associated with the Project and traffic generated by other sources.

Rail Traffic Noise

The Interim Rail Noise Guideline prescribes noise criteria of 65 $L_{Aeq\ (15hr)}$ for the day, 60 $L_{Aeq\ (9hr)}$ for the night, and 85 L_{Amax} at any time. This means that average noise levels are limited to 65 dBA and 60 dBA for the day and night periods respectively, and the loudest noise that is permissible at any moment is 85 dBA. These criteria apply to train movements on publicly owned rail lines, such as the Main Northern Railway. Noise generated by train movements on the privately owned Antiene Rail Spur is assessed under the INP.

The Australia Rail Track Corporation (ARTC) holds Environment Protection Licence (EPL) 3142, which prescribes the same noise criteria as the Interim Rail Noise Guideline.

Low Frequency Noise

Section 4 of the INP recommends that low frequency noise levels should be considered in the normal operational noise criteria by the addition of a *'modifying factor'* to a source sound power level.

Modifying factors that are relevant to the assessment, including low frequency penalties, have been applied to the adopted sound power levels for mining and transportation equipment. As a result, no separate assessment of low frequency noise levels is required.

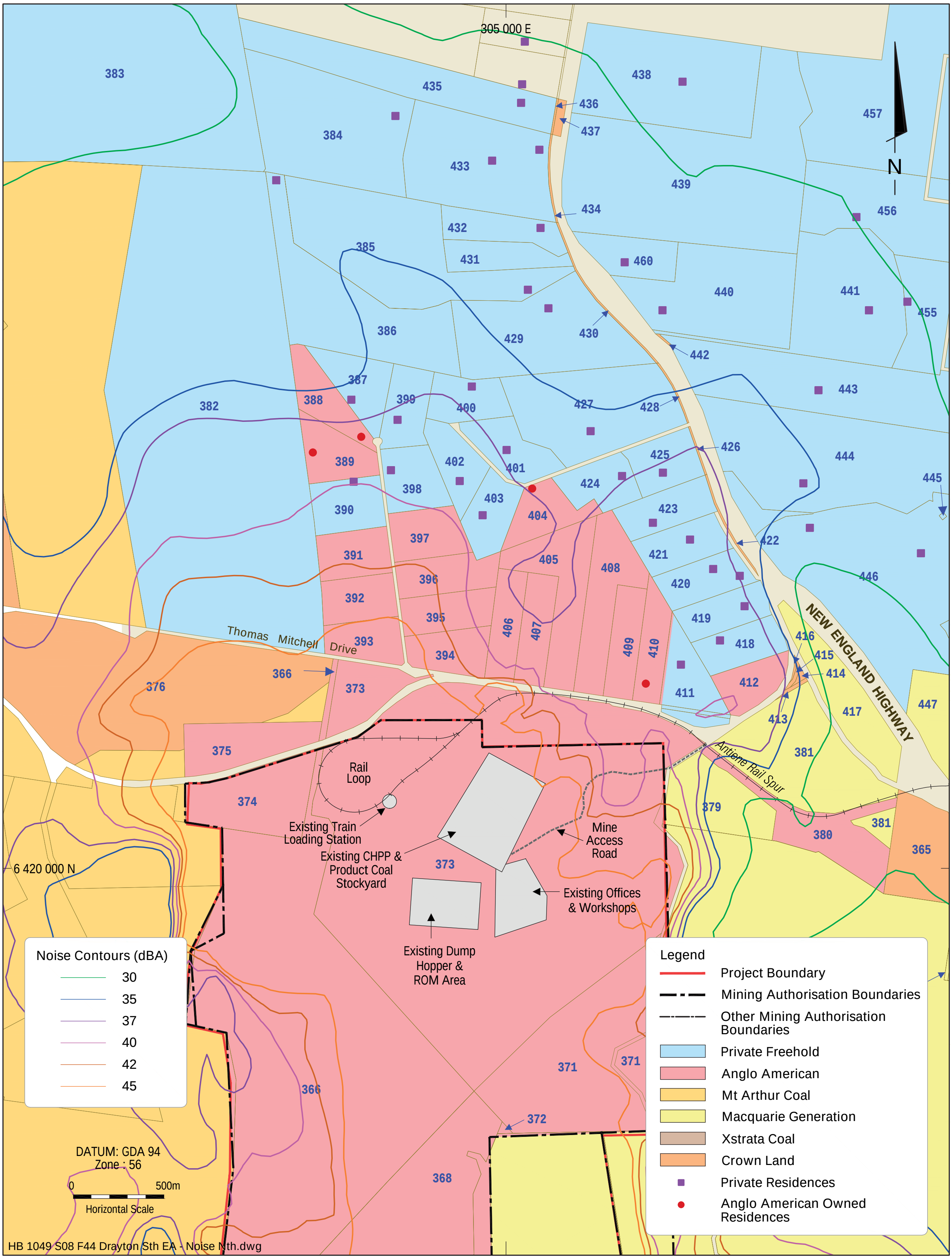
8.3.3 Impact Assessment

Project Operational Noise

Figure 44 shows the combined worst case predicted operational noise levels for the Project for all years modelled for Drayton Mine with **Figure 45** highlighting properties predicted to experience mild and moderate noise impacts. **Figure 46** shows the combined worst case predicted operational noise levels for the Drayton South area receivers. All activities associated with the Project have been included in the noise assessment including the construction of Edderton Road, the Houston visual bund and mining operations across representative years of the Project. The key assumptions used and detailed results from the predictive noise model are presented in **Appendix G**.

Table 38 Sleep Disturbance Criteria

Receiver Group	Noise Criteria $L_{A1,1min}$, (10:00 pm to 7:00 am)			
	A/Antiene	B/Antiene	C/South	D/West
Background level $L_{A90,15min}$	32	30	33	30
Historical Criteria $L_{A1,1min}$ (LA90 + 15)	47	45	48	45
RNP Awakening Criteria	60 to 65			
RNP Health Criteria	75 to 80			

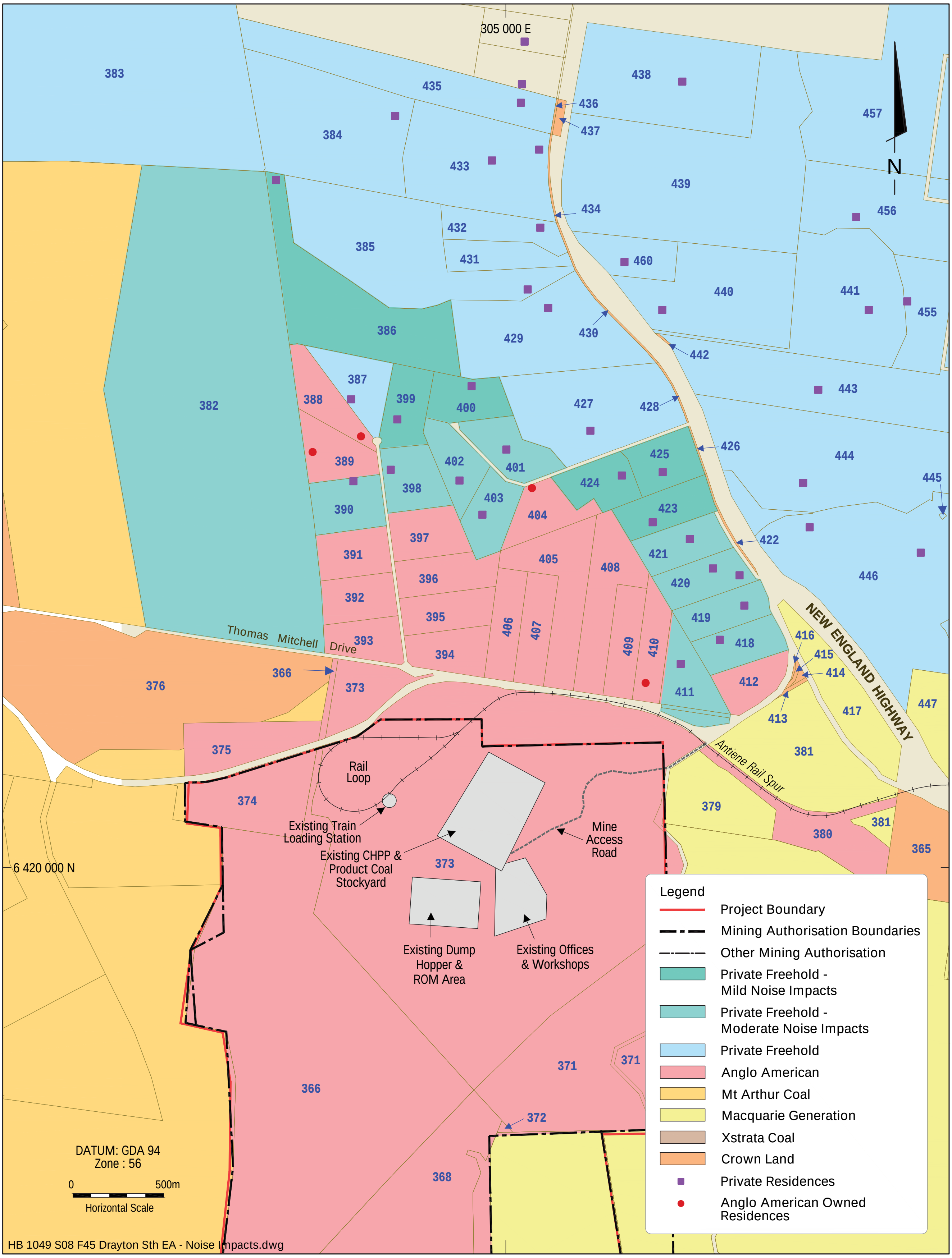


DRAYTON SOUTH COAL PROJECT

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Indicative Drayton Mine Noise Contours - All Years (Evening)

FIGURE 44

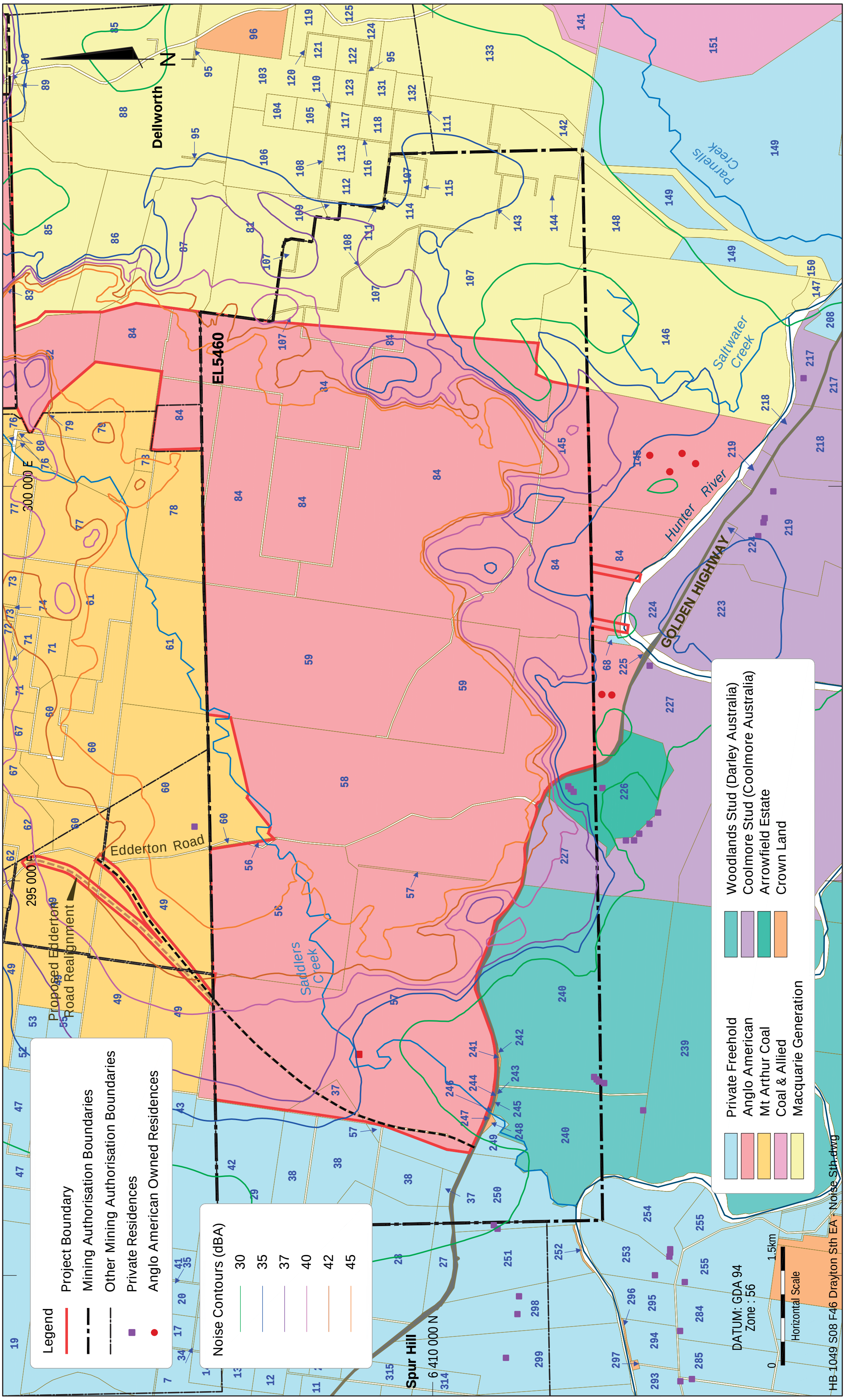


DRAYTON SOUTH COAL PROJECT

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Predicted Drayton Mine Operational Noise Impacts

FIGURE 45



DRAYTON SOUTH COAL PROJECT

Indicative Drayton South Noise Contours - All Years (Evening / Night)

FIGURE 46

The predicted noise levels for operational activities include all reasonable and feasible noise mitigation and management measures and represent the worst case scenario, which occurs when all equipment is operating simultaneously under noise enhancing conditions. Since this situation will only eventuate occasionally, noise levels will generally be lower than that predicted. Table 39 outlines the predicted noise levels during the operations phase of the Project at the Drayton Mine Receivers while Table 40 outlines the predicted noise levels during the operations phase of the Project at the Drayton South area receivers.

A receiver is deemed to be significantly impacted if the predicted operational noise level exceeds the intrusive criteria by greater than 5 dBA. Significant noise impacts are not predicted at any receivers.

If the predicted operational noise level exceeds the intrusive criteria by 2 to 5 dBA, the receiver is deemed to experience moderate noise impacts. There are seven Drayton Mine receivers (390, 398, 401, 402, 403, 411 and 418) that will experience moderate noise impacts at residences. All seven of these receivers will also experience moderate noise impacts over an area greater than 25% of the property. There are a further four Drayton Mine receivers (382, 419, 420 and 421) that will be subject to moderate noise impacts over an area greater than 25% of the property, however, no impacts are anticipated at residences.

A receiver is deemed to experience a mild noise impact if the intrusive criteria are exceeded by less than 2 dBA. There are nine Drayton Mine receivers (399, 400, 419, 420, 421, 423, 424 and 425) that will experience mild noise impacts at residences and one receiver (386) that will experience mild noise impacts over an area greater than 25% of the property. Five of these receivers (399, 400, 423, 424 and 425) will also be subject to moderate noise impacts over an area greater than 25% of the property.

There are no exceedances of the intrusive criteria for any Drayton South area receivers. All impacted receivers are in the vicinity of the existing Drayton Mine. Predicted noise levels in Table 39 are generally slightly lower than the predicted noise levels reported in the Drayton Mine Extension EA for Drayton

Table 39 Predicted Operational Noise Levels – Drayton Mine Receivers

Residence				Area ≤ 25% of Property				Criteria (dBA)
Receiver	Day	Evening	Night	Receiver	Day	Evening	Night	Day / Evening / Night
-	-	-	-	382	28.3	39.9	37.1	37/37/37
386	22.2	32.9	31.4	386	25.3	35.4	34.9	35/35/35
387[1]	25.0	35.8	34.4	387	25.2	36.0	35.0	37/37/37
399[1]	26.3	37.6	36.6	399	26.4	37.8	36.9	
390	28.2	39.9	38.3	390	29.0	40.6	38.8	37/37/37
398	27.7	39.4	38.2	398	28.1	39.8	38.8	37/37/37
400	25.7	36.3	36.3	400	26.0	36.9	36.7	35/35/35
401	26.2	36.7	37.2	401	26.4	36.9	37.4	35/35/35
402	27.7	38.8	38.5	402	27.7	38.9	38.5	35/35/35
403	28.0	38.8	38.6	403	28.3	38.8	38.7	35/35/35
411	30.8	34.2	40.1	411	31.0	34.9	40.0	37/37/37
418	30.1	33.5	39.3	418	30.1	33.8	39.4	37/37/37
419	29.2	32.1	37.9	419	30.5	33.6	39.4	37/37/37
420E[2]	28.9	31.8	37.4	420	29.7	33.5	39.4	37/37/37
420W[2]	29.2	32.6	38.3					
421	28.3	33.2	38.6	421	28.5	33.9	39.2	37/37/37
423	27.9	34.2	38.8	423	27.7	34.2	38.5	37/37/37
424	26.2	34.3	37.4	424	26.4	34.7	37.6	37/37/37
425	26.6	33.9	37.5	425	26.7	34.0	37.5	37/37/37

1 Residences 387 and 399 are under common ownership. 2 Residences 420E and 420W are under common ownership.
Note: Light Stone – a moderate noise impact of between 2 to 5 dBA above the intrusive criteria; and
Dark Stone – a mild noise impact of 2 dBA or less above the intrusive criteria.

Mine receivers, as additional noise control measures have been proposed since the EA was prepared and subsequently included in the noise modelling for the Project.

Cumulative Operational Noise

Receivers are likely to experience noise from industrial operations in close proximity to the Project, including:

- Hunter Valley Operations Coal Mine;
- Mt Arthur Coal Mine;
- Macquarie Generation's Bayswater and Liddell Power Stations; and
- Macquarie Generation's Hunter River Pump Station.

Bengalla Coal Mine, Mangoola Coal Mine and Mt Pleasant Project are located over 10 km from the Project's receivers, and are therefore unlikely to contribute materially to the cumulative operational noise levels. These operations have not been considered in the assessment.

Operational noise levels for each of the cumulative contributors in proximity to the Project were measured during the attended noise surveys. The operational noise levels measured during these short term noise surveys were $L_{Aeq\ (15min)}$ values. A correction factor of 3 dBA was applied to convert these to $L_{Aeq\ (9hr)}$ values for the purposes of the night amenity criteria. The adopted $L_{Aeq\ (9hr)}$ noise levels for neighbouring developments are listed in **Table 41**. These values were used to calculate the cumulative operational noise levels to be assessed against the amenity criteria.

The cumulative operational noise levels were found to exceed the conservative night amenity criteria adopted for Group A receivers in the Antiene area. As a result, receivers 390 and 398 will experience an exceedance of 1 dBA, with the major noise contributors being the Project and Mt Arthur Coal Mine. The cumulative operational noise level of 39 dBA only occurs during simultaneous noise enhancement from both the Project and Mt Arthur Coal Mine. In the absence of simultaneous noise enhancement for both sources, the cumulative noise level would be 37 dBA, which is within the night amenity criteria.

Project Only Construction Noise

A worst case scenario was adopted for the assessment of construction noise. This scenario considered the normal operation of Drayton Mine occurring simultaneously with construction activities, in particular upgrades to the CHPP. Mining operations within the Drayton South area will not commence until after the completion of the construction program. As a result, operational activities were not considered when assessing the noise levels for the Drayton South area receivers during the construction phase.

Table 40 Predicted Operational Noise Levels – Drayton South Area Receivers

Residence			Area ≤ 25% of Property			Criteria (dBA)
Receiver	Day	Evening and Night	Receiver	Day	Evening and Night	Day / Evening and Night
217N[1]	19.5	32.8	Coolmore Australia	19.8	31.6	40/38
217S[1]	19.5	32.8				40/38
219C[1]	21.8	34.6				40/38
219E[1]	21.6	34.2				40/38
219W[1]	21.9	35.0				40/38
227C[1]	22.7	28.2				40/38
227E[1]	20.2	34.3				40/38
227W[1]	23.4	29.6				40/38
228[1]	19.3	29.4				40/38
-	-	-	Darley Australia	15.8	25.3	35/35
250	18.1	30.0	249-251,254	17.5	30.0	35/35
226N[2]	27.6	32.3	Arrowfield Estate	26.8	30.9	40/38
226S[2]	25.8	30.7				40/38
209	17.3	31.1	209	17.4	31.3	35/35
211	15.8	30.0	174-177,208, 210,211	16.0	30.1	35/35

1 *Residences are under common ownership (Coolmore Australia)*
2 *Residences are under common ownership (Arrowfield Estate)*

Table 41 Predicted Cumulative Operational Noise Levels

Industrial Noise Source	Existing Noise Levels, $L_{Aeq\ (night)}$					
	Group A	Group B	Group C		Group D	
	Antiene	Antiene	M1	M2	M3	M4
The Project	< 37	< 36	< 30	< 35	< 30	< 35
Hunter Valley Operations Coal Mine	-	-	23	22	-	-
Hunter River Pump Station	-	-	21	21	-	-
Bayswater and Liddell Power Stations	22	22	-	-	-	-
Mt Arthur Coal Mine	35	33	< 25	< 25	< 25	30
Combined Industrial Noise Level (Night)	39	38	32	36	31	36
Amenity Criteria (Night)	38	40	40	40	40	40

The detailed assumptions used for the assessment of construction noise are detailed in Appendix G.

The predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton Mine receivers. However, it will exceed the night time criteria in the absence of noise mitigation measures and impact on a number of Drayton Mine receivers. This exceedance is primarily associated with upgrades to the CHPP.

Similarly, the predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton South area receivers with exception to residences at receivers 60, 240 and 250. Intermittent exceedances of the criteria at receivers 240 and 250 are predominantly associated with the construction of the Edderton Road realignment. Construction noise levels of 35 to 38 dBA will be experienced by these receivers during an approximately three month period. Receiver 60, which is owned by HVEC, will experience noise levels of up to 45 dBA from sources required for the construction of the Drayton South mine site facilities and the Edderton Road realignment.

Construction noise associated with the Edderton Road realignment is unlikely to be unacceptable as this work will only be undertaken during the day. This noise will be masked to a certain extent by traffic noise on the Golden Highway and the existing Edderton Road.

The only construction activities occurring within the Drayton South area during the evening and night periods are associated with the Drayton South mine site facilities and the transport corridor. No exceedances of the evening and night criteria are predicted at any of the Drayton South area receivers.

Sleep Disturbance

The greatest potential sources of sleep disturbance at Drayton Mine would currently be dozer tracks in the North Pit and train wagon bunching impacts on the rail loop. Anglo American currently (and would continue to) endeavour to minimise or avoid such sources of sleep disturbance. Dozer track noise in the North Pit would potentially continue until Drayton Mine coal is exhausted by about Year 4 and then would cease. Train wagon bunching noise would potentially continue for the life of the Project. The Project has no significant potential to increase the occurrence of sleep disturbance and is more likely to reduce the occurrence from the existing operational levels.

Other potential sources of sleep disturbance, such as noise associated with the CHPP, would continue for the life of the Project and would continue to be subject to management measures to avoid or minimise such noise.

Given Anglo American's commitment to continue to adopt leading practice noise control measures for the Project, exceedances of the ENCM sleep disturbance criteria are unlikely to occur.

Under a worst case scenario, the maximum noise levels generated by the Project in night conditions are predicted to be significantly less than the sleep disturbance criterion at all Drayton Mine receivers, excluding potential maximum noise levels from train wagon bunching on the rail loop.

It is anticipated that residences associated with receivers 411 and 403 will experience noise levels of up 57 and 55 L_{Amax}, respectively, as a result of train wagon bunching. This noise source will also result in an additional 25 Drayton Mine receivers being subject to noise levels in the range of 45 to 55 L_{Amax}. Although these predicted noise levels exceed the sleep disturbance criteria prescribed by the ENCM, they are below the levels that the RNP considers necessary to cause awakening or health impacts (see Table 38).

Road Traffic Noise

The Project will generally cause an increase in road traffic noise of 0.1 dBA during both the construction and operation phases; however, there are some receivers close to Edderton Road that will experience an increase of up to 0.5 dBA.

Traffic noise levels for receivers near the New England Highway and Denman Road are predicted to exceed the traffic noise criteria for the day period under the RNP (60 dBA). The traffic noise levels for receivers in Jerrys Plains are predicted to be equal to the day time criteria. As the Project's contribution to calculated total traffic noise levels is insignificant at all receivers, no traffic noise control or management measures are recommended.

Rail Traffic Noise

Noise produced by the loading of trains at Drayton Mine and train movements along the Antiene Rail Spur have been considered in the assessment of operational noise. The assessment of rail traffic noise only considers noise generated as the train travels on the Main Northern Railway.

The Project will be accountable for approximately 8% of train movements on the Main Northern Railway from the Antiene Rail Spur to Newcastle, which will increase the rail traffic noise level by 0.4 L_{Aeq}. The Draft RING states that a more detailed assessment is required if a project contributes greater than 10% of rail traffic or 0.5 dBA of total rail traffic noise. Since the Project's impacts are lower than both thresholds, rail traffic noise is deemed insignificant and no further assessment is required.

8.3.4 Mitigation and Management

Reasonable and Feasible Noise Controls

Numerous noise modelling investigations were undertaken during the initial mine planning phase of the Project. As part of this EA, Anglo American has committed to implementing a number of noise controls to minimise the Project's impacts on private receivers. These noise controls have been considered in the modelling of the Project's operational noise levels and are provided in Appendix G. The key noise controls that will be implemented include:

- Fitting low noise idlers to select conveyors at the CHPP;
- Fitting mobile plant with leading practice exhaust silencers and sound attenuation devices;
- Limiting the operation of particular equipment on exposed surfaces to daylight hours during select years to avoid adverse noise;
- Constructing the Houston visual bund, which will provide acoustic shielding; and
- Employing a double benching method during the initial construction of the box cut for the Houston mining area so that excavators can work below ground level.

Receivers that are impacted by the existing Drayton Mine will typically experience a 0.5 to 1 dBA reduction in noise levels as a result of fitting conveyors with low noise idlers. The cost of implementing low noise idlers is estimated to be $3.5 M. In the absence of low noise idlers, there will be three receivers that will experience significant noise impacts (greater than 5 dBA above the intrusive criteria). The implementation of low noise idlers ensures that no receivers are significantly impacted.

Initial excavation in the Houston mining area will occur only during the daytime. The excavated material will be used to construct the Houston visual bund. Double benching will allow an excavator to work on a shielded bench below ground level and the trucks to operate at the bottom of the Houston mining area. The excavators will be located on this lower stratum, which is preferable to the excavator working above ground surface. Evening and night operations in the Houston mining area will only commence when:

- The mining area reaches a depth of 12 m and a 6 m bench is established for the excavator to work below ground during noise sensitive periods; and
- The bund reaches a height of at least 15 m and a lower bench is established on the northern side of the bund for use during noise sensitive periods.

As a result of the noise controls that have been applied to equipment and the mining methods within the Drayton South area no private receivers will experience noise levels above intrusive criteria during the operational phase of the Project.

Construction Noise Management Plan

Construction activities, primarily associated with the upgrade of the CHPP, are predicted to cause exceedances of the night time intrusive criteria at a number of Drayton Mine receivers in the absence of mitigation measures. As such the existing Drayton Mine noise management plan will be revised to incorporate construction noise criteria and controls during the CHPP upgrade activities, including:

- Noise criteria for each time period;
- Time restrictions for noisy activities such as heavy earthmoving, rock or concrete removal and concrete pouring;
- Acknowledgement that quieter activities, such as installation of mechanical and electrical equipment and excavation using small machines, will be scheduled for the evening and night; and
- A construction noise monitoring program be implemented, addressing evening and night activities, to identify any noise sources that may exceed relevant noise criteria. The program will include a communication protocol and response protocol to maximise the effectiveness of the noise surveys and to minimise the potential for ongoing exceedances of the noise criteria.

Three Drayton South area receivers are anticipated to experience excessive noise during the day time period as a result of the Edderton Road realignment. It is recommended that activities associated with the Edderton Road realignment be incorporated into the existing noise management plan to ensure that all feasible and reasonable noise control measures are identified and implemented for these works.

Noise Monitoring

Ongoing monitoring will be undertaken to confirm the predicted noise levels of the assessment. The following will be incorporated by Anglo American when updating the current environmental monitoring plan and program for Drayton Mine:

- The existing noise management plan will be updated following PA and reviewed every three years;
- Real time noise monitors will be deployed in representative receiver areas or at reference locations closer to the Project to enable ongoing noise management. Data from the real time noise monitors will be transmitted to an onsite office or control room for monitoring and action. A TARP will be developed and implemented as part of the updated noise management plan to detail the actions required upon detection of noise levels over the intrusive criteria, taking into account factors such as time of day, equipment operating locations and weather conditions;
- Quarterly operator attended noise monitoring will occur at a minimum of four locations during normal mining operations to confirm Project noise levels. The monitoring locations will vary from time to time as the mine progresses and should be reviewed annually. Noise surveys will include two non-consecutive 15 minute noise measurements, and associated observations to identify and quantify dominant sources of noise during the day, evening and night at each location; and
- Results from real time noise monitoring and quarterly noise surveys will be reported annually in the Annual Review.

8.4 Blasting

8.4.1 Background

An acoustics impact assessment was undertaken by Bridges Acoustics and is provided in Appendix G. The purpose of the assessment, in part, was to predict the Project's blasting impacts on receivers in the vicinity of the Drayton South area, and to recommend measures to mitigate and manage these impacts.

The assessment was conducted in accordance with the following policies and guidelines:

- The *Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (Blasting Guideline) (ANZECC, 1990) for blasting criteria; and
- The *Assessing Vibration – a Technical Guide* (Vibration Guideline) (DEC, 2006) for ground vibration criteria and assessment procedures.

8.4.2 Methodology

The assessment calculated the likely ground vibration and overpressure levels generated by blasting required for the Project for each of the nearby receivers for comparison with the relevant criteria.

As described in Section 4, the Project is likely to require an average of up to five blast events per week to prepare overburden for removal and for coal recovery. Blasting effects to neighbouring receivers depend on the following factors:

- Ground conditions including rock types, groundwater and layers;
- Distance from the blasting site to a receiver;
- MIC for the blast event;
- Topography between the blast site and receivers; and
- Atmospheric conditions including wind speed, wind direction and vertical temperature gradient.

Air blast overpressure and ground vibration levels for blast events closest to the receiver locations were calculated utilising the methods set out in AS 2187.2 for comparison with the relevant criteria.

The analysis was conducted using predicted vibration coefficients based on patterns observed in previous mining operations, although some adjustment to these parameters may be appropriate based on initial blast monitoring results.

Blasting Criteria

Current noise and vibration criteria for occupied residences are recommended in the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines and are reproduced in Table 42. Recommended blasting criteria apply during day light hours Monday to Saturday, excluding public holidays.

Table 42 Blasting Amenity Criteria

Criteria*	Overpressure (dBL)	Ground Vibration (mm/s)
Less than 5% of total blasts to exceed	115	5
No blasts to exceed	120	10

** Criteria do not apply where an agreement is in place with the land owner.*

There are a number of non-Aboriginal heritage items and other structures that are in proximity to the Project. The vibration criteria adopted for these items are listed in Table 43.

Occupied private properties are assigned the blast criteria of 5 mm/s PPV and 115 dBL to minimise amenity impacts on occupants that are not associated with the Project. Amenity criteria are lower than the levels required to protect the structures themselves from blast related damage. In this regard, mine owned heritage structures have been assigned the criteria of 10 mm/s PPV and 120 dBL. This is considered appropriate to mitigate impacts to these structures and is consistent with the criteria adopted at the adjacent Mt Arthur Coal Mine as part of their 2009 Consolidation EA.

8.4.3 Impact Assessment

The results of the vibration and overpressure assessment for each of the closest receivers are provided in Table 43.

These results indicate that blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences and structures with the exception of Arrowfield Estate where it is predicted that the relevant criteria would be exceeded if the MIC is above 500 kg when mining in the most southerly extent of the Redbank mining area.

The calculations indicate that an MIC in the range 500 kg to 1000 kg may be required for blasts within approximately 1000 m of a sensitive receiver, which may also require special blast designs such as a limited bench height or decked charges. Larger blasts can be used progressively as distance from receiver's increases. All blasts associated with the Project would be designed to meet relevant vibration and overpressure criteria at sensitive receivers, according to the approved blast management plan (see Section 8.4.2).

Due to the Project being designed to remain behind the southern ridgeline there is a substantial section of elevated ground between the mining areas and sensitive receivers to the south, which acts as a noise and overpressure barrier. As such a conservative -5 dBL correction has been applied to calculated overpressure levels to account for this topographic barrier.

Table 43 Predicted Blasting Impacts

MIC (kg)		500	1,000	1,500	2,000	500	1,000	1,500	2,000	Adopted Criteria (mm/s, dBL)
Receiver	Distance (m)	Ground Vibration (mm/s)				Overpressure (dBL)				
Plashett Dam	2,270	0.7	1.2	1.7	2.1	-	-	-	-	10, -
Hunter River Pump Station	4,500	0.2	0.4	0.6	0.7	-	-	-	-	10, -
Strowan Homestead	3,550	0.3	0.6	0.8	1.0	98	101	103	104	5,115
Arrowfield Cottage	3,230	0.4	0.7	1.0	1.2	99	102	104	105	5,115
Woodlands Homestead	5,400	0.2	0.3	0.4	0.5	93	96	97	99	5,115
Randwick Homestead	3,130	0.4	0.7	1.0	1.3	100	102	104	105	5,115
Arrowfield Estate[1]	690	4.7	**8.2**	**11.0**	**14.0**	114	**117**	**118**	**120**	5,115
Coolmore Stud Office[1]	1,610	1.2	2.1	2.9	3.7	103	106	108	109	5,115
Private Receiver 250	2,990	0.5	0.8	1.1	1.4	100	103	105	106	5,115
Bowfield Homestead^	1,710	1.1	1.9	2.7	3.4	107	110	112	113	10,120
Plashett Homestead^	2,700	0.5	0.9	1.3	1.6	101	104	106	107	10,120
Edderton Homestead*	1,080	2.3	4.0	5.6	7.0	113	116	118	119	10,120

[1] Overpressure level has been reduced by 5 dBL due to significant topographical shielding.
^ Anglo American owned
** Criteria agreed with land owner*

Cumulative Blast Impacts

In addition to the Project, there are likely to be blasting activities associated with the neighbouring mining operations at Mt Arthur Coal Mine and Hunter Valley Operations. Anglo American will consult with the neighbouring mines to ensure that blast events from the adjoining operations would not occur simultaneously. As such, overpressure and ground vibration levels from the cumulative effects of all mines would not result in exceedances of the relevant criteria.

8.4.4 Mitigation and Management

Anglo American will update the existing blasting management plan to include appropriate management and mitigation measures to ensure that the relevant criteria are met for all privately owned residences, heritage structures and infrastructure. The following will be included:

- Blasting should not occur closer than 500 m to any occupied or sensitive building or structure unless adequate controls are implemented to minimise the risk of fly rock;
- A blast monitoring program, which is representative of the closest sensitive receivers to ensure compliance with the relevant blast criteria;
- Coordination of blasting schedules with adjoining mines to avoid any potential for simultaneous blast events;
- Notification of blast events to sensitive receivers upon request and on the Anglo American website prior to the blast event and establishment of appropriate signage, if required;
- Blast events will be designed to meet the relevant overpressure and ground vibration criteria; and
- Prior to commencement of mining operations a dilapidation assessment will be undertaken for all identified heritage items listed in Table 43.

All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

8.5 Equine Health

8.5.1 Background

An equine health impact assessment was undertaken by Dr. Nicholas Kannegieter, Specialist Equine Surgeon, and is provided in Appendix H. The purpose of the assessment was to determine whether the air quality, noise and blasting impacts of the Project will have any adverse impacts on the health of thoroughbred horses.

As discussed in Section 2.2.4, the Project is situated adjacent to Coolmore Stud and Woodlands Stud. All horses bred on these studs are intended for thoroughbred racing. As a result, the equine health impact assessment focuses specifically on the impacts of dust, noise and vibration on the horses bred and raised on these studs.

8.5.2 Methodology

The potential air quality, noise and blasting impacts of the Project have been assessed in the EA air quality impact assessment (see Section 8.1) and the EA acoustics impact assessment (see Section 8.3 and 8.4). In order to determine whether thoroughbred horses will be adversely affected by these impacts, it was necessary to ascertain the thresholds at which equine health will be impacted. As such a detailed literature review with regard to the effects of dust, noise and vibration on horses was undertaken.

The findings of the literature review were relied upon to develop suitable dust, noise and vibration thresholds for equine health. The predicted impacts of the Project were then compared against these indicative thresholds in order to determine whether there will be any detrimental impacts on equine health.

A number of scientific and veterinary databases were consulted during the literature review including:

- CAB abstracts (1990 to present);
- PUBMED;
- Science Direct;
- Wiley Online Library;
- Medline (1950 to present);
- Personal database of Dr. N Kannegieter;
- Web of Science; and
- Cambridge Journal Online.

A complete list of the relevant papers and documents that were reviewed are included in Appendix H.

Literature Review – Air Quality

An extensive literature review was conducted to establish an understanding of the levels of dust that horses are exposed to during the various stages of their life cycle. This assessment included a comparison of the air quality of the Upper Hunter to conditions in other renowned horse breeding and racing locations in Australia and around the world. This research was undertaken in order to provide an indication of the dust levels that can be tolerated by horses.

The literature review identified a number of research studies that provided data with which to compare the potential effects of the Project. There was very little published information about the equine health impacts of dust originating from the soil. However, there is a significant body of research into the effects of dust from bedding and hay on stabled horses.

The key findings from this research are summarised below:

- There is likely to be a poor correlation between humans and horses in regards to the adverse effects of dust pollution on health;
- Horses are exposed to a large amount of dust in their lives particularly when performing as athletes. The primary

sources of dust are bedding, hay and feed;

- The major causes of adverse effects from dust exposure on horses in any environment is not the particulate matter as such but rather the endotoxins, bacteria and fungi that are attached to the particulate matter;
- Horses have a highly refined respiratory tract that greatly protects against contamination of the upper and lower respiratory tracts (LRT). They also have excellent mucocillary clearance mechanisms, which when combined with the advantages of postural drainage provide a very efficient and effective means of clearing the LRT of particulate matter or foreign material;
- Despite exposure to high levels of dust, horses can compete to the best of their ability;
- Dust that does not have high levels of endotoxin associated with it (e.g. nuisance or crustal dust) does not appear to increase the incidence of Inflammatory Airway Disease in horses;
- Up to 40% of horses bred for a racing career develop Inflammatory Airway Disease within the first two weeks of entering racecourse stables for training. This suggests that hay, bedding and feed are the dominant source of endotoxins, rather than the surrounding environment; and
- Rattles is a common LRT disease that is triggered when dust containing the *R. equi* bacteria is inhaled. The *R. equi* bacteria is found in the manure of *'carrier'* mares.

Following the literature review, it was concluded that the very high amount of dust that horses are exposed to, both as a result of being fed hay and in particular being kept in a stabled environment, is an *'occupational hazard'*. There are undoubtedly effects of this dust on the respiratory tract, particularly Inflammatory Airway Disease. However, it is well documented that the effects of dust are primarily a result of endotoxins attached to the dust particle, rather than the inorganic dust component itself.

As such it was deemed necessary to test the soil in the Drayton South area for endotoxin levels. The samples used in the endotoxin testing were obtained from three sources:

- Topsoil from four representative locations within the Project Boundary;
- Dust collected by three depositional dust gauges; and
- PM_{10} collected by one HVAS.

The quantities of endotoxins in the samples were calculated by AMS Laboratories using the Kinetic Chromogenic Method (see Appendix H). The calculated endotoxin contents were compared with equine health thresholds recommended by the sources considered in the literature review.

Comparative Air Quality Study

The review concluded that the majority of horse breeding and racing enterprises within Australia and internationally operate in similar and comparable PM_{10} air quality backgrounds, typically ranging between 15 and 26 µg/m³.

As might be expected, Saudi Arabia and Hong Kong had higher concentrations of between 104 and 148 µg/m³ and 43 and 53 µg/m³, respectively. This data is important in that it provides a background level of dust that horses currently experience in various locations during racing and breeding. The findings from the comparative air quality study are provided in Table 44.

Literature Review – Noise and Vibration

The literature review also investigated the hearing ability of horses and their behaviours when exposed to noise and vibrations. The review examined actual noise levels experienced by horses during major events at racecourses. This information was used to predict how horses might respond to the noise and blasting impacts of the Project.

Table 44 PM_{10} Annual Average Concentrations at Horse Breeding and Racing Venues

Country	Location	Annual Average PM_{10} Concentration (µg/m³)
Australia	Muswellbrook	19 – 20
	Singleton	19 – 20
	Tamworth	12 – 18
	Randwick	15 – 22
	Footscray	20 – 22
Saudi Arabia	Saudi Arabia	104 – 148
Hong Kong	Sha Tin	45 – 53
	Eastern	43 – 49
United States	Louisville	22 – 26
	Louisville 2	21 – 24
	Lexington-Fayette	19 – 23
	Elizabethtown	17 – 21
	Richmond	18 – 21
Ireland	Cork, Old Station Road	15 – 26
	Cork, Heatherton Park	15 – 21
	Dublin, Dun Laoghraine	15
	Tipperary, Clonmel	19 – 20
	Kildare, Naas	17
	Kildare, Newbridge	14 – 20
	Meath, Navan	23
United Kingdom	Newmarket	16 – 21

A review of research into the relative hearing ability of a wide variety of animals found that equine hearing is similar to human hearing although less sensitive. As a guide, it is probable that horses are slightly deafer, with hearing approximately 15 dBA less sensitive than humans.

A comprehensive noise impact study was undertaken by Huybregts (2008) for the *"Big Day Out"* music festival held at Flemington Racecourse. This study found that during major race events, horses were exposed to noise levels of 58 to 62 dBA ($L_{A\,eq,\,15\,min}$) in the stables and 65 to 70 dBA in the stalls. On non-race days, the $L_{Aeq,15\,min}$ noise levels ranged from 50 to 65 dBA. During the music festival, the noise levels in the stables were in the 54 to 70 dBA range. The horses exhibited little response to the music noise, except where the noise was of an alarming character or accompanied by visual stimuli.

One other factor to consider is habituation. If the noise is familiar and not associated with danger, the animal's response will become moderated. This is most evident in the (often ineffectual) use of scare guns to remove pest species such as cockatoos from crops or seagulls from airports. Habituation in horses is commonly seen, for example in horses used in large scale performance events and shows as well as police horses. One of the best examples was the use of army and cavalry horses in many wars up until the early part of last century where horses became accustomed to explosions and gunfire.

Although there has been very little research on the effects of ground vibration on equine health, there have been numerous studies on the effects of whole body vibration (WBV). There is an increasing body of research suggesting that WBV can have a positive impact on animal health. Rubin et al. (2001) found that low level vibrations can double bone formation rates, inhibit disuse osteoporosis, and increase trabecular bone strength by 25%. Mikhaela et al. (2010) suggested that high frequency WBV may have an anabolic effect on bone and muscle.

8.5.3 Impact Assessment

Air Quality

The published studies indicate that thoroughbred horses are exposed to high levels of dust, with the dominant sources of dust being bedding, hay and feed. Cargill (1999) recommends a maximum inspirable dust concentration of 2,500 to 3,000 µg/m^3, a maximum respirable dust concentration of 230 µg/m^3 in stables and levels of 80 to170 µg/m^3 for paddocks. Concentrations of respirable dust in stables can range from 150 to 9,280 µg/m^3 (Cargill, 1999).

As discussed in Section 8.1, the annual average cumulative PM_{10} concentrations resulting from the Project will meet the regulatory criteria of 30 µg/m^3 at all locations on Woodlands Stud and Coolmore Stud. Even under a worst case scenario when considering the maximum predicted 24-hour average PM_{10} concentrations, the predicted levels will reach 52 µg/m^3 for one day in Year 10 at Coolmore Stud. The PM_{10} levels generated by the Project are well below the limit of 230 µg/m^3 recommended by Cargill (1999) and the range considered normal for a paddock. As a result, the dust produced by the Project will not pose a risk to equine health, including adults and foals.

Further it has been demonstrated through the literature review that short term increases in dust levels well above those predicted would be well handled by the equine population on the studs and any dust that is inhaled should be rapidly cleared with no adverse effects. This would apply to horses permanently residing on the properties and those visiting temporarily.

The literature review revealed that health issues associated with dust are caused by endotoxins attached to the particulate matter, rather than the inorganic particles themselves. Endotoxins are bacterial structural components that cause a pyrogenic response (rise in body temperature). If inhaled, endotoxins can induce an inflammatory response, which can lead to diseases of the LRT.

Horses possess a highly refined respiratory tract that provides good protection against contamination of the LRT, and mucocilliary clearance mechanisms that can easily expel particulate matter from their bodies. As a result, particulate matter in the absence of endotoxins is merely an irritant.

McGorum et al. (1998) found that endotoxins are unlikely to cause diseases of the LRT unless the airborne endotoxin concentration exceeds 20 ng/m^3 (0.02 µg/m^3). A typical pasture environment was found to possess endotoxin levels of 0.00129 µg/m^3, which is well below the amount likely to cause diseases of the LRT (McGorum et al., 1998).

The results of the endotoxin testing undertaken for the Project are provided in Table 45. The endotoxin contents of the soil and dust samples are expressed in terms of ng/µg (nanograms of endotoxin per microgram of soil / dust).

The endotoxin contents were multiplied by the worst case scenario PM_{10} levels to obtain the airborne endotoxin concentration. The average endotoxin content in the topsoil samples was 0.0000278 ng/µg. The dust sample collected from D11 recorded a significantly higher endotoxin content of 0.0014691 ng/µg. Assuming a 24-hour average PM_{10} concentration of 52 µg/m^3 and an annual average PM_{10} concentration of 28 µg/m^3 (at receiver 227F, Coolmore Stud in Year 10), this would equate to an endotoxin concentration of 0.00145 ng/m^3 and 0.00078 ng/m^3, respectively. These levels are substantially lower than the 20 ng/m^3 threshold recommended by McGorum et al. (1998). The results of the endotoxin testing indicate that the dust generated by the Project will not increase the incidence of LRT diseases or cause negative impacts to equine health. This would apply to horses of all ages as well as those both permanently on the properties and those visiting temporarily.

There is no result for the dust samples taken from D8 and D12 because the endotoxin content was lower than the limit of detection. There is no result for the sample taken from the Plashett HVAS because the amount of dust was too low to weigh.

Rattles is a common LRT disease that is triggered when dust containing the *R. equi* bacteria is inhaled. The *R. equi* bacteria is found in the manure of *'carrier'* mares. Since horses have not occupied the Drayton South area for a considerable period of time, it is very unlikely that dust generated by the Project will contain the *R. equi* bacteria. Therefore, there is no risk of the Project increasing the incidence of rattles.

Foals and yearlings on the properties are routinely stabled either as a result of illness, for management purposes or for training and are therefore exposed to high dust levels on a regular basis. As such there will be no increase in risk to foals or yearlings from disease or from the physical impact of dust inhalation as a result of the Project.

Noise and Vibration

From the literature review it was determined that horses exposed to noise levels in the range of 54 to 70 dBA would be unlikely to exhibit signs of distress particularly in the absence of a visual stimuli or threat. Further it was found that horses are known to demonstrate habituation. This is the ability to become accustomed to certain stimuli. If a noise becomes familiar to the horse and it is not associated with danger it will not be startled by the noise.

As discussed in **Section 8.3**, noise levels will not exceed 40 dBA on any part of Coolmore Stud or Woodlands Stud. For the majority of these properties noise levels of 30 to 33 dBA are predicted, which is comparable to the measured background noise level. Given the noise exposures experienced by thoroughbred horses in stables and the habituation ability of horses the operational noise of the Project is unlikely to have any adverse impacts on equine health.

Table 45 Results of Endotoxin Testing

Sample Type	Sample Location	Endotoxin content (ng/µg)
Topsoil	Site 1 – Plashett Ridge	0.0000189
	Site 2 – HVAS Ridge	0.0000168
	Site 3 – Stockyards Ridge	0.0000403
	Site 4 – Plashett HVAS	0.0000353
Dust	D8 – Dust Deposition Gauge	-
	D11 – Dust Deposition Gauge	0.0014691
	D12 – Dust Deposition Gauge	-
	Plashett HVAS	-

Foals born during the duration of the Project will be accustomed to any noise from the Project as they mature. Mares and foals visiting the properties temporarily will have been exposed in transit to noise levels much higher than are predicted to arise from the Project and should not be affected by any slight increase in noise.

As presented in **Table 43** overpressure levels from blasting (when closest to the receiver) are predicted in the range of 93 to 109 dBL for indicative locations on Coolmore Stud and Woodlands Stud. However, the mining within the Drayton South area will occur in a north to south direction. As a result, the distance from blasting to the horse studs will be greatest at the beginning of the Project and overpressure levels will be significantly lower. This provides the horses with an opportunity to become accustomed to noise and overpressure. As mining progresses southwards it is likely that horses will have developed an increased tolerance to blasting due to habituation.

Due to the intermittent nature of blasting, it is unlikely that the resulting ground vibration would lead to any health benefits. However, it is also unlikely that the vibrations would have any negative impacts on equine health. The vibration levels produced by blasting (see **Table 43**) would appear to be lower than the levels experienced by horses during road and air transportation.

Although there is little scientific research into the impacts of transportation on animal health, anecdotal evidence shows that horses do not suffer any ill effects from the vibrations experienced during transportation. There is also anecdotal evidence indicating that horses at the Muswellbrook racecourse and stables are not startled by blasting at the neighbouring Bengalla Mine. Therefore, the ground vibration and overpressure caused by blasting is not expected to have any negative impacts on equine health.

8.5.4 Mitigation and Management

Provided that the mitigation and management measures recommended for air quality, noise and blasting are complied with, the Project is not expected to have any material adverse impacts on equine health.

Anglo American will conduct real-time air quality monitoring so that potential exceedances can be identified and avoided. Anglo American will regularly consult with Darley Australia and Coolmore Australia about the dust levels resulting from the Project.

Anglo American will respond if there is found to be a material adverse effect on horses as a result of blasting.

All monitoring will be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

8.6 Visual

8.6.1 Background

A visual impact assessment was undertaken by JVP Visual Planning and Design (JVP) and is provided in Appendix I. The purpose of the assessment was to define the character of the surrounding landscape, assess the visual impacts of the Project and recommend measures to mitigate and manage these impacts. This included an assessment against the gateway criteria contained within the SRLUP to determine whether the Project would lead to a significant impact on either the Equine or Viticulture CICs.

8.6.2 Methodology

The assessment methodology was designed to determine the level of visual impact the Project will have on receivers in surrounding areas. The methodology involved the following main steps:

- Delineation of the visual study area;
- Definition of the existing landscape setting;
- Selection of representative viewing locations for the assessment;
- A combined consideration of the visual sensitivity of representative viewing locations and the visual effect of the Project components in order to determine the level of visual impacts; and
- An assessment of night lighting impacts.

Further details on each of these main steps are provided below.

Visual Study Area

The visual study area is the extent of the surrounding landscape that potentially has the most critical views of the Project. It was delineated based on a review of topographic plans, high resolution aerial photography and confirmed through observations in the field. The visual study area formed the focus of the visual impact assessment. The visual study area contains a diverse range of landscape settings, which vary as a result of topography, vegetation and land use.

The visual study area can be divided into four distinct viewing sectors namely the southern, northern, eastern and western sectors (see Figure 47).

The Project components associated with the existing Drayton Mine will not be changed from what is currently approved. As such views of the Drayton Mine have not been included.

Existing Landscape Setting

This step included an assessment of the existing landscape setting of the Project Boundary and surrounding areas. This enabled the visual character of the landscape and visual sensitivity of the surrounding areas to be determined.

Representative Viewing Locations

There are numerous locations within the visual study area that may experience views of the Project. For the assessment, the representative viewing locations were selected in consultation with neighbouring stakeholders. The viewing locations adopted for the visual impact assessment are shown in Figure 47 and include:

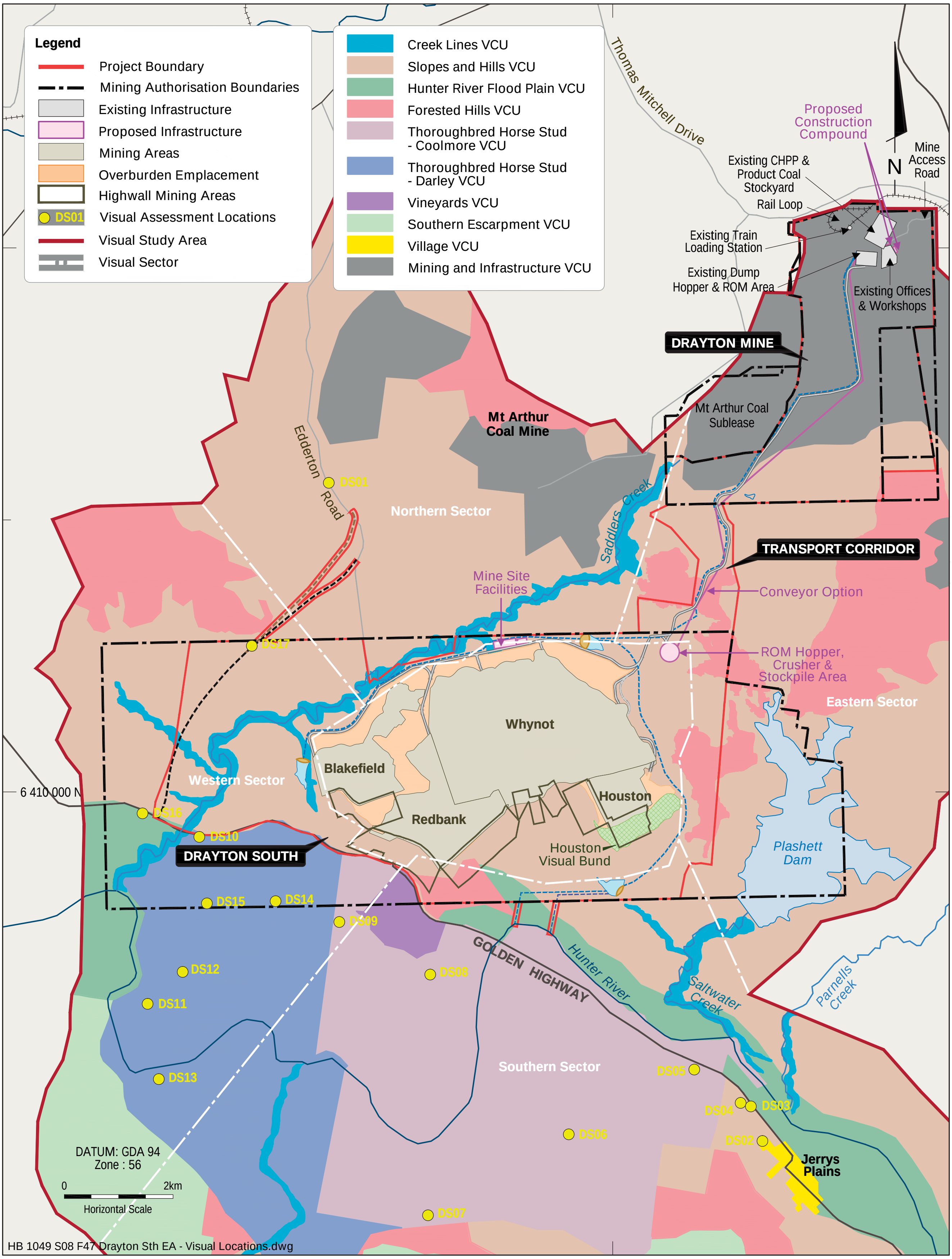
- Northern sector:
  - DS01 – Edderton Road.
- Southern sector:
  - DS02 – Jerrys Plains, Pagan Street;
  - DS03 – Jerrys Plains, Golden Highway;
  - DS04 – Gee's Property, Residence;
  - DS05 – Coolmore Stud, Ellerslie Residence;
  - DS06 – Coolmore Stud, Oak Range Road (Top);
  - DS07 – Coolmore Stud, Back Gate;
  - DS08 – Coolmore Stud, Batty Hill; and
  - DS09 – Coolmore Stud, Quarry / Cattle Paddock.
- Western sector:
  - DS10 – Woodlands Stud, Front Gate;
  - DS11 – Woodlands Stud, Manager's House;
  - DS12 – Woodlands Stud, Bowman's Hill;
  - DS13 – Woodlands Stud, Lookout;
  - DS14 – Woodlands Stud, Trig Hill;
  - DS15 – Woodlands Stud, Randwick;
  - DS16 – Ogilvies Hill, Golden Highway; and
  - DS17 – Edderton Road Realignment.

As there is limited visibility and no sensitive receivers in the eastern sector, no viewing locations were assessed.

Photographs of the view toward the Project Boundary were taken at standing eye level from the representative viewing locations. Three-dimensional computer modelling was used to generate a conceptual view of the Project from each of the representative viewing locations.

A conceptual view of the Project (photomontage) was generated for Years 3, 5, 10 and 27 of the Project. The photomontages were used to accurately illustrate the level of visual contrast between the existing environment and the visible aspects of the Project.

A complete set of the photomontages for each representative viewing location is presented in Appendix I with a selection also provided in Section 8.6.4.



DRAYTON SOUTH COAL PROJECT

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Visual Study Area and Assessment Locations

FIGURE 47

Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the landscape is perceived by persons occupying the surrounding land. Viewing locations situated in residential, tourist and recreation areas, and in case of the Project neighbouring horse studs, will have a higher visual sensitivity than locations in industrial or agricultural areas. This is a result of such operations using the scenic amenity values of the surrounding landscape as part of their business image.

Visual sensitivity is affected by factors such as screening, distance and orientation of the receiver in relation to the Project. However, if views are completely shielded from a particular location, a visual sensitivity score will not be assigned.

Visual Effect

Visual effect is the measure of the visual contrast between the Project and the surrounding environment. If there is significant contrast between the elements of the Project and surrounding landscape, the visual effect will be high. Conversely, if the elements of the Project can be substantially integrated into the existing landscape, the visual effect will be low.

Visual effect is also dependent upon the proportion of the primary viewing zone (PVZ) that is occupied by elements of the Project. If aspects of the Project feature prominently in the view from a location, the visual effect on that location is high. In contrast, if the Project occupies only a small portion of the total view, the visual effect will be low.

Visual Impact

The visual impact of the Project is assessed using a qualitative assessment of the visual sensitivity of the viewing locations and the visual effect caused by activities associated with the Project. The relationship between visual sensitivity, visual effect and visual impact is depicted in Table 46.

Lighting Impacts

Lighting impacts were evaluated qualitatively with consideration to both direct lighting effects and diffuse light effects during the night period. Direct lighting effects occur where there is a direct line of sight between the light source and the viewing location. Indirect lighting effects or diffuse light refers to the night glow created when light is reflected into the atmosphere.

8.6.3 Existing Landscape Setting

The visual character of the regional and local landscape in the vicinity of the Project is created by the mosaic of topographic form, vegetation and land cover, the Hunter River, Saddlers Creek and various land use patterns. These landscape features combine in various ways to create areas of relative visual uniformity that can be defined as visual character units (VCUs). The VCUs combine in various vistas that are obtained from viewing locations such as residences and roadways.

Figure 47 illustrates the VCUs within the visual study area and include the:

- Creek Lines VCU;
- Hunter River Flood Plain VCU;
- Slopes and Hills VCU;
- Forested Hills VCU;
- Southern Escarpment VCU;
- Thoroughbred Horse Stud Coolmore VCU;
- Thoroughbred Horse Stud Darley VCU;
- Vineyard VCU;
- Village VCU; and
- Mine and Infrastructure Area VCU.

The southern extent of the visual study area is defined by Wollemi National Park, which is a densely forested conservation area with steep topography, escarpments, isolated knolls and ridges. In the foreground of the escarpments of Wollemi National Park to the south of the Golden Highway are Coolmore Stud and Woodlands Stud. These two horse studs present irrigated grazing lands and distinctive timber post and rail fences and stock yards, which from the Golden Highway creates an attractive rural landscape with high visual appeal.

Surrounded by the grazing lands of Coolmore Stud and Woodlands Stud is the Arrowfield Estate vineyards, a commercial enterprise that in the past has operated a small scale winery and restaurant. The vineyard consists of a knoll covered by the tiers of vine rows generally following the hillside contours and local topography. These vineyards create a textured patchwork visual appearance on the landscape interspersed with mature remnant vegetation.

The northern and western extents of the visual study area contains undulating topography, including Mt Arthur, Ogilvies

Table 46 Visual Impact Assessment Matrix

Visual Sensitivity	Visual Effect			
	High	Moderate	Low	Very Low
High	High Impact	High Impact	Moderate Impact	Low Impact
Moderate	High Impact	Moderate Impact	Low Impact	Low Impact
Low	Moderate Impact	Low Impact	Low Impact	Low Impact

Hill and their associated ridges, spurs and foothills. There is extensive rural land with limited sensitive receivers in these sectors.

The eastern sector of the visual study area is comprised largely of the buffer lands associated with Macquarie Generation's Bayswater Power Station and is characterised by gently rolling grassy hills and grazing land with interspersed woodland. These features largely screen all views from the eastern sector from which there are no sensitive receivers.

The Hunter River, Saddlers Creek and Saltwater Creek are the primary watercourses meandering through the visual study area. Other significant features within the existing landscape include Coolmore Stud and Woodlands Stud, Arrowfield Estate, Mt Arthur Coal Mine, the existing Drayton Mine, Bayswater and Liddell Power Stations and Plashett Dam.

The various VCUs within the visual study area create a diverse range of visual settings and views. The forested hills create minor visual features within the landscape, contrasting strongly with the pale coloured gentle slopes of cleared grazing land. They also often create visual screens to and within the Project Boundary. In this regard, the forested hills within the Project Boundary are especially significant.

Further details on the aesthetic features of the VCUs are described in Appendix I.

Consideration of Scenic and Landscape Values

In view of the SRLUP, the region's scenic and landscape values were considered. It is recognised that scenic and landscape diversity form a resource base for tourism and associated agricultural pursuits such as viticulture and thoroughbred horse breeding. In this context the Project is considered.

In terms of scenic and landscape quality the various VCUs that make up the Project site combine to create a common but none the less intact landscape. That intactness is however adjoined and to a certain degree compromised by existing mining at Mt Arthur Coal Mine, Hunter Valley Operations and the existing Drayton Mine. Even though the mix of VCUs that make up the Project site and its surrounds create some variety in the rural landscape they would be considered minimal or common in terms of landscape quality.

Given the open character of the Project site it would have a low visual absorption. However, the ridge adjacent to the southern boundary of the Project protects for the greater part the sensitive areas of Coolmore Stud, Woodlands Stud and Arrowfield Estate. Parts of Coolmore Stud to the south of the Golden Highway including a number of residences will be exposed to the construction of the Houston visual bund for a period of 16 months. However the staged construction of the visual bund and progressive rehabilitation will reduce the potential visual impact. In a similar way the Golden Highway will be screened with exceptions to the east in the vicinity of Jerrys Plains.

The Project has been developed in consultation with Coolmore Australia to minimise visual impacts from various locations and vantage points across the property. To a large degree this has been achieved with the exception of views that will be available during the construction of the Houston visual bund.

As such, the Project does not significantly compromise the scenic and landscape settings of the tourism and agricultural businesses around the Project with activities for the greater part screened by existing topography and the proposed Houston visual bund. The potential visual impacts of the Project are described and assessed in greater detail in the following section.

8.6.4 Impact Assessment

Alternative Visual Bunds Considered

The visual impact assessment has determined that views to the Project are largely screened from the surrounding areas due to extensive redesign of the mine plan, existing natural topography, remanent vegetation and the establishment of tree screening. The exception is the views that will be available to the Houston visual bund while it is being constructed. Once established the Houston visual bund has been designed to integrate with the existing ridgeline and will assist in shielding views to the Project over the remaining operational years. As discussed in Section 4.16.6, considerable engineering and design works have been undertaken on a number of alternative bund designs as part of the Project planning phase. This included an evaluation of the effectiveness of each bund option to shield the operations from sensitive receivers and an analysis of the visual impacts that would likely be experienced during the construction of each alternative bund option.

To ascertain the effectiveness of the preferred design option (Option 3), earlier montages of Option 1 and 2 were compared with the preferred design for the Project. Photomontages are included in Figure 48 and Figure 49 showing the views from DS06 Oak Range Road (top of hill) and DS08 Batty Hill, which are two of the more sensitive viewing locations located on Coolmore Stud (refer to Figure 47).

DS06 Oak Range Road (Top of Hill)

The view point is of high sensitivity being that it is a road frequently used on the Coolmore Stud. The view to the north along Oak Range Road looks directly towards the Houston visual bund.

Figure 48 comparatively illustrates the extents of the three options against the existing view from the top of the hill on Oak Range Road.

From this viewing point, Options 2 and 3 have little variation in their visual effect, with Option 3 being slightly wider in the eastern sector. Height difference between the two options at this distance would be indistinguishable to the naked eye. Option 1 is very similar in area of PVZ, but its closer proximity would heighten the visual effect marginally.

All options will have high to moderate visual effect during the construction stage of the bund before any rehabilitation work is undertaken. By Year 5 rehabilitation will have been completed and trees planted. Over time the development of these trees will further soften the bund and allow for integration with the existing ridge line profile reducing the visual effect significantly.

DS08 Batty Hill

This is a viewpoint of high sensitivity being a lookout point on the Coolmore Stud where visitors are taken for an overview of the property.

Figure 49 comparatively illustrates the extents of the three options against the existing view from Batty Hill. Option 1 was initially shown to Coolmore Australia during the 2009 modelling work through to the initial EA modelling work. Options 2 and 3 are alternative designs investigated following feedback from Coolmore Australia in 2011.

Option 2 has the least visual effect being the furthest distance from the sensitive receiver on Batty Hill. Option 3 is slightly more visible as its profile crest is higher and is closer to Coolmore Stud than Option 2.

Both Options 2 and 3 would have high to moderate visual effect during the construction stage of the bund before any rehabilitation work is undertaken. As rehabilitation is completed, established grass land and trees will further soften the bund and screen the ridge line profile reducing the visual effects significantly. Both of these options have a smaller area of PVZ visible than the broader face of Option 1 as was originally proposed.

Assessment of the Project

The visual impact will vary according to the visual effect of the Project (its visibility) and the visual sensitivity of areas from which it is seen. These factors are considered together as indicated in Table 46 to determine impact levels by sector.

Northern Sector

The northern sector includes the existing Mt Arthur Coal Mine, Mt Arthur and a few isolated rural properties. It is predicted that viewing locations in this sector that are situated within 7.5 km of the Project Boundary will have a high sensitivity to changes in the existing landscape where views are available. In some instances, existing vegetation in the immediate vicinity will limit such views.

Edderton Homestead, which is owned by HVEC, is the only residence in this sector and it will have close views (<2.5 km) into the northern elements of the Project. As such it will likely experience high visual impacts during the early stages of the Project. This visual impact will be reduced to moderate and then low as the northern most extent of the OEAs are rehabilitated and mining advances further south.

Also within the northern sector are parts of Edderton Road , which would have a moderate sensitivity. Due to the potential for some views towards the northern faces of the OEAs from sections of Edderton Road (particularly where tree screens are not able to be planted) this will result in a high / moderate visual impact. This visual impact will be reduced to moderate and then moderate to low as the Blakefield and Whynot OEAs are rehabilitated and mining advances further south. The majority of views from Edderton Road will be screened by existing foreground vegetation (see DS01 photomontage, Appendix I) and the tree screens planned to be planted as part of the Project.

Finally, Mt Arthur which is also within the northern sector will experience high visual effects, however the low sensitivity of the restricted view location reduces impacts to moderate to low.

The impact levels on the sector as a whole will quickly be reduced as the outer faces of the OEAs are rehabilitated. This will change visual effect levels from high to moderate and eventually to low. The visual impact levels will be similarly reduced.

Eastern Sector

The eastern sector is dominated by buffer lands for Macquarie Generation's Bayswater Power Station. There are no residences or sensitive receivers in this sector. As a result, there will be minimal visual impact on the eastern sector.

Southern Sector

The southern sector contains the village of Jerrys Plains, scattered rural residences, Coolmore Stud and Arrowfield Estate. It is predicted that viewing locations in this sector that are situated within 7.5 km of the Project Boundary will have a high sensitivity to changes in the existing landscape where views are available. In some instances, existing vegetation, local topography and buildings in the immediate vicinity will limit such views.

The visual impact on the village of Jerrys Plains is limited. The western edge of the village only has potential views of the construction of the Houston visual bund. Visual effects for the majority of Jerrys Plains would be moderate to low except for Pagan Street, areas of the Golden Highway and the Gee's residence. These areas would experience views of the Houston visual bund while it is being constructed. During this time (estimated 16 months) the visual effects for these areas would be high. When combined with the high sensitivity of these residences, this would create a high visual impact on sensitive receivers in this part of Jerrys Plains. These impacts

Visual Bunds

Option 1 Option 2 Option 3 - Project

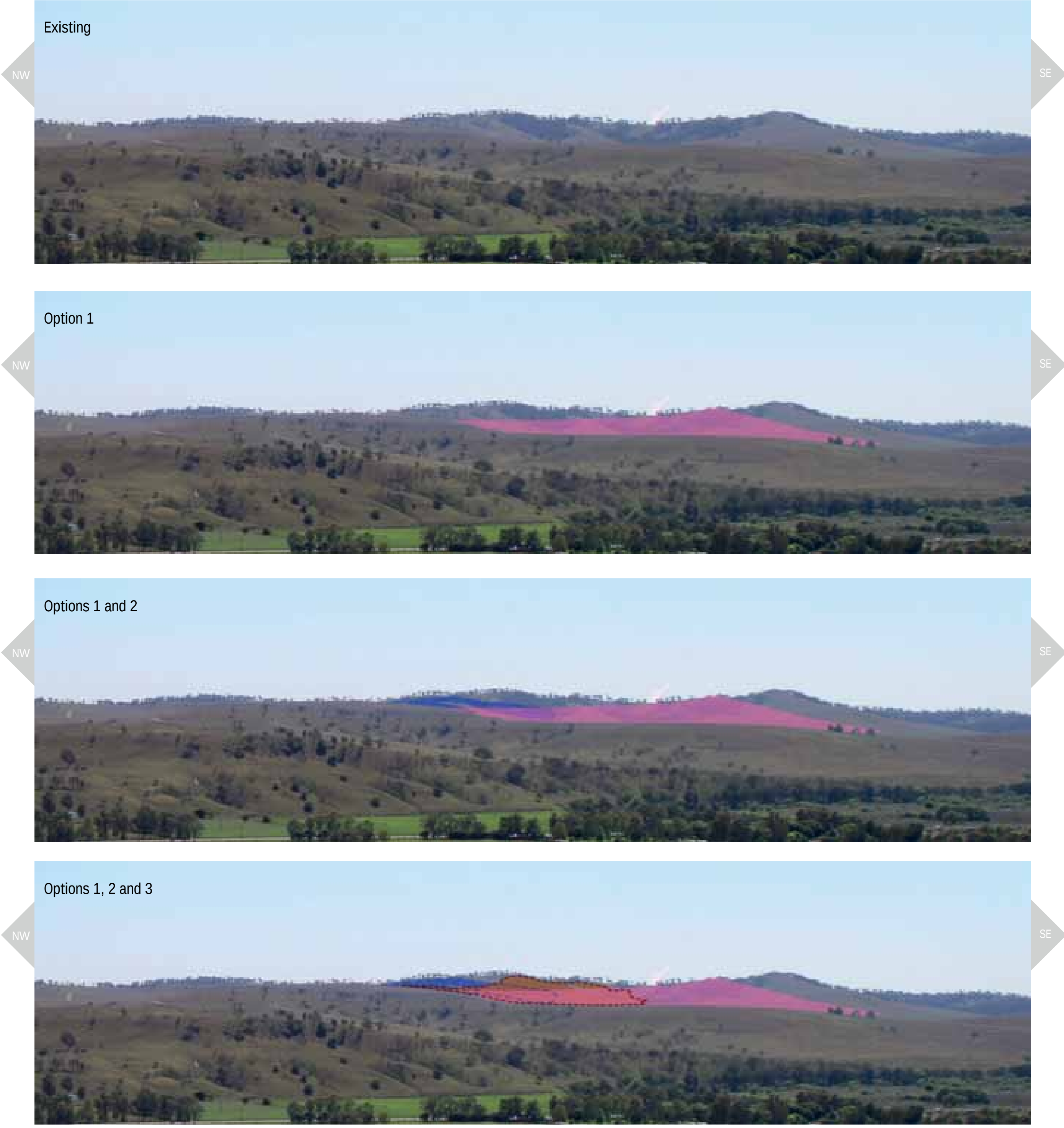
SCK52 - 1049 - BUND COMPARISONS - DS06 (DS15) COOLMORE - OAK RANGE ROAD (TOP) .ai

DRAYTON SOUTH COAL PROJECT

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Photomontage – Location DS06
Coolmore Stud, Oak Range Road (Houston Visual Bund Alternatives)

FIGURE 48



Visual Bunds

Option 1 | Option 2 | Option 3 - Project

SCK52 - 1049 - BUND COMPARISONS - DS08 (DS12) COOLMORE - BATTY HILL.ai

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS08
Coolmore Stud, Batty Hill (Houston Visual Bund Alternatives)

FIGURE 49

would be reduced as rehabilitation is completed. This is likely to be no more than three to five months following completion of the final stage lift of construction. After this, the visual impact will be reduced to low for the remainder of the Project reflecting decreasing visual effect levels. The visual effects for Jerrys Plains are illustrated in Figure 50 and Figure 51 from DS03 Golden Highway on the western side of the village.

The visual impact on Coolmore Stud is also limited. The operational areas of the Blakefield, Redbank and Whynot mining areas have been designed to conceal them from views at the most sensitive locations on the flood plain and the slopes of adjoining hills. This includes the main office, major stables and paddocks as well as the residences.

The more open views to the Houston mining area along an open gully line are screened from view by the establishment of the Houston visual bund. The construction of the bund will create a high visual effect over a 16 month period. To limit potential high impact periods, the construction of the bund has been designed in a series of lifts with progressive rehabilitation being undertaken as part of this process (see Figure 52 to Figure 53 and Section 4.7). This limits the visible lifts of the bund to approximately 11 months. The visual impacts anticipated during the construction of the Houston visual bund from Coolmore Stud are likely to be high. These impacts would be reduced as rehabilitation is completed. This is likely to be no more than three to five months following completion of the final stage lift of construction. After this, visual impact will reduce to moderate and then low reflecting decreasing visual effect levels.

Once constructed the Houston visual bund adds to the effect of the existing ridgeline in shielding views from all of the sensitive viewing locations on Coolmore Stud during the remaining years of the Project.

There will be open views to the operational areas of the Project from a ridge that supports a maintenance road and passes cattle yards and the Coolmore Stud quarry. This ridge will experience high visibility and visual effects. This location has been considered as a broad acre rural area and assigned a low sensitivity as it is not utilised as part of the day to day operations of the thoroughbred breeding aspects of Coolmore Australia's business. It also currently has views of the existing Mt Arthur Coal Mine, Hunter Valley Operations Coal Mine and Bayswater Power Station. As such, the visual impacts at this location are assessed as being moderate to low.

The visual effects for Coolmore Stud are illustrated in Figure 52 to Figure 55 from viewing locations DS06 Oak Range Road (Top) and DS08 Batty Hill.

Arrowfield Estate contains a small vineyard and an unused winery and cellar door. There are three residences on the property, none of which will experience views of the Project due to screening provided by a significant ridgeline to the immediate south of the Project Boundary. At higher elevations in the southern portion of the property, there may be views of the Project. However, these locations are of low visual sensitivity as they are not associated with past or present commercial activities conducted on the property.

Accordingly following due consideration of the gateway criteria as prescribed under the SRLUP (as outlined in Section 5.5) the visual impact assessment concludes that the Project will not lead to significant impacts on the Equine or Viticulture CICs through a loss of scenic and landscape values. As described above for the Coolmore Stud and the surrounding areas within the southern sector the visual impacts associated with the Project will be relatively short term in nature (approximately 16 months) with all other major Project components including mining areas and OEAs being designed to remain behind the existing southern ridgeline and out of view. There will also be no views to the Project (including the Houston visual bund) from the Arrowfield Estate winery, cellar door or existing residences.

Western Sector

The western sector contains Woodlands Stud, four rural residences and the realigned portion of Edderton Road where it joins the Golden Highway. It is predicted that viewing locations in this sector that are situated within 7.5 km of the Project Boundary will have a high sensitivity to changes in the existing landscape. In a number of instances, existing vegetation and local topography in the immediate vicinity will limit such views in this sector.

The visual impact on Woodlands Stud is very limited. Most of the property, including the main entrance gate on the Golden Highway, manager's residence, the lookout, Randwick Park and all residences and stables are screened by existing topography. The only exception is the location on Trig Hill. However, this location has been considered as a broad acre rural area and assigned a low sensitivity as it is not utilised as part of the day to day operations of the thoroughbred breeding aspects of Darley Australia's business. It also currently has views of the existing Mt Arthur Coal Mine. As such it is assessed as experiencing moderate to low visual impacts.

The visual effects for Woodlands Stud are illustrated in Figure 56 to Figure 58 from viewing locations DS10 and DS13 at the front gate and lookout, respectively.

Two western residences, *'Mayland'* and the more elevated *'Luloma'* would have potential views of higher elevation areas of the Whynot OEA. However these receivers are over 7.5 km away and only small portions of these operations would be seen over intervening ridges. The moderate sensitivity and low to moderate visual effects will create a moderate to low impact.

The residences of *'Ravenswood'* and *'New Haven'* are low in elevation and are screened by the Trig Hill ridges. Similarly *'Glen Munro'* is screened by an adjoining ridge line associated with Ogilvies Hill and these residences will not experience impact.

A small portion of the realigned section of Edderton road (less than 1 km) will have views across open grasslands to the Blakefield and Redbank mining areas. This is because this portion of the road is not on Anglo American owned land and as a result, tree screens are not able to be planted. The road has a moderate sensitivity up to 2.5 km. Visual effects will initially be high, therefore a high to moderate visual impact will be experienced along this portion of the road. These visual effects will last up to five years after which OEAs facing the road will be rehabilitated and impacts will be reduced. The exposed parts of Edderton Road do not fall within the defined Equine and Viticulture CICs as described in the SRLUP.

The visual effects for the Edderton Road realignment are illustrated in Figure 59 and Figure 60 from viewing location DS17. As it can be seen the southern 4 km of this road will be completely shielded by tree screens which will be planted as part of the construction period.

Views from the Golden Highway in this sector are limited to glimpses as one travels east along a limited stretch of road (approximately 200 m) on the approach to Saddlers Creek. These limited views would be to the more distant Whynot mining area creating moderate visual effects. This would create low to moderate visual impacts that would reduce once rehabilitation is completed.

Following due consideration of the gateway criteria as prescribed under the SRLUP (as outlined in Section 5.5) the visual impact assessment concludes that the Project will not lead to significant impacts on the Equine CIC through a loss of scenic and landscape values. As described above for Woodlands Stud and the surrounding areas within the western sector the visual impacts associated with the Project will be limited to glimpses as one travels east along a limited stretch of road (approximately 200 m) on the approach to Saddlers Creek and there will be no views from the commercially sensitive areas of Woodlands Stud.

View Loss Assessment

Due to the screening effect of existing topography the potential for view loss is limited and localised to areas with direct views to the Houston visual bund and tree planting along the new alignment of Edderton Road.

The Houston visual bund is located across a small valley in the south-east of the Drayton South area. Through this existing valley there is a limited local view of a maximum of 2.5 km of upper valley areas available to parts of the southern sector. This would include areas along the Golden Highway and a range of locations at Coolmore Stud such as the Ellerslie residences that would additionally loose the view of the upper most tip of Mt Arthur. It is not considered that these localised views are significant and the rural character of the view is maintained by the rehabilitation plan for the Houston visual bund (see Figure 52 and Figure 53).

At Edderton Road, foreground and near middle ground views of existing rural valleys would be screened by roadside plantings (see Figure 59 and Figure 60). The open view of this valley is typical of rural views and does not have any significant features. Loss of this view is not considered significant.

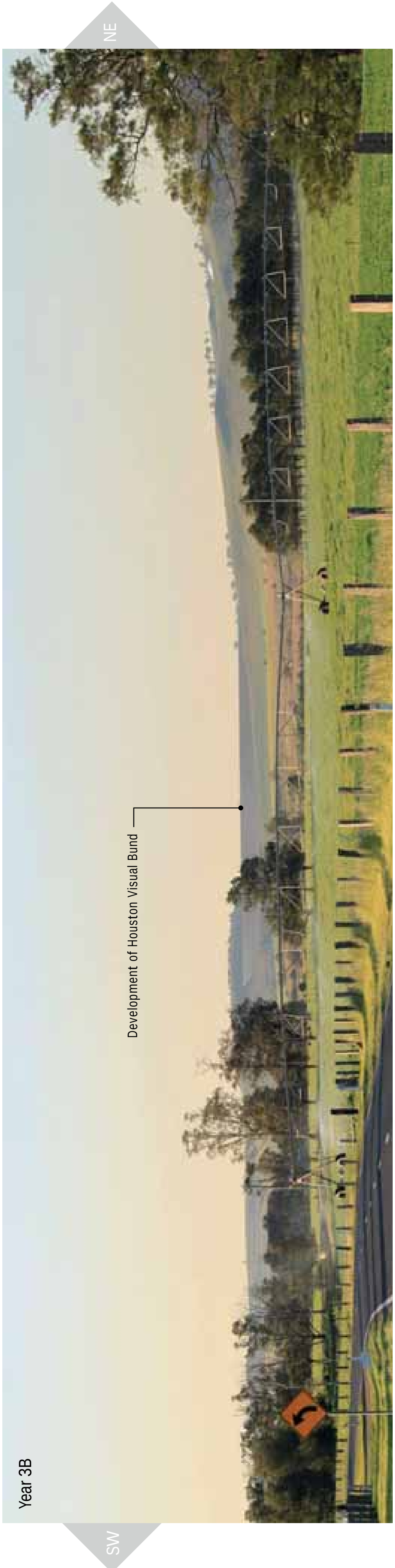
Lighting Assessment

The majority of lighting utilised at a mine site is associated with the CHPP, workshops and load out infrastructure, all of which are located at the existing Drayton Mine. The lighting utilised at the existing Drayton Mine will not change as a result of the Project. These impacts have been assessed as part of the Drayton Mine Extension EA (Hansen Bailey, 2007) and as such have not been reassessed by the Project.

Lighting impacts within the Drayton South area will predominantly be caused by lights fitted to mobile equipment operating outside of active mining areas. In most cases, direct light effects will be limited as a result of existing topography and vegetation. However, there may be intermittent direct light effects due to truck movements associated with the construction of the Houston visual bund. Where practical, other operational lighting at Drayton South, such as lighting plants, will be hooded or directed away from receivers to reduce impacts.

In the first five years of the Project, there will be vehicles and equipment working on the construction of the Blakefield and Redbank OEAs. Such mobile equipment could potentially project light to the north and west of the Drayton South area. The only receiver in these areas is Edderton Homestead, which is owned by HVEC. Once completed, the OEAs will provide complete screening for light emitted within the Drayton South mining areas.

Diffuse light effects are produced by Mt Arthur Coal Mine, Hunter Valley Operations Coal Mine and the existing Drayton Mine. Since the dominant sources of light are located at the existing Drayton Mine, mobile equipment operating within the Drayton South area will not significantly increase the overall diffuse light effect.



SCK52 - 1049 - DS03 (DS24) JERRYS PLAINS GOLDEN HIGHWAY.ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS03
Jerrys Plains, Golden Highway (Year 3A and 3B)

FIGURE 50

SCK52 - 1049 - DS03 (DS24) JERRYS PLAINS GOLDEN HIGHWAY.ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS03
Jerrys Plains, Golden Highway (Year 10 and 27)

FIGURE 51

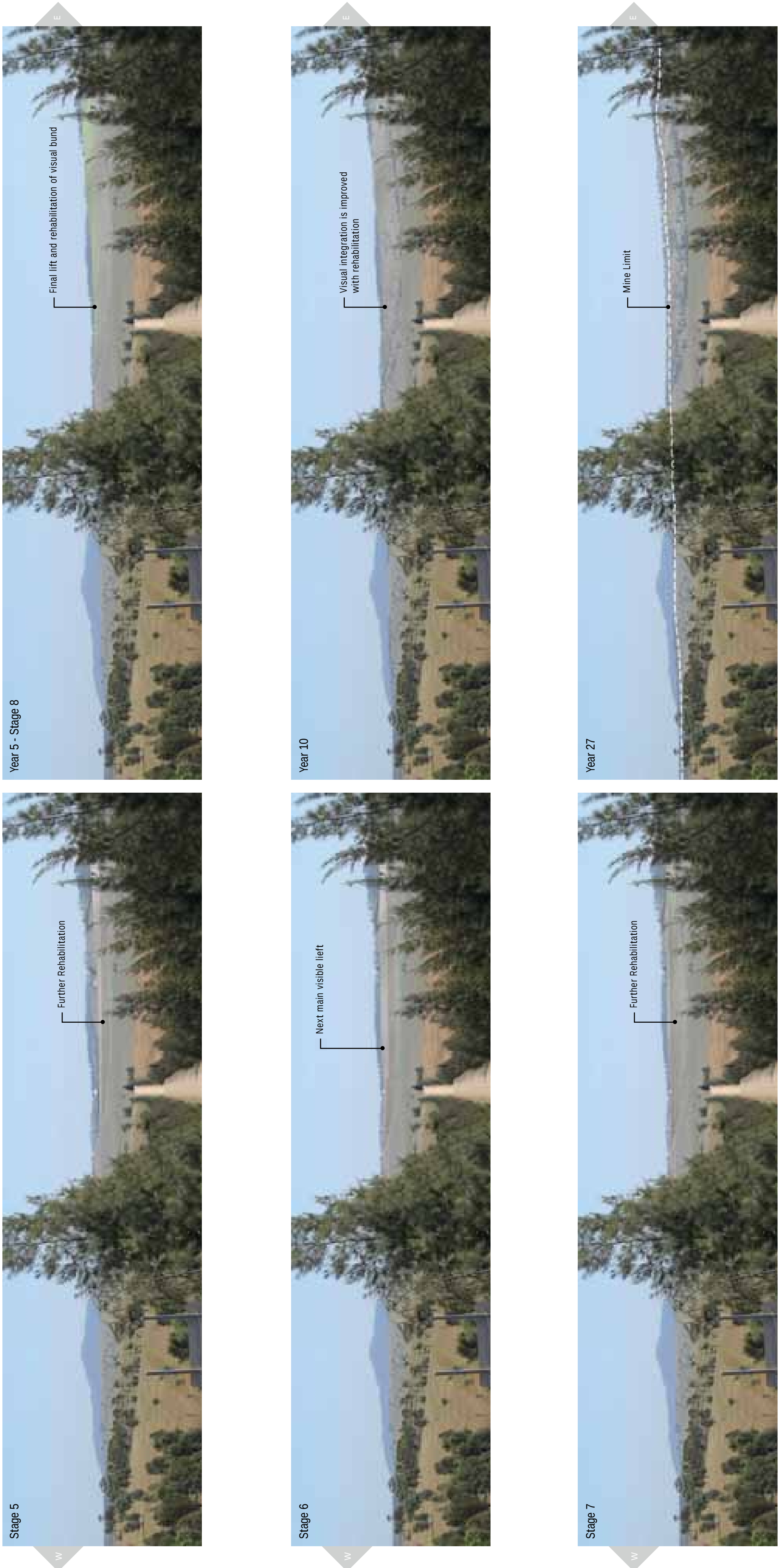
SCK52 - 1049 - DS06 (DS15) COOLMORE - OAK RANGE ROAD (TOP).ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS06
Coolmore Stud, Oak Range Road (Top) (Existing, Year 3A, Stage 1 to 4)

FIGURE 52

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS



SCK52 - 1049 - DS06 (DS15) COOLMORE - OAK RANGE ROAD (TOP).ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS06
Coolmore Stud, Oak Range Road (Top) (Stage 5 to 8, Year 10 and 27)

FIGURE 53

SCK52 - 1049 - DS08 (DS12) COOLMORE BATTY HILL.ai

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DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS08
Coolmore Stud, Batty Hill (Year 3A and 3B)

FIGURE 54

SCK52 - 1049 - DS08 (DS12) COOLMORE BATTY HILL.ai

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS08
Coolmore Stud, Batty Hill (Year 10 and 27)

FIGURE 55

SCK52 - 1049 - DS10 (DS03) WOODLANDS FRONT GATE.ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS10
Woodlands Stud, Front Gate (Existing and Year 3)

FIGURE 56

SCK52 - 1049 - DS10 (DS03) WOODLANDS FRONT GATE.ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS10
Woodlands Stud, Front Gate (Year 10 and 27)

FIGURE 57

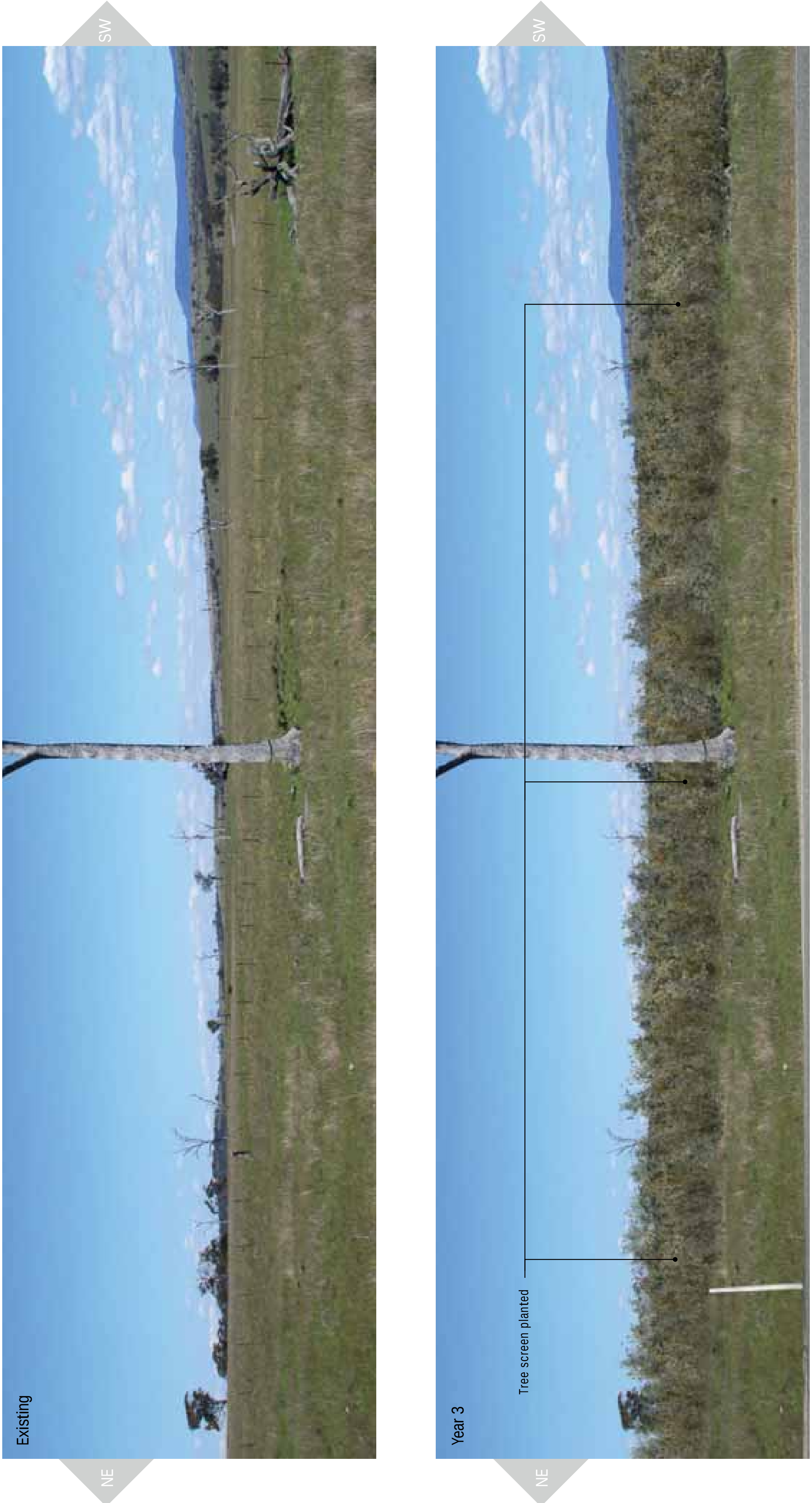
SCK52 - 1049 - DS13 (DS08) WOODLANDS LOOKOUT.ai

AngloAmerican | Hansen Bailey | ENVIRONMENTAL CONSULTANTS

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS13
Woodlands Stud, Lookout (Existing and Year 27)

FIGURE 58



SCK52 - 1049 - DS17 (DS30) EDDERTON RD REALIGNMENT.ai

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS17
Edderton Road Realignment (Existing and Year 3)

FIGURE 59

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

DRAYTON SOUTH COAL PROJECT

Photomontage – Location DS17
Edderton Road Realignment (Year 10 and 27)

FIGURE 60

8.6.5 Mitigation and Management

Numerous mitigation measures have been incorporated into the design and operating plans for the Project that will reduce the visual effect and mitigate the visual impact of the Project on sensitive viewing locations. These include:

- Mine planning and design to ensure that the southern ridgeline is maintained and that all OEAs are developed and shaped so that they remain shielded behind this ridgeline from receivers in the southern sector;
- Development of the Houston visual bund to alleviate potential long term views of the Project. The Houston visual bund has been designed to be constructed as quickly as possible in a staged lift configuration so that each main stage lift is able to be progressively covered with available topsoil and rehabilitated with a crop of pasture grass to minimise exposed areas. Tree plantings, composed of native species, will be established on the visual bund to restore visual amenity and compatibility with surrounding woodland landscapes;
- Tree screens have been established along the Golden Highway and will be planted along the ridgeline adjoining the Houston visual bund and the Edderton Road realignment to minimise views of the Project from various vantage points. These tree screens will be planted prior to and during the construction phase to allow for substantial growth and to maximise the opportunity for establishment;
- Detail planting plans will be prepared to clearly illustrate areas and character of planting on all rehabilitation areas including the visual bunds and tree screens;
- Progressive rehabilitation of OEAs and disturbed areas;
- Use of compatible tones for building and cladding colours. Such colours will include tonal variations of existing colours in the surrounding landscape;
- Use of low lux lamps and direction of fixed lights toward the ground, where practical; and
- Implementation of work procedures related to the use of mobile lighting plants to avoid adverse offsite lighting impacts.

The mitigation measures listed above will reduce the visual effect of Project components by reducing visibility for sensitive receivers and reducing the level of contrast with the surroundings.

Anglo American will also conduct ongoing consultation with stakeholders surrounding the site over the life of the Project. Should any issues arise in relation to visual impacts on surrounding sensitive viewing locations, these will be addressed through consultation with the relevant parties. If deemed necessary following further consultation with the relevant stakeholder, additional visual impact mitigation may be achieved at specific sensitive viewing locations via offsite visual treatments, such as establishing tree screens and/or plantings at the viewer's location to reduce visibility.

At completion of mining operations, the Project will be fully rehabilitated and decommissioned. The final rehabilitation and decommissioning of the site will involve further revegetation of disturbed areas on the mine site with woodland communities (see **Section 8.17**).

8.7 ECOLOGY

8.7.1 Background

An ecology impact assessment was undertaken by Cumberland Ecology Pty Ltd (Cumberland Ecology) and is provided in **Appendix J**. The purpose of the assessment was to characterise the terrestrial and aquatic flora and fauna at Drayton Mine and within the Drayton South area, including threatened species, populations and ecological communities protected under the TSC Act, Fisheries Management Act and the EPBC Act, assess the impacts of the Project on biodiversity values and recommend measures to mitigate and manage these impacts.

8.7.2 Methodology

Desktop Assessment

The biodiversity at Drayton Mine and within the Drayton South area and its surrounding areas have been extensively surveyed to support various project applications for mining and conservation projects.

These include assessments undertaken for the Drayton Mine Extension EA (Hansen Bailey, 2007), Saddlers Creek Mine (Ecotone, 2000; The Ecology Lab Pty Ltd, 2000), Bayswater Power Station (Eco Logical Australia Pty Ltd, 2009) and Mt Arthur Coal Mine (Dames and Moore, 2000; Umwelt (Australia) Pty Limited, 2006a, 2006b, 2007; Cumberland Ecology, 2009). Regional vegetation mapping of the central Hunter Valley, which incorporates Drayton Mine and the Drayton South area, has also been undertaken on behalf of the CMA (Peake, 2006).

A desktop assessment was undertaken to review the available information relevant to biodiversity at Drayton Mine and within the Drayton South area. The assessment considered published information from numerous ecological surveys undertaken for sites in the vicinity of the Project, including the Mt Arthur Coal Mine, Mount Pleasant, Bengalla Coal Mine, Muswellbrook Coal Mine and Bayswater B Power Station. Further information on biodiversity values were also sourced through regional vegetation mapping (Peake, 2006), the *Atlas of NSW Wildlife* (OEH, 2011) and the EPBC Act Protected Matters Search Tool (SEWPaC, 2011).

The Protected Matters Search Tool lists the Matters of National Environmental Significance (MNES) that are predicted to occur based on the presence of suitable habitat. This information was useful for informing threatened species searches during the field assessment.

Field Assessment

In order to understand the key biodiversity values of the Drayton South area and validate previous assessments, Cumberland Ecology undertook preliminary baseline surveys in 2009 and 2010 to characterise flora and fauna assemblages, including MNES. The results from these preliminary surveys were used to guide more detailed surveys for the EA within the Drayton South area in conjunction with surveys at Drayton Mine throughout 2011.

Surveys included comprehensive flora, fauna and aquatic investigations over a range of seasons to maximise opportunities of recording migratory and breeding species and accurately identifying plants in flower or with fertile material. The survey effort at Drayton Mine and within the Drayton South area is detailed in Table 47.

Flora Survey

The mapping of vegetation communities across the Drayton South area was initially guided by regional mapping completed by Peake (2006). The detailed vegetation mapping was then undertaken using quadrat sampling and meander transect surveys. Community boundaries were recorded using Global Positioning System (GPS).

Vegetation mapping by Peake (2006) indicated a high potential for the occurrence of the EPBC Act and TSC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) within the Drayton South area. The *EPBC Act Policy Statement for the Identification and Assessment of Box Gum Woodland and Derived Grasslands* (DEH, 2006) provides a prescriptive methodology for determining the presence of the Critically Endangered Ecological Community (CEEC), which was adopted during the field assessment.

The resultant information from the survey was synthesised using Geographical Information Systems to create a spatial database and develop a vegetation map within the Drayton South area. Aerial, topographical and geological data were also used to interpret the survey data.

The flora assemblage within the Drayton South area was recorded by quadrat sampling, random meander surveys and through targeted searches for threatened species.

A total of 35 quadrats were sampled over the course of the field assessment. The locations of these quadrats were based on the condition and composition of the vegetation patch.

The flora survey also included an assessment of the potential occurrence of groundwater dependent ecosystems (GDEs). GDEs found in NSW include:

- Terrestrial vegetation;
- River base flow systems;
- Aquifer and cave ecosystems; and
- Wetlands.

Of these GDEs, the ecosystem with the most relevance to the Drayton South area is terrestrial vegetation, where forest and woodland may be sustained, either permanently or periodically, by shallow but high quality groundwater.

Table 47 Field Assessment Survey Effort

Date	Task
Drayton South Area	
14 to 18 March 2011	• Mammal trapping; • Vegetation quadrats; • Threatened flora survey (with focus on *Acacia pendula*); and • Threatened bat surveys
2 to 3 May 2011	• Water quality sampling along Saddlers Creek and at the confluence with the Hunter River; • Macro-invertebrate sampling; and • Riparian habitat assessment
20 to 24 June 2011	• Systematic bird census, including winter migratory species; • Habitat assessment including tree hollows; • Mammal trapping; • Diurnal and spotlighting surveys; and • Vegetation quadrats
9 to 10 August 2011	• Vegetation mapping and quadrats
23 September 2011	• Targeted threatened flora survey (with focus on threatened orchids and *Acacia pendula*); and • Vegetation quadrats
Drayton Mine	
30 September 2011	• Assessment of minor additional mining areas at Drayton Mine

Fauna Survey

Over 1,000 trap nights and 50 person hours were accumulated during the fauna survey. The survey effort was conducted over numerous sites and included:

- Microchiropteran bat surveys, including anabat echolocation recordings and harp trapping;
- Reptile and amphibian surveys, including active searches (diurnal and nocturnal);
- Bird surveys (diurnal and nocturnal);
- Small mammals surveys (spotlighting and Elliott and cage trapping for arboreal species);
- Infra-red camera traps;
- Fauna habitat assessments;
- Systematic hollow-bearing tree assessments; and
- Aquatic sampling, in accordance with standard Australian Rivers Assessment System (AUSRIVAS) procedures.

8.7.3 Existing Environment

Vegetation Communities

The additional mining areas proposed at Drayton Mine mainly comprise of rehabilitated grassland sown with exotic species (18 ha) and to a lesser extent young regrowth Hunter Lowland Redgum Forest (0.4 ha), which is listed as an Endangered Ecological Community (EEC) under the TSC Act.

A high proportion of the Drayton South area is dominated by extensive areas of native perennial grassland of various diversity and floristic composition that has been derived from the clearing of the original woodland and forest communities. Remnant forest and woodland exist as scattered patches, particularly along riparian corridors and in steeper areas across the Drayton South area. The mosaic of grasslands and remnant woodland patches is typical of the locality and a result of extensive agricultural practices.

Table 48 lists the vegetation communities that were identified within the Drayton South area. This table also provides the area and status of each community as prescribed under the TSC Act and EPBC Act. **Figure 61** illustrates the spatial distribution of vegetation communities within the Drayton South area.

The majority of the remnant forest and woodland within the Drayton South area is dominated by *Eucalyptus moluccana* (Grey Box), which conforms to the Central Hunter Box-Ironbark Woodland. The remainder of the area is occupied by smaller patches of other threatened and non-threatened communities.

Upper Hunter White Box-Ironbark Grassy Woodland occurs as patches of remnant open woodland and derived native grassland in high, undulating country within the northern and eastern sectors of the Drayton South area. Narrabeen Footslopes Slaty Box Woodland occupies drier sites in the central sector and regenerating patches of *Allocasuarina luehmannii* and *Acacia salicina* are common in the western sector.

Allocasuarina luehmannii conforms to the Central Hunter Bulloak Forest Regeneration and is typically found in landscapes extensively modified by clearing and livestock grazing. *Acacia salicina* conforms to the Cooba Scrubland where it dominates a shrub stratum with little to no overstorey eucalypt emergents.

Saddlers Creek is sparsely populated by Hunter Floodplain Red Gum Woodland and Hunter Valley River Oak Forest. The principal species in these vegetation communities include *Eucalyptus camaldulensis* (River Red Gum) and *Casuarina cunninghamiana* (River Oak). The presence of these species

Table 48 Vegetation Communities

Vegetation Community	TSC Act	EPBC Act	Area (ha)
Central Hunter Bulloak Forest Regeneration	-	-	26
Hunter Valley River Oak Forest	-	-	2
Central Hunter Box-Ironbark Woodland	EEC	-	479
Hunter Floodplain Red Gum Woodland	EEC	CEEC	40
Narrabeen Footslopes Slaty Box Woodland	VEC	-	100
Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	94
Cooba Scrub	-	-	65
Planted Vegetation	-	-	9
Derived Native Grassland – Hunter Floodplain Red Gum Woodland Complex	EEC	CEEC	10
Derived Native Grassland – Upper Hunter White Box-Ironbark Grassy Woodland	EEC	CEEC	159
Other Grassland	-	-	3,613
Total			**4,597**

Note: VEC – Vulnerable Ecological Community.

suggests groundwater dependency as floodplain and creek line communities dominated by such canopy species are likely to have some root access to deep water tables and thus comprise a GDE.

Terrestrial Flora

Habitat within the additional mining areas proposed at Drayton Mine does not support any threatened flora due to the highly modified nature of the environment. In comparison, the Drayton South area supports a very high diversity of native flora with over 250 plant species, including threatened species, recorded in the survey. Table 49 lists the threatened flora that were identified within the Drayton South area and provides the status of each species as prescribed under the TSC Act and EPBC Act. Figure 62 illustrates the location of threatened flora species within the Drayton South area.

Threatened flora species recorded within the Drayton South area are also known to occur in the locality.

Terrestrial Fauna Habitat

Vegetation within the additional mining areas proposed at Drayton Mine has been significantly modified and retains minimal habitat value for fauna due to the poor habitat condition, lack of structural integrity and young age of the community.

The majority of the Drayton South area is comprised of open areas of grassland resulting from historic clearing of remnant vegetation for agriculture. The remaining woodland vegetation has either regenerated from clearing and is very young and structurally simple, or has been modified from its original state due to ongoing land use. Despite the modified nature of the existing landscape, the Drayton South area still provides habitat features for fauna, including:

- Patches of remnant forest and woodland, which provide:
  - Tree hollows suitable as shelter and breeding habitat for a range of hollow-dependant fauna;
  - Blossom-producing trees suitable as forage for a range of nectarivores; and
  - Understorey vegetation as shelter for small mammals and woodland birds.
- Regenerating shrubland (e.g. Cooba Scrub) and forest (e.g. Bulloak Forest Regeneration);
- Grassland;
- Planted trees (which include *Eucalyptus sideroxylon*, a valuable food resource for bird species such as the Swift Parrot);
- Limited riparian habitat; and
- Limited aquatic habitat (e.g. farm dams and creek lines such as Saddlers Creek).

Terrestrial Fauna

There were no records of threatened fauna within the additional mining areas proposed at Drayton Mine. Due to the highly modified nature of the environment, it is unlikely that threatened species will make use of these areas.

The assemblage of fauna residing within the Drayton South area is reflective of long term vegetation clearance and prolonged grazing in the Hunter Valley. These practices have resulted in a simplified and fragmented landscape that has subsequently altered faunal assemblages by encouraging more mobile and adaptive species to thrive.

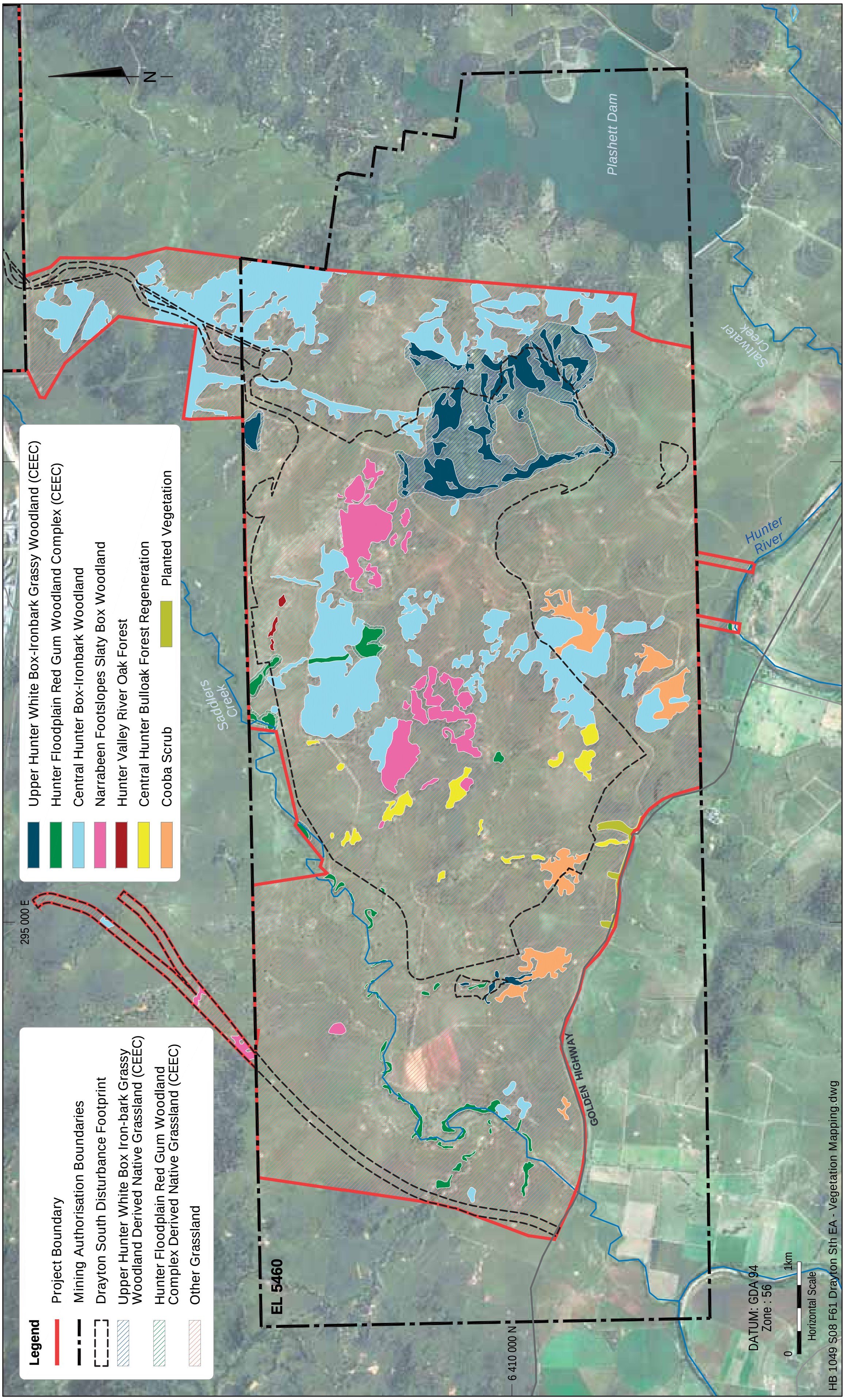
More than 175 fauna species were recorded within the Drayton South area. A large proportion of the recorded species are represented by avifauna and microbats, which are highly mobile. Conversely, reptiles, arboreal mammals and terrestrial mammals do not possess the ability to disperse as freely and as such are not as well represented. Many of the mammals recorded in the survey are represented by stock and exotic species such as cattle, horses, rabbits and mice.

Table 50 lists the threatened fauna that was identified or considered likely to occur within the Drayton South area and provides the status of each species as prescribed under the TSC Act and EPBC Act. Figure 62 illustrates the location of threatened fauna species within the Drayton South area.

Approximately eight amphibian species were recorded across the Drayton South area typically in close proximity to farm dams. The most common frog species recorded were the Eastern Common Toadlet (*Crinia signifera*) and the Spotted Grass Frog (*Limnodynastes tasmaniensis*). Based upon database information and the types of habitats available, no threatened frog species are considered likely to occur within the Drayton South area.

Table 49 Threatened Flora Species

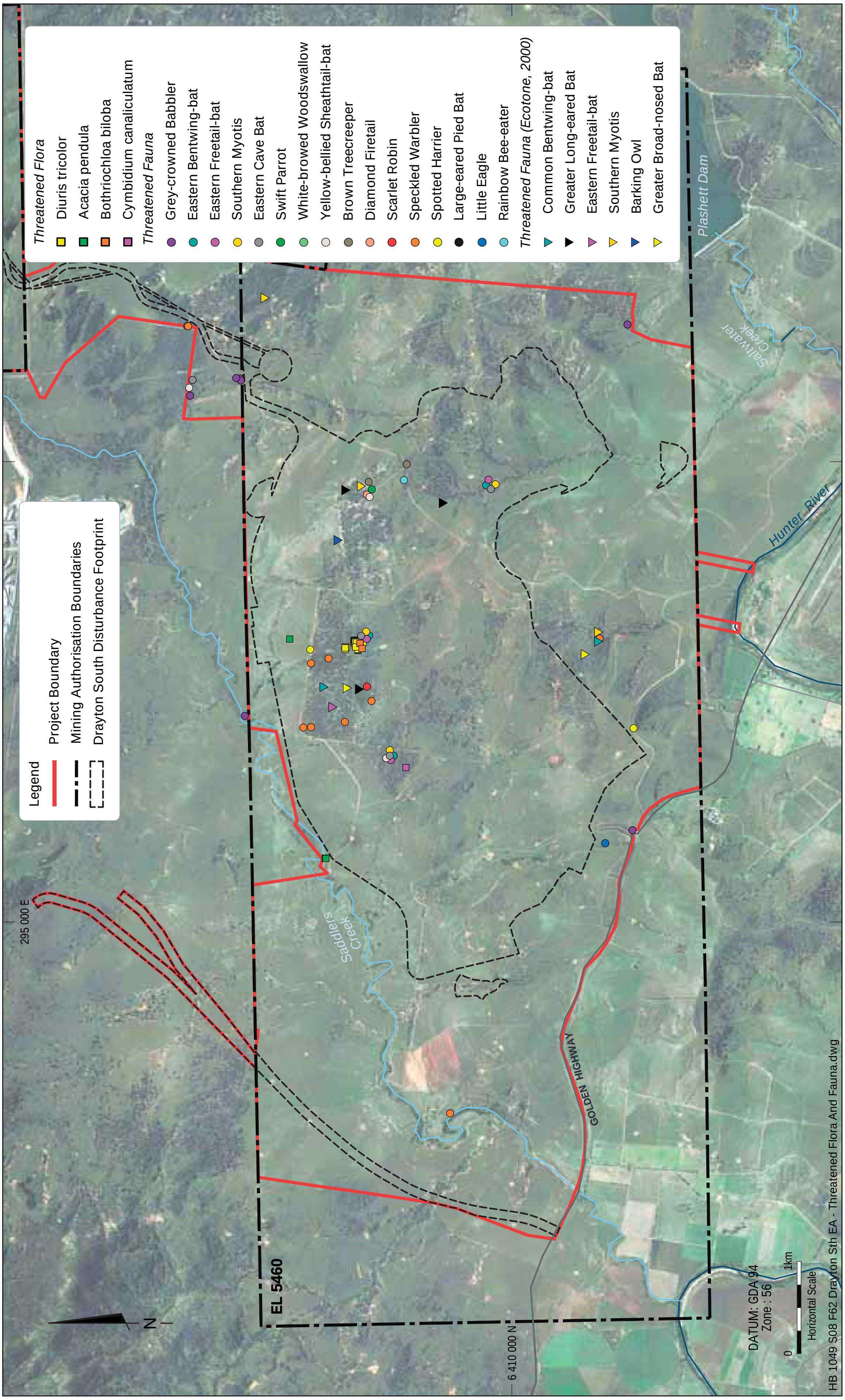
Species	TSC Act	EPBC Act
Acacia pendula (Weeping Myall)	Endangered	-
Eucalyptus camaldulensis (River Red Gum)	Endangered	-
Bothriochloa biloba (Lobed Blue Grass)	-	Vulnerable
Cymbidium canaliculatum (Tiger Orchid)	Endangered	-
Diuris tricolor (Pine Donkey Orchid)	Vulnerable; Endangered (MSC LGA)	



DRAYTON SOUTH COAL PROJECT

Vegetation Communities

FIGURE 61



DRAYTON SOUTH COAL PROJECT

Threatened Flora and Fauna

FIGURE 62

AngloAmerican

Hansen Bailey ENVIRONMENTAL CONSULTANTS

Table 50 Threatened Fauna Species

Species	TSC Act	EPBC Act	Record
Aves			
White-throated Needletail *(Hirundapus caudacutus)*	-	Mi	Yes
Spotted Harrier *(Circus assimilis)*	V	-	Yes
Little Eagle *(Hieraaetus morphinoides)*	V	-	Yes
Swift Parrot *(Lathamus discolour)*	E	E; Ma	Yes
Barking Owl *(Ninox connivens)*	V	-	Yes
Rainbow Bee-eater *(Merops ornatus)*	-	Mi	Yes
Brown Treecreeper *(Climacteris picumnus)*	V	-	Yes
Speckled Warbler *(Pyrrholaemus saggitatus)*	V	-	Yes
Black-chinned Honeyeater *(Melithreptus gularis gularis)*	V	-	Yes
Grey-crowned Babbler *(Pomatostomus temporalis temporalis)*	V	-	Yes
Scarlet Robin *(Petroica boodang)*	V	-	Yes
Hooded Robin *(Melanodryas cucullata)*	V	-	Yes
Diamond Firetail *(Stagonopleura guttata)*	V	-	Yes
Mammals – Bats			
Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)*	V	-	Yes
Eastern Freetail-bat *(Mormopterus norfolkensis)*	V	-	Yes
Large-eared Pied Bat *(Chalinolobus dwyeri)*	V	V	Yes
Eastern Bentwing-bat *(Miniopterus orianae oceanensis)*	V	-	Yes
Southern Myotis *(Myotis macropus)*	V	-	Yes
Greater Long-eared Bat *(Nyctophilus timoriensis)*	V	V	Yes
Greater Broad-nosed Bat *(Scoteanax rueppellii)*	V	-	Yes
Eastern Cave Bat *(Vespadelus troughtoni)*	V	-	Potential (calls recorded but not positively identified)

Note: V – Vulnerable, Mi – Migratory, Ma – Marine, E – Endangered

Approximately 115 bird species were recorded with most bird species located in or on the margins of the woodland areas. Raptors and some grassland species were observed across the extensive open areas.

Approximately 39 mammal species were recorded across the Drayton South area. The Eastern Cave Bat (*Vespadelus troughtoni*) was not positively identified during surveys but is considered likely to forage across the area from time to time.

Approximately 13 reptile species were recorded, including the Tree Skink (*Egernia striolata*), Bearded Dragon (*Pogona barbata*), and the Lace Monitor (*Varanus varius*), in remnant woodland areas. These non-threatened reptile species are widespread, well represented within the locality and predicted to recolonise rehabilitated areas.

Aquatic Habitat

The Industrial Dam forms a component of the existing Drayton Mine water management system and stores coal affected water. The Industrial Dam is considered unlikely to support any aquatic fauna, such as fish or amphibians, due to the poor quality of the mine water. The dam also lacks fringing vegetation that could provide suitable shelter.

The Hunter River, located to the immediate south of the Drayton South area, is a significant watercourse with constant flow. The river is characterised by a narrow band of riparian vegetation (comprising mostly exotic species) and a wide floodplain cleared of vegetation for agricultural purposes. This is typical of the landscape along much of the Hunter River's banks. The limited native riparian vegetation that does exist is in poor condition, impacting on bank stability and currently reducing its potential use as a fauna habitat corridor.

Saddlers Creek experiences only minor, intermitten flows and its tributaries are generally ephemeral. Upstream, the creek has low to no flow, and steep, eroded and exposed clay banks. Prior to historical agricultural activities, these channels were likely to have been meandering watercourses, subject to fluctuating flow regimes and the nature of the soil.

In summary, Saddlers Creek is characterised by:

- Occasional flow;
- Channel erosion at the outer banks and possible deepening by up to 0.5 m;
- Contamination of course sediments with fine-grained sediment;
- Limited aquatic fauna, typically restricted to carp;
- Limited riparian vegetation;
- Exclusion of large snags and rocks; and
- Nutrient-enriched pools.

Saddlers Creek and the Hunter River both provide habitat for a range of macroinvertebrates and possibly amphibians but are generally in moderate to poor condition.

Based on input data, most aquatic survey locations were classified as AUSRIVAS Band C (severely impaired) and achieved low SIGNAL scores (i.e. moderate to severe pollution). One location (S3) had relatively high macroinvertebrate diversity which gave it an AUSRIVAS Band A rating whilst another location in the vicinity (S2) was rated Band D (extremely impaired) (Turak et al., 2004).

The AUSRIVAS Visual Assessment ranks both the Hunter River and Saddlers Creek as being moderately to highly disturbed and indicates that all sites are severely altered or affected by surrounding land practices (agriculture, in particular livestock grazing) and do not support a diverse assemblage of aquatic invertebrate fauna. At the survey locations there is evidence of bank erosion, high levels of turbidity, reduced levels of dissolved oxygen, weed infestation, livestock trampling and nutrient enrichment (including phosphorus and nitrogen). As a result, up to 75% of expected biodiversity has been lost.

The macrophyte diversity of Saddlers Creek and the Hunter River is low and indicative of erosion or instability, turbidity or carp impact. *Typha sp.* (Cumbungi), *Juncus acutus* (Spiny Rush) and *Phragmites australis* (Common Reed) are abundant and choking the in-stream of Saddlers Creek. The presence of *Juncus acutus* (Spiny Rush) can indicate a saline environment.

The existing vegetation along Saddlers Creek provides some suitable refuge for amphibians and birds, and with proposed rehabilitation, can create an extensive habitat corridor. Saddlers Creek is unlikely to undergo natural, unassisted recovery but would benefit from active rehabilitation measures.

Seasonal surveys conducted in the Hunter River from 2005 to 2006 showed the improvement of river health, diversity and abundance of macroinvertebrate assemblages (Harris and Gehrke, 1997; Healthy Rivers Commission, 2003; Hanquet et al., 2004; Robson et al., 2005; Marshall et al. 2006; Sharpe and Downes, 2006; Sheldon and Thoms, 2006). Notwithstanding this, the Hunter River would benefit from active rehabilitation measures.

Aquatic Fauna

An assessment of the Hunter River identified a total of 23 vertebrate species in the catchment (Howell and Creese, 2010) of which 18 were native freshwater fish species and five were alien species (see Table 51). Due to the condition of the Hunter River, it is unlikely that it is capable of supporting abundant or diverse fish communities (The Ecology Lab Pty

Table 51 Aquatic Fauna Species

Species	Status	Year of Last Record
Short-finned Eel *(Anguilla australis)*	Native	2010
Long-finned Eel *(Anguilla reinhardtii)*	Native	2010
Darling River Hardyhead *(Craterocephalus amniculus)*	Species of concern (locally threatened)	2010
Freshwater Herring *(Potamalosa richmondia)*	Native	2010
Common Carp *(Cyprinus carpio)*	Alien	2009
Striped Gudgeon *(Gobiomorphus australis)*	Native	2010
Cox's Gudgeon *(Gobiomorphus coxii)*	Native	2010
Western Carp Gudgeon *(Hypseleotris klunzingeri)*	Native	1971
Empire Gudgeon *(Hypseliotris compressa)*	Native	2010
Flathead Gudgeon *(Philypnodon grandiceps)*	Native	2009
Dwarf Flathead Gudgeon *(Philypnodon macrostomus)*	Native	2009
Climbing Galaxias *(Galaxias brevipinnis)*	Native	2001
Mountain Galaxias *(Galaxias olidus)*	Native	2001

Species	Status	Year of Last Record
Sea Mullet *(Mugil cephalus)*	Native	2010
Freshwater Mullet / Pink-eye Mullet *(Trachystoma petardi syn. Myxus petardi)*	Native	2010
Australian Bass *(Macquaria novemaculeata)*	Native (stocked)	2009
Freshwater Catfish / Eel-tailed Catfish *(Tandanus tandanus)*	Native	2009
Plague Minnow / Mosquito Fish *(Gambusia holbrooki)*	Alien	2009
Australian Smelt *(Retropinna semoni)*	Native	2009
Rainbow Trout *(Oncorhynchus mykiss)*	Alien (stocked)	2010
Brown Trout *(Salmo trutta)*	Alien (stocked)	2010
Bullrout *(Notesthes robusta)*	Native	2010
Eastern Snake-necked Turtle / Long-necked Tortoise *(Chelodina longicollis)*	Native	2008

Source: Howell and Creese, 2010

Ltd, 2000; Marine Pollution Research Pty Ltd, 2009; Howell and Creese, 2010). Saddlers Creek is also unlikely to support significant freshwater fish communities but potentially provides some degree of refuge for aquatic fauna during periods of higher flow.

Habitat degradation caused by the removal of in-stream woody structures, such as snags, has been an important contributor to the decline of fish abundance in the Hunter River. These woody structures are recognised as important habitat features for native fish in lowland sections of inland rivers. The loss of snags has also been linked to the successful establishment of invasive species such as Common Carp (*Cyprinus carpio*) and Mosquito Fish (*Gambusia holbrooki*) in the Hunter River and other NSW watercourses (CRC for Freshwater Ecology). Mosquito Fish (*Gambusia holbrooki*) were caught during current surveys of the Hunter River and at some of the Saddlers Creek sites, despite the lack of flowing water.

No threatened aquatic species were recorded during current or past surveys of Saddlers Creek and the Hunter River (The Ecology Lab Pty Ltd, 2000). The Hunter River catchment is not considered to be providing suitable habitat for threatened species and communities listed under the Fisheries Management Act or EPBC Act (The Ecology Lab Pty Ltd, 2000; Umwelt (Australia) Pty Ltd, 2008).

Matters of National Environmental Significance

The likelihood of occurrence of relevant MNES was based on targeted field surveys and an evaluation of suitable habitat in the Drayton South area. A summary of MNES present and those that have the potential to occur within the Drayton South area is provided in Table 52. Further details specific to MNES are provided in Appendix M of Appendix J (ecology impact assessment) of the EA.

Table 52 Matters of National Environmental Significance

Common Name	Latin Name	EPBC Act Status	Likelihood of Occurrence
Box-Gum Woodland	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	Present. Approximately 303 ha (grassland and woodland) mapped within Drayton South area.
Weeping Myall Woodlands	Weeping Myall Woodlands	E	Not present. Unlikely to occur within the Drayton South area given current land practices.
Regent Honeyeater	*Anthochaera phrygia* (*syn. Xanthomyza phrygia*)	E, Mi	Not present. Suitable foraging habitat available. The species may forage in dry open forest, woodland and riparian forests within the Drayton South area during migratory movements.
Swift Parrot	*Lathamus discolour*	E, Ma	Present. Likely to occur occasionally within the Drayton South area in very low numbers but unlikely to visit regularly every year.
Spotted-tail Quoll	*Dasyurus maculatus maculatus*	E	Not present. Potential to visit the Drayton South area occasionally and in low numbers but unlikely to visit regularly every year.
Koala	*Phascolarctos cinereus*	V	Not present. Unlikely to occur. The Drayton South area does not support core habitat. Likely to occur in the wider area in low densities. The Drayton South area is unlikely to provide good movement corridors given surrounding land use and poor connectivity to significant areas of habitat off site.
Greater Long-eared Bat	*Nyctophilus corbeni* (*syn. N. timoriensis*)	V	Present. Suitable roosting and foraging habitat available within the Drayton South area.
Green and Golden Bell Frog	*Litoria aurea*	E	Not present. Unlikely to occur. Some suitable summer habitat is available along sections of Saddlers Creek; however, there is no suitable winter shelter habitat.
Lobed Blue Grass	*Bothriochloa biloba*	V	Present. Most likely to occur in open woodland or diverse grassland within the Drayton South area.
Finger Panic Grass	*Digitaria porrecta*	E	Not present. Unlikely to occur. Not previously known from the Muswellbrook LGA.
Leek-orchid	*Prasophyllum sp. Wybong* (*C. Phelps ORG 5269*)	CE	Not present. Low potential to occur. Suitable habitat available within the Drayton South area but outside of the seven known populations.
Illawarra Greenhood	*Pterostylis gibbosa*	E	Not present. Unlikely to occur. Not detected in flora surveys and outside of known range in the Hunter region.

Note: CE – Critically Endangered, E – Endangered, V – Vulnerable, Mi – Migratory, Ma – Marine

8.7.4 Impact Assessment

The Project will remove forest and woodland, including both non-listed and listed vegetation communities, within the Drayton South disturbance footprint and at Drayton Mine. Some of these vegetation communities contain threatened flora species or provide suitable habitat for threatened fauna species, including MNES (see Appendix M of Appendix J (ecology impact assessment) of the EA).

Vegetation Communities

The additional mining areas proposed at Drayton Mine will remove 18 ha of exotic grassland and 0.4 ha of regrowth Hunter Lowland Redgum Forest. The removal of such a small patch of modified regrowth is not considered likely to result in a significant impact to the local occurrence of this community.

Table 53 summarises the vegetation communities situated within the Drayton South disturbance footprint that will be directly impacted. The Project will result in the disturbance of 1,928 ha of vegetation, including 107 ha of Box-Gum Woodland derived native grassland and 389 ha of other native forest, woodland and shrubland, progressively over 27 years.

A total of 181 ha of vegetation within the Drayton South disturbance footprint conform to the EPBC Act and TSC Act listed CEEC Box-Gum Woodland. A further 279 ha of various communities are listed as Threatened Ecological Communities (TECs) under the TSC Act.

The direct removal of vegetation communities is likely to result in the following impacts:

- Removing or reducing the availability of important habitat features that may offer forage, shelter or breeding opportunities for fauna, thus putting more pressure on the remaining habitat to provide these features;
- Exacerbating the degree of fragmentation and isolation of woodland areas;
- Reducing connectivity by removing areas of woodland and forest that would serve as *'stepping stones'* for mobile fauna in an otherwise cleared landscape;
- Increasing edge effects, particularly along linear patches;
- Reducing nutrient and water cycling through the system;
- Loss of soil to wind or water erosion as a result of the lack of groundcover shelter; and
- Removing important pollinators such as birds, bats and insects critical for the pollination of native plants.

The TECs that will be directly impacted by the Project are considered to be over cleared in the Central Hunter region. These communities are highly fragmented, with the majority of extant patches persisting as small remnants of less than 10 ha in size (Peake, 2006). The communities are also considered to be regionally significant, threatened and poorly reserved (Peake, 2006). As a consequence of the decline in TECs, many flora and fauna species that rely on these communities for habitat are now listed as threatened under State and/or Commonwealth legislation. In the absence of suitable mitigation and compensation measures, the Project will have a significant impact on TECs, including Box-Gum Woodland. For this reason, Anglo American has aimed to avoid impacts on CEECs as much as possible during Project design and propose a biodiversity offset strategy that will result in significant benefits to flora and fauna in the locality and region, including Box-Gum Woodland and threatened species.

Groundwater Dependent Ecosystems

The occurrence of GDEs within the Drayton South area is represented by two communities, including the Hunter Floodplain Red Gum Woodland and Hunter River Oak Forest, as indicated by the presence of *Eucalyptus camaldulensis* (River Red Gum) and *Casuarina cunninghamiana* (River Oak).

It is difficult to ascertain the degree of dependence of terrestrial ecosystems on groundwater. In the Hunter region, where watercourses are typically ephemeral and historically have been degraded due to surrounding land uses and water extraction, it is likely that communities characterised by River Red Gum and River Oak trees have a moderate reliance, but not a complete dependence, on groundwater. It is unlikely that the Project will have a significant impact on GDEs.

Threatened Flora

The Project will result in the loss of individuals from four threatened flora species within the Drayton South area, including *Acacia pendula* (Weeping Myall), *Bothriochloa biloba* (Lobed Blue-grass), *Diuris tricolor* (Pine Donkey Orchid) and *Cymbidium canaliculatum* (Tiger Orchid). However, there will be no impact on *Eucalyptus camaldulensis* (River Red Gum).

Threatened Fauna

Despite the relatively small area and highly modified nature of the vegetation within the Drayton South area, a total of 21 threatened fauna species were recorded.

The loss of a large proportion of the forest and woodland within the Drayton South disturbance footprint is likely to represent a significant loss of locally important foraging and roosting habitat for the various birds, including migratory species that may rely on blossom resources in poor flowering seasons.

Flowering tree species provide important forage habitat for threatened nectarivorous birds including the Black-chinned Honeyeater (*Melithreptus gularis gularis*) and the Swift Parrot (*Lathamus discolor*). The removal of these species will have short to medium term effects on resources and thus the fauna species that depend on them.

Although some nectarivorous birds are mobile, others are fairly sedentary. The likely increase in habitat fragmentation is also likely to reduce the dispersal capacity of more sedentary

Table 53 Directly Impacted Vegetation Communities

Vegetation Community	Status	Total Area (ha)	Area within Disturbance Footprint (ha)
Central Hunter Bulloak Forest Regeneration	-	26	25
Hunter Valley River Oak Forest	-	2	2
Central Hunter Box-Ironbark Woodland	EEC	479	181
Hunter Floodplain Red Gum Woodland	EEC and CEEC	40	11
Narrabeen Footslopes Slaty Box Woodland	VEC	100	98
Upper Hunter White Box-Ironbark Grassy Woodland	EEC and CEEC	94	63
Cooba Scrub	-	65	9
Planted Vegetation	-	9	0
Derived Native Grassland - Hunter Floodplain Red Gum Woodland Complex	EEC and CEEC	10	4
Derived Native Grassland - Upper Hunter White Box-Ironbark Grassy Woodland	EEC and CEEC	159	103
Other Grassland	-	3,613	1,432
Total		**4,597**	**1,928**

Note: VEC – Vulnerable Ecological Community.

species to remnant woodland elsewhere in the locality. These species are also likely to have difficulty successfully relocating due to competition from existing residents in new areas.

Due to the risks to nectarivorous species, Anglo American is preparing a substantial biodiversity offset strategy that includes restoration of riparian communities along Saddlers Creek and onsite woodland rehabilitation. These objectives aim to replace the loss of vegetation with woodland and forest trees to maintain / increase current levels of foraging resources in the area. With the implementation of these mitigation measures, the Project is considered unlikely to result in a significant impact to nectarivorous birds.

The Project will remove known foraging and roosting habitat for woodland birds occurring within the Drayton South area, including important habitat features such as hollow resources. The Project will also increase fragmentation of the remaining forest and woodland in the short to medium term. Without staged clearance of the vegetation to minimise the loss at any one time, and actions to replace that loss in the short term, the Project will result in a significant loss of foraging, shelter and breeding habitat for locally occurring woodland bird populations, such as raptors.

The Project will result in the loss of known habitat as well as potential movement corridors for threatened microbats. Removal of woodland and forest will influence the availability of food sources and suitable habitat for tree-roosting or hollow-dependent species. This may affect the capacity of some individuals to disperse and relocate to surrounding habitat elsewhere in the locality.

Hollow-dependent microbat species are highly mobile but have consistently been recorded within the Drayton South area. It is likely that this area supports core habitat for microbats, including possible roosting sites, within their home ranges. As such, the Project is likely to have a significant impact on local occurrences without mitigation or compensatory measures.

The loss of vegetation is not likely to significantly affect the breeding or roosting habitat of microbats, which shelter in sandstone crevices and rock overhangs. Microbats of this nature are most likely to roost in the north near Mt Arthur and Mt Ogilvie. However, bat call analysis has indicated that a number of these species travel large distances from their roosting sites and visit the Drayton South area to forage.

With the exception of microbat species, no threatened mammals were recorded. Based on low records within the locality, the results of trapping sessions, habitat requirements and a likelihood of occurrence assessment, it has been determined that threatened mammals are unlikely to utilise the Drayton South area on a regular basis.

The Drayton South area contains potential habitat, as defined under SEPP 44, for the Koala (*Phascolarctos cinereus*). However, no records were documented during the field assessment, and searches for scats and other evidence of Koala activity failed to verify occupation of the area. Based on the unlikely occurrence within the Drayton South area, Koalas will not be impacted by the Project.

Hunter River and Saddlers Creek

The Project is unlikely to result in significant or long term adverse impacts to Saddlers Creek, the Hunter River or the wider catchment. As the Project will have limited interaction with these watercourses, it is unlikely to impact on downstream water quality, disrupt fauna communities, or result in the disturbance or loss of in-stream macrophytes and fringing riparian vegetation.

Anglo American in association with the CMA have committed to a program of works for the restoration of Saddlers Creek. This will ultimately restore habitats within Saddlers Creek and its riparian zone and over the longer term improve water quality within Saddlers Creek flowing into the Hunter River. Further details are provided in Section 8.8.

In addition, the Hunter River drainage basin is outside the known distribution of any species or ecological communities listed under the Fisheries Management Act. As such, no threatened species or ecological communities in the Hunter River are expected to be impacted by the Project.

Some minor clearing of vegetation may be required for the construction, operation and maintenance of the extraction and discharge pipelines. The extent of the clearing is minimal and is not expected to have a significant impact on threatened flora and fauna or fish habitats. The majority of the riparian vegetation was found to be predominantly comprised of invasive vines, grasses and herbaceous species. This vegetation is not considered to be significant from a local or regional perspective due to the very small area to be impacted and the lack of good quality native vegetation that will be removed.

From the findings of the surface water impact assessment (see Section 8.11), there is less than a 1% chance that offsite supplies would be required for the Project. That is, runoff from within the Project Boundary and dewatered groundwater from the mining areas can supply all of Drayton South's water requirements over the life of the Project (unless conditions were drier than the 99th percentile conditions). This is consistent with the existing operations at Drayton Mine, which has not needed to source offsite water over the life of its operations to date. In the event that water extraction is required from the Hunter River, it is not expected to result in an adverse impact on the ecology or water quality.

In accordance with the HRSTS, licence holders are only permitted to release water from site during peak flood flows to maintain salinity level targets. Since discharges will only occur under these lower salinity conditions, it is not expected that discharges will have any adverse impacts on the ecology of the Hunter River or its water quality.

Cumulative Impacts

The Hunter Valley has experienced extensive vegetation clearance and continues to be subject to significant landscape modification as a result of past and present land use practices. Broad scale clearance has occurred in the region to facilitate agricultural practices, including grazing, cropping and thoroughbred horse breeding, urban development, forestry and coal mining. The Project will contribute to the cumulative ecological impacts experienced on a regional scale by removing 1,928 ha of vegetation within the Drayton South area, including 389 ha of remnant forest, open woodland and shrubland.

The Hunter region is the primary coal producing centre in NSW. There are numerous approved and proposed coal mining projects in close proximity to the Project. Each mine has a significant disturbance footprint and requires land for associated infrastructure. When these are considered collectively, a high proportion of the surrounding locality will be subject to extensive mining within the next two to three decades.

Based on proposed mining authorisations in the vicinity of the Project, the cumulative impacts of mining could result in the removal of 5,113 ha of forest, woodland and derived grassland. Approximately 1,073 ha of this vegetation is Box-Gum Woodland with an additional 835 ha of other communities listed under the TSC Act.

Although mining activities in the past have resulted in significant vegetation clearing, many contemporary mining projects are capable of having a positive impact on threatened species and ecological community impacts via offsetting, particularly when considered collectively. In light of these impacts, a higher focus is being placed on replacing and supplementing ecological communities through the rehabilitation of mined areas and progressively restoring flora and fauna habitat in the medium to long term.

All of the mines currently operating in the Hunter Valley have provisions for offsetting ecological impacts. This involves the onsite rehabilitation and/or acquisition of additional land that contains suitable like-for-like forest, woodland and grassland. Rehabilitation and offsetting will collectively and significantly increase the total areas of local native vegetation that exist under conservation in the future and retain vegetation on the Hunter Valley floor.

8.7.5 Mitigation and Management

The management measures proposed for the Project aim to avoid, mitigate or compensate for all identified impacts, as follows:

- Avoid: to the extent possible, developments should be designed to avoid or minimise ecological impacts;
- Mitigate: where certain impacts are unavoidable, mitigation measures should be introduced to ameliorate the ecological impacts of the proposed development; and
- Compensate: the residual impacts of the Project should be compensated for in some way.

Each of these principles has been applied to the Project and addressed where feasible and reasonable.

Avoid

Avoiding environmental impacts has been considered, where possible, throughout the Project planning and design phases. Detailed pre-feasibility studies for the Project were undertaken and preliminary assessments of ecological values and other potential environmental impacts were used to inform mine plans and operational alternatives. The primary objective of the pre-feasibility studies was to develop a preferred Project mine plan that avoided and minimised environmental and social impacts as much as possible whilst maximising resource recovery and operational efficiency in order to justify the continuation of Drayton Mine.

The mine plan adopted for the Project, achieves the minimum practical disturbance area and its proximity to Drayton Mine means that the existing infrastructure can be utilised. The mine plan within the Drayton South area has also been limited to an existing ridgeline in the south, which considerably limits the coal resource for the Project, but provides important ecological and visual benefits. The construction of Project infrastructure and mining areas will be conducted progressively in conjunction with rehabilitation to minimise the loss of vegetation at any particular point in time.

Mitigate

Anglo American will develop and implement a biodiversity action plan, which will form a component of the existing Drayton Mine flora and fauna management plan. This document will be prepared to the satisfaction of DP&I and OEH. The plan is intended to be a working document that guides all facets of biodiversity management and mitigation for the Project, including staged disturbance, restoration and rehabilitation activities.

The development of the biodiversity action plan will be guided by leading practice guidelines and will be consistent with the desired outcomes of the *Draft National Recovery Plan for Box-Gum Woodland and Derived Native Grassland* (DECCW, 2010c).

The biodiversity action plan will enable Anglo American to apply the *'avoid and mitigate'* principles during the construction and operation of the Project. The plan will include, where practical, detailed information on:

- Fencing;
- Soil conservation;
- Pre-clearance surveys;
- Fauna rescue or translocation, where practical;
- Vegetation clearing protocols;
- Control and ongoing management of environmental and noxious weeds;
- Control and ongoing management of feral animals; and
- An ecological monitoring program.

The biodiversity action plan will also outline key performance objectives and management actions for biodiversity values, including:

- Minimising disturbance to native flora and fauna;
- Minimising impacts to and protecting threatened terrestrial species and communities;
- Minimising impacts to aquatic habitats and species;
- Implementation of adaptive management measures; and
- Ongoing monitoring of impacts on flora and fauna.

The biodiversity action plan will be reviewed on a regular basis and updated as required. All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

Compensate

A biodiversity offset strategy has been developed to compensate for the loss of Box-Gum Woodland and other native vegetation as a result of the Project. Section 8.8 provides a detailed overview of the biodiversity offset strategy for the Project.

To compensate for the removal of 0.4 ha of regrowth Hunter Lowland Redgum Forest, Anglo American will rehabilitate the additional mining areas proposed and the broader final landform at Drayton Mine with species that are representative of this vegetation community. Such rehabilitation efforts will be undertaken in accordance with the existing Drayton Mine rehabilitation and offset management plan. Section 8.17 provides further details regarding the strategies and techniques proposed for rehabilitation on site.

8.8 Biodiversity Offset Strategy

8.8.1 Background

As a component of the ecology impact assessment undertaken by Cumberland Ecology, a biodiversity offset strategy was developed in association with Anglo American. This has been developed in response to the predicted impacts of the Project on biodiversity, in particular TECs and MNES as described in Section 8.7.

Details of the biodiversity offset strategy are provided in Appendix J.

The requirement for the provision of offsets to compensate for the Project's residual impacts on biodiversity, once avoidance and mitigation measures have been implemented, is specified in the Director-General's EARs.

8.8.2 Principles for Biodiversity Offsets

The State and Commonwealth governments have developed principles for the use of offsets to compensate for impacts of development on biodiversity. The relevant policies and guidelines that are applicable to these principles include:

- The *Principles for the Use of Biodiversity Offsets in NSW* (OEH, 2011); and
- The *Environment Protection and Biodiversity Conservation Act 1999: Environmental Offsets Policy* (SEWPaC, 2012).

The biodiversity offset strategy for the Project has been developed to generally comply with these principles and will maintain and substantially improve the biodiversity values at a local and regional scale in the medium to long term.

Biodiversity Performance Standard

In addition to the biodiversity offsetting principles developed by the State and Commonwealth governments, the biodiversity offset strategy for the Project is required to meet the internal environmental requirements specified by Anglo American.

Anglo American has developed and operates in accordance with its own internal Biodiversity Performance Standard (2011) which stipulates that:

- The target of no net biodiversity loss or net positive contribution to biodiversity is to be considered at the operational level based on the biodiversity risk and/or opportunity posed to the business;
- Operational biodiversity action plans should be aligned with National Biodiversity Frameworks and take cognisance of regional and/or local conservation planning frameworks where these exist; and
- Where there is the potential for significant adverse or positive impacts on biodiversity, the implications of this risk and/or opportunity facing the operation needs to be assessed and the extent of the risk or opportunity translated into a business case for biodiversity management.

8.8.3 Strategy Overview

The biodiversity offset strategy for the Project adopts a *'maintain and improve'* approach and aims to offset the impacts on TECs, MNES and habitat for threatened fauna firstly on site within the Drayton South area. Any residual impacts that cannot be offset on site will be compensated through the acquisition of suitable land holdings.

The onsite component of the biodiversity offset strategy comprises of:

- The conservation of existing TECs and MNES within the Project Boundary;
- The rehabilitation of the Drayton South disturbance footprint with woodland communities; and
- The restoration of a significant portion of Saddlers Creek in conjunction with the CMA.

The conservation of existing TECs and MNES within the Project Boundary is a key element in maintaining stepping stones or corridors for fauna movement and seed dispersal as mining advances. These stepping stones or corridors will assist in maintaining connectivity and gene flow in a disturbed landscape. Conservation efforts will also complement adjacent communities established as part of the rehabilitation component of the biodiversity offset strategy.

Rehabilitation of the Drayton South disturbance footprint will aim to recreate TECs and MNES native to the area that are self-sustaining in the long term and capable of supporting a diverse range of viable flora and fauna populations. This will ultimately create connectivity between larger remnant patches of vegetation in the locality and retain vegetation on the Hunter Valley floor.

To enhance the ecological function of Saddlers Creek and the small existing groundwater dependent ecosystem it sustains, restoration work will be carried out in conjunction with the CMA along the section of the creek line that traverses the Project Boundary to the north-west. This will result in the improvement of wildlife corridor values, creek line condition and function, and augment adjacent conservation works in the vicinity of the Project, including those being undertaken by HVEC on the northern reaches of Saddlers Creek.

The onsite offsets have been developed to maximise the opportunities for conservation, rehabilitation and restoration in situ, which will address a significant proportion of the Project's offsetting commitments. However, there is little opportunity to expand on Drayton Mine's current offsetting commitments, including the Drayton Wildlife Refuge or the Natural Zone (see Figure 8). Therefore to compensate for the residual impacts, offsite offsets will form another component of the biodiversity offset strategy to complement the onsite offsets proposed. With the assistance of Cumberland Ecology, Anglo American have identified and secured an offsite biodiversity offset property to ensure that the Project will not result in a net loss in biodiversity. Further details are provided in Section 8.8.4.

8.8.4 Biodiversity Offset Strategy Summary

The biodiversity offset strategy has been developed to address the ecological impacts of the Project in a strategic and meaningful way that will deliver a real biodiversity outcome. The strategy consists of two main components, onsite offsets and offsite offsets, which work together to ensure that the best compensatory outcomes are achieved with the most efficient utilisation of resources and to meet State and Commonwealth offsetting requirements.

Onsite Offsets

The onsite offsets for the Project include:

- Conservation: Retention of 85 ha of existing Central Hunter Box-Ironbark Woodland (EEC) and Cooba Scrub along the primary ridgeline immediately south of the Drayton South disturbance footprint;
- Rehabilitation: Establish rehabilitated communities of Central Hunter Box-Ironbark Woodland (EEC) and Narrabeen Footslopes Slaty Box Woodland (V) on the Drayton South disturbance footprint; and
- Restoration: Maintain and improve 24 ha of existing vegetation that is situated within the immediate vicinity of Saddlers Creek and restore an additional 62 ha of Hunter Floodplain Red Gum Woodland (CEEC) through planting efforts.

The onsite offset component of the biodiversity offset strategy will concentrate on restoration and conservation efforts on available land within the Project Boundary as a priority (see Figure 63).

Offsite Offsets

The ecology impact assessment undertaken by Cumberland Ecology for the Project, included investigations of potential offsite offsets to compensate for the residual ecological impacts of the Project. Details of the offsite offset investigations are provided in Appendix J.

Methodology

A high level desktop analysis of suitable areas in which to prioritise searches for candidate offsite offsets was completed for the Project. The analysis was guided by the bioregional context of the Project as this can broadly influence flora and fauna assemblages and vegetation complexes.

Preliminary inspections and assessments were conducted for a number of properties in the Hunter Valley to ascertain the offset potential of the land for the Project. The key considerations in assessing the suitability of properties included:

- Proximity to the Project;
- Proximity to existing conservation reserves;
- Location outside known exploration and coal leases;
- Historical and current land use;
- Provision of EPBC Act and TSC Act listed Box-Gum Woodland communities;
- Provision of suitable habitat for threatened species that will potentially be affected by the Project, including MNES;
- Management potential; and
- Regenerative potential.

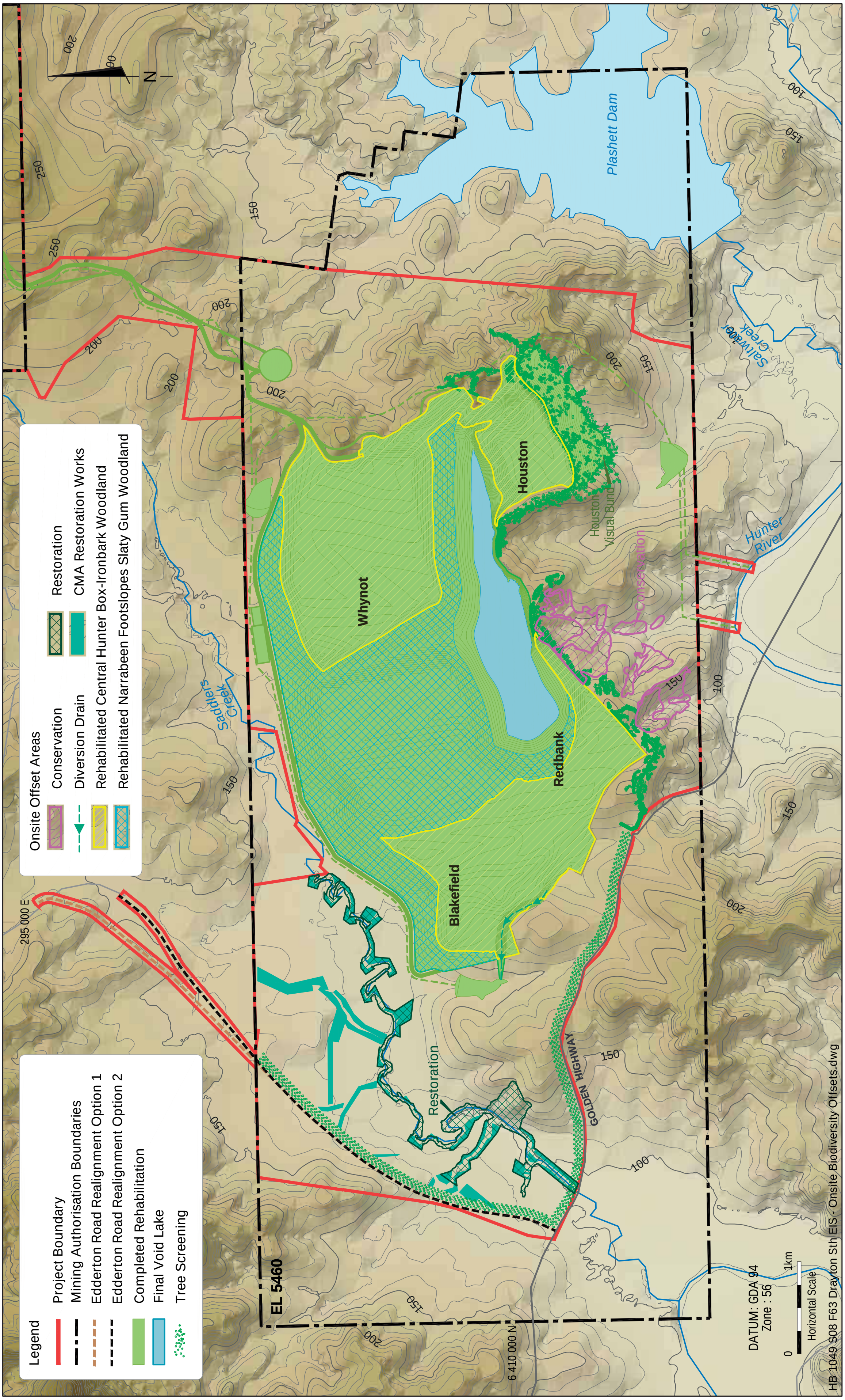
Of the candidate properties inspected, one property from the Upper Hunter region (referred to as the offsite biodiversity offset property) was deemed the most suitable to meet the Project's specific offset requirements.

Offsite Biodiversity Offset Property

The offsite biodiversity offset property is situated in the undulating hills near the township of Murrurundi in the Liverpool Range LGA. It is located approximately 75 km north of the Project Boundary at the interface between the Nandewar Bioregion and the Sydney Basin Bioregion. Figure 64 illustrates the locality of the offsite biodiversity offset property.

Although the offsite biodiversity offset property does not directly adjoin a conservation reserve, several are located within the locality (see Figure 64). The closest conservation area is the Murrurundi Pass National Park (215 ha) located approximately 900 m to the south of the property. Towarri National Park (6,074 ha) and Wingen Maid Nature Reserve (1,096 ha) are approximately 10 km and 14 km to the south respectively and Wallabadah Nature Reserve (1,132 ha) is located approximately 13 km to the north-east.

The offsite biodiversity offset property is currently used for stock grazing (sheep and cattle) and maintains some areas of improved pastures. Nevertheless, the property is well vegetated and continues to support extensive areas of diverse remnant woodland and open forest with a natural or semi-natural understorey.



DRAYTON SOUTH COAL PROJECT

Onsite Biodiversity Offsets

FIGURE 63

AngloAmerican

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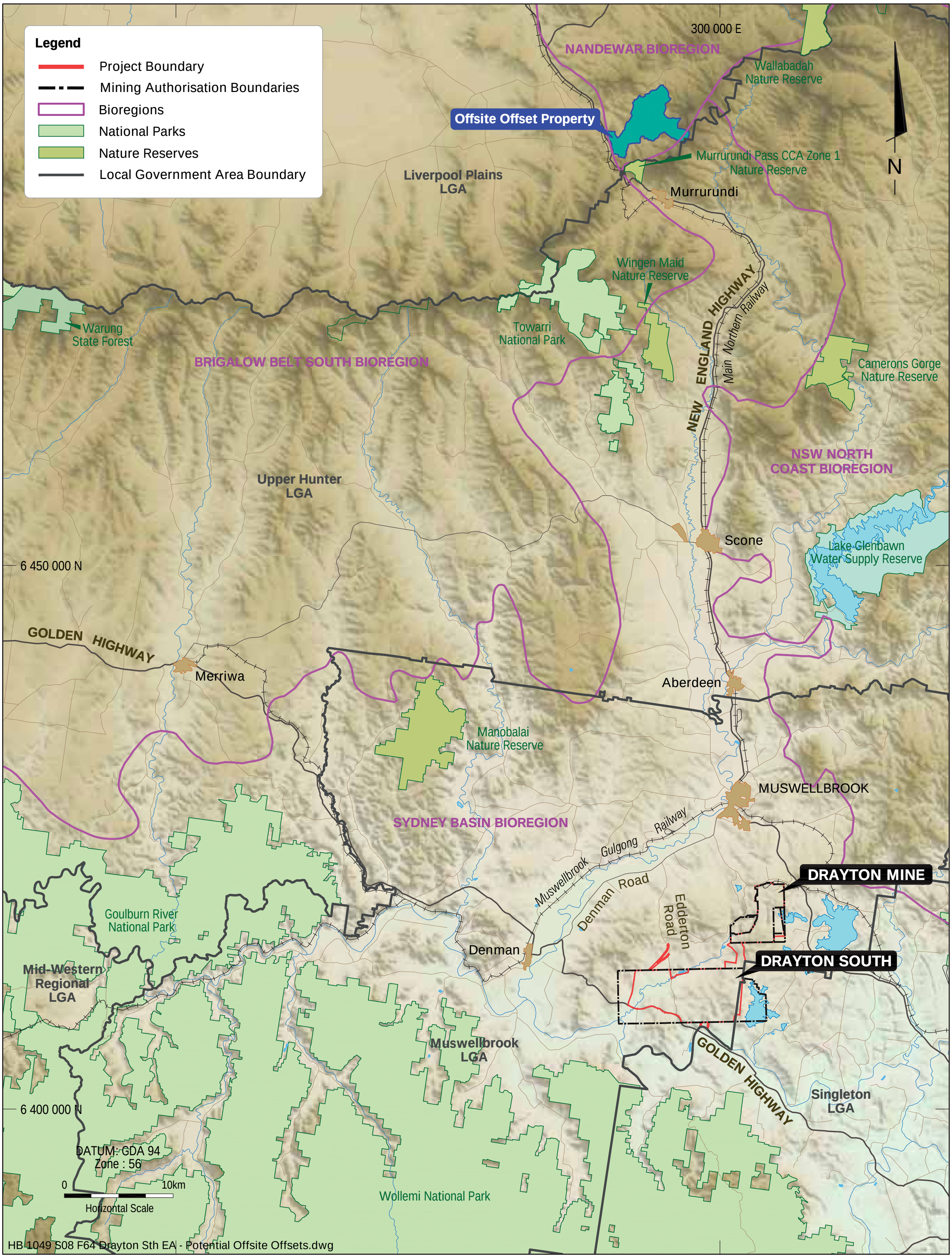


DRAYTON SOUTH COAL PROJECT

Offsite Biodiversity Offset Locality Plan

FIGURE 64

Assessment of Offsite Offset

A detailed field survey of the offsite biodiversity offset property was undertaken on 30 and 31 January, 15 to 17 February and 27 February to 1 March 2012 to assess the adequacy of the offsite biodiversity offset property for the Project. Baseline flora and fauna surveys were undertaken in line with the methodology used on site within the Drayton South area.

Results from the field survey indicated that the offsite biodiversity offset property contains 1,181 ha of remnant forest and woodland dominated by a variety of eucalypt species. The remaining 898 ha of the property supports an array of derived native grassland. The vegetation communities present on the offsite biodiversity offset property are outlined in Table 54 and shown on Figure 65.

Natural regeneration of a number of tree species is prolific across the offsite biodiversity offset property and there is evidence of regular ringbarking to provide grazing pasture for livestock. There is a high regeneration potential for all strata of vegetation, including the canopy, subcanopy, understorey and ground stratum. Overall, the offsite biodiversity offset property has a very good potential for habitat improvement.

The offsite biodiversity offset property is dominated by native perennial grasses with various mixtures of native perennial and annual herbaceous plants. When livestock are removed to make way for conservation management, it is expected that all native strata will regenerate naturally.

Due to the extensive clearing of some areas of grassland, trees are either absent or widely scattered. Such areas may require active replanting in the future to accelerate the process of regeneration towards woodland or open forest.

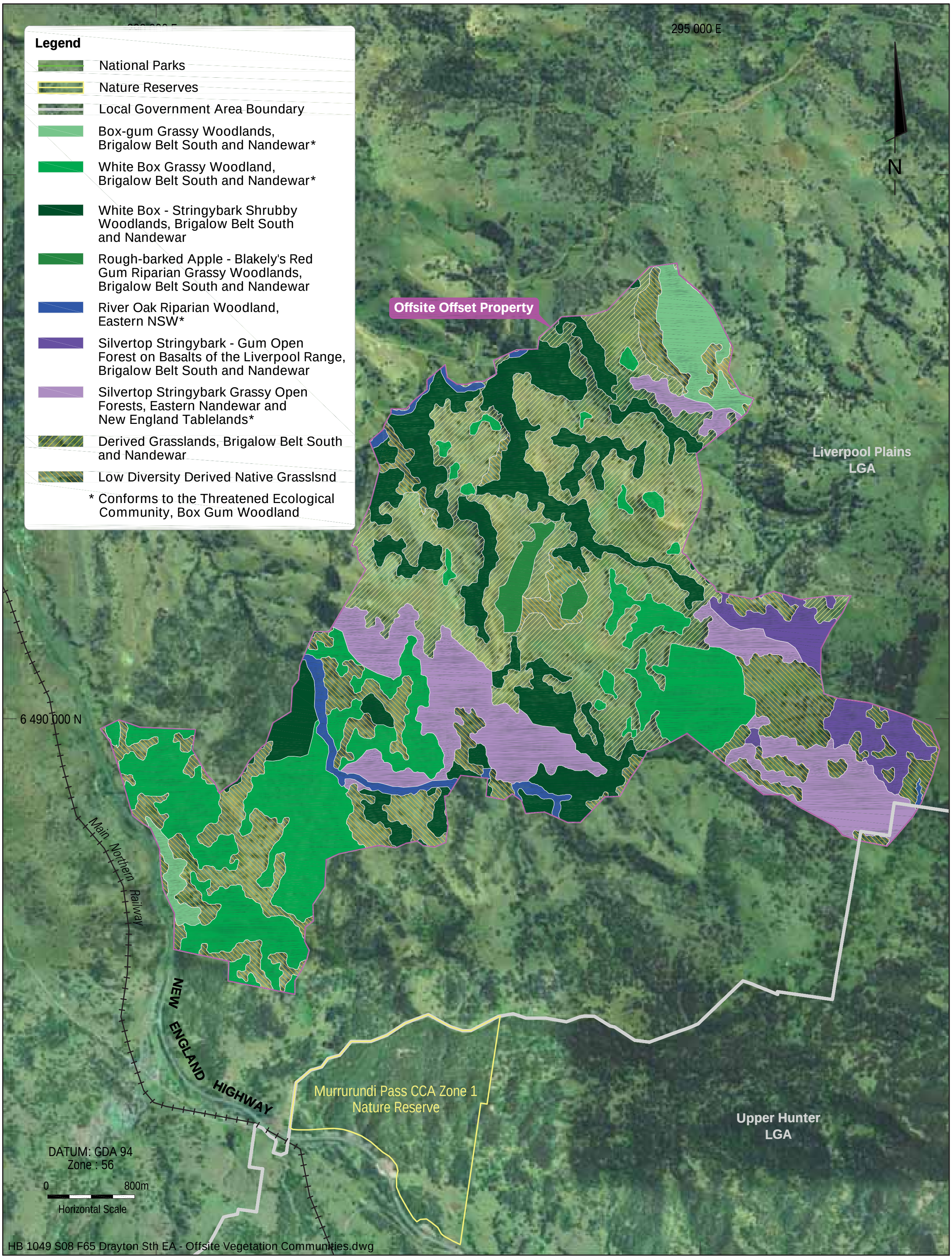
Weeds occur across the property and include species such as *Ailanthus ailtissima* (Tree of Heaven), *Rubus fruticosus* (Blackberry), *Hypericum perforatum* (St Johns Wort), *Rosa rubiginosa* (Sweet Briar) and Thistles. These will need active management when livestock grazing is phased out for conservation. Some species such as St John's Wort will need special management as they tend to proliferate in ungrazed and unmanaged farm land.

The offsite biodiversity offset property also features several favourable habitat attributes, including two permanent streams, a number of farm dams, rock outcrops, tree hollows and flowering resources. It is assessed to be suitable habitat for most of the threatened species likely to be impacted by the Project.

Results from the field survey confirmed the presence of several threatened species of fauna at the offsite biodiversity offset property, some of which also occur within the Drayton South area (see Table 55).

Table 54 Offsite Biodiversity Offset Property Vegetation Communities

Vegetation Community	EPBC Act	TSC Act	Area (ha)
Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar	-	-	71
Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	253
Box - gum grassy woodlands, Brigalow Belt South and Nandewar	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	67
White Box - stringybark shrubby woodlands, Brigalow Belt South and Nandewar	-	-	336
White Box grassy woodland, Brigalow Belt South and Nandewar	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	396
River Oak riparian woodland, eastern NSW	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	33
Rough-barked Apple - Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	25
Total Forest and Woodland			**1,181**
Derived grasslands, Brigalow Belt South and Nandewar	Box-Gum Woodland CEEC	Box-Gum Woodland EEC	343
Low Diversity Derived Native Grassland	-	Box-Gum Woodland EEC	555
Total Grassland			**898**
Total Vegetation			**2,079**



DRAYTON SOUTH COAL PROJECT

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Offsite Biodiversity Offset Property
Vegetation Communities

FIGURE 65

Adequacy of the Biodiversity Offset Strategy

The Project will result in the disturbance of 1,928 ha of vegetation within the Drayton South area, including 107 ha of Box-Gum Woodland derived native grassland and 389 ha of other native forest and woodland, progressively over 27 years.

The biodiversity offset strategy as a whole will address the predicted loss on biodiversity values, including MNES, by provision of 3,653 ha of vegetation, including 1,754 ha of Box-Gum Woodland (856 ha of woodland and 898 ha of derived native grassland), 1,457 ha of other endangered forest and woodland communities, and 442 ha of non-threatened forest and woodland. The biodiversity offset strategy will also provide large areas of habitat for all of the threatened species that will be impacted by the Project.

Table 56 provides an overview of the adequacy of the biodiversity offset strategy for addressing the impacts to MNES. Further details specific to MNES are provided in Appendix M of Appendix J (Ecology Impact Assessment) of the EA.

An evaluation of the Project's proposed biodiversity offset strategy against the *Principles for the Use of Biodiversity Offsets in NSW* (OEH, 2011) and the *Environment Protection and Biodiversity Conservation Act 1999: Environmental Offsets Policy* (SEWPaC, 2012) has been conducted and is presented in Appendix J. This demonstrates that the biodiversity offset strategy is consistent with both documents and is able to address the Project's impacts on biodiversity and deliver a conservation gain.

Table 55 Offsite Biodiversity Offset Property Threatened Fauna

Family	Common Name (Latin Name)	TSC Act Status	EPBC Act Status
Acanthizidae	Speckled Warbler *(Pyrrholaemus saggitatus)*	V	-
Accipitridae	Little Eagle *(Hieraaetus morphinoides)*	V	-
Meropidae	Rainbow Bee-eater *(Merops ornatus)*	-	Mi
Neosittidae	Varied Sittella *(Daphoenositta chrysoptera)*	V	-
Dasyuridae	Spotted-tailed Quoll *(Dasyurus maculatus)**	V	E1
Emballonuridae	Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)*	V	-
Vespertilionidae	Large-eared Pied Bat *(Chalinolobus dwyeri)*	V	V
	Little Bent-wing Bat *(Miniopterus australis)*	V	-
	Eastern Bentwing-bat *(Miniopterus orianae oceanensis)*	V	-
	Eastern Cave Bat *(Vespadelus troughtoni)*	V	-
Orchidaceae	Tiger Orchid *(Cymbidium canaliculatum)*	E2	-

**Anecdotal record*

Table 56 Adequacy of Biodiversity Offset Strategy for Matters of National Environmental Significance

Common Name	Drayton South		Onsite Biodiversity Offsets		Offsite Biodiversity Offset Property	
	Likelihood of Occurrence	Direct Impact (ha)	Available Habitat (ha) (without Restoration)	Available Habitat (ha) (with Restoration)	Available Habitat (ha) (without Restoration)	Available Habitat (ha) (with Restoration)
Box-Gum Woodland	Present	181	20	82	774	1,672
Weeping Myall Woodland	Not Present	0	0	0	0	0
Regent Honeyeater	Present (low)	389	109	1,574	1,181	2,079
Swift Parrot	Present (low)	389	109	1,574	1,181	2,079
Spotted-tailed Quoll	Present (low)	389	109	1,574	1,181	2,079
Koala	Not Present	389	109	1,574	1,181	2,079
Greater Long-eared Bat	Present	389	109	1,574	1,181	2,079
Green and Golden Bell Frog	Not Present	0	24	86	0	0
Lobed Blue-grass	Present	1,928	171	1,574	2,079	2,079
Finger Panic Grass	Not Present	0	0	0	1,181	2,079
Leek-orchid	Present (low)	1,928	171	1,574	2,079	2,079
Illawarra Greenhood	Not Present	0	171	1,574	2,079	2,079
Austral Toadflax	Not Present	0	171	1,574	2,079	2,079

8.8.5 Management of Biodiversity Offsets

The existing Drayton Mine rehabilitation and offset management plan will be revised as part of the biodiversity offset strategy to prescribe ongoing management actions for both onsite and offsite offsets. The plan will explain the key management approaches, expected gains of the offsets and prescribe a suite of measures that will be implemented to ensure that biodiversity values can be maintained and improved.

The key objectives of the revised rehabilitation and biodiversity management plan will be to:

- Maintain and improve the condition of existing forest and woodland within all offset areas, specifically to improve conditions for threatened flora and fauna;
- Maintain and improve derived native grassland areas, through the management of grazing pressure, to promote natural succession towards woodland and or open forest;
- Rehabilitate selected areas of low diversity native grassland by replanting trees and shrubs to promote a more rapid regeneration towards forest or woodland;
- Rehabilitate and restore TECs native to the area that are self-sustaining in the long term and capable of supporting a diverse range of viable flora and fauna populations; and
- Improve habitat connectivity across offset lands in order to improve wildlife movement in the long term.

Specifically, some of the measures that will be employed to promote successful regeneration of woodland and forest on offset lands include:

- Weed and feral animal management;
- Phased reduction of livestock management;
- Track and trail management;
- Active replanting and reseeding of vegetation within selected areas, where necessary;
- Fire management; and
- Ongoing monitoring.

The revised rehabilitation and biodiversity management plan will also be designed in accordance with any relevant guidelines that may be made available by DP&I and OEH.

All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

Security of Offsets

The offset lands will be permanently protected using an appropriate mechanism. There are a number of options that are available to permanently protect land for conservation, including:

- Conservation agreements between land owners and the Minister for the Environment under the NPW Act;
- Conservation covenants under section 88 of the *Conveyancing Act 1919*;
- Application to change the zoning regulation that dictates land use;
- Dedication of land to the National Parks reserve estates; and
- Land acquisition and management of the land under private ownership with conditions of commitment.

A final decision on the method of security for offsets will be made by Anglo American in consultation with the relevant agencies.

8.8.6 Cumulative Biodiversity Offsets

The biodiversity offset strategy for the Project has been developed to provide a net benefit to flora and fauna in the locality and region. Additionally, all of the mines have provisions for offsetting ecological impacts. This will involve:

- The rehabilitation of mined areas to forest and woodland, thereby, progressively reinstating flora and fauna habitat in the medium to long term; and
- The provision of land or purchase of additional surrounding lands that contain appropriate forest, woodland and derived native grassland species.

Collectively, offsets will significantly increase the total area of native vegetation that exist in the locality under conservation.

8.9 Aboriginal Archaeological and Cultural Heritage

8.9.1 Background

An Aboriginal archaeological and cultural heritage impact assessment was undertaken by AECOM and is provided in Appendix K. The purpose of the assessment was to describe the nature of the archaeological landscape within Drayton South area, assess the potential impacts that the Project may have on Aboriginal archaeological and cultural heritage values, and recommend measures to mitigate and manage these impacts.

The Aboriginal archaeological impact assessment previously undertaken for Drayton Mine (ARAS, 2006) identified a number of archaeological sites within and adjacent to the proposed mining areas. Archaeological Risk Assessment Services completed a salvage of all Aboriginal archaeological sites identified within and adjacent to the then approved disturbance footprint in July 2010. This included the additional mining areas. As such, there will be no impacts as a result of additional mining proposed at Drayton Mine.

8.9.2 Methodology

Desktop Assessment

A comprehensive desktop assessment was undertaken which included:

- A review of previous archaeological reports relevant to the regional and local area to assess the current status of Aboriginal archaeological and cultural heritage and to provide a basis for developing a predictive model;
- A search of the OEH Aboriginal Heritage Information Management System (AHIMS) databases for all registered archaeological sites within the Project Boundary; and
- A review of the landscape character and land use history, which influences patterning of sites.

Previous studies undertaken within the Project Boundary and its immediate vicinity were reviewed to gain an understanding of the Aboriginal archaeological and cultural heritage values of the area, including:

- Dyall (1980) surveyed an area immediately south of the Bayswater Colliery and at Drayton Mine. A total of three archaeological sites (all artefact scatters) were recorded on the banks of Saddlers Creek;
- Dyall (1981) surveyed an area immediately south of Mt Arthur, which was leased by Mt Arthur Coal Mine. A total of 24 open campsites were found within the lease along Saltwater Creek and Saddlers Creek. Two of the campsites contained more than 500 stone flakes scattered on the ground surface;
- Koettig and Hughes (1985) surveyed three separate development areas in the Hunter Valley, including Plashett Dam and a water storage area on Saltwater Creek, a coal mine development on Mt Arthur South, and a coal mine development on Mt Arthur North.

  Within the Plashett Dam area, a total of 86 open campsites consisting of stone artefacts scatters were recorded; six of which were excavated. The Mt Arthur South area unveiled a total of 136 archaeological sites comprising of 135 open campsites with stone artefact scatters, and a grinding groove. A survey of the Mt Arthur North area identified 93 open campsites consisting of stone artefact scatters.

  Consents to destroy were granted by the NPWS for archaeological sites at Plashett Dam and Mt Arthur South. A salvage and excavation program was carried out over eight of the archaeological sites (MAS12, MAS21, MAS24, MAS39, MAS44, MAS46, MAS477 and MAS48);
- Mills (2000) surveyed the proposed mine and haul road areas for Saddlers Creek Mine. This included a focused survey of Saddlers Creek and a number of its tributaries. Forty archaeological sites consisting of 238 artefacts were recorded, including seven isolated artefacts, 29 artefact scatters (nine with Potential Archaeological Deposits (PAD)), two stone quarries, and two scarred trees;
- HLA-Envirosciences (2002) conducted an assessment for the Drayton Mine extension and recorded a total of 14 artefact scatters along creeklines, ridgelines and crests. Indurated mudstone / tuff was the dominant material (51%), followed by silcrete (39%), quartz (5%) and porcellanite (5%). The artefacts identified comprised of flakes (49%), flaked pieces (41%), cores (9%), and backed blades (1%);
- ARAS (2006) undertook an assessment for the Drayton Mine extension and recorded a total of 480 stone artefacts across 39 archaeological sites. The majority of archaeological sites contained less than 10 artefacts, however, five sites had over 50 artefacts and were associated with drainage lines or gullies; and
- ARAS (2010) undertook a salvage and excavation program for 26 archaeological sites as part of the Drayton Mine extension. This included surface collection of artefacts at 22 sites, mechanical grader scrapes at 11 sites and hand excavation at three sites. In total, 8,505 artefacts were recovered with 7,500 of these artefacts associated with three distinct knapping sites at Ramrod Creek.

The AHIMS database search identified a total of 226 registered archaeological sites within the Project Boundary. Of these sites, 18 were listed as destroyed or deleted. The remaining 208 archaeological sites are comprised of 199 artefact scatters and isolated finds, four PADs, two stone quarries, two scarred trees, and one grinding groove.

Aboriginal Stakeholder Consultation

Aboriginal stakeholder consultation was conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a). Details of the consultation program are presented in Section 6.4.

Archaeological Field Survey

The archaeological field survey covered an area of 2,267 ha within the Drayton South area (the study area). The study area incorporates the surface disturbance footprint of 1,928 ha, which includes a 100 m corridor allowed for the Edderton Road realignment and a 100 m buffer assigned around mining areas and associated infrastructure.

The archaeological field survey was undertaken over a total of 26 days, initially between 2 May and 4 June 2011, and then on 10 and 11 October 2011. The purpose of the supplementary survey in October was to survey the land required for the Edderton Road realignment.

The aim of the archaeological field survey was to:

- Locate and re-record all AHIMS registered archaeological sites within the study area;
- Identify any previously unrecorded archaeological sites by way of targeted pedestrian transects over all landform types within the study area;
- Inspect, where appropriate, areas of known or potential Aboriginal cultural value, as identified by Aboriginal stakeholder representatives; and
- Obtain sufficient data to facilitate the development of management and mitigation measures for the Project.

All survey work was undertaken on foot, with the archaeological survey team (see Table 25) walking in line abreast at 10 m to 20 m intervals. Individual linear transect widths ranged from 70 m to 100 m. Each transect was recorded using a handheld differential GPS. The landform, soils and surface exposure characteristics along transects were recorded through descriptive notes and photographs.

All archaeological sites identified during the survey were recorded to a standard comparable to that required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b). Associated site attribute data (e.g. location, type and content) was documented using AECOM's standard open site recording form. Data recorded for identified chipped stone artefacts varied according to technological type with additional information noted for complete flakes, cores and implements. Where a significant number of artefacts (> 50) were identified within an archaeological site, records were limited to a sample of 50 artefacts and a count of the remaining artefacts was undertaken. In addition, each archaeological site was assessed for sub-surface potential (PAD).

The effective survey coverage achieved was sufficient to assess the scale and character of the archaeological resource within the study area.

8.9.3 Impact Assessment

Archaeological Resource

The archaeological resource within the Project Boundary is comprised of the 208 previously recorded sites as per the AHIMS database. Of these sites located within the Project Boundary, 85 sites are situated within the study area.

All of the registered AHIMS sites within the study area were inspected during the archaeological field survey. The application of the *'artefacts within 100 m of each other'* definition resulted in 19 instances where multiple AHIMS sites were consolidated into a single site or complex. As a result, the 85 AHIMS sites originally identified were condensed into 19 complexes and 26 single sites.

In addition to the previously recorded AHIMS sites, 160 new archaeological sites were identified and recorded within the study area. When added to the previously identified AHIMS sites, there are 205 discrete sites situated within the study area (see Figure 66). This total includes 143 artefact scatters (eight with PADs), 59 isolated finds and three stone quarries. Artefact counts for the scatter sites ranged from two to 981 artefacts, with most scatters (55%, *n* = 79) containing less than ten artefacts. The three stone quarry sites were composed of two previously recorded AHIMS sites (37-2-1954 and 37-2-1955, see Mills 2000) and one newly recorded site (DS-QR1-11).

During the assessment, the Aboriginal community and an arborist reassessed two previously recorded scarred trees (37-2-1944 and 37-2-1945) and determined that the scarring was due to natural processes.

Table 57 lists the archaeological sites identified within the study area. As a result of the Project, a total of 175 archaeological sites within the study area will be directly impacted. All remaining sites within (*n* = 30) and outside the study area but within the Project Boundary (*n* = 103) will not be impacted.

Significance Assessment

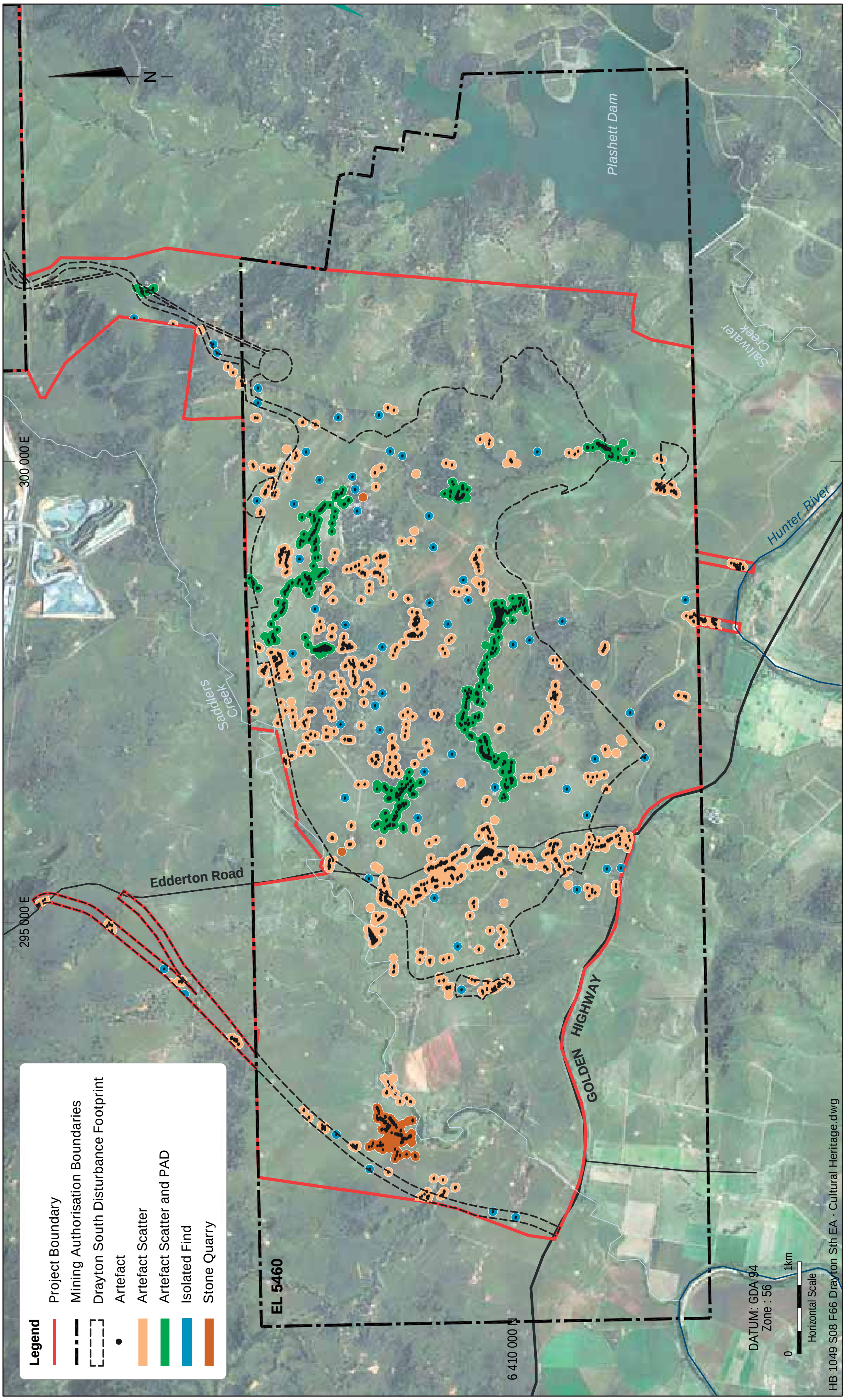
In Australia, the primary guide to the assessment of cultural significance is the Burra Charter, which defines *"cultural significance"* as the *"aesthetic, historic, scientific, social or spiritual value for past, present or future generations"* of a site or place. The significance of Aboriginal archaeological sites and places can be determined through two avenues; the assessment of scientific significance by archaeologists and the assessment of cultural or social significance by Aboriginal people.

Scientific Significance

Scientific value refers to the contribution that the heritage resource (i.e. an Aboriginal archaeological site or distribution) can make to knowledge and understanding of the past.

A heritage resource is assessed according to three criteria; rarity, representativeness and research potential. The degree to which it can contribute to knowledge is denoted by a significance rating.

A total of four archaeological sites were rated as highly significant. Three of the sites are represented by stone quarries (37-2-1954, 37-2-1955 and DS-QR1-11). These are considered rare in the Central Lowlands and offer high research value due to their ability to answer questions related to raw material use and procurement. Artefact scatter site DS-C8 is also considered to be highly significant due to the identification of two non-ground edge stone axes, the large artefact count (*n* = 981), and the high potential for archaeological deposit. Based on the combination of these



DRAYTON SOUTH COAL PROJECT

Aboriginal Cultural Heritage Items

FIGURE 66

elements, this site is considered to have the potential to answer research questions related to subsistence patterning and the organisation of technology within the study area.

A total of 18 archaeological sites were rated as moderately significant. This rating has been attributed to sites where artefacts of moderate rarity in the local area (i.e. axe heads and hammerstones) were identified, or where PADs or significant artefact numbers (> 100) were recorded.

The remaining 183 archaeological sites were rated as being of low significance. Low significance is attributed to sites that are common in the local and regional area, are highly disturbed, or have few artefact numbers.

Table 57 lists the scientific significance rating associated with each archaeological site identified in the study area.

Social (Cultural) Significance

The social (cultural) significance determined by the Aboriginal stakeholders is reflected in their responses to the assessment, which are provided in Appendix K. These responses have identified Mt Arthur and Saddlers Creek as culturally important features in the local landscape. In addition, all stone artefacts recorded within the study area have been identified as culturally

Table 57 Aboriginal Archaeology

Site ID	Site Type	Significance
Surface Collection		
DS-C11, DS-C12, DS-AS52-11, DS-AS69-11, DS-AS79-11, DS-C3, DS-C4, DS-C5, 37-2-1930	Artefact Scatter	Moderate
37-2-0074, 37-2-0077, 37-2-0082, 37-2-0377, 37-2-0398, 37-2-0408, 37-2-0416, 37-2-1938, 37-2-1939, 37-2-1940, 37-2-1942, 37-2-2035, 37-2-0427, DS-C6, DS-C9, DS-C10, DS-C17, DS-AS3-11, DS-AS4-11, DS-AS5-11, DS-AS6-11, DS-AS7-11, DS-AS8-11, DS-AS11-11, DS-AS12-11, DS-AS13-11, DS-AS16-11, DS-AS17-11, DS-AS18-11, DS-AS19-11, DS-AS20-11, DS-AS22-11, DS-AS23-11, DS-AS24-11, DS-AS25-11, DS-AS26-11, DS-AS27-11, DS-AS28-11, DS-AS29-11, DS-AS30-11, DS-AS31-11, DS-AS32-11, DS-AS40-11, DS-AS41-11, DS-AS42-11, DS-AS43-11, DS-AS44-11, DS-AS45-11, DS-AS46-11, DS-AS47-11, DS-AS48-11, DS-AS50-11, DS-AS51-11, DS-AS53-11, DS-AS54-11, DS-AS55-11, DS-AS56-11, DS-AS57-11, DS-AS58-11, DS-AS59-11, DS-AS60-11, DS-AS61-11, DS-AS62-11, DS-AS63-11, DS-AS64-11, DS-AS65-11, DS-AS70-11, DS-AS72-11, DS-AS73-11, DS-AS74-11, DS-AS75-11, DS-AS76-11, DS-AS77-11, DS-AS78-11, DS-AS83-11, DS-AS86-11, DS-AS87-11, DS-AS88-11, DS-AS89-11, DS-AS92-11, 37-2-1932, 37-2-1931, DS-AS91-11, DS-AS94-11, DS-AS95-11, 37-2-0080, DS-AS67-11, DS-AS68-11, DS-AS10-11, DS-AS21-11, DS-AS49-11, DS-AS71-11, DS-AS96-11, DS-AS97-11, DS-AS98-11, DS-AS99-11, DS-AS100-11, DS-AS101-11, DS-AS1-11, DS-AS2-11, DS-AS38-11, DS-AS39-11, DS-AS80-11, DS-AS81-11, DS-AS82-11, DS-AS84-11	Artefact Scatter	Low
DS-C8	Artefact Scatter + PAD	High
37-2-1947, DS-C7, DS-C13, DS-C14, DS-C15, 37-2-0089, DS-C16	Artefact Scatter + PAD	Moderate
DS-IF2-11, DS-IF3-11, DS-IF4-11, DS-IF8-11, DS-IF9-11, DS-IF10-11, DS-IF11-11, DS-IF12-11, DS-IF13-11, DS-IF14-11, DS-IF15-11, DS-IF16-11, DS-IF19-11, DS-IF20-11, DS-IF22-11, DS-IF23-11, DS-IF24-11, DS-IF25-11, DS-IF26-11, DS-IF27-11, DS-IF28-11, DS-IF29-11, DS-IF30-11, DS-IF31-11, DS-IF32-11, DS-IF33-11, DS-IF34-11, DS-IF36-11, DS-IF37-11, DS-IF38-11, DS-IF39-11, DS-IF40-11, DS-IF41-11, DS-IF42-11, DS-IF43-11, DS-IF44-11, DS-IF45-11, DS-IF46-11, DS-IF1-11, DS-IF35-11, 37-2-2666, DS-IF54-11, DS-IF55-11, DS-IF56-11, DS-IF57-11, DS-IF58-11, DS-IF49-11, DS-IF50-11, DS-IF51-11, DS-IF52-11	Isolated Find	Low
Excavation		
37-2-1954, 37-2-1955	Stone Quarry	High
Avoidance (Conservation)		
DS-QR1-11	Stone Quarry	High
DS-AS35-11	Artefact Scatter	Moderate
DS-IF6-11	Isolated Find	Moderate
37-2-0375, 37-2-0499, 37-2-0374, 37-2-1929, DS-C1, DS-C2, DS-C18, DS-C19, DS-AS9-11, DS-AS14-11, DS-AS15-11, DS-AS33-11, DS-AS34-11, DS-AS36-11, DS-AS37-11, DS-AS66-11, DS-AS85-11, DS-AS90-11, DS-AS93-11	Artefact Scatter	Low
DS-IF5-11, DS-IF7-11, DS-IF17-11, DS-IF18-11, DS-IF21-11, DS-IF47-11, DS-IF48-11, DS-IF53-11	Isolated Find	Low

important as they attest to the previous occupation and use of the land by Aboriginal people, and provide an important tangible link to their heritage.

8.9.4 Mitigation and Management

As a result of the Project, a total of 175 archaeological sites within the study area will be directly impacted. To manage these impacts the existing Drayton Mine Aboriginal and cultural heritage management plan will be revised in consultation with registered Aboriginal stakeholders, OEH and DP&I. The revision of the plan will include:

- Detailed salvage methodologies to be carried out prior to commencement of the Project, including:
  - Surface collection of all impacted archaeological sites;
  - Test excavation and salvage excavation for select sites;
  - Preparation of a scientific research methodology; and
  - A geomorphological assessment.
- Protection and conservation of archaeological sites that are not impacted by the Project by means of fencing where appropriate; and
- Identification of the storage location (keeping place) and procedure for the care of salvaged artefacts in accordance with the *Code of Practice for Archaeological Investigation for Aboriginal Objects in New South Wales* (DECCW, 2010b).

Surface Collection (Salvage)

To mitigate the Project's impacts on archaeological sites a surface collection will be undertaken for artefact scatters and isolated finds to be directly impacted by the Project. This will occur prior to the commencement of ground disturbing works.

Test Excavation and Salvage Excavation

In recognition that the complete archaeological resource within the study area is not identifiable by surface surveys alone, a program of subsurface test excavation and salvage excavation will be undertaken for select sites to obtain a more detailed understanding of the nature and extent of Aboriginal archaeology within the study area.

The program will include a detailed geomorphological assessment, followed by test excavation and salvage excavation. This will be developed in consultation with registered Aboriginal stakeholders and include salvage excavation of the archaeological sites impacted by the Project that are of high significance. The program will utilise the results of the archaeological field survey, including identified PAD sites and areas of archaeological sensitivity, to develop an appropriate scientific research methodology.

Test excavation and salvage excavation will be undertaken for those sites identified as having high significance that will be impacted by the Project. These sites include stone quarry site 37-2-1954 and artefact scatter site DS-C8 which were assessed as having high significance as a result of their research potential. In addition, test and salvage excavation will be undertaken within selected areas of low and high archaeological sensitivity, and across multiple landforms, to address archaeological research questions that will be developed during the formulation of a detailed research design for the salvage program. It is anticipated that excavation will occur within and adjacent to the boundaries of a number of identified archaeological sites within the Drayton South disturbance footprint, with a particular emphasis on sites associated with tributaries of Saddlers Creek. Detailed planning regarding the exact location of archaeological excavations will be determined, in part, by the results of a detailed geomorphological assessment as well as ongoing consultation with registered Aboriginal stakeholders.

Conservation and Management

Conservation and management will be undertaken for all archaeological sites (*n* = 133) within the Project Boundary that are not impacted by the Project. These sites will be identified on site plans to avoid accidental destruction and included in the revised Aboriginal and cultural heritage management plan. Where mining activities will occur in close proximity to recorded archaeological sites, fencing will be erected.

Table 57 lists the mitigation and management measures associated with each archaeological site identified within the study area.

8.10 Non-Aboriginal Heritage

8.10.1 Background

A non-Aboriginal heritage impact assessment was undertaken by AECOM and is provided in Appendix L. The purpose of the assessment was to identify and determine the impacts on non-Aboriginal heritage items within and adjacent to the Drayton South area, and to recommend measures to mitigate and manage these impacts as required.

A historical overview of the area within the vicinity of the Project provides an indication of the past land use of the region and how it has been developed.

The Hunter region was initially identified as an area of rich resources in 1797 when Lieutenant John Shortland found coal at the mouth of the Hunter River. The 1810s saw increased pressure on land around Sydney, especially following several years of drought. The farmers on the Hawkesbury River around Windsor petitioned Governor Macquarie to allow exploration inland. Macquarie rewarded the men with land grants around what is today known as Singleton.

In 1829, Jerrys Plains was surveyed as a town, however, it was not proclaimed until 1840 and official grants were not given until several years later. Despite the absence of official land ownership, development of the town continued.

The majority of the area within the Drayton South area was originally part of the Plashett estate, first granted to James Robertson. Surrounding estates included Bowfield, Arrowfield, Strowan and Edderton.

8.10.2 Methodology

Historical and archival research was undertaken to identify known and potential historical heritage items within and adjacent to the Drayton South area, including a search of relevant Commonwealth, State and Local government heritage inventories.

A field survey was undertaken in May 2011 to identify, record and assess non-Aboriginal heritage items within the Drayton South area and adjacent sites recognised as being of heritage significance. The assessment of heritage items was undertaken in accordance with the *NSW Heritage Manual* (Heritage Office, 1996) and *Assessing Heritage Significance* (Heritage Office, 2001).

8.10.3 Impact Assessment

A total of 10 non-Aboriginal heritage items were identified within and adjacent to the Drayton South area (see Table 58), including five items listed on the heritage inventories (Plashett Homestead, Edderton Homestead, Arrowfield Cottage, Strowan Homestead and Woodlands Homestead). The location of the identified items is shown in Figure 67.

The development of the Project will result in direct and indirect impacts on certain heritage items identified. The fence and Nissan hut with stockyard is situated within the Drayton South disturbance footprint and will be directly impacted and removed by mining activities and the construction of associated infrastructure.

Ground vibrations and overpressure associated with blasting have the potential to impact the structural integrity of the other listed heritage items. Findings from the acoustics impact assessment undertaken by Bridges Acoustics concluded that the blast vibration and overpressure generated by the Project will not exceed the recommended criteria at any of these heritage items (see Section 8.4.3).

The construction of the Project, including the Houston visual bund, OEAs, rehabilitation areas and tree screenings, will modify the existing visual environment and potentially the visual aesthetics of the landscape surrounding certain heritage items.

The visual impact assessment for the Project undertaken by JVP describes the likely visual impacts associated with the Project on the areas surrounding the Project Boundary (see Section 8.6).

Due to the proximity of Edderton and Bowfield Homesteads these locations will experience high visual impacts during the early stages of the Project. From Year 10 and for the remainder of the Project life, the visual impact will be reduced to moderate and then low, with the northern extent of the OEAs rehabilitated and mining advancing further south.

For Strowan Homestead and Arrowfield Cottage views will be available to the construction of the Houston visual bund during its 16 month construction period. For this period there will be a high visual impact at these locations. The visual impacts will be reduced to moderate and then low as progressive rehabilitation is completed and the bund is integrated with the surrounding landscape.

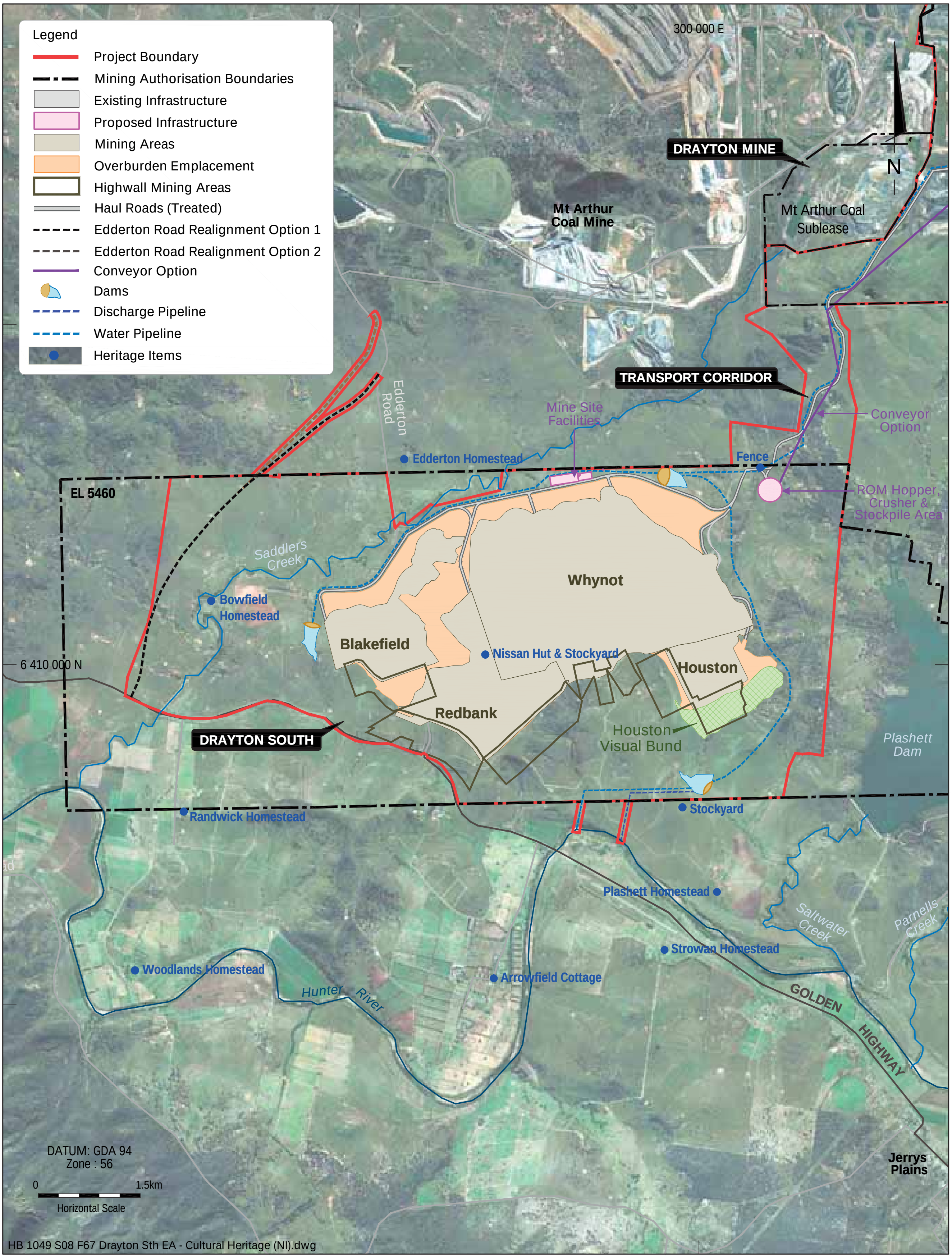
An existing hill shields the majority of the views from Plashett Homestead and as such the visual impacts are assessed as low.

Of the heritage items identified, the stockyard, Woodlands Homestead and Randwick Homestead will avoid being directly or indirectly impacted by the Project.

8.10.4 Mitigation and Management

The fence and Nissan hut with stockyard are within the Drayton South disturbance footprint and will be directly impacted by the Project. Given their age and limited historical significance, a photographic archival recording and scaled drawings of both items is all that is required to be undertaken prior to destruction.

The acoustics impact assessment for the Project concluded that blast vibration and overpressure generated by the Project



DRAYTON SOUTH COAL PROJECT

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Non-Aboriginal Heritage Items

FIGURE 67

will not exceed the recommended criteria at any heritage items (see Section 8.4.3). To ensure all relevant blast vibration and overpressure remain with the recommended criteria, Anglo American will update the existing Drayton Mine blasting management plan to include appropriate management and mitigation measures as described in Section 8.4.4.

The visual impact assessment for the Project confirmed that the landscapes within view of Edderton Homestead, Bowfield Homestead, Strowan Homestead and Arrowfield Cottage will be modified to various degrees as a result of the Project. Several mitigation measures to reduce visual impacts at sensitive viewing locations, including heritage items, have been incorporated into the design and operation of the Project, including:

- Maintaining existing topography (i.e. southern ridgeline);
- Development of the Houston visual bund;
- Tree screening; and
- Progressive rehabilitation of OEAs and disturbed areas.

If deemed necessary following further consultation with the relevant stakeholder, offsite mitigation measures, such as tree screening or plantings, can be implemented to further reduce the visual impact to landscapes surrounding heritage items.

The management of heritage items within the Project Boundary will be undertaken through a non-Aboriginal heritage management plan.

Table 58 Heritage Items

Heritage Item	Description	Significance
Fence	The item has a post and rail design. It provides an example of a popular fencing style employed in the early, formative years of farming and settlement in the Upper Hunter region. The item is located on land owned by Anglo American	Local – Historical
Nissan Hut with Stockyard	The item consists of a galvanised iron Nissan hut set on wooden stumps linked to a sheep shower and small stockyard. It provides evidence of the rural development and use of the area in a farming context. The item is located on land owned by Anglo American	Local – Historical
Bowfield Homestead	The item is a Besser-type block building constructed in the 1920s. It is evident of the continuing development of the rural economy at the time. The item is located on land owned by Anglo American	Local – Historical and research
Plashett Homestead	The item is a single storey, sandstone building, constructed in a simplified Victorian Regency style in the late 1860s. The outbuildings include a meat shed, stockyards and barns, dairy complex and hay shed. It is a rare, almost intact survivor of the mid-nineteenth century period. The item is located on land owned by Anglo American	State – Historical, research, and rarity Local – Historical associative, aesthetic and representativeness
Edderton Homestead Complex	The item is a single storey, timber framed, Federation style bungalow. The outbuildings include a weatherboard meat shed, a rubble tank stand with wooden storage underneath, and three weatherboard farm storage sheds with associated stockyards. It provides an example of an early twentieth century rural homestead and associated farming complex, which would once have been characteristic of the local area. The item is located on land owned by HVEC	Local – Historical, research and representativeness
Stockyard	The item consists of a stock run constructed from bush timbers with cut-in joints. It is associated with farming activities which have defined the development of the local area. The stockyard is located on land owned by Anglo American	Local – Historical and representativeness
Strowan Homestead	The item is a single storey, rendered brick building constructed in the Victorian style in 1860. It is a rare, almost intact survivor of the mid-nineteenth century with an association to eminent local pioneering and business families in the Upper Hunter region. The item is located on Coolmore Stud	National – Historical State – Research Local – Historical associative and representativeness
Arrowfield Cottage	The item is a two storey sandstone building, recently renovated with a strong association to the history and development of pastoralism and particularly horse breeding in the Upper Hunter region. The item is located on Coolmore Stud	Local – Historical, historical associative and research
Woodlands Homestead	The item is a 1830s sandstone building in Colonial Georgian style, recently renovated with an association to eminent pioneering and business families of the local area. The homestead is located on Woodlands Stud	Local – Historical, historical associative and research State – Historical, aesthetic and rarity
Randwick Homestead	The item is a weatherboard house located on Woodlands Stud	There is currently insufficient information to accurately assess the significance of this site

The plan will be prepared prior to construction and operation and should include, but not be limited to, the following:

- A list and map indicating the location of sites identified within the Project Boundary;
- A significance assessment and statement of significance for each heritage item; and
- Management and mitigation measures for visual and blasting impacts, including risk-based dilapidation surveys.

8.11 Surface Water

8.11.1 Background

A surface water impact assessment was undertaken by WRM Water & Environment (WRM) and is provided in Appendix M. The purpose of the assessment was to characterise the existing catchments, develop a water balance for the Drayton Complex with consideration of the proposed water management system, determine the impacts to surface water and recommend measures to mitigate and manage these impacts.

Catchment Description

The existing Drayton Mine is located in the upper headwaters of Ramrod Creek, Bayswater Creek, Saddlers Creek and Saltwater Creek.

The northern areas of Drayton Mine drain via four minor gullies to the Ramrod Creek catchment. The eastern areas previously drained to Bayswater Creek; however, the majority of the catchment is now represented by an active mining area and does not drain off site. Similarly, the southern areas of Drayton Mine are located within the upper portion of the Saltwater Creek and Saddlers Creek catchments and are now occupied by an active mining area which no longer drains off site.

Drayton South is drained by Saddlers Creek and Saltwater Creek, two minor tributaries of the Hunter River.

Saddlers Creek is the main drainage feature within the Drayton South area, which commences at the existing Drayton Mine and meanders in a south-west direction eventually connecting with the Hunter River. The creek is ephemeral and has a generally well defined channel with a thick covering of long grass across a broad base. Saddlers Creek is in poor condition with erosion evident along several sections of the stream bank. The erosion is caused by loss of vegetation, largely through clearing for agriculture in the highly dispersive soils that are characteristic of the area.

Saltwater Creek commences at the existing Drayton Mine and drains to the south-east into Plashett Dam, which captures approximately 77% of the Saltwater Creek catchment. As a result the remaining extent of Saltwater Creek downstream of Plashett Dam receives runoff from only 23% of the original catchment, which is then discharged to the Hunter River.

The Hunter River is located south of the Drayton South area and has a catchment area of 13,400 km^2. It flows in a south-easterly direction and is regulated by releases from Glenbawn Dam. The Hunter River has historically exhibited high salt concentrations. To manage these concentration levels and minimise the impact of industry on the catchment, the NSW government introduced the HRSTS, which facilitates the scheduling of saline industrial discharges at times of high river flows and low background salinity levels.

Existing Water Use Entitlements

The Project is located within Management Zone 1 of the Hunter Regulated River Water Source, defined by the WM Act. Management Zone 1 extends from Glenbawn Dam to the confluence with Glennies Creek. Flows in the Hunter River are regulated through the WSP for the Hunter River Water Source, which was gazetted on 1 July 2004 and amended by order on 1 January 2006.

All water extraction that is not for basic landholder rights must be authorised by a WAL. Each access licence stipulates a share component for a specific purpose. The share components of high security, general security and supplementary WALs are expressed as a number of unit shares. Anglo American currently holds two general security WALs (WAL 1066 and 491), totalling 198 units from the Hunter River for agricultural and domestic purposes.

Existing Water Quality

Water quality data for the Hunter River at the Glennies Creek gauging station (Station No. 210127) for the period 26 June 1993 to 1 November 2011, provides an indication of the parameters adjacent to the Drayton South area.

From an interpretation of the water quality data at the Glennies Creek gauging station, there is a strong relationship between flow rate and electrical conductivity (EC). High flows are typically associated with floods and low EC values. Conversely, higher EC values tend to occur when there are limited releases from Glenbawn Dam and the majority of flow is being generated from the downstream catchments.

Background water quality for Saddlers Creek has been monitored and recorded since 1998. The results indicate the following:

- Catchment runoff is slightly alkaline with pH ranging from 7.6 to 8.6 and 6.4 to 8;
- EC and total dissolved solids (TDS) concentrations are very high and substantially exceed the ANZECC Guidelines (ANZECC, 2000);
- EC values for site catchments are much lower, indicating that surface runoff from vegetated areas, not affected by groundwater flows, may produce lower EC; and
- Recorded total suspended solids (TSS) concentrations are low but are significantly higher in site catchments.

Existing Water Management System

Drayton Mine's water management system is based on a closed system as it does not possess a discharge licence. All mine water is stored on site in established dams or voids and is utilised by the mining operation primarily for coal processing and dust suppression purposes.

Water Storages

There are five dams integrated in the water management system, including the Mine Access Road Dam, Industrial Dam, Rail Loop Dam, Savoy Dam and West Void. The dams are connected via a network of pipes, which enables the transfer of water according to mine operational requirements.

The West Void, within the area previously subleased to Mt Arthur Coal Mine, is used as a repository for excess water. The agreement between Drayton Mine and Mt Arthur Coal Mine allows Drayton Mine to store water within the West Void until January 2017, upon which time any stored water has to be pumped back to Drayton Mine.

Further details with regard to the existing water management system currently in operation at Drayton Mine are provided in Appendix M.

Tailings Disposal

As described in Section 3.4, tailings are pumped directly from the CHPP to the East (South) Void to the approved level of RL 104 m, which is forecast to occur in 2017. This area will then be capped and rehabilitated at RL 106 m. Water is decanted during the transfer and recycled in the mine's water management system.

Proposed Water Management System

As described in Section 4.8, the main features of the proposed water management system include:

- Continued utilisation of the existing water management system and infrastructure at Drayton Mine;
- Removal of the existing mine-water Industrial Dam to allow for additional mining in the East Pit. It is proposed to shift the current functions of the Industrial Dam to the Access Road Dam. Any water remaining in the Industrial Dam at the time of decommissioning will be pumped to other storages, in particular the South Void;
- The construction of two new mine water dams within the Drayton South area (Transfer Dam and Houston Dam). An additional mine water dam (ROM Dam) will be constructed should the conveyor option be adopted for the haulage of coal from the Drayton South area to the existing Drayton Mine CHPP (as described in Section 4.6.1);
- Highwall dams and drains to collect runoff from undisturbed areas and divert it around the disturbed area. Blakefield Dam, will be constructed to manage the release of the clean highwall dam water into Saddlers Creek;
- Water collected in the active mining areas within the Drayton South area will be pumped to the Transfer Dam or approved water storages at Drayton Mine and used at the CHPP or for dust suppression;
- Rejects and tailings from the CHPP are proposed to be co-disposed in the North Void under the base case;
- Runoff from OEAs that has not come in contact with coal or carbonaceous material will be collected in sediment dams. This water will be released to the downstream environment after a period of settlement (if the stored water quality meets the relevant standards) or pumped into the water management system for reuse; and
- A water supply and discharge pipeline to the Hunter River, which will be linked to the Houston Dam. Water in excess of site use will be released directly to the Hunter River under the HRSTS via the discharge pipeline.

All water management structures will be suitably engineered to the standard required to safely capture, store and divert water of various qualities and avoid adverse impacts to the neighbouring environment.

Due to the potential conflict associated with discharging coal affected water into Saddlers Creek, which is to be restored and conserved in perpetuity as part of the biodiversity offset strategy for the Project, the discharge pipeline was directed to the Hunter River. However, clean water captured in the Blakefield Dam in excess of the designed capacity will be released into Saddlers Creek.

The proposed water management system under the base case is illustrated in Figure 31.

8.11.2 Methodology

Drayton Complex Water Balance

A computer-based simulation model (OPSIM) was used to assess the dynamics of the water balance (both volume and salt loads) under varying rainfall and catchment conditions. The OPSIM model works to dynamically simulate the operation of the water management system and in doing so keeps complete account of all site water volumes and representative water qualities on a daily time step.

The model has been configured to simulate the operations of all major components in the water management system. The simulated inflows and outflows included in the model are given in Table 59.

The OPSIM model was calibrated using the available data at the existing Drayton Mine and then updated to include the Drayton South operations. The model was run as a dynamic forecast simulation model over the 27 year Project life (2014 to 2040) using historical climatic data from the SILO Data Drill service (Jeffrey et al., 2001). The dynamic configuration allows the simulation to change over the modelled Project life, reflecting changes in the water management system over time.

Six representative stages of the Project life (Years 3, 5, 10, 15, 20 and 27) were linked in the model to reflect variations over time such as catchments, ROM coal production and groundwater seepage rates. The changes in the physical layout of the mine plan are illustrated in Figure 13 to Figure 20. The existing Drayton Mine catchments are not expected to change over the life of the Project. More detailed descriptions of the water management system and the proposed operational rules are provided in Appendix M.

Table 59 Simulated Inflows and Outflows to Water Management System

Inflows	Outflows
Direct rainfall on water surface of storages	Evaporation from water surface of storages
Catchment runoff	CHPP demand
Groundwater inflows	Dust suppression demand
Raw water supply from Hunter River	Vehicle wash down
	Offsite spills from storages
	Controlled releases under the HRSTS

To assess the effects of varying climatic conditions, the model was run for multiple cycles with each cycle corresponding to the 27 year Project life. A different rainfall input sequence was applied to each cycle. Of the 114 years of historical climatic and Hunter River flow data available from January 1893 to December 2006, there are 88 blocks of data, each 27 years in length. The first block of data, from January 1893 to December 1919, is applied to the first cycle of the model.

The second block of data, offset by one year, is then applied from January 1894 to December 1920 to the second cycle. Each subsequent cycle of the model has the rainfall data offset by one year, until the water system has been tested for 88 cycles against 114 years of rainfall data. A statistical analysis of the 88 cycles is then undertaken to assess the behaviour of the various storages over extended dry and wet periods.

Table 60 shows the predicted operational water demands and dewatered groundwater inflows for the six representative stages of the Project. The OPSIM water balance model was used to assess the impact on the water balance for a base case scenario, which includes:

- The use of a dust suppressant to reduce the haul road watering application rates to 0.015 l/m^2/hr;
- The co-disposal of rejects and tailings in the North Void; and
- An expected return rate (proportion of water returned to the CHPP from the tailings disposal storage) of 30%.

For the purpose of undertaking a sensitivity analysis, the model was also run for four alternate scenarios as follows:

- Using a different, dust suppressant agent that results in a higher haul road watering application rate of 0.08 l/m^2/hr (compared to 0.015 l/m^2/hr for the base case);
- Using the East Void to store tailings;
- Using a higher tailings decant return rate from the North Void of 45%; and
- Replacing the South Void as a water storage with the East (North) Void after Year 10.

Table 60 Predicted Operational Demands and Groundwater Inflows

Operational Demand	Stage (kL/d)					
	Year 3	Year 5	Year 10	Year 15	Year 20	Year 27
Dust Suppression	1,042	1,757	1,658	1,528	1,203	1,211
Industrial Use	1,232	1,232	1,232	1,232	1,232	1,232
Total Operational Demand	2,274	2,989	2,890	2,760	2,435	2,443
Groundwater Inflow	3,175	4,836	6,967	6,033	4,395	3,384

Flooding

The potential for impacts on the Project as a result of Saddlers Creek flooding has been investigated using the Rational Method to estimate 100 year Average Recurrence Interval (ARI) design flood discharges along the reach flowing to the north-west of the Drayton South area for pre-mine conditions. These conditions assume that both Drayton Mine and Mt Arthur Coal Mine were not built and the entire catchment drains to Saddlers Creek, which provides a worst case scenario (i.e. the maximum catchment contributing to runoff). Rational Method parameters were estimated using the recommended methodology in *Australian Rainfall and Runoff* (Pilgrim, 1998) for eastern NSW.

The Hydrologic Engineering Centres River Analysis System (HEC-RAS) hydraulic model was used to estimate design flood levels along Saddlers Creek under pre-mining conditions. The model consists of 112 cross-sections, extracted from a digital elevation model of the area.

8.11.3 Impact Assessment

The surface water modelling exercise simulated the proposed water management system to determine operational water demands, assess the behaviour of the various storages over extended dry and wet periods and predict potential impacts of future mining activities.

Catchment Changes

During and after the life of the Project, there is a potential for the reduction of catchment flows to surrounding waterways, including the Hunter River, Saddlers Creek and Saltwater Creek.

Over the life of the Project, the catchment draining to Saddlers Creek will change, potentially altering its geomorphic characteristics and ecological value.

Under existing conditions, Drayton Mine and Mt Arthur Coal Mine have already reduced the Saddlers Creek catchment by 13%. It is understood that mining as approved at Mt Arthur Coal Mine will continue to extend in a south-westerly direction taking up a further 8% of the catchment between Saddlers Creek and Edderton Road.

The greatest loss of the Saddlers Creek catchment will occur at about Year 10 of the Project. At this time, the catchment contributing runoff to Saddlers Creek will reduce by 1,345 ha (14%). At the end of the Project life, the final void will permanently reduce the Saddlers Creek catchment by 989 ha (10%). There are no licensed water users that exist along Saddlers Creek that will be affected by the reduction in catchment flows.

There are several gullies that are associated with Saddlers Creek. At the completion of mining, three gullies will no longer exist and the catchment draining to the most western gully, on which Blakefield Dam is constructed (Blakefield Gully), will increase from 224 ha to 678 ha.

The Saltwater Creek catchment is already highly impacted as a result of Plashett Dam. Further loss of catchment resulting from the Project will not cause significant impacts. A loss of 594.1 ha (11%) from the catchment is predicted following construction of the Houston Dam and the Houston mining area. This loss is generally consistent across the life of the Project. The catchment lost will be reduced by 190.8 ha (4%) when Houston Dam is removed at the end of the Project life.

The Project will reduce the catchment draining to Plashett Dam by at most 78 ha, which is 1.9% of the total Plashett Dam catchment (4,078 ha). The loss in catchment is due to open cut mining areas (49.1 ha) and the ROM Dam (28.9 ha), which will only be required if the conveyor option is implemented. At the end of the Project life, the loss of catchment will reduce to 49.1 ha (1.2%) when the ROM Dam (if required) is removed. Given the minor loss of catchment, the impact on flows draining to Plashett Dam is not expected to be significant.

The Project will have an insignificant impact on the Hunter River flows. Under mining conditions, the Project will reduce the catchment draining to the Hunter River at Liddell by a maximum of 0.14%. For post-mining conditions the final voids will reduce the Hunter River catchment at Liddell by less than 0.1%.

Mine Site Storage Inventory

Mining operations could potentially be impacted when the out-of-pit storages are too full to accept additional water from the mining areas. The out-of-pit storages (excluding the North Void) have a combined capacity of approximately 18,300 ML. The storages are kept below approximately 14,750 ML to prevent uncontrolled spills. The North Void, which will be used for the co-disposal of rejects and tailings (base case), has a capacity of 18,900 ML.

The water balance for the base case would generally be in equilibrium over the life of the Project if water in the out-of-pit storages, under median (50%) conditions, does not exceed 14,750 ML. This allows water to be pumped in from the active mining areas at all times. In the event out-of-pit storage capacity exceeds 14,750 ML, mining could be affected.

There is a 50% chance that there will be no build-up of water in the active mining areas and a minor accumulation of water in the out-of-pit storages, particularly in the South Void, with the total complex inventory rising from approximately 2,100 ML to 10,600 ML over the Project life (315 ML/year on average). There is, however, a 10% chance that at least 10,750 ML will accumulate in the out-of-pit storages over the life of the Project.

Similarly there is a 10% chance that inundation in the combined mining areas would reach a maximum of 335 ML during the Project life, when the out-of-pit storages are too full to accept additional inflows. It is likely that this amount could be redistributed around the site or pumped directly to Houston Dam for release to the Hunter River under the HRSTS and not significantly impact on mining operations.

Should 1 percentile (wet) conditions occur, the out-of-pit storages are likely to be too full to accept pumped inflows from the mining areas in the mid years of the Project's life, particularly between Year 8 and Year 18. Production will potentially be impacted during these periods and an active mining area may need to be temporarily sacrificed for water storage.

Under the use of the alternate dust suppressant agent at an application rate of 0.08 $l/m^2/hr$ (i.e. higher water usage), there will be a 50% chance that the water management system will accumulate at least 3,980 ML.

No major draw down or build-up of water is predicted in out-of-pit storage under dry conditions (90th percentile). However, there still remains a 1% chance that the out-of-pit storage will be too full to accept mining area inflows at some stage over the life of the Project.

When adopting an alternate tailings decant rate of 45%, there is a 50% chance that there will be no build-up of water in the active mining areas. Similar to the base case, there will be an accumulation of water in the out-of-pit storages with the total complex inventory rising from approximately 2,100 ML to 12,600 ML over the Project life. This is equivalent to 390 ML/year on average as opposed to 315 ML/year predicted for the base case.

By allocating the East Void for tailings disposal as opposed to the North Void, there is a 10% chance that 10,550 ML will accumulate in the out-of-pit storages over the life of the Project, which is similar to that predicted for the base case.

There is also a 10% chance that inundation in the combined mining areas would reach a maximum of 483 ML during the Project life, when the out-of-pit storages are too full to accept additional inflows. In this scenario, water will be transferred to the Houston Dam for release into the Hunter River under the HRSTS.

Similar to the base case, there is a 1% the out-of-pit storages will reach the threshold at which water cannot be pumped in after Year 7 of operations and will remain at that threshold for the Project life. As a result of this there is a 1% chance that inundation in the active mining areas would reach a maximum of 2,814 ML in Year 11 requiring an active mining area to be temporarily sacrificed for water storage.

Should the South Void be replaced with the East (North) Void for water storage from Year 10 (see Scenario 3 in Section 4.4.1), the model predicts that there is a 50% chance that the water in the out-of-pit storages would reach their capacity of approximately 2,500 ML during the middle years of the Project life. There is a 10% chance that water in the active mining areas will accumulate to a maximum of at least 2,290 ML and a 1% chance that water will accumulate to a maximum of at least 5,210 ML, which would impact on production and require an active mining area to be temporarily sacrificed for water storage.

The current production schedule has the flexibility to cater for scenarios where an active mining area is required to be temporarily sacrificed for water storage.

Uncontrolled Spills

The main mine water storages, including the Mine Access Road Dam, Savoy Dam, Transfer Dam, Houston Dam and South Void, will not spill over the life of the Project. There is, however, a 10% chance that there will be one spill (over three consecutive days) from the Rail Loop Dam over the life of the Project.

Offsite Water Supplies

The model for the base case predicts that there is less than a 1% chance that offsite water supplies will be required for the Project. That is, runoff from site catchments and dewatered groundwater can supply water requirements over the life of the Project (unless conditions were drier than the 99th percentile). The proposed use of a dust suppressant agent that minimises water use on the haul roads (application rate of 0.015 $L/m^2/hr$) has played a significant role in minimising the chance of requiring offsite supplies. This is consistent with the existing operations at Drayton Mine, which has not needed to source offsite water throughout its years of operation.

The sensitivity analysis determined that when adopting an alternate dust suppressant agent at an application rate of 0.08 $L/m^2/hr$, there will be at least a 50% chance that no offsite water will be required under this scenario. There is, however, a 10% chance that at least 622 ML will be required over the life of the Project. The majority of this offsite demand would be required towards the start of the Project life between Year 4 to Year 8. In the event that a 99th percentile conditions are experienced, there is a 1% chance that at least 1,623 ML will be required between Year 3 and Year 6 (541 ML/year on average).

In applying the alternate tailings decant rate of 45%, less water is required from the onsite catchments. Similar to the base case, there is less than a 1% chance that offsite supplies will be required to meet operational demand over the life of the Project due to the availability of onsite water.

The utilisation of the East Void to store tailings as opposed to the North Void will result in a different storage surface area relationship. The East Void catchment is 88 ha larger than the North Void and groundwater inflows are slightly higher. This will allow more water to be available for dewatering from the

East Void for operational use, thereby reducing the demand for offsite supplies.

In the event that the South Void is replaced with the East (North) Void for water storage from Year 10, the model predicts that there is a 10% chance that at least 176 ML of offsite supplies would be required to meet operational demand over the life of the Project between Year 21 and 27. However, there remains a 1% chance that at least 490 ML of offsite supplies would be required to meet operational demand over the life of the Project.

Water Allocations

Table 61 shows the estimated average volume of surface water take for the life of the Project. As the location of the highwall dams may change during detailed design, the estimates are subject to change. Runoff volumes have been separated into mine affected catchments draining to sediment / mine water dams, clean water runoff draining to highwall dams and clean water runoff draining to mine water dams.

The intercepted average annual runoff has been estimated using average annual rainfall at Jerrys Plains of 645.7 mm and a volumetric runoff coefficient of 0.048. The total surface water entitlement for the Hunter Unregulated and Alluvial Water Sources source is 80,652 units (ML/year). The Jerrys Water Source, to which the Project applies, is a component of the Hunter Unregulated and Alluvial Water Sources and is limited by an entitlement of 2,573 units (ML/year). The predicted average annual impact on the total share component for the Jerrys Water Source under the WSP for the Hunter Unregulated and Alluvial Water Sources is negligible.

Final Void

Water balance modelling of the Drayton South final void, undertaken by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) (see Section 8.12 and Appendix N) found that the predicted final void water level will be approximately 20 m lower than the pre-mining potentiometric surface surrounding the mining area and 90 m below the void spill height.

Modelling of the salinity levels in the Drayton South final void found that salt concentrations will gradually increase over time with TDS concentrations of 7,000 mg/L predicted at the end of the 122 year simulation period. It is likely that TDS concentrations would continue to increase beyond this as water evaporates and salt loads increase.

Surface Water Quality

Land disturbance associated with mining has the potential to adversely affect the quality of surface runoff in downstream receiving waters through increased sediment loads. In addition, runoff from active mining areas and haul roads may have increased concentrations of salts and other pollutants compared to natural runoff.

By implementing an effective water management system, the Project will not impact on the quality of receiving waters or on the adjoining Plashett Dam. Key elements of the proposed water management system that will reduce impacts on surface water quality include:

- Diversion of runoff from undisturbed catchments away from disturbed areas, wherever possible, using surface drains;
- Treatment of runoff from OEAs using sedimentation dams prior to discharge from the site;

Table 61 Surface Water Allocations

Legislative Act	Water Sharing Plan	Water Source	Water Impacted	Predicted Average Annual Take (ML/year)	Predicted Average Annual Impact on Water Source (%)	Current Licences	Licence / Allocations Required
WM Act	Hunter Unregulated and Alluvial Water Sources	Jerrys Water Source	Water captured off mining areas and collected within sediment / mine water dams	402	15.6	Nil	No licence required due to Clause 18 (i) of the WM Regulation
			Water captured in highwall dams and diverted around the site back into natural catchment	206	8.0	Nil	No licence required due to Clause 18 (i) of the WM Regulation
			Water falling within natural catchment and runoff into mining areas	168	6.5	Nil	168 ML/year

- Runoff from mining areas will be collected within mine water dams for reuse on site;
- Runoff from all site haul roads within the Drayton Complex, including along the length of the transport corridor, will be captured utilising a series of diversion drains, bunds and sediment dams; and
- Water in excess of site use will be released directly to the Hunter River under the HRSTS.

Flooding

Flood modelling undertaken for the Project determined that the conceptual mine plan and all related infrastructure is located outside of the 100 year ARI flood extent of Saddlers Creek for pre mine conditions. Further to this, the operational mining areas associated with the Project are more than 1.5 km from the Hunter River and are located on the other side of a significant ridgeline. As such no impacts on the Project are expected as a result of flooding from Saddlers Creek or the Hunter River.

A pipeline will be constructed to discharge water into the Hunter River as shown on Figure 11. The pipeline outlet will be designed and constructed to minimise erosion of the Hunter River during releases and to prevent the build-up of debris carried by flood water. Although modelling has shown that offsite water supply is not likely (less than 1% chance), a pump station and pipeline will be constructed, if required, near the discharge pipeline to ensure the relevant infrastructure is in place should water from the Hunter River be needed to meet operational demands. The pump station will be located on the high bank of the Hunter River above the 100 year ARI design flood level.

8.11.4 Mitigation and Management

A revision of the existing Drayton Mine water management system and management plan will be undertaken to encompass the new components, procedures and targets required for the Project as described in Section 8.11.1 and below to avoid impacting on receiving waters.

Mining Operations Management

In the event that out-of-pit-storages reach capacity and are unable to accommodate additional flows during the life of the Project, an active mining area will be temporarily sacrificed for water storage.

Given the large storage volumes that are available at Drayton Mine, the adopted base case approach of minimising water use through the use of the dust suppressant agent that results in the lower watering application of 0.015 l/m^2/hr and thereby minimising, or eliminating, the requirement for offsite supplies is the preferred water management strategy from both an operational and environmental perspective.

Although the modelling suggests that offsite water supplies are not likely to be required, approval is still being sought for the construction and operation of a pump station and pipeline to ensure relevant infrastructure is in place in extreme dry conditions. If during the Project water is deemed to be required from the Hunter River, a relevant WAL will be secured prior to sourcing water.

The design, construction and implementation of measures to improve the management of surface water runoff, including stormwater, will be conducted in accordance with *Managing Urban Stormwater Guidelines* (Landcom, 2004). These guidelines will be used primarily for erosion and sediment control during the construction and operation of the Project. Such measures will be integrated into the revision of the existing Drayton Mine water management plan and stormwater management plan.

Uncontrolled Spills

The Rail Loop Dam overflow channel will be blocked off and a new spillway constructed so that storm event overflow discharges into the North Void at Drayton Mine. This will reduce the likelihood of an uncontrolled spill leaving site.

Restoration of Saddlers Creek and Blakefield Gully

A comprehensive restoration program in conjunction with the CMA is proposed for Saddlers Creek to improve its ecological integrity, geomorphic condition and mitigate the impact of the catchment flow loss. Although the loss of catchment flows is a residual impact, the proposed restoration program will improve the condition of Saddlers Creek significantly. Further details with regard to the restoration of Saddlers Creek are provided in Section 8.8 and 8.17. A similar restoration program will be undertaken along Blakefield Gully prior to the removal of Blakefield Dam. This will substantially improve the condition of Blakefield Gully and cater for the additional flows using natural channel principles generally in accordance with the CMA.

Surface Water Monitoring

A surface water monitoring program for onsite water sources will be implemented in accordance with the procedures outlined in the existing Drayton Mine water management plan. This document specifies that all major dams, both mine water and clean, are monitored on a monthly basis for storage volume, pH, EC, TDS, suspended solids, sodium, magnesium, potassium, calcium, chloride, sulphate and bicarbonates. These results will be reported in the Annual Review.

In addition to the surface water monitoring, data will be collected to update and validate the OPSIM water balance model. The updated model results will be reported as part of the Annual Review to ensure the assumptions made in the assessment are correct and appropriate. The model will be used to continually improve the water management system to both minimise the requirement for offsite releases and maximise the use of mine affected water.

All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

8.12 Groundwater

8.12.1 Background

A groundwater impact assessment was undertaken by AGE and is provided in Appendix N. The purpose of the assessment was to characterise existing groundwater regimes, assess the impacts of the Project on these groundwater sources and other water users, quantify predicted inflows into the mining areas throughout the life of the Project and recommend measures to mitigate and manage these impacts.

Existing Groundwater System

The regional groundwater system within the vicinity of the Drayton South area consists broadly of three aquifer systems:

- Alluvium along the Hunter River, Saddlers Creek and Saltwater Creek;
- Weathered bedrock (regolith); and
- The coal seams of the Permian Wittingham Coal Measures.

The alluvial deposits of the Hunter River located to the immediate south of the Drayton South area are a significant storage for groundwater, particularly within the basal gravel sequence and overlying sands. The material overlying the basal gravel is typically less permeable and consists predominantly of silt with minor clay. The alluvial aquifer has a maximum thickness of approximately 18 m and yields of up to 21 L/s.

The water quality of the Hunter River alluvial aquifer, as reflected by EC, is quite variable ranging between 644 µS/cm (~412 mg/L TDS) and 6,700 µS/cm (~4,288 mg/L TDS). The EC range is influenced by the dominant recharge source at the time, which is typically from the underlying coal measures. This results in very poor quality water, however, recharge from rainfall or the river itself has the potential to slightly improve water quality conditions.

In contrast, the Saddlers Creek alluvium has a limited capacity to store and transmit water, exhibits low yields and poor water quality, and does not form a single, well-connected aquifer. The water quality of the Saddlers Creek alluvial aquifer is too saline for stock watering with EC in the range of 8000 to 9000 µS/cm and TDS in the range of 3,000 to 7,000 mg/L. The alluvium is dominated by clay and silt, interspersed with isolated sandy lenses that are typically only a few metres thick. Groundwater is able to accumulate within these lenses after the infiltration of surface water runoff during periods of heavy rainfall. Discharge of this groundwater maintains a base flow in the creeks and gullies, however, it is typically short lived with the alluvium expected to drain quickly.

Similarly, the alluvium associated with Saltwater Creek is thin and of limited extent due to a steep bed grade that prevents alluvial sediment being deposited. Very limited occurrence of groundwater is likely to occur within the Saltwater Creek alluvium as a result of this.

The fresh unweathered Permian strata is typically characterised by very low yielding, tightly consolidated interburden with very little primary porosity, and low to moderately permeable coal seams. These coal seams typically range in thickness from 1 m to 5 m and is the prime water bearing strata within the Permian sequence. Compared to the Hunter River alluvial aquifer, the coal seams are generally low yielding and contain poorer quality water.

Rainfall recharge to the Permian bedrock percolates downwards from the regolith at a reducing rate, due to increasing confinement and decreasing permeability. This vertical flow regime is predominantly fracture flow, where pathways depend upon fracture and joint connectivity within the rock strata.

Existing Groundwater Users

There are a number of land users that utilise the Hunter River alluvial aquifer for irrigation, stock, domestic and industrial purposes within the vicinity of the Drayton South area (see Appendix N).

A large proportion of the agricultural land and associated farming enterprises adjacent to the Drayton South area are situated on the floodplain of the Hunter River and its larger tributaries. The Hunter River also plays an important role in the operation of the region's mining and power generation industries and in irrigating Coolmore Stud, Woodlands Stud and several other agricultural enterprises within the area.

8.12.2 Methodology

Desktop Assessment

A desktop assessment was undertaken to review data sourced from historical groundwater studies specific to the Drayton South area, including Saddlers Creek Coal Mine (MER, 1998 and 2001). This established that there was a lack of available data for the Saddlers Creek and Hunter River alluvial aquifers, which in turn prompted further field work. Previous studies undertaken at Drayton Mine and shared geological and publically available hydrogeological data from the neighbouring Mt Arthur Coal Mine were also used where relevant.

Field Assessment

A field assessment was undertaken in line with the coal resource exploration drilling program in 2011 to gather additional hydrogeological information and to facilitate an ongoing monitoring program. This involved the installation of nine new groundwater monitoring bores and five vibrating wire piezometers (VWPs) within different lithological units along Saddlers Creek and the Hunter River alluvial flood plain, and within the vicinity of the Drayton South disturbance footprint. These bores were designed and tested to provide information on the underlying bedrock (regolith) and the alluvium, including existing groundwater levels, pressure, hydraulic connectivity and water quality.

Groundwater samples were collected from the new groundwater monitoring bores in August 2011 and were analysed by Australian Laboratory Services for pH, EC, TDS, major anions and cations, metals, nutrients and organics.

Model

A numerical model was developed using recent hydrology, hydrogeology and geological structure data to assess the impact of the Project on the existing groundwater regime.

The three-dimensional groundwater flow model (MODFLOW SURFACT) was used to simulate the Project's impacts on the groundwater regime over time. The model used conservative parameters and values and is considered to represent the worst case scenario for potential groundwater impacts resulting from the Project and other activities.

8.12.3 Impact Assessment

The groundwater modelling exercise simulated the existing conditions of the groundwater regime and provided predictions of the potential impacts of future mining activities.

Mining Area Inflows

The groundwater model predicts that inflows will vary throughout the mine life, which is directly related to the design of the mine plan. As mining progresses and enters into a new strip, groundwater inflows will rise, followed by a gradual reduction in inflows.

Inflows into the mining areas will gradually increase from the commencement of mining in the Drayton South area to a maximum of 4.6 ML/day (1,682 ML/year) in Year 10. The inflow rate over the life of the Project averages 477 ML/year (1.3 ML/day). However, not all of the groundwater inflow that reports to the mining area will be derived from the Permian coal measures. In Year 10 it is anticipated that close to 900 ML/year will be derived from the Permian aquifers, whilst the remainder is a result of rainfall recharge seepage through the overburden.

The model predicts that cumulative inflow (inflow from the Permian coal measures and seepage from OEAs) of groundwater over the life of the mine is approximately 23,663 ML, which is an average of 876 ML/year over the 27 years of mining.

Predicted inflows for six representative stages of the mine life are provided in Table 62.

Table 62 Predicted Groundwater Inflows

Year	Predicted Inflow Rate (ML/day)
3	0.9
5	2.5
10	4.6
15	3.6
20	1.9
27	0.8

Regional Groundwater System

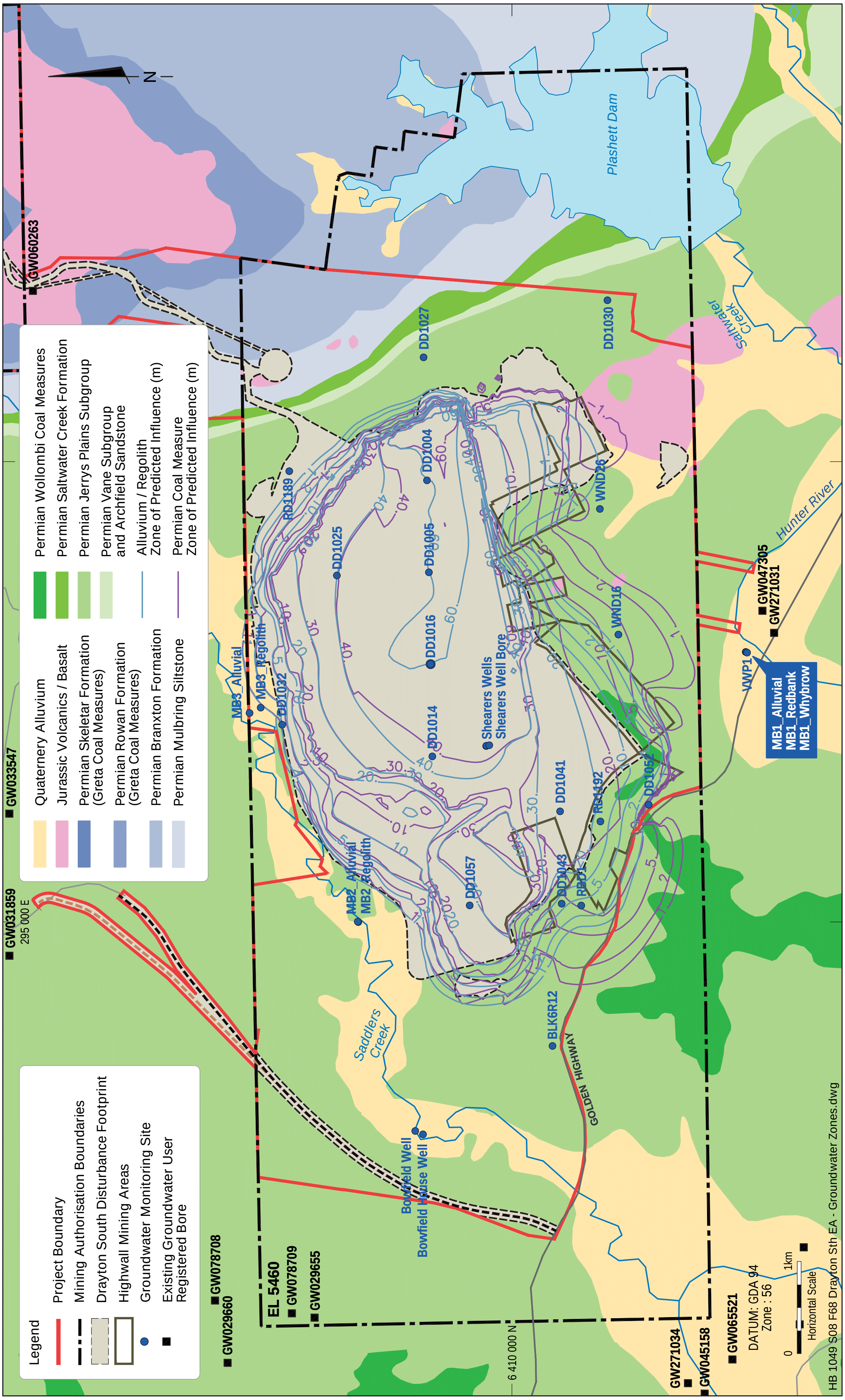
Seepage of groundwater from the aquifers intersected during mining will reduce groundwater pressures in the coal seams and overburden / interburden aquifers around the mining areas. This will lower the water table of an unconfined aquifer or depressurise a confined aquifer, lowering the potentiometric surface.

The model has predicted the development and magnitude of the zone of influence (also referred to as zone of depressurisation) for the Project with regard to the shallow regolith / alluvium and Permian coal measures. The zone of influence for each of these layers (as defined by the 1 m draw contour) will propagate out from the highwall of the mining areas and gradually increase in size as mining advances and are shown on Figure 68.

The zone of influence for the shallow regolith / alluvium, as shown on Figure 68, is predicted to be restricted to the immediate vicinity surrounding the mining areas. This is a maximum distance of approximately 600 m to the west and south of the mining areas in Year 27. The zone of influence within the shallow regolith / alluvium is not predicted to extend into the Hunter River alluvium; however, it is predicted to extend marginally into the Saddlers Creek alluvium.

The zone of influence for the Permian coal measures, as shown on Figure 68, is predicted to be restricted to a maximum distance of approximately 1 km to the west and south of the mining areas at Year 27. The zone of influence within the coal measures is predicted to extend under the Saddlers Creek alluvium. The zone of influence within the coal measures is not predicted to extend beneath the Hunter River alluvium at the end of mining. In general, the modelled zone of influence surrounding the Project is predicted to be limited as expected for the prevailing low permeability coal measures.

Depressurisation of the shallow regolith at Year 1,000 was predicted to extend to a maximum distance of 1 km south of the mining areas and is restricted by the higher permeability unit of the Hunter River alluvium. The zone of influence in the



DRAYTON SOUTH COAL PROJECT

Groundwater Zone of Influence

FIGURE 68

AngloAmerican

Hansen Bailey ENVIRONMENTAL CONSULTANTS

shallow regolith located to the south-east and south-west of the Project (i.e. where the drawdown influence is not limited by the presence of the Hunter River alluvium) is predicted to extend between 1.5 km and 2 km.

Depressurisation of the Permian coal measures is predicted to extend to approximately 1.3 km south of the mining areas at Year 1,000. The zone of influence was also predicted to extend between 3.8 km to the south-west and 3.3 km to the south-east.

Post-Mining Recovery of Groundwater Levels

The final void within the Drayton South area will collect and accumulate water from a number of sources, including groundwater seepage from the surrounding regolith and coal seams, seepage and runoff from the rehabilitated OEAs and direct rainfall into the void. All undisturbed catchment flows will be diverted around the final void to limit the impact on overland flow.

Due to the exposure of the final void lake surface to the effects of evaporation, the rising water level within the void is likely to be impeded and as such is expected to reach a *'quasi-equilibrium'* state at a level lower than the pre-mining potentiometric surface elevation. The rate of recovery for the final void water level will be dependent upon rainfall. Years of below average rainfall will extend the recovery period whereas wet years will reduce the time for stabilisation.

Water levels in the final void are predicted to reach 85% of the post-mining equilibrium level within 147 years after the cessation of mining. This water level is equivalent to approximately RL 100 m. The final void post-mining equilibrium level (approximately RL 117 m) will be reached after approximately 1,000 years. This is effectively the level at which the amount of water entering the void via runoff and inflow is equivalent to the evaporation that is expected for the area of the final void lake surface. The freeboard between the water level surface and the void spill height is predicted to be approximately 90 m.

The final void water level recovery model predicts that the post-mining equilibrium void level will be approximately 20 m lower than the pre-mining potentiometric surface surrounding the mining area. The depression of the potentiometric surface around the void will act as a *'sink'*, which prevents water within the final void from flowing outwards into the regional system. This effect will persist for approximately 700 years after mining.

As the groundwater head recovers to above RL 114 m (reaching RL 117 m after 1,000 years), it was predicted that the hydraulic gradient will be slightly reversed away from the final void. This is predicted to result in a slight loss of final void water back into the Permian coal measures. The loss of water from the final void into the coal measures may rise from 0.001 ML/day up to 0.02 ML/day during the period from 700 to 1,000 years after mining.

No other registered bores are located within the predicted zone of influence at the end of mining. Similarly, no registered bores are located within the predicted zone of influence at 1,000 years after mining.

Alluvial Aquifer Water Loss

The groundwater model predicts the migration of the zone of influence southwards towards the Hunter River over time, but not measurably beneath these alluvial lands. Consequently, the Project is predicted to have only very limited leakage impacts on the alluvial lands associated with the Hunter River.

Predicted seepage fluxes at the cessation of mining indicate that the Hunter River alluvium will continue to receive seepage at a rate comparable to pre-mining conditions. However, as the zone of influence expands over time, the seepage flux to the Hunter River alluvium may be reduced by approximately 0.01 ML/day at Year 400 or by an average 2 ML/year. This reduced seepage flux is not likely to impact groundwater levels within the alluvial aquifer by a measurable amount.

The vertical leakage fluxes between the alluvial deposits associated with Saddlers Creek and the underlying coal measures will be affected due to the proximity of the Project. The pre-mining net upward seepage flux to the Saddlers Creek alluvium is in the order of 0.31 ML/day. Operations at Mt Arthur Coal Mine are predicted to result in a maximum reduction in net flux to the Saddlers Creek alluvium of 0.19 ML/day (at the end of mining). The remaining influx to the Saddlers Creek alluvium (approximately 0.12 ML/day) may therefore be reduced to zero as a result of the Project. The flux reduces by an average 58 ML/year over the mining and post-mining phases.

Groundwater seepage from the coal seams is anticipated to continue recharging the lower portion of Saddlers Creek as it approaches Hunter River, even during peak mining activities associated with the Project and Mt Arthur Coal Mine.

Water Allocations

Table 63 shows the estimated average volume of groundwater take for the life of the Project.

The Jerrys Water Source, to which the Project applies, is a component of the Hunter Unregulated and Alluvial Water Sources and is limited by an entitlement of 2,573 units (ML/year). The groundwater model predicts an average annual loss of 2 ML/year from the Hunter River alluvium (post mining) and 58 ML/year from the Saddlers Creek alluvium (including post mining) over the life of the Project.

The predicted average annual impact on the total share component for the Jerrys Water Source under the WSP for the Hunter Unregulated and Alluvial Water Sources is negligible.

As the Project is predicted to take water from the Hunter River alluvium and this take of water is predicted to cause movement of water from a connected regulated river water source (i.e. the Hunter River), a WAL is required under the WSP for the Hunter Regulated River Water Source. Conservatively it has been predicted that an annual average of 2 ML/year will be taken from the Hunter Regulated River Water Source as a result of the Project.

Anglo American currently hold two general security WALs under the WSP for the Hunter Regulated River Water Source (WAL 491 and 1066), which provide an allocated share of 99 units each (198 units combined) for irrigation purposes. These WALs may be transferred from use for the purpose of irrigation to use for the purpose of mining. The total share component for the regulated river (general security) access licences in Management Zone 1 is 75,035 units. The predicted average annual impact on the total share component for the regulated river (general security) access licences in Management Zone 1 under the WSP for the Hunter Unregulated and Alluvial Water Sources is negligible.

Existing Groundwater Users

A total of two registered groundwater bores are located within the zone of influence (as defined by the 1 m drawdown contour, see Figure 68) at the end of mining, including Shearers Well (regolith) and Shearers Well Bore (Permian coal measures). Both of these groundwater bores are located on land owned by Anglo American, and will be intercepted by mining.

Groundwater Dependent Ecosystems

An assessment on the potential impacts of the Project on GDEs was undertaken by Cumberland Ecology a summary of which is included in Section 8.7. Further to this Eco Logical Australia Pty Ltd also conducted a stygofauna impact assessment for the Project as summary of which is provided in Section 8.13.

Groundwater Quality

Groundwater within the Permian coal measures is generally of poor quality. The environmental value of this groundwater has been assessed as being '*primary industry*'; with low yield and low quality thereby limiting its usage. During mine operations, the net movement of groundwater towards the mining areas will stop the movement of potentially poorer quality water from moving out of the Drayton South area and into the surrounding environment. However, Permian coal measures outside of the Drayton South area will continue to receive recharge via the same processes that occurred pre-mining.

As described in Section 8.12.1, seepage flux of saline groundwater contained in coal measures can result in pockets of variably saline quality groundwater in the Hunter River and Saddlers Creek alluvium.

Based on the predicted impacts described above, the groundwater quality may improve in the Saddlers Creek alluvium as discharge of higher salinity groundwater into the alluvium is predicted to be reduced. This may result in a freshening of groundwater resulting from downward migration of rainfall recharge and creek recharge.

The groundwater quality within the Hunter River alluvium is not expected to measurably change as a result of the Project. Groundwater within the coal measures is predicted to continue to discharge into the Hunter River alluvium at a rate similar to pre-mining conditions.

Based on the geochemistry impact assessment conducted by RGS Environmental (RGS), which assessed the overburden and potential reject materials, it is considered unlikely that leachate generated from these materials will adversely impact upon local or regional groundwater quality (see Section 8.14).

Water quality within the final void lake will be determined by the quality of rainfall, groundwater and leaching of salts from rehabilitated OEAs. The final void will act as a sink and draw

Table 63 Groundwater Allocations

Legislative Act	Water Sharing Plan	Water Source	Predicted average annual take (ML/year)	Predicted Average Annual Impact on Water Source (%)	Current licences	Licences / Allocations Required
Water Act	N/A	Permian Coal Measures	477	N/A	Nil	477 ML/year
WM Act	Hunter Unregulated and Alluvial Water Sources	Jerrys Water Source (Hunter River Alluvium)	2	0.08	Nil	2 ML/year
		Jerrys Water Source (Saddlers Creek Alluvium)	58	2.25	Nil	58 ML/year
	Hunter Regulated River Water Source	Management Zone 1	2	0.003	WAL 491 WAL1066	2 ML/year

N/A Not Applicable

in groundwater from surrounding aquifers, which will prevent potentially brackish to saline water from being released back into receiving waters. The long term build-up of salts in the final void was assessed by WRM as part of the surface water impact assessment for the EA (see Section 8.11). The water / salt balance model predicted that salt concentrations will gradually increase, with TDS concentrations peaking at 5,600 mg/L at the end of the simulation period (122 years). It is likely that TDS concentrations will continue to increase over time as water evaporates from the surface of the water body and salt loads increase.

It is not considered that the hydraulic gradients surrounding the final void would be conducive to leachate migration in the very long term. It is estimated that the travel time for a particle of water to move from the final void to the Hunter River will take about 600 years after the initial 700 years of void recovery, totalling about 1,400 years post mining. However, as long as the cone of depression has not recovered around the mine and the water level within the final void remains below the surrounding groundwater level, no outflow of leachate is expected.

There is the potential for spills and contamination by metals and hydrocarbons at the mine workshop, waste disposal and fuel storage areas. However, adequate monitoring in accordance with the SHECMS, bunding and immediate clean-up of spills should prevent contamination of the shallow groundwater system. Any spills from these areas are typically localised and not regionally significant.

Highly Productive Groundwater

The *Aquifer Interference Policy* (AIP) (NOW, 2012) requires a consideration of the Project's impacts on Highly Productive Groundwater (HPG). As explained above, the Project could reduce upward seepage in the Saddlers Creek alluvium to nil. Water in the Saddlers Creek alluvial aquifer typically possesses a TDS content of 3,000 to 7,000 mg/L. Therefore the Saddlers Creek alluvial aquifer does not comply with the criteria for HPG and is considered to be classified as a Less Productive Groundwater (LPG) as per the AIP. The minimal impact considerations for LPG under the AIP are met by the Project as there are no impacts to water pressure at any privately owned water supply works and there will be no change in the groundwater quality of the Saddlers Creek alluvial aquifer that would change its *'beneficial use category'*.

The water quality of the Hunter River alluvial aquifer is variable with TDS measurements ranging from 412 mg/L to 4288 mg/L. Conservatively considering the lowest TDS measured in the Hunter River alluvial aquifer, this groundwater source is considered to be classified as HPG as per the AIP. However, the Project will not have any measurable impact on the Hunter River alluvial aquifer. Therefore, the Project will not result in impacts to HPG.

Tailings and Rejects Disposal

At the completion of coal mining operations at Drayton Mine, three voids will remain. It is proposed that rejects and tailings generated at the CHPP from the Drayton South operation will be deposited in these voids, one of which will be utilised for water storage.

There are three possible scenarios for rejects and tailings disposal; however, these are contingent upon reaching a commercial agreement with Macquarie Generation (see Section 4.4.1).

Previous assessments undertaken by AGE (2006) at Drayton Mine indicated that as long as the cone of depression does not recover around the void to pre-mining levels, and the water table within the void remains below the surrounding groundwater level, there are not expected to be any outflows of leachate from the void. Given that the pre-mining groundwater level surrounding the East Void was at an elevation of approximately RL 180 m, and that the elevation of the tailings is proposed to be RL 106 m under Scenario 1 and 3, and RL 140 m under Scenario 2, it is expected that a cone of depression will be retained around the East Void and as such it is unlikely that leachate will migrate out of the void.

Previous assessments undertaken by AGE (2006) of groundwater levels surrounding the North Void at Drayton Mine indicate a pre-mining groundwater level of approximately RL 180 m and a final steady state water level (assuming that the void was not filled with tailings or rejects) of approximately RL 160 m. It was therefore concluded that the open void would act as a groundwater sink and that there was not expected to be contamination of the surrounding aquifer.

The preliminary disposal designs for Scenario 1 and 3 suggest that the North Void will be filled with rejects and tailings and capped at RL 202 m. Under Scenario 2, the North Void will be filled with rejects only and capped at RL 181 m. It is therefore assessed that the preliminary disposal designs do not provide conditions which will promote the development of a long-term cone of depression surrounding the North Void. If a cone of depression is not maintained surrounding the North Void, the hydraulic gradients within this area may lead to the movement of leachate away from the void and towards the catchment of Ramrod Creek.

8.12.4 Mitigation and Management

A revision of the existing Drayton Mine water management plan will be undertaken to encompass the new procedures and targets required for the Project as described below to avoid impacting on groundwater and the receiving environment. All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

Monitoring Bore Network

The design of the existing monitoring network (see Figure 9 and Figure 10) is deemed suitable for the long term monitoring of depressurisation of the coal measures and to determine the zone of influence created by the mining areas, and its potential to interact with the Hunter River and Saddlers Creek alluvium.

Given the adequacy of the current groundwater monitoring system in place within the Drayton South area, no further actions are required.

Groundwater Level Monitoring

Groundwater levels are currently manually measured via groundwater monitoring bores on a quarterly basis. The current monitoring frequency is suitable for identification of long-term trends in groundwater levels.

Pore pressures within the coal seams and interburden are automatically measured on a six-hourly basis by the VWPs. Automatic monitoring at six-hourly intervals is suitable for the identification of both short and long term trends in groundwater levels, and is particularly suited to capturing a response (if any) to rainfall events.

Trigger levels will be determined for the bores monitoring the Hunter River and Saddlers Creek alluvial aquifers. The trigger levels will be set after a baseline data set of two years of water level data has been collected. The baseline monitoring period will allow the natural fluctuations in alluvial water levels due to variability in rainfall recharge and surface water flow to be assessed, and a method for separating mining induced water level fluctuations developed.

Groundwater Quality Monitoring

Groundwater samples will be collected from the existing groundwater monitoring bores on a six-monthly basis and analysed for pH, EC, TDS, major ions and trace elements.

Monitoring will continue on a six-monthly basis until mine closure in Year 27 and then for a period of five years post closure. This will ensure that any deviation from the predictions made in the assessment can be identified and mitigated in a timely manner.

Trigger levels for water quality will be developed only for the monitoring bores installed in the Hunter River and Saddlers Creek alluvial aquifers. A unique trigger for each bore will be required due to the variability in the groundwater quality in the alluvial aquifers. Trigger levels should be developed after a minimum of two years of baseline data has been collected.

Groundwater Seepage Monitoring

In order to monitor and manage seepage of groundwater into the mining areas the following measures will be undertaken:

- Regular geological and geotechnical mapping of fractures in the highwall and endwall;
- Recording of the time, location and volume of any unexpected increases in groundwater outflow from the highwall and endwall;
- Recording of the location and cause of any highwall / endwall stability issues;
- Measurement of water pumped from the mining areas using flow meters or other suitable gauging apparatus; and
- Monitoring of coal moisture content.

Tailings and Rejects Disposal Monitoring and Management

As described in Section 8.12.3, the leachate associated with the tailings and rejects material that will be generated by the Project is unlikely to result in any adverse impacts on receiving waters. To ensure that key water quality parameters within the vicinity of the tailings and rejects emplacement areas remain within appropriate criteria, a monitoring program will be established nearby.

The monitoring program will include the installation of monitoring bores in strategic locations to detect the movement of seepage water away from the emplacement areas. Water levels will be recorded on a quarterly basis. In addition groundwater samples will be collected and analysed on a six-monthly basis in accordance with the groundwater quality monitoring procedures noted above. This will enable direct comparison with groundwater samples collected from areas associated with the Project.

Should the groundwater monitoring program surrounding the emplacement areas identify excessive seepage with water quality parameters exceeding guideline levels, interception or pump-back bores will be installed to avoid adverse impacts to receiving waters.

The existing Drayton Mine final void management plan and tailings management plan will be revised to incorporate the tailings and rejects emplacement areas under the selected scenario. These documents will outline, but not be limited to:

- Description of a cover system (i.e. capping);
- Designs for tailings and rejects emplacement areas; and
- Strategy and procedures for the interception and management of seepage from tailings and rejects emplacement areas (should the event occur).

Management of Existing Groundwater Users

In the unlikely event that water levels in existing landholder bores have declined as a consequence of the Project, leading to an adverse impact on water supply, the supply will be substituted by Anglo American in consultation with the landholder by either deepening the bore, constructing a new bore, or providing comparable water from an external source. However as discussed is Section 8.12.3, no impacts are predicted for any private bores.

8.13 Stygofauna

8.13.1 Background

A stygofauna impact assessment was undertaken by Eco Logical Australia Pty Ltd and is provided in Appendix O. The purpose of the assessment was to determine the potential impacts on stygofauna and to recommend measures to mitigate and manage these impacts where appropriate.

8.13.2 Methodology

Desktop Assessment

A desktop assessment was conducted to determine the likelihood of stygofauna occurring within the vicinity of the Project.

Previous studies conducted in the Hunter Valley region since 2000, have investigated the presence of stygofauna in the hyporheic zone, an area of the river bed where groundwater and surface water mix, along the Hunter River, Goulburn River and Wollombi Brook. These surveys have confirmed the existence of a diverse array of stygofauna in the Hunter Valley region, including crustaceans, flat worms and aquatic worms.

The findings of the desktop assessment suggest that stygofauna are likely to occur within the vicinity of the Project. As such, a sampling program was conducted to validate this assumption.

Sampling Program

A sampling program targeting the Hunter River and Saddlers Creek alluvial aquifers, and the underlying Permian aquifer was conducted within the vicinity of the Project.

The specifications described in the *Sampling methods and survey considerations for subterranean fauna in Western Australia* (WA EPA, 2007) were used as a guideline for the sampling program. These guidelines stipulate that bores selected for sampling should not take place until at least three months after construction. This is to provide stygofauna with sufficient time to colonise the immediate vicinity of the bore following the disturbance of the area during construction.

A total of 24 bores in the vicinity of the Drayton South area were sampled between 5 and 8 September 2011. Nine of the 24 bores were sampled within three months of construction. These nine bores were resampled on 26 and 27 October 2011 to ensure compliance with the guidelines. At completion of the program, a total of 33 samples were collected.

For all cased bores with an internal diameter of 50 mm to 150 mm, samples were collected using the combined net and pump method (Hancock and Boulton, 2009). For wells and unlined bores, samples were collected with a net only. The water level at each bore was recorded prior to sampling followed by the measurement of pH, EC, temperature and dissolved oxygen concentration after pumping 10 L, 50 L and then every 50 L thereafter.

Samples collected were sorted, counted and identified to a species level, where possible.

8.13.3 Impact Assessment

Of the 24 bore locations sampled in September 2011, stygofauna was only present in the sample collected at bore MB02_Alluvial, which monitors the Saddlers Creek alluvium. This sample contained two stygofauna taxa, namely *Ostracoda* and *Diacyclops sp.*, neither of which are endemic to the Saddlers Creek alluvial aquifer. No stygofauna was recovered in the samples collected in October 2011. It was noted that it remains a possibility for there to be species living in the aquifer that have not yet been collected.

Even though stygofauna was not detected in the Hunter River alluvial aquifer during the sampling program, communities are known to exist based on the results of previous studies.

Stygofauna was not detected in the Permian aquifers during the sampling program. Due to the depth of the water table, the low hydraulic conductivity and the isolation of the deeper Permian aquifers, these areas were considered unsuitable for stygofauna habitat.

The Project could potentially impact upon stygofauna through the following mechanisms:

- Changes to groundwater levels in aquifers due to mine dewatering, seepage into mining areas, fracturing of confining layers and modifications to drainage patterns;
- Removal of parts of the aquifer matrix; and
- Changes to water quality.

Changes to Groundwater Levels

As mining proceeds, draw down will occur at a greater rate than the recharge of the coal measures because of groundwater seepage into the mining area during extraction.

A drawdown of up to 2 m is predicted to occur along a 6 km section of the Saddlers Creek alluvial aquifer as a result of cumulative impacts associated with the Project and the adjoining Mt Arthur Coal Mine operations to the north.

The Project will also result in a decrease in the upward flux of water from the Permian aquifer into the Saddlers Creek alluvial aquifer. The pre-mining flux of water into the Saddlers Creek alluvium is approximately 0.31 ML/day. This influx rate will be reduced to approximately 0.12 ML/day as a result of the approved Mt Arthur Coal Mine operations to the north. The Project will further influence the Saddlers Creek alluvium potentially reducing the residual influx of water to zero. However, the areas of Saddlers Creek near the confluence with the Hunter River will continue to be recharged through groundwater from the Permian aquifer and rainfall, even during peak mining periods (see Section 8.12).

The draw down and the decrease in seepage flux from the Permian aquifer may degrade or diminish the habitat for stygofauna in the Saddlers Creek alluvial aquifer. As stygofauna were identified at 5 m below ground level along Saddlers Creek, these taxa are expected to be impacted by the draw down. The two stygofauna taxa identified within the Saddlers Creek alluvial aquifer are not endemic to the aquifer.

The groundwater model indicates that the zone of influence extends further to the south of the Project within proximity of the Hunter River but not measurably beneath the alluvium (see Section 8.12). Subsequently, there will be very limited, if any, impact to the Hunter River alluvium and associated stygofauna as a result of the Project.

Removal of Aquifer Material

Declining water tables can exacerbate habitat loss through the removal of the physical part of the aquifer. In cases where the coal seams themselves are habitat to stygofauna, mining poses a direct impact to any animals endemic to the area. Material may also be removed from aquifers overlying or adjacent to target strata during excavation.

Stygofauna was not recorded in the Permian aquifer during the sampling program nor are communities likely to occur in this environment. Therefore no critical habitat will be removed by mining the targeted coal seams. Mining will not remove any material associated with the Hunter River or Saddlers Creek alluvial aquifers.

Changes to Water Quality

The water quality parameter that has the greatest impact on the survival of stygofauna is EC. Hancock and Boulton (2008) observed that, although there are exceptions, most stygofauna taxa occurred when EC was less than 5,000 µS/cm. The EC of the Hunter River alluvial aquifer varies from 644 to 6,700 µS/cm. Since the Project is not expected to cause a draw down in the Hunter River alluvial aquifer, there is unlikely to be a material change in the EC range and therefore stygofauna communities associated with this aquifer are not likely to be impacted.

The EC for the Saddlers Creek alluvial aquifer is between 8,530 and 9,180 µS/cm. Due to the expected depressurisation of the Saddlers Creek alluvial aquifer as a result of the Project and cumulative impacts, there may be a reduction in saline water influx. This change in water quality is likely to have no significant impact on stygofauna.

The overburden and coal rejects for the Project are characterised by low sulphur content and minimal acid generating capabilities. Runoff and seepage from overburden and reject emplacement areas are predicted to be slightly alkaline, with a low to moderate concentration of soluble salts (see Section 8.14).

The concentration of total metals detected in overburden materials are well below applied guideline criteria for soils. Similarly, the runoff and seepage generated by most overburden and coal reject material are anticipated to have concentrations of dissolved trace metals below that of applied water quality guideline criteria. These concentrations are unlikely to present any significant impacts to surface water and groundwater quality (see Section 8.14).

Based on the geochemistry of overburden and coal reject material, leachate is unlikely to impact on stygofauna that is known to occur in the area.

8.13.4 Mitigation and Management

The alluvial aquifer of Saddlers Creek appears to be sparsely populated with stygofauna. All stygofauna collected from the aquifer are known from other locations, and there is no threat posed to any rare or significant stygofauna taxa. With the exception of parts of the Saddlers Creek alluvial aquifer it is not anticipated that the Project will pose a threat to stygofauna within the region. As such no further stygofauna sampling, mitigation or management measures are recommended for the Project.

As there will be very limited, if any, impact to the Hunter River alluvium and associated stygofauna as a result of the Project, no mitigation or management measures are recommended.

8.14 Geochemistry

8.14.1 Background

A geochemistry impact assessment was undertaken by RGS and is provided in Appendix P. The purpose of the assessment was to characterise the geochemistry of the overburden and coal reject materials associated with the mining operations within the Drayton South area, and to recommend mitigation and management measures related to overburden and coal reject emplacement and the Project's rehabilitation program.

8.14.2 Methodology

Desktop Assessment

A desktop assessment was undertaken to review the available geochemical, geological and water quality data associated with the Project to assist in the design of a suitable geochemical sampling and testing program for overburden and coal reject materials. Technical guidelines for the geochemical assessment of mine waste in Australia and worldwide were used as the framework for developing the sampling and testing program.

Sampling Program

The sampling program utilised cores derived from the 2011 exploration drilling program. The sampling strategy was based on the expected geological variability and complexity in rock types, potential for significant environmental or health impacts, size of the proposed operation, material representation requirements, material volumes, and the level of confidence in predictive ability.

Thirty overburden samples and six potential coal reject (coal seam roof and floor) samples were obtained from five drill holes selected to provide lateral and vertical coverage of the Drayton South area. An additional two composite samples of roof, floor and coal reject materials from four boreholes spanning the five target seams were also obtained for inclusion in the assessment.

Samples were subject to a series of static and kinetic geochemical tests at Australian Laboratory Services. The geochemical testing program was designed to assess the degree of risk from the oxidation of pyrite, acid generation, and leaching of soluble metals and salts.

The static tests also included characterisation of standard soil parameters, including salinity, cation exchange capacity, sodicity, potential nutrients and major metal compositions.

8.14.3 Impact Assessment

Overburden and most coal reject materials are expected to have very low oxidisable sulfur content and significant excess acid neutralising capacity. These characteristics indicate that the materials are non acid forming and likely to have a high factor of safety with respect to potential acid generation.

The runoff and seepage associated with overburden and coal reject materials are predicted to have neutral to slightly alkaline pH with low and moderate salinity levels, respectively, following surface exposure.

The salinity of runoff and seepage from these materials is expected to decrease with time as soluble salts are flushed from the system. The major ion chemistry of initial and ongoing surface runoff and seepage from overburden and coal reject materials is likely to be dominated by sodium, bicarbonate chloride and sulfate. The concentration of total metals detected in overburden materials are well below applied guideline criteria for soils and is unlikely to present any environmental issues associated with revegetation and rehabilitation. Similarly, the runoff and seepage generated by most overburden and coal reject material are anticipated to have concentrations of dissolved trace metals below that of applied water quality guideline criteria. These concentrations are unlikely to present any significant impacts to surface water and groundwater quality.

Some overburden and most coal reject materials have potential sodic properties, which could lead to structural stability issues, including dispersion and erosion. There is also a low probability of spontaneous combustion either in situ or for coal, overburden and coal reject materials generated within the Drayton South area.

8.14.4 Mitigation and Management

The ongoing management of overburden and coal reject materials will consider the geochemistry of these materials with respect to its potential risk to cause harm to the environment and their suitability for use in construction and revegetation. Anglo American will undertake:

- Pre stripping topsoil from areas to be mined for use in final rehabilitation activities consistent with that described in Section 8.15; and
- Potentially sodic overburden and coal reject materials will be placed in a manner that limits the risk of erosion.

Runoff or seepage from OEAs will be monitored to ensure key water quality parameters remain within relevant criteria, including pH, EC, TSS and dissolved metals (see Section 8.11).

8.15 Soil And Land Capability

8.15.1 Background

A soil and land capability impact assessment was undertaken by Environmental Earth Sciences and is provided in Appendix Q. The purpose of the assessment was to:

- Identify the soil types within the Drayton South area;
- Describe the pre and post-mining land capability and agricultural land suitability within the Drayton South area;
- Assess the potential impacts of the Project in accordance with the SRLUP with specific consideration for verifying BSAL;
- Determine the available topsoil resource for post-mining rehabilitation; and
- Provide selective topsoil and subsoil management measures.

8.15.2 Methodology

A desktop assessment was undertaken to gain an initial understanding of the different soil and landscapes types across the Drayton South area. This involved a review of aerial photography, topographic, soils and geological maps and previous soil and land capability assessments. A conceptual soil plan was then developed for the Drayton South area based on the available information. This plan was then used to select sample locations for the field survey.

The field survey was based upon the *'free survey'* method consistent with McKenzie et al. (2008) and focussed on a detailed assessment of the Drayton South disturbance footprint. The survey of this area was undertaken at a scale of 1:50,000 (medium intensity), which is considered suitable for strategic planning of more intensive land use development (McKenzie et al., 2008). A total of 26 soil profile exposures were collected and 22 surface observations were recorded within the Drayton South disturbance footprint.

The remainder of the Drayton South area, which will not be impacted by the Project, was surveyed at a scale of 1:100,000 (medium to low intensity), which is considered suitable for characterisation of major land use types and for regional and local planning (McKenzie et al., 2008). A total of 11 soil profile exposures were collected and 17 surface observations were recorded within the remainder of the Drayton South area.

Soil profiles extracted were assessed in accordance with the procedure devised by Elliot and Veness (1981). This procedure assesses soils based on grading, texture, structure, consistency, mottling and root presence. Selected samples were analysed to determine the structure, dispersivity and the suitability of surface (A horizon), near surface and deeper soil horizons (B and C horizons) as a growth medium.

The land capability assessment was conducted in accordance with *The Land and Soil Capability Assessment Scheme: Second Approximation* (OEH, 2012a). The scheme provides a prescriptive methodology for assessing land capability through the identification and ranking of potential hazards and limitations, such as water and wind erosion, soil structure decline, acidification, salinity, waterlogging, shallow soils and rockiness and mass movement.

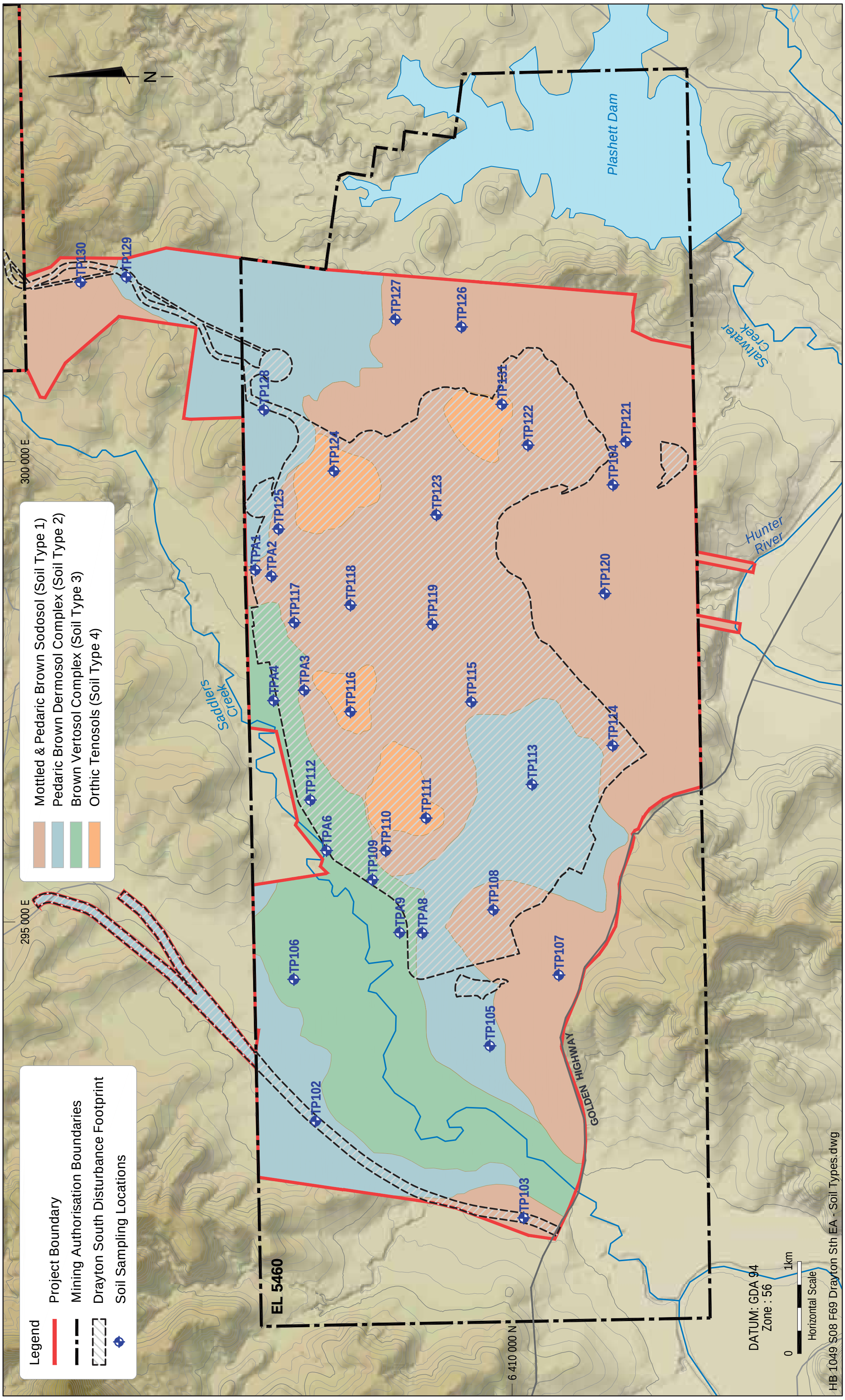
The agricultural land suitability assessment was conducted in accordance with the *Agricultural Land Classification* (NSW Agriculture, 2002). The classification system has been designed to assess land on the basis of increasing suitability and potential for agricultural production with consideration of industry specific factors that may influence these processes.

8.15.3 Impact Assessment

Table 64 presents an overview of each soil type identified and the associated area each occupies within the Drayton South area. Figure 69 provides an illustration of the spatial distribution for each soil type. Twelve soil sub-groups were identified within the Drayton South area; each of which were subsequently categorised into four sub-orders.

Table 64 Soil Types and Distribution

Soil Type	Australian Soils Classification Name	Project Soil Name	Area (%)	Area (ha)
1a	Pedaric Subnatric Brown Sodosol	Mottled and Pedaric Brown Sodosol Complex	54.7	2,513
1b	Pedaric Mesonatric Brown Sodosol			
1c	Pedaric Hypernatric Brown Sodosol			
1d	Mottled Subnatric Brown Sodosol			
2a	Pedaric Brown Dermosol	Pedaric Brown Dermosol Complex	25.5	1,174
2b	Pedaric Sodic Brown Dermosol			
2c	Pedaric Acid Sodic Brown Dermosol			
3a	Massive Brown Vertosol	Brown Vertosol Complex	15.5	712
3b	Epipedal Brown Vertosol			
4a	Orthic Tenosol	Orthic Tenosols	4.3	198
4b	Bleached Orthic Tenosol			
4c	Lithic Orthic Tenosol			
Total			**100.0**	**4,597**



DRAYTON SOUTH COAL PROJECT

Soil Types

FIGURE 69

Hansen Bailey ENVIRONMENTAL CONSULTANTS

AngloAmerican

Soil Types

Soil Type 1 – Mottled and Pedaric Brown Sodosol Complex

Soil type 1 covers 54.7% or 2,513 ha of the Drayton South area. The topsoil is slightly acidic to neutral, non-saline, non-sodic and often contains aggregates that exhibit a degree of soil stability. Organic staining, the presence of loam and plant roots, and lack of mottling is indicative of the effective infiltration and aeration of the topsoil and suitability for vegetation establishment.

The subsoil is saline, generally dispersive and has a tendency to slake when exposed to moisture. In addition, the occasional presence of mottling in the subsoil is indicative of issues with water infiltration and soil permeability.

The top 0.2 m of soil is suitable for stripping and reuse as topdressing during rehabilitation. Due to the naturally dispersive nature and salinity of the subsoil, it is not recommended for reuse in rehabilitation unless appropriate soil stabilisation measures are implemented (e.g. surface topdressing, and vegetation and slope stabilisation measures).

Soil Type 2 – Pedaric Brown Dermosol Complex

Soil type 2 covers 25.5% or 1,174 ha of the Drayton South area. The topsoil is slightly acidic, non-saline, non-sodic and contains aggregates that provide evidence of soil stability. The presence of gravel and silt, the prevalence of plant roots and lack of mottling is indicative of the effective infiltration and aeration of the topsoil and suitability for vegetation establishment.

The subsoil is typically non-saline and non-dispersive, however, has a tendency to slake when exposed to moisture. The subsoil is also known to demonstrate sodic properties in some areas, which can cause dispersion and erosion. In addition, the presence of mottling is indicative of issues with water infiltration and soil permeability.

The top 0.25 m of soil is suitable for stripping and reuse as topdressing during rehabilitation. As the subsoil has variable sodic and dispersive characteristics, it is not recommended for reuse in rehabilitation unless appropriate soil stabilisation measures are implemented.

Soil Type 3 – Brown Vertosol Complex

Soil type 3 covers 15.5% or 712 ha of the Drayton South area. The topsoil is slightly acidic to neutral, non-saline, non-sodic and can contain aggregates that provide evidence of soil stability. The presence of loam, sand and gravel, the prevalence of plant roots and lack of mottling is indicative of the effective infiltration and aeration of the topsoil and suitability for vegetation establishment.

The subsoil is typically non-saline and non-dispersive, however, has a tendency to slake when exposed to moisture. The subsoil is also known to demonstrate sodic properties in some areas, which can cause dispersion and erosion. In addition, the presence of mottling is indicative of issues with water infiltration and soil permeability.

The top 0.3 m of soil is suitable for stripping and reuse as topdressing during rehabilitation. As the subsoil has variable sodic and dispersive characteristics, it is not recommended for reuse in rehabilitation unless appropriate soil stabilisation measures are implemented.

Soil Type 4 – Orthic Tenosols

Soil type 4 covers 4.3% or 198 ha of the Drayton South area. The topsoil is slightly acidic, non-saline, non-sodic and can contain aggregates that exhibit a degree of soil stability. The presence of loam, sand and gravel, the prevalence of plant roots and lack of mottling is indicative of the effective infiltration and aeration of the topsoil and suitability for vegetation establishment.

The subsoil is saline, dispersive and has a tendency to slake when exposed to moisture.

The top 0.2 m of soil is suitable for stripping and reuse as topdressing during rehabilitation. Due to the naturally dispersive nature and salinity of the subsoil, it is not recommended for reuse in rehabilitation unless appropriate soil stabilisation measures are implemented.

Topsoil Availability

The recommended stripping depth and topsoil balance for the Project is outlined in Table 65. The estimated total volume of suitable topdressing material within the Drayton South disturbance footprint is approximately 4,151,000 m^3. Allowing for a 10% handling loss, approximately 3,735,900 m^3 of suitable topdressing is considered to be available.

Land Capability

Based on the characteristics of the soil and landscape as described above, the key constraining factors limiting the land capability within the Drayton South area relates to slope, salinity, acidity and soil structure decline (dispersivity).

The current land capability classification within the Drayton South area ranges from Class IV to Class VII, with Classes VI and VII dominating the existing landscape. Impacts to the land as a result of the Project will remain within the Drayton South disturbance footprint. Areas outside this will maintain its existing pre-mining class.

Following the completion of mining, land capability classes within the Drayton South disturbance footprint are predicted to range from Class VI to Class VIII. At this stage, the Drayton South disturbance footprint will no longer be available for the purposes outlined in *The Land and Soil Capability Assessment Scheme: Second Approximation* (OEH, 2012a). Instead, the

Table 65 Topsoil Balance

Soil Type	Recommended Stripping Depth (m)	Disturbance Footprint (ha)	Volume Available (m³)	Volume Available at 10% Loss (m³)
1	0.20	1,124	2,248,000	2,023,200
2	0.25	450	1,125,000	1,012,500
3	0.30	122	366,000	329,400
4	0.20	206	412,000	370,800
Total Area (m³)		**1,902**	-	-
Total Volume (m³)		-	**4,151,000**	-
Total Volume (10% Handling Loss Allowance)			-	**3,735,900**

land will be rehabilitated and reserved in perpetuity as part of the biodiversity offset strategy for the Project. The onsite component of the biodiversity offset strategy is discussed further in the ecology impact assessment (see Section 8.8 and Appendix J).

A comparison of the pre and post-mining rural land capability classifications within the Drayton South area is provided in Table 66 and illustrated in Figure 5 of the soil and land capability impact assessment (see Appendix Q).

Agricultural Land Suitability

The current agricultural land suitability classification within the Drayton South area ranges from Class 3 to Class 5, with the Class 4 land occupying a significant portion of the landscape. Impacts to the land as a result of the Project will remain within the Drayton South disturbance footprint. Areas outside this will maintain its existing pre-mining class.

Following the completion of mining, agricultural land suitability classes within the Drayton South disturbance footprint are predicted to range from Class 4 to Class 5. At this stage, the Drayton South disturbance footprint will no longer be available for the purposes outlined in the *Agricultural Land Classification* (NSW Agriculture, 2002). Instead, the land will be rehabilitated and reserved in perpetuity as part of the biodiversity offset strategy for the Project. The onsite component of the biodiversity offset strategy is discussed further in the ecology impact assessment (see Section 8.8 and Appendix J).

Table 66 Pre and Post-Mining Land Capability Classes

Land Class	Pre-mining		Post-mining	
	Area (ha)	Area (%)	Area (ha)	Area (%)
Class I	0.0	0.0	0.0	0.0
Class II	0.0	0.0	0.0	0.0
Class III	0.0	0.0	0.0	0.0
Class IV	420	9.1	409	8.9
Class V	565	12.3	413	9.0
Class VI	1,749	38.1	1,892	41.2
Class VII	1,863	40.5	1,811	39.4
Class VIII	0.0	0.0	72	1.6
Total	**4,597**	**100.0**	**4,597**	**100.0**

A comparison of the pre and post-mining agricultural land suitability classification within the Drayton South area is shown in Table 67.

Table 67 Pre and Post-Mining Agricultural Suitability Classes

Land Class	Pre-mining		Post-mining	
	Area (ha)	Area (%)	Area (ha)	Area (%)
Class 1	0.0	0.0	0.0	0.0
Class 2	0.0	0.0	0.0	0.0
Class 3	1,028	22.4	775	16.9
Class 4	2,917	63.5	2,791	60.7
Class 5	652	14.2	1,031	22.4
Total	**4,597**	**100.0**	**4,597**	**100.0**

Biophysical Strategic Agricultural Land

The SRLUP maps and prescribes criteria for BSAL as outlined in Table 68. The Drayton South area has been assessed against the mapping and criteria outlined in the SRLUP and validated as part of the soil and land capability impact assessment to gain an appreciation of the extent and likely impact of the Project on potential BSAL.

In accordance with the mapping illustrated in the SRLUP, the Drayton South disturbance footprint is not situated on BSAL. Furthermore, Table 68 validates that the Drayton South area, which includes the Drayton South disturbance footprint, does not trigger all relevant criteria required to represent BSAL. As such, the Project will not impact on BSAL and is not required to be assessed against the relevant gateway criteria in this regard.

Table 68 Biophysical Strategic Agricultural Land Assessment

Criteria	Validation
Land that falls under soil fertility classes 'high' or 'moderately high' under the *Draft Inherent General Fertility of NSW* (OEH), and	The Drayton South disturbance footprint is situated on land identified as soil fertility class 'moderately low' and 'moderate' as mapped by the *Draft Inherent Soil Fertility of NSW Map* (OEH). The criterion is not triggered.
Land capability classes I, II or III under the Land and Soil Capability Mapping of NSW (OEH), and	The Drayton South disturbance footprint is situated on land identified as land capability Class IV, V, VI and VII as verified by the soil and land capability impact assessment. The criterion is not triggered.
Reliable water of suitable quality, characterised by having rainfall of 350 mm or more per annum (9 out of 10 years); or Properties within 150 m of a regulated river, or unregulated rivers where there are flows for at least 95% of the time (i.e. the 95th percentile flow of each month of the year is greater than zero) or 5th order and higher rivers; or Groundwater aquifers (excluding miscellaneous alluvial aquifers, also known as small storage aquifers) which have a yield rate greater than 5 L/s and total dissolved solids of less than 1,500 mg/L	As confirmed by the surface water impact assessment (**Appendix M**) and groundwater impact assessment (**Appendix N**): • The Drayton South disturbance footprint receives 350 mm or more rainfall per annum (9 out of 10 years); • The land within the Drayton South disturbance footprint is further than 150 m from the Hunter River, which is a regulated river; • The land within the Drayton South disturbance footprint is within 150 m of Saddlers Creek, which is an unregulated watercourse, however, does not flow at least 95% of the time; and • The land within the Drayton South disturbance footprint does not overlie significant groundwater aquifers, such as that of the Hunter River. The criterion for available rainfall is triggered. Other criteria are not triggered.
or	
Land that falls under soil fertility classes 'moderate' under the *Draft Inherent General Fertility of NSW* (OEH), and	The Drayton South disturbance footprint is situated on land identified as soil fertility class 'moderately low' and 'moderate' as mapped by the *Draft Inherent Soil Fertility of NSW Map* (OEH). The criterion is triggered.
Land capability classes I or II under the Land and Soil Capability Mapping of NSW (OEH), and	The Drayton South disturbance footprint is situated on land identified as land capability Class IV, V, VI and VII as verified by the soil and land capability impact assessment. The criterion is not triggered.
Reliable water of suitable quality, characterised by having rainfall of 350 mm or more per annum (9 out of 10 years); or Properties within 150 m of a regulated river, or unregulated rivers where there are flows for at least 95% of the time (i.e. the 95th percentile flow of each month of the year is greater than zero) or 5th order and higher rivers; or Groundwater aquifers (excluding miscellaneous alluvial aquifers, also known as small storage aquifers) which have a yield rate greater than 5 L/s and total dissolved solids of less than 1,500 mg/L	As confirmed by the surface water impact assessment (**Appendix M**) and groundwater impact assessment (**Appendix N**): • The Drayton South disturbance footprint receives 350 mm or more rainfall per annum (9 out of 10 years); • The land within the Drayton South disturbance footprint is further than 150 m from the Hunter River, which is a regulated river; • The land within the Drayton South disturbance footprint is within 150 m of Saddlers Creek, which is an unregulated watercourse, however, does not flow at least 95% of the time; and • The land within the Drayton South disturbance footprint does not overlie significant groundwater aquifers, such as that of the Hunter River. The criterion for available rainfall is triggered. Other criteria are not triggered.

8.15.4 Mitigation and Management

In areas where topsoil and subsoil stripping and transportation is required (where applicable), the following measures will be implemented in order to prevent or minimise soil deterioration:

- Materials will be stripped to indicated levels in a moist condition and placed directly onto reshaped areas where practical;
- Where topsoil must be stockpiled, efforts will be made to reduce compaction by keeping soil in as coarsely textured a condition as possible;
- Stockpiles will be a maximum of 3 m in height and if stored for greater than 12 months will be shaped to be free draining, seeded, fertilised and treated for weeds prior to respreading;
- An inventory of designated areas and available soil will be maintained to ensure adequate topsoil materials are available for planned rehabilitation activities;
- Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation with all topsoiled areas lightly contour ripped to create a *'key'* between the soil and the spoil. Ripping will be undertaken on the contour, preferably when soil is moist. The respread topsoil surface will be scarified prior to, or during seeding, to reduce runoff and increase infiltration via tilling with a fine tyned plough or disc harrow;
- Re-grading will be undertaken where required to produce slope angles, lengths and shapes that are compatible with the proposed land use and not prone to an unacceptable rate of erosion. This will be done in integration with drainage structures capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation (including contour furrows or contour banks at intervals down the slope, contour ripping across the grade, and graded banks where required); and
- Engineered waterways, spillways and sediment control dams (using erosion blankets, ground cover vegetation and / or rip rap) will also be implemented to capture sediment laden runoff prior to offsite release and designed and located so as to safely convey the maximum anticipated discharge.

The existing Drayton Mine land management plan will be revised to incorporate the above mitigation and management measures for management of its soil resources within the Drayton South area.

8.16 Agriculture

8.16.1 Background

An AIS was undertaken by Scott Barnett & Associates Pty Ltd (Scott Barnett & Associates) and is provided in Appendix R.

The purpose of the assessment was to:

- Identify agricultural resources and enterprises within the Drayton South area and surrounding locality, and the offsite biodiversity offset property;
- Identify the agricultural domains with the Drayton South area and offsite biodiversity offset property;
- Assess the current and maximum agricultural potential for each agricultural domain in terms of the quantum, gross value and net value of production;
- Assess the loss of agricultural production within the Drayton South area and the offsite biodiversity offset property,
- Assess potential impacts on the agricultural resources and enterprises within the locality; and
- Recommend appropriate mitigation and management measures.

Regional Setting

There are several existing agricultural resources and enterprises within the Drayton South area and the surrounding locality. For the purposes of the AIS the locality is defined as the area within a 10 km radius of the Drayton South area (see Figure 70).

The Drayton South area is currently managed as agricultural land and operated by two licensees who occupy the land, which is owned by Anglo American. The predominant agricultural land use is extensive beef cattle grazing with the major enterprise being beef cattle breeding for the weaner and domestic market.

Some of the major landholders in the locality are coal mining and power generation operations that have agricultural enterprises occurring on non-operational land, primarily beef cattle grazing.

Coolmore Stud and Woodlands Stud are located to the immediate south of the Project Boundary while five other thoroughbred studs are also located within 10 km of the Drayton South area. These enterprises have been identified as part of the Equine CIC as described in the SRLUP.

Several other agricultural enterprises operate within the locality of the Drayton South area, including:

- 11 dairies;
- Four vineyards (three with wineries), including Arrowfield Estate to the immediate south. These enterprises have been identified as part of the Viticulture CIC as described in the SRLUP; and
- An olive grove and olive processing plant.

The significant agricultural resources in the locality of the Drayton South area include the Hunter Regulated River Water Source and Hunter Alluvial soil landscape grouping. Together these resources contribute to the BSAL identified in the SRLUP.

The location of each agricultural enterprise and resource within the locality of the Drayton South area is shown on Figure 70. This illustrates that the Project is not directly situated on BSAL or land operated by thoroughbred breeding and viticulture enterprises; however, part of the Project corresponds with the Equine and Viticulture CICs as mapped in the SRLUP.

8.16.2 Methodology

Field Assessment

A field assessment was undertaken to inspect the land within the Drayton South area and the offsite biodiversity offset property. The purpose of the assessment was to assess the existing and potential agricultural production of the land. An interview was conducted with Anglo American's Rural Property Specialist and the manager of the offsite biodiversity offset property to ascertain details of the agricultural enterprises currently in operation.

Desktop Assessment

Using the information gathered during the field assessment and the EA soil and land capability impact assessment (see Appendix Q), the agricultural domains for the Drayton South area and the offsite biodiversity offset property were mapped. In order to divide and described the mapped domains these were assigned generic letters (A to D for the Drayton South area and X to Z for the offsite biodiversity offset property) for description purposes only (see Figure 71 and Figure 72).

The current and maximum production value of each agricultural enterprise was calculated by domain for the Drayton South area and the offsite biodiversity offset property using the *Gross Margin Budgets* prepared by DTIRIS – Primary Industries (2011). These values were then reviewed against the regional, state and national agricultural production outputs to understand the contribution of each enterprise.

The assessment of the potential impacts was undertaken in consideration of the SRLUP and the *Guidelines for Agricultural Impact Statements* (DP&I, March 2012). Inputs from various EA impact assessments were used to draw conclusions regarding the impact of the Project on agriculture, particularly BSAL and CICs.

Further as part of the AIS, Gillespie Economics undertook an assessment of the potential economic implications of the impacts of the Project on agricultural enterprises and resources (see Appendix 6 of **Appendix R**). This assessment provided a comparison of the economic efficiencies of coal mining and the agricultural industry, including the consideration of the use of land and resources.

8.16.3 Impact Assessment

Drayton South

The Drayton South area was dissected into four agricultural domains as outlined in Table 69. The vast majority (2,780 ha or 60.5%) of the Drayton South area is composed of land classed as Domain C. This land is suited to grazing and typically coincides with land capability Classes V, VI and VII, and agricultural land suitability Class 4 (see Section 8.15).

The predominant agricultural enterprise operating within the Drayton South area is beef cattle breeding for the weaner and domestic market. In winter 2011, an estimated 1,140 head of cattle were carried within the Drayton South area (see Table 70).

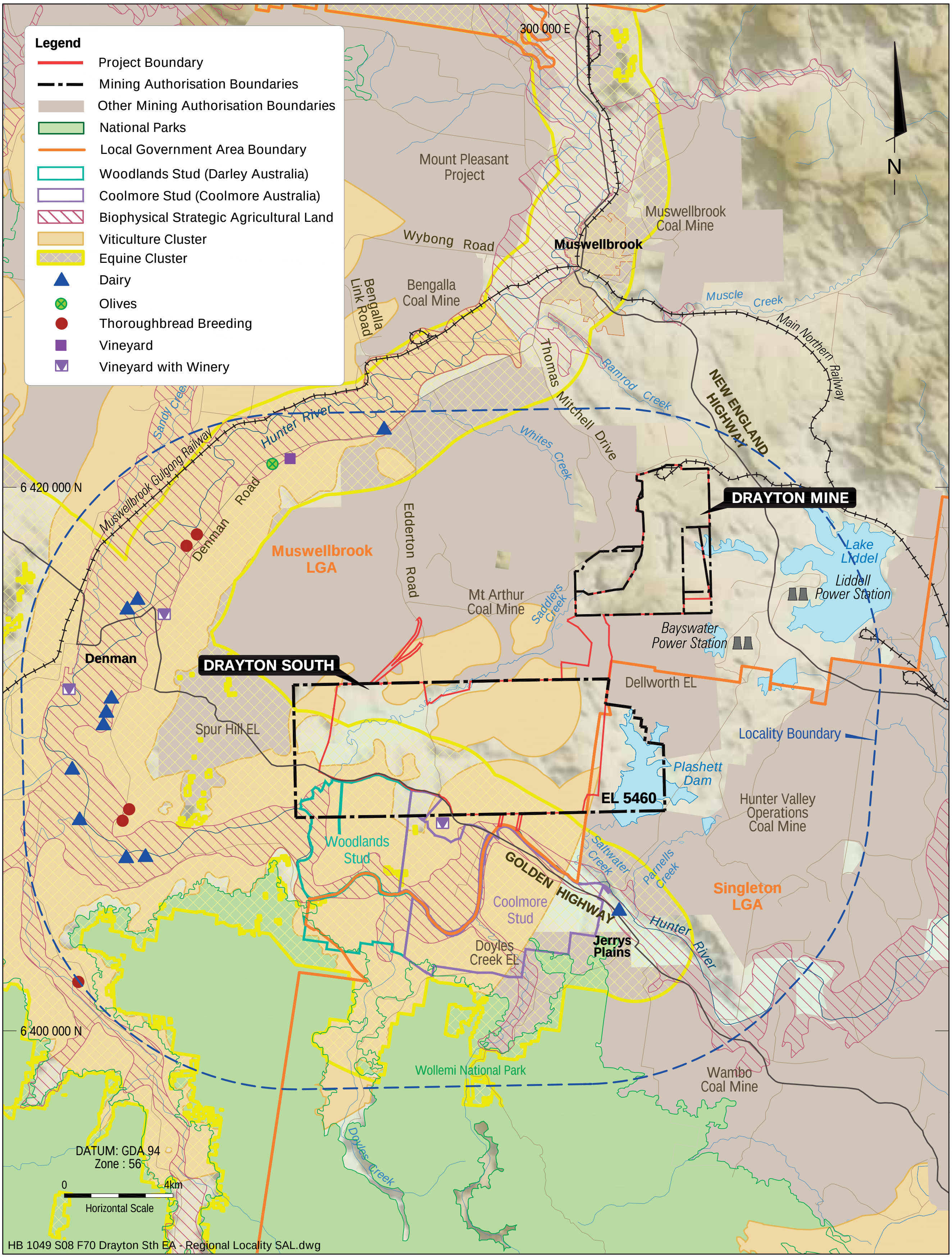
Assuming that all of the cattle are sold to the saleyards at Singleton and Scone, production within the Drayton South area accounts for 1.49% of Scone's throughput, 2% of Singleton's throughput, and 0.86% of their combined throughput. The Upper Hunter Shire Council imposes a yard charge of $8.18 per head. As a result, cattle production from within the Drayton South area contributes $9,325 to the Scone saleyard (assuming all 1,140 cattle are sold at Scone). Yard charges for Singleton were not available, but a similar contribution is expected if all cattle were sold at Singleton.

Due to the proximity of the Drayton South area to local horse studs, part of the land is also used opportunistically for dry mare agistment. The nature of this enterprise and demand for the service is driven more by factors related to the buoyancy of the thoroughbred breeding industry than agricultural or seasonal conditions. As such the associated costs have not been incorporated into the assessment.

The gross value of current agricultural production within the Drayton South area is $701,208 per annum and the net value is $432,479 per annum. The agricultural productivity could be improved through pasture improvement and paddock subdivision to allow for more intensive grazing. With improvements to the land, the gross value and net value of potential agricultural production could increase to $1,229,543 per annum and $615,006 per annum, respectively.

Any agricultural land that is situated within the Drayton South disturbance footprint will be removed from production indefinitely as a result of the Project. Sustainable farming practices will, however, continue during the life of the Project in available areas outside the Drayton South disturbance footprint that are not planned to be used for onsite biodiversity offsets (see Section 8.16.4).

Post-mining, agricultural land within the Drayton South disturbance footprint (1,928 ha) will no longer be available for agricultural purposes. Instead, the affected land will be rehabilitated to establish woodland communities. This area



DRAYTON SOUTH COAL PROJECT

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Strategic Regional Land Use and Agricultural Enterprises

FIGURE 70

Table 69 Drayton South Agricultural Domains

Agricultural Domain	Description	Area (ha)	Area (%)	Area in Disturbance Footprint (ha)
A	Area associated with the creek flats of Saddlers Creek and lower slopes, dryland country suited to fodder cropping as part of a fodder cropping improved pasture rotation or grazed as unimproved pasture	376	8.2	21
B	Area associated with creeks flats and lower slopes suited to occasional fodder cropping or pasture improvement or grazed as unimproved pasture	749	16.2	286
C	Area associated with lower to mid slopes, require soil conservation works / minimum tillage techniques to establish improved pastures or grazed as unimproved pasture	2,780	60.5	1,261
D	Area associated with steeper slopes, not suited to any cultivation due to erosion risk, restricted to native pasture or aerial semi improved pasture improvement	692	15.1	360
Total		**4,597**	**100.0**	**1,928**

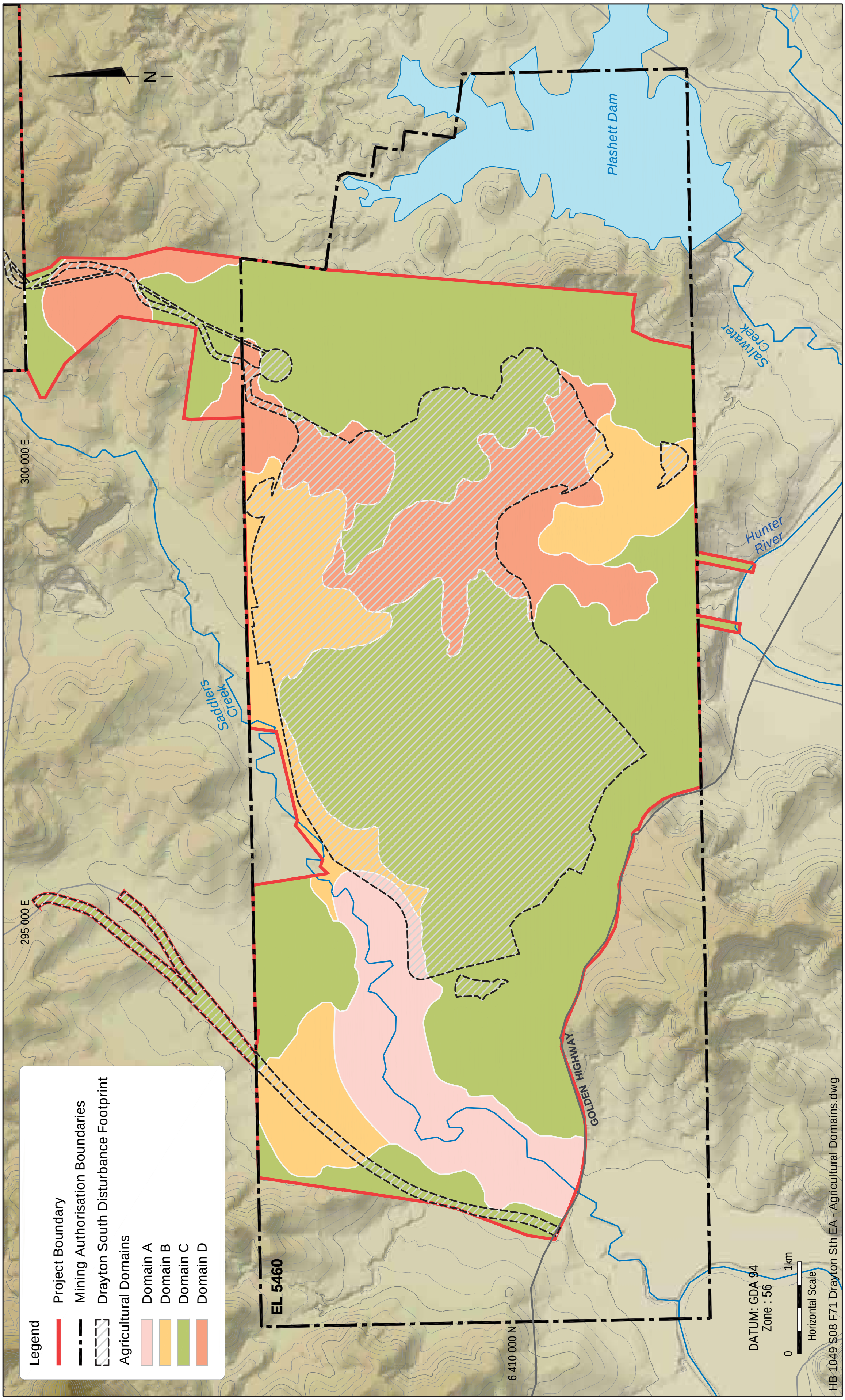
Table 70 Current Enterprises and Value within Drayton South

Agricultural Domain	Enterprise	Carrying Capacity (DSE/ha)[1]	Stocking Rate (ha/Breeding Cow)	Number Animals Sold[2]	Gross Value of Production (per annum)	Net Value of Production (per annum)
A	Vealers	8	2.0	178	$125,271	$54,375
B	Vealers	6	2.7	265	$186,891	$81,122
C	Inland weaners	4	3.7	620	$345,973	$264,102
D	Inland weaners	2	7.4	77	$43,073	$32,880
Total				**1,140**	**$701,208**	**$ 432,479**

1 DSE – Dry Sheep Equivalent, the equivalent daily energy requirement of a 50 kg wether not losing or gaining weight.
2 Includes culled breeding stock

will be reserved in perpetuity as an onsite biodiversity offset for the Project. The onsite component of the biodiversity offset strategy is discussed in Section 8.8.

Conservatively assuming that agricultural production from the entire Drayton South disturbance footprint ceases at the commencement of the Project for perpetuity, Gillespie Economics calculated the present value of gross production foregone to be $3.7 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone to be $2.4 M (using a 7% discount rate).



DRAYTON SOUTH COAL PROJECT

Agricultural Domains

FIGURE 71

AngloAmerican

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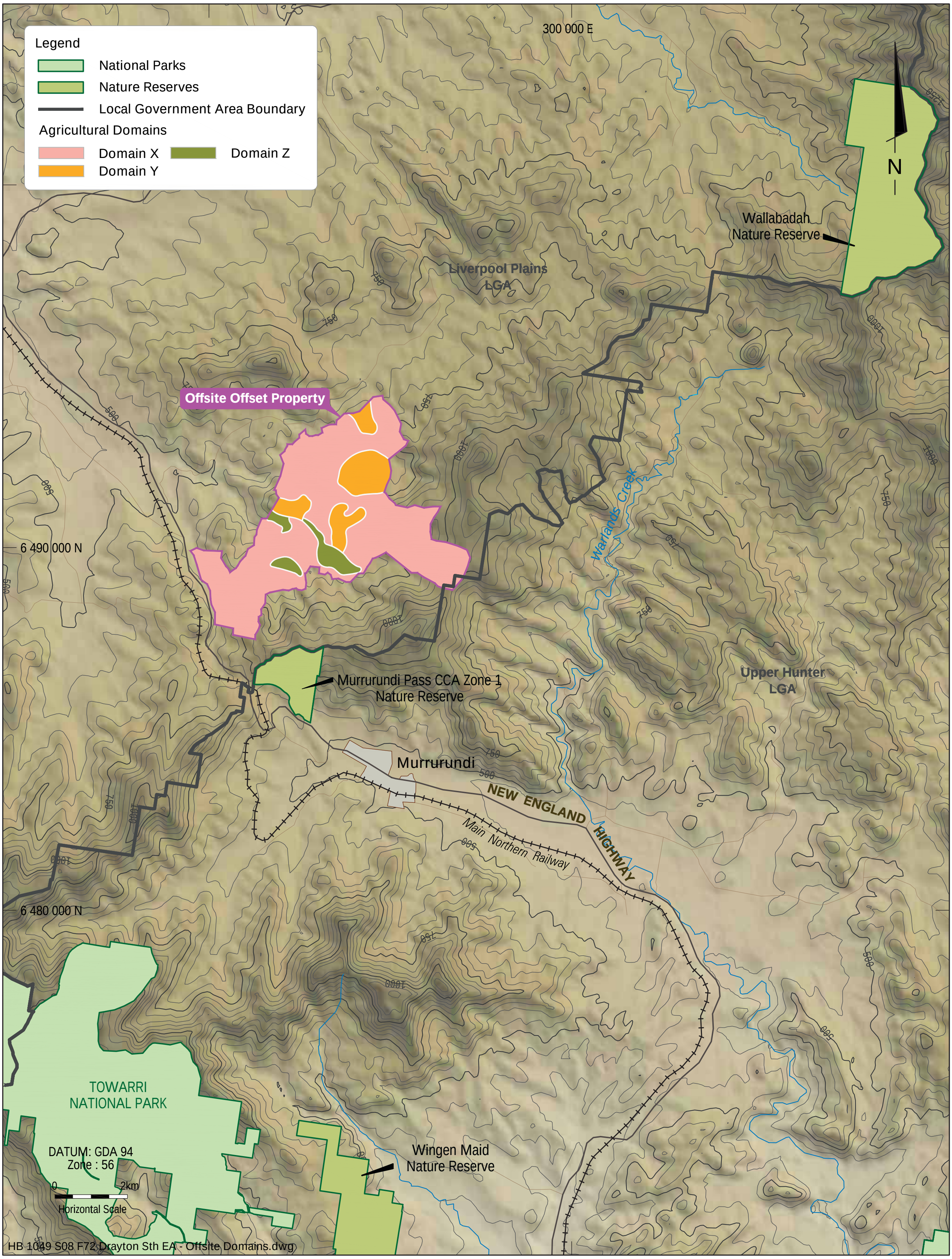

DRAYTON SOUTH COAL PROJECT

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Offsite Biodiversity Offset Property
Agricultural Domains

FIGURE 72

Offsite Biodiversity Offset Property

The offsite biodiversity offset property was divided into three agricultural domains as outlined in Table 71. The vast majority of the offsite biodiversity offset property (1,646 ha or 79.1%) is composed of land classed as Domain X. This land is suited to grazing and typically coincides with land capability Class VI and agricultural suitability Class 4. This domain is not fattening or finishing country.

The offsite biodiversity offset property is currently being used to produce beef cattle, sheep (wethers) and wool as outlined in Table 72.

The gross value of agriculture on the offsite biodiversity offset property is $500,828 per annum and comprises of:

- $284,074 from wool sales;
- $81,326 from sheep sales; and
- $135,428 from beef cattle sales.

These enterprises amount to a net value of $223,484 per annum.

Assuming that all beef cattle are sold at Scone, production at the offsite biodiversity offset property accounts for 0.25% of the annual throughput at the Scone saleyard. The sale of 192 head of cattle will also generate $1,570 for the saleyard in yard charges ($8.18 per head).

The nearest auction facility for wool is located in Newcastle and sells approximately 70,000 bales per year. The 156 bales of wool produced at the offsite biodiversity offset property represents 0.2% of the annual throughput at Newcastle.

The nearest saleyard for cull wethers is located at Tamworth. In 2011, 173,555 sheep were sold through the Tamworth sale yards. The 940 cull wethers from the offsite biodiversity offset property represent 0.54% of the 2011 throughput.

The offsite biodiversity offset property contains evidence of previous pasture improvement and paddock subdivision. Nevertheless, production could be increased by further improving the property with the potential agricultural production estimated to have a gross value of $688,048 per annum and a net value of $287,009 per annum.

Pending further land management arrangements, the property selected as an offsite offset for the Project, may:

- No longer be available for agricultural purposes and reserved in perpetuity for the conservation of ecological values; or
- Managed in part for agricultural purposes, where current land practices apply, in conjunction with the conservation of ecological values in perpetuity.

Conservatively, assuming that agricultural production from the offsite biodiversity offset property ceases at the commencement of the Project for perpetuity, the present value of the gross value of production foregone is $7.2 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $3.2 M (using a 7% discount rate) (see Appendix 6 of Appendix R).

Table 71 Offsite Biodiversity Offset Property Agricultural Domains

Agricultural Domain	Description	Area (ha)	Area (%)
X	Area associated with hill slopes and rock outcrops. Shows signs of semi-improved pasture. Suited only to pasture improvement (seeding and fertilising) by aerial means	1,646	79.1
Y	Area associated with plateau style areas with improved pastures (such as *Pharalisspp*). Suited to pasture improvement with limited soil disturbance. Some rock outcrops occur	333	16.0
Z	Area associated with timbered steeper drainage lines. Not suited to pasture improvement but offering stock shelter	100	4.9
Total		**2,079**	**100.0**

Table 72 Current Enterprises and Value within Offsite Biodiversity Offset Property

Agricultural Domain	Enterprise	Carrying capacity (DSE/ha)*	Number Animals Sold[1]	Wool Sold (including Crutchings) (kg)	Gross Value of Production (per annum)	Net Value of Production (per annum)
X	Wethers	3.5	940	43,766	$365,400	$164,700
Y	Inland weaners	6.5	192	-	$135,428	$58,784
Z	Shelter country only	-	-	-	-	-
Total			**1,132**	**43,766**	**$500,828**	**$223,484**

1 Includes culled breeding stock.

Availability and Productivity of Agricultural Land

The combined gross value of production from the impacted properties is $0.8 M per annum. As shown in Table 73, this value is 0.26% of the total agricultural production of the Hunter Region, 0.01% of NSW and 0.002% of Australia.

Gillespie Economics confirmed that the total foregone net agricultural production from agricultural land resources required for the Project is estimated at $5.6 M present value (using 7% discount rate) (see Appendix 6 of Appendix R).

As the overall agricultural contribution of the land within the Drayton South disturbance boundary and the offsite biodiversity offset property is small when compared to the total agricultural production on a regional, State and National scale, the reduced availability and productivity of this land will have a minimal impact to the industry.

The Project will not reduce the availability of land for agricultural purposes or affect the productivity of existing agricultural land outside the Drayton South disturbance footprint within the immediate locality, including land utilised by equine and viticulture enterprises.

Alternate Land Use Suitability

Thoroughbred Breeding

The southern portion of the Drayton South area, which fronts the Golden Highway and forms the northern boundary of both Coolmore Stud and Woodlands Stud, has been identified as part of the Equine CIC as mapped in the SRLUP.

Coolmore Stud and Woodlands Stud are located on and utilise the Hunter Alluvial, Ogilvie Shallow, Dartbrook Brown Clays and Brays Hill Red Clays soil landscape. The two studs also rely heavily on irrigation water from the Hunter River.

The Drayton South area is not well suited to thoroughbred breeding as it lacks the productive alluvial soils of the Hunter River and has limited quantities of the high quality Dartbrook Brown Clays and Brays Hill Red Clays. The soils of the Drayton South area are generally of poor quality with limited water holding capacity and depth to be suited to growing irrigated pasture and/or irrigated lucerne. The quality of the soils and the reliability of pasture growth supplemented with irrigation water are cornerstones to the productivity of the thoroughbred breeding industry in the Hunter Valley and the horses they produce. In this regard, it is unlikely that the land associated with this mapped Equine CIC within the Project Boundary is suitable for thoroughbred breeding operations.

Viticulture

Validation of the Drayton South area, confirms that much of the mapped Viticulture CIC within the Project Boundary (2,425 ha) fails to meet the criteria of the SRLUP (see Section 5.5). Approximately 2,102 ha of mapped Viticulture CIC correspond with land capability Class VI and VII (see Section 8.15.3) while the criteria for viticulture is a land capability of Class V or better. Furthermore, approximately 19 ha of mapped Viticulture CIC is situated further than 2 km from a mapped alluvial, including the Hunter River, Saddlers Creek and Saltwater Creek alluviums.

Mapped Viticulture CIC, as provided in the SRLUP, has been identified on Class V land and within the general vicinity of Saddlers Creek. However, the associated alluvial of Saddlers Creek is characterised as having a limited capacity to store and transmit water, offers low yields and poor water quality, and does not form a single, well-connected aquifer (see Section 8.12.1). The water quality of the alluvial is too saline for stock watering with EC ranging between 8,000 and 9,000 µS/cm and TDS ranging between 3,000 to 7,000 mg/L (see Section 8.12.1). Given the current condition of the alluvial, no licensed water allocations exist along Saddlers Creek (see Section 8.11.3). In this regard, it is unlikely that the land associated with this mapped Viticulture CIC within the Project Boundary is suitable for viticulture operations.

Table 73 Value of Total Agricultural Production Impacted and Outputs

Enterprise	Drayton South and Offsite Biodiversity Offset Property	Hunter Region	NSW	Australia
Wool produced	$0.3 M	$3.1 M	$641.1 M	$1,927.5 M
Sheep slaughtering	$0.1 M	$2.8 M	$548.3 M	$2,328.6 M
Beef slaughtering	$0.4 M	$95.5 M	$1,487.6 M	$6,550.5 M
Total agricultural production	$0.8 M	$311.7 M	$8,359.2 M	$39,645.1 M

Source: ABS, 2008; ABS 2011

Regional Impacts of Agriculture Foregone as a Result of the Project

The regional impacts of the level of annual agricultural production foregone as a result of the Project (including the Drayton South disturbance footprint and offsite biodiversity offset property) were estimated from the sectors in the Upper Hunter regional input output table by Gillespie Economics (see Appendix 6 of Appendix R).

Table 74 compares the annual regional production and economic impacts associated with the Project with the level of annual agricultural production that would be foregone as a result of the Project. Further details are provided within Appendix 6 of Appendix R.

The direct annual output of the Project is estimated at $451 M per annum. In contrast, the direct annual output of future use of agricultural lands that would be utilised by the Project is estimated at $0.8 M per annum.

Gillespie Economics also undertook a benefit cost analysis (BCA) which included an estimation of the present value of production costs and benefits of the Project over a 27 year period. The present value of net production benefits of the Project to Australia are estimated at $490 M (7% discount rate). In contrast, the present value of future use of agricultural lands that would be utilised by the Project is estimated at $5.6 M (7% discount rate). Based on these comparative values, the Project is considered to be significantly more efficient than continued agricultural production.

Assessment of Impacts on the Locality

Surface Water

Table 74 Economic Impacts of the Foregone Agriculture and the Project

Item	Agriculture Land	Project
Area (ha)	4,007[1]	1,928[2]
Production Type	Beef and sheep	Coal
Direct Output Value	$0.8 M	$451 M
Direct Income	$0.2 M	$47 M
Direct Employment	7	326
Direct and Indirect Output Value	$1.0 M	$592 M
Direct and Indirect Income	$0.3 M	$90 M
Direct and Indirect Employment	8	819

1 This is the area of agricultural land (Drayton South disturbance footprint and offsite biodiversity offset property) that would be impacted in perpetuity by the Project.

2 Drayton South disturbance footprint.

As described in Section 8.11, the surface water model for the Project predicts that there is less than a 1% chance that water will need to be sourced from off site. As such, the Project is unlikely to impact upon the availability of water for agriculture from the Hunter Regulated River Water Source. In the event of very dry conditions where water is required from the Hunter River to support Project operations, Anglo American will hold the necessary licences prior to extraction.

Over the life of the Project, the surface water model predicts that there will be an accumulation of water on site and that under certain circumstances the Project will need to discharge excess water into the Hunter River. These discharge events will be conducted in accordance with the HRSTS.

Overall the surface water impact assessment has determined that the Project will not impact on receiving waters in the locality and as such will not impact on a significant agricultural resource or divert water from irrigated agriculture, including the thoroughbred breeding industry, to mining.

Groundwater

As described in Section 8.12, the groundwater model predicts that the zone of influence is predicted to be restricted to the immediate vicinity surrounding the mining areas. This is a maximum distance of approximately 600 m to the west and south of the mining areas in Year 27. The zone of influence within the shallow regolith / alluvium is not predicted to extend into the Hunter River alluvial aquifer; however, it is predicted to extend marginally into the Saddlers Creek alluvium.

Only two registered groundwater bores are encompassed within the zone of influence at the end of mining for the Project. These are both owned by Anglo American. No private bores in the locality, including those owned and operated by Darley Australia and Coolmore Australia are predicted to be impacted as a result of the Project.

Dust

Based on the findings of the air quality and greenhouse gas impact assessment as presented in Section 8.1, the Project will have nil to minimal impact on the productivity of vegetation south on surrounding properties. This includes those properties owned by Darley Australia, Coolmore Australia and Arrowfield Estate due to the Project alone or as part of a cumulative effect with other dust sources. This is supported by work conducted by Dooley and Rossato (2010) in defining the threshold levels at which dust on vegetation is observed to inhibit growth and production.

An assessment of the potential impacts of predicted dust levels on equine health was undertaken by Dr. Nicholas Kannegieter, Specialist Equine Surgeon, as part of the equine health impact assessment for the Project. The findings of this assessment, as presented in Section 8.5, indicate that the dust produced by the Project will not pose a risk to equine health in both adults and foals, including individuals permanently residing or visiting the thoroughbred breeding operations of Darley Australia and Coolmore Australia.

Noise and Vibration

As described in Section 8.3, the Project's noise and vibration impacts are not predicted to exceed the relevant criteria at any privately owned properties to the south of the Drayton South area. As such, the Project's noise and vibration impacts will not adversely impact on agricultural resources and enterprises in the locality.

An assessment of the potential impacts of predicted noise levels on equine health was undertaken by Dr. Nicholas Kannegieter, Specialist Equine Surgeon, as part of the equine health impact assessment for the Project. The findings of this assessment, as presented in Section 8.5, indicate that noise produced by the Project will not pose a risk to equine health in both adults and foals, including individuals permanently residing or visiting the thoroughbred breeding operations of Darley Australia and Coolmore Australia.

Visual

As described in Section 4.7 and 8.6, agricultural enterprises, particularly the thoroughbred breeding and viticulture operations, are sensitive to changes in the aesthetic quality of the surrounding landscape. Careful mine planning, design and consultation was undertaken to ensure that the existing ridgeline to the south of the Project was maintained and that OEAs remained shielded behind it in order to protect views from the sensitive receptors.

In addition, a visual bund will be constructed to the south of the Houston mining area. The construction of the bund will create a high visual impact over a 16 month period. In order to limit these impacts, the construction of the bund has been designed in a series of lifts with progressive rehabilitation being undertaken as part of the process. This limits the visible exposure of the bund. During the final stages of construction, the visual impact will be reduced to moderate and then low reflecting decreasing visual effect levels. Once completed and rehabilitated, the Houston visual bund adds to the effect of the existing ridgeline in shielding views from all of the sensitive viewing locations from the south.

As discussed in Section 8.6, it is recognised that scenic and landscape diversity is a key resource base for tourism and associated agricultural pursuits such as viticulture and thoroughbred horse breeding. JVP concluded that following due consideration of the gateway criteria as prescribed under the SRLUP (as outlined in Section 5.5), the Project will not lead to significant impacts on the Equine and Viticulture CIC through a loss of scenic and landscape values. As described in Section 8.6, the visual impacts associated with the Project on sensitive receivers to the south will be relatively short term in nature (approximately 16 months) with all other major Project components, including mining areas and OEAs, being designed to remain behind the existing southern ridgeline and out of view.

Traffic and Support Infrastructure and Services

As described in Section 4.11 and **8.18**, the Project's impacts on traffic and support infrastructure and services are anticipated to be minimal. All access to the Project will continue to be via the existing Drayton Mine Access Road off Thomas Mitchell Drive with the exception of the construction works required to be undertaken on the Edderton Road realignment. Despite the minimal disruption during the construction phase, the Edderton Road realignment will result in an improved support infrastructure route to services in the north. At no stage will Edderton Road be closed during the construction phase.

As all traffic has been reduced, as far as practical along support infrastructure routes utilised by agricultural enterprises, including those by the thoroughbred breeding and viticulture industry, the impact of the Project from this aspect is minimal.

Support services directly employed by agricultural enterprises, including those by the thoroughbred breeding and viticulture industry, will not be shared by the Project and therefore will not be impacted.

Labour Supply

As described in Section 4.10 and 8.22, the Project will utilise the workforce at the existing Drayton Mine. Consequently, there will be no impact on the availability of labour for agricultural enterprises in the region, including those of the thoroughbred breeding and viticulture industry.

Biophysical Strategic Agricultural Land

The Drayton South area has been assessed against the mapping and criteria for BSAL as provided in the SRLUP. This area was further verified as part of the soil and land capability impact assessment to gain an appreciation of the extent and likely impact of the Project on potential BSAL (see Section 8.15.3).

In accordance with the mapping illustrated in the SRLUP, the Drayton South disturbance footprint is not situated on BSAL. Furthermore, the soil and land capability impact assessment has verified that the Drayton South area, which includes the Drayton South disturbance footprint, does not trigger all relevant criteria required to represent BSAL. As such, the Project will not impact on BSAL and is not required to be assessed against the relevant gateway criteria in this regard.

Critical Industry Clusters

The State government is in the process of undertaking a regional-scale verification of CICs as provided in the SRLUP. As a provisional measure, the Drayton South area has been assessed against the mapping provided in the SRLUP to gain an appreciation of the extent and likely impact of the Project on potential CICs.

The Project is situated on land identified as a potential CIC for the equine and viticulture industry. As such, the Project has been assessed in accordance with the relevant gateway criteria as listed in Section 5.5 and addressed below.

- *Surface area disturbance.*

The Project will not cause any surface area disturbance on land occupied by equine and viticulture enterprises.

- *Subsidence.*

The Project will not cause any surface subsidence through the proposed mining techniques.

- *Reduced access to agricultural resources.*

As predicted in Section 8.11.3, there is only a 1% chance that the Project will need to source water from the Hunter River. In the unlikely event that offsite water supplies are needed, Anglo American will hold the necessary WAL before taking any water from the Hunter River.

As predicted in Section 8.12.3, no private landowner bores will be impacted by the Project. In addition, the Project will not measurably reduce the seepage flux to the Hunter River alluvium. Therefore, the Project will not reduce the availability of water for agricultural enterprises.

- *Reduced access to support services and infrastructure.*

As described in Section 8.18, the Project is self-sufficient and will have minimal reliance on public infrastructure or services, including those utilised by the thoroughbred breeding and viticulture enterprises in the locality.

- *Reduced access to transport routes.*

The Project involves the realignment of Edderton Road, which is a route travelled by employees of agricultural enterprises in the locality, including that of Darley Australia, Coolmore Australia and Arrowfield Estate. Although there may be some disruptions during the construction of the new alignment, the road will remain open throughout the construction program. Therefore, the Project will not materially reduce access to transport routes.

- *Loss of scenic and landscape values.*

As described in Section 8.6.4, the only visual impact on agricultural enterprises to the south of the Project, including Coolmore Stud, Woodlands Stud and Arrowfield Estate, will be the construction of the Houston visual bund over a 16 month period. The visual bund will generate visual impacts for a short period but will eliminate views of the mining areas for the remainder of the Project life. Therefore, the Project will not have a significant loss of scenic and landscape values.

8.16.4 Mitigation and Management

Dust and Noise

To ensure that dust and noise targets are not exceeded, real time monitoring systems within the vicinity of the Project will be implemented. A specific focus of the real time monitoring system for the Project will be ensuring that dust and noise targets are not exceeded. Additional mitigation and management measures specific to dust and noise are highlighted in Section 8.1 and Section 8.3, respectively.

Visual

Several mitigation measures to reduce visual impacts at sensitive viewing locations, including Coolmore Stud, Woodlands Stud and Arrowfield Estate, have been incorporated into the design and operation of the Project, including:

- Maintaining existing topography (i.e. southern ridgeline) to shield operations from sensitive receivers in the south;
- Development of the Houston visual bund;
- Tree screening; and
- Progressive rehabilitation of OEAs and disturbed areas.

If deemed necessary following further consultation with relevant stakeholders, offsite mitigation measures, such as tree screening or plantings, can be implemented to further reduce the visual impact to surrounding agricultural properties.

Weed and Pest Management

Weed and pest management procedures and monitoring will be developed and incorporated into the revision of the existing Drayton Mine land management plan to control the distribution of invasive species and feral animals within the Drayton South area. All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

Similar measures will be included in the revision of the existing rehabilitation and offset management plan as described in Section 8.8 to manage site specific issues at the offsite biodiversity offset property.

Anglo American will consult with the Hunter Livestock Health and Pest Authority as to the appropriateness of proposed management procedures and monitoring.

Sustainable Farming Practices

Sustainable farming practices, such as rotational grazing, is considered a final land use goal in available areas outside of the Drayton South disturbance footprint on land owned by Anglo American (approximately 2,669 ha). This includes land to the west near Saddlers Creek, to the east towards Plashett Dam and to the south beyond the existing ridgeline. A description of the land and its capability in each area is provided in Appendix R.

Given that the Project will not reduce the availability or agricultural productivity of the land outside of the Drayton South disturbance footprint, the areas proposed for sustainable farming practices will retain its current condition, which is best suited for grazing.

Sustainable farming practices will be undertaken in conjunction with measures proposed by the CMA for the restoration of Saddlers Creek and any proposed onsite biodiversity offsets (see Section 8.8 and 8.17). These practices will be incorporated in the revision of the existing Drayton Mine land management plan.

Anglo American will also ensure that as part of the Licences to Occupy, land managers will be required to commit to the implementation of the program as outlined in the collaboration agreement between Anglo American and the CMA.

In the event that the offsite biodiversity offset property is managed in part for agricultural purposes, sustainable farming practices will be implemented to encourage the establishment of native grassland communities. If applicable, these practices will be incorporated in the revision of the existing rehabilitation and offset management plan as described in Section 8.8.

Avoidance

Based on the findings outlined in Section 8.16.3, the Project is not anticipated to have impacts on:

- Availability of land for agricultural purposes or the productivity of existing agricultural land in the surrounding locality, including land utilised by the thoroughbred breeding industry;
- Water supply (the Hunter Regulated River Water Source) by means of water extraction for mining purposes or depressurisation;
- Traffic regimes along support infrastructure routes;
- Labour supply; and
- Support services directly employed by agricultural enterprises.

As such, no other mitigation measures regarding these issues have been proposed.

8.17 Rehabilitation, Final Landform And Mine Closure

8.17.1 Background

Rehabilitation at Drayton Mine is currently undertaken in accordance with the existing Drayton Mine rehabilitation and offset management plan. This document sets out provisions for the rehabilitation and conservation management of all offset and rehabilitation efforts for Drayton Mine.

To complement rehabilitation efforts, Anglo American has also developed a framework for mine closure and the management of final voids at the completion of mining operations.

8.17.2 Objectives

Strategic Framework

The strategic framework for the Project's rehabilitation and mine closure is described in the existing Drayton Mine rehabilitation and offset management plan, the mine closure plan and the final void management plan.

In the revision of these plans to encompass new components of the Project, key objectives and techniques will also be guided by the *Mine Rehabilitation* (DITRa, 2006) and *Mine Closure and Completion* (DTIRb, 2006) handbooks prepared as part of the Leading Practice Sustainable Development Program.

The objectives of the existing rehabilitation and offset management plan are to:

- Establish fully viable and self-sustaining ecological communities where vegetation will be created in cleared offset areas;
- Implement assisted natural regeneration methods to increase the ecological integrity of offset areas and to enhance the native vegetation it contains;
- Secure land within a wildlife corridor;
- Reduce weed species and feral animal distribution and abundance; and
- Create a substantial area of habitat for native fauna that will be protected for conservation in the long term.

This plan will be revised to include the following objectives:

- Undertake progressive rehabilitation over the life of the Project;
- Rehabilitate land disturbed or occupied by the Project in accordance with appropriate post-mining land uses;
- Characterise materials (soils, overburden and wastes) to avoid any adverse impacts or prevent use in rehabilitation;
- Selectively place hostile spoil (e.g. highly erosive spoil), where practical;
- Understand the external environment and how it may affect rehabilitation;
- Management of site water to reduce potential erosion or pollution;
- Develop stable and safe landforms that are well integrated and where possible will incorporate some relief with the surrounding environment;
- Establish effective covers for stability and hazardous material containment within landforms, where required; and
- Manage topsoil to conserve nutrients and encourage native seed and micro-organisms.

The framework outlined under the existing final void management plan includes:

- Ensuring there is a well-defined understanding of the physical status and potential final use of each void and how this will interact with the surrounding environment;
- The establishment of design criteria and specifications to mitigate and manage environmental impacts, in particular groundwater impacts; and
- Ensuring the implementation of monitoring and management requirements for each void.

The existing mine closure plan adopts the principles of the *Strategic Framework for Mine Closure* (ANZMEC MCA, 2000). The framework outlined under the mine closure plan includes:

- Enabling all stakeholders to have their interests considered within the mine closure process;
- Ensuring the mine closure process is timely, cost effective and orderly;
- Ensuring the cost of mine closure is reflected in the budget adequately and that the community is not left with a liability;
- Ensuring there is effective implementation of the mine closure process, including adequate resources and clear accountability;
- The establishment of a set of indicators and a rehabilitation monitoring program to ensure mine closure can be demonstrated as a successfully completed process where completion criteria are met;
- Establishing a point where all agreed criteria is deemed successfully met by the relevant stakeholders;
- Ensuring future public health and safety, environmental resources, post-mining land use and socio-economic assets are not affected in any negative way and enhanced where possible; and
- The implementation of sustainable development considerations in corporate decision making processes and the reduction of risk through management strategies based on sound data.

The key objectives for mine closure include:

- Providing a landscape that is safe for the community;
- Minimising potential environmental impact and liability arising from mine closure;
- Removing any waste or potentially hazardous materials from site;
- Minimising the potential impacts from decommissioning;
- Developing landforms that return land affected by mining to a condition that is suitable for a range of sustainable land uses;
- Creating a stable, free draining post-mining landform, which is compatible with the surrounding landscape and which is capable of a productive land use that achieves land capability equal to that of pre-mining conditions;
- Establishing vegetation that is self-sustaining, perpetual and provides a sustainable habitat for local fauna and successive flora species;
- Creating a post-mining landform which enhances the local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine rehabilitation in the Hunter Valley of New South Wales* (Synoptic Plan) (DMR, 1999);
- Developing land uses that benefit the future use of the site for the local community; and
- Developing a landscape that reduces the requirement for long term monitoring and management.

Relevant Planning Instruments

Key objectives from Local and State government plans will be incorporated in the development of rehabilitation and mine closure management plans and frameworks for the Project.

For lands Zone RU1 (Primary Production) in the Muswellbrook LEP, the Project will adopt the following objectives:

- *"To protect the agricultural potential of rural land not identified for alternative land use;*
- *To maintain the rural landscape character of the land in the long term;*
- *To protect or conserve (or both):*
  - (a) *soil stability by controlling development in accordance with land capability;*
  - (b) *trees and other vegetation; and*
  - (c) *water resources, water quality and wetland areas, and their catchments and buffer areas."*

The Project has also been designed in consideration of the *'Final Landform'* principles of the draft *Muswellbrook Shire Council Land Use Development Strategy* (November 2011). The way in which the Project has considered and adopted these key principles is outlined below and addressed in greater detail throughout this section of the EA:

- Final landform design across the Drayton Complex has been engineered to ensure a successful and safe final landform, including sustainable highwalls within the North, South and East Pits at Drayton Mine and the final void within the Drayton South area;
- Utilisation of the existing voids at Drayton Mine for tailings and rejects disposal and potential future ash disposal as detailed in Section 4.4.1;
- Identification of potential future uses for the final void within the Drayton South area (see Section 8.17.4);
- Final landform design to ensure contours will be as natural as possible, developing a free-draining landform. This will ensure the stability of the final void highwalls and will minimise natural erosion and sedimentation.

- The final landform design has incorporated the re-establishment of the pre-disturbance catchment areas as far as practicable; and
- The final void within the Drayton South area will have sufficient freeboard and as such will not require a spillway.

As described in Section 8.7, the Project will impact on Box-Gum Woodland. In order to compensate for this loss, the Project will rehabilitate, restore and conserve Box-Gum Woodland on site and on the selected offsite biodiversity offset property. This will be guided by the *Draft National Recovery Plan for Box-Gum Woodland and Derived Native Grassland* (DECCW, 2010c).

The key objective of the plan is:

> *"To minimise the risk of extinction of the ecological community through:*
>
> - *Increasing protection of sites in good condition;*
> - *Increasing landscape functionality of the community through management and restoration of degraded sites;*
> - *Increasing transitional areas around remnants and linkages between remnants; and*
> - *Bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland."*

In addition, any relevant guidelines that may be made available by DP&I and OEH regarding the restoration of ecosystems in the Hunter Valley will be considered by Anglo American.

8.17.3 Strategies and Techniques

The following strategies and techniques will be applied to rehabilitation and restoration areas for the Project.

Rehabilitation

Progressive rehabilitation will continue to be an integral component of mining operations, in accordance with the SHECMS.

As mining within the Drayton South area advances to the south and OEAs are shaped in the north, progressive rehabilitation will be scheduled as shown in Figure 13 to Figure 20. It is anticipated that several planting stages will be required to establish diverse representatives of the target communities proposed as onsite biodiversity offsets, including Central Hunter Box-Ironbark Woodland and Narrabeen Footslopes Slaty Gum Woodland (see Section 8.8).

The rehabilitation program for the Drayton South disturbance footprint involves a suite of measures, including topsoil management and translocation, erosion and sediment controls and revegetation.

Topsoil resources will be stripped to the recommended depth and stockpiled ahead of mining, in accordance with the SHECMS and mitigation and management measures outlined in Section 8.15. Topsoil stockpiles will be revegetated and managed to ensure the long term viability of the soil resource and the native seed bank. This resource will then be selectively returned to rehabilitate the Drayton South disturbance footprint.

Erosion and sediment control will be a key aspect of Project rehabilitation design. This will include the construction of contour furrows or banks at intervals down rehabilitated slopes to control surface flow. The use of engineered waterways using erosion blankets, ground cover vegetation and/or rip rap will be undertaken to safely dispose of runoff down slope.

An initial combination of direct topsoiling and direct seeding techniques in optimal seasons will be required to prepare the landscape structure for consecutive planting stages. To achieve this, fast growing pioneer species, including grasses, will be incorporated in the initial mix.

Additional tube stock seedlings will be subsequently planted to supplement canopy species and other perennial species thereby increasing vegetation density and diversity. The use of local provenance native shrubs, trees and groundcover plants will assist in maintaining genetic health of planting stock and optimise success of rehabilitation. The inclusion of logs, dead trees and stumps in strategic locations will also assist in enhancing fauna habitat.

Planting arrangements will be based on a combination of the original location and suitable topography associated with each of the target vegetation community.

Detailed mining and corresponding rehabilitation schedules will be prepared and incorporated in the revision of the existing MOP. This will allow annual rehabilitation criteria and targets to be set and audited against. In addition, the biodiversity action plan (see Section 8.7) will contain further information regarding appropriate areas for rehabilitation, details of revegetation priorities and techniques, reference sites and monitoring methodology. All rehabilitation monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

As agricultural operations remain viable on areas outside the Drayton South disturbance footprint, fencing will be erected to avoid grazing pressures on rehabilitated areas.

Once the Drayton South disturbance footprint is stable and self-sustaining it will be set aside as an onsite offset in perpetuity as part of the biodiversity offset strategy for the Project (see Section 8.8).

The rehabilitation of Drayton Mine will continue to be conducted in accordance with the existing rehabilitation and offset management plan and the techniques described above, where applicable. A key focus will be the re-establishment of native vegetation communities local to the area, such as Yellow Box and Grey Gum Woodland, Hunter Lowland Redgum Forest, Spotted Gum-Grey Box Open Forest and Narrow-leaved Ironbark Woodland.

Restoration

All restoration works along Saddlers Creek will be conducted in accordance with the collaborative agreement between Anglo American and the CMA (see Appendix J). The objectives of any relevant guidelines that may be made available by DP&I and OEH regarding the restoration of ecosystems in the Hunter Valley will also be considered.

The restoration strategy for Saddlers Creek involves a combination of earthworks, revegetation, fencing and implementation of land management practices. Together, this will result in the improvement of wildlife corridor values and creek line condition and function.

Early stages of the restoration program involve a range of earthworks to prepare Saddlers Creek for subsequent revegetation. The creation of contour banks in the immediate vicinity of the creek line will divert surface water runoff away from degraded areas and minimise erosion.

Construction of a rock flume will further reduce wearing of the creek banks by concentrating flows to a stilling pond before re-entering the creek line at the existing bed level. Finally, scoured sections of the creek line will be reshaped to increase stability, which will in turn improve the creek pattern, dimension and profile. To complement the earthworks, seed and fertiliser will be applied along the creek line in order to promote rapid establishment of groundcover.

An existing 24 ha of existing vegetation is situated within the immediate vicinity of Saddlers Creek. This will be enhanced through the revegetation of an additional 62 ha of Hunter Floodplain Red Gum Woodland. As Saddlers Creek is a moderately saline watercourse (see Section 8.11 and 8.12), some salt tolerate species that are representative of the target community will be planted. Seedlings that are grown from locally occurring species will be planted. Selected species will be planted in rows along the banks and on top of the bank on each side of the creek line.

Construction of fencing along Saddlers Creek and its tributaries will be erected to protect the riparian corridor from further degradation, particularly as a result of stock grazing.

Once the Saddlers Creek corridor is stable and self-sustaining it will be set aside as an onsite offset in perpetuity as part of the biodiversity offset strategy for the Project (see Section 8.8).

In recognition of the importance of vegetation corridors to regional biodiversity, the restoration of Saddlers Creek will aim to link revegetated areas with remnant vegetation and adjacent conservation works in the vicinity of the Project, including those being undertaken by HVEC on the northern reaches of Saddlers Creek and those works planned to be completed as part of the final landform and rehabilitation plan at Drayton Mine.

This will complement the local and regional habitat corridors as presented in the Synoptic Plan. These corridors and how they have been incorporated into the final landform planning by the Drayton Complex are shown on Figure 24, Figure 26 and Figure 28.

Successful Restoration Projects

Anglo American has a proven track record for river restoration works. In 2005, a joint project between Anglo American and the CMA was established to improve the health of a 6.5 km section of the Hunter River and Dart Brook at Dartbrook Mine north of Muswellbrook. This project involved:

- Protection and enhancement of one of the largest remaining populations of River Red Gum (*Eucalyptus camaldulensis*);
- Promotion of natural regeneration within natural and artificial flood areas;
- Increasing native vegetation density and diversity;
- Minimisation of further riparian and stream biodiversity loss;
- Management of introduced species and weed infestations;
- Improvement of channel bed stability, water quality and flow regimes; and
- Restoration of fish habitat and native fish stocks.

Ongoing management, including periodic inspections by the CMA and monitoring undertaken by external consultants using the methodology as prescribed by the CMA, has determined that these works are progressing well.

Weed and Feral Animal Control

Weed and feral animal controls are essential, particularly in the early stages of the program, to the success of rehabilitation efforts and will be ongoing in order to promote the establishment of native vegetation communities. A combination of herbicide application and manual weeding will be primarily utilised to prevent or control weed infestations. In targeting feral animals, particularly rabbits and foxes, a variety of baits will be distributed.

8.17.4 Conceptual Final Landform

Drayton Mine

There are four key domains that have been identified in the rehabilitation strategy of Drayton Mine based on the Project impacts, post mine landform, future land use and biodiversity values. These are discussed in further detail below.

Disturbance Footprint

The conceptual final landform at Drayton Mine will divert water around the North Void and allow for free drainage into the four minor gullies of the Ramrod Creek catchment. The eastern and southern areas of the final landform will no longer be free draining with a significant proportion of the local catchment area occupied by the East and South Voids.

Excluding the final voids, the final landform will be shaped to be consistent with the surrounding landscape, with slopes generally less than 10 degrees with a maximum of approximately 14 degrees. The final landform will typically be characterised by land with a capability Class of V to VII.

Rehabilitation of the final landform will be conducted in accordance with the existing rehabilitation and offset management plan, which follows the strategies and techniques outlined in Section 8.17.3, where applicable.

Final Voids

Following completion of mining at Drayton Mine in 2017, Anglo American will maximise opportunities to use the final voids for storage of water, and rejects and tailings generated from the Drayton South mining areas. Void allocation is contingent upon commercial agreement with Macquarie Generation and as such there are three possible scenarios proposed (see Section 4.4.1).

Once both parties are in agreement regarding the final void scenario, the existing Drayton Mine final void management plan will be revised to include:

- Status and use of each void;
- Rehabilitation commitments and liabilities;
- Potential environmental impacts associated with each voids, with a particular focus on groundwater impacts as discussed in Section 8.12;
- Monitoring and management of each void and the substances contained; and
- Mitigation measures to minimise or prevent environmental impacts, with a particular focus on measures to control groundwater seepage as discussed in Section 8.12.

All monitoring will also be detailed in the revision of the existing Drayton Mine environmental monitoring plan.

Mine Site Facilities and Infrastructure

The existing mine site facilities and infrastructure at Drayton Mine, including the CHPP, stockyard, workshops, train loading facilities and rail loop will be decommissioned following the completion of mining within the Drayton South area. The landscape will then be rehabilitated as part of the mine closure strategy for the Project.

Existing Offsets

The existing biodiversity offsets at Drayton Mine as described in Section 3.6, constitute a separate component of the final landform for the Project and will continue to be managed in accordance with the existing Drayton Mine rehabilitation and offset management plan.

Existing offset areas will continue to be maintained and improved through such strategies as the revegetation of the Modification Offset Area and the Southern Offset Area to increase the existing density and diversity of targeted communities.

Drayton South

There are four key domains that have been identified in the rehabilitation strategy for the Drayton South area based on the Project impacts, post mine landform, future land use and biodiversity values. These are discussed in further detail below.

Disturbance Footprint

The final landform proposed for the Drayton South area is consistent with the surrounding landscape, with slopes of approximately 10 degrees. The final landform will be typically characterised by land capability Class VI and VII.

To minimise surface water catchment as far as practical, the conceptual final landform within the Drayton South area has been designed with the inclusion of diversion drains and contour banks to redirect surface water runoff away from low lying areas.

Rehabilitation of the final landform will be conducted in accordance with strategies and techniques outlined in Section 8.17.3 and Section 8.8.

Final Void

As part of the final landform it is planned that the final void will have the majority of the highwall blasted back and low wall graded to improve safety and stability. Surface water runoff and groundwater seepage will settle in the remaining void, creating a final void lake at approximately RL 117 m.

The following future land uses are considered as options for the final void within the Drayton South area:

- Overburden emplacement area for future open cut mining operations;

- Waste disposal area for future mining operations;
- Ash disposal area for neighbouring power stations;
- Water storage for neighbouring power stations or future mining operations;
- Aquaculture; or
- Recreational lake.

Mine Site Facilities and Infrastructure

The existing mine site facilities and infrastructure within the Drayton South area, including the remote workshops, operations building and dragline and equipment laydown area will be decommissioned following the completion of mining within the Drayton South area. The landscape will then be rehabilitated as part of the mine closure strategy for the Project.

Proposed Biodiversity Offsets

As discussed in **Section 8.17.3**, once the Drayton South disturbance footprint and the Saddlers Creek corridor is stable and self-sustaining it will be set aside as an onsite offset in perpetuity as part of the biodiversity offset strategy for the Project (see **Section 8.8**). The conceptual Drayton South final landform is shown in **Figure 73**.

These areas will be managed in accordance with the existing rehabilitation and offset management plan.

8.17.5 Mine Closure

The existing mine closure plan for Drayton Mine will be revised, to incorporate the new components of the Project, within five years of closure and shall reflect contemporary expectations, including changes to the final mine plan, regulatory requirements, new technologies and stakeholder expectations.

Decommissioning and removal of mine site facilities and all infrastructure items will take place if that infrastructure is not required post-mining or sold on for other industrial purposes. Any infrastructure including dams, levee banks, roads and buildings, which is beneficial for future use by post mine land owners, will be left in place in accordance with the relevant stakeholder or land owner agreements.

Land in the vicinity of mine site facilities will require remediation of any land contamination, ripping, topsoiling (if necessary) and seeding.

8.17.6 Rehabilitation Completion Criteria

Completion criteria for mine closure will be developed and agreed in consultation with the relevant government agencies and community. These criteria will continue to be revised and developed to demonstrate that the rehabilitation and restoration objectives have been achieved on site. Progress against the completion criteria will be regularly monitored and reported to relevant stakeholders.

Table 75 Preliminary Rehabilitation Criteria

Aspect	Domain		
	Disturbance Footprint	Mine Site Facilities	Biodiversity Offsets
	Criteria		
Landform	• Final slopes of the OEAs will be formed at 10 degrees or less • Erosion channels or bare areas will be managed and eliminated where possible • Contour banks will be stable and uniform • The surface layer will be free from hazardous materials • All drill holes will be sealed	• Plains will be relatively flat with no slopes • Erosion will be managed to ensure the final land use is not compromised • Contour banks will be stable, revegetated and uniform • Surface layer will be free from hazardous materials • Riparian areas will be managed to prevent instability and erosion where possible and to ensure similar pre- mining flows	
Soil	• Topsoil will be spread on all rehabilitation surface areas as soon as possible to prevent the requirement for stockpiling and will include weed infestation assessment prior to this • Soil shall be suitable for re-establishing vegetation and lightly contour ripped to create a key between the soil and spoil • pH will be monitored to encourage acceptable ranges for plant growth and similar quality to analogues sites • Erosion and sediment control will be achieved through the construction of contour furrows or contour banks at intervals down slopes		
Water	• Runoff water quality from rehabilitated areas will be managed to reduce any possible threat to downstream water quality • Catchment areas will be free draining with low velocity to minimise surface erosion		

Aspect	Domain		
	Disturbance Footprint	Mine Site Facilities	Biodiversity Offsets
	Criteria		
Vegetation	• Rehabilitated areas will be designed to attract the desired flora species characteristic of the pre-mining vegetation assemblages • Rehabilitated vegetation will be designed to develop the desired structure (i.e. shrubby forest or grassy woodland) • Second generation seedling production will be encouraged • The health of trees will be monitored for the long term to ensure high survival rates • Significant weed infestations or noxious weeds will be removed in accordance with relevant guidelines • The highest percentage soil surface cover possible will be maintained	• Rehabilitated areas will contain pastures characteristic of pre-mining land capability	• Rehabilitated areas adjoining biodiversity offsets or regional wildlife corridors will contain native vegetation with the desired structure and floristic characteristics of adjoining remnant areas • Rehabilitated creek lines and disturbed areas will be designed to contain the desired vegetation structure (i.e. Box-Gum Woodland) and characteristic species remnant areas
Fauna	• Vertebrate pests will be managed to ensure effective control • Rehabilitated areas will be designed to contain a range of habitat structures for native fauna (e.g. eucalypts, shrubs, ground layer, developing litter) • Rehabilitated areas will be designed to support stable populations of native fauna and will be monitored long term • Rehabilitated riparian areas and areas adjoining biodiversity offsets will be designed to contain a range of habitat structures for native fauna (e.g. eucalypts, shrubs, ground layer, developing litter) • Rehabilitated areas will support regional wildlife corridors and where possible reduce barrier effects	• Vertebrate pests will be managed to be absent or kept under control and monitored on an annual basis	• Vertebrate pests will be managed to be absent or kept under control and monitored on an annual basis
Land Capability	• Rehabilitated areas will be designed to be representative of a suitable land capability for slopes and batters	• Rehabilitated areas will be designed to be of a land capability class suitable for biodiversity conservation • All sites which are not disturbed by mining activities will remain the same land capability as the pre-mining class • Native flora species typical of the local area will be used in the establishment of native forest and woodland in areas of pre-mining	• Rehabilitated areas will be designed to be representative of a suitable land capability for slopes and batters • All sites which are not disturbed by mining activities will remain the same land capability as the pre-mining class • Native flora species typical of the local area will be used in the establishment of native forest and woodland in areas of pre-mining

DRAYTON SOUTH COAL PROJECT

Conceptual Drayton South 3D Final Landform

FIGURE 73

Anglo American is committed to the achievement of leading practice completion criteria for the Drayton Complex, as this will ensure the long term protection and management of the post mine landscape and its biodiversity conservation values. A list of preliminary rehabilitation completion criteria is outlined in Table 75.

8.18 Traffic And Transport

8.18.1 Background

A traffic and transport impact assessment was undertaken by DC Traffic Engineering and is provided in full in Appendix S. The purpose of the assessment was to:

- Quantify the additional traffic generated during the construction and operation phases of the Project;
- Assess the impacts of the proposed Edderton Road realignment on traffic;
- Assess the road safety implications of the Project;
- Assess the impacts of the Project on rail traffic; and
- Recommend measures to mitigate and manage the identified impacts.

Existing Road Network

The transport network in the vicinity of the Project is shown in Figure 1.

The major road in the Upper Hunter region is the New England Highway, which links Newcastle and Brisbane. This is an Auslink route and is a freight route of strategic national importance. The road is managed by RMS on behalf of the Commonwealth government. Vehicles travelling to Drayton Mine from the east will travel north-west along the New England Highway before turning left into Thomas Mitchell Drive.

From 1980 to 2004, the Annual Average Daily Traffic (AADT) for the New England Highway increased from 7,500 vehicles / day to 12,000 vehicles / day (RTA, 2004). This is an average increase of 2.5% per annum.

Thomas Mitchell Drive is an 11 km local road linking Denman Road and the New England Highway. It is a sealed road with a two-lane-two-way configuration and a width of approximately 7 m. Thomas Mitchell Drive provides access to Drayton Mine, Mt Arthur Coal Mine and the Muswellbrook Industrial Estate. The road is also used by a significant amount of traffic travelling from Denman to the New England Highway and vice versa. Thomas Mitchell Drive is managed by MSC.

The Golden Highway links Dubbo and Singleton, and passes immediately to the south of the Project Boundary. The Golden Highway is a two-lane-two-way sealed road with a width of 7 to 9 m. Vehicle movements to Drayton Mine from west of Denman will travel the Golden Highway before turning onto Denman Road. The Golden Highway is a State Road and is managed by RMS.

The vehicle movements on the Golden Highway increased from 1,100 vehicle / day in 1980 to 2,400 vehicles / day in 2004. This equates to a growth rate of 4.9% per annum (RTA, 2004).

Denman Road provides a link between the Golden Highway near Denman and the New England Highway near Muswellbrook. Denman Road is an undivided two-lane road with a sealed width of 7 to 9 m. As Denman Road is a State Road, it is under the jurisdiction of RMS.

Edderton Road is a 15 km long rural road joining Denman Road and the Golden Highway. Edderton Road has a two-lane-two-way configuration but is unmarked and has a load limit of 14 t. The sealed width is generally less than 6 m and the pavement has significant patching. Saddlers Creek crosses the route as a floodway approximately 3.5 km north of the Golden Highway.

Edderton Road carries approximately 760 vehicles / day at its northern end (as surveyed in May 2011) and 680 vehicles / day at its southern end (as surveyed in February 2012) with heavy vehicles making up approximately 19% of all traffic. As a result of the load limit, most of these are single unit rigid trucks.

Edderton Road partially lies within the Project Boundary and also runs through the western portion of Mining Lease 1358, which is held by Mt Arthur Coal Mine. Currently, Mt Arthur Coal Mine holds an approval to realign approximately 6 km of the northern-most section of this road (including its intersection with Denman Road). This is currently scheduled to take place in 2019.

Vehicle movements to Drayton Mine from the west will be via the Golden Highway and Denman Road, before turning right into Thomas Mitchell Drive.

All employees and service personnel currently access Drayton Mine via the Mine Access Road situated off Thomas Mitchell Drive. This is a 1.5 km long private road with a two-lane-two-way configuration.

Existing Rail Network

Product coal is transported from mines in the Hunter Valley to the Port of Newcastle via the Main Northern Railway. There is a dedicated double track between Newcastle and Maitland, and a shared double track between Maitland and Muswellbrook. The Antiene Rail Spur is a 9.4 km line that branches off the Main Northern Railway. Rail loading facilities for Drayton Mine and Mt Arthur Coal Mine are situated on the Antiene Rail Spur.

The current state of the Hunter Valley coal rail network is described by ARTC (2009). The maximum theoretical capacity of the network is 189 Mtpa. However, when maintenance requirements, surge volume and system reliability are taken into account, the actual capacity of the network is approximately 95 Mtpa (ARTC, 2009).

The Hunter Valley coal rail network is currently serviced by a fleet comprised of 29 trains (of varying wagon sizes and quantities). There are currently 24 train movements between Newcastle and Muswellbrook per day (12 movements in each direction).

8.18.2 Methodology

Desktop Assessment

Existing road traffic conditions were ascertained through a desktop review of previous traffic assessments and numerous traffic counts between 1980 and 2004 at locations on the New England Highway and Golden Highway. The traffic volumes were expressed as AADT values, which represent the number of vehicle movements in both directions per day.

From this information, the annual growth rates calculated were used to forecast increases in background traffic on key roads for future case scenarios to determine more accurate predictions of the Project on the road network.

Traffic Surveys

Traffic volume surveys were conducted in May 2011 and February 2012 and included:

- Turning movement survey for the Denman Road / Thomas Mitchell Drive intersection;
- Turning movement survey for the Thomas Mitchell Drive / Mine Access Road intersection;
- Turning movement survey for the Thomas Mitchell Drive / New England Highway intersection;
- Turning movement survey for the Edderton Road / Golden Highway intersection;
- 24 hour, 14 day midblock tube survey for Edderton Road; and
- 24 hour, 7 day midblock tube survey for the approaches and departures to the intersection of Edderton Road and the Golden Highway.

All turning movement surveys were conducted during both day (AM) and night (PM) peak periods. The turning movement survey for the Edderton Road / Golden Highway intersection was conducted between 2:00 pm and 5:00 pm, which was determined to be the busiest period through the analysis of tube survey data.

SIDRA

The performances of the three intersections that will be impacted by the Project were modelled using SIDRA, namely:

- Thomas Mitchell Drive / New England Highway;
- Thomas Mitchell Drive / Denman Road; and
- Thomas Mitchell Drive / Drayton Mine Access Road.

Existing and approved mining projects in the vicinity of Project were taken into consideration when assessing cumulative impacts on the road and the rail network, including Mt Arthur Coal Mine, Mount Pleasant Project, Bengalla Coal Mine and Mangoola Coal Mine.

8.18.3 Impact Assessment

Road Traffic Generated by the Project

Construction Phase

During the construction phase of the Project, it is anticipated that an average of 126 persons will report to the Drayton Complex per day via the existing Drayton Mine Access Road off Thomas Mitchell Drive with the exception of construction activities associated with realignment of Edderton Road.

The workforce has been assumed to peak in month 11 of the construction program, with 369 persons expected per day.

The construction works will be carried out during both day and night shifts, with the exception of the Edderton Road realignment, which will only be carried out between the hours of 7:00 am and 5:00 pm, Monday to Saturday.

The number of heavy vehicle deliveries to the Drayton Complex is anticipated to peak at 270 visits per month during months nine and 10 of the construction phase.

Operations Phase

The existing operations workforce of up to 530 full time employees and contractors will continue to be utilised by the Project. Mine access during the operations phase will continue to be via the existing Drayton Mine Access Road off Thomas Mitchell Drive. As such there are not anticipated to be any significant increases in traffic as a result of the Project. However, the assessment has considered a 2.5% annual growth in traffic volumes based on calculations from previous traffic counts (RTA, 2004). Given that coal mining is the major generator of traffic in the region, the growth rate of 2.5% is attributable to mining expansions. Therefore, the traffic generated by the Project is reflected in the calculated increase in the background traffic.

Road Intersection Performance

The SIDRA model was used to assess the Level of Service (LoS) at which the key intersections will perform during peak construction and operations phases. The LoS is determined by the average delay experienced by vehicles at that intersection. The different categories of LoS are explained in Table 76.

The performance of the key intersections under the existing traffic conditions is shown in Table 77.

The SIDRA model results show that the current configuration of the Denman Road / Thomas Mitchell Drive intersection would perform at a poor LoS (F) during the peak operations phase. The queue length for the right hand turn from Denman Road into Thomas Mitchell Drive will exceed 200 m during the AM peak. The right hand turn from Thomas Mitchell Drive onto Denman Road will experience queue lengths greater than 350 m.

Table 76 Performance Categories for Intersections

Level of Service	Average Delay (Seconds per Vehicle)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good, with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At traffic signals, incidents will cause excessive delays. Roundabouts will require another control mode	At capacity and requires other control mode
F	Greater than 71	Unsatisfactory, with excessive queuing	Unsatisfactory, with excessive queuing and requires other control mode

Table 77 Performance of Key Intersections

Intersection	Approach	Movement	Existing (2011) AM Peak	Existing (2011) PM Peak	Predicted Peak Construction (Year 1, 2014) AM Peak	Predicted Peak Construction (Year 1, 2014) PM Peak	Predicted Peak Operation (Year 15 - 2028) AM Peak	Predicted Peak Operation (Year 15 - 2028) PM Peak
			Average Delay (Seconds per Vehicle) / Queue Length (m) / LoS					
Denman Road / Thomas Mitchell Drive	Thomas Mitchell Drive from south-east	Left turn	16.2/5.2/B	13.7/2.5/A	18.0/7.2/B	13.7/3.5/A	26.8/24.0/B	15.6/5.8/B
		Right turn	16.9/7.2/B	16.8/26.0/B	20.8/15.5/B	26.7/93.7/B	315.4/366.0/F	734.0/1264.9/F
	Denman Road from north-east	Left turn	12.5/0.0/A	12.8/0.0/A	12.4/0.0/A	12.6/0.0/A	12.5/0.0/A	12.1/0.0/A
		Through	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.00/0.0/A	0.0/0.0/A	0.0/0.0/A
	Denman Road from south-west	Through	0.0/8.8/A	1.3/10.8/A	0.0/17.3/A	1.8/13.4/A	0.0/203.8/A	4.8/43.1/A
		Right turn	20.9/8.8/B	15.4/10.8/B	28.2/17.3/B	16.1/13.4/B	239.3/203.8/F	21.2/43.1/D
New England Highway / Thomas Mitchell Drive	New England Highway from south-east	Left turn	13.2/0.0/A	14.2/0.0/A	13.1/0.0/A	13.8/0.0/A	13.1/0.0/A	13.3/0.0/A
		Through	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A
	New England Highway from north-west	Through	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A
		Right turn	17.1/6.1/B	16.6/0.6/B	19.3/8.4/B	17.1/0.7/B	26.3/18.7/B	20.2/1.3/B
	Thomas Mitchell Drive from west	Left turn	15.1/1.4/B	16.4/2.0/B	15.8/1.6/B	16.8/2.3/B	17.6/2.7/B	19.5/4.2/B
		Right turn	29.7/21.7/C	29.2/31.3/C	41.1/38.5/C	79.8/145.9/F	1210.7/921.6/F	1223.11203.2/F
Thomas Mitchell Drive / Drayton Mine Access Road	Drayton Mine Access Road from south	Left turn	10.5/0.4/A	9.9/0.3/A	11.2/2.3/A	9.5/6.9/A	N.A.	N.A.
		Right turn	11.8/2.4/A	10.3/2.5/A	14.5/4.8/B	10.9/7.4/A		
	Thomas Mitchell Drive from east	Left turn	12.8/0.0/A	12.6/0.0/A	12.7/0.0/A	12.6/0.0/A		
		Through	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A		
	Thomas Mitchell Drive from west	Through	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A	0.0/0.0/A		
		Right turn	15.4/1.6/B	12.7/0.0/A	17.215./0B	13.0/1.5/A		

N.A. Not Applicable. Operational case not modelled as it would be similar to the existing conditions.

Drayton Mine is only responsible for 4% of the 1,122 vehicles / hour entering Denman Road / Thomas Mitchell Drive intersection during the AM peak under the 2011 base case scenario. Since there is no proposed increase in operational workforce, the Project will continue to have minimal impact on the LoS of the intersection.

The Thomas Mitchell Drive / New England Highway intersection will also perform at a poor LoS (F) under the current configuration during the PM peak construction phase, and the AM and PM peak operations phase. The maximum queue length will exceed 900 m for the right turn from Thomas Mitchell Drive onto the New England Highway during peak operation. At present, Drayton Mine is responsible for 18% of the vehicles entering this intersection.

The intersection of Thomas Mitchell Drive and the Mine Access Road will continue to perform at either a good or acceptable LoS (A or B).

The performances of the key intersections during the peak construction and operations phase are outlined in Table 77.

Traffic Volumes on Thomas Mitchell Drive

The total usage of a road is measured in Vehicle-Kilometres-Travelled (VKTs), which takes into account the number of vehicle movements generated and the distance travelled by these vehicles. The Project will generate approximately 8.2% of the daily VKTs along Thomas Mitchell Drive, and approximately 4% of the daily heavy vehicle VKTs on this road. Hence, the Project's contribution to traffic on Thomas Mitchell Drive is not significant, compared to other traffic sources.

Road Safety

There are several safety deficiencies associated with the existing road network within the vicinity of the Project.

Thomas Mitchell Drive contains a curvilinear section from 0 m to 500 m west of the New England Highway causing it be the highest risk section of the road. From 1 July 2005 to 30 June 2010, there were eight loss-of-control crashes and one head-on crash. The majority of traffic generated by the Project will utilise the 1.1 km section of Thomas Mitchell Drive between the New England Highway and Mine Access Road. This includes the 500 m long curvilinear section. As previously explained, the Project will not significantly increase the VKTs on Thomas Mitchell Drive. Therefore, the Project will not exacerbate any existing road safety issues on Thomas Mitchell Drive.

Edderton Road lacks a posted speed limit, which means that the general rural speed limit of 100 km/h applies. The road has a narrow sealed width (5.7 to 6.3 m) and no shoulders. As such, there is an elevated risk of head-on collisions. The Project will involve the realignment of a 7 km section of Edderton Road. The realigned section of road has been designed in accordance with the *Road Design Guide* (RTA, 2000). The risk of head-on collisions will be alleviated by increasing the sealed width to at least 6.6 m and adding 1.3 m wide shoulders. The shoulder will be unsealed, but still traversable, allowing errant vehicles to recover.

At the Edderton Road / Golden Highway intersection, there is a poor stopping sight distance for westbound traffic on the Golden Highway approaching the queue to turn right into Edderton Road. This is due to a crest vertical curve, a horizontal curve and a cutting slope with limited sight bench. The undulating landscape also results in poor gap acceptance sight distances from the hold line of Edderton Road. Vehicles on Edderton Road waiting to turn onto the Golden Highway only have a gap acceptance sight distance of six seconds for vehicles travelling west along the Golden Highway. The *Road Design Guide* (RTA, 2000) states that this distance must be a minimum of five seconds, but preferably greater than 14 seconds.

Under the proposed Edderton Road realignment, the Edderton Road / Golden Highway intersection will be moved 5 km west of the existing intersection. The new intersection is situated in a less undulating area, resulting in improved stopping sight distances for vehicles on the Golden Highway. This will also significantly improve the gap acceptance sight distances from Edderton Road. There will be a gap acceptance sight distance of 10 to 11 seconds for eastbound traffic and 25 seconds for westbound traffic.

Edderton Road currently crosses Saddlers Creek via a floodway. This entails a deep sag in the road. The advisory speed limit for this section of the road is 65 km/h, which is 35 km/h less than the speed limit for the road. A speed differential of 35 km/h is considered unacceptable. The proposed realignment will pass to the west of the Saddlers Creek crossing and over one of its minor tributaries approximately 1.3 km north of the Golden Highway. A fill embankment or culvert is proposed to remove the sag vertical curve at that location thereby eliminating any speed differential and making it a much safer section of road.

Edderton Road Realignment

Construction works for the Edderton Road realignment are not expected to significantly disrupt traffic. The existing Edderton Road will remain operational throughout the construction period; it will only be closed once the new alignment has been completed.

The realignment of Edderton Road will move the intersection with the Golden Highway to the west by approximately 5 km. As a result, the journey east from Edderton Road and the Golden Highway will be lengthened by 5 km. Conversely, vehicles travelling west from Edderton Road and the Golden Highway will travel 5 km less. This will increase or decrease the travel time by three to four minutes.

The improved conditions in the realigned section of the road will make the road more conducive to travel at 100 km/h. As a result, there will only be minimal impacts (in some cases a positive impact) on travel times.

Rail Transport

The peak production year for the Project is predicted to be 2017 (Year 4), in which 7 Mt of ROM coal will be extracted. This will yield approximately 5.2 Mt of product coal for that year.

In order to calculate the rail traffic generated by the Project, it has been assumed that product coal will be transported to Newcastle using 100-wagon trains. Each wagon possesses a carrying capacity of 85 t, resulting in a total payload of 8,500 t per train.

In 2017, a total of 308 trains will be needed to transport approximately 5.2 Mt of product coal to Newcastle. This equates to two trains per day, which is in line with Drayton Mine's existing approval. As such the Project will not result in any additional trains on the Antiene Rail Spur or Main Northern Railway.

Based on Mt Arthur Coal Mine's current approval, it is forecast that there will be a total between the two operations of up to 14 trains per day on the Antiene Rail Spur making the Project's contribution 14%. If Mt Arthur Coal Mine increases the number of trains they put down the Antiene Rail Spur from 12 to 19 per day as proposed in their current modification then the Projects contribution will be approximately 9.5%.

8.18.4 Mitigation and Management

As discussed in Section 8.18.3, the New England Highway/ Thomas Mitchell Drive intersection and the Denman Road / Thomas Mitchell Drive intersection will perform at a poor level of service during peak construction and operations periods. However, Mt Arthur Coal Mine is required (under PA 09_0062) to upgrade these intersections to a seagull configuration.

This provides a channelised right turn bay for vehicles turning into Thomas Mitchell Drive from the New England Highway. This ensures that through traffic is not impeded by queues of right-turning vehicles. The seagull configuration also provides an acceleration lane for vehicles turning right onto the New England Highway from Thomas Mitchell Drive.

Similarly, the indented nature of the right-turn lane into Thomas Mitchell Drive would mean that any queues that form in this lane would not affect the eastbound through direction of Denman Road. The physical separation of the acceleration lane (from the right-turn from Thomas Mitchell Drive) means that right-turning traffic from this approach only need to give way to the westbound through movement and the right-turn movement from Denman Road to Thomas Mitchell Drive.

The SIDRA model indicates that the upgrade to a seagull configuration will improve the LoS from a rating *'F'* to a rating of either *'A'* or *'B'*. As a consequence:

- The queue length for the right turn from Thomas Mitchell Drive onto the New England Highway will decrease from 900 m to approximately 25 m for the AM peak and from 1,200 m to 35 m for the PM peak; and
- The queue length for the right turn from Thomas Mitchell Drive onto Denman Road will decrease from 360 m to approximately 26 m for the AM peak and from 1,250 m to approximately 47 m for the PM peak.

Therefore, the planned upgrade of the New England Highway / Thomas Mitchell Drive intersection and the Denman Road / Thomas Mitchell Drive intersection will resolve the predicted traffic issues that would have been otherwise experienced at these intersections during the peak construction and operations phase. Since Mt Arthur Coal Mine is committed to undertake this work, no further mitigation measures are necessary. Table 78 details the performance of the Denman Road / Thomas Mitchell Drive and the New England Highway / Thomas Mitchell Drive intersections after being upgraded to seagull configurations by Mt Arthur Coal Mine.

As described in Section 8.18.3, the proposed realignment of Edderton Road will improve the safety conditions by widening the sealed length, constructing shoulders, and bypassing Saddlers Creek. The Edderton Road realignment / Golden Highway intersection will be an improvement on the existing intersection due to superior gap acceptance sight distances and stopping sight distances. The new intersection will adopt a channelised right turn configuration with an indented and protected right-turn lane on the Golden Highway.

The realignment of Edderton Road will be designed in consultation with MSC and the intersection with the Golden Highway will be designed to the satisfaction of RMS. Anglo American has agreed in principle to fund the realignment of the section of the road as required for the Project. In addition, Anglo American also plans to contribute to the funding of the upgrade of the section of road between this and the proposed Mt Arthur Coal Mine northern realignment of Edderton Road.

In order to manage traffic impacts during the construction of the Edderton Road realignment, a traffic control plan will be prepared to the satisfaction of MSC and RMS. The traffic control plan will describe management measures that will allow road works to be safety undertaken whilst still affording public access to the road.

ARTC (2009) identified a number of deficiencies in the Hunter Valley rail network and proposes upgrades to accommodate the predicted increase in coal production. Anglo American will consult with ARTC regarding forecast production rates to assist in the planning and scheduling of infrastructure upgrades.

Table 78 Performance of Upgraded Seagull Intersections

Intersection	Approach	Movement	AM Peak	PM
			Average Delay (Seconds per Vehicle) / Queue Length (m) / LoS	
Denman Road / Thomas Mitchell Drive	Thomas Mitchell Drive from south-east	Left turn	N.A.	N.A.
		Right turn	21.2/26.4/B	17.0/47.7/B
	Denman Road from north-east	Left turn	N.A.	N.A.
		Through	0.0/0.0/A	0.0/0.0/A
	Denman Road from south-west	Right turn	15.2/7.9/B	14.7/5.7/B
New England Highway / Thomas Mitchell Drive	New England Highway from south-east	Left turn	N.A.	N.A.
		Through	0.0/0.0/A	0.0/0.0/A
	New England Highway from north-west	Right turn	14.3/5.7/A	15.5/0.8/B
	Thomas Mitchell Drive from west	Left turn	N.A.	N.A.
		Right turn	18.3/24.8/B	18.6/35.6/B

N.A. No result is given where the seagull configuration has no impact on that particular movement.

8.19 Bushfire

8.19.1 Background

A review of the existing Drayton Mine bushfire management and response system and risks associated with the Project were undertaken by Hansen Bailey.

Existing Environment

The land within the Drayton South area consists predominantly of native perennial grassland of various diversity and floristic composition that has been derived from the clearing of the original woodland and forest communities.

Remnant forest and woodland exist as scattered patches across the Drayton South area, particularly along riparian corridors and on steep gradients. The mosaic of grasslands and remnant woodland patches is typical of the general locality and a result of extensive agricultural practices.

Wollemi National Park is located approximately 6 km south of the Project Boundary and encompasses an area of 501,376 ha. Approximately 90% of Wollemi National Park is open eucalyptus forest, with the remainder of the land covered by woodlands, closed forest and rainforest (NPWS, 2005).

Bushfire Management Plan

Drayton Mine currently operates in accordance with an existing bushfire management plan, which aims to:

- Prevent and minimise the potential for bushfires by monitoring and maintaining areas and equipment where bushfire hazards are present;
- Control the outbreak of fires in an effective manner; and
- Minimise the risk of bushfires spreading from Drayton Mine to adjoining land holdings.

Fire controls and emergency systems at Drayton Mine are implemented in accordance with the mine's emergency response procedures and in association with the NSW Rural Fire Service.

8.19.2 Risk Assessment

The bushfire season is generally experienced in the vicinity of the Project during September to April. The frequency and intensity of bushfires is dependent upon factors such as temperature, available fuel loads and rainfall.

Due to the high density of vegetation, there are high fuel loads (leaf drop and tinder) present within the Wollemi National Park. As a result, there is a high bushfire risk in the area to the south of the Project. However, the Hunter River segregates the Project from Wollemi National Park, significantly protecting the Drayton South area from this risk. In addition, the large majority of land within the Project Boundary and surrounding properties is used for extensive grazing, which poses a lower bushfire risk than forest and woodland areas and assists in controlling the fuel load.

8.19.3 Mitigation and Management

Anglo American will revise, as necessary, the existing bushfire management plan and associated response systems currently in operation at Drayton Mine. To maintain the efficiency of the system, relevant training for emergency response officers, including the NSW Rural Fire Service, and all employees will continue to be implemented.

8.20 Waste

8.20.1 Background

A review of the existing Drayton Mine waste management system and management plan, and requirements for the Project were undertaken by Hansen Bailey.

Drayton Mine currently operates in accordance with an existing waste management plan, which addresses all issues relevant to the processing, disposal and onsite management of waste material as required by the POEO Act.

A key objective of the existing waste management plan is to encourage reuse and recycling of waste materials. In order to meet this objective, waste material is separated into several streams and deposited in the appropriate receptacle for reuse, recycling or disposal. Waste streams that are currently generated from Drayton Mine include general and hazardous waste, and sewage.

Where applicable, Drayton Mine has appointed an independent waste contractor working within the provisions of the POEO Act to remove and report on wastes. Such information provides inputs for an onsite tracking register for all waste material generated by the operation.

General Waste

Scrap metal, batteries, empty drums, wooden pallets, timber, green waste and mixed recyclables (including paper cardboard, glass and aluminium cans) are typical of the general waste collected on site at Drayton Mine. Each waste material is separated into the appropriate receptacle for reuse, recycling or disposal.

Hazardous Waste

The handling and management of hazardous wastes at Drayton Mine is conducted in accordance with the existing waste management plan, the *Waste Classification Guidelines* (DECCW, 2008) and the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2007).

Contaminated materials generated at the workshop and vehicle wash down bay, such as grease and oil, is held in storage tanks within a bunded area prior to removal from site by an independent waste contractor for recycling or disposal. Any spills that occur in the collection areas will be contained within bunds and managed in accordance with Drayton Mine's pollution control systems.

Surface runoff from industrial areas, which may contain high levels of suspended sediment, detergents, oil and other chemicals, are captured in storage dams and treated prior to being reused in the water management system.

Effluent and Sewage Treatment

A sewage treatment facility collects and treats effluent generated on site at Drayton Mine. The treated effluent is then transferred to two settling ponds where it is pumped to an area of rehabilitation for irrigation water supply in accordance with EPL 1323 and the *Environmental Guideline for the Use of Effluent by Irrigation* (DEC, 2003).

Onsite toilet facilities, which are not connected to the sewage treatment facility, are regularly inspected by a certified contractor who disposes of effluent at an offsite public sewage treatment facility.

Rejects and Tailings

Rejects and tailings waste is produced in the coal preparation process. Rejects are currently co-disposed with overburden and tailings are pumped to the East (South) Void for disposal. Further details regarding current rejects and tailings disposal and the strategy proposed for the Drayton Complex is outlined in Section 3.4 and 4.4.1.

8.20.2 Impact Assessment

The current Drayton Mine waste management system and the newly constructed sewage treatment facility within the Drayton South area will be utilised for the Project. There is not expected to be any additional demand on the sewage treatment services as the nature of the operation and number of employees will not significantly change. This enables current arrangements to adequately address the waste management requirements of the Project in accordance with the POEO Act.

The key change to the current waste management system as a result of the Project is the allocation of rejects and tailings waste. At the completion of coal mining operations within the presently operated Drayton Mine area, three voids will remain including the North, East and South Voids (see Figure 23). It is proposed that rejects and tailings generated at the CHPP from the Drayton South operation will be deposited in two of these voids and one will be used for water storage.

Contingent on commercial arrangement with Macquarie Generation there are three possible scenarios for rejects and tailings disposal for which approval is being sought. These scenarios are described further in Section 4.4.1.

8.20.3 Mitigation and Management

Anglo American will revise the existing waste management plan and system to reflect key changes associated with the Project. In addition, training on ways of minimising the production of waste streams, reuse and recycling options and management strategies for each major waste stream relevant to key work areas will continue to be implemented.

8.21 Hazard Analysis

8.21.1 Background

A hazard analysis for the Project was undertaken by Hansen Bailey. The purpose of the analysis was to review existing management systems, identify potential hazards associated with the Project and to demonstrate that the Project will not impose an unacceptable level of risk.

8.21.2 Methodology

The hazard analysis was conducted in accordance with *SEPP 33 – Hazardous and Offensive Development Application Guidelines* (SEPP 33 Guidelines) (DUAP, 1994) and the *Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis* (Guidelines for Hazard Analysis) (DOP, 2011).

A hazard analysis has been previously undertaken in accordance with the requirements of SEPP 33 Guidelines for Drayton Mine as part of the Drayton Mine Extension EA (Hansen Bailey, 2007). As the nature and requirements for the Project will not change significantly, the previous hazard analysis has been considered in the review.

8.21.3 Hazardous Materials Management

Drayton Mine operates in accordance with an existing hazardous material management system via the SHECMS, which ensures compliance with all relevant guidelines and legislation.

All hazardous materials required to be used at Drayton Mine are checked for their safety and potential environmental impacts. A CHEMALERT database and Material Safety Data Sheets are utilised on site to assist in chemical management.

Diesel

Diesel is categorised as a C1 dangerous good under the *Work Health and Safety Regulation 2011*.

Drayton Mine maintains onsite diesel containment using above ground class C1 storage tanks. The major containments located onsite at Drayton Mine include:

- A 860,000 L above ground diesel tank;
- Two 110,000 L above ground diesel tanks; and
- A 68,000 L self-bunded above ground diesel tank.

For heavy vehicles and equipment that will not be regularly transported back to the existing Drayton Mine, fuel and lubricant facilities will be constructed adjacent to the remote maintenance workshop within the Drayton South area. Diesel will be stored in self-bunded tanks and relocated as required.

Explosives Storage and Transport

Drayton Mine utilises a variety of explosive material, including initiating products, detonators, and emulsion explosives, to facilitate open cut mining methods.

In accordance with the hazardous material management system and the *Australian Code for the Transport of Dangerous Goods by Road and Rail*, an independent, licensed contractor has been appointed to supply and transport explosive materials to an onsite explosive storage facility located south of open cut mining operations at Drayton Mine.

The explosive storage facility is surrounded by a 2.1 m high man-proof fence, including barbed wire extension with two security gates at either end. Explosive accessories such as detonating cords and boosters are secured in an explosives magazine.

The existing explosive storage facility will continue to be utilised by the Project.

Gases

Drayton Mine utilises two stores of Liquid Petroleum Gas each with a respective 2,000 L storage capacity. The tanks are bunded and tested regularly for their integrity.

Other Hazardous Material

A number of other hazardous materials including oil, grease, coolant, sealing and adhesive compounds, cleaning products, paints and chemicals are stored and utilised on site at Drayton Mine. Generally these are stored within the workshop and mine site facilities in appropriately bunded areas (particularly oils, grease and coolant) or locked storage facilities. Similar materials will also be stored at the remote maintenance workshop within the Drayton South area.

8.21.4 Impact Assessment

The Project will continue to transport and store diesel explosives, gases and other substances, which may be considered to be potentially hazardous as outlined in Section 8.21.3. The risk assessment has identified typical management measures that will be implemented to ensure operations are undertaken safely. With these measures in place, there is no aspect of the Project that is considered to be hazardous or offensive.

8.21.5 Mitigation and Management

It was concluded that the Project is not considered hazardous or offensive, and no offsite impacts are anticipated, however, existing management procedures will be revised as necessary for the Project and continue to be implemented to ensure any potential hazards are minimised and their likelihood of occurrence decreased by ensuring compliance with relevant legislation, regulations and guidelines.

8.22 Social

8.22.1 Background

A social impact assessment has been undertaken by Hansen Bailey and is provided in **Appendix T**. The purpose of the assessment was to develop a profile of the local area, which primarily encompasses the Muswellbrook and Singleton LGAs, identify any future social impacts which may result from the Project with particular attention to the thoroughbred breeding industry, including cumulative effects, and recommend measures to mitigate and manage these impacts. The social impact assessment also considered issues raised during the EA stakeholder engagement program as described in **Section 6**.

8.22.2 Methodology

The social impact assessment methodology included the following key tasks:

- Analysis of the existing local socio-economic setting based on a review of existing information;
- Analysis of the Project workforce profile and workforce accommodation strategy for the construction and operation phases;
- Assessment of potential social impacts of the Project on the local area;
- Assessment of potential social impacts associated with the Project with reference to existing and conceptual surrounding industry;
- Development of appropriate mitigation and management measures for any adverse social impacts;
- Analysis of the potential cumulative impacts of the Project and surrounding industry. The purpose of the cumulative impact analysis is to evaluate, at a high level, the potential longer-term impacts of additional mining projects in the local area; and
- Identification of areas for infrastructure development and growth in community services to support the local area in the future (having regard to both the impacts of the Project where relevant and potential cumulative impacts).

8.22.3 Existing Socio-Economic Setting

Local Area Setting

Due to the proximity of the Project to the township of Jerrys Plains, the thoroughbred breeding operations of Darley Australia and Coolmore Australia and the LGAs of Muswellbrook and Singleton, these enterprises and communities were considered those that are most likely to be impacted by the Project and surrounding industry. As a result, priority consideration has been given to the mitigation of impacts on these enterprises and townships.

Muswellbrook LGA

The Muswellbrook LGA is built on an economy supported primarily by agricultural enterprises and resource based industries, including viticulture, thoroughbred breeding, beef farming, dairying, coal mining, power generation and other supportive industries.

At 30 June 2010, Muswellbrook LGA had an Estimated Resident Population (ERP) of 16,676 people (ABS, 2011a). The recent growth of the LGA has essentially been influenced by the increased development the coal mining and energy industry and staged residential housing.

The Muswellbrook LGA is typically characterised by:

- A positive average annual growth rate from 2006 to 2010 of 1.2% (ABS, 2011a);

- A younger population with the median age at 34 (ABS, 2006);
- A higher median household weekly income of $1,060 compared to NSW and the Hunter Statistical Division (ABS, 2006);
- A low unemployment rate of 3.8% as at June 2010 (ABS, 2011b);
- Mining industry dominated employment (largest employment sector at 16%, followed by retail trade at 10%, and agriculture, forestry and fishing at 9%) (ABS, 2006); and
- A small population (4.8%) of the community from an Indigenous background.

Singleton LGA

Singleton was traditionally settled as a farming town, and still maintains successful agricultural production alongside the operation of thriving power and coal mining developments, which has allowed the LGA to maintain a strong economy and a high standard of living.

At 30 June 2010, Singleton LGA had an ERP of 24,182 people (ABS, 2011a). Similar to the Muswellbrook LGA, the increasing population is primarily attributed to the coal mining industry.

The Singleton LGA is typically characterised by:

- A positive average annual growth rate from 2006 to 2010 of 1.3% (ABS, 2011a);
- A younger population with the median age at 34 (ABS, 2006);
- A higher median household weekly income of $1,258 compared to NSW and the Hunter Statistical Division (ABS, 2006);
- A low unemployment rate of 2.1% as at June 2010 (ABS, 2011b);
- Mining industry dominated employment (largest employment sector at 20%, followed by retail trade at 10%, and manufacturing at 7%) (ABS, 2006); and
- A small population (2.7%) of the community from an Indigenous background.

Jerrys Plains

Jerrys Plains is the nearest urban settlement to the Project. The village has had a long historical association with agriculture, including viticulture, thoroughbred breeding, beef farming and dairying.

In 2006, the Jerrys Plains State Suburb covered a broader extent than the existing village with 560 people residing in the area. As of 2011, the population of Jerrys Plains was refined and estimated at 210 people based on the number of dwellings.

In 2006 (ABS), Jerrys Plains was typically characterised by:

- An older population with the median age at 38;
- A higher median household weekly income of $1,247 which is comparable to Singleton LGA;
- A low unemployment rate of 2.6%; and
- Almost equal proportions of employment within the agriculture, forestry and fishing industry (18%) and the mining sector (17%).

Available Labour Force and Skill

Table 79 provides a summary of the labour force status and an indication of the available labour in the area.

The unemployment rates for the Muswellbrook and Singleton LGAs have been generally below that of other local regions and NSW since 2005, particularly in 2010 and 2011.

As described above, labour skills in the local area are primarily driven by mining and retail industries. In 2006, the mining sector accounted for the employment of 16% of the Muswellbrook LGA and 20% of the Singleton LGA. The continued expansion and development of the mining sector, combined with increasing population numbers to the local area suggests further economic growth and reduction in unemployment rates within the Muswellbrook and Singleton LGAs.

Housing Market and Affordability

The Muswellbrook and Singleton LGAs typically receive a higher than average weekly household income, which is a factor contributing to the high standard of living.

In 2006, Singleton LGA recorded the highest median weekly rent at $180, which was on par with the Hunter Statistical Division, although less than NSW at $210. However, the median weekly rent in the Muswellbrook LGA was $150 (ABS, 2006).

At June 2011, there was a 3.8% increase in median rent over the previous 12 months for three bedroom houses in Muswellbrook LGA, while Singleton LGA had shown an increase of 11.8% in this same period (DFCS, 2012).

Between the period of 2005 and 2008, the number of houses sold within the Singleton LGA was typically steady at approximately 70 houses sold per year; however, in 2011 there was a marked increase with 109 houses sold. Since 2005, the median value of all houses sold increased steadily from $269,000 to $349,000, which is equivalent to an increase of $80,000 or 30% (RP Data, 2012).

In the Muswellbrook LGA, there has been an increase in the numbers of houses sold between 2005 (174) and 2011 (270). This is well over double the number of houses sold in Singleton in 2011. Since 2005, the median value of all houses sold increased steadily from $223,500 to $295,000, which is equivalent to an increase of $71,500 or 32% (RP Data, 2012).

In 2006, a lower percentage of households in the Muswellbrook (20.2%) and Singleton LGAs (16.8%) were experiencing mortgage stress compared to NSW (Public Health Information Development Unit, 2009). Housing stress is typically experienced when households spend more than 30% of the household income on a mortgage or rental.

The pressure on temporary accommodation from the mining workforce is anecdotally evident throughout the local area. Tourism accommodation providers, especially motels, report either high mid-week occupancy rates as mining industry employees and contractors seek accommodation, or report a high level of enquiries that they cannot fulfil. Similarly, caravan parks appear to be heavily booked by mining industry personnel.

Community Services and Facilities

Both the Muswellbrook and Singleton LGAs are serviced with health, education and recreational facilities and retail and commercial enterprises. Social capital in the area is high which is demonstrated through the proliferation of community groups and organisations, sporting clubs, industry bodies and support networks.

8.22.4 Impact Assessment

Construction Phase

The Project will make local hires a priority; however the Project will require additional hires that are non-local during the construction phase. Assuming 90% (332 employees) of the construction workforce is employed from the local area or broader locality and can be accommodated in their existing housing, the remaining 10% (37 employees) will require accommodation in the local area. It is noted that upgrades to the existing infrastructure of the Project will be staged over a 29 month construction period, which will reduce the pressure on short term accommodation.

The workforce required during the construction phase will be largely contractor based comprising of skilled workers that specialise in civil and related areas. As such there are not anticipated to be any impacts on the labour supply available for the operation of neighbouring thoroughbred horse breeding enterprises.

Population, Housing and Accommodation

The accommodation strategy for the operations phase of the Project assumes that all employees currently residing in the local area will continue to be located permanently there.

As such there are not anticipated to be any requirements for additional dwellings.

There are not anticipated to be any impacts on the housing or accommodation available for the neighbouring thoroughbred horse breeding enterprises.

Labour Pool

As outlined in Section 8.22.3, the local area has a low rate of unemployment. Given that the Project will continue to utilise the existing workforce it is considered unlikely to place an unreasonable strain on the local labour pool. As such there are not anticipated to be any impacts on the labour supply available for the operation of neighbouring thoroughbred horse breeding enterprises.

Labour Skills

As outlined in Section 8.22.3, the mining sector is the largest employer in the local area and as a result there are well established mining communities upon which to draw any replacement staff that maybe required by the Project. As such there are not anticipated to be any impacts on the labour supply available for the operation of neighbouring thoroughbred horse breeding enterprises.

Community Services and Facilities

Given there is not predicted to be a population increase resulting from the Project this will place negligible strain on community services and facilities in the local area.

Table 79 Labour Force Status

Location	Unemployed (%)	Participation (%)	Employment to Population (%)
Muswellbrook	6.4	61.0 %	57.1 %
Denman	4.1	60.7 %	58.2 %
Muswellbrook LGA	**5.4**	**61.5 %**	**58.2 %**
Singleton	4.7	63.3 %	60.3 %
Jerrys Plains	2.6	67.9 %	66.2 %
Singleton LGA	**4.2**	**65.0 %**	**62.2 %**
Hunter Statistical Division	6.9	56.2 %	52.4 %
NSW	5.9	58.9 %	55.4 %

Source: ABS, 2006

As all traffic has been reduced, as far as practical, along support infrastructure routes utilised by agricultural enterprises, including those by the thoroughbred breeding industry, the impact of the Project from this aspect is minimal.

Support services directly employed by agricultural enterprises, including those by the thoroughbred breeding industry, will not be shared by the Project and therefore will not be impacted.

Cumulative Impacts

The Project will continue to utilise the existing workforce. This will reduce the available labour pool in the local area for other projects.

The predicted future growth in the population associated with future mining projects will continue to place stress on both rental and sales markets described in **Section 8.22.3**. The contribution of the Project to the rental and sales markets stress is considered minimal.

Current services and facilities in the local area are sufficient to support the Project. It is difficult to determine which regional centres are likely to be most impacted as this will be dependent on when the potential future projects occur.

8.22.5 Mitigation and Management

Labour Pool and Skills

To ensure the timely recruitment of replacement staff as required for the Project workforce, and to protect long term workforce retention in light of competition from existing and proposed mines, Anglo American will implement labour force recruitment strategies prior to approval of other major developments in the local area and coal mining sector. A local hire strategy will remain a strong and preferred option for the Project in the short to medium term.

The recruitment strategy for the operations workforce will focus on maximising the transition of existing contractors, identifying pre-production resources, focused campaigns for the professional and maintenance workforce and local campaigns for the operations and ancillary staff.

The Project will sponsor the recruitment and training of up to at least three apprentices in varying mine related disciplines each year for the life of the Project. As part of the local hire strategy, efforts will be made in the recruitment and training of women and local Aboriginal people by the way of advertised targeted campaigns.

Voluntary Planning Agreement

Anglo American has made an offer to enter into a VPA with MSC to provide in kind and monetary contributions to ensure the potential social effects of the Project are mitigated. Discussions are progressing with MSC to reach an agreement as to the terms of the VPA.

The offer that has been made to MSC includes the following:

- A payment of $1.0 M as a direct contribution towards the cost of the Thomas Mitchell Drive upgrade;
- Meeting the full cost of design and construction of the Edderton Road realignment as required by the Project;
- An annual contribution of $80,000 to MSC to assist in funding road maintenance requirements predominately intended for Thomas Mitchell Drive and Edderton Road;
- An annual contribution of $15,000 to assist in funding environmental contributions and initiatives of MSC;
- $0.065 per product tonne toward a community fund (to be established). The community fund will be designed to provide economic, social (health and education) and environmental benefit for the community in the Muswellbrook LGA; and
- A commitment for Anglo American to use its best endeavours to engage three apprentices per annum for the life of the mine sourced from residents within the Singleton and Muswellbrook LGAs. This equates to approximately 12 apprentices on site assuming a four year apprenticeship.

A copy of the offer provided is included in **Appendix T**.

8.23 Economics

8.23.1 Background

An economic impact assessment was undertaken by Gillespie Economics and is provided in **Appendix U**. Further as part of the AIS, Gillespie Economics also undertook an assessment of the potential economic implications of the Project on agricultural resources. This assessment provided a comparison of the economic efficiencies of coal mining and the agricultural industry, including the consideration of the use of land and resources. The findings of this report are summarised in **Section 8.16** and provided in full in Appendix 6 of **Appendix R**.

The economic impact assessment was primarily concerned with the determination of the following two issues:

- The economic efficiency of the Project (i.e. consideration of economic costs and benefits); and
- The economic impacts of the Project (i.e. the economic stimulus that the Project will provide to the regional or State economy).

8.23.2 Methodology

The DP&I commissioned the development of the *Draft Guidelines for Economic Effects and Evaluation in Environmental Impact Assessment in 2002* (Economic EIA Guidelines) (James and Gillespie, 2002). The Economic EIA Guidelines identify economic efficiency as the key consideration of economic analysis.

BCA is the method used to consider the economic efficiency of proposals. The Economic EIA Guidelines identify BCA as an essential component to undertaking a proper economic evaluation of proposed developments that are likely to have significant environmental impacts.

The Economic EIA Guidelines indicate that an economic impact assessment may provide additional information as an adjunct to an economic efficiency analysis. Predicted economic stimulus to the regional and State economies can be estimated using input output modelling.

BCA involves the following key steps:

- Identification of the base case;
- Identification of the Project and its implications;
- Identification and valuation of the incremental benefits and costs;
- Consolidation of value estimates using discounting to account for temporal differences;
- Application of decision criteria;
- Sensitivity testing; and
- Consideration of non-quantified benefits and costs.

The regional economic impact assessment is primarily concerned with the effect of an impacting development on an economy in terms of a number of specific indicators, such as gross regional output, value added, income and employment. These indicators can be defined as follows:

- *Gross regional output* – the gross value of business turnover;
- *Value-added* – the difference between the gross regional output and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output;
- *Income* – the wages paid to employees including imputed wages for self-employed and business owners; and
- *Employment* – the number of people employed (including full-time and part-time).

For the purposes of the economic impact assessment for the Project, a new Drayton South sector was inserted into the regional input output tables. This reflected an assumed average production level of 5.1 Mtpa of ROM coal for the Project. The direct and indirect impacts of the Project on the local region (i.e. Muswellbrook, Singleton and Upper Hunter LGAs) and NSW on a whole was assessed.

8.23.3 Impact Assessment

Benefit Cost Analysis

The results of the BCA for the Project are summarised in Table 80. The main decision criterion for assessing the economic desirability of a Project to society is its net present value, which is the present value of benefits less the present value of costs. A positive net present value indicates that it would be desirable from an economic perspective for society to allocate resources to the Project, because the community as a whole would obtain net benefits from the Project.

The BCA 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 of $887 M with a minimum of $490 M of these net production benefits accruing to Australia.

This net production benefit is distributed amongst a range of stakeholders including:

- The local community in the form of voluntary contributions to community infrastructure and services;
- Anglo American and its shareholders;
- The Commonwealth government in the form of any Company tax payable ($170 M present value) or Minerals Resource Rent Tax from the Project, which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local region; and
- The NSW government via royalties ($320 M present value), which are subsequently used to fund provision of government infrastructure and services across the State, including the local region.

The main external economic costs associated with the Project relate to Aboriginal heritage, greenhouse gas emissions and surface water and groundwater impacts. These impacts are estimated at $188 M in total or $48 M to Australia, considerably less than the estimated net production benefits of the Project.

Other environmental and social costs including air quality, noise, blasting, ecology, traffic and transport and agricultural production were quantified and incorporated into the estimation of net production benefits via acquisition costs for affected properties and mitigation costs.

The external benefits associated with employment provided by the Project to the NSW economy have been estimated at $195 M.

Overall, the Project is estimated to have net benefits to Australia of between $443 M and $741 M and hence is desirable and justified from an economic efficiency perspective.

Regional and State Economic Impact Assessment

An economic impact analysis, using input-output analysis found that the operation of the Project is estimated to make up to the following contribution to the regional economy:

- $588 M in annual direct and indirect regional output or business turnover;

Table 80 Benefit Cost Analysis

Category	Costs	Benefits
Production	• Opportunity costs of capital • Opportunity cost of land • Capital costs of development • Operating costs of mine including mitigation measures • Rehabilitation and decommissioning costs at end of the Project life • Maximisation of the utilisation of the existing Drayton Mine assets • Avoid retrenchment of approximately 530 local jobs • Value of coal production • Residual value of capital and land at end of Project life	• Avoided decommissioning and rehabilitation in 2017
Potential Externalities	• Air quality impacts • Greenhouse gas impacts • Noise and vibration impacts • Ecology impacts • Agricultural impacts • Traffic and transport impacts • Aboriginal archaeological and cultural heritage impacts • Non-Aboriginal heritage impacts • Visual impacts • Surface and groundwater impacts	• Any non-market benefits of employment • Value of ecological offsets • Restoration of Saddlers Creek

- $264 M in annual direct and indirect regional value added;
- $86 M in annual direct and indirect household income; and
- 785 direct and indirect jobs.

The regional sectors are most impacted by output, value added and income flow-ons that would be felt across a range of sectors in the economy. Sectors that would be impacted include the coal mining sector, wholesale trade sector, retail trade sector, technical services sector, road transport sector, electricity supply sector and hotels, cafes and restaurants sector.

Property value impacts could be expected to occur where properties are adversely impacted. As a result of careful planning and design, the mine plan for the Project has been developed to ensure that the potential impacts are largely contained within the Project Boundary and on land already owned by Anglo American.

As described above, the Project will provide 869 direct and indirect jobs and continue to generate a significant economic stimulus for the region. This would result in a greater level of demand for housing in the local area and hence the Project would have a positive impact on property prices rather than a negative one.

For the NSW economy, the operation of the Project is estimated to make up to the following contributions:

- $930 M in annual direct and indirect regional output or business turnover;
- $443 M in annual direct and indirect regional value added;
- $195 M in annual direct and indirect household income; and
- 2,089 direct and indirect jobs.

The impacts on the NSW economy are substantially greater than for the regional economy. The NSW economy is able to capture more mine and household expenditure and there is a greater level of intersectoral linkages.

8.23.4 Mitigation and Management

Cessation of the Project operation may lead to a reduction in economic activity. The significance of these Project cessation impacts will depend on:

- The degree to which any displaced workers and their families remain within the region;
- The economic structure and trends in the regional economy at the time; and
- Whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

Given the uncertain circumstances at the time of Project cessation, it is important for government to effectively utilise the economic benefits, skills and expertise generated by the Project to further strengthen and broaden the region's economic base.

Mitigation measures for the specific environmental issues are addressed within other sections throughout this EA.

Statement of Commitments

9

Statement of Commitments 9

In addition to the conditions of the PA, Anglo American commits to the implementation of the operational controls outlined in Section 8 of this EA for all activities associated with the Project.

The Statement of Commitments (SoC) in Table 81 summarises the major aspects of the Project and the key management and mitigation measures proposed in this EA.

The aim of the SoC is to ensure that the Project's environmental and social impacts are minimised by implementing the appropriate management, monitoring and mitigation strategies.

Table 81 Statement of Commitments

Ref.	Commitment	EA Section
Mining Operations		
1	Anglo American will extract coal at a rate of up to 7 Mtpa ROM for 27 years, in accordance with this EA	**Section 4.1**
2	Anglo American will design and undertake highwall mining operations in accordance with this EA, ensuring that there is no noticeable subsidence (< 20 mm at the surface)	**Section 4.2.2**
3	Following the grant of a new PA, Anglo American will surrender the existing PA for Drayton Mine (PA 06_0202) and the DC for the Antiene Rail Spur (DC 106-04-00)	**Section 4.1**
4	Anglo American will obtain the relevant licences and approvals (see **Table 17**) for the Project	**Section 5.10**
Environmental Management		
5	Anglo American will revise the existing Drayton Mine SHECMS in consultation with the relevant regulators (and the Aboriginal community where relevant) and to the satisfaction of DP&I. This will include the following: • Air quality management plan (including a TARP for dust); • Noise management plan (including a TARP for noise); • Greenhouse and energy efficiency management plan; • Spontaneous combustion management plan; • Blasting management plan; • Fauna and flora management plan (including a biodiversity action plan); • Aboriginal and cultural heritage management plan; • Non-Aboriginal heritage management plan; • Water management plan; • Land management plan; • Rehabilitation and offset management plan; • Final void management plan; • Tailings management plan; • Bushfire management plan; and • Waste management plan	**Section 8**
Air Quality and Greenhouse Gases		
6	Anglo American will implement leading practice dust mitigation measures to achieve the air quality outcomes described in this EA	**Section 8.1.4**
7	Permanent haul roads will be treated using a dust suppression agent (e.g. Dust-A-Side or Dust Bloc)	**Section 8.1.4**
8	Anglo American will install an air quality monitoring network comprising real time PM_{10} and $PM_{2.5}$ monitors, TSP monitors and dust deposition gauges. This monitoring network will be designed in consultation with OEH	**Section 8.1.4**
9	Anglo American will install a real time meteorological station with predictive software capabilities. The location of this meteorological station will be selected in consultation with OEH	**Section 8.1.4**

Ref.	Commitment	EA Section
10	Anglo American will undertake monitoring of greenhouse gas emissions and review energy efficiency initiatives to ensure that Scope 1 greenhouse gas emissions are kept to the minimum level practicable	**Section 8.2.4**
Noise and Blasting		
11	Anglo American will implement leading practice noise mitigation measures to ensure that the predicted noise levels at private receivers are not exceeded	**Section 8.3.4**
12	The double benching method will be utilised when constructing the initial box cut for the Houston mining area	**Section 8.3.4**
13	Conveyors at the existing Drayton Mine will be fitted with low noise idlers	**Section 8.3.4**
14	Initial excavation in the Houston mining area will be limited to the day. Night operations will only commence once mining reaches a depth of 12 m and the Houston visual bund reaches a height of 15 m	**Section 8.3.4**
15	Anglo American will install a real time noise monitoring system, which will be designed in consultation with OEH	**Section 8.3.4**
16	Anglo American will design blasts so that the relevant overpressure and vibration criteria are not exceeded	**Section 8.4.4**
17	Anglo American will undertake monitoring of blasts at representative receivers	**Section 8.4.4**
Visual and Lighting		
18	The Houston visual bund will be constructed in accordance with this EA	**Section 4.7**
19	Tree screens will be established on the ridgeline adjoining the Houston visual bund, as well as sections of the Golden Highway and the realigned Edderton Road within the Project Boundary	**Section 4.7** and **8.6.5**
20	If a landholder considers that they are experiencing significant visual impacts, Anglo American will consult with that landholder. Anglo American will implement offsite visual treatments (such as tree screens) if it is determined that additional mitigation is required	**Section 8.6.5**
21	In order to reduce direct lighting impacts, fixed lights will be directed away from sensitive receivers and low lux lamps will be used wherever practicable	**Section 8.6.5**
Ecology		
22	Anglo American will progressively rehabilitate mined areas, with an emphasis on re-establishing woodland communities	**Section 4.2.1, 8.7.5** and **8.8**
23	Anglo American will implement the biodiversity offset strategy described in this EA for the purpose of initially maintaining and ultimately improving the ecological values of the region	**Section 8.8**
24	Anglo American will progressively undertake the Saddlers Creek restoration program in conjunction with the CMA	**Section 8.8.3** and **8.17.3**
Aboriginal Archaeological and Cultural Heritage		
25	Protection and salvage of Aboriginal objects will be conducted in accordance with the Aboriginal and cultural heritage management plan, which will be revised in consultation with the Aboriginal community and OEH. The revised plan will include a suitable Aboriginal Cultural Heritage Induction Program for the construction phase and the early stages of the operations phase	**Section 8.9.4**
26	Anglo American will establish, in consultation with the Aboriginal community and OEH, a keeping place for the purpose of housing salvaged Aboriginal artefacts from the local area	**Section 8.9.4**
Non-Aboriginal Heritage		
27	Non-Aboriginal heritage items will be managed in accordance with a non-Aboriginal heritage management plan, which will be revised in consultation with OEH	**Section 8.10.4**
28	Anglo American will prepare photographic archival recordings and scaled drawings for each of the heritage items to be impacted by the Project	**Section 8.10.4**
Water Resources		
29	Anglo American will revise the existing Drayton Mine water management system in consultation with the relevant regulators	**Section 4.8** and **8.11.4**
30	Anglo American will conduct ongoing monitoring of surface water quantity and quality. The monitoring data will be used to update and validate the OPSIM water balance model	**Section 8.11.4**
31	In the event that out-of-pit storages reach capacity, one of the four mining areas at Drayton South will be temporarily used for water storage	**Section 8.11.4**

Ref.	Commitment	EA Section
32	In the event that offsite water supplies are required, Anglo American will obtain the necessary WAL prior to sourcing water from the Hunter River	**Section 8.11.4**
33	Anglo American will conduct ongoing monitoring of groundwater quantity and quality. In particular, monitoring bores will be installed near the rejects and tailings emplacements to detect movement of seepage away from these areas	**Section 8.12.4**
Agriculture		
34	Anglo American will enable or establish sustainable farming practices on available agricultural areas within the Drayton South area	**Section 8.16.4**
Geochemistry		
35	Anglo American will monitor the quality of seepage and runoff from the OEAs	**Section 8.14.4**
Traffic and Transport		
36	The realignment of Edderton Road will be designed in consultation with MSC, and the intersection of Edderton Road and the Golden Highway will be designed in consultation with RMS	**Section 8.18.4**
Rehabilitation, Final Landform and Final Land Use		
37	Anglo American will rehabilitate mined areas in accordance with this EA	**Section 8.17**
38	Anglo American will implement leading practice soil management measures, as described in **Section 8.15.4**, to minimise degradation of soil reserved for rehabilitation	**Section 8.15.4**
39	The final landform will be designed in accordance with this EA	**Section 8.17**
Community		
40	Anglo American will offer a VPA to MSC	**Section 8.22.5**
41	Anglo American will sponsor the recruitment and training of at least three apprentices per year for the life of the Project	**Section 8.22.5**
42	Anglo American will support a CCC for the Drayton Complex	**Section 6.5**
43	Anglo American will support the continuation of working groups with Coolmore Australia and Darley Australia with regard to the construction and operation of the Project	**Section 6.5**
Reporting		
44	Anglo American will prepare an Annual Review (which reports monitoring results and evaluate performance), to be distributed to the relevant regulatory authorities and the Drayton CCC	**Section 8**

Project Justification

10

Project Justification 10

10.1 Overview

This EA has assessed the potential impacts of the Project in accordance with the Director-General's EARs issued on 3 August 2011, and the supplementary EARs issued on 30 April 2012. The assessment has also considered all regulatory requirements and the findings from the very extensive consultation program undertaken for the Project.

This justification demonstrates that the Project is consistent with the objects of the EP&A Act when one weighs the social and economic benefits against its predicted social and environmental costs.

When the management and mitigation measures proposed in this EA are adopted, the residual environmental impacts of the Project are within acceptable limits. These impacts are justifiable when considered against the need for the Project and its social and economic benefits.

10.2 Context

In its 29 years of operation, Drayton Mine has produced 117 Mt of thermal coal of which 32 Mt has been provided to the Liddell and Bayswater Power Stations and 85 Mt exported. The coal delivered for domestic electricity production and for export has an estimated present value of $700 M and $8,500 M, respectively.

During its operation, Drayton Mine has been a major employer of the local community, currently employing 530 full time equivalent workers of which approximately 32% reside in the Muswellbrook LGA, while 25% and 16% reside in the neighbouring LGAs of Singleton and the Upper Hunter, respectively. Estimated total wages, in present value terms, is in the order of $1,500 M with current wage payments in the order of $89 M per annum. Amounts paid to local contractors represent a major contribution to the local economy. Total royalties paid to the NSW government are in excess of $350 M (actual dollars) and is currently paid at a rate in the order of $33 M per annum.

Approved mining operations at Drayton Mine are scheduled to continue until the expiry of the current PA in 2017. The Project will allow mining to continue at Drayton Mine, ensuring security of employment for the existing workforce and continuity of socio-economic benefits for the Hunter region, NSW and Australia.

The Project will facilitate the continuing recovery of a valuable coal resource in an area that has long been set aside for mining by the NSW government and acquired by Anglo American for the specific purpose of facilitating the continuation of Drayton Mine.

The Drayton South coal resource was identified in the early 1900s with prospecting activities commencing in the late 1940s. Exploration intensified from the 1960s onwards, culminating in the granting of a DC for the Mt Arthur South Coal Project in 1986. Subsequently, a Mining Lease over this area was granted in 1989.

The DC and Mining Lease expired in 1991 and 1994, respectively, due to failure to physically commence the development.

To secure the continuity of mining at Drayton Mine, EL 5460 over the Drayton South area was acquired by Anglo American in 1998 with the required land assets secured shortly afterwards.

The Project maximises resource recovery and economic returns from capital invested in Drayton Mine, and minimises environmental costs by utilising the existing infrastructure and the final landform at Drayton Mine. The Project provides continuity for the existing workforce, services and supply contracts, and maintains the beneficial social and economic interactions between Drayton Mine and the local community. The Project will not cause the community disruption and the environmental costs that would otherwise be associated with the establishment of a new mine.

10.3 Project Need

The Project will facilitate the recovery of a valuable, export steaming coal. Thermal coal remains a highly sought after energy source in Asian countries, including Japan, China and India. These countries continue to be the world's largest coal importers, and will largely account for an approximately 70% growth in total coal imports from 2009 to 2035 (U.S. EIA, 2011). This increasing demand supports the need for the Project and justifies further investment in the industry.

Exports of product coal generated by the Project will also provide net economic benefits to local communities, State and Commonwealth governments in the order of $443 M to $741 M. Royalties for the NSW government are expected to total $320 M (present value).

The Project will also offer employment opportunities for a total of 899 personnel across the construction and operation phases of the Project, of which 530 personnel will be directly associated with the production of up to 7 Mtpa of ROM coal from the Drayton Complex.

As such the Project will:

- Assist Australia to continue to meet the international demand for thermal coal, for at least the next 27 years, during which time it is expected that there will continue to be a world demand for coal for the generation of electricity;
- Support Australia in maintaining its reputation as a consistent and reliable supplier of coal to its existing and expanding markets; and
- Contribute materially to sustaining the Australian economy and maintaining the economic stability of NSW and the Muswellbrook and Singleton LGAs.

10.4 Project Alternatives

Anglo American considered five alternatives for the extraction of the coal resource within the Drayton South area, including a scenario where there would be no mining. These alternatives are described in detail in Section 4.16. The Project mine plan was determined to be the most economically and environmentally desirable method of mining this resource.

The following conclusions were drawn for the five alternatives considered by Anglo American:

- Alternative 1: The closure of Drayton Mine was considered unsuitable because it would result in the sterilisation of 119 Mt of coal, the retrenchment of the existing workforce (530 full time personnel), the loss of the ability to optimise the Drayton Mine final landform, and the loss of the socio-economic benefits provided by Drayton Mine;
- Alternative 2: Mining the target seams using underground methods was considered unsuitable because recovery of the underground coal resource in the target seams was substantially lower than mining by open cut methods, making underground mining uneconomic;
- Alternative 3: Mining the deep seams below the target seams using underground methods was considered unsuitable because it could impact the effectiveness of open cut mining of the shallower seams;
- Alternative 4: The mine plan that maximises resource recovery was considered unsuitable because it would result in unacceptable environmental impacts on neighbouring land uses; and
- Alternative 5: The Project mine plan was considered the only suitable alternative because it allowed for the majority of coal to be extracted in an economically viable manner without causing excessive environmental impacts.

10.5 Project Development

Once it was concluded that the closure of Drayton Mine, underground mining and the maximum recovery mine plan were not appropriate approaches, the Project mine plan was critically assessed and progressively modified so that the Project could satisfy legal, political, environmental and social expectations, and achieve a '*social licence to operate*'. The following modifications have been incorporated into the Project mine plan described and assessed in this EA:

- Significantly reducing the footprint of the Blakefield and Redbank mining areas to the north of the *'ridgeline'*;
- Utilisation of highwall mining to maximise coal recovery while maintaining the existing ridgeline as a buffer between the operational areas of the Project and the receptors to the south;
- Revised design and location of the Houston visual bund;
- Incorporation of extensive tree screening into the Project mine plan to limit views of the operational areas of the Project and to improve the amenity of the surrounding area;
- Limiting the intensity of excavator operations in the Redbank mining area between Year 10 and 15 to reduce dust emissions;
- Progressively replacing the existing truck fleet with larger trucks in Year 10 to reduce dust emissions;
- Initial construction of the Houston mining area utilising the double benching method to reduce noise impacts;
- Treatment of all permanent haul roads with a dust suppressant to minimise dust emissions associated with vehicle movements;
- Design of the mine plan to ensure sufficient buffer zones are maintained for both the Hunter River alluvium and the Saddlers Creek stream bank; and
- Avoidance of the *'stone quarry'* archaeological site when realigning Edderton Road.

10.6 Environmental Planning Assessment

10.6.1 Permissibility and Planning Controls

Permissibility is considered in Section 5.2. Mining as proposed is situated entirely on land within zone RU1 under the Muswellbrook LEP. Mining is permissible within zone RU1 with DC.

A small portion of the required Edderton Road realignment is located on land within Zone E3 (Environmental Management) under the Muswellbrook LEP. Development for the purposes of a "*road*" is permissible with DC in Zone E3 under the Muswellbrook LEP.

10.6.2 Environmental Assessment

Extensive consultation with key neighbouring stakeholders during the Project planning phase has resulted in the development of a mine plan that maximises resource recovery while minimising environmental and social impacts on society. The environmental consequences which have been assessed in compliance with the EARs, indicate that the social and economic benefits of the Project far outweigh the social and environmental costs thereby making the Project consistent with the '*objects*' of the EP&A Act as described in Section 10.8.

The Project has been assessed on a '*worst case*' environmental impact basis, assuming the Project will operate at a maximum coal production rate of 7 Mtpa, with all feasible and reasonable management and mitigation measures being applied. Anglo American confirms its commitment to best environmental outcomes by making the operational '*commitments*' specified in Section 9.

The Anglo American commitment to the community to compensate for the socio-economic costs of the Project and to ensure that the benefits from it flow to the local community is manifested in the offer of a VPA to MSC as reported at Section 8.22.5.

The position of near neighbours, particularly in relation to noise, blasting, air quality and potential visual issues have been addressed via the reduction of the open cut footprint and the application of all feasible and reasonable management controls to address community concerns. The EA conclusions as to the principal potential environmental impacts are summarised in Section 10.7.1.

Based on the findings of this EA, the continuation of Drayton Mine would be in the public interest taking into account the BCA undertaken for the Project.

10.7 Environmental, Social and Economic Impacts

The environmental assessment of the Project has adopted the following methodology:

- Considering the '*objects*' of the EP&A Act, including the principles of ESD and leading practice environmental and social standards;
- Performing a risk assessment using the Anglo American risk assessment matrix (Section 7);
- Extensively consulting with stakeholders to identify issues that require particular attention (Section 6);
- Performing detailed technical assessments to quantify the potential environmental impacts with certainty (Section 8); and
- Developing and committing to environmental management and mitigation measures (Section 8 and 9).

10.7.1 Environmental Impacts

The predicted environment impacts of the Project are described in detail in Section 8. The most significant environmental impacts are outlined below.

Air Quality

Air quality modelling shows that with the application of all feasible and reasonable management and mitigation measures only one receiver located to the south of the Drayton Complex is predicted to experience air quality levels greater than the relevant amenity criteria.

Noise

Noise modelling shows that when noise management and mitigation measures are implemented, there are no exceedances of the regulatory amenity noise criteria at any receivers in the vicinity of the Drayton South area. There are exceedances of the noise criteria for receivers at Antiene, which are due to activities at the existing Drayton Mine rather than operations within the Drayton South area. These exceedances fall in the '*mild*' and '*moderate*' impact categories. This means that Anglo American will continue to liaise with these land owners regarding the management of noise impacts

Equine Health

The Project is not expected to present any risks to the health of horses on the neighbouring Woodlands Stud and Coolmore Stud. The PM_{10} levels generated by the Project will be substantially lower than the recommended limit of 230 µg/m^3. More importantly, the dust generated by the Project has very low endotoxin content. The airborne endotoxin concentration will be well below the threshold at which there is a risk of respiratory diseases in horses.

Previous studies have shown that horses can comfortably withstand noise levels of 54 to 70 dBA. The noise levels predicted to be experienced on Coolmore Stud and Woodlands Stud will generally range between 30 to 33 dBA. Therefore, the noise generated by the Project is unlikely to pose any risk to equine health. The vibration produced by blasting will only be intermittent. Since horses can withstand prolonged vibration during road and air transportation, it is not expected that the ground vibration caused by blasting will have any adverse impacts on equine health.

Visual

Sensitive receivers are located to the south of the Project. In order to avoid significant visual impacts on these receivers, the Drayton South mining areas have been limited to the north of an existing ridgeline. As a result, there are no views of the Project from sensitive locations on Woodlands Stud and Arrowfield Estate as the mining areas and OEAs are hidden behind the ridgeline.

There are locations on Coolmore Stud and from Jerrys Plains where the ridgeline does not adequately screen views of the Project. Here, the Houston visual bund will be constructed to supplement the screening provided by the ridgeline. The 16 month construction of the bund will be visible from Coolmore Stud and parts of Jerrys Plains, and will result in high visual impacts. Once the visual bund has been constructed and rehabilitated, the visual impact will reduce to moderate and eventually low as the Project will be entirely hidden.

Surface Water

There is a 50% chance that there will be no build up of water in the active mining areas. That is, if actual conditions are drier than 50th percentile conditions, the out-of-pit storages will have sufficient capacity to store all water captured on site. However, if conditions are wetter than 50th percentile conditions, there will be some accumulation of water in the active mining areas. This is unlikely to affect production as water can either be redistributed within the site or discharged into the Hunter River in accordance with the HRSTS. There is a 1% chance that there will be a large accumulation of water in the active mining areas. If these very wet conditions eventuate, production may temporary cease in one of the four mining areas to allow that area to be used for water storage.

There is only a 1% chance that offsite water supplies will be needed. If extremely dry conditions occur, natural runoff and groundwater inflows will be able to satisfy the operational water demands at the Drayton Complex. The very low likelihood of requiring offsite water supplies is partly due to the use of a dust suppressant agent, which significantly reduces the water application rate for dust suppression.

Groundwater

Groundwater inflows over the life of the Project will total an estimated 23,663 ML, which is an average of 876 ML/year. The zone of influence for the shallow regolith / alluvium will extend approximately 600 m to the west and south of the mining areas. The zone of influence for the Permian coal measures will extend up to 1 km to the west and south of the mining areas.

The zone of influence is not expected to extend under the Hunter River alluvium, but will extend under the Saddlers Creek alluvium.

The post-mining water level is expected to reach RL 100 m after 147 years. The post-mining equilibrium water level for the final void is RL 117 m, and will be reached after 1,000 years. The depression of the potentiometric surface around the void will act as a '*sink*', which prevents water within the final void from flowing outwards into the regional system.

Ecology

The Project will result in the disturbance of 1,928 ha of vegetation within the Drayton South area, including 107 ha of Box-Gum Woodland derived native grassland and 389 ha of other native forest, woodland and shrubland, progressively over 27 years. A further 18 ha of exotic grassland and 0.4 ha of regrowth Hunter Lowland Redgum Forest will be removed as a result of the additional mining areas proposed at Drayton Mine.

To compensate for the removal of 0.4 ha of regrowth Hunter Lowland Redgum Forest at Drayton Mine, Anglo American will rehabilitate the additional mining areas proposed and the broader final landform at Drayton Mine with species that are representative of this vegetation community. A biodiversity offset strategy for the Project has also been proposed to compensate for the impacts within the Drayton South area. This involves the conservation, restoration and rehabilitation of 1,574 ha onsite and the establishment of an additional offsite biodiversity offset area of 2,079 ha which is of greater ecological value than the land within the Drayton South area. The combined area of 3,653 ha designated as biodiversity offsets for the Project will be conserved in perpetuity resulting in a net benefit to threatened species, populations and ecological communities. The areas of EECs included within the biodiversity offset strategy are significantly higher than the areas that will be cleared within the Drayton South area.

Agriculture

The land within the Drayton South disturbance footprint and the offsite biodiversity offset property will be removed from agricultural production. The combined agricultural production that would be forfeited amounts to a value of $0.8 M per annum. This represents 0.26% of regional production, 0.01% of state production and 0.002% of national production.

As such there will not be any material reduction in agricultural productivity of the Upper Hunter region or the State as a result of the Project or the setting aside of the offset areas proposed for protection of the ecological biodiversity. The EA has addressed the requirements of the EARs with regard to agriculture and the NSW government policy for AIS.

Strategic Regional Land Use Plan Gateway Criteria

The consideration of the gateway criteria within this EA draws from the reports of various technical specialists. The "*Site Verification*" concludes that there is no BSAL within the Project Boundary (see Section 5.5 and 8.15.3).

The Project is partly within the SRLUP mapped Equine CIC and Viticulture CIC as shown on Figure 39, however, the land is owned and currently occupied by Anglo American and not used for any equine or viticulture enterprises or activities with regard to the gateway criteria. There will not be any effects as to items *(a) surface area disturbance*, *(b) subsidence*, *(c) reduced access to agricultural resources* or *(d) reduced access to support services and infrastructure* of the elements of the Equine CIC or Viticulture CIC with no material effect to item *(e) access to transport routes* or item *(f) loss of scenic and landscape values*.

Benefit Cost Analysis

As part of the AIS, Gillespie Economics undertook a BCA which included an estimation of the present value of production costs and benefits of the Project over a 27 year period (see Appendix 6 of Appendix R). The present value of net production benefits of the Project to Australia are estimated at $490 M (7% discount rate). In contrast, the present value of future use of agricultural lands that would be utilised by the Project is estimated at $5.6 M (7% discount rate). Based on these comparative values, the Project is considered to be significantly more efficient than continued agricultural production and as such in the public interest.

Social

As explained in Section 4.10 and 8.22, the Project will benefit the community by providing ongoing employment for the existing workforce of 530 persons. Given there is not predicted to be a population increase it is predicted that the Project will place negligible strain on community services and facilities in the local area.

Anglo American will offer a VPA to MSC and will make the necessary contributions to address the extra demands created by the Project.

Economics

When the production costs and production benefits are considered, the Project will provide net production benefits of approximately $887 M with a minimum of $490 M of these net production benefits accruing to Australia. Based on this outcome, the Project is considered to be justified from an economic efficiency perspective.

The Project will deliver significant socio-economic benefits to the Singleton and Muswellbrook regions and the State of NSW through the generation of employment, export revenue, taxes and royalties.

The Project will result in the following economic benefits to the NSW economy:

- $930 M in annual direct and indirect regional output or business turnover;
- $443 M in annual direct and indirect regional value added;
- $195 M in annual direct and indirect household income; and
- 2,089 direct and indirect jobs.

The Project will result in the following economic stimulus to the Muswellbrook and Singleton economies:

- $588 M in annual direct and indirect regional output or business turnover;
- $264 M in annual direct and indirect regional value added;
- $86 M in annual direct and indirect household income; and
- 785 direct and indirect jobs.

10.8 Consistency with Objects of Environmental Planning and Assessment Act 1979

The Project has been designed to be consistent with the objects of the EP&A Act, as outlined under section 5 of the Act.

10.8.1 Objects of the Environmental Planning and Assessment Act 1979

The '*objects*' of the EP& A Act are:

> *"To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment."*

The Project will facilitate the development of the valuable coal resource within the Wittingham Coal Measures. These measures have been successfully developed by other mining operations in the Upper Hunter region, including Mt Arthur Coal Mine, Wambo Coal Mine, Hunter Valley Operations Coal Mine and Bengalla Coal Mine.

In the Upper Hunter region, the mining industry employs more persons that any other industry. The Project will secure ongoing employment for 530 persons. The continued operation of the Drayton Mine will also stimulate the local economy by creating commercial opportunities for businesses providing support services to the mining sector.

Therefore, the Project will assist in promoting the social and economic welfare of the community. Mining developments are a major driver of development for towns and villages in regional areas.

The implementation of the management and mitigation measures listed in Section 8 will ensure that the coal resource can be recovered as efficiently as possible, whilst minimising any potential environmental and social impacts.

> *"To encourage the promotion and co-ordination of the orderly and economic use and development of land."*

The Project will result in the recovery of a valuable coal resource from land that has long been recognised as having mining potential. In fact, the land within the Drayton South area has previously been the subject of a DC and Mining Lease (for the Mt Arthur South Coal Project).

The management and mitigation measures described in Section 8 allow development to occur on the land in an '*orderly*' fashion. These measures allow the mining to be undertaken without generating impacts that prejudice neighbouring land uses. That is, the Project will not unduly impact the operations of the Bayswater Power Station, Mt Arthur Coal Mine, and agricultural enterprises in the vicinity (including Coolmore Stud and Woodlands Stud).

Of the possible uses of the land, the Project represents the most economically valuable land use. The Project will facilitate the extraction of 119 Mt of ROM coal over 27 years. The Project is estimated to have total net production benefits of $887 M. If the land within the Drayton South area was used for agricultural purposes, the maximum net production that can be derived from this land would have a value of $615,006.

> *"To encourage the protection, provision and co-ordination of communication and utility services."*

Since Drayton Mine is an existing mining operation, communications and utility services are in place to serve the Project. The Project will protect the existing power supply infrastructure by relocating existing power lines to enable the progression of mining.

> *"To encourage the provision of land for public purposes."*

In order to offset the predicted impacts on ecology, the Project's biodiversity offset strategy includes the conservation, restoration and rehabilitation of 1,574 ha on site and the establishment of an additional offsite biodiversity offset area of 2,079 ha which is of greater ecological value than the land within the Drayton South area. These areas will be set aside for conservation purposes in perpetuity.

> *"To encourage the provision and co-ordination of community services and facilities."*

Anglo American will offer a VPA to MSC which will involve the provision and/or funding of community services and facilities. The Project will also generate an estimated $320 M (present value) in royalties, which will be used by the State government to provide community services and facilities across NSW.

> *"To encourage the protection of the environment, including the protection and conservation of native animals and plants, including Threatened species, populations and ecological communities, and their habitats."*

The Project will result in the loss of TECs and the habitats of threatened species. In order to compensate for these impacts Anglo American has developed a biodiversity offset strategy for the Project which includes the conservation, restoration and rehabilitation of 1,574 ha onsite and the establishment of an additional offsite biodiversity offset area of 2,079 ha which is of greater ecological value than the land within the Drayton South area. The combined area of 3,653 ha designated as biodiversity offset for the Project will be conserved in perpetuity resulting in a net benefit to threatened species, populations and ecological communities. The areas of EECs included within the biodiversity offset strategy are significantly higher than the areas that will be cleared within the Drayton South area.

> *"To encourage ecologically sustainable development."*

The Project is consistent with the principles of ESD as discussed in Section 10.8.2.

> *"To encourage the provision and maintenance of affordable housing."*

The revenues for the NSW government generated through mining royalties will assist the government in the provision and maintenance of affordable housing.

> *"To promote the sharing of the responsibility for environmental planning between the different levels of government in the State."*

The stakeholder engagement process undertaken during the preparation of this EA included ongoing consultation with State government agencies (primarily DP&I, DTIRIS – DRE, OEH, NOW) and the relevant Local governments (MSC and SSC). Further details of consultations with government stakeholders are provided in Section 6 and Appendix C.

> *"To provide increased opportunity for public involvement and participation in environmental planning and assessment."*

Anglo American engaged in an extensive stakeholder engagement program during the preparation of this EA. The public was given the opportunity to provide input into the planning of the Project and its assessment in this EA. Key members of the public in the Muswellbrook and Singleton LGA were provided with newsletters in April 2011 and October 2011. These newsletters provided details about the Project and invited community members to provide feedback. The community consultation process undertaken for the Project is described in further detail in Section 6.

10.8.2 Ecologically Sustainable Development

One of the '*objects*' of the EP&A Act is *"To encourage ecologically sustainable development"*. The principles of ESD are articulated in section 6(2)(a) of the *Protection of the Environment Administration Act 1991*, which states that *"ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs".*

Precautionary Principle

The precautionary principle states "*that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options"

The precautionary principle was considered during the planning of the Project. Anglo American conducted a pre-feasibility study for the Project in 2010. The pre-feasibility study considered two mine plan options: the '*maximum production mine plan*' and the Project mine plan. The risk-weighted consequences of both options were assessed in the pre-feasibility study and it was determined that the '*maximum production mine plan*' involved too great a risk of significant environmental harm.

The precautionary principle was also applied during the EA process. Whilst predicting the Project's potential environmental impacts, scientific uncertainty was overcome to a large extent by conservatively assuming the '*worst case'* environmental impact scenario. That is, where there was uncertainty regarding circumstances in the future, it was assumed that worst case conditions would occur. As a result, this EA has determined the worst case environment impacts with substantial scientific certainty. In any event, the Project has adopted management and mitigation measures to minimise the risk of serious or irreversible environmental harm. Therefore, the Project is consistent with the precautionary principle.

Intergenerational Equity

The intergenerational equity principle requires "*that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations".*

The Project has adopted comprehensive management and mitigation measures to minimise its environmental impacts. These measures will be implemented to ensure that the health, diversity and productivity of the surrounding environment are not significantly affected by the development.

The Project will not adversely impact the utility value of the productive agricultural land to the south of the Hunter River, nor will it impact the recreation value of the Wollemi National Park. Impacts on the Hunter River will be manageable (as all discharges will be in accordance with the HRSTS) and will not result in irreversible harm. The Saddlers Creek restoration program will result in a net benefit to the ecological value of the creek. Therefore, the values of the surrounding environment will be maintained for the benefit of future generations.

The land within the Project Boundary will be rehabilitated following the completion of mining. This will ensure that the land is capable of being used by future generations for agricultural, ecological and recreational uses. Therefore, the Project is consistent with the principle of intergenerational equity.

Conservation of Biological Diversity and Ecological Integrity

This principle requires the "*conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration*" of any development proposal.

Anglo American recognised that the land disturbance required for the Project will have a significant impact on threatened species, populations and ecological communities. In order to ensure that biological diversity and ecological integrity are conserved, Anglo American has developed a biodiversity offset strategy for the Project. This includes the conservation, restoration and rehabilitation of 1,574 ha onsite and the establishment of an additional offsite biodiversity offset

area of 2,079 ha. The areas included in the biodiversity offsets strategy are of greater ecological value than the land presently within the Drayton South area. The combined area of 3,653 ha designated as biodiversity offset for the Project will be conserved in perpetuity.

The dedication of this land for conservation purposes demonstrates Anglo American's adherence to the principle of conservation of biological diversity and ecological integrity.

Improved Valuation

The improved valuation principle involves "*improved valuation, pricing and incentive mechanisms—namely that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems."

Since Anglo American is a producer of coal, only the '*polluter pays principle*' is applicable. This is evident through:

- The requirement to obtain WALs and HRSTS credits in accordance with the relevant WSP to ensure water extraction and salinity limits are not exceeded;
- Significant capital investment in the acquisition of offset lands and the establishment of rehabilitation programs to protect and enhance local and regional ecological biodiversity values;
- Direct payments to the Commonwealth government in accordance with requirements of the Carbon Tax; and
- The sterilisation of coal resources to manage stakeholder expectations and environmental impacts.

Anglo American also bears the cost of mitigation measures designed to limit pollution, such as dust suppression, the implementation of low noise idlers, the retrofitting of noise attenuation devices to mobile plant, and the progressive upgrade of the truck fleet in Year 10 of the Project life. Therefore, Anglo American abides by this principle to the extent that it is applicable.

10.9 Conclusion

This justification concludes that the assessment of the Project, has been conducted in accordance with the Director-General's EARs and that it meets the '*objects*' of the EP&A Act. This Project justification has established that:

- There is an increasing global demand for thermal coal, which the Project will assist in satisfying;
- The Project will result in significant economic benefits for the region, state and nation as a whole;
- The Project is the most suitable alternative for extracting the Drayton South coal resource (of the five possible alternatives);
- A number of improvements have been made to the Project during the pre-feasibility study and EA process to alleviate potential environmental impacts;
- This EA has quantified the Project's social and environmental impacts with a high degree of scientific certainty; and
- The Project's social and environmental impacts will be minimised by implementing comprehensive management and mitigation measures.

It has been demonstrated that the Project will serve the essential purpose of providing 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 far outweigh its social and environmental costs. Therefore, the Project is in the public interest.

Glossary and Abbreviations

11

Glossary and Abbreviations 11

Abbreviation	Description
AADT	Annual Average Daily Traffic
AECOM	AECOM Australia Pty Limited
AGE	Australasian Groundwater and Environmental Consultants
AHIMS	Aboriginal Heritage Information Management System
AIP	Aquifer Interference Policy
Anglo American	Anglo American Metallurgical Coal Pty Limited
ANTC	Aboriginal Native Title Consultants
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ARTC	Australian Rail Track Corporation
BBC	Bullen Bullen Consultants
BCA	Benefit Cost Analysis
bcm	Bank cubic metres
BoM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CA	Culturally Aware
CCC	Cacatua Cultural Consultants
CEEC	Critically Endangered Ecological Community
CH_4	Methane
CHPP	Coal Handling and Preparation Plant
CPP	Coal Preparation Plant
CIC	Critical Industry Cluster
CL	Coal Lease

Abbreviation	Description
CMHS Act	*Coal Mines Health and Safety Act 2002*
CO_2	Carbon dioxide
CPCW	Claimants for the Plains Clan of the Wonnarua
Cumberland Ecology	Cumberland Ecology Pty Limited
Dams Safety Act	*Dams Safety Act 1978*
dBA	The peak sound pressure level, expressed as decibels (dB) and scaled on the 'A-weighted' scale, which attempts to closely approximate the frequency response of the human ear
DC	Development Consent
DP&I	NSW Department of Planning and Infrastructure (formerly Department of Planning, DIPNR, Planning NSW and DUAP)
Draft RING	Draft Rail Infrastructure Noise Guideline
DTIRIS	NSW Department of Trade & Investment, Regional Infrastructure and Services (formerly I&I NSW)
DTIRIS - DRE	NSW Division of Resources and Energy (within the Department of Trade & Investment, Regional Infrastructure and Services)
DTIRIS - PI	NSW Primary Industries (within the Department of Trade & Investment, Regional Infrastructure and Services)
Drayton CCC	Drayton Mine Community Consultative Committee
DSC	NSW Dams Safety Committee
EA	Environmental Assessment
EARs	Director-General's Environmental Assessment Requirements
EC	Electrical Conductivity

Abbreviation	Description
EEC	Endangered Ecological Community
Economic EIA Guidelines	Draft Guidelines for Economic Effects and Evaluation in Environmental Impact Assessment
EIS	Environmental Impact Statement
EL	Exploration Licence
EMP	Environmental Monitoring Program
ENCM	Environmental Noise Control Manual
ENM	Environmental Noise Model
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
Fisheries Management Act	*Fisheries Management Act 1994*
GDE	Groundwater Dependent Ecosystem
GPS	Global Positioning System
Guidelines for Hazard Analysis	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
GWCHC	Gidawaa Walang Cultural Heritage Consultancy
GWh	Gigawatt hour
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
CMA	Hunter-Central Rivers Catchment Management Authority
HEC-RAS	Hydrologic Engineering Centres River Analysis System
HPG	Highly Productive Groundwater

Abbreviation	Description
HRSTS	Hunter River Salinity Trading Scheme
HTO	Hunter Traditional Owners
HVAC	Hunter Valley Aboriginal Corporation
HVAS	High Volume Air Sampler
HVEC	Hunter Valley Energy Coal Pty Limited
HVCS	Hunter Valley Cultural Surveying
HVNCRM	Hunter Valley Natural and Cultural Resources Management
INP	NSW Industrial Noise Policy 2000
ISO	International Organisation for Standardisation
JVP	JVP Visual Planning and Design
KECHS	Kayaway Eco Cultural and Heritage Services
LA_1	The noise level exceeded for 1% of the time
LA_{10}	The noise level exceeded for 10% of the time
LA_{90}	Commonly referred to as the background noise, this is the noise level exceeded for 90% of the time.
LA_{eq}	The summation of noise over a selected period of time. It is the energy average noise from a source and is the equivalent continuous sound pressure level over a given period
LHWCI	Lower Hunter Wonnarua Council Inc
LGA	Local Government Area
LoS	Level of Service
m	Metre
M	Million
MASCL	Mount Arthur South Coal Limited
MGATSIC	Murong Gialinga Aboriginal and Torres Strait Islander Corporation
MIC	Maximum Instantaneous Charge
Mining Act	*Mining Act 1992*

Abbreviation	Description
ML	Megalitre
Mlcm	Million loose cubic metres
MNES	Matters of National Environmental Significance
MOP	Mining Operations Plan
MSC	Muswellbrook Shire Council
Mt	Million tonnes
Mtpa	Million tonnes per annum
Muswellbrook LEP	Muswellbrook Local Environment Plan 2009
MW	Megawatt
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1974*
NuCoal	NuCoal Resources NL
NSW	New South Wales
OEA	Overburden Emplacement Area
OEH	NSW Office of Environment and Heritage
PA	Project Approval
PAC	Planning Assessment Commission
PEA	Preliminary Environmental Assessment
$PM_{2.5}$	Particulate Matter <2.5 microns
PM_{10}	Particulate Matter <10 microns
POEO Act	*Protection of the Environment Operations Act 1997*
Project Boundary	Project Application Boundary
PVZ	Primary Viewing Zone
RBL	Rating Background Level
RGS	RGS Environmental

Abbreviation	Description
RL	Reduced Level
RMS	NSW Roads and Maritime Services
ROM	Run of Mine
RTA	NSW Roads and Traffic Authority
SAL	Strategic Agricultural Land
SEPP	State Environmental Planning Policy
SEPP 33	State Environmental Planning Policy 33 – Hazardous and Offensive Development
SEPP 33 Guidelines	SEPP 33 – Hazardous and Offensive Development Application Guidelines
SEPP 44	State Environmental Planning Policy 44 – Koala Habitat Protection
SEPP Major Development	State Environmental Planning Policy (Major Development) 2005
SEPP Mining	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
SEWPaC	Commonwealth Department of Environment, Water, Population and Communities (formerly Commonwealth Department of Environment, Water, Heritage and the Arts)
SHECMS	Safety, Health, Environment and Community Management System
Singleton LEP	Singleton Local Environment Plan 1996
SO_2	Sulphur dioxide
SRLUP	Strategic Regional Land Use Plan – Upper Hunter
SSC	Singleton Shire Council
t	Tonne
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
TEOM	Tapered Element Oscillating Microbalance
The Project	Drayton South Coal Project
tpa	Tonnes per annum
tph	Tonnes per hour

Abbreviation	Description
TSC Act	*Threatened Species Conservation Act 1995*
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UAC	Ungooroo Aboriginal Corporation
UCCS	Ungooroo Cultural and Community Services
µg	Microgram
UHHCC	Upper Hunter Heritage Culture Consultants
UHWCI	Upper Hunter Wonnarua Council Inc
VCU	Visual Character Units
VKT	Vehicle-Kilometres-Travelled
VPA	Voluntary Planning Agreement
VWP	Vibrating Wire Piezometers

Abbreviation	Description
W1C	Wonn 1 Contracting
WAL	Water Access Licence
Water Act	*Water Act 1912*
WBV	Whole body vibration
WC	Wanaruah Custodians
WLALC	Wanaruah Local Aboriginal Land Council
WM Act	*Water Management Act 2000*
WM Regulation	Water Management Regulation 2011
WNAC	Wonnarua Nation Aboriginal Corporation
WRM	WRM Water and Environment
WSP	Water Sharing Plan
WWTO	Wattaka Wonnarua Traditional Owners
YCS	Yinarr Cultural Services

References

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References 12

Archaeological Risk Assessment Services (ARAS) (2006) *Aboriginal Archaeology & Cultural Heritage Assessment Report on Drayton Mine Extension*. Report prepared for Anglo Coal Pty Ltd.

Archaeological Risk Assessment Services (ARAS) (2010) *Drayton Management System Standard Aboriginal Cultural Heritage Management Plan*. Report to Anglo Coal Pty Ltd.

Australian and New Zealand Environment and Conservation Council (ANZECC) (1990) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration.*

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) *National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality.*

Australian and New Zealand Minerals and Energy Council/Minerals Council of Australia (ANZMEC MCA) (2000) *Strategic Framework for Mine Closure*.

Australian Bureau of Statistics (ABS) (2006) *Census: Community Profile Series: Basic Community Profiles.*

Australian Bureau of Statistics (ABS) (2011a) *Regional Population Growth, Australia, 2009-10 (Cat. No. 3218.0).*

Australian Bureau of Statistics (ABS) (2011b) *National Regional Profiles 2006-2010.*

Australian Coal Association (ACA) (2011) *Black Coal Statistical Summary Australia*.

Australian Coal Association (ACA) (2012a) *Facts and Figures*, accessed 11 July 2012, http://www.australiancoal.com.au/facts-and-figures.html.

Australian Coal Association (ACA) (2012b) *Contribution to the Economy*, accessed 11 July 2012, http://www.australiancoal.com.au/contribution-to-the-economy.html.

Australian Rail Track Corporation (ARTC) (2009) *2009-2018 Hunter Valley Corridor Capacity Strategy Consultation Document.*

Buchan Consulting (2011) *Upper Hunter Economic Diversification Project, Report 1 of 3: Upper Hunter Regional Economy and Industry Report*.

Cargill, C. (1999) *Reducing Dust in Horse Stables and Transporters: A Report for the Rural Industries Research and Development Corporation*, South Australian Research and Development Institute, RIRDC Publication No. 99/44.

Coal Services Pty Ltd (2010) *Australian Black Coal Statistics*.

Commonwealth of Australia (2011) *Securing a Clean Energy Future - The Australian Government's Climate Change Plan.*

CSIRO. Fama M., Shen B. and Maconochie P. (2001) *Optimal Design and Monitoring for Highwall Mining – Australian Coal Association Research Program Report C8033*.

Cumberland Ecology (2009) *Mt Arthur Coal Consolidation Project. Ecological Assessment. Final Report*. Prepared for Hansen Bailey.

Cunningham, G., Higginson, F., Riddler, A. and Emery, K. (1988) *Systems Used to Classify Rural Lands in New South Wales*, NSW Department of Land, Water and Conservation, Sydney NSW.

Dames and Moore (2000) *Mount Arthur North Coal Project Flora and Fauna Report*. Prepared for Coal Operations Australia Limited.

Department of Environment and Heritage (DEH) (2006) *EPBC Act Policy Statements - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Grasslands*.

Department of Foreign Affairs and Trade (DFAT) (2011) *Trade at a Glance 2011.*

Department of Industry, Tourism and Resources (DITR) (2006a) *Mine Rehabilitation.*

Department of Industry, Tourism and Resources (DITR) (2006b) *Mine Closure and Completion.*

Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2012) *Environment Protection and Biodiversity Conservation Act 1999: Environmental Offsets Policy*.

Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2011) *EPBC Protected Matters Search Tool*.

Donnelly S., Balch, A., Wiebe, A., Shaw, N., Welchman, S., Schloss, A., Castillo, E., Henville, K., Vernon, A. and Planner, J. (2011) *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*.

Dyall, L. (1980) *Aboriginal Relics on the Drayton Coal Lease, Muswellbrook*. Unpublished report.

Dyall, L. (1981) *Aboriginal Relics on the Mt Arthur South Coal Lease*. Unpublished report.

Ecotone Ecological Consultants Pty Ltd (Ecotone) (2000) *Flora and Fauna and Threatened Species Assessment for the Proposed Coal Mining Area at Saddlers Creek*.

Eco Logical Australia Pty Ltd (Eco Logical) (2009) *Proposed Bayswater B Power Station, Part 3A Flora and Fauna Assessment*. Prepared for AECOM.

Elliott, G.and Veness, R. (1981) *Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley*, The Journal of the Soil Conservation Service of New South Wales, Volume 37, No. 1.

Geoscience Australia (2010) *Australian Minerals Atlas*, accessed January 2010, http://www.australianminesatlas.gov.au/education/fact_sheets/coal.jsp.

Hancock, P. and Boulton, A. (2008) *Stygofauna Biodiversity and Endemism in Four Alluvial Aquifers in Eastern Australia*, Invertebrate Systematics, 22, 117-126.

Hancock, P. and Boulton, A. (2009) *Sampling Groundwater Fauna: Efficiency of Rapid Assessment Methods Tested in Monitoring Wells in Eastern Australia*, Freshwater Biology, 54, 902-917.

Hansen Bailey (2007) *Drayton Mine Extension Environmental Assessment.* Prepared for Anglo Coal (Drayton Management) Pty Ltd.

Hanquet, D., Legalle, M., Garbage, S., Cereghino, R. (2004) *Ontogenetic Microhabitat Shifts in Stream Invertebrates with Different Biological Traits*. Hydrobiology 160(3): 329-346.

Harris, J. and Gehrke, P. (1997) *Fish and Rivers in Stress: The NSW Rivers Survey*. NSW Fisheries and the CRC for Freshwater Ecology.

Healthy Rivers Commission (2003) *Healthy Rivers for Tomorrow, Final Report*.

HLA-Envirosciences Pty Ltd (2002) *Archaeological Assessment of Proposed Drayton Mine Extension EIS*. Report to Macquarie Generation.

Howell, T. and Creese, B. (2010) *Freshwater Fish Communities of the Hunter, Manning, Karuah and Macquarie-Tuggerah Catchments: A 2004 Status Report*. Prepared for Industry & Investment NSW.

Huybregts. C. (2008) *Protecting Horses from Excessive Music Noise – A Case Study*, 9th International Congress on Noise as a Public Health Problem, Foxwoods, CT 2008.

International Energy Agency (IEA) (2011) *Coal Information 2011 Edition*.

James, D. and Gillespie, R. (2002) *Draft Guidelines for Economic Effects and Evaluation in Environmental Impact Assessment.*

Jeffrey, S., Carter, J., Moodie, K. and Beswick, A. (2001) *Using Spatial Interpolation to Construct a Comprehensive Archive of Australian Climate Data, Environmental Modelling and Software*, Volume 16/4, pp 309 – 300.

Katestone Environmental (Katestone) (2009) *Air Quality Impact Assessment for the Proposed Bayswater B Power Station Project*. Prepared for Macquarie Generation.

Koettig, M. and Hughes, P. (1985) *Archaeological Investigations at Plashett Dam, Mount Arthur North, and Mount Arthur South in the Hunter Valley. Vols 1 - 3.* Report to the Electricity Commission of NSW and Mount Arthur South Coal Pty Ltd.

Landcom (2004) *Managing Urban Stormwater Guidelines.*

Marine Pollution Research Pty Ltd (2009) *Bowmans Creek Diversion: Appendix 9 Riparian & Aquatic Ecology Assessment*. Prepared for Ashton Coal Operations Limited.

Marshall, J., Sheldon, F., Thoms, M. and Choy, S. (2006) *The Macroinvertebrate Fauna of an Australian Dryland River: Spatial and Temporal Patterns and Environmental Relationships*. Marine and Freshwater Research 57(1): 61-74.

McGorum, B.C., Ellison, J. and Cullen, R.T., (1998) *Total and Respirable Airborne Dust Endotoxin Concentrations in Three Equine Management Systems*. Equine Vet. J. 30, 430–434.

Mackie Environmental Research (MER) (1998) *Saddlers Creek Coal: Pre-feasibility Water Management Studies in the Edderton Resource Block – October 1998.*

Mackie Environmental Research (MER) (2001) *Saddlers Creek Coal: 2001 Groundwater Data Collation – September 2001.*

Mikhael, M., Orra, R. and Fiatarone Singha, M. (2010) *The Effect of Whole Body Vibration Exposure on Muscle or Bone Morphology and Function in Older Adults: A Systematic Review of the Literature*, Maturitas 66:150–157.

Mills, R. (2000) *An Archaeological Survey for a Feasibility Study for Saddlers Creek Mine, near Muswellbrook*. Unpublished report to Shell Coal.

Muswellbrook Shire Council (MSC) (November 2011) *Draft Muswellbrook Shire Council Land Use Development Strategy.*

Muswellbrook Shire Council (MSC) (2012) *Industry Profile* http://www.muswellbrook.nsw.gov.au/about-muswellbrook-shire/Industry-profile.htm.

National Environment Protection Council (NEPC) (1998) *National Environment Protection Measures for Ambient Air Quality*.

National Transport Commission (2007) *Australian Code for the Transport of Dangerous Goods by Road and Rail.*

NSW Agriculture (2002) *Agricultural Land Classification*.

NSW Environmental Protection Authority (EPA) (1985) *Environmental Noise Control Manual.*

NSW Environmental Protection Authority (EPA) (2000) *New South Wales Industrial Noise Policy.*

NSW Minerals Council (2011) *Key Industry Statistics 2011.*

NSW Department of Environment and Conservation (DEC) (2003) *Environmental Guideline for the Use of Effluent by Irrigation*.

NSW Department of Environment and Conservation (DEC) (2005) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.

NSW Department of Environment and Conservation (DEC) (2006) *Assessing Vibration – A Technical Guide.*

NSW Department of Environment and Climate Change (DECC) (2007) *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects.*

NSW Department of Environment and Climate Change (DECC) (2009) *Interim Construction Noise Guideline*.

NSW Department of Environment, Climate Change and Water (DECCW) (2008) *Waste Classification Guidelines*.

NSW Department of Environment, Climate Change and Water (DECCW) (2010a) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

NSW Department of Environment, Climate Change and Water (DECCW) (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.*

NSW Department of Environment, Climate Change and Water (DECCW) (2010c) *Draft National Recovery Plan for Box-Gum Woodland and Derived Native Grassland.*

NSW Department of Environment, Climate Change and Water (DECCW) (2011) *New South Wales Road Noise Policy.*

NSW Department of Family and Community Services – Housing (DFCS) (2012) *NSW Rent and Sales Report*.

NSW Department of Mineral Resources (DMR) (1999) *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales*.

NSW Department of Mineral Resources (DMR) (2003) *Guidelines for Applications for Subsidence Management Approvals*.

NSW Department of Planning (DOP) (2011) *Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis.*

NSW Department of Planning and Infrastructure (DP&I) (March 2012) *Guidelines for Agricultural Impact Statements.*

NSW Department of Planning and Infrastructure (DP&I) (September 2012) *Strategic Regional Land Use Plan – Upper Hunter.*

NSW Department of Planning and Infrastructure (DP&I) (March 2012) *Draft Strategic Regional Land Use Plan – Upper Hunter.*

NSW Department of Planning, Infrastructure and Natural Resources (DPINR) (2005) *Management of Stream/Aquifer Systems in Coal Mining Developments, Hunter Region*.

NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) (Primary Industries) (2011) *Gross Margin Budgets* http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets.

NSW Department of Urban Affairs and Planning (1994) *State Environmental Planning Policy 33 – Hazardous and Offensive Development Application Guidelines*.

NSW Heritage Office (2001) *Assessing Heritage Significance*.

NSW Heritage Office and Department of Urban Affairs and Planning (Heritage Office) (1996) *NSW Heritage Manual*.

NSW National Parks and Wildlife Service (2005) *Fire Management Strategy Wollemi National Park*.

NSW Office of Environment and Heritage (OEH) (2012a) *The Land and Soil Capability Assessment Scheme: Second Approximation.*

NSW Office of Environment and Heritage (OEH) (2012b) *Draft Rail Infrastructure Noise Guideline.*

NSW Office of Environment and Heritage (OEH) (2011) *Atlas of NSW Wildlife* http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp.

NSW Office of Environment and Heritage (OEH) (2011) *Principles for the Use of Biodiversity Offsets in NSW.*

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

Peake, T. (2006) *The Vegetation of the Central Hunter Valley, New South Wales. A Report on the Findings of the Hunter Remnant Vegetation Project.* Paterson, Hunter-Central Rivers Catchment Management Authority.

Pilgrim, D. (1998) *Australian Rainfall and Runoff – A Guide to Flood Estimation*, Institution of Engineers, Barton, ACT.

Public Health Information Development Unit (2009) *Social Health Atlas of Australian Local Government Areas.*

Reed et al. (2006) *Respiratory Illness in Farmers - Dust and Bioaerosols Exposures in Animal Handling Facilities*, RIRDC Publication No 06/1071289.

Roads and Traffic Authority (RTA) (2000) *Road Design Guide – Section 4 – Intersections at Grade*.

Roads and Traffic Authority (RTA) (2004) *Traffic Volume Data for Northern and Hunter Regions.*

Robson, B., Hogan, M. and Forrester, T. (2005) *Hierarchical Patterns of Invertebrates Assemblage Structure in Stony Upland Streams Change with Time and Flow Permanence.* Freshwater Biology 50: 944-953.

RP Data Pty Ltd (2012) *Rental Properties Listed and Rental Prices*, Viewed 27 and 28 February 2012, www.rpdata.com.

Rubin C., Sommerfeldt, D., Judex, S. and Qin, Y. (2001) *Inhibition of Osteopenia by Low Magnitude, High-frequency Mechanical Stimuli*, DDT, Vol. 6, No. 16:848-858.

Sharpe, A. K. and Downes, B. J. (2006) *The Effects of Potential Larval Supply, Settlement and Post-settlement Processes on the Distribution of Two Species of Filter-feeding Caddisflies*. Freshwater Biology 51(4): 717-729.

Sheldon, F. and Thoms, M. C. (2006) *Relationships Between Flow Variability and Macroinvertebrate Assemblage Composition: Data from Four Australian Dryland Rivers*. River Research and Applications 22(2): 219-238.

Standards Australia (2006) *Australian Standard 2187.2-2006 Explosives – Storage and use, Part 2: Use of explosives.*

The Ecology Lab Pty Ltd (2000) *Saddlers Creek Environmental Feasibility Study: Assessment of Fish Habitats*.

Turak, E., Waddell, N. and Johnstone, G., Eds. (2004) *New South Wales (NSW) Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual.*

Umwelt (Australia) Pty Limited (2006a) *Mt Arthur Coal Ecological Assessment for Downcast Ventilation Shaft Facility.* Prepared for Mt Arthur Coal Pty Limited.

Umwelt (Australia) Pty Limited (2006b) *Mt Arthur Coal Ecological Assessment Proposed South Pit Extension Project*. Prepared for Mt Arthur Coal Pty Limited.

Umwelt (Australia) Pty Limited (2007) *Ecological Assessment Proposed Mt Arthur Underground Project*. Prepared for Mt Arthur Coal Pty Limited.

Umwelt (Australia) Pty Ltd (2008) *Ecological Assessment - Proposed Modification for Mangoola Coal Pipeline*. Prepared for Xstrata Mangoola Pty Ltd.

U.S. Energy Information Administration (U.S. EIA) (2011) *World Energy Outlook 2011*.

WA Environmental Protection Authority (2007) *Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia.*