



Centennial Coal



MODIFICATION REPORT

Airly Mine Extension Project State Significant Development 5581 Modification 3

Volume 1: Main Report

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Centennial Coal

Airly

Airly Mine

SSD 5581 – Modification 3

MODIFICATION REPORT

Prepared for:

Centennial Airly Pty Limited

Prepared by:

Centennial Coal Company Limited

Level 18, 1 Market St
Sydney NSW 2000



STATEMENT OF VALIDITY

Submission of Modification Report

Under Section 4.55(2) of the *Environmental Planning and Assessment Act 1979*

Development Application

Applicant Name	Centennial Airly Pty Limited
Applicant Address	Level 18, 1 Market St, Sydney NSW 2000
Development	Airly Mine Extension Project
Development Description	Modification 3 to Airly Mine's Consent SSD 5581 for activities described in Chapter 5.0 of this document.
Land to be Developed	Refer to Schedule of Land (Appendix A)
Environmental Impact Assessment	Modification Report

Document Preparation

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Declaration

I certify I have prepared this Modification Report, and to the best of my knowledge:

- It contains all available information that is relevant to the environmental impact assessment of the development to which this statement relates.
- It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.



EXECUTIVE SUMMARY

Background

Airly Mine commenced operations in 1998. The mine currently operates under State Significant Development (SSD) 5581 consent pertaining to the Airly Mine Extension Project. The Project was approved on 15 December 2016. The consent allows mining operations at Airly Mine for a period of 20 years from the date of commencement (31 January 2017), and rehabilitation to be undertaken after this period. SSD 5581 consent will lapse on 31 January 2037.

Proposed Modification

Centennial Airly is proposing a modification to Airly Mine's consent SSD 5581 to allow for:

- an increase in the run-of-of mine (ROM) coal production rate from the approved 1.8 million tonne per annum (Mtpa) to 3.0 Mtpa
- an amendment to the approved 20-year mine schedule for the increased production rate
- an increase in workforce from the approved 155 full time equivalent (FTE) personnel to 200 FTE personnel
- an increase in the movement of laden coal trains and water trains leaving the site from the approved average frequency of 2 trains per day to 3 trains per day over any calendar year but maintaining the approved maximum 5 trains per day leaving the site on any day
- underground blasting (or shot-firing) activities for the removal of geological structures in the event they are encountered within the mining areas.

The increase in production rate will be achieved through a combination of:

- (i) the proposed increase in workforce
- (ii) the installation and operation of additional underground mining equipment
- (iii) an improved strategy for underground mining equipment utilisation and availability.

The SSD 5581 Project Application Area boundary will remain unchanged and no changes to the site infrastructure will be required. The existing water management system will not change.

Hours of operations are not proposed to change from the approved 24 hours per day and seven days per week.

Environmental Impact Assessment

This Modification Report has been prepared to support the modification application by Centennial Airly to be submitted under Section 4.55 (2) of the *Environment Planning and Assessment Act 1979* (EP&A Act). The Modification Report describes the proposed modification and assesses the potential environmental impacts due to the modification elements. Measures that will be required to mitigate potential environmental impacts, wherever relevant, are also described.

The SEE has been prepared to meet the form of Part 1 Clause 2(4) of Schedule 1 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and it includes information required under Clause 115 of the EP&A Regulation for Section 4.55 modifications.

The Modification Report relies on and builds on information presented in the *Environmental Impact Statement* for the Airly Mine Extension Project (the Project) (Golder Associates, 2014), referred to as Airly MEP EIS in this document.



Environmental Impacts

The table below presents an overview of the environmental, economic and social impact assessments outcomes from technical assessments supporting the Modification Report.

Summary of Environmental, Economic and Social Impacts

Issue	Overview of Key Findings
Groundwater	<p>The maximum mine inflow predictions for the proposed 3 Mtpa production rate at 71 ML/year (2027) from the recalibrated groundwater model is less than that predicted at 76 ML/year (2030) for the approved 1.8 Mtpa approved condition, and significantly less than the 183 ML/year (2030) provided in the Airly MEP EIS. The differences in the predictions are attributable to a combination of recalibration of the groundwater model and the longer mine inflows sustained for the 1.8 Mtpa prediction scenario.</p> <p>Predictions on drawdowns and baseflow reductions lead to the following conclusions.</p> <ul style="list-style-type: none"> • Measurable drawdowns in the shallow Gap Creek and Genowlan Creek alluviums will result in minor baseflow reductions to these watercourses, however will not significantly change the stream flow compared to the approved case. • No measurable impact on the identified downstream surface water user on Genowlan Creek is predicted. • Minimal difference in predicted drawdown in the Permian strata and the Shoalhaven Group between the approved and proposed conditions is predicted, and the spatial extent of drawdown in groundwater sources does not extend far beyond the Project Application Area. Hence, no impacts on the private registered landholder bores or the Gardens of Stone National Park are predicted. • Residual groundwater impacts under both proposed and approved conditions will be less than the Level 1 Criteria under the NSW Aquifer Interference Policy and considered to be acceptable. • Baseflow reductions to Gap Creek and Genowlan Creek alluviums are not significantly different between the proposed and approved conditions or significantly different to the predictions included in the Airly MEP EIS. • Baseflows to Gap Creek and Genowlan Creek alluviums will return to pre-mining conditions 50 years after end of mining. <p>The beneficial use category of the alluvial groundwater is not expected to change within or outside the Project Application Area, and the level of impact is less than the Level 1 minimal impact considerations under the Aquifer Interference Policy and impacts are considered acceptable.</p>
Surface water	<p>The site water and salt balance assessment provide the following outcomes.</p> <ul style="list-style-type: none"> • The proposed modification will not result in an increase in the frequency or magnitude of potential water discharges from the pit top to Airly Creek. • The water quality of the downstream receiving environment will not deteriorate due to the proposed modification. • The three registered surface water users on Coco Creek and one registered user on Genowlan Creek will not be impacted by the proposed modification. <p>The proposed modification will not result in environmental consequences on the downstream receiving environment, including any consequences on the aquatic ecology of Airly Creek.</p>
Road traffic	<p>The proposed increase in workforce by 45 FTE personnel will result in:</p> <ul style="list-style-type: none"> • minimal additional staff trip generation estimated at no more than 20 vehicles per hour in any shift changeover period on Castlereagh Highway and Glen David Road • no requirements to upgrade roads or intersections due to the existing sufficient capacity and the very good level of service • no impact on the capacity, efficiency or safety of the local and sub-regional road network through the life of the Project.
Rail traffic	<p>The increase in the frequency of rail movements on the Wallerawang-Gwabegar rail line from an average frequency of 2 trains per day to 3 trains per day over a calendar year will result in</p>

Issue	Overview of Key Findings
	<p>negligible impacts as spare train pathing exists on the rail line. No cumulative impact is expected as the rail line is currently only used by Airly Mine trains.</p> <p>The efficiency and the safety of the rail network will not be impacted by the proposed modification.</p>
Noise and vibration	<p>The noise and vibration assessment has concluded the following.</p> <ul style="list-style-type: none"> The operational noise levels due to the modification will be below relevant project trigger noise levels and SSD 5581 consent criteria at all residential and passive sensitive receptors, and the L_{max} noise levels are predicted to be below the sleep disturbance noise levels under standard and noise enhancing meteorological conditions. The average L_{Aeq}(15hour) and L_{Aeq}(9hour) rail noise levels would increase by up to 1.8 dB on the Wallerawang-Gwabegar Railway between Airly Mine and Wallerawang, however will comply with the trigger levels in the <i>Rail Infrastructure Noise Guideline</i> (EPA, 2013) and the noise limits in the John Holland Rail Pty Limited's Environment Protection Licence of 13421 for the rail line. Road traffic noise levels from the existing and proposed traffic volumes comply with the <i>Road Noise Policy</i> (DECCW, 2011) noise criteria at the nearest affected receiver on Glen Davis Road during the day and night-time periods. The predicted traffic noise level increase in Castlereagh Highway will be <2 dB and is considered barely perceptible. The recommended minimum safe blasting distances from vibration sensitive locations will be observed for vibration to remain within the EPA's recommended ANZEC <i>Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration</i>. Blasting will be undertaken on an as needs basis and will be undertaken in accordance with a <i>Blast Management Plan</i>.
Air quality	<p>The air quality impact assessment has concluded the following.</p> <ul style="list-style-type: none"> Relevant short term and long-term pollutant concentrations (Total Suspended Solids, PM₁₀ and PM_{2.5}) and dust deposition rates would be well below the respective NSW EPA air quality criteria, including the more stringent criteria for annual average PM₁₀ concentration, at all sensitive receptors. Incremental concentration predictions of air quality parameters due to the activities proposed in Modification 3 are unlikely to result in any exceedances of the air quality criteria in SSD 5581 at the nearest sensitive receptors.
Greenhouse gas emissions	<p>The modification will generate GHG emissions totalling 48,682 t CO₂-e / annum of combined Scope 1 and Scope 2 emissions. These emissions will contribute to global climatic effects, however the combined Scope 1 and Scope 2 emissions are a relatively small proportion of both the Australian and NSW total emissions, accounting for less than 0.01% of total Australian GHG production. The contributions from Modification 3 to the global climate change will be proportional to its GHG emissions and will be undetectable.</p>
Biodiversity	<p>No surface disturbance is proposed in Modification 3. The modification will not result in any impacts on any threatened species, populations and ecological communities, and their habitats.</p>
Cultural Heritage	<p>No surface disturbance is proposed in Modification 3, and no impacts to the cultural heritage values of the area are expected.</p>
Visual Amenity	<p>No new infrastructure is proposed in the modification and there will be no change in the visual amenity of the Airly Mine pit top.</p> <p>The modification is not proposing to amend the approved mine design philosophy, or the maximum subsidence approved for the mining zones. Impacts to geodiversity of the surroundings will not change and the aesthetic values of the area will not be impacted by the modification.</p>
Hazardous materials	<p>No impacts are expected from the handling, storage and use of explosives and detonators for underground blasting activities given only small volumes will be transported to the site and they will not be stored at the site permanently. Explosives will be transported, handled and used in accordance with an <i>Explosives Control Plan</i>. The management of the explosives and all other hazardous materials used in the operations will be undertaken in accordance with the updated <i>Hazardous Material Management Plan</i>.</p>



Issue	Overview of Key Findings
Waste	Modification 3 is not expected to affect the existing Airly Mine waste management strategy for residual waste and recyclable materials.
Economic	<p>The Project as modified has a greater net present value by approximately \$35 million than the Project as approved due to earlier realisation of benefits. The economic cost of the Project as modified due to environmental impacts is lower than the Project as approved despite the increase in GHG emissions. The environmental impacts will be sustained for a shorter period.</p> <p>The labour surplus from the proposed 45 FTE personnel is approximately \$2 million. This will result in positive economic benefits in the region due to increased household consumption and investment activities.</p> <p>The qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities will be an enhancement of Airly Mine’s current contributions to social engagement and community cohesion in the region.</p>
Social	<p>The minimal environmental impact footprint of the proposed modification means the amenity of the surroundings will not change, and impacts on personal and property rights, cultural heritage, community identity and sense, aesthetic values are unlikely.</p> <p>Qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities will result in the enhancement of Airly Mine’s current contributions to social engagement and community cohesion in the region.</p> <p>Notwithstanding the positive socioeconomic benefits of the proposed modification and the reduced economic cost of the environmental impacts, Modification 3 has resulted in a high degree of angst across the community, as evident from the consultation feedback from the community. The issues raised have also been ongoing since the inception of the Project and will likely continue in the future. A <i>Social Impact Management Plan</i> is proposed to assist in resolving the ongoing issues.</p>

Community Consultation

Airly Mine maintains an open two-way communication with the local community. The prime method of community communication is via the Airly Community Consultative Committee (CCC).

Consultation with the community on Modification 3 was commenced in January 2018. The modification has been discussed in CCC meetings and in dedicated technical sessions. These meetings allowed the community to provide feedback on Modification 3. Issues raised have been addressed in the Modification Report.

The broader community will be notified of the proposed modification through an advertisement placed in the local newspaper following lodgement of the modification application. The community will also be asked to take part in the modification assessment process through the public exhibition process, whereby the community will be invited to make formal submissions on the modification.

Justification and Conclusion

Airly Mine is a well-established underground coal mine, with established community relationships which commenced when trial mining commenced at the mine in 1998. The mine has an outstanding record for compliance with its consent conditions and this is objectively verifiable. The mine does not receive complaints on its operations from the residential sensitive receptors.

Modification 3 is proposing to increase coal production rate to 3 Mtpa with the associated workforce and train movement increases in line with its current five-year business plan. Environmental impacts, with the exception of greenhouse gas emissions, are lesser or remains unchanged from the impacts assessed and approved in the consent SSD 5581. The Project’s greenhouse gas emissions will increase due to the proposed modification and the Scope 1 and Scope 2 emissions will account for 0.01% of the Australian greenhouse gas emissions. The contribution of the Project as modified to global climate change will be proportional to its greenhouse gas contributions and will be undetectable. Airly Mine’s Scope 2 emissions are likely to reduce by approximately 25% in the future due to the implementation of



abatement measures, including the operation of the newly installed Solar Farm to reduce the mine's carbon footprint.

The modification's proposed increase in coal production limit will allow operational flexibility to Airly Mine and will also improve the mine's economic viability. A consequence of this operational flexibility is that the mine can respond to market opportunities that may present themselves. This flexibility has potentially positive implications for the State, as the ability to increase production in favourable markets would result in increased royalty returns to NSW. The Project as modified will have a positive effect on the quantum of economic benefits accruing to NSW by approximately \$35 million compared to the Project as approved, primarily through earlier realisation of benefits.

The increase in workforce will result in positive economic benefits in the region relating to the additional workforce's household consumption and investment activities. There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region

The modification is a minor alteration of the approved Project and is substantially the same development as the character of the Project will not change. The environmental impacts of the proposed modification elements are predicted not to be significant. The benefits of the modification can therefore be achieved with little to no harm to the environment. The modification meets the relevant objects of the EP&A Act and is consistent with the principles of the ecologically sustainable development. In weighing up the environmental impacts (costs and benefits), the Project as modified, on balance, is considered to be of public interest to the State of NSW.



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1.0 INTRODUCTION

1.1 Overview

Centennial Airly Pty Limited (Centennial Airly) is proposing to modify State Significant Development (SSD) 5581 consent, which granted approval to the Airly Mine Extension Project (the Project). The consent was granted under Section 4.38 (previous Section 89E) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 15 December 2016 by the then Planning Assessment Commission of NSW, as delegate of the Minister of Planning. The consent allows mining operations at Airly Mine for a period of 20 years from the date of commencement, and rehabilitation to be undertaken after this period. The consent will lapse on 31 January 2037. The SSD 5581 consent has been modified two times under Section 4.55(1A) of the EP&A Act, with Modification 1 approved in August 2018 and Modification 2 approved in July 2019.

The Project is a controlled action (EBPC 2013/7076) pursuant to Sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The approval EBPC 2013/7076 was granted on 18 May 2017 and has effect until 31 March 2047.

Airly Mine is located 5 kilometres (km) northeast of the village of Capertee within the Lithgow Local Government Area, approximately 40 km north-northwest of Lithgow and approximately 171 km northwest of Sydney (**Figure 1**). The Project is on the northern fringe of the Western Coalfield and is partly located within the Mugii Murum-ban State Conservation Area. The Project Application Area is shown in **Figure 2**.

The consent SSD 5581 allows for the operation of an underground coal mine using partial extraction techniques. The consent allows for the construction and operation of surface infrastructure. It allows mining of coal from the Lithgow Seam at the rate of 1.8 million tonnes per annum (Mtpa). The mine is approved to operate 24 hours per day, seven days per week. Airly Mine operates under Environment Protection Licence (EPL) 12374.

The proposed modifications to the Project will allow:

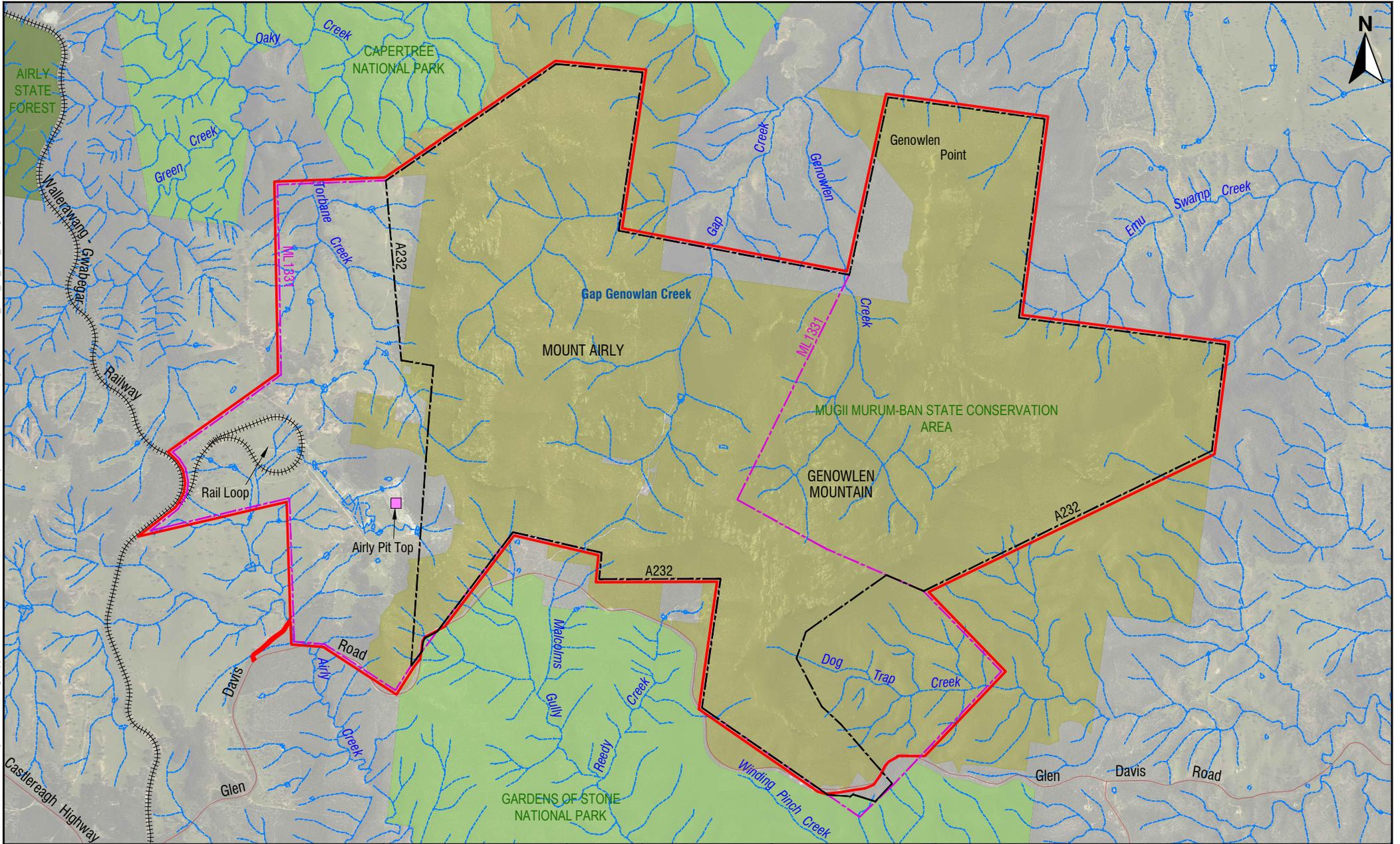
- an increase in the run-of-of mine (ROM) coal production rate from the approved 1.8 million tonne per annum (Mtpa) to 3.0 Mtpa
- an amendment to the approved 20-year mine schedule for the increased production rate
- an increase in workforce from the approved 155 full time equivalent (FTE) personnel to 200 FTE personnel
- an increase in the movement of laden coal trains and water trains leaving the site from the approved average frequency of 2 trains per day to 3 trains per day over any calendar year but maintaining the approved maximum 5 trains per day leaving the site on any day
- underground blasting (or shot-firing) activities for the removal of geological structures in the event they are encountered within the mining areas.

A modification (Modification 3) to the SSD 5581 consent, under section 4.55(2) of the EP&A Act, is sought to undertake these activities. This Modification Report assesses environmental issues pertinent to the proposed modifications to a level of detail commensurate with the scale of the modification, industry standards and the legislative framework under which it is permissible.

1.2 Background

Airly Mine is an existing underground coal mine, located in the Lithgow Local Government Area (LCC LGA), producing high quality thermal coal which is supplied to both domestic and export markets. Mining at Airly Mine commenced in 1994, under a development consent granted in 1993 (DA 162/91).

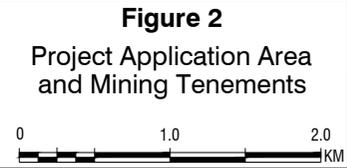
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LEGEND:	
— Project Application Area	--- Watercourse
 A232 Authorisation Boundary (offset for clarity)	+++++ Railway
 ML1331 Current Lease Boundary (offset for clarity)	 State Forest
 Major Roads	 National Park
	 State Conservation Area

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Centennial Coal Airly

Prepared by: SLR

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Airly Mine is currently operating under SSD 5581, as modified, and the operations are supported by the following documents.

- *Airly Mine Extension Project: Environmental Impact Statement (Airly MEP EIS)* (Golder Associates, 2014) dated September 2014 and associated Response to Submissions and supplementary information
- Modification 1 – *Airly Mine SSD 5581 MOD 1: Statement of Environmental Effects* (Centennial Coal, 2018a), dated 21 June 2018, and including the associated Response to Submissions
- Modification 2 – *Statement of Environmental Effects: Airly Mine Extension Project MOD 2 - State Significant Development 5581* (Centennial Coal, 2019a), dated April 2019, including the associated Response to Submissions dated 13 June 2019, and supplementary information.

The development consent SSD 5581 as modified allows mining operations to continue until 31 January 2037 and permits:

- extraction of 1.8 Mtpa of run-of-mine (ROM) coal by partial extraction mining methods
- transportation of product coal by rail to domestic markets (Eraring and Vales Point Power Stations) and Port Newcastle for the export markets
- importation of 170 ML/year of water from Charbon Colliery by rail
- operation of supporting surface and underground infrastructure
- rehabilitation.

1.3 The Applicant

Centennial Airly Pty Limited (Centennial Airly) is the Applicant for the proposed modification. The postal address of Centennial Airly is: Level 18, 1 Market St Sydney NSW 2000.

1.4 Modification Objectives

The assessment of the Airly MEP EIS was protracted and required over 2 years to be completed, from the time the EIS was submitted for exhibition in September 2014 and determination in December 2016. Since the EIS submission, Airly Mine's business plan has changed and the current five-year business plan is based on a production rate of 3.0 Mtpa. As will be demonstrated in **Section 8.11** and **Chapter 9**, the Project at the increased production rate has a greater net present value than the Project as approved, and therefore the Project as modified is more economically viable.

The increase in production rate will be achieved through a combination of:

- (i) the proposed increase in workforce
- (ii) the installation and operation of additional underground mining equipment
- (iii) an improved strategy for underground mining equipment utilisation and availability.

Equipment to be installed will comprise an additional continuous miner (increase from the existing 3 continuous miners to 4 continuous miners) and one additional set of panel and pillar extraction equipment, to allow a reduction in relocation time between extraction panels. The narrow extraction voids and relatively short panels within the panel and pillar zone result in a rapid retreat rate, and therefore numerous outages can occur during equipment relocations. Each relocation of a longwall machine from a completed longwall panel to the next longwall panel results in the suspension of operations for approximately 4 weeks. With the additional set of panel and pillar extraction equipment, Centennial Airly would develop and prepare the next panel while extraction from the current panel is ongoing, thereby reducing downtime to 5 days and allowing additional days in a year for coal extraction. The additional days available for extraction will increase production efficiency and achieve the proposed 3 Mtpa production rate. While there will be an additional set of panel and pillar extraction equipment

underground, only one panel and pillar extraction equipment will be operated at a time, consistent with the assessments undertaken in the EIS.

There is no proposal to change the approved mining technique or the mine design philosophy to achieve the proposed increase in production. The annual mining intensity will change, however, the daily production rates will not change significantly. Subsidence impacts will not change and the mine will continue to meet the subsidence impact performance measures included in Schedule 3 Condition 2 (natural and heritage features etc.) and Schedule 3 Condition 3 (built features) of SSD 5581.

The proposed modification does not include any physical works or significant changes to the existing underground mine operation and surface activities.

1.5 Modification Approval Pathway and Technical Assessments

No Secretary's environmental assessment requirements were issued for the modification. Centennial Airly described proposed modification in a letter to the Department of Planning, Industry and Environment (DPIE), dated 28 August 2019. The letter also outlined the technical assessments to assess the impacts of the modification elements in a Modification Report, the approval pathway (**Section 6.2**), stakeholder engagement, and sought DPIE's confirmation on the adequacy of the proposed technical assessments and approval pathway. In a response dated 30 September 2019 (**Appendix B**), DPIE confirmed the approval pathway was Section 4.55(2) under the EP&A Act, and that the scope of the technical assessments was adequate, with the additional requirements:

- Social Impact Assessment – to be prepared in accordance with the Department's *Social Impact Assessment Guideline for State Significant mining, petroleum and extractive industry development (2017)*
- Biodiversity impacts – determine if the proposal would have any additional impact on biodiversity values on the site by completing Table 1 in Attachment A and including it in the Modification Report
- Stakeholder engagement – in addition to the public authorities outlined consultation with the NSW Resources Regulator, Transport for NSW and the rail operator.

1.6 Document Structure

The Modification Report is presented in two volumes. The main Modification Report forms Volume 1 form, while the appendices form Volume 2. The main report provides the strategic environmental context, descriptions of the modifications in the context of the approved operations, the strategic context of the Project, the statutory context, the stakeholder engagement, assessment of potential impacts, and the evaluation of the merits of the Project as modified.

The technical assessments included in the appendices include:

- Groundwater
- Surface water and site water balance
- Traffic and transport
- Noise and vibration
- Air quality and greenhouse gas emissions
- Economic
- Social

Other environmental aspects (hazards and risk, biodiversity, Aboriginal and historic cultural heritage, visual, waste) have also been considered.

2.0 STRATEGIC CONTEXT

2.1 Introduction

The approval for the Airly Mine Extension Project was sought on the basis that the mining industry was an important component of the regional economy and the Project would provide revenue streams to Federal (e.g. corporate income taxes), State (e.g. royalties, payroll tax) and Local (e.g. land rates) governments over the period of the operation of the mine.

Lithgow has been a mining town since the 1850s. According to the Australian Bureau of Statistics 2016 Census Data, mining provides 11.1% of the employment in the LCC LGA. The mining and energy sectors dominate the economic base of Lithgow. The role Airly Mine plays in contributions to the regional economy is discussed in **Section 2.2** and **Section 2.3** below. While discussions on the importance of Airly Mine to the LCC LGA and the State are discussed below, it is noted that approximately 50% of the mine's workforce live in the Mid-Western Regional Council (MWRC) and MWRC LGA also benefits from Airly Mine operations. This is discussed in detail in **Section 8.11**.

Airly Mine supplies thermal coal to domestic power stations (Vales Point and Eraring) and to the export market. The importance of supplying coal to these end-users is discussed in **Section 2.4** with reference to NSW Government's *Strategic Statement on NSW Coal* (State of NSW, 2014).

The sections below identify the relevant LCC and NSW strategies that provide the strategic context of the Project. The statutory context of the Project is provided in **Chapter 6**.

2.2 Lithgow City Council Economic Development Strategy 2018 – 2022

The Lithgow City Council *Regional Economic Development Strategy 2018 – 2022* (REDS) has been prepared in conjunction with the Centre for Economic and Regional Development within the NSW Government Department of Premier and Cabinet to ensure alignment with broader State and regional planning strategies and priorities. The LCC REDS recognises the importance of coal mining to the regional economy and that, at some point in the future, the region will need to transition to a post-mining economy.

Coal mining is identified as the largest contributor to gross regional product (GRP) in LCC REDS. Consistent with the GRP data, the mining industry is the largest regional exporter, and considering relative scale, is also the largest importer. It is the second largest industry by employment and is recognised as a key endowment and economic driver for the economy more broadly.

The Project as modified will, on balance, result in positive economic benefit for State, regional and local areas (**Appendix L, Section 8.11**). Benefit to locally and regionally based businesses dealing with Airly Mine and employees will likely experience higher levels of business activity.

There are opportunities for Airly Mine to supply coal to the local Mount Piper Power Station on an ongoing basis. This will be in addition to Airly Mine's existing supply to other domestic energy suppliers. Thus, the mine will support the New South Wales economy directly as well as indirectly.

2.3 Lithgow Land Use Strategy 2010 – 2030

Lithgow City Council's *Lithgow Land Use Strategy 2010 – 2030* is significant to Council and the community because it sets directions and the policy for the LGA's settlement and land use until 2030. The strategy is implemented through the *Lithgow Local Environmental Plan 2014*.

The strategy has raised as an issue that LCC LGA is highly dependent on mining and retail as the two highest employment providers and that these two employment sectors are inextricably linked. A reduction in mining employment significantly affects the LGA's disposable income and demand for retail services.

In relation to this issue, the Project as modified will increase employment opportunities in the mining sector in the Lithgow LGA and contribute to the regional economy and in addition sustain the retail economy.

The strategy raises the issue of land use conflict where proliferation of rural lifestyle development in primary production areas impacts on the ability of these lands to maximise their potential in terms of the natural and primary resource.

The Project as approved was developed not to impact on other land uses through the conservative mine design approaches with no significant impact on the aesthetic values of the area. Use of conservative mine design in the proposed modification will continue to produce no significant impacts on the surface and groundwater users downstream. The Project as modified will not alter the intention of the initial conservative mine design approved, and the implementation of ongoing adaptive management will ensure Airly Mine is a low impact development.

2.4 Strategic Statement on NSW Coal

The *Strategic Statement on NSW Coal* (State of NSW, 2014), referred to as the Strategic Statement, outlines the NSW Government's objective to deliver strong and economic growth by maintaining an optimal balance between resource development and the management of other State assets, such as the farmland, waterways, parks and forest and the environment. The State aims to realise this economic value while protecting the environment and the health of the communities.

The Strategic Statement recognises the value of the development of NSW's coal resources and the significant economic benefits that coal production can deliver to local communities such as Lithgow, the Illawarra and the Hunter in terms of employment and investment. It recognises that coal provides a low cost and reliable source of electricity. It also recognises the significant contribution that coal export makes as the State's largest single export earner.

The Project as modified will be consistent with the relevant objectives of the Strategic Statement as described below.

- **Land use conflict:** The Project as initially developed considered the benefits and consequences of the development for other land users and all NSW residents. The Project implements a conservative mine design which would result in minimal environmental impacts. In this regard, mining at Airly Mine will not impact on the aesthetic values of the outstanding and unique geodiversity of the Mount Airly and Genowlan Mountain mesa complex (Washington and Wray, 2011). The pit top has large buffer land surrounding it which minimises impacts to the sensitive residential receptors.

The Project as modified will not alter the conservative mine design philosophy. The surface and groundwater impacts are expected to be low to negligible and there are no expected impacts on the downstream agricultural lands. The noise and air quality impacts of the Project are negligible, and the amenity of the area will not be degraded significantly from pre-mining conditions.

- **Transparency and process:** The Project was approved based on an EIS that was supported by evidence-based and robust technical assessments prepared in accordance with the applicable policies, guidelines and legislation and assessed by all relevant government agencies. The decision-making process was informed by public participation through direct consultation, submissions on the EIS and participation in two public hearings. Consultation on Modification 3 with the stakeholders have been undertaken since January 2018 and will be ongoing until after determination.
- **Sustainability – environmental, economic and social aspects:** The Project was approved based on the environmental, economic and social impact assessments and decisions governed by triple bottom line considerations which promote comprehensive and balanced decision-making. The Modification Report is also supported by environmental, economic and social

assessments to promote balanced decision-making. The Project incorporates ecologically sustainable development considerations, discussed in detail in **Chapter 10**.

- **Safety:** The Project operates within Centennial Airly Mine's safety management system and NSW legislation, to manage potential risks to all people.
- **Best practice and leading technologies:** The mine design and subsidence assessments relied on the geological and geotechnical data of the mining area and were developed using multiple lines of evidence from many complementary studies (refer Section 8.2.1 of the Airly MEP EIS). Similarly, the technical assessments for the EIS was prepared with the available monitoring data and the best assessment methodologies. Post-approval subsidence monitoring is undertaken using leading edge technologies (**Section 4.14.3.1**) and there is a comprehensive environmental monitoring program already in place (**Section 4.13.3**). The Project will continue with the monitoring programs and continue to include new technologies in the existing monitoring efforts as required.
- **Achieving value for the economy and adequate returns for taxpayers:** The Modification Report includes a cost benefit analyses in an Economic Assessment (**Appendix L, Section 8.11**) to provide an indication of the financial returns for the NSW Government and the public and compares the revised economic benefits of the modified Project to the Project as approved (base case). The Project as modified would generate significant returns for society through contributions to State royalties, taxes and labour surplus. The Project supplies coal to domestic power stations and to the export market. The Project as modified will increase contributions to the export market which, as noted above, is the State's largest single export earner.
- **Regional economic development:** A local effects analyses has been undertaken in the Economic Assessment (**Appendix L, Section 8.11**) for the Project as modified to discuss the positive economic and social benefits in the region relating to the additional workforce's household consumption, investment activities, and voluntary involvement in the community organisations in the LGA Airly Mine is located and surrounding regional areas, including MWRC LGA.

2.5 Conclusion

Centennial Airly has operated the Airly Mine in the LCC LGA since 1998, initially extracting coal up to 500,000 tonne per year during the trial mining phase to supply to Mount Piper Power Station until 2002. The mine was fully operational by 2009. After being on care and maintenance for 14 months from December 2012, Airly Mine recommenced operations in March 2014 and has been steadily increasing annual production rate to meet domestic and export market demands. The introduction of a panel and pillar equipment has significantly increased production. The introduction of a second set of panel and pillar equipment, in conjunction with increased workforce, will increase the production rate even further and will exceed the approved production rate in 2020. The increased production rate will allow Airly Mine to explore opportunities to supply coal to the local Mount Piper Power Station on an ongoing basis whilst still meeting its obligations to supply coal to the existing end users located in the Newcastle area and internationally.

The cost benefit analysis shows it is likely that, on balance, the proposed modification will result in positive economic benefit for the State, and local and regional areas in which Airly Mine is located. The Project as modified will provide an additional economic benefit of \$34.5 million, compared to the Project as currently approved due to the earlier realization of benefits. The labour surplus due to the additional workforce will increase by approximately \$2 million over the life of mine. The economic cost of the Project as modified will be lesser by approximately \$2 million and will be sustained for a shorter period. Similarly, benefit to locally and regionally based businesses trading with the mine are likely to experience higher levels of business activity.



There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region.

The economic benefits of the Project as modified meets the objectives of the Lithgow City Council *Regional Economic Development Strategy 2018 – 2022* and the *Lithgow Land Use Strategy 2010 – 2030*. It also meets the objectives of the NSW Government's *Strategic Statement on NSW Coal* (State of NSW, 2014).

3.0 ENVIRONMENTAL CONTEXT

3.1 Site Location

Airly Mine is located 5 km northeast of the village of Capertee within the LCC LGA, approximately 40 km north-northwest of Lithgow and approximately 171 km northwest of Sydney (**Figure 1**). The Project is on the northern fringe of the Western Coalfield and is partly located within the Mugii Murum-ban State Conservation Area (Mugii Murum-ban SCA).

The Gardens of Stone National Park and Ben Bullen State Forest lie almost immediately to the south of the Project Application Area, whilst Wollemi National Park is approximately 35 km to the east. The Gardens of Stone National Park is part the Greater Blue Mountains World Heritage Area. The Capertee National Park lies immediately to the north of the Project Application Area.

The Castlereagh Highway is the major arterial road in the region and Glen Davis Road links the Mine Access Road with the Castlereagh Highway.

3.2 Project Application Area

The Project Application Area includes Mining Lease ML1331 and Authorisation 232 (A232) with areas of 2,744 ha and 3,096 ha respectively and is shown in **Figure 2**. The Project Application Area encompasses an area of 3,982 ha and is characterised by environmental features such as rock outcrops, sandstone cliffs and deep valleys. Approximately 3,090 ha or approximately 78% of the Project Application Area is within the 3,650 ha Mugii Murum-ban SCA.

3.3 Land Zoning

The Project Application Area falls under the *Lithgow Local Environmental Plan 2014* (Lithgow LEP). The Lithgow LEP commenced on 19 December 2014 and is the principal planning instrument affecting land use in the Lithgow Local Government Area. Under the Lithgow LEP the Project Application Area encompasses the following zones, shown in **Figure 3**.

- E1 National Parks and Nature Reserves
- RU1 Primary Production
- RU2 Rural Landscape.

3.4 Land Ownership

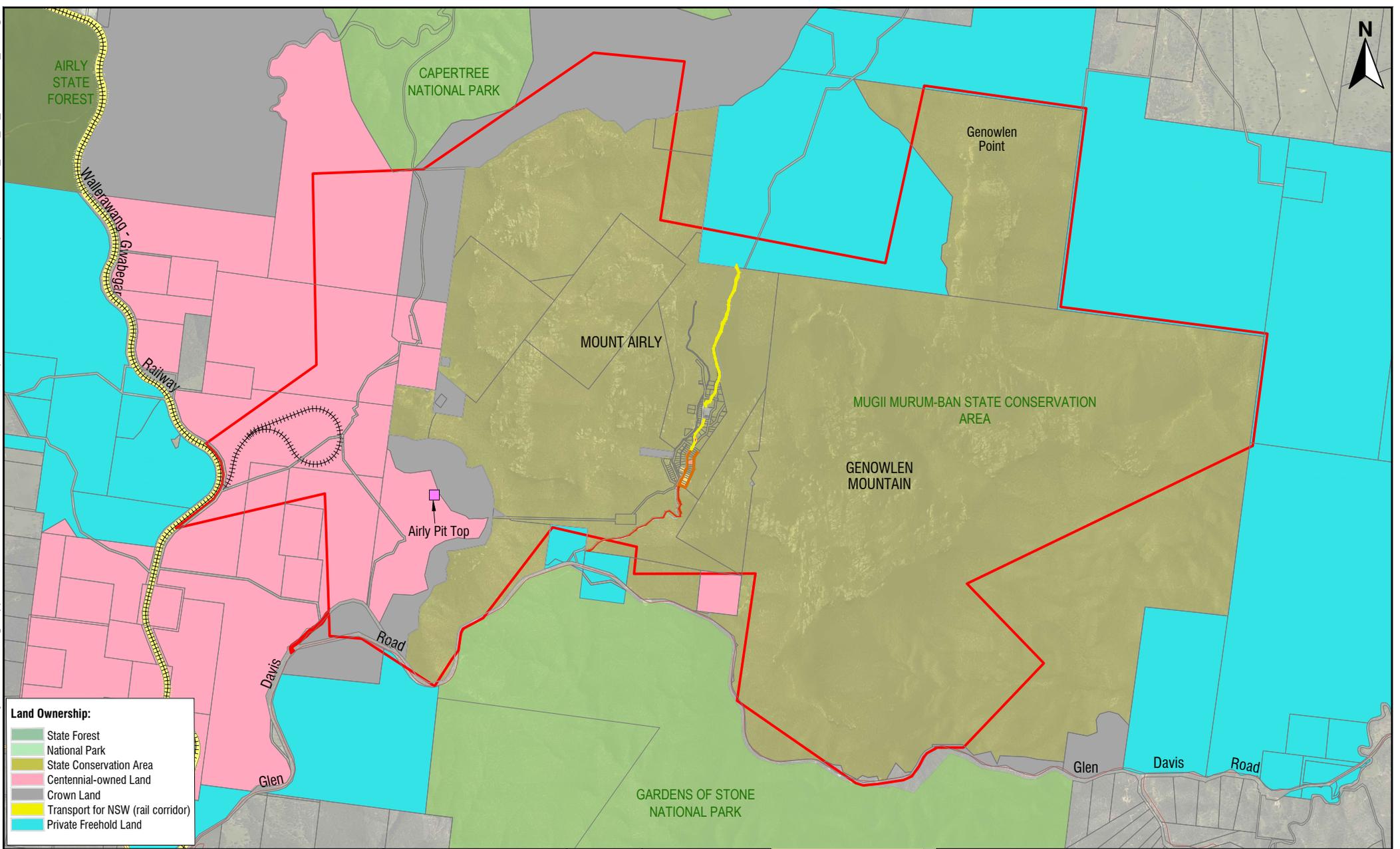
Land ownership within and surrounding the Project Application Area consists of Crown Land, land owned by Centennial Coal, privately owned land and land owned and managed by the National Parks and Wildlife Service NSW. The land ownership is shown in **Figure 4**. Most land in the Project Application Area (Mugii Murum-ban SCA) is owned by the National Parks and Wildlife Service NSW and most of the remainder is owned by Centennial Airly. There are two freehold private properties in the Project Application Area, one being the Parr property on the southern fringe of the Project Application Area, and the second being the Wilkinson property in Airly Gap.

A schedule of land relevant to the Project Application Area is provided in **Appendix A**.

3.5 Land Uses

Land use in the vicinity of the Airly Mine consists of rural residential, grazing, underground coal mining, coal handling infrastructure, transport infrastructure, commercial forestry, recreation (including tourism) and nature conservation within the Mugii Murum-ban SCA and nearby National Parks (Capertee National Park and Gardens of Stone National Park).

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Land Ownership:

- State Forest
- National Park
- State Conservation Area
- Centennial-owned Land
- Crown Land
- Transport for NSW (rail corridor)
- Private Freehold Land

LEGEND:

- Project Application Area
- Major Roads
- Railway
- Cadastral Boundary

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Figure 4
Land Ownership

Centennial Coal
Airly

Prepared by:

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The nearby Capertee Valley is known to have significant natural and historic heritage value. Visitors come to the area for environmental tourism (e.g. bird watching), four-wheel driving, camping, bushwalking, photography. Bird watching, in particular, is an important attraction to the Capertee Valley.

Historically, oil shale mining and associated petroleum production was an important land use in the vicinity, with large mining and industrial complexes at Glen Davis, Glen Alice and Newnes. The historical remains of these mines and works are significant tourist attractions.

The land use within the Project Application Area is dominated by the Mugii Murum-ban SCA, which covers 3,062 ha and is used for recreational and conservation. A portion of the Project Application Area (480 ha) is cleared of native vegetation and forms sections of grazing properties owned by Centennial Airly. Due to slope and soil type constraints, the areas cleared of native vegetation within the Project Application Area are not suited to cultivation; the current use of cattle grazing is the most suitable.

Two Centennial-owned properties are located in the Project Application Area. 'Carinya', located to the north of the surface facilities area, includes areas of cleared land used for cattle grazing although areas in the north of the property still predominantly contain native vegetation with high connectivity values. 'Airly' which is the property that encompasses the surface facilities area includes mostly cleared land and is also used for cattle grazing.

3.6 Topography

Airly Mine is characterised by steep and rugged topography, as well as lower lying, undulating areas. The topography of the Project Application Area is dominated by Mount Airly to the west and Genowlan Mountain to the east. Site elevation varies from over 1000 m Australian Height Datum (AHD) to less than 750 m AHD in the south-eastern section of the site. The Airly Mine surface facilities area is located at the foot of Mount Airly at an elevation of about 780 m AHD.

3.7 Soils

The majority of the Project Application Area comprises the Hassans Walls Soil Landscape. Eleven Soil Landscapes exist within the Project Application Area. The dominant soil type is the Hassans Walls Soil Landscape, covering approximately 55% of the Project Application Area, followed by the Warragamba Soil Landscape at approximately 16%.

The Hassans Walls Soil Landscape consists of cliffs derived from Narrabeen Group sandstones and steep colluvial talus side slopes developed over the Illawarra Coal Measures and the Shoalhaven Group. Open forest and open woodland are associated with this landscape. This Soil Landscape is susceptible to erosion given its sandy basis and is generally unsuitable for cultivation or grazing due to severe limitations, however some gentler slopes and narrow drainage flats are capable of light grazing.

The majority of the Project Application Area comprises soils with low to moderately low inherent fertility. The one exception is the Mount Tomah Soil Landscape with moderately high inherent fertility, however, this Soil Landscape has limitations associated with steep slopes and mass movement and covers a very small proportion of the Project Application Area.

3.8 Hydrology

Airly Mine lies within the Capertee River catchment, which is part of the Greater Hawkesbury/Nepean catchment.

The Project Application Area has a dendritic drainage network which is divided into four sub-catchments (**Figure 5**) as follows:

- Torbane-Oaky Creek sub-catchment
- Airly-Coco Creek sub-catchment

- Gap-Genowlan Creek sub-catchment
- Emu Swamp Creek sub-catchment.

The Airly Creek system drains the southern sector of the site and flows into Coco Creek, which joins the Capertee River in the northeast direction from the mine approximately 17 km northeast of the surface facilities area. Sections of Airly and Coco Creeks flow through the Gardens of Stone National Park, however the Coco Creek and Capertee River confluence is not located with the Gardens of Stone National Park. The Capertee River flows in a south-east direction to its confluence with the Wolgan River to form the Colo River, which ultimately contributes to the Hawkesbury River and Broken Bay.

Surface runoff from a small area of the north-east of the site drains to Emu Swamp Creek, which flows in a north-east direction and joins the Capertee River approximately 10 km downstream.

Dog Tap Creek drains the southeast sector of the Project Application Area and is part of the Airly-Coco Creek sub-catchment.

Surface runoff from the northern sections of the site drains into Gap Creek and Genowlan Creek. The two creeks, which are groundwater fed in parts, drain northwards approximately 2 km before converging into the greater Genowlan Creek. Genowlan Creek continues to drain in a northeast direction until its confluence with the Capertee River approximately 8 km downstream. The Gap-Genowlan Creek sub-catchment occupies the largest portion of the site, with 1558 ha draining to the creek system.

The north-west section of the site area is drained by the Torbane-Oaky Creek system. Torbane Creek joins Oaky Creek approximately 2 km downstream of the site.

All of the watercourses draining the Airly Mine Project Application Area are ephemeral. Generally, these watercourses flow for relatively brief periods following significant rainfall events. Flows within Airly Creek, Oaky Creek, Coco Creek and Genowlan Creek become perennial outside the Project Application Area boundary.

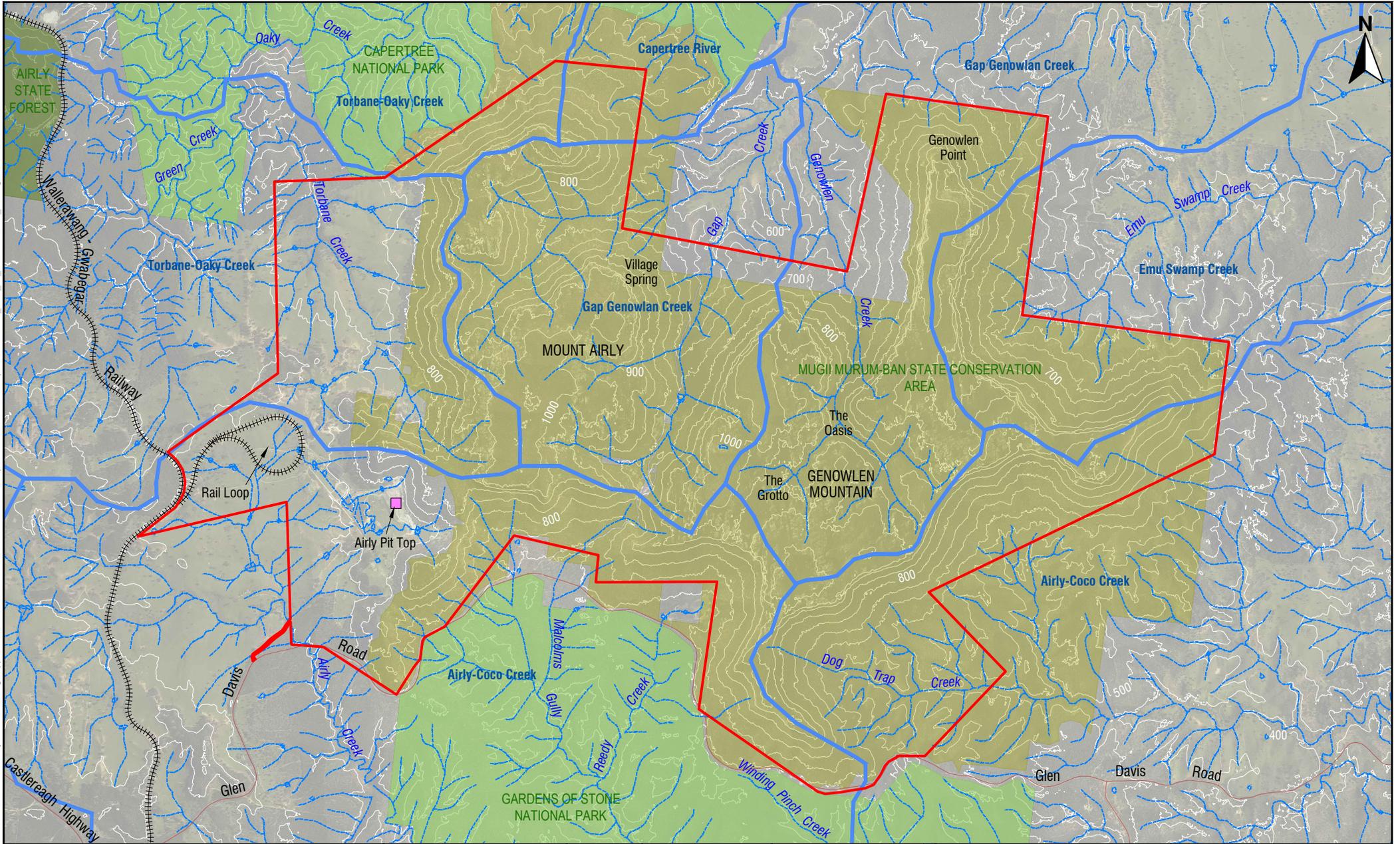
The Grotto and the Oasis shown in **Figure 5** are significant features within the Project Application Area and are popular with tourists visiting Mount Genowlan.

3.9 Geology

The Airly Mine Project Application Area is located within the northern edge of the Western Coalfield of NSW, on the western edge of the Sydney Basin. The area is underlain by Triassic sandstone of the Narrabeen Group, which is underlain by the Permian Illawarra Coal Measures. Further, below the coal measures lie the Shoalhaven Group sedimentary rocks, which are in turn underlain by a range of metamorphic strata comprising quartzite, shales, sandstones, limestone and tuff. There are small patches of quaternary alluviums adjacent to Gap and Genowlan Creeks.

The Grose sandstone of the Triassic Narrabeen Group outcrops throughout the plateau and cliffs of Mount Airly and Genowlan Mountain, with small areas of Tertiary basalt outcrop at the higher elevations. The Triassic strata are up to 200 m thick.

The Permian Illawarra Coal Measures outcrop around the Triassic formations at lower elevations, including the zone between Mount Airly and Genowlan Mountain. The Lithgow Seam within the lower Illawarra Coal Measures is the target coal seam at Airly Mine. The seam outcrops completely within the site boundary and is therefore disconnected to the areas of occurrence of this seam located several kilometres to the south and north-west. The thickness of the Lithgow Seam ranges between 3 m and 4 m with an average thickness of 3.4 m.

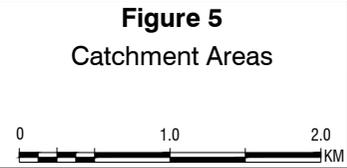


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LEGEND:	
	Project Application Area
	Catchment Boundary
	Major Roads
	Watercourse
	Contour (50m interval)
	Railway
	State Forest
	National Park
	State Conservation Area

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The depth of cover above the Lithgow Seam ranges from less than 20 m in areas of outcrop and in the Gap Creek area, up to approximately 310 m. The seam dips gradually to the east at around 1 degree. The average thickness of the Permian overburden is 105 m.

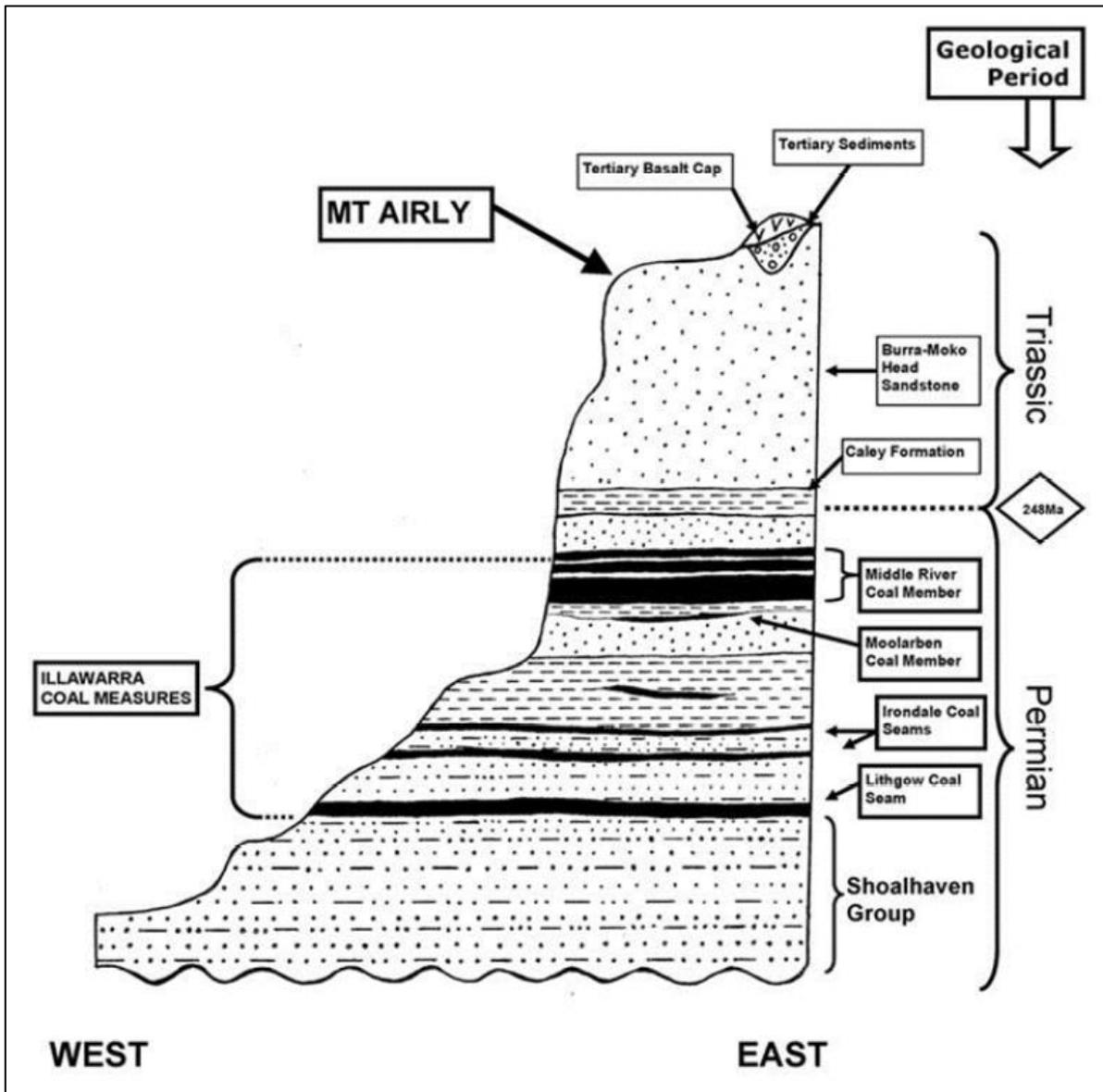


Figure 6 Geological Cross Section at Airly Mine

Interbedded siltstone and sandstone of the older Shoalhaven Group outcrop across the surface facilities area and beyond the Airly Project Application Area boundary. Metamorphic rocks also outcrop beyond the site in areas of lower elevation.

The Devonian basement and shallow geology of the site is characterised by the number of NW, NE and NS trending fault and joint features. A review of structural geological features identified the potential domains where faults and joints may extend from the basement strata to the surface e.g. Gap Creek Lineament exists within the Project Application Area and are discussed in Section 3.2.4 of GHD (2019a) with reference to SRK (2018), which reviewed and updated geological features such as faults and joints that could potentially extend from the basement Devonian strata to the surface.

3.10 Hydrogeology

Local and regional groundwater sources are both relevant to Airly Mine. The relevant groundwater features are shown schematically in **Figure 6** and described below.

- *Alluvium and Quaternary strata*: Alluvium is the soil and loose rock material that is located at the surface and overlies the rock mass below. These provide baseflow to Gap and Genowlan Creeks (including The Grotto and The Oasis marked in **Figure 5**), potential habitat to vegetation and stygofauna groundwater dependent ecosystems (GDEs) and supply a small number of users along Genowlan Creek downstream of the Project Application Area.
- *Narrabeen Sandstone of the Triassic*: The local porous and fractured rock groundwater sources include the Narrabeen Sandstone and coal seams of the Illawarra Coal Measures. These sources are recharged by rainfall via fractures within overlaying strata and seep out of the side of the mountains or directly into watercourses. They comprise the local groundwater source within the Project Application Area and provide a potential habitat to stygofauna and feeds seepage areas/springs.
- *Illawarra Coal Measures of the late Permian*: Local groundwater sources within the Project Application Area that provides baseflow to Gap and Genowlan Creeks and feed seepage areas/springs such as the Village Spring.
- *Shoalhaven Group of the early Permian*: The upper regional groundwater source occurs within siltstone and sandstone of the Shoalhaven Group that underlies the Permian strata. This stratum lies approximately 5 m below the floor of the Lithgow Seam and is generally 100 – 150 m thick. This regional groundwater source supplies a small number of registered users, including Airly pit top.
- *Lower Devonian Metamorphic Strata*: Below the Shoalhaven Strata lies a ‘highly productive’ groundwater source within Devonian metamorphic strata containing shale, sandstone and limestone. Recharge areas occur to the north, south and east of the Project Application Area and groundwater flow is generally to the east. This fresh regional groundwater source provides the majority of registered groundwater users (**Section 8.2.2.5**) to the east of the Project Application Area.

The alluvium, Narrabeen Sandstone Triassic and Permian aquifer systems are defined as localised sources of groundwater because they are isolated from the surrounding land by virtue of being elevated above the valley floor in the Mount Airly and Genowlan Mountain structures. The Shoalhaven and Devonian aquifers are defined as regional groundwater sources due to them being connected to the broader land mass of the valley floor.

3.11 Climate

3.11.1 Introduction

Long term data (for 27 years from 1991 to 2018) from the Bureau of Meteorology (BOM) weather station Nullo Mountain (Station # 062100) is presented in **Table 1**.

Table 1 Distribution of Temperature (°C) (BOM Station # 062100)

Temperature °C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum	24.2	22.9	20.2	16.8	12.9	9.6	9.2	10.9	14.3	17.5	20	22.4	16.7
Highest	36.4	37.4	32	27.7	21	16.8	17.3	20.6	26.4	28.1	34.2	32.7	37.4
Lowest maximum	11.7	10.6	9.3	4.1	1.4	1.3	0.2	1.9	4.6	4.9	7.5	9.6	0.2
Mean minimum	13.6	13.3	11.4	8.6	5.7	3.5	2.5	3	5.6	7.9	10.1	11.9	8.1
Lowest	4.4	3.8	2.9	-0.8	-2.2	-3.4	-3.6	-4.1	-3.7	-1.1	0.2	1.8	-4.1
Highest minimum	23.6	25.6	21.4	15.8	12.9	10.7	12	12.6	18.4	18.6	22.2	22.9	25.6

3.11.2 Rainfall

GHD (2019a) provides a rainfall analysis based on Scientific Information for Land Owners (SILO) database hosted by the Science Delivery Division of the Queensland Government's Department of Environment and Science. SILO point data consist of interpolated estimates based on historically observed data from Bureau of Meteorology stations. This analysis for the period 1889 and 2018 shows the following:

- minimum annual rainfall was 347 mm (1982)
- average annual rainfall was 731 mm
- median annual rainfall was 721 mm
- maximum annual rainfall was 1530 mm (1950).

3.11.3 Evaporation

Evaporation varies seasonally, being higher in summer than in winter. There is also a similar, but less pronounced, seasonal variation in monthly rainfall totals. This seasonal variation is typical of the mild and cool temperature climate of the site (GHD, 2019a).

3.11.4 Wind

A summary of the annual wind behaviour predicted by CALMET for the Airly pit top for the year 2014 (SLR, 2019) shows the predominant wind direction is seasonally dependent, with the seasonal wind roses indicating that:

- Summer winds blow from the east and east-southeast, with very few winds from the north and west
- autumn winds blow from the west-southwest
- winter winds are the strongest and the majority blow from between the south east-southeast and south, and between west-southwest and west directions
- spring winds blow from east and south directions, with very few winds from the north.

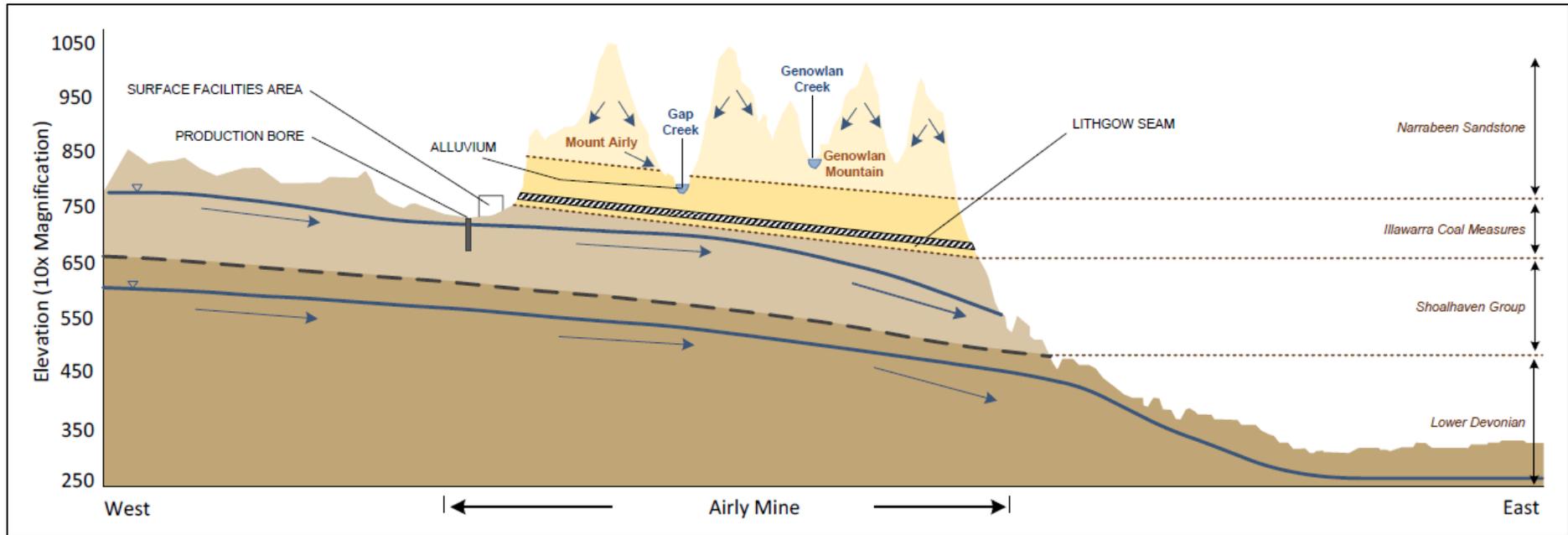


Figure 7 Conceptual Hydrogeological Environment Surrounding Airly Mine



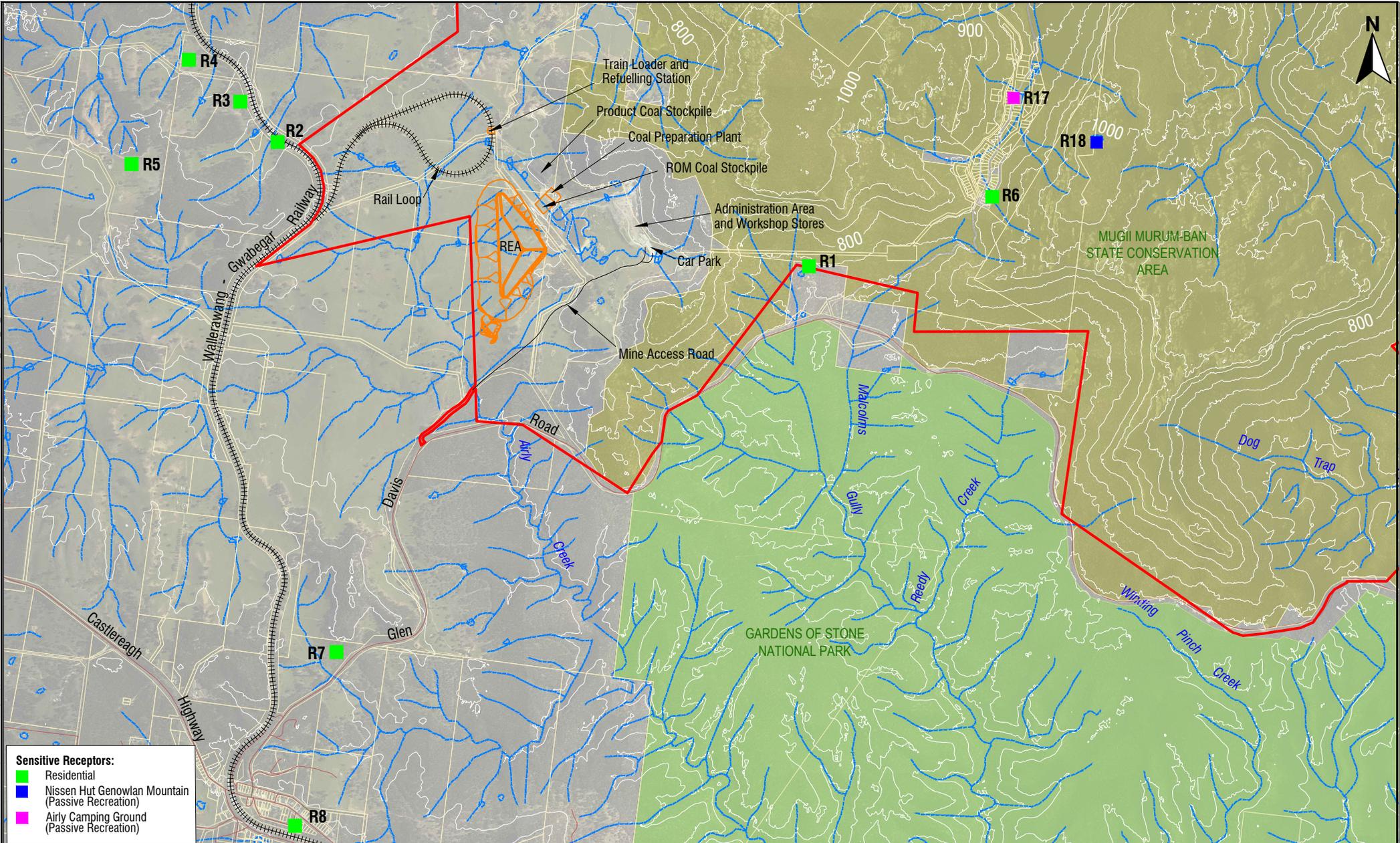
3.12 Sensitive Receptors

The Project's sensitive residential and passive recreation receptors are shown in **Figure 8**.

The sensitive water receptors have been identified as:

- Groundwater dependent ecosystems within the Project Application Area (**Section 8.2.2.4**)
- Registered groundwater bores (**Section 8.2.2.5**)
- Licensed surface water users on Genowlan Creek (**Section 8.3.2.3**) and Coco Creek (**Section 8.4.2**).

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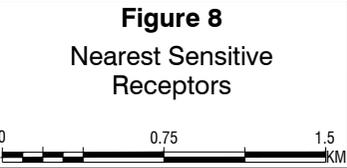


- Sensitive Receptors:**
- Residential
 - Nissen Hut Genowlan Mountain (Passive Recreation)
 - Airly Camping Ground (Passive Recreation)

LEGEND:	
—	Project Application Area
—	Catchment Boundary
—	Major Roads
—	Watercourse
—	Contour (50m interval)
—	Infrastructure (not constructed)
+++++	Railway
—	National Park
—	State Conservation Area

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Centennial Coal Airly



4.0 EXISTING OPERATIONS & ENVIRONMENTAL MANAGEMENT

4.1 Overview of Approved Operations

Airly Mine operates under SSD 5581 as modified. This consent allows Airly Mine to:

- develop underground access roadways and extract up to 1.8 Mtpa of ROM coal from the Lithgow seam using partial extraction methods within the ML1331 and the A232 areas
- operate and maintain the existing ancillary surface infrastructure for mine access, underground ventilation, electricity, water, materials supply, and communications for mining operations
- use existing infrastructure for the management of ROM coal at the pit top and transfer off site by rail
- complete the construction of the coal handling and preparation plant (CHPP) through construction of a Coal Preparation Plant (CPP) and associated overland conveyors
- construct a life of mine reject emplacement area (REA) for the co-disposal of reject materials from the CPP, including the associated water management infrastructure (dam and a licensed discharge point (REA LDP))
- use the existing water storage dams and a production bore at the pit top to meet operational water demands
- import up to 170 ML/year of water from Charbon Colliery by rail to meet any shortfall in process water demand
- operate 24 hours per day and seven days per week
- employ a workforce of up to 155 full time equivalent personnel
- progressively rehabilitate exploration boreholes and disturbed areas at the pit top no longer required
- undertake life-of-mine rehabilitation at the pit top disturbance areas to create final landforms commensurate with the surrounding areas.

4.2 Existing Approvals

4.2.1 Approvals

Airly Mine operates under the development consent SSD 5581 and EPBC 2013/7076 Approvals outlined in **Table 2**.

Table 2 Approvals

Reference	Description	Issued by	Issue Date	Expiry Date
SSD 5581	State significant development consent permitting: <ul style="list-style-type: none"> • Annual production limit of 1.8 Mtpa ROM coal • Consent life of 20 years from date of commencement • Operations 24 hours per day, 7 days per week • Employment of 155 full time equivalent personnel • Surface operations comprising: 	NSW Planning Assessment Commission	15 December 2016	31 January 2037

Reference	Description	Issued by	Issue Date	Expiry Date
	<ul style="list-style-type: none"> ○ Coal handling, processing and stockpiling ○ Mine ventilation ○ Underground mine access ○ Ancillary infrastructure ○ Reject material emplacement ○ Water management ○ Waste management ● Coal transportation off site to domestic markets and export using rail ● Importation of 170 ML/year of water from Charbon Colliery by rail ● Land preparation ● Rehabilitation – progressive and life of mine ● Exploration activities. 			
EPBC 2013/7076	To expand underground mining operations at the existing Airly Mine near Capertee in the Western Coalfields of NSW.	Department of the Environment and Energy	18 May 2017	31 March 2047
DA033/19	Development Approval for the construction of Airly Solar Farm (Lot 159 DP 722293)	Lithgow City Council	31 May 2019	N/A

4.2.2 Other Regulatory Requirements

Airly Mine has a number of other approvals, licences and permits as listed in **Table 3**.

Table 3 Approvals and Licences

Type	Approval Number	Regulatory Authority	Issue Date	Details
Mining Operations Plan (01 January 2018 – 31 December 2024)	N/A	Department of Planning and Environment (Division of Resources and Geosciences)	January 2018	The objectives of the MOP are to meet requirements of statutory guidelines for reporting on operational activities at Airly Mine. The MOP satisfies the requirements of a Rehabilitation Management Plan, required by Condition 29 under Schedule 4 of SSD 5581.
Environment Protection Licence	EPL 12374	NSW EPA	12 December Anniversary Date	EPL 12374 authorises the mining for coal up to 2,000,000 tpa, and coal works up to 2 Mtpa. The EPL also limits water discharge quality. Monitoring is undertaken in accordance with the licence and results reported to the EPA via an <i>Annual Return</i> . The EPL is renewed annually on 12 December.
Consent	N/A	National Parks and Wildlife Service	07/07/2016	Drilling of coal exploration boreholes in Mugii Murum-ban State Conservation Area

Type	Approval Number	Regulatory Authority	Issue Date	Details
Licence for Minor Works and Occupation	BMB 18-11	National Parks and Wildlife Service	24/09/2018	Subsidence monitoring activities within Mugii Murum-ban State Conservation Area
Construction Certificate	CC148/19	Lithgow City Council	18/09/2019	Construction Certificate for the Solar Project
Extraction Plan – Cliff Line Zone of First Workings (ML1331)	N/A	Department of Planning, Industry and Environment	16/10/2017	Extraction Plan for the Cliff Line Zone of First Workings within ML1331, approved on 16/10/2017
Extraction Plan – Splitting and Quartering (ML1331)	N/A	Department of Planning, Industry and Environment	30/08/2018 07/05/2019	Extraction Plan for Quartering and Splitting in Trial Mining Area (Panels 206 & 207) within ML1331 granted on 30/08/2018, and in line with Airly MOD 1 determination. Approval for the 400 and 401 Panel Areas in ML1331 granted on 07/0/2019 following successful completion of trial mining.
Extraction Plan – Mount Airly Panel and Pillar Mining Zone (ML1331)	N/A	Department of Planning, Industry and Environment	31/5/2019 25/6/2019	Extraction Plan for the introduction of Panel and Pillar Mining (miniwall) under Mount Airly (Panels MW02-MW05), with extraction conservatively at 26.5° angle of draw (AOD) setback from tops of cliffs in Cliff Line Zone, followed by Panels MW06-MW15 (at full 26.5° AOD setbacks).
Onsite Sewage Management System (ECOMAX)	034/10S68	Lithgow City Council	07/06/2011	Approval to operate the ECOMAX onsite sewage management system, with expiry date of 14 July 2023.
Groundwater Licences	Water Access Licence (WAL) 24386	Department of Industry – Water	17/02/11	In perpetuity for the extraction of groundwater (volumetric limit of 158 ML/annum) from the Sydney Basin North Water Source
	WAL 36565	Department of Industry – Water	16/10/13	In perpetuity for the extraction of groundwater (volumetric limit of 120 ML/annum) from the Sydney Basin North Water Source
Groundwater monitoring licences	10BL604518	Department of Industry – Water	14/02/2011	In perpetuity for monitoring bore ARP01
	10BL604520		14/02/2011	In perpetuity for monitoring bores ARP02A and ARP03A
	10BL604521		14/02/2011	In perpetuity for monitoring bores ARP04 and ARP05
	10BL605352		28/03/2013	In perpetuity for monitoring bores ARP06, ARP07, ARP08, ARP09
	10BL605794		19/08/2016	In perpetuity for monitoring bore ARP11

Type	Approval Number	Regulatory Authority	Issue Date	Details
	10BL605793		17/08/16	In perpetuity for monitoring bores ARP12, ARP13, ARP13SP, ARP14, ARP15, ARPSP

4.2.3 Mining Tenements

The relevant mining tenements for Airly Mine are provided in **Table 4**.

Table 4 Mining Tenements

Reference	Title Holder	Grant Date	Expiry Date	Area (ha)
ML1331	Centennial Airly Pty Limited	12/10/93 Renewed 8/5/2014	12 October 2035	2745
A232	Centennial Airly Pty Limited	1980 Renewed 03/06/10 Renewed 21/5/2015	20 October 2019	3054
MLA559	Centennial Airly Pty Limited	Application submitted on 25 May 2018		

4.3 Existing Operations

4.3.1 Project Life

Airly Mine is approved to carry out mining operations for a period of 20 years from the date of commencement (31 January 2017) with rehabilitation to be undertaken after the 20 years of mining. The expiry date for mining operations is 31 January 2037.

4.3.2 Hours of Operation

Airly Mine is approved to undertake mining operations 24 hours a day, 7 days a week.

4.3.3 Employment

The approved workforce number is a total of 155 full time equivalent (FTE) personnel comprising up to 135 full time employees and 20 contractors.

4.3.4 Site Access

The Airly Mine pit top is accessed via the Mine Access Road, off Glen Davis Road, approximately 3 km from Capertee village.

4.3.5 Rail Transport

Rail transport is used for the transport of product coal off site to the domestic power stations (Vales Point and Eraring) and for the export market via Port Newcastle. Rail transport is also utilised for the importation of water from Charbon Colliery. The following restrictions (Condition 8, Schedule 2 of SSD 5581) apply on the number of trains leaving the Airly pit top via the rail loop to enter the Wallerawang-Gwabegar rail line.

- (a) All product coal is transported from site by rail.
- (b) Movement of laden coal trains and water trains is restricted to:
 - (i) no more than an average of 2 trains leaving the site per day over any calendar year, and
 - (ii) no more than 5 trains leaving the site on any day, and
- (c) No more than one water train is received from Charbon Colliery on any day.

The rail transportation routes for the coal and water trains are shown in **Figure 9**.

Trains arrive at the pit top from the south, and coal laden trains travel to the south on the Wallerawang-Gwabegar rail line destined for power stations and Port Newcastle. Water laden trains arrive from the north and reverse into the Airly rail loop, and after unloading the water, reverse out of the rail loop and into the Wallerawang-Gwabegar Rail Line, before heading north back to Charbon Colliery.

The Wallerawang-Gwabegar rail line merges into the Main Western rail line at Wallerawang. Both these rail lines are owned by Transport for NSW, however are operated and maintained by John Holland Rail Pty Limited.

The Wallerawang-Gwabegar rail line is currently not operated to a fixed timetable, and only Centennial Coal trains utilise the rail line for coal and water transport.

4.3.6 Mining

4.3.6.1 Mine Design and Mining Zones

Airly Mine extracts the Lithgow coal seam, which is the only economic coal seam within the Project Application Area. The Lithgow seam is the lower portion of the coalesced Lithgow and Lidsdale seams, which have a combined thickness of 4.8 – 5.9 m. The target extraction horizon is the lower 2.7 – 2.8 m of the Lithgow and Lidsdale seam combination. The roof is considered weak and the floor is moderate to strong in accordance with the coal mine roof rating number.

The mining area at Airly Mine comprises a diverse range of natural features (refer Section 2.3.3. of Airly MEP EIS) comprising cliffs, pagodas (smooth and platy) steep slope and deeply incised gorges, referred to as geodiversity (Washington and Wray, 2011) which are considered to have significant conservation value. The mining area also has two notable natural features, the Oasis and the Grotto, which are tourist attractions.

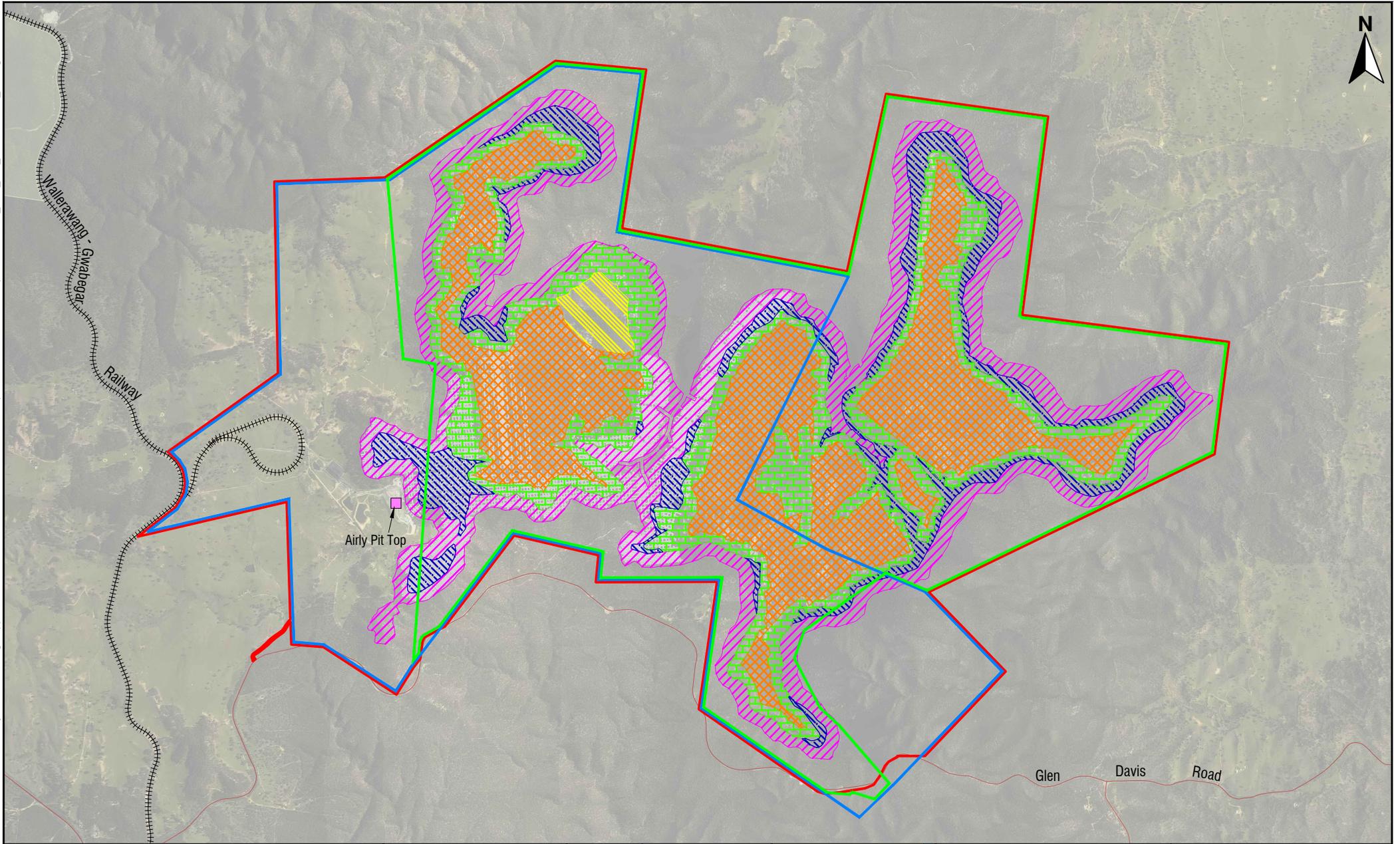
The five mining zones proposed in the Airly MEP EIS were conservative, with the fundamental premise that subsidence within each mining zone would avoid surface cracking thereby minimise risks of cliff collapse and impacts to pagodas and other natural features.

The five approved mining zones under SSD 5581 permit different forms of mining (first workings, partial extraction, panel and pillar extraction). Airly Mine is not approved to a fixed mine plan over the entire mining area due to the flexible nature of the first workings, partial pillar extraction, and panel and pillar mining methods approved in the Project. The five mining zones allow varying mining systems to be engineered to the desired subsidence level for each zone to maintain safety, minimise disruption to surface infrastructure, and minimise environmental and social consequences.

The mining zones are described below and shown in **Figure 10**.

- **Panel and Pillar Zone:** This is the plateau area with cover depths of >160 m. The maximum void width is 61 m (includes gateroads) and is highly sub-critical. Long term stable pillars are left between the voids to limit the level of subsidence. This zone covers majority of the mining area.
- **Cliff Line and First Workings Zone:** This is an area of primarily first workings beneath the significant outer and internal cliffs defined by setback of 30 m from both the crest and toe of the cliffs of the Mount Airly and Genowlan Mountain mesas.

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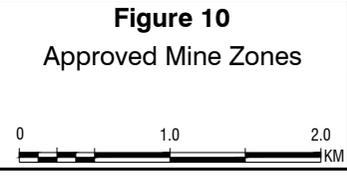


LEGEND:	
	Project Application Area
	Major Roads
	Railway
	ML 1331 (Offset for Clarity)
	A323 (Offset for Clarity)

APPROVED MINE ZONES	
	Panel and pillar mining zone
	Cliff line zone and zone of first workings
	Partial pillar extraction zone
	Shallow zone
	New Hartley Shale Mine potential interaction zone

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- **Partial Pillar Extraction Zone:** This zone extends from the downslope side of the Cliff Line Zone to the 80-100 m depth contours and is the zone of partial pillar extraction, creating limited spans (15.5 m to 25.5 m) and leaving long-term stable pillars remaining to provide overburden support.
- **Shallow Zone:** This is a zone of low impact extraction using splitting and quartering between the 20 m and 100 m depth of cover contours, which can generally be described as extending outward from the downslope side of the Cliff Line Zone (or the Partial Pillar Zone as the case may be) to a minimum depth of cover of 30 m.
- **New Hartley Shale Mine Potential Interaction Zone:** First workings only (subsidence <20 mm) in this zone with no secondary extraction allowed in this zone.

The consent SSD 5581 places the following **restrictions on mining** (Schedule 3 Condition 1) following approval of Airly MOD 1 in August 2018.

The Applicant must not carry out any second workings:

- a) in the Panel and Pillar Zone within an angle of draw of 26.5 degrees of the crest of any cliffs identified in the Cliff Line Zone of First Workings before at least four adjacent extraction panels in the Panel and Pillar Zone beneath Mount Airly have been completed*
- b) in the Partial Pillar Extraction Zone within an angle of draw of 26.5 degrees of the toe of any cliffs identified in the Cliff Line Zone of First Workings before it has completed the Trial Mining Area in Panels 206 and 207 as shown in Appendix 11 of SSD 5581*
- c) within an angle of draw of 26.5 degrees plus 50 metres of the limit of the New Hartley Shale Mine workings.*

The maximum subsidence effects in each zone are provided in Chapter 8 of the Airly MEP EIS. Maximum subsidence predictions in the mining zones (excluding the New Hartley Shale Mine Potential Interaction Zone) was 125 mm vertical subsidence, maximum tensile strain to 2 mm/m, maximum compressive strain to 2 mm/m, and maximum tilt to 3 mm/m in the Panel and Pillar Zone. No surface cracking is expected in any of the mining zones.

The subsidence impacts are revised and updated during the Extraction Plan process (**Section 4.3.6.2**) as more monitoring data become available and the understanding of impacts are progressively enhanced. Subsidence in each zone is required to be consistent with the EIS predictions or lesser. However, mining must meet performance measures provided for natural and heritage features (Condition 2) and built features (Condition 3) under Schedule 3 of SSD 5581.

4.3.6.2 Extraction Plans and Adaptive Management in Mine Design

Condition 7 under Schedule 3 of SSD 5581 requires the preparation of Extraction Plans for secondary approval by DPIE prior to carrying out first workings within the Cliff Line Zone and Zone of First Workings or second workings in the other approved mining zones. The Extraction Plans are prepared in consultation with an Independent Expert Panel (IEP), DPIE, NSW Resources Regulator and key stakeholders including (but not necessarily limited to) NPWS as managers of the Mugii Murum-ban SCA.

The IEP established for the Project provides independent expert advice on the adequacy of key components of each Extraction Plan, including Subsidence Monitoring Programs, to ensure the overlying geodiversity is protected. The IEP reviews relevant aspects of proposed mining, including (but not limited to) mine plans, subsidence predictions, monitoring methods and results, and the adequacy of adaptive management measures to ensure mining can perform within approved performance criteria.

Each Extraction Plan is supported by management and monitoring plans prescribed by Condition 7, Schedule 3 of SSD 5581, and as relevant to each extraction plan area in a mining zone.

- Subsidence Monitoring Program
- Built Features Management Plan

- Water Management Plan
- Biodiversity Management Plan
- Land Management Plan
- Heritage Management Plan
- Public Safety Management Plan

The subsidence monitoring programs supporting the Extraction Plans comprise a wide range of integrated subsidence monitoring methods (refer **Section 4.13.3.1**), which provide complementary information used to demonstrate that subsidence effects and impacts within each mining zone are within the performance criteria noted above.

Each Extraction Plan is supported by an overarching *Trigger Action Response Plan* (TARP) to manage any potential impacts through identification of triggers for required actions and responses to be implemented to manage potential impacts. The conservative mine design is such that expected subsidence levels are well below those that would be likely to cause any impacts at the surface, and indeed in many areas are at or near current limits of measurability. The TARP includes adaptive management processes to begin investigating and managing subsidence above expectations before any impacts will occur. Management processes extend from change in mine design such as varying start and end points of extraction panels to (if necessary) the potential for relocation of the panel and pillar equipment (when extracting narrow panels), to longer term changing of panel design parameters to avoid impacts.

Extraction Plans are prepared on an ongoing basis, and the progression of mining within the Project Application Area boundary is planned such that the less environmentally sensitive areas under Mount Airly are mined first prior to moving into more sensitive areas.

Monitoring data collected for mining under Mount Airly allows confirmation of subsidence predictions in the Airly MEP EIS and that the mine design is performing as devised. Data collected permits informed decisions on the future mine design and monitoring systems as mining progresses from the lesser sensitive areas to areas where greater protection to the geodiversity is required. The more sensitive areas within the approved mining area under SSD 5581 are typically located on Genowlan Mountain, and Genowlan Point.

To date, the following impact avoidance measures have been undertaken during the preparation of Extraction Plans.

- A setback of 50 m from the historic shale mine workings within the New Hartley Shale Mine Potential Interaction Zone in addition to the 26.5 deg Angle of Draw (AOD) has been adopted, different from the 50 m setback from the included New Hartley Shale Mine Potential Interaction Zone boundary.
- No secondary extraction in the New Hartley Shale Mine Potential Interaction Zone (proposed in the Airly MEP EIS) in accordance with recommendations of the IEP and subsequently included in Condition 1 under Schedule 3 of SSD 5581 (Airly Modification 1), reflecting the potential for cumulative subsidence impacts with the existing shale workings.
- Conservative introduction of Panel and Pillar Mining (miniwall) on Mount Airly initially employing a setback of 26.5° AOD from the tops of cliffs located within the Cliff Line Zone on Mount Airly for four panels (MW02 – MW05) initially, approved on 31 May 2019, followed by approval for the Panels MW06 – MW15 (at full 26.5° AOD setbacks) on 25/6/2019. In accordance with Condition 1 in Schedule 3 of SSD5581, following successful completion of the miniwall mining and demonstration with subsidence measurements that exceedances against predictions in the EIS are not likely, the extraction plan may be potentially modified in the future to the 8° AOD setback assessed and approved in the EIS.
- Whilst approved, minimal secondary extraction has been undertaken in the Partial Pillar Mining Zone. Extraction has been limited to depths less than 110 m or an AOD of 26.5° from the base



of the cliffs or where pre-mining vertical stresses exceed 3 MPa (whichever comes first) This effectively provides a significant increase in the protective setback to the base of cliffs located in the Cliff Line Zone.

- Only lower impact splitting and quartering methods have been used in the Shallow Mining Zone and within the shallower parts of the Partial Pillar Mining Zone.

The impact avoidance measures implemented in mine design and planning to date, in consultation with the IEP and other government agencies, demonstrates that Centennial Airly has adopted a conservative approach to mining within the approved mining zones, which effectively provides even greater protection to the geodiversity of the area than envisaged in the EIS.

4.3.6.3 Mine Schedule

The 20-year mine schedule is appended to the SSD 5581 consent as Figure 3 in Appendix 3. Mining has continued from the existing workings in the west and has to date progressed generally eastwards under Mount Airly, Gap Creek and Genowlan Mountain.

4.3.7 Surface Infrastructure

The Airly Mine pit top infrastructure (**Figure 11**) comprises mine support facilities that support surface and underground operations, as follows:

- Site access road and car park
- Underground mine access and associated infrastructure
- Coal handling, crushing and stockpiling
- Coal transport infrastructure
- Rail loop
- Bath house facilities
- Onsite sewerage system (ECOMAX)
- Ventilation facilities
- Workshop, services and administration infrastructure, telecommunications systems
- Underground water management
- Surface water management systems including separation of dirty and clean water flow paths, and receipt and management of imported water from Charbon Colliery.

Minimal visual impact of this infrastructure is experienced at the sensitive receptors of Glen Davis Road or from vantage points from Mugii Murum-ban SCA. The sloping and ridgeline landforms with moderate to dense tree cover surrounding the pit top (**Plate 1**) means that the capability of the landform to absorb the visual impact of the infrastructure is high. The newly constructed administration building (**Plate 2**) for example is green in colour and the paint is non-reflective for the building to blend with the surroundings. Broad area lighting is minimal and the use individual and direction flood lighting at the pit op minimises visual impact at night time.

4.4 Coal Production, Handling, Processing and Transport

4.4.1 Coal Production Rate

The maximum ROM production limit is 1.8 million tonne in any calendar year.



Plate 1 Airly Mine Pit Top



Plate 2 Administration Buildings at Airly Mine Pit Top

4.4.2 Coal Handling and Stockpiles

The coal handling at the site is undertaken using a system of surface and underground conveyors with the capability of operation at 500 tonne per hour. The system of conveyors (not fully constructed) will in the long term allow ROM coal to be transferred from the underground to the Product Coal Stockpile and the ROM Coal Stockpile in the vicinity of the Coal Preparation Plant (CPP) when the CPP is constructed and the ROM Coal Stockpile has been established. Currently, ROM coal is transferred from the underground to the Product Coal Stockpile, following processing in a crusher and screening plant.

In the event the Product Coal Stockpile becomes full, coal from the underground conveyor system is currently placed on the ROM Emergency Stockpile by truck and front-end loader. When the Product Coal Stockpile level falls sufficiently, the diverted coal from the ROM Emergency Stockpile is fed back onto the surface conveyor using a front-end loader. There is no facility to divert coal directly from the underground conveyor to the ROM Emergency Stockpile.

Three stockpiles are approved at the pit top as follows:

- a 30,000 tonne ROM Emergency Stockpile, constructed and operational
- a 200,000 tonne Product Coal Stockpile, constructed and operational
- a 40,000 tonne ROM Coal Stockpile in the vicinity of the CPP, not constructed.

4.4.3 Coal Processing

ROM coal (minus 300 mm) from underground is processed through the crushing and screening plant to less than 50 mm size prior to transfer to the Product Stockpile. ROM coal beneficiation (washing) does not occur currently at Airly Mine, given the CPP has not been constructed. The current five-year business plan at Airly Mine is not to construct the CPP. The CPP could be constructed in the future if the business plan changes.

4.4.4 Coal Transport

All coal is transported from Airly Mine by rail for domestic (Eraring and Vales Point Power Stations) and overseas markets via Port Newcastle.

The rail movements for coal train and water trains occur within the restrictions discussed in **Section 4.3.5**.

4.5 Reject Materials Management

A co-disposal reject emplacement area (REA) for the management of both fine and coarse reject materials from the CPP is approved, however has not been constructed to date. The concept design of the REA is shown in **Figure 11**. The approved REA will, when constructed, have an associated REA Dam and a new licensed discharge point.

Given the CPP has not been constructed (**Section 4.4.2**), hence no ROM coal beneficiation occurs and there has been no need to establish the REA and the associated water management structures. The construction of the REA is not in Airly Mine's current five-year business plan.

Part of the approved REA will house a 2 MW solar farm (the Solar Project) until such time the REA is required (**Section 4.6**). Installation of the solar farm is currently underway.

4.6 Solar Farm Project

Installation of a 2 MW solar farm (the Solar Project), approved by Lithgow City Council (DA033/19) is currently underway at Airly Mine to reduce its demand for electricity from the grid, and hence its carbon footprint (Umwelt, 2019). The Solar Project includes the installation of 5,000 400 W photovoltaic (PV) modules (panels) and connection of the solar system to the existing Airly substation 1. The system will supplement power for mine operations. The Solar Project is expected to supply approximately 25% of the site's electricity consumption.

Construction of the Solar Farm Project commenced on 19 August 2019 (**Plate 3**) and all construction works will be completed by December 2019 and fully operational by March 2020. The location of the solar panels distant from the direct line of sight from Glen Davis Road, the surrounding landscape and the overall low visibility of the site infrastructure ensures the Project's visual impact remains low.



Plate 3 Airly Mine Solar Farm Panels

4.7 Underground Water Management

Airly Mine operates a dewatering system comprising pipelines, underground impoundment dams and pump stations, to pump mine inflows from the underground to the 109 ML Dirty Water Dam for storage and subsequent use as process water. Pipelines also exist to transfer process water underground from the 35 ML Discharge Dam for use in dust suppression.

4.8 Surface Water Management

4.8.1 Clean and Dirty Water Management

4.8.1.1 Water Management Structures

The existing water management structures at the pit top (**Figure 12**) allows for the separation and storage of clean and dirty water and provide process water for operations. Figure 12 shows the water management infrastructure associated with the concept design REA, the REA Dam and an associated licensed discharge point (REA LDP). The key water management structures comprise:

- a series of concrete lined clean and dirty water diversion drains
- a number of small coarse settling ponds for trapping coarse sediment located near the car park and in the vicinity of the 109 ML Dirty Water Dam
- dirty water dams comprising:
 - the 109 ML Dirty Water Dam, used to de-silt water before being pumped to the 35 ML Discharge Dam
 - 7 ML Dam into which overflows from the Product Coal Stockpile occur
 - Train Loader Dam, enlarged after Modification 2 (**Plate 3**) is the pollution control dam for the train loading activities and used as a temporary storage dam prior to water being pumped to the 109 ML Dirty Water Dam
- 35 ML Discharge Dam used for the storage of clean / settled water, and which can overflow via LDP001 into Airly Creek, but rarely occurs
- Rail Loop Pollution Control Dam, for the capture of spills in the rail loop and subsequent management and to avoid downstream pollution impacts in Airly Creek.

The 35 ML Discharge Dam receives surface run-off from non-disturbed areas and either overflow or piped water fed by gravity from the 109 ML Dirty Water Dam following de-silting. Discharge from the 35 ML Discharge Dam via LDP001 occurs only due to rare rainfall events, comprising total 44 mm rainfall exceeding 44 mm over five days. This represents the rainfall depth for a 95th percentile, five-day rainfall event design criteria of the 35 ML Discharge Dam.

Additional water, up to 170 ML/year, is imported from Charbon Colliery by rail to meet shortfall in process water demand. The importation of water occurs on an as-needs basis. Water from trains are discharged, under gravity, directly into the Train Loader Dam (**Plate 4**) using flexible hoses prior to being pumped to the 109 ML Dirty Water Dam for storage and de-silting.

Figure 12 shows the catchments of all onsite water storages, with the exception of the Rail Loop Pollution Control Dam, under construction. This dam does not form part of the water management system at Airly Mine, as it will not be used for surface run-off capture to meet process water demand.

Surface run-off from around the pit top area, not captured in the existing onsite water storages, is diverted to Airly Creek.

4.8.1.2 Discharge Management Controls

To ensure that all water captured in surface dams and imported water from Charbon Colliery is available for site operations and discharge to Airly Creek is minimised, the following management controls are in place.

- The importation of water from Charbon Colliery is undertaken as required, and when Airly Mine surface water storages are less than 75% full. However, a 25% freeboard is maintained in all dams at all times.



Plate 4 **Enlarged Train Loader Dam**



Plate 5 **Water Trains from Charbon Colliery Discharging Water to Train Loader Dam**



- The water levels in surface water storages are continuously monitored.
- The water levels in surface water storages are maintained with sufficient freeboard to contain the 95th percentile, five-day rainfall event of 44 mm.
- Water is only imported from Charbon Colliery if there is no risk of discharges as a result of a five consecutive day total rainfall of 44 mm, allowed under Condition L2.5 of EPL 12374.

4.8.1.3 Maximum Harvestable Rights

Based on the contiguous area of property under ownership of Centennial Airly at the Airly pit top of 1710 ha, the maximum harvestable right for Airly Mine, comprising 10% of the average rainfall runoff of the total area is 128 ML/year (GHD, 2014b). The capacity of existing dams (excluding dams located in the surface facilities area, which are exempt) is estimated to be approximately 70 ML, and therefore, the remaining harvestable rights for the Project are 58 ML/year (45% of the total). The predicted volume of clean catchment runoff captured by the mine water management system has been estimated to be 28 ML/year. As this volume is within the maximum harvestable rights, there is no requirement for licensing of clean catchment runoff by Centennial Airly under the *Water Management Act 2000*.

4.8.2 Environment Protection Licence and Licensed Discharge Points

Airly Mine operates under Environment Protection Licence (EPL) 12374. Three licensed discharge points are included in EPL 12374 as follows (**Figure 12**):

- LDP001 (located on the 35 ML Discharge Dam)
- LDP002 (located on the 7 ML Dam)
- LDP003 (located on the Train Loader Dam).

No volumetric limits in discharges apply at any LDP. Limits on water quality of discharges at all are stipulated in Condition 2.4 of EPL 12374, however, the concentration limits do not apply when the discharge occurs solely as a result of rainfall measured at the premises which exceeds a total of 44 mm of rainfall over any consecutive 5-day period.

4.9 Process Water

The current primary water demands are for underground mining operations, surface dust suppression, machinery washdown, fire-fighting storage and staff amenities. Water sources at the pit top that meet the process water demand include:

- direct rainfall onto storages and catchment runoff
- roof run-off (for bathhouse and amenities)
- groundwater inflows to the underground workings, when available
- production bore
- water imported from Charbon Colliery to meet a shortfall in process water.

Seepage of groundwater into the underground workings has been reported to be negligible generally, and this seepage has not to date required regular mine dewatering. Monitoring data to date indicates that groundwater inflows and additional process water used in underground operations is entrained in the ROM coal. As a result, no groundwater inflows are available to be reclaimed and reused as process water.

4.10 Potable Water

As Airly Mine is not connected to a municipal water supply, drinking water is supplied by bottled water. As noted above, water for amenities is harvested from the rooftops of the administration and facilities buildings, however is supplemented by trucked water when required.

4.11 Mine Inflows and Recalibrated Groundwater Model

The original Airly Mine numerical MODFLOW groundwater model, developed in 2014, informed the Groundwater Impact Assessment (GHD, 2014a) for the Airly MEP EIS (Golder Associates, 2014). Mine inflow predictions in the Airly MEP EIS have recently been reviewed against contemporary monitoring data. To date, only very small volumes of water have been intercepted during mining (**Section 4.9**). The original groundwater model has been recalibrated with the recent monitoring data.

Mine inflow predictions from the recalibrated groundwater for the approved 1.8 Mtpa production rate was reported in Groundwater Assessment letter report (GHD, 2019b), supporting the *Statement of Environmental Effects* (Centennial Coal, 2019a) for Airly Modification 2 application. The mine inflows predicted for the 1.8 Mtpa scenario was 76 ML/year (2030).

The Hydrogeological Model Report (HMR) (GHD, 2019a) for the calibrated groundwater model is appended as **Appendix C**. The model is considered to have the characteristics predominantly of class 2 confidence level (i.e. moderate confidence) in accordance with the confidence level classification of the *Australian Groundwater Modelling Guidelines* (AGMG) (Barnett et al., 2012).

The HMR (GHD, 2019a) has been peer reviewed by Dr Noel Merrick (HydroSimulations), as required by the NSW Aquifer Interference Policy. The peer review letter for the HMR, is appended to the HMR (GHD, 2019a) in **Appendix C**. The peer review letter concludes:

- the degree of model complexity and modelling effort are appropriate for Airly Mine, being risk-assessed as a low risk assessment
- the recalibrated model is *fit for purpose*, where the purpose is jointly estimation of water take and reduction in groundwater pressure heads.

Section 4.3.1 of the HMR (GHD, 2019a) also describes the uncertainty analysis undertaken in accordance with IESC (2018), using a wide range of parameters to determine a range of possible groundwater inflows into the mine for the proposed 3 Mtpa case.

4.12 Effluent Management

Sewage and grey water at the pit top are treated on site using a sewage treatment facility approved by Lithgow City Council (Approval # 034/10S68). The ECOMAX effluent treatment system is rated for 150 FTE personnel.

Effluent from the underground, the administration buildings and bathhouse are directly transferred to the ECOMAX effluent treatment system using pipeline systems for disposal via soil infiltration. Sewage and wastewater from the septic tanks located in the vicinity of the Train Loader facility is transferred to the treatment system using licensed contractor.

4.13 Waste Management

4.13.1 Production Waste

No production waste comprising reject materials from ROM coal beneficiation is generated at Airly Mine as the CPP has not been constructed.

4.13.2 Non-Production Waste

Waste management at Airly Mine is managed in accordance with the MOP with all potentially hazardous material stored and/or banded appropriately in accordance with relevant standards. A waste management and recycling strategy is currently implemented and Airly Mine has a contract with JR Richards for waste disposal.

4.14 Environmental Management

4.14.1 Environmental Management Strategy

Airly Mine operates under an Environmental Management Strategy (EMS) (Centennial Coal, 2018b) developed to adhere to Centennial Coal's Environmental Policy. The Centennial Coal Environmental Policy promotes environmental awareness and is designed to minimise impacts and thus manage its operations in a sustainable manner.

The EMS incorporates a number of Environmental Management Plans (EMPs), listed below, designed to assist in meeting community expectations and regulatory conditions, including the conditions of the EPL 12374. The below listed approved management plans are available at the Centennial Coal website:

- Airly Mine Extraction Plans and associated management plans
- Airly Mine Noise Management Plan
- Airly Mine Air Quality and Greenhouse Management Plan
- Airly Mine Water Management Plan, comprising:
 - Site Water Balance
 - Surface Water Management Plan
 - Groundwater Management Plan
- Airly Mine Biodiversity Management Plan
- Airly Mine Traffic Management Plan
- Airly Mine Historic Heritage Management Plan
- Airly Mine Aboriginal Cultural Heritage Management Plan
- Exploration Activities and Minor Surface Infrastructure Management Plan
- Rehabilitation Management Plan (Mining Operations Plan)
- Extraction Plans
- Pollution Incident Response Management Plans

Airly Mine operates in accordance with the *Airly Mine Mining Operations Plan (MOP) 01 January 2018 to 31 December 2024* (Centennial Coal, 2017a).

4.14.2 Environmental Monitoring, Independent Audit and Reporting

Monitoring undertaken for compliance with relevant criteria under Schedule 4 of SSD 5581 are reported on an annual basis in an *Annual Review* (Schedule 6 Condition 10) submitted to DPIE and other the stakeholders by the end of March every year. The *Annual Review* also reports in accordance with Condition 3 of mining lease ML 1331, EPL 12374 conditions, subsidence data in accordance with Extraction Plan approvals, WALs and onsite ECOMAX sewage management approval. The Statement of Compliance included in the *2018 Annual Review* shows the mine was compliant with all conditions of the relevant approvals.

Operational activity data (rail transport, coal stockpile, employee numbers) are also included in the *Annual Reviews*.

The EPBC Act approval EPBC 2013/7607 Condition 4 requires preparation of an *Annual Compliance Report*.

Copies of *Annual Reviews* (SSD 5581) and the *Annual Compliance Report* (EPBC 2013/7607) are available at the Centennial Coal's website.

Environmental monitoring data, to satisfy the requirements of EPL 12374 for air quality and surface water quality are reported at the Centennial website on a monthly basis. These reports also provide coal transport and water receipt data (days and times of coal loading on trains and water trains received from Charbon Colliery, tonnage of coal transported off site and volumes of water received from Charbon Colliery).

Condition 12 under Schedule 12 of SSD 5581 requires within one year of commencement and every 3 years thereafter, unless the Planning Secretary directs otherwise, an Independent Environmental Audit at Airly Mine. An environmental audit was carried out by MCW Environmental in January 2018 (MCW Environmental, 2018). The audit report and Airly Mine's responses are available at the Centennial Coal website.

Incident reporting, as required under Schedule 6 Condition 9, is undertaken in accordance with the Pollution Incident Response Management Plans.

Notifications of landowners / tenants of exceedances of any relevant criteria in Schedule 4 are required under Schedule 5 Condition 1.

4.14.3 Environmental Monitoring Relevant to Modification 3

4.14.3.1 Subsidence

As noted in **Section 4.3.6.2**, the Extraction Plans prepared for secondary extraction within approved zones (in accordance with Condition 7, Schedule 3 of SSD 5581) require the development and implementation of an integrated Subsidence Monitoring Program to demonstrate that subsidence effects and impacts within each mining zone are within approved limits and meet the performance criteria for natural and built environments and the heritage values of the area.

Subsidence Monitoring Program for each Extraction Plan is developed in consultation with the IEP, NSW RR and key stakeholders including NPWS as landowners and managers of the Mugii Murum-ban SCA.

Conventional subsidence monitoring techniques have historically typically required targeted clearing of vegetation to establish narrow (but potentially long) survey lines. In the case of mines such as Airly, where conservative mine planning is specifically designed to avoid surface impact, clearing required for survey *monitoring* can potentially present an even greater risk to sensitive vegetation than the *mining* it is actually intended to monitor. In such cases an alternative approach is required.

Accordingly, an **integrated** approach to subsidence monitoring is undertaken at Airly Mine, particularly for panel and pillar 'miniwall' mining, harnessing a wide range of methods which provide complementary information which can be used to demonstrate that subsidence effects and impacts within each mining zone are within approved consent conditions.

The integrated monitoring program at Airly Mine currently encompasses the following techniques and methods.

- Underground mining controls comprising routine survey of workings and visual inspections.
- Detailed conventional monitoring of ground movements and effects including:
 - conventional subsidence monitoring lines, which provide accurate 3D movements at specific survey line locations during periodic survey, and are located primarily on existing

- tracks and trails on Mount Airly to monitor panel and pillar mining, and two existing subsidence lines in Airly Gap for the bord and pillar workings
- fixed GPS monitoring at targeted locations providing accurate real-time data for 3D movements at key sensitive locations including cliffs in proximity to mining
- conventional laser survey of prisms located on targeted sensitive features in key locations (e.g. pagodas and cliffs), providing accurate 3D movements during periodic survey.
- Remote monitoring of the surface environment comprising:
 - high resolution 3D photogrammetry providing detailed georeferenced data across the entire surface of survey areas at 5 cm pixel resolution or better
 - routine high definition LiDAR surveys providing detailed georeferenced data across the entire surface of survey areas at 4 returns/m² or better
 - additional aerial visual inspection at a higher frequency interval if required e.g. during the commencement panel for miniwall mining on Mount Airly, or as per TARP requirements.

The ongoing data collected from each mining zone allows confirmation that subsidence predictions are within the approved limits and mine design is performing as designed. The monitoring data gathered also informs decisions on the future mine design and monitoring systems as mining progresses from less sensitive areas to areas where greater protection to the geodiversity is required. The data acquired is complementary and progressively enhances the current understanding of any potential mining impacts through sophisticated analyses of collected data to establish any correlations between mine design parameters and measured subsidence under defined geological / geotechnical conditions. Through successful implementation of low impact advanced and integrated remote monitoring techniques on Mount Airly, it is intended to demonstrate that subsidence can be successfully monitored without the need for conventional monitoring on the surface which could involve vegetation clearing. The result will be that no significant new disturbance would be required in future mining areas (particularly Genowlan Mountain) thus avoiding the impacts of conventional survey monitoring lines

Full details of monitoring locations, methods and frequencies are provided within the Subsidence Monitoring Program relevant to each approved Extraction Plan.

The currently approved Extraction Plans are described in **Table 3**.

4.14.3.2 Surface Water

Water flow and quality monitoring are undertaken in accordance with the *Airly Water Management Plan* being part of the *Western Region Water Management Plan* (Centennial Coal, 2018c). **Figure 13** shows the monitoring locations for both surface flow and water quality monitoring.

Water quality monitoring sites comprise sites at the pit top as well sites for Gap Creek and Genowlan Creek. Continuous flow monitoring is undertaken at LDP001, Gap Creek and Genowlan Creek. Additional flow monitoring (V-notch weir) is planned to be installed at the Genowlan Creek 2 site in 2019, to provide continuous flow monitoring.

The surface water monitoring program consists of:

- continuous flow gauging on Gap Creek and Genowlan Creek (two locations)
- monthly water quality sampling (when water is present) at Airly Creek, Gap Creek, Genowlan Creek and The Grotto.
- monthly water quality sampling of dams at the pit top
- water quality sampling at LDP001, LDP002 and LDP003 during discharge and gauging at LDP001.

Condition L2 of EPL12374 requires surface water quality monitoring on a monthly frequency during discharges at LDP001, LDP002 and LDP003 for electrical conductivity (EC), pH, total suspended solid concentration (TSS), and oil & grease.

There have been no discharges from LDP001 since April 2012 and no discharges from LDP002. LDP003 discharges are infrequent, with only two discharges reported since approval of SSD 5581 in December 2016.

Water flow and quality monitoring data are reported as part of the monthly environmental monitoring data, *Annual Reviews* and *Annual Returns* for EPL 12374.

Stream health monitoring also forms part of the *Airly Water Management Plan* and the program comprises:

- watercourse stability monitoring every two years
- biannual aquatic ecology monitoring on Airly Creek, Torbane Creek, Dog Trap Creek, Gap Creek and Genowlan Creek.

4.14.3.3 Groundwater

Groundwater level and quality monitoring are undertaken in accordance with the *Airly Water Management Plan* being part of the *Western Region Water Management Plan* (Centennial Coal, 2018c). **Figure 14** shows the monitoring locations.

The groundwater monitoring (level, water quality) network consists of:

- 10 standpipe groundwater monitoring bores
- 27 vibrating wire piezometers (VWP) at 9 locations
- sampling of groundwater quality (see below)

The monitoring network also includes:

- monitoring of seepage from old shale workings at Village Spring
- annual stygofauna sampling at 5 standpipes.

Groundwater level monitoring undertaken monitor different strata or aquifers (**Section 3.10, Figure 15**) comprising the Narrabeen Sandstone, Irondale Seam, Lithgow Seam, Marrangaroo Sandstone, Middle River Seam, Shoalhaven Group, and Devonian groundwater. The groundwater level monitoring data from 2012 to 2018 are shown in hydrographs included in Appendix B.2 of the Groundwater Impact Assessment (GHD, 2019c), appended as **Appendix E**.

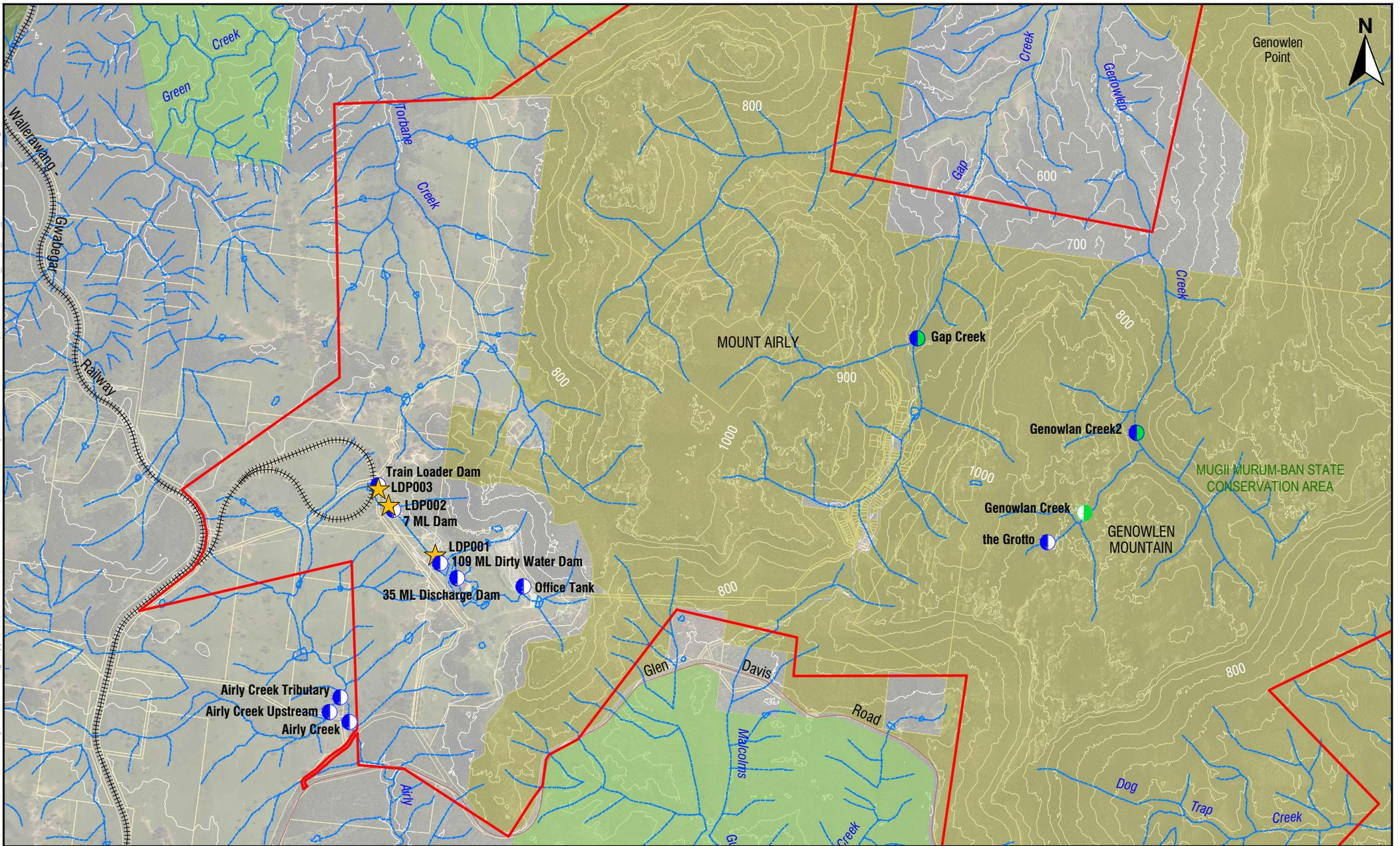
Groundwater quality is monitored at the following aquifers:

- local groundwater alluvium sources (Standpipes: ARP05, ARP09, ARP14), sediments above the outcropping Narrabeen Sandstone/ Permian Coal Measures (ARP11), Narrabeen Sandstone (ARP15SP) and Lithgow Seam (ARP13SP)
- Shoalhaven Group (as represented by 'Production Bore' AM2B-1)
- Lower Devonian Group (as represented by 'Nioka').

Level and water quality data are acquired at the following monitoring frequencies:

- groundwater levels and pressures recorded continuously at standpipes (every 1 to 6 hours) and VWPs (every 12 hours) and downloaded monthly
- flow gauge continuously records flow at Village Spring
- monthly groundwater quality sampling at standpipes, Village Spring and the production bore
- quarterly groundwater quality sampling at Nioka.

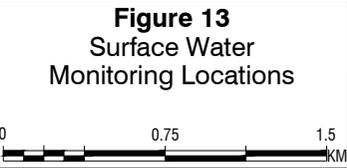
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LEGEND:	
	Project Application Area
	Flow Monitoring
	Flow and Water Quality Monitoring
	Water Quality Monitoring
	Licensed Discharge Point
	Major Roads
	Watercourse
	Cadastral Boundary
	Railway
	State Forest
	National Park
	State Conservation Area

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DATE	09.10.2019
SEAM	LITHGOW
REFERENCE	SLR63012381_AM3_F13_AIR_SURFWATER_03.dwg
SCALE	1 : 35000



Centennial Coal
Airly

Prepared by: SLR

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The groundwater quality data in the period 2010 – 2018 are presented in Appendix B.3 of the Groundwater Impact Assessment (GHD, 2019c).

Seepage monitored at the Village Spring is fed by drainage from old shale workings. The average rate of seepage of groundwater at the Village Spring from the Permian strata at using data between February 2011 and August 2013, was approximately 4.8 kL/day, and between September 2013 and December 2014, it was 2.8 kL/day. From January 2015 onwards, the typical rate of seepage has been between 1 kL/day and 2 kL/day.

Level and water quality monitoring data are reported in *Annual Reviews*. No groundwater drawdowns have been reported beyond the consent boundary. Drawdowns observed within the consent boundary in the alluvium and the Permian strata are consistent with the drawdown predictions included in the EIS groundwater impact assessment (GHD, 2014). There has been no observable change to groundwater quality or change in the beneficial use of groundwater.

As required by Condition 14 under Schedule 4, Airly Mine's Water (Groundwater) Management Plan was reviewed by Greg Sheppard, Principal Hydrogeologist from Jacobs in 2018 (Jacobs, 2018), as part of the Independent Environmental Audit, and also included the review of the Hydrogeological Model that supported the EIS (GHD, 2014a).

4.14.3.4 Noise

Airly Mine has no specific noise monitoring requirements or noise criteria on EPL 12374. However, Schedule 4, Condition 2 of SSD 5581 provides noise criteria for any residence on privately-owned land and two passive recreation receptors (Camp Ground) and Nissen Hut, shown in **Figure 7**.

Noise monitoring is undertaken in accordance with the *Airly Mine Noise Management Plan* (Centennial Coal, 2018d), with attended noise monitoring undertaken for day, evening and night periods once a year at three locations comprising rail loop, off Glen Davis Road and Camp Ground.

No non-compliances against the noise criteria in SSD 5581 at any monitoring location have been recorded to date, since monitoring commenced in 2013. There have been no noise-related complaints received by the site to date.

4.14.3.5 Air Quality

Condition 5 under Schedule 4 provides air quality criteria for PM₁₀ particulate matter, total suspended solids and deposited for compliance at any residence on privately-owned land. Air quality monitoring is undertaken in accordance with the *Air Quality & Greenhouse Gas Management Plan* (Centennial Coal, 2018e). Deposited dust rates in accordance with the short-term goals are monitored at four representative locations. A High-Volume Air Sampler for PM₁₀ concentration monitoring will be installed in 2019 as part of the long-term monitoring program described in the *Air Quality & Greenhouse Gas Management Plan*.

The monthly deposited dust results in the last 6 years since monitoring commenced in 2013 have not shown any exceedance against the criterion 4 g/m²/month.

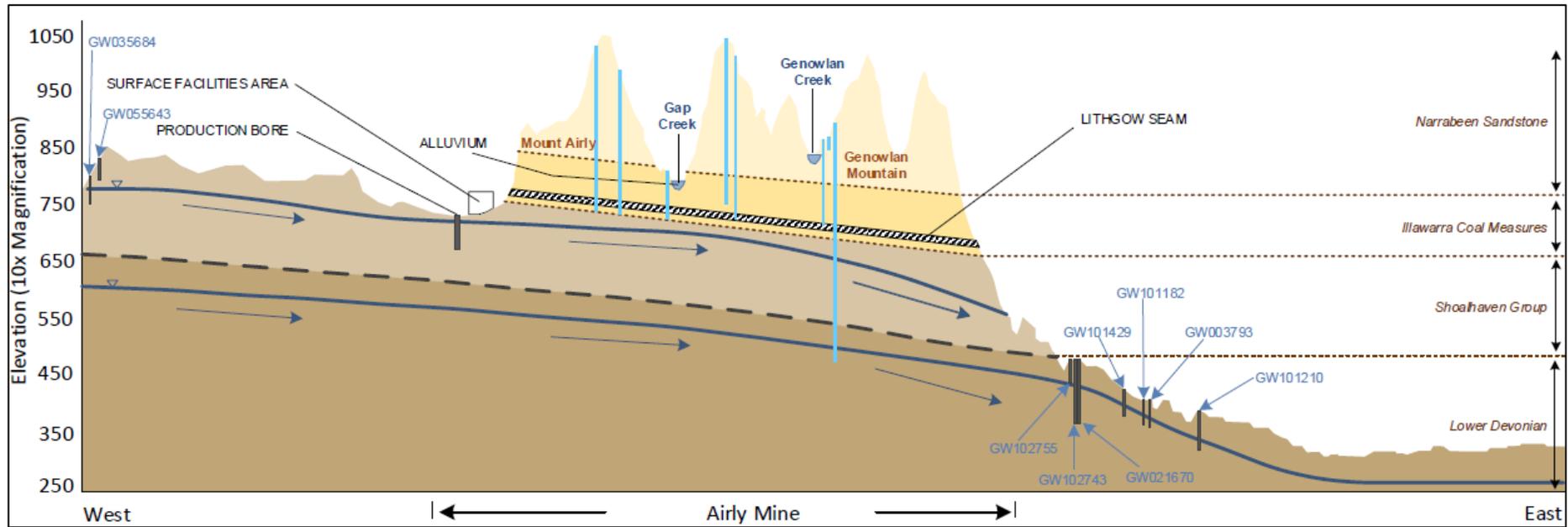


Figure 15 Airly Mine Monitoring Bores and Select Nearby Groundwater Users



4.15 Water Licensing

The Project Application Area is regulated by two Water Sharing Plans (WSP), made under Section 50 of the *Water Management Act 2000* (WM Act). The Greater Metropolitan Region Unregulated River Water Sources WSP (GMRU WSP) regulates surface water resources and the Greater Metropolitan Region Groundwater Sources WSP (GMR WSP) regulates groundwater resources.

Airly Mine is located within the Capertee River Management Zone which is part of the Hawkesbury and Lower Nepean Rivers Water Source covered by the GMRU WSP.

Groundwater extraction and interception is from the Sydney Basin North Groundwater Source which is covered by the GMR WSP.

Airly Mine holds two Water Access Licences (WAL) under the WM Act from the Sydney Basin North Groundwater Source with a total volumetric limit of 278 ML/year (**Table 3**):

- WAL24386 (for the Production Bore) with volumetric limit of 158 ML/year
- WAL36565 with volumetric limit of 120 ML/year.

These WALs collectively cover the mine inflows and the Production Bore extraction. The water supply work approval associated with the production Bore is 10WA112537.

4.16 Rehabilitation and Final Landform

Rehabilitation activities at Airly Mine are undertaken in accordance with the *Airly Mine Mining Operations Plan (MOP) 01 January 2018 to 31 December 2024* (Centennial Coal, 2017a). The MOP has been prepared in accordance with the Department of Industry – Division of Resources and Energy (DRE) publication titled *ESG3: Mining Operations Plan (MOP) Guidelines* (Division of Resources and Energy, 2013). The MOP addresses the requirements of a *Rehabilitation Management Plan* for the mine in accordance with Condition 29 under Schedule 4 of SSD 5581, and Condition 3 of ML1331.

Since Airly Mine is an underground mine, the relatively small disturbance footprint associated with surface infrastructure at the pit top means there are limited opportunities for progressive rehabilitation. Progressive rehabilitation is undertaken to the extent that is appropriate in areas no longer required for mining or mining related activities and are undertaken as soon as is reasonably practicable.

Rehabilitation works undertaken are reported annually in the *Annual Review*, as required to meet the requirements of Condition 11 under Schedule 6 of SSD 5581 and the *Post-approval requirements for State significant mining development – Annual Review Guideline* (DPE, 2015a). The *Annual Review* is submitted to regulators and made available to the community via Airly Mine's website.



5.0 DESCRIPTION OF MODIFICATIONS

5.1 Overview

Centennial Airly Pty Limited is proposing a modification to Airly Mine's consent SSD 5581 to allow:

- an increase in the ROM coal production rate from the approved 1.8 Mtpa to 3.0 Mtpa (**Section 5.2.1.1**)
- an amendment to the approved 20-year mine schedule for the increased production rate (**Section 5.2.1.3**)
- underground blasting (or shot-firing) activities for the removal of geological structures in the event they are encountered within the mining areas (**Section 5.2.1.4**)
- an increase in workforce from the approved 155 FTE personnel to 200 FTE personnel (**Section 5.2.2**)
- an increase in the movement of laden coal trains and water trains leaving the site from the approved average of 2 trains per day to 3 trains per day over any calendar year but maintaining the approved maximum 5 trains per day leaving the site on any day (**Section 5.2.5**).

The SSD 5581 Project Application Area boundary will remain unchanged and no major changes to the site infrastructure will be required. The existing water management will not change. Surface water harvested from the site and water available from the Production Bore will continue to be utilised as process water prior to importing additional water from Charbon Colliery. The revised mine inflows (**Section 5.3**) from the recent recalibration of Airly Mine groundwater model using recent groundwater monitoring shows the mine cannot rely on mine inflows to supplement the process water requirements.

Hours of operations are not proposed to change from the approved 24 hours per day and seven days per week.

5.2 Proposed Modification Details

Table 5 summarises and compares the relevant components of the operations approved under SSD 5581, and the operations that are proposed to be modified.

The following sections provide further details on the proposed modifications.

5.2.1 Mining

5.2.1.1 Coal Production Rate

The ROM coal production rate is proposed to be increased to 3.0 Mtpa. The annual mining intensity will increase, however the daily production rates will not change significantly as a result of the proposed increase in production rate. As discussed in **Section 1.4**, the proposed increase in production will be achieved through a combination of strategies but mainly through mining coal on more days in a year. This is possible due to the availability of additional mining equipment underground which reduces downtime from 4 weeks to 5 days and allowing additional days in a year for coal extraction.

There is no proposal to beneficiate (wash) the ROM coal prior to dispatch offsite, given the construction and operation of the CPP and the REA is not in the current Airly Mine's five-year business plan.

Table 5 Modification Key Features and Comparison with Approved Operations

Key Feature	Description of Approved Operations	Proposed Change
Project Life	20 years from date of commencement with expiry date of 31 January 2037.	<ul style="list-style-type: none"> No change
Development Consent Boundary	Corresponds to the Project Application Area boundary comprising Mining Lease ML1331 and Authorisation 232 (A232) with areas of 2,744 ha and 3,096 ha respectively, and a total 3,982 ha.	<ul style="list-style-type: none"> No change
Hours of Operation	24 hours per day, 7 days per week	<ul style="list-style-type: none"> No change
Employment	155 FTE personnel including contractors	<ul style="list-style-type: none"> 200 FTE personnel
Mining Method and Mining Area	Underground mining using a combination of first workings and partial extraction mining methods, within five approved mining zones. <ul style="list-style-type: none"> Panel and Pillar Zone Cliff Line and First Workings Zone Partial Pillar Extraction Zone Shallow Zone New Hartley Shale Mine Potential Interaction Zone (first workings only). Restrictions on mining as per Condition 1 of Schedule 3 apply (Section 3.3.6).	<ul style="list-style-type: none"> No change
ROM Coal Production	1.8 Mtpa	<ul style="list-style-type: none"> 3.0 Mtpa
Coal Handling, Stockpiling and Processing	<ul style="list-style-type: none"> A system of surface and underground conveyors constructed to operate at 500 tonne per hour. Three approved coal stockpiles: <ul style="list-style-type: none"> a 30,000 tonne ROM Emergency Stockpile a 200,000 tonne Product Coal Stockpile a 40,000 tonne ROM Coal Stockpile in the vicinity of the CPP. A CPP with a processing capacity of 500 tonne per hour with water recycling facility is approved but is not constructed as yet. 	<ul style="list-style-type: none"> No change
Rail Transport (coal and water)	<ul style="list-style-type: none"> All product coal transported from the site by rail to domestic power stations and export markets. No more than an average of 2 laden trains leave the site each day over any calendar year No more than 5 trains (10 train movements) per day leave the site on any day No more than 1 water train (2 movements) is received from Charbon Colliery on any day. 	<ul style="list-style-type: none"> No change in coal destinations Increase in the frequency of trains leaving the site to an average of 3 trains per day over a calendar year but maintaining the approved maximum 5 trains leaving the site on any day.
Reject Management	<ul style="list-style-type: none"> Co-disposal REA for emplacement of fine and coarse reject materials. REA capacity of 5.3 Mm³ Reject materials hauled from CPP to REA using trucks. 	<ul style="list-style-type: none"> No change
Site Access	Mine Access Road off Glen Davis Road, 3 km from Capertee Village	<ul style="list-style-type: none"> No change

Key Feature	Description of Approved Operations	Proposed Change
Mine Support Facilities	<ul style="list-style-type: none"> Underground access and associated infrastructure Engineering and services Coal handling, preparation and transport infrastructure Support services and administration at the Pit Top Non- mine owned infrastructure 	<ul style="list-style-type: none"> No change
Underground Water Management	A mine dewatering system, comprising pipelines, underground impoundment dams and pump stations, to pump mine inflows from the underground to the 109 ML Dirty Water Dam for storage and subsequent use as process water.	<ul style="list-style-type: none"> No change
Surface Water Management	<ul style="list-style-type: none"> A system of water management structures comprising settling ponds, clean and dirty water diversion drains allow separation and storage of clean and dirty water at the pit top, for use as process water. Clean and dirty water dams comprise: <ul style="list-style-type: none"> 109 ML Dirty Water Dam 7 ML Dam Train Loader Dam REA Dam (not constructed) 35 ML Discharge Dam Three Licensed discharge points on EPL 12374: LDP001, LDP002, LDP003 Rail Loop Pollution Control Dam (under construction) 	<ul style="list-style-type: none"> No change
Process Water	Process water sources: <ul style="list-style-type: none"> Mine inflows (when available) Surface dams at Airly pit top Airly Mine's production bore (Bore Licence Number 10BL603503) Charbon Colliery - up to 170 ML/year, on an as needs basis. 	<ul style="list-style-type: none"> No change.
Mine Ventilation	Two electrically powered centrifugal fans (exhausting types), attached to the northern-most access adit at the pit top.	<ul style="list-style-type: none"> No change
Waste Management	Production (reject) and non-production waste (putrescibles and recyclables)	<ul style="list-style-type: none"> No change
Construction & Exploration	<ul style="list-style-type: none"> Construction of REA and CPP Construction hours: <ul style="list-style-type: none"> 7:00 am - 6:00 pm Monday to Friday 8:00 am to 1:00 pm Saturdays No construction work is to take place on Sundays or Public Holidays.	<ul style="list-style-type: none"> No change
Rehabilitation	Progressive and life of mine	<ul style="list-style-type: none"> No change

5.2.1.2 Mining Method and Mining Area

No changes are proposed to the approved mining methods, the approved mining zones or the mining area. The proposed increase in production will not result in increases in the magnitude of subsidence impacts though the predicted impacts would occur more quickly. Subsidence impacts over the life of mine will continue to meet the subsidence impact performance measures included in Schedule 3 Condition 2 (natural and heritage features etc.) and Schedule 3 Condition 3 (built features) of SSD 5581.

5.2.1.3 Mine Schedule

The approved mine schedule has been updated to reflect the increase production rate of 3.0 Mtpa. Approval is sought for the updated mine schedule, however the mine life of 20 years from the date of consent and the consent expiry date (31 January 2037) is not proposed to be amended.

Consultations for the Airly MEP EIS and subsequent Extraction Plans have resulted in a clear focus to develop **low-impact** mining strategies which protect threatened flora and endangered ecological communities (e.g. at Genowlan Point) and the geodiversity of the Mount Airly and Genowlan Mountain mesas, with higher protection required to be afforded to Genowlan Mountain with platy pagodas due to their uniqueness (Washington and Wray, 2011).

A strategic and logical approach was proposed in the EIS to commence mining and monitoring on Mount Airly in less sensitive areas where there is existing disturbance (including existing tracks and trails) and the geodiversity is of lesser sensitivity, prior to moving to more sensitive areas including Genowlan Mountain.

Figure 16 provides the updated mine schedule. The mine schedule proposed continues to reflect the intention to complete panel and pillar mining under Mount Airly prior to undertaking panel and pillar mining under Mount Genowlan. The ongoing subsidence data acquisition (**Section 4.14.3.1**) in conjunction with any other monitoring required during the Extraction Plan approvals will be sufficient for any adaptive management actions to be implemented for the proposed mining.

5.2.1.4 Blasting

Geological structures such as lineaments and igneous rock dykes have not been encountered to date during mining at Airly Mine and therefore has hindered mining progress. Whilst igneous intrusions are not expected to be pervasive across the mining area (SRK, 2012; 2018), there is potential for the occurrence of minor geological structures in the Lithgow coal seam, which would require the use of explosives to break the features to allow mining to progress.

To allow for the mine to be able to use explosives to remove any geological structures within the mining area if the need arises, approval to carry out underground blasting is sought in this modification. Blasting will be undertaken within all approved mining zones within the Mount Airly–Genowlan Mountain mesa complex, discussed in **Section 4.3.6.1** and shown in **Figure 10**.

Blasting will not be carried out regularly and will only be undertaken on an as needs basis, when a geological structure cannot be dislodged by mining equipment safely and requires removal by blasting.

Explosives required for the blasting will not be stored on site but will be brought to the site on the day it will be used. Handling of explosives and detonators and the blasting (shot-firing) will be undertaken by suitably qualified personnel from within Centennial Coal operations, or a suitably qualified contractor will be engaged to undertake the tasks.

A High-Risk Activity notification, under the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*, along with the relevant documentation will be provided to the Division of Resources and Geosciences seven days prior to the activity.

5.2.2 Employment

The workforce is proposed to be increased by 45 FTE personnel to 200 FTE personnel, and will include contractors. Additional staff is required to facilitate the proposed increase in ROM coal production, in conjunction with other approaches to achieve the proposed production rate.

5.2.3 Water Management

Mine water management at the pit top will not change. Both the surface and groundwater management will continue to be undertaken as described in **Section 4.7** and **Section 4.8**.

Section 5.3 provides the maximum mine inflow predictions for the 3 Mtpa production rate will be 71 ML/year (2027), slightly less than the 76 ML/year predicted for the approved 1.8 Mtpa production rate.

Site water balance assessments presented in GHD (2019d) and **Section 8.4** show that, with the mine inflows predictions for the 3 Mtpa and 200 FTE personnel the volumes of water available from site sources and the 170 ML/year water imported from Charbon Colliery (**Section 4.8**) will not be sufficient to meet the total process water demand in a dry year. There will be a deficit of 42 ML/year (**Table 16**) in dry year for all currently approved operations (including the CPP and the REA), however no deficits identified have been identified for the wet year and on average.

The proposed modification is not seeking to increase the volume of water imported from Charbon Colliery. Given the construction of the CPP and the REA are not in Airly Mine's current five-year business plan (refer **Section 4.4.3** and **Section 4.5**), a site water balance without the operation of the CPP and the REA confirms (**Table 16**) that the mine can operate at 3 Mtpa production rate and 200 FTE personnel within the constraints of the existing water management and process water availability at the site, including in a dry year.

In the event that, Airly Mine's five-year business plan changes and the mine makes a decision to construct the CPP to beneficiate ROM coal, Centennial Airly will review the water balance and implement management practices to ensure no additional importation of process water would be required (**Section 8.4.6**).

5.2.4 Effluent Management

The existing ECOMAX sewage treatment facility, currently rated for 150 FTE personnel, will be upgraded or replaced when the number of FTE personnel at the site exceed 150 personnel. A review of the existing system will be undertaken to determine whether an update or the replacement of the system is required. Approvals from LCC will be sought prior to update or replacement works.

5.2.5 Rail Transport

Coal will continue to be transported from Airly pit top to offsite locations (domestic power stations and for the export market) using rail. To accommodate the clearance of the additional coal production, an increase in train movements is proposed in the modification. It is proposed to increase the train movements from an average of 2 trains per day to an average of 3 trains per over a calendar year but retain the approved maximum of 5 trains per day. These train movements will include water trains as well. The rail noise assessment (**Section 8.7**) has assessed maximum 3 coal trains operating on the Wallerawang-Gwabegar rail line, in the day period (7 am – 10 pm) or the night period (10 pm – 7 am), to provide flexibility in operations as the availability of train pathing is not always in Centennial Airly Mine's control.

The restrictions on the proposed rail movements will be consistent with Condition 8, Schedule 2 of SSD 5581) and the number of water and coal trains leaving the Airly pit top via the rail loop to enter the Wallerawang-Gwabegar rail line will be as follows.

- (a) Movement of laden coal trains and water trains will be restricted to:
 - (i) no more than an average of 3 trains leaving the site per day over any calendar year, and
 - (ii) no more than 5 trains leaving the site on any day, and
- (b) No more than one water train will be received from Charbon Colliery on any day.

The rail transportation routes for the coal and water trains will not change (**Figure 9**).

5.2.6 Additional Underground Equipment

To achieve the increase production rate the following additional equipment will be required underground:

Equipment to be installed will comprise an additional continuous miner (increase from the existing three continuous miners to four continuous miners) and one additional set of panel and pillar extraction equipment, to allow a reduction in relocation time between extraction panels (**Section 1.4**).

The additional continuous miner is already available. Some of the components for the additional set of panel and pillar extraction equipment are already available and the remainder will be sourced from other Centennial Coal subsidiaries and will be utilised following minor refurbishment works.

5.3 Mine Inflows for 3 Mtpa Production Rate

Predictions for the 3 Mtpa production rate proposed in this Modification Report from the recalibrated groundwater model (**Section 4.11**) is presented in **Figure 17**. The mine inflows from the recalibrated model for the 1.8 Mtpa production rate (GHD, 2019a) and the mine inflows included in the Airly MEP EIS from GHD (2014b) are also included in **Figure 17**.

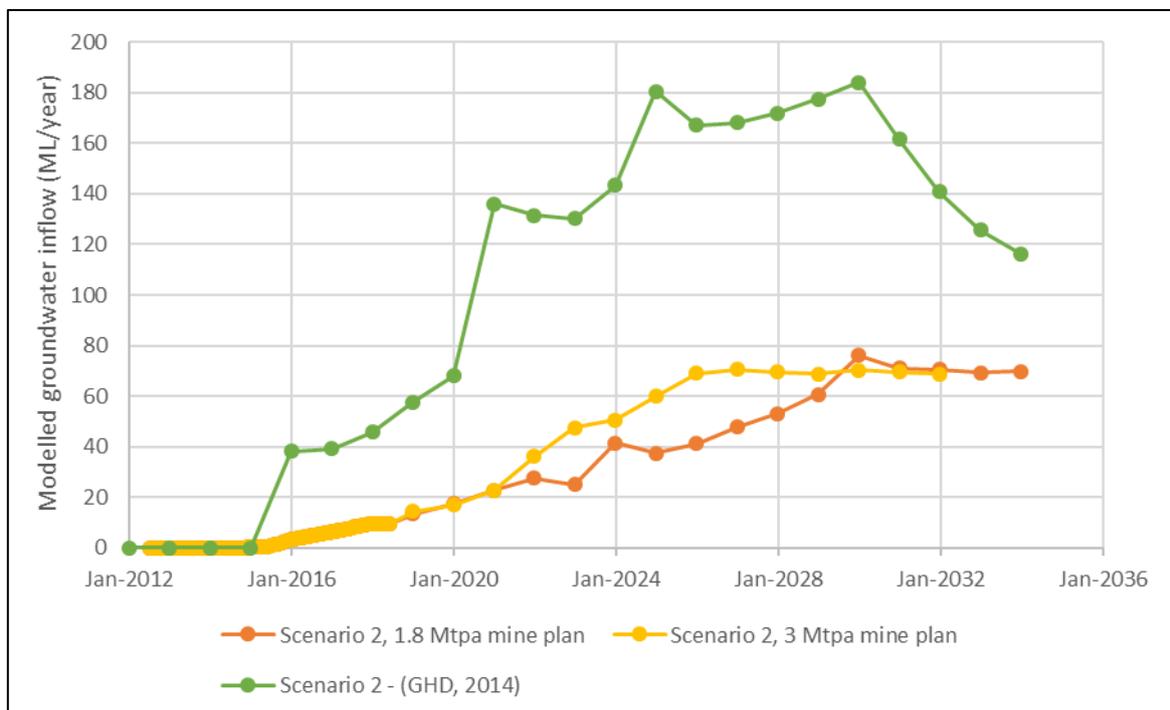


Figure 17 Mine Inflows from Recalibrated Groundwater Model and EIS

The significance of the Scenario 1 and Scenario 2 predictive modelling simulations are described in detail in Section 4.2 of the Hydrogeological Model Report (HMR) (GHD, 2019b). The Groundwater Impact Assessment (GHD, 2019c) utilised the Scenario 2 mine inflows for the impact assessment and

a justification for using Scenario 2 over Scenario 1 predictions is provided in Section 5.1.2 of GHD (2019c)

Figure 17 shows for the 3 Mtpa production rate the modelled groundwater inflow rate increases over time to a peak of 71 ML/year in 2027, before gradually decreasing, to 69 ML/year in 2031, the final year of mining. The peak inflow for the 3 Mtpa production rate is predicted to occur earlier than for the 1.8 Mtpa production rate, however the peak inflow is predicted to be slightly greater for the 1.8 Mtpa case (76 ML/year) in 2030. The mine inflow predictions for both the 1.8 Mtpa and 3 Mtpa production rates from the groundwater model are significantly less than the 183 ML/year maximum mine inflows predicted for the 1.8 Mtpa production rate in the Airly MEP using the original groundwater model (GHD, 2014b).

It is noted that, for the 1.8 Mtpa production rate, mining is scheduled to finish in 2033. Mine inflows for both the 1.8 Mtpa and the 3 Mtpa production rates are similar at the end of mining as the mine plan has the same footprint for both scenarios. Therefore, at the end of mining in both scenarios, groundwater inflow into the mine is occurring into the same mine area resulting in similar inflows.

5.4 Water Licensing

No changes to water licensing will be required due to the proposed modification.

5.5 Environmental Management

Airly Mine will continue to undertake monitoring and reporting in accordance with the existing EMS as described in **Section 4.14**. The management plans will continue to be reviewed regularly and updated as required. Monitoring results will continue to be reported in accordance with the EPL 12374 requirements, and on an annual basis in an *Annual Review*.

Groundwater monitoring effort will be augmented to include water quality monitoring at two additional groundwater bores located downstream of the mine contingent on landowner access agreements and suitability of the bore for the purpose. This monitoring will be undertaken in addition to the monitoring of a private bore (Nioka) in the current monitoring program. The additional monitoring will be undertaken in response to the local community's request (**Section 8.12.3.7**), to address their concerns that mining is having an impact on groundwater bores.

Subsidence monitoring will continue as described in **Section 4.14.3.1**. Monitoring data will be reviewed regularly to confirm the adequacy of the monitoring program in relation to the mine design and environmental sensitivity of the area to ensure any potentially impact can be adaptively managed. Additional monitoring proposed in Extraction Plans in consultation with the IEP, the DPIE and other stakeholders will be implemented on an ongoing basis.

5.6 Rehabilitation and Final Landform

As the proposed modification does not entail changes to the existing surface infrastructure, there will be no change to the rehabilitation activities due to the modification. Progressive rehabilitation will be undertaken as required.

6.0 STATUTORY CONTEXT

6.1 Introduction

This chapter describes the strategic planning context and the requirements and application of State and Commonwealth legislations, including relevant State Environmental Planning Policies and *Lithgow Local Environment Plan 2014*.

6.2 Approval Pathway and Approval Authority

The Airly Mine Extension Project was approved on 15 December 2016 as a State Significant Development (SSD 5581) under Section 4.38 (previous Section 89E) Part 4 Division 4.7 (previous Division 4.1) of the EP&A Act. The Project's development application under Section 4.36 (previous Section 89C) was declared a State significant development pursuant to Clause 8(1) (mining) of the *State Environmental Planning Policy (State and Regional Development) 2011*.

SSD consents may be modified under Section 4.55(2) of the EP&A Act provided that “*the consent as modified is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified*”. SSD 5581 has been modified two times previously.

Centennial Airly is proposing to modify the SSD 5581 consent with modification described in Chapter 5, under Section 4.55(2) of the EP&A Act. This approval pathway was confirmed by DPIE in a letter dated 30 August 2019.

The Minister for Planning and Public Spaces or the Independent Planning Commission will be the consent authority for the application under Section 4.5(a) of the EP&A Act.

6.3 NSW State Legislation

6.3.1 Environmental Planning and Assessment Act 1979

6.3.1.1 Section 4.55(2) Modification

The proposed modification will be assessed under Section 4.55(2) of the EP&A Act. Section 4.55(2) states:

A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

- (a) *it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and*

...

Table 6 provides the Section 4.55 (2) requirements relevant to Modification 3 that the consent authority would need to consider. **Table 6** also provides responses to the requirements and actions implemented by Centennial Airly.

Table 6 Section 4.55 (2) Requirements

Section 4.55 (2) Requirement	Responses
<p>A consent authority may, ... modify the consent if:</p> <p>(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all)</p>	<p>The Project as modified will be substantially the same development that was granted the consent SSD 5581, as discussed in Section 10.2, as the character of the Project will not change substantially. It remains an underground mine utilising the same mine design philosophy as approved and the mining footprint and the impacts of the Project as modified would be similar to the approved Project. The consent boundary and life of mine will not change.</p>
<p>(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent,</p>	<p>Centennial Airly consulted with the officers of DPIE on the proposed modification in a meeting on 23 October 2018, and via a letter dated 28 August 2019 to seek confirmation on the proposed approval pathway and the adequacy of the proposed technical assessments to assess the modification elements (Section 1.5). A response from DPIE was received on 30 August 2019.</p> <p>Centennial Airly contacted National Parks and Wildlife Service (NPWS) on 30 August 2019 to articulate Centennial Airly's intention to modify the consent SSD 5581 and seek advice on the process for landowner consent from the Minister of Energy and Environment, given the proposed modification has implications of mining impacts under Mugii Murum-ban SCA.</p> <p>A formal request will be made to NPWS by Centennial Airly for the landowner consent and will be accompanied by the Modification Report for review by NPWS for potential impacts to Mugii Murum-ban SCA from the modification elements.</p>
<p>(c) it has notified the application in accordance with:</p> <p>(i) the regulations, if the regulations so require, or</p> <p>(ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and</p>	<p>The proposed modification will be advertised by DPIE in a local newspaper in Lithgow and each person who made a submission to the original development application will be notified within 14 days of the modification application by the consent authority in accordance with Clause 118 of the <i>Environmental Planning and Assessment Regulation 2000</i>. Concurrently, Centennial Airly will advertise Modification 3 as required by Clause 49(5)(b) of EP&A Regulation (Table 9).</p> <p>The Modification Report will be placed on public exhibition for a minimum of 14 days.</p>
<p>(d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.</p>	<p>A Submissions Report will be prepared by Centennial Airly and provided to the consent authority to address any submissions received on the Modification Report during the public exhibition period.</p>

6.3.1.2 Section 1.3 Objects of EP&A Act

The objects of the EP&A Act generally seek to promote management and conservation of natural and artificial resources, while also permitting appropriate development to occur. The consistency of the modification with the relevant objects under Section 1.3 of the EP&A Act is summarised in **Table 7**.

Table 7 Objects of the EP&A Act

Object	Consistency of the Modification
(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	<p>The modification will facilitate the continued operation of Airly Mine at a greater net present value and that itself will provide significant social and economic welfare to the local and wider community, principally by the generation of employment and payment of taxes and royalties.</p> <p>The modification will have minor impacts on the State's natural environment through increase in greenhouse gas emissions equivalent to 0.01% of Australian greenhouse gas contributions. The Project as modified will contribute 0.01% of the greenhouse gas emissions to the global climate change, which is likely to be undetectable.</p>
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment	<p>The Project was approved based on the environmental, economic and social impact assessments and decisions governed by triple bottom line considerations which promote comprehensive and balanced decision-making. The Modification Report is also supported by environmental, economic and social assessments to promote balanced decision-making.</p>
(c) to promote the orderly and economic use and development of land	<p>The orderly and economic use of land is served by development that is permissible under the relevant planning regime and in accordance with the prevailing planning controls. The modification comprises a permissible development which is consistent with the statutory and strategic planning controls and proposes a minor alteration to an approved coal mine and represents an orderly and economic use of land.</p>
(d) to promote the delivery and maintenance of affordable housing	<p>Not applicable to the proposal.</p>
(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats	<p>No native vegetation clearing will be undertaken as a result of the modification.</p>
(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage)	<p>No surface disturbance will be undertaken in the modification. No impacts to built or cultural heritage are likely.</p>
(g) to promote good design and amenity of the built environment	<p>Not applicable to the proposal.</p>
(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants	<p>Not applicable to the proposal.</p>
(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State	<p>Extensive consultation with many different levels of government (Federal, State, local) was undertaken during the preparation of the Airly MEP EIS. The assessment process and determination included consultation with different levels of government, including local government.</p> <p>The modification will be assessed and determined under Section 4.55(2) of the EP&A Act and the process will be undertaken by the DPIE in consultation with other relevant government agencies.</p> <p>Consultation with DPIE, Lithgow City Council and other Government agencies have been undertaken during the preparation of the Modification Report (Section 7.3).</p>

Object	Consistency of the Modification
(j) to provide increased opportunity for public involvement and participation in environmental planning and assessment.	<p>Appropriate consultation with a wide range of stakeholder was undertaken during the preparation of Airly MEP EIS. Consultation with the local community has been ongoing since the granting of consent through regular Airly Community Committee (CCC) meetings. More recent CCC meetings have briefed the members on the modification elements assessed in this Modification Report. Community engagement for the modification has been extensive (Section 7.4).</p> <p>The community will have the opportunity to comment on the modification application during the public exhibition of the Modification Report.</p>

6.3.1.3 Section 4.15 (1) Matters for Consideration

When assessing an application under Section 4.55 (2) of the EP&A Act, the consent authority is required to consider evaluation criteria outlined in Section 4.15(1) as are relevant, including any relevant environmental planning instruments under Section 4.55 (3) of the EP&A Act. The proposed modification meets the relevant provisions of Section 4.15 (1) as demonstrated in **Table 8**.

Table 8 Section 4.15 (1) Matters for Consideration

Section 4.15 (1) Matter for Consideration	Where Addressed in Modification Report
(a) the provisions of:	
(i) any environmental planning instrument	Relevant planning instruments are discussed in Section 6.5 .
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and	There are no proposed instruments relevant to the modification.
(iii) any development control plan	There are no development control plans that are relevant.
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and	There are no planning agreements relevant to the modification.
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates.	The requirements of Clause 115 of the EP&A Regulation are addressed in Table 9 .
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	The Modification Report (refer Chapter 8) comprehensively describes the likely impacts of the proposed modification, including on both the natural and built environments, the economic benefits for the State and the region, and the social impacts in the locality.
(c) the suitability of the site for the development,	The proposed modification will be undertaken within the consent boundary. The site was assessed in the Airly MEP EIS. The site remains suitable for the Project as modified.

Section 4.15 (1) Matter for Consideration	Where Addressed in Modification Report
(d) any submissions made in accordance with this Act or the regulations,	Submissions from the public and public authorities will be sought by DPIE during the public exhibition of the Modification Report. DPIE will consider all submissions and Centennial Airly's Submissions Report will be considered in the preparation of the Planning Secretary's Assessment Report.
(e) the public interest.	Chapter 10 provides an evaluation of merits of the proposed modification in terms of the environmental, economic and social impacts of the proposed modification, allowing triple bottom line considerations for a comprehensive and balanced decision-making in relation to the public interest in relation to the Project.

6.3.2 Environmental Planning and Assessment Regulation 2000

An application for the modification of development consent must contain the information stipulated in Clause 115 of the *Environment Planning and Assessment Regulation, 2000* (EP&A Regulation).

Table 9 provides the relevant requirements for the proposed modification and notes where those requirements have been addressed in the SEE.

Table 9 Clause 115 Requirements for Section 4.55(2) Applications

Clause 115 Requirement	Where Addressed in Modification Report
(a) The name and address of the applicant.	Section 1.3
(b) A description of the development to be carried out under the consent.	Chapter 4.0
(c) The address, and formal particulars of title, of the land on which the development is to be carried out.	Section 3.4 and Appendix A.
(d) A description of the proposed modification to the development consent.	Chapter 5.0
(e) A statement that indicates either: (i) that the modification is merely intended to correct a minor error, misdescription or miscalculation, or (ii) that the modification is intended to have some other effect, as specified in the statement.	N/A Chapter 8.0. The modification will have minimal environmental impacts.
(f) A description of the expected impacts of the modification.	Chapter 8.0
(g) An undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved.	The development as modified will remain substantially the same as the development that was originally approved in consent SSD 5581, discussed in detail in Section 10.2 .
(h) If the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner),	Landowner's consent is generally required for SSD projects unless they are "public notification developments" under Clause 49(5) of EP&A Regulation. Public notification development means an SSD set out in Clause 5 of Schedule 1 of <i>State Environmental Planning Policy (State and Regional Development) 2011</i> but does not include development to the extent that is carried out on land that is a state conservation area reserved under the <i>National Parks and Wildlife Act 1974</i> . Clause 5 specifically lists coal mining as such a development. Mining approved in the

Clause 115 Requirement	Where Addressed in Modification Report
	<p>development falls under a state conservation area (Mugii-Murum-ban SCA), and as such is excluded from being a public notification development. The pit top activities are not under the Mugii-Murum-ban SCA.</p> <p>Landowners consent from the Minister of Environment and Energy will be required for the proposed modification and will be sought.</p> <p>Centennial Airly will also notify landowners of the application to modify through an advertisement placed in local newspapers within 14 days following lodgement of the modification application in accordance with Clause 49(5)(b) of EP&A Regulation.</p>
<p>(i) A statement as to whether the application is being made to the Court (under Section 4.55) or to the consent authority (under Section 4.56) and, if the consent authority so requires, must be in the form approved by that authority.</p>	<p>The application is being made to the consent authority.</p>

Note: Item (i) is verbatim from the EP&A Regulation. The EP&A Act notes that Section 4.55 is relevant to consent authorities and Section 4.56 refers to application made to the Court.

6.4 Other Key NSW State Legislation

The existing approvals relevant for Airly Mine are described in **Section 4.2**. **Table 10** lists other relevant NSW State legislation and indicates the implications, if any, for the modification.

Table 10 Other Key NSW State Legislation

Relevant State Legislative Act	Project Implications (approvals, licences and/or authorities)
<i>Protection of the Environment Operations Act 1997</i>	<p>Centennial Airly Pty Limited is the licensee of EPL 12374, which authorises the mining of coal up to 2 Mtpa, and coal works up to 2 Mtpa. EPL 12374 has listed three separate licensed discharge points (LDP001, LDP002, LDP003). All LDPs have water quality limits in discharges.</p> <p>Condition A1.1 of EPL 12374 will require a variation to increase coal mining and coal works to accommodate the proposed increase in annual production and handling capacities.</p>
<i>Mining Act 1992</i>	<p>Airly Mine holds several mining tenements listed in Table 3, granted under the <i>Mining Act 1992</i>.</p> <p>Airly Mine operates under a Mining Operations Plan (MOP) which addresses the requirements of Condition of ML 1331. The MOP has been prepared in accordance with the Department of Industry – Division of Resources and Energy (DRE) publication titled <i>ESG3: Mining Operations Plan (MOP) Guidelines</i> (DRE 2013).</p>
<i>Water Management Act 2000</i>	<p>The <i>Water Management Act 2000</i> (WM Act) is intended to ensure that water resources are conserved and properly managed for sustainable use benefitting both present and future generations. Water sharing plans prepared in accordance with the WM Act include rules for protecting the environment and administering water licensing and trading.</p> <p>The Project Application Area is regulated by two Water Sharing Plans (WSP), made under Section 50 of the WM Act. The Greater Metropolitan Region Groundwater Sources WSP (GMR WSP) regulates groundwater resources while the Greater Metropolitan Region Unregulated River Water Sources WSP (GMRU WSP) regulates surface water resources.</p>



Relevant State Legislative Act	Project Implications (approvals, licences and/or authorities)
	<p>With respect to surface water, Airly Mine is located within the Capertee River Management Zone which is part of the Hawkesbury and Lower Nepean Rivers Water Source covered by the GMRU WSP.</p> <p>Groundwater extraction and interception is from the Sydney Basin North Groundwater Source which is covered by the GMR WSP.</p> <p>Airly Mine holds two Water Access Licences (WAL) under the WM Act from the Sydney Basin North Groundwater Source with a total volumetric limit of 278 ML/year (Table 3, Section 4.15).</p>
<i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i>	<p><i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i> aims to securing and promoting the health and safety of persons at work at mines, petroleum sites or related places, and to protect workers at mines and petroleum sites and other persons against harm to their health and safety through the elimination or minimisation of risks arising from work.</p> <p>Centennial Airly currently holds all necessary approvals under the <i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i>.</p>
<i>Crown Lands Act 1989</i>	There is Crown land within the Project Application Area boundary.
<i>Biodiversity Conservation Act 2016</i>	<p>The <i>Biodiversity Conservation Act 2016</i> and aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.</p> <p>Given there is no surface disturbance proposed, the modification will not impact any listed species, communities or areas of outstanding biodiversity value.</p> <p>The consent authority is required to consider whether a proposal would affect biodiversity values. The effect on biodiversity values have been assessed in accordance with Table 1 of the BDAR Waiver Request and included in Appendix N.</p>
<i>National Parks and Wildlife Act 1974</i>	<p>The <i>National Parks and Wildlife Act 1974</i> (NPW Act) contains provisions for the protection and management of national parks, historic sites, nature reserves and Aboriginal heritage.</p> <p>Aboriginal heritage sites exist within the Project Application Area boundary and are listed in the <i>Western Region Aboriginal Cultural Heritage Management Plan</i> (Centennial Coal, 2017b). No impacts from the proposed modification will ensue and these items will continue to be monitored and managed in accordance with the protocols identified in the plan.</p>
<i>Heritage Act 1977</i>	Historical archaeological relics, buildings, structures, archaeological deposits and features are protected under the <i>Heritage Act 1977</i> . Items of historic heritage significance exist within the Project Application Area. These items are listed in the <i>Western Region Historic Heritage Management Plan</i> (Centennial Coal 2018f) and will continue to be managed in accordance with the monitoring programs included in the plan.
<i>Contaminated Land Management Act 1997</i>	The <i>Contaminated Land Management Act 1997</i> establishes a process for the investigation and remediation of contaminated land. The relevance of this legislation to the proposed modification is outlined in Section 6.5.3 .

6.5 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are Environmental Planning Instruments (EPIs) prepared by the Minister to address issues significant to NSW. The SEPPs outlined below contain provisions that are relevant to the proposed modification, and therefore are matters to be considered by the consent authority in determining the modification application.

6.5.1 SEPP (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) identifies development to which the SSD assessment and determination process under Division 4.7 in Part 4 of the EP&A Act applies. Pursuant to Section 4.36 (previous Section 89C) of the EP&A Act the Airly Mine Extension Project at the time of submission in 2014 was classified as an SSD and it was declared to be such by Schedule 1 of SRD SEPP. Clause 5 of the Schedule 1 of SRD SEPP identifies a development for the purposes of coal mining as an SSD.

6.5.2 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW.

Part 3 of the Mining SEPP stipulates matters for consideration by the consent authority before determining an application for consent in respect of development for the purposes of mining. Specifically, Clauses 12 to 17 (inclusive) requires consideration to be given to the compatibility of projects with other surrounding land uses, including the existing and potential extraction of minerals, natural resource management and environmental management, resource recovery, transportation and rehabilitation.

The information presented in the Modification Report addresses relevant matters for consideration prescribed in the abovementioned clauses. The technical assessments are appropriate and commensurate with the level of potential impacts expected from the modification elements. Mitigation measures have been included, if required, to minimise adverse impacts.

Mining SEPP Part 3 matters for consideration that are particularly relevant to this modification are as follows.

- **Clause 12AB** – this clause outlines a number of non-discretionary development standards that, if complied with, prevents the consent authority from requiring more onerous standards for those matters (but that does not prevent the consent authority granting consent even though any such standard is not complied with) for the purpose of Sections 4.15(2) and (3) of the EP&A Act in relation to mining developments. These standards relate to:
 - cumulative noise levels – these have been assessed in **Section 8.7** and noise levels will not exceed the recommended amenity noise levels, as determined in accordance with Table 2.2 of the *Noise Policy for Industry* (EPA, 2017), for residences that are private dwellings.
 - airblast overpressure and ground vibration have been considered in **Section 8.8** and will not exceed the ANZEC (1990) criteria
 - cumulative air quality levels – these have been assessed in **Section 8.9** and cumulative annual average level greater than 25 µg/m³ of PM₁₀ or 8 µg/m³ of PM_{2.5} for private dwelling
 - aquifer interference – the Groundwater Impact Assessment (**Section 8.2**) confirms the residual groundwater impacts and the beneficial use category of the alluvial groundwater will be less than the Level 1 Minimal Impact Considerations for aquifer interference activities under the Aquifer Interference Policy (DPI, 2012) and therefore acceptable.
- **Clause 12** refers to the consideration of the compatibility of the application on other land uses in the vicinity. Land uses are described in **Section 3.5**. The modification will not change the approved land use of Airly Mine, and mining will continue to be undertaken at the site which commenced in 1998.
- **Clause 12A** refers to consideration of voluntary land acquisition and mitigation policy. The outcomes of air quality and noise impact assessments do not suggest acquisitions of properties are required in the Project and is discussed in **Section 8.12**.



- **Clause 13** refers to the consideration of the compatibility of the application with mining, petroleum production and extractive industry in the vicinity. The nearest industry, Sibelco lime processing facility at Charbon is located approximately 7 km from Airly Mine pit top. Neither the approved operation nor the proposed modification will change the compatibility of Airly Mine with other mines, petroleum production or extractive industries in the vicinity.
- **Clause 14** requires a consideration of impacts on surface and groundwater, threatened species, biodiversity and greenhouse gas emissions. **Chapter 8.0** provides details in the impacts of the modification on these aspects.
- **Clause 16** has the effect of discouraging road transport of materials. The haulage of hazardous materials on public roads will occur (**Section 8.13**), however the transport will be infrequent and the required protocols for the transport of the materials will be observed.
- **Clause 17** refers to rehabilitation of the site. No change to the rehabilitation at the site is required due to the proposed modification (**Section 5.6**).

6.5.3 SEPP No. 55 – Remediation of Land

SEPP No. 55 – Remediation of Land (SEPP 55) provides for a state-wide planning approach to the remediation of contaminated land in order to reduce the risk to human health or any other aspect of the environment.

Clause 7(1) of SEPP 55 provides that a consent authority must not consent to the carrying out of any development on land unless:

- it has considered whether the land is contaminated
- if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
- if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Whilst a contaminated site assessment has not been undertaken for the site, the fact the Airly pit top infrastructure was very recently built the potential for contamination at the pit top is low, especially as the site actively reduces potential for any contamination, through implementation of best management practices.

A Remediation Action Plan (RAP), relating to the environmental management and remediation strategy for soil and/or water contamination at the site, will be prepared as part of the Mine Closure and a Rehabilitation MOP within five years of the mine ceasing mining operations.

The Project as modified will continue to use hazardous materials (**Section 8.13**). With the continued implementation of best management practices for hazardous materials at the site, as well as effective implementation of the approved environmental management plans and work health and safety management systems, the potential for contamination and associated issues remains low for Airly Mine, and the proposed modification will not alter this position.

6.5.4 SEPP No. 33 – Hazardous and Offensive Development

SEPP No. 33 - Hazardous and Offensive Development (SEPP 33) regulates, amongst other things, the determination of development applications to carry out what is defined in SEPP 33 as development for the purposes of a "potentially hazardous industry" or "potentially offensive industry".

The proposed modification elements would not result in the emission of a polluting discharge in a manner which would have a significant adverse impact in its locality or on the existing or likely future development on other land. The proposed use of explosives for underground blasting (Section

On the above bases, the proposed modification does not comprise a "potentially hazardous industry" or a "potentially offensive industry" within the meaning of these expressions in SEPP 33. Therefore, a preliminary hazard analysis was not prepared as required by Clause 12 of SEPP 33 and nor does Clause 13 of SEPP 33 apply to the consent authority's determination of the modification.

6.6 Lithgow Local Environment Plan 2014

The *Lithgow Local Environmental Plan 2014* (Lithgow LEP) is the principal planning instrument affecting land use in the Lithgow Local Government Area (LGA). The Lithgow LEP commenced on 19 December 2014. The aims of the Lithgow City LEP include the encouragement of the proper management, development and conservation of natural resources and the built environment within the Lithgow LGA, by protecting, enhancing or conserving, amongst other things, timber, minerals, soil, water quality, stream environment and other natural resources.

The land use zones that apply to the proposed modification have changed due to the implementation of the Lithgow LEP, which repealed the Lithgow Local Environmental Plan 1994, when compared to the zonings that were included in the AMEP EIS. The Project Application Area encompasses three zones:

- E1 National Parks and Nature Reserves
- RU1 Primary Production
- RU2 Rural Landscape

Sub-clause 7(1)(a) of the Mining SEPP also states that development for the purpose of underground mining may be carried out on any land with development consent. In relation to any inconsistency between the Mining SEPP and an LEP, sub-clause 5(3) provides that the Mining SEPP prevails to the extent of the inconsistency. On this basis, any provision in the Lithgow LEP that would otherwise operate to prohibit the proposed modification has no effect, and accordingly, the proposed modification is permissible with development consent on the land in which the proposed modification will be carried out that is within the Lithgow LGA.

6.7 Other Considerations

6.7.1 Water Sharing Plans

Water Sharing Plans (WSP) prepared in accordance with Section 50 of the WM Act include rules for protecting the environment, extractions, managing licence holders' water accounts, and water trading within defined areas and specified water sources. The Water Sharing Plans provide the basis for equitable sharing of surface water and groundwater between water users, including the environment.

Airly Mine holds two Water Access Licences (WAL) under the WM Act from the Sydney Basin North Groundwater Source with a total volumetric limit of 278 ML/year (**Table 3, Section 4.15**):

- WAL24386 (for the Production Bore) with volumetric limit of 158 ML/year
- WAL36565 (mine in flows) with volumetric limit of 120 ML/year.

Additional WALs or increase in the volumetric limits are not required for the modification.

6.7.2 NSW Aquifer Interference Policy

The NSW *Aquifer Interference Policy* (AIP) (DPI, 2012) is a key component of the NSW Government's Strategic Regional Land Use Policy. The AIP clarifies the water licensing and approval requirements for aquifer interference activities, including the taking of water from an aquifer in the course of carrying out mining, and defines the considerations for assessing potential impacts to key water-dependent assets.

The AIP indicates that where mining results in the loss of water from an overlying source that is covered by a Water Sharing Plan, a water access licence is required under the WM Act to account for this take

of water. According to the AIP, proponents of a mining projects seeking development consent under Part 4 of the EP&A Act must provide estimates of all quantities of water likely to be taken from any water source during and following cessation of the activity and all predicted impacts associated with the activity.

As noted above, Airly Mine already holds two WALs for the extraction of groundwater at a total of 278 ML/year from the Sydney Basin North groundwater source under the WSP for the Greater Metropolitan Region Groundwater Sources. The proposed modification is not proposing to extract a greater volume of groundwater than allowed on two WALs held by Airly Mine.

The AIP also requires that potential impacts on groundwater sources, including their users and GDEs, be assessed against minimal impact considerations, outlined in Table 1 of the Policy. The Level 1 minimal impact considerations have been adopted for the Groundwater Impact Assessment discussed in **Section 8.2**, and the residual groundwater impacts and the beneficial use of the alluvial groundwater is less than the Level 1 minimal impact considerations and considered acceptable.

6.8 Commonwealth Legislation

6.8.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment and Energy (DEE) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as matters of 'national environmental significance'. An action that "has, will have or is likely to have a significant impact on a matter of National Environmental Significance" (MNES) may not be undertaken without prior approval from the Commonwealth Environment Minister, as provided under Part 9 of the EPBC Act. Approval under the EPBC Act is also required where actions are proposed on, or will affect, Commonwealth land and its environment.

Potential impacts on any MNES are subject to assessments of significance pursuant to the EPBC Act *Significant Impact Guidelines 1.1* (DoE 2013a). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Commonwealth Environment Minister.

6.8.1.1 Previous Referrals

Airly Mine holds approval EBPC 2013/7076 under the EPBC Act with the following controlling provisions.

- World Heritage properties
- National heritage places
- Listed threatened species and communities
- Water resources/trigger

6.8.1.2 Proposed Modification

The modification will not impact on any World Heritage properties of any National Heritage places. Given there is surface disturbance proposed, the modification will not impact on listed threatened ecological communities.

An assessment against the *Significant Impact Guidelines for Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources* (DoE 2013b) (**Section 8.4.7.2**) confirms the proposed modification will be compliant with the all impact criteria (hydrological characteristics and water quality) assessed.



Given the proposed modification will not have or is not likely to have a significant impact on an MNES Airly Mine's consent as modified will operate within the constraints of the EPBC Approval 2013/7076. Therefore, a referral to DEE in relation to the modification is not required.

6.8.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people may have rights and interests to certain land and waters which derive from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country.

No new mining leases will be required in relation to the proposed modification. There is an existing native title claim on the MLA559 application (**Table 4**). Centennial Coal has commenced negotiations with the claimants through the right to negotiate process under the Act.

6.8.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) introduced a single national reporting framework for the reporting and dissemination of corporations' greenhouse gas emissions and energy use. The NGER Act makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

Centennial Airly triggers the NGER Act reporting threshold and accordingly reports energy use and greenhouse gas emissions from its activities. The reporting will continue for the Project as modified.



7.0 ENGAGEMENT

7.1 Introduction

This chapter provides information on consultation undertaken with stakeholders with respect to the proposed modification in accordance with a stakeholder engagement strategy developed specifically for Airly Modification 3.

7.2 Modification Stakeholder Engagement Strategy

The project specific engagement strategy identified the following groups as key stakeholders.

- Government (Local and State)
- National Parks and Wildlife Service as the landowner
- Local community
- Aboriginal stakeholders.

The following sections describe the consultations undertaken with the stakeholders.

7.3 Consultation with Government

7.3.1 Department of Planning, Industry and Environment

A face to face meeting was held with officers of DPIE on 23 October 2018 to discuss the proposed modification. A follow-up letter was provided to DPIE on 28 August 2019 to discuss the updated modification elements, and to seek confirmation on the approval pathway and the adequacy of the proposed technical assessments for the Modification Report. A response was received from DPIE on 30 August 2019 (refer **Section 1.5**). Copies of letters to and from DPIE are included in **Appendix B**.

7.3.2 Environment Protection Authority

A letter on the proposed modification was provided to the Environment Protection Authority (EPA) on 26 September 2019. The letter included descriptions of the modification elements and noting that there would be no change to water management at the pit top, an overview of the technical assessment outcomes of interest to the EPA (water resources, air quality and noise), and a request for a meeting with the EPA representatives to discuss the assessment outcomes in detail. EPA responded on 30 September 2019 to advise that no meeting was necessary but to confirm that the noise impact assessment was undertaken in accordance with the *Noise Policy for Industry* (NPfI) (EPA, 2017). The noise impact assessment has been undertaken in accordance with NPfI (**Section 8.7**).

7.3.3 Transport for New South Wales

A letter describing the modification elements, and specifically Centennial Airly's proposal to increase train movements on the Wallerawang-Gwabegar, Great Western and Main Northern rail lines was provided to Transport for NSW (TfNSW) on 25 September 2019. A response from TfNSW was received on 18 October 2019, with the following matters:

- TfNSW will organize a meeting with John Holland Rail (JHR) for further discussions on increase on train movements
- Centennial Airly to liaise with Sydney Trains in regard to the proposed increase in the train movements on the Main Northern rail line, required for access to Vales Point and Earing Power Stations and Port Newcastle



- Centennial Airly to provide further information on the underground blasting proposed in the modification.

The requested information was provided to TfNSW.

7.3.4 Roads and Maritime Services

A letter describing the modification elements and the outcomes of the road traffic impact assessment was provided to Roads and Maritime Services (RMS) on 01 October 2019. A request for a site meeting was included in the letter. No response has been received from RMS to date.

7.3.5 New South Wales Resources Regulator

A letter describing the modification elements was provided to the New South Wales Resources Regulator (NSW RR) on 01 October 2019, and to specifically note:

- the increased production rate, whilst intensifying the production rate on an annual basis, will not significantly change on a daily basis
- subsidence will develop more quickly but the magnitudes will not change due to increased production rate and hence there will be no change to environmental consequences already approved in SSD 5581
- the wide range of subsidence monitoring techniques that are currently being undertaken to demonstrate that the observed subsidence falls within the approved limits
- justification for the proposed mine schedule to be included in the Modification Report.

An invitation to discuss the modification and any aspects of Airly mine design philosophy that would be of interest to NSW RR was extended in the letter. No response has been received to date.

7.3.6 Division of Resources and Geoscience

A site meeting with the officers of Division of Resources and Geoscience (DRG) in DPIE was held at Airly Mine on 20 December 2018 to go underground and, also discuss the modification details, to specifically to discuss if the modification will result in:

- the life of mine being shortened or extended
- an increase in the mine footprint
- a change in the total amount of resource to be recovered over the life of mine.

A presentation was made to the DRG officers to discuss the above matters.

7.3.7 Division of Water

A letter discussing the recalibration undertaken of the Airly Mine groundwater model, revised mine inflow predictions for Airly Mine's approved operations and the proposed 3 Mtpa scenario was provided to the Water Division within DPIE on 24 October 2019. A meeting request to discuss the recalibration of the Airly Groundwater Model and mine inflows predictions from the recalibrated model in further detail was requested in the letter.

7.3.8 Lithgow City Council

A letter describing the modification elements, an overview of the outcomes of all technical assessment outcomes was provided to LCC on 14 October 2019. A meeting request to discuss the modification and the technical assessment outcomes in greater detail was included in the letter. There has been no response to date.



Consultation with LCC on the mine's operation occurs on an ongoing basis, including their membership to the Airly Mine Community Consultative Committee. Approvals and modification to the consent are discussed at the CCC meetings. Modification 3 has been discussed at the CCC meetings since January 2018 (**Section 7.4.1**).

7.3.9 National Parks and Wildlife Service

A letter describing the modification elements was provided to the National Parks and Wildlife Service on 30 August 2019, and to specifically discuss:

- the increased production rate and the potential impacts of mining under the Mugii Murum-ban SCA and the proposal to undertake blasting on an as needs basis
- the minimization of mining impacts through the conservative mine design philosophy and secondary approval sought from DPIE via the Extraction Plan process prior to any mining
- the requirement of landowner consent from the Minister of Energy and Environment prior to determination of Modification 3 by the consent authority.

The Modification Report will be supplied to NPWS along with a formal request for landowner consent when the modification application has been submitted.

Consultation with NPWS occurs on an ongoing basis, including their membership to the Airly Mine Community Consultative Committee. Approvals and modification to the consent are discussed at the CCC meetings. Modification 3 has been discussed at the CCC meetings since January 2018 (**Section 7.4.1**).

7.4 Consultation with Community

Centennial Coal operations consult with the local community on an ongoing basis. Centennial Airly is aware of its community obligations and the importance of open communication with the community. Airly Mine keeps the local community affected by its operations informed of its direction, plans and environmental performance. This is achieved by the following engagement mechanisms:

- CCC meetings (**Section 7.4.1**)
- technical sessions when required
- holding open days and displays at local shows
- participation in community organisations and activities
- a 24-hour telephone complaints line
- engaging in informal discussions with local residents, as required.

7.4.1 Airly Mine Community Consultative Committee

Consultation in relation to Airly MOD 3 commenced via the Airly CCC in early 2018. Discussions on Modification 3 were included in the CCC meetings on the following dates. The discussions centred on the proposed modification elements, the technical assessments supporting the Modification Report and assessment outcomes, the timing of submission of the modification application.

- 17 January 2018
- 23 October 2018
- 15 January 2019
- 21 May 2019
- 24 July 2019



- 15 October 2019

Another mechanism for the discussions with the community on the modification elements and technical assessment outcomes were through technical sessions, which included presentations by groundwater specialists and Airly Mine's Technical Services Manager. These technical sessions also provided opportunities to discuss the local community's ongoing concerns on water resources and subsidence impacts, and a vehicle for presentation of environmental monitoring undertaken and monitoring data.

The technical sessions were held on the following dates.

- 23 October 2018 (combined with the CCC meeting) on surface and groundwater resources
- 09 January 2019 on regional geology and groundwater system overview and water monitoring program
- 28 July 2019 on subsidence, regional geology and groundwater system overview, surface and groundwater impacts, traffic and transport, noise, air quality and greenhouse gases
- 11 August 2019 with the same technical contents as the technical session on 28 July 2019

Responses to these concerns and how issues raised at the CCC meetings and technical session have been addressed are included in **Appendix D**.

7.4.2 Registered Aboriginal Parties

The Centennial Western Region operations engage with 11 Registered Aboriginal Parties (RAPs) on Aboriginal cultural heritage matters pertinent to approvals and including Aboriginal cultural heritage identification, monitoring and management across its operations. The *Western Region Aboriginal Cultural Heritage Management Plan* (Centennial Coal, 2017b) lists all the RAPs for Centennial's Western Operations.

A six-monthly meeting with the RAPs is also organised, in accordance with the *Western Region Aboriginal Cultural Heritage Management Plan*, to provide information on the activities undertaken of each operation and the approvals being prepared by each operation

The proposed modification was discussed at the meeting in February 2019 and will be discussed further at the next meeting in November 2019.

7.5 Ongoing Consultation

7.5.1 Community

The broader community will be notified of the proposed Modification 3 through advertisements placed in the local newspapers (Lithgow Mercury) following lodgement of the modification application, as required by Clause 49(5)(b) of the EP& A regulation.

Similarly, DPIE will place an advertisement in the Lithgow Mercury, as required under Clause 118 of the EP & A Regulation as required by Section 4.55 (2)(c) (**Table 6**) on the proposed modification and invite to community to make formal submissions on the modification through the public exhibition process.

Consultation with the community and other stakeholders will continue through CCC meetings and engagement with individual community members, as required, to ensure the community remains informed of the outcomes of the modification application.

7.5.2 Government

Centennial Airly regularly engages with government agencies to report on its environmental performance. This is facilitated through a number of vehicles including:

- LCC and NPWS representation on the Airly CCC



- provision of CCC minutes to all stakeholders and making it available on the Centennial Coal websites soon after the meeting of the CCC has been held
- provision of *Annual Review* to the DPIE and other relevant government agencies
- liaison with and reporting to the EPA with regard to performance against EPL conditions
- provision of the *Annual Licence Return* to the EPA
- provision of the National Pollution Inventory (NPI) to DEE.

Centennial Airly will continue to consult with the relevant government agencies during the assessment of the proposed modification.

7.6 Consultation Outcomes

Matters raised during meetings with the community (**Section 7.4.1**) are included in **Appendix D** in **Table D1**. This table also provides responses to matters raised section references in the Modification Report where the issues have been addressed.



8.0 ASSESSMENT OF IMPACTS

8.1 Introduction

This section assesses the potential environmental, social and economic impacts due to the proposed modifications described in **Chapter 5**. The following technical assessments underpin the Modification Report.

- Groundwater
- Surface water
- Site water and salt balance
- Road traffic
- Rail traffic
- Noise
- Blasting
- Air quality
- Greenhouse gas emissions
- Economic
- Social
- Hazards management
- Other aspects:
 - Biodiversity
 - Aboriginal and historic heritage
 - Visual
 - Waste

The technical assessments prepared by specialist experts are included in **Appendices E to N**.

8.2 Groundwater

8.2.1 Introduction

The Groundwater Impact Assessment (GHD, 2019c) was prepared by GHD Pty Ltd, and is provided in full as **Appendix E**. This assessment informs this section of the Modification Report. The Groundwater Impact Assessment (GHD, 2019c), is itself informed by a revised version of the hydrogeological model report first developed for the Airly MEP (GHD, 2014a), discussed in **Section 4.11** and **Section 5.3**.

There have been low to negligible mine inflows observed at Airly Mine since 2014, whereas GHD (2014a) predicted higher mine inflows. This has led to the conclusion that the original 2014 groundwater model over-predicted groundwater inflows into the mine workings. This observation necessitated the recalibration of the 2014 groundwater model with additional monitoring data collected since 2014.

The recalibrated model has been used to predict:

- groundwater inflows as a result of the development of the mine workings
- baseflow reductions to watercourses above the mining area

- approximate recovery times in groundwater levels and baseflow
- drawdown in groundwater sources including register landholder bores.

The Groundwater Impact Assessment assesses the potential impact of the proposed modification on the sensitive groundwater sources (**Section 8.2.2.6**) including their users, namely the registered landholder bores (**Section 8.2.2.5**) and GDEs (**Section 8.2.2.4**). The assessment has been undertaken in accordance with the Aquifer Interference Policy (DPI, 2012). The potential impacts have been assessed against minimal impact considerations, outlined in Table 1 of the Policy. If the predicted impacts are less than the minimal impact considerations, then these impacts will be considered as acceptable.

8.2.2 Existing Environment

Chapter 3 describes the topography, soils, hydrology, geology and the hydrogeology of the site. **Section 3.11** provides a basic hydrogeological description of the area, and **Figure 7** provides a conceptual hydrogeological cross section of the area. Table 3-1 in GHD (2019c) provides the stratigraphic sequence at Airly Mine. In summary, the Triassic Narrabeen Group rocks overlie the Permian Illawarra Coal Measures. Further below the coal measures lie the Shoalhaven Group sedimentary rocks, which are in turn underlain by the Devonian strata comprising a range of metamorphic strata comprising quartzite, shales, sandstones, limestone and tuff. There are small patches of quaternary alluviums adjacent to Gap and Genowlan Creeks. Interbedded siltstone and sandstone of the older Shoalhaven Group outcrop across the pit top area and beyond the Project Application Area. Metamorphic rocks also outcrop beyond the Project Application Area in areas of lower elevation.

8.2.2.1 Local Groundwater Sources

The local groundwater sources within the Project Application Area are generally low yielding and predominantly within the Quaternary alluvium, weathered and/or fractured sandstone and coal seams that occur within Mount Airly and Genowlan Mountain. They are classified as ‘less productive’ in accordance with the criteria specified in the NSW Aquifer Interference Policy. The local groundwater sources are managed under the WSP for the Great Metropolitan Region Groundwater Sources and specifically are part of the Sydney Basin North groundwater source. These local groundwater sources are confined to the Project Application Area since their outcrop boundaries occur entirely within this area.

Alluvium

The alluvium throughout the Project Application Area forms an unconfined shallow aquifer with groundwater ranging in depth from less than 1 m to over 5 m below ground level, and aquifer thickness generally less than 12 m.

The alluvium associated with Gap Creek and Genowlan Creek is generally a silty sand material and recharged from rainfall as well as inter-aquifer flow from adjacent (primarily Permian) strata. Alluvial groundwater discharges to connected streams. The alluvium is fresh and slightly acidic.

Sections of Genowlan Creek and Gap Creek are fed relatively consistently by rainfall based subsurface flows that emerge from Quaternary colluvium and alluvium. Although the sources for this recharge is rainfall based, anecdotal evidence infers that these rainfall-based flows are held in the Quaternary strata and released slowly into the reaches of Genowlan Creek above The Grotto and The Oasis, as well as in certain reaches of Gap Creek. Flows throughout The Oasis area are relatively constant, and they have therefore been considered a component of baseflow for the assessment.

Porous and Fractured Rock

The local porous and fractured rock groundwater sources include the Narrabeen Sandstone as well as Permian sources including coal seams of the Illawarra Coal Measures. These sources are recharged by rainfall via fractures within overlaying strata and seep out of the side of the mountains or directly into watercourses. At some locations, including the Village Spring, the seepage flow is small but persistent. Discharge from these groundwater sources is predominantly to seepage areas and there is minimal inter-aquifer flow to underlying regional groundwater sources.

Village Spring

The Village Spring, marked in **Figure 5**, whilst not a groundwater source, is fed by seepage from old shale workings. The old shale workings are located in the Glen Davis Formation. As shown in Table 3-1 of GHD (2019b), the Glen Davis Formation is located in the Permian strata above the Irondale Coal Seam. The old shale workings are located in the New Hartley Shale Mine potential interaction zone (**Figure 10**). Groundwater monitoring undertaken at Airly Mine suggests the recovery of groundwater pressure within the Narrabeen Sandstone above the old shale workings has taken place over time, most likely due to the infilling of old cracks.

8.2.2.2 Regional Groundwater Sources

The regional groundwater sources occur within the siltstones and sandstones of the Shoalhaven Group below the target coal seam, as well as within the underlying metamorphic rocks. These groundwater sources are part of the Sydney Basin North Groundwater Source.

Regional groundwater sources occur within strata well below the target coal measures and extend laterally beyond the development consent boundary. According to the western coalfield (southern part) regional geology 1:100,000 map, the deeper Shoalhaven group was deposited in a marine environment and therefore the groundwater is brackish to saline. The production bore at the pit top is screened within this groundwater source. Groundwater flow is generally to the east. It is a 'less productive' groundwater source since the salinity exceeds 1,500 mg/l based on available data.

The lower regional groundwater source (Devonian) occurs within metamorphic strata containing shale sandstone and limestone. The groundwater here has a lower salt content less than the Shoalhaven Group and supplies numerous registered users to the east of the development consent boundary. Recharge areas occur to the north, south and east of the development consent boundary and groundwater flow is generally to the east. This groundwater source is 'highly productive' in parts where the yield exceeds 5 L/s and the salinity is less than 1.500 mg/L.

GHD (2019c) concluded there would be minimal inter-aquifer hydraulic connection between the upper local and lower regional groundwater sources, based on observed differences in groundwater chemistry (**Section 8.2.2.3**).

8.2.2.3 Interconnectivity between Local and Regional Groundwater Sources

Groundwater quality monitoring data (**Section 4.14.3.3**) consistently indicates that there would be minimal inter-aquifer hydraulic connection between the upper and lower regional groundwater sources (refer **Figure 7**), based on differences in groundwater chemistry. As shown in the Piper Diagram in Figure 3-7 in GHD (2019c), the Devonian groundwater (as represented by 'Nioka') is a calcium bicarbonate/sulfate type water and clearly different to the Shoalhaven Group (as represented by 'Production Bore') which is magnesium sulfate type water and the upper local groundwater sources which are of sodium/calcium bicarbonate/chloride type.

The measured EC of water from these three aquifers (See Figure B-20 in Appendix B) are very different, potentially reflective of any inter-aquifer hydraulic connection between the upper and lower regional groundwater sources. The EC of the local groundwater above the Lithgow seam is generally below 1000 $\mu\text{S}/\text{cm}$ with the exception of ARP11 piezometer which shows EC greater than 1000 $\mu\text{S}/\text{cm}$ but

below 2000 $\mu\text{S}/\text{cm}$. The EC of water from the lower Devonian aquifer ('Nioka') is approximately 1600 $\mu\text{S}/\text{cm}$. The EC from the Shoalhaven aquifer, which lies between the upper aquifers and the lower Devonian aquifer, is approximately 5000 $\mu\text{S}/\text{cm}$.

8.2.2.4 Groundwater Dependent Ecosystems

GHD (2019c) reports no high priority vegetative groundwater dependent ecosystems (GDEs) have been identified within the development consent boundary, although there is potential for facultative ecosystems existing as moist sheltered gully forests to occur along creek lines. Stygofauna have been collected in low densities and diversity from groundwater bores.

The groundwater sources most likely to provide habitat to stygofauna are the alluvium and Narrabeen Sandstone (Cardno, 2014), however groundwater monitoring has shown that the extensive natural fracturing of the sandstone results in the seepage of groundwater along the slopes of the mountains and therefore limited groundwater within these strata exists to support stygofauna.

8.2.2.5 Registered Landholder Bores

A search of the database of registered groundwater bores (WaterNSW, 2018) within a 5 km radius of the Project Application Area identified 40 bores, with the majority (30 bores) being registered for domestic, irrigation and/or stock use, nine bores registered as monitoring bores and one registered as a test bore. The locations of the bores are shown in **Figure 18**.

The registered domestic and stock bores that were identified primarily extract groundwater from the lower regional groundwater source (sandstone and conglomerate formations) to the east of Airly Mine, with yields generally less than 2.5 L/s. Some registered bores are also located within Genowlan Creek alluvium to the north-east. The closest registered bores are at least 1 km from the Project Application Area boundary.

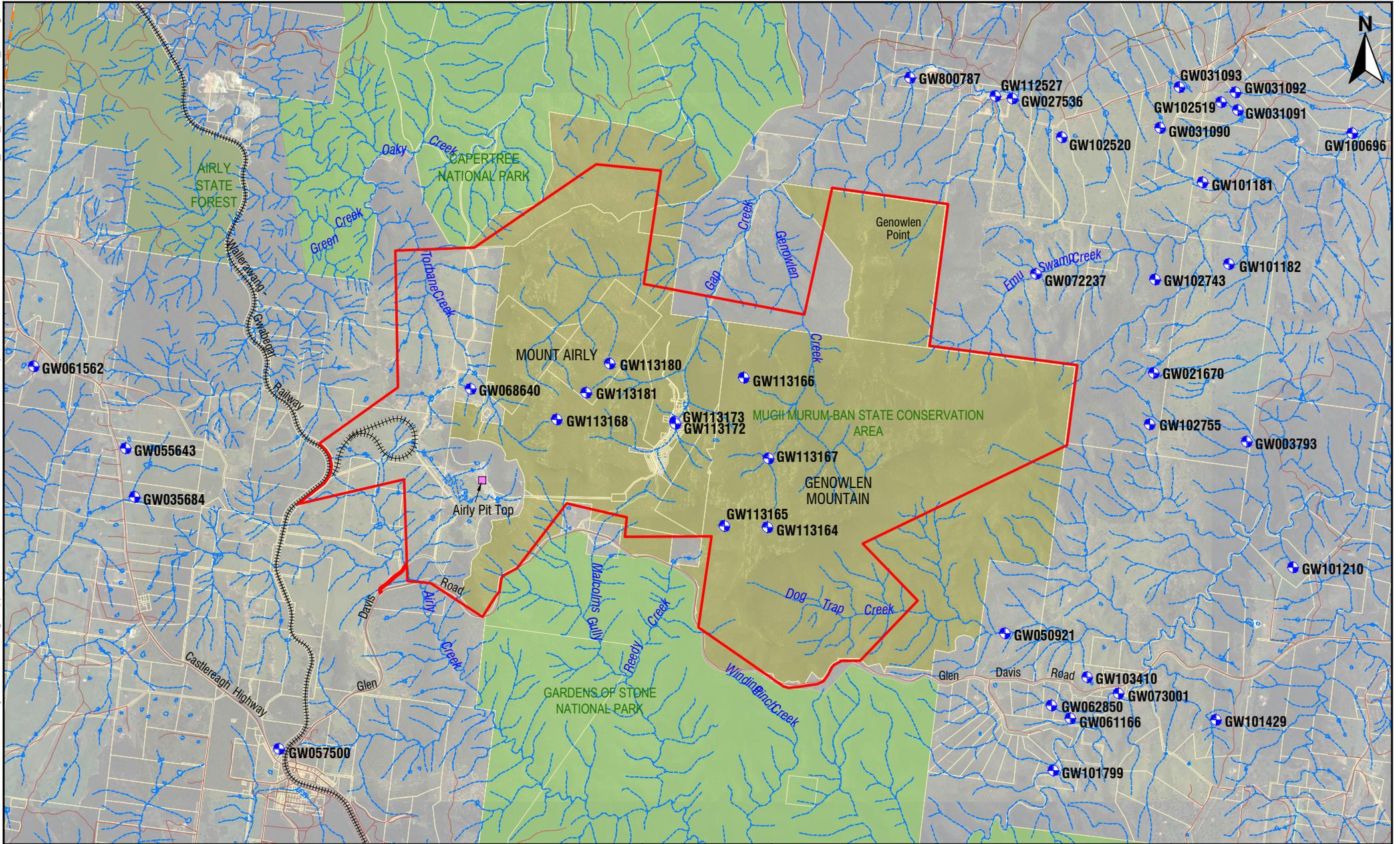
The search also identified three registered landholder bores located to the west of Airly Mine. Based on the depth (6.4 m) and location in the vicinity of a creek line, registered bore GW035684 is likely located in the alluvium. Based on the location and bore depth, GW061562 and GW055643 are likely installed in the Shoalhaven Group.

8.2.2.6 Groundwater Resources Sensitive Receptors

The Groundwater Impact Assessment focusses on potential impacts of the modification on the following sensitive groundwater resources:

- *Alluvium and Quaternary strata*: provide baseflow to Gap Creek and Genowlan Creek (including the Grotto and Oasis areas), potential habitat to vegetation and stygofauna GDEs and is a groundwater source to a small number of users along Genowlan Creek downstream of the Project Application Area.
- *Narrabeen Sandstone*: local groundwater source within the Project Application Area that provides a potential habitat to stygofauna and feeds seepage areas/springs.
- *Illawarra Coal Measures*: local groundwater sources within the Project Application Area that provide baseflow to Gap Creek and Genowlan Creek and feed seepage areas/springs such as the Village Spring.
- *Shoalhaven Group*: a highly brackish to saline regional groundwater source providing a small proportion of water supply requirements to Airly Mine.
- *Devonian Metamorphic Strata*: a slightly brackish regional groundwater source that provides the majority of registered groundwater users to the east of the Project Application Area
- Village Spring.

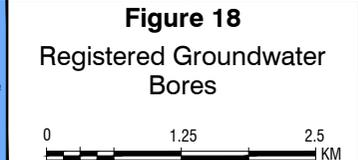
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LEGEND:	
	Project Application Area
	State Forest
	Major Roads
	National Park
	Watercourse
	State Conservation Area
	Cadastral Boundary
	Registered Groundwater Bore
	Railway

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DATE	09.10.2019
SEAM	LITHGOW
REFERENCE	SLR63012381_AM3_F18_REG-GW_03.dwg
SCALE	1 : 70000



	Prepared by:		A4

8.2.3 Impact Predictions

The model outputs from the recalibrated groundwater model are provided for both the proposed (3 Mtpa) and approved conditions (1.8 Mtpa). The model outputs for the 1.8 Mtpa condition, as was presented in the Airly MEP EIS (GHD, 2014a), are also presented in this section and **Section 8.2.4** for completeness. However, comparisons of the 3 Mtpa condition are made against the 1.8 Mtpa (recalibrated model) condition instead of the 1.8 Mtpa predictions in the Airly MEP EIS for meaningful and scientifically valid comparisons. It is noted that in a number of cases the approved condition impacts are slightly greater than the proposed conditions. This is attributed to the model recalibration as mining continues for a longer period for the 1.8 Mtpa condition.

8.2.3.1 Mine Inflows

Figure 19 provides the mine inflow predictions for the approved 1.8 Mtpa and the proposed 3 Mtpa conditions, from the recalibrated groundwater model.

Detailed discussions on the relative mine inflows for the two conditions, and compared to the EIS predictions (GHD, 2014a), are included in **Section 5.3**. The following statements summarise the mine inflow predictions.

- The maximum groundwater inflows for the 3 Mtpa condition (yellow line) is predicted at 71 ML/year in 2027, which gradually decreases to 69 ML/year in 2031.
- The peak inflow for the 3 Mtpa scenario is predicted to occur earlier than for the approved 1.8 Mtpa mining rate (orange line), however the peak inflow is predicted to be slightly lower than that for the 1.8 Mtpa mining rate (76 ML/year).
- Mine inflows for both the 1.8 Mtpa and 3 Mtpa mining rate are similar at the end of mining as the mine plan has the same footprint for both scenarios.

A review of the potential effect of lineaments on groundwater predictions and groundwater / surface water interactions was also undertaken in GHD (2019b), including the modelling of Gap Creek lineament zone. Underground mining has extended through the Gap Creek lineament and no groundwater inflow was observed during or following mining in this area. Nevertheless, lineaments have been considered as part of the sensitivity analysis of the hydrogeological modelling (GHD, 2019a). Specifically, the assessment in GHD (2019a) was undertaken to investigate any enhancement of mining-induced impacts on mine inflow predictions due to the occurrence of lineaments. This also addressed the submission by the Independent Expert Scientific Committee on the Airly Mine Extension Project EIS.

The analysis undertaken on lineaments is described in Section 6.1.4 of the groundwater impact assessment (GHD, 2019a). The calibration results show that lineaments have a minimal effect if any impact on groundwater inflow at Airly Mine and GHD (2019a) provide multiple lines of evidence to support the conclusion.

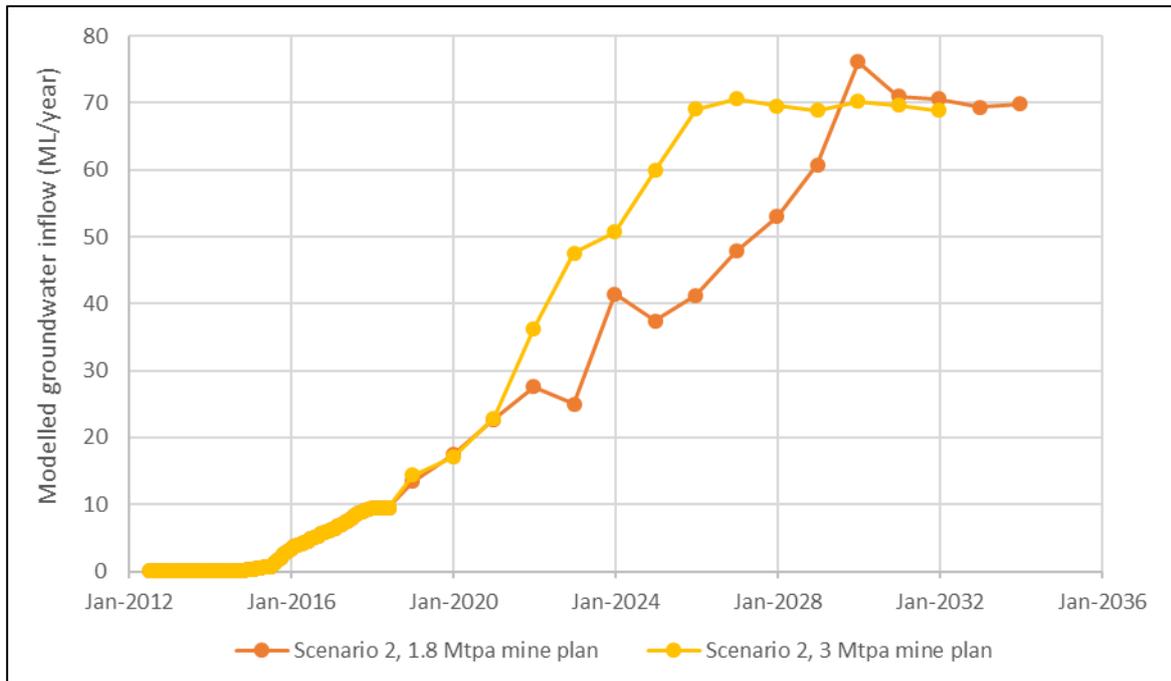


Figure 19 Mine Inflows for 1.8 Mtpa and 3 Mtpa Production Rates

8.2.3.2 Groundwater Drawdown and Recovery

Drawdown

Predicted groundwater drawdown contour plots for the approved (1.8 Mtpa) and proposed (3 Mtpa) conditions for all strata considered, are included in Appendix C of GHD (2019c). The drawdown contours indicate the expected zone of groundwater impact under proposed and approved conditions.

Drawdowns for both conditions for end of mining and for 30 years after mining have been modelled for the following strata:

- Shallow strata (Gap Creek and Genowlan Creek alluviums)
- Lithgow seam (late Permian Illawarra Coal Measures)
- Marrangaroo Formation
- Upper Shoalhaven Group

Table 11 provides a summary of the maximum modelled drawdowns for the 1.8 Mtpa and 3 Mtpa production rates.

The predicted drawdowns reported in the Airly MEP groundwater impact assessment are also included in **Table 11** for completeness. While limited comparisons of drawdowns predicted for the 1.8 Mtpa and 3 Mtpa scenarios from the recalibrated groundwater model are made against the drawdown reported in the Airly MEP EIS, the only valid comparisons are between model predictions for the approved and proposed scenarios using the recalibrated model. This comparison provides a more realistic assessment of the impact of the proposed modification on the hydrogeological environment within the consent boundary and the immediate surroundings encompassing the zone of influence.

Table 11 Maximum Modelled Drawdowns for 1.8 Mtpa and 3 Mtpa Production Rates

Conditions	Mining stage	Shallow strata /alluvium	Late Permian Illawarra Coal Measures	Early Permian Shoalhaven Group
Approved 1.8 Mtpa (GHD, 2014a)	End of mining	3.5 m (Gap Creek) 1.1 m (Genowlan Creek)	7.5 m (Permian Siltstone) 6.2 m (Lithgow Seam) 6 m (Marrangaroo)	0.1 m
	30 years after end of mining	Not assessed		
Approved 1.8 Mtpa (Recalibrated model)	End of mining	2.0 m (Gap Creek) 1.9 m (Genowlan)	16.1 m (Lithgow Seam) 16.1 m (Marrangaroo)	7.3 m
	30 years after end of mining	0.4 m (Gap Creek and Genowlan Creek)	0.3 m (Lithgow Seam) 0.3 m (Marrangaroo)	0.4 m
Proposed 3 Mtpa	End of mining	1.9 m (Gap Creek and Genowlan Creek)	16.5 m (Lithgow Seam) 16.4 m (Marrangaroo)	7.4 m
	30 years after end of mining	1.0 m (Gap Creek catchment) 0.2 m (Genowlan Creek)	0.3 m (Lithgow Seam) 0.3 m (Marrangaroo)	0.4 m

Drawdowns from the recalibrated model for the approved and proposed conditions can be summarised as follows.

- Peak drawdown in the shallow alluviums will generally be less than that which was predicted in GHD (2014a), and there is little difference between the recalibrated approved and proposed conditions.
- Peak drawdown in the Illawarra Coal Measures will be more than double that which was predicted in GHD (2014a), although there is little difference between the recalibrated approved and proposed conditions.
- Peak drawdown in the Shoalhaven Group will be many times more than that which was predicted in GHD (2014a) and there is little difference between the recalibrated approved and proposed conditions.

Increased maximum predicted groundwater drawdown for the Illawarra Coal Measures and the Shoalhaven Group presented in **Table 11** is attributable to the recalibration of the groundwater model, which has modified hydraulic conductivity and storage properties of the strata to better match observed data.

As shown in **Table 11**, there is minimal difference in predicted drawdown between approved and proposed conditions for the recalibrated model. As noted above, this comparison is valid and provides an accurate impact of the proposed increase in production rate on the hydrogeological environment at Airly Mine.

Recovery

The other important aspect of groundwater drawdown is the time that it takes for groundwater levels to recover after the cessation of mining. The predicted drawdowns included in **Table 10** and graphically displayed in Appendix C of GHD (2019b), shows the following.

- The lateral extent of drawdown recovery in the shallow alluviums will be almost complete within 30 year after mining, with only isolated areas of drawdown remaining. Under proposed conditions, 30 years after the end of mining, a maximum remnant drawdown of 1 m is predicted



in the Gap Creek catchment and a maximum remnant drawdown of 0.2 m in the Genowlan Creek catchment, compared to a prediction of 0.4 m for both catchments in recalibrated approved conditions.

- The peak drawdown in the Illawarra Coal Measures 30 years after mining is predicted to be identical for both the recalibrated approved and proposed conditions, with a remnant peak drawdown of 0.3 m for Lithgow Seam
- The drawdowns within the Marrangaroo Formation at the end of mining and after 30 years after mining the radius of depressurisation the formation has greatly reduced and levels have almost recovered to pre-mining levels with maximum drawdown of 0.4 m at this time.
- The peak remnant drawdown in the Shoalhaven Group 30 years after mining is predicted to be identical for both the recalibrated approved and proposed conditions, with a remnant peak of 0.2 m.
- Overall, similar groundwater recovery is predicted under both approved and proposed conditions based on the recalibrated model.

8.2.3.3 Baseflow

Flow budgets for proposed and approved conditions for the final year of mining in each case (2031 and 2033, respectively, for 3 Mtpa and 1.8 Mtpa) have been compared in order to assess potential changes in baseflow as a result of the proposed increase of production rate to 3 Mtpa. Details of baseflow calculations are provided in Section 6.1.3 and the end of mining flow budget schematics for the approved and the proposed conditions are shown in Figure 6-4 and Figure 6-5 respectively of GHD (2019b).

GHD (2019c) predicts that baseflow will decrease throughout the period of mining for both recalibrated approved and proposed conditions. Baseflow has been calculated at the following locations (**Figure 21**).

- Gap Creek at the boundary of the Project Application Area
- Genowlan Creek at the boundary of the Project Application Area
- Confluence of Genowlan Creek and Gap Creek

The modelled pre mining baseflow and the minimum modelled baseflow for Gap Creek and Genowlan Creek is summarised in **Table 12**. For comparison, baseflow for the whole of the whole of the model domain is also included in **Table 12**.

Under proposed and approved conditions, after the end of mining, baseflow is modelled to gradually recover to pre-mining rates. Within Gap Creek and Genowlan Creek, baseflow is modelled to return to pre-mining rates within 50 years of the end of mining.

Table 12 also provides an indication of the predicted reduction in total annual flows (i.e. including catchment runoff) as a result of changes in baseflow for *average rainfall conditions in the Gap Creek and Genowlan Creek catchment*. These calculations assumed that catchment runoff was equal to 5% of the mean annual rainfall, consistent with GHD (2014a). As was discussed in GHD (2014a), annual runoff is likely to be more than 5% of annual rainfall due to the rocky nature and steep topography of the catchment. Therefore, the estimated reductions of total annual flow in Gap and Genowlan Creeks in **Table 12** are conservative i.e. impacts are likely to be less than indicated.

Table 12 Potential Changes in Baseflow in Gap Creek and Genowlan Creek

Conditions		Whole of model domain	Gap Creek at Project boundary	Genowlan Creek at Project boundary	Confluence of Gap and Genowlan Creeks
Approved (GHD, 2014a)	Pre-mining baseflow*(ML/year)	581.2	32.1	9.2	198.0
	Minimum baseflow (ML/year)	506.1	25.9	5.4	170.9
	Estimated reduction of total annual flow (under average rainfall conditions)	Not assessed	3.4%	2.1%	3.3%
Approved (recalibrated model)	Pre-mining baseflow* (ML/year)	414.0	30.9	12.5	186.1
	Minimum baseflow (ML/year)	393.4	22.7	8.5	168.7
	Estimated reduction of total annual flow (under average rainfall conditions)	Not assessed	4.5%	2.2%	2.1%
Proposed	Pre-mining baseflow* (ML/year)	414.0	31.0	12.5	186.1
	Minimum baseflow (ML/year)	394.6	24.4	8.5	171.7
	Estimated reduction of total annual flow (under average rainfall conditions)	Not assessed	3.6%	2.2%	1.8%

*Pre-mining refers to January 2010

Baseflow and reduction to total annual flow presented in Airly MEP (GHD, 2014a) differs to baseflow and total annual flow calculated from the recalibrated model. This discrepancy is due to recalibration of the model and changes in rainfall recharge. For the recalibrated model outputs, the reduction in baseflow and total annual flow to Gap Creek and Genowlan Creek is greater under approved conditions than for proposed conditions, however the differences are not significant.

The consequence of these predicted baseflow reductions on surface stream flows at one licensed surface water user on Genowlan Creek is discussed in **Section 8.3**.

8.2.4 Impact Assessment

This section provides an assessment of potential impacts on the sensitive groundwater resources identified in **Section 8.2.2.6**, under proposed and approved conditions.

8.2.4.1 Alluvium Groundwater Sources

Water Table

Under proposed conditions, groundwater drawdown within Gap Creek and Genowlan Creek alluvium are predicted to peak at 1.9 m and 2.0 m, respectively, (**Table 11**) at the end of mining. Under approved conditions, the groundwater drawdown within Gap Creek and Genowlan Creek alluvium will peak at 2.0 m and 1.9 m, respectively. The differences between the proposed and approved conditions are minor and not significant. The areas where groundwater drawdown is expected to occur within the alluvium/shallow zone strata are shown in Figure C-1 in Appendix C of GHD (2019b). No drawdown is

predicted in the Grotto or Oasis areas. All drawdown within Gap Creek and Genowlan Creek alluvium is predicted to occur within 300 m of the Project Application Area.

Within the alluvial groundwater sources, since there are no identified high priority GDEs (either vegetation or stygofauna) or groundwater supply works (operating under either basic landholder rights or Water Access Licences) in the areas of groundwater drawdown, the predicted impacts are less than the Level 1 minimal impact considerations under the Aquifer Interference Policy (DPI, 2012) and are therefore considered to be acceptable.

Groundwater Quality

The existing beneficial use categories for Gap Creek and Genowlan Creek alluvium are environmental protection as well as domestic and agricultural use. Under both approved and proposed conditions, it is not expected the predicted localised drawdown will change these categories either within the Project Application Area or further down gradient. Between August 2012 and March 2014, the groundwater level in Gap Creek alluvium at (ARPO5 piezometer) fell by approximately 5.3 m and is likely due to a combination of climatic conditions and potentially mining influence. Over this time period, there was no noticeable change in groundwater quality. Therefore, it is unlikely the groundwater drawdown will result in an increase in salinity in the connected surface watercourses, Gap Creek and Genowlan Creek.

The beneficial use category of the alluvial groundwater is not expected to change within or outside the Project Application Area and the level of impact is less than the Level 1 minimal impact considerations under the Aquifer Interference Policy.

Baseflow

Baseflow to Genowlan Creek and Gap Creek will decrease during the period of mining under approved and proposed conditions.

Under approved conditions, the maximum reduction in baseflow at the boundary of the Project Application Area is 10.9 ML/year and 6.3 ML/year in Gap Creek and Genowlan Creek, respectively (**Table 12**). Under approved conditions, reduction in total annual flow under average rainfall conditions at the boundary of the Project Application Area is 4.5% and 2.2% in Gap Creek and Genowlan Creek respectively. Under approved conditions the maximum reduction in baseflow and total flow will occur in 2034, 1 year after the end of mining.

Under proposed conditions, the maximum reduction in baseflow at the boundary of the Project Application Area is 6.6 ML/year and 4.0 ML/year in Gap Creek and Genowlan Creek, respectively (**Table 12**). Under proposed conditions, reduction in total annual flow under average rainfall conditions at the boundary of the Project Application Area is 3.6% and 2.2% in Gap Creek and Genowlan Creek respectively. Under proposed conditions the maximum reduction in baseflow and total flow will occur in 2032, 1 year after the end of mining.

The small decrease or no change in flows in Gap and Genowlan Creeks under proposed conditions compared are not significant, and as noted above are attributable to model recalibration and that for the approved condition mining and dewatering occurs for a longer period, allowing additional time for loss in baseflow to occur.

Cumulative Impacts

There are no other mining operations or groundwater extraction/interception activities in the area that impact the alluvial and Quaternary groundwater sources.

8.2.4.2 Porous and Fractured Rock Groundwater Sources

The Narrabeen Sandstone, Illawarra Coal Measures and Shoalhaven Group groundwater sources are considered to be 'less productive' under the AIP since the yields are typically less than 5 L/s and/or the groundwater salinity exceeds 1,500 mg/L.

Water Pressure

Predictions in change in water pressure for the approved and proposed conditions for the modelled strata are as follows.

- Depressurisation of the Narrabeen Sandstone is expected to be negligible or not measurable for both conditions throughout most of the strata, although there may be some localised drawdown at the interface with the underlying Permian strata of up to 2.1 m under both conditions.
- Maximum depressurisation of the Permian strata of the Illawarra Coal Measures overlying and including the Lithgow Seam is 16.5 m under proposed conditions, which is slightly greater than the maximum of 16.1 m for approved conditions.
- Maximum depressurisation of the underlying Marrangaroo Formation of 16.4 m is predicted under proposed conditions and up to 16.1 m under approved conditions.
- Maximum depressurisation of the underlying Shoalhaven Group regional groundwater source of up to 7.4 m is predicted under proposed conditions and up to 7.3 m under approved conditions. Depressurisation in the Shoalhaven Group due to mining does not extend to the Airly Mine production bore or landholder bores to the west of Airly Mine.
- Depressurisation of less than 0.2 m is predicted at the boundary of the Gardens of Stone National Park under both approved and proposed conditions. This minor depressurisation at the boundary of the Gardens of Stone National Park is within the resolution of uncertainty associated with modelling predictions and the expected climatic fluctuations.
- No drawdown of regional groundwater is expected to extend to private landholder bores to the east of the Project Application Area.

Groundwater quality

The predicted drawdown in the less productive porous and fractured rock groundwater sources is not expected to result in the interaction between salty or poor-quality groundwater (i.e. Permian and Shoalhaven Group) and fresh high-quality groundwater (alluvium, Narrabeen Sandstone, Devonian regional groundwater) under proposed conditions. Since the poorer quality regional groundwater (Shoalhaven Group) is located above the higher quality Devonian groundwater, the minor depressurisation of the upper Shoalhaven Group that is predicted due to mining of the overlying Lithgow Seam will not impact groundwater levels or quality of the underlying Devonian. Further, any hydraulic connection that may currently exist between the Shoalhaven Group groundwater and Devonian groundwater due to lineaments (which is considered to be limited based on the water quality assessment) will not be enhanced due to mining since the mining occurs well above this zone. Overall, it is not expected that the beneficial use category of the porous and fractured rock groundwater will change under approved or proposed conditions.

Cumulative Impacts

The extents of the Narrabeen Sandstone and Illawarra Coal Measures groundwater sources are limited to the Project Application Area. There are no other mining operations or groundwater extraction/interception activities in the area that impact these sources.

The modelled impact on the Shoalhaven Group due to underground mining does not extend to the production bore. Therefore, there are no cumulative drawdown or groundwater quality impacts from the operation of the production bore and the coal extraction activities.

8.2.5 Consequence of Potential Impacts

8.2.5.1 Registered Bore Users

The drawdown contours included in Appendix C of GHD (2019c) demonstrate measurable drawdowns for the proposed condition at the end of mining in the shallow strata (alluvium), the Lithgow Seam and Marrangaroo Formation, however, the maximum drawdowns are restricted to 300 m within the Project Application Area boundary.

The predicted drawdown in the Upper Shoalhaven Group does not extend to the production bore or the pit top. The yield of the production bore is currently < 0.8 L/s, and extraction at this rate will not result in any drawdown. Given that drawdown will not be greater than 2 m at any other water supply work in the vicinity, the impacts are less than the Level 1 minimal impact considerations.

Drawdown in the registered bores to the east of the Project Application Area, most of which draw water from the in regional Devonian groundwater source, are not expected. As discussed in **Section 8.2.2.3** there is minimal inter-aquifer hydraulic connection between the upper and lower regional groundwater sources, based on differences in groundwater chemistry. The numerous landholder bores are all within the lower regional groundwater sources and so are isolated from groundwater drawdown in higher strata that would be caused by mining. Accordingly, the predicted groundwater drawdown in the upper aquifers will have no effect on the registered bore users sourcing water from the Devonian aquifer.

8.2.5.2 Village Spring

As was assessed in the Airly MEP EIS and the Groundwater Impact Assessment (GHD, 2014a), mining in the New Hartley Shale Mine potential interaction zone has the potential to induce further cracking of the strata. Extraction and the resulting subsidence of 200 – 500 mm discussed in the Airly MEP EIS in the existing shale workings has the potential to induce further cracking of the strata. As previously assessed in GHD (2014a), the cracking may affect the Village Spring seep and therefore there would be a possibility that discharges from Village Spring will decrease or cease as a result of proposed mining.

Since secondary extraction within the New Hartley Shale Mine potential interaction zone is no longer proposed by Centennial Airly, this would reduce the likelihood of cracking of strata in this zone and would reduce the likelihood of impacts on Village Spring.

8.2.5.3 Groundwater Dependent Ecosystems

Stygofauna have been identified in the shallow Narrabeen Sandstone (**Section 8.2.2.3**), although groundwater monitoring has shown that the extensive natural fracturing of the sandstone results in the seepage of groundwater along the slopes of the mountains and therefore limited groundwater within these strata to support stygofauna. Negligible drawdown is predicted in the Narrabeen Sandstone due to mining. Therefore, the groundwater source that supports identified stygofauna will not be impacted by mining.

Since there are no high priority vegetation GDEs (either vegetation or stygofauna) or groundwater supply works (operating under either basic landholder rights or Water Access Licences) in the areas of groundwater drawdown and no drawdown in the groundwater source that supports identified stygofauna, the predicted impacts are less than the Level 1 minimal impact considerations under the AIP and are therefore considered to be acceptable.

8.2.6 Monitoring and Management

Surface and groundwater monitoring currently undertaken in accordance with the monitoring programs included in the *Airly Mine Water Management Plan* (Centennial Coal, 2018c) and discussed in **Section 4.14.3.3** will continue to be undertaken to assess potential impacts of mining operations on water resources. The monitoring data will continue to be reported in the *Annual Review* as per Condition 11 under Schedule 6 of SSD 5581 and in the *Annual Return* as required by EPL 12374.

8.2.7 Water Licensing

Groundwater extraction and interception from the GMR WSP Sydney Basin North Groundwater Source over the life of the Project under proposed conditions can be summarised as follows.

- Groundwater inflows will peak at 71 ML/year in year 2027, primarily from the Illawarra Coal Measures, and the majority of which will be realised as increased ROM coal moisture rather than free water pumped from the underground workings.
- Groundwater extraction from the Shoalhaven Group via the existing production bore could be up to 25 ML/year (~0.8 L/s), based on the current extraction rate; this extraction could decrease over time to zero.
- Inherent (or in situ) coal moisture, which forms part of the ROM coal moisture, is predicted at 71 ML/year (GHD, 2019e) during mining operations, discussed in **Section 8.4**, and this combined with groundwater inflows will result in maximum take of groundwater at 146 ML/year.

The total extraction and interception from the Sydney Basin North groundwater source over the life of the mine is expected to peak at 171 ML/year. Given that most of this volume will be as ROM coal moisture and that the water balance model predicts that the site will be in water deficit under almost all climatic conditions considered (GHD, 2019e), this total is not expected to vary significantly due to climatic conditions over the life of the mine. The peak volume is within Centennial Airly's existing WAL for the Sydney Basin Groundwater Source of 278 ML/year (**Section 4.15**).

8.2.8 Conclusion

The maximum mine inflows 71 ML/year for the proposed 3 Mtpa is predicted for the year 2027, which is less than the predictions for the 1.8 Mtpa condition at 74 ML/year. Groundwater flow into mine workings is primarily from local groundwater sources which are not hydraulically connected to the regional Devonian aquifers that supply majority of the private landholder bores located to the east of the Project Application Area. Predicted inflows from the recalibrated model are considerably less than the peak inflow reported in GHD (2014a) of 183 ML/year. The production bore yield of 0.8 ML/year could potentially supply 25 ML/year for process water. These volumes are within Centennial Airly's existing Water Access Licences for the Sydney Basin North Groundwater Source of 278 ML/year. Therefore, the proposed Project will be able to operate in accordance with the rules of the Sydney Basin North groundwater source.

Drawdown predictions demonstrate measurable drawdowns for the proposed condition at the end of mining in the shallow strata (Gao Creek and Genowlan Creek alluviums), however the maximum drawdowns are restricted to 300 m within the Project Application Area boundary. The differences in drawdowns for the proposed conditions are not significantly different from the approved condition from the recalibrated groundwater model.

There is minimal difference in predicted drawdown in the Permian strata and the Shoalhaven Group between the approved and proposed conditions. The spatial extent of drawdown in porous and fractured rock groundwater sources does not extend far beyond the Project Application Area and there is no drawdown of private registered landholder bores predicted. In addition, no groundwater impacts are predicted to occur within World Heritage Areas, including the Gardens of Stone National Park, within the resolution of uncertainty associated with modelling predictions and the expected climatic fluctuations.

Therefore, residual groundwater impacts under both proposed and approved conditions are considered to be less than the Level 1 criteria under the NSW Aquifer Interference Policy and considered to be acceptable.

Baseflow to Genowlan Creek and Gap Creek alluvium will decrease during the period of mining under approved and proposed conditions. Under proposed conditions there will be a 3.6% reduction in Gap Creek as a result of change in baseflow for average rainfall conditions. The equivalent reduction for Genowlan Creek is calculated at 2.2%. These reductions are not significantly different to the 4.5% and 2.2% reductions, respectively for Gap and Genowlan Creeks for the 1.8 Mtpa condition from the calibrated model.

Under proposed and approved conditions, after the end of mining, baseflow is modelled to gradually recover to pre-mining rates. Within Gap Creek and Genowlan Creek, baseflow is modelled to return to pre-mining rates within 50 years of the end of mining.

The beneficial use category of the alluvial groundwater is not expected to change within or outside the Project Application Area and the level of impact is less than the Level 1 minimal impact considerations under the Aquifer Interference Policy (DPI, 2012), and impacts are considered acceptable.

8.3 Surface Water

8.3.1 Introduction

This section assesses the impact of the baseflow reduction predicted in the shallow strata (**Section 8.2.3.3**) and the resulting impacts on stream flows in Gap Creek and Genowlan Creek and including one identified downstream water user on Genowlan Creek. The Surface Water Letter Report was prepared by GHD Pty Ltd (GHD, 2019d) and is appended to the Modification Report as **Appendix F**.

8.3.2 Existing Environment

8.3.2.1 Local Hydrology

Airly Mine lies within the Capertee River catchment, which is part of the Greater Hawkesbury/Nepean catchment. **Section 3.8** describes the surface hydrological features of the Project Application Area. **Section 4.8** describes the surface water management at the pit top and **Section 4.14.3.2** outlines the surface flow and water quality monitoring undertaken by the mine.

Three watercourses (**Figure 5**) of relevance to the modification are:

- Airly Creek, drains the southern sector of the Project Application Area and is the receiving environment for discharges through the licensed discharge points on EPL 12374
- Gap Creek, which flows through Airly Gap and flows into Genowlan Creek outside of the Project Application Area
- Genowlan Creek, with the headwaters in Genowlan Mountain, flows into Capertee River.

Airly Creek is not discussed further in this section as the headwaters of this watercourse do not overlie the mining area. Gap Creek and Genowlan Creek overlie the mining areas and have the potential to be impacted by mining.

8.3.2.2 Gap Creek and Genowlan Creek Streamflow

Surface flow monitoring in Gap and Genowlan Creeks (**Section 4.14.3.2**) has been undertaken since 2013. The monitoring locations are shown in **Figure 13**. **Figure 20** shows the stream flow data for the two monitoring locations, and also the site rainfall data from January 2013 to July 2019.

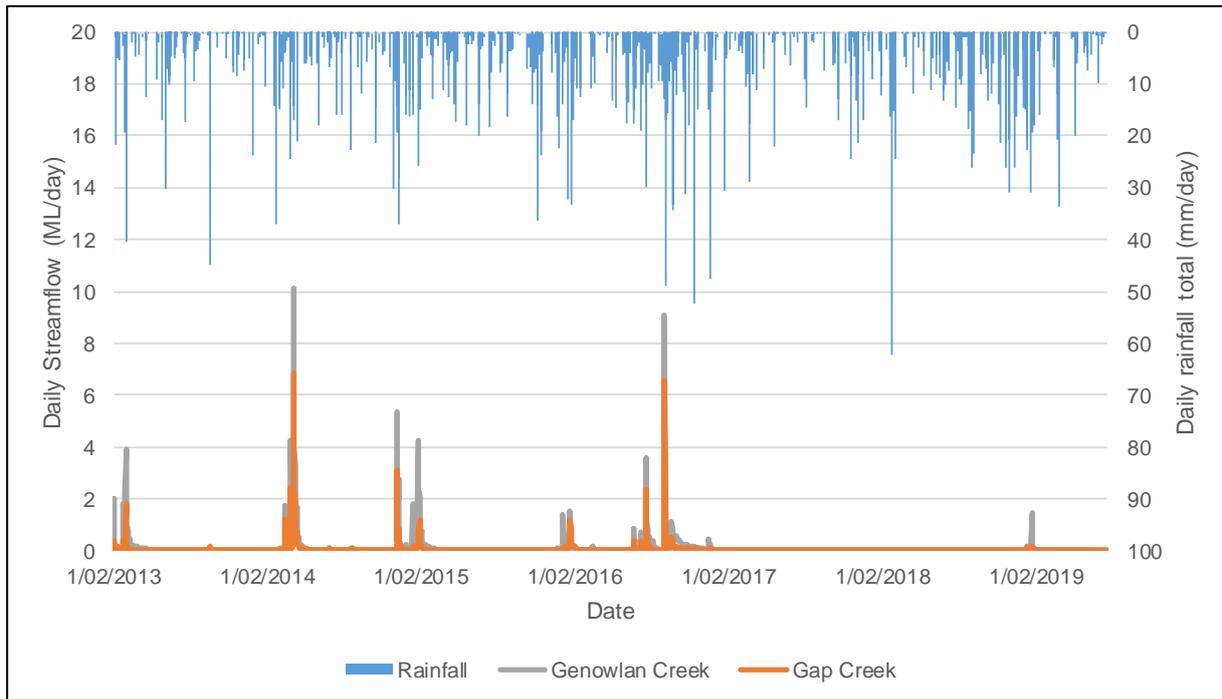


Figure 20 Gap Creek and Genowlan Creek Streamflow Data

Figure 20 shows that brief periods of streamflow occur in both Gap and Genowlan Creeks during and following rainfall events, before quickly receding to no-flow condition during periods where there is insufficient rainfall and runoff to maintain surface water flow. One flow event has been observed in both Genowlan and Gap Creek since late 2016 (in February 2019). The absence of observed flow is consistent with below average rainfall during this period, and unlikely to be associated with mining at Airly Mine.

8.3.2.3 Downstream Water User

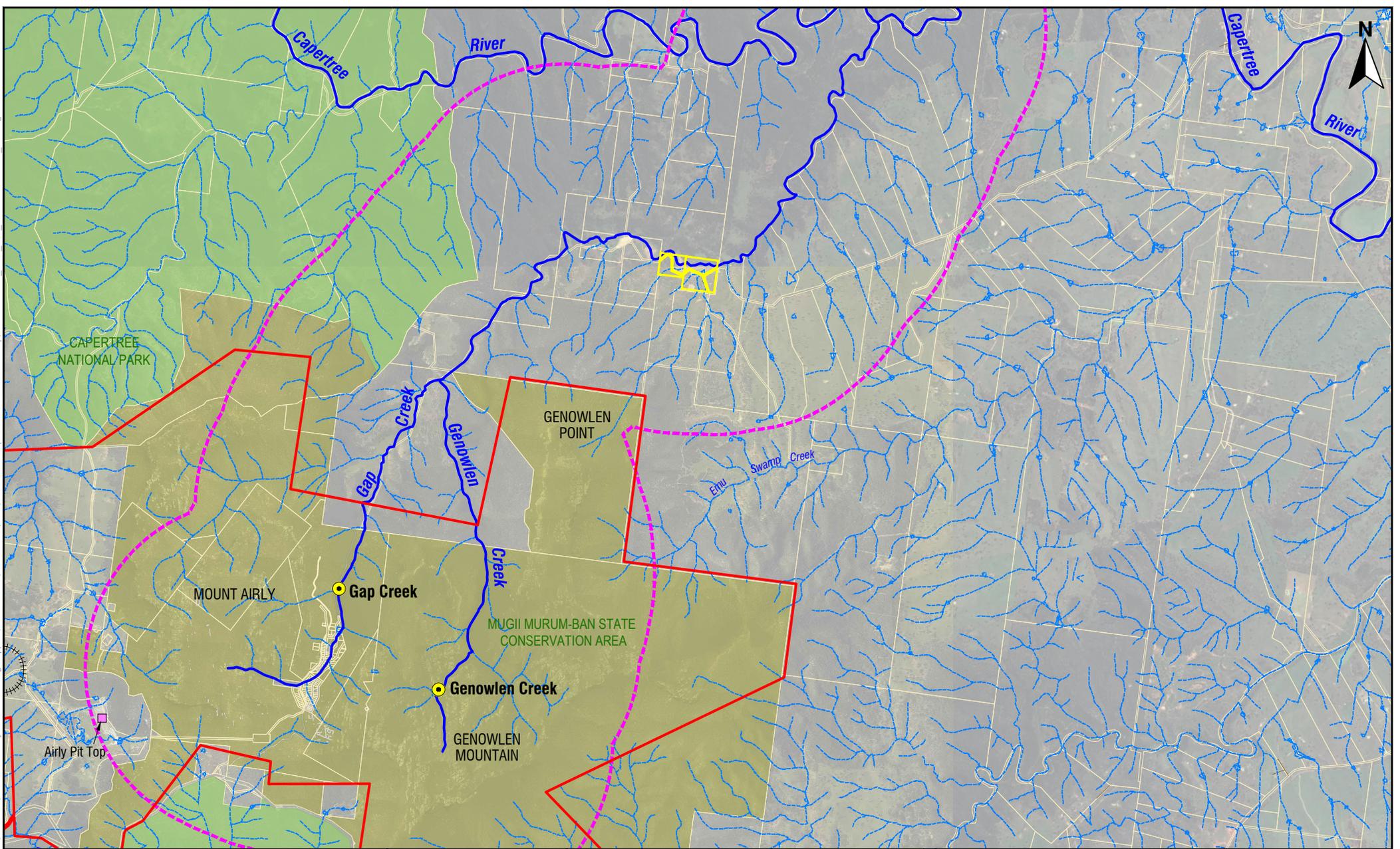
A search of lots within 2 km of Genowlan and Gap Creek using the *NSW Water Register* (WaterNSW 2019) identified one downstream surface water user on Genowlan Creek (**Figure 21**).

The works approval and the associated water access licence for the identified licensed user are summarised in **Table 13**. WAL 26203 is an unregulated river category in the Capertee River Management Zone of the Hawkesbury and Lower Nepean Rivers Water Source. The use purpose of WAL 26203 is irrigation.

Table 13 Potential Changes in Baseflow in Gap Creek and Genowlan Creek

Lot/DP	Approval number	Work	Use purpose	WAL number	WAL share components	Category
Lot 5, DP 755786 Lot 9, DP 755786	10CA104516	50 mm centrifugal pump	Irrigation	26203	41.00	Unregulated river

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LEGEND:	
	Project Application Area
	National Park
	Major Roads
	Watercourse
	Railway
	Cadastral Boundary
	State Conservation Area
	Flow Gauge
	Downstream Watercourse
	Downstream Water User Search Area
	Downstream Surface Water User

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Figure 21
Downstream Surface Water
Users - Genowlen Creek

Prepared by:

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8.3.3 Impact Assessment

The potential impact of baseflow reduction in Gap and Genowlan Creek for the proposed condition has been assessed using the available observed flows of both creeks (**Figure 20**) and the baseflow reduction estimates from the recalibrated hydrogeological model (**Section 8.2.3.3**). Analyses are undertaken for three locations:

- Gap Creek at Project Application Area boundary
- Genowlan Creek at Project Application Area boundary
- Genowlan Creek at Gap Creek confluence.

Based on data from GHD (2014a) and GHD (2019c), **Table 14** summarises the predicted baseflow reduction for the proposed and approved conditions from the recalibrated groundwater model, expressed as daily averages at the three locations assessed. The estimated baseflow reduction for the 1.8 Mtpa condition included in the Airly MEP EIS is also included for completeness.

Table 14 Estimated Baseflow Reduction in Gap Creek and Genowlan Creek

Location	Approved 1.8 Mtpa (GHD, 2014a) (ML/day)	Approved 1.8 Mtpa (recalibrated model) (ML/day)	Proposed 3 Mtpa (ML/day)
Gap Creek at Project Application Area boundary	0.010	0.022	0.018
Genowlan Creek at Project Application Area boundary	0.010	0.011	0.011
Genowlan Creek at Gap Creek confluence	0.074	0.048	0.040

The following are noted in relation to data in **Table 13**.

- There are minor differences between the two sets of 1.8 Mtpa conditions, due to the recalibration of the groundwater model.
- Baseflow reductions under proposed conditions are expected to less than or equal to baseflow reductions under approved conditions (recalibrated). The minor differences are not significant and relate to the different mining schedules between the 1.8 Mtpa (approved) and 3.0 Mtpa (proposed) production rates from the recalibrated model with the 3 Mtpa production showing earlier completion of mining, however the mining footprint remains unchanged.

The predicted baseflow reductions in **Table 13**, when applied to the observed stream flow record (**Figure 20**) allows an assessment of the potential impacts on flow regime using flow duration curves. The flow duration curves for Gap Creek and Genowlan Creek are shown in **Figure 22** and **Figure 23**, respectively. The approved (GHD, 2014a; GHD, 2014b)) case has been included for completeness however cannot be compared with the approved (recalibrated model) and the proposed case.

Figure 22 shows that Gap Creek has measurable surface flow on approximately 10% of days, ranging in the order of 0.1 ML/day to 10 ML/day. Some reduction in baseflow and measurable flows days are expected as a result of approved mining at Airly Mine. The reduction is slightly less (that is, not significantly) for proposed conditions compared to approved conditions.

Figure 23 shows that Genowlan Creek has measurable surface flow on about 18% of days, ranging in the order of 0.1 ML/day to 10 ML/day. Some reduction in baseflow and measurable flows days are expected as a result of approved mining. No change to this potential reduction is expected under proposed conditions compared to approved conditions.

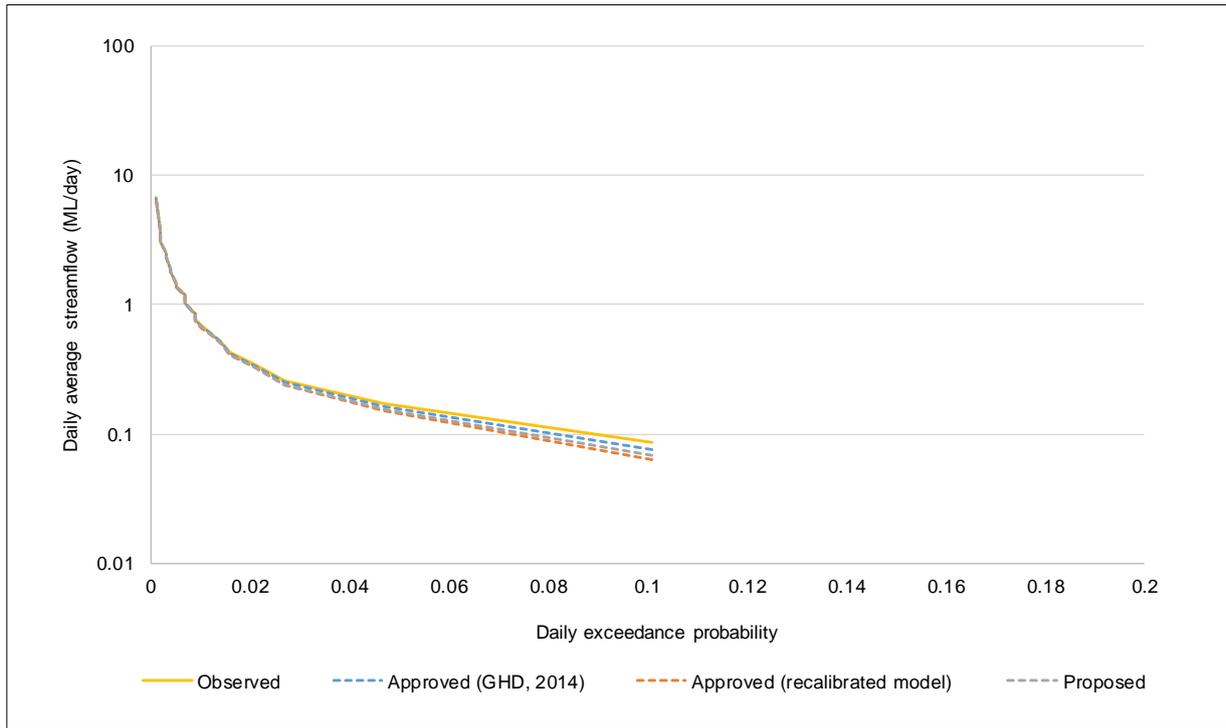


Figure 22 Modelled Impacts on Gap Creek Flow Regime

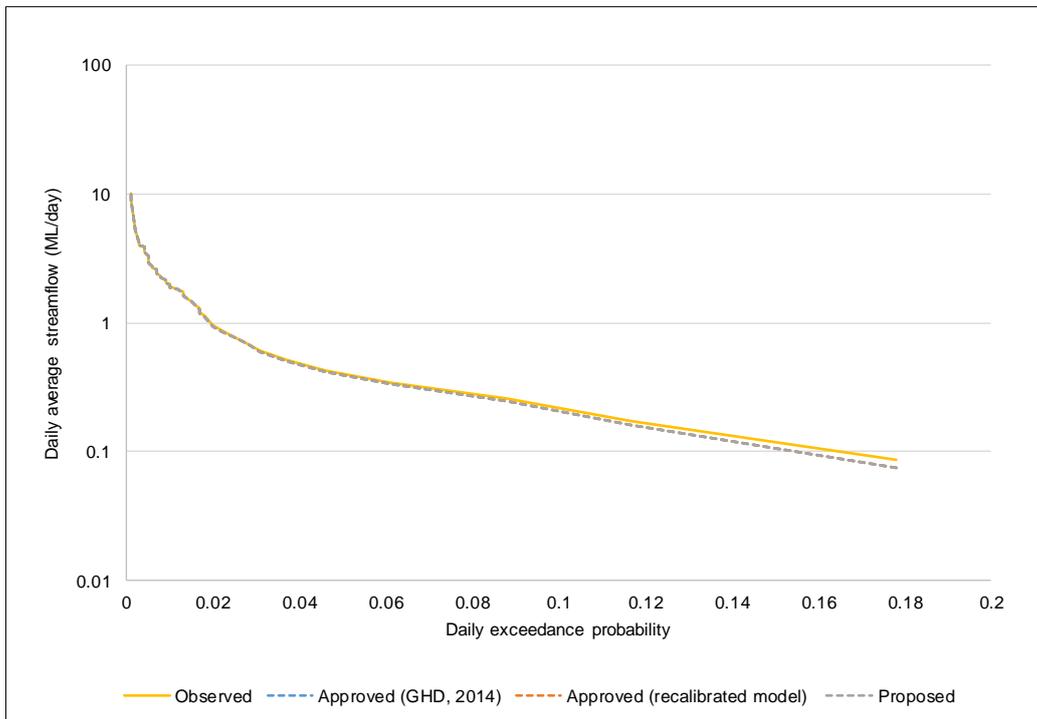


Figure 23 Modelled Impacts on Genowlan Creek Flow Regime



8.3.4 Consequence of Potential Impact

An assessment undertaken of the potential impact of the predicted baseflow reduction and change in the Genowlan Creek flow regime on the identified surface water user (**Figure 21**) concluded no measurable impact on flows will be experienced by the user.

8.3.5 Mitigation and Management

Surface water monitoring included in the site-specific water management plan (Centennial Coal, 2018c) at Airly Mine (**Section 4.14.3.2**) will continue to be undertaken to assess potential impacts of mining operations on water resources. The monitoring data will continue to be reported in the *Annual Review* as per Condition 11 under Schedule 6 of SSD 5581 and in the *Annual Return* as required by EPL 12374.

8.3.6 Conclusion

The potential impact of the proposed modification on baseflow and flow regimes in Gap Creek and Genowlan Creek are expected to be slightly less than approved conditions, based on the recalibrated groundwater model predictions. The differences are small between the two conditions and the impact of the proposed modification on the hydrological environment downstream from the mining area within the Genowlan Creek catchment is not expected to be significant. The proposed modification can therefore be considered equivalent to the potential impacts of approved operations at Airly Mine.

8.4 Site Water and Salt Balance

8.4.1 Introduction

A Site Water and Salt Balance was prepared by GHD Pty Ltd and appended as **Appendix G**, and which identified the following potential impacts to the surface water system as a result of the proposed modification:

- changes to site water management
- changes to site water and salt balance.

The key potential impact to the site water and salt balance are due to the increased production rate, from 1.8 Mtpa to 3 Mtpa, and the increase in workforce from 155 FTE personnel to 200 FTE personnel. The increased production rate results in a change in mine inflow predictions compared to the approved condition, and this was discussed in **Section 8.2.3.1**.

No change to the existing mining infrastructure is proposed, however the ECOMAX effluent treatment system, with the design capacity adequate for 150 FTE personnel, will be upgraded or replaced to accommodate the 200 FTE personnel proposed in the modification.

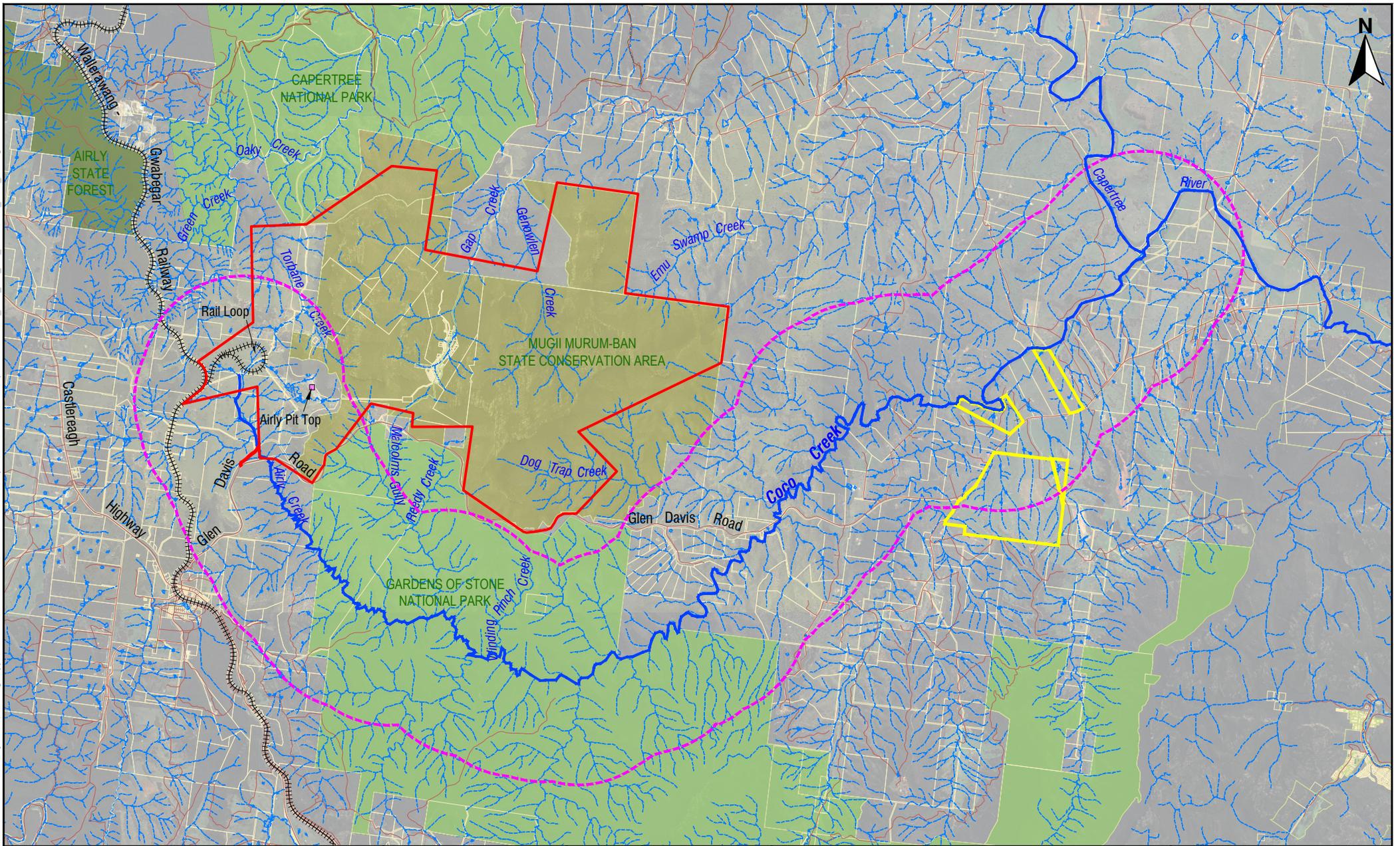
8.4.2 Sensitive Surface Water Receptors

The sensitive water receptors have been identified as:

- Airly Creek, which is the receiving environment for discharges from the Airly Mine pit top water management system
- Licensed surface water users on Coco Creek, approximately 20 km downstream of the Airly Mine pit top, listed in **Table 15**.

The locations of the licensed water users are shown in **Figure 24**.

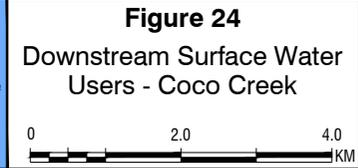
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LEGEND:	
—	Project Application Area
 	Cadastral Boundary
—	Downstream Watercourse
 	Works Approval Search Area
 	Licensed Water User
—	Major Roads
 	Watercourse
 	Railway
 	State Forest
 	National Park
 	State Conservation Area

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Prepared by: **SLR**

Centennial Coal
Airly

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Table 15 Downstream Licenced Water Users

Lot/DP	Approval number	Kind of approval	Work type	Use	WAL number	WAL share components
Lot 10, DP 247318	10CA104429	Water supply works and water use	Diversion works – pumps	Irrigation	26541	12 ML/year
Lot 4, DP 866875	10CA105445	Water supply works and water use	Diversion works – pumps, storages	Irrigation	25906	5 ML/year
					26039	42.5 ML/year
Lot 42, DP 751640	10CA105144	Water supply works and water use	Diversion works – pumps, storages	Irrigation	26728	4 ML/year
					26601	45 ML/year

8.4.3 Water and Salt Balance Assessment Method

The original site water and salt balance GoldSim model, developed for the Airly MEP EIS is was updated (GHD, 2019f) for Airly Modification 2 to reflect:

- new site information, including dust suppression estimates, catchment and runoff model parameters
- revised groundwater inflows into the underground workings predicted by the recalibrated hydrogeological modelling for the both the approved 1.8 Mtpa production rate (GHD 2019f).
- degraded reliability and average flow rates from the production bore
- importation of up to 170 ML/year of water from Charbon Colliery by rail haulage to be unloaded at the Rail Loader Dam and transferred to the 35 ML Discharge Dam.

The site water balance for Modification 3 (GHD, 2019e) provides modelling outcomes for three conditions: existing, approved and proposed conditions discussed below to support the proposed modification.

8.4.3.1 Existing Conditions

Airly Mine does not currently operate at its full approved production rate and not all approved activities are undertaken. The existing conditions site water and salt balance, using data for the year 2018, reflects the actual conditions experience in 2018. The model outputs for the existing condition is provided in GHD (2019e), and not discussed further in this report.

8.4.3.2 Approved Conditions

The approved conditions represent the baseline scenario where all approved activities are undertaken. The following assumptions were included in the water and salt balance model simulation:

- the existing water management system, operated as approved in Airly MOD 2
- the operation of the CPP and REA and potential discharges from the REA Dam via an associated REA LDP, as described in the Airly MEP EIS
- maximum production rate of 1.8 Mtpa of ROM coal, and assuming all ROM coal would be beneficiated in the CPP, resulting in 20% coarse and fine reject material
- maximum mine inflows from the approved condition from the recalibrated groundwater model (**Section 8.2.3.1**).
- maximum workforce of 155 FTE personnel

- importation of up to 170 ML/year of water from Charbon Colliery when the surface water storages will be less than 75% full
- median EC of 2320 $\mu\text{S}/\text{cm}$ pit top, being the maximum EC of water at the site due to imported water from the LDP4 Dam at Charbon Colliery.

8.4.3.3 Proposed Conditions

Proposed conditions reflect the changes proposed as part of the modification. Proposed conditions were similar to approved conditions, except for the increase in maximum production rate from 1.8 to 3 Mtpa ROM coal and increase in workforce from 155 FTE to 200 FTE personnel. The approved CPP and REA are not in the current five-year plan at Airly Mine, and therefore two proposed scenarios have been considered:

- Proposed conditions A: the approved CPP and REA are not constructed or used.
- Proposed conditions B: the approved CPP and REA are constructed and used.

8.4.3.4 Modelling Methodology

The water and salt balance models for Modification 3 were simulated over projected life of the mine, from existing conditions in 2018 until 2037, and selected outputs from the modelled system were statistically summarised.

The site's water management system and the various water transfers between the system components for the site water balance are shown as schematics in Figure 4-1 and Figure 5-2, respectively in GHD (2019e). The salt balance model was developed as an extension of the water balance model, with expected concentrations of salt applied to water inflows into the system. Transfers of the resulting salt loads were modelled throughout the site.

To assess the impact of rainfall on the site, modelling for the approved and proposed conditions was completed by using a historical time series of daily rainfall data extending over 130 years, from January 1889 to December 2018. A total of 130 simulations were applied, with each simulation modelling a different rainfall pattern from the record.

The GoldSim model outputs in GHD (2019e) include the average annual transfers between water management elements as well as the 10th percentile and 90th percentile values. The three results for each water transfer show the average transfer volume and an indication of the range of values expected due to possible variation in rainfall. The 10th percentile represents the value at which 10% of the modelled outputs were less than this value. Similarly, the 90th percentile represents the value at which 90% of the modelled outputs were less than this value.

It is noted the 10th and 90th percentile results are not the same as the “dry” and “wet” year results presented in **Section 8.4.4** (water balance) and **Section 8.4.5** (salt balance). The “dry” and “wet” year results are based on an equilibrium modelling approach with the driest and wettest rainfall year on record (347 mm in 1982 and 1530 mm in 1950, respectively) being repeated continuously as the simulated rainfall.

8.4.4 Water Balance Results and Discharges

The GoldSim water balance results (10th and 90th percentile and average) for the approved and proposed conditions A and B (**Section 8.4.3.3**) are included in full in GHD (2019e). For both proposed conditions, the maximum mine inflows for the 3 Mtpa production rate of 70 ML/year in year 2030 has been used in the modelling. The following sections provide summaries of the results presented in GHD (2019e).

8.4.4.1 Annual Water Balance Results – Approved Condition

A summary of the approved condition results for transfers between water cycle components is provided in Figure 5-5 of GHD (2019e). The results are provided for the year 2030 which represents the year of maximum mine inflows for the 1.8 Mtpa production rate (**Section 8.2.3.1**).

The approved condition results, including discharges through licensed discharge points, are discussed in **Section 8.4.4.2** when the proposed condition results are presented and discussed. The approved condition results present a baseline to assess the impact of the proposed conditions A and B.

8.4.4.2 Annual Water Balance Results – Proposed Conditions

The water balance model was used to estimate the annual transfers between the water cycle components under the proposed conditions A (no CPP and REA) and B (with CPP and REA). The forecast annual water transfers for proposed conditions are presented in Figure 6-1 (proposed condition A) and Figure 6-2 (proposed condition B) in GHD (2019e). Mine inflows used in the site water balance was 71 ML/year (2027).

The annual inputs and outputs for the water balance for the approved and proposed conditions A and B are summarised in **Table 16**. Results are rounded to the nearest 1 ML/year, except for discharges via the REA LDP, which is shown to the first decimal place. For both the approved and proposed conditions, results are presented as average results and ‘dry’ and ‘wet’ year results.

Modelling results in **Table 16** indicate the following.

- Runoff capture is much reduced in average, wet or dry years under proposed conditions A due to the REA dam not being available. Runoff capture in proposed conditions B equals the approved condition, across the seasonal variation modelled.
- The total volume of water entrained in ROM coal increases for proposed conditions mainly due to the higher quantity of coal proposed to be mined.
- Approved transfers of process water from Charbon Colliery vary, with more water required in dry years than wet, more for the proposed condition A due to the higher mining rate, and more again for proposed condition B due to coal washing requirements. In wet years, it is predicted that no importation of water from Charbon Colliery will be needed.
- Evaporation loss and dust suppression usage is approximately equal across conditions modelled, but as expected increases in dry years.
- Predicted discharges from LDP001 on average on an annual basis as a result of rare rainfall event will generally decrease due to the proposed modification, with no discharges in dry years and generally higher discharges in wet years. The decrease in discharge on average corresponds to higher demand of process water for the higher production rate.
- Predicted discharges at LDP002 and LDP003 remain at nil.

Overall, **Table 16** shows that, on average, the proposed increases to production and workforce is forecast to be able to be accommodated with the transfer of up to 170 ML/year from Charbon Colliery in the case where the CPP and REA are not operated (proposed conditions A). In the case where the CPP and REA are operated (proposed conditions B), the proposed production increase is forecast to result in a process water deficit of up to 42 ML/year in a ‘dry’ year.

Table 16 Annual Water Balance Results for Approved (2030) and Proposed (2027) Conditions

Water management element	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B
	Average (mean) (ML/year)			'Dry' year (ML/year)			'Wet' year (ML/year)		
INPUTS									
Rainfall and catchment runoff	165	114	165	34	25	34	724	500	724
External potable water supply	1	2	2	1	2	2	0	1	1
Groundwater inflows	76	71	71	76	71	71	76	71	71
Extraction from production bore	0	0	0	0	0	0	0	0	0
In situ coal moisture	45	75	75	45	75	75	45	75	75
Transfer from Charbon Colliery	63	86	100	168	165	170	0	0	0
TOTAL INPUTS	351	347	413	324	337	351	845	647	870
OUTPUTS									
Evaporation	48	48	48	49	47	47	54	54	54
Dust suppression	5	5	5	6	6	6	4	4	4
Sewage to Ecomax system	2	3	3	2	3	3	2	3	3
Discharge through LDP001	28	11	20	0	0	0	517	306	472
Discharge through LDP002	0	0	0	0	0	0	0	0	0
Discharge through LDP003	0	0	0	0	0	0	0	0	0
Discharge through REA LDP	0.5	NA	0.5	0	NA	0	0	NA	0
Product coal moisture	210	281	281	210	281	281	210	281	281
Moisture retained in rejects	57	0	57	57	0	57	57	0	57
TOTAL OUTPUTS	351	347	414	324	337	393	845	647	870

Water management element	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B
	Average (mean) (ML/year)			'Dry' year (ML/year)			'Wet' year (ML/year)		
CHANGE IN STORAGE									
Surface water storages	0	0	0	0	0	0	0	0	0
Underground water storages	0	0	0	0	0	0	0	0	0
TOTAL CHANGE IN STORAGE	0	0	0	0	0	0	0	0	0
BALANCE									
Deficit	0	0	1	0	0	42	0	0	0

8.4.4.3 Daily Water Discharges – Approved and Proposed Conditions

Figure 25 presents the daily LDP001 water discharges predicted for the approved and proposed conditions for all 130 historical rainfall patterns modelled. The results are shown with a logarithmic vertical axis and therefore values of 0 ML/day are not plotted. The horizontal axis shows the proportion of days that a given offsite discharge rate was simulated not to occur, for example 99% daily percentile corresponds to only discharges occurring on 1% of days.

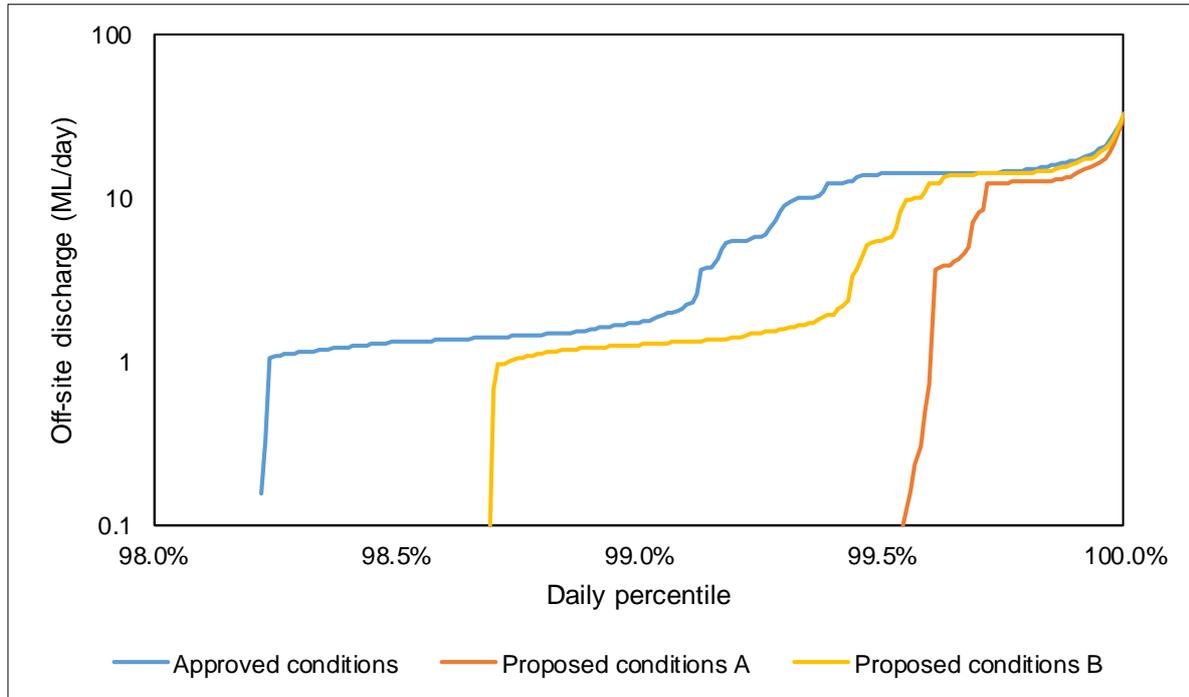


Figure 25 Predicted Daily LDP001 Water Discharges

Approved Condition

Discharges offsite through LDP001 to Airly Creek are expected to occur only due to rare rainfall events. All discharges modelled under approved conditions were predicted to occur as a result of rainfall events exceeding 44 mm over five days, which is the rainfall depth for a 95th percentile, five-day rainfall event design criteria for the 35 ML Discharge Dam (**Section 4.8.1.1**). **Figure 25** shows for the approved condition, discharges were predicted to occur on less than 2% of days modelled, with the maximum daily discharge estimated to be approximately 30 ML/day.

Proposed Conditions

Figure 25 shows that the already rare discharges are forecast to be less frequent (shift to the right) as a result of the proposed modification. Conversely, a rarer rainfall event than 44 mm rainfall over 5 days is required for a discharge to occur from LDP001. To explain this differently, it will take a more intense or longer rain event to require LDP001 to discharge due to the proposed modification. It is noted for the proposed condition B, discharges will occur at a greater frequency than for the proposed condition A due to larger catchment from the REA area for the former case. In all both proposed cases, the maximum daily discharge via LDP001 is estimated to be approximately 30 ML/day, the same as for the approved condition.

The less frequent discharges due to the proposed modification arises from the modelled increase in process water usage resulting from increases in production rate and workforce. The proposed modification results in no increases in the potential for offsite discharges.

Regardless of the assessment outcomes above, Airly Mine implements a number of management controls to avoid any discharge off site, discussed in **Section 4.8.1.2**.

8.4.5 Salt Balance Results and Discharges

The GoldSim salt balance results (10th and 90th percentile and average) for the approved and proposed conditions A and B (**Section 8.4.3.3**) are included in full in GHD (2019e). The salt balance model was developed as an extension of the water balance model with expected concentrations of salt applied to water inflows into the system.

The following sections provide summaries of the results presented in GHD (2019e).

8.4.5.1 Annual Salt Balance Results – Approved Condition

A summary of the approved condition results for salt transfers between water cycle components is provided in Figure 5-7 of GHD (2019e). The results are provided for the year 2030 which represents the year of maximum mine inflows for the 1.8 Mtpa production rate (**Section 8.2.3.1**).

The approved condition results, including discharges through licensed discharge points, are discussed in **Section 8.4.5.2** when the proposed condition results are presented and discussed. The approved condition results present a baseline to assess the impact of the proposed conditions A and B.

8.4.5.2 Annual Salt Balance Results – Proposed Conditions

The salt balance model was used to estimate the annual salt transfers between the water cycle components under the proposed conditions A (no CPP and REA) and B (with CPP and REA). The forecast annual salt transfers for proposed conditions are presented in Figure 6-4 (proposed condition A) and Figure 6-5 (proposed condition B) in GHD (2019e).

The annual inputs and outputs for the salt balance for the approved and proposed conditions A and B are summarised in **Table 17**. Results are rounded to the nearest 1 ML/year, except for discharges via the REA LDP, which is shown to the first decimal place. For both the approved and proposed conditions, results are presented as average results and ‘dry’ and ‘wet’ year results.

Table 17 shows that the modification is expected to result in generally higher salinity in the process water at Airly Mine, based on the conservative salinity assumptions used in the modelling, due to the increase reliance on transfers from Charbon Colliery. However, as discharges are forecast to be lower on average, due to the increase process water consumption, potential discharges of salt are forecast to be lower as a result of the proposed modification.

The salient points from **Table 17** are as follows.

- Salt from runoff capture is much reduced in average, wet or dry years under proposed condition A due to the CHP and REA not operating. Salt in runoff captured in proposed condition B equals the approved state, across the seasonal variation modelled.
- The total volume of water, and therefore salt entrained in ROM coal, increases for proposed conditions mainly due to the higher quantity of coal proposed to be mined.
- Salt loads from the transfer of process water from Charbon Colliery vary with water volume, with more water required in dry years than wet, more for the proposed condition A due to the higher mining rate, and more again for proposed condition B due to coal beneficiation requirements. In wet years, it is predicted that no transfers from Charbon Colliery will be needed and therefore salt loads from Charbon Colliery reduce in these years.
- Salt losses from predicted discharges from LDP001 follow water volume changes and will decrease due to the proposed modification.

Table 17 Annual Salt Balance Results for Approved (2030) and Proposed (2027) Conditions

Water management element	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B
	Average (mean) (tonne/year)			'Dry' year (tonne/year)			'Wet' year (tonne/year)		
INPUTS									
Rainfall and catchment runoff	49	30	49	10	6	10	179	111	179
External potable water supply	0	0	0	0	0	0	0	0	0
Groundwater inflows	42	39	39	42	39	39	42	39	39
Extraction from production bore	0	0	0	0	0	0	0	0	0
In situ coal moisture	25	42	42	25	42	42	25	42	42
Transfer from Charbon Colliery	98	134	155	260	256	264	0	0	0
TOTAL INPUTS	213	244	284	336	343	355	245	191	260
OUTPUTS									
Evaporation	0	0	0	0	0	0	0	0	0
Dust suppression	4	6	5	9	11	8	1	1	1
Sewage to Ecomax system	1	1	1	1	2	1	1	1	1
Discharge through LDP001	13	6	10	0	0	0	147	76	132
Discharge through LDP002	0	0	0	0	0	0	0	0	0
Discharge through LDP003	0	0	0	0	0	0	0	0	0
Discharge through REA LDP	0.2	NA	0.2	0	NA	0	0	NA	0
Product coal moisture	154	230	222	254	330	304	76	114	106
Moisture retained in rejects	42	0	47	71	0	67	21	0	20
TOTAL OUTPUTS	213	244	285	33'	343	379	245	191	260

Water management element	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B	Approved conditions	Proposed conditions A	Proposed conditions B
	Average (mean) (tonne/year)			'Dry' year (tonne/year)			'Wet' year (tonne/year)		
CHANGE IN STORAGE									
Surface water storages	0	0	0	0	0	0	0	0	0
Underground water storages	0	0	0	0	0	0	0	0	0
TOTAL CHANGE IN STORAGE	0	0	0	0	0	0	0	0	0
BALANCE									
Deficit	0	0	1	0	0	24	0	0	0

- Predicted salt discharges at LDP002 and LDP003 remain nil, consistent with no water discharges predicted from these locations.
- Salt in annual product coal production increases significantly due to the proposed modification, mainly due to the higher production rate.

Modelling results in **Table 17** show, that while salt inputs increase due to the modification because of additional salt in Charbon Colliery water and the additional ROM coal mined, salt outputs in product coal transported off site also increase. From the average results, there is little difference in the remnant salt load after allowing for salt capture in the REA and transport off site in coal trains. In fact, the salt load in these conditions ranges from 17 tonnes/year for the approved condition to 14 tonnes/year for the proposed A condition, and 15 tonnes/year for the proposed B condition.

Table 17 shows that most of the remnant salt will be discharged through LDP001, with the proposed A and B conditions generating less salt discharge than the approved condition.

This reduction in salt discharge through LDP001 is magnified in wet years where the modelling shows that proposed condition A operations would discharge half the salt of the approved case. There is no requirement to discharge salt through LDP001 in a dry year.

8.4.5.3 Daily Salt Discharges – Approved and Proposed Conditions

Figure 26 presents the percentiles of the EC corresponding to the daily volume of water predicted to be discharged through LDP001 into Airly Creek under approved condition and the proposed A and B condition. The x-axis in **Figure 26** represents the daily percentile occurrence of discharges from LDP001, while the y-axis represents the electrical conductivity (EC, or saltiness) of discharge water. The data in **Figure 26** are consistent with the predicted discharge flowrate, or daily volumes of water predicted to discharge through LDP001 as presented in **Figure 25**.

Approved Condition

For the approved condition, **Figure 26** shows the predicted EC of discharges (discharges shown in **Figure 25**) ranges from approximately 300 $\mu\text{S}/\text{cm}$ to approximately 1600 $\mu\text{S}/\text{cm}$.

Proposed Condition

Figure 26 shows the predicted EC range of potential offsite discharges does not change as a result of the proposed modification and shows the same range as the approved condition predictions. While **Figure 26** shows the frequency of the offsite discharge decreases as a result of the modification, for both proposed condition A and B, the maximum EC (approximately 1600 $\mu\text{S}/\text{cm}$) in discharge does not change significantly from that modelled for the approved condition and is lower than the EPL 12374 limit of 2244 $\mu\text{S}/\text{cm}$ at LDP001.

8.4.6 Process Water Deficit

The forecast deficit for the proposed condition B in **Table 16** for a 'dry' year indicates Airly Mine will not be able to operate at the proposed production rate and with increased workforce if the CPP and the REA are to be constructed and operated, without increasing the volume of water imported from Charbon Colliery or from another external source.

Options will be investigated for meeting the identified deficit of 42 ML/year should Airly Mine elect to construct and operate the CPP and the REA in the future, comprising:

- review of the current water management practices at the site and rationalisation of the volume of water used as process water including utilisation of more water efficient plant and equipment
- review of the design specifications of the CPP currently modelled in the site water balance and construct, if possible, a CPP which will use less water

- reduce ROM coal production in a ‘dry’ year when adequate water is not available from all approved water sources for the 3 Mtpa production rate.

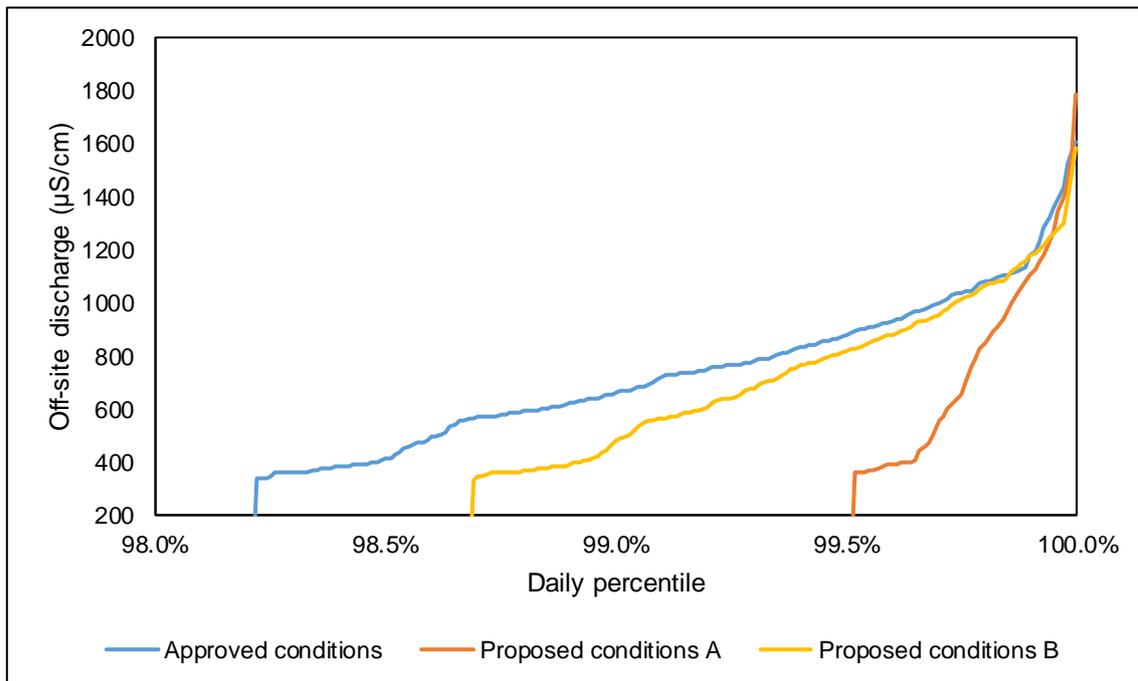


Figure 26 Predicted Electrical Conductivity of Daily LDP001 Discharges

8.4.7 Impact Assessment

8.4.7.1 NSW Water Quality and River Flow Objectives 2006 Assessment

The NSW Water Quality and River Flow Objectives (DECCW, 2006) provide the agreed environmental values and long-term goals for each catchment in NSW and are intended to be considered in assessing and managing the potential impacts of activities on waterways.

The Project is in the Hawkesbury-Nepean River catchment. There are no environmental objectives for the Hawkesbury-Nepean River as, at the time of the objectives were approved, the Healthy Rivers Commission had completed a public enquiry and recommended water quality objectives for the catchment. These objectives were for nutrients, namely 0.035 mg/L for total phosphorus and 0.7 mg/L for total nitrogen. (NSW Government, 2001: Table 2, p. 22). These trigger levels are less stringent than the ANZECC (2000) guideline levels for upland rivers applied in the assessment undertaken in the Surface Water Assessment (GHD, 2019f) for Airly Modification 2.

The site water and salt balance assessment undertaken for Airly Modification 3 has shown that the modification will not result in an increase in the frequency or magnitude, nor a deterioration of water quality, of potential discharges.

8.4.7.2 Significant Impact Criteria Assessment

The significant impact criteria defined by the *Significant Impact Guidelines* 1.3 (DoE, 2013a) are presented in **Table 18**, along with a response.



Table 18 Significant Impact Criteria Assessment

Impact criteria	Response
Hydrological characteristics	
Changes in the water quantity, including the timing of variations in water quantity.	No impact. No change to extraction from surface water resources is proposed. The proposal is not expected to increase in offsite discharge.
Changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage.	No impact. No change to extent of the underground or surface parts of the site is proposed.
Changes in the area or extent of a water resource.	No impact. No change to the approved surface water catchments of the surface facilities area is proposed.
Water quality	
Substantially reduces the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality.	No changes to water extraction at Airly Mine are proposed. No increase to offsite discharges quantities is expected.
Creates risk to human or animal health or to the condition of the natural environment as a result of the change in water quality.	No impact. The modification is not expected to result in an increase of the salinity of potential off-site discharges. No change to the water sources at Airly Mine is proposed. This indicates that no deterioration in the water quality of potential offsite discharges or potential for establishment of invasive species are expected as a result of the modification.
Causes persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment.	
There is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives).	
Seriously affects the habitat or lifestyle of a native species dependent on a water resource.	
Causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource.	
High quality water is released into an ecosystem which is adapted to a lower water quality.	Not applicable. No increase to the frequency or magnitude of potential offsite discharges is expected. The quality of water in the water management system at Airly Mine is not considered high.

8.4.7.3 Impacts on Downstream Water Users

The modification has identified three lots of licensed for surface water users on Coco Creek downstream of the Airly Mine pit top, listed in **Table 15** and shown in **Figure 24**. As the modification is not expected to result in any measurable impacts to water quantity or quality downstream of Airly Mine, no impact on the downstream water users are expected.

8.4.7.4 Cumulative Impacts

As the modification is not expected to result in any measurable impacts to water quantity or quality downstream of Airly Mine and given that there are no other developments in the vicinity of Airly Mine, cumulative impacts are unlikely to occur as a result of the modification.

8.4.8 Consequence of Potential Impact

As there are no predicted increases in the frequency, magnitude or salinity of any offsite discharges from the mine when compared to approved conditions, there are no environmental consequences as a result of the proposed modification.

8.4.9 Water Licensing

No changes to existing water access licences held by Airly Mine (**Section 5.4**) are required.

8.4.10 Mitigation and Management

The ECOMAX sewage management system at the pit top will be upgraded or replaced when the workforce number exceeds 150 FTE personnel, following a review on the future requirements of the mine and the suitability of any system to be installed.

Airly Mine will continue to implement management controls (**Section 4.8.1.2**) to avoid discharges from the pit top water management system to Airly Creek.

Water quality and flows will continue to be undertaken in accordance with the *Airly Mine Water Management Plan* and described briefly in **Section 4.14.3.2**.

8.4.11 Conclusion

The site water and salt balance assessments for the proposed condition A (with no operation of CPP and REA) and proposed condition B (operation of CPP and REA) concluded the following when compared against the approved condition.

- A deficit in the process water requirements for the proposed 3 Mtpa production rate and 200 FTE personnel has been identified in a 'dry' year should the CPP be constructed as per the modelled specifications, and the full 3 Mtpa ROM coal is beneficiated.
- The proposed modification will not result in an increase in the frequency or magnitude of potential water discharges from the pit top to Airly Creek.
- The water quality of the downstream receiving environment will not deteriorate due to the proposed modification.
- The registered surface water user on Coco Creek will not be impacted by the proposed modification.

The proposed modification will not result in any downstream environmental consequences, including any consequences on the aquatic ecology of Airly Creek.

8.5 Road Traffic

8.5.1 Introduction

A Traffic Impact Assessment (TIA) for the Modification Report has been undertaken by Ason Group (Ason, 2019), which is provided in full in **Appendix G**. The TIA has included a detailed assessment of:

- existing Airly Mine operations, including peak traffic generating periods across the day and week
- existing road network operations, focusing on the key intersections providing access between Airly Mine and the regional road network
- the future peak period trip generation and distribution of Airly Mine further to the proposed modification, and the potential impact of those additional trips on the road network

- parking requirements and adequacy of the existing car park at the pit top.

The TIA has been prepared to meet the traffic and transport assessment requirements included in the Director General’s Requirements and requirements of the Roads and Maritime Services issued on the Airly Mine Extension Project SSD 5581 in 2014. The TIA has been prepared in accordance with all the relevant RMS, TfNSW and Austroads guidelines.

The TIA has relied on traffic survey data undertaken by TTM in the 7-day period from 30 November to 06 December 2018, attached in Appendix A of Ason (2019), at the following locations:

- Castlereagh Highway east and west of Glen Davis Road
- Glen Davis Road south of Mine Access Road
- Mine Access Road north of Glen Davis Road.

8.5.2 Existing Environment

8.5.2.1 Airly Mine Operational Shift Structure

Airly Mine operates 24 hours a day, 7 days a week, and is approved to employ 155 FTE staff, including up to 20 contract staff. However, the mine does not currently employ staff at the approved level. The shift structure for the current 146 personnel accessing the Airly Mine is shown in **Table 19**.

Table 19 Existing Airly Mine Personnel and Shift Structure

Shifts and Staff Numbers	Weekday Shifts (Mon – Fri)			Weekend Shifts (Sat – Sun)	
	Day	Afternoon	Night	Day	Night
	7:00 am – 3:30 pm	3:00 pm – 11:30 pm	11:00 pm – 7:30 am	7:00 am – 7:00 pm	7:00 pm – 7:00 am
Mining staff	25	25	25	21	14
General Staff and Contractors	26	4	2	2	2
Total	51	29	27	23	16

8.5.2.2 Mine Access and Car Parking

All vehicle access to Airly Mine pit top is via Glen Davis Road to Mine Access Road. Mine Access Road is a sealed road, provides two traffic lanes and has a posted speed limit of 60 km/h.

The Glen Davis Road / Mine Access Road intersection is approximately 3 km from Capertee. To the southwest of Airly pit top, Glen Davis Road intersects with Castlereagh Highway, which essentially provides for all staff and service vehicle trips to and from the pit top.

The pit top car park provides 119 parking spaces. Given that the maximum on-site parking demand at any one time is for approximately 80 staff vehicles (during the changeover between the Weekday Day shift and Weekday Afternoon shift, generally between 2:00 pm and 4:00 pm) the car park provides more than adequate capacity to accommodate the peak demand.

8.5.2.3 Road Network

The sub-regional road network which provides access for the Airly workforce is detailed further in sections below.

Castlereagh Highway

Castlereagh Highway (State Route 86, National Route B55) is a regional highway connecting the Great Western Highway at Marrangaroo to Mudgee and Gulgong, and then further through northwest NSW. Castlereagh Highway generally provides two traffic lanes and has a posted speed limit of 50km/h through Capertee (including through the intersection with Glen Davis Road) but otherwise generally has a posted speed limit 100 km/h.

Great Western Highway

The Great Western Highway (State Highway 5, National Route 32) is a regional highway which intersects with the Castlereagh Highway at Marrangaroo. This highway links to the east to Lithgow and Katoomba and then through to the broader Sydney metropolitan area (M4), and to the west to Bathurst.

Glen Davis Road

Glen Davis Road is a lightly trafficked rural road which runs from Castlereagh Highway in the south, then north (to the immediate east of Airly Mine) before turning east to the small village of Glen Davis. Glen Davis Road generally provides two traffic lanes. The road has a posted speed limit of 50 km/h through Capertee, as well as School Zone speed restrictions (40 km/h) during school peak periods. Outside of Capertee it has a posted speed limit of 100 km/h.

Castlereagh Highway & Glen Davis Road

The intersection of Castlereagh Highway & Glen Davis Road operates under priority (Give Way) control, and provides significant auxiliary infrastructure, including:

- a Channelised Left (CHL) lane, Castlereagh Highway to Glen Davis Road
- a Channelised Right (CHR) lane, Castlereagh Highway to Glen Davis Road.

Glen Davis Road & Mine Access Road

The intersection of Glen Davis Road & Mine Access Road operates under priority (Stop) control and provides a Basic Left design Glen Davis Road to Mine Access Road. Ason (2019) have assessed there is essentially no trip demand for the right turn Glen Davis Road to Mine Access Road (nor any significant southbound through traffic volume) and as such no demand for any higher order intersection treatment.

8.5.2.4 Traffic Generation and Distribution

Airly Staff Trip Distribution

The 2018 traffic survey data from the Mine Access Road shows the Airly workforce drives to the pit top via private vehicles, and no sharing of rides. With reference to the socioeconomic profile prepared for Airly Mine (Aigis, 2018) approximately 45% of the workforce arrives from eastern part of the Mid-Western Regional Council LGA (primarily Kandos and Rylstone) and the rest from the Lithgow LGA and Mudgee East.

The traffic surveys show the staff arrivals and departures are offset as a function of shift structure presented in **Table 19**. Not all staff arrives and departs in the immediate periods prior to or after each shift; the arrival and departure periods are generally generated over 1 – 2 hours. Similarly, the general staff arrival and departure periods occur over extended (1 – 2 hour) AM and PM peak periods, respectively.

Daily Traffic Volumes

A summary of average weekday traffic volumes at all survey locations (**Section 8.5.1**) on an hourly basis for the 24-hour period is provided in Table 2 of Ason (2019). Survey data for daily weekend traffic volumes are provided in Appendix A of Ason (2019), noting that the weekend volumes are significantly lower than the average weekday volumes, and that Airly Mine generates significantly fewer trips over the weekend.

Table 20 provides surveyed weekday traffic volumes for the peak mining shift arrival and departure periods (AM peak hour 6:00 – 7:00 am; PM peak hour 3:00 – 4:00 pm).

Table 20 Average Surveyed Weekday Traffic Volumes for Airly Mine Peak Periods

Survey Location	Direction	Existing Average Daily Traffic (ADT)	
		AM Peak Hour 6:00 am – 7:00 am	PM Peak Hour 3:00 pm – 4:00 pm
Castlereagh Highway East of Glen Davis Road	Eastbound	41	98
	Westbound	58	96
Castlereagh Highway West of Glen Davis Road	Eastbound	46	78
	Westbound	34	99
Glen Davis Road North of Castlereagh Highway	Northbound	34	7
	Southbound	4	31
Mine Access Road	Northbound	32	1
	Southbound	1	26

Peak Period Traffic Volumes

Using the average weekday traffic volumes (**Table 20**), intersection analyses for peak mining shift arrival and departure periods (AM peak hour 6:00 – 7:00 am; PM peak hour 3:00 – 4:00 pm) have been undertaken on two intersections (Castlereagh Highway & Glen Davis Road, Glen Davis Road & Mine Access Road) that provide access to Airly pit top.

Surveyed average weekday traffic volumes during the AM and PM peak hours are shown in **Figure 27**.

The peak hour generation on either a Saturday or Sunday was 19 vph in the Sunday arrival peak for the Weekday Night commencing on Sunday evening at 11:00pm. Given traffic flows in Castlereagh Highway are less than 20 vph at this time, Ason (2019) considered further analyses of the existing peak weekend traffic volumes, or the impact of the proposed modification, on the sub-regional network not warranted.

Based on the surveyed weekday traffic volumes depicted in **Figure 27** Airly Mine shift peak hours, Airly staff (mining and general) currently generates:

- approximately 224 weekday light vehicle trips per day (vpd) and 22 heavy vehicle trips per day
- a weekday AM peak hour generation of 32 vehicle trips per hour (vph), coinciding with the arrival period for the Weekday Day shift
- a weekday PM peak hour generation of 26 vph, coinciding with the departure period for the Weekday Day shift
- up to 43 weekend (Sunday) vpd
- a maximum of 19 vph at the weekend coinciding with the the arrival peak for the Weekday Night shift (which actually occurs on the Sunday evening).

It is noted Airly Mine generates only a very minor heavy (service) vehicle demand, being an average of 22 heavy vehicle trips per weekday, including deliveries of equipment and light materials, maintenance vehicles, and occasionally machinery.

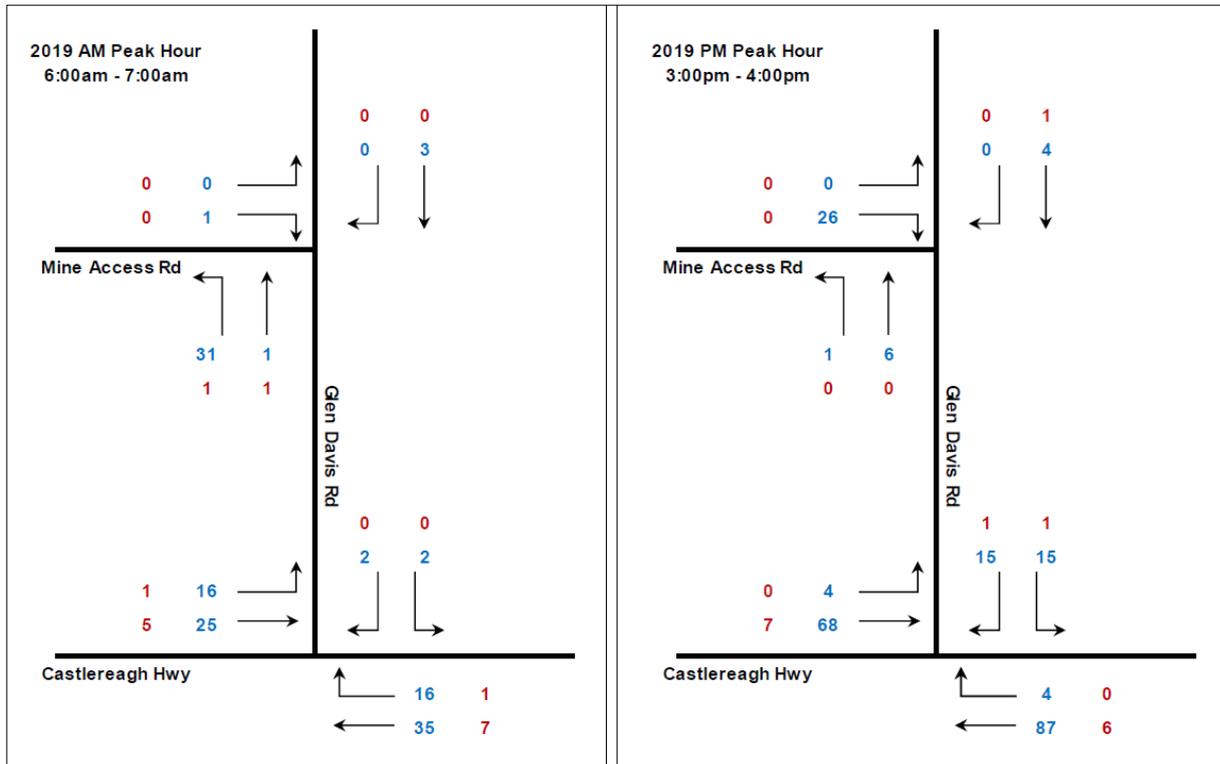


Figure 27 2019 Airly Mine Shift Peak Hour Traffic Volumes

8.5.2.5 Existing Intersection Operations

SIDRA Model

SIDRA intersection modelling has been undertaken to establish the existing performance of the key intersections (Castlereagh Highway & Glen Davis Road, Glen Davis Road & Mine Access Road) to provide an appropriate baseline for assessments of the proposed modification.

The following SIDRA model outputs have been used to discuss the measure of the performance of the Castlereagh Highway & Glen Davis Road, Glen Davis Road & Mine Access Road intersections.

- **Average Vehicle Delay (AVD):** AVD, or average delay per vehicle in seconds is used to determine an intersection’s Level of Service (see below).
- **Degree of Saturation (DOS):** DOS is defined as the ratio of demand (arrival) flow to capacity.
- **Level of Service (LOS):** LOS is a comparative measure that provides an indication of the operating performance, based on AVD.

Table 3 in Ason (2019) provides the SIDRA recommended criteria for the assessment of intersections, which reference the LOS and delay criteria outlined in the RMS Guide.

Table 21 provides the SIDRA outputs (DoS, AVD, LoS) for Castlereagh Highway & Glen Davis Road, soperate at very good or LoS A, during each of the Airly Mine shift arrival and departure peak periods, with essentially no delays, and AVD/vehicle for all periods is <6s. There is significant available capacity, as the RMS Guide criteria for LoS A is <14s AVD/vehicle.

Table 21 SIDRA Existing Intersection Performance

Intersection	Peak Period	Degree of Saturation (DoS)	Average Vehicle Delay (AVD)	Level of Service (LoS)
Castlereagh Highway & Glen Davis Road	AM	0.004	5.5s	A
	PM	0.034	5.9s	A
Glen Davis Road & Mine Access Road	AM	0.020	5.6s	A
	PM	0.022	5.6s	A

Intersection Design: Castlereagh Highway & Glen Davis Road

As discussed in **Section 8.5.2.3**, this intersection provides both a CHL and CHR turns on Castlereagh Highway to Glen Davis Road. The design of the intersection, with reference to Ausroads Intersection Warrants, provides significant capacity, in fact the capacity is significantly greater than would generally be required to accommodate the surveyed traffic volumes under the low speed conditions in Capertee.

Road Capacity

While the capacity of urban and rural roads is generally determined by the capacity of intersections, capacity can also be assessed with reference to general traffic carrying capacity. The TIA has utilised data in Table 4.6 of the RMS Guide on Urban Road LoS Criteria (reproduced as Table 5 in Ason (2019)) to assess the road capacity of Castlereagh Highway through Capertee, and Table 4.5 of the RMS Guide on two-way, two-lane rural road LoS criteria (reproduced as Table 6 in Ason (2019)) for Glen Davis Road.

Based on the surveyed traffic data and traffic volumes in both Castlereagh Highway and Glen Davis Road, Ason (2019) concludes:

- Castlereagh Highway road capacity falls within the LoS A criterion, which is the highest or the best LoS criteria for urban roads
- Glen Davis Road falls within the LoS B criterion, which is the highest or the best LoS criterion for rural roads.

8.5.2.6 Traffic Safety

An assessment of the local road safety statistics reveals that a total of 5 crashes were recorded during the 5-year period between 2013 and 2017. All incidents, on Castlereagh Highway, were due to single vehicle leaving the carriageway midblock and colliding with an off-road object. No fatalities were recorded on the local roadwork network during the data period. None of the incidents were attributable to Airly Mine operations.

8.5.3 Impact Assessment

8.5.3.1 Workforce Increase

The modification is proposing to increase workforce to 200 FTE personnel within the shift structure included in **Table 22**. The numbers in brackets show the increase in staff in each shift compared to the existing number presented in **Table 19**.

Table 22 Proposed Staff and Shift Structure

Shifts and Staff Numbers	Weekday Shifts (Mon – Fri)			Weekend Shifts (Sat – Sun)	
	Day	Afternoon	Night	Day	Night
	7:00 am – 3:30 pm	3:00 pm – 11:30 pm	11:00 pm – 7:30 am	7:00 am – 7:00 pm	7:00 pm – 7:00 am
Mining staff	33 (8)	32 (7)	32 (7)	29 (8)	24 (10)
General Staff and Contractors	30 (4)	6 (2)	4 (2)	5 (3)	5 (3)
Total	63 (12)	38 (9)	36 (2)	34 (11)	29 (13)

Note: Numbers in brackets show increase in employee number in each staff category and in the shift indicated.

8.5.3.2 Mine Access

Access to the Airly Mine pit top will not change.

8.5.3.3 Trip Generation and Distribution

Given the surface and underground operations are not proposed to change due to Modification 3 compared to the current operations, the number of heavy vehicles accessing the site for services will not increase and is not considered further.

For the impact assessment for light vehicles, it has been assumed, consistent with **Section 8.5.2.4**, that:

- trip generation potential of the additional staff would not change from the current profile, where each staff member would drive to and from Airly Mine individually in a private vehicle
- the trip distribution profile of the additional staff has been assumed to be approximately 50% to/from the south, and 50% of staff trips will be generated to/from the north.

8.5.3.4 Trip Assignment

The additional staff trips determined above have been assigned to the intersections of Castlereagh Highway & Glen Davis Road, and Glen Davis Road & Mine Access Road along with the 2029 base flows.

The base flows refer to the sub-regional traffic growth on Castlereagh Highway that have been adjusted 2% per year forecast to 2029, using historic Average Annual Daily Traffic (AADT) data using the data at Count Station 99084 in Marrangaroo available for the period 2008 – 2012. The 10-year adjusted AADT provides the worst-case assessment of future conditions (and further to Modification 3) at the intersection of Castlereagh Highway with Glen Davis Road.

The resulting traffic volumes at the Castlereagh Highway & Glen Davis Road, Glen Davis Road & Mine Access Road intersections for AM and PM Airly Mine peak periods in the forecast year of 2029 are shown in **Figure 28**.

The additional staff trip generation due to the proposed modification is minimal, estimated at no more than 20 vph in any shift changeover period.

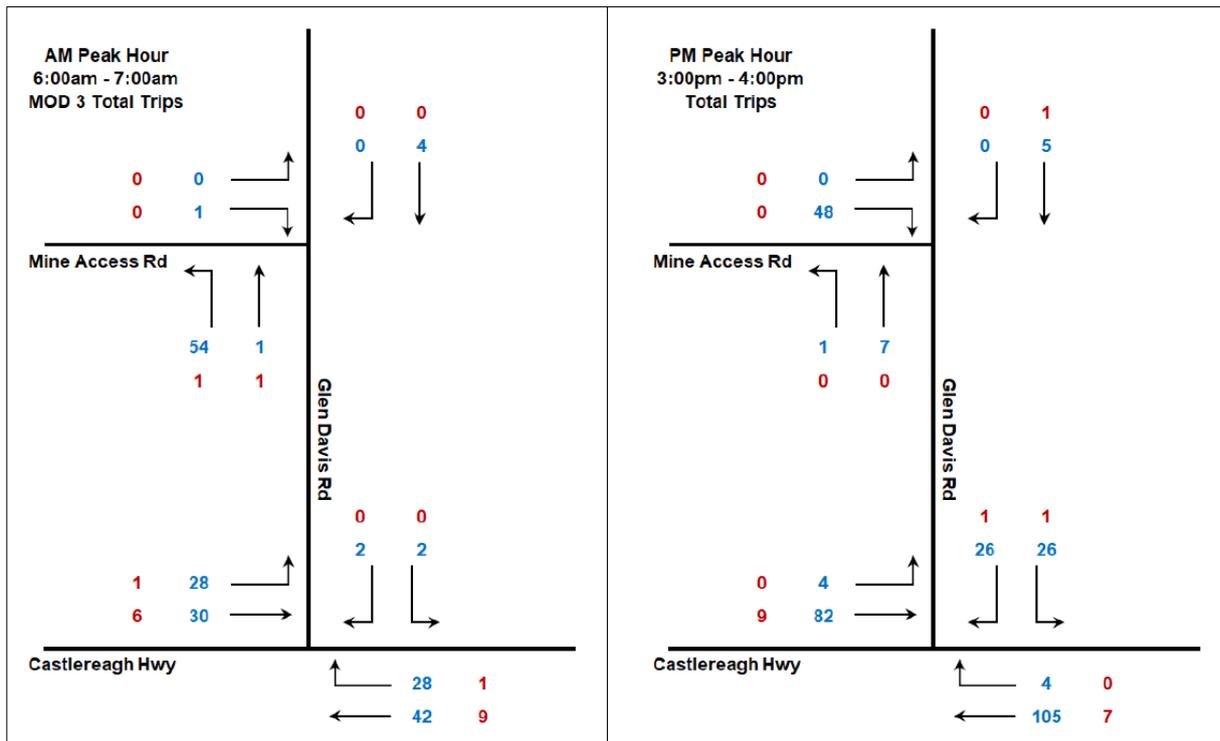


Figure 28 2029 Airly Mine Shift Peak Hour Traffic Volumes

8.5.3.5 Future Road Network Performance

Future Intersection Performance

SIDRA analyses of the peak hour traffic volumes for Castlereagh Highway & Glen Davis Road and Glen Davis Road & Mine Access Road intersections for 2029 shown in **Figure 28** was undertaken, and the data presented in **Table 23**.

Data in **Table 23** show that the two key intersections will continue to operate at a very good LoS A during each of the Airly Mine weekday shift arrival and departure peak periods further to Modification 3, with again essentially no delays and significant available capacity.

Table 23 SIDRA 2029 Intersection Performance

Intersection	Peak Period	Degree of Saturation (DoS)	Average Vehicle Delay (AVD)	Level of Service (LoS)
Castlereagh Highway & Glen Davis Road	AM	0.004	5.4s	A
	PM	0.059	6.2s	A
Glen Davis Road & Mine Access Road	AM	0.033	5.6s	A
	PM	0.004	5.7s	A

Intersection Design and Road Capacity

The additional traffic generated due to the proposed modification would not require any upgrades of the Castlereagh Highway & Glen Davis Road and Glen Davis Road & Mine Access Road intersections, nor result in any change in the LoS of Castlereagh Highway or Glen Davis Road.

Road Safety

As the proposed modification will not significantly alter traffic flows, it is considered unlikely safety on the local road network will be exacerbated.

8.5.3.6 Car Parking

The peak parking demand at any one time would increase to 101 staff vehicles, again during the changeover between the Weekday Day shift and Weekday Afternoon shift (generally between 2:00 pm and 4:00 pm). As such, the 119 car spaces available in the existing car park will continue to fully meet peak parking demand.

8.5.4 Consequence of Potential Impact

A consequence of the minor increase in traffic on Glen Davis Road is the potential noise impacts on residential receptors. The road noise has been assessed in **Section 8.7.6** and concludes road traffic noise levels from the existing and proposed traffic volumes comply with the *Road Noise Policy* (RNP) (DECCW 2011) noise criteria at the nearest affected receivers on Glen Davis Road during the day and night-time periods. The increase in traffic noise on Castlereagh Highway due to the modification is predicted to be <2 dBA and is compliant with the RNP criteria.

8.5.5 Mitigation and Management

No additional traffic management or mitigation measures for the local and regional road network have been proposed, given the negligible traffic impact associated with the proposed modification.

Airly Mine will continue to operate in accordance with the *Airly Mine Traffic Management Plan* (Centennial Coal, 2018g) to manage any potential traffic impacts on Glen Davis Road and Capertee during construction of new infrastructure or upgrade of the existing infrastructure.

8.5.6 Conclusion

The proposed increase in the Airly Mine workforce by 45 FTE personnel will result in minimal additional staff trip generation. The roads and intersections providing access to Airly Mine have significant inbuilt capacity, such that the additional trips would have no impact on the current very good LoS. This will be the case even under future conditions with additional background traffic growth in Castlereagh Highway. The proposed increase in staff will not warrant an increase in the existing number of car spaces available at the pit top.

The proposed modification will have no impact on the capacity, efficiency or safety of the local and sub-regional road network through the life of the Project.

8.6 Rail Traffic

8.6.1 Introduction

A Rail Impact Assessment (RIA) for the Modification Report has been undertaken by Barnson Pty Ltd (Barnson, 2019), which is provided in full in **Appendix I**. The RIA has included:

- an analyses of existing rail volumes on the Wallerawang-Gwabegar rail line utilised by Airly Mine for its operations
- an analysis of the proposed increase in rail movements on the Wallerawang-Gwabegar rail line, including cumulative impacts

- the overall safety and efficiency of the rail network
- the proposed mitigation measures to ensure safety and efficiency of the rail network.

8.6.2 Existing Environment

8.6.2.1 Wallerawang-Gwabegar Rail Line

Airly Mine utilises the Wallerawang-Gwabegar rail line for both the transport of coal off site to domestic power stations (Vales Point and Eraring) and Port Newcastle for export, and for the importation of water from Charbon Colliery. The Wallerawang-Gwabegar rail merges with the Main Western rail line at Wallerawang. Both the Wallerawang-Gwabegar and the Main Western Line are operated and maintained by John Holland Rail (JHR), as part of the Country Regional Network (CRN) owned by Transport for NSW.

The Wallerawang-Gwabegar rail line is not operated to any timetable currently. The line previously accommodated coal trains from Airly Mine as well as Baal Bone, Invincible and Charbon Collieries. Over the past few years however, these mines have all ceased formal mining operations.

For coal transport off site from Airly pit top, trains with empty coal wagons arrive at the pit top from the south and coal laden trains leave the site after travelling around the rail loop in an anti-clockwise direction, and then travel to the south to the final destinations. For water importation, water laden trains arrive from the north (Charbon Colliery). These water trains cannot directly enter the rail loop, but instead travel past the rail loop entrance and after stopping for a short period reverse into the rail loop. Following discharge of water from the ISO containers, the empty train continues to reverse in the anticlockwise direction and onto the Wallerawang-Gwabegar rail line. After a brief stop, the empty trains travel back north to Charbon Colliery.

Rail movement restrictions apply on the Wallerawang-Gwabegar rail line as per condition 8 under Schedule 2 of SSD 5581, discussed in **Section 4.3.5**.

8.6.2.2 Airly Rail Loop

The Airly rail loop infrastructure is owned and maintained by Airly Mine. The rail loop joins the Wallerawang-Gwabegar rail line approximately 4 km north of Capertee. A Safety Interface Agreement (SIA) exists between JHR, as the Rail Infrastructure Manager (RIM) for CRN and Centennial Airly Pty Limited as the RIM for *Airly Coal Balloon Loop Private Siding*, dated 13 December 2018. The SIA relates to the interface between the Airly Mine's private rail loops and CRN's main rail line, specifically the Wallerawang to Kandos section, referred to as the Wallerawang-Gwabegar rail line in this assessment. The SIA provides surety regarding management of risks to the environment posed by the operations of the Airly rail loop on any potential or actual impacts on the JHR operational corridor.

The SIA stipulates that Airly Mine's operations should not pose potential or actual risks to the continuation of JHR's EPL 13421. The SIA also identifies communication and dispute resolution protocols between Centennial Airly and JHR.

Airly Mine rail loop operates in accordance with the *Airly Mine Rail Safety Management Plan* sets out the rail safety requirements to be implemented to ensure so far as is reasonably practicable, the safety of personnel, rail infrastructure and rolling stock operations during the railway operations carried out by Centennial Airly or their agents.

8.6.2.3 Rail Level Crossings

Between Charbon Colliery and Wallerawang, the Wallerawang-Gwabegar rail line has six main road crossings, all of which are located between Clandulla and Ben Bullen Two of the six rail crossings feature an overpass such that the trains do not interact with traffic. The remaining four rail crossings are listed below. These rail crossings all display Railway Crossing Stop signage, and in the cases of the Carewell Street (Clandulla) Castlereagh Highway (Ben Bullen) crossings flashing lights are also installed.

- Canary Street (Clandulla)
- Carwell Street (Clandulla)
- Flatlands Road (Clandulla)
- Castlereagh Highway (Ben Bullen)

8.6.2.4 Traffic Accident History

The RMS traffic accident history in the period 2013 – 2017 in the proximity of rail crossings in the general area of Airly Mine showed:

- three accidents in the vicinity of the Carwell Street (Clandulla) rail crossing which ranged from non-casualty to serious injury
- one non-casualty accident in the vicinity of the Ben Bullen rail crossing.

None of the accidents noted above involved collision with a train.

8.6.2.5 Operating Hours

Airly Mine has consent to operate 24 hours a day, seven days a week. The utilisation of the rail infrastructure, and the loading and unloading of trains at the pit top can occur 24 hours a day, seven days a week.

8.6.3 Impact Assessment

8.6.3.1 Rail Network

Proposed Rail Movements on Wallerawang-Gwabegar Rail Line

The average frequency of total trains (coal and water) entering and leaving Airly is proposed to be increased to three trains per day (six train movements) over a calendar year, but maintaining the current maximum of five trains (ten train movements) per day. Restrictions on rail movements discussed in **Section 8.6.2.1** will continue to apply.

Barnson (2019) has assessed the impact of increasing the average frequency of trains on the Wallerawang-Gwabegar rail line to be negligible given the rail line had previously serviced multiple mining operations including Baal Bone, Invincible and Charbon Collieries which have now ceased operations. More train paths exist on the Wallerawang-Gwabegar rail line than proposed to be utilised by Airly Mine for the transport of water and coal.

Proposed Rail Movements on Main Western Rail Line

Coal trains travelling along the Wallerawang-Gwabegar rail line will merge onto the Main Western rail line in Wallerawang. Barnson (2019), following consultation with JHR's Business Development Manager (pers comm, dated 06 August 2019), concluded the impact of an average increase of two train movements per day along this rail line is marginal in comparison to current rail traffic, and could be accommodated within the line's capacity. Formal confirmation on the pathing availability will be negotiated between Centennial Airly and JHR. Consultation with TfNSW and JHR on this aspect has commenced (**Section 7.3.3**).

Airly Rail Loop

The existing SIA between Centennial Airly and JHR does not have an expiry date, and the agreement will continue to be valid. Centennial Airly has initiated consultations with JHR and Transport for NSW,

on the proposal (**Section 7.3.3**) to increase the number of trains arriving at Airly pit top and for the continued access of the site from the Airly Rail Loop and Gwabegar-Wallerawang rail line interface.

The Airly Mine water and coal trains will continue to be operated 24 hours per day, seven days per week, involving unloading / loading on the rail loop and the access of Wallerawang-Gwabegar rail line from the rail loop as discussed in **Section 8.6.2.1**.

8.6.3.2 Cumulative Impacts

There are no other major developments planned in the area, therefore there will be no cumulative impact to rail traffic generation. The only trains that will be operated on the Wallerawang-Gwabegar rail line will be those operated by Centennial Airly.

8.6.4 Mitigation and Management

Given the proposed increase in rail movements will result in negligible impacts and will be less than the historical train movements on the Wallerawang-Gwabegar rail line, no specific mitigation measures are required.

Centennial Airly regularly consults with JHR on the timing of train pathing availability for rail movements for both coal and water transport. This facilitate all services required and to minimise interactions between Centennial trains and any other users of the rail lines.

A formal consultation process is underway with Transport for NSW to initiate discussions on the proposed increase in rail movements and the availability of train pathing on the Wallerawang-Gwabegar, Main Western and Main Northern rail lines.

8.6.5 Consequence of Potential Impact

An environmental consequence of the proposed increase in train movements on the Wallerawang-Gwabegar rail line is the potential increase in rail noise. Rail noise was assessed in SLR (2019a) and discussed in **Section 8.7.6**. The rail noise assessment concludes there are no expected exceedances of the trigger levels in *Rail Infrastructure Noise Guideline* (EPA, 2013) and noise limits in John Holland's EPL 13421 noise limits for the Wallerawang-Gwabegar rail line for the day and night periods and maximum passbys.

8.6.6 Conclusion

The RIA has concluded the increase in the frequency of rail movements leaving Airly pit top from an average 2 trains per day (4 train movements) over a calendar year to 3 trains per day (6 train movements) will result in only negligible impacts on the Wallerawang-Gwabegar and Main Western rail lines. The efficiency and the safety of the rail network will not be impacted by the proposed modification.

8.7 Noise

8.7.1 Introduction

A Noise and Vibration Impact Assessment (NVIA) for the Modification Report has been undertaken by SLR Consulting Australia Pty Ltd (SLR, 2019a), which is provided in full in **Appendix J**. The NVIA has assessed the following modification elements relevant to potential offsite noise impacts, in addition to the existing approved operations:

- an increase in the production rate from the approved 1.8 Mtpa to 3.0 Mtpa
- an increase in workforce from the approved 155 FTE personnel to 200 FTE personnel

- an increase in the frequency of laden coal trains and water trains leaving the site from the approved average of two trains per day to three trains per day over any calendar year but maintaining the approved maximum five trains per day leaving the site on any day.

The NVIA has been prepared with reference to Australian Standards (AS) 1055:2018 *Acoustics - Description and Measurement of Environmental Noise* and in general accordance with the Environment Protection Authority's (EPA) NSW *Noise Policy for Industry (NPfI)*, *NSW Road Noise Policy (RNP)* and *NSW Rail Infrastructure Noise Guideline (RING)*.

8.7.2 Existing Environment

The general area surrounding the Airly pit top comprises a number of rural / residential properties. Majority of lands around the pit top are Centennial-owned (**Figure 4**). This provides a buffer and minimises impacts of the mine's operations on the residential receptors.

8.7.2.1 Sensitive Receptors

Sensitive receptors in the Project for noise comprise eight residential sensitive receptors with the potential to be impacted by the pit top operations and two passive recreation receptors (Airly Camping Ground, Nissen Hut), shown in **Figure 8**.

8.7.2.2 Noise Criteria

The noise criteria in SSD 5581 for all sensitive receptors relevant to Airly Mine was based on the noise impact assessment undertaken in accordance with the then in force *Industrial Noise Policy (INP)* (EPA, 2000) and provided in Condition 2 under Schedule 4 of SSD 5581.

Noise monitoring at Airly Mine is undertaken in accordance with the *Airly Mine Noise Management Plan* (Centennial Coal, 2018d). Operator attended noise monitoring is conducted annually at locations representative of the nearest residential receivers. Noise monitoring to date indicates the Airly Mine operations comply with the noise criteria, and that Airly Mine noise emissions do not trigger any modifying factors as described by the *Noise Policy for Industry (NPfI)* (EPA, 2017). To date, no complaints regarding noise emissions from Airly Mine have been received.

8.7.3 Project Noise Impact Assessment Criteria

8.7.3.1 Ambient Noise Environment

The Airly MEP noise impact assessment used pre-mining background noise monitoring conducted in February and March of 2009. Monitoring was conducted at four locations surrounding Airly Mine, representative of the nearest potentially affected receivers. Rating Background Levels (RBLs) at all locations were determined in accordance with the INP to be 30 dBA.

No significant industrial development, other than Airly Mine, has occurred in the vicinity of these residences, hence, results of the previous noise monitoring for the RBL are considered to be relevant to the current assessment. Additional noise monitoring using noise loggers was conducted in November 2018 to determine existing road traffic noise levels on Glen Davis Road as well as rail noise levels in the vicinity of the Airly Mine rail loop. Noise loggers would also quantify the existing ambient noise levels.

The procedures for developing the project operational noise levels in accordance with the NPfI, road traffic noise as per RNP and rail noise goals as per RING are described in Section 3 of (SLR, 2019a).

8.7.3.2 Operational Noise

Applicable Project Trigger Noise Levels (PTNL) and Sleep Disturbance Noise Levels (SDNL) for all receiver areas surrounding the Project have been established with reference to the NPfl and are presented in **Table 24**.

Table 24 Operational Project Trigger and Sleep Disturbance Noise Levels

Location	Period	Project Intrusiveness ¹ LAeq(15minute)	Project Amenity ² LAeq(period)	Project Amenity ³ LAeq(15minute)	Resulting PTNL ⁴ LAeq(15minute)	SDNL ⁵ LAeq(15minute) / LAmax
R1 – R8	Day	40 dBA	45 dBA	48 dBA	40 dBA	n/a
	Evening	35 dBA	40 dBA	43 dBA	35 dBA	n/a
	Night	35 dBA	35 dBA	38 dBA	35 dBA	40 / 52 dBA
R17 – R18	When in use	N/A	45 dBA	48 dBA	48 dBA	n/a

Note 1: Project Intrusiveness is the RBL plus 5 dBA

Note 2: Project Amenity (period) noise level is the Amenity Criteria minus 5 dBA

Note 3: Project Amenity (15 minute) is the Project Amenity (period) noise level plus 3 dB

Note 4: Resulting PTNL is the lower of the Project Intrusiveness and the Project Amenity (15 minute) noise levels

Note 5: SDNL as described in Section 3.1 of SLR (2019)

8.7.3.3 Road Traffic Noise Goals

Section 3.2 of SLR (2019a) provides the relevant project specific operational and construction road traffic noise goals that are applicable for the Project in accordance with the RNP. For the assessment of increased traffic on Glen Davis Road the following criteria applies.

- Day period (7:00 am – 10:00 pm): LAeq(1hour) 55 dBA (external)
- Night period (10:00 pm – 7:00 am): LAeq(1hour) 50 dBA (external)

8.7.3.4 Rail Noise Goals

The rail noise trigger levels for rail generating developments in accordance with RING, and applicable to the Project are as follows.

- LAeq(15hour) 65 dBA (7:00 am – 10:00 pm)
- LAeq(9hour) 60 dBA (10:00 pm – 7:00 am)
- LAmax (95th percentile) 85 dBA

John Holland Rail's EPL 13421 also contains noise limits (set as goals) for the operation of the Wallerawang-Gwabegar rail line and is reproduced below.

L2.1 It is an objective of this License to progressively reduce noise levels to the goals of 65 dB(A)Leq, (day time from 7am - 10pm), 60 dB(A)Leq, (night time from 10pm - 7am) and 85 dB(A) (24 hr) max pass-by noise, at one metre from the façade of affected residential properties.

The noise goals in EPL 13421 are consistent with the RING trigger levels outlined above.

8.7.4 Noise Modelling Methodology and Assumptions

The operational noise modelling was undertaken using the Concawe algorithms within SoundPLAN v7.4 software. Prediction of noise emission levels was carried out under standard and noise-enhancing atmospheric conditions, as discussed in Section 4.1 and Table 6 of SLR (2019), and required by NPfI.

The operational scenario modelled during each period (day, evening, night) together with the sound power level information (in LAeq(15minute)) are included in Table 13 of SLR (2019a). The sleep disturbance noise levels were predicted using the LAmax sound power levels on identified significant plant and equipment.

The following assumptions were made in modelling noise emissions from the Project.

- All acoustically significant plant and equipment operates simultaneously.
- Mobile noise sources were modelled at typical locations and assumed to operate in repetitive cycles.

SLR (2019a) investigated whether any of the noise sources contain certain characteristics, such as dominant low frequency content, that could potentially cause greater annoyance at a receiver than other noise at the same level. A detailed assessment of low frequency noise confirmed no modifying factor correction for low-frequency noise is triggered for the Project.

8.7.5 Impact Assessment

8.7.5.1 Operational Noise Impacts

Predicted noise emission levels at the nearest noise sensitive receiver locations are provided in **Table 24**. Results shown are the highest predicted noise level under applicable standard or noise enhancing weather conditions.

A noise contour map representing the outer envelope noise emissions under noise enhancing weather conditions is provided in **Figure 29**.

Results presented in **Table 25** show that predicted noise levels from the modelled operational scenarios are below the relevant PTNL/SDNL and SSD 5581 noise criteria at all privately-owned residential assessment locations as well as Airly Gap Campground and the Nissen Hut under assessed meteorological conditions.

Table 25 Predicted Noise Levels in dBA

Receiver ID	Period	Predicted Noise Level LAeq(15minute)		Predicted SDNL LAmax Noise Enhancing Weather Conditions	Noise Assessment Criteria	
		Standard Weather Conditions	Noise Enhancing Weather Conditions		PTNL LAeq(15minute) / SDNL LAmax	SSD 5581 LAeq(15minute) / LAmax
R1	Day	<30	<30	-	40	35
	Evening	<30	<30	-	35	35
	Night	<30	<30	<30	35/52	35/52
R2	Day	31	35	-	40	35
	Evening	31	35	-	35	35
	Night	31	35	45	35/52	35/52
R3	Day	<30	<30	-	40	35

Receiver ID	Period	Predicted Noise Level LAeq(15minute)		Predicted SDNL LAmax Noise Enhancing Weather Conditions	Noise Assessment Criteria	
		Standard Weather Conditions	Noise Enhancing Weather Conditions		PTNL LAeq(15minute) / SDNL LAmax	SSD 5581 LAeq(15minute) /LAmax
	Evening	<30	<30	-	35	35
	Night	<30	<30	36	35/52	35/52
R4	Day	<30	30	-	40	35
	Evening	<30	30	-	35	35
	Night	<30	30	38	35/52	35/52
R5	Day	<30	<30	-	40	35
	Evening	<30	<30	-	35	35
	Night	<30	<30	31	35/52	35/52
R6	Day	<30	<30	-	40	35
	Evening	<30	<30	-	35	35
	Night	<30	<30	<30	35/52	35/52
R7	Day	<30	<30	-	40	35
	Evening	<30	<30	-	35	35
	Night	<30	<30	<30	35/52	35/52
R8	Day	<30	<30	-	40	35
	Evening	<30	<30	-	35	35
	Night	<30	<30	32	35/52	35/52
R17	When in use	<30	<30	-	48	50 LAeq(period)
R18	When in use	<30	<30	-	48	50 LAeq(period)

8.7.6 Road Traffic Noise

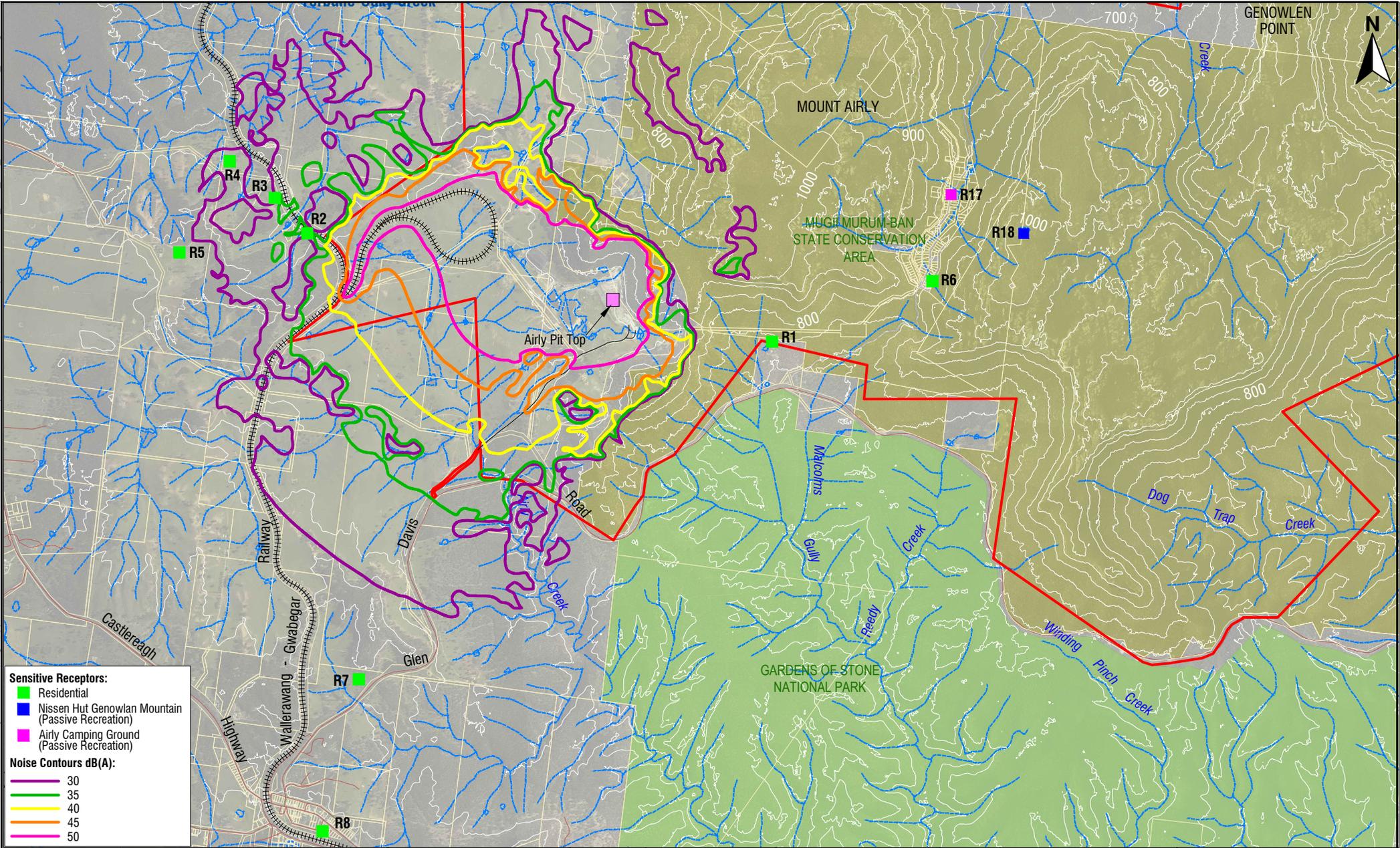
The proposed increase in workforce by 45 FTE personnel results in increases in traffic volumes on the local road network (**Section 8.5.3.4**) and can potentially increase road traffic noise.

The existing and Project related traffic flows on the road network are provided in **Table 26**. The existing traffic volumes have been obtained from the TTM traffic survey data undertaken from 30 November to 06 December 2010, appended as Appendix A to Ason (2019).

The traffic flows have been calculated for day and night periods on Castlereagh Highway to allow comparison against the assessment criteria in the RNP under the freeway/arterial/sub-arterial road category. It is also conservatively assumed that **all** additional traffic generation due to the proposed modification will travel on Castlereagh Highway to Airly Mine via the east **or** the west of Glen Davis Road. In reality, the trip distribution for the proposed 45 FTE personnel will be proportionately split and will arise both from the east and the west of Glen Davis Road (**Section 8.5.3.3**).

For Glen Davis Road, the noise assessment takes into consideration the traffic flows during the day and night peak hourly movements, given Glen Davis Road is classified a local road.

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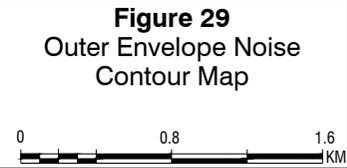
- Sensitive Receptors:**
- Residential
 - Nissen Hut Genowlan Mountain (Passive Recreation)
 - Airly Camping Ground (Passive Recreation)
- Noise Contours dB(A):**
- 30
 - 35
 - 40
 - 45
 - 50

LEGEND:

— Project Application Area	■ National Park
— Major Roads	■ State Conservation Area
— Watercourse	
— Cadastral Boundary	
— Contour (50m interval)	
+++++ Railway	

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Centennial Coal
Airly

Prepared by: **SLR**

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Table 26 Existing and Projected Traffic Volumes

Location	Time Period	Existing Traffic Flows	Additional Traffic Flows	Total
Castlereagh Highway - East of Glen Davis Road	Day	2191	66 ¹	2257
	Night	283	16 ¹	299
Castlereagh Highway - West of Glen Davis Road	Day	2072	66 ¹	2138
	Night	233	16 ¹	249
Glen Davis Road - South of Airly Mine Entrance	Day - Peak Hourly Movements	40	12	52
	Night - Peak Hourly Movements	38	12	50

Note 1: This conservatively assumes that all Project traffic travels to Airly Mine on the Castlereagh Highway via the east OR west of Glen Davis Road.

Based upon the expected road traffic movements presented in **Table 25**, **Table 26** provides a summary of the results of the road traffic noise assessment for Glen Davis Road at the nearest receiver located approximately 170 m from the roadway. The road traffic noise levels from the existing and proposed traffic volumes comply with the RNP noise criteria at the nearest affected receivers on Glen Davis Road during the day and night-time periods.

Table 27 Glen Davis Road Traffic Noise Assessment

Location	Period	Existing Road Traffic Noise Level LAeq(1hour)	Predicted Road Traffic Noise Level LAeq(1hour)	RNP Assessment Criteria LAeq(1hour)
Glen Davis Road 170 m from Roadway	Day	47 dBA	48 dBA	55 dBA
	Night	48 dBA	49 dBA	50 dBA

Additional traffic due to the modification on the Castlereagh Highway equates to an increase in traffic volumes of up to 3% during the day time and 7% during the night time. This would lead to a minor increase in noise levels on the Castlereagh Highway of up to 0.1 dB during the day time and 0.3 dB during the night time period. The increase in traffic noise from the modification is predicted to be <2 dB. In accordance with the RNP, in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

8.7.7 Rail Traffic Noise

8.7.7.1 Methodology and Assumptions

The calculation of LAeq for the day and night periods and the maximum passby levels have been conducted using the Nordic Rail Prediction Method (1994). The predictions are compared to the RING noise trigger levels (**Section 8.7.3.4**).

Rail noise predictions have been undertaken for the Wallerawang-Gwabegar rail line for coal trains south of Airly Mine and for water trains north of the mine (**Section 4.3.5, Figure 9**).

Given that scheduling of coal and water trains (peak daily and average daily movements) on the Wallerawang-Gwabegar rail line may not always be in Centennial Airly's control, the following assumptions have been made to provide a conservative rail noise assessment.

- **Coal trains** – all coal train traffic (3 trains average, 5 peak trains) would occur either during the day time period or the night time period
- **Water trains** – the one train per day would occur either in the day time or the night time period.

An assessment of the average percentage increase on the Main Western rail line due to the proposed modification would comprise less than 10% of cumulative train movements. For this reason, rail noise assessment on the Main Western rail line has not been undertaken.

8.7.7.2 Wallerawang-Gwabegar Rail Line Noise Predictions and Assessment

Wallerawang-Gwabegar Rail Line – North of Airly Mine

Predicted rail noise levels at the offset distance to the nearest receiver in Clandulla on the Wallerawang-Gwabegar rail line north of Airly Mine for one train per day (i.e two movements during the day or night period) are provided in **Table 28**.

Rail noise levels are predicted to be below the trigger levels at all receiver locations north of Airly Mine and would not change as a result of the modification.

Table 28 Predicted Rail Traffic Noise (North of Airly Mine)

Distance to Wallerawang-Gwabegar Rail Line	Predicted Noise Levels			RING (EPA, 2013) Trigger Levels		
	Day LAeq(15hour)	Night LAeq(9hour)	Passby LAmax	Day LAeq(15hour)	Night LA60eq(9hour)	Passby LAmax
50 m	43	45	83	65	60	85

Wallerawang-Gwabegar Rail Line – South of Airly Mine

The LAeq(period) and maximum (5% exceedance) pass-by noise levels for the existing (average and peak frequencies) and the proposed rail traffic (average and peak frequencies) during the day time and night time periods are presented in **Table 29** and **Table 30**, respectively.

Table 29 Daytime Predicted Rail Traffic Noise (South of Airly Mine)

Distance to Receiver	Rail Noise without Modification			Rail Noise with Modification			Increase in Noise Levels	
	LAeq(15hour) dBA		LAmax dBA	LAeq(15hour) dBA		LAmax dBA	LAeq(15hour) dBA	
	Average	Peak		Average	Peak		Average	Peak
11 m	57	61	91	59	61	91	1.8	0.0
25 m	53	57	87	55	57	87	1.8	0.0
50 m	50	54	84	52	54	84	1.8	0.0
100 m	47	51	81	49	51	81	1.8	0.0
150 m	45	49	79	47	49	79	1.8	0.0

Table 30 Night-time Predicted Rail Traffic Noise (South of Airly Mine)

Distance to Receiver	Rail Noise without Modification			Rail Noise with Modification			Increase in Noise Levels	
	LAeq(9hour) dBA		LAmix dBA	LAeq(9hour) dBA		LAmix dBA	LAeq(9hour) dBA	
	Average	Peak		Average	Peak		Average	Peak
11 m	59	63	91	61	63	91	1.8	0.0
25 m	56	59	87	57	59	87	1.8	0.0
50 m	52	56	84	54	56	84	1.8	0.0
100 m	49	53	81	51	53	81	1.8	0.0
150 m	48	52	79	49	52	79	1.8	0.0

The predicted rail noise levels in **Table 29** and **Table 30** conclude the following assessed impact on the Wallerawang-Gwabegar rail line south of Airly Mine.

- A comparison of the existing and proposed operating average rail movements indicates that average LAeq(15hour) (day time) and LAeq(9hour) (night time) noise levels would increase by up to 1.8 dB
- No increases in the peak LAeq(15hour) or LAeq(9hour) rail noise levels are predicted.
- The proposed operating average and peak LAeq(15hour) rail noise levels meet the 65 dBA rail noise trigger level at all receivers on the Wallerawang-Gwabegar rail line.
- The proposed operating average LAeq(9hour) noise level meets the 60 dBA day time rail noise trigger level at a distance of 14 m (and greater).
- The proposed operating peak LAeq(9hour) would remain unchanged due to the modification and would continue to meet the 60 dBA night time trigger level at a distance of 23 m (and greater).
- The existing and proposed operating maximum pass-by noise level would remain unchanged due to the modification and would continue to meet the 85 dBA passby level at a distance of 41 m (and greater).
- In all instances the predicted increase in rail noise levels due to the proposed modification is <2 dB.

8.7.8 Mitigation and Management

Mitigation and management measures for operational noise are described in the *Airly Mine Noise Management Plan* (Centennial Coal, 2018d), and would continue to be implemented. The management plan also provides procedures to be followed in the event of an exceedance of the relevant consent noise criteria, and the complaint response protocols.

8.7.9 Consequence of Potential Impact

Given that:

- the predicted operational noise levels due to the modification are below the relevant PTNL/SDNL and SSD 5581 noise criteria at the sensitive receptors
- the predicted road traffic noise on Glen Davis Road due to the proposed traffic volumes comply with the RNP day time and night time noise criteria

- the predicted rail noise on the Wallerawang-Gwabegar rail line due to the increased frequency of trains to an average of 3 trains per day meet the day time and night time RING trigger levels and the maximum passby level

no environmental consequence arises due to the proposed modification.

8.7.10 Conclusion

Operational noise predictions indicate that noise levels due to the proposed modification will be below relevant project trigger noise levels and SSD 5581 noise criteria at sensitive receptors under standard and noise enhancing meteorological conditions. Cumulative impacts are predicted to be negligible at all identified receivers. The L_{Amax} noise levels are predicted to be below the sleep disturbance noise levels under standard and noise enhancing meteorological conditions at all privately-owned residential receptors.

Road traffic noise levels from the existing and proposed traffic volumes comply with the RNP noise criteria at the nearest affected receiver on Glen Davis Road during the day and night-time periods. Additional traffic due to the modification on the Castlereagh Highway equates to an increase of <2 dB which, in accordance with the RNP, represents a minor impact that is considered barely perceptible.

A comparison of the existing and proposed operating average rail movements indicates that average L_{Aeq}(15hour) (day time) and L_{Aeq}(9hour) (night time) noise levels would increase by up to 1.8 dB on the Wallerawang-Gwabegar rail line between Airly Mine and Wallerawang. The proposed operating average and peak L_{Aeq}(15hour) noise levels meets the 65 dBA RING trigger level at all receivers on the rail line, with the proposed operating average L_{Aeq}(9hour) noise level meeting the 60 dBA RING trigger level at a distance of 14 m (and greater). The existing and proposed operating maximum pass-by noise level would remain unchanged due to the proposed modification and would continue to meet the RING criterion of 85 dBA at a distance of 41 m (and greater).

Rail noise levels from the Project are predicted to be below the trigger levels at all receiver locations on the Wallerawang-Gwabegar Railway north of Airly Mine and would not change as a result of the proposed modification.

8.8 Blasting

8.8.1 Introduction

An assessment of potential blasting impacts has been considered in the Noise and Vibration Impact Assessment (NIA) prepared for the Modification Report by SLR Consulting Australia Pty Ltd (SLR, 2019a), and which is provided in full in **Appendix J**

As discussed in **Section 5.2.1.4**, no underground blasting is undertaken at Airly Mine, however may be required in the event a geological structure is encountered. The blasting section of the NVIA has determined, with reference to the ANZEC *Technical basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990), the minimum safe blasting distances from vibration at the identified sensitive locations in order to remain compliant with the ANZEC vibration criteria.

Although the proposed blasting will be undertaken underground, there is potential for airblast pressure to propagate from the blast location to exit through openings (ventilation shafts, portals) to the surface. However, the airblast level would attenuate as it travels through the underground workings and is likely to have no adverse noise impacts at the nearest sensitive receivers. The impact of airblast from underground blasting was not considered in the NIA.

8.8.2 Existing Environment

No surface or underground blasting is undertaken at Airly Mine. Sensitive receptors exist within the Project Application Area with the potential to be impacted by any underground blasting and result in the following impacts from ground vibration:

- human discomfort
- building damage
- infrastructure damage e.g., Telecommunications Tower and cables on Genowlan Mountain
- damage to roads and access tracks on Mount Airly and Genowlan Mountain
- damage to archaeological sites and geodiversity on the Mount Airly and Genowlan Mountain mesa complex.

8.8.3 Blast Assessment Criteria

Section 9.1 of SLR (2019a) provides detailed justifications for the development of the ground vibration criteria that would be required to be met for Airly Mine to be compliant with ANZEC (1990). The following safe blast (ground vibration) design vibration criteria have been adopted in determining the minimum safe blasting distances from vibration at the identified sensitive locations.

- **Human comfort ground vibration** – Peak Vector Sum (PVS) vibration velocity of 5 mm/s, which may be exceeded on up to 5% of the total number of blasts over a period of 12 months, but cannot exceed 10 mm/s (PVS) at any time.
- **Building damage vibration** – criterion of 12.5 mm/s based on buildings of historical value, and hence would be conservative damage assessment criterion for all privately-owned residences in the vicinity of Airly Mine.
- **Infrastructure vibration damage** – a conservative vibration damage criterion of 50 mm/s for the Telecommunications Tower and cables, and 80 mm/s for roadway and track infrastructure.
- **Archaeological / geological vibration damage** – a conservative safe blast design vibration criterion of 250 mm/s (5% exceedance) as being applicable to archaeological and geological structures and Aboriginal heritage sites (e.g. rock shelters), if present.

8.8.4 Vibration Assessment

In order to determine the mass of the explosive that could be utilised to ensure the established blast assessment criteria (**Section 8.8.3**) will not be exceeded in the approved mining zones with varying depths of cover, the generalised predicted ground vibration level safe working distances from typical Maximum Instantaneous Charge mass (in kg) (MIC) blast designs for vibration sensitive locations have been calculated. The generalised safe working distances for 5 – 20 kg MIC are provided in **Table 31**.

Table 31 Generalised Safe Working Distances

Vibration Receiver / Blast Assessment Criterion	Safe Working Distances (m) 5% Blast Vibration Exceedance Level			
	5 kg MIC	10 kg MIC	15 kg MIC	20 kg MIC
Residential Receiver 5 mm/s	91	129	158	182
Historical Sensitive/Heritage 12.5 mm/s	52	73	89	103

Vibration Receiver / Blast Assessment Criterion	Safe Working Distances (m) 5% Blast Vibration Exceedance Level			
	5 kg MIC	10 kg MIC	15 kg MIC	20 kg MIC
Telecommunications Tower & cable 50 mm/s	22	31	38	43
Roadway (culvert) Vibration 80 mm/s	17	23	28	33
Archaeological/Geological Structure Vibration 250 mm/s	8	12	14	16

8.8.5 Impact Assessment

Airly Mine will use the safe working distances provided in **Table 31** to determine the MIC required for explosives at a blasting location underground and with regard to the sensitive receptors in the vicinity. Given the implementation of the blast designs for vibration sensitive locations, the impact of the proposal for ground vibration impacts are likely to be negligible. Based on the historical observations, occurrences of geological structures at Airly Mine are rare (**Section 5.2.1.4**) and underground blasting using explosives in the Project is likely to be infrequent.

8.8.6 Mitigation and Management

Underground mine blasting will only be required in the Project where geological structures are encountered. Notwithstanding, when blasting is required Centennial Airly would implement blast design with a high margin of conservatism to ensure that the applicable blast criteria at a sensitive location will not be exceeded. In addition, if blasting is required in the Project approaching the minimum safe working distances, vibration monitoring would be conducted to validate predicted vibration levels.

A *Blast Management Plan* will be prepared prior to any blasting activity and will include blast monitoring and evaluation, and blast notification protocol for all stakeholders.

An Explosive Control Plan will be prepared for the handling and management of explosives in transit and the temporary storage on site (refer **Section 8.13**)

Blasting will only be undertaken between 9 am and 5 pm Monday to Saturday inclusive. No blasting will be undertaken on Sunday or public holidays.

A High-Risk Activity notification, under the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*, along with the relevant documentation will be provided to the Division of Resources and Geosciences seven days prior to the proposed activity.

8.8.7 Consequence of Potential Impact

Given the Project will implement blast design with a high margin of conservatism to ensure that the applicable blast criteria at a sensitive location will not be exceeded, the impact and the environmental consequence will be negligible.

8.8.8 Conclusion

The blasting assessment has established the blast assessment vibration criteria for all potential sensitive receivers within the Mount Airly – Genowlan Mountain mesa with the potential to be impacted by the proposed underground blasting at Airly Mine. Based on these criteria the generalised predicted ground

vibration level safe working distances from typical Maximum Instantaneous Charge mass have been calculated. These safe distances will ensure the blast design will meet the blast assessment criteria and the potential impact and environmental consequences will be negligible.

8.9 Air Quality

8.9.1 Introduction

An Air Quality Impact Assessment (AQIA) for the modification was undertaken by SLR Consulting Australia Pty Ltd *Airly Mine: Air Quality Impact Assessment and Greenhouse Gas Assessment* (SLR, 2019b), which is provided in full in **Appendix K**.

Emissions of particulate matter from materials surface handling activities, wheel generated dust and wind erosion, and emissions from the ventilation shafts due to underground activities due to the proposed modification elements and the existing operations have been assessed in the AQIA.

The AQIA has been prepared in accordance with the “Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2017), (Approved Methods). The Approved Methods specify the assessment criteria for Total Suspended Particulate (TSP) and PM₁₀ and PM_{2.5}. The air quality goals adopted for particulate matter in the AQIA, which conform to the current EPA (2017 and Federal air quality criteria, are summarised in **Table 32**.

The project air quality goals are consistent with the SSD 5581 air quality criteria (Condition 5, Schedule 4) for TSP, PM₁₀ and deposited dust. No PM_{2.5} criteria are included in SSD 5581, however the AQIA considers these supplementary criteria.

Table 32 Project Air Quality Goals

Pollutant	Averaging Period	Criteria (µg/m ³)
PM ₁₀	24-hour	50
	Annual	25
PM _{2.5}	24-hour	25
	Annual	8
TSP	Annual	90
Criteria (g/m²/month)		
Deposited dust	Annual	2 (maximum increase in deposited dust level) 4 (maximum total deposited dust level)

8.9.2 Existing Environment

8.9.2.1 Background Air Quality

The air quality in the region surrounding Airly Mine pit top is influenced by emissions generated by sources originating from both within and outside of the local area. Specifically, air quality is influenced by traffic-generated pollution, conservation and recreation related activities within the Mugii Murum-ban SCA, nearby agricultural activities, pollution transported into the area from more distant sources, and pollution generated by the existing Airly Mine operations itself.

Dust deposition is monitored at four locations around Airly Mine. All dust deposition results meet the cumulative assessment criterion of 4 g/m²/month. Over a 5-year period from all locations the average deposition rate yielded 1.2 g/m²/month (**Table 33**).

No monitoring of TSP, PM₁₀ or PM_{2.5} is conducted at Airly Mine. The nearest OEH Air Quality Monitoring Station (AQMS) measuring continuous PM₁₀ and PM_{2.5} concentrations is in Bathurst, approximately 50 km southwest of Airly Pit Top. Background PM₁₀ data from 2014 from Bathurst has been used in the AQIA to align with the same year (2014) modelled in the meteorological model used (Weather Research and Forecast Model) to allow contemporaneous analyses.

No TSP monitoring is conducted by the Bathurst AQMS. In the absence of TSP monitoring data, daily-varying ambient TSP concentration has been estimated from the monitored PM₁₀ concentrations from Bathurst using a PM₁₀/TSP ratio of 0.5, which is typical for rural areas in Australia.

Ambient PM_{2.5} concentration has been monitored at Bathurst AQMS since 2016. In the absence of PM_{2.5} monitoring data for 2014, daily-varying ambient PM_{2.5} concentration has been estimated from the monitored 2014 PM₁₀ concentrations using a PM_{2.5}/PM₁₀ ratio (0.44) derived from concurrent measurements recorded during the latest full year (2018) of measurements.

The site-specific ambient air quality concentrations adopted for use in the AQIA are summarised in **Table 33**.

Table 33 Adopted Background Air Quality Data

Pollutant	Averaging Period	Regional Background	Notes
TSP	Annual	29.2 µg/m ³	Assumed to be twice the monitored PM ₁₀ concentration at Bathurst AQMS
PM ₁₀	24-hour	Daily varying	As monitored at Bathurst AQMS during 2014
	Annual	14.6 µg/m ³	As monitored at Bathurst AQMS during 2014
PM _{2.5}	24-hour	Daily varying	Assumed to be half the monitored PM ₁₀ concentration at Bathurst
	Annual	7.3 µg/m ³	Assumed to be half the monitored PM ₁₀ concentration at Bathurst
Deposited dust	Annual	1.2 g/m ² /month	Estimated from on-site monitoring program

8.9.2.2 Sensitive Receptors

Sensitive receptors in the Project for air quality comprise eight residential sensitive receptors with the potential to be impacted by the pit top operations and two passive recreation receptors (Airly Camping Ground, Nissen Hut), shown in **Figure 8**.

8.9.3 Assessment Methodology

The emissions estimation, the emissions factors utilised, the activated rates and the summary of estimated emissions (TSP, PM₁₀, PM_{2.5}) for the Airly Mine operations, including the Modification 3 components are detailed in Section 4 of SLR (2019b). Due to the higher coal throughput proposed, the total estimated emissions for the operations as proposed to be modified are greater for TSP, PM₁₀ and PM_{2.5} compared to those calculated for the Airly MEP AQIA (SLR, 2014).

The air dispersion methodology for the AQIA is described in Section 5 of SLR (2019b). Emissions from the Project have been modelled using the CALPUFF (Version 6.267) modelling system, using the 3D wind field data generated by the meteorological pre-processor CALMET. The Weather Research and Forecast Model was used to produce the meteorological field required as an input to the CALMET meteorological model over the model domains defined for the Project. The meteorological modelling was performed for the 2014 calendar year and is consistent with the 2014 background air quality dataset utilised from the Bathurst AQMS (refer **Section 7.8.2**). The selection of the year 2014 is consistent with

the approach prescribed in the Approved Methods, which suggests adopting a ‘representative’ meteorological year within the last five years.

8.9.4 Impact Assessment

TSP, PM₁₀ and PM_{2.5} concentrations and dust deposition rates predicted by the air dispersion model at the nominated sensitive receptors are presented below. Pollutant isopleth plots are also provided in Appendix B of SLR (2019b), which show the maximum incremental particulate concentrations and deposition rates due to the proposed modification.

As discussed above, regional background particulate concentrations at the pit top and the surrounding areas have been estimated based on the air quality data from Bathurst AQMS. The predicted incremental contributions from the proposed modification have been added to the relevant background dataset in order to provide information on the potential cumulative impact of the proposed Airly Mine activities on air quality within the local area. The air quality data for the currently approved operations are also included in the tables, noting the regional air quality from Bathurst AQMS used for the cumulative impact for the Project was for the year 2010. The greater 2014 regional background data exaggerates the impact of the proposed modification.

8.9.4.1 Total Suspended Particulates

Table 34 presents the annual average incremental and cumulative TSP concentration predicted at each receptor for both Modification 3 and the current approved operations.

Table 34 shows the cumulative annual average TSP concentration at all nominated receptors is predicted to be well below the criterion of 90 µg/m³ and generally show very minor increases in the incremental impact due to Modification 3. The regional background TSP concentration contributes the vast majority of cumulative dust concentrations in all cases. The newer background data used in this current assessment has significantly greater annual average concentrations than that used in the 2014 assessment and has exaggerated the impacts of Modification 3.

Table 34 Predicted Annual Average TSP Concentration at Sensitive Receptors

Receptor ID	Annual Average TSP Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact
R1	29.2	1.3	30.5	1.1	19.8
R2	29.2	3.3	32.5	2.9	21.7
R3	29.2	2.5	31.7	1.8	20.5
R4	29.2	1.8	31.0	1.1	19.8
R5	29.2	1.6	30.8	1.2	20.0
R6	29.2	0.5	29.7	ND ³	ND ³
R7	29.2	0.2	29.4	0.1	18.9
R8	29.2	0.1	29.3	0.1	18.8
R17	29.2	0.5	29.6	0.5	19.3
R18	29.2	0.4	29.6	ND ³	ND ³
Criterion			90		90

¹ Regional background estimated from PM₁₀ levels recorded by the Bathurst AQMS in 2014 using a PM₁₀/TSP ratio of 0.5.

² As reported in the Airly MEP AQIA for Proposed Scenario 3 (SLR 2014).

³ Receptor locations not assessed in Airly MEP AQIA (SLR 2014).

8.9.4.2 PM₁₀

Maximum 24-hour Average PM₁₀ Concentration

Table 35 presents the maximum incremental and cumulative 24-hour average PM₁₀ concentration at each receptor for both MOD 3 and the current approved operations.

Table 35 shows that the cumulative 24-hour average PM₁₀ concentration at all receptors is predicted to be below the criterion of 50 µg/m³. The regional background dust concentration contributes the vast majority of cumulative dust concentrations in all cases.

Table 35 shows the predicted incremental PM₁₀ concentration at some receptors is slightly lesser than the incremental impacts predicted for the current approved operations in the Airly MEP AQIA (SLR 2014) despite the proposed increase in the ROM coal throughput. This is due to updates in the emission factors, meteorological data and modelling methodology (i.e. wind speed dependent wind erosion emission rates). Despite the lesser incremental impacts predicted at some receptors, the predicted cumulative impacts are similar for both the approved operation and Modification 3 due to changes in the regional background PM₁₀ levels used to calculate the cumulative impacts compared to the regional data used in the Airly MEP AQIA (SLR, 2014).

Table 35 Predicted 24-Hour Average PM₁₀ Concentration at Sensitive Receptors

Receptor ID	Maximum 24-Hour Average PM ₁₀ Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact
R1	42.8	4.9	43.7	8.6	<43.4
R2	42.8	6.5	45.1	7.9	<43.4
R3	42.8	6.4	44.1	6.1	<43.4
R4	42.8	4.6	43.1	4.5	<43.4
R5	42.8	3.6	44.6	3.9	<43.4
R6	42.8	2.0	43.0	ND ³	ND ³
R7	42.8	1.8	42.8	0.5	<43.4
R8	42.8	0.9	42.8	0.2	<43.4
R17	42.8	1.7	42.9	7.6	<43.4
R18	42.8	1.5	42.9	ND ³	ND ³
Criterion			50		50

¹ Daily varying regional background PM₁₀ values used as recorded by the Bathurst AQMS in 2014.

² As reported in Airly MEP AQIA for Proposed Scenario 3 (SLR 2014).

³ Receptor locations not assessed in the Extension Project AQIA (SLR 2014).

Annual Average PM₁₀ Concentration

Table 36 presents the incremental and cumulative annual average PM₁₀ concentration each receptor for both MOD 3 and the current approved operations. The table shows that the cumulative annual average PM₁₀ concentration at all receptors is predicted to be well below the new, more stringent criterion of 25 µg/m³, which was included in SSD 5581 in July 2019 after Modification 2. The regional

background PM₁₀ concentration contributes the vast majority of cumulative PM₁₀ concentration in all cases.

Table 36 shows the incremental annual average PM₁₀ concentration predicted at most receptors are generally double the incremental impacts predicted for the current approved operations in the Airly MEP AQIA (SLR 2014). The predicted cumulative impacts are greater than those for the current approved operations (SLR 2014) mainly due to changes in the regional background PM₁₀ levels used in this AQIA compared to the regional data used in SLR (2014).

Table 36 Predicted Annual Average PM₁₀ Concentration at Sensitive Receptors

Receptor ID	Annual Average PM ₁₀ Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact
R1	14.6	0.5	15.1	0.3	9.6
R2	14.6	1.3	15.9	0.7	10.1
R3	14.6	1.0	15.6	0.5	9.8
R4	14.6	0.8	15.3	0.3	9.7
R5	14.6	0.6	15.2	0.3	9.7
R6	14.6	0.2	14.8	ND ³	ND ³
R7	14.6	0.1	14.7	<0.1	<9.5
R8	14.6	<0.1	14.6	<0.1	<9.5
R17	14.6	0.2	14.8	0.1	9.5
R18	14.6	0.1	14.7	ND ³	ND ³
Criterion			25		30

¹ Daily varying regional background PM₁₀ values used as recorded by the Bathurst AQMS in 2014.

² As reported in Airly MEP AQIA for Proposed Scenario 3 (SLR 2014).

³ Receptor locations not assessed in the Extension Project AQIA (SLR 2014).

8.9.4.3 PM_{2.5}

Maximum 24-hour Average PM_{2.5} Concentration

Table 37 presents the maximum 24-hour average PM_{2.5} concentration predicted at each receptor for both MOD 3 and the current approved operations.

The cumulative 24-hour average PM_{2.5} concentration at all receptors is predicted to be below the criterion of 25 µg/m³. The regional background PM_{2.5} concentration contributes to the vast majority of cumulative PM_{2.5} concentration in all cases.

The incremental PM_{2.5} concentration predicted at most receptors is slightly lower than the incremental impacts predicted for the current approved operations (SLR, 2014) despite the proposed increase in the ROM throughput. This is due to updates in the emission factors, meteorological data and modelling methodology (i.e. wind speed dependent wind erosion emission rates).

Table 37 Predicted 24-Hour Average PM_{2.5} Concentration at Sensitive Receptors

Receptor ID	Maximum 24-Hour Average PM _{2.5} Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact ³
R1	18.8	0.6	18.9	1.4	NA
R2	18.8	0.8	19.1	1.4	NA
R3	18.8	0.9	19.0	0.8	NA
R4	18.8	0.6	18.9	0.6	NA
R5	18.8	0.5	19.1	0.7	NA
R6	18.8	0.3	18.9	ND ⁴	ND ⁴
R7	18.8	0.2	18.8	0.1	NA
R8	18.8	0.1	18.8	<0.1	NA
R17	18.8	0.2	18.9	<0.1	NA
R18	18.8	0.2	18.8	ND ⁴	ND ⁴
Criterion			25		25

¹ Daily varying background PM_{2.5} values used estimated from PM₁₀ concentrations recorded by the Bathurst AQMS in 2014 using a PM₁₀/PM_{2.5} ratio of 0.44.

² As reported in Airly MEP AQIA for Proposed Scenario 3 (SLR 2014).

³ Cumulative PM_{2.5} concentrations not assessed in the Extension Project AQIA due to background data not being available.

⁴ Receptor locations not assessed in Airly MEP AQIA (SLR 2014).

Annual Average PM_{2.5} Concentration

Table 38 presents the annual average PM_{2.5} concentration predicted at each receptor for both MOD 3 and the current approved operations. The results indicate the cumulative annual average PM_{2.5} concentration at all receptors is predicted to be below the criterion of 8 µg/m³. The regional background PM_{2.5} concentration contributes to the vast majority of PM_{2.5} concentration in all cases.

Table 38 shows the incremental annual average PM_{2.5} concentration predicted at most receptors is very similar to the incremental impacts predicted for the current approved operations (SLR, 2014).

Table 38 Predicted Annual Average PM_{2.5} Concentration at Sensitive Receptors

Receptor ID	Annual Average PM _{2.5} Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact ³
R1	6.4	0.1	6.5	<0.1	NA
R2	6.4	0.2	6.6	0.1	NA
R3	6.4	0.1	6.6	0.1	NA
R4	6.4	0.1	6.5	<0.1	NA
R5	6.4	0.1	6.5	<0.1	NA

Receptor ID	Annual Average PM _{2.5} Concentration (µg/m ³)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact ³
R6	6.4	<0.1	<6.5	ND ⁴	ND ⁴
R7	6.4	<0.1	<6.5	<0.1	NA
R8	6.4	<0.1	<6.5	<0.1	NA
R17	6.4	<0.1	<6.5	<0.1	NA
R18	6.4	<0.1	<6.5	ND ⁴	ND ⁴
Criterion			8		8

¹ Regional background estimated from PM₁₀ levels recorded by the Bathurst AQMS in 2014 using a PM₁₀/PM_{2.5} ratio of 0.44.

² As reported in the Airly MEP Proposed Scenario 3 (SLR 2014).

³ Cumulative PM_{2.5} concentration not assessed in Airly MEP AQIA due to background data not being available.

⁴ Receptor locations not assessed in Airly MEP AQIA (SLR 2014).

8.9.4.4 Dust Deposition

Table 38 provides the annual average dust deposition rate predicted at each receptor for both Modification 3 and the current approved operations. The results indicate the incremental and cumulative annual average dust deposition rate at all receptors are predicted to be well below the criterion of 2 g/m²/month (incremental increase in dust deposition) and below 4 g/m²/month (cumulative dust deposition). There is minimal variation in the predicted incremental and cumulative impacts between the Airly MEP (SLR 2014) and the current assessment.

Table 39 Predicted Annual Average Dust Deposition Rate at Sensitive Receptors

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)				
	Modification 3			Current Approved Operations ²	
	Regional Background ¹	Incremental Impact	Cumulative Impact	Incremental Impact	Cumulative Impact
R1	1.2	0.1	1.3	<0.1	<1.3
R2	1.2	0.1	1.3	<0.1	<1.3
R3	1.2	0.1	1.3	<0.1	<1.3
R4	1.2	0.1	1.3	<0.1	<1.3
R5	1.2	<0.1	<1.3	<0.1	<1.3
R6	1.2	<0.1	<1.3	ND ³	ND ³
R7	1.2	<0.1	<1.3	<0.1	<1.3
R8	1.2	<0.1	<1.3	<0.1	<1.3
R17	1.2	<0.1	<1.3	<0.1	<1.3
R18	1.2	<0.1	<1.3	ND ³	ND ³
Criterion			4.0		4.0

¹ Regional background estimated from dust deposition rates measured by the Airly Mine air quality monitoring programme.

² As reported in the Airly MEP AQIA for Proposed Scenario 3 (SLR 2014).

³ Receptor locations not assessed in Airly MEP AQIA (SLR 2014).

8.9.4.5 Cumulative Impact Assessment

SLR (2019b) has considered cumulative impacts from other dust emitting developments and activities in the area, noted below, and concluded no significant cumulative impacts will arise due to the proposed modification based on the following reasons.

- **Excelsior Limestone Quarry:** Given the quarry is located 5 km northwest of the Airly pit top, no significant cumulative impacts are expected.
- **Surrounding recreational activities:** Conservation and recreation related activities within the Mugii Murum-Ban State Conservation Area, Gardens of Stone National Park and other areas around the Airly pit top are limited to unsealed road use by vehicles. Given the infrequent nature of these activities, significant cumulative impact with the Project operation is not likely.
- **Agricultural activities:** Grazing is the most frequent agricultural activity, however is likely to have negligible impact on ambient particulate levels, and cumulative impact with the Project operation is therefore unlikely.

8.9.5 Consequence of Potential Impact

The AQIA shows the air quality impacts due to Modification 3 will meet the air quality goals adopted for the Project and will remain within the relevant air quality criteria in SSD 5581, including the more stringent annual average PM₁₀ criterion of 25 µg/m³, and the additional 24 hour average PM_{2.5} criterion of 25 µg/m³ and annual average PM_{2.5} criterion of 8 µg/m³.

Modelling shows that generally there will be increased incremental contributions due to Modification 3, but that these increases are modest, and the cumulative impacts calculated for each air quality parameter are vastly overwhelmed by the regional background concentrations (TSP, PM₁₀, PM_{2.5}) sourced from the Bathurst AQMS.

Accordingly, no additional environmental consequences are predicted for air quality at the sensitive receptors around Airly Mine due to Modification 3.

8.9.6 Mitigation and Management

Given the AQIA demonstrates that proposed modification will meet the air quality goals adopted for the Project and will remain within the relevant air quality criteria in SSD 5581, no additional mitigation measures are required. Air quality monitoring at Airly Mine will continue to be undertaken in accordance with the Airly Mine *Air Quality and Greenhouse Gas Management Plan* (Centennial Coal, 2018e).

8.9.7 Conclusion

The dust levels (i.e. TSP, PM₁₀, PM_{2.5} and dust deposition) of the Project, as proposed to be modified, will meet all air quality goals adopted for particulate matter in AQIA, which all conform to the EPA and Federal air quality criteria, and are consistent with the SSD 5581 air quality criteria.

8.10 Greenhouse Gas Emissions

8.10.1 Introduction

A quantitative greenhouse gas (GHG) assessment has prepared by SLR Consulting Australia Pty Ltd *Airly Mine: Air Quality Impact Assessment and Greenhouse Gas Assessment* (SLR, 2019b), which is provided in full in **Appendix K**. The GHG assessment was performed to determine the potential impact of MOD 3 on the GHG emissions from Airly Mine.

8.10.2 Assessment Methodology and Scope Definition

The GHG assessment has been prepared in accordance with the relevant legislation, guidelines, and policies, described in detail in Section 8.2 of SLR (2019b).

Emissions of GHG can be termed as being Scope 1, Scope 2 or Scope 3, and ‘direct’ or ‘indirect’ emissions (**Figure 30**). The definitions of these scopes included in the GHG assessment (from WRI and WBCSD GHG Protocol (WRI, 2004)) allows the determination of those sources of GHG emissions which can be directly controlled by Centennial Airly (Scope 1 and Scope 2), or those which Centennial Airly would have some, but limited control over (Scope 3).

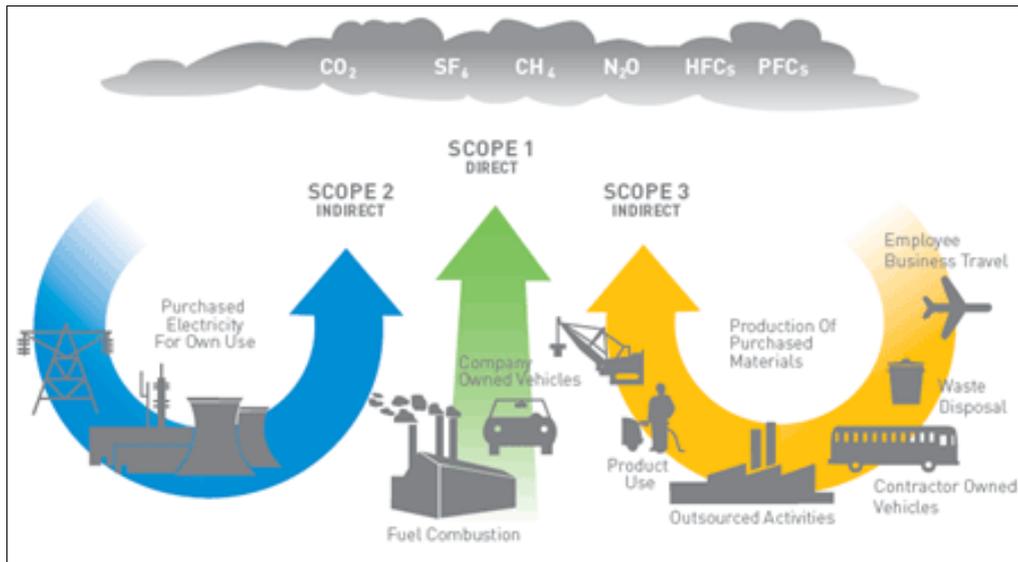


Figure 30 Scope 1, 2 and 3 GHG Emissions as Defined in GHG Protocol Initiative

The proposed changes to the Airly Mine operations associated with MOD 3 that have the potential to increase GHG emissions from the site have been identified as follows.

- **Scope 1:**
 - increased diesel usage in mining equipment due to the proposed increase in ROM throughput
 - increased use of oils and greases in equipment due to proposed increase in ROM throughput
 - increased ventilation system flowrate associated with the proposed increase in ROM throughput as well as the additional underground equipment.
- **Scope 2:**
 - increased electricity consumption associated with the proposed increase in ROM throughput as well as the addition of underground equipment.
- **Scope 3:**
 - production and transport of additional diesel, greases and oil consumed at the site
 - transmission losses associated with the additional electricity consumed at the site
 - rail transport of additional product coal
 - rail transport of water from Charbon Colliery
 - disposal of increased volumes of solid waste generated by the site

- additional staff traffic movements due to the increase in workforce
- end use (combustion) of the additional product coal produced.

The GHG emission inventory activity data and emission factors used in the calculation of Scope 1, Scope 2 and Scope 3 emissions are provided in Section 8.3.3 and Section 8.3.4 of SLR (2019b). For comparative purposes, non-CO₂ GHGs are awarded a “CO₂-equivalence” (CO₂-e) based on their contribution to the enhancement of the greenhouse effect. The CO₂-e of the gases from the Project have been calculated using the Global Warming Potentials included in Table 21 in SLR (2019b).

8.10.3 Existing Environment

Projected activity data for the approved and proposed MOD 3 operations have been estimated based on operations at Airly Mine for the 2017/18 financial year, the approved and proposed mine ROM production rates, and activity data compiled for the GHG assessment performed for the Airly MEP (SLR, 2014). The 2017/2018 data was reported under the Federal *National Greenhouse and Energy Reporting System* (NGERS) in October 2018.

The average ROM coal throughput for the 2017/18 financial year was 0.882 Mtpa and the amount of product coal produced was 0.838 Mtpa, giving a ROM coal to product coal ratio of 95%. This ratio was used to estimate product coal throughputs for the current approved and proposed MOD 3 operations.

8.10.4 Impact Assessment

8.10.4.1 GHG Emissions due to Modification 3

The estimated annual GHG emissions for the current, approved and proposed MOD 3 operations at Airly Mine are shown in **Table 40**.

From **Table 40**, the annual Scope 1 and Scope 2 GHG emissions from MOD 3 operations are estimated to be 0.016 tonnes of CO₂-e per ROM tonne of coal produced. This is decreased from 0.019 t CO₂-e/t ROM coal for the current approved operations.

The main contributors to the estimated annual Scope 1 and Scope 2 GHG emissions is electricity consumption, which accounts for 61% of the total estimated Scope 1 and Scope 2 emissions. It is noted the electricity consumption for the panel and pillar equipment was not available in the 2017/2018 financial year activity data and were estimated conservatively.

Fugitive CO₂ emissions from the ventilation shaft are estimated to contribute 35% of the total combined Scope 1 and Scope 2 emissions. Diesel fuel consumption is estimated to account for only 4%.

Table 40 GHG Emission Inventory – Estimated Scope 1, 2 and 3 Emissions

Activity/Source	Estimated GHG Emissions (tonnes CO ₂ -e/annum)		
	2017/18 Financial Year	Current Approved	Proposed (MOD 3)
Scope 1			
Diesel combustion	570.0	1,163.4	1,938.9
Oil consumption	28.9	59.0	98.4
Grease consumption	0.2	0.3	0.6
SF6 leakage	4.9	4.9	4.9
Fugitive emissions	7,600.2	8,872.1	17,100.4
Sub-Total – Scope 1	8,204.2	10,099.7	19,143.1

Activity/Source	Estimated GHG Emissions (tonnes CO ₂ -e/annum)		
	2017/18 Financial Year	Current Approved	Proposed (MOD 3)
Scope 2			
Electricity consumption	8,666.9	17,687.8	29,538.6
Sub-Total – Scope 1 + Scope 2	16,871.1	27,787.5	48,681.7
Scope 3			
Diesel combustion	29.2	59.7	99.4
Oil consumption	7.5	15.2	25.4
Grease consumption	0.2	0.3	0.6
Electricity consumption	1,056.9	2,157.0	6,832.1
Coal transport by rail	2,444.7	4,989.3	8,682.6
Water transport by rail	0.0	0.0	93.9
Staff commuting	606.6	1,059.5	1,367.2
Solid waste	305.8	446.6	576.3
Coal combustion - Australia	1,225,439.5	2,500,923.8	2,084,103.2
Coal combustion - Overseas	816,959.6	1,667,282.5	4,862,907.4
Sub-Total – Scope 3	2,046,850.0	4,176,934.0	6,961,458.1

8.10.4.2 Comparison to National and State Emission Inventories

Australia's net GHG emissions totalled 533.0 Mt CO₂-e in 2016 (Australian Greenhouse Emission Information System (DEE, 2016)). The energy sector accounted for over 81% of the total national emissions with energy generation through the combustion of fossil fuels accounting for 79% of the national energy sector emissions. Fugitive emissions accounted for approximately 11% of energy sector emissions.

The reported 2016 total NSW emissions of 130.3 Mt CO₂-e accounted for approximately 24% of national GHG emissions. The energy sector contributed 110.1 Mt CO₂-e which is approximately 85% of the state emission total. Fugitive emissions account for approximately 14% of NSW total energy sector emission total.

The contributions of the predicted annual Scope 1 and 2 emissions resulting from the proposed MOD 3 operations are detailed in **Table 41**. The emissions from the proposed modifications are a relatively small proportion of both the Australian and NSW total emissions, accounting for <0.01% of total Australian GHG production. As such, the relatively small amount of GHG emissions generated by MOD 3 will have an undetectable effect on global climate change.

Table 41 Emission Contributions to State & National Annual Emission Totals

	Modification 3 t CO ₂ -e / annum	2016 Total Emissions (t CO ₂ -e)	
		Australia	NSW
Modification 3 Operations - Scope 1 and 2	48,682	532,971,150	130,273,520
Modification 3 as a percentage of National /State emissions inventory	-	0.009%	0.037%

8.10.5 Consequence of Potential Impact

As noted above, the proposed modification will result in <0.01% of total Australian GHG production and is considered undetectable. The environmental consequence and Airly Mine's contribution to climate change would be in proportion to its contribution to global GHG emissions.

8.10.6 Mitigation and Management

The estimated emissions in **Table 40** confirm the significant contribution that electricity consumption makes to the GHG profile for the proposed MOD 3 activities, accounting for 61% of the total estimated Scope 1 and Scope 2 emissions. Fugitive CO₂ emissions from the ventilation shaft are estimated to contribute 35% of the total combined Scope 1 and Scope 2 emissions.

Airly Mine currently implements an *Energy and Greenhouse Gas Management System* that monitors and reports energy usage. Key performance indicators are tracked and include energy demand and GHG emissions per tonne of ROM coal produced.

Airly Mine has relatively low GHG emission levels and implements a number of GHG emission reduction measures on site, including:

- Engineered mine and infrastructure design to improve energy efficiency;
- Regular maintenance of plant and equipment to minimise fuel consumption; and
- Consideration of energy efficiency in plant and equipment selection.

In addition, Airly Mine is currently in the process of installing a 2 MW solar farm (Solar Project), to reduce its demand for electricity from the grid, and hence its carbon footprint (Umwelt, 2019), discussed in **Section 4.6**.

The Solar Project is expected to supply approximately 25% of the site's electricity consumption, hence in the long term the Scope 2 emissions will be lower than included in this GHG assessment. The plant will also supply the grid with any electricity generated but not required at the site.

Once the Solar Project is operational, the reduction in purchased electricity will be tracked and the relevant data will be available for use in future GHG emission inventory calculations for the site.

8.10.7 Conclusion

Comparison of the estimated Scope 1 and 2 emissions with State and National GHG emission totals indicates that the GHG emissions from Airly mine operations are a relatively small proportion of both the Australian and NSW total emissions, accounting for less than 0.01% of total Australian GHG production.

Given the above, it is concluded that the relatively small amount of Scope 1 and Scope 2 GHG emissions generated by Modification 3 will have an undetectable effect on global climate change.

Centennial Airly will continue the ongoing management of its contribution to Australian GHG inventories through participation in the Federal government’s NGERs.

8.11 Economic

8.11.1 Introduction

An Economic Assessment (EA) for the proposed modification was undertaken by Agis Group (Agis, 2019) Economic Impact Assessment: Airly Mine Extension Project Modification 3 and is included in **Appendix L**. The EIA has been prepared in accordance with the Guidelines for the economic assessment of mining and coal seam gas proposals (DPE, 2015b) and the supporting Technical Notes (DPE, 2018). However, the discussions on Centennial Airly’s Federally levied corporate income taxes, State payroll tax and local government land rates liabilities are not included in the EA, for reasons discussed in Section 2.3.2 of Agis (2019).

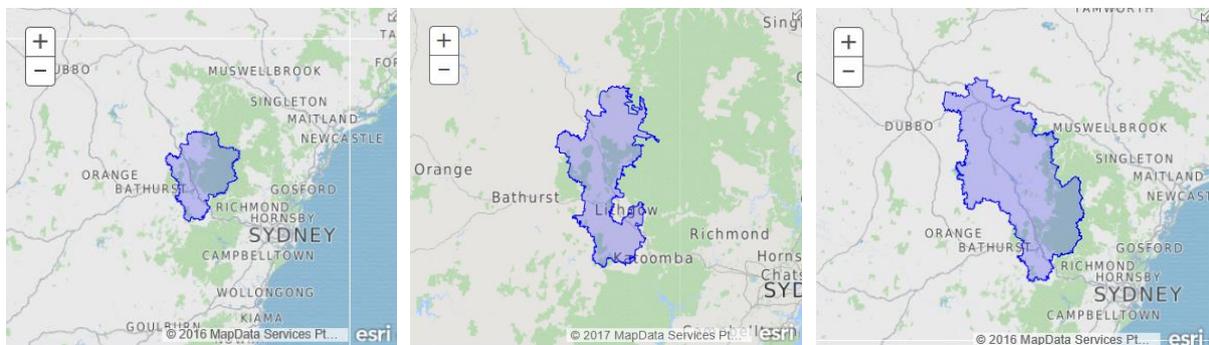
Key aspects of the proposed modification of relevance to the EA assessment for the proposed modification are:

- the proposed increase in ROM coal production
- the proposed increase in the size of the workforce and the resulting direct and indirect economic effects
- the economic cost of environmental impacts from the proposed modification
- changes in the timing of realisation of economic outcomes resulting from an accelerated rate of production.

8.11.2 Statistical Areas of Interest

A review of the ABS 2016 Census Data for the industry structure, the economic and employment metrics within regions surrounding Airly Mine (refer Section 4.1.2 of Agis (2019)) demonstrate the importance of the mining industry in the Lithgow City Council (LCC) and Mid-Western Regional Council (MRWC) LGAs when compared with NSW as a whole. The Lithgow Region Statistical Area Level 2 (SA2) (**Figure 31**) is particularly reliant on mining employment. This has further implications for the structure of the regional economies, in terms of supporting industries and businesses that also rely on the presence and scale of the mining industry.

Electricity gas, water and waste services are also comparatively over-represented in the region, particularly in Lithgow and the Lithgow Region SA2, compared with NSW. This emphasises the interdependencies between the regional mining and electricity generation industries.



Lithgow LGA SA2

Lithgow Region SA2

Lithgow-Mudgee SA3

Figure 31

Lithgow and Lithgow-Mudgee Statistical Areas

Employee households and mining companies in the region, including Airly Mine, that trade with local and regional businesses are both significant sources of economic activity and strength in both LCC and MWRC LGAs.

Approximately 93% of the existing Airly Mine workforce is resident in the LCC and MWRC LGAs, specifically within the three SA2s nearest to and including Airly Mine (Lithgow, Lithgow Region and Mudgee East). The data demonstrate that the workforce is regionally based. As a consequence, much of the social and economic activity of the Airly Mine existing workforce takes place in the local and regional areas, contributing to the socioeconomic functioning of these areas.

8.11.3 Regional Economic Development Strategies

Both LCC and MWRC have developed Regional Economic Development Strategies (REDS), which have been prepared in conjunction with the Centre for Economic and Regional Development within the NSW Government Department of Premier and Cabinet to ensure alignment with broader State and regional planning strategies and priorities.

8.11.3.1 Lithgow City Council Local Government Area

The LCC REDS recognises the importance of coal mining to the regional economy and that at some future point the region will need to transition to a post-mining economy. Coal mining is identified as the largest contributor to gross regional product (GRP). Consistent with the GRP data, the mining industry is the largest regional exporter, and considering relative scale, is also the largest importer. It is the second largest industry by employment and is recognised as a key endowment and economic driver for the economy more broadly.

Coal mining employment in LCC LGA generated 947 FTE jobs (ABS, 2016 Census Data) or 11.1% in the LGA, and second to public administration and safety at 12.2%. In the Lithgow SA2, mining employment makes up 31.2% of the workforce, and in the Lithgow-Mudgee SA3 mining comprises 14.4% compared to only 0.9% in NSW. As noted above, Lithgow SA2 is particularly reliant on mining employment.

Approximately 35% of the Airly Mine workforce resides in Lithgow LGA SA2.

8.11.3.2 Mid-Western Regional Council Local Government Area

The MWRC REDS describes a different emphasis on the coal mining industry in the LGA. The regional industry is in a growth stage, which contrasts with the assessed LCC LGA situation. Although MWRC has traditionally been a more agriculture-focused regional economy, the increasing importance of mining is evident in the report. Mining employment increased by 30% between 2011 and 2016, with the industry now being the largest sector by number employed.

Coal mining employment in MWRC LGA generated 1831 FTE jobs (ABS, 2016 Census Data) or 17.5% in the LGA, and was supported the highest employment by industry. In the Lithgow-Mudgee SA3 mining comprises 14.4% of the workforce compared to only 0.9% in NSW.

Approximately 50% of the Airly Mine workforce resides in MWRC LGA, mainly in Rylstone (~25%) and Kandos (~19%) areas.

8.11.4 Assessment Methodology

Agis (2019) has conducted two types of analyses in the EA, based on the DPE (2015b) and DPE (2018) guidelines:

- a Cost-Benefit Analyses (CBA) to evaluate the potential net benefits of the proposed modification at the NSW State level, or of public interest

- a Local-Effects Analyses (LEA) to assess the impact on the local region adopted for the Project, comprising:
 - effects relating to local employment
 - effects relating to non-labour project expenditure
 - environmental and social impacts on the local community.

For both the CBA and the LEA assessments, the base case (also referred to as Business as Usual, BAU) against which the environmental, social and economic impacts due to the proposed modification are assessed, is the currently approved Project.

Population-based estimates, where required, have been calculated based on the Lithgow – Mudgee Statistical Area Level 3 (SA3), as stipulated in DPE (2015b) as the nominal locality.

8.11.4.1 Cost Benefit Analyses

CBA is used to assess the public interest by estimating the net present value of a project to the NSW community. CBA estimates and compares, on a common basis, the total benefits and costs of a project on the NSW community.

The CBA estimations for the BAU and Modification 3 is based on independent coal pricing assumptions, being an average of the KPMG and World Bank prices included in Annexure 3 of Aigis (2019). For Modification 3, CBA data have also been estimated using Centennial Coal's internal coal pricing assumptions for comparison purposes.

The CBA in the EA is limited, as the proposed modification does not involve construction of new surface infrastructure which would may have increased environmental cost of the Project through for example visual, biodiversity and cultural heritage impacts, if applicable.

8.11.4.2 Local Effects Analyses

LEA complements the CBA by translating effects identified at the NSW level to the potential environmental impacts on both the natural and built environments, and the social and economic impacts in the locality.

For the LEA in the EA, the locality was defined as the LGAs of MWRC and Lithgow, and the ABS Statistical areas SA2 (Lithgow Region) and SA3 (Lithgow-Mudgee Region). For quantification purposes the SA 3 was used.

For discussions on employment effects, it has been assumed the 45 FTE personnel will be moving into the region from outside the region, whereas in reality the new employees will most likely be already resident in the region. In this regard, the calculations performed for the estimation of direct beneficiaries, the potential effects on housing demand, and demand on key services in the region presented in **Section 8.11.6** would be considered conservative. These 'worst case' calculations have been undertaken to investigate the potential impacts, in the unlikely event 100% in-migration occurs to the region to occupy the 45 FTE position and there is a resulting population increase in the region.

The LEA assessment differs from that undertaken for the Airly MEP EIS Economic Assessment (Aigis, 2014; 2015) in that a significant proportion of local effects analyses are presented as qualitative assessments, as quantitative assessments may not be applicable, as per the guidelines (DPE, 2015b).

8.11.4.3 New South Wales Royalties and Sensitivity Analyses

The majority of Airly Mine's product coal is sold to domestic power stations (Eraring, Vales Point) with the balance exported to overseas customers. The valuation of this scenario and related royalties is based on the thermal coal pricing assumptions and forecasts (Centennial internal assumptions and two independent independent forecasts by the World Bank and KPMG) and exchange rate assumptions presented in Annexure 3 of Aigis (2019).

It is noted that for the estimation of economic benefit, the coal pricing assumptions for the BAU case have been amended from those used in Aigis (2014; 2015) to allow valid comparisons of the CBA data for the proposed modification with the BAU scenario.

Royalties (and other CBA data) are presented as Present Values (PV) and Net Present Values (NPV) at an assumed discount rate of 7% as required by guidelines. Sensitivity analyses of royalty assessments were undertaken based on the NSW Treasury lower and upper bound discount rates of 4% and 10%, respectively.

8.11.5 Project Economic Analyses – Cost Benefit Analyses

The CBA component of the EA presents the State-level economic implications of Modification 3 and has been assessed quantitatively. The LEA (**Section 2.5**) addresses the qualitative environmental and economic impacts, along with key economic aspects of the proposed modification, the effects of which are likely to be concentrated in the LCC LGA and those parts of the MWRC LGA near to Airly Mine.

8.11.5.1 New South Wales Government Royalties

The estimated royalties for the BAU and the proposed modification at 7% discount rate, and the upper and lower bound discount rates of NPV are presented in **Table 42**.

Table 42 Estimated Royalties for Modification 3 Scenarios at Indicated Discount Rates

Assessment Scenario	Estimated Royalties at Discount Rate		
	7% (\$ million)	10% (\$ million)	4% (\$ million)
BAU ¹	106.9	91.9	127.2
Modification 3 ¹	137.6	122.3	156.3
Modification 3 ²	150.5	132.6	172.9

Note 1: Calculated using average of independent (World Bank, KPMG) coal pricing assumptions

Note 2: Calculated using Centennial internal coal price assumptions

8.11.5.2 Impacts of Additional Employment

The additional employment positions (45 FTE personnel) proposed in the modification are expected to result in economic benefit to new employees and their households. In calculating the labour surplus, which serves as an estimate of the additional disposable income that may be generated by the new positions, the following assumptions support the summary of employment effects:

- the increased production rate will decrease the term of employment from 16 years for the BAU (the current Project), case to 11 years for the Project as modified.
- the assumed average total income of Airly Mine employees as at October 2018.

Table 43 provides the estimated labour surplus for the BAU and Modification 3 scenarios at the 7% discount rate, and 4% and 10% discount rates.

The increase in employment is likely to have generally positive effects. However, despite the magnitude of the proposed FTE workforce increase at Airly Mine (≈30%), the overall economic effects are modest. From **Table 43**, the increase in labour surplus due to the increase in workforce by 45 FTE personnel will be approximately \$2 million at 7% discount rate. The increase in present value related to earlier realisation of employment-related economic benefit resulting from the shorter period of production is offset to some extent in practical terms by the longer-term employment required for the BAU case.

Table 43 Estimated Labour Surplus for Modification 3 Scenarios at Indicated Discount Rates

Assessment Scenario	Estimated Labour Surplus		
	7% (\$ million)	10% (\$ million)	4% (\$ million)
BAU (155 FTE personnel)	92.1	77.8	111.5
Modification 3 (200 FTE personnel)	94.1	82.7	108.5

It is noted the additional employment is likely to have more significant effect in the local and regional economies, as discussed further below (**Section 8.11.6.2**).

8.11.5.3 Summary of Economic Benefit and Sensitivity Analyses

Table 44 summarises the economic benefit associated with the proposed modification. The economic benefits show the Project as modified (after Modification 3) shows a higher NPV, by approximately \$33 million than the Project as approved (BAU scenario). This difference is largely due to the shorter mine schedule assessed in the 3 Mtpa production rate than the longer 1.8 Mtpa production schedule in the BAU case.

Table 44 Estimate of Economic Benefit for Modification 3

Economic Benefit	Estimate of Economic Benefit at 7% Discount Rate		
	Project as Approved (\$ million)	Project after Modification 3 (\$ million)	Difference (\$ million)
NSW Government royalties (Assumed royalty rate: 7.2%)	106.9	137.6	+30.7
Labour surplus – direct 45 FTE positions ¹	92.1	94.1	+2
Other Federal, State and Local government taxes, rates etc. ²	Not quantitatively estimated	Not quantitatively estimated	Not quantitatively estimated
Total Economic Benefit Present Value	199.0	231.7	+32.7

Note1: Refer to Annexure 2 in Aigis (2019)

Note 2: Refer to Annexure 1 in Aigis (2019)

A sensitivity analyses undertaken for the BAU and Modification 3 assessment scenarios (not shown in **Table 44**), based on the total economic benefit at the lower 4% and the upper 10% discount rates provides approximately \$35 million increase in the NPV of the Project as modified scenario at 4% discount rate and an increase of \$26 million at the 10% discount rate.

8.11.5.4 Estimation of Quantified Economic Cost

Section 2 of Aigis (2019) describes the valuation bases and the methodology for quantifying the cost of the environmental impacts associated with the proposed modification. The assessments of the economic costs of the environmental impacts associated with the modification have been undertaken (refer Section 3.2.2 of Aigis (2019)). The economic costs (with discount rate-based sensitivity parameters for the BAU and Modification 3 scenarios) are included in **Table 45 (Section 8.11.5.5)**.

The economic cost estimates show that the Project as modified (i.e. after Modification 3 is approved) has a lesser lower economic cost associated with it than the Project as approved or the BAU scenario by approximately \$2 million at 7% discount rate (refer Table 8 of Aigis (2019)).

8.11.5.5 Summary of Cost Benefit Analyses Estimation

Table 45 provides a summary of the CBA estimation outputs and NPVs for the three scenarios assessed, including the Modification 3 scenario based on Centennial internal pricing assumptions.

The additional quantified economic benefit of the proposed modification when compared with the approved BAU case is \$34.5 million.

Table 45 Estimate of Economic Benefit for Modification 3

Assessment Scenario	Estimate at Discount Rate		
	7% (\$ million)	10% (\$ million)	4% (\$ million)
BAU ¹			
Total economic benefit	199.0	169.7	238.7
Quantified economic cost	24.2	20.3	29.6
Net economic benefit	174.9	149.4	209.1
Modification 3 ¹			
Total economic benefit	231.7	205.0	264.8
Quantified economic cost	22.3	19.5	25.9
Net economic benefit	209.4	185.5	238.9
Modification 3 ²			
Total economic benefit	244.6	215.3	284.4
Quantified economic cost	22.3	19.5	25.9
Net economic benefit	222.3	195.8	255.5
Increase in NPV (Modification 3 versus BAU)	34.5	36.1	29.8

Note 1: Calculated using average of independent (World Bank, KPMG) coal pricing assumptions

Note 2: Calculated using Centennial internal coal price assumptions

8.11.6 Economic Effects Analyses – Local Effects Analyses

The LEA component presented in this section considers the potentially more apparent economic effects of the proposed modification, from the local and regional perspectives. This involves consideration of the environmental effects which were assessed quantitatively in **Section 8.11.5.2**, placing these in the qualitative, local and regional context. Similarly, relevant elements of economic benefit that accrue to the local and regional communities are discussed, some of which, particularly the ‘labour surplus’ estimated in **Section 8.11.5.2**, are also likely to be of greatest effect in the context of the region, where the additional workforce is likely to be based.

8.11.6.1 Effects on Local and Regional Supply Chain and Contractor Businesses

The proposed modification will have effects on the local and regional supply chain and contractor businesses. The most significant changes in impacts on businesses in the local and regional economies

which trade with Airly Mine are timing-related. The shorter duration of the production period is likely to result in more business activity taking place sooner, which generally would be regarded positively by business operators. An indicative Airly Mine's regional commercial activity and in all of NSW is provided in Table 17 of Aigis (2019). The proposed modification will likely increase the commercial activity further, both on the regional and State levels.

8.11.6.2 Employment Effects

93.3% of the Airly Mine workforce resides within the three SA2s nearest to and including the mine (Lithgow, Lithgow Region and Mudgee East). The data demonstrate that the mining workforce is regionally based. As a consequence, much of the social and economic activity of the workforce takes place in the local and regional areas, further contributing to the socioeconomic functioning of these areas.

The retention of mining employee incomes in the region is economically significant, particularly through comparing mining employee incomes. Mine employee incomes are significantly higher than the median employee incomes in other employment categories in both LCC and MRWC LGAs (refer Table 16 in Aigis (2019)). Based on this, the residual contribution to the economy due to the proposed 45 personnel would be greater than in most other forms of employment in the regions.

The additional labour requirement represents between 1% and 1.3% of the existing regional mining workforce (refer Table 21 and 22 in Aigis (2019)). Unemployment rates for LCC and MRWC LGAs of 7.2% and 5.4% respectively, suggest that there may be some unused or under-utilised capacity in the regional labour force, which can supply the additional workforce. On this basis, the proposed 45 FTE positions can be absorbed into the region without causing any material disruption or distortion to local or regional labour markets.

Quantification of the impacts of the additional employment for the CBA estimation (refer **Section 8.11.5.2**), showed the Project as modified will provide \$94 million over the life of Airly Mine, and is approximately \$2 million more than for the BAU case. Expenditure of this additional disposable income will support business activity and employment across a wide spectrum of local and regional businesses.

8.11.6.3 Potential Effects on Beneficiaries Residing in Employee Households

A further qualitative assessment of the Airly Mine employment effects on the direct beneficiaries residing in employee households, using current average household size data based on two estimates of average household size for the SA3, identified that the proposed 45 FTE personnel will support additional 108 to 139 residents, increasing from the current 372 to 481 direct beneficiaries in employee households in the region.

8.11.6.4 Potential Effects on Housing Demand

Based on current direct and contractor employee residential origins (Aigis, 2018), Centennial Airly anticipates the additional employees will be approximately evenly distributed between residence in the LCC and MRWC LGAs. An analysis of the unoccupied private dwellings in both LGAs confirms there is sufficient capacity in the existing housing market to accommodate the new personnel, should all personnel be drawn from outside the region.

The additional 45 FTE personnel, if they originate from outside the region will not place undue pressure on the current rental market in the region or inflate property prices in the region.

8.11.6.5 Demand on Key Services

As identified above, the additional 45 FTE personnel proposed could potentially result in a population increase of the order of 108 to 139 residents (assuming 100% in-migration) and may create additional demand for services such as predominantly public-funded health and education. An assessment of the impact of the proportional population increase (refer Section 4.4 of Aigis (2019)) confirmed the

proportional increases in population was not material in the context of regional capacity to manage associated additional demand on publicly and privately provided services.

8.11.6.6 Community Contribution Effects

Airly Mine provides regular direct support to a number of community-based organisations and events in the region. Based on the most recent financial data from Airly Mine, at least eight organisations in the Capertee, Kandos and Rylstone areas benefited from financial support from Airly Mine.

In addition, the existing Airly Mine employees also make community contributions, particularly through activities such as volunteering in a diverse range of community activities. Based on recent workforce research at Springvale Mine, where 161 respondents (approximately 62% of total respondents) reported a total of 288 voluntary involvements in community activities, it is expected out of the new 45 FTE employees 28 employees may engage in approximately 50 community-based activities.

Employees at Centennial Coal are able to undertake, without incurring any penalty, voluntary duties with organisations such as the Rural Fire Service, State Emergency Service and NSW Fire and Rescue. The new 45 personnel may elect to engage in these activities at relevant times.

The proposed increase in workforce will further enhance Airly Mine's existing contributions to the enrichment of the local and regional communities.

8.11.7 Cumulative Assessment

There is a potential for a combined increase in workforce of 145 FTE personnel in Centennial Coal western operations when the Modification 3 increase of 45 FTE is combined with the recently approved Clarence Colliery Modification 5, which will increase the workforce at the mine by 100 FTE personnel.

Aigis (2019) estimates the total increase of 145 FTE personnel as a proportion of the existing labour force will be in the range 2.8% to 4%. Taking into consideration the labour market characteristics, Aigis (2019) conclude the cumulative effects of the total increase of 145 FTE in the region:

- would not result in undue disruption to, or distortion of, regional labour markets
- the economic effects are likely to be positive due to additional disposable income becoming available for expenditure in the local and regional economies

The Clarence Colliery workforce will likely all reside in the LCC LGA. An analysis of the housing demands from Clarence Colliery Modification 5 and Airly Modification 3 confirmed there is sufficient capacity within regional housing markets to absorb demand associated with the additional workforce at the two mines.

8.11.8 Economic Effect of Environmental Impacts

8.11.8.1 Potential Local Environmental Effects

Section 8.11.5.5 quantified the potential changes in the timing and intensity of environmental effects of from Airly Mine operations as proposed to be modified. While increased GHG emissions may notionally have broader impacts (e.g. climate change), a number of potential impacts will be localised (noise, air quality, traffic, water resources). These potential local environmental impacts from the Project as modified will all continue to all meet the relevant criteria, and it is unlikely that any quantifiable, material change in effects is likely to be experienced by the identified sensitive receptors or any visitors to the area. The quantified economic cost of environmental impacts, discussed in **Section 8.11.5.5**, for the Project as modified, is lesser than the economic cost associated the Project as approved or the BAU scenario by approximately \$2M at 7% discount rate.

8.11.8.2 Community Perceptions of Effects

Notwithstanding the outcomes of the technical assessments and the ongoing implementation of management controls (**Sections 8.2 – 8.10; 8.12 – 8.14**), the local community, and in particular the identified sensitive receptor properties, may perceive a greater potential for effects resulting from the modification especially relating to impacts which could potentially result at the locality level. This is discussed further in the *Social Impact Assessment* (Centennial Coal, 2019b) for the modification and **Section 8.12**.

8.11.9 Consequence of Potential Impacts

Given the assessed outcome discussed above the consequence of potential economic impact due to the proposed modification will be a positive economic benefit for the State, and local and regional areas assessed and discussed above.

8.11.10 Mitigation and Management

No specific mitigation measures or management controls are required to be implemented due to the proposed modification based on the economic assessment.

Centennial Airly will develop a Mine Closure Plan for the Project approximately 5 years prior to the closure, and will be prepared in consultation with all stakeholders, including the local community. The Mine Closure Plan will include consideration of mitigation of potential adverse socioeconomic effects due to the reduction in employment at Project closure.

8.11.11 Conclusion

The cost-benefit analyses undertaken in Aigis (2019) shows it is likely that, on balance, the proposed modification will result in positive economic benefit for the State, and local and regional areas in which Airly Mine is located. The Project as modified will provide an additional economic benefit of \$34.5 million, compared to the Project as currently approved due to the earlier realization of benefits. The economic cost of the Project as modified will be lesser by approximately \$2 million and will be sustained for a shorter period. Similarly, benefit to locally and regionally based businesses trading with the mine are likely to experience higher levels of business activity, however over a shorter period.

The labour surplus due to the proposed increase in the workforce by 45 FTE personnel will be \$2 million. The new workforce will be drawn from the region and will likely be resident in the LCC and MWRC LGAs. In the unlikely event that there will be 100% in-migration, the existing housing and key services in the region will accommodate the modest increase of 45 personnel.

The increase in workforce will result in positive economic benefits in the region relating to the additional workforce's household consumption and investment activities in the LCC and MWRC LGAs and surrounds. There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region.

8.12 Social

8.12.1 Introduction

The Social Impact Assessment (SIA) *Airly Mine Modification 3: Social Impact Assessment* (Centennial Coal, 2019b) entitled was prepared by James Marshall (Group Manager Stakeholder Engagement) of Centennial Coal Company Limited and is included in **Appendix M**. The SIA has been prepared in

accordance with the *Social Impact Assessment Guideline for State significant mining, petroleum production and extractive industry development*.

Given there will be no change in the surface operations to increase the production rate, the modification elements that have the potential to impact on the social fabric surrounding Airly Mine are:

- increase in production rate with the resulting increase in baseflow reductions in alluviums overlying the mining areas and reduced stream flows in downstream watercourses
- increase in workforce with the consequences on traffic flows and road noise at sensitive receptors in the vicinity of Airly Mine pit top
- increase in rail movements with the potential consequence on rail noise at sensitive receptors
- vibration impacts due to the proposal to undertake underground blasting when required.

Extensive consultation with the local community was undertaken during the development of the SIA.

8.12.2 Existing Environment

8.12.2.1 Area of Influence

The SIA defines the area of social influence as the combined LCC LGA SA2, Lithgow Region SA2 in the MWRC LGA and Lithgow-Mudgee Region (corresponding to SA3), given:

- Airly Mine is located in Lithgow LGA
- Airly Mine workforce live in Lithgow LGA / Lithgow Region with the remainder living in MWRC LGA, mainly in Rylstone and Kandos
- local community with the potential to be impacted by Airly Mine operations live in the nearby village of Capertee
- downstream communities such as Glen Davis who have raised concerns on an ongoing basis on the potential environmental impacts from the mine's operations
- traditional owners.

The Lithgow LGA, the Lithgow Region SA2 and the Lithgow-Mudgee SA3 boundaries are shown in **Figure 31**.

The population of the Lithgow LGA, according to the 2016 ABS Census, on Census night was 21,090. It is noted Lithgow LGA incorporates the Lithgow Region SA2 and the Lithgow SA2. The latter is largely concentrated around the township of Lithgow and its immediate surrounds. The Lithgow Region SA2 comprises approximately 39% of the LCC LGA population and includes the area extending to the boundary with the MWRC LGA.

8.12.2.2 Employees

Approximately 93% of the Airly Mine workforce resides within the three SA2s nearest to and including the mine (Lithgow, Lithgow Region and Mudgee East). Approximately 50% of the workforce lives in Rylstone and Kandos areas. Majority of these employees were relocated from Charbon Colliery when that mine entered the rehabilitation phase in 2015.

8.12.2.3 Community Consultation

Community consultation at Airly Mine occurs predominantly via the Community Consultative Committee (CCC) meetings. The CCC membership includes representatives from Lithgow City Council and National Parks and Wildlife Service. The CCC is an advisory committee, however the meetings provide a process for a two-way engagement with the members on the operations of the mine, including environmental management, dissemination of technical and monitoring information, and engagement on planning

approvals being sought by the mine. The meetings provide an avenue for identifying any issues or concerns stakeholders may have, and which are generally resolved through further discussions at the CCC meetings (or technical sessions if required) and subsequent development of appropriate strategies to mitigate any concerns as required.

Consultation with the Aboriginal people, the traditional owners of the land, on the operation of the mine, site inspections and approvals occur via the six-monthly meetings with Centennial's Western Region Registered Aboriginal Parties undertaken in accordance with the *Aboriginal Cultural Heritage Management Plan* (Centennial Coal, 2017b).

The minutes of the CCC meetings are provided to the CCC members and made available on the Airly Mine website.

Ongoing Consultation

Consultation with the community has been ongoing for many years, since 1997 when Centennial Coal Company Limited (Centennial Coal) purchased Airly Mine from Novacoal Australia Pty Limited and trial mining commenced in December 1998. Since that time consultation has occurred during the development of the Airly MEP EIS, throughout the assessment and following the grant of SSD 5581.

Consultation with the Aboriginal RAPs occurs separately via the six-monthly meetings (**Section 6.4.2**).

From the consultation discussions at the CCC (refer Section 5 of the SIA), it is evident the local community have concerns on a number of issues, primarily water resources, that were first identified at the time the mine commenced consultations with them for the development of the Airly MEP EIS. Responses to these concerns were provided in the Response to Submissions for the Airly MEP.

Issues on water resources were again raised during consultation for Airly Modification 2 (Centennial Coal, 2017a). The SEE for Modification 2 provided responses to issues that were raised during CCC meetings, albeit that some issues raised at the time were not relevant to the modification.

The SIA provides detailed summaries of the ongoing community concerns with the existing operations as well as concerns on the potential impacts of the proposed Modification 3 elements. These concerns relate to the following aspects.

- Surface and groundwater impacts raised as a key area of concern from surrounding landholders, especially in the Glen Davis and Glen Alice, Bogee areas, due to scarcity of water in these areas.
- Impact of subsidence on surface features on the area, for example cliff lines and items of cultural heritage value.
- Loss of rural amenity due to noise, deposited dust, visual impacts, lights and traffic.
- Adverse impact on tourism in the area.
- Adverse impact on flora and fauna.
- Loss of property values.
- The potential for irreversible damage to the environment if the mine does not perform as it is intended (i.e. polluted water discharge into Airly Creek, damage to surface features such as cliffs due to subsidence, loss of groundwater).
- The lack of benefit for the broader community as the Project will not employ local people and will therefore not generate local spending, participation in social / community activities, contribute to the school population etc.
- The unnecessary risk to the environment due to the perceived lack of financial viability of the Project.
- The area's high conservation value and the community with an interest in the Project are not limited to landholders.

Consultation for Modification 3

Consultation in relation to Airly MOD 3 commenced via the Airly CCC in early 2018. Discussions on Modification 3 were included in six CCC meetings, noted in **Section 7.4.1**.

Technical sessions on the proposed modification were also held. These technical sessions also provided opportunities to discuss the community's ongoing concerns on water resources and subsidence impacts, and a vehicle for presentation of environmental monitoring undertaken and monitoring data. The technical sessions held are described in **Section 7.4.1**.

Responses to these concerns have been addressed and are included in this Modification Report (refer **Section 7.4.1**).

8.12.2.4 Social Baseline

A description of the existing population profile, employment, housing health, education and other services is provided in the SIA and the Economic Assessment (Aigis (2019)) for the modification. The Project is primarily located in the LCC LGA, which has a significant population and established social services and infrastructure in the region. Given approximately 50% of the Airly workforce live in the MWRC LGA, the social services and the infrastructure in that LGA are also utilised.

The Airly Mine, and other Centennial Coal existing operations in the region, and the associated employment, expenditure, sponsorship mine performance, community and land use characteristics form part of the social baseline for the local and wider region. Given that Centennial Airly Mine has undertaken activities in this area since 1998, there is a good understanding of the social characteristics of the area.

Community consultation for the modification, and the ongoing discussions on the operations of the mine with the community via the CCC are also considered the social baseline for the Project. A number of issues raised by the community on an ongoing basis (**Section 8.12.2.3**) are relevant to the proposed modification.

8.12.3 Impact Assessment

The SIA and the EA for the modification have assessed potential socioeconomic impacts and opportunities of the Project as modified for local and regional communities. The economic benefits and the environmental cost of the Project as modified have been discussed in detail in **Section 8.11.5**. The potential cumulative impact of the proposed increase on workforce has been assessed in **Section 8.11.7**.

8.12.3.1 Surroundings

The impact of the Project on the surroundings was assessed in the Airly MEP EIS and approved in SSD 5581. Modification 3 is not proposing any new infrastructure and there will be no impact on the visual amenity, the cultural heritage and biodiversity values of the area.

No changes to the mine design philosophy, the mining footprint of any changes to the five mining zones are proposed. The production rate and hence the mining intensity will increase and subsidence will develop more quickly than in the 1.8 Mtpa scenario. However, subsidence will not increase and the mine will continue to be compliant with subsidence performance measures for natural, heritage and built features included in Conditions 2 and 3 under Schedule 3 of SSD 5581.

Groundwater impacts due to the increased production rate have in fact been assessed to be lesser than previously assessed and approved in SSD 5581. No changes are proposed in the existing water management at the pit top. The noise, vibration and air quality impacts of the Project as modified will meet all the relevant criteria and therefore amenity of the surrounding areas will not be impacted. The assessment outcomes show that, with the exception of greenhouse gas emissions, no further impact than that already assessed and approved will occur. On that basis, the modification results in no potential further changes to the amenity of the area.

Greenhouse gas emissions, which will have an impact on a broader scale, will increase only marginally (0.01%) when compared against the of total Australian GHG production, and will have undetectable effect on global climate change.

Impacts from subsidence on the surrounding geodiversity, aesthetic values of the area, impacts to tourism and the general way of life (also of great concern to community) will not ensue. The proposed modification will not have further subsidence impacts than currently approved as there is no proposal to change the mine design philosophy discussed above.

It is recognised, however that the community hold the environment in very high regard and regardless of the limited impact of the proposed modification on the surroundings, the community are concerned about the environmental risk arising from Airly Mine operations. Community concerns on surface and groundwater resources are particularly high given that if there is an adverse impact it is the 'downstream community who have the most to lose' given they rely on groundwater for activities which include productive farms and lifestyle pursuits.

8.12.3.2 Personal and Property Rights

No direct impacts on privately owned property have resulted in the operation of Airly Mine to date. Since the grant of SSD 5581, there have been no exceedances in noise and air quality criteria and thus the amenity of the area has not been impacted by the mine's operations. The air quality and noise impact assessments for Modification 3 have concluded the Project as modified will meet the relevant criteria in SSD 5581 at all identified sensitive receptors. As such, no further impacts on privately owned property is likely to occur.

There are no restrictions on access to the Mugii Murum-ban SCA currently. The mine design philosophy approved in SSD 5581 is conservative, and the Modification 3 is not proposing to alter this. Subsidence impacts to the overlying geodiversity within the Mugii Murum-ban SCA will not change as a result of Modification 3. The mine will continue to meet the performance measures for natural, cultural heritage and built features included in SSD 5581. As a result, there will be no changes to land use characteristics within the Project Application Area.

In summary, there are no requirements to acquire property to mitigate against amenity impacts because:

- the Project's impacts, as modified, will remain largely within the impacts already approved SSD 5581
- there are no changes to land use
- there are no access restrictions (brought about by mining) to land within the Mugii Murum-ban SCA, and this will not change due to the proposed modification.

8.12.3.3 Culture

The potential for impacts on Aboriginal cultural values, community identity, (which is tied to sense of place), and appreciation of environmental qualities from the Project was assessed in the relevant Airly MEP EIS technical assessments. The impacts of Modification 3 on the cultural values of the area has been again considered in the SIA. No items of cultural significance (Aboriginal and European heritage) will be impacted by the proposed modification given no surface disturbance will be required. There will be no impacts to freehold access to groups who have cultural heritage connection to the land.

8.12.3.4 Community

Population and Housing

Changes to population and housing as reflected in the 2011 and 2016 ABS Census periods relate to boundary changes of the statistical areas rather than changes to the population characteristics of the Capertee and Glen Davis / Glen Alice community structure.

Kandos on the other hand has experienced a change in community. Kandos has experienced increases in the demographic indicators of an ageing population. Kandos experienced a decline in coal mining employment of 62.5% over this period (48 employees in 2011, 18 in 2016). Other structural change indicators comprised:

- a concurrent increase in the proportion of unskilled workers (labourers)
- a decrease in the proportion of persons with tertiary qualifications (down from 12.1% to 4.5%)
- an increase in the proportion of lower-income households.

Based on historical trends, the EA has assumed that 50% of the new 45 FTE personnel is likely to be already resident in the Kandos and Rylstone areas and Mudgee LGA. The EA (**Section 8.11.8**) however assumed the worst-case scenario and assessed the migration of the 45 FTE personnel into the region in the proposed modification will occur. The economic effects analyses assessment confirmed that even with the 100% in-migration the existing housing in the region will accommodate the modest increase of the 45 new personnel.

Community Identity and Sense of Place

There is a strong sense of identity and sense of place within the area amongst the community, which has been evident since consultation commenced for the Airly MEP EIS. Regardless of the limited impact of Airly Mine, the community holds the area in very high regard and undertakes steps to protect and conserve the environment. This is evident via local community-based activities, involvement on organisation such as the Capertee Valley Landcare, local tourism etc.

Issues raised during Airly MEP EIS consultation in 2014 remain relevant to the community (refer **Section 8.12.2.3**). This is discussed in detail in the SIA prepared for Modification 3. The SIA notes that, despite the Project's minor environmental impact footprint, the Project has resulted in a high degree of angst across the community, which is evident from the consultation undertaken for the proposed modification.

The SIA concludes the key social impact arising from the Project is related to the high regard the surrounding community have for the environment. The presence of the Project, regardless of its actual minor environmental impact footprint, represents a loss of the connection to the environment which the community hold in high regard.

The continued fear of the Project by the community is regardless of the technical assessment outcomes presented at technical sessions and at CCC meetings for Modification 3. The outcomes of the majority of the technical assessments demonstrate, other than the greenhouse gas emissions, the Project as modified will result in lesser environmental impacts (groundwater, surface water) or will meet the relevant criteria in the current consent (noise, air quality). Mine design philosophy or approved subsidence impacts will not change.

The economic assessment (**Section 8.12**) demonstrates the Project as modified will result in positive economic benefits to the community and the region. The increase in workforce will result in economic benefits relating to the additional workforce's household consumption and investment activities in the LCC and MWRC LGAs and surrounds.

8.12.3.5 Access to Services and Infrastructure

It is likely the proposed 45 FTE personnel will already be resident in the region, and that based on historical trends 50% of the personnel will be drawn from the LCC and MWRC LGAs as there is an existing mining workforce in both these LGAs. This occurred at the time Charbon Colliery ceased mining and the majority of the existing Airly Mine workforce were transferred from Charbon Colliery.

The EA has assessed the worst-case scenario of 100% in-migration of the 45 personnel from outside of the region. The economic assessment (**Section 8.11.6**) showed the proportional increases in population will be minor in the context of regional capacity, and existing services and infrastructure in the region will be able to manage associated additional demand on publicly and privately provided services.

8.12.3.6 Health and Wellbeing

Modification 3 will not result in adverse material impacts to health and wellbeing of the local community as evidenced by the outcomes presented in the technical assessments, specifically the air quality and noise assessments, which show that the Project as modified will continue to meet the consent criteria for noise and air quality.

The economic assessment demonstrated the increased employment at Airly Mine would contribute to individual and household well-being for the new employees and their families and contribute positively to economic development.

8.12.3.7 Decision-making Systems

Airly Mine regularly holds CCC meetings and provides operational information on the mine and engages with the community on the environmental aspects of the Project, including provision of environmental monitoring results and data. The monitoring information are provided to the community on request, and are also available from the Airly Mine's website, and in *Annual Review* reports (**Section 4.14.2**). The practice of involving the community in the mine's operations and ongoing review of environmental monitoring data will continue. As noted in **Section 8.12.2.3**, Airly Mine engages with the community via the CCC meetings. Concerns raised are generally resolved through further discussions (or technical sessions if required) and subsequent development of appropriate strategies to mitigate any concerns as required.

Airly Mine has recently consulted with the Capertee Valley community to identify and establish additional downstream groundwater monitoring, notwithstanding the existing groundwater monitoring is undertaken in accordance with the approved *Water Management Plan* (Centennial Coal, 2018c). This consultation is in response to the community's ongoing concerns that mining at Airly Mine has the potential to impact on the regional Devonian aquifer that supplies majority of the bores, despite the groundwater assessments for Airly MEP EIS (GHD, 2014a), Airly Modification 2 (GHD, 2019b) and Modification 3 (GHD, 2019c) (refer **Section 8.2.2.3**) demonstrating negligible, if any, hydraulic connectivity between the overlying local aquifers with the potential to be impacted by mining activities and the regional Devonian aquifer. The community requested, and Airly Mine agreed, the review of the existing groundwater monitoring by an independent hydrogeologist at the mine's cost. The review has been undertaken, and Airly Mine has agreed at the meeting held on 15 October 2019 to the additional monitoring (and the cost) at select registered groundwater bores, the results from which will be independently reviewed and reported to the Airly CCC and Capertee community.

8.12.3.8 Fears and Aspirations

As noted above, despite the Project's minimal to negligible environmental impacts, and the availability of monitoring data from a number of years and technical assessments prepared by specialists with many years' experience in the preparation of technical reports, the community still has concerns about the Project. The technical assessments discussed in **Section 8.2** to **Section 8.10** demonstrate that, other than the greenhouse gas emissions, the assessed environmental impacts of the Project as modified will continue to fall within the relevant criteria or meet the SSD 5581 consent conditions, and provides addition socioeconomic benefits.

Notwithstanding, it is likely the community's issues on the Project's existence in the area would continue. However, it is noted that the outcome of the Airly CCC meeting held on 15 October 2019 demonstrated a positive result for all stakeholders. The limited scope of the modification 3 is not the issue but rather there is an ongoing fear of the environmental impact (in particular water) from Airly Mine's operations, although the mine is compliant with its consent conditions.

Ongoing consultation, the ongoing provision of monitoring data and any relevant information to the community via number of avenues encapsulated in a *Social Impact Management Plan* may be resolve the ongoing community issues in the future.

8.12.4 Mitigation and Management

In order to mitigate and manage the community's ongoing concerns on Airly Mine's operations and the environmental impact footprint the following will be implemented.

- A *Social Impact Management Plan* will be developed to address the ongoing concerns of the local community discussed above.
- The frequency of CCC meetings will be increased to a minimum of four meetings in a year, and in addition to general business discussions on the mines operations, will also include discussions on the environmental monitoring results, as agreed with the members.
- An annual summary report on Airly Mine's on the water monitoring data will be provided to the local community in the form of a newsletter.
- The site's existing groundwater quality monitoring efforts will be supplemented by the monitoring of two additional landowner groundwater bores, subject to access agreements and adequate existing pumping facilities available at the bores. The *Airly Mine Water Management Plan* will be updated to reflect the additional monitoring.

8.12.5 Conclusion

The SIA assessed the social impacts of the proposed modification based on the assessment outcomes included in the supporting technical assessments, which demonstrate negligible impacts on water resources, noise, air quality and traffic. As a result, impacts to the amenity of the surroundings, personal and property rights, cultural heritage, community identity and sense are unlikely.

The Economic Assessment (**Section 8.11**) demonstrates that the Project as modified on balance will result in positive economic benefit for the State, and local and regional areas in which Airly Mine is located. The labour surplus of approximately \$2 million due to the proposed increase in the workforce by 45 FTE personnel will have direct positive economic benefits in the LCC and MWRC LGAs and surrounds through the additional workforce's household consumption and investment activities.

There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region.

Notwithstanding the positive socioeconomic benefits of the proposed modification and the assessed minimal environmental impact footprint, Airly Modification 3 has resulted in a high degree of angst across the community, as evident from the consultation feedback from the community. The issues raised have been ongoing since the inception of the Project and will likely to continue in the future. Additional engagement with the local community on the environmental performance of Airly Mine will be undertaken on an ongoing basis. A *Social Impact Management Plan* will be prepared to manage the future engagement with the community with the objective of addressing the ongoing matters of concern to them.

8.13 Hazard and Risk

8.13.1 Introduction

This section assesses the change in the management of hazardous materials at the Airly pit top site and the underground blasting proposed in the modification.

8.13.2 Hazardous Materials Management

Potentially hazardous materials required for operations include hydrocarbons (diesel, petrol, oils, greases, degreaser and kerosene). The risks posed by the usage of these materials include their transport, handling, storage and consumption.

Airly Mine uses the electronic database Chemwatch to source and review safety data sheets (SDS) for all hazardous materials used in operations to manage risks associated with their handling, consumption and storage. The SDSs contain information on the identity of the product and any hazardous ingredients, potential health effects, toxicological properties, physical hazards, safe use, handling and storage, emergency procedures, and disposal requirements specific to the chemical.

The management of hazardous chemicals is managed to meet the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and the Airly Mine Safety Management System. The management plan assigns roles, responsibilities and management structure of personnel involved in the safe management of hazardous materials used in the Project.

Modification 3 is seeking approval to undertake blasting activities in the event geological structures which require removal. Explosives required for the blasting will not be stored on site but will be brought to the site on the day it will be used. The existing *Hazardous Materials Management Plan* will be updated to include explosives and detonators prior to any blasting or shot-firing being undertaken.

8.13.3 Explosives Handling and Underground Blasting

A storage magazine will be established on the surface for the temporary storage, issue and return of explosives and detonators prior to transfer to the underground. This temporary storage of explosives will only be applicable for the period during which shot-firing is required. The explosives will be kept in the purpose-built containers for transport and storage and will be kept locked at all times except when the containers are required to transport explosives or detonators to or from the surface. The area will be kept fenced off, clean and maintained by the appointed handler or a shot-firer. Documentation of movement into and out of the area of explosives and detonators will also be kept. Any unused explosives and detonators will be removed from the site and will not be stored at the site permanently.

Explosives and detonators will be handled by suitably qualified personnel from within Centennial Coal operations, or a suitably qualified contractor will be engaged to undertake the tasks. Handling of explosives and detonators and shot-firing will be managed in accordance with an *Explosives Control Plan*.

A *Blast Management Plan* will be prepared prior to any blasting activity and will include blast monitoring and evaluation and blast notification procedures for all stakeholders. A notification of blasting activities will be posted on Centennial Airly website prior to the activity being undertaken.

A Preliminary Hazardous Analyses in accordance with clause 12 of SEPP 33 – Hazardous and Offensive Development was not prepared for the explosives and detonators given that these materials will only be temporarily stored on site at distances >500 m to the site boundary, the same as all other hazardous materials used at the pit top.

A High-Risk Activity notification, under the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*, along with the relevant documentation will be provided to the Division of Resources and Geosciences seven days prior to the activity.

8.13.4 Conclusion

The existing risk profile of the management of the hazardous materials at Airly Mine will not be altered significantly with the introduction of underground blasting activities given:

- the proposed temporary storage of explosives and detonators at the site in a location that will be >500 m from the site boundary

- the handling of explosives and detonators and shot-firing will be undertaken in accordance with the *Explosive Control Plan*
- the blasting will be undertaken in accordance with a *Blast Management Plan* blast monitoring and evaluation and blast notification procedures for all stakeholders.

8.14 Other Environmental Aspects

An assessment of other environmental aspects, with no potential for significant impact, but relevant to the modification elements are provided in **Table 46**.

Table 46 Other Environmental Aspects

Environmental Aspect	Assessment
Biodiversity	<p>Airly Mine undertakes flora and fauna monitoring in spring and summer in accordance with the <i>Airly Mine Biodiversity Management Plan</i> (Centennial Coal, 2018h). To date, no mining related change to the ecology has been detected.</p> <p>Modification 3 will not result in any surface disturbance and no impacts on any threatened species, populations and ecological communities, and their habitats, listed under the BC Act or the EPBC Act will occur.</p> <p>There is no change proposed in the mine design philosophy and mining induced impacts on biodiversity will not occur due to the proposed modification. The proposed modification will not reduce the existing ecological values of the area. Regardless, a BDAR Waiver Request – Table 1 has been prepared and included in Appendix N.</p> <p>The spring / summer flora and fauna monitoring will continue in accordance with the <i>Airly Mine Biodiversity Management Plan</i>.</p>
Aboriginal heritage	<p>Aboriginal sites exist within the Project Application Area boundary and are listed in the <i>Western Region Aboriginal Cultural Heritage Management Plan</i> (Centennial Coal, 2017b) and monitored in accordance with this plan. To date, five Aboriginal sites have been undermined between December 2010 and May 2017. No impacts to these sites have been detected.</p> <p>Modification 3 will not result in any surface disturbance and there will be no potential for any direct impacts on Aboriginal sites. The proposed modification will not impact on the existing cultural heritage values of the area.</p> <p>Items of Aboriginal heritage will continue to be monitored and managed in accordance with the protocols identified in the <i>Western Region Aboriginal Cultural Heritage Management Plan</i>.</p>
Historic heritage	<p>There are items of historic significance located within the Project Application Area boundary. These items are listed in the <i>Western Region Historic Heritage Management Plan</i> (Centennial Coal, 2018f). Given no surface disturbance proposed, there will be no potential for direct impacts to any historic site.</p> <p>There is no change proposed in the mine design philosophy and mining induced impacts on items of historic heritage will not occur due to the proposed modification. The proposed modification will not impact on the cultural heritage values of the area.</p> <p>Items of historic heritage will continue to be managed in accordance with the monitoring programs included in the <i>Western Region Historic Heritage Management Plan</i>.</p>
Visual amenity	<p>Modification 3 is not proposing surface disturbance, installation of any new infrastructure or upgrade of any existing infrastructure not approved in SSD 5581. No impacts on visual amenity will occur due to the proposed modification. The site's existing minimal visual impact from the pit top due to the surrounding landforms will remain unchanged (Section 4.3.7).</p> <p>There is no proposal to change the mine design philosophy or increase subsidence levels in the mining zones approved in SSD 5581. As a result, there will be no change to subsidence impacts and the aesthetic values of the area will not change.</p>
Waste	<p>The modification will generate additional volumes of waste given the increase in production rate and increase in workforce. The waste generated in the operations will continue to be disposed of, or recycled, in accordance with the current practice at the site and in accordance with the site's waste management strategy.</p>

9.0 SUMMARY OF MITIGATION MEASURES

Centennial Airly is committed to the identification, mitigation and management of potential risks from the continued operations at the mine. Key environmental management plans are already well developed and in place to manage and monitor the performance of all activities currently undertaken.

New mitigation measures and management controls proposed to be implemented in Modification 3 are provided in **Table 47**.

Table 47 Mitigation Measures

Issue	Mitigation Measure
Effluent management	The ECOMAX sewage waste management system will be upgraded or replaced, after a review in an options assessment, when the workforce exceeds 150 FTE personnel.
Hazards Management	The existing <i>Hazardous Materials Management Plan</i> will be updated to include explosives and detonators prior to any underground blasting (shot-firing) being undertaken.
Underground blasting	An <i>Explosives Control Plan</i> will be prepared for the transport, handling of explosives and detonators required for underground blasting. A <i>Blast Management Plan</i> will be prepared prior to any blasting activity and will include blast monitoring and evaluation and blast notification for all stakeholders.
Engagement with local community	A <i>Social Impact Management Plan</i> will be developed to address the ongoing concerns of the local community. The frequency of CCC meetings will be increased to a minimum of four meetings in a year, and will include discussions of environmental monitoring results, as agreed with members. An annual summary report on Airly Mine's on the water monitoring data will be provided to the local community in the form of a newsletter.
Groundwater monitoring	The site's existing groundwater quality monitoring program will be supplemented by the monitoring of two additional landowner groundwater bores, subject to access agreements and adequate existing pumping facilities available at the bores. The <i>Airly Mine Water Management Plan</i> will be updated to reflect the additional monitoring.

10.0 EVALUATION OF MERITS

10.1 Introduction

This chapter provides a summary evaluation of merits for the proposed modification having regard to environmental, economic and social considerations. It summarises the potential adverse environmental impacts and the positive socioeconomic benefits. It considers the proposed modification against the principles of Ecologically Sustainable Development.

10.2 Substantially the Same Development

The proposed modification constitutes a minor change to an existing consent SSD 5581 for Airly Mine. The Project Application Area boundary will remain unchanged and there is no proposal for new infrastructure at the pit top. Hours of operations are not proposed to change from the approved 24 hours per day and seven days per week.

There is no proposal to change the conservative mine design being implemented. The increase in production rate will be achieved through increasing the number of days coal extraction will occur through utilisation of a second set of panel and pillar equipment underground and increased workforce. Average daily coal production will not change significantly. The subsidence profile will develop more quickly at the increased annualised production rate, however the mine will continue to meet the subsidence impact performance measures for natural and heritage features and built features provided in Conditions 2 and 3 under Schedule. The aesthetic and cultural values of the area will not change due to the proposed modification.

The environmental impacts, other than greenhouse gas emissions, are lesser than or equal to the approved impacts (groundwater, surface water), or minimal (road traffic and rail traffic) or will meet the consent conditions (noise and air quality). No impacts to visual amenity, cultural heritage and biodiversity values will occur. There will be increases in Scope 1 and Scope 2 greenhouse gas emissions, however the however the combined Scope 1 and Scope 2 emissions are a relatively small proportion of both the Australian and NSW total emissions, accounting for less than 0.01% of total Australian GHG emissions. The contributions from the Modification 3 to global climate change will be proportional to its emissions and will be undetectable.

The socioeconomic benefits are predicted to be positive with the Project as modified on balance will result in positive economic benefit for the State, and local and regional areas in which Airly Mine is located. The Project as modified will provide an additional economic benefit of \$34.5 million, compared to the Project as currently approved due to the earlier realisation of benefits.

The character of the Project will not change due to Modification 3 and will remain substantially the same as the development that was originally approved as SSD 5581.

10.3 Summary of Environmental, Economic and Social Impacts

Table 48 provides an overview of the key environmental, economic and issues discussed in this Modification Report.

Table 48 Summary of Environmental, Economic and Social Impacts

Issue	Overview of Key Findings
Groundwater	The maximum mine inflow predictions for the proposed 3 Mtpa production rate at 71 ML/year (2027) from the recalibrated groundwater model is less than that predicted at 76 ML/year (2030) for the approved 1.8 Mtpa approved condition, and significantly less than the 183 ML/year (2030) provided in the Airly MEP EIS. The differences in the predictions are attributable to a combination of recalibration of the groundwater model and the longer mine inflows sustained for the 1.8 Mtpa prediction scenario.



Issue	Overview of Key Findings
	<p>Predictions on drawdowns and baseflow reductions lead to the following conclusions.</p> <ul style="list-style-type: none"> • Measurable drawdowns in the shallow Gap Creek and Genowlan Creek alluviums will result in minor baseflow reductions to these watercourses, however will not significantly change the stream flow compared to the approved case. • No measurable impact on the identified downstream surface water user on Genowlan Creek is predicted. • Minimal difference in predicted drawdown in the Permian strata and the Shoalhaven Group between the approved and proposed conditions is predicted, and the spatial extent of drawdown in groundwater sources does not extend far beyond the Project Application Area. Hence, no impacts on the private registered landholder bores or the Gardens of Stone National Park are predicted. • Residual groundwater impacts under both proposed and approved conditions will be less than the Level 1 Criteria under the NSW Aquifer Interference Policy and considered to be acceptable. • Baseflow reductions to Gap Creek and Genowlan Creek alluviums are not significantly different between the proposed and approved conditions or significantly different to the predictions included in the Airly MEP EIS. • Baseflows to Gap Creek and Genowlan Creek alluviums will return to pre-mining conditions 50 years after end of mining. <p>The beneficial use category of the alluvial groundwater is not expected to change within or outside the Project Application Area, and the level of impact is less than the Level 1 minimal impact considerations under the Aquifer Interference Policy and impacts are considered acceptable.</p>
Surface water	<p>The site water and salt balance assessment provide the following outcomes.</p> <ul style="list-style-type: none"> • The proposed modification will not result in an increase in the frequency or magnitude of potential water discharges from the pit top to Airly Creek. • The water quality of the downstream receiving environment will not deteriorate due to the proposed modification. • The three registered surface water users on Coco Creek and one registered user on Genowlan Creek will not be impacted by the proposed modification. <p>The proposed modification will not result in environmental consequences on the downstream receiving environment, including any consequences on the aquatic ecology of Airly Creek.</p>
Road traffic	<p>The proposed increase in workforce by 45 FTE personnel will result in:</p> <ul style="list-style-type: none"> • minimal additional staff trip generation estimated at no more than 20 vehicles per hour in any shift changeover period on Castlereagh Highway and Glen David Road • no requirements to upgrade roads or intersections due to the existing sufficient capacity and the very good level of service • no impact on the capacity, efficiency or safety of the local and sub-regional road network through the life of the Project.
Rail traffic	<p>The increase in the frequency of rail movements on the Wallerawang-Gwabegar rail line from an average frequency of 2 trains per day to 3 trains per day over a calendar year will result in negligible impacts as spare train pathing exists on the rail line. No cumulative impact is expected as the rail line is currently only used by Airly Mine trains.</p> <p>The efficiency and the safety of the rail network will not be impacted by the proposed modification.</p>
Noise and vibration	<p>The noise and vibration assessment has concluded the following.</p> <ul style="list-style-type: none"> • The operational noise levels due to the modification will be below relevant project trigger noise levels and SSD 5581 consent criteria at all residential and passive sensitive receptors, and the LAmax noise levels are predicted to be below the sleep disturbance noise levels under standard and noise enhancing meteorological conditions. • The average LAeq(15hour) and LAeq(9hour) rail noise levels would increase by up to 1.8 dB on the Wallerawang-Gwabegar Railway between Airly Mine and Wallerawang, however will comply with the trigger levels in the <i>Rail Infrastructure Noise Guideline</i> (EPA, 2013)

Issue	Overview of Key Findings
	<p>and the noise limits in the John Holland Rail Pty Limited's Environment Protection Licence of 13421 for the rail line.</p> <ul style="list-style-type: none"> Road traffic noise levels from the existing and proposed traffic volumes comply with the <i>Road Noise Policy</i> (DECCW, 2011) noise criteria at the nearest affected receiver on Glen Davis Road during the day and night-time periods. The predicted traffic noise level increase in Castlereagh Highway will be <2 dB and is considered barely perceptible. The recommended minimum safe blasting distances from vibration sensitive locations will be observed for vibration to remain within the EPA's recommended ANZEC <i>Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration</i>. Blasting will be undertaken on an as needs basis and will be undertaken in accordance with a <i>Blast Management Plan</i>.
Air quality	<p>The air quality impact assessment has concluded the following.</p> <ul style="list-style-type: none"> Relevant short term and long-term pollutant concentrations (Total Suspended Solids, PM₁₀ and PM_{2.5}) and dust deposition rates would be well below the respective NSW EPA air quality criteria, including the more stringent criteria for annual average PM₁₀ concentration, at all sensitive receptors. Incremental concentration predictions of air quality parameters due to the activities proposed in Modification 3 are unlikely to result in any exceedances of the air quality criteria in SSD 5581 at the nearest sensitive receptors.
Greenhouse gas emissions	<p>The modification will generate GHG emissions totalling 48,682 t CO₂-e / annum of combined Scope 1 and Scope 2 emissions. These emissions will contribute to global climatic effects, however the combined Scope 1 and Scope 2 emissions are a relatively small proportion of both the Australian and NSW total emissions, accounting for less than 0.01% of total Australian GHG production. The contributions from Modification 3 to the global climate change will be proportional to its GHG emissions and will be undetectable.</p>
Biodiversity	<p>No surface disturbance is proposed in Modification 3. The modification will not result in any impacts on any threatened species, populations and ecological communities, and their habitats.</p>
Cultural Heritage	<p>No surface disturbance is proposed in Modification 3, and no impacts to the cultural heritage values of the area are expected.</p>
Visual Amenity	<p>No new infrastructure is proposed in the modification and there will be no change in the visual amenity of the Airly Mine pit top.</p> <p>The modification is not proposing to amend the approved mine design philosophy, or the maximum subsidence approved for the mining zones. Impacts to geodiversity of the surroundings will not change and the aesthetic values of the area will not be impacted by the modification.</p>
Hazardous materials	<p>No impacts are expected from the handling, storage and use of explosives and detonators for underground blasting activities given only small volumes will be transported to the site and they will not be stored at the site permanently. Explosives will be transported, handled and used in accordance with an <i>Explosives Control Plan</i>. The management of the explosives and all other hazardous materials used in the operations will be undertaken in accordance with the updated <i>Hazardous Material Management Plan</i>.</p>
Waste	<p>Modification 3 is not expected to affect the existing Airly Mine waste management strategy for residual waste and recyclable materials.</p>
Economic	<p>The Project as modified has a greater net present value by approximately \$35 million than the Project as approved due to earlier realisation of benefits. The economic cost of the Project as modified due to environmental impacts is lower than the Project as approved despite the increase in GHG emissions. The environmental impacts will be sustained for a shorter period.</p> <p>The labour surplus from the proposed 45 FTE personnel is approximately \$2 million. This will result in positive economic benefits in the region due to increased household consumption and investment activities.</p> <p>The qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region.</p>

Issue	Overview of Key Findings
Social	<p>The minimal environmental impact footprint of the proposed modification means the amenity of the surroundings will not change, and impacts on personal and property rights, cultural heritage, community identity and sense, aesthetic values are unlikely.</p> <p>Qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities will result in the enhancement of Airly Mine’s current contributions to social engagement and community cohesion in the region.</p> <p>Notwithstanding the positive socioeconomic benefits of the proposed modification and the reduced economic cost of the environmental impacts, Modification 3 has resulted in a high degree of angst across the community, as evident from the consultation feedback from the community. The issues raised have also been ongoing since the inception of the Project and will likely continue in the future. A <i>Social Impact Management Plan</i> is proposed to assist in resolving the ongoing issues.</p>

10.4 Environmental Costs

The environmental impacts, other than greenhouse gas emissions, are not considered significant. The Economic Assessment (Aigis, 2019) has quantified the cost of environmental impacts to be lesser in the Project as modified compared to Project as approved by approximately \$2 million, despite the increase in greenhouse gas emissions. Additionally, the Project as modified will sustain the environmental impacts for a shorter period.

Socioeconomic benefits discussed in **Section 10.5** (below) can be achieved with little to no risk of adverse environmental impact. Based on the predicted environmental effects of the modification elements and the ability to manage these effects to minimise harm to the environment, the Project as modified will present an overall minimal residual consequence.

10.5 Socioeconomic Benefits

The Economic Assessment (**Section 8.11**) shows the modification will have a positive effect on the quantum of economic benefits accruing to NSW. The modification will result in an increase in net benefit of approximately \$35 million when compared with the net benefit of the Project as approved, primarily due to the earlier realisation of benefits. While the impacts of royalties are broadly distributed across the State, the direct and indirect effects of wages that will be earned by the additional workforce at Airly Mine will benefit the local community more. Benefits to locally and regionally based businesses trading with the mine are likely to experience higher levels of business activity, albeit over a shorter period.

The increase in workforce will result in positive economic benefits in the region relating to the additional workforce’s household consumption and investment activities. There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine’s current contributions to social engagement and community cohesion in the region.

The modification’s proposed increase in coal production limit will allow operational flexibility to Airly Mine, and at the same time improve the mine’s economic viability. A consequence of this operational flexibility is that the mine can respond to market opportunities that may present themselves. This flexibility has potentially positive implications for the State, as the ability to increase production in favourable markets would result in increased royalty returns to NSW.

10.6 Ecologically Sustainable Development

The Commonwealth Government has recognised the importance of sustainable development through the development of *National Strategy for Ecologically Sustainable Development* (NSES) (Commonwealth of Australia, 1992) that defines ecologically sustainable development (ESD) as:

using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

Australia's commitment to the principles of ESD is considered in the EPBC Act. For the purposes of this Modification Report, the relevant definition of ESD, and as adopted by the objects of the EP&A Act is found under Section 6(2) of the *Protection of the Environment Administration Act 1991* as:

6(2) For the purposes of subsection (1)(a), 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:

- (a) The precautionary principle – namely, 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,**
- (b) inter-generational equity – namely, 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,*
- (c) conservation of biological diversity and ecological integrity – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
- (d) 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.**

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future.

Airly Mine is committed to the principles of ESD and understands that social, economic and environmental objectives are interdependent. Centennial Airly acknowledges that a well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation. Consideration has been given to appropriately identifying, avoiding, mitigating and managing environmental risk in the Project.

The consistency of the modification with each of the ESD principles noted above is discussed in subsections below.

10.6.1 Precautionary Principle

The precautionary principle reinforces the need to take risk and uncertainty into account, particularly in relation to threats of irreversible environmental damage. For this reason, the Airly MEP EIS had presented and the Project was approved on a conservative mine design philosophy that aims to protect

the overlying geodiversity (cliff line, pagodas) and biodiversity values (threatened species, endangered ecological values) of the area by limiting the subsidence limits and environmental consequences. The staged approach of mining in the approved mining zones through Extraction Plans and management of subsidence effects on environmentally sensitive surface features provides for the implementation of additional response and contingency measures to ensure approved subsidence limits are not exceeded. To date, Airly Mine has not exceeded the approved subsidence limits and continue to meet the subsidence impact performance measures for natural and heritage features and built environment included in Conditions 2 and 3 under Schedule 3 of SSD 5581.

Based on the conservative mine design and assessments of environmental consequences, the Airly MEP EIS had concluded no significant alteration to the supporting physical or hydrological environments due to the Project. The recent recalibration of the groundwater model with contemporary monitoring data has allowed revised mine inflow predictions with greater degree of certainty. All predictions however contain a degree of certainty which reflects the variable nature of the water environment. Uncertainty and /or sensitivity analyses of mine inflow predictions have been undertaken in Modification 3 which allow management of long-term potential risks of the Project on the hydrogeological environment, and therefore mining-induced impacts on the downstream hydrological environment.

Given the minimal impacts in the environmental assessments, the Project as modified is unlikely to pose a greater threat of irreversible environmental damage than the Project as approved.

10.6.2 Intergenerational Equity

The principle of intergenerational and intragenerational equity (or social equity) is centred on the concept 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 principles of social equity have been addressed in the modification through assessments of economic and social impacts of the modification. The Project as modified will result in an increase in net benefit of approximately \$35 million when compared with the net benefit of the Project as approved. The benefit would be distributed across the State, however the direct and indirect socioeconomic effects of wages that will be earned by the additional workforce at Airly Mine will benefit the local community more. In this regard, the Project as modified will continue to benefit the current and future generations.

The benefits of the Project as modified would also flow to sectors like coal-fired power stations which provide electricity to NSW and are likely to supply power for a while in the future until superseded completely by alternative or renewable energy sources.

The Project mitigates and manages environmental impacts as much as practical. Monitoring or impacts are undertaken and reported to all stakeholders. Environmental incidents and exceedances consent criteria are investigated and managed appropriate to ensure impacts to the health, diversity and productivity of the environment do not continue.

10.6.3 Conservation of Biological Diversity and Ecological Integrity

The principle of conservation of biological diversity and ecological integrity holds that the conservation of biological diversity and ecological integrity should be a fundamental consideration for development proposals.

For the purposes of the Modification Report, it has been assumed that the biological diversity and ecological integrity refers to the ecological values of the area with the potential to be impacted by the proposed modification. No surface disturbance and therefore vegetation clearing is proposed. The mine design philosophy will not change and subsidence impacts in the Project will not change. Hence subsidence impacts on threatened species, endangered ecological communities and habitats will not change from that assessed in the Airly MEP EIS, which had concluded the impacts unlikely to be significant due to the low predicted levels of subsidence. In this regard, the Project as modified is unlikely to impact on the ecological values of the area.

Airly Mine is an existing contributor to NSW and Australian greenhouse gas emissions. The Project as modified will continue to contribute to these emissions, however at a greater level, equivalent to 0.01% of the 2016 Australian emissions and will contribute to global climate change. Ecosystems are vulnerable to climate change and in this regard Airly Mine's contributions to climate change could potentially have implications on the diversity and integrity of biodiversity. However, it is emphasised all sources of greenhouse gas emissions will contribute in some way (not easily quantifiable) towards the global climate change. Airly Mine's contribution to global climate change would be proportional to its greenhouse gas emissions. The contributions are likely to decrease in the future when the mine's Solar Farm Project is operational reduces the Scope 2 emissions by approximately 25%.

10.6.4 Improved Valuation, Pricing and Incentive Mechanisms

The principle of improved valuation, pricing and incentive mechanisms deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource.

Economic efficiency is an underlying goal of sustainability. Resources are required to be managed to maximise the welfare of society, both for now and the future generations. The significance of the resource proposed to be mined in the Airly MEP was independently assessed in 2015 by the then Division of Resources and Energy (DRE), which concluded the Project would add \$2.8 billion to the value of NSW export and domestic coal markets over a 20-year period, and importantly DRE supported the Project as a responsible utilisation of the State's coal resources.

Consideration of economic efficiency, with the improved valuation of the environment, overcomes the under-pricing of the natural resources and integrates the economic and environmental considerations in decision making, as required by ESD. The Economic Assessment (Aigis, 2019) has considered the environmental cost as well as the economic benefits of the Project as modified. The Project as modified has a lesser environmental cost by approximately \$2 million compared to the approved Project, despite the increase in the cost of greenhouse gas emissions. The Project as modified results in an increase in net benefit of approximately \$35 million when compared with the net benefit of the Project as approved, primarily due to the earlier realisation of benefits.

10.7 Section 4.15 of the EP&A Act

Section 4.15 (previous Section 79C) of the EP&A Act requires matters included in Section 4.15 (b) to (e) the consent authority considers as are of relevance to the development the subject of the development application:

- (b) *the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,*
- (c) *the suitability of the site for the development,*
- (d) *any submissions made in accordance with this Act or the regulations,*
- (e) *the public interest.*

Section 4.15 (b) matters are addressed in the Modification Report. A summary of the environmental impacts due to the modification elements, and social and economic impacts in the locality are included in **Section 10.3** to **Section 10.5**.

The matters in Section 4.15 (c)–(e) are addressed below.

10.7.1 Site Suitability

The proposed modification will be undertaken within the Project Application Area boundary assessed and approved in the Airly MEP EIS. No changes are required at the site for the proposed modification.

10.7.2 Submissions

This Modification Report will be placed on public exhibition for a minimum of 14 days. During this period the public will be invited to provide submissions which will be considered by the Minister or his delegate, or the Independent Panel Commission in the determination of the proposed modification.

10.7.3 Public Interest

The proposed modification is of public interest because of the positive socioeconomic benefits that will arise, as discussed in **Section 10.5**. The socioeconomic benefits discussed can be achieved with little to no risk of adverse environmental impact.

The Project as modified complies with the objects of the EP&A Act and applicable planning policy objectives and a justifiable strategic context, as discussed in **Chapter 2.0**.

10.8 Conclusion

Modification 3 is proposing to increase coal production rate to 3 Mtpa with associated workforce and train movement increases in line with its current five-year business plan. Environmental impacts, with the exception of greenhouse gas emissions, are lesser or remains unchanged from the impacts assessed and approved in the consent SSD 5581. The Project's greenhouse gas emissions will increase due to the proposed modification and the combined Scope 1 and Scope 2 emissions will account for 0.01% of the Australian greenhouse gas emissions. The contribution of the Project as modified to the global climate change will be proportional to its greenhouse gas contributions and will be undetectable. Airly Mine's Scope 2 emissions are likely to reduce by approximately 25% in the future due to the implementation of abatement measures including the operation of Solar Farm to reduce the mine's carbon footprint.

The modification's proposed increase in coal production limit will allow operational flexibility to Airly Mine and will improve the mine's economic viability. A consequence of this operational flexibility is that the mine can respond to market opportunities that may present themselves. This flexibility has potentially positive implications for the State, as the ability to increase production in favourable markets would result in increased royalty returns to NSW. The Project as modified will have a positive effect on the quantum of economic benefits accruing to NSW by approximately \$35 million compared to the Project as approved, primarily through earlier realisation of benefits.

The increase in workforce will result in positive economic benefits in the region relating to the additional workforce's household consumption and investment activities. There are also likely to be qualitative social benefits associated with the involvement of the additional workforce households in a wide range of community-based activities which will be an enhancement of Airly Mine's current contributions to social engagement and community cohesion in the region

The modification is a very minor alteration of the approved Airly Mine Extension Project and is substantially the same development as the character of the Project will not change. The environmental impacts of the proposed modification elements are predicted not to be significant. The benefits of the modification can therefore be achieved with little or no harm to the environment. The modification meets the relevant objects of the EP&A Act and is consistent with the four principles of the ecologically sustainable development. In weighing up the environmental impacts (costs and benefits), the Project as modified, on balance, is considered to be of public interest to the State of NSW.

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12.0 ACRONYMS, UNITS AND ABBREVIATIONS

Acronyms, Units and Abbreviations	Definition
%	percent
%ile	Percentile
°C	Degrees Celsius
AHD	Australian Height Datum
BOM	Bureau of Meteorology
CBA	Cost Benefit Analyses
CCC	Community Consultative Committee
CCL	Consolidated Coal Lease
CHPP	Coal Handling and Preparation Plant
CL	Coal Lease
cm	centimetre
dB(A)	Decibels, A weighted (a filter has been applied to the measured result to mimic the human response to noise)
DEE	Federal Department of Environment and Energy
DECC	Department of Environment and Climate Change (NSW)
DECCW	(Former) Department of Environment, Climate Change and Water (NSW) (now known as Office of Environment and Heritage (OEH))
DPE	The former Department of Planning and Environment (NSW)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EL	Exploration Licence
EMS	Environmental Management System
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EPA	Environment Protection Authority
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
EPL	Environment Protection Licence
g	gram
GDE	Groundwater Dependent Ecosystem
GHD	GHD Pty Ltd
GHG	Greenhouse Gas
kL	kilolitre
km	kilometre
km ²	square kilometre
LCC	Lithgow City Council

Acronyms, Units and Abbreviations	Definition
LDP	Licensed Discharge Point
LEA	Local Effects Analyses
LEP	Local Environmental Plan
LGA	Local Government Area
m	metre
M	million
m/s	Metres per second
m ²	Square metre
m ³	Cubic metre
mg/L	Milligram per litre
ML	Megalitre or Mining Lease
MLA	Mining Lease Application
MNES	Matter of National Environmental Significance
mm	millimetre
mm/m	millimetre per metre
MOP	Mining Operations Plan
Mt	Million tonne
Mtpa	Million tonnes per annum
MWRC	Mid-Western Regional Council
NES	National Environmental Significance
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service
NSW	New South Wales
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
RBL	Rated Background Level
ROM	Run of Mine
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SLR	SLR Consulting Australia Pty Ltd.
TARP	Trigger Action Response Plan
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
t	tonne
WM Act	<i>Water Management Act 2000</i>

