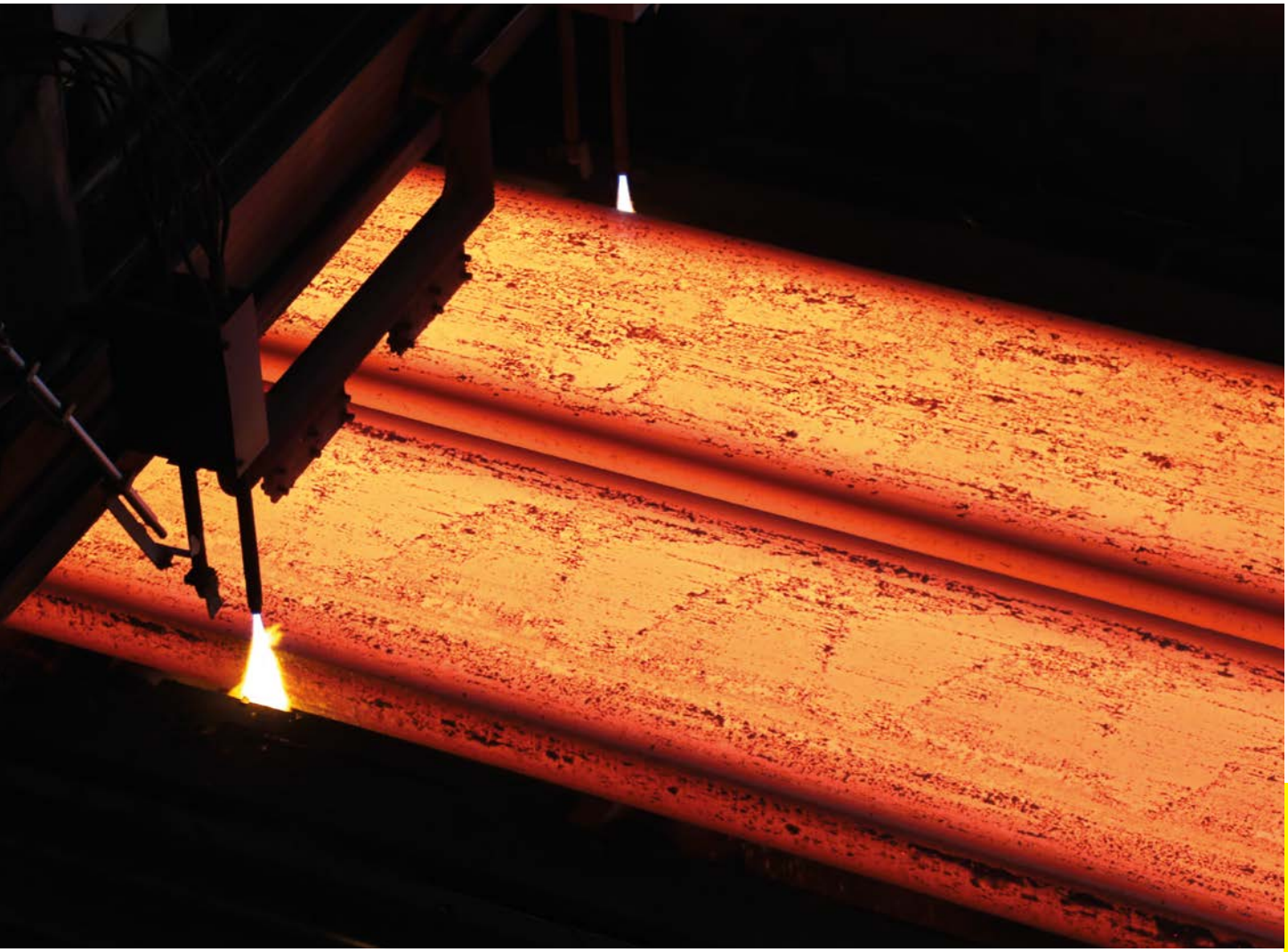
SOUTH32

DENDROBIUM MINE EXTENSION PROJECT

2022



ENVIRONMENTAL IMPACT STATEMENT

EXECUTIVE SUMMARY

IMC's Existing Dendrobium Mine

- Our Dendrobium Mine in the Illawarra Region of New South Wales (NSW) is an existing underground mine primarily producing metallurgical coal for steelmaking.
- Dendrobium Mine began operating in 2002 and is an essential supplier of metallurgical coal to Australian steelmakers, including BlueScope Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks.
- The approved Dendrobium Mine has development consent until 2030.

Previous Application

- We previously sought to extend operations at the Dendrobium Mine through an application which, although recommended for approval by the Department of Planning and Environment (DPE), was refused by the Independent Planning Commission (IPC).
- We have re-designed Dendrobium Mine Extension Project (the Project) taking into account the feedback from the IPC by reducing the overall footprint, thereby reducing potential impacts in comparison to the previous application.

Proposed Project

- The proposed Project involves continuation of mining activities at the Dendrobium Mine with a new underground mining area (Area 5) within the existing mining lease, including the use of existing infrastructure and development of minimal additional surface infrastructure.
- Continued mining would sustain the employment of Dendrobium Mine's workforce, create additional jobs and allow ongoing access to a consistent supply of metallurgical coal for local and overseas customers.

Environmental Impact Statement

- We are seeking State and Commonwealth approval for the Project, with our application supported by this Environmental Impact Statement (EIS).
- The EIS has been developed through extensive consultation with our stakeholders and is informed by the previous application and the Secretary's Environmental Assessment Requirements for the Project.
- We have prepared specialist environmental studies for the EIS to address the assessment requirements and the feedback from our stakeholders.

Key Environmental Assessment Outcomes and Mitigation Measures

- The Project has reduced the proposed mining footprint by approximately 60 per cent (%) from the previous application with associated reductions in impacts to key surface features including streams, swamps and Aboriginal heritage sites.
- There is no predicted "seam to surface" fracturing when calculated using the Tammetta Equation.
- Peak annual surface water losses are predicted to have reduced by 78% in comparison to the previous application.
- We are not proposing to longwall mine beneath any water supply dams, key stream features, third order and above streams or previously identified high archaeological (scientific) significance Aboriginal heritage sites.
- We would offset the agreed volume of surface water losses from the Sydney drinking water catchment, during mining and post-mining (estimated at less than 1% of the Avon and Cordeaux catchment yields).

Substantial Socio-economic Benefits

- The Project would provide ongoing employment for 700 people, including 650 people currently employed at Dendrobium Mine and an additional 50 people for the Project.
- 100 additional jobs will be created during construction of the Project.
- The ongoing operation of Dendrobium Mine would support associated business opportunities for local suppliers, Illawarra industries and reliant businesses.
- It would also support the ongoing financial sustainability of the Appin Mine, and the broader Southern Coalfield economic ecosystem.
- The total net benefit to the NSW economy of $649 million in net present value terms (net of costs associated with environmental externalities) for the Project in royalties, taxes and rates for local councils and the NSW and Commonwealth Governments.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

EXECUTIVE SUMMARY

ES1 SUMMARY

The approved Dendrobium Mine is an underground coal mine situated in the Southern Coalfield of New South Wales (NSW) approximately 8 kilometres (km) west of Wollongong (Figures ES-1 and ES-2).

Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited (South32), is the owner and operator of the Dendrobium Mine[1].

This document is an Environmental Impact Statement (EIS) for the Dendrobium Mine Extension Project (the Project). The Project includes the continuation of longwall mining at the approved Dendrobium Mine within a new underground mining area (Area 5) (Figures ES-1 and ES-3) to extract approximately 31 million tonnes (Mt) of run-of-mine (ROM) coal, extending the life of the Dendrobium Mine.

This EIS provides, as required by the Secretary's Environmental Assessment Requirements (SEARs):

- a description of the Project;
- the strategic importance of the Project;
- the statutory context of the Project;
- a summary of engagement undertaken;
- an assessment of potential impacts;
- the Project environmental management strategy, including continuation and extension of existing Dendrobium Mine environmental mitigation measures and monitoring; and
- a Project justification and evaluation including consideration of the requirements of relevant policies and legislation.

IMC previously sought to extend mining operations at the Dendrobium Mine through a previous development application (known as the Dendrobium Mine – Plan for the Future: Coal for Steelmaking [the previous application]).

The Project represents a continuation of mining at Dendrobium Mine, providing ongoing employment for the existing Dendrobium Mine workforce and additional employment opportunities created during construction and operations.

The NSW Department of Planning, Industry and Environment (DPIE) (now Department of Planning and Environment [DPE]) concluded in their "whole-of-government" Assessment Report that the previous application was in the public interest and recommended approval (DPIE, 2020a).

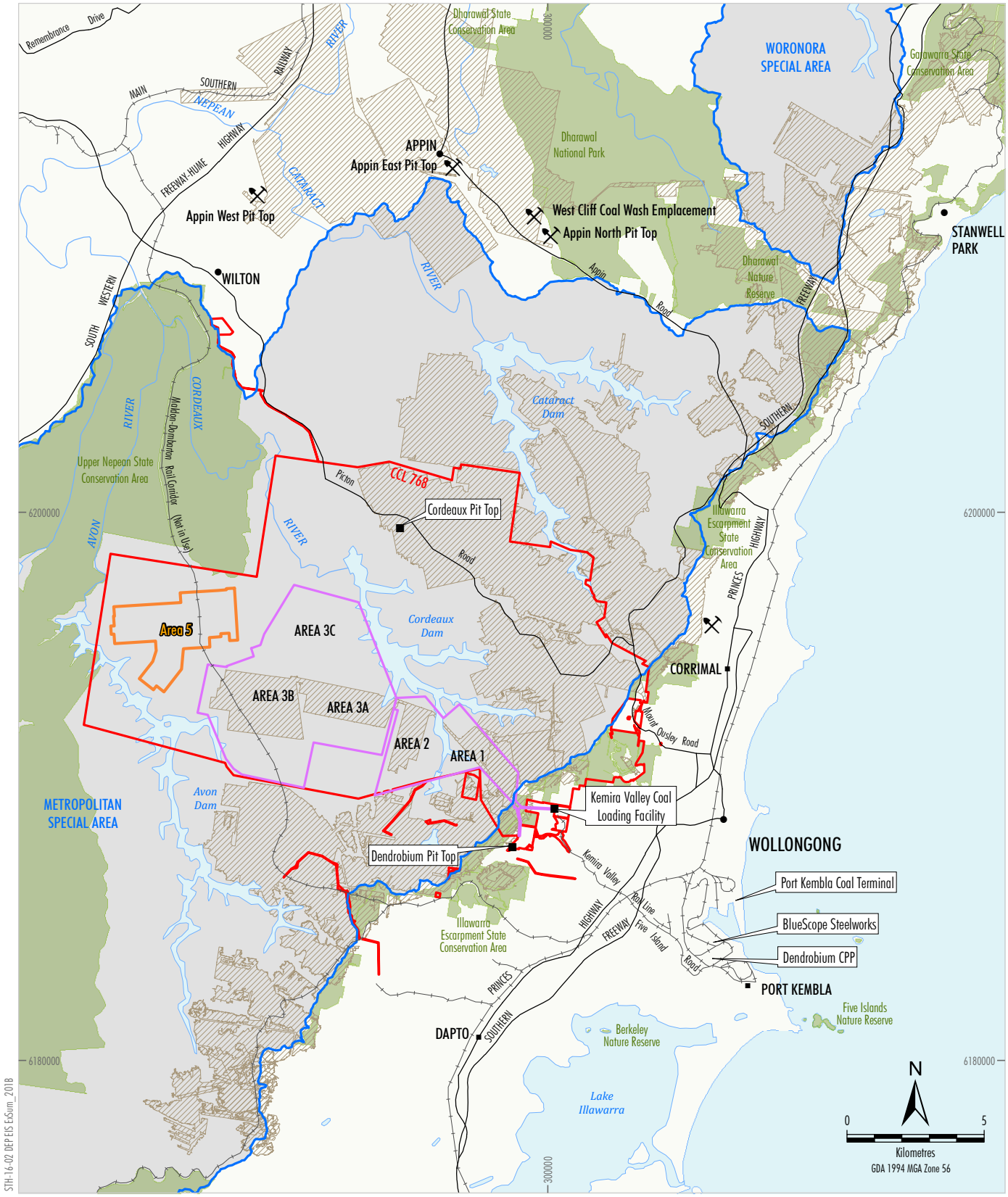
However, this previous application was refused by the Independent Planning Commission (IPC) in February 2021, primarily due to the IPC's view of the potential impacts of the mine development on the Sydney drinking water catchment.

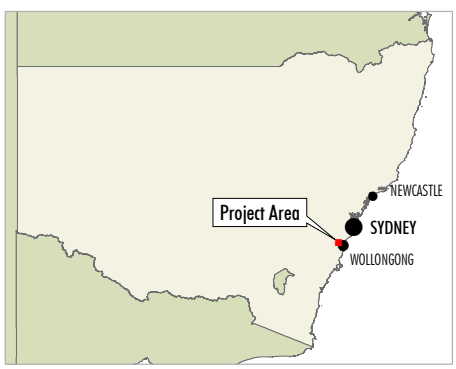
In recognition of the importance of the Dendrobium Mine to NSW, on 5 May 2021, the NSW Upper House passed a Parliamentary Motion recommending the Project be declared State Significant Infrastructure (SSI), with IMC to then submit a new application with a revised mine plan that takes into account the feedback from the IPC.

To address the key concerns raised by the IPC, IMC has re-designed the Project to reduce the overall footprint, thereby reducing potential impacts, to meet the following Project objectives:

- to facilitate continuity of mining at the Dendrobium Mine, directly through the addition of Area 5 for the Project, and also indirectly as the Project supports the financial sustainability of IMC (Dendrobium Mine and Appin Mine) as well as the broader Southern Coalfield economic ecosystem;
- to address the IPC's concerns for the previous application; and
- to avoid and minimise impacts on the Metropolitan Special Area.

[1] Throughout the Executive Summary, Illawarra Coal Holdings Pty Ltd is referred to as IMC.





LEGEND

- Dendrobium Mining Lease
- Road
- Railway
- National Park, Nature Reserve and State Conservation Area
- Historic Mine Workings
- Declared Catchment Area
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Extension Project

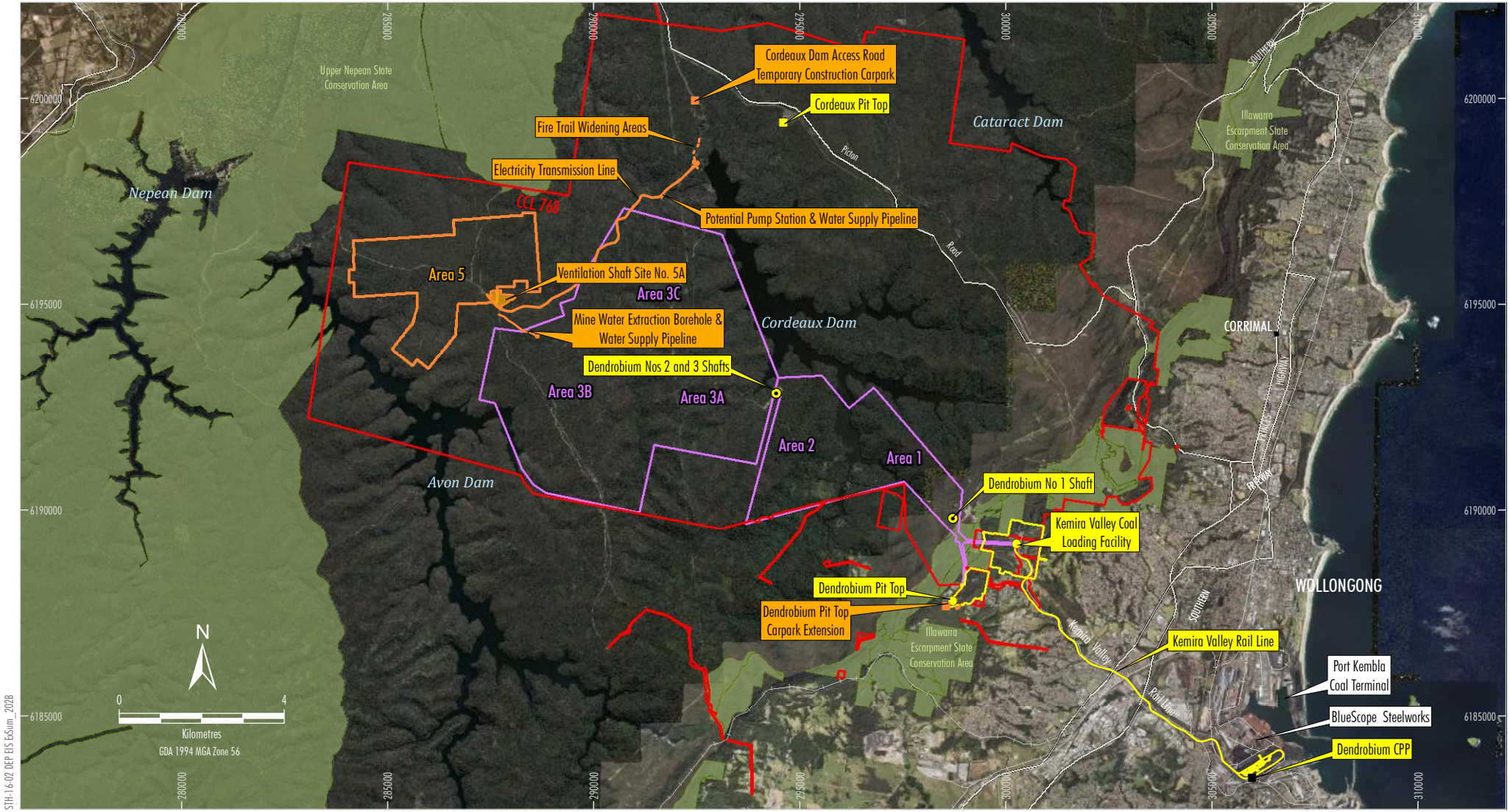
Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Regional Location

Figure ES-1



STH-16-02 DEP EIS EGsum_2028

LEGEND

- Dendrobium Mining Lease
- Road
- Railway
- National Park, Nature Reserve and State Conservation Area

Dendrobium Mine

- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)

Dendrobium Mine Extension Project

- Dendrobium Underground Mining Area - Extension Project
- Surface Facilities (Existing Dendrobium Mine)
- Surface Facilities (Proposed Dendrobium Mine Extension Project)

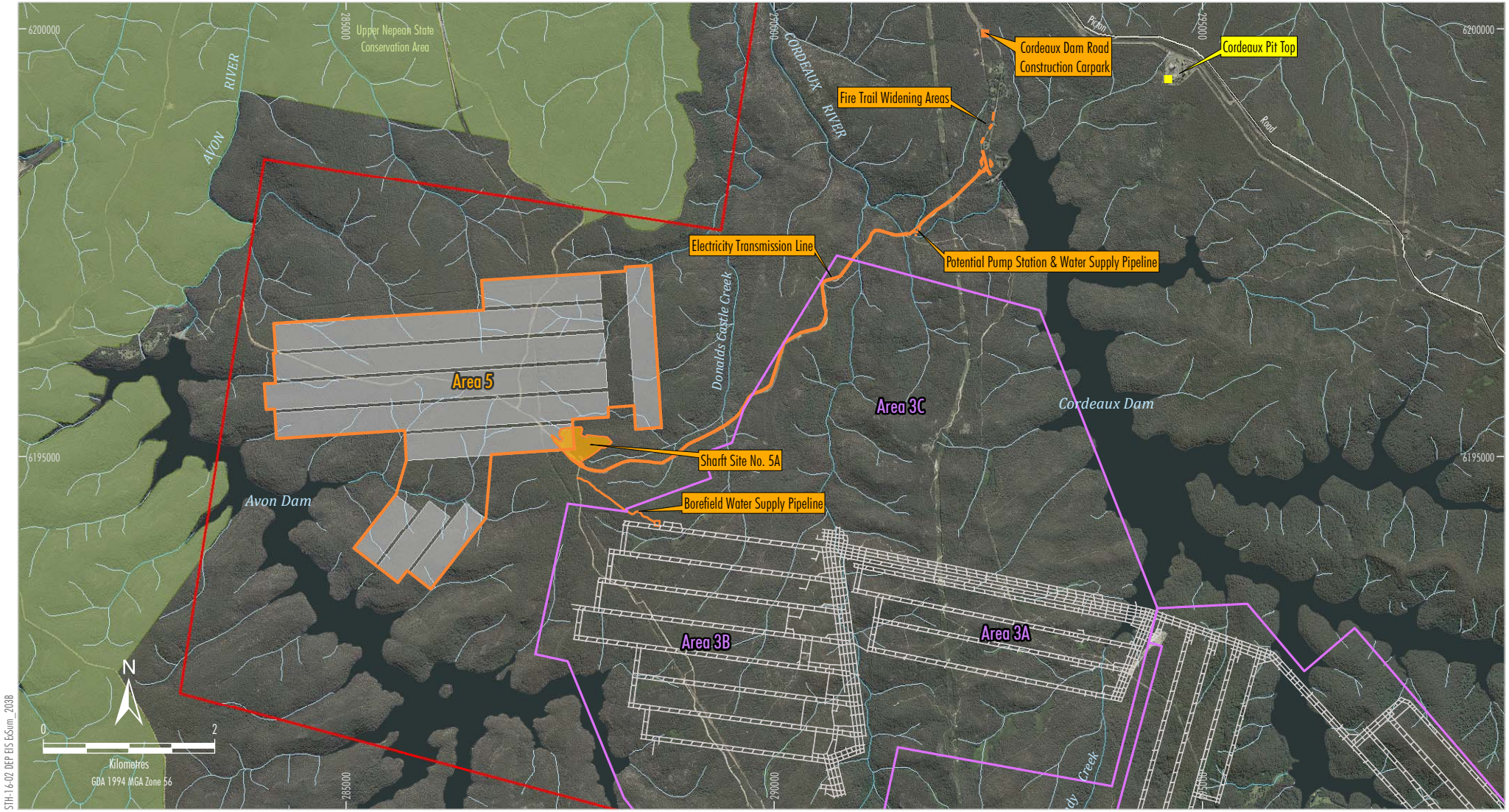
Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32
Illawarra Coal

DENDROBIUM MINE

General Arrangement
Dendrobium Mine Extension Project

Figure ES-2



STH-16-02 DEP EIS EGum_2038

LEGEND

- Dendrobium Mining Lease
- Road
- National Park, Nature Reserve and State Conservation Area

Dendrobium Mine

- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)

Dendrobium Mine Extension Project

- Dendrobium Underground Mining Area - Extension Project
- Surface Facilities (Existing Dendrobium Mine)
- Surface Facilities (Proposed Dendrobium Mine Extension Project)

Source: Geoscience Australia, 2006; Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Dendrobium Mine Extension Project- Underground Mining Area

Figure ES-3

In December 2021, the Project was declared SSI, under section 5.12 of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), by the Minister for Planning and Public Spaces (the Minister).

IMC has re-designed the Project to reduce the overall footprint compared to the previous application, thereby reducing potential impacts through (Figures ES-4 and ES-5):

- approximately 60% reduction in longwall mining area;
- approximately 78% reduction in peak annual surface water losses (from the previous application);
- no predicted connective fracturing from the seam-to-surface when using the Tammetta equation;
- no longwall mining beneath 3rd, 4th and 5th order (or above) streams;
- approximately 50% reduction in the length of 1st and 2nd order streams longwall mined beneath;
- approximately 40% reduction in the number of swamps (listed as threatened) longwall mined beneath;
- commitment to avoid longwall mining beneath identified key stream features;
- reduction in the number of Aboriginal heritage sites directly mined beneath from 22 to six sites (with the likelihood of direct impacts to these six sites expected to be approximately 1 in 10, based on extensive monitoring of subsidence-related impacts to heritage sites);
- no longwall mining beneath previously identified high archaeological significance Aboriginal heritage sites;
- longwall mining at least 400 metres (m) from named watercourses (i.e. the Avon River, Cordeaux River and Donalds Castle Creek);
- minimum longwall mining setback distance of 300 m from the Full Supply Level (FSL) of the Avon Dam;
- minimum longwall mining setback distance of 1,000 m from dam walls; and
- use of existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium Coal Preparation Plant [CPP], Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement Area), which would reduce the requirement for additional disturbance.

ES2 STRATEGIC CONTEXT

ES2.1 Regional Context

The SSI declaration has reinforced the NSW Government's identification of the strategic importance of the continuation of Dendrobium Mine to the financial sustainability of IMC's operations and the overall financial sustainability of the Southern Coalfield economic ecosystem.

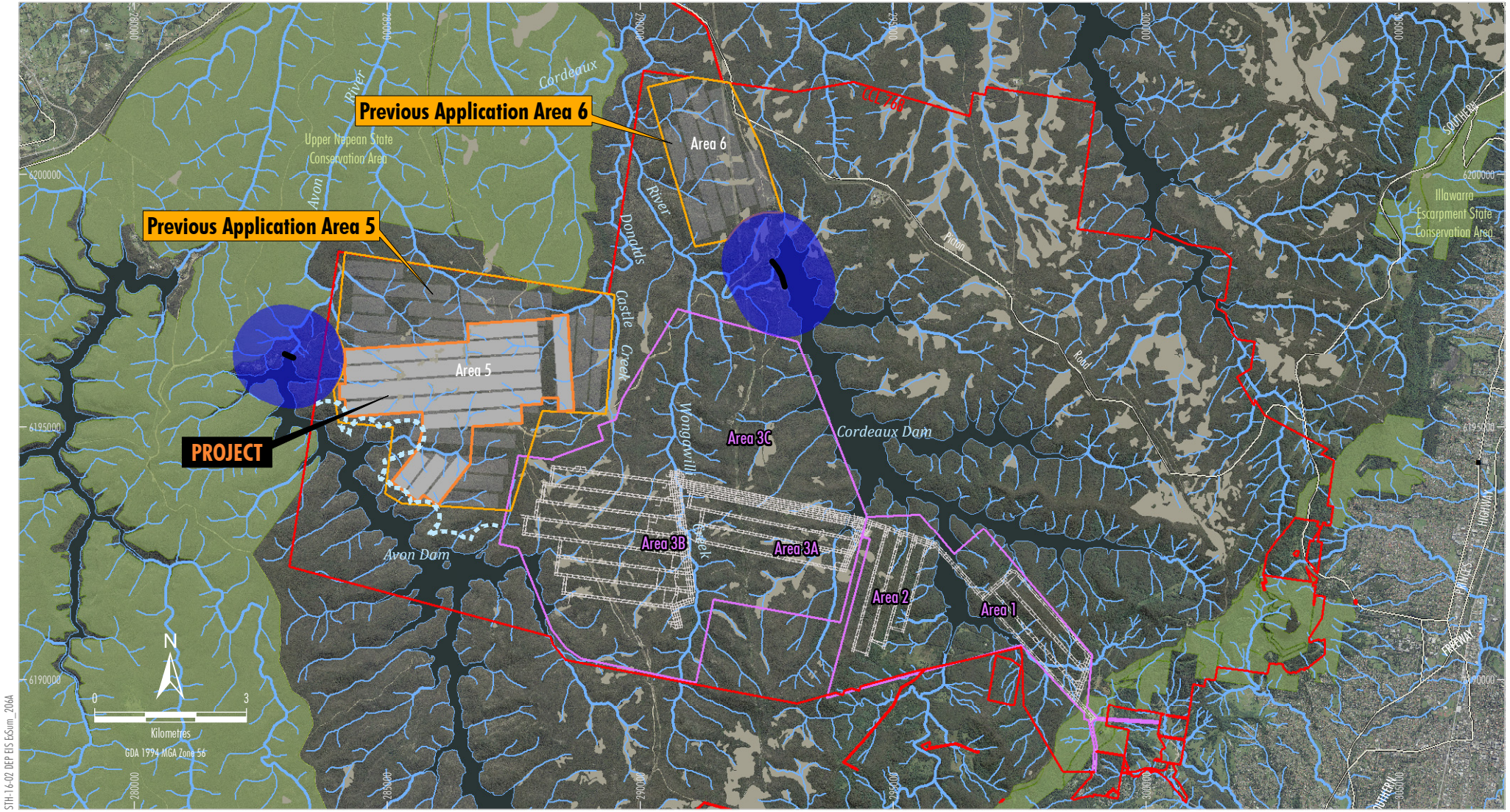
Economic Significance of the Steelmaking Industry

Steel remains a fundamental material for a variety of construction and manufacturing industries, and domestic steelmaking is a strategically valuable asset for Australia's economic security and prosperity.

The importance of local (i.e. Australian) steelmaking is described in the Parliamentary Report *Australia's Steel Industry: Forging Ahead*, which outlines the safety benefits and economic significance of the steel industry to the Australian economy and to regional economies where steelmaking facilities are located. In the Illawarra Region, the Port Kembla Steelworks:

- directly employs 3,000 people;
- indirectly supports about 10,000 jobs in the region (with the Illawarra Business Chamber noting in its submission to the Report that the multiplier effect of the steel industry is 3 to 5 indirect jobs for every direct job generated by the industry); and
- contributes approximately $1.9 billion per annum to the economy, based on analysis conducted by Wollongong City Council (without considering any multiplier effect).

The Port Kembla Steelworks is the largest steel production facility in Australia, and one of only two primary iron and steelmaking facilities in Australia.



STH-16-02 DEP EIS EGsum_206A

LEGEND

- Dendrobium Mining Lease
- Road
- National Park, Nature Reserve and State Conservation Area
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Previous Application
- Dendrobium Underground Mining Area - Extension Project
- EIS Base Plan Longwalls
- Coastal Upland Swamp
- Streams -3rd and Higher Order
- Streams -1st and 2nd Order
- Dam Wall Setback (1 km)
- 300 m Full Supply Level Setback

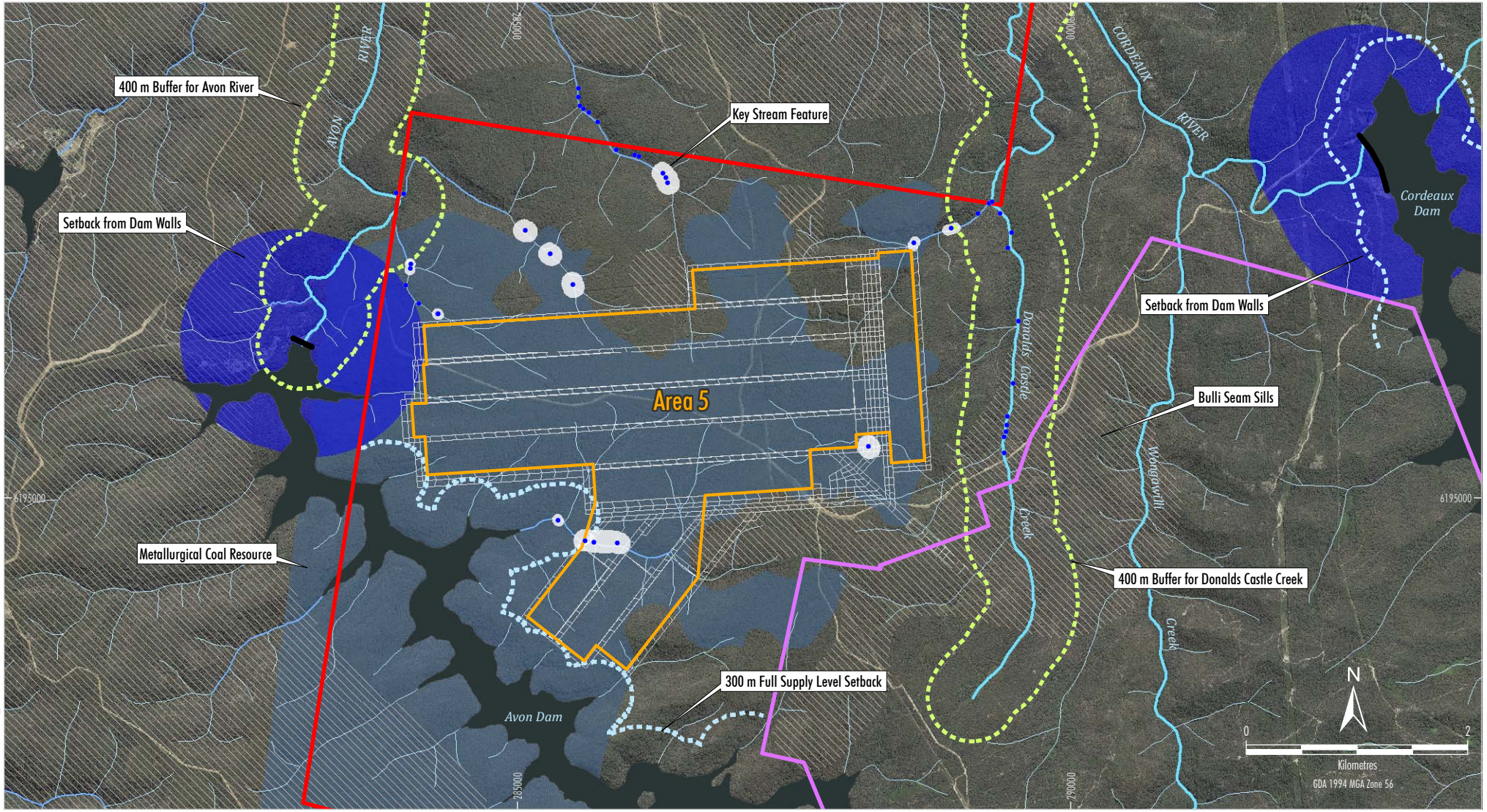
Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018)

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Comparison of the Project and the Previous Application

Figure ES-4



LEGEND

- Dendrobium Mining Lease
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Extension Project
- 3rd Order and Above Watercourses
- 300 m Full Supply Level Setback
- 400 m Buffer for Regulated and Named Watercourses
- Key Stream Feature
- Setback from Dam Walls
- Metallurgical Coal Resource
- Bulli Seam Sills

Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32 Illawarra Coal

DENDROBIUM MINE

Project Mine Design Plan

Figure ES-5

Use of Coal in Steel Production

Metallurgical coal is a raw material that is essential for the manufacture of "virgin iron" and steel (also known as "primary steelmaking" or "integrated steelmaking"). The other key raw material is iron ore.

While the Port Kembla Steelworks produces a portion of its steel using recycled scrap steel as a feed stock, there is not sufficient supply of scrap steel to meet demands; therefore, the steelmaking process continues to require the use of metallurgical coal and iron ore.

Metallurgical coal is used as a reducing agent in the steelmaking process. The carbon in the metallurgical coal is used to convert iron ore to molten iron in a blast furnace.

Research into the use of alternative reducing agents in the blast furnace method, such as hydrogen, is being undertaken. However, there is currently no economically viable alternative to the use of metallurgical coal as a reducing agent in the blast furnace method (i.e. a method employed at the Port Kembla Steelworks) at a commercial scale (BlueScope, 2019).

The Commonwealth Department of Agriculture, Water and Environment (DAWE) (2021), with reference to the International Energy Agency, outlines that alternative technologies for steelmaking that do not rely on the blast furnace method are unlikely to be operating at scale until the 2030s.

BlueScope has reiterated the need for continued supply of metallurgical coal for steelmaking, as emerging "green steel" technologies are not yet ready for large scale implementation (BlueScope, 2021).

Furthermore, BlueScope is seeking Infrastructure Approval for the Port Kembla Steelworks Blast Furnace No. 6 Reline Upgrade Project, and lodged an EIS stating the following regarding alternative steelmaking processes (BlueScope, 2022):

> *As these technologies require significant development, and are unlikely to be commercially viable at industrial-scale for use in the specific circumstances at Port Kembla Steelworks prior to the end of the current 5BF campaign, the most technically feasible and economically viable option for BlueScope at this time is to progress with the project.*

The Port Kembla Steelworks Blast Furnace No. 6 Reline Upgrade Project was subsequently declared as Critical State Significant Infrastructure (CSSI) by the Minister in 2021 for the following reasons (DPIE, 2021h):

- *the project is essential to NSW for economic and employment reasons as it would enable continued domestic production of steel, ensuring supply chain security for nation building projects such as infrastructure, commercial and residential developments; and*
- *the project is a significant capital investment of $700 million and would generate 1,000 contractor jobs and retain 4,500 existing jobs at the steelworks, delivering significant economic and employment benefits to NSW.*

In addition, the Federal Government has granted funding to BlueScope to assist with re-development projects and to upgrade its steelmaking capabilities.

Importance of Local Metallurgical Coal Supply

The proximity of the Southern Coalfield metallurgical coal mines is a major factor in BlueScope's ability to make steel economically.

BlueScope blends coal from its supply base to produce a coke product for use in its operation and for export, with current operations at BlueScope designed to primarily utilise coal produced in the Illawarra Region, supplemented by imported coal and iron ore.

Local supply provides significant benefits to both BlueScope and NSW. For BlueScope, these benefits relate to, but are not limited to, coal quality, delivered cost, supply chain certainty, just-in-time supply with associated working capital benefits, and the maintenance of a competitive supply base, whilst minimising their carbon footprint associated with raw material freight.

For NSW, these benefits include royalties from local production and economic benefits (both generated by IMC but also related businesses such as BlueScope).

Coal from both IMC operations (i.e. the Dendrobium Mine and Appin Mine) is currently blended for sale into the export and domestic markets. This is forecast to continue if the Project proceeds, except in circumstances where a single source of supply from either mine is preferred by a customer and agreed to by IMC.

The dependency of the Port Kembla Steelworks on the continued supply of metallurgical coal from local sources in the Southern Coalfield was acknowledged by the NSW Legislative Council (5 May 2021), the DPE (2020a), and the independent economic study commissioned by the DPE for the previous application (BAEconomics, 2020). BlueScope has actively supported the continuation of mining in the Southern Coalfield in its prior submissions to the IPC stating (15 December 2020):

> *The purpose of BlueScope's submission is to firstly emphasise to the Independent Planning Commission, and the state of NSW, the critical importance of a continuation of mining in the Southern Coalfield of NSW for the ongoing production of iron and steel at the Port Kembla Steelworks.*
>
> *Metallurgical coal supplies for BlueScope are reliant upon an ongoing commercially viable coal mining sector in the Southern Coalfield. BlueScope understands that export sales are critical to the mining operations remaining commercially viable. Further, local supplies of metallurgical coal are vital for the continuing economic health of the Illawarra Region and NSW at large, including the 4,500 direct jobs and contractors, supporting around 8,900 jobs that rely on Port Kembla Steelworks, the largest steel production facility in Australia.*
>
> *This importance has only been enhanced as the production of domestic steel has become a critical part of:*
>
> *a) The development of sustainable and secure supply chains post the COVID pandemic; and*
>
> *b) the significant step up in investment in renewable energy projects across NSW because of recently announced NSW Government policies.*
>
> *The second purpose of this submission is to emphasis the important role of the Dendrobium Mine, operated by South32, as one key mine that supplies metallurgical coal for steelmaking at Port Kembla.*

In addition, the importance of multiple local metallurgical coal supplies to the Port Kembla Steelworks is outlined by the ACCC (2017) which noted the disadvantages the Port Kembla Steelworks may face if it were required to source metallurgical coal from the Bowen Basin in Queensland (rather than the Illawarra Region):

> *… there is significant additional cost associated with transporting substitute coking coal from alternative sources to the Australia steelmakers as well as potential capacity constraints limiting the ability of one steelmaker to import large volumes of coal by ship.*
>
> *… In relation to transportation cost, BlueScope would incur significantly higher freight logistics costs to ship coal from the Bowen Basin via the Queensland coal exporting ports to its steel mill at Port Kembla compared to the costs associated with the supply of coal from South32 and Metropolitans mines in the Illawarra to its steelworks and Port Kembla. Market inquiries indicate that the cost of transporting coal from the Bowen Basin to Port Kembla is likely to be between $US10 -15 per tonne.*

BlueScope is a major contributor to the Illawarra Region, NSW and Australia, generating an economic input of $ 1.9 billion per annum based on analysis by Wollongong City Council. As a consequence, BlueScope's proposed Port Kembla Steelworks Blast Furnace Reline Project has gained CSSI status.

The Port Kembla Steelworks Blast Furnace Reline Project is expected to extend the life of its blast furnace operations to approximately 2045. BlueScope is continuing with current blast furnace technology given the prevailing view that 'green steel' is still under development and many years away.

This creates ongoing metallurgical coal demand for the life of the blast furnace.

Plate ES-1 – Mount Kembla Memorial Pathway

Southern Coalfield Economic Ecosystem

The independent economic assessment undertaken on behalf of DPE for the previous application by BAEconomics concluded the worst-case scenario would be the closure of the Dendrobium Mine and Appin Mine which would lead to broader impacts to the Southern Coalfield economic ecosystem, such as the cessation of coal exports through PKCT and the production of primary steel at the Port Kembla Steelworks (BAEconomics, 2020):

> *….the ongoing economic viability of the premium hard coking coal mining , iron smelting and coal transport and shipping businesses located in and around the Wollongong Port Kembla area and elsewhere in the Southern coalfield of NSW is critically dependent on the continuing success of Illawarra Metallurgical Coal and BlueScope steel. Major changes in either of these businesses would have flow on effects to the other as well as to other significant coal and iron and steel related businesses.*

The independent economic assessment (BAEconomics, 2020) goes further in stating the future of IMC and the broader Southern Coalfield economic ecosystem is related:

> *….the historical linkages and dependencies between Illawarra Metallurgical Coal and the primary steelmaking operations at BlueScope mean that the failure of one will compromise the other.*

Closure of IMC operations could cost the local Wollongong region around $6.4 billion per year in lost regional product and the estimated loss to the Australian economy as a whole could be as high as $10.7 billion per year (BAEconomics, 2020).

In addition, the closure of IMC's operations could result in the loss of employment for some estimated 5,500 direct personnel in the Illawarra Region, and inclusive of the indirect workforce losses, up to approximately 25,000 total jobs nationally (BAEconomics, 2020).

Without the Project, the Dendrobium Mine and other operations may become less financially sustainable (i.e. the Appin Mine), which in turn may result in the PKCT and other Southern Coalfield mines becoming less financially sustainable (the mines in the Southern Coalfield currently operating, including IMC's operations, Peabody's Metropolitan Mine and SIMEC's Tahmoor Colliery engage approximately 2,500 personnel) (BAEconomics 2020).

Port Kembla Coal Terminal

In addition, IMC is a key enabler to support a viable PKCT and hence local competitive supply of metallurgical coal to the Port Kembla Steelworks and the seaborne market. IMC currently provides 60% of the hard coking coal and 75% of the total coal exported through PKCT.

PKCT provides access to seaborne export and domestic markets and therefore underpins the operation of the mines in the Southern Coalfield region.

The maintenance of a strong local coal industry is important for competition and ongoing supply to both the domestic and export markets.

IMC forms a key part of the local coal and supporting industries which includes IMC, Tahmoor Mine (SIMEC), Metropolitan Mine (Peabody Energy) Russell Vale (Wollongong Coal), PKCT and BlueScope. This industry generates significant benefits for the region (e.g. economic, employment) as well as significant taxes and royalties for NSW as identified in BAEconomics (2020).

Current mine approvals in the Southern Coalfield foreshadow a reduction in total coal production with current approvals for Tahmoor Mine to 2033, Metropolitan Mine to 2032 and Russell Vale to (approximately 2026). This is likely to increase the cost burden on PKCT.

PKCT primarily supplies services to the five operating mines in the Southern Coalfield, however, from a volume perspective, IMC is forecast to contribute a minimum of 75% of the export volumes shipped through PKCT over the next 10 years and hence fund the bulk of the port operating costs and is important to the ongoing financial viability of PKCT.

This proportion may increase if the throughput of the other Southern Coalfield operations who use PKCT decreases (noting the port costs are allocated on a throughput basis with less tonnage increasing cost for the remaining users).

Based on current operating structures and cost regimes applicable to PKCT, reduced throughput is expected to increase costs per tonne for the use of PKCT.

Coal from the Project, if developed, is forecast to make up approximately 35% of the coal shipped through PKCT.

As the major shipper (forecast to be a minimum of 75%), continued supply of coal from IMC is critical for the viability of PKCT.

The importance of competition has been well developed in the various economic reports (as described above). A cost effective port is essential to support the Southern Coalfield operations.

The closure of IMC's operations could cost the local Wollongong region around A$6.4 billion per year in lost regional product and the estimated loss to the Australian economy as a whole could be as high as A$10.7 billion per year (BAEconomics, 2020).

ES2.2 Project Context

The Port Kembla Steelworks was originally developed due to its proximity to the coal mines of the Southern Coalfield.

IMC currently supplies approximately 60% of BlueScope's total hard coking coal requirements.

IMC has designed the mine plan to target areas that would predominantly yield the highest quality metallurgical coal resource (i.e. rather than thermal or pulverized coal injection [PCI] product).

The Project would continue to make use of the existing Kemira Valley Rail Line, which connects the Dendrobium Mine Kemira Valley Coal Loading Facility directly to Port Kembla. The Dendrobium CPP is located in the Port Kembla industrial precinct and IMC pays a fee to BlueScope for the use of the facility.

As such, the Dendrobium CPP is located within the steelworks and is integrated with BlueScope's operations.

Dendrobium Mine's existing direct rail access to the Port Kembla industrial precinct also facilitates the transport of Dendrobium product coal to other Australian customers (including the Liberty Primary Steel Whyalla Steelworks) and international customers, via the PKCT.

Under the Project, Dendrobium Mine product coal would continue to be transported from the PKCT to Australian and international customers.

The continued operation of Dendrobium Mine, should the Project be approved, would support the continued operation of the PKCT.

The effect of underground mining within the Metropolitan Special Area to water resources has been subject to multiple reviews, including the Stored Water Inquiry by Justice Reynolds (Reynolds, 1976), Southern Coalfield Inquiry (NSW Government, 2008a) and reviews by the Independent Expert Panel for Mining in the Catchment (IEPMC).

The most recent review by the IEPMC (2019) concluded there has been no observed material impacts to drinking water supplies due to mining in these catchments, including mining at Dendrobium Mine:

> *Reservoir leakage rates – there is no measured evidence of significant long-term leakage from reservoirs due to mining in the Special Areas.*
>
> *…*
>
> *Watercourse bed leakage (at catchment scale) – from material presented to the Panel, there remains no strong evidence that cracking of watercourse beds leads to significant losses of water at catchment scales relevant for water supplies.*

Further, with respect to potential impacts on water quality in the catchment, the IEPMC (2019) concluded:

> *Although the impact of underground long-wall mining in the catchment could lead to small changes in the levels of impurities in water entering SCA's dams, these changes can be coped with by SW's* [Sydney Water's] *treatment plants as evidence to date does not suggest a sufficiently large change in soluble organic concentrations to be of concern.*

Mining operations and nearby land uses, such as state conservation areas and suburban areas have historically co-existed and this would continue for the Project (e.g. no evidence of significant loss of water, or changes in water quality from mining, of concern to water supply).

The Project would also be developed in a manner that is responsible and considers the benefits and consequences of the development for other land uses, including coexistence with the Metropolitan Special Area.

Therefore, the site is considered suitable for the Project as it would not adversely impact, or be inconsistent with, adjoining existing or future land uses.

ES2.3 Strategic Statement on Coal Exploration and Mining in NSW

The NSW Government's *Strategic Statement on Coal Exploration and Mining in NSW* outlines how the NSW Government will continue to support responsible resource development for the benefit of the State (NSW Government, 2020a).

The Project would be consistent with the *Strategic Statement on Coal Exploration and Mining in NSW* as:

- Dendrobium Mine is a metallurgical coal mine.
- The Project would facilitate the continuation of the approved Dendrobium Mine, represents a logical continuation of the development of Dendrobium Mine within existing mining leases and would support the ongoing financial sustainability of IMC.
- The Project would be developed in a manner that is responsible and considers the benefits and consequences of the development for other land uses, including coexistence with the Metropolitan Special Area.
- The Project decision-making process would be informed by public involvement and participation through the EIS consultation program, public exhibition of the EIS, and assessment of the Project by the Minister in accordance with the EP&A Act.
- The Project incorporates relevant ecologically sustainable development considerations.
- The EIS has been prepared using the best available science, and the Project would incorporate comprehensive management, monitoring and adaptive management.
- Significant returns for society would be generated through:
  - continuation of operational employment at the Dendrobium Mine of approximately 650 personnel, and generation of approximately 50 operational jobs and approximately 100 construction jobs;
  - enabling IMC to continue supporting BlueScope's Australian operations at its Port Kembla Steelworks and the Australian steelmaking industry, including local and regional businesses;
  - enabling IMC to continue supporting the PKCT;
  - State and Commonwealth corporate tax contributions; and
  - payment of coal royalties to the NSW Government over the life of the Project.
- IMC is also committed to ongoing financial support for community projects through the Dendrobium Community Enhancement Program (DCEP).

ES2.4 Alternatives Considered

Clause 192(1)(c) of the EP&A Regulation requires that an EIS must include:

> *(c) an analysis of feasible alternatives to the carrying out of the development, activity or infrastructure, considering its objectives, including the consequences of not carrying out the development, activity or infrastructure*

In addition, the *State Significant Infrastructure Guidelines* (DPIE, 2021a) and SEARs for the Project require consideration of feasible alternatives.

Consideration of key alternatives to the Project is provided in Attachment 11 and summarised below.

The key, feasible alternatives to the Project considered were as follows:

- Consequences of not proceeding with the Project.
- Alternative longwall mining locations within IMC's existing coal tenements.
- Alternative underground mining methods within the Project underground mining area (Area 5).
- Alternative longwall layouts within the Project underground mining area to further avoid directly mining beneath surface features.
- Alternative mine parameters within the Project underground mining area to consider the implications of sub-surface fracturing and potential surface water losses.

Consequences of Not Proceeding with the Project

If the Project did not proceed, while there would be reduced environmental impacts, there would be likely significant adverse socio-economic implications given:

- In the absence of the Project, operations at Dendrobium Mine would most likely cease following the completion of Longwall 23 in Area 3, with associated:
  - Discontinuation of employment opportunities for the existing Dendrobium Mine and the Project, royalty payments, taxes and expenditure with regional businesses.
  - Increased risks to the financial sustainability of the Appin Mine, as continued operation of the Dendrobium Mine via the Project offsets the higher costs of IMC's Appin Mine operations and, as such, supports the financial sustainability of IMC and the broader Southern Coalfield economic ecosystem.
  - Increased risks of impacts on downstream industries in the Southern Coalfield economic ecosystem that currently transport or directly use Project coal, including PKCT and Port Kembla Steelworks.
- There would also be increased risks to the availability of local supplies of metallurgical coal to the Port Kembla Steelworks, given that:
  - Non-IMC coal supplies are not currently approved past 2033, compared to anticipated demand up to approximately 2045 based on BlueScope's recent decision to seek Infrastructure Approval for the Blast Furnace No. 6 Reline Project.
  - As such, while BlueScope may be able to source alternate supplies of metallurgical coal locally, the quantity and longevity of this option is uncertain.
  - It should be noted that, ultimately, decisions around coal supplies and blends as important ingredients for steelmaking lie with the end user and any coal supply arrangement is contingent upon future decisions by and agreements between the end user and supplier as to coal supply. As such, while BlueScope has stated that over 80% of its coal supplies are currently sourced from mines in the Illawarra Region (BlueScope, 2020)[2], with IMC currently supplying approximately 60% of its total hard coking coal requirements, the make-up of specific future coal supplies to the Port Kembla Steelworks is outside of IMC's control. Similarly, decisions by non-IMC operations regarding their product sales is outside of IMC's control.

Alternative Longwall Locations to the Project

Alternative longwall locations, including scenarios involving underground mining larger portions of IMC's existing tenements compared to the Project, which could result in increased resource recovery, may also result in associated increased economic, environmental and social impacts.

While these alternative locations could potentially meet the Project objective of continuity of mining, it is considered they would not meet the Project objective of addressing the concerns raised by the IPC.

Accordingly, these alternatives were not adopted for the Project.

Alternative Underground Mining Methods within the Project Underground Mining Area

Bord and pillar mining would not be economic for the Project as longwall mining is the only economic primary production method in Australia to use at depths from the surface that are greater than about 200 m (Department of Planning [DoP], 2008). Therefore, bord and pillar mining would not meet the Project objective of continuity of mining.

The consequences of not carrying out the Project are described above. Accordingly, alternative mining methods were not adopted for the Project.

2 BlueScope Steel Limited (2020) Dendrobium Mine Extension Project Submission - Submission to Independent Planning Commission.

Alternative Longwall Layouts within the Project Underground Mining Area

The Project has already significantly reduced potential impacts compared to the previous application, including an approximately 60% reduction in mining area, no mining beneath 3rd order and above streams, no mining beneath previously identified high archaeological (scientific) significance Aboriginal heritage sites and reduction in number of Aboriginal heritage sites directly mined beneath from 22 to six sites, and is therefore considered to address the concerns raised by the IPC.

Reductions in longwall layout to further reduce potential impacts to surface features are not considered reasonable and feasible as:

- Avoidance of streams defined as "significant" by WaterNSW and upland swamps would result in a mine plan that is not economically viable:
  - These alternatives would not meet the Project objective of continuity of mining.
  - The consequences of not carrying out the Project are described above.
  - Accordingly, these alternatives were not adopted for the Project.
- Any mine design seeking to achieve no risk of potential impacts to Aboriginal cultural heritage may not be economically viable:
  - Avoidance of directly mining beneath previously identified Aboriginal heritage sites (which are identified as having low or medium archaeological [scientific] significance) would result in a decrease in resource recovery and a mine plan that may be less economically viable, and would not achieve no risk of potential impact.
  - There are other factors that affect potential impacts to cultural values, for example potential impacts to streams, and for some stakeholders, any mining development may be considered to impact intangible cultural values.
  - This alternative would not meet the Project objective of continuity of mining and/or would not materially change the Project objective relating to addressing the IPC concerns or minimising potential impacts.
  - Accordingly, this alternative was not adopted for the Project. It is noted that the longwall layout for the Project results in a reduction in the number of Aboriginal heritage sites directly mined beneath from 22 to six sites in comparison to the previous application (with the likelihood of direct impacts to these six sites expected to be approximately 1 in 10, based on extensive monitoring of subsidence related impacts to heritage sites).

Alternative Mine Parameters within the Project

The Project has already significantly reduced potential surface water impacts compared to the previous application, and is therefore considered to address the concerns raised by the IPC:

- As the Project targets areas of relatively higher depth of cover and lower cutting height (in the Bulli Seam), there is no predicted seam-to-surface fracturing (or free drainage) when calculated using the Tammetta Equation.
- There is an estimated reduction of approximately 78% in peak annual surface water losses for the Project compared to the previous application.
- IMC proposes that surface water offsets would be provided for the Project, consistent with the terms agreed with the NSW Government for the previous application.

Reductions in longwall width and/or cutting height to limit the predicted height of connective fracturing would adversely affect the financial sustainability of the Project and are not considered reasonable and feasible given that:

- Significant reductions in longwall widths/cutting heights to limit the predicted height of fracturing using the Tammetta Equation to below the Bald Hill Claystone would not be financially sustainable, given the significantly increased operating costs and reduced resource recovery.
- Marginal reductions in longwall width/cutting heights are not expected to materially change potential surface water losses (i.e. surface water losses would occur and surface water offsets would be required).

- Accordingly, these alternatives do not satisfy the Project objectives of maintaining longwall continuity and/or would not materially change the Project objectives to address the IPC's concerns and minimise potential impacts. The consequences of not carrying out the Project are described above.
- It is noted that subsidence-related effects for reduced longwall width and cutting height would still be sufficient to result in impacts and consequences to surface features (adverse environmental impacts are still anticipated for reduced longwall widths down to approximately 150 m) and, as such, these alternatives would not satisfy the Project objective of further minimising impacts in the Metropolitan Special Area. Consideration of alternative mine layouts is provided above.

Accordingly, these alternatives were not adopted for the Project.

ES3 APPROVAL PROCESS

ES3.1 New South Wales

The EP&A Act and EP&A Regulation set the framework for planning and environmental assessment in NSW.

In December 2021, the Minister declared the Project to be SSI. As the Project was declared SSI under section 5.12 of the EP&A Act, approval for the Project will be sought under the SSI provisions (i.e. Division 5.2) under Part 5 of the EP&A Act.

This EIS has been prepared to accompany an Infrastructure Approval Application made for the Project, in accordance with Part 5 of the EP&A Act.

This EIS considers the potential environmental impacts of the Project in accordance with the SEARs issued by the DPE.

The Minister is the approval authority for SSI (including the Project) under Part 5 of the EP&A Act.

Mining activities for the Project would be carried out within existing mining leases, and therefore no mining leases are required to be issued under the *Mining Act 1992* to enable the Project to be carried out.

ES3.2 Commonwealth

IMC referred the relevant elements of the Project to the Federal Minister for the Environment in November 2021 (EPBC 2021/9115) (the proposed Action). A delegate of the Federal Minister determined on 13 January 2022 that the proposed Action is a "controlled action" and, therefore, the Action requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The proposed action is to be assessed pursuant to the NSW Assessment Bilateral Agreement between the Commonwealth of Australia and the State of NSW. Therefore, this EIS provides an assessment of potential impacts on the following controlling provisions considered by the Federal Minister to be relevant to the action:

- threatened species and communities listed under the EPBC Act; and
- water resources.

ES3.3 Determination

Following public exhibition of this EIS by the DPE, submissions from the community and government agencies will be addressed by IMC.

The Project will then be determined by the Minister under the EP&A Act.

Following completion of the NSW assessment process, the Project will then also be determined by the Commonwealth Minister for the Environment under the EPBC Act.

ES4 THE PROJECT

There has been no previous mining in the proposed Project underground mining area. However, Figure ES-1 illustrates that underground coal mining in the Metropolitan Special Area has been extensive, and the Project is an extension to this previous development.

Previous underground mining in the vicinity of the Project has included:

- Kemira Colliery;
- Wongawilli Colliery;
- Nebo Colliery;
- Elouera Colliery;

- Cordeaux Colliery;
- Corrimal Colliery; and
- Dendrobium Mine.

Historically, mining was carried out using bord and pillar methods; however, more recently, coal has been extracted using longwall mining methods at Corrimal, Cordeaux, Kemira and Elouera Collieries, and at the existing Dendrobium Mine (Section ES2.4).

Underground coal mining is currently the only major revenue-generating industry that is both compatible with the catchment status of the Project area, and permissible with approval.

ES4.1 Interactions with the Approved Dendrobium Mine

Approved Dendrobium Mine

The existing operations at Dendrobium Mine are undertaken in accordance with Development Consent DA 60-03-2001 (as modified), as well as the Approval Decision (EPBC 2001/214) under the EPBC Act.

Dendrobium Mine currently extracts coal from the Wongawilli Seam (also known as the No. 3 Seam) within Consolidated Coal Lease (CCL) 768 using underground longwall mining methods. Dendrobium Mine includes the following:

- five approved underground mining domains, named Areas 1, 2, 3A, 3B and 3C (longwall mining is currently being undertaken in Area 3B, with extraction largely complete in Areas 1, 2 and 3A);
- approved operational capacity of up to 5.2 million tonnes per annum (Mtpa) of ROM coal; and
- approved mine life until 31 December 2030.

Key surface facilities at Dendrobium Mine include the:

- Dendrobium No 1 Shaft Site and No 2 and 3 Shaft Sites (i.e. ventilation shafts);
- Dendrobium Pit Top;
- Kemira Valley Coal Loading Facility;
- Kemira Valley Rail Line;
- Dendrobium CPP located at Port Kembla; and
- West Cliff Stage 3 Coal Wash Emplacement Area[3].

The general arrangement of the approved Dendrobium Mine is shown on Figure ES-2.

There is uncertainty regarding the ability to extract the remaining resource in the approved Area 3C and the timing, which is contingent on IMC's ability to effectively drain gas from the seam to achieve levels which facilitate safe extraction of the resource.

IMC is seeking a modification (Modification 9) to the existing Dendrobium Mine Development Consent DA 60-03-2001 for the development of gas management infrastructure to effectively drain the gas from approved Area 3C.

Area 3C would be mined under Development Consent DA 60-03-2001 (as modified); however, as the approved mine life of Dendrobium Mine under Development Consent DA 60-03-2001 is 31 December 2030, the necessary extension to the operational life of Dendrobium Mine under Development Consent DA 60-03-2001 to allow mining in the majority Area 3C (i.e. areas where there is currently high gas content) after 31 December 2030 would be subject to a separate application for approval.

Accordingly, in the absence of the Project there will be longwall discontinuity and, therefore, no production from Dendrobium Mine for an extended period (i.e. due to the uncertainty and timing required to effectively drain gas from Area 3C), which may potentially make Dendrobium Mine and IMC less financially sustainable.

Interactions with the Approved Appin Mine

Historically, the Dendrobium Mine has delivered lower operating costs (than the Appin Mine) making a significant contribution to the overall financial sustainability of IMC.

Therefore, the continued operation of the Dendrobium Mine via the Project would continue to support the financial sustainability of IMC and the broader Southern Coalfield economic ecosystem.

[3] Operated under Project Approval 08_0150 for the Appin Mine.

ROM coal from Appin Mine would continue to be transported to the West Cliff CPP for processing, however, it could also be transported to the Dendrobium CPP for processing, if required (consistent with Project Approval 08_0150).

Development and rehabilitation of the West Cliff Stages 3 and 4 Coal Wash Emplacement Area[4] would continue to be conducted in accordance with Project Approval 08_0150 for Appin Mine, with current approval for use until 31 December 2041.

The currently approved West Cliff Coal Wash Emplacement Area has sufficient capacity for the Project and other IMC operations. This is partly due to IMC's supply of coal wash for engineering purposes (e.g. civil construction fill), or for other beneficial uses, reducing the quantity of coal wash required to be emplaced at the West Cliff Coal Wash Emplacement Area (Figures ES-6 and ES-7).

Therefore, there is no proposed change to the capacity, extent, height, final landform or rehabilitation of the West Cliff Stage 3 and Stage 4 Coal Wash Emplacement Area required for the Project.

Interactions with the Port Kembla Steelworks

BlueScope owns and operates the Port Kembla Steelworks in the Wollongong LGA. The Port Kembla Steelworks is located on approximately 742 hectares (ha) of land adjacent to Port Kembla Harbour and operates under a number of approvals.

The Dendrobium CPP is located within the Port Kembla Steelworks and is integrated with its operations. Metallurgical coal from IMC's operations that is sold to BlueScope for steelmaking would continue to be transported to operations within the Port Kembla Steelworks via infrastructure operated by BlueScope. The handling and use of IMC's metallurgical coal at BlueScope's operations beyond the Dendrobium CPP would occur in accordance with the approvals for the Port Kembla Steelworks, and these activities are not part of the Project.

Plate ES-2 – Port Kembla Industrial Complex

The Project would produce metallurgical coal for steelmaking.

The proximity of the Southern Coalfield metallurgical coal mines is a major factor in BlueScope's ability to make steel economically.

Interactions with the Port Kembla Coal Terminal

The PKCT operates in accordance with Project Approval 08_0009 (Figure ES-6). It receives coal from a number of operations in the region via a combination of public and private roads and rail.

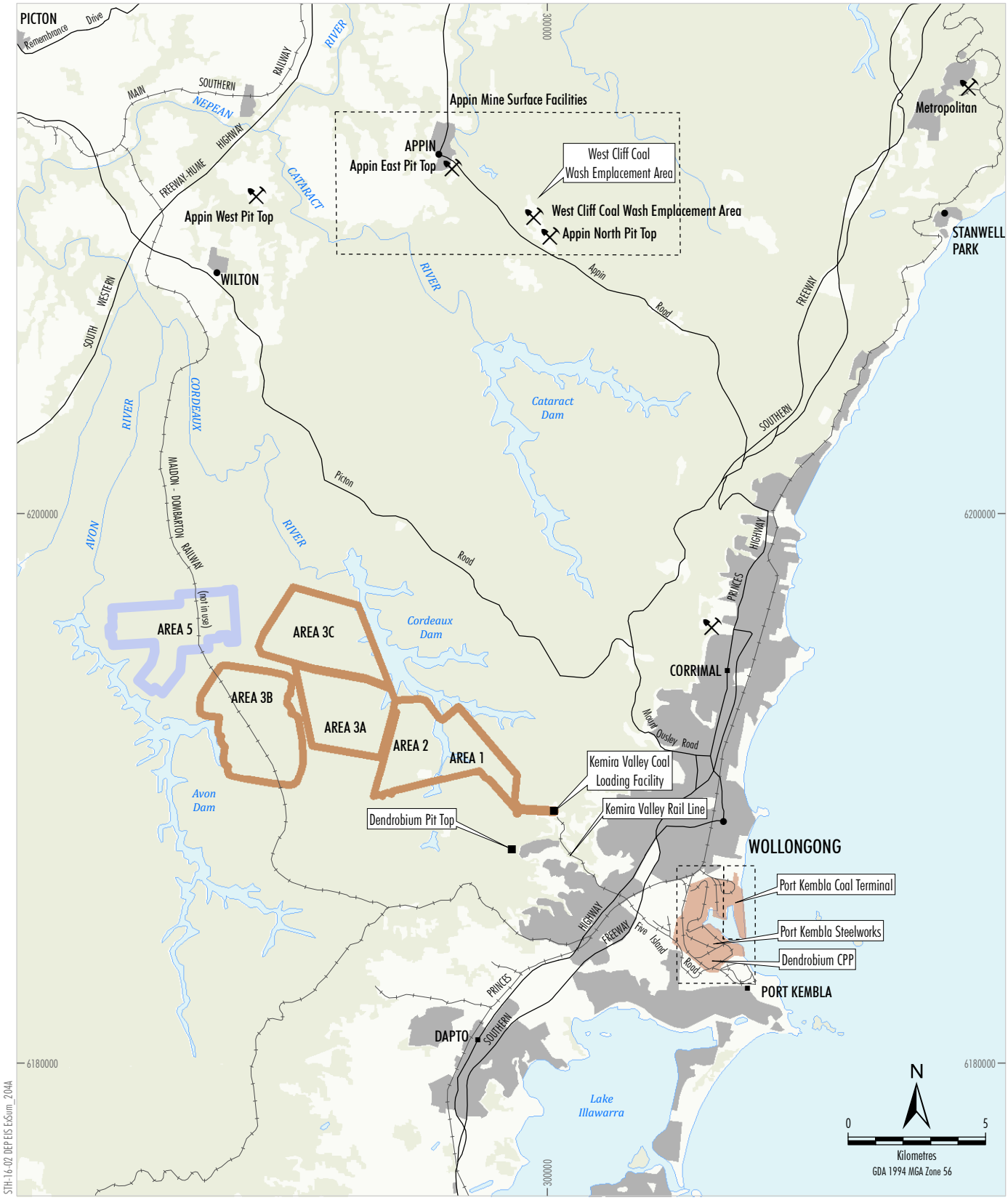
Metallurgical coal from the Project to be sold for export would be transported to the PKCT via private roads within the Port Kembla Steelworks, where it would be stockpiled for transport to Liberty Primary Steel Whyalla Steelworks or for export.

The handling and stockpiling of Project metallurgical coal at the PKCT would occur in accordance with the approvals for the PKCT, and these activities are not part of the Project.

Metallurgical coal from IMC's operations currently accounts for the majority of throughput at the PKCT.

If the Project were not to proceed it would adversely affect the financial sustainability of the PKCT.

[4] Stage 4 not yet commenced.



STH-16-02 DEP FIS ESum_2044

LEGEND

- Road
- Railway
- Urban Area
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Proposed Project (SS1-33143123)

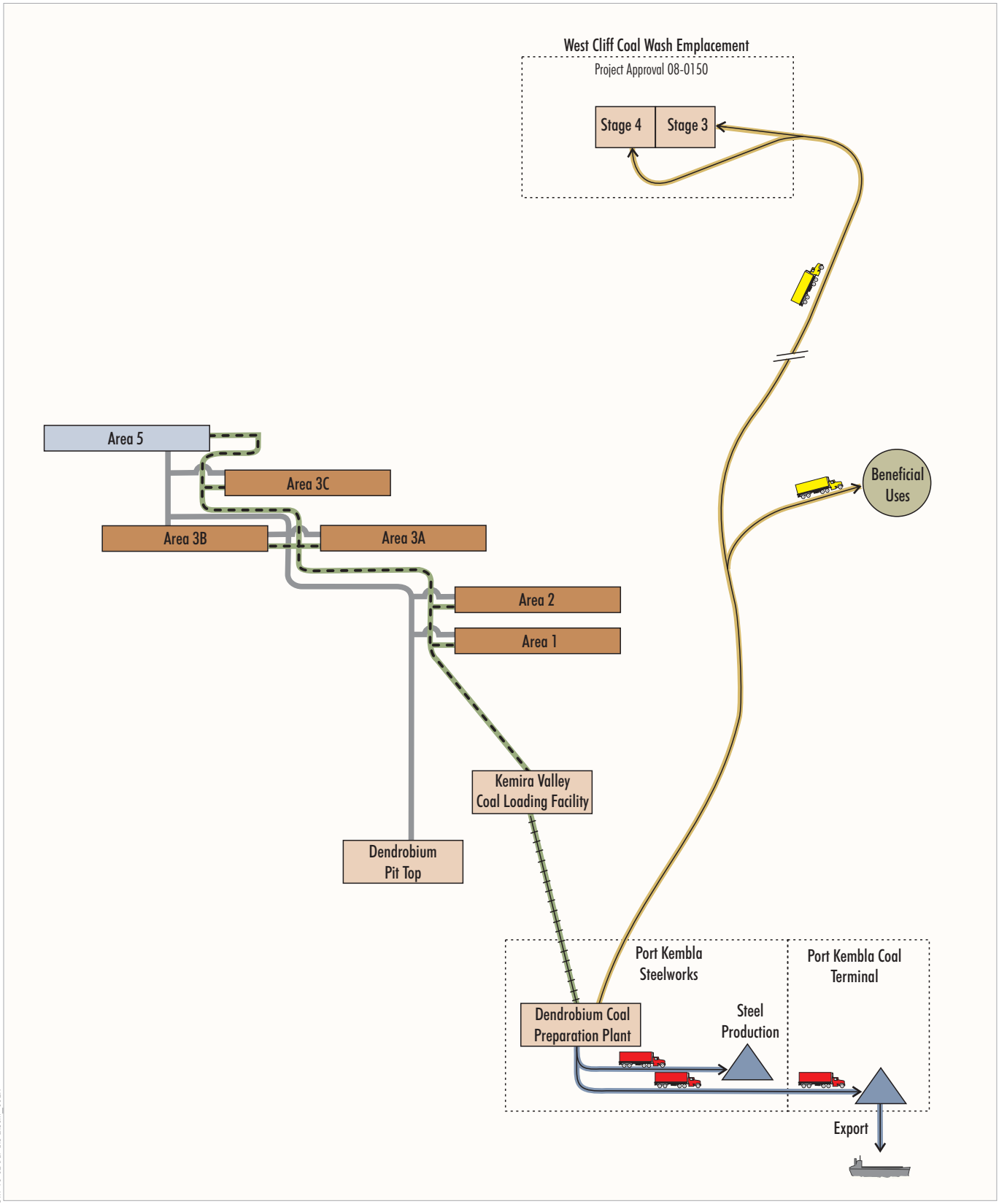
Source: Geoscience Australia, 2006; Department of Industry (2018); Department of Finance, Services & Innovation (2018);

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Materials Handling Spatial Relationship

Figure ES-6



Not to Scale

LEGEND

- Illawarra Coal Surface Facility Area
- Dendrobium Underground Mining Area - Proposed Project (SSI-33143123)
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Men & Materials - Underground
- ROM Coal
- Product Coal
- Coal Wash
- Third Party Product Coal Storage
- Road Transport - Surface
- Rail Transport - Surface
- Conveyor Transport - Underground
- Road Transport Private Roads
- Road Transport Public Roads

SOUTH32 Illawarra Coal

DENDROBIUM MINE

Material Handling Schematic Flowsheet

Figure ES-7

ES4.2 Project Summary

The Project underground mining area would be located wholly within CCL 768. No additional mining tenements are required for the Project.

The Project would support the extraction of approximately 31 Mt of ROM coal in total. The Project is required to facilitate the continuation of Dendrobium Mine with longwall panels of up to 305 m void width. Extraction heights in the Bulli Seam in Area 5 would be up to 3.2 m and would occur at depths of 250 m to 390 m below the surface.

The Project does not include the approved underground mining operations in the Wongawilli Seam in Areas 1, 2, 3A, 3B and 3C at the Dendrobium Mine (Figure ES-2) and associated surface activities (such as monitoring and remediation). These operations would continue to operate in accordance with Development Consent DA 60-03-2001 (as modified).

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 Mtpa of ROM coal;
- extension of underground mining operations within Area 5 until approximately 2035;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium CPP and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- handling and processing of coal from Dendrobium Mine (including the Project) and IMC's Appin Mine (if required) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the PKCT;
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and Stage 4 Coal Wash Emplacement Area;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement Area (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure;
- controlled release of excess water (similar to the current regime in the Environmental Protection Licence [EPL] 3241) and/or beneficial use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

The location of the Project underground mining area relative to other historical mine workings is shown on Figure ES-1. The proximity of the existing Dendrobium Mine materials handling facilities to the urban areas of Wollongong is also shown on Figure ES-6.

Table ES-1 provides a comparative summary of activities associated with the Project compared to the approved Dendrobium Mine.

Table ES-1
Summary Comparison of the Approved Dendrobium Mine and the Project

Component	Approved Dendrobium Mine (DA 60-03-2001)	Project
Mine Life	Until 31 December 2030.	Until 31 December 2041[2].
Mining Method	Underground extraction using longwall mining methods.	No change.
Resource	Mining of the Wongawilli Seam in Areas 1, 2, 3A, 3B and 3C within CCL 768.	Approximately 31 Mt of additional ROM coal within the Bulli Seam in Area 5 within CCL 768.
Annual Production	Handling and processing of up to 5.2 Mtpa of ROM coal.	No change.
Coal Handling and Processing	Transport of coal from underground workings to the Kemira Valley Coal Loading Facility via an underground conveyor network. Sizing and stockpiling of coal at the Kemira Valley Coal Loading Facility prior to transport to the Dendrobium CPP via the Kemira Valley Rail Line, in accordance with the approved hours of operation. Processing of up to 5.2 Mtpa of sized ROM coal at the Dendrobium CPP.	No change.
Management of Mining Waste	Transportation of up to approximately 1.1 Mtpa of coal wash by road from the Dendrobium CPP to the West Cliff Stage 3 and Stage 4[1] Coal Wash Emplacement Area. Development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement Area. Supply of coal wash to customers for engineering purposes (e.g. civil construction fill) or for other circular economy opportunities (e.g. beneficial uses).	No change. No change. No change.
General Infrastructure	• Dendrobium Pit Top. • Kemira Valley Coal Loading Facility. • Kemira Valley Rail Line. • Dendrobium CPP. • Dendrobium Shaft Nos 1, 2 and 3. • West Cliff Stage 3 Coal Wash Emplacement Area.	Continued use of existing infrastructure with minor upgrades and extensions. Development of new surface infrastructure associated with mine ventilation and gas management and abatement at Shaft Site No. 5A to support underground mining operations in Area 5, and other ancillary infrastructure (including electricity transmission line [ETL] to proposed mine ventilation infrastructure) and minor fire trail upgrades. Development of additional carpark facilities.
Product Transport	Delivery of product coal from the Dendrobium CPP to the BlueScope Port Kembla Steelworks or to PKCT for transport to Liberty Primary Steel Whyalla Steelworks or for export.	No change.

Table ES-1 (Continued)
Summary Comparison of the Approved Dendrobium Mine and the Project

Component	Approved Dendrobium Mine (DA 60-03-2001)	Project
Water Management	Water management infrastructure to separate clean, oily and dirty water. Use of a combination of recycled treated mine water and potable water purchased from Sydney Water in underground and surface operations. Release of water in accordance with the conditions of EPL 3241.	No change (with augmentations and extensions to existing water management infrastructure as required). No change. No change (release volumes and release infrastructure to be modified as required based on Project mine inflow rates). Development of temporary water supply infrastructure for construction water supply for Shaft Site No. 5A. Provision of offsets (funding of "indirect" offsets) for predicted surface water take as a result of the Project, that would result in a net gain to Metropolitan water supplies.
Workforce	Current workforce of approximately 650 operational personnel.	At full development, the Project would employ approximately 700 operational personnel (650 existing workforce, additional 50 workforce for the Project). Up to approximately 100 personnel would also be required for construction and development activities.
Hours of Operation	Operated on a continuous basis, 24 hours per day, seven days per week. Trains do not travel on the Kemira Valley Rail Line between 11.00 pm and 6.00 am, unless written approval is obtained from the NSW Environment Protection Authority (EPA) for emergency use of the rail line.	No change.

1 Development and rehabilitation of the West Cliff Coal Wash Emplacement Area would continue to be conducted in accordance with Project Approval 08_0150 for the Appin Mine.

2 Area 5 mine life to approximately 2035. Use of surface infrastructure that forms part of the Project proposed to continue until 2041 to allow receipt of coal mined in approved Area 3C, and the potential for receipt of Appin Mine coal (if required) to the end of the currently approved Appin Mine life under Project Approval 08_0150.

The Project underground mining area is located within the catchments of the Avon and Cordeaux Rivers, which are part of Sydney's drinking water catchment. These catchments are included within the Metropolitan Special Area (a WaterNSW Special Area) declared under the NSW *Water NSW Act 2014* (Figure ES-1).

Refined groundwater modelling for the Project indicates there would be an approximate 78% reduction in peak annual surface water losses from the Metropolitan Special Area (compared to the previous application).

ES4.3 Project Construction

The Project would use existing pit tops and supporting infrastructure. Additional infrastructure and upgrades to existing infrastructure that are required to support the Project would be progressively developed in parallel with ongoing mining operations, including:

- development of underground roadways, coal clearance infrastructure and other ancillary infrastructure required to access and support the Project underground mining area;
- underground mining machinery replacement and upgrades;
- development and augmentation of mine ventilation infrastructure;
- additional gas management and abatement infrastructure;
- upgrades to the Dendrobium Pit Top and decommissioning and removal of redundant infrastructure;
- ongoing maintenance and upgrades of the Kemira Valley Rail Line and water management infrastructure;
- upgrades and replacement of infrastructure at the Dendrobium CPP and removal of redundant infrastructure;
- development of additional electricity supply infrastructure;
- development of additional water supply infrastructure;
- development of additional carparking facilities; and
- minor augmentations and upgrades of other surface facilities.

The capital investment value of the Project is approximately $853 million (in real terms).

The Project would provide for the continuation of support for local suppliers through ongoing expenditure.

Additional surface infrastructure for the Project have been sited in close proximity to, or within, existing fire trails to minimise land disturbance associated with vehicle access, and each site was designed to avoid disturbance of threatened ecological communities and upland swamps.

Additional surface infrastructure for the Project has also been designed to avoid all previously identified Aboriginal heritage sites.

ES4.4 Mining Operations

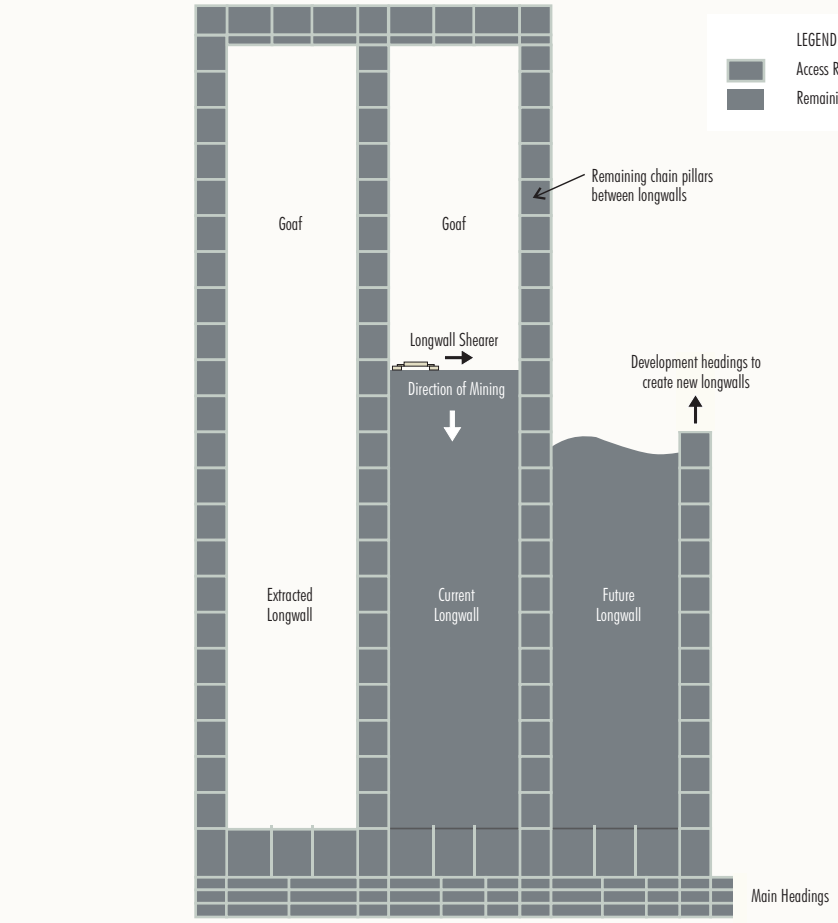
The Project involves longwall mining operations within CCL 768 to extract the Bulli Seam in Area 5.

The underground mining operations for the Project would extract approximately 31 Mt of ROM coal from Area 5 up to a rate of 5.2 Mtpa of ROM coal.

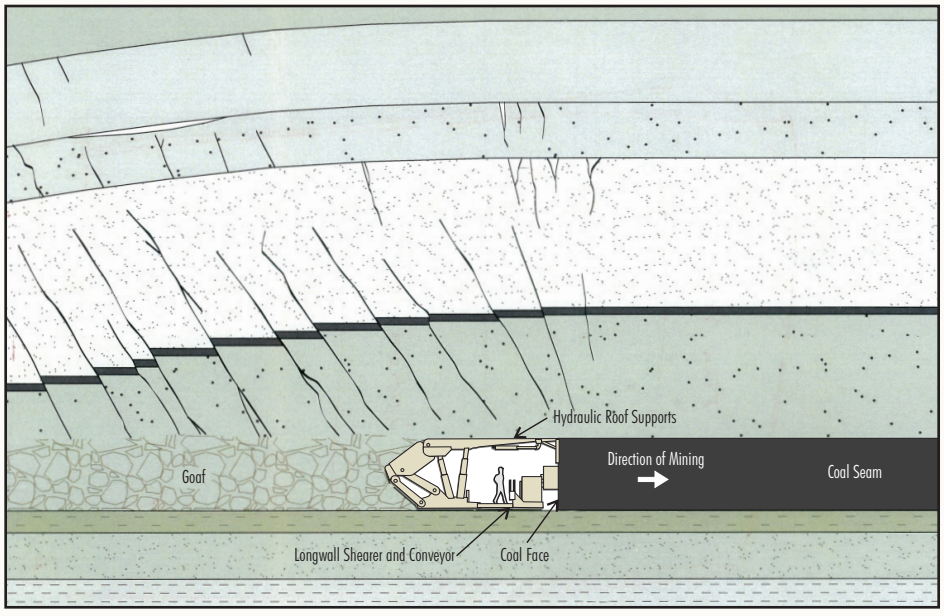
Underground mining operations would be conducted on a continuous basis, 24 hours per day, seven days per week.

Longwall mining involves the extraction of rectangular panels of coal defined by underground roadways constructed around each longwall. The longwall mining machine travels back and forth across the width of the coal face, progressively removing coal in slices from the panel. Once each slice of coal is removed from the longwall face, the hydraulic roof supports are moved forward, allowing the roof and a section of the overlying strata to collapse behind the longwall machine (referred to as forming “goaf”) (Figure ES-8).

Extraction of coal by longwall mining methods results in the vertical and horizontal movement of the land surface. The land surface movements are referred to as subsidence effects. The type and magnitude of subsidence effects are dependent on a range of variables that include the mine geometry and topography, the depth of mining, the number of seams mined, the coal recovery from each seam, the nature of overlying strata and other geological factors. The subsidence effects pertinent to the Project include non-conventional and systematic subsidence movements.



Plan View



Section View

Source: After Hansen Consulting (2008)

STH-16-02 DEP EIS ExSum_001A

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Longwall Mining Method - Conceptual Cross Section and Plan

Figure ES-8

Project Mine Design

Mining Method

Dendrobium Mine currently uses conventional longwall underground mining methods, which would be continued for the Project.

Longwall Layout

The Project underground mining area (Area 5) is constrained by the extent of CCL 768 to the west and north and the extent of the approved Area 3 (under Development Consent DA 60-03-2001) to the east.

In the Project underground mining area (i.e. Area 5), it is not feasible to extract metallurgical coal resource in the Wongawilli Seam (i.e. the seam mined at the existing Dendrobium Mine) due to the presence of sills.

Area 5 is also constrained by igneous intrusions in the Bulli Seam to the north and east, Avon Dam to the south and Avon River to the west.

IMC has designed the mine plan to target areas that would predominantly yield the highest quality metallurgical coal resource (i.e. rather than thermal or PCI coal product).

Longwall Design Features

Longwalls for the Project would have panel widths of approximately 295 m with a 5 m wide gate road either side, resulting in a void of approximately 305 m consistent with the existing Dendrobium Mine. The extraction height is determined by the seam thickness of the Bulli Seam, which ranges between approximately 2.1 m to 3.2 m in Area 5.

IMC has identified a number of key natural and built features in the vicinity of CCL 768 that may be susceptible to subsidence impacts. These features would *not* be mined beneath and the Project has incorporated minimum setbacks from these features.

The location of these key features and an example of how these longwall constraints have been applied is shown on Figure ES-9.

Final Project longwall layouts would be subject to review and approval as a component of future Extraction Plans developed in consultation with the relevant authorities and to the satisfaction of the Secretary of the DPE.

IMC would also implement an adaptive management approach to achieve any relevant performance measures to maintain the safety and serviceability of surface infrastructure during the life of the Project.

Adaptive management would involve the monitoring and periodic evaluation of environmental consequences against subsidence performance measures and, if necessary, mitigation measures and/or the mine design and mining extent may be adjusted to achieve the Infrastructure Approval performance measures to maintain the safety and serviceability of surface infrastructure and other performance measures during the life of the Project.

Indicative Mining Schedule

An indicative mining schedule for the Project is presented in Section 4 and is based on the planned maximum ROM coal production rate of 5.2 Mtpa.

The actual timing and mining sequence may vary in consideration of localised geological features, coal quality characteristics, detailed mine design, mine economics, market volume requirements, and/or adaptive management requirements.

Underground Access and Development

Personnel and materials access to Area 5 would be from the Dendrobium Pit Top and the Dendrobium Tunnel (Figure ES-7).

An access/egress winder and/or crane pad would also be installed at the proposed ventilation shaft site to facilitate emergency transportation to/from the underground mining operations.

Underground main roads would be developed to access and support the Project underground mining areas (i.e. for access, ventilation and coal clearance).

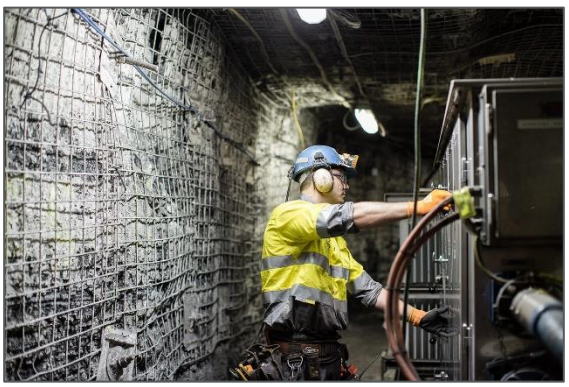
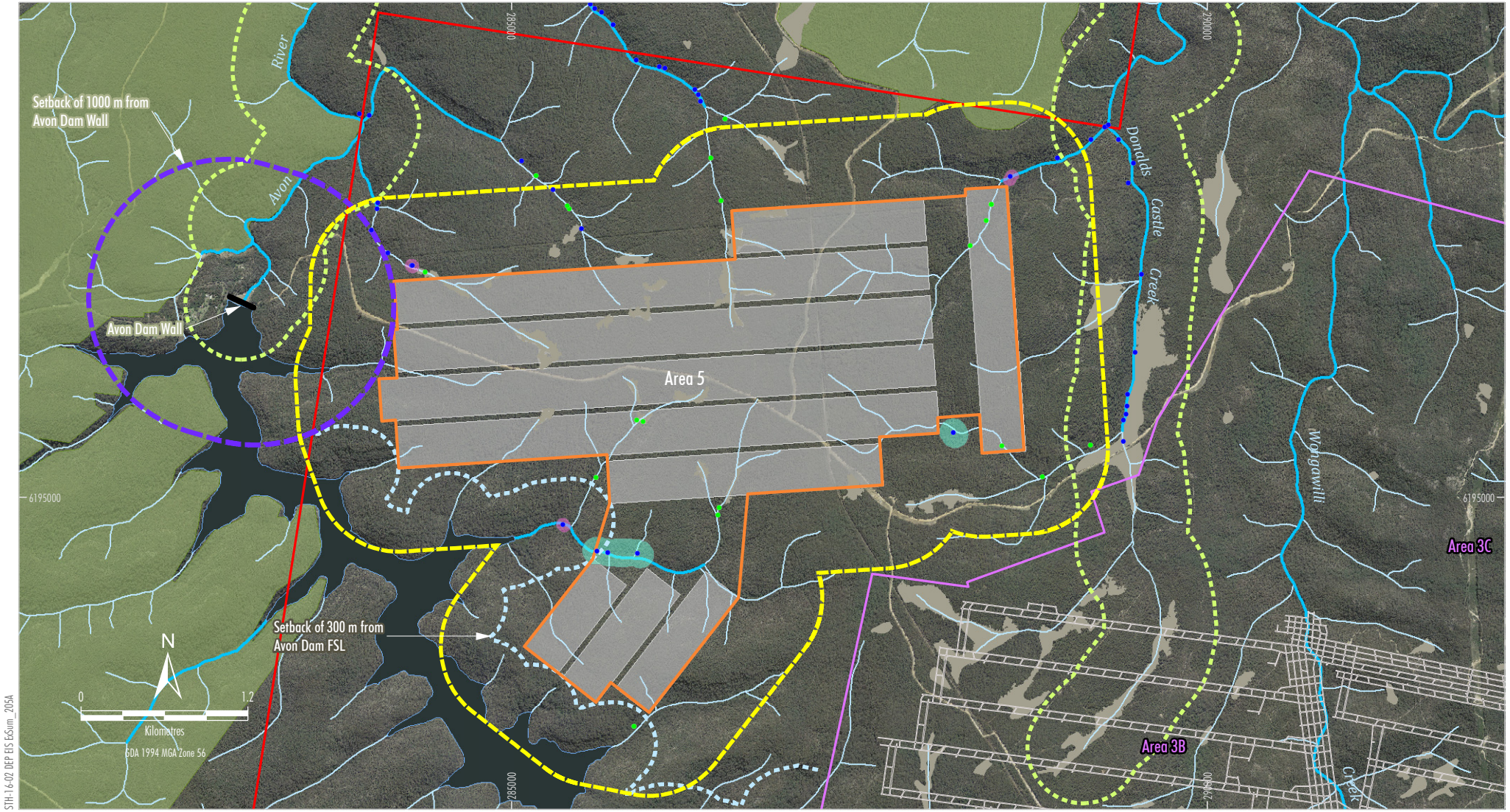


Plate ES-3 – Underground Facilities



LEGEND

- Dendrobium Mining Lease
- Road
- National Park, Nature Reserve and State Conservation Area
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Extension Project
- Coastal Upland Swamp
- Streams -3rd and Higher Order
- Streams -1st and 2nd Order
- Dam Wall Setback (1 km)
- 300 m Full Supply Level Setback
- 400 m Buffer for Regulated and Named Watercourses
- Key Stream Features
- 50 m Offset for Key Stream Features
- 100 m Offset for Key Stream Features
- Additional Stream Features
- Study Area Based on 600 m Boundary

Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018)

SOUTH32
Illawarra Coal

DENDROBIUM MINE

Project Mining Constraints for Named Watercourses, Key Stream Features and Water Supply Infrastructure

Figure ES-9

Plate ES-4 – Kemira Valley Coal Loading Facility

ROM Coal Handling

ROM coal would be transported from the Project underground operations to the Kemira Valley Coal Loading Facility via an underground conveyor network, reaching the surface via the Kemira Valley Tunnel.

ROM coal would continue to be temporarily stockpiled at the Kemira Valley Coal Loading Facility before being loaded onto trains for transport to the Dendrobium CPP.

Up to 5.2 Mtpa of ROM coal would be handled at the Kemira Valley Coal Loading Facility over the life of the Project.

A material handling schematic for the Project, showing the handling of ROM coal, product coal and coal wash is shown on Figure ES-7.

Mine Ventilation

Ventilation shafts, fans and associated surface infrastructure would be required for the Project to maintain a safe working environment within the underground workings.

The existing No 1 Shaft Site and No 2 and 3 Shaft Sites would continue to ventilate the Project underground mining area.

The Project would also involve the development of an additional ventilation shaft site to support Area 5 (Shaft Site No. 5A). The ventilation shaft site would include a downcast and an upcast ventilation shaft during the life of the Project.

Gas Management

Pre-mining gas drainage, and post-mining gas drainage would be undertaken for the Project to reduce the gas content in the coal seam and in the underground mining area to levels suitable for safe underground mining operations.

Centralised gas management infrastructure would be constructed at No 2 and 3 Shaft Site and/or Shaft Site No. 5A.

Gas would be flared or, if the gas is too low in methane content for flaring (or for other operational reasons), vented to the atmosphere.

Gas monitoring systems would be implemented for the Project to monitor gas composition of the air in the underground workings to maintain a safe working environment.

ES4.5 ROM Coal Transport

Up to 5.2 Mtpa of ROM coal from Areas 5 and 3 would be transferred to the surface at the Kemira Valley Coal Loading Facility via the Kemira Valley Tunnel.

The Kemira Valley Rail Line is a private rail line, approximately 9 km long. ROM coal would continue to be transported from the Kemira Valley Coal Loading Facility to the Dendrobium CPP at Port Kembla via the Kemira Valley Rail Line (Figures ES-6 and ES-7).

Train movements on the Kemira Valley Rail Line would continue to be limited to between 6:00 am and 11:00 pm.

ES4.6 Coal Processing and Product Coal Transport

After train unloading, sized ROM coal would be temporarily stockpiled at the Dendrobium CPP or fed directly into the CPP for processing at a rate of up to 5.2 Mtpa.

The Dendrobium CPP would produce the following main streams:

- metallurgical coal;
- energy coal; and
- coal wash.

Product coal would be transported from the Dendrobium CPP to the BlueScope Port Kembla Steelworks for use in the steelmaking process or to the PKCT for transport to Liberty Primary Steel Whyalla Steelworks or export.

ROM coal from the Appin Mine would continue to be transported to the West Cliff CPP for processing; however, it could also be transported to the Dendrobium CPP for processing, if required (consistent with Project Approval 08_0150).

All product coal transportation would be via private internal roads within the Port Kembla industrial precinct.

ES4.7 Coal Wash Management

Over the life of the Project, approximately 5.2 Mt of additional coal wash would be produced at Area 5 from processing of coal from the Project underground mining area.

The West Cliff Coal Wash Emplacement Area already has approved capacity to accommodate the disposal of Project coal wash material, and this capacity would be supplemented by a range of beneficial re-use opportunities for the coal wash (e.g. civil construction fill), as is currently occurring for coal wash produced by the approved operations.

ES4.8 Water Management

The Project would involve the use of the existing water management infrastructure with minor augmentations and extensions, including the progressive development of sumps, pumps, pipelines, water storage and other water management infrastructure.

The underground mining operations for the Project would be supported by water management systems to transfer accumulated water from the underground workings directly into the Nebo workings and/or the Kemira workings, which act as water storage areas for Dendrobium Mine.

Excess mine water that accumulates at the Kemira Valley Coal Loading Facility from the underground mine workings would continue to be discharged via the existing licensed discharge point to Allans Creek. IMC is currently investigating options for the beneficial use of excess mine water with major water users in the Illawarra.

ES4.9 Infrastructure and Services

Existing surface infrastructure and services would continue to be used throughout the Project life, with required upgrades and extensions.

Surface infrastructure and services would continue to operate 24 hours per day, seven days per week (except where existing curfews are in place, such as avoiding rail movements along the Kemira Valley Rail Line between 11:00 pm and 6:00 am).

The Project would continue to use existing access roads at the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Cordeaux Pit Top, Dendrobium CPP and No 1 Shaft Site and No 2 and 3 Shaft Sites.

A new access road would be constructed off Cordeaux Road to service the proposed additional carparking area for the Dendrobium Pit Top, with new pedestrian access (e.g. pedestrian road crossing). Access roads would also be developed or improved for the Shaft Site No. 5A, as required. IMC would consult with the local community on the proposed design of the additional carparking area for the Dendrobium Pit Top.

During construction of Shaft Site No. 5A, a temporary carparking facility would be required to accommodate the construction workforce, which is proposed to be located at either the existing Cordeaux Dam Picnic Area carpark, or within a cleared road verge/fire break management area adjacent to the Cordeaux Dam Access Road.

IMC would consult with WaterNSW regarding the selection of the final construction carpark location for the Project.

Coal wash from the Dendrobium CPP would continue to be hauled to the West Cliff Coal Wash Emplacement Area and to customers for beneficial use in the region via the public road network.

The Endeavour Energy high voltage distribution network would continue to supply most of the electricity requirements of the Project.

Electricity for the Project underground mining operations would be distributed via the existing substation located adjacent to the Kemira Valley Coal Loading Facility. Electricity would be reticulated to the underground mining operations through cables running along the coal conveyor route. An additional transformer and other associated works would be required at Kemira Valley over the life of the Project.

Construction power supply for Shaft Site No. 5A would be via a new private 33 kilovolt (kV) ETL proposed along Fire Trail 6 (primarily within existing disturbed areas) connecting the site to the existing Endeavour Energy 33 kV line at a location proximal to Cordeaux Dam wall.

As the mining operations progress, additional service boreholes may be installed, if required, and would generally be located in or adjacent to existing cleared areas , resulting in minimal additional land disturbance at the surface.

ES4.10 Workforce

The Project would provide continuation and extension of employment for the existing Dendrobium Mine workforce of approximately 650 personnel and provide an estimated 50 additional jobs during operations and 100 additional jobs during construction and development.

It is estimated that the Project operational workforce would peak in 2029.

Additional short-term contractors would also be required during the operational life of the Project; for example, for conveyor installations, during longwall change-outs, and at the Dendrobium CPP during shutdown maintenance activities.

It is anticipated that the operational workforce would be augmented during the Project to accommodate additional development units and additional gas management works. This would continue to include a combination of IMC staff and on-site contractor personnel.

Plate ES-5 – IMC Workforce

ES5 ENGAGEMENT

Consultation for the EIS has been undertaken in consideration of the *Undertaking Engagement Guidelines for State Significant Projects* given:

- Extensive consultation has been conducted for the previous application since 2017, as well as throughout the operation of Dendrobium Mine since 2002.
- The extensive consultation undertaken has allowed for key concerns in regard to Dendrobium Mine and the Project to be well understood.
- A range of engagement activities have been undertaken, including:
  - interviews and meetings with relevant stakeholders;
  - focus group with the Dendrobium Community Consultation Committee (DCCC);
  - distribution of community newsletters; and
  - maintenance of website and community call line for provision of feedback regarding Dendrobium Mine and the Project.
- Commitment to continue consultation with a range of stakeholders following the lodgement of the EIS and during the life of the Project.

Furthermore, IMC has carefully considered the feedback provided by the local community, Government agencies and other stakeholders on the previous application for Dendrobium Mine.

IMC has sought to address stakeholder concerns and perceptions through commitment to a number of significant Project design measures, genuine community engagement and successful environmental management.

Regulatory and public engagement by IMC for the Project and the previous application has identified the following key assessment issues for the Project:

- Mine subsidence effects and associated potential impacts on:
  - water supply yield and quality;
  - water supply infrastructure;
  - the interaction of groundwater and surface water resources;
  - upland swamp drying and wetting cycles and associated plant species distribution; and
  - riparian and aquatic habitats due to alterations to surface water flows.
- Potential impacts of direct land disturbance on biodiversity and heritage values.
- Potential impacts of the continuation of existing Dendrobium Mine surface facilities (e.g. amenity, traffic and safety issues).
- Potential continuation and extension of the Dendrobium Mine's positive impacts on employment, regional expenditure and royalties.
- The importance of local metallurgical coal supplies to the operation and socio-economic benefits of the PKCT and Port Kembla Steelworks.

Key potential adverse impacts can be generally grouped into: impacts related to underground mining subsidence and associated impacts on the overlying physical environment; and impacts of the surface activities of the Dendrobium Mine that are not related to mine subsidence (noting that the Project maximises the use of the existing surface infrastructure of the Dendrobium Mine).

Key potential benefits of the Project identified in engagement were largely socio-economic in nature. It is noted that potential adverse social impacts were not generally raised as a concern for the Project; however, some respondents highlighted the fear of negative social impacts should the Project not be approved.

ES5.1 Public Consultation

Local Community and Affected Landholders

IMC has liaised with the local community through:

- the established DCCC; and
- a letter and fact sheet provided to a number of residents and local community groups.

Consultation was also undertaken with the local community and potentially affected landholders for the Social Impact Assessment, including interviews, a focus group and provision of general information to the broader public undertaken by IMC.

Consultation indicated that noise, dust and traffic are of concern to the local community in the vicinity of the Dendrobium Pit Top and Kemira Valley Rail Line. Consultation also indicated that the history of Kembla Heights as a mining village was important to the local community, and the importance of IMC in maintaining this heritage.

Potential opportunities for further community consultation may include:

- ongoing consultation with landowners and the community;
- Project information sessions;
- distribution of community newsletters;
- operation of the DCCC;
- maintenance of the South32 website and community call line; and
- ongoing public reporting requirements.

IMC would continue to monitor, review and adapt community engagement over the life of the Project to maintain effective community consultation.

Aboriginal Communities

Aboriginal community consultation has been undertaken in accordance with, but not limited to, clause 60 of the NSW *National Parks and Wildlife Regulation 2019* and the *Aboriginal cultural heritage consultation requirements for proponents 2010*.

All stakeholders who registered an interest in the Project were invited to participate in the Aboriginal Cultural Heritage Assessment. Feedback provided by registered Aboriginal parties was considered and incorporated into the Aboriginal Cultural Heritage Assessment.

IMC has initiated additional consultation with registered Aboriginal parties and other Aboriginal stakeholders via a cultural values engagement process to identify and better understand the cultural values, including both tangible and intangible values and Aboriginal places, associated with the Project area and surrounding landscape.

If the Project is approved, IMC would continue to undertake further engagement with any Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area and surrounds.

ES5.2 Government Agencies and Other Organisations

IMC consults with relevant NSW State Government agencies on a regular basis in relation to the current operations of Dendrobium Mine.

Consultation with key NSW State Government agencies in relation to the Project commenced in 2021. Extensive consultation has also been conducted with NSW State Government agencies for the previous application since 2017, as well as throughout the operation of Dendrobium Mine since 2002.

During the preparation of this EIS and for the previous application, a wide range of meetings and briefings were held with government agencies to ascertain and discuss issues of potential relevance to the Project.

IMC also consulted with owners of infrastructure located proximal to the Project (e.g. WaterNSW).

Plate ES-6 – Workforce Underground

ES6 ENVIRONMENTAL ASSESSMENT

The EIS is supported by a number of specialist studies that include detailed impact assessments covering all environmental, social and economic aspects that may be potentially impacted by the Project.

The following sub-sections provide a summary of the key environmental impacts and benefits of the Project, as well as the mitigation measures that would avoid, minimise and offset any potential impacts.

ES6.1 Evaluation of Key Potential Impacts

Regulatory and public engagement by IMC for the Project and the previous application have identified a number of key assessment issues for the Project. Key potential Project direct impacts and indirect adverse impacts are described below (Tables ES-2 to ES-4).

Potential Adverse Direct Impacts

Tables ES-2 to ES-4 summarise key direct impacts, the proposed mitigation measures to address these impacts, and the associated Project outcomes associated with:

- mine subsidence effects on water resources;
- biodiversity and Aboriginal heritage values; and
- amenity effects from the continued operation of Dendrobium Mine surface facilities.

Table ES-2
Key Potential Impacts and Associated Project Outcomes – Water Supply

Summary of Potential Impact Mechanism	Summary of Mitigation Measures	Project Outcome Summary
Reduced water yield from drinking water catchments.		
Due to fracturing above the goaf (which is predicted to remain below the surface fracture network for the Project) and associated groundwater depressurisation, a proportion of surface water flows from streams overlying the Project underground mining area would report to deeper groundwater systems (i.e. be lost from the surface), and ultimately into the Project water management system. This has been estimated to be less than 1% of the Avon and Cordeaux catchment yields.	For the previous application, the NSW Government proposed an agreement with Government that would require IMC to make payments to offset any water quantity impacts during and post-mining (the terms of which were accepted by IMC). The terms of the proposed agreement with Government were outlined in the draft conditions of consent for the previous application and included: • during mining – annual payments based on actual surface water taken (as modelled annually) due to the Project for each water year (annual payments priced at the actual Independent Pricing and Regulatory Tribunal (IPART) retail price for that water year and varied over time to reflect inflation and drought/non-drought year prices); and • post-mining – up-front payment made upon approval of the first Extraction Plan for the Project to account for predicted post-mining surface water losses (value of payment based on the present value of modelled post-mining losses and IPART prices). IMC would seek to enter into a similar agreement with the NSW Government to offset water quantity and quality impacts during and post-mining for the Project to result in a net benefit to Sydney's drinking water supply. In addition, IMC already holds water access licences for the groundwater take of the Project from the deeper groundwater systems, including the volume that may report to groundwater systems from surface water systems.	An agreement with Government would allow the Minister for Water, Property and Housing to spend these funds (as required) on priority water projects to result in a net benefit to Sydney's drinking water supply.
Potential impacts on water quality in drinking water catchments.		
The *Special Areas Strategic Plan of Management 2015* (WaterNSW and OEH, 2015) describes land management programs to control sedimentation in the Special Catchment Areas as a priority. Additional Project surface disturbance activities within the drinking water catchments may lead to sediment generation. Mine subsidence could result in localised, episodic pulses in iron, manganese and electrical conductivity in surface water systems, as has been observed as a result of previous longwall mining.	Project sediment controls for surface disturbance activities would be designed consistent with *Managing Urban Stormwater Soils and Construction – Volume 2E – Mines and Quarries* (DECC, 2008). While there has been no measurable effect on water quality in Special Catchment Areas dams as a result of localised, episodic pulses in iron, manganese and electrical conductivity from longwall mining in the past, IMC proposes to fund water quality improvement actions such as transfer of 20 ha of IMC-owned land within the Metropolitan Special Area to WaterNSW and fire management measures (e.g. slashing) and maintenance of unsealed roads as part of the Project. These actions for the Project would be additional to those already proposed and funded annually by WaterNSW and would target reduced sedimentation in the Special Catchment Areas. This would result in material improvements to water quality within the Special Catchment Areas, as the measures are consistent with WaterNSW's planned management works.	Notwithstanding the Project's declaration as SSI, it is considered the Project would have a neutral or beneficial effect on water quality in the Special Catchment Areas, consistent with Chapter 8 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* and the DPE's and IPC's conclusions regarding the previous application.
Potential subsidence impacts on water supply infrastructure.		
Mine subsidence could adversely impact surface infrastructure, including water supply infrastructure maintained by WaterNSW.	The longwall layout proposed for the Project has been designed with a number of longwall mine constraints to minimise potential impacts, including a minimum 1 km setback from the existing Avon Dam wall and a minimum 300 m longwall setback from the FSL of Avon Dam. Approval from Dams Safety NSW would be required for any Project mining within the Dams Safety NSW Notification Area associated with the existing Avon Dam.	No material subsidence impacts on existing WaterNSW water supply infrastructure are predicted to occur due to the Project.

Table ES-3
Key Potential Impacts and Associated Project Outcomes – Biodiversity and Aboriginal Heritage Values

Summary of Potential Impact Mechanism	Summary of Mitigation Measures	Project Outcome Summary
Potential impacts on upland swamp drying and wetting cycles.		
Project mine subsidence may result in changes to upland swamp hydrology for upland swamps within 60 m of the longwalls (i.e. longer dry periods due to an increased rate of water level recession following rainfall). Upland swamps include TECs and provide habitat for threatened fauna species.	The Swamp Offset Policy (OEH, 2016a) provides the framework for offsetting residual impacts to swamps from longwall mining. Many upland swamps overlying Area 5 currently experience natural drying and wetting cycles. Based on monitoring data from previously mined beneath upland swamps at the Dendrobium Mine (and other mining operations in the Southern Coalfield), changes in swamp hydrology as a result of subsidence are not expected to result in significant changes to the extent of upland swamp vegetation and species composition. Notwithstanding, predicted impacts to upland swamps due to the Project subsidence would be offset via the Project biodiversity offset strategy. IMC would offset potential subsidence impacts to TECs associated with upland swamps, as well as offsets for threatened fauna species for which the upland swamps provide habitat.	Potential Project subsidence impacts on upland swamps and associated potential habitat effects would be offset consistent with NSW and Commonwealth Government policies.
Potential impacts on riparian and aquatic values due to alteration of surface water flows.		
Project mine subsidence may result in changes to stream hydrology overlying the longwalls (e.g. recession of pools following rainfall) with potential impacts on aquatic ecology habitat values and associated threatened fauna species.	The proposed longwalls are located at a minimum longwall mining distance of 400 m from named streams (the Avon River and Donalds Castle Creek are located at distances of 900 m and 700 m, respectively, while the Cordeaux River and Wongawilli Creek are located more than 1.9 km from the proposed longwalls). The Project also does not directly mine beneath 3rd order and above streams and avoids direct mining beneath mapped "key stream features" overlying the Project underground mining Area 5 through implementation of setbacks. Significant Project impacts on aquatic ecology are predicted to be unlikely. Notwithstanding, impacts on threatened biodiversity in all streams that are predicted to be adversely impacted would be offset in accordance with the BC Act. IMC would implement remediation measures to mitigate physical damage to the streams, where it is practicable to do so, where monitoring indicates that subsidence-related impacts have occurred to key stream features (i.e. named watercourses and key stream features).	Potential Project subsidence impacts on aquatic ecology values and associated potential habitat effects would be offset consistent with NSW and Commonwealth Government policies.
Potential impacts of direct land disturbance on biodiversity and heritage values.		
Project surface development works within the Drinking Water Catchment may impact on the largely undisturbed biodiversity values associated with these protected areas.	Additional Project surface infrastructure has been preferentially sited in close proximity to or within existing fire trails to minimise land disturbance, and designed to particularly avoid potential disturbance of mapped TECs and upland swamps. Notwithstanding, predicted impacts on biodiversity from surface disturbance activities would be offset in accordance with the BC Act.	Potential Project surface disturbance impacts on biodiversity would be offset consistent with NSW and Commonwealth Government policies.
Potential subsidence impacts on Aboriginal heritage values.		
Mine subsidence could adversely impact on the largely undisturbed Aboriginal heritage values associated with the Metropolitan Special Area.	Proposed surface infrastructure for the Project has been designed to avoid all known Aboriginal heritage sites. Aboriginal heritage sites which are directly mined beneath by the Project are all classed as low archaeological (scientific) significance. The Aboriginal heritage sites assessed as having moderate or high archaeological (scientific) significance would not be directly mined beneath by the Project. If the Project is approved, IMC would continue to undertake further engagement with Aboriginal stakeholders that may hold knowledge regarding cultural values in the vicinity of the Project.	An Aboriginal Heritage Management Plan would be developed for the Project in consultation with the registered Aboriginal parties and the relevant government agencies (e.g. Heritage NSW) to manage potential impacts on Aboriginal heritage values.

Table ES-4
Key Potential Impacts and Associated Project Outcomes – Amenity

Summary of Potential Impact Mechanism	Summary of Mitigation Measures	Project Outcome Summary
Potential amenity impacts of the continuation of the Dendrobium Mine surface facilities.		
The Project proposes only minor changes to the currently approved and operating surface facilities of the Dendrobium Mine. Existing amenity impacts associated with the operation of these facilities would be extended from 2030 to 2041 for the Project. These primarily ongoing amenity impacts from the Dendrobium Mine comprise: • rail noise; • operational noise; • dust emissions; and • road transport noise.	IMC would continue and extend the current mitigation and monitoring framework for the management of amenity impacts from Dendrobium Mine surface facilities as described in the current and proposed environmental management plans, including the: • Traffic Management Plan; • Dendrobium Mine Driver's Code of Conduct; • Noise Management Plan; and • Air Quality and Greenhouse Gas Management Plan. IMC would also continue the application of restricted rail haulage operating hours for the Kemira Valley Rail Line (between 6:00 am and 11:00 pm) and where reasonable and feasible, would implement further progressive rail noise mitigation measures over the life of the Project.	Existing amenity impacts associated with the operation of the Dendrobium Mine surface facilities would continue under the Project. IMC would comply with the requirements and criteria stipulated in the Infrastructure Approval, should the Project be approved.

Potential Adverse Indirect Impacts

Most potential indirect impacts of the Project identified are positive in nature (e.g. indirect employment effects, supplier benefits, the significance of local metallurgical coal supply to the ongoing operation of Port Kembla Steelworks).

However, an indirect adverse impact of the Project is the potential for Scope 1 and Scope 2 greenhouse gas emissions of the Project, and Scope 3 greenhouse gas emissions (i.e. customer greenhouse gas emissions from the burning of Project product metallurgical coal) to contribute to adverse global climate change effects.

Table ES-5 summarises the potential impacts of greenhouse gas emissions from the production and burning of Project product coal and the associated Project outcome.

ES6.2 Evaluation of Key Potential Benefits

Regulatory and public engagement by IMC for the Project and the previous application has identified a number of key potential benefits for the Project.

The Project would support the extraction of approximately 31 Mt of ROM coal, with production of up to approximately 5.2 Mtpa of ROM coal.

The Project is required to facilitate the continuation of Dendrobium Mine, with uncertainty regarding the ability to extract the remaining resource in the approved Area 3C and the timing, which is contingent on IMC's ability to effectively drain gas from the seam to achieve levels that facilitate safe extraction of the resource.

In the absence of the Project there will be longwall discontinuity and, therefore, no production from Dendrobium Mine for an extended period (due to the uncertainty and timing required to effectively drain gas from Area 3C), which may potentially make Dendrobium Mine and IMC less financially sustainable.

The Project would include the implementation of environmental mitigation measures (including performance monitoring and adaptive management) to minimise potential impacts on the environment and community.

Table ES-5
Key Potential Impacts and Associated Project Outcomes – Indirect Impacts

Summary of Potential Impact Mechanism	Summary of Mitigation Measures	Project Outcome Summary
Potential impacts of greenhouse gas emissions, plus greenhouse gas emissions from the end use of Project coal.		
Dendrobium Mine is an existing contributor to NSW and Australian greenhouse gas emissions, and this would continue to be the case for the Project. The Project's contribution to global climate change effects would be proportional to its contribution to global greenhouse gas emissions. Many natural ecosystems are considered to be vulnerable to climate change. Patterns of temperature and precipitation are key factors affecting the distribution and abundance of species (Preston and Jones, 2005). Projected changes in climate will have diverse ecological implications. Habitat for some species will expand, contract and/or shift with the changing climate, resulting in habitat losses or gains, which could prove challenging, particularly for species that are threatened. Greenhouse gases directly generated at the Project (i.e. Scope 1 emissions) and indirect emissions associated with the on-site use of fuel and electricity (i.e. Scope 2 emissions) have together been estimated at an annual average (during Area 5 longwall mining) of approximately 1.1 million tonnes carbon dioxide equivalent (Mt CO_2-e) per year (when flaring is considered) to 1.5 Mt CO_2-e per year during operations. In addition to Scope 1 and 2 emissions for the Project, the Scope 3 emissions for the Project from upstream and downstream sources would also contribute to global greenhouse gas emissions. The majority of Scope 3 emissions from the Project relate to the downstream use of Project metallurgical coal in the manufacture of steel, in both Australia (at the Port Kembla Steelworks or Whyalla Steelworks) and overseas.	Consistent with Dendrobium Mine, the Project would continue to operate in consideration of the objectives of South32's company-wide Climate Change Strategy and annual *Sustainable Development Report*. The NSW Government's long-term objective to reach net-zero emissions by 2050 is consistent with the target of South32's Climate Change Strategy. South32 has set a group-level medium-term target to halve its operational Scope 1 and Scope 2 emissions by 2035. South32 is investing in efficiency projects, applying low carbon design principles and evaluating carbon reduction technologies to achieve this goal. IMC's greenhouse gas mitigation strategy is focused on reducing fugitive emissions by increasing the efficiency of gas drainage and assessing technologies for reducing ventilation air methane. The Project's direct (Scope 1) greenhouse gas emissions would, therefore, be minimised as far as possible in particular through maximising gas flaring (predicted to reduce total Scope 1 emissions by approximately 31% over the life of the Project). Further opportunities to maximise gas capture via pre-drainage and management of goaf gas would be investigated and implemented if technically feasible and commercially viable. Project-specific greenhouse gas minimisation measures would be described in an Air Quality and Greenhouse Gas Management Plan for the Project.	Scope 1 greenhouse gas emissions from the Project would be minimised as far as reasonable and feasible. The Project's contribution to global climate change effects would be proportional to its contribution to global greenhouse gas emissions.

Socio-Economic Benefits

The Project would increase the availability and longevity of employment at Dendrobium Mine.

At full development, the Project operational workforce would be in the order of 700 full-time equivalent on-site personnel inclusive of both direct IMC employment and on-site contractors. The Project, therefore, would include an increase of approximately 50 operational personnel from the current workforce of Dendrobium Mine.

An additional construction workforce of up to approximately 100 people would also be required during a two-year construction period for the Project.

The Economic Assessment indicates the Project would result in a total net benefit to the NSW economy of $649 million in NPV terms ($1,287 million in real terms), net of estimated costs for environmental externalities and internalisation of environmental management costs by IMC.

This net benefit includes some $293 million in total direct benefits to NSW in NPV terms ($634 million in real terms), comprising:

- $35 million of net producer surplus attributable to NSW ($144 million in real terms);
- $82 million in company tax attributable to NSW ($160 million in real terms); and
- $177 million paid to the NSW and local governments, in the way of coal royalties ($148 million [$280 million in real terms]), payroll tax, land taxes and council rates.

In addition to the direct economic impacts, it is estimated the Project would generate $364 million in indirect economic impacts in NPV terms ($675 million in real terms), comprising:

- a Project increase in worker benefit for the NSW economy of $231 million ($417 million in real terms); and
- a Project net supplier benefit for the NSW economy of $133 million ($258 million in real terms).

Further, Project coal production would continue to contribute to the continuation of manufacturing operations at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks, the operation of the PKCT, NSW export income and industry in other countries that purchase Project product coal.

ES7 CONCLUSION

The Project is a continuation of the existing approved Dendrobium Mine that would comply with applicable statutory requirements and relevant strategic and statutory planning policy objectives.

The Project would provide for the continuation of employment of the existing Dendrobium Mine workforce of approximately 650 personnel, with approximately 50 additional operational jobs generated by the Project and approximately 100 additional jobs generated during surface facility construction and longwall development activities.

The Project is required to facilitate the continuation of Dendrobium Mine, with uncertainty regarding the ability to extract the remaining resource in the approved Area 3C.

Historically, the Dendrobium Mine has delivered lower operating costs (than the Appin Mine) making a significant contribution to the overall financial sustainability of IMC.

Therefore, the continued operation of the Dendrobium Mine via the Project would continue to support the financial sustainability of IMC and the broader Southern Coalfield economic ecosystem.

There is currently no economically viable, commercial-scale alternative to the use of metallurgical coal in making steel using the blast furnace method, which is employed at the Port Kembla Steelworks. The proximity of the Southern Coalfield metallurgical coal mines is a major factor in BlueScope's ability to make steel economically.

IMC previously sought to extend mining operations at Dendrobium Mine through the previous application.

DPE concluded in its "whole-of-government" Assessment Report that the previous application was in the public interest and recommended approval.

However, the previous application was refused by the IPC in February 2021, primarily due to the IPC's view of the potential impacts of the mine development on the Sydney drinking water catchment.

To address the key concerns raised by the IPC regarding the previous application, IMC has re-designed the Project to reduce the overall footprint, thereby reducing potential impacts, to meet the following Project objectives:

- to facilitate continuity of mining at the Dendrobium Mine, directly through the addition of Area 5 for the Project, and also indirectly as the Project supports the financial sustainability of IMC (Dendrobium Mine and Appin Mine) as well as the broader Southern Coalfield economic ecosystem;
- to address the IPC's concerns for the previous application; and
- to avoid and minimise impacts on the Metropolitan Special Area.

Compared to the previous application, the Project would reduce the overall underground mining footprint by 60%, thereby reducing potential environmental impacts including a 78% reduction in predicted peak annual surface water losses from the Metropolitan Special Area, while also allowing for significant benefits to the greater Wollongong region and the State of NSW.

Key feasible alternatives to the Project were considered; however, these alternatives were not adopted on the basis that the Project objectives would not be satisfied. In particular, further reductions in mine footprint or reduced longwall panel widths and/or cutting heights would result in significant adverse impacts to the economic sustainability of the Project (noting the Project has already reduced the longwall mining footprint by 60% in comparison to the previous application) and, therefore, would not satisfy the Project objective of ongoing continuity of mining.

If the Project does not proceed, there would be reduced environmental impacts as well as significant adverse socio-economic implications.

Engagement with members of the public and key government agencies has also informed IMC's design of the Project, including adoption of a range of avoidance measures to minimise impacts on named watercourses, mapped key stream features and existing WaterNSW water supply infrastructure.

IMC would apply offsets or other Project-specific measures to address key residual impacts on biodiversity, catchment yield and water quality.

The site is suitable for the proposed Project use, as underground coal mining by longwall methods is considered compatible with the catchment area status of much of the site and the Project would generate a significant net benefit to the State of NSW.

IMC is committed to the sustainable development of natural resources and to successful environmental management. IMC believes the Project strikes the right balance of developing the resources the world needs, while minimising environmental impacts, and is in the public interest.