



FINAL PRELIMINARY REGIONAL ISSUES ASSESSMENT

Hawkins-Rumker Potential Release Areas

Advice to the Advisory Body for Strategic Release

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Cover image: View of Rylstone (foreground) and the border of Hawkins and Rumker areas (background). Photo courtesy of Rylstone Region Coal Free Community (2021)

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Executive Summary

Background and Purpose

The New South Wales (NSW) Government is considering whether to release two areas located in mid-western NSW, known as the Hawkins and Rumker potential release areas, for coal exploration. These two areas collectively cover an area of approximately 327 square kilometres and are located in the Mid-Western Regional local government area.

The Hawkins potential release area is located approximately 26 kilometres (km) east of Mudgee and the Rumker potential release area is located approximately 37 km southeast of Mudgee. There are approximately 170 private landholders and leaseholders within the potential release areas.

Mining is currently the largest industry of employment in the region and Mudgee hosts significant mining workforces for the existing local mining operations (e.g. Ulan, Moolarben and Wilpinjong Coal Mines). Other land uses in and surrounding the potential release areas are characterised by a combination of agricultural, rural residential and conservation uses. The adjoining Greater Blue Mountains World Heritage Area (incorporating Wollemi National Park) is a key environmental tourism asset in the local area, along with the attractive historical towns and villages of Rylstone, Kandos and Lue.

Under the Strategic Release Framework for Coal and Petroleum Exploration, the Minister with responsibility for the *Mining Act 1992* must obtain advice from the Advisory Body for Strategic Release (ABSR) on whether the areas should be released (either wholly or in part) for exploration. In giving this advice, the ABSR must consider the strategic and economic importance of the potential coal resource and relevant social, environmental and economic matters associated with the potential release of the two areas for exploration and potential future mining.

The ABSR has asked the Department of Planning, Industry and Environment (the Department) to prepare a Preliminary Regional Issues Assessment (PRIA) to assist with the consideration of these matters.

This PRIA has considered general development scenarios that could flow from the release of the Hawkins and Rumker areas including exploration and underground mining by longwall methods.

In preparing this PRIA, the Department has consulted with the community and key stakeholders and reviewed existing Government data sources. Community members and other interested stakeholders were notified of the potential release areas through advertisements in local and State papers and notification of landowners and stakeholders through a combination of letters, emails and phone calls. Formal consultation was undertaken between June and mid-August. During this period, the Department held seven online community meetings, which were attended by around 170 community members. The Department also received 2,064 submissions during the consultation period, representing a significant community response to the proposal.

Engagement Outcomes

The Department has heard strong concerns about potential exploration and mining from the community, particularly from the Rylstone area, with almost all of the 2,064 submissions strongly opposed to any release.

Given the recent experience of the local community with other mining projects in the region, most notably the refused Bylong Coal Project, the community is concerned about any future coal exploration and mining and associated impacts on water quality and quantity, land use conflicts (particularly agriculture, biodiversity conservation and tourism land uses) and social impacts including effects on mental health and wellbeing and more.

The local and wider community is also sceptical of any benefits from coal exploration or mining and has expressed strong views that there would be greater public benefit from the growing tourism industry and agricultural sector that relies on the protection of existing rural and natural values of the region. Numerous local community members and Aboriginal people noted during the consultation sessions the '*stunning natural beauty*' of the area.

The Aboriginal community also expressed significant concern regarding the cumulative impacts of mining in the wider region on environmental features (e.g. swamps, watercourses and rock features) and connection with Country and song lines.

More broadly, submissions have expressed strong opposition to the development of new greenfield mining projects, instead calling for existing mines to meet thermal coal demand and for increased investment in renewable energy sources.

Many submissions (both locally and from the broader community) raised concerns that releasing the areas for exploration would be contradictory to Australia's net-zero obligations under the Paris Agreement and the NSW Government's emissions strategy of net-zero by 2050 and interim target of 35% reduction in emissions by 2030.

The community also cited strategic reports including the Intergovernmental Panel on Climate Change's (IPCC) sixth assessment report, the International Energy Agency's 'The World's Roadmap to Net Zero by 2050' and the 2021-22 NSW Intergenerational Report. Submissions reflected on the findings of these reports including the need for immediate, rapid and large-scale reductions in greenhouse gas emissions to limit the risks from global warming and to reduce the severity of predicted climate change impacts. They also cited the importance of increased investment and uptake of renewable energy sources.

The community also raised concerns about the consultation process, including the adequacy of notifications, timeframe for submissions and lack of face-to-face meetings due to COVID-19 restrictions. Several community groups were also critical of the transparency of the Strategic Release Framework, requesting that the Department's assessment report and Geological Survey's Resource Assessment Report be made publicly available when submitted to the ABSR.

Findings

This PRIA has considered general development scenarios that could flow from the release of the Hawkins and Rumker areas, including exploration and underground mining by longwall methods. This approach is consistent with the outcomes of the Resource Assessment Report which considers that any future mining would be by underground methods.

The extraction of the resource would undoubtedly result in significant economic benefits to NSW including royalties upwards of \$917 million. The development of the coal resource would also support regional economic activity and stability, and construction and supply contracts would benefit regional businesses and the regional economy.

However, the Department has identified a number of fundamental constraints to exploring and mining the two areas that are likely to be unavoidable.

Firstly, the Department notes that exploration in the Hawkins and Rumker areas could have negative social impacts for this region, including the town of Rylstone, as a result of large-scale land acquisitions that can accompany the exploration phase of mining projects. These impacts have been observed in the nearby Bylong Valley as a result of the now refused Bylong Coal Project where large-scale land acquisitions had impacted the population and social fabric of the Bylong Valley before any decision was made on whether the Bylong Coal Project could proceed.

The Department considers that any future exploration in the Hawkins and Rumker areas would have the potential for similar social impacts given this is a greenfield coal mining area. The Department recognises that the uncertainty as to whether a mining project may ultimately proceed may cause anxiety within some aspects of the community (particularly the 170 affected landholders).

The associated decline in local population from property acquisitions could result in a reduction in local populations, services, community values and sense of place as has been the case in the nearby Bylong Valley and the village of Wollar.

Given the relatively small size of the Rylstone community (approximately 920 people), the proportion of landowners that would potentially be affected, the observed social impacts in the nearby Bylong Valley and the magnitude of social change that would result from exploration and development of a greenfield coal mine in these particular areas of Hawkins and Rumker, the Department considers that there is a high likelihood for negative social impacts.

Furthermore, there is a high potential for land use conflicts and community opposition as evidenced by the extensive community feedback requesting protection of the areas. This, combined with the likely property mitigation, acquisitions and subsidence mitigation measures, would likely further constrain the potential for a future mining project to obtain a social licence.

Notwithstanding, any future mining of the potential release areas would have significant positive social impacts including direct employment for hundreds of people as well as indirect employment opportunities and support for local business and organisations. The mining industry is an important element of the Mid-Western Regional local government area's employment base with approximately 1700 people employed at mining operations located north of Mudgee. If developed, the potential release areas would offer sustained employment opportunities for the workforce of these nearby mining projects which are scheduled to conclude in the next 12 to 18 years.

The Department notes that it is difficult to predict the extent and scale of any negative social impacts that would result from the release of the areas. Consequently, the negative social impacts are unlikely to preclude any release in their own right. However, any negative social impacts must be considered and balanced against the likelihood of positive social impacts and other opportunities and constraints.

Secondly, the offsite transport of coal is likely to be constrained by a range of factors. The Department has identified several options for any future transport of coal including by road, overland conveyor and by rail.

The ability to transport via road could be constrained by costs and physical constraints associated with loading and unloading trucks, as well as amenity and safety issues. A mining operation in this location is unlikely to be commercially viable at the production rates that would be feasible and acceptable using road transport. One of the Government's key regulatory instruments for mining, the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, specifically discourages the transport of coal by road given the potential for significant safety and amenity impacts.

An overland conveyor to a nearby mining operation could be approximately 30 to 40 km in length and the cost and engineering feasibility are likely to be a constraint over this distance. Combined with the potential impacts, including additional surface disturbance, restricted landholder access, visual impacts and potential changes to surface water flow paths, an overland conveyor is unlikely to be a viable transport option.

Significant capital expenditure would be required to reinstate the Wallerawang-Gwabegar Railway between Kandos and Gulgong (approximately 93 km in length), with a Transport for NSW assessment report concluding that the cost benefit of such upgrades would be marginal. Coal transportation via rail either north through Lue and Mudgee or south through Rylstone and Kandos would also have significant amenity impacts (specifically

noise and air quality) on residents, local business and tourism uses and would likely be met with significant community resistance.

The towns of Rylstone and Kandos are located immediately adjacent to the railway and any rail transport through these towns would have the potential to impact a significant number of landowners (approximately 180 in Rylstone and 254 in Kandos). Impacts from rail noise are likely to represent a significant constraint to any future mining. This is due to the fact that the railway is currently decommissioned, landowners are not currently subject to any rail noise, background noise levels in these areas are very low, and high noise levels are likely to persist even with the implementation of noise mitigation measures.

Lastly, the Commercial Viability Assessment Report indicates that the economic viability of any future mining project is marginal and would be heavily dependent on relatively high coal prices and extensive longwall mining of both areas. Although the Department cannot predict the long-term price of coal with certainty, the Department recognises that the demand for thermal coal is expected to decline over the long-term.

All five of NSW's coal generators, which together supply 84% of the State's utility-scale electricity, are expected to retire over the coming two decades. The nearby Mount Piper Power Station (located approximately 60 km south of the potential release areas) is also anticipated to close early than expected (by 2040) which could be an indicator for decreasing demand for domestic thermal coal. Given the time taken to progress an exploration project to coal production (generally 10 years or more), domestic supply, in isolation, would not be sufficient to support a greenfield coal mining development in the potential release areas.

The expected demand for thermal coal is also expected to decline and at a rate faster than anticipated, as forecast by the 2020 World Energy Outlook. The coal market, and support for net-zero emissions targets, are rapidly changing both in Australia and internationally. Given the uncertainty over the long-term prospects for coal exports, it is anticipated that only those coal reserves with higher coal quality and that can be accessed at a low cost would remain attractive for development. Consequently, the Department considers there is a high degree of uncertainty as to whether any greenfield mine would be viable in the potential release areas of Hawkins and Rumker in the next 10 to 20 years.

Furthermore, the Commercial Viability Assessment Report does not consider additional constraints identified in the PRIA, including:

- The potential release areas are highly populated with almost 170 private landowners/leaseholders occupying the potential release areas. Underground mining would have the potential for subsidence impacts on private properties (including far field effects) that would require careful monitoring, management, and remediation (if required) and the potential costs associated with such work may form an economic constraint to any development.
- Ferntree Gully Reserve contains important biodiversity, scenic and tourism values that would need to be protected. Setbacks from this area would likely be required to avoid any subsidence impacts.
- The areas contain known pagoda complexes and may contain other significant pagoda landforms and cliff line features that would need to be avoided.
- The areas contain significant Aboriginal cultural heritage artefacts and values that would need to be avoided including 'Baby's Feet Cave' and other rock shelter sites with art. There is also a high likelihood for other values to be identified, particularly along the centre of the release areas in steeper topography and ridgelines.
- There are several areas of moderate to high potential Groundwater Dependent Ecosystems (GDEs) in the region as well as key swamp and spring features which may form a constraint to any potential future mine

design. Setbacks would likely be required to avoid subsidence impacts on these high value ecosystems as any impacts would likely be irreversible and offsets would be difficult to obtain.

- Any future development would need to consider the water quality impacts on local streams and the Goulburn and Cudgegong Rivers if any off-site discharge is proposed.
- At least 32 basic landholder water licences would need to be afforded a level of protection and there may be constraints associated with the provision of an alternate water supply depending on the nature and extent of potential drawdown impacts and landholder negotiations.

While each of these additional issues are unlikely to form a material constraint in their own right, the cumulative and widespread nature of these additional constraints, and the high potential for further investigations to identify additional features (particularly Aboriginal cultural heritage sites), is likely to represent a significant limitation to any wide-scale longwall mining across the two areas.

Given the level of uncertainty around the economics of future mining without these considerations in mind, the Department considers that these constraints are likely have a significant impact on the financial viability of any future mine and consequently represent a fundamental constraint to any release.

The Department has also identified constraints that have been factored in the economic assessment including:

- The need to avoid mining within 300 m of the Wollemi National Park to prevent subsidence impacts.
- The need to avoid subsidence impacts on regionally significant Biophysical Strategic Agricultural Land and highly productive groundwater aquifers associated with the Growee River, which is capable of supporting intensive agricultural uses including cropping.

Recommendations

The Department concludes that there is considerable uncertainty as to whether a future mine in the Hawkins and Rumker areas would be viable, noting the marginal economics of potential mine plans for the area, key transport constraints to mining, significant community opposition to any new coal mine development and the rapidly changing coal market.

While any future mining would result in significant economic benefits to NSW, there appears to be little certainty that these benefits could be realised. This uncertainty is likely to prolong and exacerbate negative social impacts on the community, particularly to the 170 landowners in the two areas.

On this basis, the Department considers there to be sufficient constraints that the Hawkins and Rumker areas should **not** be released for coal exploration.

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1.0 Background

1.1 Strategic Release Framework for Coal and Petroleum Exploration

The New South Wales (NSW) Government's Strategic Release Framework for Coal and Petroleum Exploration (the Strategic Release Framework) allows for controlled strategic release and competitive allocation of resource exploration titles in NSW. Legislation implementing the Strategic Release Framework was passed by the NSW Government in October 2015.

The Strategic Release Framework is designed to provide greater clarity and transparency in decisions about where resource exploration activities may take place. The Strategic Release Framework also introduces a competitive process for determining who may undertake the exploration activities.

The key steps and the various NSW Government authorities involved in the Strategic Release Framework are shown in **Figure 1** and **Table 1**.

In June 2020, the NSW Government released the Strategic Statement on Coal Exploration and Mining, which identifies potential coal exploration release areas under the Strategic Release Framework (**Figure 2**). The NSW Government is considering whether to release two of these areas, known as Hawkins and Rumker, for coal exploration and potential future mining.

Under the Strategic Release Framework, the Advisory Body for Strategic Release (ABSR) will make a recommendation to the Minister with responsibility for administering the *Mining Act 1992*, on whether the areas should be released (either wholly or in part). In making this recommendation, the ABSR will consider the Resource Assessment Report¹ prepared by the Geological Survey of NSW and this Preliminary Regional Issues Assessment (PRIA).

1.2 Preliminary Regional Issues Assessment

This PRIA has been prepared for the Hawkins and Rumker potential release areas located in mid-western NSW.

This PRIA outlines the advice of the Department of Planning, Industry and Environment (the Department) to the ABSR under the Strategic Release Framework on social, environmental and economic opportunities and constraints should these areas be released for coal exploration and potential future mining.

The PRIA relies on available data obtained from relevant local, State and Commonwealth government agencies and has been developed through engagement with interested and potentially impacted stakeholders (see Section 1.0). Community feedback received on the PRIA process, including the Strategic Release Framework, is discussed in Section 4.0.

The development of this PRIA included:

- engaging with the community to gain knowledge on local matters of interest and concern;
- collecting relevant data to identify key issues, opportunities and constraints associated with potential release; and
- examining the potential issues to inform decision makers on whether to release the areas for exploration and potentially mining, and the terms of any release.

¹ The Resource Assessment Report summarises the findings of the Inventory Resource Report prepared by Geological Survey of NSW and the Commercial Viability Assessment Report commissioned by Geological Survey of NSW.

The PRIA is an issues identification process and does not pre-empt the assessment or determination of any future applications for exploration or subsequent mining activities.

Should the Minister with responsibility for administering the *Mining Act 1992* decide to release the areas, there are subsequent statutory processes involved in issuing exploration licences and any approvals for future mining applications.

In the case of exploration, if the Minister (and subsequently the NSW Cabinet) elect to proceed with inviting applications for exploration licences in the potential release areas, any exploration licences, if granted, would be issued under the *Mining Act 1992*.

Any future proposed coal mining would also be subject to a comprehensive triple-bottom-line merit assessment under the *Environmental Planning and Assessment Act 1979* (EP&A Act), including extensive consultation with the community and government agencies and detailed technical environmental assessment (see **Section 3.5**).



Figure 1: Steps in the Strategic Release Framework



Source: NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Local Government Area Boundary
 - Railway
 - Railway (non-operational)
 - Major River
 - Operating Mine
 - Proposed Mining Operation/Exploration Project



REGIONAL LOCALITY OF THE HAWKINS AND RUMKER POTENTIAL RELEASE AREAS

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Figure 2: Regional Locality of the Hawkins and Rumker Potential Release Areas

Table 1: Key Authorities Involved in the Strategic Release Framework

Authority	Role
Advisory Body for Strategic Release (an interagency group with an independent Chair)	Recommends to the Minister where, when and how coal and petroleum resources should be released for exploration, based on whole-of-Government advice and assessments.
Department of Planning, Industry and Environment – Planning and Assessment	Undertakes the PRIA to inform the ABSR about environmental, economic and social matters.
Department of Regional NSW – Mining, Exploration and Geoscience	Prepares initial resource assessments identifying prospective areas for gas or coal. Oversees the Strategic Release Framework and the granting of exploration licences.
Minister with responsibility of the <i>Mining Act 1992</i>	Recommends to Cabinet the areas for consideration based on the advice of the ABSR.
Cabinet	Reviews Ministerial recommendations for the granting of exploration licences and provides endorsement where appropriate.

1.3 Potential Release Areas

The potential release areas are located in mid-western NSW and collectively cover an area of approximately 327 square kilometres (km²). The potential release areas are:

- **Hawkins** - located approximately 26 kilometres (km) east of Mudgee extending northeast, over an area of approximately 149 km².
- **Rumker** - located approximately 37 km southeast of Mudgee extending east, over an area of approximately 178 km².

The extent of the potential release areas is shown in **Figure 2**.

The potential release areas have been identified by the Geological Survey of NSW based on the extent of the identified coal resource. The potential release areas exclude land within a National Park or Conservation Area, in particular the Wollemi National Park, which forms part of the Greater Blue Mountains World Heritage Area.

1.4 Regional Context

Other major projects and coal resources in the vicinity of the potential release areas (see **Figure 2**) include:

- Mount Piper Power Station, located approximately 60 km south of the potential release areas near Lithgow – predicted to operate until 2040.
- Wilpinjong Coal Mine, located approximately 37 km north-east of Mudgee – operating with an approved life until 2033.
- Moolarben Coal Operations, located approximately 32 km north-east of Mudgee – operating with an approved life until 2038.
- Ulan Coal Mine Complex, located approximately 40 km north-east of Mudgee – operating with an approved life until 2033.
- Airly Underground Mine, located south of Kandos – operating with an approved life until 2037.
- Charbon Mine, located south of Kandos – currently closed and in rehabilitation since 2015.
- Bowdens Silver Project, located north-west of Rylstone – proposed project currently under assessment by the Department.

-
- Bylong Coal Project, located north of Rylstone and around 20 km north of the Hawkins release area – open cut and underground mining proposal refused in 2019 by the NSW Independent Planning Commission (IPC).
 - Inglenook Exploration Project, located south of Rylstone – three exploration tenements held by Centennial Coal.
 - Running Stream, located south of Rylstone – an undeveloped thermal coal resource within an assessment lease held by a subsidiary of Glencore (Oakbridge).

In April 2021, the Wollar area located between the established coal mining complex of three coal mines in the Mudgee region and the Bylong Valley was released for potential coal exploration under the competitive coal allocation pathway (as opposed to the PRIA pathway that the Hawkins-Rumker areas are subject to).

The Ganguddy-Kelgoola potential release area is also identified in the Government's Strategic Statement on Coal Exploration and Mining and adjoins the proposed Rumker release area to the south. However, the Ganguddy-Kelgoola potential release area does not form part of this PRIA report.

2.0 Overview of the Coal Resources

The potential release areas are located in the Western Coalfield of NSW in the Sydney Basin, which is a sedimentary basin in eastern NSW (**Figure 3**). The Western Coalfield of NSW contains four currently operating coal mines to the north and south of the potential release areas (**Figure 2**).

2.1 History of Exploration

Exploration in the Hawkins and Rumker potential release areas and surrounds commenced in the mid-1970s, with the Joint Drilling Program (Joint Coal Board and the NSW Government). The NSW Government conducted a number of other programs in the wider region until the mid-1980s to continue the assessment of potential coal resources.

The NSW Government completed a four-stage intensive exploration investigation in December 2016 (within Authorisation (AUTH) 286).

In the past, several exploration licences and authorisations have been granted over parts of the Hawkins and Rumker potential release areas (see **Appendix A**). Coal Authorisation (AUTH) 230 is located immediately south of the Rumker potential release area and would expire in 2025, subject to renewal. Mineral Exploration Licences (ELs) 8168 and 8403 associated with the proposed Bowdens Silver Project (currently under assessment with the Department) intersect both areas.

Previous exploration activity is shown in **Figure 4**.

2.2 Coal Resource Potential

The Inventory Resource Report concludes that the two potential release areas have suitable geological features to suggest significant underground coal resources. The coal quality (determined by ash content - see below) indicates these would be thermal coal resources, with quality similar to adjacent operations in the Western Coalfield (e.g. the Ulan, Wilpinjong and Moolarben mines).

Two working sections (UDWS and UG) were considered to be of sufficient thickness, quality and continuity to present potentially economically viable inventory resources.

An underground coal resource of 286 million tonnes (Mt) run-of-mine (ROM) was estimated for the UDWS section. This section was estimated to yield around 89% product coal with an ash content of 17.9% and would be categorised as high ash export thermal coal.

An underground coal resource of 624 Mt ROM was estimated for the UG section. This section was predicted to yield around 82% washed product coal, with an ash content of 14.5%, and would be categorised as low-medium ash export thermal coal.

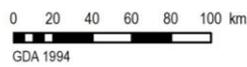
Further assessment commissioned by Geological Survey of NSW estimated that between approximately 130 Mt and 290 Mt of product coal could be recovered based on likely mining constraints and product yields. The constraints identified were relatively limited, relying on desktop analysis and existing available data. The estimations of potential yield are therefore considered to be conservative and do not consider the additional environmental constraints identified in this PRIA or any future development application process that would likely further constrain the resource potential and commercial viability of any future project.

Potential exploration and mining development scenarios which consider the available resource within the Hawkins and Rumker potential release areas are described further below.



- KEY**
- Potential Release Area
- Coalfields**
- Gunnedah Coalfield
 - Hunter Coalfield
 - Newcastle Coalfield
 - Southern Coalfield
 - Western Coalfield
 - Central Coalfield
 - Gloucester Basin

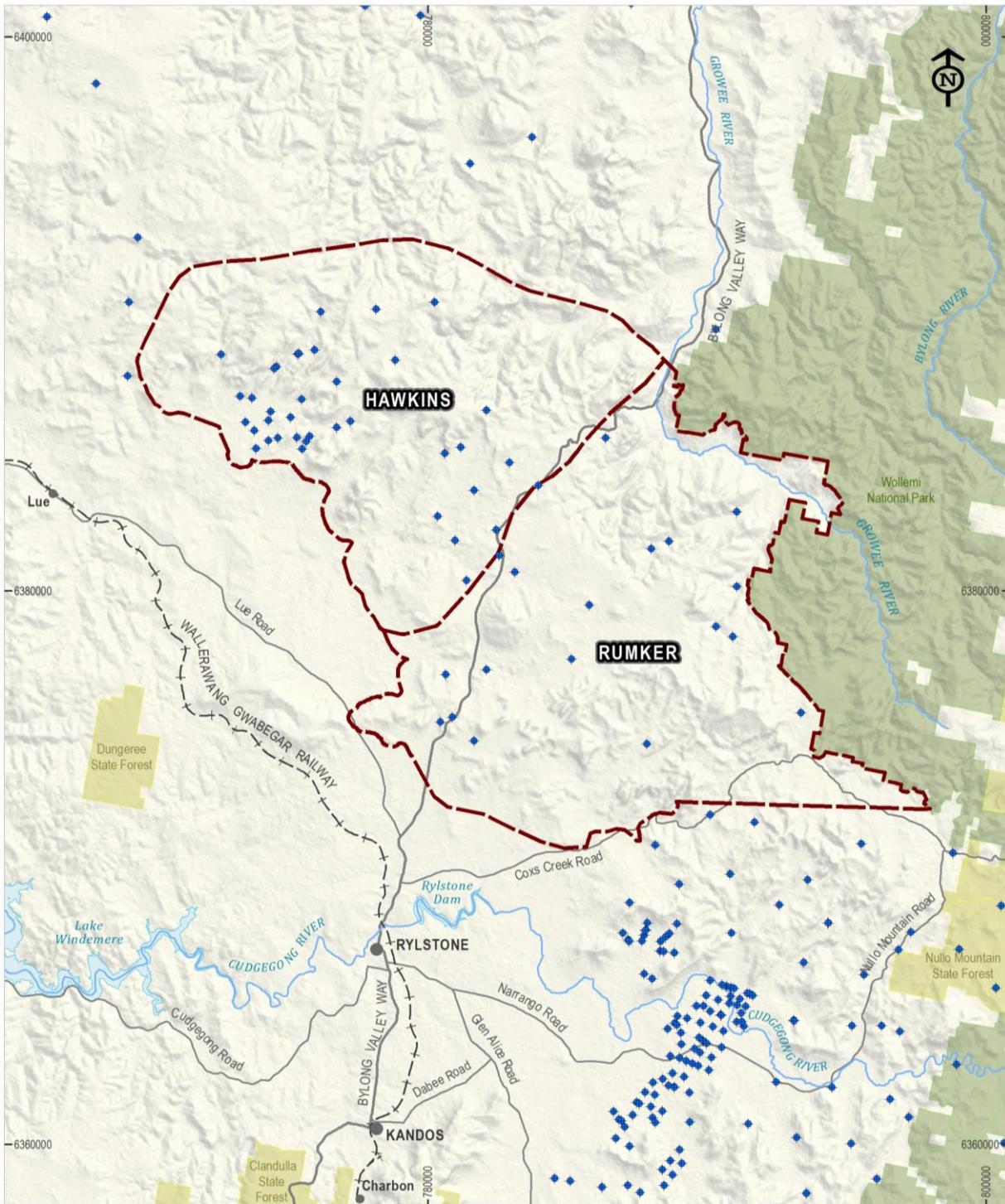
Source: NSW Spatial Services (2021); Geological Survey of NSW (2021)



NEW SOUTH WALES COALFIELDS

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Figure 3: New South Wales Coalfields



Source: NSW Spatial Services (2021), Geological Survey of NSW (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - ◆ Exploration Borehole

**PREVIOUS EXPLORATION
IN THE HAWKINS RUMKER
POTENTIAL RELEASE AREAS**

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Figure 4: Previous Exploration in the Hawkins and Rumker Potential Release Areas

2.3 Development Scenarios

Exploration

The purpose of exploration within the potential release areas is to identify areas where coal resources may be present, establish the quality and quantity of these resources, and investigate the viability of extracting the resources.

Exploration licences would have an initial term of up to 6 years, if granted over part, or all of the potential release areas.

The nature and location of any exploration activities would be determined by the tenement holder and would likely be conducted in stages. Initial exploration generally involves activities with limited disturbance, such as airborne surveys and ground-based surveys. Exploration drilling would also be conducted if the initial exploration activities indicate that further exploration is warranted.

The tenement holder would need to obtain relevant access agreements with landholders for its exploration activities and relevant exploration activity approvals under Part 5 of the EP&A Act (see **Section 3.5**).

Mining

Coal exploration does not always lead to coal mining. In cases where development proceeds, it is typically a smaller portion of the larger exploration area.

Any future proposed coal mining activities in the potential release areas would be subject to a merit assessment by the NSW Government, which would include significant community consultation (see **Section 3.5**).

As this PRIA occurs at an early stage in the evaluation of the potential coal resource, knowledge of the likelihood and nature of any future coal mining is limited. Notwithstanding, this PRIA has been prepared on the basis that the identified coal resources would be extracted via underground mining methods, consistent with the outcomes of the Resource Assessment Report.

Underground mining methods available for the potential release areas include bord and pillar mining and longwall mining:

- Bord and pillar mining – involves the initial extraction of coal from a network of underground roadways (known as panels), followed by the extraction of a portion of the remaining coal (secondary extraction).
- Longwall extraction mining – involves the extraction of rectangular panels of coal (longwalls) 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.

The Resource Assessment Report for the Hawkins and Rumker potential release areas determined that an underground mining operation would likely only be viable using longwall mining methods. However, secondary bord and pillar mining could supplement longwall mining in areas with shallow overburden or geological constraints.

The Commercial Viability Assessment Report considered three potential underground mining layouts, producing between approximately 140 Mt and 350 Mt ROM coal, resulting in between 136 Mt and 290 Mt of product coal.

Any coal mining undertaken via underground mining methods would be expected to include development of access points to the underground mine (e.g. boxcuts and/or portals), underground roadways and shafts to support underground extraction. Any potential boxcut construction to facilitate underground mine access would typically occupy up to 50 hectares (depending on coal seam depth at the location of the boxcut).

Typical surface infrastructure associated with underground mining operations would include (but not be limited to) coal processing facilities, coal stockpiles, emplacement areas for coal rejects (a by-product of coal processing), gas and ventilation infrastructure, water management infrastructure, site offices, access roads and utilities.

Underground coal mining operations can operate for several decades, contingent on the availability of resources and mine plan. Remediation of subsidence impacts occurs throughout the life of a mine. Following completion of coal mining, the operation would be decommissioned, and all disturbance associated with surface infrastructure would be rehabilitated.

The method of transporting coal from any future mining operation in the potential release areas would depend on whether coal is processed in an on-site coal handling and processing facility or off site. There may also be opportunities to use infrastructure at existing mining operations.

Once mined and/or processed, coal would need to be transported to local markets or to the Port of Newcastle or Port Kembla for export. Potential transport options include:

- coal haulage via trucks on public roads;
- rail transport, including construction of a rail loop and train load-out infrastructure; and
- construction of an overland coal conveyor to another mining operation.

Potential impacts associated with land subsidence from underground mining activities and off-site transportation of coal were raised during consultation activities for this PRIA. Further detail on these aspects are provided in **Sections 5.1** and **5.16**, respectively.

3.0 Strategic Planning Context

3.1 Regional and Sub-Regional Context

The potential release areas are located in the Mid-Western Regional local government area (LGA) and the Australian Bureau of Statistics (ABS) Lithgow-Mudgee Level 3 Statistical Area (SA3) (see **Figure 5**).

The key population and services centre in proximity to the potential release areas is Mudgee (population 10,923²), located approximately 26 km west of the Hawkins potential release area and 37 km north-west of the Rumker potential release area. Other communities and localities in the vicinity include Kandos (1,315), Rylstone (920) and Lue (192) (see **Figure 4**).

Nearly half (48%) of employment in the Lithgow-Mudgee SA3 boundary is in mining, health care and social assistance, retail trade, accommodation and food services and construction. Other main industries of employment include education and training, agriculture, forestry and fishing, public administration and safety, and manufacturing³.

Mudgee hosts significant mining workforces for local mining operations (e.g. Ulan, Moolarben and Wilpinjong Coal Mines, see **Section 5.11**). The mining industry employs 857 people in the Mudgee ABS Level 2 Statistical Area (SA2), where mining is the largest industry of employment followed by retail and health services. This significant existing local workforce is expected to possess a range of skills that are directly transferrable to coal exploration and potential future mining in the potential release areas.

The main road transport links in the region are the Castlereagh, Great Western and Golden Highways. The Castlereagh Highway is a sealed road that provides a regional connection between Lithgow (south of the potential release areas) and Mudgee, as well as providing access to the Queensland border and Newcastle via the Golden Highway. The Great Western Highway is a sealed road and links Lithgow with Bathurst and Sydney.

Other major roads in the region, such as between Mudgee and Rylstone (Lue Road), and Rylstone and Kandos (Bylong Valley Way) are largely sealed. Adjoining unsealed minor roads limit all-weather road access in these areas.

A key natural feature located immediately east of the potential release areas is the Greater Blue Mountains World Heritage Area, which incorporates the Wollemi National Park. Lake Windemere and the Cudgegong River are also located south-west of the potential release areas (**Figure 6**).

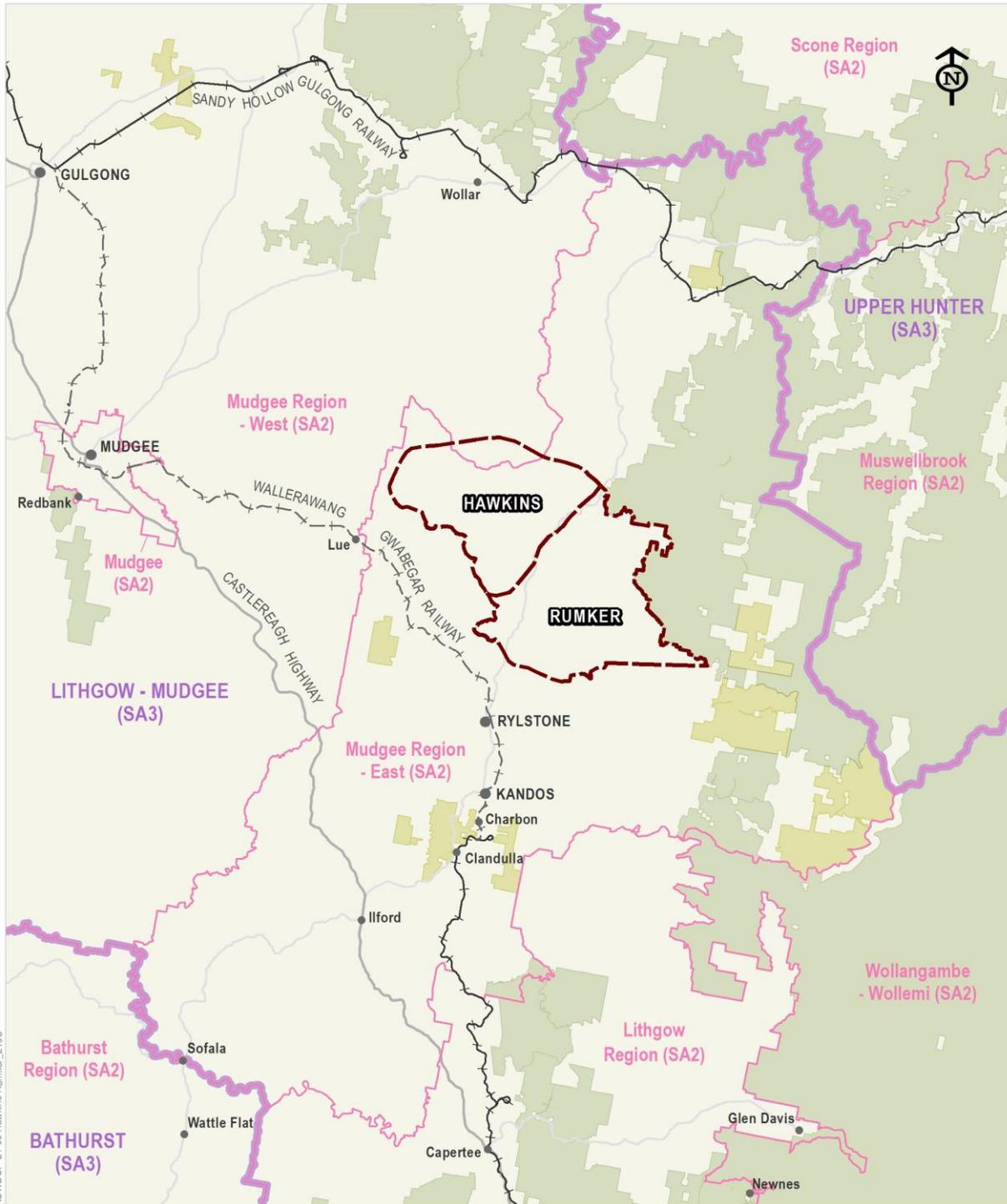
Land use in and around the potential release areas is characterised by grazing (sheep, cattle), dryland and irrigated agriculture, mining, tourism and nature conservation uses⁴. The area is classified as a mild temperate zone with a 675 millimetres (mm) annual average rainfall.⁵

² Source: ABS, 2016 (<https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20QuickStats>).

³ Source: ABS, 2016 (<https://dbr.abs.gov.au/region.html?lyr=sa3&rgn=10303>).

⁴ Source: NSW Government, 2017 (<https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017-v1p2-f0ed>).

⁵ Source: BoM, 2021 (http://www.bom.gov.au/jsp/ncc/climate_averages/rainfall/index.jsp).



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway
 - Railway (non-operational)
 - Major Road
 - Secondary Road
 - Local Government Area
 - Statistical Area Level 2 (SA2)
 - Statistical Area Level 3 (SA3)

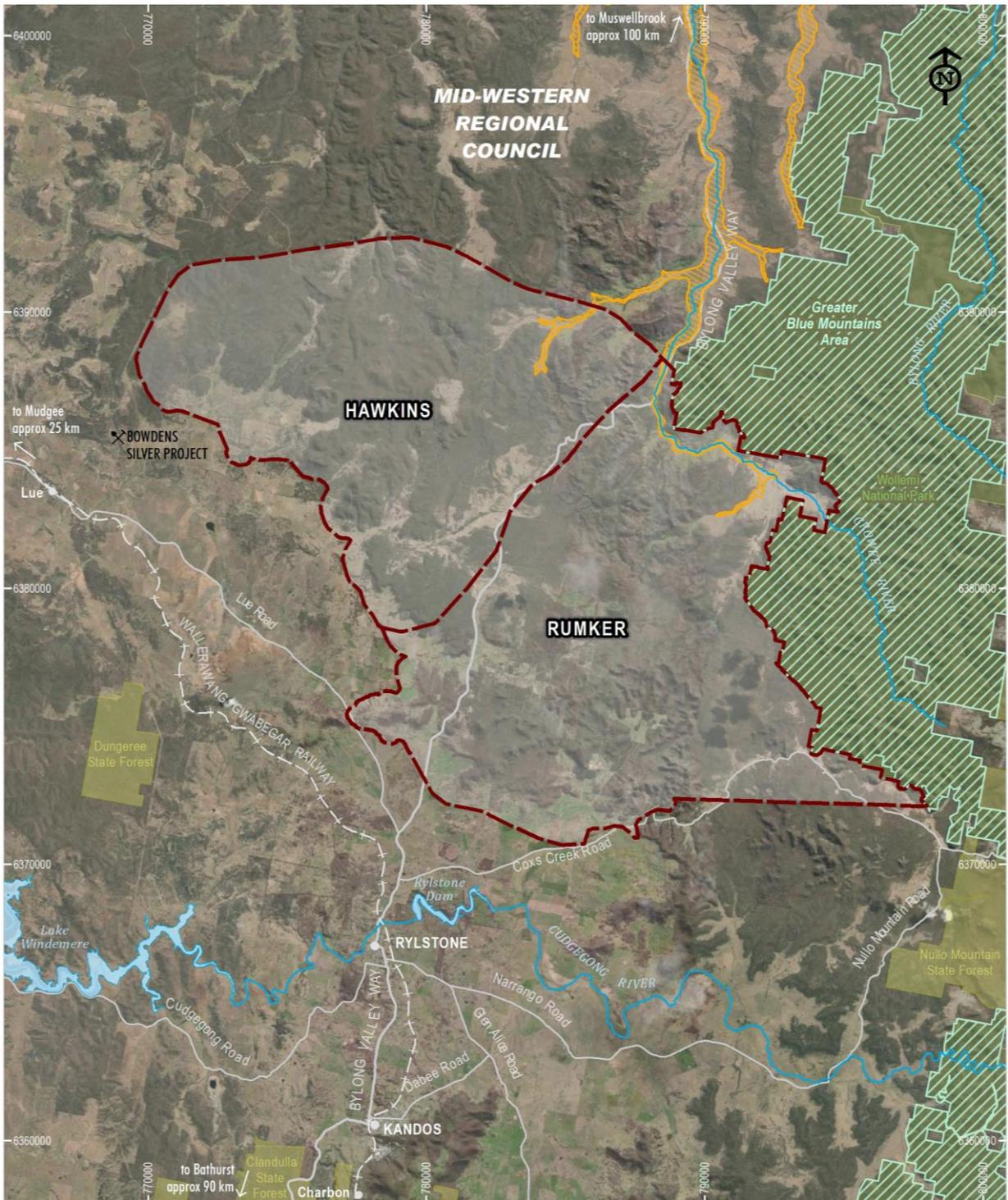
Source: Australian Bureau of Statistics (ABS) (2017)
DPIE (2021); NSW Spatial Services (2021)



**REGIONAL CONTEXT -
SOCIO-ECONOMIC STATISTICAL
AREAS**

**PRELIMINARY REGIONAL
ISSUES ASSESSMENT**

Figure 5: Regional Context – Socio Economic Statistical Areas



Source: NSW Spatial Services (2021), ESRI Imagery (2020)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - World Heritage Area
 - Highly Productive Groundwater
 - Railway (non-operational)
 - ✂ Mining Operation



**REGIONAL CONTEXT
- HAWKINS AND RUMKER
POTENTIAL RELEASE AREAS**

PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 6: Regional Context – Hawkins and Rumker Potential Release Areas

3.2 Strategic Statement on Coal Exploration and Mining

The *Strategic Statement on Coal Exploration and Mining* outlines the NSW Government's approach to manage the global transition to low carbon sources of energy and assist regional communities reliant on the NSW thermal coal mining industry. The Statement recognises that coal is a significant industry in NSW, in particular for numerous regional communities where the coal industry provides jobs and royalties used to fund public services and infrastructure.

The NSW Government will act in four areas:

1. Improving certainty about where coal mining should not occur.
2. Supporting responsible coal production in areas deemed suitable for mining.
3. Addressing community concerns about the impacts of coal mining.
4. Supporting diversification of coal-reliant regional economies to assist with the phase-out of thermal coal mining.

In addition, the *Strategic Statement on Coal Exploration and Mining* identifies a number of potential coal exploration release areas under the Strategic Release Framework, including the Hawkins and Rumker areas.

The Statement suggests that although long-term thermal coal demand from NSW will likely decrease up to 2050, the global transition to low carbon sources of energy will take some decades to complete.

Since its release, there has been further acceleration in global commitments to reducing carbon emissions and the rapidly changing policy setting will have important implications for global coal demand over the coming years (see **Section 3.4** below).

In regard to the domestic market, it is noted that all five of NSW's coal generators, which together supply 84% of the State's utility-scale electricity, are expected to retire over the coming two decades. The 2021-22 NSW Intergenerational Report states that domestic energy generation will be mostly from renewables by 2040.

In 2020, the top three thermal coal export destinations for NSW (i.e. Japan, South Korea and China) all announced their commitment to net zero emissions by 2050. More recently, the European Union and the United States have outlined policies which would impose carbon tariffs on imports from countries with higher greenhouse gas emissions.

Additionally, the lasting effects of the COVID-19 pandemic has led to forecasts of global demand being revised down considerably, including the 2020 World Energy Outlook published by the International Energy Agency. The Legislative Assembly Committee on Environment and Planning Report (August 2021) recommends the NSW Government monitors changes in the coal export market to plan for the impact of a decline in coal exports, particularly in regard to impacts on regional communities and economies heavily reliant on the coal industry.

Given the uncertainty over the long-term prospects for coal exports, it is anticipated that only those coal reserves with higher coal quality and that can be accessed at a low cost would remain attractive for development.

3.3 NSW Regional Plans

The Department's Central West Plan sets out the strategic vision for the Central West and Orana region of NSW which includes 19 local government areas, including Mid-Western Regional. The potential release areas are contained within the area covered by the Central West Plan.

The Central West Plan includes four key goals: the most diverse regional economy in NSW; a stronger, healthier environment and diverse heritage; quality freight, transport and infrastructure networks; and dynamic, vibrant and healthy communities.

The plan recognises the importance of mining and resources to the regional economy of the Central West and Orana region, but also identifies the need to manage potential land use conflicts.

The plan also sets out a vision for current and future infrastructure and upgrades, such as proposed investment in improving the Golden Highway from Dubbo to Newcastle and improvements to the regional freight network (both road and rail).

3.4 Climate Change Policy Framework

The *NSW Climate Change Policy Framework*, released in November 2016, defines the NSW Government's role in reducing carbon emissions and adapting to the impacts of climate change, and sets policy directions to guide implementation of the framework.

As part of the *NSW Climate Change Policy Framework*, the NSW Government endorses the United Nations Paris Agreement on climate change. The NSW Government is taking action that is consistent with the level of obligation required to achieve Australia's commitments to the Paris Agreement and complements national action.

The *NSW Climate Change Policy Framework* recognises a number of different pathways to reducing greenhouse gas emissions, involving different combinations of action on:

- renewable energy;
- energy efficiency;
- carbon sequestration; and
- emissions savings from other sectors such as agriculture and land use.

The safe and sustainable development of coal resources in NSW during the transition to more renewable energy sources (as outlined in Strategic Statement on Coal Exploration and Mining) is not inconsistent with the *NSW Climate Change Policy Framework* and its aspirational targets.

The *NSW Climate Change Policy Framework* does not seek to prevent private development, including coal industries, as a means for Australia to meet its commitments under the Paris Agreement or the long-term aspirational objective of the *NSW Climate Change Policy Framework*.

However, since the *NSW Climate Change Policy Framework* was released, the Intergovernmental Panel on Climate Change (IPCC) released its sixth Assessment Report finding that, "*unless there are immediate, rapid and large scale reductions in greenhouse gas emissions, limiting global warming to close to 1.5 degrees Celsius or even 2 degrees Celsius will be beyond reach*".

Numerous community submissions highlighted the IPCC's conclusion regarding available carbon budgets for climate scenarios of warming of 1.5 and 2 degrees Celsius. The Department also notes that the IPCC's Assessment Report considers one climate scenario, which would require consideration along with other relevant scenarios during assessment of a potential future mining operation.

Further, in May 2021, the International Energy Agency also released its report 'The World's Roadmap to Net Zero by 2050', which states that to meet the objectives of the Paris Agreement, developed nations must not explore for or exploit any further fossil fuel reserves.

3.5 Regulatory and Planning Framework

The current regulatory and planning framework has been considered during the process of identifying and considering key issues, opportunities and constraints.

The Strategic Release Framework represents the first stage in the exploration and potential development of a coal resource.

If the areas are released for exploration, the NSW Government has processes in place to assess, monitor and manage any impacts associated with coal exploration and mining activities.

Assessment of exploration activities would occur under Part 5 of the EP&A Act.

Any future proposed coal mining activities in the potential release areas would be subject to a detailed merit assessment under the State Significant Development (SSD) provisions of the EP&A Act, which includes comprehensive community consultation.

In addition to the above, the Commonwealth *Native Title Act 1993* provides the framework for the recognition and protection of native title and interaction with holders of native title.

A number of Codes of Practice would apply to exploration activities through conditions imposed on the exploration licence and regulated by the NSW Environment Protection Authority. These Codes of Practice would include:

- Exploration code of practice: community consultation.
- Exploration code of practice: environmental management.
- Exploration code of practice: produced water management, storage and transfer.
- Exploration code of practice: rehabilitation.

The Resources Regulator has released guidance material on drilling practices, most notably the *Guideline for mineral exploration drilling; drilling and integrity of petroleum exploration and production wells*. This Guideline provides information and seeks to inform industry practices.

Exploration

Before coal exploration, an explorer must first obtain an exploration licence under the *Mining Act 1992*. An application for an exploration activity approval is generally accompanied by a Review of Environmental Factors (REF), which provides information about the specific nature and location of exploration activities and how the environmental impacts of the activity will be controlled. An Environmental Impact Statement (EIS) is required if the activity will significantly impact the environment.

In assessing an application for an exploration activity approval, Section 5.5 of the EP&A Act requires the Resources Regulator to 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity'. Section 5.5 also requires the Resources Regulator to consider the effects on conservation agreements, wilderness areas, critical habitat, protected fauna, flora and threatened species, populations and ecological communities and their habitats.

Following the completion of the Part 5 assessment process, the Resources Regulator may grant or refuse an application for approval to carry out a particular exploration activity. Any approval will typically be issued subject to terms. These terms will usually require compliance with any commitments made in a REF. Other terms may require the tenement holder to prepare additional plans, undertake specific mitigating measures or limit the proposed activity in some way to minimise harm to the environment.

The assessment and approval of an exploration activity under the *Mining Act 1992* does not affect any obligation to comply with the requirements (including any requirement to obtain an approval) under other

legislation. Examples of legislation imposing such requirements include the *National Parks and Wildlife Act 1974* (NPW Act), *Protection of the Environment Operations Act 1997*, *Roads Act 1993*, *Water Management Act 2000*, *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Native Title Act 1993*.

An exploration licence would provide the tenement holder with exclusive rights to explore for coal resources within the designated area but does not permit mining, nor does it guarantee that a mining lease will be granted.

Exploration licences are granted subject to standard and/or special conditions, including strict environmental management conditions to protect native vegetation, fauna, land, water resources, heritage and community values.

Tenement holders are also required to rehabilitate areas disturbed by exploration activities and must provide financial security to cover the likely rehabilitation costs in the event that they default on this obligation.

Development Consent

Future coal mining in the potential release areas would be considered SSD under the *State Environmental Planning Policy (State and Regional Development) 2011*. This is because these types of development are major developments which are significant from a state-wide social, environmental and economic perspective.

All SSD applications must go through a rigorous merit assessment process in accordance with the mandatory matters for consideration in Section 4.15 of the EP&A Act. An EIS is required for SSD applications which must be prepared in accordance with requirements issued by the Department and include a detailed assessment of the environmental, social and economic impacts of the proposal. The EIS must also be prepared in consultation with the community and government agencies.

In assessing an application for SSD, the Department will publicly exhibit the application which allows the community to have a say on the project before a final decision is made.

For most major resource projects, the IPC is the consent authority and will make the final decision on the merits of a project. Any approval will typically be granted subject to a range of conditions that require the applicant to undertake specific monitoring, management and offsetting measures to minimise and compensate for the residual impacts of the project.

4.0 Community and Stakeholder Engagement

The development of this PRIA was informed by engagement with interested and potentially impacted stakeholders. The engagement process was designed to:

- inform the community and other stakeholders of the scope of the PRIA process, including the Strategic Release Framework, and potential for future exploration and production activities in the two potential release areas;
- identify potential risks, opportunities and constraints; and
- document and report on the input from the community as part of this PRIA.

4.1 Consultation with Public Authorities

The Department has consulted with State and Commonwealth Government agencies in preparing the PRIA, which has included interagency meetings and data sharing. This agency engagement enabled the Department to:

- identify and collate relevant environmental, social and economic data on the four potential release areas; and
- examine available information to categorise and prioritise key issues, opportunities and constraints associated with potentially releasing the areas for coal exploration.

Input has been provided by the Environment, Energy and Science Group, the Water Group (DPIE-Water) and Crown Lands within the Department; NSW Environment Protection Authority; Department of Primary Industries – Agriculture; Department of Primary Industries – Fisheries; Department of Agriculture, Water and the Environment – Water; Geological Survey of NSW; Department of Premier and Cabinet (including Heritage NSW); Transport for NSW; WaterNSW and NSW Aboriginal Affairs.

The Department also engaged directly with the Mid-Western Regional Council.

The information received from public authorities has been incorporated and considered in this PRIA, including in the summary of feedback received on key potential risks, opportunities and constraints provided in **Section 5.0**.

4.2 Engagement Activities

Community members, landowners and other interested stakeholders were initially notified of the PRIA process through advertisements in local and State papers and a combination of letters, emails and phone calls. These stakeholders included Aboriginal groups such as Local Aboriginal Land Councils and Native Title Groups, community organisations such as Lock the Gate and the Rylstone District Environment Society, and other special interest groups.

Formal consultation commenced in early June, with exhibition commencing on the Department's Planning Portal on 14 June 2021.

Following a high level of stakeholder interest and feedback about the engagement process, the Department made additional efforts to notify and consult with stakeholders. This included additional advertisements in local and State newspapers and a mailout to all addresses in the Rylstone and Kandos areas.

At the request of the Department, the ABSR also endorsed an extension to the community consultation period until 18 August 2021. This extended consultation period ensured the community had a total of eight weeks to provide feedback.

Feedback was obtained from stakeholders through a variety of methods including email, phone conversations, video and completion of an online feedback form. The Department also maintained a dedicated email and

phone number for engaging with the community and had several options available for people without reliable access to the internet to provide feedback.

Video meetings were held with the Rylstone Region Coal Free Community Group, North East Wiradjuri Company (including representatives from the Dabee clan), Rylstone Kandos Chamber of Commerce, Ferntree Gully Reserve Land Manager, Mudgee District Environment Group, NSW Aboriginal Land Council, Mudgee Local Aboriginal Land Council, and Lock the Gate Alliance.

The Department also met with the Hon. Paul Toole MP – Member for Bathurst and Independent MP Justin Field MLC.

The Department held a total of seven online community meetings from late June to early August 2021, which were attended by around 170 community members.

The Department acknowledges the impacts of the COVID-19 outbreak on the consultation process which has meant that the Department has been unable to hold face-to-face community meetings in the local area. However, given the extensive community feedback received (discussed further below), the Department is confident that it is well informed of the community's views on any potential exploration and mining, and the constraints to releasing the potential release areas.

4.3 Feedback Received

Nature of the Feedback Received

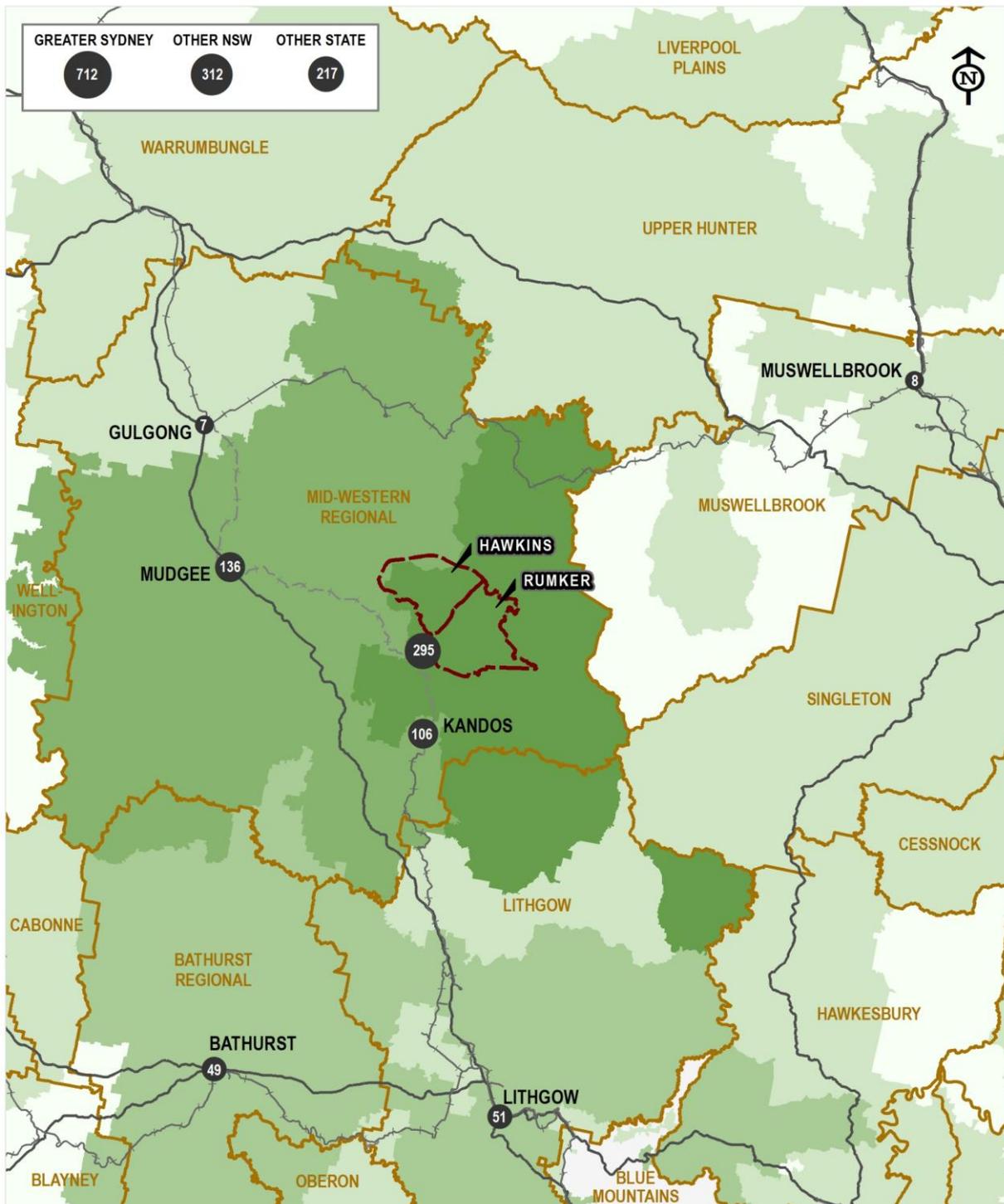
The Department received feedback from a total of 2,064 community members, community and industry groups, and local Councils. The public feedback was overwhelmingly opposed to any coal exploration or mining in the areas with 15 submissions in support, 1 commenting and 2,048 submissions objecting. Around 295 submissions were received from the Rylstone postcode area and 106 submissions were received from the Kandos postcode area. Around 25% of submissions came from the Rylstone, Mudgee and Kandos postcode areas. The locations of the submissions (by postcode) are shown on **Figure 7**.

The Department received several substantial submissions from special interest groups. The submission from Lock the Gate Alliance included a detailed technical environmental report prepared by Earthscapes⁶ with mapping and analysis of the values of the Hawkins, Rumker and adjoining Ganguddy-Kelgoola strategic release areas sourced from various existing databases. Values mapped included recorded threatened species and communities, groundwater dependent ecosystems, land use, Aboriginal heritage sites, strategic agricultural land, water resources and groundwater bores.

The Department also received a detailed submission from the Rylstone Region Coal Free Community (RRCFC) that included detailed reports on the key environmental constraints focusing on the potential surface water, biodiversity, health and social, noise, tourism and heritage impacts of mining in the Hawkins and Rumker proposed release areas. Their submission also included survey results and petition signatories strongly opposing any proposed release of these areas.

6

Western Coalfields Strategic Release Mapping and Analysis (Earthscapes 2021), prepared for Lock the Gate Alliance.



Source: NSW Spatial Services (2021)

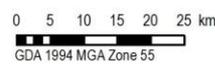


KEY

- Potential Release Area
- Local Government Area
- Major Road
- +— Operational Railway
- - - Railway (non-operational)

Number of Public Submissions

- 0
- 1 - 15
- 15 - 50
- 50 - 150
- 150 - 300



NUMBER OF PUBLIC SUBMISSIONS BY LOCATION

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 7: Numbers of Public Submissions by Location

Key Risks, Constraints and Opportunities Raised

The issues raised during the Department's community engagement process have been considered in the discussion of opportunities and constraints in **Section 5.0** and in developing the Department's recommendations in **Section 6.0**. Conceptually, these submissions had three key themes.

First, they were almost universally opposed to new coal exploration and development due to the implications for greenhouse gas emissions and climate change. They argued that urgent action is required to address climate change, and that NSW should be doing everything it can to transition away from fossil fuels, such as coal, towards a greater reliance on renewable energy (wind, solar, battery storage and pumped hydro). There were significant calls for increased investment in renewable energy over the development of new coal mines.

There were concerns that any proposed release would be contradictory to the commitments made by NSW and Australia including net-zero obligations under the Paris Agreement and the NSW Government's own emissions strategy (35% reduction of emissions by 2030 compared to 2005 levels). Many submissions also questioned the strategic viability of any new coal development citing the International Energy Agency report 'The World's Roadmap to Net Zero by 2050', which states that to meet the objectives of the Paris Agreement, developed nations must not explore for or exploit any further fossil fuel reserves.

These submissions argued that the development lead time for any new mine would mean it would be unlikely to go ahead at the cost of unnecessary uncertainty for the community. Several submissions focussed on the economic justification and likely commercial viability of any future development, citing investment risks such as reduced capital availability in the sector and changing societal attitudes. They argued that the decline of thermal coal demand is happening faster than anticipated due to increasing international commitments to net zero emissions targets and uptake of renewable energy sources. Submissions also questioned the strategic significance of the resource, arguing that there are sufficient coal resources in existing mines or extensions to existing mines to meet projected demand.

Second, the submissions were concerned about the direct environmental impacts of mining (and to a lesser extent exploration), the most common of which included:

- threats to biodiversity and natural features, including the potential impacts of mining on threatened species and communities already impacted by drought and bushfires, groundwater dependent ecosystems, river systems, wildlife corridors, pagodas, locally significant reserves (namely Ferntree Gully), the future of existing conservation agreements, and impacts to Wollemi National Park that forms part of the World Heritage area;
- water-related impacts including access and availability of water (including drought-resilience), competition with other water users for stock and domestic use, surface water pollution from discharges, subsidence impacts on interconnected groundwater and surface water systems, and impacts to drinking water;
- amenity and health impacts including potential noise, dust and transport-related impacts;
- cultural heritage impacts (discussed further below);
- tourism impacts, including the increasing economic and social prospects of Rylstone's unique tourism experience; and
- potential land use conflicts such as threats to other land uses including bushwalking, camping, ecotourism and agriculture.

Finally, the submissions were concerned about the social impacts of exploration and mining, citing the examples of Wollar village and the Bylong Valley. Submissions highlighted that even at the exploration phase, mental health impacts such as stress and anxiety may occur due to the potential threat of mining impacts on the region, economic stability and devaluing of land. Concerns were also raised over the compounded effects of the recent bushfires, drought and COVID-19 pandemic on the community's resilience to absorb further social

impacts. Other social impacts included those associated with property acquisitions including a reduction in local populations, services, community values and sense of place and changes in the social fabric of the area.

The Aboriginal community have raised concerns about potential impacts not only to key sites of significance but the broader cultural heritage landscape and connection to Country. They expressed concern that mining of any kind risks disturbing sites, and that moving, damaging, or destroying one site, destroys the meaning of the sites and their interconnectedness. Concerns were also raised about potential exclusion of Aboriginal peoples from accessing their cultural heritage, subsidence impacts on significant swamps, rock and water features, increased pressure on water resources in an area affected by drought and the cumulative impact of mining on Aboriginal heritage in the region. The cumulative loss of important sites was flagged as a key concern during engagement with Aboriginal community members, indicating the loss is already impacting on intergenerational transfer of knowledge and cultural practices. Several submissions indicated the potential for many more sites to be present than identified in the REF and that further consultation should be undertaken with the Aboriginal community should any exploration be undertaken to ensure the cultural heritage values of the region can be adequately assessed.

While the large majority of stakeholders raised concerns about potential coal exploration and production, a few submissions recognised the potential employment, economic and infrastructure development opportunities that might result from coal exploration. Whilst acknowledging the potential constraints of mining, Mid-Western Regional Council also acknowledged benefits such as diversifying employment in the region, noting the resilience of the Mudgee economy is attributable to the mix of tourism, agriculture and existing mining operations. Other stakeholders thought that local employment and other flow-on economic benefits would not be realised in the locality or region, as mining workers would choose to live elsewhere.

Other Issues Raised

In addition to the feedback received about the community consultation process, concerns were raised about the transparency of the Strategic Release Framework, including requests for the Department's assessment report and Resource Assessment Report to be made publicly available when submitted to the ABSR.

The Department also heard concerns about the REF assessment prepared for the potential release areas. Specific concerns related to the adequacy of information considered (i.e. that key environmental values were under-represented and not well supported by field data) and the level of consultation including with the Aboriginal community. The Department notes that the REF process is overseen by the Department of Regional NSW and does not form part of the scope of this PRIA.

Several community groups raised concerns about the assumption that any potential mining would be via underground methods only and that the PRIA does not consider the potential impacts of extensive open cut mining. It was argued that this would be the preferred development scenario given the depth of the resource and the approach of other mining operations in the region. While the Department acknowledges that it cannot predict the exact mining development scenario, it has based its assessment on the Geological Survey's Resource Assessment Report that considers an underground mining scenario only, with the potential for a small open cut to support development of underground workings.

Finally, the Department heard concerns about potential cumulative impacts with the adjoining Ganguddy-Kelgoola potential release area and the possible extent of mining operations and cumulative impacts should this area be released. As noted above, the Ganguddy-Kelgoola potential release area does not form part of this PRIA report.

Summary of Issues Raised

A summary of all the feedback received during consultation is provided in Table 2.

Table 2: Summary of Key Matters Raised

Issues	
Greenhouse Gas Emissions and Climate Change	<ul style="list-style-type: none"> • Significant concern about greenhouse gas emissions associated with coal extraction and use. • Calls for increased investment in renewable energy over development of new coal mines, as per international obligations. • Concern that the development of new coal mines is contradictory to: <ul style="list-style-type: none"> ○ the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report. ○ Australia’s obligations under the Paris Agreement and specifically the NSW Government’s emissions strategy of net-zero by 2050 and interim target of a 35% reduction in emissions by 2030. ○ The report by the International Energy Agency ‘The World’s Roadmap to Net Zero by 2050’. The roadmap states that to meet the objectives of the Paris Agreement, developed nations must not explore for or exploit any further fossil fuel reserves. ○ The Federal Court ruling regarding duty of care relating to future harm inflicted by carbon emissions (Sharma & Ors v Minister for the Environment [2021] FC 560). ○ The 2021-22 NSW Intergenerational Report stating that domestic energy generation will mostly be from renewables by 2040.
Strategic/economic significance	<ul style="list-style-type: none"> • Significant concerns about the strategic merit of new coal mining activities, specifically in relation to the long-term viability of coal mining. References cited included: <ul style="list-style-type: none"> ○ Recent G7 joint action to end public support for overseas unabated coal generation by end of 2021. ○ Reserve Bank of Australia indication that the long-term, international demand for thermal coal is set to decline. ○ Existing coal mines in proximity to the proposed release area have scaled back extension plans (Angus Place). ○ Worldwide reduction in demand for thermal coal. ○ The Legislative Assembly Committee on Environment and Planning Report that recommends the NSW Government monitors changes in the coal export market to plan for the impact of a decline in coal exports. ○ NSW Government’s June 2020 Strategic Statement on Coal Exploration and Mining in NSW. The plan outlined the government’s intention to support economic diversification of coal-reliant regions, in order to facilitate phasing out thermal coal mining. • Lack of certainty that existing coal mines in the Hunter Region are operating at full capacity. • Approvals for existing coal mines have the capacity to meet projected coal demand. • Unease surrounding the intergenerational impact of new coal mines for the future local economy when coal mining is not viable. • Concern that the proposal to release new areas for coal mining does not align with: <ul style="list-style-type: none"> ○ The aims of the Mid-Western Regional Local Environmental Plan 2012. ○ Cl.12 of the Mining SEPP 2007, which requires the consideration of land uses. • Lack of confidence that the coal seam in the proposed release area is suitable for energy generation (high ash content). • Concern that the issuance of exploration licences could set precedence for future expansion. • Significant concern that coal exploration poses a threat to the World Heritage listing of the Greater Blue Mountains Area World Heritage area. • Strong views that coal exploration is not in the public interest of the local community.
Biodiversity	<ul style="list-style-type: none"> • Potential impacts on endangered and threatened flora and fauna, including Wollemi Pine, Small Purple-pea, Koalas, Regent Honeyeaters, Powerful Owl and Spotted-tailed Quolls. Concerns about the potential fragmentation of habitat impacting seasonal migration. • Impacts of the 2019/20 bushfires on local populations and their habitats, and resilience to further impacts. • Impact of mining activities on wildlife corridors, groundwater dependent ecosystems and remnant vegetation, including the riparian meadows along Reedy and Breakfast Creeks. • Lack of certainty surrounding the future of existing conservation agreements. • Cumulative impacts from existing and future mining operations on the Greater Blue Mountains Area World Heritage area and Wollemi National Park. • Lack of confidence in BioBanking or offsets schemes in protecting endangered fauna.

Issues	
Tourism and recreation	<ul style="list-style-type: none"> Loss of tourism/emerging tourism opportunities in Rylstone arising from coal mining activities and amenity impacts. Existing and future tourism opportunities cited included ecotourism (bushwalking) and agritourism (food and wine), accommodation and astronomy tourism. Specific concerns about the impact of coal mining on Lindoway Farm (animal refuge), Ferntree Gully (hiking / recreation), Ganguddy – Dunns Swamp (camping / recreation), Bylong Labyrinth (hiking) and the Mudgee Classic (bike riding). Potential loss of viticulture as a result of mining activities. Community concerns that the ingress of workers and families associated with mining activities would impact tourist-oriented businesses and the growth in local tourism (e.g. The Tablelands Way).
Water resources	<ul style="list-style-type: none"> Concerns about the impact of mining activities on high value waterways including the headwater streams of Cudgegong River and upper catchments of the Goulburn River. Potential contamination of drinking water from mining in the Rylstone and Windamere Dam catchments. Subsidence impacts on Coxs Creek, Growee River, water tables and swamps. Possible geomorphological impacts on the catchment including cracking, sedimentation, altering channel hydraulics and bank erosion. Potential downstream pollution from mine water discharges and poor management of tailings dams, settling ponds and washing stations. Lack of certainty that the water supply in the proposed release area is sufficient to support coal mining activities. Insufficient confidence in water availability accounting under different climatic scenarios to allow for exploration to proceed.
Agriculture	<ul style="list-style-type: none"> Potential degradation of farmland from subsidence and loss of surface water. Concerns about the viability of agricultural operations if subsoil water is negatively impacted by mining operations. Concerns about the impact of water contamination on downstream agricultural activities. Concern about the loss of BSAL land. Concern about declining farm values and stagnation of on-farm investments.
Aboriginal heritage	<ul style="list-style-type: none"> Potential impacts to documented and undocumented sites of Wiradjuri heritage, including potential rock shelters, painted/engraved art, camp sites and grinding grooves. Broader concerns about the cumulative impact of mining to Country, the Wiradjuri peoples and their connection and access to the land, biodiversity and water resources to practice culture. Desecration of ancestral resting grounds. Cumulative loss of important cultural heritage sites and artefacts leading to concerns regarding an inability to undertake intergenerational transfer of knowledge and cultural practices. Allowing further mining would contribute to the ongoing cycle of intergenerational trauma. Negative effects on the social and emotional wellbeing of the local Wiradjuri people. Concern that mining operations would prevent Aboriginal peoples from accessing cultural heritage sites. Concerns about the adequacy of Aboriginal community consultation. General feedback that the areas contain significant and widespread cultural heritage values including an important women's songline running from Ulan to Lithgow.
Local economy	<ul style="list-style-type: none"> Fears surrounding the impact on local investment in agriculture, business and housing. Concern that economic benefits of mining activities will not flow on to the local economy. Lack of confidence in future local employment opportunities that could be taken by fly-in fly-out or drive-in and out workers from regional locations like Newcastle and the Hunter Valley. Concern that highly paid mine workers would push up local house prices and existing housing and accommodation would be taken up to accommodate workers associated with mining activities. Potential disincentive for landowner investments in small-scale agriculture in the area.

Issues	
Social	<ul style="list-style-type: none"> • Rising concerns about the growing social division within the community about coal mining and its compatibility with the character of the area. • Concerns mining operations can bring increased rates of alcohol and drug abuse, violence, sexual assault and crime in the adjoining communities. • Potential disruption of deep family connections to land and concerns about the legacy of impacts on future generations. • Concerns about the rapid demographic changes and displacement induced by coal exploration and its effects on the resilience of communities, particularly considering the 2019/20 bushfires, extended drought and the COVID-19 pandemic. • Significant concerns about the impacts from a change in land-use from traditional agriculture and the associated acquisition of property and loss of long-term landholders in the region, and the impacts on the social fabric and cohesiveness of the local community. • Strong views that any mining project would not have a social licence to operate given potential impacts on physical and mental health, access to water, housing and services, and impacts on Aboriginal cultural heritage. • Concerns that the social impacts of the Bylong Coal Project would be repeated for the communities of Rylstone and Kandos. • Concern that mine blasting activities within proximity to the Rylstone Aerodrome Park would render the area dangerous, therefore ceasing aircraft operations. The Rylstone Aerodrome Park provides essential connection to flying emergency services.
Pollution	<ul style="list-style-type: none"> • Air quality impacts for those residing near the mine and mining transport routes (road and rail). • Management and treatment of by-product and associated soil pollution. • Potential for heavy metal exposure to fragile ecosystems. • Complex geology of area poses potential risk of coal seam gas leakage. • Concerns about the impacts of light, noise and air pollution on neighbouring townships and Wollemi National Park.
Health	<ul style="list-style-type: none"> • Health concerns around increases in acute and chronic respiratory conditions associated with coal mining, coal transportation and coal-fired power generation. • Strong views that constant noise from mining operations will increase health concerns through sleep deprivation. • Heightening mental health concerns for community members in relation to the PRIA assessment, exploration and mining.
Natural disasters	<ul style="list-style-type: none"> • Potential impact of mining activities on water supply could make the region more susceptible to bushfires. • Potential for increased landslide risk due to ground instability. • Mine-related impacts on surface/ground water could potentially exacerbate future drought.
Governance	<ul style="list-style-type: none"> • Lack of confidence in regulation and compliance of mines with pollution regulation. • Concerns that the financial assurances paid by mining companies are ineffective in guaranteeing rehabilitation. Specifically, the potential of the projected decline of coal demand preventing mining operators from financing rehabilitation. • Fears about the impact of exploration on landowners in the proposed release area. • Concerns about post-mining impacts including ongoing fugitive emissions. • Significant concerns about the transparency of the strategic release process. • Mining operations in the proposed release area would require substantial and risky public investment to establish transport infrastructure.
Infrastructure	<ul style="list-style-type: none"> • Concerns that existing community infrastructure cannot support an expansion in population to accommodate mine-related workforce. • Escalating concerns that the current transport infrastructure is unable to support increased mining activity.

5.0 Identification and Preliminary Assessment of Environmental, Social and Economic Matters

This section considers key environmental, social and economic matters based on available data and the outcomes of community and stakeholder engagement. In addition to the environmental and heritage matters occurring within each potential release area, consideration has also been given to environmental and built features in the vicinity of each of the areas (such as the Cudgegong River, Growee River, non-operational Wallerawang-Gwabegar Railway Line and towns of Rylstone, Kandos, Lue and Mudgee). These issues are discussed in no particular order.

Key sources of data that have informed this PRIA include:

- feedback obtained through community and stakeholder engagement;
- the *Central West and Orana Regional Plan*;
- Strategic Statement on Coal Exploration and Mining in NSW;
- topographic and cadastral data and aerial imagery from NSW Spatial Services;
- geological data and information from Geological Survey of NSW;
- information on catchments, highly productive groundwater, groundwater use and groundwater dependent ecosystems from DPIE – Water, the NSW Water Register and in Water Sharing Plans or Water Resource Plans;
- spatial data on wetlands and lakes from the Biodiversity, Conservation and Science Directorate (BCS);
- key fish habitat spatial data provided by the Department of Primary Industries;
- spatial data on threatened flora and fauna species sightings provided by the BCS;
- spatial data on land systems, regional vegetation mapping, regional BSAL, land and soil capability, landform type, declared wilderness and State heritage made publicly available by the BCS;
- spatial data on wildlife refuge, conservation agreements and the Saving Our Species Program management sites provided by the BCS;
- spatial data of conservation areas provided by the BCS;
- information on matters of national environmental significance made publicly available by the Commonwealth Department of Agriculture, Water and the Environment;
- information on Crown reserves provided by Crown Lands;
- information on Native Title Claims, Aboriginal land claims and Indigenous Land Use Agreements made publicly available by the National Native Title Tribunal;
- information on Aboriginal cultural heritage available through the Aboriginal Sites Decision Support Tool and NSW Aboriginal Heritage Information Management System (AHIMS);
- Australian Bureau of Statistics (ABS) census data and Small Area Labour Markets data;
- agricultural gross value production (GVP) estimates made publicly available by the Department of Primary Industries - Agriculture;
- publicly available information on the Kandos to Gulgong Line reinstatement feasibility assessment;
- information on other major projects, primarily available from the Department's Major Projects portal; and
- information on tenements under the *Mining Act 1992* from Mining, Exploration and Geosciences (MEG).

The Department considers that sufficient information was available through existing Government data sources and through consultation with the community and stakeholders to identify high-level strategic issues and constraints.

5.1 Subsidence from Underground Mining Activities

Extraction of coal by underground mining methods can result in the vertical and horizontal movement of the land surface. These land surface movements are generically referred to as subsidence effects.

Any future underground mining within the potential release areas is likely to be undertaken primarily via longwall methods. Given the known depth of the coal seam below the surface (average of approximately 200 m), a conservative estimate of the maximum vertical subsidence movement would be in the order in the order of 1 to 2 m of vertical subsidence (i.e. 65% of the extracted coal thickness). Differential subsidence that occurs across and between longwall panels can result in changes in land slope (known as tilt) and strains that can cause cracking and heaving of the land surface.

Subsidence effects have the potential to impact water resources, including overlying swamps and groundwater dependent ecosystems, and other natural features including pagoda landforms, Aboriginal cultural heritage and biodiversity. A description of relevant environmental resources and natural features, as well as consideration of impacts that could result from a potential future mining operation, are discussed further in **Sections 5.1 to 5.11**.

Subsidence can also impact on built features, including private properties and associated houses and improvements (such as swimming pools), rural infrastructure (such as fences) and public infrastructure (such as roads and power lines).

The Department acknowledges that undermining houses is an issue that requires careful consideration. Mine operators are required to maintain private property in a safe, serviceable and repairable condition and the proponent of any potential future mining operation would be responsible for repair of any subsidence impacts on built features and/or compensation to property owners.

Potential subsidence impacts on residential dwellings may require the mine operator to relocate residents to alternative housing and then monitor and undertake repairs to the building (for example, releveling of wet areas, roof gutter replacement and/or repair of cracks). Alternatively, property acquisition may be involved, or the mine could be designed to avoid significant subsidence impacts by incorporating setbacks into the mine design.

For the Bylong Coal Project, subsidence impacts were predicted for the Bylong Valley Way, which also intersects with the proposed release areas and would likely be impacted by any future mining operations. The Bylong Valley way is a popular tourist route and serves as a connection between Rylstone and the Hunter Valley. Consequently, any subsidence impacts on the Bylong Valley Way would need to be monitored and managed to ensure the road remains safe and serviceable.

Remediation of subsidence impacts would be undertaken in accordance with approved Extraction Plans if required. Extraction Plans are required to be prepared and submitted for approval by the Department as a standard condition of development consent for underground coal mines in NSW and would need to contain:

- relevant background or baseline data;
- review of predictions of the potential subsidence effects, subsidence impacts and environmental consequences;
- a monitoring program to provide data to assist with the management of the risks associated with subsidence, validate subsidence predictions and analyses the relationship between subsidence effects and impacts and any ensuing environmental consequences;
- a plan to manage and remediate subsidence impacts and/or environmental consequences;
- trigger action response plans to identify risks and actions to avoid exceedances of performance measures;

-
- contingency plans, including adaptive management where an agreed performance measures is exceeded; and
 - reporting and review mechanisms.

Even with these measures in place, the Department considers that subsidence impacts on private properties could form a material economic constraint to the feasibility of a mining operation. This is due to the large number of existing landowners (i.e. greater than 170) within the potential release areas.

The incorporation of setbacks to avoid and minimise potential impacts on built features reduces the amount of coal that could be extracted and results in higher operational costs associated with shorter longwall panels. Alternatively, the need to reach agreements with landholders to acquire affected properties and/or undertake repair and remediation works, would also impose a significant cost on any potential future mining operation. The Department also notes that the potential release areas are not located in a Mine Subsidence District, and therefore any houses would not have been designed or constructed to accommodate potential subsidence movements.

5.2 Groundwater Resources

The potential impacts of coal exploration and production activities on the quality and quantity of groundwater resources was raised as a key issue of concern during community engagement for the PRIA.

Subsidence from longwall mining has the potential to result in sub-surface fracturing of overburden above mining panels which can cause changes in hydraulic properties. This would provide pathways for vertical and horizontal groundwater movement.

Groundwater that accumulates in underground workings is generally pumped to the surface to maintain safe working conditions underground. Groundwater extraction from an underground coal mining operation will cause a local reduction in groundwater pressures within the mined coal seam and to a lesser extent the overlying/underlying aquifers. Additionally, groundwater extraction can also potentially lower water tables and will cause a local change in groundwater flow direction, with water entering the mine from all directions.

The Department engaged Mr George Gates PSM to assist with reviewing available groundwater information and understanding groundwater systems in the potential release areas. Mr Gates has over 40 years of experience in hydrogeology and is a former Director of Water Management at the NSW Office of Water.

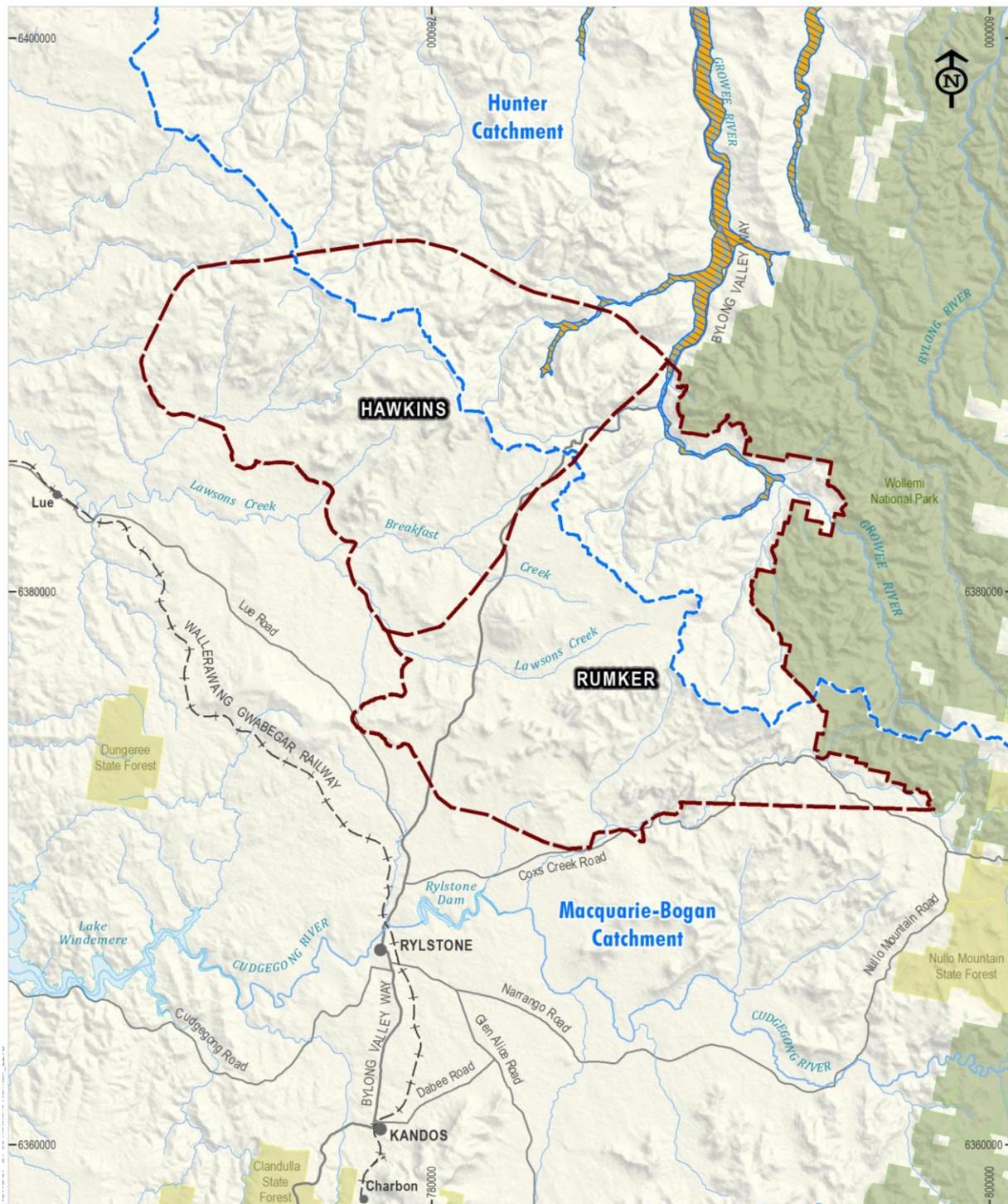
Mr Gates has extensive knowledge of the State's groundwater systems and has developed a number of groundwater policies for NSW. A complete copy of the report prepared by Mr Gates is provided in **Appendix B**.

The potential release areas occur in a geological formation called the Sydney Basin, which is a deep sedimentary basin in eastern NSW (see **Section 2.0**). Detailed groundwater studies have not been carried out in the potential release areas and Mr Gates undertook his review using publicly available water bore data as well as records from coal exploration drilling.

It can be inferred that groundwater flows in the same direction as surface water and that there is a groundwater divide situated under the plateau forming the central spine of the proposed release areas (**Figure 8**).

The potential release areas are located on Triassic and Permian rocks which contain minor aquifers that have been mapped by DPIE-Water as 'less productive groundwater' due to low bore yields and often brackish water quality (**Appendix B**). Groundwater aquifers within the Triassic and Permian strata have a large storage volume and water supply from bores in these rocks are not greatly affected by periodic droughts.

Alluvial aquifers associated with the Growee River have been mapped as 'highly productive groundwater' (see **Figure 8**) and are associated with a small area of high quality, regionally mapped BSAL (refer **Section 5.6**). BSAL is land that is considered highly suitable for intensive



Source: NSW Spatial Services (2021); WSP Geodatabase (2020)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Surface Water Catchment Boundary
 - Highly Productive Groundwater
 - Low Productive Groundwater
- Hunter Unregulated and Alluvial Water Sources**
- Unnamed Upriver Alluvium in WSP in the Bylong River Water Source



HIGHLY PRODUCTIVE GROUNDWATER

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 8: Highly Productive Groundwater

agriculture and has been mapped based on a combination of landform, soil and water resource quality data. Accordingly, any impacts to the alluvial aquifers in this area would also have the potential to impact on high productive agricultural land uses.

Any underground mining in proximity to Growee River would have the potential to reduce natural contribution to baseflow from alluvial sediments to connected surface water systems. This could affect the resilience of the Growee River particularly during drought periods.

Water quality in the alluvium is generally low in salinity however natural variation in water quality occurs due to recharge contributions from river leakage. The Growee River alluvium is a highly-connected surface and groundwater system. The shallow alluvial sediments have a much smaller storage to recharge ratio and hence a much lower security of water supplies from wells and bores (**Appendix B**).

Mr Gates has recommended that these issues would require careful examination and management should a potential future mining operation be proposed for the Hawkins and Rumker potential release areas. Accordingly, the Department considers that this issue could potentially form a constraint to a future mining operation.

The Department notes that potential impacts on BSAL was a key issue raised in the IPC's assessment and refusal of the Bylong Coal Project. The Commission's reasons for refusal focussed on the amount of BSAL and its local and regional significance. As discussed further in **Section 5.6**, further site verification and assessment would be required to confirm the presence and extent of BSAL.

In the event these areas are verified to be BSAL, the Department considers that setbacks would likely be required to avoid impacts to both the aquifers and the associated BSAL.

There are also minor alluvial sediments located to the south of the potential release areas along parts of Lawsons Creek and Breakfast Creek (see **Figure 8**). Further investigations would be required to determine their value and inform assessment of potential future mining operations (**Appendix B**).

Registered bore data provided by DPIE-Water indicates that there is low to moderate groundwater use within the potential release areas. There are 9 water supply licences and 32 basic landholder right licences within the potential release areas. During drought conditions, 'low productivity' groundwater (as is the majority of the potential release areas) is highly valued as it is largely unaffected by climate variation due to a large storage volume to recharge ratio (**Appendix B**). The Department notes that the location of all bores/wells is currently unknown and a bore census would be required to identify additional bores and to inform any future environmental assessments.

Any groundwater drawdown at privately-owned bores as a result of a potential future mining operation would require consideration against the impact criteria in the NSW Aquifer Interference Policy. If predicted groundwater drawdown is greater than 2 m cumulatively (i.e. exceeds the Level 1 minimal impact criteria in the NSW Aquifer Interference Policy), the proponent would be required to implement 'make good' provisions.

'Make good' provisions may include deepening the affected groundwater bore, construction of a new groundwater bore and/or provision of an alternative water supply of suitable quality and quantity. Depending on the amount of groundwater drawdown, the provision of an alternate water supply could form a constraint to any future development. The principal constraint is the unwillingness of some landholders to participate in the process, which may include restricting access to private property. There may also be difficulties in reaching agreement about the impacts, monetary value or an alternative water supply option.

Water Trading

Any future tenement holder would need to obtain a water access licence for groundwater use under the *Water Management Act 2000* for both exploration and potential future mining operations. The amount of water used or produced during exploration or mining operation would need to be assessed under the requirements of the NSW Aquifer Interference Policy.

Use of groundwater within the potential release areas is regulated under the *Water Management Act 2000* via the *Water Sharing Plan for the Hunter Unregulated and Alluvial Sources 2009* (Bylong River Water Source), *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (Sydney Basin – North Coast groundwater source) and *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Source 2020* (Sydney Basin Murray-Darling Basin (MDB) groundwater source) (see Figure 9).

Unassigned water may be available from the Sydney Basin MDB groundwater source via controlled allocation orders from DPIE-Water. The other two relevant groundwater sources are fully allocated. Notwithstanding, trades of licenses with existing licence holders within the source is permitted under the water sharing plans. The information available indicates that water licences should be available to a future mine. Water entitlements could be sourced through a combination of controlled allocation orders and water trading. To this end, the Department notes:

- 346 unit shares were offered in the Sydney Basin MDB Groundwater Source in May 2020 under a controlled allocation order.
- There are 9 water supply bores and 32 basic landholder rights bores inside the PRIA areas. Currently, tradeable groundwater shares within this area include; zero units for the Sydney Basin North Coast Groundwater Source, 145 units for the Sydney Basin MDB Groundwater Source and 105 units for the Bylong River Water Source.
- Considerably more tradeable water shares are held outside of the PRIA areas but within the relevant water sharing plans. For example, DPIE-Water has advised that Kepco Bylong Australia Limited has 11 groundwater licences with a total of 3,045 share units in the Bylong River Water Source and two licences with a total of 411 share units in the Sydney Basin North Coast Groundwater Source. Subject to the future of the Bylong Coal Project, these licences are potentially available for trade.

The water sharing plan for the Bylong River Water Source has provisions to manage water take by visible flow conditions and trigger levels, including cease to pump rules. However, The Department notes that mines are generally exempt from cease to pump orders when it relates to indirect take.

For each of the water sources, the water usage figures (albeit of poor reliability) are considerably lower than water entitlements. This underutilisation is common in less productive aquifers and supports the availability of water for trading.

The Department considers that there are no significant groundwater availability constraints that would preclude the release of the areas for exploration and development. The proponent of any future mining development would need to obtain necessary water licences under the *Water Management Act 2000* and carry out a detailed assessment in accordance with the NSW Aquifer Interference Policy.

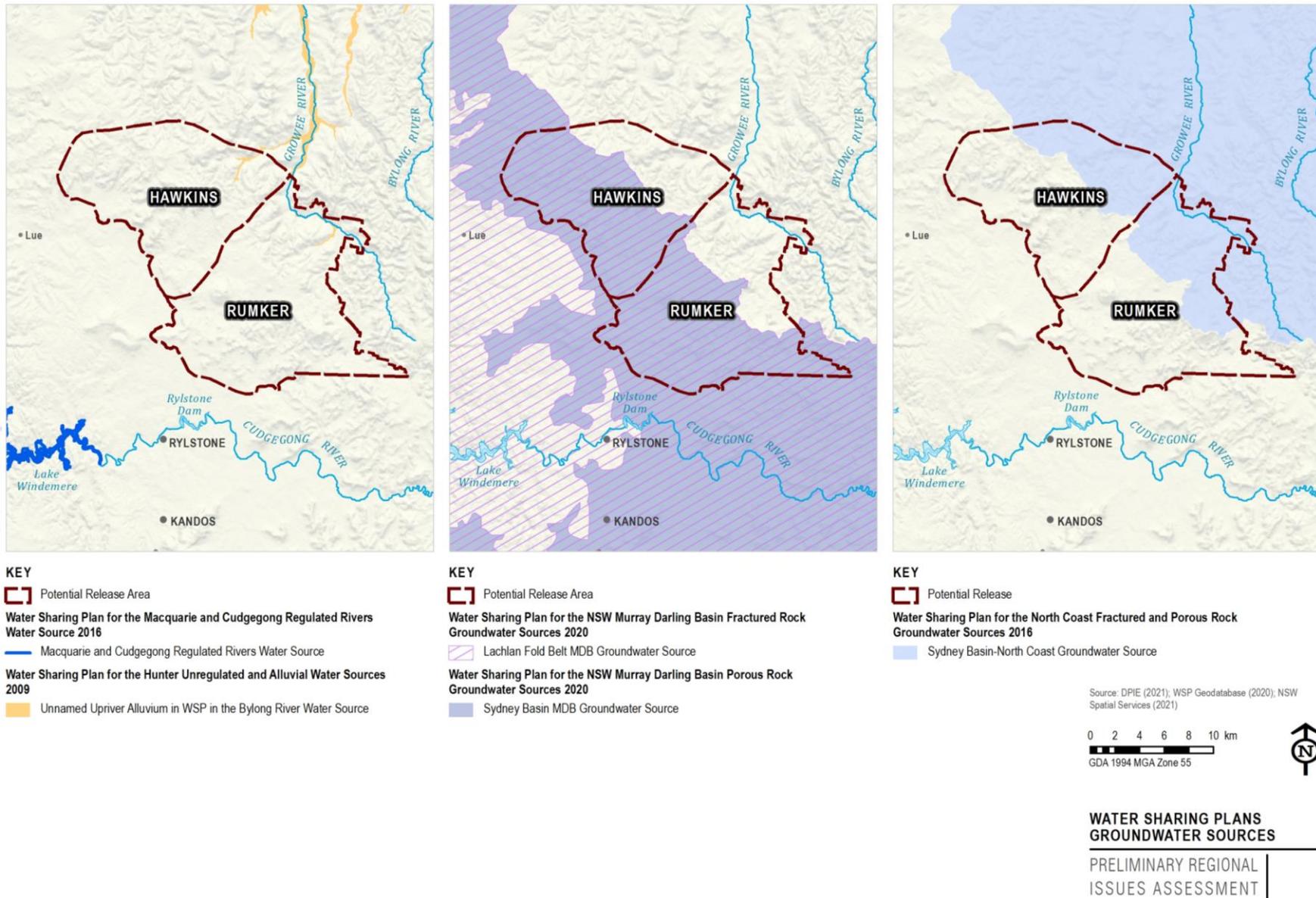


Figure 9: Water Sharing Plans Groundwater Sources

5.3 Surface Water Resources

The potential impacts of coal exploration and mining on surface water resources, particularly the Cudgegong River and Growee River, was raised as a key issue of concern during community engagement.

Underground mining operations can affect the availability of surface water resources as a result of reduced baseflows, subsidence effects such as cracking and increased ponding. Mining can also result in water quality impacts from any off-site discharges.

Mining could also result in induced vertical leakage from overlying surface water sources through fracturing that occurs above the goaf (the part of the mine from which the coal has been partially or completely removed) (**Appendix B**). This fracturing may or may not reach the surface and detailed modelling would be required as part of any assessment process to confirm whether or not these impacts could be expected.

Any leakage would have the potential to impact downstream flows, biodiversity and landholders that rely on surface flows.

The community specifically raised concerns about the use of large volumes of water to support exploration and mining activities and the impact this could have on water supply for stock and domestic use including small business operators utilising the unique springs in the area to produce artesian food and drink. Concerns were also raised about the potential availability of water under various climate change scenarios, with the recent drought highlighting that water security remains a critical issue for the broader community and any potential future mining project.

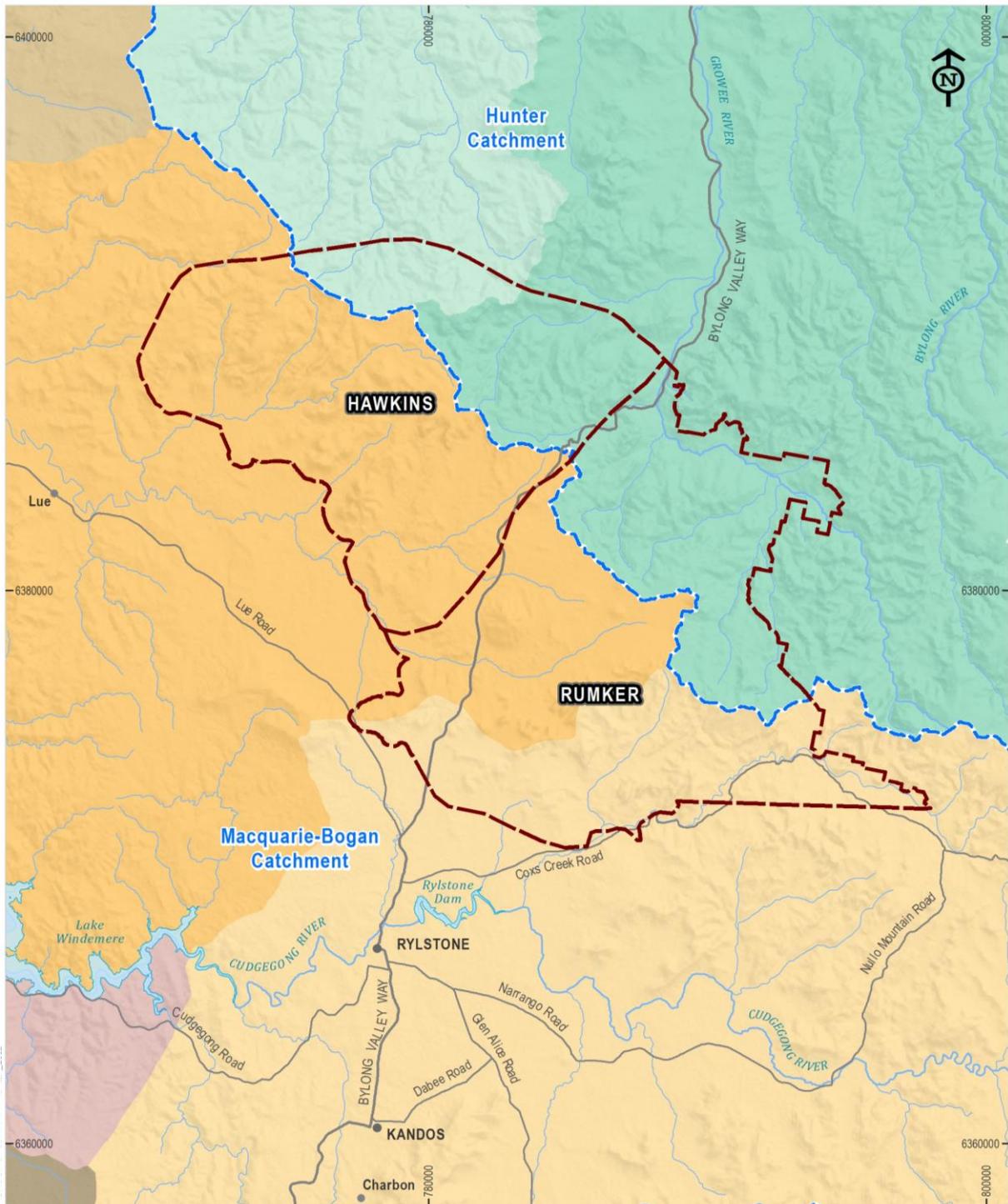
The Department notes that there can be significant variability in the volume of water required for coal processing as it would depend on the *in-situ* coal quality, the target product coal quality and the processing methods. Indicatively, a mining operation in this location may require approximately 1,400 megalitres per annum in site water⁷.

As shown on **Figure 10**, the potential release areas are located within the broader catchments of the Hunter (including the Hunter River and its tributary the Growee River) and Macquarie-Bogan catchment (including the Macquarie River and its tributary the Cudgegong River). The catchment divide runs north-west through the centre of both of potential release areas.

The Hawkins and Rumker potential release areas straddle the Great Dividing Range. Surface drainage on the eastern part of the plateau flows eastwards into the Hunter River catchment. Whilst on the western part of the plateau, surface waters flow to the west of the tributaries of the Cudgegong River, which forms part of the Murray Darling Basin.

Exploration activities are considered unlikely to result in any material changes to regional surface water quality or flows. This is because exploration is a temporary activity, and the area used at any one time is very small.

⁷ As estimated in the Commercial Viability Assessment commissioned by Geological Survey of NSW.



- KEY**
- Potential Release Area
 - Surface Water Catchment Boundary
- Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009**
- Bylong River Water Source
 - Wollar Creek Water Source
- Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012**
- Lawsons Creek Water Source
 - Upper Cudgegong River Water Source
 - Cooyal Wialdra Creek Water Source
 - Piambong Creek Water Source
 - Turon Crudine River Water Source

Source: DPIE (2021); WSP Geodatabase (2020); NSW Spatial Services (2021)



CATCHMENT BOUNDARIES

PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 10: Catchment Boundaries

Any coal exploration or mining activities would also need to be designed to:

- include appropriate erosion and sediment control measures;
- manage potential contamination risks;
- include appropriate measures in the vicinity of river banks and lakes to avoid impacts on water flow and fish habitat (e.g. *Managing Urban Stormwater: Soils and Construction Requirements: Volume 2C Unsealed Roads* [DECC, 2008] and *Policy and Guidelines for Fish Habitat Conservation and Management* [Department of Primary Industries, 2013]);
- obtain appropriate sources of water through adequate consultation with the landholder and obtaining appropriate water licences; and
- include appropriate measures to reuse or dispose of any excess water.

Use of surface water within the potential release areas is regulated under the *Water Management Act 2000* via the *Water Sharing Plan for the Hunter Unregulated and Alluvial Sources 2009* (Bylong River and Wollar Creek Water Sources) and *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Sources 2012* (Lawsons Creek and Upper Cudgegong River water sources) (see **Figure 10**).

The Growee River alluvium is highly connected to surface flows (see **Section 5.1**), therefore both surface water and groundwater are managed under the same rules for the Bylong River source in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

The Bylong River and Wollar Creek water sources are over-allocated and Lawsons Creek and Upper Cudgegong River water sources are fully allocated. On this basis, no additional licenses can be made available within these sources via a controlled allocation.

A future tenement holder would need to obtain appropriate water licences, which may require trading of entitlements. WaterNSW is responsible for managing the trade of water access licences, licence entitlements and water allocations. DPIE-Water undertakes the assessment of trade impacts. The Department acknowledges that trades of licenses within a source to support a potential future mining operation would divert water supply from stock and domestic users.

Under the relevant water sharing plan, trades are permitted from other water sources into the Bylong River and Wollar Creek sources. Aquifer licences within the Bylong River water source can also be transferred to unregulated river licences following appropriate assessment. Dealings into the Lawsons Creek and Upper Cudgegong River water sources are not permitted under the relevant water sharing plan.

The Department notes that licence trades within these water sharing plans are already constrained due to small volumes available. It is noted that a large portion of licenses within the Bylong River and Wollar Creek sources are already owned by existing mining operations. As noted in **Section 5.2**, DPIE-Water has advised that Kepco Bylong Australia Limited has 11 groundwater licences with a total of 3,045 share units in the Bylong River Water Source. Given that the decision to refuse the Bylong Coal Project has recently been upheld in court, these licences would potentially be available for trade.

During community consultation, landholders also raised concerns regarding potential reductions in the volume of Available Water Determinations as a result of mining operations securing significant licences. The acquisition of licences in accordance with the rules of a water sharing plan should not affect the Available Water Determination within a water source. This is because the rules of the water sharing plan are designed to allow for ongoing sustainable use of water.

Some community submissions raised concerns about potential surface water impacts including salinity impacts due to mine water discharges such as at other mines in the Lithgow region. The three existing mines to the

north of potential release areas operate reverse osmosis plants to manage salinity of water discharged into the Goulburn River and its tributaries.

Extensive efforts have been implemented to improve water quality and reduce salinity impacts in the Hunter River with the introduction of the Hunter River Salinity Trading Scheme and any mining proposal would need to demonstrate that any water disposed would meet the appropriate salinity criteria. The potential capital costs associated with construction of a reverse osmosis plant (which could be in the order of \$10 M) and associated operating costs would need to be factored into the commercial viability analysis for any future potential development project. Water inflows into a mine at this location are likely to be brackish, therefore any future development of the coal resource would need to consider the water quality impacts on local streams and the Goulburn and Cudgegong Rivers if any off-site discharge is proposed.

The Department considers that potential impacts on surface water, particularly subsidence impacts on streams and the Growee River, may form a constraint to any potential future mine design. For example, the mine design may need to incorporate setbacks from significant stream features to avoid or minimise potential impacts, which would reduce the amount of coal that could be extracted and result in higher operational costs associated with shorter longwall panels and/or additional longwall moves.

The current regulatory and planning framework would require the assessment of any changes to water quantity, water quality and flow regimes as part of future planning processes and the regulation of water licensing under the *Water Management Act 2000*. With the information available at this stage, the Department considers that this is unlikely to represent a constraint that should preclude release of the areas for exploration. Any potential future mining operation would be required to demonstrate the feasibility of proposed water supply and licencing options.

5.4 Town Water Supplies

The potential impacts of coal exploration and mining on town water supply, particularly in Rylstone, Kandos and Mudgee, was raised during engagement with the community.

Rylstone and Kandos source their main water supply from the Rylstone Dam on the Cudgegong River, with the water treated at the Rylstone Water Treatment Plant.

Mudgee and surrounding areas source water from the Windamere Dam on the Cudgegong River, downstream of the Rylstone Dam. Water from the Windemere Dam is treated at the Mudgee Water Treatment Plant. The Windamere Dam operates in conjunction with the Burrendong Dam on the Macquarie River to supply water in the broader Cudgegong and Macquarie Valleys (including Mudgee).

The potential release areas are located a significant distance from the Rylstone Dam and Windamere Dam, approximately 3 km and 16 km, respectively. Less than half of the Rumker potential release area reports to the Upper Cudgegong water source that supplies the Rylstone Dam.

Consequently, the Department is satisfied that any coal exploration or mining activities would be unlikely to have material conflicts with town water supplies.

5.5 Groundwater Dependent Ecosystems, Wetlands and Fish Habitat

Several high priority GDEs, including springs, swamps and caves, have been identified in relevant water sharing plans within and in the immediate vicinity of the potential release areas. These features are shown on **Figure 11**.

Relevant Water Sharing Plans have also mapped small patches of medium and high priority groundwater dependant vegetation ecosystems in the porous and fractured rock groundwater sources within parts of both

potential release areas (see **Figure 11**). This vegetation gets at least some of its water from shallow groundwater.

The Wild Bull Spring is located approximately 5 km north of the Hawkins potential release area. The Wild Bull Spring is listed as a high priority GDE under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.

As noted in **Section 5.7**, springs are often sites of cultural significance. Field validation and use of Aboriginal and landholder knowledge would be required during any future assessment and exploration activities to make sure all known springs are recorded.

Swamps within the Upper Cudgegong River catchment (which encompasses part of the PRIA area) were characterised by Baird and Benson (2018) and were considered comparable to ecological communities listed as threatened under the BC Act and EPBC Act. There are three swamps listed within Water Sharing Plans as high priority GDEs within the Rumker potential release area: Spring Log Swamp on the eastern border; Growee Swamp on the north-eastern border; and Dairy Swamp within the southern portion of the Rumker potential release area (**Figure 11**). Two additional swamps (Davis and King Swamps) are located approximately 5 km and 10 km south-east of the potential release areas. A number of community members also provided feedback that there are unrecorded springs within and surrounding the potential release areas which should be investigated further.

Stygofauna have been previously recorded at multiple locations in the Hunter River alluvium as well as in the Bylong River alluvium (EcoLogical Australia, 2013; 2015). This indicates stygofauna may also be present in the upland alluvium of the Growee River within the Hawkins and Rumker potential release areas.

A review of the High Ecological Value Ecosystems Vegetation Groundwater Dependent Ecosystems Value – Hunter-Central Rivers dataset indicates that there are areas of moderate to high potential GDEs in the region.

This includes areas of high potential for aquatic GDEs approximately 2 km north west of the potential release areas and small areas of moderate to high potential for terrestrial GDEs within the study areas and to the north west of the potential release areas within a 5 km buffer (see **Figure 12**). Further studies would need to be undertaken to verify the existence and extent of these GDEs.

The proponent of any future mining development would be required to consider potential groundwater drawdown at the swamps, springs and caves listed in the water sharing plans. Subsidence from underground mining can result in significant and irreversible impacts to these features if not properly avoided and mitigated.

Mines in NSW have been required to limit the lengths of specific longwalls and avoid mining in particular areas to avoid subsidence impacts on similar features including swamps. For example, the Springvale Mine must undertake extensive monitoring to inform avoidance and minimisation measures required to comply with stringent performance measures (including negligible environmental consequences on hanging swamps) and must also provide a \$2 million bond to secure future swamp offset liabilities.

The Department therefore considers that GDEs and swamps may form a constraint to any potential future mine design as setbacks would likely be required to avoid subsidence impacts on these high value ecosystems. Further, any impacts would likely be irreversible and offsets would be difficult to obtain and/or form a cost constraint to any development.

The Department of Primary Industries - Fisheries provided spatial data on key fish habitats and wetlands in the potential release areas and surrounds, which are presented on **Figure 13**. Mapped key fish habitat is an area that is important to the maintenance of fish populations and/or the survival and recovery of threatened aquatic species.



Source: DPIE (2021); WSP Geodatabase (2020); Water NSW (2021); NSW Spatial Services (2021); ESRI Imagery (2020)



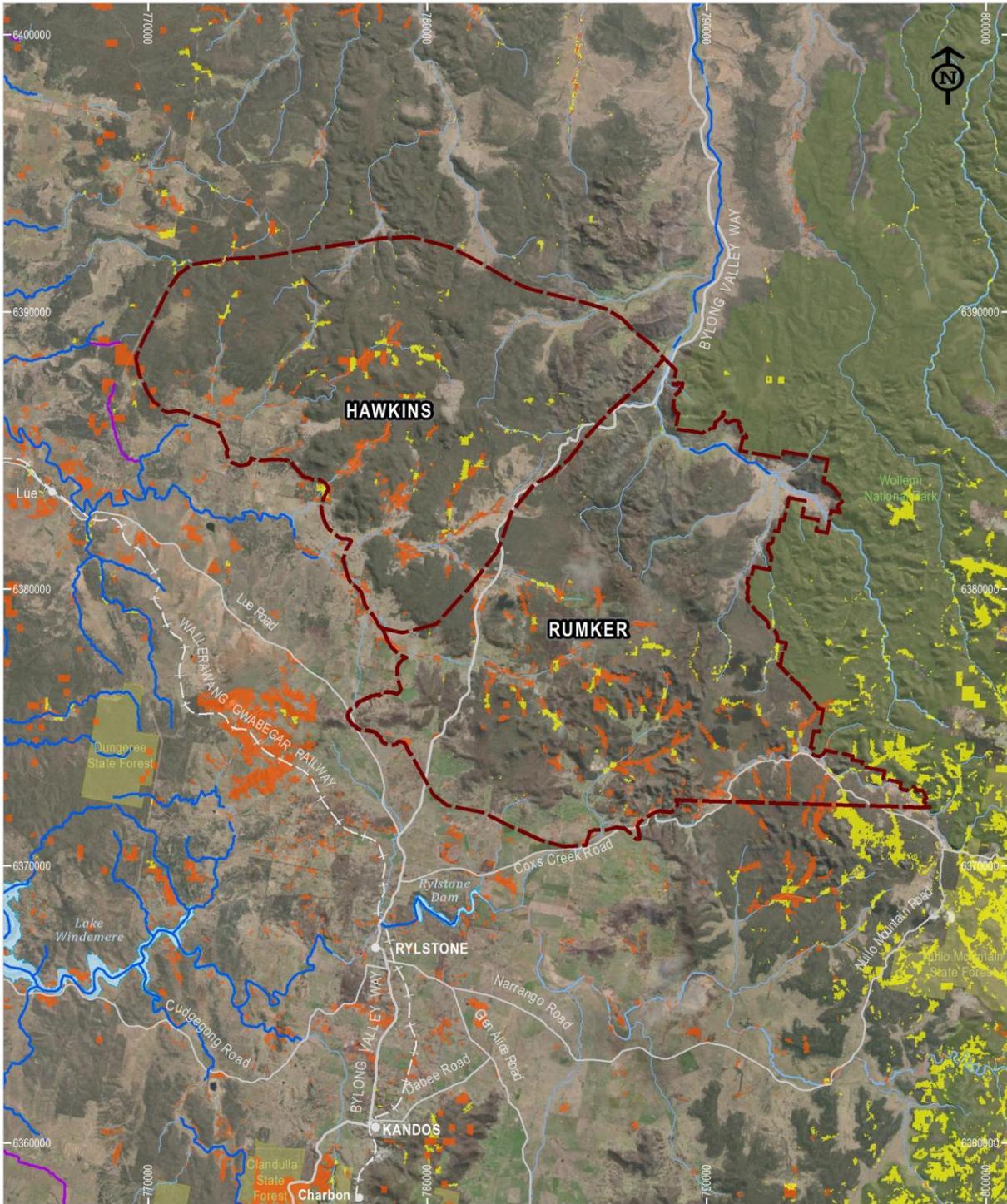
- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Cave
 - Spring
 - ♁ Swamp
- Registered Groundwater Bore within PRIA (Purpose, Status)**
- Water Supply, Functioning
 - Water Supply, Unknown
 - Irrigation, Non-functional
 - Irrigation, Unknown
 - Stock and Domestic
 - Unknown, Functioning
 - Unknown, Unknown
- Water Sharing Plan for the NSW Murry Darling Basin Porous Rock Groundwater Sources 2020**
- High Priority Groundwater Dependent
 - Medium Priority Groundwater Dependent



GROUNDWATER DEPENDENT ECOSYSTEMS

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 11: Groundwater Dependent Ecosystems Identified in Water Sharing Plans



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Major River
 - Major Creek
- Terrestrial GDE (from Regional Studies)**
- High Potential
 - Moderate Potential
- Aquatic GDE (from National Assessment)**
- High Potential
 - Moderate Potential

Source: DPIE (2021); NSW Spatial Services (2021); ESRI Imagery (2020)

0 1 2 3 4 5 km

GDA 1994 MGA Zone 55

**AQUATIC AND TERRESTRIAL
GROUNDWATER DEPENDENT
ECOSYSTEMS**

PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 12: Aquatic and Terrestrial Groundwater Dependent Ecosystems



Source: NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Major River
 - Major Creek
- Key Fish Habitat**
- Watercourse
 - Waterbody
 - Reservoir



**WETLANDS AND
KEY FISH HABITAT**

PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 13: Wetlands and Key Fish Habitat

There is one threatened fish species habitat and one aquatic ecological community listed under the NSW *Fisheries Management Act 1994* within and in the immediate vicinity of the potential release areas (see **Figure 14**):

- Eel-Tailed Catfish – endangered population in the Murray-Darling Basin – distribution is modelled to occur within the Cudgegong River south of the Rumker area and Lawsons Creek to the west of the Hawkins area.
- Southern Purple Spotted Gudgeon – endangered species – distribution is modelled to occur within the Reedy Creek catchment, Breakfast Creek catchment and Coxs Creek catchment within the potential release areas.

The Department is satisfied that the current regulatory and planning framework is sufficient to manage potential impacts of coal exploration or mining activities on aquatic fauna with the implementation of appropriate groundwater and surface water monitoring and control measures (**Sections 5.2 and 5.3**). These measures may include setback of mining from significant features and water licensing to mitigate potential impacts to flow volumes.

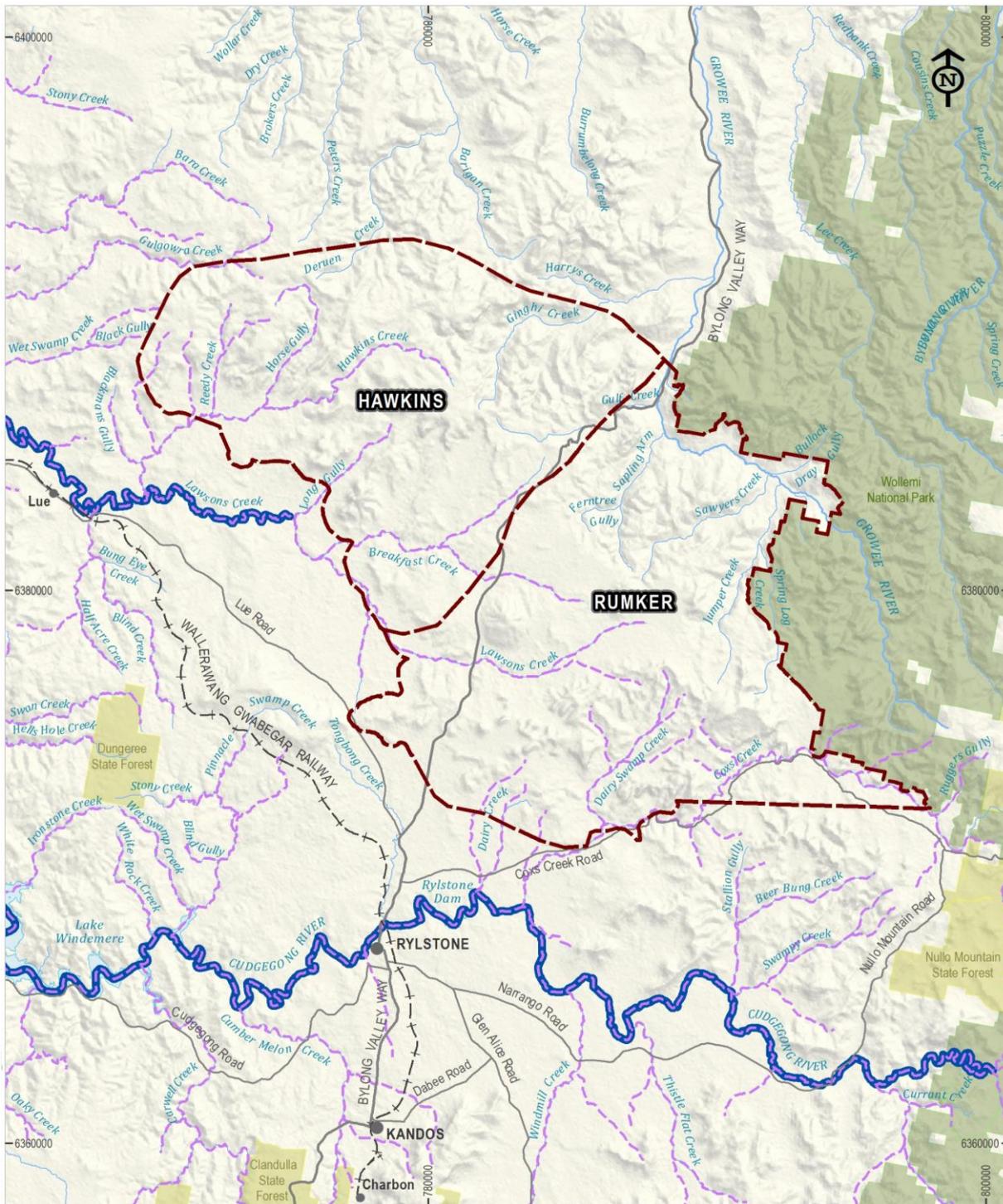
5.6 Land Capability, Land Use and Landforms

Land Capability

State-wide land and soil capability mapping by the former Office of Environment and Heritage over the potential release areas is presented on Figure 15. The Land and Soil Capability Scheme uses biophysical land features, including position, slope, drainage, climate, soil type and soil characteristics, to derive rating tables for land and soil hazards (see **Table 3**).

Land in the potential release areas range from Class 2 (very high capability) to Class 7 (very low capability).

Class 2 land, which is capable of sustaining intensive cropping with cultivation, is located along the Growee River in the Rumker area and a small portion on the north-eastern edge of the Hawkins area (approximately 2.4 km² in total).



Source: NSW Spatial Services (2021)



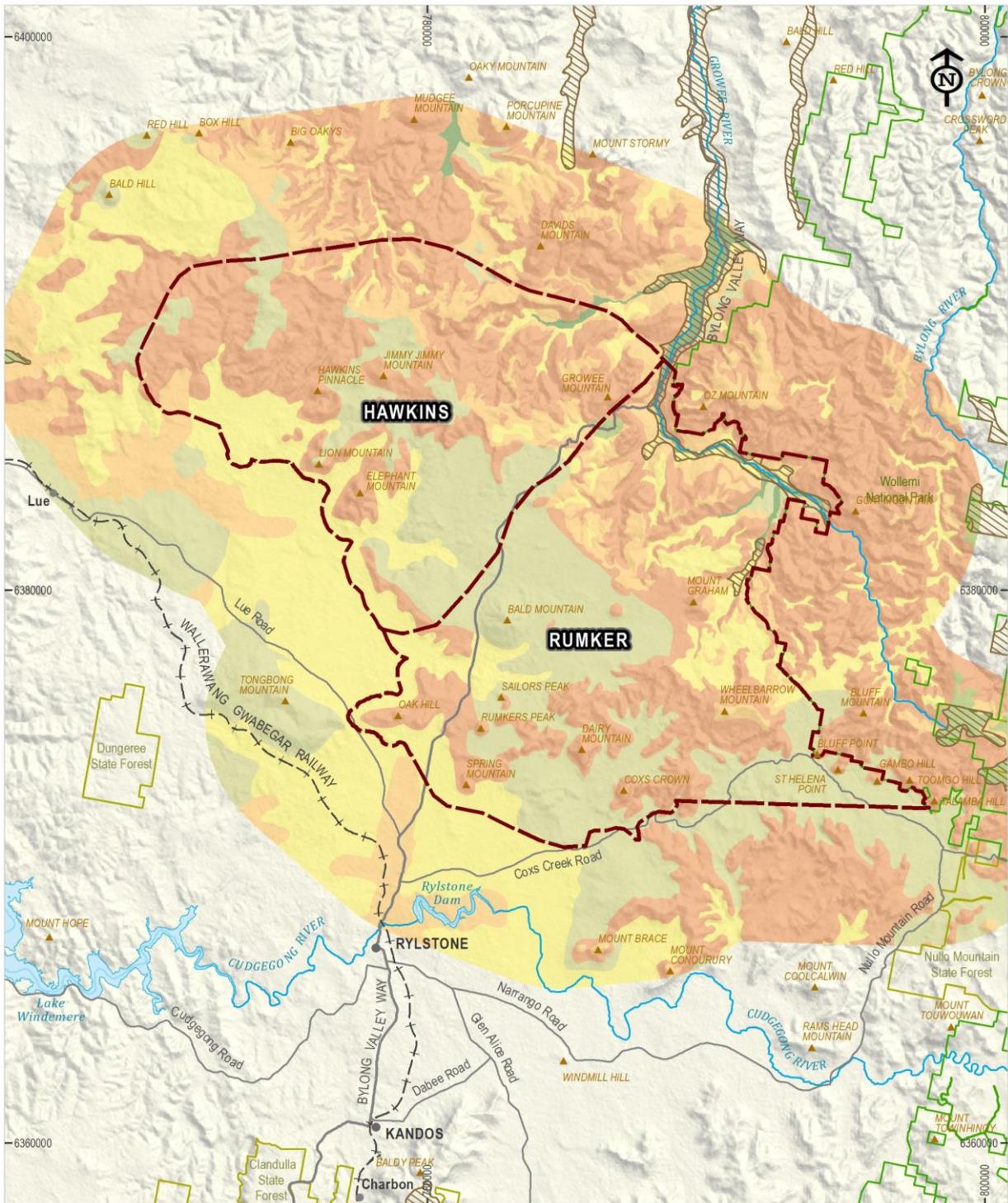
- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Major River
 - Major Creek
- Threatened Freshwater Species Habitat**
- Southern Purple Spotted Gudgeon
 - Eel-tailed Catfish

0 1 2 3 4 5 km
GDA 1994 MGA Zone 55

THREATENED FRESHWATER SPECIES DISTRIBUTION

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 14: Threatened Freshwater Species Distribution



Source: NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Regionally Mapped Biophysical Strategic Agricultural Land
- Land and Soil Capability**
- Class 2 Slight but Significant Limitations
 - Class 3 Moderate Limitations
 - Class 4 Moderate to Severe Limitations
 - Class 5 Severe Limitations
 - Class 6 Very Severe Limitations
 - Class 7 Extremely Severe Limitations



LAND AND SOIL CAPABILITY
PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 15: Land and Soil Capability

Table 3: Land and Soil Capability Classes - General Definitions

LSC class	General definition
Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation)	
1	Extremely high capability land: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices.
2	Very high capability land: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
3	High capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.
Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)	
4	Moderate capability land: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
5	Moderate–low capability land: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture)	
6	Low capability land: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation
Land generally incapable of agricultural land use (selective forestry and nature conservation)	
7	Very low capability land: Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
8	Extremely low capability land: Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.

Class 4 land is described as moderate capability land and is capable of a variety of uses including cropping with restricted cultivation, pasture cropping and grazing. There is approximately 37 km² and 66 km² in the Hawkins and Rumker areas, respectively.

Both the Hawkins and Rumker areas are predominantly Class 4 to Class 7 land (99.6% for Hawkins and 98.3% for Rumker).

BSAL is land that is considered highly suitable for agriculture and has been mapped regionally based on a combination of landform, soil and water resource quality data. A small area of BSAL is located in the Rumker and Hawkins potential release areas, associated with the Class 2 land mapped along the Growee River (see **Figure 16**).

The proponent of any future coal exploration or mining development would be required to undertake soil surveys and analysis to prepare site-specific mapping and determine if any portions of land meet the criteria for BSAL in accordance with the *Interim protocol for site verification and mapping of biophysical strategic agricultural land* (NSW Government, 2013).

If BSAL is identified during these surveys, a 'gateway certificate' is required to be obtained from the Mining and Petroleum Gateway Panel (which is now a sub-committee of the IPC). The Mining and Petroleum Gateway Panel would assess the proposal against the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) to determine potential impacts to agricultural and water resources and any specific further assessment requirements.

For any other portion of the potential release areas not identified as BSAL, which would form part of a future coal exploration or mining development, the proponent would be required to undertake a site verification process under the Mining SEPP.

Land Use

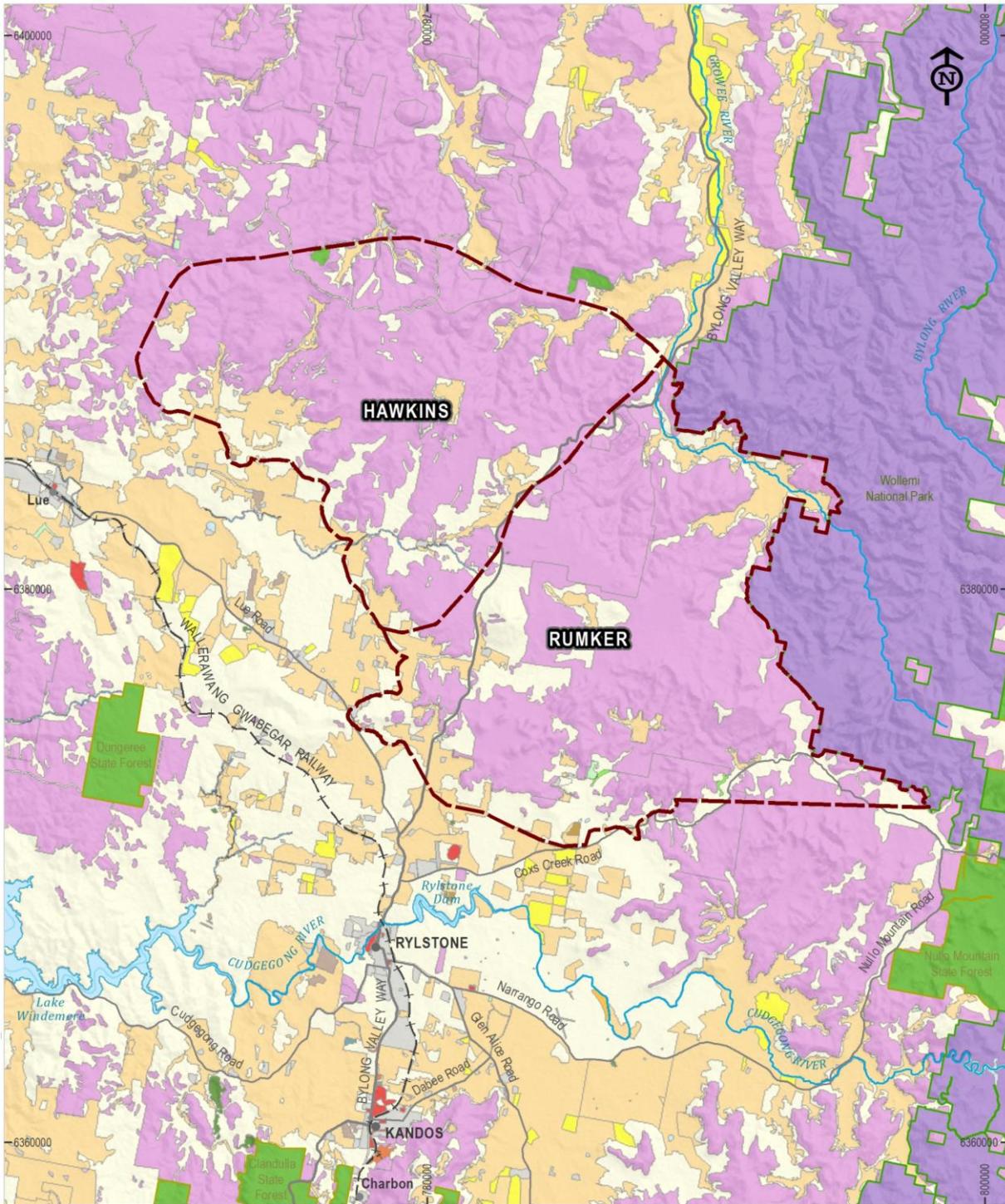
State-wide land use mapping has been undertaken by the Department to capture how the broader landscape of NSW is being used for food production, forestry, nature conservation, infrastructure and urban development in consideration of aerial imagery and tenure information.

The majority of land use within the Hawkins and Rumker potential release areas is classed as 'other minimal use – residual native cover' (71% and 64%, respectively) (see **Figure 16**), largely corresponding to Crown land. Sub uses for 'other minimal use' include defence land, natural areas, stock routes, residual native cover and rehabilitation.

'Grazing native vegetation' makes up a small portion of the Hawkins and Rumker potential release areas (18% and 23%, respectively). 'Grazing native vegetation' is defined as grazing by domestic stock on native vegetation where there has been limited or no deliberate attempt at pasture modification. The remainder of the potential release areas largely comprise 'grazing modified pastures', with other small areas of native forestry, plantation forests and residential and farm infrastructure.

The potential impacts of coal exploration and potential future mining activities on agricultural land uses were raised as an issue of concern during community engagement for the PRIA.

The primary concerns were associated with potential mining impacts (as opposed to exploration impacts) and were focused on potential impacts on water resources (quality and availability), potential mine subsidence impacts if mining were to proceed and competing demand for labour due to higher average wages within the mining industry. These concerns were raised in the context of the recent impacts of drought and bushfire on agricultural activities in the area and future resilience of the industry.



Source: NSW Spatial Services (2021)



<p>KEY</p> <ul style="list-style-type: none"> Potential Release Area National Park State Forest Railway (non-operational) <p>Land Use</p> <ul style="list-style-type: none"> Nature conservation Managed resource protection Other minimal use Grazing native vegetation Production native forests Plantation forests Grazing modified pastures Cropping Grazing irrigated modified pastures Residential and farm infrastructure Perennial horticulture Seasonal horticulture Land in transition Irrigated plantation forestry Irrigated cropping Irrigated perennial horticulture Irrigated seasonal horticulture Irrigated land in transition Intensive horticulture Intensive animal production Manufacturing and industrial Services Utilities Transport and communication Mining Waste treatment and disposal 	<p>LAND USE</p> <ul style="list-style-type: none"> Lake Reservoir/dam River Channel/aqueduct Marsh/wetland <p>0 1 2 3 4 5 km</p> <p>GDA 1994 MGA Zone 55</p> <p>LAND USE</p> <p>PRELIMINARY REGIONAL ISSUES ASSESSMENT</p>
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Figure 16: Land Use

Exploration tenement holders are required to address the concerns raised in engagement through the negotiation of land access agreements with the landholder. The *Exploration code of practice: environmental management* requires the tenement holder to:

- implement all practicable measures to prevent the introduction and spread of weeds, pest animals and animal and plant diseases;
- implement all measures to prevent, so far as practicable, causing adverse impacts to livestock;
- consult with relevant landholders prior to establishing any new roads or tracks; and
- plan, design, construct, maintain and use roads and tracks in a manner which minimises the area and duration of disturbance to the environment and landholders to as low as practicable.

An exploration activity application must also assess whether the activity is likely to significantly disrupt or change current land uses and/or create biosecurity risks and describe the mitigation measures that would be implemented to address these risks. Similar measures would be identified and implemented for any future coal mining activities through the merit assessment process under the SSD provisions of the EP&A Act.

Based on current information the Department is satisfied that the land capability and soils and land use in the potential release areas do not form a constraint that should entirely preclude coal exploration or mining activities. To the end, the Department notes that exploration works are a temporary activity and underground mining methods would not significantly impact land capability and agricultural land uses.

However, as discussed in **Sections 5.2** and **5.6**, regionally mapped BSAL areas along the Growee River (and associated alluvium) would be a potential constraint to mine design as impacts may need to be avoided depending on the local significance of the BSAL and in consideration of other environmental aspects, including groundwater and surface water interactions and biodiversity values.

Landforms

The potential release areas are characterised by undulating hills, steep terrain and rocky escarpments and contain significant natural landscape features including rock pagodas and cliff lines. Community feedback noted the presence of pagodas within the Hawkins and Rumker potential release areas, including in the Ferntree Gully Reserve which is located in the Rumker potential release area (see Figure 17).

The Department notes that pagoda landforms located in the nearby Greater Blue Mountains World Heritage Area have been recognised as an internationally significant landscape and that the significance of these features includes the rock formations themselves and the gullies and wooded slopes below the pagodas. Pagodas also provide habitat for the Broad-Headed Snake and other threatened species.



Figure 17: Rock Pagodas in the Rumker Area⁸

The pagoda features in the Ferntree Gully Reserve contain similar characteristics to these landforms and therefore the Department considers that they are of significance as part of the broader landscape. While the Department is aware of another significant pagoda formation near Dunns Swamp (located approximately 10 km from the potential release areas), the extent of any additional pagodas in the potential release areas is relatively unknown and not available in any existing data sources.

Given the presence of these features, and the topography and rock outcropping in other parts of the release areas, it is possible that other pagoda landforms are located in the Hawkins and Rumker areas.

Longwall mining and associated subsidence would have the potential to impact pagodas and any other significant cliff line and rock features that might be identified in the potential release areas. The potential for subsidence impacts would depend on the size and continuous nature of the feature. Smaller, isolated and disconnected rock features are less likely to be subject to significant subsidence impacts when undermined

⁸ Source: www.rylstonekandos.com

compared to continuous cliff lines. The Department notes that other longwall mining operations in the vicinity of the Greater Blue Mountains World Heritage Area have been required to modify the orientation and extent of the mine layout to protect pagoda features.

Further studies would be required to determine the extent, size, visual amenity, Aboriginal cultural heritage value and ecological value of these features.

However, the Department notes that the Ferntree Gully pagoda complex is likely to form a constraint to longwall mining as setbacks could be required to avoid impacts to the pagodas and the surrounding landscape features. If other pagoda features are identified they may also pose a constraint if impacts cannot be avoided.

5.7 Aboriginal Cultural Heritage

The Local Aboriginal Land Councils (LALCs) that cover the potential release areas include the Mudgee LALC; Bathurst LALC and Wanaruah LALC (see **Figure 18**).

Undetermined Aboriginal Land Claims under the *Aboriginal Land Rights Act 1983* also exist over parts of the Hawkins and Rumker potential release areas.

The Warrabinga Native Title Claimants Aboriginal Corporation has a registered Native Title Claim and Indigenous Land Use Agreement over the potential release areas. The Warrabinga Native Title Claimants Aboriginal Corporation lodged a submission objecting to the release of these areas for exploration.

There are also three local Aboriginal groups with an interest in the potential release areas, namely the Ibbai Waggon Wiradjuri People, Wellington Valley Wiradjuri Aboriginal Corporation and North East Wiradjuri Company, who were also consulted as part of this PRIA process.

Feedback received from the Native Title Claimants and other local Aboriginal groups expressed significant concerns regarding the cumulative impacts of mining in the wider region on Aboriginal cultural heritage sites, significant environmental features (e.g. swamps, watercourses and rock features) and connection with Country and songlines. This feedback is discussed further below.

The Department notes that any mining would have the potential for impacts on Aboriginal cultural heritage sites as a result of surface disturbance for infrastructure and subsidence movements. Some features, such as rock shelters, are sensitive to subsidence movements whereas other features, such as artefacts, are less sensitive.

The Department has reviewed the Aboriginal Sites Decision Support Tool to identify the potential for Aboriginal sites within the release areas. This tool has been developed to support the assessment of Aboriginal sites in NSW at a broad landscape-scale.



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Local Aboriginal Land Council Administrative Boundary
 - Aboriginal Land Claim
 - Native Title Determination Applications
 - Accepted for Registration

Source: National Native Title Tribunal (2021); DPIE (2021); NSW Spatial Services (2021)



LOCAL ABORIGINAL LAND COUNCIL AREAS AND NATIVE TITLE DETERMINATION APPLICATIONS

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 18: Local Aboriginal Land Council Areas and Native Title Determination Applications

As shown in **Figure 19**, the Aboriginal Sites Decision Tool indicates a higher likelihood of all site types (artefacts, rock art, burials, and a range of others) present in the majority of release areas. The Aboriginal Sites Decision Tool indicates a higher likelihood of rock art in areas of steeper slopes and topography, largely focused along the centre of the release areas and extending ridgelines (see **Figure 20**).

There have been few systematic regional Aboriginal cultural heritage investigations within and in the immediate vicinity of the potential release areas, with most undertaken in discrete areas for the purpose of management studies for conservation reserves and for mining developments.

Extensive archaeological assessments have previously occurred both to the north-east and west of the potential release areas for the Bowdens Silver Project and the Bylong Coal Project, as well as in the wider region at the Wilpinjong, Moolarben and Ulan Coal Mines to the north. These assessments have identified a range of important features including rock shelters, art sites and an ochre quarry near the Bylong Valley.

The Department has undertaken a search of the AHIMS which identified 43 previously documented Aboriginal sites within the potential release areas (see **Figure 21**). These include:

- Six (6) artefact sites.
- Nineteen (19) shelter sites, comprising eleven (11) with art, two (2) with art and artefact, three (3) with art and potential archaeological deposit (PAD) and three (3) with PAD only.
- Three (3) grinding groove sites.
- Fifteen (15) sites are restricted with unknown site types.

Given there has been no widespread survey of the potential release areas and that consultation with the Aboriginal community has been limited to date (including the absence of any on-ground fieldwork with community representatives), the Department acknowledges the limitations of the AHIMS database and the above list is considered to be highly conservative and not a full representation of the likely extent of cultural heritage items.

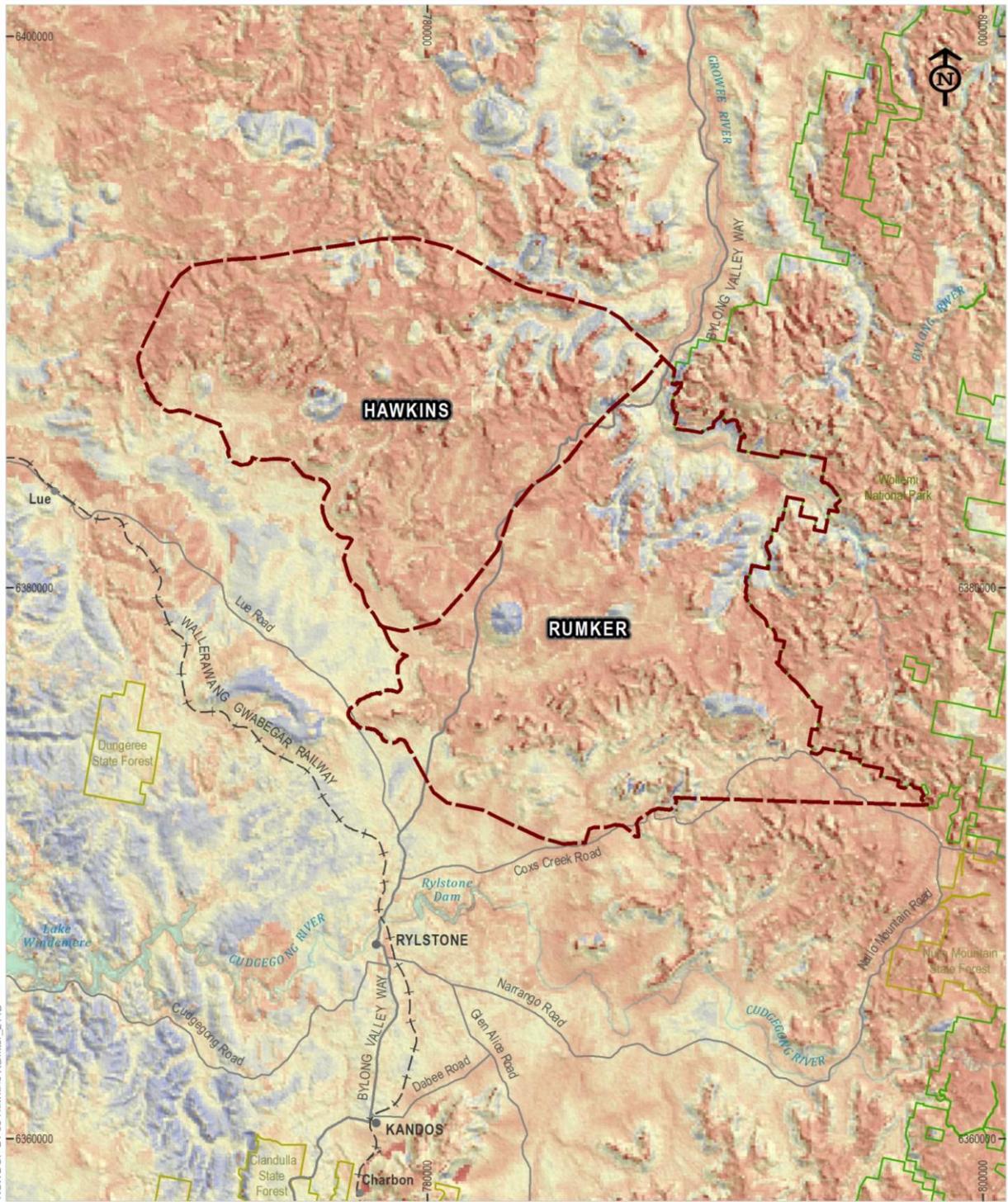
In addition to these sites, there are other features such as springs and waterways throughout the potential release areas that are often sites of cultural significance.

An unrecorded Aboriginal cultural heritage site was also identified during the consultation process, referred to as 'Baby's Feet Cave'. Although the exact location of 'Baby's Feet Cave' is unknown, it is indicated to occur approximately 15 km north of Rylstone in the Growee Gulf. The site contains hand and baby feet stencils within a cave formed by a boulder.

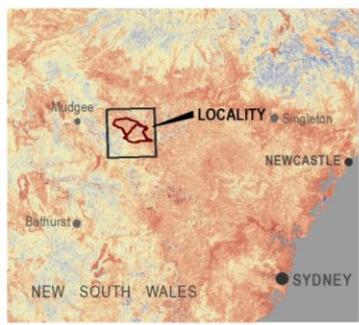
Community submissions also identified the Ganguddy-Dunns Swamp as an area of cultural significance for the Aboriginal community. The Ganguddy-Dunns Swamp is located within the Wollemi National Park approximately 10 km from the potential release areas, upstream on the Cudgegong River, and contains significant pagoda features with rock art.

Given the features of the area (including unique topography/rock formations and water features that are commonly associated with Aboriginal use), and feedback received from the Aboriginal community including the Native Title Claimants, it is expected that further assessment of these areas would likely result in many additional sites being documented.

In this regard, the Department also acknowledges feedback received from the Native Title Claimants advising that they are currently in the process of providing an updated list of additional sites for inclusion in the AHIMS database. There is also unwritten knowledge of site locations and ongoing consultation with the Aboriginal community would be necessary should any consideration of future coal exploration or mining be undertaken.



Source: Aboriginal Sites Decision Support Tool v.7, NSW Spatial Services (2021)



KEY

- Potential Release Area
- National Parks and Wildlife Estate
- State Forest
- Railway (non-operational)

Predicted Likelihood for All Features Types Combined

High

Low

ABORIGINAL SITES DECISION SUPPORT TOOL - ALL FEATURE TYPES COMBINED

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 19: Aboriginal Sites Decision Support Tool - All Feature Types Combined



Figure 20: Aboriginal Sites Decision Support Tool – Rock Art



Source: NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - + Railway (non-operational)
- Site Types**
- ◆ Artefact
 - ▲ Axe Grinding Groove
 - ▼ Grinding Groove
 - Open Camp Site
 - PAD
 - Shelter with Art
 - Shelter with Art and Artefact
 - Shelter with Art and PAD
 - ⊗ Shelter with PAD

0 1 2 3 4 5 km
GDA 1994 MGA Zone 55

REGISTERED ABORIGINAL CULTURAL HERITAGE SITES (FROM AHIMS)

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 21: Registered Aboriginal Cultural Heritage Sites (from AHIMS)

It is also acknowledged that some sites may be of such significance or type that impacts should be avoided and/or proposed mitigation such as relocation may not be suitable or accepted by the Aboriginal community.

Combined with the high potential for these sites to occur across the release areas, it is likely that any mine proposal would either be significantly constrained in design or would face significant opposition from the Aboriginal community if impacts could not be avoided or mitigated. It is noted that this extends to impacts to the broader landscape values as well as individual sites and artefacts.

In this regard, the broader landscape of the potential release areas was identified as having a high cultural value and a key component for the Aboriginal community and their connection to Country. Submissions identified to the need to consider the connection of sites with the broader cultural landscape.

The Aboriginal community expressed deep concerns about the effects of subsidence from underground mining on the Newnes Plateau area near Lithgow and that this could affect the waterways, springs and hanging swamps in the Hawkins and Rumker areas. Concerns were also raised about the cumulative impacts of mining in the region on Wiradjuri culture, the potential disruption of songlines and impacts to the general Nullo Mountain landscape as a significant ceremonial meeting place. When speaking with Aboriginal community members during the engagement period, it was reported that the cumulative loss of important cultural heritage sites and artefacts was already impacting on the ability to undertake intergenerational transfer of knowledge and cultural practices.

In considering the potential impacts of exploration to Aboriginal cultural heritage, the Department notes there is flexibility to avoid or minimise impacts in consultation with the local Aboriginal community. In particular, any exploration in the potential release area would most likely avoid elevated valley sides and ridgelines and therefore would not be expected to directly impact rock shelter sites.

Where impacts may occur as a result of exploration activities, the tenement holder must obtain an Aboriginal Heritage Impact Permit (AHIP) under the NPW Act. The AHIP application process requires a process of consultation with the Aboriginal community, including opportunities for survey of the proposed exploration areas and protocols for salvage or avoidance of identified cultural heritage sites.

Processes to manage access to Native Title lands are set out in the Commonwealth *Native Title Act 1993* and the NSW *Aboriginal Land Rights Act 1983*. These processes would apply to any exploration activities in the potential release areas.

The potential impacts to Aboriginal heritage as a result of any future coal mining activities would also be subject to detailed merit assessment under the SSD provisions of the EP&A Act, which requires extensive consultation with the Aboriginal community and consideration of potential cumulative impacts.

Notwithstanding, mining setbacks may need to be implemented to further mitigate potential impacts to identified significant Aboriginal cultural heritage sites as is typical at other mining operations in the Western Coalfield. These measures would need to be developed in close consultation with the local Aboriginal community, as part of any future mine planning and environmental assessment and approval process.

Given the high and widespread potential for significant sites such as rock art shelters to be identified across the areas, and the limitations around accepted mitigation options (i.e. where impacts are required to be avoided), it is expected that these sites would form a constraint to future mine design and the scale and extent of longwall mining.

5.8 Non-Aboriginal Heritage

The Department is not aware of any sites of significance within the potential release areas. There is some potential for sites of local or limited significance associated with historic pastoral activities, such as homesteads.

There are two non-Aboriginal heritage sites listed in the State Heritage Register within Rylstone (the Bridge View Inn and Rylstone Railway Station and Yard) and an additional site within Lue (Lue Railway Station).

Various items of local heritage significance are listed under the *Mid-Western Regional Local Environmental Plan 2012*, across the region, including within Rylstone, Kandos and Lue. Examples of the historic village buildings in Rylstone are shown in **Figure 22**.

Given that the majority of heritage items are located outside the potential release areas, it would be unlikely that any of these would be directly impacted by either coal exploration or any future development of the resource. Notwithstanding, the Department is mindful that the indirect impacts associated with the potential railway coal transport options (through the townships of Rylstone and Kandos to the south or Lue to the north) could impinge on the local heritage character and amenity of these villages, and in turn, the attractiveness of these precincts to the tourism sector.



Figure 22: Rylstone Village⁹

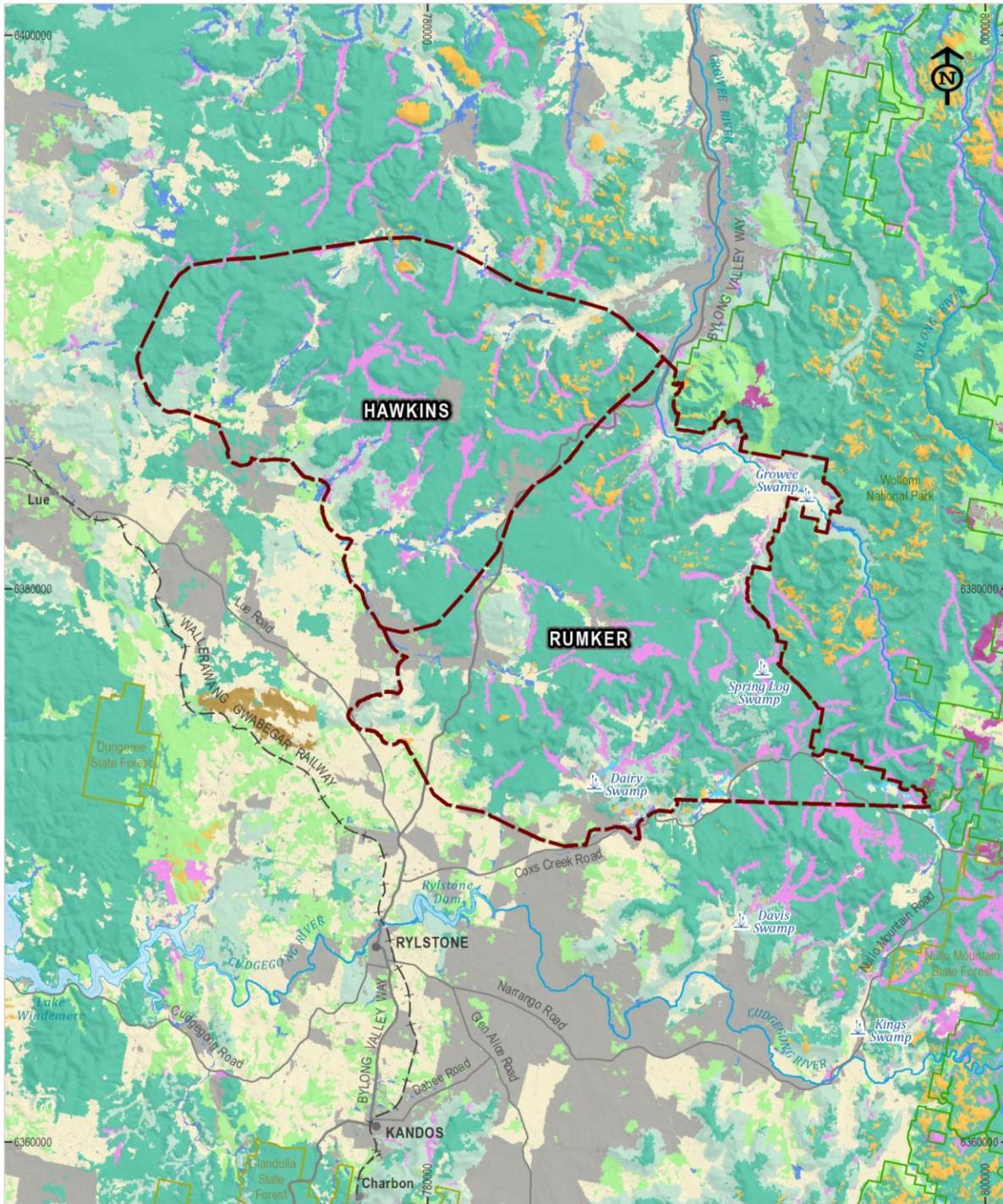
5.9 Biodiversity

State Vegetation Type Mapping for the Hawkins and Rumker potential release areas predicts that there are 16 native vegetation communities present in the Hawkins area and 18 native vegetation communities present in the Rumker area, comprising nine different vegetation classes (see **Figure 23**).

Approximately 95% of Hawkins area and 96% of the Rumker area is comprised of native vegetation (see **Table 4**). The remaining area is comprised of non-native vegetation, largely exotic pastures. Shrubby dry sclerophyll forests make up a large portion of the Hawkins (67%) and Rumker (59%) potential release areas.

The mapped vegetation communities may also potentially align with the White Box, Yellow Box, Blakely's Red Gum Woodland Threatened Ecological Community (Box Gum Woodland TEC) (see **Table 5**). Box Gum Woodland TEC is likely to be represented in the study area by several grassy box woodland types. Box Gum Grassy Woodland is also represented by native grasslands derived from the historical clearance of the ecological community. Box Gum Woodland TEC is listed as a critically endangered ecological community under both the BC Act and the EPBC Act.

⁹ images from VisitNSW.com and <https://suggpix.com.au/>



Source: DPIE (2021), NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
 - Swamp
- Vegetation**
- Dry Sclerophyll Forests (Shrubby sub-formation)
 - Dry Sclerophyll Forests (Shrub/grass sub-formation)
 - Wet Sclerophyll Forests (Shrubby sub-formation)
 - Wet Sclerophyll Forests (Grassy sub-formation)
 - Semi-arid Woodlands (Shrubby sub-formation)
 - Forested Wetlands
 - Freshwater Wetlands
 - Grassy Woodlands
 - Grasslands
 - Heathlands
 - Rainforests
 - Non Native
 - NA



REGIONAL VEGETATION MAPPING

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 23: Regional Vegetation Mapping

Table 4: Fauna and Flora Conservation Status

Vegetation Class	Number of Vegetation Communities		Percentage of study area (%)	
	Hawkins	Rumker	Hawkins	Rumker
Dry Sclerophyll Forests (Shrub/grass sub-formation)	2	2	9	12
Dry Sclerophyll Forests (Shrubby sub-formation)	3	3	67	59
Forested Wetlands	2	2	2	<1
Freshwater Wetlands	1	1	<1	<1
Grasslands	2	2	7	10
Grassy Woodlands	2	3	1	2
Heathlands	2	2	2	2
Wet Sclerophyll Forests (Grassy sub-formation)	2	2	7	9
Wet Sclerophyll Forests (Shrubby sub-formation)	0	1	0	<1
Totals (native vegetation)	16	18	95	94
<i>Non-Native</i>	<i>1</i>	<i>1</i>	<i>5</i>	<i>6</i>

Table 5: Threatened Ecological Communities

Threatened ecological community	Listing under the BC Act	Listing under the EPBC Act
White Box, Yellow Box, Blakely's Red Gum Woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions. (Endangered Ecological Community)	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. (Critically Endangered Ecological Community)

Table 6: Threatened Fauna and Flora Conservation Status

Species	Scientific Name	BC Act Listing	EPBC Act Listing	Location of Record
Threatened Fauna				
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	Vulnerable	Not listed	Hawkins (1) Rumker (1)
Diamond Firetail	<i>Stagonopleura guttata</i>	Vulnerable	Not listed	Rumker (1) Vicinity (2)
Dusky Woodswallow	<i>Artamus cyanopterus</i>	Vulnerable	Not Listed	
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Vulnerable	Not listed	Rumker (6) Vicinity (1)
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	Vulnerable	Not listed	Hawkins (1) Rumker (1)
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i>	Vulnerable	Not listed	Hawkins (1) Vicinity (2)
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata</i>	Vulnerable	Not listed	Hawkins (1)
Little Lorikeet	<i>Glossopsitta pusilla</i>	Vulnerable	Not listed	
Powerful Owl	<i>Ninox strenua</i>	Vulnerable	Not listed	Hawkins (1) Rumker (2)
Regent Honeyeater	<i>Anthochaera phrygia</i>	Critically Endangered	Critically Endangered	Rumker (3) Vicinity (1)
Scarlet Robin	<i>Petroica boodang</i>	Vulnerable	Not listed	Hawkins (4) Rumker (5) Vicinity (3)
Speckled Warbler	<i>Chthonicola sagittata</i>	Vulnerable	Not listed	Rumker (2)
Square-tailed Kite	<i>Lophoictinia isura</i>	Vulnerable	Not Listed	Rumker (1)
Varied Sittella	<i>Daphoenositta chrysoptera</i>	Vulnerable	Not listed	Rumker (1) Vicinity (1)
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Vulnerable	Rumker (1)

Species	Scientific Name	BC Act Listing	EPBC Act Listing	Location of Record
Koala	<i>Phascolarctos cinereus</i>	Vulnerable	Vulnerable	Hawkins (2) Vicinity (1)
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Vulnerable	Endangered	Hawkins (4) Rumker (4) Vicinity (2)
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	Endangered	Vulnerable	Hawkins (1)
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	Endangered	Vulnerable	
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	Vulnerable	Not Listed	Rumker (1)

Threatened Flora

Pultenaea sp. Olinda	<i>Pultenaea sp. Olinda</i>	Endangered	Not Listed	Rumker (1) Vicinity (1)
Capertee Stringybark	<i>Eucalyptus cannonii</i>	Vulnerable	Not Listed	Rumker (1) Vicinity (1)
Silky Swainson-pea	<i>Swainsona sericea</i>	Vulnerable	Not Listed	Vicinity (1)
Small Purple-pea	<i>Swainsona recta</i>	Endangered	Endangered	Hawkins (2) Vicinity (3)

Note: shaded cells indicated the species are listed under both the BC Act and the EPBC Act.

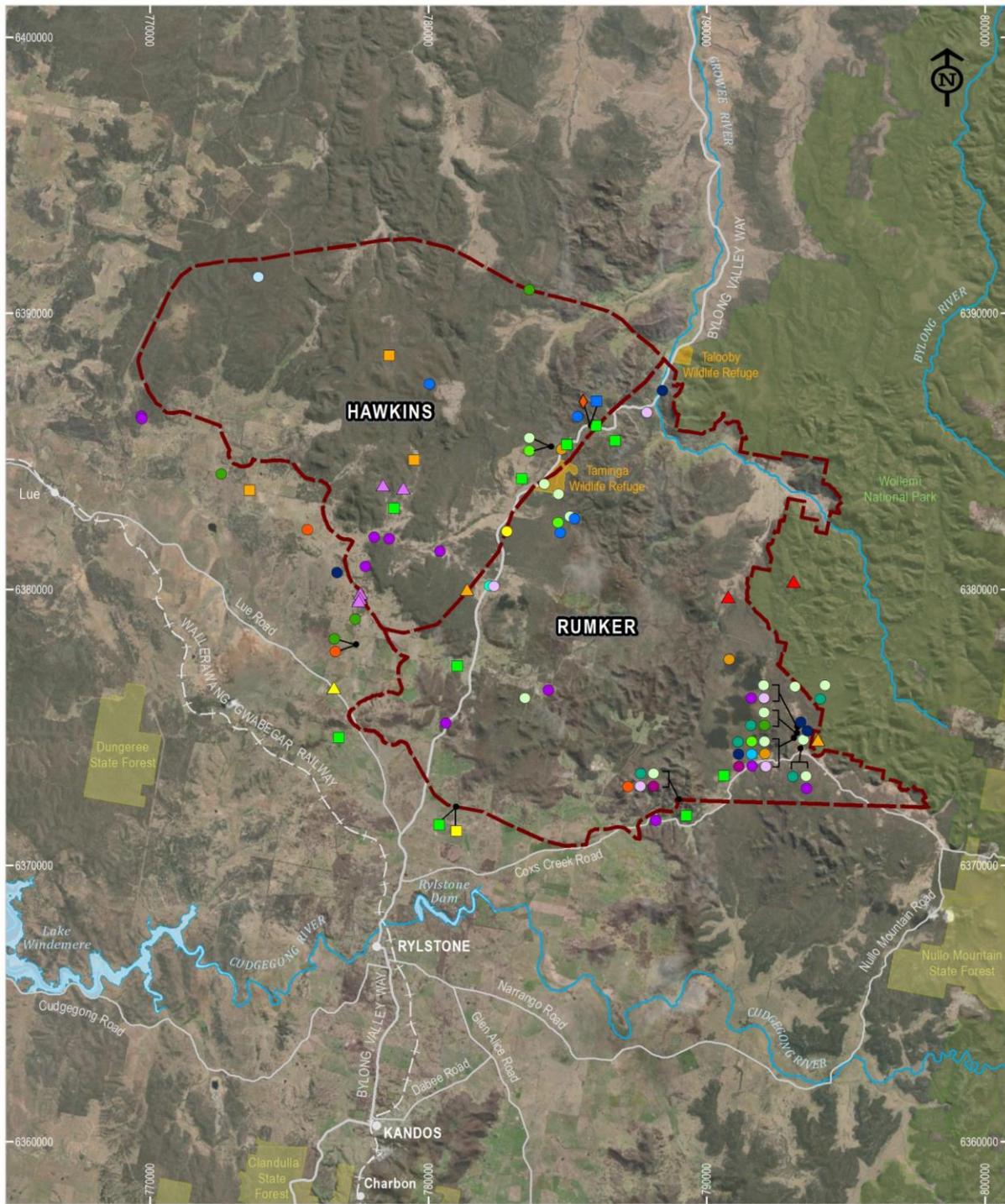
The potential release areas contain remnant vegetation and habitat for a wide variety of flora and fauna, including threatened species. The NSW BioNet Indicative Threatened Ecological Community, Population and Species Distributions dataset indicates that four threatened flora species and 20 threatened fauna species are known to occur within or in the immediate vicinity of the potential release areas (see **Table 6**).

BCS also provided threatened species sighting data for the potential release areas (see **Figure 24**).

One sighted threatened fauna species – the Regent Honeyeater (*Anthochaera Phrygia*) – is listed under the BC Act as critically endangered, two are listed as endangered under the BC Act (Brush-tailed Rock-wallaby [*Petrogale penicillata*] and Broad-headed Snake [*Hoplocephalus bungaroides*]), and a further 17 as vulnerable under the BC Act.

There have been no sightings of threatened flora species listed under the BC Act as critically endangered in the potential release areas, however, two threatened flora species listed as endangered (*Pultenaea sp. Olinda* and Small Purple-pea [*Swainsona recta*]) and a further two listed as vulnerable (Capertee Stringybark [*Eucalyptus cannonii*] and Silky Swainson-pea [*Swainsona sericea*]) have been sighted.

Throughout the community consultation process, the Department heard concerns about recent bushfires and the resilience of the area to further impacts induced by exploration and mining. The Department notes that approximately 40% of the Rumker area adjacent to the Wollemi National Park was subject to impact from the recent 2019 bushfire event (see **Figure 25**). A large portion of the Wollemi National Park and Greater Blue



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Wildlife Refuge (within PRIA 1 km Buffer)
 - Railway (non-operational)
- Threatened Species Records (within PRIA 1 km Buffer)**
- Black-breasted Buzzard
 - Brown Treecreeper (Eastern Subspecies)
 - Diamond Firetail
 - Dusky Woodswallow
 - Gang-gang Cockatoo
 - Glossy Black-Cockatoo
 - Grey-crowned Babbler (Eastern Subspecies)
 - Hooded Robin (South-eastern Form)
 - Little Lorikeet
 - Powerful Owl
 - Regent Honeyeater
 - Scarlet Robin
 - Speckled Warbler
 - Square-tailed Kite
 - Varied Sittella
 - Grey-headed Flying-fox
 - Koala
 - Spotted-tailed Quoll
 - Brush-tailed Rock-wallaby
 - ◆ Broad-headed Snake

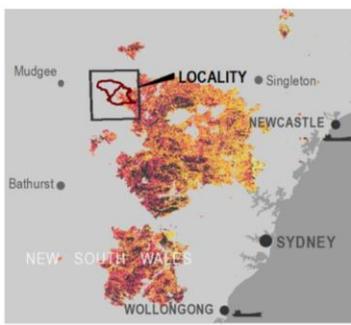
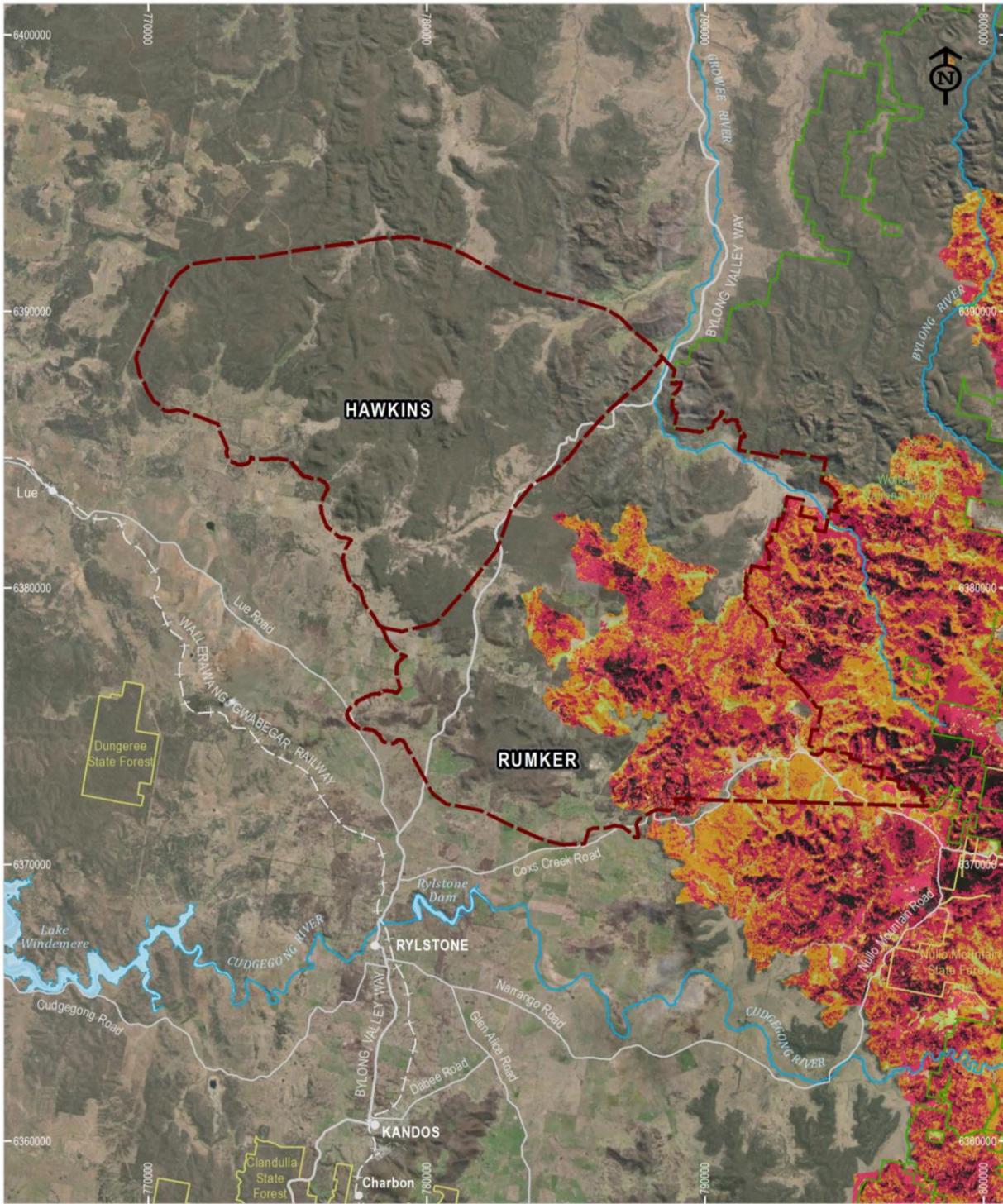
Source: NSW Spatial Services (2021); ESRI Imagery (2020)

- ▲ *Pultenaea sp. Olinda*
 - ▲ Capertee Stringybark
 - ▲ Silky Swainson-pea
 - ▲ Small Purple-pea
- 0 1 2 3 4 5 km
GDA 1994 MGA Zone 55

THREATENED FAUNA AND FLORA SPECIES SIGHTINGS

PRELIMINARY REGIONAL ISSUES ASSESSMENT

Figure 24: Threatened Fauna and Flora Species Sightings



- KEY**
- Potential Release Area
 - National Park
 - State Forest
 - Railway (non-operational)
- GEEBAM Class**
- 6 - Not Native Vegetation
 - 5 - Very High
 - 4 - High
 - 3 - Medium
 - 2 - Low

Source: DPIE (2021); NSW Spatial Services (2021); ESRI Imagery (2020)

0 1 2 3 4 5 km

GDA 1994 MGA Zone 55

**BURNT AREA MAPPING
- 2019 BUSHFIRE EVENT**

PRELIMINARY REGIONAL
ISSUES ASSESSMENT

Figure 25: Burnt Area Mapping – 2019 Bushfire Event

Mountains World Heritage Area was also burnt. The Rylstone Region Coal Free Community group considers that the unburnt habitat within the Hawkins and Rumker potential release areas likely acted as a refuge for native species during and after the bushfires.

Any coal exploration and potential future mining in potential release areas would have the potential to impact on the range of threatened species, populations, and communities within the potential release areas.

Given there is relatively high degree of flexibility in coal exploration activities, the Department anticipates that these activities could be designed to avoid or minimise significant impacts on threatened species, populations and communities. In addition, underground mining would further minimise potential impacts due to surface disturbance.

As coal mining within the potential release areas would likely be undertaken using underground mining methods, the nature of direct impacts from surface disturbance are unlikely to be significant. To this end, any surface infrastructure is likely to be developed on flatter and cleared parts in the south-western extent. This area is relatively free from threatened flora and fauna records and has not been subject to significant impacts from the bushfires. Notwithstanding, this area does contain grassy woodlands which may align with Box Gum Woodland TEC.

Having regard to these considerations, the Department considers that potential impacts to biodiversity values could be effectively minimised and/or avoided through appropriate mine design, and residual impacts compensated for through the NSW Biodiversity Offsets Scheme.

In addition to direct disturbance (both surface disturbance and undermining), coal exploration and mining activities would have the potential to have indirect impacts on biodiversity, for example through the spread of weeds or pests. The Central Western Regional Strategic Weed Management Plan provides information on priority weeds in the potential release areas and surrounding region. The Exploration code of practice: environmental management requires the tenement holder to implement all practicable measures to prevent the introduction and spread of weeds, pest animals and animal and plant diseases.

The Department is satisfied that there are no significant or fundamental constraints to the release of the areas from a biodiversity perspective and that the current regulatory and planning framework is sufficient to manage potential impacts of any coal exploration and mining activities.

This would include the need to implement the exploration Codes of Practice and avoid, mitigate or offset potential impacts in accordance with the requirements of the BC Act. Avoidance and offsetting measures may be an economic constraint for potential future mine design depending on the type and scale of impacts to biodiversity values specifically threatened species habitat and availability and cost of suitable offsets.

5.10 Matters of National Environmental Significance

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance, require approval from the Australian Government Minister for the Environment. The nine matters of national environmental significance protected under the EPBC Act are considered in **Table 7**.

If there is likely to be a significant impact on listed threatened species and ecological communities or migratory species, the tenement holder would be required to refer the proposed exploration and potential future mining to the Commonwealth Department of Agriculture, Water and the Environment for consideration under the EPBC Act.

Table 7: Consideration of Matters of National Environmental Significance

Matter	Consideration
World heritage properties	There are no world heritage properties within the potential release areas. The Greater Blue Mountains World Heritage Area is immediately adjacent to the potential release areas.
National heritage places	There are no national heritage places within the potential release areas. The Greater Blue Mountains World Heritage Area is immediately adjacent to the potential release areas.
Wetlands of international importance (listed under the Ramsar Convention)	There are no wetlands of international importance listed under the Ramsar Convention within or in close proximity to the potential release areas.
Listed threatened species and ecological communities	Habitat is present within the potential release areas (see Table 4 , Table 5 and Table 6). Potential impacts on listed threatened species and ecological communities as a result of coal exploration or mining activities would require detailed consideration by the tenement holder. ¹⁰
Migratory species protected under international agreements	Habitat is present within the potential release areas. Potential impacts on migratory species as a result of coal exploration or mining activities would require detailed consideration by the tenement holder.
Commonwealth marine areas	Not relevant.
Great Barrier Reef Marine Park	Not relevant.
Nuclear actions (including uranium mines)	Not relevant.
A water resource, in relation to coal seam gas development and large coal mining development	Potential significant impacts on a water resource as a result of a large coal mining development would require detailed consideration by the tenement holder as well as federal assessment and approval.

5.11 Other Protected and Significant Areas

Wollemi National Park and Conservation Areas

The Wollemi National Park is excluded from the Hawkins and Rumker potential release areas, however, adjoins the eastern boundaries of both areas. Wollemi National Park is managed by the NSW National Parks and Wildlife Service under plans of management and in accordance with principles of the NPW Act.

The Wollemi National Park also comprises part of the Greater Blue Mountains World Heritage Area which is protected and managed under the EPBC Act. The Greater Blue Mountains World Heritage Area is also subject to an Aboriginal joint management arrangement between the local Aboriginal people and the NSW Government.

¹⁰ It is an offence under Part 3 of the EPBC Act to take an action that will have a significant impact on a listed threatened species, ecological community or migratory species without approval under the EPBC Act (or other relevant defence).

The *Developments adjacent to National Parks and Wildlife Service lands*¹¹ guideline notes that consent authorities need to consider the following issues when assessing proposals adjoining National Parks and land managed by the National Parks and Wildlife Service:

- erosion and sediment control;
- stormwater runoff;
- wastewater;
- management implications relating to pests, weeds and edge effects;
- fire and the location of asset protection zones;
- boundary encroachments and access through National Parks and Wildlife Service lands;
- visual, odour, noise, vibration, air quality and amenity impacts;
- threats to ecological connectivity and groundwater-dependent ecosystems;
- cultural heritage; and
- access to parks.

On the basis that adequate consideration is given to the *Developments adjacent to National Parks and Wildlife Service lands* guideline as part of the assessment process for any coal exploration or mining activities, the Department is satisfied that any significant conflicts with the existing conservation uses adjacent to the Hawkins and Rumker potential release areas are likely to be avoidable.

Notwithstanding, the guideline encourages proponents to consider implementation of an appropriate buffer or setback between any development and a National Park to avoid or minimise edge effects and amenity impacts and accommodate existing access.

The Department considers that there should be at least a 300 m buffer between the project boundary and the National Park to avoid any subsidence impacts.

The locations of other conservation areas have been provided by the BCS and include land voluntarily protected by the landholder via a Wildlife Refuge under the NPW Act (now managed under the BC Act). There are two wildlife refuges within the potential release areas (Taminga and Talooby) and their locations are shown on **Figure 24**.

There is no land within the potential release areas voluntarily protected by the landholder under a Conservation Agreement, under a Biodiversity Stewardship Site Agreement or subject to a targeted conservation project for a threatened species under the NSW Government Saving Our Species program.

A number of submissions received during community consultation discussed the significant biodiversity and heritage values provided by the Ferntree Gully Reserve, which is located on Crown land within the Rumker potential release area, including habitat for vulnerable species. The Ferntree Gully Reserve has also been described as a scenic rainforest area important for its tourist appeal and pagoda landforms (as discussed further in **Section 5.6**).

Given these values, the Department considers that the Reserve should be protected and that setbacks would be required to avoid subsidence related impacts, particularly on the significant pagoda features.

Any mining activities would also need to be managed to avoid conflict with the other conservation land uses identified. The Department notes that underground mining can occur beneath areas covered by Conservation Agreements and there are numerous precedents of mining occurring beneath biodiversity offsets. If there were

¹¹ <https://www.environment.nsw.gov.au/research-and-publications/publications-search/developments-adjacent-to-national-parks-and-wildlife-service-lands>.

particularly sensitive features (e.g. cliff lines) that were required to be avoided, then longwall setbacks could be applied.

Dark Sky Region

The Sidings Springs Observatory (SSO) is located approximately 180 km to the north-west of the Hawkins and Rumker potential release areas. Consequently, the potential release areas are situated within the Dark Sky Region, as defined in the *Dark Sky Planning Guideline*. The Wiruna Observatory is also located approximately 35 km to the south-east of the potential release areas, on the other side of the Greater Blue Mountains World Heritage Area.

A number of existing mining operations and regional towns are situated between the potential release areas and the SSO which may contribute to the levels of sky glow already experienced. Exploration activities are not expected to significantly contribute to existing sky glow.

Like other mines in the region, any future mining operations would be required to comply with the mitigation measures in the *Dark Sky Planning Guideline* and relevant Australian Standards to minimise outdoor lighting impacts. Consequently, the Dark Sky Region is unlikely to represent a constraint to the release of the areas.

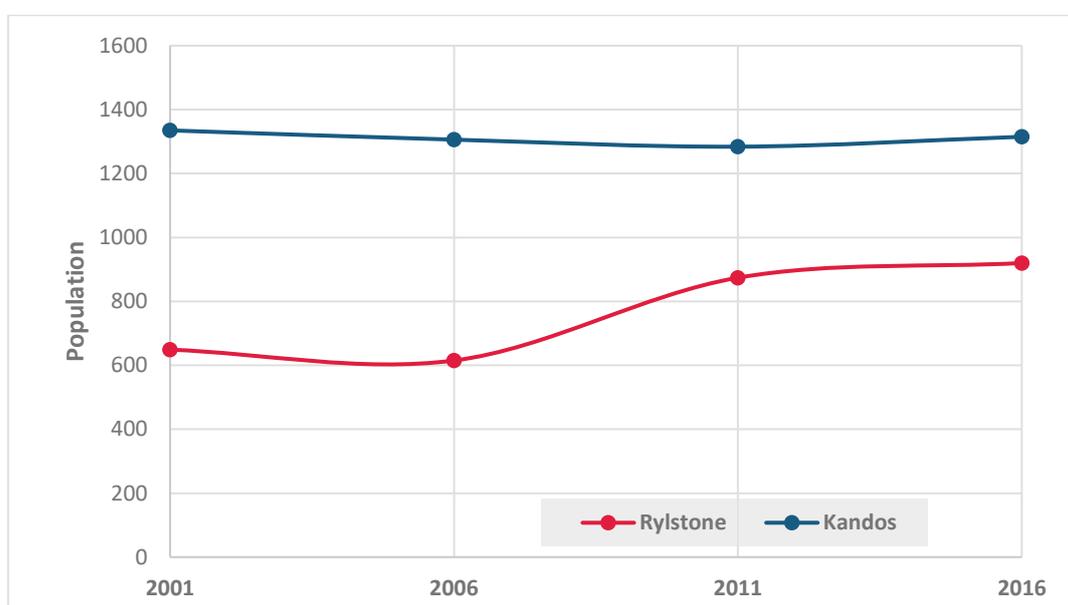
5.12 Social Considerations

The communities and towns in the Mid-Western Regional LGA are primarily serviced by Mudgee, including Rylstone (population 920 based on 2016 ABS data for this suburb). The area is well known for its built heritage, food and wine tourism, and mining.

Mining activity has led to growth in Mudgee and surrounds in recent years and is the largest industry of employment. There is also a significant mining employment base in the nearby Lithgow LGA.

Kandos, which is located approximately 12 km from the potential release areas, has experienced a downward trend in population with the closure of the Kandos cement works in 2011 (see **Figure 26**). Rylstone, which is located approximately 5.5 km from the potential release areas, has experienced some population growth over time.

Indigenous peoples make up a larger proportion of the population within the area (5.3% in the Mudgee Region-East Statistical Area and 5.4% in the Mudgee Region-West Statistical Area) compared to other areas of NSW (average of 2.9%). **Table 8** presents the population of the statistical areas covering the potential release areas.



Source: Australian Bureau of Statistics 2001 to 2016.

Figure 26: Population of Rylstone and Kandos between 2001 and 2016

Table 8: Population in the Statistical Areas Covering the Potential Release Areas

Area	Total Population 2016	Indigenous Population (2016) (% of 2016 population)
Mudgee Region-East (SA2)	3,444	181 (5.3%)
Mudgee Region-West (SA2)	10,359	555 (5.4%)
Total NSW	7,480,228 ¹²	216,176 (2.9%)

¹² Note: estimated population of NSW in 2020 is 8,167,532 (ABS, 2021).

Throughout the entire lifecycle of a coal mining operation, there would be different benefits and impacts for the community, from exploration and construction to mining and decommissioning. The Department notes that there is no guarantee that a project would proceed through all of the phases, as a potential resource may be determined to be unviable at any point.

The small workforce typically associated with exploration activities would be temporary and is unlikely to materially affect employment and the availability of services and houses in the region.

Exploration activities are likely to result in some local purchasing and associated flow-on economic benefits (e.g. purchase of food/catering from local businesses, use of local road maintenance contractors).

If an underground coal mining project were to proceed within the potential release areas, the local employment and flow-on economic benefits are likely to be much more significant than for exploration activities.

It is likely that any workforce for an underground coal mining project would utilise the existing pool of skilled mining workers in the Mid-Western Regional LGA and Lithgow LGA, as well as result in an influx of new workers from other regions. This could provide sustained opportunities for the existing workforce of nearby mining projects which are scheduled to conclude in the next 12 to 18 years.

Workers and their families relocating to nearby communities, such as Rylstone and Kandos, could have significant positive economic and social impacts, particularly given recent population declines. Feedback received during community consultation identified concerns that workers would not reside in the region and therefore potential impacts associated with a drive-in, drive-out workforce may be experienced in local communities.

Feedback from Mid-Western Regional Council indicates that there is sufficient vacant land available to provide adequate housing stock in the long-term for increases in population.

Areas of the Mid-Western Regional LGA are known to experience low rental vacancies periodically. For example, SQM Research estimates that residential vacancy rates are below 1% in areas in the Central Tablelands region.¹³ Anecdotally, short-term and temporary accommodation can be limited during times of peak activity within the region. Therefore, it would be important that cumulative impacts are considered as part of future impact assessments.

If the resource were to be developed, further work would be required to determine the capacity of the local and regional community to manage any social impacts associated with an underground coal mining project. This would occur, at the appropriate time, as part of a Social Impact Assessment in accordance with the *Social Impact Assessment Guideline: For State Significant Projects* (or its latest version).

Notwithstanding, the Department recognises that social impacts may occur during the exploration phase, including:

- uncertainty and anxiety within some aspects of the community (particularly the 170 affected landholders) about whether or not a mining project may proceed (noting that this can be extended over many years); and
- social impacts associated with property acquisitions by the tenement holder in advance of obtaining development consent for a mining operation (as has occurred previously prior to the commencement of other mining operations in the region).

¹³ Source: SQM Research residential vacancy rates data for Central Tablelands (https://sqmresearch.com.au/graph_vacancy.php).

The associated decline in local population from property acquisitions can significantly affect community values and senses of place via a potential loss of access to local services, changes in rural character and amenity of the local towns and loss of community cohesion from the relocation of families. This has been previously observed and documented in the Wollar and Bylong communities, and has been reported during feedback to have occurred to some extent during the exploration phase for the proposed Bowdens Silver Project near Lue.

Feedback received during community engagement included descriptions of the lasting social impacts resulting from land acquisitions by the proponents of the Bylong Coal Project, including closure of the local store, displacement of generational farming families, cessation of community groups and events and loss of tourism values. A community member described the fear of losing “*the vibrancy, morale and spirit*” of the small country towns in the area if coal mining were to proceed and further feared “*it would be terminal for us*”.

The Department’s assessment of the Bylong Coal Project acknowledged that social impacts had already occurred due to the acquisition of land by the proponent of the project in the Bylong Valley with loss of social cohesion and loss of connections in the local farming community.

Feedback also raised concerns about the cumulative social impacts of mining in the Mid-Western Regional LGA, citing that a large area of land is now owned by the coal industry between Ulan and Bylong, resulting in economic and social disadvantage for the remaining few private property owners.

The Department acknowledges feedback from the community that landholders in these areas have already experienced stress as a result of the 2019/20 bushfires, extended drought and the Covid-19 pandemic, and the potential impacts of uncertainty and displacement from potential exploration and mining would exacerbate these stressors.

The Department considers that there would be a high likelihood for negative social impacts during the exploration phase, particularly as a result of any land acquisitions. There are a large number of landowners in the potential release areas that would be impacted by the prospect of exploration and any future mining and this will undoubtedly create uncertainty for this part of the community.

Given the relatively small size of the Rylstone community, and the proportion of landowners that would potentially be affected, the Department has concerns as to whether the community would be resilient to such impacts.

The Department also notes that negative social impacts are unlikely to be offset by benefits during the exploration phase. The small workforces typically associated with exploration activities would be temporary and are unlikely to materially affect employment and the availability of services and houses in the region. While exploration activities can result in some local purchasing and associated flow-on economic benefits (e.g. purchase of food/catering from local businesses, use of local road maintenance contractors), these are not anticipated to be significant.

Given the number of landowners potentially affected, the proximity to the small township of Rylstone, the observed social impacts in the nearby Bylong Valley and the magnitude of social change that would result from exploration and development of a greenfield coal mine in these areas, the Department considers that there is a high likelihood for negative social impacts from releasing the Hawkins and Rumker areas. However, the Department notes that it is difficult to predict the extent and scale of any negative social impacts that would result from the release of the areas. Consequently, the negative social impacts are unlikely to preclude any release in their own right. However, the negative social impacts must be considered and balanced against the likelihood of positive social benefits and other opportunities and constraints associated with release of the areas.

In this regard, the Department notes that there are economic constraints to release the potential release areas (discussed in **Section 5.13**), uncertainty as to whether a project would be viable and therefore a significant amount of uncertainty as to whether any of the positive social impacts of any future mining would be realised. This uncertainty has the potential to prolong and exacerbate any negative social impacts that could occur during exploration and when these issues are considered cumulatively, the Department considers that they represent a significant constraint to releasing the Hawkins and Rumker areas.

5.13 Economic Considerations

Tourism

Feedback received during community engagement highlighted potential impacts from a future mining operation to tourism values in the region, particularly for small businesses and industries that rely on tourist trade. Potential for localised impacts to nature-based tourism operations and farm stay experiences that rely on access to particular natural features and the scenic and peaceful rural amenity values of the area was also raised as a key constraint. A community member in an online session noted that “*there is nothing beautiful about a mine*”, whereas numerous community members and Aboriginal people noted the ‘*stunning natural beauty*’ of the area.

The Central West Plan recognises the importance of tourism as a key component of the economic base in the region. The Greater Blue Mountains World Heritage Area is a key environmental tourism asset in the local area, along with attractive historical towns and villages.

In 2016, over 300 tourism businesses operated within the Mid-Western Regional LGA.¹⁴ The Rylstone Region Coal Free Community group identify that some 660,000 people per year on average are visiting the Mudgee Region including the towns of Rylstone, Kandos, Mudgee, and Gulgong, and reports significant growth in domestic tourists visiting Rylstone in the last 2 years. The Greater Blue Mountains Tourist Drive includes Bylong Valley Way from Rylstone to Bylong. Tourism values identified for Rylstone and Kandos include agritourism (food and wine), heritage tourism, arts and culture and natural tourism.

It is expected that an appropriately designed mining project could co-exist with tourism in the broader region. Notwithstanding, the Department is mindful that should the rail coal transport option proceed through the villages of Rylstone and Kandos (to the south) or Lue and Mudgee (to the north), the ability for these sectors to co-exist would be significantly decreased due to the likely amenity impacts associated with the railway infrastructure.

Local investment and employment that can be generated by mining operations can contribute towards thriving and diverse communities as acknowledged by Mid-Western Regional Council. In addition, planning contributions from mining operations to local councils can be used towards local improvements that can improve services and aesthetics in towns and villages and attract tourism.

Notwithstanding, the Department acknowledges that there is potential for localised impacts to tourism land uses.

Commercial Viability

The Resource Assessment Report identifies that the commercial viability of the resource is highly dependent on initial capital expenditure and coal prices.

¹⁴ Tourism Research Australia (2016) (<https://www.destinationnsw.com.au/wp-content/uploads/2012/03/Mid-Western-Regional-LGA-profile.pdf>).

The assessment identified that capital costs would be high relative to revenue generated, due to the greenfield nature of any future project, the need to upgrade local rail infrastructure, the lack of infrastructure synergies with any other mine developments in the region and the long period required for feasibility studies and mine development.

The analysis indicated that the economics of a future mine are marginal and that a long-term average coal price of approximately US\$75 per tonne (approximately AUD\$98 per tonne) would be required to support a viable mining feasibility and development project. The Department notes that the current price of thermal coal is significantly higher than required to sustain a future mine in the potential release areas (approximately US\$168). However, this price appears to be driven by strong international demand resulting from the COVID-19 pandemic and is unlikely to sustain in the long-term. Pre-COVID predictions estimated the long-term price of coal around US\$75 per tonne.

The Commercial Viability Assessment Report considered mine setbacks from Wollemi National Park, regionally mapped BSAL areas and alluvium along the Growee River and Bylong Valley Way. The assessment also identified the limited transport options including rail transport feasibility constraints, noting that significant capital expenditure would be required to upgrade the railway line and that alternative rail transport options would be met with significant community resistance.

However, as discussed in **Section 2.2**, the analysis did not consider mine plan changes that may be required to mitigate impacts on environmental surface constraints, such as:

- Aboriginal heritage sites;
- houses and other built features on private properties;
- groundwater bores used for water supply; and
- significant pagoda complexes in Ferntree Gully Reserve, GDEs, significant stream features or other natural features that provide biodiversity and/or aesthetic values.

The assessment did not incorporate costs that may be associated with biodiversity offset measures, the purchase of water licences, property mitigation and acquisitions associated with potential amenity impacts, and subsidence mitigation and remediation measures. It also did not consider additional costs and limitations associated with other transport options such as road transport or construction of an overland conveyor.

Given that the economics of future mining are marginal without these considerations in mind, and the uncertainty about the long-term price of coal, the Department considers that these constraints are likely have a significant impact on the financial viability of any mining and consequently represent a fundamental constraint to any release.

Economic Benefits

The mining industry is an important element of the Mid-Western Regional LGA's employment base and is acknowledged by Mid-Western Regional Council to be a key contributor to the resilience of the Mudgee economy. Mining is the largest industry of employment, with approximately 600 personnel employed at the Wilpinjong Coal Mine, 220 employed at Moolarben Coal Mine and 900 employed at Ulan Coal Mine.

Mid-Western Regional Council identified the benefits that mining in the potential release area would bring to the region including sustained employment opportunities for the significant existing mine workforce.

The Department also notes that the development of the coal resource would also support regional economic activity and stability, and construction and supply contracts would benefit regional businesses and the regional economy.

Although the Department cannot predict future market prices, development of the resource at the minimum assumed price required for commercial viability would also result in significant royalties to the State of NSW estimated between \$917 million and \$2 billion.

5.14 Potential Impacts to Health and Amenity of Local Communities

Coal exploration and potential future mining has the potential to create noise, dust, other emissions and vibration from blasting. This may affect the amenity of people in close proximity to the activities in the townships of Rylstone and Kandos or, if unmitigated, may have health impacts. Coal transport also has the potential to create amenity impacts whether it be via road or rail.

Feedback received during community consultation described potential health concerns as a result of future mining, including impacts to water supply and quality, air quality (specifically particulate matter emissions), noise levels and sleep disruption, mental health and climate change related health issues.

The NSW Government has policies and processes to assess, monitor and manage noise, blasting and air quality impacts. This includes the following:

- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW – outlines methods to assess impacts on air quality and impact assessment criteria for common pollutants to protect the amenity, health and safety of people.
- Noise Policy for Industry – provides noise levels for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures.
- Rail Infrastructure Noise Guideline – outlines assessment requirements for rail traffic-generating developments, such as coal mining projects.
- Voluntary Land Acquisition and Mitigation Policy – describes the NSW Government’s policy for voluntary mitigation and land acquisition to address noise and dust (particulate matter) impacts from State significant coal developments (as well as mining, other petroleum and extractive industry developments).
- ANZECC blasting guidelines and relevant Australian Standards – provide criteria to address annoyance and discomfort caused by blasting impacts from mining, quarrying and construction.

The Department considers that coal exploration could be adequately located and conducted to mitigate any material health, safety and amenity impacts on local residents and communities.

However, any potential mining activities would have the potential for amenity impacts and surface infrastructure would need to be appropriately designed and sited to mitigate any impacts. It is anticipated that this may involve the acquisition of properties that may experience significant noise and/or air quality impacts.

As expressed in community feedback, there is substantial concern about the potential for large-scale acquisitions as a means of providing an appropriate buffer to a proposed mining operation and the potential social ramifications which may be experienced by affected landholders and the wider community due to these acquisitions (discussed further in **Section 5.13**). Although noise and particulate emissions may meet regulatory requirements, levels may result in landholders leaving the area causing flow-on social impacts such as loss of community cohesion and local services.

Potential noise impacts associated with off-site coal transport may also be significant and warrant receiver-based controls (e.g. provision of double glazing and noise attenuation), particularly associated with any rail transport (which is considered the most likely option as discussed in **Section 5.16**) through Rylstone and Kandos.

The EPA's Rail Infrastructure Noise Guidelines identifies the potential adverse effects on residents living alongside rail lines from exposure to increased train movements, extended rail operating hours and development along transport routes. Additional noise may adversely impact daytime, evening and night-time activities including sleeping and, by extension, increase the stress and annoyance of affected residents. Some residents may experience a significant deterioration in general quality of life due to increased noise.

If coal were to be transported through Rylstone and Kandos a significant number of landowners (approximately 180 in Rylstone and 254 in Kandos), business and tourism uses would be potentially impacted. Given that the railway is currently decommissioned, the area is characterised by low background noise levels, and high noise levels are likely to persist notwithstanding the implementation of noise mitigation measures, these impacts are likely to represent a key constraint to any future mining.

The Executive Summary for the Transport for NSW Kandos to Gulgong Line Reinstatement Feasibility Study (2020) also noted that while trains previously passed through the towns of Kandos, Rylstone, Lue and Mudgee, the passage of time and the lack of rail activity has meant that residents no longer expect to have train operations through the town. The summary also stated that *"Concerns have been expressed by the Mid-Western Regional Council, based in Mudgee, that the reintroduction of trains would have a disruptive impact on these towns. Council has suggested that there would be a strong community response to trains in the towns, particularly from the residents of Mudgee, where recent development has been proximate to the rail corridor."*

Other amenity related impacts from coal transport by rail or road could also be expected including dust emissions, safety and health-related impacts.

Any future coal mining-related infrastructure would also have the potential to create visual impacts from public viewpoints and at private residences, including potential impacts from lighting in an otherwise dark rural environment. If the resource were to be developed, further work would be required to consider these potential visual impacts and identify suitable controls and mitigation measures to be implemented both on-site and at-receivers, informed by consultation with affected landowners and the community.

5.15 Greenhouse Gas Emissions

The context of the potential coal resource in relation to the NSW Government's Climate Change Policy and international framework is discussed in **Section 3.4**. Many submissions raised concerns about the contribution of greenhouse gases from any future mining proposal to climate change and that any approval would be inconsistent with the carbon budget approach to stabilization.

As discussed in **Section 4.3**, there were significant concerns that any proposed release would be contradictory to the commitments made by NSW and Australia including net-zero obligations under the Paris Agreement and the NSW Government's own emissions strategy.

The potential greenhouse gas emissions associated with exploring or developing the coal resource cannot be reliably quantified at this stage. However, assuming a conservative upper limit, the combustion of approximately 290 Mt of product coal would result in approximately 707 Mt carbon dioxide equivalent (CO₂-e) of Scope 3 greenhouse gas emissions.

The main sources of emissions would be from electricity consumption, fugitive emissions of carbon dioxide and methane, diesel usage and the transport and end use of product coal.

Based on the Department's experience, Scope 1 and Scope 2 emissions form only a small proportion of the emissions. Scope 1 emissions typically contribute to a very small percentage of Australia's current annual greenhouse gas emissions and a small contribution when compared to Australia's commitment under the Paris Agreement, as identified in the Commonwealth government's nationally determined contribution.

Contemporary consent conditions for mining projects typically include requirements to manage and reduce the greenhouse gas emissions of the project over which it has control (Scope 1 and Scope 2).

Scope 3 emissions associated with use of the coal (either domestically or overseas) would generate much higher levels of greenhouse gas emissions. It is acknowledged by the Department that Scope 3 emissions from the combustion of product coal is a significant contributor to anthropogenic climate change and that the contribution of any future mining application to the potential impacts of climate change in NSW must be considered when assessing the overall merits of the application.

The Federal Minister for the Environment's Statement of Reasons for the Vickery Extension Project (approved on 16 September 2021) acknowledged that Scope 3 emissions associated with Australian facilities that occur outside Australia's jurisdiction (e.g. emissions from the combustion of Australia's coal in an export destination) are accounted for in the countries where those emissions occur under the Paris Agreement.

It also noted that the Paris Agreement does not require parties to take particular measures to achieve their nationally determined contributions (NDCs), rather, parties may determine which domestic mitigation measures to pursue, with the aim of achieving the objective of their NDC. Finally it was noted that there is no government policy requiring approval of coal mines to be refused in order to meet Australia's commitments under the Paris Agreement, or to prevent coal being available to other countries to reduce other countries' emissions.

Notwithstanding, the Department acknowledges that there has been a significant policy shift since the Government's Strategic Statement on Coal Exploration and Mining was released and that the coal market, and support for net-zero emissions targets, are rapidly changing both in Australia and internationally. There has been a demonstrated increase in political support and commitments for net-zero emissions targets, bolstered by the delivery of the latest IPCC report that has highlighted the need to immediately expedite large-scale reductions in greenhouse gas emissions to limit the impacts of climate change. Other reports reflective of the changing policy context have included the International Energy Agency's 'The World's Roadmap to Net Zero by 2050' report released in May 2021, which further highlighted the need to accelerate the transition to renewable energy sources and stating that developed nations must not explore for or exploit any further fossil fuel reserves.

Any future proposal would be required to undertake a greenhouse gas emissions assessment and the costs and benefits would be required to be accounted for as part of the overall assessment of the merits of any development application.

5.16 Availability and Access to Infrastructure and Utilities

The potential release areas are approximately 30 km to 45 km via road to the Castlereagh Highway, which forms a key link between Mudgee and Sydney.

Access to the potential release areas is available via the regional road network, including Bylong Valley Way (recently upgraded) and other major/minor roads, with all-weather road access limited in some areas. Access within the potential release areas (other than Bylong Valley Way) is limited to Growee Road, Jimmy Jimmy Road and Newells Road, along with unsealed private roads and farm tracks.

Apart from these roads, there are very few formed roads throughout the potential release areas. Consequently, it is possible that obtaining access and providing services to some parts of the potential release areas would be difficult. Road upgrade works (e.g. widening and grading) and development of new access tracks would likely be required to facilitate better access for exploration.

The Department notes that any exploration is not likely to generate any significant traffic volumes. However, upgrades to additional roads might be required to support any future workforces associated with coal mining in the area.

The Department has considered the constraints of potential transport options in its assessment including potential transport via rail, road or an overland conveyor to another mining operation in the region.

An overland conveyor to a nearby mining operation could be approximately 30 to 40 km in length, however the cost and engineering feasibility are likely to be a constraint over this distance. Combined with the potential impacts including additional surface disturbance, restricted landholder access, visual impacts and potential changes to surface water flow paths mean it is unlikely to be a viable transport option.

Some smaller coal mining operations, and other extractive industries, transport product via trucks on public roads. The ability to transport via road is often constrained by costs and physical constraints associated with loading and unloading trucks, as well as amenity and safety issues. A mining operation in this location is unlikely to be commercially viable at the production rates that would be feasible and acceptable using road transport (i.e. at approximately 4 Mt per annum). It is further noted that one of the Government's key regulatory instruments for mining, the Mining SEPP, specifically discourages the transport of coal by road given the potential for significant safety and amenity impacts.

In regard to rail transport, the distance by rail from Rylstone to Port Kembla and the Port of Newcastle is about 350 km and 360 km, respectively.

The Wallerawang-Gwabegar Railway Line branches from the Main Western Railway Line at Wallerawang (north of Lithgow) and travels through Kandos, Rylstone, Mudgee and Gulgong (end of the line). Use of the Wallerawang-Gwabegar Railway Line has been suspended from north of the Charbon Colliery (just outside of Kandos) through to Gulgong (approximately 93 km). The line from Kandos to Gulgong is currently in a non-trafficable condition as its age and non-operational status have led to degradation (e.g. of sleepers and timber bridge) and discontinuation of the rail line at several locations (e.g. where the rail corridor crosses existing roads).

Transport for NSW completed a Feasibility Study for reinstatement of the Railway Line between Kandos and Gulgong in 2020¹⁵. The assessment summary concluded that significant upgrade is required to allow coal transport and that the cost benefit of such upgrades would be marginal based on the demand scenarios considered.

If the Wallerawang-Gwabegar Railway Line is reinstated (at least to within proximity of the potential release areas), it could be used to transport coal to local power stations near Lithgow, to Port Kembla for export or via Mudgee to the Port of Newcastle.

Otherwise a mine operator would be required to upgrade at least 12 km of railway between the Hawkins area and Kandos if transporting coal to Port Kembla or approximately 80 km of railway to Gulgong. A rail spur line and rail loading facilities would also be required as part of any future mining project to provide access to the railway.

As discussed in **Section 5.12**, it is noted that coal transportation via rail would have amenity impacts on residents located in proximity to the rail line. It would also result in impacts on traffic flow at level crossings.

Due to the constraints associated with transporting coal by road and overland conveyor, the Department considers that any future transport of coal is likely to be by rail. However, rail transport is constrained to the

¹⁵ Source: Kandos to Gulgong Line Reinstatement Feasibility Study – Executive Summary (Transport for NSW, 2020).

north due to the economic constraints of upgrading 80 km of railway and to the south due to amenity impacts on residents and the towns of Rylstone and Kandos. The Department considers that these are significant constraints that could preclude mining in the future.

The potential release areas are located in close proximity to existing electricity infrastructure, including TransGrid's 500 kilovolt (kV) Electricity Transmission Line between Ilford and Mudgee (adjacent to the potential release areas) and Endeavour Energy's 66 kV Electricity Transmission Line which intersects the Hawkins and Rumker areas to connect Rylstone, Breakfast Creek and Lue.

The majority of infrastructure and services in the vicinity of the potential release areas are concentrated in Mudgee, approximately 40 minutes from the potential release areas by car. Therefore, it is unlikely that any temporary accommodation facilities would be required to support any future production or development of the coal resource.

Community members expressed concern about coal exploration and potential future mining activities placing additional demand on telecommunication infrastructure, affecting access for the local community. These impacts could be mitigated by upgrading existing facilities (which has occurred in some parts of mid-western NSW, including Camboo, Lue and Boguee, through the Federal Mobile Black Spot Program).

5.17 Other Industries and Land Uses

As noted in **Section 1.4**, there are a number of other major projects in the region however these are all located outside the potential release areas and are unlikely to be affected by any coal exploration or production.

Depending on the location of any future coal production, any future tenement holder may need to consider the cumulative impacts, particularly on infrastructure and services in towns and centres, including Rylstone, Lue, Kandos and Mudgee.

Parts of the Hawkins and Rumker potential release areas overlap with four exploration licences held by Bowdens Silver Pty Limited for metallic minerals (EL 8403, EL8168, EL6354 and EL5920).

The Department notes that overlapping parts of the above mentioned metallic mineral exploration titles are relatively small compared to the potential release areas. Consequently, the Department considers that there is unlikely to be any material conflicts between any coal exploration and potential future mining and the current exploration activities for metallic minerals in the potential release areas.

However cumulative transport impacts and regional social and economic impacts would need to be considered in any future development application.

Community submissions identified concern that mine blasting activities within proximity to the Rylstone Aerodrome Park, located near Rylstone, would render the area dangerous, therefore ceasing aircraft operations. It was reported that the Rylstone Aerodrome Park provides essential connection to flying emergency services. Given that any future mining is likely to be by longwall methods there are unlikely to be any blasting impacts on the Rylstone Aerodrome Park.

6.0 Findings and Considerations

The PRIA outlines the Department's advice to the ABSR on environmental, social and economic matters relating to the potential release of the Hawkins and Rumker potential release areas in the Western Coalfield of NSW for coal exploration.

In preparing this PRIA, the Department consulted with the community and key stakeholders and reviewed existing Government data sources.

Engagement Outcomes

The Department has heard strong concerns about potential exploration and mining from the community, particularly in the Rylstone area, with almost all of the 2,064 submissions strongly opposed to any release.

Given the experience of the local community with other mining projects in the region, most notably the refused Bylong Coal Project, the community is concerned about any future coal exploration and mining including impacts on water quality and quantity, conflicts with agricultural, biodiversity conservation and tourism land uses and social impacts including effects on mental health and wellbeing and more.

The local and wider community is also sceptical of any benefits from coal exploration or mining and has expressed strong views that there would be greater public benefit from the growing tourism industry and agricultural sector that relies on the protection of existing rural and natural values of the region. The Aboriginal community has also expressed significant concern regarding the cumulative impacts of mining in the wider region on heritage sites, environmental features (e.g. swamps, watercourses and rock features) and connection with Country and song lines.

More broadly, submissions have expressed strong opposition to the development of new greenfield mining projects, instead calling for existing mines to meet thermal coal demand and for increased investment in renewable energy sources.

Many submissions (both locally and from the broader community) raised concerns that releasing the areas for exploration would be contradictory to Australia's net-zero obligations under the Paris Agreement and the NSW Government's emissions strategy of net-zero by 2050 and interim target of 35% reduction in emissions by 2030.

The community cited strategic reports including the Intergovernmental Panel on Climate Change's (IPCC) sixth assessment report, the International Energy Agency's 'The World's Roadmap to Net Zero by 2050' report and the 2021-22 NSW Intergenerational Report. Submissions reflect on the findings of these reports including the need to transition away from any new fossil fuel development and to expedite decarbonisation efforts.

The community also raised concerns about the consultation process and the transparency of the Strategic Release Framework, including requests for the Department's assessment report and Geological Survey's Resource Assessment Report to be made publicly available when submitted to the ABSR.

Findings

This PRIA has considered general development scenarios that could flow from the release of the Hawkins and Rumker areas including exploration and underground mining by longwall methods. This approach is consistent with the outcomes of the Resource Assessment Report which considers that any future mining would be by underground methods.

The extraction of the resource would undoubtedly result in significant economic benefits to NSW including royalties upwards of \$917 million. The development of the coal resource would also support regional economic

activity and stability, and construction and supply contracts would benefit regional businesses and the regional economy.

However, the Department has identified a number of fundamental constraints to exploring and mining the two areas that are likely to be unavoidable.

Firstly, the Department notes that exploration in the Hawkins and Rumker areas could have negative social impacts for the region, including the town of Rylstone, as a result of large-scale land acquisitions that can accompany the exploration phase of mining projects. These impacts have been observed in the nearby Bylong Valley as a result of the now refused Bylong Coal Project where large-scale land acquisitions had impacted the population and social fabric of the Bylong Valley before any decision was made on whether the Bylong Coal Project could proceed.

The Department considers that any future exploration in the Hawkins and Rumker areas would have the potential for similar social impacts given this is a greenfield mining area. The Department recognises that the uncertainty as to whether a mining project may ultimately proceed may cause anxiety within some aspects of the community (particularly the 170 affected landholders).

The associated decline in local population from property acquisitions could result in a reduction in local populations, services, community values and sense of place as has been the case in the nearby Bylong Valley and the village of Wollar.

Given the relatively small size of the Rylstone community (approximately 920 people), and the proportion of landowners that would potentially be affected, the observed social impacts in the nearby Bylong Valley and the magnitude of social change that would result from exploration and development of a greenfield coal mine in these particular areas of Hawkins and Rumker, the Department considers that there is a high likelihood for negative social impacts.

Furthermore, there is high potential for land use conflicts and community opposition as evidenced by the extensive community feedback opposing release and requesting protection of the area. This, combined with the likely property mitigation, acquisitions and subsidence mitigation measures, would likely further constrain the potential for a future mining project to obtain a social licence.

Notwithstanding, any future mining of the potential release areas would have significant positive social impacts including direct employment for hundreds of people as well as indirect employment opportunities and support for local business and organisations. The mining industry is an important element of the Mid-Western Regional local government area's employment base with approximately 1700 people employed at mining operations located north of Mudgee. If developed, the potential release areas would offer sustained employment opportunities for the workforce of these nearby mining projects which are scheduled to conclude in the next 12 to 18 years.

The Department notes that it is difficult to predict the extent and scale of any negative social impacts that would result from the release of the areas. Consequently, the negative social impacts are unlikely to preclude any release in their own right. However, any negative social impacts must be considered and balanced against the likelihood of positive social impacts and other opportunities and constraints.

Secondly, the offsite transport of coal is likely to be constrained by a range of factors. The Department has identified several options for any future transport of coal including by road, overland conveyor and by rail.

The ability to transport via road could be constrained by costs and physical constraints associated with loading and unloading trucks, as well as amenity and safety issues. A mining operation in this location is unlikely to be commercially viable at the production rates that would be feasible and acceptable using road transport.

An overland conveyor to a nearby mining operation could be approximately 30 to 40 km in length and the cost and engineering feasibility are likely to be a constraint over this distance. Combined with the potential impacts, including additional surface disturbance, restricted landholder access, visual impacts and potential changes to surface water flow paths, an overland conveyor is unlikely to be a viable transport option.

Significant capital expenditure would be required to reinstate the Wallerawang-Gwabegar Railway between Kandos and Gulgong, with a Transport for NSW assessment concluding that the cost benefit of such upgrades would be marginal. Coal transportation via rail either north through Mudgee or south through Rylstone would also have significant amenity impacts (specifically noise and air quality) on residents, local business and tourism uses and would likely be met with significant community resistance.

The towns of Rylstone and Kandos are located immediately adjacent to the railway and any rail transport to the south would have the potential to impact a significant number of landowners (approximately 180 in Rylstone and 254 in Kandos). Impacts from rail noise are likely to represent a significant constraint to any future mining. This is due to the fact that the railway is currently decommissioned, landowners are not currently subject to any rail noise, background noise levels in these areas are very low, and high noise levels are likely to persist even with the implementation of noise mitigation measures.

Lastly, the Commercial Viability Assessment Report indicates that the economic viability of any future mining project is marginal and would be heavily dependent on relatively high coal process and extensive longwall mining of both areas. Although the Department cannot predict the long-term price of coal with certainty, the Department recognises that the demand for thermal coal is expected to decline over the long-term.

All five of NSW's coal generators, which together supply 84% of the State's utility-scale electricity, are expected to retire over the coming two decades. The nearby Mount Piper Power Station (located approximately 60 km south of the potential release areas) is also anticipated to close early than expected (by 2040) which could be an indicator for decreasing demand for domestic thermal coal. Given the time taken to progress an exploration project to coal production (generally 10 years or more), domestic supply, in isolation, would not be sufficient to support a greenfield coal mining development in the potential release areas.

The expected demand for thermal coal is also expected to decline and at a rate faster than anticipated, as forecast by the 2020 World Energy Outlook. The coal market, and support for net-zero emissions targets, are rapidly changing both in Australia and internationally. Consequently, the Department considers there is considerable uncertainty as to whether any greenfield mine would be viable in the potential release areas of Hawkins and Rumker in the next 10 to 20 years.

Furthermore, the Commercial Viability Assessment Report does not consider additional constraints (as shown in **Figure 27**) identified in the PRIA, including:

- The potential release areas are highly populated with almost 170 private landowners occupying the potential release areas. Underground mining would have the potential for subsidence impacts on private properties (including far field effects) that would require careful monitoring, management, and remediation (if required) and the potential costs associated with such work may form an economic constraint to any development.
- Ferntree Gully Reserves contains important biodiversity, scenic and tourism values that would need to be protected. Setbacks from this area would likely be required to avoid any subsidence impacts.
- The areas contain known pagoda complexes and may contain other significant pagoda landforms and cliff line features that would need to be avoided.

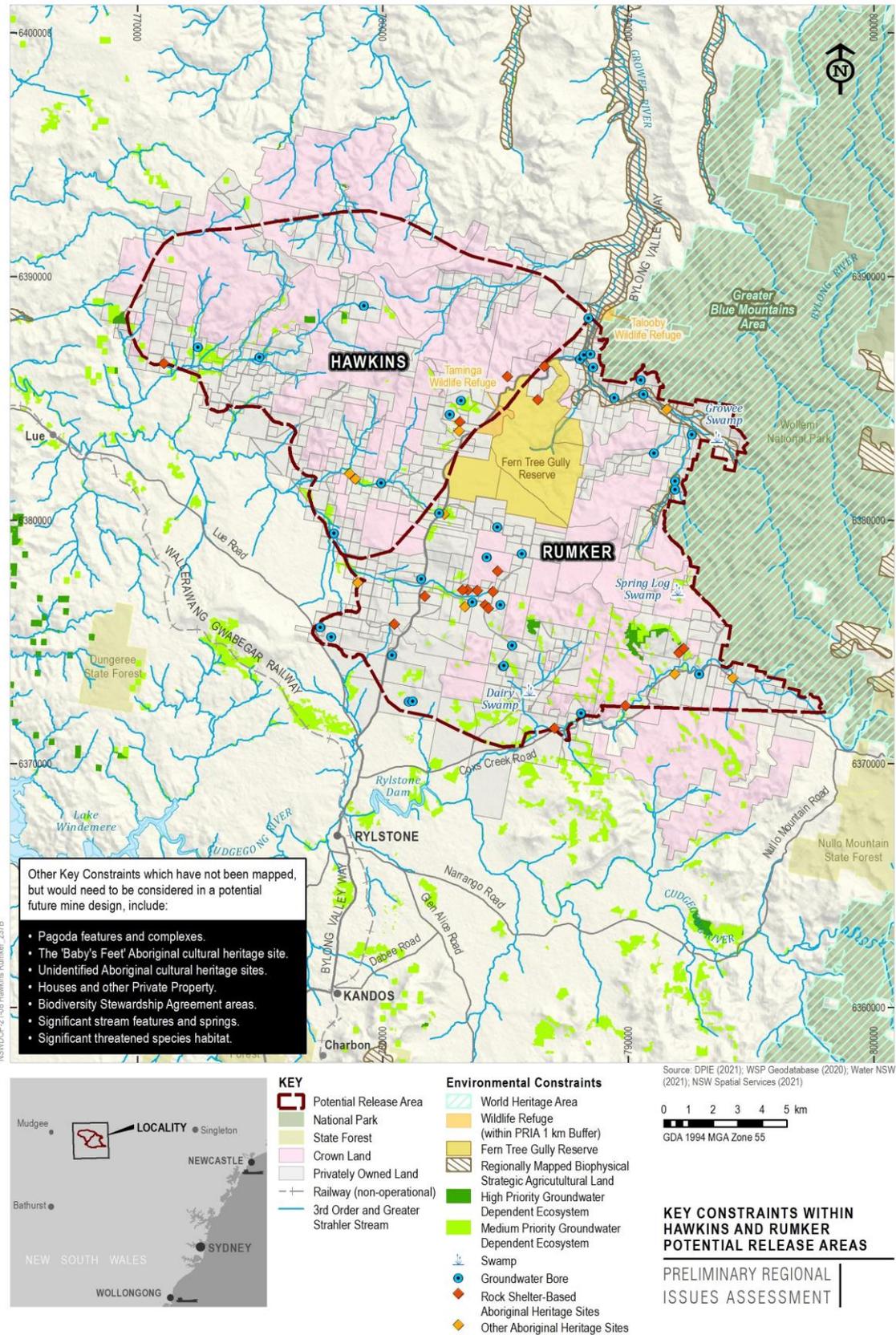


Figure 27: Constraints Mapping

-
- The areas contain significant Aboriginal cultural heritage artefacts and values that would need to be avoided including 'Baby's Feet Cave' and other rock shelter sites with art. There is also a high likelihood for other values to be identified, particularly along the centre of the release areas in steeper topography and ridgelines.
 - There are several areas of moderate to high potential GDEs in the region as well as key swamp and spring features which may form a constraint to any potential future mine design. Setbacks would likely be required to avoid subsidence impacts on these high value ecosystems as any impacts would likely be irreversible and offsets would be difficult to obtain.
 - Any future development would need to consider the water quality impacts on local streams and the Goulburn and Cudgegong Rivers if any off-site discharge is proposed.
 - At least 32 basic landholder water licences would need to be afforded a level of protection and there may be constraints associated with the provision of an alternate water supply depending on the nature and extent of potential drawdown impacts and landholder negotiations.

While each of these issues are unlikely to form a material constraint in their own right, the cumulative and widespread nature of these constraints, and the high potential for further investigations to identify additional features (particularly Aboriginal cultural heritage sites), is likely to represent a significant limitation to any wide-scale longwall mining across the two areas.

Given the level of uncertainty around the economics of future mining without these considerations in mind, the Department considers that these constraints are likely have a significant impact on the financial viability of any mining and consequently represent a fundamental constraint to any release.

The Department has also identified constraints that have been factored in the commercial viability assessment including:

- The need to avoid mining within 300 m of the Wollemi National Park to prevent subsidence impacts.
- The need to avoid subsidence impacts on regionally significant Biophysical Strategic Agricultural Land and highly productive groundwater aquifers associated with the Growee River which is capable of supporting intensive agricultural uses including cropping with cultivation.

The Department has not identified any fundamental environmental constraints in relation threatened flora and fauna, aquatic flora, availability of groundwater and surface water licenses, town water supplies and non-Aboriginal heritage.

Recommendations

The Department concludes that there is considerable uncertainty as to whether a future mine in these areas would be viable, noting the marginal economics of potential mine plans for the area, key transport constraints to mining, significant community opposition to any new coal mine development and the rapidly changing coal market.

While any future mining would result in significant benefits to NSW there appears to be little certainty that these benefits could be realised. This uncertainty is likely to prolong and exacerbate negative social impacts on the community, particularly to the 170 landowners in the two areas.

On this basis, the Department considers that there are sufficient constraints such that the Hawkins and Rumker areas should **not** be released for coal exploration.

Appendix A – Previous and Current Exploration Licences and Authorisations

Table A-1: Previous and Current Exploration Licences and Authorisations over the Hawkins and Rumker Potential Release Areas

Title Reference	Tenement Holder	Approximate Year of Operation	Groups	Area
Current				
AUTH286	NSW Government	2001 – 2021	Group 9	Entirety of Hawkins and Rumker
EL8403	Bowdens Silver Pty Limited	2015 – 2024	Group 1	North region of Hawkins
EL6354	Bowdens Silver Pty Limited	2004 – 2026	Group 1	North region of Hawkins
EL5920	Bowdens Silver Pty Limited	2002 – 2023	Group 1	North region of Hawkins
EL8168	Bowdens Silver Pty Limited	2013 – 2026	Group 1	Western Rumker
Previous				
EL4956	Central West Gold NI, Compound Securities and Management Limited, Mount Conqueror Minerals NI	1996 – 1998	Group 2, Group 6	North region of Hawkins
EL7909	Lue Rylstone Pty Ltd	2012 – 2014	Group 1, Group 2, Group 6	Eastern region of Hawkins
EL3583	CRA Exploration Pty Limited	1990 – 1991	Group 1	Central Hawkins
EL7507	Centennial Fassifern Pty Ltd	2010 – 2015	Group 8	South Hawkins
EL3252	Silver Standard Australia Pty Limited	1989 – 2002	Group 1, Group 10	Eastern Hawkins
EL87	Continental Oil Co of Australia Limited	1967 – 1968	Group 1	Northern Hawkins
EL82	Continental Oil Co of Australia Limited	1967 – 1968	Group 1	Southern half Hawkins and all of Rumker
PEL483	East Coast Power Pty Ltd	2010 – 2012	Petroleum	Eastern Hawkins
EL5005	Silver Standard Australia Pty Limited	1996 – 2002	Group 1, Group 10	Eastern Hawkins

Title Reference	Tenement Holder	Approximate Year of Operation	Groups	Area
EL4956	Central West Gold NI, Compound Securities and Management Limited, Mount Conqueror Minerals NL	1996 – 1998	Group 2, Group 6	Hawkins and Eastern Rumker
EL7964	Bylong South Pty Ltd	2012 – 2014	Group 1, Group 2, Group 6	Western Margin of Hawkins
EL7908	Lue Rylstone Pty Ltd	2012 – 2014	Group 2, Group 6	Hawkins and Central Rumker
EL7696	Strategic Materials Pty Ltd	2011 – 2013	Group 1	Hawkins and Central Rumker
PEL278	The Electricity Commission of NSW (Trading As Pacific Power)	1992 – 1993	Petroleum	Eastern Hawkins and Rumker
PEL73	Wood, A.J.	1963 – 1964	Petroleum	Hawkins and Rumker
PEL236	Australian International & British Limited	1981	Petroleum	Eastern Hawkins and Rumker
PSPAUTH16	Macquarie Energy Pty Ltd	2007	Petroleum	Hawkins and Rumker
PEL460	Dart Energy (Apollo) Pty Ltd	2008 – 2015	Petroleum	Hawkins and Rumker
EL1672	Broken Hill Proprietary Company Limited	1981-1982	Group 6	Eastern Margin Hawkins
EL705	Mining Houses of Australia	1974 – 1976	Group 2	Central Hawkins and Western Rumker
EL1706	Noette Pty Limited	1982 – 1982	Group 6	Southern Margin Hawkins and Western Rumker
MC224	Andu, Claire Frances	1998 – 2001	Group 2	Southern Rumker
PSPAUTH20	Leichhardt Resources Pty Ltd	2009	Petroleum	Eastern Rumker
EL7910	Lue Rylstone Pty Ltd	2012 – 2014	Group 1, Group 2, Group 6	Southern Rumker

Title Reference	Tenement Holder	Approximate Year of Operation	Groups	Area
EL7071	Diamond Mining Limited	2008 – 2009	Group 6	Southern Margin Rumker
EL5935	Gemstar Diamonds Limited	2002 – 2004	Group 6	Southern Margin Rumker
EL5936	Gemstar Diamonds Limited	2002 – 2004	Group 6	Southeastern Rumker
EL370	Kruger Mining NI	1970 – 1971	Group 1	Southern Margin Rumker
EL7508	Centennial Fassifern Pty Ltd	2010 – 2013	Group 8	Southern Margin Rumker
PEL4	AGL Upstream Investments Pty Limited	1993 – 2015	Petroleum	Eastern Rumker
PEL468	Leichhardt Resources Pty Ltd	2008 – 2018	Petroleum	Eastern Rumker
EL1943	CRA Exploration Pty Limited	1982 - 1984	Group 6	Southern Margin Rumker
EL1516	Australian Anglo American Group	1980 - 1983	Group 1	Western Margin Hawkins
EL722	Le Nickel (Australia) Pty Limited	1974 – 1977	Group 1	Western Margin Hawkins
EL1712	Broken Hill Proprietary Company Limited	1981 – 1982	Group 6	Northern Hawkins
EL2609	Ulan Coal Mines Limited	1986	Group 6	Northern Hawkins
MC186	Hickson, Bruce Charles, Hickson, Camille Heather	1996 – 2001	Group 2	Southern Margin Rumker
EL5284	Silver Standard Australia Pty Limited	1997 – 2002	Group 1, Group 10	Western Margin Rumker
EL4777	GSM Exploration Pty Limited	1995 - 1997	Group 1	Western Margin Rumker
EL2917	Alkane Exploration NL	1987 – 1988	Group 1	Western Margin Hawkins and Western Margin Rumker

Title Reference	Tenement Holder	Approximate Year of Operation	Groups	Area
EL1680	Broken Hill Proprietary Company Limited	1981 – 1982	Group 1	Southern Margin Rumker

Source: NSW Minview (<https://minview.geoscience.nsw.gov.au/#/?lon=148.5&lat=-32.50000&z=7&l=>).

Appendix B – Groundwater Review by Mr George Gates PSM

**HAWKINS – RUMKER GROUNDWATER REVIEW
FOR
PRELIMINARY REGIONAL ISSUES ASSESSMENT**

**Professional Opinion prepared by George Gates PSM
Senior Hydrogeologist**

October 2021

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SUMMARY

This report is part of a Preliminary Regional Issues Assessment (PRIA) prepared for the Advisory Body for Strategic Release.

The Hawkins and Rumker potential release areas are located on Triassic and Permian rocks (including: sandstones, conglomerate, siltstones, claystones, shales and coal seams). These rocks contain minor aquifers that have been classified by the NSW Government as 'less productive' because of their low bore yields and often brackish water quality. Nevertheless, useful supplies of stock water and, to a lesser extent, domestic water can be obtained from bores in these strata, generally within 60 meters (m) from ground surface. During times of drought this source of water is highly valued as it is largely unaffected by climate variation due to a large storage volume to recharge ratio.

The Hawkins – Rumker areas occur on a plateau that straddles the Great Dividing Range. A water shed runs through the spine of the plateau with some water flowing east into the Hunter Valley and some flowing west into the Cudgegong River, part of the Murray Darling Basin. Groundwater flow is inferred to be in the same direction as surface water flow, with recharge occurring in the hills and discharge along the valley floors.

The Growee River alluvium is a 'highly productive' aquifer that occurs within the north eastern boundary of the Hawkins – Rumker areas. This aquifer consists of sand, gravel and clays approximately 2 to 10 m thick and can yield 6 litres per second (L/s) to a well or bore at selected locations. The alluvium is highly connected to surface flows and the water level falls significantly during droughts. Because of the high connection both surface water and groundwater are managed under the same rules in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

The potential release areas are located within or in proximity to several water sharing plan areas that contain the rules for water management in this vicinity. The NSW Department of Planning, Industry and Environment – Water (DPIE-Water) has identified the availability of water for a future mine as a potential issue. The information in **Table 2 (Section 4.3)** indicates that water licences should be available to a future mine on the PRIA areas, if a mining venture was approved by government. Water entitlements could be sourced through a combination of controlled allocation orders and water trading (**Section 4.3**). Both avenues for obtaining water would need to be investigated in more detail by any prospective miner.

A possible constraint to a purchaser of water in the Bylong River Water Source is that the water sharing plan has provisions to manage surface water extractions by visible flow conditions that includes cease to pump rules. The plan also has provisions to manage groundwater extractions based on groundwater trigger levels but these have not yet been established. Mines are generally exempt from cease to pump orders when it relates to indirect take (DPIE-Water, 2021).

Regional groundwater dependent ecosystem studies show that swamps and springs exists both within and adjacent to the Hawkins – Rumker areas and could potentially be impacted by mining activities.

Figure 7 in **Section 4.6** shows the sites which have their species composition and natural ecological processes determined to some extent by the availability of groundwater. Should a mine be proposed then a detailed ecological study would need to be carried out to check the accuracy and efficacy of the regional work.

It is generally accepted that coal mines that take groundwater as part of their mining process will cause some level of impact on water assets. All groundwater removed by a mine will initially come from storage and for a period will exceed the local recharge volume. Hence the decline in aquifer pressures and the water table that can be experienced locally. This is a common response for coal mines taking groundwater.

The extent of depressurisation can be several kilometers beyond the mine footprint. For example, pressure declines in the Ulan coal seam at the Ulan Coal Mine are recorded up to 10 km from the mine, while at the Wilpingjong Coal Mine predictions are for pressure declines of 2 km or more in the Ulan coal seam.

It should be noted that the pressure decline is greatest in the coal seam being mined and reduces both away from the mine area and also vertically in the overlying/underlying aquifers. Importantly, the impact on shallow aquifers, such as nearby alluvial sources, may be small and can be predicted by a groundwater flow model. The changes to groundwater pressures and flow can persist, for many decades after mining ceases, until groundwater pressures/levels recover to a new equilibrium level.

If longwall mining is proposed, then there is the added potential to induce vertical leakage from overlying surface water sources through increased fracturing that occurs above the goaf.

Mining causes changes in the hydraulic conditions of the host rock, such as increases in permeability and storage characteristics of the goaf area and fracturing above the goaf in longwall mining. These may include permanent changes (albeit mostly small) in groundwater flow in the vicinity of the mine. For example:

- Rainfall recharge may be made easier through surface cracking as a result of longwall mining.

- If land subsidence occurs then local surface runoff may be altered and can cause erosional features in the landscape.
- Perched aquifers may be drained and the height of the water table may be altered, either lowered or raised slightly.
- New water bores constructed post mining into goaf areas may have greater yields than other nearby bores.

All of the above would need to be examined in detail before any mining was considered for approval.

To estimate the size and extent of groundwater impacts a mine can have on nearby water assets, a numerical groundwater flow model will be required. The modelling should include an uncertainty analysis so that the approving authority and technical experts can have a level of confidence in the results.

The model can be used to estimate:

- the extent, both laterally and vertically, of groundwater level decline that a mine will cause on water assets;
- mine inflow volumes;
- where the water will come from so that the appropriate water licences and volumes can be sought;
- recovery time for water levels (both pressure and water table) after mining ceases; and
- cumulative impacts on water assets by nearby mines.

Water inflows into a mine at this location are likely to be brackish so any future development of the coal resource would need to consider the water quality impacts on local streams and the Goulburn and Cudgegong Rivers if any off-site discharge is proposed.

The distance between the Hawkins – Rumker areas and the other operating mines to the north is greater than 20 km. Based on the output from the *Northern Sydney Basin Bioregional Assessment - Hunter Subregion* (Australian Government, 2015), there will be no measurable overlapping impact with these existing mining operations. This will of course have to be demonstrated through model predictions.

Provided third-party impacts on the environment and other water users are acceptable and can be adequately addressed via appropriate levels of management, including: obtaining relevant water licences, environmental monitoring, review of system performance and make good provisions. Then the NSW Government commitment to manage groundwater systems within long term sustainable levels can be achieved at a groundwater source scale, whilst allowing pockets of water extraction in excess of local recharge.

The principal constraint on the make good approach is the unwillingness of some landholders to participate in the process. Even to the extent of denying access to private property. Other constraints include getting landholder acceptance on the predicted impact to a bore. In some cases, agreement cannot be reached on the monetary value of the impact or an alternative water supply option. All of the above make negotiations on make good approaches difficult to conclude.

The drilling and other activities associated with coal exploration will have a much smaller environmental footprint than a full-scale underground mining operation. A review of environmental factors (REF) is required before an exploration licence can be issued.

1. INTRODUCTION

This report is part of a Preliminary Regional Issues Assessment (PRIA) prepared for the Advisory Body for Strategic Release. This body provides advice to the Minister for Regional NSW on the allocation of new coal and petroleum exploration licenses.

The focus of this report is to review relevant groundwater information from material supplied by State and Commonwealth agencies together with published information, that would help define:

- the hydrogeology of the Hawkins and Rumker potential release areas;
- the groundwater flow system at the potential release areas, including possible hydraulic connections to nearby water assets such as highly productive groundwater sources, stream flows and connected ecosystems; and
- the possible changes that may occur within the groundwater system should coal exploration or mining activities occur within the Hawkins and Rumker areas in the future.

The Hawkins and Rumker areas are located next to each other on Authorisation 286 in the Western Coalfield of the Sydney–Gunnedah Basin, approximately 240 kilometres (km) north west from Sydney and 6 to 20 km north of the village of Rylstone (see **Figure 1**).

This groundwater assessment is based on information available from:

- *Hawkins – Rumker Inventory Resource Report* (Geological Survey of NSW, 2017);
- the WaterNSW groundwater data base;
- DPIE-Water;
- nearby mining company groundwater reports; and
- data supplied from various Western Coalfield exploration programs.



- KEY**
- Potential Release Area
 - National Parks and Wildlife Estate
 - State Forest
 - Railway (non-operational)
 - Major River
 - Major Creek
 - X Mining Operation
 - Exploration Bore with Pressure Data
 - Exploration Bore with Yield Data

Figure 1 Location of Proposed Release Areas

2. GEOLOGICAL SETTING

There are five coalfields in the Sydney-Gunnedah Geological Basin. The Western Coalfield is reported to produce high-energy thermal coal from the Permian Illawarra Coal Measures. **Figure 2** shows the location of the Western Coalfield within the Sydney-Gunnedah Basin.

Six coal mining complexes are in operation in the general area. Three mines (Moolarben, Wilpinjong and Ulan) are situated approximately 35 km north of the Hawkins – Rumker areas and three operations (Clarence, Springvale and Angus Place) are located approximately 75 km to the south. These mines target the Katoomba, Lithgow and Ulan seams (Geological Survey of NSW, 2017).

At the Hawkins – Rumker potential release areas, the Lidsdale coal seam is the equivalent of the Ulan seam. Its economic potential is restricted to the upper and lower parts of the Lidsdale coal seam known respectively as the UDWS seam and the UG seam. Both of these seams are said to be of sufficient size and quality to support economic extraction, subject to further detailed geological assessment and environmental studies (Geological Survey of NSW, 2017).

2.1. Local Geology

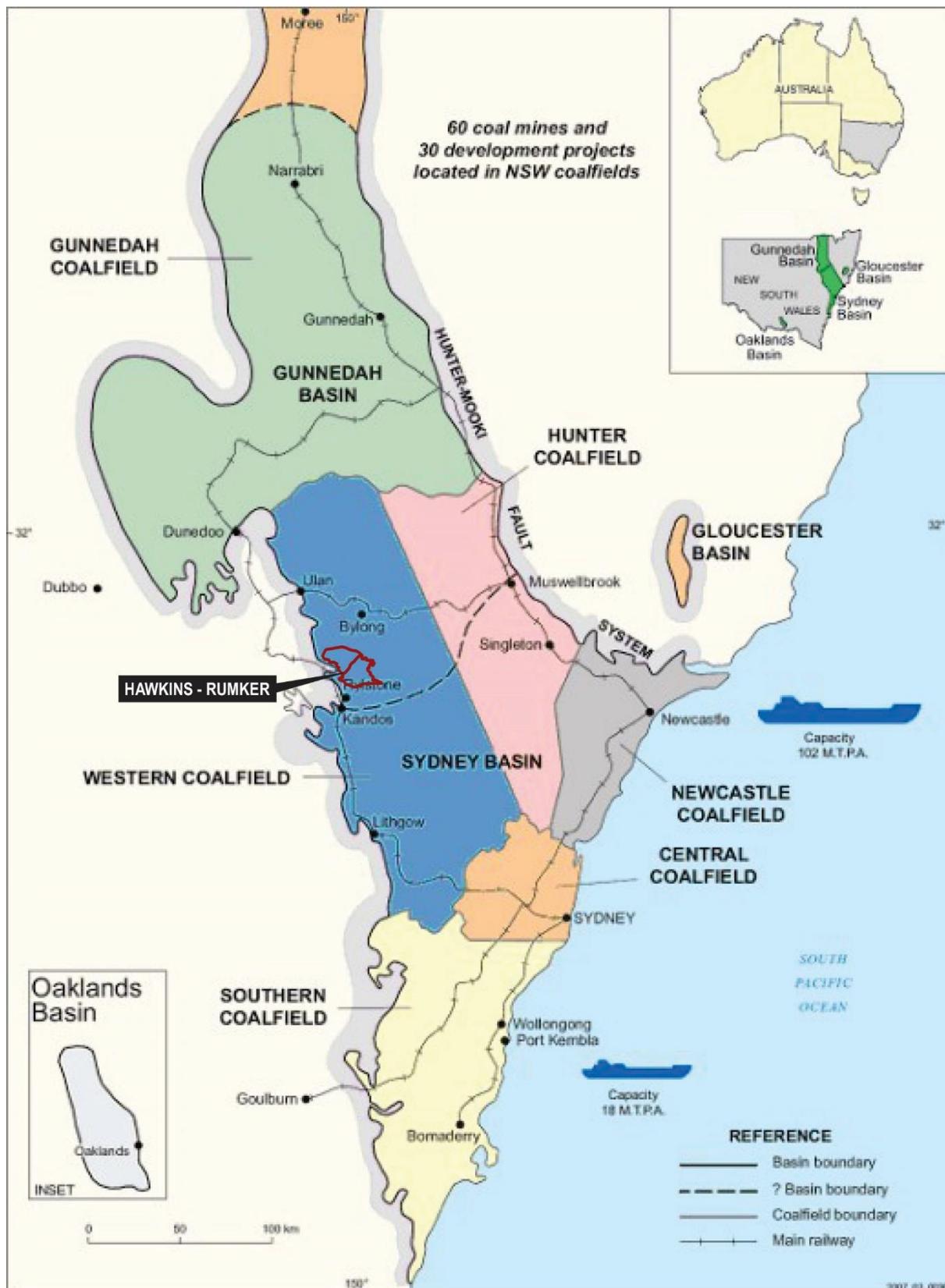
Figure 3 shows the surface geology of the potential release areas.

The elevated southeast – northwest spine of the project areas is located on plateau terrain which comprises weathered sandstones and conglomerates of the Triassic Narrabeen Group. These resistant Narrabeen Group rocks form cliffs in the northern part of the study area.

The softer more erodible Late Permian Illawarra Coal Measures unconformably underlies the Narrabeen Group strata and occurs on the hill slopes below the plateau terrain. It in turn overlies the Lower Permian Shoalhaven Group which outcrops on the lower slopes and gullies in the west, south and northeast, and is the geological limit of the Sydney Basin in the area.

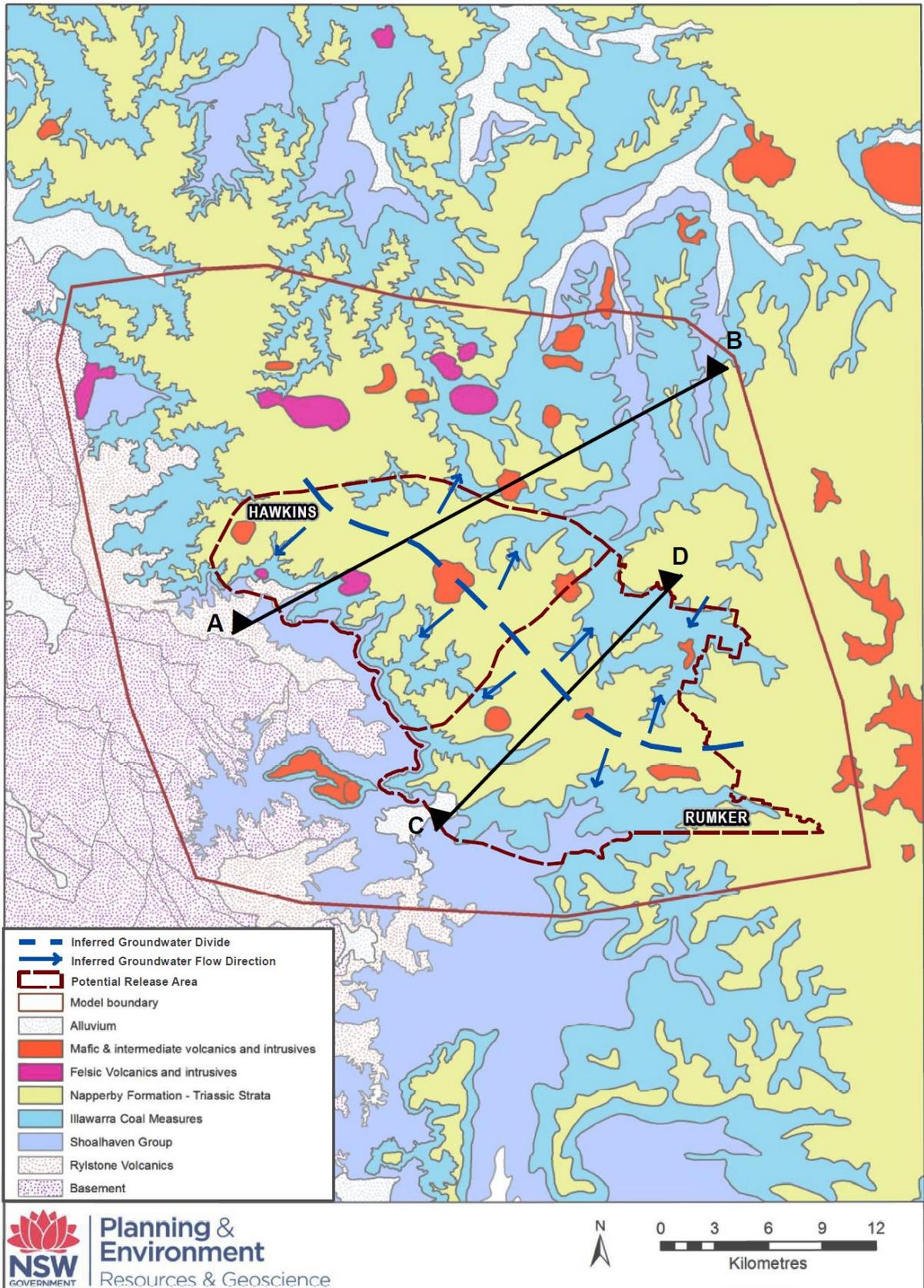
The Shoalhaven Group unconformably overlies the early Permian Rylstone Volcanics and the older Carboniferous basement in the western part of the study area.

There are several subgroups in the Illawarra Coal Measures all of which contain coal seams interspersed with shales, claystones and occasional conglomerate and sandstone layers. The potentially economic Lidsdale coal seam is located in the Cullen Bullen Subgroup (see **Table 1** for details).



Source: NSW Resources and Geoscience

Figure 2 Location of Western Coalfield

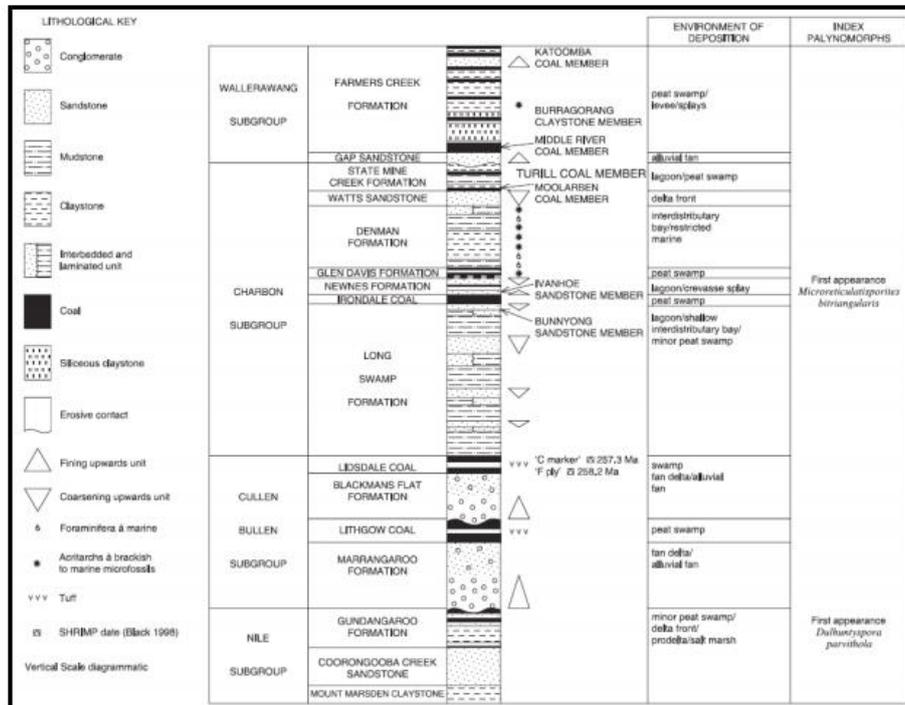


Modified after Geological Survey of NSW, 2017

Figure 3 Surface geology with Inferred Groundwater Flow

Table 1
Western Coalfield Stratigraphy
 Reproduced from Geological Survey of NSW, 2017

Period		Western Coalfield			
		Southern Part		Northern Part	
		Group	Subgroup	Formation	Formation
Tertiary				Basalt	Basalt
Jurassic					Pilliga Sandstone Purlawaugh Formation
Triassic		Wiannamatta Group		Ashfield Shale	Napperby Formation
		Hawkesbury Sandstone			
		Narrabeen Group	Grose Subgroup	Burralow Formation	Digby Formation
				Banks Wall Sandstone	
				Mt York Claystone	
Burra-Moko Head Sandstone					
		Caley Formation			
Permian	Late	Illawarra Coal Measures	Wallerawang Subgroup	<i>See below</i>	
			Charbon Subgroup		
Cullen Bullen Subgroup					
Nile Subgroup					
Early		Shoalhaven Group		Berry Siltstone Snapper Point Formation	Shoalhaven Group Undifferentiated



The Lidsdale seam subcrops in the western area while the depth of cover averages 200 m and increases to more than 400 m under the more elevated parts of the plateau. The upper coal section (UDWS) averages 2.4 m in thickness and the lower section (UG) averages 2.0 m.

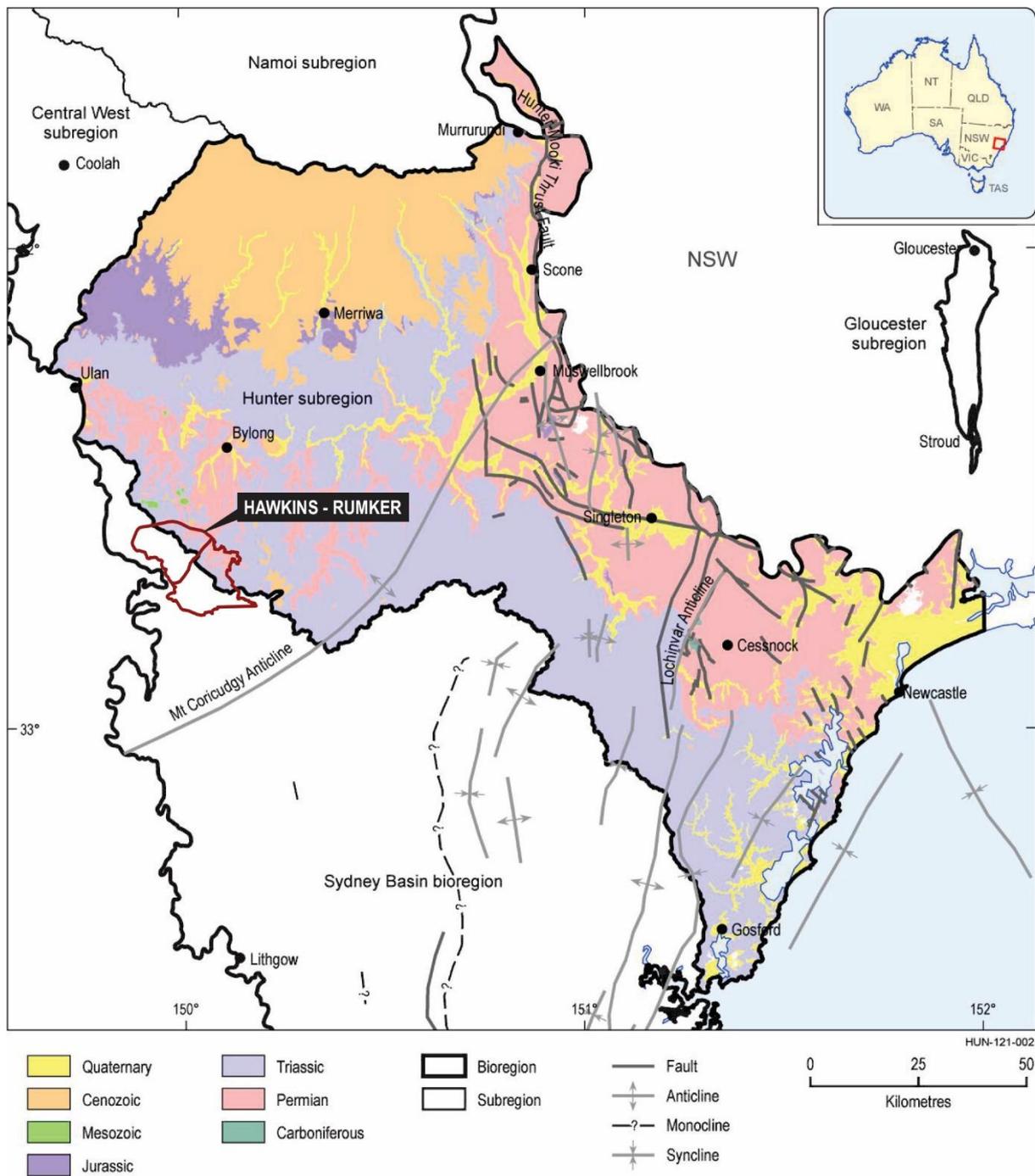
Significant igneous activity has occurred in the area. The Early Permian Rylstone Volcanics occur west of the Hawkins – Rumker plateau. This unit is interpreted as a rhyolite emplaced as either a lava flow or high-level sill (Geological Survey of NSW, 2017). Several coal exploration bores were terminated within the Rylstone Volcanics.

More recent igneous activity occurred during the Jurassic and Tertiary Periods. Figure 3 shows the location of igneous features such as phonolitic plugs, sills, dykes, diatremes and basaltic plugs, caps and flows. The majority of intersected intrusions within boreholes in the study area have been encountered above the Lidsdale seam, with most encountered within the Glen Davis Formation (Geological Survey of NSW, 2017).

Some thin alluvial/colluvial sediments occur along the Growee River, which drains north out of the potential release areas. These unconsolidated sediments consist of sands, gravel, silt and clay. Some thin alluvium is also associated with western draining creeks, including Lawson Creek and Breakfast Creek.

2.2. Structural Setting

It is reported that structurally, the Permian strata are gently dipping to the northeast (1 – 2 degrees) with limited faulting observed. Figure 4 below, reproduced from the *Northern Sydney Basin Bioregional Assessment – Hunter Subregion* (Australian Government, 2015), shows a generally benign and consistent structure in the vicinity of the study area. The study area occupies the southern portion of the Wollar Shelf. This shelf environment was a relatively stable depositional setting for peat and clastic sediment accumulation.



Source: Australian Government 2015

Figure 4 Hunter Subregion Surface Geology, including Geological Structures

3. HYDROGEOLOGY

3.1. Porous Rocks

Triassic

The Triassic Narrabeen Group strata occurs on the southeast - northwest spine of the Hawkins – Rumker potential release areas. These rocks are in excess of 100 m thick and consists of a near horizontal sedimentary sequence of porous and sometimes fractured sandstones, conglomerate, siltstone and claystone.

The sandstones are often minor aquifers and the claystones may act as aquitards. Bores drilled in such strata generally yield 0.2 to 1.0 L/s, with the better supplies often encountered in fractures and joints in the country rock. Aquifers are reported as confined to semi-confined, resulting in the standing water level in a bore being many metres in elevation above the aquifer level.

Groundwater within the Triassic strata is derived from recharge by rainfall infiltration through the shallow weathered rock zone in topographically higher areas. Groundwater quality is reported to be generally low in salinity and suitable for most stock and domestic purposes (Total Salinity < 1000 mg/L). The salinity of groundwater in the Triassic rocks is very low in recharge areas but may increase slightly along its flow path in a down gradient direction.

Springs are reported to occur in this landscape, but few details are known. The weathered profile or regolith can be tens of metres thick and feed water into local springs. However, most are depleted during extended dry periods.

Aquifers within these rocks are classified by the NSW Department of Planning, Infrastructure and Environment – Water (DPIE – Water) as ‘less productive’ as defined in the NSW Aquifer Interference Policy (Department of Primary Industries [DPI], 2012).

Permian

As noted above (see **Section 2.1**), the Permian Illawarra Coal Measures host several coal-bearing subgroups. These subgroups are commonly fine-grained shales, siltstone, mudstone and sandstone. They have low primary porosity and permeability. Most groundwater flow in these units occurs preferentially along zones of enhanced secondary porosity, such as minor faults and fracture networks.

The better aquifers are often the coal seams due to their extensive cleat system. Bore yields in the range 0.2 to 1.5 L/s are possible from the coal seams. Springs are also known to occur in this environment.

It is generally accepted that the Permian interburden and overburden are hydrogeologically “tight” and hence low yielding to a bore. The coal seams may have moderate permeability so are often the prime water bearing aquifers. The aquifers are confined to semi-confined.

The Permian strata in the Western Coalfield is known to contain brackish to saline groundwater because of the marine to near marine mode of origin of the rocks, through which groundwater passes.

Exploration drilling results for the potential release areas show groundwater salinities in the range of 190 to 4,740 microsiemens/cm ($\mu\text{S}/\text{cm}$) and pH in the range of 6.7 to 9.5. It is unclear from the drilling results which aquifers have been tested or whether the sample was from an open bore hole. It is likely the results represent a mixed water sample.

The higher salinity of groundwater in the Permian rocks is well known and is typically in the range 4,000 to 12,000 $\mu\text{S}/\text{cm}$ (Australian Government, 2015). Groundwater from Permian strata in the Hunter region often contains heavy metals in excess of the ANZECC (2000) Guidelines for Fresh and Marine Water Quality.

Aquifers within these rocks are classified by DPIE – Water as ‘less productive’ as defined in the NSW Aquifer Interference Policy (DPI, 2012).

3.2. Fractured Rocks

Permian Volcanics

The Permian Rylstone volcanics (rhyolite) which occur in the west of the potential release areas should yield small supplies of groundwater from fractures to a bore at targeted sites. Few details are available on water quality but given the acidic nature of the rocks it is likely to be suitable for stock and domestic purposes at most locations.

These rocks have the characteristics of ‘less productive’ aquifers as defined in the NSW Aquifer Interference Policy (DPI, 2012).

Jurassic and Tertiary Volcanics

The igneous activity that occurred during the Jurassic and Tertiary Periods produced such features as phonolitic plugs, sills, dykes, diatremes and basaltic plugs, caps and flows.

It is likely that small quantities of groundwater can be obtained from fractures in these rocks at targeted sites. Also, the contact zone with the country rock may transmit water as some deformation may have occurred which will enhance the movement of groundwater. Springs may be a feature at some of these sites.

Mafic rocks such as the ones cited above generally contain ‘hard’ water that contains elevated calcium and magnesium ions and is hard to lather with soap. Its use in domestic households would be limited but it is generally suitable for stock.

These rocks have the characteristics of ‘less productive’ aquifers as defined in the NSW Aquifer Interference Policy (DPI, 2012).

3.3. Alluvium

As described in **Section 2.1**, the northern part of the potential release areas includes unconsolidated alluvial sediments (sand, gravel and clay) along the Growee River and its tributaries.

These sediments are mapped as Quaternary in age and may be in the order of 2 to 10 m thick in places, however further drilling is required to confirm this. Wells constructed in this alluvium yield small irrigation supplies of water, up to 6 L/s.

Alluvial aquifers are highly connected to stream flow in this area, with water exchange occurring between the stream and the alluvial aquifer. The major recharge source for the alluvial aquifer is considered to be river leakage, although both diffuse recharge from rainfall on the river flats and upward leakage from underlying rocks may also contribute water (Australian Government, 2015). The alluvial aquifers are unconfined and the water table may vary several metres in response to climatic variations.

The water quality in the alluvium is generally low in salinity (less than 1000 mg/L). Salinity levels however may vary from location to location depending on recharge contributions from river leakage and the country rock.

The alluvial aquifers along the Growee River have been classified by DPIE – Water as ‘highly productive’ as defined in the NSW Aquifer Interference Policy (DPI, 2012) and so require a higher level of protection than less productive aquifers.

To the south of the study site there are minor alluvial sediments along parts of Lawsons Creek and Breakfast Creek. These will need to be investigated in more detail to determine their value as a water source.

3.4. Groundwater Flow and Storage

The Hawkins – Rumker potential release areas straddle the Great Dividing Range. Surface drainage on the eastern part of the plateau flows eastwards into the Hunter River catchment. Whilst on the western part of the plateau, surface waters flow to the west into tributaries of the Cudgegong River, which is part of the Murray Darling Basin.

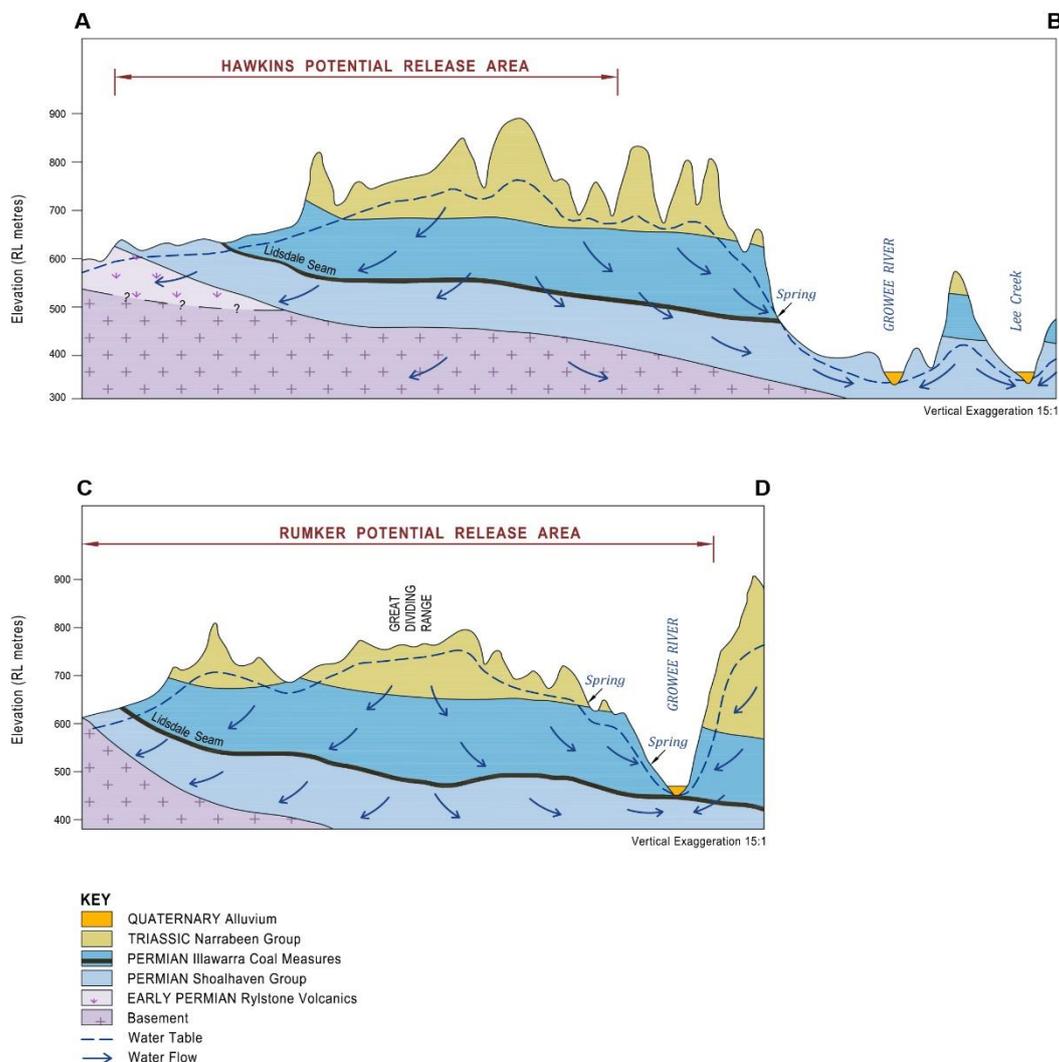
No detailed groundwater studies have been carried out in the potential release areas to date. However, some water bore data is available on the public record from privately-owned bores in the general area. This, together with records from coal exploration drilling, provides useful background information to make assumptions about local groundwater flow and storage.

It is assumed in this report that groundwater flows in the same direction as surface water and that there is a groundwater divide located under the plateau that is the central spine of the proposed release areas. Whilst there is a lack of hydrogeological data to confirm this interpretation it is accepted convention to have groundwater flow in the same direction as surface water, in most instances.

The exact position of the groundwater divide is unknown. **Figure 3** shows inferred groundwater flow directions, which will need to be confirmed or otherwise by detailed groundwater studies.

Figure 5 provides a simplistic groundwater flow system in cross-section. This is useful as it depicts flow driven by gravity from elevated areas to areas lower in the landscape. Eventually discharge will occur in the lower parts of the catchment such as into alluvial sediments, streams and ecosystems such as swamps or springs.

In reality, groundwater flow is more complicated than shown on **Figure 5** as both porous flow and fracture flow will occur. Water will move through the rock by seeking pathways of least resistance. Low permeability strata such as shales and mudstone will act as aquitards and slow up groundwater movement. Fracture zones and rocks with good primary porosity will act as aquifers and transmit water more readily.



Modified from Geological Survey of NSW, 2017

Figure 5 Generalised Cross Sections A-B and C-D with Inferred Groundwater Flow

Should potential future coal mining of the Hawkins – Rumker areas be pursued, a numerical groundwater flow model would be required to support preparation of an Environmental Impact Statement (EIS). In a numerical groundwater model, the simplified groundwater system described above would be subdivided into separate hydrostratigraphic layers to capture the nuances of groundwater flow between and across aquitards.

A literature review of groundwater studies, prepared for the nearby Willpingjong Coal Mine, showed previous estimates of groundwater recharge to be 0 to 5% of average rainfall for hard-rock and 6 to 20% for alluvium (Hydro Simulations, 2015). The Hydro Simulations report suggests that whilst this is a useful starting point, analysis of local field data shows that rainfall recharge for both sedimentary rocks and alluvium is much lower, and in the range 1 to 2% for Permian rock and 2 to 4% for alluvium.

Some limited water pressure data has been collected for the site. It shows vertical movement of water from higher elevations to lower levels at most sites. Some data is corrupted and is of no value. This confirms the importance of collecting site-specific rainfall, streamflow and groundwater data that can be used in groundwater modelling for an EIS.

Groundwater in the Triassic and Permian strata have a significant storage volume due to the overall thickness and extent of these rocks. Hence water supplies from bores in these rocks are not greatly affected by periodic droughts. This is not the case for the shallow alluvial sediments, which have a much smaller storage to recharge ratio. Here the security of water supplies from wells and bores is much lower.

DPIE-Water (2016) have classified the northern flowing tributaries to the Goulburn River, such as the Growee River, as a highly-connected surface and groundwater system which is managed together as a single unit. In effect, extracting from groundwater can significantly affect surface water flows and vice-versa.

4. WATER MANAGEMENT AND ACCESS RIGHTS

4.1. Water Management Act 2000

The NSW *Water Management Act 2000* establishes the framework for sharing water and provides priorities for how water is shared and allocated.

The *Act* recognises the need to allocate and provide water to maintain the environmental health of rivers and groundwater systems, while also providing licence holders with more secure access to water and greater opportunities to trade water through the separation of water licences from land. The main tool in the *Act* for managing the state's water resources are water sharing plans.

4.2. Water Sharing Plans

Water sharing plans are the legal instruments for managing water resources in NSW. The rules for sharing water between the environment and different licence categories over a 10-year period are set out in the plans.

Mines that take water as part of their operating procedures are required to hold a water access licence for the water that they take. Water entitlements can be obtained either through trading with existing entitlement holders or via a controlled allocation process where the Minister for Water releases water via an auction process. This only occurs for groundwater sources where unassigned water is available, and to date it has been done on an irregular basis.

Figure 6 shows groundwater sharing plans near the Hawkins and Rumker areas. **Table 2** provides some information for the water sharing plans where water entitlement is most likely to be sought by any proposed future mining venture.

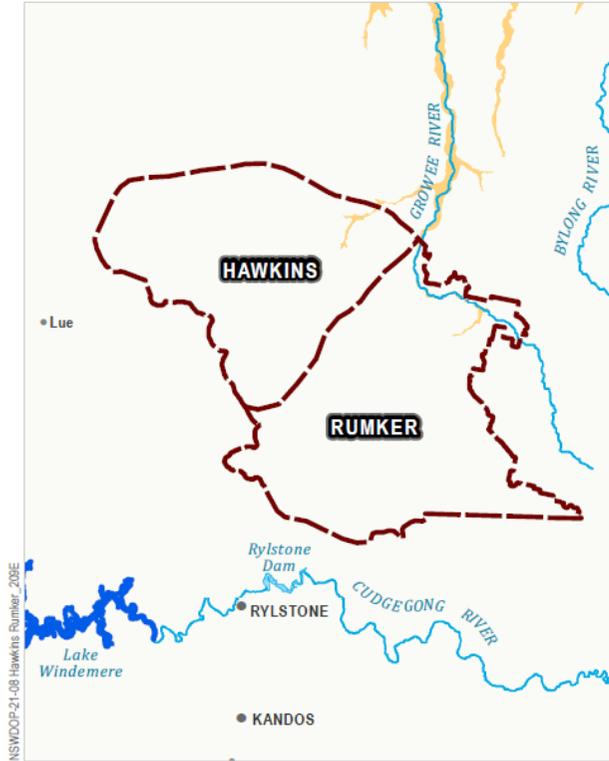
Any proponent interested in potentially developing a coal mine within the Hawkins and Rumker areas should consult with DPIE - Water on the likelihood and method of obtaining the necessary water licences and entitlement for their operation.

With the current information to hand and the distances involved, it is considered unlikely that a proposed future mine would materially affect surface flows in the Macquarie and Cudgegong Regulated Rivers or the fractured rock aquifers of the Lachlan Fold Belt groundwater sources. Groundwater modelling will be required to confirm or otherwise this statement.

4.3. Water Trading

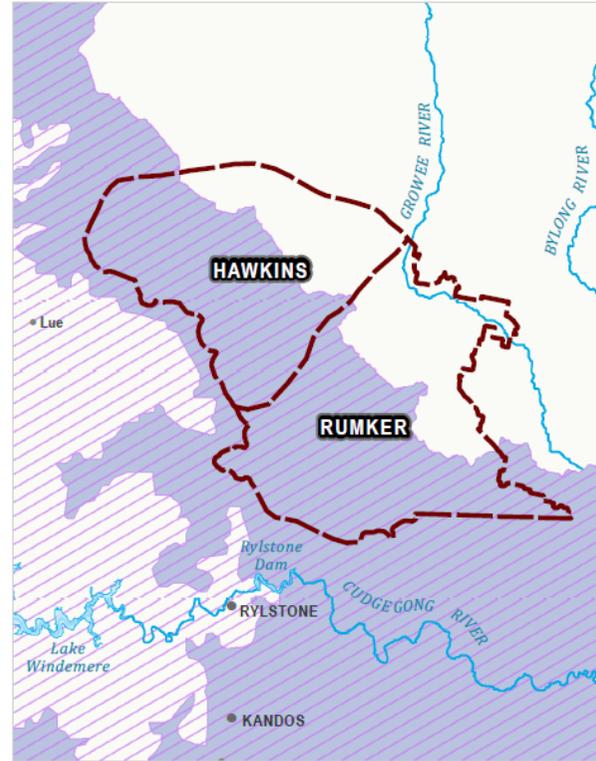
Water access licences can be traded within a groundwater source. Both licence shares (permanent trades) and water allocations (temporary trades) can be bought and sold. Trades are referred to as 'dealings' in the NSW *Water Management Act 2000*.

Groundwater trades have to be assessed for third-party impacts. Trades will not be approved if impacts are too great. WaterNSW is responsible for managing the trade of water access licences, licence entitlements and water allocations. DPIE-Water undertakes the assessment of trade impacts.



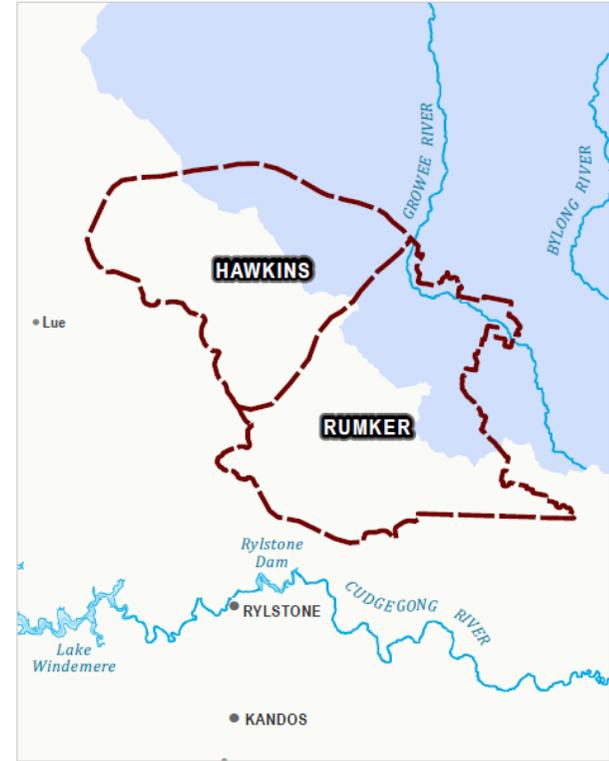
KEY

- Potential Release Area
- Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016**
- Macquarie and Cudgegong Regulated Rivers Water Source
- Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009**
- Unnamed Upriver Alluvium in WSP in the Bylong River Water Source



KEY

- Potential Release Area
- Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020**
- Lachlan Fold Belt MDB Groundwater Source
- Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020**
- Sydney Basin MDB Groundwater Source



KEY

- Potential Release Area
- Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016**
- Sydney Basin-North Coast Groundwater Source

Source: DPIE (2021); WSP Geodatabase (2020); NSW Spatial Services (2021)

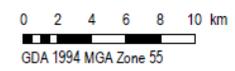


Figure 6 Water Sharing Plan Boundaries

Table 2
Water Sharing Plan Information

Water Sharing Plan	Extraction Limit ML/yr	Comments
<p>NSW Murray Darling Basin Porous Rock Groundwater Source 2020</p> <ul style="list-style-type: none"> Sydney Basin MDB Groundwater Source 	<p align="center">19,100</p>	<p>Granting of additional access licences is possible as there is unassigned water.</p> <ul style="list-style-type: none"> 346 unit shares offered for sale in 2020 <p>Groundwater = 10,474 unit shares Water usage not available. Carryover 0.25 ML/yr of share component. Max. extraction 1.25 ML/yr of share component. Trading permitted subject to assessment.</p>
<p>North Coast Fractured Rock and Porous Rock Groundwater Sources 2016</p> <ul style="list-style-type: none"> Sydney Basin – North Coast Groundwater source 	<p align="center">90,000</p>	<p>Fully allocated Groundwater = 67,632 unit shares Water usage = 8,338 ML in 2020/21 Carryover 100% of share component. Max usage 200% of share component. Trading permitted subject to assessment.</p> <ul style="list-style-type: none"> 1,400 unit shares were traded in 2020/21
<p>Hunter Unregulated and Alluvial Water Sources 2009</p> <ul style="list-style-type: none"> Bylong River Water Source 	<p align="center">No numerical value set</p>	<p>Fully allocated Groundwater shares = 7,719 unit shares Unregulated river shares = 89 unit shares Water usage not available. Groundwater managed to the rules for surface water as it is a highly connected surface/groundwater system. Cease to pump levels exist for surface water but are not yet established for groundwater licences. Trading permitted subject to assessment. Granting of new licences restricted.</p>

The information in Table 2 indicates that water licences should be available to a future mine within the Hawkins and Rumker areas, if a mining venture was approved by government. Water entitlements could be sourced through a combination of controlled allocation orders and water trading. Both avenues for obtaining water need to be investigated in detail, however the following information may be of assistance:

- Under a controlled allocation order, 346 unit shares were offered in the Sydney Basin MDB Groundwater Source in May 2020.
- There are 9 water supply bores and 32 basic landholder rights bores inside the PRIA areas. Currently, tradeable groundwater shares within this area include; zero units for the Sydney Basin North Coast Groundwater Source, 145 units for the Sydney Basin MDB Groundwater Source and 105 units for the Bylong River Water Source.
- Considerably more tradeable water shares are held outside of the PRIA areas and within the relevant water sharing plan areas. One example is Kepco Bylong Coal, which was refused approval to mine in September 2019 by the Independent Planning Commission. They hold water shares including 11 water access licences (WALS) with a total of 3,045 share units in the Bylong River Water Source and two WALS with a total of 411 share units in the Sydney Basin North Coast Groundwater Source (DPIE-Water, 2021).

A possible constraint to a purchaser of water in Bylong River Water Source is that the water sharing plan has provisions to manage surface water extractions by visible flow conditions that includes cease to pump rules. The plan also has provisions to manage groundwater extractions based on groundwater trigger levels but these have not yet been established. Mines are generally exempt from cease to pump orders when it relates to indirect take (DPIE-Water 2021).

At a water source level, the water usage figures (albeit of poor reliability) are considerably lower than water entitlements. This underutilisation is common in less productive aquifers. Whilst this information supports the availability of water for trading there still remains the constraint of having the trades approved through the assessment process described below.

4.4. Aquifer Interference

The NSW *Water Management Act 2000* defines an aquifer interference activity as that which involves any of the following:

- penetration of an aquifer;
- interference with water in an aquifer;
- obstruction of the flow of water in an aquifer;
- taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations; and

- disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Examples of aquifer interference activities include mining, coal seam gas extraction, injection of water, and commercial, industrial, agricultural and residential activities that intercept the water table or interfere with aquifers.

The NSW Aquifer Interference Policy (DPI, 2012) states that: “All water taken by aquifer interference activities, regardless of quality, needs to be accounted for within the extraction limits defined by the water sharing plans.”

A water licence is required under the NSW *Water Management Act 2000* by a person carrying out an aquifer interference activity. The water access licence holder must have sufficient share component and water allocation to account for the take of water from the relevant water source at all times.

Proponents of aquifer interference activities, such as mining activities, are required to provide predictions of the volume of water to be taken from all water sources as a result of the activity. These predictions need to be calculated prior to granting of development consent and these volumes need to be measured and reported annually.

The NSW Aquifer Interference Policy (DPI, 2012) divides groundwater sources into ‘highly productive’ and ‘less productive’. A highly productive groundwater source is defined by the NSW Aquifer interference Policy (DPI, 2012) as a groundwater source which has been declared in Regulations and datasets, based on the following criteria:

- a) has a total dissolved solids (TDS) concentration less than 1,500 mg/L; and
- b) contains water supply works that can yield water at a rate greater than 5 L/s.

‘Highly productive’ groundwater sources are further grouped by geology into alluvial, coastal sands, porous rock, and fractured rock. ‘Less productive’ groundwater sources are those that do not meet the criteria given above.

In the Hawkins and Rumker potential release areas, groundwater in the Triassic Narrabeen Group sediments and the underlying Permian rocks are classified as ‘less productive’ aquifers while the alluvium along the Growee River is classified as ‘highly productive’. Other small pockets of alluvium along the western flowing streams such as Lawsons Creek and Breakfast Creek will need to be examined in more detail to establish their classification.

The NSW Aquifer Interference Policy (DPI, 2012) describes minimal impact considerations for aquifer interference activities based on whether the water source is ‘highly productive’ or ‘less productive’ and whether the water source is alluvial or porous / fractured rock in nature.

In most situations it is where an aquifer interference activity results in a cumulative drawdown of more than 2 m at a water supply point then the impacts are not considered to be acceptable and either more studies are required to refine and

lessen the impacts or make good provisions should apply. More details are provided in The NSW Aquifer Interference Policy (DPI, 2012).

Where a water bore is located either above or nearby to an underground coal mine and an impact greater than the NSW Aquifer Interference Policy minimal impact criteria is predicted, then make good provisions should be negotiated with affected landholders. Consultation with affected landholders may include topics such as:

- Increased pumping costs.
- Deepening a pump in an existing bore and increased pumping costs.
- Drilling a replacement bore. (For this action to apply there has to be good prospects of getting a suitable replacement supply of water at depth. This is the case both at and near the PRIA areas).
- Providing a reliable alternative water supply such as installing a pipeline to the affected property, constructing surface water dams or installing tanks to buildings.
- Providing financial compensation.

Individual situations will differ and legally binding agreements should outline the exact nature of make good measures and a timeframe for implementing same. A field verification process is required to establish the conditions of a landholder's bore. A monitoring bore network is required to verify or otherwise predicted drawdowns.

4.5. Protecting Basic Landholder Rights

The NSW *Water Management Act 2000* defines basic landholder rights as consisting of domestic and stock rights, harvestable rights and native title rights. Water may be extracted under these rights without the need for a water access licence. Only a works approval is required.

Bore and wells in this category exist in the vicinity of the Hawkins and Rumker potential release areas and will need to be afforded a level of protection as outlined in the relevant water sharing plan and the NSW Aquifer Interference Policy. Information from the DPIE-Water indicates that there are 32 basic landholder right licences within the potential release areas. It is noted that there is likely to be other bores/wells that are not known to DPIE-Water.

4.6. Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which have their species composition and natural ecological processes determined to some extent by the availability of groundwater. The Water Sharing Plans used to manage groundwater in the potential release areas contain rules that have been designed to protect significant GDEs where they are known to occur.

Figure 7 shows the location of known GDEs from the Water Sharing Plans. They include swamps, springs, and endangered ecological communities of both high and medium groundwater dependency.

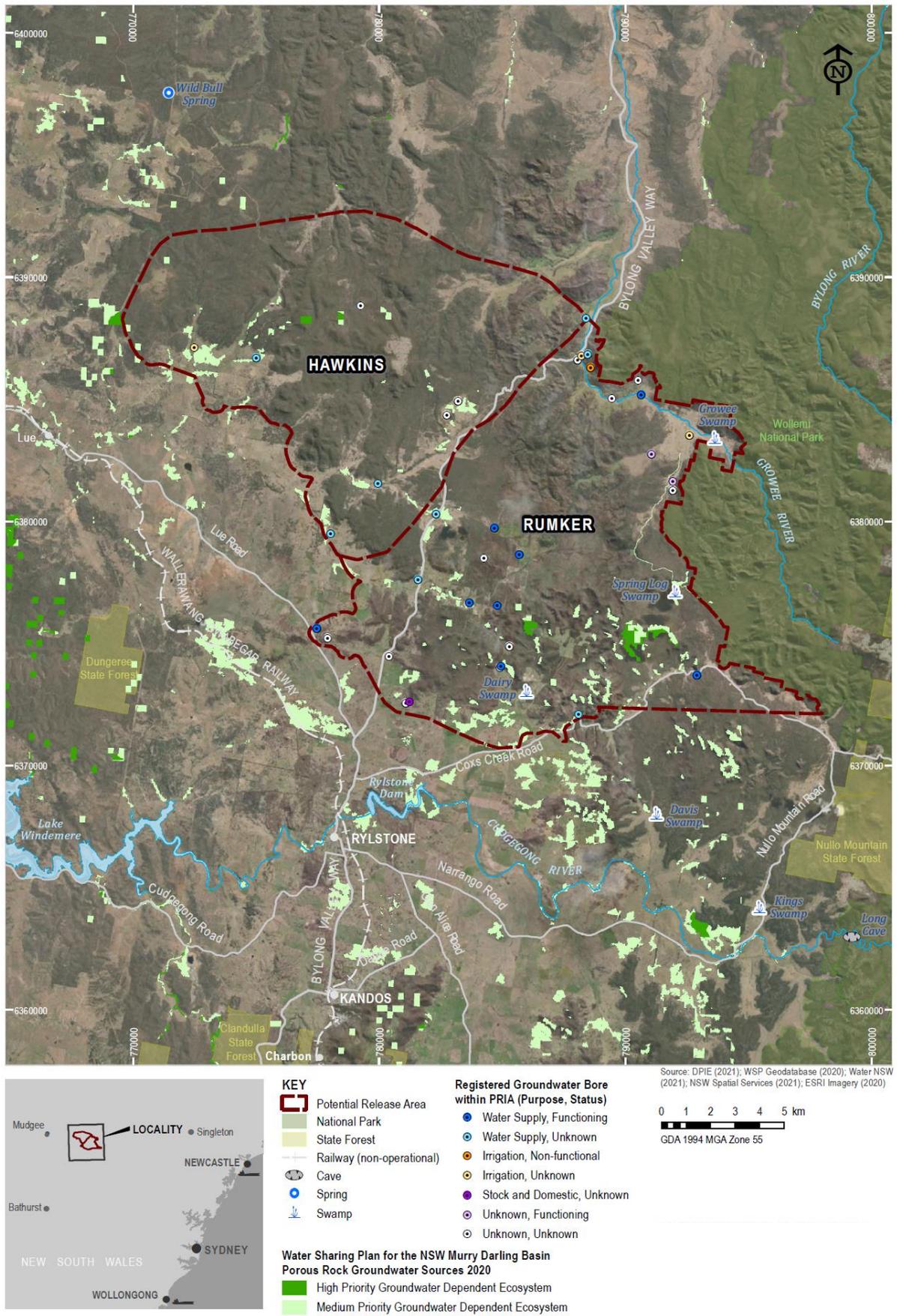


Figure 7 Potential Groundwater Dependent Ecosystems

Some information on GDEs has been derived from remote sensing data and only provides a guide to groundwater dependency. It should be checked for accuracy if or when a potential future coal mining operation is proposed. An ecology study to support an EIS would investigate the presence of GDEs and their environmental value. The NSW Aquifer Interference Policy provides guidance on acceptable water level impacts for high-priority GDEs.

It is evident from **Figure 7** that swamps and springs exist both within and adjacent to the Hawkins – Rumker areas and would be an important focus for future ecological studies to establish their groundwater dependency. More sites may be present than the ones shown above and field work will be required to establish if this is the case.

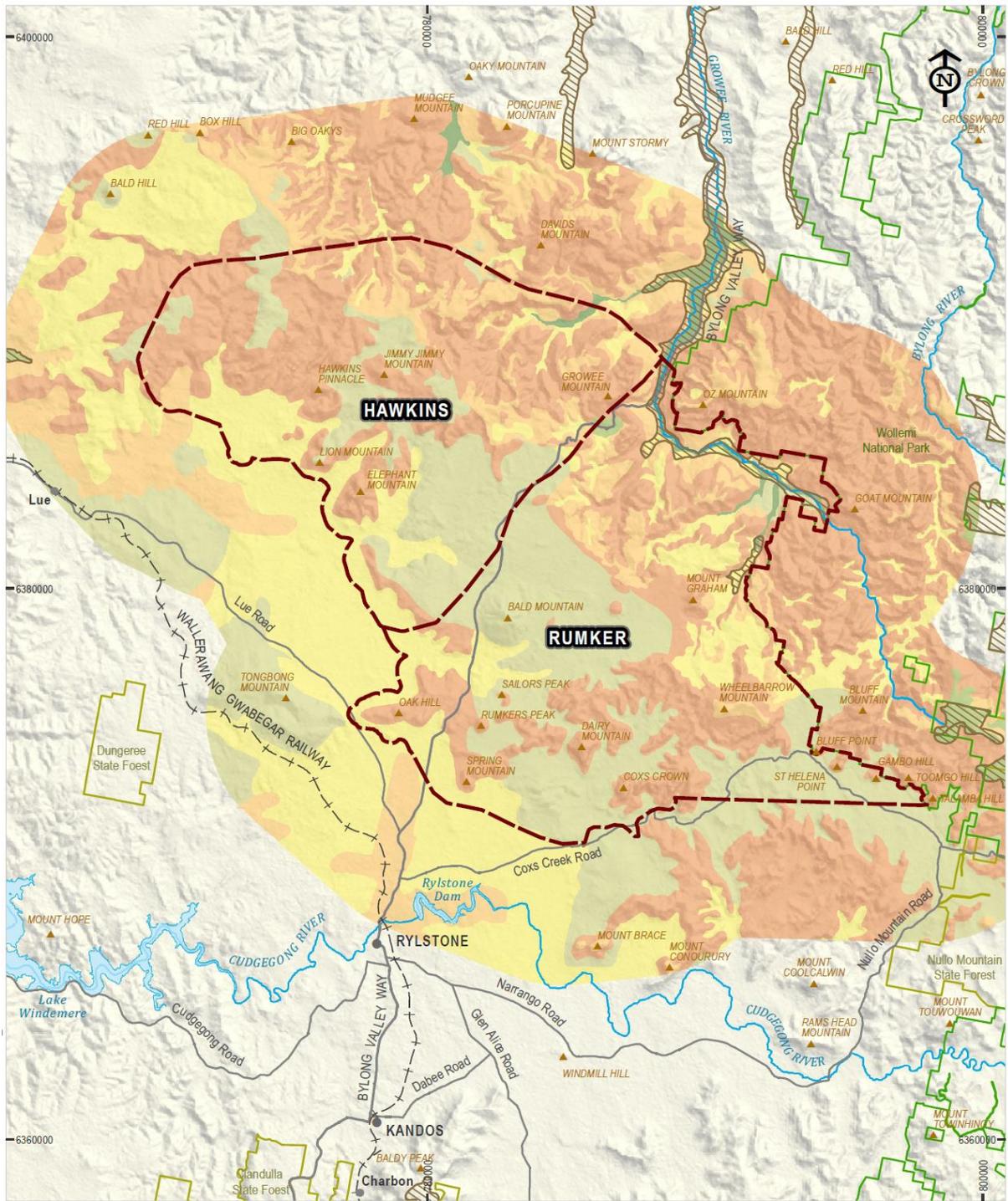
Stygofauna, that is fauna living within groundwater systems, have been identified at multiple locations in Hunter River alluvium by Ecological Australia (2013) and others, and have also been identified in alluvium associated with the Bylong River by Ecological Australia (2015). On this basis, stygofauna may also be present in upland alluvium near the Hawkins – Rumker areas.

4.7. Biophysical Strategic Agricultural Land

Biophysical Strategic Agricultural Land (BSAL) is land with high quality soil and water resources capable of sustaining high levels of productivity. BSAL has been mapped across parts of NSW as part of the Strategic Regional Land Use Policy (NSW Government, 2012). Mapping was done at a regional scale, not at a property boundary level.

Regional BSAL mapping shows the Hawker – Rumker areas as containing potential areas of BSAL along the Growee River flats (see **Figure 8**). Again because of the regional nature of the mapping, site specific studies will be needed to confirm or otherwise the presence of BSAL on the potential release areas.

If BSAL is present, then a ‘Gateway’ Assessment will be required and this will require preliminary studies (pre-EIS) into potential mining impacts on soils, agriculture and groundwater resources. If studies show that BSAL is not present then a Site Verification Certificate can be issued by DPIE, and the Gateway Assessment will not be required.



Source: NSW Spatial Services (2021)



- KEY**
- Potential Release Area
 - National Parks and Wildlife Estate
 - State Forest
 - Railway (non-operational)
 - Regionally Mapped Biophysical Strategic Agricultural Land
- Land and Soil Capability**
- Class 2 Slight but Significant Limitations
 - Class 3 Moderate Limitations
 - Class 4 Moderate to Severe Limitations
 - Class 5 Severe Limitations
 - Class 6 Very Severe Limitations
 - Class 7 Extremely Severe Limitations

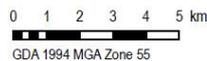


Figure 8 Biophysical Strategic Agricultural Land

5. POTENTIAL MINING IMPACTS ON WATER ASSETS

It is generally accepted that all mines that take groundwater as part of their mining operations will cause some level of impact on water assets. The NSW Aquifer Interference Policy (DPI, 2012) was developed on that basis and sets out criteria on what is an acceptable level of impact on nearby water assets.

Groundwater extraction from an underground coal mining operation will cause a local reduction in groundwater pressures within the mined coal seam and to a lesser extent the overlying/underlying aquifers. There is also potential to lower the water table. Groundwater extraction will cause a local change in groundwater flow direction, with water entering the mine from all directions.

The extent of depressurisation can be several kilometers beyond the mine footprint. For example, pressure declines in the Ulan coal seam at the Ulan Coal Mine are recorded up to 10 km from the mine, while at the Willpingjong Coal Mine predictions are for pressure declines of 2 km or more in the Ulan coal seam. It should be noted that the pressure decline is greatest in the coal seam being mined and reduces both away from the mine area and also vertically in the overlying/underlying aquifers. Importantly, the impact on shallow aquifers, such as nearby alluvial sources, may be small and can be predicted by a groundwater flow model. The changes to groundwater pressures and flow can persist, for many decades after mining ceases, until groundwater pressures/levels recover to a new equilibrium level.

Water assets such as private bores, springs, streams and GDEs located in proximity to an underground mine can be negatively impacted by extraction of groundwater. A bore census will be required to be undertaken to locate bores/wells that are not in the NSW Government database, as well as natural groundwater features.

All State Significant Developments (SSDs), including applications for proposed coal mining operations, must undergo a rigorous environmental assessment process in accordance with the NSW *Environmental Planning and Assessment Act 1979*. An EIS is required for SSD applications which must be prepared in accordance with requirements issued by DPIE and include a detailed assessment of the environmental, social and economic impacts of the proposal.

With respect to groundwater impacts a numerical groundwater flow model is generally used to estimate:

- the extent, both laterally and vertically, of groundwater level decline that a mine will cause on water assets;
- mine inflow volumes;
- where the water will come from so that the appropriate water licences and volumes can be sought;
- recovery time for water levels (both pressure and water table) after mining ceases; and
- cumulative impacts on water assets by nearby mines.

Any modelling should include an uncertainty analysis so that the approving authority and technical experts can have a level of confidence in the results.

With longwall underground coal mining there is added potential for induced vertical leakage from overlying surface water sources through fracturing that occurs above the goaf. This fracturing may or may not reach the surface and would be studied in detail as part of any approval process. Fracturing increases both the porosity and permeability of the host rock through which the groundwater is flowing.

Mining causes changes in the hydraulic conditions of the host rock, such as increases in permeability and storage characteristics of the goaf area and fracturing above the goaf in longwall mining. These may include permanent changes (albeit mostly small) in groundwater flow in the vicinity of the mine. For example:

- Rainfall recharge may be made easier through surface cracking as a result of longwall mining.
- If land subsidence occurs then local surface runoff may be altered and can cause erosional features in the landscape.
- Perched aquifers may be drained and the height of the water table may be altered, either lowered or raised slightly.
- New water bores constructed post mining into goaf areas may have greater yields than other nearby bores.

All of the above would need to be examined in detail for a potential future mining operation and make good provisions considered if predicted impacts are greater than minimal impact as defined in the NSW Aquifer Interference Policy (DPI, 2012).

Most importantly, in areas where a 'highly productive' aquifer is in proximity of a potential future mining operation, such as the alluvial sand and gravel deposits along Growee River, underground mining has the potential to cause a reduction in the natural groundwater outflow towards these alluvial sediments and their connected streams.

This can affect the resilience of the connected alluvium/stream during drought times. Gaining stream conditions may occur after wet periods and coal mining may result in the stream drying up earlier than would otherwise be the case. Stream-aquifer hydraulic connections in this area will need to be carefully examined and managed should a potential future mining operation be proposed for the Hawkins and Rumker potential release areas.

Water quality changes are also possible and must be managed to limit impacts. Any potential future development of the coal resource would need to consider the water quality impacts on local streams including the Goulburn River and Cudgegong River. It is reported that all three existing mines to the north of Hawkins – Rumker areas operate reverse osmosis plants to manage salinity of water discharged into the Goulburn River and its tributaries.

At this early stage of reviewing the available groundwater data it is not possible to speculate with any accuracy on the likely inflow volumes to a potential future underground mine within the potential release areas.

Cumulative impacts with other mines are not expected to be a significant issue but will need to be considered in an EIS. The distance between the Hawkins and Rumker areas and the other operating mines to the north is greater than 20 km. Based on the outputs from the *Northern Sydney Basin Bioregional Assessment - Hunter Subregion* (Australian Government, 2015) there will be no measurable overlapping impact with these existing mining operations. This will of course have to be demonstrated through model predictions.

All groundwater removed by a mine will initially come from storage and for a period will exceed the local recharge volume. Hence the decline in aquifer pressures and the water table that can be experienced locally. This is a common response for all coal mines taking groundwater.

Provided third-party impacts on the environment and other water users are acceptable and can be adequately addressed via appropriate levels of management, including: obtaining relevant water licenses, local monitoring, review of system performance and make good provisions, then the NSW Government commitment to manage groundwater systems within long term sustainable levels can be achieved at a groundwater source scale, whilst allowing pockets of water extraction in excess of local recharge.

The principal constraint on the make good approach is the unwillingness of some landholders to participate in the process. Even to the extent of denying access to private property. Other constraints include getting landholder acceptance on the predicted impact to a bore. In some cases, agreement cannot be reached on the monetary value of the impact or an alternative water supply option. All of the above make negotiations on make good approaches difficult to conclude.

The drilling and other activities associated with coal exploration work have a much smaller environmental footprint than a mine. A review of environmental factors (REF) is required before an exploration licence can be issued. This work will determine the size of potential impacts if any, on local water assets. Sourcing water for drilling purposes should not be an issue in this area. Maintaining drilling fluids on site and disposing of them in an acceptable manner together with site hygiene would be covered in the REF amongst other matters.

6. DATA GAPS AND DATA ACQUISITION

Some data exists for the Hawkins – Rumker areas from previous coal exploration drilling and privately owned bores from which groundwater values can be established and generalized flow directions inferred.

The collection of more detailed baseline data is essential for an EIS, should one be required in future, to better understand regional and local groundwater flow conditions. The collection of the data outlined below will provide baseline information against which to measure future changes that coal mining activities could cause and be suitable input into a groundwater flow model.

Any coal exploration program should undertake studies and collect groundwater data to help fill knowledge gaps and answer questions raised as part of the environmental assessment process. Additional hydraulic specific information will also be required to be collected as part of the formal EIS assessment.

Information to be collected during an exploration program and subsequent hydrogeology studies should include, but not be limited to:

- Recording all water bearing zones during exploration drilling and undertake airlift tests, drill stem tests or packer tests on any significant aquifers (say yielding 0.25 L/s or more).
- Undertaking wire line geophysical logs to establish detailed lithology.
- Measuring the standing water level (pressure level) of all significant aquifers.
- Collecting water samples for chemical analysis for all significant aquifers.
- Survey levelling the measuring points that water levels are taken from.
- Setting up a network or monitoring piezometers at various depths so the impacts of coal extraction can be directly measured and reported.
- Undertaking pumping tests to establish hydraulic parameters (significant aquifers only) for input into a groundwater flow model. The location and frequency of monitoring should be discussed with DPIE – Water.
- Conducting a bore and spring census to better establish the location of water assets.

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