MALABAR COAL

MAXWELL PROJECT

SECTION 2

Background to the Project

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2 BACKGROUND TO THE PROJECT

2.1 PROJECT HISTORY

The Maxwell Underground area, which has previously been known as Mt Arthur South, Saddlers Creek project and Drayton South, has long been identified as having a significant *in-situ* coal resource. Prospecting for coal within the Maxwell Underground area and surrounds commenced in the late 1940s, with exploration intensifying during the 1960s and 1970s.

2.1.1 Authorisation 169 and Mt Arthur South Project

In 1979, the NSW Government issued a prospecting authority for coal (A 169) to the Electricity Commission of NSW in an area that overlaps with the Maxwell Underground area.

In 1982, Mt Arthur South Coal Limited submitted an application for planning approval for open cut coal mining in the Mt Arthur South area.

A Development Consent was granted by the Minister for Planning in September 1986 for the development of a large-scale open cut coal mine, and a subsequent mining lease was granted in August 1989 to allow mining to commence. As the Mt Arthur South Coal Project did not commence, the Development Consent and mining lease lapsed in 1991 and 1994, respectively.

2.1.2 Drayton South Coal Project

Anglo American plc lodged its first project application, including an EIS, to develop the coal reserve within EL 5460 as an open cut mine in November 2012 (the Drayton South Coal Project). The application was refused by the NSW Planning Assessment Commission (PAC) (now known as the Independent Planning Commission [IPC]) (as delegate of the Minister for Planning) in October 2014.

A second development application and EIS for an open cut mining operation was lodged by Anglo American plc in May 2015.

The second development application for the Drayton South Coal Project included changes to the open cut mine design in response to the PAC recommendations. The key change was positioning the open cut mine behind a ridgeline approximately 1 kilometre (km) north of the Golden Highway to increase the buffer between the open cut mine and the horse studs (Anglo American Coal Pty Ltd, 2015). This change removed the Redbank and Houston open cut mining areas.

The second Drayton South Coal Project application was subject to a PAC review in 2015. The review (PAC, 2015) found (emphasis added):

> *While rejection of the mine would prevent extraction of the coal resource in the Whybrow, Redbank Creek, Whynot and Blakefield Seams for now, there are considerable underground coal resources, of a higher quality that may still be able to be exploited at some future date, pending confirmation that this could be done without impacting on the neighbouring studs/land uses.*

The second development application for open cut mining was refused by the PAC (as delegate of the Minister for Planning) in February 2017 for reasons including potential air quality and blast noise impacts on existing land uses, unacceptable negative economic and social impacts in the locality, incompatibility with 'the particular nature, operations and requirements of existing land uses', and potential impacts on the sustainability of the Equine Critical Industry Cluster (CIC) (PAC, 2017).

Notwithstanding the refusal, the PAC concluded that the open cut mining proposal, with the implementation of mitigation measures, would have acceptable impacts on surface water and groundwater resources, biodiversity, air quality impacts on humans, noise, lighting, visual, Aboriginal cultural heritage and non-Indigenous cultural heritage.

2.1.3 Transfer to Malabar Ownership

In May 2017, Malabar publicly announced its intention to acquire EL 5460 and the Maxwell Infrastructure.

As part of this announcement, Malabar confirmed its commitment to investigate development of the resource in EL 5460 solely as an underground mine.

To reinforce this commitment, Malabar announced it would accept conditions that prevent any open cut development being imposed on EL 5460. Malabar also volunteered to relinquish that portion of EL 5460 that was south of, and including, the Golden Highway. The relinquishment of open cut mining rights in EL 5460 is discussed further in Section 2.1.4.

The transfer of ownership of EL 5460 and the Maxwell Infrastructure to Malabar was formally completed on 26 February 2018.

Since that time, Malabar has established a team at the Maxwell Infrastructure site, recommenced rehabilitation activities (Plate 2-1), progressed its underground mine planning and prepared this EIS.

2.1.4 Relinquishment of Open Cut Mining Rights in EL 5460

EL 5460 was renewed on 8 December 2017 with the voluntary relinquishment of the portion that was south of, and including, the Golden Highway. In addition, a condition was imposed on EL 5460 that authorises prospecting for the purposes of the assessment and potential future extraction of an underground resource only.

In December 2017, the Minister for Planning publicly exhibited a proposed change to the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) that would prohibit a development application for open cut mining in EL 5460. Malabar wrote a submission in support of this change, and the Mining SEPP was formally amended on 22 December 2017.

The prohibition applies only to open cut mining, as the key reasons for the refusal of previous applications for open cut mining included noise and dust impacts, both of which would be significantly less for underground mining (NSW Government, 2017).

Malabar's commitment to an underground mining operation has been reaffirmed through ongoing interactions with stakeholders and Malabar's significant investment in technical and environmental studies into the development of the site solely as an underground mining operation.

Plate 2-1 – Angus-Charolais Cross Steers on Rehabilitation of Former Open Cut Mining Areas at the Maxwell Infrastructure

2.1.5 Design Philosophy for the Project

This Project is for an underground mining operation and is substantially different to previous proposals in EL 5460.

Measures to address stakeholder concerns and perceptions of previous proposals have been incorporated into the Project design and Malabar's operating philosophy.

Malabar has sought to address previous feedback through a commitment to underground mining, other significant Project design measures, genuine community engagement and successful environmental management over time.

Malabar has approached the design of this Project and its conduct in the local community with the following aims:

- being aware of the points of view and perceptions of neighbouring landholders;
- developing a Project that can operate as a sustainable long-term enterprise;
- maintaining and enhancing agricultural activity on land that Malabar owns that is not required for mining activities, the Maxwell Solar Project or biodiversity conservation;
- encouraging and being supportive of other community and government proposals or initiatives for the use of Malabar land or infrastructure that can co-exist with the Project; and
- supporting local employment and local businesses.

Further detail on how Malabar has incorporated stakeholder feedback into the Project design and other initiatives is provided in Section 5.2.

2.2 HISTORY OF DEVELOPMENT IN THE AREA AND SURROUNDS

The Project is surrounded by various developments, including coal mining, power generation, rail and agriculture, which are described further below.

Underground coal mining commenced in the Muswellbrook area in the late 1800s. In 1944, open cut mining was introduced to the Muswellbrook area.[1]

A growing demand for coal, particularly thermal coal, discovery of low strip ratio mining areas and advancements in earth-moving technology resulted in an increase in open cut mines being established in the area and surrounds. The growth of the region was influenced by the development of open cut mining and the establishment of the Liddell and Bayswater Power Stations (Muswellbrook Shire Council, 2015a).

2.2.1 Coal Measures in the Area

Three coal measure sequences occur within the Hunter Coalfield: the Early to Middle Permian Greta Coal Measures, the Late Permian Wittingham Coal Measures and the overlying Late Permian Newcastle Coal Measures (formerly known as the Wollombi Coal Measures) (Figure 2-1).

The coal measure sequences are separated by marine strata of the Maitland Group, Bulga Formation and Denman Formation, respectively (Department of Mineral Resources [DMR], 1988).

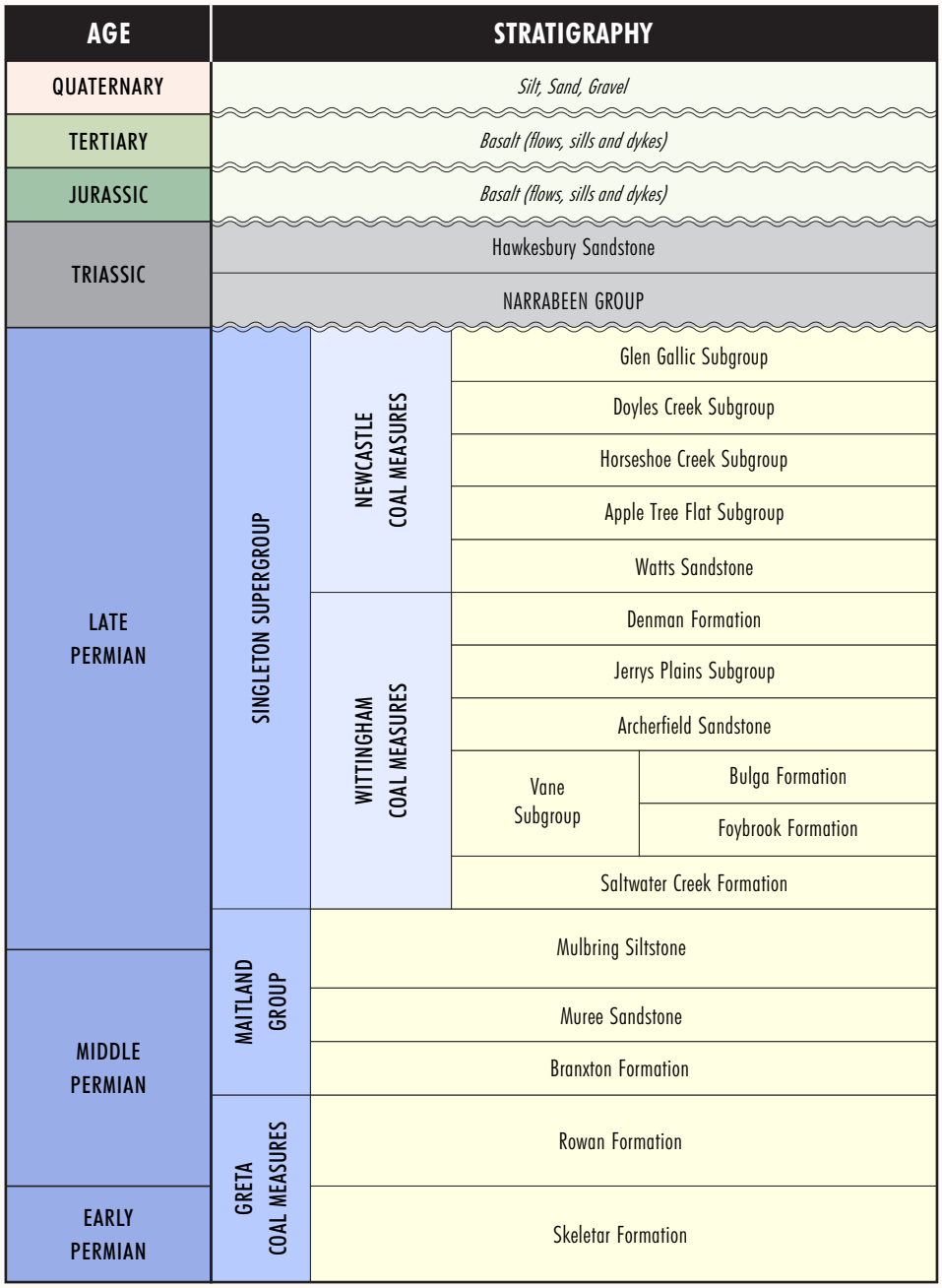
The Muswellbrook Anticline is a prominent regional feature trending north-south, along which the Greta Coal Measures and the Maitland Group crop out.

The Greta Coal Measures are divided into two stratigraphic units, namely the Skeletar and Rowan Formations. Previously targeted seams within the Rowan Formation include Brougham, Grasstrees, Thiess, Puxtrees and Balmoral Seams. The Skeletar Formation is a non-coal-bearing formation consisting primarily of claystones (DMR, 1988).

The Wittingham Coal Measures occur widely within the Hunter Coalfield and contain many recoverable seams. The two important coal-bearing subgroups within the Wittingham Coal Measures are the lower Vane Subgroup and the overlying Jerrys Plains Subgroup. The Project targets mining of the Whynot, Woodlands Hill, Arrowfield and Bowfield Seams. The target seams are contained within the Jerrys Plains Subgroup, forming part of the upper and middle units of the Wittingham Coal Measures (DMR, 1988).

The Newcastle Coal Measures have been subdivided into four subgroups, namely the Apple Tree Flat, Horseshoe Creek, Doyles Creek and Glen Gallic Subgroups. These subgroups contain numerous, thin, banded coal seams which split and merge, locally reaching thicknesses of up to 2 metres (m) (DMR, 1988).

[1] Muswellbrook Shire Council (2015a).



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Resource Strategies

Source: Department of Mineral Resources (1988)

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Stratigraphy of the Hunter Coalfield

Figure 2-1

2.2.2 Former Drayton Mine

The former Drayton Mine is located approximately 6 km to the north-east of the proposed Maxwell Underground, and is immediately adjacent to the Mt Arthur Mine (Figure 2-2). Mining operations at Drayton Mine occurred within mining authorities ML 1531, CL 229 and CL 395.

Operations at the mine commenced in 1983. A Development Consent granted by the Muswellbrook Shire Council in 2002 (DA 163/2002) allowed for production of up to 5.5 million tonnes per annum (Mtpa) of ROM coal. On 1 February 2008, Project Approval 06_0202 was granted for the extension of open cut mining operations with a maximum extraction rate of 8 Mtpa of ROM coal, and for the continued use of, and maintenance of, surface infrastructure.

The Drayton Mine targeted the Broughams, Grasstrees, Thiess, Puxtrees and Balmoral Seams, within the Rowan Formation of the Greta Coal Measures.

Open cut mining comprised a dragline, excavators, and haul trucks to remove mining waste, with loaders and/or excavators for coal extraction supported by a fleet of haul trucks, which transported the ROM coal to the CHPP.

Open cut mining at the former Drayton Mine ceased in October 2016 under the ownership of Anglo American plc. Approval for coal extraction, under Project Approval 06_0202, lapsed on 31 December 2017.

On 26 February 2018, the ownership of both the former Drayton Mine (now the Maxwell Infrastructure) and EL 5460 was formally transferred to Malabar. Further information on the transfer of ownership to Malabar is provided in Section 2.1.3.

In March 2018, Malabar recommenced rehabilitation activities under Project Approval 06_0202. Activities, including landform reshaping, capping, seeding, monitoring and maintenance works, are conducted on areas identified for rehabilitation. Section 7 describes the current rehabilitation status.

Existing Infrastructure

The existing infrastructure at the Maxwell Infrastructure (Plate 2-2) includes:

- site access road from Thomas Mitchell Drive;
- CHPP, which includes:
  - ROM coal stockpile and ROM hopper;
  - coal processing plant; and
  - product coal stockpiles with mechanical stacking and reclaim;
- train load-out facility and rail loop (connecting to the Antiene Rail Spur);
- administration, employee amenities, training centre, emergency services, workshops, store and carpark facilities;
- electrical distribution infrastructure; and
- site water management infrastructure (including water storages, pumps and pipelines, and a wastewater treatment facility).

The infrastructure is currently under care and maintenance.

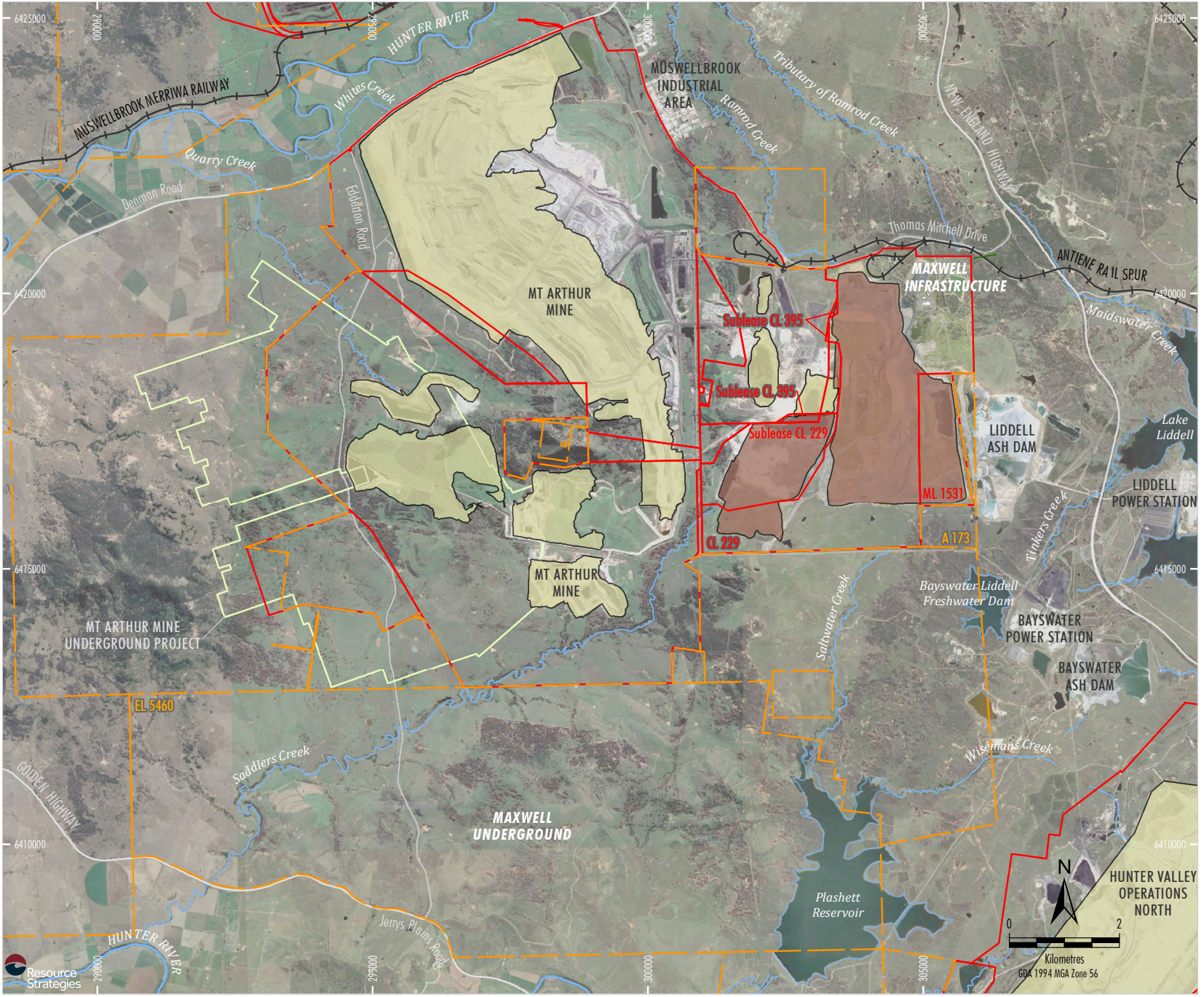
Voids remaining at the cessation of mining include the North Void, South Void and East Void within the mining authorities CL 229 and ML 1531 (Figure 2-3).

The Antiene Rail Spur (approved under Development Consent DA 106-04-00), which is shared with Mt Arthur Mine, was utilised to transport export thermal coal to the Port of Newcastle via the Main Northern Railway. Further information on the Antiene Rail Spur is provided in Section 2.2.5.

Modifications to Project Approval 06_0202

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

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



Source: Malabar (2018); Umwelt (2016); AGE (2016); © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019)
Orthophoto Mosaic: 2018, 2016, 2011

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Previous Mining Activities

Figure 2-2

SHM-18-03 Maxwell_EIS_Sect 2_201F

SHM-18-03 Maxwell_EIS_Sect 2_202F

LEGEND
Railway
Exploration Licence Boundary
Mining and Coal Lease Boundary

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019) Orthophoto Mosaic: 2018, 2016, 2011

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Former Drayton Mine

Figure 2-3

Plate 2-2 – Existing Maxwell Infrastructure

Environmental Monitoring and Management

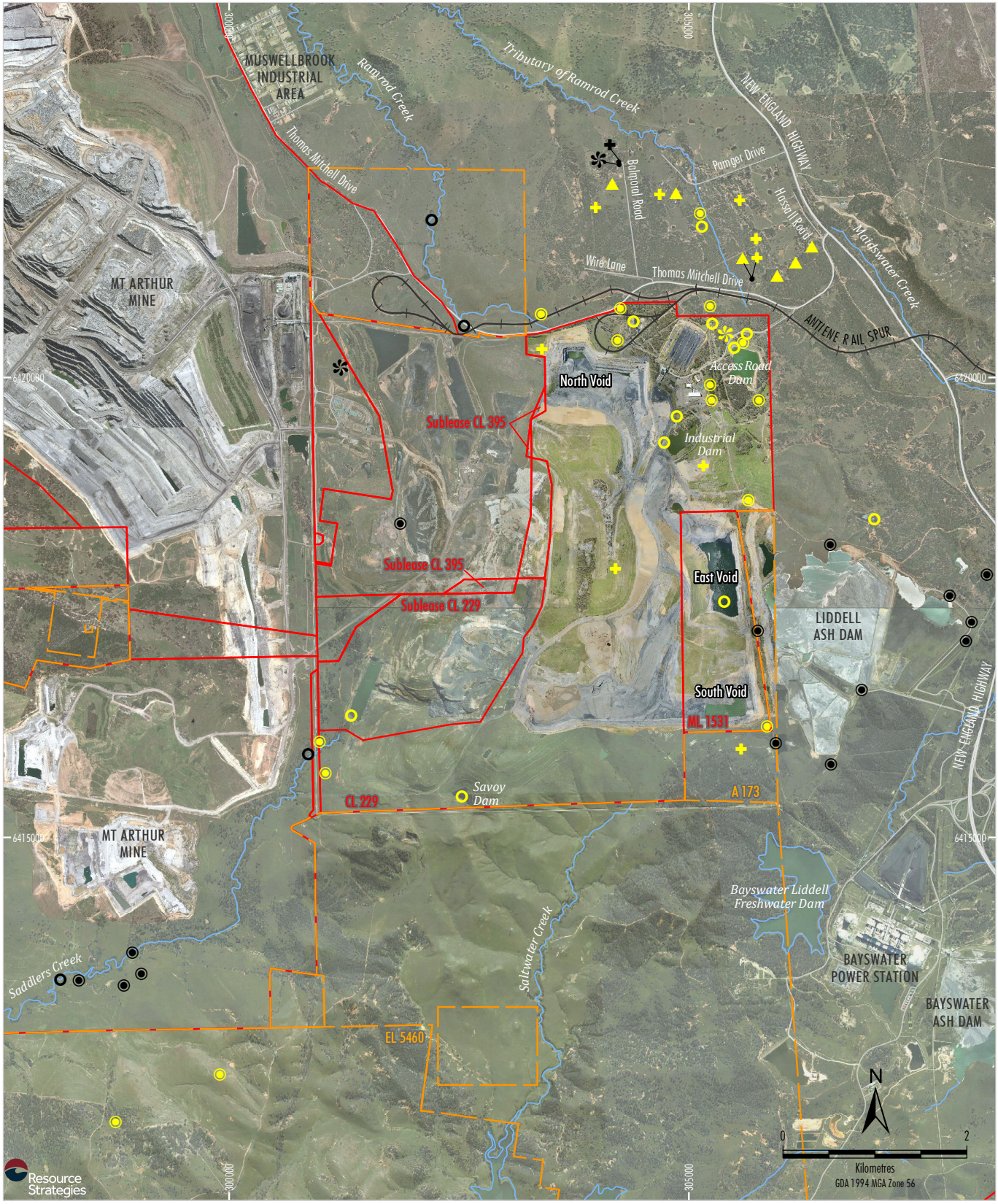
Malabar has implemented an Environmental Management System at the Maxwell Infrastructure to minimise the potential environmental impacts of its rehabilitation and care and maintenance activities. The following environmental strategies and environmental management plans are in place at the Maxwell Infrastructure:

- Environmental Management Strategy.
- Pollution Incident Response Management Plan.
- Aboriginal Cultural Heritage Management Plan.
- Noise Management Plan.
- Blast Management Plan.
- Spontaneous Combustion Management Plan.
- Air Quality and Greenhouse Gas Management Plan.
- Water Management Plan (incorporating the Erosion and Sediment Control Plan).
- Offset Strategy.
- Landscape Management Plan.
- Rehabilitation and Offset Management Plan.
- Flora and Fauna Management Plan.
- Mining Operations Plan (MOP) (incorporating the Final Void Management Plan and Mine Closure Plan).
- Environmental Monitoring Program.

Malabar has implemented a monitoring program at the Maxwell Infrastructure and the Maxwell Underground to record environmental conditions, assess environmental performance and determine compliance to regulatory requirements on an ongoing basis.

The locations of current monitoring sites are shown on Figures 2-4 and 2-5. The method, frequency and other requirements of the monitoring program are detailed in the relevant environmental management plans.

The assessments in this EIS are based on an extensive baseline dataset, which also includes available monitoring data in addition to the monitoring sites presented on Figures 2-4 and 2-5.



LEGEND

- Railway
- Exploration Licence Boundary
- Mining and Coal Lease Boundary

Malabar Monitoring Sites

- Noise Monitoring Site
- Air Quality Monitoring Site
- Meteorological Station
- Surface Water Quality Monitoring Site
- Groundwater Monitoring Site

BHP/AGL Monitoring Sites

- Air Quality Monitoring Site
- Meteorological Station
- Surface Water Quality Monitoring Site
- Groundwater Monitoring Site

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019) Orthophoto Mosaic: 2018, 2016, 2011

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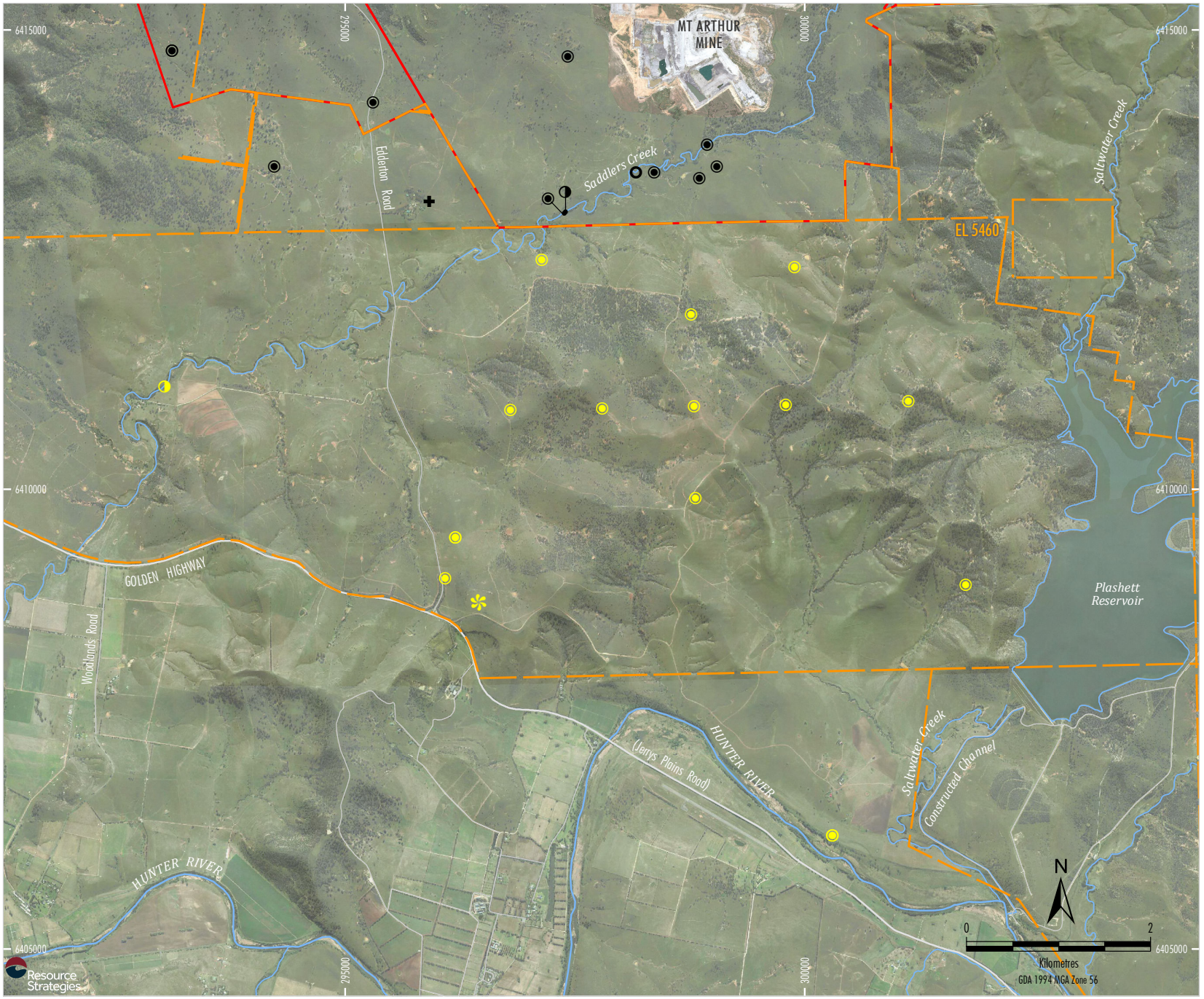
Current Environmental Monitoring Sites - Maxwell Infrastructure

Figure 2-4



LEGEND

- Exploration Licence Boundary
- Mining and Coal Lease Boundary

Malabar Monitoring Sites

- Meteorological Station
- Gauging Station
- Groundwater Monitoring Site

BHP Monitoring Sites

- Air Quality Monitoring Site
- Gauging Station
- Surface Water Quality Monitoring Site
- Groundwater Monitoring Site

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019) Orthophoto Mosaic: 2018, 2016, 2011

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Current Environmental Monitoring Sites - Maxwell Underground

Figure 2-5

SHM-18-03 Maxwell_EIS_Sect 2_203D

Existing Biodiversity Offsets

Biodiversity offsets were established for the former Drayton Mine. The Drayton Wildlife Refuge was established in 1987 under section 68 of the *National Parks and Wildlife Act, 1974* (NPW Act). Following approval of Modification 1 of Project Approval 06_0202 in 2009, two additional offset areas were established (i.e. the Northern Offset Area and the Southern Offset Area).

Final Landform

The *Drayton Mine Extension Environmental Assessment* (Hansen Bailey, 2007a) considered and assessed two final landform scenarios:

- Three legacy final voids remaining at the Maxwell Infrastructure (North Void, South Void and East Void), with these voids gradually filling with water until an equilibrium water table level establishes within the spoil material and the open void.
- One legacy final void remaining at the Maxwell Infrastructure (South Void) if the following were to occur:
  - MacGen (now AGL Energy Limited [AGL]) used the East Void for disposal of fly-ash, subject to commercial arrangements and necessary planning approvals; and
  - North Void was used for coarse reject emplacement by neighbouring mining operations, subject to commercial arrangements and necessary planning approvals.

Figure 2-6 presents the two final landform scenarios described above and presented in the *Drayton Mine Extension Environmental Assessment* (Hansen Bailey, 2007a). The conceptual final landform for the Project is shown on Figure 7-1.

Commercial arrangements and necessary planning approvals have not been obtained for beneficial use of the East Void and North Void to date, and three legacy voids remain at the Maxwell Infrastructure (Figure 2-3). It is noted that AGL still retains an option for the transfer of ML 1531 and to seek planning and other required approvals to authorise disposal of fly-ash in the East Void (Section 2.3.5).

2.2.3 Bayswater Mine and Mt Arthur Open Cut

The former Bayswater Mine and Mt Arthur Open Cut are located to the immediate west of the Maxwell Infrastructure.

Mining commenced in the Mt Arthur area in the late 1950s with an underground mine that operated until 1964. Open cut mining began at Bayswater No. 2 in 1966 within the Greta Coal Measures.

Coal production slowly increased until September 1994, when approval was obtained (DA 210/93) for a significant expansion of the operation into the Bayswater No. 3 mining lease (ML 1358). Mining at Bayswater No. 3 targeted the Wittingham Coal Measures. Development Consent DA 210/93 for Bayswater No. 3 approved the mining of up to 5 Mtpa of ROM coal.

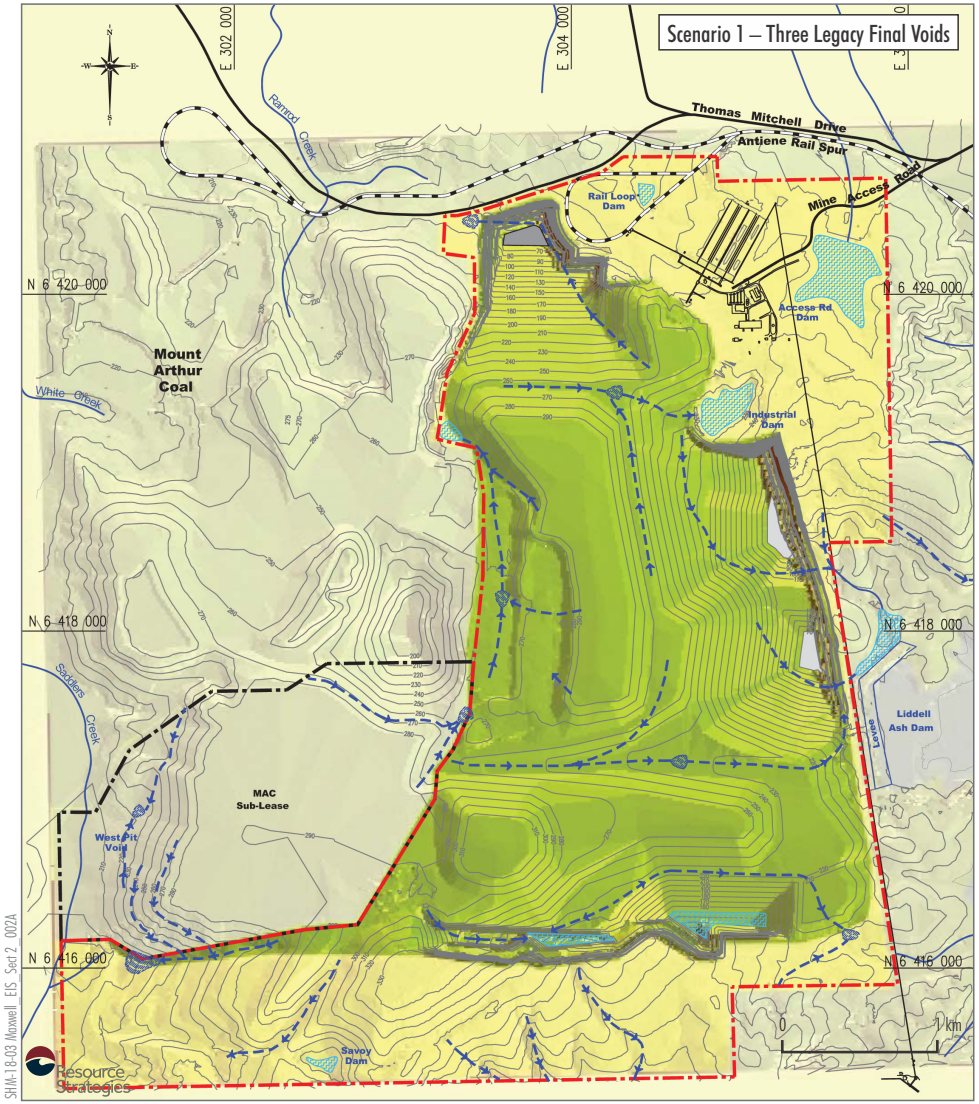
Mining began at Bayswater No. 3 in 1995, serviced by the existing coal processing and industrial facilities located at Bayswater No. 2. Coal extraction was completed within Bayswater No. 2 in late 1998. The approved Bayswater No. 3 comprised the Saddlers, McDonalds, Belmont and Calool Pits, which targeted seams in the Wittingham Coal Measures.

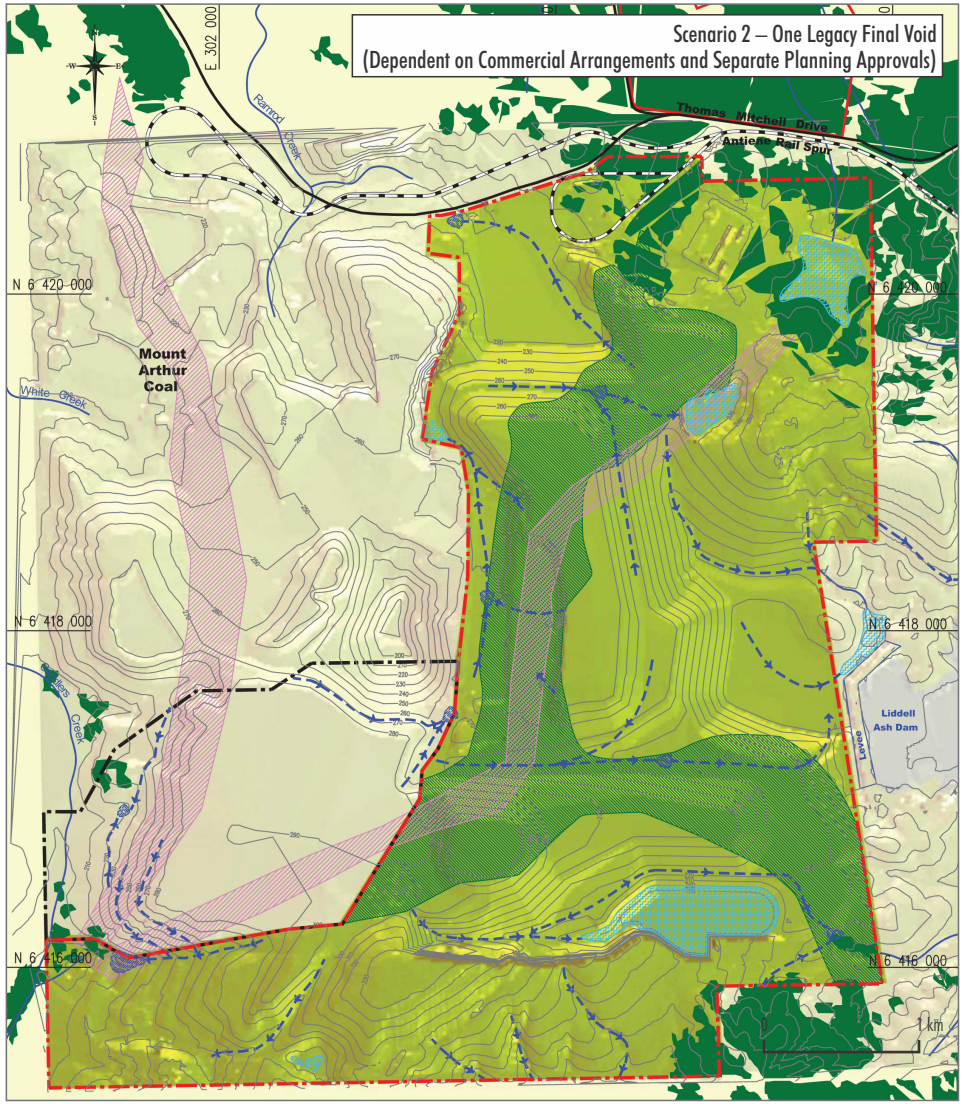
To support the expanded operation and to remove coal transport from public roads, approval was obtained in November 2000 for the construction and operation of the Bayswater rail loading facility and spur line linking into the Antiene Rail Spur (Section 2.2.5).

In May 2001, the Mt Arthur North Project, located adjacent to the Bayswater operations, was granted development consent by the then Minister for Planning (Development Consent DA 144-05-2000). Mt Arthur North was approved to produce 15 Mtpa of ROM coal. Construction of the Mt Arthur North Project commenced in late 2001 and coal mining began in 2002.

Bayswater No. 2, Bayswater No. 3 and Mt Arthur North mining operations were integrated to form the current Mt Arthur Mine complex in 2002 (Plate 2-3). Since this time, mining has been focused within the Mt Arthur North area, along with limited mining in the Bayswater No. 3 area.

Coal preparation, handling and loading are undertaken at the CHPP located within ML 1487, with coal then loaded onto trains for export via the Bayswater rail loading facility or stockpiled and transported by conveyor to the nearby Bayswater Power Station, operated by AGL Macquarie Pty Limited, a subsidiary of AGL.





LEGEND

- Rehabilitation
- EA Boundary
- MAC Sub-lease
- Rail
- Road
- Creek
- Waterbody
- Fly Ash Emplacement
- Coarse Reject
- Drainage
- Proposed Dam
- Remnant Vegetation
- Proposed Woodland Area
- Synoptic Plan Corridor
- Wildlife Refuge

Source: Hansen Bailey (2007)

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Final Landform Scenarios
Assessed for the Drayton Mine Extension

Figure 2-6

Plate 2-3 – Mt Arthur Mine
Source: Integral Landscape Architecture and Visual Planning (2009).

In March 2006, BHP (through a subsidiary) submitted an application to the NSW Department of Planning (now DPIE) under Part 3A of the EP&A Act to extend the currently approved South Pit at Mt Arthur North into the Bayswater No. 3 mining lease. The extension of the open cut mining area, known as the South Pit Extension Project was approved in January 2008 (Project Approval 06_0108). The South Pit Extension Project allowed for the recovery of an additional 25 million tonnes (Mt) of ROM coal over the life of the Mt Arthur Mine (Umwelt [Australia] Pty Limited [Umwelt], 2008).

In November 2009, BHP (through a subsidiary) submitted an application to the Department of Planning under Part 3A of the EP&A Act to consolidate the open cut mining operation planning approvals and extend the mining footprint, which was approved in September 2009 as part of the Consolidation Project Approval 09_0062 (HVEC, 2009).

In 2013, BHP (through a subsidiary) submitted an application to the Department of Planning and Infrastructure (DP&I) (now DPIE) to modify the Consolidation Project Approval 09_0062 for the Mt Arthur Mine under Part 3A of the EP&A Act. The modification included an extension of the open cut mine life from 2022 to 2026 at the maximum rate of 32 Mtpa of ROM coal, an increase in open cut disturbance, duplication of the existing rail loop and other minor ancillary modifications (HVEC, 2013).

Open cut mining at the Mt Arthur Mine is conducted using multi-bench, multi-strip shovel and truck or excavator and truck operation for waste, with an excavator/front end loader and truck fleet to mine and transport the coal to on-site processing and stockpiling facilities. Mining predominantly occurs in the Northern Open Cut, which is comprised of several sub-pits, namely Macleans Hill, Windmill, Huon, Calool and Roxburgh (HVEC, 2013).

To allow for mining to progress within the approved South Pit, Mt Arthur Coal needs to relocate the northern section of Edderton Road, including the Denman Road and Edderton Road intersection. Two potential realignment options were shown in the Environmental Assessment documentation (HVEC, 2013).

2.2.4 Mt Arthur Underground

The approved Mt Arthur Underground is located directly north of the Maxwell Underground (Figure 2-2).

In January 2008, Mt Arthur Coal submitted an application to the Department of Planning (now DPIE) under Part 3A of the EP&A Act to develop an underground longwall mining operation, which was subsequently approved in December 2008.

The approved Mt Arthur Underground would comprise longwall mining operations in five coal seams in the Wittingham Coal Measures, with transport of ROM coal by conveyor for processing at the existing Mt Arthur CHPP. A maximum extraction rate of 8 Mtpa of ROM coal may be sourced from the Mt Arthur Underground (Umwelt, 2008).

An underground entry and approximately 8 km of roadway were developed in 2009; however, Mt Arthur Underground is yet to commence underground longwall coal extraction (HVEC, 2013).

The Mt Arthur Open Cut and Mt Arthur Underground have a combined extraction limit of 36 Mtpa of ROM coal. Operations at the Mt Arthur Open Cut are currently approved until 2026, and approval of operations at the Mt Arthur Underground extend until 2030.

2.2.5 Antiene Rail Spur

The Antiene Rail Spur is located to the north of the Maxwell Infrastructure, with part of the Antiene Rail Spur located within CL 229 (Figure 2-2).

The Antiene Rail Spur was originally commissioned in 1983, with the extension to Mt Arthur Mine commissioned in late 2001.

The Antiene Rail Spur was used by the former Drayton Mine and is currently used by the Mt Arthur Mine to transport coal from their operations via the Main Northern Railway Line to the Port of Newcastle for export (Plate 2-4). The Antiene Rail Spur is owned by the Antiene Joint Venture, which is currently managed by BHP and Malabar.

Plate 2-4 – Antiene Rail Spur

Initially, the use of the Antiene Rail Spur was governed by two separate planning approvals, granted individually to Drayton Mine and Mt Arthur Mine on 2 November 2000. These were Development Consents DA 106-04-00 and DA 105-04-00, respectively. The two approvals had complementary provisions and interacting obligations that were supported by one EIS that jointly assessed the use of the Antiene Rail Spur by Drayton Mine and Mt Arthur Mine.

Under the two complementary approvals, Anglo American plc and BHP entered into a joint acquisition management plan in January 2001 to manage cumulative impacts between the respective mining operations and the joint use of the Antiene Rail Spur.

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

In 2010, BHP consolidated a number of their existing planning approvals; subsequently, the Development Consent DA 105-04-00 was surrendered and the relevant conditions were incorporated into Project Approval 09_0062.

The section of the Antiene Rail Spur used to service the former Drayton Mine is approved to operate under Development Consent DA 106-04-00 until November 2025.

Malabar will separately lodge a modification to extend the operation of Development Consent DA 106-04-00. Potential environmental impacts associated with use of the Antiene Rail Spur for the Project have been assessed in this EIS.

2.2.6 Liddell and Bayswater Power Stations

The Liddell and Bayswater Power Stations, both owned by AGL, are located to the east of the Project (Figure 2-2).

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

The Liddell Power Station, commissioned in 1969, contains four 500 megawatt (MW) generating units, producing approximately 8,000 gigawatt hours (GWh) of electricity annually. The Bayswater Power Station (Plate 2-5), commissioned in 1985, utilises four 660 MW generating units to produce approximately 15,000 GWh of electricity annually (AGL, 2018).

Plate 2-5 – Bayswater Power Station

Each year AGL supplies approximately 12% of the electricity demand for eastern Australia, from South Australia through to North Queensland. This is equivalent to 30% of the electricity demand of NSW, placing AGL's Hunter Valley based operations amongst Australia's largest electricity providers.

The land to the immediate east of the Project is owned by AGL, and forms part of the buffer lands for its power stations. This land includes one of AGL's primary water storages, Plashett Reservoir, a 65,000 megalitre dam, which also provides water to the township of Jerrys Plains. It captures water from much of the Saltwater Creek catchment along with pumped inflows from the Hunter River. AGL currently holds 78,000 megalitres per annum in major utility and supplementary water access licences (WALs) for the Hunter River, along with other licences (NSW Department of Industry, 2018).

The Liddell Power Station currently operates under a development consent issued by the Denman Shire Council (now part of the Muswellbrook Shire Council) and Environment Protection Licence (EPL) 2122.

The Bayswater Power Station currently operates under Project Approval 06_0047 and EPL 779.

On 12 January 2010, the DP&I granted Concept Approval for the Bayswater B Power Station. This is a proposed coal- or gas-fired power station, to be constructed on AGL's landholdings to the immediate east of the Project.

In July 2018, AGL submitted an EIS for the Bayswater Power Station Turbine Efficiency Upgrade Project (SSI 9234), to replace four turbines in each of the four generating units with higher efficiency turbines. The EIS detailed that there would be no other changes to the approved operations due to the upgrades, other than an increase in the capacity of each generating unit from 660 MW to 685 MW (AGL, 2018).

In December 2018, DP&E granted approval to the Bayswater Power Station Turbine Efficiency Upgrade Project (SSI 9234).

AGL has announced the planned closure of the Liddell Power Station in 2022. The Bayswater Power Station is currently planned for closure in 2035.

2.2.7 Agricultural Developments

The Project is located on lands that have been largely disturbed by previous agricultural activities, particularly grazing. European settlers in the mid-1820s commenced agricultural activities in the Muswellbrook area. The land within the Project area is primarily cleared, open paddock grazing land, with some areas of remnant forest and open woodland.

The main agricultural industries within the surrounding locality include cattle grazing, cropping, horse breeding and viticulture.

The properties within the Project area passed from private ownership to the Electricity Commission of NSW in 1982 and have been held by resource companies, formerly Anglo American plc and now Malabar, for more than 15 years.

During that time, the properties have been leased; Bowfield and Llanillo to one family, while the Plashett property has been managed separately. Malabar's Bowfield property extends more than 2 km to the west of the Maxwell Underground.

Land use within the Project area consists primarily of cattle grazing, with small areas of opportunistic fodder cropping (under favourable conditions).

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

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

Neighbouring equine businesses include the Coolmore Stud and Godolphin Woodlands Stud. These internationally-owned, thoroughbred horse-breeding studs are located south of the Maxwell Underground and south of the Golden Highway.

The Hollydene Estate Wines vineyard, winery, restaurant and cellar door are also located south of the Maxwell Underground and south of the Golden Highway.

The Woodlands Stud was first developed in 1908. Following the purchase of the property by Lord Derby in 1971, the Woodlands Stud was developed into a major private racing enterprise. The Ingham brothers conducted large-scale thoroughbred breeding operations on the property until 2008, when the Woodlands Stud was purchased by Darley Australia (renamed as Godolphin Australia Pty Ltd [Godolphin] in 2016).

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

The Bowman family originally used the Arrowfield property for farming and grazing in conjunction with thoroughbred breeding from 1912 to 1924. In the 1970s, the property was acquired by WR Carpenter Holdings Limited. The Bowman family also operated a Clydesdale Stud on the Strowan property.

In 1986, the Arrowfield, Strowan and Oak Range properties were purchased by Australian Racing and Breeding Stables Ltd, which later changed its name to the Arrowfield Group. Coolmore Australia purchased these properties from the Arrowfield Group in 1991, and has since acquired a number of other adjoining properties, many of which operated as dairies, to extend their horse-breeding enterprise. Coolmore Australia established Coolmore Stud in 1991. Recently, dairy farms and other properties adjoining the Coolmore Stud (totalling approximately 257 ha) were acquired by Tomag Holdings Pty Ltd in 2018.

It is understood that, currently, no stallion is kept or covering occurs at the Godolphin Woodlands Stud. Covering for the Godolphin Woodlands Stud is undertaken at another Godolphin operation, Kelvinside. Mares are returned to the Godolphin Woodlands Stud to foal. In 2012, it was estimated the Woodlands Stud produced 160 foals (Short and Thomson, 2013).

At Coolmore Stud, a range of activities are currently being undertaken, including but not limited to, breeding, foaling, weaning and boarding (Coolmore Australia, 2019). In 2011, it was estimated the Coolmore Stud housed approximately 1,000 horses (i.e. stallions, broodmares, foals, yearlings, agistment) and produced 300 foals (Short and Thomson, 2013).

2.3 RELATIONSHIP OF THE PROJECT WITH OTHER DEVELOPMENTS

2.3.1 Former Drayton Mine and Maxwell Infrastructure

The Project would include the use of the substantial existing Maxwell Infrastructure, along with the development of some new infrastructure.

The key existing infrastructure at the Maxwell Infrastructure is described in Section 2.2.2.

Malabar intends to consolidate current rehabilitation activities under Project Approval 06_0202 at the former Drayton Mine into the Project's Development Consent, if approved.

Section 3 of the EIS provides a detailed description of the Project, including activities at the Maxwell Infrastructure. A summary comparison of the currently approved Maxwell Infrastructure and the Maxwell Infrastructure following approval of the Project is presented in Table 2-1.

The Project would involve the continuation of rehabilitation activities at the Maxwell Infrastructure, including landform reshaping, capping, seeding, monitoring and maintenance works.

In the absence of approval for the Project, the existing Maxwell Infrastructure (including the CHPP and train load-out facilities) would be decommissioned and the potential benefits of its continued use would be lost.

If the Project is approved, the Maxwell Infrastructure would be used for the life of the Project and decommissioned following the completion of mining. Implementation of some aspects of the approved Final Void Management Plan (such as highwall blasting) would also be deferred until the end of the Project life, when nearby surface infrastructure would be decommissioned and removed, and the voids are no longer required for water storage and/or CHPP reject emplacement.

Table 2-1
Comparison of Currently Approved Maxwell Infrastructure and Maxwell Infrastructure with the Project

Component	Maxwell Infrastructure Approved under Project Approval 06_0202	Maxwell Infrastructure with the Project
Mining Method and Resource	Extraction of coal seams in the Greta Coal Measures using open cut mining methods within ML 1531, CL 229 and CL 395.	No further open cut mining activities. Continued rehabilitation of former open cut mining areas. Support for an underground mining operation within EL 5460.
Mine Life	Open cut mining ceased in October 2016. Approval for coal extraction, under Project Approval 06_0202, lapsed on 31 December 2017.	Use of surface infrastructure at the Maxwell Infrastructure for 26 years to support underground coal extraction within EL 5460.
Coal Handling and Preparation	Facilities for the handling and processing of up to 8 million tonnes of ROM coal per annum. Processing of coal mined from the Greta Coal Measures occurred at the Maxwell Infrastructure from late 2004 to 2016.	No change to the maximum annual handling and processing rate. Upgrades to coal handling and preparation infrastructure over the life of the Project, including: • extension of the product coal stockpile area; • development of an additional ROM stockpile adjacent to the coal processing plant; • installation of additional conveyors to allow for bypass of coal around the existing coal processing plant; • replacement, upgrade and augmentation of other conveyor systems; • upgrade and/or replacement of the train load-out bin and transfer conveyors; • upgrade and/or replacement of screens and other components within the coal processing plant; • other minor upgrades and ancillary works; and • removal of redundant infrastructure, such as primary and secondary sizers and hoppers (Section 3.4.5).
Management of Reject Material (i.e. Stone-derived Material)	Co-disposal of rejects and emplacement of tailings in open cut voids.	Emplacement of coarse rejects and tailings primarily within the existing East Void. Upgrades and/or replacement of CHPP reject handling infrastructure.
General Infrastructure	Key existing infrastructure includes the site access road, CHPP, train load-out facilities and rail loop, administration, employee amenities, training centre, emergency services, workshops, washdown bays, store and parking facilities, explosives storage facilities, electrical distribution infrastructure and site water management infrastructure.	Use of the existing Maxwell Infrastructure with upgrades to coal handling and preparation infrastructure, removal of redundant infrastructure and other minor upgrades and ancillary works.
Product Transport	Transport of product coal to market or to the Port of Newcastle for export via the existing Antiene Rail Spur and Main Northern Railway or via conveyor to nearby power stations.[1] Transport of up to 7 million tonnes of product coal per annum along the rail loop (up to 12 train movements per day).	No change.

Table 2-1 (Continued)
Comparison of Currently Approved Maxwell Infrastructure and Maxwell Infrastructure with the Project

Component	Maxwell Infrastructure Approved under Project Approval 06_0202	Maxwell Infrastructure with the Project
Water Management	On-site water management system, including: recycling of water on-site; storage of water on-site (including in voids) and sharing of water with Mt Arthur Mine.	Use of the existing water management system with augmentations and extensions to existing infrastructure and development of new water management storages, sumps, pumps, pipelines, sediment control, mine dewatering, water treatment and wastewater treatment infrastructure. Continued sharing of water with Mt Arthur Mine, along with sharing of water with other users and irrigation or evaporation of water within the Project site (Section 3.10).
Workforce	Approved workforce of up to 388 personnel during previous open cut mining operations. Current workforce is restricted to rehabilitation and care and maintenance activities.	During operation, the Project would directly employ approximately 350 personnel.
Hours of Operation	Operated on a continuous basis, 24 hours per day, seven days per week.	No change.
Mine Access	From Thomas Mitchell Drive via the site access road.	No change.
Final Voids	Three legacy final voids remaining at the Maxwell Infrastructure (North Void, South Void and East Void). One legacy final void remaining at the Maxwell Infrastructure (South Void) if the following were to occur: • AGL use the East Void for disposal of fly-ash, subject to commercial arrangements and necessary planning approvals; and • North Void is used for coarse reject emplacement by neighbouring mining operations, subject to commercial arrangements and necessary planning approvals.	Three legacy final voids remaining at the Maxwell Infrastructure (North Void, South Void and East Void), with partial backfilling of the East Void with coarse rejects and tailings. One legacy final void remaining at the Maxwell Infrastructure (South Void) if the following were to occur: • AGL use the East Void for disposal of fly-ash, subject to commercial arrangements and necessary planning approvals; and • North Void is used for coarse reject emplacement by neighbouring mining operations, subject to commercial arrangements and necessary planning approvals. The volume of legacy final voids may also be reduced by emplacing CHPP reject material from possible future underground mining activities undertaken by Malabar within EL 5460 and EL 7429 (Spur Hill Underground Coking Coal Project) (subject to separate assessment and approval).

[1] Under the current approval for the Antiene Rail Spur (DA 106-04-00) coal may be hauled on public roads under emergency or special situations with the prior written permission of the Secretary of the DPIE, RMS and Muswellbrook Shire Council.

2.3.2 Maxwell Solar Project

As a separate project, and in parallel with this Project, Malabar is planning to submit a development application for a solar farm, known as the "Maxwell Solar Project" (SSD 18_9820). The solar panels would be located on areas of previous open cut mining disturbance within CL 229.

The Maxwell Solar Project would have an installed capacity of 25 MW and would provide additional employment opportunities in the local district during construction and operation.

The proposed capacity of the Maxwell Solar Project would power approximately 10,000 homes, which is equivalent to the towns of Muswellbrook and Singleton combined.

The Maxwell Solar Project would allow for beneficial use of an area previously subject to open cut mining. The location would be adjacent to a major electricity generating hub in NSW (Liddell and Bayswater Power Stations), and in proximity to high voltage power lines.

The Maxwell Solar Project would not constrain or negatively impact the development of this Project. The development of the Maxwell Solar Project would be subject to separate environmental assessment and approvals. Relevant cumulative impacts associated with the operation of the Project and the Maxwell Solar Project have been considered, including interactions with rehabilitation objectives, along with cumulative road transport, biodiversity, employment and population effects.

2.3.3 Mt Arthur Mine

The Mt Arthur Mine is comprised of the Mt Arthur Open Cut (currently operating) and the Mt Arthur Underground (yet to commence longwall coal extraction) (Sections 2.2.3 and 2.2.4).

Integration of Landforms

In 2006, Anglo American plc granted a sublease over part of CL 229 to BHP for depositing waste rock, tailings and other materials, as part of the Mt Arthur Mine operations (Figure 2-2). The coal resource within this area has been exhausted and, on completion of activities in this area, it is to be rehabilitated by BHP. Activities within this sublease do not form part of the Project.

The approved MOPs for Mt Arthur Mine and the Maxwell Infrastructure both show potential integration between the final landforms. Malabar would continue consultation with BHP regarding potential interactions between the Maxwell Infrastructure and Mt Arthur Mine final landforms.

Further detail regarding consultation with BHP is provided in Section 5.

Transfer of Water

Similar to the approved arrangements for the existing Maxwell Infrastructure, water may be transferred between the Project and Mt Arthur Mine, providing appropriate commercial terms are in place between Malabar and BHP. Any transfer infrastructure between the two sites would be located along previously disturbed land and would be documented in the MOPs for both operations.

Cumulative Impacts

Mt Arthur Mine has approval to realign and upgrade the northern portion of Edderton Road to allow for future mining operations. Malabar has, therefore, assessed the potential impacts of road realignments cumulatively (Section 6.14.3).

Relevant cumulative impacts associated with the operation of the Project and the Mt Arthur Mine have been considered in this EIS, including groundwater, surface water, aquatic ecology, noise, air quality, agriculture, road and rail interactions, visual and landscape character and employment and population effects (Sections 2.3.9 and 6).

2.3.4 Antiene Rail Spur

The Project would also involve the use of the Antiene Rail Spur, which is shared with the Mt Arthur Mine and is regulated under a separate Development Consent (DA 106-04-00). The Project would operate within current rail limits on the Antiene Rail Spur for the Maxwell Infrastructure over an extended period.

Potential cumulative noise impacts associated with the operation of the Project and the Antiene Rail Spur over the life of the Project have been considered in this EIS (Section 6.15).

2.3.5 Liddell and Bayswater Power Stations

Final Voids

AGL granted Anglo American plc a lease to occupy its land within ML 1531 to facilitate mining activities.

Under the existing arrangement, AGL has the right to claim identified final voids by means of a transfer of ML 1531 and to seek planning and other required approvals to authorise disposal of fly-ash from AGL's power stations in the existing voids in ML 1531. In this scenario, AGL would assume responsibility for the final rehabilitation of the transferred area, which would be released from ML 1531.

Consultation with AGL is ongoing regarding AGL's rights under the existing arrangement and the potential negotiation of a revised arrangement (Section 5.3.4). In the event that AGL does not elect to use the void that remains within ML 1531 under the existing arrangement, Malabar would be responsible for final rehabilitation consistent with statutory requirements. The rehabilitation strategy for the Project is described in Section 7.

Transport and Services Corridor

An overpass across the existing AGL-owned conveyor, which transports coal from the Mt Arthur Mine to Bayswater Power Station, and access to AGL-owned land is required to facilitate the construction of the transport and services corridor for the Project.

Malabar has agreement with AGL regarding the traversing of its land by the transport and services corridor. The proposed overpass of the AGL-owned conveyor would be finalised as part of the detailed design process.

Cumulative Impacts

As described in Section 2.2.6, closure of the Liddell Power Station is planned for 2022, and closure of the Bayswater Power Station is planned for 2035.

Relevant cumulative impacts associated with the operation of the Project and the Liddell and Bayswater Power Stations have been considered in this EIS, including groundwater, surface water, air quality, visual and landscape character, and employment and population effects (Sections 2.3.9 and 6).

2.3.6 Spur Hill Underground Coking Coal Project

Spur Hill Management Pty Ltd (a wholly owned subsidiary of Malabar) owns EL 7429, immediately west of EL 5460. Substantial exploration works have been completed since the grant of EL 7429.

Malabar is continuing to undertake work to enhance its geological understanding of the area, with the current focus on the zone where EL 5460 meets EL 7429. The improved understanding will be used to optimise the development plans for the Spur Hill Underground Coking Coal Project. At this stage, it is not anticipated that the Spur Hill Underground Coking Coal Project would proceed as proposed in previous documentation.

Any future integration of the Maxwell Project and the Spur Hill Underground Coking Coal Project would be subject to future separate rigorous environmental assessment and approvals, including assessment of any potential cumulative impacts.

On this basis, potential cumulative impacts from the Spur Hill Underground Coking Coal Project have not been assessed in this EIS. An assessment of cumulative impacts would occur at the appropriate stage in the future.

2.3.7 Other Mining Developments

Bengalla Mine

The Bengalla Mine is an open cut coal mine located 4 km west of Muswellbrook (Figure 1-1). The Bengalla Mine is owned by Bengalla Mining Company Pty Ltd, a joint venture between New Hope Group and Taipower.

Development Consent SSD-5170 (as modified) permits open cut coal mining operations and associated activities to 2039, with open cut mining at a rate of up to 15 Mtpa of ROM coal.

There would be no direct interaction between the Project and the Bengalla Mine; however, potential cumulative impacts have been considered in relation to air quality, road and rail traffic interactions, and employment and population effects (Sections 2.3.9 and 6).

Hunter Valley Operations

The Hunter Valley Operations Mining Complex (HVO) is an open cut coal mine located approximately 24 km north-west of Singleton (Figure 1-1). HVO is owned under a joint venture between Yancoal Australia Ltd and Glencore Coal Pty Ltd (a subsidiary of Glencore plc).

HVO comprises two operations:

- HVO South, an open cut coal mine approved to produce up to 20 Mtpa of ROM coal; and
- HVO North, an open cut coal mine approved to produce up to 12 Mtpa of ROM coal from the West Pit and 10 Mtpa of ROM coal from the Carrington Pit.

Under Development Consent DA 450-10-2003, the Hunter Valley Coal Preparation Plant can process up to 20 Mtpa of coal, and the West Pit Coal Preparation Plant up to 6 Mtpa of coal. Both preparation plans are part of HVO.

HVO North and HVO South are approved to operate up to 12 June 2025 and 24 March 2030, respectively.

There would be no direct interaction between the Project and HVO; however, potential cumulative impacts have been considered in relation to air quality, and employment and population effects (Sections 2.3.9 and 6).

Mount Pleasant Operation

The Mount Pleasant Operation is a thermal coal project and is located immediately to the north of the Bengalla Mine and approximately 4 km north-west of Muswellbrook (Figure 1-1). The Mount Pleasant Operation is owned by MACH Energy Australia Pty Ltd (MACH Energy). The approved Mount Pleasant Operation permits extraction of up to 10.5 Mtpa of ROM coal until December 2026.

Mining operations at Mount Pleasant Operation commenced in November 2017 in accordance with Development Consent DA 92/97.

There would be no direct interaction between the Project and the Mount Pleasant Operation; however, there would be interaction with both road and rail traffic, as well as cumulative employment and population effects. These interactions are considered in Sections 2.3.9 and 6.

Mangoola Mine

The Mangoola Mine is an open cut coal mine located approximately 20 km west of Muswellbrook and 20 km north-west of the Project (Figure 1-1). Mangoola Mine is owned by Mangoola Coal Operations Pty Ltd (a subsidiary of Glencore plc) and is approved to produce up to 13.5 Mtpa of ROM coal until November 2029 under Project Approval 06_0014 (as modified).

There would be no direct interaction between the Project and the Mangoola Mine; however, there would be interaction with both road and rail traffic, employment and population effects. These potential interactions are considered in Sections 2.3.9 and 6.

Mangoola Coal Continued Operations Project

The Mangoola Coal Continued Operations Project would involve an extension of open cut mining operations at the Mangoola Mine into a new mining area north of existing operations (i.e. further away from the Project), and an extension of the mine life to 2030. Mining would occur at the currently approved ROM coal extraction rate, with no change to the existing approved operational workforce (Mangoola Coal Operations Pty Ltd, 2019).

An Environmental Impact Statement for the proposed Mangoola Coal Continued Operations Project commenced exhibition in July 2019.

There would be no additional interactions in terms of rail traffic beyond that of the existing Mangoola Mine, given that there would be no change to the approved ROM coal extraction rate or train movements (Mangoola Coal Operations Pty Ltd, 2019).

Potential cumulative impacts of the Mangoola Coal Continued Operations Project have been considered in relation to employment and population effects and road traffic interactions in the event that the construction phases for the two projects coincide (Sections 2.3.9 and 6).

Dartbrook Mine

The Dartbrook Mine is located approximately 10 km north-west of Muswellbrook (Figure 1-1). The Dartbrook Mine has been in care and maintenance since December 2006 and was acquired by AQC Dartbrook Management Pty Limited (AQC), a wholly owned subsidiary of Australian Pacific Coal Limited, in May 2017.

AQC lodged an Environmental Assessment in support of a modification to the Dartbrook Mine Development Consent in June 2018 (DA 231-7-2000 MOD 7). MOD 7 to the Dartbrook Mine would involve bord and pillar mining of up to 1.5 Mtpa of ROM coal until December 2027 and would facilitate the recommissioning of mining operations at Dartbrook Mine (Australian Pacific Coal Limited, 2018).

There would be no direct interaction between the Project and the Dartbrook Mine; however, there would be interaction with both road and rail traffic, as well as cumulative employment and population effects. These interactions are considered in Sections 2.3.9 and 6.

Dartbrook Open Cut Project

AQC has publicly stated it is investigating the feasibility of an open cut mining operation at the Dartbrook Mine site. It is understood that feasibility studies on an optimised mine plan are underway (AQC, 2018).

At the time of preparation of this EIS, AQC has not released any public information regarding the extent or timing of open cut mining at Dartbrook Mine. On this basis, cumulative impacts with this proposal have not been assessed. AQC would be required to assess cumulative impacts associated with any future application for an open cut proposal.

Greater Ravensworth Area Operations

The Greater Ravensworth Area Operations are located approximately 20 km south-east of Muswellbrook and comprises three mining operations, specifically the Ravensworth Operations, Liddell Coal Operations and the Mt Owen Complex. The Greater Ravensworth Area Operations are owned and operated by Glencore Coal Pty Limited (a subsidiary of Glencore plc).

The Ravensworth Operations are approved, under Project Approval 09_0176, to produce high-quality thermal and semi-soft coking coal by open cut mining methods at a maximum of 16 Mtpa of ROM coal. Coal extraction at the Ravensworth Operations are approved up to 31 December 2039.

The Liddell Coal Operations involves open cut mining activities at a rate of up to 8 Mtpa of ROM coal under Development Consent DA 305-11-01, which expires on 31 December 2028.

The Mt Owen Complex holds three separate Development Consents:

- Glendell has approval to extract up to 4.5 Mtpa of ROM coal through open cut mining under Development Consent DA 80/952 until June 2024;
- Mt Owen Mine has approval to extract up to 10 Mtpa of ROM coal from open cut mining under Development Consent DA 14-1-2004 until December 2031; and
- Ravensworth East has approval to extract up to 4 Mtpa of ROM coal from open cut mining under Development Consent DA 52-03-99 until March 2021.

There would be no direct interaction between the Project and the Greater Ravensworth Area Operations; however, there would be potential interaction with employment and population effects. These potential interactions are considered in Sections 2.3.9 and 6.

Dellworth Pty Limited

EL 6812 is located to the north-east of the Project and is held by Dellworth Pty Limited (Dellworth), a subsidiary of NuCoal Resources Ltd (NuCoal). EL 6812 overlaps land owned by Malabar and parts of the transport and services corridor for the Project.

Malabar has consulted with NuCoal regarding the potential interaction of the Project with EL 6812 (Section 5.3.4). NuCoal indicated it has no issues in relation to the Project to date.

As NuCoal has not released any public information regarding the extent or timing of any future mining in EL 6812, this EIS does not consider cumulative impacts associated with any mining activities in EL 6812.

2.3.8 Agricultural Developments

Godolphin Woodlands Stud and Coolmore Stud are located south of the Maxwell Underground and south of the Golden Highway. These internationally-owned thoroughbred horse-breeding studs are considered to play an important role in the Hunter thoroughbred industry (DP&E, 2015).

Due to the proximity of the Project to the Godolphin Woodlands Stud, Coolmore Stud and other agricultural developments, this EIS considers a range of potential interactions, including but not limited to cumulative impacts to biodiversity, air quality, noise, access to water resources, transport routes, and landscape and visual character.

2.3.9 Overview of Approach to Cumulative Impact Assessment

Table 2-2 provides an overview of the approach to cumulative impact assessment taken for the key studies completed in support of this EIS. In particular, Table 2-2 describes:

- how cumulative impacts have been considered, including the Project's relative contribution to those cumulative impacts;
- which past, present and reasonably foreseeable planned developments are relevant due to their proximity and/or potential to interact with potential Project impacts; and
- how cumulative impacts are separately assessed and/or managed through strategic planning or policy.

Table 2-2
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Subsidence	There are no relevant applicable strategic planning or policy considerations in addition to the EP&A Act framework.	The Subsidence Assessment (Appendix A) considers cumulative subsidence predictions and potential impacts from all seams proposed to be mined as part of the Project. There are no past, present or reasonably foreseeable planned developments that would result in surface subsidence that would interact with subsidence associated with Project activities.
Groundwater	Cumulative impacts on groundwater sources have been assessed in accordance with the minimal impact considerations in the *NSW Aquifer Interference Policy* (AIP) (NSW Government, 2012a), which includes cumulative considerations. Cumulative impacts on groundwater and surface water sources are managed through water sharing plans. Water sharing plans provide a number of functions, including, but not limited to (Department of Industry, 2019): • providing water for the environment by protecting a proportion of the water available for fundamental ecosystem health and/or including specific environmental rules; • protecting the water required to meet basic landholder rights; • setting annual limits on water extractions to ensure that water extractions do not increase and therefore reduce the water available to the environment or the security of supply to water users; • determining how water is shared among different types of licensed users by setting the priorities of supply; and • specifying rules to minimise impacts on other groundwater users, dependent ecosystems, water quality and the stability of the aquifer. Attachment 8 outlines how the Project would be undertaken in accordance with relevant water sharing plans. Cumulative salinity impacts on the Hunter River are managed through the Hunter River Salinity Trading Scheme. The Project does not propose any controlled release of water under this Scheme.	The numerical modelling conducted for the Groundwater Assessment (Appendix B) incorporates past, present and approved activities at the Mt Arthur Mine (both open cut and underground mining activities). The numerical modelling also includes previous mining activities at the Maxwell Infrastructure and the surface water and fly-ash storages used by the Liddell Power Station and Bayswater Power Station. Other mining operations in the region (such as the Bengalla Mine, Mangoola Mine and HVO) would not materially interact with groundwater intersected as part of the Project. The effects of other aquifer interference activities on the groundwater system (such as agricultural water use) are captured by calibrating the numerical groundwater model to observed groundwater levels.
Surface Water		The Surface Water Assessment (Appendix C) considers past, present and approved activities at the Maxwell Infrastructure, Mt Arthur Mine (both open cut and underground mining activities), Liddell Power Station and Bayswater Power Station in the cumulative assessment of potential impacts on local watercourses. The assessment is also undertaken in the context of previous and existing agricultural and other land management practices in the area.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Geomorphology	There are no relevant applicable strategic planning or policy considerations in addition to the EP&A Act framework.	The Geomorphology Assessment (Appendix D) considers potential impacts on geomorphic forms and processes in the context of previous and existing agricultural and land management practices that have occurred in the area. There are no reasonably foreseeable planned developments that would interact with potential Project impacts on geomorphic forms and processes.
Terrestrial Biodiversity	Cumulative impacts on biodiversity are managed through the requirement for the provision of biodiversity offsets under NSW *Biodiversity Conservation Act, 2016* (the BC Act) (and its predecessor the *Threatened Species Conservation Act, 1995*) and the Commonwealth EPBC Act, which seek to conserve biodiversity in the long-term.	The Project is proposed in a landscape that has been impacted by previous and existing agricultural and land management practices and open cut mining operations. The BDAR (Appendix E) considers the potential cumulative impacts of vegetation and habitat disturbance associated with previous open cut mining activities, ongoing rehabilitation activities and the Maxwell Solar Project. The direct loss of habitat associated with the Project in combination with the proposed offset provisions would result in no net loss cumulatively in biodiversity (Appendix E).
Aquatic Ecology and Stygofauna	The management of cumulative impacts on groundwater and surface water resources (which provide aquatic ecology and stygofauna habitat) is discussed above. Cumulative impacts on aquatic ecology are managed under the NSW *Fisheries Management Act, 1994* (the FM Act) and the BC Act which include the objectives of conserving fish stocks, key fish habitats and threatened species, populations and ecological communities.	The assessment of baseline aquatic ecology and stygofauna habitat has been completed in the context of previous and existing agricultural and other land management practices in the area. The Aquatic Ecology and Stygofauna Assessment (Appendix F) considers the outcomes of the Groundwater Assessment (Appendix B) and Surface Water Assessment (Appendix C), which include assessment of cumulative impacts, as described above.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Aboriginal Cultural Heritage	The *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (NSW Office of Environment and Heritage [OEH], 2011) requires the consideration of cumulative impacts as a component of the ACHA (in particular, the nature and extent of the Aboriginal objects proposed to be harmed in relation to other identified sites in the region). The Department of Urban Affairs and Planning established the Upper Hunter Aboriginal Cultural Heritage Trust in 2001 for the purposes of funding regional Aboriginal heritage studies in the Upper Hunter and to provide a framework for Aboriginal cultural heritage management. The Upper Hunter Aboriginal Cultural Heritage Trust has funded a number of projects that contribute to the knowledge and understanding of Aboriginal cultural heritage across the Upper Hunter.	The ACHA (Appendix G) considers the Project's potential impacts on Aboriginal heritage relative to the known and potential archaeological resource in the region. The Project would result in an approximate 0.18% decline in the region's potential open artefact resource (Appendix G). As such, AECOM (Appendix G) concludes that the impact of the Project on the potential Aboriginal archaeological resource of the region would not be significant. Therefore, the Project would not materially contribute to potential cumulative impacts. Mitigation measures have been developed for the Project's potential impacts on Aboriginal heritage as described in Section 6.12.4.
Historic Heritage	Priorities for the conservation of heritage sites and places are established through statutory registers of heritage sites and places at a Commonwealth, State and local government level.	The Project is proposed in a landscape that has been impacted by previous and existing agricultural and other land management practices and open cut mining operations. These land uses create the baseline landscape against which potential cumulative impacts are considered in the Historic Heritage Assessment (Appendix H). The Historic Heritage Assessment (Appendix H) describes that there has been some incremental loss of historic places as a result of mining operations and other activities, over many years. However, the Project would not result in any additional direct impacts on heritage places. There would be no material adverse impacts on the cultural landscapes as a result of the Project and, therefore, the Project would not materially contribute to potential cumulative impacts.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Noise	The *Noise Policy for Industry* (NSW Environment Protection Authority [EPA], 2017) sets project amenity noise levels to regulate cumulative noise impacts from industry. Cumulative impacts from rail noise are assessed in accordance with Appendices 2 and 3 of the *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013). Cumulative rail noise impacts along the Main Northern Railway would continue to be regulated under the Australian Rail Track Corporation's (ARTC's) EPL 3142. Cumulative impacts from traffic-generating developments are managed through the *NSW Road Noise Policy* (NSW Department of Environment, Climate Change and Water [DECCW], 2011), which sets assessment criteria to limit any additional traffic noise impacts as far as practicable. Strategic planning documents (such as local environmental plans [LEPs]) also address the cumulative impacts of transport and land use development to minimise exposure to unacceptable noise levels (e.g. through land zoning).	The Noise Impact Assessment (Appendix I) assesses cumulative noise levels based on the relative noise contributions from the Project and the Mt Arthur Mine. The contribution of noise from the Mt Arthur Mine was taken from predictions of noise emissions included in *Mt Arthur Coal Open Cut Modification – Noise and Blasting Assessment* (Wilkinson Murray, 2013). The Project has been assessed against the relevant project amenity noise levels and would comply at all identified sensitive receivers (Appendix I). Wilkinson Murray (Appendix I) concludes that the Liddell Power Station, Bayswater Power Station, Bengalla Mine, HVO, Greater Ravensworth Area Operations and mining operations further afield would have a negligible impact on noise levels at sensitive receivers in the vicinity of the Project, due to their locations relative to the Project. The assessment of potential rail noise impacts along the Antiene Rail Spur considers the cumulative rail movements of both the Project and the ongoing operation of the Mt Arthur Mine (until the end of 2026). Cumulative rail movements along the Main Northern Railway are considered at the point that the Antiene Rail Spur joins the line, including currently approved average daily train movements and other projects in the planning phase which will potentially involve additional future movements (Appendix I). Assessment of potential road noise impacts includes cumulative traffic volumes (including from other mining developments) estimated by the Road Transport Assessment (discussed further below).
Air Quality	The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016) sets air quality goals for the total dust burden in the air (i.e. the cumulative impact) and not just the incremental dust from the Project. Continuous improvement in the management of potential dust impacts from coal mining operations is regulated by the EPA through a range of initiatives and actions. This includes attaching legally binding Pollution Reduction Programs (PRPs) to EPLs issued by the EPA (EPA, 2018).	The Air Quality and Greenhouse Gas Assessment (Appendix J) models ongoing rehabilitation activities at the Maxwell Infrastructure, along with the following mining operations with the potential to tangibly influence the dust levels at sensitive receivers near the Project: • Mt Arthur Mine. • Bengalla Mine. • HVO. The potential dust contributions of the above operations were estimated based on the currently approved production limit at the operation. The Air Quality and Greenhouse Gas Assessment (Appendix J) includes an allowance for other background dust levels, which is based on background monitoring data and would capture sources such as the Liddell Power Station, Bayswater Power Station, Mount Pleasant Operation, Mangoola Mine, Greater Ravensworth Area Operations, agricultural activities and urban activities.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Road Transport	Strategic road network planning is managed by the RMS for State roads and by Muswellbrook Shire Council for regional and local roads. Road maintenance and upgrades are funded through a variety of mechanisms, including, but not limited to, light vehicle and heavy vehicle registration charges, Council rates and direct maintenance contributions.	The Road Transport Assessment (Appendix K) is based on surveyed traffic volumes, which include the contribution of existing developments, such as the Mt Arthur Mine, Bengalla Mine, Mount Pleasant Operation, Mangoola Mine, Muswellbrook Industrial Area and care and maintenance activities at the Maxwell Infrastructure. The Road Transport Assessment accounts for reasonably foreseeable changes in traffic volumes associated with the: • Maxwell Solar Project. • Mt Arthur Mine. • Mount Pleasant Operation. • Bengalla Mine. • Mangoola Mine. • Dartbook Mine. In addition, the Road Transport Assessment applies a background growth rate to current traffic volumes to account for general population and industrial growth and changes in population or travel behaviour (Appendix K). Traffic reductions associated with the planned closure of Liddell Power Station have conservatively not been quantified (Appendix K). An addendum to the Road Transport Assessment (Appendix K) reviewed the implications of the Project construction phase coinciding with the construction phase of the Mangoola Coal Continued Operations Project, and determined that the assessment conclusions would not change. The cumulative impacts on travel time along Edderton Road associated with the potential realignment proposed as part of the Project and the approved realignment for the Mt Arthur Mine have also been assessed (Appendix K). The Road Transport Assessment concludes that no specific measures or upgrades are required to mitigate the impacts of the Project on the capacity, safety and efficiency of the road network (Appendix K).

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Social and Community Infrastructure	Land use and infrastructure planning priorities and decisions are undertaken by the NSW Government (e.g. through the *Hunter Regional Plan 2036* [NSW Government, 2016] and *Upper Hunter Economic Diversification Action Plan: Implementation Priorities* [NSW Government, 2018a]) and by local Councils. The funding, delivery and strategy planning of community and social infrastructure is the responsibility of a number of Government agencies.	The Project would be developed in a region already heavily dominated by mining operations. These operations form part of the existing industry operating environment and, as such, are reflected in the social baseline characteristics (e.g. population and housing) considered in the SIA (Appendix L). The SIA (Appendix L) includes consideration of the following cumulative impacts on social and community infrastructure: • development and operation of the Maxwell Solar Project; • commencement and operation of developments that may occur within a similar timeframe as the Project (Dartbrook Underground and Mt Arthur Underground); • the proposed Mangoola Coal Continued Operations Project that would extend the life of the Mangoola Mine and would involve a 16 month construction phase, but would not alter the existing full-time operational workforce; and • operations that are planned for closure in the first five years of the Project's operation (the Liddell Power Station and Muswellbrook Coal Mine). The SIA (Appendix L) concludes that the Project would result in only small incremental increases in demand for services (such as medical services, police and emergency services, childcare, education and training, Council services and facilities) that would be within the limits of projected population growth. Therefore, the Project would not materially contribute to potential cumulative impacts. The SIA also considers the outcomes of other studies described in this table, which include assessment of cumulative impacts.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Economic Effects	The *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2015) and the *Technical Notes Supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DP&E, 2018) set the framework for the consideration of economic effects of mining projects. The framework includes consideration of both the net economic benefits of a project to the NSW community through a Cost Benefit Analysis and the likely effects of a project on the locality through a Local Effects Analysis. Cost Benefit Analysis is designed to identify and analyse the incremental impacts of a project. This is because the net position of the incremental costs and benefits of a project are the critical decision-making item from an economic point of view. This means that Cost Benefit Analysis is not well suited to identification of cumulative effects (Appendix M). Cumulative effects on the local and State economies are considered as part of the Local Effects Analysis.	The Local Effects Analysis in the Economic Assessment (Appendix M) analyses the flow-on benefits of the Project to the local and State economies using a computable general equilibrium (CGE) model. A CGE model takes into account the current production capacity of the economy, such as the spare machinery and labour available, as well as the likely demand for new outputs. This means that the CGE model considers the economic impact of the Project in a cumulative sense: the Project must compete with other similar projects for scarce economic resources as inputs and also must compete internationally in output markets. Consideration of the compatibility of the Project with existing, approved and likely preferred land uses is provided in Section 9.1.5.
Landscape and Visual Character	Land use planning decisions, which affect the region's landscape and visual character, are undertaken by the NSW Government and by Muswellbrook Shire Council.	The Project is proposed in a landscape that has been impacted by previous and existing agricultural and land management practices, open cut mining operations and other industrial developments (e.g. Liddell and Bayswater Power Stations). The Landscape and Visual Impact Assessment (Appendix N) has been prepared in this context. As a proposed underground mining operation, the Project is visible at a limited number of sensitive receptors and the visible features would be at a significantly smaller scale than surrounding open cut mining operations. The Project also incorporates a number of design elements to reduce potential visual impacts. Therefore, the Project would not materially contribute to potential cumulative impacts on landscape and visual character.

Table 2-2 (Continued)
Overview of Approach to Cumulative Impact Assessment

Study	Consideration of Applicable Strategic Planning and Policy	Consideration of Relevant Other Developments
Agriculture	Land use planning decisions, which affect the land available for agriculture, are undertaken by the NSW Government (e.g. through the *Hunter Regional Plan 2036* [NSW Government, 2016]) and by Muswellbrook Shire Council.	The assessment of potential impacts on the availability and productivity of agricultural land in the Agricultural Impact Statement (Appendix Q) includes the establishment of Malabar's Maxwell Solar Project on land at the Maxwell Infrastructure. The Agricultural Impact Statement concludes there would be no material change in agricultural production from the Project area with the implementation of appropriate management measures (with the potential for an improvement in production). Therefore, the Project would not materially contribute to potential cumulative impacts on the regional agricultural industry. The Agricultural Impact Statement also considers the outcomes of other studies described in this table, which include assessment of cumulative impacts.
Human Health	The management of cumulative impacts on groundwater, surface water, the noise environment and air quality (which all have the potential to affect human health) is discussed above.	The Human Health Risk Assessment (Appendix R) assesses both cumulative exposure and the incremental risk associated with the Project, and considers relevant available health-related indicators and statistics for the Project area and surrounds. The Human Health Risk Assessment is based upon the outcomes of the Groundwater Assessment (Appendix B), Surface Water Assessment (Appendix C), Noise Impact Assessment (Appendix I) and Air Quality and Greenhouse Gas Assessment (Appendix J). These assessments include consideration of cumulative impacts, as described above.
Greenhouse Gas Emissions	The assessment of cumulative impacts of greenhouse gas emissions and the management of greenhouse gas emissions are described further in Sections 6.19 and 9. In summary, this includes: • The international climate change framework, including the *Paris Agreement*. • Australia's Nationally Determined Contribution (NDC) under the framework of the *Paris Agreement*, and the laws and policies that Australia has adopted for the purposes of facilitating the achievement of its NDC. • The domestic climate change laws, policies, NDCs and objectives of the countries that would be export destinations for the Project's coal. • The climate change law and policy framework in NSW, including the *NSW Climate Change Policy Framework* (OEH, 2016a).	The Air Quality and Greenhouse Gas Assessment (Appendix J) estimates the incremental greenhouse gas emissions associated with the Project with reference to the *National Greenhouse Accounts Factors* (Commonwealth Department of the Environment and Energy [DEE], 2018). The average annual contribution of greenhouse emissions from the Project (Scopes 1 and 2) in comparison to the Australian greenhouse emissions for the 2016 period is estimated to be approximately 0.08% (Appendix J). Cumulative considerations are addressed through strategic planning and policy.
Rehabilitation and Mine Closure	There are no relevant applicable strategic planning or policy considerations in addition to the EP&A Act and NSW *Mining Act, 1992* framework.	The Preliminary Rehabilitation and Mine Closure Strategy (Malabar, 2019a) (Appendix U) considers relevant interactions with the Maxwell Solar Project, the Antiene Rail Spur, the adjacent Mt Arthur Mine landform and the Liddell Ash Dam at the adjacent Liddell Power Station.