2 Project need and context

2.1 Project need

CHC is developing the Project to supply coal to four of six large coal-fired power stations operating in NSW. The historical development of the electricity industry in NSW, including the construction of these power stations and their coal supply arrangements, is described below.

An overview of the geology, environmental and social context in which the Project will be developed is also provided. Detailed descriptions of the existing environment are provided in Chapters 6 to 21 'Impact assessment'.

2.1.1 Electricity generation in NSW

i Electricity industry development

Mains electricity was first introduced to NSW in 1904. Over the next 46 years, the rapidly expanding electricity market was supplied by councils or private companies operating power stations generally in urban areas close to the largest electricity demands. Coal was brought to the power stations from the coalfields by rail or ship. By the end of the 1940s, this decentralised system could not meet the state's electricity demands and there were crippling power shortages and blackouts from 1948 to 1953.

The Electricity Commission of NSW was established in 1950 to resolve these structural issues in the electricity industry. The commission had a monopoly to centrally plan the development of electricity infrastructure in NSW and then generate and transmit bulk electricity in the state.

Electricity demand in NSW grew by about 40 times between 1950 and 1996 and the commission built seven large coal-fired power stations to meet this increasing demand. The power stations were built near coal resources on the Central Coast (Eraring, Munmorah and Vales Point), in the Hunter Valley (Bayswater and Liddell) and in the Western Coalfield close to Lithgow (Mt Piper and Wallerawang). With the exception of Munmorah power station, these power stations continue to produce the majority of the state's electricity.

The commission was also an early pioneer of renewable technologies and energy efficiency initiatives in the 1990s.

In 1992, the commission was divided into six agencies covering generation, sale and distribution of electricity. By 1996, there were three state-owned corporations responsible for electricity generation — Delta Electricity, Macquarie Generation and Pacific Power (which later became Eraring Energy). The transmission lines were operated by TransGrid and electricity was distributed by six operators.

The electricity market was deregulated in 1996 and the market was allowed to determine electricity prices. This was assisted by the formation of the National Electricity Market in 1998 (see below).

ii Electricity supply and demand

NSW (combined with the Australian Capital Territory) has around 18,000 megawatts (MW) of installed electricity generation capacity. Interconnectors with Queensland and Victoria provide additional capacity of about 1,100 MW and 1,500 MW respectively (DTIRIS 2012a). NSW uses 78,800 gigawatt hours (GWh) of electricity annually (TransGrid 2011). Coal generates more than 90% of the electricity produced in NSW.

The remainder is generated by other types of power stations (mainly hydro-electrical stations) or is transferred from Victoria or Queensland (largely from coal-fired power stations).

It is forecast that electricity production, assuming medium economic growth and the introduction of a carbon price, will need to increase to some 92,700 GWh in 2020–21 (TransGrid 2011).

There are two potential alternatives to the large scale, base-load electricity generated by coal-fired power stations: gas and hydroelectricity. The NSW gas industry is small, and produces about 6% of the state's gas needs. It is unlikely gas will produce a larger proportion of NSW's power in the medium term. The state's hydroelectricity resources are well used and have little additional potential.

The market and a number of state and Commonwealth subsidy schemes have encouraged NSW electricity generators to invest in the production of renewable energy, such as from wind and solar. However, as these will only meet a small portion of NSW's electricity needs in the medium term, coal-fired power stations will continue to provide the majority of NSW's electricity before alternatives are implemented.

iii National electricity market

In 1996, the National Electricity Market (NEM) began operating to encourage efficient electricity production and distribution through trading electricity between states. The NEM allows excess electricity produced in one state to supply an electricity shortage in another.

Every power station in the NEM competes to supply electricity in the eastern states of Australia. The higher coal prices in NSW mean its power stations are used less, with the shortfall made up by electricity produced interstate. However, there are limitations on these transfers based on the capacity and security of the interconnecting transmission lines.

The NEM contains a mixture of generators owned by the private sector and government. As part of their risk management strategy, many of these generators have a guaranteed coal supply through owning mines near to their power stations. They also continue to expand existing mines or to develop new ones.

2.1.2 Coal supply

i Coal supply for electricity generation

Until 1973, the State Mines Control Authority supplied coal to NSW government instrumentalities, principally the Department of Railways and the Electricity Commission. In 1973, the four coal mines under the authority's control (Awaba, Liddell, Wyee and Munmorah) were transferred to the Electricity Commission, and then to Elcom Collieries Pty Ltd. The coal was used to generate the state's electricity. It was supplemented by coal bought under long-term contracts from privately owned mines that were developed in the Hunter Valley and Western Coalfield in the 1970s to 1990s. Elcom Collieries also developed mines in these areas and eventually operated seven underground mines and an open cut mine.

Elcom Collieries became Powercoal and was privatised in 2002 when it was acquired by Centennial Coal. Centennial Coal entered into further long-term contracts to supply coal to the power stations.

As the export coal industry developed in the Hunter Valley, it was matched by port and rail improvements that gave better access to foreign markets. Concurrently, many mining operations were acquired and consolidated by multinational companies that focused on the export market. Export demand and prices continued to increase over the decade from 2000 and, at the same time, the long-term coal contracts between the mines and the three state-owned generators began to expire. Thus the generators had to negotiate to buy coal from mines that could export all the coal they produced. They often received small, or no, bids from mines to supply coal, or were forced to pay much higher prices close to export levels. This reduced the ability of the NSW generators to produce affordable electricity.

As no mines have been planned by the private sector to produce domestic coal and no mining titles have been reserved to produce coal to supply NSW power stations since 2002, an alternative domestic coal supply is required.

ii Future coal supply for power generation

The search for domestic coal supply led the three state-owned generators (Macquarie Generation, Delta Electricity and Eraring Energy) to form an unincorporated joint venture and apply for a coal exploration licence with a view to developing a mine to secure domestic coal supplies. EL 7394 was awarded to the unincorporated joint venture in 2009. The unincorporated joint venture become CHC in 2011 and has extensively explored in EL 7394 and confirmed it contains a coal resource that can meet the requirements for electricity generation.

CHC has entered into long-term (17 years) coal supply contracts with the state-owned electricity generators, Macquarie Generation and Delta Electricity, and the publically-listed company, Origin Energy, which operates Eraring Power Station. These contracts will supply about 30% of all of the coal used for electricity production in NSW and are essential for the secure supply of electricity in the state. The remaining coal required for power generation will need to be sourced from private mine operators.

The Project will not supply coal to the Mount Piper or Wallerawang power stations, which are owned by Delta Electricity. These will continue to be supplied by mines in the south of the Western Coalfield.

iii Project need

The NSW generators require a reliable, secure and economically stable domestic coal supply so they can provide affordable electricity in NSW. The Project is being developed to meet this need. The coal resource in EL 7394 should meet all of the criteria for it to supply four of NSW's six large coal-fired power stations:

- the resource must be accessible to an entity that is committed to supplying coal to the power stations — EL 7394 (held by CHC) is the only NSW exploration licence held for supplying coal to the NSW generators and will be converted to a mining licence if the Project is approved;
- it must be possible to extract the coal without unacceptable social and environmental impacts — this EA concludes this is the case (see Chapter 24 'Project Justification');
- there must be enough of the resource to meet long-term contract requirements — the Australasian Joint Ore Reserves Committee (JORC)-compliant measured coal resource of 440 Mt is sufficient to meet the coal supply contracts;
- there must be an efficient means to transport the coal to the power stations — the Project is close to existing rail infrastructure;

- it must be possible to extract the coal economically — the Project will extract and transport the coal to power stations at a cost that is substantially below that of the export price; and

- the coal must be of the right quality for power generation — the coal can be used directly or treated so it can be used for domestic power generation.

There are no other coal resources in NSW that meet all of these criteria. All other coal mines and exploration titles in NSW are being developed almost exclusively to produce export coal. If the Cobbora resource is not developed:

- the generators will be more exposed to the volatile thermal coal price on the international market;

- electricity generation in NSW will increasingly depend on interstate electricity transfers with attendant higher environmental and financial costs; and

- there will be a real risk of substantial social costs for NSW electricity consumers because electricity prices would be relatively high compared to other parts of Australia and supply security may be jeopardised.

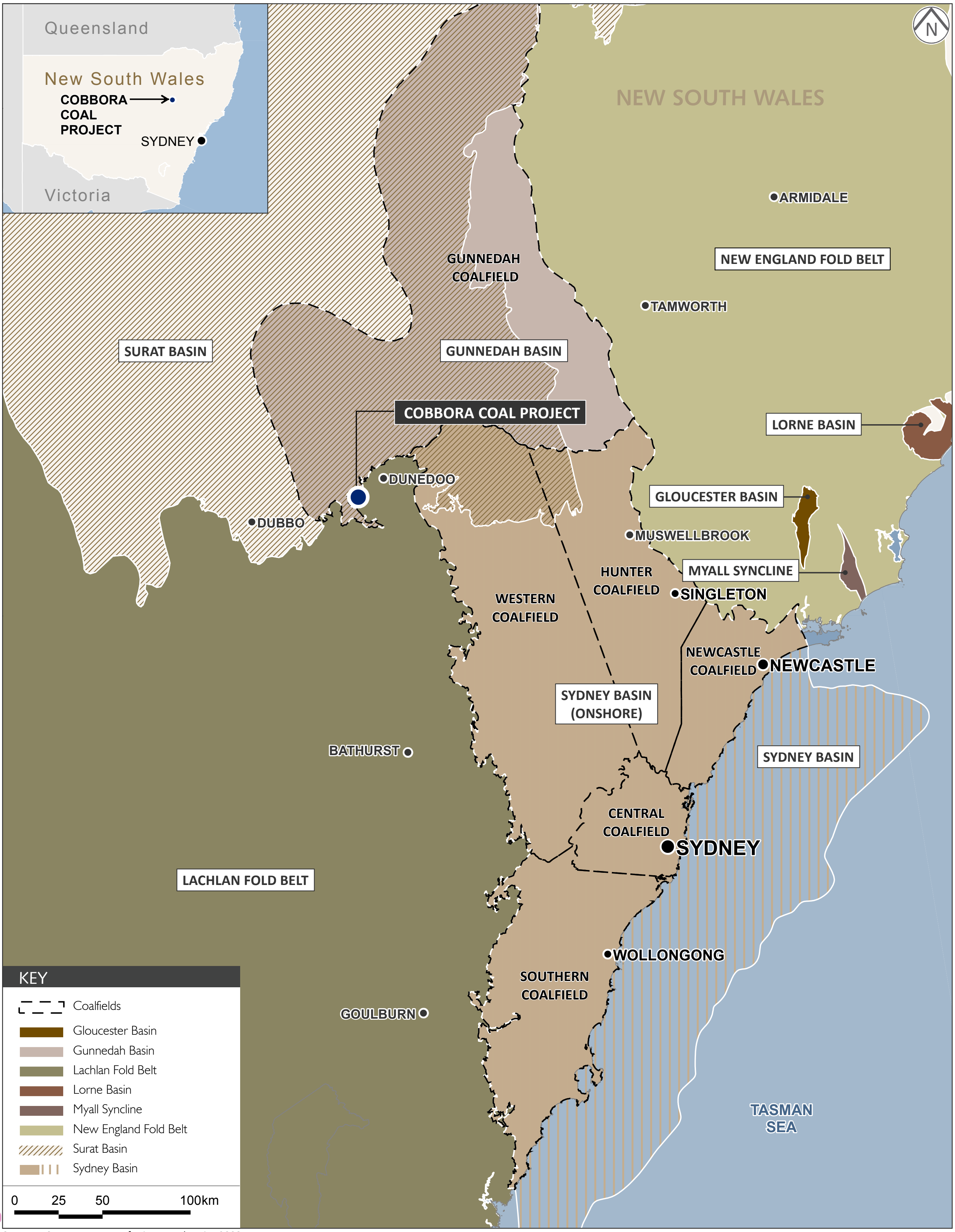
2.2 Project context

2.2.1 Regional geology

The sedimentary basin containing the Cobbora coal deposit is in the southern part of the Gilgandra Trough, which has been classified by the Department of Planning and Infrastructure (DP&I) as a south-western extension of the Gunnedah Basin (Figure 2.1). This part of the Gilgandra Trough is separated from the Western Coalfield by Palaeozoic strata of the Rocky Glen Ridge to the east. It is also separated from the main section of the Gunnedah Basin by the northern extension of the Rocky Glen Ridge, the Dunedoo High, to the north. Apart from the Ulan Seam, the correlation between the rock strata in the Cobbora deposit and the strata in the Western Coalfield or the Gunnedah Basin is uncertain.

The Cobbora region contains Pre-Permian metamorphic basement rocks that are overlain by coal-bearing strata and sediments dating from the Triassic and Jurassic periods. Sporadic volcanic rocks intrude and overlie the older material. Undulating plains cover the coal-bearing Permian strata while the overlying sediments of the Triassic Digby Formation occur as sandstone ridges that trend to the north-west.

A regional fault identified as the Laheys Creek Fault (but yet to be accurately delineated) runs through the deposit. The fault is believed to have a throw of about 20 m in the north, diminishing to some 2 m in the south. Other minor faults have been intersected by the exploration drilling programs and are known to exist in localised areas.



Source: NSW Department of Primary Industries 2008

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Regional Geology

Cobbora Coal Project - Environmental Assessment

Figure 2.1

2.2.2 Local geology

Over 500 holes have been drilled in the area since the late 1970s, all of which were used to varying extents to characterise the local geology.

Recent exploration indicates the geological structure of the Cobbora coal deposit is relatively simple. The primary structure is a sinuous syncline (ie a fold of rock layers that slope upwards on both sides of a common low point). The regional dip increases on both flanks of the syncline and, to the west, the sediments lap unconformably onto the underlying basement strata of the Lachlan Fold Belt (ie the sedimentary strata are discontinuous with the underlying strata). The proposed pits are located on a 15° to 20° westerly dipping limb of the 15° south-easterly plunging syncline.

The Upper Permian rock strata contain five potentially mineable coal seams, which in descending stratigraphic order are the Trinkey, Whaka and Flyblowers Creek seams and two splits of the Ulan Seam. The stratigraphy down to and including the Permian strata is summarised in Table 2.1. Strata of various descriptions and unknown thicknesses from the Devonian, Silurian and Ordovician periods lie beneath the Permian strata. The Gunnedah Basin nomenclature is included in Table 2.1 for reference, and the mineable coal seams are highlighted.

Of the five seams in the Cobbora coal deposit, the main mining targets are the Flyblowers Creek and the Ulan Upper and Ulan Lower seams. The consistent distribution across the mining areas, shallow overburden cover, relatively low strip ratio and shallow dip of the seams will allow a relatively simple mining operation to be developed. The Trinkey and Whaka seams have generally higher ash content than the other seams and hence are deemed of marginal value to the proposed development.

Table 2.1 Summary of geological stratigraphy

Period	Group	Formation*	Description	Thickness
Quaternary		Alluvium	Gravels and sand with some clay layers associated with stream and river channels and floodplains	Up to 24 m along the Talbragar River
Tertiary		Basalts	Topographically inverted tertiary basalt flows forming caps on hills with some intrusive formations	variable
Jurassic		Pilliga Sandstone	Fine to coarse sandstone	>100 m
		Purlawaugh Formation	Mudstone, siltstone and sandstone	>100 m
Triassic		Napperby Formation	Siltstone and sandstone	~100 m (maximum)
	Narrabeen Group	Digby Formation	Fluvial lithic and quartz conglomerates, sandstones and minor fine grained sediments	~20 m

Table 2.1 Summary of geological stratigraphy *(Cont'd)*

Period	Group	Formation*	Description	Thickness
Permian	Dunedoo Formation	Trinkey Seam (Nea Subgroup)	Coal	2–5 m
	Dunedoo Formation	Ellismayne Formation (Nea Subgroup)	Interbedded siltstone, sandstone and claystone	2–18 m
	Dunedoo Formation	Whaka Formation (Nea Subgroup)	Interbedded carbonaceous claystone and tuff with stony coal seams	2–14 m
	Dunedoo Formation	Avymore Claystone (Coogal Subgroup)	Claystone	1–13 m
	Dunedoo Formation	Flyblowers Creek Seam (Coogal Subgroup)	Coal seam with minor tuff	3–5 m
	Dunedoo Formation	Tomcat Gully Sandstone (Coogal Subgroup)	Coarse sandstone and conglomerate, some shale	3–13 m
	Dunedoo Formation	Upper Ulan Seam (Coogal Subgroup)	Coal, minor tuff	3–5 m
	Dunedoo Formation	C-Marker Clay (Coogal Subgroup)	Claystone	0.1–5 m
	Dunedoo Formation	Lower Ulan Seam (Coogal Subgroup)	Coal interbedded with tuff and shale	2–5 m
	Dunedoo Formation	Dapper Formation (Brothers Subgroup)	Coarse sandstone and lithic conglomerates	~60 m
		Early Permian sequence (Watermark, Porcupine and Maules Creek Formations)	Interbedded shales, siltstones and fine sandstone	unknown

*Note: *Gunnedah Basin nomenclature in brackets and mineable coal seams shaded.*

Coal seams tend to subcrop (or come close to the surface) continuously in a north-west to south-east line to the west of Laheys Creek and Spring Ridge Road, and can be observed outcropping in several locations within the PAA, including in the bed of Sandy Creek. A zone with no coal is present in the central part of the deposit where coal seams lap onto a small isolated basement high to the east of Sandy Creek. Permian age outliers occur in the east of the deposit where Triassic sediments resistant to erosion have protected the underlying Permian coal measures.

The surface geology is dominated by red–brown soils that have formed on the weathered Napperby Formation (see Chapter 9 ‘Soils and agriculture’). The depth of weathering, determined from drill cores, varies from 4 m in the south to more than 20 m in the north-east and averages 8 m across the deposit.

The waste rock will comprise mainly non-pyritic bedded and massive sandstone, with lesser siltstone, conglomerate and mudstone/claystone, and occasional carbonaceous zones. Siderite ($FeCO_3$) bands are also present in the waste rock, along with thin calcite ($CaCO_3$) veining in both the coal seams and waste rock.

2.2.3 Landscape

The landscape in the PAA is characterised by undulating terrain, with broad valleys and low hills. The maximum elevation is about 600 m AHD in the southern part of the PAA, with a high point of 580 m near to the mining area (in Tuckland State Forest). The area is mainly cleared for agriculture with some remaining areas of native vegetation (Figure 2.2).

2.2.4 Climate

The Köppen climate classification for the region is 'temperate with hot summer' (BoM 2010). The monthly mean minimum temperature ranges from 2°C to 17°C and the monthly mean maximum temperature ranges from 15°C to 32°C. Average climatic conditions recorded at the Dunedoo Post Office, about 22 km north-east of the mining area, are presented in Table 2.2.

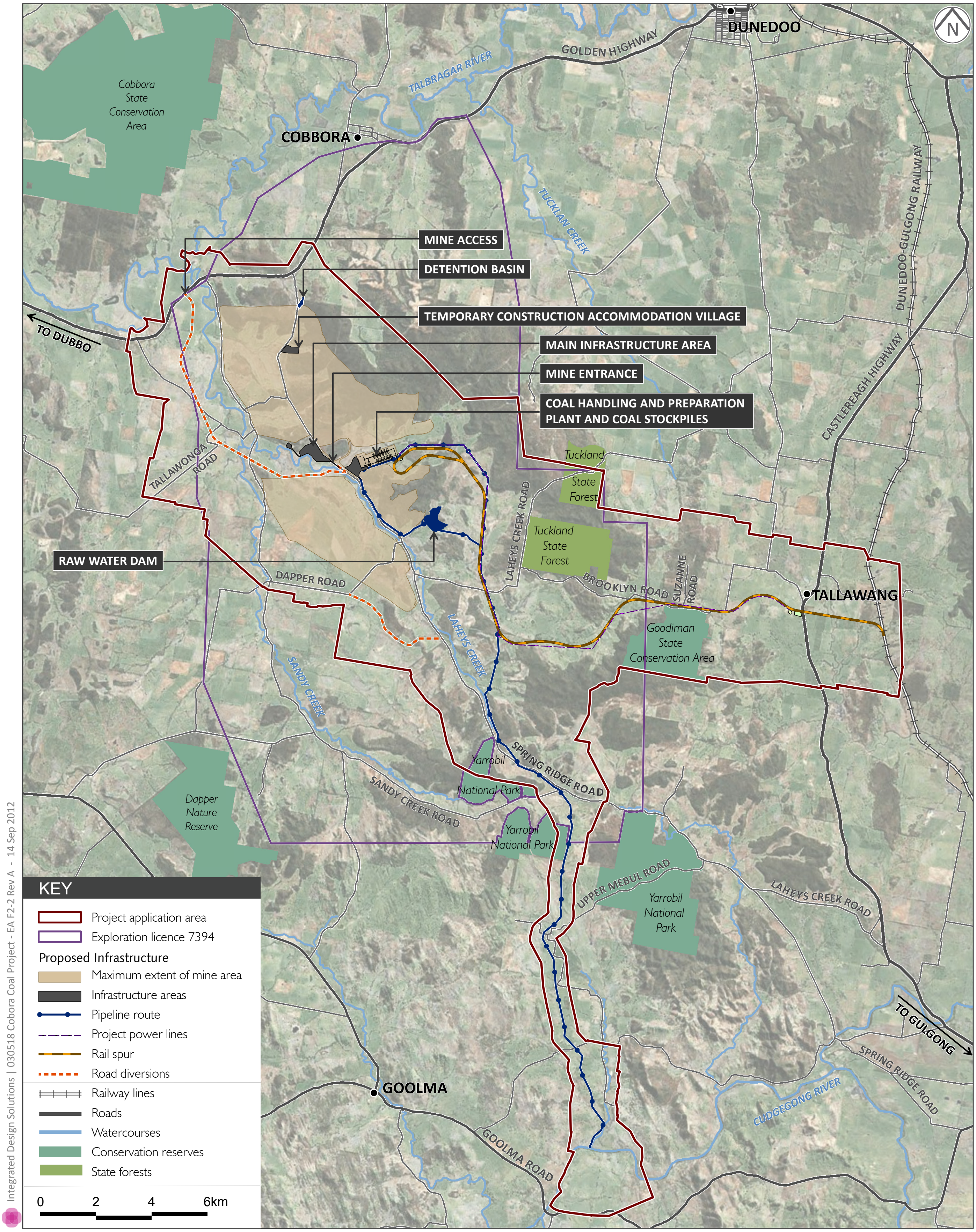
Table 2.2 Climate data for Dunedoo Post Office (1946 to 2011)

Month	Average minimum temperature (°C)	Average maximum temperature (°C)	Median rainfall (mm)	Rain days (>1 mm)	Average 9 am wind speed (km/h)	Average 3 pm wind speed (km/h)
January	16.9	31.9	69.8	5.3	15.4	16.5
February	17.2	30.8	64.3	5.0	14.7	15.6
March	14.3	28.3	52.6	4.3	13.8	15.3
April	9.7	24.2	41.5	3.7	11.8	14.3
May	6.2	19.5	44.4	5.0	10.1	14.8
June	3.6	16.0	44.5	5.6	8.5	14.3
July	2.0	15.3	46.5	5.9	8.0	13.9
August	3.0	17.1	41.0	5.6	10.1	16.0
September	5.8	20.6	43.0	5.3	12.2	16.5
October	9.1	24.2	52.6	5.8	14.1	16.7
November	12.3	27.6	55.5	5.6	14.9	17.1
December	15.0	30.8	62.7	5.7	15.0	17.3
Annual	**9.6**	**23.9**	**618.6**	**62.8**	**12.4**	**15.7**

Source: BoM (2011).

The median rainfall is 619 millimetres (mm) with rain greater than 1 mm on 63 days per year on average. Rainfall generally occurs throughout the year with the highest median rainfall over summer and the lowest median rainfall over winter.

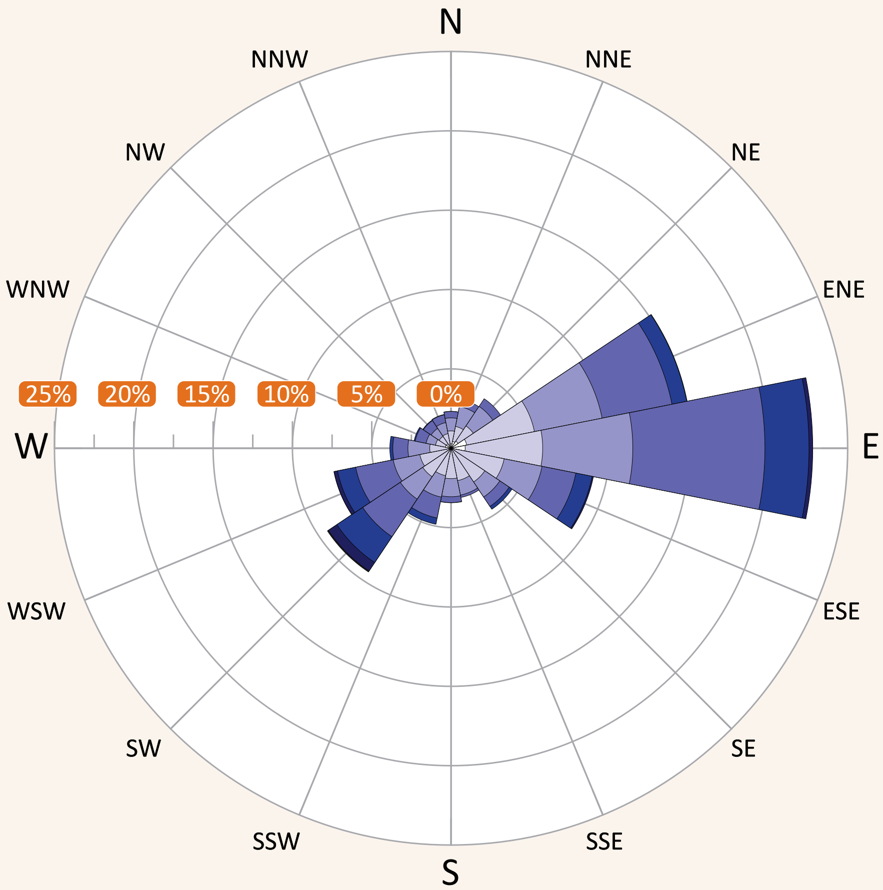
Based on records for November 2010 to November 2011 from the Project's meteorological stations close to the proposed mining area (MET 01 and MET 02), the prevailing winds are from the east (Figure 2.3). Less frequent but higher speed winds are from the south-west. The average wind speed in the mining area is 2.7 metres per second (m/s). Calm conditions (wind speeds less than 0.5 m/s) occur about 8% of the time.



Surrounding Environment

Cobbora Coal Project - Environmental Assessment

Figure 2.2



Annual - Calms = 8.2% (Average 2.7 m/s)

KEY

Wind Speed (m/s)

- > 0 - 0.5
- > 0.5 - 1.5
- > 1.5 - 3
- > 3 - 5.5
- > 5.5 - 8
- > 8 - 10.5
- > 10.5

Source: ENVIRON (2012)

Annual Wind Rose at MET 01 (November 2010 to November 2011)

Cobbora Coal Project - Environmental Assessment

Figure 2.3

2.2.5 Water resources

The Project is in the NSW Central West catchment at the eastern edge of the Murray-Darling Basin. The Talbragar River, which generally runs to the west, is immediately north of the PAA (see Figure 1.1). The Cudgegong River, which also generally runs to the west, is in the south of the PAA. Both rivers are part of the Macquarie River catchment.

There are two main creeks in the PAA. Sandy Creek runs on the western side of the proposed mining area while its tributary, Laheys Creek, runs between sections of the proposed mining area. Both creeks are ephemeral with vegetated channels. The creeks flow to the north and meet about 7 km south of the Talbragar River. There are a number of smaller creeks and drainage lines in the PAA.

The waterways in the PAA are part of the lower Darling River aquatic ecological community.

2.2.6 Biological environment

The PAA has been extensively cleared for agriculture. Native vegetation is generally confined to road reserves, conservation reserves and isolated patches on farms, particularly next to the creeks. There is a larger contiguous patch of native vegetation on the north-east side of the proposed mining area. The larger forest and woodland areas generally occur in association with the less fertile rock outcrops on the low hills and ridges.

There are a number of vegetation remnants in the PAA, including ironbark, stringybark and Cypress pine woodlands, box woodlands, red gum woodlands, regenerating scrubland and grasslands (including native pasture). Of these, three are threatened ecological communities listed under the *Threatened Species Conservation Act* (TSC Act) (NSW) and/or EPBC Act (Commonwealth):

- the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived Native Grassland (Box Gum Woodland);
- the Grey Box Grassy Woodland and derived Native Grasslands of South Eastern Australia (Grey Box Woodland); and
- the Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.

Fauna species in the area include frogs, ground-dwelling and arboreal (tree-dwelling) mammals, reptiles, birds, fish and macroinvertebrates. Some of these species are listed as threatened (see Chapter 10 'Ecology').

The Goodiman State Conservation Area is wholly within the PAA. Parts of the Yarrobil National Park and the Tuckland State Forest are also in the PAA.

2.2.7 Setting

There are no settlements in the PAA.

The nearest towns are Cobbora, Dunedoo and Gulgong. Larger towns in the region are Dubbo, Wellington Gulgong and Mudgee. Of these, Dubbo is the largest and has a broad range of services and facilities.

Dubbo, Wellington and Mid-Western Regional LGAs experienced recent population growth while Warrumbungle LGA's population fell (see Chapter 21 'Social'). Dubbo is likely to continue to grow through to 2036. Warrumbungle and Wellington are likely to experience a decline. Mid-Western Regional is likely to remain stable.

2.2.8 Residential land use

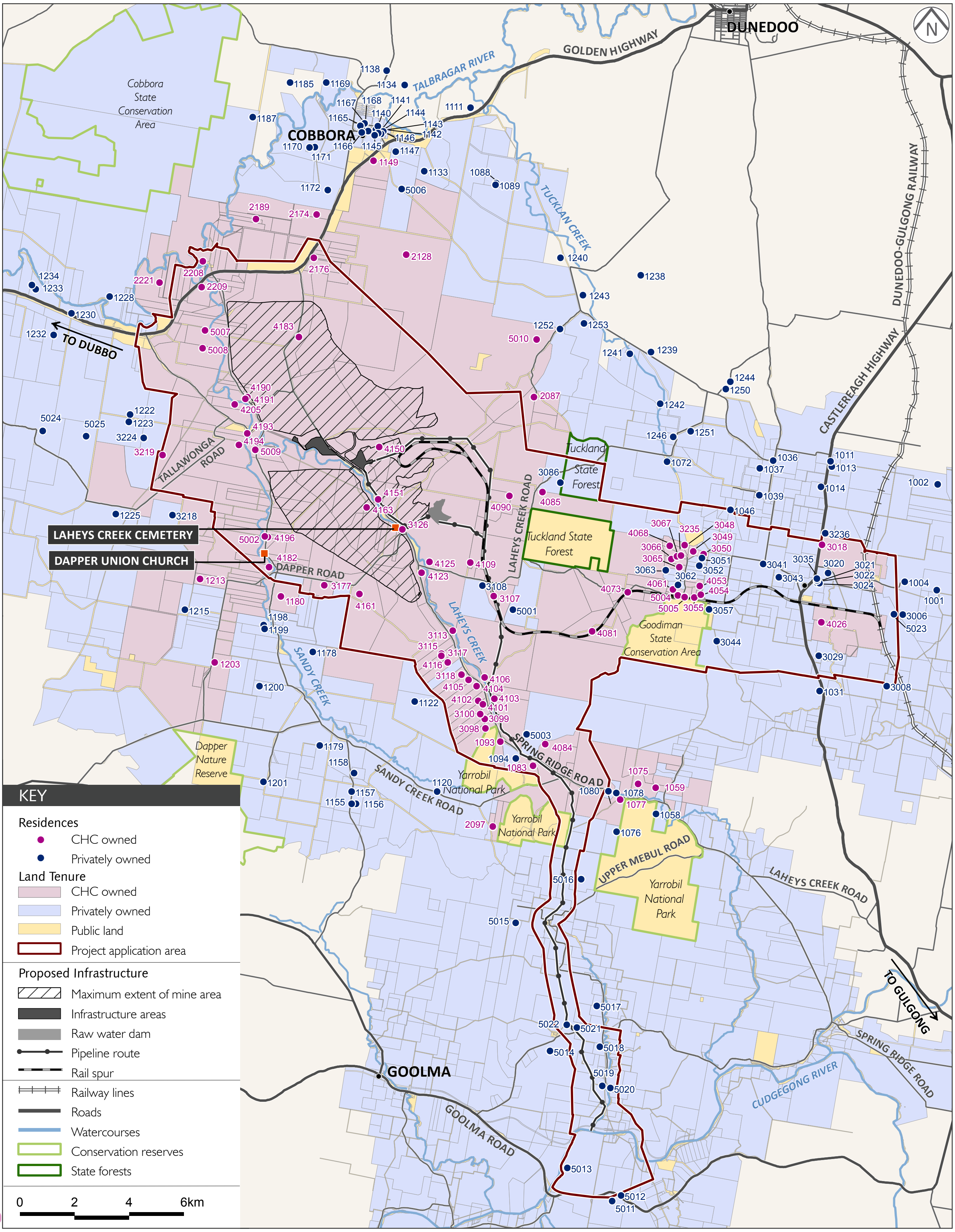
As of June 2012, over 65% of the land in the PAA is owned by CHC. There are 90 residences generally scattered across the PAA (Figure 2.4), with CHC owning 68 of them and in the process of entering into agreements to buy a number of others. In addition, in most cases where there is potential noise impact or a need to build and operate infrastructure on these properties, CHC has either entered or is discussing amenity or easement agreements with the landholders. Most of the privately owned residences are in the eastern section of the PAA along the proposed rail spur, or in the southern section of the PAA along the proposed water pipeline.

2.2.9 Agricultural land use

Agriculture occupies 66% of the land in the region (Dubbo, Mid-Western, Wellington and Warrumbungle LGAs). Most of this land is used for cattle and sheep grazing with only 8% used for cropping. Only small areas are irrigated, for example, less than 0.1% (some 1,000 ha) of the land in Warrumbungle LGA is irrigated.

2.2.10 Coal mines in the region

There are four coal mines in the region, all in the Mid-Western Regional LGA. The long-established Ulan Coal Mine is about 55 km west of the PAA. Project approval has recently been granted to construct the new 'Ulan West' mine. Two mines are to the immediate east of the Ulan Mine: Wilpinjong, which started operations in 2007, and Moolarben, which started operations in 2010. The fourth mine is Charbon located 4 km south of Kandos. It is a small, predominantly export mine which may expand marginally over the current approval period.



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Project Application Area - Land Tenure

Cobbora Coal Project - Environmental Assessment

Figure 2.4

2.2.11 Local infrastructure

The Golden Highway, in the north of the PAA, and the Castlereagh Highway, in the east of the PAA, link Newcastle, Dubbo and major towns such as Mudgee and Lithgow. Spring Ridge Road and Laheys Creek Road are the main local roads in the PAA and link properties to towns such as Dunedoo and Gulgong via the highways. Minor local roads link properties in the PAA to the main local roads and highways.

The Dunedoo–Gulgong Railway in the east of the PAA is regularly used to transport mineral ore and occasionally other commodities such as grain.

Mains electricity is supplied to the PAA by a 66 kilovolts (kV) transmission line connecting to the main Essential Energy line from Beryl; it is distributed via an 11 kV and low voltage network.

There is no mains water in the PAA. Residences are self-sufficient for water, using rainwater, bores on the property or water from the Cudgegong or Talbragar rivers.

Community facilities and services are available in towns outside the PAA. The only community facilities in the PAA are the Dapper Union Church, which is used occasionally, and the Laheys Creek Rural Fire Service.