

Section 4

Environmental Features, Management Measures and Impacts

This section describes the specific environmental features of the Mine Site and its surrounds that would or may be affected by the Longwall Project. The proposed design and/or operational safeguards and management measures are presented, followed by an assessment of the predicted level of impact the proposed activities may have after implementation of these measures. Where appropriate, proposed monitoring programs are also described.

This section is presented in two parts:

- Part A: presents a range of background information relating to a number of the subsequent issues;*
 - Part B: presents the predicted impacts associated with the surface disturbing and subsidence related impacts associated with the proposed longwall mining operations.*
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Section 4A

Background Information

The descriptions of various assessments of potential environmental impacts (Part 4B) are reliant upon a range of background information common to many of the key environmental issues. Background information is provided on the topography, meteorology, land ownership, land uses and surrounding residences.



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4A.1 TOPOGRAPHY

4A.1.1 Local Topography

The local topography between Narrabri and Baan Baa is shown on **Figure 4A.1**.

The Mine Site lies within the Namoi River Valley in an area representative of the transition from the open plains to the west in the Walgett and Coonamble areas and the more elevated and dissected country to the northeast (the Nandewar Ranges) and further south associated with the Warrumbungle and Liverpool Ranges (both which are part of the Great Dividing Range).

The local topography is generally flat to undulating, with elevations typically up to 400m AHD in the west in Jacks Creek State Forest and decreasing to approximately 230m AHD in the east toward the Namoi River.

4A.1.2 Mine Site Topography

The topography of the Mine Site varies from areas that are comparatively flat in the east with low, gentle and undulating topography towards the west (refer to **Figure 4A.2**). Elevations range from 370m AHD in the west to 240m AHD in the east. Slopes across the Mine Site average 3° with two low ridges oriented parallel and northeast to southwest across the Mine Site. The maximum slopes of approximately 18° occur in the southwest of the Mine Site whilst the minimum slopes of <1° are common in the northeast.

4A.1.3 Pit Top Area Topography

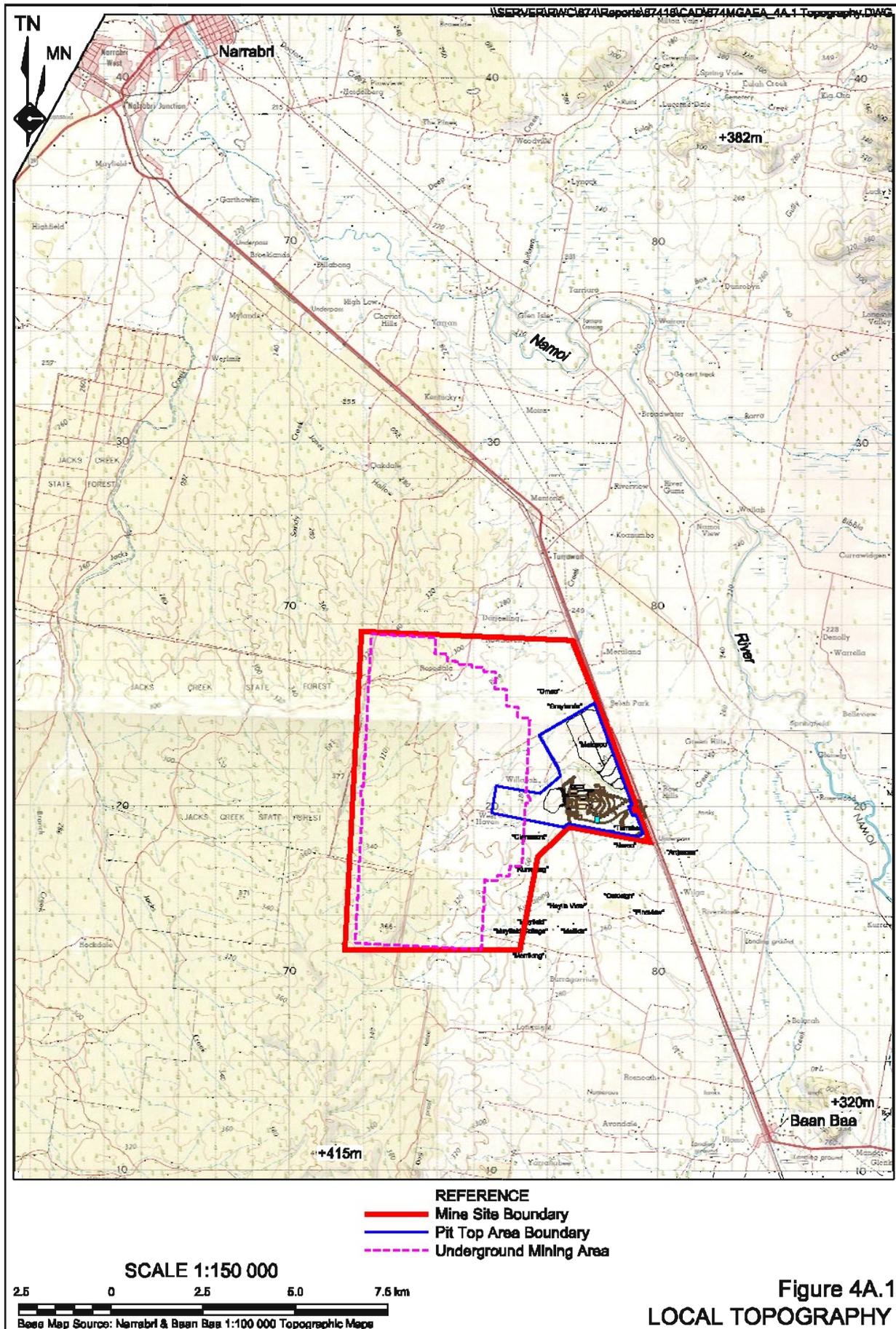
The existing topography within the Pit Top Area is displayed on **Figure 4A.2**.

The natural topography displays a general grade from west to east (285m AHD to 245m AHD) with slopes ranging from approximately 4° in the west to <1° in the east in the vicinity of two tributaries of Kurrajong Creek.

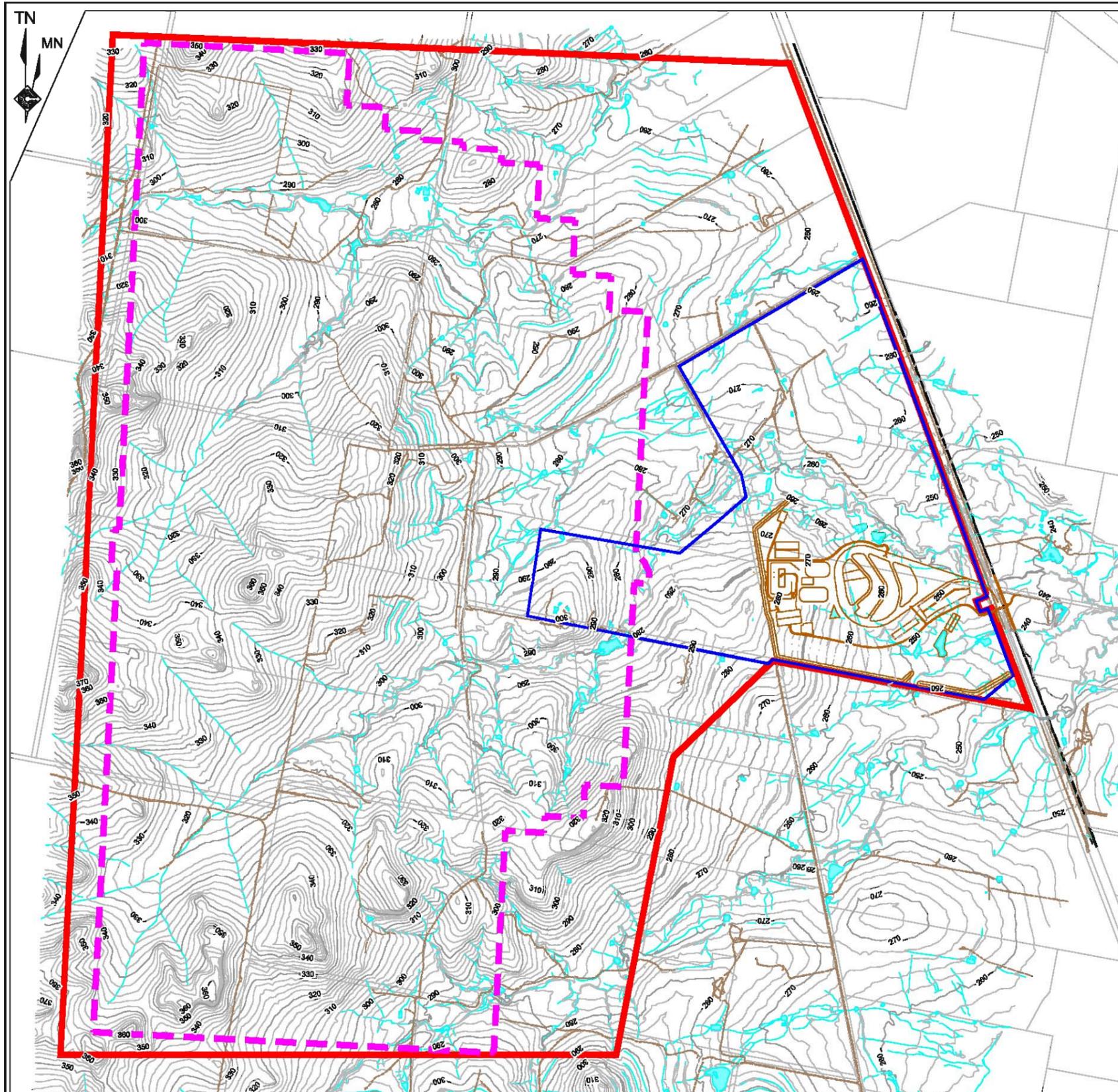
Since commencement of site establishment activities associated with the approved Narrabri Coal Mine (Stage 1), the topography of the Pit Top Area of the Mine Site has been modified, most noticeably by:

- the excavation of the box cut for entry to the underground mine;
- the construction of a 5m high bund wall around the southern and western perimeter of the surface facilities;
- cut and fill earthworks associated with the construction of the Narrabri Coal Mine rail loop and various hardstand surfaces; and
- various soil stockpiles.





\\SERVER\RWC\674\Report\67416\CAD\674MGAE_4A.2 Pit Top Topography.DWG



- REFERENCE
- Mine Site Boundary
 - Pit Top Area Boundary
 - - - Underground Mining Area
 - Cadastral Boundary
 - Contour (m AHD)(Interval = 2m)
 - Creek / Drainage Line
 - Unsealed Road / Track
 - Approved Disturbance within the Pit Top Area

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Figure 4A.2
 MINE SITE TOPOGRAPHY

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4A.2 METEOROLOGY

4A.2.1 Introduction

The Namoi River Valley is situated between the tropical and temperate climatic zones, ie. between the belts of the sub-tropical highs and the zone of mid-latitude westerlies. In summer, synoptic highs dominate the climate. Low pressure systems pass at regular intervals bringing milder temperatures and winds from the southerly quadrant. The climate is also influenced by substantial mountain ranges located to the east and south, and to a lesser extent to the west.

4A.2.2 Sources of Data

Meteorological data has been sourced from a number of sources to establish the local meteorological conditions of the Mine Site. The following provides a summary of the data sources used.

Temperature, Relative Humidity and Wind Speed

Records of local temperature have been collected for the last 41 years by the Bureau of Meteorology at the Narrabri West Post Office (Station No. 053030), located approximately 25km northwest of the Pit Top Area. Temperature data has also been collected from an on-site meteorological station established in June 2006. To date, the data collected reflects similarities with the longer term data used for the various impact assessments throughout this document.

Rainfall and Evaporation

Rainfall and evaporation data for the Mine Site was sourced from WRM Water and Environment Pty Ltd (2009) – see Part 3 of the *Specialist Consultant Studies Compendium*. The rainfall data listed in **Table 4A.1** was obtained from interpolated data assembled by the Queensland Department of Natural Resources and Mines (NR&M) Data Drill (Database), for the 119 year period 1889 to 2008. The Database takes into consideration the spatial difference in rainfall between the nearest rainfall station at Narrabri and the Mine Site. The data set also contains no gaps in record and as such is preferable to raw rainfall data.

Wind Direction (and Speed)

Annual and seasonal wind roses (displaying wind speed and direction) which were compiled by Heggies Pty Ltd (see Part 7 of the *Specialist Consultant Studies Compendium*) using The Air Pollution Model (TAPM) software developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). In a similar manner to the rainfall data, the TAPM software uses measured data and adjusts it to provide the most accurate wind conditions for the Mine Site.

4A.2.3 Summary of Meteorological Conditions

Table 4A.1 summarises average monthly temperature, relative humidity and wind speed at Narrabri West Post Office based on data acquired over varying time spans.



Table 4A.1
Mean Monthly Meteorological Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	No. Years Data
TEMPERATURE (°C) – Narrabri West Post Office														
Mean Maximum	33.8	33.2	31.2	27.3	22.5	18.7	<u>18.0</u>	19.8	23.4	27.1	30.1	33.0	26.5	40
Mean Minimum	19.3	19.1	16.4	11.9	8.3	5.2	<u>3.7</u>	4.6	7.6	11.7	14.8	17.7	11.7	40
RAINFALL (mm) – WRM Water and Environment Pty Ltd (2009)														
Ave. Monthly Rainfall	78.8	59.4	50.1	<u>34.5</u>	43.5	46.1	41.8	37.6	37.5	50.4	56.6	63.1	599.1	119
POTENTIAL EVAPORATION (mm) – WRM Water and Environment Pty Ltd (2009)														
Ave. Monthly Potential Evaporation	199.3	165.0	151.7	104.8	73.6	<u>53.0</u>	57.9	76.6	104.7	145.7	173.2	198.7	1 504.2	119
RELATIVE HUMIDITY (%)– Narrabri West Post Office														
Mean 9:00am	61	65	64	66	78	84	82	73	65	<u>57</u>	59	59	68	17
Mean 3:00pm	38	40	39	42	49	52	50	42	39	<u>37</u>	39	<u>37</u>	42	17
WINDS (km/hr) – Narrabri West Post Office														
Mean 9:00am Wind Speed	17.1	17.6	17.1	14.7	12.9	12.6	<u>11.7</u>	13.1	16.3	18.5	18.3	18.8	15.7	38
Mean 3:00pm Wind Speed	16.9	17.1	17.4	16.4	<u>15.4</u>	16.8	17.3	18.5	19.7	19.2	19.2	19.0	17.7	38
Source: Bureau of Meteorology Station No. 053030 and WRM (2009)														
Bold = maximum <i>Italics</i> = minimum														

The meteorological data listed in **Table 4A.1** provides the following profile of the climate in the Narrabri area.

- Seasonal temperature fluctuations are typical for the region with the average maximum daily temperatures being recorded in the summer months of December, January and February (33.0°C to 33.8°C) and the average lowest daily temperatures being recorded in the winter months of June, July and August (17.7°C to 19.3°C).
- The average annual rainfall at the Mine Site is estimated at 599mm with the median annual rainfall calculated at 562mm. The annual rainfalls on the Mine Site can vary considerably from year to year. Based on the 119 years of records, the 10% and 90% annual rainfalls at the Mine Site are estimated at 397mm and 839mm respectively.
- The average monthly rainfalls at the Mine Site vary during the year from a low of 34.5mm in April to a high of 78.8mm in January. The summer average month rainfalls (50.1mm to 78.8mm) are generally higher than the equivalent winter monthly rainfalls (34.5mm to 46.1mm).
- The average annual potential evaporation at the Mine Site is estimated at 1504mm. Evaporation varies seasonally, with high evaporation rates occurring between October and March. The values in **Table 4A.1** indicate that the potential evaporation rate during the summer months is greater (approximately 2.5 times) than the evaporation rate during the winter months.



- The average potential evaporation exceeds average rainfall for all months of the year. The annual deficit between mean rainfall and evaporation levels is 905mm.
- The average relative humidity recorded at 9:00am varies between 57% and 84% throughout the year. The relative humidity is highest during the winter months and lowest during the summer months.
- The wind speed follows similar seasonal patterns to temperature with the highest values recorded in the summer months and the lowest values recorded in the winter months.

The wind roses compiled from the TAPM data are presented in **Figure 4A.3**. The annual wind rose indicates that the Mine Site would tend to experience light to fresh winds (average wind speed of between 1.5m/s and 10.5m/s) from the east-southeast to south-southwest (approximately 38% combined) and from the west to the northwest (approximately 22% combined). Seasonal variations include the following.

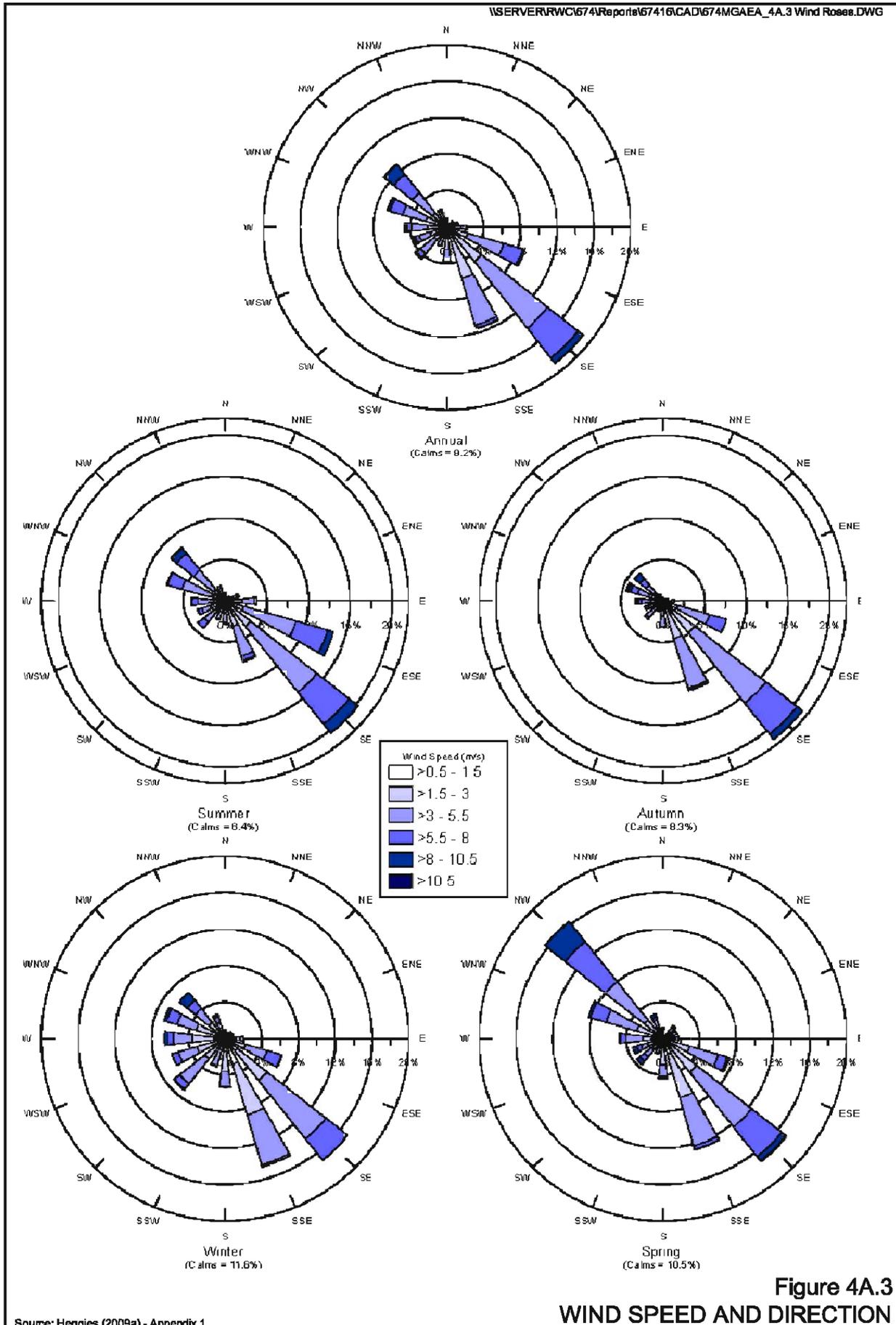
- In spring, light to fresh winds are experienced predominantly from the east-southeast to south-southeast (approximately 36% combined) and west to northwest (approximately 29% combined);
- In summer, light to fresh winds are experienced predominantly from the east-southeast to south-southeast (approximately 42% combined);
- In autumn, light to fresh winds are experienced predominantly from the east-southeast to south-southeast (approximately 40% combined); and
- In winter, light to moderate winds (between 1.5 m/s and 8 m/s) are experienced from the east-southeast to south (approximately 43% combined) and light to fresh winds from the southwest to northwest (approximately 34% combined).

4A.3 LAND OWNERSHIP, SURROUNDING RESIDENCES AND LAND USE

4A.3.1 Introduction

In order to assess the impact the Longwall Project would have on the surrounding environment, an understanding of the number and location of surrounding landholdings and residences along with the land use is required. This sub-section identifies the landholdings and the proximity of surrounding residences to the main proposed areas of activity. An overview is provided of the land uses both in the local area and immediately surrounding the Mine Site.





4A.3.2 Land Ownership and Surrounding Residences

Figure 4A.4 presents the ownership details within and immediately surrounding the Mine Site. The Proponent has purchased nine properties, and a section of a further three properties, on the Mine Site covering an area of 3 825ha. The landholdings surrounding those owned by the Proponent vary in size from 830ha to 70ha with an average size of 250ha.

Figure 4A.4 also shows the locations of 19 residences within and immediately surrounding the Mine Site. Eight of the residences, namely those on “Claremont”, “Turrabaa”, “Willarah”, “Matoppo”, “Mayfield”, “Mayfield Cottage”, “Westhaven” and “Rosedale” are owned by the Proponent and hence classified as project-related. The distances from each of the surrounding residences to the main proposed areas of activity within the Pit Top Area and initial Ventilation Shaft Area are listed in Table 4A.2. The Jacks Creek and Pilliga East State Forests are located within and beyond the western boundary of the Mine Site.

Table 4A.2
Proximity of Residences to Project Activity Areas (m)

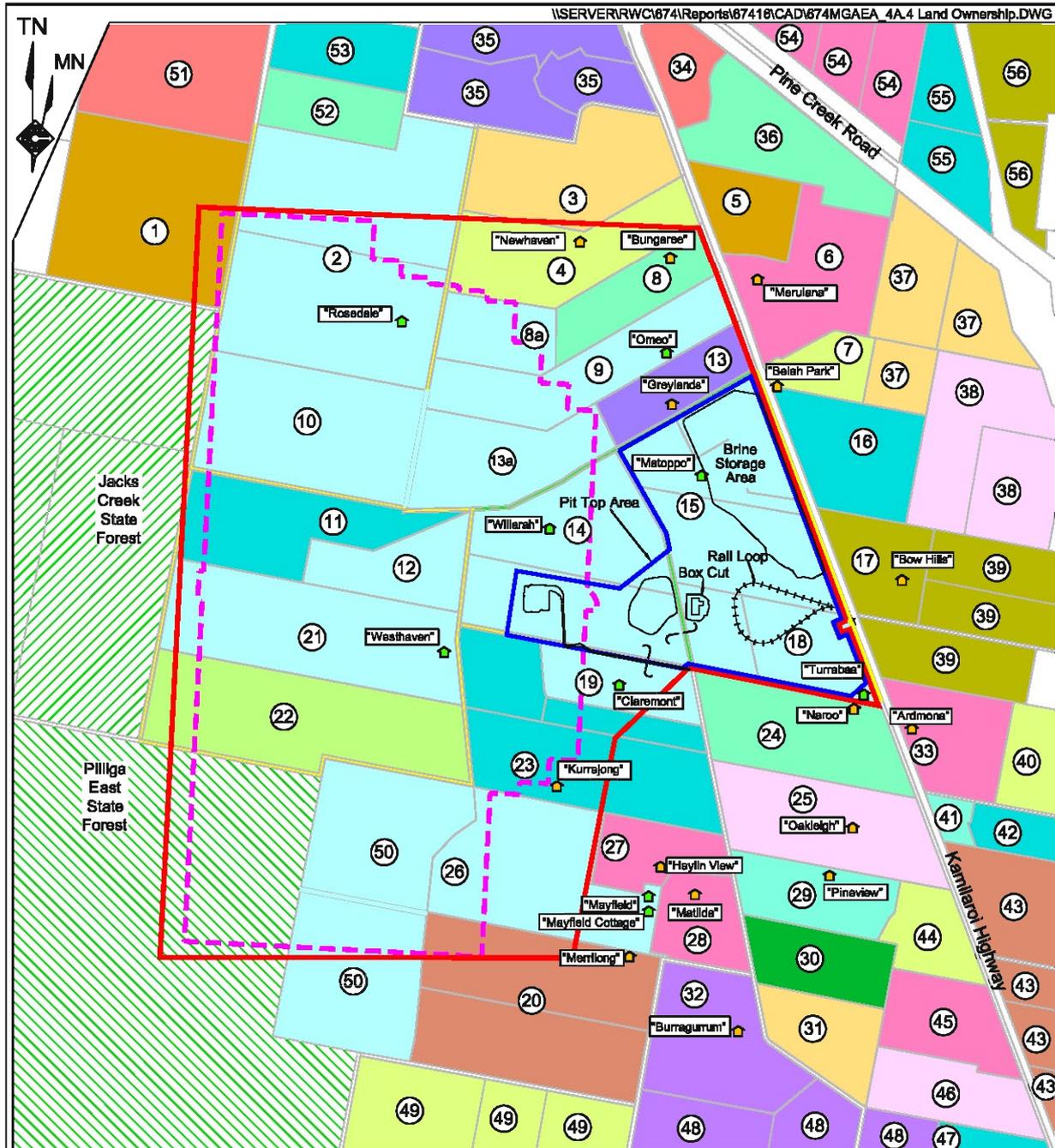
Residence	Coal Preparation Plant	Reject Emplacement Area	Initial Ventilation Shaft Area	Rail Loop (Cutting/Embankment)*	Mine Access Road
“Ardmona”	2 615	3 015	4 510	1 490 (+2.0m)	1 330
“Belah Park”	2 650	2 530	3 950	2 270 (+1.5m)	2 840
“Bow Hills”	2 120	2 600	4 280	705 (+2.0m)	750
“Bungaree”	4 220	3 810	4 080	3 920 (-0.6m)	4 770
“Burrigurum”	4 890	4 720	5 400	4 480 (-3.4m)	4 450
“Claremont”**	1 460	675	1 190	1 560 (-6.0m)	1 170
“Greylands”	2 440	2 000	3 030	2 240 (-0.6m)	2 590
“Haylin View”	3 050	2 700	3 130	2 800 (-3.4m)	2 700
“Kurrajong”	2 760	2 040	1 740	2 800 (-6.0m)	2 550
“Matilda”	3 310	3 050	3 610	2 980 (-3.4m)	2 920
“Matoppo”**	1 560	1 230	2 620	1 340 (-0.6m)	1 730
“Mayfield Cottage”**	3 580	3 225	3 530	3 330 (-3.4m)	3 240
“Mayfield”**	3 400	3 045	3 360	3 170 (-3.4m)	3 080
“Merrilong”	4 150	3 745	3 970	3 890 (-3.4m)	3 820
“Merulana”	3 840	3 590	4 340	3 530 (+1.5m)	4 380
“Naroo”	1 920	2 300	3 790	1 080 (+2.0m)	980
“Newhaven”	4 550	3 970	4 040	4 400 (-0.6m)	4 720
“Oakleigh”	2 960	3 200	4 240	2 380 (+2.0m)	2 230
“Omeo” **	3 020	2 585	3 520	2 810 (-0.6m)	3 180
“Pineview”	3 340	3 460	4 450	2 750 (-3.2m)	2 680
“Rosedale”	4 900	4 090	3 515	4 960 (-2.2m)	5 150
“Turrabaa”**	1 800	2 350	3 760	730 (+2.0m)	640
“Westhaven”**	3 220	2 150	1 070	3 390 (-7.6m)	3 070
“Willarah” **	2 170	1 220	1 160	2 250 (-5.6m)	2 150

* Depth of Cutting expressed as –m / Embankment height above natural ground level expressed as +m
** Project-related residence

4A.3.3 Land Use

On the Mine Site itself and other properties to the north, south and east, agricultural land uses involving primarily grazing and cereal cropping are most common. Figure 4A.5 illustrates the land use within and immediately surrounding the Mine Site.





LAND OWNERSHIP					
1	N. & F. King	17	J. & R. Stieger	35	J. & A. Collins
2	Narrabri Coal Pty Ltd	18	Narrabri Coal Pty Ltd	38	S. & J. Holman
3	A. & L. Grumley	19	Narrabri Coal Pty Ltd	37	Boonery Pty Ltd
4	K. & J. Scott	20	R. & S. Chappel	38	C. & R. Melbourne
5	W. & A. Tick	21	Narrabri Coal Pty Ltd	39	J. & R. Stieger
6	P. Smart	22	D., P., B. & N. Grncarski	40	J. Richards
7	G. & C. Sevil	23	J. & G. Lennox	41	G. Smith
8	Property 8 of J. & M. Bleh	24	M. W. Foster	42	S. Murton
8a	Narrabri Coal Operations Pty Ltd	25	C. Towns	43	P. Webb
9	Narrabri Coal Operations Pty Ltd	26	Narrabri Coal Pty Ltd	44	T., W. & S. Tapscott
10	Narrabri Coal Pty Ltd	27	W. Chapman	45	M. Thomas
11	P. Bradbury	28	W. Chapman	46	B. Scott
12	Narrabri Coal Pty Ltd	29	C. & D. Kirby	47	B. & A. Mainey
13	M. & D. White	30	M. Thomas	48	G. & L. Stuart
13a	Narrabri Coal Operations Pty Ltd	31	B. Scott	49	G. & L. Clarke
14	Narrabri Coal Pty Ltd	32	G. & L. Stuart	50	Narrabri Coal Pty Ltd
15	Narrabri Coal Pty Ltd	33	P. C. Webb	51	J. Irvine
16	C. Heallon	34	J. Pattison	52	S. Smith
53	J. Westwood				
54	S. & J. McGowan				
55	J. & D. Zimmerman				
56	J. & W. Baylis				

REFERENCE	
	Mine Site Boundary
	Pit Top Area Boundary
	Underground Mining Area
	Residence (Project Related)
	Residence (Non-project Related)
	Property Owned by Narrabri Coal Operations Pty Ltd or related company
	Crown Land
	Crown Road
	Council Road

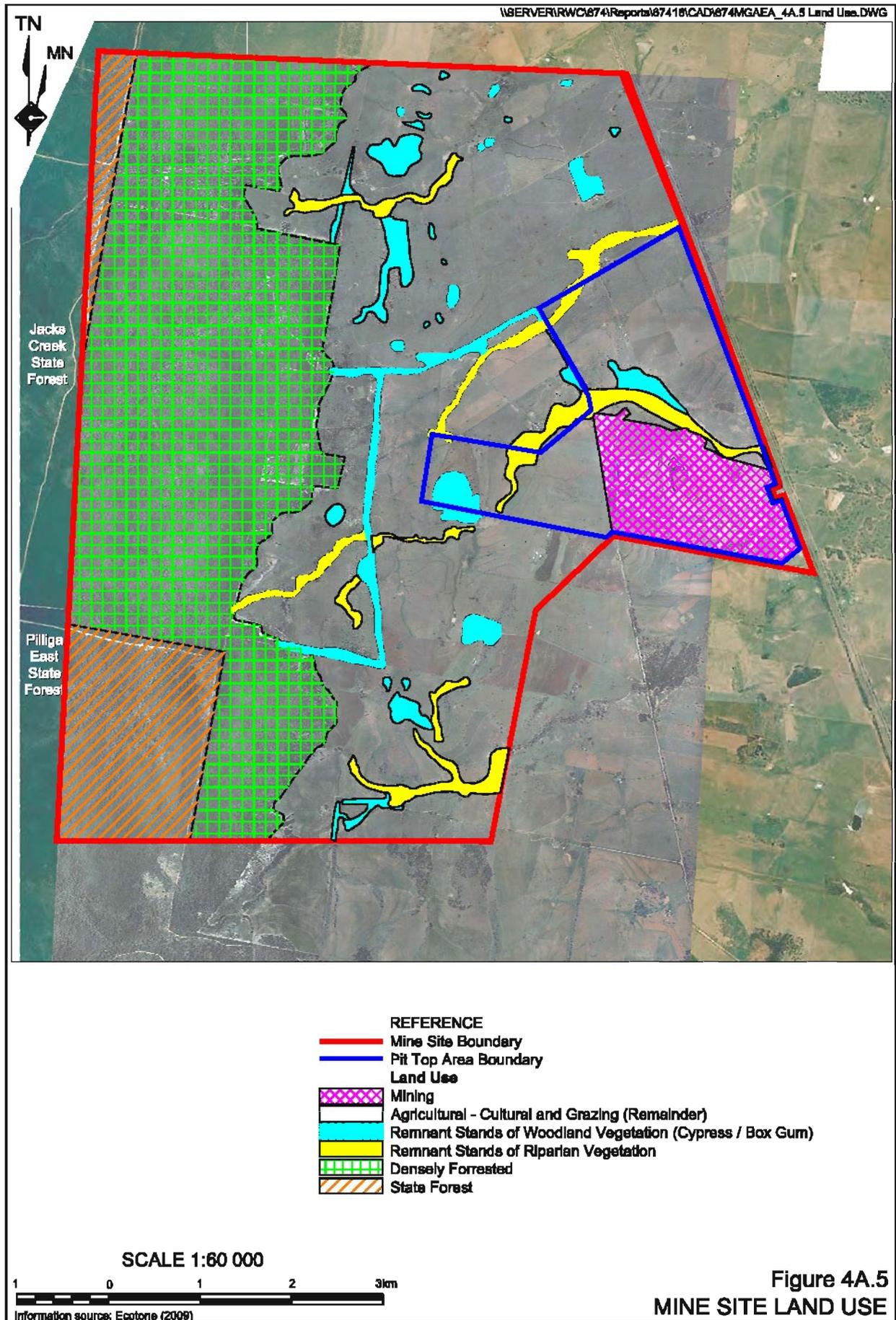
SCALE 1:75 000

1 0 1 2 3 4km

Land Ownership Source: Dept. of Lands / Narrabri Coal Operations Pty Ltd

Figure 4A.4
LAND OWNERSHIP AND
SURROUNDING RESIDENCES





The eastern half of the Mine Site is predominantly cleared for grazing (cattle, sheep and horses) with some cereal crops grown, particularly wheat. Small patches of remnant native vegetation remain within the agricultural areas, along creeks, Crown roads or as isolated areas. The remaining western half of the Mine Site is predominantly forested with woodlands dominated by cypress pine and box gum trees. The southwestern corner of the Mine Site is located within the Pilliga East State Forest.

The native vegetation extends well beyond the western boundary of the Mine Site within the Pilliga East State Forest and Jacks Creek State Forest. The eastern boundary of the Mine Site lies adjacent to the Kamilaroi Highway and the North Western Branch Railway Line. Beyond the transport corridor to the east, the land is used predominantly for cropping given most of the land lies within the Namoi River Floodplain. A small quarry is present on the “Bow Hills” property approximately 350m east of the Kamilaroi Highway.

