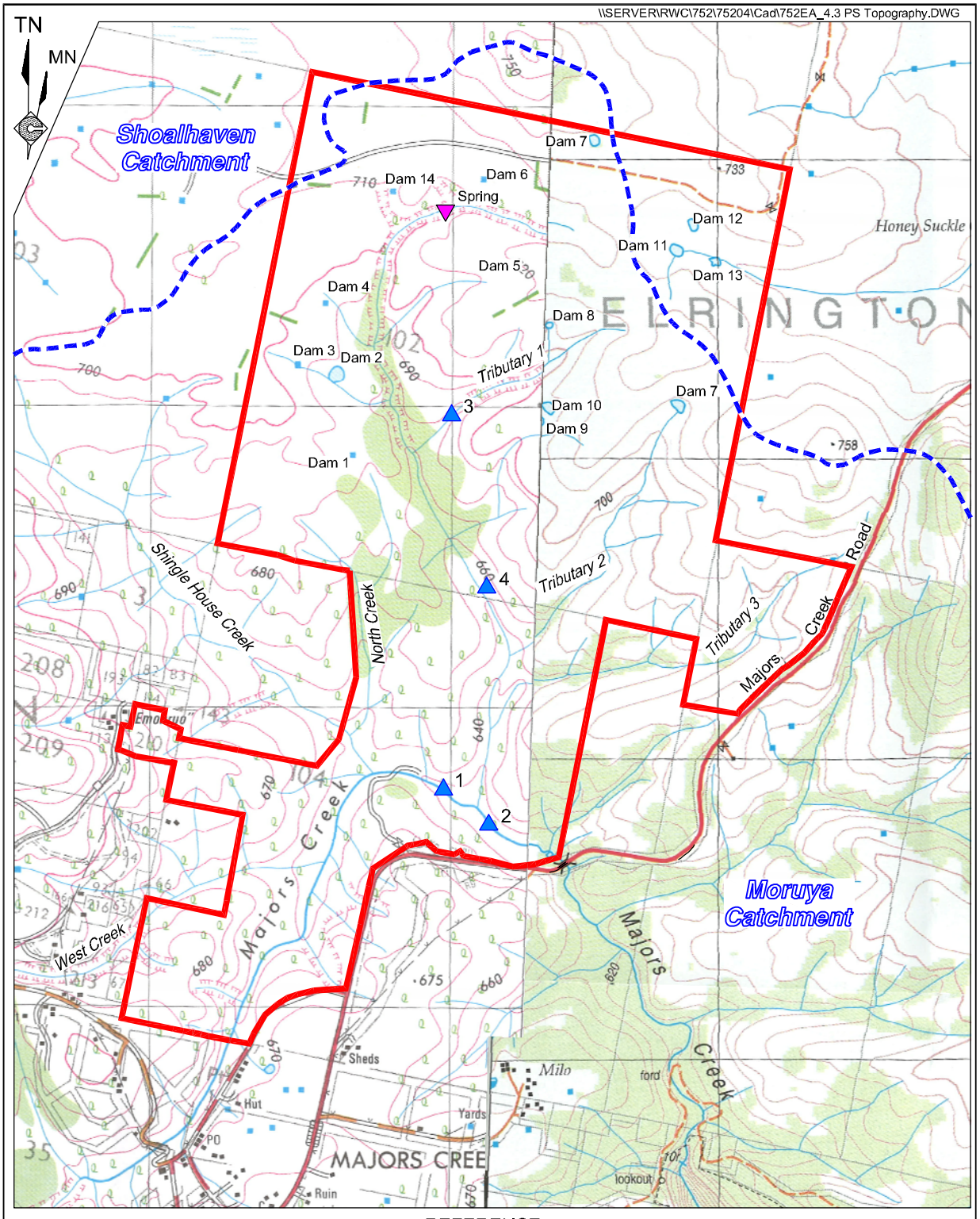

Figure 4.3
PROJECT SITE TOPOGRAPHY AND DRAINAGE

Drainage within the northern section of the Project Site is dominated by Spring Creek and a number of unnamed tributaries (referred to as Tributaries 1, 2 and 3). This creek is fed by a small spring in the headwaters of the creek (**Figure 4.3**). Spring Creek merges with Majors Creek in the southern section of the Project Site. The creek and its tributaries have been extensively disturbed by previous mining-related activities.

Drainage immediately to the west of the Project Site is dominated by Shingle House Creek and its tributary, North Creek.

Drainage within the southern section of the Project Site is dominated by Majors Creek which, within the Project Site, flows from west to east. This creek has also been extensively disturbed by previous mining-related activities, with the alluvial sediments subjected to sluicing and dredging. In addition, the non-Aboriginal Heritage Assessment (ASR, 2010b – see Section 4.7) noted that at least two stamp batteries and a chlorination plant were established within the creek.

Within the small section of the Project Site within the Shoalhaven Catchment, drainage lines are typically poorly defined and ephemeral.

Within the Project Site a number of farm dams have been constructed. These are identified on **Figure 4.3** and are discussed further in Section 4.5.

4.1.3 Climate

4.1.3.1 Introduction

Climatic conditions have the potential to influence a range of potential Project-related impacts on surrounding residents and the environment. This sub-section provides a brief overview of the climatic conditions surrounding the Project Site, focusing particularly on those aspects of the climate that are likely to influence the potential Project-related environmental impacts.

4.1.3.2 Data Sources

Meteorological data from the following Bureau of Meteorology-operated stations is presented in **Table 4.1.** These stations are located approximately 13km to the north-northeast of the Project Site.

- Braidwood – Wallace Street Station - (temperature - 1907 to 1975, rainfall -1887 to 2010, evaporation – 1996 to 2010).
- Braidwood Racecourse Station – (temperature - 1985 to 2010).

Temperature data from these stations has been combined for the period 1907 to 2010.

4.1.3.3 Temperature and Humidity

January is the hottest month, with a maximum average temperature of 26.0°C. July is the coldest month with an average maximum temperature of 11.4°C and an average minimum temperature of -0.2°C.

Table 4.1
Climate Data

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (C°)													
Mean maximum temperature	26.0	25.4	23.0	19.1	15.2	12.0	11.4	13.2	16.4	19.4	22.0	25.0	
Mean minimum temperature	10.9	11.1	9.3	5.9	2.6	0.7	-0.2	0.8	2.7	5.4	7.6	9.6	
Rainfall (mm)													
Mean rainfall	70.3	65.6	69	56.4	58	66.5	47.2	47.4	48.8	62.7	62.9	64	718.8
Highest rainfall	262	324	340	249	664	517	345	251	146	358	216	278	1342
Lowest rainfall	0.8	0.0	0.3	0.0	1.2	0.5	0.0	0.6	4.1	2.0	1.3	0.0	340.0
Mean number of rain days	8.6	8.0	8.3	7.4	7.7	8.5	7.6	8.1	8.8	8.9	8.6	8.2	98.7
Highest daily rainfall	104.6	175.0	160.4	118.0	199.9	113.3	101.9	89.6	154.9	106.7	86.9	106.7	
Open Pan Evaporation (mm)													
Mean daily evaporation	4.7	3.9	3.1	2.2	1.3	0.9	1	1.7	2.6	3.5	4	4.6	2.8

Note Temperature data from 1907 to 1975 sourced at Braidwood – Wallace Street. Temperature data from 1985 to 2010 has been sourced from the Braidwood Racecourse Station. Combined data has been used to calculate mean, maximum and minimum temperatures for the period 1907 to 2010.

Source: Bureau of Meteorology – Braidwood – Wallace Street (Station Number: 069010) and Braidwood Racecourse (Station Number: 069132).

4.1.3.4 Rainfall and Evaporation

Annual average rainfall is 718.8mm, with rainfall distributed reasonably evenly through the year, with between 47mm and 70mm falling on average each month. The driest year on record is 1982 when 340mm of rain was recorded. By contrast, the wettest year on record is 1974 when 1 341mm of rain was recorded. The maximum daily rainfall recorded is 200mm which was recorded on 27 April 1925.

Annual evaporation is approximately 1 022mm and varies from approximately 4.7mm per day in January to 0.9mm per day in June. Monthly evaporation exceeds rainfall in all months except May, June and July.

4.1.3.5 Wind and Atmospheric Stability

Wind speed, wind direction and sigma-theta (a measure of the fluctuation of the horizontal wind direction) data have been collected from a meteorological station operated within the Project Site since March 2009. **Figure 4.4** presents the annual and seasonal wind roses compiled by PAEH (2010) from the data collected from the Project Site meteorological station for the period March 2009 to March 2010.

On an annual basis, the data show a high frequency of winds from the south-southeast and from the northwest directions. In summer and autumn, winds are predominantly from the south-southeast and to a lesser extent from the northwest direction. In winter and spring, the dominant winds are from the northwest, with predominant winds also from the south-southeast in spring. On an annual basis, the mean wind speed for the Project Site is 3.7m/s and the percentage of calms (wind speeds less than 0.5m/s) is 3.6%. Seasonal wind roses by time of day as required by the *NSW Industrial Noise Policy* are presented in Appendix D of Spectrum (2010b).

\\SERVER\RWC\752\75204\Cad\752EA_4.4 wind.DWG

Figure 4.4
ANNUAL AND SEASONAL WINDROSES

Source: PAE Holmes - Figure 4

The data from March 2009 to March 2010 was used by PAEH (2010) to generate proportional occurrences of Pasquill Gifford Stability Classes (a description of the vertical mixing potential or atmospheric turbulence). Six atmospheric turbulence stability classes are classified (A to F) with class A being the most unstable (or most turbulent) class, and class F the most stable (or least turbulent) class. **Table 4.2** presents the frequency of occurrence of the six stability categories.

Table 4.2
Frequency of Atmospheric Stability Classes

Pasquill Gifford Stability Class	Frequency (%)
A	2.0
B	3.5
C	11.9
D	59.6
E	18.6
F	4.4
Source: Modified after PAEH (2010) – Table 4.2	

The most common stability class for the Project Site was determined to be class D at 59.7%. PAEH (2010) interprets this as indicating that the dispersion conditions are such that dust emissions disperse rapidly for a significant proportion of the time. The frequency of E and F class conditions (slow dispersal conditions) are lower at 23% (combined).

4.1.4 Local and Regional Geology

The Project Site and surrounds are underlain by Devonian-aged Braidwood Granodiorite, an intrusive pluton consisting of multiple intrusions and occupying an area of about 1 000km^2 (**Figure 4.5).**

The Braidwood Granodiorite intruded the early Devonian-aged Long Flat Volcanics, a felsic extrusive, which outcrops the west of the Project Site. Ordovician-aged sediments occur to the east of the granodiorite approximately 10km to the east of the Project Site.

The Braidwood Granodiorite is cut by a number of north-west / south-east trending, steeply dipping faults. The granodiorite is also cut by a second suite of structures striking to the north-northeast (**Figure 4.5**). These structures are zones of weakness and appear to control drainage patterns within the Project Site and surrounds.

Gold mineralization at Dargues Reef is structurally controlled and is hosted within east-west trending lenses that maintain a steep southerly dip within strongly altered granodiorite near the contacts of a sub-vertical diorite to quartz diorite dyke. The lenses follow the east-west fracture system in the granodiorite which is particularly well developed adjacent to the diorite dykes. The mineralised lodes have a width of between 5m and 20m, a strike length of up to 140m and they extend down-dip for at least 450m.

The upper 10m to 15m of the granodiorite is weathered with a sharp contact with the underlying fresh rock.

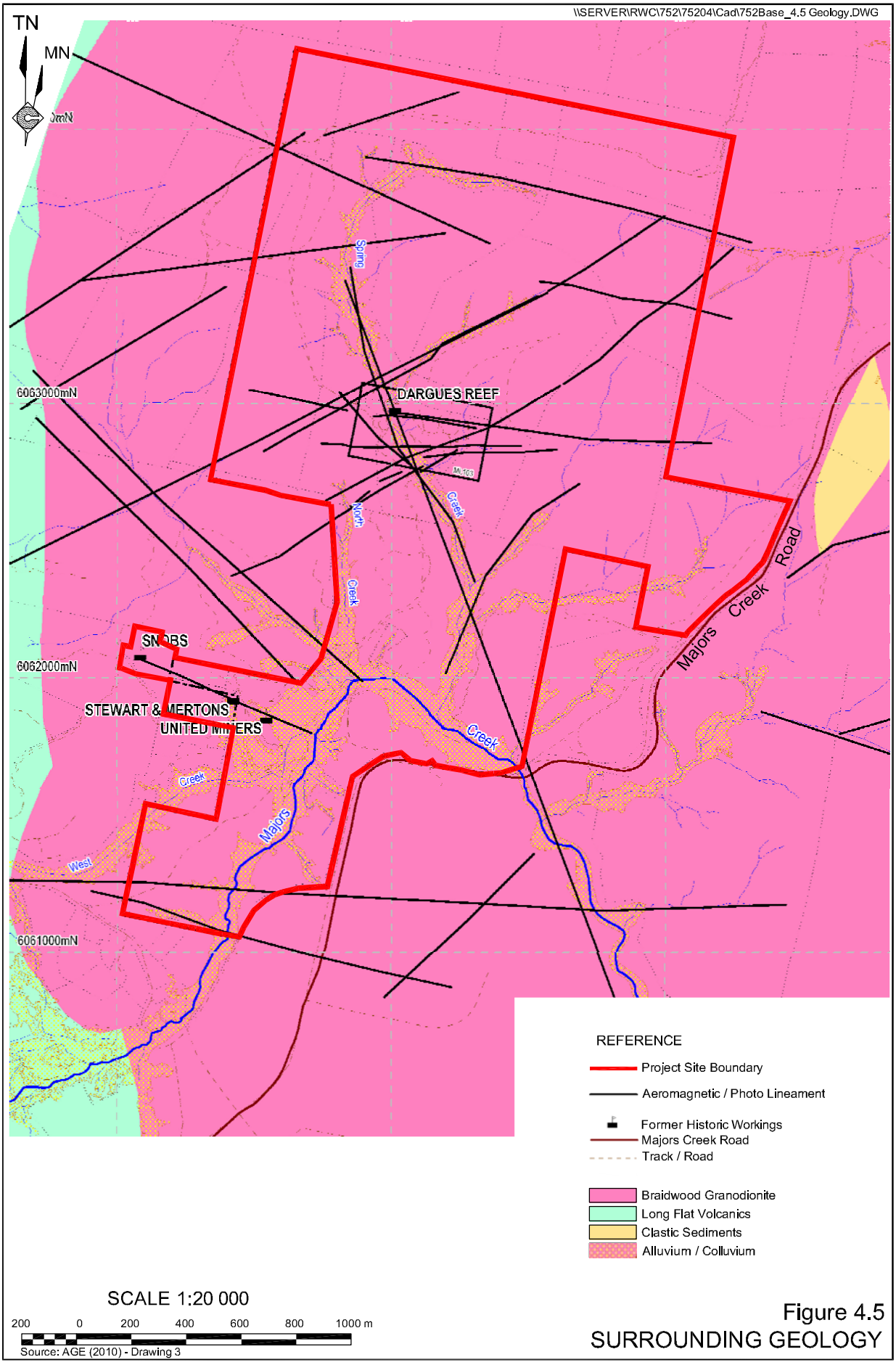

Figure 4.5
SURROUNDING GEOLOGY

Alluvium, consisting of coarse sand and clay and granodiorite boulders has been deposited along Majors Creek, whereas the deposits in the base and sides of the tributaries to Majors Creek are colluvial material that has washed from the slopes above the tributaries. The alluvium along Majors Creek varies between about 60m and 200m in width and has been extensively disturbed by goldmining activities in the late 1800's, early 1900's.

4.1.5 Surrounding Land Ownership, Residences and Land Use

4.1.5.1 Land Ownership and Residences

Table 4.3 and **Figure 4.6** presents the land ownership surrounding the Project Site while **Figure 4.7** presents the residences surrounding the Project Site. It is noted that landownership data was sourced from an extensive search of the register of land titles administered by the Land and Property Authority Management in March 2010. In addition, the residence plan was prepared based on site inspections from public roads by the Proponent and interpretation of aerial photographs. As a result, while all reasonable steps were taken during preparation of these plans and associated table to ensure their accuracy, it may be that some landownership details have changed since the date of the database search or that some structures identified as residences and visa versa.

Table 4.3
Surrounding Land Ownership

Page 1 of 4

Land Reference[1]	Residence Reference[2]	Section/Lot/DP	Landowner[3]
1	-	1021/1127185, 102/755934, 1/986483, 2/986483, 3/986483, 4/986483, 5/986483, 104/1100849.	Cortona Resources Limited
2	-	103/755934	Exeter Farm Pty Ltd
3	R34	98/755934	Ref not held
4	-	2/1099172, 1/61600	Glendaruel (Holdings) Pty Limited
5	-	1/996501, 2/996501, 1/5/758636, 2/5/758636, 3/5/758636, 4/5/758636, 5/5/758636, 6/5/758636, 7/5/758636, 9/5/758636, 10/5/758636, 13/5/758636, 14/5/758636, 9/835597,	P. Callan, C McGrath, L Haggan
6		Reference not used	
7	R31	1/136801, 2/136801, 3/755934, 82/755934, 83/755934, 95/755934, 113/755934, 114/755934, 141/755934, 143/755934	P. & L. Matthias
8	R24	1/199645, 2/199645	S.J. Redden
9	-	1/28/758636, 2/28/758636, 3/28/758636, 5/28/758636, 5A/28/758636, 6/28/758636, 7/28/758636, 10/28/758636, 11/28/758636, 13/28/758636, 14/28/758636	Valerie Carpenter
10	-	12/28/758636	Certificate has not been issued
11	-	18/27/758636	D.P. Drew
12	-	13/27/758636	B.S. & S.F. Drew
13	R58	14/27/758636	N.V. Harrington

Table 4.3 (Cont)
Surrounding Land Ownership

Land Reference[1]	Residence Reference[2]	Section/Lot/DP	Landowner[3]
14	-	15/27/758636	S. Lee
15	-	16/27/758636	Reference not held
16	R55	17/27/758636	Reference not held
17	R54	9/31/758636	A.D. & M.S. Phillips
18	R53	2/31/758636	Mangold Investments (NSW) Pty Ltd
19	-	2A/27/758636	Reference not held
20	-	701/1054207, 701/1054979, 1/123143, 1/123393, 1/48260, 161/755934, 162/755934, 188/755934, 193/755934, 209/755934, 213/755934, 5/4/758636, 6/4/758636, 7/4/758636, 8/4/758636, 9/4/758636, 1/21/758636, 2/21/758636, 3/21/758636, 4/21/758636, 7/21/758636, 8/21/758636, 9/21/758636, 10/21/758636, 1/24/758636, 2/24/758636, 4/24/758636, 5/24/758636, 6/24/758636, 7/24/758636, 8/24/758636, 9/24/758636, 10/24/758636, 11/24/758636, 12/24/758636, 4/25/758636, 5/25/758636, 6/25/758636, 7/25/758636, 8/25/758636, 9/25/758636, 10/25/758636, 11/25/758636, 12/25/758636, 13/25/758636, 1/53/758636, 3/53/758636, 4/53/758636, 5/53/758636, 6/53/758636, 701/93977	State of NSW
21	R59	20/27/758636	L.G. Delamont
22	-	19/27/758636	Y.M. Chin
23	-	7/27/758636	Reference not held
24	-	7A/27/758636	Reference not held
25	R21, R71, R72	8/27/758636	Reference not held
26	-	9/27/758636	Reference not held
27	-	10/27/758636	Reference not held
28	-	21/27/758636, 22/27/758636	1/1112412 – Timothy James Rankin
29	R60	1/42/758636, 2/42/758636, 3/42/758636, 4/42/758636, 5/42/758636,	R.A. & J.A. South McKenzie
30	-	7/15/758636	The Right Reverend Mesac Thomas
31	-	121/48413, 120/755934, 8/15/758636	K.M. Stuart
32			Reference not used
33	R61	5/15/758636, 6/15/758636	A. & C.W.Y.H. Brace & R. Mahncke
34	-	1/4/758636, 2/4/758636	W. Brickwood
35	-	2A/4/758636, 3/4/758636, 4/4/758636	Crown land
36	-	8/5/758636	A.J. & L.E.M.M. Astley
37	-	1/14/758636, 2/14/758636, 2A/14/758636, 3/14/758636, 3A/14/758636, 4/14/758636, 4A/14/758636, 6/14/758636, 6A/14/758636, 7/14/758636, 7A/14/758636, 8/14/758636, 9/14/758636, 5/836923	B.W. McCarron

Table 4.3 (Cont)
Surrounding Land Ownership

Land Reference[1]	Residence Reference[2]	Section/Lot/DP	Landowner[3]
38	-	5/6/758636	C.A. & M.T. Powell
39	R44	6/6/758636, 7/9/758636	B.D. & G.B.L. Hayes
40	R45	8/6/758636	A.A. Casey
41	R40	A/336039	N. Tetley & S.L. Buchanan
42	R39	1/665110	B. Sheridan & J. McIntyre
43		2/6/758636, 3/6/758636, 4/6/758636	W.M. Nelson
44	R43	1/39/758636, 2/39/758636	S.P. & K.A. Junor
45		240/775934	Reference Not Held
46	R84	6/877483	W.H. & J.F. Butcher
47	R85	5/877483	L.J. Stinson
48	R86	4/877483	R.M. Grant & M. Allatt
49	R87	3/877483	S.L. Bennett
50	R88	1/877483, 2/877483	B.R. Doherty & N.L. Watts
51	R91	23/1004205	M.J. Franz
52	R64	5/13/758636, 5A/13/758636, 6/13/758636, 7/13/758636, 7A/13/758636,	A.H. & C.E. Struzina
53	R65	4/13/758636, 4A/13/758636	K. Angel
54	R66	33/1012809	R. & E.P. Blakely-Kidd
55	R67	2/13/758636	N.L. Amey
56	R68	1/13/758636	J.L. & C.A. Corcoran
57	R63	2/17/758636	J.T. & C.M. Bowman
58	-	3/17/758636, 4/17/758636	R.E. McCarron
59	-	1/17/758636	J.W. Wiggins
60	-	9/18/758636	Reference Not Held
61	R94	1/18/758636, 2/18/758636, 3/18/758636, 7/18/758636	M.A. Ross
62	R93	4/18/758636, 5/18/758636, 5A/18/758636, 1/26/758636	Star Buttons Enterprises Pty Ltd
63	-	6/18/758636	Lachmere Pty Ltd
64	R70	1/40248, 11/15/758636, 1/16/758636, 2/16/758636,	S.M. McCarron
65	-	9/1068558	J.S. Weeks & J.B. McDonald
66	-	10/1068558	D.E. Jeffery & M.A. Stoyles
67	-	11/1068558	A. & M.J. McDonald
68	R19	8/1068558	A.P. Dann
69	-	7/1068558	P.A. & V.L. Grindrod
70	-	6/1068558	R.C. Stone
71	R20	5/1068558	A. & M.Z. Page
72	R6	1/797719	B. Carruthers
73	R7	253/755934	A.K. & N. Riley
74	R2	3/842928, 6/842928, 7/842928, 8/842928, 45/872802	D.B.R. & B.A. Messum
75	R16	11/709905, 9/735425, 10/735425, 1/986527	L.T. & P.S. Ruzicka
76	R17	1/831229, 2/831229	B. McDonald
77	R18	14/842928, 1/859129	G. Gibson
78	R23	4/1068558	M.L. Cathro
79	R22	3/1068558	P.J. & L.J. Cram
80	-	2/1068558	G. & J. Wheatley and K. & S. Jones
81	-	1/1068558	D.J. & L.M. Avery

Table 4.3 (Cont)
Surrounding Land Ownership

Land Reference[1]	Residence Reference[2]	Section/Lot/DP	Landowner[3]
82	-	4/755934	Reference Not Held
83	-	3/20/758636, 4/20/758636	H.A. Gillespie
84	-	11/574879, 12/574879, 13/574879	The Council of the Shire of Tallaganda
85	-	1/19/758636	R. Allen & S.M. McIlveen
86	R9	247/755934, 15/22/758636, 16/22/758636, 17/22/758636, 18/22/758636	William Edmund Waterhouse
87	R10	5/21/758636, 6/21/758636	Sarah Elizabedth Vella
88	R11	2/53/758636, 9/53/758636	G.E. & L.H. Ison
89	-	21/720161	L.A. & G.M. Baillie
90	R13	13/24/758636, 14/24/758636, 15/24/758636, 16/24/758636, 17/24/758636, 18/24/758636, 19/24/758636, 20/24/758636, 21/24/758636, 22/24/758636, 23/24/758636, 24/24/758636	B. Vugec
91	-	3/24/758636	W.A. & K.T. O'Leary
92		1/36/758636	R.J. & C.H. Smith-Roberts
93	R14	65/755934, 67/755934, 191/755934, 216/755934	D.K. & D.M. Wood
94	R12	163/755934, 164/755934	S, P, P, W & J. Cootes
95	R15	125/755934, 212/755934	M. Flakelar & J. Holmes
96	R32, R36	211/755934	B. Crittenden
97	-	202/755934	V. Laurie
98	R29	1/194317, 66/755934, 210/755934	B. & C. James
99	R1	93/755934, 166/755934	M. Toner & R. Manderson
100	-	5/1093136	J. & K. Spring
101	-	?/54/758636	Reference Not Held
102	-	?/1/758636	Reference Not Held
103	-	1/23/758636	Reference Not Held
104	-	165/755934	Reference Not Held
105	R30	94/755934	Reference Not Held
106	R26,R27, R28	104/755934	Reference Not Held
107	-	113/755934	Folio Cancelled
108	-	95/755934	Reference Not Held
109	-	101/755934	Reference Not Held
110	-	4/755934	Reference Not Held
111	-	9/18/758636	Reference Not Held
112	-		Reference Not Held
113	-	96/755934	Reference Not Held
114	-	104/1149075	J. Stachow & R. Stachow

Note 1: See **Figure 4.6**
Note 2: See **Figure 4.7**
Note 3: "reference not held" indicates that the owner of the land is not registered on the Land Titles Register, possibly as a result of the land being "Old Title."

Source: Land and Property Management Authority (March 2010)