

Narromine Shire Council
PO Box 115
NARROMINE NSW 2821

Job No. AT371

Attn: Ms Kylie Rowe

8 May 2015

Re: Flooding Investigation Associated with the Proposed Rezoning of Land within the Narromine Aerodrome for Industrial Purposes

Dear Kylie

This letter sets out the findings of an investigation which was undertaken to assess the impact a possible industrial subdivision development within the Narromine Aerodrome would have on flooding behaviour. A set of Interim Flood Planning Levels (**IFPL's**) were also derived for the industrial subdivision site based on the findings of the investigation.

1. Background

Narromine Shire Council (**NSC**) is presently considering rezoning land which is located within the Narromine Aerodrome for industrial development. **Figure 1** shows the location of the industrial subdivision site adjacent to the southern boundary of the aerodrome.

Previous studies have shown that parts of Narromine are subject to flooding when the Macquarie River breaks its left bank during floods with annual exceedance probabilities (**AEP's**) less than about 2 per cent. **Figures 2 and 3** show the indicative extent and depth of inundation for floods with AEP's of 2% and 1%, respectively.

At the 2% AEP level floodwater is shown to surcharge the western bank of the Macquarie River downstream of the Narromine Eumungarie Rail Road bridge, where it crosses Warren Road and partially inundates the two runways. The peak 2% AEP flood level at the intersection of the north-south and east-west runways is RL 236.5 m AHD.

At the 1% AEP level the industrial subdivision site is affected by floodwater which originates from the following two sources:

- As a result of floodwater which surcharges the Town Cowal at the location where the Mitchel Highway crosses an existing irrigation canal which runs around the perimeter of the Narromine Golf Course.
- As a result of floodwater which surcharges the left bank of the Macquarie River immediately downstream of the Narromine Eumungarie Rail Road bridge. Floodwater which surcharges the river at this location crosses Warren Road where it flows in a westerly direction between the aforementioned irrigation canal and the Sky Park development.

The depth of flow through the industrial subdivision site at the 1% AEP level generally ranges between 100 and 400 mm (refer inset on **Figure 2**), while flow velocities are relatively mild at between 0.2 - 0.4 m/s. Peak 1% AEP flood levels fall in a westerly direction from about RL 237.2 m AHD to about RL 236.9 m AHD.

2. Impact of Proposed Industrial Subdivision on Flooding Behaviour

The structure of the two-dimensional hydraulic that was developed as part of L&A, 2013 was adjusted to include the footprint of the proposed building arrangement within the industrial subdivision. The blocking effects of the buildings were schematised in the model by applying a very high hydraulic roughness value when compared to that adopted for the adjacent floodplain.

Figure 4 shows the impact the erection of two rows of buildings adjacent to the Mitchell Highway west of the Narromine Golf Course will have on flooding behaviour at the 1% AEP level. Increases in peak flood levels are generally confined to the southern portion of the aerodrome, extending south as far as the Mitchell Highway. Increases in peak flood levels are greatest along the south boundary of the aerodrome and are in the range 100-200 mm.

3. Impact of Potential Earth Bund Failure on Flooding Behaviour

The impact the potential failure of an earth bund which runs around the perimeter of the Narromine Golf Course adjacent to the aforementioned irrigation canal was assessed given the potential for peak flood levels to increase in the vicinity of the proposed industrial subdivision site, possibly exceeding the 500 mm freeboard provision which is set out in NSC's Flood Policy.

The structure of the two-dimensional hydraulic model which incorporated the footprint of the proposed buildings was adjusted whereby natural surface levels along the length of the earth bund were lowered to the elevation of the adjacent floodplain.

Figure 5 shows that peak flood levels in the vicinity of the building footprints would be increased by a maximum of about 200 mm were the earth bund to fail during a 1% AEP flood event. Based on this finding, the 500 mm freeboard provision incorporated in NSC's Flood Policy is considered adequate to take account of uncertainties in the peak flood level estimate for the industrial subdivision site.

4. Interim Flood Planning Levels

Figure 6 shows the set of 1% AEP IFPL's which apply to the industrial subdivision site. The IFPL's were derived by adding 500 mm to peak post-subdivision 1% AEP flood levels.

The 2% AEP IFPL for the industrial subdivision is RL 237.0 m AHD. This was derived by adding 500 mm to the peak flood level at the intersection of the two runways.

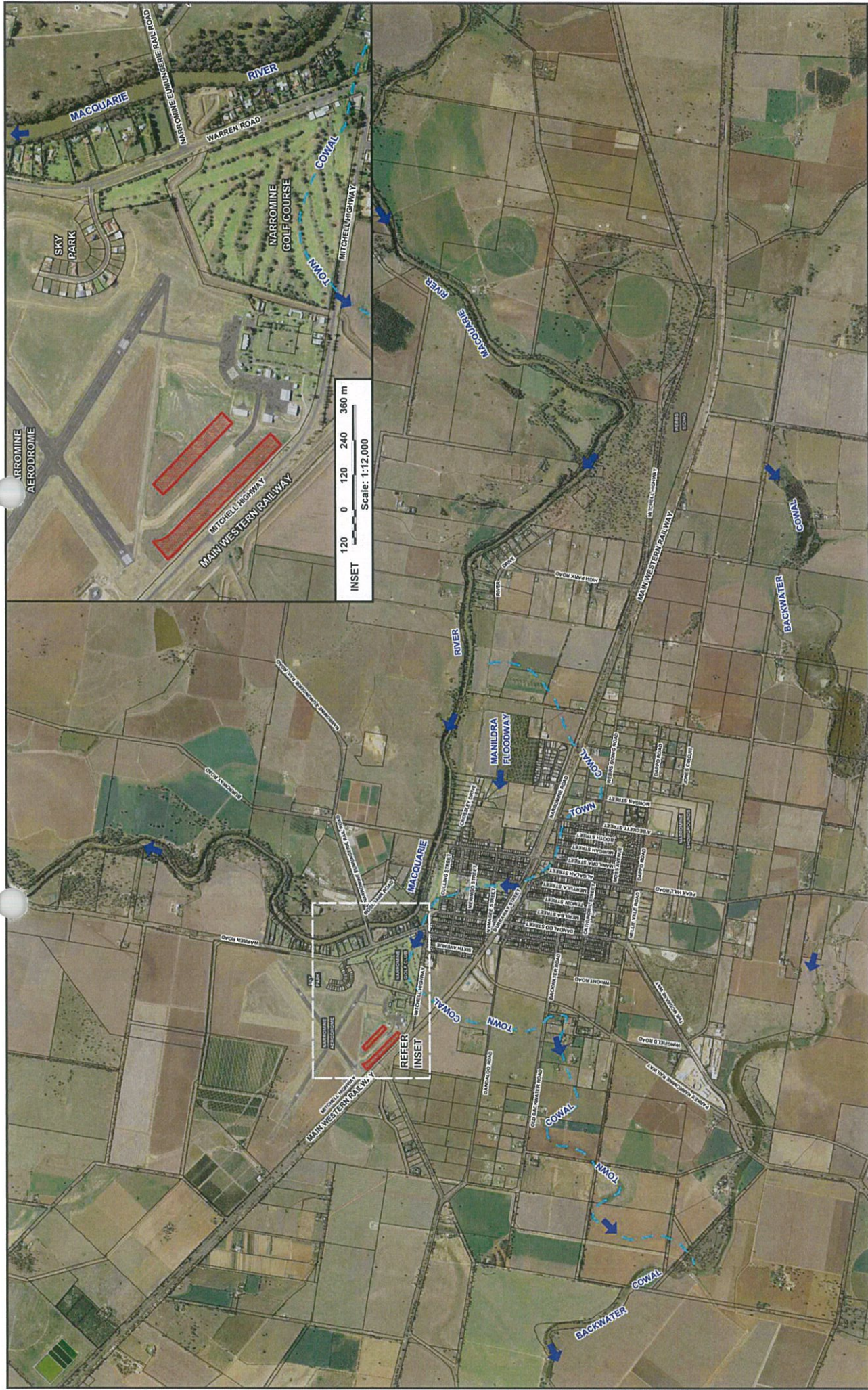
We trust that the advice set out in this letter will assist NSC in its consideration of the proposal to rezone land located within the Narromine Aerodrome for industrial development. However, please do not hesitate to contact the undersigned should you wish to discuss any aspect of the advice contained in this letter.

Yours faithfully

Lyall & Associates Consulting Water Engineers

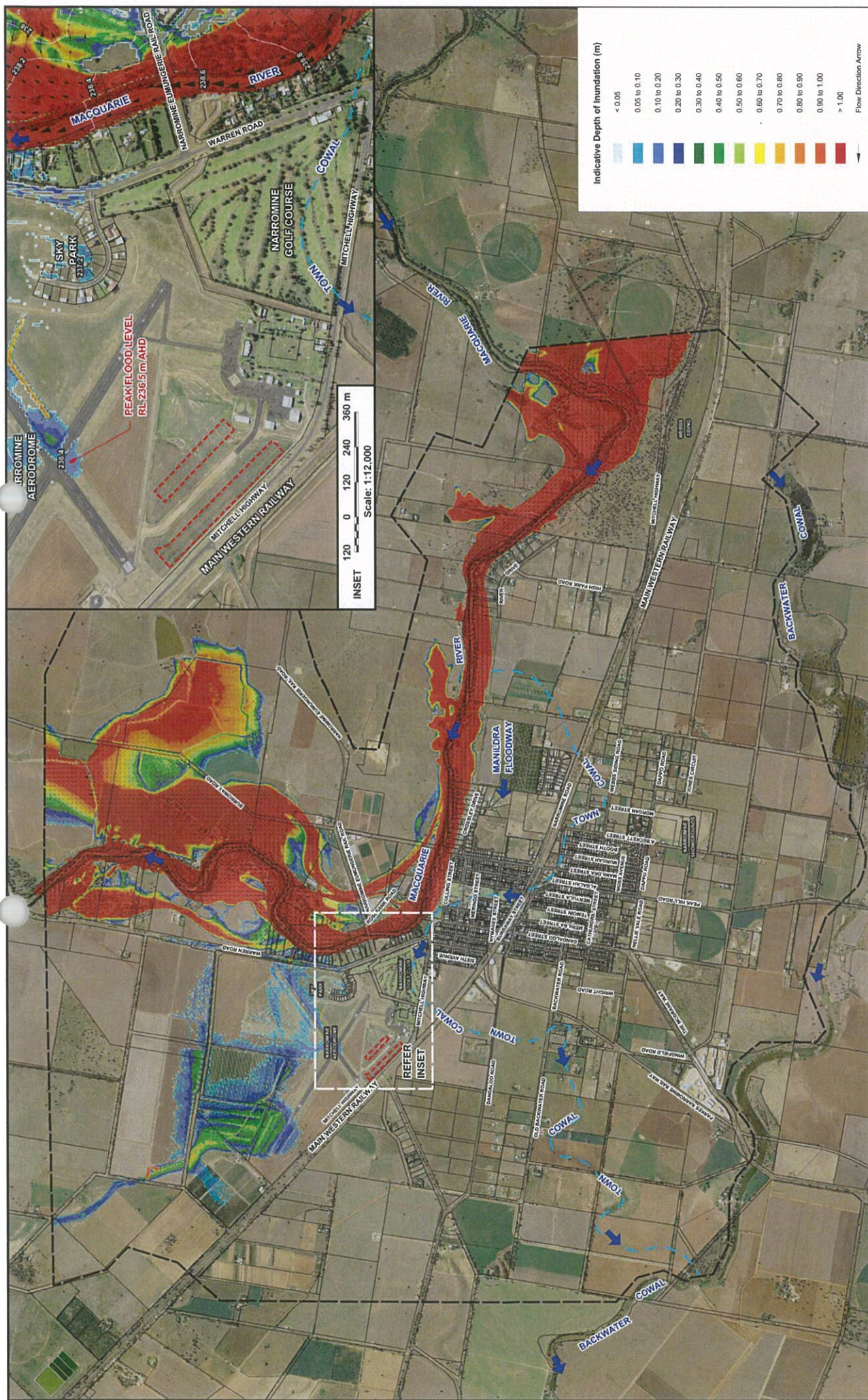


Scott Button
Principal



NARROMINE AERODROME REZONING PROPOSAL FLOODING INVESTIGATION

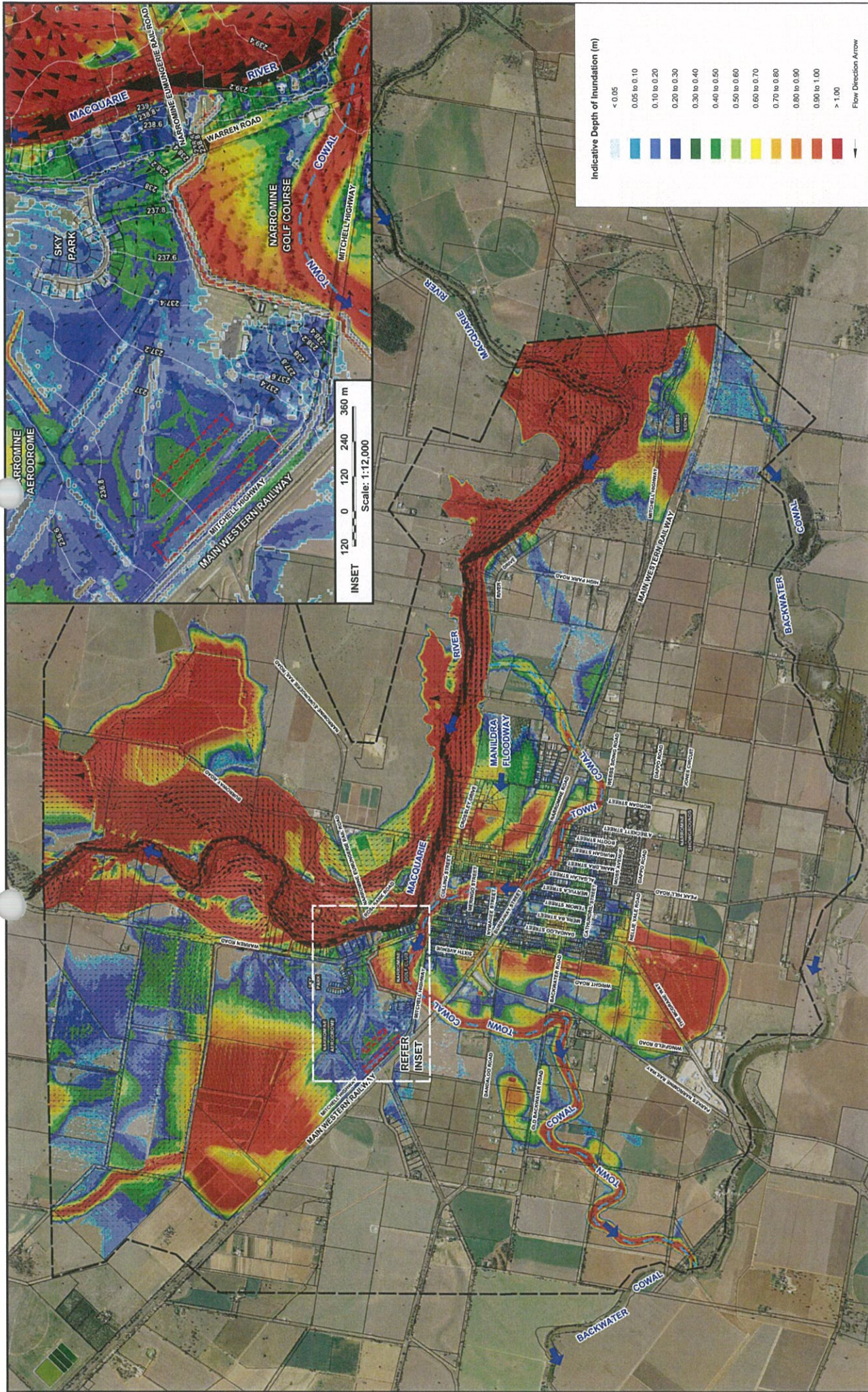
Figure 1



NARROMINE AERODROME REZONING PROPOSAL FLOODING INVESTIGATION

Figure 2

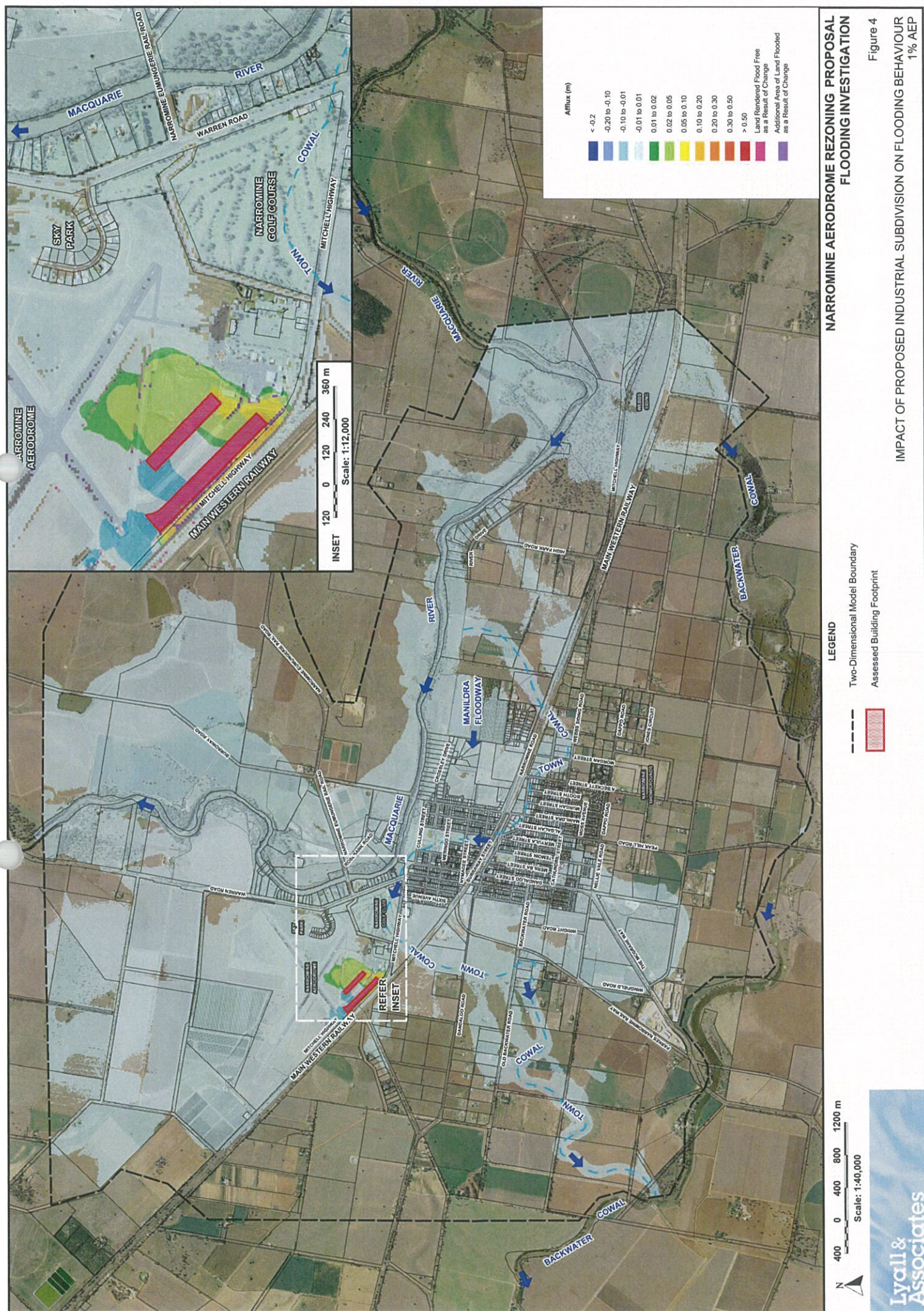
INDICATIVE EXTENT AND DEPTH OF INUNDATION
PRESENT DAY CONDITIONS - 2% AEP

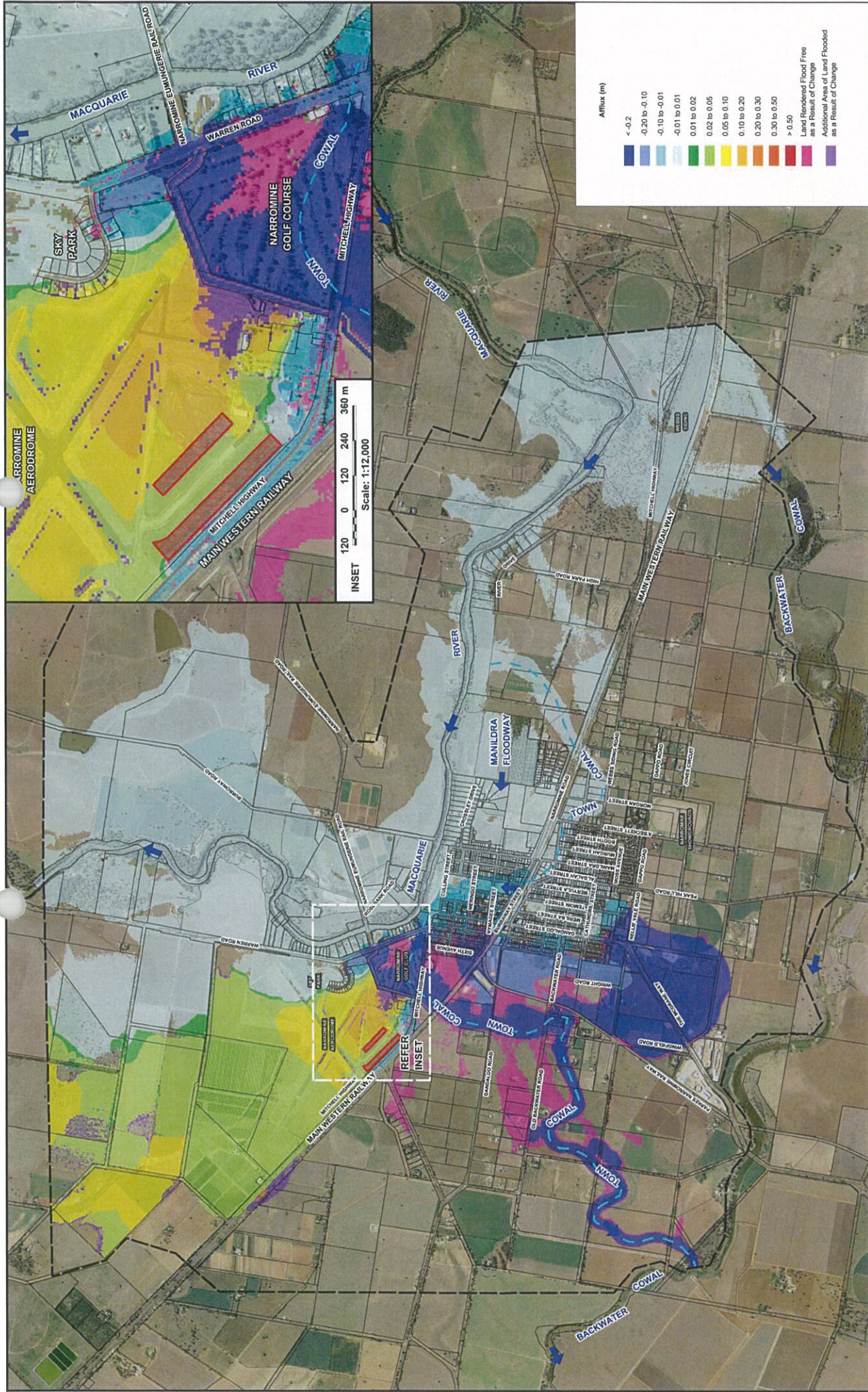


NARROMINE AERODROME REZONING PROPOSAL FLOODING INVESTIGATION

Figure 3

INDICATIVE EXTENT AND DEPTH OF INUNDATION
PRESENT DAY CONDITIONS - 1% AEP





NARROMINE AERODROME REZONING PROPOSAL FLOODING INVESTIGATION

Figure 5

IMPACT OF EARTH BUND FAILURE ON FLOODING BEHAVIOUR
POST-SUBDIVISION CONDITIONS - 1% AEP



NARROMINE AERODROME REZONING PROPOSAL FLOODING INVESTIGATION

Figure 6

INTERIM FLOOD PLANNING LEVELS
POST-SUBDIVISION CONDITIONS - 1% AEP

LEGEND

- Extent over which Interim Flood Planning Levels have been shown
- Interim Flood Planning Level Contour ¹ (m AHD)
- Interim Flood Planning Level ¹ (m AHD)
- Assessed Building Footprint

NOTE:
1. Interim Flood Planning Level set equal to 1% AEP plus 500 mm freeboard



Lyall & Associates

SURVEYING & SPATIAL INFORMATION REGULATION 2006							
MARK	M.G.A. CO-ORDINATES		ZONE	CLASS	ORDER	METHOD	ORIGIN
	EASTING	NORTHING					
P.M. 69851	615 504.348	6 434 115.687	55	B	2	FROM SCIMS	FOUND
P.M. 69852	616 439.070	6 435 496.992	55	B	2	FROM SCIMS	FOUND
P.M. 170483	615 048.335	6 434 698.816	55	B	2	FROM SCIMS	FOUND
XX	XXX	XXX	X	X	X	XXX	XX
XX	XXX	XXX	X	X	X	XXX	XX
SOURCE	MGA CO-ORDINATES		ADOPTED FROM SCIMS AS AT			3rd AUGUST, 2010	
COMBINED SCALE FACTOR = 0.999728							

NUMBERED ARCS & LINES

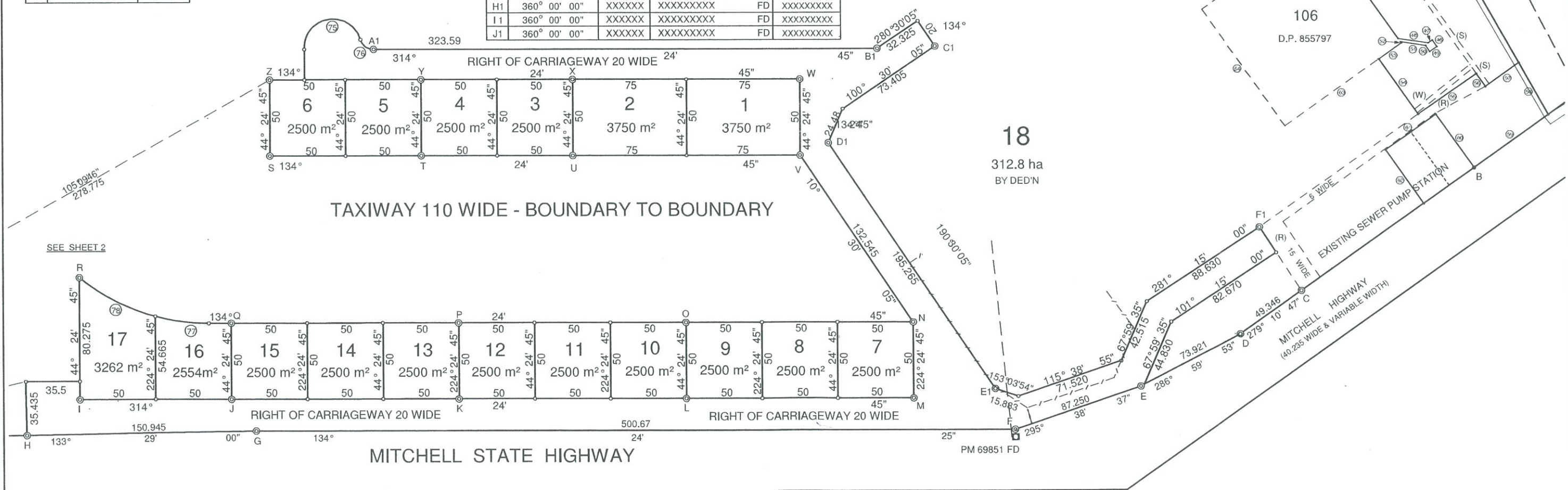
No	DISTANCE	P. O.
35	15.19	LINE
36	37.785	LINE
37	19.495	LINE
38	33.93	LINE
39	13.58	LINE
40	40.465	LINE
41	17.265	LINE
42	34.14	LINE
43	49.66	LINE
44	18.24	LINE
45	90.39	LINE
46	20.01	LINE
47	3.19	LINE
48	5.2	LINE
49	5.665	LINE
50	4.79	LINE
51	16.59	LINE
52	0.85	LINE
53	18.255	LINE
54	44.41	LINE

NUMBERED ARCS & LINES

No	DISTANCE	P. O.
55	46.7	LINE
56	10.345	LINE
57	27.13	LINE
58	39.235	LINE
59	60.35	LINE
60	43.15	LINE
61	40.52	LINE
62	43.15	LINE
63	75.745	LINE
64	94	LINE
65	75.76	LINE
66	54.54	LINE
67	20.265	LINE
68	11.685	LINE
69	3.71	LINE
70	31.215	LINE
71	3.69	LINE
72	11.645	LINE
73	20.265	LINE

REFERENCE AND PERMANENT MARKS					
COR	BEARING	DISTANCE	FROM	PLAN	
A	15° 48' 05"	6.445	D. H. & WING	FD	D.P. 1100630
B	9° 00' 25"	0.42	G. I. PIPE	FD	D.P. 855797
C	11° 12' 25"	0.305	G. I. PIPE	FD	D.P. 1100630
D	9° 10' 25"	1.985	G. I. PIPE	FD	D.P. 550396
E	360° 00' 00"	XXXXXX	XXXXXXX		
F	41° 33' 10"	2.78	P. M. 69851		
G	332° 49' 00"	3.18	G. I. PIPE	FD	MS. 1663.3030
H	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
I	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
J	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
K	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
L	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
M	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
N	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
O	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
P	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
Q	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
R	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
S	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
T	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
U	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
V	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
W	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
X	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
Y	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
Z	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
A1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
B1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
C1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
D1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
E1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
F1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
G1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
H1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
I1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX
J1	360° 00' 00"	XXXXXX	XXXXXXX	FD	XXXXXXX

SCHEDULE OF CURVED BOUNDARIES					
No	CHORD		ARC	RAD	LOT
	BEARING	DISTANCE			
75	124° 35' 35"	37.735	55.185	19	18
76	171° 06' 00"	10.755	11.53	9	18
77	321° 57' 25"	35.95	35.60	135	16
78	341° 31' 10"	56.175	56.59	135	17
5	360° 00' 00"	XXXXXX	XXXXXX	XXXXX	XXXXX
6	360° 00' 00"	XXXXXX	XXXXXX	XXXXX	XXXXX
7	360° 00' 00"	XXXXXX	XXXXXX	XXXXX	XXXXX



Surveyor : GRAEME STEPHEN ASTLEY
Date of Survey : 16th AUGUST, 2010
Surveyor's Ref : 08 / 112
(08112 VER.-2, DWG 08-112 DP SHT 1)

PLAN OF SUBDIVISION OF
LOT 33 IN D.P. 1100630

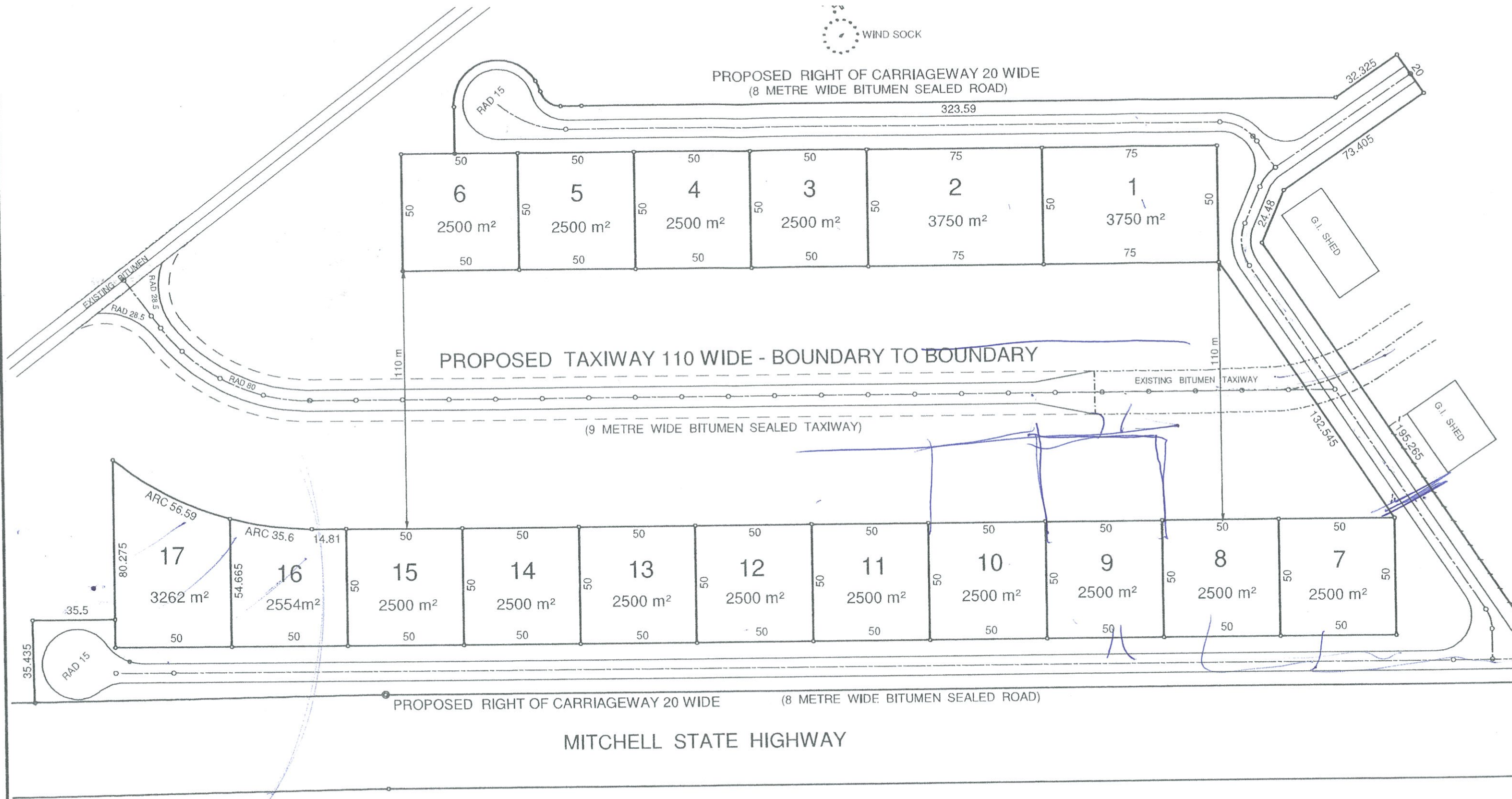
L. G. A. : NARROMINE
NARROMINE
Subdivision No. :
Lengths are in metres.
Reduction Ratio 1 : 1800

Registered

DP



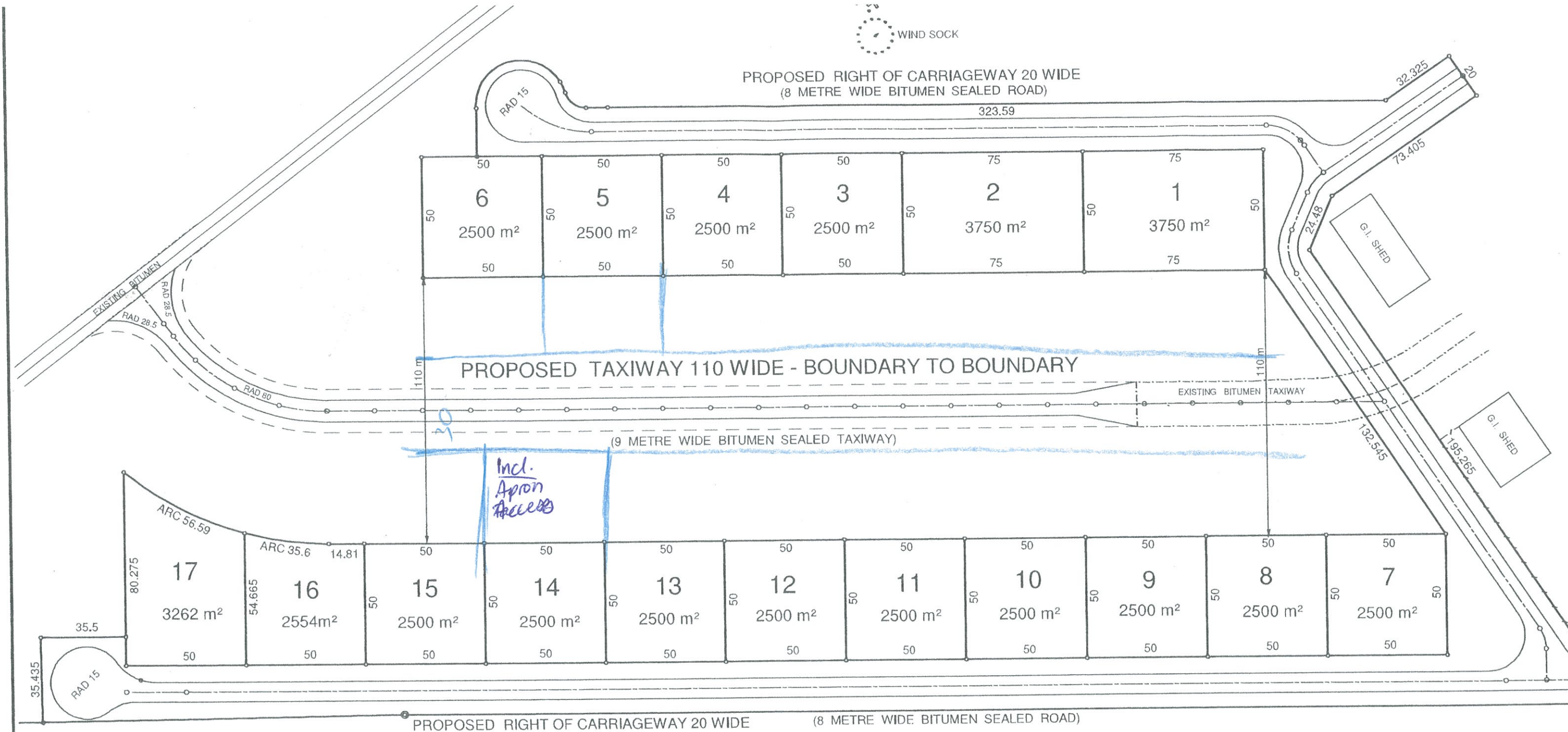
PROPOSED RIGHT OF CARRIAGEWAY 20 WIDE
(8 METRE WIDE BITUMEN SEALED ROAD)



No.	Date	Amendments	App'd	Reduction Ratio	Survey -	Checked	Job File	This drawing and its contents are subject to return on demand and may not be copied or disclosed to any third party or used directly	NARROMINE S
1	15 - 04 - 10	First Issue		1 : 1250 (A1)	Date -	Date	S : \ 2008 \ 08112		
				10 7 14 21 28 35	70				
									1st Floor, 64 Talbragar Street.



PROPOSED RIGHT OF CARRIAGEWAY 20 WIDE
(8 METRE WIDE BITUMEN SEALED ROAD)



No.	Date	Amendments	App'd	Reduction Ratio	Survey	Checked	Job File	This drawing and its contents are subject to return on demand and may not be copied or disclosed to any third party or used directly	NARROMINE S
1	15 - 04 - 10	First Issue		1 : 1250 (A1)	Date	Date	S:\ 2008\08112		
				0 7 14 21 28 35 70					1st Floor, 64 Talbragar Street.