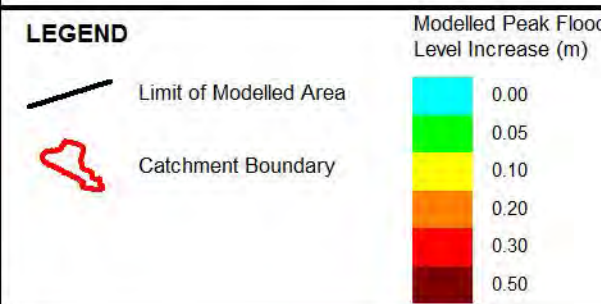
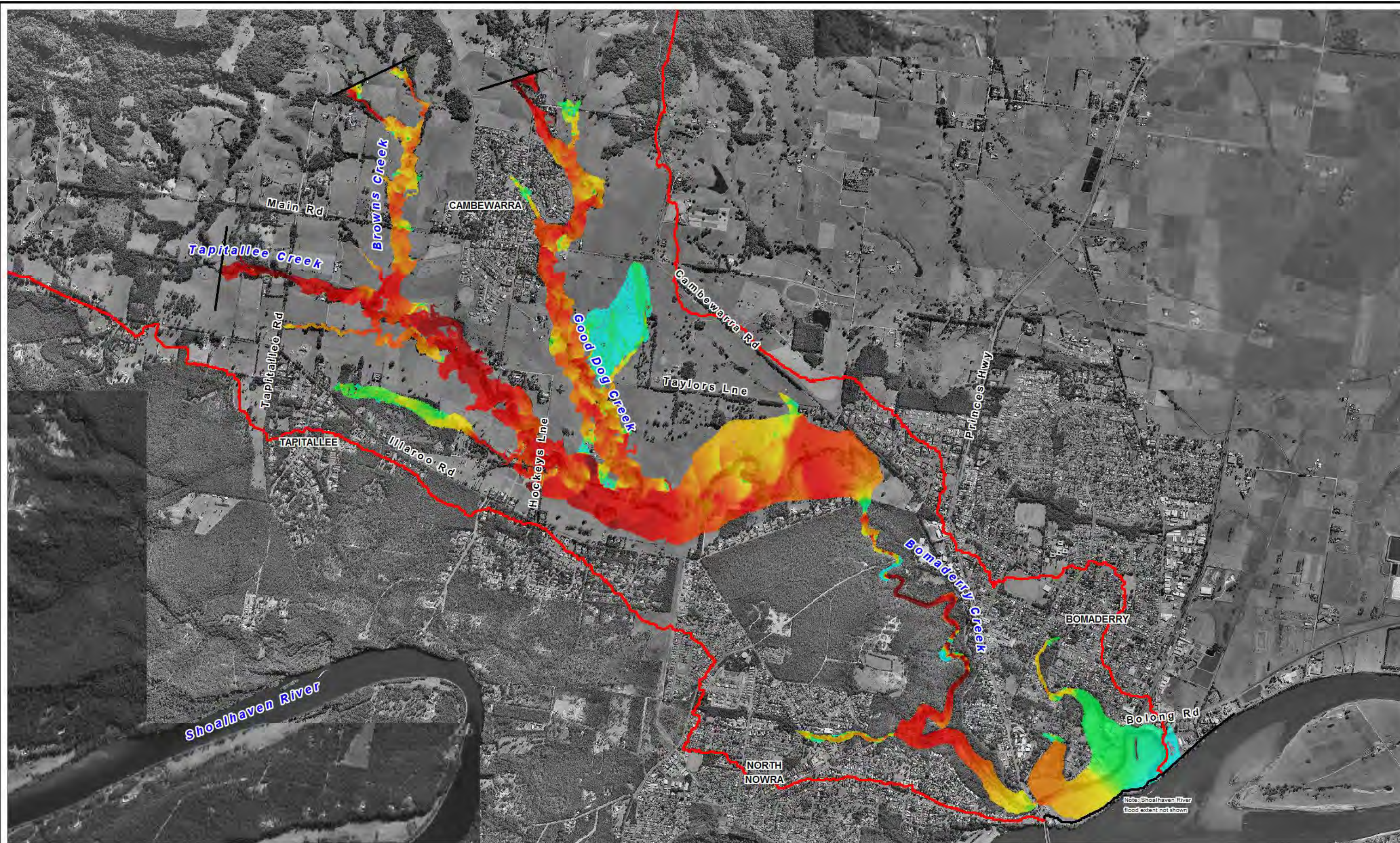


APPENDIX B: SENSITIVITY TESTS – FLOOD IMPACT MAPPING



Title:
Bomaderry Creek Flood Study
Peak Flood Level Afflux - Roughness Scenario: 1% AEP Event

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

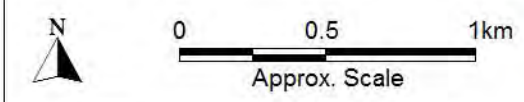


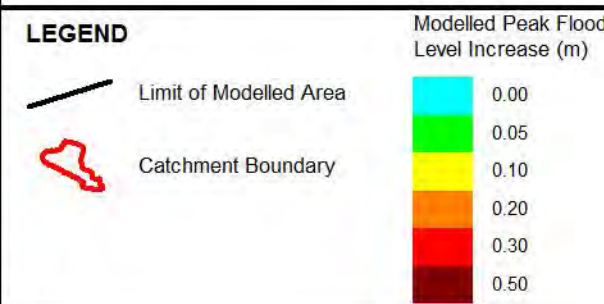
Figure:
B-1

Rev:
A



Filepath : K:\N1267_Bomaderry_Creek_Flood_Study\MI\Workspaces\DRG_028_091110_1%_AEP_Roughness.WOR

Note: Shoalhaven River flood extent not shown



Title:
Bomaderry Creek Flood Study
Peak Flood Level Afflux - Blockage Scenario: 1% AEP Event

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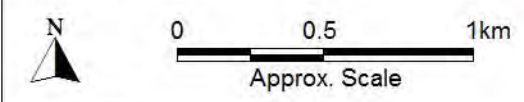


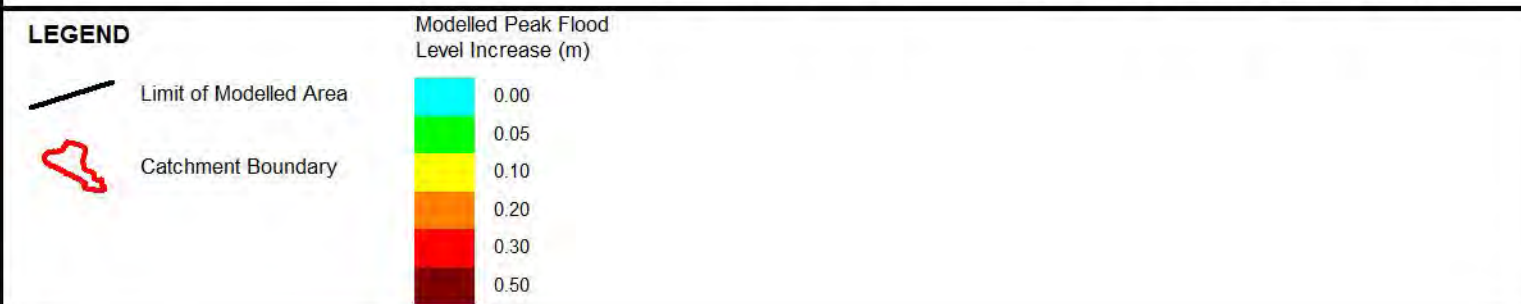
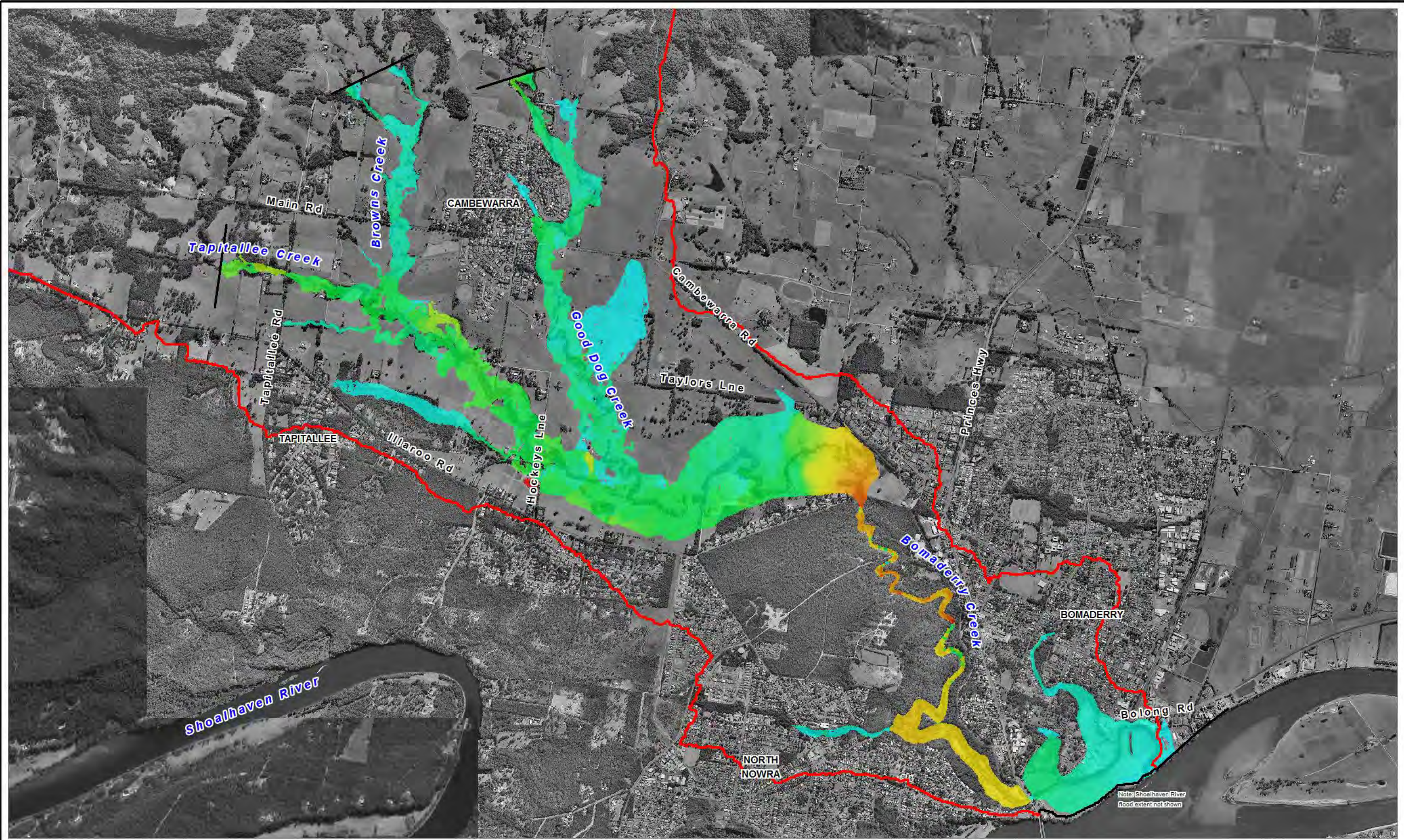
Figure:
B-2

Rev:
A



Filepath : K:\W1267_Bomaderry_Creek_Flood_Study\MIWorkspaces\DRG_029_091110_1%_AEP_Blockage.WOR

Note: Shoalhaven River flood extent not shown



Title:
Bomaderry Creek Flood Study
Peak Flood Level Afflux - Losses Scenario: 1% AEP Event

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0 0.5 1km
 Approx. Scale

Filepath : K:\N1267_Bomaderry_Creek_Flood_Study\MI\Workspaces\DRG_030_091110_1%_AEP_Losses.WOR

Figure:
B-3

Rev:
A

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APPENDIX C: DESIGN RAINFALL DATA

Rainfall Intensity for Bomaderry Creek, NSW

Duration	Average Recurrence Interval						
	1 Year (mm/hr)	2 Year (mm/hr)	5 Year (mm/hr)	10 Year (mm/hr)	20 Year (mm/hr)	50 Year (mm/hr)	100 Year (mm/hr)
5.0 m	106	136	172	193	221	257	285
5.5 m	103	132	167	188	215	250	277
6.0 m	100	128	162	182	209	244	270
6.5 m	97	124	158	178	204	238	264
7.0 m	94	121	154	173	199	232	258
7.5 m	92	118	150	169	194	227	252
8.0 m	89	115	147	165	190	222	247
8.5 m	87	112	144	162	186	218	242
9.0 m	85	110	141	159	182	214	237
9.5 m	84	107	138	156	179	210	233
10 m	82	105	135	153	176	206	229
11 m	79	101	130	147	170	199	221
12 m	76	98	126	142	164	193	214
13 m	73	94	122	138	159	187	208
14 m	71	91	118	134	155	182	203
15 m	69	88	115	130	150	177	197
16 m	66	86	112	127	146	173	192
17 m	65	84	109	123	143	168	188
18 m	63	81	106	120	139	165	184
19 m	61	79	103	118	136	161	180
20 m	60	77	101	115	133	158	176
21 m	58	76	99	113	131	154	173
22 m	57	74	97	110	128	151	169
23 m	56	72	95	108	126	149	166
24 m	55	71	93	106	123	146	163
25 m	54	69	91	104	121	143	161
26 m	52	68	90	102	119	141	158
27 m	51	67	88	100	117	139	155
28 m	50	66	86	99	115	136	153
29 m	49.6	64	85	97	113	134	151
30 m	48.7	63	84	96	111	132	148
32 m	47.1	61	81	93	108	129	144
34 m	45.6	59	79	90	105	125	140
36 m	44.2	58	76	88	102	122	137
38 m	43.0	56	74	85	100	119	134
40 m	41.8	55	72	83	97	116	131
45 m	39.2	51	68	79	92	110	124
50 m	36.9	48.3	65	75	87	104	118
55 m	35.0	45.8	62	71	83	100	113
60 m	33.3	43.7	59	68	80	96	108
75 m	29.3	38.4	52	60	70	84	95
90 m	26.3	34.5	46.5	54	63	76	86
105 m	24.0	31.5	42.5	49.3	58	70	79
120 m	22.2	29.1	39.3	45.6	54	65	73
135 m	20.6	27.1	36.7	42.6	50	60	68
150 m	19.4	25.4	34.5	40.0	47.1	57	64
165 m	18.3	24.0	32.6	37.8	44.5	54	61
180 m	17.4	22.8	30.9	35.9	42.3	51	58
195 m	16.5	21.7	29.5	34.2	40.4	48.6	55
210 m	15.8	20.8	28.2	32.8	38.6	46.5	53
225 m	15.2	19.9	27.1	31.5	37.1	44.7	51
240 m	14.6	19.2	26.0	30.3	35.7	43.0	48.8
270 m	13.6	17.9	24.3	28.2	33.3	40.2	45.5
5 h	12.7	16.8	22.8	26.5	31.3	37.8	42.8
6 h	11.4	15.0	20.5	23.8	28.1	34.0	38.5
7 h	10.4	13.7	18.7	21.8	25.7	31.0	35.2
8 h	9.59	12.6	17.2	20.1	23.8	28.7	32.6
9 h	8.93	11.8	16.1	18.8	22.2	26.8	30.4
10 h	8.38	11.0	15.1	17.6	20.9	25.2	28.6
11 h	7.92	10.4	14.3	16.7	19.7	23.9	27.1
12 h	7.51	9.90	13.6	15.8	18.8	22.7	25.8
14 h	6.89	9.09	12.4	14.5	17.2	20.8	23.6
16 h	6.40	8.43	11.5	13.5	15.9	19.3	21.9
18 h	5.99	7.89	10.8	12.6	14.9	18.0	20.5
20 h	5.64	7.44	10.2	11.9	14.1	17.0	19.3
22 h	5.35	7.05	9.64	11.2	13.3	16.1	18.3
24 h	5.09	6.71	9.17	10.7	12.7	15.3	17.4
30 h	4.47	5.89	8.06	9.40	11.1	13.4	15.3
36 h	4.02	5.29	7.23	8.44	9.98	12.1	13.7
42 h	3.66	4.82	6.59	7.68	9.08	11.0	12.5
48 h	3.37	4.44	6.06	7.07	8.36	10.1	11.5
54 h	3.13	4.12	5.63	6.56	7.75	9.37	10.6
60 h	2.92	3.85	5.25	6.12	7.24	8.74	9.92
66 h	2.74	3.61	4.93	5.75	6.79	8.20	9.30
72 h	2.59	3.40	4.65	5.42	6.40	7.73	8.76

The rainfall intensities shown above are calculated in accordance with Chapter 2, Australian Rainfall and Runoff - 1987 Edition.

Bomaderry Creek, NSW; 34.825 South 150.55 East

APPENDIX D: COMMUNITY QUESTIONNAIRE RESPONSES

Bomaderry Creek Flood Study Questionnaire

ID	1	2	3	4	5	6	7
How many years have you lived in the study area?	5-10 years	10-20 years		10-20 years	0-5 years	more than 20 years	more than 20 years
What is the type of property?	Residential	Residential		Residential	Residential	Commercial	Commercial
Do you recall any significant floods in your area?	At various times the water covers ? Oval. Last week (5/2/08) wasas much water as I have seen over the ovals.	1988/89			Feb-08	Think 1978 ? Over 2 metre in factory	1994 Approx
For any flood, do you have records of the height the flood waters reached? For example, you may have made a mark on a shed, or a light post.	X	X		X	X	✓	✓
If yes, please provide a short description.						Marked on steel column in factory	No as these premises border Bom. Creek, also surrounded by a 6' fence. The water level was approx 12" below the fence level.
Have you noticed any changed to the ground in recent years that may affect flooding? This could include road raising, construction or general filling. Please indicate any such changes on the attached map. Also please indicate below how you consider flooding may be altered by this change.						Council easement full of vegetation plus an increase storm water.	Bom. Creek is bordered by huge coral trees which are breaking off and falling into the water. This would impede some flow.
In your opinion, what causes flooding in your area, and are there any features / structures that make flooding worse?	The creek that flows along the edge of Tawana St & the ovals is full of elephant ear weed & needs cleaning out.				Low lying land.	Stormwater which has doubled can't get away. As river rises the stormwater has doubled.	As mentioned above, these coral trees need to be removed. One tree has just fallen into the creek with latest rainfall.
Most severe flood experienced							
Date or Year:				Any heavy rain	2008	We think 1978 2 metres	31/05/1905
Parts of the property that flooded and (depth of water):					✓ 10cm		
Grounds							
Garage/Shed						✓	
Building							✓
Access							
What was the source of flooding?							
Overflow from the Creek		✓		✓	✓	✓	✓
Overflowing stormwater drains (flow down roads)					✓	✓	
Overflow from neighbouring property						✓	
Inadequate drainage/ponding on your property						✓	
Other						✓	
How long did the flooding last?				1 day	A few days	About 2 or 3 days then 2 days cleanup so we lost a weeks production.	Until rain stopped and water receded, a few hours.
Where was the water flowing to and from?		From Bomaderry Creek to Oval		Down the creek		From all the back streets of Bomaderry Belting us to F206 Hollow	Water was coming from Bom. Creek, behind the Bomaderry country store
How fast was the water flowing?		Still Water		Running Pace	Still Water	Walking Pace	Still Water
Did access roads get flooded?		✓		✓		✓	X
If yes, which ones, (duration and depth?)		Bolong Road - Several days at ankle deep.		Main Road - 10-15cm			
Did you record/mark:							
Water Level						✓	
Rainfall							
Have photograph/video							
Other floods experienced							
Date(s):				Any heavy rain		Factory, office and showroom, varies from year to year.	1994 approx
Parts of the property that flooded and (depth of water):				The creek runs down 1m and covers 2-3 metres of my property. (property boundary is middle of ? Dry creek)			Back storage sheds, approx 12" water covered the floor.
What were the flood characteristics (duration, flow velocities, flow directions, rainfall)?				Creek ? Within hours of rain stopping.			All night and to around midday the following day, the water rose steadily, pushed back by the tide. Went downstream into the shoalhaven river, towards the sea. 10-12" overnight. Highland water contributed also at the time.
Please feel free to express here any additional personal comment/opinion about your flooding experiences in the Study area including any suggestions for resolving flooding and drainage issues?	As mentioned earlier if the creek that runs along the southern edge of Tanewana St & nothern edge of Thurgate ovals was cleaned of the elephant ear weed I am sure the water would clear much quicker.			Main Road ? Dog Creek and Mose Vale Rd intersection regularly to 10cm ?? Moving it and on heavy rain events in ? ? ? ? ? ? ? ? ? ?	The flooding observed were in Bolong Rd near Beinda St in the soccer ovak adjacent to it and in Bridge Road near the highway. In both Bolong Road and Bridge Rd the flooding was on half the carriageway with traffic using half the road. Perhaps one solution may be raising the roadwat in both cases.	Added damage is caused by traffic allowed to drive through the flooded water on Bolong Rd. This creates a wash that destroys our front entry. We need to close Bolong Rd till water level has receded, clean basement. Would help us.	Bom Creek is becoming choked up with fallen trees, mainly coral trees which are unpredictable at the best of time. One large tree has become dislodged behind the store in recent rain (feb 08). The creek needs cleaning out, coral trees along the northern bank need removing, permanently.
As part of the study, the consultants may want to clarify the information provided by you, or may want to survey any flood marks that you have. If you can be of any more assistance in this regard, please fill in your contact details below.							
Contact Name							
Contact Phone No							
Address							
Suburb							

Bomaderry Creek Flood Study Questionnaire

ID	16	17	18
How many years have you lived in the study area?	10-20 years	more than 20 years	more than 20 years
What is the type of property?	Residential	Residential	Commercial
Do you recall any significant floods in your area?	Aug-07, Feb-08	October 1959, Many other over the years	Jan-08
For any flood, do you have records of the height the flood waters reached? For example, you may have made a mark on a shed, or a light post.		✓	✗
If yes, please provide a short description.		The water Main & Cattle bridge immediately down stream of the old highway bridge was washed out.	
Have you noticed any changed to the ground in recent years that may affect flooding? This could include road raising, construction or general filling. Please indicate any such changes on the attached map. Also please indicate below how you consider flooding may be altered by this change.			
In your opinion, what causes flooding in your area, and are there any features/structures that make flooding worse?	Properties on higher ground in the estate allow run off to lower blocks.	Usually back up from the Shoalhaven River however in Oct 59 the river was not particularly high and Bomaderry Ck flooded.	
Most severe flood experienced			
Date or Year:	Aug-07	Bomaderry Ck Oct 1959	N/A - property has never flooded
<i>Parts of the property that flooded and (depth of water):</i>			
Grounds	✓	✓	
Garage/Shed	✓		
Building			
Access			
<i>What was the source of flooding?</i>			
Overflow from the Creek			
Overflowing stormwater drains (flow down roads)			
Overflow from neighbouring property	✓		
Inadequate drainage/ponding on your property			
Other			
How long did the flooding last?	Receded 2 hours after heavy rain.		
Where was the water flowing to and from?	From blocks on higher ground down to creek.		
How fast was the water flowing?	Running Pace		
Did access roads get flooded?	✗	✓	
If yes, which ones, (duration and depth?)			
<i>Did you record/mark:</i>			
Water Level	✓ 75cm flowing across blocks into drain, drain depth 250mm		
Rainfall			
Have photograph/video			
Other floods experienced			
Date(s):		Many Shoalhaven River floods	
Parts of the property that flooded and (depth of water):		Lot 1 DP2886 (sec 28) Tarrawara St	
What were the flood characteristics (duration, flow velocities, flow directions, rainfall)?		Intense rain overnight, widespread damage. Bomaderry Creek high velocity flow.	
Please feel free to express here any additional personal comment/opinion about your flooding experiences in the Study area including any suggestions for resolving flooding and drainage issues?		The Cattle bridge on bigger property was washed away and the water supply to AMM was cut. The bridge was rebuilt and raised 3ft? At that stage the old timber bridge was still in place on the highway. There was intense rainfall overnight and there had been a flood in the river several days earlier which had dropped to a little over high tide level before Bomaderry Ck came down in flood.	
As part of the study, the consultants may want to clarify the information provided by you, or may want to survey any flood marks that you have. If you can be of any more assistance in this regard, please fill in your contact details below.			
Contact Name			
Contact Phone No			
Address			
Suburb			