Attachment A

ATTENTION: This site was updated recently, changing some of the functionality. Please see the changelog (./changelog) for further information

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	150.461
Latitude	-34.53
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Interim Climate Change Factors	show
Probability Neutral Burst Initial Loss (./nsw_specific)	show

Data

River Region

Division	South East Coast (NSW)
River Number	12
River Name	Hawkesbury River

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2016_v1

ARF Parameters

A R F = M i n { 1 , [1 – a (A r e a b – c log 10 D u r a t i o n) D u r a t i o n – d + e A r e a f D u r a t i o n g (0.3 + log 10 A E P) + h 10 i A r e a D u r a t i o n 1440 (0.3 + log 10 A E P)] }

Zone	a	b	c	d	e	f	g	h	i
SE Coast	0.06	0.361	0.0	0.317	8.11e-05	0.651	0.0	0.0	0.0

Short Duration ARF

A R F = M i n [1 , 1 – 0.287 (A r e a 0.265 – 0.439 log 10 (D u r a t i o n)) . D u r a t i o n – 0.36 + 2.26 x 10 – 3 x A r e a 0.226 . D u r a t i o n 0.125 (0.3 + log 10 (A E P)) + 0.0141 x A r e a 0.213 x 10 – 0.021 (D u r a t i o n – 180) 2 1440 (0.3 + log 10 (A E P))]

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Note: As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. The continuing storm loss information from the ARR Datahub provided below should only be used where relevant under the loss hierarchy (level 5) and where used is to be multiplied by the factor of 0.4.

ID	30453.0
Storm Initial Losses (mm)	35.0
Storm Continuing Losses (mm/h)	4.8

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECsouth.zip)

code	ECsouth
Label	East Coast South

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2016_v2

Areal Temporal Patterns | Download (.zip) (./static/temporal_patterns/Areal/Areal_ECsouth.zip)

code	ECsouth
arealabel	East Coast South

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2016_v2

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-34.530330025&longitude=150.461157627&sdmin=true&sdhr=true to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

Time Accessed	07 July 2020 06:50PM

Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	1.0 (0.040)	1.1 (0.032)	1.1 (0.029)	1.2 (0.026)	0.8 (0.014)	0.5 (0.008)
90 (1.5)	0.5 (0.016)	1.0 (0.026)	1.4 (0.029)	1.7 (0.031)	1.0 (0.016)	0.5 (0.007)
120 (2.0)	0.0 (0.000)	0.4 (0.009)	0.6 (0.012)	0.8 (0.014)	0.8 (0.011)	0.8 (0.010)
180 (3.0)	1.9 (0.048)	2.3 (0.044)	2.6 (0.041)	2.8 (0.040)	3.4 (0.040)	3.9 (0.040)
360 (6.0)	4.1 (0.073)	11.8 (0.155)	16.8 (0.188)	21.7 (0.210)	21.8 (0.179)	21.9 (0.161)
720 (12.0)	5.0 (0.062)	9.0 (0.080)	11.6 (0.086)	14.2 (0.091)	18.7 (0.102)	22.1 (0.109)
1080 (18.0)	3.1 (0.031)	8.6 (0.061)	12.3 (0.072)	15.9 (0.080)	16.5 (0.071)	16.9 (0.065)
1440 (24.0)	0.8 (0.007)	5.1 (0.031)	8.0 (0.040)	10.7 (0.046)	11.8 (0.043)	12.7 (0.042)
2160 (36.0)	0.0 (0.000)	1.8 (0.009)	3.0 (0.013)	4.2 (0.015)	3.8 (0.011)	3.5 (0.009)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.1 (0.003)	1.9 (0.004)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	12.6 (0.510)	11.8 (0.353)	11.2 (0.283)	10.7 (0.231)	11.4 (0.205)	11.9 (0.188)
90 (1.5)	11.6 (0.400)	12.3 (0.317)	12.8 (0.278)	13.3 (0.247)	18.4 (0.286)	22.2 (0.304)
120 (2.0)	17.6 (0.540)	17.7 (0.406)	17.8 (0.345)	17.9 (0.299)	22.3 (0.311)	25.6 (0.315)
180 (3.0)	17.1 (0.438)	35.0 (0.665)	46.8 (0.752)	58.1 (0.808)	46.8 (0.547)	38.4 (0.398)
360 (6.0)	25.3 (0.455)	42.5 (0.561)	53.9 (0.600)	64.8 (0.625)	72.0 (0.589)	77.4 (0.567)
720 (12.0)	30.2 (0.373)	43.5 (0.384)	52.2 (0.387)	60.7 (0.388)	62.6 (0.341)	64.1 (0.315)
1080 (18.0)	19.7 (0.198)	32.5 (0.229)	41.0 (0.240)	49.1 (0.247)	50.8 (0.217)	52.0 (0.201)
1440 (24.0)	24.3 (0.213)	27.5 (0.167)	29.6 (0.149)	31.6 (0.135)	40.0 (0.146)	46.3 (0.152)
2160 (36.0)	4.1 (0.030)	16.5 (0.084)	24.7 (0.103)	32.5 (0.114)	26.5 (0.078)	22.0 (0.058)
2880 (48.0)	7.1 (0.048)	9.5 (0.044)	11.0 (0.041)	12.5 (0.039)	16.7 (0.044)	19.9 (0.046)
4320 (72.0)	0.0 (0.000)	0.1 (0.001)	0.2 (0.001)	0.3 (0.001)	10.4 (0.024)	17.9 (0.036)

Layer Info

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Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	59.6 (2.409)	61.7 (1.847)	63.0 (1.586)	64.3 (1.388)	58.3 (1.047)	53.9 (0.849)
90 (1.5)	24.2 (0.835)	31.9 (0.820)	36.9 (0.802)	41.8 (0.781)	61.2 (0.953)	75.8 (1.039)
120 (2.0)	46.0 (1.412)	59.8 (1.367)	68.9 (1.330)	77.6 (1.292)	89.8 (1.251)	98.9 (1.217)
180 (3.0)	59.8 (1.528)	85.6 (1.628)	102.7 (1.652)	119.1 (1.656)	129.1 (1.508)	136.5 (1.415)
360 (6.0)	56.3 (1.012)	84.5 (1.114)	103.1 (1.148)	121.0 (1.167)	124.9 (1.023)	127.8 (0.936)
720 (12.0)	59.5 (0.735)	85.1 (0.753)	102.0 (0.756)	118.2 (0.756)	115.0 (0.627)	112.7 (0.553)
1080 (18.0)	48.4 (0.486)	64.4 (0.454)	74.9 (0.439)	85.0 (0.427)	102.7 (0.440)	116.0 (0.448)
1440 (24.0)	54.0 (0.473)	63.3 (0.386)	69.4 (0.349)	75.3 (0.322)	90.5 (0.329)	101.9 (0.334)
2160 (36.0)	27.3 (0.203)	40.5 (0.207)	49.3 (0.205)	57.7 (0.202)	73.3 (0.216)	84.9 (0.225)
2880 (48.0)	25.5 (0.173)	35.4 (0.163)	41.9 (0.156)	48.2 (0.150)	67.8 (0.177)	82.4 (0.192)
4320 (72.0)	3.5 (0.021)	8.5 (0.035)	11.9 (0.040)	15.1 (0.042)	49.4 (0.113)	75.1 (0.152)

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Interim Climate Change Factors

	RCP 4.5	RCP6	**RCP 8.5**
2030	**0.869 (4.3%)**	0.783 (3.9%)	**0.983 (4.9%)**
2040	**1.057 (5.3%)**	1.014 (5.1%)	**1.349 (6.8%)**
2050	**1.272 (6.4%)**	1.236 (6.2%)	**1.773 (9.0%)**
2060	**1.488 (7.5%)**	1.458 (7.4%)	**2.237 (11.5%)**
2070	**1.676 (8.5%)**	1.691 (8.6%)	**2.722 (14.2%)**
2080	**1.810 (9.2%)**	1.944 (9.9%)	**3.209 (16.9%)**
2090	**1.862 (9.5%)**	2.227 (11.5%)	**3.679 (19.7%)**

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2019_v1
Note	ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.

Probability Neutral Burst Initial Loss

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	15.9	9.1	9.3	10.0	9.3	8.4
90 (1.5)	17.7	11.6	10.4	11.1	9.1	6.6
120 (2.0)	15.3	10.2	9.4	9.8	8.7	6.2
180 (3.0)	14.1	8.9	8.8	8.0	7.5	4.5
360 (6.0)	13.6	8.4	8.1	6.5	6.4	2.1
720 (12.0)	14.0	10.4	10.4	9.2	9.3	2.2
1080 (18.0)	16.6	12.4	12.4	10.0	11.3	3.7
1440 (24.0)	17.3	14.6	14.2	13.2	13.3	7.1
2160 (36.0)	21.9	16.9	16.1	15.4	16.4	7.0
2880 (48.0)	22.3	18.9	18.5	20.7	17.8	8.3
4320 (72.0)	26.7	24.6	25.6	26.0	19.9	7.0

Layer Info

Time Accessed	07 July 2020 06:50PM
Version	2018_v1
Note	As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. Probability neutral burst initial loss values for NSW are to be used in place of the standard initial loss and pre-burst as per the losses hierarchy.

Download TXT (downloads/b8ba48a1-6972-4e68-bb50-2466e9795c56.txt)

Download JSON (downloads/961c2f37-ebd6-4d9a-953c-06a9847c4e5a.json)

Download PDF ()

APPENDIX A. GLOSSARY AND TERMINOLOGY

Appendix A

ADOPTED TERMINOLOGY

Frequency Descriptor	EY	AEP (%)	AEP (1 in x)	ARI
Very Frequent	12			
	6	99.75	1.002	0.17
	4	98.17	1.02	0.25
	3	95.02	1.05	0.33
	2	86.47	1.16	0.5
	1	63.21	1.58	1
	0.69	50	2	1.44
Frequent	0.5	39.35	2.54	2
	0.22	20	5	4.48
	0.2	18.13	5.52	5
	0.11	10	10	9.49
Rare	0.05	5	20	20
	0.02	2	50	50
	0.01	1	100	100
	0.005	0.5	200	200
Very Rare	0.002	0.2	500	500
	0.001	0.1	1000	1000
	0.0005	0.05	2000	2000
	0.0002	0.02	5000	5000
Extreme			↓	
			PMP/ PMPDF	

Australian Rainfall and Runoff (ARR, ed Ball et al, 2016) recommends terminology that is not misleading to the public and stakeholders. Therefore the use of terms such as “recurrence interval” and “return period” are no longer recommended as they imply that a given event magnitude is only exceeded at regular intervals such as every 100 years. However, rare events may occur in clusters. For example there are several instances of an event with a 1% chance of occurring within a short period, for example the 1949 and 1950 events at Kempsey. Historically the term Average Recurrence Interval (ARI) has been used.

ARR16 recommends the use of Annual Exceedance Probability (AEP). Annual Exceedance Probability (AEP) is the probability of an event being equalled or exceeded within a year. AEP may be expressed as either a percentage (%) or 1 in X. Floodplain management typically uses the percentage form of terminology. Therefore a 1% AEP event or 1 in 100 AEP has a 1% chance of being equalled or exceeded in any year.

ARI and AEP are often mistaken as being interchangeable for events equal to or more frequent than 10% AEP. The table above describes how they are subtly different.

The Probable Maximum Flood is the largest flood that could possibly occur on a catchment. It is related to the Probable Maximum Precipitation (PMP). The PMP has an approximate probability. Due to the conservativeness applied to other factors influencing flooding a PMP does not translate to a PMF of the same AEP. Therefore an AEP is not assigned to the PMF.

GLOSSARY

From the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m^3/s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). **infill development:** refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be

imposed on infill development.

new development: refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power.

redevelopment: refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.

disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves an their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.

flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammetic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the Aflood liable land@ concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPL=s are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the Astandard flood event@ in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. **existing flood risk:** the risk a community is exposed to as a result of its location on the floodplain. **future flood risk:** the risk a community may be exposed to as a result of new development on the floodplain. **continuing flood risk:** the risk a community is exposed to after floodplain risk

management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.

flood storage areas Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.

floodway areas Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.

freeboard Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.

habitable room **in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom.

in an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.

hazard A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community. Definitions of high and low hazard categories are provided in the Manual.

hydraulics Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.

hydrograph A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.

hydrology Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.

local overland flooding Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

local drainage Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.

mainstream flooding Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.

major drainage Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves:

$ the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or

$ water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or

$ major overland flow paths through developed areas outside of defined drainage reserves; and/or

$ the potential to affect a number of buildings along the major flow path.

mathematical/computer models The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.

merit approach The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State=s rivers and floodplains.

The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.

minor, moderate and major flooding Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood:

minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.

moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.

modification measures Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.

peak discharge The maximum discharge occurring during a flood event.

Probable Maximum Flood (PMF) The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding

	associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to water level. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.

APPENDIX B. COMMUNITY CONSULTATION

Appendix B

REVIEW OF THE WINGECARRIBEE RIVER FLOOD STUDY

A Review of the Wingecarribee Flood Study is to be prepared for the Wingecarribee Shire Council. The study will examine flooding caused by Wingecarribee River and its tributary creeks. It will form the basis for floodplain management planning for the area, and investigate measures to reduce flood risk.

What's Happening Now?

Flood Study aims to understand and determine the nature and extent of flood risk in the area. The first stage of the Flood Study will collect, compile and review all available information and past reports, including community knowledge and experiences of past flooding.

We are asking for information such as photos and observations of flooding behaviour. In particular, information on observed peak flood levels is most important. This is where we need your help.

Bong Bong Weir

Hasn't this been done before?

Wingecarribee Shire Council completed a previous flood study in early 2014. The Flood Study will be reviewed and updated, and will include data from events in 2015, 2016 and 2017. In addition to this, national guidelines related to the estimation of design flood events (Australian Rainfall and Runoff) have recently been updated, incorporating approximately 30 years of additional data and revised procedures. These guidelines and best practice computer flood modelling techniques will be used in this study to provide an improved and more comprehensive assessment of flood behaviour.

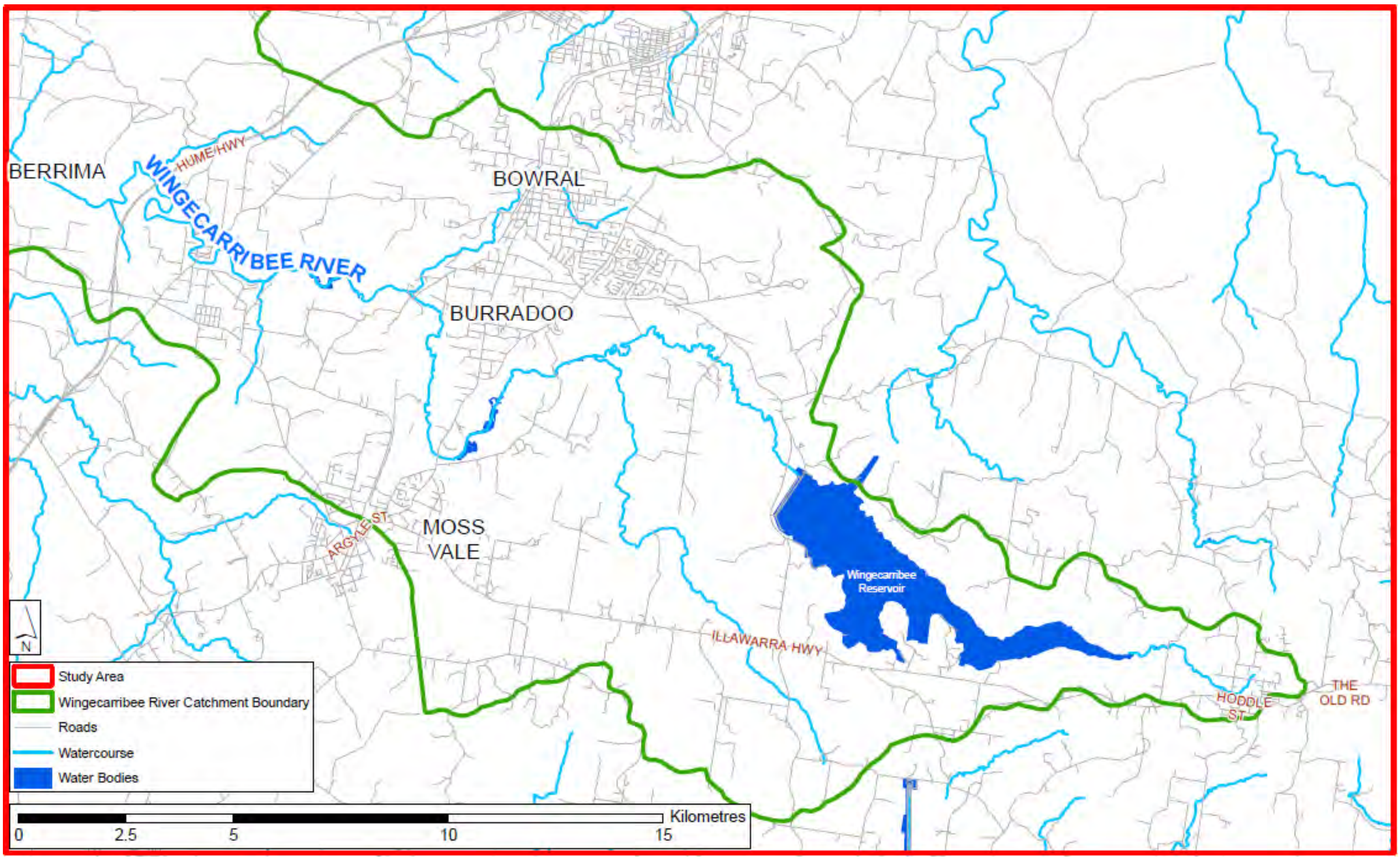
Railway Bridge at Railway Road, Burradoo

wma water

NSW GOVERNMENT | Planning, Industry & Environment

WINGECARRIBEE SHIRE COUNCIL

REVIEW OF THE WINGECARRIBEE RIVER FLOOD STUDY



Study Area

The study area will encompass the entire Wingecarribee River within the Wingecarribee Shire, from upstream of the Wingecarribee Dam, through the Berrima township and downstream to Wallaby Rocks. This area includes the towns of Bowral, Burradoo, Moss Vale (part), New Berrima and Berrima.

How Can I Have My Say?

A questionnaire is enclosed with this newsletter. Please complete this and fold to an envelope size, with the pre-paid envelope showing. Seal with tape and post it back.

Alternatively, complete the questionnaire online: www.surveymonkey.com/r/WRFloodStudy
Please return your survey before Friday 12th June 2020 or it may not be considered.

If you have additional information you would like to make available, or further comments, please attach these to your questionnaire response or get in touch with one of the contacts below.
Further information is also available at https://wrfs.wmawater.com.au/

Contacts

WINGECARRIBEE SHIRE COUNCIL

Sha Prodhan
Floodplain and Stormwater Engineer
Sha.Prodhan@wsc.nsw.gov.au

Wingecarribee Shire Council
Tel: 02 4868 0888

wma water

Rhys Hardwick Jones / Michael Reeves
WRFS@wmawater.com.au

WMAwater
Tel: 02 9299 2855

WINGECARRIBEE FLOOD STUDY QUESTIONNAIRE

Please complete this questionnaire and return by folding, sealing and posting.
Attach additional pages if the space provided below is not enough.

1. Your Details

(Please note your contact details are optional, will be held confidential and will only be used to contact you in relation to this study)

Name:	
Address:	
Telephone:	
Email:	

Can we contact you directly for more information?

☐ Yes

☐ No

2. How long have you lived or worked at your current address?

☐ Years

3. How long have you lived in this area?

☐ Years

4. Have you been affected by flooding in the Wingecarribee area?

☐ Yes. My property was directly affected.

☐ I have observed flooding but my property was not affected.

☐ No. I haven't observed or been affected by flooding.

If you were affected or have observed flooding do you have any information we could use such as photographs of flooding, recorded observations of flood depths or other information? Please provide details below or attach information. Please include dates when known.

5. Was your residence, business or other property affected by flooding?

☐ Residence

☐ Business

☐ Other

☐ None

Tick all that apply. Please provide details:

WINGECARRIBEE FLOOD STUDY QUESTIONNAIRE

6. If your residence, business or other property has been affected, what was the extent?

☐ None ☐ Only the land (not buildings) ☐ Buildings affected above floor level

If Yes, please provide details below regarding the date and time of the flooding if known. (Additional information can be attached to this questionnaire if necessary or emailed to WRFS@wmawater.com.au)

7. Has any damage ever been caused to your home or property due to flooding?

☐ Yes ☐ No

Please give a brief description of the damages and the date they occurred.

8. Have you or members of your household been isolated or evacuated due to flooding?

☐ Yes ☐ No

Please provide details such as length of isolation, length of time away from home and other disruptions (such as being unable to work or go to school for example).

9. Do you know what height a flood reached at your home or elsewhere (e.g. a specific height on your house, fence or shed) or any photos of the flooding?

☐ Yes ☐ No

We can use this information to make our flood models more accurate. If Yes, please provide details below (additional information including photos can be attached to this questionnaire if necessary or emailed to (WRFS@wmawater.com.au).

10. Please use this section to provide any additional information or comments if you have them

Fold here

Fold here

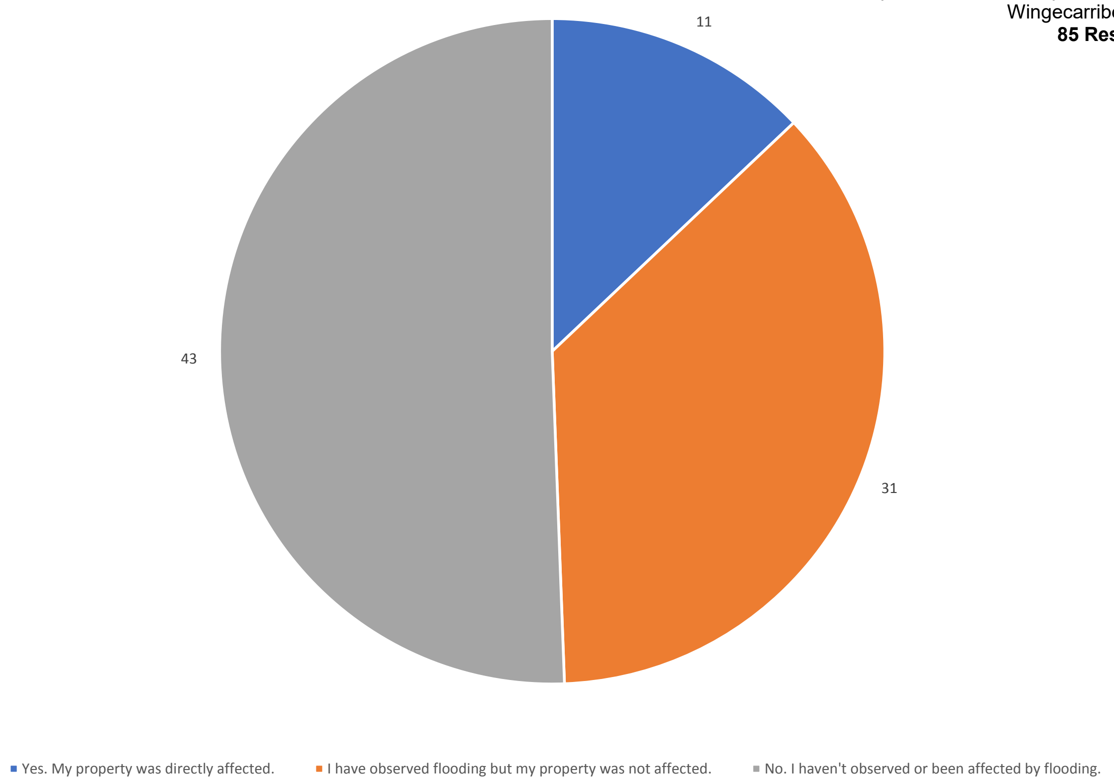
Delivery Address:
PO Box 141
MOSS VALE NSW 2577

No stamp required if posted in Australia

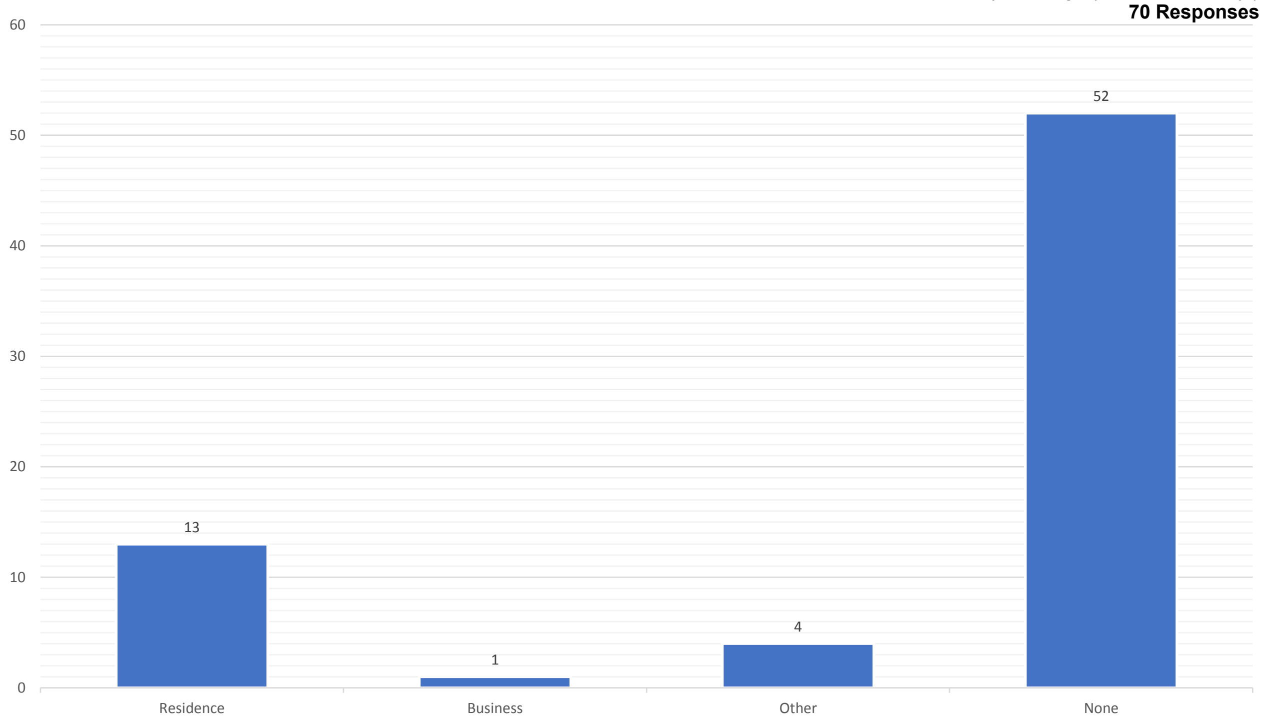
WSC
Reply Paid 141
MOSS VALE NSW 2577

FLOOD SURVEY

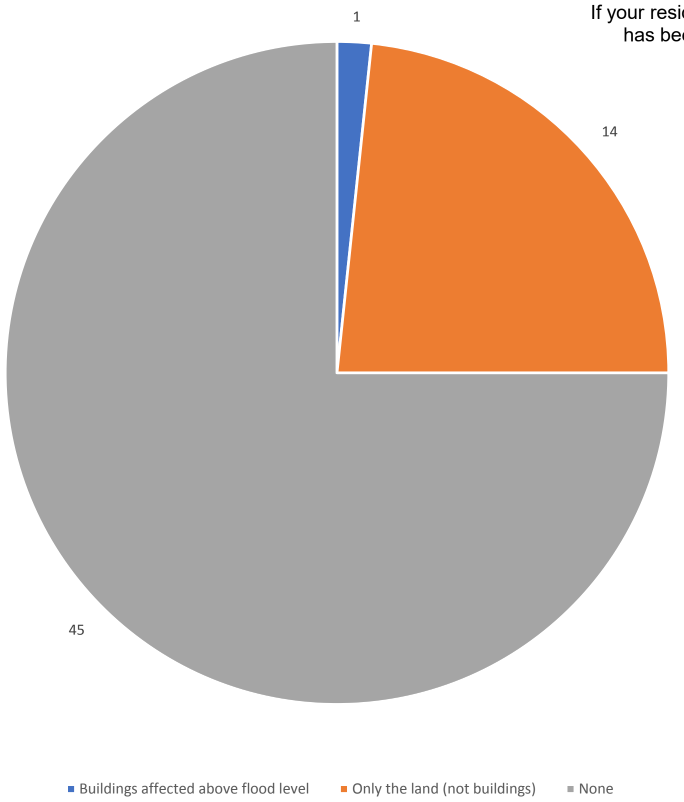
QUESTION 4
Have you been affected by flooding in the Wingecarribee area?
85 Responses



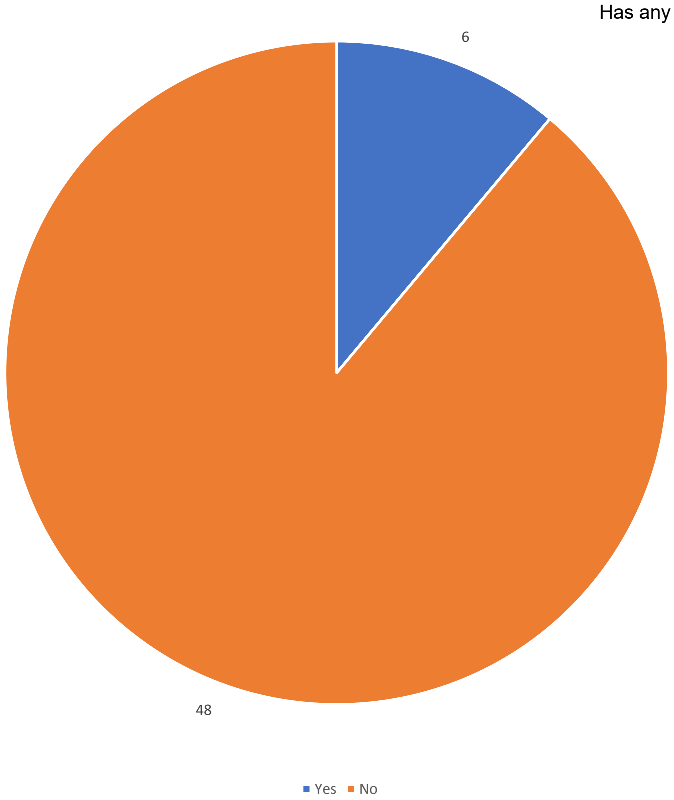
QUESTION 5
Was your residence, business or other property affected by flooding? (Tick all that apply.)
70 Responses



QUESTION 6
If your residence, business or other property has been affected, what was the extent?
60 Responses

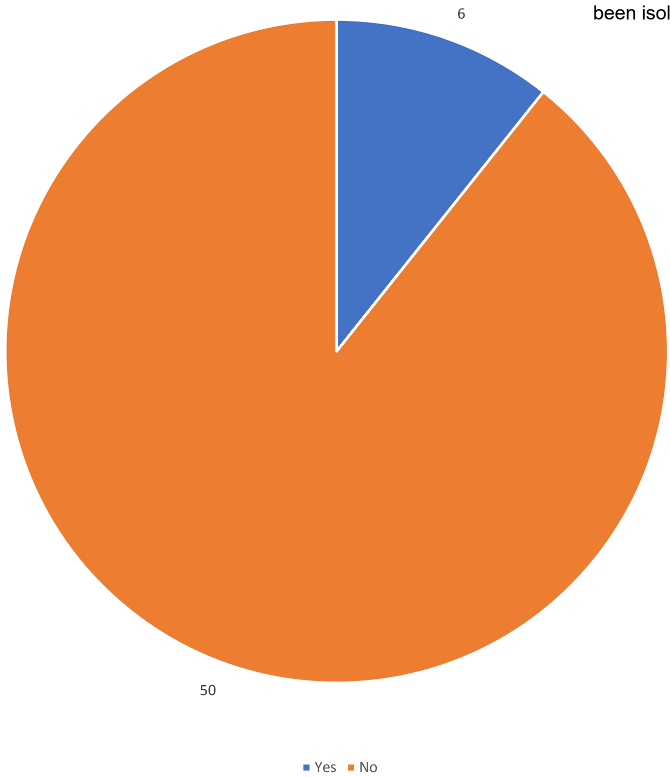


QUESTION 7
Has any damage ever been caused to your home or property due to flooding?
54 Responses



J:\Jobs\120019\Community_Consultation\Responses\Wingecarribee_Community_Responses_200623_Graphs.xlsx

QUESTION 8
Have you or members of your household been isolated or evacuated due to flooding?
56 Responses



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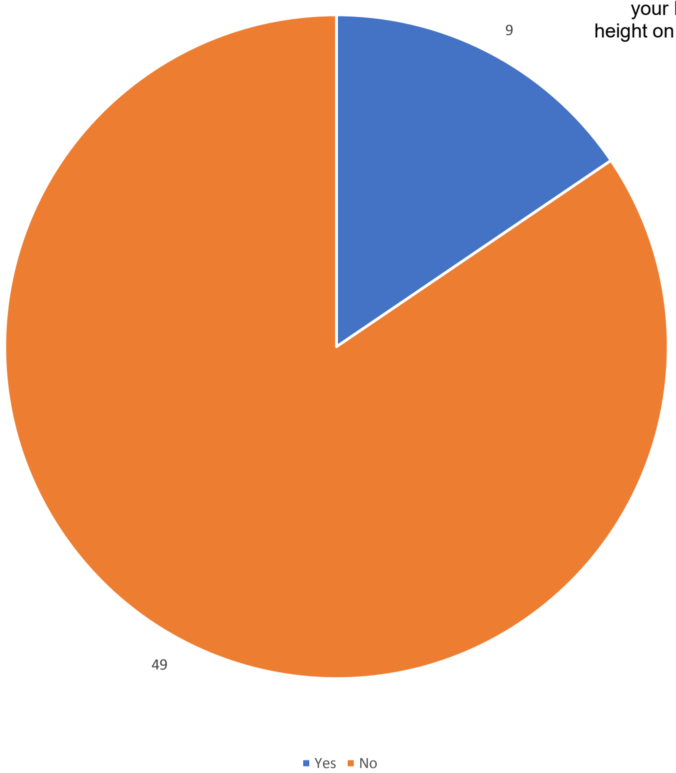
QUESTION 9
Do you know what height a flood reached at your home or elsewhere (e.g. a specific height on your house, fence or shed) or any photos of the flooding?
58 Responses



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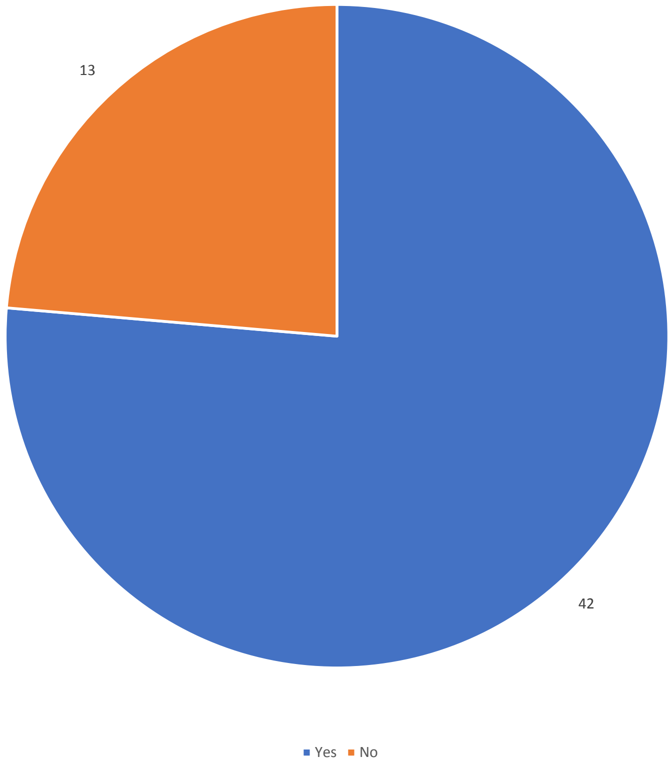
QUESTION 11
Can we contact you directly for more information?
55 Responses



WINGECARRIBEE RIVER FLOOD STUDY UPDATE

VOLUME 2 – A3 MAPPING

FINAL REPORT

REPORT FIGURES

FEBRUARY 2022

APPENDIX C. HISTORICAL FLOOD PHOTOS

Appendix C

Photos of flooding from the community

Photo C1: Flooding at Old Hume Hwy property, Berrima (6 December 2014)

Photo C2: Flooding at Old Hume Hwy property, Berrima (6 December 2014)

Photo C3: Flooding at Old Hume Hwy property, Berrima (6 December 2014)

Photo C4: Flooding at Old Hume Hwy property, Berrima (6 December 2014)

Photo C5: Flooding at Old Hume Hwy property, Berrima (6 December 2014)

Photo C6: Flooding at Old Hume Hwy property, Berrima (25 August 2015)

Photo C7: Flooding at Old Hume Hwy property, Berrima (25 August 2015)

Photo C8: Flooding at Old Hume Hwy property, Berrima (25 August 2015)

Photo C9: Fence Damage at Old Hume Hwy property, Berrima (7 June 2016)

Photo C10: Fence damage at Old Hume Hwy property, Berrima (7 June 2016)

Photo C11: Fence damage at Old Hume Hwy property, Berrima (7 June 2016)

Photo C12: Flooding on Headlam Road, Moss Vale (25 June 2013)

Photo C13: Flooding on Headlam Road, Moss Vale (18 August 2014)

Photo C14: Flooding on Headlam Road, Moss Vale (26 August 2014)

Photo C15: Flooding on Headlam Road, Moss Vale (17 July 2015)

Photo C16: Flooding on Headlam Road, Moss Vale (26 August 2015)

Photo C17: Flooding on Headlam Road, Moss Vale (5 June 2016)

Photo C18: Flooding on Headlam Road, Moss Vale (17 March 2017)

Photo C19: Flooding on Headlam Road, Moss Vale (19 March 2017)

Photo C20: Flooding on Headlam Road, Moss Vale (22 March 2017)

Photo C21: Flooding on Headlam Road, Moss Vale (23 March 2017)

Photo C22: Potholes on Headlam Road following flooding, Moss Vale (27 March 2017)

Photo C23: Flooding on Headlam Road, Moss Vale (11 April 2017)

Photo C24: Flooding on Headlam Road, Moss Vale (26 February 2018)

Photo C25: Flooding at Bong Bong Common (10 February 2020)

Photo C26: Bong Bong Common Flooding, looking towards Burradoo (10 February 2020)

Photo C27: Bong Bong Common Flooding (10 February 2020)

Photo C28: Bong Bong Common Flooding, looking towards Burradoo (10 February 2020)

Photo C29: Bong Bong Common Flooding (10 February 2020)

Photo C30: Flooding at Wingecarribee St, Berrima (March 2009)

Photo C31: Flooding at Wingecarribee St, Berrima (February 2020)

Photo C32: Flooding at Wingecarribee St, Berrima (February 2020)

Photo C33: Flooding at Wingecarribee St, Berrima (February 2020)

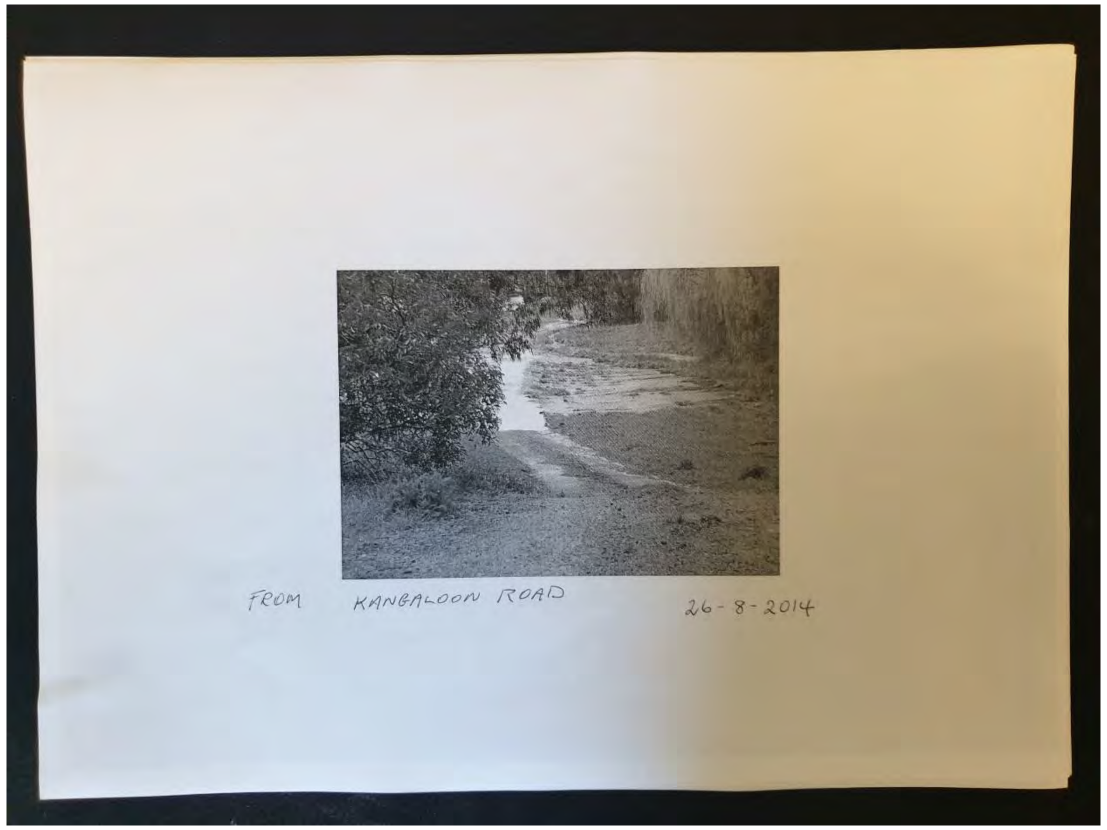


Photo C34: Riverine Flooding at Kangaloon Road (26 August 2014)

Photo C35: Flooding from Kangaloon Road (26 August 2014)

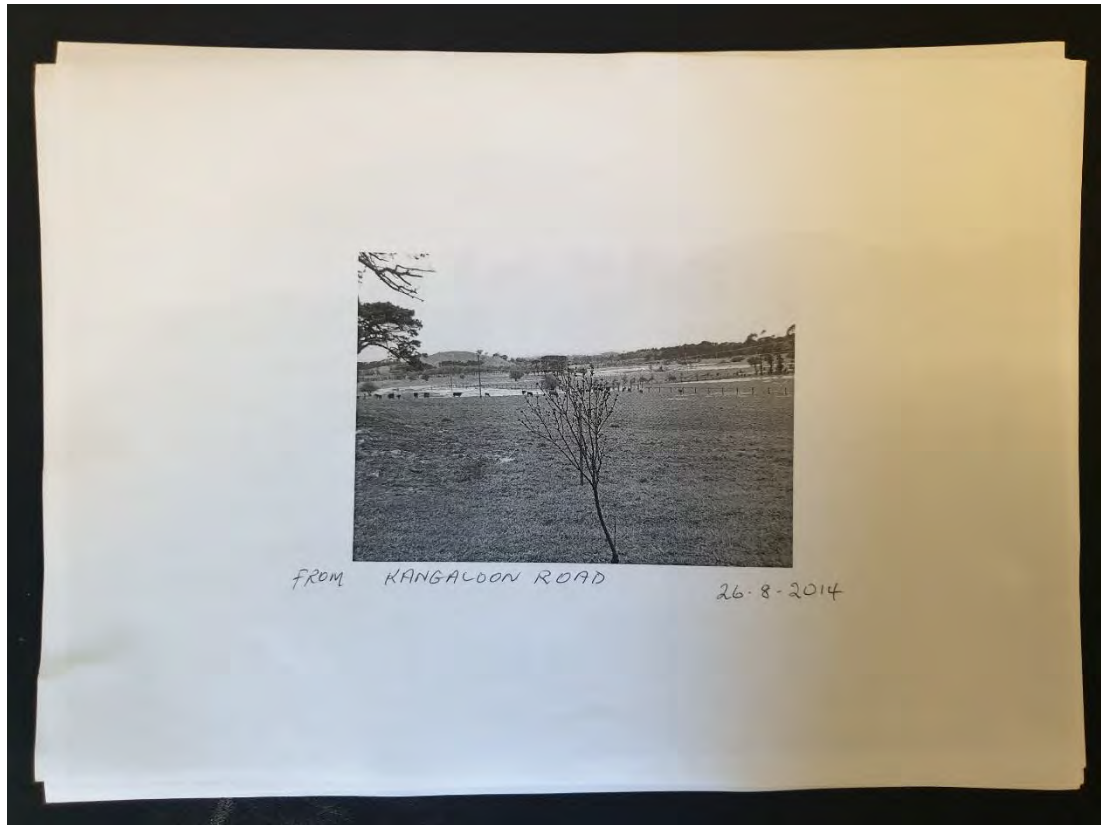


Photo C36: Flooding from Kangaloon Road (26 August 2014)

Photo C37: Flooding at Kangaloon Road (26 August 2014)

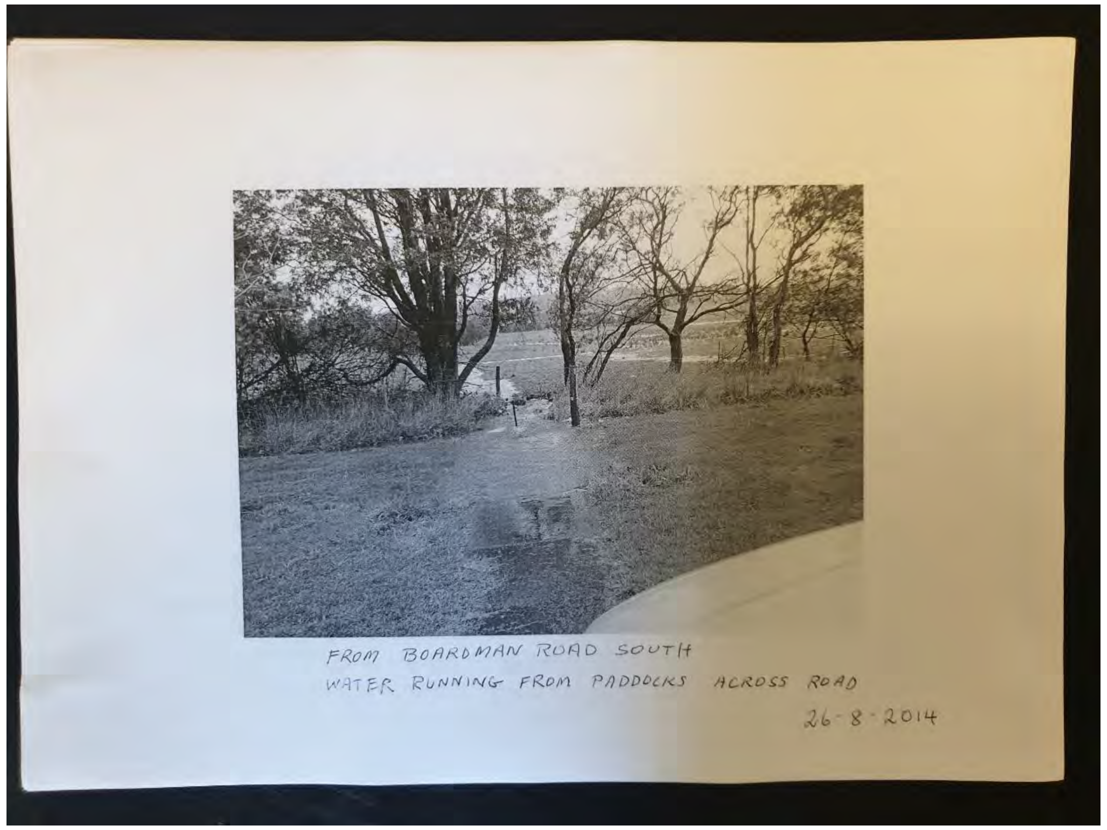


Photo C38: Flooding across Boardman Road South (26 August 2014)

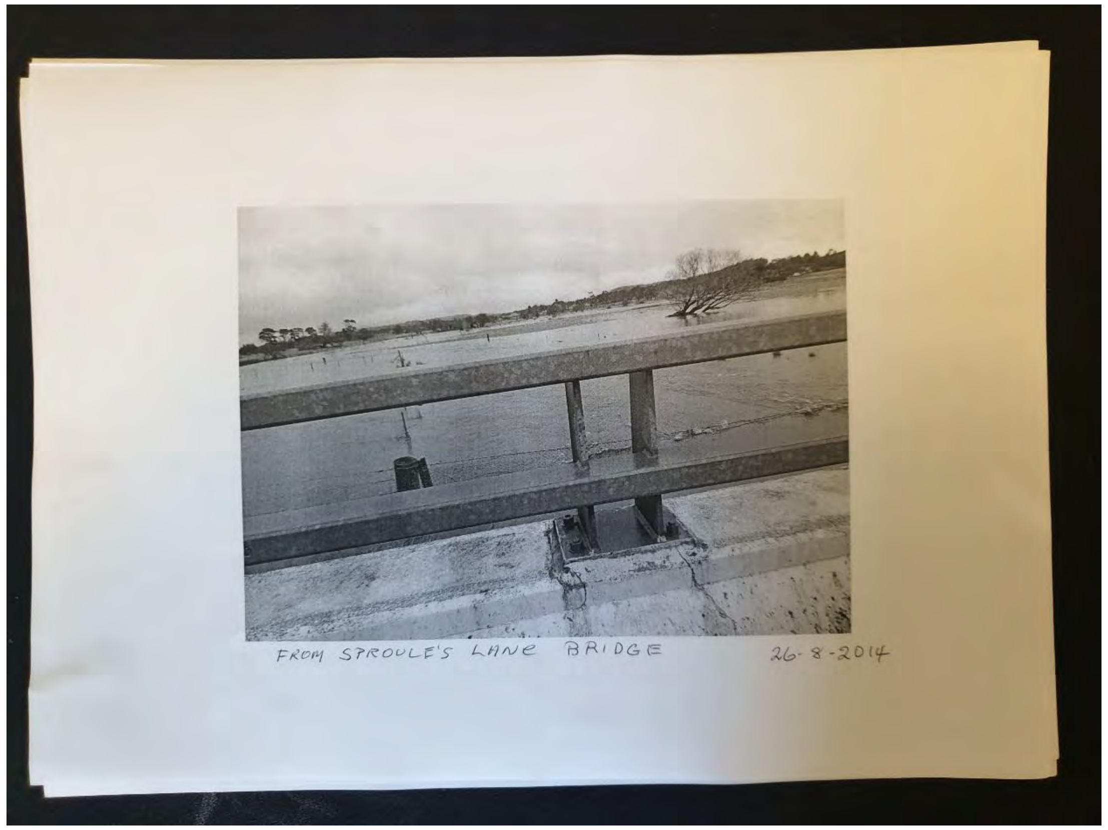


Photo C39: Flooding near Sproule's Lane Bridge (26 August 2014)

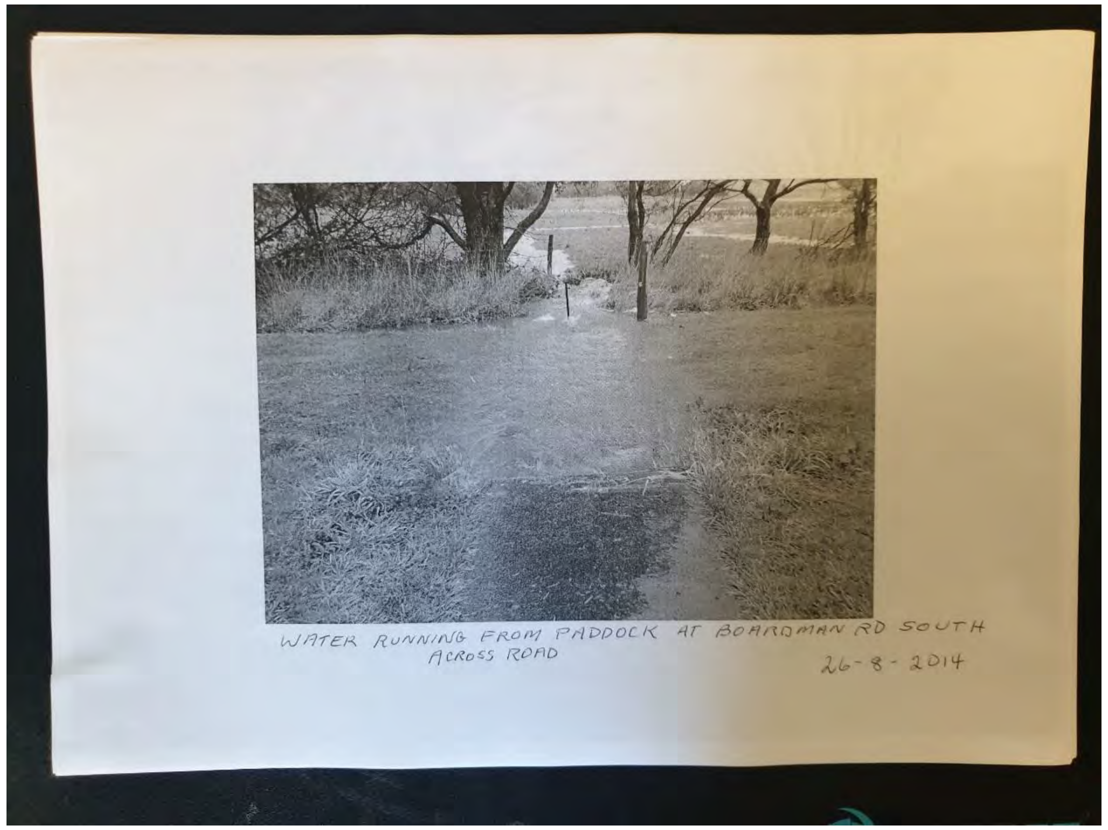


Photo C40: Flooding across Boardman Road South (26 August 2014)

Photo C41: Flooding at Kangaloon Road (26 August 2014)

Photo C42: Flooding at Bong Bong Racecourse (26 August 2014)

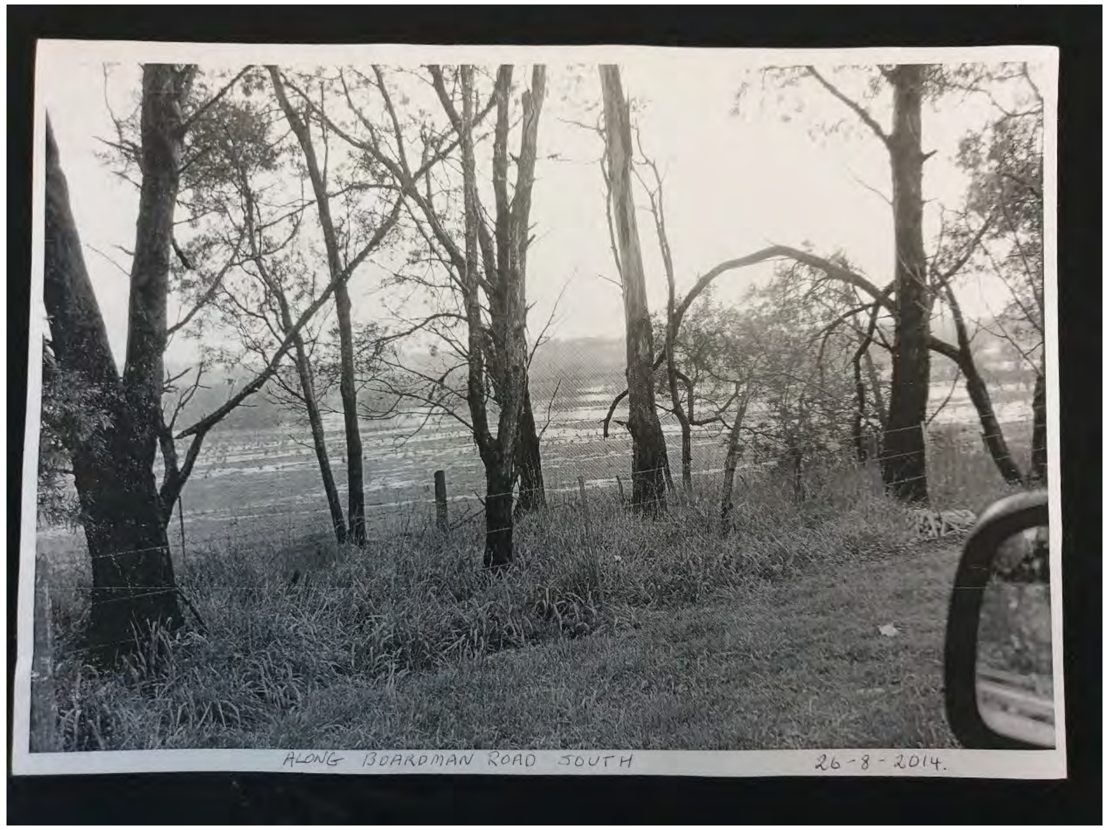


Photo C43: Riverine flooding at Kangaloon Road (26 August 2014)

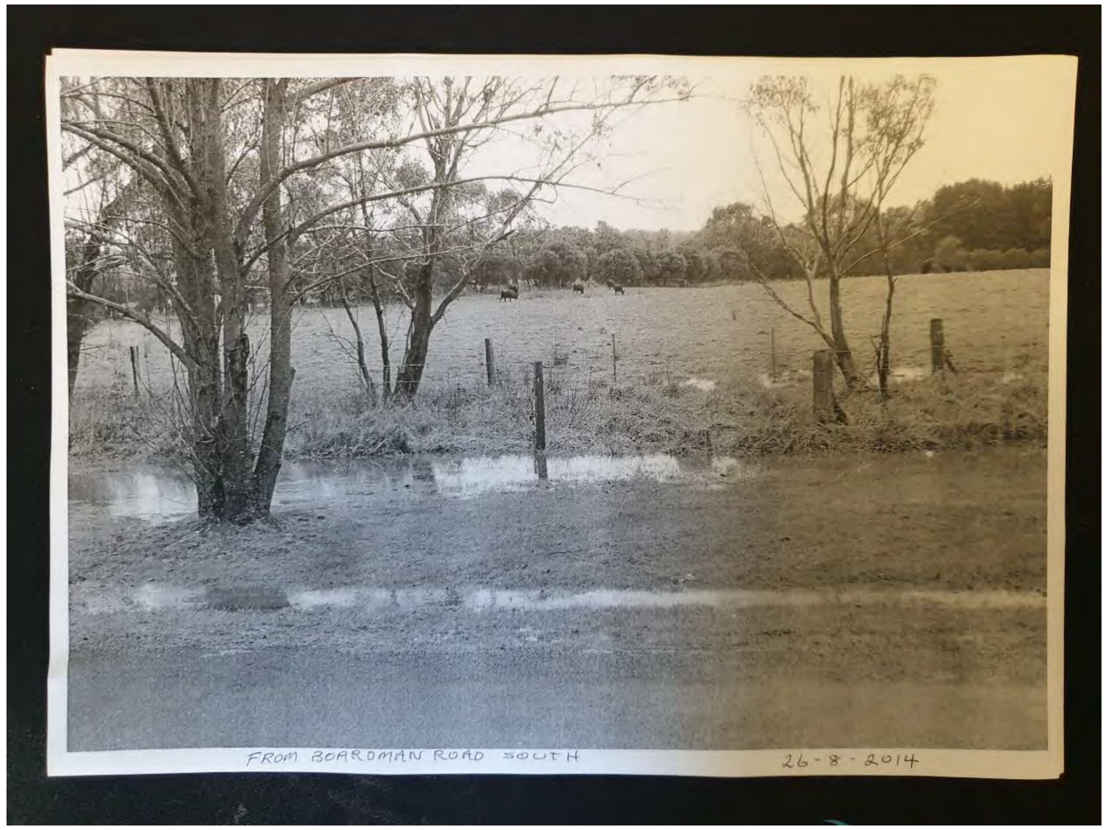


Photo C44: Flooding along Boardman Road South (26 August 2014)

Photo C45: Flooding along Sproule's Lane (26 August 2014)

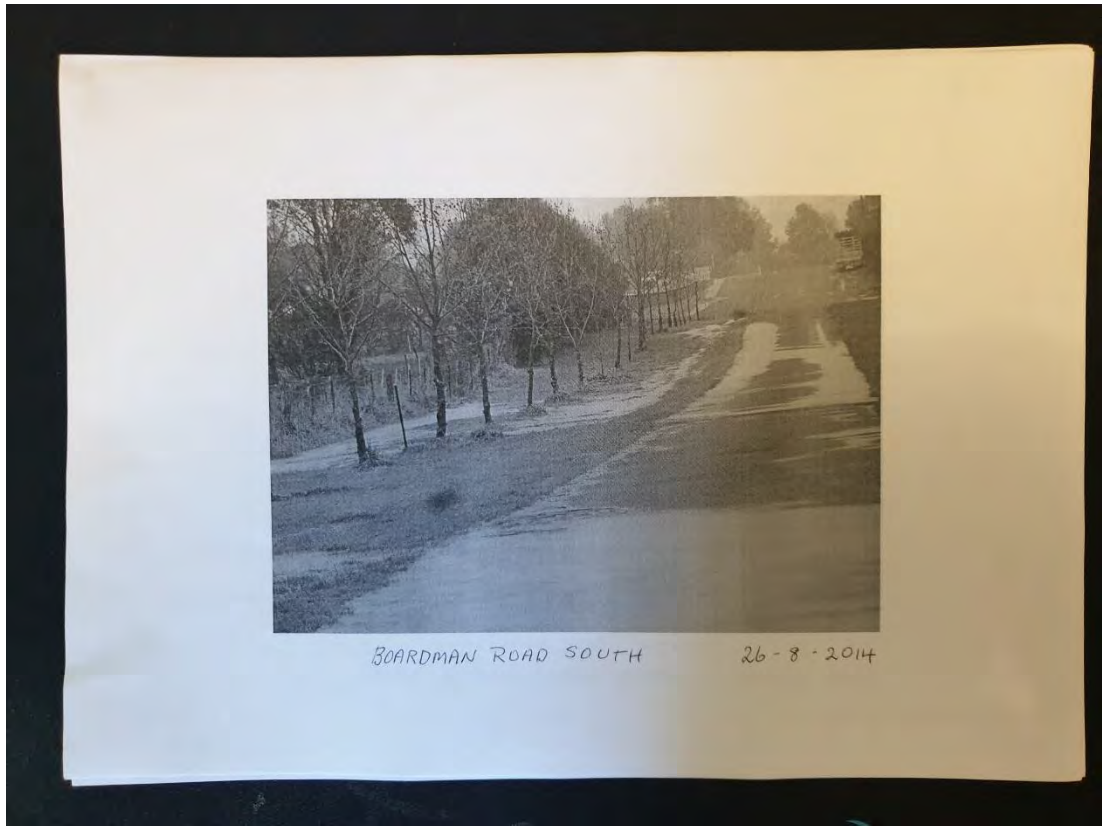


Photo C46: Flooding at Boardman Road South (26 August 2014)

Photo C47: Riverine flooding from end of Boardman Road South (26 August 2014)

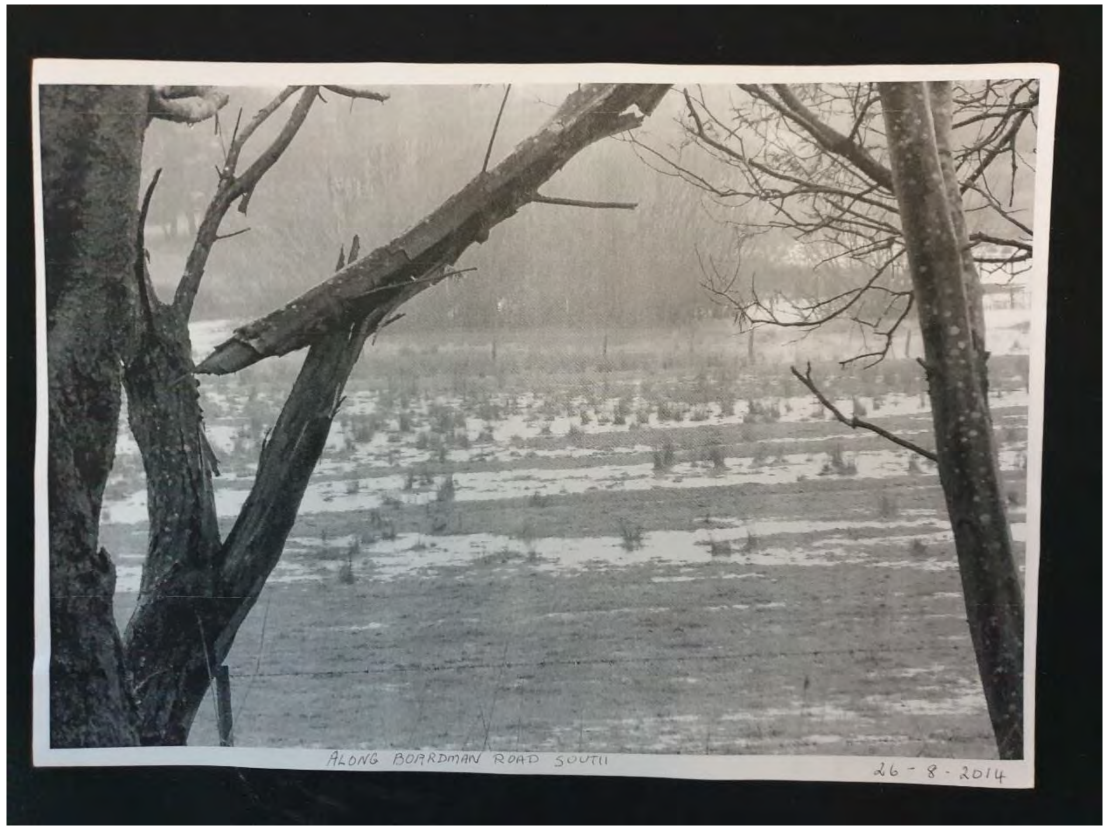


Photo C48: Flooding along Boardman Road South (26 August 2014)

Photo C49: Flooding at Riverside Park, Osborne Road, Burradoo (August 2015)

Photos of flooding from Wingecarribee Shire Council

Photo C50: Flooding at Bong Bong Common (August 1986)

Photo C51: Flooding at Burrado Railway Bridge (15 June 2007)

Photo C52: Flooding at Bong Bong Bridge and Track (June 2007)

Photo C53: Flooding at Bong Bong Track under signs (June 2007)

Photo C54: Flooding at Bong Bong Bridge (June 2007)

Photo C55: Flooding at Bong Bong Track (June 2007)

Photo C56: Flooding downstream Bong Bong Bridge (June 2007)

Photo C57: Flooding at Bong Bong flat (June 2007)

Photo C58: Flooding at Bong Bong Weir (June 2007)

Photo C59: Flooding at Model Aeroplane Club (June 2007)

Photo C60: Flooding at Wongabri (June 2007)

Photo C61: Flooding upstream of Bong Bong Bridge (June 2007)

Photo C62: Flooding at Wongabri (June 2007)

Photo C63: Flooding in the Wingecarribee River (June 2007)

Photo C64: Flooding at Berrima (16 June 2007)

Photo C65: Flooding at Burrado Railway Bridge (June 2007)

Photo C66: Flooding at Bong Bong Weir (15 June 2007)

Photo C67: Flooding in the Wingecarribee River (June 2007)

Photo C68: Flooding at walking track gate near Railway Road (June 2007)

Photo C69: Flooding of the Wingecarribee River (June 2007)

Photo C70: Flooding at Wongabri (June 2007)

Photo C71: Flooding at Bong Bong (16 June 2007)

Photo C72: Flooding at Bong Bong from Headlam Road (16 June 2007)

Photo C73: Flooding at Bong Bong from Headlam Road (16 June 2007)

Photo C74: Flooding at Bong Bong Track near Bong Bong Bridge (16 June 2007)

Photo C75: Flooding of Wingecarribee River (16 June 2007)

Photo C76: Flooding of the Wingecarribee River (16 June 2007)

Photo C77: Flooding at Railway Road, Burrado (16 June 2007)

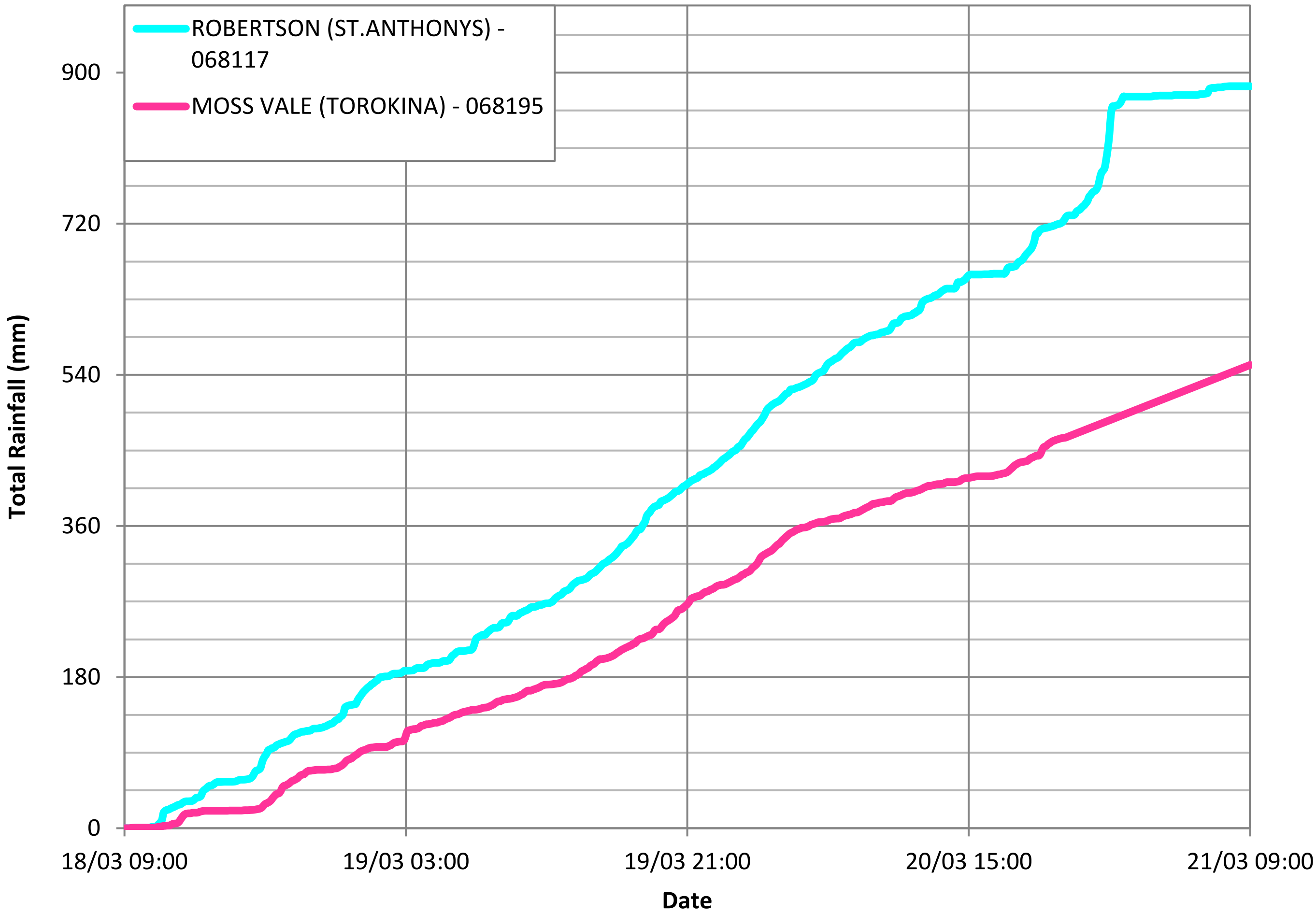
Photo C78: Flooding at Railway Road, Burrado (16 June 2007)

Photo C79: Flooding at Railway Road, Burrado (8 March 2012)

APPENDIX D. CALIBRATION EVENTS – RAINFALL CHARTS AND MAPS

Appendix D

CUMULATIVE RAINFALL DATA
MARCH 1978 EVENT



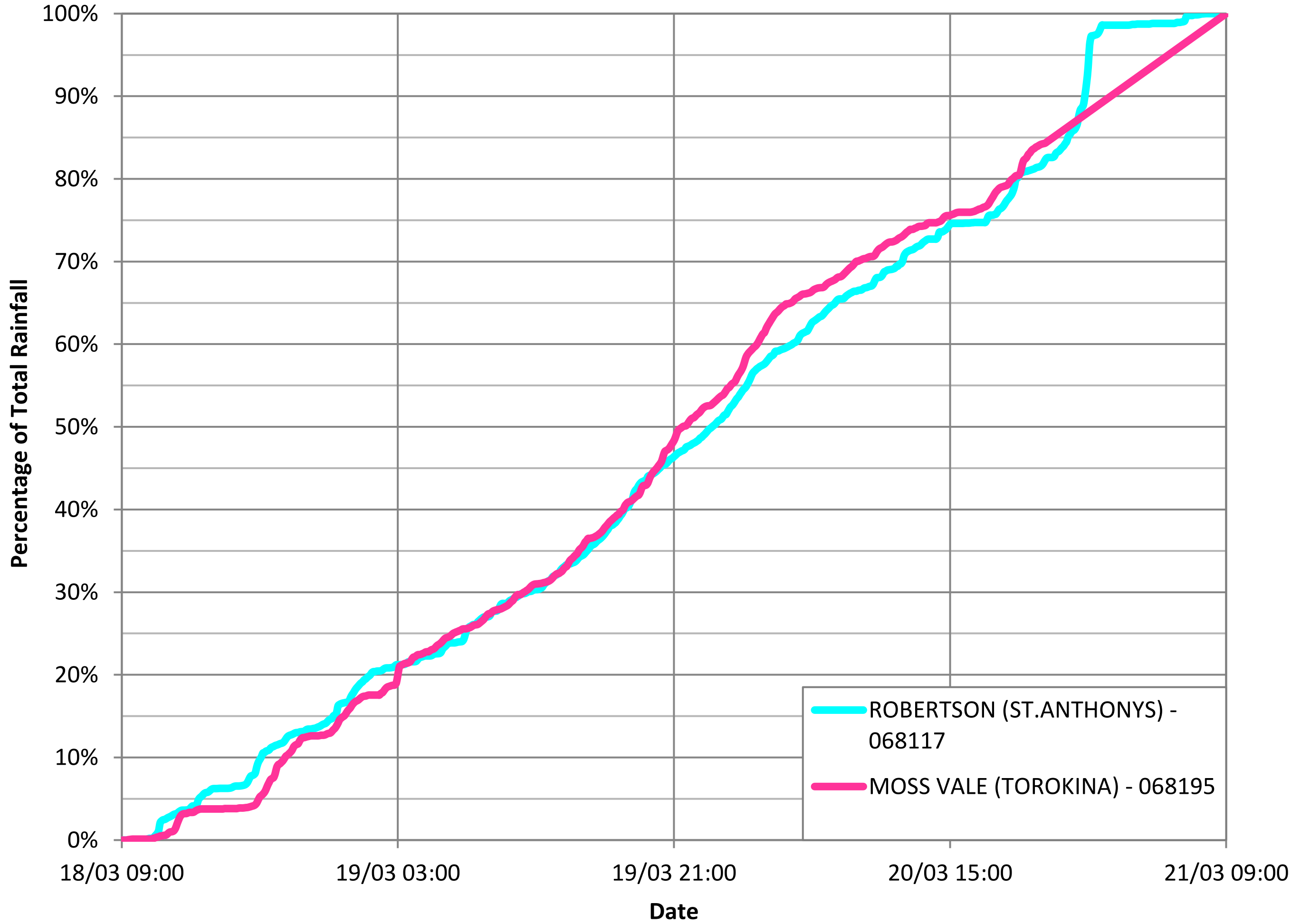
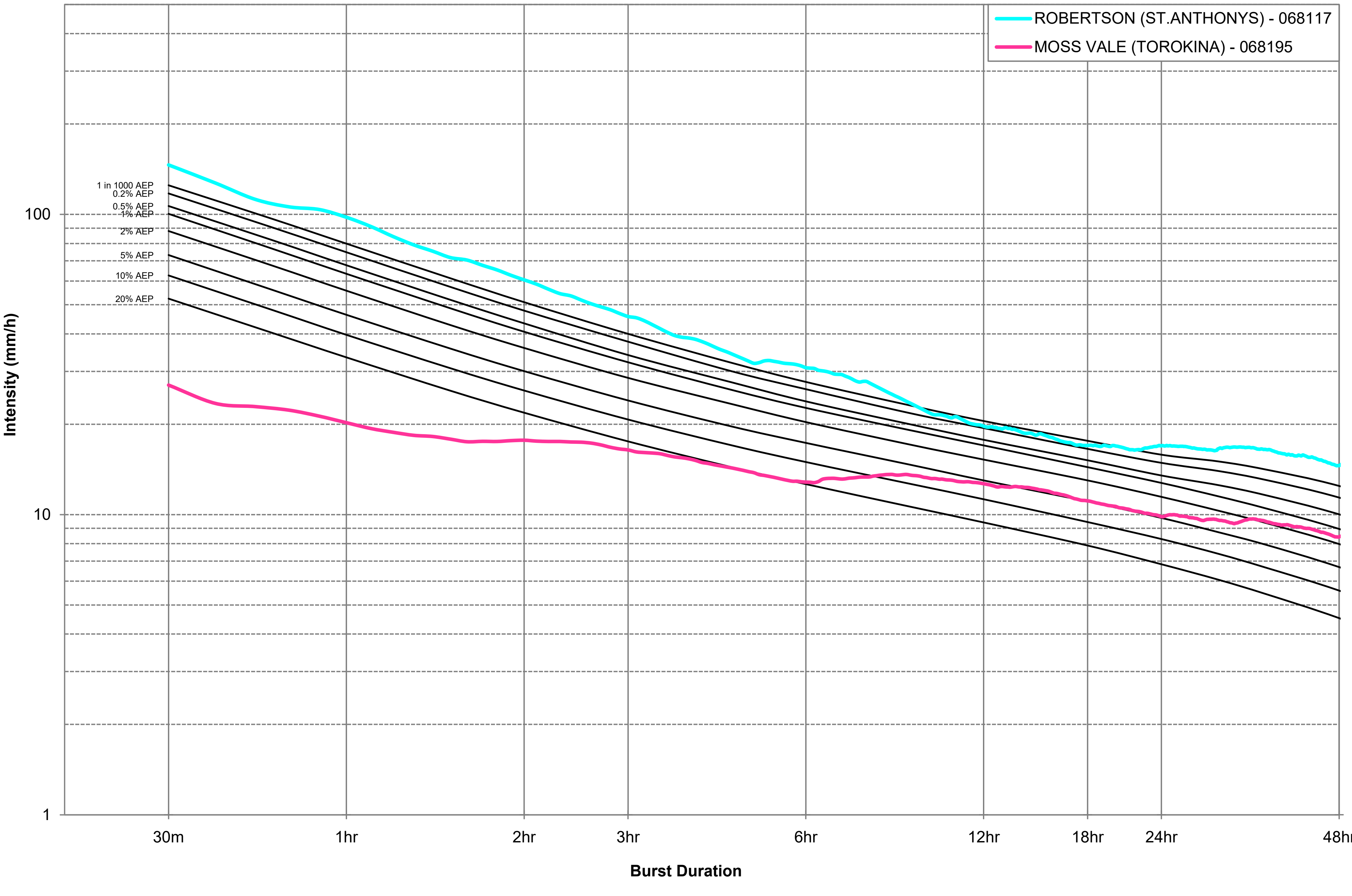


FIGURE D2
BURST INTENSITIES AND FREQUENCIES
MARCH 1978 FLOOD EVENT



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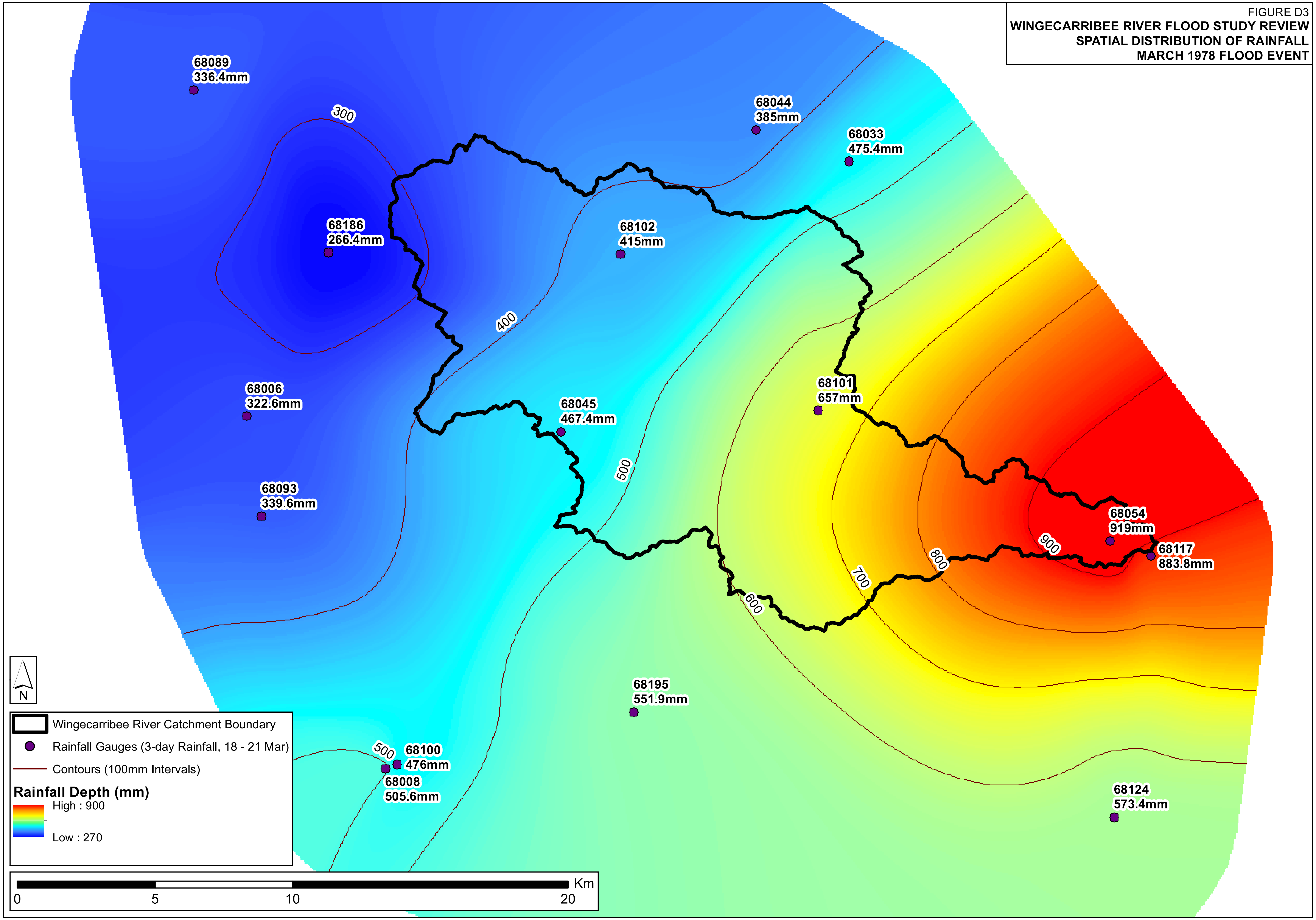
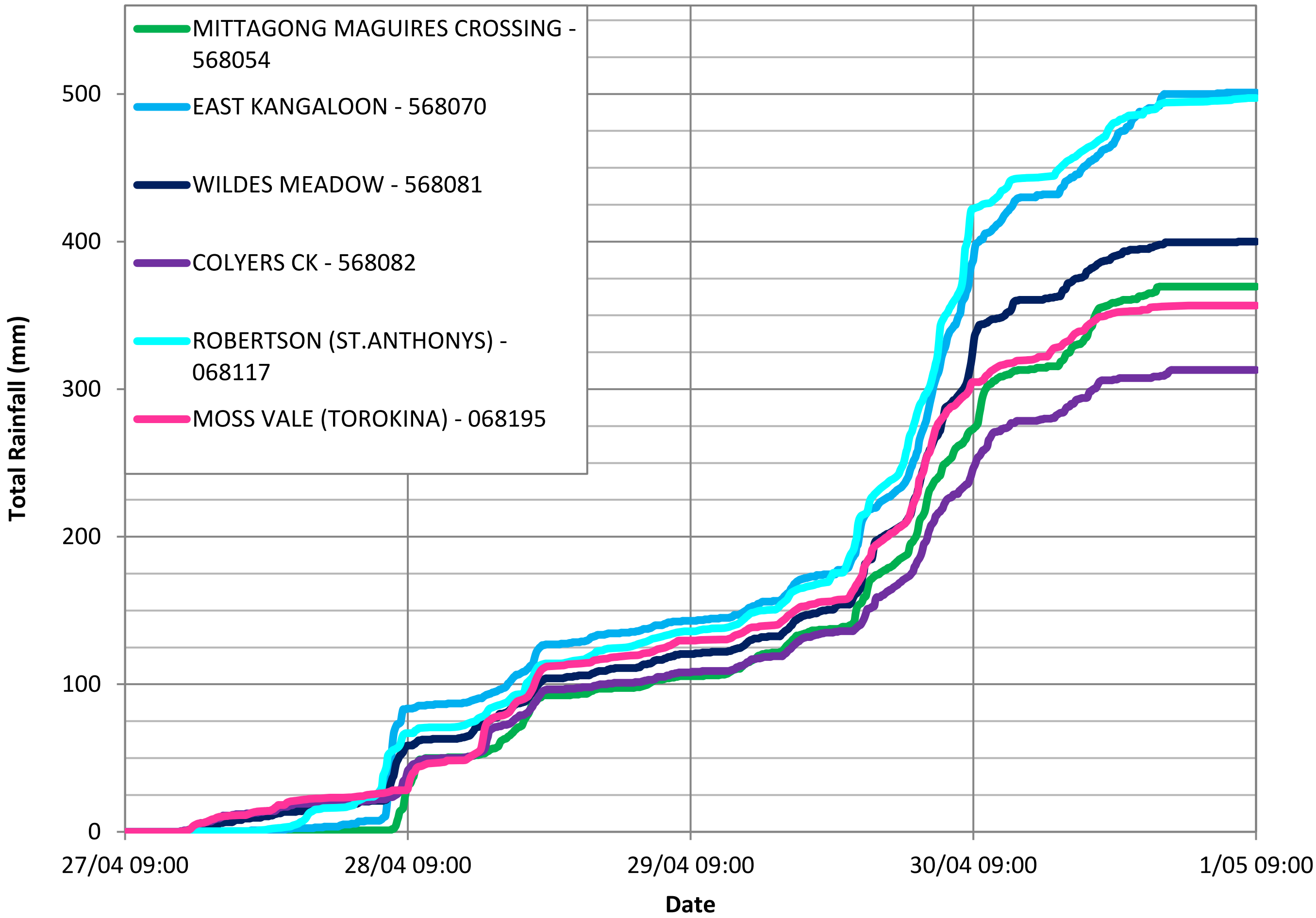


FIGURE D3
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
MARCH 1978 FLOOD EVENT
68089
336.4mm
300
68044
385mm
68033
475.4mm
68186
266.4mm
68102
415mm
400
68101
657mm
68006
322.6mm
68045
467.4mm
500
68093
339.6mm
68054
919mm
900
68117
883.8mm
800
700
600
68195
551.9mm
500
68100
476mm
68008
505.6mm
68124
573.4mm
N
Wingecarribee River Catchment Boundary
Rainfall Gauges (3-day Rainfall, 18 - 21 Mar)
Contours (100mm Intervals)
Rainfall Depth (mm)
High : 900
Low : 270
Km
0
5
10
20

FIGURE D4
CUMULATIVE RAINFALL DATA
APRIL 1988 EVENT



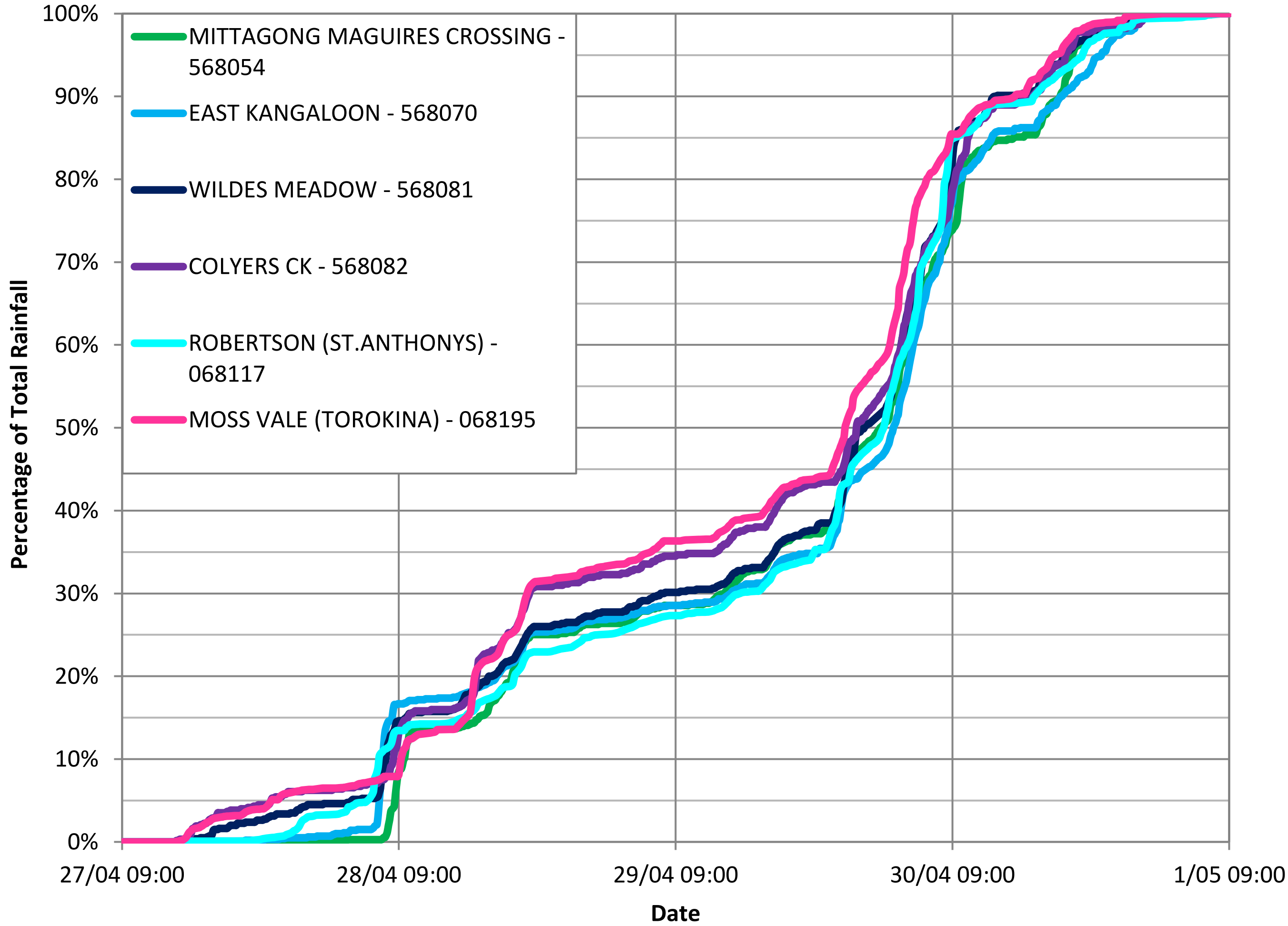


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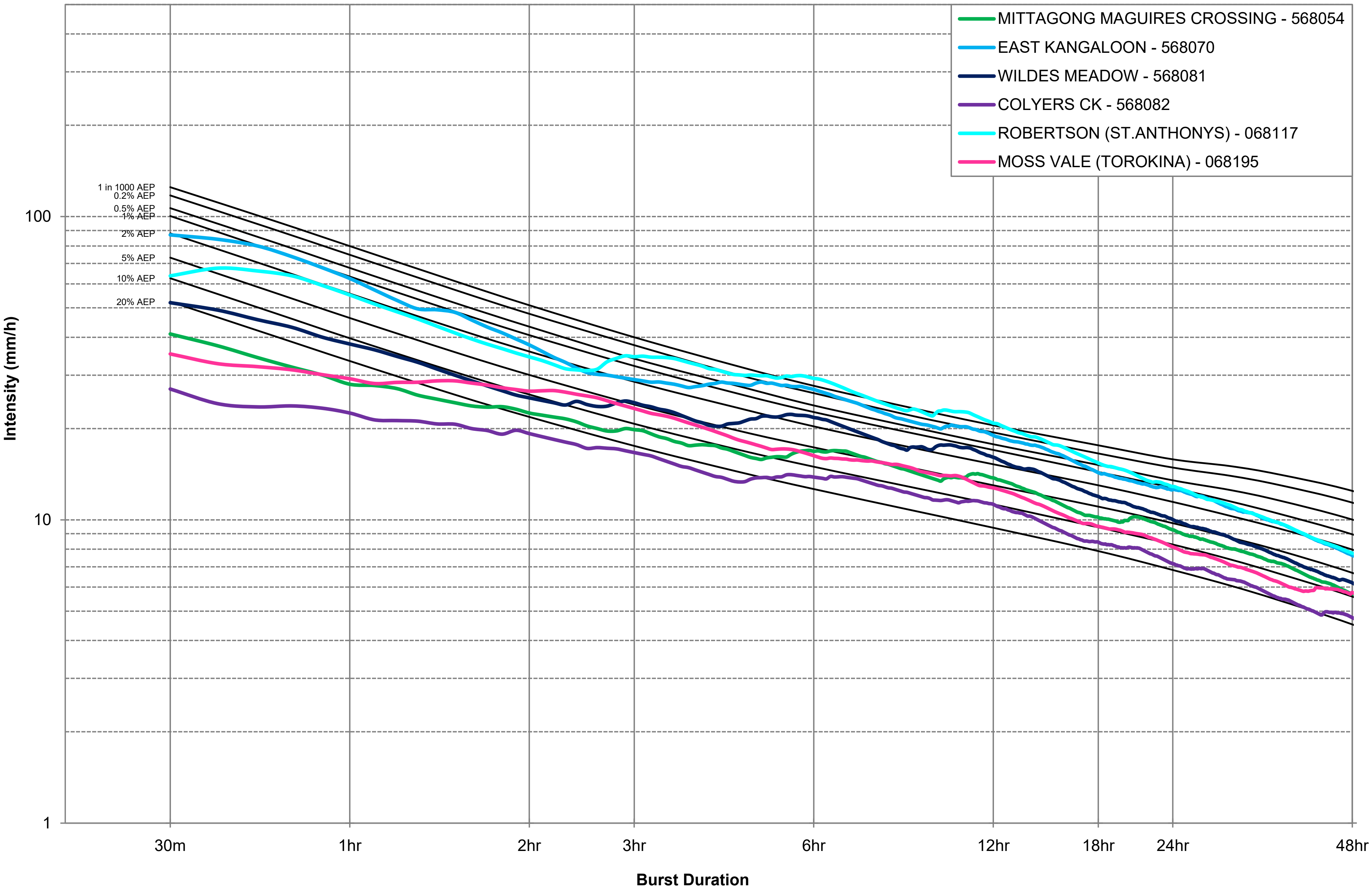
FIGURE D5
BURST INTENSITIES AND FREQUENCIES
APRIL 1988 FLOOD EVENT



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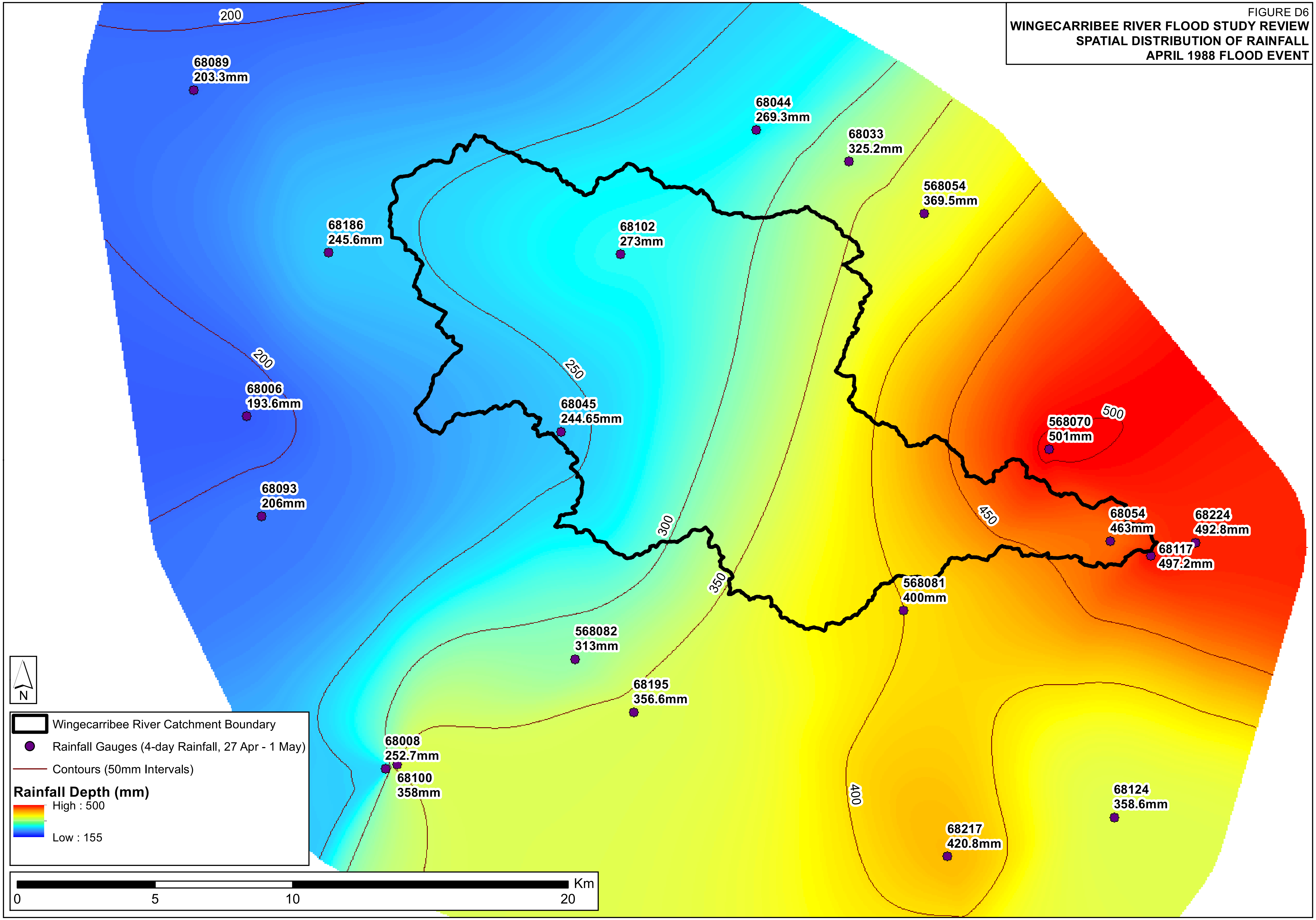
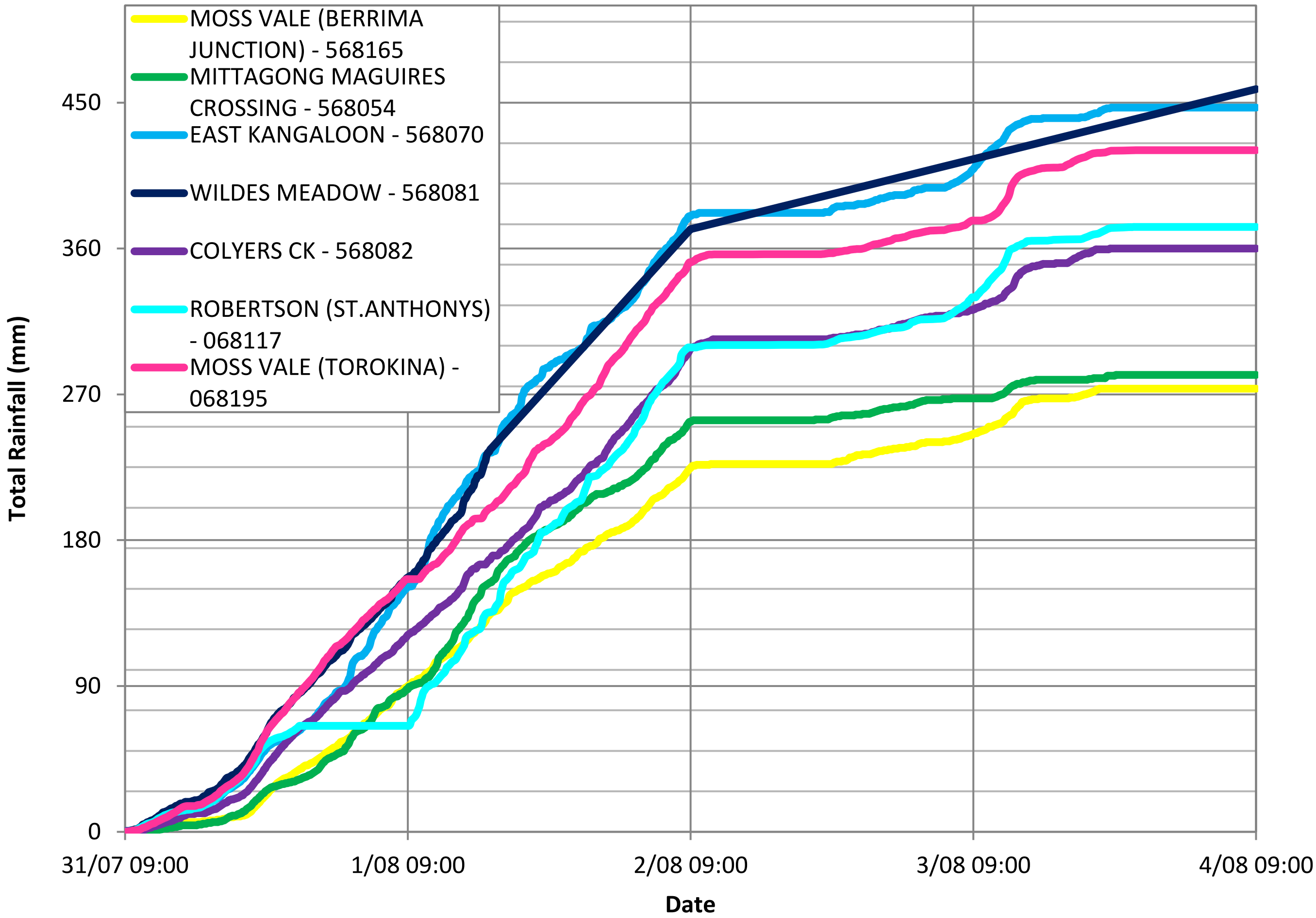


FIGURE D6
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
APRIL 1988 FLOOD EVENT

FIGURE D7
CUMULATIVE RAINFALL DATA
AUGUST 1990 EVENT



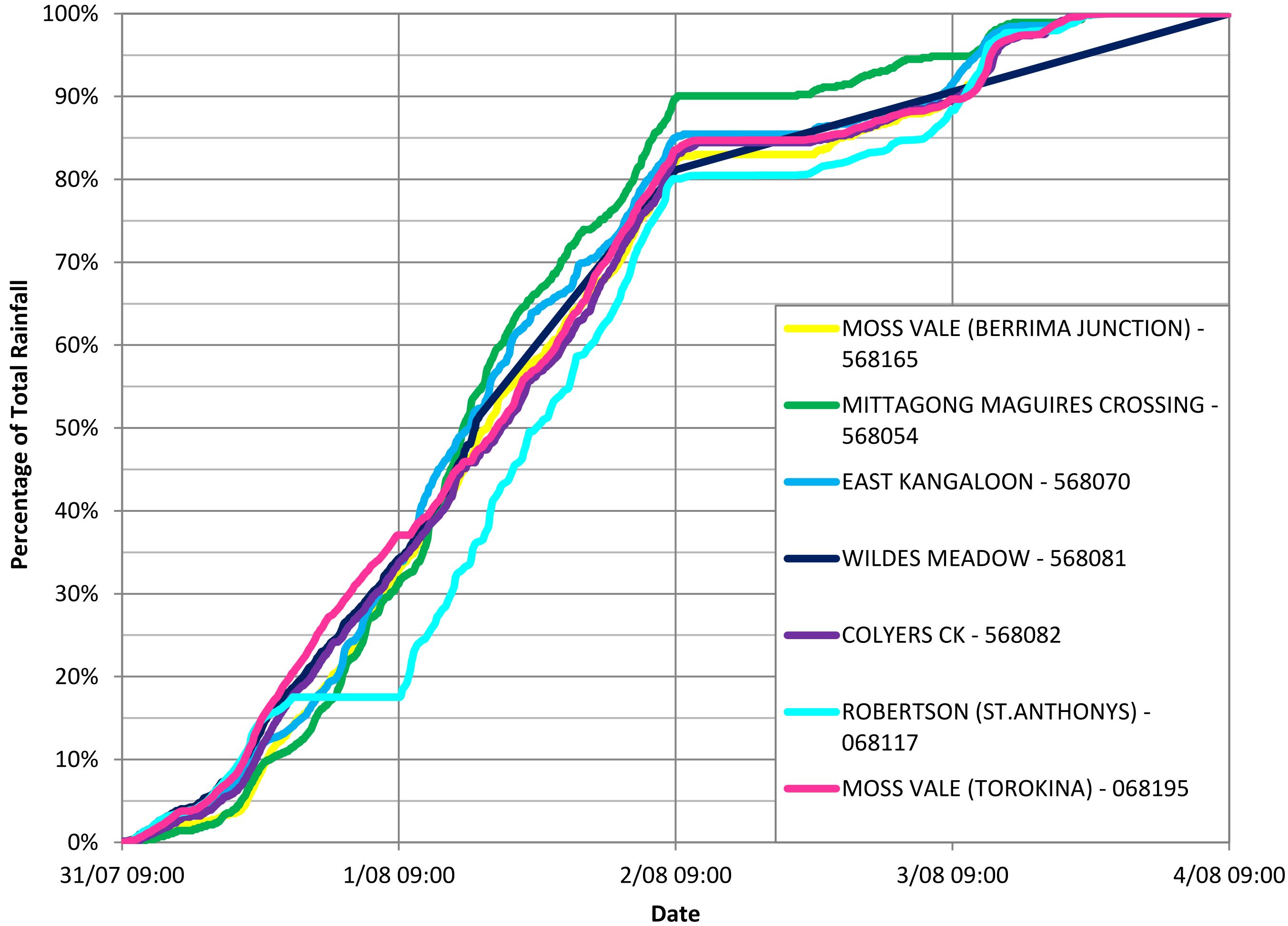


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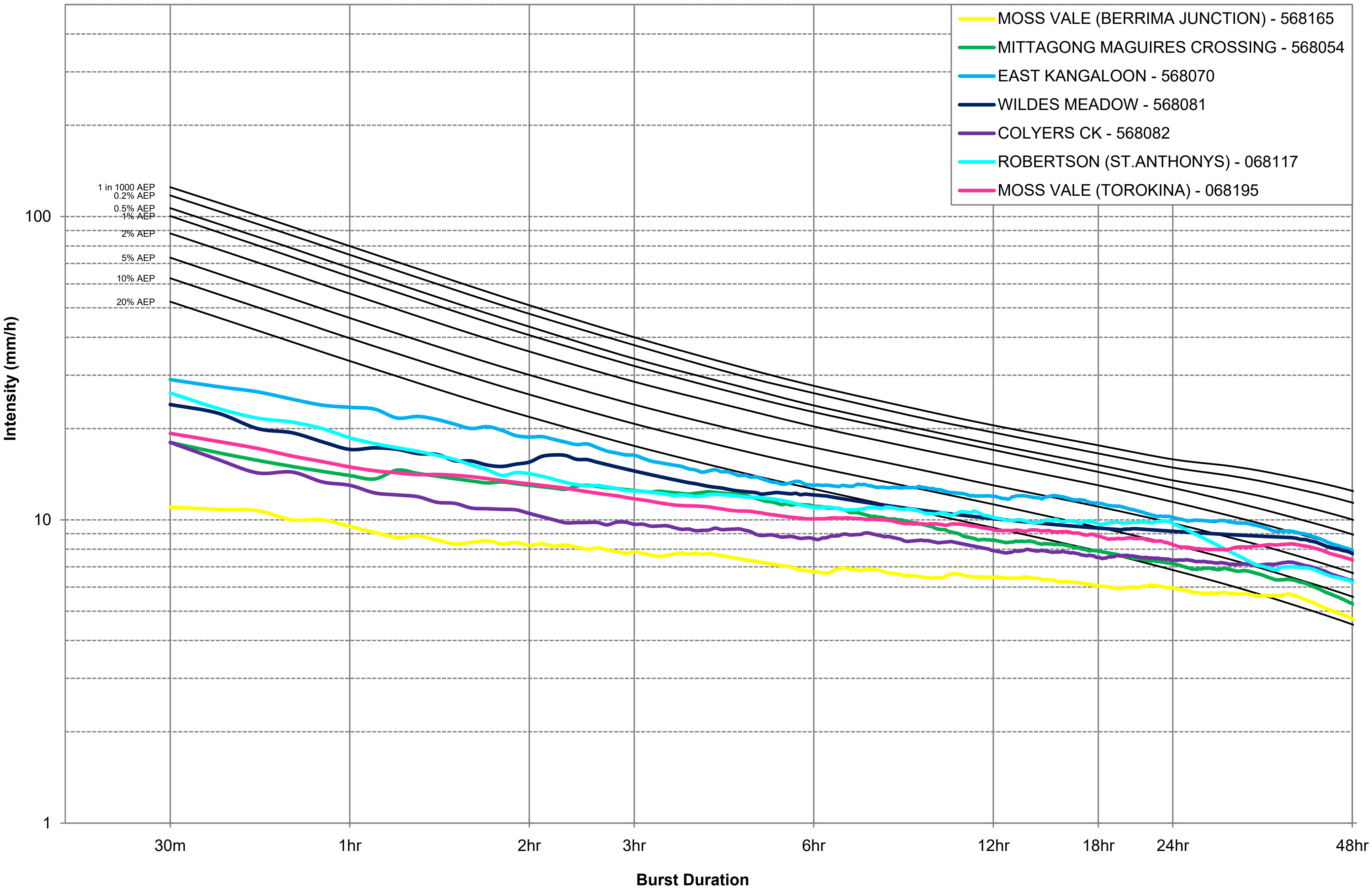
FIGURE D8

BURST INTENSITIES AND FREQUENCIES
AUGUST 1990 FLOOD EVENT



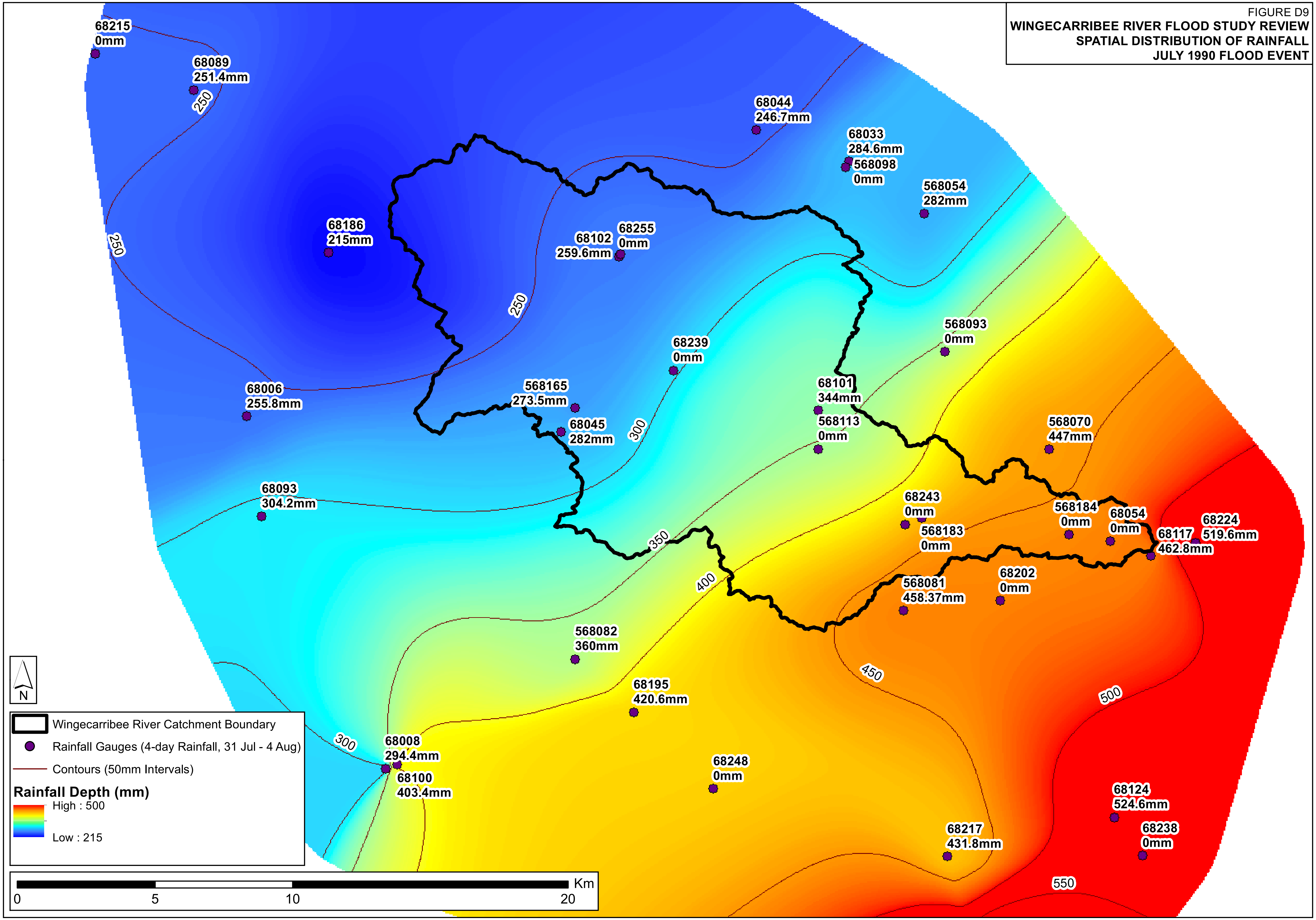
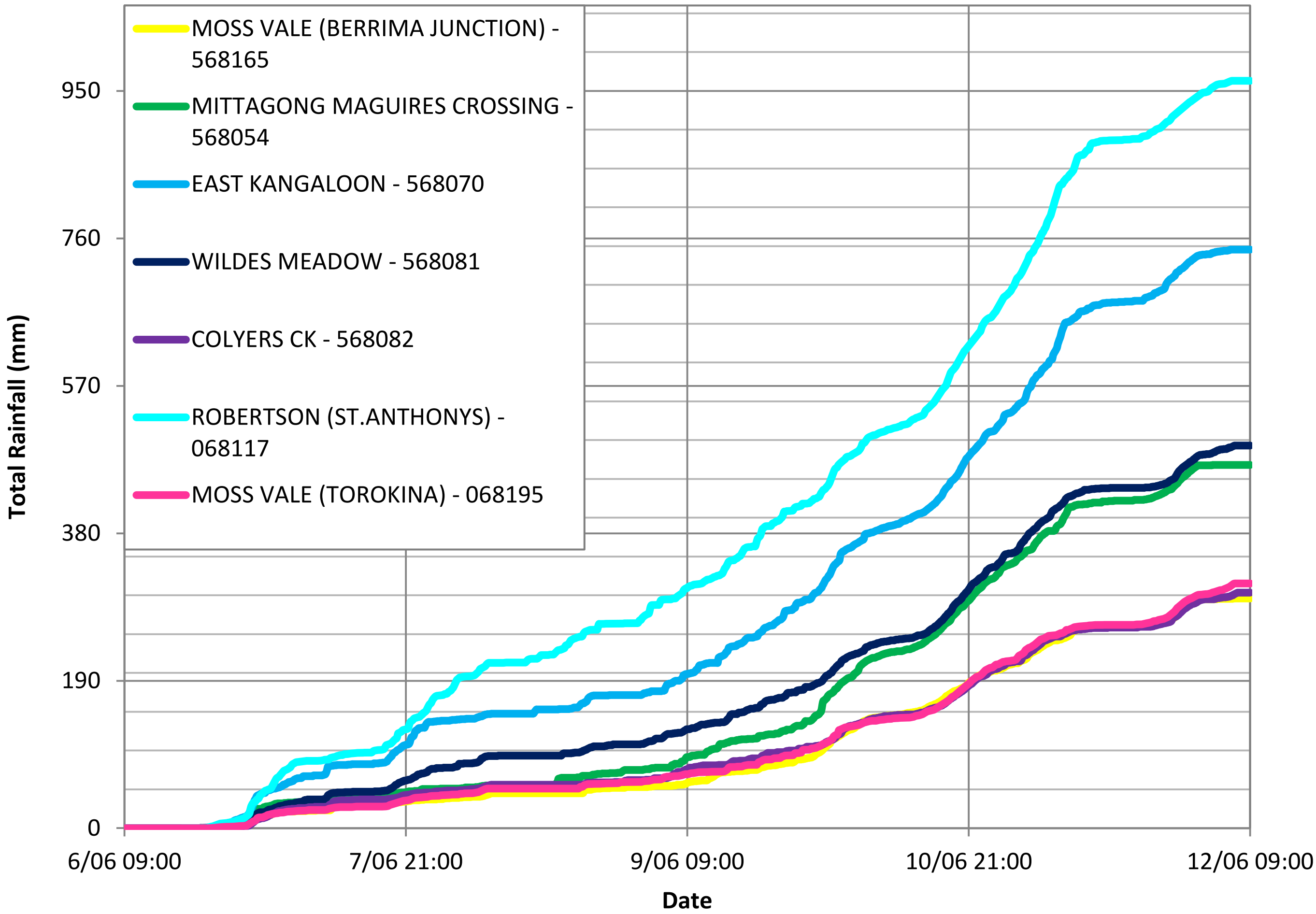


FIGURE D9
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
JULY 1990 FLOOD EVENT

FIGURE D10
CUMULATIVE RAINFALL DATA
JUNE 1991 EVENT



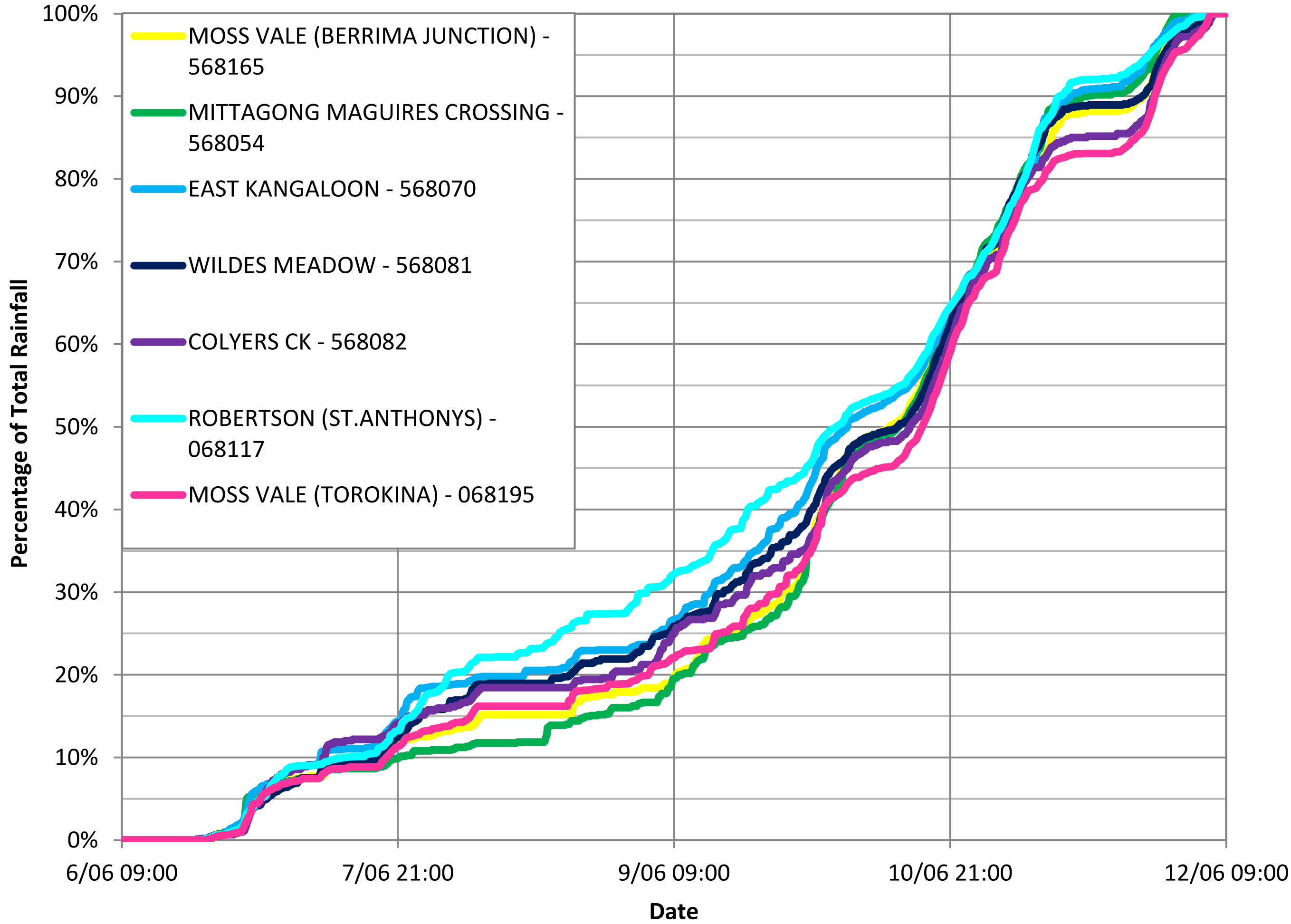


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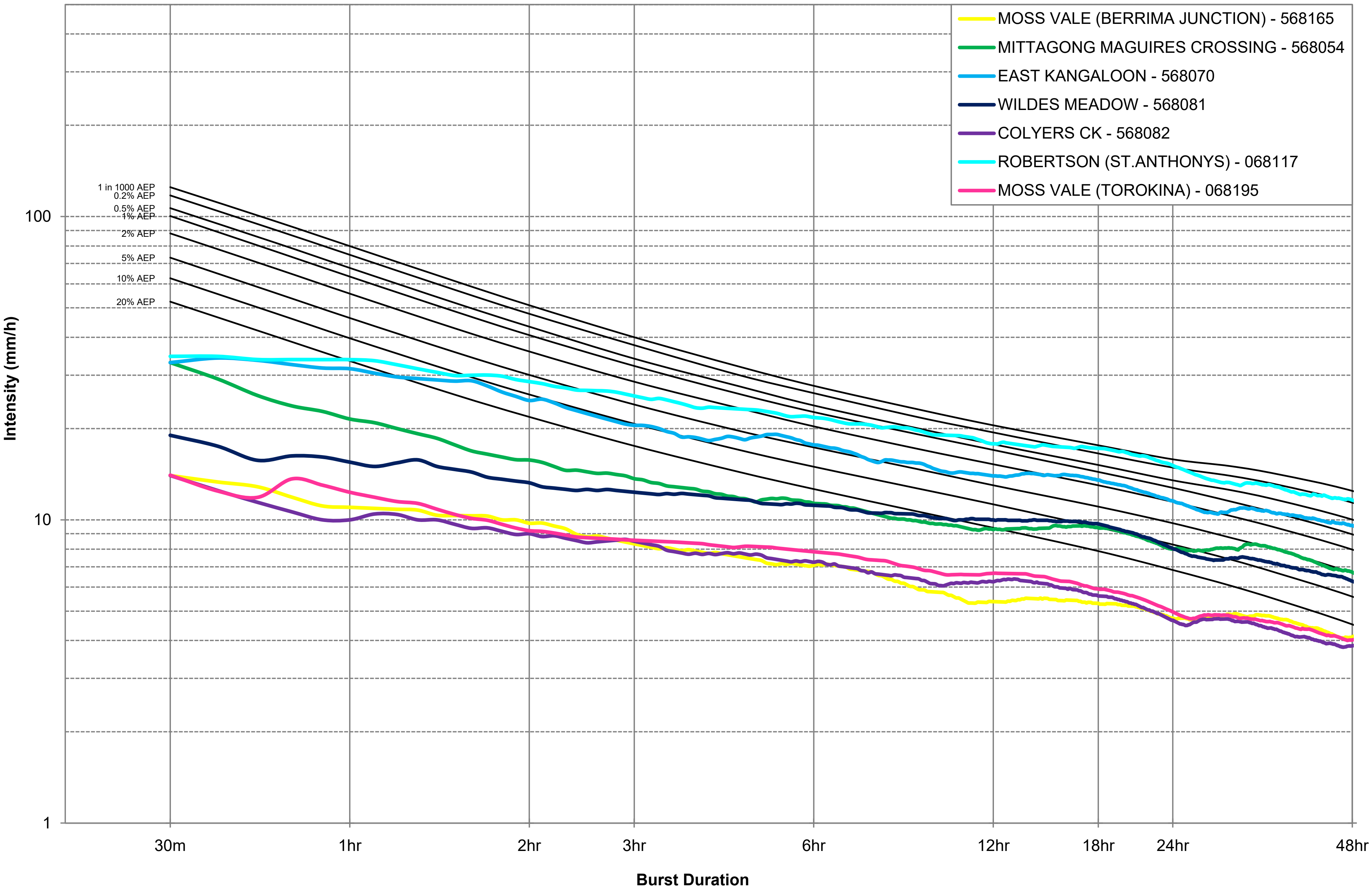
FIGURE D11
BURST INTENSITIES AND FREQUENCIES
JUNE 1991 FLOOD EVENT



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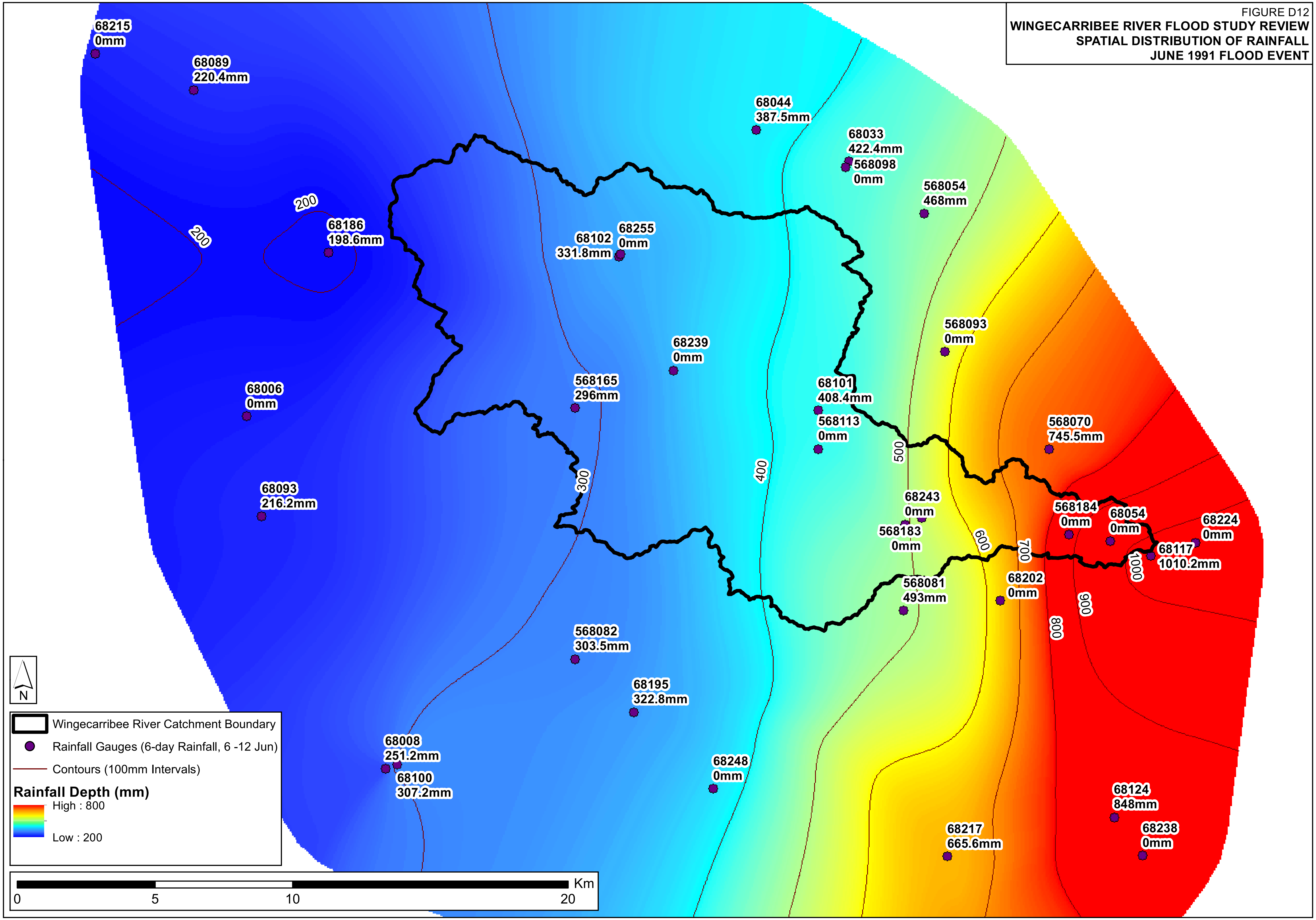
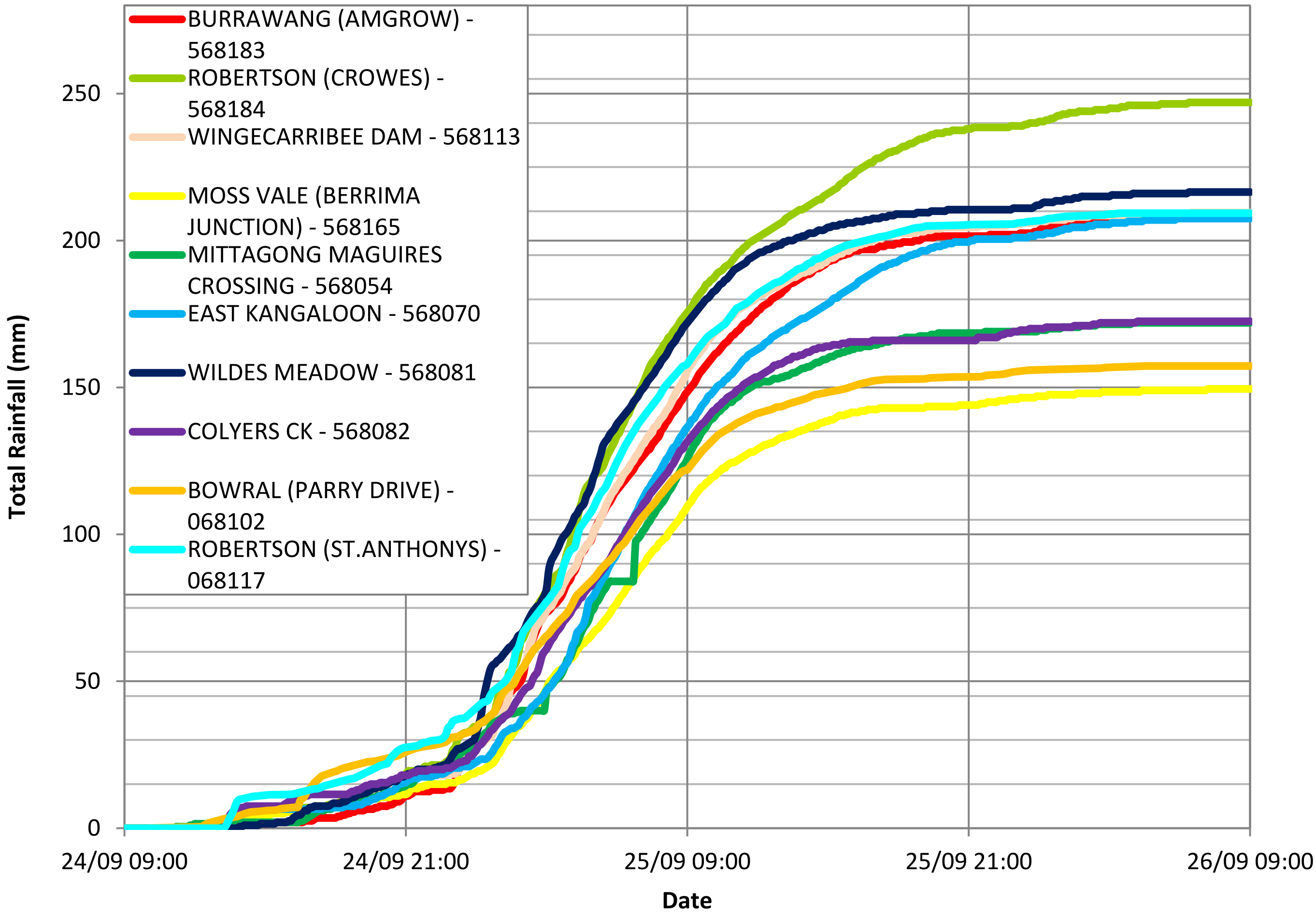


FIGURE D12
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
JUNE 1991 FLOOD EVENT

FIGURE D13
CUMULATIVE RAINFALL DATA
SEPTEMBER 1995 EVENT



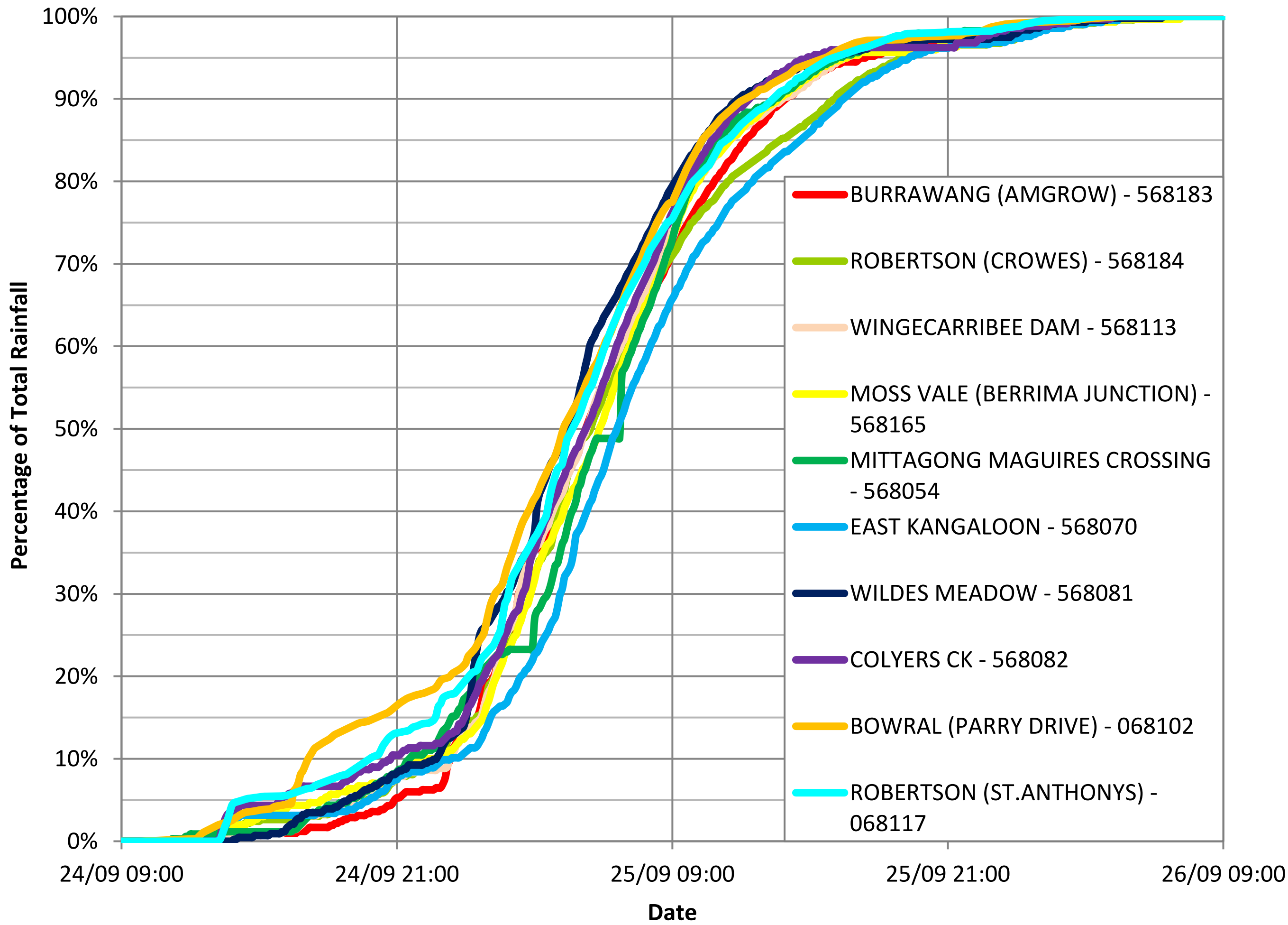


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FIGURE D14
BURST INTENSITIES AND FREQUENCIES
SEPTEMBER 1995 FLOOD EVENT

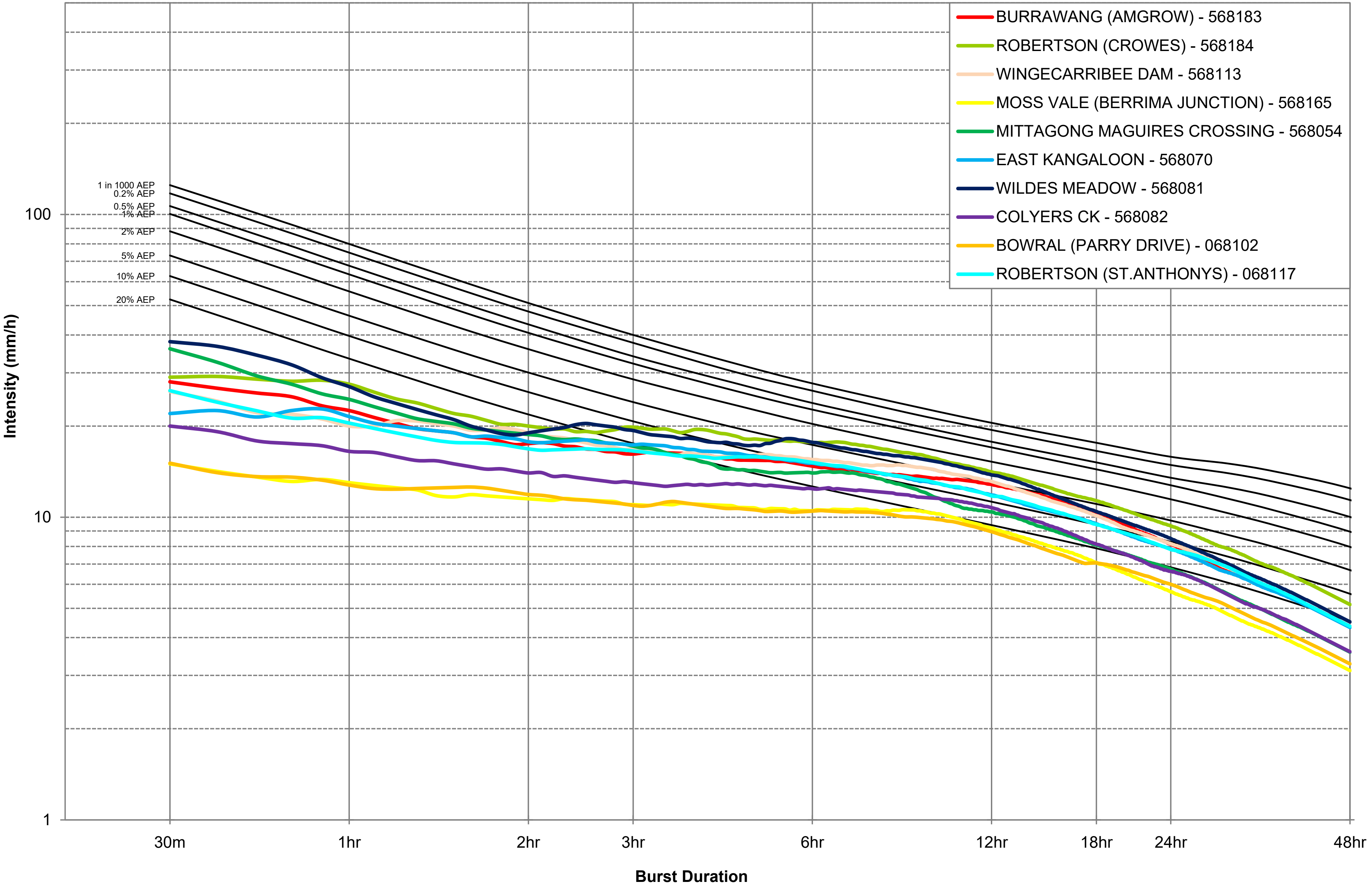

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FIGURE D15
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
SEPTEMBER 1995 FLOOD EVENT

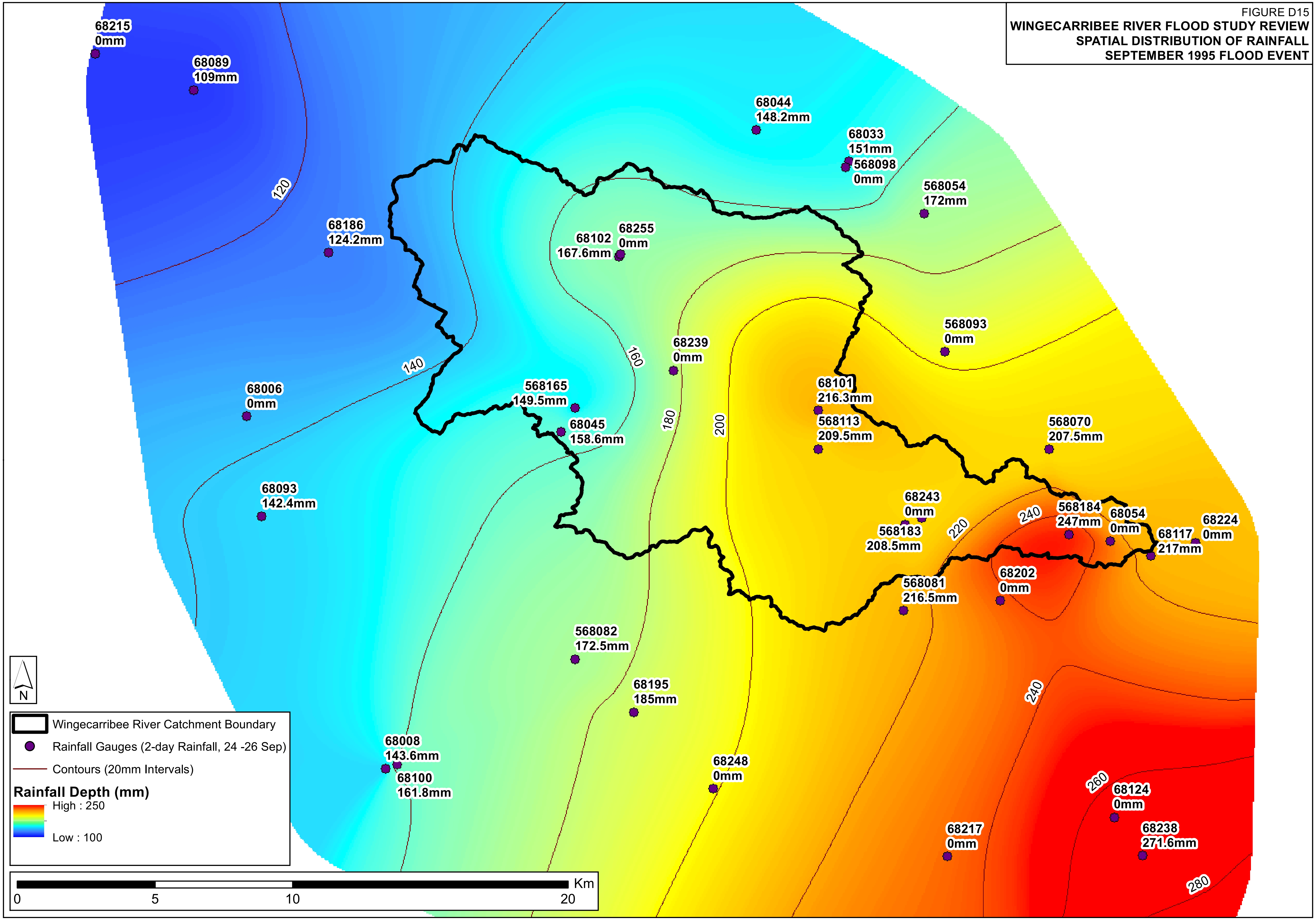
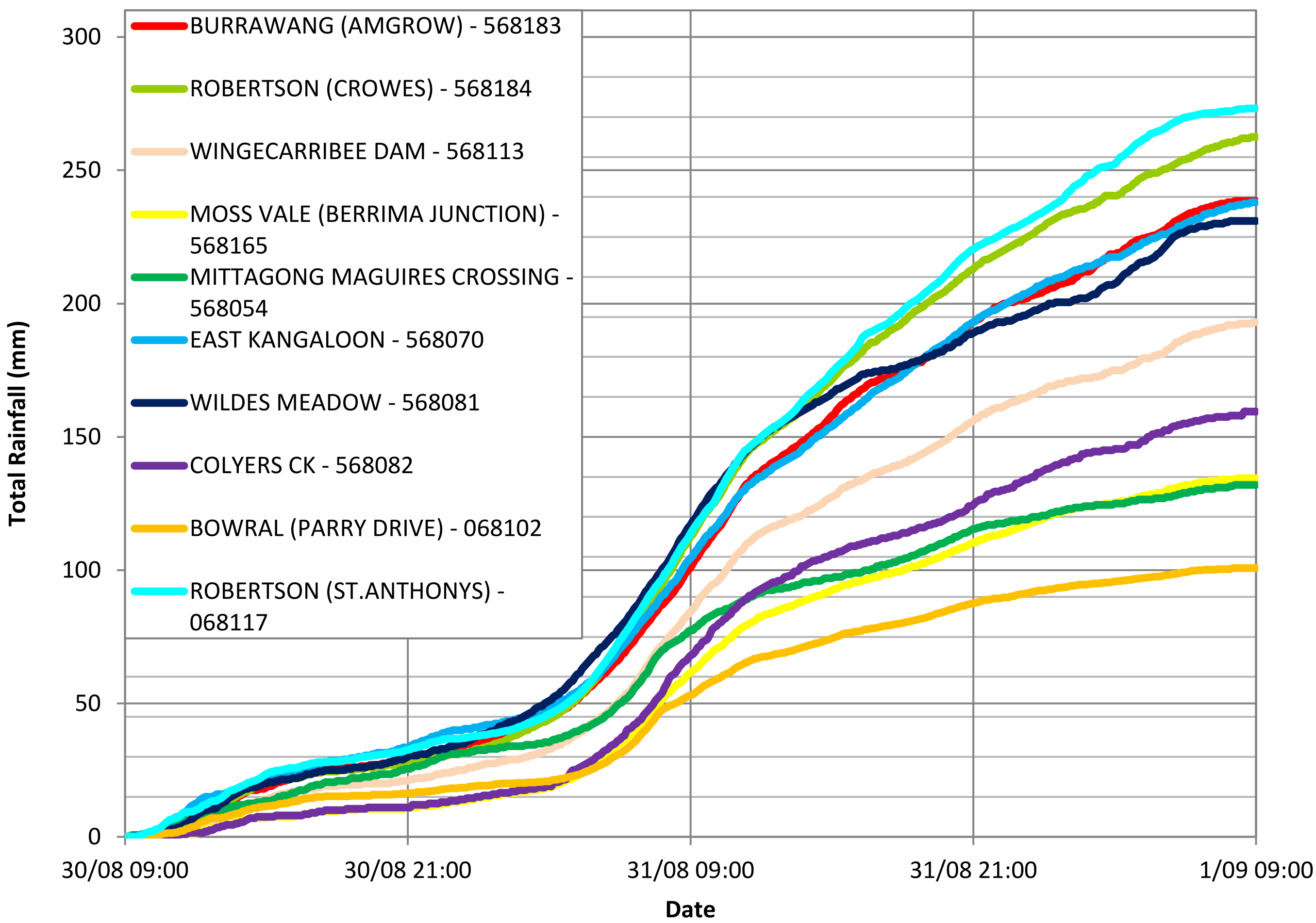
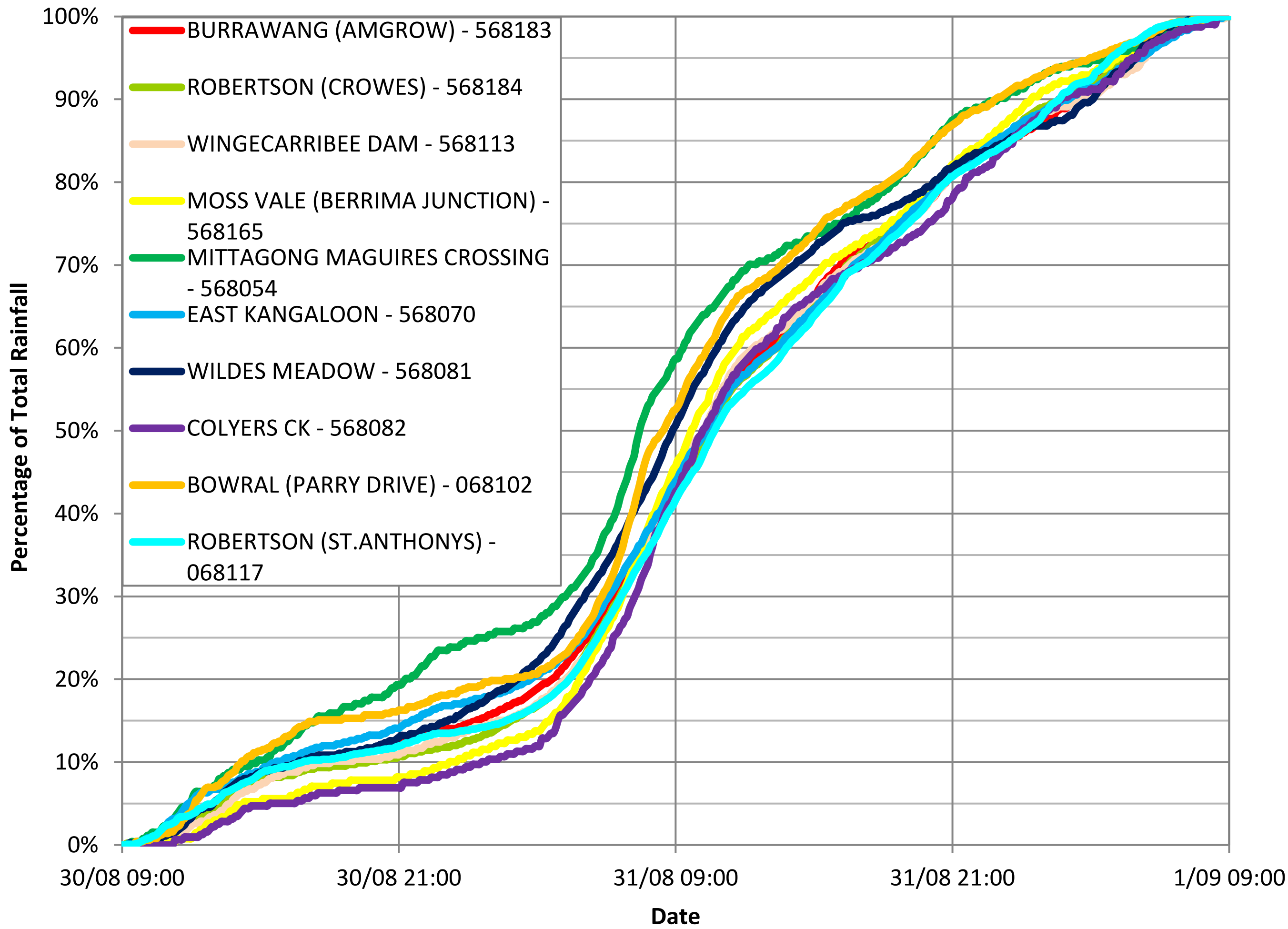


FIGURE D16
CUMULATIVE RAINFALL DATA
AUGUST 1996 EVENT

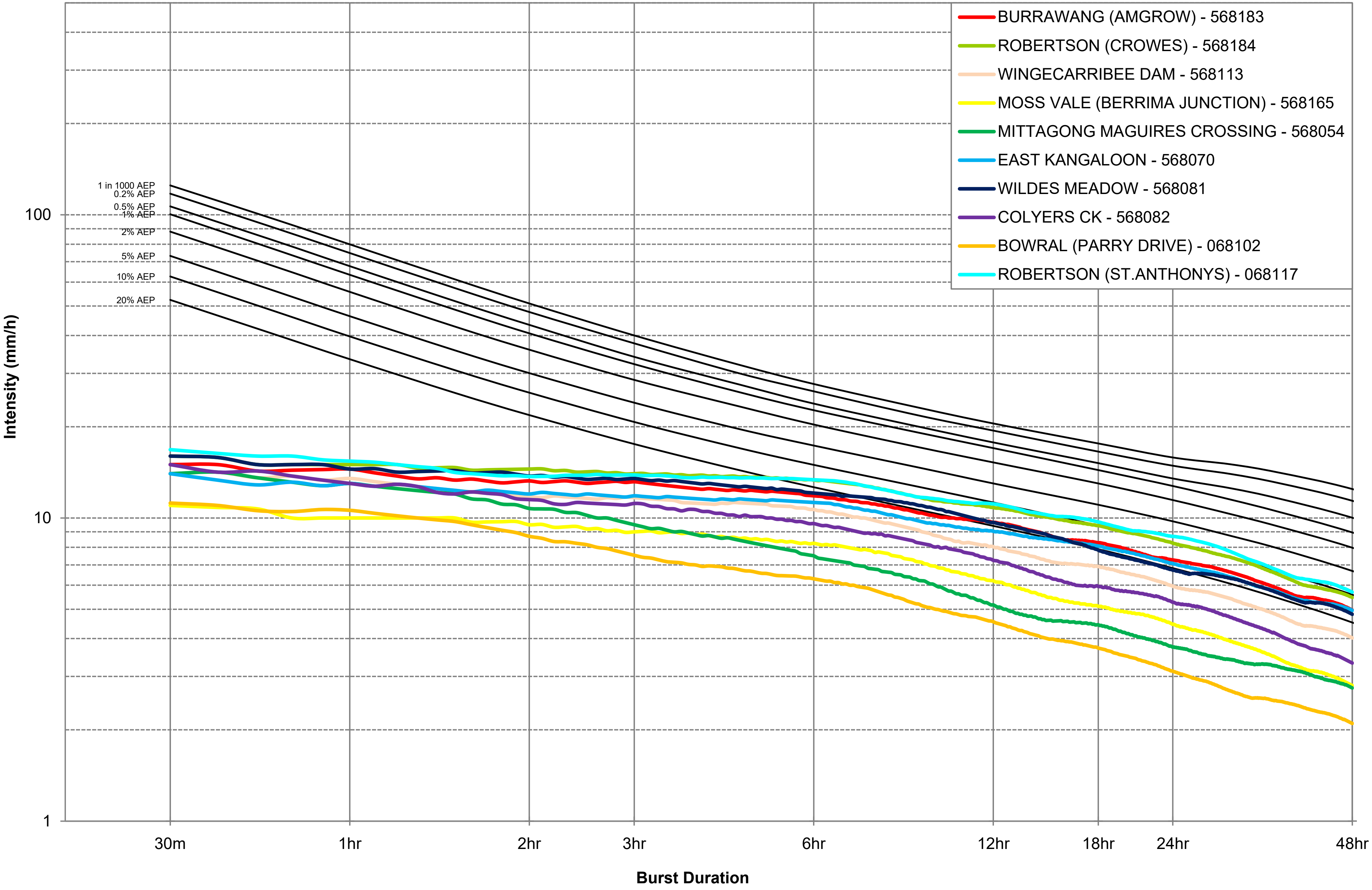




J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

FIGURE D17

BURST INTENSITIES AND FREQUENCIES
AUGUST 1996 FLOOD EVENT



J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

FIGURE D18
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
AUGUST 1996 FLOOD EVENT

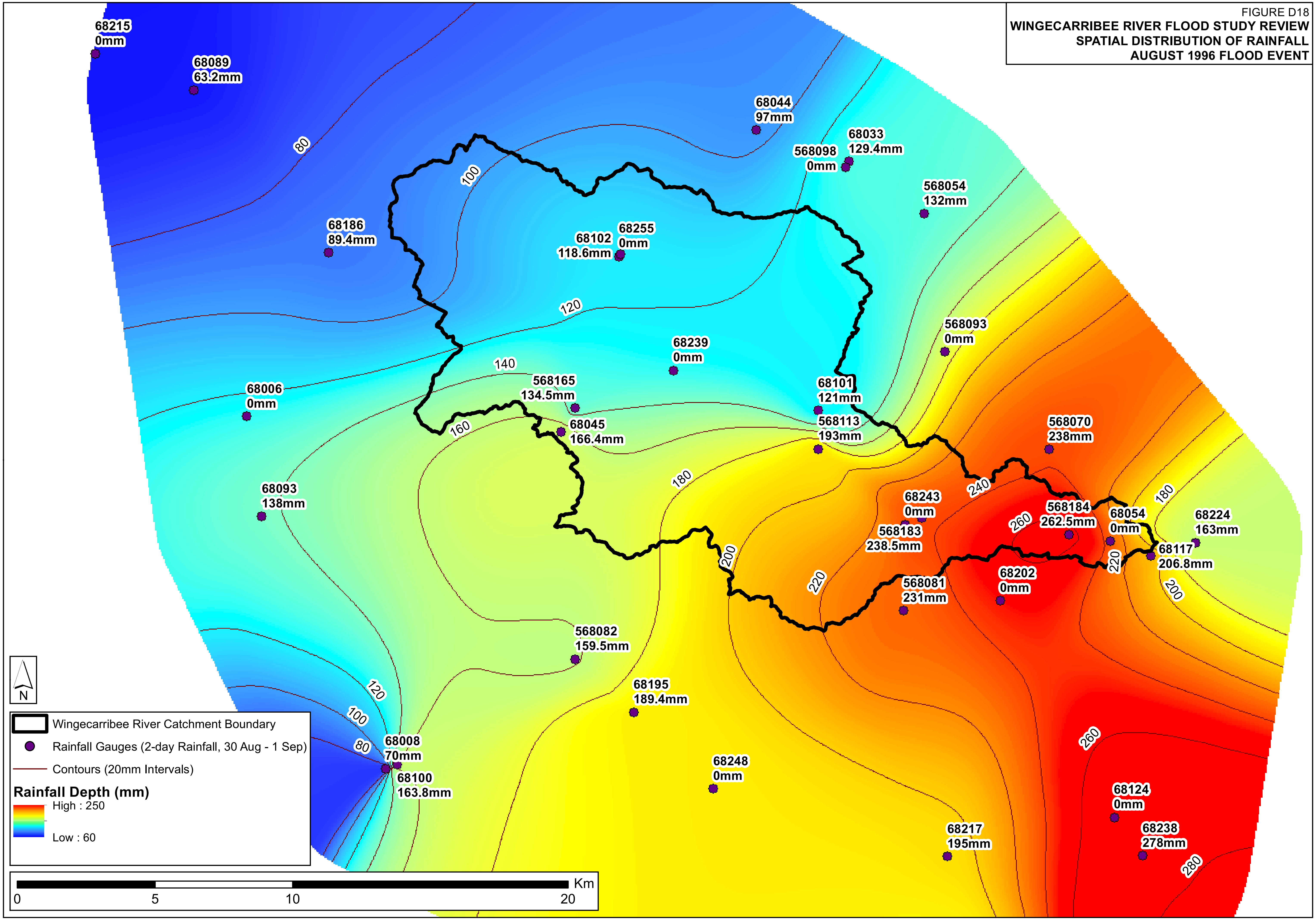
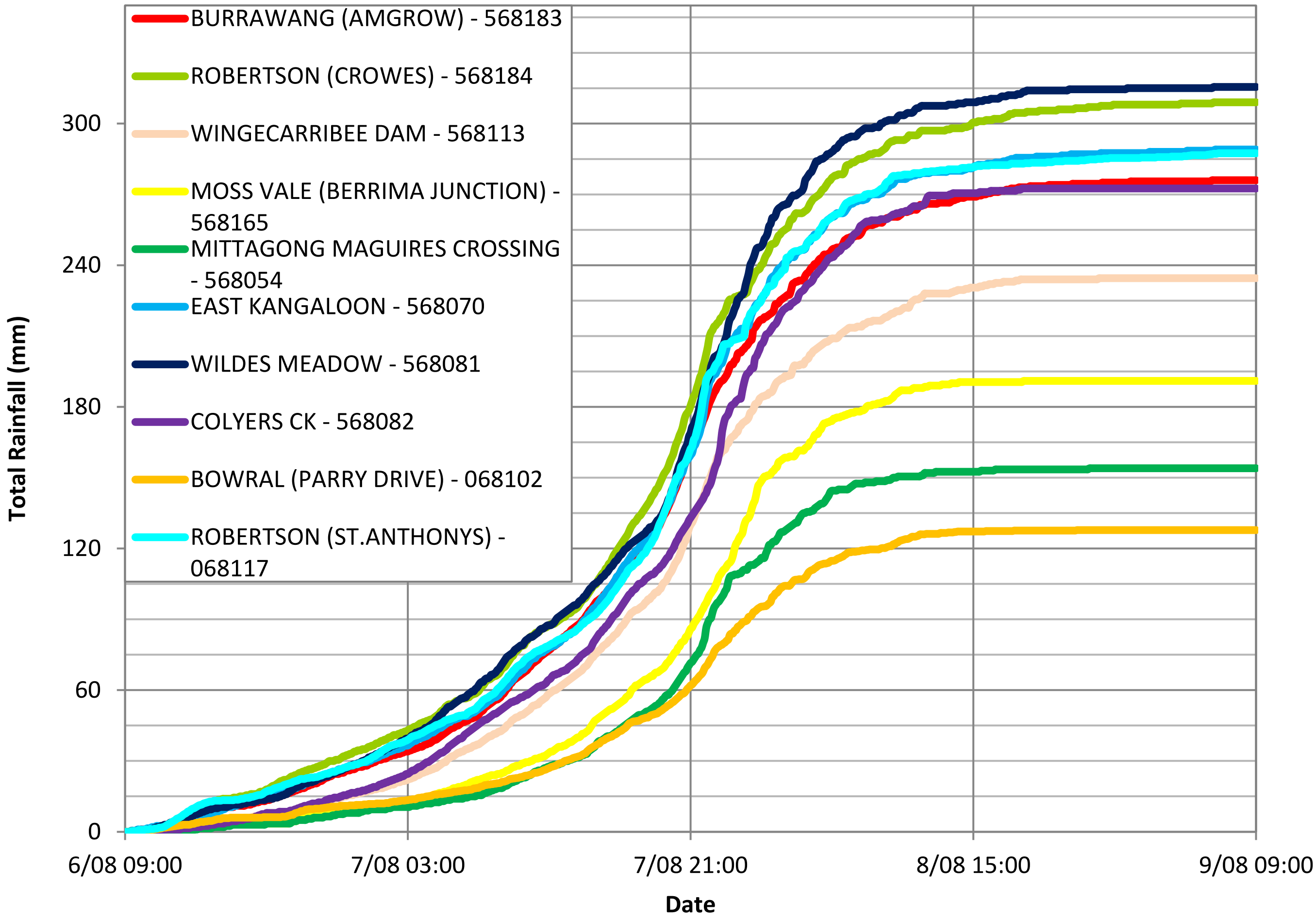


FIGURE D19
CUMULATIVE RAINFALL DATA
AUGUST 1998 EVENT



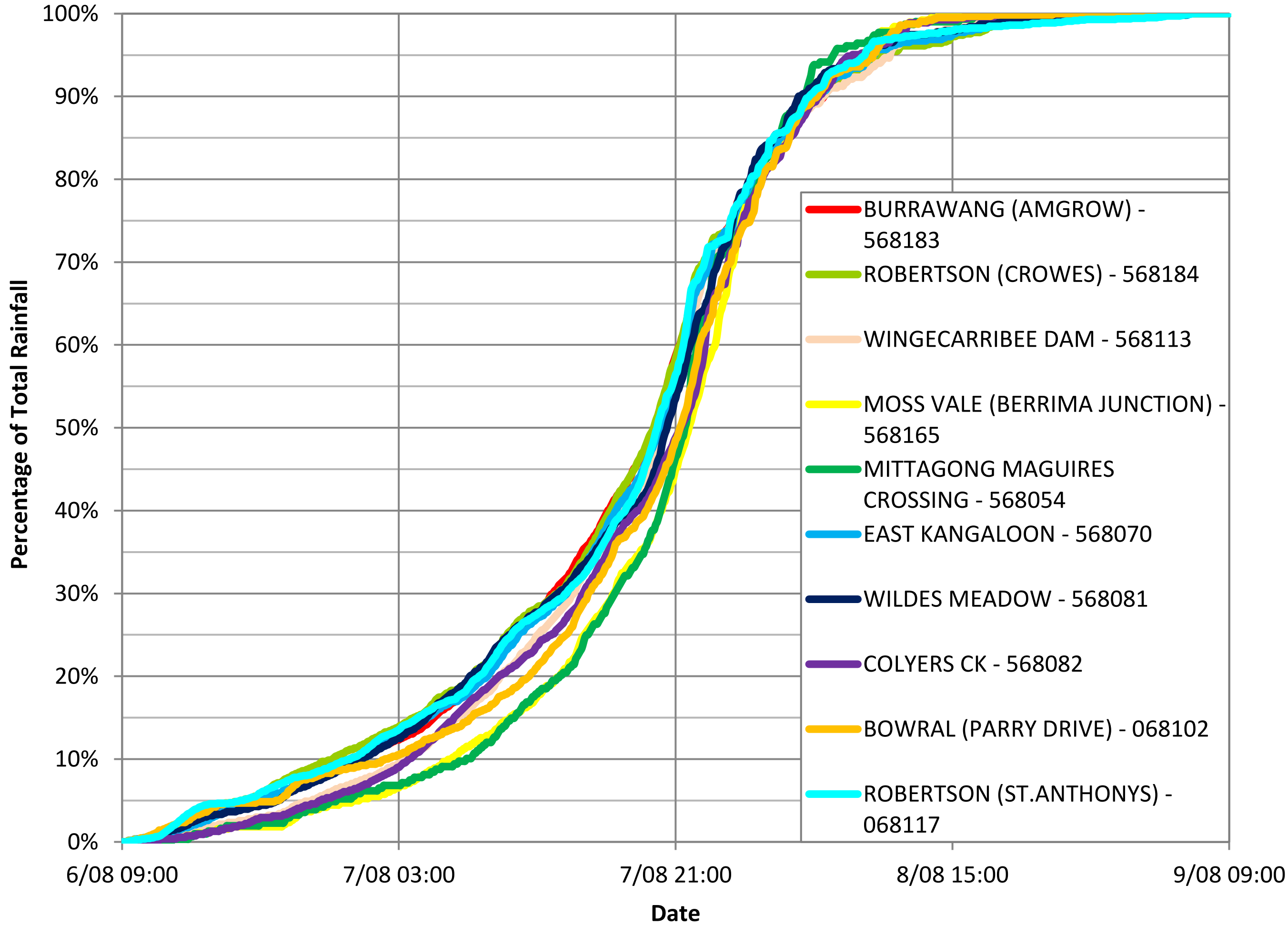


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FIGURE D20
BURST INTENSITIES AND FREQUENCIES
AUGUST 1998 FLOOD EVENT

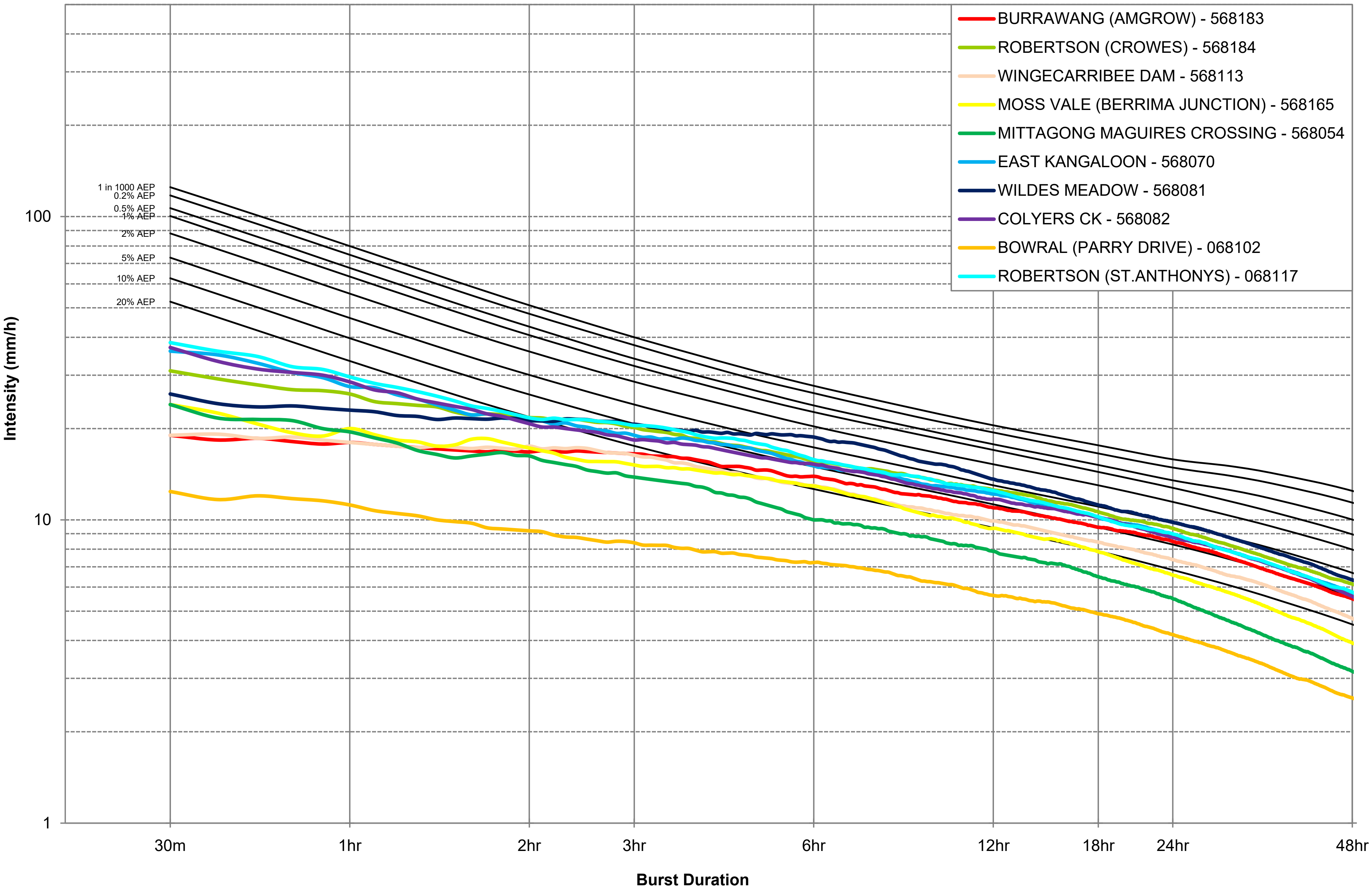

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FIGURE D21
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
AUGUST 1998 FLOOD EVENT

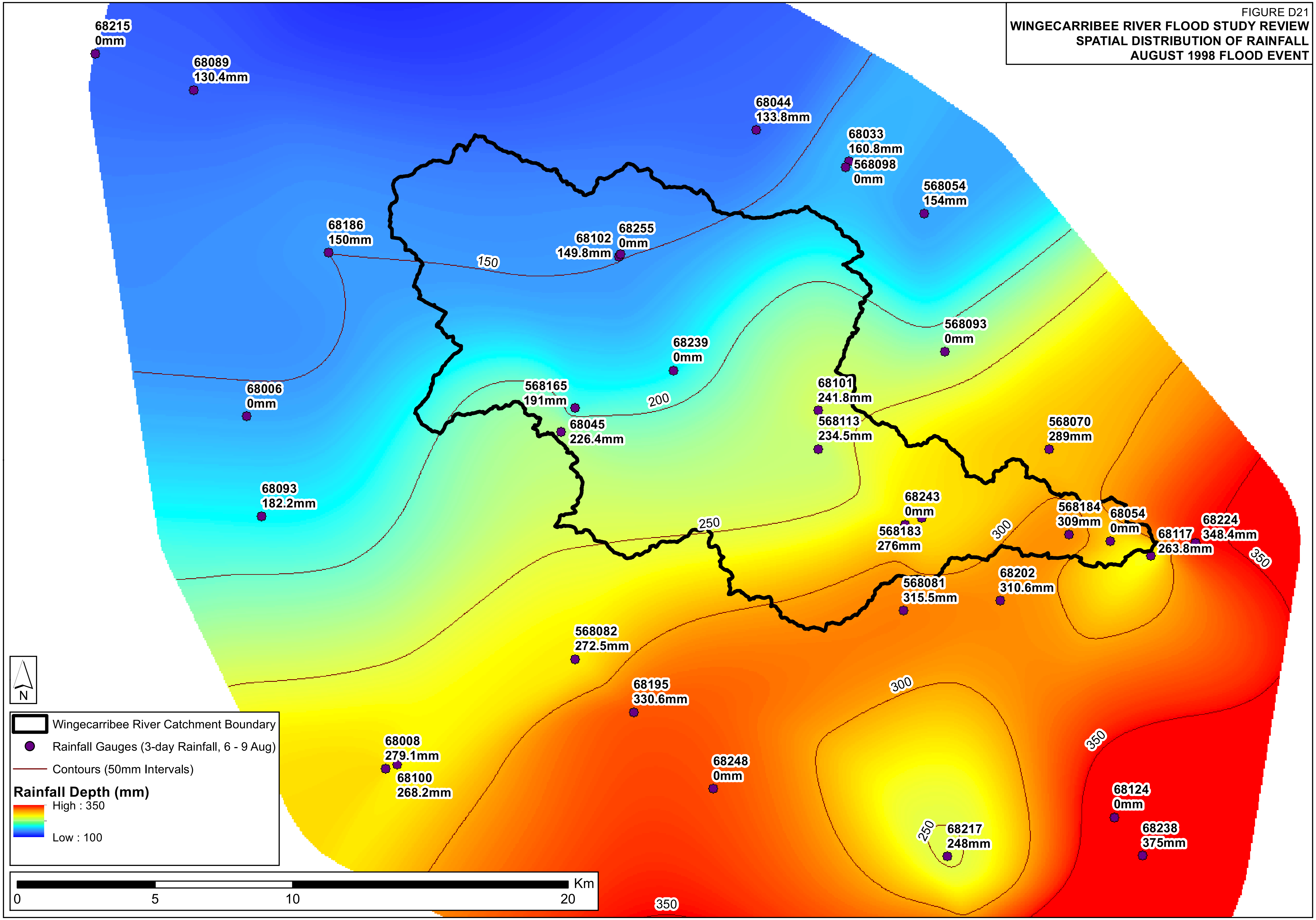

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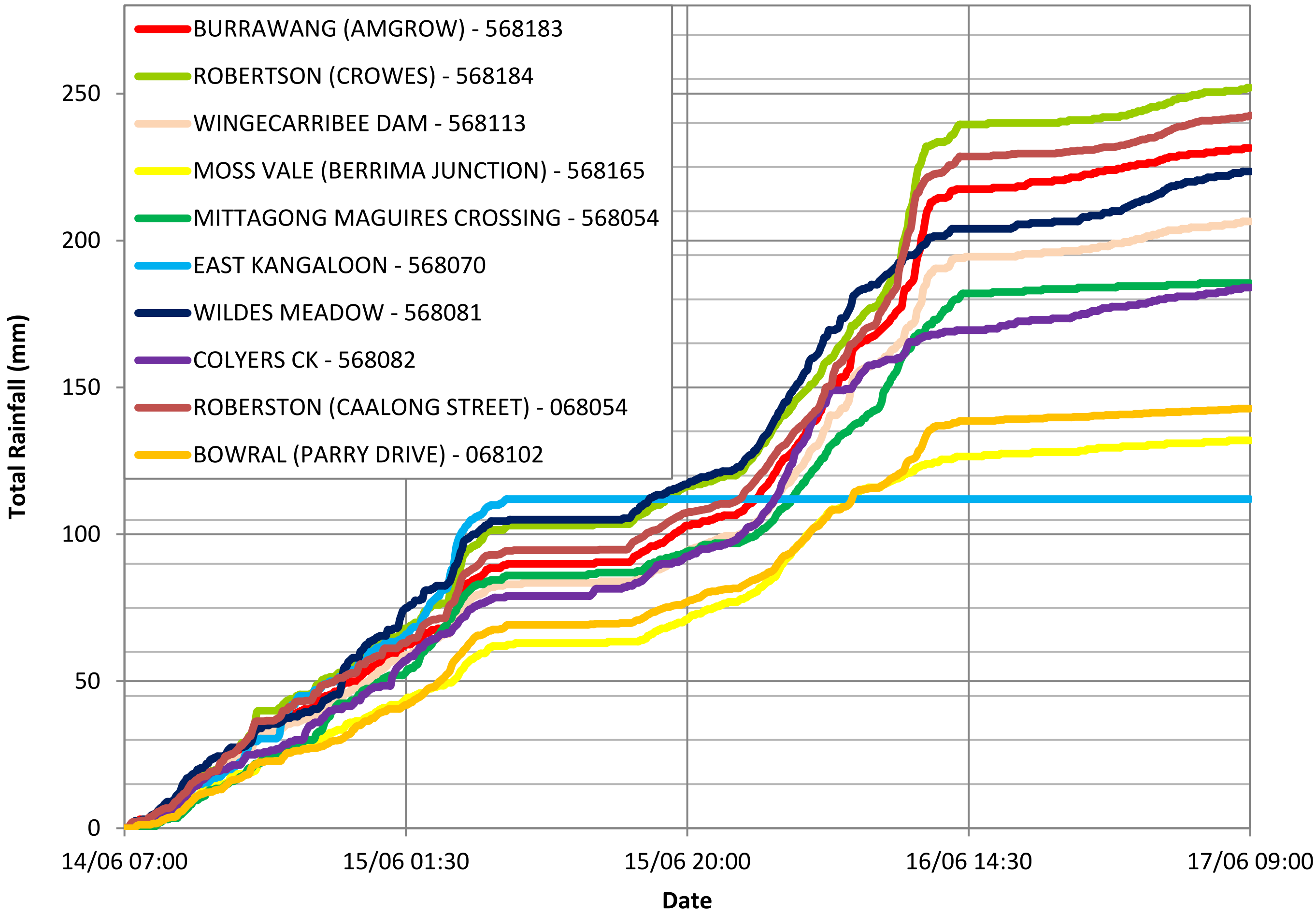
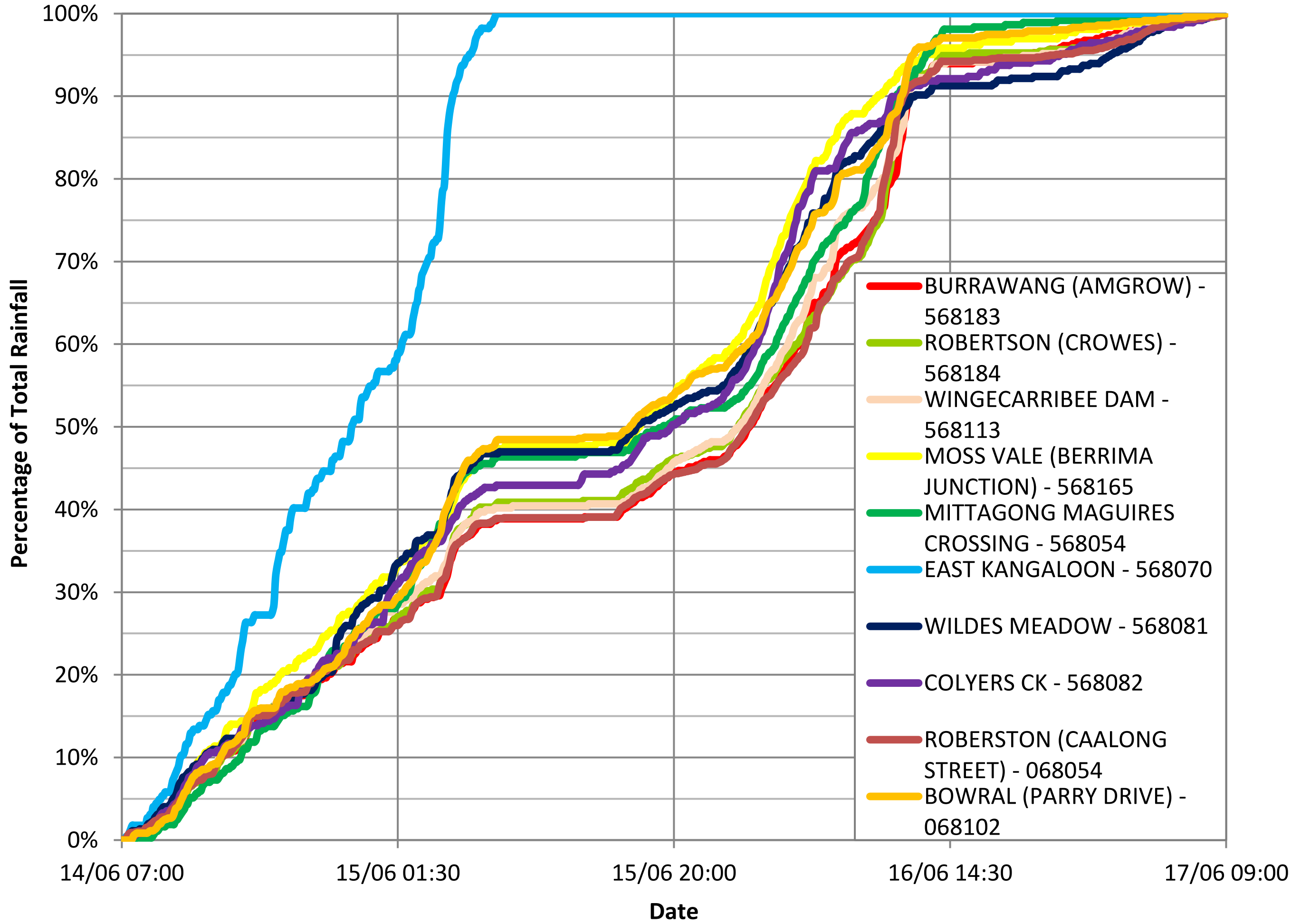
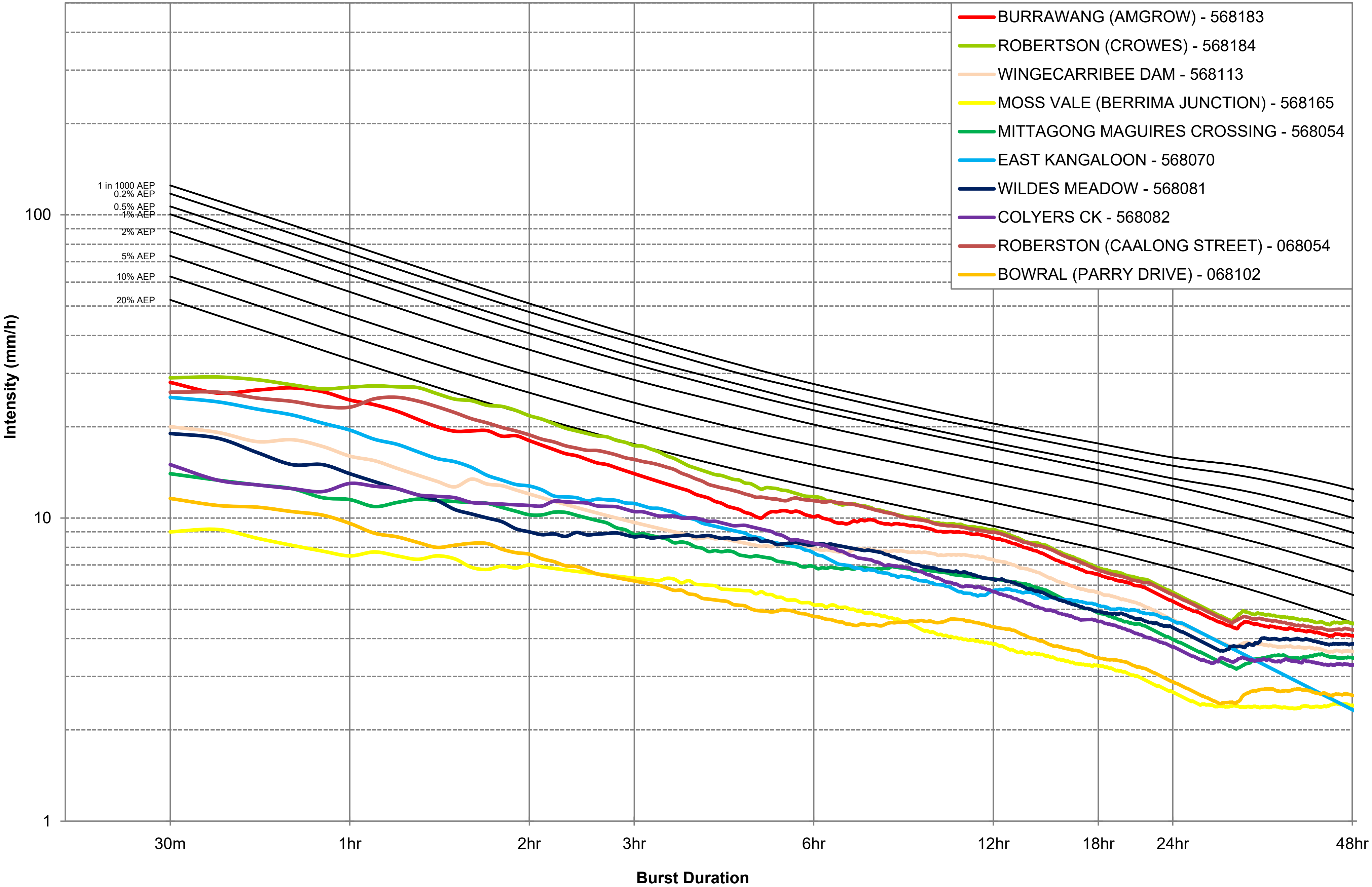
FIGURE D22
CUMULATIVE RAINFALL DATA
JUNE 2007 EVENT





J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

FIGURE D23
BURST INTENSITIES AND FREQUENCIES
JUNE 2007 FLOOD EVENT



J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

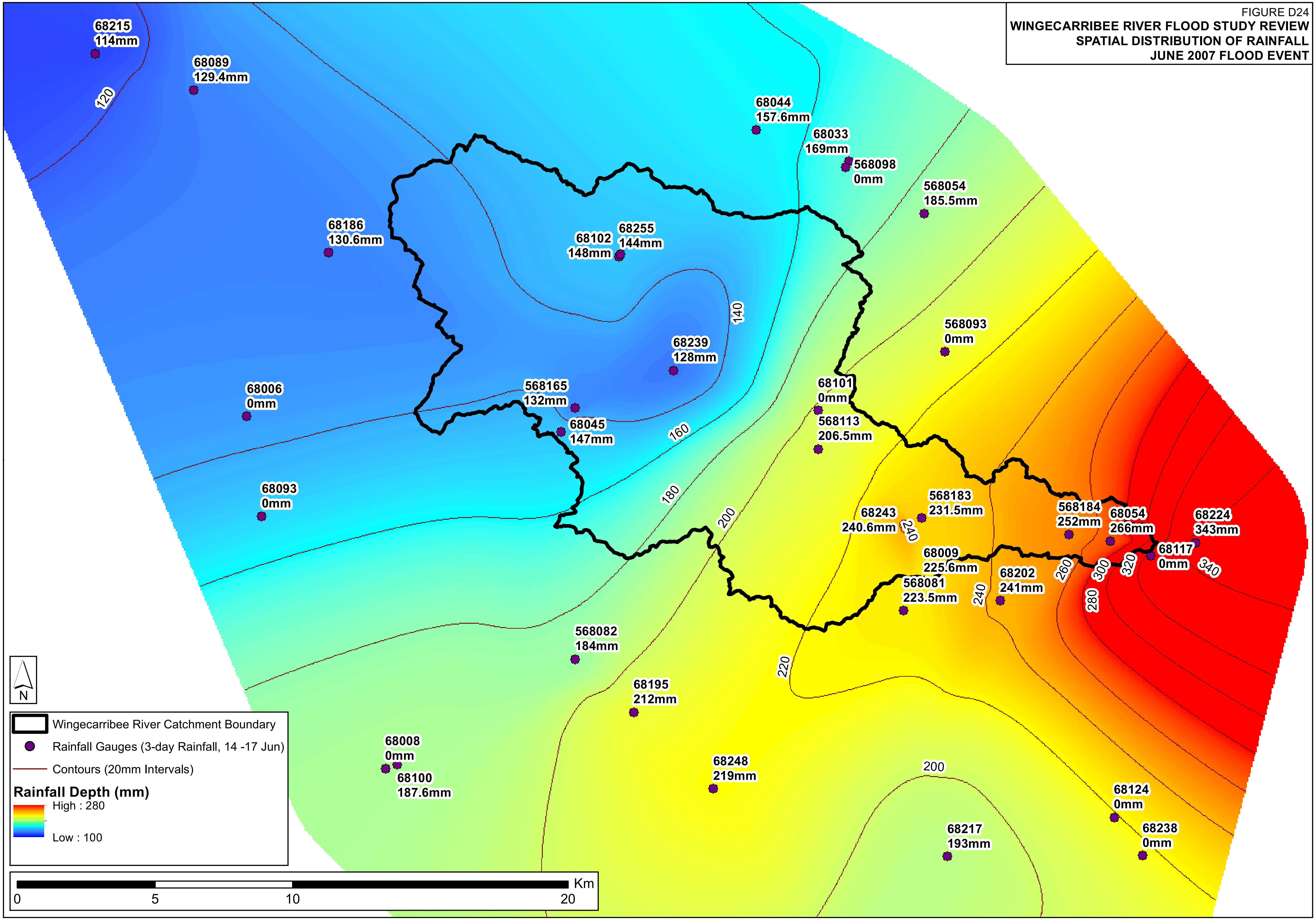
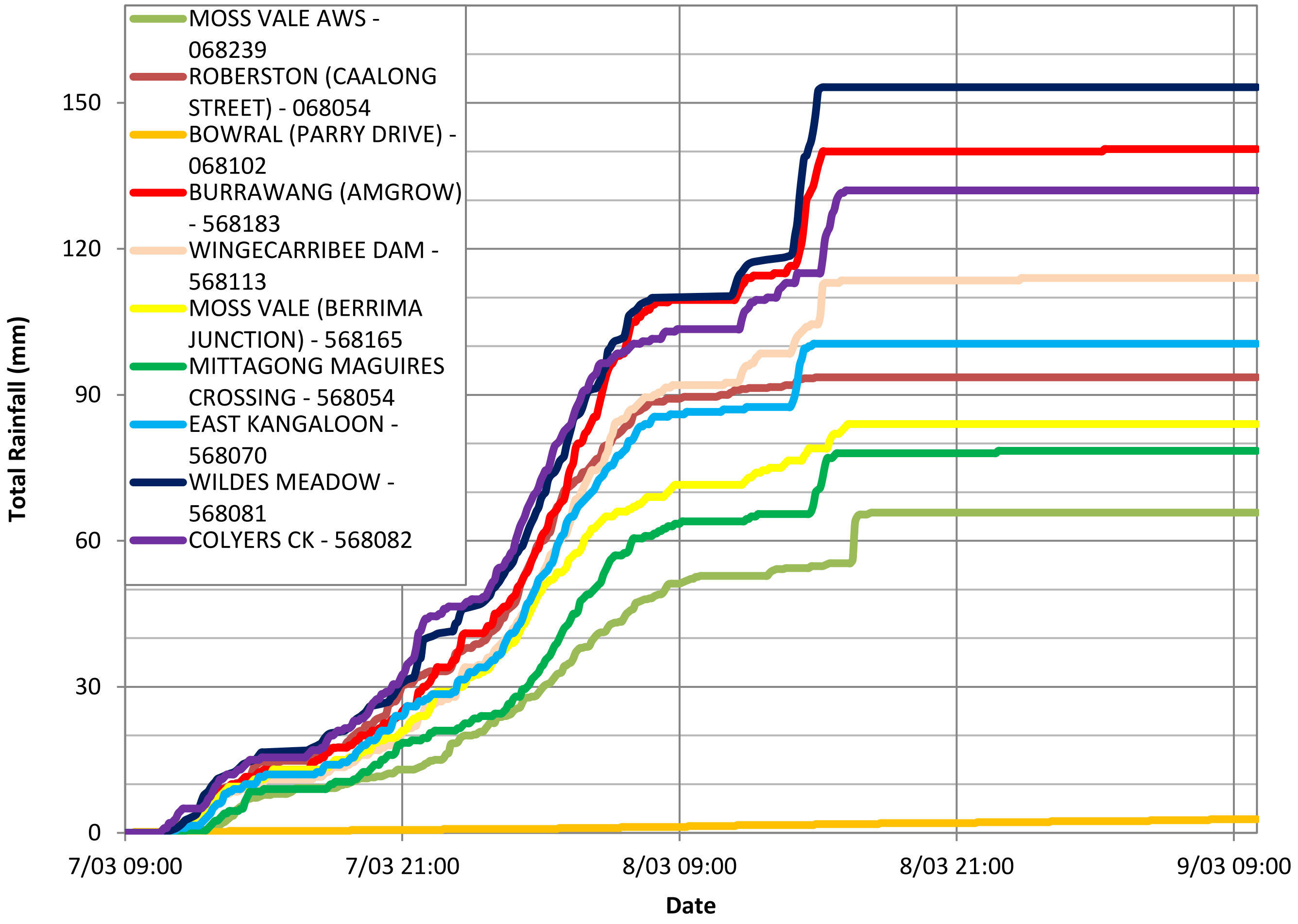


FIGURE D24
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
JUNE 2007 FLOOD EVENT

FIGURE D25
CUMULATIVE RAINFALL DATA
MARCH 2012 EVENT



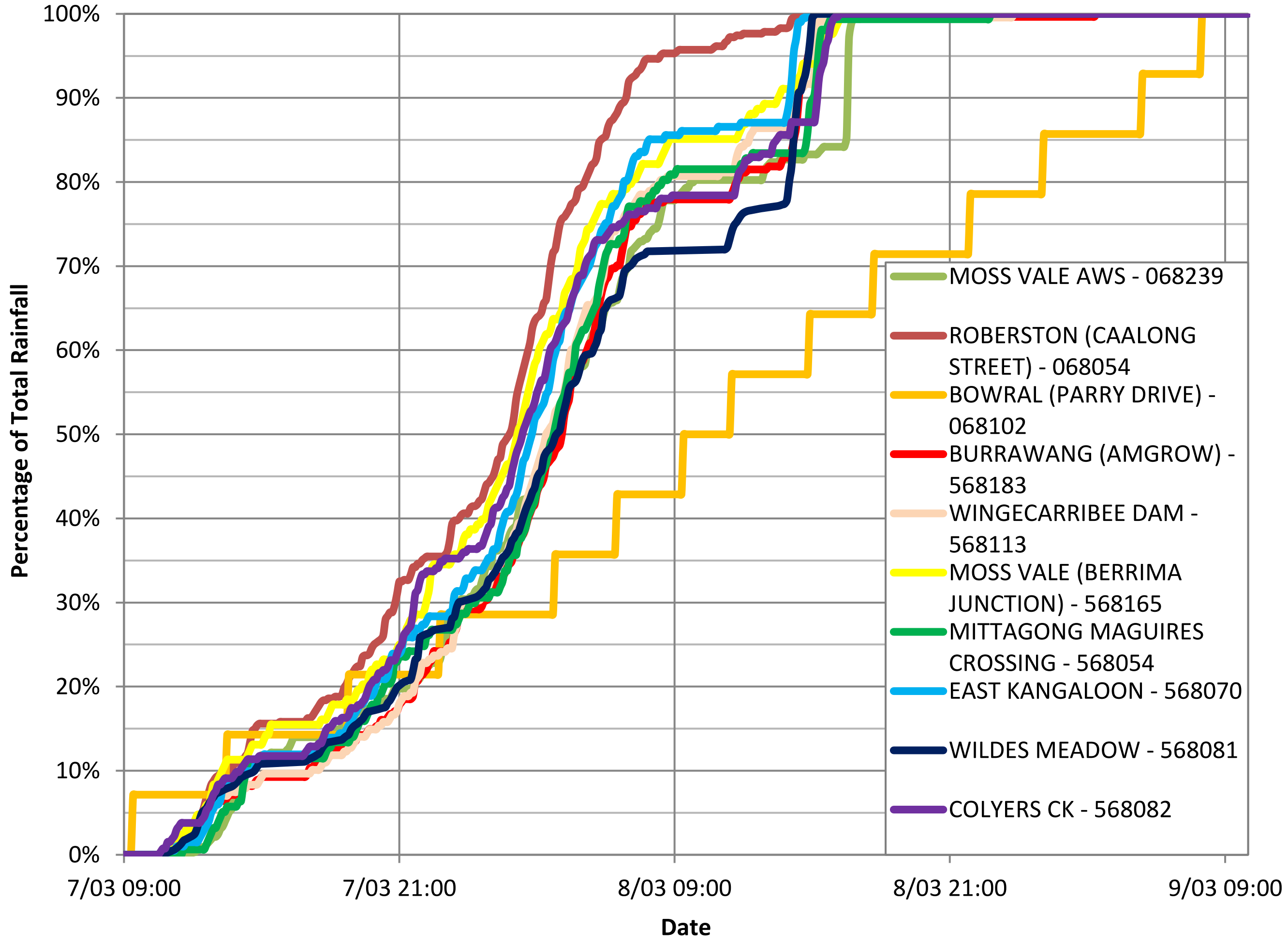
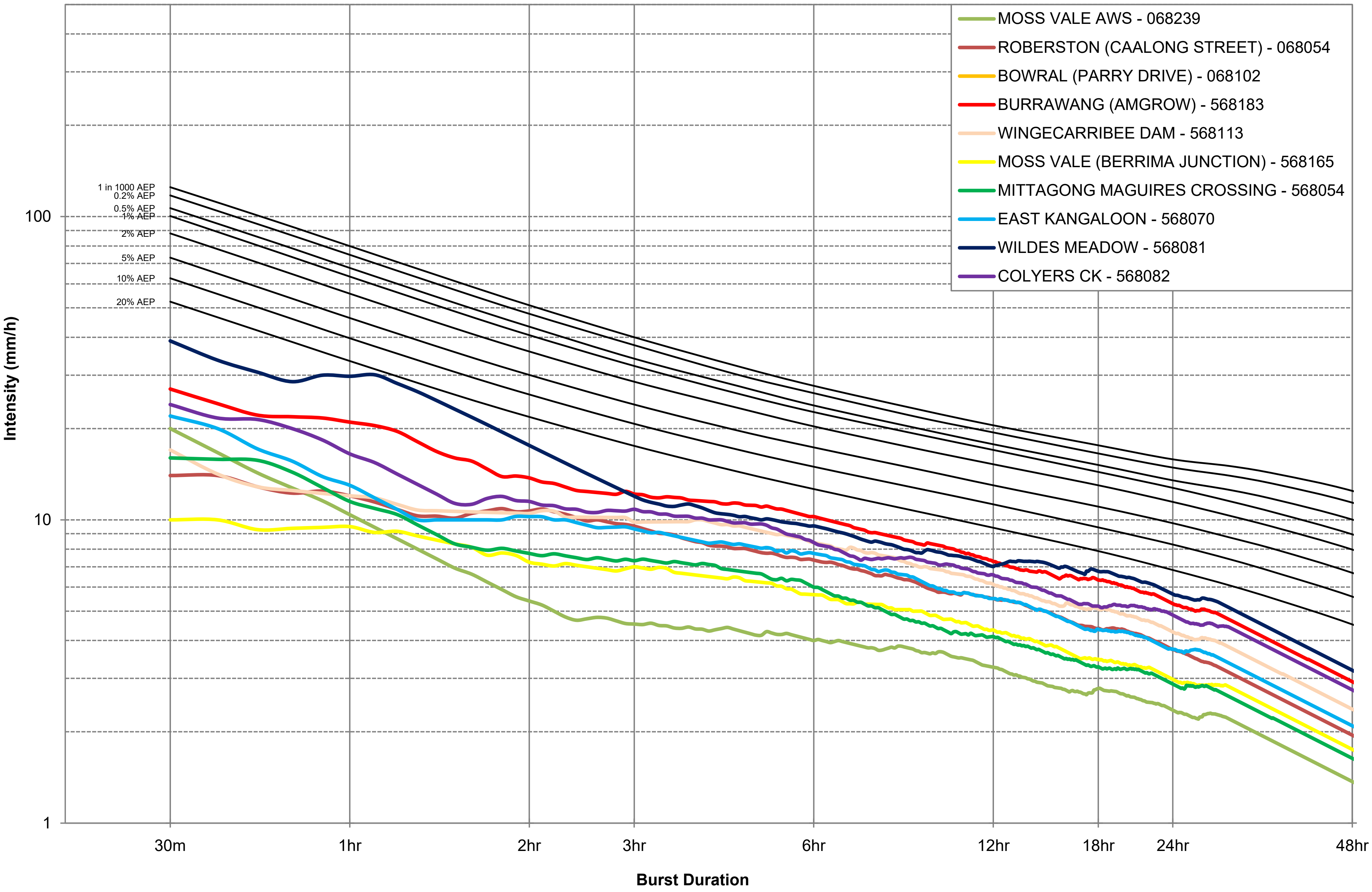


FIGURE D26
BURST INTENSITIES AND FREQUENCIES
MARCH 2012 FLOOD EVENT



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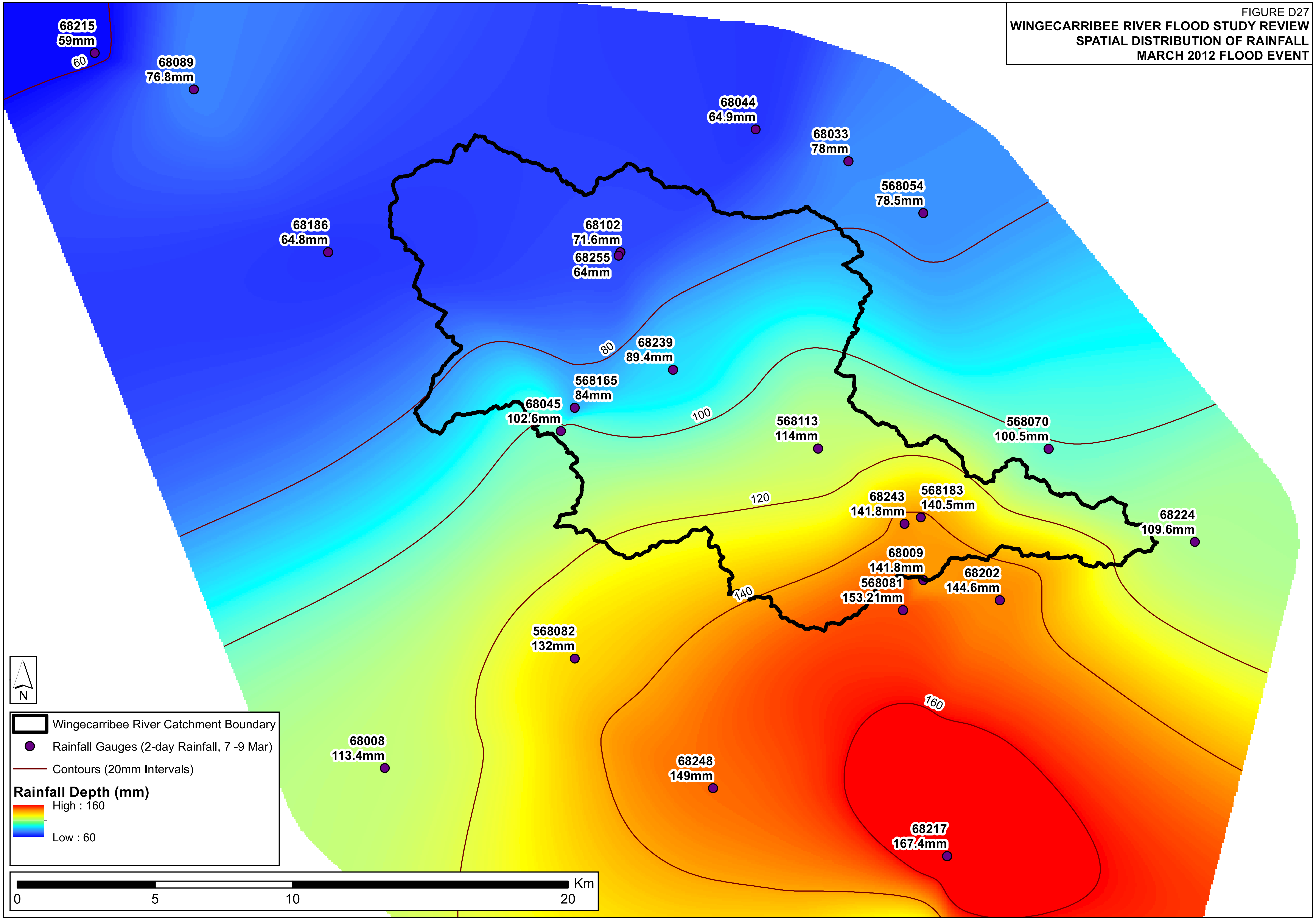
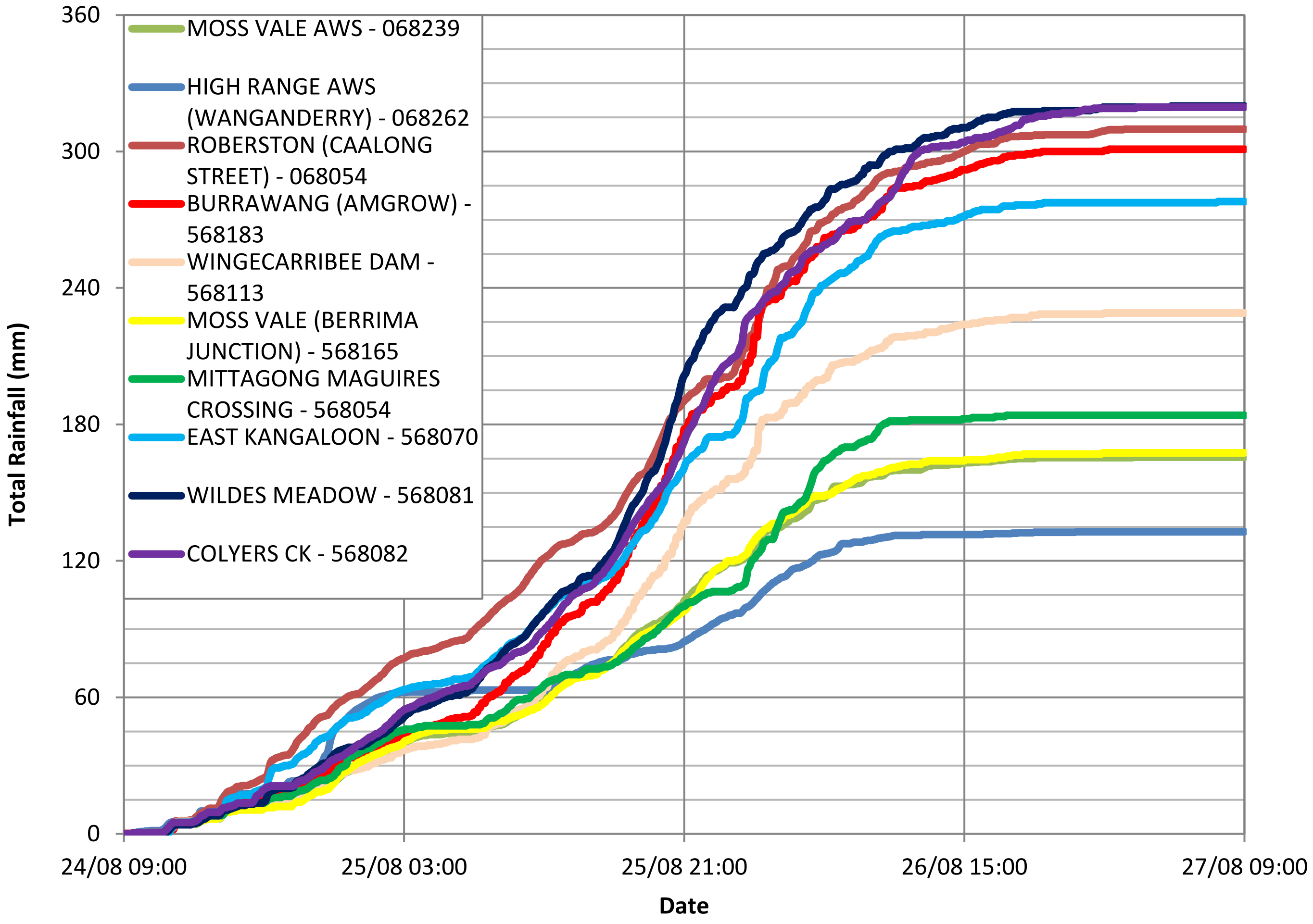


FIGURE D27
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
MARCH 2012 FLOOD EVENT


Total Rainfall (mm)
360
300
240
180
120
60
0
MOSS VALE AWS - 068239
HIGH RANGE AWS (WANGANDERRY) - 068262
ROBERSTON (CAALONG STREET) - 068054
BURRAWANG (AMGROW) - 568183
WINGECARRIBEE DAM - 568113
MOSS VALE (BERRIMA JUNCTION) - 568165
MITTAGONG MAGUIRES CROSSING - 568054
EAST KANGALOON - 568070
WILDES MEADOW - 568081
COLYERS CK - 568082
24/08 09:00
25/08 03:00
25/08 21:00
26/08 15:00
27/08 09:00
Date

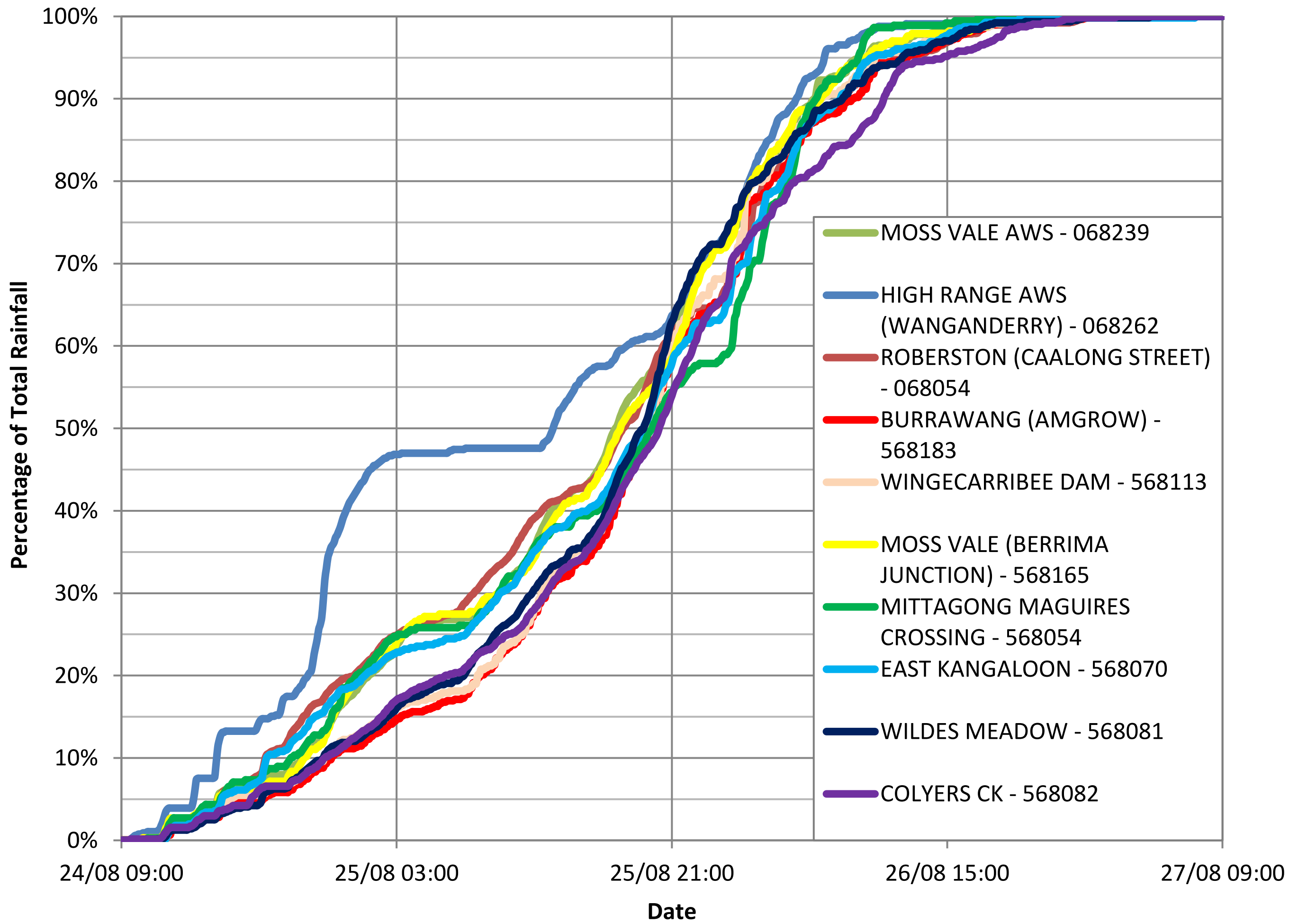

Percentage of Total Rainfall
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
MOSS VALE AWS - 068239
HIGH RANGE AWS (WANGANDERRY) - 068262
ROBERSTON (CAALONG STREET) - 068054
BURRAWANG (AMGROW) - 568183
WINGECARRIBEE DAM - 568113
MOSS VALE (BERRIMA JUNCTION) - 568165
MITTAGONG MAGUIRES CROSSING - 568054
EAST KANGALOON - 568070
WILDES MEADOW - 568081
COLYERS CK - 568082
24/08 09:00
25/08 03:00
25/08 21:00
26/08 15:00
27/08 09:00
Date

FIGURE D29

BURST INTENSITIES AND FREQUENCIES
AUGUST 2015 FLOOD EVENT

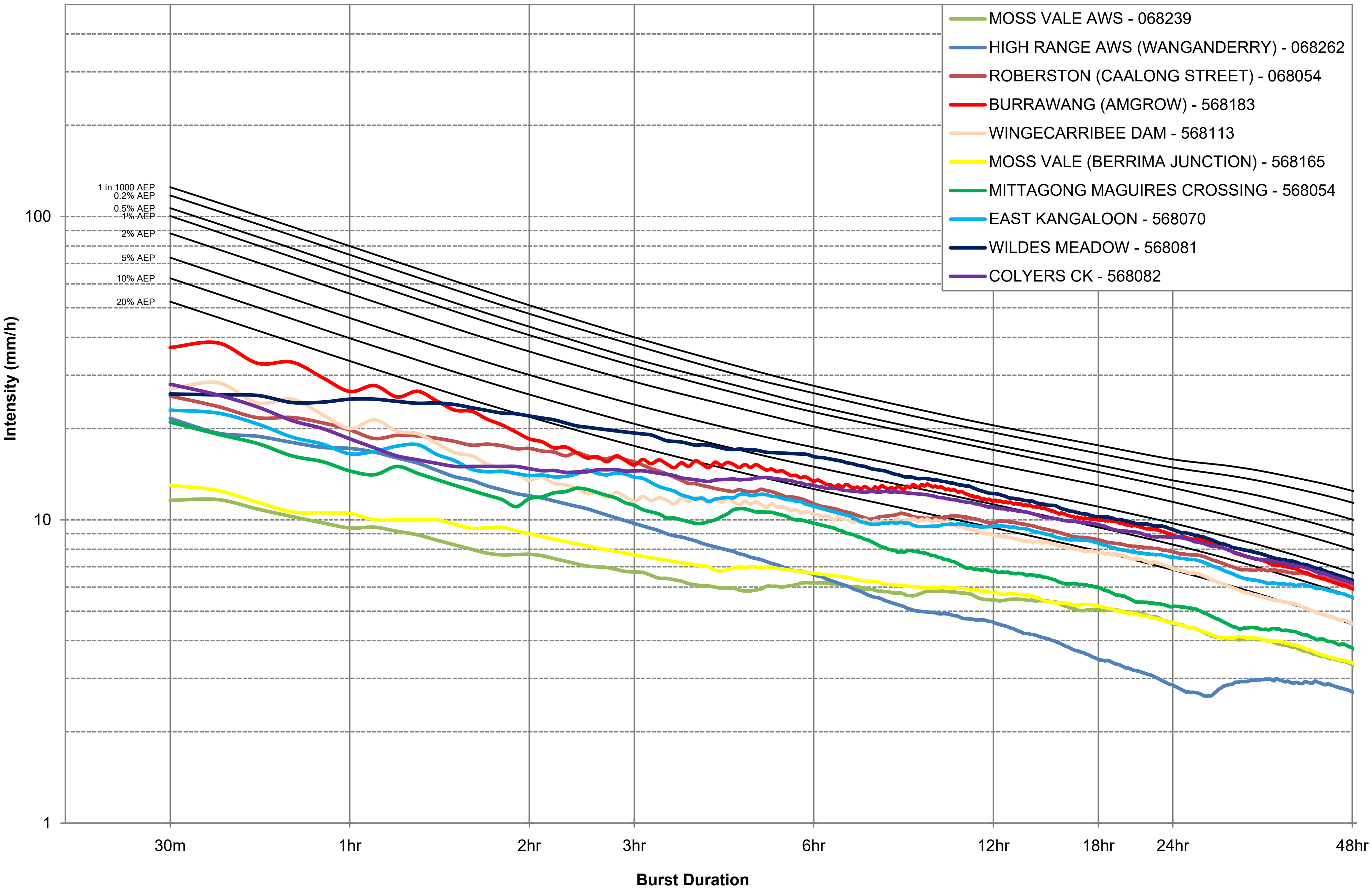


FIGURE D30
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
AUGUST 2015 FLOOD EVENT

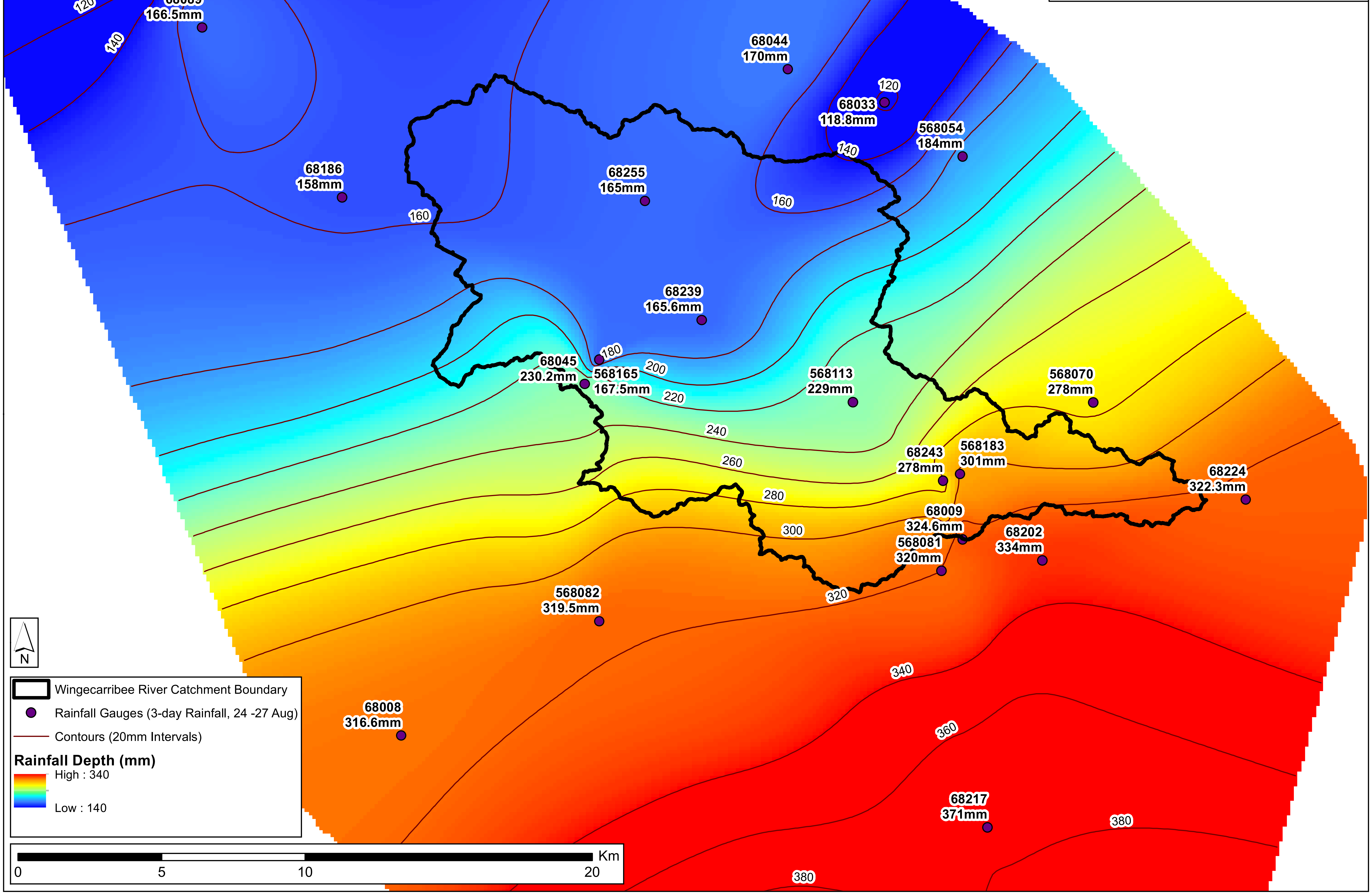
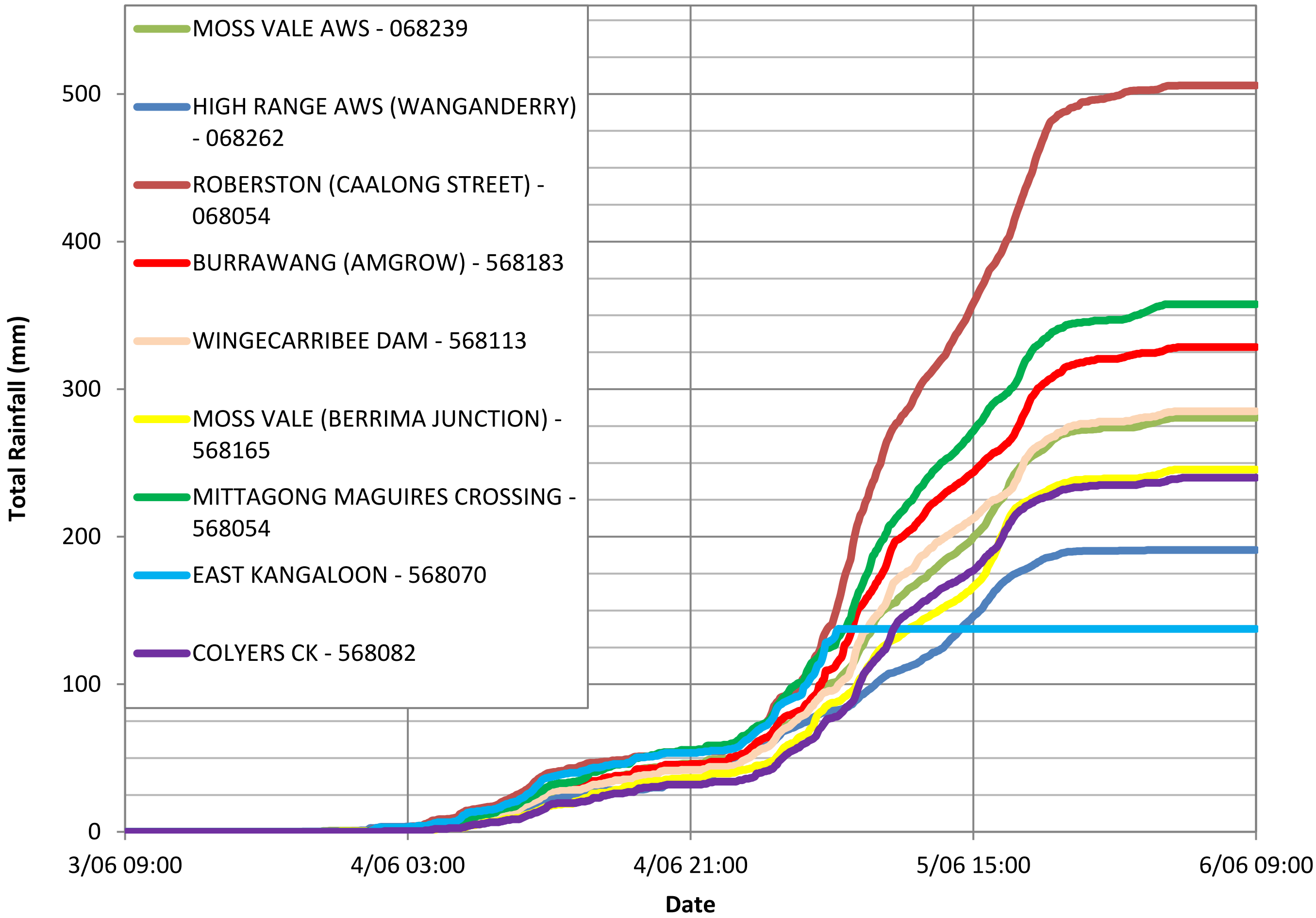


FIGURE D31
CUMULATIVE RAINFALL DATA
JUNE 2016 EVENT



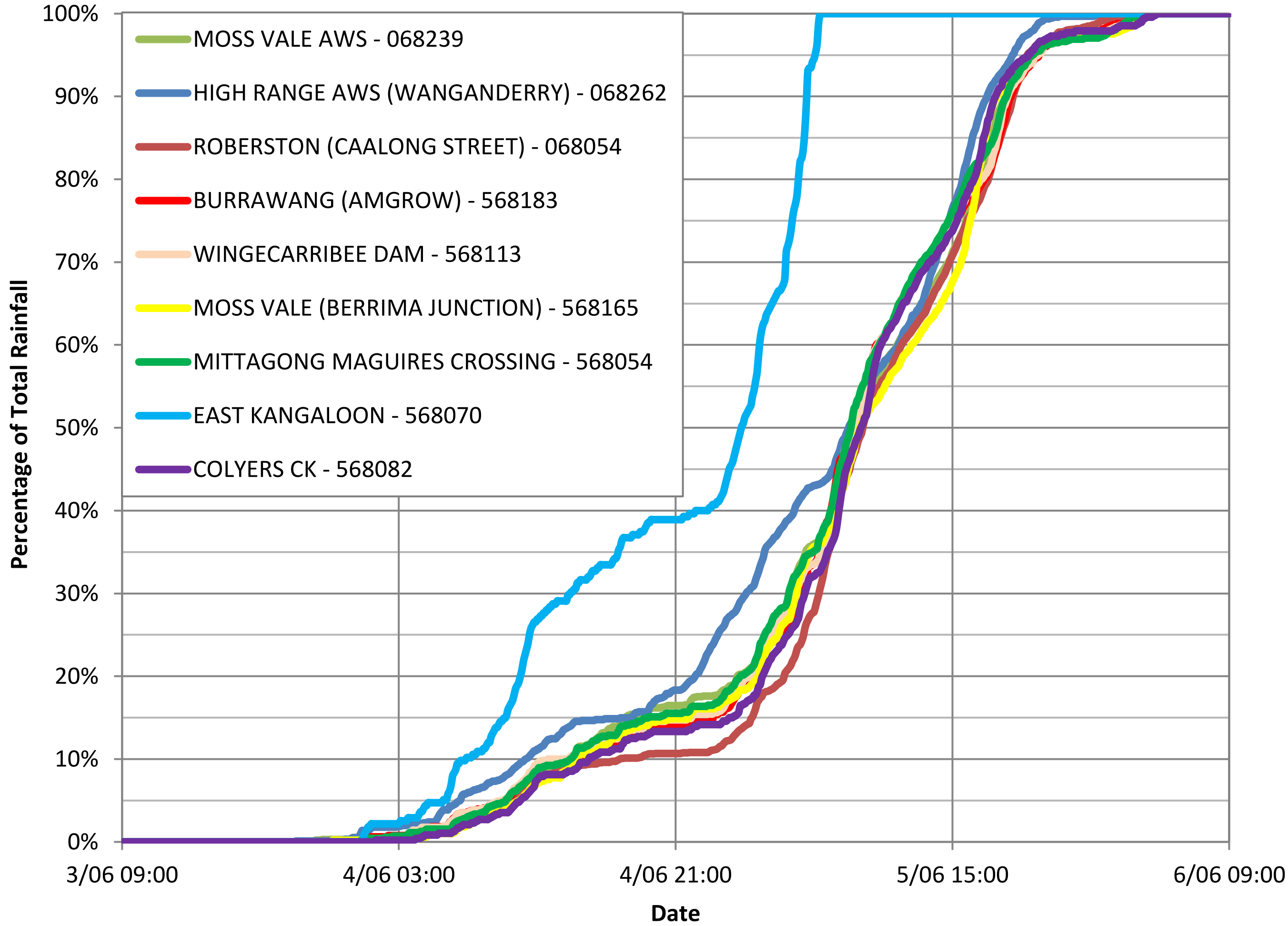


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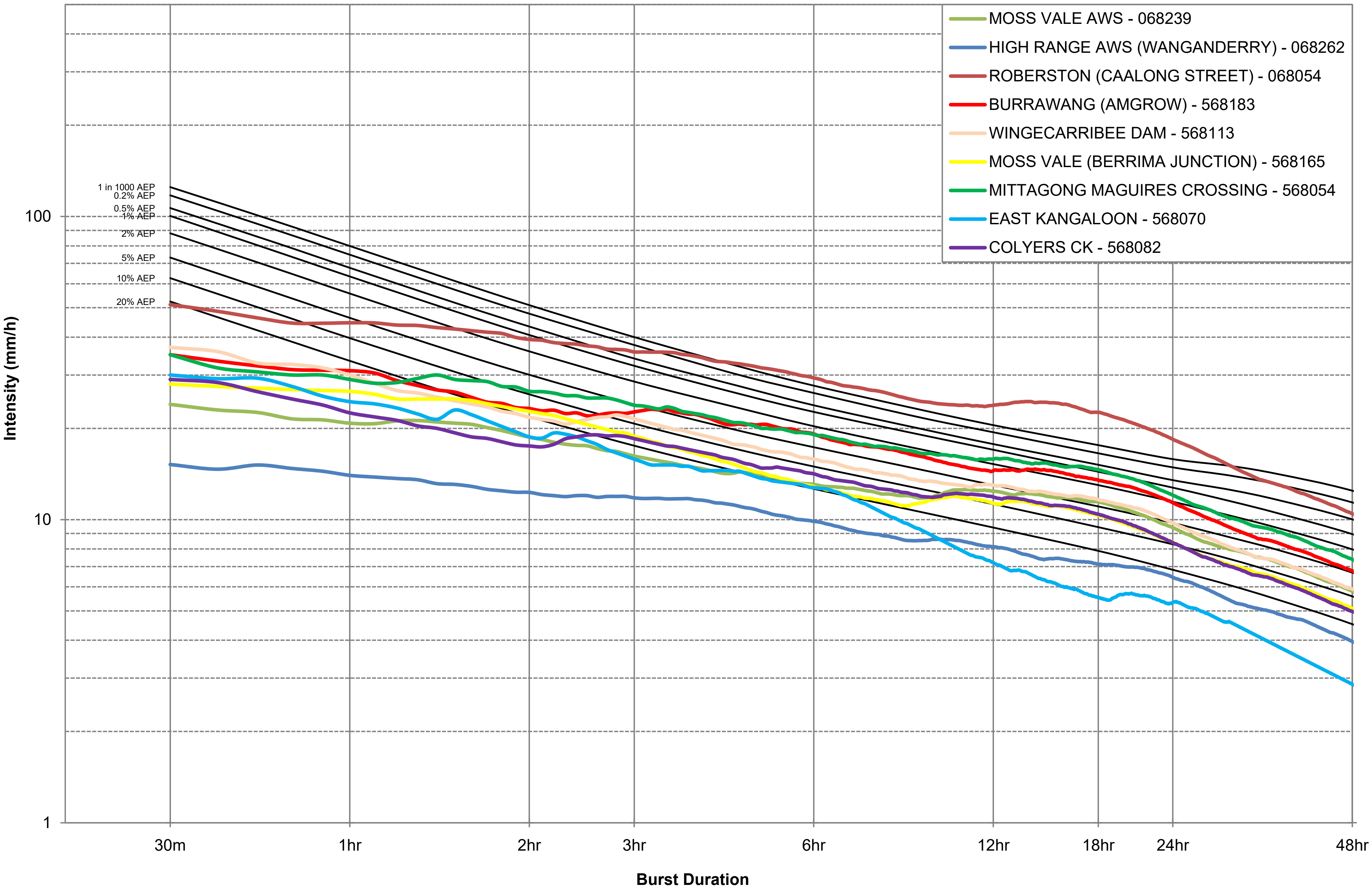
FIGURE D32
BURST INTENSITIES AND FREQUENCIES
JUNE 2016 FLOOD EVENT



J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

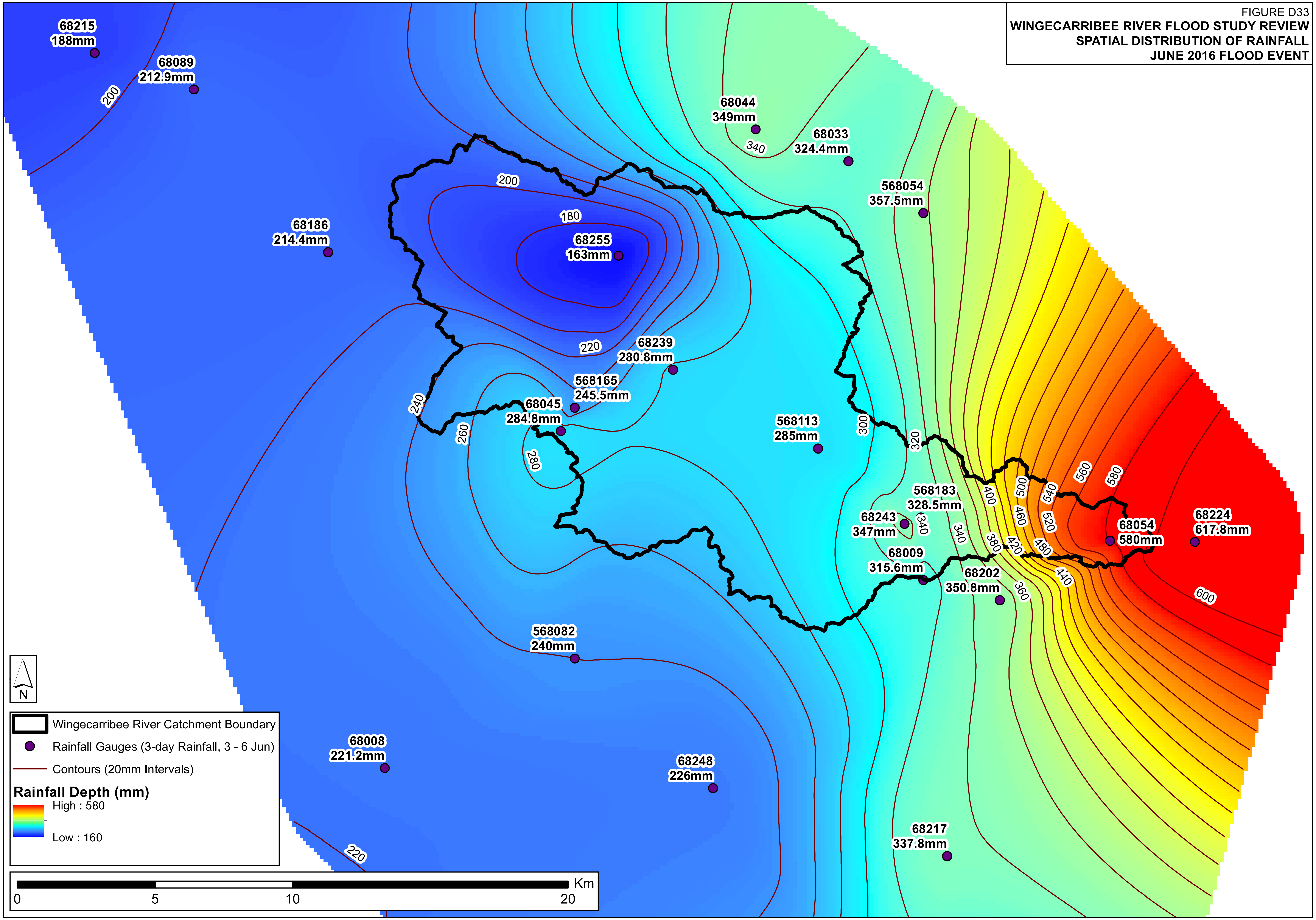
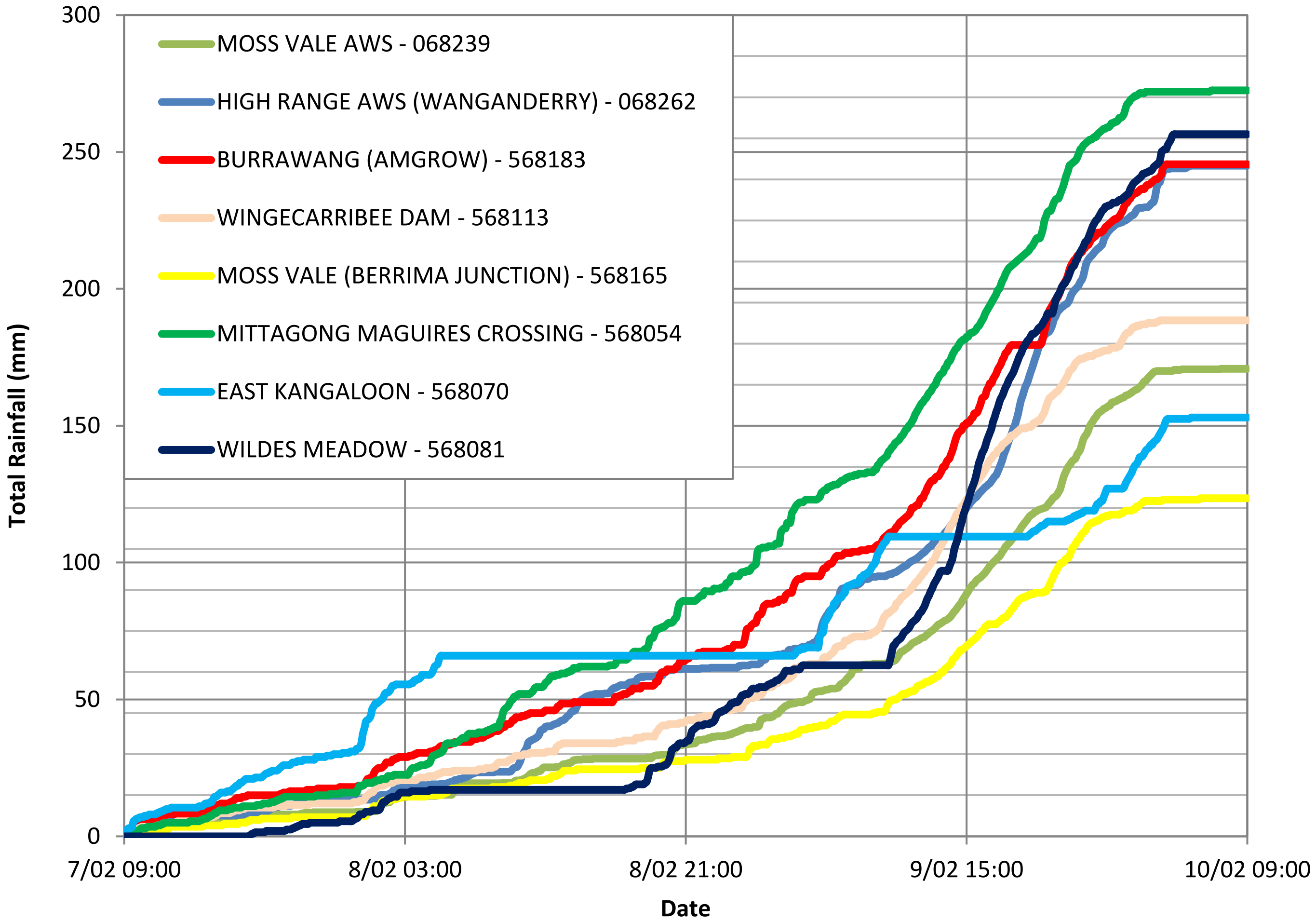


FIGURE D33
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
JUNE 2016 FLOOD EVENT
68215
188mm
68089
212.9mm
68186
214.4mm
68255
163mm
68239
280.8mm
568165
245.5mm
68045
284.8mm
68044
349mm
68033
324.4mm
568054
357.5mm
568113
285mm
568183
328.5mm
68243
347mm
68009
315.6mm
68202
350.8mm
68054
580mm
68224
617.8mm
568082
240mm
68008
221.2mm
68248
226mm
68217
337.8mm
N
Wingecarribee River Catchment Boundary
Rainfall Gauges (3-day Rainfall, 3 - 6 Jun)
Contours (20mm Intervals)
Rainfall Depth (mm)
High : 580
Low : 160
0
5
10
20
Km

FIGURE D34
CUMULATIVE RAINFALL DATA
FEBRUARY 2020 EVENT



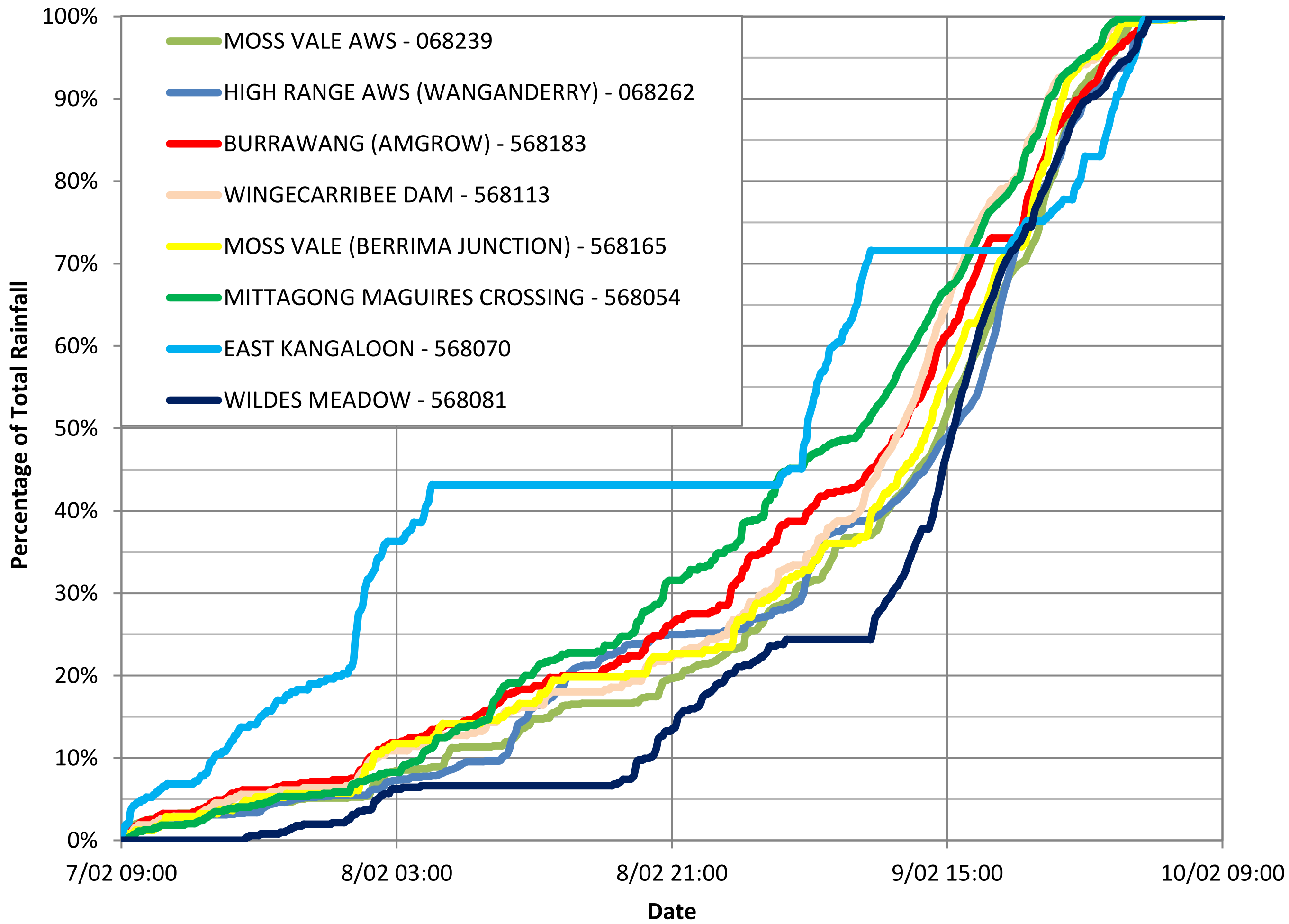


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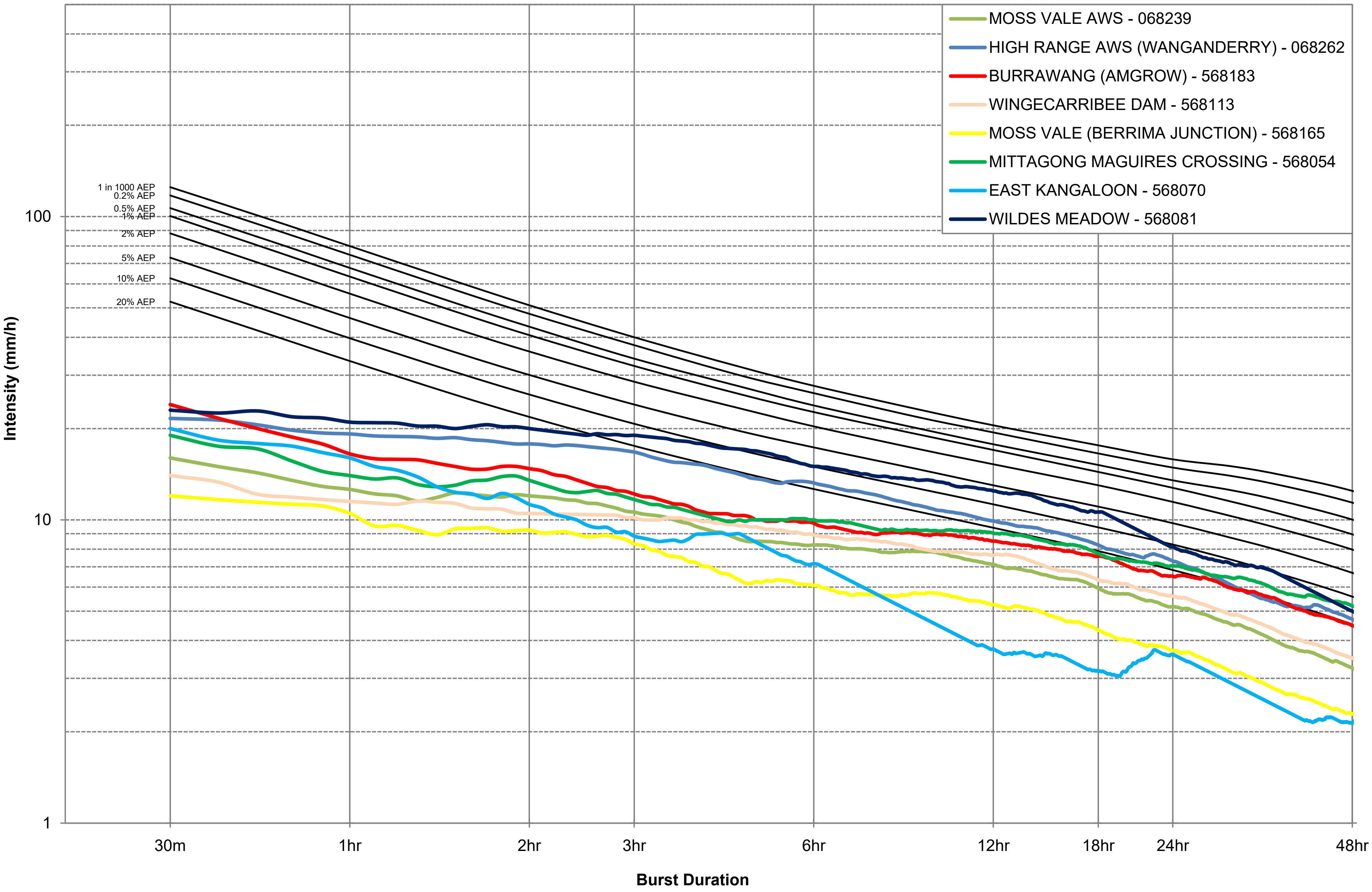
FIGURE D35
BURST INTENSITIES AND FREQUENCIES
FEBRUARY 2020 FLOOD EVENT



J:\Jobs\120019\Hydrology\Events\WRFS_Historical_Burst_IFD_Comparison_v1.4.xlsm

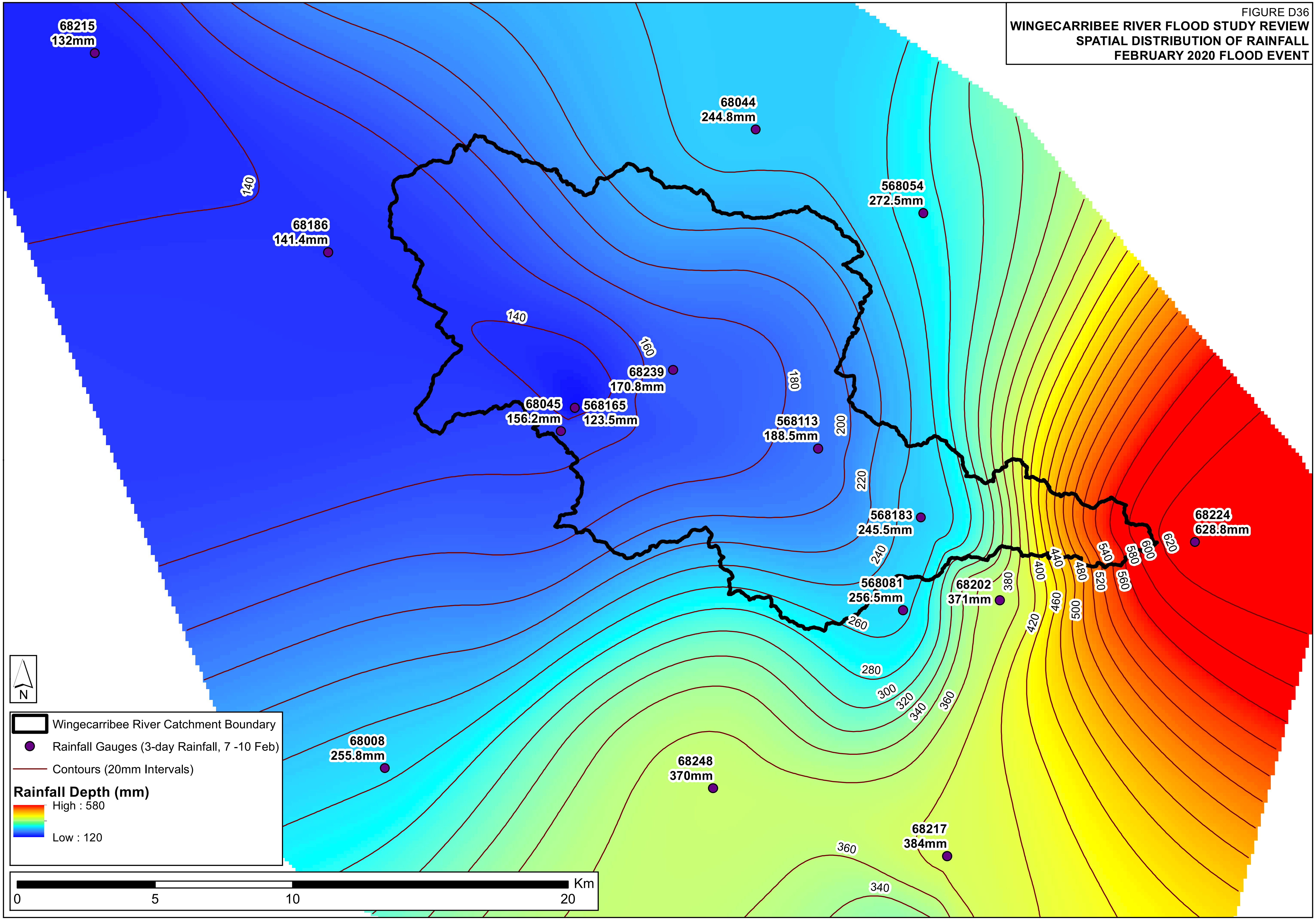


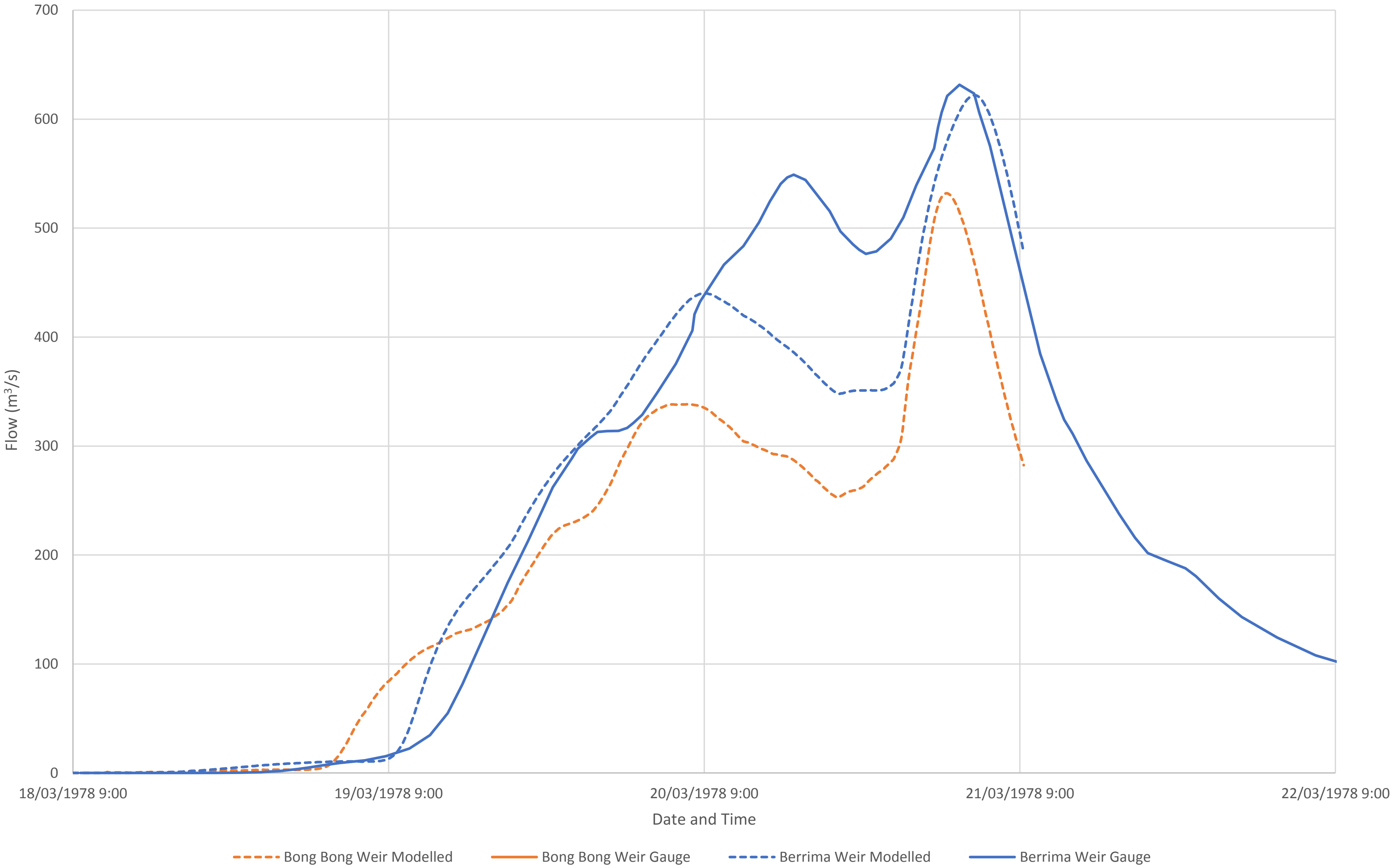
FIGURE D36
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
SPATIAL DISTRIBUTION OF RAINFALL
FEBRUARY 2020 FLOOD EVENT

APPENDIX E. CALIBRATION RESULTS – MAPPING AND CHARTS

Appendix E

FIGURE E1

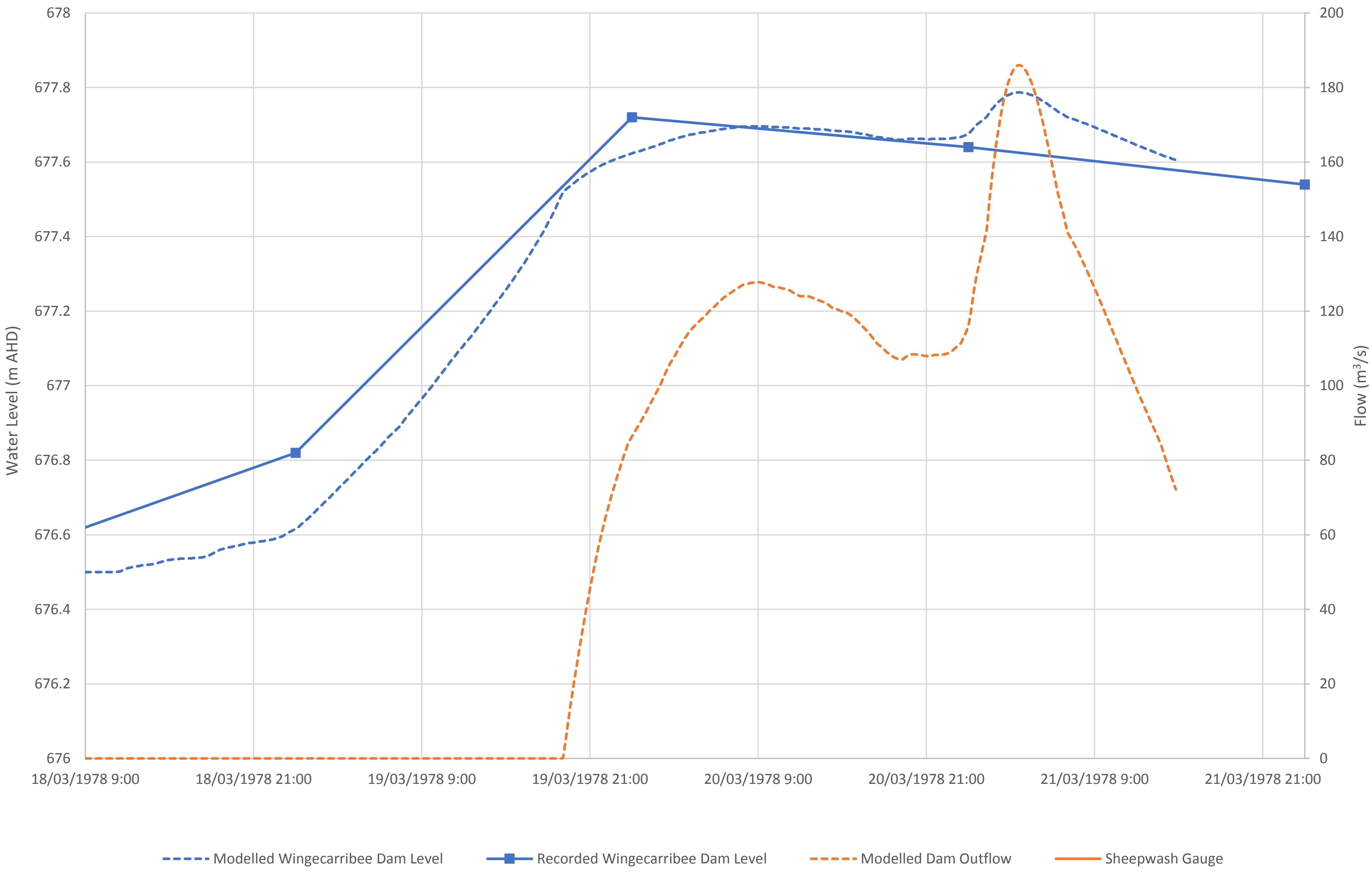
WBNM MODEL CALIBRATION
MARCH 1978 EVENT



J:\Jobs\120019\Hydrology\WBNM\WRFS_WBNM_Model_Calibration.xlsm

FIGURE E2

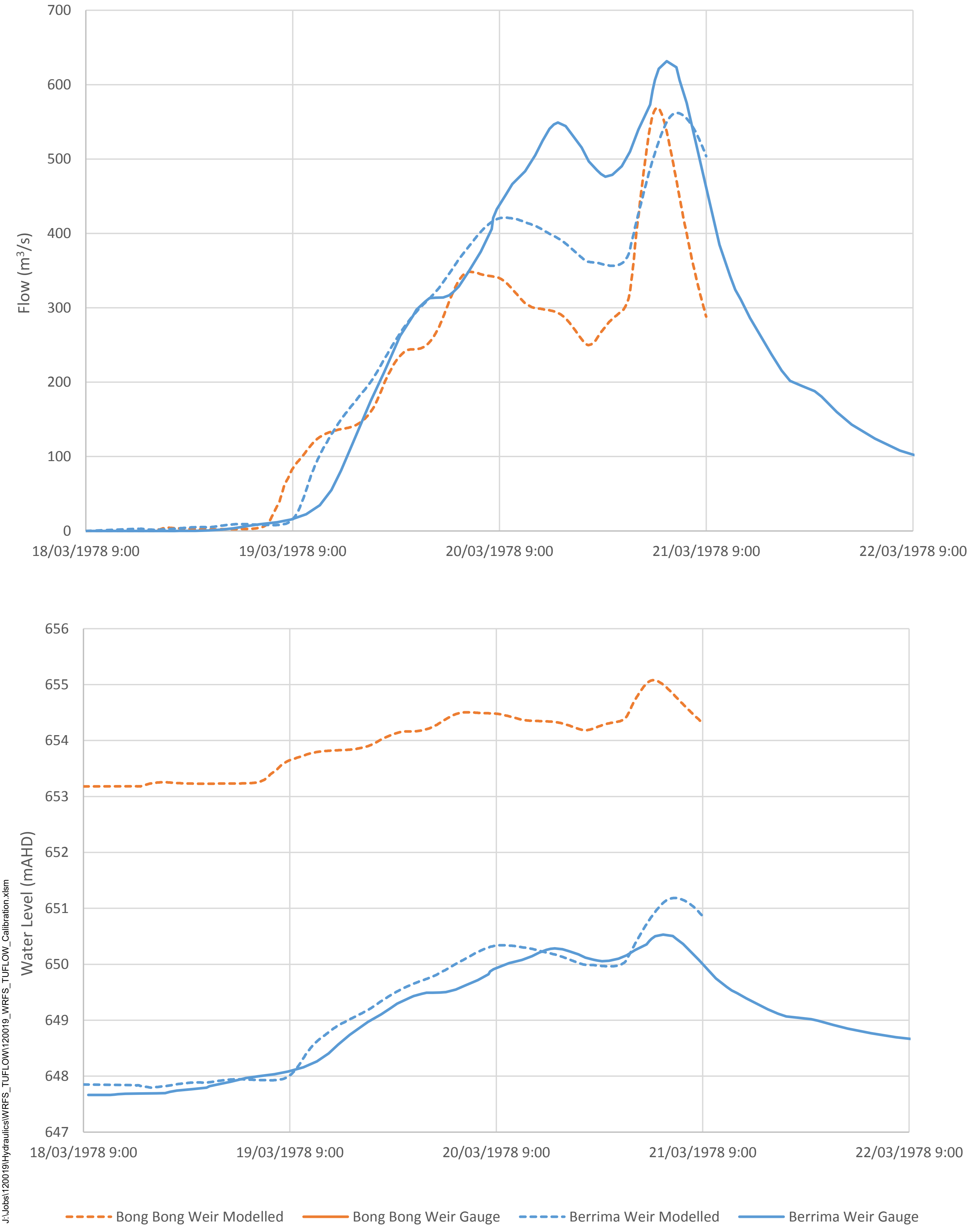
WBNM MODEL DAM CALIBRATION
MARCH 1978 EVENT



J:\Jobs\120019\Hydrology\WBNM\WRFS_WBNM_Model_Dam_Calibration.xlsm

FIGURE E3

TUFLOW GAUGE CALIBRATION RESULTS
MARCH 1978 EVENT



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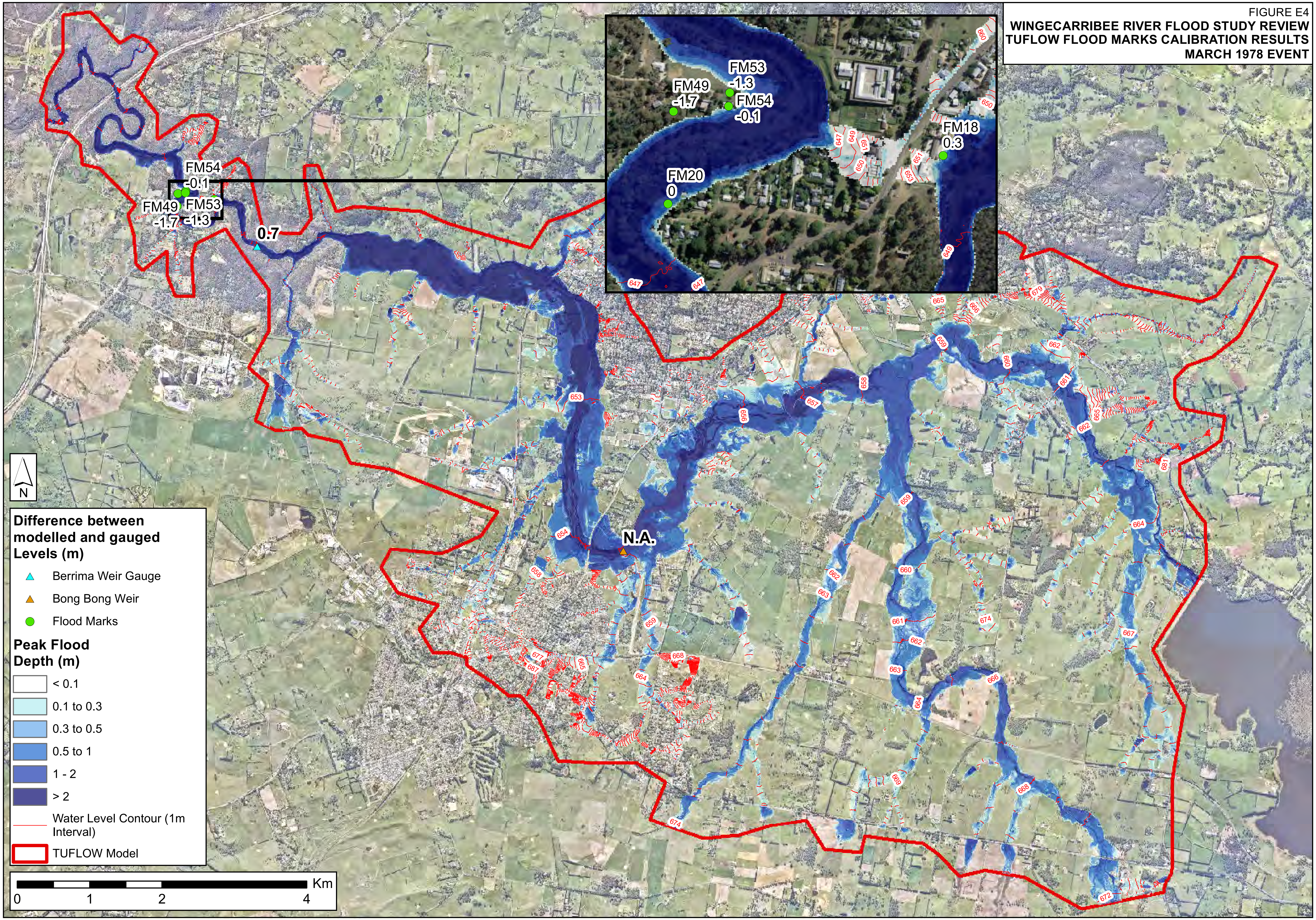

FIGURE E4
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
MARCH 1978 EVENT
FM53
-1.3
FM49
-1.7
FM54
-0.1
FM18
0.3
FM20
0
FM54
-0.1
FM49
-1.7
FM53
-1.3
0.7
N.A.
N
Difference between modelled and gauged Levels (m)
Berrima Weir Gauge
Bong Bong Weir
Flood Marks
Peak Flood Depth (m)
< 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1
1 - 2
> 2
Water Level Contour (1m Interval)
TUFLOW Model
0
1
2
4
Km

FIGURE E5

WBNM MODEL CALIBRATION
APRIL 1988 EVENT

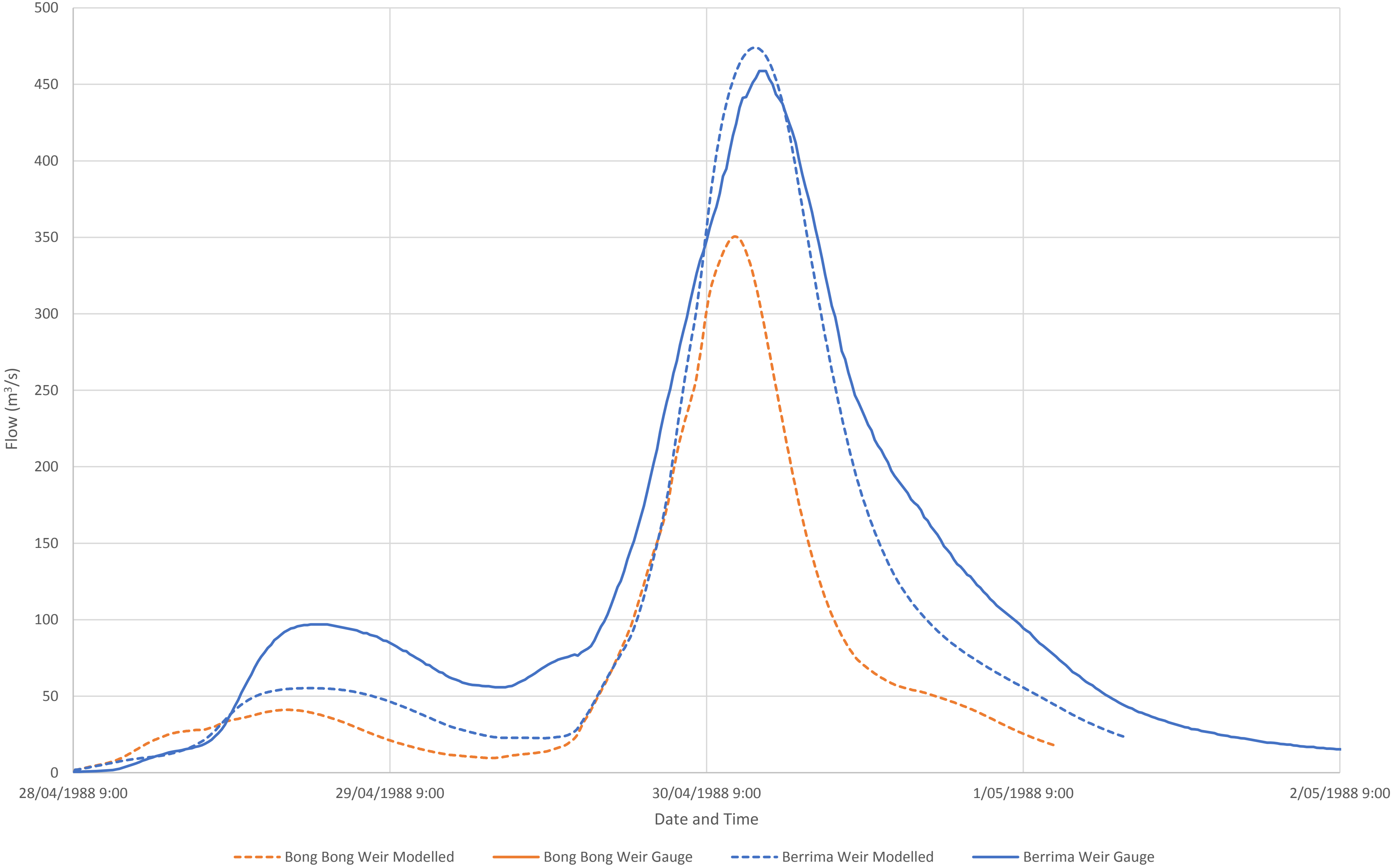

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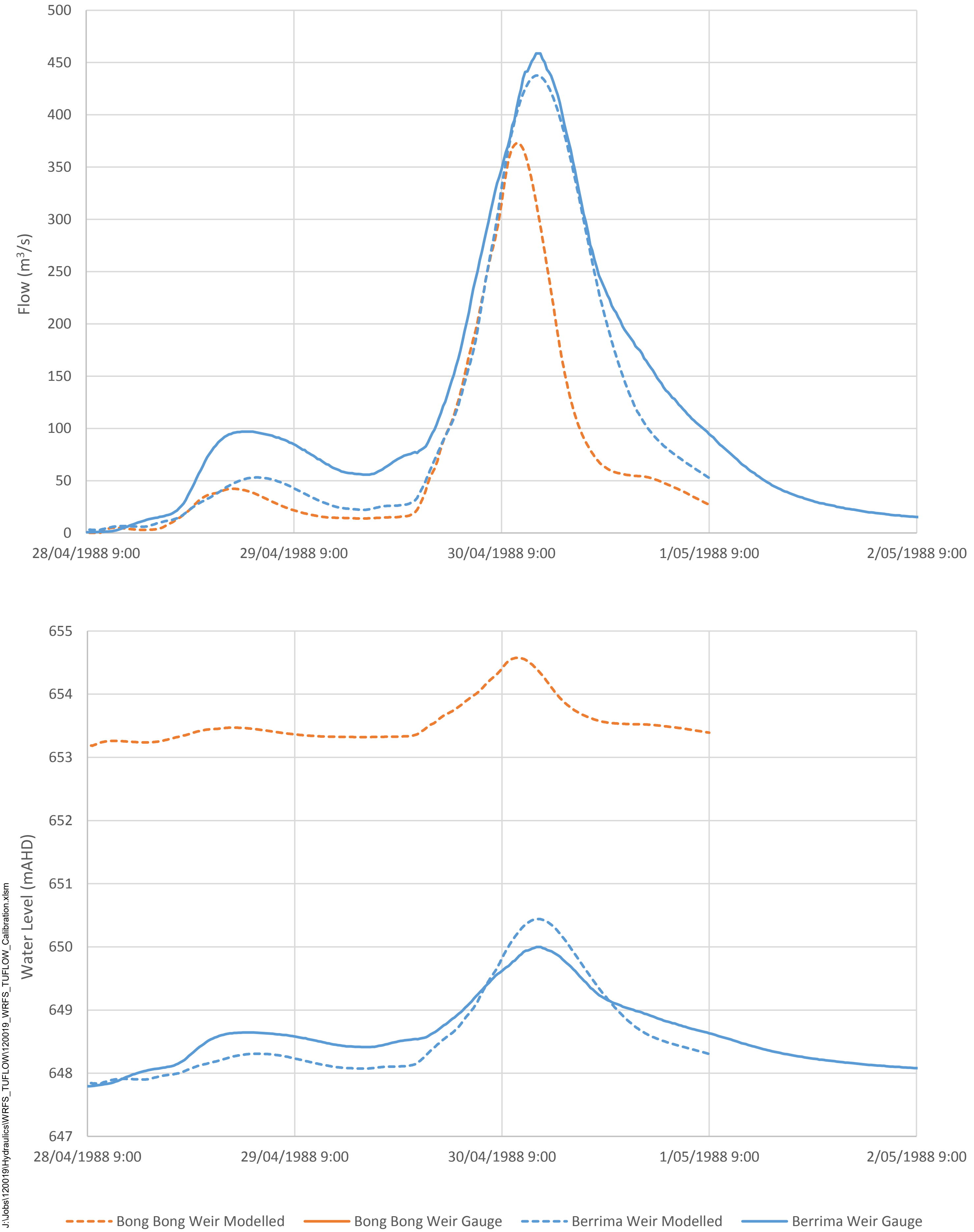
FIGURE E6

TUFLOW GAUGE CALIBRATION RESULTS
APRIL 1988 EVENT



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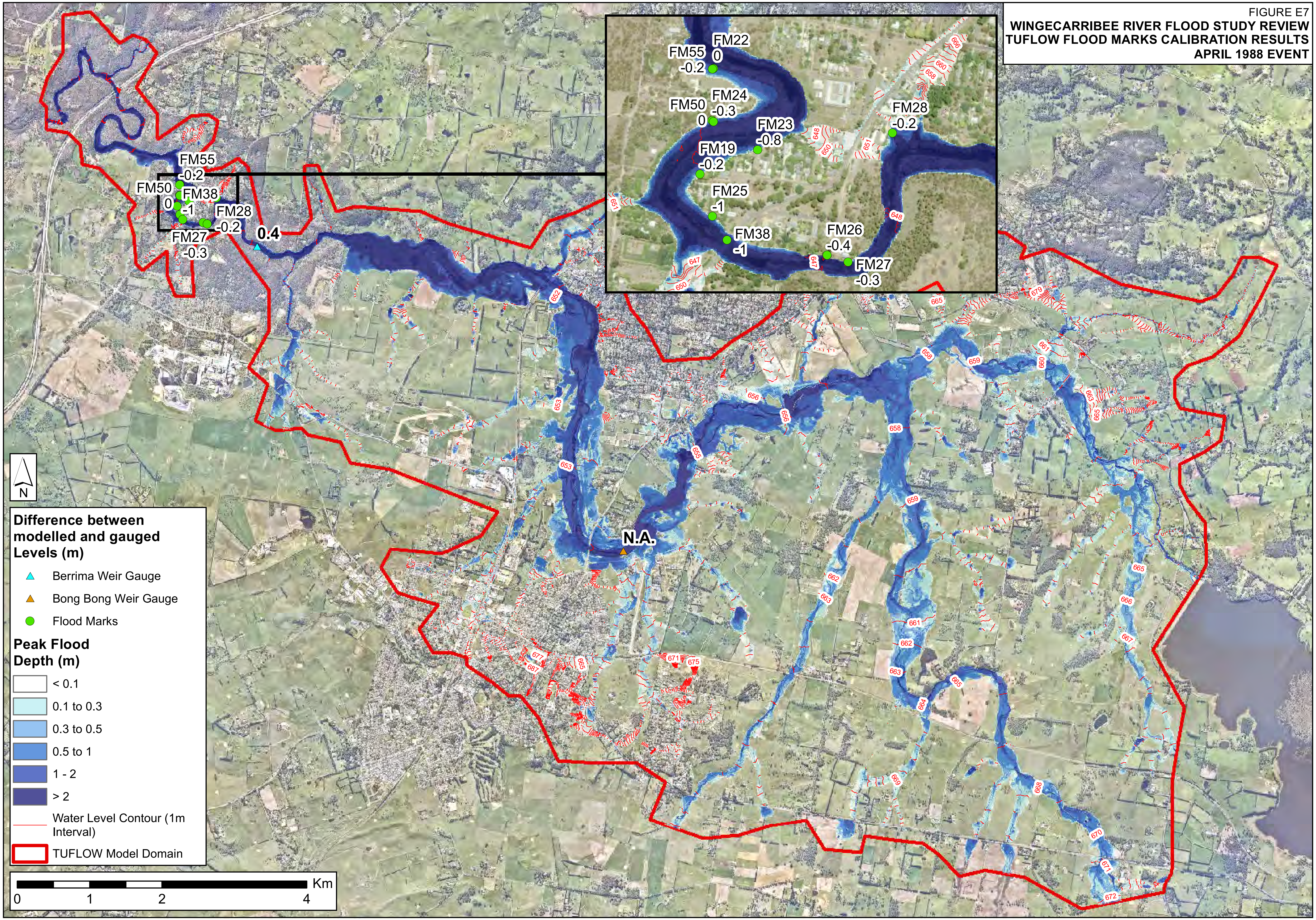


FIGURE E7
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
APRIL 1988 EVENT

FIGURE E8
WBNM MODEL CALIBRATION
AUGUST 1990 EVENT

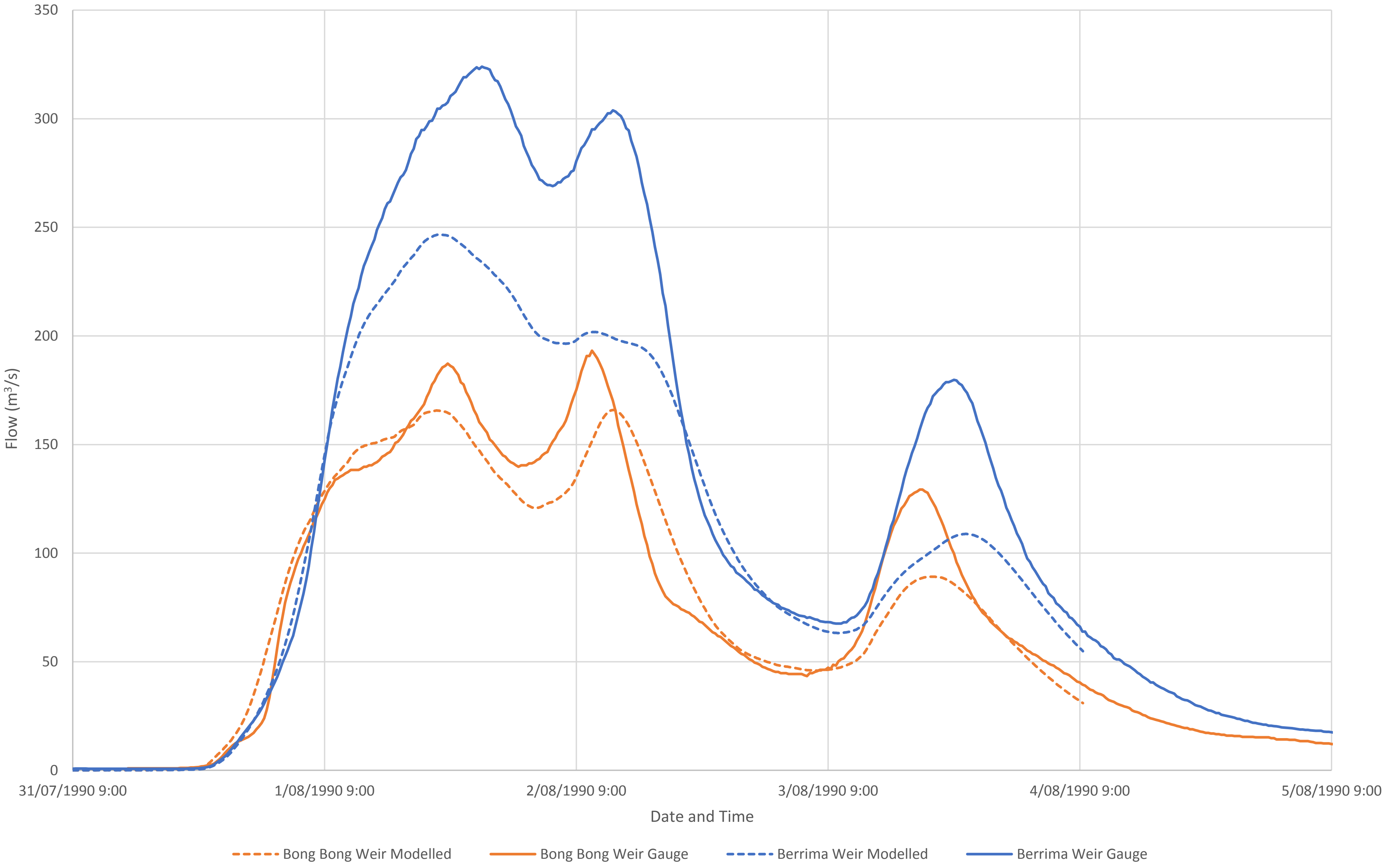
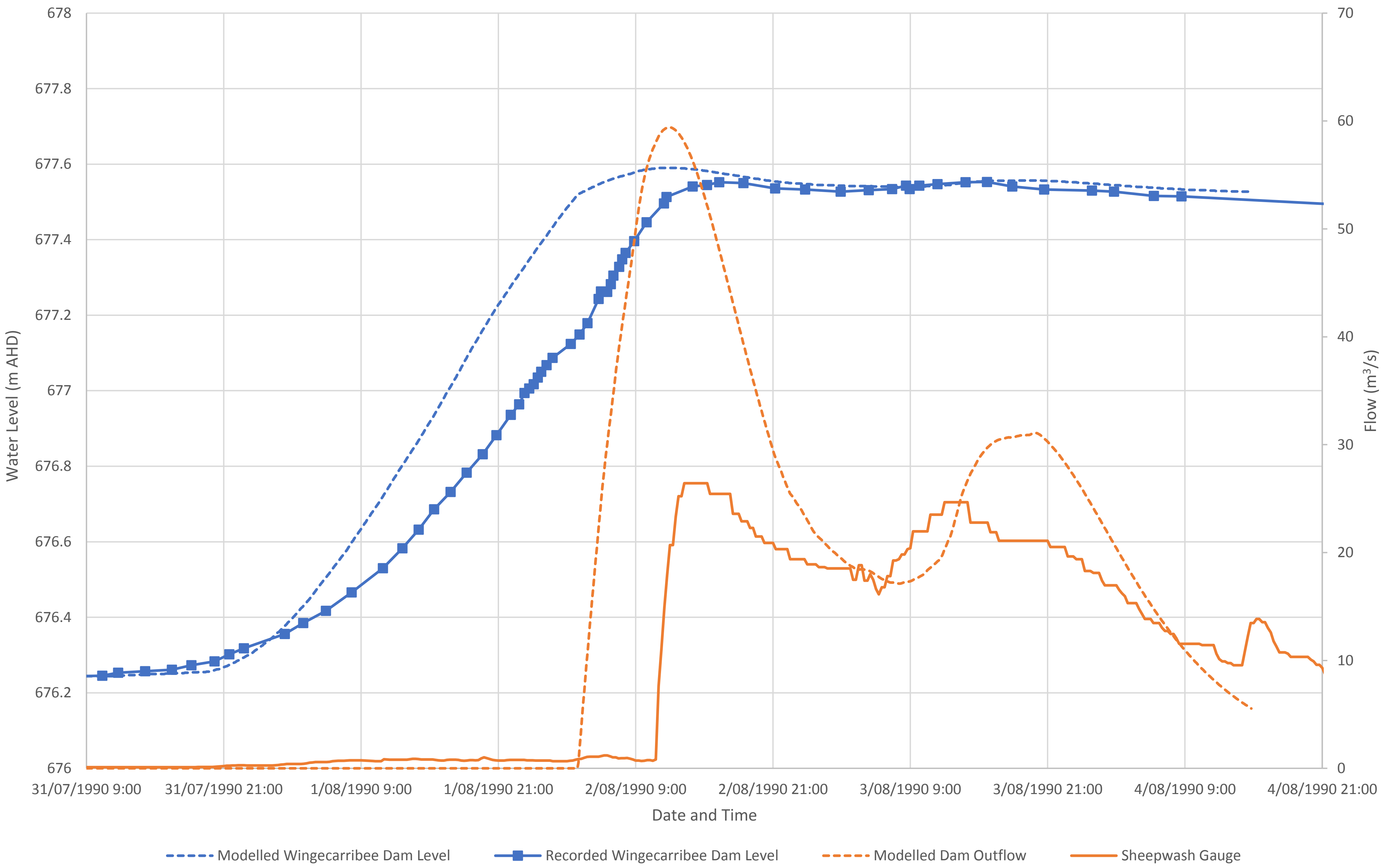


FIGURE E9

WBNM MODEL DAM CALIBRATION
AUGUST 1990 EVENT



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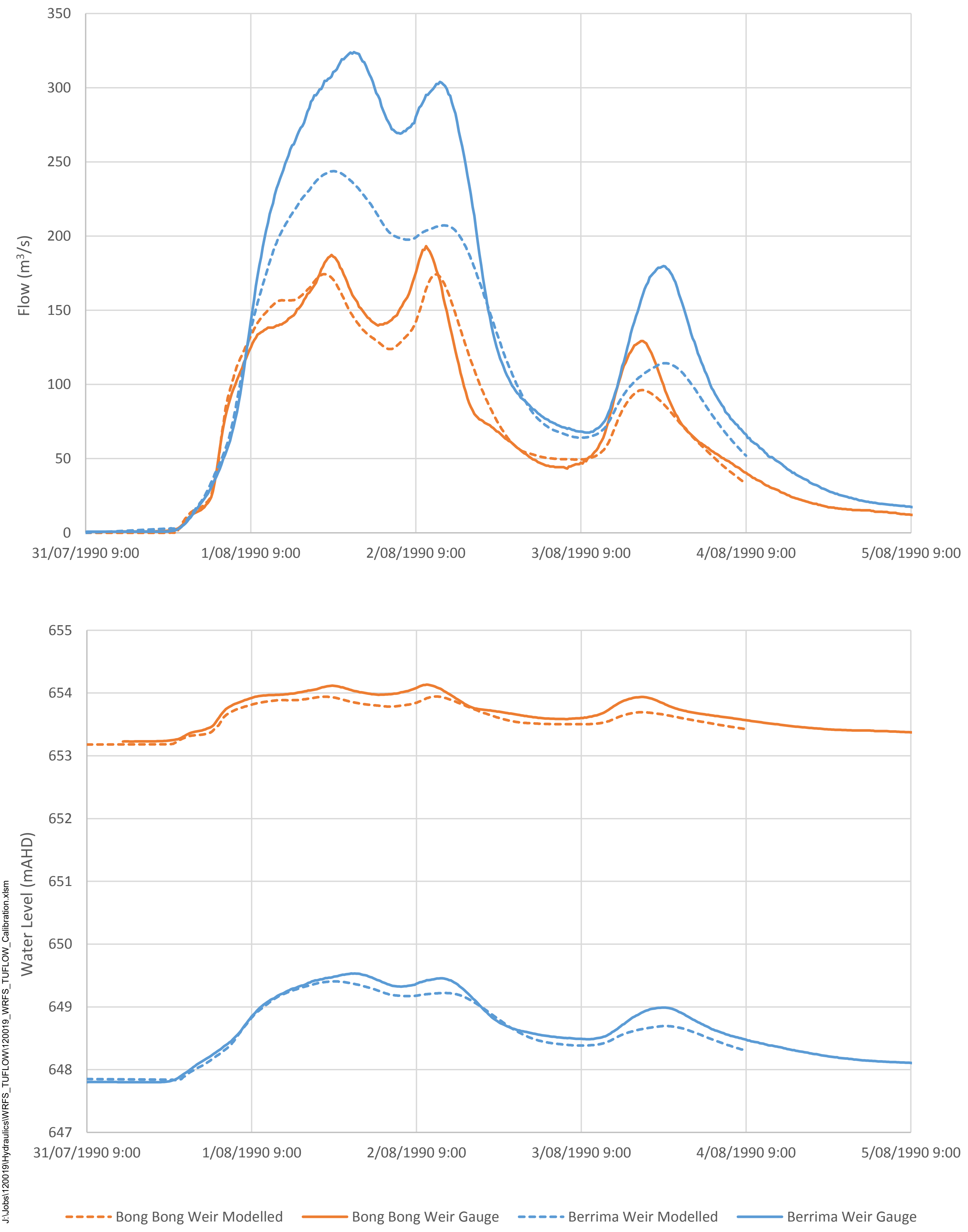
TUFLOW GAUGE CALIBRATION RESULTS
AUGUST 1990 EVENT



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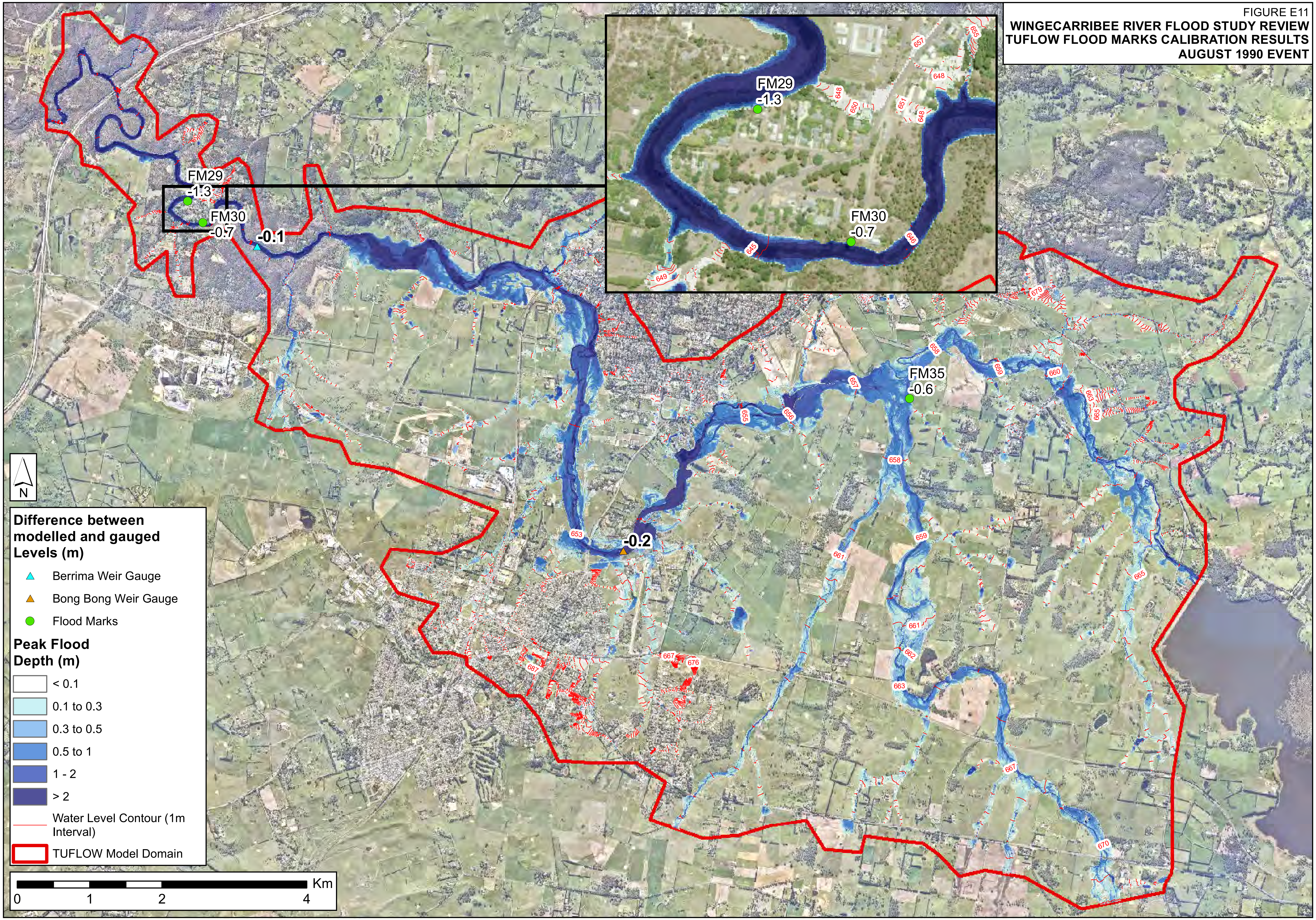

FIGURE E11
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
AUGUST 1990 EVENT
FM29
-1.3
FM30
-0.7
-0.1
-0.2
FM35
-0.6
N
Difference between modelled and gauged Levels (m)
Berrima Weir Gauge
Bong Bong Weir Gauge
Flood Marks
Peak Flood Depth (m)
< 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1
1 - 2
> 2
Water Level Contour (1m Interval)
TUFLOW Model Domain
Km
0
1
2
4

FIGURE E12
WBNM MODEL CALIBRATION
JUNE 1991 EVENT

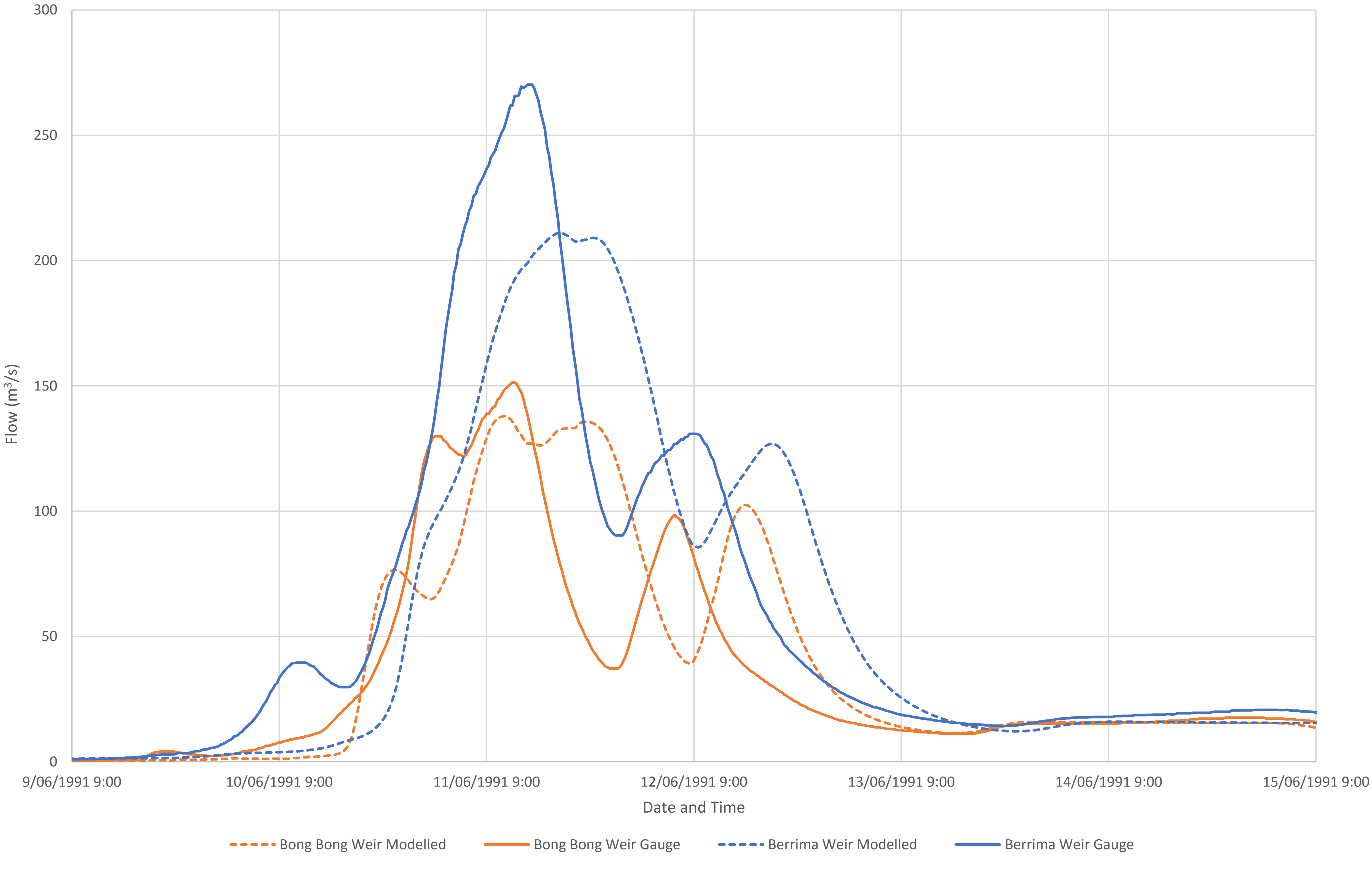

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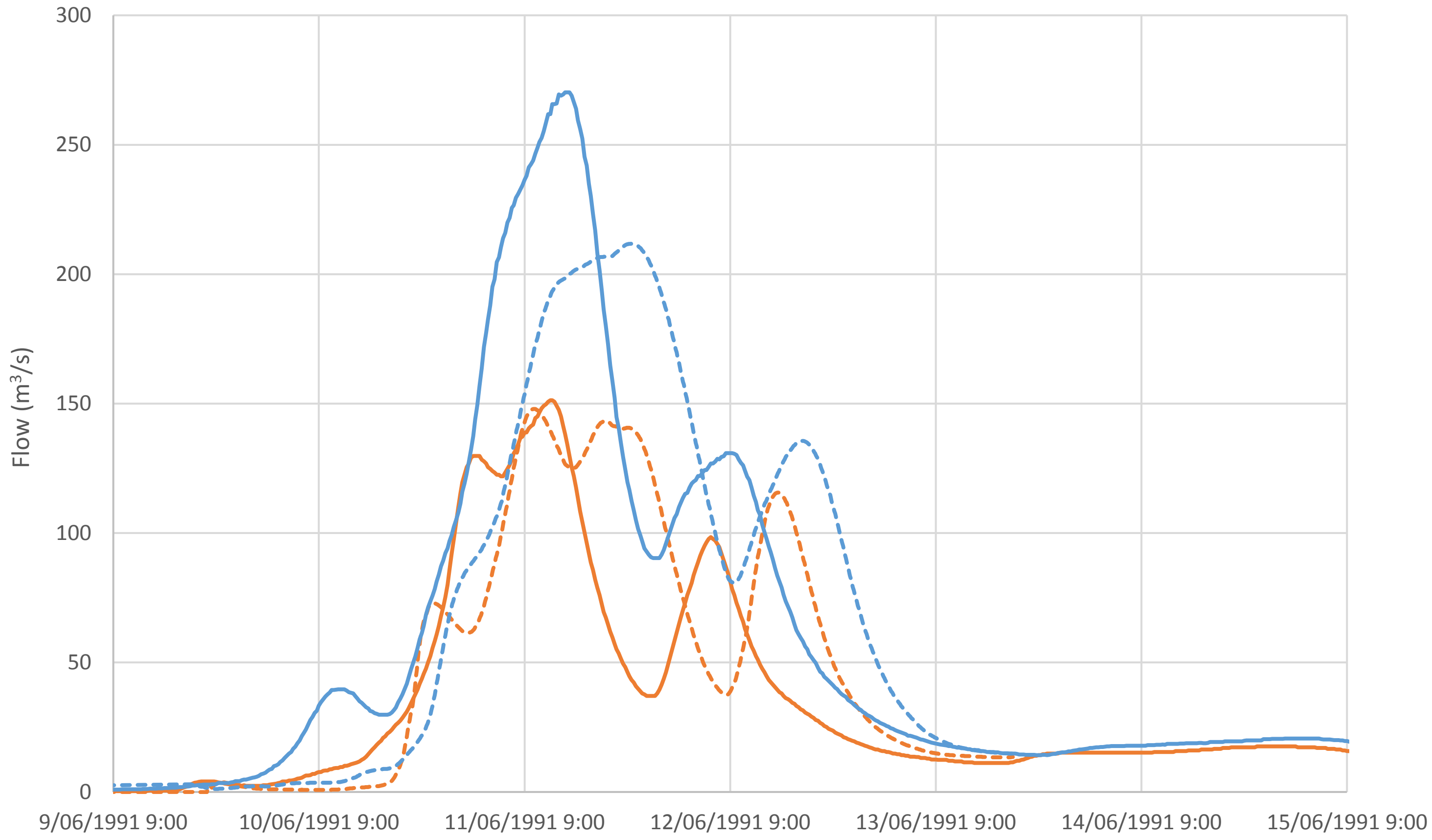
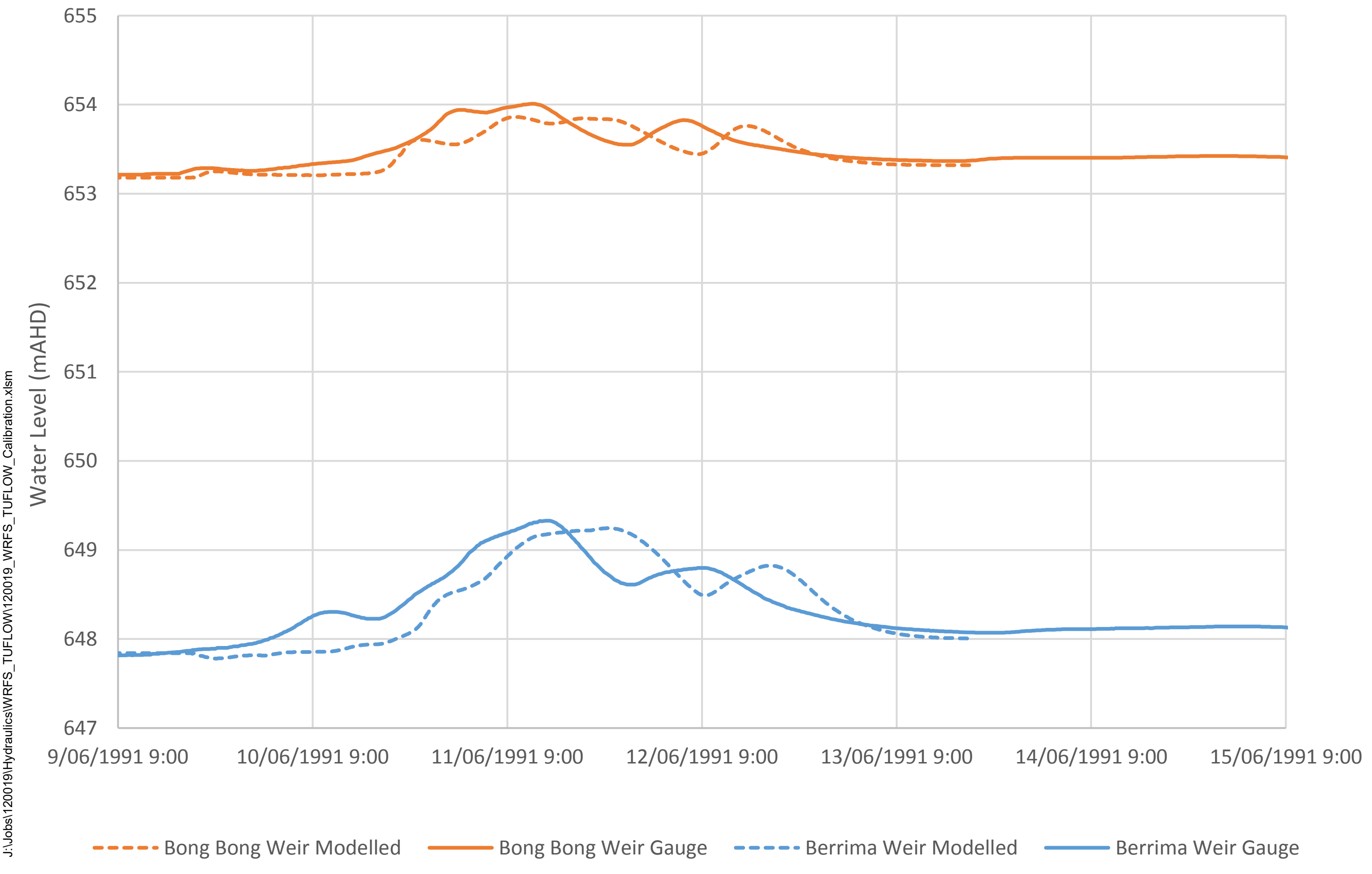
FIGURE E13
TUFLOW GAUGE CALIBRATION RESULTS
JUNE 1991 EVENT





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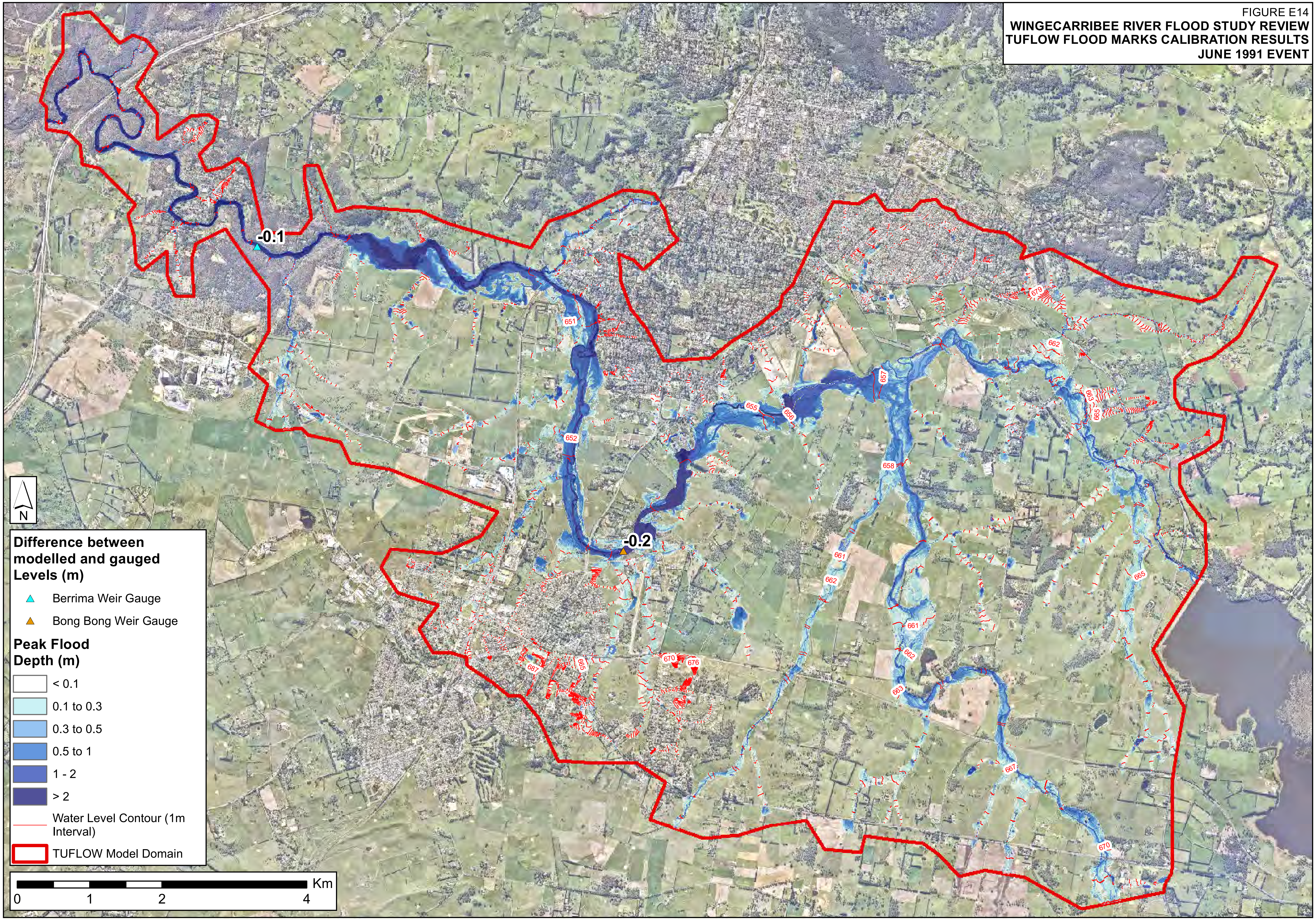
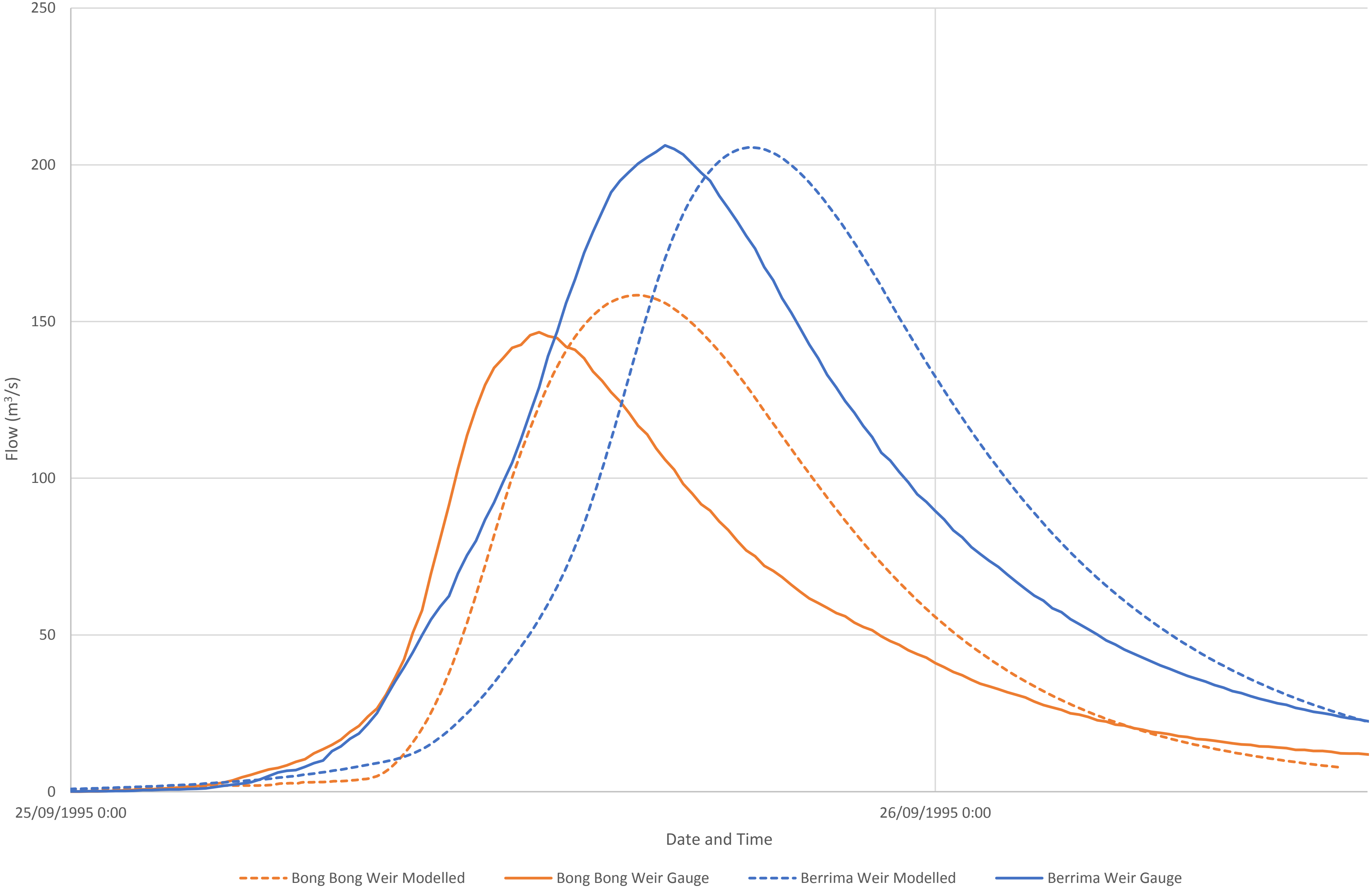


FIGURE E14
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
JUNE 1991 EVENT
-0.1
-0.2
N
Difference between modelled and gauged Levels (m)
Berrima Weir Gauge
Bong Bong Weir Gauge
Peak Flood Depth (m)
< 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1
1 - 2
> 2
Water Level Contour (1m Interval)
TUFLOW Model Domain
Km
0
1
2
4

FIGURE E15

WBNM MODEL CALIBRATION
SEPTEMBER 1995 EVENT



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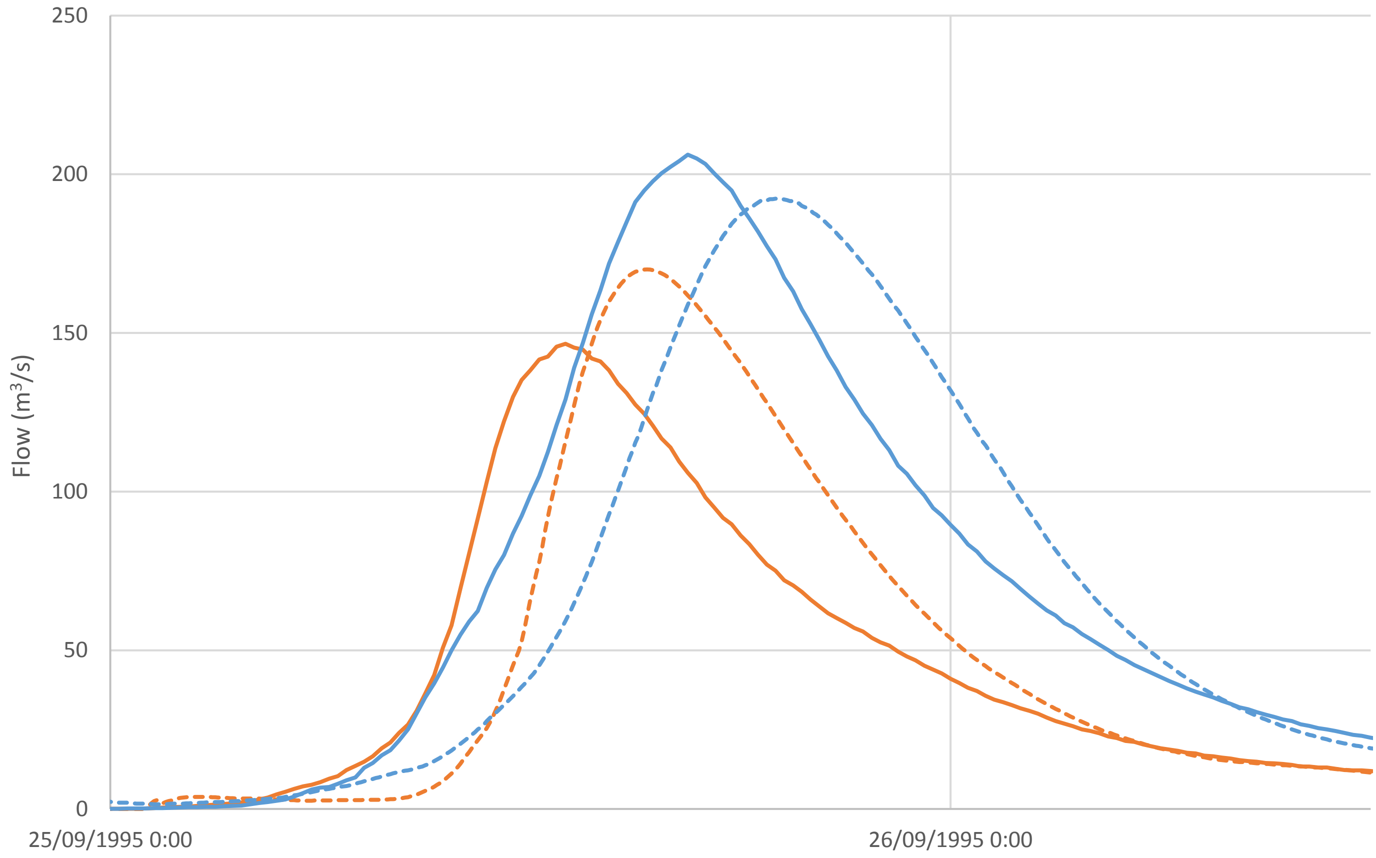
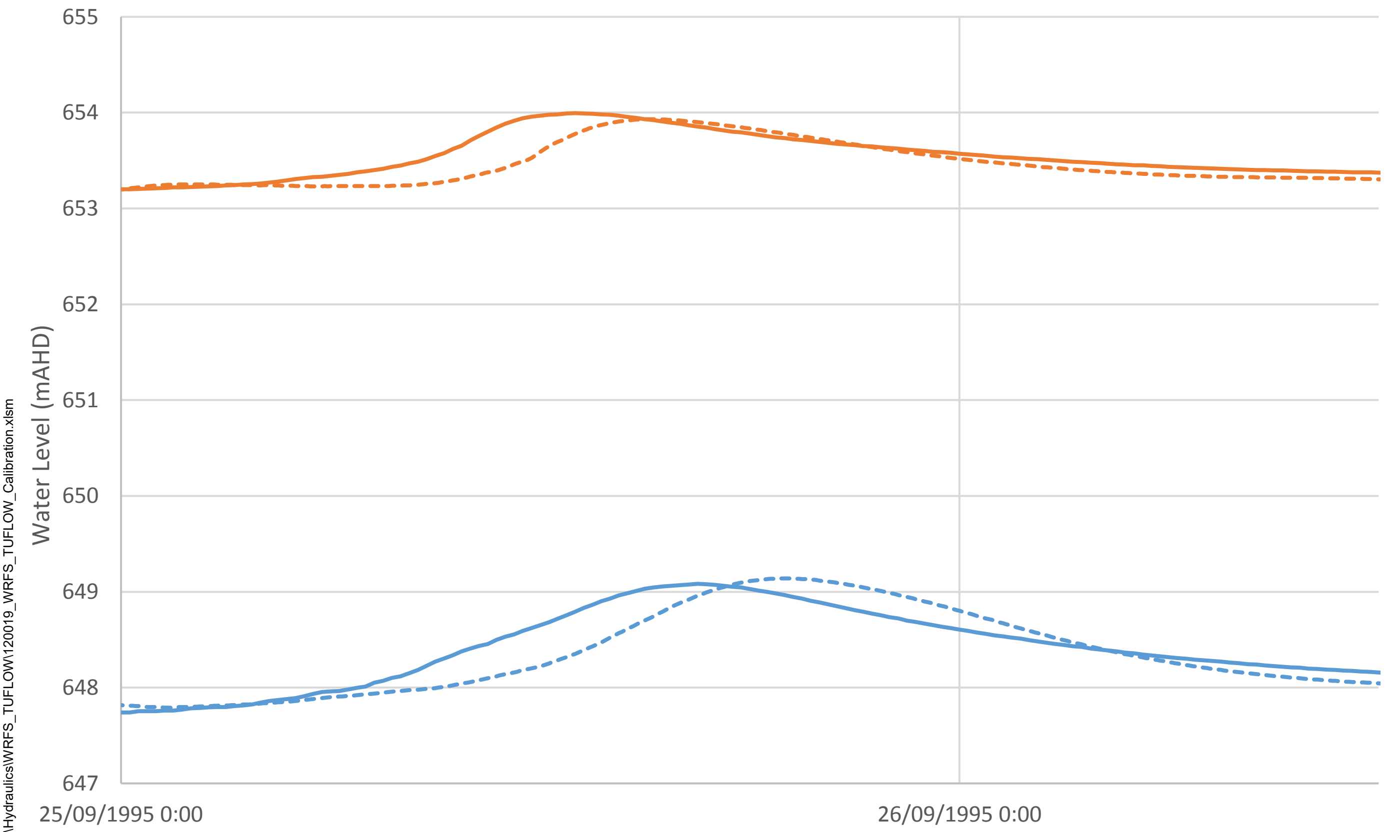
TUFLOW GAUGE CALIBRATION RESULTS
SEPTEMBER 1995 EVENT





Bong Bong Weir Modelled — Bong Bong Weir Gauge — Berrima Weir Modelled — Berrima Weir Gauge

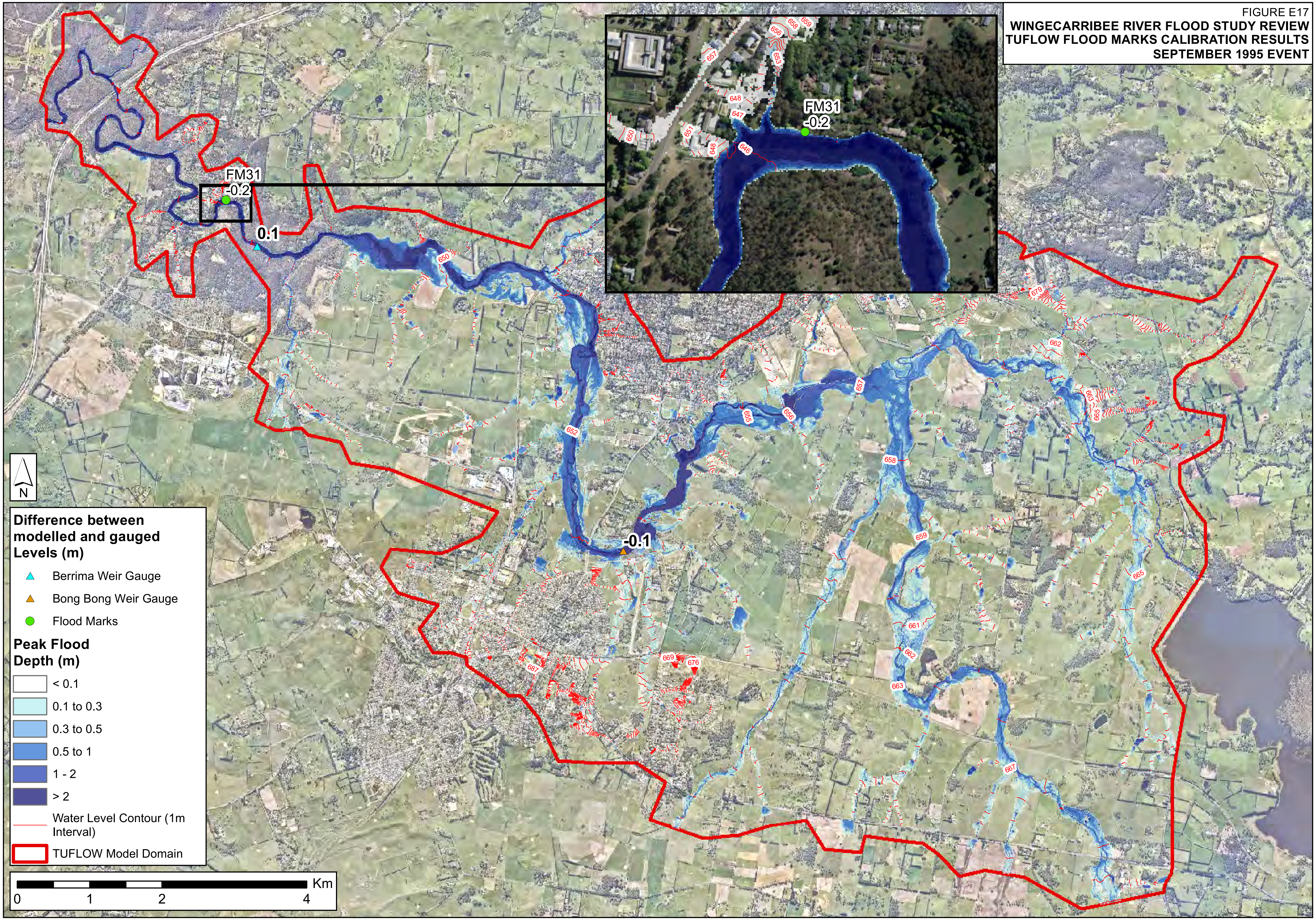


FIGURE E17
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
SEPTEMBER 1995 EVENT
FM31
-0.2
0.1
-0.1
N
Difference between modelled and gauged Levels (m)
Berrima Weir Gauge
Bong Bong Weir Gauge
Flood Marks
Peak Flood Depth (m)
< 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1
1 - 2
> 2
Water Level Contour (1m Interval)
TUFLOW Model Domain
Km
0
1
2
4

FIGURE E18

WBNM MODEL CALIBRATION
AUGUST 1996 EVENT

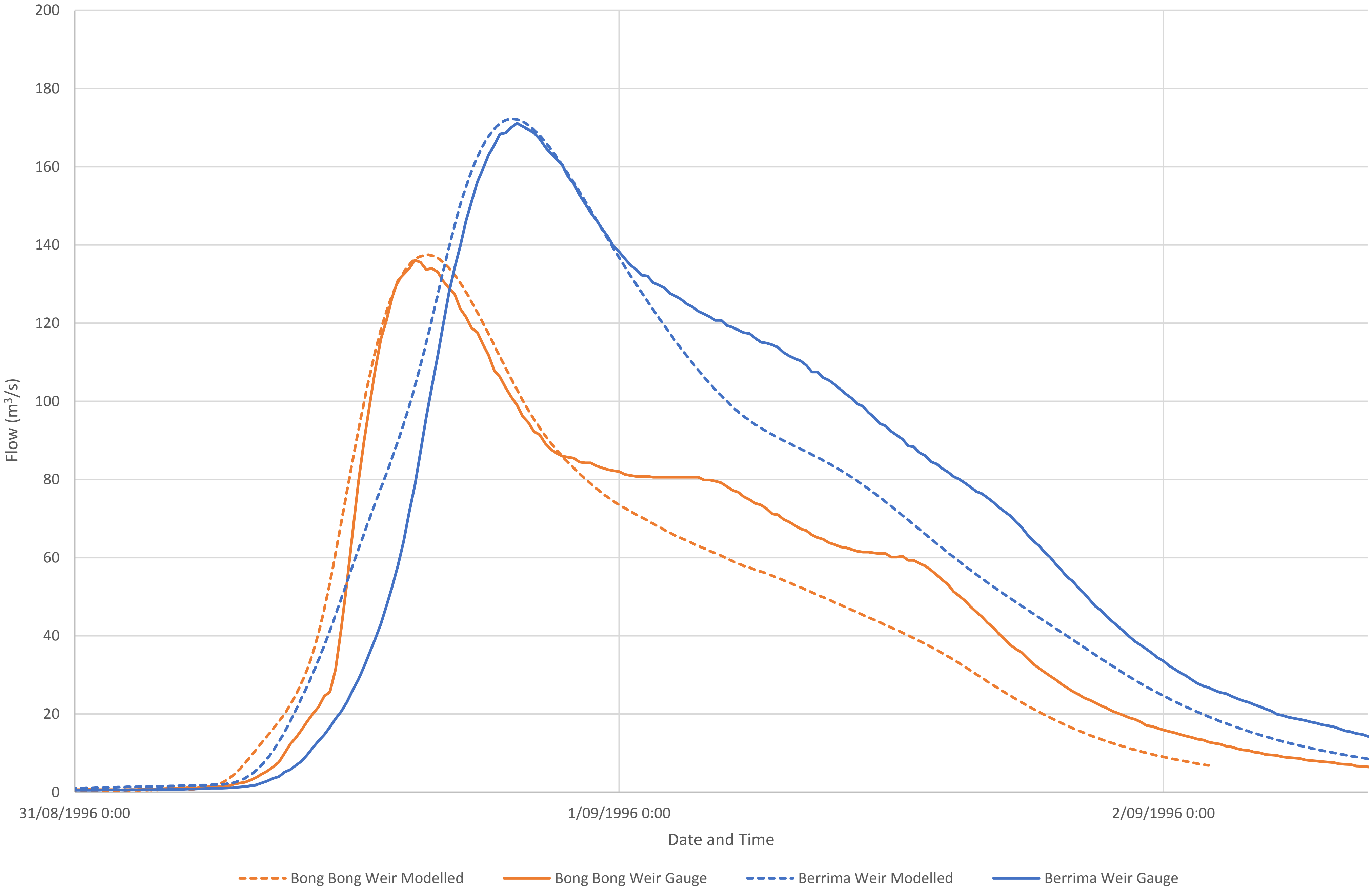


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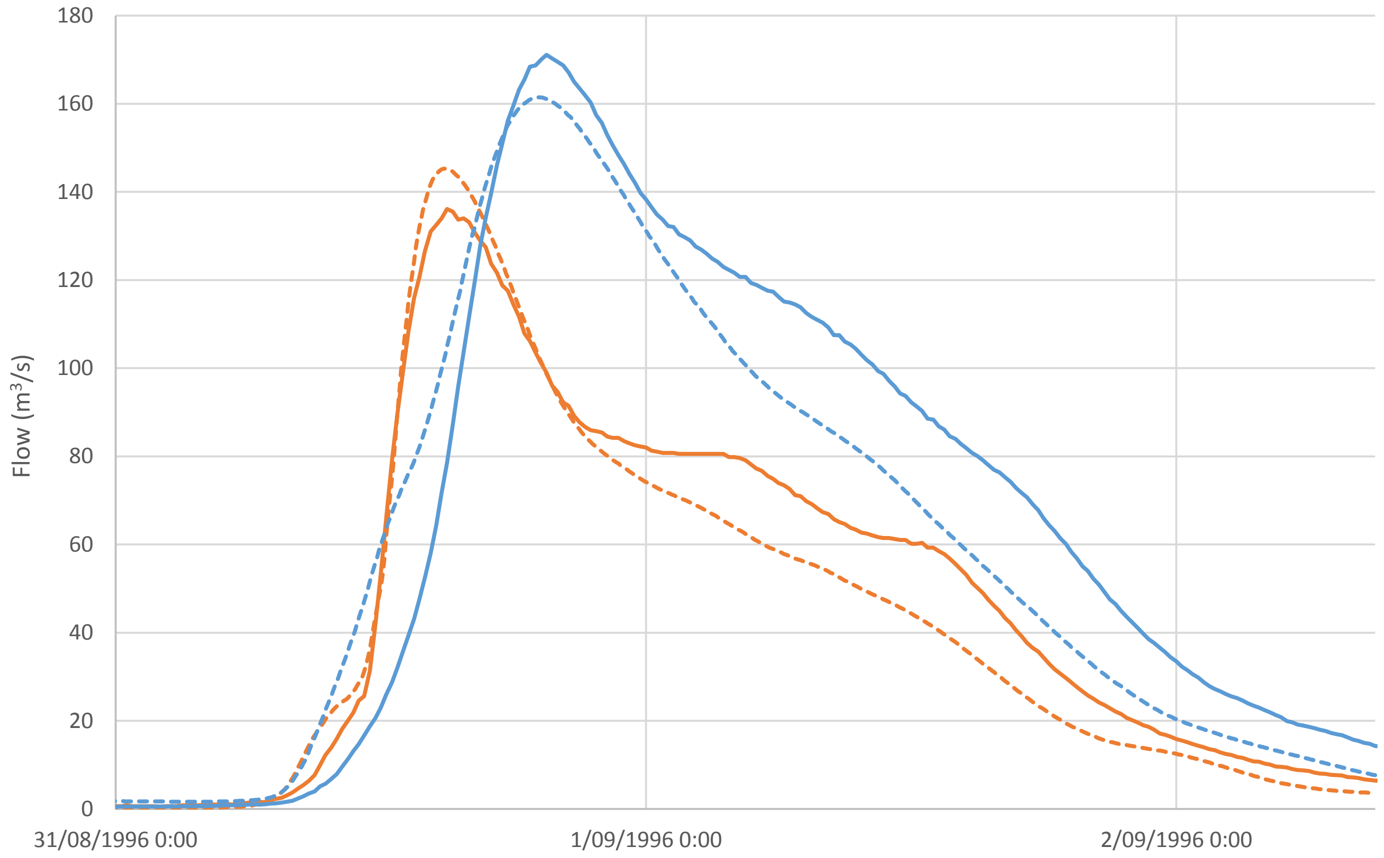
FIGURE E19

TUFLOW GAUGE CALIBRATION RESULTS
AUGUST 1996 EVENT



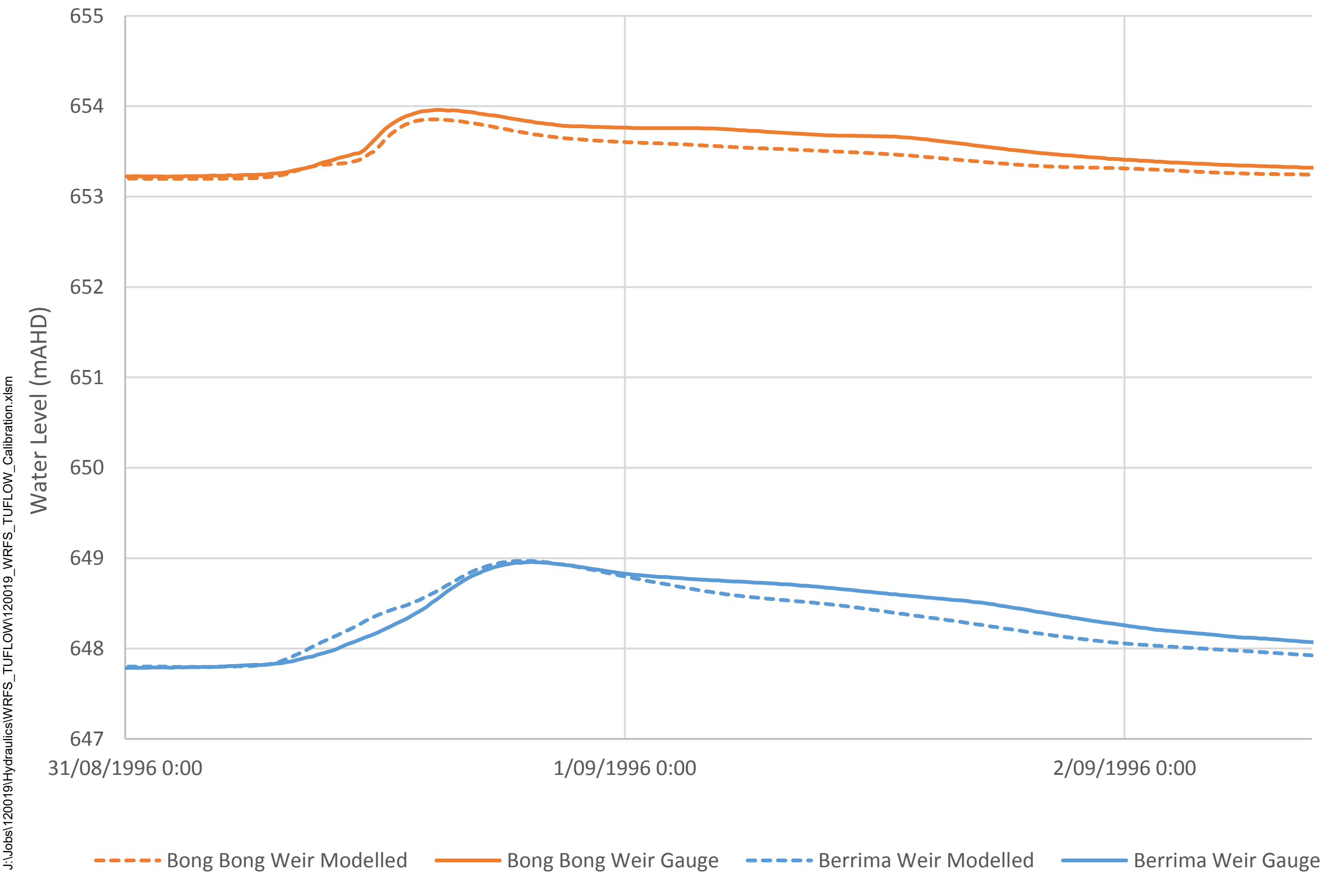


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FIGURE E20

WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
AUGUST 1996 EVENT

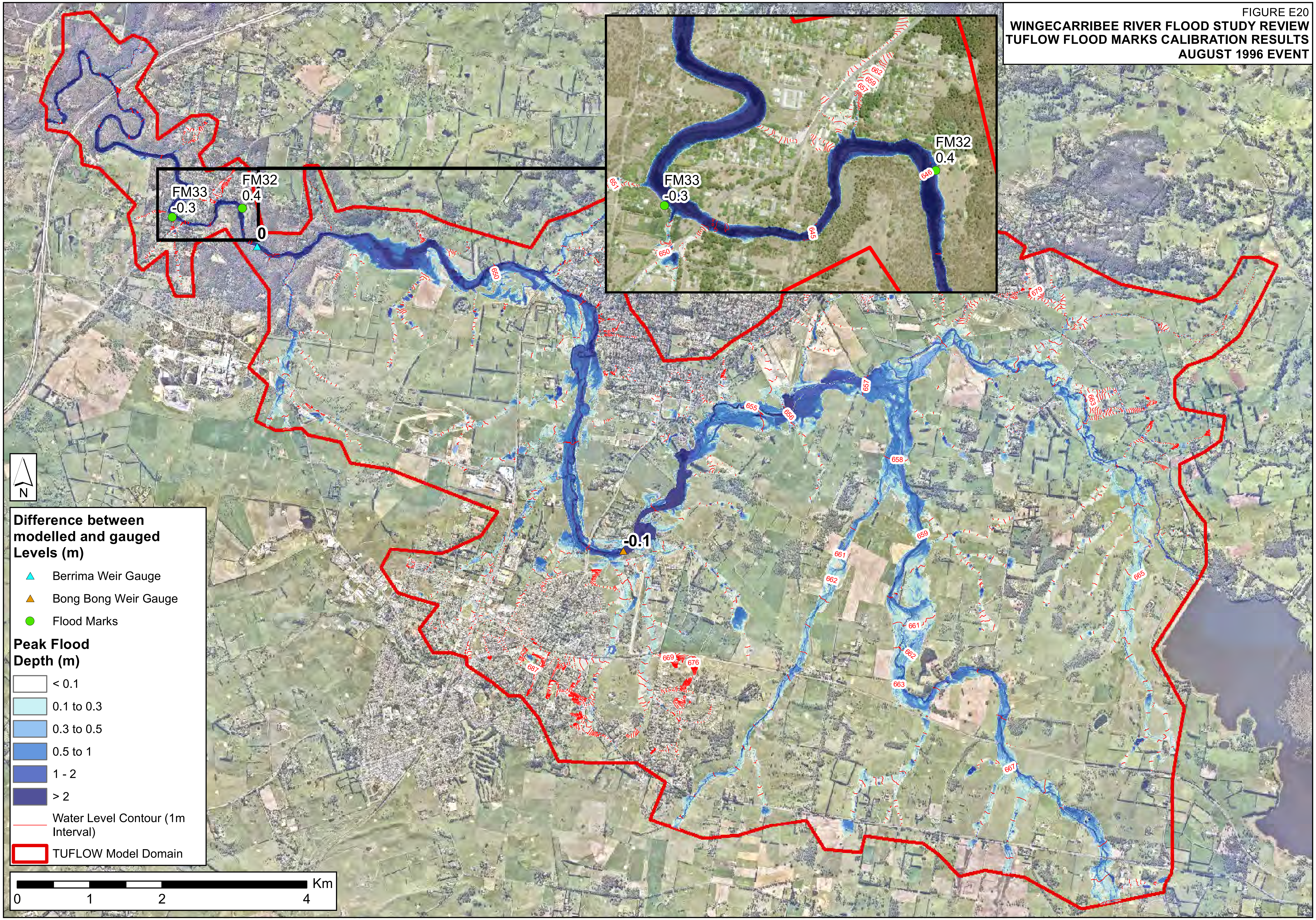

FIGURE E21

WBNM MODEL CALIBRATION
AUGUST 1998 EVENT

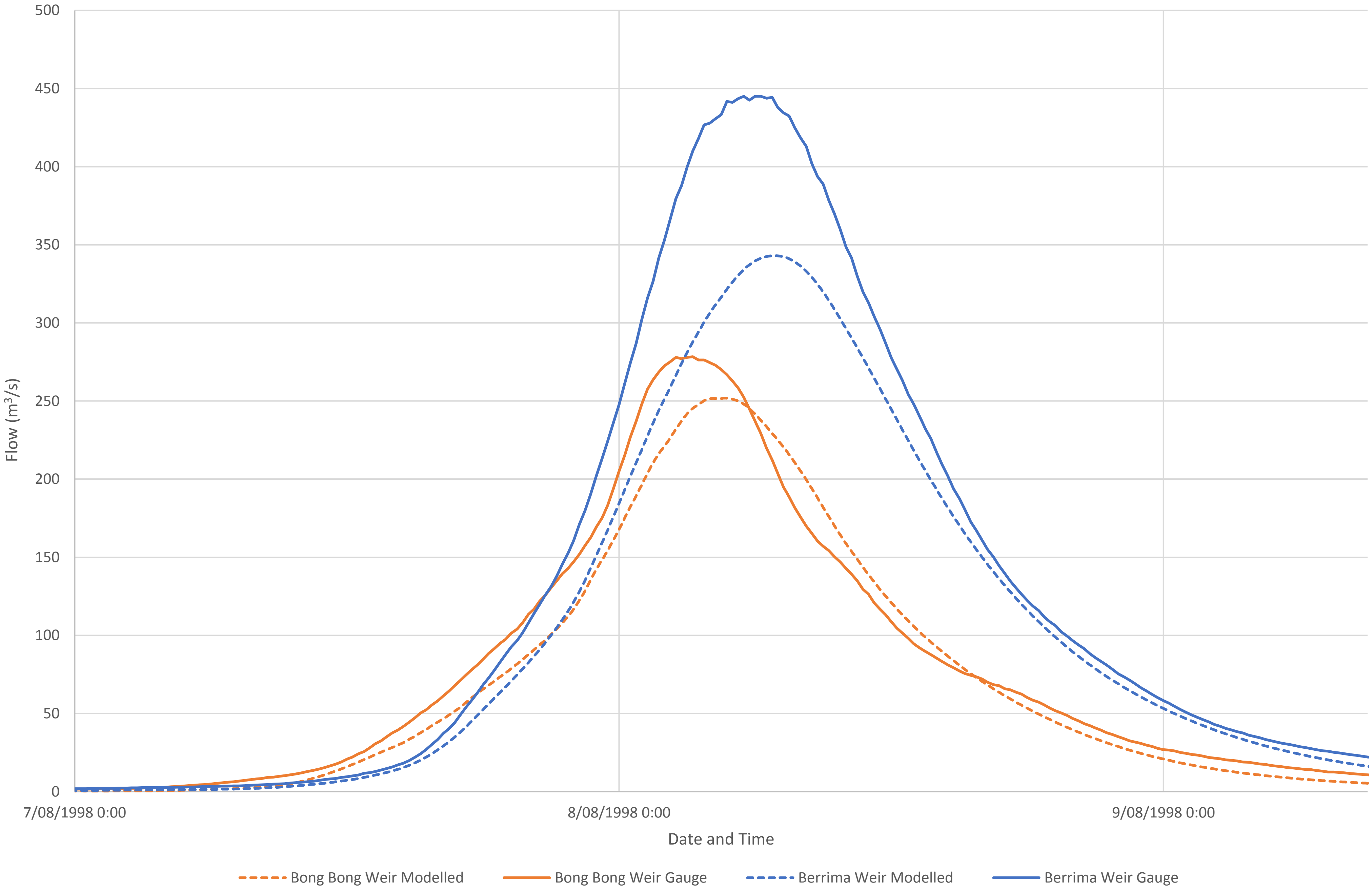

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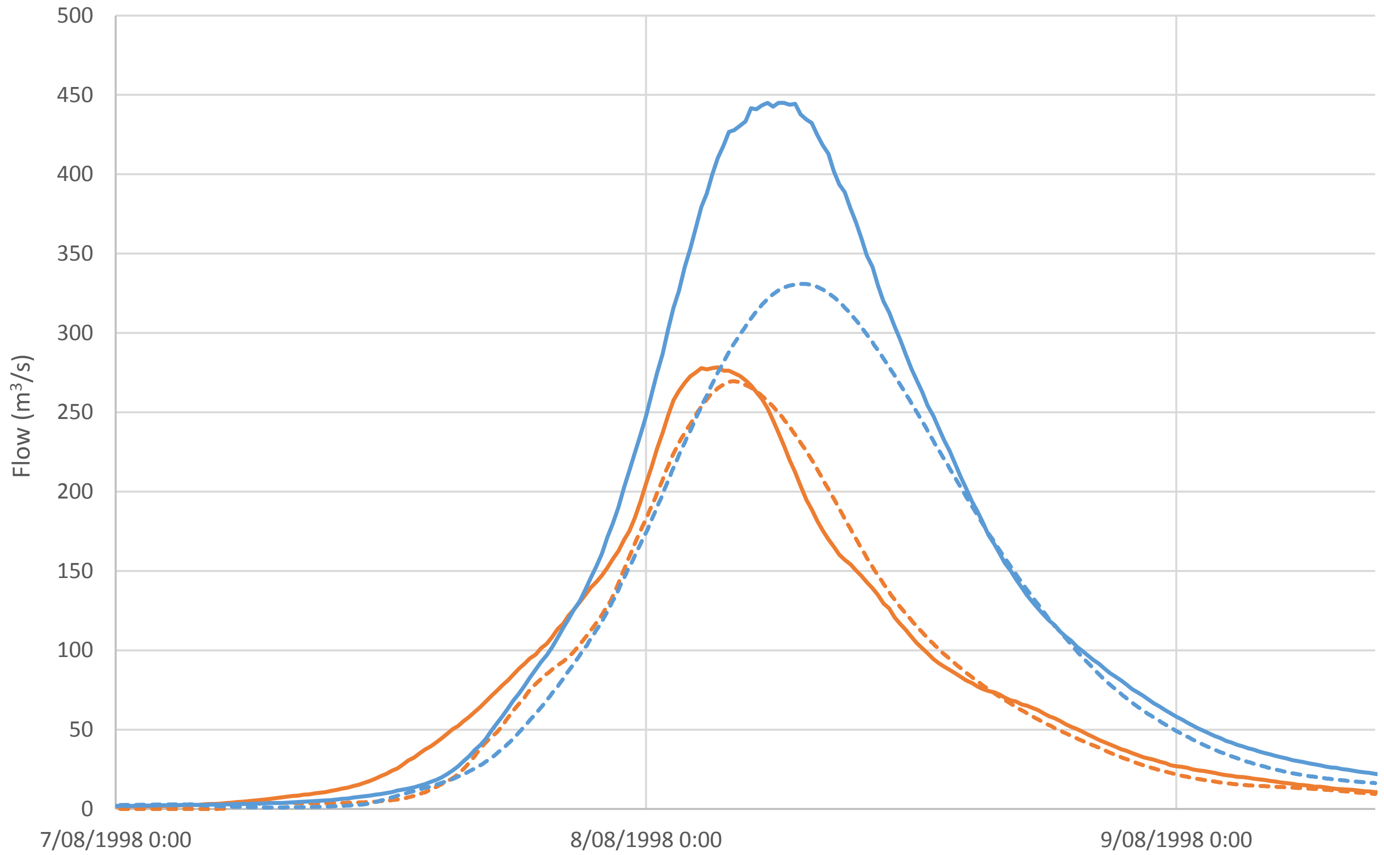
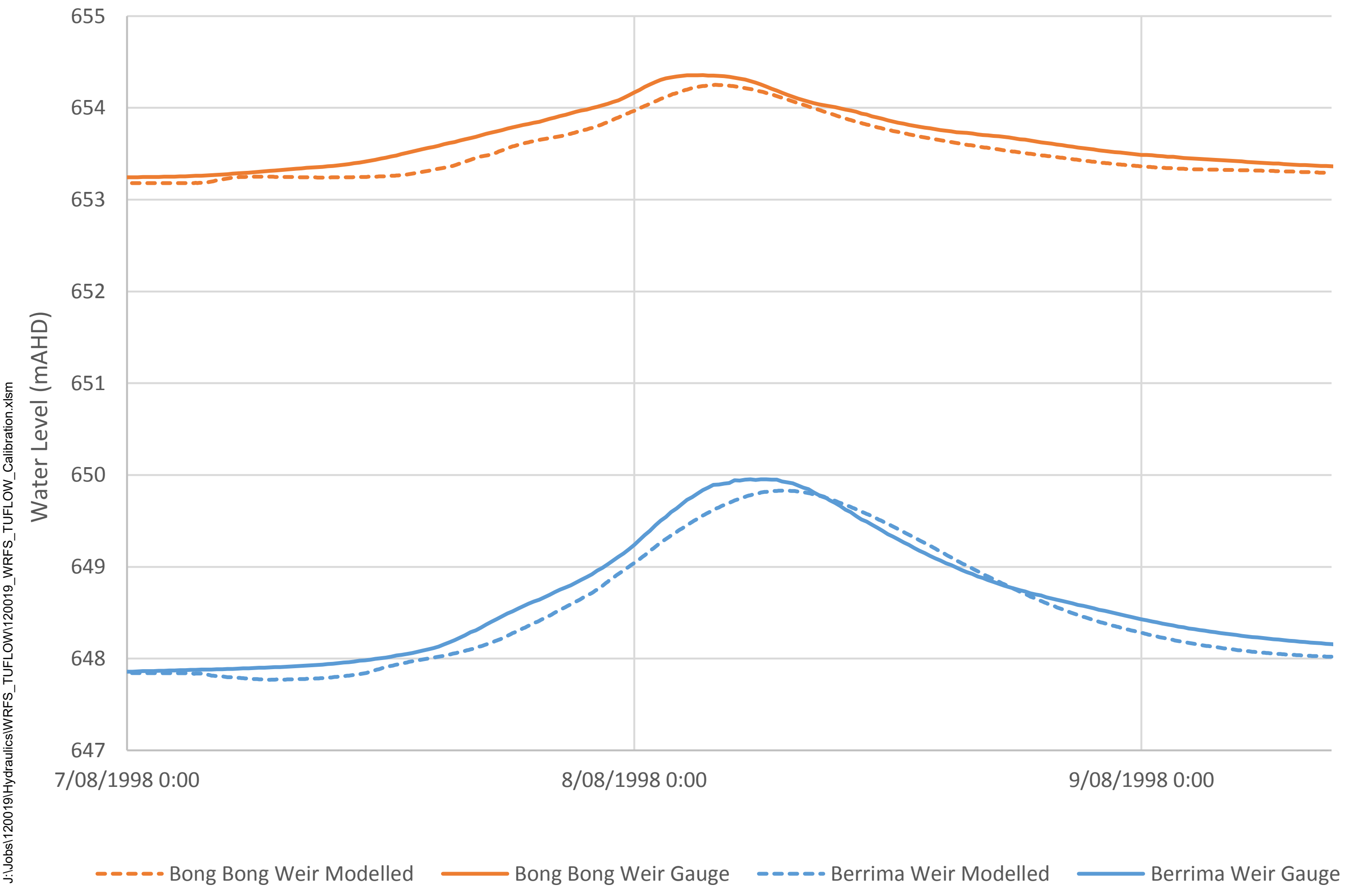
FIGURE E22

TUFLOW GAUGE CALIBRATION RESULTS
AUGUST 1998 EVENT





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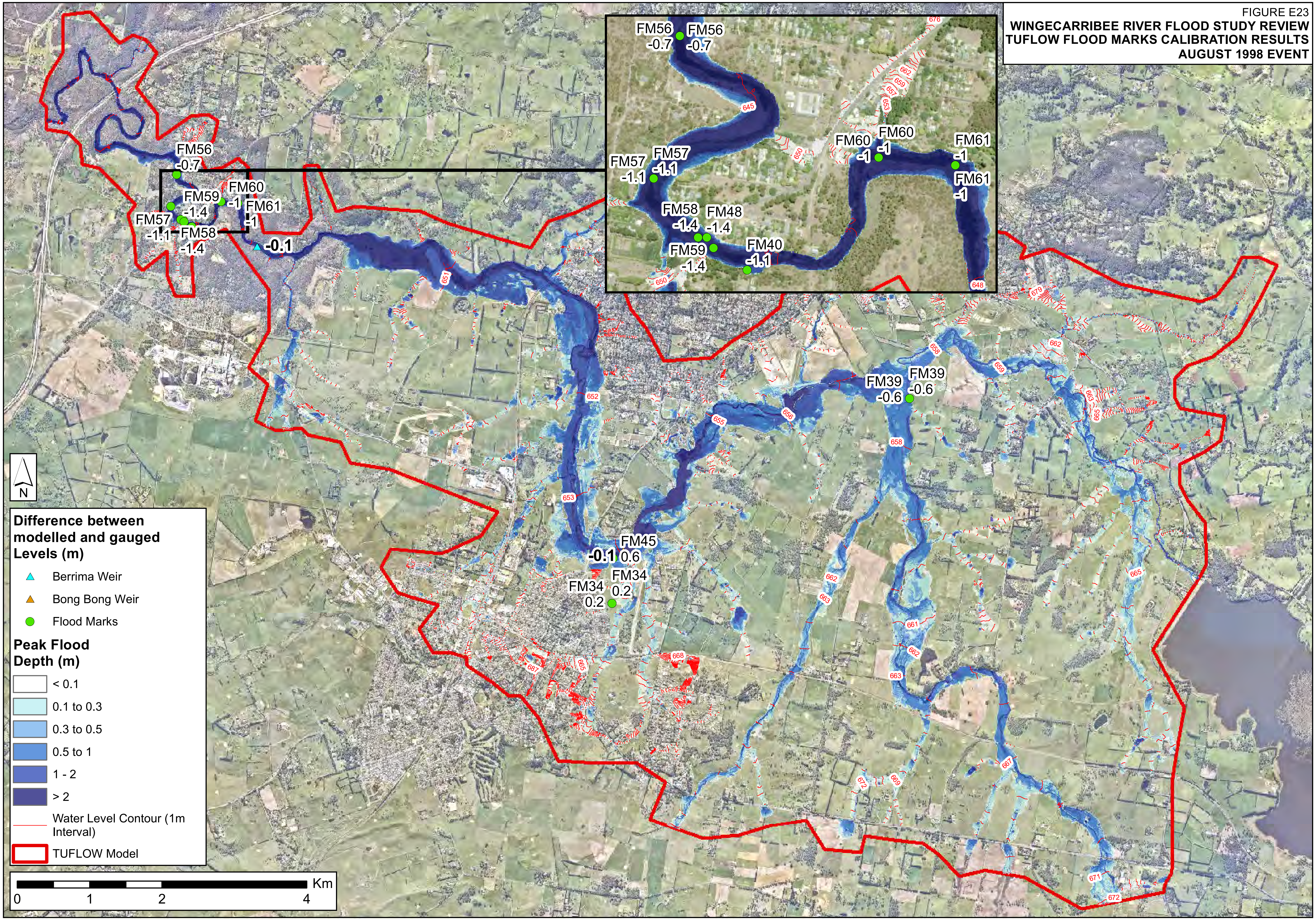

FIGURE E23
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
AUGUST 1998 EVENT

FIGURE E24
WBNM MODEL CALIBRATION
JUNE 2007 EVENT

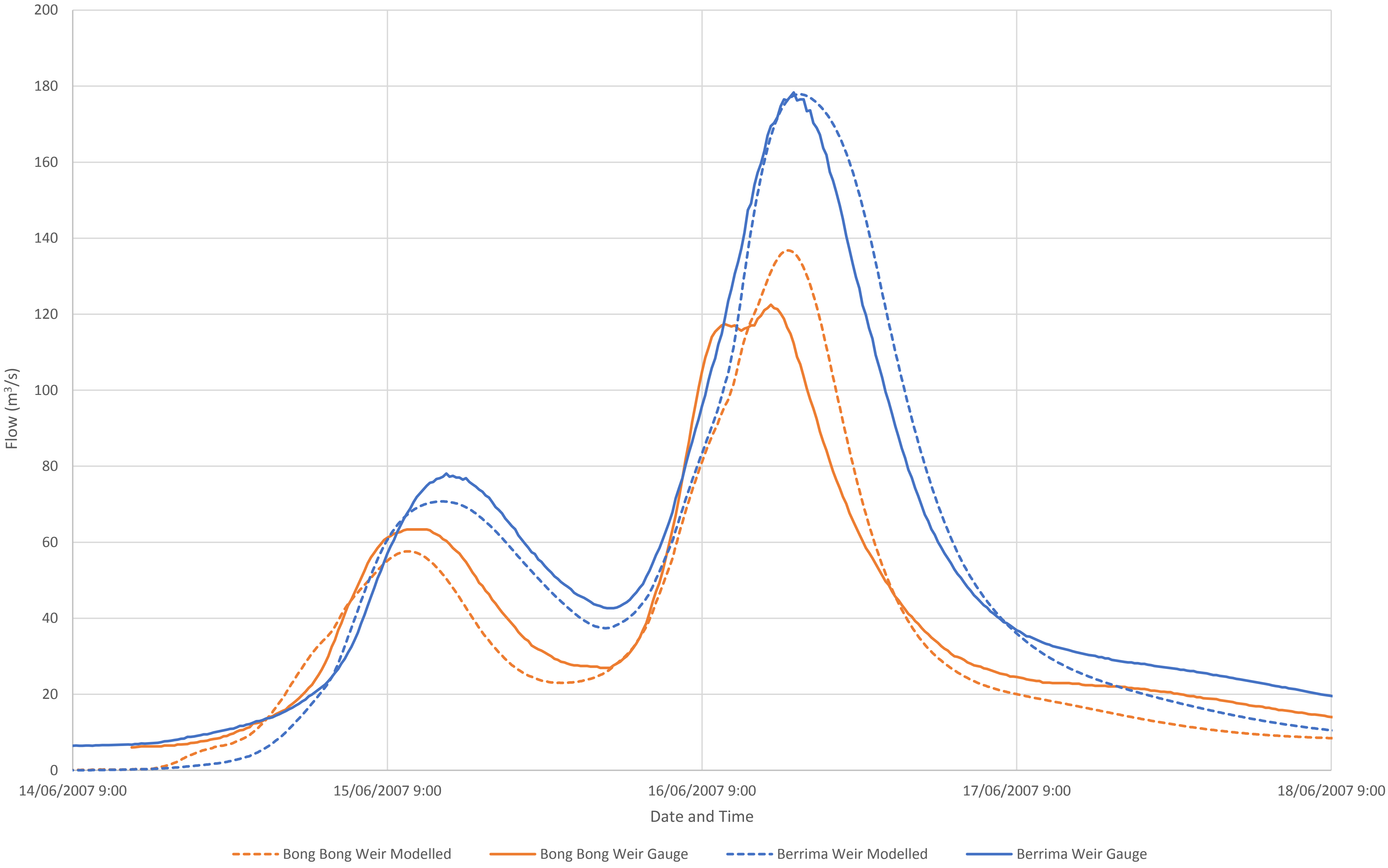

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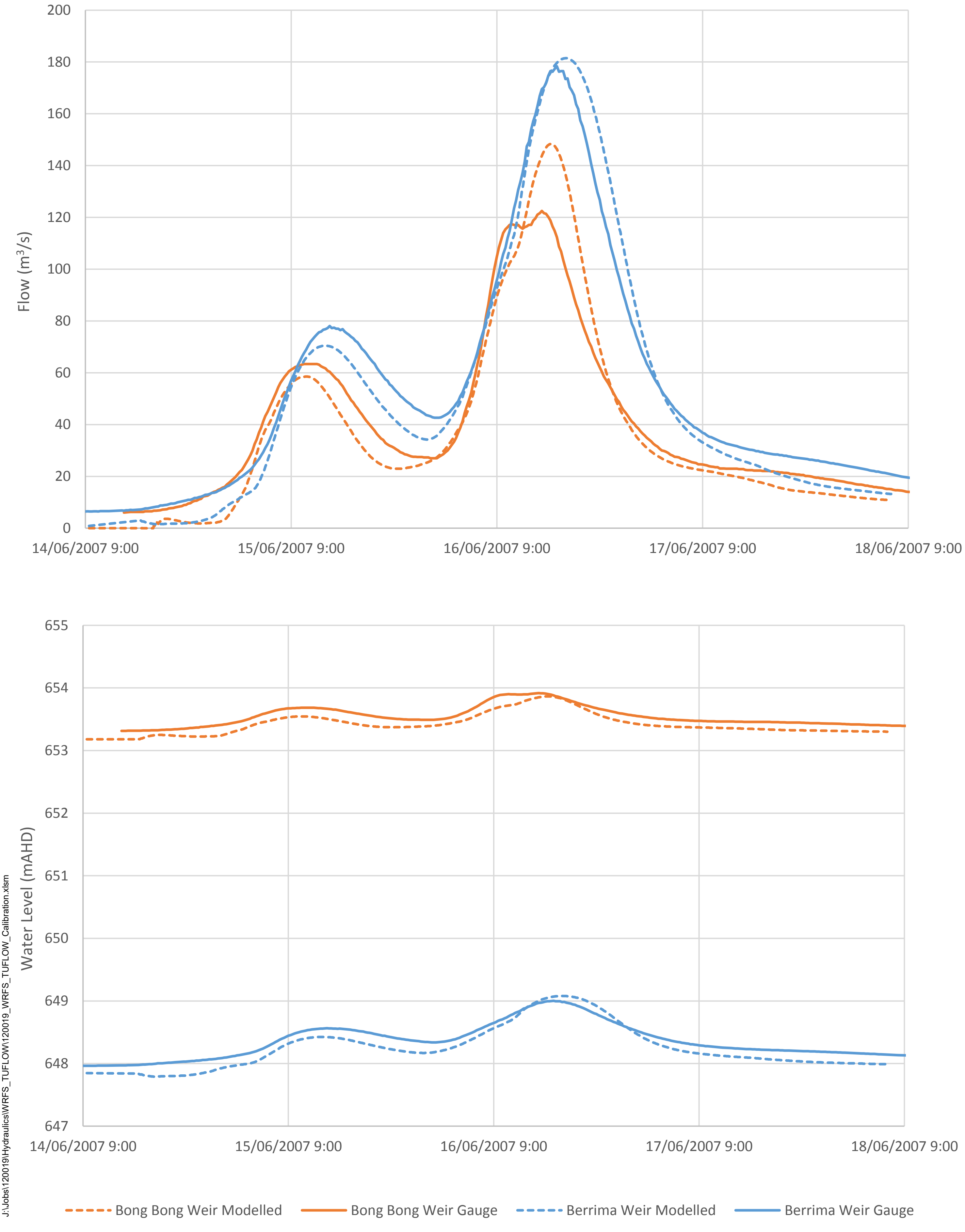
FIGURE E25

TUFLOW GAUGE CALIBRATION RESULTS
JUNE 2007 EVENT



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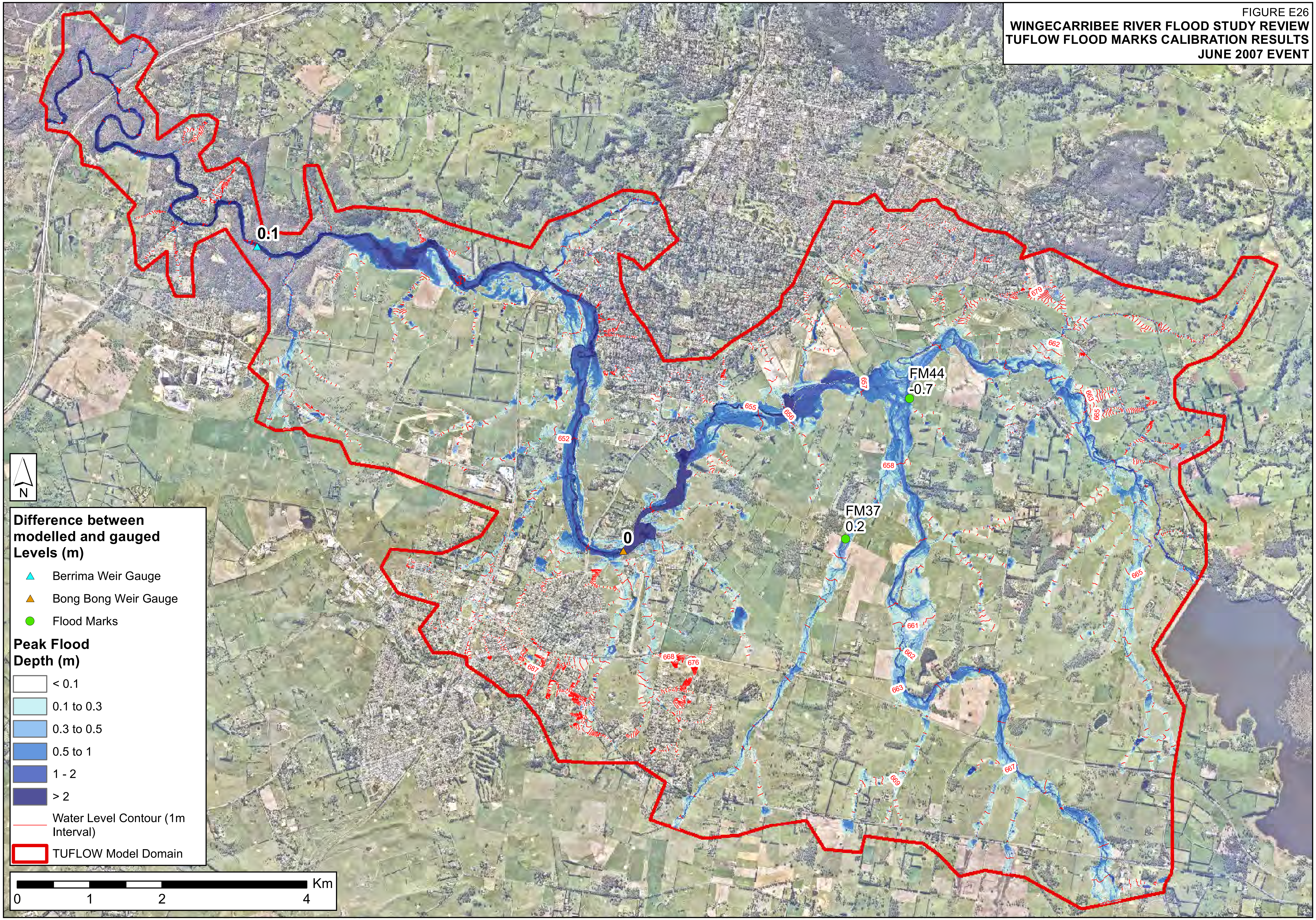

FIGURE E26
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
JUNE 2007 EVENT

FIGURE E27

WBNM MODEL CALIBRATION
MARCH 2012 EVENT

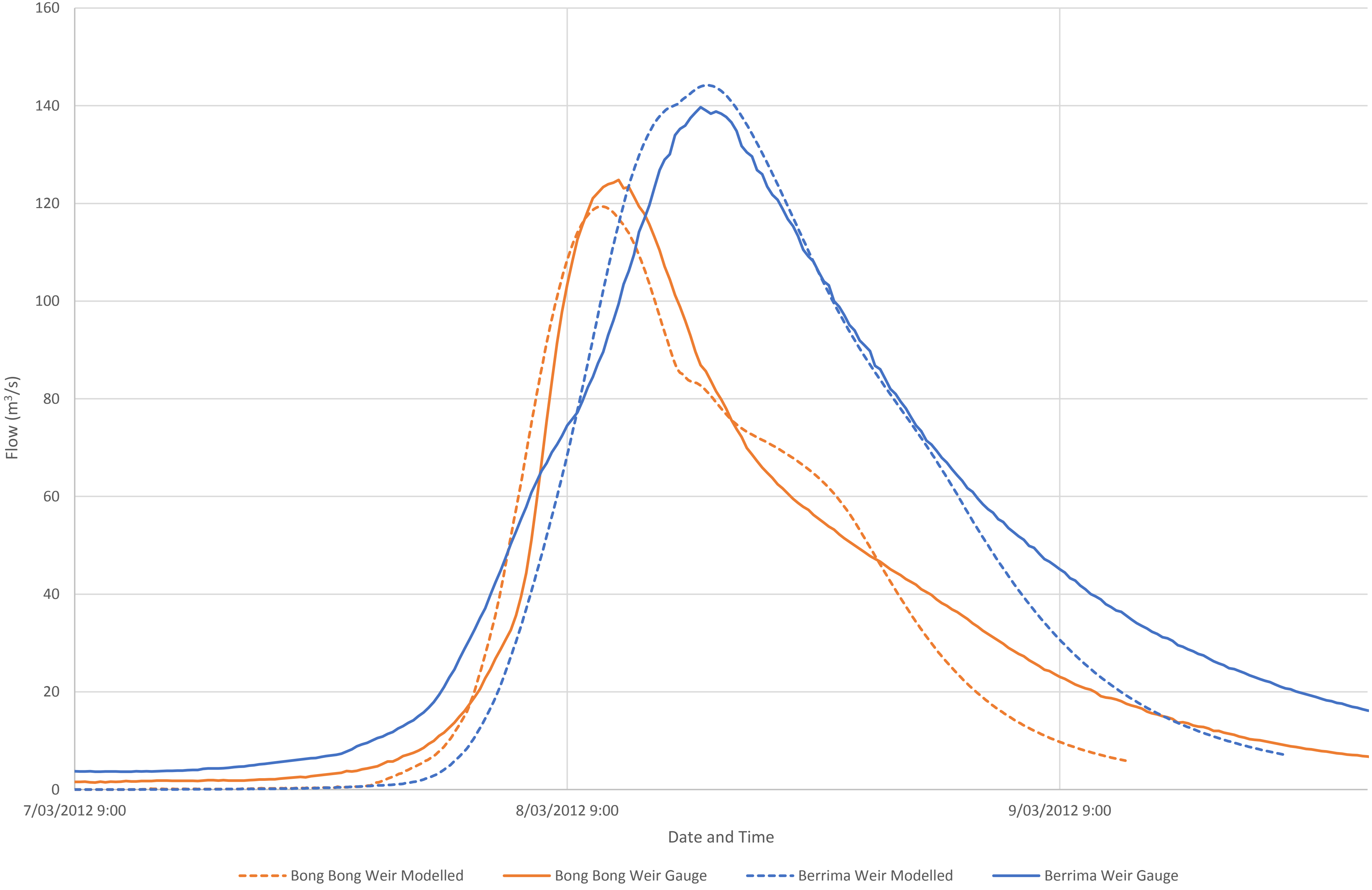

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FIGURE E28

TUFLOW GAUGE CALIBRATION RESULTS
MARCH 2012 EVENT

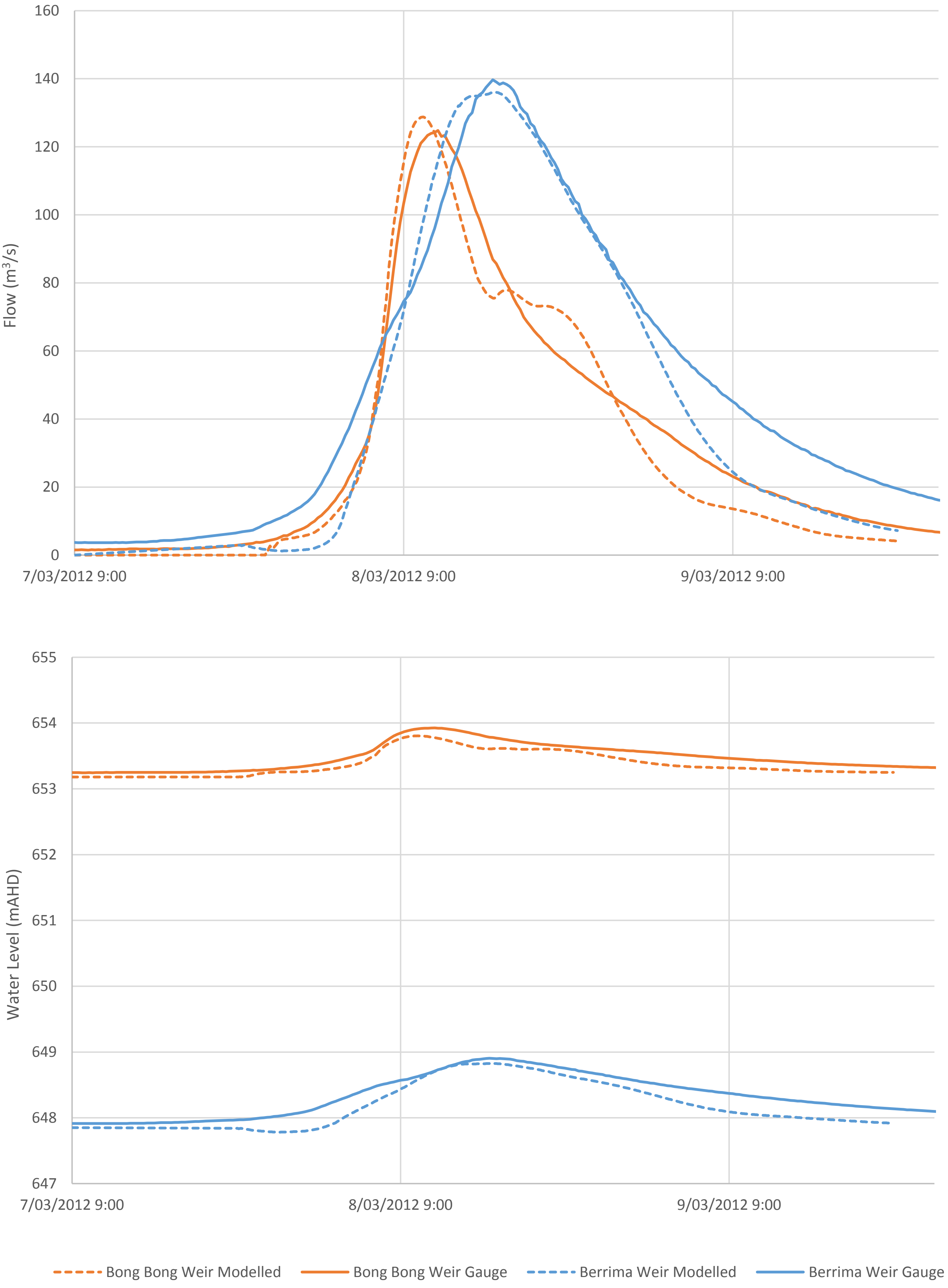

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FIGURE E29
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
MARCH 2012 EVENT

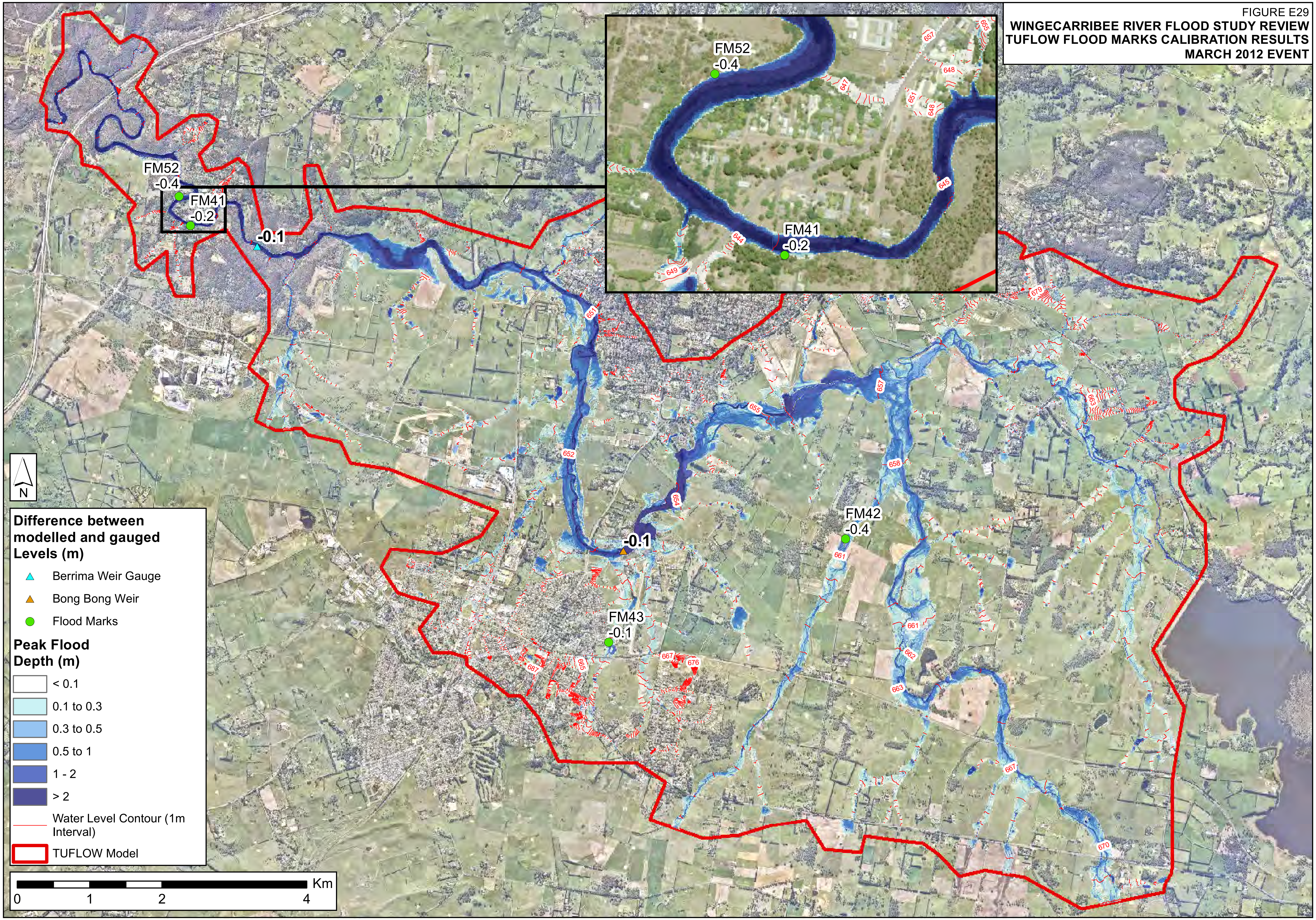

FIGURE E30

WBNM MODEL CALIBRATION
AUGUST 2015 EVENT

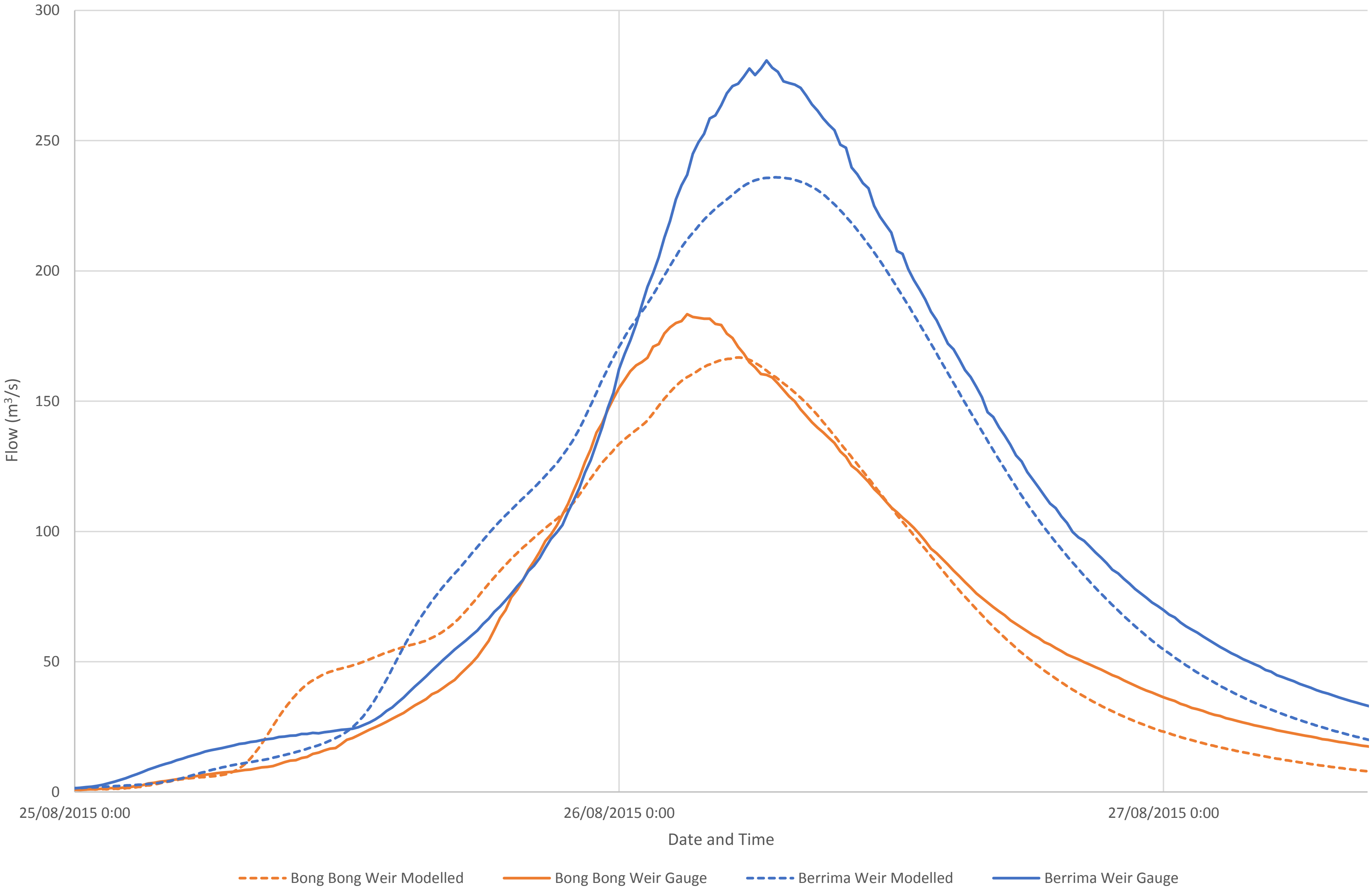

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FIGURE E31

TUFLOW GAUGE CALIBRATION RESULTS
AUGUST 2015 EVENT

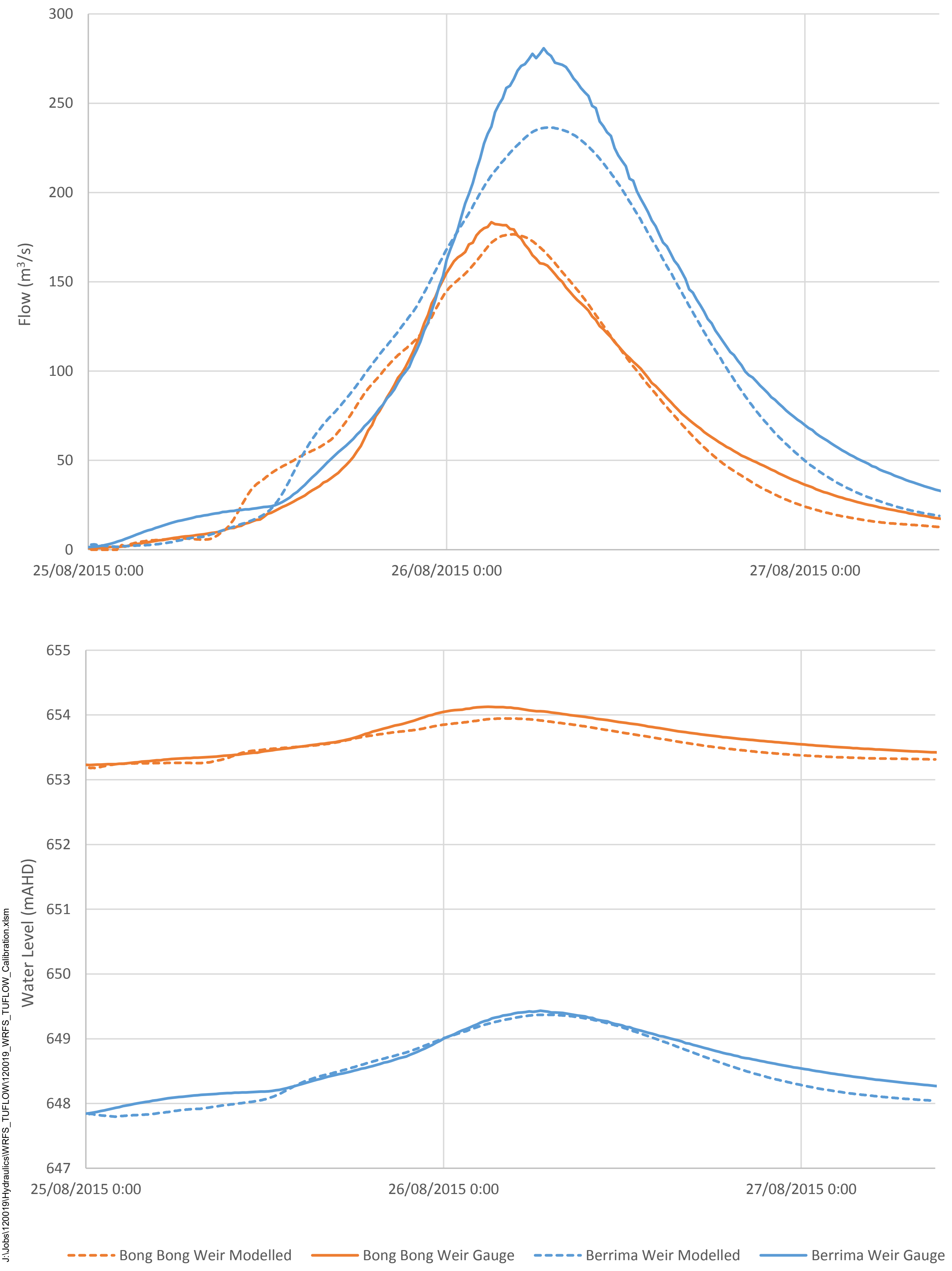

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FIGURE E32
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
AUGUST 2015 EVENT

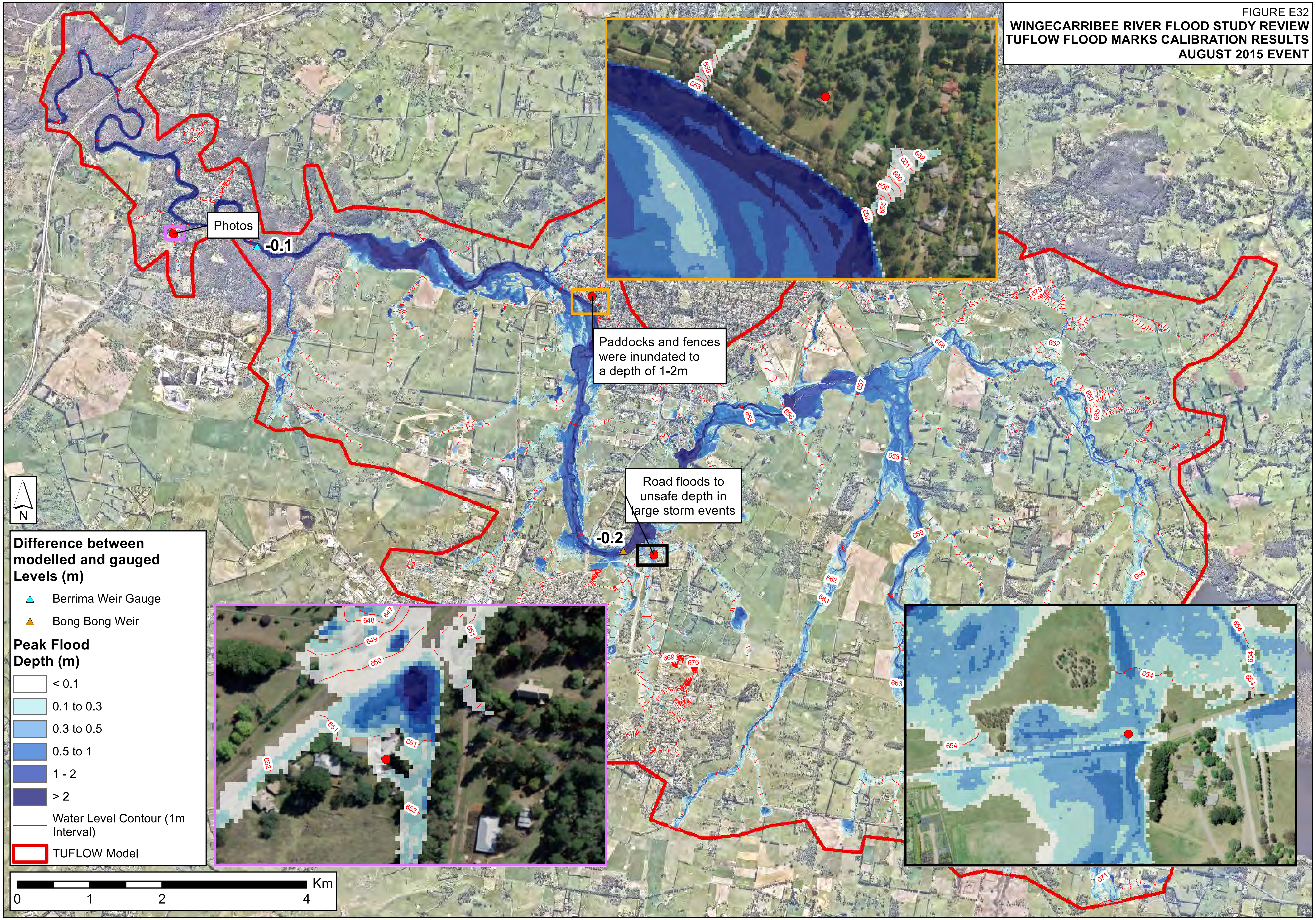

FIGURE E33

WBNM MODEL CALIBRATION
JUNE 2016 EVENT

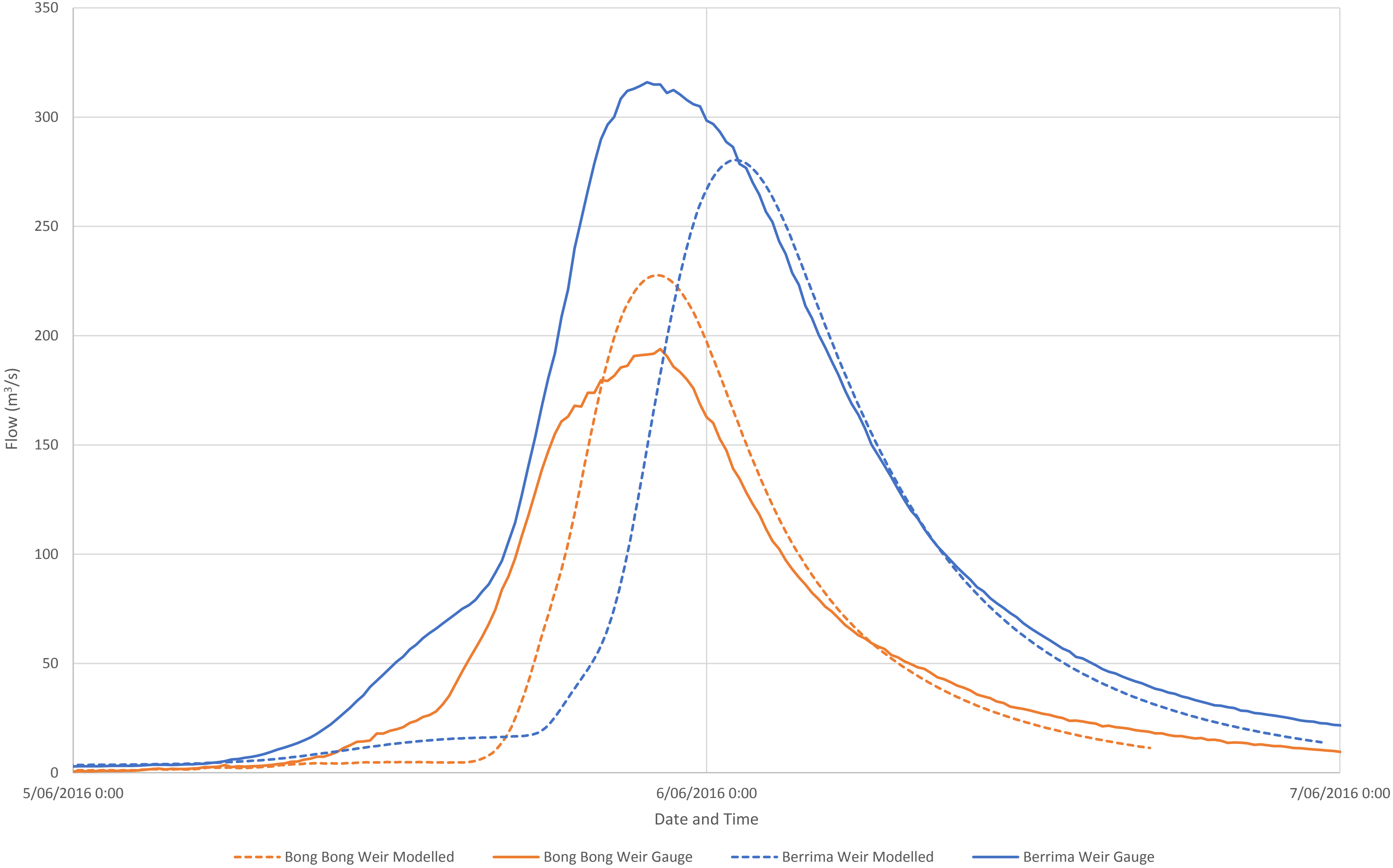

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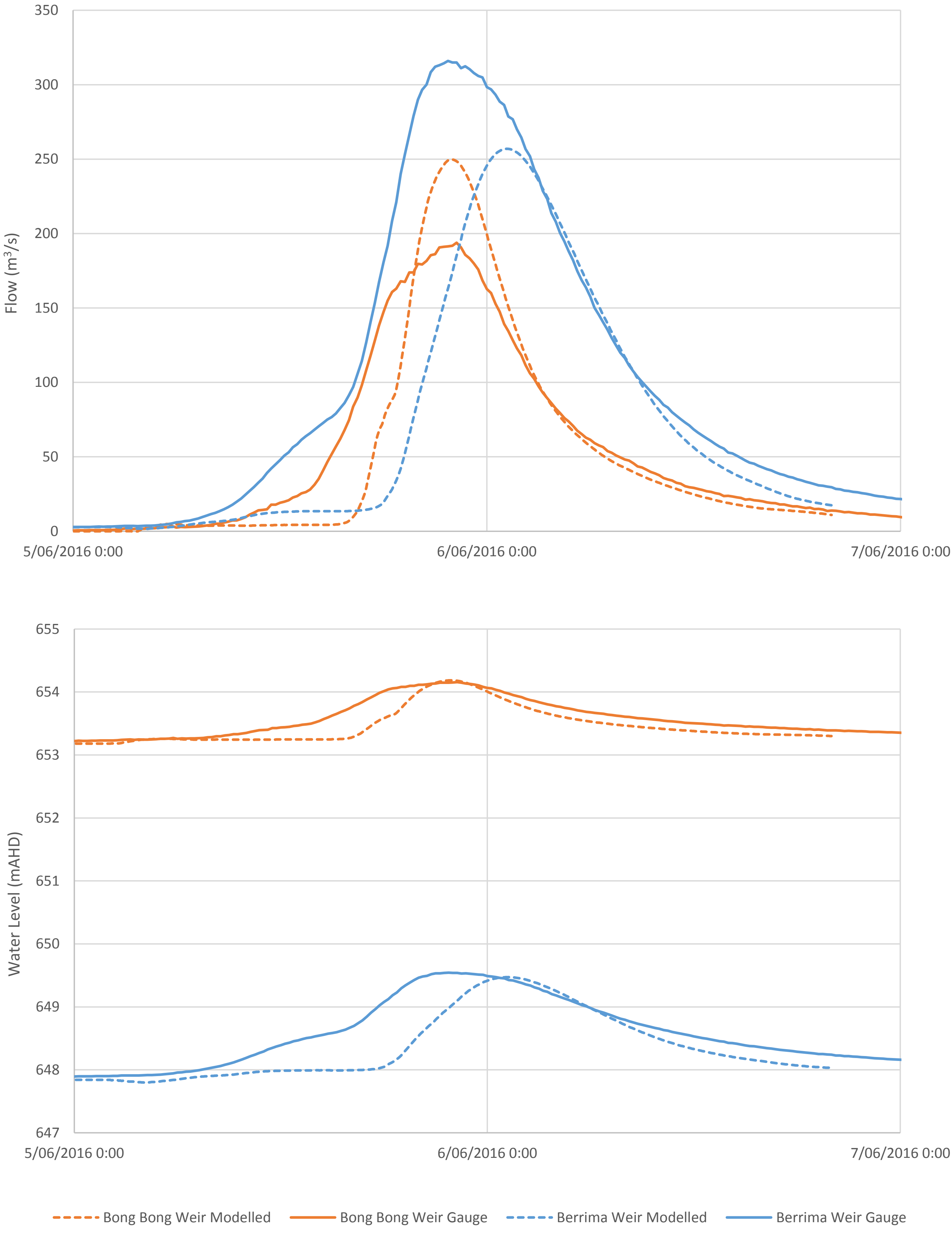
FIGURE E34

TUFLOW GAUGE CALIBRATION RESULTS
JUNE 2016 EVENT



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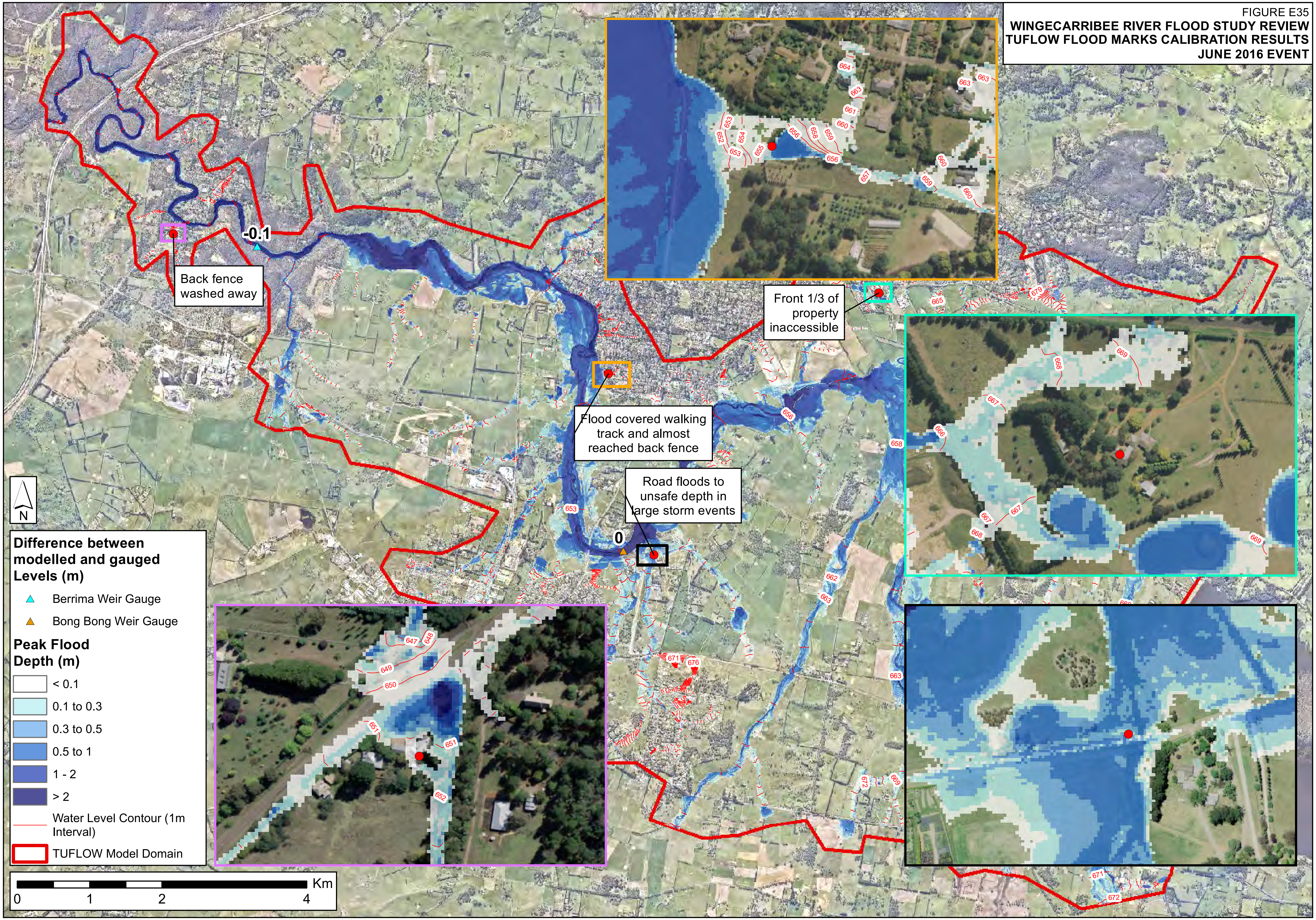

FIGURE E35
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
JUNE 2016 EVENT

FIGURE E36
WBNM MODEL CALIBRATION
FEBRUARY 2020 EVENT

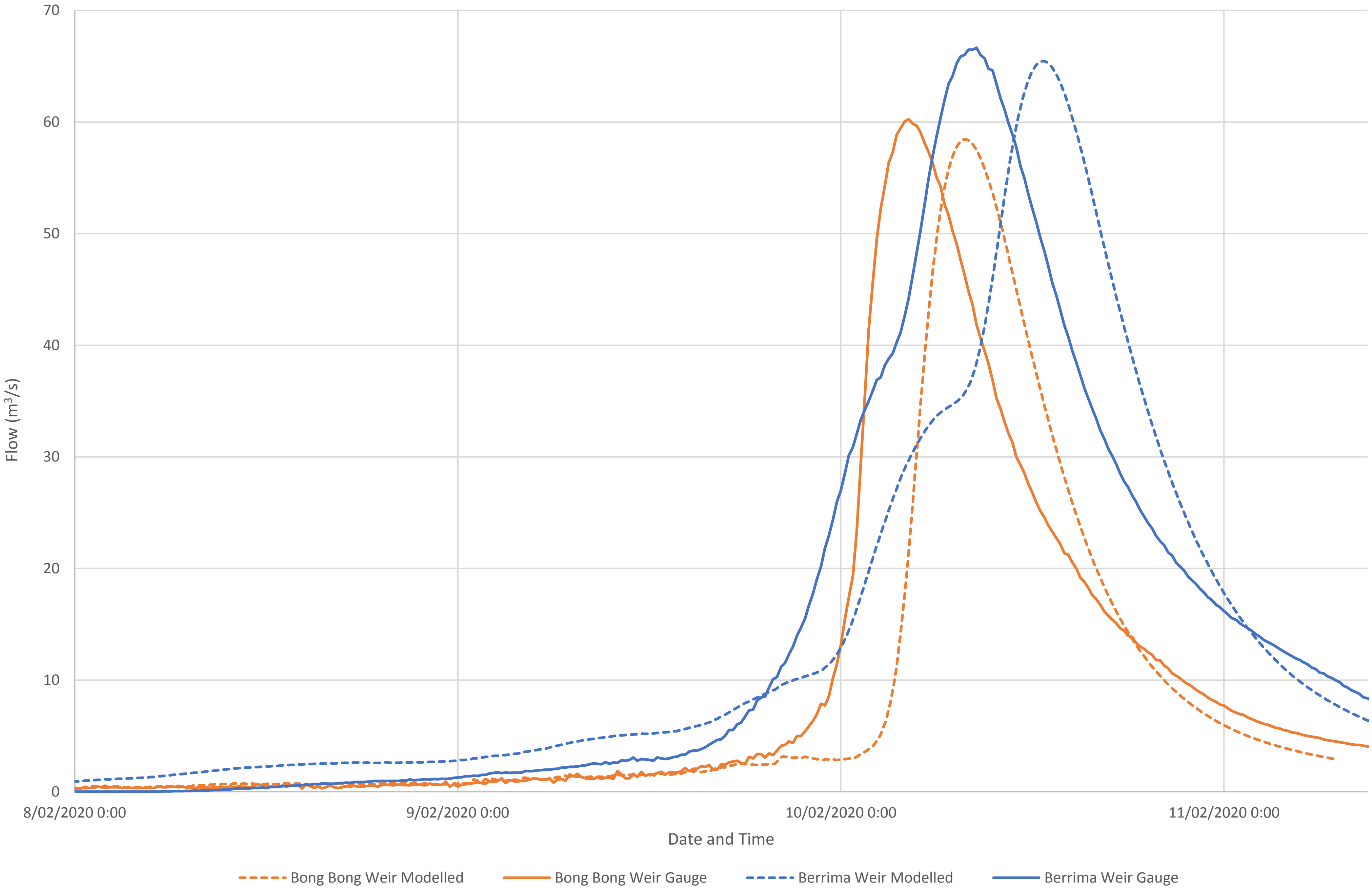

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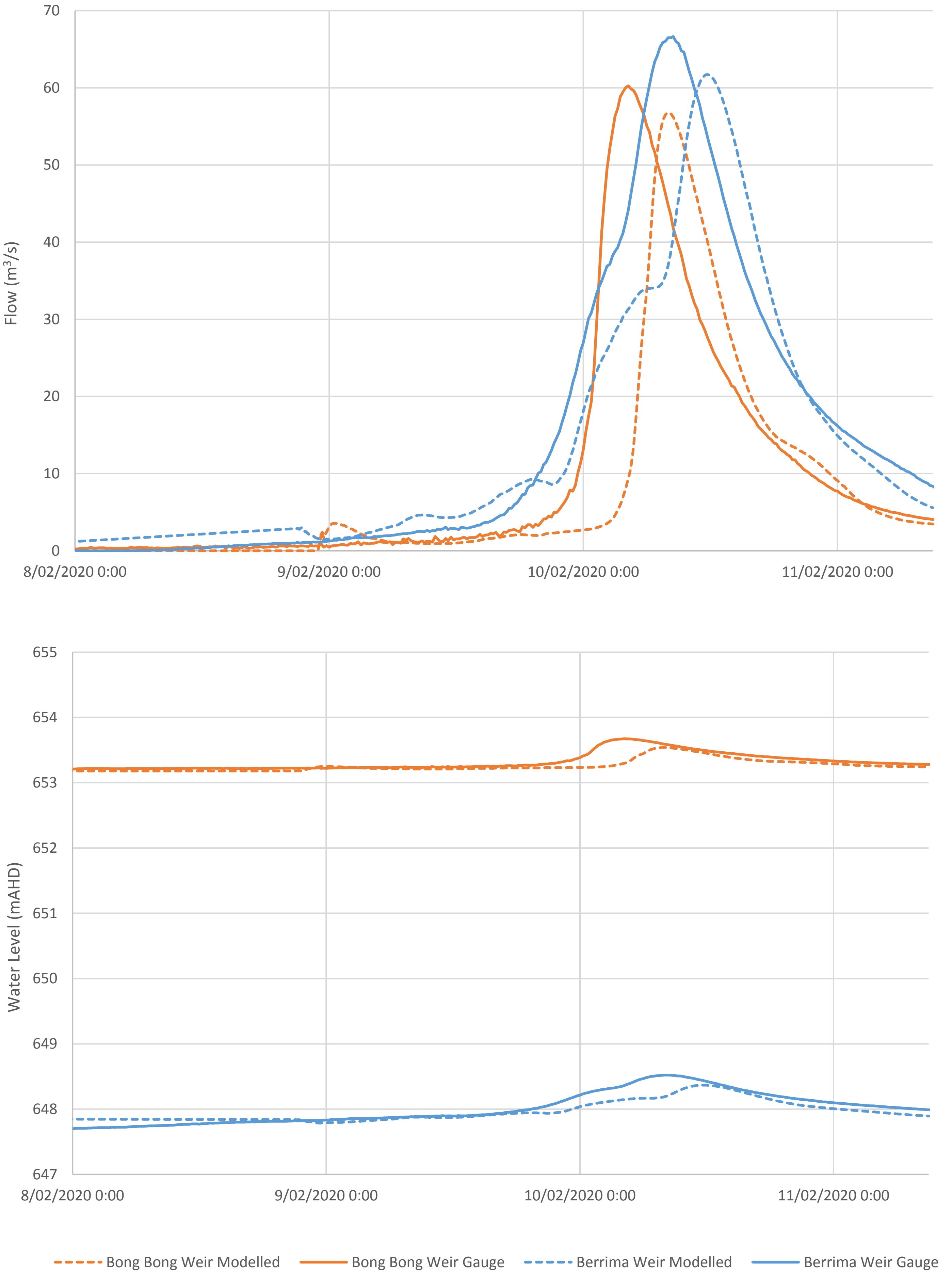
FIGURE E37

TUFLOW GAUGE CALIBRATION RESULTS
FEBRUARY 2020 EVENT



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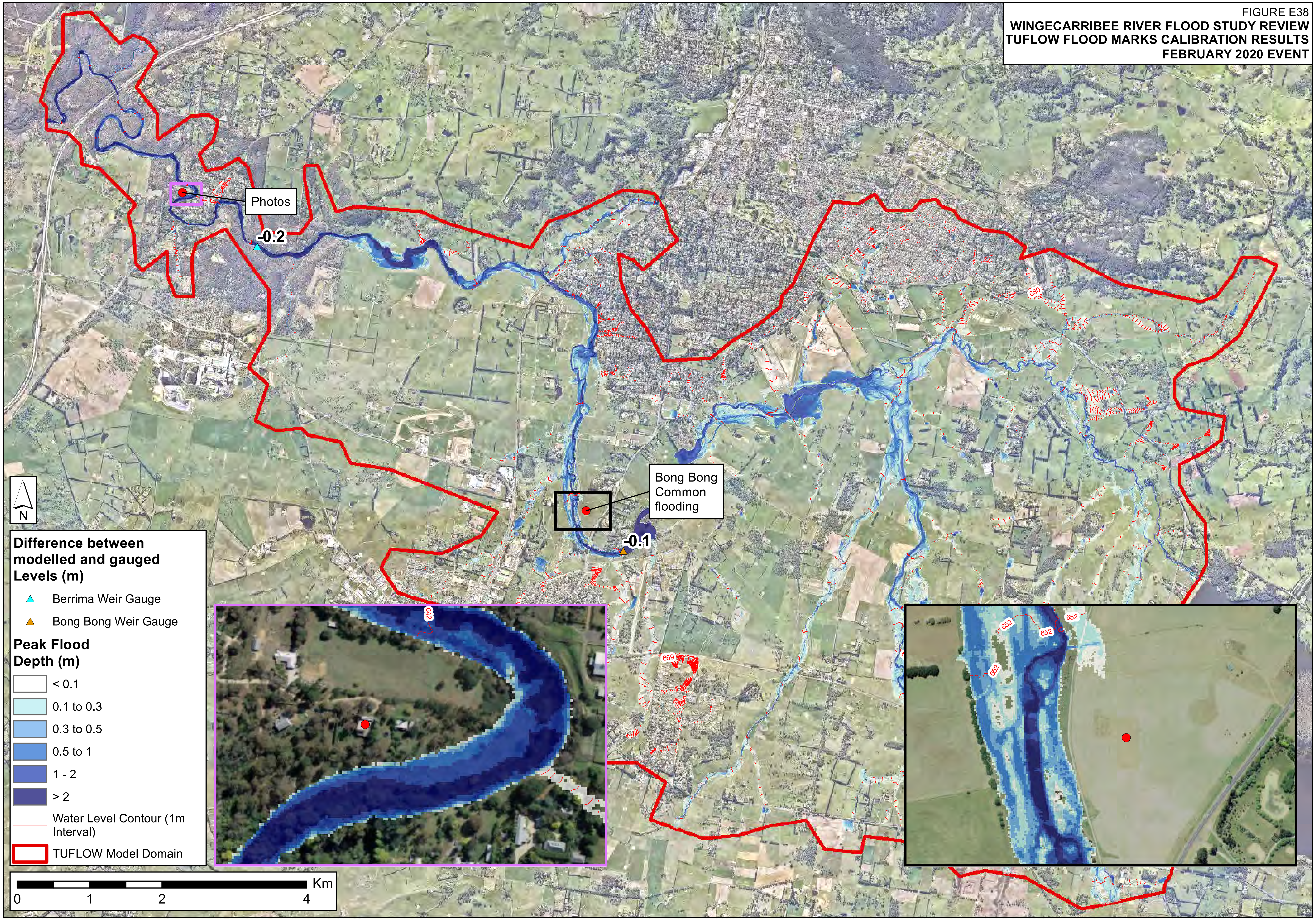
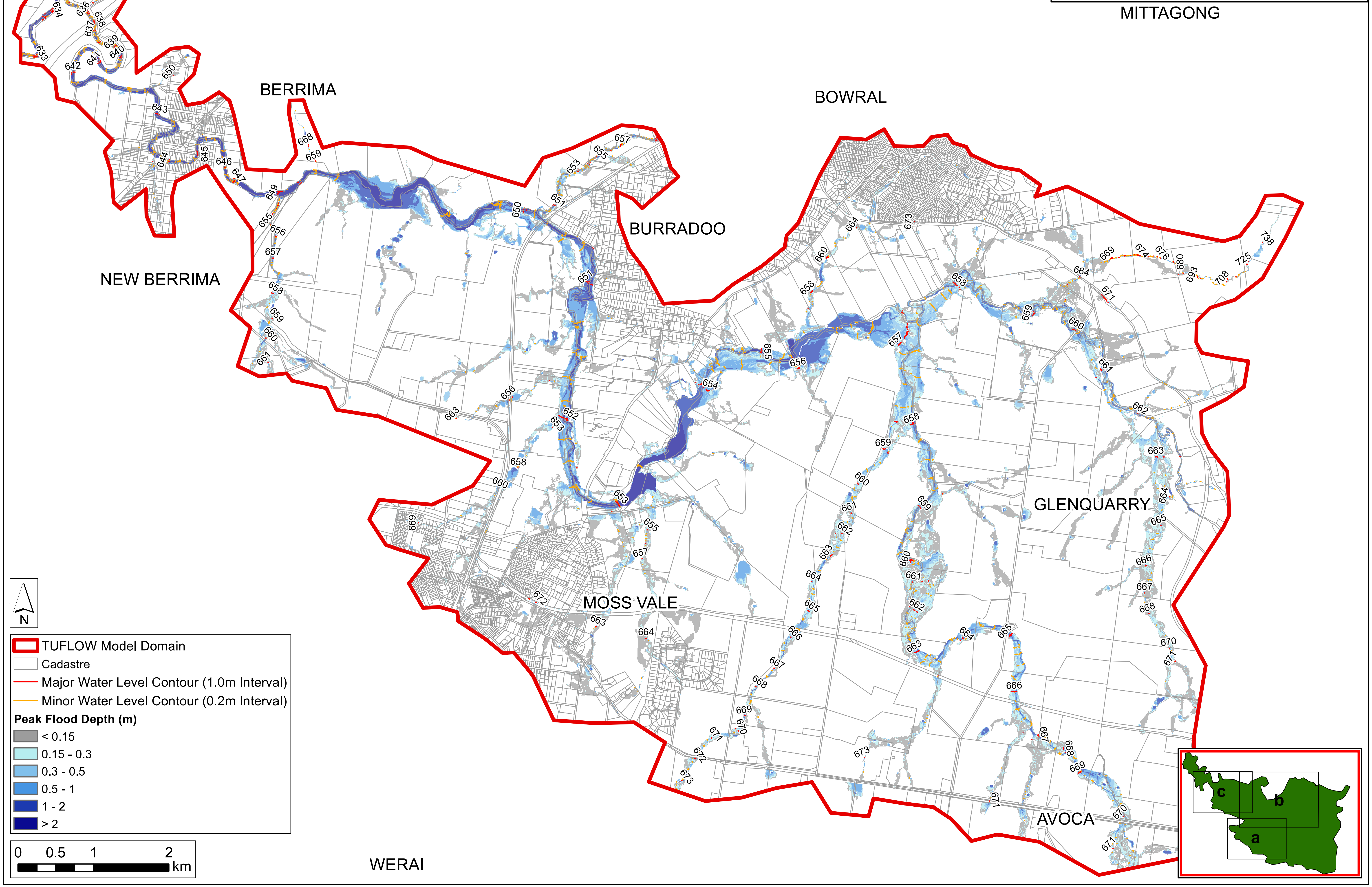


FIGURE E38
WINGECARRIBEE RIVER FLOOD STUDY REVIEW
TUFLOW FLOOD MARKS CALIBRATION RESULTS
FEBRUARY 2020 EVENT
Photos
-0.2
Bong Bong
Common
flooding
-0.1
660
669
642
652
N
Difference between modelled and gauged Levels (m)
Berrima Weir Gauge
Bong Bong Weir Gauge
Peak Flood Depth (m)
< 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1
1 - 2
> 2
Water Level Contour (1m Interval)
TUFLOW Model Domain
0
1
2
4
Km

APPENDIX F. DESIGN FLOOD MAPPING

Appendix F

FIGURE F1
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
50% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F01_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_50p_AEP_EVENT.mxd

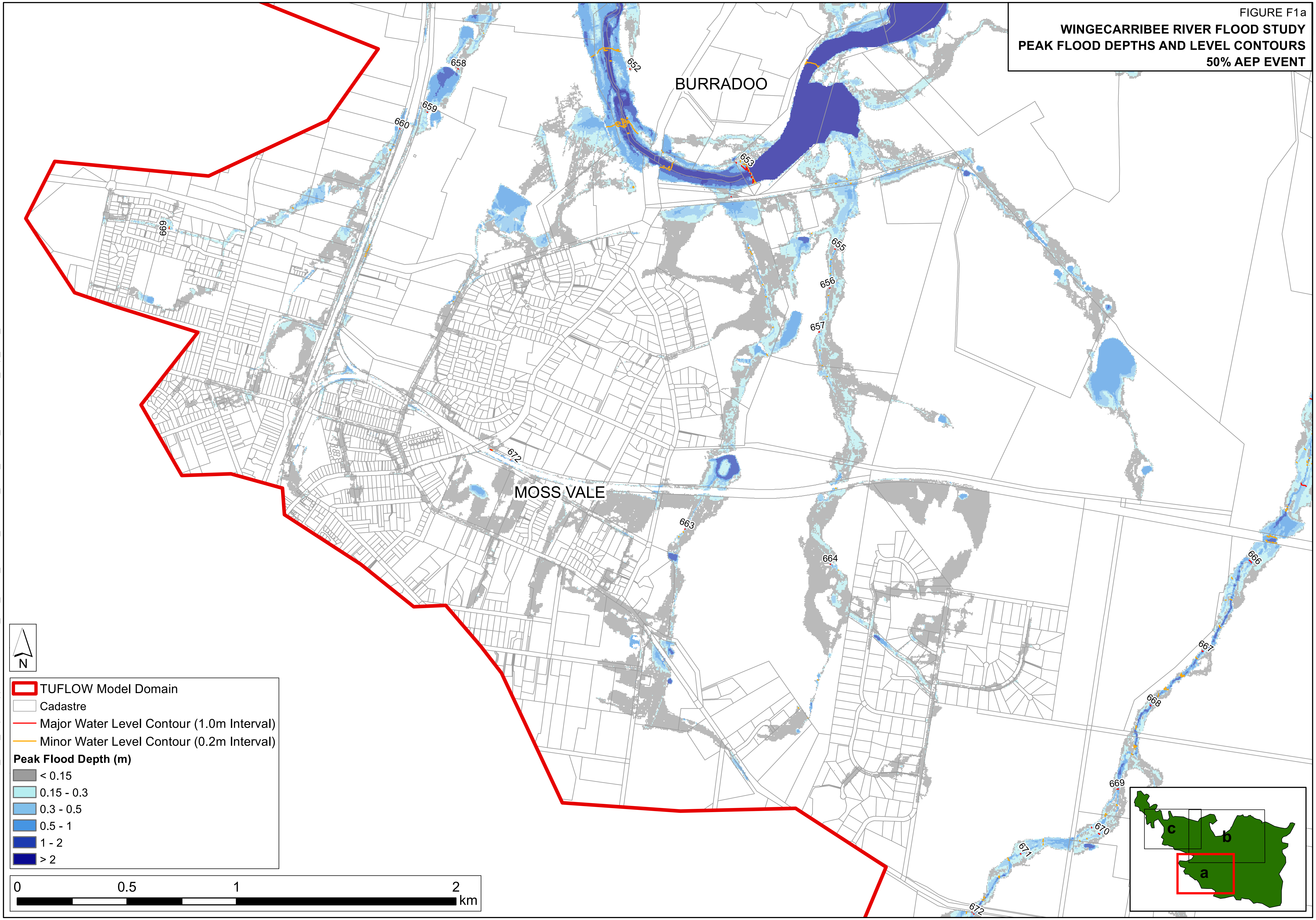


FIGURE F1a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
50% AEP EVENT
BURRADOO
MOSS VALE
TUFLOW Model Domain
Cadastre
Major Water Level Contour (1.0m Interval)
Minor Water Level Contour (0.2m Interval)
Peak Flood Depth (m)
< 0.15
0.15 - 0.3
0.3 - 0.5
0.5 - 1
1 - 2
> 2
N
0
0.5
1
2
km
a
b
c
652
653
655
656
657
658
659
660
663
664
666
667
668
669
670
671
672
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F01_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_50p_AEP_EVENT.mxd

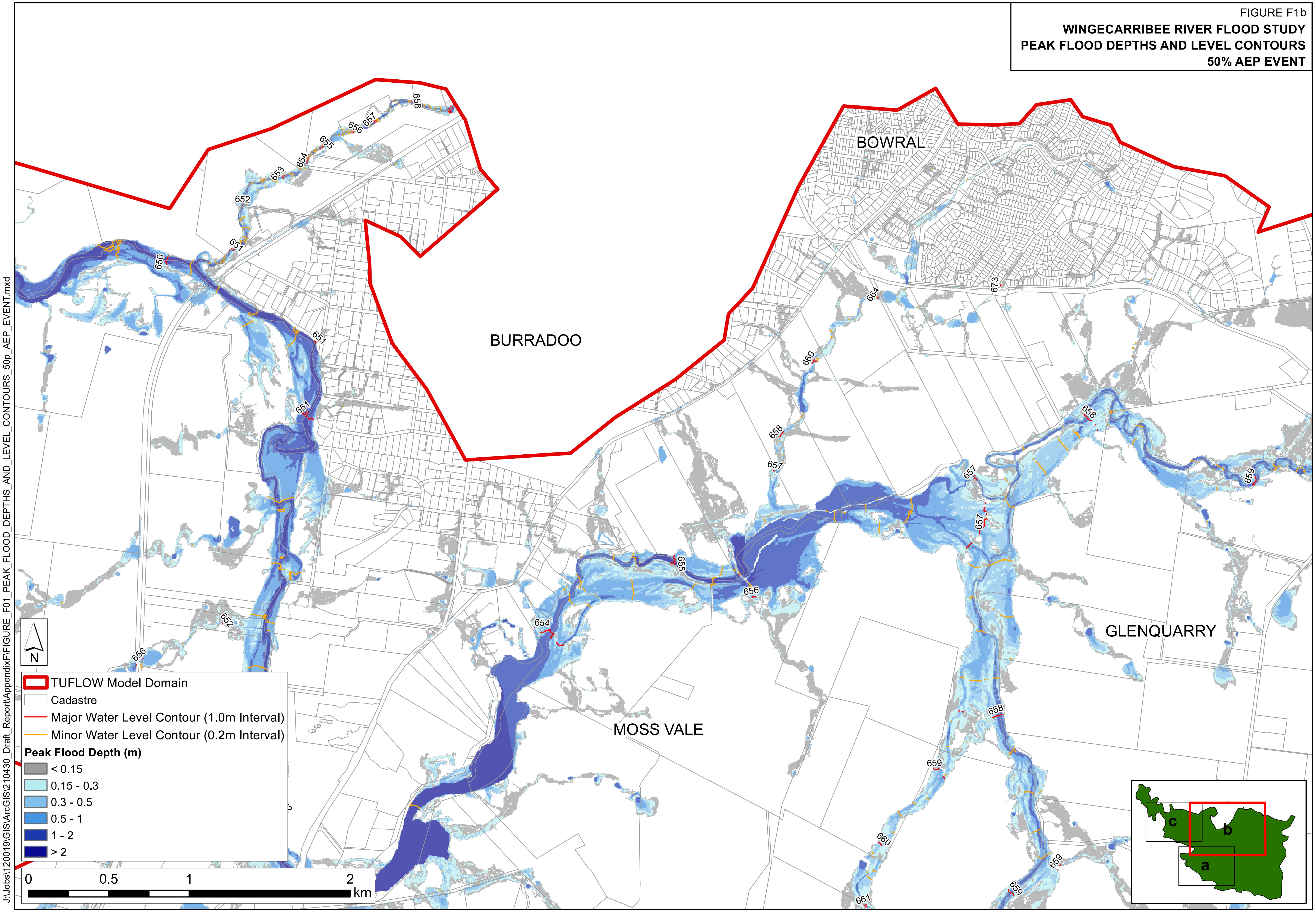
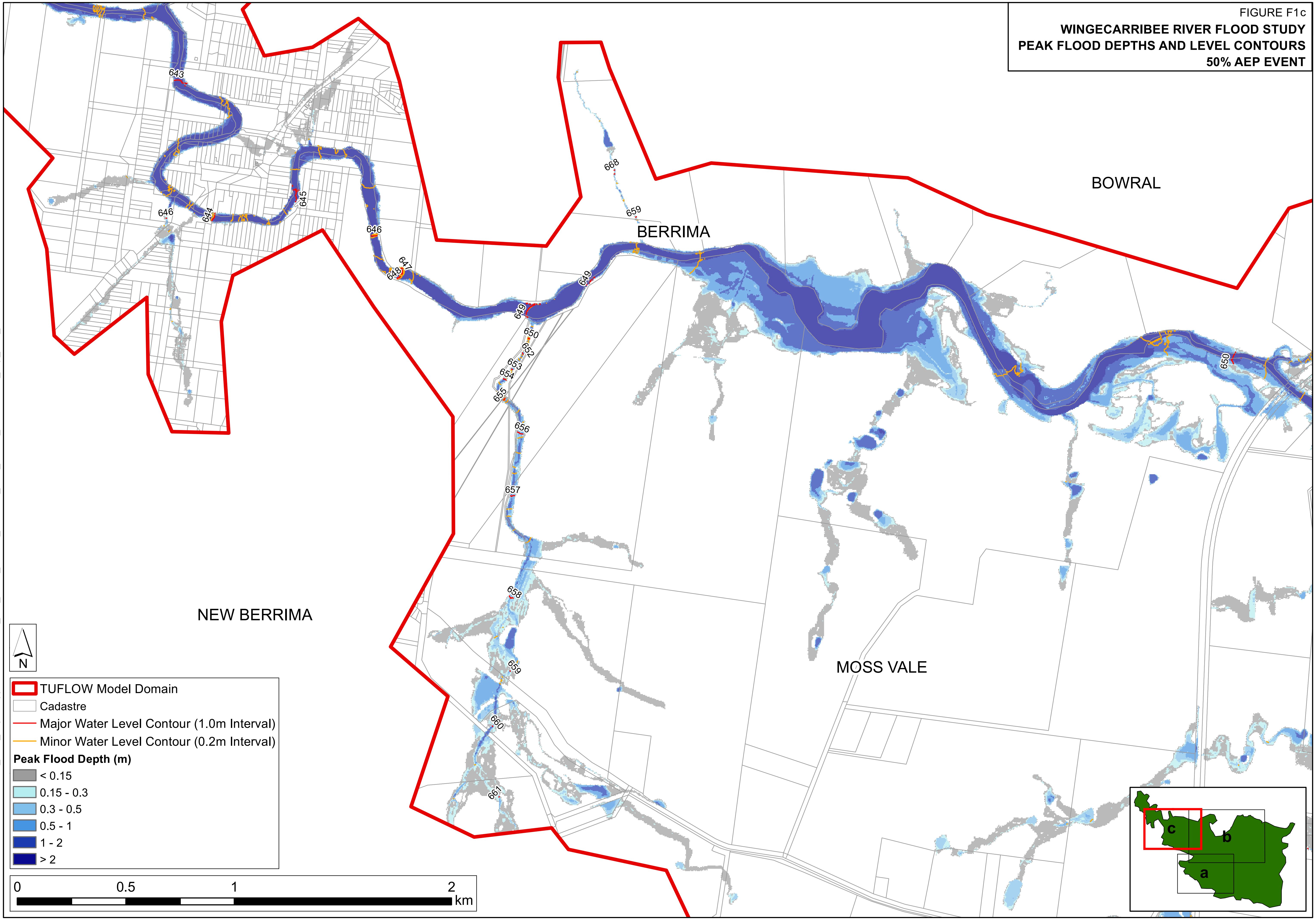


FIGURE F1b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
50% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
TUFLOW Model Domain
Cadastre
Major Water Level Contour (1.0m Interval)
Minor Water Level Contour (0.2m Interval)
Peak Flood Depth (m)
< 0.15
0.15 - 0.3
0.3 - 0.5
0.5 - 1
1 - 2
> 2
0
0.5
1
2
km
N
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F01_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_50p_AEP_EVENT.mxd

FIGURE F1c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
50% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F01_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_50p_AEP_EVENT.mxd

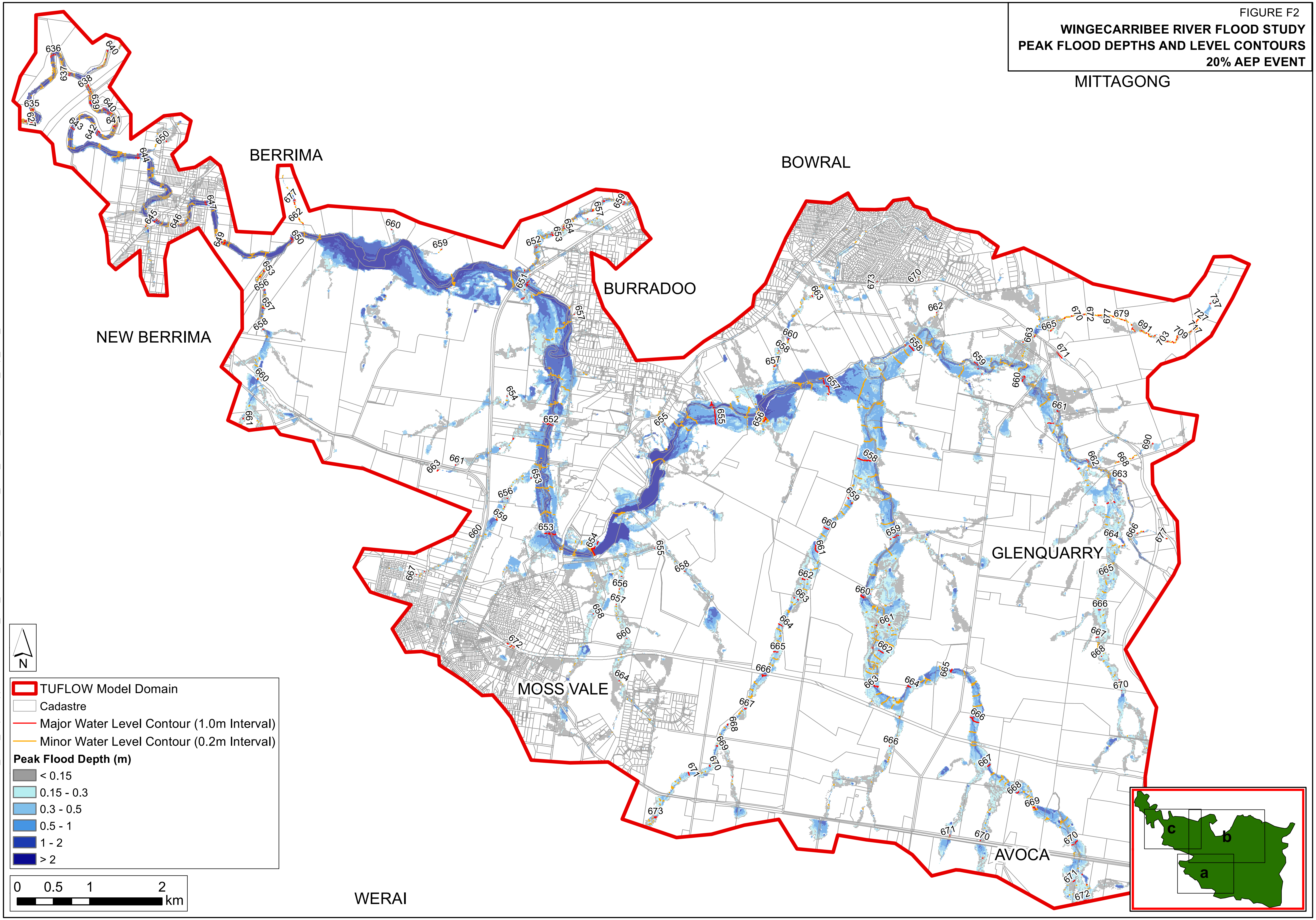
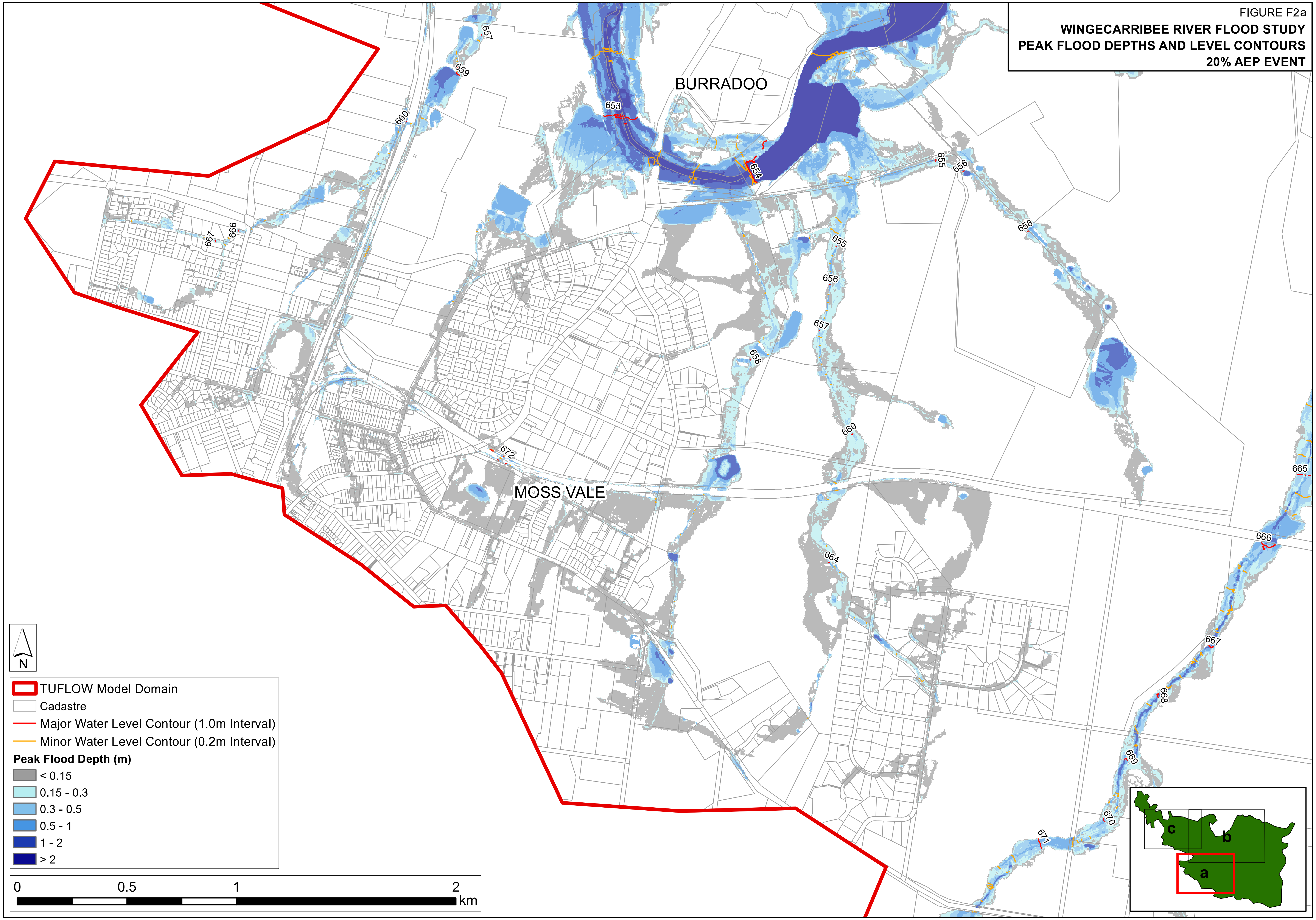


FIGURE F2
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
20% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F02_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_20p_AEP_EVENT.mxd

FIGURE F2a

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
20% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F02_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_20p_AEP_EVENT.mxd

FIGURE F2b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
20% AEP EVENT

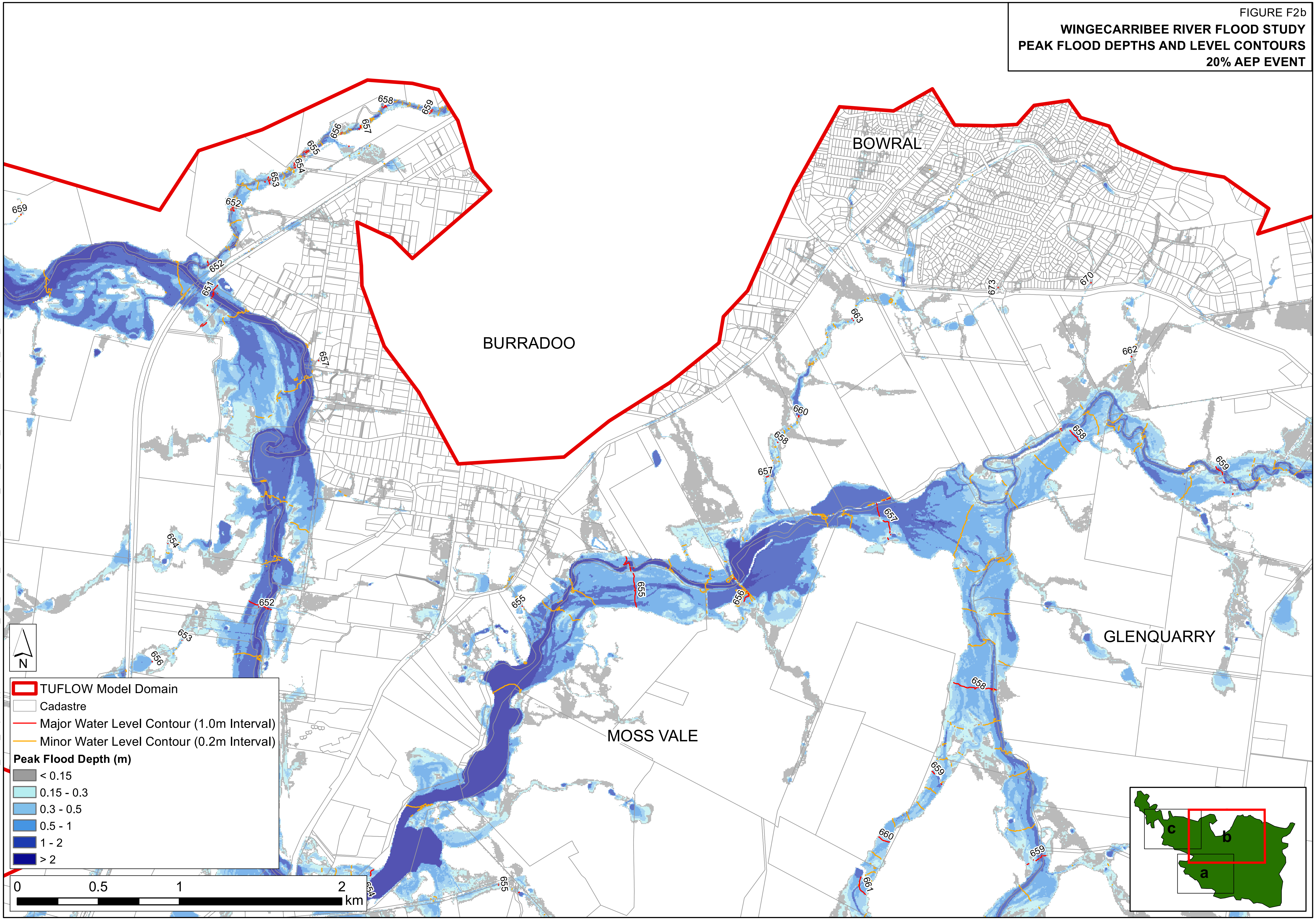
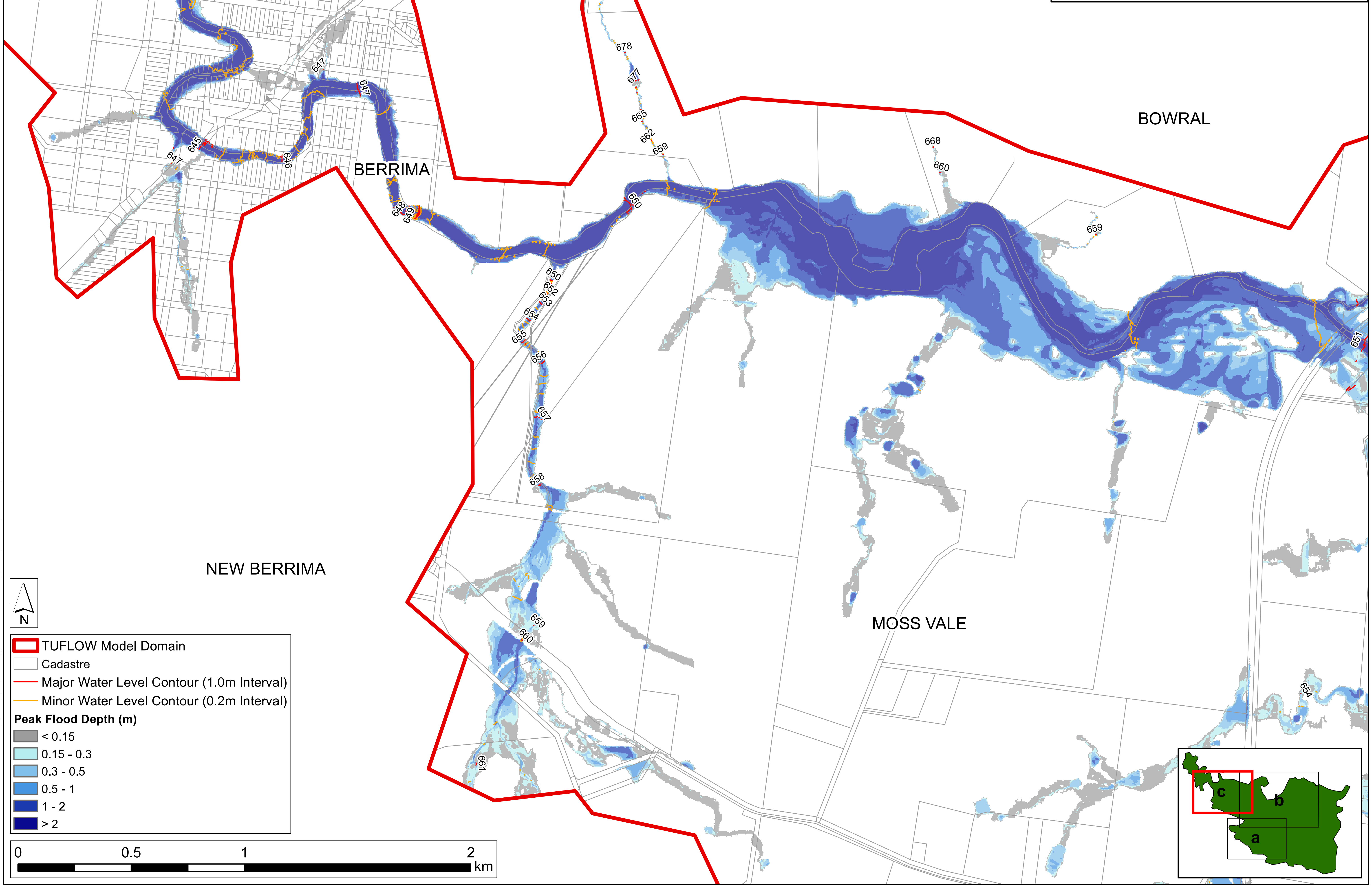
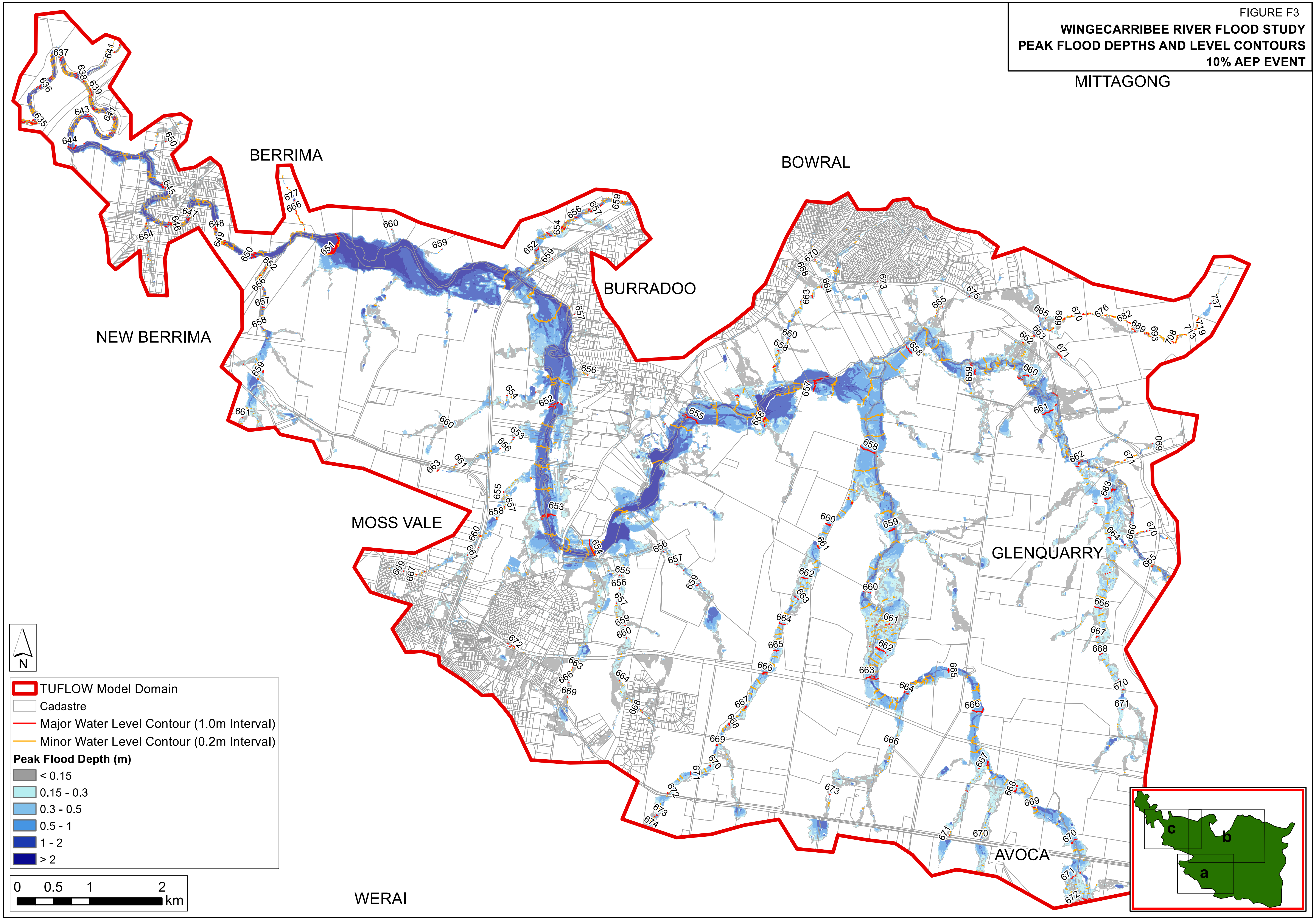


FIGURE F2c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
20% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F02_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_20p_AEP_EVENT.mxd

FIGURE F3
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
10% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F03_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_10p_AEP_EVENT.mxd

FIGURE F3a

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
10% AEP EVENT

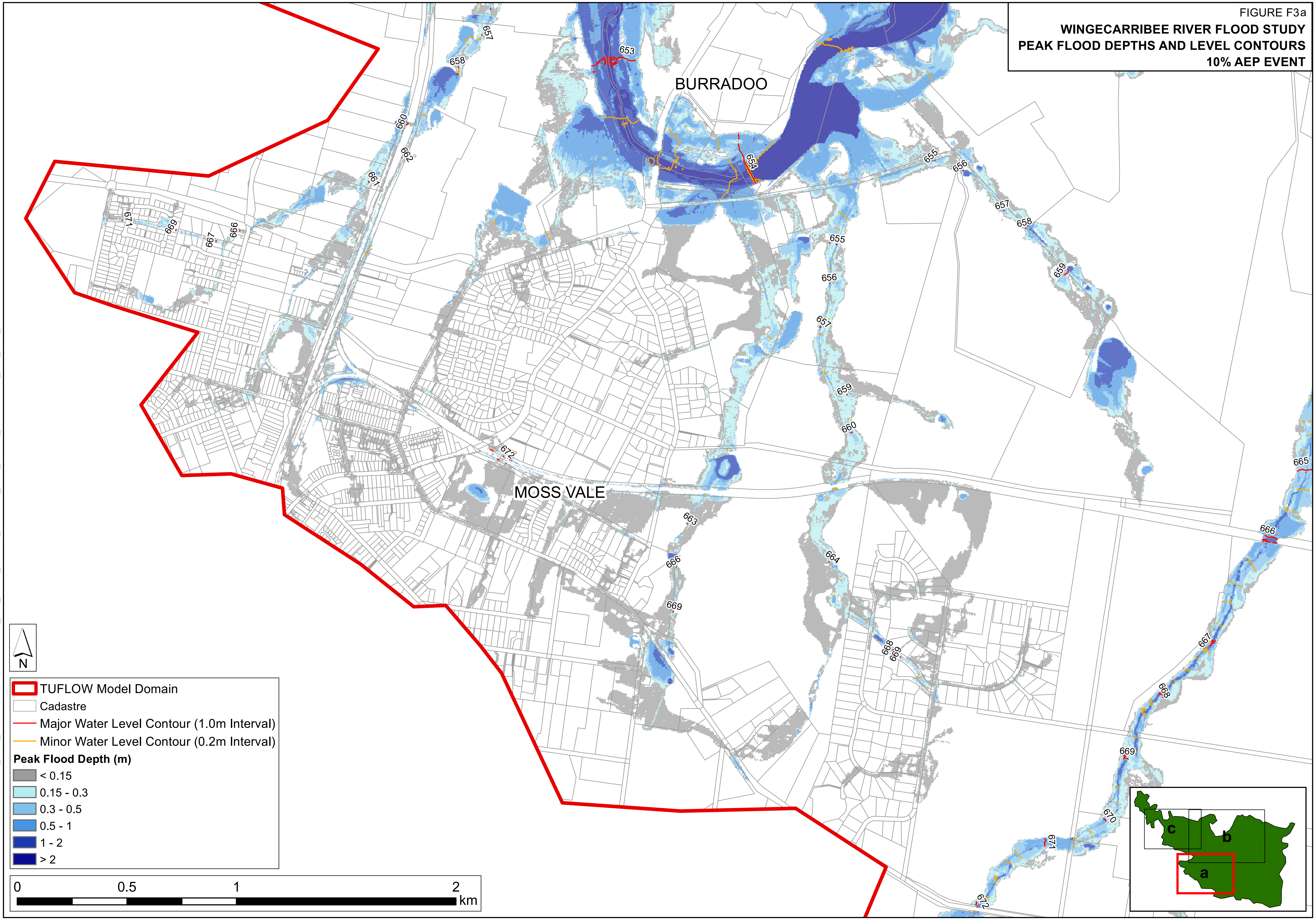


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FIGURE F3b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
10% AEP EVENT

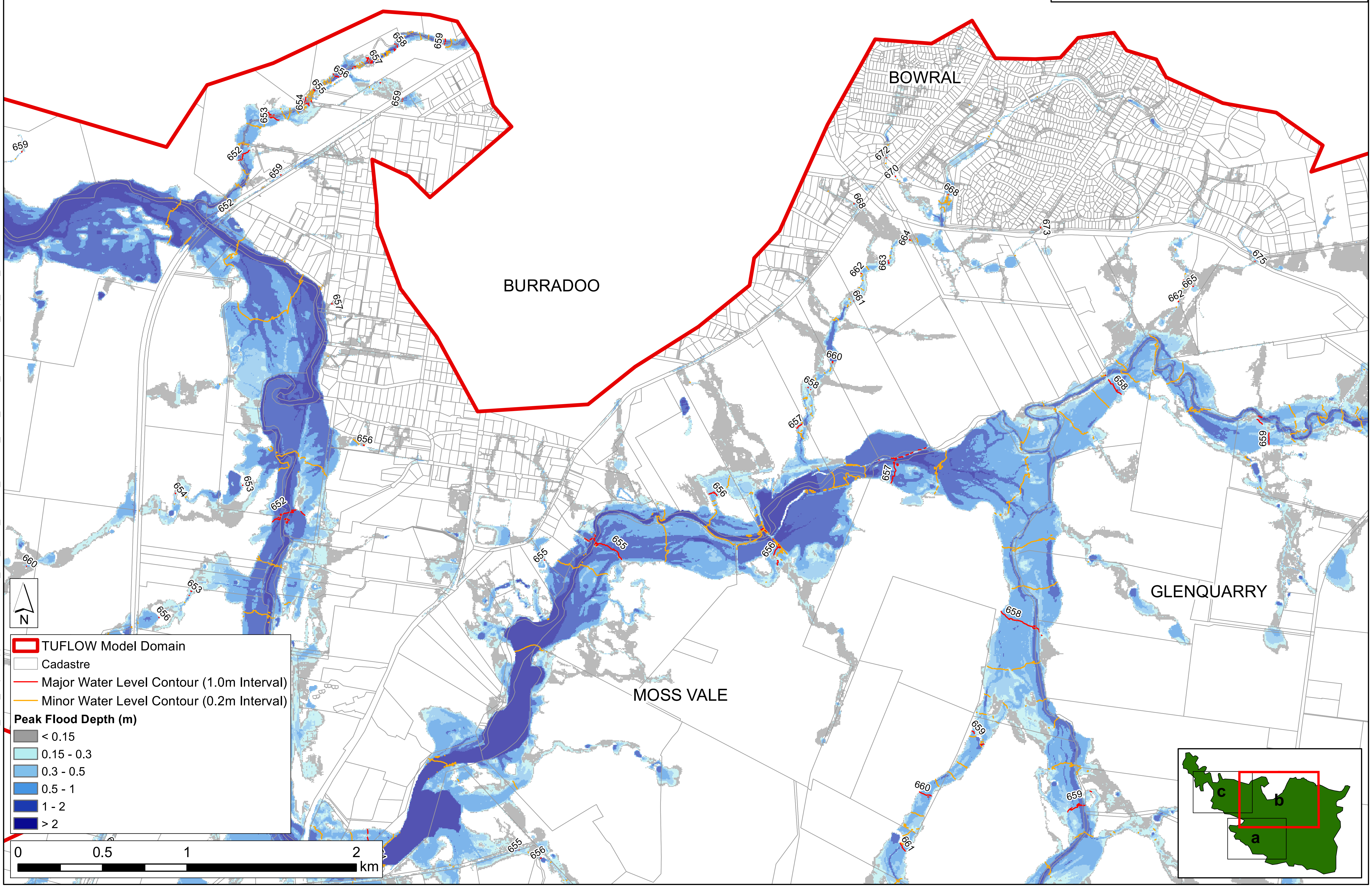
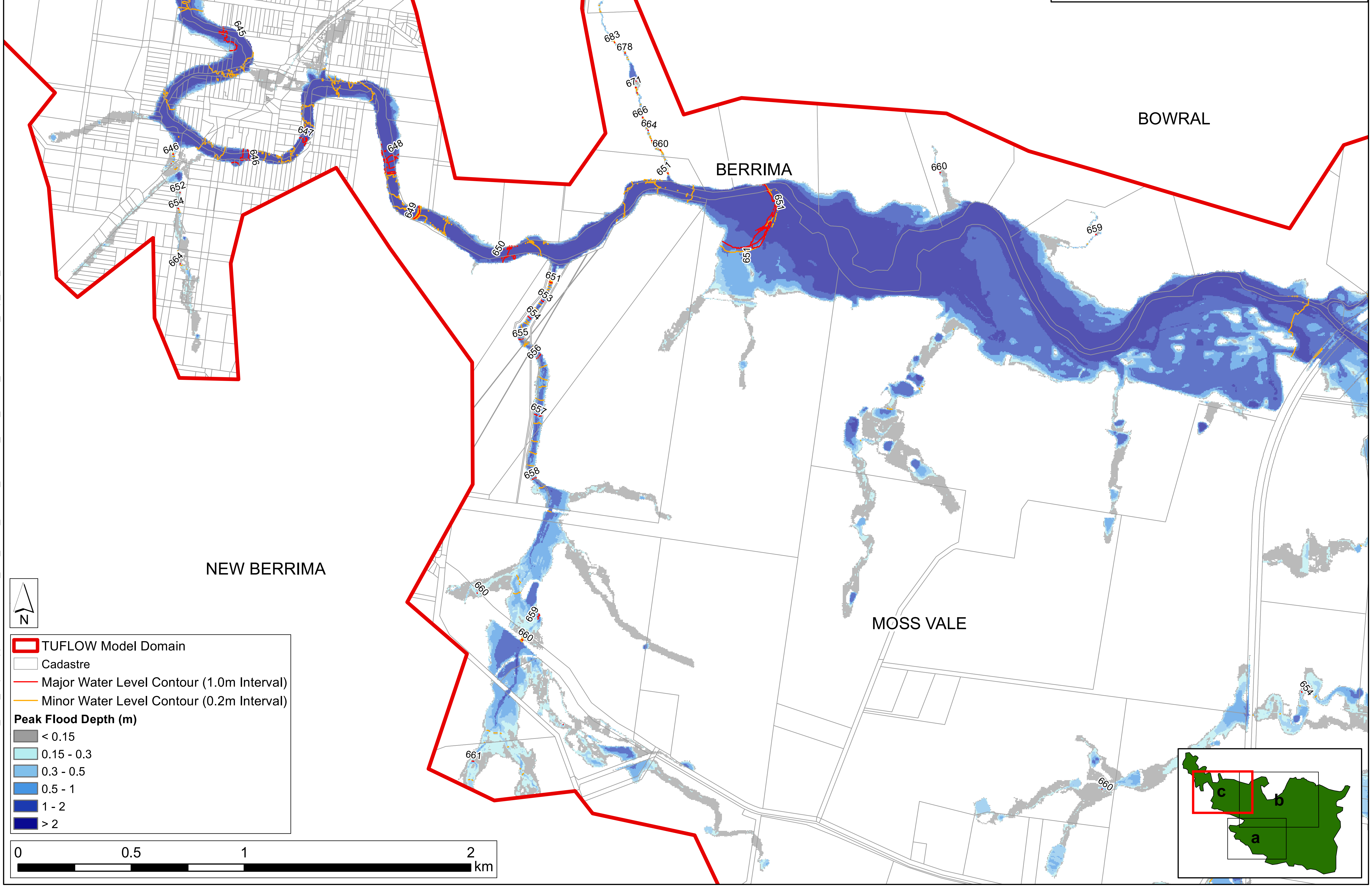
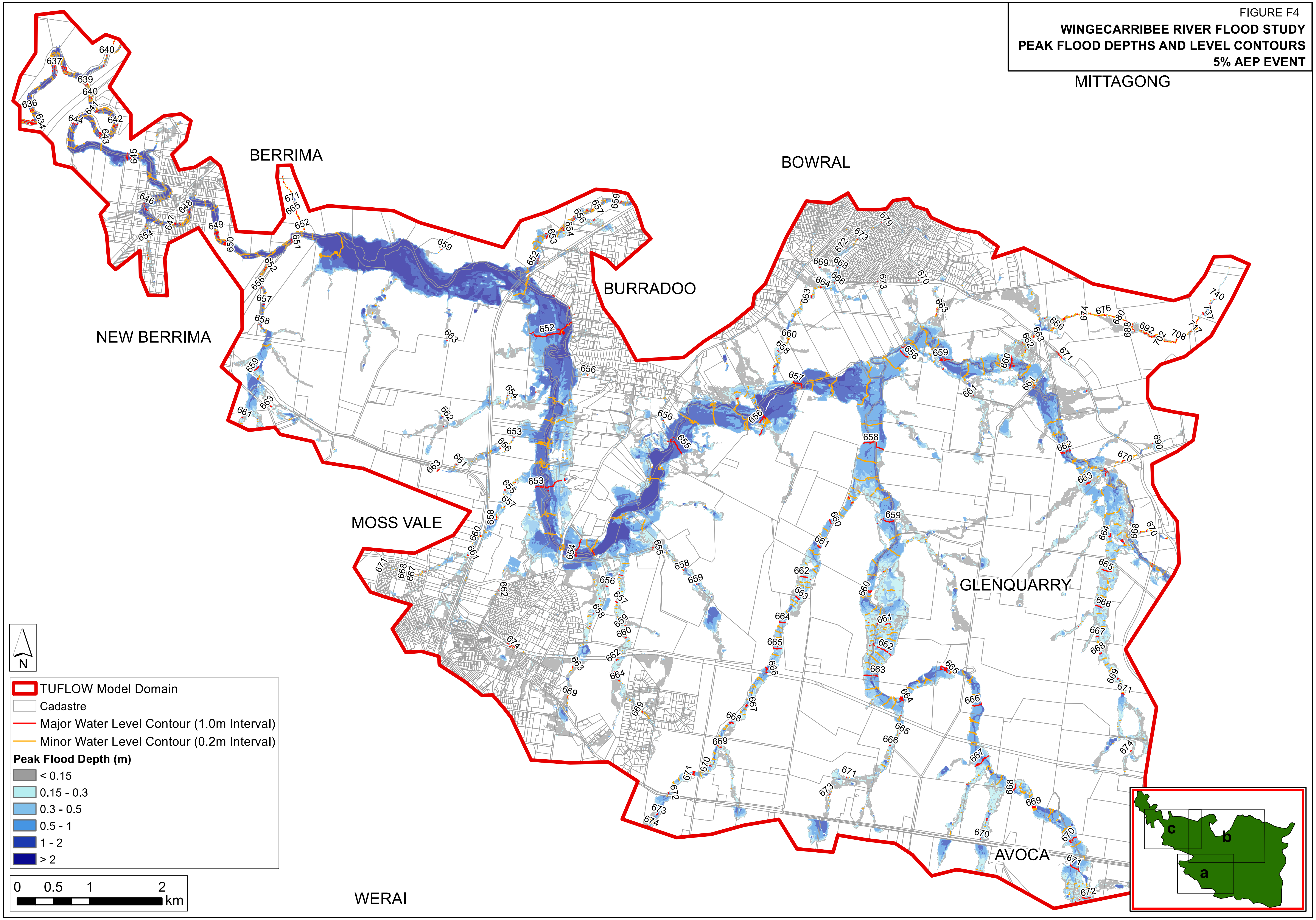


FIGURE F3c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
10% AEP EVENT

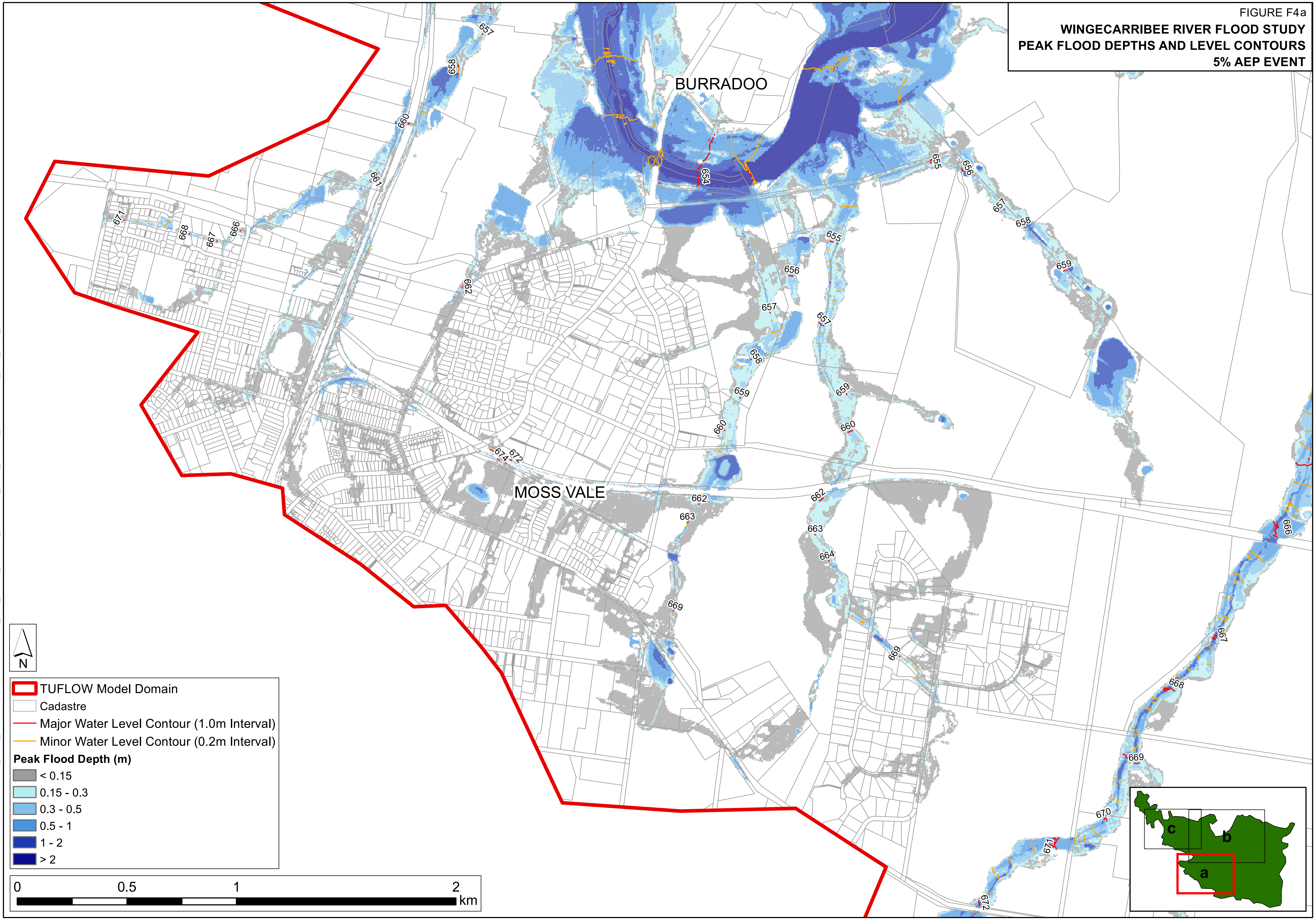


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F03_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_10p_AEP_EVENT.mxd



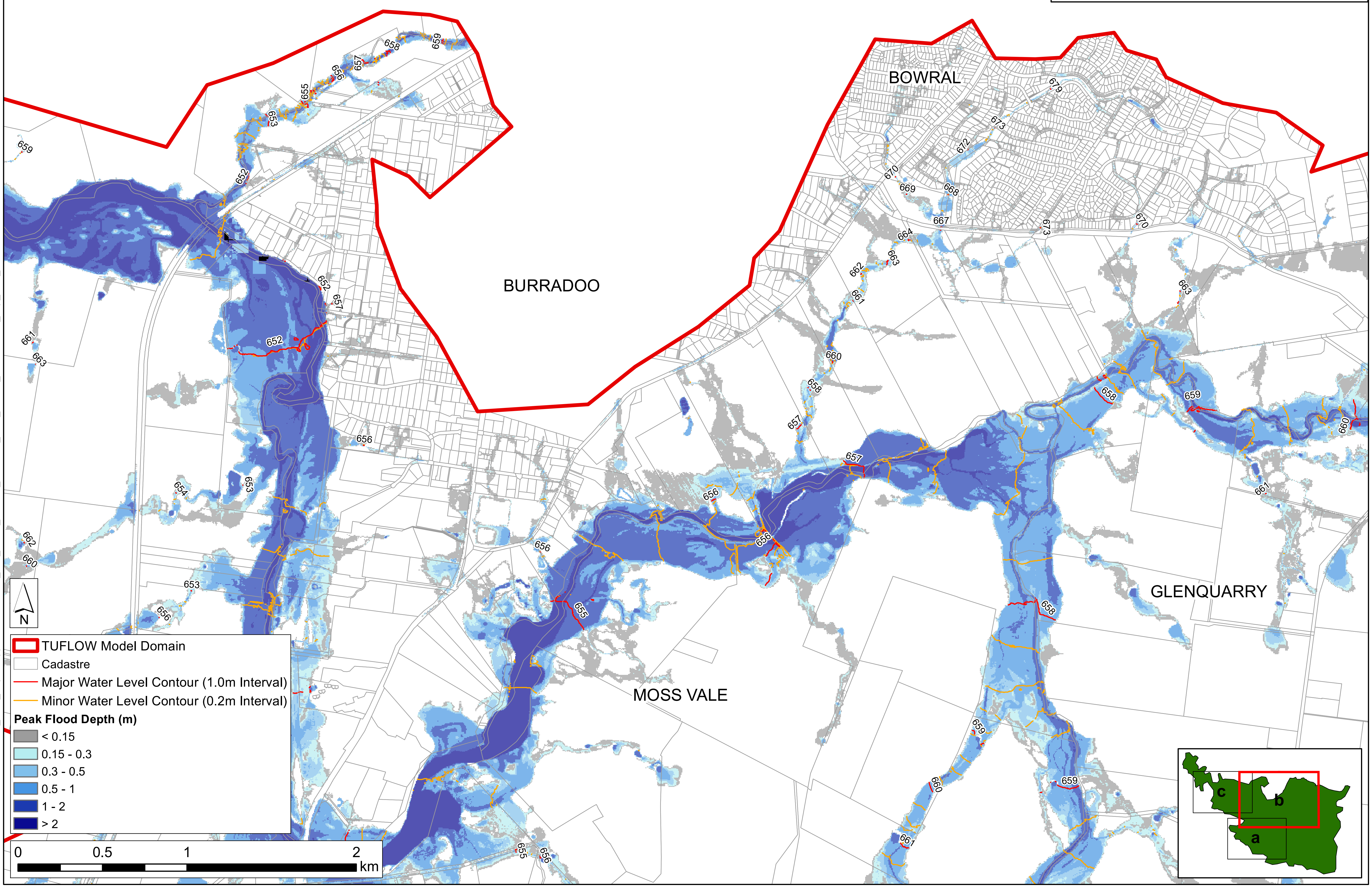
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F04_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_05p_AEP_EVENT.mxd

FIGURE F4a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
5% AEP EVENT



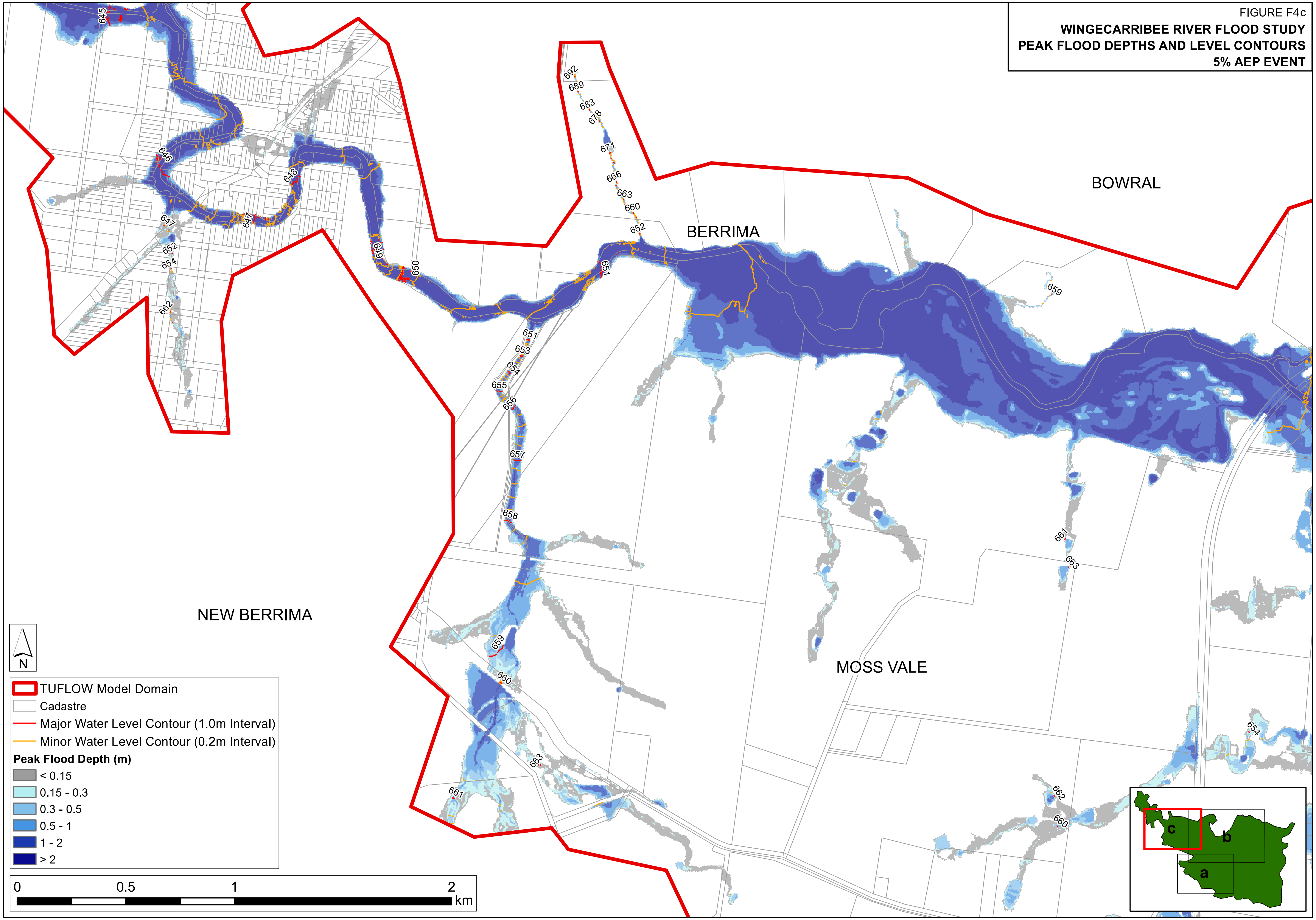
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F04_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_05p_AEP_EVENT.mxd

FIGURE F4b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
5% AEP EVENT



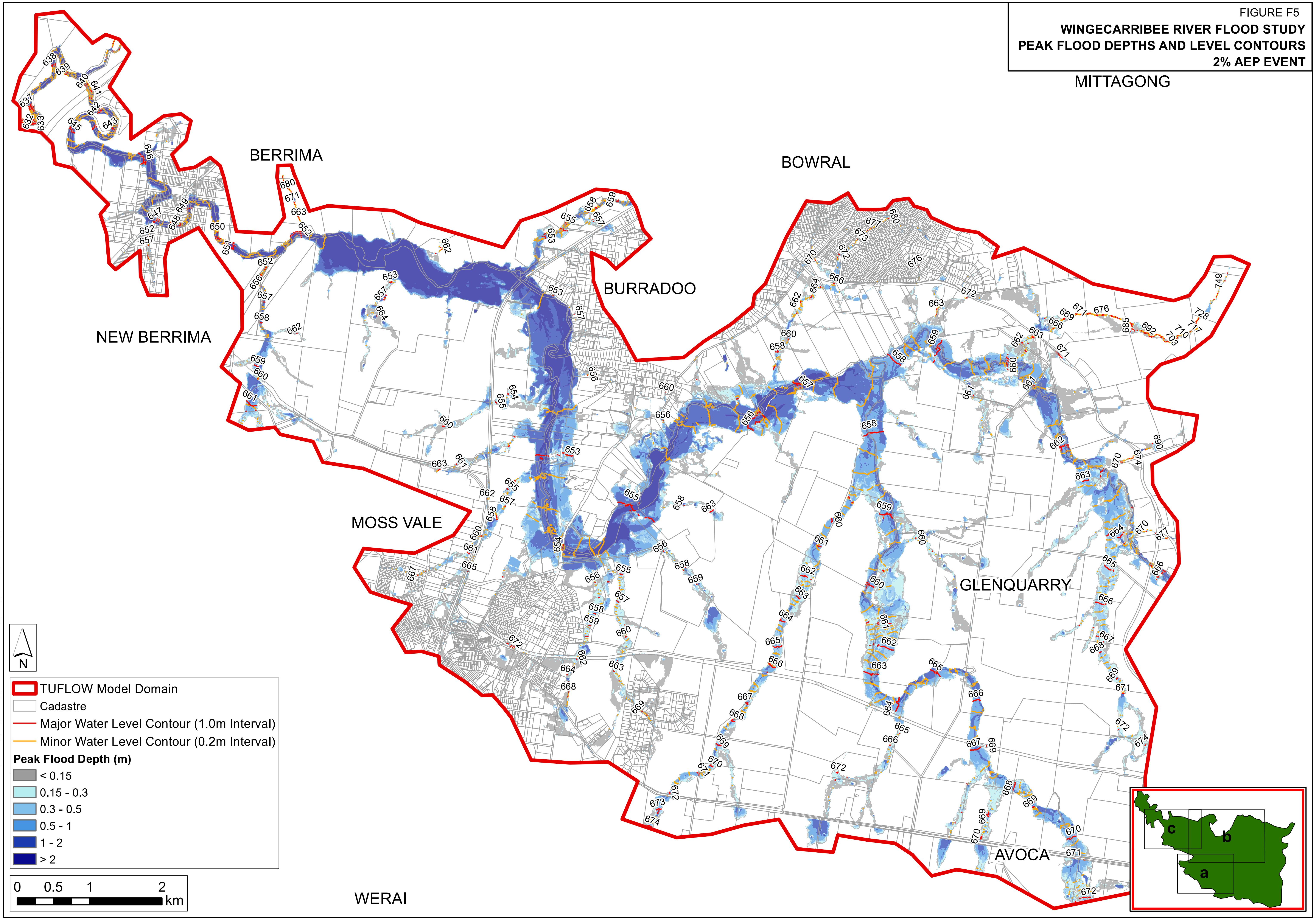
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F04_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_05p_AEP_EVENT.mxd

FIGURE F4c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F04_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_05p_AEP_EVENT.mxd

FIGURE F5
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F05_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_02p_AEP_EVENT.mxd

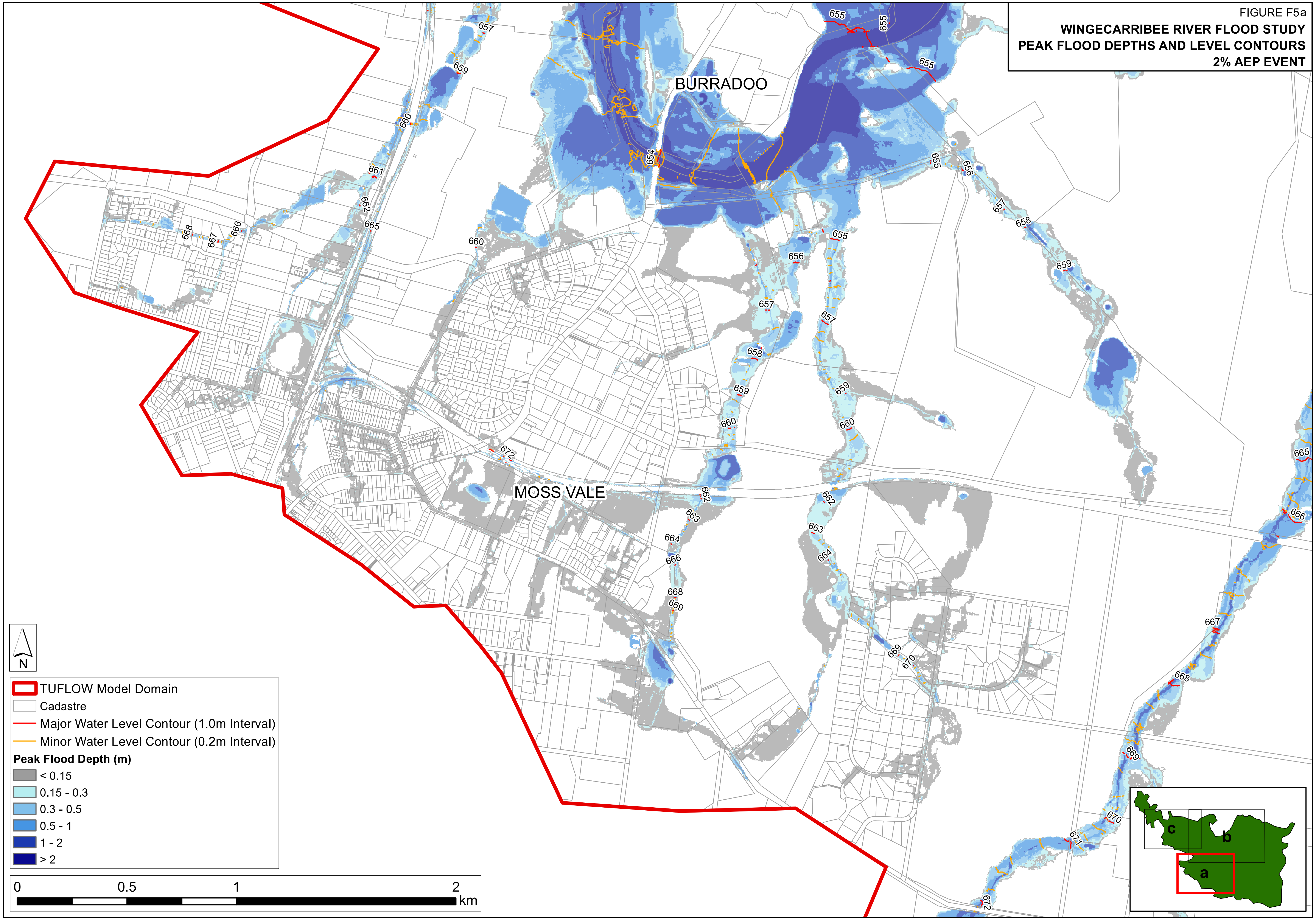


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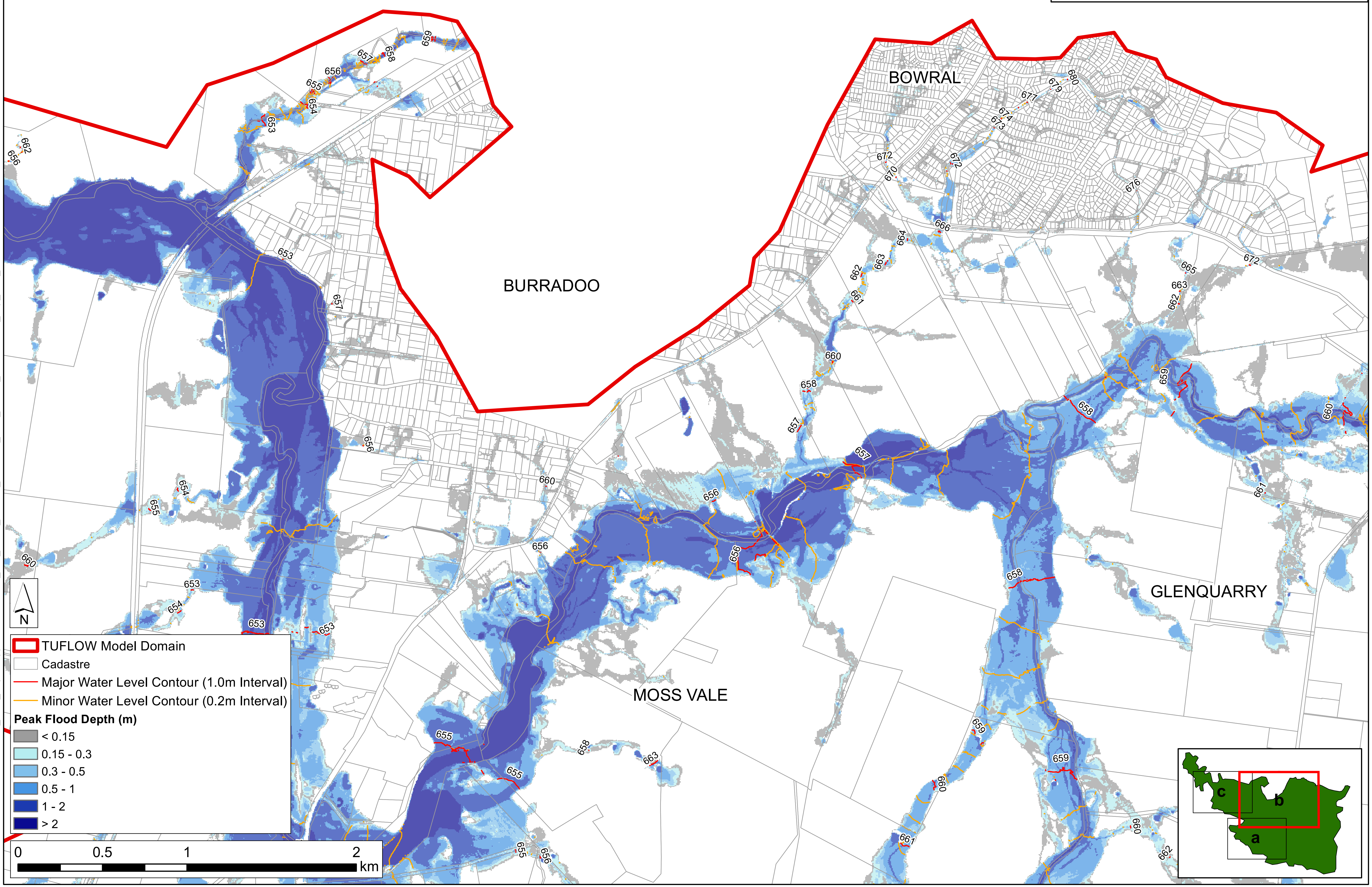
FIGURE F5b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
2% AEP EVENT



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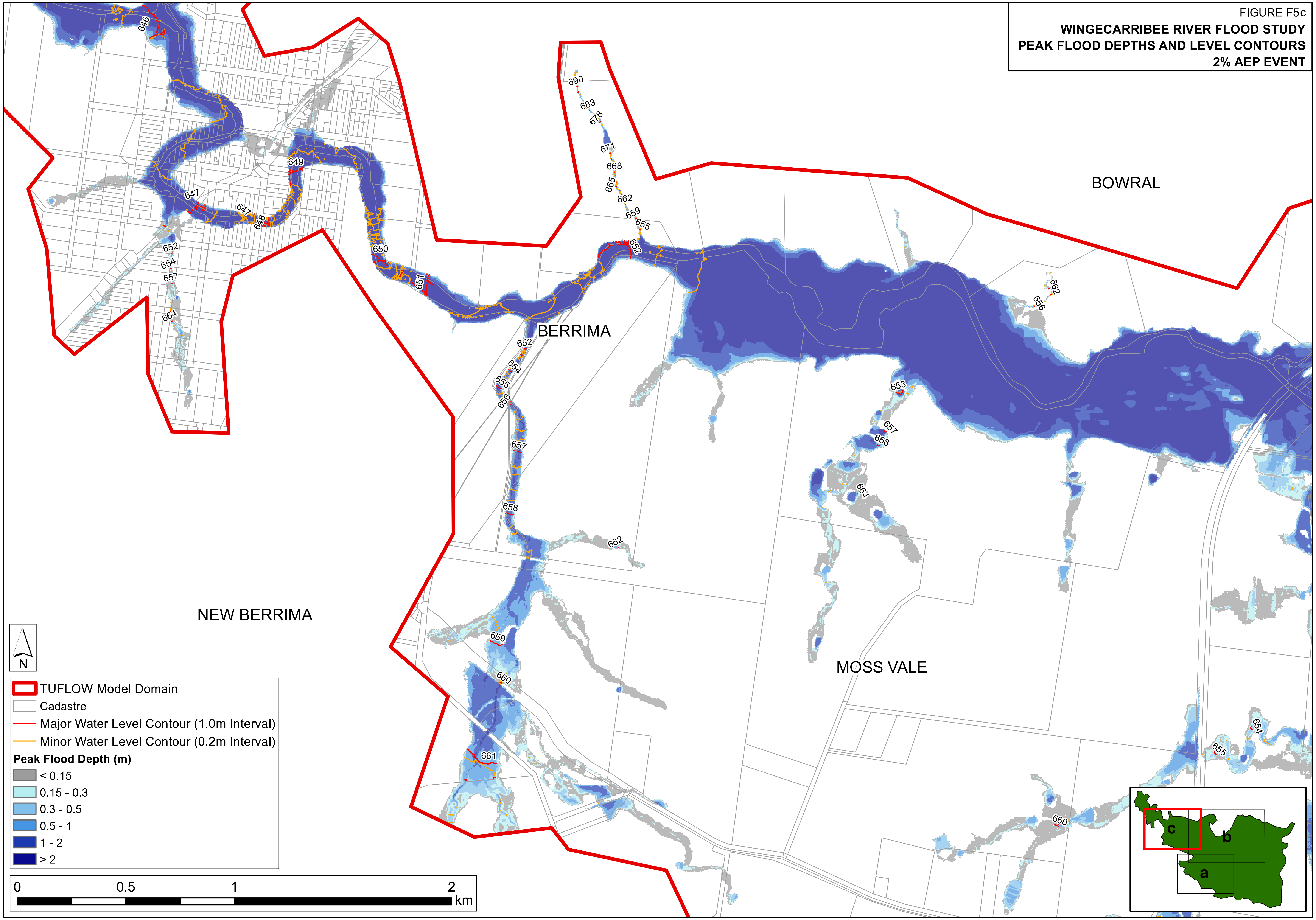
FIGURE F5c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
2% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Major Water Level Contour (1.0m Interval)
Minor Water Level Contour (0.2m Interval)
Peak Flood Depth (m)
< 0.15
0.15 - 0.3
0.3 - 0.5
0.5 - 1
1 - 2
> 2
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F05_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_02p_AEP_EVENT.mxd

FIGURE F6
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
1% AEP EVENT

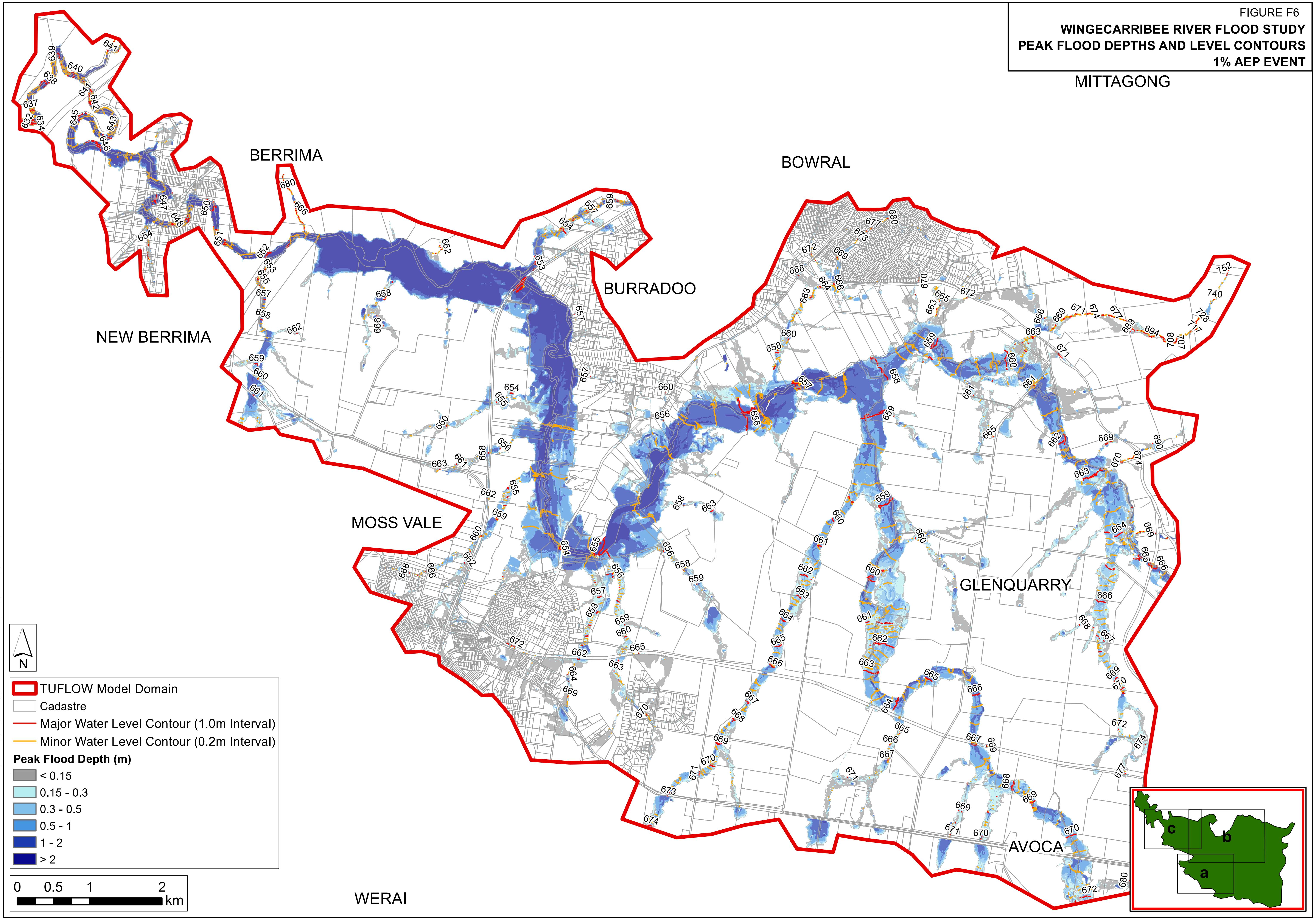

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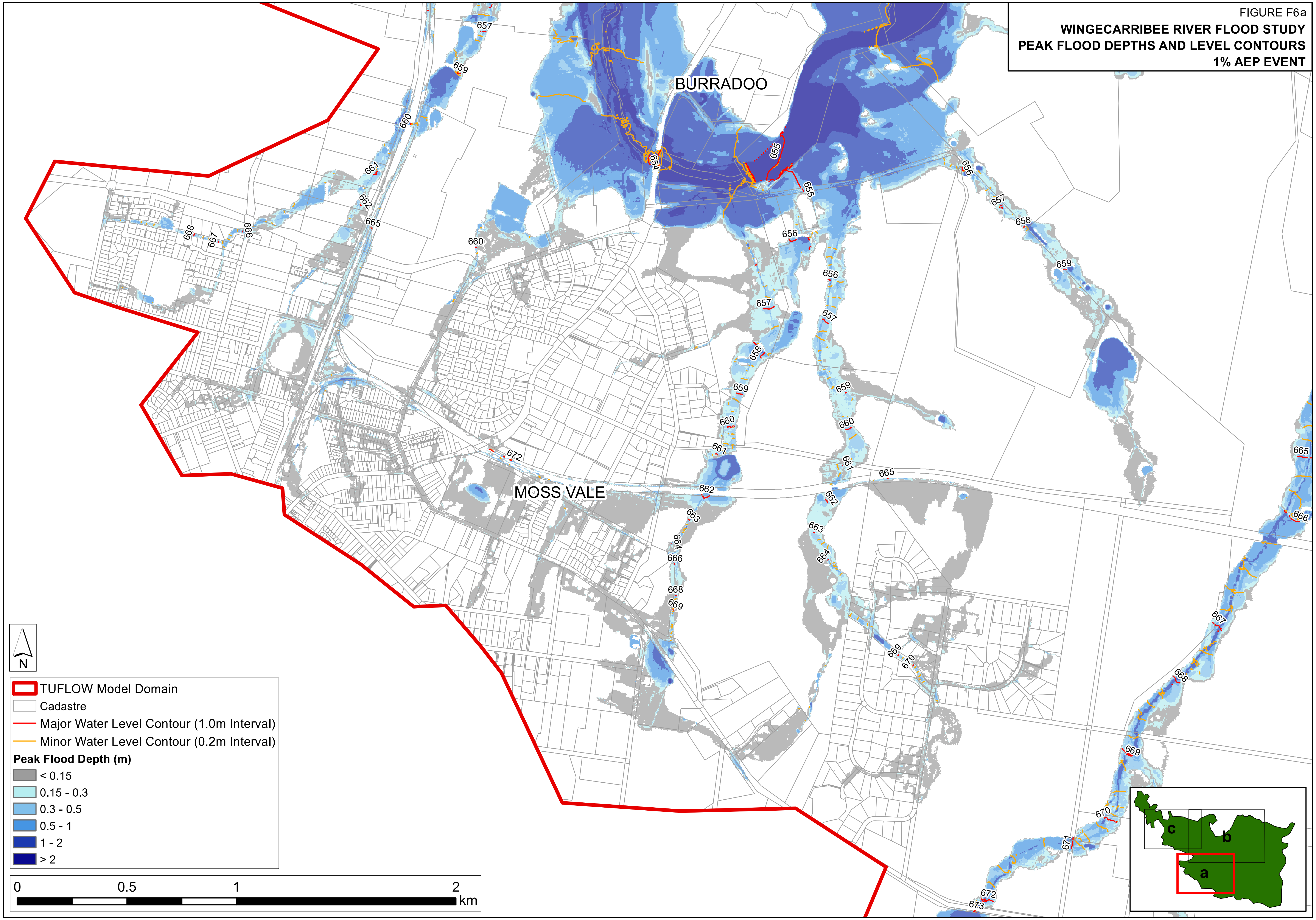
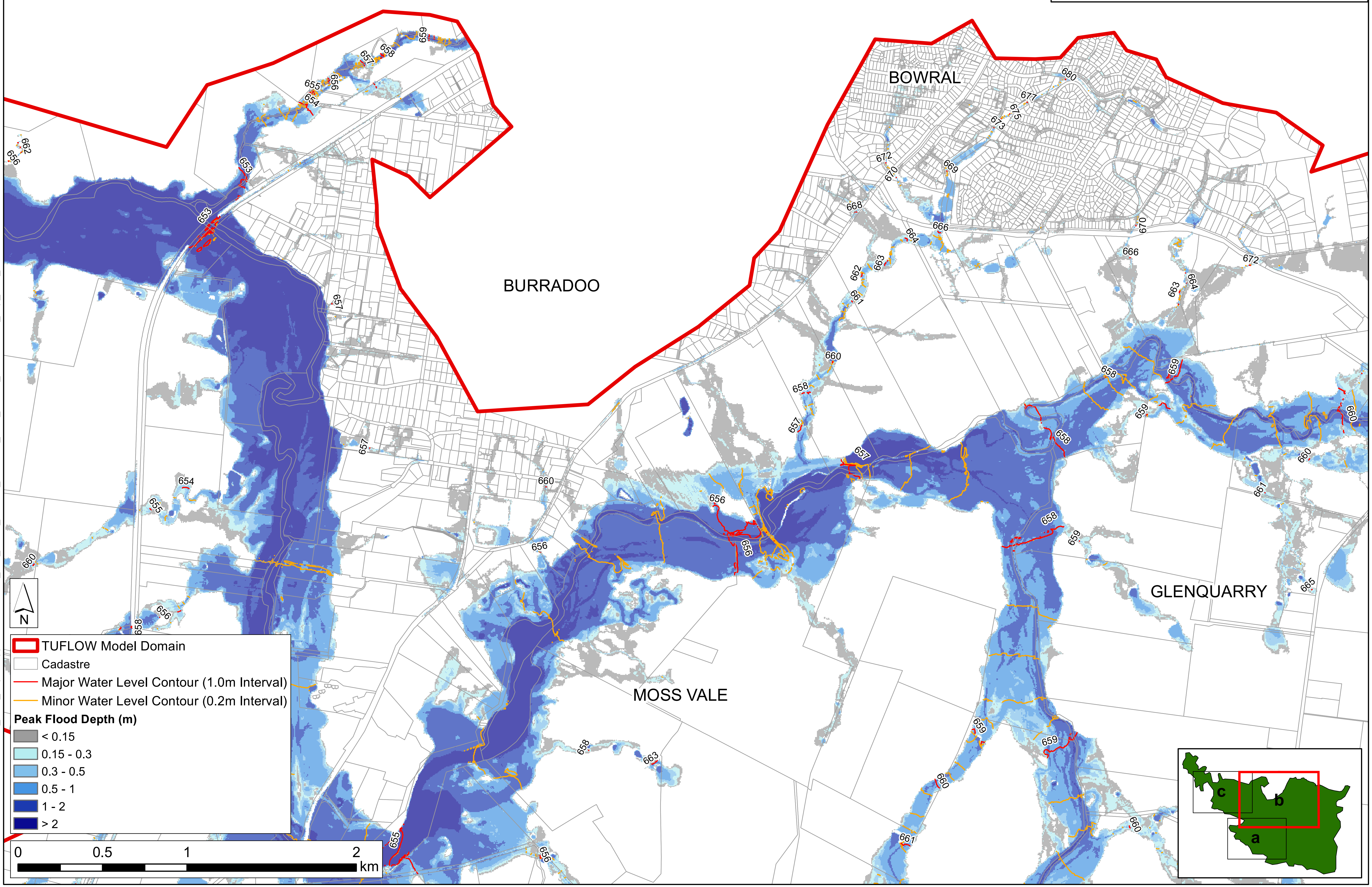
FIGURE F6a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
1% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F06_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_01p_AEP_EVENT.mxd

FIGURE F6b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
1% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F06_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_01p_AEP_EVENT.mxd

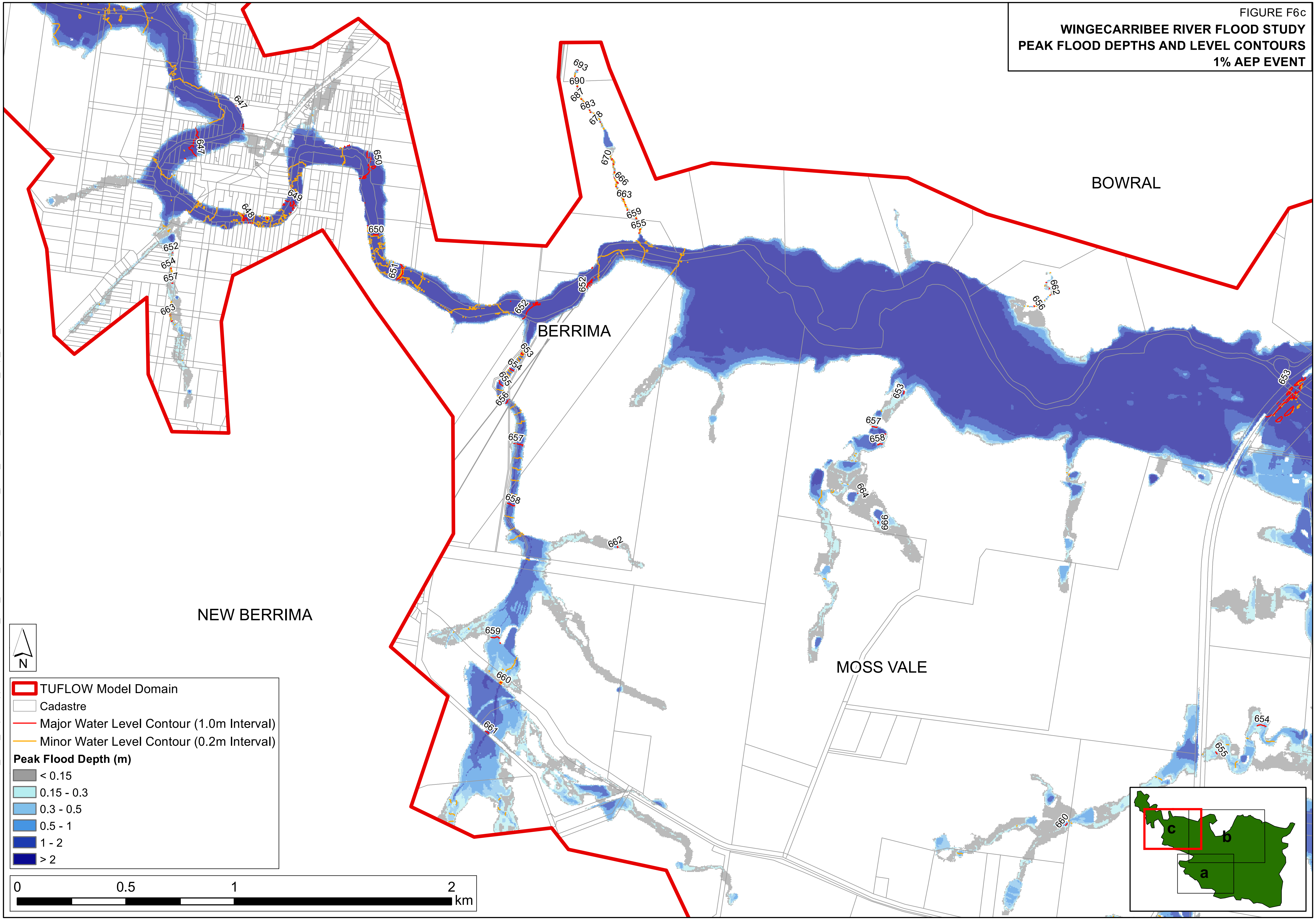


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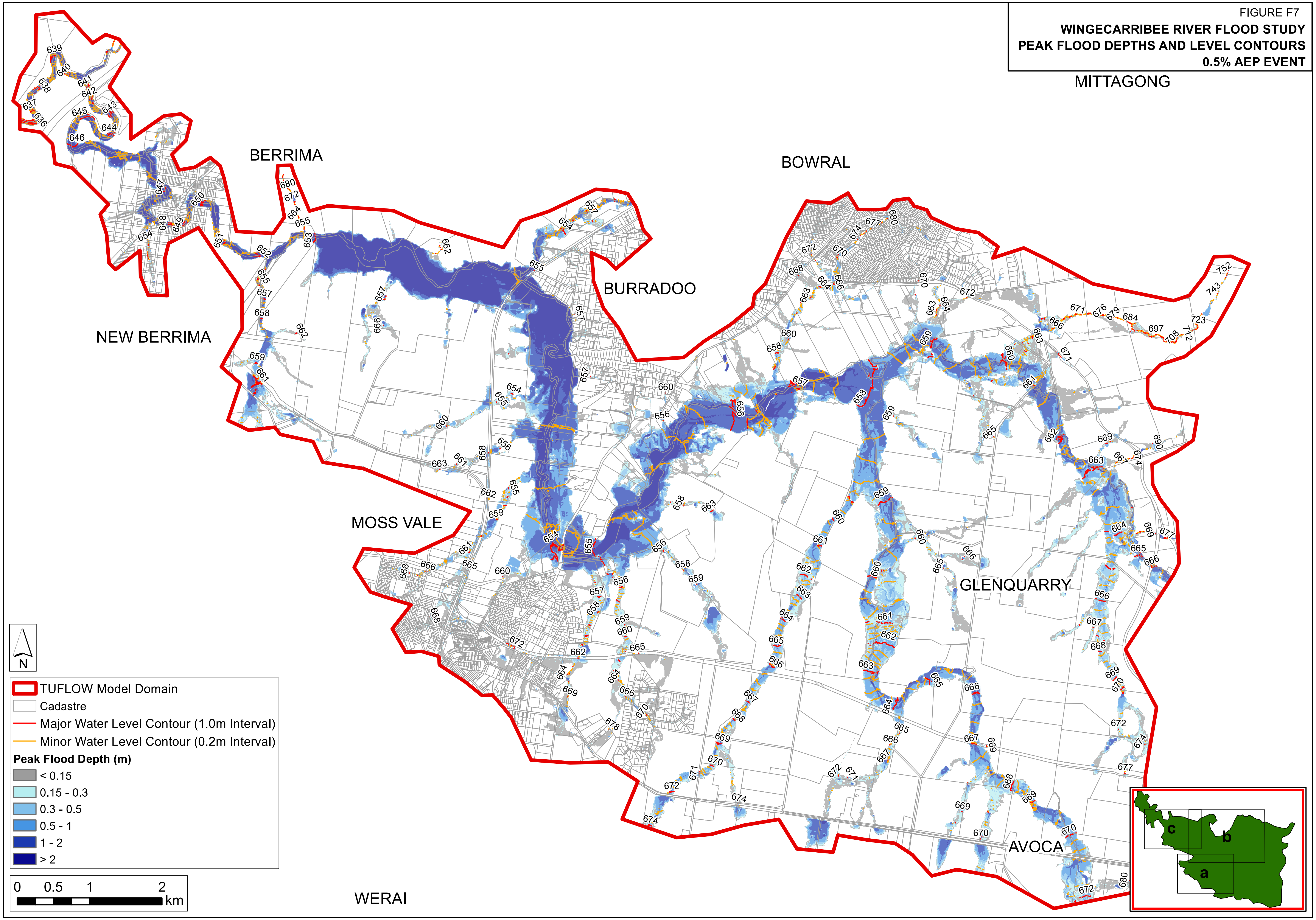
FIGURE F7
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F07_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in200_AEP_EVENT.mxd

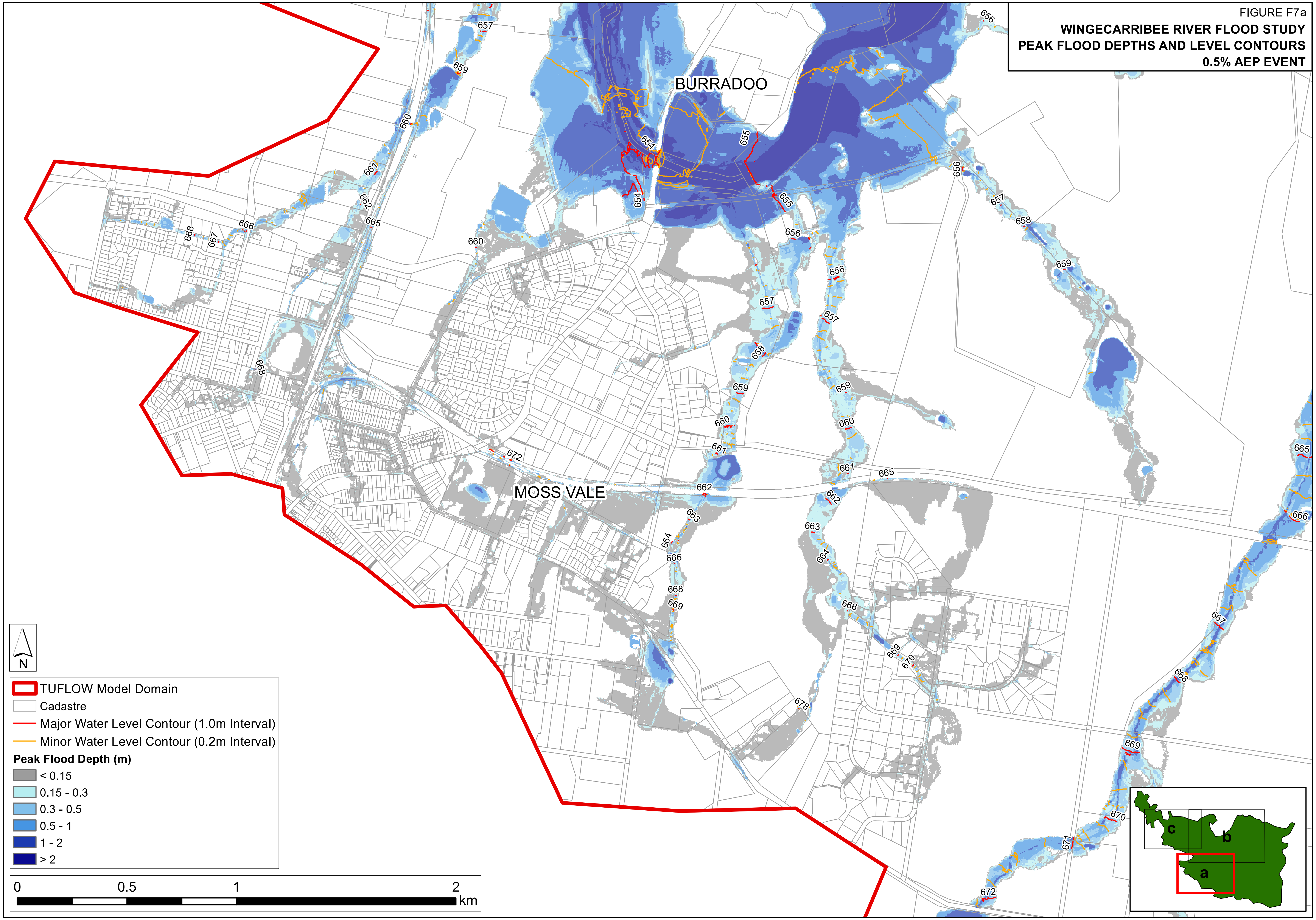
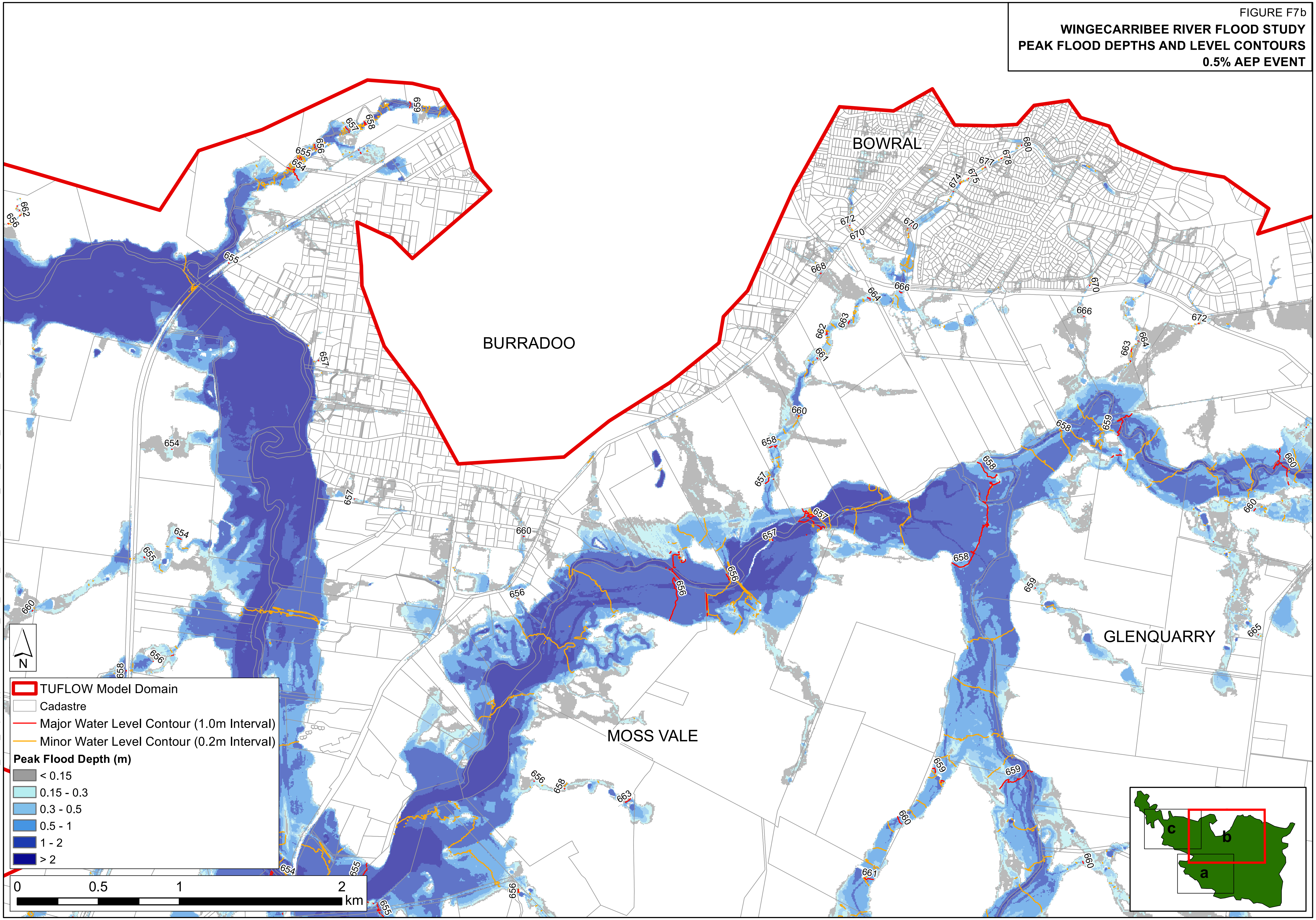


FIGURE F7a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.5% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F07_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in200_AEP_EVENT.mxd

FIGURE F7b

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.5% AEP EVENT



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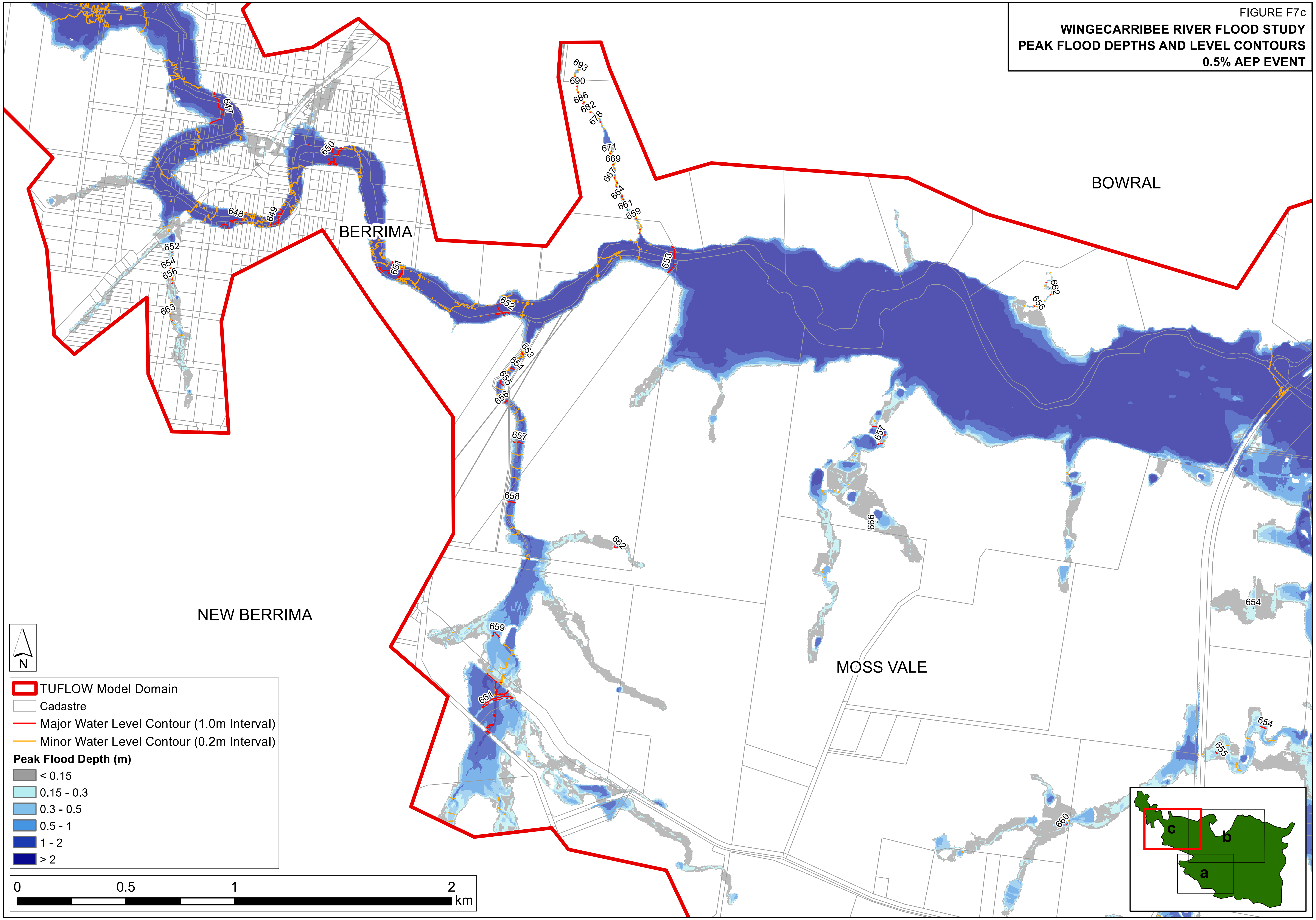

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F07_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in200_AEP_EVENT.mxd

FIGURE F8

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.2% AEP EVENT

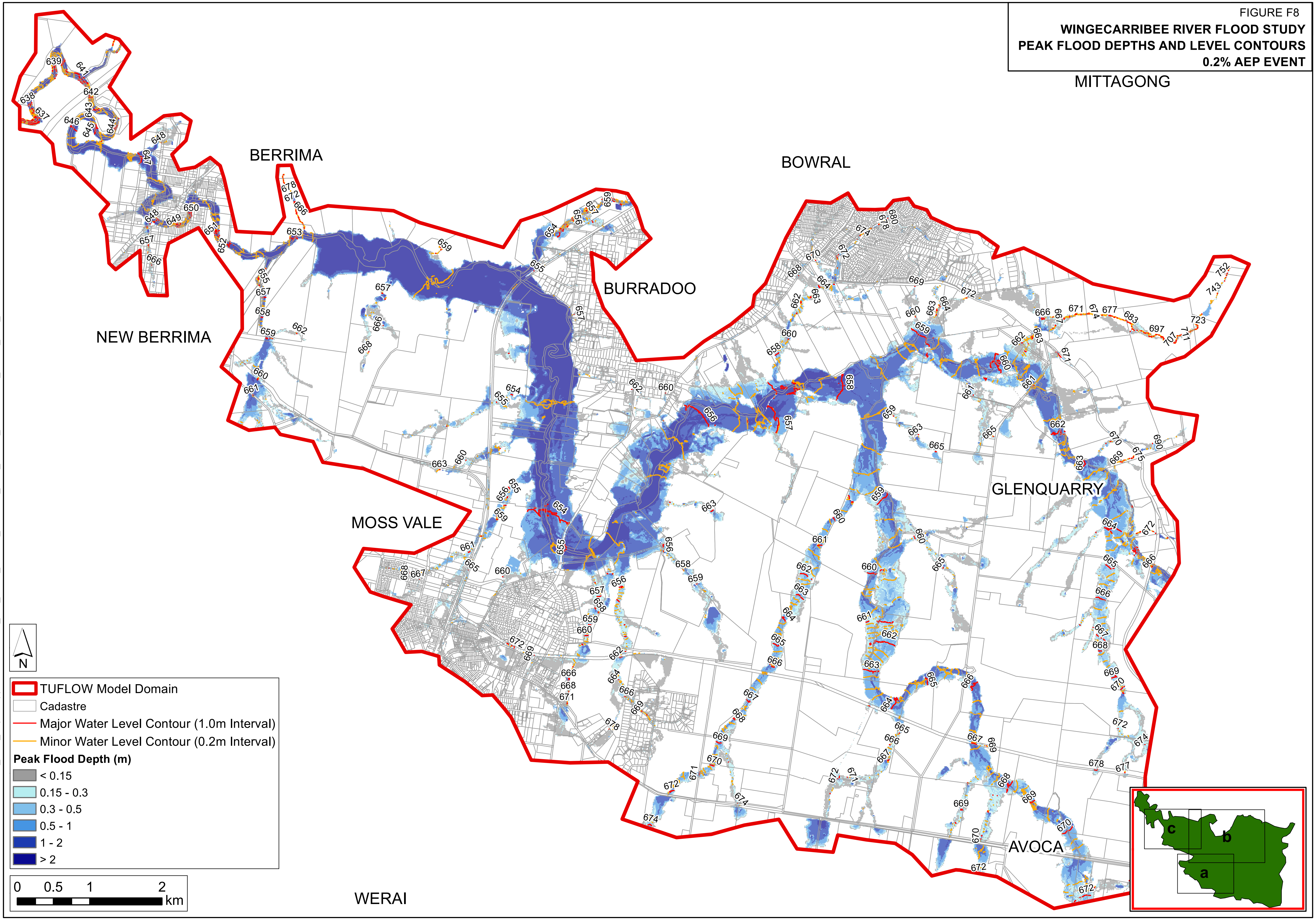

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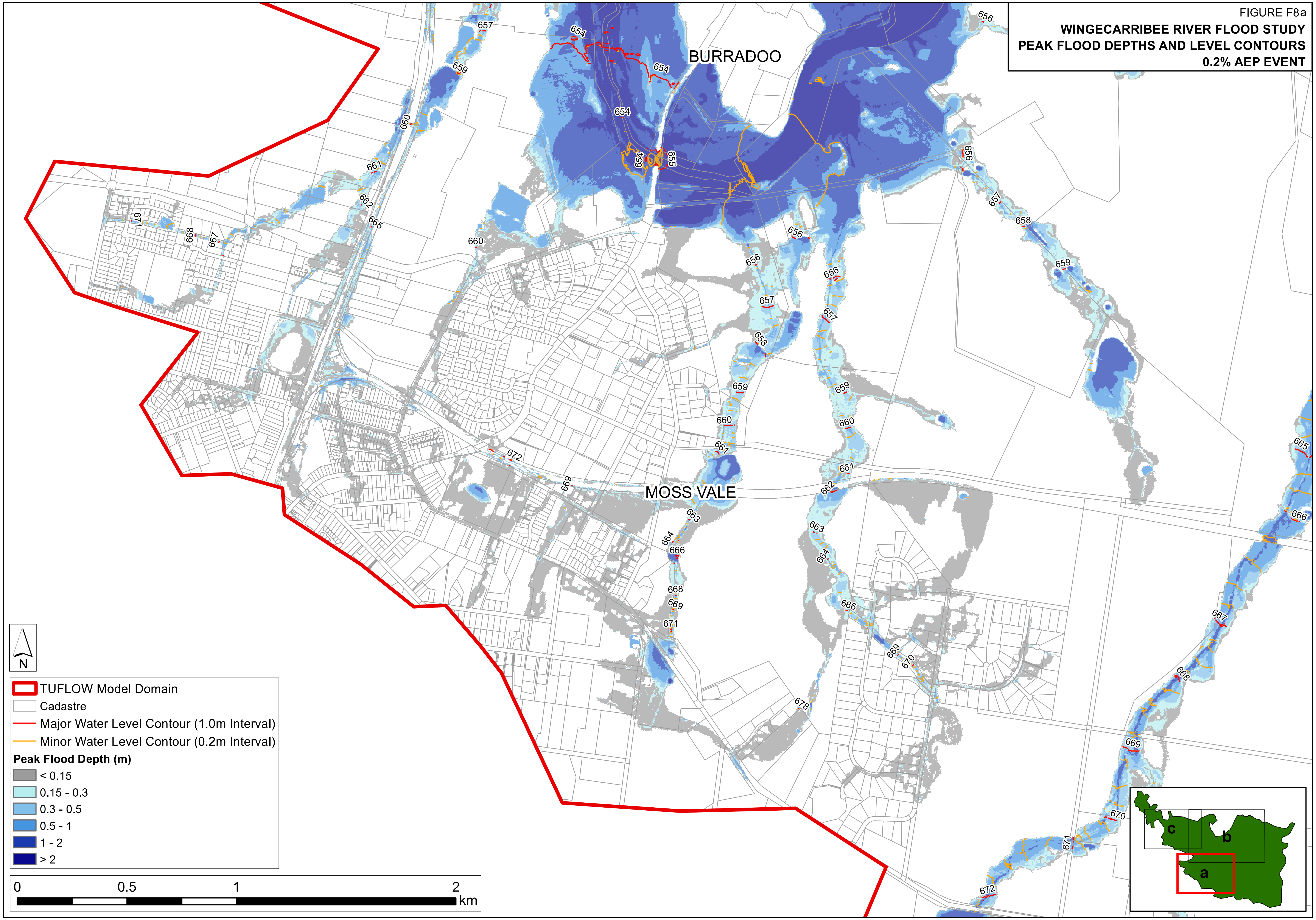
FIGURE F8a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F08_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in500_AEP_EVENT.mxd

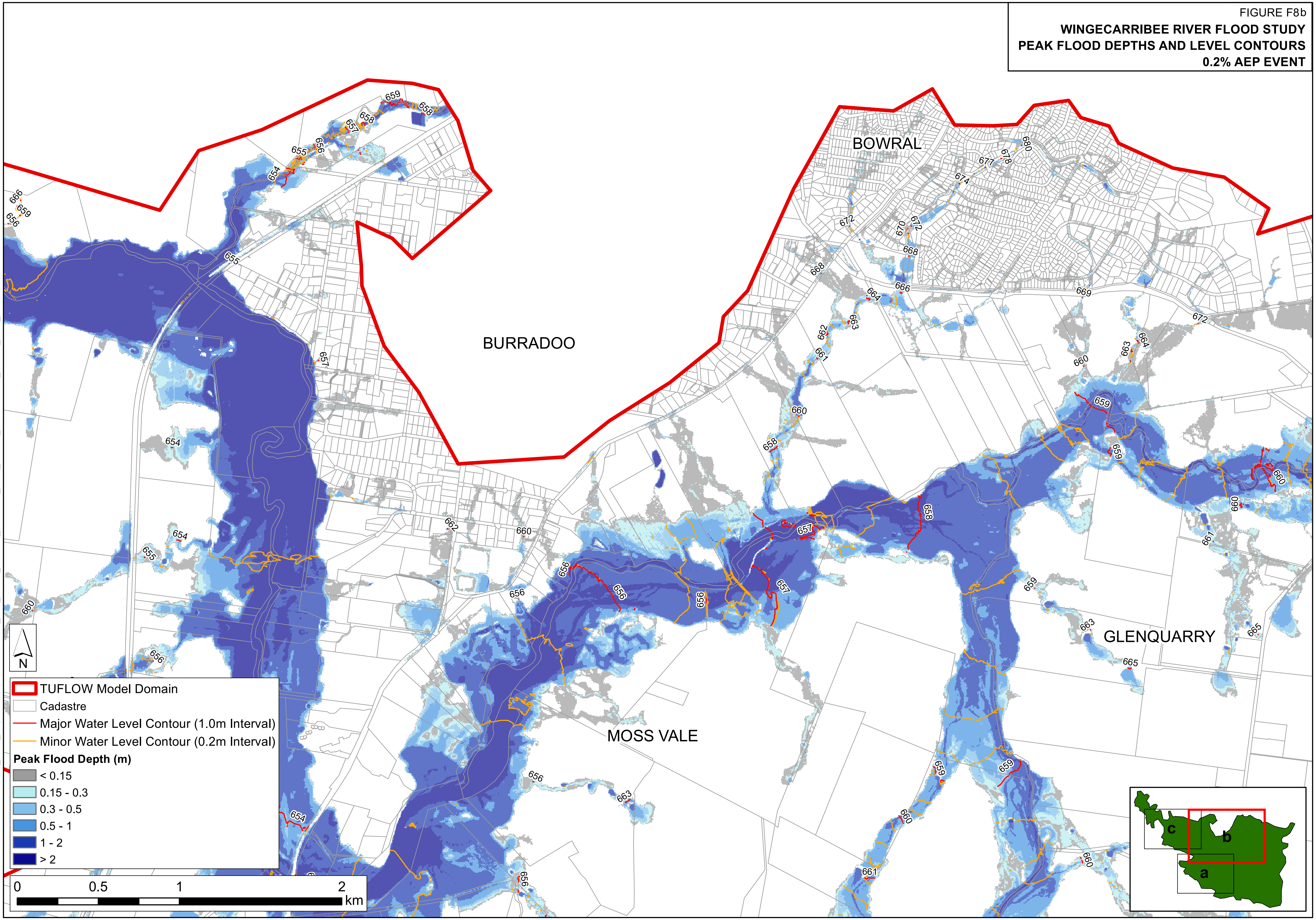


FIGURE F8b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.2% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_ReportAppendixF\FIGURE_F08_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in500_AEP_EVENT.mxd

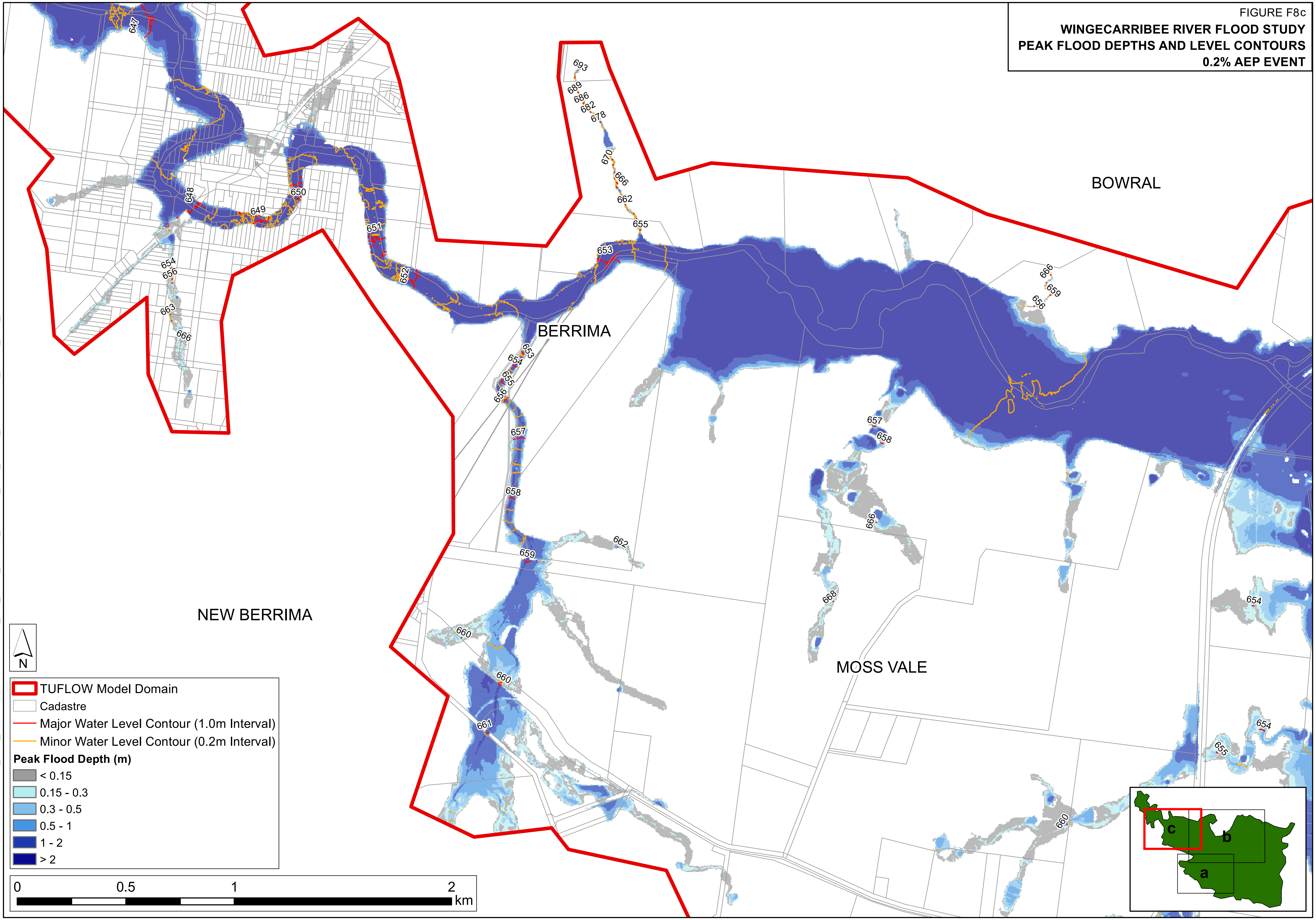
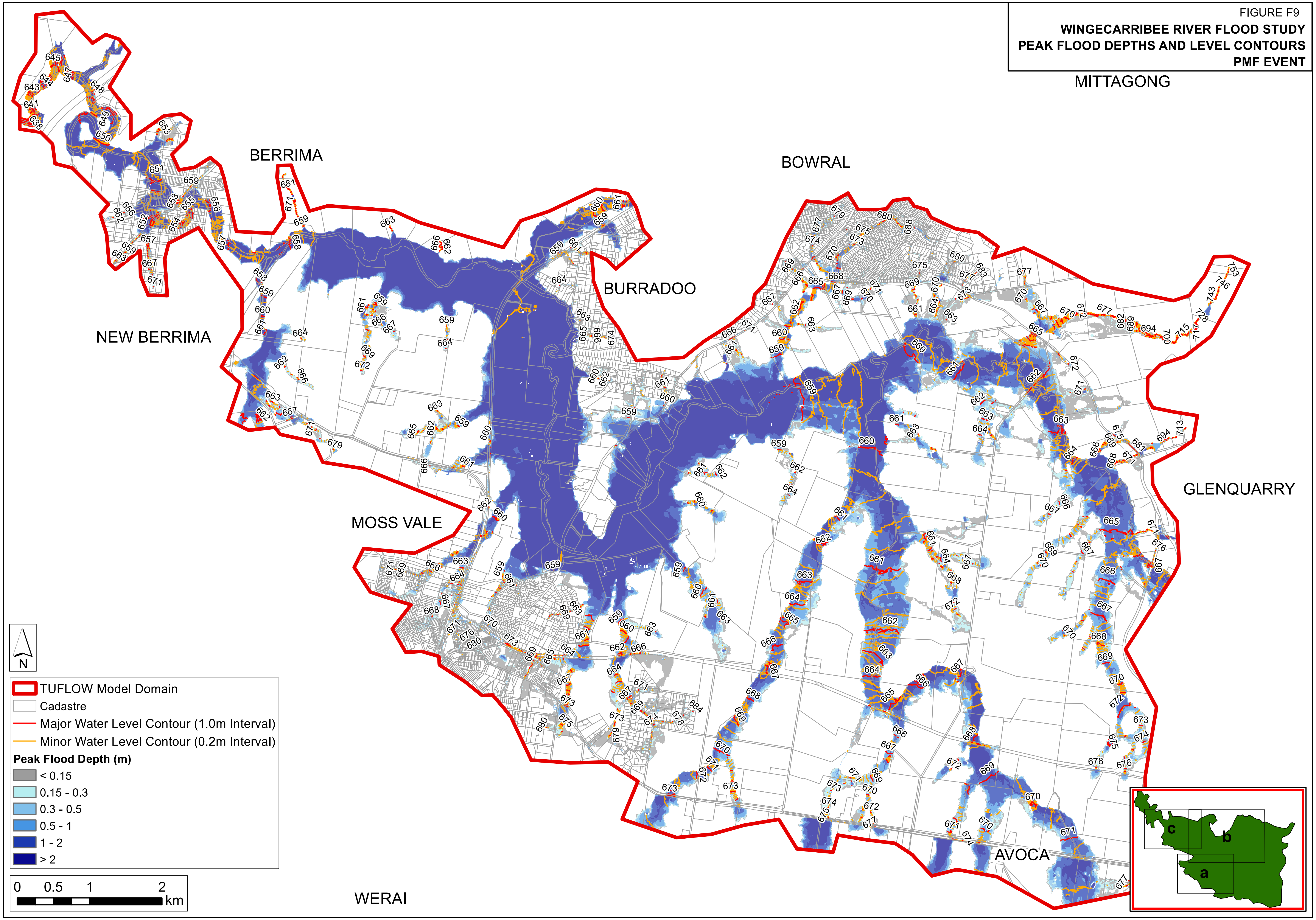
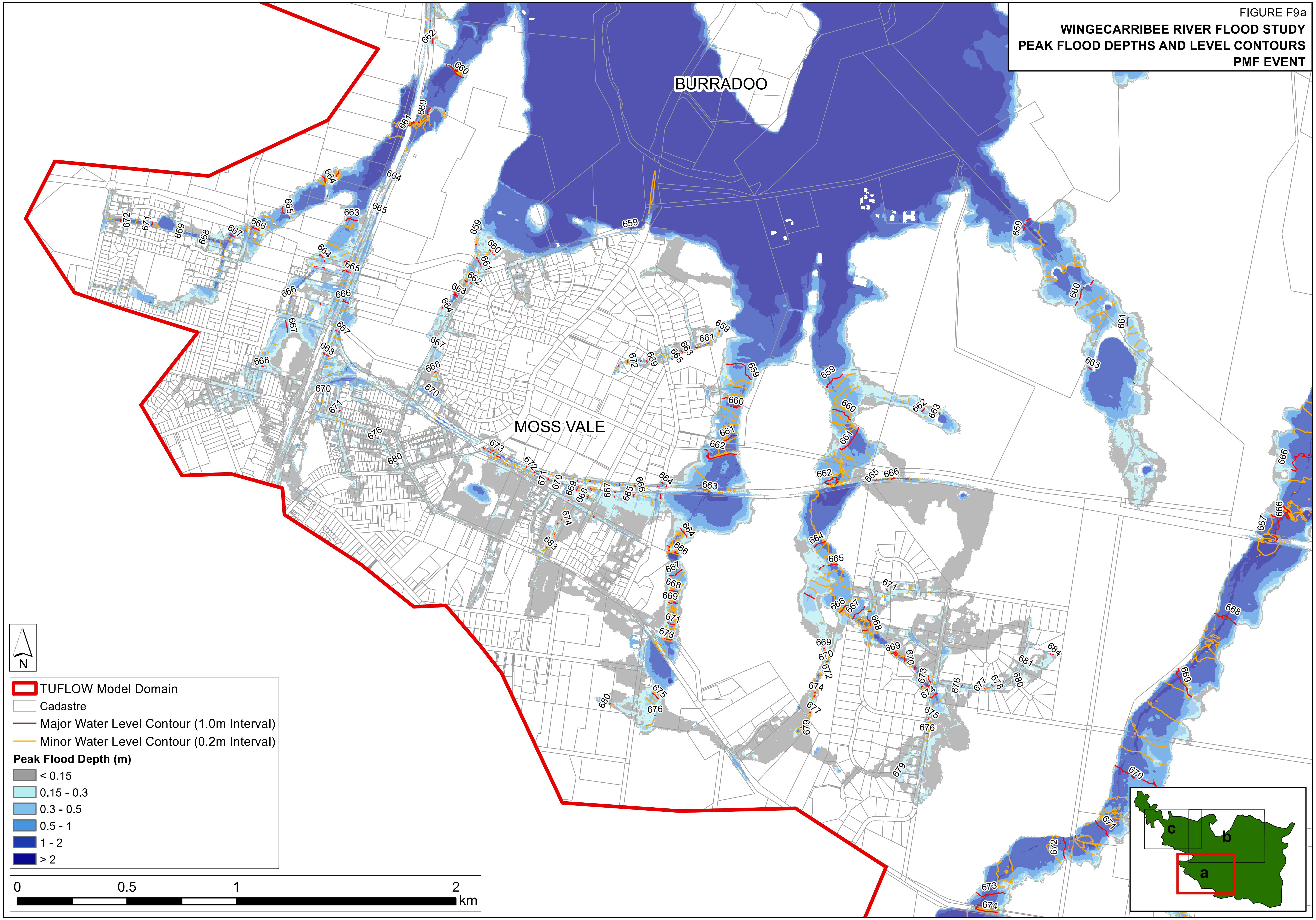


FIGURE F8c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.2% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Major Water Level Contour (1.0m Interval)
Minor Water Level Contour (0.2m Interval)
Peak Flood Depth (m)
< 0.15
0.15 - 0.3
0.3 - 0.5
0.5 - 1
1 - 2
> 2
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F08_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_1in500_AEP_EVENT.mxd



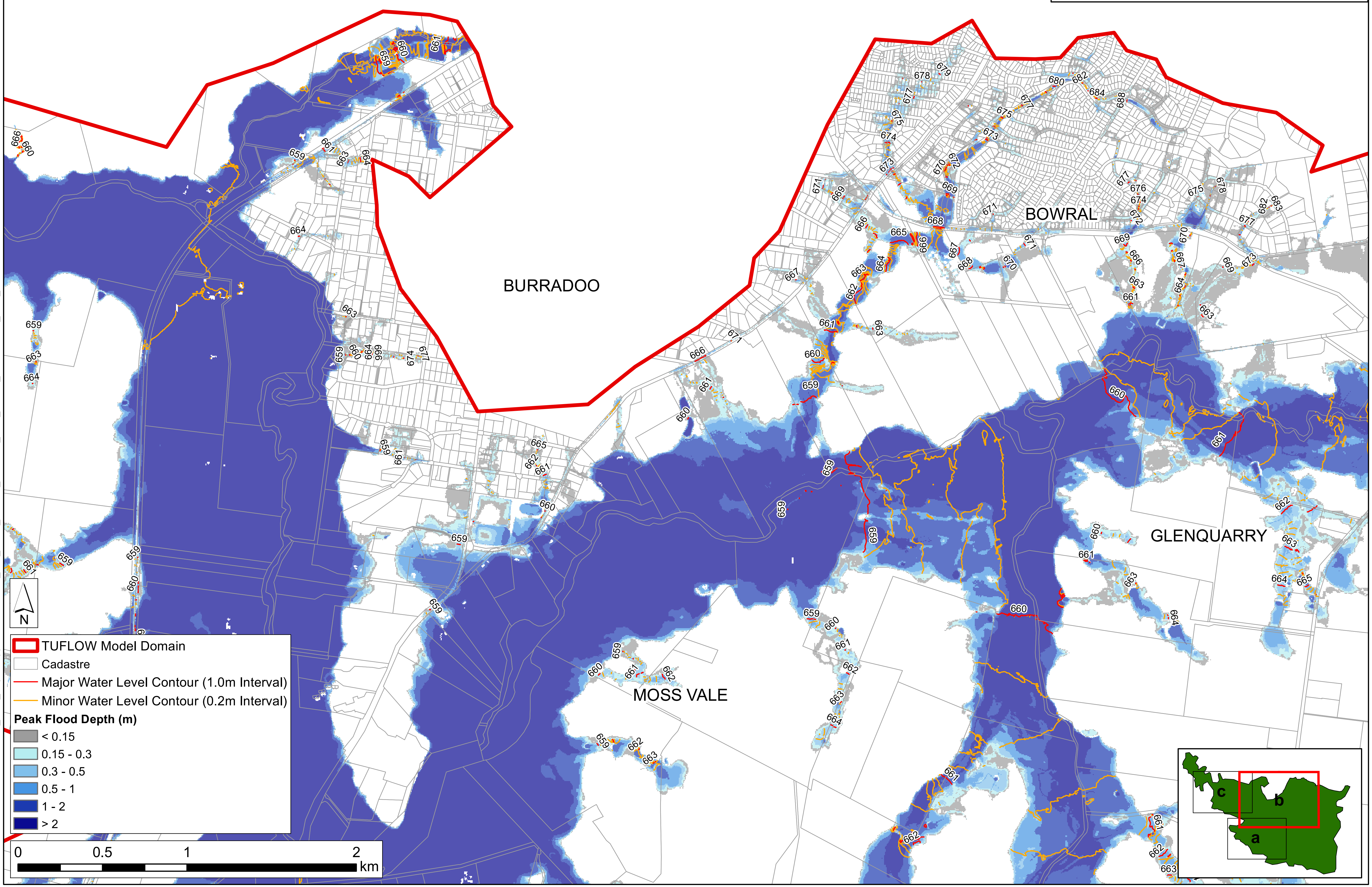
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F09_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_PMF_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F09_PEAK_FLOOD_DEPTHS_AND_LEVEL_CONTOURS_PMF_EVENT.mxd

FIGURE F9b

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
PMF EVENT



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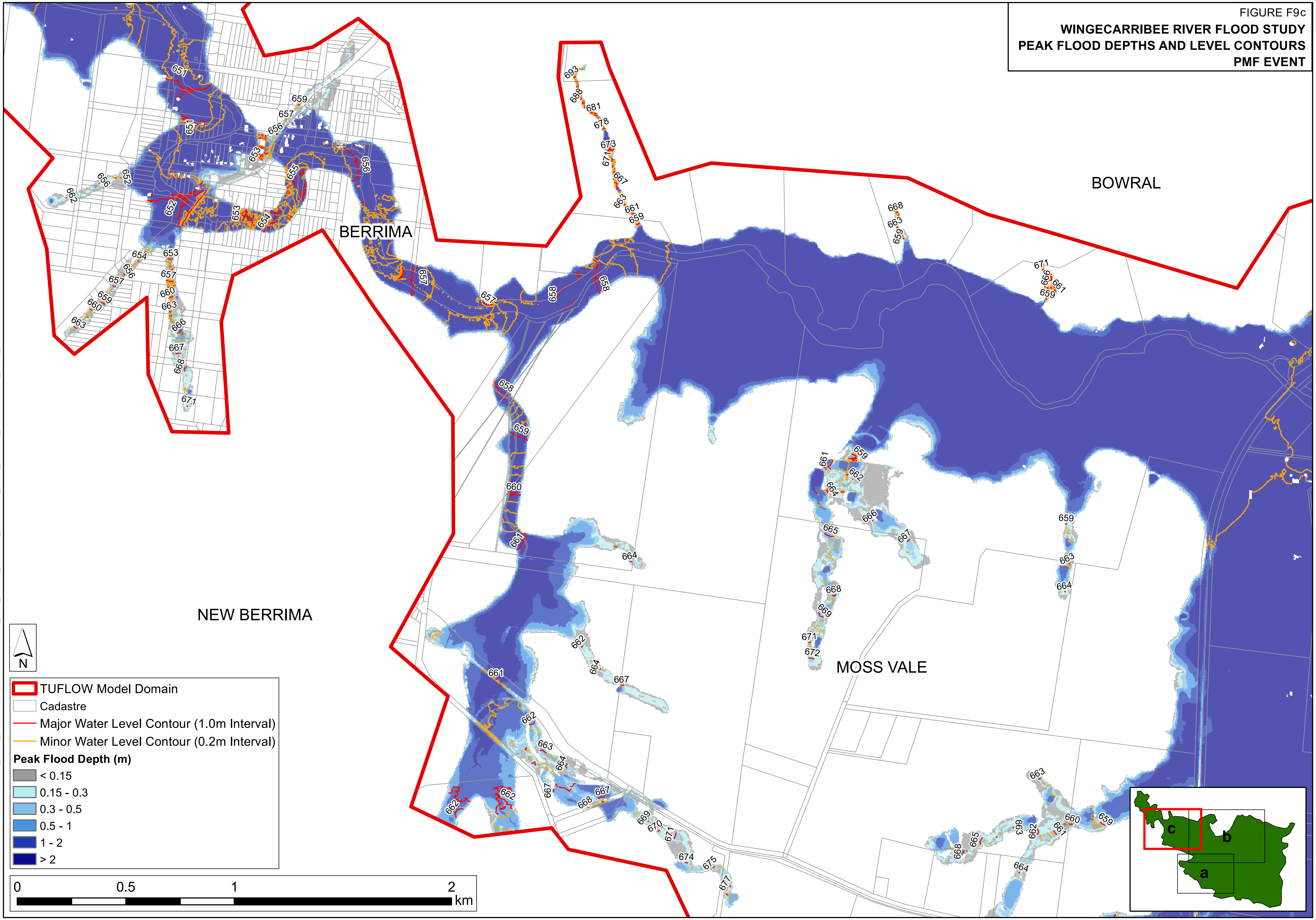

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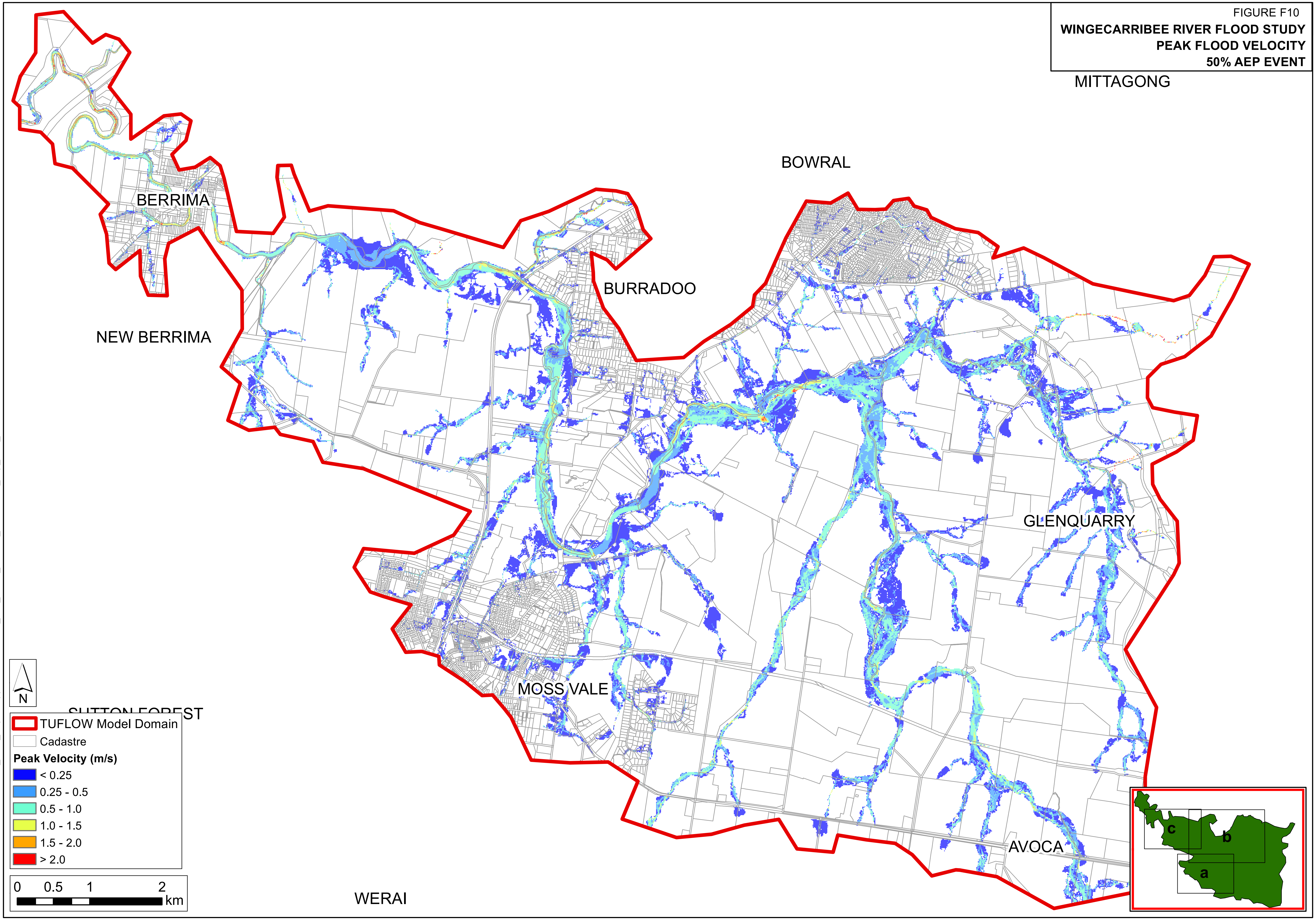

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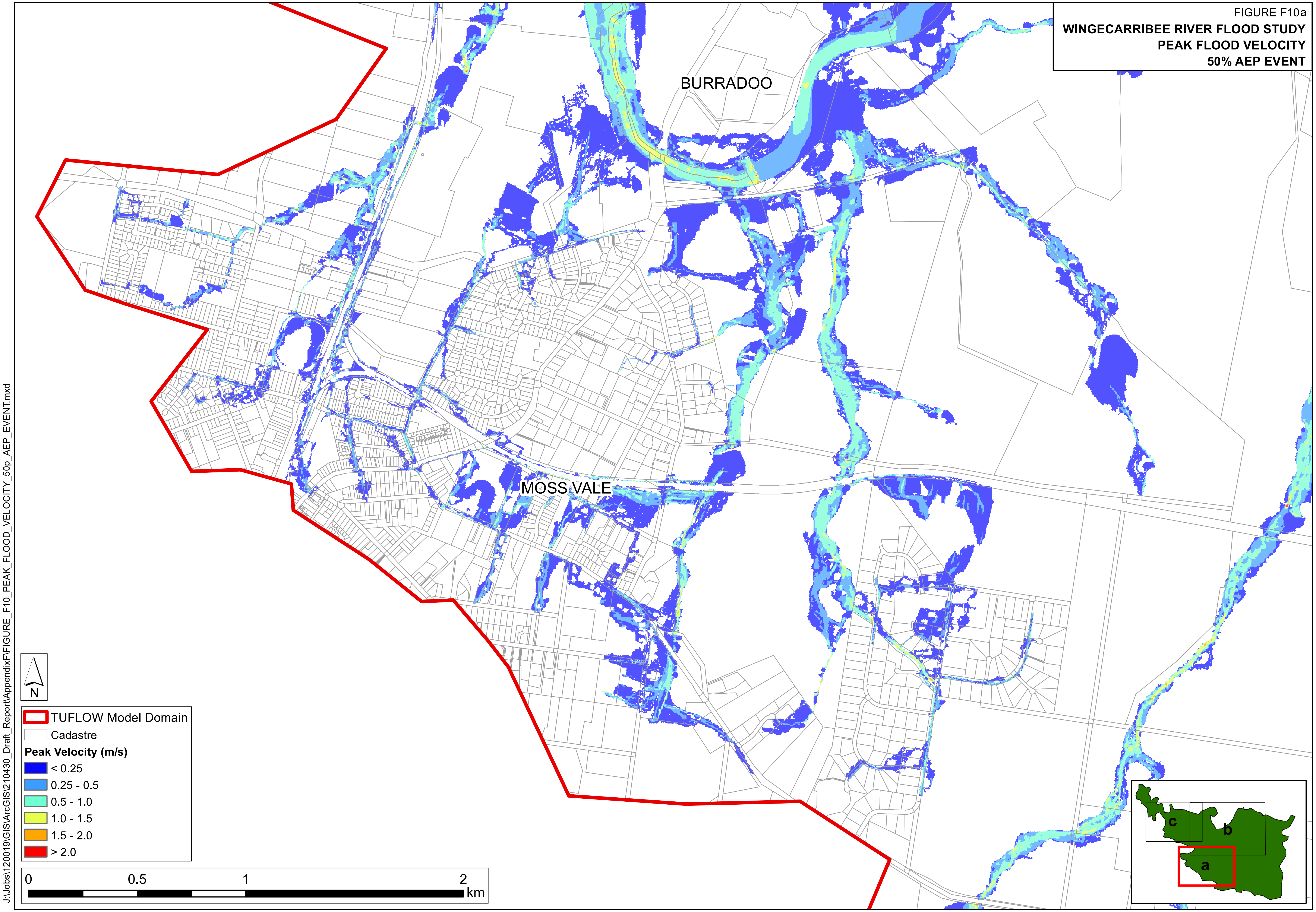


FIGURE F10a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
50% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F10_PEAK_FLOOD_VELOCITY_50p_AEP_EVENT.mxd

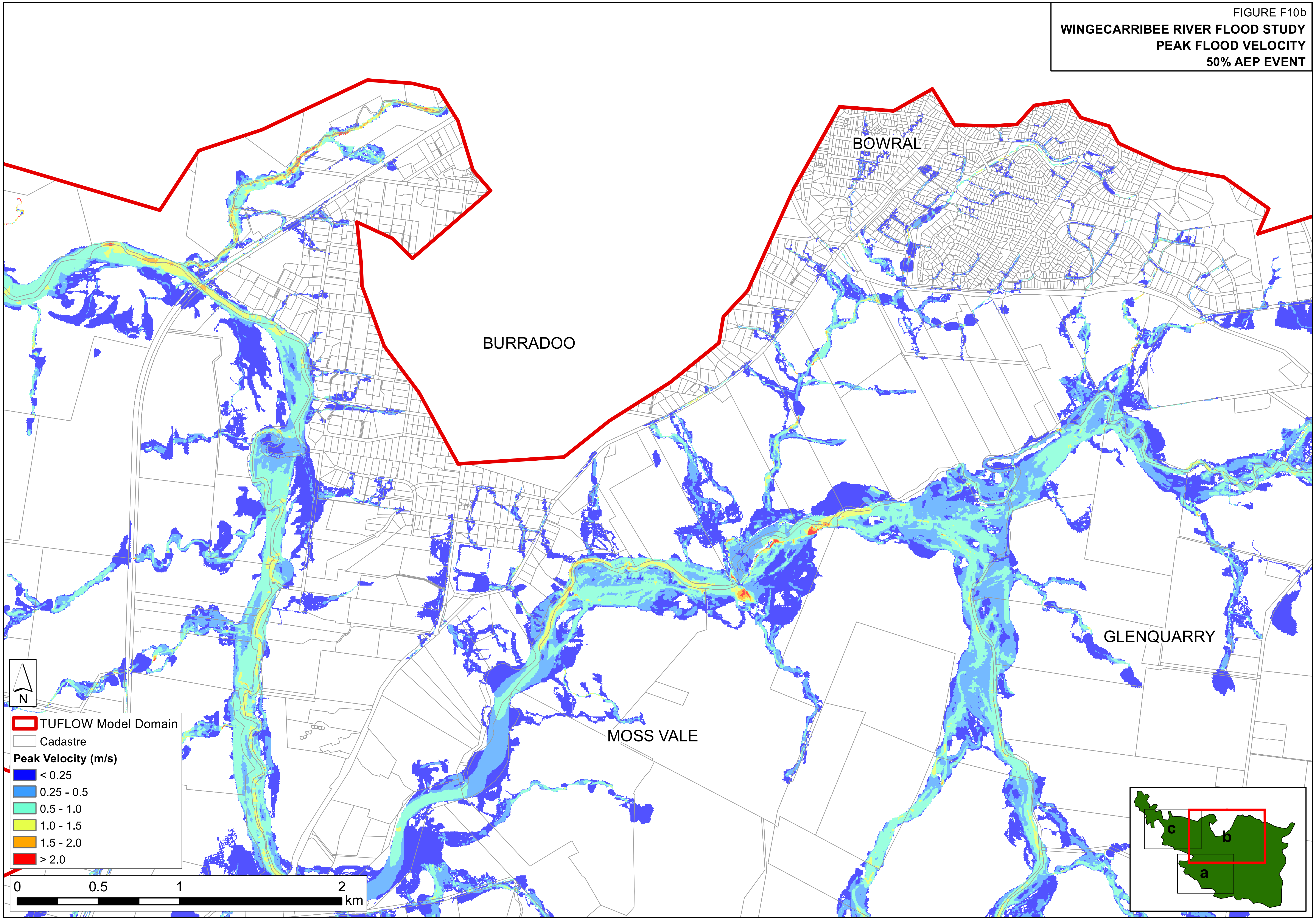


FIGURE F10b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
50% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
N
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F10_PEAK_FLOOD_VELOCITY_50p_AEP_EVENT.mxd

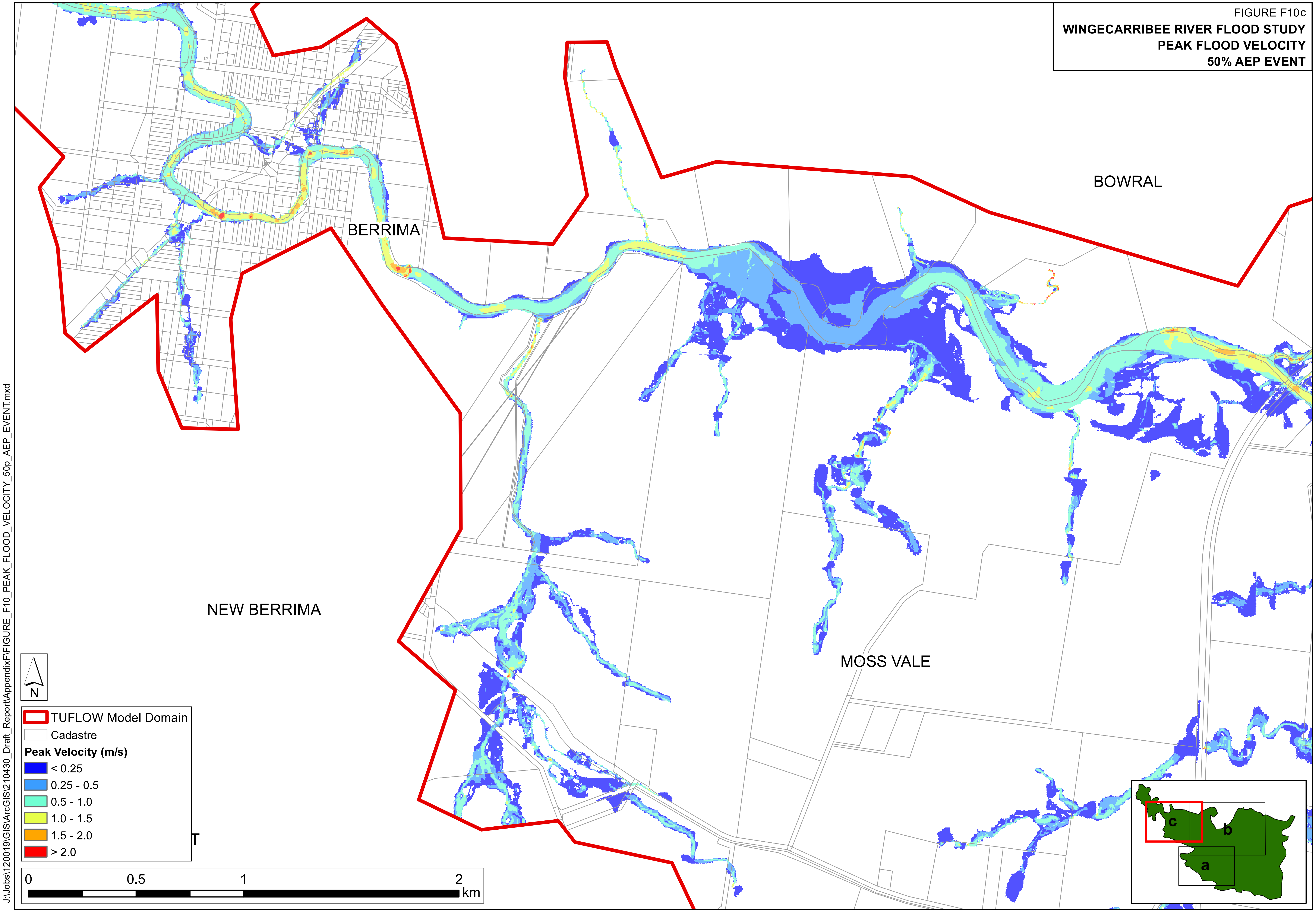
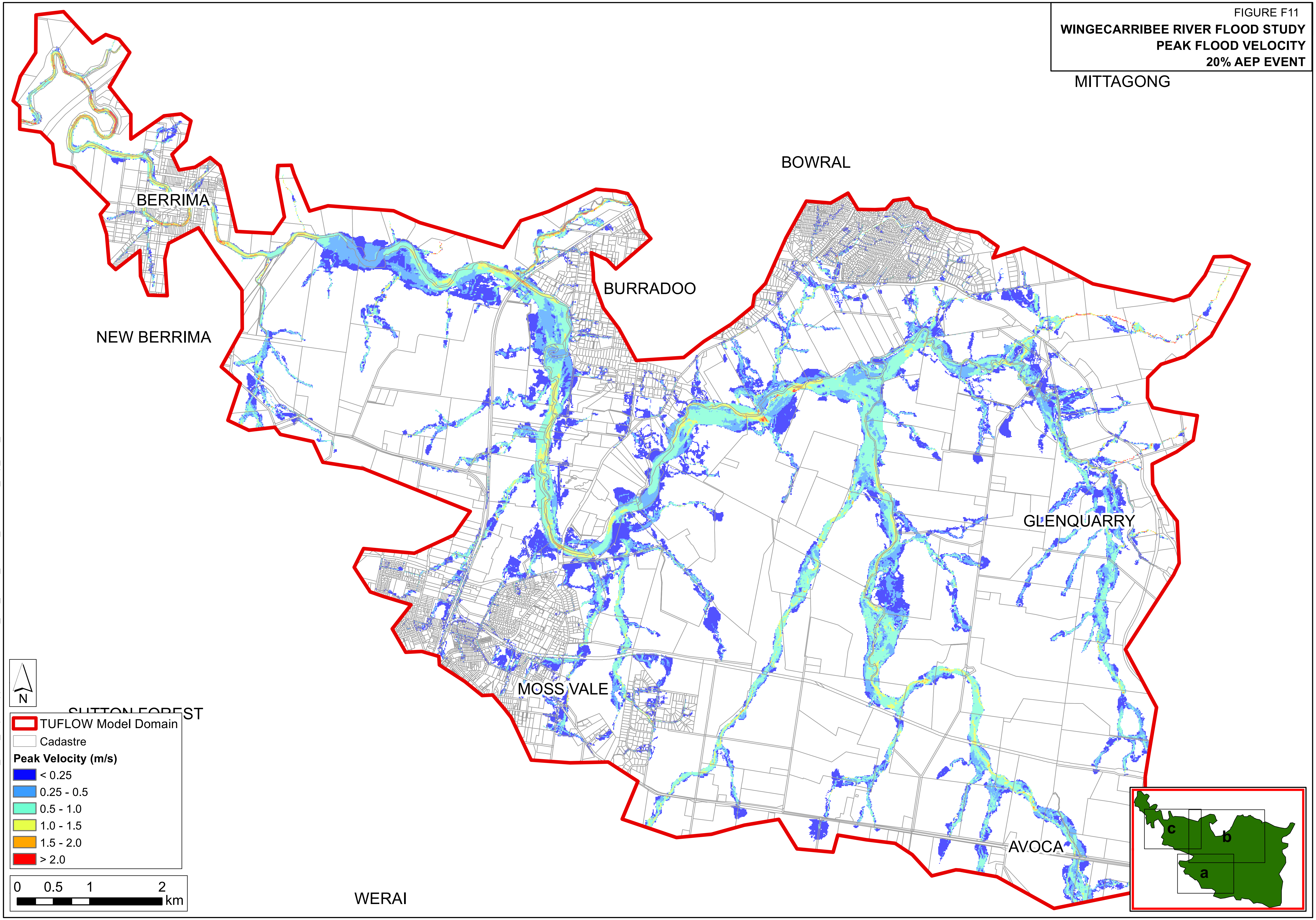


FIGURE F10c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
50% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F10_PEAK_FLOOD_VELOCITY_50p_AEP_EVENT.mxd

FIGURE F11
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
20% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F11_PEAK_FLOOD_VELOCITY_20p_AEP_EVENT.mxd

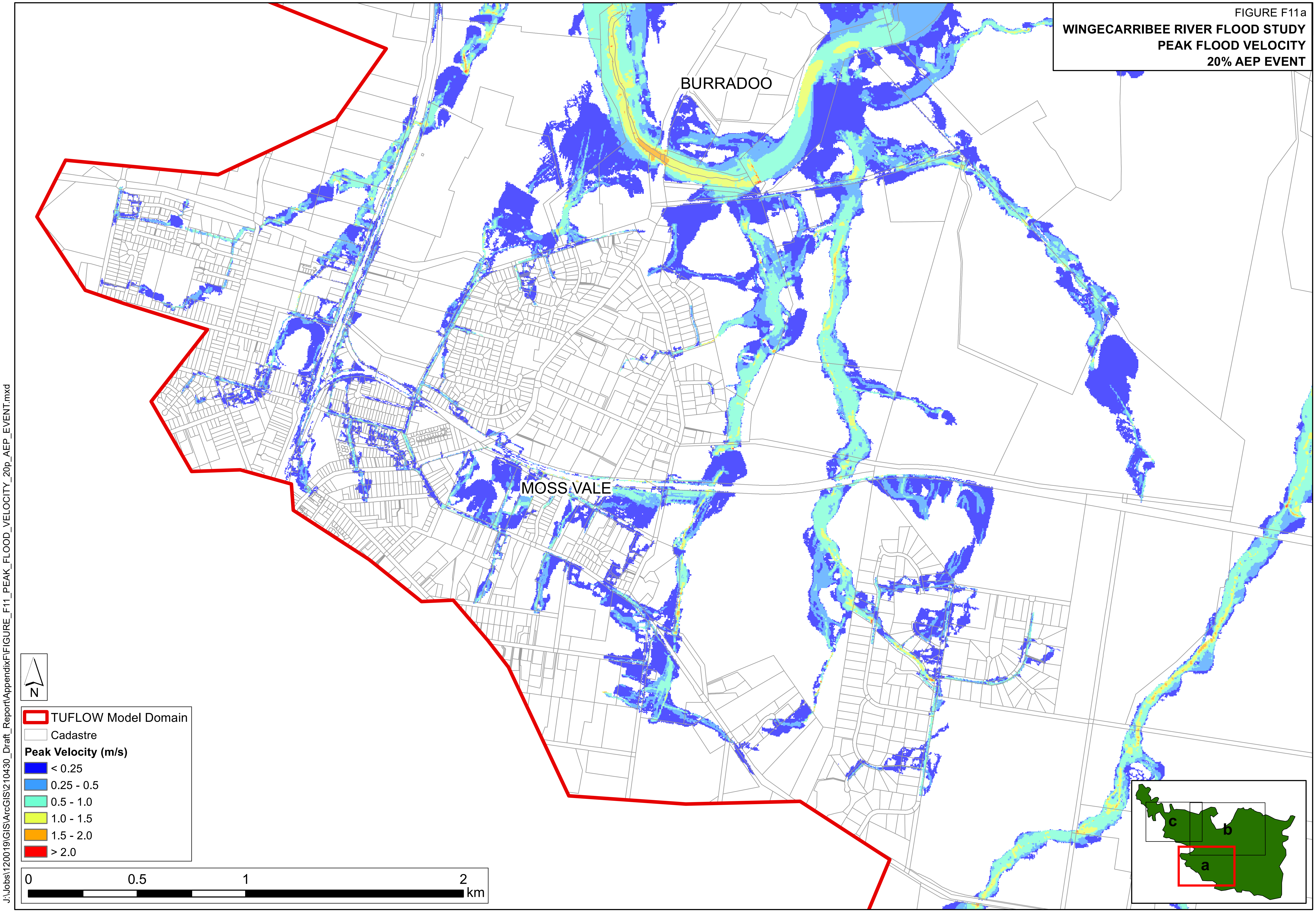


FIGURE F11a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
20% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F11_PEAK_FLOOD_VELOCITY_20p_AEP_EVENT.mxd

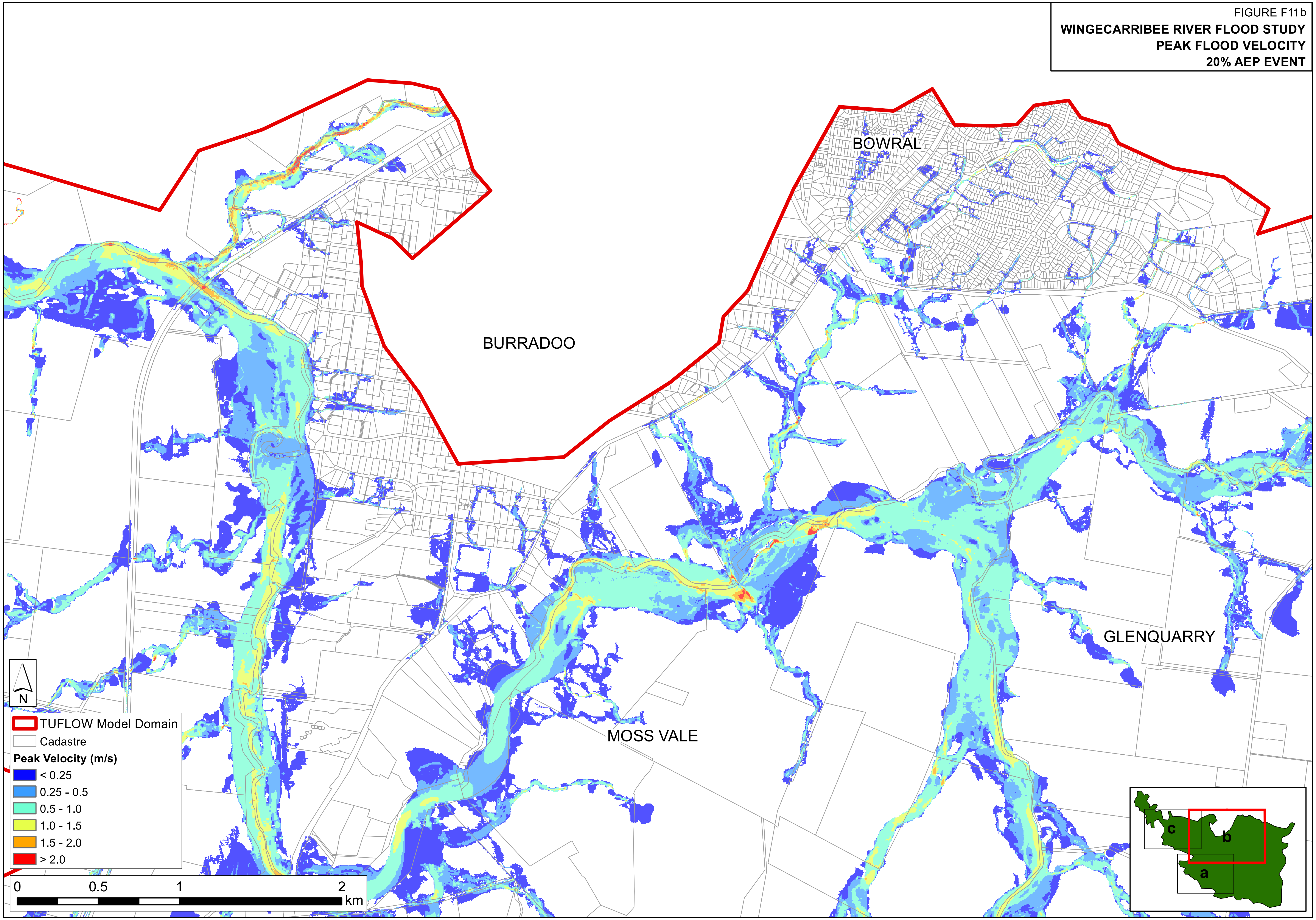


FIGURE F11b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
20% AEP EVENT
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
N
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F11_PEAK_FLOOD_VELOCITY_20p_AEP_EVENT.mxd

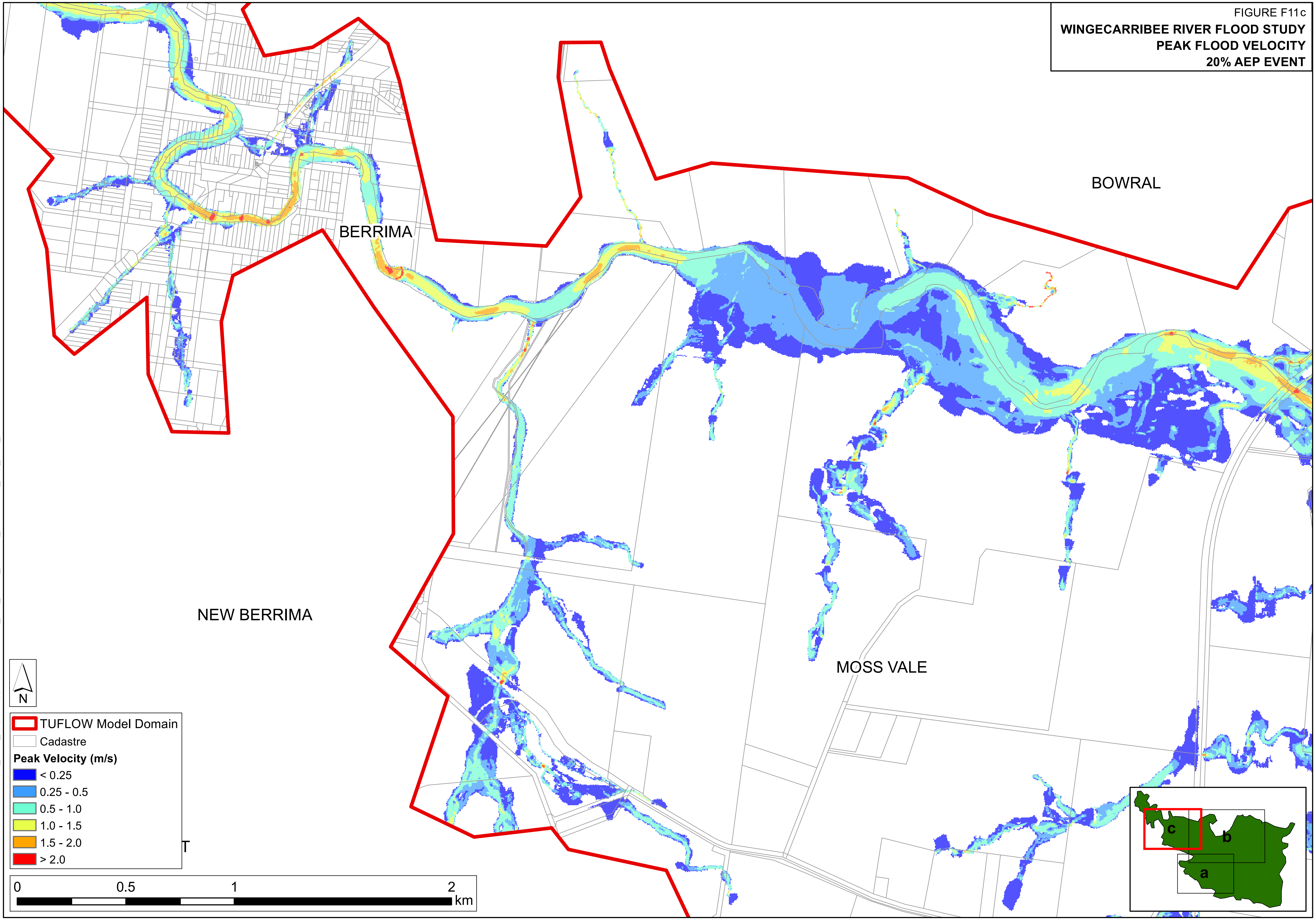


FIGURE F11c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
20% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F11_PEAK_FLOOD_VELOCITY_20p_AEP_EVENT.mxd

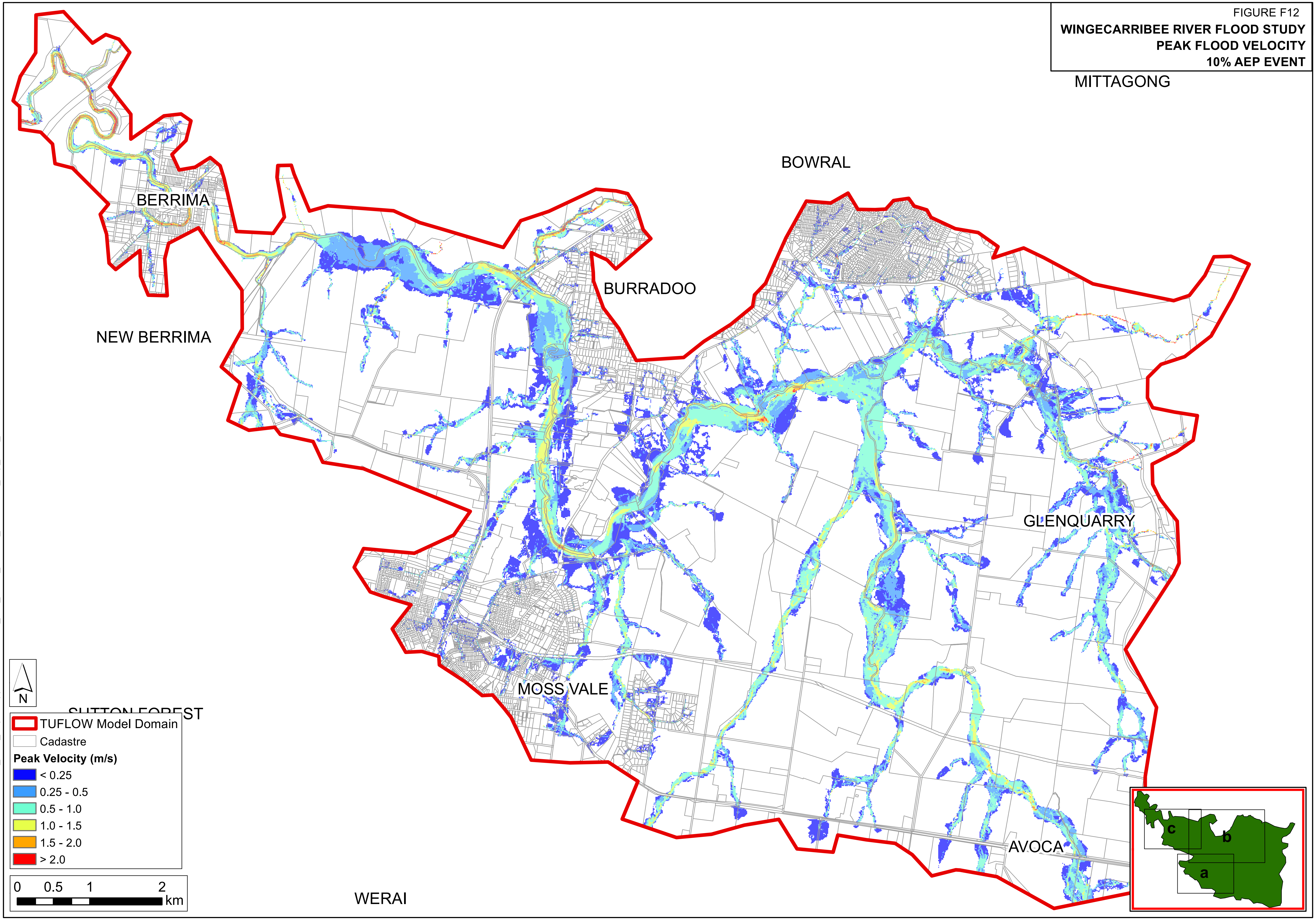
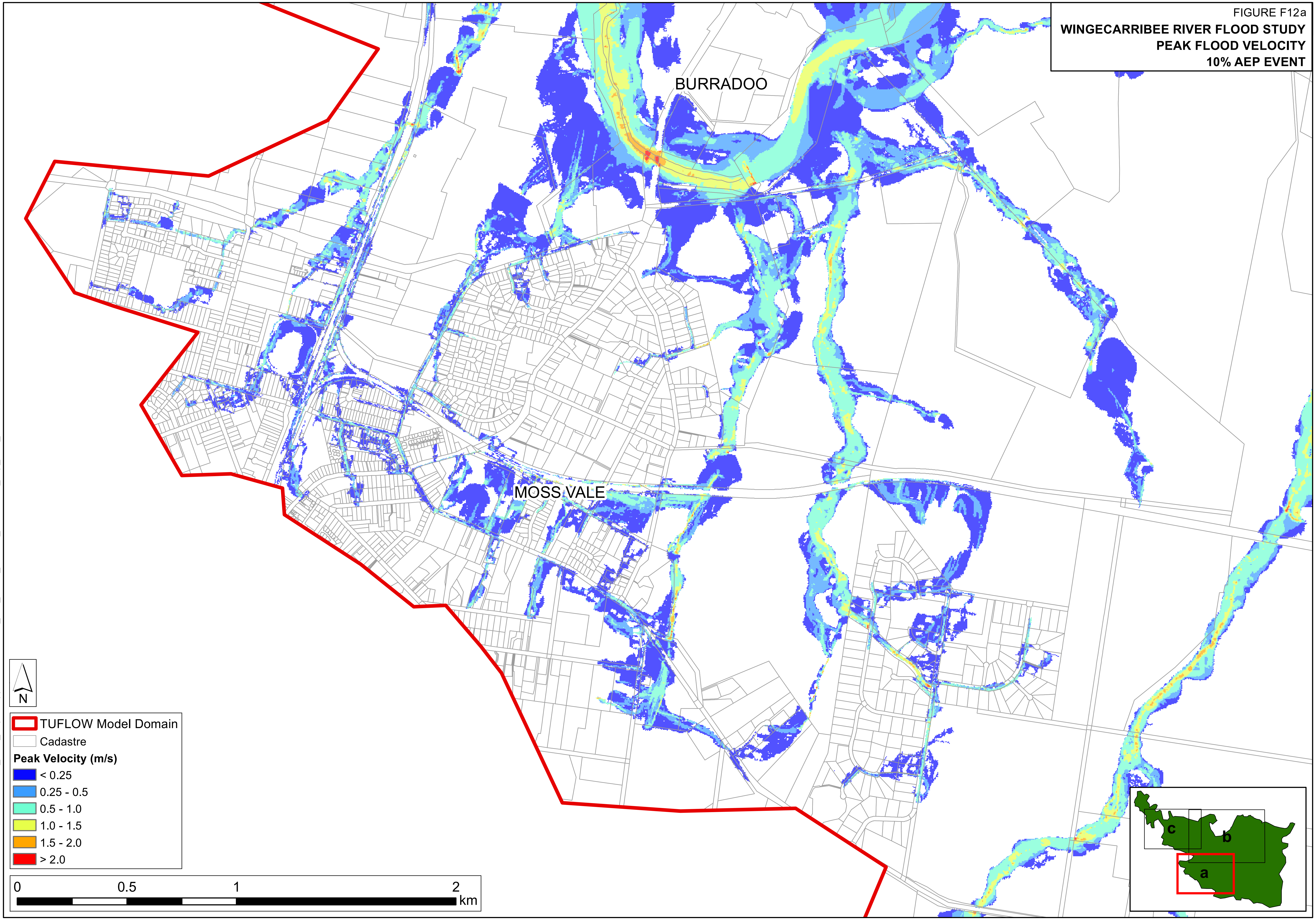


FIGURE F12
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
10% AEP EVENT
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
SUTTON FOREST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0 0.5 1 2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F12_PEAK_FLOOD_VELOCITY_10p_AEP_EVENT.mxd

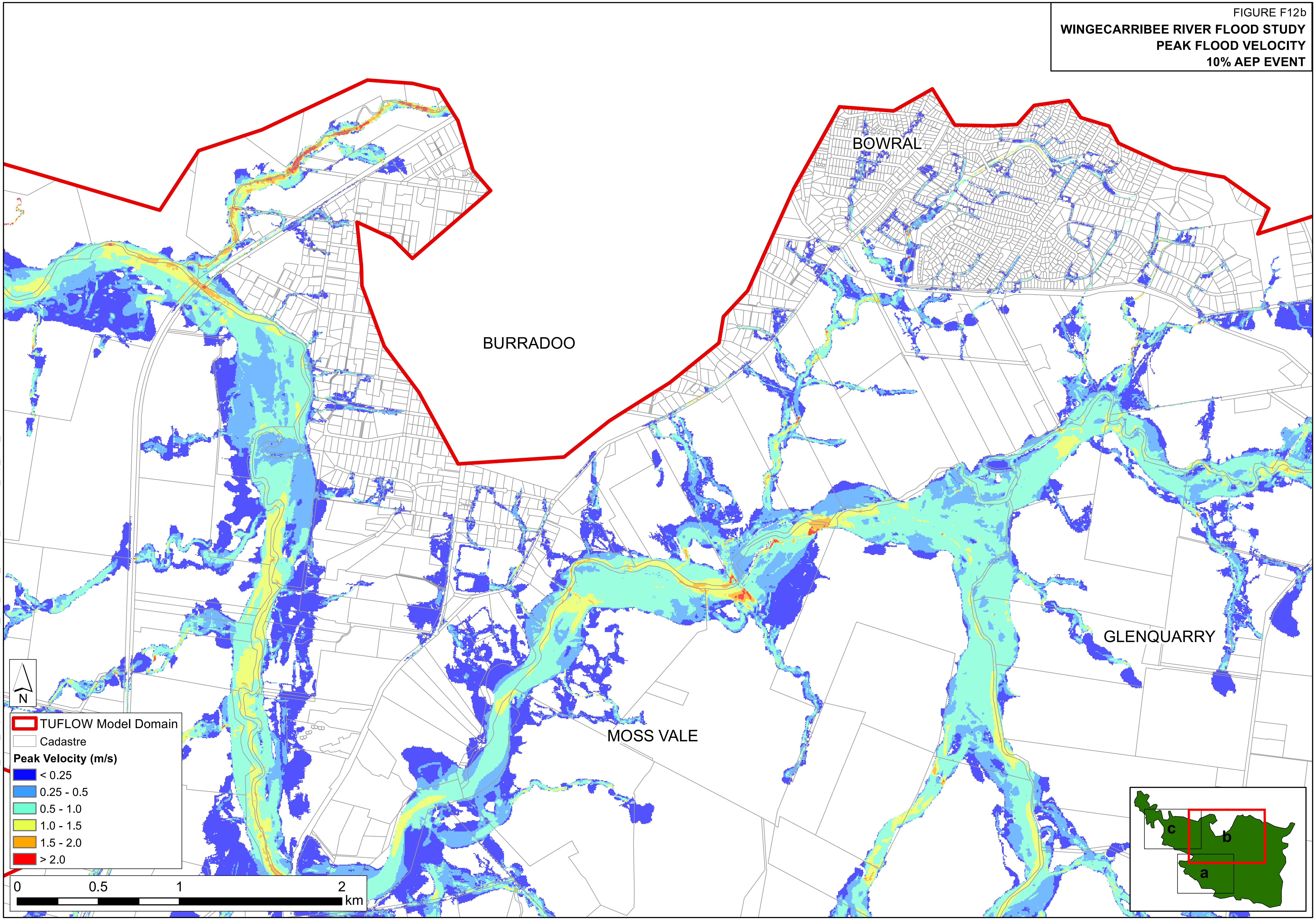
FIGURE F12a

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
10% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F12_PEAK_FLOOD_VELOCITY_10p_AEP_EVENT.mxd

FIGURE F12b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
10% AEP EVENT



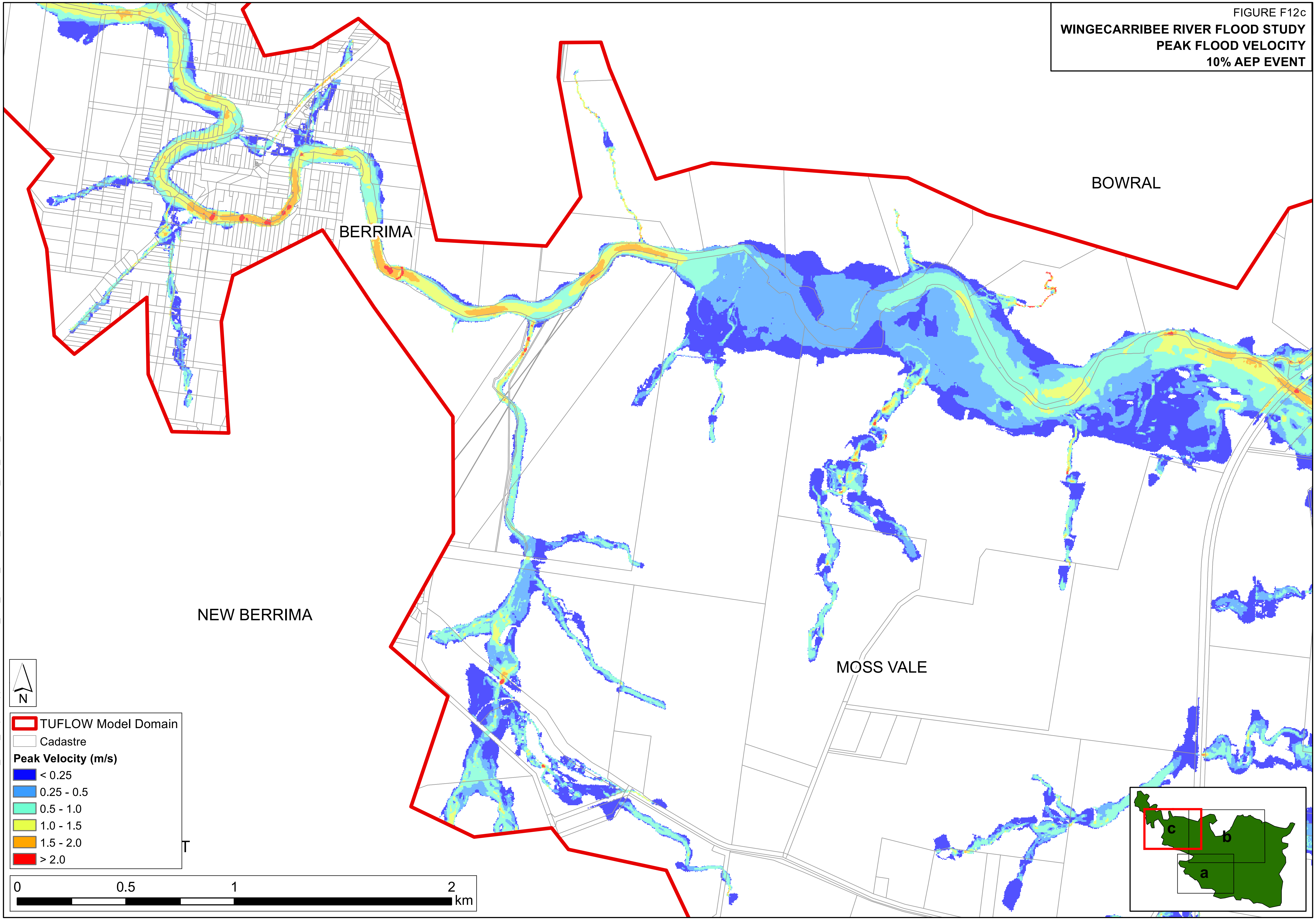
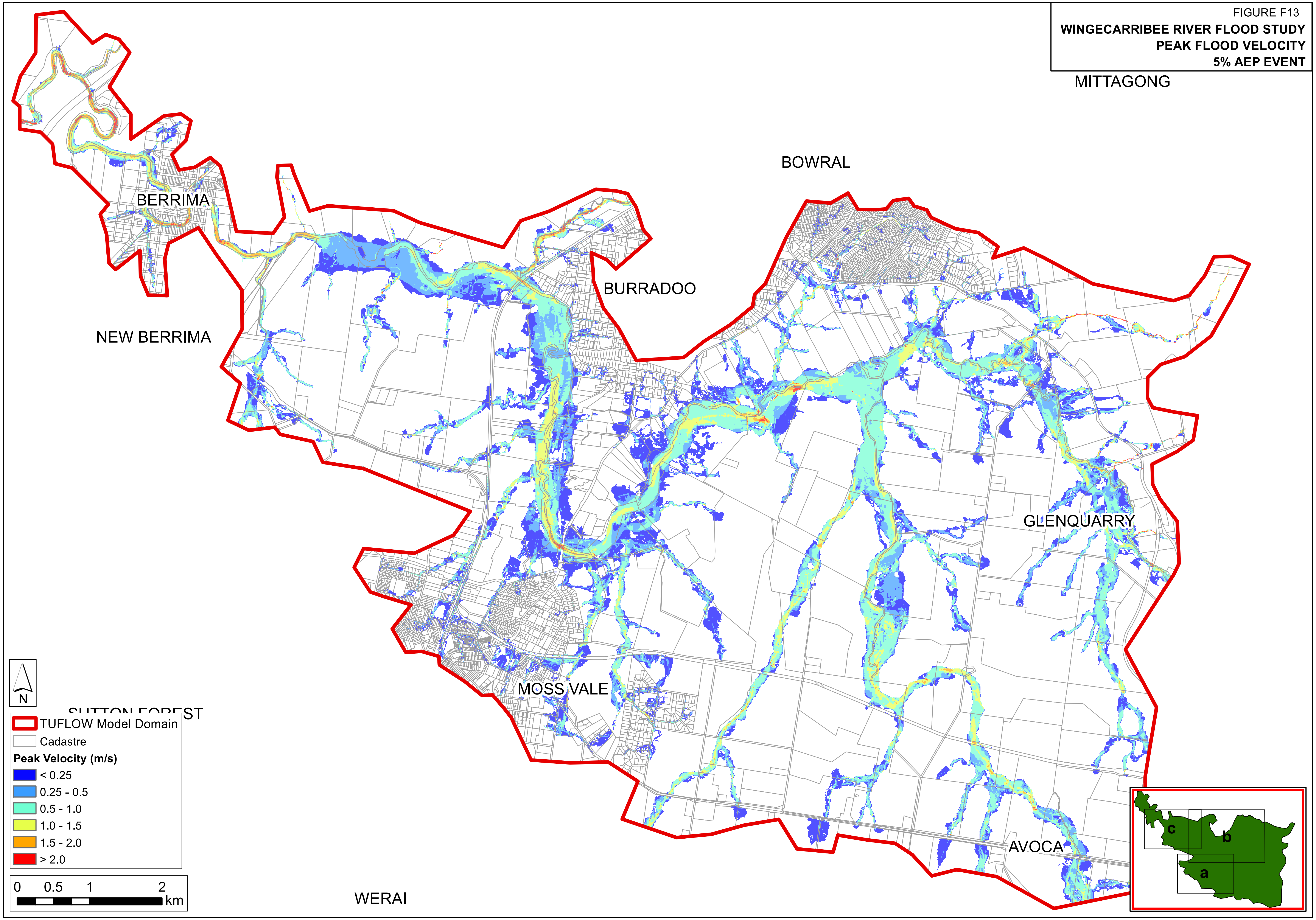


FIGURE F12c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
10% AEP EVENT

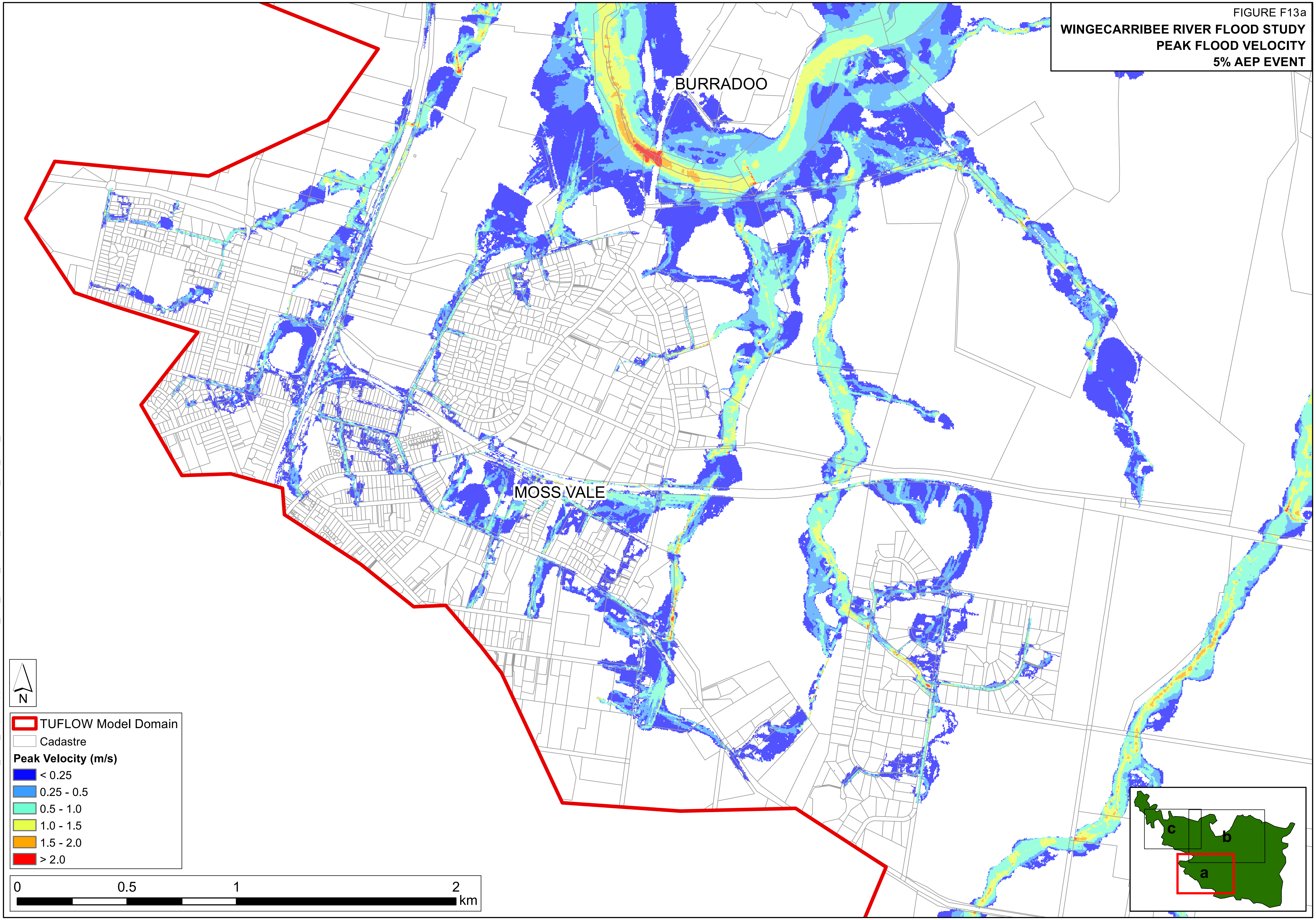
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F12_PEAK_FLOOD_VELOCITY_10p_AEP_EVENT.mxd

FIGURE F13

WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F13_PEAK_FLOOD_VELOCITY_05p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F13_PEAK_FLOOD_VELOCITY_05p_AEP_EVENT.mxd

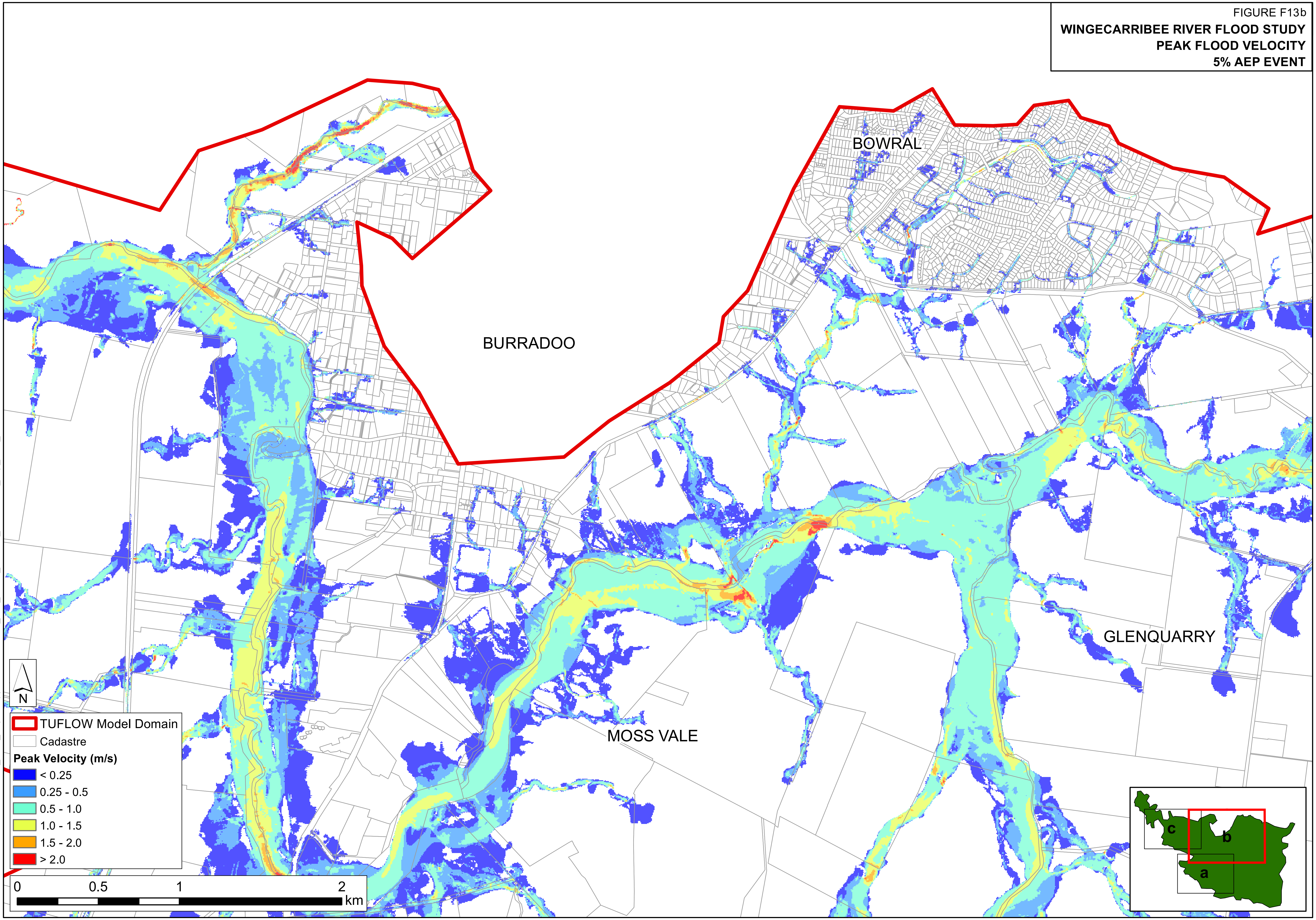
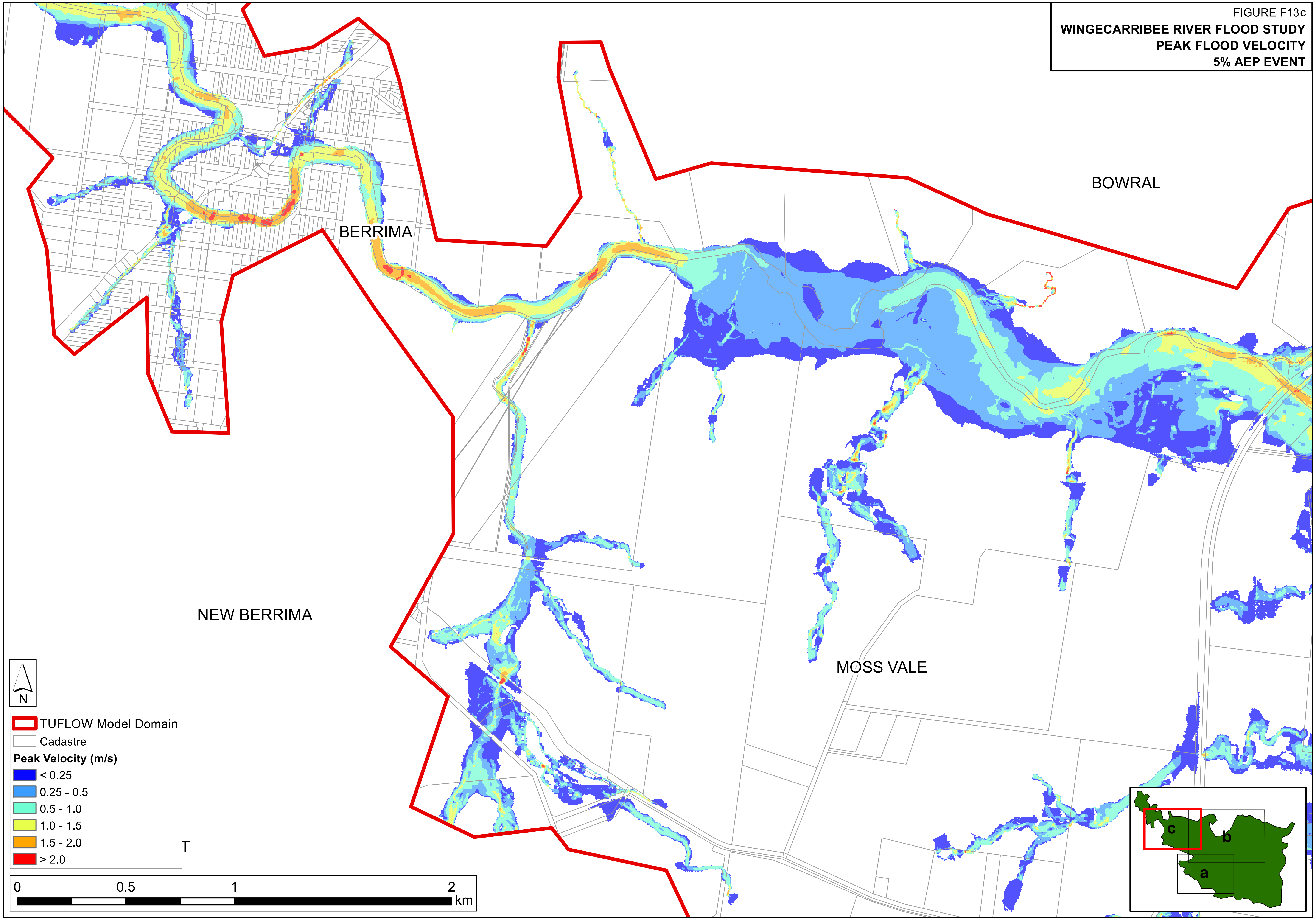


FIGURE F13b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
5% AEP EVENT

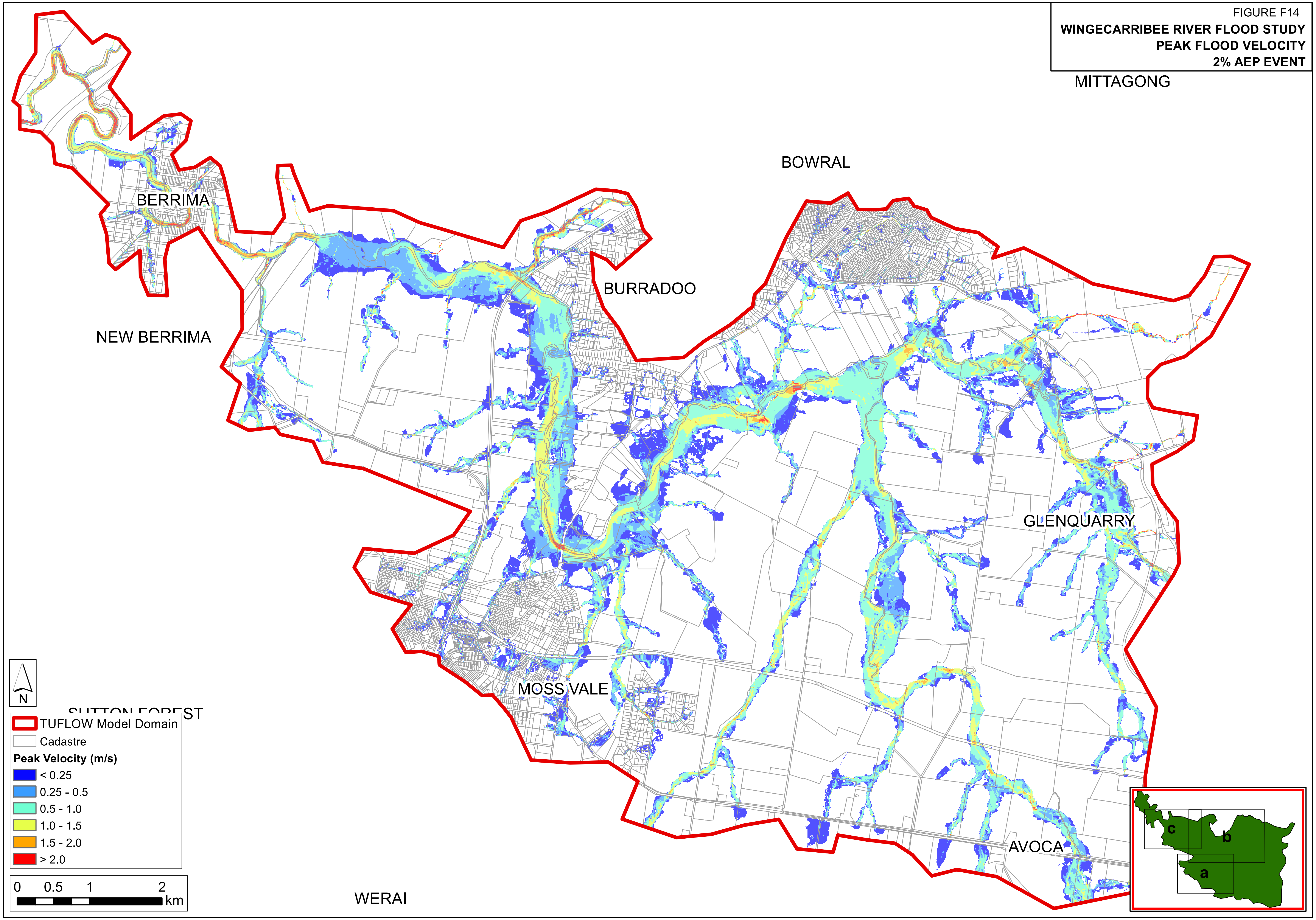
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F13_PEAK_FLOOD_VELOCITY_05p_AEP_EVENT.mxd

FIGURE F13c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
5% AEP EVENT

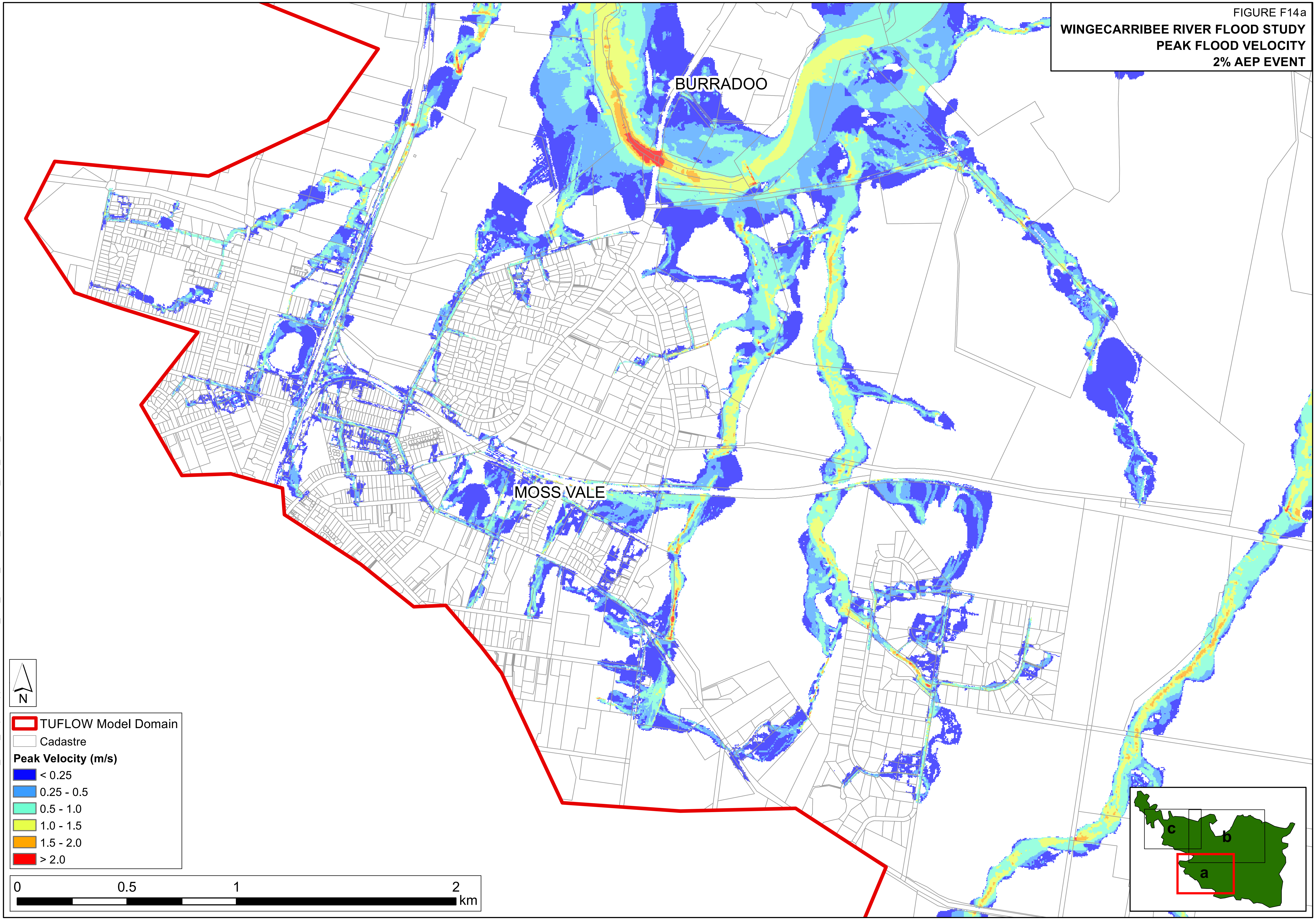


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F13_PEAK_FLOOD_VELOCITY_05p_AEP_EVENT.mxd

FIGURE F14
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F14_PEAK_FLOOD_VELOCITY_02p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F14_PEAK_FLOOD_VELOCITY_02p_AEP_EVENT.mxd

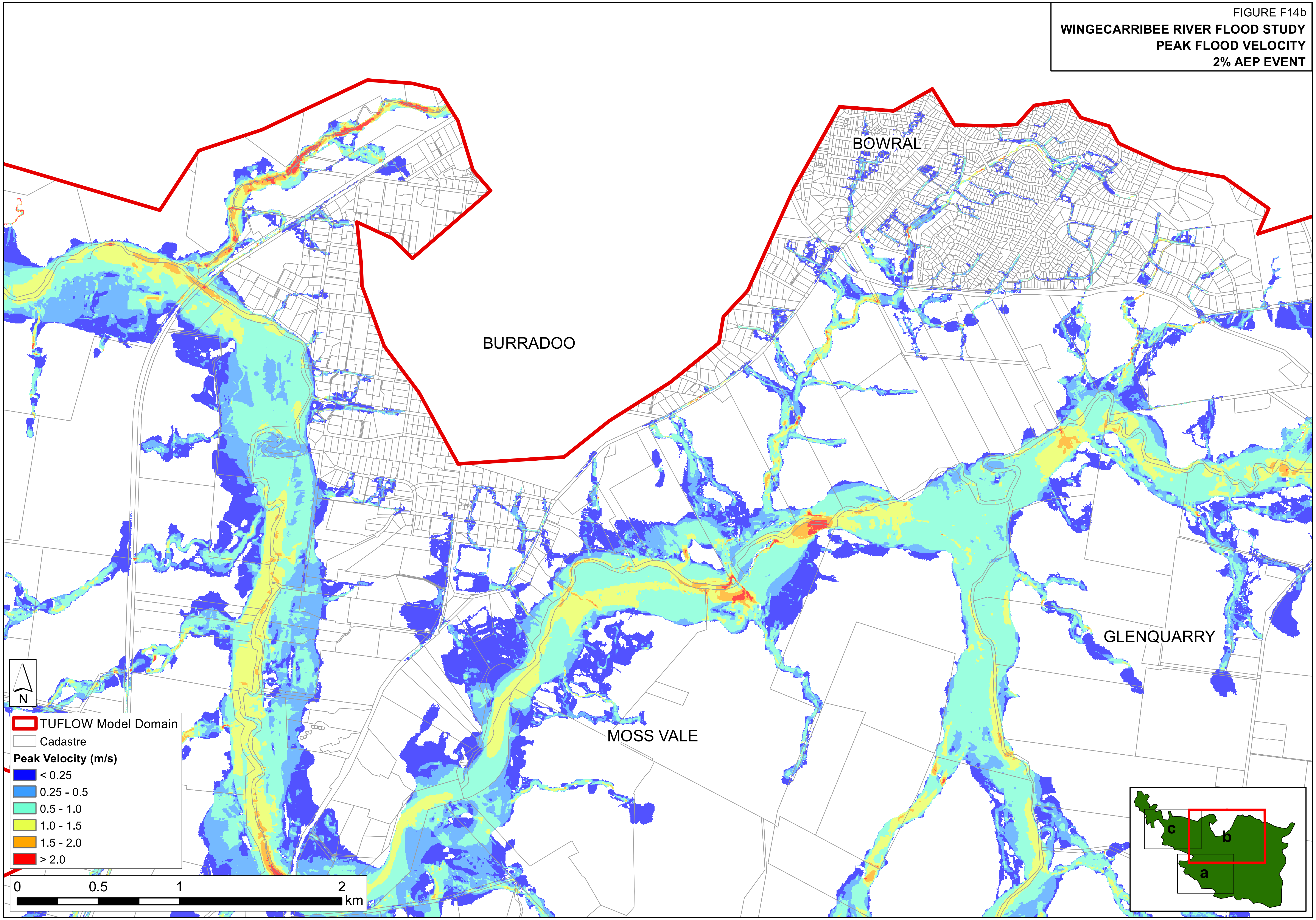
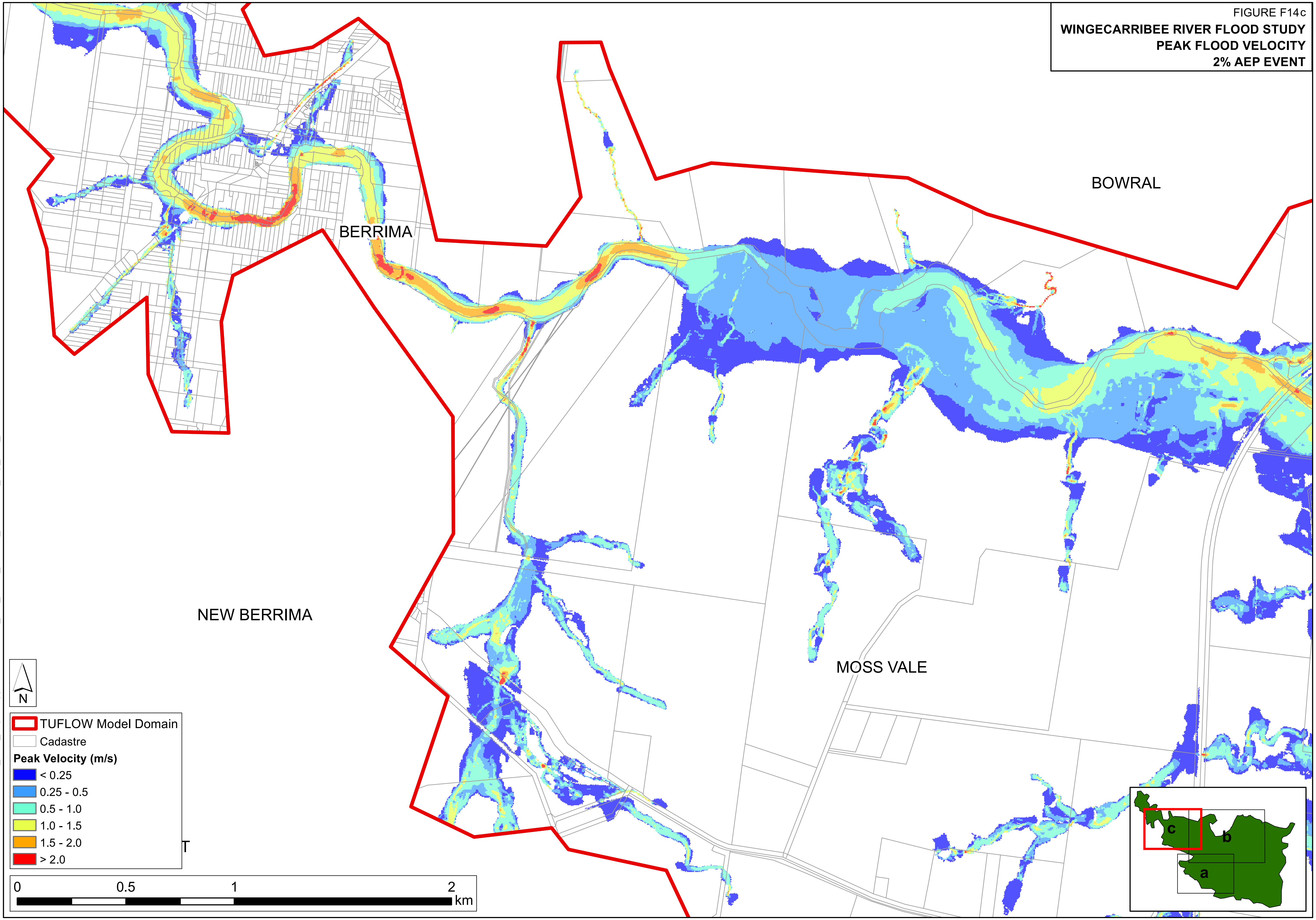


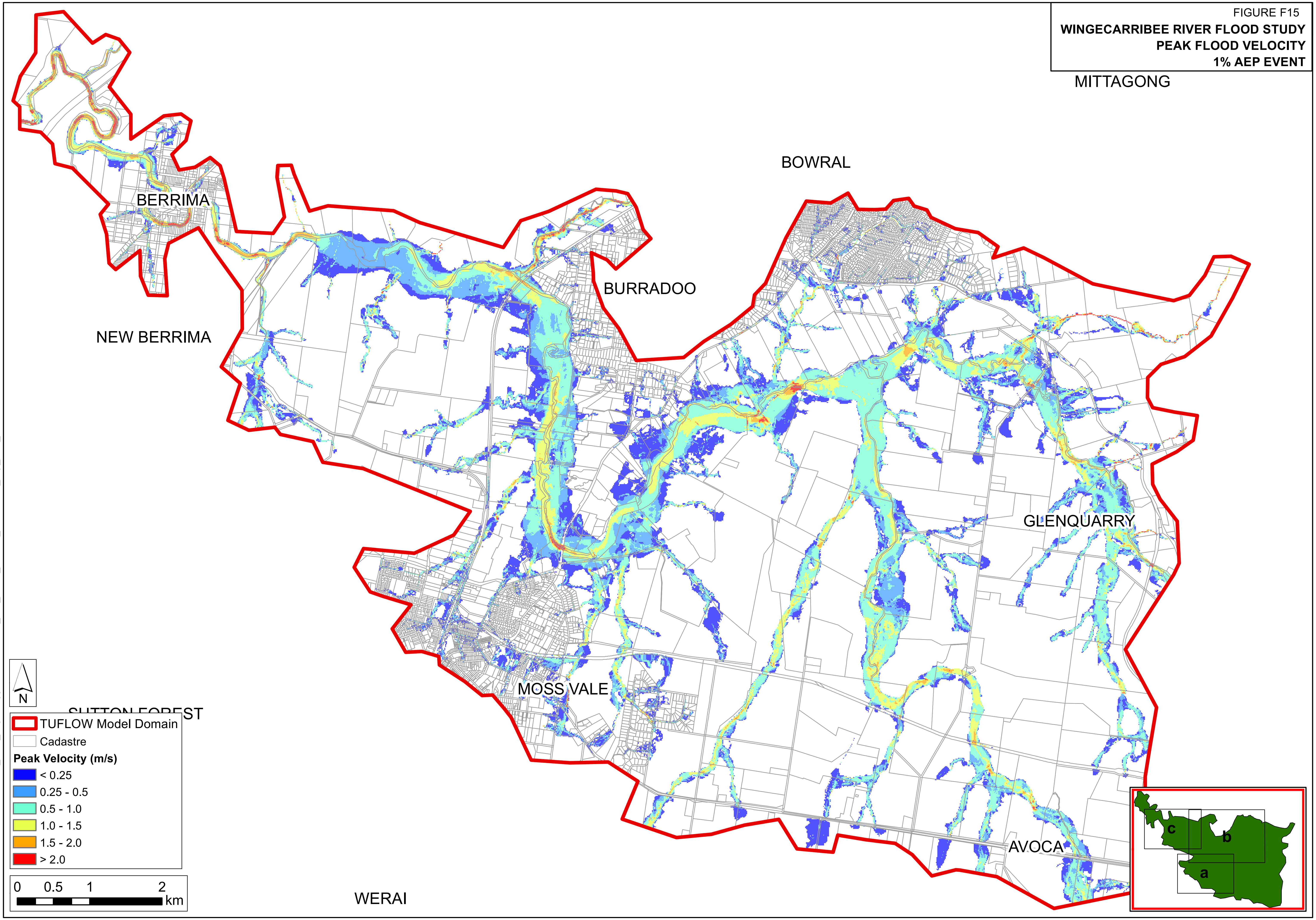
FIGURE F14b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
2% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F14_PEAK_FLOOD_VELOCITY_02p_AEP_EVENT.mxd

FIGURE F14c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F14_PEAK_FLOOD_VELOCITY_02p_AEP_EVENT.mxd

FIGURE F15
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
1% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F15_PEAK_FLOOD_VELOCITY_01p_AEP_EVENT.mxd

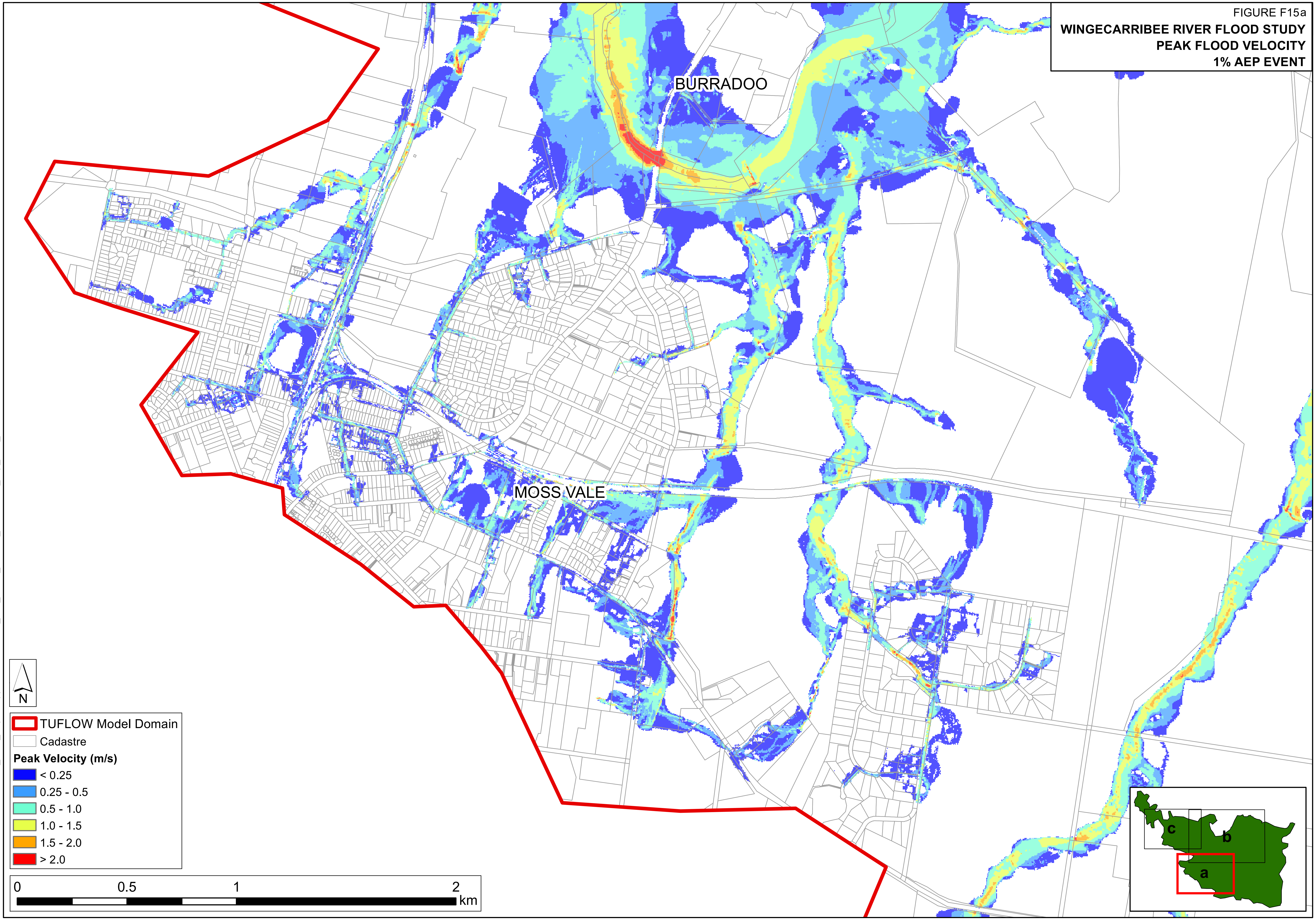


FIGURE F15a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
1% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F15_PEAK_FLOOD_VELOCITY_01p_AEP_EVENT.mxd

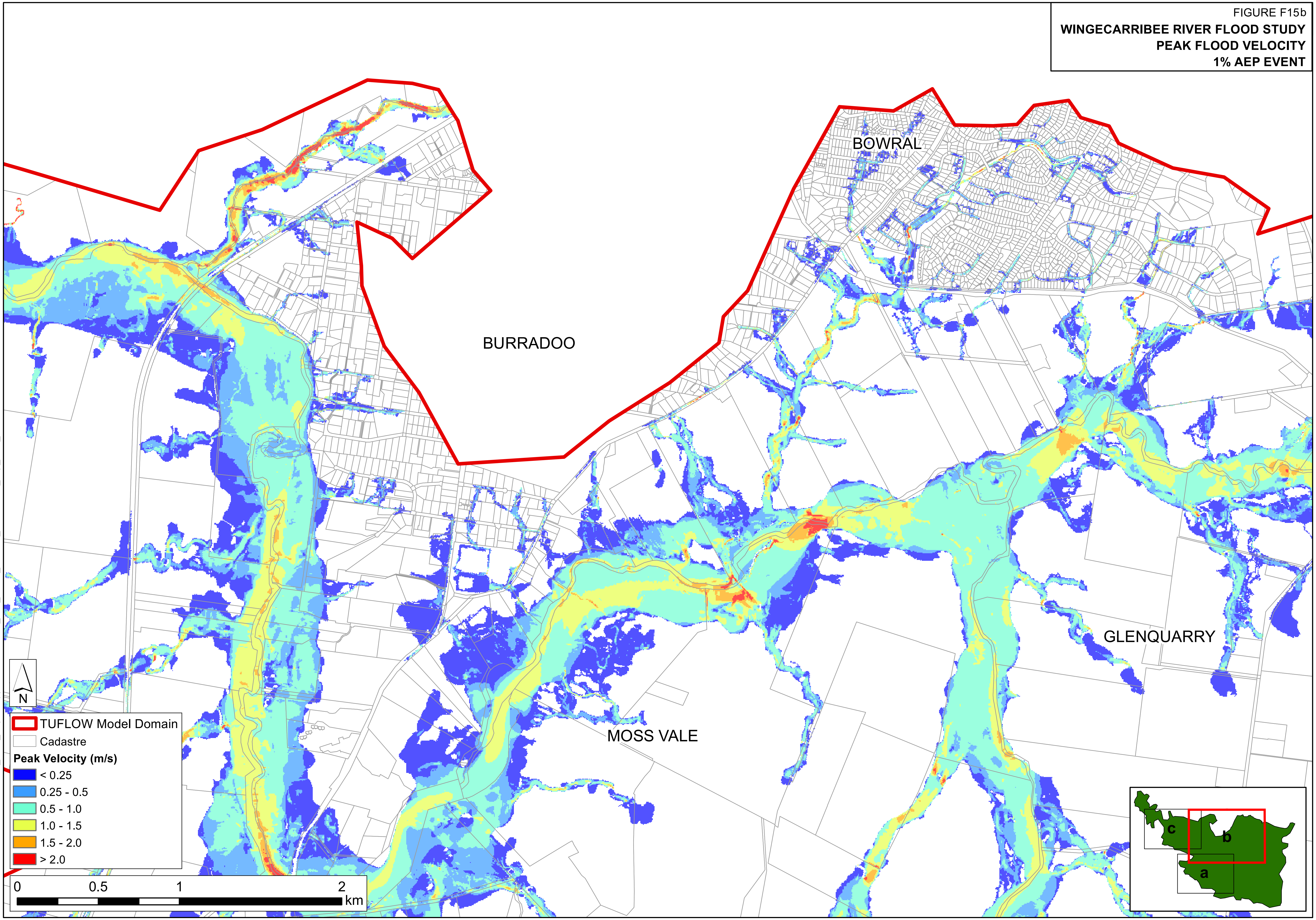


FIGURE F15b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
1% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
N
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F15_PEAK_FLOOD_VELOCITY_01p_AEP_EVENT.mxd

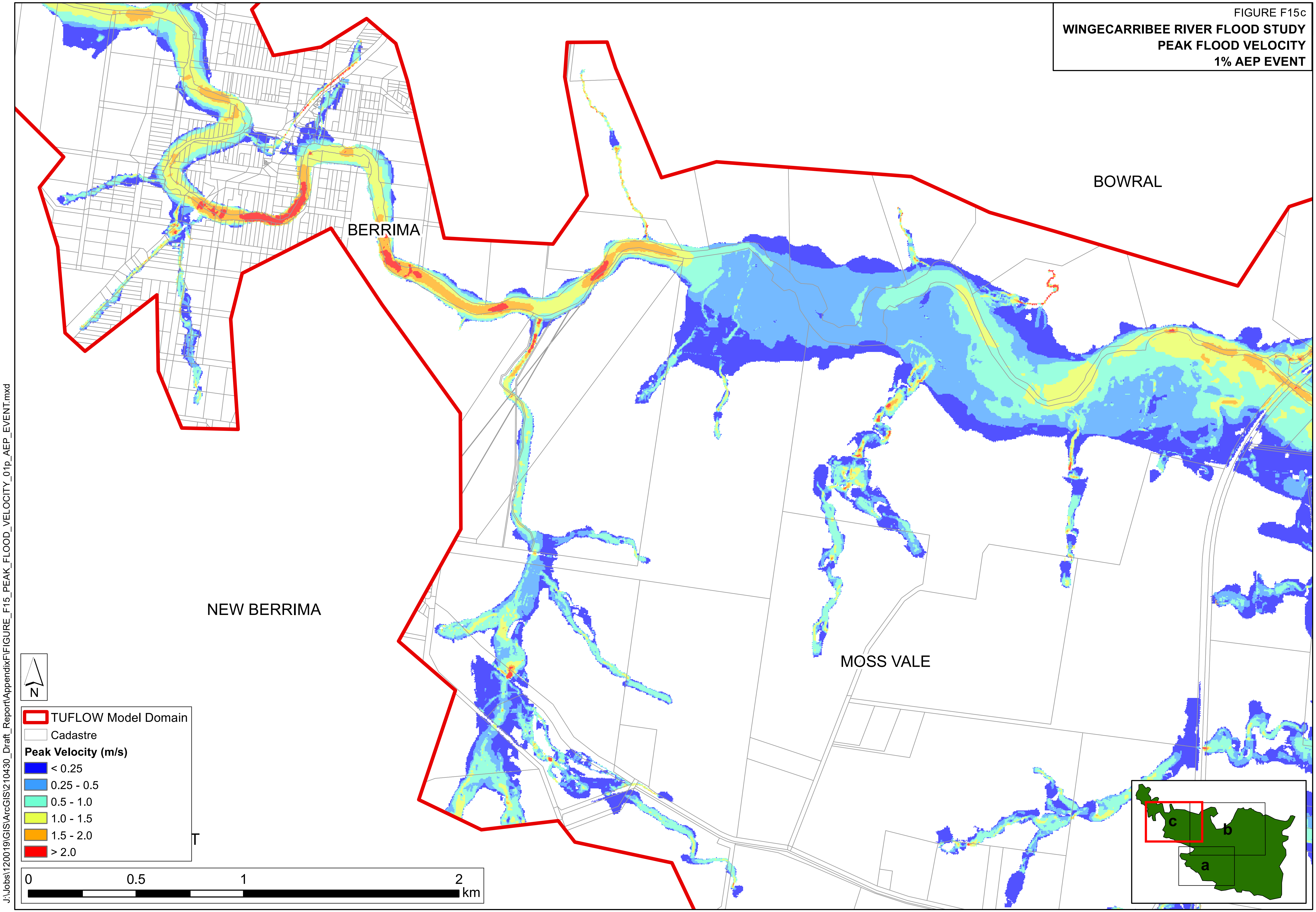
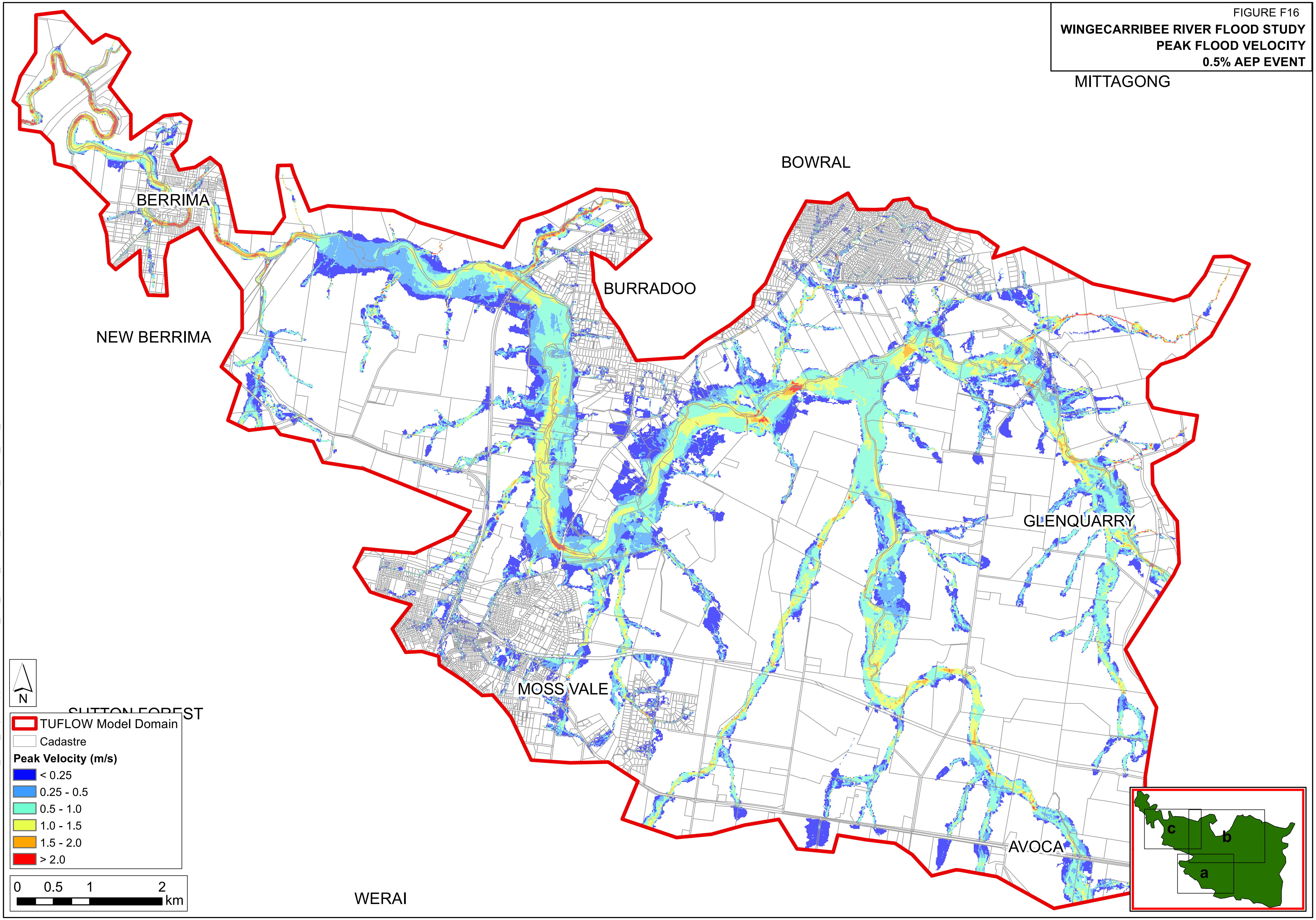


FIGURE F15c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
1% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F15_PEAK_FLOOD_VELOCITY_01p_AEP_EVENT.mxd

FIGURE F16
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F16_PEAK_FLOOD_VELOCITY_1in200_AEP_EVENT.mxd

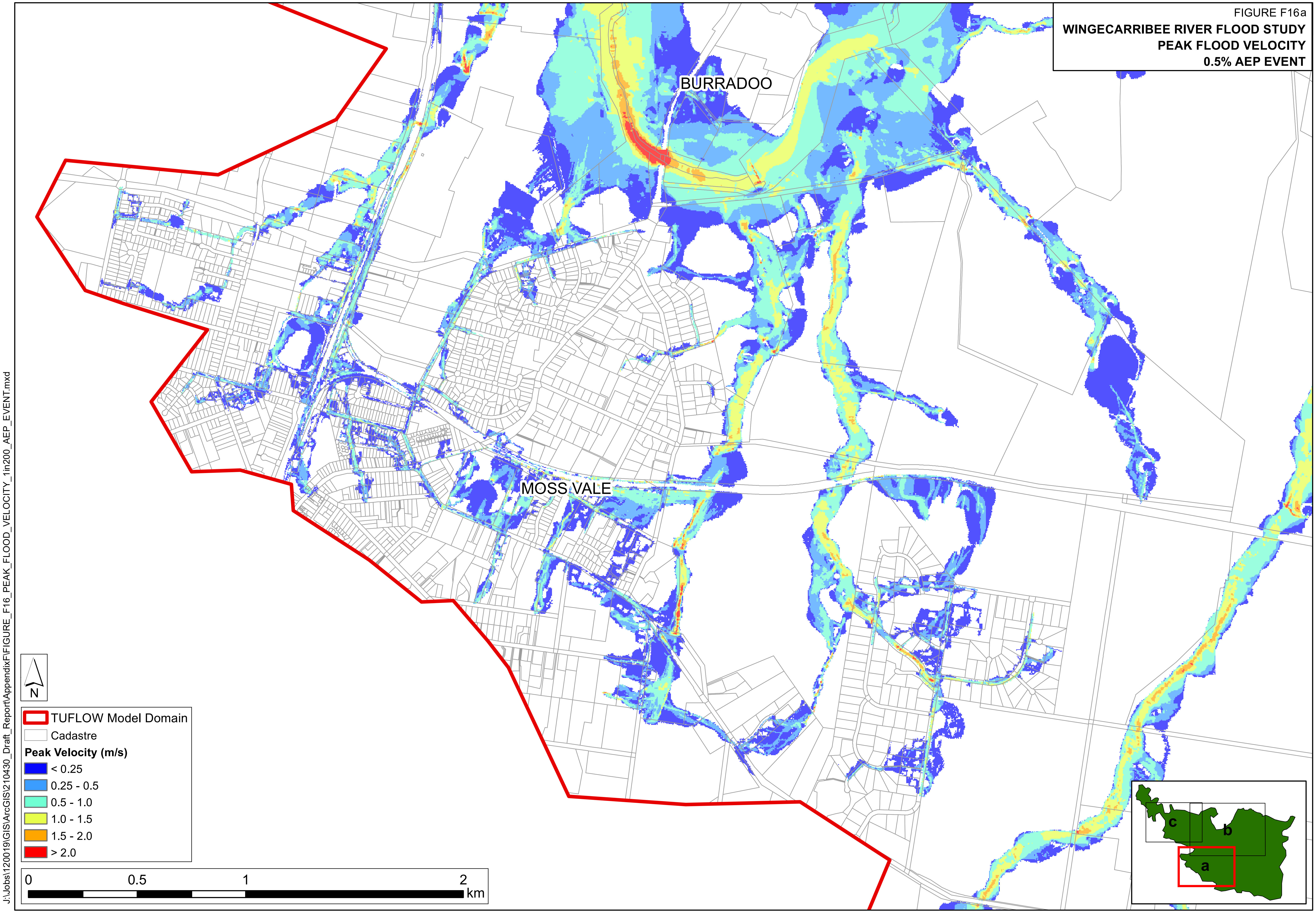
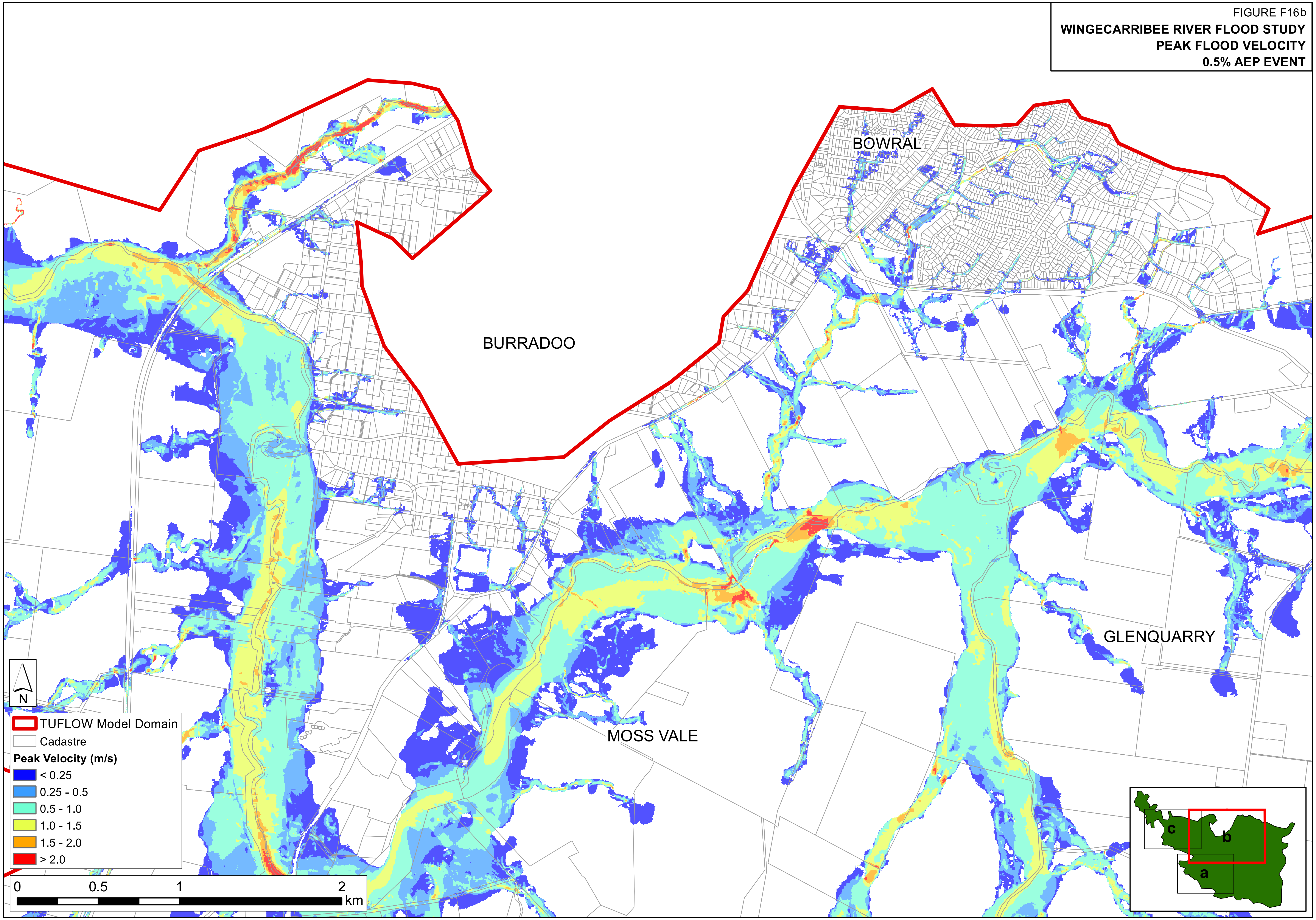


FIGURE F16a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.5% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F16_PEAK_FLOOD_VELOCITY_1in200_AEP_EVENT.mxd

FIGURE F16b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F16_PEAK_FLOOD_VELOCITY_1in200_AEP_EVENT.mxd

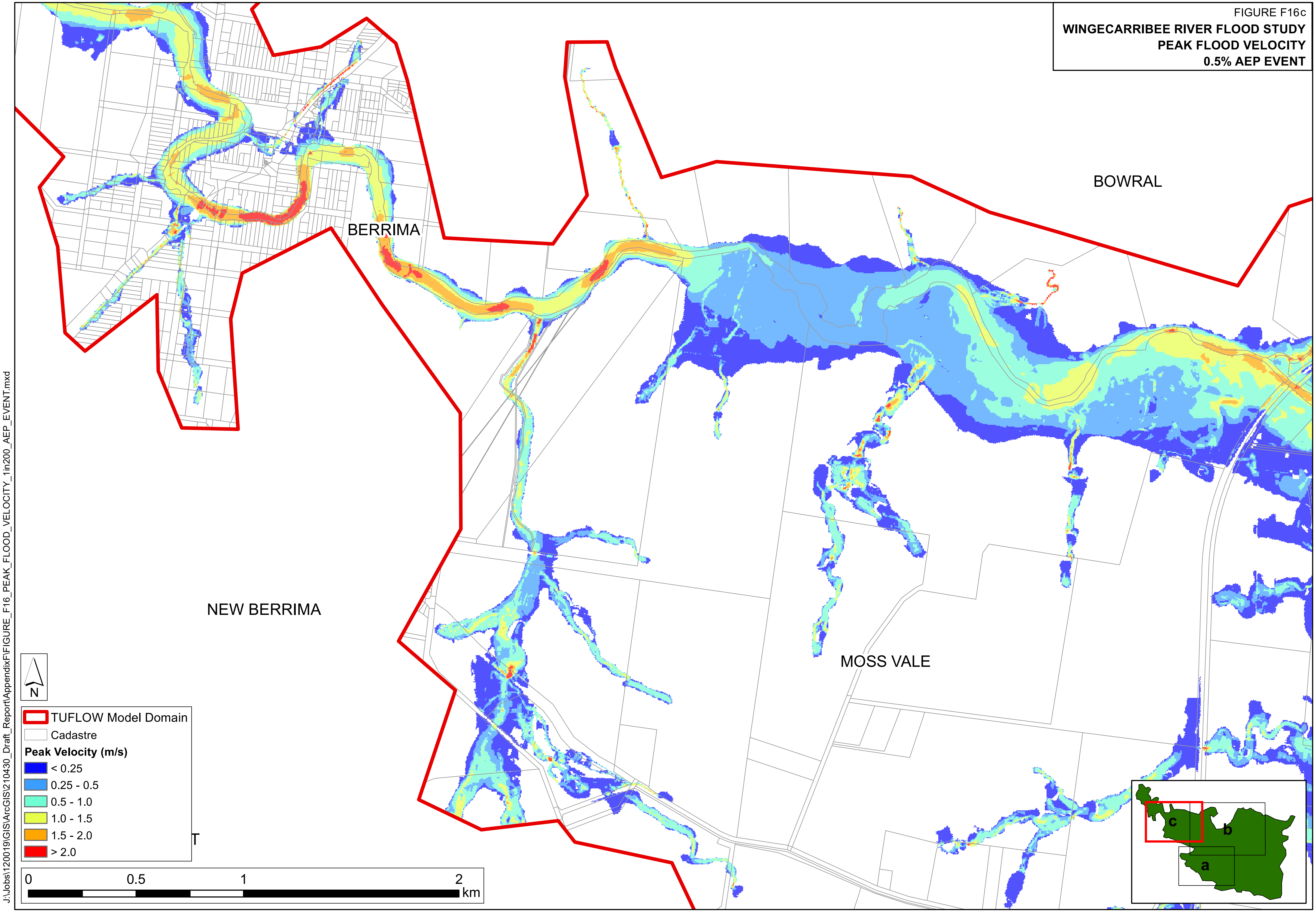


FIGURE F16c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.5% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F16_PEAK_FLOOD_VELOCITY_1in200_AEP_EVENT.mxd

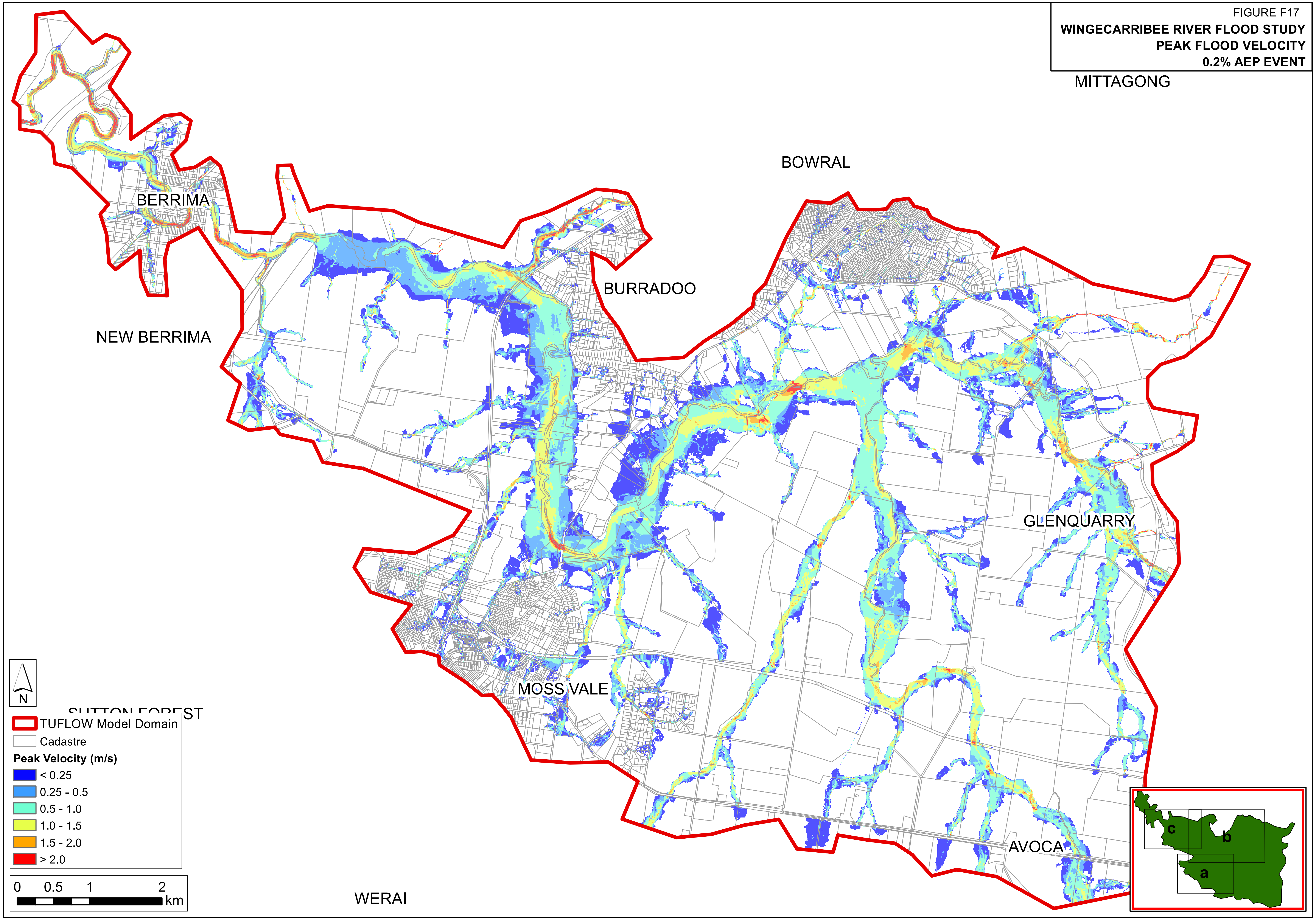
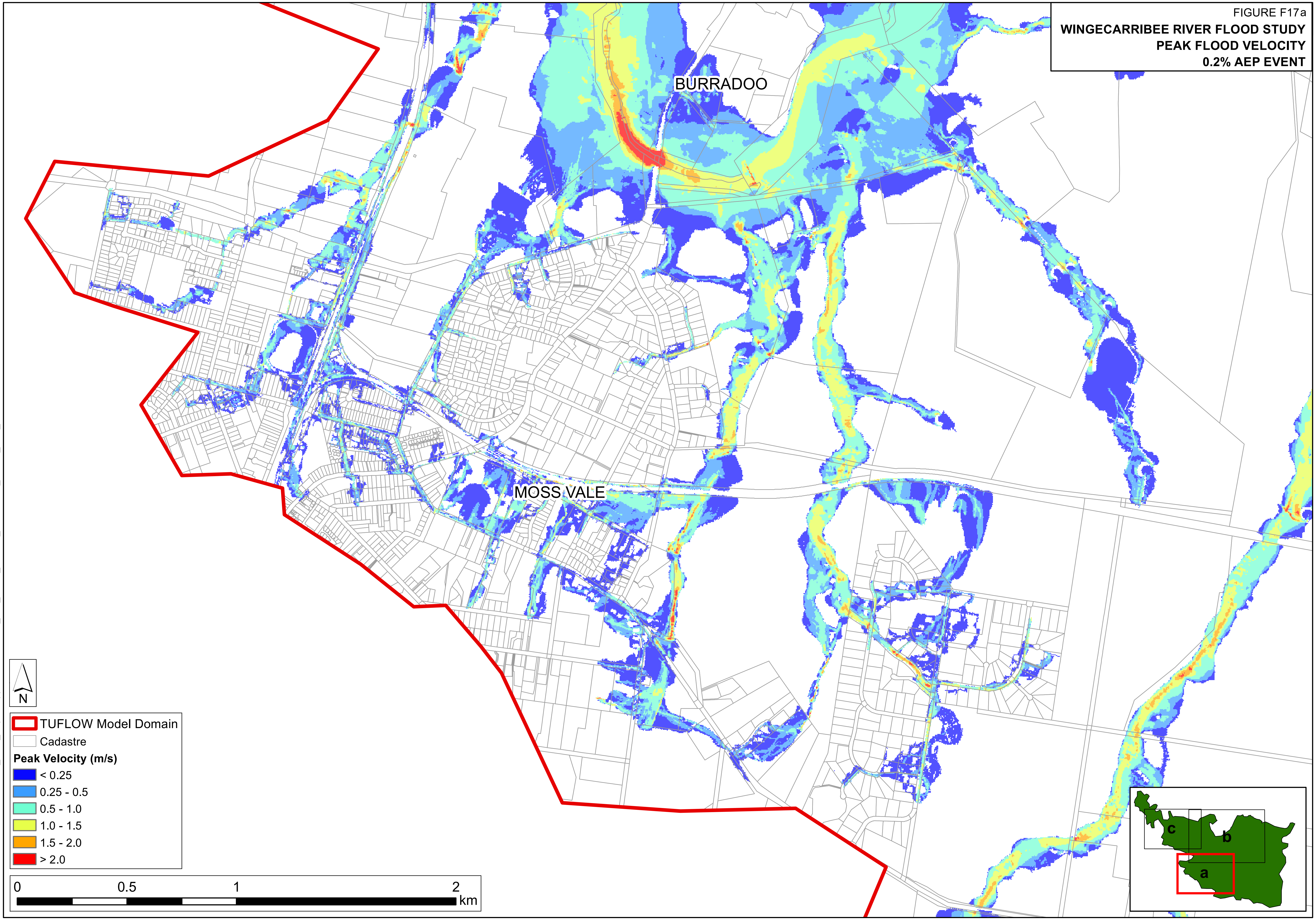


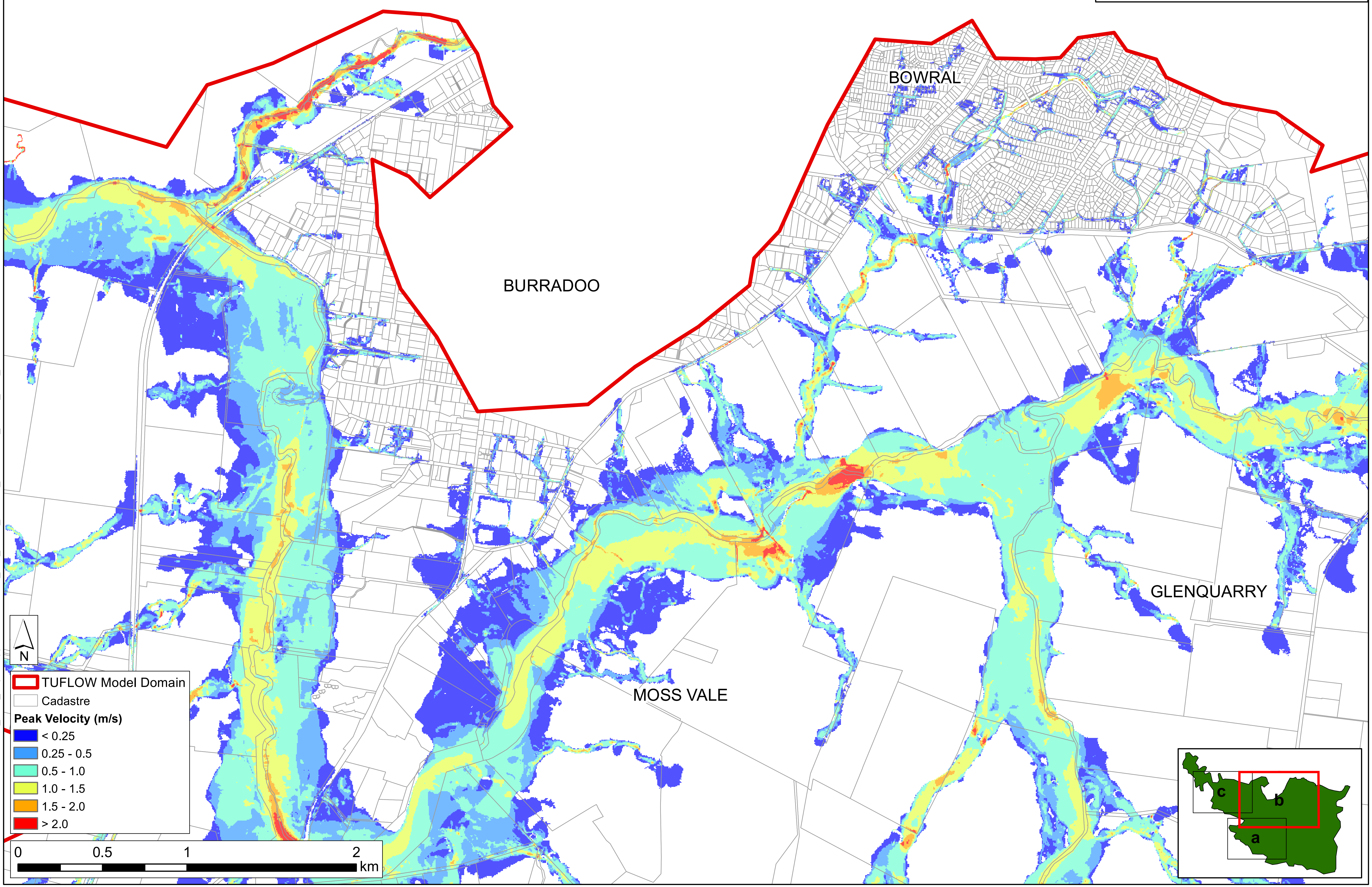
FIGURE F17
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.2% AEP EVENT
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
SUTTON FOREST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0 0.5 1 2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F17_PEAK_FLOOD_VELOCITY_1in500_AEP_EVENT.mxd

FIGURE F17a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F17_PEAK_FLOOD_VELOCITY_1in500_AEP_EVENT.mxd

FIGURE F17b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.2% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F17_PEAK_FLOOD_VELOCITY_1in500_AEP_EVENT.mxd

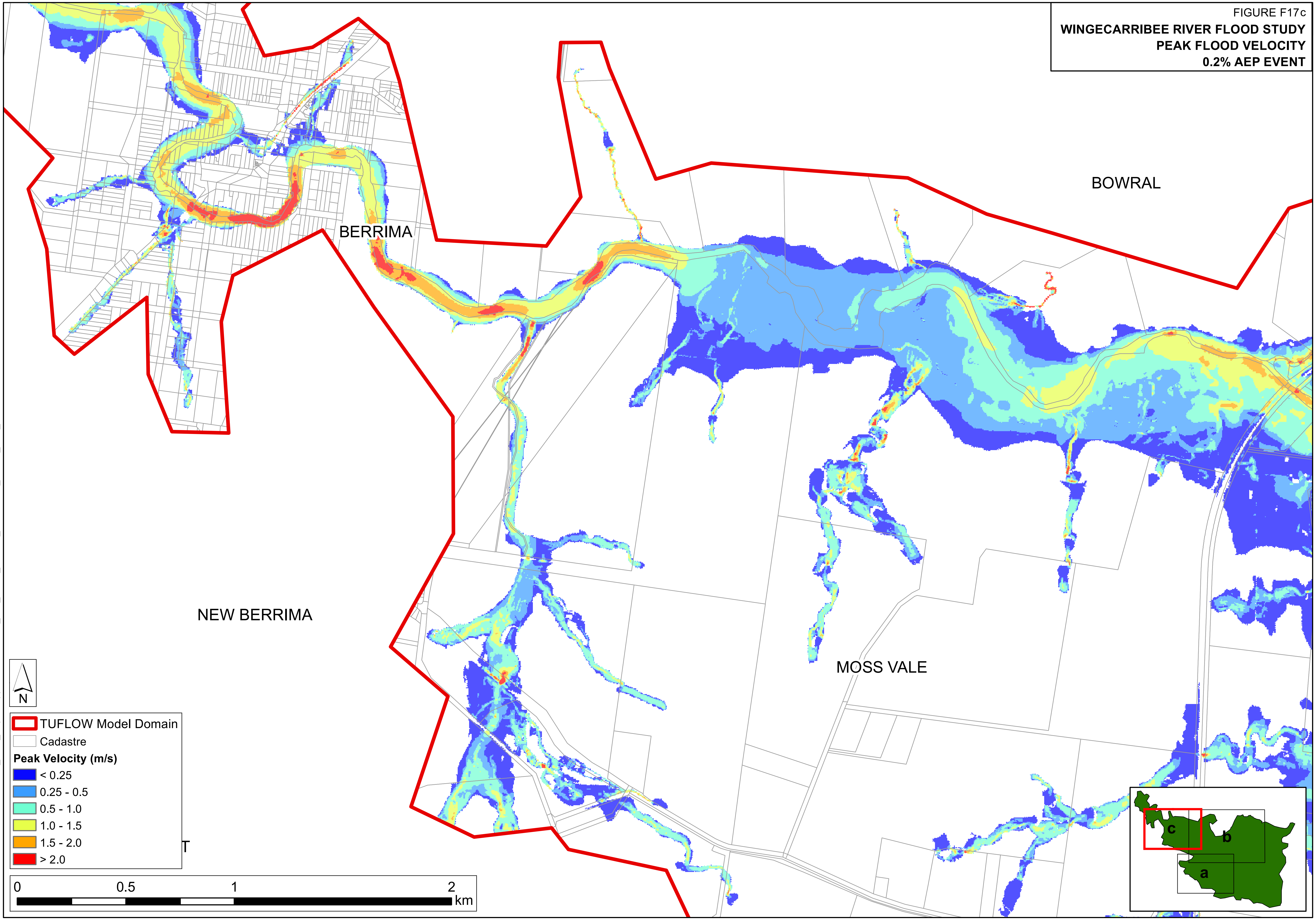
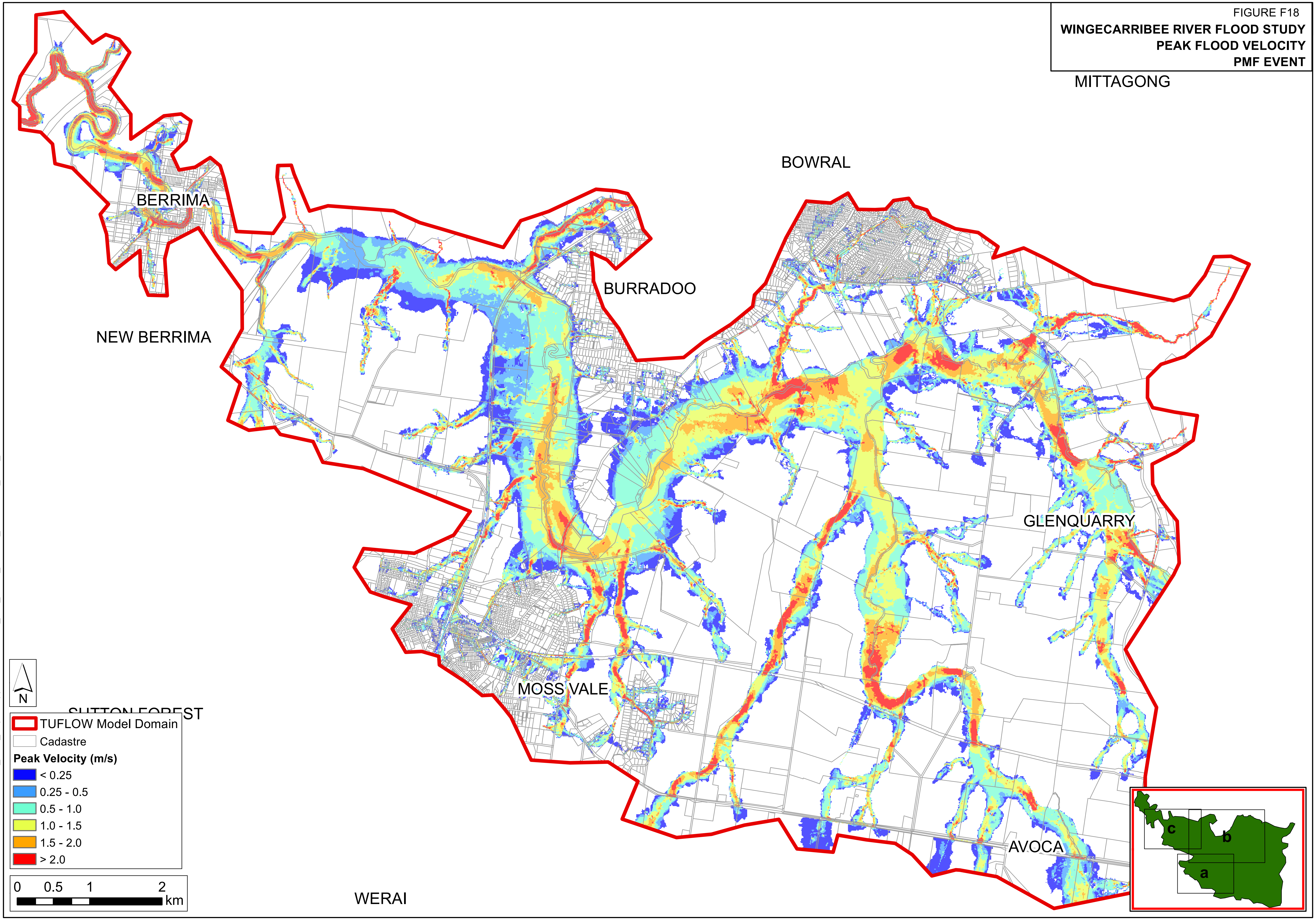


FIGURE F17c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
0.2% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F17_PEAK_FLOOD_VELOCITY_1in500_AEP_EVENT.mxd

FIGURE F18
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
PMF EVENT



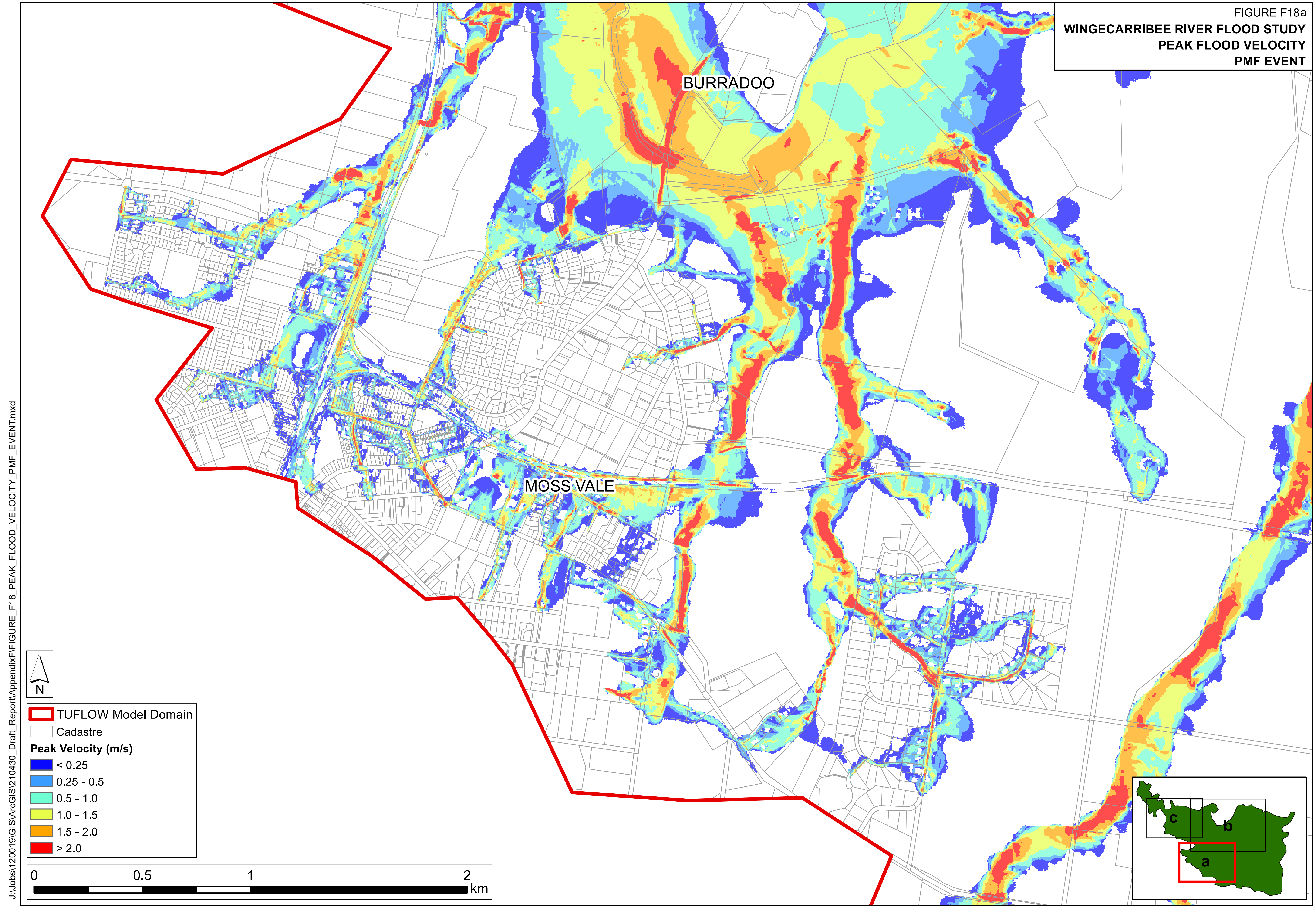
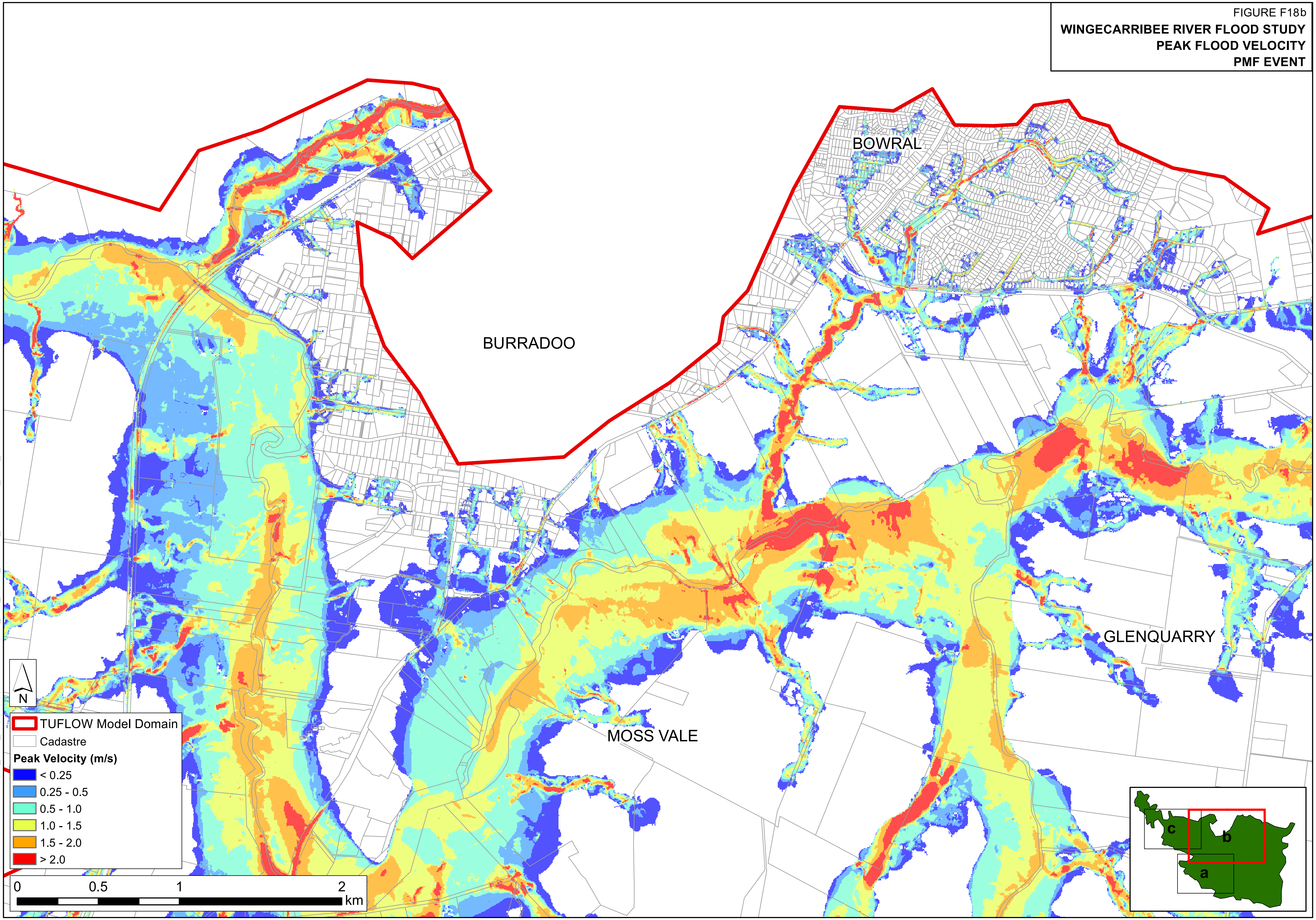


FIGURE F18a
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
PMF EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F18_PEAK_FLOOD_VELOCITY_PMF_EVENT.mxd

FIGURE F18b
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
PMF EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F18_PEAK_FLOOD_VELOCITY_PMF_EVENT.mxd

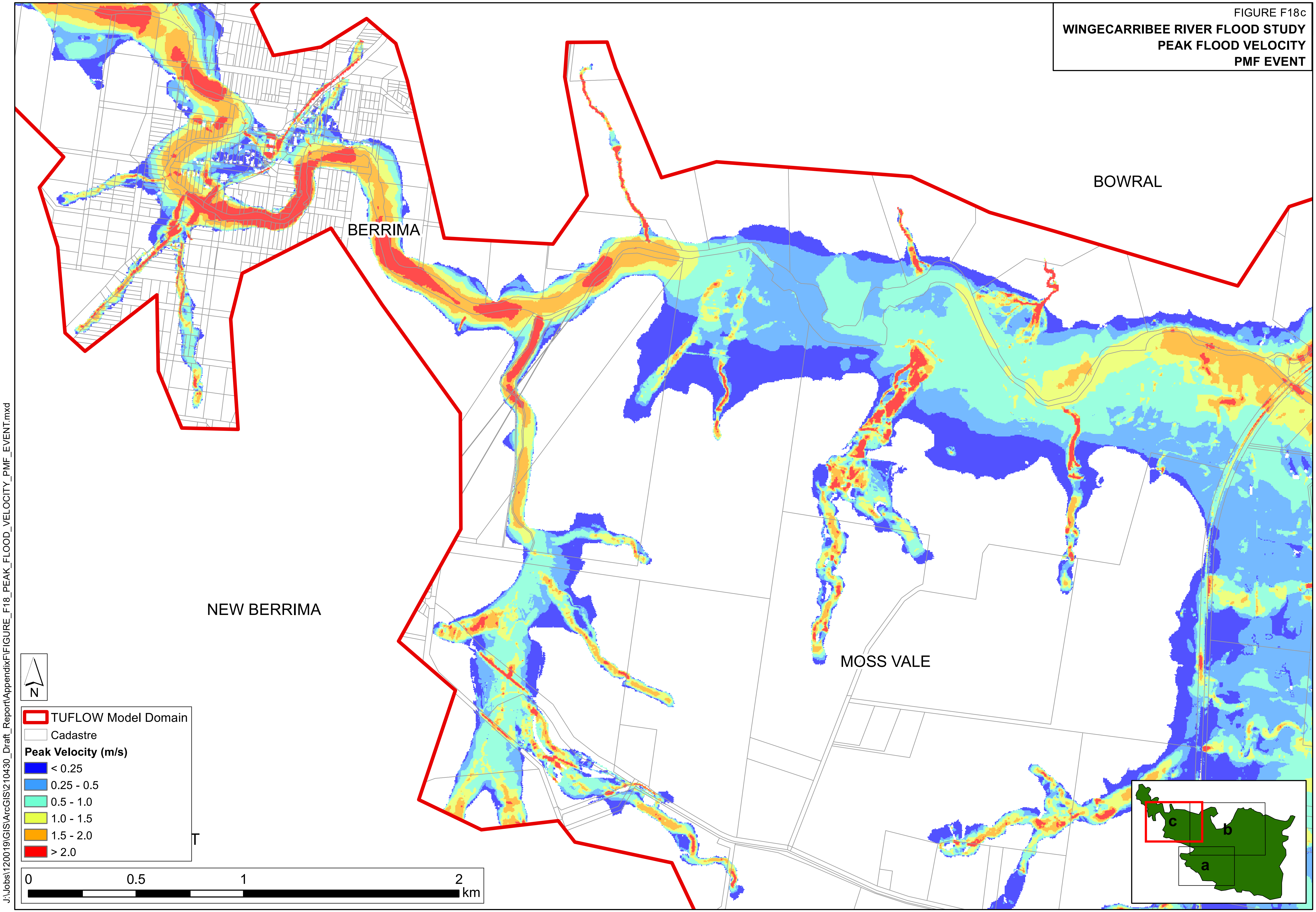
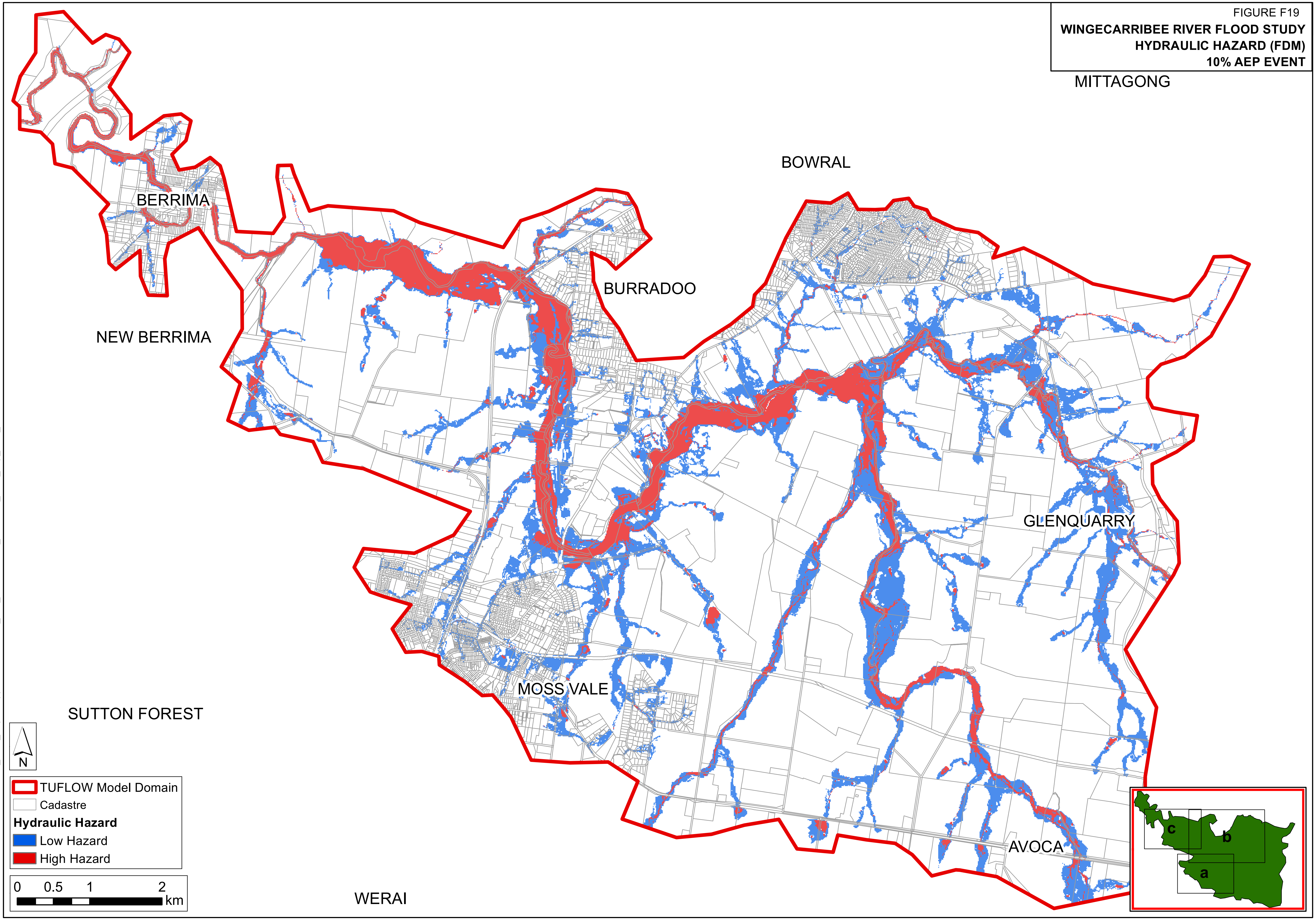


FIGURE F18c
WINGECARRIBEE RIVER FLOOD STUDY
PEAK FLOOD VELOCITY
PMF EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Peak Velocity (m/s)
< 0.25
0.25 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F18_PEAK_FLOOD_VELOCITY_PMF_EVENT.mxd

FIGURE F19
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
10% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F19_HYDRAULIC_HAZARD_FDM_10p_AEP_EVENT.mxd

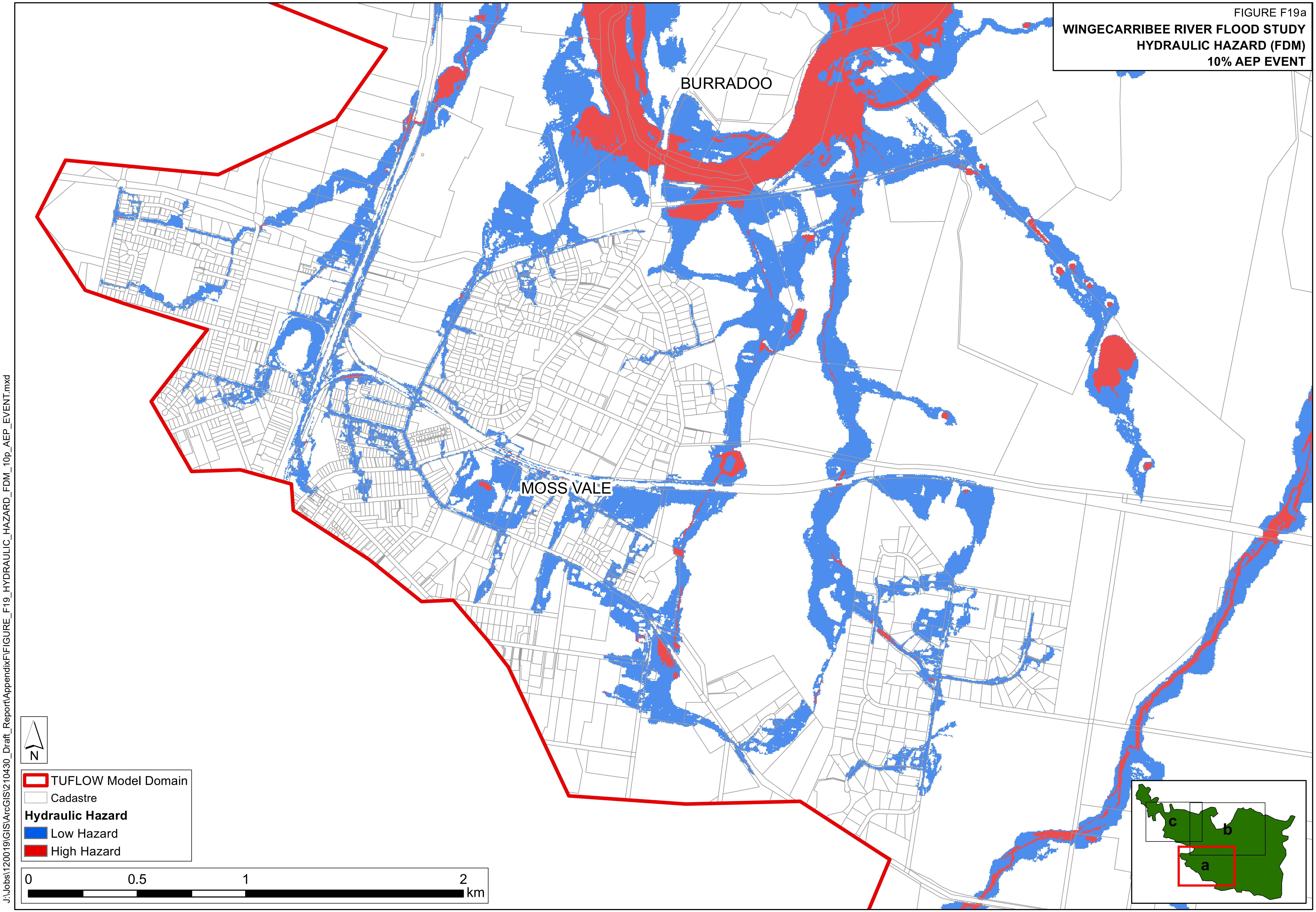


FIGURE F19a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
10% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F19_HYDRAULIC_HAZARD_FDM_10p_AEP_EVENT.mxd

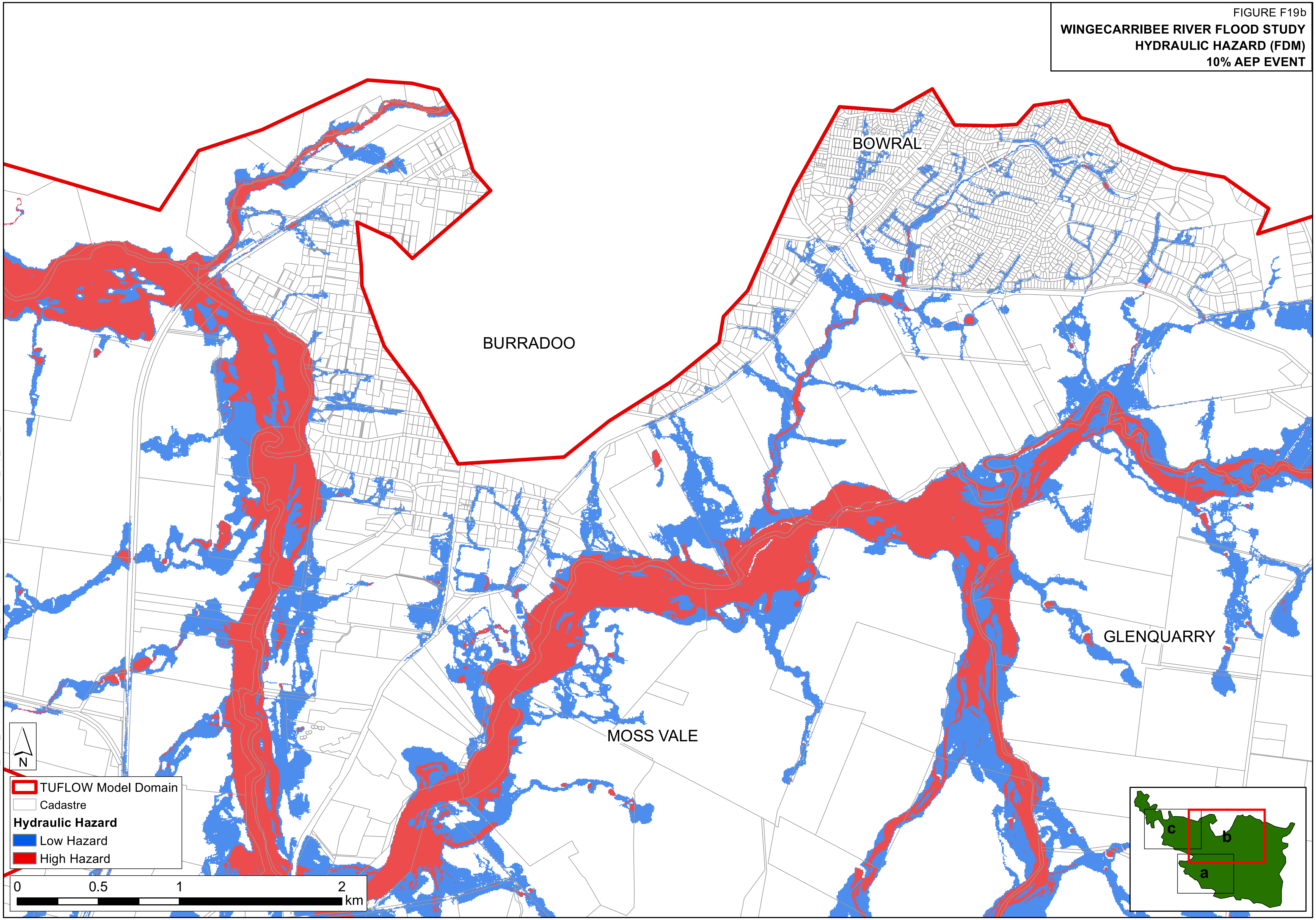
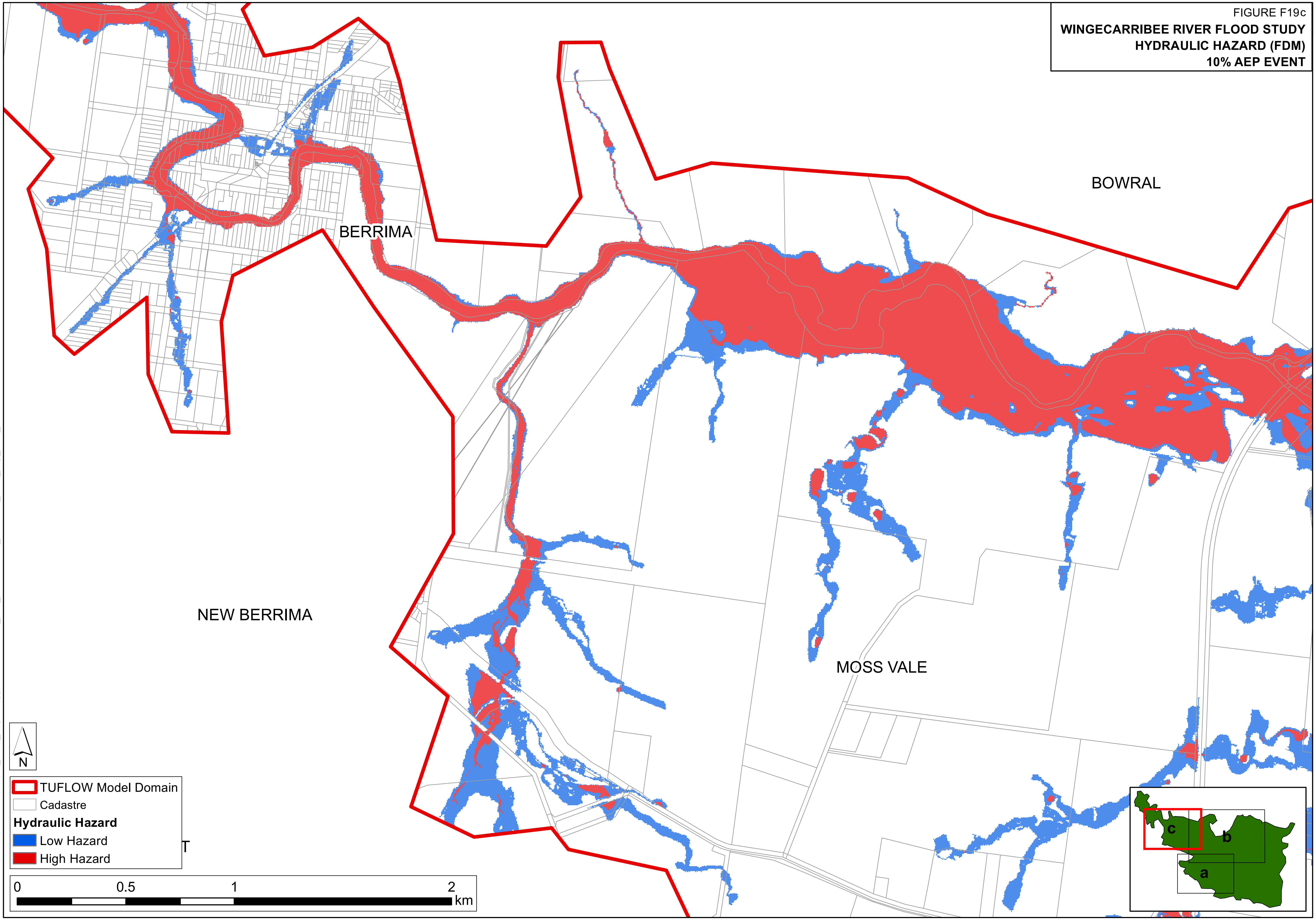


FIGURE F19b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
10% AEP EVENT
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F19_HYDRAULIC_HAZARD_FDM_10p_AEP_EVENT.mxd

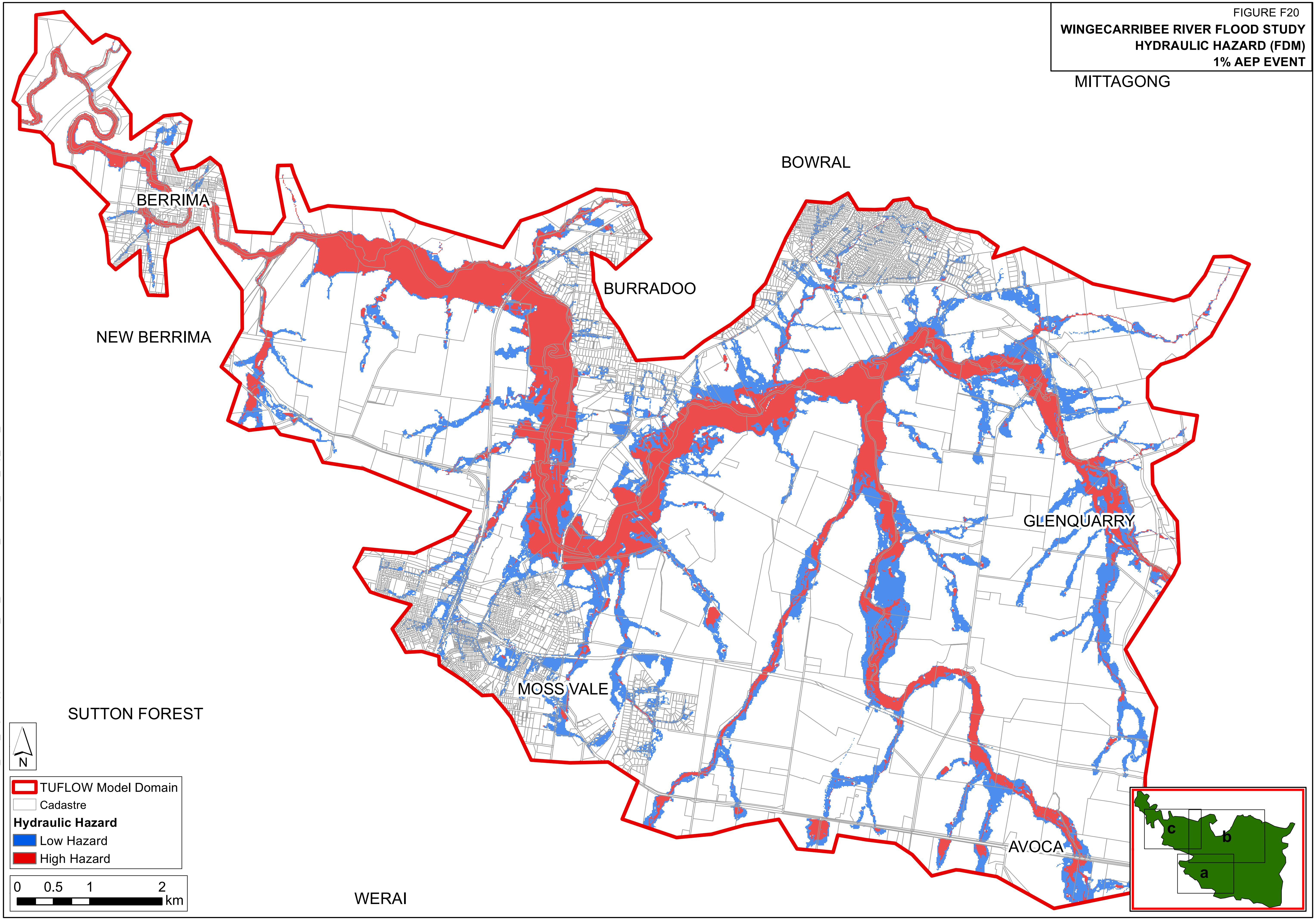
FIGURE F19c
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
10% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F19_HYDRAULIC_HAZARD_FDM_10p_AEP_EVENT.mxd

FIGURE F20

WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
1% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F20_HYDRAULIC_HAZARD_FDM_01p_AEP_EVENT.mxd

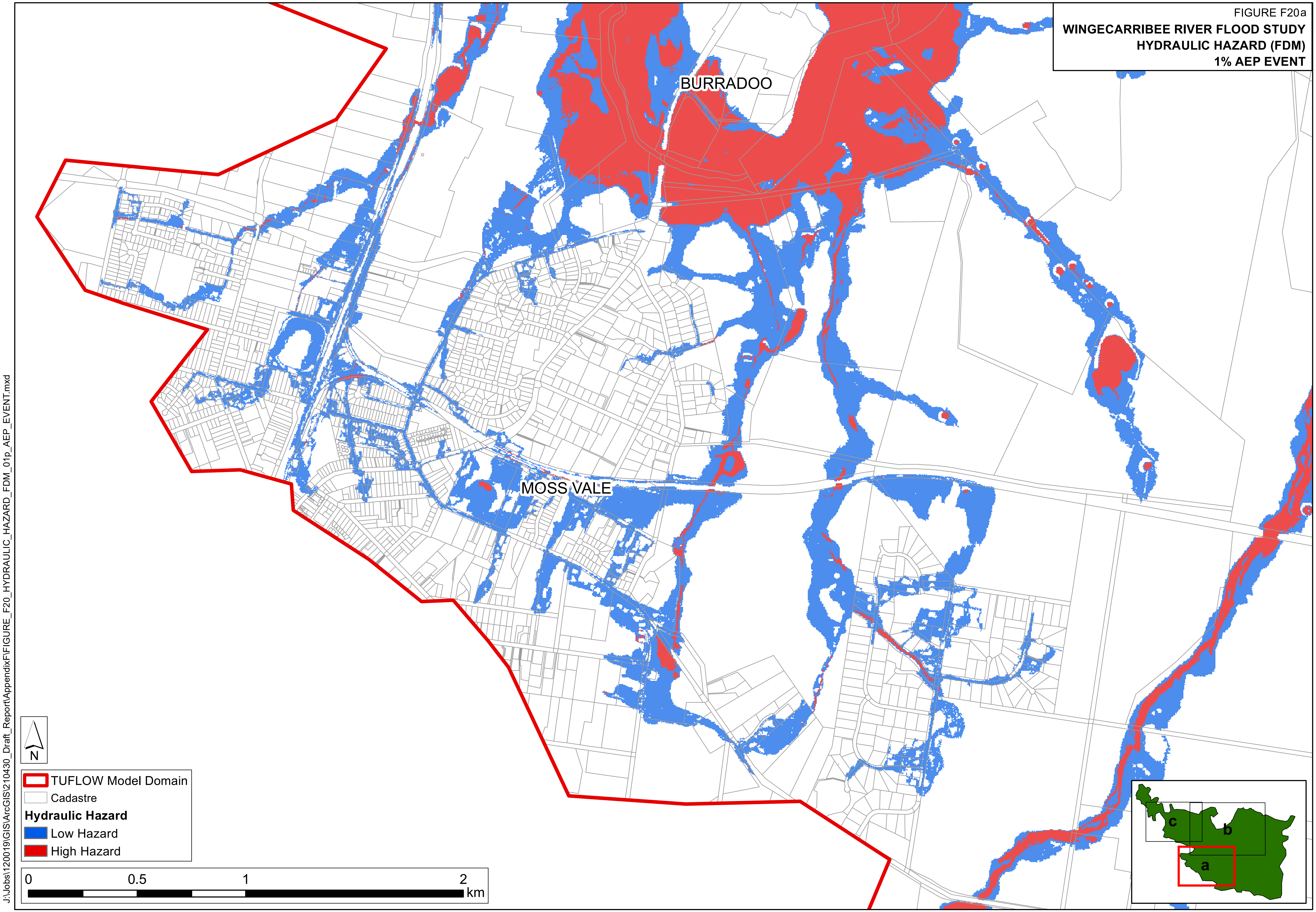


FIGURE F20a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
1% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F20_HYDRAULIC_HAZARD_FDM_01p_AEP_EVENT.mxd

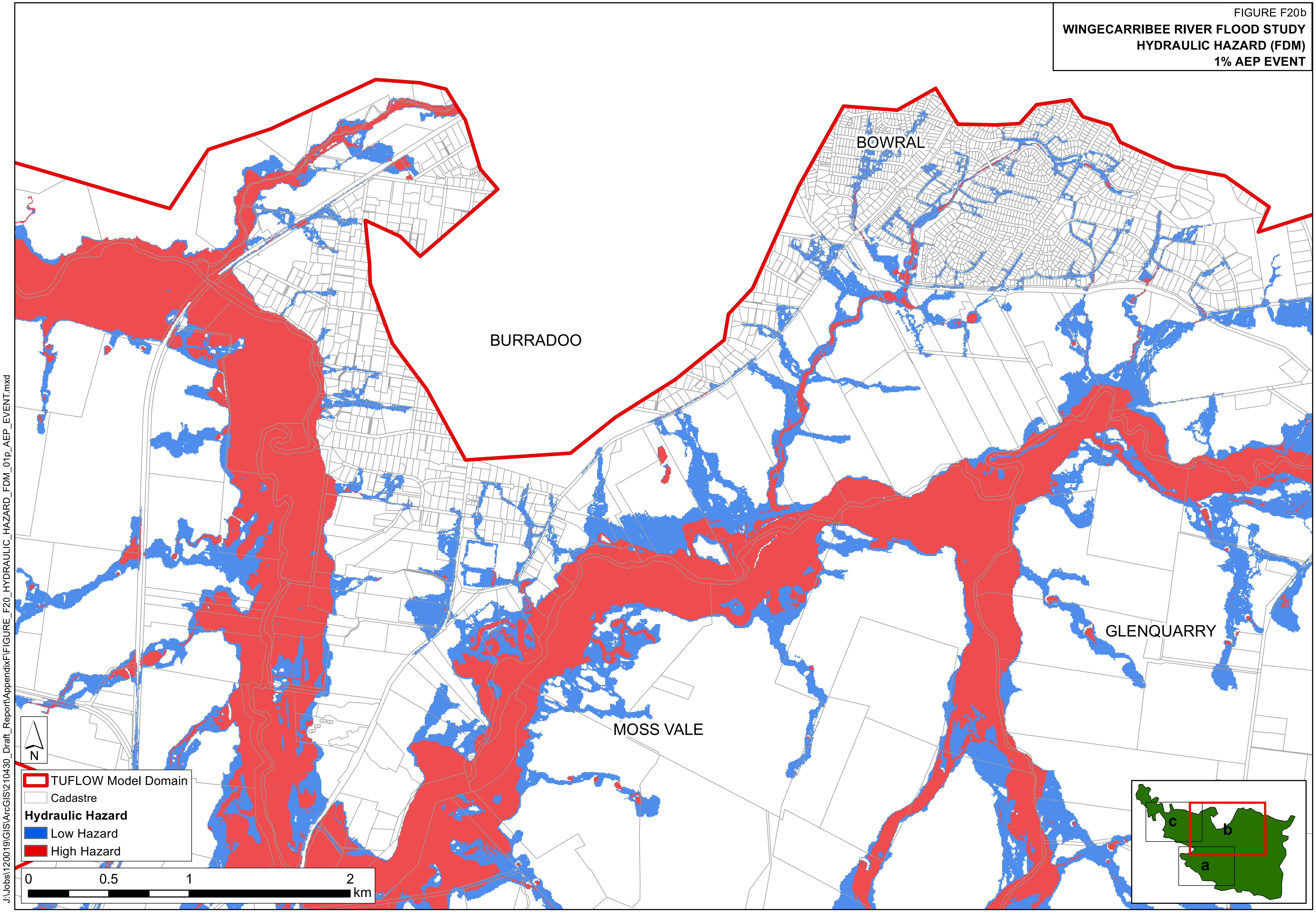
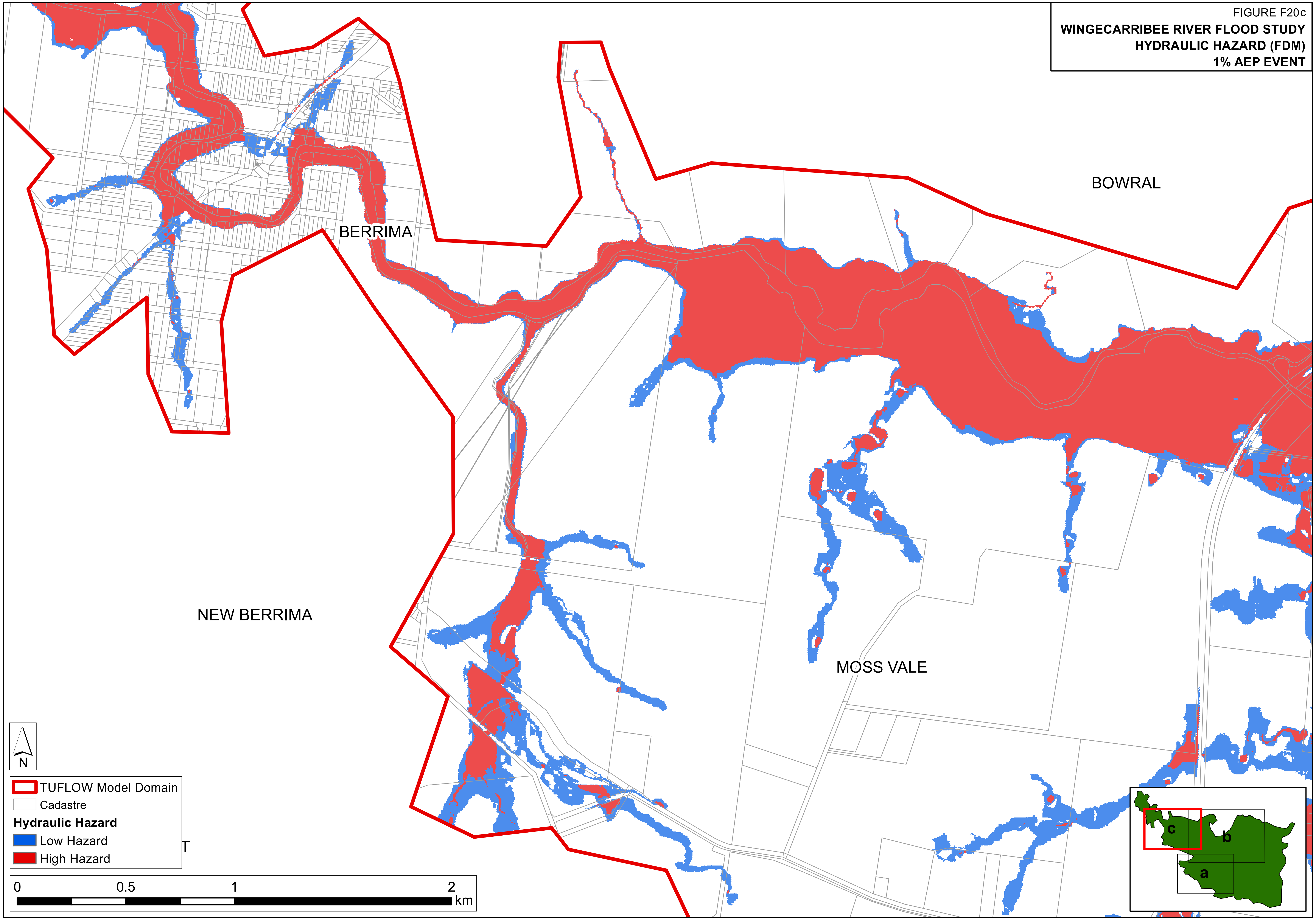


FIGURE F20b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
1% AEP EVENT
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F20_HYDRAULIC_HAZARD_FDM_01p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F20_HYDRAULIC_HAZARD_FDM_01p_AEP_EVENT.mxd

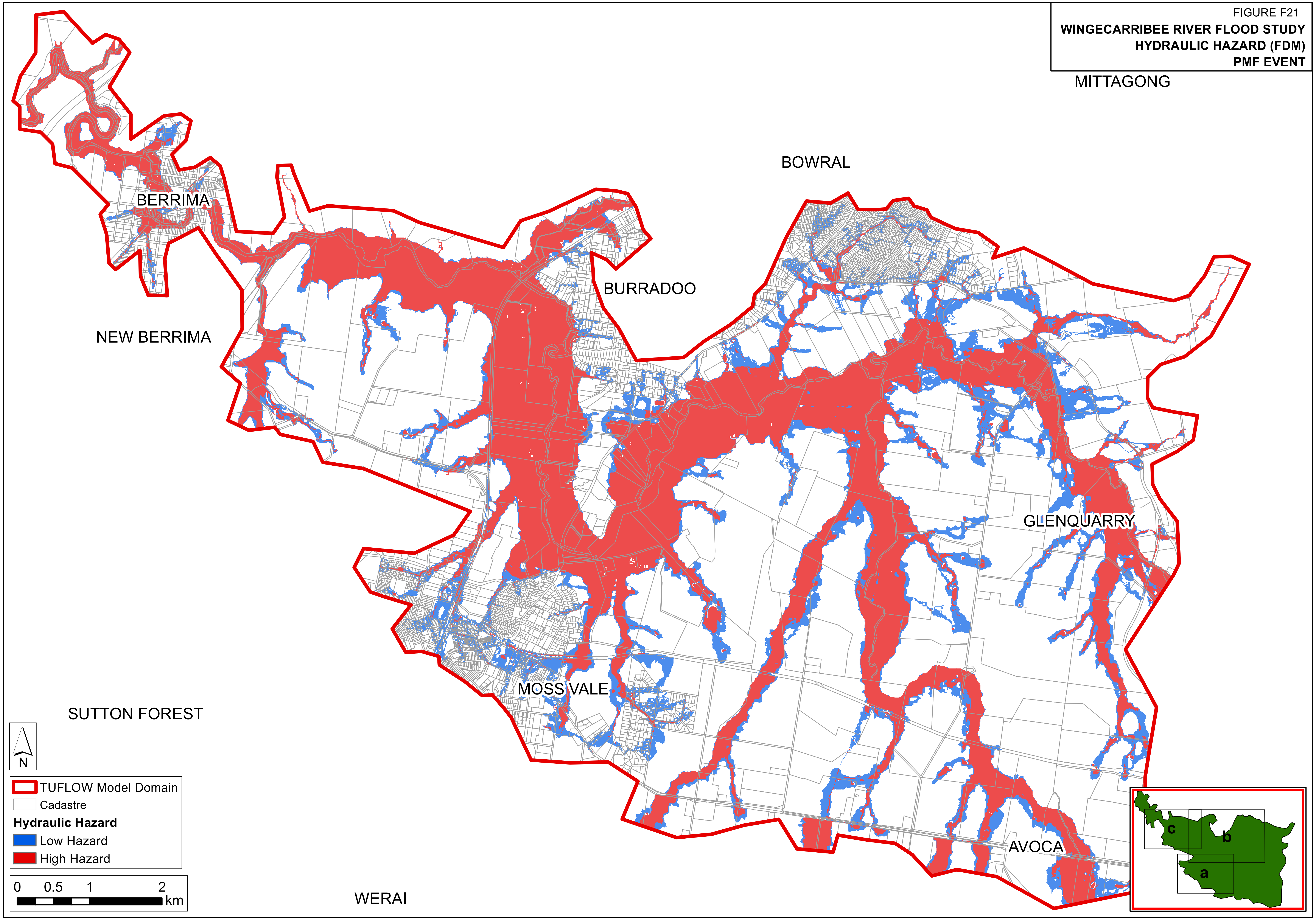


FIGURE F21
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
PMF EVENT
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
SUTTON FOREST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0 0.5 1 2 km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F21_HYDRAULIC_HAZARD_FDM_PMF_EVENT.mxd

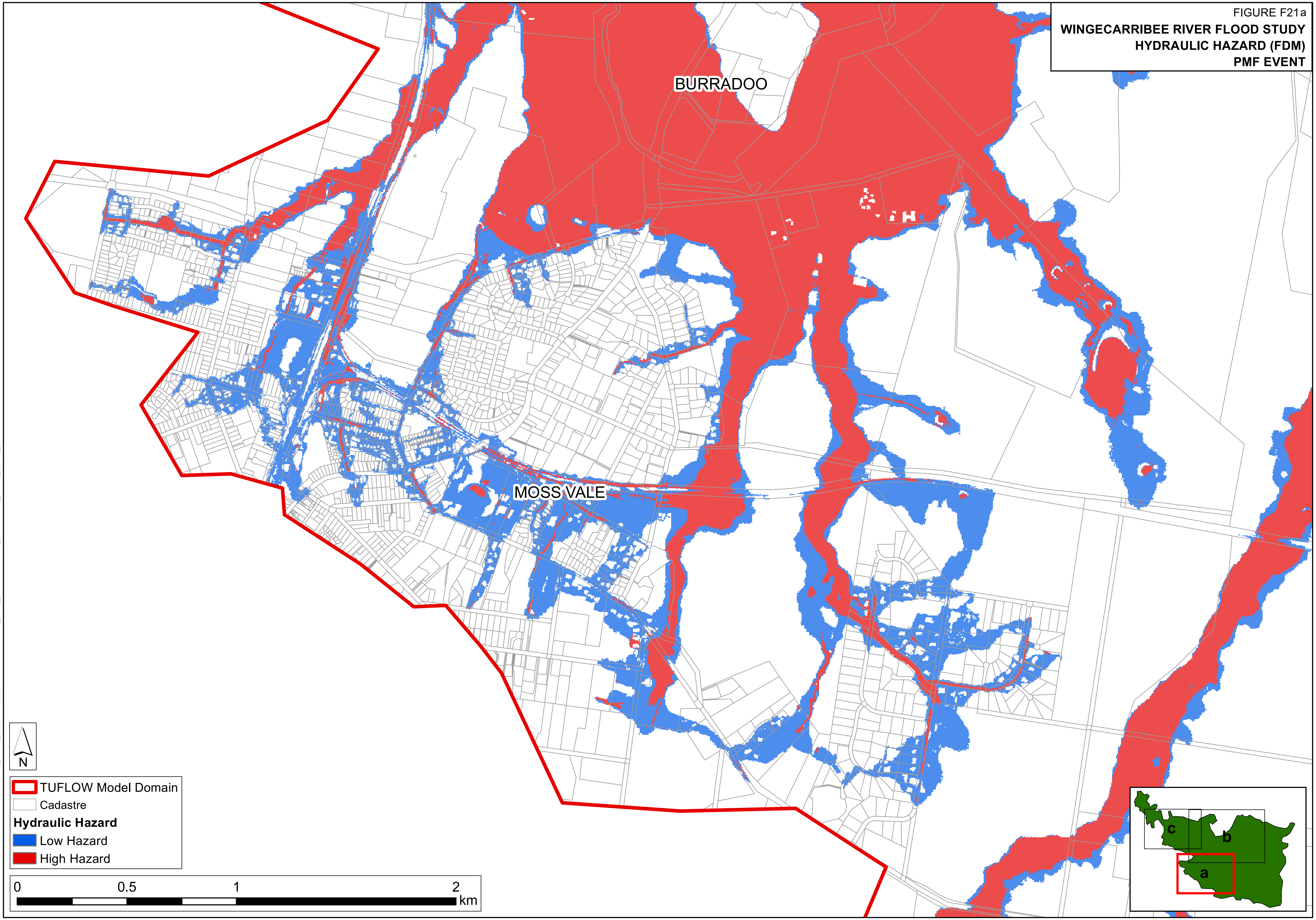
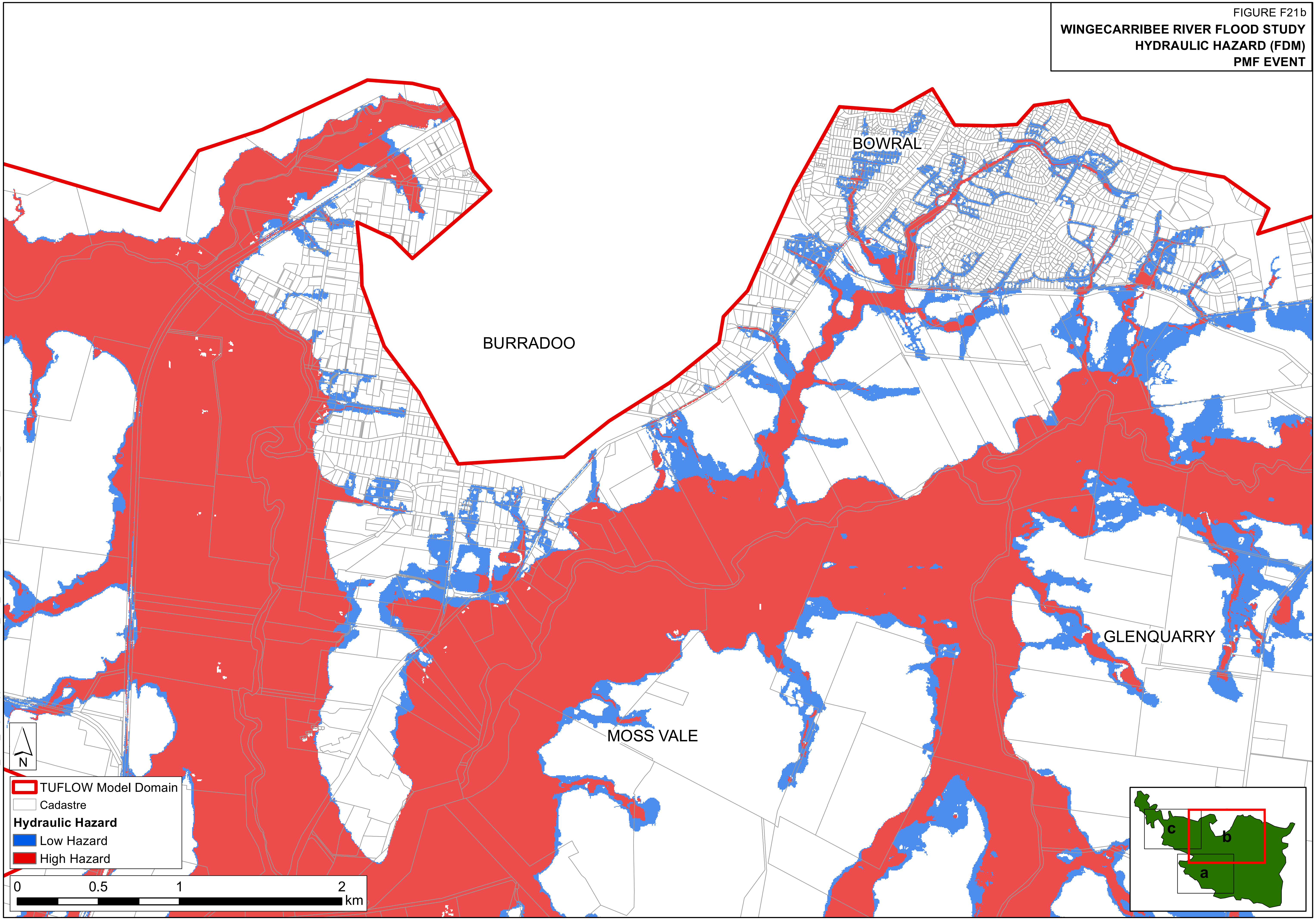


FIGURE F21a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
PMF EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F21_HYDRAULIC_HAZARD_FDM_PMF_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F21_HYDRAULIC_HAZARD_FDM_PMF_EVENT.mxd

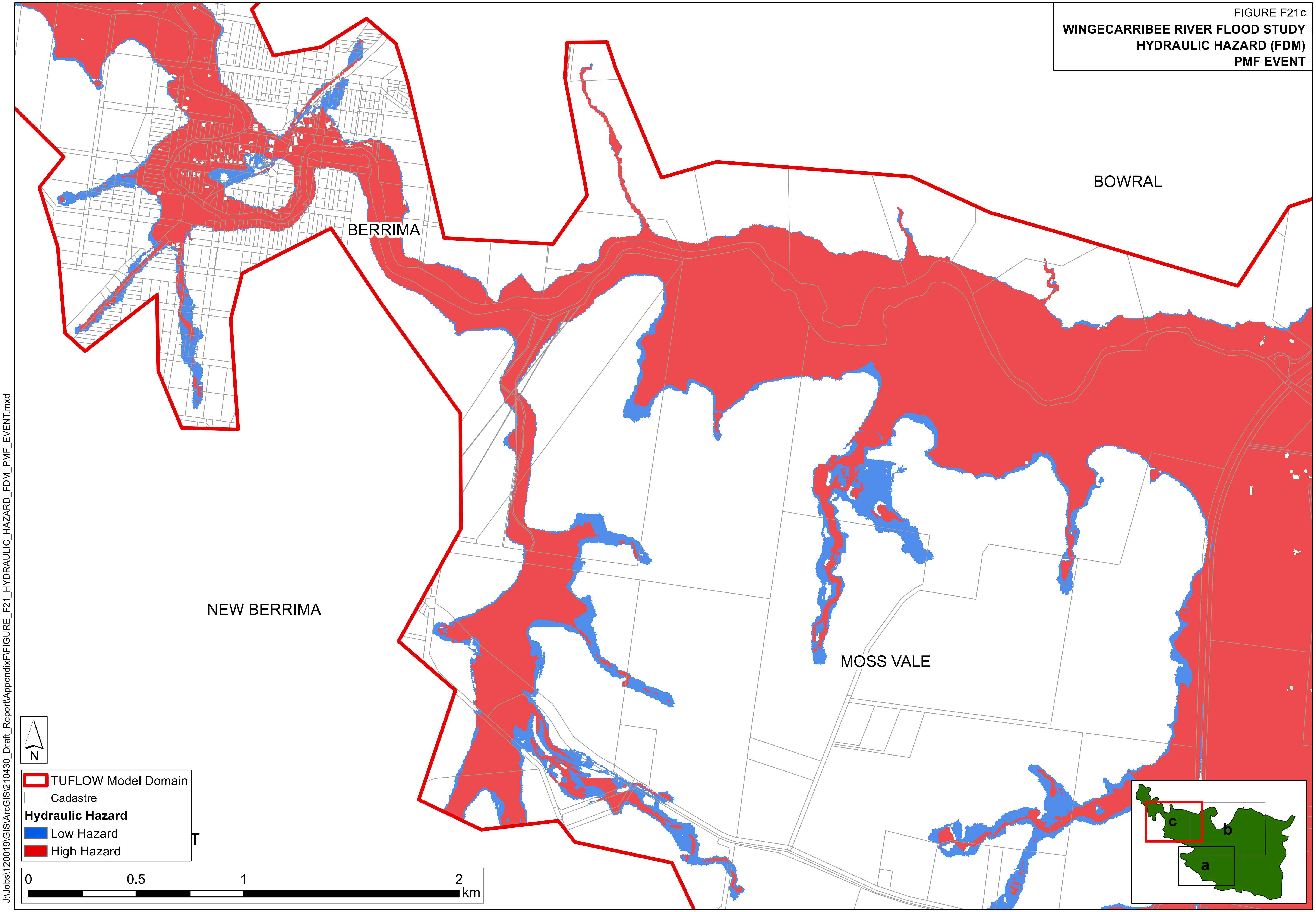
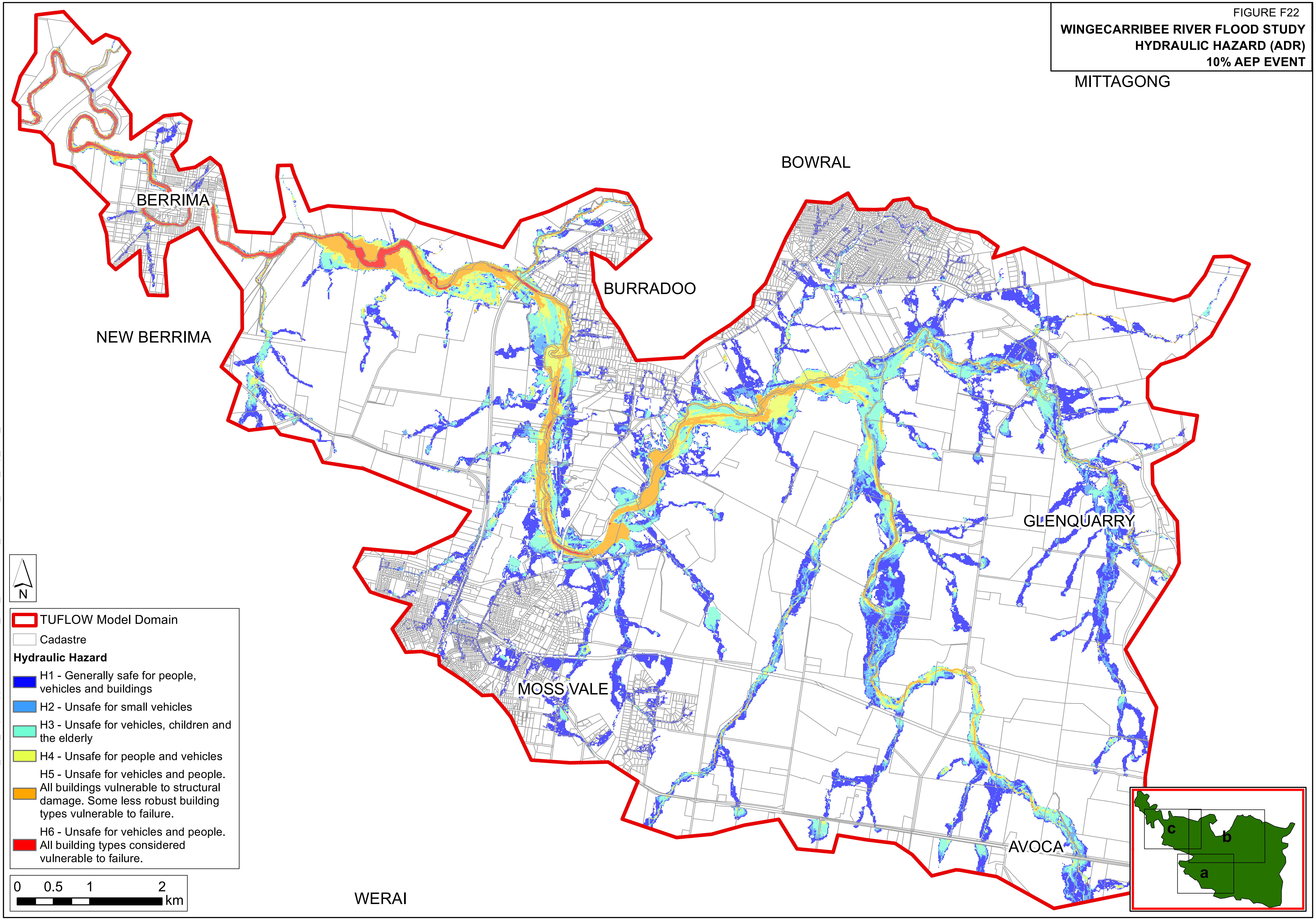
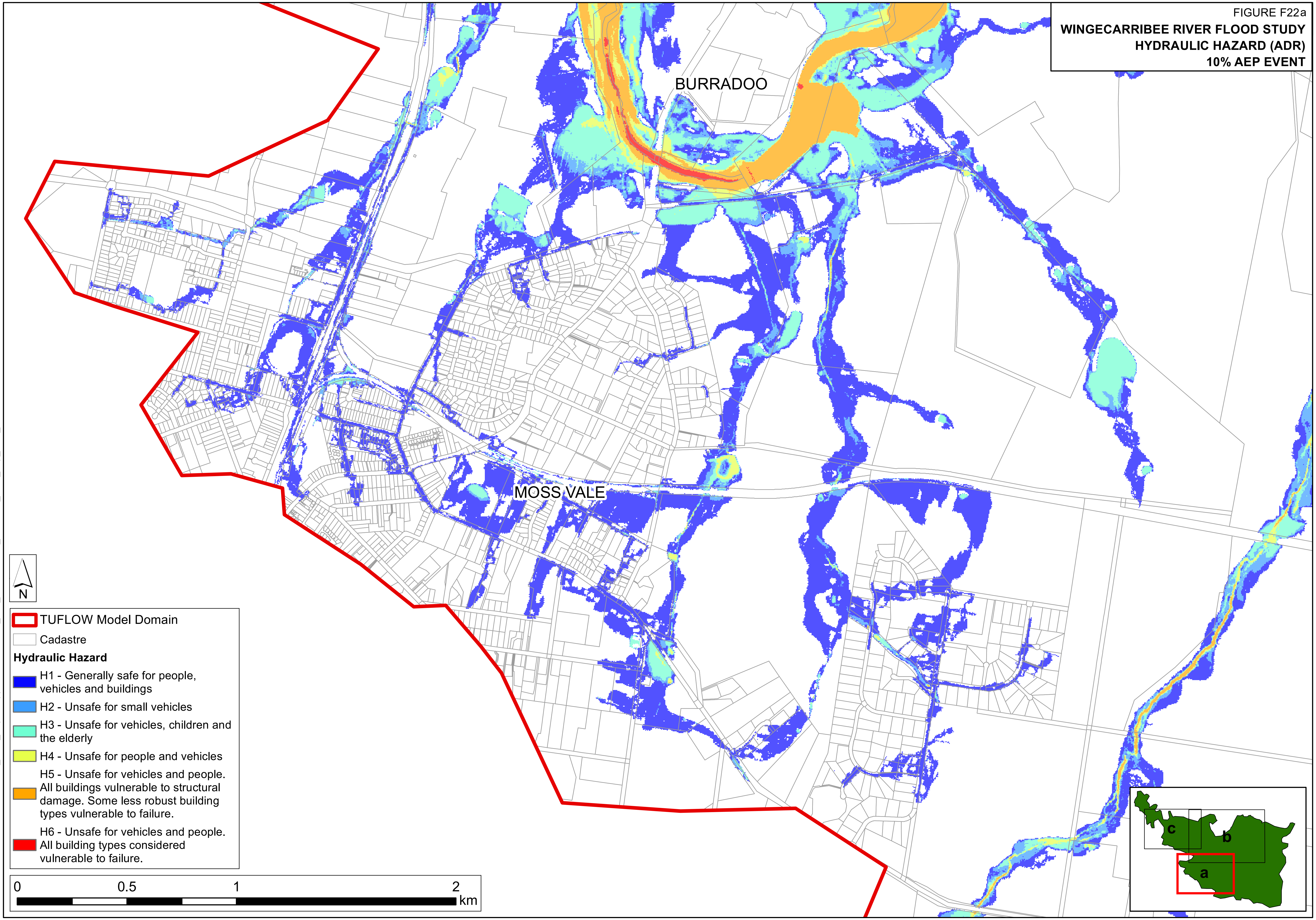


FIGURE F21c
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (FDM)
PMF EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
Low Hazard
High Hazard
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F21_HYDRAULIC_HAZARD_FDM_PMF_EVENT.mxd

FIGURE F22
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
10% AEP EVENT

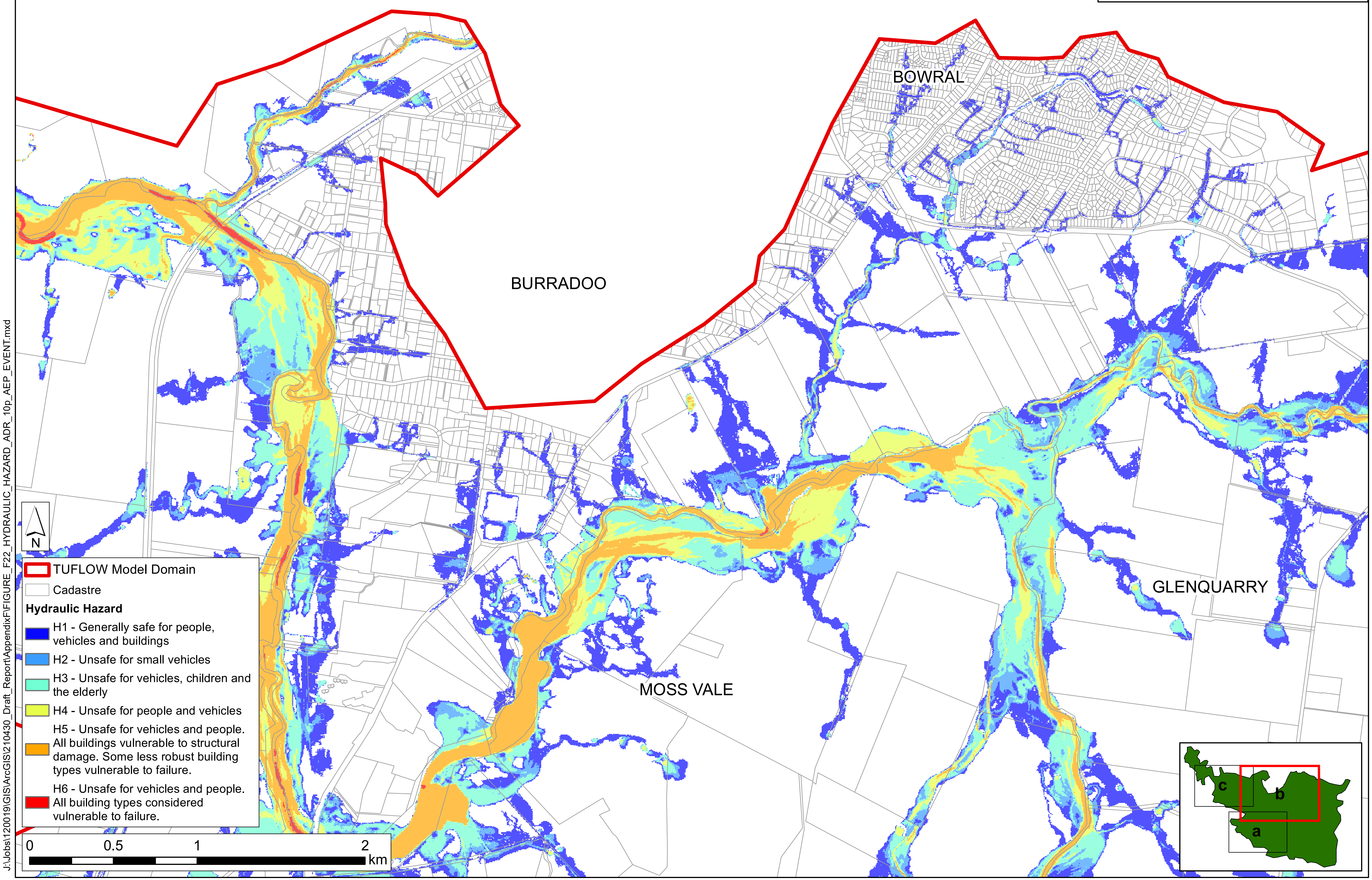


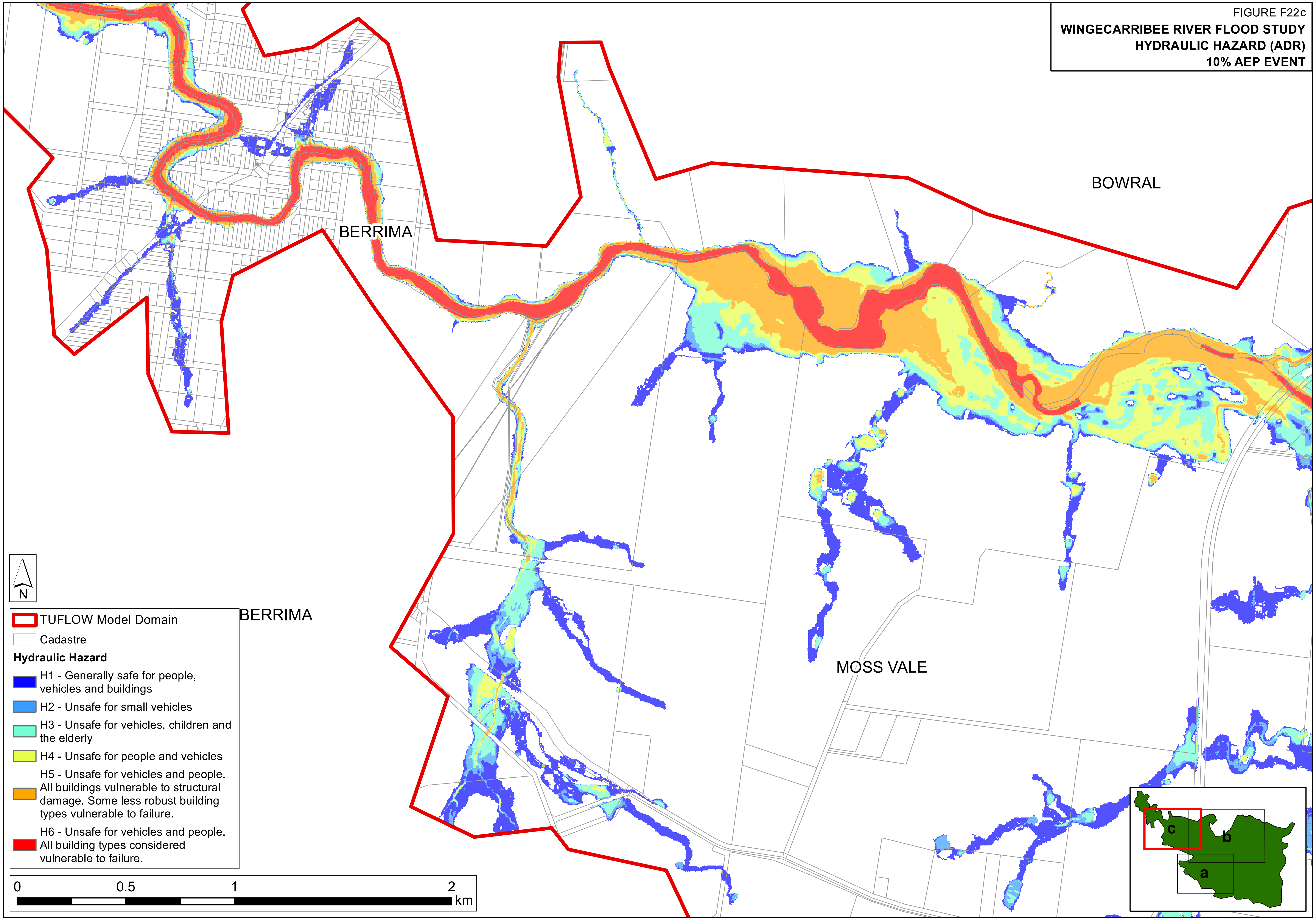
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F22_HYDRAULIC_HAZARD_ADR_10p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F22_HYDRAULIC_HAZARD_ADR_10p_AEP_EVENT.mxd

FIGURE F22b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
10% AEP EVENT





J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F22_HYDRAULIC_HAZARD_ADR_10p_AEP_EVENT.mxd

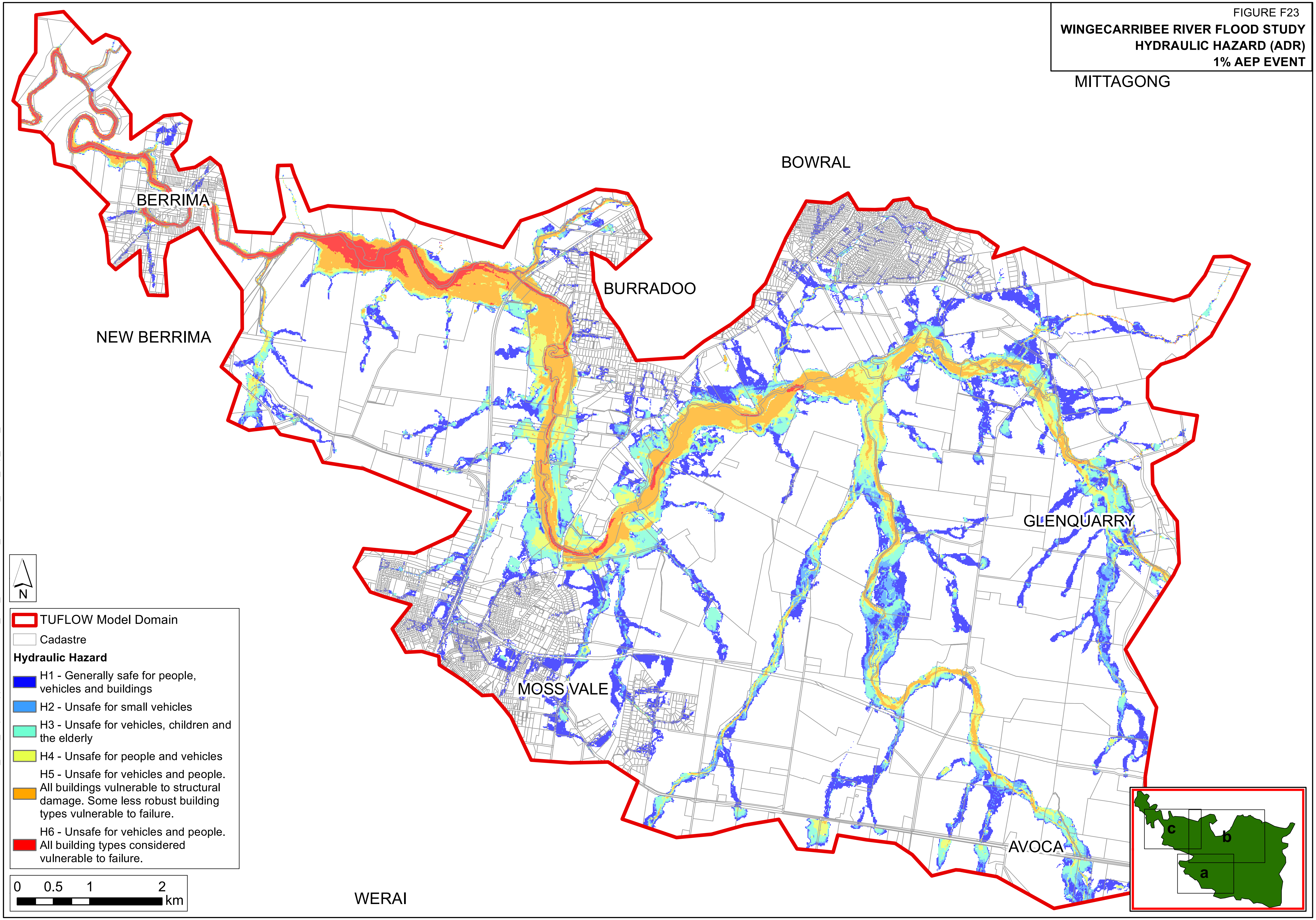


FIGURE F23
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
1% AEP EVENT
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.
0 0.5 1 2 km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F23_HYDRAULIC_HAZARD_ADR_01p_AEP_EVENT.mxd

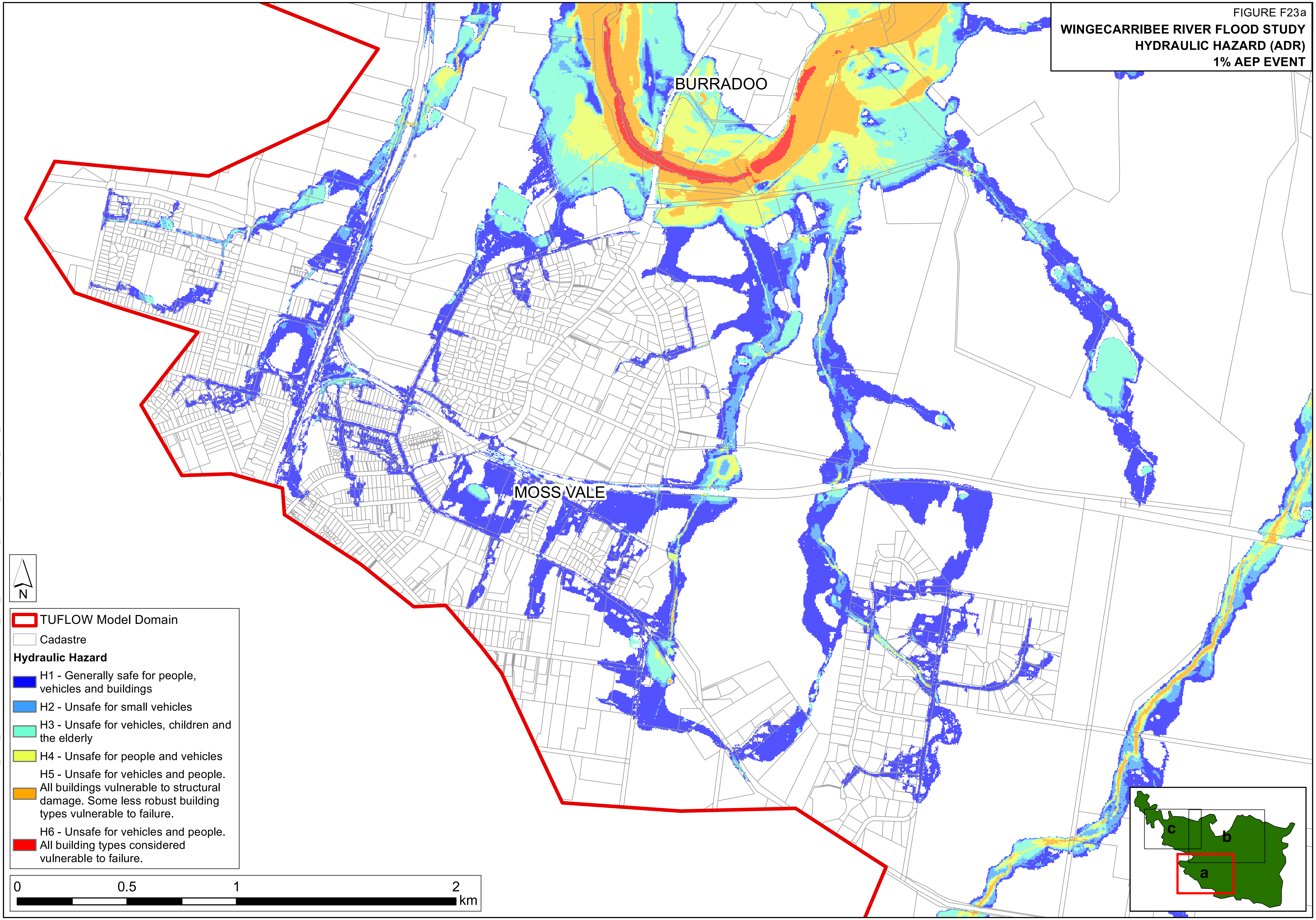


FIGURE F23a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
1% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F23_HYDRAULIC_HAZARD_ADR_01p_AEP_EVENT.mxd

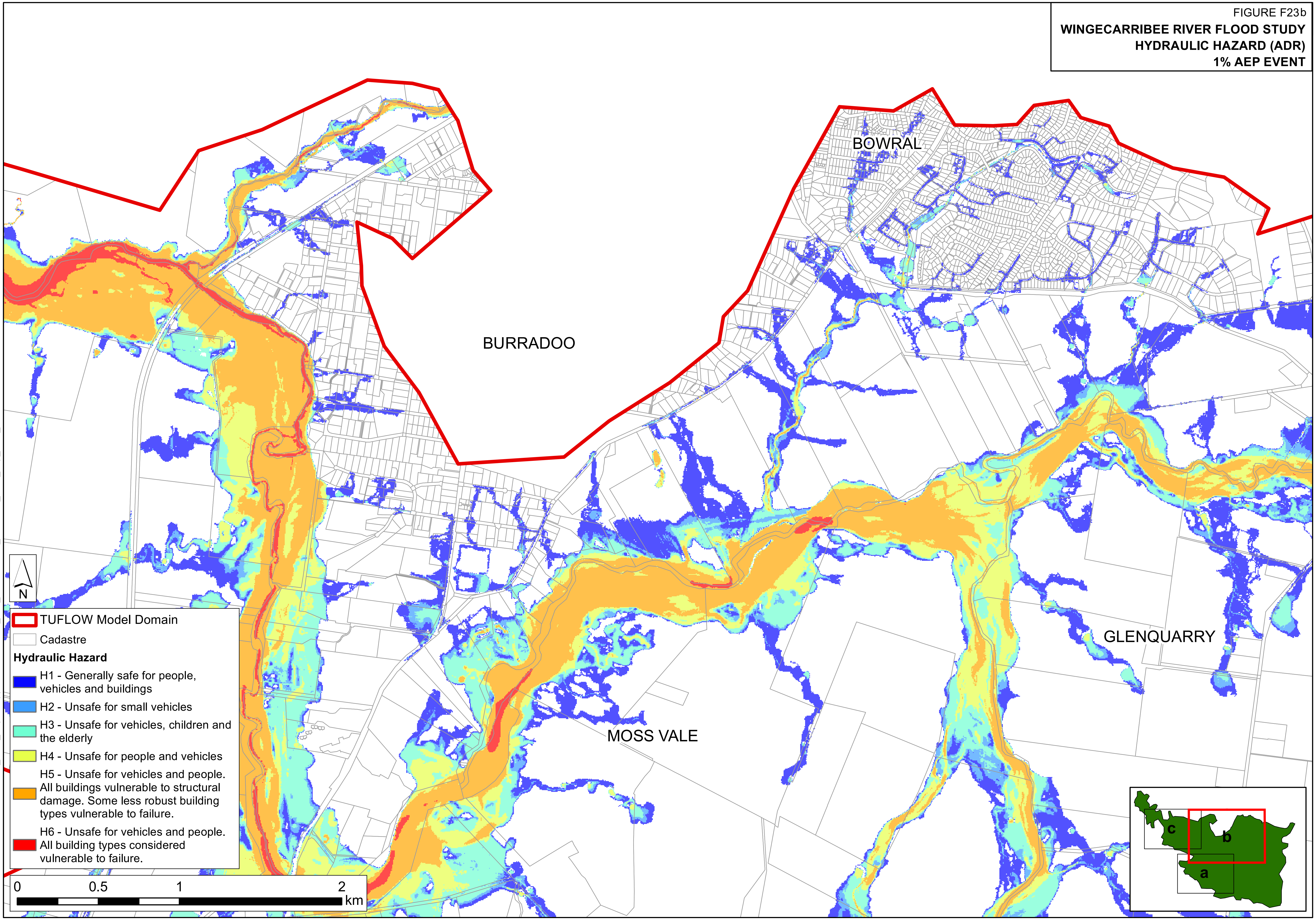
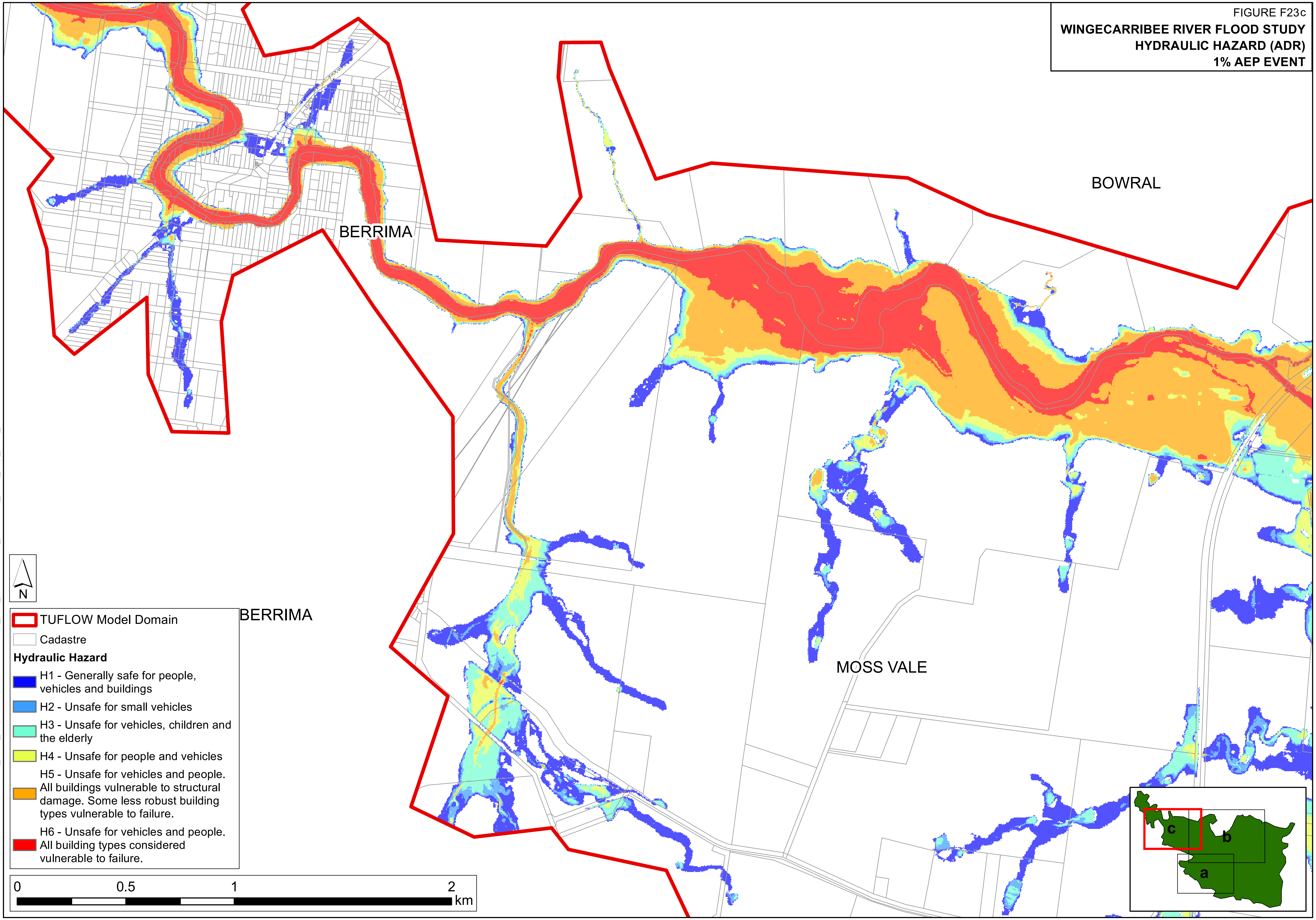
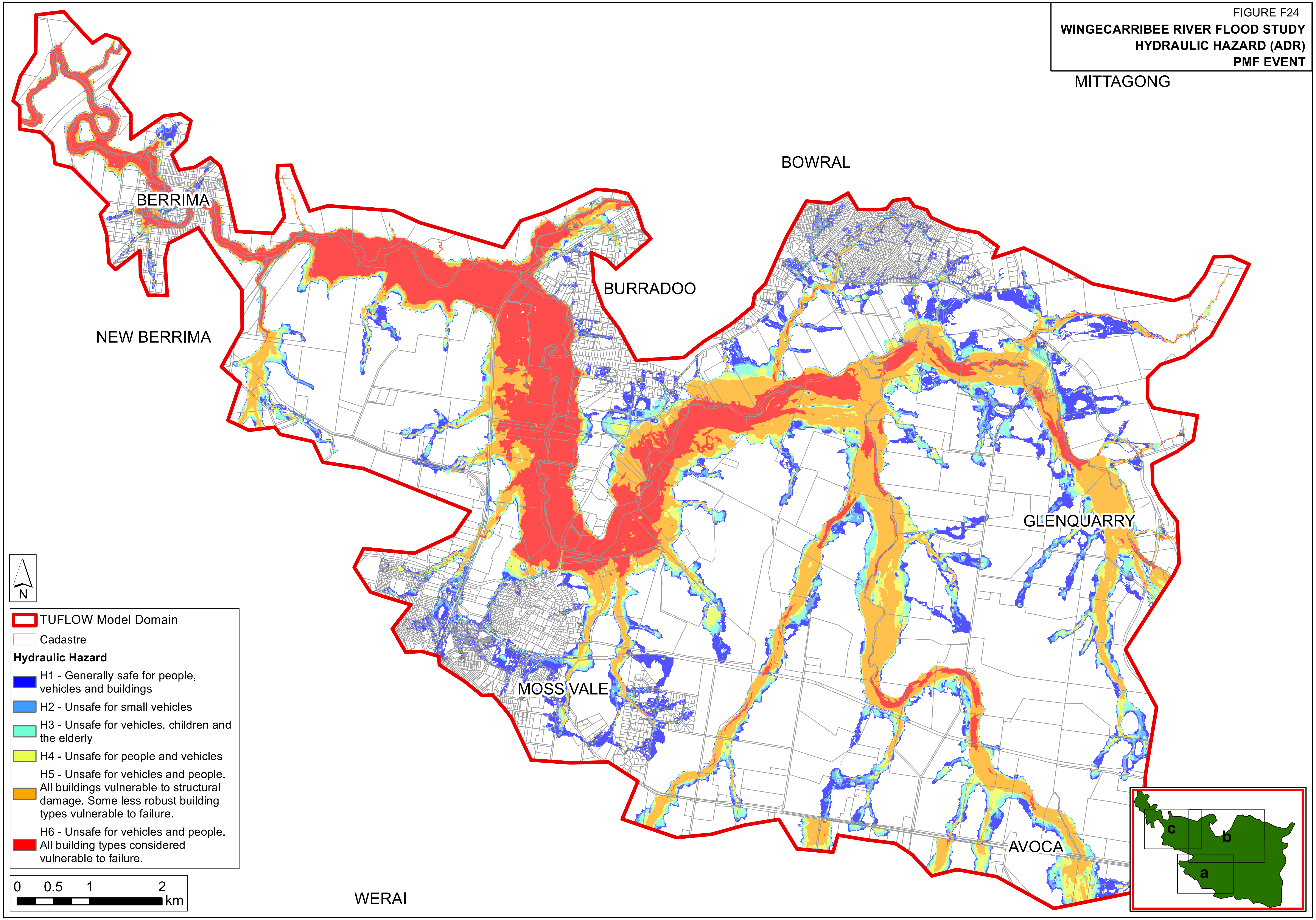


FIGURE F23b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
1% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F23_HYDRAULIC_HAZARD_ADR_01p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix F\FIGURE_F23_HYDRAULIC_HAZARD_ADR_01p_AEP_EVENT.mxd

FIGURE F24
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
PMF EVENT



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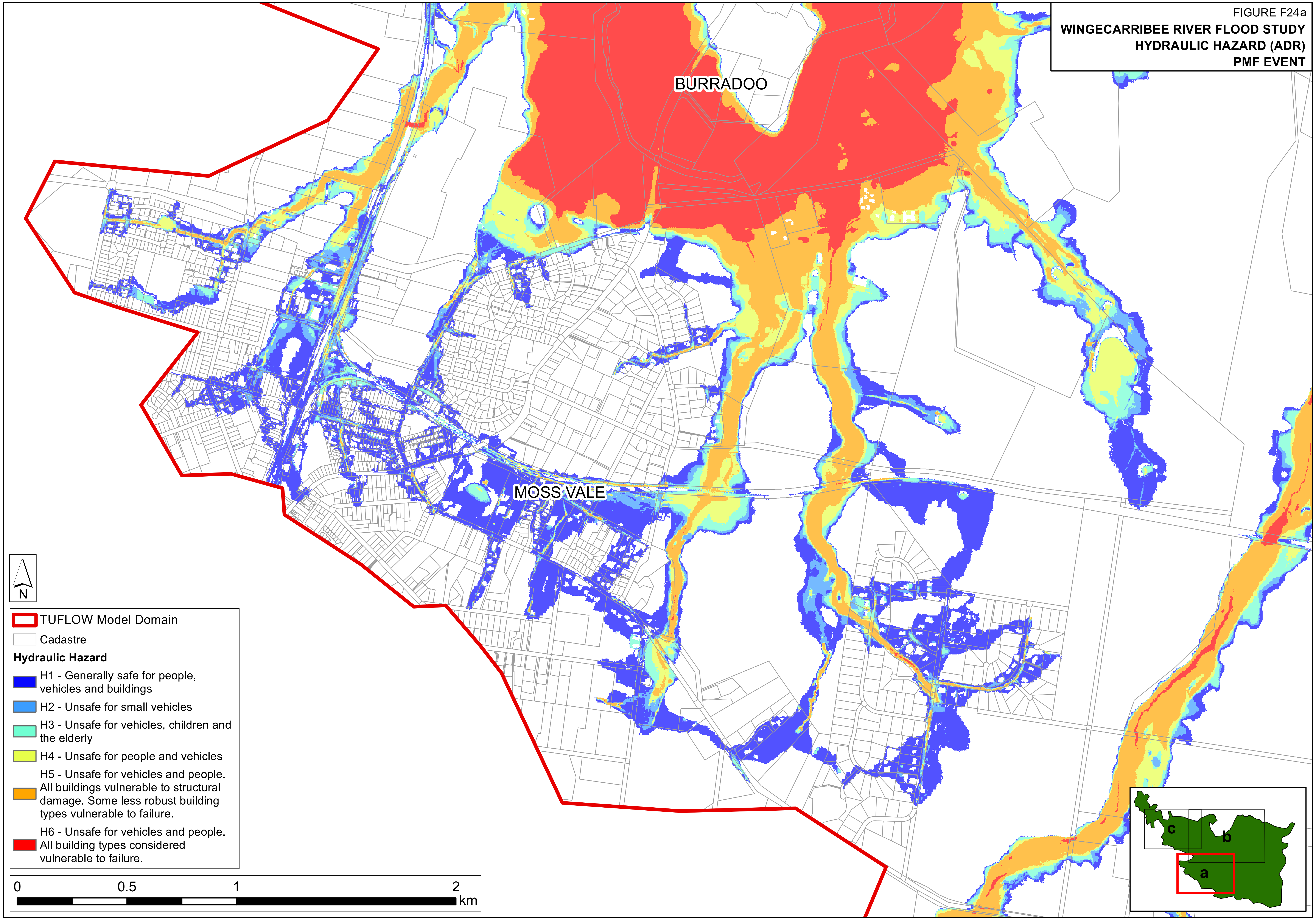
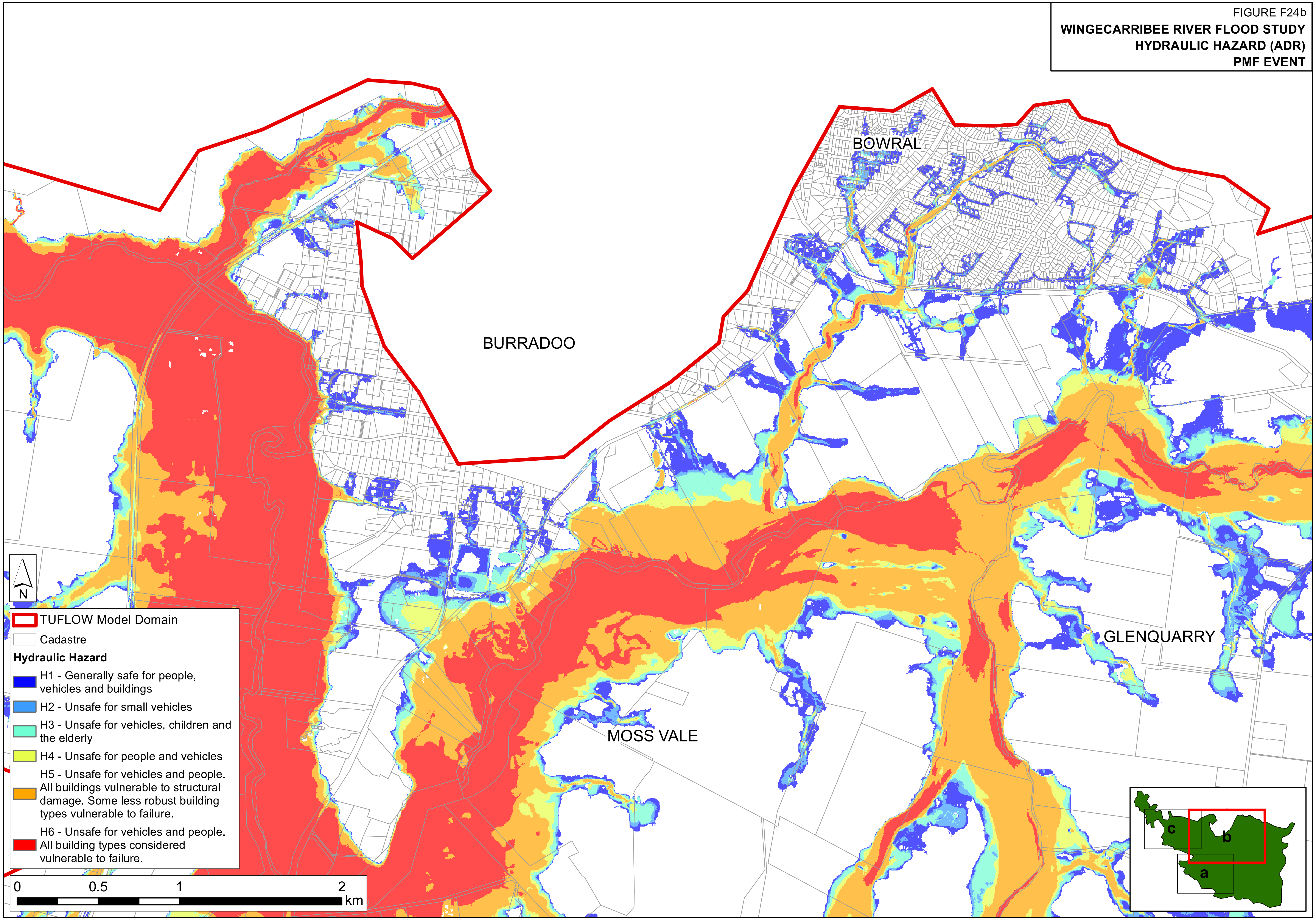


FIGURE F24a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
PMF EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F24_HYDRAULIC_HAZARD_ADR_PMF_EVENT.mxd



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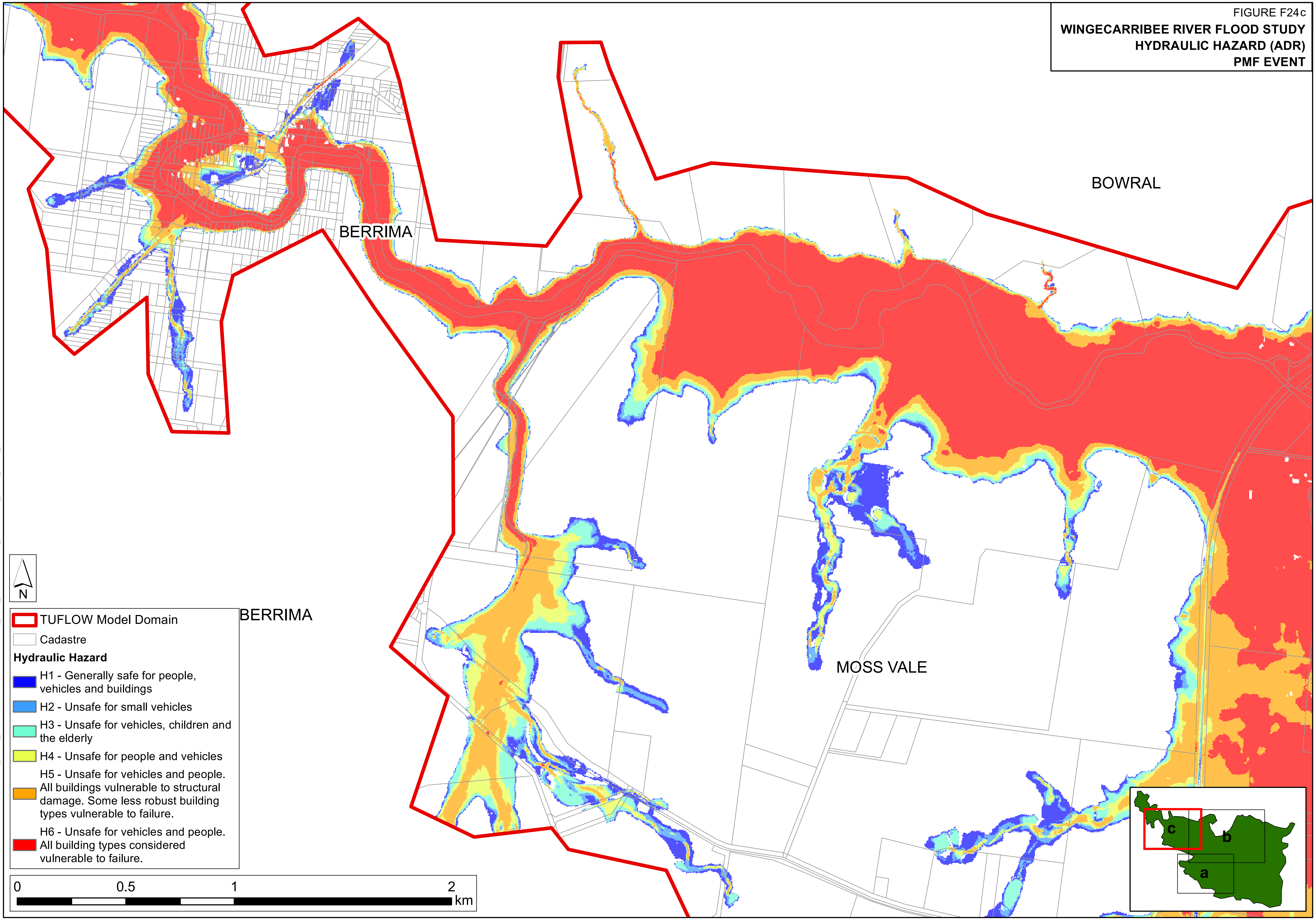
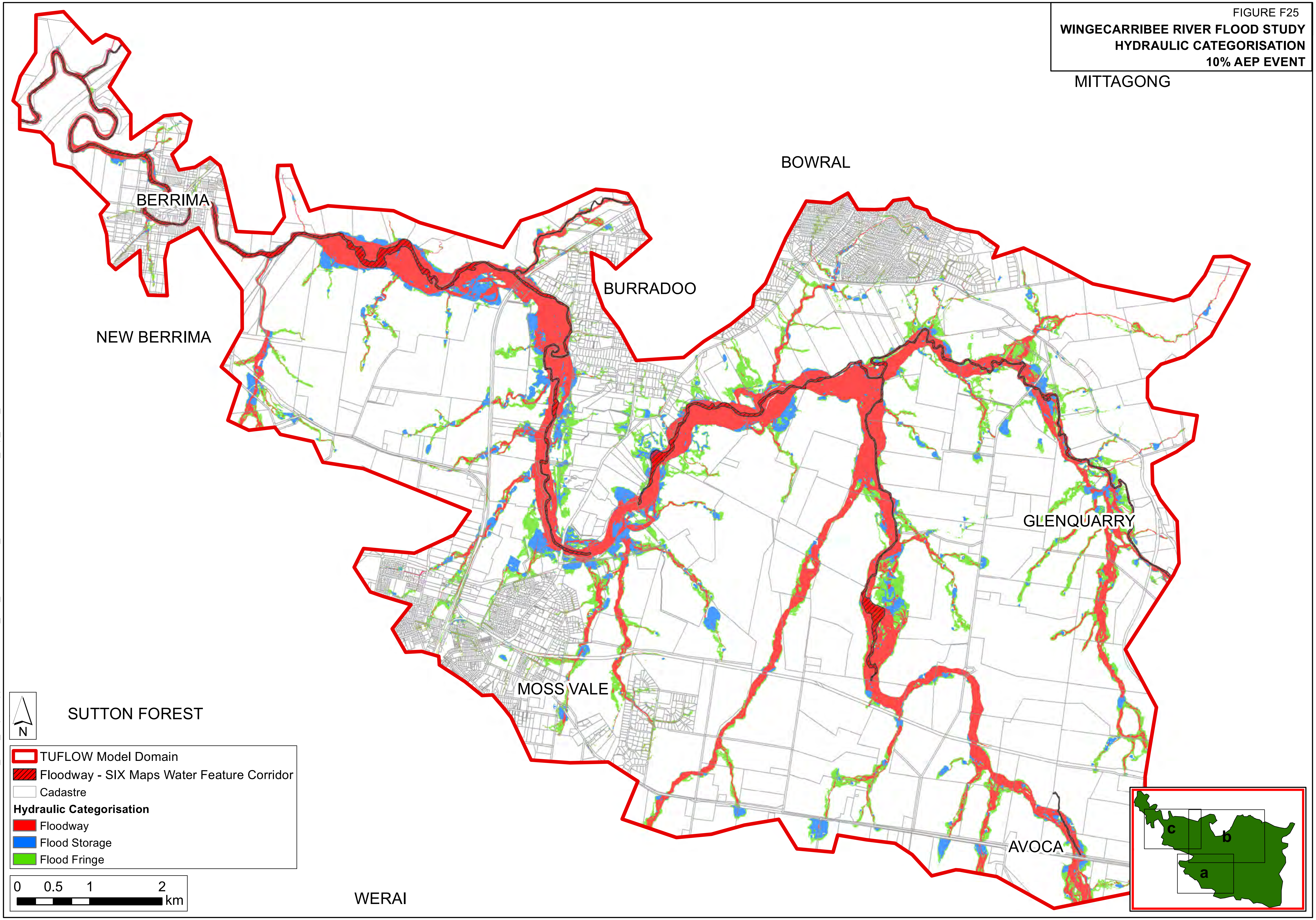


FIGURE F24c
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC HAZARD (ADR)
PMF EVENT
BOWRAL
BERRIMA
BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Hydraulic Hazard
H1 - Generally safe for people, vehicles and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F24_HYDRAULIC_HAZARD_ADR_PMF_EVENT.mxd

FIGURE F25
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
10% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F25_HYDRAULIC_CATEGORISATION_10p_AEP_EVENT.mxd

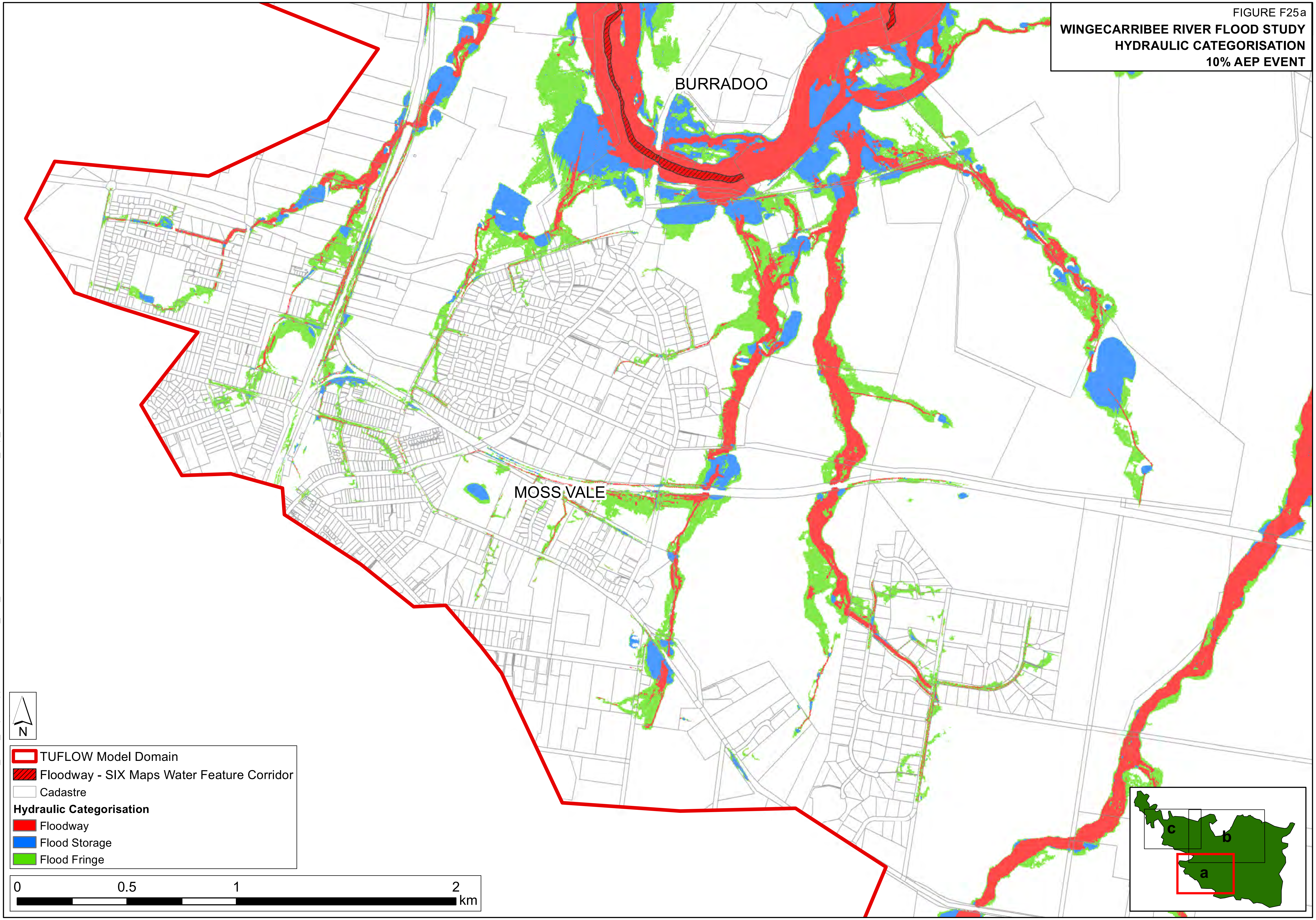


FIGURE F25a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
10% AEP EVENT
BURRADOO
MOSS VALE
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
N
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F25_HYDRAULIC_CATEGORISATION_10p_AEP_EVENT.mxd

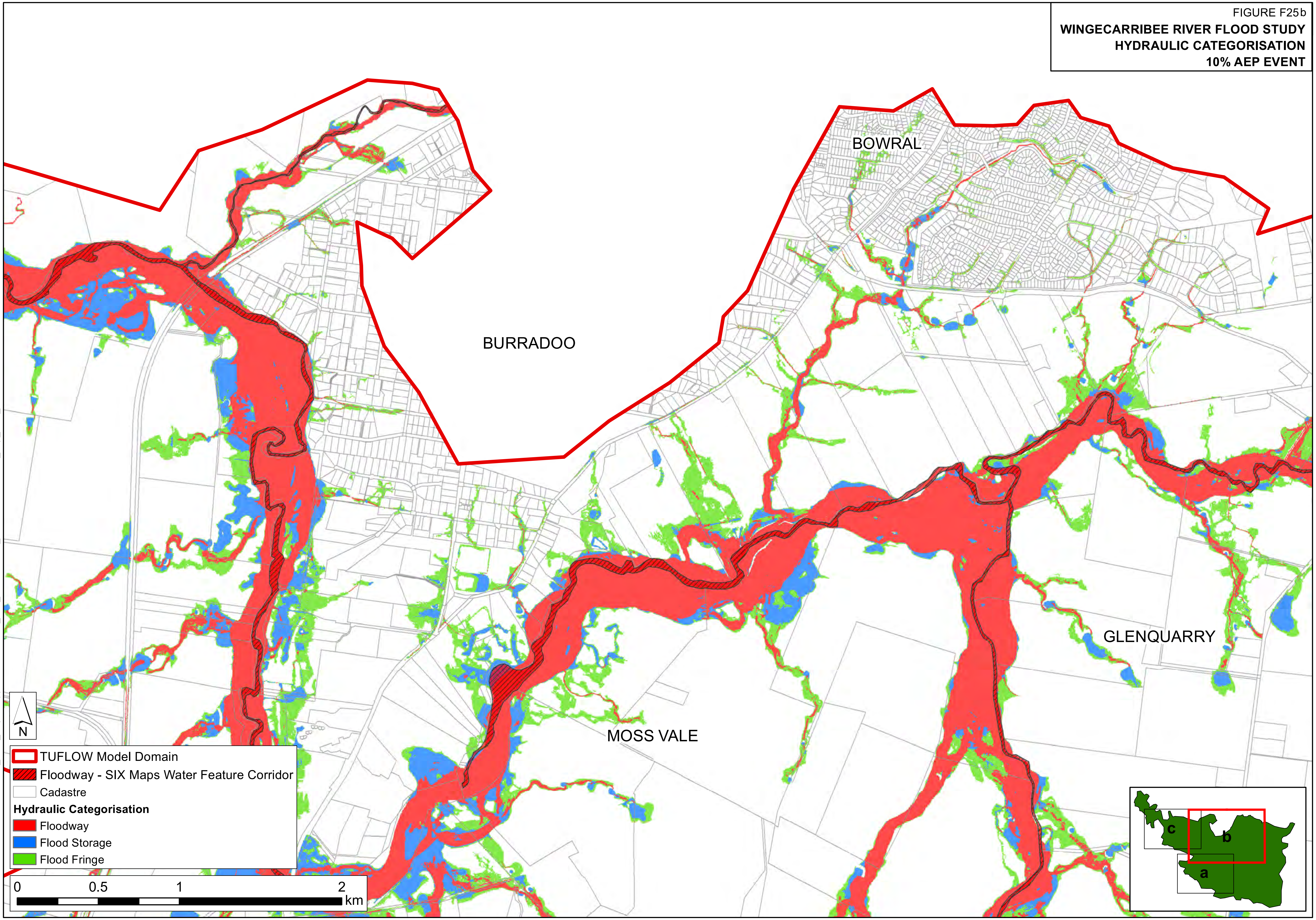


FIGURE F25b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
10% AEP EVENT
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
N
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F25_HYDRAULIC_CATEGORISATION_10p_AEP_EVENT.mxd

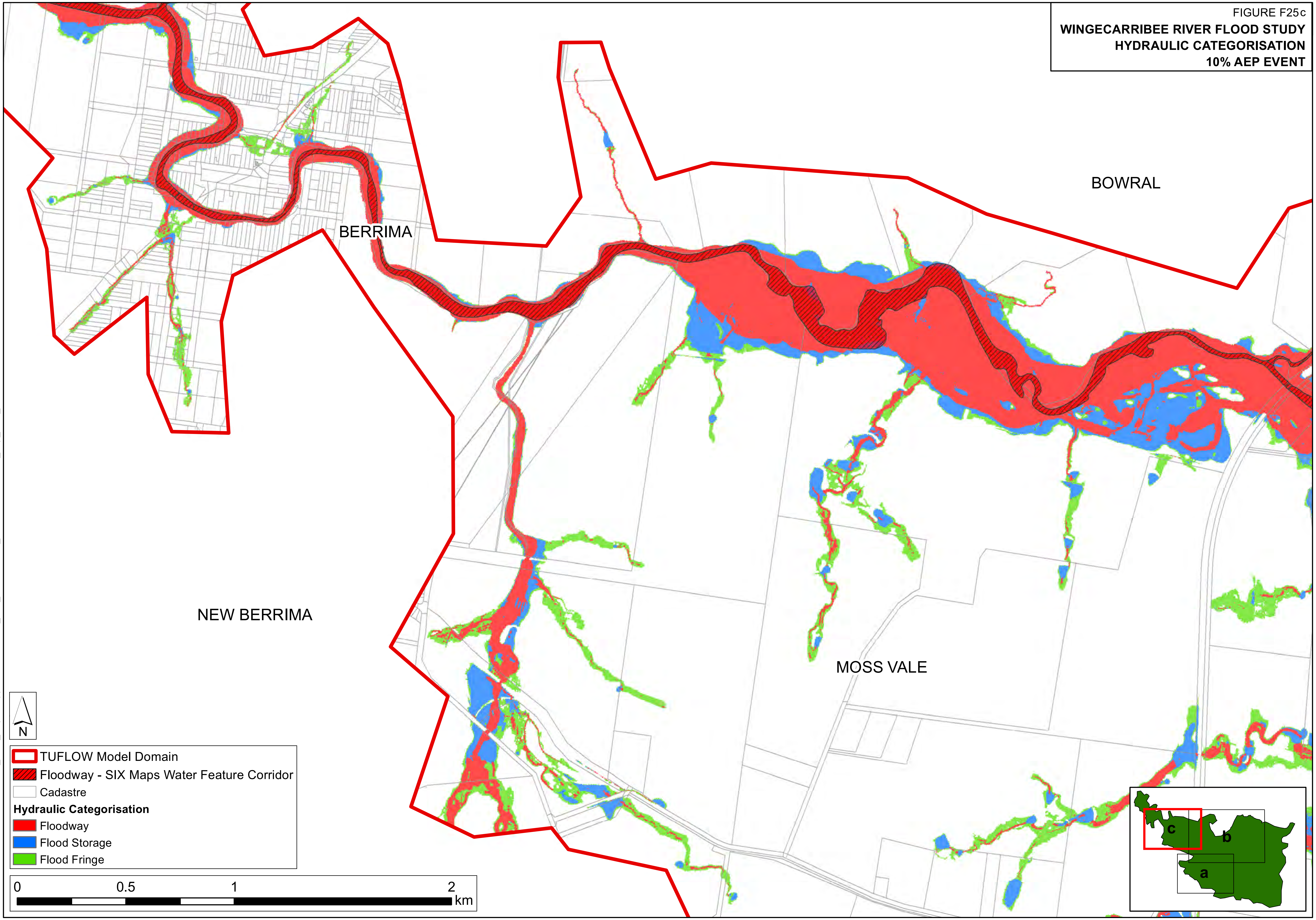
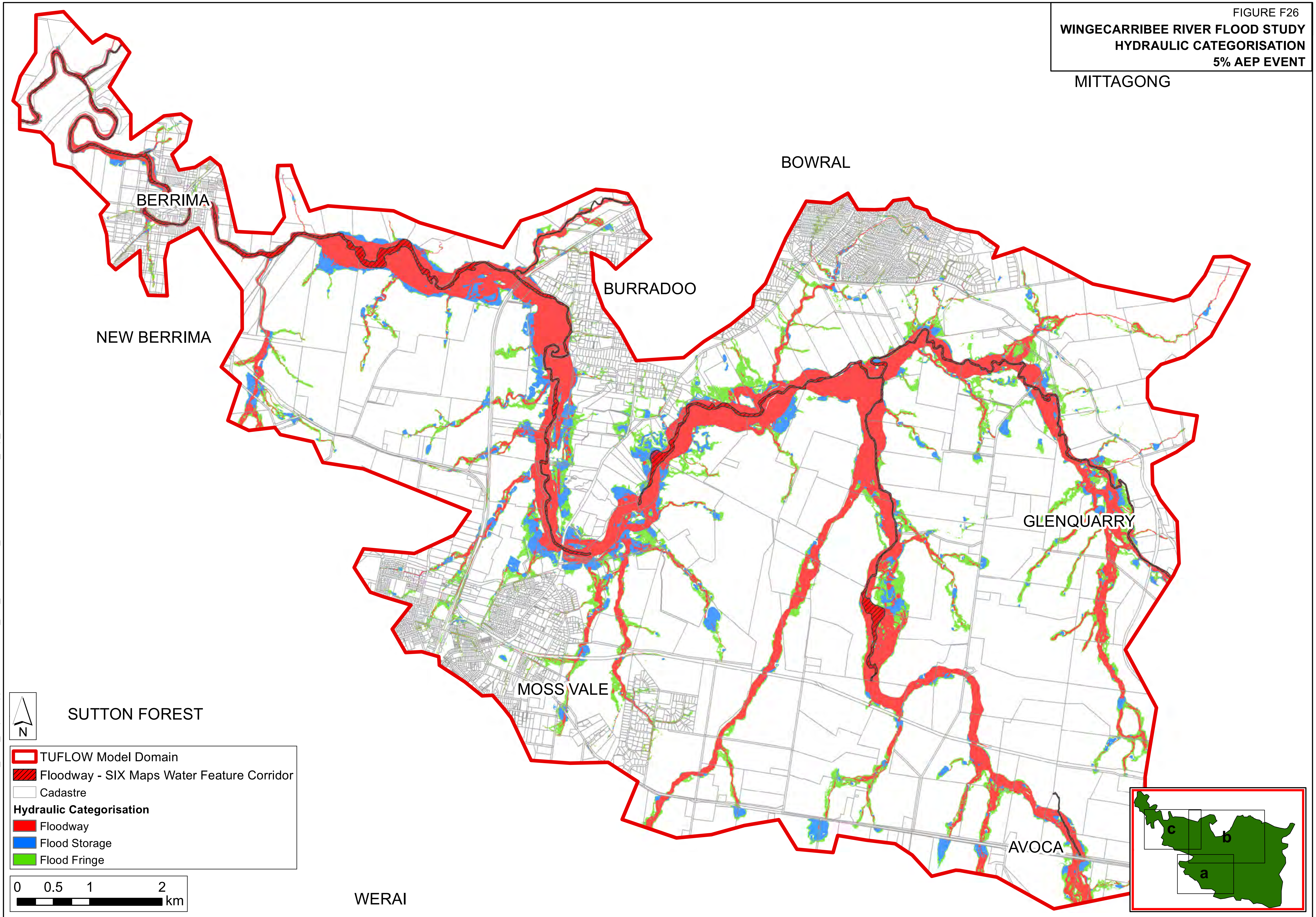


FIGURE F25c
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
10% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F25_HYDRAULIC_CATEGORISATION_10p_AEP_EVENT.mxd

FIGURE F26
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F26_HYDRAULIC_CATEGORISATION_05p_AEP_EVENT.mxd

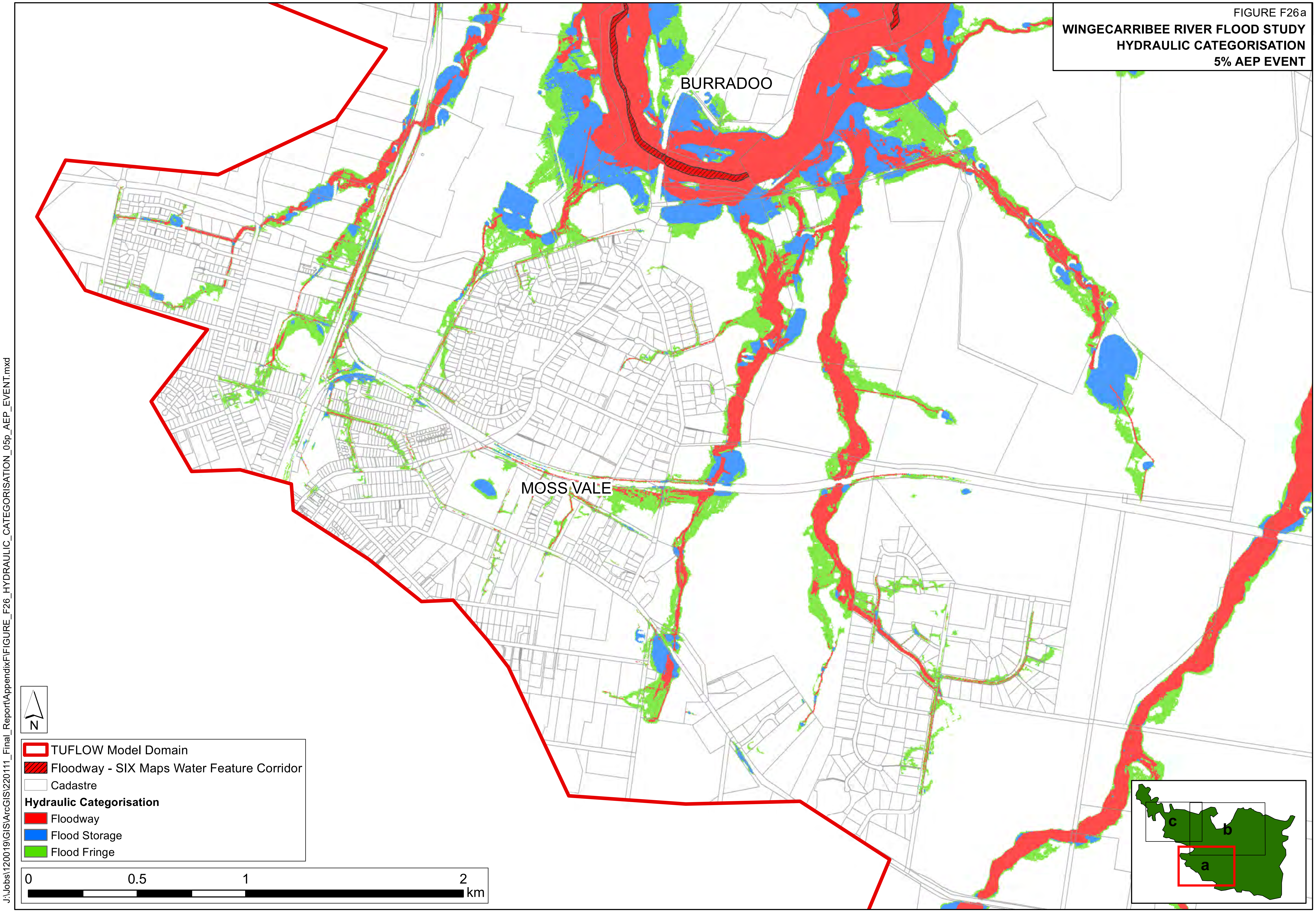
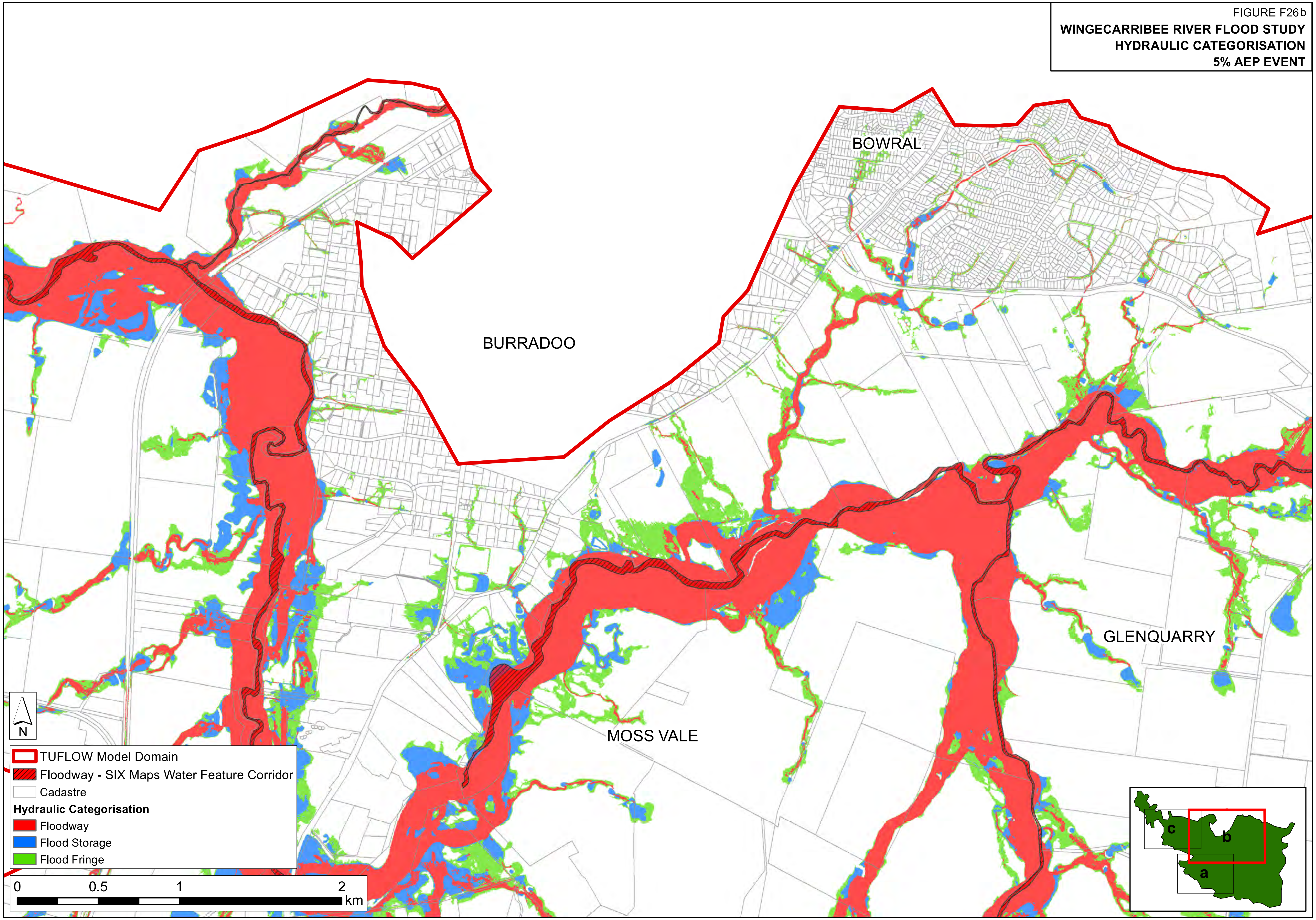


FIGURE F26a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
5% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F26_HYDRAULIC_CATEGORISATION_05p_AEP_EVENT.mxd



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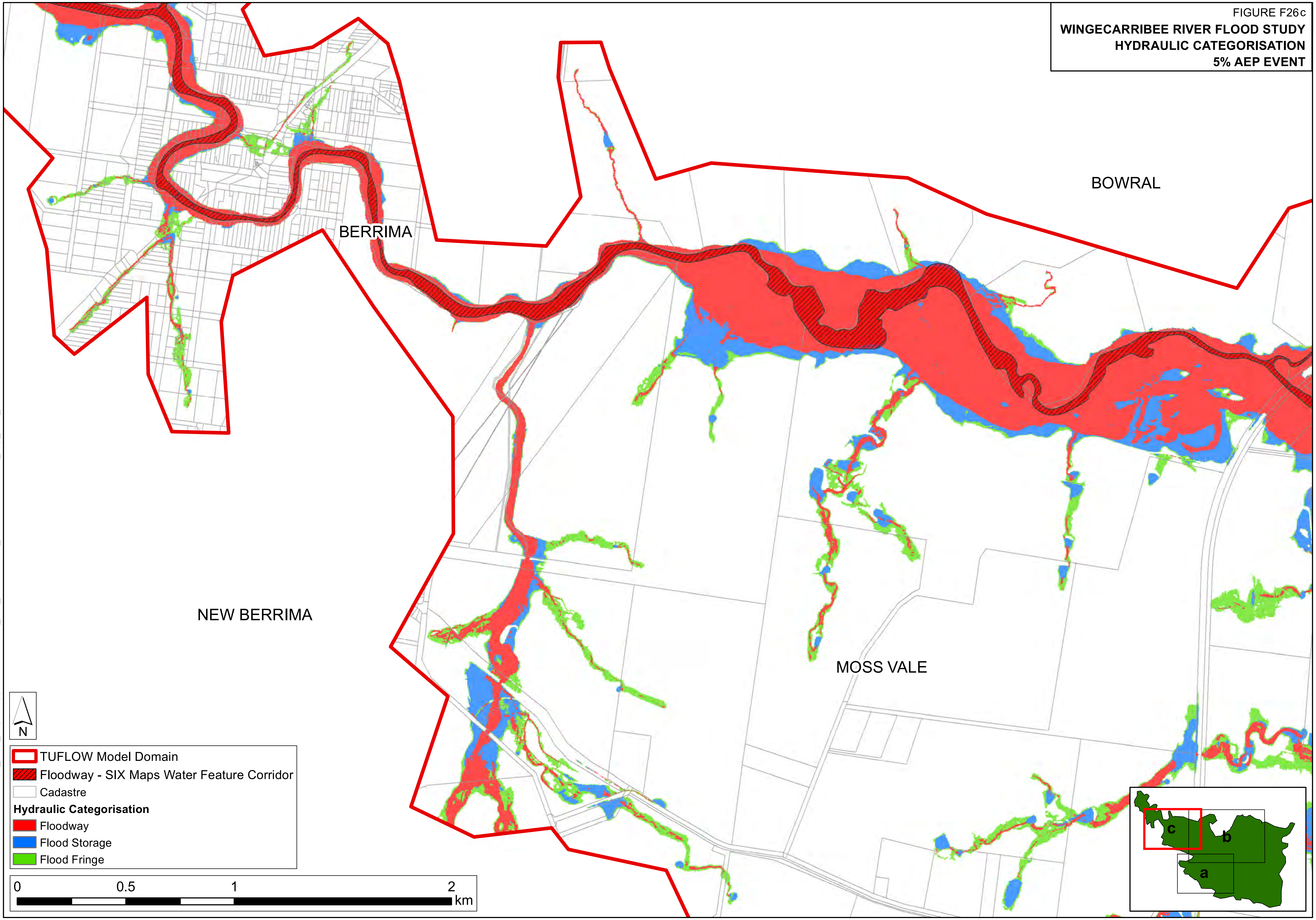

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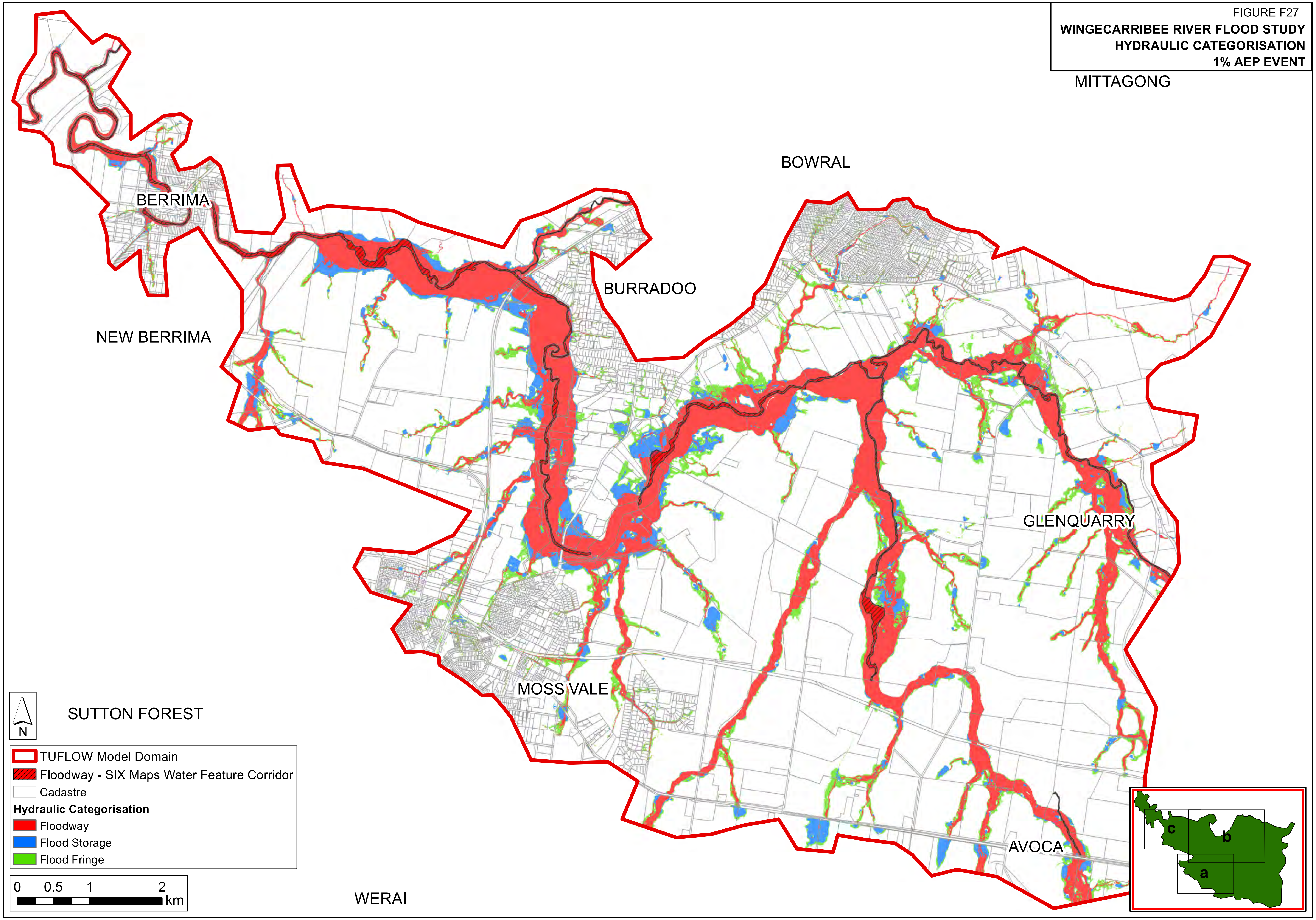


FIGURE F27
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
1% AEP EVENT

J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F27_HYDRAULIC_CATEGORISATION_01p_AEP_EVENT.mxd

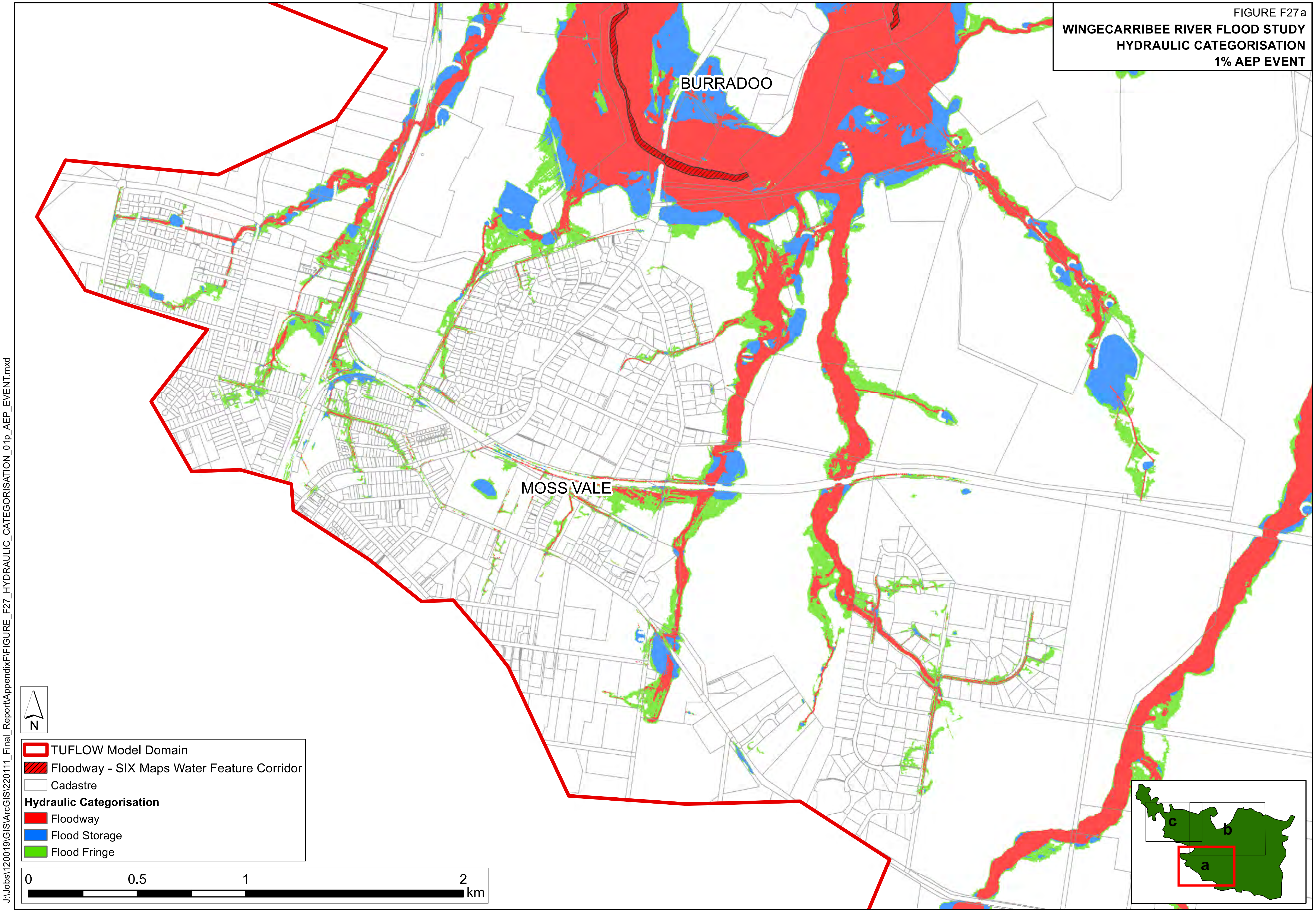
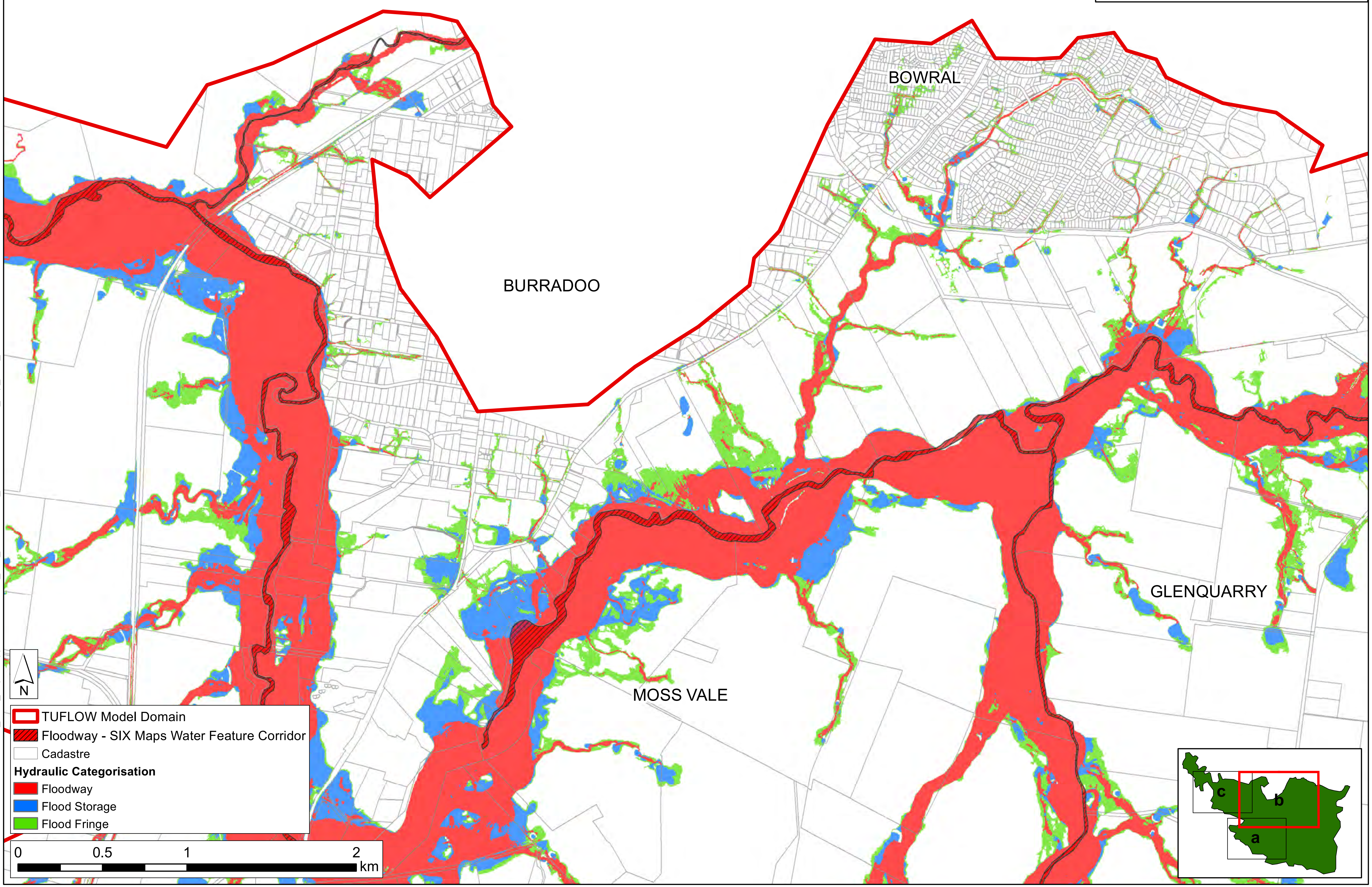


FIGURE F27a
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
1% AEP EVENT
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F27_HYDRAULIC_CATEGORISATION_01p_AEP_EVENT.mxd

FIGURE F27b
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
1% AEP EVENT



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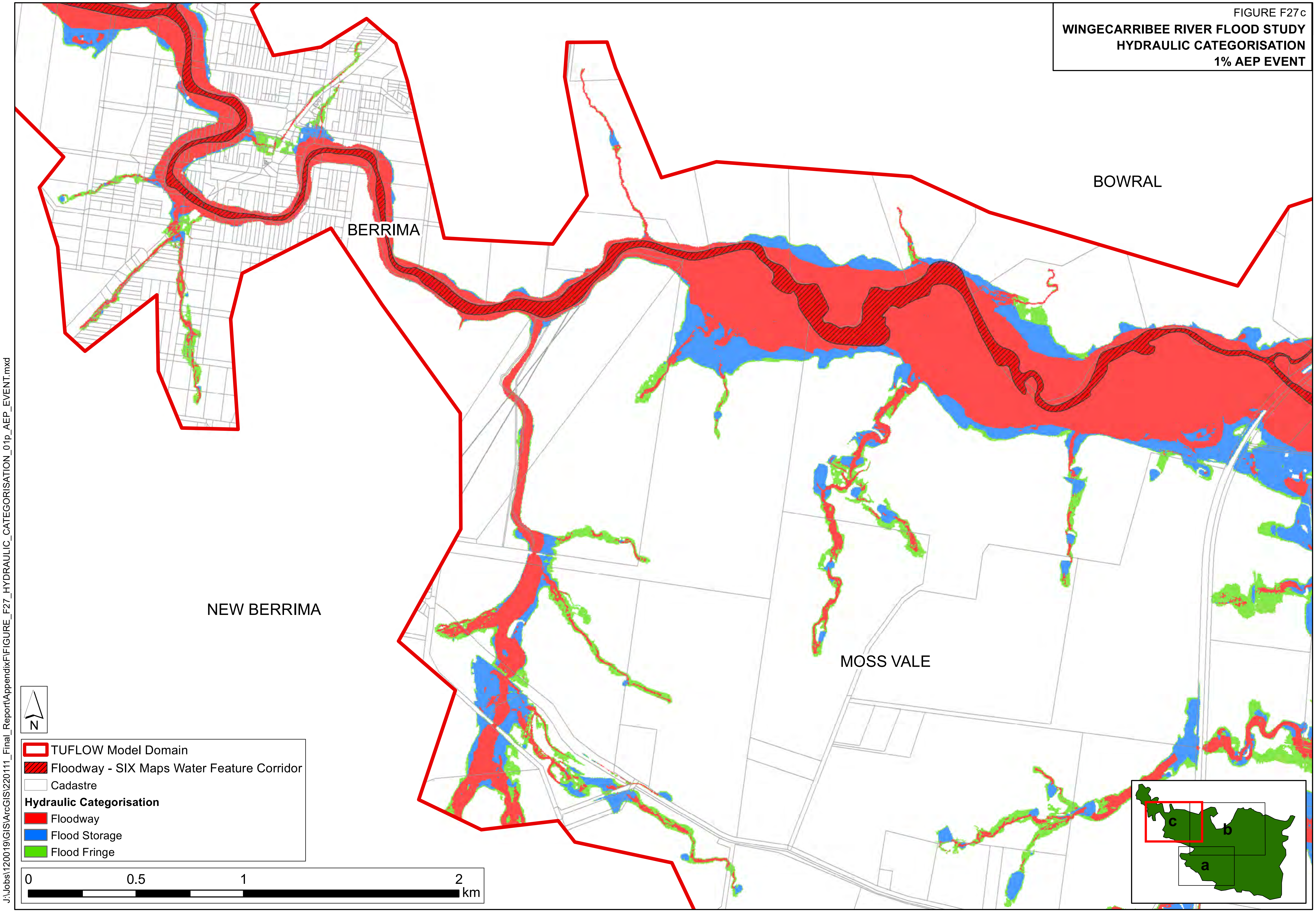
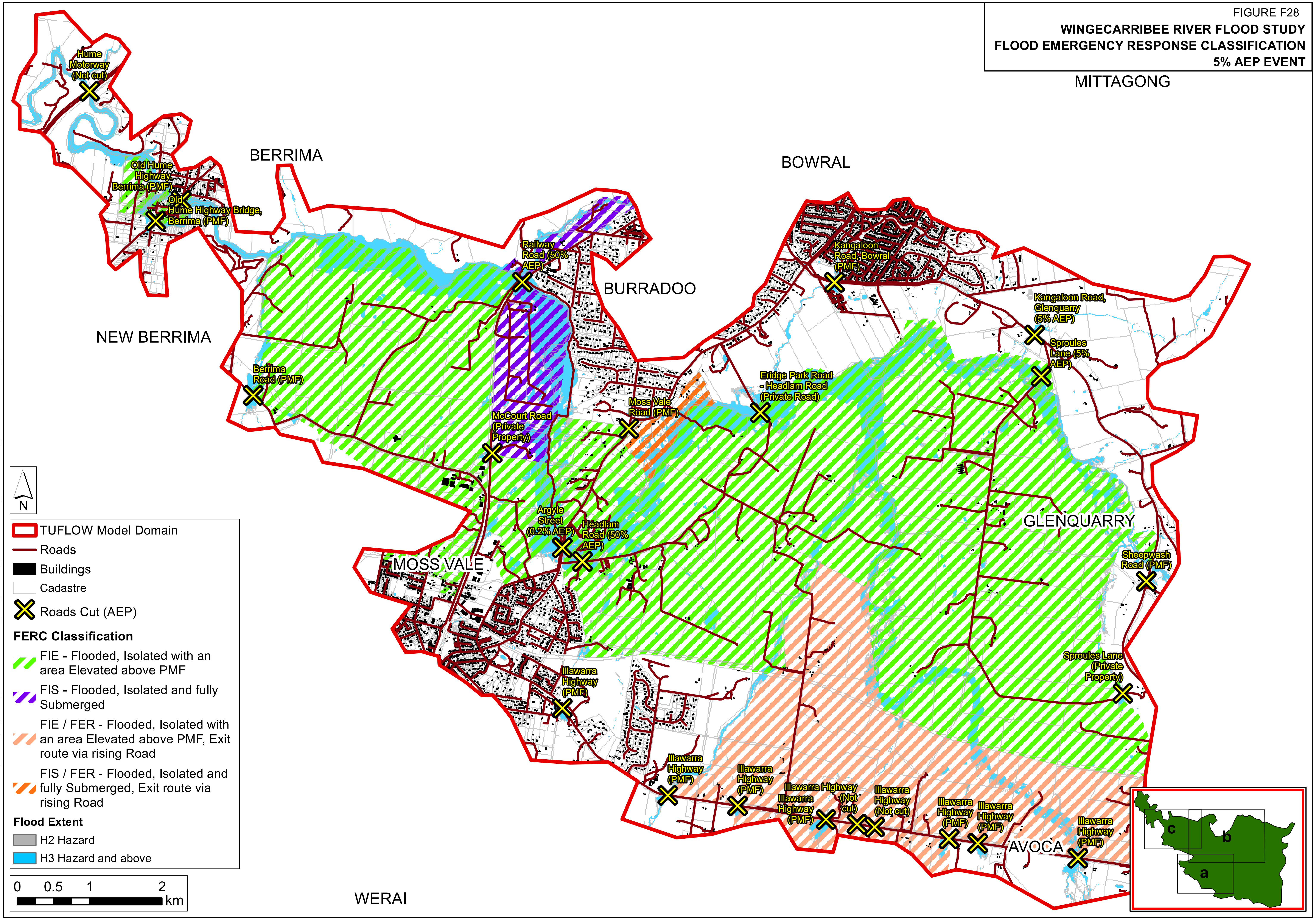
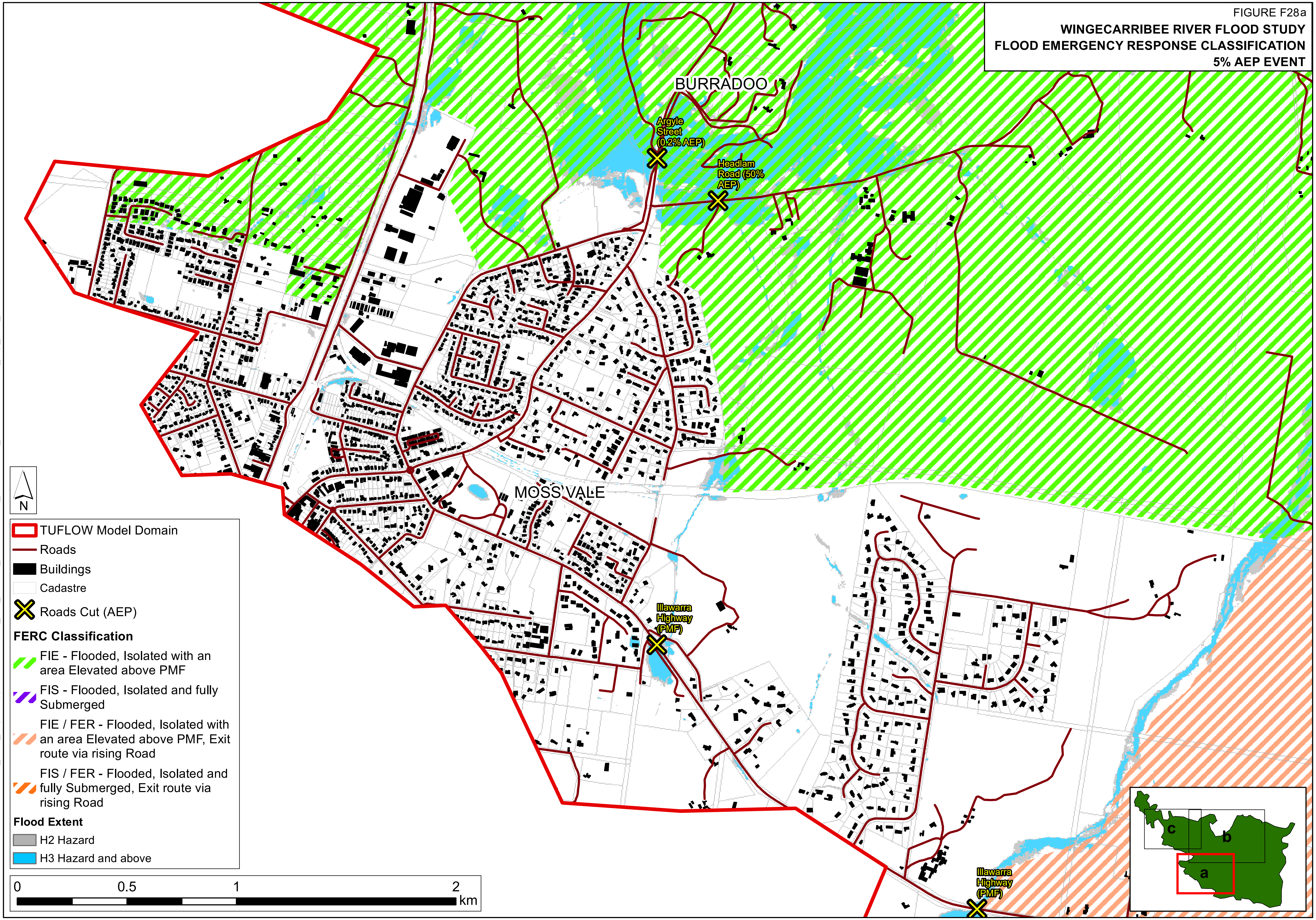


FIGURE F27c
WINGECARRIBEE RIVER FLOOD STUDY
HYDRAULIC CATEGORISATION
1% AEP EVENT
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Floodway - SIX Maps Water Feature Corridor
Cadastre
Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F27_HYDRAULIC_CATEGORISATION_01p_AEP_EVENT.mxd

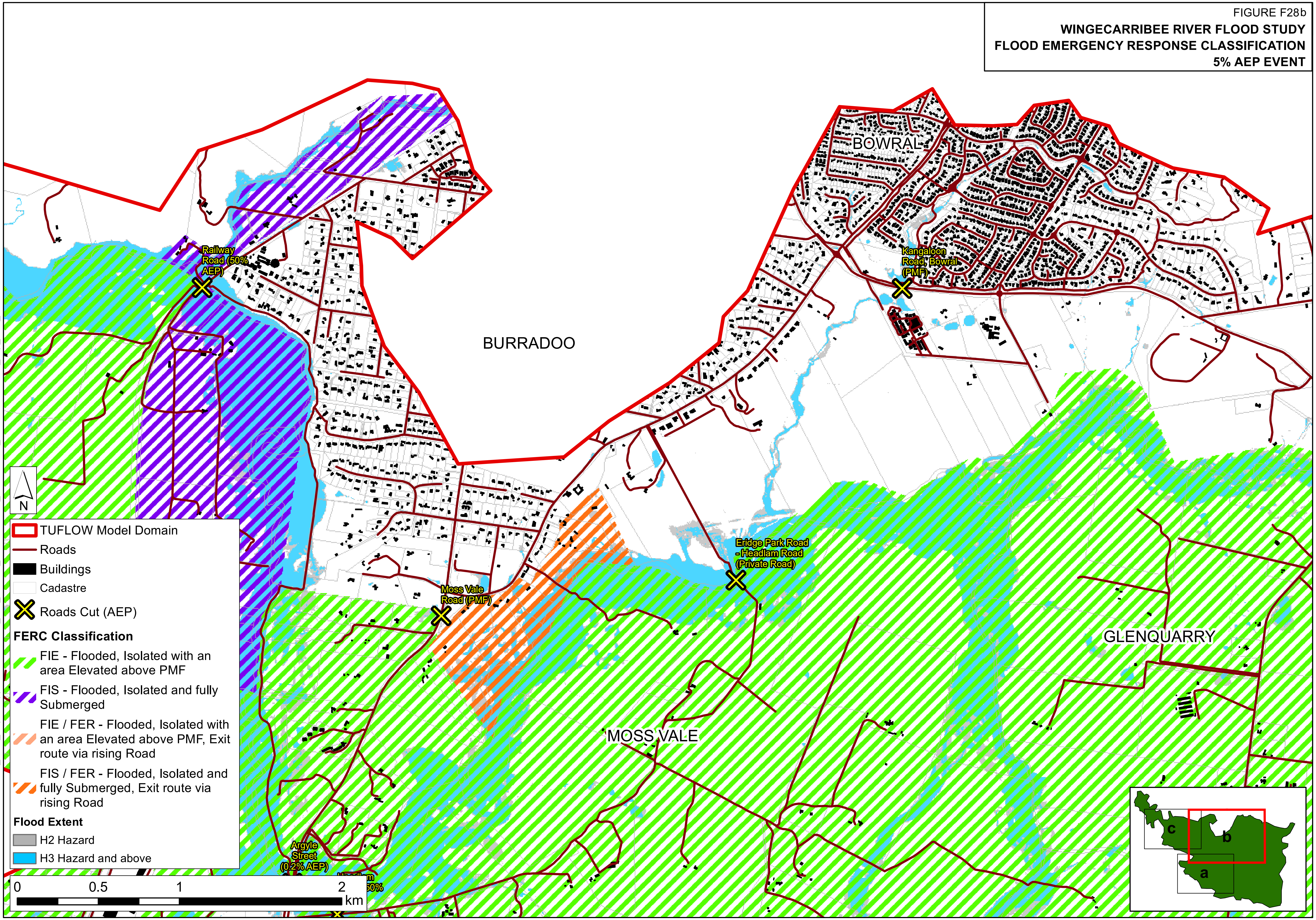
FIGURE F28
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
5% AEP EVENT



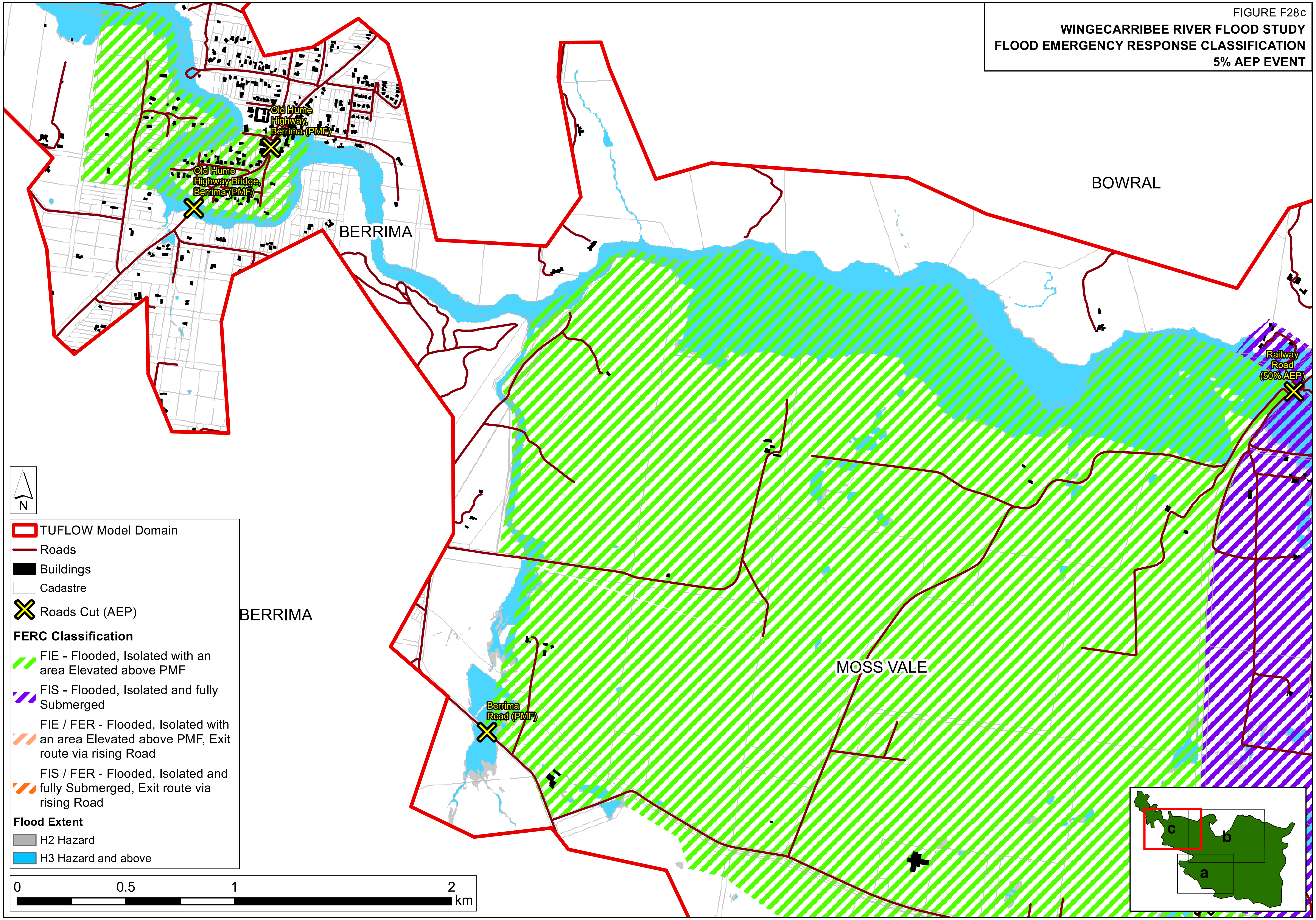


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F28_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_05p_AEP_EVENT.mxd

FIGURE F28b
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
5% AEP EVENT



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F28_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_05p_AEP_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F28_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_05p_AEP_EVENT.mxd

FIGURE F29
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
1% AEP EVENT

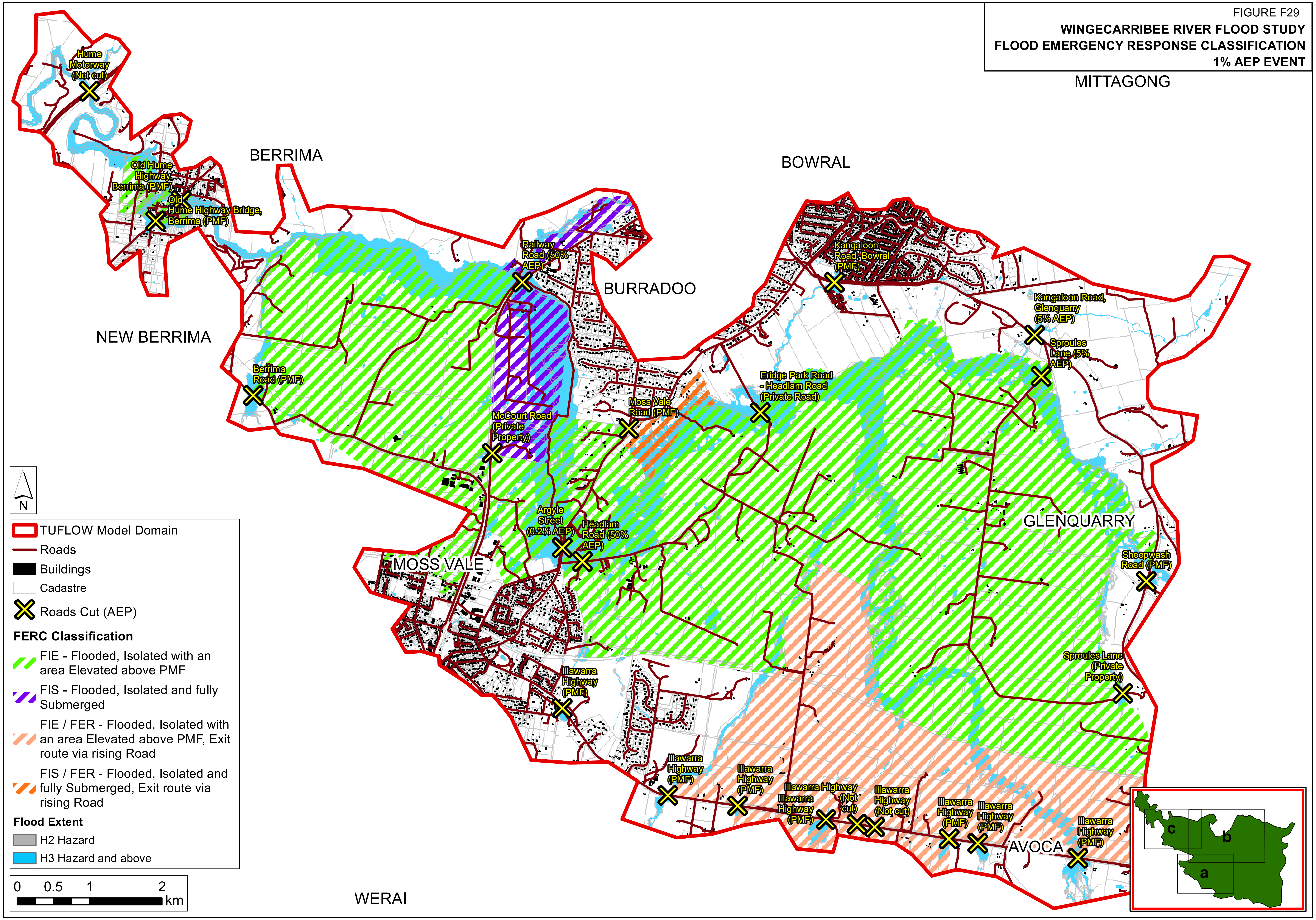
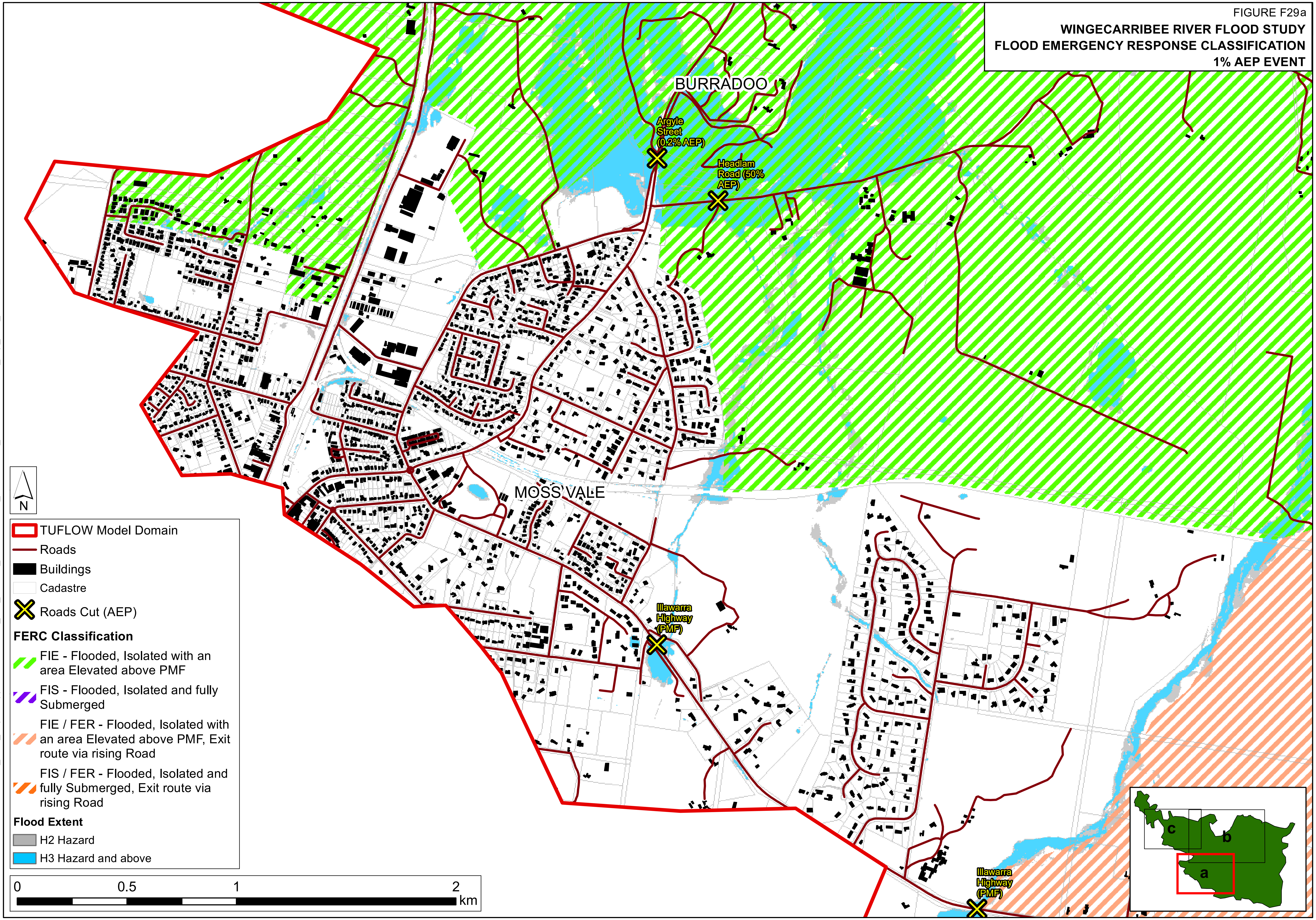
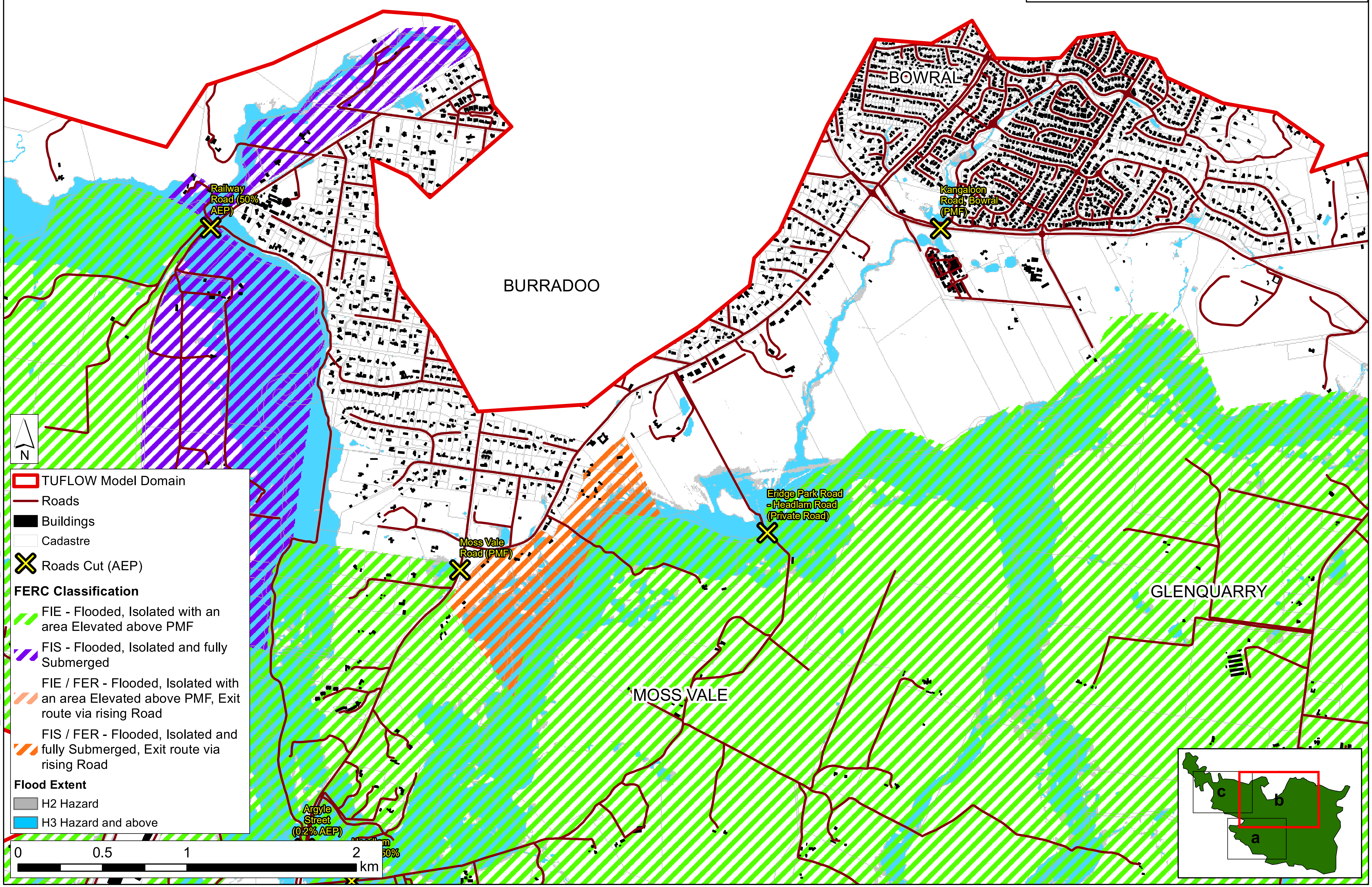


FIGURE F29a
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
1% AEP EVENT



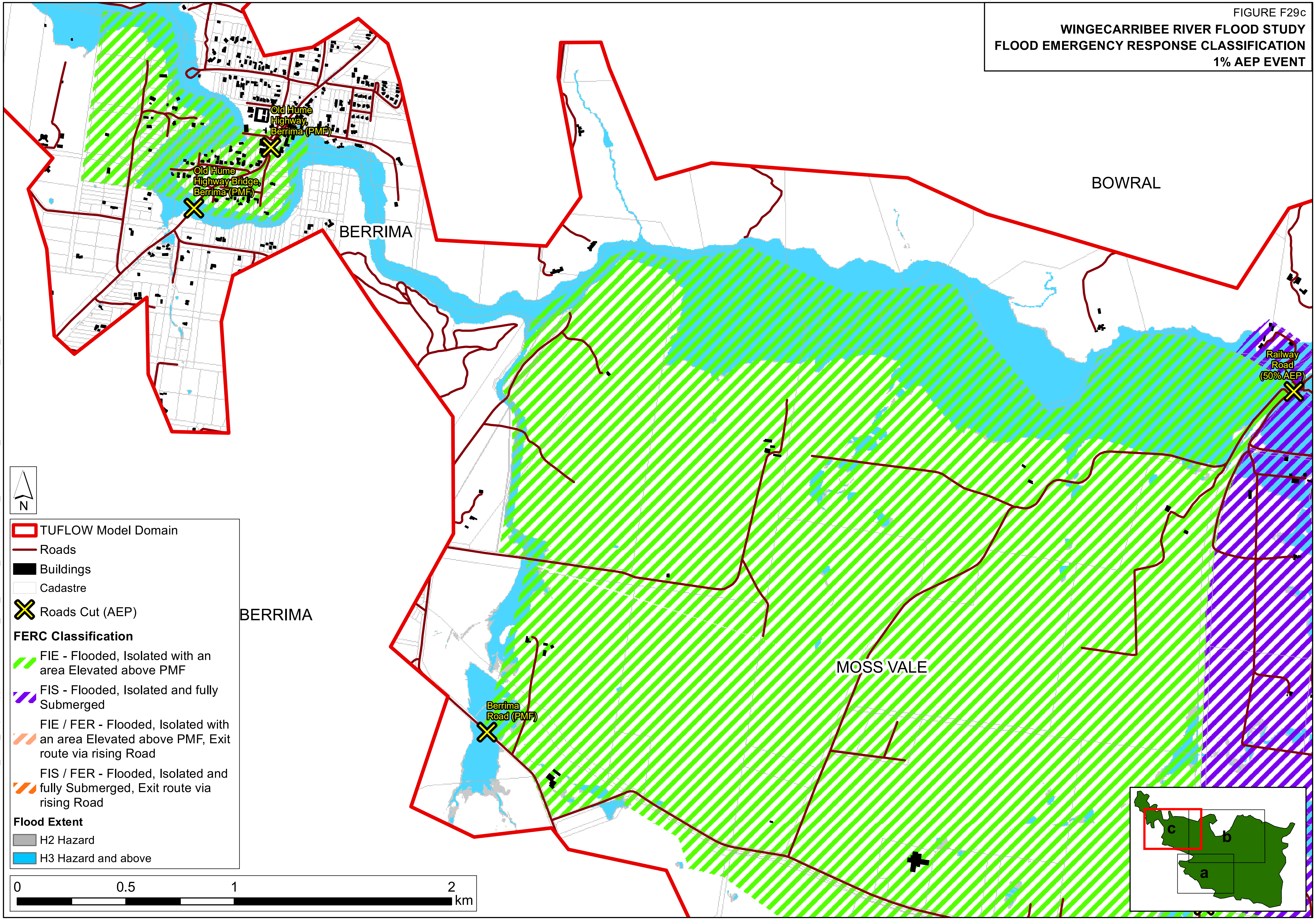
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F29_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_01p_AEP_EVENT.mxd

FIGURE F29b
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
1% AEP EVENT



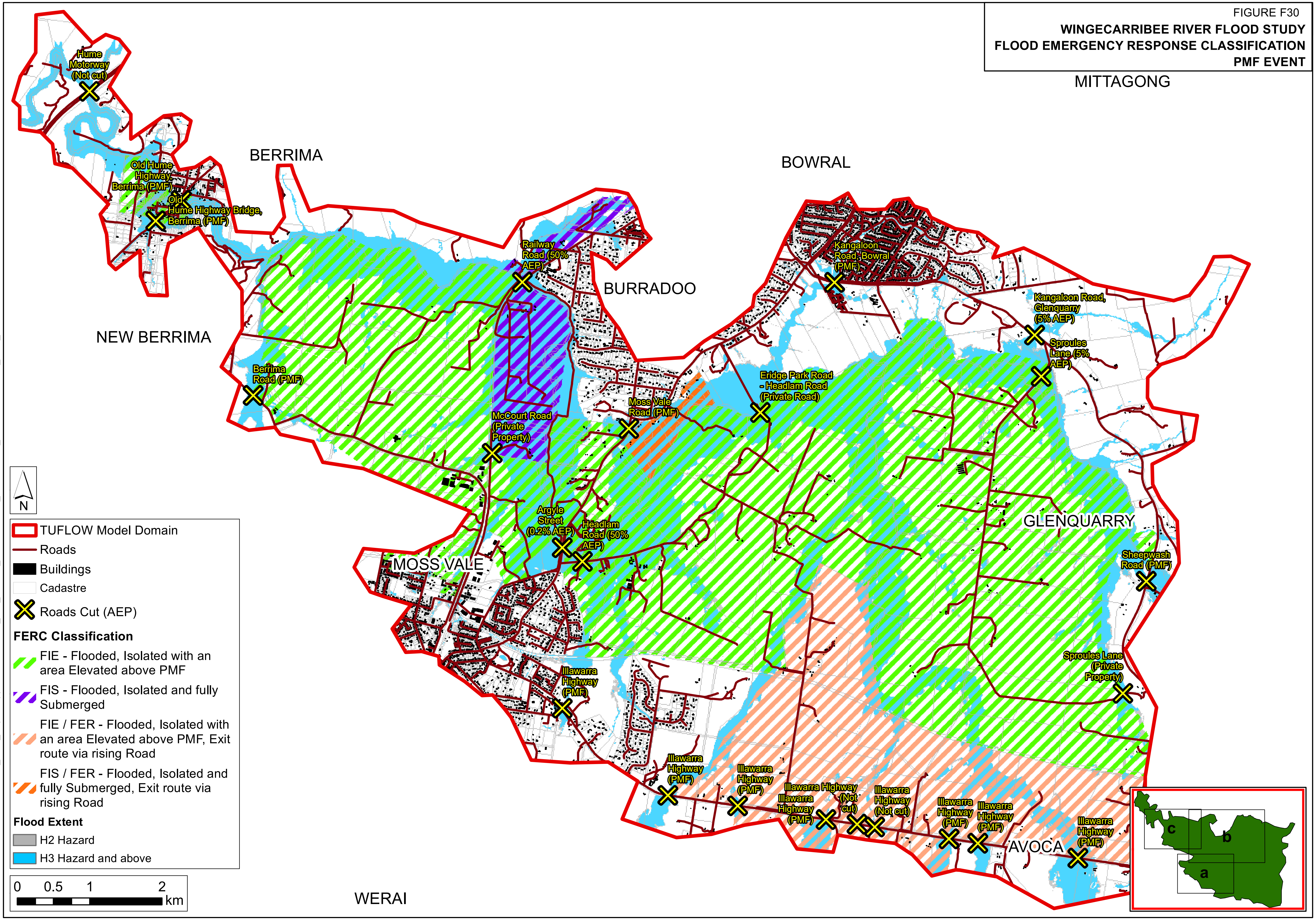
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F29_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_01p_AEP_EVENT.mxd

FIGURE F29c
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
1% AEP EVENT

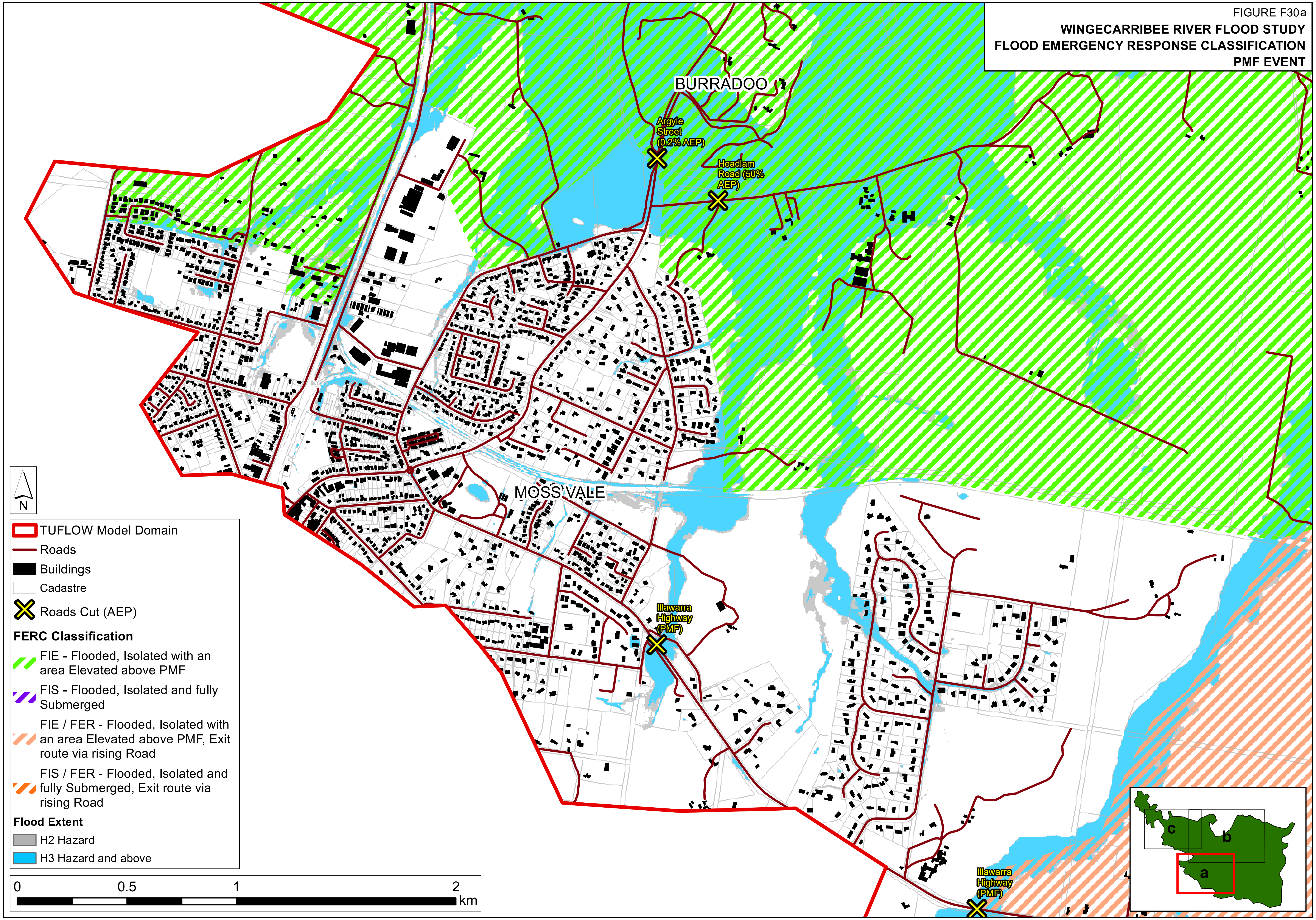


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F29_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_01p_AEP_EVENT.mxd

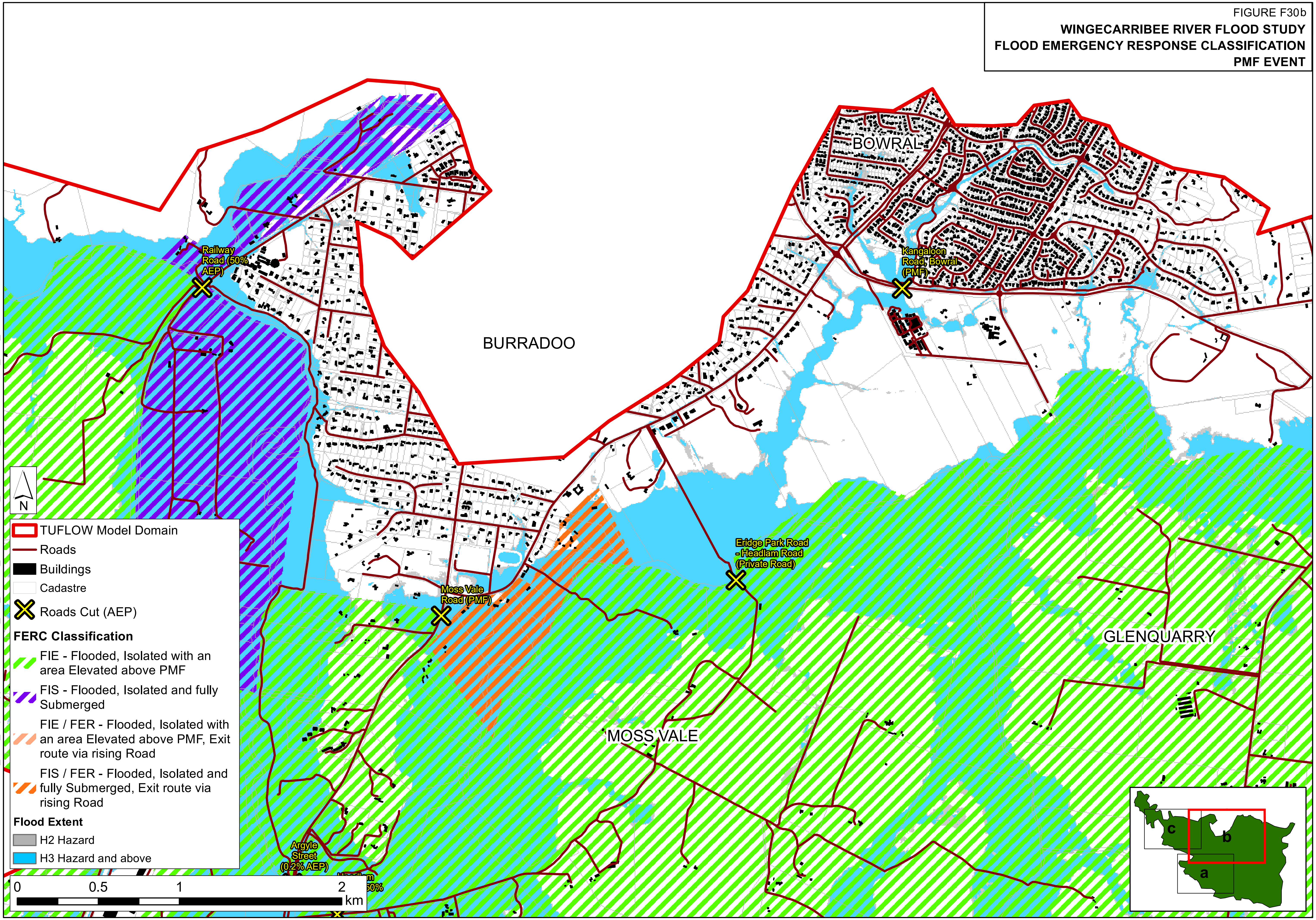
FIGURE F30
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD EMERGENCY RESPONSE CLASSIFICATION
PMF EVENT



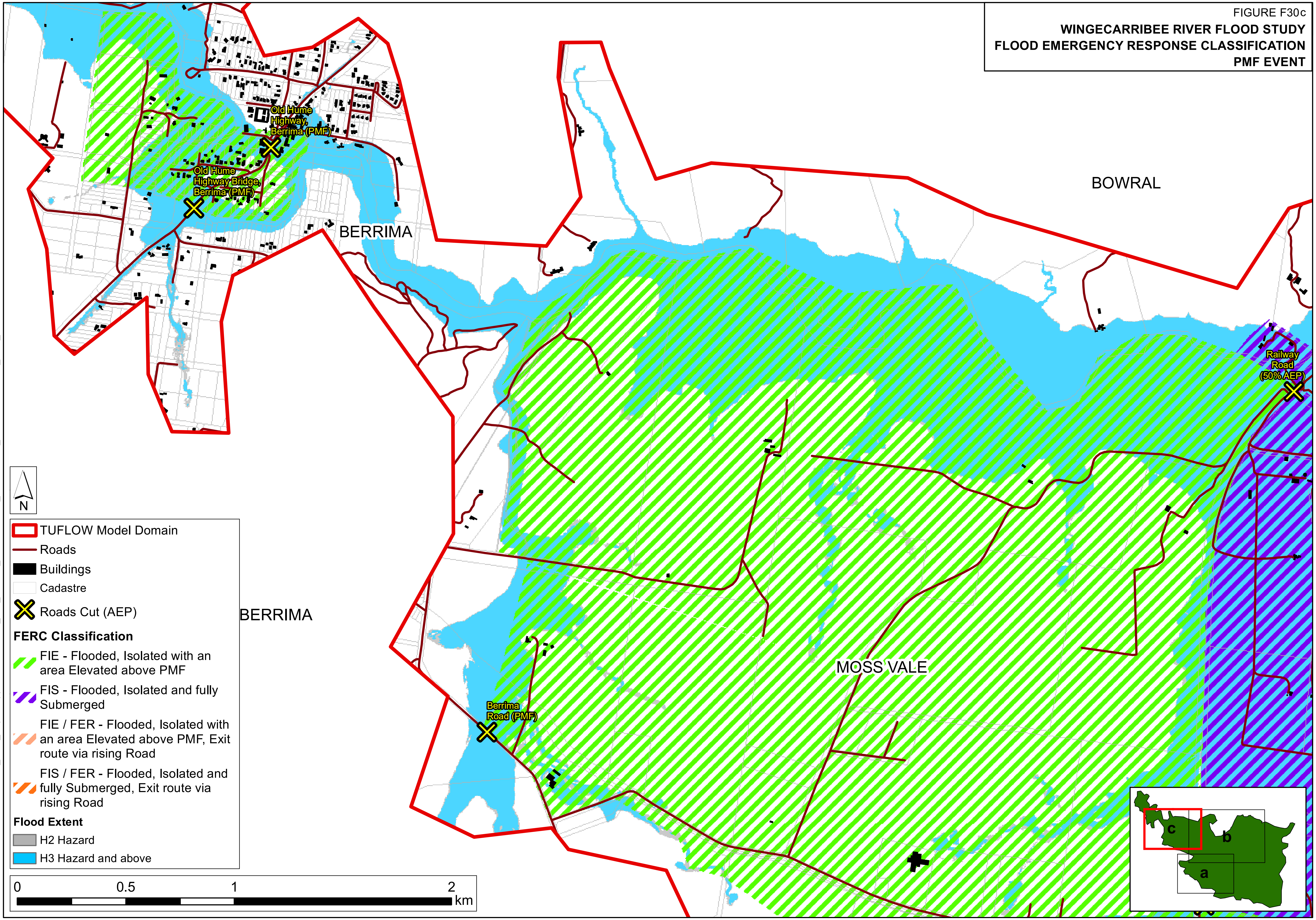
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F30_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_PMF_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F30_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_PMF_EVENT.mxd

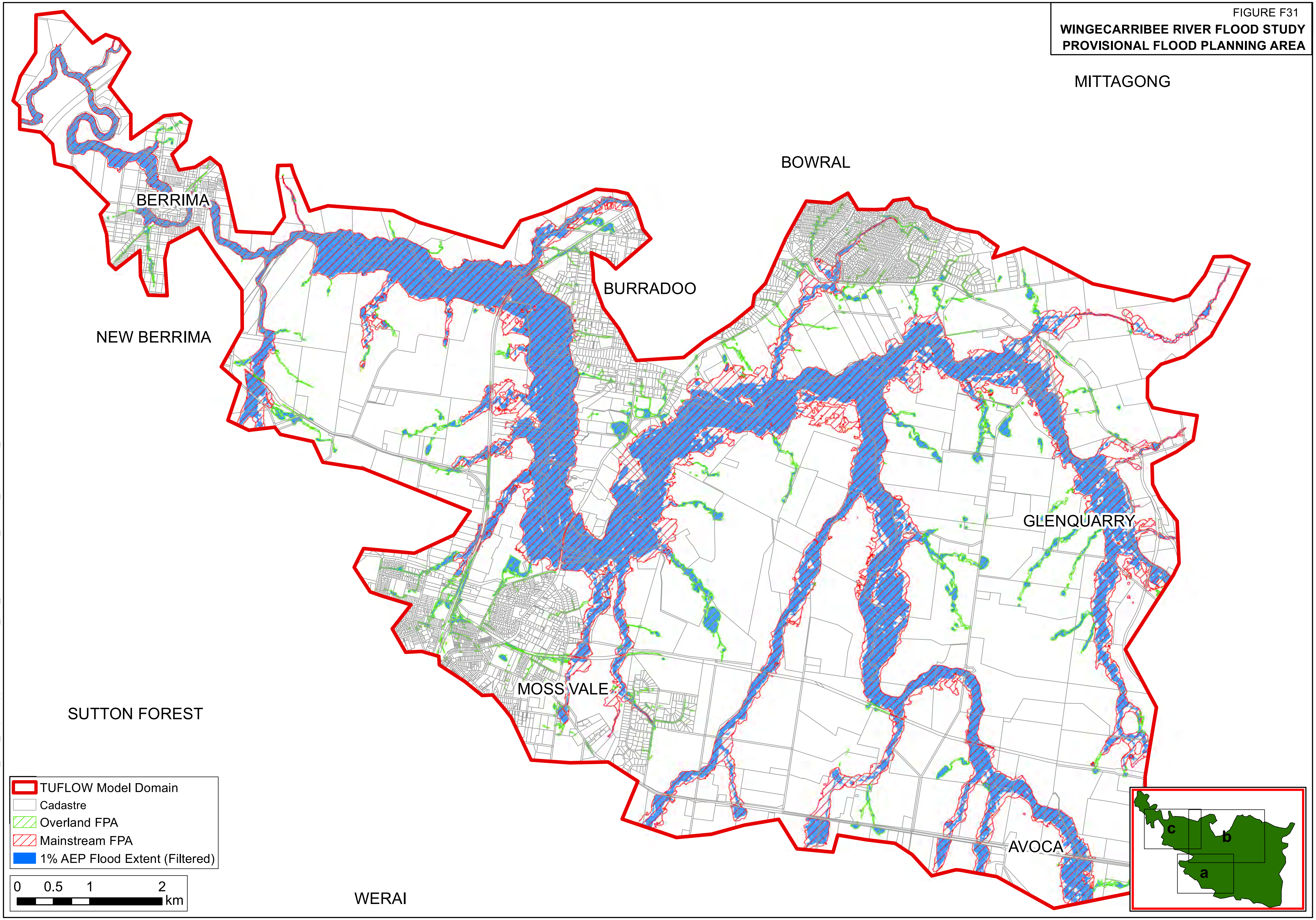


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F30_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_PMF_EVENT.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixF\FIGURE_F30_FLOOD_EMERGENCY_RESPONSE_CLASSIFICATION_PMF_EVENT.mxd

FIGURE F31
WINGECARRIBEE RIVER FLOOD STUDY
PROVISIONAL FLOOD PLANNING AREA



J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F31_PROVISIONAL_FLOOD_PLANNING_AREA.mxd

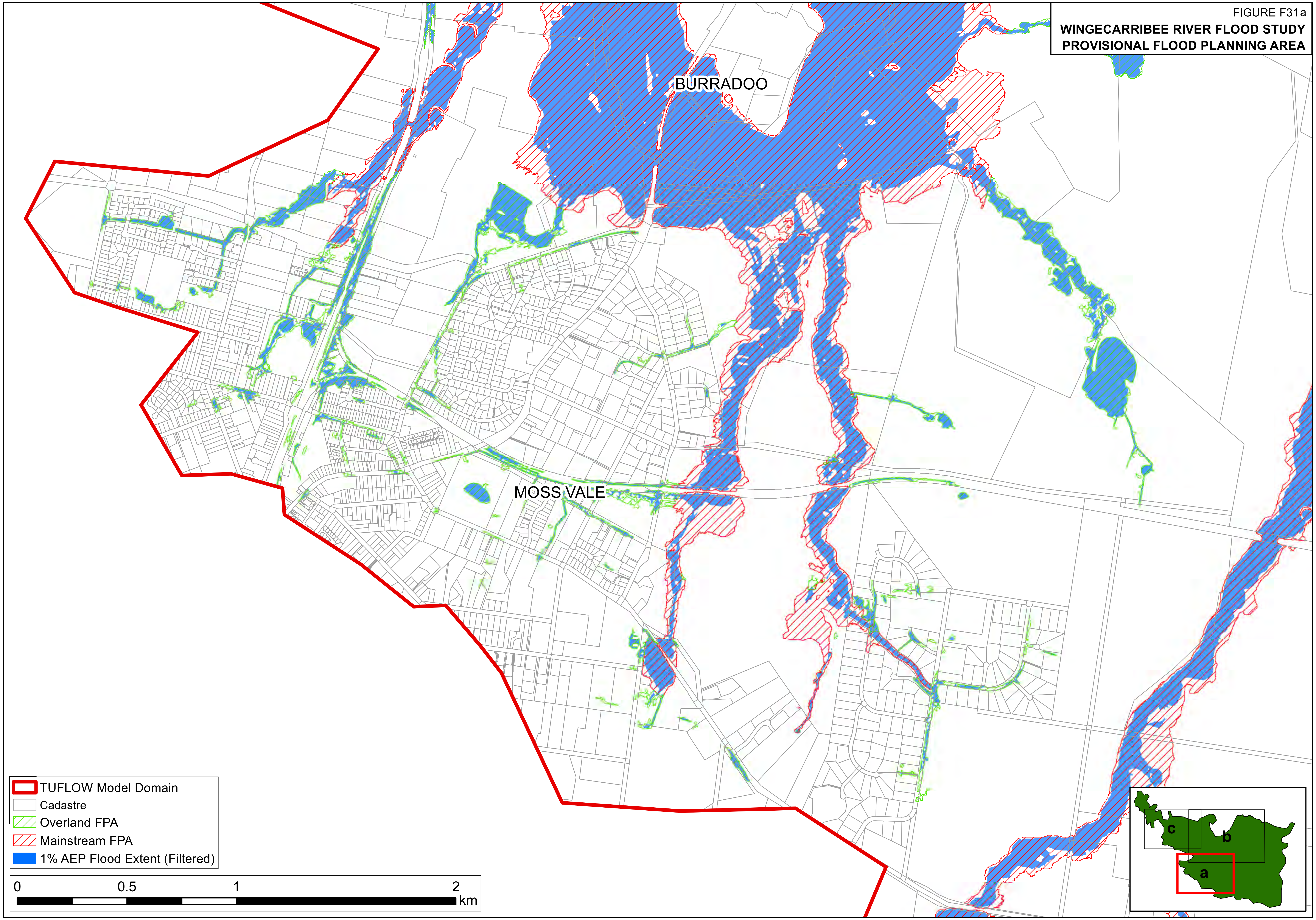
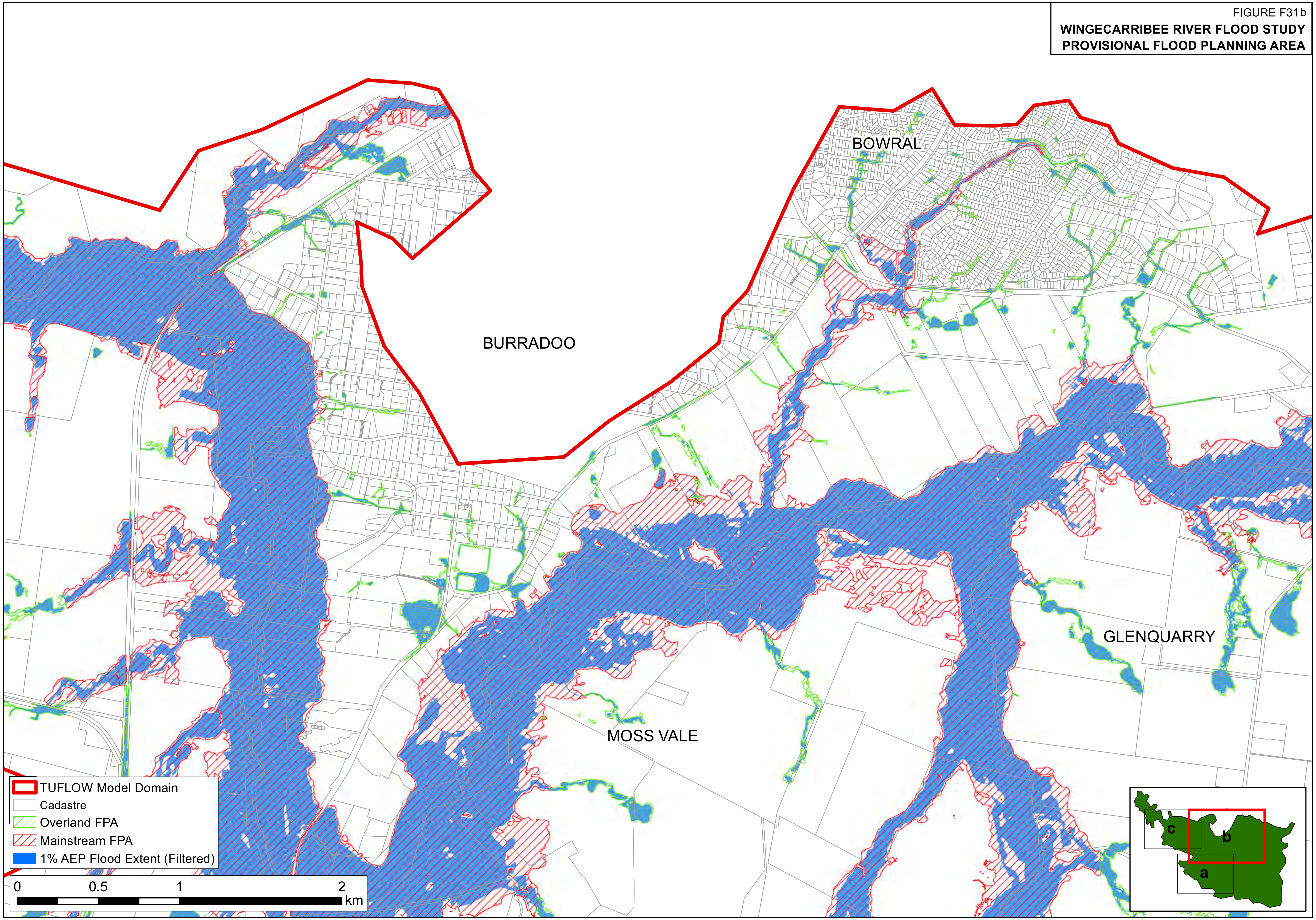


FIGURE F31a
WINGECARRIBEE RIVER FLOOD STUDY
PROVISIONAL FLOOD PLANNING AREA

J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F31_PROVISIONAL_FLOOD_PLANNING_AREA.mxd

FIGURE F31b

WINGECARRIBEE RIVER FLOOD STUDY
PROVISIONAL FLOOD PLANNING AREA



J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F31_PROVISIONAL_FLOOD_PLANNING_AREA.mxd

FIGURE F31c

WINGECARRIBEE RIVER FLOOD STUDY
PROVISIONAL FLOOD PLANNING AREA

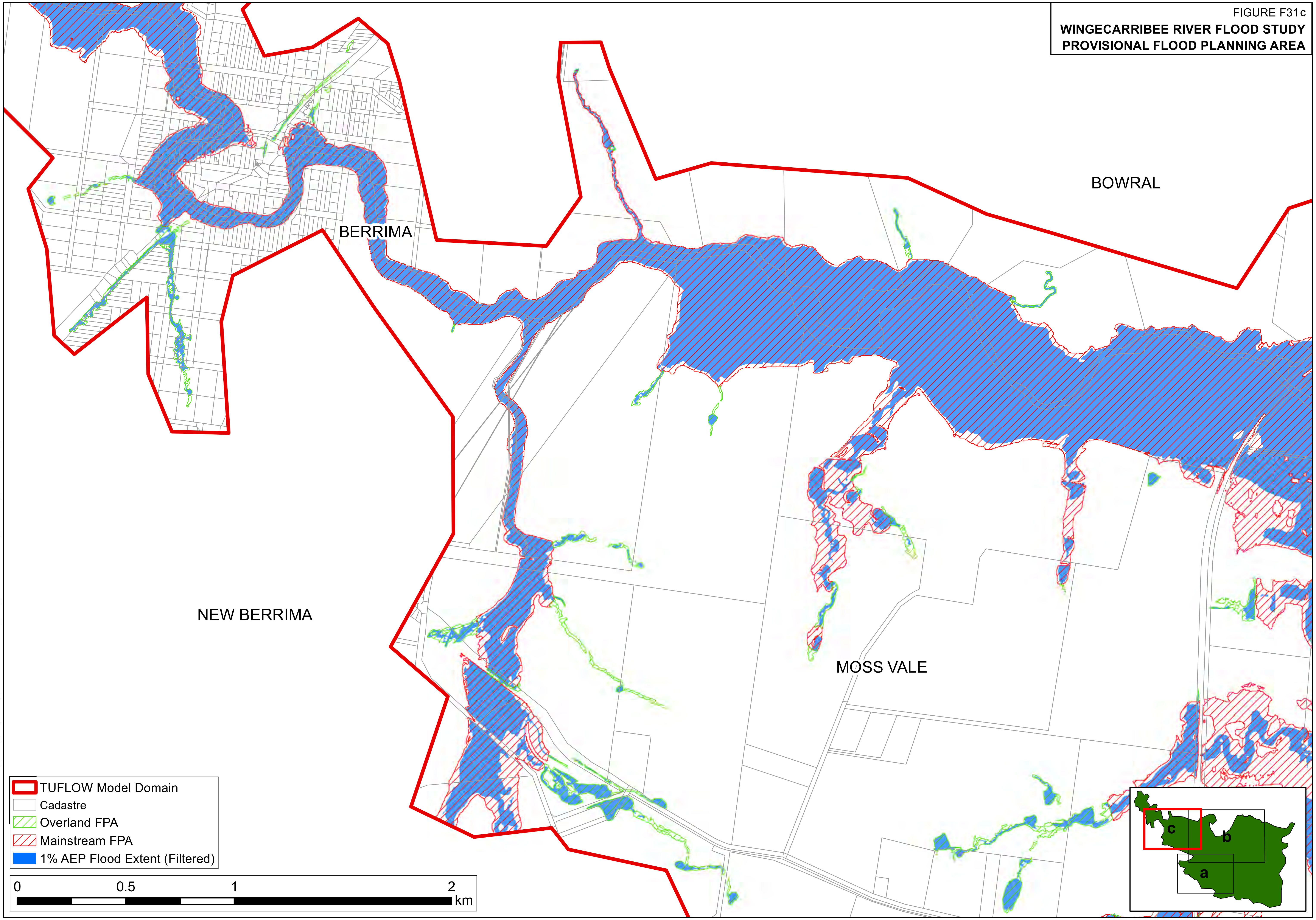
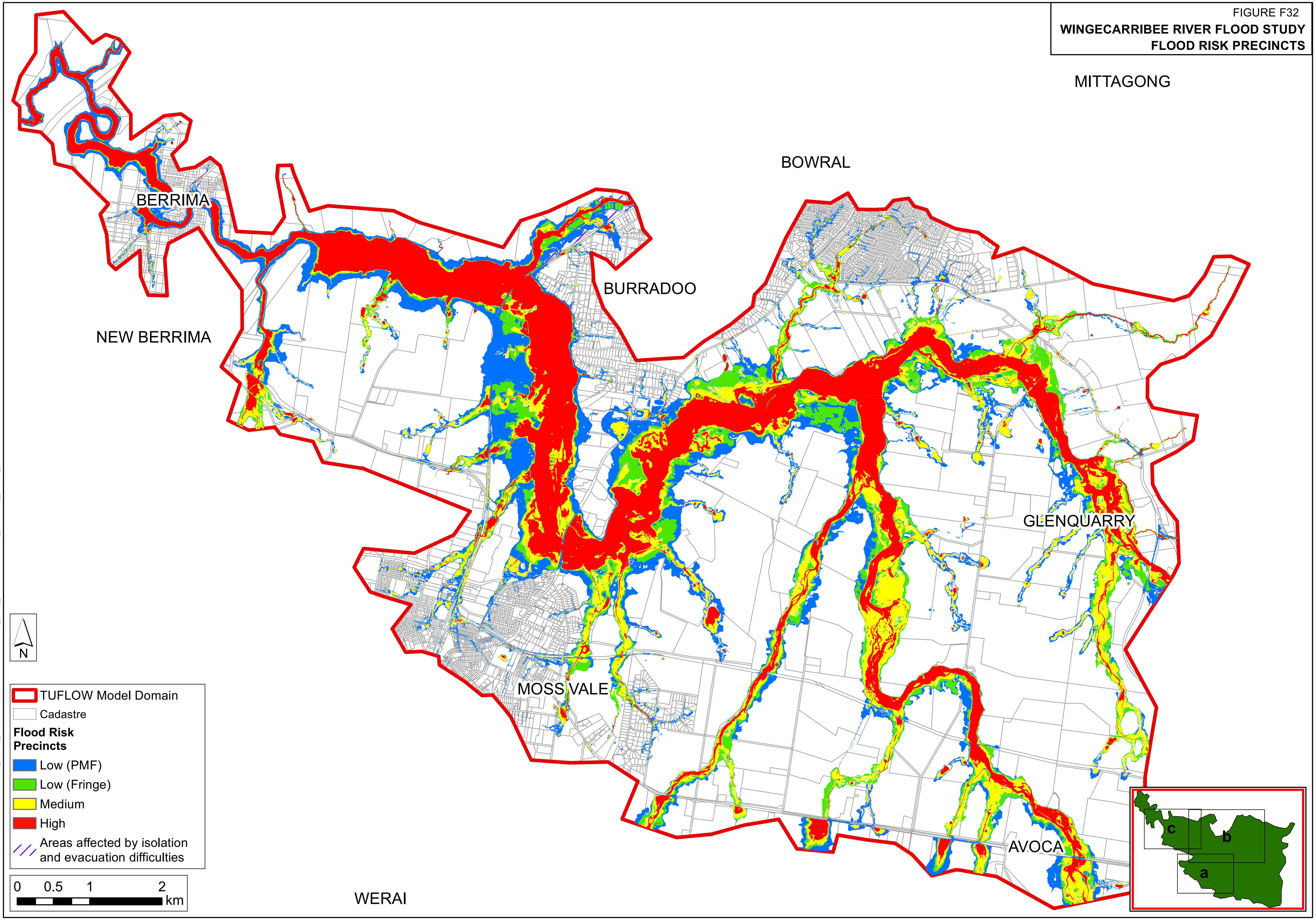
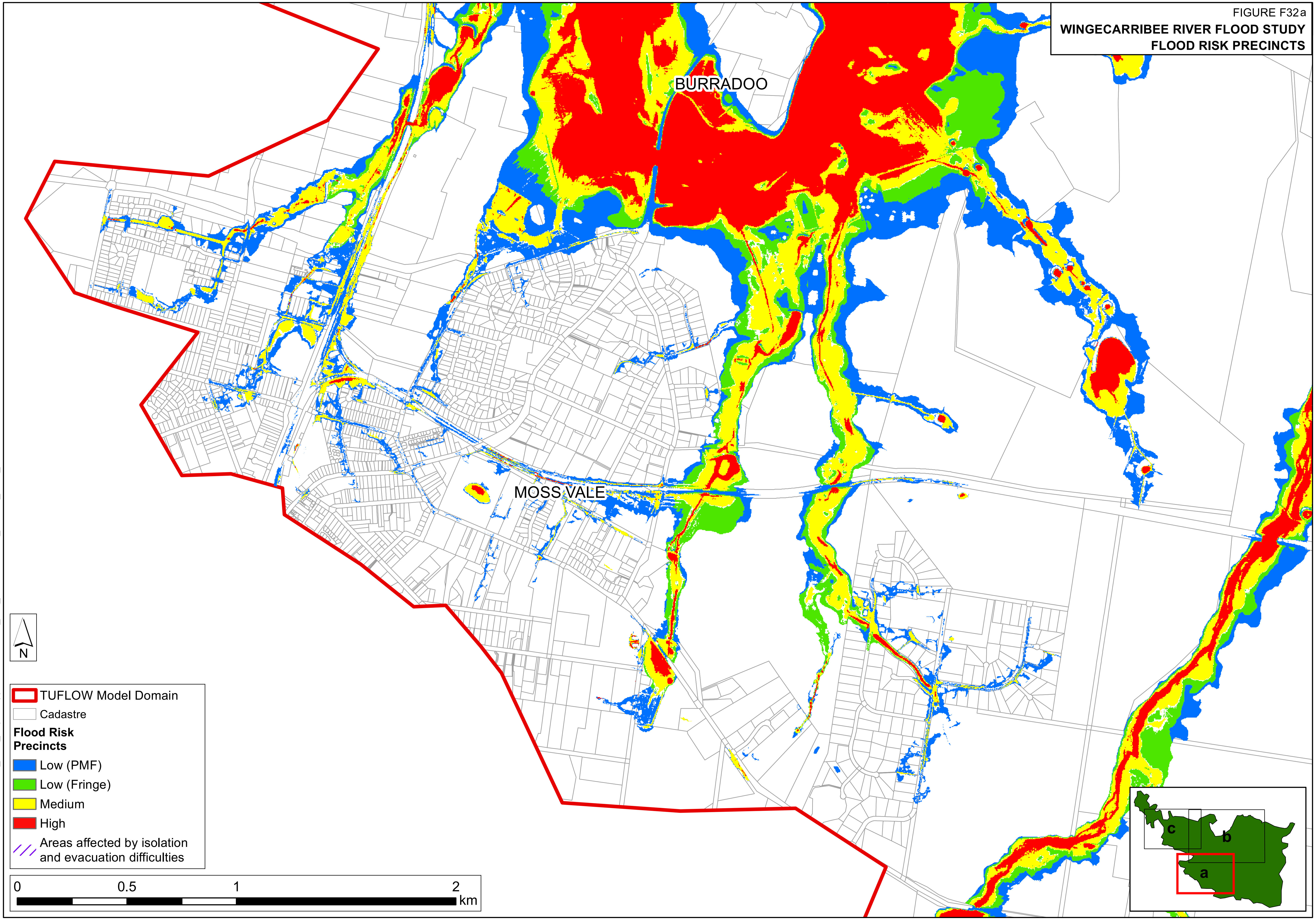


FIGURE F32
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD RISK PRECINCTS



J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F32_PROVISIONAL_FLOOD_RISK_PRECINCTS.mxd

FIGURE F32a
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD RISK PRECINCTS



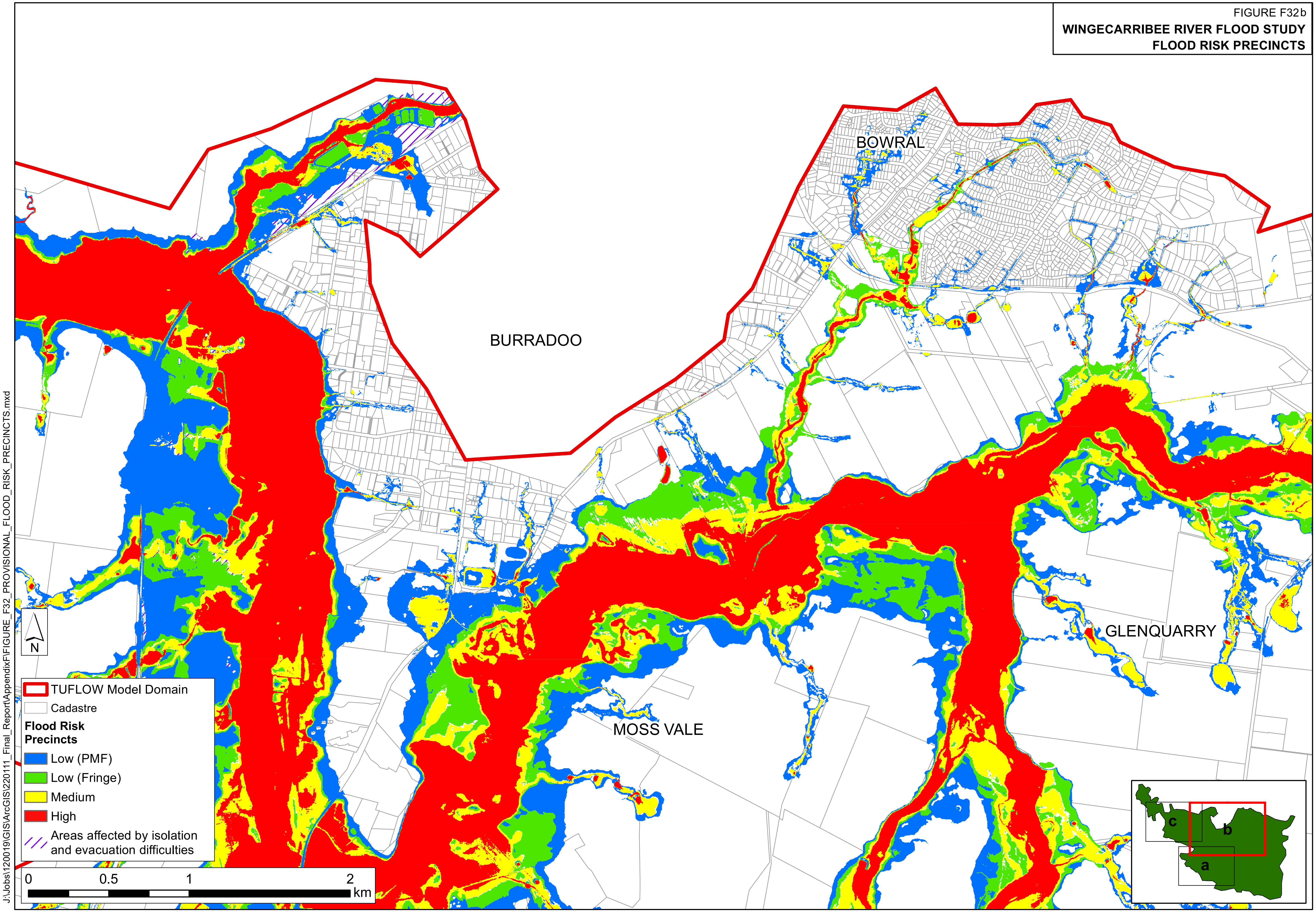


FIGURE F32b
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD RISK PRECINCTS
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
N
TUFLOW Model Domain
Cadastre
Flood Risk Precincts
Low (PMF)
Low (Fringe)
Medium
High
Areas affected by isolation and evacuation difficulties
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F32_PROVISIONAL_FLOOD_RISK_PRECINCTS.mxd

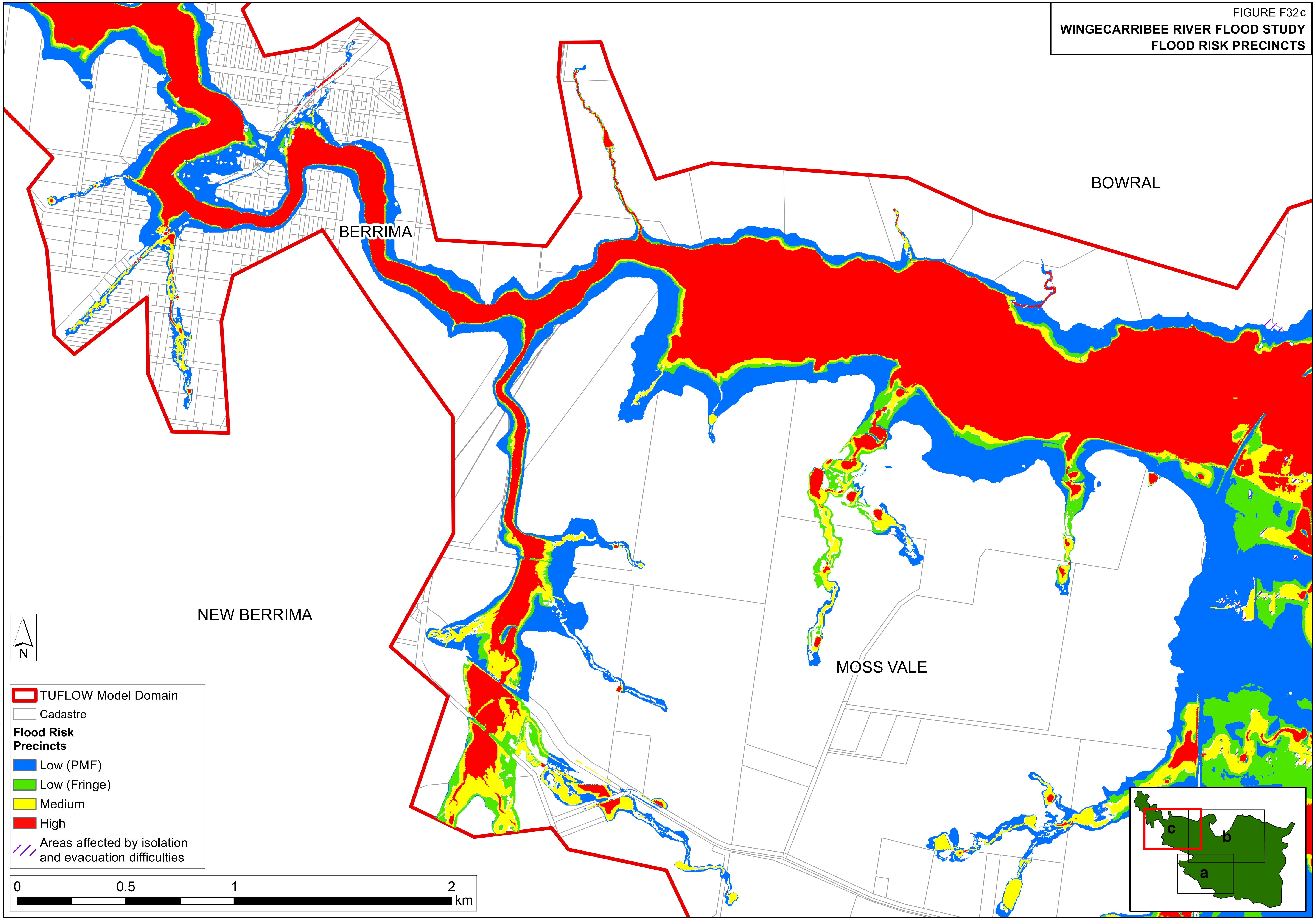


FIGURE F32c
WINGECARRIBEE RIVER FLOOD STUDY
FLOOD RISK PRECINCTS
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Flood Risk Precincts
Low (PMF)
Low (Fringe)
Medium
High
Areas affected by isolation and evacuation difficulties
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\220111_Final_Report\AppendixF\FIGURE_F32_PROVISIONAL_FLOOD_RISK_PRECINCTS.mxd

APPENDIX G. DESIGN FLOOD TABLES AND CHARTS

Appendix G

FIGURE G1
PEAK FLOOD LEVEL PROFILE
WINGECARRIBEE RIVER UPSTREAM BONG BONG WEIR
DESIGN STORMS

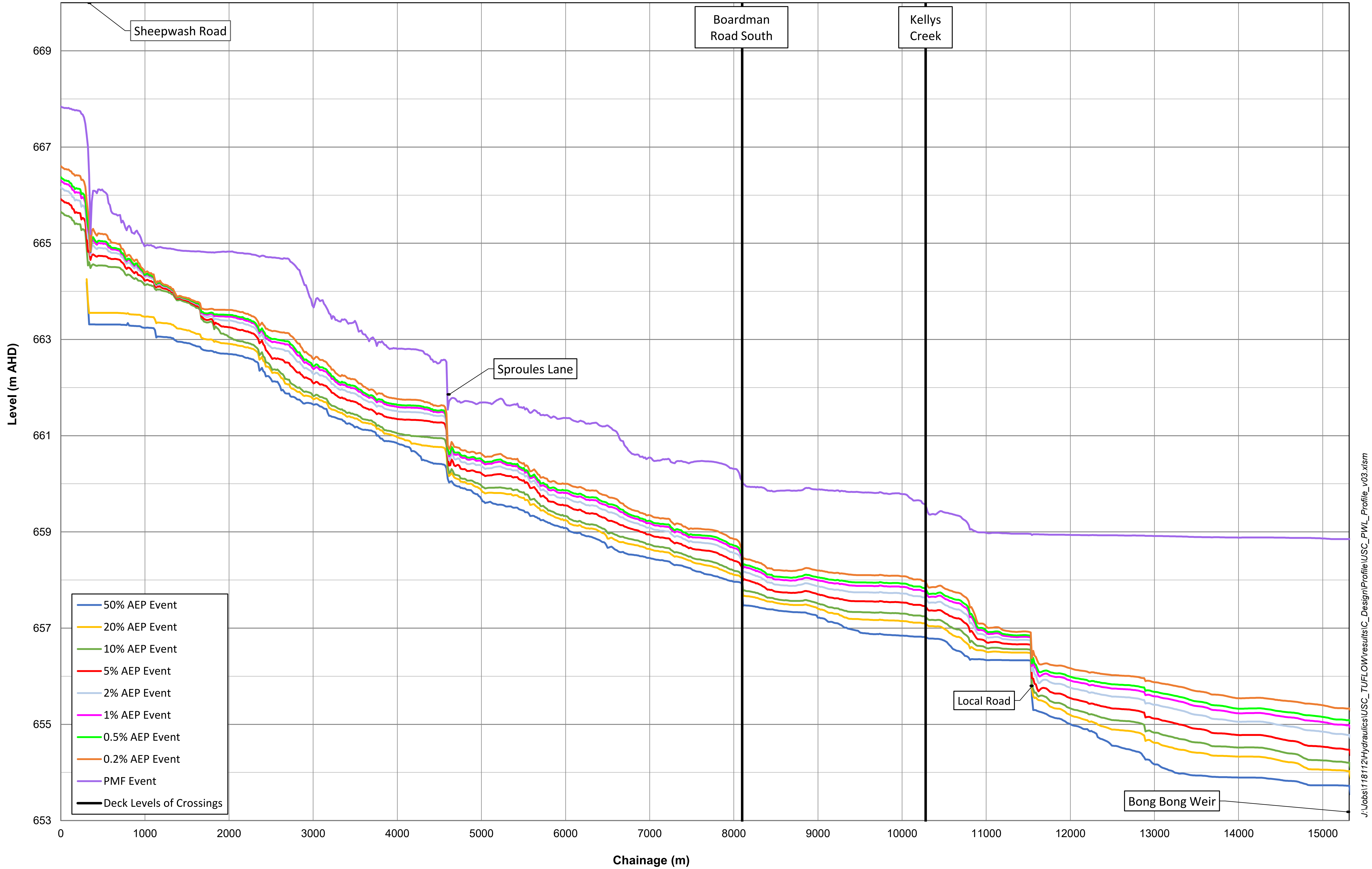
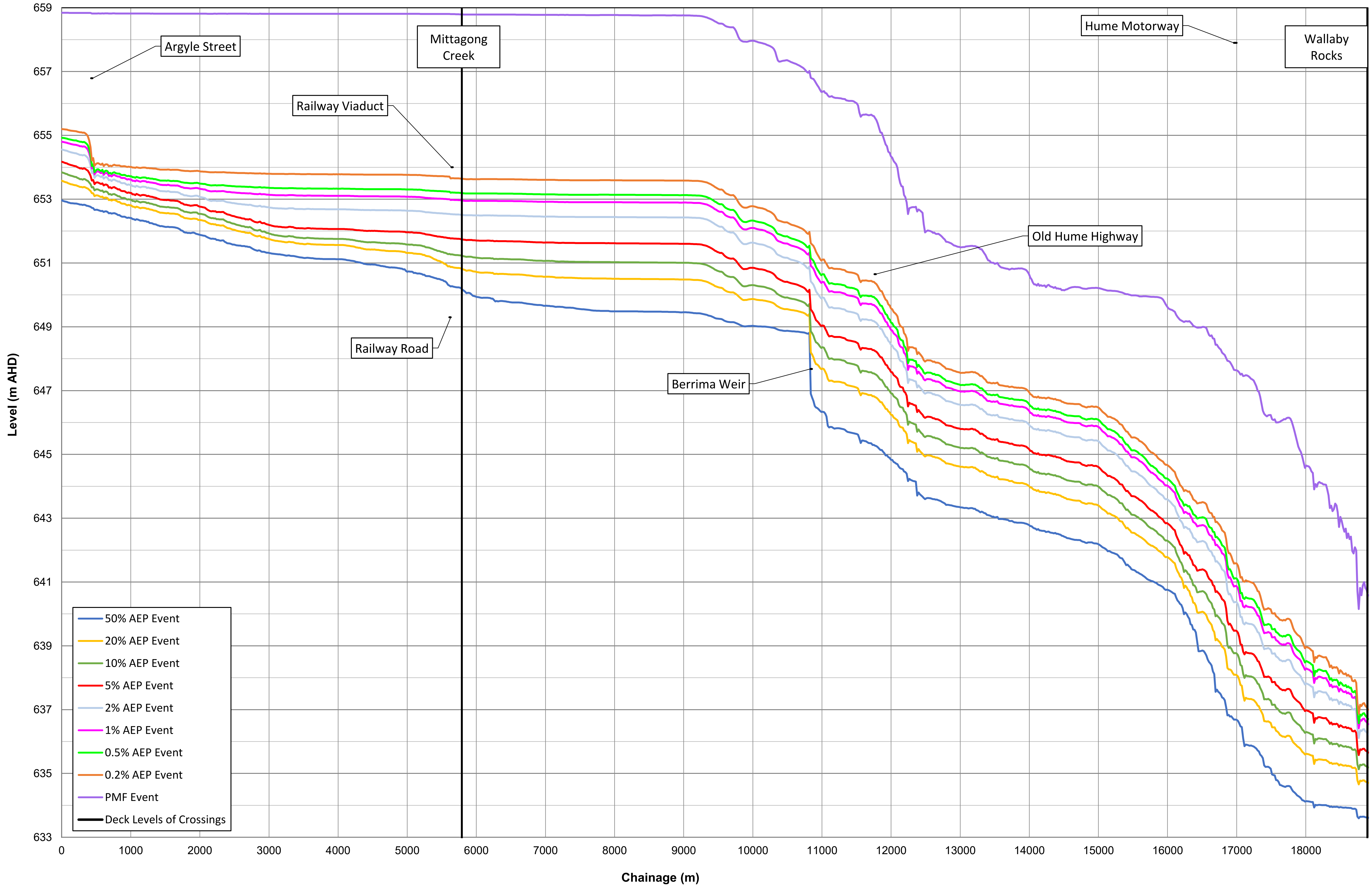


FIGURE G2
PEAK FLOOD LEVEL PROFILE
WINGECARRIBEE RIVER DOWNSTREAM BONG BONG WEIR
DESIGN STORMS



J:\Jobs\118112\Hydraulics\USC_TUFLOW\results\C_Design\Profile\USC_PWL_Profile_v03.xlsm

APPENDIX H. MODEL SENSITIVITY RESULTS

Appendix H

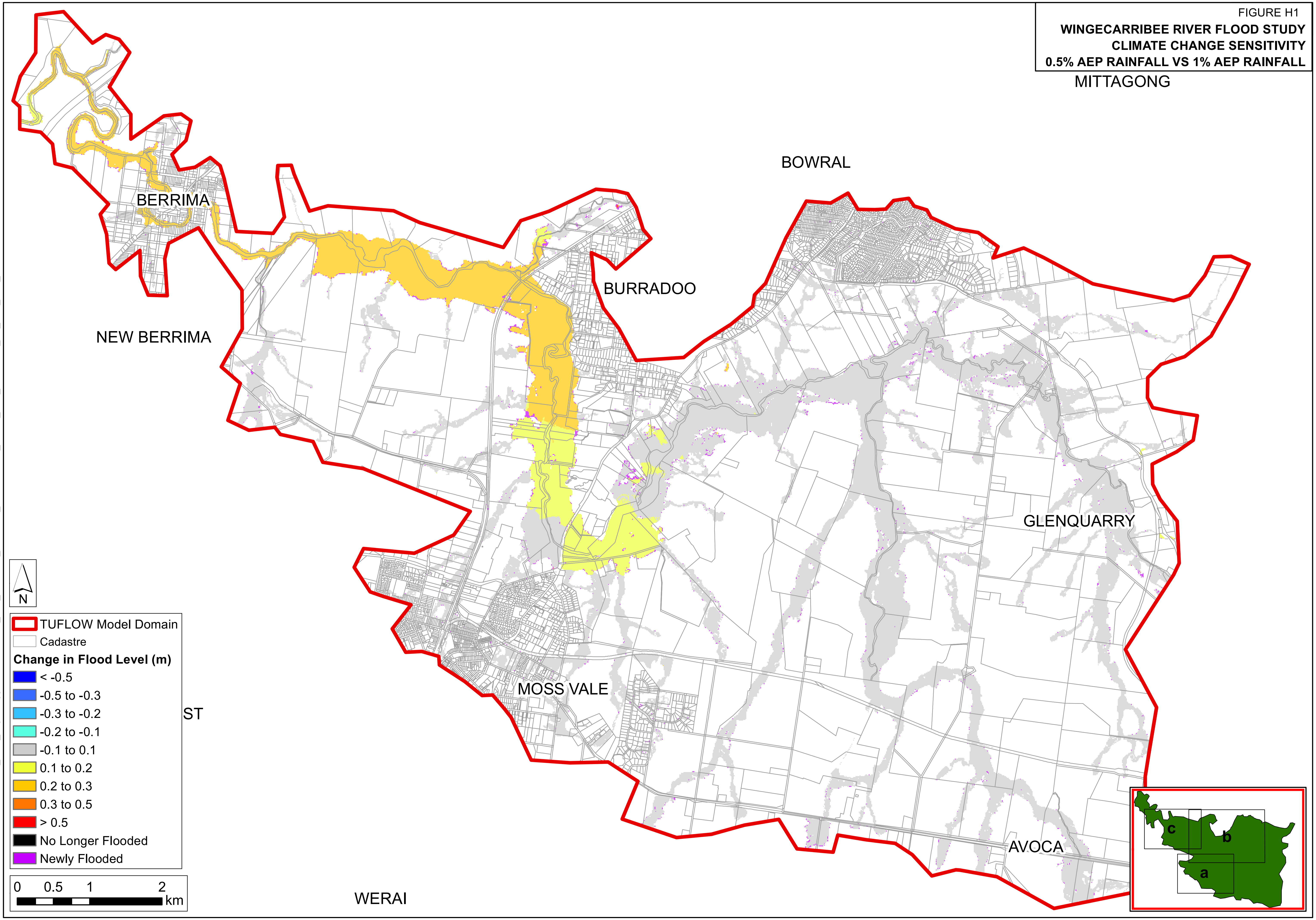
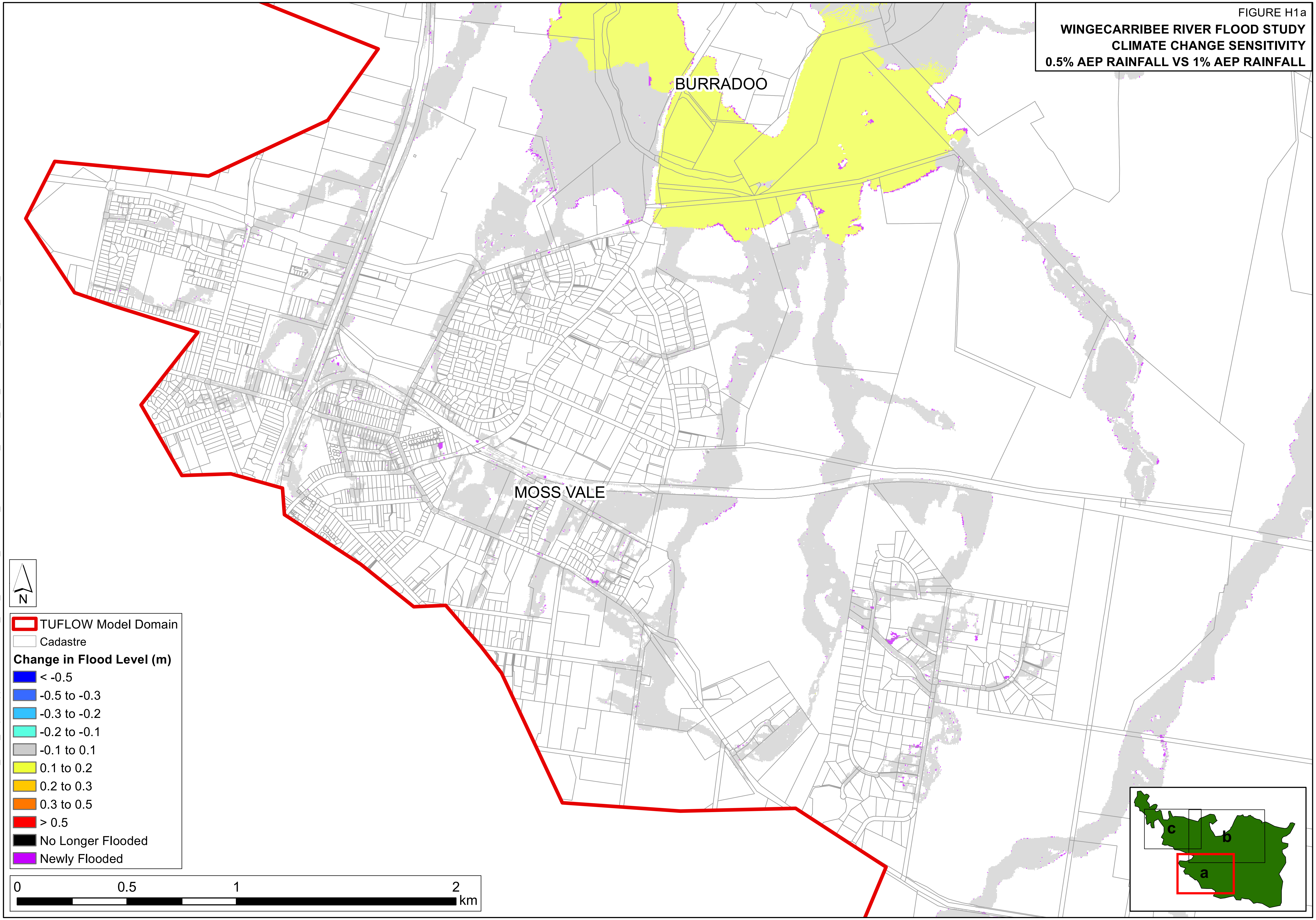
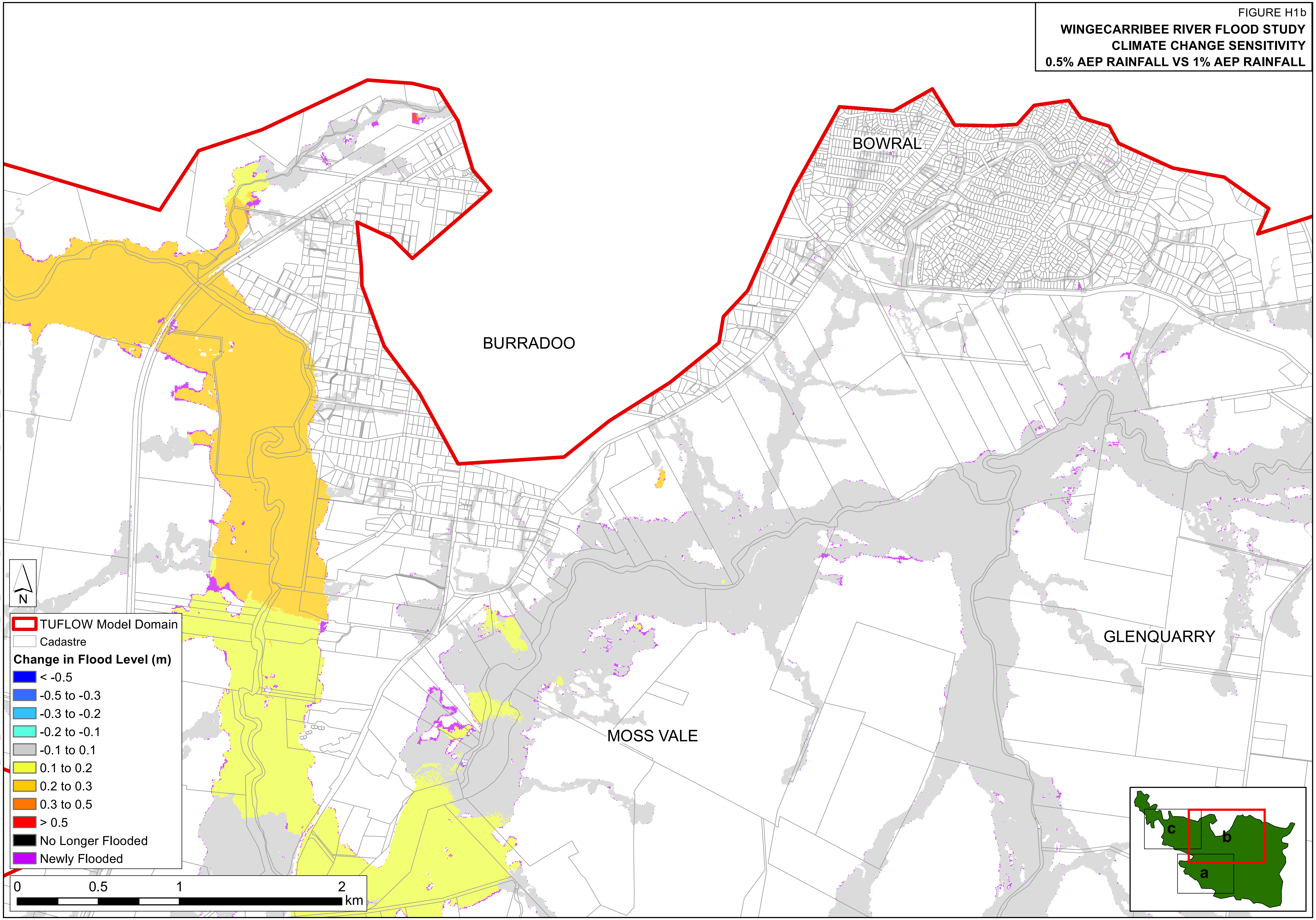


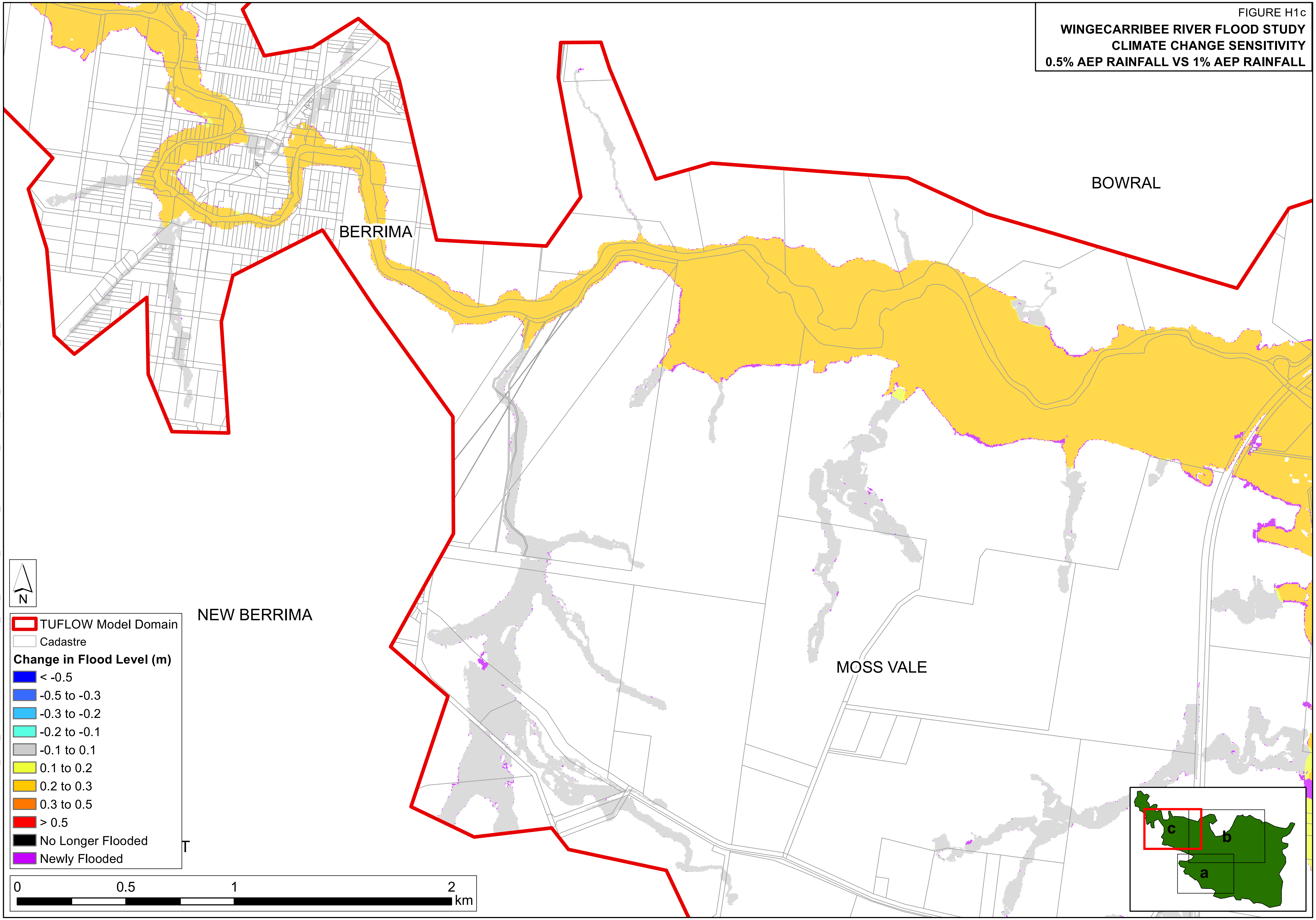
FIGURE H1
WINGECARRIBEE RIVER FLOOD STUDY
CLIMATE CHANGE SENSITIVITY
0.5% AEP RAINFALL VS 1% AEP RAINFALL
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
ST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0 0.5 1 2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H01_CLIMATE_CHANGE_SENSITIVITY_1in200_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H01_CLIMATE_CHANGE_SENSITIVITY_1in200_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H01_CLIMATE_CHANGE_SENSITIVITY_1in200_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H01_CLIMATE_CHANGE_SENSITIVITY_1in200_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd

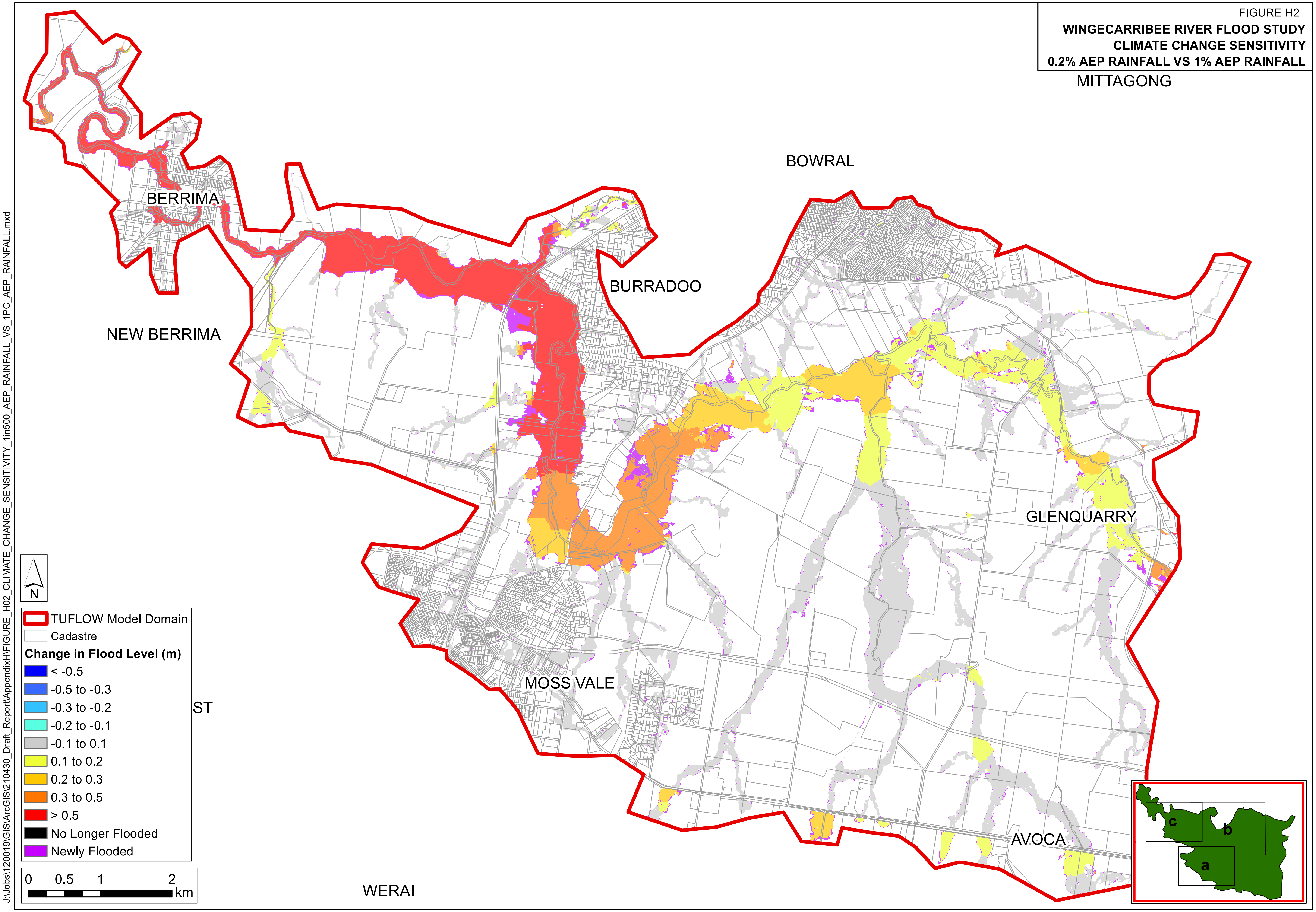


FIGURE H2
WINGECARRIBEE RIVER FLOOD STUDY
CLIMATE CHANGE SENSITIVITY
0.2% AEP RAINFALL VS 1% AEP RAINFALL
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
ST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0 0.5 1 2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H02_CLIMATE_CHANGE_SENSITIVITY_1in500_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd

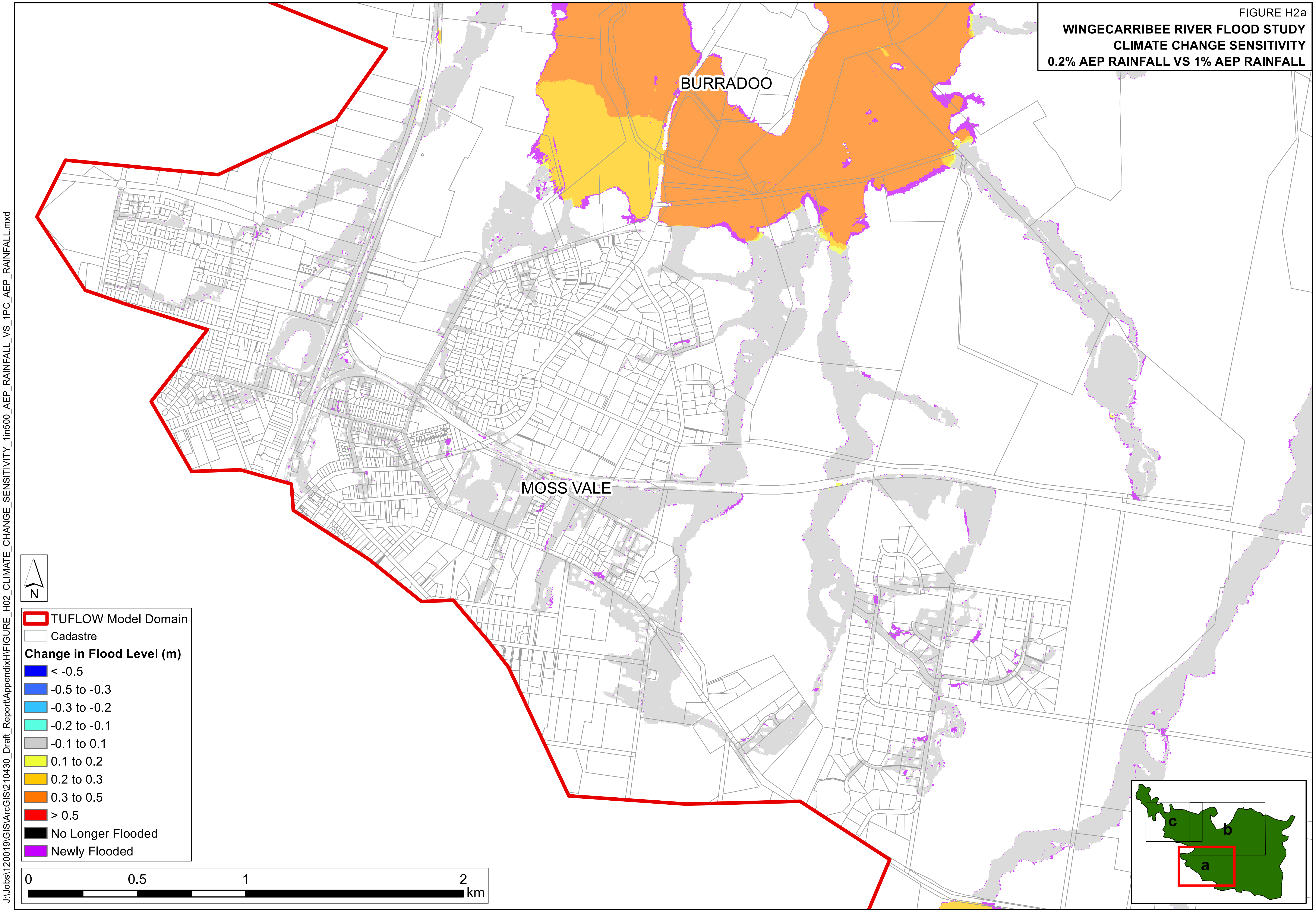
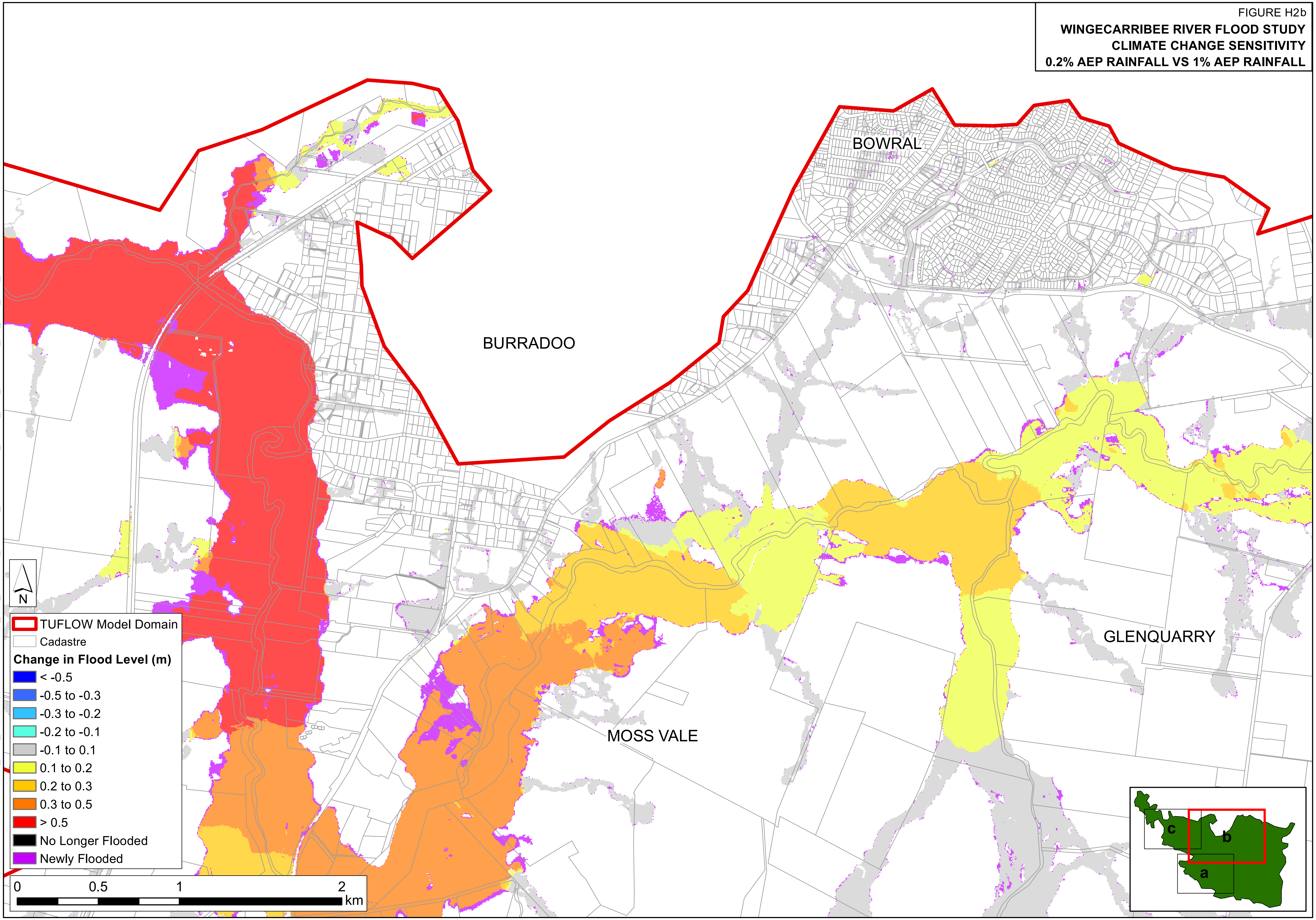
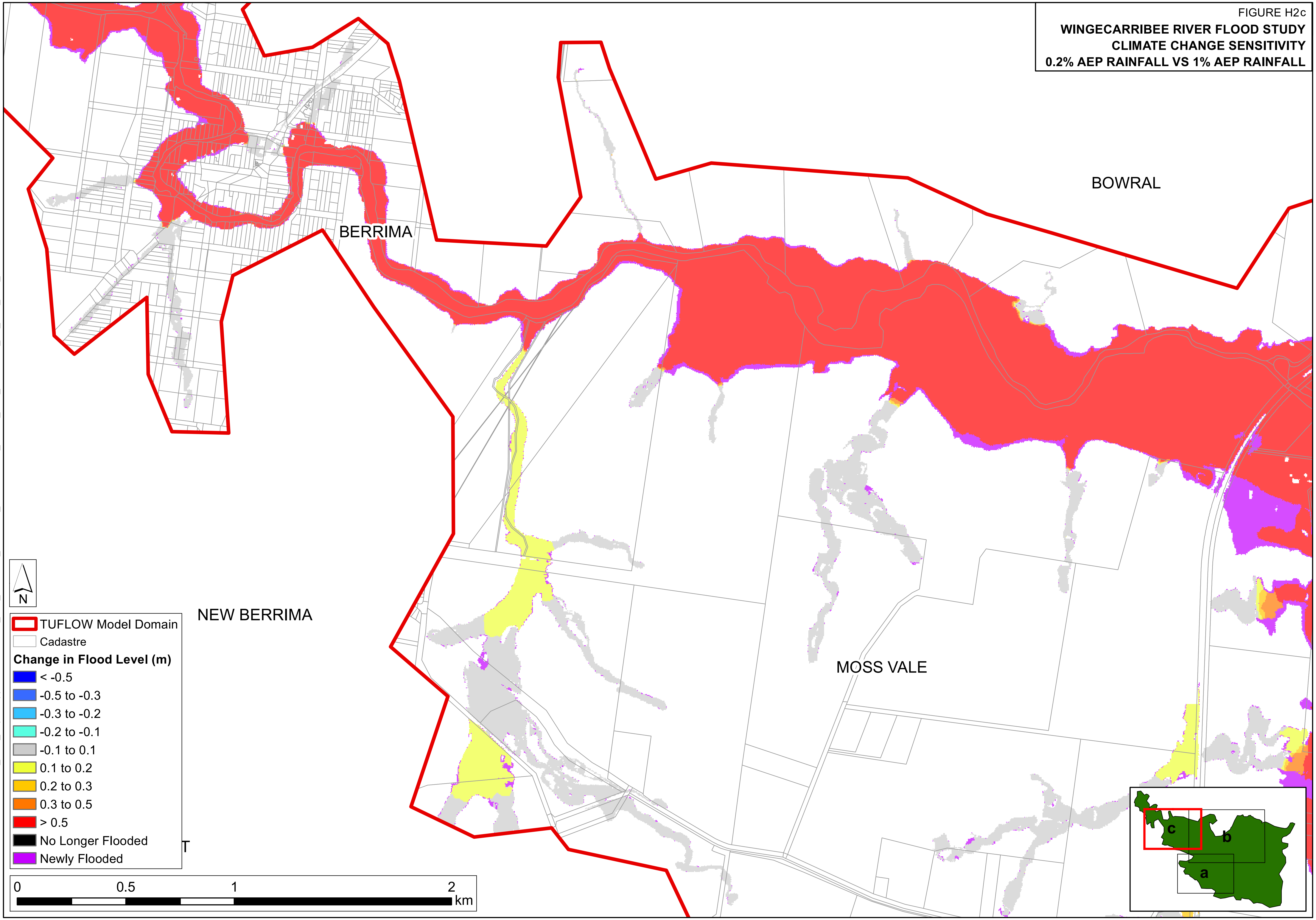


FIGURE H2a
WINGECARRIBEE RIVER FLOOD STUDY
CLIMATE CHANGE SENSITIVITY
0.2% AEP RAINFALL VS 1% AEP RAINFALL
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H02_CLIMATE_CHANGE_SENSITIVITY_1in500_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd

FIGURE H2b
WINGECARRIBEE RIVER FLOOD STUDY
CLIMATE CHANGE SENSITIVITY
0.2% AEP RAINFALL VS 1% AEP RAINFALL



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H02_CLIMATE_CHANGE_SENSITIVITY_1in500_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H02_CLIMATE_CHANGE_SENSITIVITY_1in500_AEP_RAINFALL_VS_1PC_AEP_RAINFALL.mxd

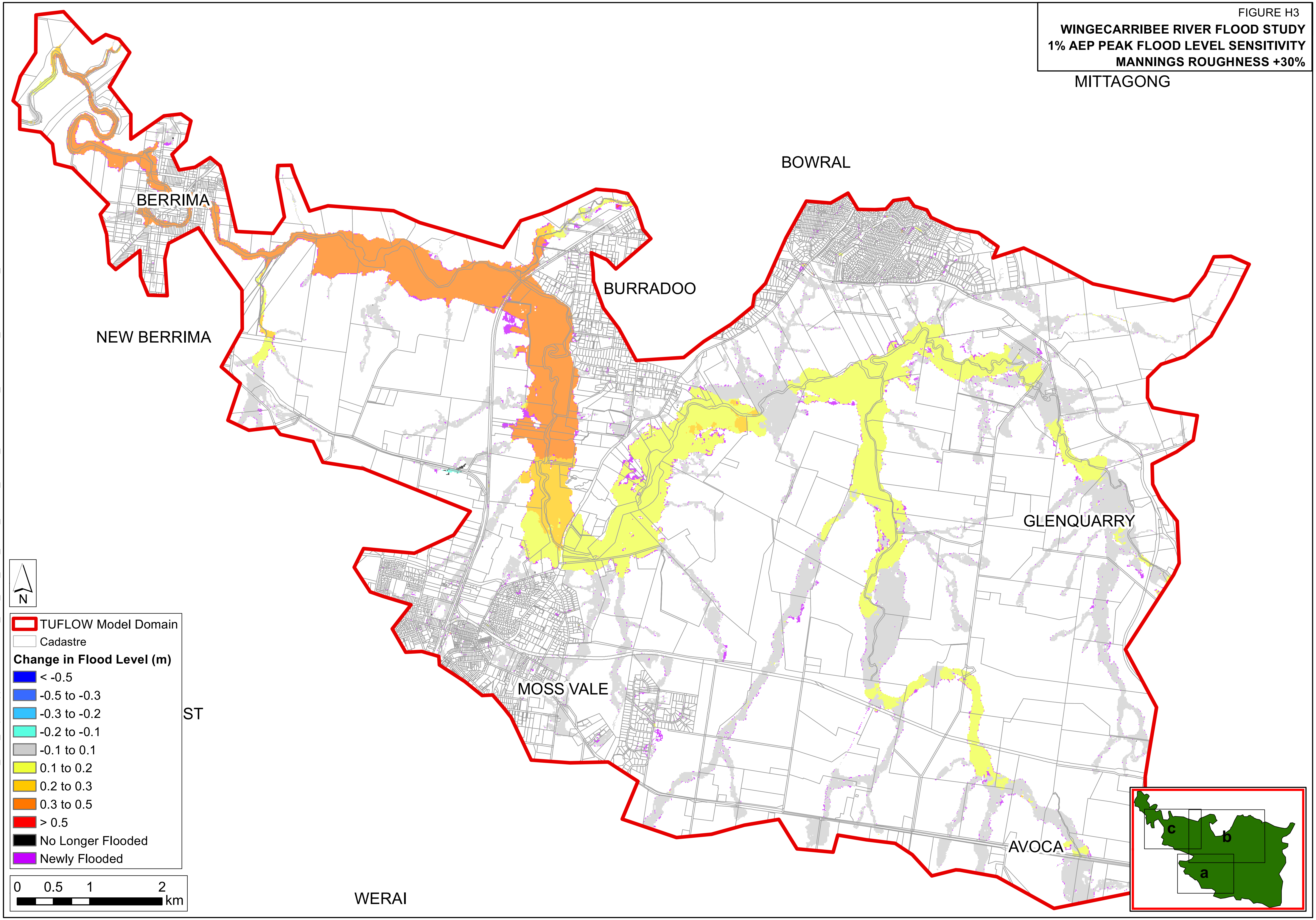
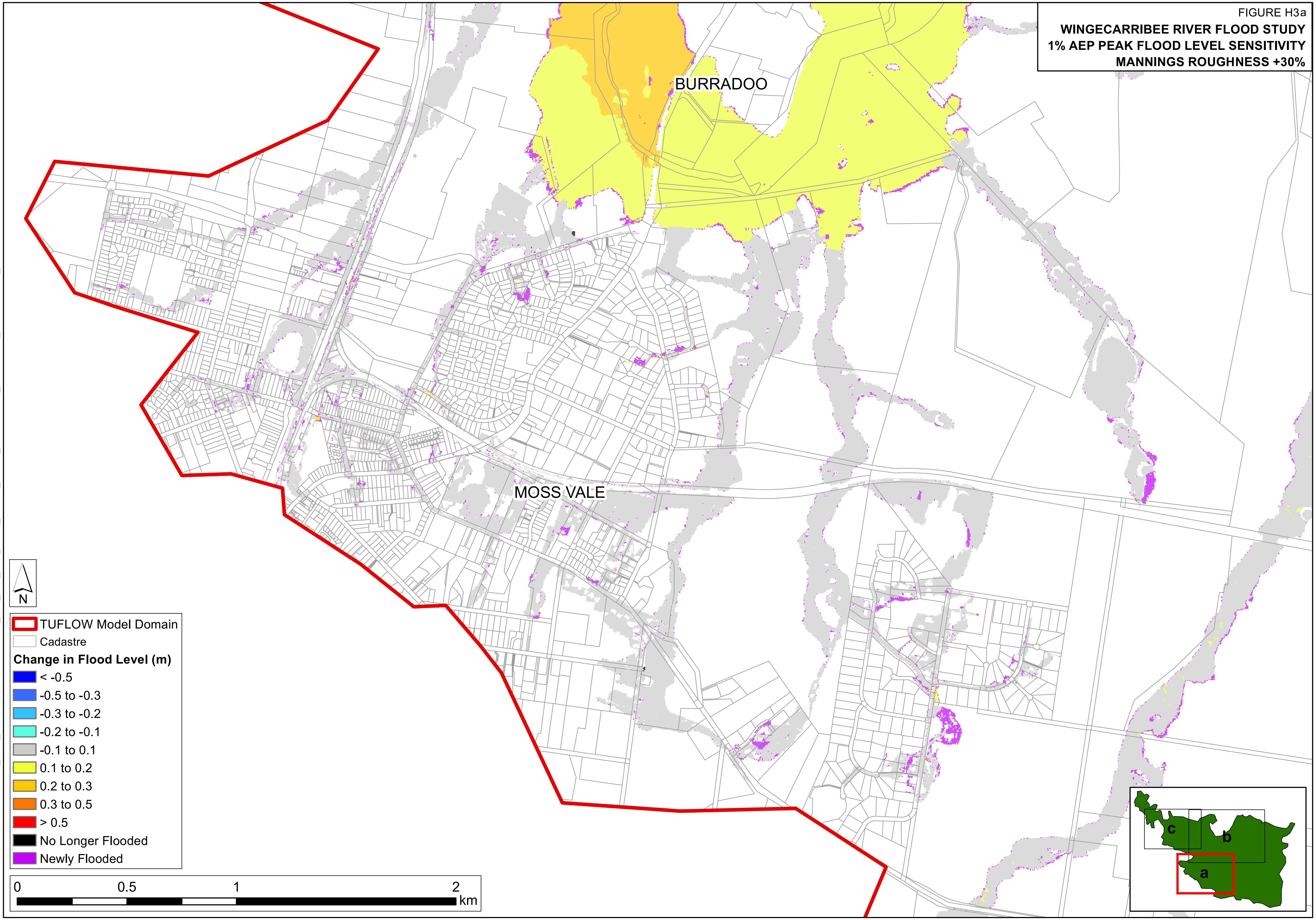


FIGURE H3
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
MANNINGS ROUGHNESS +30%
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
ST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0 0.5 1 2 km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H03_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_PLUS30PC.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H03_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_PLUS30PC.mxd

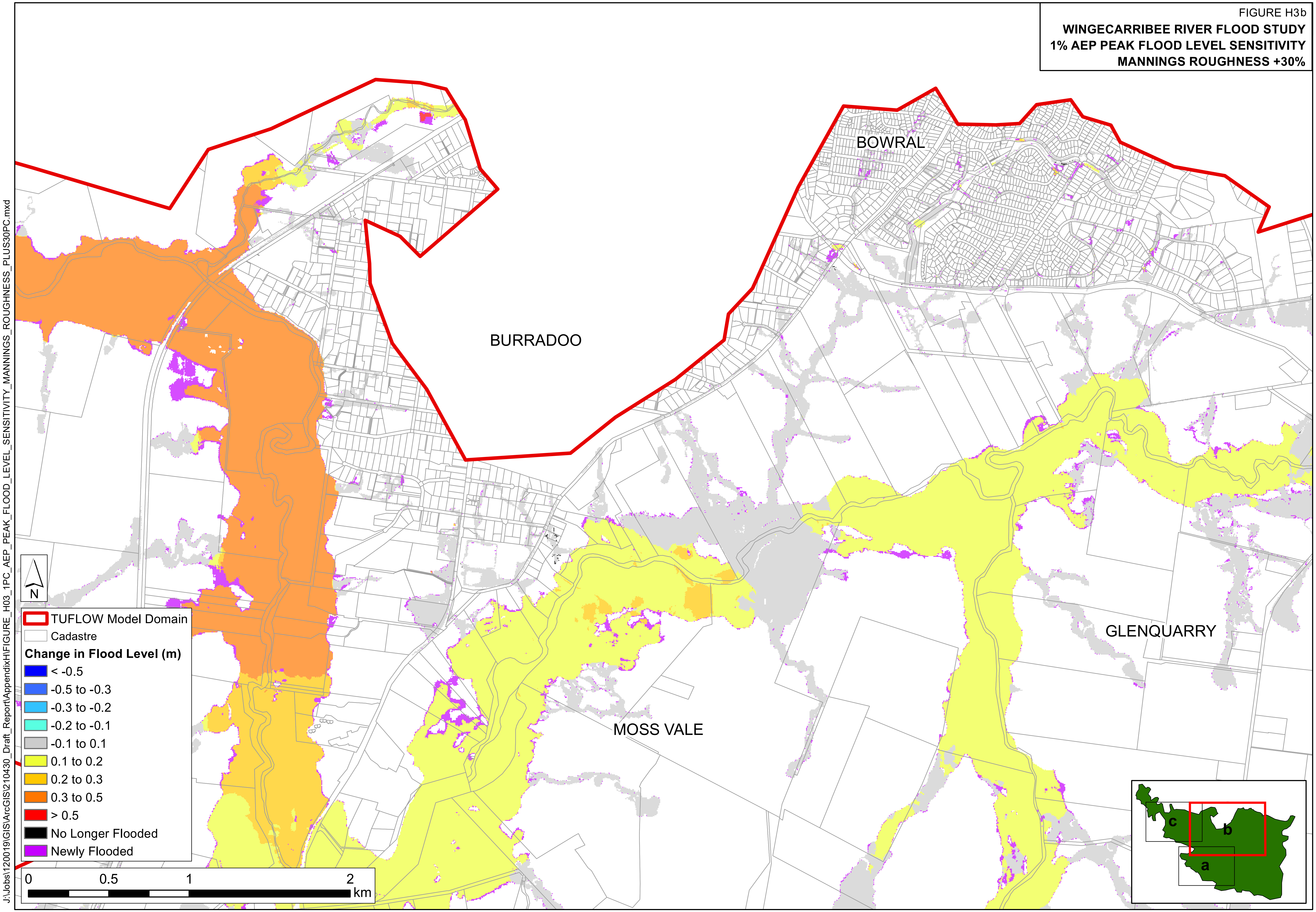
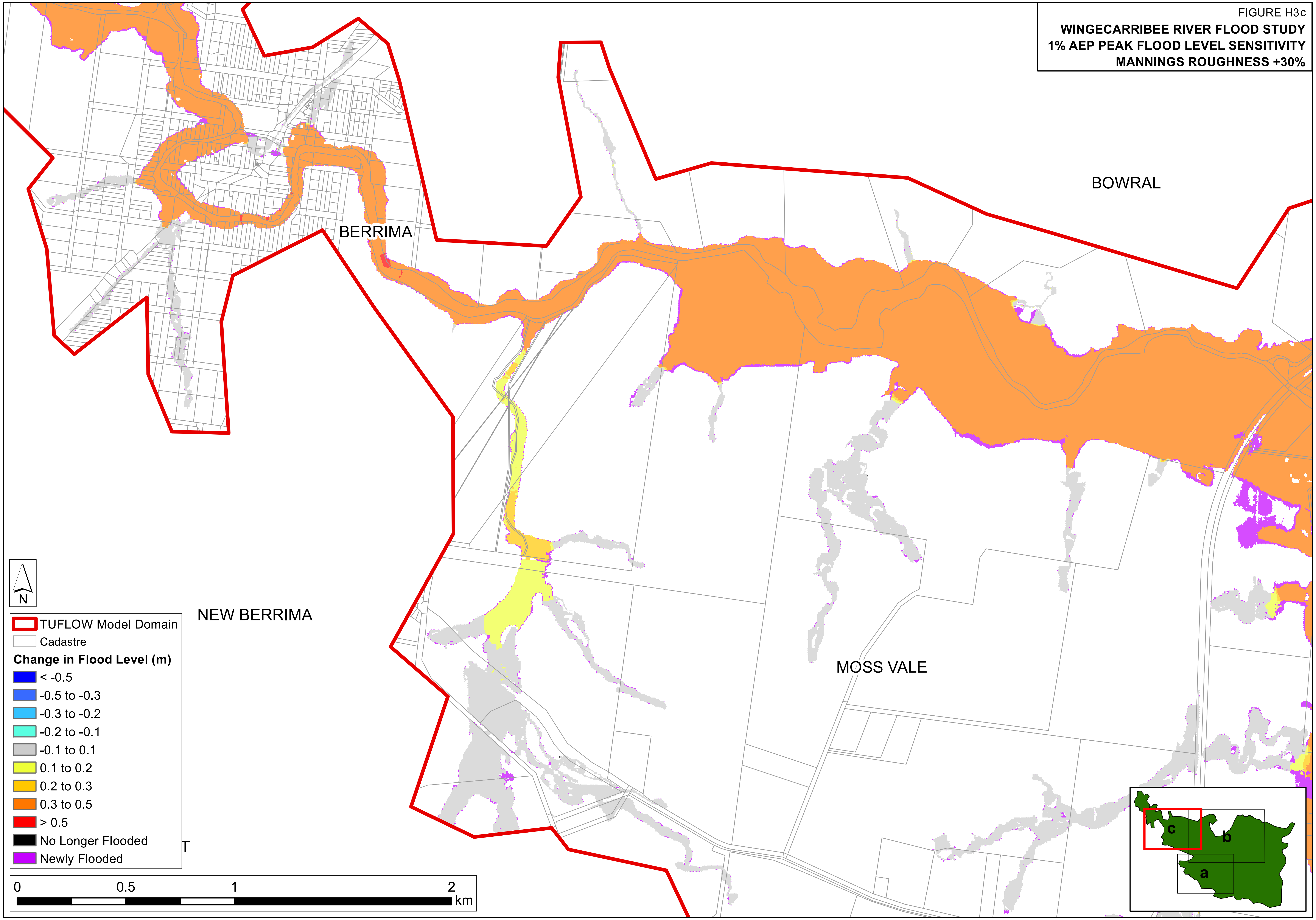


FIGURE H3b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
MANNINGS ROUGHNESS +30%
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H03_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_PLUS30PC.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H03_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_PLUS30PC.mxd

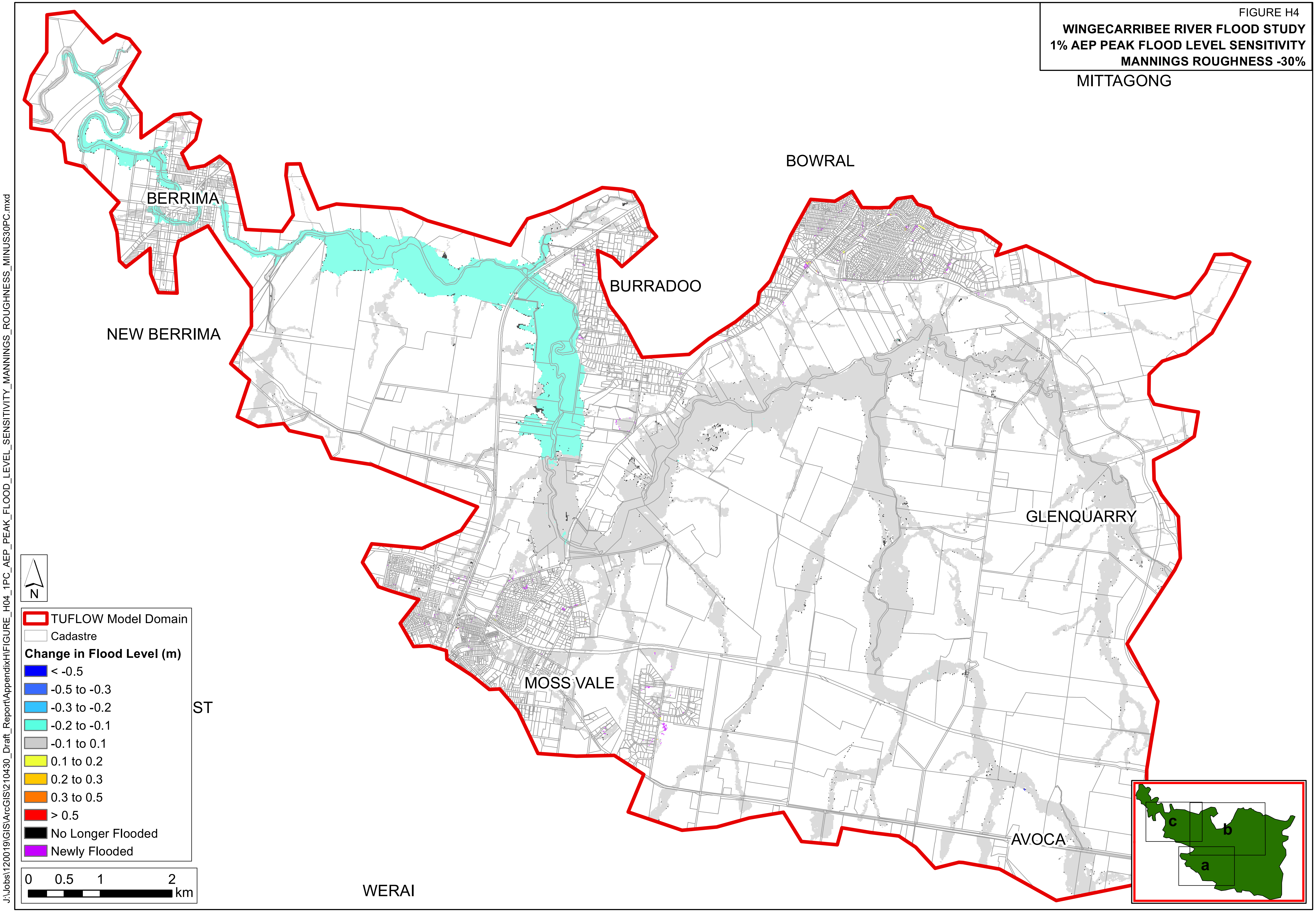


FIGURE H4

WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
MANNINGS ROUGHNESS -30%

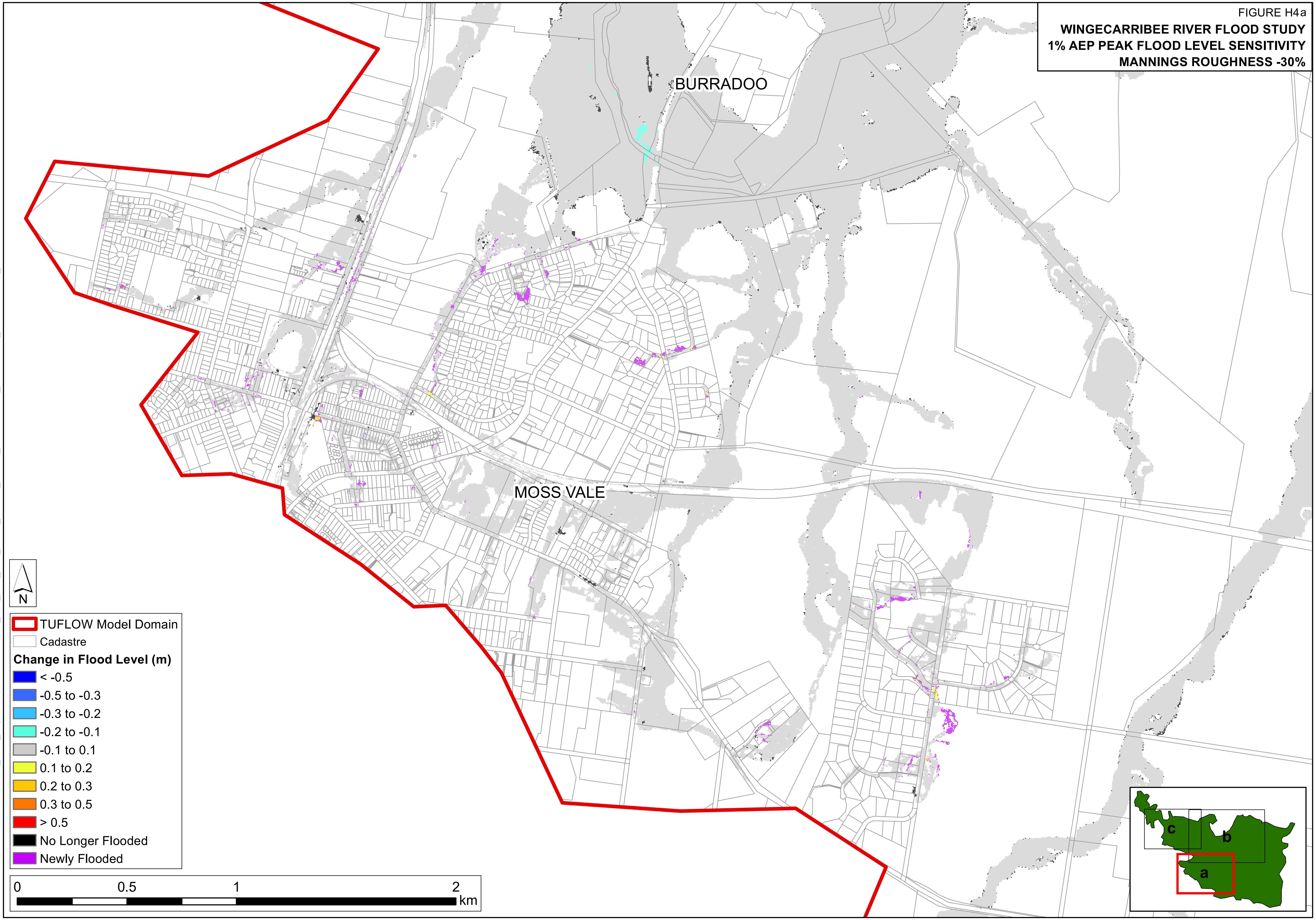


FIGURE H4a
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
MANNINGS ROUGHNESS -30%
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H04_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_MINUS30PC.mxd

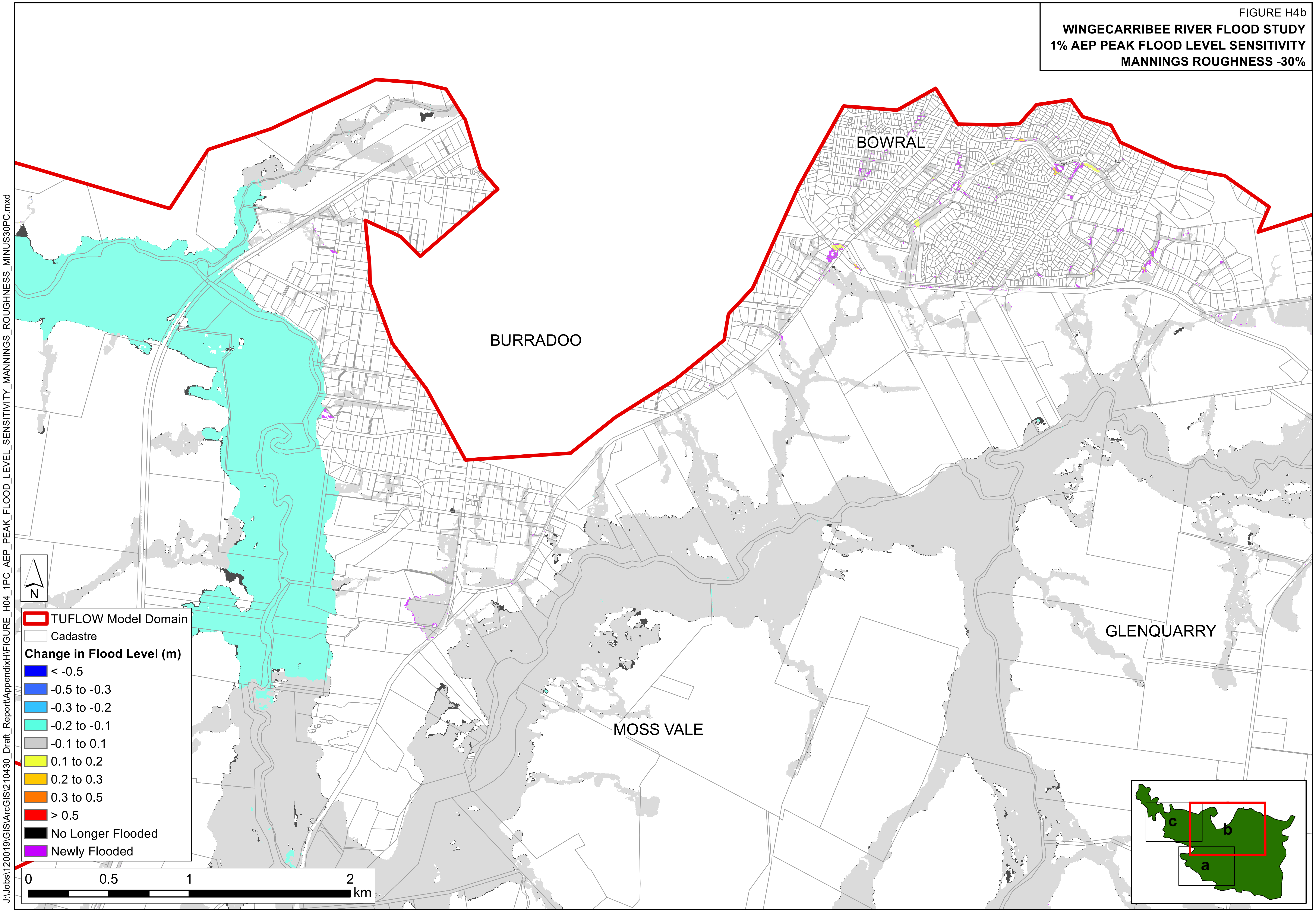
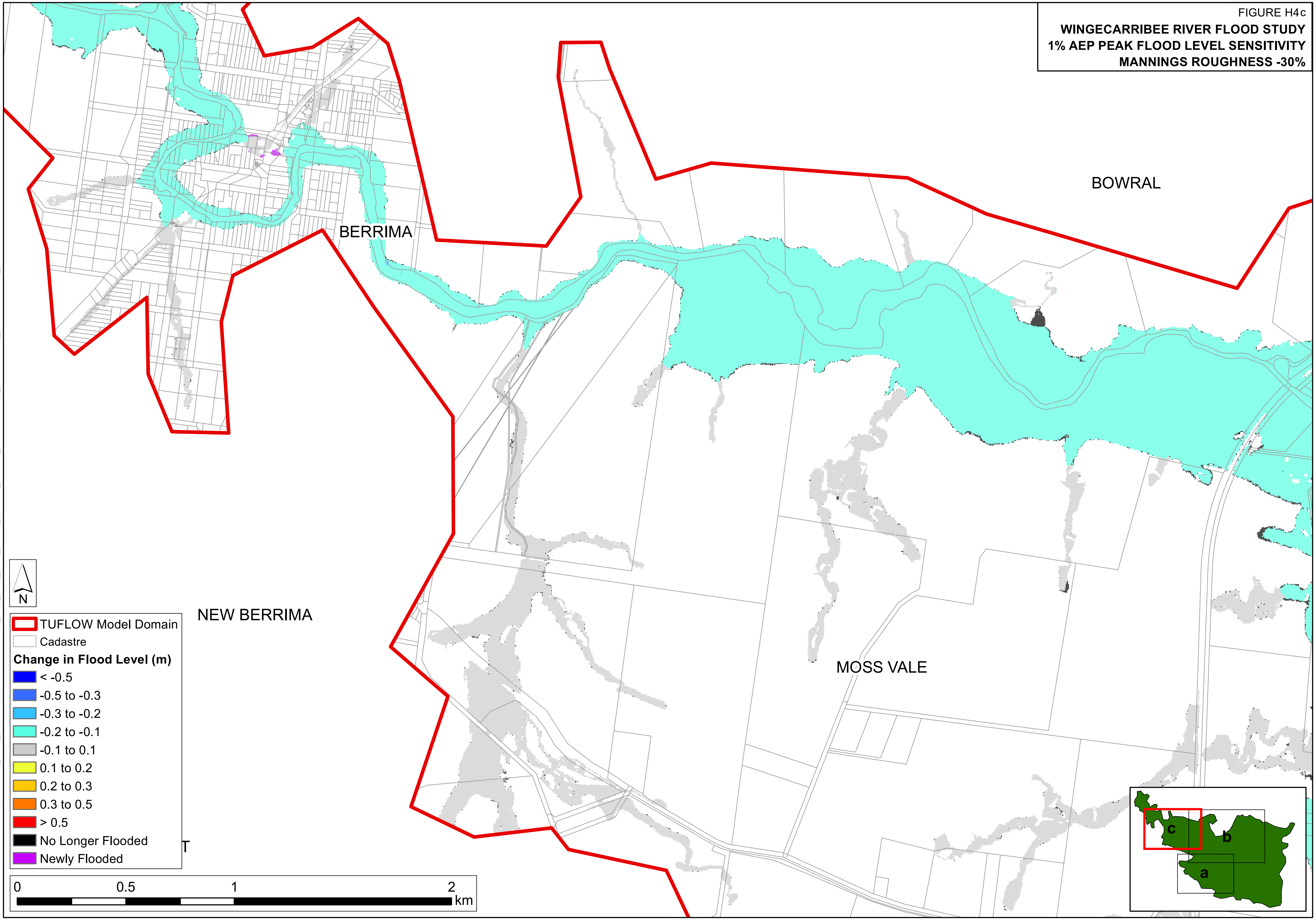
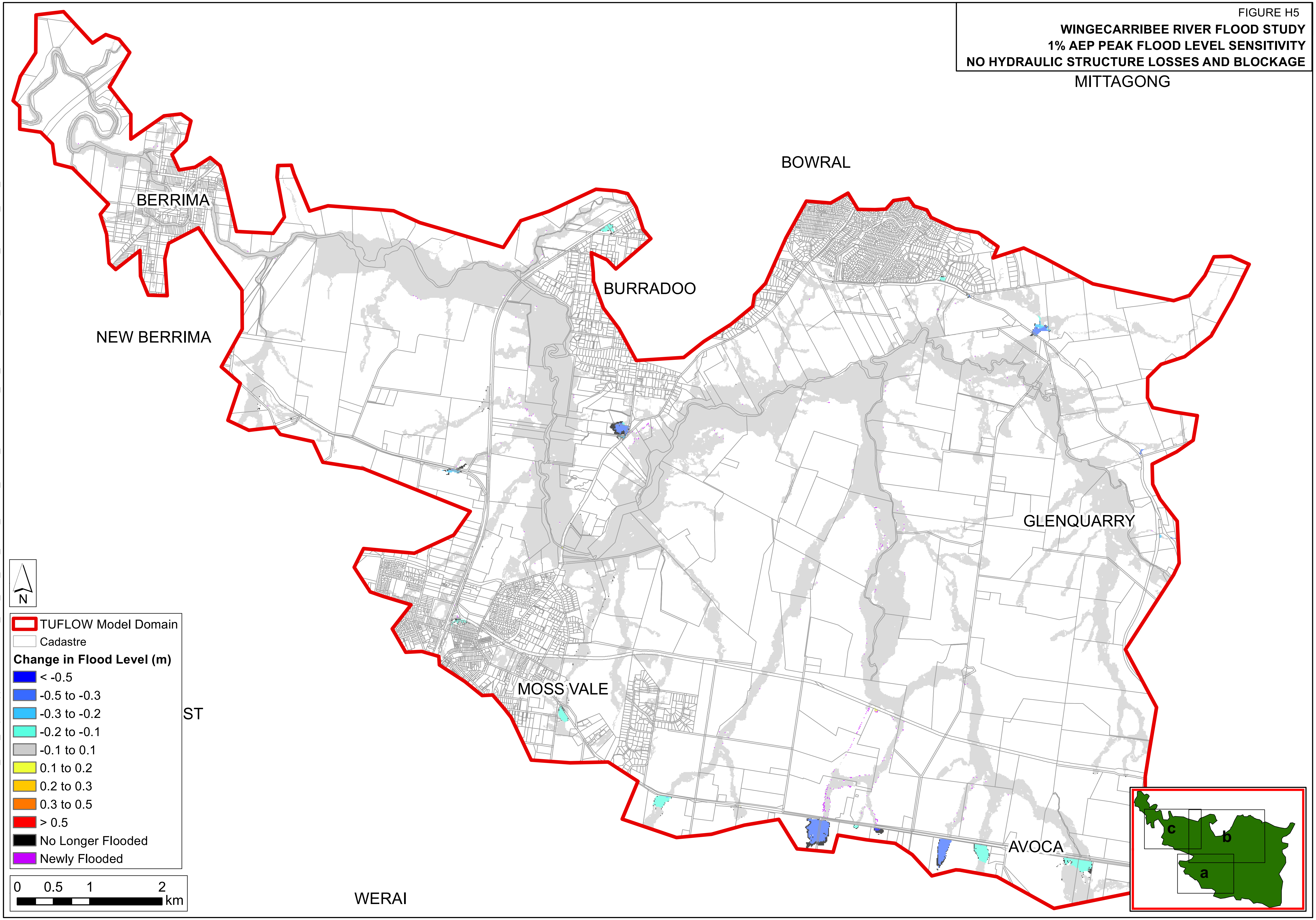


FIGURE H4b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
MANNINGS ROUGHNESS -30%
BOWRAL
BURRADOO
MOSS VALE
GLENQUARRY
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H04_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_MINUS30PC.mxd



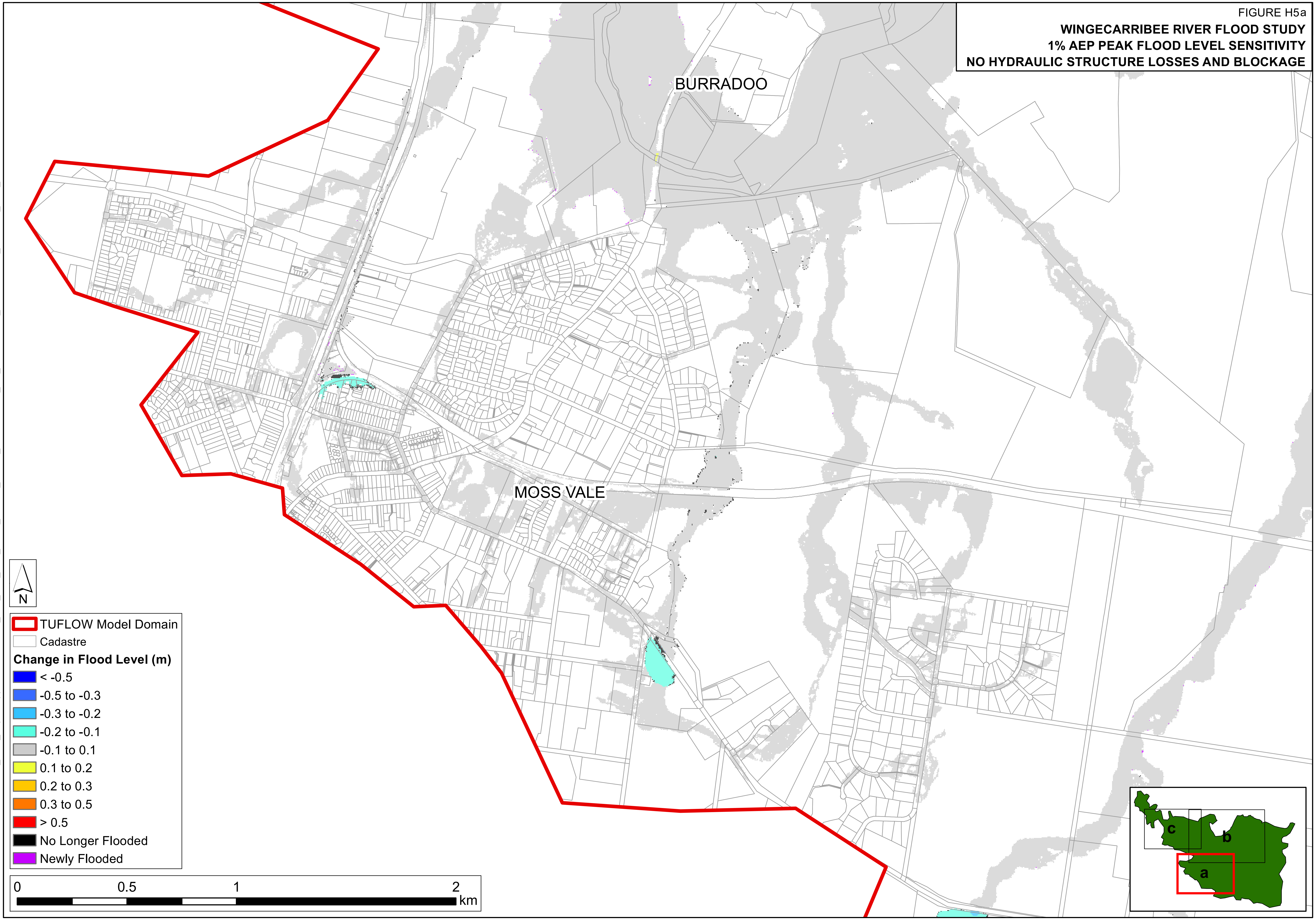
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H04_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_MANNINGS_ROUGHNESS_MINUS30PC.mxd

FIGURE H5
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
NO HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H05_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_NO_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

FIGURE H5a
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
NO HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H05_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_NO_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

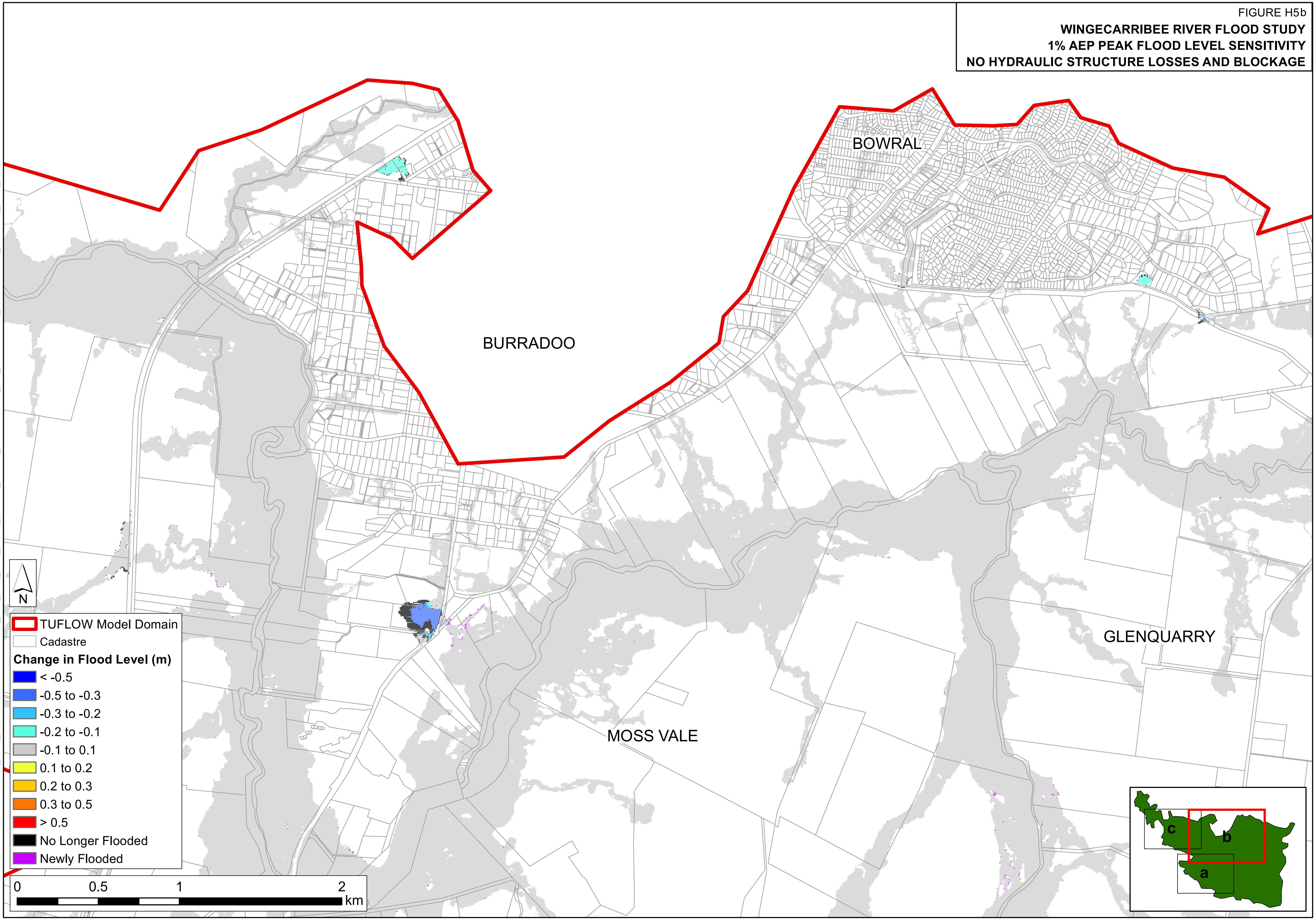
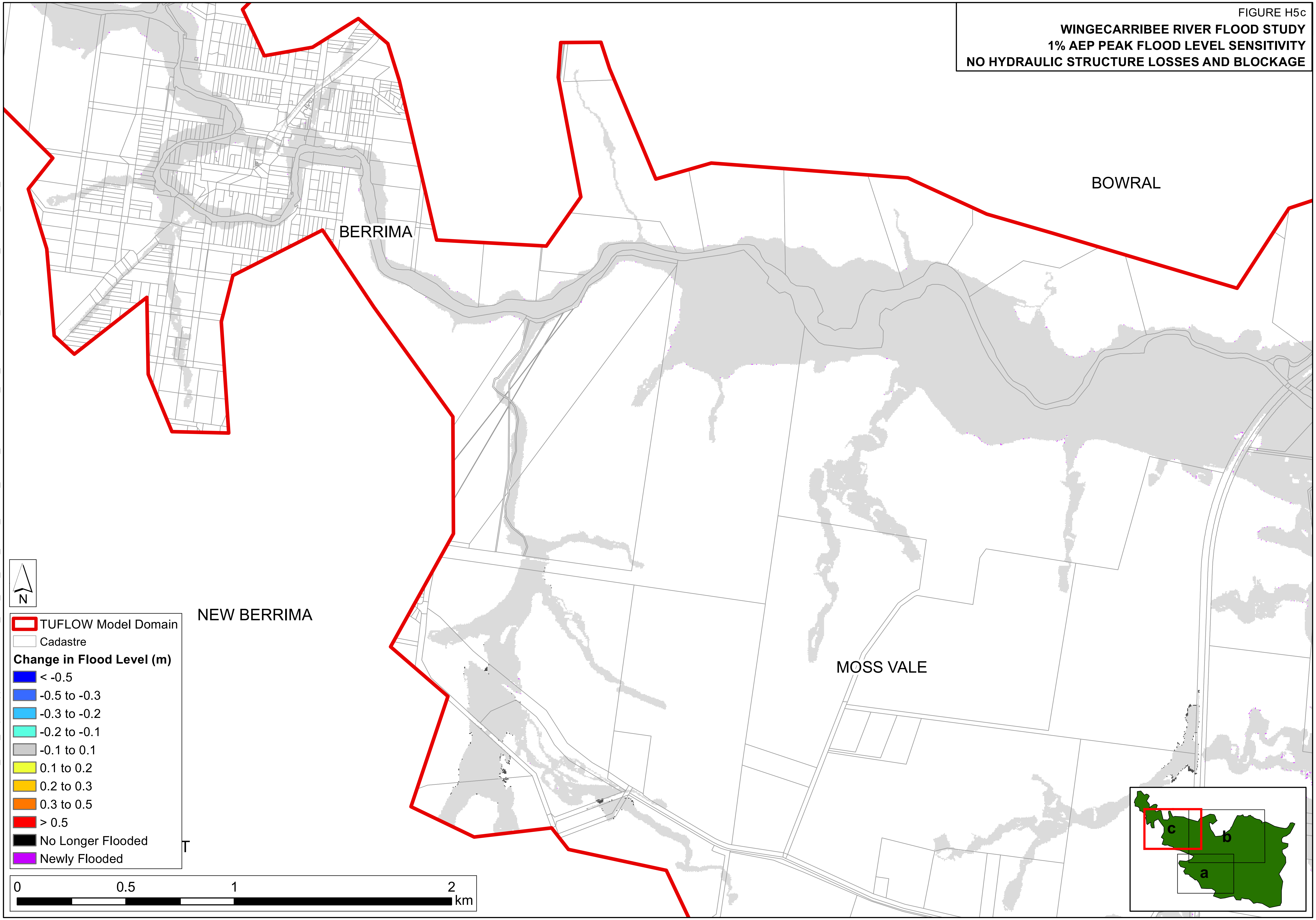


FIGURE H5b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
NO HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H05_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_NO_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H05_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_NO_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

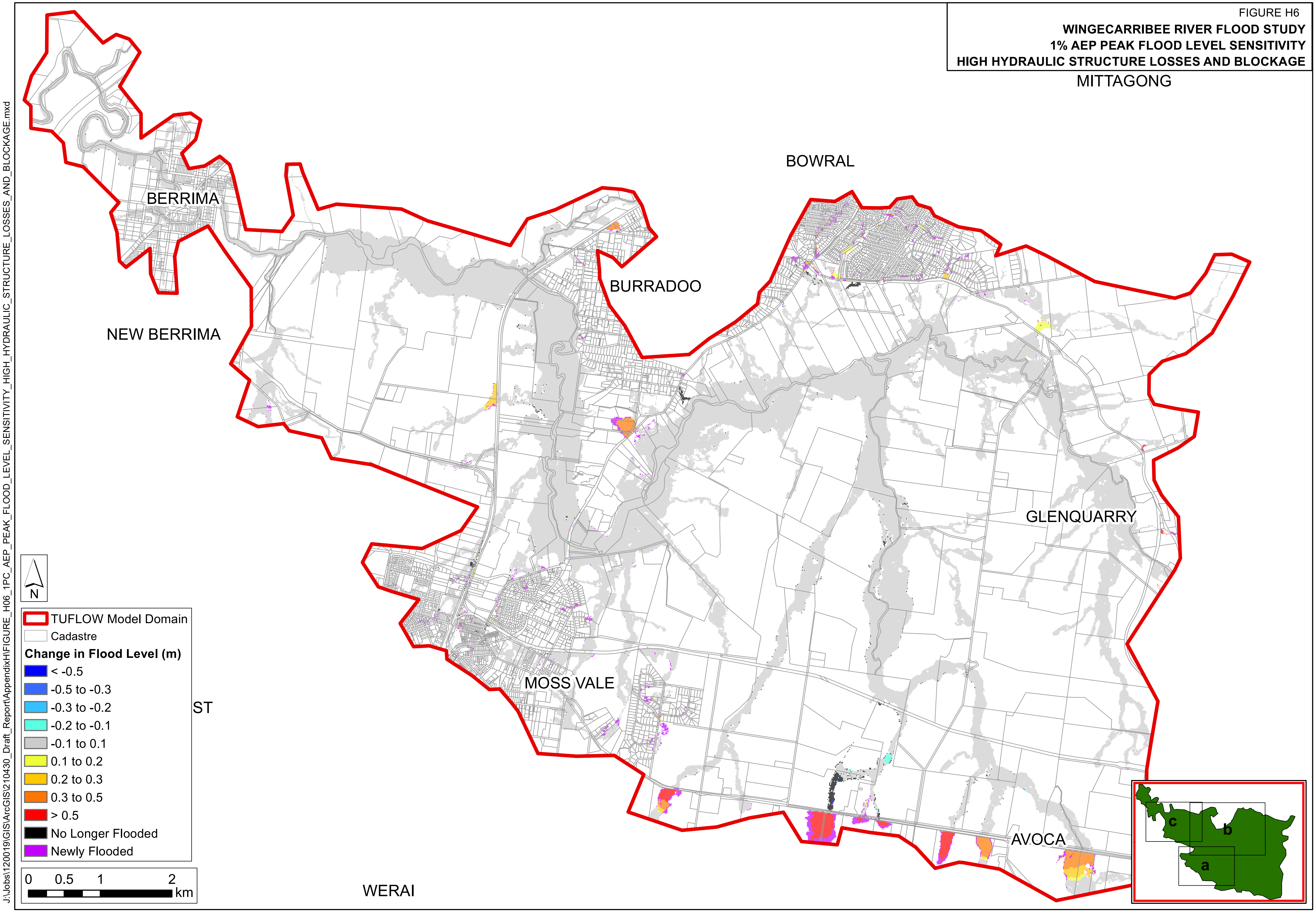
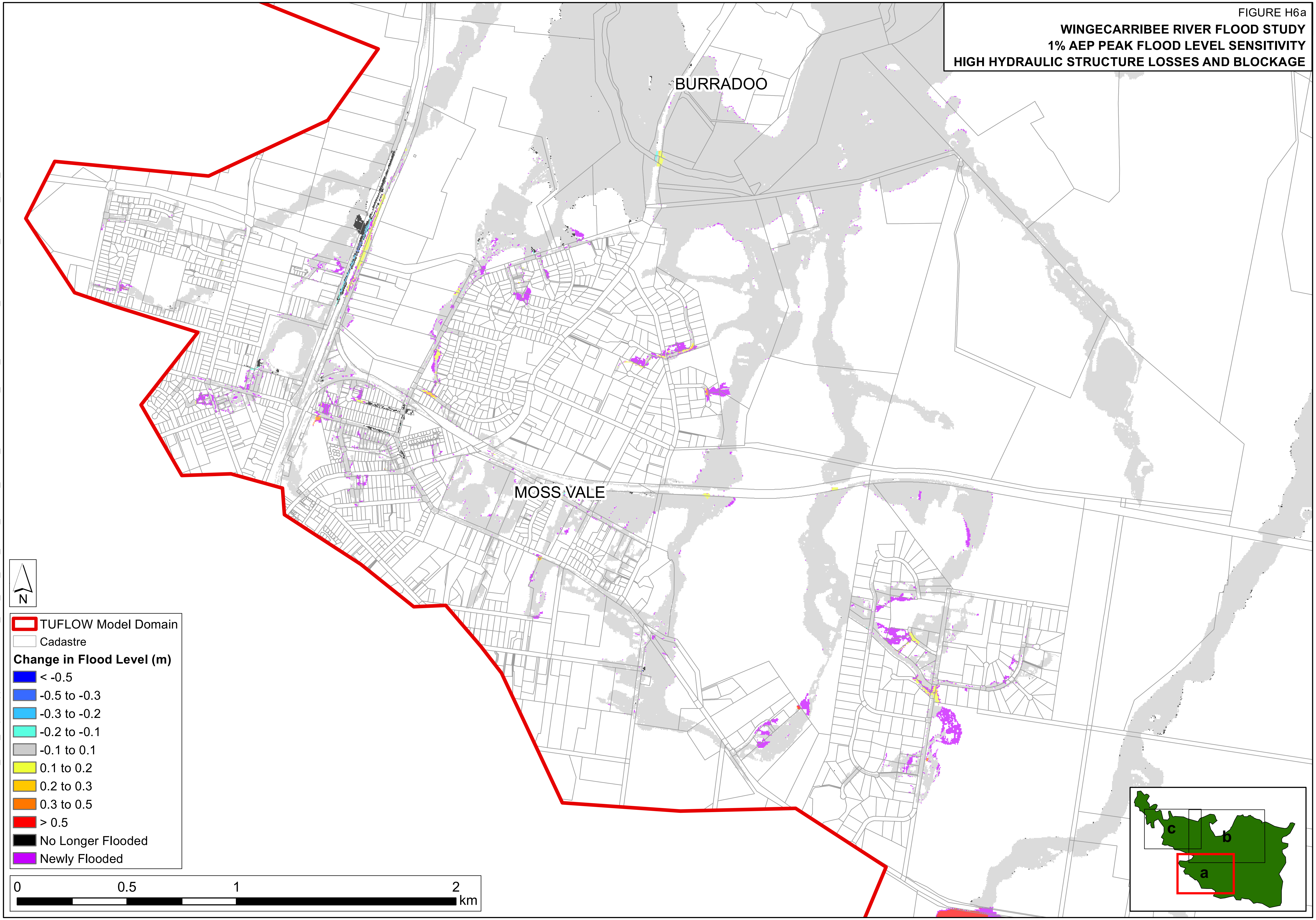


FIGURE H6
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HIGH HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE
MITTAGONG
BOWRAL
BERRIMA
BURRADOO
NEW BERRIMA
GLENQUARRY
MOSS VALE
ST
AVOCA
WERAI
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0 0.5 1 2 km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H06_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HIGH_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

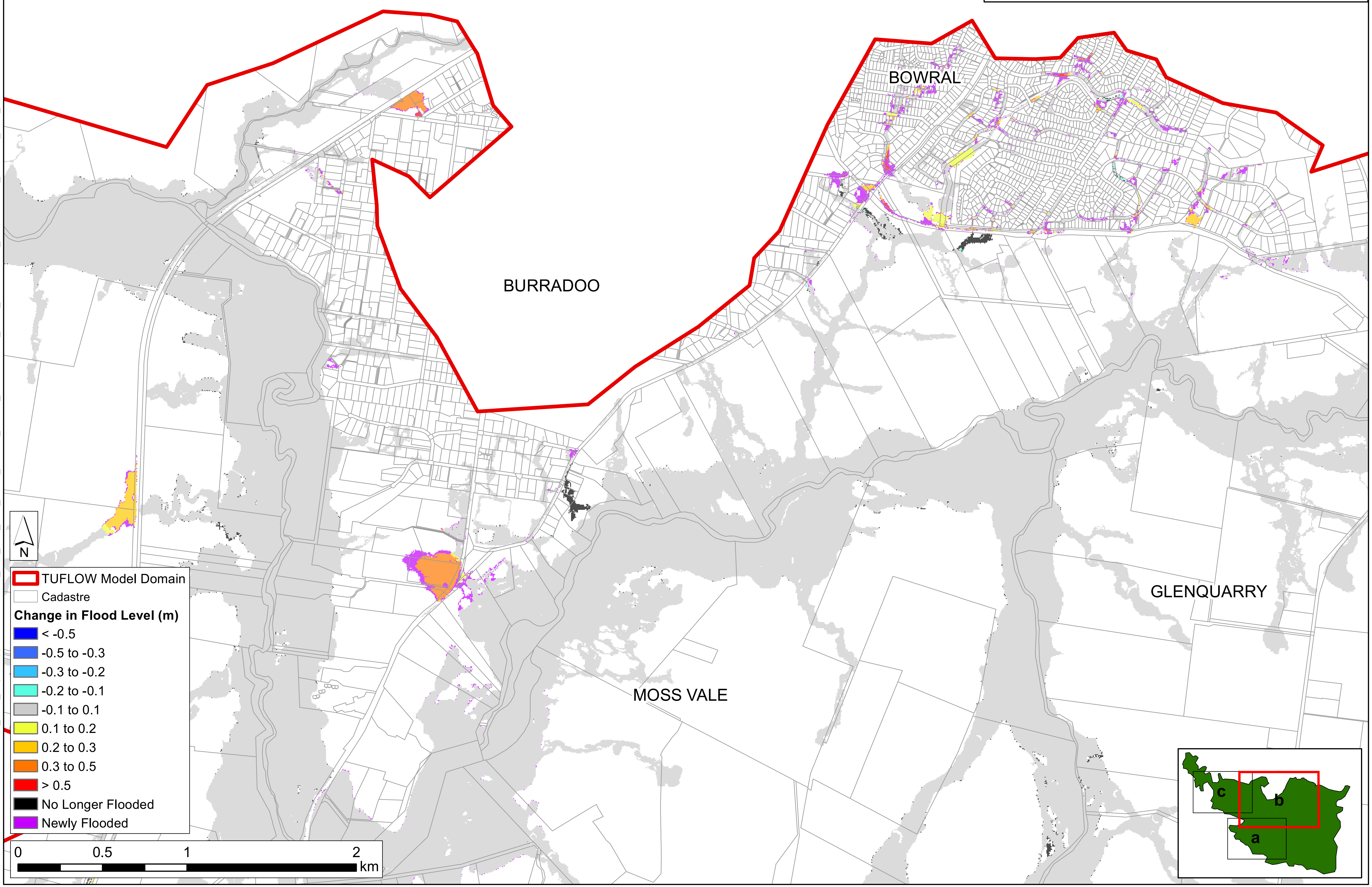
FIGURE H6a

WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HIGH HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE

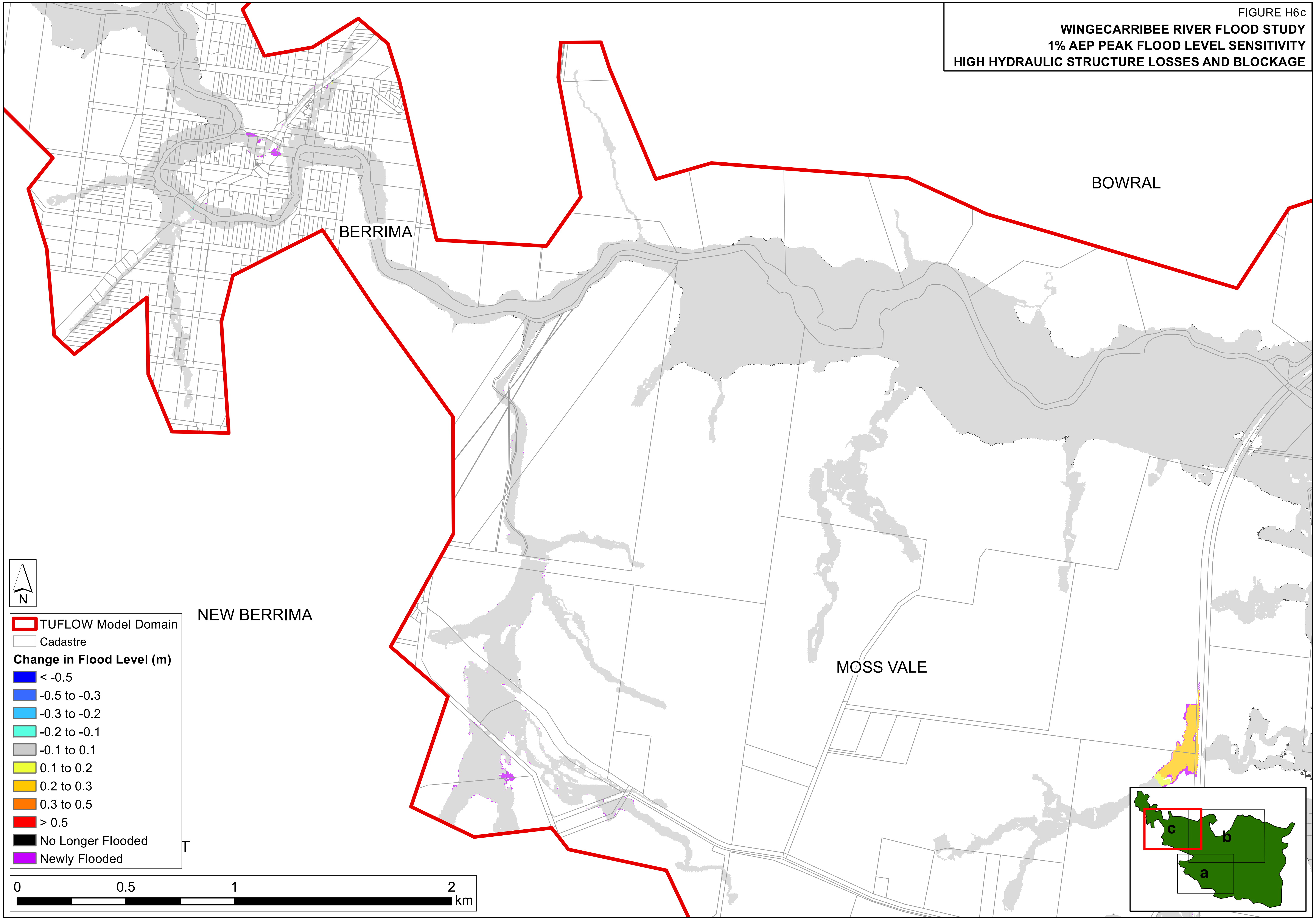


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H06_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HIGH_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

FIGURE H6b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HIGH HYDRAULIC STRUCTURE LOSSES AND BLOCKAGE

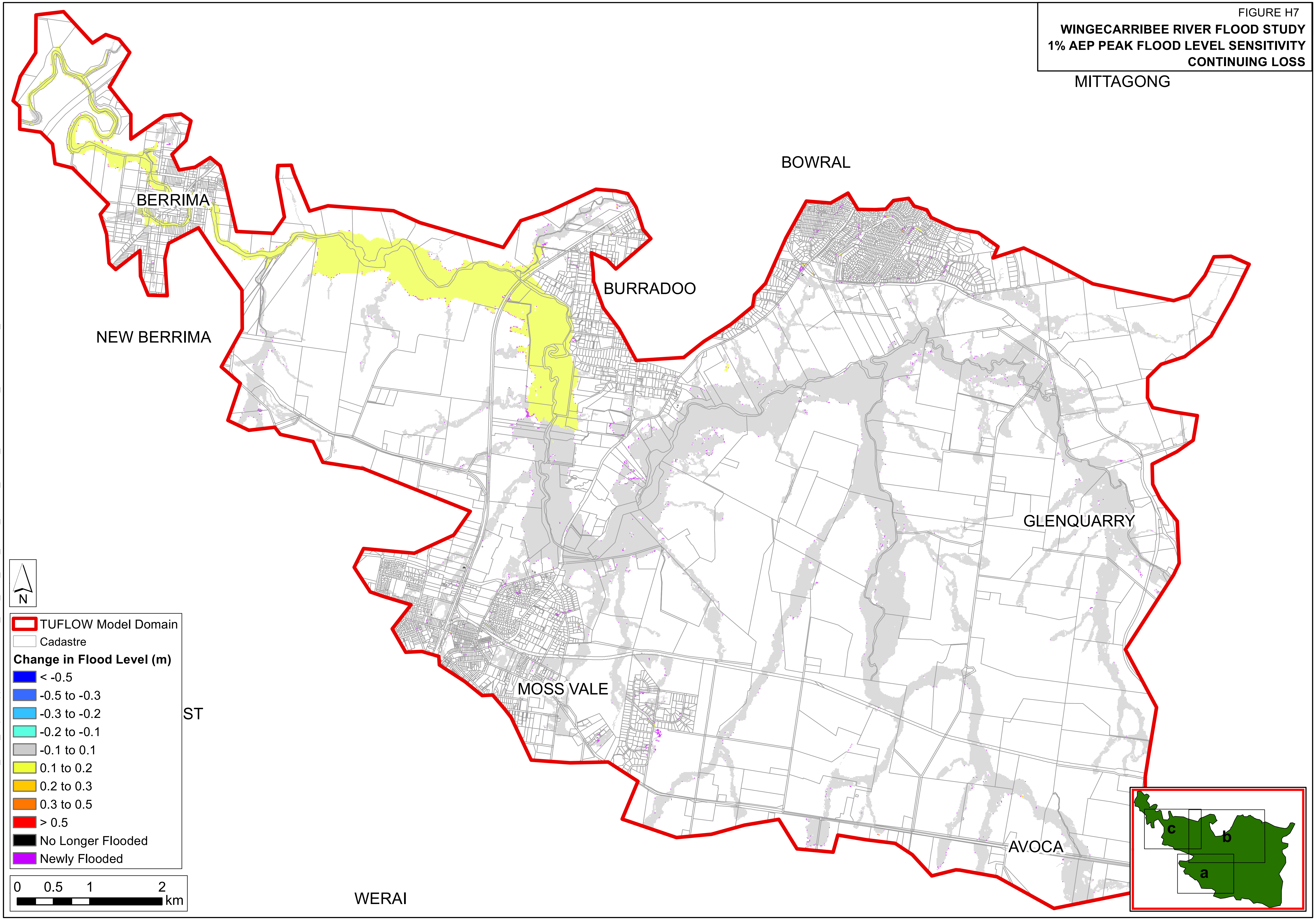


J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H06_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HIGH_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H06_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HIGH_HYDRAULIC_STRUCTURE_LOSSES_AND_BLOCKAGE.mxd

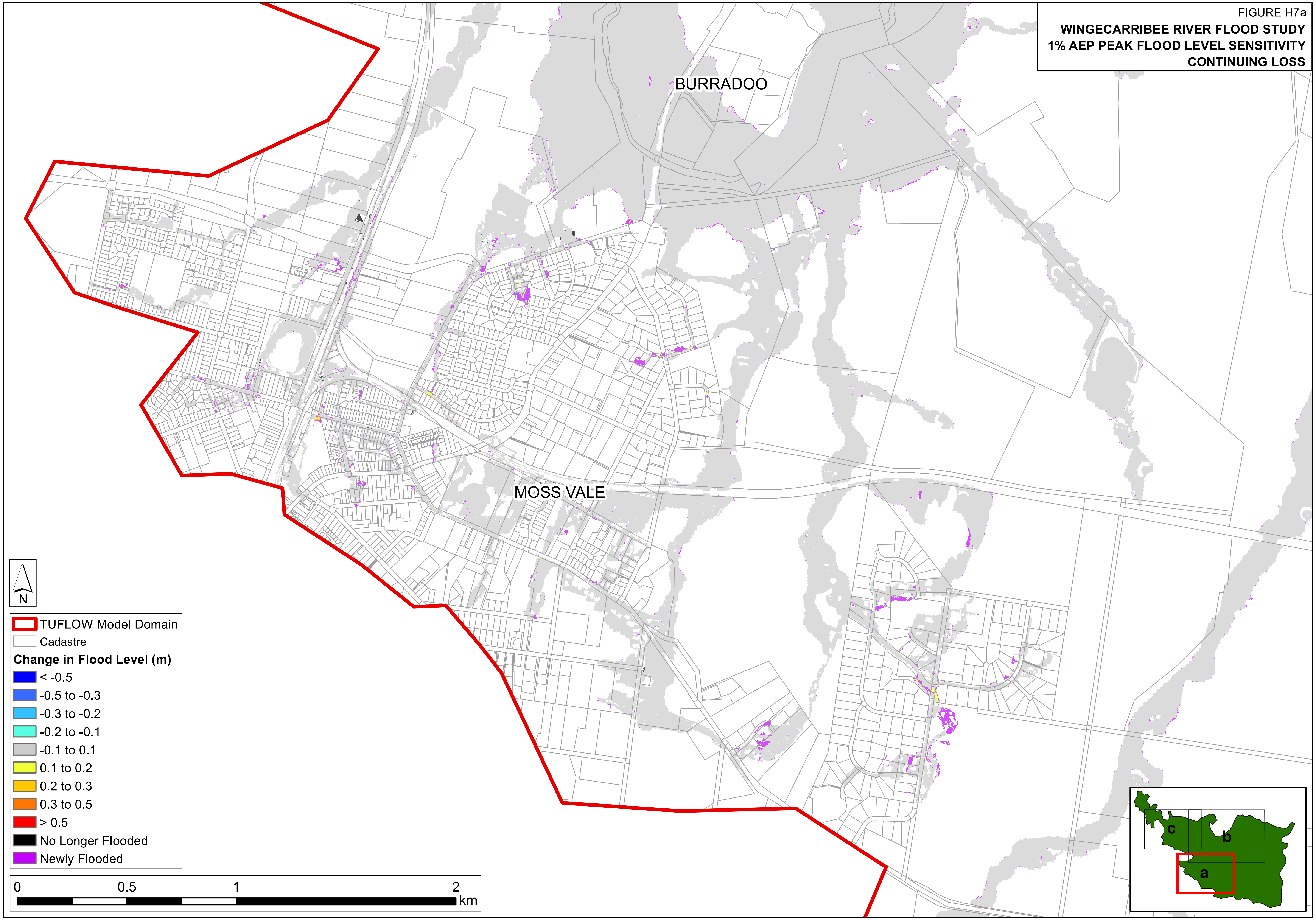
FIGURE H7
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
CONTINUING LOSS



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H07_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_CONTINUING_LOSS.mxd

FIGURE H7a

WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
CONTINUING LOSS



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H07_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_CONTINUING_LOSS.mxd

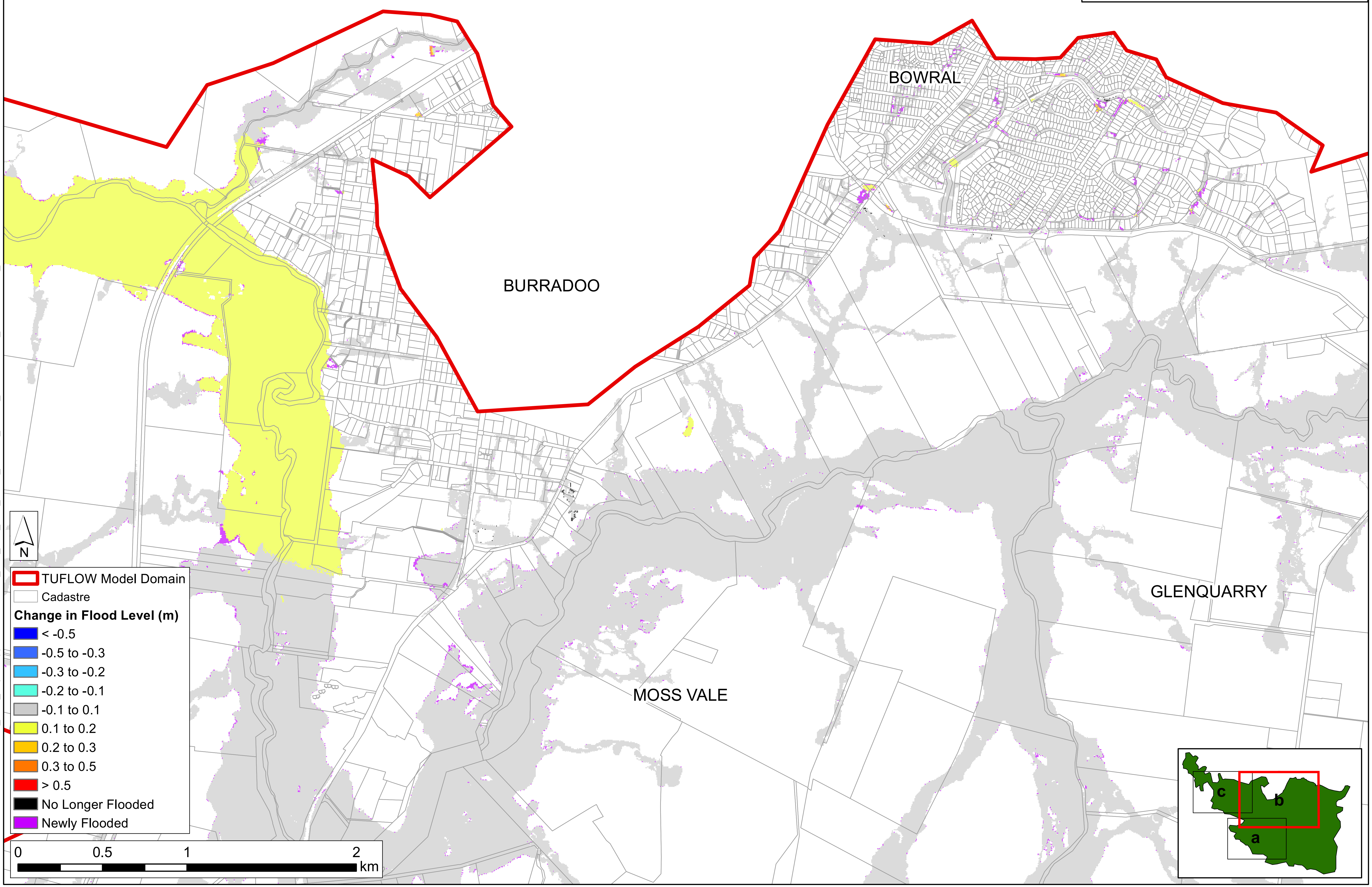
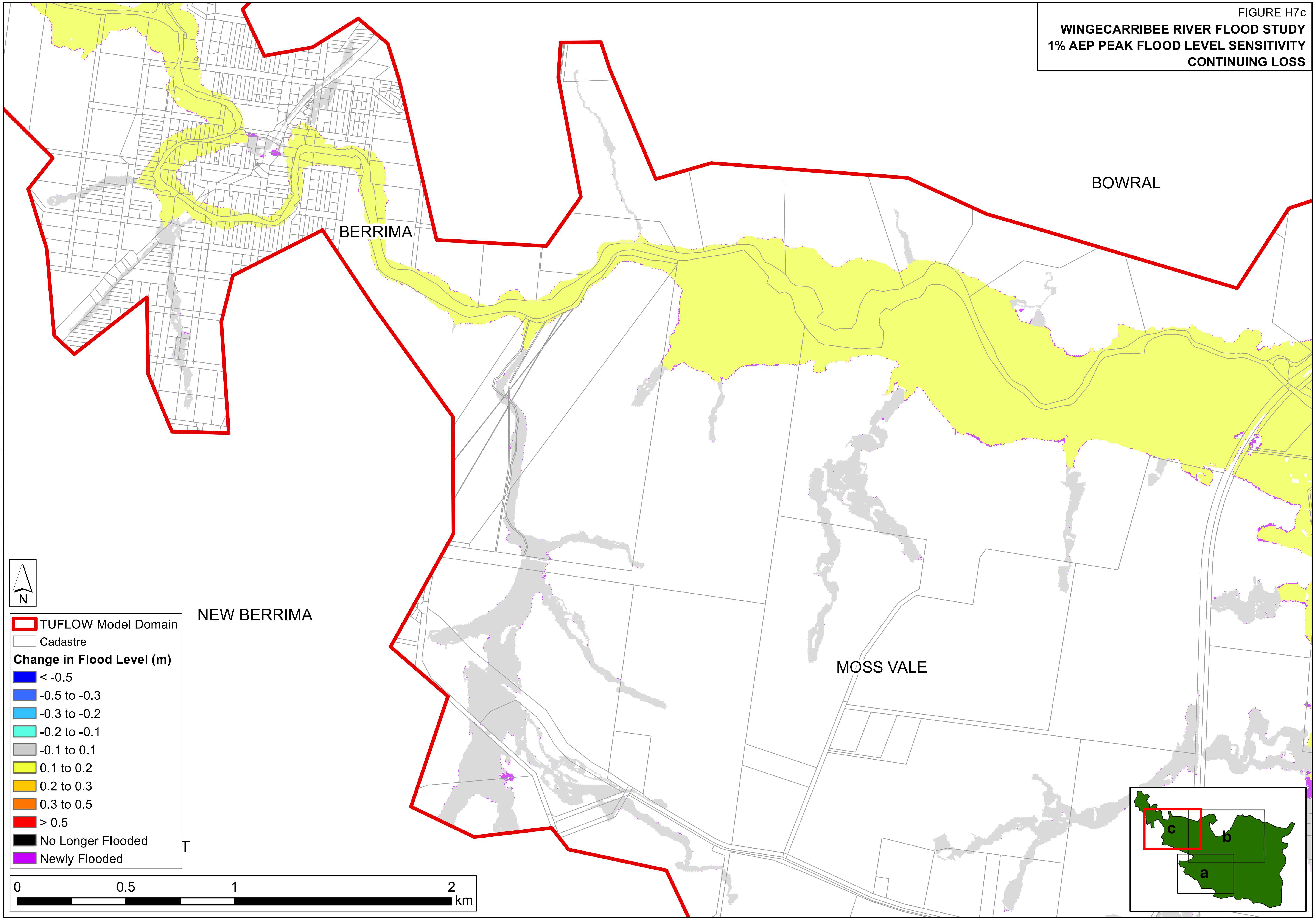


FIGURE H7b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
CONTINUING LOSS

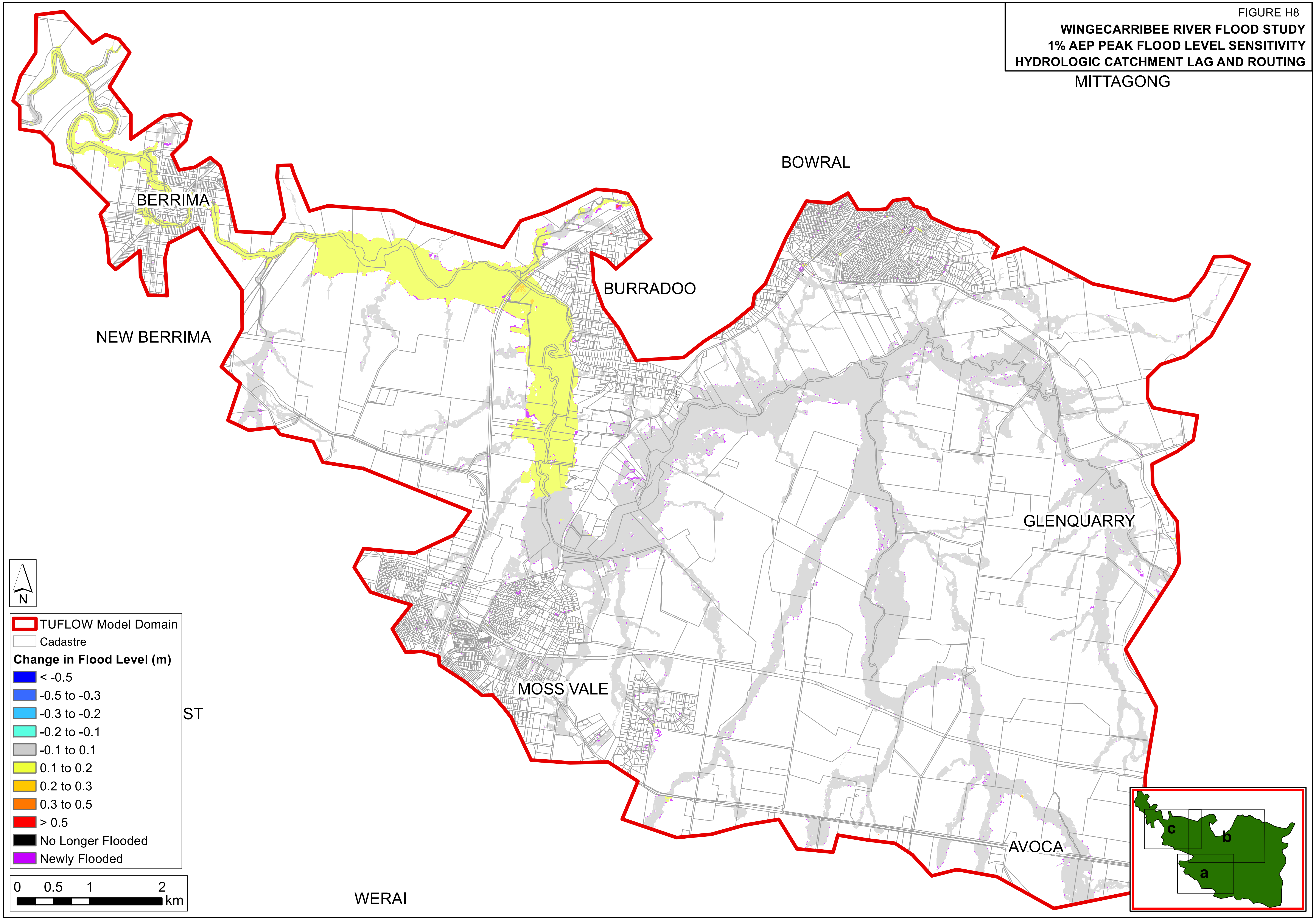
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H07_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_CONTINUING_LOSS.mxd

FIGURE H7c
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
CONTINUING LOSS



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H07_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_CONTINUING_LOSS.mxd

FIGURE H8
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HYDROLOGIC CATCHMENT LAG AND ROUTING



J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H08_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HYDROLOGIC_CATCHMENT_LAG_AND_ROUTING.mxd

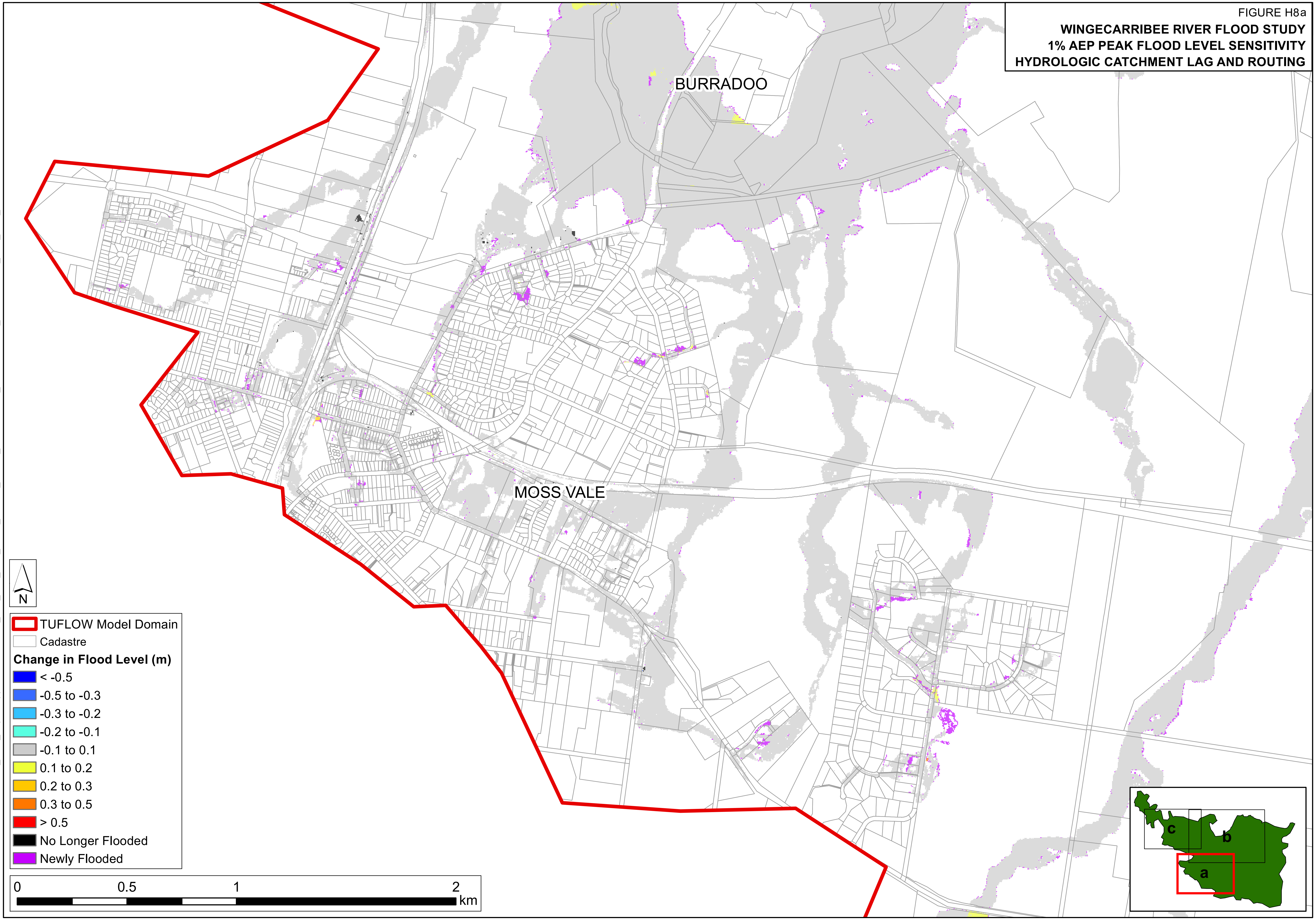


FIGURE H8a
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HYDROLOGIC CATCHMENT LAG AND ROUTING
BURRADOO
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
a
b
c
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H08_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HYDROLOGIC_CATCHMENT_LAG_AND_ROUTING.mxd

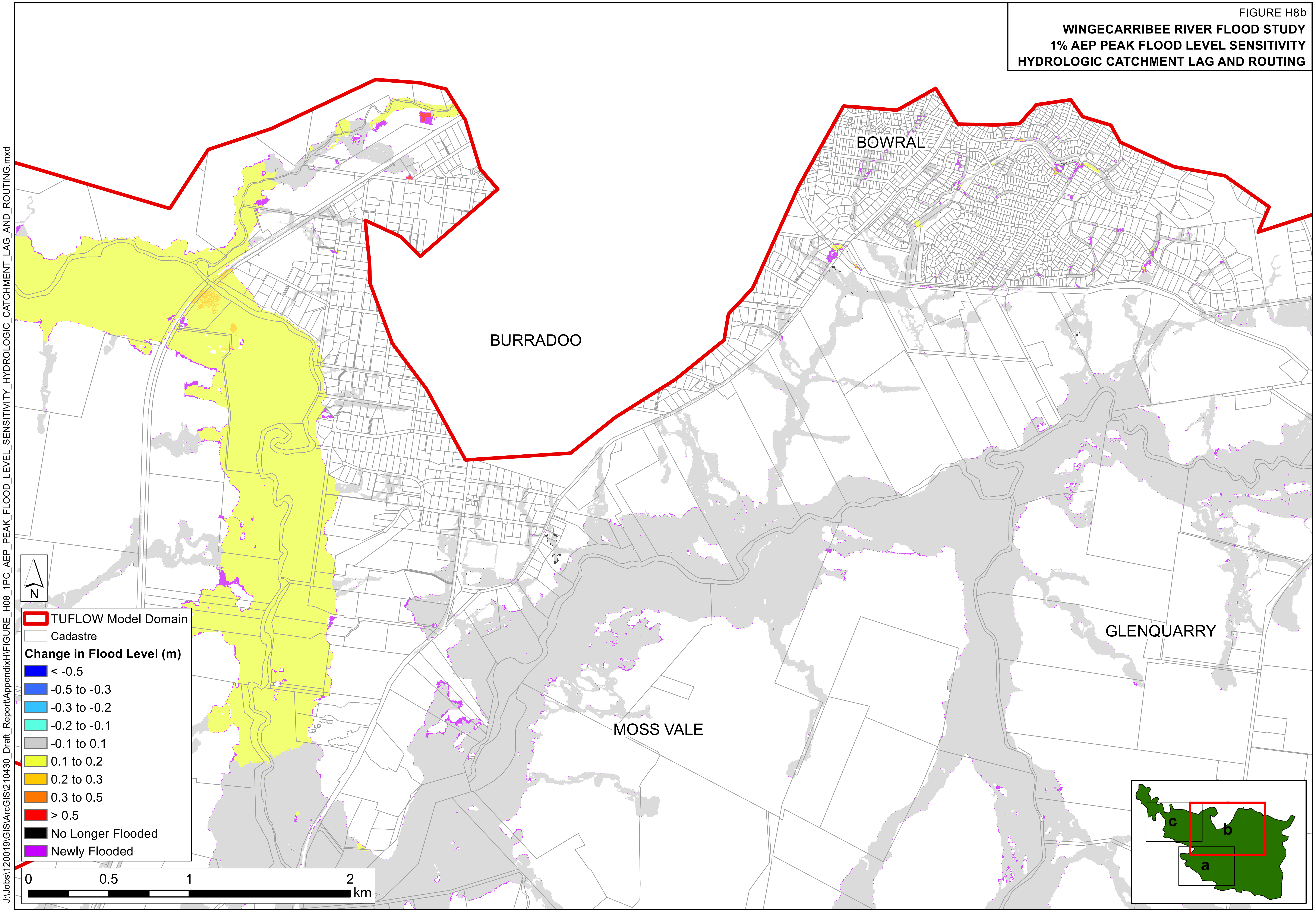


FIGURE H8b
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HYDROLOGIC CATCHMENT LAG AND ROUTING
BOWRAL
BURRADOO
GLENQUARRY
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\AppendixH\FIGURE_H08_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HYDROLOGIC_CATCHMENT_LAG_AND_ROUTING.mxd

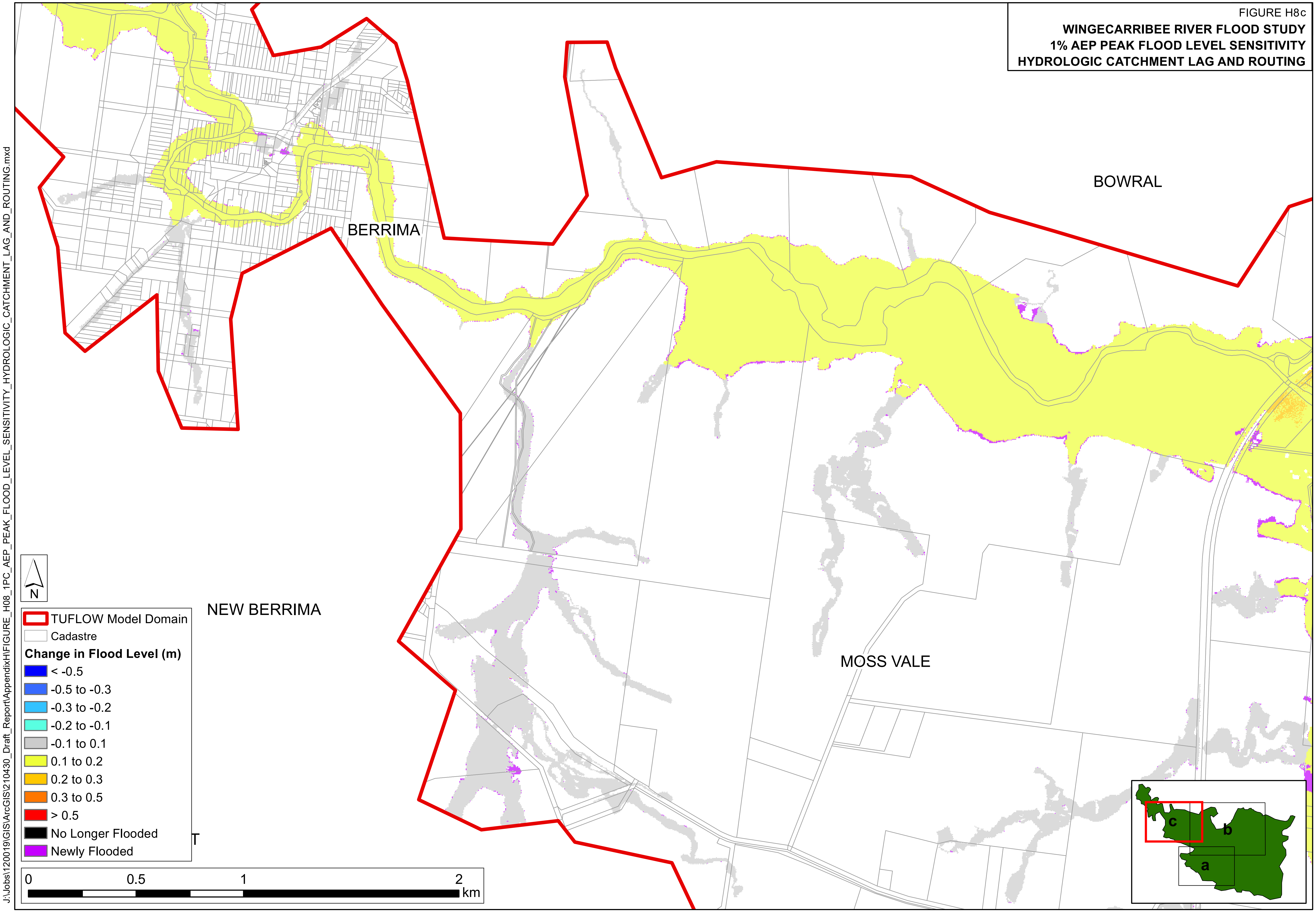


FIGURE H8c
WINGECARRIBEE RIVER FLOOD STUDY
1% AEP PEAK FLOOD LEVEL SENSITIVITY
HYDROLOGIC CATCHMENT LAG AND ROUTING
BOWRAL
BERRIMA
NEW BERRIMA
MOSS VALE
N
TUFLOW Model Domain
Cadastre
Change in Flood Level (m)
< -0.5
-0.5 to -0.3
-0.3 to -0.2
-0.2 to -0.1
-0.1 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.5
> 0.5
No Longer Flooded
Newly Flooded
0
0.5
1
2
km
c
b
a
J:\Jobs\120019\GIS\ArcGIS\210430_Draft_Report\Appendix H\FIGURE_H08_1PC_AEP_PEAK_FLOOD_LEVEL_SENSITIVITY_HYDROLOGIC_CATCHMENT_LAG_AND_ROUTING.mxd

APPENDIX I. PUBLIC EXHIBITION SUBMISSIONS

Appendix I

Table I1:Summary of submissions:

No.	Submitter	Summary of Submission	Summary of Outcome
1	Guthrie	Provided photographs of Wingecarribee River floodplain inundation and local overland flow near Eridge Park Road from May 2021	The photos do not provide any additional information for the purposes of model calibration or validation, and no revision to the draft report is warranted. The pictures appear to show these overland flow channels functioning as expected, with water contained within the drainage channels and not intruding into the gardens of the residents. In some cases the pictured channels appear to have been built in conjunction with the development of properties owned by the signatories to the submission, to formalise the local drainage paths around these properties.
2	Marvello / Athanasopoulos	a) Requests a "summary for property owners in the impacted area." b) Suggests that a 1 in 100 year flood has been observed 3 times in the 2 years preceding the submission (water in the Wingecarribee River 300 m away from the property). c) Refers to potential development of an adjacent rural landholding and requests an investigation of the impacts of potential development. d) Refers to potential impacts of releases from Wingecarribee Reservoir.	a) The study covers thousands of individual properties and providing interpretation of the outcomes for each property is beyond the study scope. b) The events referred to were not 1 in 100 AEP events. The Wingecarribee River and surrounding streams will frequently carry water when it rains, not just during rarer flood events of 1 in 100 AEP magnitude. It is to be expected that surface water will be visible in drainage channels when it rains in these locations, even during relatively frequent low-intensity rainfall events. c) Such an investigation is outside the scope of this study. This type of assessment is normally required to be undertaken by the proponent of any development during the Planning Proposal stage (for rezoning) and during the development design stage (as part of the relevant development applications). Council's LEP and DCP contain flood-related development controls that would apply to this area, as for any other area, including requirements for the development to ensure there are no adverse flood impacts on neighbouring land. d) Information about the historical frequency and impact of reservoir releases and the assumed effect of such releases on the design flood estimates are already provided in the report.
3	Morgon / Athanasopoulos / Conroy / Zammit	a) Expresses concern about future development, particularly on an adjacent rural landholding, and the potential impact on drainage. b) Requests notification of any attempt to develop this land. c) Provides photographs of overland flow within nearby local drainage channels from March 2021 d) Contains assertions about the use of Wingecarribee Reservoir for flood control e) Requests a study of dam wall failure and impacts	a) Such an investigation is outside the scope of this study. This type of assessment is normally required to be undertaken by the proponent of any development during the Planning Proposal stage (for rezoning) and during the development design stage (as part of the relevant development applications). Council's LEP and DCP contain flood-related development controls that would apply to this area, as for any other area, including requirements for the development to ensure there are no adverse flood impacts on neighbouring land. b) Notifications relating planning and development proposals/approvals are addressed by relevant planning legislation and are not part of this study. c) The pictures appear to show these overland flow channels functioning as expected, with water contained within the drainage channels and not intruding into the gardens of the residents. In some cases the pictured channels appear to have been built in conjunction with the development of properties owned by the signatories to the submission, to formalise the local drainage paths around these properties. d) Wingecarribee Reservoir is a water supply dam and does not have a flood control or flood mitigation function. Safety aspects relating to the integrity of the dam wall are covered by the NSW Dams Safety Act and are the responsibility of the dam owner, and are beyond the scope of this study. Assumptions relating to releases of water via the dam spillway as part of normal operations are already documented in this report. e) This type of study is part of the requirements under the NSW Dams Safety Act, and is the responsibility of the dam owner, not Council.
4	Stack	Provided photographs of Wingecarribee River floodplain inundation and local overland flow near Eridge Park Road from December 2020	The photos do not provide any additional information for the purposes of model calibration or validation, and no revision to the draft report is warranted.
5	Taylor	The submission provides comments on previous Bewsher 1998 and SMEC 2014 studies, and expresses an opinion that the updated WMAwater study does not adequately consider the effect of vegetation on historical flood levels, as well as an opinion that the estimated flood levels are too high.	There is insufficient evidence or data provided to support the opinions stated in the submission, and therefore there is no need to review the model calibration.