

ORDINARY COUNCIL

Wednesday 15 May 2019

Ordinary Council Meeting

Wednesday, 15 May 2019

Items of Business

Item	Subject	Page
09.03	DRAFT CODE OF CONDUCT AND DRAFT PROCEDURES FOR THE ADMINISTRATION OF THE MODEL CODE OF CONDUCT	
	Attachment 1: DRAFT Code of Conduct	5
	Attachment 2: Draft Procedures for the Administration of the Model Code of Conduct	39
09.06	A PROPOSAL TO AMEND THE BOUNDARY OF THE LOCALITIES OF HACKS FERRY AND LIMEBURNERS CREEK	
	Attachment : Plan Depicting Extent of Hacks Ferry to be Incorporated Within Limeburners Creek	75
09.07	MONTHLY BUDGET REVIEW - APRIL 2019	
	Attachment : April 2019 Budget Review	76
09.08	QUARTERLY BUDGET REVIEW STATEMENT - MARCH 2019	
	Attachment : Quarterly Budget Review Statement - March 2019	81
09.09	2018-2019 OPERATIONAL PLAN - QUARTERLY PROGRESS REPORT AS AT 31 MARCH 2019	
	Attachment : 2018-2019 Operational Plan Quarterly Progress Report as at 31 March 2019	89
09.12	INVESTMENTS - APRIL 2019	
	Attachment 1: Port Macquarie-Hastings Council Monthly Report - April 2019	177
	Attachment 2: Port Macquarie-Hastings Council Portfolio as at 30 April 2019	193
09.13	2019-2020 COUNCILLOR AND MAYORAL FEES	
	Attachment : 2019 Annual Determination LGRT	197
10.02	GRANT APPLICATIONS QUARTERLY REPORT	
	Attachment : 2018/19 Grants Funding Register	219
10.03	RECOMMENDED ITEMS FROM THE MAYOR'S SPORTING FUND SUB-COMMITTEE - APRIL 2019	
	Attachment : Extract Item 11 - MSF Meeting - April 2019	221
11.01	ECONOMIC DEVELOPMENT STRATEGY 2017-2021: SIX MONTHLY REPORT ON PROGRESS	
	Attachment : Implementation Update - 2017-2021 Economic Development Strategy ~ May 2019	223
11.02	RECOMMENDED ITEM FROM ECONOMIC DEVELOPMENT STEERING GROUP - SMART REGIONAL CITY PLANNING	
	Attachment : Item 6 - Economic Development Steering Group Minutes 10 April 2019	233
12.02	QUESTION FROM PREVIOUS MEETING - NEW PEDESTRIAN CROSSING - BOLD STREET, LAURIETON	
	Attachment 1: Laurieton PAMP - May 2015	

Attachment 2:	Bold Street Streetscape Masterplan - May 2017	236
Attachment 3:	Pedestrian Crossing Preliminary Design - July 2018	239
Attachment 4:	Local Traffic Committee Report - Bold Street Pedestrian Crossing - October 2018	262
Attachment 5:	Ordinary Council Meeting Report - Bold Street Pedestrian Crossing - December 2018	266
12.04	RECOMMENDED ITEM FROM COAST, ESTUARY & FLOODPLAIN ADVISORY SUB COMMITTEE - HIBBARD PRECINCT FLOOD STUDY - DRAFT REPORT	
Attachment :	Hibbard Precinct Flood Study Draft Report 2019.....	268
12.05	RECOMMENDED ITEM FROM COAST, ESTUARY & FLOODPLAIN ADVISORY SUB COMMITTEE - NORTH BROTHER FLOOD STUDY DRAFT REPORT	
Attachment 1:	North Brother Flood Study Draft Report	400
Attachment 2:	North Brother Calibration Report.....	631

1 Leadership and Governance

15/05/2019

What we are trying to achieve

A community that works together in decision making that is defined as ethically, socially and environmentally responsible.

What the result will be

We will have:

- A community that has the opportunity to be involved in decision making
- Open, easy, meaningful, regular and diverse communication between the community and decision makers
- Partnerships and collaborative projects, that meet the community's expectations, needs and challenges
- Knowledgeable, skilled and connected community leaders
- Strong corporate management that is transparent

How we will get there

- 1.1 Inform and engage with the community about what Council does using varied communication channels
- 1.2 Maintain strong partnerships between all stakeholders - local, state and federal — so that they are effective advocates for the community
- 1.3 Demonstrate leadership
- 1.4 Use innovative, efficient and sustainable practices
- 1.5 Ensure strong corporate and financial management that is transparent and accountable

Code of Conduct

2019

TABLE OF CONTENTS

PART 1	INTRODUCTION.....	3
PART 2	DEFINITIONS.....	5
PART 3	GENERAL CONDUCT OBLIGATIONS	7
PART 4	PECUNIARY INTERESTS.....	11
PART 5	NON-PECUNIARY CONFLICTS OF INTEREST.....	18
PART 6	PERSONAL BENEFIT	23
PART 7	RELATIONSHIPS BETWEEN COUNCIL OFFICIALS.....	26
PART 8	ACCESS TO INFORMATION AND COUNCIL RESOURCES.....	29
PART 9	MAINTAINING THE INTEGRITY OF THIS CODE	33

PART 1 INTRODUCTION

Port Macquarie-Hastings Council prides itself on the application of high standards of behaviour in regard to integrity, responsibility and fair dealing. Our ratepayers need to have confidence that as Council officials, we will continue to strive to maintain the highest standards in our dealings with the community we serve.

This Code of Conduct is made for the purposes of section 440 of the *Local Government Act 1993* ("the Act"). Section 440 of the Act requires every council to adopt a code of conduct that incorporates the provisions of the Model Code of Conduct for local councils in NSW. This Code applies to all Council officials.

Based on this Code, a "Statement of Business Ethics" has been developed for Council contractors and consultants. Reference should be made to Council Policy "Statement of Business Ethics".

Port Macquarie-Hastings Council's Code of Conduct outlines our standards and provides you with guidelines to ensure your decisions reflect our Council's vision, mission and values, which are:

COMMUNITY VISION

A sustainable high quality of life for all

COMMUNITY MISSION

Building the future together - People, Place, Health, Education, Technology

VALUES

Communication - we keep each other informed

Accountability - we hold ourselves and others accountable

Professionalism - we deliver the best value

Integrity - we are open, honest and fair

Teamwork - we achieve together

The Code of Conduct sets the minimum standards of conduct for council officials. It is prescribed by regulation to assist council officials to:

- understand and comply with the standards of conduct that are expected of them
- enable them to fulfil their statutory duty to act honestly and exercise a reasonable degree of care and diligence (section 439)
- act in a way that enhances public confidence in local government.

As a Council official, it is your responsibility to comply with the standards in our Code.

Councillors, administrators, members of staff of councils, delegates of councils, (including members of council committees that are delegates of a council) and any other person a council's adopted code of conduct applies to, must comply with the applicable provisions of their council's code of conduct. It is the personal responsibility of council officials to comply with the standards in the

code and to regularly review their personal circumstances and conduct with this in mind.

Council contractors and volunteers will also be required to observe the relevant provisions of Council's Code of Conduct.

Failure by a councillor to comply with the standards of conduct prescribed under this code constitutes misconduct for the purposes of the LGA. The LGA provides for a range of penalties that may be imposed on councillors for misconduct, including suspension or disqualification from civic office. A councillor who has been suspended on three or more occasions for misconduct is automatically disqualified from holding civic office for five years.

Failure by a member of staff to comply with a council's code of conduct may give rise to disciplinary action.

PART 2 DEFINITIONS

In this code the following terms have the following meanings:

LGA	the <i>Local Government Act 1993</i>
administrator	an administrator of a council appointed under the LGA other than an administrator appointed under section 66
committee	see the definition of “council committee”
complaint	a code of conduct complaint made for the purposes of clauses 4.1 and 4.2 of the Procedures.
council	includes county councils and joint organisations
council committee	a committee established by a council comprising of councillors, staff or other persons that the council has delegated functions to
council committee member	a person other than a councillor or member of staff of a council who is a member of a council committee other than a wholly advisory committee
council official	includes councillors, members of staff of a council, administrators, council committee members, delegates of council and, for the purposes of clause 4.16, council advisers
councillor	any person elected or appointed to civic office, including the mayor and includes members and chairpersons of county councils and voting representatives of the boards of joint organisations and chairpersons of joint organisations
conduct	includes acts and omissions
delegate of council	a person (other than a councillor or member of staff of a council) or body, and the individual members of that body, to whom a function of the council is delegated
designated person	a person referred to in clause 4.8
election campaign	includes council, state and federal election campaigns
environmental planning	

instrument	has the same meaning as it has in the <i>Environmental Planning and Assessment Act 1979</i>
general manager	includes the executive officer of a joint organisation
joint organisation	a joint organisation established under section 400O of the LGA
local planning panel	a local planning panel constituted under the <i>Environmental Planning and Assessment Act 1979</i>
mayor	includes the chairperson of a county council or a joint organisation
members of staff of a council	includes members of staff of county councils and joint organisations
the Office	Office of Local Government
personal information	information or an opinion (including information or an opinion forming part of a database and whether or not recorded in a material form) about an individual whose identity is apparent or can reasonably be ascertained from the information or opinion
the Procedures	the Procedures for the Administration of the Model Code of Conduct for Local Councils in NSW prescribed under the Regulation
the Regulation	the Local Government (General) Regulation 2005
voting representative	a voting representative of the board of a joint organisation
wholly advisory committee	a council committee that the council has not delegated any functions to

PART 3 GENERAL CONDUCT OBLIGATIONSGeneral conduct

- 3.1 You must not conduct yourself in a manner that:
- a) is likely to bring the council or other council officials into disrepute
 - b) is contrary to statutory requirements or the council's administrative requirements or policies
 - c) is improper or unethical
 - d) is an abuse of power
 - e) causes, comprises or involves intimidation or verbal abuse
 - f) involves the misuse of your position to obtain a private benefit
 - g) constitutes harassment or bullying behaviour under this code, or is unlawfully discriminatory.
- 3.2 You must act lawfully and honestly, and exercise a reasonable degree of care and diligence in carrying out your functions under the LGA or any other Act. (*section 439*).

Fairness and equity

- 3.3 You must consider issues consistently, promptly and fairly. You must deal with matters in accordance with established procedures, in a non-discriminatory manner.
- 3.4 You must take all relevant facts known to you, or that you should be reasonably aware of, into consideration and have regard to the particular merits of each case. You must not take irrelevant matters or circumstances into consideration when making decisions.
- 3.5 An act or omission in good faith, whether or not it involves error, will not constitute a breach of clauses 3.3 or 3.4.

Harassment and discrimination

- 3.6 You must not harass or unlawfully discriminate against others, or support others who harass or unlawfully discriminate against others, on the grounds of sex, pregnancy, breastfeeding, race, age, marital or domestic status, homosexuality, disability, transgender status, infectious disease, carer's responsibilities or political, religious or other affiliation.
- 3.7 For the purposes of this code, "harassment" is any form of behaviour towards a person that:
- a) is not wanted by the person
 - b) offends, humiliates or intimidates the person, and
 - c) creates a hostile environment.

Bullying

3.8 You must not engage in bullying behaviour towards others.

3.9 For the purposes of this code, "bullying behaviour" is any behaviour in which:

- a) a person or a group of people repeatedly behaves unreasonably towards another person or a group of persons and
- b) the behaviour creates a risk to health and safety.

3.10 Bullying behaviour may involve, but is not limited to, any of the following types of behaviour:

- a) aggressive, threatening or intimidating conduct
- b) belittling or humiliating comments
- c) spreading malicious rumours
- d) teasing, practical jokes or 'initiation ceremonies'
- e) exclusion from work-related events
- f) unreasonable work expectations, including too much or too little work, or work below or beyond a worker's skill level
- g) displaying offensive material
- h) pressure to behave in an inappropriate manner.

3.11 Reasonable management action carried out in a reasonable manner does not constitute bullying behaviour for the purposes of this code. Examples of reasonable management action may include, but are not limited to:

- a) performance management processes
- b) disciplinary action for misconduct
- c) informing a worker about unsatisfactory work performance or inappropriate work behaviour
- d) directing a worker to perform duties in keeping with their job
- e) maintaining reasonable workplace goals and standards
- f) legitimately exercising a regulatory function
- g) legitimately implementing a council policy or administrative processes.

Work health and safety

3.12 All council officials, including councillors, owe statutory duties under the *Work Health and Safety Act 2011* (WH&S Act). You must comply with your duties under the WH&S Act and your responsibilities under any policies or procedures adopted by the council to ensure workplace health and safety. Specifically, you must:

- a) take reasonable care for your own health and safety
- b) take reasonable care that your acts or omissions do not adversely affect the health and safety of other persons
- c) comply, so far as you are reasonably able, with any reasonable instruction that is given to ensure compliance with the WH&S Act and any policies or procedures adopted by the council to ensure workplace health and safety
- d) cooperate with any reasonable policy or procedure of the council relating to workplace health or safety that has been notified to council staff

- e) report accidents, incidents, near misses, to the general manager or such other staff member nominated by the general manager, and take part in any incident investigations
- f) so far as is reasonably practicable, consult, co-operate and coordinate with all others who have a duty under the WH&S Act in relation to the same matter.

Land use planning, development assessment and other regulatory functions

3.13 You must ensure that land use planning, development assessment and other regulatory decisions are properly made, and that all parties are dealt with fairly. You must avoid any occasion for suspicion of improper conduct in the exercise of land use planning, development assessment and other regulatory functions.

3.14 In exercising land use planning, development assessment and other regulatory functions, you must ensure that no action, statement or communication between yourself and others conveys any suggestion of willingness to improperly provide concessions or preferential or unduly unfavourable treatment.

Binding caucus votes

3.15 You must not participate in binding caucus votes in relation to matters to be considered at a council or committee meeting.

3.16 For the purposes of clause 3.15, a binding caucus vote is a process whereby a group of councillors are compelled by a threat of disciplinary or other adverse action to comply with a predetermined position on a matter before the council or committee, irrespective of the personal views of individual members of the group on the merits of the matter before the council or committee.

3.17 Clause 3.15 does not prohibit councillors from discussing a matter before the council or committee prior to considering the matter in question at a council or committee meeting, or from voluntarily holding a shared view with other councillors on the merits of a matter.

3.18 Clause 3.15 does not apply to a decision to elect the mayor or deputy mayor, or to nominate a person to be a member of a council committee or a representative of the council on an external body.

Obligations in relation to meetings

3.19 You must comply with rulings by the chair at council and committee meetings or other proceedings of the council unless a motion dissenting from the ruling is passed.

3.20 You must not engage in bullying behaviour (as defined under this Part) towards the chair, other council officials or any members of the public

present during council or committee meetings or other proceedings of the council (such as, but not limited to, workshops and briefing sessions).

- 3.21 You must not engage in conduct that disrupts council or committee meetings or other proceedings of the council (such as, but not limited to, workshops and briefing sessions), or that would otherwise be inconsistent with the orderly conduct of meetings.
- 3.22 If you are a councillor, you must not engage in any acts of disorder or other conduct that is intended to prevent the proper or effective functioning of the council, or of a committee of the council. Without limiting this clause, you must not:
- a) leave a meeting of the council or a committee for the purposes of depriving the meeting of a quorum, or
 - b) submit a rescission motion with respect to a decision for the purposes of voting against it to prevent another councillor from submitting a rescission motion with respect to the same decision, or
 - c) deliberately seek to impede the consideration of business at a meeting.

PART 4 PECUNIARY INTERESTSWhat is a pecuniary interest?

- 4.1 A pecuniary interest is an interest that you have in a matter because of a reasonable likelihood or expectation of appreciable financial gain or loss to you or a person referred to in clause 4.3.
- 4.2 You will not have a pecuniary interest in a matter if the interest is so remote or insignificant that it could not reasonably be regarded as likely to influence any decision you might make in relation to the matter, or if the interest is of a kind specified in clause 4.6.
- 4.3 For the purposes of this Part, you will have a pecuniary interest in a matter if the pecuniary interest is:
- (a) your interest, or
 - (b) the interest of your spouse or de facto partner, your relative, or your partner or employer, or
 - (c) a company or other body of which you, or your nominee, partner or employer, is a shareholder or member.
- 4.4 For the purposes of clause 4.3:
- (a) Your "relative" is any of the following:
 - i) your parent, grandparent, brother, sister, uncle, aunt, nephew, niece, lineal descendant or adopted child
 - ii) your spouse's or de facto partner's parent, grandparent, brother, sister, uncle, aunt, nephew, niece, lineal descendant or adopted child
 - iii) the spouse or de facto partner of a person referred to in paragraphs (i) and (ii).
 - (b) "de facto partner" has the same meaning as defined in section 21C of the *Interpretation Act 1987*.
- 4.5 You will not have a pecuniary interest in relation to a person referred to in subclauses 4.3(b) or (c):
- (a) if you are unaware of the relevant pecuniary interest of your spouse, de facto partner, relative, partner, employer or company or other body, or
 - (b) just because the person is a member of, or is employed by, a council or a statutory body, or is employed by the Crown, or
 - (c) just because the person is a member of, or a delegate of a council to, a company or other body that has a pecuniary interest in the matter, so long as the person has no beneficial interest in any shares of the company or body.

What interests do not have to be disclosed?

- 4.6 You do not have to disclose the following interests for the purposes of this Part:
- (a) your interest as an elector
 - (b) your interest as a ratepayer or person liable to pay a charge

- (c) an interest you have in any matter relating to the terms on which the provision of a service or the supply of goods or commodities is offered to the public generally, or to a section of the public that includes persons who are not subject to this code
- (d) an interest you have in any matter relating to the terms on which the provision of a service or the supply of goods or commodities is offered to your relative by the council in the same manner and subject to the same conditions as apply to persons who are not subject to this code
- (e) an interest you have as a member of a club or other organisation or association, unless the interest is as the holder of an office in the club or organisation (whether remunerated or not)
- (f) if you are a council committee member, an interest you have as a person chosen to represent the community, or as a member of a non-profit organisation or other community or special interest group, if you have been appointed to represent the organisation or group on the council committee
- (g) an interest you have relating to a contract, proposed contract or other matter, if the interest arises only because of a beneficial interest in shares in a company that does not exceed 10 per cent of the voting rights in the company
- (h) an interest you have arising from the proposed making by the council of an agreement between the council and a corporation, association or partnership, being a corporation, association or partnership that has more than 25 members, if the interest arises because your relative is a shareholder (but not a director) of the corporation, or is a member (but not a member of the committee) of the association, or is a partner of the partnership
- (i) an interest you have arising from the making by the council of a contract or agreement with your relative for, or in relation to, any of the following, but only if the proposed contract or agreement is similar in terms and conditions to such contracts and agreements as have been made, or as are proposed to be made, by the council in respect of similar matters with other residents of the area:
 - i) the performance by the council at the expense of your relative of any work or service in connection with roads or sanitation
 - ii) security for damage to footpaths or roads
 - iii) any other service to be rendered, or act to be done, by the council by or under any Act conferring functions on the council, or by or under any contract
- (j) an interest relating to the payment of fees to councillors (including the mayor and deputy mayor)
- (k) an interest relating to the payment of expenses and the provision of facilities to councillors (including the mayor and

deputy mayor) in accordance with a policy under section 252 of the LGA,

- (l) an interest relating to an election to the office of mayor arising from the fact that a fee for the following 12 months has been determined for the office of mayor
- (m) an interest of a person arising from the passing for payment of a regular account for the wages or salary of an employee who is a relative of the person
- (n) an interest arising from being covered by, or a proposal to be covered by, indemnity insurance as a councillor or a council committee member
- (o) an interest arising from the appointment of a councillor to a body as a representative or delegate of the council, whether or not a fee or other recompense is payable to the representative or delegate.

4.7 For the purposes of clause 4.6, "relative" has the same meaning as in clause 4.4, but includes your spouse or de facto partner.

What disclosures must be made by a designated person?

4.8 Designated persons include:

- (a) the general manager
- (b) other senior staff of the council for the purposes of section 332 of the LGA
- (c) a person (other than a member of the senior staff of the council) who is a member of staff of the council or a delegate of the council and who holds a position identified by the council as the position of a designated person because it involves the exercise of functions (such as regulatory functions or contractual functions) that, in their exercise, could give rise to a conflict between the person's duty as a member of staff or delegate and the person's private interest
- (d) a person (other than a member of the senior staff of the council) who is a member of a committee of the council identified by the council as a committee whose members are designated persons because the functions of the committee involve the exercise of the council's functions (such as regulatory functions or contractual functions) that, in their exercise, could give rise to a conflict between the member's duty as a member of the committee and the member's private interest.

4.9 A designated person:

- (a) must prepare and submit written returns of interests in accordance with clauses 4.21, and
- (b) must disclose pecuniary interests in accordance with clause 4.10.

4.10 A designated person must disclose in writing to the general manager (or if the person is the general manager, to the council) the nature of any

pecuniary interest the person has in any council matter with which the person is dealing as soon as practicable after becoming aware of the interest.

- 4.11 Clause 4.10 does not require a designated person who is a member of staff of the council to disclose a pecuniary interest if the interest relates only to the person's salary as a member of staff, or to their other conditions of employment.
- 4.12 The general manager must, on receiving a disclosure from a designated person, deal with the matter to which the disclosure relates or refer it to another person to deal with.
- 4.13 A disclosure by the general manager must, as soon as practicable after the disclosure is made, be laid on the table at a meeting of the council and the council must deal with the matter to which the disclosure relates or refer it to another person to deal with.

What disclosures must be made by council staff other than designated persons?

- 4.14 A member of staff of council, other than a designated person, must disclose in writing to their manager or the general manager the nature of any pecuniary interest they have in a matter they are dealing with as soon as practicable after becoming aware of the interest.
- 4.15 The staff member's manager or the general manager must, on receiving a disclosure under clause 4.14, deal with the matter to which the disclosure relates or refer it to another person to deal with.

What disclosures must be made by council advisers?

- 4.16 A person who, at the request or with the consent of the council or a council committee, gives advice on any matter at any meeting of the council or committee, must disclose the nature of any pecuniary interest the person has in the matter to the meeting at the time the advice is given. The person is not required to disclose the person's interest as an adviser.
- 4.17 A person does not breach clause 4.16 if the person did not know, and could not reasonably be expected to have known, that the matter under consideration at the meeting was a matter in which they had a pecuniary interest.

What disclosures must be made by a council committee member?

- 4.18 A council committee member must disclose pecuniary interests in accordance with clause 4.28 and comply with clause 4.29.
- 4.19 For the purposes of clause 4.18, a "council committee member" includes a member of staff of council who is a member of the committee.

What disclosures must be made by a councillor?

4.20 A councillor:

- (a) must prepare and submit written returns of interests in accordance with clause 4.21, and
- (b) must disclose pecuniary interests in accordance with clause 4.28 and comply with clause 4.29 where it is applicable.

Disclosure of interests in written returns

4.21 A councillor or designated person must make and lodge with the general manager a return in the form set out in schedule 2 to this code, disclosing the councillor's or designated person's interests as specified in schedule 1 to this code within 3 months after:

- (a) becoming a councillor or designated person, and
- (b) 30 June of each year, and
- (c) the councillor or designated person becoming aware of an interest they are required to disclose under schedule 1 that has not been previously disclosed in a return lodged under paragraphs (a) or (b).

4.22 A person need not make and lodge a return under clause 4.21, paragraphs (a) and (b) if:

- (a) they made and lodged a return under that clause in the preceding 3 months, or
- (b) they have ceased to be a councillor or designated person in the preceding 3 months.

4.23 A person must not make and lodge a return that the person knows or ought reasonably to know is false or misleading in a material particular.

4.24 The general manager must keep a register of returns required to be made and lodged with the general manager.

4.25 Returns required to be lodged with the general manager under clause 4.21(a) and (b) must be tabled at the first meeting of the council after the last day the return is required to be lodged.

4.26 Returns required to be lodged with the general manager under clause 4.21(c) must be tabled at the next council meeting after the return is lodged.

4.27 Information contained in returns made and lodged under clause 4.21 is to be made publicly available in accordance with the requirements of the *Government Information (Public Access) Act 2009*, the *Government Information (Public Access) Regulation 2009* and any guidelines issued by the Information Commissioner.Disclosure of pecuniary interests at meetings

4.28 A councillor or a council committee member who has a pecuniary interest in any matter with which the council is concerned, and who is present at a meeting of the council or committee at which the matter is being

considered, must disclose the nature of the interest to the meeting as soon as practicable.

- 4.29 The councillor or council committee member must not be present at, or in sight of, the meeting of the council or committee:
- (a) at any time during which the matter is being considered or discussed by the council or committee, or
 - (b) at any time during which the council or committee is voting on any question in relation to the matter.
- 4.30 In the case of a meeting of a board of a joint organisation, a voting representative is taken to be present at the meeting for the purposes of clauses 4.28 and 4.29 where they participate in the meeting by telephone or other electronic means.
- 4.31 A disclosure made at a meeting of a council or council committee must be recorded in the minutes of the meeting.
- 4.32 A general notice may be given to the general manager in writing by a councillor or a council committee member to the effect that the councillor or council committee member, or the councillor's or council committee member's spouse, de facto partner or relative, is:
- (a) a member of, or in the employment of, a specified company or other body, or
 - (b) a partner of, or in the employment of, a specified person.
- Such a notice is, unless and until the notice is withdrawn or until the end of the term of the council in which it is given (whichever is the sooner), sufficient disclosure of the councillor's or council committee member's interest in a matter relating to the specified company, body or person that may be the subject of consideration by the council or council committee after the date of the notice.
- 4.33 A councillor or a council committee member is not prevented from being present at and taking part in a meeting at which a matter is being considered, or from voting on the matter, merely because the councillor or council committee member has an interest in the matter of a kind referred to in clause 4.6.
- 4.34 A person does not breach clauses 4.28 or 4.29 if the person did not know, and could not reasonably be expected to have known, that the matter under consideration at the meeting was a matter in which they had a pecuniary interest.
- 4.35 Despite clause 4.29, a councillor who has a pecuniary interest in a matter may participate in a decision to delegate consideration of the matter in question to another body or person.
- 4.36 Clause 4.29 does not apply to a councillor who has a pecuniary interest in a matter that is being considered at a meeting if:
- (a) the matter is a proposal relating to:

- (i) the making of a principal environmental planning instrument applying to the whole or a significant portion of the council's area, or
 - (ii) the amendment, alteration or repeal of an environmental planning instrument where the amendment, alteration or repeal applies to the whole or a significant portion of the council's area, and
- (b) the pecuniary interest arises only because of an interest of the councillor in the councillor's principal place of residence or an interest of another person (whose interests are relevant under clause 4.3) in that person's principal place of residence, and
- (c) the councillor made a special disclosure under clause 4.37 in relation to the interest before the commencement of the meeting.

4.37 A special disclosure of a pecuniary interest made for the purposes of clause 4.36(c) must:

- (a) be in the form set out in schedule 3 of this code and contain the information required by that form, and
- (b) be laid on the table at a meeting of the council as soon as practicable after the disclosure is made, and the information contained in the special disclosure is to be recorded in the minutes of the meeting.

4.38 The Minister for Local Government may, conditionally or unconditionally, allow a councillor or a council committee member who has a pecuniary interest in a matter with which the council is concerned to be present at a meeting of the council or committee, to take part in the consideration or discussion of the matter and to vote on the matter if the Minister is of the opinion:

- (a) that the number of councillors prevented from voting would be so great a proportion of the whole as to impede the transaction of business, or
- (b) that it is in the interests of the electors for the area to do so.

4.39 A councillor or a council committee member with a pecuniary interest in a matter who is permitted to be present at a meeting of the council or committee, to take part in the consideration or discussion of the matter and to vote on the matter under clause 4.38, must still disclose the interest they have in the matter in accordance with clause 4.28.

PART 5 NON-PECUNIARY CONFLICTS OF INTERESTWhat is a non-pecuniary conflict of interest?

- 5.1 Non-pecuniary interests are private or personal interests a council official has that do not amount to a pecuniary interest as defined in clause 4.1 of this code. These commonly arise out of family or personal relationships, or out of involvement in sporting, social, religious or other cultural groups and associations, and may include an interest of a financial nature.
- 5.2 A non-pecuniary conflict of interest exists where a reasonable and informed person would perceive that you could be influenced by a private interest when carrying out your official functions in relation to a matter.
- 5.3 The personal or political views of a council official do not constitute a private interest for the purposes of clause 5.2.
- 5.4 Non-pecuniary conflicts of interest must be identified and appropriately managed to uphold community confidence in the probity of council decision-making. The onus is on you to identify any non-pecuniary conflict of interest you may have in matters that you deal with, to disclose the interest fully and in writing, and to take appropriate action to manage the conflict in accordance with this code.
- 5.5 When considering whether or not you have a non-pecuniary conflict of interest in a matter you are dealing with, it is always important to think about how others would view your situation.

Managing non-pecuniary conflicts of interest

- 5.6 Where you have a non-pecuniary conflict of interest in a matter for the purposes of clause 5.2, you must disclose the relevant private interest you have in relation to the matter fully and in writing as soon as practicable after becoming aware of the non-pecuniary conflict of interest and on each occasion on which the non-pecuniary conflict of interest arises in relation to the matter. In the case of members of council staff other than the general manager, such a disclosure is to be made to the staff member's manager. In the case of the general manager, such a disclosure is to be made to the mayor.
- 5.7 If a disclosure is made at a council or committee meeting, both the disclosure and the nature of the interest must be recorded in the minutes on each occasion on which the non-pecuniary conflict of interest arises. This disclosure constitutes disclosure in writing for the purposes of clause 5.6.
- 5.8 How you manage a non-pecuniary conflict of interest will depend on whether or not it is significant.

5.9 As a general rule, a non-pecuniary conflict of interest will be significant where it does not involve a pecuniary interest for the purposes of clause 4.1, but it involves:

- a) a relationship between a council official and another person who is affected by a decision or a matter under consideration that is particularly close, such as a current or former spouse or de facto partner, a relative for the purposes of clause 4.4 or another person from the council official's extended family that the council official has a close personal relationship with, or another person living in the same household
- b) other relationships with persons who are affected by a decision or a matter under consideration that are particularly close, such as friendships and business relationships. Closeness is defined by the nature of the friendship or business relationship, the frequency of contact and the duration of the friendship or relationship.
- c) an affiliation between the council official and an organisation (such as a sporting body, club, religious, cultural or charitable organisation, corporation or association) that is affected by a decision or a matter under consideration that is particularly strong. The strength of a council official's affiliation with an organisation is to be determined by the extent to which they actively participate in the management, administration or other activities of the organisation.
- d) membership, as the council's representative, of the board or management committee of an organisation that is affected by a decision or a matter under consideration, in circumstances where the interests of the council and the organisation are potentially in conflict in relation to the particular matter
- e) a financial interest (other than an interest of a type referred to in clause 4.6) that is not a pecuniary interest for the purposes of clause 4.1
- f) the conferral or loss of a personal benefit other than one conferred or lost as a member of the community or a broader class of people affected by a decision.

5.10 Significant non-pecuniary conflicts of interest must be managed in one of two ways:

- a) by not participating in consideration of, or decision making in relation to, the matter in which you have the significant non-pecuniary conflict of interest and the matter being allocated to another person for consideration or determination, or
- b) if the significant non-pecuniary conflict of interest arises in relation to a matter under consideration at a council or committee meeting, by managing the conflict of interest as if you had a pecuniary interest in the matter by complying with clauses 4.28 and 4.29.

5.11 If you determine that you have a non-pecuniary conflict of interest in a matter that is not significant and does not require further action, when

disclosing the interest you must also explain in writing why you consider that the non-pecuniary conflict of interest is not significant and does not require further action in the circumstances.

- 5.12 If you are a member of staff of council other than the general manager, the decision on which option should be taken to manage a non-pecuniary conflict of interest must be made in consultation with and at the direction of your manager. In the case of the general manager, the decision on which option should be taken to manage a non-pecuniary conflict of interest must be made in consultation with and at the direction of the mayor.
- 5.13 Despite clause 5.10(b), a councillor who has a significant non-pecuniary conflict of interest in a matter, may participate in a decision to delegate consideration of the matter in question to another body or person.
- 5.14 Council committee members are not required to declare and manage a non-pecuniary conflict of interest in accordance with the requirements of this Part where it arises from an interest they have as a person chosen to represent the community, or as a member of a non-profit organisation or other community or special interest group, if they have been appointed to represent the organisation or group on the council committee.

Political donations

- 5.15 Councillors should be aware that matters before council or committee meetings involving their political donors may also give rise to a non-pecuniary conflict of interest.
- 5.16 Where you are a councillor and have received or knowingly benefitted from a reportable political donation:
- a) made by a major political donor in the previous four years, and
 - b) the major political donor has a matter before council,
- you must declare a non-pecuniary conflict of interest in the matter, disclose the nature of the interest, and manage the conflict of interest as if you had a pecuniary interest in the matter by complying with clauses 4.28 and 4.29. A disclosure made under this clause must be recorded in the minutes of the meeting.
- 5.17 For the purposes of this Part:
- a) a "reportable political donation" has the same meaning as it has in section 6 of the *Electoral Funding Act 2018*
 - b) "major political donor" has the same meaning as it has in the *Electoral Funding Act 2018*.
- 5.18 Councillors should note that political donations that are not a "reportable political donation", or political donations to a registered political party or group by which a councillor is endorsed, may still give rise to a non-pecuniary conflict of interest. Councillors should determine whether or not

such conflicts are significant for the purposes of clause 5.9 and take the appropriate action to manage them.

- 5.19 Despite clause 5.16, a councillor who has received or knowingly benefitted from a reportable political donation of the kind referred to in that clause, may participate in a decision to delegate consideration of the matter in question to another body or person.

Loss of quorum as a result of compliance with this Part

- 5.20 A councillor who would otherwise be precluded from participating in the consideration of a matter under this Part because they have a non-pecuniary conflict of interest in the matter is permitted to participate in consideration of the matter if:

- a) the matter is a proposal relating to:
 - i) the making of a principal environmental planning instrument applying to the whole or a significant portion of the council's area, or
 - ii) the amendment, alteration or repeal of an environmental planning instrument where the amendment, alteration or repeal applies to the whole or a significant portion of the council's area, and
- b) the non-pecuniary conflict of interest arises only because of an interest that a person has in that person's principal place of residence, and
- c) the councillor discloses the interest they have in the matter that would otherwise have precluded their participation in consideration of the matter under this Part in accordance with clause 5.6.

- 5.21 The Minister for Local Government may, conditionally or unconditionally, allow a councillor or a council committee member who is precluded under this Part from participating in the consideration of a matter to be present at a meeting of the council or committee, to take part in the consideration or discussion of the matter and to vote on the matter if the Minister is of the opinion:

- a) that the number of councillors prevented from voting would be so great a proportion of the whole as to impede the transaction of business, or
- b) that it is in the interests of the electors for the area to do so.

- 5.22 Where the Minister exempts a councillor or committee member from complying with a requirement under this Part under clause 5.21, the councillor or committee member must still disclose any interests they have in the matter the exemption applies to, in accordance with clause 5.6.

Other business or employment

- 5.23 The general manager must not engage, for remuneration, in private employment, contract work or other business outside the service of the council without the approval of the council.
- 5.24 A member of staff must not engage, for remuneration, in private employment, contract work or other business outside the service of the council that relates to the business of the council or that might conflict with the staff member's council duties unless they have notified the general manager in writing of the employment, work or business and the general manager has given their written approval for the staff member to engage in the employment, work or business.
- 5.25 The general manager may at any time prohibit a member of staff from engaging, for remuneration, in private employment, contract work or other business outside the service of the council that relates to the business of the council, or that might conflict with the staff member's council duties.
- 5.26 A member of staff must not engage, for remuneration, in private employment, contract work or other business outside the service of the council if prohibited from doing so.
- 5.27 Members of staff must ensure that any outside employment, work or business they engage in will not:
- a) conflict with their official duties
 - b) involve using confidential information or council resources obtained through their work with the council including where private use is permitted
 - c) require them to work while on council duty
 - d) discredit or disadvantage the council
 - e) pose, due to fatigue, a risk to their health or safety, or to the health and safety of their co-workers.

Personal dealings with council

- 5.28 You may have reason to deal with your council in your personal capacity (for example, as a ratepayer, recipient of a council service or applicant for a development consent granted by council). You must not expect or request preferential treatment in relation to any matter in which you have a private interest because of your position. You must avoid any action that could lead members of the public to believe that you are seeking preferential treatment.
- 5.29 You must undertake any personal dealings you have with the council in a manner that is consistent with the way other members of the community deal with the council. You must also ensure that you disclose and appropriately manage any conflict of interest you may have in any matter in accordance with the requirements of this code.

PART 6 PERSONAL BENEFIT

6.1 For the purposes of this Part, a gift or a benefit is something offered to or received by a council official or someone personally associated with them for their personal use and enjoyment.

6.2 A reference to a gift or benefit in this Part does not include:

- a) a political donation for the purposes of the *Electoral Funding Act 2018*
- b) a gift provided to the council as part of a cultural exchange or sister-city relationship that is not converted for the personal use or enjoyment of any individual council official or someone personally associated with them
- c) attendance by a council official at a work-related event or function for the purposes of performing their official duties, or
- d) free or subsidised meals, beverages or refreshments of token value provided to council officials in conjunction with the performance of their official duties such as, but not limited to:
 - i) the discussion of official business
 - ii) work-related events such as council-sponsored or community events, training, education sessions or workshops
 - iii) conferences
 - iv) council functions or events
 - v) social functions organised by groups, such as council committees and community organisations.

Gifts and benefits

6.3 You must avoid situations that would give rise to the appearance that a person or body is attempting to secure favourable treatment from you or from the council, through the provision of gifts, benefits or hospitality of any kind to you or someone personally associated with you.

6.4 A gift or benefit is deemed to have been accepted by you for the purposes of this Part, where it is received by you or someone personally associated with you.

How are offers of gifts and benefits to be dealt with?

6.5 You must not:

- a) seek or accept a bribe or other improper inducement
- b) seek gifts or benefits of any kind
- c) accept any gift or benefit that may create a sense of obligation on your part, or may be perceived to be intended or likely to influence you in carrying out your public duty
- d) subject to clause 6.7, accept any gift or benefit of more than token value as defined by clause 6.9

- e) accept an offer of cash or a cash-like gift as defined by clause 6.13, regardless of the amount
 - f) participate in competitions for prizes where eligibility is based on the council being in or entering into a customer–supplier relationship with the competition organiser
 - g) personally benefit from reward points programs when purchasing on behalf of the council.
- 6.6 Where you receive a gift or benefit of any value other than one referred to in clause 6.2, you must disclose this promptly to your manager or the general manager in writing. The recipient, manager, or general manager must ensure that, at a minimum, the following details are recorded in the council's gift register:
- a) the nature of the gift or benefit
 - b) the estimated monetary value of the gift or benefit
 - c) the name of the person who provided the gift or benefit, and
 - d) the date on which the gift or benefit was received.
- 6.7 Where you receive a gift or benefit of more than token value that cannot reasonably be refused or returned, the gift or benefit must be surrendered to the council, unless the nature of the gift or benefit makes this impractical.

Gifts and benefits of token value

- 6.8 You may accept gifts and benefits of token value. Gifts and benefits of token value are one or more gifts or benefits received from a person or organisation over a 12-month period that, when aggregated, do not exceed a value of \$50. They include, but are not limited to:
- a) invitations to and attendance at local social, cultural or sporting events with a ticket value that does not exceed \$50
 - b) gifts of alcohol that do not exceed a value of \$50
 - c) ties, scarves, coasters, tie pins, diaries, chocolates or flowers or the like
 - d) prizes or awards that do not exceed \$50 in value.

Gifts and benefits of more than token value

- 6.9 Gifts or benefits that exceed \$50 in value are gifts or benefits of more than token value for the purposes of clause 6.5(d) and, subject to clause 6.7, must not be accepted.
- 6.10 Gifts and benefits of more than token value include, but are not limited to, tickets to major sporting events (such as international matches or matches in national sporting codes) with a ticket value that exceeds \$50, corporate hospitality at a corporate facility at major sporting events, free or discounted products or services for personal use provided on terms that are not available to the general public or a broad class of persons, the use of holiday homes, artworks, free or discounted travel.
- 6.11 Where you have accepted a gift or benefit of token value from a person or organisation, you must not accept a further gift or benefit from the same

person or organisation or another person associated with that person or organisation within a single 12-month period where the value of the gift, added to the value of earlier gifts received from the same person or organisation, or a person associated with that person or organisation, during the same 12-month period would exceed \$50 in value.

- 6.12 For the purposes of this Part, the value of a gift or benefit is the monetary value of the gift or benefit inclusive of GST.

"Cash-like gifts"

- 6.13 For the purposes of clause 6.5(e), "cash-like gifts" include but are not limited to, gift vouchers, credit cards, debit cards with credit on them, prepayments such as phone or internet credit, lottery tickets, memberships or entitlements to discounts that are not available to the general public or a broad class of persons.

Improper and undue influence

- 6.14 You must not use your position to influence other council officials in the performance of their official functions to obtain a private benefit for yourself or for somebody else. A councillor will not be in breach of this clause where they seek to influence other council officials through the proper exercise of their role as prescribed under the LGA.
- 6.15 You must not take advantage (or seek to take advantage) of your status or position with council, or of functions you perform for council, in order to obtain a private benefit for yourself or for any other person or body.

PART 7 RELATIONSHIPS BETWEEN COUNCIL OFFICIALSObligations of councillors and administrators

- 7.1 Each council is a body politic. The councillors or administrator/s are the governing body of the council. Under section 223 of the LGA, the role of the governing body of the council includes the development and endorsement of the strategic plans, programs, strategies and policies of the council, including those relating to workforce policy, and to keep the performance of the council under review.
- 7.2 Councillors or administrators must not:
- a) direct council staff other than by giving appropriate direction to the general manager by way of council or committee resolution, or by the mayor or administrator exercising their functions under section 226 of the LGA
 - b) in any public or private forum, direct or influence, or attempt to direct or influence, any other member of the staff of the council or a delegate of the council in the exercise of the functions of the staff member or delegate
 - c) contact a member of the staff of the council on council-related business unless in accordance with the policy and procedures governing the interaction of councillors and council staff that have been authorised by the council and the general manager
 - d) contact or issue instructions to any of the council's contractors, including the council's legal advisers, unless by the mayor or administrator exercising their functions under section 226 of the LGA.
- 7.3 Despite clause 7.2, councillors may contact the council's external auditor or the chair of the council's audit risk and improvement committee to provide information reasonably necessary for the external auditor or the audit, risk and improvement committee to effectively perform their functions.

Obligations of staff

- 7.4 Under section 335 of the LGA, the role of the general manager includes conducting the day-to-day management of the council in accordance with the strategic plans, programs, strategies and policies of the council, implementing without undue delay, lawful decisions of the council and ensuring that the mayor and other councillors are given timely information and advice and the administrative and professional support necessary to effectively discharge their official functions.
- 7.5 Members of staff of council must:
- a) give their attention to the business of the council while on duty
 - b) ensure that their work is carried out ethically, efficiently, economically and effectively
 - c) carry out reasonable and lawful directions given by any person having authority to give such directions

- d) give effect to the lawful decisions, policies and procedures of the council, whether or not the staff member agrees with or approves of them
- e) ensure that any participation in political activities outside the service of the council does not interfere with the performance of their official duties.

Inappropriate interactions

7.6 You must not engage in any of the following inappropriate interactions:

- a) councillors and administrators approaching staff and staff organisations to discuss individual or operational staff matters (other than matters relating to broader workforce policy), grievances, workplace investigations and disciplinary matters
- b) council staff approaching councillors and administrators to discuss individual or operational staff matters (other than matters relating to broader workforce policy), grievances, workplace investigations and disciplinary matters
- c) subject to clause 8.6, council staff refusing to give information that is available to other councillors to a particular councillor
- d) councillors and administrators who have lodged an application with the council, discussing the matter with council staff in staff-only areas of the council
- e) councillors and administrators approaching members of local planning panels or discussing any application that is either before the panel or that will come before the panel at some future time, except during a panel meeting where the application forms part of the agenda and the councillor has a right to be heard by the panel at the meeting
- f) councillors and administrators being overbearing or threatening to council staff
- g) council staff being overbearing or threatening to councillors or administrators
- h) councillors and administrators making personal attacks on council staff or engaging in conduct towards staff that would be contrary to the general conduct provisions in Part 3 of this code in public forums including social media
- i) councillors and administrators directing or pressuring council staff in the performance of their work, or recommendations they should make
- j) council staff providing ad hoc advice to councillors and administrators without recording or documenting the interaction as they would if the advice was provided to a member of the community
- k) council staff meeting with applicants or objectors alone AND outside office hours to discuss planning applications or proposals
- l) councillors attending on-site inspection meetings with lawyers and/or consultants engaged by the council associated with current or proposed legal proceedings unless permitted to do so by the council's general manager or, in the case of the mayor or

28

administrator, unless they are exercising their functions under section 226 of the LGA.

PART 8 ACCESS TO INFORMATION AND COUNCIL RESOURCESCouncillor and administrator access to information

- 8.1 The general manager is responsible for ensuring that councillors and administrators can access information necessary for the performance of their official functions. The general manager and public officer are also responsible for ensuring that members of the public can access publicly available council information under the *Government Information (Public Access) Act 2009* (the GIPA Act).
- 8.2 The general manager must provide councillors and administrators with the information necessary to effectively discharge their official functions.
- 8.3 Members of staff of council must provide full and timely information to councillors and administrators sufficient to enable them to exercise their official functions and in accordance with council procedures.
- 8.4 Members of staff of council who provide any information to a particular councillor in the performance of their official functions must also make it available to any other councillor who requests it and in accordance with council procedures.
- 8.5 Councillors and administrators who have a private interest only in council information have the same rights of access as any member of the public.
- 8.6 Despite clause 8.4, councillors and administrators who are precluded from participating in the consideration of a matter under this code because they have a conflict of interest in the matter, are not entitled to request access to council information in relation to the matter unless the information is otherwise available to members of the public, or the council has determined to make the information available under the GIPA Act.

Councillors and administrators to properly examine and consider information

- 8.7 Councillors and administrators must ensure that they comply with their duty under section 439 of the LGA to act honestly and exercise a reasonable degree of care and diligence by properly examining and considering all the information provided to them relating to matters that they are required to make a decision on.

Refusal of access to information

- 8.8 Where the general manager or public officer determine to refuse access to information requested by a councillor or administrator, they must act reasonably. In reaching this decision they must take into account whether or not the information requested is necessary for the councillor or administrator to perform their official functions (see clause 8.2) and whether they have disclosed a conflict of interest in the matter the information relates to that would preclude their participation in consideration of the matter (see clause 8.6). The general manager or public officer must state the reasons for the decision if access is refused.

Use of certain council information

8.9 In regard to information obtained in your capacity as a council official, you must:

- a) subject to clause 8.14, only access council information needed for council business
- b) not use that council information for private purposes
- c) not seek or obtain, either directly or indirectly, any financial benefit or other improper advantage for yourself, or any other person or body, from any information to which you have access by virtue of your office or position with council
- d) only release council information in accordance with established council policies and procedures and in compliance with relevant legislation.

Use and security of confidential information

8.10 You must maintain the integrity and security of confidential information in your possession, or for which you are responsible.

8.11 In addition to your general obligations relating to the use of council information, you must:

- a) only access confidential information that you have been authorised to access and only do so for the purposes of exercising your official functions
- b) protect confidential information
- c) only release confidential information if you have authority to do so
- d) only use confidential information for the purpose for which it is intended to be used
- e) not use confidential information gained through your official position for the purpose of securing a private benefit for yourself or for any other person
- f) not use confidential information with the intention to cause harm or detriment to the council or any other person or body
- g) not disclose any confidential information discussed during a confidential session of a council or committee meeting or any other confidential forum (such as, but not limited to, workshops or briefing sessions).

Personal information

8.12 When dealing with personal information you must comply with:

- a) the *Privacy and Personal Information Protection Act 1998*
- b) the *Health Records and Information Privacy Act 2002*
- c) the Information Protection Principles and Health Privacy Principles
- d) the council's privacy management plan
- e) the Privacy Code of Practice for Local Government

Use of council resources

8.13 You must use council resources ethically, effectively, efficiently and carefully in exercising your official functions, and must not use them for private purposes, except when supplied as part of a contract of

employment (but not for private business purposes), unless this use is lawfully authorised and proper payment is made where appropriate.

- 8.14 Union delegates and consultative committee members may have reasonable access to council resources and information for the purposes of carrying out their industrial responsibilities, including but not limited to:
- a) the representation of members with respect to disciplinary matters
 - b) the representation of employees with respect to grievances and disputes
 - c) functions associated with the role of the local consultative committee.
- 8.15 You must be scrupulous in your use of council property, including intellectual property, official services, facilities, technology and electronic devices and must not permit their misuse by any other person or body.
- 8.16 You must avoid any action or situation that could create the appearance that council property, official services or public facilities are being improperly used for your benefit or the benefit of any other person or body.
- 8.17 You must not use council resources (including council staff), property or facilities for the purpose of assisting your election campaign or the election campaigns of others unless the resources, property or facilities are otherwise available for use or hire by the public and any publicly advertised fee is paid for use of the resources, property or facility.
- 8.18 You must not use the council letterhead, council crests, council email or social media or other information that could give the appearance it is official council material:
- a) for the purpose of assisting your election campaign or the election campaign of others, or
 - b) for other non-official purposes.
- 8.19 You must not convert any property of the council to your own use unless properly authorised.

Internet access

- 8.20 You must not use council's computer resources or mobile or other devices to search for, access, download or communicate any material of an offensive, obscene, pornographic, threatening, abusive or defamatory nature, or that could otherwise lead to criminal penalty or civil liability and/or damage the council's reputation.

Council record keeping

- 8.21 You must comply with the requirements of the *State Records Act 1998* and the council's records management policy.
- 8.22 All information created, sent and received in your official capacity is a council record and must be managed in accordance with the requirements

of the *State Records Act 1998* and the council's approved records management policies and practices.

- 8.23 All information stored in either soft or hard copy on council supplied resources (including technology devices and email accounts) is deemed to be related to the business of the council and will be treated as council records, regardless of whether the original intention was to create the information for personal purposes.
- 8.24 You must not destroy, alter, or dispose of council information or records, unless authorised to do so. If you need to alter or dispose of council information or records, you must do so in consultation with the council's records manager and comply with the requirements of the *State Records Act 1998*.

Councillor access to council buildings

- 8.25 Councillors and administrators are entitled to have access to the council chamber, committee room, mayor's office (subject to availability), councillors' rooms, and public areas of council's buildings during normal business hours and for meetings. Councillors and administrators needing access to these facilities at other times must obtain authority from the general manager.
- 8.26 Councillors and administrators must not enter staff-only areas of council buildings without the approval of the general manager (or their delegate) or as provided for in the procedures governing the interaction of councillors and council staff.
- 8.27 Councillors and administrators must ensure that when they are within a staff only area they refrain from conduct that could be perceived to improperly influence council staff decisions.

PART 9 MAINTAINING THE INTEGRITY OF THIS CODEComplaints made for an improper purpose

9.1 You must not make or threaten to make a complaint or cause a complaint to be made alleging a breach of this code for an improper purpose.

9.2 For the purposes of clause 9.1, a complaint is made for an improper purpose where it is trivial, frivolous, vexatious or not made in good faith, or where it otherwise lacks merit and has been made substantially for one or more of the following purposes:

- a) to bully, intimidate or harass another council official
- b) to damage another council official's reputation
- c) to obtain a political advantage
- d) to influence a council official in the exercise of their official functions or to prevent or disrupt the exercise of those functions
- e) to influence the council in the exercise of its functions or to prevent or disrupt the exercise of those functions
- f) to avoid disciplinary action under the Procedures
- g) to take reprisal action against a person for making a complaint alleging a breach of this code
- h) to take reprisal action against a person for exercising a function prescribed under the Procedures
- i) to prevent or disrupt the effective administration of this code under the Procedures.

Detrimental action

9.3 You must not take detrimental action or cause detrimental action to be taken against a person substantially in reprisal for a complaint they have made alleging a breach of this code.

9.4 You must not take detrimental action or cause detrimental action to be taken against a person substantially in reprisal for any function they have exercised under the Procedures.

9.5 For the purposes of clauses 9.3 and 9.4, a detrimental action is an action causing, comprising or involving any of the following:

- a) injury, damage or loss
- b) intimidation or harassment
- c) discrimination, disadvantage or adverse treatment in relation to employment
- d) dismissal from, or prejudice in, employment
- e) disciplinary proceedings.

Compliance with requirements under the Procedures

9.6 You must not engage in conduct that is calculated to impede or disrupt the consideration of a matter under the Procedures.

9.7 You must comply with a reasonable and lawful request made by a person exercising a function under the Procedures. A failure to make a written or

oral submission invited under the Procedures will not constitute a breach of this clause.

- 9.8 You must comply with a practice ruling made by the Office under the Procedures.
- 9.9 Where you are a councillor or the general manager, you must comply with any council resolution requiring you to take action as a result of a breach of this code.

Disclosure of information about the consideration of a matter under the Procedures

- 9.10 All allegations of breaches of this code must be dealt with under and in accordance with the Procedures.
- 9.11 You must not allege breaches of this code other than by way of a complaint made or initiated under the Procedures.
- 9.12 You must not make allegations about, or disclose information about, suspected breaches of this code at council, committee or other meetings, whether open to the public or not, or in any other forum, whether public or not.
- 9.13 You must not disclose information about a complaint you have made alleging a breach of this code or a matter being considered under the Procedures except for the purposes of seeking legal advice, unless the disclosure is otherwise permitted under the Procedures.
- 9.14 Nothing under this Part prevents a person from making a public interest disclosure to an appropriate public authority or investigative authority under the *Public Interest Disclosures Act 1994*.

Complaints alleging a breach of this Part

- 9.15 Complaints alleging a breach of this Part by a councillor, the general manager or an administrator are to be managed by the Office. This clause does not prevent the Office from referring an alleged breach of this Part back to the council for consideration in accordance with the Procedures.
- 9.16 Complaints alleging a breach of this Part by other council officials are to be managed by the general manager in accordance with the Procedures.

Procedures for the Administration of the Model Code of Conduct

2019

TABLE OF CONTENTS

PART 1	INTRODUCTION.....	3
PART 2	DEFINITIONS.....	3
PART 3	ADMINISTRATIVE FRAMEWORK.....	5
PART 4	HOW MAY CODE OF CONDUCT COMPLAINTS BE MADE?.....	8
PART 5	HOW ARE CODE OF CONDUCT COMPLAINTS TO BE MANAGED?.....	10
PART 6	PRELIMINARY ASSESSMENT OF CODE OF CONDUCT COMPLAINTS ABOUT COUNCILLORS OR THE GENERAL MANAGER BY CONDUCT REVIEWERS	18
PART 7	INVESTIGATIONS OF CODE OF CONDUCT COMPLAINTS ABOUT COUNCILLORS OR THE GENERAL MANAGER	23
PART 8	OVERSIGHT AND RIGHTS OF REVIEW	32
PART 9	PROCEDURAL IRREGULARITIES	34
PART 10	PRACTICE DIRECTIONS	34
PART 11	REPORTING STATISTICS ON CODE OF CONDUCT COMPLAINTS ABOUT COUNCILLORS AND THE GENERAL MANAGER..	35
PART 12	CONFIDENTIALITY	35

PART 1 INTRODUCTION

These procedures ("the Model Code Procedures") are prescribed for the administration of the *Model Code of Conduct for Local Councils in NSW* ("the Model Code of Conduct").

The Model Code of Conduct is made under section 440 of the *Local Government Act 1993* ("the LGA") and the *Local Government (General) Regulation 2005* ("the Regulation"). Section 440 of the LGA requires every council (including county councils) and joint organisation to adopt a code of conduct that incorporates the provisions of the Model Code of Conduct.

The Model Code Procedures are made under section 440AA of the LGA and the Regulation. Section 440AA of the LGA requires every council (including county councils) and joint organisation to adopt procedures for the administration of their code of conduct that incorporate the provisions of the Model Code Procedures.

In adopting procedures for the administration of their adopted codes of conduct, councils and joint organisations may supplement the Model Code Procedures. However, provisions that are not consistent with those prescribed under the Model Code Procedures will have no effect.

Note: References in these procedures to councils are also to be taken as references to county councils and joint organisations.

Note: In adopting the Model Code Procedures, joint organisations should adapt them to substitute the terms "board" for "council", "chairperson" for "mayor", "voting representative" for "councillor" and "executive officer" for "general manager".

Note: In adopting the Model Code Procedures, county councils should adapt them to substitute the term "chairperson" for "mayor" and "member" for "councillor".

Note: Parts 6, 7, 8 and 11 of these procedures apply only to the management of code of conduct complaints about councillors (including the mayor) or the general manager.

PART 2 DEFINITIONS

In these procedures the following terms have the following meanings:

LGA	the <i>Local Government Act 1993</i>
administrator	an administrator of a council appointed under the LGA other than an administrator appointed under section 66

code of conduct	a code of conduct adopted under section 440 of the LGA
code of conduct complaint	a complaint that is a code of conduct complaint for the purposes of clauses 4.1 and 4.2 of these procedures
complainant	a person who makes a code of conduct complaint
complainant councillor	a councillor who makes a code of conduct complaint
complaints coordinator	a person appointed by the general manager under these procedures as a complaints coordinator
conduct reviewer	a person appointed under these procedures to review allegations of breaches of the code of conduct by councillors or the general manager
council	includes county councils and joint organisations
council committee	a committee established by a council comprising of councillors, staff or other persons that the council has delegated functions to
council committee member	a person other than a councillor or member of staff of a council who is a member of a council committee other than a wholly advisory committee
councillor	any person elected or appointed to civic office, including the mayor, and includes members and chairpersons of county councils and voting representatives of the boards of joint organisations and chairpersons of joint organisations
council official	any councillor, member of staff of council, administrator, council committee member, delegate of council and, for the purposes of clause 4.16 of the Model Code of Conduct, council adviser
delegate of council	a person (other than a councillor or member of staff of a council) or body, and the

	individual members of that body, to whom a function of the council is delegated
external agency	a state government agency such as, but not limited to, the Office, the ICAC, the NSW Ombudsman or the police
general manager	includes the executive officer of a joint organisation
ICAC	the Independent Commission Against Corruption
joint organisation	a joint organisation established under section 400O of the LGA
mayor	includes the chairperson of a county council or a joint organisation
members of staff of a council	includes members of staff of county councils and joint organisations
the Office	the Office of Local Government
investigator	a conduct reviewer
the Regulation	the <i>Local Government (General) Regulation 2005</i>
respondent	a person whose conduct is the subject of investigation by a conduct reviewer under these procedures
wholly advisory committee	a council committee that the council has not delegated any functions to

PART 3 ADMINISTRATIVE FRAMEWORK

The establishment of a panel of conduct reviewers

- 3.1 The council must by resolution establish a panel of conduct reviewers.
- 3.2 The council may by resolution enter into an arrangement with one or more other councils to share a panel of conduct reviewers including through a joint organisation or another regional body associated with the councils.

- 3.3 The panel of conduct reviewers is to be established following a public expression of interest process.
- 3.4 An expression of interest for members of the council's panel of conduct reviewers must, at a minimum, be advertised locally and in the Sydney metropolitan area.
- 3.5 To be eligible to be a conduct reviewer, a person must, at a minimum, meet the following requirements:
- a) an understanding of local government, and
 - b) knowledge of investigative processes including but not limited to procedural fairness requirements and the requirements of the *Public Interest Disclosures Act 1994*, and
 - c) knowledge and experience of one or more of the following:
 - i) investigations
 - ii) law
 - iii) public administration
 - iv) public sector ethics
 - v) alternative dispute resolution, and
 - d) meet the eligibility requirements for membership of a panel of conduct reviewers under clause 3.6.
- 3.6 A person is not eligible to be a conduct reviewer if they are:
- a) a councillor, or
 - b) a nominee for election as a councillor, or
 - c) an administrator, or
 - d) an employee of a council, or
 - e) a member of the Commonwealth Parliament or any State Parliament or Territory Assembly, or
 - f) a nominee for election as a member of the Commonwealth Parliament or any State Parliament or Territory Assembly, or
 - g) a person who has a conviction for an indictable offence that is not an expired conviction.
- 3.7 A person is not precluded from being a member of the council's panel of conduct reviewers if they are a member of another council's panel of conduct reviewers.
- 3.8 An incorporated or other entity may be appointed to a council's panel of conduct reviewers where the council is satisfied that all the persons who will be undertaking the functions of a conduct reviewer on behalf of the entity meet the selection and eligibility criteria prescribed under this Part.
- 3.9 A panel of conduct reviewers established under this Part is to have a term of up to four years.
- 3.10 The council may terminate the panel of conduct reviewers at any time by resolution. Where a panel of conduct reviewers has been terminated, conduct reviewers who were members of the panel may continue to deal with any matter referred to them under these procedures prior to the

termination of the panel until they have finalised their consideration of the matter.

- 3.11 When the term of the panel of conduct reviewers concludes or is terminated, the council must establish a new panel of conduct reviewers in accordance with the requirements of this Part.
- 3.12 A person who was a member of a previous panel of conduct reviewers established by the council may be a member of subsequent panels of conduct reviewers established by the council if they continue to meet the selection and eligibility criteria for membership of the panel.

The appointment of an internal ombudsman to a panel of conduct reviewers

- 3.13 Despite clause 3.6(d), an employee of a council who is the nominated internal ombudsman of one or more councils may be appointed to a council's panel of conduct reviewers with the Office's consent.
- 3.14 To be appointed to a council's panel of conduct reviewers, an internal ombudsman must meet the qualification requirements for conduct reviewers prescribed under clause 3.5 as modified by the operation of clause 3.13.
- 3.15 An internal ombudsman appointed to a council's panel of conduct reviewers may also exercise the functions of the council's complaints coordinator. For the purposes of clause 6.1, an internal ombudsman who is a council's complaints coordinator and has been appointed to the council's panel of conduct reviewers, may either undertake a preliminary assessment and investigation of a matter referred to them under clauses 5.26 or 5.33 or refer the matter to another conduct reviewer in accordance with clause 6.2.
- 3.16 Clause 6.4(c) does not apply to an internal ombudsman appointed to a council's panel of conduct reviewers.

The appointment of complaints coordinators

- 3.17 The general manager must appoint a member of staff of the council or another person (such as, but not limited to, a member of staff of another council or a member of staff of a joint organisation or other regional body associated with the council), to act as a complaints coordinator. Where the complaints coordinator is a member of staff of the council, the complaints coordinator should be a senior and suitably qualified member of staff.
- 3.18 The general manager may appoint other members of staff of the council or other persons (such as, but not limited to, members of staff of another council or members of staff of a joint organisation or other regional body associated with the council), to act as alternates to the complaints coordinator.

- 3.19 The general manager must not undertake the role of complaints coordinator.
- 3.20 The person appointed as complaints coordinator or alternate complaints coordinator must also be a nominated disclosures coordinator appointed for the purpose of receiving and managing reports of wrongdoing under the *Public Interest Disclosures Act 1994*.
- 3.21 The role of the complaints coordinator is to:
- a) coordinate the management of complaints made under the council's code of conduct
 - b) liaise with and provide administrative support to a conduct reviewer
 - c) liaise with the Office and
 - d) arrange the annual reporting of code of conduct complaints statistics.

PART 4 HOW MAY CODE OF CONDUCT COMPLAINTS BE MADE?

What is a code of conduct complaint?

- 4.1 For the purpose of these procedures, a code of conduct complaint is a complaint that shows or tends to show conduct on the part of a council official in connection with their role as a council official or the exercise of their functions as a council official that would constitute a breach of the standards of conduct prescribed under the council's code of conduct if proven.
- 4.2 The following are not "code of conduct complaints" for the purposes of these procedures:
- a) complaints about the standard or level of service provided by the council or a council official
 - b) complaints that relate solely to the merits of a decision made by the council or a council official or the exercise of a discretion by the council or a council official
 - c) complaints about the policies or procedures of the council
 - d) complaints about the conduct of a council official arising from the exercise of their functions in good faith, whether or not involving error, that would not otherwise constitute a breach of the standards of conduct prescribed under the council's code of conduct.
- 4.3 Only code of conduct complaints are to be dealt with under these procedures. Complaints that do not satisfy the definition of a code of conduct complaint are to be dealt with under the council's routine complaints management processes.

When must a code of conduct complaint be made?

- 4.4 A code of conduct complaint must be made within three months of the alleged conduct occurring or within three months of the complainant becoming aware of the alleged conduct.
- 4.5 A complaint made after 3 months may only be accepted if the general manager or their delegate, or, in the case of a complaint about the general manager, the mayor or their delegate, is satisfied that the allegations are serious and compelling grounds exist for the matter to be dealt with under the code of conduct.

How may a code of conduct complaint about a council official other than the general manager be made?

- 4.6 All code of conduct complaints other than those relating to the general manager are to be made to the general manager in writing. This clause does not operate to prevent a person from making a complaint to an external agency.
- 4.7 Where a code of conduct complaint about a council official other than the general manager cannot be made in writing, the complaint must be confirmed with the complainant in writing as soon as possible after the receipt of the complaint.
- 4.8 In making a code of conduct complaint about a council official other than the general manager, the complainant may nominate whether they want the complaint to be resolved by mediation or by other alternative means.
- 4.9 The general manager or their delegate, or, where the complaint is referred to a conduct reviewer, the conduct reviewer, must consider the complainant's preferences in deciding how to deal with the complaint.
- 4.10 Notwithstanding clauses 4.6 and 4.7, where the general manager becomes aware of a possible breach of the council's code of conduct, they may initiate the process for the consideration of the matter under these procedures without a written complaint.

How may a code of conduct complaint about the general manager be made?

- 4.11 Code of conduct complaints about the general manager are to be made to the mayor in writing. This clause does not operate to prevent a person from making a complaint about the general manager to an external agency.
- 4.12 Where a code of conduct complaint about the general manager cannot be made in writing, the complaint must be confirmed with the complainant in writing as soon as possible after the receipt of the complaint.

- 4.13 In making a code of conduct complaint about the general manager, the complainant may nominate whether they want the complaint to be resolved by mediation or by other alternative means.
- 4.14 The mayor or their delegate, or, where the complaint is referred to a conduct reviewer, the conduct reviewer, must consider the complainant's preferences in deciding how to deal with the complaint.
- 4.15 Notwithstanding clauses 4.11 and 4.12, where the mayor becomes aware of a possible breach of the council's code of conduct by the general manager, they may initiate the process for the consideration of the matter under these procedures without a written complaint.

PART 5 HOW ARE CODE OF CONDUCT COMPLAINTS TO BE MANAGED?

Delegation by general managers and mayors of their functions under this Part

- 5.1 A general manager or mayor may delegate their functions under this Part to a member of staff of the council or to a person or persons external to the council other than an external agency. References in this Part to the general manager or mayor are also to be taken to be references to their delegates.

Consideration of complaints by general managers and mayors

- 5.2 In exercising their functions under this Part, general managers and mayors may consider the complaint assessment criteria prescribed under clause 6.31.

What complaints may be declined at the outset?

- 5.3 Without limiting any other provision in these procedures, the general manager or, in the case of a complaint about the general manager, the mayor, may decline to deal with a complaint under these procedures where they are satisfied that the complaint:
- a) is not a code of conduct complaint, or
 - b) subject to clause 4.5, is not made within 3 months of the alleged conduct occurring or the complainant becoming aware of the alleged conduct, or
 - c) is trivial, frivolous, vexatious or not made in good faith, or
 - d) relates to a matter the substance of which has previously been considered and addressed by the council and does not warrant further action, or
 - e) is not made in a way that would allow the alleged conduct and any alleged breaches of the council's code of conduct to be readily identified.

How are code of conduct complaints about staff (other than the general manager) to be dealt with?

- 5.4 The general manager is responsible for the management of code of conduct complaints about members of staff of council (other than complaints alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct) and for determining the outcome of such complaints.
- 5.5 The general manager must refer code of conduct complaints about members of staff of council alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct to the Office.
- 5.6 The general manager may decide to take no action in relation to a code of conduct complaint about a member of staff of council other than one requiring referral to the Office under clause 5.5 where they consider that no action is warranted in relation to the complaint.
- 5.7 Where the general manager decides to take no action in relation to a code of conduct complaint about a member of staff of council, the general manager must give the complainant reasons in writing for their decision and this shall finalise the consideration of the matter under these procedures.
- 5.8 Code of conduct complaints about members of staff of council must be managed in accordance with the relevant industrial instrument or employment contract and make provision for procedural fairness including the right of an employee to be represented by their union.
- 5.9 Sanctions for breaches of the code of conduct by staff depend on the severity, scale and importance of the breach and must be determined in accordance with any relevant industrial instruments or contracts.

How are code of conduct complaints about delegates of council, council advisers and council committee members to be dealt with?

- 5.10 The general manager is responsible for the management of code of conduct complaints about delegates of council and council committee members (other than complaints alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct) and for determining the outcome of such complaints.
- 5.11 The general manager must refer code of conduct complaints about council advisers, delegates of council and council committee members alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct to the Office.
- 5.12 The general manager may decide to take no action in relation to a code of conduct complaint about a delegate of council or a council committee

member other than one requiring referral to the Office under clause 5.11 where they consider that no action is warranted in relation to the complaint.

- 5.13 Where the general manager decides to take no action in relation to a code of conduct complaint about a delegate of council or a council committee member, the general manager must give the complainant reasons in writing for their decision and this shall finalise the consideration of the matter under these procedures.
- 5.14 Where the general manager considers it to be practicable and appropriate to do so, the general manager may seek to resolve code of conduct complaints about delegates of council or council committee members, by alternative means such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour. The resolution of a code of conduct complaint under this clause is not to be taken as a determination that there has been a breach of the council's code of conduct.
- 5.15 Where the general manager resolves a code of conduct complaint under clause 5.14 to the general manager's satisfaction, the general manager must notify the complainant in writing of the steps taken to resolve the complaint and this shall finalise the consideration of the matter under these procedures.
- 5.16 Sanctions for breaches of the code of conduct by delegates of council and/or council committee members depend on the severity, scale and importance of the breach and may include one or more of the following:
- a) censure
 - b) requiring the person to apologise to any person or organisation adversely affected by the breach in such a time and form specified by the general manager
 - c) prosecution for any breach of the law
 - d) removing or restricting the person's delegation
 - e) removing the person from membership of the relevant council committee.
- 5.17 Prior to imposing a sanction against a delegate of council or a council committee member under clause 5.16, the general manager or any person making enquiries on behalf of the general manager must comply with the requirements of procedural fairness. In particular:
- a) the substance of the allegation (including the relevant provision/s of the council's code of conduct that the alleged conduct is in breach of) must be put to the person who is the subject of the allegation, and
 - b) the person must be given an opportunity to respond to the allegation, and
 - c) the general manager must consider the person's response in deciding whether to impose a sanction under clause 5.16.

How are code of conduct complaints about administrators to be dealt with?

- 5.18 The general manager must refer all code of conduct complaints about administrators to the Office for its consideration.
- 5.19 The general manager must notify the complainant of the referral of their complaint in writing.

How are code of conduct complaints about councillors to be dealt with?

- 5.20 The general manager must refer the following code of conduct complaints about councillors to the Office:
- a) complaints alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct
 - b) complaints alleging a failure to comply with a requirement under the code of conduct to disclose and appropriately manage conflicts of interest arising from political donations (see section 328B of the LGA)
 - c) complaints alleging a breach of the provisions relating to the maintenance of the integrity of the code of conduct contained in Part 9 of the code of conduct
 - d) complaints that are the subject of a special complaints management arrangement with the Office under clause 5.49.
- 5.21 Where the general manager refers a complaint to the Office under clause 5.20, the general manager must notify the complainant of the referral in writing.
- 5.22 The general manager may decide to take no action in relation to a code of conduct complaint about a councillor, other than one requiring referral to the Office under clause 5.20, where they consider that no action is warranted in relation to the complaint.
- 5.23 Where the general manager decides to take no action in relation to a code of conduct complaint about a councillor, the general manager must give the complainant reasons in writing for their decision within 21 days of receipt of the complaint and this shall finalise the consideration of the matter under these procedures.
- 5.24 Where the general manager considers it to be practicable and appropriate to do so, the general manager may seek to resolve code of conduct complaints about councillors, other than those requiring referral to the Office under clause 5.20, by alternative means such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour. The resolution of a code of conduct complaint under this clause is not to be taken as a determination that there has been a breach of the council's code of conduct.

- 5.25 Where the general manager resolves a code of conduct complaint under clause 5.24 to the general manager's satisfaction, the general manager must notify the complainant in writing of the steps taken to resolve the complaint within 21 days of receipt of the complaint and this shall finalise the consideration of the matter under these procedures.
- 5.26 The general manager must refer all code of conduct complaints about councillors, other than those referred to the Office under clause 5.20 or finalised under clause 5.23 or resolved under clause 5.24, to the complaints coordinator.

How are code of conduct complaints about the general manager to be dealt with?

- 5.27 The mayor must refer the following code of conduct complaints about the general manager to the Office:
- a) complaints alleging a breach of the pecuniary interest provisions contained in Part 4 of the code of conduct
 - b) complaints alleging a breach of the provisions relating to the maintenance of the integrity of the code of conduct contained in Part 9 of the code of conduct
 - c) complaints that are the subject of a special complaints management arrangement with the Office under clause 5.49.
- 5.28 Where the mayor refers a complaint to the Office under clause 5.27, the mayor must notify the complainant of the referral in writing.
- 5.29 The mayor may decide to take no action in relation to a code of conduct complaint about the general manager, other than one requiring referral to the Office under clause 5.27, where they consider that no action is warranted in relation to the complaint.
- 5.30 Where the mayor decides to take no action in relation to a code of conduct complaint about the general manager, the mayor must give the complainant reasons in writing for their decision within 21 days of receipt of the complaint and this shall finalise the consideration of the matter under these procedures.
- 5.31 Where the mayor considers it to be practicable and appropriate to do so, the mayor may seek to resolve code of conduct complaints about the general manager, other than those requiring referral to the Office under clause 5.27, by alternative means such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour. The resolution of a code of conduct complaint under this clause is not to be taken as a determination that there has been a breach of the council's code of conduct.
- 5.32 Where the mayor resolves a code of conduct complaint under clause 5.31 to the mayor's satisfaction, the mayor must notify the complainant in

writing of the steps taken to resolve the complaint within 21 days of receipt of the complaint and this shall finalise the consideration of the matter under these procedures.

- 5.33 The mayor must refer all code of conduct complaints about the general manager, other than those referred to the Office under clause 5.27 or finalised under clause 5.30 or resolved under clause 5.31, to the complaints coordinator.

How are complaints about both the general manager and the mayor to be dealt with?

- 5.34 Where the general manager or mayor receives a code of conduct complaint that alleges a breach of the code of conduct by both the general manager and the mayor, the general manager or mayor must either:
- a) delegate their functions under this part with respect to the complaint to a member of staff of the council other than the general manager where the allegation is not serious, or to a person external to the council, or
 - b) refer the matter to the complaints coordinator under clause 5.26 and clause 5.33.

Referral of code of conduct complaints to external agencies

- 5.35 The general manager, mayor or a conduct reviewer may, at any time, refer a code of conduct complaint to an external agency for its consideration, where they consider such a referral is warranted.
- 5.36 The general manager, mayor or a conduct reviewer must report to the ICAC any matter that they suspect on reasonable grounds concerns or may concern corrupt conduct.
- 5.37 Where the general manager, mayor or conduct reviewer refers a complaint to an external agency under clause 5.35, they must notify the complainant of the referral in writing unless they form the view, on the advice of the relevant agency, that it would not be appropriate for them to do so.
- 5.38 Referral of a matter to an external agency shall finalise consideration of the matter under these procedures unless the council is subsequently advised otherwise by the referral agency.

Disclosure of the identity of complainants

- 5.39 In dealing with matters under these procedures, information that identifies or tends to identify complainants is not to be disclosed unless:
- a) the complainant consents in writing to the disclosure, or
 - b) it is generally known that the complainant has made the complaint as a result of the complainant having voluntarily identified themselves as the person who made the complaint, or

- c) it is essential, having regard to procedural fairness requirements, that the identifying information be disclosed, or
 - d) a conduct reviewer is of the opinion that disclosure of the information is necessary to investigate the matter effectively, or
 - e) it is otherwise in the public interest to do so.
- 5.40 Clause 5.39 does not apply to code of conduct complaints made by councillors about other councillors or the general manager.
- 5.41 Where a councillor makes a code of conduct complaint about another councillor or the general manager, and the complainant councillor considers that compelling grounds exist that would warrant information that identifies or tends to identify them as the complainant not to be disclosed, they may request in writing that such information not be disclosed.
- 5.42 A request made by a complainant councillor under clause 5.41 must be made at the time they make a code of conduct complaint and must state the grounds upon which the request is made.
- 5.43 The general manager or mayor, and where the matter is referred to a conduct reviewer, the conduct reviewer, must consider a request made under clause 5.41 before disclosing information that identifies or tends to identify the complainant councillor, but they are not obliged to comply with the request.
- 5.44 Where a complainant councillor makes a request under clause 5.41, the general manager or mayor or, where the matter is referred to a conduct reviewer, the conduct reviewer, shall notify the councillor in writing of their intention to disclose information that identifies or tends to identify them prior to disclosing the information.

Code of conduct complaints made as public interest disclosures

- 5.45 These procedures do not override the provisions of the *Public Interest Disclosures Act 1994*. Code of conduct complaints that are made as public interest disclosures under that Act are to be managed in accordance with the requirements of that Act, the council's internal reporting policy, and any guidelines issued by the NSW Ombudsman that relate to the management of public interest disclosures.
- 5.46 Where a councillor makes a code of conduct complaint about another councillor or the general manager as a public interest disclosure, before the matter may be dealt with under these procedures, the complainant councillor must consent in writing to the disclosure of their identity as the complainant.
- 5.47 Where a complainant councillor declines to consent to the disclosure of their identity as the complainant under clause 5.46, the general manager or the mayor must refer the complaint to the Office for consideration. Such

a referral must be made under section 26 of the *Public Interest Disclosures Act 1994*.

Special complaints management arrangements

- 5.48 The general manager may request in writing that the Office enter into a special complaints management arrangement with the council in relation to code of conduct complaints made by or about a person or persons.
- 5.49 Where the Office receives a request under clause 5.48, it may agree to enter into a special complaints management arrangement if it is satisfied that the number or nature of code of conduct complaints made by or about a person or persons has:
- a) imposed an undue and disproportionate cost burden on the council's administration of its code of conduct, or
 - b) impeded or disrupted the effective administration by the council of its code of conduct, or
 - c) impeded or disrupted the effective functioning of the council.
- 5.50 A special complaints management arrangement must be in writing and must specify the following:
- a) the code of conduct complaints the arrangement relates to, and
 - b) the period that the arrangement will be in force.
- 5.51 The Office may, by notice in writing, amend or terminate a special complaints management arrangement at any time.
- 5.52 While a special complaints management arrangement is in force, an officer of the Office (the assessing OLG officer) must undertake the preliminary assessment of the code of conduct complaints specified in the arrangement in accordance with the requirements of Part 6 of these procedures.
- 5.53 Where, following a preliminary assessment, the assessing OLG officer determines that a code of conduct complaint warrants investigation by a conduct reviewer, the assessing OLG officer shall notify the complaints coordinator in writing of their determination and the reasons for their determination. The complaints coordinator must comply with the recommendation of the assessing OLG officer.
- 5.54 Prior to the expiry of a special complaints management arrangement, the Office may, at the request of the general manager, review the arrangement to determine whether it should be renewed or amended.
- 5.55 A special complaints management arrangement shall expire on the date specified in the arrangement unless renewed under clause 5.54.

**PART 6 PRELIMINARY ASSESSMENT OF CODE OF CONDUCT
COMPLAINTS ABOUT COUNCILLORS OR THE GENERAL MANAGER
BY CONDUCT REVIEWERS**Referral of code of conduct complaints about councillors or the general manager to conduct reviewers

- 6.1 The complaints coordinator must refer all code of conduct complaints about councillors or the general manager that have not been referred to an external agency or declined or resolved by the general manager, mayor or their delegate and that have been referred to them under clauses 5.26 or 5.33, to a conduct reviewer within 21 days of receipt of the complaint by the general manager or the mayor.
- 6.2 For the purposes of clause 6.1, the complaints coordinator will refer a complaint to a conduct reviewer selected from:
- a) a panel of conduct reviewers established by the council, or
 - b) a panel of conduct reviewers established by an organisation approved by the Chief Executive of the Office.
- 6.3 In selecting a suitable conduct reviewer, the complaints coordinator may have regard to the qualifications and experience of members of the panel of conduct reviewers. Where the conduct reviewer is an incorporated or other entity, the complaints coordinator must also ensure that the person assigned to receive the referral on behalf of the entity meets the selection and eligibility criteria for conduct reviewers prescribed under Part 3 of these procedures.
- 6.4 A conduct reviewer must not accept the referral of a code of conduct complaint where:
- a) they have a conflict of interest in relation to the matter referred to them, or
 - b) a reasonable apprehension of bias arises in relation to their consideration of the matter, or
 - c) they or their employer has entered into one or more contracts with the council (other than contracts relating to the exercise of their functions as a conduct reviewer) in the 2 years preceding the referral, and they or their employer have received or expect to receive payments under the contract or contracts of a value that, when aggregated, exceeds \$100,000, or
 - d) at the time of the referral, they or their employer are the council's legal service provider or are a member of a panel of legal service providers appointed by the council.
- 6.5 For the purposes of clause 6.4(a), a conduct reviewer will have a conflict of interest in a matter where a reasonable and informed person would perceive that they could be influenced by a private interest when carrying out their public duty (see clause 5.2 of the Model Code of Conduct).

- 6.6 For the purposes of clause 6.4(b), a reasonable apprehension of bias arises where a fair-minded observer might reasonably apprehend that the conduct reviewer might not bring an impartial and unprejudiced mind to the matter referred to the conduct reviewer.
- 6.7 Where the complaints coordinator refers a matter to a conduct reviewer, they will provide the conduct reviewer with a copy of the code of conduct complaint and any other information relevant to the matter held by the council, including any information about previous proven breaches and any information that would indicate that the alleged conduct forms part of an ongoing pattern of behaviour.
- 6.8 The complaints coordinator must notify the complainant in writing that the matter has been referred to a conduct reviewer, and advise which conduct reviewer the matter has been referred to.
- 6.9 Conduct reviewers must comply with these procedures in their consideration of matters that have been referred to them and exercise their functions in a diligent and timely manner.
- 6.10 The complaints coordinator may at any time terminate the referral of a matter to a conduct reviewer and refer the matter to another conduct reviewer where the complaints coordinator is satisfied that the conduct reviewer has failed to:
- a) comply with these procedures in their consideration of the matter, or
 - b) comply with a lawful and reasonable request by the complaints coordinator, or
 - c) exercise their functions in a timely or satisfactory manner.
- 6.11 Where the complaints coordinator terminates a referral to a conduct reviewer under clause 6.10, they must notify the complainant and any other affected person in writing of their decision and the reasons for it and advise them which conduct reviewer the matter has been referred to instead.

Preliminary assessment of code of conduct complaints about councillors or the general manager by a conduct reviewer

- 6.12 The conduct reviewer is to undertake a preliminary assessment of a complaint referred to them by the complaints coordinator for the purposes of determining how the complaint is to be managed.
- 6.13 The conduct reviewer may determine to do one or more of the following in relation to a complaint referred to them by the complaints coordinator:
- a) to take no action
 - b) to resolve the complaint by alternative and appropriate strategies such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour

- c) to refer the matter back to the general manager or, in the case of a complaint about the general manager, the mayor, for resolution by alternative and appropriate strategies such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour
 - d) to refer the matter to an external agency
 - e) to investigate the matter.
- 6.14 In determining how to deal with a matter under clause 6.13, the conduct reviewer must have regard to the complaint assessment criteria prescribed under clause 6.31.
- 6.15 The conduct reviewer may make such enquiries the conduct reviewer considers to be reasonably necessary to determine what options to exercise under clause 6.13.
- 6.16 The conduct reviewer may request the complaints coordinator to provide such additional information the conduct reviewer considers to be reasonably necessary to determine what options to exercise in relation to the matter under clause 6.13. The complaints coordinator will, as far as is reasonably practicable, supply any information requested by the conduct reviewer.
- 6.17 The conduct reviewer must refer to the Office any complaints referred to them that should have been referred to the Office under clauses 5.20 and 5.27.
- 6.18 The conduct reviewer must determine to take no action on a complaint that is not a code of conduct complaint for the purposes of these procedures.
- 6.19 The resolution of a code of conduct complaint under clause 6.13, paragraphs (b) or (c) is not to be taken as a determination that there has been a breach of the council's code of conduct.
- 6.20 Where the conduct reviewer completes their preliminary assessment of a complaint by determining to exercise an option under clause 6.13, paragraphs (a), (b) or (c), they must provide the complainant with written notice of their determination and provide reasons for it, and this will finalise consideration of the matter under these procedures.
- 6.21 Where the conduct reviewer refers a complaint to an external agency, they must notify the complainant of the referral in writing unless they form the view, on the advice of the relevant agency, that it would not be appropriate for them to do so.
- 6.22 The conduct reviewer may only determine to investigate a matter where they are satisfied as to the following:

- a) that the complaint is a code of conduct complaint for the purposes of these procedures, and
- b) that the alleged conduct is sufficiently serious to warrant investigation, and
- c) that the matter is one that could not or should not be resolved by alternative means.

6.23 In determining whether a matter is sufficiently serious to warrant investigation, the conduct reviewer is to consider the following:

- a) the harm or cost that the alleged conduct has caused to any affected individuals and/or the council
- b) the likely impact of the alleged conduct on the reputation of the council and public confidence in it
- c) whether the alleged conduct was deliberate or undertaken with reckless intent or negligence
- d) any previous proven breaches by the person whose alleged conduct is the subject of the complaint and/or whether the alleged conduct forms part of an ongoing pattern of behaviour.

6.24 The conduct reviewer must complete their preliminary assessment of the complaint within 28 days of referral of the matter to them by the complaints coordinator and notify the complaints coordinator in writing of the outcome of their assessment.

6.25 The conduct reviewer is not obliged to give prior notice to or to consult with any person before making a determination in relation to their preliminary assessment of a complaint, except as may be specifically required under these procedures.

Referral back to the general manager or mayor for resolution

6.26 Where the conduct reviewer determines to refer a matter back to the general manager or to the mayor to be resolved by alternative and appropriate means, they must write to the general manager or, in the case of a complaint about the general manager, to the mayor, recommending the means by which the complaint may be resolved.

6.27 The conduct reviewer must consult with the general manager or mayor prior to referring a matter back to them under clause 6.13(c).

6.28 The general manager or mayor may decline to accept the conduct reviewer's recommendation. In such cases, the conduct reviewer may determine to deal with the complaint by other means under clause 6.13.

6.29 Where the conduct reviewer refers a matter back to the general manager or mayor under clause 6.13(c), the general manager or, in the case of a complaint about the general manager, the mayor, is responsible for implementing or overseeing the implementation of the conduct reviewer's recommendation.

6.30 Where the conduct reviewer refers a matter back to the general manager or mayor under clause 6.13(c), the general manager, or, in the case of a complaint about the general manager, the mayor, must advise the complainant in writing of the steps taken to implement the conduct reviewer's recommendation once these steps have been completed.

Complaints assessment criteria

6.31 In undertaking the preliminary assessment of a complaint, the conduct reviewer must have regard to the following considerations:

- a) whether the complaint is a code of conduct complaint for the purpose of these procedures
- b) whether the complaint has been made in a timely manner in accordance with clause 4.4, and if not, whether the allegations are sufficiently serious for compelling grounds to exist for the matter to be dealt with under the council's code of conduct
- c) whether the complaint is trivial, frivolous, vexatious or not made in good faith
- d) whether the complaint discloses prima facie evidence of conduct that, if proven, would constitute a breach of the code of conduct
- e) whether the complaint raises issues that would be more appropriately dealt with by an external agency
- f) whether there is or was an alternative and satisfactory means of redress available in relation to the conduct complained of
- g) whether the complaint is one that can be resolved by alternative and appropriate strategies such as, but not limited to, explanation, counselling, training, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour
- h) whether the issue/s giving rise to the complaint have previously been addressed or resolved
- i) any previous proven breaches of the council's code of conduct
- j) whether the conduct complained of forms part of an ongoing pattern of behaviour
- k) whether there were mitigating circumstances giving rise to the conduct complained of
- l) the seriousness of the alleged conduct (having regard to the criteria specified in clause 6.23)
- m) the significance of the conduct or the impact of the conduct for the council
- n) how much time has passed since the alleged conduct occurred
- o) such other considerations that the conduct reviewer considers may be relevant to the assessment of the complaint.

**PART 7 INVESTIGATIONS OF CODE OF CONDUCT COMPLAINTS
ABOUT COUNCILLORS OR THE GENERAL MANAGER**What matters may a conduct reviewer investigate?

- 7.1 A conduct reviewer (hereafter referred to as an “investigator”) may investigate a code of conduct complaint that has been referred to them by the complaints coordinator and any matters related to or arising from that complaint.
- 7.2 Where an investigator identifies further separate possible breaches of the code of conduct that are not related to or arise from the code of conduct complaint that has been referred to them, they are to report the matters separately in writing to the general manager, or, in the case of alleged conduct on the part of the general manager, to the mayor.
- 7.3 The general manager or the mayor or their delegate is to deal with a matter reported to them by an investigator under clause 7.2 as if it were a new code of conduct complaint in accordance with these procedures.

How are investigations to be commenced?

- 7.4 The investigator must at the outset of their investigation provide a written notice of investigation to the respondent. The notice of investigation must:
- a) disclose the substance of the allegations against the respondent, and
 - b) advise of the relevant provisions of the code of conduct that apply to the alleged conduct, and
 - c) advise of the process to be followed in investigating the matter, and
 - d) advise the respondent of the requirement to maintain confidentiality, and
 - e) invite the respondent to make a written submission in relation to the matter within at least 14 days or such other period specified by the investigator in the notice, and
 - f) provide the respondent the opportunity to address the investigator on the matter within such reasonable time specified in the notice.
- 7.5 The respondent may, within 7 days of receipt of the notice of investigation, request in writing that the investigator provide them with such further information they consider necessary to assist them to identify the substance of the allegation against them. An investigator will only be obliged to provide such information that the investigator considers reasonably necessary for the respondent to identify the substance of the allegation against them.
- 7.6 An investigator may at any time prior to issuing a draft report, issue an amended notice of investigation to the respondent in relation to the matter referred to them.

- 7.7 Where an investigator issues an amended notice of investigation, they must provide the respondent with a further opportunity to make a written submission in response to the amended notice of investigation within at least 14 days or such other period specified by the investigator in the amended notice.
- 7.8 The investigator must also, at the outset of their investigation, provide written notice of the investigation to the complainant, the complaints coordinator and the general manager, or in the case of a complaint about the general manager, to the complainant, the complaints coordinator and the mayor. The notice must:
- a) advise them of the matter the investigator is investigating, and
 - b) in the case of the notice to the complainant, advise them of the requirement to maintain confidentiality, and
 - c) invite the complainant to make a written submission in relation to the matter within at least 14 days or such other period specified by the investigator in the notice.

Written and oral submissions

- 7.9 Where the respondent or the complainant fails to make a written submission in relation to the matter within the period specified by the investigator in their notice of investigation or amended notice of investigation, the investigator may proceed to prepare their draft report without receiving such submissions.
- 7.10 The investigator may accept written submissions received outside the period specified in the notice of investigation or amended notice of investigation.
- 7.11 Prior to preparing a draft report, the investigator must give the respondent an opportunity to address the investigator on the matter being investigated. The respondent may do so in person or by telephone or other electronic means.
- 7.12 Where the respondent fails to accept the opportunity to address the investigator within the period specified by the investigator in the notice of investigation, the investigator may proceed to prepare a draft report without hearing from the respondent.
- 7.13 Where the respondent accepts the opportunity to address the investigator in person, they may have a support person or legal adviser in attendance. The support person or legal adviser will act in an advisory or support role to the respondent only. They must not speak on behalf of the respondent or otherwise interfere with or disrupt proceedings.
- 7.14 The investigator must consider all written and oral submissions made to them in relation to the matter.

How are investigations to be conducted?

- 7.15 Investigations are to be undertaken without undue delay.
- 7.16 Investigations are to be undertaken in the absence of the public and in confidence.
- 7.17 Investigators must make any such enquiries that may be reasonably necessary to establish the facts of the matter.
- 7.18 Investigators may seek such advice or expert guidance that may be reasonably necessary to assist them with their investigation or the conduct of their investigation.
- 7.19 An investigator may request that the complaints coordinator provide such further information that the investigator considers may be reasonably necessary for them to establish the facts of the matter. The complaints coordinator will, as far as is reasonably practicable, provide the information requested by the investigator.

Referral or resolution of a matter after the commencement of an investigation

- 7.20 At any time after an investigator has issued a notice of investigation and before they have issued a draft report, an investigator may determine to:
- a) resolve the matter by alternative and appropriate strategies such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour, or
 - b) refer the matter to the general manager, or, in the case of a complaint about the general manager, to the mayor, for resolution by alternative and appropriate strategies such as, but not limited to, explanation, counselling, training, mediation, informal discussion, negotiation, a voluntary apology or an undertaking not to repeat the offending behaviour, or
 - c) refer the matter to an external agency.
- 7.21 Where an investigator determines to exercise any of the options under clause 7.20 after the commencement of an investigation, they must do so in accordance with the requirements of Part 6 of these procedures relating to the exercise of these options at the preliminary assessment stage.
- 7.22 The resolution of a code of conduct complaint under clause 7.20, paragraphs (a) or (b) is not to be taken as a determination that there has been a breach of the council's code of conduct.
- 7.23 Where an investigator determines to exercise any of the options under clause 7.20 after the commencement of an investigation, they may by written notice to the respondent, the complainant, the complaints coordinator and the general manager, or in the case of a complaint about

the general manager, to the respondent, the complainant, the complaints coordinator and the mayor, discontinue their investigation of the matter.

- 7.24 Where the investigator discontinues their investigation of a matter under clause 7.23, this shall finalise the consideration of the matter under these procedures.
- 7.25 An investigator is not obliged to give prior notice to or to consult with any person before making a determination to exercise any of the options under clause 7.20 or to discontinue their investigation except as may be specifically required under these procedures.

Draft investigation reports

- 7.26 When an investigator has completed their enquiries and considered any written or oral submissions made to them in relation to a matter, they must prepare a draft of their proposed report.
- 7.27 The investigator must provide their draft report to the respondent and invite them to make a written submission in relation to it within at least 14 days or such other period specified by the investigator.
- 7.28 Where the investigator proposes to make adverse comment about any other person (an affected person) in their report, they must also provide the affected person with relevant extracts of their draft report containing such comment and invite the affected person to make a written submission in relation to it within at least 14 days or such other period specified by the investigator.
- 7.29 The investigator must consider written submissions received in relation to the draft report prior to finalising their report in relation to the matter.
- 7.30 The investigator may, after consideration of all written submissions received in relation to their draft report, make further enquiries into the matter. If, as a result of making further enquiries, the investigator makes any material change to their proposed report that makes new adverse comment about the respondent or an affected person, they must provide the respondent or affected person as the case may be with a further opportunity to make a written submission in relation to the new adverse comment.
- 7.31 Where the respondent or an affected person fails to make a written submission in relation to the draft report within the period specified by the investigator, the investigator may proceed to prepare and issue their final report without receiving such submissions.
- 7.32 The investigator may accept written submissions in relation to the draft report received outside the period specified by the investigator at any time prior to issuing their final report.

Final investigation reports

- 7.33 Where an investigator issues a notice of investigation they must prepare a final report in relation to the matter unless the investigation is discontinued under clause 7.23.
- 7.34 An investigator must not prepare a final report in relation to the matter at any time before they have finalised their consideration of the matter in accordance with the requirements of these procedures.
- 7.35 The investigator's final report must:
- a) make findings of fact in relation to the matter investigated, and,
 - b) make a determination that the conduct investigated either,
 - i. constitutes a breach of the code of conduct, or
 - ii. does not constitute a breach of the code of conduct, and
 - c) provide reasons for the determination.
- 7.36 Where the investigator determines that the conduct investigated constitutes a breach of the code of conduct, the investigator may make one or more of the following recommendations:
- a) that the council revise any of its policies, practices or procedures
 - b) that the respondent undertake any training or other education relevant to the conduct giving rise to the breach
 - c) that the respondent be counselled for their conduct
 - d) that the respondent be removed from membership of a committee of the council or any other body or organisation that the respondent serves on as the council's representative
 - e) that the respondent gives an undertaking not to repeat the offending behaviour in such time and form specified by the recommendation
 - f) that the respondent apologise to any person or organisation affected by the breach in such a time and form specified by the recommendation
 - g) that findings of inappropriate conduct be made public by publishing the investigator's findings and determination in the minutes of the council meeting at which the matter is considered
 - h) in the case of a breach by the general manager, that action be taken under the general manager's contract
 - i) in the case of a breach by a councillor, that the councillor be formally censured for the breach under section 440G of the LGA
 - j) in the case of a breach by a councillor, that the council resolves as follows:
 - i. that the councillor be formally censured for the breach under section 440G of the LGA, and
 - ii. that the matter be referred to the Office for further action under the misconduct provisions of the LGA.
- 7.37 Where the investigator determines that the conduct investigated does not constitute a breach of the code of conduct, the investigator may make one or more of the following recommendations:

- a) that the council revise any of its policies, practices or procedures
- b) that a person or persons undertake any training or other education.

7.38 In making a recommendation under clause 7.36, the investigator may have regard to the following:

- a) the seriousness of the breach
- b) whether the breach can be easily remedied or rectified
- c) whether the respondent has remedied or rectified their conduct
- d) whether the respondent has expressed contrition
- e) whether there were any mitigating circumstances
- f) the age, physical or mental health or special infirmity of the respondent
- g) whether the breach is technical or trivial only
- h) any previous proven breaches
- i) whether the breach forms part of an ongoing pattern of behaviour
- j) the degree of reckless intention or negligence of the respondent
- k) the extent to which the breach has affected other parties or the council as a whole
- l) the harm or potential harm to the reputation of the council or local government in general arising from the conduct
- m) whether the findings and recommendations can be justified in terms of the public interest and would withstand public scrutiny
- n) whether an educative approach would be more appropriate than a punitive one
- o) the relative costs and benefits of taking formal disciplinary action as opposed to taking no action or taking informal action
- p) what action or remedy would be in the public interest.

7.39 Where the investigator proposes to make a recommendation under clause 7.36(j), the investigator must first consult with the Office on their proposed findings, determination and recommendation prior to finalising their report, and must take any comments by the Office into consideration when finalising their report.

7.40 At a minimum, the investigator's final report must contain the following information:

- a) a description of the allegations against the respondent
- b) the relevant provisions of the code of conduct that apply to the alleged conduct investigated
- c) a statement of reasons as to why the matter warranted investigation (having regard to the criteria specified in clause 6.23)
- d) a statement of reasons as to why the matter was one that could not or should not be resolved by alternative means
- e) a description of any attempts made to resolve the matter by use of alternative means
- f) the steps taken to investigate the matter
- g) the facts of the matter

- h) the investigator's findings in relation to the facts of the matter and the reasons for those findings
- i) the investigator's determination and the reasons for that determination
- j) any recommendations.

7.41 The investigator must provide a copy of their report to the complaints coordinator and the respondent.

7.42 At the time the investigator provides a copy of their report to the complaints coordinator and the respondent, the investigator must provide the complainant with a written statement containing the following information:

- a) the investigator's findings in relation to the facts of the matter and the reasons for those findings
- b) the investigator's determination and the reasons for that determination
- c) any recommendations, and
- d) such other additional information that the investigator considers may be relevant.

7.43 Where the investigator has determined that there has not been a breach of the code of conduct, the complaints coordinator must provide a copy of the investigator's report to the general manager or, where the report relates to the general manager's conduct, to the mayor, and this will finalise consideration of the matter under these procedures.

7.44 Where the investigator has determined that there has been a breach of the code of conduct and makes a recommendation or recommendations under clause 7.36, paragraph (a) only, the complaints coordinator must provide a copy of the investigator's report to the general manager. Where the general manager agrees with the recommendation/s, the general manager is responsible for implementing the recommendation/s.

7.45 Where the investigator has determined that there has been a breach of the code of conduct and makes a recommendation or recommendations under clause 7.36, paragraphs (b) or (c) only, the complaints coordinator must provide a copy of the investigator's report to the general manager or, where the report relates to the general manager's conduct, to the mayor. The general manager is responsible for arranging the implementation of the recommendation/s where the report relates to a councillor's conduct. The mayor is responsible for arranging the implementation of the recommendation/s where the report relates to the general manager's conduct.

7.46 Where the investigator has determined that there has been a breach of the code of conduct and makes a recommendation or recommendations under clause 7.36, paragraphs (d) to (j) (whether or not in conjunction with recommendations made under clause 7.36, paragraphs (a) to (c)), the complaints coordinator must, where practicable, arrange for the

investigator's report to be reported to the next ordinary council meeting for the council's consideration, unless the meeting is to be held within the 4 weeks prior to an ordinary local government election, in which case the report must be reported to the first ordinary council meeting following the election.

Consideration of the final investigation report by council

- 7.47 The role of the council in relation to a final investigation report is to impose a sanction if the investigator has determined that there has been a breach of the code of conduct and has made a recommendation in their final report under clause 7.36, paragraphs (d) to (j) (whether or not in conjunction with recommendations made under clause 7.36, paragraphs (a) to (c)).
- 7.48 The council is to close its meeting to the public to consider the final investigation report in cases where it is permitted to do so under section 10A of the LGA.
- 7.49 Where the complainant is a councillor, they must absent themselves from the meeting and take no part in any discussion or voting on the matter. The complainant councillor may absent themselves without making any disclosure of interest in relation to the matter unless otherwise required to do so under the code of conduct.
- 7.50 Prior to imposing a sanction, the council must provide the respondent with an opportunity to make a submission to the council. A submission may be made orally or in writing. The respondent is to confine their submission to addressing the investigator's recommendation/s.
- 7.51 Once the respondent has made their submission they must absent themselves from the meeting and, where they are a councillor, take no part in any discussion or voting on the matter.
- 7.52 The council must not invite submissions from other persons for the purpose of seeking to rehear evidence previously considered by the investigator.
- 7.53 Prior to imposing a sanction, the council may by resolution:
- a) request that the investigator make additional enquiries and/or provide additional information to it in a supplementary report, or
 - b) seek an opinion from the Office in relation to the report.
- 7.54 The council may, by resolution, defer further consideration of the matter pending the receipt of a supplementary report from the investigator or an opinion from the Office.
- 7.55 The investigator may make additional enquiries for the purpose of preparing a supplementary report.

- 7.56 Where the investigator prepares a supplementary report, they must provide copies to the complaints coordinator who shall provide a copy each to the council and the respondent.
- 7.57 The investigator is not obliged to notify or consult with any person prior to submitting the supplementary report to the complaints coordinator.
- 7.58 The council is only required to provide the respondent a further opportunity to make an oral or written submission on a supplementary report if the supplementary report contains new information that is adverse to them.
- 7.59 A council may by resolution impose one or more of the following sanctions on a respondent:
- a) that the respondent undertake any training or other education relevant to the conduct giving rise to the breach
 - b) that the respondent be counselled for their conduct
 - c) that the respondent be removed from membership of a committee of the council or any other body or organisation that the respondent serves on as the council's representative
 - d) that the respondent gives an undertaking not to repeat the offending behaviour in such time and form specified by the resolution
 - e) that the respondent apologise to any person or organisation affected by the breach in such a time and form specified by the resolution
 - f) that findings of inappropriate conduct be made public by publishing the investigator's findings and determination in the minutes of the meeting
 - g) in the case of a breach by the general manager, that action be taken under the general manager's contract for the breach
 - h) in the case of a breach by a councillor, that the councillor be formally censured for the breach under section 440G of the LGA
 - i) in the case of a breach by a councillor:
 - i. that the councillor be formally censured for the breach under section 440G of the LGA, and
 - ii. that the matter be referred to the Office for further action under the misconduct provisions of the LGA.
- 7.60 The council is not obliged to adopt the investigator's recommendation/s. Where the council proposes not to adopt one or more of the investigator's recommendation/s, the council must resolve not to adopt the recommendation/s and state in its resolution the reasons for its decision.
- 7.61 Where the council proposes to impose a sanction on the respondent under clause 7.59 that is different to the sanction recommended by the investigator in their final report, the council must state in its resolution the reasons for its decision.

- 7.62 Where the council resolves not to adopt the investigator's recommendation/s or imposes a sanction on the respondent under clause 7.59 that is different to the sanction recommended by the investigator, the complaints coordinator must notify the Office of the council's decision and the reasons for it.

PART 8 OVERSIGHT AND RIGHTS OF REVIEW

The Office's powers of review

- 8.1 The Office may, at any time, whether or not in response to a request, review the consideration of a matter under a council's code of conduct where it is concerned that a person has failed to comply with a requirement prescribed under these procedures or has misinterpreted or misapplied the standards of conduct prescribed under the code of conduct in their consideration of a matter.
- 8.2 The Office may direct any person, including the council, to defer taking further action in relation to a matter under consideration under the council's code of conduct pending the completion of its review. Any person the subject of a direction must comply with the direction.
- 8.3 Where the Office undertakes a review of a matter under clause 8.1, it will notify the complaints coordinator and any other affected persons, of the outcome of the review.

Complaints about conduct reviewers

- 8.4 The general manager or their delegate must refer code of conduct complaints about conduct reviewers to the Office for its consideration.
- 8.5 The general manager must notify the complainant of the referral of their complaint about the conduct reviewer in writing.
- 8.6 The general manager must implement any recommendation made by the Office as a result of its consideration of a complaint about a conduct reviewer.

Practice rulings

- 8.7 Where a respondent and an investigator are in dispute over a requirement under these procedures, either person may make a request in writing to the Office to make a ruling on a question of procedure (a practice ruling).
- 8.8 Where the Office receives a request in writing for a practice ruling, the Office may provide notice in writing of its ruling and the reasons for it to the person who requested it and to the investigator, where that person is different.

8.9 Where the Office makes a practice ruling, all parties must comply with it.

8.10 The Office may decline to make a practice ruling. Where the Office declines to make a practice ruling, it will provide notice in writing of its decision and the reasons for it to the person who requested it and to the investigator, where that person is different.

Review of decisions to impose sanctions

8.11 A person who is the subject of a sanction imposed under Part 7 of these procedures other than one imposed under clause 7.59, paragraph (i), may, within 28 days of the sanction being imposed, seek a review of the investigator's determination and recommendation by the Office.

8.12 A review under clause 8.11 may be sought on the following grounds:

- a) that the investigator has failed to comply with a requirement under these procedures, or
- b) that the investigator has misinterpreted or misapplied the standards of conduct prescribed under the code of conduct, or
- c) that in imposing its sanction, the council has failed to comply with a requirement under these procedures.

8.13 A request for a review made under clause 8.11 must be made in writing and must specify the grounds upon which the person believes the investigator or the council has erred.

8.14 The Office may decline to conduct a review, in cases where the grounds upon which the review is sought are not sufficiently specified.

8.15 The Office may undertake a review of a matter without receiving a request under clause 8.11.

8.16 The Office will undertake a review of the matter on the papers. However, the Office may request that the complaints coordinator provide such further information that the Office considers reasonably necessary for it to review the matter. The complaints coordinator must, as far as is reasonably practicable, provide the information requested by the Office.

8.17 Where a person requests a review under clause 8.11, the Office may direct the council to defer any action to implement a sanction. The council must comply with a direction to defer action by the Office.

8.18 The Office must notify the person who requested the review and the complaints coordinator of the outcome of the Office's review in writing and the reasons for its decision. In doing so, the Office may comment on any other matters the Office considers to be relevant.

8.19 Where the Office considers that the investigator or the council has erred, the Office may recommend that a decision to impose a sanction under these procedures be reviewed.

8.20 In the case of a sanction implemented by the general manager or mayor under clause 7.45, where the Office recommends that the decision to impose a sanction be reviewed:

- a) the complaints coordinator must provide a copy of the Office's determination in relation to the matter to the general manager or the mayor, and
- b) the general manager or mayor must review any action taken by them to implement the sanction, and
- c) the general manager or mayor must consider the Office's recommendation in doing so.

8.21 In the case of a sanction imposed by the council by resolution under clause 7.59, where the Office recommends that the decision to impose a sanction be reviewed:

- a) the complaints coordinator must, where practicable, arrange for the Office's determination to be tabled at the next ordinary council meeting unless the meeting is to be held within the 4 weeks prior to an ordinary local government election, in which case it must be tabled at the first ordinary council meeting following the election, and
- b) the council must:
 - i. review its decision to impose the sanction, and
 - ii. consider the Office's recommendation in doing so, and
 - iii. resolve to either rescind or reaffirm its previous resolution in relation to the matter.

8.22 Where, having reviewed its previous decision in relation to a matter under clause 8.21, the council resolves to reaffirm its previous decision, the council must state in its resolution its reasons for doing so.

PART 9 PROCEDURAL IRREGULARITIES

9.1 A failure to comply with these procedures does not, on its own, constitute a breach of the code of conduct, except as may be otherwise specifically provided under the code of conduct.

9.2 A failure to comply with these procedures will not render a decision made in relation to a matter invalid where:

- a) the non-compliance is isolated and/or minor in nature, or
- b) reasonable steps are taken to correct the non-compliance, or
- c) reasonable steps are taken to address the consequences of the non-compliance.

PART 10 PRACTICE DIRECTIONS

10.1 The Office may at any time issue a practice direction in relation to the application of these procedures.

10.2 The Office will issue practice directions in writing, by circular to all councils.

10.3 All persons performing a function prescribed under these procedures must consider the Office's practice directions when performing the function.

PART 11 REPORTING STATISTICS ON CODE OF CONDUCT COMPLAINTS ABOUT COUNCILLORS AND THE GENERAL MANAGER

11.1 The complaints coordinator must arrange for the following statistics to be reported to the council within 3 months of the end of September of each year:

- a) the total number of code of conduct complaints made about councillors and the general manager under the code of conduct in the year to September (the reporting period)
- b) the number of code of conduct complaints referred to a conduct reviewer during the reporting period
- c) the number of code of conduct complaints finalised by a conduct reviewer at the preliminary assessment stage during the reporting period and the outcome of those complaints
- d) the number of code of conduct complaints investigated by a conduct reviewer during the reporting period
- e) without identifying particular matters, the outcome of investigations completed under these procedures during the reporting period
- f) the number of matters reviewed by the Office during the reporting period and, without identifying particular matters, the outcome of the reviews, and
- g) the total cost of dealing with code of conduct complaints made about councillors and the general manager during the reporting period, including staff costs.

11.2 The council is to provide the Office with a report containing the statistics referred to in clause 11.1 within 3 months of the end of September of each year.

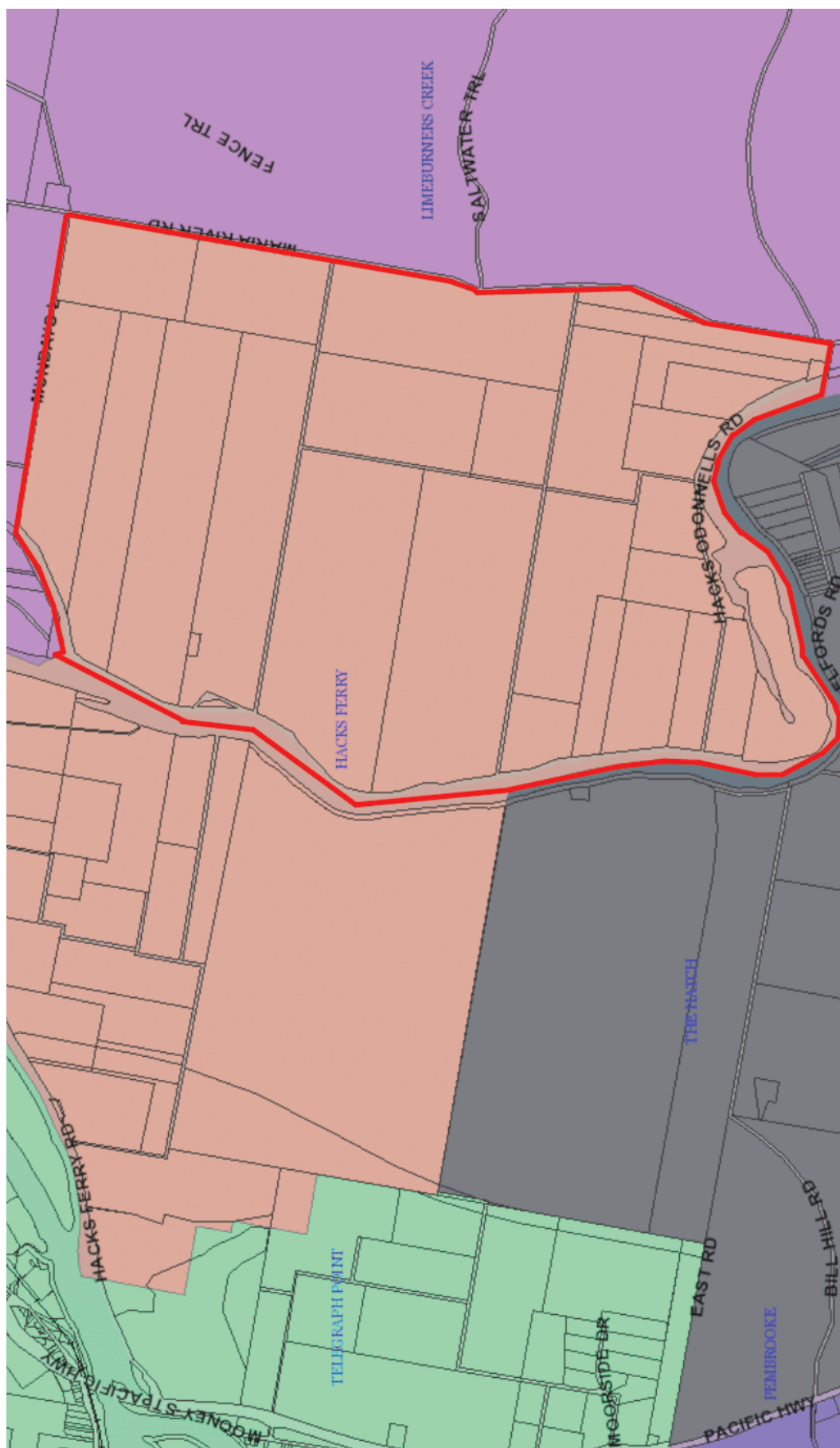
PART 12 CONFIDENTIALITY

12.1 Information about code of conduct complaints and the management and investigation of code of conduct complaints is to be treated as confidential and is not to be publicly disclosed except as may be otherwise specifically required or permitted under these procedures.

12.2 Where a complainant publicly discloses information on one or more occasions about a code of conduct complaint they have made or purported to make, the general manager or their delegate may, with the

consent of the Office, determine that the complainant is to receive no further information about their complaint and any future code of conduct complaint they make or purport to make.

- 12.3 Prior to seeking the Office's consent under clause 12.2, the general manager or their delegate must give the complainant written notice of their intention to seek the Office's consent, invite them to make a written submission within at least 14 days or such other period specified by the general manager or their delegate, and consider any submission made by them.
- 12.4 In giving its consent under clause 12.2, the Office must consider any submission made by the complainant to the general manager or their delegate.
- 12.5 The general manager or their delegate must give written notice of a determination made under clause 12.2 to:
- a) the complainant
 - b) the complaints coordinator
 - c) the Office, and
 - d) any other person the general manager or their delegate considers should be notified of the determination.
- 12.6 Any requirement under these procedures that a complainant is to be provided with information about a code of conduct complaint that they have made or purported to make, will not apply to a complainant the subject of a determination made by the general manager or their delegate under clause 12.2.
- 12.7 Clause 12.6 does not override any entitlement a person may have to access to council information under the *Government Information (Public Access) Act 2009* or to receive information under the *Public Interest Disclosures Act 1994* in relation to a complaint they have made.



DISCLAIMER

DISCLAIMER
This map was prepared by the Geographic Information Services section of the Hastings Council and is not a legal document. It was prepared from data supplied by the Department of Land and Natural Resources. The data was captured at a scale of 1:250,000 for urban areas and 1:400,000 for urban areas. The positional accuracy of plots becomes less reliable the further they are from the coast. The map is not intended to be used for legal purposes. It is not responsible if a plot is greater than the plot's scale. Port Macquarie-Hastings Council accepts no responsibility either in contract or tort and particularly in negligence for any errors, omissions or inaccuracies which may be contained within or arising from this map. No information could be obtained from the Port Macquarie-Hastings Council to update it.

Part of Hacks Ferry to be renamed

PORT MACQUARIE
HASTINGS

Printed on 01/02/2016
Compiled by lanR

Item 09.06
Attachment 1

BUDGET VARIATIONS - APRIL 2019												
Section	Project Description	Capital/ Operating	Item	Report Note No	Full Year Original Budget	Full Year Current Budget	Actuals to 30 April 2019	New Yearly Proposed Budget - April 2019	Movement	Funding Source	EFFECT ON FUNDING POSITION	Comment
Corporate Performance												
Corporate Performance Management	00181 Corporate Performance Management	Operating	Result	Result	785,890	785,890	493,359	685,890	100,000	Revenue	100,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Corporate Performance Management	10430 Overhead Income - Corporate Performance Management	Operating	Result	Result	-855,852	-855,852	-641,889	-837,852	-18,000	Revenue	-18,000	A reduction in expenses for Corporate Performance Management requires a reduction in the overhead income.
General Manager	00398 Allowance for Vacancies	Operating	Result	Result	-300,000	-300,000		0	-300,000	Revenue	-300,000	Council included a budget of \$300k in the original budget for staff vacancies. As salary budgets have been reduced in this review this budget can be deleted.
Governance & Executive	10885 Insurance Rebate	Operating	Result	Result	-40,000	-40,000	-58,605	-58,605	18,605	Revenue	18,605	Council has received an insurance rebate from Statewide Mutual
Governance & Executive	00294 Governance & Executive Services	Operating	Result	Result	389,524	389,524	262,471	349,524	40,000	Revenue	40,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Governance & Executive	10990 Overhead Income - Governance & Executive Services	Operating	Result	Result	-827,949	-827,949	-620,964	-800,793	-27,156	Revenue	-27,156	A reduction in expenses for Governance & Executive Services requires a reduction in the overhead income.
Procurement & Stores	00328 Procurement	Operating	Result	Result	591,834	591,834	375,131	531,834	60,000	Revenue	60,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Procurement & Stores	10930 Overhead Income - Procurement	Operating	Result	Result	-1,005,331	-1,005,331	-717,420	-989,131	-16,200	Revenue	-16,200	A reduction in expenses for Procurement requires a reduction in the overhead income.
The Glasshouse	41910 Glasshouse Studio Performance Space Seating Upgrade	Capital	a	1				138,328	-138,328	Grant/Reserve	0	Council has received a grant from the NSW Dept Planning and Environment for this project.
The Glasshouse	19086 Grants Capital - Glasshouse	Capital	a	1				-127,828	127,828	Grant	0	This is to recognise the grant from the NSW Dept Planning & Environment for project 41910 Glasshouse Studio Seating
The Glasshouse	19090 Unexpended Contribution Restriction	Operating	a	1				-7,371	7,371	Contribution	0	Council has been holding funds for the seat Endowment Program for some time. The remaining funds will be used to support 41910 Glasshouse Seating Upgrade.
The Glasshouse	41101 The Glasshouse - Technical Equipment Purchases	Capital	a	1	56,000	56,000	5,101	52,871	3,129	Reserve	0	These funds have been transferred to 41910 Glasshouse Seating Upgrade in line with the grant agreement.

BUDGET VARIATIONS - APRIL 2019													
Section	Project	Project Description	Capital/ Operating	Item	Report Note No	Full Year Original Budget	Full Year Current Budget	Actuals to 30 April 2019	New Yearly Proposed Budget - April 2019	Movement	Funding Source	EFFECT ON FUNDING POSITION	EFFECT Comment
Corporate Performance Total													
Corporate													
Nil													
Corporate Total													
Strategy and Growth													
Community Place	10240	Grants Operating - Youth Worker	Operating	Result	Result			-92,361	-92,361	92,361	Revenue	92,361	Council received grant funds towards the employment of a youth worker. The salary for this worker was included in Council's original budget so these grant funds can go into consolidated revenue.
Community Place	41919	Hamilton Green Enhancement Project	Operating	b	1				30,000	-30,000	Grant	0	The Rotary Group has secured funding for this project and passed it onto council to undertake the works.
Community Place		Grant Funding - Community Place	Operating	b	1				-30,000	30,000	Grant	0	This is to recognise the grant funding for 41919 Hamilton Green Enhancement Project
Development Contributions	10410	Section 7.11 - Roadworks	Operating	c	4	-3,394,250	-3,394,250	-3,830,085	-4,230,085	835,835	S7.11	0	
Development Contributions	10320	Section 7.11 - Admin Levy	Operating	c	4	-200,000	-200,000	-166,640	-275,000	75,000	S7.11	0	
Development Contributions	10390	Section 7.11 - Car Parking	Operating	c	4		-44,780	-112,414	-112,414	67,634	S7.11	0	
Development Contributions	10400	Section 7.11 - Open Space	Operating	c	4	-2,096,202	-2,096,202	-2,078,546	-2,300,000	203,798	S7.11	0	The receipt of S7.11 contributions has been higher than originally anticipated.
Development Contributions	10350	Section 7.11 - Community Facilities	Operating	c	4	-2,283,030	-2,750,000	-2,734,952	-3,000,000	250,000	S7.11	0	
Development Contributions	10415	Section 7.11 - Voluntary Planning Agreements	Operating	c	4		-327,926	-410,873	-410,873	82,947	S7.11	0	
Development Contributions	09050	Transfer to S7.11 Restricted Asset	Operating	c	4	8,373,482	9,542,076		11,057,290	-1,515,214	S7.11	0	
Strategy and Growth Total													
Development & Environment													
Environment & Compliance	00234	Building Regulation Services	Operating	Result	Result	863,842	863,842	683,923	833,842	30,000	Revenue	30,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Building Certification	00236	Building Certification Expenses	Operating	Result	Result	1,002,682	1,002,682	818,641	912,682	90,000	Revenue	90,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Development Assessment	00255	Development Assessment Expenses	Operating	Result	Result	1,455,826	1,455,826	826,628	1,205,826	250,000	Revenue	250,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.

BUDGET VARIATIONS - APRIL 2019												
Section	Project Description	Capital/ Operating	Item	Report Note No	Full Year Original Budget	Full Year Current Budget	Actuals to 30 April 2019	New Yearly Proposed Budget - April 2019	Movement	Funding Source	EFFECT ON FUNDING POSITION	EFFECT Comment
Development Engineering	11130 Construction Certificate Income	Operating	Result	Result	-490,000	-490,000	-231,050	-330,000	-160,000	Revenue	-160,000	The slow down of the property market has resulted in a drop in expected income in this area.
Development Engineering	00336 Engineering Development	Operating	Result	Result	1,031,011	1,031,011	790,043	991,011	40,000	Revenue	40,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Facilities	41747 Shelly Beach Reserve - Replace Public Amenities	Capital	d	6			2,871	2,871	-2,871	Revenue	-2,871	This is to cover minor finalisation costs for this project. The funds have been transferred from maintenance allocations
Facilities	00421 Port Macquarie Building Maintenance	Capital	d	6	683,500	683,500	585,671	680,629	2,871	Revenue	2,871	These funds have been transferred to 41747 Shelly Beach Reserve Amenities
Natural Resources	00392 Bush Regeneration	Capital	Result	Result	481,336	481,336	300,176	421,336	60,000	Revenue	60,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Parks & Reserves	41859 Stuart Park - Regional Sporting Precinct	Capital	e	6	1,540,000	1,540,000	36,047	580,000	960,000	Grant	0	This project is made up of a number of components. For ease of tracking expenditure the Engineers has requested that this project be split into the two major components.
Parks & Reserves	41922 Upgrade Wood Street, Port Macquarie	Capital	e	6				960,000	-960,000	Grant	0	These grant funds have been transferred from 41859 Stuart Park so that expenditure on this component of the project can be tracked more easily.
Parks & Reserves	11545 Employment Training Grant - Parks & Reserves	Operating	Result	Result			-7,500	-7,500	7,500	Revenue	7,500	Council has received an employment training grant from Nova Skills for workers within the parks and recreation section.
Parks & Reserves	41757 Sanroxx Reserve Colvin Street - Playground Replacement	Capital	Result	Result			1,232	1,232	-1,232	Revenue	-1,232	This is to cover minor finalisation costs on this project.
Natural Resources	41885 Lakeside Woods Fire Trail Mice VPA	Operating	f	4A			868	1,980	-1,980	S94	0	Council has received VPA funding for this project.
Natural Resources	19236 S94 Funding - Natural Resources	Operating	f	4A		-60,215		-62,195	1,980	S94	0	This is to recognise the use of S94 Funding for project Lakeside Woods Fire Trail Maintenance
Waste Management	11650 Carbon Credits	Operating	g	2	-100,000	-100,000	-169,050	-169,050	69,050	Revenue	69,050	Council has received income from the Clean Energy Regulator for the sale of Carbon Credits.
Waste Management	09400 Transfer to Reserve - Carbon Credits	Operating	g	2	100,000	100,000		169,050	-69,050	Revenue	-69,050	The sale of carbon credits is transferred to reserve to allow Council to undertake environmentally sustainable projects such as solar power installations.

BUDGET VARIATIONS - APRIL 2019													
Section	Project	Project Description	Capital/ Operating	Item	Report Note No	Full Year Original Budget	Full Year Current Budget	Actuals to 30 April 2019	New Yearly Proposed Budget - April 2019	Movement	Funding Source	EFFECT ON FUNDING POSITION	Comment
Waste Management	11690	Cairncross Waste Depot Income	Operating	h	2	-5,508,000	-5,508,000	-5,126,546	-5,960,000	452,000	Revenue	452,000	This increase is primarily due to large quantities of concrete from the PM Waste Depot site being deposited at Cairncross along with increased usage.
	00745	Cairncross Waste Depot Expenditure	Operating	h	2	1,970,500	1,970,500	1,706,325	2,050,000	-79,500	Revenue	-79,500	Increased usage at the Cairncross Waste Depot has increased the costs at this site.
	09400	Transfer to Reserve - Waste Management	Operating	h	2	2,449,050	2,349,415		2,720,915	-372,500	Revenue	-372,500	Any additional revenue within the waste fund must be transferred to the waste reserve for future capital works.
Development & Environment Total										316,268		316,268	
Infrastructure													
Bushfire Control	41914	Hollisdale Rural Fire Service Shed	Capital	i	1				14,727	-14,727	Grant/Revenue	-147	Council has received a grant from the Department of Industry for the extension to the Hollisdale Bushfire Shed
Bushfire Control	19252	Grants - Bushfire Control	Capital	i	1	-350,000	-702,478	-717,058	-717,058	14,580	Grant	0	This is to recognise the grant received from the Department of Industry for 41914 Hollisdale RFS Shed
Bushfire Control	00427	Bushfire Control Management	Operating	i	1	514,900	514,900	489,304	514,753	147	Revenue	147	These funds have been transferred to 41914 to enable the finalisation of the project.
Bushfire Control	00427	Bushfire Fighting Fund	Operating	Result	Result	480,000	480,000	458,415	458,415	21,585	Revenue	21,585	
SES & Public Safety	00424	Cont to NSW State Emergency Services	Operating	Result	Result	135,000	135,000	108,411	108,411	26,589	Revenue	26,589	The final payment has been made to Revenue NSW for the Emergency Services Levies.
SES & Public Safety	00428	NSW Fire Brigade Contributions	Operating	Result	Result	360,000	360,000	342,767	342,767	17,233	Revenue	17,233	
Water Supply	11340	Developer Contributions - Water	Operating	j	4	-5,000,000	-5,000,000	-4,612,989	-5,100,000	100,000	Revenue	100,000	The receipt of S64 contributions has been greater than anticipated.
Water Supply	09201	Transfer to S64 Restricted Asset - Water Supply	Operating	j	4	5,000,000	5,000,000		5,100,000	-100,000	Revenue	-100,000	Additional S64 revenue has to be transferred to the S64 restricted asset.
Infrastructure Delivery	00405	Infrastructure Delivery Management	Operating	Result	Result	647,290	647,290	419,147	577,290	70,000	Revenue	70,000	A detailed review of salary allocations has been undertaken. Due to staff vacancies and leave taken this budget will not be fully spent this financial year.
Infrastructure Delivery	11241	Overhead income - Infrastructure Projects Management	Operating	Result	Result	-1,002,950	-1,002,950	-752,211	-980,350	-12,600	Revenue	-12,600	A reduction in expenses for Infrastructure Delivery Management requires a reduction in the overhead income.
Infrastructure Total										122,807		122,807	

BUDGET VARIATIONS - APRIL 2019											
Section	Project/Description	Capital/ Operating	Item	Report Note No	Full Year Original Budget	Full Year Current Budget	Actuals to 30 April 2019	New Yearly Proposed Budget - April 2019	Movement Funding Source	EFFECT ON FUNDING POSITION	
ORGANISATIONAL TOTAL - THIS REVIEW											
FORECAST FOR FINANCIAL YEAR ENDED 30 JUNE 2019											
	Original Budget as at 1 July 2018										
	Plus Adjustments										
	July Review										
	August Review										
	September Review										
	October Review										
	November Review										
	December Review										
	January Review										
	February Review										
	March Review										

**Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Income & Expenses**

	ANNUAL					YEAR TO DATE		CURRENT QUARTER					
	Original Budget 2018/19	Original Budget including Carry-over 2018/19 (000's)	Approved Changes Jul-Aug 18 Reviews (000's)	Approved Changes Sep-Nov 18 Reviews (000's)	Dec 18-Feb 19 Reviews (000's)	Revised Budget	Projected year end result 2018/19 (000's)	YTD Actuals (000's)	YTD Budget (000's)	Actuals as a % of Budget	Jan 19 - Mar 19 Actuals	Jan 19 - Mar 19 Budget	Actuals as a % of Budget
Income													
Rates and annual charges	97,248	97,248				97,248	97,248	95,251	95,280	100.0%	2,038	1,966	103.7%
User charges and fees	36,825	36,825	(10)		600	37,415	37,415	26,941	25,608	105.2%	10,464	9,775	107.0%
Interest and investment revenue	7,643	7,643				7,643	7,643	6,597	5,730	115.1%	2,159	1,914	112.8%
Other revenues	5,701	5,701	(108)		52	5,645	5,645	4,377	4,026	108.7%	1,504	1,352	111.2%
Grants and contributions - operating	14,944	15,447	611	147	81	16,286	16,286	9,456	6,430	147.1%	1,478	1,188	124.4%
Grants and contributions - capital	28,282	35,716	1,580	1,319	4,850	43,465	43,465	19,577	17,974	108.9%	7,614	8,260	92.2%
Total income from continuing operations	190,643	198,580	2,073	1,466	5,583	207,702	207,702	162,199	155,048	104.6%	25,257	24,455	103.3%
Expenses													
Employee costs	55,960	55,973	(3,041)	(49)	89	52,972	52,972	37,016	40,764	90.8%	11,636	13,380	87.0%
Borrowing costs	2,994	2,994				2,994	2,994	1,944	1,931	100.7%	449	461	97.4%
Materials and contracts	37,252	40,235	3,492	(825)	(990)	41,912	41,912	27,027	29,004	93.2%	10,203	9,776	104.4%
Depreciation	44,395	44,395				44,395	44,395	24,441	33,296	73.4%	144	11,098	1.3%
Other expenses	14,030	14,030	50	200		14,280	14,280	9,816	6,997	140.3%	3,374	2,022	166.9%
Net Loss/(Profit) from disposal of assets	3,000	3,000			(186)	2,814	2,814	786	2,250	34.9%	623	750	0.0%
Total expenses from continuing operations	157,631	160,627	501	(674)	(1,087)	159,367	159,367	101,030	114,242	88.4%	26,429	37,487	70.5%
Net operating result from continuing operations - Surplus/(Deficit)	33,012	37,953	1,572	2,140	6,670	48,335	48,335	61,169	40,806	149.9%	(1,172)	(13,032)	9.0%
Net operating result before capital items - Surplus/(Deficit)	4,730	2,237	(8)	821	1,820	4,870	4,870	41,592	22,832	182.2%	(8,786)	(21,292)	41.3%

Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Capital Budget (excluding Commitments)

	Original Budget 2018/19	Carry-over (000's)	Approved Changes Jul-Aug 18 (000's)	Approved Changes Sep-Nov 18 (000's)	Dec 18- Feb 19 Reviews (000's)	Revised Budget	Projected year end result 2018/19 (000's)	YTD Actuals (000's)	YTD Budget (000's)	Actuals as a % of Budget	Jan 19 - Mar 19 Actuals	Jan 19 - Mar 19 Budget	Jan 19 - Mar 19 Actuals as a % of Budget
Capital Funding													
General fund rates and environmental levy	17,879	3,405	23	1,098	(425)	21,980	21,980	12,243	14,666	83.5%	2,551	4,051	63.0%
Capital grants and contributions	14,397	7,124	1,953	1,293	4,571	29,338	29,338	6,472	9,521	68.0%	3,288	4,973	66.1%
Internal Restrictions	9,257	5,710	4,410	(2,381)	(30)	16,966	16,966	6,146	11,705	52.5%	1,192	4,121	28.9%
External Restrictions	24,271	3,449	(2,808)	6,587	(1,101)	30,398	30,398	8,977	20,307	44.2%	4,570	7,594	60.2%
S94/64 funds	7,540	4,131	256	(275)	(275)	11,652	11,652	4,454	8,568	52.0%	629	3,073	20.5%
Loans	1,500	2,904		(1,628)	(1,628)	2,776	2,776	954	1,924	49.6%	(10)	99	-10.1%
Total Capital Funding	74,844	26,723	3,834	6,597	1,112	113,110	113,110	39,246	66,691	58.8%	12,220	23,911	51.1%
Capital Expenditure													
General fund asset purchases/construction	34,587	22,351	3,834	2,412	1,246	64,430	64,430	20,208	35,493	56.9%	5,643	12,795	44.1%
Waste management asset purchases/construction	1,050	501				1,551	1,551	127	550	23.1%	38	185	20.5%
Water supply asset purchases/construction	10,381	1,711		3,300	(593)	14,799	14,799	6,303	10,106	62.4%	1,397	2,872	48.6%
Sewerage services asset purchases/construction	17,712	2,160		885	459	21,216	21,216	5,515	13,435	41.0%	3,687	6,616	55.7%
Capital Expenditure excluding Loans	63,730	26,723	3,834	6,597	1,112	101,996	101,996	32,153	59,584	54.0%	10,765	22,468	47.9%
Loan Repayments (principal)	11,114		0			11,114	11,114	7,093	7,107	99.8%	1,455	1,443	100.8%
Total Capital Expenditure	74,844	26,723	3,834	6,597	1,112	113,110	113,110	39,246	66,691	58.8%	12,220	23,911	51.1%

Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Cash & Investments

	Original Budget 2018/19 (000's)	Carry- over (000's)	Approved Changes Jul- Aug 18 Reviews (000's)	Approved Changes Sep- Nov 18 Reviews (000's)	Dec 18- Feb 19 Reviews (000's)	Revised Budget	Projected year end result 2018/19 (000's)	YTD Actuals (000's)
Unrestricted	(512)		147		7	(358)	(358)	
Externally restricted								
Developer Contributions (Incl Water & Sewer)	99,790	(4,131)	(222)	(4,225)	1,559	92,771	92,771	
Unexpended contributions	71					71	71	
Unexpended grants	5,650					5,650	5,650	
Unexpended loans	0	(2,941)				(2,941)	(2,941)	
Water Supply	57,201	(432)			320	57,089	57,089	
Sewerage Services	29,713	(2,097)			134	27,750	27,750	
Employee Leave Entitlements (Restricted)	1,155					1,155	1,155	
Special Rates	1,467				(160)	1,307	1,307	
Domestic Waste Management	13,864	(501)		(200)		13,163	13,163	
Stormwater Management	834	(80)				754	754	
Deposits & Bonds	6,888					6,888	6,888	
Total externally restricted	216,633	(10,182)	(222)	(4,425)	1,853	203,657	203,657	
Internally restricted								
Operational Reserves								
Committed Works	6,944	(3,044)		(20)	450	4,330	4,330	
Employee Leave Entitlements	5,717					5,717	5,717	
Office Building & Equipment	258	(542)	(95)			(379)	(379)	
Plant Replacement	5,047	(1,900)			(30)	3,117	3,117	
Working Capital	8,427	(1,183)				7,244	7,244	
	26,393	(6,669)	(95)	(20)	420	20,029	20,029	0
Quarantined Funds								
Crown Reserves	256	(10)				246	246	
Environment Levy	1,817	(1,368)		(131)		318	318	
Onsite Effluent	606					606	606	
Surf Clubs	701					701	701	
Tourism & Industry Promotion	355	(102)	36			289	289	
Wauchope Heated Indoor Pool	0	0				0	0	
	3,735	(1,480)	36	(131)	0	2,160	2,160	0
Roads & Infrastructure								
Asset Revaluation	135		(40)			95	95	
The Glasshouse	457					457	457	
Ferries Maintenance	1,187					1,187	1,187	
Infrastructure Priorities	1,375	(232)				1,143	1,143	
Lake Road Upgrade	182	(20)				162	162	
Major Buildings Renewals	332	(71)	(239)			22	22	
Playing Fields	300					300	300	
PM Town Centre Masterplan	1,335	(650)			583	1,268	1,268	
Road Environmental Works	75					75	75	
Regional Road Infrastructure	7,478		(338)			7,140	7,140	
Transport Infrastructure Renewal	5,294	(1,661)	(150)		(112)	3,371	3,371	
Works Associated with Developments	200					200	200	
	18,350	(2,634)	(767)	0	471	15,420	15,420	0
Council Business Units								
Airport	4,022	(164)	(10)			3,848	3,848	
Crematorium & Lawn Cemetery	1,087				(26)	1,061	1,061	
Property Investment	3,678	(28)	(1,204)		186	2,632	2,632	
	8,787	(192)	(1,214)	0	160	7,541	7,541	0
Coastal & Estuary Management								
Canal Maintenance	222	(573)			1,153	802	802	
Lake Cathie Dredging	14					14	14	
Town Beach Sand Nourishment/4WD Access	600					600	600	
	836	(573)	0	0	1,153	1,416	1,416	0
Other								
Council Election	236					236	236	
Cultural Activities	230	(80)				150	150	
HA/CC Greenmeadows	0					0	0	
PM Handa Sister City	0					0	0	
Street Lighting	780					780	780	
Town Bands	98					82	82	
	1,344	(80)	0	0	0	1,248	1,248	0
Total internally restricted	59,445	(11,628)	(2,040)	(151)	2,204	47,814	47,814	
Total restricted	276,078	(21,810)	(2,262)	(4,576)	4,057	251,471	251,471	
Total cash and investments	275,566	(21,810)	(2,115)	(4,576)	4,064	251,113	251,113	293,260
Available cash	(512)	0	147	0	7	(358)	(358)	

Total Cash & Investments per the Trial Balance 293,260
less Cash at Bank & on Hand 2,491

Total funds invested per the Investment Report 295,751

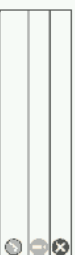
Responsible Accounting Officer Statement

All restricted funds are invested in accordance with Council's Investment Policy.
Council's cash has been reconciled to the bank statement to the 31 March 2019
The YTD Total Cash and Investments have been reconciled with funds invested and Cash at Bank.

Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
TCORP Ratios
T-Corp Ratios

Ratio	Purpose	Definition	Benchmark	Projected June 2019 Position			Internal Target - Short Term (1-2 yrs)	Fit for the Future Submission by 18/19 (General Fund Only & averaged)	CALCULATION METHOD
				June 2018 Actual Result	Original 2018/19 Budget	Revised 2018/19 Budget			
Operating Performance	This ratio measures Council's achievement of containing operating expenditure within operating revenue.	(Operating Revenue excluding capital grants and contributions - operating expenses) / (Operating Revenue excluding capital grants and contributions)	Greater than 0	4.66%	4.79%	5.35%	>0%	-2.60%	Budget
Own Source Revenue	This ratio measures fiscal flexibility. It is the degree of reliance on external funding sources such as operating grants and contributions. A Council's financial flexibility improves the higher the level of its own source revenue.	Operating Revenue excluding all grants and contributions/ Total Revenue including all grants and contributions	Greater than 60%	66.14%	77.33%	71.46%	60.00%	78.48%	Budget
Unrestricted Current Ratio	This ratio is designed to represent Council's ability to meet short term obligations as they fall due.	Current assets less all external restrictions/ current liabilities less specific purpose liabilities	Greater than 1.5	2.05	2.23	1.96	>1.5	NA	Estimate
Debt Service Cover	This ratio measures the availability of operating cash to service debt including interest, principal and lease payments.	(Op results before capital excluding interest & depre, impairment, amortisation) / (Principal repayments + borrowing costs)	Greater than 2	3.98	3.91	4.01	>2	9.38	Estimate
Rates and Annual Charges Outstanding Percentage	To assess the impact of uncollected rates and annual charges on liquidity and the adequacy of recovery efforts.	Rates and annual charges outstanding/ Rates and annual charges collectible	<5% metro and <10% rural	4.88	5.50	5.50	< 5.5%	NA	Estimate
Cash Expenses Cover	This liquidity ratio indicates the number of months a Council can continue paying for its immediate expenses without additional cash flow.	(Current year's cash equivalents + term deposits)/ (Payments from cash flow of operating and financing activities) x 12	Greater than 3 months	26.14	24.52	28.26	> 3 months	NA	Estimate
Building and Infrastructure Renewals Ratio	This ratio compares the proportion spent on infrastructure asset renewals and the asset's deterioration measured by its accounting depreciation.	Asset renewals (building, infrastructure and other structures)/ Depreciation, amortisation and impairment (building, infrastructure and other structures)	100%	87.64%	48.51%	88.17%	>45%	63.32%	Estimate
Infrastructure Backlog Ratio	This ratio shows what proportion the backlog is against the total value of Council's infrastructure.	Estimated cost to bring assets to a satisfactory condition/ Total value of infrastructure, building, other structures and depreciable land improvement assets.	Less than 2%	5.63%	5.36%	5.15%	<8%	8.20%	Estimate
Asset Maintenance	This ratio compares actual versus required annual maintenance, as detailed in Special Schedule 7 (of the annual financial statements).	Actual asset maintenance/ Required asset maintenance	Greater than 1	0.91	0.93	0.93	>.9	0.97	Estimate

Meets ratio benchmark
 Close to meeting ratio benchmark
 Does not meet benchmark



Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Consultancy and Legal Expenses

	Expenditure YTD excluding GST	Budgeted Y/N
Expense		
Legal Fees	594,689	Yes
Audit Fees	4,100	Yes
Business Consultant	417,972	Yes
Engineering Consulting	1,083,333	Yes
Environmental Consulting	225,996	Yes
IT Consulting	213,130	Yes
Property Development	73,675	Yes
Total Expense	2,612,895	

Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Contracts entered into during the March quarter.

Division	Contractor	Contract detail & purpose	Contract value	Commencement Date	Duration of Contract	Budgeted Y/N	Explanation as to why not budgeted.
Infrastructure	Eire Constructions Pty Ltd	T-18-41 Extension of Sewer Rising Main's and Water Main - Dunbogan Tip Access Road	\$826,547	19-Oct-18	Complete on delivery	Yes	Not Applicable
Corporate Performance	Regional Publishers Pty Ltd t/a Port Macquarie News	T-18-28 Port Macquarie-Hastings Council Advertising - Community Now Notices	\$118,488	1-Nov-18	two years + one x one year option	Yes	Not Applicable
Infrastructure	Terex Australia Pty Ltd	T-18-44 Supply and Delivery of a Lift and Carry 4WD Crane	\$336,950	22-Nov-18	Complete on delivery	Yes	Not Applicable
Infrastructure	Coffs Harbour City Council t/as Coastal Works	T-18-47 Laurieton Sewer Rising Main SPS No.1	\$747,695	22-Nov-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	Public Works Advisory	Kew Sewage Treatment Plant Upgrade - Public Works Advisory Project Management Engagement	\$1,219,295	22-Nov-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	Birdon Pty Ltd	T-18-12 Provision of Dredging Services - Settlement Shores Estate Canal Maintenance Dredging (Part B)	\$780,863	22-Nov-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	AMAC Holdings Pty Ltd t/as Alfresco Shade	T-18-36 Port Macquarie Town Square Shade Structures	\$186,800	22-Nov-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	Sims Group Australia Holdings Ltd t/as Sims Metal Management	T-18-39 Collection, Sorting and Removal of Ferrous and Non-Ferrous Scrap Metal and Used Lead Acid Batteries (ULAB)	as required	1-Dec-18	two years + two x one year options	Yes	Not Applicable
Infrastructure	Glen & Cathy Barnett t/as B&B Wheelie Bin Wash	T-18-40 Pressure Cleaning of Street Litter Bins	as required	1-Dec-18	three years + two x one year options	Yes	Not Applicable
Infrastructure	RPS Manidis Pty Ltd t/as straight Talk	T-18-43 Orbital Road Communications Strategy and Community Engagement for Phase two	\$106,525	1-Dec-18	Complete on finalisation of project	Yes	Not Applicable

Port Macquarie-Hastings Council
Budget Review for the quarter ended 31 March 2019
Contracts entered into during the March quarter.

Division	Contractor	Contract detail & purpose	Contract value	Commencement Date	Duration of Contract	Budgeted Y/N	Explanation as to why not budgeted.
Infrastructure	Rees Electrical Pty Ltd	T-18-24 Sports Field Lighting Installation Program Part A: Wayne Richards Park Hockey Precinct	\$200,300	1-Dec-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	Rees Electrical Pty Ltd	T-18-24 Sports Field Lighting Installation Program Part B: Port Macquarie Regional Sports Stadium	\$113,000	1-Dec-18	Complete on finalisation of project	Yes	Not Applicable
Infrastructure	Davis Earthmoving & Quarrying Pty Ltd	T-18-33 Concrete, Bricks and Masonry Processing	as required	1-Jan-19	two years + three x one year options	Yes	Not Applicable

Responsible Accounting Officer Statement


It is my opinion that the Quarterly Budget Review Statement for Port Macquarie-Hastings Council for the quarter ended 31 March 2019 indicates that Council's projected financial position at 30 June 19 will be satisfactory at year end, having regard to the projected estimates of income and expenditure and the original budgeted income and expenditure.

At the end of each quarter this financial year budget review meetings will be undertaken with all Managers to ensure any budget deficit is addressed.

**Nicole Spencer**

March 31, 2019

Responsible Accounting Officer - Port Macquarie-Hastings Council



**PORT MACQUARIE-HASTINGS
COUNCIL**

A R Bluett Memorial Award Winner 2017
"Most progressive Council in NSW"

**The Bluett
AWARD**

2018-2019 OPERATIONAL PLAN
QUARTERLY PROGRESS REPORT AS AT 31 MARCH 2019

COMMUNITY THEME 1 Leadership and Governance

What we are trying to achieve

A collaborative community that works together and uses opportunities for community participation in decision making that is defined as ethically, socially and environmentally responsible.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.1 Use a variety of tools to engage with the community in a manner that is transparent, effective, relevant and inclusive

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.1.1 Use engagement methods to facilitate community involvement in decision making	Community Place	1. Capture the number of engagement activities undertaken during the year and numbers of participants	1. 100%	1. 100%	On target. Excluding the Community Planning engagements which are accounted for in OP Action 1.1.2.3 and submissions made via Have Your Say OP Action 1.1.1 the following face-to-face engagements occurred during the 1st quarter of 2019: Orbital Road: 26 community sessions over 3 weeks. 1788 attendees Health & Education Precinct: multiple sessions with planners, residents, enquiry by design (EBD) participants, Business Chamber Draft Operational Plan (in progress): 2 sessions so far - 90 attendees Bold St Pedestrian Crossing (Laureton): 12 face-to-face conversations with businesses and residents Kew Playground: 40 at pop-up session.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.1 Use a variety of tools to engage with the community in a manner that is transparent, effective, relevant and inclusive

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.1.2 Ensure community lead decision making through engagement	Economic Development and Communications	1. Deliver regular, positive and engaging media messaging	1. 100%	1. 100%	On target. During Q1 2019 there were: 16,200 site visits on HYS 80 site registrations 627 engaged participants (ie completed a submission or survey) 5,700 informed participants (ie downloaded a document) 11,000 aware visitors (ie viewed a project on HYS) Engagement via HYS was particularly active during February and March due to the Orbital Rd project see figures below: 9,200 site visits on HYS 13 site registrations 523 engaged participants (ie completed a submission or survey) 4000 informed participants (ie downloaded a document) 6,400 aware visitors (ie viewed a project on HYS) A number of projects and policies were available for community input as summarised below: The Proposed Port Macquarie Orbital Road Kew Playground Health & Education Precinct Master Plan Draft 2019/2020 Operational Plan (still on exhibition)
		2. Increased community participation on Council's Have your Say online portal	2. 100%	2. 100%	On target. 562 media releases, statements, events, alerts, announcements and reactive responses were actioned from July 2018 to March 2019. These appeared through a mix of different media channels, and included a combination of driving positive messaging on Council services and projects, Mayoral messages and managing media enquiries.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.1 Use a variety of tools to engage with the community in a manner that is transparent, effective, relevant and inclusive

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Increase community engagement with Council's digital channels	2. 100%	2. 100%	On target. The total number of visits to Council's website during January - March was 198,765, website sessions was 248,057 and page views was 402,551. This represents an increase of 4%, 3.9% and 3.3% respectively on the same period last year. The most popular pages were job vacancies, contact us, bin collection days, Australia day, water restrictions and trigger levels, make a payment and application tracker. Likes for the corporate Facebook page increased by 1.65% from 8,624 to 8,766. This is an increase of 14.42% since March 2018. Facebook reached 566,396 people and 50,684 people engaged with the page. YouTube received 11,441 video views during this quarter and our average watch time was 1 minute 12 seconds. Compared to March 2018, video views increased by 1% and overall watch time has increased by 8%.
1.1.1.3 Research and analyse customer preferred communication methods	Economic Development and Communications	1. Research on customer preferred communication methods undertaken	1. 100%	1. 100%	On target. Monthly analysis of community engagement via digital channels is ongoing. Face to face and on-line customer research is to be conducted during quarter 4 FY 2018/19.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels
Delivery Program Objective: 1.1.2 Support community involvement in decision making through education around Council matters and services

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.2.1 Facilitating community involvement and understanding of Council's programs and projects through engagement	Community Place	1. Undertake engagement using a variety of engagement tools and communication methods	1. 100%	1. 100%	On target. The following tools and methods have been used to engage with the community: - Face to Face engagement sessions via drop-in information sessions, one-on-one engagement, group engagement and pop-up information sessions. - Postcard surveys - 'Have Your Say online' engagement

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels
Delivery Program Objective: 1.1.2 Support community involvement in decision making through education around Council matters and services

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.2.2 Work with the community to write and implement place based community plans	Community Place	1. Community Plans complete and implementation commenced	1. 100%	1. 100%	On target. To date we have commenced community planning with 6 communities: Postcard campaign and community think tanks (workshops) for six (6) localities completed: Bonny Hills, North Shore, Laurieton area, Innes Lake area, Kendall area, Comboyne area; Number of Postcards completed - 290 Approx. 500+ people attended 12 workshops; Draft Vision, key themes and draft Action Plan established for each of the 6 communities 5 Community Council Action Teams (CCAT) developed in Bonny Hills, North Shore, Laurieton area, Kendall area, Comboyne area; with regular monthly meetings held. CCATS intent is to assist in the development of the community plans and the implementations of charter developed and 12 month intended timeline. Focus has been on: Building relations with the groups; Developing plan and reviewing the draft Action Plan through; Identified and Prioritising actions for inclusion in the 2019/20 Operational Plan; Footpath connections for inclusion in the 2019/20 Footpath and Cycleways Program; and Assessing projects for potential grant funding opportunities 3-5yr actions Education on Council processes.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels
Delivery Program Objective: 1.1.2 Support community involvement in decision making through education around Council matters and services

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.2.3 Deliver the Community Planning Program	Community Place	1. Delivery of the Community Planning Program undertaken	1. 100%	1. 100%	On target. Community Planning activity continued according to schedule during Q1 2019. The following activities were undertaken: Community-Council Action Teams (CCATs) were formed for the following 5 communities: Bonny Hills North Shore Kew/Kendall Camden Haven Comboyne. C-CAT meetings have focused on defining priorities for potential inclusion in the 2019/2020 Operational Plan, commencing the Draft Community plans and accompanying Action Plans. A Community Planning Co-ordinator has been appointed and planning has begun for the next tranche of 4 communities which began in late April.

Delivery Program Objective: 1.1.3 Engage with the community on impacts and changes to services.

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.3.2 Develop a community engagement and education program to enable community involvement in decision making	Community Place	1. Development of the community engagement and education program is complete	1. 100%	1. 100%	On target. The development of the Working Together Framework is all but complete with a review of actions in relation to Communications, engagement and education to be further defined.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels
Delivery Program Objective: 1.1.4 Provide easy to understand and accessible community reporting.

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.4.1 Produce and submit the annual report in accordance with Local Government Act requirements	Organisational Performance	1. Have annual report adopted by Council and submitted to the Office of Local Government (OLG) by 30 November 2. Publish community report card (Part A); statutory report (Part B); and financial statements (Part C) for distribution	1. 100% 2. 100%	1. 0% 2. 100%	Achieved. The 2017-18 Annual Report, which included Part A Community Report Card, Part B Statutory Information and Part C Financial Statements was presented to the Ordinary Council Meeting in November 2018 and was also submitted to the Office of Local Government in accordance with statutory timeframes. Achieved. The 2017-2018 Annual Report was presented and adopted at the 21 November 2018 Ordinary Council Meeting. Hard copies have been distributed to Council offices and Libraries in Laurieton, Port Macquarie and Wauchope. The report is also available on Councils website.
1.1.4.2 Provide progress reports on implementation of the Delivery Program in accordance with Local Government Act requirements	Organisational Performance	1. Provide Delivery Program progress report to Council on a six monthly basis	1. 100%	1. 100%	Achieved. The Delivery Program six monthly progress reports were presented to the September 2018 and March 2019 Ordinary Council Meetings. The reports covered the period of reporting from January to December 2018. The next six monthly progress report will be presented to the September 2019 Ordinary Council Meeting in the new financial year.
1.1.4.3 Undertake development of the one year Operational Plan (2019-2020) in accordance with Local Government Act requirements	Organisational Performance	1. Have an annual operational plan adopted by 30 June	1. 100%	1. 100%	On target. The DRAFT 2019-2020 Operational Plan was presented to the 20 March 2019 Ordinary Council Meeting to place on public exhibition. The plans were on public exhibition from 21 March to 18 April 2019. The final documents will be presented to the 19 June 2019 Ordinary Council Meeting.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.4 Provide easy to understand and accessible community reporting.

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.4.4 Review the current corporate reporting tool	Organisational Performance	1. Complete the review of the corporate reporting tool	1. 100%	1. 100%	On target. Currently undertaking a review of existing corporate reporting tool functionality with a business case being developed.
1.1.4.5 Undertake review of Resourcing Strategy in accordance with Local Government Act requirements	Organisational Performance	1. Organised Resourcing Strategy working group to deliver reviewed Resourcing Strategy	1. 100%	1. 100%	On target. A working group has been established, and the review is ongoing with work currently in progress and underway.

Delivery Program Objective: 1.1.5 Develop an effective and coordinated community focused Communications Strategy

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.5.1 Develop and implement a strategic approach to Council communications	Economic Development and Communications	1. Commence implementation of identified actions	1. 100%	1. 100%	On target. Councillors have endorsed a strategic approach to communication, engagement and education. Implementation in progress in consultation with the Communications, Governance and Community Relations Portfolio.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.5 Develop an effective and coordinated community focused Communications Strategy

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.5.2 Deliver marketing/education campaigns	Economic Development and Communications	1. Continuous improvement in campaign engagement results	1. 100%	1. 100%	On target. There have been multiple waste related messages in market during the January - March quarter, utilising a range of communication channels (print advertising, Facebook organic posts and advertising, face-to-face event engagement, surveys, radio advertising, bin signage, education videos, television and factsheets). Messaging included 'drop off for free', which encouraged use of the Community Recycling Centre, promoting the harmful effects of Marine Litter amongst the fishing community, the re-introduction of the 'Which Bin' household waste disposal messaging, promoting multiple waste messages at the inaugural Hastings Sustainability Showcase and promoting the new Port Macquarie 'Sea Bin'. Total visits to the waste pages on Council's website totalled 51,318, which is a 5% increase on the same period last year. Waste related messaging on Facebook reached 64,698 people, and 141 Marine Litter surveys were completed.
		2. Deliver education program by 30 June	2. 100%	2. 100%	On target. Delivery of the 2018/19 Waste Management education campaign is continuing. Broader education messaging is being programmed in Council communications as appropriate.

Community Strategic Plan: 1.1 Inform and engage with the community about what Council does using varied communication channels

Delivery Program Objective: 1.1.6 Continue to promote access by the community to Councillors

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.1.6.1 Develop a Councillor professional development program	Governance and Procurement	1. Develop a Councillor professional development program	1. 100%	1. 100%	On target. The Councillor Professional Development Program is currently being managed as needs are identified and as per the adopted policy. The Office of Local Government have reviewed the proposed Councillor Induction and Professional Development Guidelines, these were gazetted 14/12/18. Currently researching opportunities for needs assessment and delivery of training.
1.1.6.2 Deliver the Take the Council to the Community program	Governance and Procurement	1. Hold two off-site Council meetings during the year (March Wauchope, October Laurieton)	1. 100%	1. 100%	Achieved. Laurieton and Wauchope Ordinary Council meetings were held in October 2018 and March 2019 respectively.

Community Strategic Plan: 1.2 Maintain strong partnerships between all stakeholders — local, state and federal — so that they are effective advocates for the community

Delivery Program Objective: 1.2.1 Promote Council participation and build linkages in local, state and federal initiatives, forums and opportunities to support Council's continued planning for the growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.2.1.1 Convene meetings with local business chambers for the Mayor and Senior Staff	Strategy and Growth	1. Schedule meetings throughout the year (with local business chambers for the Mayor and Senior Staff)	1. 100%	1. 100%	On target. Meetings held with Camden Haven, Port Macquarie and Wauchope Chambers of Commerce. Communications with the various chambers are ongoing.

Community Strategic Plan: 1.2 Maintain strong partnerships between all stakeholders — local, state and federal — so that they are effective advocates for the community

Delivery Program Objective: 1.2.1 Promote Council participation and build linkages in local, state and federal initiatives, forums and opportunities to support Council's continued planning for the growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.2.1.2 Convene meetings with State and Federal Members for the Mayor and Senior Staff	General Manager's Office	1. Schedule meetings throughout the year (with State and Federal Members for the Mayor and Senior Staff)	1. 100%	1. 100%	On target. Meetings held with Leslie Williams MP on 15 January 2019, 19th February 2019 regarding the Camden Haven Surf Club and a third meeting scheduled for 04 April 2019. Meeting with Melinda Pavey MP at Beltingen Council with the Mayor regarding the Pacific Highway was held on the 01 February 2019.

Community Strategic Plan: 1.3 Demonstrate leadership

Delivery Program Objective: 1.3.1 Provide effective leadership and equity

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.1.1 Participate in the North Coast Joint Organisation (JO)/Mid North Coast Regional Organisation of Councils (MIDROC)	General Manager's Office	1. Attendance at the Regional Joint Organisation meetings	1. 100%	1. 100%	On target. MNCJO Board Meeting held (extraordinary) 24 January 2019, 01 February 2019 and scheduled for 05 April 2019. A GMAC Meeting was held on 18 January 2019. The General Manager of Port Macquarie-Hastings Council has been appointed the Interim Executive Officer for the MNCJO therefore has also attended several Joint Organisation Teleconferences and a Joint Organisation Executive Officers network meeting was attended in Sydney on 13 February 2019.

Community Strategic Plan: 1.3 Demonstrate leadership**Delivery Program Objective:** 1.3.2 Build trust and improve Council's reputation through transparency, good decision making and living Council's Values

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.2.1 Manage the Legislative Compliance Register	Governance and Procurement	1. Undertake annual review and report on it	1. 100%	1. 100%	On target. The Legislative Compliance review for 2017-2018 was presented to the August 2018 Audit, Risk and Improvement Committee Meeting and then presented to the September 2018 Ordinary Council Meeting. Another review will commence shortly.
1.3.2.2 Produce and submit the annual Code of Conduct complaints report in accordance with Office of Local Government requirements	Governance and Procurement	1. Report prepared annually and presented to Council no later than 31 December	1. 100%	1. 100%	Achieved. Presented at the December 2018 Ordinary Council meeting.
1.3.2.3 Produce and submit the annual Government Information Public Access (GIPA) Report in accordance with the GIPA Act requirements	Governance and Procurement	1. Submit GIPA annual report to Information and Privacy Commission no later than 31 October	1. 100%	1. 100%	Achieved. Information is collected and entered in to the online Information and Privacy Commission (IPC) database on a monthly basis. The 2017/18 Annual Report was submitted to the IPC in August.
1.3.2.4 Coordinate lodgement of annual Disclosure of Interest Returns	Governance and Procurement	1. Annually update Disclosure Register by 30 September	1. 100%	1. 100%	Achieved. Disclosure register updated and made available at the October Ordinary Council meeting.
1.3.2.5 Review the payment of expenses and provision of facilities for Councillors Policy	Governance and Procurement	1. Review policy in line with Australian Taxation Office determination	1. 100%	1. 100%	Achieved. The policy web link to the Australian Tax Office (ATO) determination was updated in August, to ensure Councillors are directed to the correct ATO website.
1.3.2.6 Report on Public Interest Disclosures (PID)	Governance and Procurement	1. Report biannually in July and February on any Public Interest Disclosures (PIDs) 2. Submit PID annual report to NSW Ombudsman by 31 October	1. 100% 2. 100%	1. 100% 2. 100%	On target. Information was collected and entered in to the Ombudsman's database in August 2018. Achieved. Submitted to the NSW Ombudsman in August.

Community Strategic Plan: 1.3 Demonstrate leadership**Delivery Program Objective:** 1.3.2 Build trust and improve Council's reputation through transparency, good decision making and living Council's Values

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.2.7 Submit annual performance reporting for the water and sewer business to NSW Office of Water for benchmarking comparisons	Water and Sewer	1. Collate and forward performance reporting data to NSW Office of Water annually	1. 100%	1. 100%	Achieved. Annual performance indicator data has been submitted to NSW Department of Industry for 2017/18.
Delivery Program Objective: 1.3.3 Ensure there is appropriate management of risk to mitigate impact for Council and the community					
Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.3.1 Review the Corporate Risk Register	Governance and Procurement	1. Review the risk register on a quarterly basis and report to the Audit Committee	1. 100%	1. 100%	On target. The Corporate Risk Register was presented at the February 2019 Audit, Risk and Improvement Committee Meeting.
1.3.3.2 Manage the Risk Management Action Plan, as part of the state wide continuous improvement program	Governance and Procurement	1. Review and implement the Risk Management Action Plan on a quarterly basis and report to Executive	1. 100%	1. 100%	On target. The revised Insurance Risk Management Action Plan (RMAP) has been developed and actions are underway.
1.3.3.3 Conduct an annual review of insurance coverage	Governance and Procurement	1. Complete annual review and ensure insurance renewals are in place	1. 100%	1. 100%	Achieved. The insurance policies are in place for the 2018/2019 financial year. The renewals process will begin soon.
1.3.3.4 Implement improvements to the Project Management Framework	Governance and Procurement	1. Commenced implementation (improvements to the Project Management Framework)	1. 100%	1. 100%	On target. The Project Management Framework has been implemented with training complete. Ongoing improvements to the Project Management Framework are being captured on the Continuous Improvement Log, assessed and managed.
1.3.3.5 Align corporate Risk Management Framework to ISO 3100 standards	Governance and Procurement	1. Complete Risk Management Framework alignment in line with project milestones	1. 100%	1. 100%	On target. The Risk Management policy was adopted at the February 2019 Ordinary Council meeting.

Community Strategic Plan: 1.3 Demonstrate leadership**Delivery Program Objective:** 1.3.3 Ensure there is appropriate management of risk to mitigate impact for Council and the community

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.3.6 Capture high risk electrical assets in Council's asset management system	Assets and Property Investment	1. Complete electrical asset data survey by 30 June 2019	1. 100%	1. 100%	On target. Map layers including asset attributes have been created for asset capture. All above ground terminal electrical assets in public open space have been recognised. Recognition of high risk electrical assets underground in public open space is progressing. New works with electrical assets in open space are now captured in the GIS layers upon receipt of completion reports.

Delivery Program Objective: 1.3.4 Manage our workforce to deliver community outcomes

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.4.1 Implement workplace strategies and processes to continue to improve Human Resources	Organisational Performance	1. Implementation of Workforce Management Strategy actions	1. 100%	1. 100%	On target. A significant number of Workforce Management Strategy items have been delivered, and many are currently underway.
1.3.4.2 Implement workplace strategies and processes to continue to improve Work, Health and Safety.	Organisational Performance	1. Implementation of Work, Health Safety Strategy actions	1. 100%	1. 80%	Behind schedule. Implementation of strategy actions will take place after strategy is adopted. The strategy is in draft and undergoing early consultation. A Safety Audit has also commenced.
1.3.4.3 Implement workplace strategies and processes to continue to improve Learning and Development	Organisational Performance	1. Implementation of Learning and Development Strategy actions	1. 100%	1. 50%	Behind schedule. Yet to commence. Implementation of strategy actions will take place once the strategy is adopted.
1.3.4.4 CW Construct new works depot in Port Macquarie (multi-year project in 2017-18 linked to 1.3.4.5 CW)	Assets and Property Investment	1. Deliver project according to approved project plan (Works Depot in Port Macquarie)	1. 100%	1. 100%	Yet to commence. Deliverable dependant on OP item 1.3.4.5 - pre construction and design of works depot.

Community Strategic Plan: 1.3 Demonstrate leadership**Delivery Program Objective:** 1.3.4 Manage our workforce to deliver community outcomes

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.4.5 CW Works Depot relocation - preconstruction/design (multi-year project in 2017-18 linked to 1.3.4.4 CW)	Assets and Property Investment	1. Deliver project according to approved project plan (Works Depot relocation)	1. 100%	1. 75%	Behind schedule. Land negotiations commencing.

Delivery Program Objective: 1.3.5 Build an engaged workforce

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.3.5.1 Continue the development of a highly engaged workforce who are solutions focused	Organisational Performance	1. Deliver annual Employee Engagement Days 2. Embed, streamline and measure Employee Engagement Process (EEP) and implement identified areas of improvement	1. 100% 2. 100%	1. 80% 2. 70%	On target. Planning for the annual 2018-19 Employee Engagement Days (EED) is well underway. The Working group are meeting regularly and have formed sub groups. EED's held on 7 and 8 May 2019. On target. The intranet has been updated with relevant tools to support staff with having Employee Engagement process (EEP) conversations and its development is ongoing. Two Pilot sessions have been run for Part 1 of the EEP Roadshow to help with clarifying the EEP. 160 Council supervisors/managers have been invited to attend one of the nine sessions being facilitated over the coming 3 months. Part two and Part three of the EEP Roadshow is in development in conjunction with the HR Employee Relations Advisor is intended to support with how to have conversations and set performance goals. The feedback and questions from the EEP Roadshow sessions will be used to inform the development of future workshops for Council's people leaders.

Community Strategic Plan: 1.3 Demonstrate leadership

Delivery Program Objective: 1.3.5 Build an engaged workforce

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		3. Identify new employee engagement opportunities	3. 100%	3. 70%	On target. Opportunities for new ways to engage with employees are consistently being identified. An example is the series of Millennial's workshops that took place throughout 2018. Workforce initiatives developed by the staff were presented to the Executive Team in December 2018 and work on the endorsed projects will continue through the first half of 2019 by staff engaged in the process.
		4. Implement 2018 Employee Engagement Survey	4. 100%	4. 100%	Completed. 2019 Annual Employee Engagement Survey was completed in February 2019. Q12 Action planning sessions have started across the divisions.
1.3.5.3 Implement the Human Resource Information System (HRIS)	Organisational Performance	1. Commenced implementation of HRIS system 2. Commenced training of HRIS system	1. 100% 2. 100%	1. 20% 2. 0%	Behind schedule. System requirements have now been determined. Behind schedule. Yet to commence. Unlikely that implementation will occur in 2018/19 as training can only occur post system implementation.

Community Strategic Plan: 1.4 Use innovative, efficient and sustainable practices

Delivery Program Objective: 1.4.1 Provide efficient technology and inclusive digital systems that are easy to use and easy to access

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.4.1.1 CW Renew technology infrastructure to provide secure and responsive Information Communication Technology (ICT) systems (ICT - Projects - multi-year project) Allocated Amount 2018-19 \$1,600,000	Digital Technology	1. Deliver project according to approved project plan (ICT - Projects)	1. 100%	1. 95%	On target. Planning is currently underway for delivery of customer experience projects. Other DT projects are currently on schedule, as per the DT roadmap.

Community Strategic Plan: 1.4 Use innovative, efficient and sustainable practices

Delivery Program Objective: 1.4.1 Provide efficient technology and inclusive digital systems that are easy to use and easy to access

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.4.1.2 CW Undertake delivery of ICT projects (Information and Communications Technology - Renewals - multi-year project) - Allocated Amount 2018 -19 \$200,000	Digital Technology	1. Deliver project according to approved project plan (ICT - Renewals)	1. 100%	1. 100%	On target. Email archive migration to cloud services is currently underway. To be completed by end of April 2019. This is the final project task and this item will be delivered.
1.4.1.3 Provide Geographic Information Systems (GIS) to the organisation and to the community in a timely and effective manner	Digital Technology	1. Receive less than five complaints received relating to GIS data accuracy as captured in the Customer Record Management (CRM) system	1. 100%	1. 100%	On target. Nil complaints received to date
1.4.1.5 Develop asset design and as constructed templates as part of the Asset Data Standards Review	Assets and Property Investment	1. Develop an Auto CAD file template for asset design and as-constructed plans that meets Asset Design As Constructed (ADAC) standards by 30 June 2019	1. 100%	1. 100%	Yet to commence. Following on from feedback from the development industry at the Asset Delivery and Information Workshops in November and December additional workshop will be scheduled.

Delivery Program Objective: 1.4.2 Deliver agreed services at the agreed service level at best value

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.4.2.1 Work across the organisation to facilitate the implementation of the Business Improvement Strategy	Organisational Performance	1. Plan developed to support embedding a culture of continuous improvement	1. 100%	1. 100%	On target. The Business Improvement Office (BIO) are updating the BIO toolkit and intranet page to enable the workforce to access tools to make improvements. In addition a series of improvement training workshops with the Organisational Performance Team are being implemented in addition to establishing a Local Business Improvement Network for benchmarking and knowledge sharing.

Leadership and Governance Page 17

Community Strategic Plan: 1.4 Use innovative, efficient and sustainable practices

Delivery Program Objective: 1.4.2 Deliver agreed services at the agreed service level at best value

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Provide updates to the Executive, the Risk, Audit and Improvement Committee and Councillors	2. 100%	2. 100%	On target. Regular updates are being provided on the progress of the Business Improvement Office to the Executive and the Risk, Audit and Improvement Committee.
		3. Undertake process improvements	3. 100%	3. 100%	On target. The Business Improvement Office (BIO) is working across various service areas to progress process improvement initiatives. Currently BIO are working on process mapping and opportunities for improvement within Development and Environment and have been supporting Digital Technology with the implementation of Procure to Pay.
		4. Undertake service reviews	4. 100%	4. 100%	On target. The Business Improvement Office (BIO) is working on creating a program of service reviews to commence in 2019. BIO will commence three service reviews in the 18/19 financial year. During quarter 3, BIO have reviewed and updated BIO methodology; engaged with other councils on their Service Review processes and commenced scoping the three services reviews.

Delivery Program Objective: 1.4.3 Deliver a customer focused service that provides the community a consistent experience of Council

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.4.3.1 Deliver high quality customer interactions through the Customer Service Centers and Call Centre within service level standards	Community Place	1. Answer 75% of calls within service level standards (currently 20 seconds)	1. 75%	1. 75%	On target. 75% of calls answered which meets the service standard set target of 75%.

Community Strategic Plan: 1.4 Use innovative, efficient and sustainable practices

Delivery Program Objective: 1.4.3 Deliver a customer focused service that provides the community a consistent experience of Council

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.4.3.2 Review and evaluate referrals, compliments and complaints on an annual basis 1.4.3.3 Manage the 'Our Customer Experience' Project and commence implementation		2. Complete greater than 75% of customer initial interactions at first point of contact	2. 75%	2. 94%	On target. 94% of initial customer interactions were dealt with at first point of contact through customer service centres. 68,768 counter enquiries, 57,190 calls and 24,614 emails were received for the period 1 July 2018 to 31 March 2019.
		3. Ensure call abandonment rate is 3% or lower	3. 3%	3. 3%	On target. Percentage of abandon calls were kept at the set 3% target.
		1. Report annually to Council	1. 100%	1. 100%	Achieved. Report prepared in September 2018 and presented to Council.
		1. "Our Customer Experience" Project complete and implementation commenced	1. 100%	1. 90%	Monitoring required. The Customer Experience Project plan was delivered on time in October 2018, additional work was undertaken to develop design briefs for the recommended high priority projects. The Executive are currently reviewing the approach to implementing the next stage with some focus being on digital outcomes.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable

Delivery Program Objective: 1.5.1 Manage Council's financial assets and provide accurate, timely and reliable information

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.1.1 Monitor and accurately report on Council's financial position in accordance with Local Government Act requirements	Financial Services	1. Lodge audited financial statements with OLG by 31 October	1. 100%	1. 100%	Achieved. 2017/18 audited financial statements lodged with OLG by due date.
		2. Submit three quarterly budget review statements and an annual report to Council	2. 100%	2. 100%	On target. First 2 quarterly reviews presented to Council within required timeframes.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable
Delivery Program Objective: 1.5.1 Manage Council's financial assets and provide accurate, timely and reliable information

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.1.2 Manage Council's investment portfolio to optimise investment returns within the constraints of the policy, the Local Government Act and Regulations	Financial Services	1. Exceed benchmark for investment return 2. Table report to Council as required	1. 100% 2. 100%	1. 100% 2. 100%	On target. Investment return exceeded benchmark for both month and Financial Year to Date. On target. Investment reports presented monthly.
1.5.1.3 Develop annual Operational Plan budget and review the Long Term Financial Plan	Financial Services	1. Develop the draft annual budget in line with Integrated Planning and Reporting timeframes 2. Have final budget adopted by Council by 30 June 3. Review the Long Term Financial Plan in line with the budget	1. 100% 2. 100% 3. 100%	1. 100% 2. 100% 3. 100%	Achieved. Draft budget submitted to Council and currently on exhibition. On target. Draft budget currently on exhibition - on track for adoption by 30 June 2019. On target. Long Term Financial Plan reviewed as part of budget process.
1.5.1.4 Prepare monthly financial reports for Council	Financial Services	1. Present financial reports to Council as required	1. 100%	1. 100%	On target. Monthly financial reports presented to Council as required.
1.5.1.6 Partridge Creek residential development planning	Assets and Property Investment	1. Amend and update existing Development Application to enable relocation of the neighbourhood centre zone within the Partridge Creek residential development at Thrumster	1. 100%	1. 100%	Yet to commence. Commencement of 2018-19 action items are subject to finalisation of lodged Development Application.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable
Delivery Program Objective: 1.5.1 Manage Council's financial assets and provide accurate, timely and reliable information

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Obtain updated land valuation for Partridge Creek residential development upon receipt of updated Development Approval 3. Provide report to Council outlining Partridge Creek residential development options upon receipt of updated land valuation	2. 100% 3. 100%	2. 100% 3. 100%	Yet to commence. Commencement of 2018-19 action items are subject to finalisation of lodged Development Application. Yet to commence. Commencement of 2018-19 action items are subject to finalisation of lodged Development Application.
1.5.1.7 Greenmeadows Drive residential development planning	Assets and Property Investment	1. Develop concept plan for Greenmeadows Drive development 2. Lodge Development Approval application for Greenmeadows Drive development	1. 100% 2. 100%	1. 50% 2. 50%	Behind schedule. Project on hold. Behind schedule. Project on hold.
1.5.1.8 Conduct asset revaluation of land under roads, stormwater, flood and foreshore assets	Assets and Property Investment	1. Complete asset revaluation by 30 June 2019	1. 100%	1. 75%	On target. 2018-2019 Revaluation project commenced with Project Management Framework. Project Charter and Project Plan signed off by Project Sponsor. Specification for quote is with Asset Accountant for review and comment. A decision was made by Finance to not proceed with the revaluation of stormwater and flood and foreshore assets this financial year because of lack of remaining useful life information on stormwater assets.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable

Delivery Program Objective: 1.5.2 Use procurement, tendering, purchasing and contract management approaches that are transparent and equitable

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.2.1 Continue to implement and monitor the procurement strategy action items	Governance and Procurement	1. Completion of audit action items as per agreed timelines with quarterly reporting to the Audit Committee 2. Completion of Procurement Strategy Implementation Plan actions within agreed timeframes	1. 100% 2. 100%	1. 100% 2. 100%	On target. Audit recommendations are presented at each Audit, Risk and Improvement meeting. On target. The procurement strategy action items will be reported to a future Procurement Steering Group.
1.5.2.2 CW Ensure plant purchases are in line with the plant replacement program - multi-year project - Allocated Amount 2018-19 \$2,500,000	Transport and Stormwater Network	1. Plant replacement program delivered according to approved schedule	1. 100%	1. 100%	On target. Plant replacement program delivered to approved schedule.
1.5.2.3 Manage and maintain Council's Plant and Fleet to support the operational activities of Council	Transport and Stormwater Network	1. Plant and Fleet managed and maintained in accordance with adopted program and budget	1. 100%	1. 100%	On target. Plant and Fleet managed in accordance with adopted program and budget.
1.5.2.4 Renew Council's procurement of rural aerial imagery data	Digital Technology	1. Rural aerial imagery data renewed by 30 June 2019	1. 100%	1. 100%	On target. All rural aerial imagery data has been purchased for FY18/19.

Delivery Program Objective: 1.5.3 Develop, manage and maintain Council Business Units through effective commercial management

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.3.1 Increase operating revenue at the Airport, the Glasshouse, the Environmental Laboratory and the Crematorium	Commercial Business Units	1. Increase operating revenue by 3% per annum per business unit (Airport)	1. 3%	1. 0%	Behind target. Income impacted due to passenger numbers being down approx. 5% on the corresponding period last year.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable
Delivery Program Objective: 1.5.3 Develop, manage and maintain Council Business Units through effective commercial management

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Increase operating revenue by 3% per annum per business unit (Crematorium)	2. 3%	2. 17%	On target. Income this financial year has increased due to an increase in reservations and memorialisations. Income is variable, and while the increase year to date compared to the same period last financial year is 17.2%, income this financial year is comparable to the corresponding period in 2016-17.
		3. Increase operating revenue by 3% per annum per business unit (Environmental Laboratory)	3. 3%	3. 9%	On target. Laboratory income year to date is up 8.9% on the corresponding period last financial year.
		4. Increase operating revenue by 3% per annum per business unit (Glasshouse)	4. 3%	4. 20%	On target. It should be noted that this increase is due to a number of factors, including the seasonal variation (availability and timing) in Glasshouse events, income associated with the Archibald Exhibition in Sep-18, and some delays in processing income last financial year.
1.5.3.2 Review and update the Glasshouse Strategic Plan	Commercial Business Units	1. Deliver actions according to adopted Glasshouse Strategic Plan	1. 100%	1. 100%	On target. The review of the Glasshouse Strategic Plan has commenced and input has been sought from the Cultural Steering Group, in accordance with the recently adopted Cultural Plan.
		2. Present biannual reports to Council	2. 100%	2. 100%	On target. The Glasshouse presented its biannual report at the February 2019 council meeting. The next report is due in August 2019.
		3. Review the Glasshouse Podium Fee by September 2018	3. 100%	3. 100%	On target. Initial review undertaken with further consideration to be given in conjunction with the review of the Glasshouse Strategic Plan.

Community Strategic Plan: 1.5 Ensure strong corporate and financial management that is transparent and accountable

Delivery Program Objective: 1.5.3 Develop, manage and maintain Council Business Units through effective commercial management

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.3.6 Manage Council's property management, leasing and licencing, and statutory property functions for the most appropriate return to Council and the community	Commercial Business Units	1. Maintain Council's Land and Leasing Registers according to Statutory Requirements	1. 100%	1. 100%	On target. 159 commercial leases operating (including airport, waste, telecommunications, residential, outdoor dining/ trading and temporary licences). 73 community leases operating.
1.5.3.7 Continue to implement and monitor the property investment strategy	Assets and Property Investment	1. Provide six monthly update reports to Council on the status of the Property Investment Portfolio	1. 100%	1. 100%	On target. 6 monthly update report tabled at November 2018 Ordinary Council Meeting. Next 6 monthly report scheduled for the May 2019 Ordinary Council Meeting.
1.5.3.8 CW Land Acquisitions for Council Roads - Survey, Valuation and Land Transactions	Commercial Business Units	1. Deliver projects according to approved project plan (Land Acquisitions for Council Roads - Survey, Valuation and Land Transactions)	1. 100%	1. 100%	On target. Land matters are progressed as required.

Delivery Program Objective: 1.5.4 Identify new commercially viable revenue sources

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
1.5.4.1 Review current revenue sources and investigate the commercial viability of identified new revenue sources	Commercial Business Units	1. Identify new revenue sources	1. 100%	1. 100%	On target. Review of revenue sources continuing in conjunction with the development of the 2019-2020 Schedule of Fees and Charges and construction of the upgraded Airport terminal building.



Community Strategic Plan: 2.1 Create a community that feels safe

Delivery Program Objective: 2.1.1 Support Community Safety initiatives

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.1.1.1 Manage the contract for approved lifeguard services	Recreation and Buildings	1. Deliver approved lifeguard services 2. Deliver lifeguard education programs to schools and community groups (target 2500 students)	1. 100% 2. 100%	1. 100% 2. 100%	On target. Lifeguard patrols are continuing at Town and Flynn's beaches. On target. The lifeguard education program has been delivered to over 4500 students this financial year.
2.1.1.2 Support and promote the Hastings Liqueur Accord	Community Place	1. Capture the number of Programs/initiatives supported	1. 100%	1. 100%	On target. Key areas of focus over the last quarter have been regular monthly meetings with the Local Area Command to discuss licensing requirements and applications across the LGA as well as on key events and festivals such as Luna Electric, Australia Day, Touch Football, Under the Southern stars, Red Hot summer as well as the focus of the Hastings Accord on supporting responsive service.

Community Strategic Plan: 2.1 Create a community that feels safe

Delivery Program Objective: 2.1.1 Support Community Safety initiatives

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Support Hastings Liquor Accord projects as required	2. 100%	2. 100%	On target. Continued support for the Hastings Liquor accord. Key areas of focus over the last quarter have been regular monthly meetings with the Local Area Command to discuss licensing requirements and applications across the LGA as well as on key events and festivals such as Luna Electric, Australia Day, Touch Football, Under the Southern stars, Red Hot summer as well as the focus of the Hastings Accord on supporting responsive service.
2.1.1.3 Delivery the Graffiti Blasters Program	Community Place	1. Capture the number of removals and volunteer time (hrs) 2. Deliver Graffiti Blasters Program	1. 100% 2. 100%	1. 100% 2. 100%	On target. Approx 200 tags per month removed during the July 2018 to March 2019. Noting that in December 2018 approx 300 tags were removed. Approx 200 hours of volunteer time has been donated per month on average. On target. The Graffiti Blasters program has undertaken training session for students this quarter to encourage awareness of the removal of graffiti tags.

Delivery Program Objective: 2.1.2 Advocate for, support and coordinate emergency services

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.1.2.1 CW Council supports Emergency Management Operations and Agencies	Infrastructure	1. Provide coordination and support to emergency service units as required	1. 100%	1. 100%	On target.
2.1.2.2 Pappinbarra Fires - Disaster funding	Transport and Stormwater Network	1. Undertake works associated with the Pappinbarra Fires - Disaster funding	1. 100%	1. 100%	Achieved. Culvert replaced.

Community Strategic Plan: 2.1 Create a community that feels safe

Delivery Program Objective: 2.1.2 Advocate for, support and coordinate emergency services

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.1.2.3 Hannam Vale Road - Flood Damage - Natural Disaster	Transport and Stormwater Network	1. Undertake works associated with the Hannam Vale Floods	1. 100%	1. 100%	Achieved. Slope stability works completed by contractor in March 2019.

Delivery Program Objective: 2.1.3 Conduct regulatory and educational activities which safeguard public and environmental health, and ensures compliance with planning and building standards

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.1.3.1 Monitor and take action as appropriate to ensure compliance with development approvals and building, environmental, public health and on-site sewage standards	Regulatory Services	1. Respond to greater than 80% of complaints relating to building, environmental, public health and on-site sewage issues within set customer service standards 2. Undertake 1,000 on-site sewage inspections 3. Undertake 250 pool inspection 4. Undertake a minimum of 40 fire safety inspections 5. Undertake 195 public health inspections	1. 80% 2. 1,000# 3. 250# 4. 40# 5. 195#	1. 87% 2. 724# 3. 243# 4. 32# 5. 163#	On target. On target. On target. On target. On target.
2.1.3.3 Provide ranger and law enforcement services to ensure compliance with legislation, regulations and Council policies relating to parking, beach patrols, illegal signage, sale of goods on roads	Regulatory Services	1. Capture the number of companion animal incidents 2. Capture the number of offences detected during proactive patrols	1. 0# 2. 0#	1. 1,106# 2. 2,047#	On target. On target.

Community Strategic Plan: 2.1 Create a community that feels safe

Delivery Program Objective: 2.1.3 Conduct regulatory and educational activities which safeguard public and environmental health, and ensures compliance with planning and building standards

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		3. Respond to greater than 80% of complaints regarding compliance with parking, beach patrols, illegal signage, sale of goods on roads, building site sediment control and companion animal management	3. 80%	3. 87%	On target.
2.1.3.4 Manage Council's Environmental Laboratory and provide sampling, analysis, reporting and professional advice of water quality analysis in accordance with operational and regulatory requirements	Commercial Business Units	1. Complete all sampling, analysis and reporting of operational and regulatory requests in accordance with approved budgets 2. Complete greater than 90% of all sampling, analysis and reporting of operational and regulatory requests in accordance with the required service standards 3. Maintain National Association of Testing Authorities (NATA) corporate accreditation	1. 100% 2. 90% 3. 100%	1. 100% 2. 97% 3. 100%	On target. All sampling, analysis and reporting conducted within budget On target. 97.1% of finalised reports met the required service standard. All reports for urgent request and non-compliant results were met within the agreed service standard. On target. NATA accreditation maintained.
2.1.3.5 Provide a safe water supply in accordance with Australian Drinking Water Quality Guidelines	Water and Sewer	1. Have nil reportable incidents in accordance with NSW Health agreed protocols	1. 100%	1. 99%	Behind target. An exceedance of Nickel was detected in one of the water samples taken during the reporting period and reported to NSW Health. Repeat sample was found to be within the Australian Drinking Water Guideline limits.

Community Strategic Plan: 2.2 Advocate for social inclusion and fairness

Delivery Program Objective: 2.2.1 Support and advocate for all community sectors

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.2.1.1 Provide opportunities for young people to learn and develop through 'youth-focused' initiatives in line with the Community Inclusion Plan	Community Place	1. Coordinate Youth Advisory Council activities	1. 100%	1. 100%	Monitoring required. Youth Advisory Council (YAC) has not been active since the middle of 2018. A new leadership project is underway to assist in redefining what the purpose of YAC will be in the future. It is anticipated that a new YAC model will be developed by December 2019. A youth forum was held at Council at the request of the NSW governor in February 2019 to discuss key youth issues with 19 young people from across the LGA attending.
		2. Hold Youth Week annually	2. 100%	2. 100%	On target. Council's Youth Week events plan has been developed and includes a number of key activities being planned for the second week of April 2019. Council has also released Youth Events Grant to encourage and support youth focused groups organising events particularly for Youth Week.
		3. Youth week actions developed and delivered as part of the Community Inclusion plan	3. 100%	3. 100%	On target. Council continues to plan, develop and support youth activities across the LGA, working with key Youth Services - Headspace, ETC, YP-Space, Girls Space to deliver outcomes for young people. Council was successful in getting a Youth Leader Grant through Building Better Regions (BBR) to develop a Young leaders and mentor program and support the development of a new look YAC.
2.2.1.3 Coordinate the grants program to assist the community to deliver projects that contribute to a sense of place	Community Place	1. Deliver Community Grants Program through two rounds per year	1. 100%	1. 100%	On target. Round 2 of the 2018/2019 to go to May Council meeting for endorsement and distribution on Wednesday 29th May.

Community Strategic Plan: 2.2 Advocate for social inclusion and fairness

Delivery Program Objective: 2.2.1 Support and advocate for all community sectors

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Undertake a review the current Community Grants program to meet the needs of a changing community	2. 100%	2. 100%	On target. Review to continue and be complete and to be presented by June 2019
2.2.1.6 Finalise a new Port Macquarie Hastings Events Plan	Community Place	1. Commence implementation of actions relating to community events 2. Finalise Events Plan	1. 100% 2. 100%	1. 90% 2. 90%	Monitoring required. The Draft plan is still under review and needs to be finalised and endorsed by June 2019. Monitoring required. The Draft plan is still under review and needs to be finalised and endorsed by June 2019. Prioritising actions to deliver with current resources will be the focus for the next quarter.
2.2.1.7 Finalise the Community Inclusion Plan, that determines focused actions for Seniors, Youth, Aboriginal Communities, Diversity, Multiculturalism and LGBTIQ groups	Community Place	1. Implement the Community Inclusion Plan actions	1. 100%	1. 90%	Monitoring required. The Community Inclusion plan has been drafted and is to be presented to the Executive this month prior to being presented to Council for approval to be placed on public exhibition.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.1 Ensure access to community facilities and activities: including access to natural environment

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.1.1 CW Implement the Disability Inclusion Action Plan and inclusive programs (Disabled Accesses - Buildings/Recreation Facilities - multi-year project) Allocated Amount 2018-19 \$106,100	Community Place	1. Implement the Disability Inclusion Action Plan (including Disabled Accesses - Buildings/Recreation Facilities)	1. 100%	1. 100%	On target. A good quarter for disability inclusion projects. Highlights include: - New accessible (disability) public toilet built at Comboyne War Memorial Hall - Manufacturing has commenced for our first 'Boundless' adult change table, hoist and accessible toilet. This will be installed at Port Macquarie Short St car park, and scheduled for later in the year. - Access Committee business visits to the new Bunnings and Colonial Arcade shops. - 6 x Dementia Friendly workshops delivered and an animation created for the ArtWalk event. - Launch of the 'Hands on History' exhibition at the Library. - Presentation at the Regional Experiences in Dementia Conference about Council's Four Seasons Dementia Programme. - 2 x Access Sub-Committee's coordinated, including DA review of the proposed entertainment complex (near Kmart). - Audit of Lake Road with the Road Safety Officer, identifying 5 missing kerb ramps from the round-a-bout to the Private Hospital.

Delivery Program Objective: 2.3.2 Provide a range of inclusive sporting and recreational opportunities and facilities to encourage a healthy and active lifestyle

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.2.1 Continue implementation of the Recreation Action Plan 2015-2025 (including Town Green Central and West - Preconstruction)	Recreation and Buildings, (Infrastructure Delivery)	1. Delivery Project according to approved project plan (Town Green Central and West - Preconstruction)	1. 100%	1. 85%	On target. Design phase ongoing including extensive heritage and cultural assessments, Construction phase of this project subject to additional funding being secured. This project will continue into 2019/20 FY.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.2 Provide a range of inclusive sporting and recreational opportunities and facilities to encourage a healthy and active lifestyle

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Implement the identified actions from the Recreation Action Plan	2. 100%	2. 90%	Monitoring required. Hastings Regional Sporting Facility - Stage 1 development: Detailed design for the facility is progressing. Sancroft/Thrumster Sports Fields: Project planning has commenced. Engagement of a consultant to commence the detailed design for the facility is subject to finalisation of a Development Application for fill for the site being approved by Council. Westport Park - Riverwall and pathway upgrade complete. Hastings River, Port Macquarie: Detailed design and approvals for new recreational boating facility: Detailed concept plans have been developed for this project.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.2 Provide a range of inclusive sporting and recreational opportunities and facilities to encourage a healthy and active lifestyle

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.2.2 CW Deliver sporting facility renewal and upgrades program across the LGA	Recreation and Buildings	1. Deliver renewal and upgrades as per schedule and reported according to seasonal sports	1. 100%	1. 100%	On target. Blackbutt Park Facility Upgrade and replacement of Park Furniture: Works have commenced onsite. Stuart Park Install sub-soil drainage to fields 1 and 2. This project is linked to Council's successful Regional Sport Infrastructure Fund application for major improvements for the Stuart Park sports precinct. This project is now a multi-year project in accordance with the funding deed. Port Macquarie Hastings Hockey Facility - install lighting to Field 2: Contractor engaged for delivery of this project. Port Macquarie Regional Sports Stadium - construction of new training field including lighting: Lighting installation scheduled for April 2019. Field specification is currently being finalised. Oxley Oval - Sporting Infrastructure Upgrade: Contractor engaged to supply and install sub-station. Commencement of sports clubhouse construction has been delayed while project partners seek finalisation of funding deed.
2.3.2.3 Manage the Mayor's Sporting Fund	Community Place	1. Distribute funds as required and coordinate fundraising events	1. 100%	1. 100%	On target. Reports prepared for Sub-Committee agenda, Minutes done. Report to Ordinary Council meeting prepared with recommendations endorsed. Cheques drawn, correspondence prepared and databases updated accordingly. First fund raising event conducted on 29 March. \$1800 raised from event. Next event 10 May 2019.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.2 Provide a range of inclusive sporting and recreational opportunities and facilities to encourage a healthy and active lifestyle

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.2.4 Undertake regional master planning for recreational facilities	Recreation and Buildings	1. Commence Master Plan development for the Vince Inmon Sporting Complex (Adopted Ord Council Meeting 21 Nov'18) 2. Commence master planning for Bain Park, Wauchope 3. Continue master planning for Flynns Beach	1. 100% 2. 100% 3. 100%	1. 100% 2. 0% 3. 50%	On target. Project planning complete. Draft Master Plan has been developed in consultation with Vince Inmon user group. Yet to commence. This project has been deferred to align with development of the Wauchope Community Plan. Behind schedule. Draft Flynns Beach Master Plan is to be presented to the Council in June 2019 to seek support for public exhibition of the draft plan.
2.3.2.5 CW Undertake Camden Haven River recreational boating upgrade improvements, incl Bruce Porter Reserve and Dunbogan Reserve - Boat Ramp upgrades - multi-year project - Adopted 2017-18 - \$500,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Camden Haven River recreational boating upgrade incl Bruce Porter Reserve)	1. 100%	1. 100%	On target. The upgrade of Bruce Porter Reserve boat ramp and Dunbogan boat ramp are projects that have continued from 2017/18 FY. Construction of both upgrades has commenced in Mar 2019 and is expected to be complete by mid 2019.
2.3.2.6 CW Hastings River recreational boating improvements - Undertake design/pre-construction for provision of new facility as per Boating Needs Investigation Allocated Amount 2018-19 - \$310,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Hastings River recreational boating improvements)	1. 100%	1. 80%	Behind schedule. This project remains in the initiation phase. Design phase commencement is pending negotiations re land acquisition and traffic/intersection planning. No construction is proposed on this project during the 2018/19 FY. This project will continue into the 2019/20 FY.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.3 Develop and implement management of operational and maintenance programs for open space, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.3.01 CW Undertake the maintenance program for parks, reserves, sporting fields and beaches (including parks signage, Riverfront and Rowing Club Rerve, Bunny's Corner and Settlement Point erosion)	Recreation and Buildings	1. Deliver maintenance program, including beach cleaning and playground inspections according to approved maintenance schedules	1. 100%	1. 100%	On target. During January, February and March staff focus has been on: - maintaining park furniture in the Wauchope, Camden Haven and Port Macquarie areas, sports field preparation for weekly fixtures, change over to winter sports and mowing of our parks and reserves. - preparing sites for events during this period. e.g markets, weddings, circus, concerts, etc - garden maintenance in the Port Macquarie CBD area including pruning, watering, weed treatment and mulching - Garden maintenance Estate gardens, pruning and weed treatment, e.g Crestwood, Dahlsford, Lake Cathie. - Inspection of all playgrounds and repairs made - Field preparations for Regional Stadium and Tuffins Lane for the Junior State Cup touch football - cleaning of bin hides and bubbler's across the local government area. - Mowing of Cemeteries across the LGA - Inspections for CRM based requests - Staff training for new Trainees and Park Attendants, Traffic control Spraying staff induction Playground.
2.3.3.02 CW Undertake scheduled and reactive maintenance programs of all Council-owned buildings including office furniture replacement - Allocated Amount 2018-19 - \$45,600	Recreation and Buildings	1. Deliver projects according to facilities works program	1. 100%	1. 100%	On target. Works are being carried out as per our current maintenance schedules and reporting mechanisms.
2.3.3.03 CW Undertake building rectification works in line with Council Asset Management - multi-year project - Allocated Amount 2018-19 - \$314,300	Recreation and Buildings	1. Deliver project according to approved project plan (building rectification works)	1. 100%	1. 100%	On target. Works are being carried out in line with the 2018-19 Building Asset Management Plan.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.3 Develop and implement management of operational and maintenance programs for open space, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.3.04 Provide, maintain and manage public aquatic facilities	Recreation and Buildings	1. Oversee the management of Council's public aquatic facilities in accordance with lease obligation checklist 2. Undertake annual off-season facility maintenance in accordance with approved program	1. 100% 2. 100%	1. 100% 2. 100%	On target. All four aquatic facilities are being managed in accordance with the pool management and operational guidelines. On target. Programmed and reactive maintenance continues to be undertaken as required across the four pools.
2.3.3.05 Deliver park furniture renewals across the local government area, including donated seats program, North Haven Boat Ramp and Aqua Reserve Lake Cathie Fish Cleaning Table upgrades	Recreation and Buildings	1. Deliver Park furniture replacement program according to approved schedule	1. 100%	1. 100%	On target. Furniture renewal is being delivered as per program.
2.3.3.06 CW Carry out playground equipment replacement program (incl Herons Creek Resv, Wall Resv, Foreshore Resv and Pioneer Park Comboyne)	Recreation and Buildings	1. Deliver the Playground Equipment Replacement program according to approved schedule (including Herons Creek Reserve and Wall Reserve)	1. 100%	1. 100%	On target. Herons Creek upgrade complete. Concept designs for the upgrade of Wall Reserve are complete, construction to commence in fourth quarter of this financial year.
2.3.3.08 CW Deliver recreational walkway replacement program across the local government area including Kooloonbung Creek Nature Park- Allocated Amount - \$40,000	Recreation and Buildings	1. Deliver Recreational walkway program (including Kooloonbung Creek Nature Park) according to approved project plan	1. 100%	1. 100%	On target. Works have commenced on upgrading a section of walkway in Kooloonbung Creek Nature Park and is ongoing and scheduled to be complete by 30 June 2019.
2.3.3.09 Implement maintenance programs for boat ramps, wharves and jetties	Transport and Stormwater Network	1. Deliver programs according to approved maintenance and schedule (for boat ramps, wharves and jetties)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's road risk rating and road hierarchy systems.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.3 Develop and implement management of operational and maintenance programs for open space, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.3.10 CW Undertake the maintenance program for beaches	Recreation and Buildings	1. Undertake beach and beach access maintenance as per program 2. Undertake inspections of beach access signs	1. 100% 2. 100%	1. 100% 2. 100%	On target. Beach accesses maintained and cleaned as required for summer season. Detailed beach grooming undertaken at all high profile beaches during the summer season. On target. Signs inspected, repaired and replaced as required.
2.3.3.11 CW Rocks Ferry Reserve - Riverbank revetment extension - Adopted 2017-18 - \$150,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Rocks Ferry Reserve)	1. 100%	1. 100%	On target. This project continues from 2017/18 FY. Construction practically complete during Oct 2018 within anticipated budget. Additional scope of works to extend rock armouring has been agreed to take advantage of remaining budget. The lead time of the approvals of the additional scope is expected to be 6 months. This project may therefore continue into 2019/20FY.
2.3.3.12 CW Sancroix/Thrumster Sports Fields - Detailed design and approvals - multi-year project - Adopted 2017-18 - \$300,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Sancroix/Thrumster Sports Fields - design and approvals)	1. 100%	1. 85%	Behind schedule. This project continues from 2017/18 FY. This design phase only project is progressing towards design finalisation in late 2019. The design phase of this project is pending the Development Approval (private developer) for the filling of the sports field site. timing TBC. No construction budget allocation has been made to this project at this stage.
2.3.3.13 CW Westport Park - Riverwall and pathway upgrade - multi-year project- Adopted 2017-18 - \$375,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Westport Park - Riverwall and pathway upgrade)	1. 100%	1. 100%	Achieved. Construction continued from 2017/18 FY. Construction completed on target during Oct 2018.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.3 Develop and implement management of operational and maintenance programs for open space, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.3.14 CW Undertake the Public Amenities Renewals Program - Allocated Amount 2018-19 - \$255,030 Short Street Car Park Reserve	Recreation and Buildings	1. Deliver project according to approved project plan (Public Amenities Renewals program incl Short Street Car Park Reserve)	1. 100%	1. 90%	Monitoring required. This facility is under construction off site and is planned for delivery May 2019, Project will be still be completed prior to 30 June 2019
2.3.3.15 CW Kendall Skatepark – renewal of facility at end of useful life – Design and construct Allocated Amount 2018-19 - \$150,000	Recreation and Buildings, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Kendall Skatepark renewal)	1. 100%	1. 50%	Behind schedule. The initiation phase of this project dependent on confirmation of land availability for the proposed skatepark. Construction of this project by the targeted end date of June 2019 is at risk.
2.3.3.16 Manage burial, cremation and memorialisation services at Innes Garden Memorial Park, Wauchope, Laurieton and other outlying cemeteries	Commercial Business Units	1. Carry out services in accordance with legislative and customer requirements	1. 100%	1. 100%	On target. All cremation and burial services performed in accordance with legislation and customer requests.
2.3.3.17 CW Carry out improvement and expansion works at Innes Garden Memorial Park, Wauchope and Laurieton cemeteries Allocated Amount 2018-19 - \$15,000 Wauchope Cemetery – Install New Shelter	Commercial Business Units	1. Deliver projects according to approved project plan (improvement and expansion works at cemeteries)	1. 100%	1. 100%	On target. Planning for construction is underway with works due May / June.
2.3.3.18 Administration of public roads, public spaces, events and customer engagement: Section 138 Road Applications, Road Encroachments, Customer Enquiries, Statutory Road Functions, Road Policies	Transport and Stormwater Network	1. Deliver works in accordance with Council's Policies and Procedures	1. 100%	1. 90%	Behind schedule. Level of service for responding to applications and enquiries has dropped to a reduction in personnel within the Group.
2.3.3.19 CW Crestwood Park – Construct new park Allocated Amount 2018-19 - \$370,670	Recreation and Buildings	1. Deliver project according to approved project plan (Crestwood Park)	1. 100%	1. 100%	Achieved. Construction of the new park is complete and opened in February 2019.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.3 Develop and implement management of operational and maintenance programs for open space, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.3.21 CW Kew Community Park - Construct new park - Allocated Amount \$151,662	Recreation and Buildings	1. Deliver project according to approved project plan (Kew Community Park - Construct new park)	1. 100%	1. 100%	On target. Community consultation undertaken and designs commenced.
2.3.3.22 CW Coal Wharf Reserve Upgrade - Installation of sub-surface drainage system	Recreation and Buildings	1. Deliver project according to approved project plan (Coal Wharf Reserve Upgrade)	1. 100%	1. 100%	On target. Project charter complete. Community engagement undertaken. Concept designs to be completed by 30 June 2019.

Delivery Program Objective: 2.3.4 Plan, investigate, design and construct open spaces, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.4.02 CW Port Macquarie Coastal Walk — upgrade as per adopted master plan - Allocated Amount 2018-19 - \$1,265,000	Recreation and Buildings	1. Deliver project according to approved project plan (Port Macquarie Coastal Walk)	1. 100%	1. 100%	On target. The Westport Park segment of the Coastal Walk upgrade was completed in November 2018. Works on the Charlie Uptin and Doctors Walk segments are currently in design phase of this project.
2.3.4.03 Wayne Richards Park — Stage 3B detailed design and approvals - Adopted 2016-17 - \$300,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Wayne Richards Park — Stage 3B)	1. 100%	1. 85%	Behind schedule. Design underway for this multi year project and is expected to continue into the 2019/20FY with estimated design completion in May 2020. The construction phase would then be subject to depot relocation and budget allocation.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.4 Plan, investigate, design and construct open spaces, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.4.06 CW Flynn's Beach — upgrade sea wall - multi-year project - Adopted 2015-16 - \$668,006	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Flynn's Beach — upgrade sea wall)	1. 100%	1. 100%	On target. This project continues from 2017/18 FY. Following changes to NSW environmental legislation this project required a formal Development Application (DA). This DA is expected to be determined in early Apr 2019. Construction of this project is programmed to commence in early May 2019 following the busy summer period and be complete by November 2019.
2.3.4.07 CW Googik Track - construct shared walkway/cycleway, Stage 2 - multi-year project - Adopted 2017-18 - \$75,696	Recreation and Buildings	1. Deliver project according to approved project plan (Googik Track - construct shared walkway/cycleway, Stage 2)	1. 100%	1. 20%	Behind schedule. The next stage of works associated with the Googik Track was confirmed by National Parks at the August 2018 Googik Track Working Group Meeting. Design timelines are to be confirmed by National Parks.
2.3.4.08 CW Hastings Regional Sporting Facility - Stage 1 development - multi-year project - Allocated Amount 2018-19 - \$1,500,000	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Hastings Regional Sporting Facility - Stage 1)	1. 100%	1. 100%	On target. This project continues from the 2017/18 FY. Design works are progressing towards an anticipated design completion in mid 2019. Minor preliminary works to receive fill from RMS on site are now complete. Construction works planning and associated phasing are currently being developed. This is a multiyear project and will continue into 2019/20 reporting period for the construction phase (pending funding).
2.3.4.09 CW Town Centre Master Plan - Kooloonbung Creek Foreshore - Gordon to Hayward Street upgrade - Adopted 2017-18 - \$371,565	Recreation and Buildings (Infrastructure Delivery)	1. Deliver project according to approved project plan (Town Centre Master Plan - Kooloonbung Creek Foreshore)	1. 100%	1. 85%	Behind schedule. Construction progressing towards completion in May 2019, one month later than originally planned due to lower productivity than originally estimated, and specialist sub contractor unavailability.

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.4 Plan, investigate, design and construct open spaces, recreational and community facilities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.4.12 CW Port Macquarie Town Centre Master Plan (TCMP) Improvements Banner Poles, Clarence St - Tree and Understorey Replanting, Foreshore Landscaping - General Embellishment, Gordon St Bridge	Recreation and Buildings	1. Deliver project according to approved project plan (PMQ TCMP Improvements)	1. 100%	1. 100%	On target. Gordon Street underpass works are ongoing. The following TCMP projects have been deferred to allow for focus on the finalisation of designs and approvals for the Port Macquarie Foreshore Walk: Foreshore Landscaping, Clarence Street Tree and Understorey Replanting and William Street - Tree and Understorey.
2.3.4.13 CW Develop off leash dog exercise parks in Port Macquarie and Wauchope - Allocated Amount 2018-19 - \$120,000	Recreation and Buildings	1. Deliver project according to approved project plan (Develop off leash dog exercise parks in Port Macquarie and Wauchope)	1. 100%	1. 100%	On target. The Port Macquarie facility now forms part of the broader upgrade of the Stuart Park Regional Sporting Precinct project. Wauchope Dog Off Leash Park has been completed.
2.3.4.14 CW Port Macquarie Pool - Detailed design and approvals - Allocated Amount 2018-19 - \$500,000	Recreation and Buildings	1. Deliver project according to approved project plan (Port Macquarie Pool - Detailed design and approvals)	1. 100%	1. 90%	Behind schedule. The draft aquatics strategy is currently being reviewed by staff. Possible sites for an aquatic facility are being determined by staff prior to commencement of a broad community engagement process regarding this project.
2.3.4.15 CW Mrs Yorks Garden - Concept Plan development - Allocated Amount 2018-19 - \$50,000	Recreation and Buildings	1. Deliver project according to approved project plan (Mrs Yorks Garden - Concept Plan development)	1. 100%	1. 100%	On target. The Master Plan was adopted by Council March 2019. Detailed design and approvals process for key elements of the plan have commenced.
2.3.4.16 CW Wayfinding Signage Implementation (Town and Village Signage) - Allocated Amount 2018-19 - \$50,000	Community Place	1. Deliver project according to approved project plan (Wayfinding Signage Implementation - Town and Village signage)	1. 100%	1. 100%	On target. Sign locations determined, communities engaged on symbolism, quotes for signage received and manufacturing of sign imminent for installation prior to the end of the financial year

Community Strategic Plan: 2.3 Provide quality programs, community facilities and public spaces, e.g. for example, Community community halls, parks and vibrant town centres

Delivery Program Objective: 2.3.5 Plan and deliver innovative Library Services which cater for new technology and growing population

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.5.1 CW Provide a range of library programs and lending services across the local government area (including Library Furnishings, Fittings and Equip; Library Local Priority Grant)	Community Place	1. Annual library events program delivered 2. Increase Library membership	1. 100% 2. 100%	1. 100% 2. 100%	On target. Programs have been delivered as per Operational Plan. On target. Membership is currently 33977 as compared to 33834 last year.
2.3.5.2 CW Purchase of Library Books - multi-year project - Allocated Amount 2018-19 - \$264,900	Community Place	1. Complete book purchases	1. 100%	1. 100%	On target. 75% of the budget has been allocated.
2.3.5.3 Library Development – New Spaces – users and staff (study room and Technology space)	Community Place	1. Completion of the new library spaces	1. 100%	1. 100%	Achieved.
2.3.5.4 Undertake development of a Library Strategic Plan	Community Place	1. Library Strategic Plan development complete	1. 100%	1. 100%	On target. Draft strategic plan is with the Group Manager Community Place for review.
2.3.5.5 CW Library - Webpage Upgrade - Allocated Amount 2018-19 - \$26,000	Community Place	1. Library webpage upgrades complete	1. 100%	1. 100%	On target. Specifications and development brief completed. Quotes have been requested.

Delivery Program Objective: 2.3.6 Support a range of inclusive community activities and programs

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.3.6.2 Develop a strategic approach to Community Programs and activities that align with organisational strategies, particularly the community inclusion plan	Community Place	1. Implement community programs and activities	1. 100%	1. 100%	On target. The Council delivered/supported a number of activities and programs to our community throughout Q1 2019 including: - Rural halls Network Meetings at Hollisdale Hall and Rolland Plains - Australia Day activities at Laurieaton, Port Macquarie and Wauchope - Seniors Week Expo - Mayor's Sporting Fund - fundraising cruise - Hands on History workshops and exhibition (as part of the 4 Seasons in One Dementia Day Program)

Community Strategic Plan: 2.4 Empower the community through encouraging active involvement in projects, volunteering and events

Delivery Program Objective: 2.4.1 Work with the community to identify and address community needs, to inform Council processes, services and projects

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.4.1.1 Promote and coordinate volunteer involvement in Council programs and activities as part of the Community Inclusion Plan	Community Place	1. Promote and coordinate volunteer involvement in Council programs and activities as part of the Community Inclusion Plan	1. 100%	1. 100%	On target. Increase in volunteering across the LGA this month, with 56 new volunteers donating time and resources in a variety of programs and projects.

Community Strategic Plan: 2.5 Promote a creative and culturally rich community

Delivery Program Objective: 2.5.1 Support cultural activities within the community

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.5.1.1 Implement the Cultural Plan	Community Place	1. Implement Cultural Plan actions	1. 100%	1. 100%	On target. The 2018 - 2021 Cultural Plan was adopted at the September 2018 Ordinary Council Meeting. The Cultural Steering Group continues to meet monthly to review progress and prioritise actions. The Plan has 30 actions to be achieved by 2021. An annual report on the 2018 - 2019 actions will be reported at the Ordinary Council Meeting planned for September 2019. Council was successful in an application for grant funding that was lodged under the Building Better Regions Fund to assist in the development of a Cultural Economy Plan. A grant of \$35,000 was received which will be matched by Council. This will be delivered in 19/20 FY.

Community Strategic Plan: 2.5 Promote a creative and culturally rich community
Delivery Program Objective: 2.5.1 Support cultural activities within the community

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.5.1.2 CW Undertake Glasshouse back of house maintenance (Plant and Equipment Purchases; Technical Equipment Purchases - multi-year project)	Commercial Business Units	1. Undertake Glasshouse back of house maintenance as required	1. 100%	1. 100%	On target. Planned Preventative Maintenance on the building and equipment at the Glasshouse included; - Test and Tag on electrical equipment - Painting walls- meeting rooms, offices, artlab, fire doors, main stage - Install kitchen shelving - Stage 2 fire doors repair and replacement program - Boardroom 3 painted and set up - Meeting room moveable wall serviced - Radio microphone frequencies rescanned and reset - Glasshouse external window cleaning of all glass panels - Security system back up batteries replaced across the venue - Lights in stairwells replaced by LED
2.5.1.3 Manage the delivery of a range of high quality performing and visual arts events at the Glasshouse	Commercial Business Units	1. Number of performing arts events presented by 30 June 2. Number of visual arts events presented by 30 June	1. 100% 2. 100%	1. 100% 2. 100%	On target. The Glasshouse Performing Arts Program presented the following events as per the annual season program: -Two -The Gruffalo - Live on stage! - 3 performances The Performing Arts Program operates within the calendar year, it was launched on 31 January 2019 and continues through to November 2019. On target. As per the annual Visual Arts Program, the Glasshouse Regional Gallery presented the following exhibitions: - Discovery Fe26 - Artist Blacksmiths Association of NSW - The National Photographic Portrait Prize 2018 - National Portrait Gallery - Todd Fuller - From Somewhere - Claire Johnson - Ode to a Woman - Jackie Dean - Drift - Sue Bell & Jann Kesby - Two Obsessions

Community Strategic Plan: 2.5 Promote a creative and culturally rich community
Delivery Program Objective: 2.5.1 Support cultural activities within the community

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
2.5.1.4 CW Wauchope Bicentenary Riverside Sculptural Trail - Allocated Amount - \$196,140	Community Place	1. Commence installation of sculptures, seating and signage for the Wauchope Bicentenary Riverside Sculptural Trail	1. 100%	1. 100%	On target. Grant funding received in February 2019. Project planning commenced.



Community Strategic Plan: 3.1 Embrace business and a stronger economy

Delivery Program Objective: 3.1.1 Assist the growth of local business and industry, ensuring this is a central consideration of Council activities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.1.1.1 Implement actions from the 2017-2021 Economic Development Strategy to lead, create and proactively support an environment that stimulates sustainable industry, business and investment growth	Economic Development and Communications	1. Implement actions from the Economic Development Strategy	1. 100%	1. 100%	On target. Highlights have included The Hub pop-up co-working and business space plus associated events, investment attraction presence at the International Convention Centre, and collaboration with CSU to complete a hackathon with IT students assisting local businesses.
		2. Meet the charter requirements of the Small Business Friendly Council Program	2. 100%	2. 100%	On target. The major initiatives as part of the Small Business Friendly Council program include the Local Preference Policy and Outdoor Dining Policy. The Outdoor Dining trial was extended to include a fee waiver for footpath trading in towns and villages.
		3. Undertake and report on an annual business confidence survey	3. 100%	3. 100%	On target. Request For Quotation released for 2019 Business Confidence Survey.

Community Strategic Plan: 3.1 Embrace business and a stronger economy**Delivery Program Objective:** 3.1.2 Optimise the use of appropriately zoned land for business uses

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.1.2.1 Finalise Local Environmental Plan (LEP) and Development Control Plan (DCP) amendments in relation to a business park near Port Macquarie Airport	Strategic Land Use Planning	1. Report to Council regarding adoption of LEP and DCP amendments by 31 Dec	1. 100%	1. 50%	Behind schedule. Planning Proposal lodged end March 2019 for the proposed airport precinct business park. At the time of writing this report, this item is expected to be reported to May 2019 Council Meeting.
3.1.2.2 Investigate the capacity of land at the intersection of Ocean Drive and Houston Mitchell Drive Lake Cathie, for potential service industrial development	Strategic Land Use Planning	1. Review of information submitted by landowners and progress report to Council by 31 December 2018	1. 100%	1. 95%	Monitoring required. Site Specific Planning Proposal request submitted by land owner proposing the rezoning of the land for potential industrial development and under assessment. Assessment and reporting of the Planning Proposal request to Council is pending the submission of additional information from the Proponent.

Delivery Program Objective: 3.1.3 Implement Major Events Strategy

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.1.3.2 Finalise and implement a new Port Macquarie-Hastings Events Plan	Economic Development and Communications	1. Commence implementation of actions relating to 'Major Events'	1. 100%	1. 100%	On target. Council supported 8 major events during the January - March quarter. These events resulted in a combined economic impact of almost \$13 million for our community. The Event Sponsorship Program has awarded funding to successful recipients for events held in the second half of 2019.
		2. Finalise Events Plan	2. 100%	2. 99%	Monitoring required. The Events Plan has been reviewed with final updates underway. It is scheduled to be presented to Executive Group for endorsement by the end of the financial year with implementation planned from the second half of 2019

Community Strategic Plan: 3.1 Embrace business and a stronger economy

Delivery Program Objective: 3.1.4 Implement the Destination Management Plan

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.1.4.1 Deliver actions from the Destination Management Plan in accordance with the identified strategic outcomes	Economic Development and Communications	1. Implement actions within the Destination Management Plan (DMP)	1. 100%	1. 100%	On target. During the second quarter of FY 18-19 delivery of DMP actions was ongoing. Notable mentions include; Completion of the 2019 Visitor Profiling and Satisfaction Survey. Completion of the Destination Audit and Analysis Report. Five local activities businesses were formally recognised as Export Ready and attended a New Product Workshop hosted by DNSW with 24 international inbound tour buyers. They will also be promoted at the Australian Tourism Exchange 2019 in Perth. Ongoing conversations with both National Parks and Wildlife Service and Forestry Corporation around local nature attractions, activation and collaboration. Provided ongoing support to Destination North Coast regarding the creation of a Business Events Bureau for the North Coast. Planning for 'Fly Port Macquarie' and Winter Campaign' this includes partnership involvement by DNSW, Alliance Airlines, Qantas and Virgin Australia. The destination public relations program secured famils from Sydney Weekender, The Weekend Australian Magazine, Fairfax Traveller and Channel 10's The Cooks Pantry. Coverage also appeared in Country Style.
		2. Increase new monthly visits to the website by more than 15% in 12 months	2. 100%	2. 100%	On target. Visits to the destination website so far for the third quarter show an increase of 47.23% year on year. This represents an increase in users from 182,956 for the period in 2017-2018 to 269,368 for the same period in 2018-2019.

Community Strategic Plan: 3.1 Embrace business and a stronger economy

Delivery Program Objective: 3.1.4 Implement the Destination Management Plan

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		3. Review and update the Destination Management Plan	3. 100%	3. 100%	On target. The Economic Development team have finalised the Visitor Profiling and Satisfaction Survey and the Destination Audit and Analysis report, these two key reports will underpin the Destination Management Plan review process. Internal planning using Council's Project Management Framework will commence once Winter Campaign planning is complete.

Community Strategic Plan: 3.2 Create vibrant and desirable places

Delivery Program Objective: 3.2.1 Support vibrant commercial, tourism, recreational and or community hubs across the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.2.1.1 Continue installation of town and village signage installation	Community Place	1. Deliver project according to approved project plan (installation of town and village signage)	1. 100%	1. 100%	On target. Sign locations determined, communities engaged on symbolism, quotes for signage received and manufacturing of sign imminent for installation prior to the end of the financial year.
3.2.1.2 Support towns and villages initiatives that will provide activation and economic return	Economic Development and Communications	1. Identify initiatives and secure stakeholder support	1. 100%	1. 100%	On target. Wauchope Main Street Upgrade works progressing. Creative Wauchope and Motorcycle Friendly Wauchope initiatives handed over to Wauchope Chamber of Commerce and Industry. Engagement with Camden Haven Chamber of Commerce on improving Bold Street vibrancy, visual merchandising workshop scheduled for May 2019.

Community Strategic Plan: 3.3 Embrace opportunity and attract investment to support the wealth and growth of the community

Delivery Program Objective: 3.3.1 Develop, manage and maintain Port Macquarie Airport as a key component of the regional transport network and continue to grow the airport's contribution to the regional economy

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.3.1.1 Continue to monitor, plan and implement the Port Macquarie Airport Master Plan to meet demand and regulatory requirements - multi-year project	Commercial Business Units	1. Deliver identified actions from the Airport Master Plan according to approved plan	1. 100%	1. 100%	On target. Terminal Building Upgrade - construction commenced with Stage 1 works due for completion mid-2019. Parallel Taxiway - concept design finalised. Environmental approval pathway to be confirmed. Biodiversity Certification Agreement - progressing with implementation post approval. Council Biobanking Agreement Application submitted to OEH.
3.3.1.2 Support, facilitate and advocate for regular public transport (RPT) airline services at Port Macquarie Airport	Commercial Business Units	1. Increase in passenger numbers compared to previous year	1. 100%	1. 96%	Behind target. Passenger numbers for March 2019 are 2.1% up on March 2018, however passenger numbers over the past 12 months (April 2018 to March 2019) are 4.5% down compared to 12 months prior (April 2017 to March 2018).
3.3.1.3 CW Port Macquarie Airport Terminal Upgrade - finalise construction - multi-year project - Allocated Amount 2018-19 \$3,500,000	Commercial Business Units (Infrastructure Delivery)	1. Deliver project according to approved project plan (Port Macquarie Airport Terminal Upgrade)	1. 100%	1. 100%	On target. Terminal Building Upgrade - construction commenced with Stage 1 works due for completion mid-2019.
3.3.1.4 New Port Macquarie Airport Parallel Taxiway Stage 1 and General Aviation pavement renewal – finalise detailed design	Commercial Business Units (Infrastructure Delivery)	1. Deliver project according to approved project plan (Port Macquarie Airport Parallel Taxiway Stage 1 and GA Pavement Renewal)	1. 100%	1. 100%	On target. Parallel Taxiway - concept design finalised. Environmental approval pathway to be confirmed.
3.3.1.5 Continue to monitor, plan and implement the Port Macquarie Airport Bio certification Strategy - multi-year project	Commercial Business Units, Environmental Services	1. Deliver identified actions from the Bio certification Strategy according to approved project plan	1. 100%	1. 100%	On target. Biodiversity Certification Agreement - progressing with implementation post approval. Council Biobanking Agreement Application submitted to OEH.

Community Strategic Plan: 3.3 Embrace opportunity and attract investment to support the wealth and growth of the community

Delivery Program Objective: 3.3.1 Develop, manage and maintain Port Macquarie Airport as a key component of the regional transport network and continue to grow the airport's contribution to the regional economy

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.3.1.6 Operate and maintain Port Macquarie Airport in accordance with regulatory and safety requirements	Commercial Business Units	1. Carry out daily aerodrome inspections according to regulatory requirements 2. Ensure airport operational manuals are reviewed by 30 June	1. 100% 2. 100%	1. 100% 2. 100%	On target. All inspections carried out in accordance with regulatory requirements. On target. The Airport Operational Manuals are updated progressively throughout the year as required.
3.3.1.7 Airport Business Precinct development planning	Assets and Property Investment, Commercial Business Units	1. Commence infrastructure concept planning upon receipt of Council rezoning decision	1. 100%	1. 100%	Yet to commence. Commencement subject to receipt of Council rezoning decision

Delivery Program Objective: 3.3.2 Promote investment, education and lifestyle opportunities

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.3.2.1 Promote local growth and opportunities within and outside the region	Economic Development and Communications	1. Ensure the Investment Prospectus is up to date 2. Include broader place opportunity messaging through marketing channels	1. 100% 2. 100%	1. 100% 2. 100%	On target. Prospectus reviewed and reprinted, photography update completed, next update to be designed and released in Q2 2019. On target. Further videography commenced for the live, work, invest campaign.

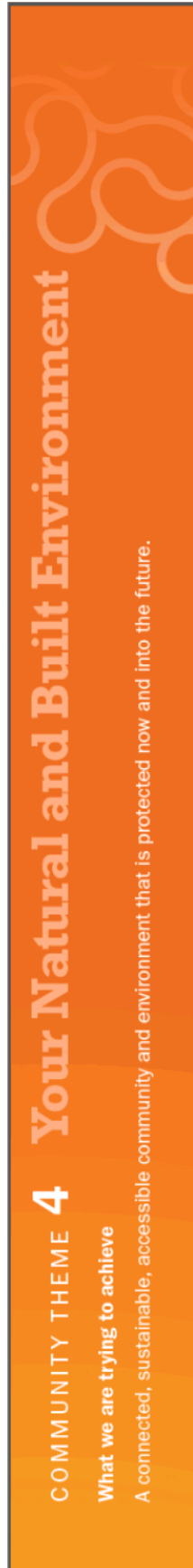
Community Strategic Plan: 3.4 Partner for success with key stakeholders in business, industry, government, education and the community

Delivery Program Objective: 3.4.2 Support local business networks

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.4.2.1 Work closely with local business networks and organisations to build their capacity and facilitate the growth of existing enterprises.	Economic Development and Communications	1. Ongoing engagement with, and support for local business networks	1. 100%	1. 100%	On target. The Business Hub is meeting regularly with 75% attendance and is actively involved with The Hub business and co-working space.

Delivery Program Objective: 3.4.3 Encourage innovation that will support our growth as a regional city including smart community technology

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
3.4.3.2 Prioritise, advocate and implement projects that enhance the local digital environment.	Economic Development and Communications	1. Expand the local free Council WiFi network 2. Support the delivery of projects which enhance local digital engagement and 'smart' technology roll out.	1. 100% 2. 100%	1. 100% 2. 100%	On target. Planning progressing for new Council wifi at the upgraded Airport Terminal and at the Port Macquarie Pool. Investigation of potential new sites has focused on Port Macquarie Bus Terminal. On target. On-going support provided via The Hub Business and Co-Working Space events. Support provided for Local Wordpress Conference funding bid; engagement with tourism operators on outcomes and digital opportunities identified from Council's recent Visitor Profiling and Satisfaction Survey.



Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.1 Plan, investigate, design and construct water supply assets ensuring health, safety, environmental protection and security of supply for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.1.01 CW Commencement of the construction of the Sancroix to Thrumster trunk main (DN750), Thrumster - Adopted Amount 2017-18 - \$1,500,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Sancroix Reservoir to Area 13 - 750 mm)	1. 100%	1. 100%	On target. This project continues from 2017/18 FY and is a multiyear project Design phase now practically complete with construction phase to follow into 2019. The construction phase of this project is expected to continue into 2019/20FY and require some carry over of project budget
4.1.1.04 CW Installation of new water supply services to residential and business premises - to cater for new development - Allocated Amount 2018-19 - \$408,800 Annual installation of New Services	Water and Sewer	1. Deliver project according to approved project plan (new water supply services to residential and business premises)	1. 100%	1. 100%	On target. New water and re-lined services installed to meet development. 63% of budget spend.
4.1.1.09 CW Undertake future water supply design works as required - Allocated Amount 2018-19 \$102,200	Water and Sewer	1. Complete future water supply design works as required	1. 100%	1. 100%	On target. Works being carried out as required.
4.1.1.11 CW Korea Island HV incoming electrical upgrade (33KV) - Adopted 2017-18 - \$150,000	Water and Sewer	1. Deliver project according to approved project plan (Korea Island HV incoming electrical upgrade)	1. 100%	1. 100%	Achieved. High voltage upgrade complete.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.1 Plan, investigate, design and construct water supply assets ensuring health, safety, environmental protection and security of supply for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.1.13 CW Commence construction of Area 14 reclaimed outlet trunk main (DN250), Bonny Hills - Adopted 2017-18 - \$950,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Area 14 Reclaimed trunk main)	1. 100%	1. 100%	On target. Construction commenced in early 2019 on this multi year project. This project comprises both the inlet and outlet mains for the reclaimed water network connection between the Grants Head reservoir and the Bonny Hills development Area 14. This project is programmed to continue into the 2019/20 reporting period and is expected to be completed in early 2020.
4.1.1.16 CW Thrumster Reclaimed Water Interim Supply - Rising Main to Thrumster Reservoir - undertake construction - Adopted 2017-18 - \$5,850,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Thrumster Reclaimed Water Interim Supply)	1. 100%	1. 100%	On target (multi-year project). Design phase being finalised presently. Target construction tender advertisement early 2019, ahead of construction commencement. The construction phase of this project will continue into 2019/20FY and require some carry over of the project budget.
4.1.1.17 CW Beechwood Rosewood Reservoir - Beechwood connection - Undertake Construction/Delivery of Voluntary Planning Agreement (VPA) Council funded works - Adopted 2017-18 - \$1,850,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Beechwood Rosewood Reservoir)	1. 100%	1. 100%	On target. Progressing well towards completion in mid 2019. Continuation into July 2019 may be required for final connections and completion of the Hasting River Underbore.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.1 Plan, investigate, design and construct water supply assets ensuring health, safety, environmental protection and security of supply for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.1.18 CW Commence construction of the Wauchope to Sancroix Trunk Main - Allocated Amount 2018-19 - \$1,285,574	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Construction of the Wauchope to Sancroix Trunk Main)	1. 100%	1. 60%	Behind schedule. This project is in the finalisation of the design phase. During the previous reporting period the environmental assessment pathway for the proposed watermain was reviewed and the need for an Environmental Impact Statement (EIS) and Development Application (DA) was confirmed to be required for a portion of the propose route. These additional environmental assessment processes delayed the completion of the project design phase until mid 2019, hence delaying the potential construction commencement until the start of the 2019/20FY at earliest. This project budget will consequently require some carry over into the 2019/20FY.
4.1.1.20 CW Construction of the Southern Arm Trunk Main (DN900) - Cowarra Balance tank to Pacific Hwy - Allocated Amount 2018-19 - \$4,599,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Construction of the Southern Arm Trunk Main (DN900))	1. 100%	1. 100%	On target. Project continues from 2017/18 FY. Construction underway and expected to be completed ahead of program in early 2019.
4.1.1.25 CW Commence Port Macquarie Sewerage Pumping Station (SPS) #64 Electrical upgrade works - Allocated Amount 2018-19 - \$165,000	Water and Sewer	1. Deliver project according to approved project plan (Port Macquarie Sewerage Pumping Station (SPS) #64)	1. 100%	1. 100%	On target. Upgrade works are nearing completion and commissioning in early April.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
Delivery Program Objective: 4.1.2 Develop and implement annual maintenance and preventative works program for water supply assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.2.1 CW Conduct water asset replacement and renewal programs for live water mains, water meters, renewals and minor works and switchboards	Water and Sewer	1. Deliver programs according to approved schedule (Live water mains, water meters, renewals and minor works, pumps, switchboards and flow meters)	1. 100%	1. 100%	On target. Annual allocations for operational works to replace water supply assets based on operational, condition, age and unplanned events in accordance with approved project plans. Water Meters - Replacements ongoing delivery targeting 200 x 20mm meters per month, 57% of annual allocation spend to date; Renewals and Minor Works - Delivery of Prioritised works, 25% of annual allocation spend to date; Live Water Mains Renewals - prioritised replacement of water mains based on condition, age & defects 67% of annual allocation spend to date; Construction resources prioritised with delivering other projects funded alternative to this reoccurring allocation; Relocations - Relocations associated with capital works for Infrastructure Delivery and Transport and Stormwater Groups, 29% of annual allocation spend to date.
4.1.2.2 CW Upgrade disinfection dosing system at various locations - Allocated Amount 2018-19 - \$204,400	Water and Sewer	1. Deliver project according to approved project plan (Upgrade disinfection dosing system at various locations)	1. 100%	1. 50%	Behind target. Sourcing alternative quotes for a sodium hypochlorite dosing package for the Telegraph Point Water Treatment Plant as the chlorine gas system proved not to be feasible.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.3 Plan, investigate, design and construct sewerage assets ensuring health, safety, environmental protection and the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.3.01 CW Commence construction of the Port Macquarie Sewer rising main (PMSP71), Port Macquarie - Adopted 2017-18 - \$1,388,749	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Port Macquarie Sewer Pump Station 71)	1. 100%	1. 85%	Behind schedule. This project continues from 2017/18 FY and is a multi-year project. Detailed design phase has reached completion during the reporting period, and construction phase planning progressing towards commencement in early 2019 and will continue into 2019/20FY and require some project budget carry over.
4.1.3.03 CW Small towns sewerage program - provision of centralised sewerage systems for Comboyne - multi-year project - Allocated Amount 2018-19 \$4,000,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Small towns sewerage program - provision of centralised sewerage systems for Comboyne)	1. 100%	1. 100%	On target. This project continues from previous FY's. A tender for the construction of the 3 villages Sewer Schemes was awarded at the August Ordinary Council meeting. Construction commencement Oct 2018 and continue to 2020.
4.1.3.04 CW Small towns sewerage program - provision of centralised sewerage systems for Long Flat - multi-year project- Allocated Amount 2018-19 - \$4,000,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Small towns sewerage program - provision of centralised sewerage systems for Long Flat)	1. 100%	1. 100%	On target. This project continues from previous FY's. A tender for the construction of the 3 villages Sewer Schemes was awarded at the August Ordinary Council meeting. Construction commencement Oct 2018 and continue to 2020.
4.1.3.05 CW Small towns sewerage program - provision of centralised sewerage systems for Telegraph Point - multi-year project - Allocated Amount 2018-19 - \$4,000,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Small towns sewerage program - provision of centralised sewerage systems for Telegraph Point)	1. 100%	1. 100%	On target. This project continues from previous FY's. A tender for the construction of the 3 villages Sewer Schemes was awarded at the August Ordinary Council meeting. Construction commencement Oct 2018 and continue to 2020.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.3 Plan, investigate, design and construct sewerage assets ensuring health, safety, environmental protection and the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.3.06 CW Area 15 (Lakewood/Kew) - sewerage upgrade to provide for future development - multi-year project - Allocation Amount - \$424,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Area 15 (Lakewood/Kew) - sewerage upgrade)	1. 100%	1. 100%	On target. (to continue into 2019/20 and through into 2020/21) PMHC partnering with NSW Public Works Advisory for the delivery of this project. NSW Public Works Advisory progressing with project management for the detailed design and delivery of this STP upgrade. The design and investigations phase is programmed to continue into the 2019/20FY. The construction phase of this project is estimated to commence not before early 2020 based on current project status.
4.1.3.13 CW Undertake future Sewerage design works as required - Allocated Amount 2018-19 - \$102,200	Water and Sewer	1. Complete future sewerage design works as required	1. 100%	1. 100%	On target. Works being carried out as required.
4.1.3.15 CW Commencement of the construction of the Area 14 reclaimed Inlet trunk main (DN250), Bonny Hills - Allocated Amount 2018-19 - \$1,100,000	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Reclaimed Water - Area 14 Reclaimed Trunk Main)	1. 100%	1. 100%	See item 4.1.1.13 CW
4.1.3.17 CW Construction of Sewer Rising Main from Camden Haven Sewer Pump Station #1 to Dunbogan Bridge and Sewer Rising Main Extension to Dunbogan Sewer Treatment Plant	Water and Sewer (Infrastructure Delivery)	1. Deliver project according to approved project plan (Sewer Rising Main from Camden Haven Sewer Pump Station #1)	1. 100%	1. 100%	On target. This project will be incorporate the upgrade to the sewer rising main and water main servicing the Dunbogan STP. Progressing well and on target for completion ahead of program and prior to end of FY.
4.1.3.18 CW Preconstruction of Thrumster Sewerage treatment Plant (Area 13) - Phase 1 - 20000EP - Allocated Amount 2018-19 - \$511,000	Water and Sewer	1. Deliver project according to approved project plan (Preconstruction of Thrumster Sewerage Treatment Plant (Area 13))	1. 100%	1. 50%	Behind target. This project has been included as a high priority with Integrated Water Cycle Management project engagement with Public Works Advisory and includes Environmental Impact Statement and feasibility assessment of different options for Thrumster and the Port Macquarie STPs that can cater for growth in the Port Macquarie area.

Your Natural and Built Environment Page 58

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.3 Plan, investigate, design and construct sewerage assets ensuring health, safety, environmental protection and the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.3.19 CW Sewer Treatment Plant (STP) Road Resurfacing	Water and Sewer	1. Deliver project according to approved project plan (Sewer Treatment Plant (STP) Road Resurfacing)	1. 100%	1. 100%	On target. Road resurfacing at Port Macquarie completed. Bonny Hills Wastewater Treatment Plant to be carried out during May 2019.
4.1.3.20 CW Wauchope Sewer Treatment Plant (STP) Office Construction	Water and Sewer	1. Deliver project according to approved project plan (Wauchope Sewer Treatment Plant (STP) Office Construction)	1. 100%	1. 100%	Achieved. Wauchope Wastewater Treatment Plant demountable office has been installed and is now functional.
4.1.3.27 CW Camden Haven Reticulation Augmentation Allocated Amount - \$930,390	Water and Sewer, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Camden Haven Reticulation Augmentation)	1. 100%	1. 100%	On target. Works progressing on Sewer Pump Station No1 rising main upgrades to Camden haven Sewer Treatment Plant.
4.1.3.28 CW Laurieton Sewer Rising Main SPS#1 to Dunbogan Bridge - \$930,390	Water and Sewer, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Laurieton Sewer Rising Main SPS#1 to Dunbogan Bridge)	1. 100%	1. 100%	On target. Project progressing well with Construction near completion and due for finalisation during May 2019.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
Delivery Program Objective: 4.1.4 Develop and implement annual maintenance and preventative works program for sewerage assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.4.1 CW Programmed replacement of Sewer Pumps and Electrical switchboards at Sewage Pump Stations	Water and Sewer	1. Deliver project according to approved project plan (Programmed replacement of Sewer Pumps and Electrical switchboards at Sewage Pump Stations)	1. 100%	1. 100%	On target. Annual allocations for operational works to replace sewerage assets based on operational, condition, age and unplanned events in accordance with approved project plans. Sewer Pump Replacement Program - Replacements to fleet of sewerage pumps, 89% of annual allocation spend to date; Sewer Switchboard Replacement program - Replacements to fleet of sewerage switchboards, 88% of annual allocation spend to date.
4.1.4.4 CW Carry out programmed replacement of Sewer Treatment Plant electrical and mechanical assets including instruments	Water and Sewer	1. Deliver project according to approved project plan (Carry out programmed replacement of Sewer Treatment Plant electrical and mechanical assets)	1. 100%	1. 100%	On target. Programmed replacement/refurbish of mechanical and electrical assets at Councils Sewage Treatment Plants.
4.1.4.5 CW Conduct sewer assets replacement and maintenance program for odour control installations, Sewer Rehabilitation Renewal and Relining Works	Water and Sewer	1. Deliver project according to approved project plan (Conduct sewer assets replacement and maintenance program)	1. 100%	1. 100%	On target. Annual allocations for operational works to replace Sewerage assets based on operational, condition, age and unplanned events in accordance with project plan. Sewer Rehabilitation - Delivery of Prioritised works, 27% of annual allocation spend to date. Sewer Relining - Delivery of Prioritised works, 75% of annual allocation spend to date.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.5 Work towards planning, investigation, design, construction of stormwater assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.5.06 CW Black Swan Terrace - Stormwater detention facility - Adopted 2017-18 - \$300,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Black Swan Terrace - Stormwater detention facility)	1. 100%	1. 80%	Behind schedule. Design is currently being amended to remove services clashes (Telstra and sewer).
4.1.5.07 CW Continue stormwater remediation - Calwalla Crescent - Allocated Amount 2018-19 - \$275,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Continue stormwater remediation - Calwalla Crescent)	1. 100%	1. 100%	On target. Design phase complete. Construction planning underway targeting commencement in early 2019 and completion prior to end of FY.

Delivery Program Objective: 4.1.6 Develop and implement annual maintenance and renewal programs for stormwater assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.6.01 CW Stormwater line maintenance and repairs, Andrew's Park Wauchope - Adopted 2017-18 - \$100,000	Transport and Stormwater Network	1. Deliver program according to approved schedule (Andrews Park, Wauchope)	1. 100%	1. 100%	On target. Works completed.
4.1.6.02 Settlement Shores canals - undertake maintenance as required	Transport and Stormwater Network	1. Settlement shore canal maintenance undertake in accordance with customer requests on a reactive basis	1. 100%	1. 100%	On target. Tasks being undertaken as per established procedures.
4.1.6.04 Broadwater canals - undertake maintenance	Transport and Stormwater Network	1. Undertake canal maintenance works in accordance with the rolling priority program and risk management processes.	1. 100%	1. 100%	On target. Tasks being undertaken as per established procedures.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
Delivery Program Objective: 4.1.6 Develop and implement annual maintenance and renewal programs for stormwater assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.6.05 Settlement Shores canals - Major Maintenance and Dredging	Transport and Stormwater Network	1. Complete Settlement Shores canals dredging	1. 100%	1. 100%	On target. Contractor selected and endorsed at November 2018 Council Meeting. Contractor will begin works in July 2019 - note that this will automatically result in a carryover of funding into the 2019-2020 financial year.
4.1.6.07 CW Carry out the Stormwater Renewal Program - Allocated Amount 2018-19 - \$646,930	Transport and Stormwater Network	1. Deliver program according to approved schedule (Stormwater Renewal)	1. 100%	1. 100%	On target. The 2018-19 Stormwater Renewal program includes the following projects and status: Planning Phase (Stormwater Relining): Fairmont Gardens, Wauchope (subject to funding) Completed (Stormwater Relining): 559 Ocean Dr, North Haven Bell St, Dunbogan 5 Cook St, North Haven Andrews Park, Wauchope (OP Item) Repairs to the stormwater line underneath Andrews Park, Wauchope were completed in November 2018. The Fairmont Gardens stormwater line contains many sinkholes under the sportsfield, The project requires further investigation (stormwater camera) before quotation and the commencement of works. The programme is on track for completion in June 2019.
4.1.6.08 CW Investigation of Stormwater Remediation Options - Panorama Drive Catchment - Allocated Amount 2018-19 - \$50,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Remediation Options - Panorama Drive Catchment)	1. 100%	1. 100%	On target. This project involves the development of a concept design only to address stormwater issues at this location. Design phase commenced in Jan 2019 and is expected to be complete by mid 2019.
4.1.6.09 CW Construction of Stormwater Flooding Mitigation measures - Rodley Street Bonny Hills - Allocated Amount 2018-19 - \$700,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Flooding Mitigation measures - Rodley Street Bonny Hills)	1. 100%	1. 100%	On target. Design phase underway from 2017/18 FY. Construction expected to commence in May 2019 and be complete during Sept 2019.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
Delivery Program Objective: 4.1.6 Develop and implement annual maintenance and renewal programs for stormwater assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.6.10 Stormwater Asset Management Condition Rating of stormwater assets	Transport and Stormwater Network	1. Deliver project to approved project plan (Condition Rating of stormwater assets)	1. 100%	1. 100%	On target. Capture of stormwater condition data is ongoing, with the results being used to guide stormwater renewal program development and future maintenance activities.
4.1.6.11 CW Investigation of Stormwater Remediation options - Bellbowrie/Bay Street Catchment Allocated Amount 2018-19 - \$50,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Remediation options - Bellbowrie/Bay Street)	1. 100%	1. 100%	On target. This design only project is underway and progressing towards completion in May 2019.
4.1.6.12 CW Stormwater Remediation Designs – various Designs of drainage improvement works - Allocated Amount 2018-19 - \$20,000	Transport and Stormwater Network	1. Deliver project to approved project plan (Stormwater Remediation Designs – various designs)	1. 100%	1. 100%	On target. Designs to be prioritised and completed in response to operational needs identified during the financial year in accordance with the established stormwater drainage risk assessment process.
4.1.6.13 CW Construction of Stormwater Remediation measures - Stage 2 - Batar Creek Road Kendall - Allocated Amount 2018-19 - \$320,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Remediation measures - Stage 2 - Batar Creek Road Kendall)	1. 100%	1. 100%	Achieved. Construction commenced during Aug 2018 and be completed by Oct 2018. Supplementary works also completed Dec 2018.
4.1.6.15 CW Detailed Designs of Stormwater Remediation measures identified in the Westport Stormwater Management Plan - Gordon Street to Buller Street PMQ - Allocated Amount 2018-19 - \$300,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Detailed Designs of Stormwater - Gordon Street to Buller Street Port Macquarie) - Allocated Amount 2018 -19 - \$300,000	1. 100%	1. 100%	On target. Stormwater catchment analysis and design phase progressing.

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management

Delivery Program Objective: 4.1.6 Develop and implement annual maintenance and renewal programs for stormwater assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.6.16 CW Stormwater Remediation - 10 Dilladerry Cr, Port Macquarie - Detailed Design - Adopted 2017-2018 - \$125,056	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Remediation - 10 Dilladerry Cr, Port Macquarie)	1. 100%	1. 100%	On target. This design only project continues from 2017/18 FY. Design now complete. The construction phase of this project will be delivered in conjunction with the Calwalla Cr project.
4.1.6.17 CW Stormwater Remediation - Lincoln Rd/Racewyn Close - Detailed Design - Adopted 2017-2018 - \$100,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project to approved project plan (Stormwater Remediation - Lincoln Rd/Racewyn Close - Detailed Design)	1. 100%	1. 100%	On target. Design underway since 2017/18 FY. (design only project) Design completion expected Mar 2019. No construction phase presently proposed for this project.

Delivery Program Objective: 4.1.7 Develop and implement effective waste management strategies

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.7.01 CW Kingfisher Waste Depot - Commence construction for expansion (upgrade and expansion - multi-year project) Allocated Amount 2018-19 - \$1,000,000	Environmental Services, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Kingfisher Waste Depot - Commence construction for expansion)	1. 100%	1. 100%	On target. Detailed design phase near completion. The design phase is expected to continue until May 2019 with construction to continue into 2019-20 FY. This is a multi-year project. No monthly report.
4.1.7.02 Deliver a resident, commercial & industrial education program to encourage source separation of waste	Environmental Services	1. Deliver the Waste Education program by 30 June	1. 100%	1. 100%	On target. Continuing with TV, Radio, Digital billboard and social media.
4.1.7.03 Ensure continuing kerb-side domestic waste collection	Environmental Services	1. Deliver domestic waste collection service	1. 100%	1. 100%	On target
4.1.7.04 Provide drop-off waste services and recycling facilities at Kingfisher, Kew, Caimcross, Comboyne, Wauchope	Environmental Services	1. Deliver drop-off waste services - waste transfer stations	1. 100%	1. 100%	On target
4.1.7.05 Provision of commercial waste collection services	Environmental Services	1. Deliver commercial waste collection service	1. 100%	1. 100%	On target

Community Strategic Plan: 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
Delivery Program Objective: 4.1.7 Develop and implement effective waste management strategies

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.1.7.06 Operate Kingfisher and Cairncross Waste Depots to process and dispose of waste to landfill	Environmental Services	1. Processing and disposal of waste including organics	1. 100%	1. 100%	On target.
4.1.7.07 Continue to provide waste collection for public places – town centres and parks and provide waste collection for public events (as required)	Environmental Services	1. Deliver public space waste collection service	1. 100%	1. 100%	On target.
4.1.7.08 CW Wauchope Transfer Station - Replacement of three transfer bins - Allocated Amount 2018-19 - \$50,000	Environmental Services	1. Deliver project according to approved project plan (Wauchope Transfer Station - Replacement of three transfer bins)	1. 100%	1. 100%	On target. Specification developed and quotes being sought.
4.1.7.09 Illegal Dumping Clean Up / Prevention Program	Environmental Services	1. Illegal Dumping Clean Up / Prevention Program delivered	1. 100%	1. 100%	On target. Further communication and marketing planned for 2019. Clean up works planned for April.
4.1.7.10 Preparation for Multi Dwelling Organics Recovery Project	Environmental Services	1. Preparation of the Multi Dwelling Organics Recovery Project underway	1. 100%	1. 0%	Not available. This project has been deferred until 2019-2020 due to China National Sword (recycling).
4.1.7.11 CW Kingfisher Waste Depot - Finalise Development Application and Design	Environmental Services (Infrastructure Delivery)	1. Deliver project according to approved project plan (Kingfisher Waste Depot - Finalise Designs)	1. 100%	1. 100%	On target. Detailed design phase progressing well. This is a multiyear project and will continue into the 2019/20 reporting period.
4.1.7.12 CW Cairncross Waste Depot - Facility Upgrade and Expansion Approvals	Environmental Services	1. Deliver project according to approved project plan (Cairncross Waste Depot - Facility Upgrade and Expansion Approvals)	1. 100%	1. 100%	On target. Response to public submissions submitted to Dept of Planning - assessment underway.
4.1.7.13 Port Macquarie Hastings Fishing Litter Project	Environmental Services	1. Port Macquarie Hastings Fishing Litter Project delivered	1. 100%	1. 100%	On target. Communication planned for early 2019. Engagement underway.

Community Strategic Plan: 4.2 Aim to minimise the impact of natural events and climate change, for example, floods, bushfires and coastal erosion

Delivery Program Objective: 4.2.1 Develop and implement Coastal, Estuary, Floodplain, and Bushfire management plans

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.2.1.01 Deliver annual maintenance programs for bushfire risk mitigation works on Council land in accordance with the Bush Fire Risk Management Plan (BFRMP) - adopted by NSW Rural Fire Service	Environmental Services	1. Deliver project according to approved project plan (Annual maintenance programs for bushfire risk mitigation works on council land)	1. 100%	1. 100%	On target.
4.2.1.02 (a) Continue to implement Floodplain Risk Management Plan	Environmental Services	1. Implementation of Floodplain risk management actions underway	1. 100%	1. 0%	Refer to 4.2.1.4 and 4.2.1.5.
4.2.1.03 Undertake development of Coastal Management Plans (Coastal Management Program)	Environmental Services	1. Development of Coastal Management Plans complete (Coastal Management Program)	1. 100%	1. 50%	Behind schedule. Development of the over arching Coastal Management Program is dependent on funding. Grant funding being sought. Project Plan being developed.
		2. Development of Estuary Management Plans complete (Coastal Management Program)	2. 100%	2. 50%	Behind schedule. Development of the over arching Coastal Management Program is dependant on funding. Grant funding being sought. Project Plan being developed.
4.2.1.04 Wrights and Yarranabee Creeks Flood Study - Update to include Urban Drainage Systems	Environmental Services	1. Wrights and Yarranabee Creeks Flood Study complete	1. 100%	1. 0%	Behind target. Flood study presented to the December 2018 Ordinary Council Meeting, however due to policy change (climate change) developing scope for further modelling.
4.2.1.05 North Brother Local Catchments Flood Study	Environmental Services (Transport and Stormwater Network)	1. North Brother Local Catchments Flood Study underway	1. 100%	1. 100%	On target. Draft North Brother Local Catchment Flood Study report has been endorsed by the Councils Coast, Estuary and Floodplain Sub-committee and will be reported to the April Ordinary Council Meeting prior to being placed on public exhibition.

Community Strategic Plan: 4.2 Aim to minimise the impact of natural events and climate change, for example, floods, bushfires and coastal erosion

Delivery Program Objective: 4.2.1 Develop and implement Coastal, Estuary, Floodplain, and Bushfire management plans

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.2.1.06 Undertake the Flood Mitigation Maintenance Program	Environmental Services (Transport and Stormwater Network)	1. Flood Mitigation Maintenance Program delivered	1. 100%	1. 100%	On target. Works have been programmed for completion by Operational Maintenance team.
4.2.1.07 CW Implementation of strategies of Lake Cathie Coastal Zone Management Plan - Stormwater Repair	Environmental Services	1. Implementation of strategies of Lake Cathie Coastal Zone Management Plan underway - Stormwater Repairs	1. 100%	1. 100%	On target. Middle Rock and Chapana St stormwater outlets repair complete. Utilising remaining funds to complete aboriginal heritage assessment on remaining outlets. Consultant engaged.
4.2.1.08 CW Lake Cathie Illaroo Road Revetment Wall Funding Model	Environmental Services	1. Lake Cathie Illaroo Road Revetment Wall Funding Model complete	1. 100%	1. 100%	On target. Cost benefit analysis underway and ongoing. Initial draft report being reviewed.
4.2.1.09 Undertake Detailed Hibbard Floodway Investigations	Environmental Services	1. Detailed Hibbard Floodway Investigations commenced	1. 100%	1. 80%	Behind schedule. Floodway blockage modelling complete, however some delays from consultant providing draft report.

Community Strategic Plan: 4.3 Facilitate development that is compatible with the natural and built environment

Delivery Program Objective: 4.3.1 Undertake transparent and efficient development assessment in accordance with relevant legislation

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.3.1.1 Ensure development assessment, building certification and subdivision certification activities are completed efficiently and in accordance with legislation	Development Assessment	1. Capture the number of applications and processing times, together with a commentary on development trends and report to Council quarterly	1. 100%	1. 100%	On target. Determined applications for the 1 July 2018 to March 2019 include: 801 Development Applications with an average processing time of 41 days, 124 Development Applications Modifications (S4.55) with an average processing time of 10 days, 383 Building Construction Certificates with an average processing time of 8 days and 72 Complying Development Certificates with an average processing time of 14 days.
4.3.1.2 Ensure the Development Assessment Panel operates in accordance with their charter and all applications are accurately determined	Development Assessment	1. Have no successful legal appeals relating to process errors	1. 100%	1. 100%	On target. No legal appeals have been received during the reporting period from July 2018 to March 2019.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.02 Develop a Regional Integrated Transport Strategy - multi-year project	Transport and Stormwater Network	1. Deliver project according to approved project plan (Develop a Regional Integrated Transport Strategy)	1. 100%	1. 80%	Behind schedule. Project has been delayed due to the Orbital Community Engagement Project.
4.4.1.03 CW Construct multiple footpath/cycleway projects throughout the local government area (LGA) - Allocated Amount 2018-19 - \$500,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver program according to approved schedule (Construct multiple footpath/cycleway projects)	1. 100%	1. 100%	On target. Works completed on priority footpath construction works at Central Road, and Hill St Port Macquarie and Ocean Dr and The Parade, North Haven and Kendall Rd at Kew so far in year to date. Preliminary works to continue on stage 2 of footpath works on Hill Street Port Macquarie.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.05 CW Wauchope Main Street, Improvements to pedestrian amenity - Stage 1 Construction - multi-year project - Adopted 2017-18 - \$126,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Wauchope Main Street) - Improvements to pedestrian amenity - Stage 1 Construction)	1. 100%	1. 100%	On target. Construction continuing with works now underway on northern side of high Street. This project will continue into 2019/20FY as a multiyear project.
4.4.1.06 CW Comboyne Road – Continue construction to replace bridge over Hartys Creek Id No.09 - multi-year project - Allocated Amount 2018-19 - \$700,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Comboyne Road - Commence construction to replace bridge over Hartys Creek Id No.09)	1. 100%	1. 100%	Achieved. This project continued from the 2017/18FY. Construction works complete with the 10 day full road closure for the installation of the new bridge structure successfully completed during Nov 2018.
4.4.1.10 CW Lake Road - continuation of detailed design of dual lanes - Jindalee to Fernhill intersections and Chestnut Road to Ocean Drive - multi-year project	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Lake Road - continuation of detailed design of dual lanes)	1. 100%	1. 75%	Behind schedule. This design only project continues from 2017/18 FY. Design is now progressing towards anticipated completion in June 2019 due to additional traffic study investigations required to inform the detailed designs.
4.4.1.12 CW Beechwood Road - continue the design for Stages 5 and 6 of Beechwood Road reconstruction - Riverbreeze to Waugh Street - multi-year project	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Design Stages 5 and 6 of Beechwood Road reconstruction)	1. 100%	1. 85%	Behind schedule. This design only project continues from the 2017/18 FY. Design works ongoing including Yippen Creek crossing remain on the revised target of completion by Jun 2019.
4.4.1.13 CW Hastings River Drive - Hughes Place to Boundary Street upgrade - Detailed design - multi-year project - Adopted 2017-18 - \$800,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Hastings River Drive - Hughes Place to Boundary Street upgrade)	1. 100%	1. 100%	On target. This project continues from 2017/18 FY. Design phase works presently progressing towards completion in late 2019. This project will continue into the 2019/20 FY. The construction of this segment of Hastings River Dr is subject to additional funding being allocated/secured

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.14 CW Continue construction for Hastings River Drive - Newport Island Road roundabout - Adopted 2017-18 - \$2,700,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Hastings River Drive - Newport Island Road roundabout)	1. 100%	1. 100%	Achieved. Project complete and re opened to traffic ahead of schedule in Nov 2018.
4.4.1.21 CW Dunbogan Bridge - Reid Street - undertake substructure rehabilitation - multi-year project - Allocated Amount 2018-19 - \$1,500,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Dunbogan Bridge - Reid Street - undertake substructure rehabilitation)	1. 100%	1. 100%	On target. Detailed design complete. Construction tender review complete with contract award in April /early May.
4.4.1.22 CW Kindee Bridge - structural repairs and Bridge Replacement optioneering - multi-year project - Adopted 2017-18 - \$550,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Kindee Bridge - structural repairs (multi-year project)	1. 100%	1. 100%	On target. Initial repairs and detailed investigations complete. Draft heritage assessment complete to inform strategic management plan for the bridge.
4.4.1.23 CW Roads Maritime Service Grants (RMS) - Safety Program and Active Transport Program (subject to grant funding, includes shared footpaths) Allocated Amount 2018-19 - \$500,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Roads Maritime Service Grants (RMS) - Safety Program and Active Transport Program)	1. 100%	1. 100%	On target. Funds being transferred to Wauchope Main Street upgrade project.
4.4.1.29 CW Diamond Head Rd/The Boulevard Flood Access raising road (Dependant on success of grant funding application) Allocated Amount 2018-19 - \$1,500,000 (Floodplain Risk Mangt Plan Action)	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Diamond Head Rd/The Boulevard Flood Access raising road)	1. 100%	1. 80%	Behind schedule. This project continues from 2017/18 FY and is pending finalisation of the environmental assessment and grant funding being announced. Construction not anticipated to commence prior to May 2019.
4.4.1.30 Undertake review of the Parking Strategy	Transport and Stormwater Network	1. Complete Parking Strategy review	1. 100%	1. 0%	Deferred. Project has been deferred to 2019-20 financial year in line with the Regional Integrated Transport Strategy development.

Your Natural and Built Environment Page 70

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.31 CW Deliver Bold Street Pedestrian Crossing Laurieton - Allocated Amount 2018-19 - \$347,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Bold Street - Pedestrian Crossing Laurieton)	1. 100%	1. 85%	Behind schedule. Design completion has been delayed by one month to May 2019. Construction commencement now expected in June 2019 with works continuing into the 2019/20 reporting period. Target construction completion is Dec 2019.
4.4.1.32 Continue corridor planning - Kendall Road - Ocean Drive - Hastings River Drive regional road corridor (MR538 /MR600) - multi-year project	Transport and Stormwater Network	1. Corridor planning - Kendall Road - Ocean Drive- Hastings River Drive regional road corridor commenced	1. 100%	1. 100%	On target. Traffic counts undertaken in March 2019. Currently preparing tender documents for appointment of a suitable Contractor to assist with the project.
4.4.1.33 CW Continue detailed designs - north of Miala Street to Orana Drive Lake Cathie - Adopted 2017-18 - \$250,000	Transport and Stormwater Network (Infrastructure Delivery)	1. Deliver project according to approved project plan (Detailed designs - north of Miala Street to Orana Drive Lake Cathie)	1. 100%	1. 85%	Behind schedule. This design only project continues from 2017/18 FY. The design engagement process is progressing and a community engagement session has been completed and a council report was presented to the Dec 2018 Ordinary Council meeting summarising the community feedback. The council have resolved to update the concept design to include parking lanes and a supplementary community engagement activity is proposed to inform the community of the updated designs once completed. The detailed design for the project will then follow for section A (Southern portion of works, Miala to Fiona Crs) and continue in 2019/20FY. Target design completion has extended from Sept to Dec 2019.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.34 CW Kew Main Street - Continue identified works. Detailed investigation and designs for car parking and assoc infrastructure works-Nancy Bird Walton Drv and Kendall Rd Adopted 2017-18 \$100,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Kew Main Street - undertake identified works)	1. 100%	1. 100%	On target. This project continues from 2017/18 FY and will continue into 2019/20 reporting period. Design phase of this project is ongoing and is expected to be completed in mid 2019 ahead of construction works. Recent funding announcement of construction funding from NSW State Government. The construction of this project would not commence prior to Jul 2019 based on current status.
4.4.1.35 Complete broad analysis of priorities for sealing of unsealed roads - multi-year project	Transport and Stormwater Network	1. Report outcomes to Council October 2018	1. 100%	1. 100%	Achieved. Unsealed roads policy be presented to November 2018 Ordinary Council Meeting.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.37 CW Local Roads Proactive Transport Program – Funds provided for the proactive maintenance of lower trafficked roads throughout the LGA - Allocated Amount 2018-19 - \$1,000,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Local Roads Proactive Transport Program)	1. 100%	1. 100%	On target. The 2018-19 Road Rehabilitation program includes the following projects and status: Planning Phase: Bransdon St, Wauchope Bay St, Port Macquarie Bellbowrie St, Port Macquarie Completed: Bago Rd (Milligans to Herons Creek), Herons Creek (OP item) - final bitumen seal in September 2019 Beechwood Rd (Riverbreeze to Waugh), Wauchope (OP item) - final bitumen seal in September 2019 Colonial Cct, Wauchope Burrawan Dr, Wauchope Fairmont Dr, Wauchope Range St, Wauchope The 2018 -19 Reseal Programme includes the following projects and status: Reseal Preparation Phase: Lighthouse Beach Local Roads, Port Macquarie The reseals in the lighthouse Beach area were completed in January - March 2019. Further resealing works have been scheduled for Watonga St (subject to hot temperatures) however resealing on Matthew Flinders will be postponed until September 2019 to avoid impacting on the Ironman event (May 2019).
4.4.1.40 CW Bago Road - Pavement Rehabilitation Programme (Milligans Rd to Pacific Highway) Allocated Amount 2018-19 - \$2,037,243	Transport and Stormwater Network	1. Deliver project according to approved project plan (Bago Road - Pavement Rehabilitation Programme)	1. 100%	1. 100%	On target. Bago Rd (Milligans to Herons Creek), Herons Creek (OP item) - final bitumen seal in September 2019

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.41 CW Beechwood Road – Pavement rehabilitation east of Riverbreeze Drive	Transport and Stormwater Network	1. Deliver project according to approved project plan (Beechwood Road – Pavement rehabilitation)	1. 100%	1. 100%	On target. Beechwood Rd (Riverbreeze to Waugh), Wauchope (OP item) - final bitumen seal in September 2019
4.4.1.42 CW John Oxley Drive Upgrade – Detailed Design – The Ruins Way to Wrights Road (Oxley Highway) - Allocated Amount 2018-19 - \$500,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (John Oxley Drive Upgrade – Detailed Design)	1. 100%	1. 100%	On target. (multi year project) This design only project is underway and is expected to continue into 2019 in conjunction with Council's broader transport network strategic planning and prioritisation. Traffic study is being updated following the opening of new Buntings and fed into design considerations. The design phase of this project is expected to continue into early 2020.
4.4.1.44 Conduct sealed road network condition survey	Assets and Property Investment	1. Complete transport asset data survey by 30 June 2019	1. 100%	1. 100%	On target. Project scope developed. Contractor engaged and data collection commenced. High speed data and visual data collection complete. Falling weight deflectometer data collection and additional data analysis outstanding. Anticipated completion June 2019.
4.4.1.45 CW Ocean Drive duplication - Matthew Flinders Drive to Greenmeadows - multi-year project - Allocated Amount 2018-19 - \$360,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Ocean Drive duplication - Matthew Flinders Drive to Greenmeadows)	1. 100%	1. 90%	Monitoring required. An issue has been identified with the traffic modelling which has delayed the business case development. This issue is being worked through with revised business case due by 15/04/19.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.46 CW Design and investigations for Gordon Street Pavement Reconstruction and Service Relocations - between Ocean Drive and Horton Street - Allocated Amount 2018-19 - \$200,000	Transport and Stormwater Network, (Infrastructure Delivery)	1. Deliver project according to approved project plan (Design and investigations for Gordon Street Pavement Reconstruction)	1. 100%	1. 100%	On target (multi-year project). Design and investigations phase of this project expected to continue through to Nov 2019. Construction phase expected to commence in early 2020 based on current design status. This project will continue into the 2019/20 reporting period.
4.4.1.48 Development Contribution Plan (Roads) Review and Update	Transport and Stormwater Network	1. Deliver project according to approved project plan (Development Contribution Plan (Roads) Review and Update)	1. 100%	1. 80%	Behind schedule. Project scoping has been delayed due to other higher priority program activities.
4.4.1.49 CW Transport and Traffic various design works - additional Transport and Stormwater Designs - Allocated Amount - 2018-19 - \$200,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Transport and Traffic various design works - additional Transport and Stormwater Designs)	1. 100%	1. 100%	On target. Design work continuing on Kew Main Street and various intersection across the LGA.
4.4.1.50 CW Wall Reserve car park sealing - Seal the access road to Wall Reserve - Allocated Amount - 2018-19 - \$71,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Wall Reserve Car park Sealing)	1. 100%	1. 100%	Achieved. Works completed in November 2018.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.51 CW Installation of new bus shelters as per the Community Passenger Transport Infrastructure Grant Scheme (CPTIGS) Program - Allocated Amount 2018-19 - \$90,000	Transport and Stormwater Network	1. Bus shelter installations completed as per the program	1. 100%	1. 100%	On target. The 2018-19 New Bus Shelter program includes the following projects and status: Planning Phase: 1 x Port Macquarie Airport Completed: 1 x High St, Wauchope 1 x Cameron St, Wauchope 2 x Beechwood Rd, Beechwood 1 x Pacific Dr, Port Macquarie 1 x Ocean Dr, Port Macquarie 2 x Ocean Dr, Lake Cathie 1 x Granite St, Port Macquarie 3 x Greenmeadows Dr, Port Macquarie 1 x Hastings River Dr, Port Macquarie 1 x Pacific Dr, Port Macquarie 1 x High St, Wauchope 1 x Ocean Dr, West Haven The programme is on track for completion in June 2019.
4.4.1.52 AUS-SPEC Review - Undertake a comprehensive review of Councils full suite of design and construction specifications - multi-year project	Transport and Stormwater Network	1. Deliver project according to approved project plan (AUS-SPEC Review)	1. 100%	1. 80%	Behind schedule. Implementation of revised specifications have been delayed by other higher priority projects.
4.4.1.53 Settlement Point Ferry and Hibbard Ferry - upgrade to ferry access and the installation of extra signage	Transport and Stormwater Network	1. Deliver project according to approved project plan (Settlement Point Ferry and Hibbard Ferry - upgrade to ferry access and the installation of extra signage)	1. 100%	1. 100%	On target. Project progressing according to approved project plan (Settlement Point Ferry and Hibbard Ferry - upgrade to ferry access and the installation of extra signage).

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.54 North South Link Road - ongoing design/preconstruction (multi-year project) (including Orbital Road Study - Ocean Drive - Hastings River Drive)	Transport and Stormwater Network	1. Deliver project according to approved project plan (North South Link Road - ongoing design/preconstruction - including Orbital Road Study - Ocean Drive - Hastings River Drive)	1. 100%	1. 100%	Achieved.
4.4.1.55 CW Beach to Beach - shared path project at Camden Haven	Transport and Stormwater Network (Infrastructure Delivery)	1. Deliver project according to approved project plan (Beach to Beach - shared path project at Camden Haven)	1. 100%	1. 100%	On target. Construction of Stage D9 of pathway practically complete. GHD have been engaged to undertake an alignment feasibility study and environmental pathways assessment for the remaining sections of path.
4.4.1.56 CW Wrights Road to Port Macquarie CBD - shared path	Transport and Stormwater Network (Infrastructure Delivery)	1. Deliver project according to approved project plan (Wrights Road to Port Macquarie CBD - shared path)	1. 100%	1. 100%	On target (design only project). Project initiation and design ongoing with preferred alignment identified. On target for design completion in Apr 2019.
4.4.1.57 CW Lighthouse Road Tourism Connectivity Project - Commence Lighthouse road east upgrades - Matthew Flinders Drive to The Lighthouse	Transport and Stormwater Network	1. Deliver project according to approved project plan (Commence Lighthouse Road east upgrades - Matthew Flinders Drive to The Lighthouse)	1. 100%	1. 100%	On target. Project being delivered in accordance with approved project plan - construction tender currently being advertised.
4.4.1.58 Orbital Road Engagements - Undertake Orbital Road Community Engagement	Transport and Stormwater Network	1. Orbital Road Community Engagement undertaken	1. 100%	1. 100%	On target. Community engagement phase has now been completed with the reporting commenced. On target for a report to June Council meeting.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.1 Plan, investigate, design and construct transport assets which address pedestrians, cyclist and vehicular needs to cater for the future growth of the region

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.1.59 CW Gordon/Horton Street - intersection upgrade - details designs	Transport and Stormwater Network	1. Deliver project according to approved project plan (Gordon/Horton Street - intersection upgrade - details designs)	1. 100%	1. 100%	On target. Project planning, survey and concept development complete. Design work now commenced.
4.4.1.73 CW Telegraph Point Pedestrian Safety Upgrades - New footpaths and pedestrian refuges on Mooney Street - Allocated Amount \$698,000	Transport and Stormwater Network	1. Deliver project according to approved project plan (Telegraph Point Pedestrian Safety Upgrades)	1. 100%	1. 100%	On target.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities
Delivery Program Objective: 4.4.2 Develop and implement annual maintenance and renewal programs for transport assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.2.1 CW Undertake road resurfacing and rehabilitation works throughout the local government area in accordance with the rolling priority program and roads maintenance hierarchy	Transport and Stormwater Network	1. Complete road resurfacing and rehabilitation works in accordance with the rolling priority program and roads maintenance hierarchy	1. 100%	1. 100%	On target. The 2018-19 Road Rehabilitation program includes the following projects and status: Planning Phase: Bransdon St, Wauchope Bay St, Port Macquarie Bellbowrie St, Port Macquarie Completed: Bago Rd (Milligans to Herons Creek), Herons Creek (OP item) - final bitumen seal in September 2019 Beechwood Rd (Riverbreeze to Waugh), Wauchope (OP item) - final bitumen seal in September 2019 Colonial Cct, Wauchope Burrawan Dr, Wauchope Fairmont Dr, Wauchope Range St, Wauchope The 2018-19 Reseal Programme includes the following projects and status: Reseal Preparation Phase: Lighthouse Beach Local Roads, Port Macquarie The reseals in the lighthouse Beach area were completed in January - March 2019. Further resealing works have been scheduled for Watonga St (subject to hot temperatures) however resealing on Matthew Flinders will be postponed until September 2019 to avoid impacting on the Ironman event (May 2019).
4.4.2.2 Carry out annual unsealed road maintenance program including resheeting, grading, drainage and vegetation and rural roadside vegetation clearing	Transport and Stormwater Network	1. In accordance with adopted programs and reactive maintenance requirements based on risk (annual unsealed road maintenance program)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's road risk rating and road hierarchy systems.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities
Delivery Program Objective: 4.4.2 Develop and implement annual maintenance and renewal programs for transport assets

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.2.3 Carry out annual sealed road network maintenance program including resurfacing, heavy patching, vegetation management, roadside furnishing and drainage	Transport and Stormwater Network	1. In accordance with adopted programs and reactive maintenance requirements based on risk (annual sealed road network maintenance program)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's road risk rating and road hierarchy systems.
4.4.2.4 Undertake bridges and culverts maintenance and repair program including inspections, monitoring and bridge repair works	Transport and Stormwater Network	1. In accordance with adopted programs and reactive maintenance requirements based on risk (bridges and culverts maintenance and repair program)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's road risk rating and road hierarchy systems.
4.4.2.5 Carry out reactive maintenance to Koala Food Trees and Koala Fencing on Link Rd (Ocean Dr)	Transport and Stormwater Network	1. In accordance with adopted programs and reactive maintenance requirements based on risk (reactive maintenance to Koala Food Trees and Koala Fencing)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's road risk rating and road hierarchy systems.
4.4.2.6 Bridgeworks and Road Rehabilitation Program - Undertake regular bridge and geotechnical road pavement tests to inform and develop programme	Transport and Stormwater Network	1. Deliver project according to approved project plan (Bridgeworks and Road Rehabilitation Program)	1. 100%	1. 100%	On target. Works delivered on budget. Works schedule based on inspections and assessment criteria from Council's bridge and road risk rating and road hierarchy systems.

Community Strategic Plan: 4.4 Plan for integrated transport systems that helps people get around and link our communities

Delivery Program Objective: 4.4.3 Develop and implement traffic and road safety programs

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.4.3.1 Develop a Road Safety Action Plan and undertake associated safety education and awareness programs identified in the plan (incl Westport Public School Zone installation and Bike Week)	Transport and Stormwater Network	1. Undertake road safety educational programs	1. 100%	1. 100%	On target. The following two projects are in progress and will be delivered in accordance with Transport for NSW and Roads and Maritime Services guidelines: - Distracted Driver Action Plan Implementation - Safety Around Schools
4.4.3.2 Install and maintain street lights in accordance with identified priorities	Transport and Stormwater Network	1. Deliver street lighting program according to approved schedule and prioritisation	1. 100%	1. 100%	On target. Upgrade investigation, design and delivery undertaken in accordance with program.
4.4.3.3 Area-wide traffic study (multi-year project)	Transport and Stormwater Network	1. Deliver project according to approved project plan (Area-wide traffic study)	1. 100%	1. 100%	Achieved.

Community Strategic Plan: 4.5 Plan for integrated and connected communities across the Port Macquarie-Hastings area

Delivery Program Objective: 4.5.1 Carry out strategic planning to manage population growth and provide for co-ordinated urban development

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.5.1.07 Investigate LEP and DCP amendments for the proposed Yippin Creek urban release area to the west of Wauchope	Strategic Land Use Planning	1. Report recommended draft planning outcomes to Council by 30 June	1. 100%	1. 50%	Monitoring required. Limited land owner interest and commitment to funding. Project status was considered as part of April 2019 report to Council on UGMS priorities.
4.5.1.08 Commence preparation of Local Environmental Plan (LEP), Development Control Plan (DCP) and Contributions Plan (CP) provisions for the Port Macquarie Health and Education Precinct	Strategic Land Use Planning	1. Completion of a Project Plan for the LEP, DCP and CP process by 31 December 2018	1. 100%	1. 100%	On target. Preliminary Project Planning commenced ahead of and subject to adoption of Master Plan for the Health and Education Precinct. Post exhibition report to Council proposed in May 2019.

Community Strategic Plan: 4.5 Plan for integrated and connected communities across the Port Macquarie-Hastings area**Delivery Program Objective:** 4.5.1 Carry out strategic planning to manage population growth and provide for co-ordinated urban development

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
		2. Implementation of key Stage 1 actions in accordance with the Project Plan by 30 June 2019	2. 100%	2. 100%	On target. Preliminary project Plan completed ahead of adoption of Master Plan for the Health & Education Precinct
4.5.1.09 Commence Stage 1 of a comprehensive review of the Port Macquarie-Hastings Development Control Plan 2013 for completion in 2019-20	Strategic Land Use Planning	1. Completion of project planning, stakeholder engagement and support studies by 30 June 2019	1. 100%	1. 100%	On target. Project Planning commenced for a Stage 1 house-keeping review of DCP 2013. The NSW Department of Planning & Environment is developing a Standard DCP format that will be used by councils to guide the development of new DCP's into the future. This work will help inform the review of Council's DCP.
4.5.1.10 Commence a review of housing related Local Environmental Plan (LEP) and Development Control Plan (DCP) provisions to promote housing choice options	Strategic Land Use Planning	1. Preliminary support studies complete to inform the review by 30 June 2019	1. 100%	1. 75%	Behind schedule. The project has been delayed due to resourcing constraints in the Strategic Planning Team. Consultants are expected to be appointed in Q4 to prepare a local housing strategy and the project completed in 2019-20.
4.5.1.11 Preparation of Local Environmental Plan (LEP), Development Control Plan (DCP) and Contributions Plan (CP) provisions for the "gateway sites" at the intersection of the Pacific and Oxley Hwy	Strategic Land Use Planning	1. Report to Council regarding proposed LEP, DCP and CP outcomes by 30 June 2019	1. 100%	1. 100%	On target. Planning Proposal for the Highway Service Centre, Planning Agreement and draft Highways Gateway Sites DCP provisions to commence public exhibition on 10 April to 13 May 2019. Further report to be presented to the June 2019 Council Meeting.

Community Strategic Plan: 4.5 Plan for integrated and connected communities across the Port Macquarie-Hastings area

Delivery Program Objective: 4.5.2 Plan for infrastructure that supports population growth

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.5.2.2 Commence a review of the Major Roads Contributions Plan and Water and Sewerage Development Servicing Plans for completion in 2020	Strategic Land Use Planning	1. Preliminary support studies complete to inform the review and an update provided to Council by 30 June 2019	1. 100%	1. 90%	On target. Roads, water and sewerage works program under preparation by Infrastructure Division as pre-cursor to contributions plan and DSP reviews.

Community Strategic Plan: 4.6 Restore and protect natural areas

Delivery Program Objective: 4.6.1 Develop and implement a range of programs for the environmental management of lands within the local government area

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.6.1.01 Undertake weed management program according to the Mid North Coast Invasive Plant Species Strategy 2012, working in partnership with community groups such as Landcare	Environmental Services	1. 20% of all plant nurseries in the local government area (LGA) inspected for invasive weeds 2. 240 ha land treated for invasive weeds 3. 300 properties inspected for invasive weeds 4. 600 km weed dispersal routes treated	1. 100% 2. 100ha 3. 300# 4. 600km	1. 100% 2. 604ha 3. 176# 4. 801km	On target On target. Currently exceeding target. On target. On target.
4.6.1.02 Control feral animals on Council-controlled land	Environmental Services	1. Undertake feral animal control	1. 100%	1. 100%	On target. Works will be ongoing throughout the year and have commenced.
4.6.1.03 Implement riparian restoration works	Environmental Services	1. Undertake a minimum of 70 km (lineal) control	1. 70#	1. 35#	On target.

Community Strategic Plan: 4.6 Restore and protect natural areas

Delivery Program Objective: 4.6.1 Develop and implement a range of programs for the environmental management of lands within the local government area

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.6.1.04 In collaboration with community groups, such as Landcare, implement the Bushland Regeneration Program	Environmental Services	1. 1,200ha of bushland under active management	1. 1,200ha	1. 694ha	Behind schedule. Resourcing limitations resulting from vacancies in this area have prevented this program from meeting target. The new Team Leader is to commence in April 2019.
4.6.1.06 Inform and educate residents, industry and community groups about Council's tree management requirements within the Port Macquarie-Hastings 2013 Development Control Plan (DCP)	Recreation and Buildings	1. Develop and implement educational material and delivery program 2. Provide advice in accordance with service standards and industry best practice	1. 100% 2. 100%	1. 100% 2. 44%	On target. Informal advice on tree management requirements was provided on 12 occasions from July 18 to March 19. Behind target. Total number of active CRM's is 977. 774 (Public), 156 (Private) and 47 (illegal tree removal/pruning). 62 customer requests currently exceed service standard. This has been impacted by a number of storm events resulting in tree damage during this reporting period. Additional information: 271 enquires (236 Public phone and 35 private phone and email enquires). This does not include calls transferred from call centre to mobile or landline.
		3. Undertake investigations in relation to all reported illegal tree works	3. 100%	3. 100%	On target. 47 illegal tree incidents reported and investigated during this reporting period from July 2018 to March 2019.
4.6.1.08 Undertake implementation of the Koala Management Strategy incl the Koala Management Project - Fire & Biodiversity Consort, the Koala Road Strike Project, Flood Mitigation Maintenance Prog	Environmental Services	1. Commence implementation of the identified actions in the Koala Management Strategy (incl Fire & Biodiversity Consort and Koala Road Strike Project)	1. 100%	1. 100%	On target. Fire and biodiversity consortium work is on track, completion of brigade meetings are on track. The Koala Road Strike Program is not progressing at the moment due to resource constraints. Flood mitigation project on track.

Community Strategic Plan: 4.6 Restore and protect natural areas

Delivery Program Objective: 4.6.1 Develop and implement a range of programs for the environmental management of lands within the local government area

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.6.1.09 Complete preparation of a Comprehensive Koala Plan of Management (CKPoM) for coastal areas in the Port Macquarie-Hastings	Strategic Land Use Planning	1. Report to Council following exhibition of a draft CKPoM by 30 September 2018	1. 100%	1. 90%	On target. Reported to Council following exhibition in September 2018. Further investigation required on related legislation. Completion of the project is now expected in 2019.
4.6.1.10 Estuarine Lake Linkages - Protecting the Islands and Foreshores of the Camden Haven	Environmental Services	1. Undertake the Estuarine Lake Linkages program	1. 100%	1. 100%	On target. Program is on track and is finishing up at the end of June 2019.
4.6.1.11 Hastings River Streamflow and Rainfall Gauges	Environmental Services	1. Hastings River Streamflow and Rainfall Gauges	1. 100%	1. 100%	On target. REF being prepared.

Community Strategic Plan: 4.7 Provide leadership in the development of renewable energy opportunities

Delivery Program Objective: 4.7.1 Promote renewable energy outcomes within Council

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.7.1.2 CW Install solar energy systems at the Kew Waste Transfer Station and the Port Macquarie Reclaimed Water Treatment Plant	Environmental Services, Water and Sewer	1. Solar system installation at the Kew Waste Transfer Station complete 2. Solar system installation at the Port Macquarie Reclaimed Water Treatment Plant complete	1. 100% 2. 100%	1. 0% 2. 20%	Deferred. Project and funding deferred to 2019-2020 financial year. Behind target. Public works have been engaged to develop tender specifications. Tender for solar installation at the Port Macquarie Reclaimed Water Treatment Plant is likely to be issued in Q4 of 18/19 due to delays with Tender documentation from Public Works.
4.7.1.4 CW Undertake LED lighting upgrade to the Port Macquarie Council Office building and other public buildings - Allocated Amount 2018-19 - \$25,000	Recreation and Buildings	1. Complete LED lighting upgrade to the Port Macquarie Council office building	1. 100%	1. 0%	Achieved.

Community Strategic Plan: 4.7 Provide leadership in the development of renewable energy opportunities

Delivery Program Objective: 4.7.1 Promote renewable energy outcomes within Council

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.7.1.6 CW Install solar energy systems at selected existing Council facilities - Allocated Amount 2018-19 - \$100,000	Recreation and Buildings	1. Install solar energy systems at identified Council facilities	1. 100%	1. 80%	Behind schedule. Our two nominated projects, Wauchope & Kendall Pool have had all preliminary works completed
4.7.1.7 Develop feasibility for bulk street lighting upgrade to LED (Category V)	Assets and Property Investment	1. Complete feasibility assessment for bulk street lighting upgrade to LED (Category V)	1. 100%	1. 100%	Yet to commence. Subject to finalisation of Category V street lighting specifications by network distributor.
4.7.1.8 Continue to implement and monitor the Long Term Energy Strategy	Assets and Property Investment	1. Provide six monthly update reports to Council on the status of the Long Term Energy Strategy	1. 100%	1. 100%	On target. Six monthly update report tabled at November 2018 Ordinary Council meeting. Next Six monthly update report scheduled for the April 2019 Ordinary Council Meeting.

Community Strategic Plan: 4.8 Increase awareness of issues affecting our environment, including the preservation of flora and fauna

Delivery Program Objective: 4.8.1 Ensure all Council operations comply with environmental standards and regulations

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.8.1.1 Operate and maintain water treatment plants in accordance with adopted maintenance programs and scheme requirements	Water and Sewer	1. Monitor plants continuously with plant breakdowns attended to within 24 hours	1. 100%	1. 100%	On target. All Water Treatment Plants monitored continuously by Council's remote water monitoring system (SCADA C).
4.8.1.2 Operate the water supply network to ensure public health and safety	Water and Sewer	1. Ensure any public health and safety issues in relation to water supply are responded to in line with service standards	1. 100%	1. 100%	On target. Drinking water treatment systems operated in accordance with Council's Drinking Water Quality Management System.
4.8.1.3 Maintain and operate storage dams in accordance with Australian National Committee On Large Dams (ANCOLD) guidelines	Water and Sewer	1. Ensure any issues in relation to the operation and maintenance of storage dams are handled in line with ANCOLD guidelines	1. 100%	1. 100%	On target. Storage dams operated in accordance with ANCOLD guidelines.

Community Strategic Plan: 4.8 Increase awareness of issues affecting our environment, including the preservation of flora and fauna

Delivery Program Objective: 4.8.1 Ensure all Council operations comply with environmental standards and regulations

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.8.1.4 Operate and maintain sewerage treatment plants in accordance with environmental licences, adopted maintenance programs and scheme requirements	Water and Sewer	1. Monitor plants continuously with plant breakdowns attended to within 24 hours	1. 100%	1. 100%	On target. All Wastewater Treatment Plants monitored continuously by Council's remote water monitoring system (Clear SCADA).
4.8.1.5 Operate the sewerage network to ensure service delivery meets public health and safety requirements	Water and Sewer	1. Ensure any public health and safety issues in relation to sewerage network are responded to in line with service standards	1. 100%	1. 100%	On target. Sewerage System monitored continuously by Council's remote water monitoring system (SCADA) with Duty Officer available at all times. There three notifiable sewerage surcharge events during the 3 month reporting period.

Delivery Program Objective: 4.8.2 Increase community awareness and enable access to the natural environment

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.8.2.1 Deliver bushfire preparedness and planning programs to the community	Environmental Services	1. Deliver bushfire preparedness and planning programs	1. 100%	1. 100%	On target. Programs delivered as part of daily business including customer request management.

Delivery Program Objective: 4.8.3 Promote Biodiversity Programs

Operational Plan Activity 2018 - 2019	Lead Responsibility	Success Measures	Target	Actual	Comment on Progress
4.8.3.1 Finalise the Biodiversity Strategy	Environmental Services	1. Biodiversity Strategy presented to Council for adoption	1. 100%	1. 100%	On target. Re-design of the document is currently underway. To be taken to Council June 2019.



Monthly Investment Report

April 2019

IMPERIUM MARKETS

Level 14, 5 Martin Place
Sydney, NSW 2000
Website: <http://www.imperiummarkets.com.au>
Email: michael.chandra@imperiummarkets.com.au
Phone: +61 414 738 121
ABN: 87 616 579 527
ACN: 616 579 527
AFSL No: 429718
Holder of an [Australian Market Licence](#)



Executive Summary

Compliance

Compliance Measure	Within Policy Limits (Y/N)	Reason if Not Compliant
Term to Maturity	Yes – Compliant	n/a
Counterparty	Yes – Compliant	n/a
Credit Quality	Yes – Compliant	n/a

Performance

As at 30/04/2019	1m (actual)	1m (% p.a.)	FYTD (actual)	FYTD (% p.a.)
AusBond Bank Bill Index	0.16%	2.01%	1.69%	2.03%
Council's Portfolio[^]	0.25%	3.09%	2.50%	3.01%
Outperformance	0.09%	1.08%	0.81%	0.98%

[^]Total portfolio performance excludes Council's cash account holdings. Overall returns would be lower if cash was included.

Council's Portfolio

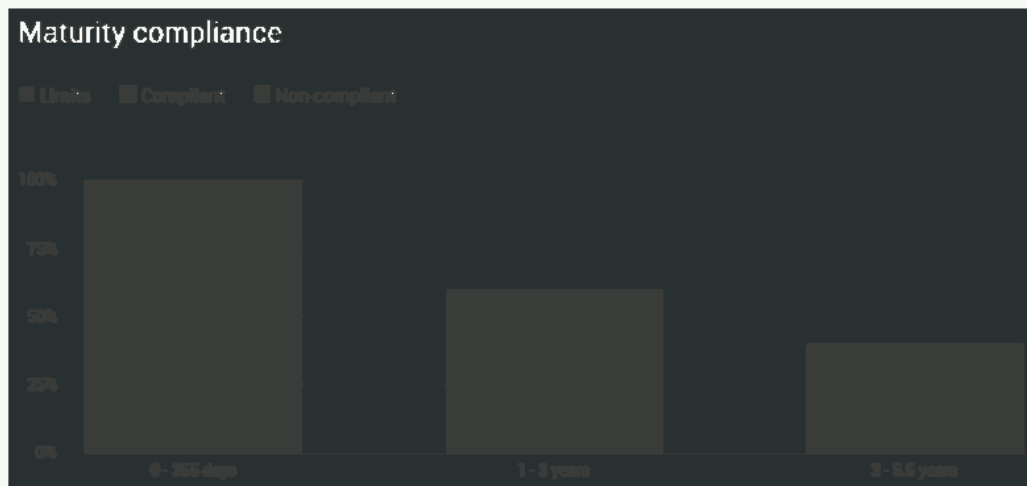
Asset Allocation

The entire portfolio is directed to fixed term deposits (96.98%) and the cash account with Westpac (3.02%). With credit securities becoming more attractive relative to deposits, we suggest Council consider introducing liquid senior floating rate notes (FRNs) into the portfolio. This will not only offer additional upside with regards to the portfolio's investment returns, but also provide additional liquidity (FRNs are saleable – generally accessible within 2 business days). FRNs are also dominated by the higher rated ADIs which allows Council to maintain a bias towards to the higher rated banks.



Term to Maturity

All maturity limits (minimum and maximum) comply with the Investment Policy. Medium-Term (3-5 years) assets account for around 6½% of the total investment portfolio, with capacity of around \$97m at month-end.



Where there is (counterparty) capacity to invest in attractive 3-5½ year investments, we recommend this be allocated to new senior FRN issues and fixed or floating rate term deposits (refer to respective sections below).

Compliant	Horizon	Invested (\$)	Invested (%)	Min. Limit (%)	Max. Limit (%)	Available (\$)
✓	0 – 365 days	\$118,751,320	40.98%	0%	100%	\$171,000,000
✓	1 – 3 years	\$152,000,000	52.46%	0%	60%	\$21,850,792
✓	3 – 5.5 years	\$19,000,000	6.56%	0%	40%	\$96,900,528
✓	5.5 – 10 years	\$0	0.00%	0%	20%	\$57,950,264
		289,751,320	100.00%			



Counterparty

As at the end of April, Council did not have an overweight position to any single ADI. Overall, the portfolio is diversified across the investment grade credit spectrum (rated BBB- or higher), with no exposure to unrated ADIs.

Compliant	Issuer	Rating	Invested (\$)	Invested (%)	Max. Limit (%)	Available (\$)
✓	CBA	AA-	\$3,000,000	1.04%	30.00%	\$83,925,396
✓	NAB	AA-	\$51,000,000	17.60%	30.00%	\$35,925,396
✓	WBC (St George)	AA-	\$86,751,320	29.94%	30.00%	\$174,076
✓	Rabobank	A+	\$19,000,000	6.56%	20.00%	\$38,950,264
✓	AMP	A	\$5,000,000	1.73%	20.00%	\$52,950,264
✓	ICBC Sydney	A	\$42,000,000	14.50%	20.00%	\$15,950,264
✓	ING Bank	A	\$38,000,000	13.11%	20.00%	\$19,950,264
✓	BOQ	BBB+	\$10,000,000	3.45%	10.00%	\$18,975,132
✓	Bendigo	BBB+	\$4,000,000	1.38%	10.00%	\$24,975,132
✓	Auswide	BBB	\$5,000,000	1.73%	10.00%	\$23,975,132
✓	ME Bank	BBB	\$5,000,000	1.73%	10.00%	\$23,975,132
✓	Newcastle PBS	BBB	\$21,000,000	7.25%	10.00%	\$7,975,132
			\$289,751,320	100.00%		

We remain supportive of the regional and unrated ADI sector (and have been even throughout the GFC period). They continue to remain solid, incorporate strong balance sheets, while exhibiting high levels of capital – typically, much higher compared to the higher rated ADIs. Some unrated ADIs have up to 25-40% more capital than the domestic major banks, and well above the Basel III requirements.

APRA's Chairman affirmed that the banks had satisfactorily moved towards an '*unquestionably strong*' capital position and that bank's stress testing contingency plans were now far better positioned than was previously the case years ago. APRA's stress test which hypothetically increased the unemployment rate to 11% (more than double the current rate) and for house prices to fall 35% showed the banks remained above the minimum capital levels. We note that APRA's latest discussion paper also highlighted that the domestic major banks were required to raise more capital while the lower rated ADIs were already deemed to be at a satisfactory level.

Overall, the lower rated ADIs (BBB and unrated) are generally now in a better financial position than they have been historically (see the Capital Ratio figure below). We believe that deposit investments with the lower rated ADIs should be continued going forward, particularly when they offer 'above market' specials. Not only would it diversify the investment portfolio and reduce credit risk, it would also improve the portfolio's overall returns.

In the current environment of high regulation and scrutiny, all domestic ADIs continue to carry high levels of capital, particularly amongst the lower ("BBB") and unrated ADIs. There is minimal (if any) probability of any ADI defaulting on their deposits going forward – this was stress tested during the GFC.



The biggest single risk that depositors face in the current low interest rate environment is not credit risk, but reinvestment risk.



Credit Quality

The portfolio remains lightly diversified from a credit ratings perspective. The portfolio is entirely directed to the investment grade ADIs (BBB- or higher), with zero allocation to unrated ADIs. There is high capacity to invest in the higher rated ADIs (A or higher), particularly after the downgrades of BoQ and Bendigo-Adelaide Bank in May 2017, which now fall back into the “BBB” rated category.

There is also considerable capacity to invest with the “BBB” rated ADIs following the adoption of a new policy.

Given the large number of “BBB” rated ADIs currently in the market (and conversely, the low number of “A” or higher rated ADIs), we suggest Council direct new funds into this sector. We note that it is within this category where the most value is currently experienced. The difference in pricing can amount up to 10-20bp on any day.

All ratings categories are within the Policy limits:

Compliant	Credit Rating	Invested (\$)	Invested (%)	Max. Limit (%)	Available (\$)
✓	AA Category	\$140,751,320	48.58%	100%	\$149,000,000
✓	A Category	\$104,000,000	35.89%	60%	\$69,850,792
✓	BBB Category	\$45,000,000	15.53%	30%	\$41,925,396
✓	Unrated ADIs	\$0	0.00%	10%	\$28,975,132
		\$289,751,320	100.00%		



Performance

Council's performance for the month ending 30 April 2019 is summarised as follows:

Performance	1 month	3 months	6 months	FYTD	1 year
Official Cash Rate	0.12%	0.36%	0.74%	1.25%	1.50%
AusBond Bank Bill Index	0.16%	0.50%	0.99%	1.69%	2.02%
Council's Portfolio [^]	0.25%	0.73%	1.49%	2.50%	3.01%
Outperformance	0.09%	0.23%	0.50%	0.82%	0.99%

[^]Total portfolio performance excludes Council's cash account holdings. Overall returns would be lower if cash was included.

For the month of April, the deposit portfolio provided a solid return of +0.25% (actual), outperforming the benchmark AusBond Bank Bill Index return by +0.09% (actual). The strong performance continues to be driven by the handful of deposits still yielding above 3½% p.a. However, most of these individual deposits have now matured and will be reinvested at lower prevailing rates.

Over the past year, the deposit portfolio returned +3.01% p.a., outperforming bank bills by 0.99% p.a. and more than double the official cash rate of 1½%. This has been relatively strong given deposit rates reached their all-time lows and margins have generally contracted over the past 3 years.

Investors using the Imperium Markets platform have reduced the invisible costs associated with brokerage, and thereby lift client portfolio returns as investors are able to deal in deposits directly with the ADIs and execute at the best price possible. Council has experienced this over the past 12-18 months, receiving on average, 2-4bp higher for every deposit dealt on the platform.



Council's Term Deposit Portfolio & Recommendation

As at the end of April 2019, Council's deposit portfolio was yielding 2.98% p.a. (down 2bp from the previous month), with an average duration of ~1½ years. Where possible, we recommend Council extends or at least maintains this average duration. In the low interest rate environment, the biggest collective risk that the local government sector has faced over the post-GFC era has been the dramatic fall in interest rates - from 7¼% to the current historical low levels of 1½% (potentially lower over coming months).

As the past decade has highlighted (post-GFC era), we have seen too many portfolios' roll a high proportion of their deposits between 3-6 months, resulting in their deposits being reinvested at lower prevailing rates. That is, depositors have generally not insured themselves against the low interest rate environment by diversify their funding across various tenors (out to 5 years) but rather placed all their 'eggs in one basket' and kept all their deposits short. **Reinvestment risk has collectively been and continues to be the biggest detriment to depositors' interest income over the post-GFC period. Another interest rate cut is highly anticipated over coming months.**

At the time of writing (early May), we see value in:

ADI	LT Credit Rating	Term	T/D Rate
Auswide Bank	BBB	5 years	~2.80%-2.85% p.a.
BoQ	BBB+	4 years	~2.70% p.a.
Newcastle Permanent BS	BBB	3 years	~2.60% p.a.
Newcastle Permanent BS	BBB	2 years	~2.50% p.a.
Auswide Bank	BBB	2 years	~2.50% p.a.

For those investors that have capacity issues with the "BBB" and unrated ADI sector, we see value in:

ADI	LT Credit Rating	Term	T/D Rate
AMP	A-	2 years	^2.85% p.a.

[^] AMP T/Ds – these are grossed up rates which includes a 0.20% p.a. rebated commission from Imperium Markets. Temporarily lift to around \$7m cap (requires approval), applies per individual investor.

The above deposits are suitable for investors looking to provide some income protection and mitigate reinvestment/rollover risk in the low interest rate environment.



For terms under 12 months, we believe the strongest value is currently being offered by a number of lower and unrated ADIs offering above-market specials (dependent on daily funding requirements):

ADI	LT Credit Rating	Term	T/D Rate
Bank of Sydney	Unrated ADI	6 months	2.65% p.a.
Bank of Sydney	Unrated ADI	7-12 months	2.60% p.a.
Bank of Sydney	Unrated ADI	3 months	2.60% p.a.
Australian Military Bank	Unrated ADI	12 months	2.50% p.a.
Newcastle PBS	BBB	12 months	2.50% p.a.
Australian Military Bank	Unrated ADI	3 months	2.45% p.a.
ME Bank	BBB	3-6 months	2.44% p.a.
Auswide Bank	BBB	12 months	2.40% p.a.
Bendigo-Adelaide	BBB+	4-6 months	2.40% p.a.

Excluding AMP (A-), we note the spread between the higher rated ADIs and the lower rated regional and unrated ADIs is becoming wider. Amongst the higher rated ADIs ("A" rated or higher), the following deposits remain attractive for terms under 12 months:

ADI	LT Credit Rating	Term	T/D Rate
AMP	A-	6-8 months	^2.70% p.a.
AMP	A-	9-11 months	^2.60% p.a.
NAB	AA-	12 months	2.35% p.a.
ICBC Sydney Branch	A	4-10 months	2.32% p.a.

[^] AMP T/Ds – these are grossed up rates which includes a 0.20% p.a. rebated commission from Imperium Markets. Temporarily lift to around \$7m cap (requires approval), applies per individual investor.



Senior FRNs & Recommendations

Over April, amongst the senior major bank FRNs, physical credit securities were marked significantly tighter across the curve. The 3 and 5 year part of the curve tightened by around -5bp and -6bp respectively. All four domestic major banks issued benchmark issues earlier in the year – we expect further new primary issuances over coming months.

Despite the rally over the month, we still see good relative value for a new 5 year major bank FRN (at around +86bp), given the slight premium offered in the primary market, and particularly once factoring in the potential capital gains which could be realised from as early as two years after being launched. **The grossed up returns would be around +120-125bp over a 2 year holding period in a relatively stable credit environment,** over and above where the highest margins are paying compared to the medium to longer-dated deposits.

We continue to see better value in longer tenors (i.e. favour 5 year terms over 3 year terms) amongst the “AA” rated ADIs due to their high liquidity and ability to ‘roll down the curve’ over a 2-2½ year holding period.

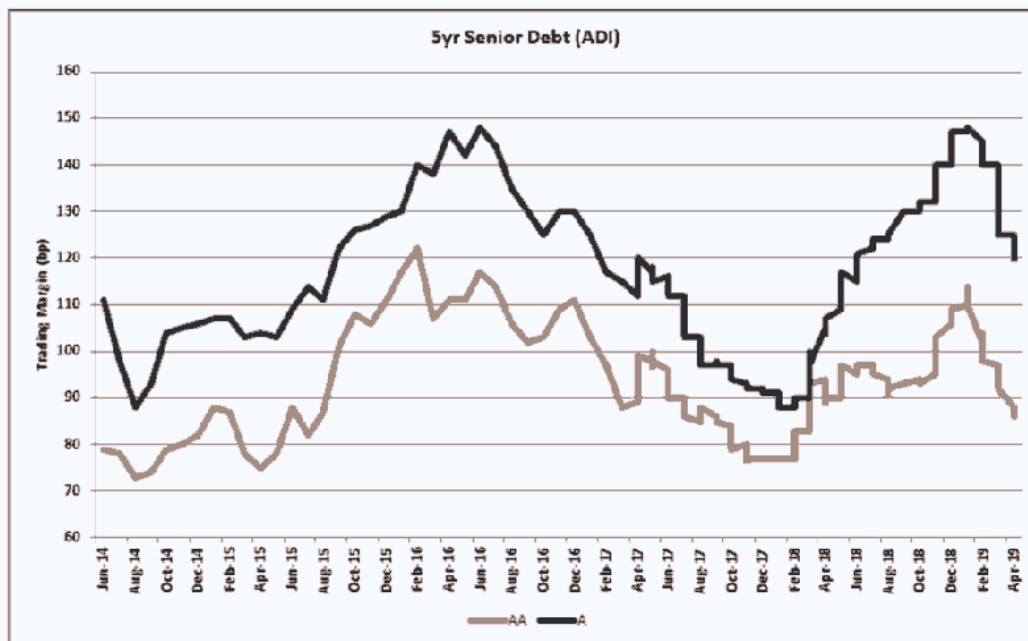
Collectively over the month, the “A” rated cohort tightened around -8bp and -5bp respectively for the 3 and 5 year part of the curve. During the month, Bank of China (A) issued at 3½ year senior FRN at +100bp while Suncorp (A+) issued a 3 year benchmark issue at +70bp. We saw much better value in Bank of China’s 3 year issue which has since tightened around -5bp in the secondary market.

Meanwhile, the “BBB” rated ADIs tightened -10bp to +110bp over the 3 year part of the curve, following the broader markets movement. There remains very little turnover (traditionally) in the secondary market amongst the lower regional ADIs.

Overall, credit remains tight on a historical basis but much more attractive after the recent correction experienced in credit markets over December / early January. The relative movement in spreads between medium-longer dated deposits and FRNs has seen the latter become much more attractive over the past few months, although this may change should rate cuts be delivered over coming months.

Senior FRNs (ADIs)	30/04/2019	31/03/2019
“AA” rated – 5yrs	+86bp	+92bp
“AA” rated – 3yrs	+61bp	+66bp
“A” rated – 5yrs	+120bp	+125bp
“A” rated – 3yrs	+92bp	+100bp
“BBB” rated – 3yrs	+110bp	+120bp

Source: IBS Capital



Source: IBS Capital

We now generally **recommend switches** ('benchmark' issues only) into new primary issues, out of the following senior FRNs that are maturing:

- On or before early 2022 for the "AA" rated ADIs (domestic major banks);
- On or before 2020 for the "A" rated ADIs; and
- Within 12 months for the "BBB" rated ADIs (consider case by case).

Investors holding onto the above senior FRNs ('benchmark' issues only) in their last 1-2 years are now generally holding sub-optimal investments and are not maximising returns by foregoing realised capital gains. In the current low interest rate environment, any boost in overall returns should be locked in when it is advantageous to do so.

We recommend Council starts introducing liquid senior FRNs into the portfolio, potentially starting with the domestic major banks.



Economic Commentary Review

International Market

Global equity markets continued their rally over April in the “risk-on” environment. In the US, **the S&P 500 Index surpassed its all-time highs, gaining +3.93% for the month, while the NASDAQ rose +4.74%**. Across Europe, the main economies surged, led by Germany’s DAX (+7.10%), UK’s FTSE (+4.86%) and France’s CAC (+4.41%).

US Q1 GDP came in at a much better than expected +3.2% headline rate, although 1.7% of the 3.2% rise was accounted for by inventory accumulation and a 1% contribution from net exports.

The US Fed’s preferred core PCE deflator (CPI), which strips out volatile food and energy prices, was **flat for the month of March and up +1.6% y/y, the lowest rate in over a year**. The headline number rose +0.2% for a +1.5% increase over the year.

The US unemployment rate was unchanged at 3.8% in March, while the participation rate fell by 0.2% to 63.0% from 63.2%.

US retail sales printed +1.6% in headline terms in March and +1.0% m/m for the so-called ‘control group’ that feeds directly into the consumption component of GDP.

Eurozone headline inflation was +1.4% y/y against +1.5% expected, and core inflation was +0.8% y/y against +0.9% expected. Meanwhile unemployment data remained stable at around 7.8% in February, though the headline disguises some dispersion in recent trends. Italy’s unemployment rate edged higher by two-tenths to 10.7%, while in contrast unemployment is falling in Spain (13.9% from 14.1%) and in Portugal (6.3% from 6.6%).

UK labour market data came in line with expectations, with the unemployment rate printing at 3.9% in February, its lowest rate since 1975, while real wages growth remained strong. If not for the uncertainty of Brexit, the Bank of England would likely be hiking rates.

China’s trade data revealed March exports jumped +14.2% y/y against expectations of a +6.5% y/y rise. There was further positive US-China trade news, with US Treasury Secretary Mnuchin indicating that the two countries are making progress, indicating the two sides are edging closer to an accord.

The International Monetary Fund (IMF) downgraded its global growth outlook for the third time in six months, its lowest forecast since the GFC. The IMF cut its forecast for global growth this year to 3.3%, down from 3.5% in January.

The MSCI World ex-AUS gained +3.42% for the month of April.

Index	1m	3m	1yr	3yr	5yr	10yr
S&P 500 Index	+3.93%	+8.94%	+11.25%	+12.57%	+9.35%	+12.94%
MSCI World ex-AUS	+3.42%	+7.50%	+4.57%	+9.41%	+5.49%	+9.47%
S&P ASX 200 Accum. Index	+2.37%	+9.29%	+10.41%	+11.10%	+7.52%	+10.01%

Source: S&P, MSCI



Domestic Market

The RBA left interest rates on hold at 1.50% at its April Board Meeting as widely expected. The significant change in the RBA's commentary was highlighted in their important final paragraph, which stated *"the Board judged that it was appropriate to hold the stance of policy unchanged at this meeting. The Board will continue to monitor developments and set monetary policy to support sustainable growth in the economy and achieve the inflation target over time"*, which emphasised their move towards an easing bias.

The Bank has been puzzled about the weakness in the GDP data while noting the strength in the labour market, which it continued to describe as strong. **The RBA Minutes subsequently discussed conditions in which the Board would cut interest rates.** They indicated that lower rates would be appropriate in a scenario where *"inflation did not move any higher and unemployment trended up"*.

Employment rose strongly in March, up +25.7k, as the **unemployment rate ticked up from an eight year low of 4.9% to 5.0%**, driven by the rising participation rate from 65.6% to 65.7%. The underemployment rate also ticked up from a five year low of 8.1% to 8.2%.

Q1 headline CPI inflation was weaker than expected, printing +0.0% q/q, or an annual rate of +1.3%. The trimmed mean CPI recorded +0.3% q/q, softening from the +0.5% in Q4 2018, dragging annual core inflation to +1.6% for the year.

The budget is forecast to be in surplus in 2019-20 to the tune of \$7.1b (0.4% of GDP), after a small deficit this year of \$4.2b (slightly larger than forecast at Dec 18). This would mark the first surplus since the economy entered the global financial crisis in 2007-08.

Retail sales lifted +0.8% in the month, after a weak print of +0.1% m/m in January. The trade surplus unexpectedly improved in February, increasing from \$4.4b in January to \$4.8b.

February building approvals lifted a significant +19.1% in the month, with a massive 64.6% rise in apartment approvals. The sharp rise in the month was led by Victoria and NSW, which rose 37% and 25% respectively – all due to apartment approvals.

The Australian dollar fell another -0.7% this month, finishing at US70.39 cents (from US70.87 cents the previous month).

Credit Market

The main global credit indices narrowed significantly over April, tightening around 10% across the board. Credit spreads are now back to where they were in mid-2018 and remain very tight on a historical basis:

Index	April 2019	March 2019
CDX North American 5yr CDS	58bp	63bp
iTraxx Europe 5yr CDS	58bp	65bp
iTraxx Australia 5yr CDS	66bp	76bp

Source: Markit



Fixed Interest Review

Benchmark Index Returns

Index	April 2019	March 2019
Bloomberg AusBond Bank Bill Index (0+YR)	+0.16%	+0.17%
Bloomberg AusBond Composite Bond Index (0+YR)	+0.28%	+1.82%
Bloomberg AusBond Credit FRN Index (0+YR)	+0.35%	+0.40%
Bloomberg AusBond Credit Index (0+YR)	+0.57%	+1.44%
Bloomberg AusBond Treasury Index (0+YR)	+0.19%	+2.15%
Bloomberg AusBond Inflation Gov't Index (0+YR)	+0.82%	+1.75%

Source: Bloomberg

Other Key Rates

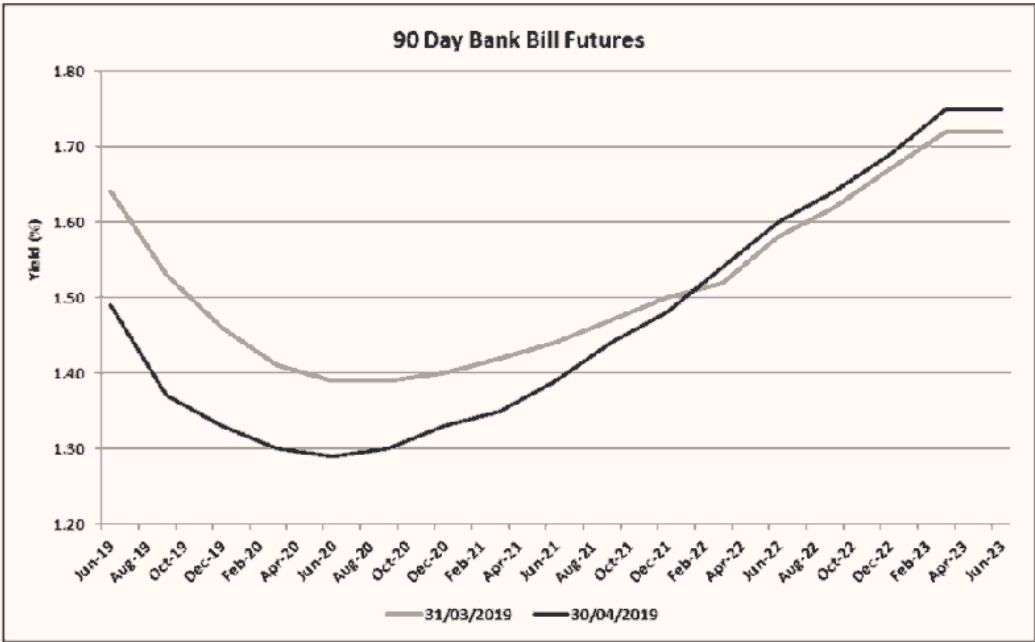
Index	April 2019	March 2019
RBA Official Cash Rate	1.50%	1.50%
90 Day (3 month) BBSW Rate	1.56%	1.77%
3yr Australian Government Bonds	1.28%	1.40%
10yr Australian Government Bonds	1.79%	1.78%
US Fed Funds Rate	2.25%-2.50%	2.25%-2.50%
10yr US Treasury Bonds	2.51%	2.41%

Source: RBA, AFMA, US Department of Treasury



90 Day Bill Futures

Over April, bill futures fell significantly at the short-end of the curve on impending expectations of an RBA rate cut. **The futures market was factoring around a 50% chance of a rate cut in the May meeting while fully pricing in one rate cut by July 2019.**



Source: ASX



Fixed Interest Outlook

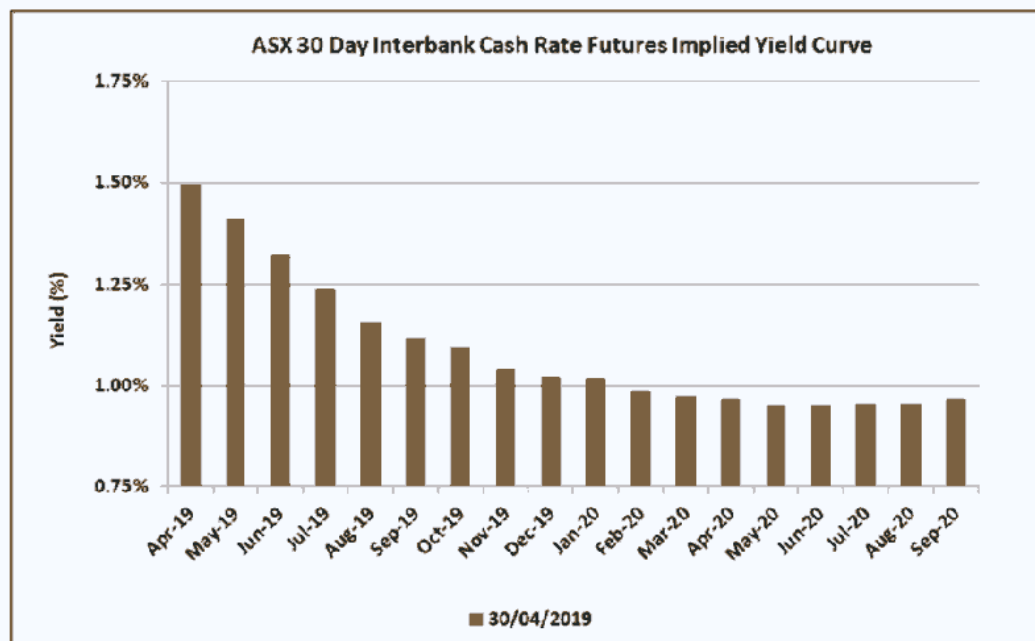
With inflation softening in the US, this could see the Fed cutting interest rates before the end of 2019. The market is currently factoring in around a 60% chance that the Fed will cut rates by December.

ECB President Draghi reiterated the more downbeat assessment of the Eurozone economy, with the forward guidance on rates on hold "at least through the end of 2019".

Domestically, the RBA shifted its view and has become openly more dovish, signalling the scenario in which it will cut interest rates (rising unemployment, low inflation, below trend growth). For now, they are endeavouring to remain on a neutral bias while employment continues to show strength. Housing concerns are closely being monitored with the fall in house prices (mainly in Sydney and Melbourne) finally being acknowledged as having an impact on the 'wealth effect' towards consumers.

The key risks for the RBA stem from the impact of international trade wars and a slowdown in the Chinese economy, US inflation and a broader slowdown in the global economy. Domestically, they are focused on employment, inflation, wage growth, housing and consumption. As a result of these uncertainties, the Bank continues to be cautious and is now seemingly ready to adjust interest rates should any downside risks materialise.

The futures market is now clearly focused on a rate cut **with the prospect of a 25bp cut by July 2019 seen as a 100% scenario**. Some economists are predicting the RBA will be forced to cut multiple times this year on expectations of a slowdown in the domestic and global economy, household finances impacting consumer confidence and a further downturn in residential property.



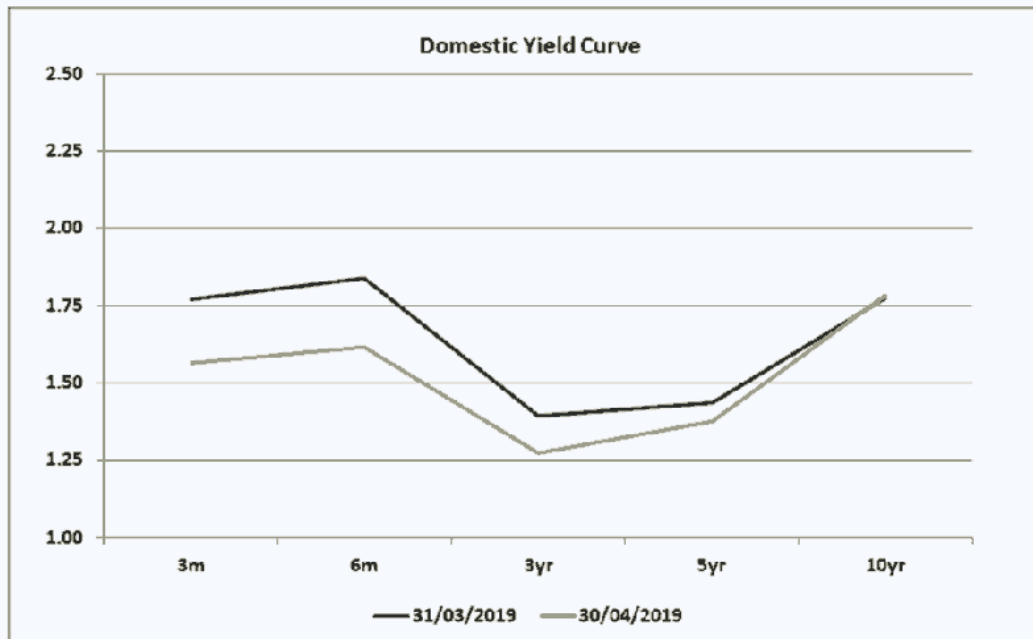
Source: ASX

Monthly Investment Report: April 2019

Page
15



Longer-term, the bond market continues to suggest a 'lower-for-longer' period of interest rates. Domestic yields fell significantly at the short-end of the curve during April, falling as much as -22bp at the 6 month part of the curve, on the back of the market factoring in an interest rate cut over coming months.



Source: AFMA, RBA

Disclaimer

The information provided in this document is intended for investors of Imperium Markets only and does not constitute a recommendation or an offer to invest. Market sections of this document are descriptive and do not take into account the investment objectives, financial situation or particular needs of any particular investor. Before making an investment decision or acting on any of the information or recommendations contained in this report, the investor should consider whether such recommendation is appropriate given the investor's particular investment needs, objectives and financial circumstances. We recommend you consult your investment adviser for updated advice that addresses your specific needs and situation before making investment decisions. All information and recommendations expressed herein constitute judgements as of the date of this report and may change without notice.

Monthly Investment Report

01/04/2019 to 30/04/2019



Portfolio valuation

As at 30/04/2019



Issuer	Rating	Type	Alloc	Interest	Purchase	Maturity	Rate	Value	Accrued	AccrMTD	Ref
AMP Bank	A-	TD	GENERAL	Maturity	17/05/2018	07/05/2019	2.7500	5,000,000.00	131,472.60	11,301.37	TD364564047-47889
Members Equity Bank	BBB	TD	GENERAL	Annual	19/05/2017	20/05/2019	2.8700	3,000,000.00	81,382.19	7,076.71	24821
Rabobank Australia	A+	TD	GENERAL	Annual	23/05/2016	23/05/2019	3.1500	6,000,000.00	177,608.22	15,534.25	18843
Westpac	AA-	TD	GENERAL	Qtly	29/05/2018	11/06/2019	2.7100	3,000,000.00	13,809.86	6,682.19	6775257
Bendigo and Adelaide	BBB+	TD	GENERAL	Annual	07/07/2016	08/07/2019	3.1500	2,000,000.00	51,090.41	5,178.08	1986640
NAB	AA-	TD	GENERAL	Maturity	17/07/2018	16/07/2019	2.7800	2,000,000.00	43,870.68	4,569.86	GMI-DEAL-10549241
Westpac	AA-	TD	GENERAL	Annual	24/07/2017	24/07/2019	2.9400	4,000,000.00	90,535.89	9,665.75	032-697 114230
Westpac	AA-	TD	GENERAL	Annual	15/08/2016	15/08/2019	3.1000	3,000,000.00	65,991.78	7,643.84	032-586 511-284
Newcastle Permanent	BBB	TD	GENERAL	Annual	15/08/2016	15/08/2019	3.0000	2,000,000.00	42,575.34	4,931.51	31125
Westpac	AA-	TD	GENERAL	Annual	22/08/2017	22/08/2019	2.9000	3,000,000.00	60,065.75	7,150.68	032-697 115436
ING Direct	A	TD	GENERAL	Annual	22/08/2017	22/08/2019	2.7500	5,000,000.00	94,931.51	11,301.37	26932
Commonwealth Bank	AA-	TD	GENERAL	Annual	04/09/2017	29/08/2019	2.7300	3,000,000.00	53,627.67	6,731.51	B37942904.6
Westpac	AA-	TD	GENERAL	Annual	04/09/2017	04/09/2019	2.9600	3,000,000.00	58,145.75	7,298.63	032-697 115 794
St George Bank	AA-	TD	GENERAL	Annual	08/09/2016	08/09/2019	3.2000	5,000,000.00	102,136.99	13,150.68	355290684
St George Bank	AA-	TD	GENERAL	Annual	27/09/2016	27/09/2019	3.2000	4,000,000.00	75,747.95	10,520.55	355333138
NAB	AA-	TD	GENERAL	Annual	11/07/2018	15/10/2019	2.8500	3,000,000.00	68,868.49	7,027.40	GMI-DEAL-10547992
ICBC Sydney Branch	A	TD	GENERAL	Annual	31/10/2018	29/10/2019	2.8300	4,000,000.00	56,444.93	9,304.11	00001
ICBC Sydney Branch	A	TD	GENERAL	Maturity	20/11/2018	12/11/2019	2.8600	5,000,000.00	63,468.49	11,753.42	01250011000001867
ICBC Sydney Branch	A	TD	GENERAL	Annual	13/11/2018	19/11/2019	2.8600	4,000,000.00	52,968.77	9,402.74	00003
ICBC Sydney Branch	A	TD	GENERAL	Annual	28/11/2018	26/11/2019	2.8200	5,000,000.00	59,490.41	11,589.04	00006
Westpac	AA-	TD	GENERAL	Qtly	14/12/2018	10/12/2019	2.7300	3,000,000.00	10,770.41	6,731.51	7389786
Westpac	AA-	TD	GENERAL	Qtly	14/12/2018	17/12/2019	2.7300	4,000,000.00	14,360.55	8,975.34	7389774
Westpac	AA-	TD	GENERAL	Qtly	14/01/2019	14/01/2020	2.7200	5,000,000.00	5,961.64	5,961.64	7448784
Members Equity Bank	BBB	TD	GENERAL	Annual	24/01/2017	24/01/2020	3.2600	2,000,000.00	17,327.12	5,358.90	22835
ICBC Sydney Branch	A	TD	GENERAL	Maturity	20/02/2019	04/02/2020	2.7200	1,000,000.00	5,216.44	2,235.62	00010
ING Direct	A	TD	GENERAL	Annual	15/02/2018	17/02/2020	2.8700	4,000,000.00	23,589.04	9,435.62	30810
ING Direct	A	TD	GENERAL	Annual	28/02/2018	03/03/2020	2.8900	4,000,000.00	19,636.16	9,501.37	378133
Newcastle Permanent	BBB	TD	GENERAL	Annual	10/03/2016	10/03/2020	3.7000	2,000,000.00	10,339.73	6,082.19	29843
ING Direct	A	TD	GENERAL	Annual	02/03/2018	17/03/2020	2.8800	4,000,000.00	18,305.75	9,468.49	378677

Issuer	Rating	Type	Alloc	Interest	Purchase	Maturity	Rate	Value	Accrued	AccrMTD	Ref
Rural Bank	BBB+	TD	GENERAL	Maturity	18/04/2019	14/04/2020	2.5500	2,000,000.00	1,816.44	1,816.44	2952006
Auswide Bank	BBB	TD	GENERAL	Maturity	30/04/2019	29/04/2020	2.4500	5,000,000.00	335.62	335.62	
BOQ	BBB+	TD	GENERAL	Annual	19/05/2017	19/05/2020	3.0000	3,000,000.00	85,068.49	7,397.26	453470
ING Direct	A	TD	GENERAL	Annual	22/05/2018	26/05/2020	2.9400	4,000,000.00	110,833.97	9,665.75	403498
ING Direct	A	TD	GENERAL	Annual	29/05/2018	09/06/2020	2.8800	3,000,000.00	79,772.05	7,101.37	6775257
Westpac	AA-	TD	GENERAL	Qty	06/06/2018	16/06/2020	2.9100	5,000,000.00	22,323.29	11,958.90	6795148
NAB	AA-	TD	GENERAL	Annual	03/07/2018	07/07/2020	2.9000	5,000,000.00	119,972.60	11,917.81	10545823
NAB	AA-	TD	GENERAL	Annual	11/07/2018	14/07/2020	2.9200	3,000,000.00	70,560.00	7,200.00	GMI-DEAL-10547993
ING Direct	A	TD	GENERAL	Annual	21/08/2018	25/08/2020	2.8500	4,000,000.00	79,019.18	9,369.86	424329
ING Direct	A	TD	GENERAL	Annual	13/09/2018	08/09/2020	2.8700	4,000,000.00	72,339.73	9,435.62	429068
Westpac	AA-	TD	GENERAL	Annual	13/09/2017	14/09/2020	3.1700	3,000,000.00	59,926.03	7,816.44	032-697 116017
ING Direct	A	TD	GENERAL	Annual	13/09/2018	22/09/2020	2.8700	4,000,000.00	72,339.73	9,435.62	429067
NAB	AA-	TD	GENERAL	Annual	17/10/2018	13/10/2020	2.7800	4,000,000.00	59,712.88	9,139.73	GMI-DEAL-10573417
ICBC Sydney Branch	A	TD	GENERAL	Annual	31/10/2018	27/10/2020	2.9300	6,000,000.00	87,659.18	14,449.32	00002
ICBC Sydney Branch	A	TD	GENERAL	Annual	13/11/2018	10/11/2020	2.9300	5,000,000.00	67,831.51	12,041.10	00004
ICBC Sydney Branch	A	TD	GENERAL	Annual	05/12/2018	08/12/2020	2.8600	2,000,000.00	23,036.71	4,701.37	01250011000001867
ICBC Sydney Branch	A	TD	GENERAL	Annual	14/12/2018	15/12/2020	2.8900	6,000,000.00	65,559.45	14,252.05	00009
BOQ	BBB+	TD	GENERAL	Annual	24/01/2017	25/01/2021	3.6500	2,000,000.00	19,400.00	6,000.00	438425
Westpac	AA-	TD	GENERAL	Annual	21/02/2017	22/02/2021	3.3900	2,000,000.00	12,816.99	5,572.60	032-586 519825
BOQ	BBB+	TD	GENERAL	Annual	10/03/2016	10/03/2021	3.8000	3,000,000.00	15,928.77	9,369.86	391843
ING Direct	A	TD	GENERAL	Annual	20/02/2019	16/03/2021	2.8200	2,000,000.00	10,816.44	4,635.62	475707
Westpac	AA-	TD	GENERAL	Qty	22/03/2018	23/03/2021	3.0200	4,000,000.00	13,238.36	9,928.77	6791206
Westpac	AA-	TD	GENERAL	Qty	22/05/2018	25/05/2021	3.1000	4,000,000.00	23,101.37	10,191.78	6927394
Rabobank Australia	A+	TD	GENERAL	Annual	08/06/2017	07/06/2021	3.0200	5,000,000.00	135,279.45	12,410.96	25359
Westpac	AA-	TD	GENERAL	Qty	06/06/2018	15/06/2021	3.1000	3,000,000.00	14,268.49	7,643.84	6795153
NAB	AA-	TD	GENERAL	Annual	03/07/2018	22/06/2021	3.0000	4,000,000.00	99,287.67	9,863.01	10545826
NAB	AA-	TD	GENERAL	Annual	03/07/2018	06/07/2021	3.0000	3,000,000.00	74,465.75	7,397.26	083-375 99-999-9947
Westpac	AA-	TD	GENERAL	Qty	17/07/2018	13/07/2021	3.0400	5,000,000.00	5,830.14	5,830.14	7052868
NAB	AA-	TD	GENERAL	Annual	26/07/2018	20/07/2021	3.0400	4,000,000.00	92,949.04	9,994.52	GMI-DEAL-10552065
NAB	AA-	TD	GENERAL	Annual	02/08/2018	03/08/2021	3.0700	5,000,000.00	114,389.04	12,616.44	GMI-DEAL-10554251
Westpac	AA-	TD	GENERAL	Qty	13/09/2018	14/09/2021	2.8800	5,000,000.00	19,331.51	11,835.62	7180013
NAB	AA-	TD	GENERAL	Annual	27/09/2018	28/09/2021	3.0500	5,000,000.00	90,246.58	12,534.25	GMI-DEAL-10568550
Westpac	AA-	TD	GENERAL	Qty	13/09/2018	12/10/2021	2.8900	5,000,000.00	19,398.63	11,876.71	7179943
ICBC Sydney Branch	A	TD	GENERAL	Annual	05/12/2018	07/12/2021	3.0100	4,000,000.00	48,489.86	9,895.89	01250011000001867

IMPERIUM MARKETS

2-4

Issuer	Rating	Type	Alloc	Interest	Purchase	Maturity	Rate	Value	Accrued	AccrMTD	Ref
Newcastle Permanent	BBB	TD	GENERAL	Qtly	07/02/2019	08/02/2022	3.0500	4,000,000.00	27,742.47	10,027.40	1381/37459
NAB	AA-	TD	GENERAL	Annual	21/02/2017	21/02/2022	3.4600	5,000,000.00	32,704.11	14,219.18	10420935
Westpac	AA-	TD	GENERAL	Annual	21/02/2017	21/02/2022	3.6100	2,000,000.00	13,648.77	5,934.25	23294
BOQ	BBB+	TD	GENERAL	Annual	15/03/2017	15/03/2022	3.8000	2,000,000.00	9,786.30	6,246.58	445483
Newcastle Permanent	BBB	TD	GENERAL	Qtly	12/03/2019	22/03/2022	2.9000	4,000,000.00	15,890.41	9,534.25	1684
Newcastle Permanent	BBB	TD	GENERAL	Annual	27/03/2019	29/03/2022	2.8000	5,000,000.00	13,424.66	11,506.85	
Newcastle Permanent	BBB	TD	GENERAL	Qtly	18/04/2019	19/04/2022	2.7000	4,000,000.00	3,846.58	3,846.58	1978
Rabobank Australia	A+	TD	GENERAL	Annual	08/06/2017	07/06/2022	3.2200	5,000,000.00	144,238.36	13,232.88	25360
NAB	AA-	TD	GENERAL	Annual	02/08/2018	02/08/2022	3.2200	4,000,000.00	95,982.47	10,586.30	GMI-DEAL-10554252
NAB	AA-	TD	GENERAL	Annual	16/08/2018	16/08/2022	3.0500	4,000,000.00	86,235.62	10,027.40	GMI-DEAL-10557367
Westpac	AA-	TD	GENERAL	Annual	13/09/2017	13/09/2022	3.4100	3,000,000.00	64,463.01	8,408.22	032-697 116 009
Rabobank Australia	A+	TD	GENERAL	Annual	13/09/2017	13/09/2022	3.3800	3,000,000.00	63,895.89	8,334.25	27388
Westpac	AA-	CASH	GENERAL	Month	31/05/2017	31/12/2150	2.2000	8,751,320.10	15,824.30	15,824.30	WESTPAC COMMERCIAL BANK DAY NOTICE SAVER ACCOUNT
TOTALS									\$4,044,768.41	\$289,751,320.10	\$674,924.30



Government Gazette

of the State of
New South Wales

Number 37
Friday, 26 April 2019

The New South Wales Government Gazette is the permanent public record of official NSW Government notices. It also contains local council, private and other notices.

From 1 January 2019, each notice in the Government Gazette has a unique identifier that appears in round brackets at the end of the notice and that can be used as a reference for that notice (for example, (n2019-14)).

The Gazette is compiled by the Parliamentary Counsel's Office and published on the NSW legislation website (www.legislation.nsw.gov.au) under the authority of the NSW Government. The website contains a permanent archive of past Gazettes.

To submit a notice for gazettal – see Gazette Information.

ISSN 2201-7534

By Authority
Government Printer

NSW Government Gazette No 37 of 26 April 2019 pages 1208 to 1228

Local
Government
Remuneration
Tribunal

Annual Report
and
Determination

*Annual report and determination under sections 239 and
241 of the Local Government Act 1993*

15 April
2019

[NSW Remuneration Tribunals website](#)

Local Government Remuneration Tribunal

Contents

Contents	1
Executive Summary	2
Section 1 Introduction	3
Section 2 Background	3
Section 2 2018 Determination	4
Section 3 2019 Review	4
Categorisation	5
Fees	8
Other matters	10
Conclusion	10
Section 4 Determinations	12
Determination No. 1- Determination Pursuant to Section 239 of Categories of Councils and County Councils Effective From 1 July 2019	12
Table 1: General Purpose Councils - Metropolitan	12
Table 2: General Purpose Councils – Non-Metropolitan	13
Table 3: County Councils	14
Determination No. 2- Determination Pursuant to Section 241 of Fees for Councillors and Mayors	15
Table 4: Fees for General Purpose and County Councils	15
Appendices	16
Appendix 1 Criteria that apply to categories	16

Local Government Remuneration Tribunal

Executive Summary

The Local Government Remuneration Tribunal (the Tribunal) is required to report to the Minister for Planning and Public Spaces by 1 May each year as to its determination of categories of councils and the maximum and minimum amounts of fees to be paid to mayors, councillors, and chairpersons and members of county councils.

Categories

The Tribunal did not undertake a broad review of the categorisation of councils and considered only those requests where an individual submission was made. The Tribunal found that the current allocation of councils into the current categories is appropriate.

The Tribunal will next consider the model, the criteria applicable to each group and the allocation of councils in detail in 2020. The criteria applicable to each of the categories are published in Appendix 1 of the determination and are unchanged from 2018.

Fees

The Tribunal has determined that the minimum and maximum fees applicable to each category will be increased by 2.5 per cent which is consistent with the government's policy on wages.

Local Government Remuneration Tribunal

Section 1 Introduction

1. The role of Assessor assisting the Local Government Remuneration Tribunal (the Tribunal), pursuant to section 236 (1) (b) of the *Local Government Act 1993* (the LG Act) was undertaken by Mr Ian Reynolds from 1 July 2015 until the expiration of his appointment on 27 November 2018. The Tribunal thanks Mr Reynolds for his contributions over those years.
2. On 28 November 2018, Dr Robert Lang was re-appointed as the Tribunal and Mr Brian Bell PSM was appointed to the role of Assessor assisting the Tribunal pursuant to section 236 (1) (b) of the LG Act. The role of Assessor assisting the Tribunal pursuant to 236 (1) (a) continues to be undertaken by Mr Tim Hurst, CEO, Office of Local Government, Department of Planning and Environment.

Section 2 Background

3. Section 239 of the LG Act provides for the Tribunal to determine the categories of councils and mayoral offices and to place each council and mayoral office into one of those categories. The categories are to be determined at least once every 3 years.
4. Section 241 of the LG Act provides for the Tribunal to determine, not later than 1 May in each year, for each of the categories determined under section 239, the maximum and minimum amount of fees to be paid to mayors and councillors of councils, as well as chairpersons and members of county councils.
5. In determining the maximum and minimum fees payable in each of the categories, the Tribunal is required, pursuant to section 242A (1) of the LG Act, to give effect to the same policies on increases in remuneration as those of the Industrial Relations Commission. The current policy on wages is that public sector wages cannot increase by more than 2.5 per cent, and this includes the maximum and minimum fees payable to councillors and mayors and chairpersons and members of county councils.
6. The Tribunal is however able to determine that a council can be placed in another existing or a new category with a higher range of fees without breaching the government's wage policy pursuant to section 242A (3) of the LG Act.

Local Government Remuneration Tribunal

7. The Tribunal's determinations take effect from 1 July in each year.

Section 2 2018 Determination

1. The Tribunal considered ten requests for re-categorisation having regard to the case put forward and the criteria for each category. A multi variable approach was adopted in assessing each council against all the criteria (not only population) for the requested category and the relativities within the categories.
2. The Tribunal noted that at the time of making the determination only the population data as of 2016 was available.
3. The Tribunal found that the current categorisation for the ten councils was appropriate and noted that some of those councils seeking to be moved are likely to meet the criteria for re-categorisation in future determinations in the medium term.
4. The Tribunal's 2018 Determination was made on 17 April 2018 and provided a general increase of 2.5 per cent which was consistent with the Government's policy on wages.

Section 3 2019 Review

5. The Tribunal wrote to all mayors in December 2018 advising of the commencement of the 2019 Annual Review. In doing so the Tribunal noted that it is only required to review the categories every three years and will next consider the model, the criteria applicable to each group and the allocation of councils in detail in 2020.
6. The Tribunal also stated that it does not intend to alter the groups that apply to individual councils unless there is a very strong case to do so. Any requests for a review should be supported by evidence which would indicate that the council is more appropriately allocated in another category based on the criteria.
7. The Tribunal also wrote to the President of Local Government NSW (LGNSW) in similar terms, and subsequently met with the President and Chief Executive of LGNSW. The Tribunal thanks the President and Chief Executive for making the time to meet with the Tribunal.
8. In response to this review the Tribunal received 20 submissions from individual councils and a submission from LGNSW. Those submissions addressed the allocation of councils into

Local Government Remuneration Tribunal

those categories and fees. The Tribunal also received a submission from a joint organisation requesting that the Tribunal determine the fees for members of the boards of joint organisations. A summary of the matters raised, and the Tribunal's consideration of those matters is outlined below.

Categorisation

9. Ten submissions received from councils requested re-categorisation now and two submissions requested re-categorisation when the Tribunal considers the categories in detail in 2020. Each of the ten requests for re-categorisation now were considered having regard to the case put forward and the criteria for each category.
10. At the time of making the determination the Tribunal had available to it the 30 June 2018 population data released by the Australian Bureau of Statistics (ABS) on 27 March 2019. In reviewing the submissions received the Tribunal also applied a multi variable approach assessing each council against all the criteria (not only population) for the requested category and the relativities within the categories.
11. The Tribunal finds that the allocation of councils into the current categories is appropriate but again notes that some of those councils seeking to be moved are likely to meet the criteria for re-categorisation in future determinations.
12. A few submissions have suggested alternative categorisation models. The Tribunal will consider this in detail in the 2020 review. The Tribunal intends to commence the 2020 annual review earlier than usual to ensure there is time to review the existing model and to examine alternatives. The Tribunal is of the preliminary view that a case may exist to revise the number of categories, and their applicable criteria, particularly for regional and rural councils.
13. A summary of the Tribunal's findings for each of the 2019 applications for re-categorisation is outlined in the following paragraphs.

Metropolitan Large

14. Canterbury-Bankstown and Penrith have sought re-categorisation to new categories noting that no changes to the categories of councils are planned until 2020. Canterbury-Bankstown has proposed a new categorisation model for consideration in the 2020 review. The proposed model would provide different categories for metropolitan councils. Penrith

Local Government Remuneration Tribunal

has again sought to be re-categorised to a new category - 'Metropolitan Large – Growth Centre'.

15. Both councils may wish to provide further details for consideration in the 2020 annual review.

Metropolitan Medium Councils

16. Inner West has again sought to be re-categorised to Metropolitan Large. The Tribunal outlined in the 2018 determination that Inner West did not demonstrate enough additional criteria to warrant re-categorisation at that time, but with population growth the council would likely be more comparable with other Metropolitan Large councils in the short to medium term.
17. The Tribunal has again considered in detail the features of Inner West having regard to the other criteria for Metropolitan Large councils. The Tribunal finds that Inner West does not provide the same degree of regional servicing or have an equivalent sphere of economic influence as other Metropolitan Large councils. This is supported by development and planning information published by the Greater Sydney Commission.
18. Inner West's June 2018 population of 198,024 is below the indicative population of other Metropolitan Large councils. Based on existing growth predictions it is likely Inner West will meet the minimum population threshold for inclusion in Metropolitan Large in 2020.

Metropolitan Small Council

19. Willoughby and Camden have sought to be re-categorised to Metropolitan Medium.
20. Willoughby's June 2018 population of 80,339 is below the indicative population of Metropolitan Medium Councils. The Tribunal outlined in the 2018 determination that Willoughby sought recognition of its scale of operations and businesses and regional significance of its centres and high percentage of non-resident visitors and workers. The Tribunal found the characteristics of the council were more appropriately aligned with those of other Metropolitan Small councils and found no case for it to be re-categorised at that time.
21. Willoughby's 2019 submission argues there is an over emphasis on resident population and no recognition of the complexity or burden on high volumes of non-resident populations.
22. As previously stated, the Tribunal considers a range of factors (not only population) in determining categories as required under section 240 of the LG Act. The Tribunal has again considered in detail the features of Willoughby having regard to the other criteria for other

Local Government Remuneration Tribunal

Metropolitan Medium councils and finds that Willoughby has not demonstrated the criteria to warrant inclusion in the Metropolitan Medium group at this time.

23. Camden's 2018 population of 94,159 is below the indicative population of Metropolitan Medium councils. The Tribunal has considered the features of Camden having regard to the other criteria for Metropolitan Medium councils. The Tribunal finds that Camden does not provide the same degree of regional servicing or have an equivalent sphere of economic influence as Metropolitan Medium councils. The Tribunal notes however that the ABS identifies that Camden has the largest and fastest population growth in NSW. Based on existing growth predictions it is likely Camden will meet the minimum population threshold for inclusion in Metropolitan Medium in 2020.

Regional Strategic Area Councils

24. Central Coast has sought to be re-categorised to Regional City. The council submits that its characteristics are more like Newcastle and Wollongong (Regional City) and substantially different to Lake Macquarie (Regional Strategic Area). The Tribunal finds that Central Coast has not demonstrated the additional criteria to warrant inclusion in the Regional City group.

Regional Rural Councils

25. Shellharbour and Port Macquarie have sought re-categorisation to Regional Strategic Area.
26. Shellharbour's June 2018 population of 72,240 is significantly below the indicative population of Regional Strategic Area councils. In addition, the submission was not supported by evidence which would indicate that the council is more appropriately allocated in another category based on the criteria.
27. Port Macquarie's June 2018 population of 83,131 is significantly below the indicative population of Regional Strategic Area councils. The Tribunal finds that Port Macquarie has not demonstrated the additional criteria to warrant inclusion in the Regional Strategic Area group.
28. Port Macquarie (as an alternative) and Mid-Coast sought to be re-categorised to a new category between Regional Strategic Area and Regional Rural. Both councils may wish to provide further details for consideration in the 2020 annual review.

Rural Councils

29. Muswellbrook and Federation have sought to be re-categorised to Regional Rural.

Local Government Remuneration Tribunal

30. Muswellbrook's June 2018 population of 16,383 and Federation's June 2018 population of 12,462 are well below the indicative population of Regional Rural councils. Both councils have not demonstrated the additional criteria to warrant inclusion in the Regional Rural group.
31. The Tribunal also undertook a review of Hilltops having regard to its 2018 submission and the Tribunal's findings that re-categorisation at that time was not warranted:

"41. Hilltops Council has sought to be re-categorised from Rural to Regional Rural. The new Hilltops Council is an amalgamation of three former councils in the Rural category (Young, Boorowa and Harden). The submission states that the new council has increased complexity of business and should be recognised as Regional Rural.

42. The Tribunal notes that Hilltops has a population of 19,150 (2016) which is just below the indicative population range of Regional Rural councils. The category of Regional Rural currently includes one council – Broken Hill – which has a population similar to that of Hilltops. Broken Hill warrants categorisation as Regional Rural in recognition of the degree of regional servicing it provides to far western NSW. It is not considered that Hilltops provides the same degree of regional services and on that basis re-categorisation is not warranted at this time."

32. Hilltops' June 2018 population of 18,782 is below the indicative population range of Regional Rural councils. The Tribunal has reviewed the additional criteria and finds no reason to alter its findings as outlined in the 2018 determination.

Fees

33. The LGNSW submission requested that the Tribunal increase fees by the allowable maximum of 2.5 per cent. The submission also repeated its view that the current arrangement for setting fees is inadequate and does not compensate elected members for the significant workload and range of responsibilities which are expanding. Comparative information was presented in respect to board fees, fees paid to mayors and councillors of councils in Queensland, and salaries for members of Parliament. A report detailing the findings of an independent review conducted on current remuneration paid to councillors and mayors was also provided. The LGNSW submission

Local Government Remuneration Tribunal

also requested that the Tribunal make a recommendation in support of the payment of superannuation.

34. Several submissions sought an increase to the allowable maximum of 2.5 per cent and raised similar issues to LGNSW in respect to the current fees not being adequate compensation for increased responsibilities and workload required to carry out mayoral and councillor duties and non-payment of superannuation. Several submissions also sought an increase significantly higher than the allowable 2.5 per cent or that fees be increased by benchmarking them to Principal CBD fees or population per councillor or using the base salary and allowances for Members of Parliament in the relevant region.
35. Two submissions also raised the matter of fees for deputy mayors. The Tribunal addressed this matter in the 2018 determination and will make no further comment.
36. The Tribunal has considered the submissions received. The Tribunal is mindful that the roles and responsibilities of councillors and mayors in NSW are outlined in the LG Act and notes that they are not necessarily comparable to the roles and responsibilities of councillors and mayors in other states, members of Parliament or members of boards and committees.
37. The Tribunal again notes that some of the other matters raised by submissions are more appropriately dealt with in the context of the current Local Government reform agenda and are outside the Tribunal's powers.
38. The Tribunal is required to have regard to the Government's wages policy when determining the increase to apply to the maximum and minimum fees that apply to councillors and mayors. The public sector wages policy currently provides for a cap on increases of 2.5 per cent.
39. The Tribunal has reviewed the key economic indicators, including the Consumer Price Index and Wage Price Index, and had regard to budgetary limitations imposed by the Government's policy of rate pegging, and finds that the full increase of 2.5 per cent is warranted. The 2.5 per cent increase will apply to the minimum and the maximum of the ranges for all existing categories.

Local Government Remuneration Tribunal**Other matters**

40. The submission from LGNSW and several councils have again raised the matter of the non-payment of superannuation. The Tribunal addressed this matter in the 2018 determination as outline below and will make no further comment:

“54. The matter of the non-payment of superannuation has been previously raised in submissions to the Tribunal and is not a matter for the Tribunal to determine. Section 251 of the LG Act confirms that councillors are not employees of the council and the fee paid does not constitute a salary under the Act. The Tribunal notes that the Australian Tax Office has made a definitive ruling (ATO ID 2007/205) that allows councillors to redirect their annual fees into superannuation on a pre-tax basis and is a matter for councils (Ref: Councillor Handbook, Oct 2017, Office of Local Government p.69).”

41. The Tribunal also received a submission from the Canberra Region Joint Organisation (CRJO) although no invitation to do so was issued by the Tribunal. The CRJO has requested that the Tribunal set chair and member fees for joint organisations in the 2019 annual determination.
42. The Tribunal is constituted under Chapter 9, Part 2, Division 4 of the LG Act. The Tribunal’s determinations apply to Councils, Mayors and Councillors within the meaning of Chapter 9 of the LG Act.
43. Joint organisations, including the Board of a joint organisation, are constituted under Chapter 12, Part 7 of the LG Act. The Tribunal’s jurisdiction does not apply to joint organisations, as provided for in section 400ZH(3)(e) of the LG Act.
44. On that basis the Tribunal has no power to consider the CRJO submission and it is a matter that the CRJO may wish to raise with the Minister for Planning and Public Spaces who is the Minister responsible for the LG Act. The Tribunal has written to the CRJO in the above terms.

Conclusion

45. The Tribunal’s determinations have been made with the assistance of the two Assessors - Mr Brian Bell and Mr Tim Hurst. The allocation of councils into each of the categories,

Local Government Remuneration Tribunal

pursuant to section 239 of the LG Act, is outlined in Determination No. 1. The maximum and minimum fees paid to councillors and mayors and members and chairpersons of county councils, pursuant to section 241 of the LG Act, are outlined in Determination No. 2.

The Local Government Remuneration Tribunal

(Signed)

Dr Robert Lang

Dated: 15 April 2019

Local Government Remuneration Tribunal

Section 4 Determinations

Determination No. 1- Determination Pursuant to Section 239 of Categories of Councils and County Councils Effective From 1 July 2019

Table 1: General Purpose Councils - Metropolitan

Principal CBD (1)	Major CBD (1)
Sydney	Parramatta
Metropolitan Large (8)	Metropolitan Medium (9)
Blacktown	Bayside
Canterbury-Bankstown	Campbelltown
Cumberland	Georges River
Fairfield	Hornsby
Liverpool	Ku-ring-gai
Northern Beaches	Inner West
Penrith	Randwick
Sutherland	Ryde
	The Hills
Metropolitan Small (11)	
Burwood	
Camden	
Canada Bay	
Hunters Hill	
Lane Cove	
Mosman	
North Sydney	
Strathfield	
Waverley	
Willoughby	
Woollahra	

Local Government Remuneration Tribunal

Table 2: General Purpose Councils – Non-Metropolitan

Regional City (2)	
Newcastle	
Wollongong	

Regional Strategic Area (2)	
Central Coast	
Lake Macquarie	

Regional Rural (37)	
Albury	
Armidale	
Ballina	
Bathurst	
Bega	
Blue Mountains	
Broken Hill	
Byron	
Cessnock	
Clarence Valley	
Coffs Harbour	
Dubbo	
Eurobodalla	
Goulburn Mulwaree	
Griffith	
Hawkesbury	
Kempsey	
Kiama	
Lismore	
Lithgow	
Maitland	
Mid-Coast	
Mid-Western	
Orange	
Port Macquarie-Hastings	
Port Stephens	
Queanbeyan-Palerang	
Richmond Valley	
Shellharbour	
Shoalhaven	
Singleton	
Snowy Monaro	
Tamworth	
Tweed	
Wagga Wagga	
Wingecarribee	
Wollondilly	

Rural (57)	
Balranald	Kyogle
Bellingen	Lachlan
Berrigan	Leeton
Bland	Liverpool Plains
Blayney	Lockhart
Bogan	Moree Plains
Bourke	Murray River
Brewarrina	Murrumbidgee
Cabonne	Muswellbrook
Carrathool	Nambucca
Central Darling	Narrabri
Cobar	Narrandera
Coolamon	Narromine
Coonamble	Oberon
Cootamundra-Gundagai	Parkes
Cowra	Snowy Valleys
Dungog	Temora
Edward River	Tenterfield
Federation	Upper Hunter
Forbes	Upper Lachlan
Gilgandra	Uralla
Glen Innes Severn	Walcha
Greater Hume	Walgett
Gunnedah	Warren
Gwydir	Warrumbungle
Hay	Weddin
Hilltops	Wentworth
Inverell	Yass
Junee	

Local Government Remuneration Tribunal

Table 3: County Councils

Water (4)	Other (6)
Central Tablelands	Castlereagh-Macquarie
Goldenfields Water	Central Murray
Riverina Water	Hawkesbury River
Rous	New England Tablelands
	Upper Hunter
	Upper Macquarie

Local Government Remuneration Tribunal

**Determination No. 2- Determination Pursuant to Section 241 of Fees
for Councillors and Mayors**

Pursuant to s.241 of the *Local Government Act 1993*, the annual fees to be paid in each of the categories to Councillors, Mayors, Members and Chairpersons of County Councils effective on and from 1 July 2019 are determined as follows:

Table 4: Fees for General Purpose and County Councils

Category		Councillor/Member Annual Fee		Mayor/Chairperson Additional Fee*	
		Minimum	Maximum	Minimum	Maximum
General Purpose Councils - Metropolitan	Principal CBD	27,640	40,530	169,100	222,510
	Major CBD	18,430	34,140	39,160	110,310
	Metropolitan Large	18,430	30,410	39,160	88,600
	Metropolitan Medium	13,820	25,790	29,360	68,530
	Metropolitan Small	9,190	20,280	19,580	44,230
General Purpose Councils - Non-metropolitan	Regional City	18,430	32,040	39,160	99,800
	Regional Strategic Area	18,430	30,410	39,160	88,600
	Regional Rural	9,190	20,280	19,580	44,250
	Rural	9,190	12,160	9,780	26,530
County Councils	Water	1,820	10,140	3,920	16,660
	Other	1,820	6,060	3,920	11,060

*This fee must be paid in addition to the fee paid to the Mayor/Chairperson as a Councillor/Member (s.249(2)).

The Local Government Remuneration Tribunal

(Signed)

Dr Robert Lang

Dated: 15 April 2019

Local Government Remuneration Tribunal

Appendices

Appendix 1 Criteria that apply to categories

Principal CBD

The Council of the City of Sydney (the City of Sydney) is the principal central business district (CBD) in the Sydney Metropolitan area. The City of Sydney is home to Sydney's primary commercial office district with the largest concentration of businesses and retailers in Sydney. The City of Sydney's sphere of economic influence is the greatest of any local government area in Australia.

The CBD is also host to some of the city's most significant transport infrastructure including Central Station, Circular Quay and International Overseas Passenger Terminal. Sydney is recognised globally with its iconic harbour setting and the City of Sydney is host to the city's historical, cultural and ceremonial precincts. The City of Sydney attracts significant visitor numbers and is home to 60 per cent of metropolitan Sydney's hotels.

The role of Lord Mayor of the City of Sydney has significant prominence reflecting the CBD's importance as home to the country's major business centres and public facilities of state and national importance. The Lord Mayor's responsibilities in developing and maintaining relationships with stakeholders, including other councils, state and federal governments, community and business groups, and the media are considered greater than other mayoral roles in NSW.

Major CBD

The Council of the City of Parramatta (City of Parramatta) is the economic capital of Greater Western Sydney and the geographic and demographic centre of Greater Sydney. Parramatta is the second largest economy in NSW (after Sydney CBD) and the sixth largest in Australia.

As a secondary CBD to metropolitan Sydney the Parramatta local government area is a major provider of business and government services with a significant number of organisations relocating their head offices to Parramatta. Public administration and safety has been a growth sector for Parramatta as the State Government has promoted a policy of moving government agencies westward to support economic development beyond the Sydney CBD.

The City of Parramatta provides a broad range of regional services across the Sydney Metropolitan area with a significant transport hub and hospital and educational facilities. The City of Parramatta is home to the Westmead Health and Medical Research precinct which represents the largest concentration of hospital and health services in Australia, servicing Western Sydney and providing other specialised services for the rest of NSW.

The City of Parramatta is also home to a significant number of cultural and sporting facilities (including Sydney Olympic Park) which draw significant domestic and international visitors to the region.

Local Government Remuneration Tribunal**Metropolitan Large**

Councils categorised as Metropolitan Large will typically have a minimum population of 200,000.

Other features may include:

- total operating revenue exceeding \$200M per annum
- the provision of significant regional services to greater Sydney including, but not limited to, major education, health, retail, sports, other recreation and cultural facilities
- significant industrial, commercial and residential centres and development corridors
- high population growth.

Councils categorised as Metropolitan Large will have a sphere of economic influence and provide regional services considered to be greater than those of other metropolitan councils.

Metropolitan Medium

Councils categorised as Metropolitan Medium will typically have a minimum population of 100,000.

Other features may include:

- total operating revenue exceeding \$100M per annum
- services to greater Sydney including, but not limited to, major education, health, retail, sports, other recreation and cultural facilities
- industrial, commercial and residential centres and development corridors
- high population growth.

The sphere of economic influence, the scale of council operations and the extent of regional servicing would be below that of Metropolitan Large councils.

Metropolitan Small

Councils categorised as Metropolitan Small will typically have a population less than 100,000.

Other features which distinguish them from other metropolitan councils include:

- total operating revenue less than \$150M per annum.

While these councils may include some of the facilities and characteristics of both Metropolitan Large and Metropolitan Medium councils the overall sphere of economic influence, the scale of council operations and the extent of regional servicing would be below that of Metropolitan Medium councils.

Local Government Remuneration Tribunal**Regional City**

Councils categorised as Regional City will typically have a population above 150,000. These councils are metropolitan in nature with major residential, commercial and industrial areas. These Councils typically host government departments, major tertiary education and health facilities and incorporate high density commercial and residential development.

These councils provide a full range of higher order services and activities along with arts, culture, recreation and entertainment facilities to service the wider community and broader region. These councils typically also contain ventures which have a broader State and national focus which impact upon the operations of the council.

Newcastle City Council and Wollongong City Councils are categorised as Regional City.

Regional Strategic Area

Councils categorised as Regional Strategic Area are differentiated from councils in the Regional Rural category on the basis of their significant population. Councils categorised as Regional Strategic Area will typically have a population above 200,000. These councils contain a mix of urban and rural settlements. They provide a range of services and activities including business, office and retail uses, along with arts, culture, recreation and entertainment facilities to service the wider community. These councils host tertiary education campuses and health facilities.

While councils categorised as Regional Strategic Area may have populations which exceed those of Regional City, they would not typically provide the same range of regional services or have an equivalent sphere of economic influence.

Central Coast Council and Lake Macquarie Council are categorised as Regional Strategic Area.

Regional Rural

Councils categorised as Regional Rural will typically have a minimum population of 20,000.

Other features which distinguish them from other non-metropolitan councils include:

- a major town or towns with the largest commercial component of any location in the surrounding area
- a significant urban population existing alongside a traditional farming sector, and are surrounded by smaller towns and villages or may be located on or close to the coast with high levels of population and tourist facilities
- provide a full range of higher-order services including business, office and retail uses with arts, culture, recreation and entertainment centres
- regional services to the wider community through principal referral hospitals, tertiary education services and major regional airports
- these councils may also attract large visitor numbers to established tourism ventures.

Local Government Remuneration Tribunal**Rural**

Councils categorised as Rural will typically have a population below 20,000.

Other features which distinguish them from other non-metropolitan councils include:

- one or two significant townships combined with a considerable dispersed population spread over a large area and a long distance from a major regional centre
- a limited range of services, facilities and employment opportunities compared to Regional Rural councils
- local economies based on agricultural/resource industries.

County Councils - Water

County councils that provide water and/or sewerage functions with a joint approach in planning and installing large water reticulation and sewerage systems.

County Councils - Other

County councils that administer, control and eradicate declared noxious weeds as a specified Local Control Authority under the *Noxious Weeds Act 1993*.

(n2019-1018)

2 Your Community Life

15/05/2019

What we are trying to achieve

A healthy, inclusive and vibrant community.

What the result will be

We will have:

- Community hubs that provide access to services and social connections
- A safe, caring and connected community
- A healthy and active community that is supported by recreational infrastructure
- A strong community that is able to identify and address social issues
- Community participation in events, programs, festivals and activities

How we will get there

- 2.1 Create a community that feels safe
- 2.2 Advocate for social inclusion and fairness
- 2.3 Provide quality programs, community facilities and public spaces, for example, community halls, parks and vibrant town centres
- 2.4 Empower the community through encouraging active involvement in projects, volunteering and events
- 2.5 Promote a creative and culturally rich community

GRANTS REGISTER (2018-2019)									
Date App Submitted	Project Title	Grant Program	Organisation Offering the Grant	Grant amount reported for	Council's contribution	Assessed grant	Funding Type Local, State, Federal	Grant Successful?	
02-Jul-17	Local Land Services Weed Action Plan 2018-19	NSW Weeds Action Program 2018-2020	Department of Primary Industries	N/A	\$0	\$116,002	State	Yes	
18-Oct-17	Shired path-Port Macquarie CSD to Wrights Road	RMS Active Transport	Roads & Maritime Services	\$70,000	\$0	\$70,000	State	Yes	
02-May-18	2018-2019 Bush Fire Risk Mitigation and Resilience Grant Program	Bush Fire Risk Mitigation and Resilience Grant Program	Rural Fire Service	\$17,800	\$0	\$17,800	Priority State	Yes	
04-May-18	Hazardous Sports Field Lighting and Infrastructure	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$443,484	\$0	\$443,484	State	Yes	
04-May-18	Hazardous Tennis Courts Upgrades	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$55,420	\$0	\$0	State	No	
04-May-18	Gordon Haven Sports Field Lighting & Infrastructure	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$448,750	\$0	\$448,750	State	Yes	
04-May-18	Port Macquarie Sporting Field Upgrades	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$250,336	\$0	\$132,854	State	Yes	
04-May-18	East Central Maitland River Implementation	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$222,696	\$0	\$222,696	State	Yes*	
04-May-18	Teaglen Point Pedestrian Safety Upgrades	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$668,000	\$0	\$668,000	State	Yes	
04-May-18	New Community Park	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$115,862	\$0	\$115,862	State	Yes	
04-May-18	Tom Beach Picnic Area	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$202,052	\$0	\$0	State	No	
04-May-18	Port Macquarie-Hastings Community Hall Upgrade	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$99,876	\$0	\$0	State	No	
04-May-18	Tacking Point Lighthouse Accessible Walkway	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$152,862	\$0	\$0	State	No	
04-May-18	Wauchope Boardwalk Riverside Sculpture Trail	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$198,140	\$0	\$198,140	State	Yes	
04-May-18	Oak Creek Reserve Upgrades	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$50,470	\$0	\$50,470	State	Yes	
04-May-18	Port Macquarie Tennis Club Lighting Upgrade	Stronger Country Communities Fund (Round 2)	NSW Department of Industry	\$160,038	\$0	\$0	State	No	
27-Jun-18	Westport Public School	RMS	Roads & Maritime Services	\$3,336	\$0	\$3,336	State	Yes	
02-Jul-18	Bus Shelter Replacement Program	Councils Passenger Transport Infrastructure Grant Scheme	Transport for NSW	\$138,500	\$0	\$138,500	State	Yes	
02-Jul-18	Boat Street Pedestrian Crossing	Stronger Country Communities Fund (Round 1)	NSW Department of Industry	\$347,000	\$0	\$347,000	State	Yes	
02-Jul-18	Upgrade technology and resources	Local Priority Grant 2018-19	NSW State Library	\$43,028	\$0	\$43,028	State	Yes	
04-Jul-18	Hastings/Maitland/Koola Recovery Partnership (Mid North Coast Joint Organisation application)	100% Saving Our Species (\$450,000) + Koola Hospital (\$150,000) + Port Mac (\$60,000) over three years	Office of Environment & Heritage	N/A	\$270,000	\$660,000	State + Local + Other	Yes	
24-Jul-18	New South Wales State Parks	RMS	Roads & Maritime Services	\$2,000	\$0	\$2,000	State	Yes	
14-Aug-18	Seniors Week Festival	NSW Seniors Festival	NSW Family and Children's Services	\$98,500	\$0	\$0	State	No	
20-Aug-18	Contaminated Land Management (joint application with Kempsey & Berriang Councils)	2018-2021 Council Regional Capacity Building Program	NSW Department of Premier and Cabinet	\$3,000	\$0	\$0	State	No	
31-Aug-18	Gastropod Regional Gallery Program 2019	2018-2021 Council Regional Capacity Building Program	NSW Environment Protection Authority	\$417,000	\$0	\$0	State	No	
31-Aug-18	Bluff Point Regional Sporting Precinct Upgrade	Regional Sport Infrastructure Fund (Round 2)	NSW Department of Premier and Cabinet	refer to Apr 18	\$0	TBA	State	TBA	
31-Aug-18	Fire hazard reduction program	Rural Fire Service Hazard Reduction Vendors (RFFV remuneration)	NSW Office of Sport	\$3,182,398	\$800,000	\$3,182,398	State	Yes	
18-Sep-18	Library Vets	Regional Culture Fund	NSW Rural Fire Service	\$228,138	\$0	\$198,920	State	Yes	
21-Sep-18	Gastropod Studio Performance Space Seating Upgrade	2018 Medium Term Cultural Fund - Infrastructure Round 2	Creative NSW	\$138,470	\$0	\$138,470	State	Yes	
03-Oct-18	Permaculture Road Safety Treatments	NSW Safer Roads Program	Roads & Maritime Services	\$150,000	\$0	\$150,000	State	Yes	
03-Oct-18	Railroad Island Road Safety Treatments	NSW Safer Roads Program	Roads & Maritime Services	\$150,000	\$0	\$150,000	State	Yes	
03-Oct-18	Bluff Road safety improvements between Gungah Road and Lifford Road	Australian Government Back Sport Program	Roads & Maritime Services	\$200,000	\$0	\$200,000	State	Yes	
03-Oct-18	Wauchope Town Centre Entry Treatments	Australian Government Back Sport Program	Roads & Maritime Services	\$200,000	\$0	\$200,000	State	Yes	
12-Oct-18	Port Macquarie Warrawee Ferry (Nonoperational)	Regional Communities Development Program	Department of Premier & Cabinet	\$1,800,000	\$0	\$1,800,000	State	Yes	
15-Oct-18	Bluff Road Upgrade and Sealing	King Country Roads	Infrastructure NSW	\$4,607,000	\$200,000	\$0	State	No	
15-Nov-18	Young Leaders Program for Port Macquarie	Building Better Regions Fund	Dept of Industry Innovation & Science	\$25,000	\$25,000	\$25,000	Federal	Yes	
15-Nov-18	Cultural Economy Plan for Port Macquarie-Hastings	Building Better Regions Fund	Dept of Industry Innovation & Science	\$37,500	\$37,500	\$25,000	Federal	Yes	
15-Nov-18	New Town Centre Upgrade	Building Better Regions Fund	Dept of Industry Innovation & Science	\$800,000	\$800,000	\$800,000	Federal	Yes	
04-Dec-18	Beeping Study for Port Macquarie Water Treatment Plant	Safe and Secure Water Program	Department of Industry - Water	\$97,000	\$228,000	\$97,000	State	Yes	

Legend

Successful

Unsuccessful

To be confirmed

Added since the February 2019 report update

Legend

SUCCESSFUL

UNSUCCESSFUL

TO BE CONFIRMED

ADDED SINCE THE FEBRUARY 2019 REPORT

UPDATE

14-Dec-18	Gardiner Haven Shores Park, Oakley Highway Shores Path (Design), Macquarie LGA.	RMS Active Transport		Roads & Maritime Services	\$1,800,000	\$600,000	TBA	State	TBA	Yes
21-Dec-18	Play and Stay, Tonn Beach playground renewal	Play and Stay NSW Grant Fund		Dept of Planning & Environment	\$200,000	\$415,000	\$0	State	\$0	No
21-Dec-18	Play and Stay, Bear Street playground upgrade	Play and Stay NSW Grant Fund		Dept of Planning & Environment	\$60,000	\$60,000	\$60,000	State	\$60,000	Yes
13-Jan-19	ArtWalk - Creative Festival	Destination NSW		Destination NSW	\$20,000	\$20,000	\$0	State	\$0	No
Recurring Grant	Food Macquarie Structures - Maintenance Grant	Food Macquarie Structures - Maintenance Program		Office of Environment & Heritage	\$9,700	\$0	\$9,700	State	\$9,700	Yes
05-Feb-19	Seaton Creek Bridge Upgrade	Bridges Renewal Program		Dept of Infrastructure, Regional Development and Cities	\$455,000	\$455,000	\$455,000	Federal		Yes
05-Feb-19	Thompson Bridge Upgrade	Bridges Renewal Program		Dept of Infrastructure, Regional Development and Cities	\$415,000	\$415,000	\$415,000	Federal		Yes
08-Feb-19	Local Government Heritage Studies	Community Heritage Grants		Office of Environment & Heritage	\$30,000	\$30,000	TBA	NSW		Yes
08-Feb-19	Great Heritage Grants Program	Community Heritage Grants		Office of Environment & Heritage	\$11,250	\$11,250	TBA	NSW		Yes
08-Feb-19	Heritage Advisory Services	Community Heritage Grants		Office of Environment & Heritage	\$10,000	\$10,000	TBA	NSW		Yes
28-Feb-19	Orbital Road Strategic Business Case Development	Direct Request to Member of Port Macquarie		Office of Environment & Heritage	\$400,000	\$400,000	TBA	NSW		Yes
03-Mar-19	Pyralis - Incorporating Green Management Plan	Lo NSW Pyralis Grants Program		Lo NSW	\$50,400	\$50,400	TBA	NSW		Yes
03-Mar-19	Airport Security Screening Upgrades	Regional Airport Security Screening Fund		Department of Home Affairs	\$420,000	\$0	TBA	Federal		Yes
22-Mar-19	Jahara Reserve Pits Cleaning Work	Crown Reserves Improvement Fund		Department of Primary Industries	\$18,255	\$0	TBA	State		Yes
04-Apr-19	Port Macquarie West Sewer Development Project Business Case	Growing Local Economies - Regional Growth Fund		Department of Premier & Cabinet	\$4,618,500	\$395,490	TBA	State		Yes

Election Funding Commitments to Council				
Election Funding Commitments	Project Title	Election Commitment by	State/Federal	Commitment Amount
03-Mar-19	Newa River Road Sealing	NSW, Nationals and Liberals King Local Roads Program	State	not specified
14-Mar-19	Duplication of Ocean Drive	NSW, Liberals and Nationals Government	State	\$20m
18-Apr-19	Tom Green West Upgrade	Federal Liberal National Coalition Government	Federal	\$1.2million

01 GENERAL BUSINESS

11.0 Mayors Sporting Fund Applications - Received after Report Close Off

CONSENSUS:

1. That Madelaine Goodridge receive financial assistance in the amount of \$500.00 to assist with expenses she will incur travelling to and competing at the 2019 Georgina Hope Foundation Swimming Championships to be held in Adelaide, South Australia from 15 - 22 April 2019 inclusive.
2. That Morgan Jean receive financial assistance in the total amount of \$800.00 to assist with the expenses he will incur travelling to and competing at both the NSW CHS Swimming Championships held in Sydney from 10 - 12 April 2019 and the 2019 Georgina Hope Foundation Swimming Championships to be held in Adelaide, South Australia from 15 - 22 April inclusive.

3 Your Business and Industry

15/05/2019

What we are trying to achieve

A region that is a successful place that has vibrant, diversified and resilient regional economy that provides opportunities for people to live, learn, work, play and invest.

What the result will be

We will have:

- A strong economy that fosters a culture supportive of business and ensures economic development of the region
- Townships, villages and business precincts that are vibrant commercial, cultural, tourism, recreational and/or community hubs
- A region that attracts investment to create jobs
- Partnerships that maximise economic return and create an efficient and effective business environment

How we will get there

- 3.1 Embrace business and a stronger economy
- 3.2 Create vibrant and desirable places
- 3.3 Embrace opportunity and attract investment to support the wealth and growth of the community
- 3.4 Partner for success with key stakeholders in business, industry, government, education and the community

Economic Development Outcomes, Strategic Objectives and Actions (May 2019 Update)



2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
Embracing business and a stronger economy A Council that recognises the importance of a strong economy and fosters a culture that is supportive of business and that ensures the economic development of the region is a central consideration in all its activities.	1. Ensure a whole of organization 'solutions focused' culture and approach to supporting business.	A commitment to the Small Business Friendly Council program and associated initiatives.	Local Preference Policy trial complete and Policy adopted. Outdoor Dining trial extended until Jun-19, new waiver of fees for footpath trading and A-frame signs in towns and villages outside Port Macquarie. Customer Experience Project review complete.	Annual Report on Local Preference Policy outcomes due August 2019. Review of footpath trading and A-frame signage policy. Customer Experience Project outcomes implementation.	
	2. Economic development considerations are central to the activities of Council.	On-going review of policies and procedures.	Review of Council policies with focus on clarity and brevity (ongoing). Commercial Activities on Council-managed Land on-going. Footpath trading & A-frame signage policy review commenced.		
	3. Maintain a strong connection with the business community and an understanding of their needs.	Conduct an annual business survey. Provide support to local business award programs.	Markets Policy adopted by Council Nov 2018. 2018 Business Confidence Survey completed.	Ongoing implementation. One year review Nov 2019. Next survey August 2019.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
	4. A Council which provides leadership to the business and broader community.	Continued engagement with local business networks and the 'Business Hub'.	The Business Hub is meeting regularly with 75% attendance. Regular Council representation at network meetings. Council presentation at Port Chamber meeting Nov-18. On-going Wauchope Chamber engagement & support re: CBD upgrades, Creative Wauchope Festival, Motorcycle Friendly Town initiatives. Engagement with Camden Haven Chamber Retail sub-committee.	Bi-monthly meetings and support of The Hub. Visual Merchandising workshop planned for May-19.	
		Maintain regular and open communication with local stakeholders on matters of economic significance to ensure effective advocacy by all.	Quarterly Chamber Meetings; Monthly Economic Development Steering Group Meetings; GPMTA marketing sub-committee; Social media – The Business Portal (Facebook page) contribution; Economic Development Matters e-Newsletter; local media releases	On-going meetings and communication activities.	
		Implement Urban Growth Management Strategy.	On-going implementation.	On-going implementation.	
Providing the foundations A Council that initiates and drives the livability and sustainability of the region through improved planning, infrastructure and services.		Finalise Port Macquarie Health and Education Precinct Planning.	Enquiry by Design and draft masterplan exhibited and revisions in progress.	Masterplan to be presented to Council for adoption (May-19 tbc), then stage two investigation and implementation commences.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
5.Ensure appropriately zoned land and precinct planning to encourage business investment and the development of new industries.		Progress Airport Precinct expansion opportunities.	Port Macquarie Airport – terminal construction on target for completion by late 2019 (Stage 1 due mid-19). Draft planning proposal for Airport Business Park to B7 zoning to Council meeting in May -19 (tbc). Concept design for parallel taxiway complete (detailed design on hold pending environmental impact statement). Progressed Australian Government environmental approval, with final assessment expected within the next 3 to 6 months.	Terminal construction completion and Airport Business Park planning.	\$5 million - NSW Gov't - Restart NSW Regional Tourism Infrastructure Fund. \$1.25 million - Australian Government - Community Development Grants. Council - \$1.25 million Airport Reserve
		Review existing tourism-zoned land and investigate potential sites for future tourism development.	Destination Product Audit and Analysis completed as lead-in step.	Review planning controls for rural and environmental areas in relation to nature-based tourism.	
		Provide support for timely strategic planning.	On-going under UGMS and priorities as confirmed by Council.		
		Review Infrastructure Gap Analysis Report and recommend prioritisation of key elements.	Under review noting Regional Integrated Transport Strategy development.		
		Plan for alternate north/south link roads in Port Macquarie.	Engineering feasibility and Area Wide Traffic Study Complete. Proposed Orbital Road engagement undertaken.	Council consideration of next steps (Jun-19)	
		Support high speed broadband rollout and promote the associated benefits.	NBN associated work continuing. NBN Presentation at March EDSC.	Work with local businesses to make the most of high speed broadband opportunities.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
6. Prioritise, advocate and provide leadership in the delivery of infrastructure projects that will make Port Macquarie-Hastings the premier place to live, learn, work, play and invest on the North Coast.	Support the delivery of projects which enhance connectivity.	Advocate for the further development of the public transport network to meet the needs of the local community and visitors.	Town Green WIFI provision on-going. Planning in-progress for airport roll-out. Investigation work progressed for potential new sites (PMQ pool, Bus Terminal).	Consideration of further CBD wifi connectivity - Wauchope, Laurieton & Port.	
		Develop a Port Macquarie CBD Parking Strategy.		On-going advocacy - particularly for Health and Education Precinct options.	
		Implementation of priorities from the Area Wide Traffic Study.	Area Wide Traffic Study complete.	Proposed for delivery in draft 2019/20 budget.	
				Consideration and implementation via Regional Integrated Transport Strategy and in on-going works program.	
7. Work with key stakeholders to implement major capital works projects.	Implement Port Macquarie Foreshore Master Plans.		Flagstaff Hill access work complete. Detail design underway for Coastal Walk upgrade Town Beach to Flagstaff Hill. Work underway for foreshore walk upgrade Hayward to Gordon St. Commenced detailed design for remainder of foreshore walk (Town Green Central to Westport Park).	Finalise design and commence construction. Commence engagement design for upgrade to Town Beach playground.	\$765,000 - under NSW Regional Growth Environment and Tourism Fund (matched to \$1.5m).
		Development of the Hastings Regional Sports Fields.	Detailed design progressed.	Finalise design and preparation for construction.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
	8. Further position Port Macquarie as a centre for learning and investment in education with a focus on domestic and international tertiary students with great employment possibilities.	Continue to support Wauchope Main Street Plan.	Stage 1 construction progressing	Complete Stage 1 construction (Aug-19); Stages 2, 3, 4 and 5 over five year period.	\$530,000 - NSW Government - NSW's Active Transport program. \$1.8m – Roads and Maritime Services – Wauchope Main Street rejuvenation
		Facilitate investment in student accommodation.	On-going policy allowing for deferral of contributions for student accommodation development.		
		Promote the opportunity to live, learn and earn in the Port Macquarie-Hastings LGA.	Digital content developed and on-line marketing campaign delivered. Attendance at Sydney Franchising Expo. Integration of our content and ideas in 'Invest NSW' marketing.	Additional digital (business relocation/stories videos) content.	\$15,000 - Regional Growth – marketing and promotion fund. \$10,000 - Council. \$1,000 RDA & Port Macquarie Chamber of Commerce
		Develop a Regional City Strategy.	-	to be considered in context of Dept of Planning "Regional City Strategy" draft	
Creating vibrant and desirable places A region where the townships, villages and business precincts are vibrant, connected, commercial, cultural, tourism, recreational and/or community hubs.		Implement the Town Centre Master Plan.	New banner poles and Town Square shade structures installed. Completed design for Gordon St underpass (seeking quotations). Parklets (2) progressing design.	New amenities Short Street car park installation.	Amenities - \$255k

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
	9. Planning for a Smart Regional City.	Implement the Cultural Plan.	Grant application for Cultural Economy Plan development successful; drafting of updated public Art Policy; planning for Artwalk, other cultural events.	Finalise Public Art Policy Review and Master Plan development.	\$37,500 - building better regions fund (Cultural Economy Plan)
		Smart & Connected Communities - Value at Stake Analysis.	Complete		
		Continue to implement and plan for smart city initiatives.	Continued rollout of smart technologies as part of the Long Term Energy Strategy and other relevant projects.		
		Complete CBD Wifi rollout.	12 month trial complete.	No further hardware upgrades proposed immediately but future options available.	
		Continue to investigate feasibility of a Smart Work Hub.	One year review of two year Hub Co-working "pop up" trial undertaken in Feb-19	Next review and further detail on potential next steps Aug-19.	
		Further implementation of the Digital Strategy.	Port Macquarie Town Green public WIFI, ongoing.	WIFI trials in Wauchope and Camden Haven main streets to be investigated.	
		Towns and villages initiatives, including the investigation of footpath trading opportunities.	Community Planning program underway. Waiver of footpath trading and A-Frame sign fees for towns and villages out of Port Macquarie during policy review.	On-going community planning. Review of footpath trading and A-frame signage policy.	
		Explore opportunities to further activate public spaces including commercial opportunities.	Temporary Licence Panel looking at commercial opportunities in the LGA.	On-going assistance to temporary licence applicants.	
	10. In collaboration with relevant stakeholders, provide practical support to the LGA's towns and villages to plan for a sustainable and prosperous future.				

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
Driving opportunity A region that embraces and creates opportunities. A region that attracts investment to create additional jobs and increase the wealth of the region and its residents.		Implement the Port Macquarie-Hastings Recreation Action Plan.	Detailed designs of recreational boating facilities. New sports field lighting. Pool tender assessment.	Site selection and concept plan for new aquatic facility. Deliver projects under Stronger Country Communities Fund. Wauchope sporting complex.	Stuarts Park - \$3.1m; Portoon - \$80k, NSW Boating Now Program Boat Ramps - \$570k, NSW Boating Now Program Regional Stadium - \$186k, Hockey Field 2 - \$237k
		2016 Census data review.	On-going review and use of data releases.	On-going review and use of data releases.	
	11. Gather and analyse economic data to identify key trends, opportunities and gaps.	Tourism Product Gap Analysis.	Destination Product Audit and Analysis project complete.	Information used to inform Destination Management Plan update.	
	12. Develop and implement marketing campaigns, collateral and content to promote the region as a place to live, learn, work, play and invest.	Implementation of Destination Management Plan (DMP).	Working with GPMTA to implement the DMP with a focus on marketing campaign and PR delivery, research, industry development and partnerships. Visitor Profiling and Satisfaction Survey complete Dec-18.	DMP update second half 2019.	
		Update of the investment prospectus.	Shape of the Future (investment prospectus) updated in May 2017 and March 2018.	Next Shape of the Future update mid-19	
		Place Marketing to attract investment.	Participation in Sydney Franchising Expo. Integration of our content and ideas in "Invest NSW" marketing. Sourced new local imagery.	New digital content development.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
	13. Positive and proactive engagement with event owners, funding bodies and event placement organisations to sustain a full event portfolio.	Implementation of the Major Events Strategic Action Plan.	On-going management of hosting contracts and bidding for new events.		
		Support to existing and emerging events.	Events Sponsorship Program helps grow local events. Round 2 2019 funding decisions finalised in April-19.	Future funding rounds.	
		Food Cluster Feasibility Study.	not yet commenced		
	14. Develop and support projects which generate job creation opportunities.	Tele-commuter / tele-worker attraction.	The Hub business and co-working space operating to cater for tele-commuter/tele-workers.	Further targeting of remote workers and micro business relocation.	
		Work with key stakeholders to encourage investment in new industrial areas.	On-going inquiry responses, prospectus promotion. Growing Local Economies Fund business case developed for infrastructure to support new industrial land.	On-going inquiry responses, prospectus promotion.	
	15. Collaborate to encourage innovation, competitiveness, entrepreneurship and support for the start-up community.	A targeted approach to attracting large enterprises.	Circulation of 'Shape of the Future' prospectus.	Further marketing and distribution activities.	
		Business Incubator/Innovation Centre Feasibility Study.	POP UP business and co-working hub focusing on business incubation and innovation. 'Hackathon' complete with CSU. Support for CSU Stage 2B funding (inc. business innovation hub).	Assessing models for future delivery and local innovation/entrepreneur support. Planning for regional 'Pitchfest' Event in Jun-19.	

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
Partnering for success A Council which works alongside key stakeholders in business, industry, government and the community to build a strong, innovative and resilient economy.	16. Plan for current and future workforce needs.	Undertake a Regional Skills Audit. Support for the Careers Market.	Skills Audit completed in 2018. Brochure and Report Summary in distribution. Various presentations. Exploration of identified opportunities with stakeholders. Planning for presence at Careers Market 2019.	Engagement with potentially 'reinvigorated' Education and Skills Forum group.	\$25,262 Federal Government – Building Better Regions Fund – Community investment Stream
	17. Identify and secure grant funding to support economic development initiatives.	Identify and pursue opportunities to secure funding for projects that will support the delivery of Council priorities. Build awareness of grant opportunities for local businesses.	Priority projects identified. On-going liaison with other levels of government and promotion of grant opportunities via Council channels.	Funding being pursued for priority Council projects. Ongoing.	On-going pursuit of opportunities
	18. Support the growth of the Port Macquarie Airport precinct.	Grow passenger numbers and route options (eg scheduling, competition and destinations) Support airport precinct expansion opportunities.	Funding secured from Destination NSW for flights marketing campaign and campaign planning to commence May 2019. Terminal expansion funded. Planning for Business Park continuing.	Hights marketing campaign delivery (supported by Virgin/Alliance and Qantas). Terminal upgrade and expansion to enhance the user experience, on-going advocacy for expanded route options. Terminal construction. Planning for Business Park ongoing.	\$50,000 Destination NSW Regional Cooperative Marketing Fund \$5m Restart NSW Funding \$1.25m Regional Community Development Grant
		Food Industry Development including a focus on value-adding.	Council sponsorship of Slice of Haven event.		

2017 to 2021 Outcomes	Strategic Objectives	Actions (for annual review)	Action to Date (focus on last 6 months)	Future Priorities	Non-Council project Funding
	19. Provide timely support to existing and emerging industries in a partnership capacity to encourage growth and sustainability.	Construction Industry Action Group.	Quarterly meeting of Construction Industry Action Group.	Working with CIAG on priorities.	
		Cultural Plan implementation and on-going review.	See above	See above	
		Destination Management Plan review and implementation, including pursuing opportunities for education-related tourism products.	Collaborating with universities on growing international student numbers.	Destination Management Plan review and update mid- 2019.	
	20. Work closely with local business networks and organisations to build their capacity and facilitate the growth of existing enterprises.	Work with key stakeholders to recognise, support and promote creative industries.	On-going engagement with Creative Wauchope Sub-Committee, Artwalk 2019 planning, Art Smarts Program delivered.	Implement initiatives as identified in the Cultural Plan.	
		Assist local Chambers of Commerce to enhance internal governance, improve business representation, and advocate their role as primary local business networks.	On-going support for Chambers of Commerce and business support networks.	On-going support for Chambers of Commerce and business support networks.	
	21. Proactively partner with all levels of government to grow the local economy.	Facilitate and lead conversations with Government representatives, departments and bodies.	On-going advocacy and application for funding support.	Finalisation of the Port Macquarie Regional City Strategy (NSW Dept of Planning); On-going advocacy.	

06 SMART REGIONAL CITY PLANNING

The Group Manager Economic Development and Communications and Senior Economic Development Officer presented a summary of observations and Steering Group discussions to date on the six policy priorities identified in the National Cities Performance Framework.

CONSENSUS:

That the Group:

1. Note the summary observations from Smart City analysis and discussions to date.
2. Agree a the local innovation and digital environment be discussed at a future meeting.
3. Recommend Council give consideration to developing a Smart City Strategy.

4 Your Natural and Built Environment

15/05/2019

What we are trying to achieve

A connected, sustainable, accessible community and environment that is protected now and into the future.

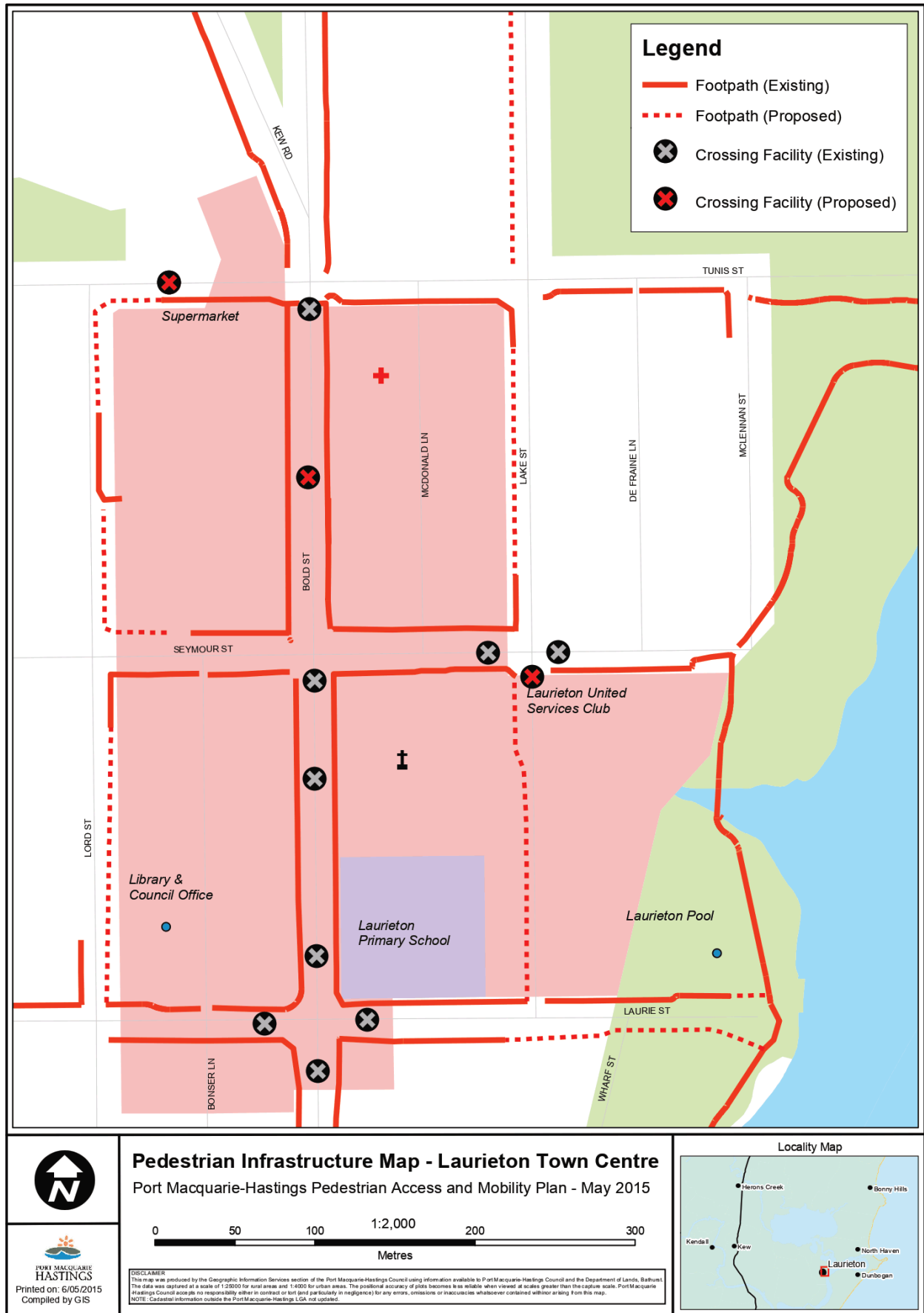
What the result will be

We will have:

- Effective management and maintenance of essential water, waste and sewer infrastructure
- A community that is prepared for natural events and climate change
- Sustainable and environmentally sensitive development outcomes that consider the impact on the natural environment
- Accessible transport network for our communities
- Infrastructure provision and maintenance that meets community expectations and needs
- Well planned communities that are linked to encourage and manage growth
- Accessible and protected waterways, foreshores, beaches and bushlands
- An environment that is protected and conserved for future generations
- Renewable energy options that are understood and accessible by the community

How we will get there

- 4.1 Provide (appropriate) infrastructure and services including water cycle management, waste management, and sewer management
- 4.2 Aim to minimise the impact of natural events and climate change, for example, floods, bushfires and coastal erosion
- 4.3 Facilitate development that is compatible with the natural and built environment
- 4.4 Plan for integrated transport systems that help people get around and link our communities
- 4.5 Plan for integrated and connected communities across the Port Macquarie-Hastings area
- 4.6 Restore and protect natural areas
- 4.7 Provide leadership in the development of renewable energy opportunities
- 4.8 Increase awareness of issues affecting our environment, including the preservation of flora and fauna



PORT MACQUARIE-HASTINGS COUNCIL



MIDCOAST CONSULTING ENGINEERS
Civil & Environmental Engineering
PO BOX 1047
PORT MACQUARIE NSW 2444
P 02 6552 5453
E info@midcoastengineers.com.au

BOLD STREET MASTERPLAN TUNIS ST TO SEYMOUR ST LAURIE TON

- LIST OF DRAWINGS**
1. COVER SHEET
 2. GENERAL OVERVIEW
 3. DETAILED CONCEPT PLAN



LOCALITY PLAN
NOT TO SCALE

REFERENCES:

AUS SPEC HASTINGS COUNCIL EDITION 2004
AUSTROADS - PAVEMENT DESIGN MANUAL
AUSTROADS - GUIDE TO ROAD DESIGN SUITE
AUSTRALIAN STANDARDS - AS 1742 MANUAL OF UNIFORM
TRAFFIC CONTROL
AUSTRALIAN STANDARDS - AS 1428 DESIGN FOR ACCESS
& MOBILITY

LIST OF STANDARD DRAWINGS
N/A



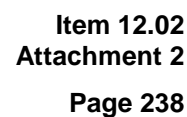
CONTACT DIAL BEFORE YOU
DIG PRIOR TO COMMENCING
ANY EXCAVATION WORKS

SCHEDULE OF SERVICE ALERTS		
SERVICE	LOCATION	DESCRIPTION

ISSUE: FINAL CONCEPT
DATE 10.05.2017

SHEET NO. 1 OF 3 PLAN NO. RR-LAU-057





PORT MACQUARIE-HASTINGS COUNCIL



BOLD STREET STREETSCAPING SEYMOUR ST TO TUNIS ST, LAURIETON INCLUDING BOLD ST MARKED CROSSING

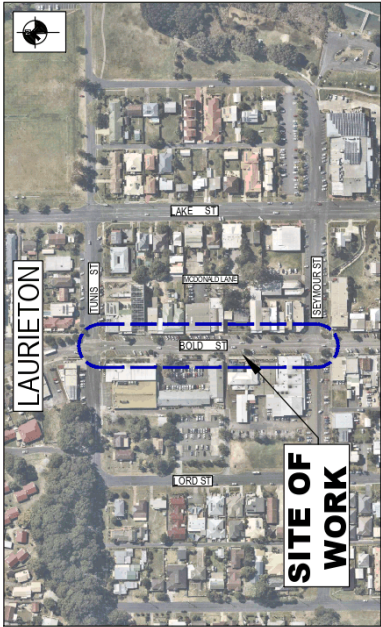


IMAGE PROVIDED UNDER LICENSE AGREEMENT WITH NSRWAP

LOCALITY PLAN
NOT TO SCALE

REFERENCES:

- AUS-SPECHASTINGS COUNCIL EDITION 2004
- AUSTROADS - GUIDE TO ROAD DESIGN SUITE
- AUSTROADS - GUIDE TO ROAD DESIGN SUITE
- TRAFFIC CONTROL DEVICES
- AUSTRALIAN STANDARDS - AS 428 DESIGN FOR ACCESS & MOBILITY



CONTACT DIAL BEFORE YOU
DIG PRIOR TO COMMENCING
ANY EXCAVATION WORKS

ISSUE B - PRELIMINARY
DATE 17/07/18

SHEET NO. 1 OF XX PLAN NO. RU-LAU-057

LIST OF DRAWINGS

1. COVER SHEET
2. PLAN SHEET
3. DEMOLITION PLAN
4. GENERAL ARRANGEMENTS PLAN & TUNIS ST
5. CROSS SECTIONS & STREET FURNISHING
6. DETAILED PATH LEGS
7. PLANTING SCHEDULE
8. LONG SECTION DESIGN CENTRELINE
9. STAGE 1 WORKS - DETAILED LAYOUT
10. STAGE 2 WORKS - DETAILED LAYOUT
11. STAGE 3 WORKS - LONG SECTIONS DESIGN CROSSING BULSTERS
12. CROSS SECTIONS Ch.0 - Ch.50
13. CROSS SECTIONS Ch.60 - Ch.110
14. CROSS SECTIONS Ch.120 - Ch.170
15. CROSS SECTIONS Ch.180 - Ch.230
16. CROSS SECTIONS Ch.240 - Ch.300
17. DESIGN KERB RETURNS SEYMOUR RD
18. DESIGN KERB RETURNS TUNIS RD
19. DESIGN KERB RETURNS BOLD ST
20. MATERIALS PALETTE
21. DETAILS SHEET 1
22. DETAILS SHEET 2
23. DESIGN DRIVEWAYS

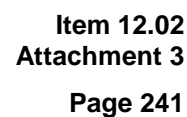
UNDER
DESIGN

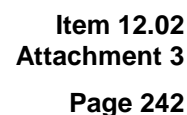
UNDER
DESIGN

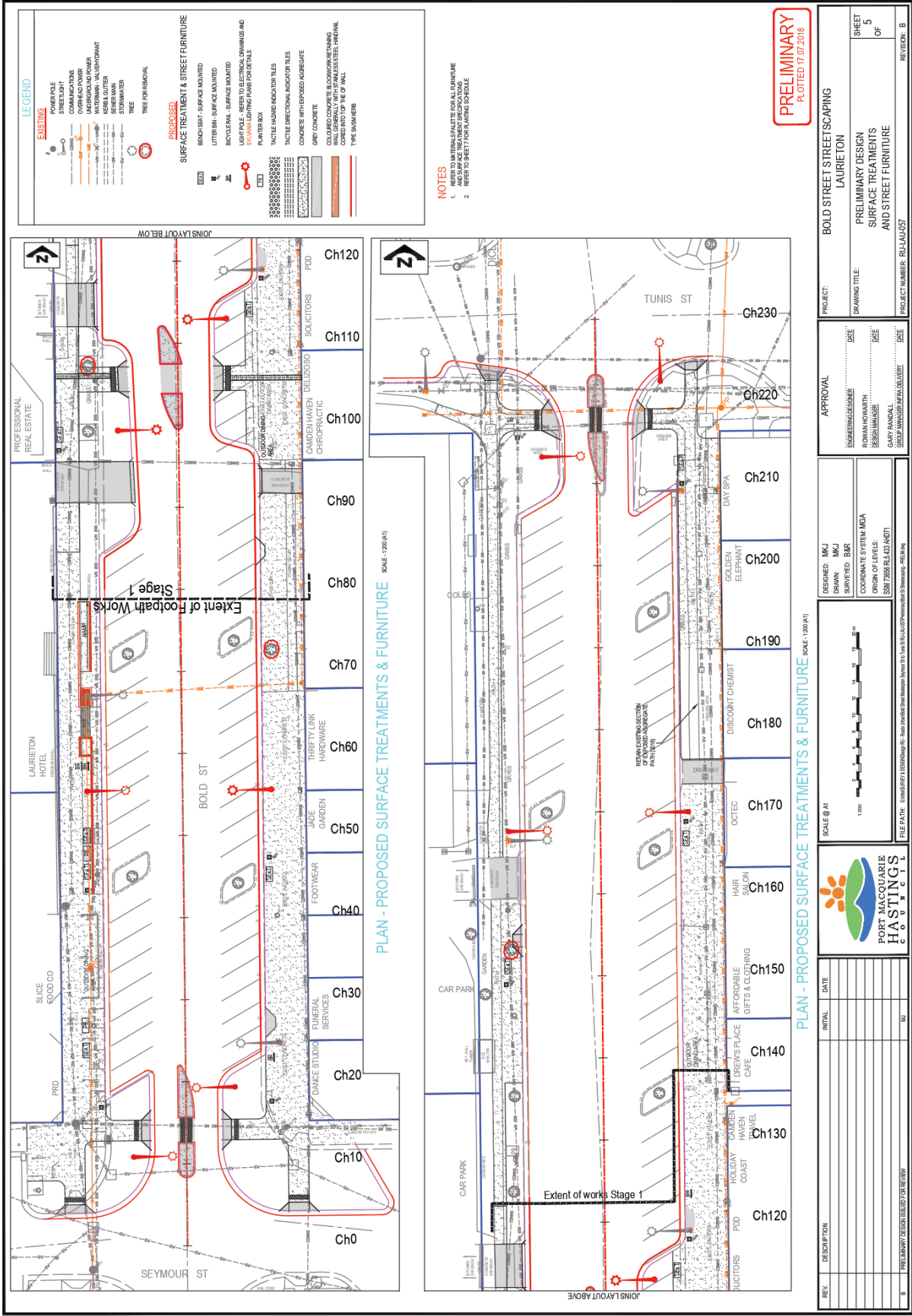
SCHEDULE OF SERVICE CLASHES/ALERTS

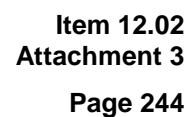
SERVICE	LOCATION	DESCRIPTION
POWER	Ch. 0 - EAST SIDE	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
POWER	Ch. 0 - WEST SIDE	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
WATER	Ch. 0 -	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
WATER	Ch. 220	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
WATER	Ch. 40 - Ch. 180 - WEST SIDE	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
WATER	Ch. 180 - WEST SIDE	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS
COMMUNICATIONS, SEWER, WATER	OVER WHOLE SITE	EXISTING 11KV OVERHEAD POWER LINE CROSSING UNDERGROUND POWER, LOWER EXISTING CONDUIT WORKS BY OTHERS

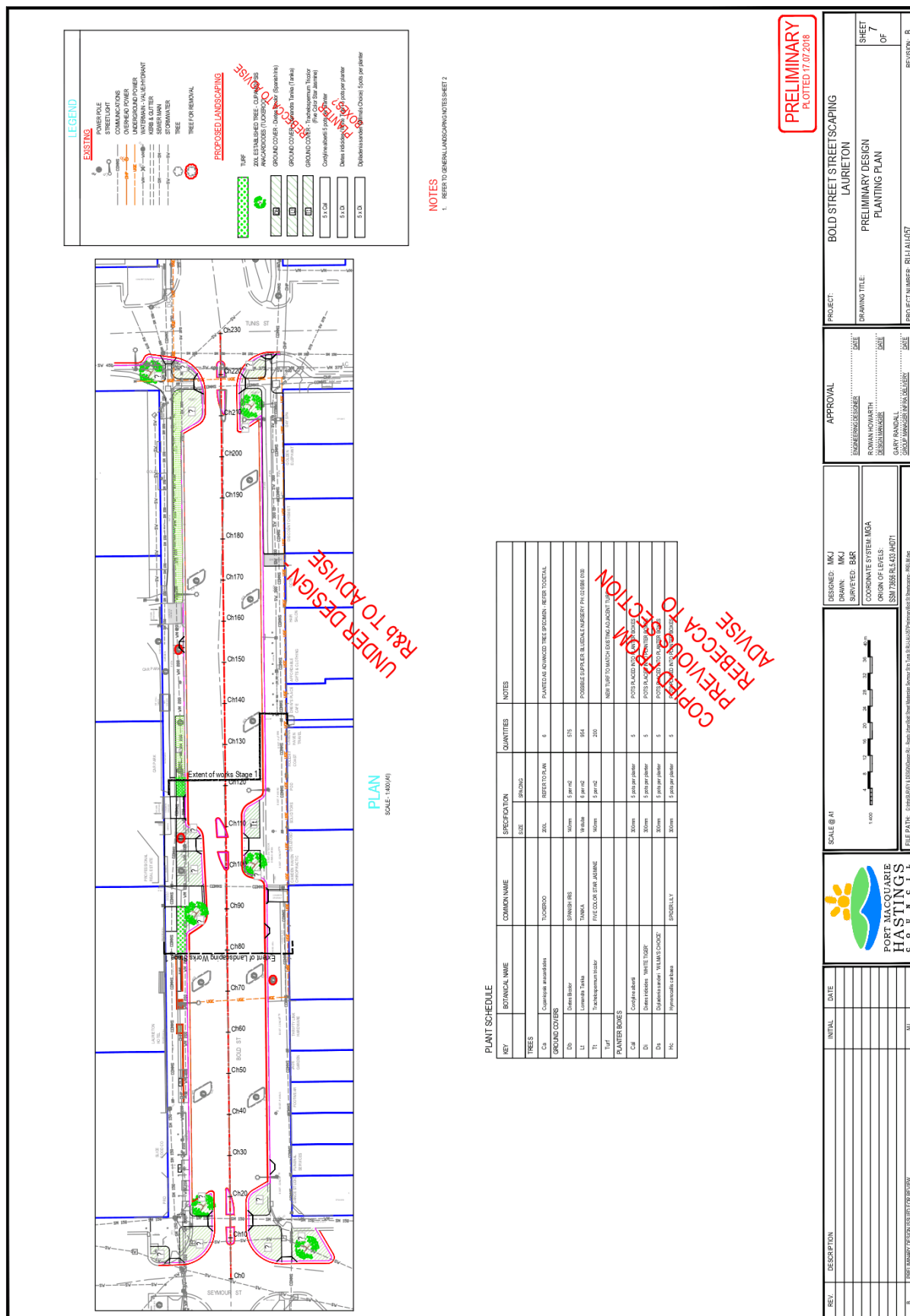
PRELIMINARY
PLOTTED 17.07.2018



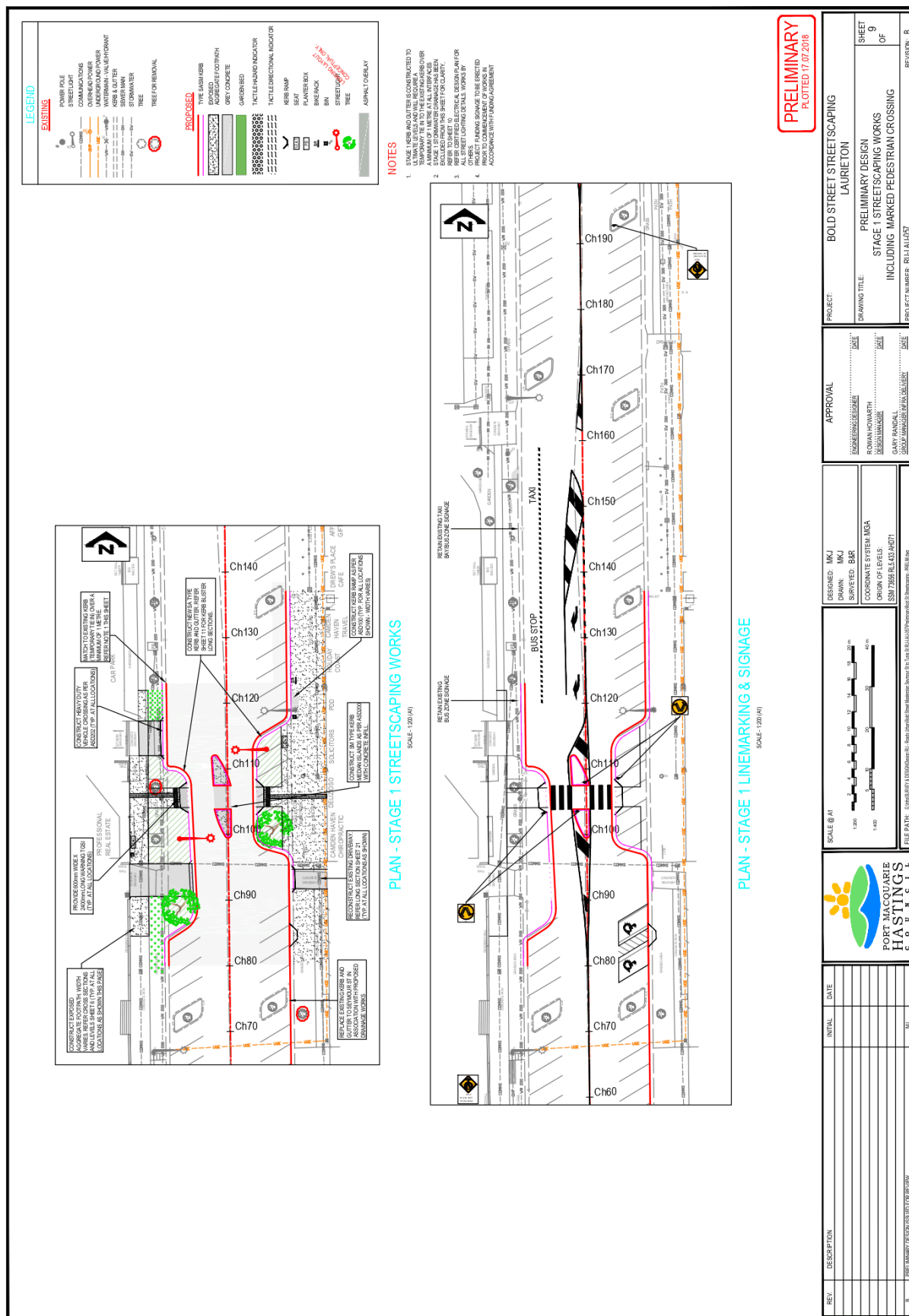


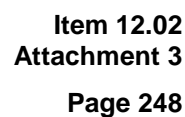


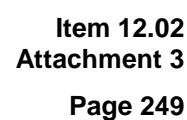


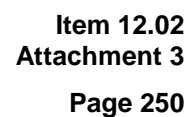


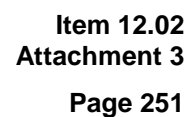


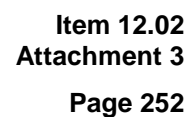


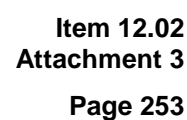


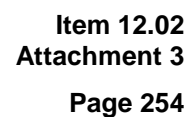




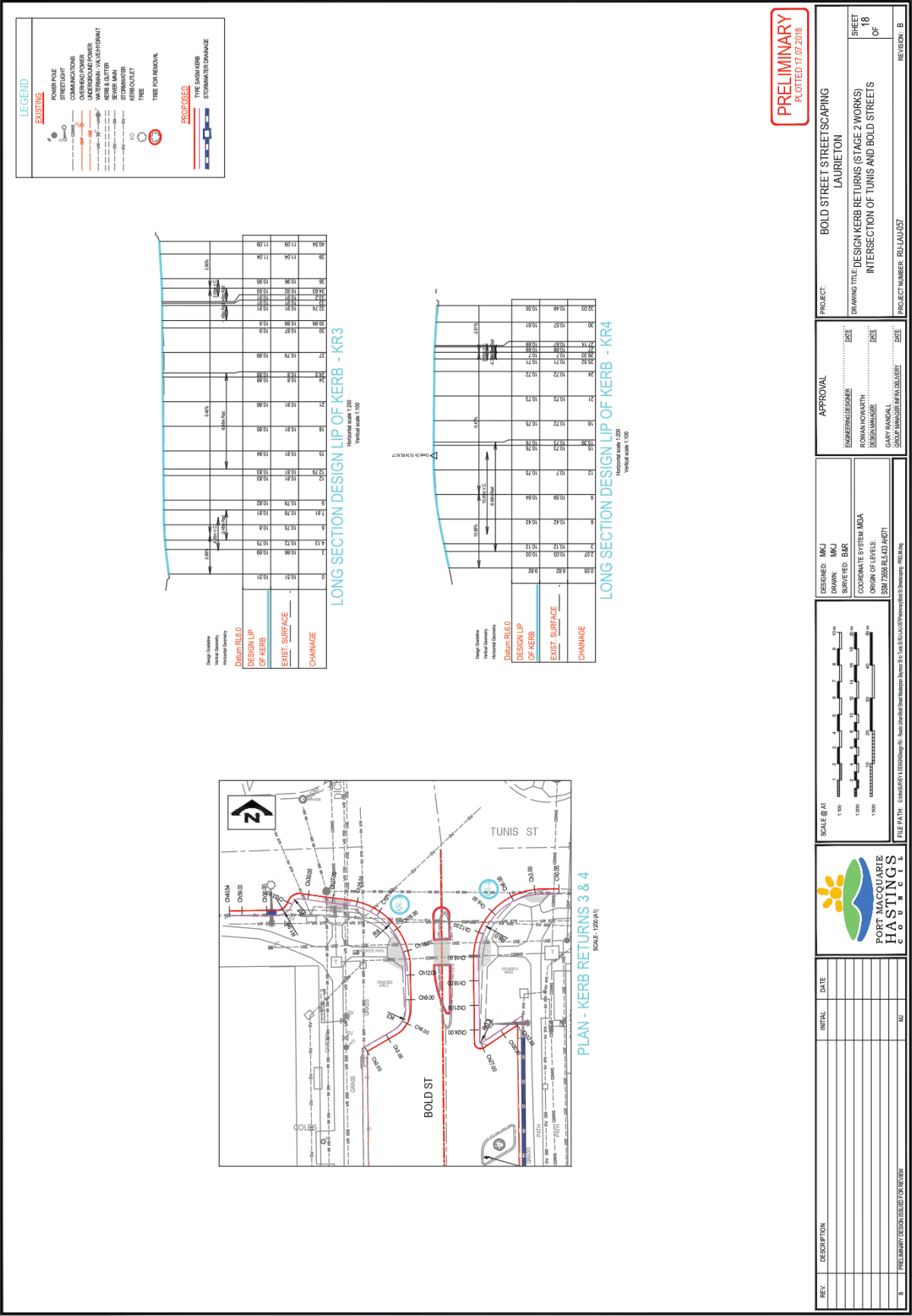


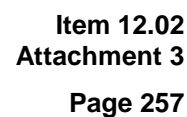






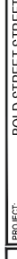







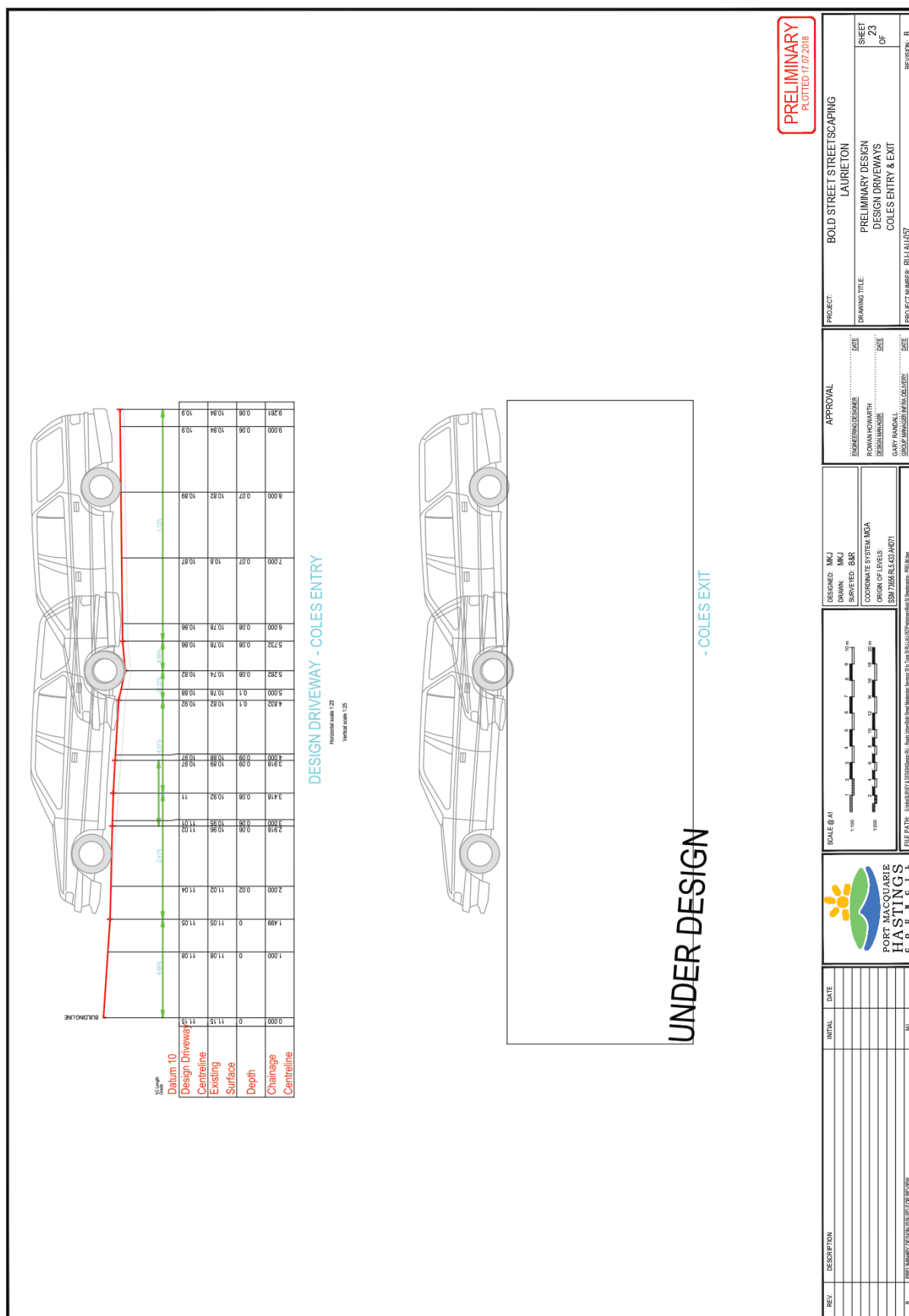


ITEM	SPECIFICATION	NOMINATED SUPPLIER
PAVING / HARD WORKS TREATMENT		
EXPOSED AGGREGATE	100mm THICK, REFER TO PLAN FOR LOCATION. 10mm BLUE AGGREGATE, IN CHARCOAL CEMENT. STRENGTH 32MPa. TO MATCH EXISTING PAVEMENT. CONTACT RAY THOMPSON 0401 901 130 FOR FURTHER DETAILS.	
CONCRETE FOR LAMBDA KERB SECTION	STRENGTH 32MPa, GREY CEMENT, BROOM FINISHED	
CONCRETE FOR ALL OTHER SURFACE WORKS	STRENGTH 32MPa, GREY CEMENT, SMOOTH FINISH.	
RETAINING WALLS	COLOURED CONCRETE BLOCKS 190H x 119 D x 390mm. HANSON. FINISH SMOOTH. COLOUR: COOCOLOA CREAM MORTAR TO BE TYPE IM WITH EFFLUESCENCE INHIBITOR. COLOUR TO MATCH COOCOLOA CREAM.	POSSIBLE SUPPLIER: EASTCOAST MASONRY PH: 02 5581 1561
RETAINING WALLS - TOP ROW	COLOURED CONCRETE BLOCKS 90H x 190 D x 330mm. HANSON. FINISH HONED TO BOTH SIDES, TO EUDS AS REQUIRED. COLOUR: VOLCANIC ASH MORTAR TO BE TYPE IM WITH EFFLUESCENCE INHIBITOR. COLOUR TO MATCH VOLCANIC ASH.	POSSIBLE SUPPLIER: EASTCOAST MASONRY PH: 02 5581 1561
RETAINING WALLS - CAPPING	COLOURED CONCRETE BLOCKS 40H x 190 D x 330mm. HANSON. FINISH HONED TOP & SIDES, TO EUDS AS REQUIRED. COLOUR: VOLCANIC ASH MORTAR TO BE TYPE IM WITH EFFLUESCENCE INHIBITOR. COLOUR TO MATCH VOLCANIC ASH.	POSSIBLE SUPPLIER: EASTCOAST MASONRY PH: 02 5581 1561
ANTI GRAFFITI COATING TO RETAINING WALLS	ANTI GRAFFITI COATING - CLEAR, LOW SHEEN OR FLAT FINISH, NON-SACRIFICIAL	
STREETSCAPE ELEMENTS		
LITTER BINS	NEW, FREEBORN 1000S SURFACE MOUNTED TO EXPOSED AGGREGATE. CONCRETE TO MANUFACTURERS RECOMMENDATIONS / DETAILS TYPE: 1000S FREEBORN, TIMBER TYPE: JARRAH, OIL STAINED TIMBER AND SANDCAST UNLISHED ALUMINIUM FINISHES.	TOWN AND PARK FURNITURE PH: 02 9507 6411
BENCH SEATS	NEW, FREEBORN 2000S SURFACE MOUNTED TO EXPOSED AGGREGATE. CONCRETE TO MANUFACTURERS RECOMMENDATIONS / DETAILS TYPE: 2000S FREEBORN, TIMBER TYPE: JARRAH, OIL STAINED TIMBER AND SANDCAST UNLISHED ALUMINIUM FINISHES.	TOWN AND PARK FURNITURE PH: 02 9507 6411
TACTILE INDICATORS	TACTILE SURFACE INDICATORS HAZARDOUS AND DIRECTIONAL. TYPE: INSTALLED DETAILS TO COMPLY WITH AUSTRALIAN STANDARD AS 1428 AND MANUFACTURERS INSTRUCTIONS. 300,200mm TILES TO BE SET IN FLUSH WITH ADJACENT EXPOSED AGGREGATE CONCRETE. COLOUR: IVORY. TO BE SPECIFIED BY ELECTRICAL CONSULTANT	GRANITO PH: 02 5965 7221
STREET LIGHTS	CORA CODE: CBR18 UNLISHED STAINLESS STEEL 316 GRADE FINISH. SURFACE MOUNTED TO MANUFACTURERS RECOMMENDATIONS / DETAILS.	CORA PH: 1800 249 878
BICYCLE RACKS	SILVER BRUSHED ALUMINIUM PLATE WITH BLACK LETTERING 100mm HIGH STATING "GOPHER PARKING" CONCEAL FIXED TO BLOCKWORK WALLS.	
NEW GOPHER PARKING SIGNAGE	STRESS RELIEVED POLYPROPYLENE LINER, BLACK FINISH 1550 x 320 x 370mm HIGH (OVERALL EXTERNAL DIMENSION - REFER TO DETAIL).	
PLANTER BOX LINER	TIMBER TREATMENT STEP 1 - INTERGRAN BARRIER STEP 2 - HAYMES DEX PRESS STAIN COLOUR. JARRAH. APPLY AS PER MANUFACTURER RECOMMENDATIONS.	WATERFORCE PH: 07 2536 4544
PLANTER BOX HARDWOOD FINISH	HORIZONTAL STAINLESS STEEL 316 GRADE 40 x 3 x 37mm DIAMETER PIPE TO POSTS. 350mm DIAMETER TUBE HANDRAILS WITH 15mm DIAMETER REDUCERS.	
BALUSTRADES / HANDRAILS	STAINLESS STEEL 316 GRADE WIRE ROPE 3mm, WITH ALLEN KEY ADJUSTABLE PINS. TYPE 10 TO BE CONFIRMED WITH STRUCTURAL ENGINEER.	POSSIBLE SUPPLIER: PACIFIC BALUSTRADES PH: 02 5581 0245 or MIRKA STEEL PH: 02 6581 7225
SOFT LANDSCAPE WORKS		
MUCH - GARDEN BED	WOOD CHIP MULCH	APPROVED LOCAL LANDSCAPE SUPPLIER
TOPSOIL	SOIL FOR USE IN GARDEN BEDS TO COMPLY WITH "SOIL BLEND" FROM AS 4419:2003	APPROVED LOCAL LANDSCAPE SUPPLIER

REV.	DESCRIPTION	INITIAL	DATE	 PORT MACQUARIE HASTINGS COUNCIL	SCALE @ A1 1:100  1:200  1:500 		DESIGNED: MKJ DRAWN: MKJ SURVEYED: BAK COORDINATE SYSTEM: MGA ORIGIN OF LEVELS: SNN 7858 RL 443.14071		APPROVAL ENGINEER/INSPECTOR: _____ DATE: _____ ROWAN HOWARTH DESIGN/MANAGER _____ DATE: _____ GARY RANDALL GROUP MANAGER/PAUL DELIVERY _____ DATE: _____		PROJECT: BOLD STREET STREETSCAPING LAURIE TON DRAWING TITLE: MATERIALS PALETTE & SPECIFICATIONS SHEET 20 OF PROJECT NAMES: RILLI AL1477 DESIGNER: A	
					PRELIMINARY PLOTTED 17/07/2016							

[illegible]

[illegible]



AGENDA

LOCAL TRAFFIC COMMITTEE
31/10/2018

Item: 07

Subject: PEDESTRIAN CROSSING - BOLD STREET, LAURIETON

Presented by: Infrastructure, Alex Fisher

RECOMMENDATION

That it be a recommendation to Council:

That a 'pedestrian (zebra) crossing' be installed in Bold Street, Laurieton, between Tunis Street and Seymour Street.

Discussion

Bold Street, between Tunis and Laurie Streets, is the main road through the Laurieton town centre. There is significant demand for pedestrians to cross from one side of the road to the other. Formal crossing opportunities are facilitated by four pedestrian refuges – south of Tunis Street, south of Seymour Street, north of Laurie Street and south of Laurie Street – and one pedestrian (zebra) crossing midway between Seymour and Laurie Streets.

There is a clear need for a pedestrian crossing midway between Tunis and Seymour Streets, to supplement the existing crossing in the adjacent block to the south, i.e. between Seymour and Laurie Streets.

Council has received grant funding under the Stronger Country Communities Fund to construct a pedestrian crossing at the location shown in Figure 1. The works also involve kerb extensions, additional street lights and modification of parking layout, taxi stand, bus stop and loading zones in the vicinity of the crossing location.

The proposed pedestrian crossing is included in the Laurieton Pedestrian Access and Mobility Plan that was adopted by Council in 2015 (refer to Attachment 1).

The suburb of Laurieton has one of the highest proportions of aged people in NSW. The site is therefore classified as a Reduced Warrant location due to the significant use by aged and children pedestrians. Pedestrian warrant counts were collected in October 2018 as summarised in the following table. The proposal easily exceeds the RMS warrant for a pedestrian crossing at this location.

Time (weekday)	Pedestrians (P>30)	Vehicles (V>500)	PV (PV>45,000)
11:00 – 12:00	97	759	73,623
12:00 – 13:00	111	730	81,030
13:00 – 14:00	116	583	67,628
Outcome	Meets RMS warrant		



Item 07

Page 19

AGENDA

LOCAL TRAFFIC COMMITTEE
31/10/2018

Pedestrian crossing location

Figure 1: Proposed pedestrian crossing location

Consultation

Council has received a number of requests from the community, including the Camden Haven Chamber of Commerce, to install a pedestrian crossing on Bold Street, between Tunis and Seymour Streets. The frequency of these requests has increased since the opening of a large new pharmacy in 2018 on the eastern side of Bold Street which generates significant pedestrian traffic across the road to the supermarket on the western side.

The proposed pedestrian crossing has strong community support and therefore no further community consultation is proposed.



Item 07

Page 20

AGENDA

**LOCAL TRAFFIC COMMITTEE
31/10/2018**

Recommendation

It is proposed to install a pedestrian crossing on Bold Street, midway between Tunis and Seymour Streets.

The cost of the pedestrian crossing will be funded from the Stronger Country Communities Fund grant.

Attachments

1 [View](#). Laurieton Pedestrian Access and Mobility Plan

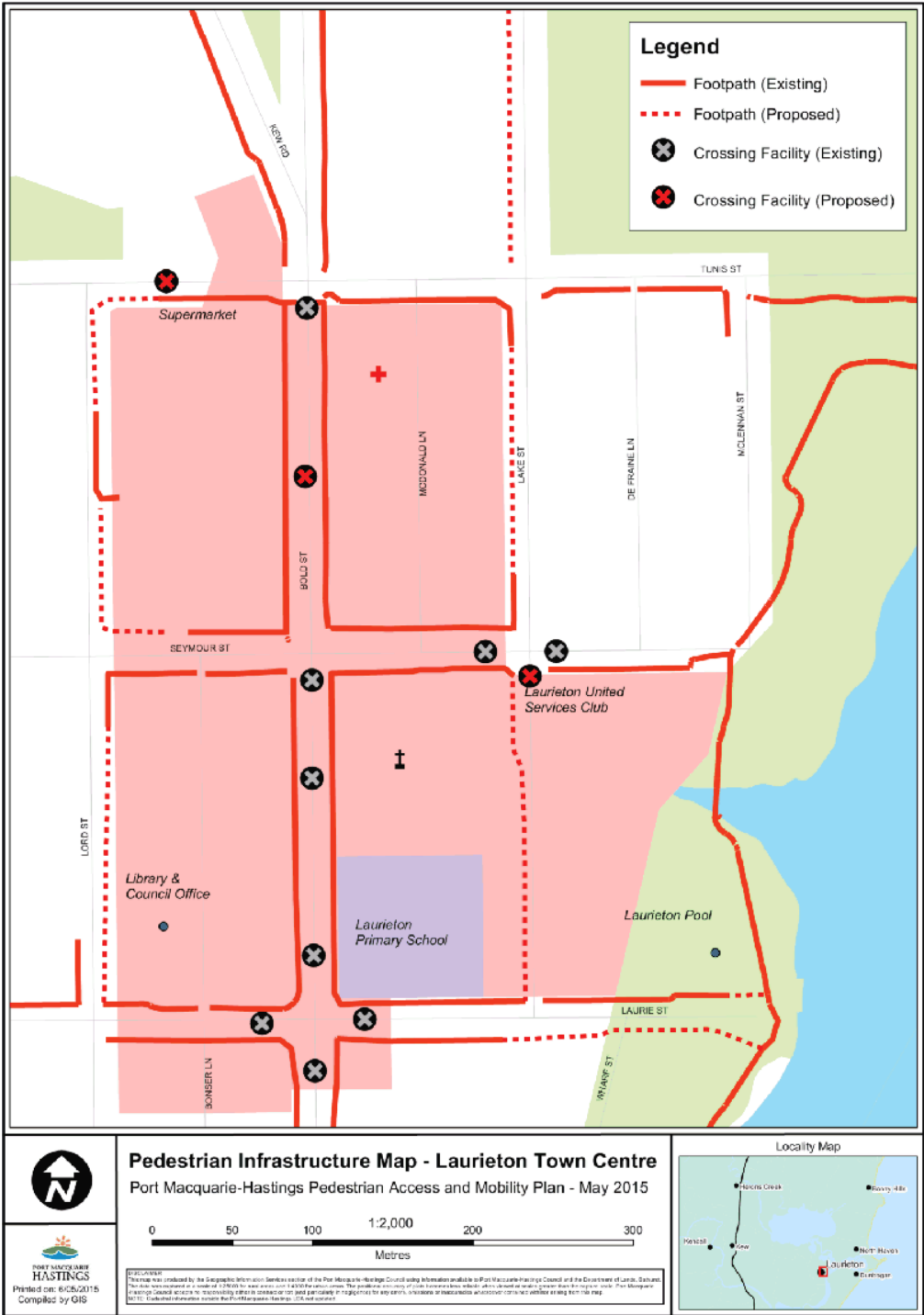


Item 07

Page 21

Item 12.02
Attachment 4

Page 264



AGENDA

ORDINARY COUNCIL
12/12/2018YOUR NATURAL AND
BUILT ENVIRONMENT

Item: 12.06Subject: **RECOMMENDED ITEM FROM LOCAL TRAFFIC COMMITTEE -
PEDESTRIAN CROSSING - BOLD STREET, LAURIETON**Presented by: Infrastructure, Jeffery Sharp

Alignment with Delivery Program

4.5.2 Plan for infrastructure that supports population growth.

RECOMMENDATION

That Council endorse the Local Traffic Committee's recommendation for a 'pedestrian (zebra) crossing' to be installed in Bold Street, Laurieton, between Tunis Street and Seymour Street.

Executive Summary

Bold Street, between Tunis and Laurie Streets, is the main road through the Laurieton town centre. There is significant demand for pedestrians to cross from one side of the road to the other. Formal crossing opportunities are facilitated by four pedestrian refuges – south of Tunis Street, south of Seymour Street, north of Laurie Street and south of Laurie Street – and one pedestrian (zebra) crossing midway between Seymour and Laurie Streets.

There is a clear need for a pedestrian crossing midway between Tunis and Seymour Streets. Council has received a number of requests from the community, including the Camden Haven Chamber of Commerce, to install a pedestrian crossing at this location. The frequency of these requests has increased since the opening of a new pharmacy in 2018 on the eastern side of Bold Street which generates significant pedestrian traffic across the road to the supermarket on the western side.

Council has received grant funding under the Stronger Country Communities Fund to construct a pedestrian crossing at the location shown on the following page. The works also involve kerb extensions, additional street lights and modification of parking layout, taxi stand, bus stop and loading zones in the vicinity of the crossing location. Detailed design of the works are currently in progress.



Item 12.06

Page 138

AGENDA

ORDINARY COUNCIL
12/12/2018

Pedestrian crossing location

The Local Traffic Committee met on 31 October 2018 and reached consensus on Item 07 with the following resolution:

07 PEDESTRIAN CROSSING - BOLD STREET, LAURIETON
CONSENSUS:

That it be a recommendation to Council:

That a 'pedestrian (zebra) crossing' be installed in Bold Street, Laurieton, between Tunis Street and Seymour Street.

Attachments

Nil

YOUR NATURAL AND
BUILT ENVIRONMENT

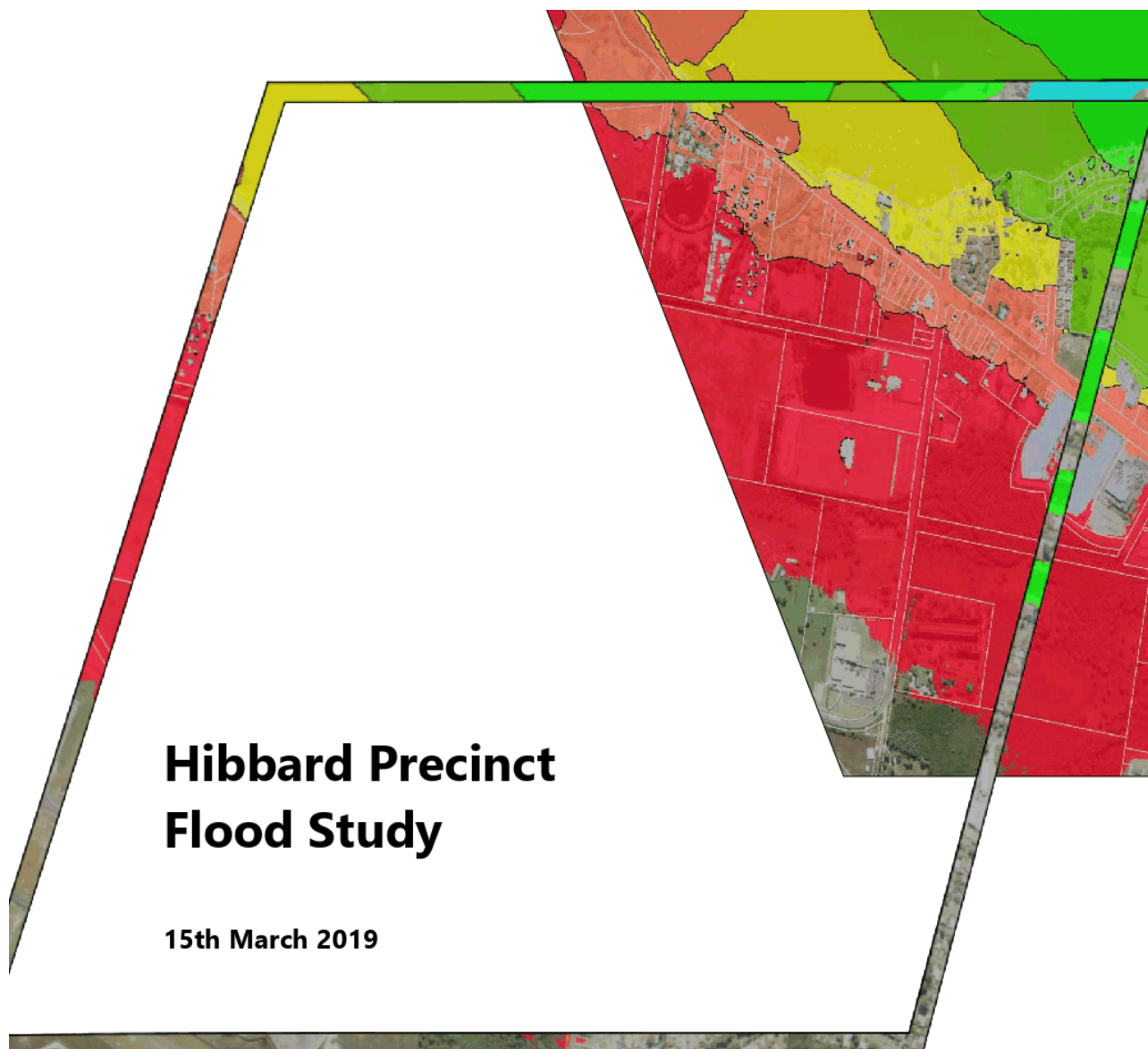


Item 12.06

Page 139

Item 12.02
Attachment 5

Page 267



Hibbard Precinct Flood Study

15th March 2019

Level 17, 141 Walker St
North Sydney NSW 2060
Australia

rp301015-03826rg_crt190315-Hibbard Precinct FS (Rev B).docx

Revision B

www.advisian.com



Advisian

WorleyParsons Group

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Disclaimer

This report has been prepared on behalf of and for the exclusive use of Port Macquarie-Hastings Council, and is subject to and issued in accordance with the agreement between Port Macquarie-Hastings Council and Advisian (trading as WorleyParsons Services Pty Ltd).

Advisian accepts no liability or responsibility whatsoever for it in respect of any use of or reliance upon this report by any third party.

Copying this report without the permission of Port Macquarie-Hastings Council and Advisian is not permitted.

Project: HIBBARD PRECINCT FLOOD STUDY

Rev	Description	Author	Reviewer	Advisian Approval	Date
A	Draft Report (Issued for Client Review)	RG	CRT	Chris Thomas	20/02/2019
B	Final Draft Report	CT	LT	Chris Thomas	15/03/2019



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

Table of Contents

1	INTRODUCTION	1
2	DESCRIPTION OF THE HIBBARD PRECINCT	3
2.1	Study Area.....	3
2.2	Topography	3
3	REVIEW OF AVAILABLE DATA.....	4
3.1	Topographic Data	4
3.1.1	Aerial Laser Survey (ALS) and Light Detection and Ranging (LiDAR) Survey	4
3.1.2	Hydraulic Controls	4
3.2	Hydrographic Data.....	5
3.3	Previous Investigations	5
3.3.1	Lower Hastings River Flood Study (2006)	5
3.3.2	Hastings River Floodplain Risk Management Study (2012).....	6
3.3.3	Hastings River Floodplain Risk Management Plan (2014).....	7
3.3.4	Updated Hastings River Flood Study (Exhibition Draft, 2018).....	7
4	HIBBARD PRECINCT RMA-2 FLOOD MODEL.....	9
4.1	Background.....	9
4.1.1	2006 Flood Study Model.....	9
4.1.2	2018 Updated Flood Study Model	10
4.2	Flood Model Updates	11
4.2.1	Model Network	11
4.2.2	Model Topography.....	11
4.2.3	Model Roughness Values and Distribution.....	13
4.2.4	Boundary Conditions	14
4.3	Validation to the February 2013 Flood.....	14
4.3.1	February 2013 Event Overview	15
4.3.2	Hydraulic Model Inflows – XP-RAFTS Modelling	19
4.3.3	RMA-2 Model Validation.....	19
4.4	Sensitivity Analysis.....	20
5	DESIGN EVENT MODELLING	22
5.1	General	22
5.2	Hydrodynamic Modelling	22



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

5.2.1	Design Simulations.....	22
5.2.2	Inflow Hydrographs.....	22
5.2.3	Ocean Levels	22
5.3	Design Flood Modelling Results.....	23
5.3.1	Peak Flood Levels and Extents	23
5.3.2	Peak Flood Depths.....	24
5.3.3	Peak Flow Velocities.....	24
5.3.4	Comparison to Previous Studies	24
6	IMPACT OF CLIMATE CHANGE ON FLOOD CHARACTERISTICS	26
6.1	Background.....	26
6.2	Modelling of Climate Change Impacts	26
6.2.1	Boundary Conditions	26
6.2.2	Results	27
7	PROVISIONAL Hazard Mapping	29
7.1	Adopted Criteria.....	29
7.2	Updated Provisional Flood Hazards.....	30
8	UPDATED HYDRAULIC CATEGORIES.....	32
8.1	General	32
8.2	Definitions.....	32
8.3	Previous Investigations	32
8.4	Re-Assessment of the Hibbard Floodway Corridor.....	33
8.4.1	Applicability of the Stage 2 Flood Level Increase Criteria	34
8.4.2	Stage 1 – Delineating the Floodway based on Existing Modelling Results	35
8.4.3	Stage 2 – Encroachment/Blockage Modelling.....	36
8.4.4	Final Floodway Extent.....	37
8.5	Flood Storage and Fringe.....	37
8.6	Hydraulic Category Mapping for the Hibbard Precinct	37
9	CONCLUSIONS and recommendations	38
9.1	Conclusions	38
9.2	Recommendations	38
10	REFERENCES.....	40



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

Appendices

- Appendix A** Comparison of 2002 ALS Survey and 2012 LiDAR Topographic Data
- Appendix B** Survey Data provided by Pacific Surveys [Bridges & Creek Cross-Sections]
- Appendix C** Comparison of Hibbard Design Flood Modelling Results to Previous Studies



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

List of Figures

- Figure 2.1** Location of the Hibbard Precinct Study Area
- Figure 2.2** The Hibbard Precinct
- Figure 2.3** Topography based on 2012 LiDAR in the vicinity of the Hibbard Precinct
- Figure 3.1** Extent of Available 2012 LiDAR Survey
- Figure 3.2** Overview of Available Topographic and Hydrographic Survey
- Figure 4.1** Comparison of 2006 and 2018 Flood Study RMA-2 Networks
[Overview]
- Figure 4.2** Comparison of 2006 and 2018 Flood Study RMA-2 Networks
[Extent 1 of 4 – South West]
- Figure 4.3** Comparison of 2006 and 2018 Flood Study RMA-2 Networks
[Extent 2 of 4 – Central]
- Figure 4.4** Comparison of 2006 and 2018 Flood Study RMA-2 Networks
[Extent 3 of 4 – North]
- Figure 4.5** Comparison of 2006 and 2018 Flood Study RMA-2 Networks
[Extent 4 of 4 – South East/Town]
- Figure 4.6** Extent of RMA-2 Model Refinements completed as part of the
Hibbard Precinct Flood Study
- Figure 4.7** Topography based on Elevations Assigned Within the updated RMA-2
Model
- Figure 4.8** Adopted Element Types and Distribution for the updated Hibbard
Precinct RMA-2 Model
- Figure 4.9** Location and Surveyed Elevation of the High Water Marks collected for
the February 2013 Event
- Figure 4.10** Location of all Streamflow & Flood Mark Data collected and used for
Validation to the February 2013 Event
- Figure 4.11** Adopted Spatial Distribution of Rainfall for Modelling of the February
2013 Storm Event in the XP-RAFTS Hydrologic Model
- Figure 4.12** Comparison of predicted XP-RAFTS flows to recorded flows at the
Ellenborough Gauge (207004)
- Figure 4.13** Comparison of predicted XP-RAFTS flows to recorded flows at the
Avenal Gauge (207014)
- Figure 4.14** Comparison of predicted RMA-2 flood levels to recorded levels at the
Hastings River at Wauchope Gauge (207401)
- Figure 4.15** Comparison of predicted RMA-2 flood levels to recorded levels at the
Wilson River at Telegraph Point Gauge (207415)



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

- Figure 4.16** Comparison of predicted RMA-2 flood levels to recorded levels at the Hastings River at Dennis Bridge Gauge (207444)
- Figure 4.17** Comparison of predicted RMA-2 flood levels to recorded levels at the Hastings River at Settlement Point Gauge (207418)
- Figure 4.18** Comparison of predicted RMA-2 flood levels to recorded levels at the Hastings River at Port Macquarie Gauge (207450)
- Figure 4.19** Validation of the RMA-2 Hibbard Model to High Water Marks collected for the February 2013 Event
- Figure 4.20** Sensitivity Scenario #1 – Modelling of Buildings with High Roughness instead of being removed [based on 1% AEP Flood Event]
- Figure 4.21** Sensitivity Scenario #2 – Increase of Material Roughness by 20% [based on 1% AEP Flood Event]
- Figure 4.22** Sensitivity Scenario #3 – Decrease of Material Roughness by 20% [based on 1% AEP Flood Event]
- Figure 4.23** Sensitivity Scenario #4 – Adoption of Local Tailwater Levels [based on 1% AEP Flood Event]
- Figure 5.1** Hastings River Inflow Hydrographs for the 5% AEP, 1% AEP and the Extreme Flood Events
- Figure 5.2** Wilson River Inflow Hydrographs for the 5% AEP, 1% AEP and the Extreme Flood Events
- Figure 5.3** Maria River Inflow Hydrographs for the 5% AEP, 1% AEP and the Extreme Flood Events
- Figure 5.4** Varying Tidal Boundary
- Figure 5.5** Predicted Peak Flood Levels during the 5% AEP Flood
- Figure 5.6** Predicted Peak Flood Levels during the 1% AEP Flood
- Figure 5.7** Predicted Peak Flood Levels during the Extreme Flood Event
- Figure 5.8** Predicted Peak Flood Depths during the 5% AEP Flood
- Figure 5.9** Predicted Peak Flood Depths during the 1% AEP Flood
- Figure 5.10** Predicted Peak Flood Depths during the Extreme Flood Event
- Figure 5.11** Predicted Peak Flow Velocities during the 5% AEP Flood
- Figure 5.12** Predicted Peak Flow Velocities during the 1% AEP Flood
- Figure 5.13** Predicted Peak Flow Velocities during the Extreme Flood Event
- Figure 6.1** Predicted Peak Flood Levels for the adopted Climate Change Scenario
- Figure 6.2** Predicted Peak Flood Depths for the adopted Climate Change Scenario
- Figure 6.3** Predicted Peak Flow Velocities for the adopted Climate Change Scenario

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

- Figure 8.1** 1% AEP Flows & Velocity-Depth Product predicted in the vicinity of Hibbard
- Figure 8.2** Hibbard Floodway Corridor determined based on a review of Flood Model Results [Stage 1]
- Figure 8.3** Flood Level Difference Mapping for Stage 2 Blockage Scenario #1 for the 1% AEP Flood
- Figure 8.4** Flood Level Difference Mapping for Stage 2 Blockage Scenario #2 for the 1% AEP Flood
- Figure 8.5** Flood Level Difference Mapping for Stage 2 Blockage Scenario #3 for the 1% AEP Flood
- Figure 8.6** Flood Level Difference Mapping for Stage 2 Blockage Scenario #4 for the 1% AEP Flood
- Figure 8.7** Flood Level Difference Mapping for Stage 2 Blockage Scenario #5 for the 1% AEP Flood
- Figure 8.8** Flood Level Difference Mapping for Stage 2 Blockage Scenario #6 for the 1% AEP Flood
- Figure 8.9** Hydraulic Categories for the 1% AEP Flood

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

1 INTRODUCTION

The *Hastings River Flood Study* was published in 2006 and was based on flood modelling that was developed over the preceding 5 years. The study was developed from topographic and hydrographic survey data that was current at that time. The Flood Study (2006) included modelling results for the design 5%, 2%, 1% and 0.5% Annual Exceedance Probability (AEP) floods and for the Probable Maximum Flood (PMF), as well as mapping of provisional flood hazard and hydraulic categories.

The *Hastings Floodplain Risk Management Study (2012) (FRMS)* and the *Hastings Floodplain Risk Management Plan (2014) (FRMP)* examined a range of options for managing, mitigating and/or reducing the existing flood risk that the community of the lower Hastings Valley can be exposed to. This included consideration and modelling of structural measures such as levees, changes to planning controls and the preparation of emergency response community data sheets.

The FRMS (2012) also included a detailed review of the provisional floodway areas that were determined as part of the Flood Study (2006). This involved a detailed assessment of flooding patterns across floodplain areas to identify areas of significant flow followed by encroachment and blockage modelling to confirm and/or refine the extent of the floodway areas.

An updated flood study for the Lower Hastings River was published in September 2018. The *Hastings River Flood Study Update (2018)* presents updated flood characteristics for the region that have been derived from updated modelling that incorporates the physical changes to the floodplain that have occurred since 2006. The most notable of these changes include the upgrade to the Oxley Highway and construction of the new Pacific Highway between the Oxley Highway and Telegraph Point.

In addition to these topographic changes, the updated modelling included modifications to selected model parameters and an overall refinement of the RMA-2 model network to better utilise the processing and modelling capabilities of present-day computers and the RMA-2 modelling software.

The Updated Flood Study (2018) includes modelling results for the 1% AEP flood and a range of climate change scenarios. The climate change modelling considered various climate change scenarios which were identified in the 2012 and 2014 studies to provide Council with an understanding of the potential future changes to flood characteristics along the Hastings River downstream of the Bains Bridge crossing near Beechwood, as well as along the Wilson and Maria Rivers which drain the northern section of the valley.

The climate change scenario which has been relied upon for this study is based on a present day 1% AEP catchment flood event with a 900 mm provision for Sea Level Rise (SLR) and a 10% increase in rainfall intensity and volume due to predicted changes in emissions to the year 2100.

Following completion of the *Updated Hastings River Flood Study (2018)*, Council commissioned Advisian to undertake detailed flood modelling and investigations for the Hibbard Precinct for the purpose of better defining the floodway between Fernbank Creek and the Hibbard Precinct.

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

The 2012 FRMS documented the provisional extent of this floodway and highlighted the need for it to be assessed at a local scale due to the existing development within or nearby to the floodway extent. The Implementation Plan included within the 2014 FRMP listed confirmation of the Hibbard Floodway extent as a priority item for Council's Floodplain Management Committee.

The primary goal of the Hibbard Precinct Flood Study is to define the extent of the floodway at a local scale, which will then be used to undertake a detailed investigation to assess options for maintaining the floodway into the future and for mitigating impacts associated with its adoption on affected landowners. The detailed investigation of the selected option(s) will form a future stage of this project.

Accordingly, the existing two-dimensional RMA-2 flood model (*last modified for the Hastings River Flood Study Update*) was further refined to incorporate additional topographic detail and physical features across the Hibbard Precinct. The upgraded flood model was used to confirm the importance of the floodway and to assess options for maintaining the flood function of this area of the floodplain. This report documents the findings from these investigations.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

2 DESCRIPTION OF THE HIBBARD PRECINCT

2.1 Study Area

The Hibbard Precinct is situated along the southern floodplain of the Hastings River approximately four (4) kilometres west of the central business district (CBD) of Port Macquarie. As shown in **Figure 2.1**, Hibbard is located approximately 2.1 kilometres south-east of the Maria and Hastings River confluence and approximately 6.5 river kilometres west of the river entrance.

As shown in **Figure 2.2**, the Hibbard Precinct primarily consists of a mixture of residential and commercial properties the majority of which are located along Hastings River Drive, Boundary Street and Hibbard Drive. Many of the commercial properties are caravan parks or hotel/motel accommodation reflecting the strength of the local tourism market. The Precinct also includes several large areas of open space, sporting fields, creeks and wetlands. As shown in **Figure 2.2**, Port-Macquarie Regional Airport is located immediately south of the Precinct.

2.2 Topography

The topography across the Hibbard Precinct generally ranges between 1.0 and 4.0 mAHD. Between the Hastings River in the north and the Port Macquarie Airport in the south, the floodplain is generally flat with very little overall change in elevation. The topography does increase near the Port Macquarie Airport which is typically at or above 6.0 mAHD (refer **Figure 2.3**).

The lowest elevations throughout the Hibbard Precinct occur within the creek channels and waterbodies (*lake and wetlands*). The topographic mapping shown in **Figure 2.3** does not reliably represent the elevation in the vicinity of these waterbodies as the topographic data has been derived using Light Detection and Ranging (LiDAR) survey techniques. LiDAR techniques are not able to penetrate water surfaces. Accordingly, the elevations shown in **Figure 2.3** are likely to represent the water surface at the time of data capture.

Locations of higher terrain, such as areas with topographic elevation above 3.0 mAHD, are generally limited to areas of development across which a fill mound had been constructed. This includes the Ultiqa Village Resort and the Riverside Residential Village, both of which are located to the west of Hibbard, the Port Home Zone and commercial lots near the centre and the residences to the east (refer **Figure 2.3**).



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

3 REVIEW OF AVAILABLE DATA

3.1 Topographic Data

3.1.1 Aerial Laser Survey (ALS) and Light Detection and Ranging (LiDAR) Survey

The RMA-2 model that was originally developed as part of the *Hastings River Flood Study (2006)* and used extensively for flood investigations up to and including the *Updated Hastings River Flood Study (Exhibition Draft, 2018)* was developed based on Aerial Laser Survey (ALS) that covered the entire Port Macquarie-Hastings Local Government Area. The ALS data was obtained in September 2005 and comprises spot elevations across all terrestrial sections of the lower Hastings River floodplain at an average spacing of 1.4 metres. The data is understood to have been verified to a vertical and horizontal accuracy of 0.2 metres and 0.75 metres, respectively.

Further validation of the ALS data was undertaken by comparison against 1,970 test points gathered by traditional survey methods. The mean difference between ALS and field survey was found to be 0.03 metres with a standard deviation of 0.07 metres.

As part of the Hibbard Precinct Flood Study, Port Macquarie-Hastings Council provided Light Detection and Ranging (*LiDAR*) survey for the study area and its surrounds. The metadata provided with the LiDAR survey indicates a collection date for the survey of May 2012 and vertical and horizontal accuracies of 0.3 metres and 0.8 metres, respectively.

The extent of 2012 LiDAR data made available for use in updating the RMA-2 flood model is shown in **Figure 3.1**.

A comparison of topographic elevations between the 2012 LiDAR and 2005 ALS survey is provided in **Appendix A** in **Figures A1 to A4**. **Figures A1 and A3** provide a comparison of topographic elevations based on an adopted low range of values of +/- 0.5 metres at intervals of 0.05 metres. **Figures A2 and A4** provide a comparison of topographic elevations based on a high range of values of +/- 2 metres at intervals of 0.2 metres.

Figures A1 to A4 generally indicate that changes to topographic elevations are sporadic between the two data-sets with neither clearly being higher or lower across the wider floodplain and across the Hibbard Precinct. Several locations of significant change in floodplain elevations align with known locations of development completed since 2002.

3.1.2 Hydraulic Controls

Survey data for hydraulic controls across the Hibbard Precinct was collected by Pacific Surveys at the commencement of the study. As shown in **Figure 3.2**, the survey involved collection of:

- Spot elevations along Tuffins Lane, Hastings River Drive, Boundary Street and Hibbard Drive (including road crests);
- Hydrographic survey of creek channels through and along the boundaries of the Ultiqa Village Resort to the east of Tuffins Lane;

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

- Survey of footbridges located within the Ultiqa Village Resort and the Hastings River crossing located to the west of the Aquatic Caravan Park; and,
- Elevations at the base and top of the impervious fence along the western boundary the Ultiqa Village Resort (*east of Tuffins Lane*) and the southern boundary of the Aquatic Caravan Park (*north of Hastings River Drive*).

Additional survey data collected by King & Campbell covering the road surface and shoulder areas of Boundary Street and parts of Hastings River Drive were also incorporated into the topographic survey data base. The extent of this survey data is also shown in **Figure 3.2**.

Cross-sections of all surveyed bridges are included within **Appendix B**.

3.2 Hydrographic Data

Hydrographic survey was also collected by Pacific Surveys at seventeen locations along the creek channels that pass through and around the Ultiqa Village Resort. The location and extent of the creek cross-sections collected are shown in **Figure 3.2**.

The cross-section data is also included within **Appendix B**.

No additional hydrographic survey was collected to define bed elevations along the Hastings River. Bathymetric data for the Hastings River was obtained as part of the *Hastings River Flood Study (2006)* and incorporated into the RMA-2 model. It is considered to still be representative of river bed conditions in the vicinity of Hibbard and sufficiently accurate for the modelling of flood conditions.

3.3 Previous Investigations

3.3.1 Lower Hastings River Flood Study (2006)

The *Lower Hastings River Flood Study (2006)* was prepared by Patterson Britton & Partners (*now Advisian*) for Port Macquarie-Hastings Council. The primary objective of the study was to quantify and define flood characteristics along the lower reaches of the Hastings, Wilson and Maria Rivers for existing topographic and development conditions. The report provides information relating to historic and design flood behaviour along both the Hastings and Wilson Rivers, including the flood immunity of the existing Pacific Highway crossing of both rivers.

The Flood Study indicates that the Hastings, Wilson and Maria Rivers have experienced significant flooding on a number of occasions in the past. The 1963 and 1968 floods are the largest floods to have occurred over the last 70 years and are considered to approximate the 1% Annual Exceedance Probability (AEP) (*also known referred to as the 100 year Average Recurrence Interval flood*) flood along the Hastings River (Patterson Britton, 2006).

A RAFTS-XP hydrologic model of the Hastings, Maria and Wilson River catchments was developed as part of the study and was used to establish discharge hydrographs for the design 20, 50, 100 and 200 year recurrence floods. The RAFTS model was calibrated using available daily read rainfall and pluviometer data, as well as streamflow data for a significant flood that occurred in 1978.

**Advisian**
WorleyParsons Group**Port Macquarie Hastings Council**
Hibbard Precinct Flood Study

The model was also verified using available rainfall and streamflow data for a smaller flood that occurred in 1995.

Design flood characteristics for the Hastings, Maria and Wilson Rivers were defined using a fully two-dimensional hydrodynamic model that was developed using the RMA-2 software. The RMA-2 model was used to simulate flood behaviour during the design 20, 50, 100 and 200 year average recurrence floods.

The Probable Maximum Flood was also approximated using an equivalent extreme event. The extreme flood was approximated using a peak discharge equivalent to three (3) times the peak 100 year average recurrence flood discharge.

The RMA-2 model was calibrated and verified using historic flood mark information for floods that occurred in 1963, 1968, 1978 and 1995.

3.3.2 Hastings River Floodplain Risk Management Study (2012)

The *Hastings Floodplain Risk Management Study (2012) (FRMS)* expanded on the investigations carried out for the *Lower Hastings River Flood Study (2006)* by assessing a range of mitigation measures to reduce flood risk to the local community.

Several flood response (*or structural mitigation*) options were explored, including levees at Hibbard, Settlement Point and at two different locations at North Shore. These potential levee proposals were investigated in isolation and as part of various combinations of levees which were targeted toward protecting existing development from flooding while at the same time minimising the adverse impact of the levee on predicted peak flood levels elsewhere. A high flow bypass option was also considered for the purpose of alleviating the magnitude of flooding predicted at North Shore.

Each of the flood response options was modelled using modified versions of the existing case RMA-2 flood model. The modelling was undertaken to quantify the potential impact of each option on flood characteristics.

A triple-bottom line assessment was also undertaken to identify the flood response option that afforded the greatest benefit. The option involving construction of a levee system to protect North Shore and a concurrent levee system along Settlement Point was identified as having the best benefit relative to cost. This option was recommended in the Floodplain Risk Management Plan for further investigation with a view to developing a business case to support proceeding with implementation of the associated works.

The 2012 FRMS also addressed flood emergency management issues and provided recommendations for additions / changes to flood-related clauses within Council's existing Flood Policy. Response modification measures such as installation of extra stream flow gauges and road upgrades were proposed.

An interim assessment of climate change on flood levels was provided based on the modelling that had been completed at that time. However, it was recommended that a more detailed study be undertaken following the adoption of the Hastings Floodplain Risk Management Plan.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

3.3.3 Hastings River Floodplain Risk Management Plan (2014)

The *Hastings River Floodplain Risk Management Plan (2014) (FRMP)* detailed the recommended flood, property and responses modification works first proposed in the 2012 FRMS. The FRMP prioritised the proposed works into low, medium and high priority tasks and provided an indicative cost estimate for each item of work.

Updates to planning controls and policies were given highest priority and included items such as adopting floodway and flood storage extents, changing relevant sections of the DCP and LEP as well as reviewing Section 149 Certificates for flood prone properties. High priority was also given for the raising of sections of Settlement Point Road, Shoreline Drive and North Shore Drive.

The FRMP also recommended that detailed flood modelling and investigations be undertaken for the Hibbard Precinct in order to better define the identified floodway between Fernbank Creek and the Hibbard Precinct. The confirmation of the Hibbard Floodway extent was prioritised by Council's Floodplain Management Committee. Advisian has prepared this Hibbard Precinct Flood Study in accordance with recommendations in the 2014 FRMP.

3.3.4 Updated Hastings River Flood Study (Exhibition Draft, 2018)

Council commissioned Advisian to undertake an update to the 2006 Hastings River Flood Study with the primary purpose of assessing the impacts of climate change on design flood characteristics (principally peak levels), in accordance with recommendations documented in the 2012 FRMS and 2014 FRMP. The update was also to incorporate any further physical changes to floodplain topography that could impact on flood characteristics.

The existing two-dimensional RMA-2 flood model was refined for this Updated Flood Study and was used to update flood maps for the 1% AEP flood event. A range of development that has occurred across the floodplain since 2006 was also incorporated into the updated flood model. This included road embankments, bridge and culvert structures associated with the Oxley Highway upgrade and the new section of the Pacific Highway between the Oxley Highway and Telegraph Point.

The climate change assessment considered five scenarios:

- Scenario 1 - 100 year ARI catchment event with 900 mm Sea Level Rise (SLR) + 10% increase in rainfall intensity and volume
- Scenario 2 - 100 year ARI catchment event with 900 mm SLR
- Scenario 3 - 100 year ARI catchment event with 400mm SLR + 10% increase in rainfall intensity and volume
- Scenario 4 - 100 year ARI catchment event with 400 mm SLR
- Scenario 5 - PMF event with 900 mm SLR (*900 mm SLR applied to the adopted 100yr Tide 2.2 mAHD*)

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Aside from the PMF scenario, it was found that Scenario 1 provided the most conservative estimate for flood level increases both across tidally influenced areas and in areas further upstream.

As Scenario 1 is consistent with previous NSW SLR Policy Statement benchmarks, Council's Coast, Estuary and Floodplain Advisory Sub-Committee recommended that it be adopted for future flood planning and floodplain management policies. Accordingly, this study proceeded on that basis, providing peak flood levels and mapping based on the application of Scenario 1 in the updated flood modelling.

However, at its December 2018 meeting, Council adopted Scenario 3 as the basis for defining Flood Planning Levels (FPLs). That is, it adopted the 400 mm sea level rise scenario as the basis for defining FPLs.

The timing of this policy decision coincided with completion of most of the modelling that was undertaken for this report, which was based on Scenario 1. In order to ensure that the project is not delayed, Council instructed that the Hibbard Precinct Flood Study be completed based on the existing modelling and that further modelling to generate flood levels and flooding mapping based on Scenario 3 be completed as part of management study (options) phase.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

4 HIBBARD PRECINCT RMA-2 FLOOD MODEL

4.1 Background

The RMA-2 model adopted for the Hibbard Precinct investigations was first developed in the years preceding 2006 as part of the *Hastings River Flood Study (2006)*. The model was later relied upon for a range of studies including the *Hastings River Floodplain Risk Management Study (2012)*, various studies associated with the Pacific Highway Upgrade (2007 onwards) and the *Updated Hastings River Flood Study (2018)*. The history of the development of the RMA-2 flood model is discussed in the following sections.

4.1.1 2006 Flood Study Model

Flood characteristics for the lower Hastings, Maria and Wilson Rivers were until recently defined by the results of flood modelling that was completed between 2004 and 2006 as part of the *Hastings River Flood Study (2006)*. A two-dimensional (2D) hydrodynamic flood model was developed as part of the Flood Study using the RMA-2 software package. The model was calibrated against significant historical floods including the 1963 and 1968 events and was applied to simulate a range of design floods including the 1% Annual Exceedance Probability (AEP) flood.

The RMA-2 model was developed from available bathymetric data for the major tributaries and Aerial Laser Survey (ALS) data that was obtained for floodplain areas extending to the predicted extent of the Probable Maximum Flood (PMF). It covered the full extent of the Hastings River floodplain from the Bains Bridge crossing near Beechwood to the ocean entrance at Port Macquarie. The model also included the floodplains of the Wilson and Maria Rivers extending downstream from the Pacific Highway crossing of the Wilson River near Telegraph Point and south along the Maria River from its headwaters near the Port Macquarie-Hastings LGA and Kempsey Shire LGA boundary.

The extent of the 2006 RMA-2 flood model is shown in **Figure 4.1**.

The 2006 RMA-2 model was limited in size and level of detail by the processing limitations of both the modelling software and the computer hardware that was available at the time. It is important to recognise that although the Flood Study was formally adopted in 2006, the network generation and flood modelling was largely completed by December 2004. There have been many advancements in both the software and the processing capacity of computers since then.

The 2006 model was based on topographic elevations defined at 12,900 nodes and floodplain roughness defined across 14,450 model elements. The 2006 RMA-2 model network is shown in **Figure 4.1**.

Between 2006 and 2015, the RMA-2 model was used as the basis for numerous flood related investigations. These included the following:

- Hydrology and Hydraulics investigations for the Pacific Highway Upgrade between the Oxley Highway and Kundabung.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

This included investigations for the river crossings of the Hastings and Wilson Rivers and their associated floodplains for the Environmental Impact Statement, for the concept design and for the detail design and construction phases of the project.

- The *Hastings Floodplain Risk Management Study (2012)*.

This involved an assessment of a range of flood modification measures aimed at reducing potential flood damages that could be experienced in rural, commercial and residential areas.

In addition, the RMA-2 flood model has been used extensively as a tool to assess residential and commercial development applications proposed at a range of locations across the floodplain including, but not limited to, Wauchope, Sancrox, Hibbard, North Shore and the western areas of Port-Macquarie.

Each of the investigations completed post 2006 has involved varying degrees of updates to the 2006 RMA-2 flood model. The updates have in most cases been confined to localised network refinements completed to ensure the topography in the vicinity of the area of interest was reliably defined. In many cases, this has involved the inclusion of updated topographic data based on detailed site survey. An example of this is the work-as-executed survey obtained for the Pacific Highway Upgrade Project to define the post-development road surface and drainage infrastructure.

The updates to the RMA-2 flood model between 2006 and 2015 led to a significant increase in model size with the total number of nodes and elements increasing to 31,600 and 35,700, respectively. This represents a 250% increase in the number of model nodes and elements relative to 2006 and reflects the greater level of topographic detail that was incorporated into the model over this period. This greater level of floodplain delineation within the model network enables more reliable results to be produced.

4.1.2 2018 Updated Flood Study Model

The RMA-2 flood model that was developed as part of the *Hastings Flood Study (2006)*, and refined as part of subsequent flood investigations in the years following, was then updated to formalise the network changes that have occurred since 2006 and to ensure the model could be reliably used to simulate a range of climate change scenarios.

The following major changes to the RMA-2 model were completed as part of the *Updated Hastings River Flood Study (2018)*:

- (i) Consolidation of all previous model updates to create the most up-to-date representation of the Hastings River floodplain
- (ii) Inclusion of the recently constructed Oxley Highway between Port Macquarie and Thrumster
- (iii) Model refinement along the peripheries of the floodplain in particular for areas between the 1% AEP and PMF flood extents

The changes outlined above led to an increase in the number of model nodes and elements from 12,900 and 14,450 to 49,300 and 57,800, respectively. In that regard, the present-day version of the RMA-2 model is based on four times the number of nodes and elements to define the topography and roughness compared to the 2006 version.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

An overview of the 2018 RMA-2 updated model network is shown in **Figure 4.1**.

A comparison of the changes to the RMA-2 model network between 2006 and 2018 is provided in **Figures 4.2 to 4.5**. The comparison shows the extent to which additional detail has been incorporated into the RMA-2 model across the entire model domain, including the Hibbard Precinct.

4.2 Flood Model Updates

4.2.1 Model Network

The RMA-2 model that was developed for the *Updated Hastings River Flood Study (2018)* was used as the base model for the Hibbard Precinct investigations which are the subject of this report. As the model had been developed and used for regional scale investigations, it was considered beneficial to further refine the model network for the local scale investigations required to assess the provisional floodway delineation previously determined for the Hibbard Precinct.

More detailed topographic data was also collected as part of the study to assist with the local scale definition of topography and key physical features. As discussed in **Section 3.1**, this included Light Detection and Ranging (*LiDAR*) survey, spot elevations of hydraulic controls such as road and fence (*brick and concrete only*) crest heights, creek cross-sections and details of bridge and culvert crossings.

The refinements in the vicinity of the Hibbard Precinct led to an increase in the total number of nodes and elements from 49,300 and 57,800 to 64,150 and 77,700, respectively. This represents an increase in the number of nodes and elements of more than 30%, all of which were incorporated only in the vicinity of Hibbard.

The final RMA-2 model network across the Hibbard Precinct is shown in **Figure 4.6**. The upgraded network includes a much finer network spacing, particularly at hydraulic controls such as roads, impervious fences, buildings and channels. In that regard, where the topography is generally flat the network spacing can be larger without affecting the reliability of the flood model predictions.

4.2.2 Model Topography

Topographic elevations within the RMA-2 model are assigned to each node based on the most reliable data source available. In that regard, most nodes across the Hibbard Precinct have been assigned elevations based on the 2012 LiDAR survey. The exceptions to this are:

- Crest elevations along Tuffins Lane, Boundary Street, Hastings River Drive and Hibbard Drive have been assigned based on surveyed spot elevations.
- Elevations at the base and crest of brick fences (*such as those located along Tuffins Lane along the part of the western boundary of the Ultiqa Village Resort and at the Aquatic Caravan Park*) based on surveyed spot elevations, refer **Plates 4.1 and 4.2**.
- Bed elevations along creeks based on surveyed cross-sections, and
- Elevation and locations of bridge approach abutments, piers and culverts.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study



Plate 4.1 Brick Fence along Tuffins Lane and the western boundary of the Ultiqa Village Resort



Plate 4.2 Brick Fence along Hastings River Drive and the southern boundary of the Aquatic Caravan Park


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

The final elevations assigned to the RMA-2 model nodes are shown in **Figure 4.7** as thematic terrain mapping.

Elevations for nodes outside of the study area were not changed as part of these updates. That is, all areas outside of the study area have been unchanged from the model version developed as part of the *Updated Hastings River Flood Study (Exhibition Draft, 2018)* and as discussed in **Section 4.1.2**.

4.2.3 Model Roughness Values and Distribution

Roughness values for creek channels and overbank areas were estimated across the Hibbard Precinct from aerial photograph analysis and field observations. Element types were delineated to 'pick-up' distinct variations in hydraulic roughness across the floodplain. In some instances, the RMA-2 model network was refined to allow greater delineation of element types where it was considered that a variation in roughness was warranted.

To allow for greater discretisation of roughness values throughout the study area a new set of material roughness types was created for specific use within the study area. This option was preferred as opposed to using the existing types and values that had been adopted for the remainder of the RMA-2 model domain due to the greater concentration of urban development.

The roughness types and values adopted for the Hibbard Precinct are listed in **Table 4.1**.

Table 4.1 ADOPTED RMA-2 MODEL ROUGHNESS PARAMETERS FOR THE HIBBARD PRECINCT

RMA-2 ELEMENT NUMBER [^]	DESCRIPTION	ROUGHNESS PARAMETER VALUE
1	Waterway Clear	0.030
2	Waterway Overgrown	0.080
3	Bridges & Culverts	0.100
4	Grassed Floodplain	0.035
5	Light Trees / Foliage	0.055
6	Moderate Trees / Foliage	0.075
7	Dense Trees / Foliage	0.095
8	Urban Area – Open and Unobstructed	0.040
9	Urban Area – Clutter and Fences	0.060
10	Buildings – Blocked to Flow	N/A
11	Roadways and Hardstand Areas	0.015
12	MDST Flow Control Element ^{^^}	N/A

[^] The listed element numbers and roughness types are only applicable to the RMA-2 model network across the Hibbard Precinct study area. Accordingly, the element numbers and types does not include those adopted elsewhere across the remainder of the model domain.

^{^^} MDST Flow Control Elements are used at critical flow locations (such as weirs, fences and road embankments) to reduce the potential for sub-surface flows.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

The distribution of material types across the Hibbard Precinct based on the final model network is shown in **Figure 4.8**.

4.2.4 Boundary Conditions

The Hastings River RMA-2 model has three upstream boundary conditions and one downstream boundary. The three upstream boundaries are used to input flow hydrographs into the model and are located as follows:

- (i) The Hastings River approximately 500 metres upstream of Bains Bridge (*approximately 5.5 river kilometres upstream of the Wauchope Railway Bridge*).
- (ii) The Wilson River approximately 3.5 river kilometres upstream of the Pacific Highway Crossing at Telegraph Point, and
- (iii) The Maria River approximately 1 kilometre north of the confluence with the Wilson River.

The only downstream boundary is located approximately 1 kilometre east of the Hastings River breakwater/river entrance and 6.5 kilometres east of Hibbard. For all simulations time-varying ocean levels are defined at the downstream boundary.

The locations and configuration of the boundary conditions adopted for the Hibbard Precinct RMA-2 model match those used for the *Updated Hastings River Flood Study (Exhibition Draft, 2018)* modelling.

4.3 Validation to the February 2013 Flood

Calibration and verification of any hydraulic flood model is an important step in the model development process. If an acceptable calibration of the model to recorded events can be achieved, it ensures the reliability of the results of design flood simulations such as the 1% Annual Exceedance Probability (AEP) flood.

As discussed in **Section 3.3**, the RMA-2 model was calibrated and verified as part of the *Hastings River Flood Study (2006)* using flood mark information recorded for floods that occurred in 1963, 1968, 1978 and 1995. Out of these four events, one flood mark was recorded in the vicinity of the Hibbard Precinct for the 1963, 1968 and 1995 events (*refer Section 6.3 of the 2006 Flood Study*).

The community consultation undertaken in the early stages of the study identified the February 2013 flood as an event of significance to the local community. Data gathered during the consultation process included the location and height that floodwaters reached at the peak of the event. Following discussions with residents, a surveyor was commissioned to collect elevations for four (4) flood marks that were identified as representative peak levels for the February 2013 at Hibbard. The location and surveyed elevation of each of the February 2013 flood marks is shown in **Figure 4.9**.

Rainfall and streamflow records were also obtained from data loggers for those gauges that were operational, and which fall within the Hastings River catchment. The locations of all streamflow gauges for which data was collected are shown in **Figure 4.10**.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

4.3.1 February 2013 Event Overview

On the 18th February 2013, a low-pressure system formed off the east coast of Australia. Over the next few days the system tracked in a westerly direction, making landfall on the north coast of New South Wales on the 22nd February (refer **Plate 4.3**). This resulted in widespread, persistent and heavy rainfall across the Hastings River catchment.

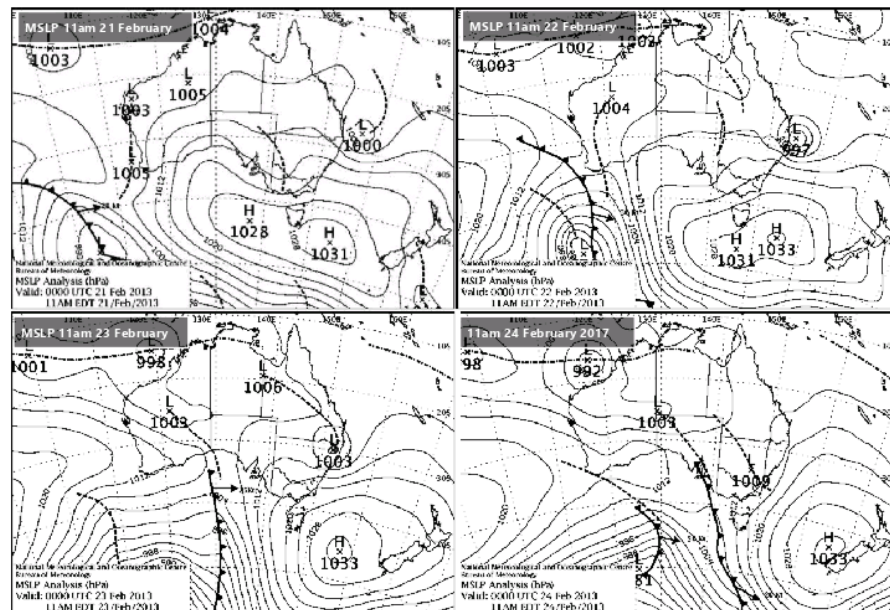


Plate 4.3 Mean Sea Level Pressure (MSLP) Plots for the February 2013 Event

Rainfall across the Hastings River catchment was well above average during February 2013 (refer **Plate 4.4**). Heaving rain and thunderstorms affected large parts of the New South Wales east coast between the 20th and 25th of February, with locally heavy rainfall breaking records at some locations.

Severe thunderstorms affected parts of the Hastings River catchment between the 22nd and 23rd February, with multiple rainfall gauges recording over 150 mm in a 24-hour period across the two days. The BOM rainfall gauge at Yarras recorded 415 mm in the period between 9am on the 22nd February and 9am on the 23rd February.

Cumulative rainfall totals for the month of February 2013 as recorded at various daily-read gauges and pluviographs throughout the catchment are presented in **Plate 4.5**. The data shows that significant rainfall was recorded throughout February, most notably between the 22nd and 24th.

An estimate of the Annual Exceedance Probability (AEP) can be determined by comparing the recorded rainfall totals to Intensity-Frequency-Duration for various durations. Due to large spatial extent of the Hastings River catchment this analysis was undertaken for rainfall data recorded across the upper, middle and lower parts of the catchment.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

New South Wales Rainfall Deciles February 2013
Distribution Based on Gridded Data
Product of the National Climate Centre

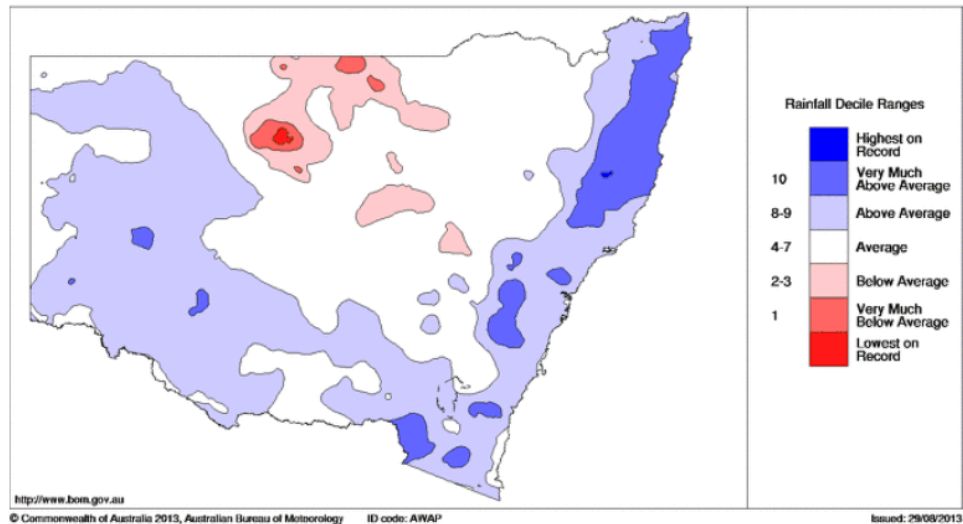


Plate 4.4 Monthly Rainfall Totals across New South Wales

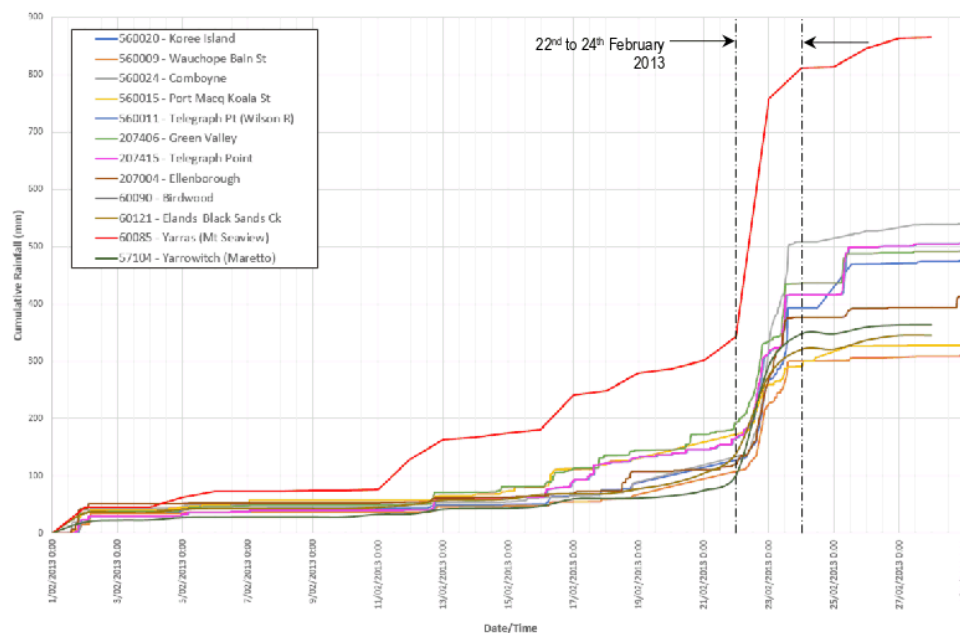


Plate 4.5 Cumulative Rainfall Totals across the Hastings River Catchment for February 2013



Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

As shown in **Plate 4.6**, **Plate 4.7** and **Plate 4.8** for the upper, middle and lower catchments, respectively, a maximum AEP for all gauges and durations of between 2% and 1% AEP was recorded at the Yarras Gauge (60085) for a 24 hour duration.

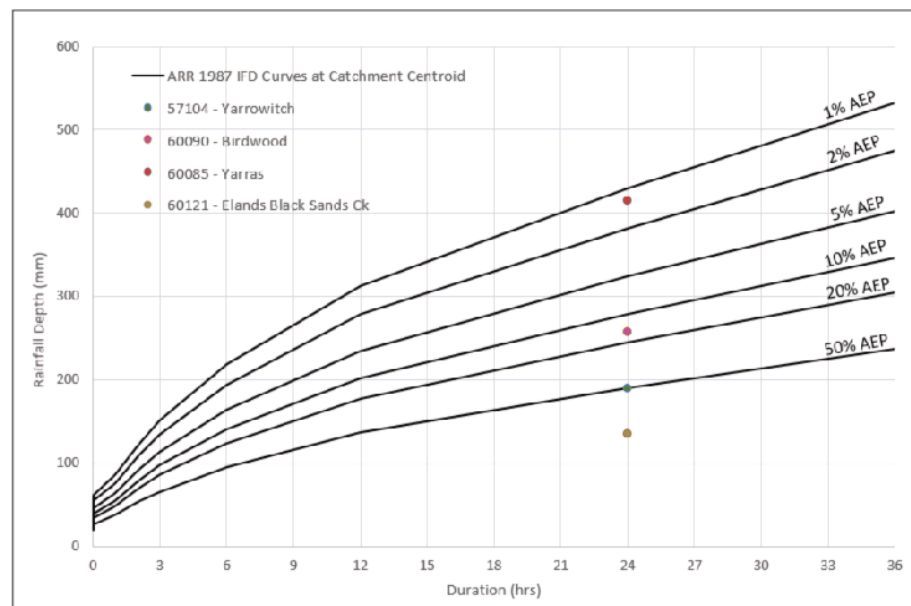


Plate 4.6 Annual Exceedance Probability (AEP) of Rainfall recorded for the February 2013 Event across the Upper Hastings River Catchment

Based on **Plate 4.6**, the rainfall recorded at the Yarras Gauge over a 24 hour period was in the order of a 1.2% AEP event; which is approximately equivalent to an average recurrence interval of 83 years.

It should be noted that each of the Yarras, Yarrawitch, Birdwood and Elands Black Sands Creek rainfall gauges referred to in **Plate 4.6** are daily read rainfall stations; that is, the depth of rainfall is measured once every 24 hours (typically at 9 am). All other gauges within the catchment are continuous recording stations which have the capacity to generate pluviographs. Therefore, for the gauges referred to in **Plate 4.6**, it is only possible to approximate AEPs for the 24-hour duration storm and hence the recorded rainfall is presented as a coloured "dot" corresponding to the different gauges.

The second largest rainfall total for the February 2013 event was recorded at the Comboyne Gauge (560024), which is located in the southern section of the Upper Hastings River Catchment. As shown in **Plate 4.7**, the Comboyne Gauge recorded 325 mm over a 24 hour period. This equates to a 5% AEP event for this duration; ie., equivalent to an average recurrence interval of once every 20 years.

All other gauges across the upper and middle areas of the catchment recorded rainfall that was approximately equivalent to the ARR 87 estimate for the 20% AEP event; ie., equivalent to an average recurrence interval of once every 5 years.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

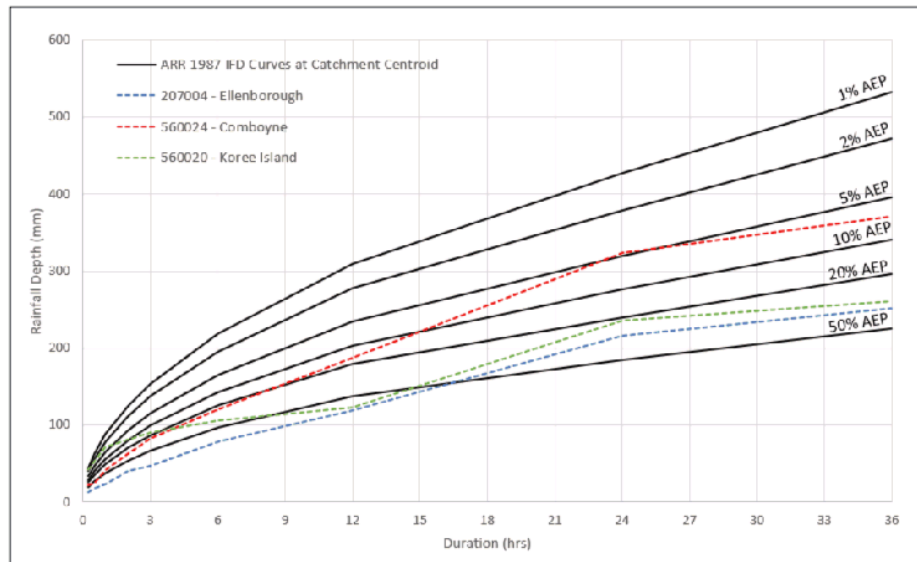


Plate 4.7 Annual Exceedance Probability (AEP) of Rainfall recorded for the February 2013 Event across the Middle Hastings River Catchment

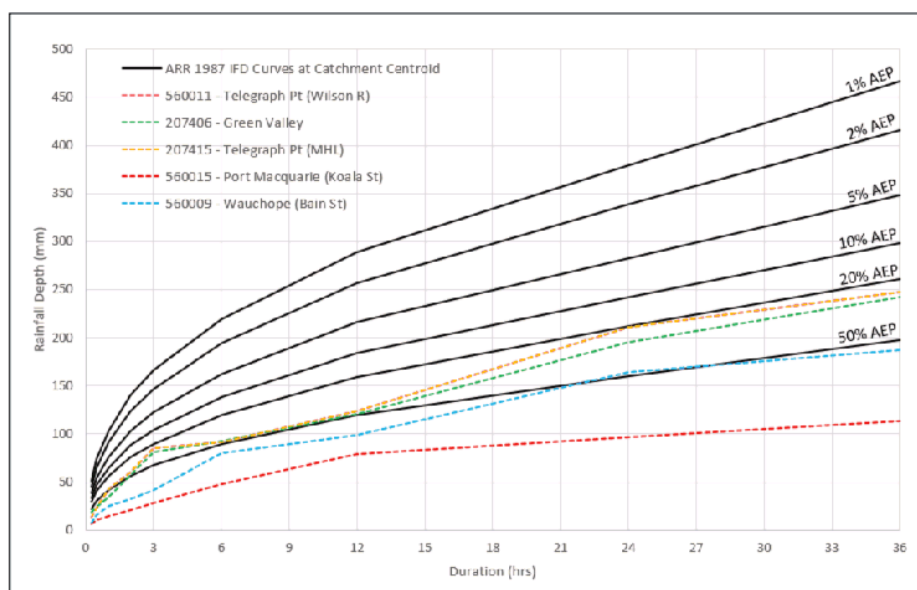


Plate 4.8 Annual Exceedance Probability (AEP) of Rainfall recorded for the February 2013 Event across the Lower Hastings River Catchment



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

4.3.2 Hydraulic Model Inflows – XP-RAFTS Modelling

The validation was completed using an updated version of the XP-RAFTS hydrologic model that was developed as part of the *Updated Hastings River Flood Study (Exhibition Draft, 2018)*. This updated version of the model was adopted as it incorporates increased sub-catchment definition downstream of the boundary inflow locations to the RMA-2 hydraulic model which can be used to validate predicted flows against those recorded at available streamflow gauges.

An overview of the rainfall gauges relied upon and the spatial distribution adopted to simulate the February 2013 event in XP-RAFTS is shown in **Figure 4.11**. Rainfall data from a total of eleven (11) gauges was used to define the rainfall distribution across the catchment.

Due to the lack of pluviometers in the upper catchment, sub-catchments west of Ellenborough and Kindee Bridge relied on daily rainfall totals which were temporally distributed according to the temporal distribution recorded at Ellenborough (207004) and Comboyne (560024), respectively.

Figure 4.12 and **Figure 4.13** provide a comparison between discharge hydrographs simulated using XP-RAFTS and hydrographs derived from rating curves and data recorded at the Ellenborough gauge (*Hastings River*) and at Avenal Gauge (*Wilson River*), respectively.

As shown in **Figure 4.12**, the predicted flow hydrograph at Ellenborough matches well to the recorded data. It has a similar shape to the recorded hydrograph and generates a similar peak discharge ($3,567 \text{ m}^3/\text{s}$ compared to $3,660 \text{ m}^3/\text{s}$).

As shown in **Figure 4.13**, validation of the model to recorded data from the Avenal Gauge is less convincing. It was not possible to match both the recorded peak discharge and the double peak evident in the recorded hydrograph shape. The multiple simulated hydrographs presented in **Figure 4.13** show the extensive scenario testing that was undertaken to achieve better validation by using different combinations of recorded temporal distributions and daily rainfall totals.

Because a reasonable fit between predicted and recorded discharges could not be achieved at the Avenal Gauge (*Wilson River*) it was decided that the recorded flows would be adopted for input into the RMA-2 model. This was the case only for the Wilson River inflow with all other inflows (*boundary and element*) based on results derived from the “validated” XP-RAFTS model.

4.3.3 RMA-2 Model Validation

Validation of the Hibbard RMA-2 model was undertaken by adopting the inflow hydrographs extracted from the XP-RAFTS model at the Hastings River and Maria River inflow locations. For the reasons outlined above, the recorded hydrograph for the Wilson River was adopted as the upstream boundary condition at Telegraph Point. Flows generated from rainfall falling across sub-catchments within the RMA-2 model domain were input as local element inflows.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

A comparison of predicted flood level hydrographs to recorded levels at gauges located within the RMA-2 model domain are shown on:

- **Figure 4.14** for the Hastings River at Wauchope Railway Bridge Gauge (207401)
- **Figure 4.15** for the Wilson River at Telegraph Point Gauge (207415)
- **Figure 4.16** for the Hastings River at Dennis Bridge Gauge (207444)
- **Figure 4.17** for the Hastings River at Settlement Point Gauge (207418), and,
- **Figure 4.18** for the Hastings River at Port Macquarie Gauge (207420).

Flood levels predicted by the RMA-2 model for the February 2013 event are considered to match reasonably well to the recorded data. In particular, the shape of the flood level hydrographs are well replicated and differences in peak levels were generally within 0.2 to 0.3 metres, or better. As the focus of this study is the Hibbard Precinct, the validation evident by the comparisons outlined above were considered to be adequate.

Accordingly, no modifications were made to the RMA-2 model network or adopted roughness parameters to try to improve the validation to recorded gauge data.

A comparison of peak February 2013 flood levels predicted using the Hibbard RMA-2 flood model against flood marks recorded in the vicinity of Hibbard is presented in **Figure 4.19**.

The RMA-2 flood model generates peak flood levels which are in good agreement with the two HWMs surveyed at a residential property located along Boundary Street. Predicted and recorded flood levels are within 0.01 and 0.04 metres at these locations. Predicted flood levels generated from the RMA-2 model are within 0.09 metres of the recorded HWM located along Hibbard Drive and along the river frontage.

A final HWM located on the banks of the 'Southern Cove' is considered to be unreliable due to conflicting information provided by the landowner.

Overall the Hibbard RMA-2 flood model is considered to predict flood levels for the February 2013 event that are in good agreement to the three (3) reliable flood marks located within the study area. The good agreement to these flood marks, and the reasonable agreement to the available gauge records, indicates that the RMA-2 flood model that has been developed for the Hibbard Precinct is a reliable tool for use in predicting design flood characteristics across the precinct.

4.4 Sensitivity Analysis

An analysis was completed for the 1% AEP flood to assess the sensitivity of the results generated by the Hibbard RMA-2 flood model to variations in adopted parameters and to changes to model inputs. The following sensitivity scenarios were simulated.

- **Sensitivity Scenario 1** – Modelling of buildings within the precinct based on the allowing them to be "flooded" but applying a roughness of 0.15 as opposed to having the buildings completely "blocked out" such that no flow travels through them during a simulation.
- **Sensitivity Scenario 2** – 20% increase to the roughness value for all elements within the study area.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

- **Sensitivity Scenario 3** – 20% decrease to the roughness value for all elements within the study area.
- **Sensitivity Scenario 4** – Reduced ocean tailwater levels from peaks of 2.2 mAHd to 0.5 mAHd; reduction by 1.7 metres.

Flood level difference mapping was prepared for each sensitivity scenario and is presented in **Figures 4.20 to 4.23**.

As shown in **Figure 4.20**, peak flood levels for the 1% AEP event were not sensitive to changes to the approach adopted for modelling buildings (*Sensitivity Scenario 1*). By allowing floodwaters to enter the building footprints, albeit with a high roughness value, peak 1% AEP flood levels reduced slightly (*by up to 0.02 metres*) across areas south of Hastings River Drive. The reduction in levels is attributed to a minor increase in available flood storage.

Sensitivity Scenarios 2 and 3 were found to cause the smallest change to peak 1% AEP flood levels across Hibbard. As shown in **Figure 4.21** and **4.22**, the changes to roughness values caused maximum changes to flood levels of +/- 0.01 metres.

It is worth noting again that the changes to roughness values were only applied to those parts of the network within the study area. Areas outside the Hibbard Precinct were not altered from the roughness values adopted in the modelling undertaken for the Updated Hastings River Flood Study (*Exhibition Draft, 2018*).

Sensitivity Scenario 4 generated the largest change in peak 1% AEP flood levels across Hibbard. As shown in **Figure 4.23**, 1% AEP catchment flood levels across Hibbard would be lowered by about 0.35 metres if the assumed peak ocean level is reduced from 2.2 to 0.5 mAHd. This indicates that the level that floodwater reach at Hibbard during large floods is particularly influenced by ocean entrance conditions and specifically ocean storm surge levels. The 1963 flood is considered to be the largest recorded flood in the lower Hastings Valley. It was characterised by elevated ocean levels which prevented floodwaters from the upper catchment discharging to the ocean. This led to elevated flood levels across the area downstream of Dennis Bridge, including Hibbard.

Notwithstanding, the results of Sensitivity Scenario 4 also show that it takes a substantial reduction in ocean level to result in a modest reduction in peak 1% AEP flood level at Hibbard – compare a 1.7 m reduction in ocean level to a resultant reduction in 1% AEP flood level at Hibbard of only 0.35 m. In reality, the meteorology that would generate major flooding in the Hastings Valley is unlikely to be independent of an elevated ocean condition. For example, an East Coast Low similar to that which made landfall at Newcastle in June 2007 is considered to be characteristic of the weather event that would cause major flooding in the Hastings. East Coast Lows typically generate ocean levels that exceed 1.8 mAHd.

Therefore, although the choice of ocean level for modelling is shown by Sensitivity Scenario 4 to have the potential to lower 1% AEP flood levels at Hibbard, the adoption of an ocean level for the generation of flood levels for planning purposes (*e.g., setting minimum floor levels for residential development*) would necessitate the adoption of an ocean level of 1.8 mAHd or higher, which in turn would result in very little reduction in the 1% AEP flood levels generated for this report.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

5 DESIGN EVENT MODELLING

5.1 General

Design floods are hypothetical floods that are commonly used for planning and floodplain risk management investigations. Design floods are based on statistical analysis of rainfall and flood records and are defined by their probability of occurrence. For example, a 1% Annual Exceedance Probability (AEP) flood is the best estimate of a flood that will have a 1 chance in 100 of occurring in any given year.

Design floods can also be expressed by their expected interval of occurrence, for example the 1% AEP flood can also be expressed as the 100 year Average Recurrence Interval (ARI) flood. That is, it represents a flood that is likely to occur on average, once in every one hundred years.

It should be noted that there is no guarantee that the design 1% AEP flood will occur just once in a one hundred year period. It may occur more than once, or at no time at all in the one hundred year period. This is because the design floods are based upon a statistical 'average'.

5.2 Hydrodynamic Modelling

5.2.1 Design Simulations

The Hibbard RMA-2 flood model that was developed for the project was used to simulate flooding of the Hastings River across the Hibbard Precinct and adjoining floodplain. The model was used to simulate the design 5% and 1% AEP flood events, and an adopted Extreme Flood.

The design simulations were based on a range of boundary condition data which is described in the following sections.

5.2.2 Inflow Hydrographs

Upstream boundary conditions were defined for each design flood based on the inflow hydrographs generated using the RAFTS hydrologic model developed as part of the *Lower Hastings River Flood Study (2006)*. In that regard, the adopted inflow hydrographs are unchanged to those adopted for the 2006 Flood Study.

The peak flows for each design event at the three upstream inflow locations to the RMA-2 model are listed in **Table 5.1**. As shown in **Table 5.1**, the adopted Extreme flood event has been assumed to correspond to a flood that is three (3) times the magnitude of the peak flow for the 1% AEP flood. Inflow hydrographs for the 5% and 1% AEP floods and the adopted Extreme Flood are shown graphically in **Figures 5.1 to 5.3** for the Hastings, Wilson and Maria Rivers, respectively.

5.2.3 Ocean Levels

Ocean boundary conditions for each design flood are defined based on the varying tide levels adopted as part of the *Lower Hastings River Flood Study (2006)*. Accordingly, a varying tidal boundary condition with a peak level of 2.2 mAHd was adopted for all design flood simulations.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

The adopted tidal boundary condition is shown graphically in **Figure 5.4**.

Table 5.1 Peak Flows for Design Events Extracted from the Flood Study (2006)

Inflow Location	Peak Flow (m^3/s)		
	5% AEP Event	1% AEP Event	Extreme Flood
Hastings River	4,565	6,848	20,550
Wilson River	1,740	2,707	8,115
Maria River	420	711	2,130

5.3 Design Flood Modelling Results

5.3.1 Peak Flood Levels and Extents

Peak flood level estimates were extracted from the modelling results and were used to generate flood extent and flood level plots for each design events. The plots show the variation in flood levels across the Hibbard Precinct at contour intervals of 0.1 metres. Mapping for the 5% and 1% AEP flood events are shown in **Figures 5.5** and **5.6**, respectively. Mapping for the adopted extreme event is presented in **Figure 5.7**.

The variations in peak flood levels between design events are listed in **Table 5.2** for six points scattered across the Hibbard Precinct. The locations of each point selected for this comparison are identified on **Figures 5.5** to **5.7**.

Table 5.2 Comparison of Peak Flood Levels Predicted for Each Design Event at Points Throughout the Hibbard Precinct

Flood Level Comparison Points [^]	Predicted Flood Levels (m AHD)		
	5% AEP Flood	1% AEP Flood	Extreme Flood Event
A	2.53	3.24	7.57
B	2.53	3.23	7.51
C	2.53	3.23	7.38
D	2.50	3.12	7.35
E	2.51	3.16	7.40
F	2.40	2.95	7.26
G	2.39	2.96	7.12
H	2.35	2.88	7.00

[^] Point locations are identified on **Figures 5.5** to **5.7**

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

5.3.2 Peak Flood Depths

Peak flood depth estimates were extracted from the flood modelling results and were used to generate depth mapping for each of the design events. The plots show the variation in flood depths across Hibbard at the peak of each event.

Peak depths for the 5% AEP flood event are shown in **Figure 5.8**. The variations in flood depths are shown at intervals of 0.3 metres and for depths up to 3.0 metres. As shown in **Figure 5.8**, flood depths are predicted to exceed 3.0 metres only within watercourses such as creek and river channels (*refer yellow shading*).

Similar mapping of peak flood depths for the 1% AEP flood event is presented in **Figure 5.9**. Depths for the 1% AEP event are shown at 0.5 metres and to a maximum depth of 5.0 metres. Flood depths are only predicted to exceed 5 metres within the Hastings River channel and in parts of the canal subdivision located downstream of Hibbard.

Flood depth mapping for the adopted extreme flood event are shown in **Figure 5.10**. Depth mapping is presented at intervals of 1.0 metre to a maximum depth of 8.0 metres.

As shown in **Figure 5.10**, most of Hibbard is predicted to be inundated to flood depths of between 4.5 to 7.0 metres at the peak of the extreme event.

5.3.3 Peak Flow Velocities

Mapping showing the variation in peak flow velocities predicted across Hibbard for the 5% and 1% AEP floods and the adopted Extreme event are shown in **Figures 5.11 to 5.13**, respectively.

The mapping indicates that flow velocities for the 5% AEP event will generally range between 0.0 and 0.4 m/s across Hibbard (*refer Figure 5.11*). Flow velocities are predicted to increase slightly for the 1% AEP flood with typical velocities of between 0.1 and 0.5 m/s across Hibbard (*refer Figure 5.12*). Localised flow paths with higher velocities are shown to form in between buildings and at locations where road embankments are overtopped.

For the extreme flood event, peak flow velocities are predicted to range between 0.3 and 1.2 m/s across Hibbard (*refer Figure 5.13*).

5.3.4 Comparison to Previous Studies

Flood level difference maps have been prepared to compare the Hibbard Precinct RMA-2 results to those generated as part of previous studies (*refer Section 3.3*). The comparison plots have been prepared to cover the entire model domain with an inset included focusing on the Hibbard Precinct.

Table 5.3 lists the design events simulated as part of the Hibbard Precinct study along with any previous simulations from previous studies for which a comparison plot has been prepared.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Table 5.3 Comparison of Hibbard Design Flood Modelling Results to Results Determined from Previous Studies

Design Flood Event	Previous Studies	
	Lower Hastings River Flood Study (2006)	Updated Hastings River Flood Study (Exhibition Draft, 2018)
5% AEP	Refer Figure C1 in Appendix C	/
1% AEP	Refer Figure C2 in Appendix C	Refer Figure C3 in Appendix C
1% AEP Climate Change Scenario	/	Refer Figure C5 in Appendix C
Extreme Flood	Refer Figure C4 in Appendix C	/



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

6 IMPACT OF CLIMATE CHANGE ON FLOOD CHARACTERISTICS

6.1 Background

A detailed assessment of the potential impact of climate change on peak flood levels in the Hastings River was recently completed and documented in the *Updated Hastings River Flood Study (Exhibition Draft, 2018)*. The updated flood study included assessment and modelling of five climate change scenarios with different magnitudes of sea level rise and/or increases in rainfall intensities.

The five climate change scenarios considered were:

- Scenario 1 - 1% AEP catchment event with 900 mm Sea Level Rise (SLR) + 10% increase in rainfall intensity and volume
- Scenario 2 - 1% AEP catchment event with 900 mm SLR
- Scenario 3 - 1% AEP catchment event with 400mm SLR + 10% increase in rainfall intensity and volume
- Scenario 4 - 1% AEP catchment event with 400 mm SLR
- Scenario 5 - Extreme event with 900 mm SLR
(900mm SLR applied to the adopted 100yr Tide_2.2 mAHD)

The report recommended that Climate Change Scenario 1 be adopted for the purpose of flood planning and floodplain management (i.e., a 1% AEP event with 900 mm Sea Level Rise and 10% increase in rainfall intensity).

Scenario 1 is also consistent with the NSW Sea Level Rise Policy Statement benchmarks, existing planning directions of Port-Macquarie Hastings Council, and reflects the certainties of sea level rise while acknowledging the limitations of the predicted rainfall increases. Although the NSW Sea Level Rise Policy is no longer in effect, the guideline documents are still considered to represent a reliable guide to the potential changes to sea levels and rainfall intensities due to climate change.

6.2 Modelling of Climate Change Impacts

6.2.1 Boundary Conditions

The boundary conditions adopted in the modelling undertaken for the *Updated Hastings River Flood Study (Exhibition Draft, 2018)* were also assumed to assess the potential impact of climate change on peak flood levels for the Hibbard Precinct. That is, Climate Change Scenario 1 was applied using the Hibbard Precinct RMA-2 flood model.

The magnitude of flows entering the RMA-2 flood model at the peak of the 1% AEP event with and without climate change are listed in **Table 6.1**. As shown in **Table 6.1**, a 10% increase in rainfall intensities during the design 1% AEP rainfall event is predicted to increase peak flows entering the study area by between 15.3% and 19.3%.


Advisian

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Table 6.1 Comparison between Existing and Predicted Year 2100 Flood Flows

Inflow Location	Peak Flow (m^3/s)		Difference (%)
	1% AEP Event	1% AEP Event with 10% Rainfall Increase	
Hastings River	6,848	7,896	+15
Wilson River	2,707	3,122	+15
Maria River	711	848	+19

The ocean boundary conditions used for modelling of the 1% AEP event was modified by increasing the tidal elevation at each timestep in the simulation by 900mm. This resulted in a peak tidal elevation for Climate Change Scenario 1 of 3.1 mAHD; i.e., 2.2 mAHD plus 0.9 metres SLR.

6.2.2 Results

Predicted flood levels and extents at the peak of the adopted 1% AEP climate change scenario are shown in **Figure 6.1**. Variations in flood depths and flow velocities are shown in **Figures 6.2** and **6.3**.

A comparison of flood levels across the Hibbard Precinct for the 1% AEP flood with and without climate change are listed in **Table 6.2**. The location of each comparison point is identified on **Figure 6.1**.

Table 6.2 Comparison of Peak Flood Levels Predicted for Each Design Event at Points Throughout the Hibbard Precinct

Flood Level Comparison Points	Predicted Flood Levels (mAHD)		
	1% AEP Flood	1% AEP Flood with Climate Change	Difference
A	3.24	3.92	+ 0.68 m
B	3.23	3.87	+ 0.64 m
C	3.23	3.85	+ 0.62 m
D	3.12	3.82	+ 0.70 m
E	3.16	3.82	+ 0.66 m
F	2.95	3.72	+ 0.77 m
G	2.96	3.69	+ 0.73 m
H	2.88	3.63	+ 0.75 m

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Difference mapping comparing peak flood levels predicted for the 1% AEP flood with climate change based on modelling undertaken using the Hibbard RMA-2 hydrodynamic model to the results documented in the *Updated Hastings River Flood Study (Exhibition Draft, 2018)* are shown in **Figure C5 of Appendix C**.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

7 PROVISIONAL HAZARD MAPPING

7.1 Adopted Criteria

The personal danger and physical property damage caused by a flood varies both in time and place across the floodplain. Accordingly, the variability of flood patterns across the floodplain over the full range of floods, needs to be understood by flood prone landholders and by floodplain risk managers.

Representation of the variability of flood hazard across the floodplain provides floodplain risk managers with a tool to assess the existing flood risk and to determine the suitability of land use and future development. The hazard associated with a flood is represented by the static and dynamic energy of the flow, which is in essence, the depth and velocity of the floodwaters. Therefore, the flood hazard at a particular location within the floodplain, is a function of the velocity and depth of the floodwaters at that location.

The NSW Government's '*Floodplain Development Manual*' (2005), characterises hazards associated with flooding into a combination of three hydraulic categories and two hazard categories. Hazard categories are broken down into high and low hazard for each hydraulic category as follows:

- | | |
|------------------------------|-------------------------------|
| ▪ Low Hazard – Flood Fringe | ▪ High Hazard – Flood Fringe |
| ▪ Low Hazard – Flood Storage | ▪ High Hazard – Flood Storage |
| ▪ Low Hazard – Floodway | ▪ High Hazard – Floodway |

As a result, the manual effectively divides hazard into two categories, namely, high and low. An interpretation of the hazard at a particular site can be established from **Figures L1** and **L2** on the following page, which have been taken directly from the manual.

As shown in the **Figures L1** and **L2**, flood hazard is a measure of the degree of difficulty that pedestrians, cars and other vehicles will have in egressing flooded areas, and the likely damage to property and infrastructure. At low hazard, passenger cars and pedestrians (adults) are able to move out of a flooded area. At high hazard, wading becomes unsafe, cars are immobilised and damage to light timber-framed houses would occur.

Figure L1 and **L2** show that the flood hazard throughout the floodplain is categorised according to a combination of the flow velocity and the depth of floodwaters. The hazard categories are defined by lower and upper bound values for the product of flow velocity and floodwater depth.

The '*Hastings River Flood Study*' (2006) found that by adopting the Low and High criteria for hazards defined in the '*Floodplain Development Manual*' (2005) the majority of land within the lower Hastings Valley would be classified as high hazard for large events such as the 1% AEP flood. For the purposes of better understanding the variability of hazard throughout the floodplain the high hazard category was further subdivided into High Hazard, Very High Hazard and Extreme Hazard. Similarly, the low hazard category defined in the manual was subdivided to create Low Hazard and Medium Hazard categories.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

This greater discretisation of hazards was adopted as it allows for a greater understanding of the flood hazard affecting existing development and areas of potential future development, the low and high hazard categories were further subdivided. A summary of the criteria adopted for each hazard category is listed in **Table 7.1** and shown in **Plate 7.1**.

TABLE 7.1 ADOPTED HAZARD CRITERIA

HAZARD CATEGORY	CRITERIA	PRACTICAL APPLICATION
Low	<ul style="list-style-type: none"> Depth (d) < 0.4m & Velocity (v) < 0.5m/s 	<ul style="list-style-type: none"> Suitable for cars
Medium	<ul style="list-style-type: none"> exceeding Low criteria, and $d \leq 0.8m$, $v \leq 2.0m/s$, and $vxd \leq 0.5$ 	<ul style="list-style-type: none"> Suitable for heavy vehicles and wading by able bodied adults
High	<ul style="list-style-type: none"> exceeding Medium criteria, and $d \leq 1.8m$, $v \leq 2.0m/s$, and $vxd \leq 1.5$ 	<ul style="list-style-type: none"> Suitable for light construction, timber frame, brick veneer etc
Very High	<ul style="list-style-type: none"> exceeding High criteria, and $0.5m/s < \text{velocity} < 4m/s$ and $vxd \leq 2.5$ 	<ul style="list-style-type: none"> Suitable for heavy construction, steel frame, concrete etc
Extreme	<ul style="list-style-type: none"> exceeding Very High criteria and $v > 5m/s$ 	<ul style="list-style-type: none"> Unsuitable for development - indicates significant conveyance of flow or floodway

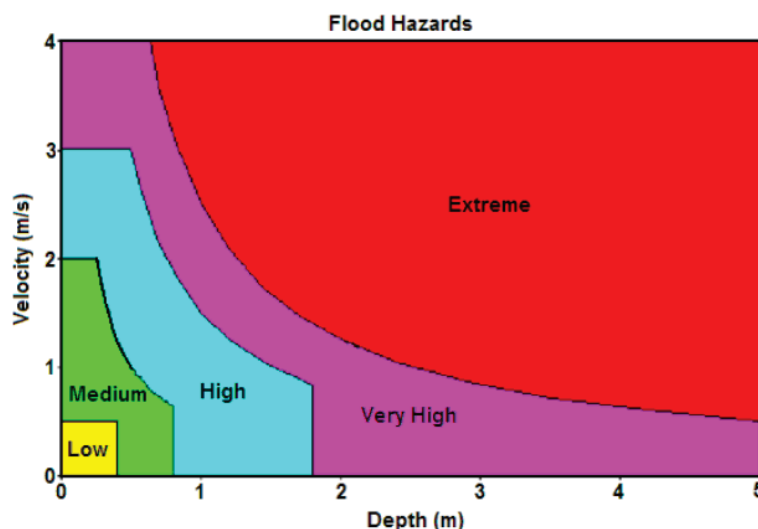


PLATE 7.1 CHART OF ADOPTED HAZARD CRITERIA

7.2 Updated Provisional Flood Hazards

The modelling results described in **Section 5** for design flood events and **Section 6** for the adopted climate change scenario we used to prepare provisional flood hazard mapping for the Hibbard Precinct. Accordingly, the model results were analysed to determine those parts of the



Port Macquarie Hastings Council
Hibbard Precinct Flood Study

floodplain that fall within each of the Low, Medium, High, Very High and Extreme Hazard categories that are listed in **Table 7.1**.

Provisional flood hazard mapping for the 5% and 1% AEP floods and the adopted climate change scenario (*refer Section 6*) are presented in **Figures 7.1 to 7.3**, respectively.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

8 UPDATED HYDRAULIC CATEGORIES

8.1 General

A major component of the Hibbard Precinct Flood Study is the re-assessment of hydraulic categories in the vicinity of Hibbard. This has involved a review of the existing floodway corridor, which when defined as part of the *Hastings River Floodplain Risk Management Study (2012)*, was based on modelling that was broad scale and which reflected the regional focus of that study.

As discussed in **Section 4.2**, the regional Hastings River flood model has been updated to incorporate additional detail in the Hibbard area. The updates include network refinement to incorporate building footprints, hydraulic controls such as impervious fences, culverts, bridges and road crests, as well as general refinements to better reflect the floodplain topography. These updates have resulted in a flood model that has greater capacity to simulate the pattern of flooding through Hibbard which in turn, can be used to better define the hydraulic function of areas within the precinct.

8.2 Definitions

The NSW Floodplain Development Manual (2005) defines three hydraulic categories of flood prone land; viz., floodway, flood storage and flood fringe. Each of these hydraulic categories are combined with flood hazard to define the variation in risk across flood-prone areas. The combination of hydraulic categories and flood hazard can be used to assess the risk to existing development and to identify appropriate types of development for different areas of the floodplain.

Floodways are those areas of a floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels and are areas that if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood level. By definition, floodways are areas of high flow conveyance and can often be identified by areas of high flow velocity (*NSW Office of Environment & Heritage, 2013*).

The blocking of floodways typically results in significant impacts on flood characteristics such as increases in predicted peak flood level and changes in flow velocities. Therefore, it is important to define floodways in floodplain risk management so that areas where development is undesirable can be identified.

8.3 Previous Investigations

Hydraulic category mapping for the lower Hastings River floodplain is documented in Section 9 of the *Hastings River Floodplain Risk Management Study (2012)*.

In order to delineate the floodway corridor a three-stage approach was adopted based on a methodology outlined by Thomas et al (2012). Stage 1 of this approach involved delineation of a 'preliminary' floodway extent that was based on a detailed review of existing flood modelling results that considered the following:

- the location of flood storages readily identifiable from aerial photography;



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

- available ALS / LiDAR terrain data;
- the location and potential impacts of hydraulic controls;
- mapping of contours of 'velocity-depth' product ($V \times D$);
- mapping of the variation in flood depths and peak flow velocities; and,
- the distribution of floodwater flow, including the area required to carry 80% of the peak flow in the 1% AEP flood.

The 'preliminary' floodway corridor determined from this Stage 1 analysis was then tested and verified as part of the second stage of the process which involved selective encroachment analysis.

The Stage 2 analysis involved flood modelling to test whether the "blockage" of areas outside of the preliminary floodway corridor would result in significant increases in local flood levels; i.e., increases of more than 100 mm. Where encroachment modelling results in flood level increases that are greater than 100 mm it follows that the preliminary floodway corridor is too narrow requiring it to be widened and re-tested. This iterative approach led to the development of the Stage 2 floodway corridor.

The final and third stage involved a joint review of the Stage 2 floodway corridor by representatives from Council, the Office of Environment and Heritage (OEH) and Advisian (*WorleyParsons at the time*). The review relied upon flood engineering judgement and experience and a practical "common sense" check of the floodway line against cadastral and property constraints to "fine tune" the floodway extent mapping

Once the floodway extent was defined, investigations were undertaken to determine the flood storage and flood fringe. In order to determine the boundary between flood storage and fringe, the variation in peak flood depths in areas outside of the floodway extent were mapped. A depth of 0.3 metres was selected as the transitional point between flood storage and fringe; i.e., an area is designated as flood fringe if the flood depths are 0.3 metres or less.

8.4 Re-Assessment of the Hibbard Floodway Corridor

As discussed in **Section 8.3**, the floodway corridor determined as part of the Hastings River FRMS (2012) was delineated based on a review of predicted flood behaviour and then tested and further refined by encroachment modelling. Because both of these stages of assessment relied on the broad scale flood model developed as part of the *Lower Hastings River Flood Study* (2006) there existed limitations in the amount of local scale detail that could be taken into consideration. Having the local scale detail is especially important in urbanised areas such as Hibbard where floodwaters can be obstructed and/or re-directed by hydraulic controls such as buildings, fences and road embankments.

These localised features have now been incorporated into the Lower Hastings River/Hibbard Precinct flood model and the refined model has been used to re-simulate design flood conditions. With this new information available a re-assessment of the floodway corridor was undertaken by applying the same methodology adopted for the *Lower Hastings Floodplain Risk Management Study* (2012). The method also considered the findings of additional research documented in Thomas et al (2018).

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

As the floodway re-assessment was focused only on a localised part of the lower Hastings River floodplain that covers less than 1% of the total floodplain assessed as part of the floodplain risk management study, it is possible that the previously adopted flood level increase criteria, that is the 100 mm increase, may not be entirely applicable.

This recognises that the encroachment/blockage testing will be applied only to the southern floodplain and the presence of a significant flood storage area upstream of Hibbard which would dampen the peak magnitude of any resulting increases in flood levels.

The applicability of the increase threshold value, and the findings of the Stage 1 and Stage 2 investigations are documented in the following sections.

8.4.1 Applicability of the Stage 2 Flood Level Increase Criteria

As discussed in **Section 8.3**, the Stage 2 analysis undertaken as part of the FRMS (2012) involved flood modelling to test whether the “blockage” of areas outside of the Stage 1 floodway corridor would result in flood level increases of more than 100 mm. Where the encroachment modelling indicated that flood level increases were greater than 100 mm, this indicated the floodway corridor was too narrow requiring it to be widened and re-tested.

Although this same approach can be applied to test floodway corridors at Hibbard the 100 mm increase criteria may only be applicable at a ‘local’ scale such as directly against a blockage point instead of across a widespread area. This is particularly the case for any flood level increases that extend upstream of Hibbard (*i.e.*, west of Tuffins Lane) due to the large flood storage area located upstream and to the south-west which would act to dampen the peak magnitude of any increase in flood level due to a localised floodway encroachment.

A secondary reason the 100 mm increase criteria will not be possible to achieve over an extended area is due to the encroachment/blockage testing applying only to Hibbard and the southern floodplain.

In that regard, the encroachment/blockage scenarios will not apply to the full “width” of the floodplain which would typically be necessary to cause the widespread 100mm increase to occur. For example, the main Hastings River channel and the Kings Point floodway channel crossing were retained as “unblocked” flow paths during the analysis carried out to assess the extent of the Hibbard Precinct floodway.

Notwithstanding, the encroachment/blockage modelling can still be applied at Hibbard to test whether a proposed floodway extent has been sized sufficiently for the passage of local flood flows. Accordingly, the 100 mm criteria was adopted and used to assess the impact of encroachment scenarios on peak flood levels immediately upstream of Hibbard or adjacent to the floodway itself.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

8.4.2 Stage 1 – Delineating the Floodway based on Existing Modelling Results

The Stage 1 analysis involved a detailed review of the flood modelling results documented in **Section 5.3**.

The analysis involved identifying those parts of the floodplain across which velocities, depths and the velocity-depth product were 'locally' high and indicative of an area with high hydraulic importance and/or an area conveying a significant amount of the flow occurring 'locally'. The emphasis on 'locally' is included to reinforce that floodway runners can be formed away from and separate to the greater floodplain. This scenario of a flood runner is considered applicable to the Hibbard Precinct with floodwaters arriving overland from the west and not from flows leaving the Hastings River which is located immediately north of the Precinct (*refer Figure 8.1*).

This separation of the flows that are conveyed through Hibbard from those to the north (*within the Hastings River and the northern floodplain*) is evident by comparing the magnitude of the velocity-depth product.

In that regard, the velocity-depth product for the 1% AEP event across Hibbard is predicted to reach up to 1.2 m²/s compared to 2.6 m²/s across the floodplain north of the Hastings River (*refer Figure 8.1*). The difference in flood characteristics is even more evident when comparing the magnitude of flows through the northern and southern (*Hibbard Precinct*) floodplains at the peak of the 1% AEP flood.

As shown in **Figure 8.1**, a peak flow magnitude of 900 m³/s is predicted across the northern floodplain compared to 280 m³/s through Hibbard.

Application of Stage 1 of the assessment procedure led to identification of a 'preliminary' floodway extent for the Hibbard Precinct. This is shown in **Figure 8.2**.

The Stage 1 floodway corridor includes a main floodway arm that crosses Tuffins Lane before turning towards the north to cross Hastings River Drive. Before crossing Hastings River Drive the floodway arm splits into two branches which flow to the east and west of the Riverside Resort and the brick fence that exists along its frontage (*refer Figure 8.2*).

A secondary floodway arm that starts immediately east and downstream of Tuffins Lane conveys floodwaters through the Ultiqa Village Resort and along the narrow canal and creek system. As shown in **Figure 8.2**, this floodway arm joins the western floodway branch upstream of Hastings River Drive.

In determining the Stage 1 floodway corridor, flow distributions were analysed relative to the predicted velocity-depth product. As shown in **Figure 8.2**, the Stage 1 floodway corridor aligns generally well with a velocity-depth value in the range of 0.7 m²/s to 1.2 m²/s.

Although there are several locations where flow paths exhibit velocity-depth values within or near this range these were not included as they either conveyed a relatively (*assessed based on local flow distributions*) low proportion of the local flow and/or were separated from the main floodway arm by a band of lesser hydraulic importance. For locations falling in the latter category inclusion of the area was only considered where it was required to maintain the conveyance capacity of the corridor.

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

Thomas et al (2012 and 2018) and the Hastings River FRMS (2012) determined that for most situations the area of the floodplain that conveys 80% of the peak 1% AEP flow is representative of the floodway extent. However, a strict application of this criterion to the Hibbard Precinct, when considered in isolation, is not considered appropriate. This is because if the full width of the Hastings floodplain at Hibbard is considered, those areas to the north of Hibbard that were identified in the 2102 FRMS already convey over 80% of the total flow.

Therefore, in applying a flow criterion to the Hibbard floodway arm a value of 60% of the total local flow was initially adopted.

8.4.3 Stage 2 – Encroachment/Blockage Modelling

Encroachment modelling was undertaken for the Stage 1 floodway corridor to assess whether the corridor was sufficiently sized to ensure all local flows could be conveyed without causing flood level increases of greater than 100 mm locally and adjacent to blockage locations.

Five encroachment scenarios were set-up and simulated by gradually increasing the encroachment extent. This approach was adopted in lieu of simulating a single scenario in which the whole floodway extent was blocked on the basis that any impacts at the upstream limit of testing could influence impacts for sections downstream. Therefore, this issue was avoided by simulating gradual increases in the encroachment extent.

The results of the five encroachment scenarios are presented as flood level difference mapping in **Figure 8.3** to **Figure 8.7**.

The flood level difference plots indicate that the maximum flood level increase caused by any of the modelled scenarios is predicted to be 100 mm. This maximum increase occurs for the second encroachment scenario. This scenario was the first to include blockages to areas outside of both floodway arms, including blockage of Boundary Street (refer **Figure 8.4**). This indicates that the width of both floodway arms is sufficient to ensure flood level increases locally do not exceed 100 mm.

For all other blockage/encroachment scenarios the maximum flood level increase is predicted to be 50 mm. Although this magnitude of increase is below the target criteria of 100 mm, the large spatial extent across which it occurs (*extending approximately 4.2 km upstream to Dennis Bridge and the Pacific Highway and 5.0 km to the south-west into the large flood storage area*) makes it an unreasonable target (refer discussion under **Section 8.4.1**).

In order to confirm the importance of maintaining the two floodway arms that cross Hastings River Drive to the west and east of the Riverside Resort, a final encroachment scenario was run that blocks the eastern floodway arm as far south as Hastings River Drive. As shown in **Figure 8.8**, blockage of the eastern floodway arm causes flood levels to increase locally by up to 120 mm, which is in excess of the 100 mm criterion.

As for other blockage scenarios, the extent of flood level increases are significant. They extend across all of Hibbard and include areas upstream and west of Tuffins Lane.

**Advisian**

WorleyParsons Group

Port Macquarie Hastings Council

Hibbard Precinct Flood Study

8.4.4 Final Floodway Extent

The Stage 2 encroachment modelling shows that the Stage 1 floodway corridor will lead to flood level increases locally of up to 100 mm (*refer Figure 8.4*). Blockage of the eastern floodway arm is predicted to cause flood levels to increase locally by up to 120 mm which is above the threshold target and therefore indicates blockage of a floodway (*refer Figure 8.8*).

Although flood level increases further upstream of the two floodway arms are only predicted to reach up to 50 mm, these increases are effectively “damped” by the extensive floodplain storage upstream and to the south-west of Hibbard. This floodplain storage feeds floodwaters into the Hibbard floodway during major flooding of the Hastings River. Although the predicted increases are less than the 100 mm criteria that is typically adopted, the extent of the floodplain over which they would occur indicates that the associated blockage of the Hibbard floodway arms would result in significant impacts (*refer Figure 8.4 to Figure 8.7*).

Therefore, based on the discussion above and the results of the Stage 2 encroachment modelling, it is proposed that the floodway corridor delineated through the Stage 1 analysis be adopted for the Hibbard Precinct.

8.5 Flood Storage and Fringe

As discussed in **Section 8.2**, in the Hastings River FRMS (2012) the transition between areas categorised as flood storage and flood fringe was delineated based on mapping flood depths of up to 0.3 metres. Accordingly, flood storage and flood fringe were defined as:

- Flood Storage - those parts of the floodway outside of the floodway corridor and with depths of over 0.3 metres at the peak of the 1% AEP flood.
- Flood Fringe - those parts of the floodway outside of the floodway corridor and with depths of up to 0.3 metres at the peak of the 1% AEP flood.

It is proposed that these criteria for flood storage and fringe areas be retained for the mapping of hydraulic categories at Hibbard.

Notwithstanding, as design flood behaviour has changed as a function of the hydraulic model updates made as part of this study (*refer Section 4.2*) remapping of storage and fringe areas is recommended.

8.6 Hydraulic Category Mapping for the Hibbard Precinct

Mapping of hydraulic categories for the Hibbard Precinct are shown in **Figure 8.9** for the 1% AEP flood.

**Advisian**
WorleyParsons GroupPort Macquarie Hastings Council
Hibbard Precinct Flood Study

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The Hibbard Precinct is an area to the west of Port Macquarie that has developed as “strip” development adjacent to Hastings River Drive which served historically as the major connection between the CBD and the Pacific Highway. Development occurred due to proximity to infrastructure, the river and Port Macquarie Regional Airport. This includes service industries to support the airport, tourism facilities including accommodation, and more recently, commercial and bulky goods development that could take advantage of the relatively flat land and good access afforded by the road network.

However, parts of Hibbard are very low lying and have historically served to convey floodwaters from the extensive flood storage area located to the south west of the airport back into the main channel of the Hastings River. The *Hastings River Floodplain Risk Management Study (2012)* identified the importance of the connection between this flood storage and the main channel of the Hastings River. Investigations completed for the FRMS identified a provisional floodway corridor through the Hibbard Precinct and sought to formally recognise the need for the free passage of floodwaters to be maintained into the future.

Notwithstanding, the FRMS recognised that floodway mapping prepared at that time was based on a broad scale assessment of flood characteristics commensurate with the valley wide scale of the study. The FRMS recommended that a more detailed investigation was required to confirm the existence of a floodway through the Hibbard Precinct, and if one existed, to more accurately define its extent and function.

Investigations completed for this study have confirmed that a floodway corridor does exist through the Hibbard Precinct. Flood modelling of blockage scenarios has established that if a floodway is not retained through the Hibbard Precinct then 1% AEP flood levels in areas upstream and particularly to the south-west can be expected increase. This could reduce the level of service currently afforded by important infrastructure, including the Port Macquarie Regional Airport.

Notwithstanding, the investigations have established that the extent of the floodway required is less than the extent that was provisionally determined as part of the 2012 FRMS. The recommended floodway is presented in **Figure 8.9**.

9.2 Recommendations

The follow recommendations are made:

- (i) Revised 1% AEP flood levels for the Hibbard Precinct be adopted based on the peak flood levels presented in **Figure 5.6** and **Table 5.2**.
- (ii) Revised 1% AEP Hazard Categories be adopted based on the mapping presented in **Figure 7.2**.
- (iii) Revised Hydraulic Categories, including the “new” floodway, be adopted based on the mapping presented in **Figure 8.9**.



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

- (iv) Revised Flood Planning Levels for the Hibbard Precinct be considered in the floodplain risk management study phase



Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

10 REFERENCES

- Australian Institute for Disaster Resilience (2017), "*Australian Disaster Resilience Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia*"; © Commonwealth of Australia 2017 third edition.
- Department of Environment & Climate Change (2007), '*Floodplain Risk Management Guideline – Practical Consideration of Climate Change*'
- Department of Environment, Climate Change & Water (2009), '*Scientific Basis of the 2009 Sea Level Rise Benchmark – Draft Technical Note*'
- Department of Environment, Climate Change & Water (2009), '*Draft Flood Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments*'
- Department of Infrastructure, Planning & Natural Resources (May 2005), '*Floodplain Risk Management Guideline No 5 – Ocean Boundary Conditions*'; Developed by the State Urban Flood Unit
- NSW Government (April 2005), '*Floodplain Development Manual: the Management of Flood Liable Land*'; ISBN 0 7347 5476 0
- NSW Government (2007), '*Floodplain Risk Management Guideline – Floodway Definition*'; prepared by NSW Office of Environment & Heritage
- Port Macquarie-Hastings Council (2006), '*Hastings River Flood Study*'; prepared by Patterson Britton & Partners (now WorleyParsons)
- Port-Macquarie Hastings Council (2012), '*Hastings River Floodplain Risk Management Study*', prepared by WorleyParsons
- Port-Macquarie-Hastings Council (2018), '*Hastings Flood Study Update (Exhibition Draft)*', prepared by Advisian (part of the WorleyParsons group)
- Port Macquarie – Hastings Council (September, 2015), '*Port Macquarie Hastings LGA Flood Policy*'
- Port Macquarie – Hastings Council, '*Port Macquarie-Hastings Council – Development Control Plan 2013*'
- Port Macquarie-Hastings Council (2011), '*Port Macquarie-Hastings Local Environmental Plan 2011*'
- Thomas C R & Golaszewski, R (2012), '*Refinement of Procedures for Floodway Definition*'; Proceedings of 52nd Annual Floodplain Management Authorities Conference, Narooma, February 2012
- Thomas C R, Golaszewski R & Cox R (2018), '*Methodology for Determining Floodway / Flow Conveyance Extent in Australian Floodplains*'; Proceedings of Hydrology and Water Resources Symposium, Melbourne, December 2018

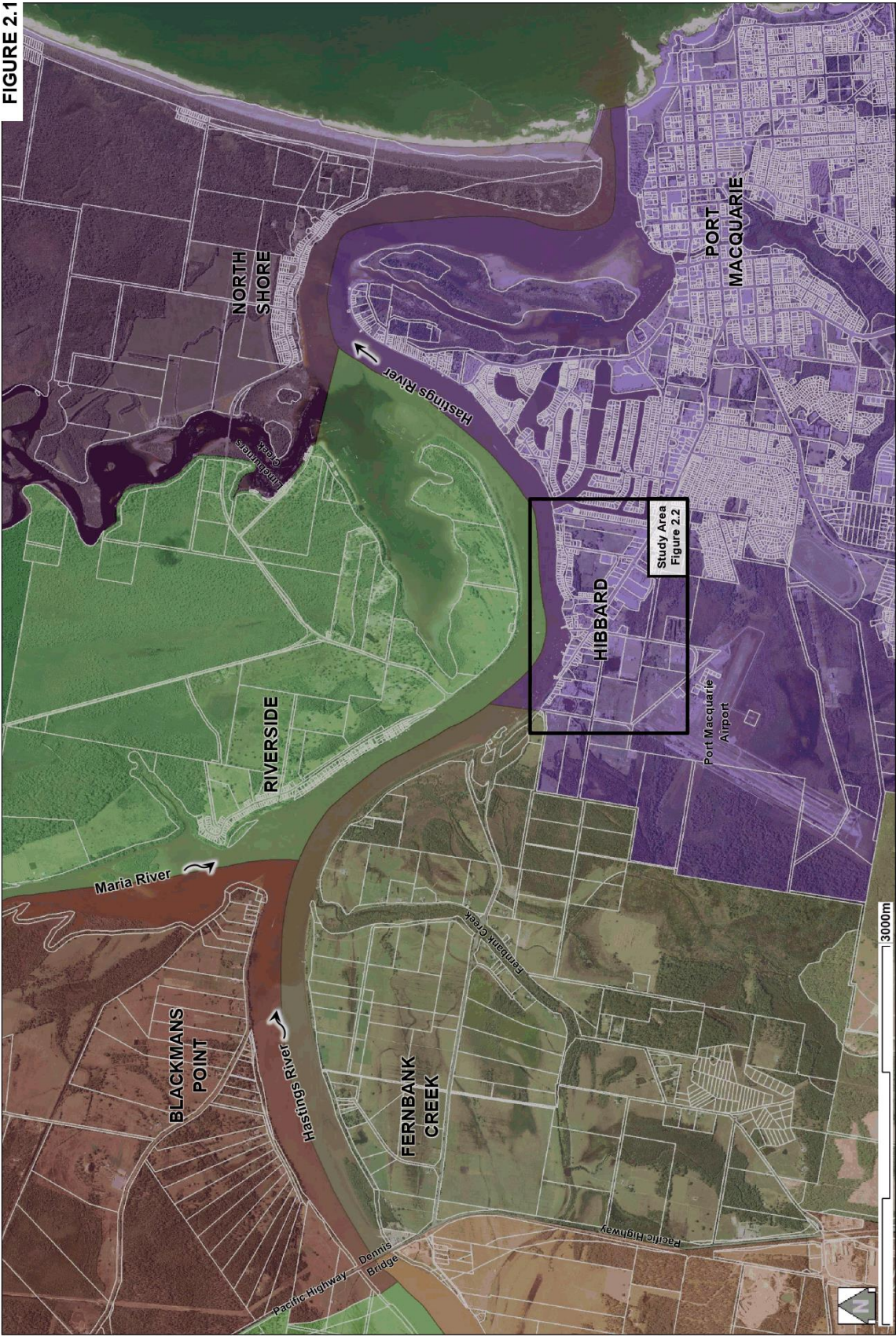


Port Macquarie Hastings Council
Hibbard Precinct Flood Study

Figures



FIGURE 2.1



LOCATION OF THE
HIBBARD PRECINCT STUDY AREA

Advisian
30/01/15-03/02/15 Hibbard Floodway Investigation
gs301015-03/02/15 160594_Fig 2.1 Study Area.docx

FIGURE 2.2

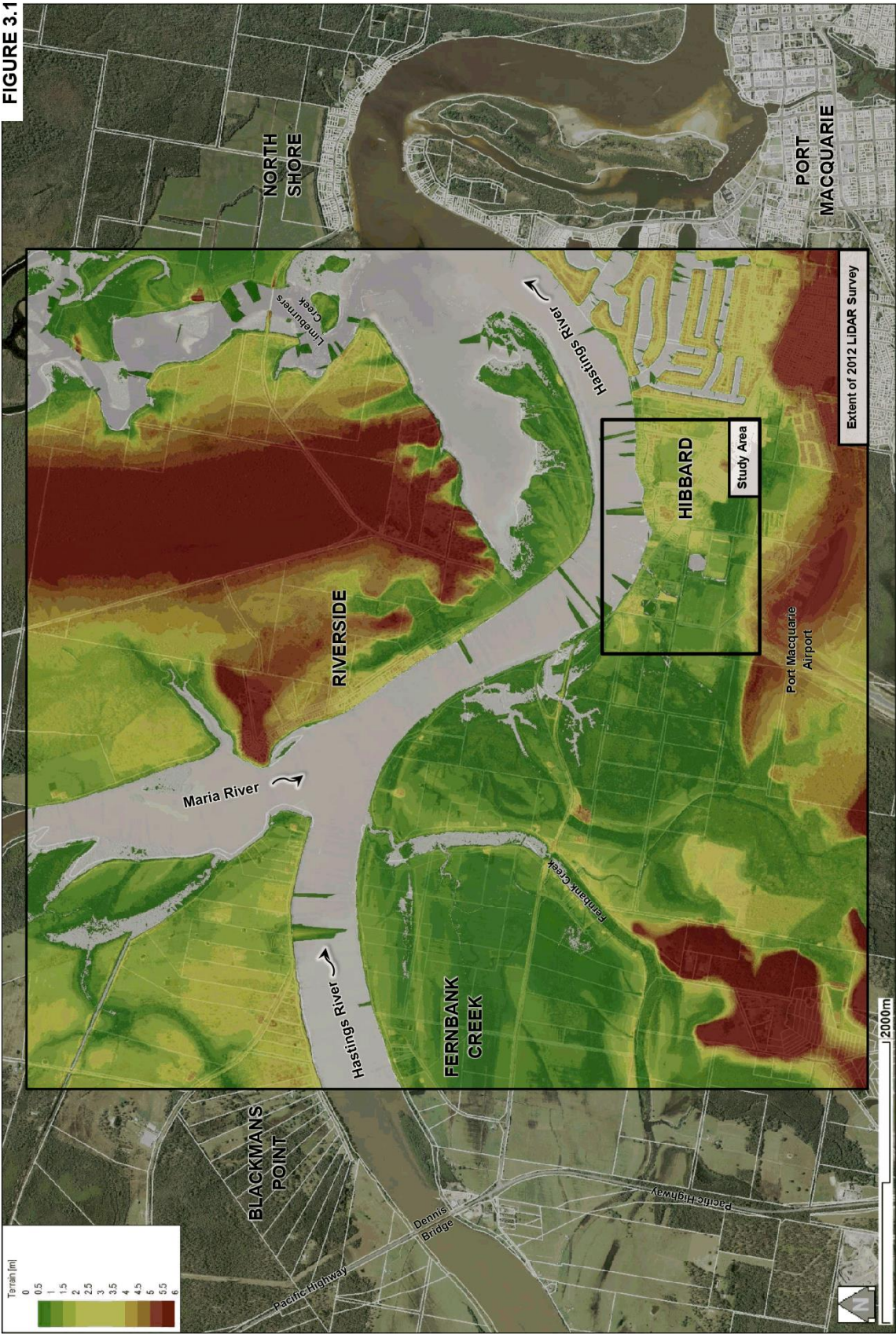


THE HIBBARD PRECINCT

FIGURE 2.3



FIGURE 3.1



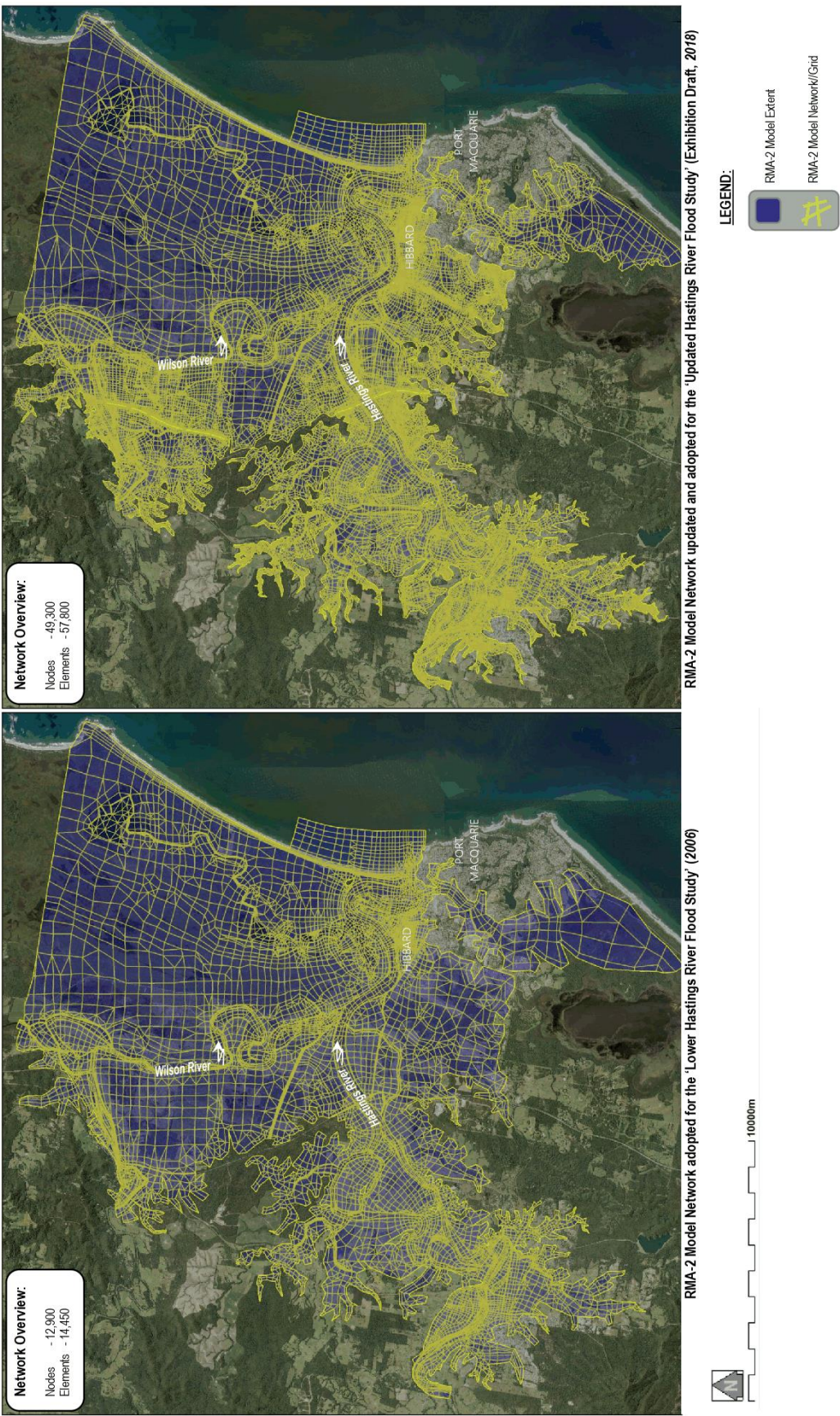
EXTENT OF AVAILABLE
2012 LiDAR SURVEY

FIGURE 3.2



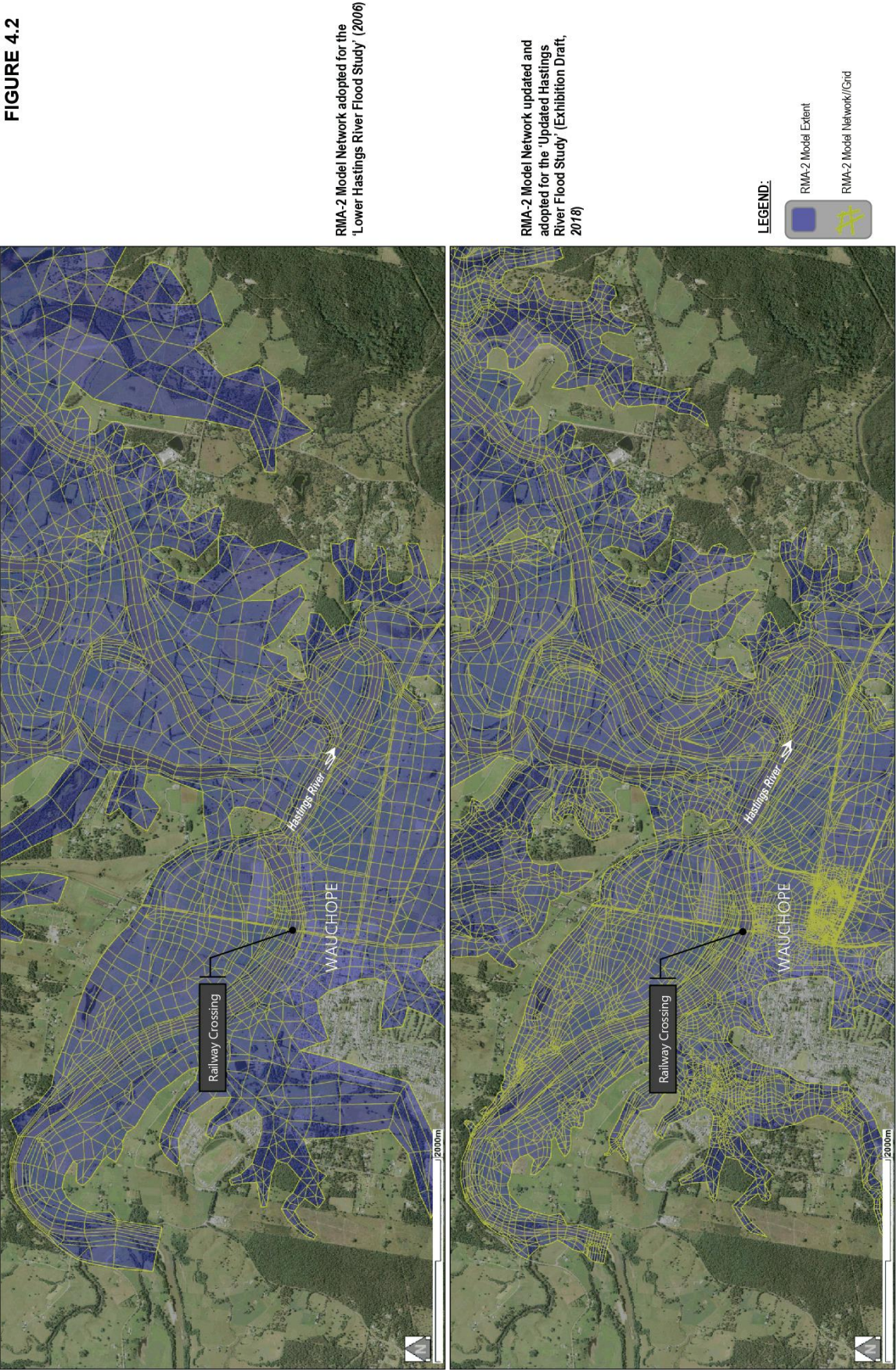
OVERVIEW OF AVAILABLE TOPOGRAPHIC
AND HYDROGRAPHIC SURVEY

FIGURE 4.1



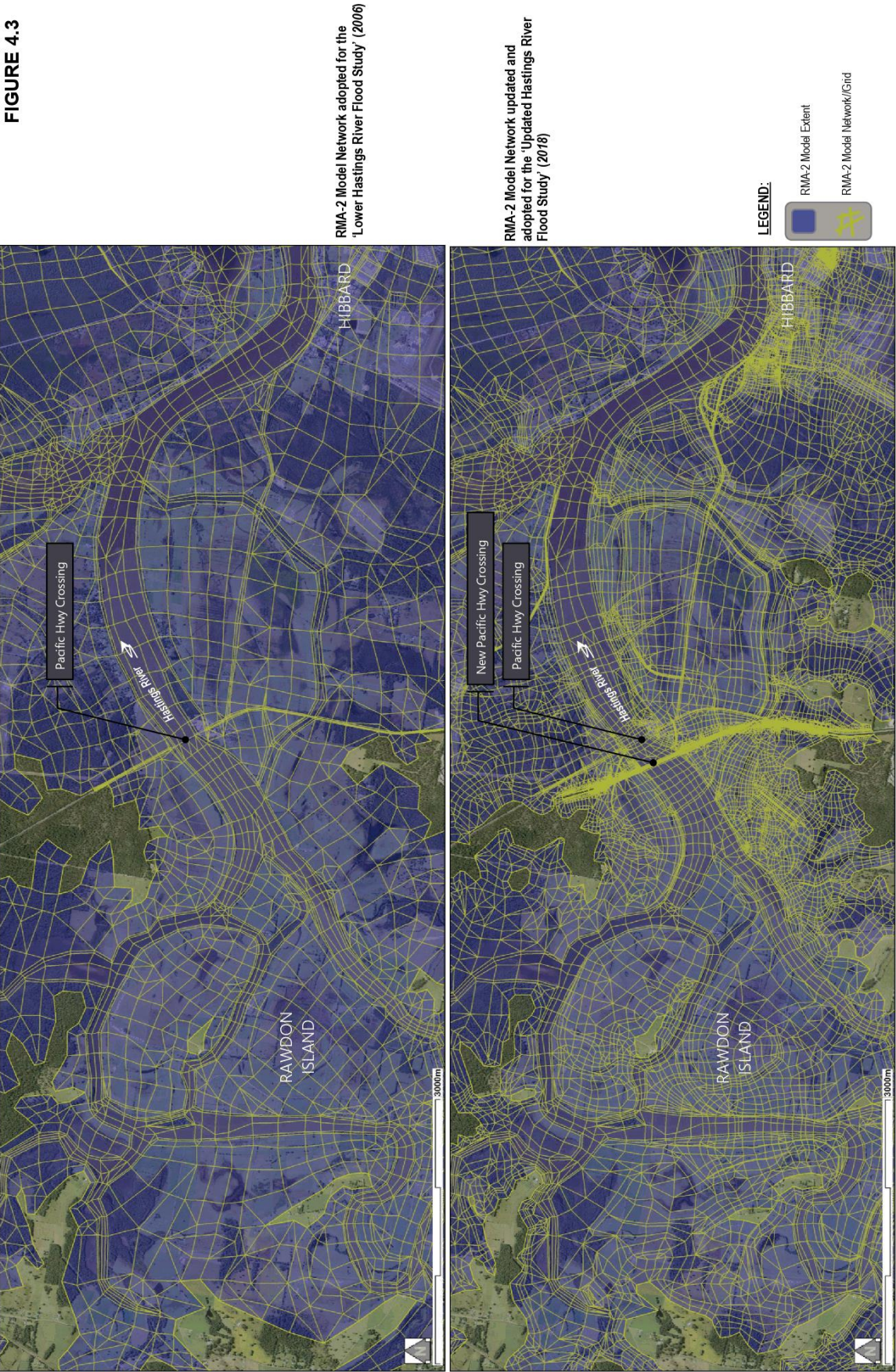
COMPARISON OF 2006 AND 2018
FLOOD STUDY RMA-2 NETWORKS
[Overview]

FIGURE 4.2



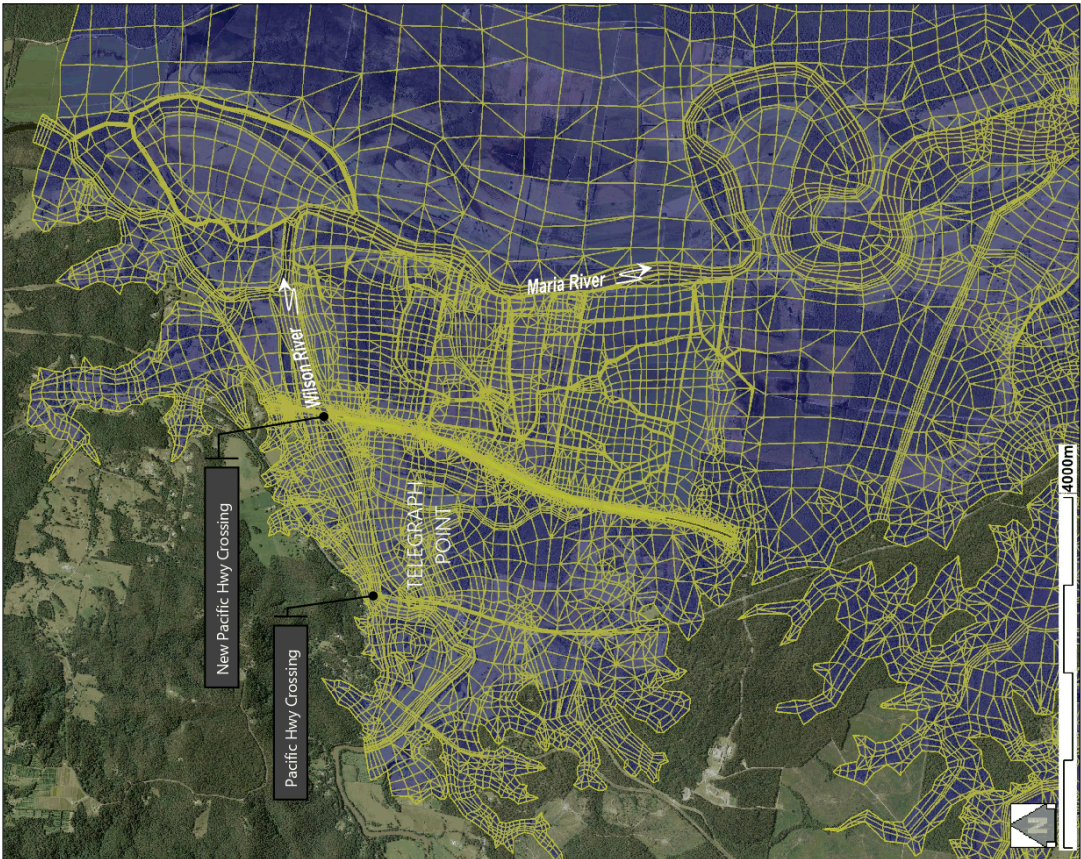
COMPARISON OF 2006 AND 2018
FLOOD STUDY RMA-2 NETWORKS
[Extent 1 of 4 – South-West]

FIGURE 4.3



COMPARISON OF 2006 AND 2018
FLOOD STUDY RMA-2 NETWORKS
[Extent 2 of 4 – Central]

FIGURE 4.4
RMA-2 Model Network updated and adopted for the 'Updated Hastings River Flood Study' (Exhibition Draft, 2018)



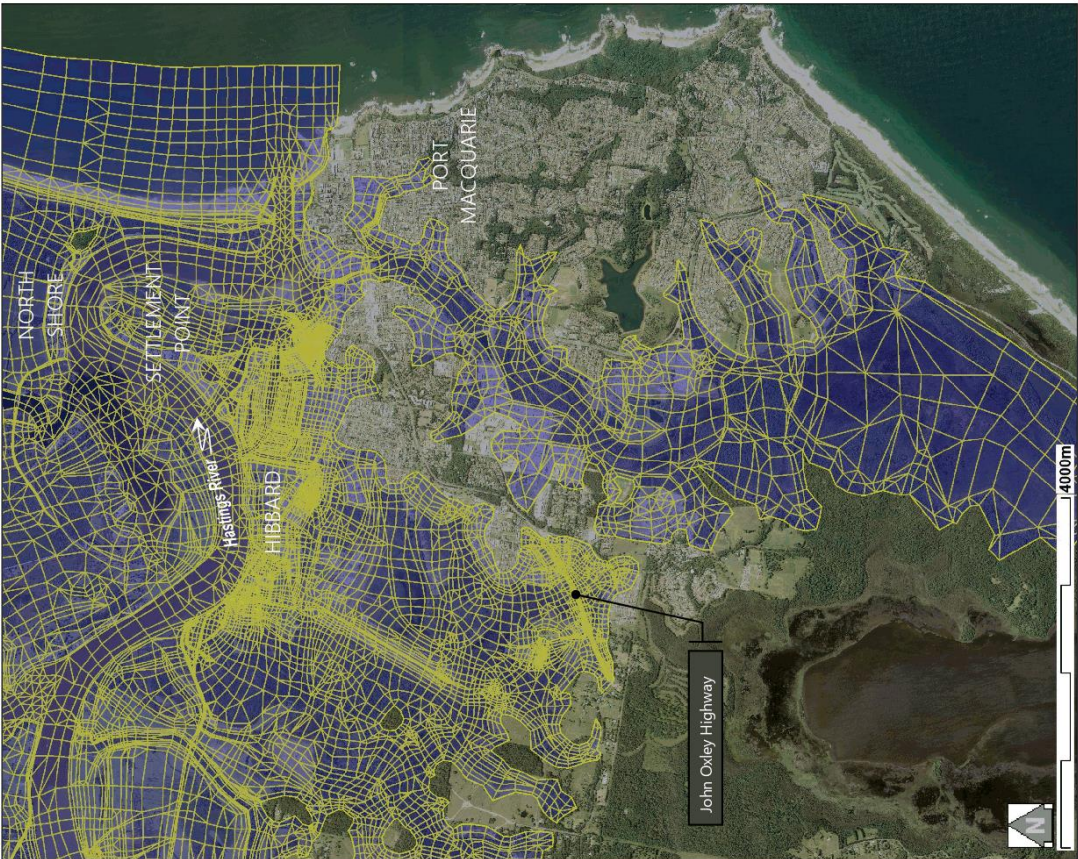
RMA-2 Model Network adopted for the 'Lower Hastings River Flood Study' (2006)



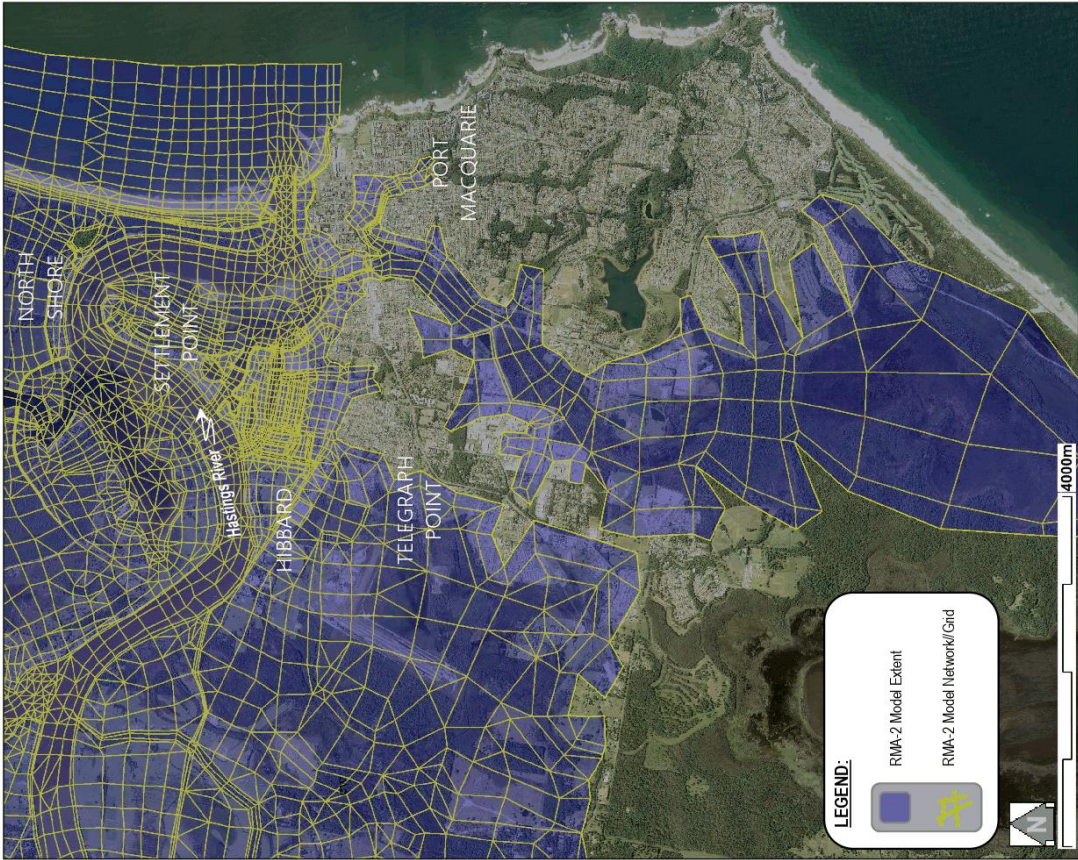
COMPARISON OF 2006 AND 2018
FLOOD STUDY RMA-2 NETWORKS
[Extent 3 of 4 – North]

Advisian
Worleyparsons Group
301015-03826-Hillbards Floodway FRMS
fg301015-03826-Hillbards_Fig 4.4 2006 & 2018 RMA-2 Networks (View C)

FIGURE 4.5
RMA-2 Model Network updated and adopted for the 'Updated Hastings River Flood Study' (Exhibition Draft, 2018)



RMA-2 Model Network adopted for the 'Lower Hastings River Flood Study' (2006)

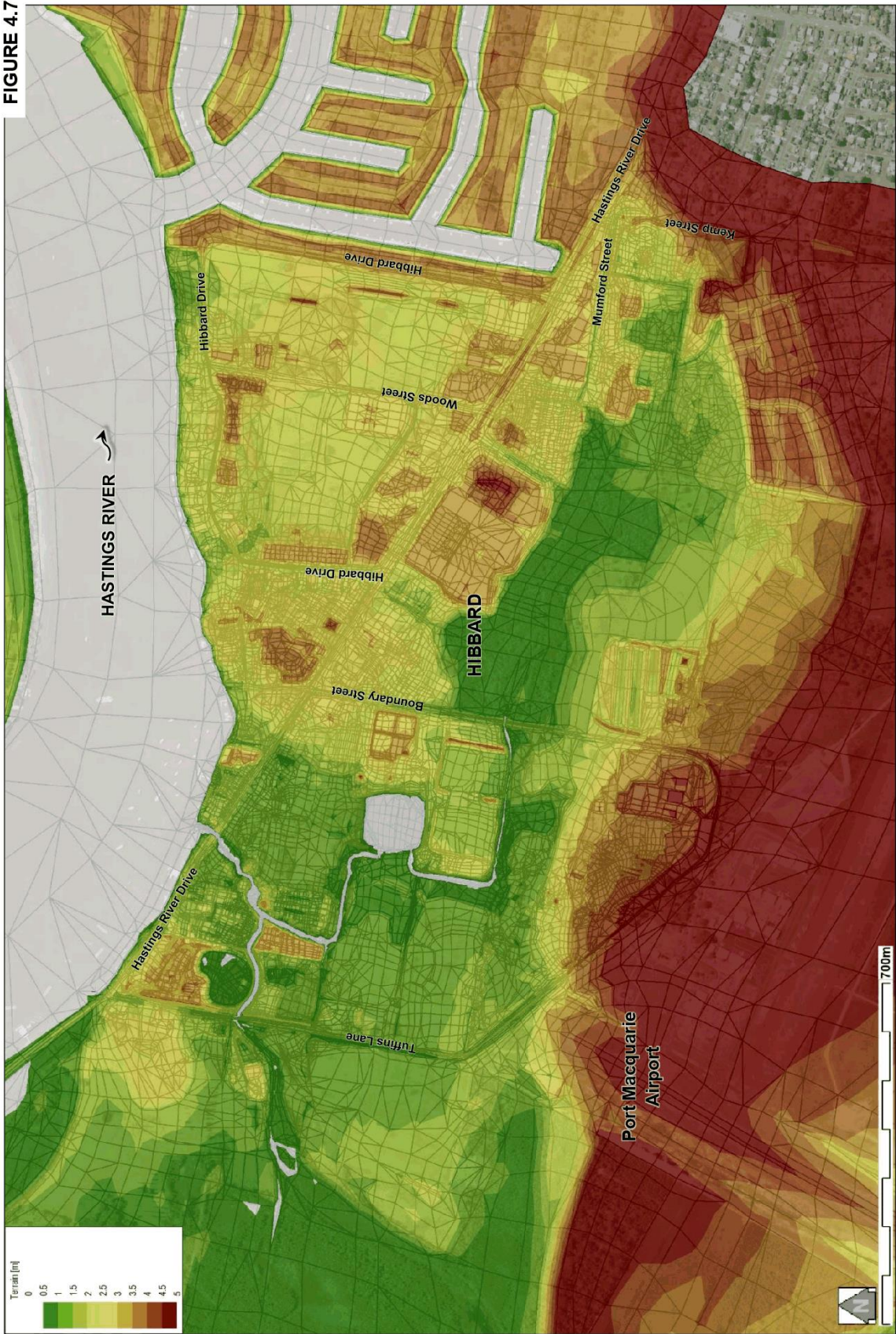


COMPARISON OF 2006 AND 2018
FLOOD STUDY RMA-2 NETWORKS
[Extent 4 of 4 – South East/Town]

EXTENT OF RMA-2 MODEL REFINEMENTS COMPLETED AS PART OF THE HIBBARD PRECINCT FLOOD STUDY



FIGURE 4.7



TOPOGRAPHY BASED ON
ELEVATIONS ASSIGNED WITHIN
THE UPDATED RMA-2 MODEL

Advisian
30/01/15-3826-Hibbard Floodway Investigation
gs301015-0326H160394_Fig 4.6 2019 Hibbard FS RMA-2 Network.docx

FIGURE 4.8



**ADOPTED ELEMENTS TYPES AND
DISTRIBUTION FOR THE UPDATED
HIBBARD PRECINCT RMA-2 MODEL**

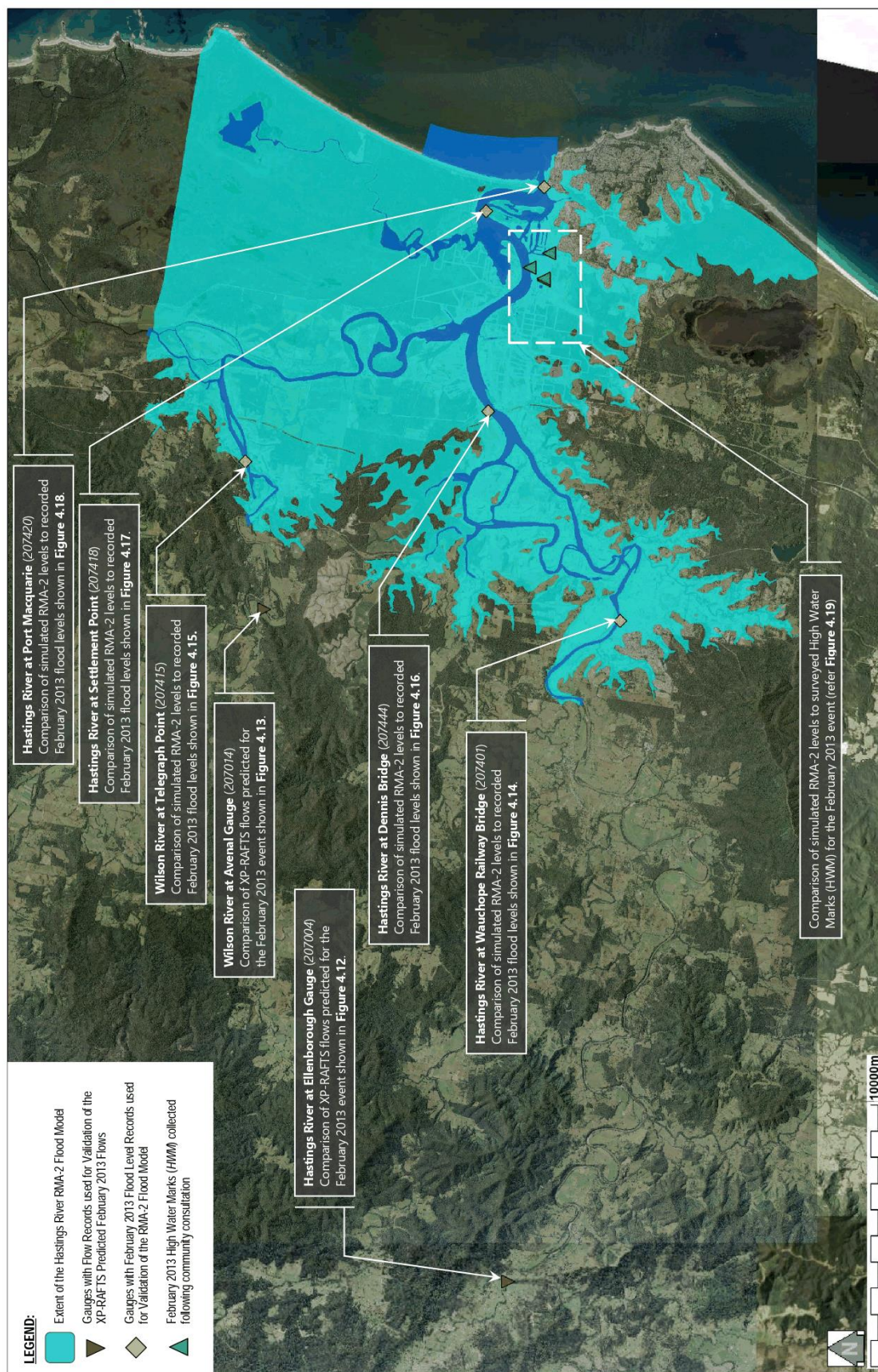
Advisian
30/015-03626-Hibbard Floodway Investigation
I9301015-03626176394_Fig 4.8 Material Types.docx

FIGURE 4.9



LOCATION AND SURVEYED ELEVATION OF THE
HIGH WATER MARKS COLLECTED FOR
THE FEBRUARY 2013 EVENT

FIGURE 4.10



LOCATION OF ALL STREAMFLOW &
FLOOD MARK DATA COLLECTED AND USED FOR
VALIDATION TO THE FEBRUARY 2013 EVENT

Recorded Rainfall:
21/02/13 – 43 mm
22/02/13 – 125 mm
23/02/13 – 88.5 mm
24/02/13 – 47 mm
25/02/13 – 4.5 mm
Total – 309 mm

Recorded Rainfall:
21/02/13 – 38 mm
22/02/13 – 137 mm
23/02/13 – 88.5 mm
24/02/13 – 472.5 mm
25/02/13 – 11.5 mm
Total – 347.5 mm

207415 – Telegraph Pt (MHL Data)
Derived from pluviograph data
Temporal pattern based on St 207415

Recorded Rainfall:
18-21/02/13 – 54 mm
22/02/13 – 87.2 mm
23/02/13 – 33 mm
24-25/02/13 – 26.4 mm
Total – 347.5 mm

560015 – Port Macquarie (Koala St)
Derived from pluviograph data
Temporal pattern based on St 207415

Recorded Rainfall:
18-21/02/13 – 57.8 mm
22/02/13 – 132.2 mm
23/02/13 – 50 mm
24-25/02/13 – 5.8 mm
Total – 245.8 mm

560009 – Wauchope (Bain St)
Derived from pluviograph data
Temporal pattern based on St 207415

Note: rainfall depths in red are indicative only – the rainfall gauge was reset during the respective 24-hour period.

Legend
— XP-RAFTS subcatchment boundary
▲ Pluviograph rainfall station
□ Daily read rainfall station
□ XP-RAFTS subcatchment ID

Recorded Rainfall:
18-21/02/13 – 63.8 mm
22/02/13 – 155 mm
23/02/13 – 44 mm
24-25/02/13 – 76.4 mm
Total – 394.2 mm

Recorded Rainfall:
21/02/13 – 35 mm
22/02/13 – 140.5 mm
23/02/13 – 91.5 mm
24/02/13 – 61 mm
25/02/13 – 22.5 mm
Total – 350.5 mm

207406 – Green Valley
Derived from pluviograph data
Temporal pattern based on St 207406

Recorded Rainfall:
21/02/13 – 31.00
22/02/13 – 30.00
23/02/13 – 30.01
24/02/13 – 20.02
25/02/13 – 20.025
Total – 121.035

560011 – Telegraph Pt (Wilson R)
Derived from pluviograph data
Temporal pattern based on St 560011

Recorded Rainfall:
21/02/13 – 21.00
22/02/13 – 20.00
23/02/13 – 20.01
24/02/13 – 22.00
25/02/13 – 13.00
Total – 96.015

Recorded Rainfall:
18-21/02/13 – 69.8 mm
22/02/13 – 264.4 mm
23/02/13 – 103 mm
24-25/02/13 – 19.4 mm
Total – 456.6 mm

560020 – Kores Island
Derived from pluviograph data
Temporal pattern based on St 207415

560024 – Coniboynne (Thone R)
Derived from daily read rainfall data
Temporal pattern based on St 207004

Recorded Rainfall:
21/02/13 – 30.6 mm
22/02/13 – 257 mm
23/02/13 – 42.4 mm
24/02/13 – 0.4 mm
25/02/13 – 9 mm
Total – 339.4 mm

60050 – Birdwood
Derived from daily read rainfall data
Temporal pattern based on St 207004

Recorded Rainfall:
21/02/13 – 31.6 mm
22/02/13 – 41.6 mm
23/02/13 – 41.6 mm
24/02/13 – 41.6 mm
25/02/13 – 41.6 mm
Total – 206.0 mm

57104 – Yarrowitch (Maretto)
Derived from daily read rainfall data
Temporal pattern based on St 207004

Recorded Rainfall:
21/02/13 – 27 mm
22/02/13 – 190 mm
23/02/13 – 56 mm
24/02/13 – 0 mm
25/02/13 – 12 mm
Total – 285 mm

Recorded Rainfall:
21/02/13 – 3.00
22/02/13 – 2.00
23/02/13 – 4.01
24/02/13 – 1.01
25/02/13 – 1.015
Total – 10.035

60085 – Yarras (Mt Seaview)
Derived from daily read rainfall data
Temporal pattern based on St 207004

Recorded Rainfall:
21/02/13 – 31.6 mm
22/02/13 – 181.4 mm
23/02/13 – 53 mm
24/02/13 – 2.2 mm
25/02/13 – 32.8 mm
Total – 544 mm

207004 – Hastings R @ Ellenborough
Derived from pluviograph data
Temporal pattern based on St 207004

Recorded Rainfall:
21/02/13 – 4 mm
22/02/13 – 4 mm
23/02/13 – 4 mm
24/02/13 – 4 mm
25/02/13 – 4 mm
Total – 20 mm

Recorded Rainfall:
21/02/13 – 35 mm
22/02/13 – 135 mm
23/02/13 – 46 mm
24/02/13 – 0.2 mm
25/02/13 – 13.6 mm
Total – 2318 mm

60121 – Elands Black Sands Creek
Derived from daily read rainfall data
Temporal pattern based on St 207004

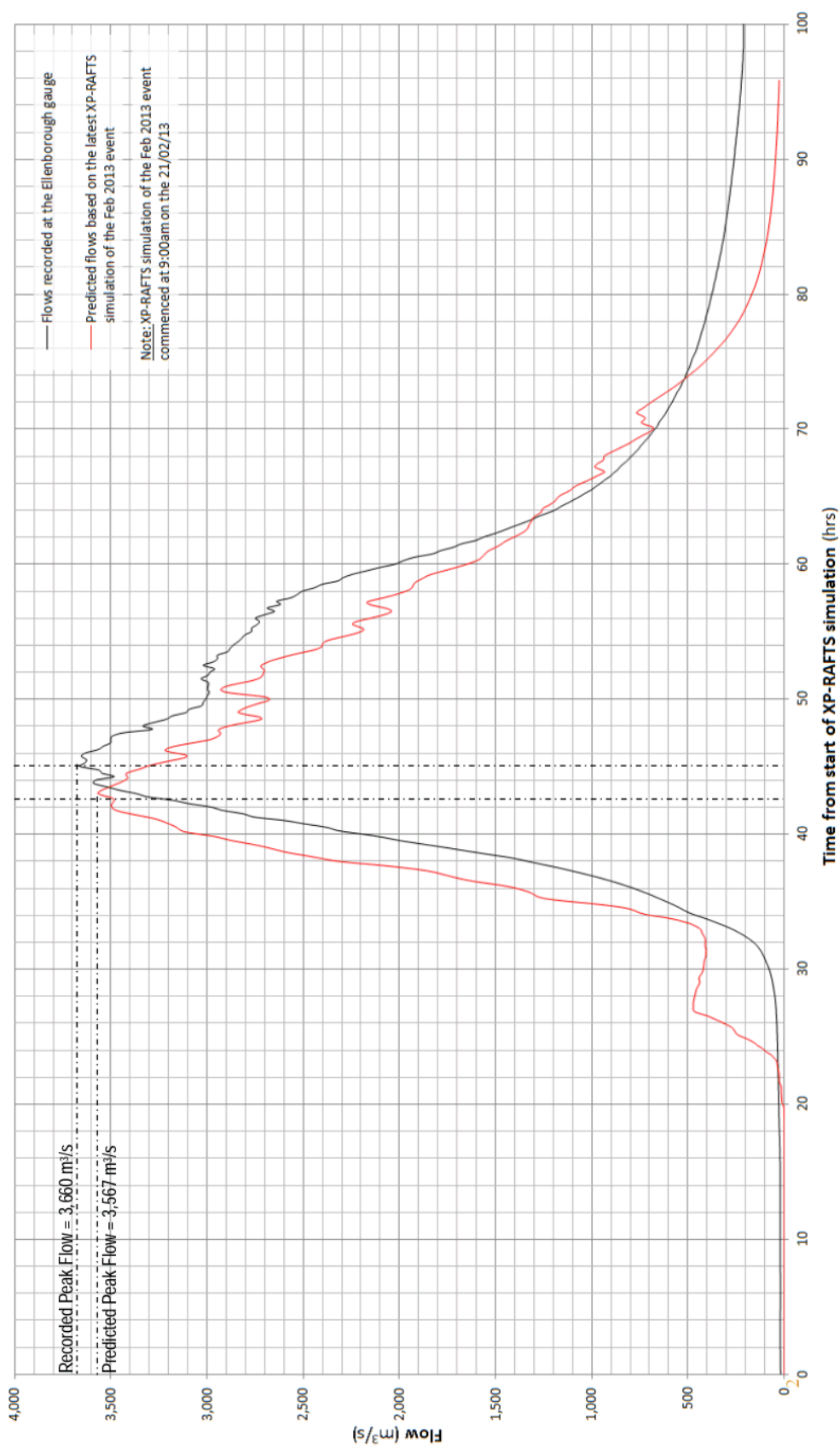
Recorded Rainfall:
21/02/13 – 35 mm
22/02/13 – 135 mm
23/02/13 – 46 mm
24/02/13 – 0.2 mm
25/02/13 – 13.6 mm
Total – 2318 mm

Scale: 0 5 10 15 20 km

North Arrow: N

ADOPTED SPATIAL DISTRIBUTION OF RAINFALL
FOR MODELLING OF THE FEBRUARY 2013 STORM EVENT
IN THE XP-RAFTS HYDROLOGIC MODEL

FIGURE 4.12

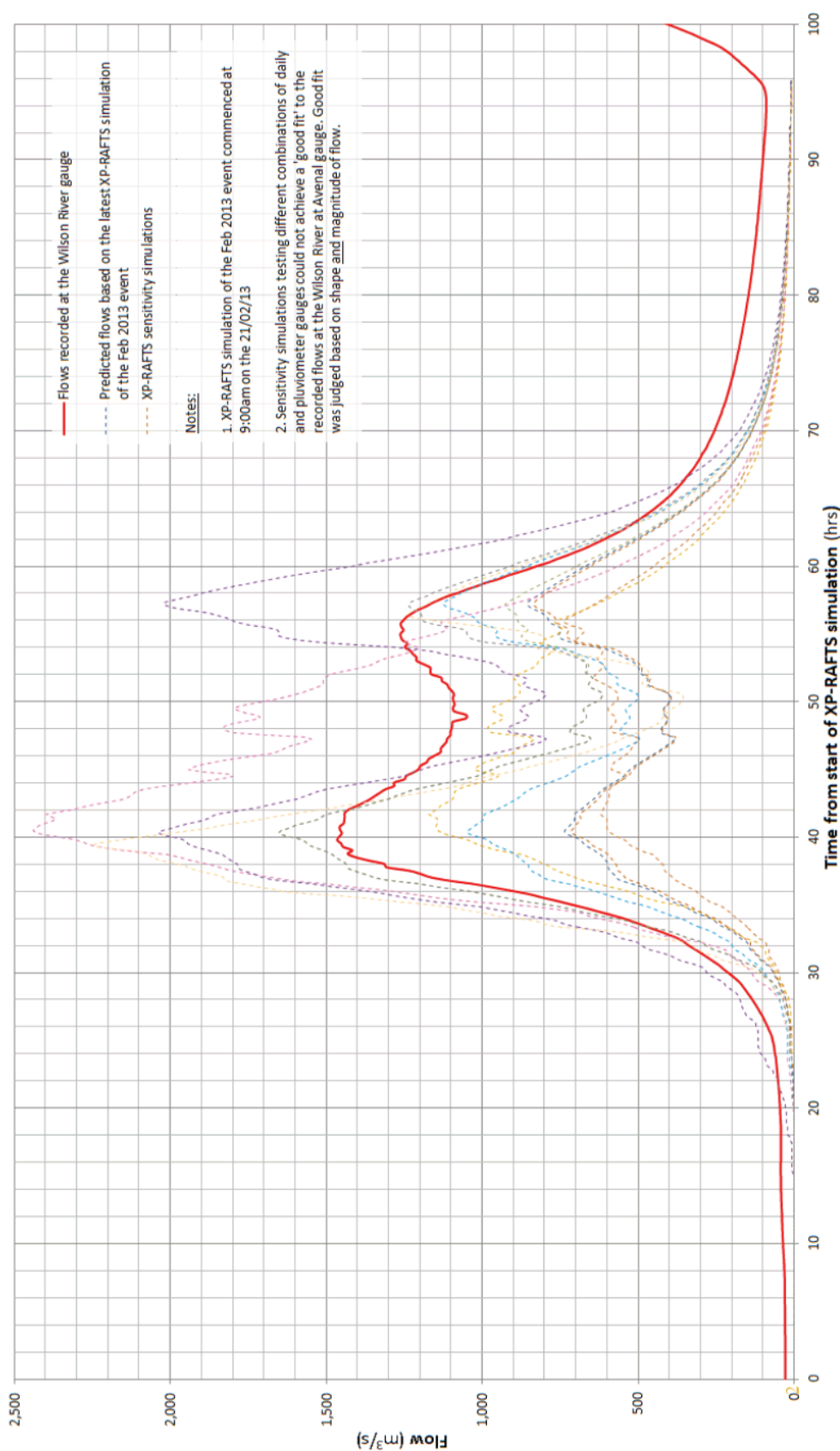


COMPARISON OF PREDICTED XP-RAFTS
FLOWS TO RECORDED FLOWS AT THE
ELLENBOROUGH GAUGE (207004)



301015-03826-Hibbard Floodway FRMS
fg301015-03826g180718_Fig 4.12 - XP-RAFTS Validation to Ellenborough Gauge.docx

FIGURE 4.13

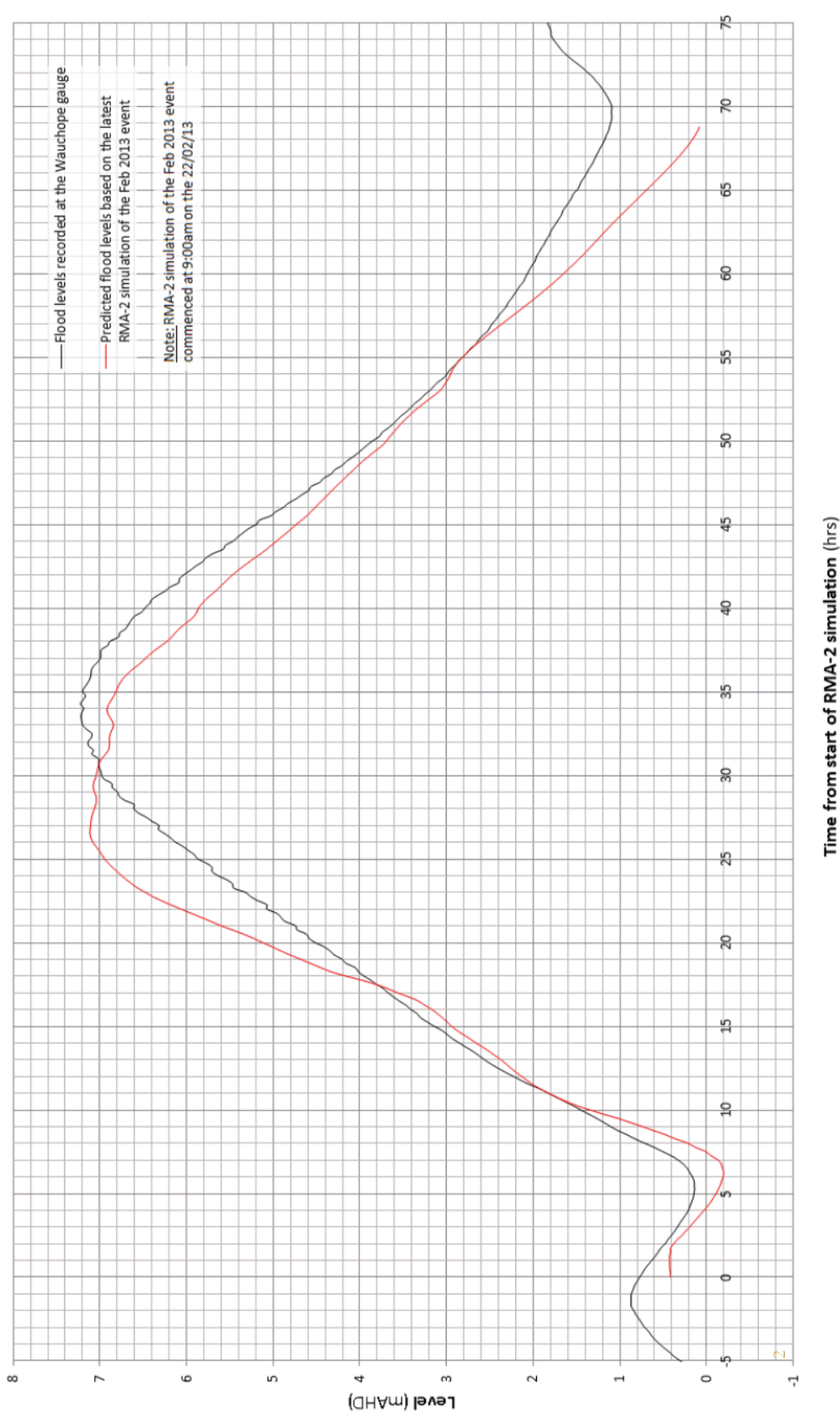


COMPARISON OF PREDICTED XP-RAFTS
FLOWS TO RECORDED FLOWS AT THE
WILSON RIVER AT AVENAL GAUGE (207014)



301015-03826-Habard Floodway FRMS
fg301015-03826g180718_Fig 4.13 - XP-RAFTS Validation to Avenal Gauge.docx

FIGURE 4.14

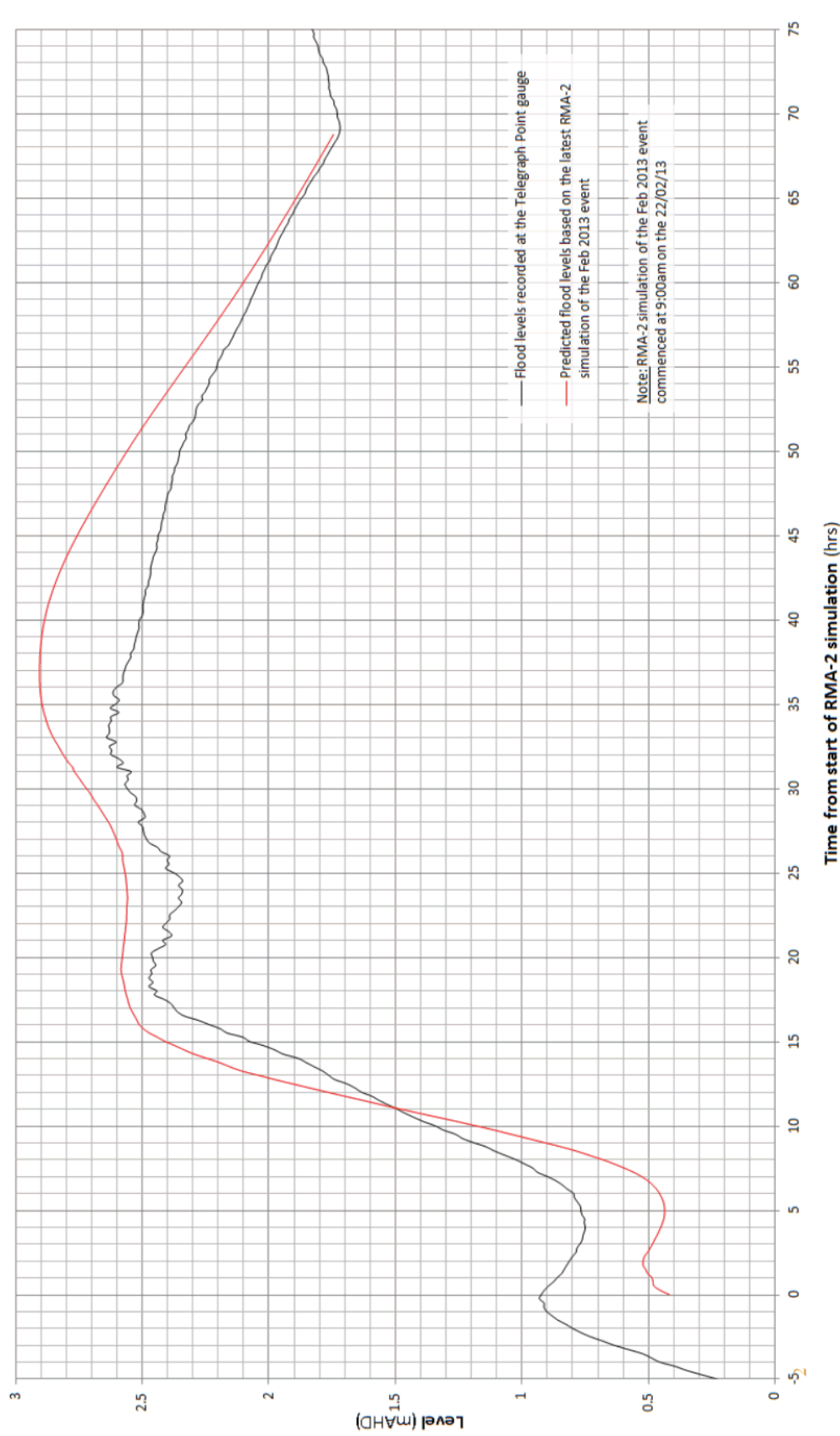


Advisian
Water Partners Group

301015-03826-Habard Floodway FRMS
fg301015-03826gl180718_Fig 4.14 - RMA-2 Validation to Wauchope Gauge.docx

COMPARISON OF PREDICTED RMA-2
FLOOD LEVELS TO RECORDED LEVELS AT THE
HASTINGS RIVER AT WAUCHOPE GAUGE (207401)

FIGURE 4.15

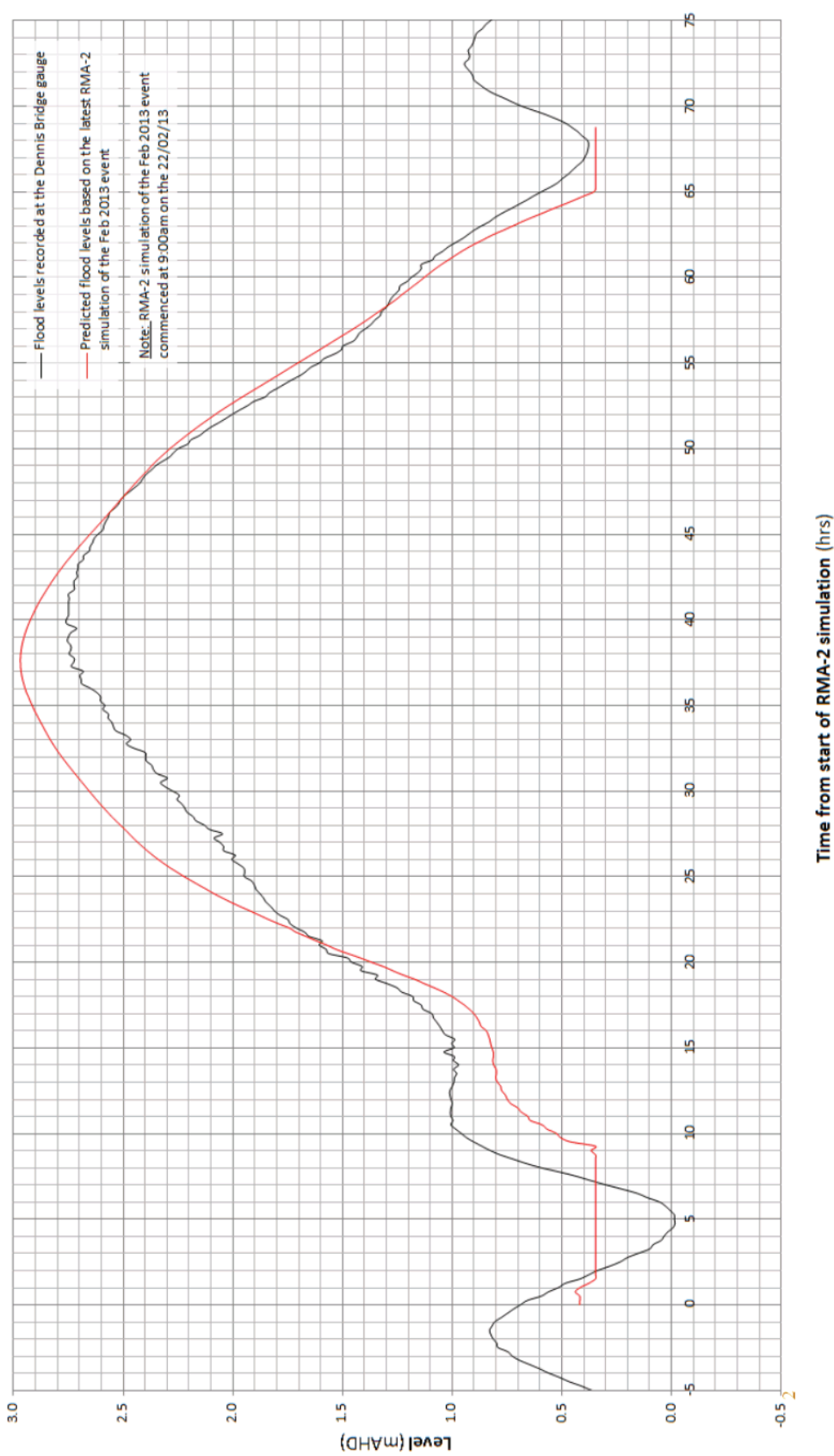


Advisian
WorleyParsons Group

301015-03826-Habard Foodway FRMS
fg301015-03826g180718_Fig 4.15 - RMA-2 Validation to Telegraph Point Gauge.docx

COMPARISON OF PREDICTED RMA-2
FLOOD LEVELS TO RECORDED LEVELS AT THE
WILSON RIVER AT TELEGRAPH POINT GAUGE (207415)

FIGURE 4.16

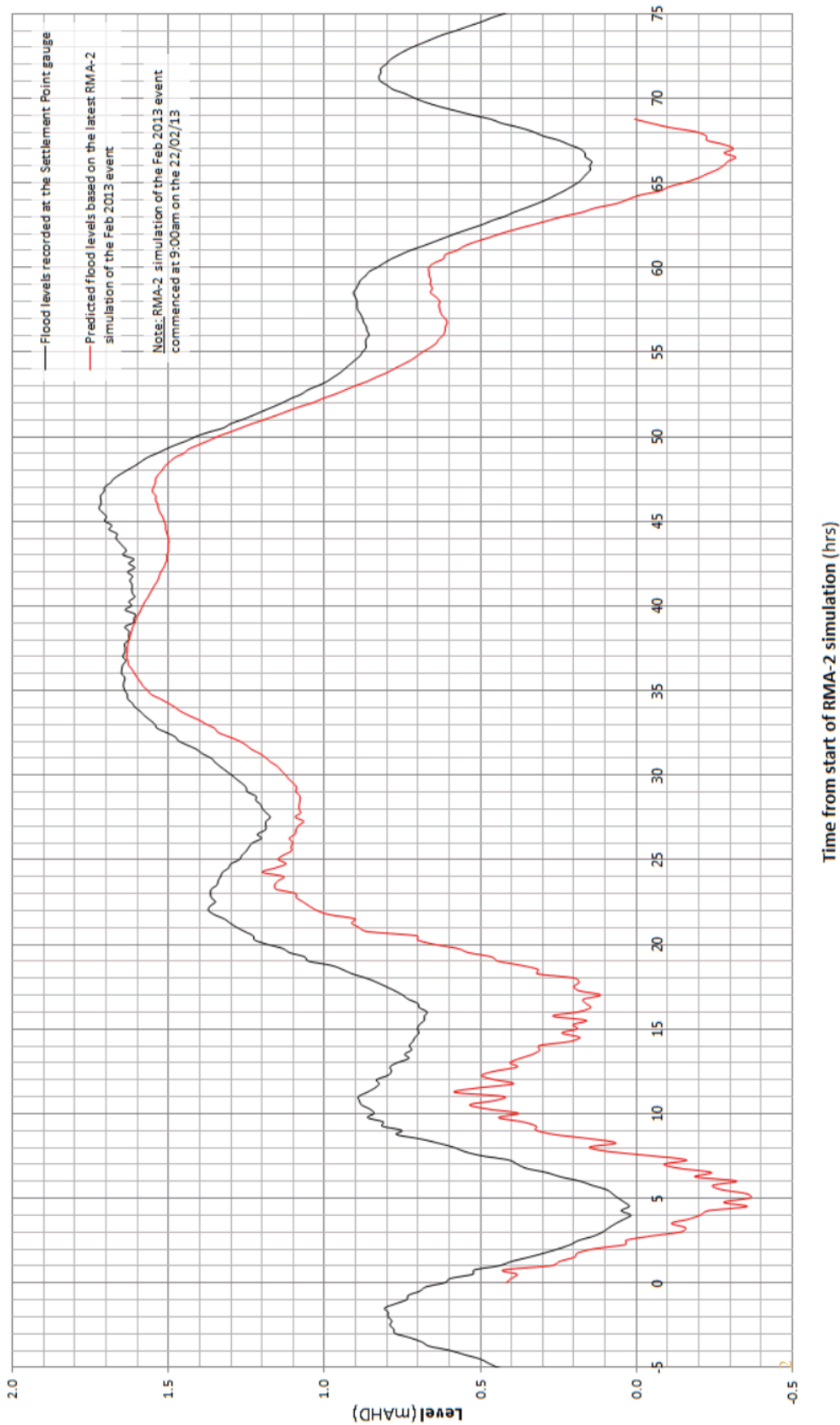


Advisian
WorleyParsons Group

301015-03826-Habard Floodway FRMS
fg301015-03826g180718_Fig 4.16 - RMA-2 Validation to Dennis Bridge Gauge.docx

COMPARISON OF PREDICTED RMA-2
FLOOD LEVELS TO RECORDED LEVELS AT THE
HASTINGS RIVER AT DENNIS BRIDGE GAUGE (207444)

FIGURE 4.17

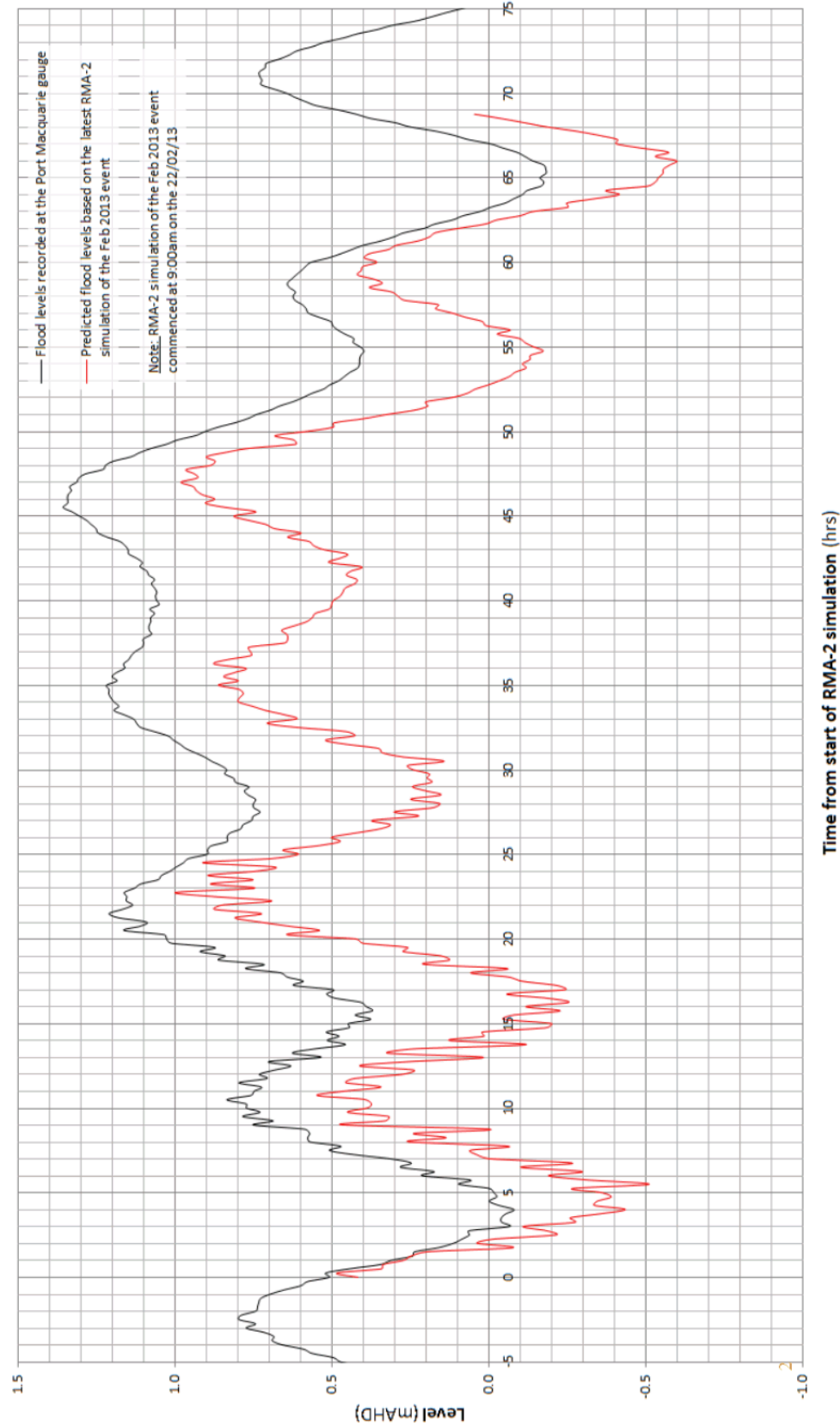


Advisian
WorleyParsons Group

301015-03826-Habard Floodway FRMS
fg301015-03826g180718_Fig 4.17 - RMA-2 Validation to Settlement Point Gauge.docx

COMPARISON OF PREDICTED RMA-2
FLOOD LEVELS TO RECORDED LEVELS AT THE
HASTINGS RIVER AT SETTLEMENT POINT GAUGE (207418)

FIGURE 4.18

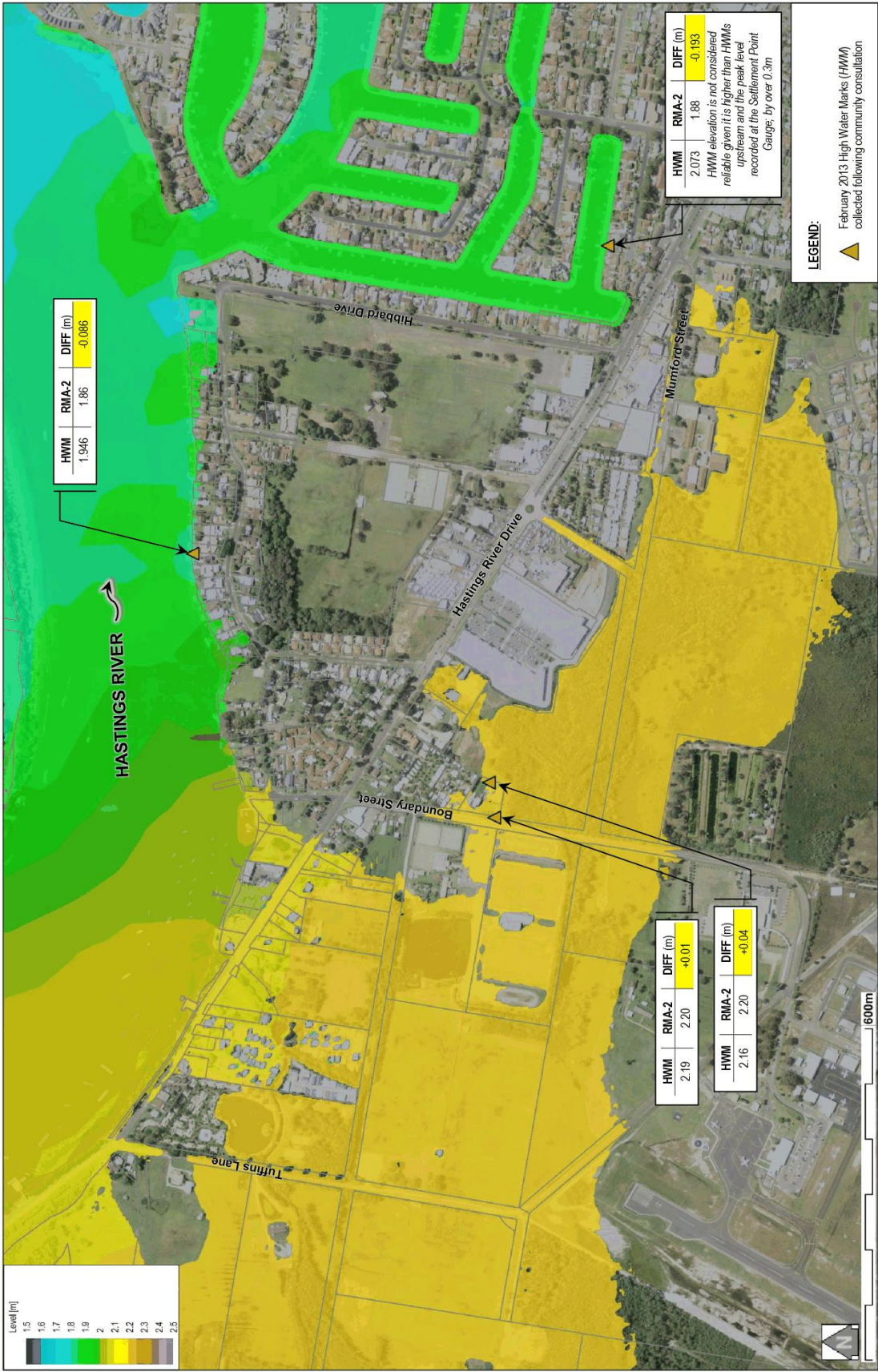


COMPARISON OF PREDICTED RMA-2
FLOOD LEVELS TO RECORDED LEVELS AT THE
HASTINGS RIVER AT PORT MACQUARIE GAUGE (207450)



301015-03826-Habard Foodway FRMS
fg301015-03826g180718_Fig 4.18 - RMA-2 Validation to Port Macquarie Gauge.docx

FIGURE 4.19



HASTINGS RIVER

Hastings River Drive

Boundary Street

Mumford Street

Kemp Street

Hastings River Drive

Port Macquarie Airport

500m

White shading indicates changes in peak 1% AEP flood levels do not exceed 0.01 metres

Blue shading indicates typical decrease in peak 1% AEP flood level of 0.02 metres

LEGEND:

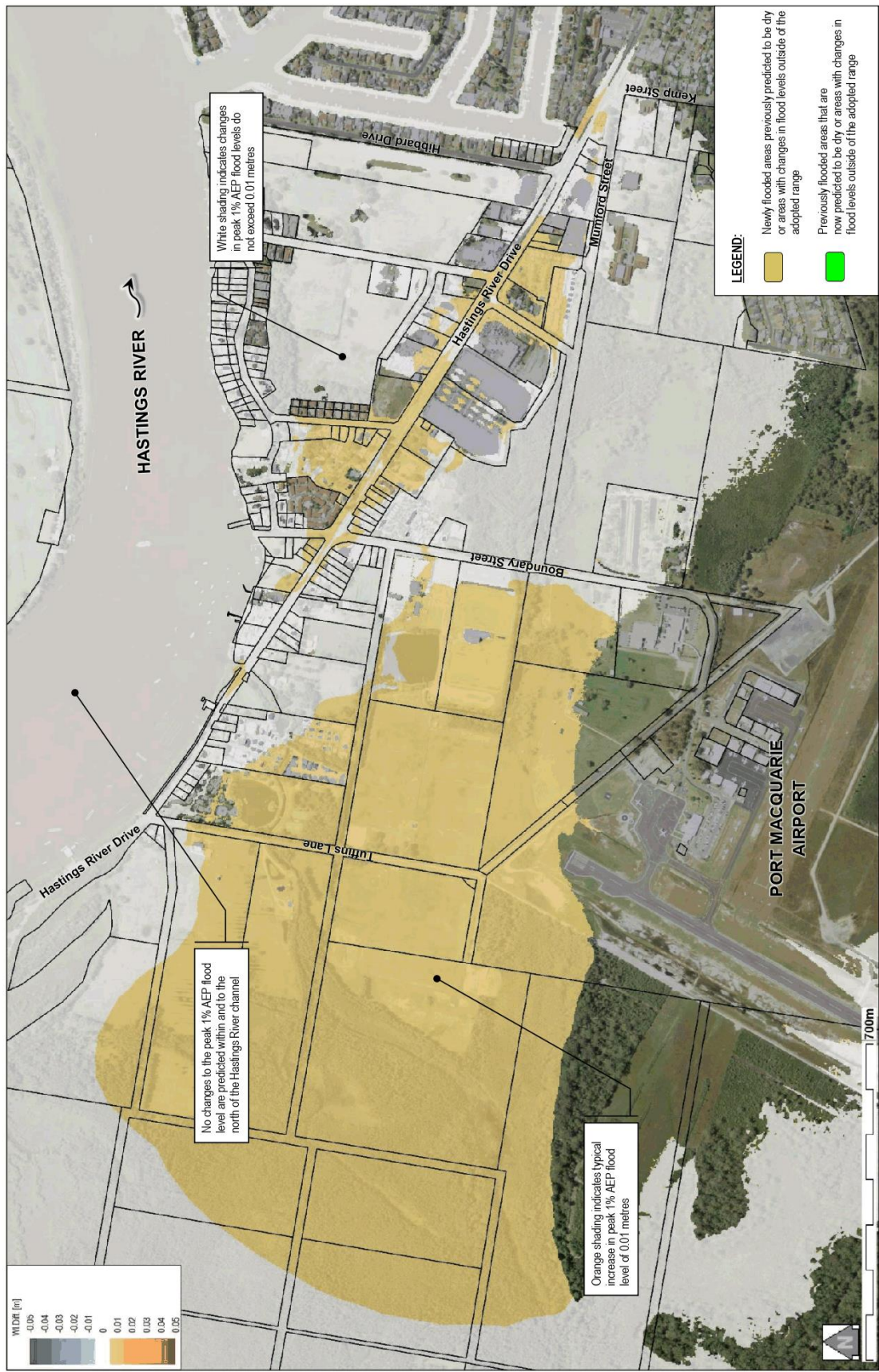
- Newly flooded areas previously predicted to be dry or areas with changes in flood levels outside of the adopted range
- Previously flooded areas that are now predicted to be dry or areas with changes in flood levels outside of the adopted range

WIDE [m]

-0.1	-0.08	-0.06	-0.04	-0.02	0	0.02	0.04	0.06	0.08	0.1
------	-------	-------	-------	-------	---	------	------	------	------	-----

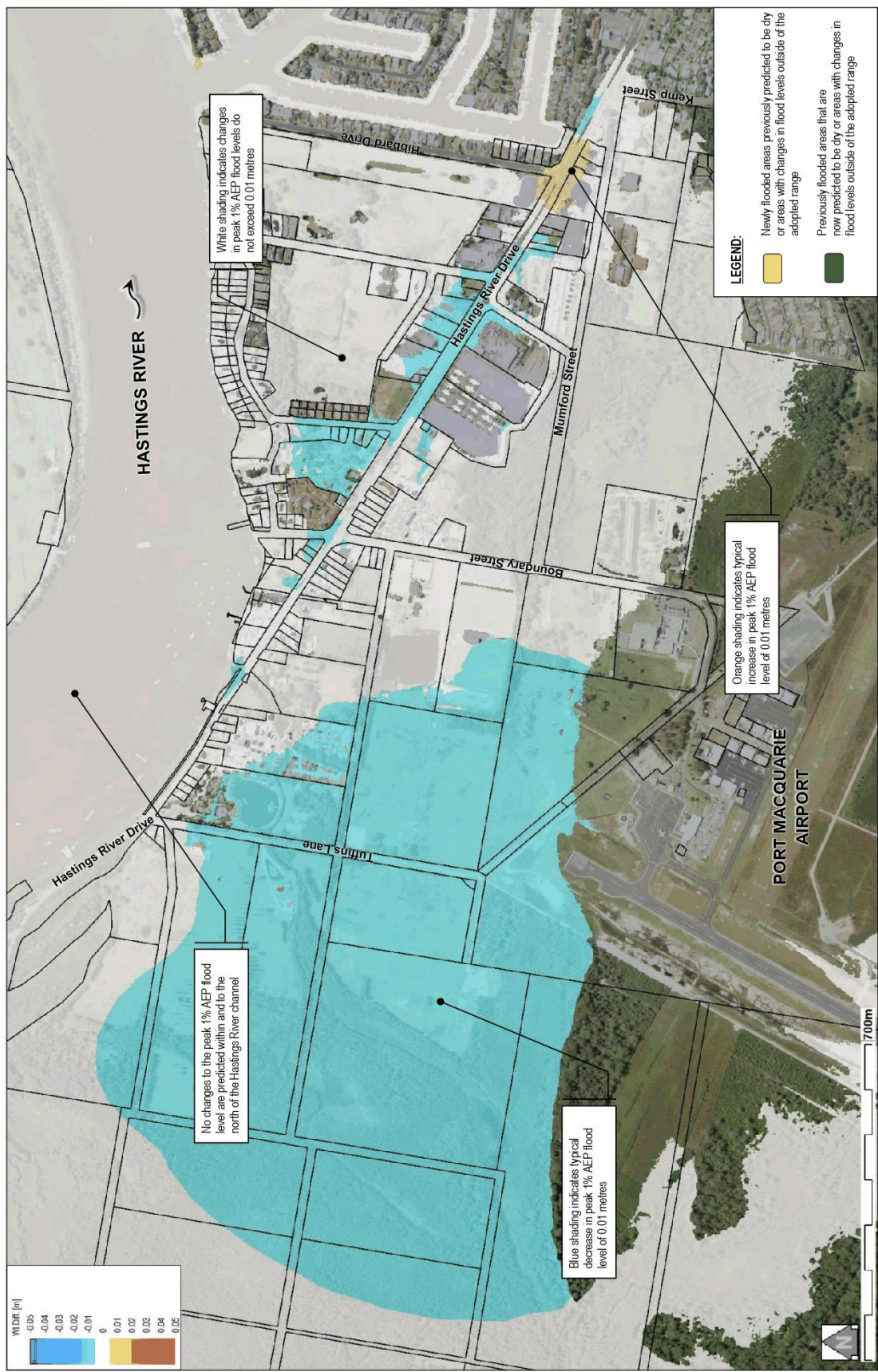
SENSITIVITY SCENARIO #1
MODELLING OF BUILDINGS WITH HIGH ROUGHNESS
INSTEAD OF BEING REMOVED
(Based on 1% AEP Flood Event)

FIGURE 4.21



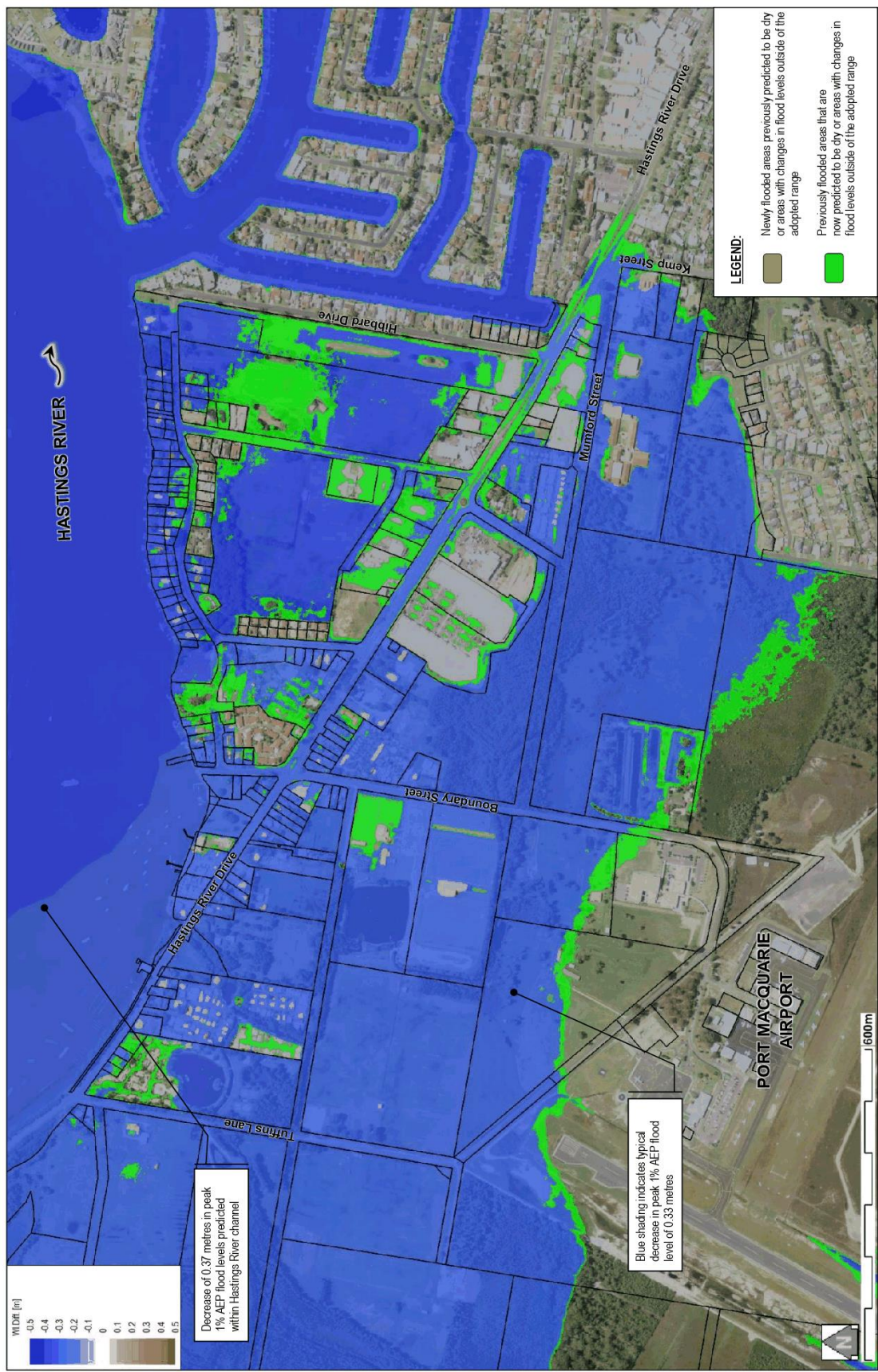
SENSITIVITY SCENARIO #2
INCREASE OF MATERIAL ROUGHNESS BY 20%
(Based on 1% AEP Flood Event)

FIGURE 4.22



SENSITIVITY SCENARIO #3
DECREASE OF MATERIAL ROUGHNESS BY 20%
(Based on 1% AEP Flood Event)

FIGURE 4.23



SENSITIVITY SCENARIO #4
ADOPTION OF LOCAL TAILWATER LEVELS
(Based on 1% AEP Flood Event)

FIGURE 5.1

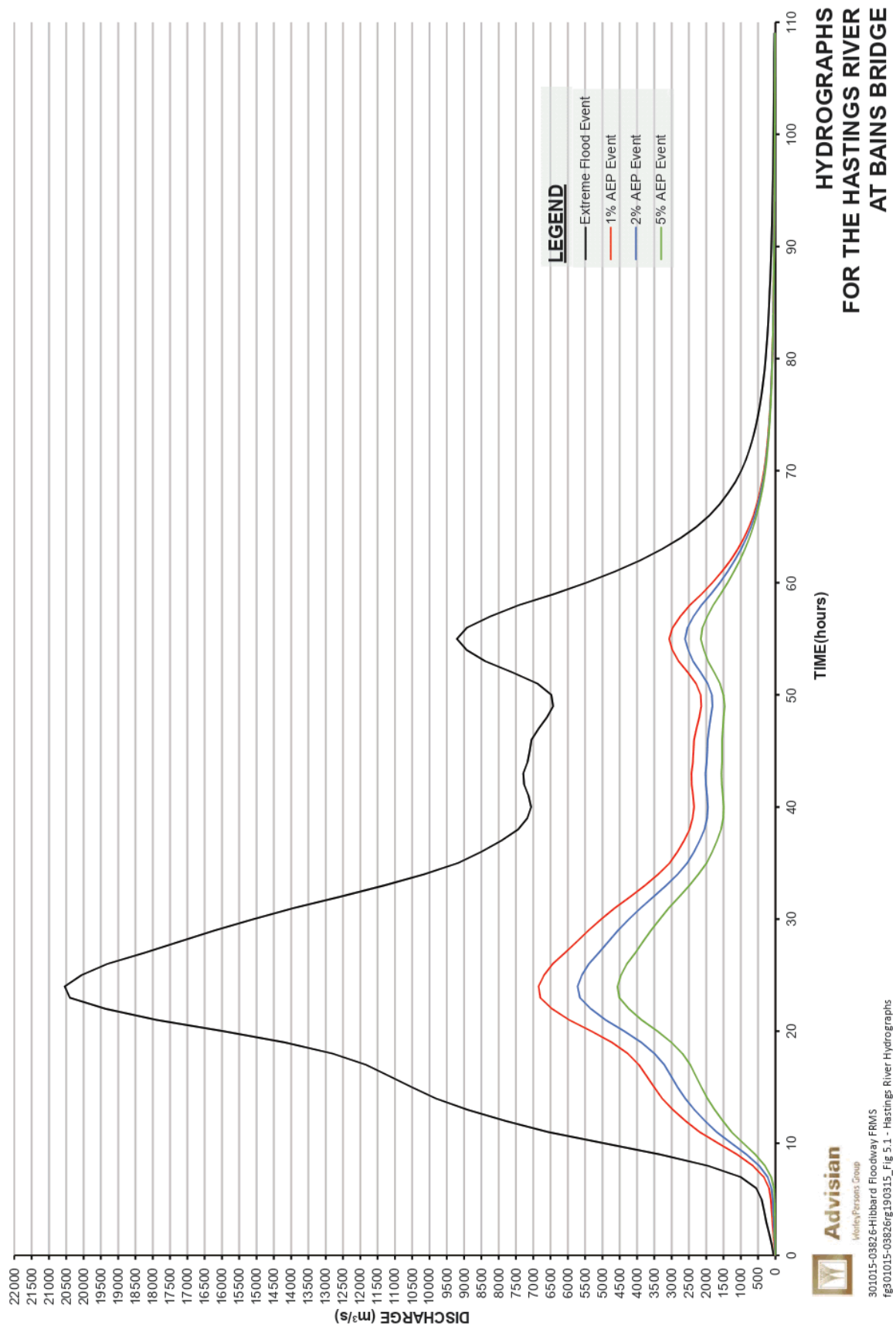
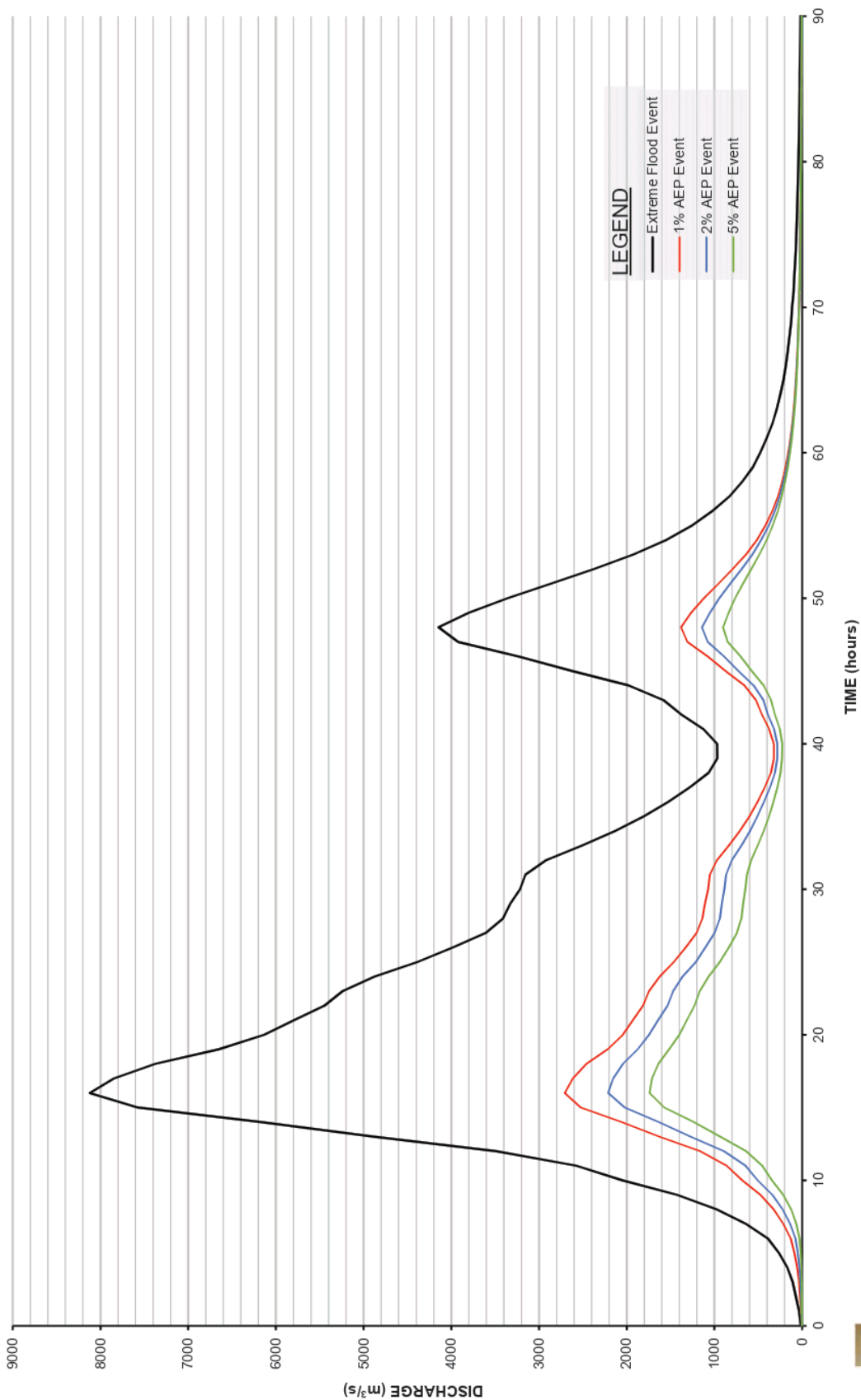


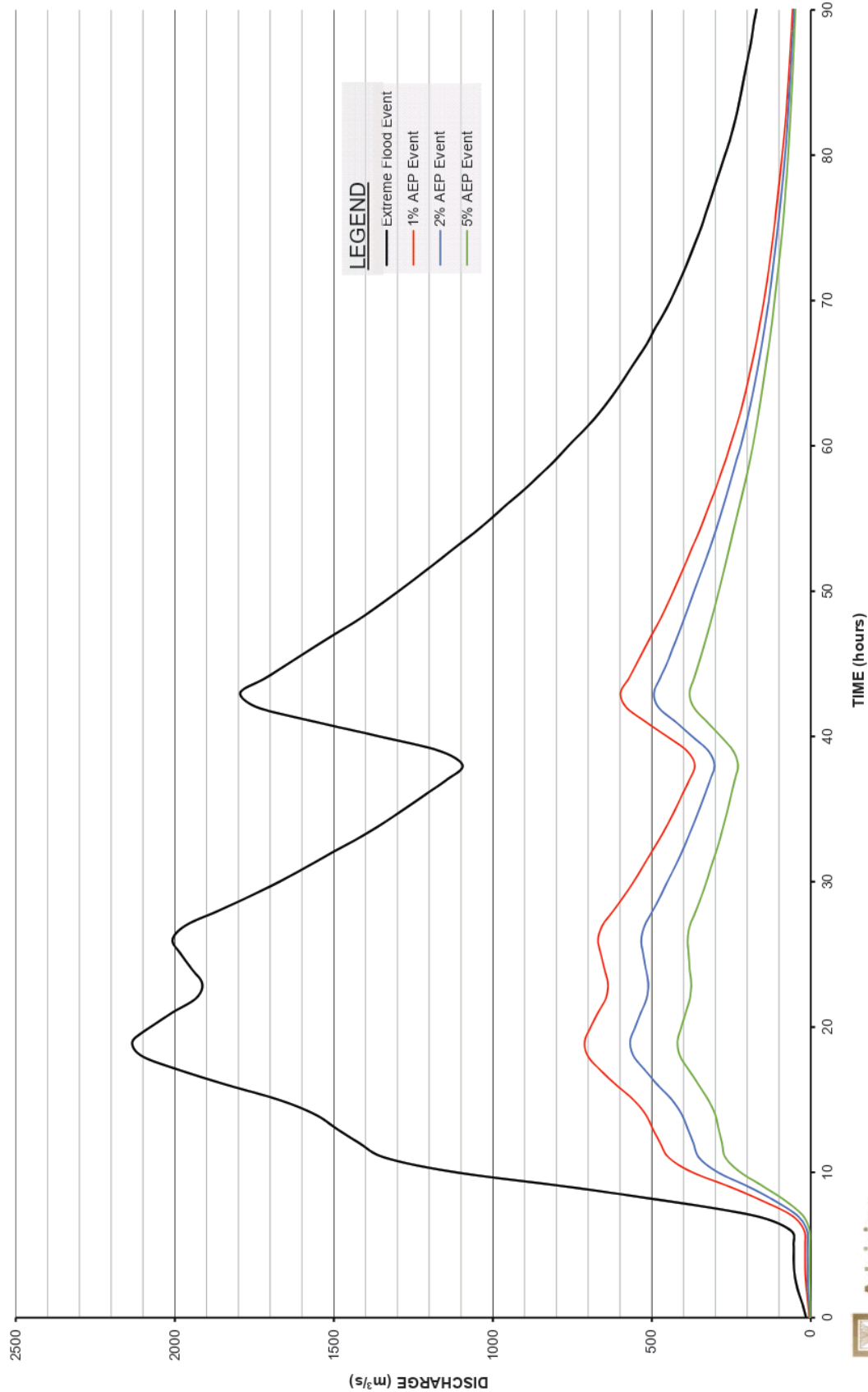
FIGURE 5.2



HYDROGRAPHS FOR THE WILSON RIVER
UPSTREAM OF PACIFIC HIGHWAY

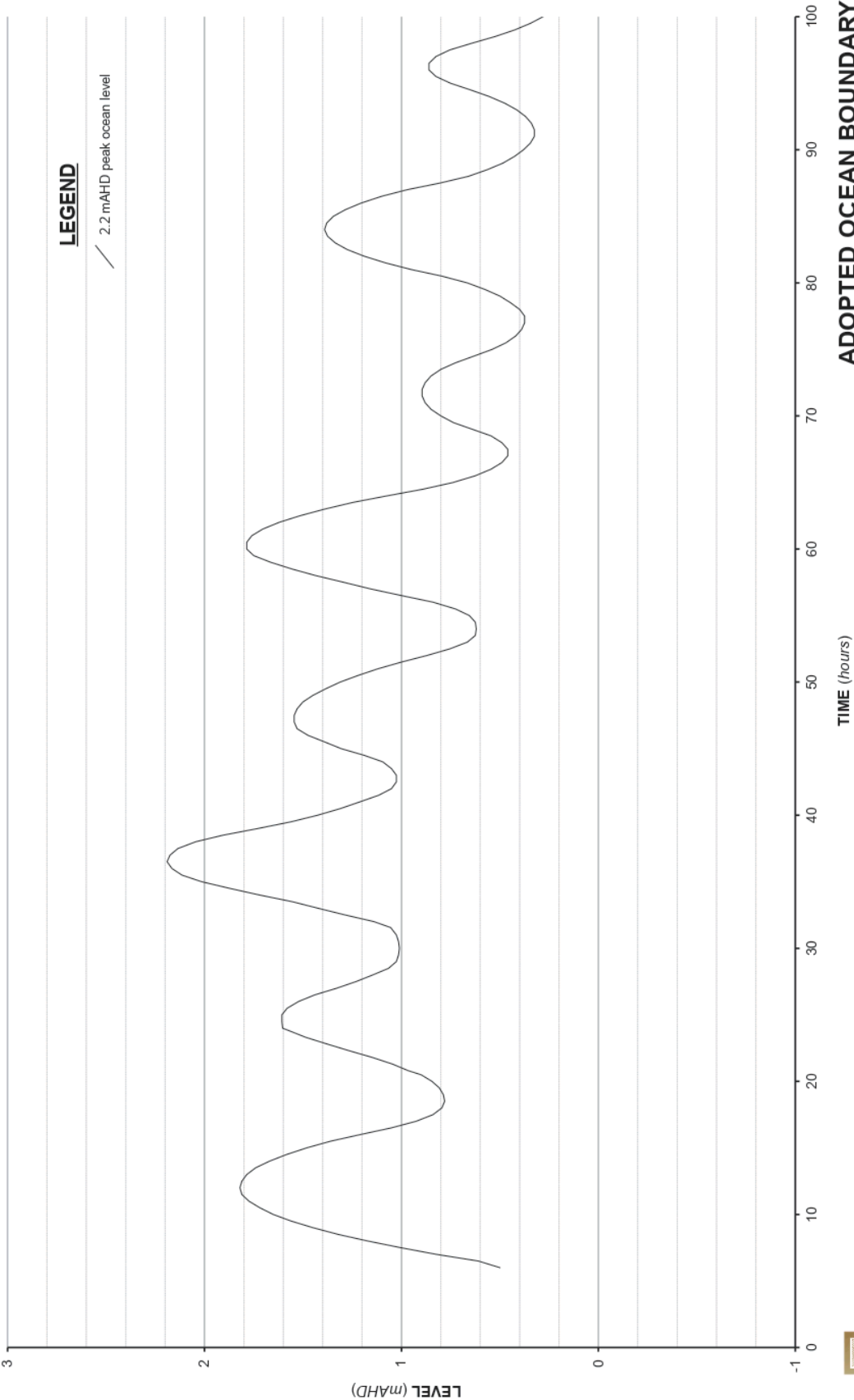
Advisian
Mott MacDonald Group
301015-03826-Hibbard Floodway FRMS
fig301015-03826fig190315_Fig 5.2 - Wilson River Hydrographs

FIGURE 5.3



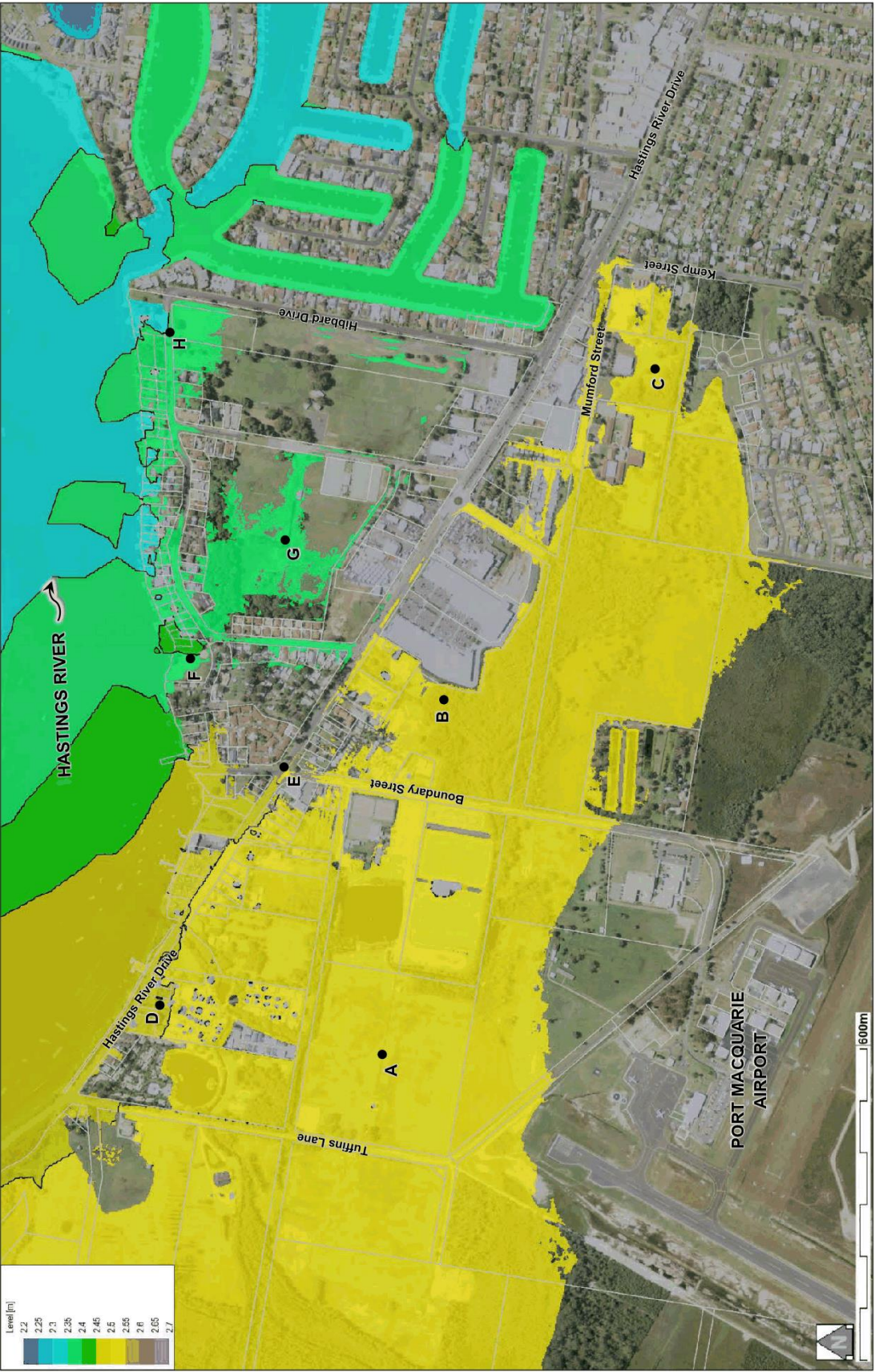
Advician
McIntyre & Partners Group
301015-03826-Hibbard Floodway FRMS
fg301015-03826rg190315_Fig 5.2 - Wilson River Hydrographs

FIGURE 5.4



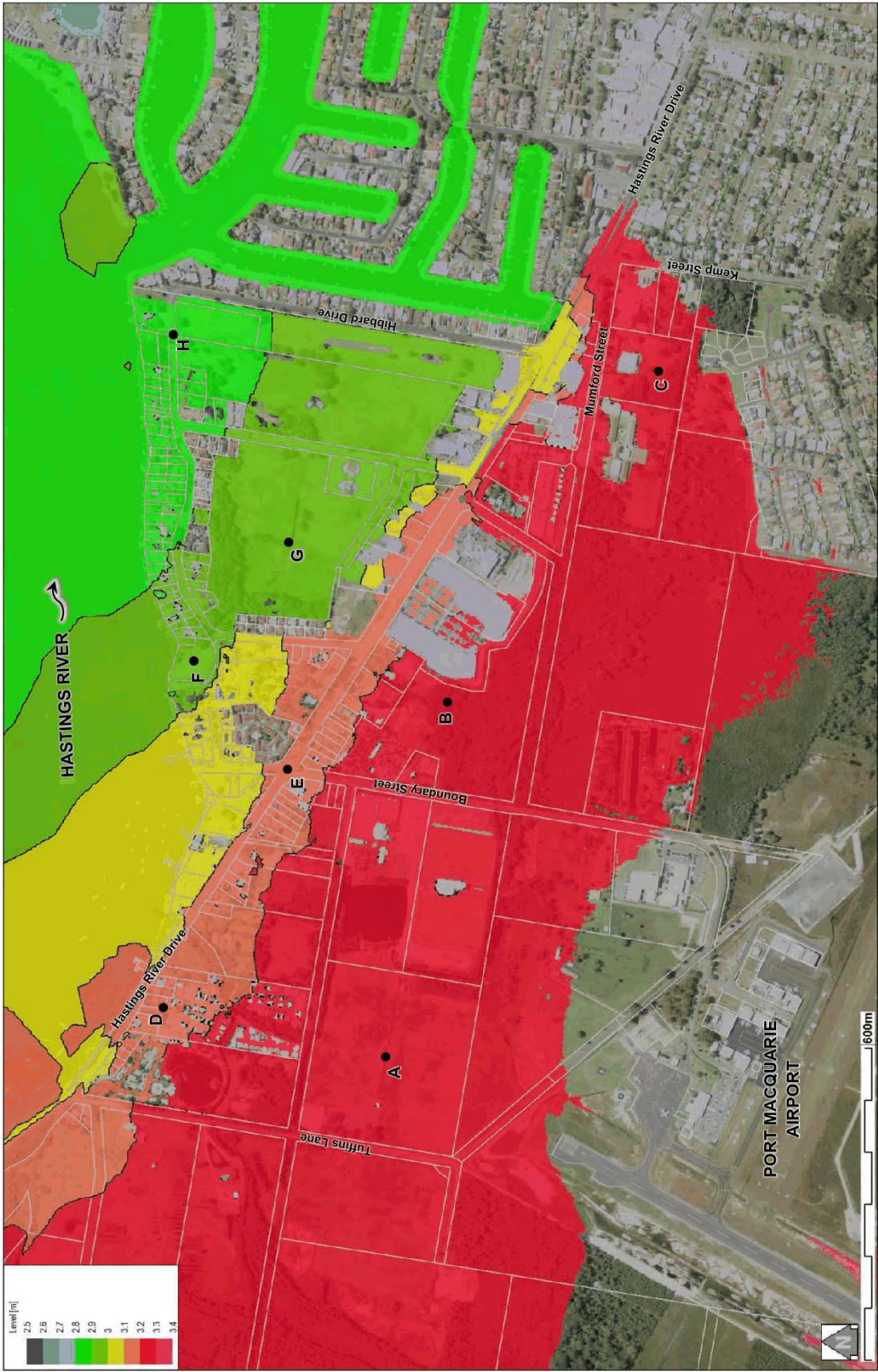
ADOPTED OCEAN BOUNDARY
CONDITIONS FOR DESIGN
FLOOD SIMULATIONS

FIGURE 5.5



PREDICTED PEAK FLOOD LEVELS
DURING THE 5% AEP FLOOD

FIGURE 5.6

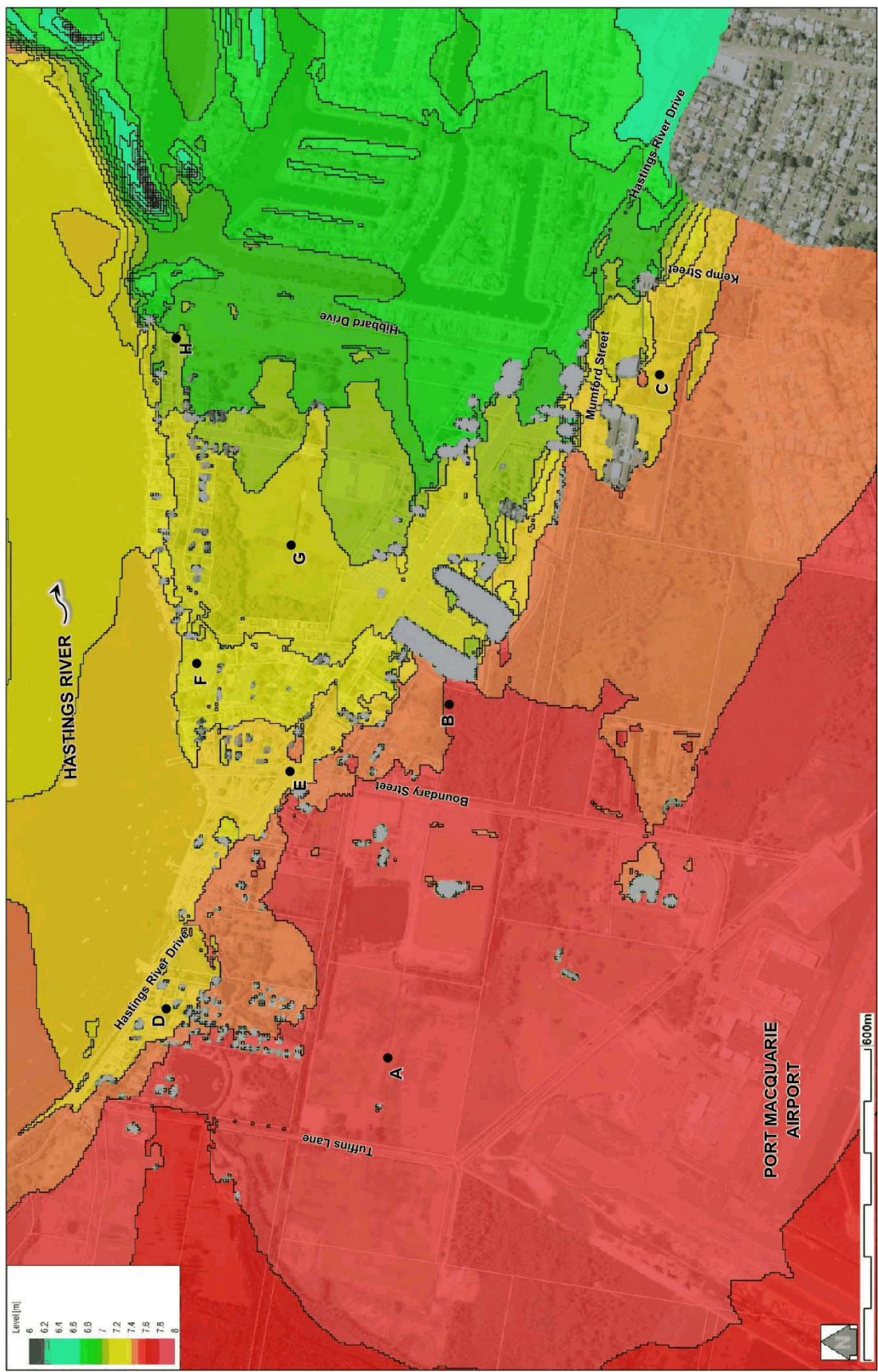


PREDICTED PEAK FLOOD LEVELS
DURING THE 1% AEP FLOOD

Advisian

300015-03826-Hibbard Floodway FRMS
fig301015-03826fig30108_Fig 3.0 - 1% AEP Levels.docx

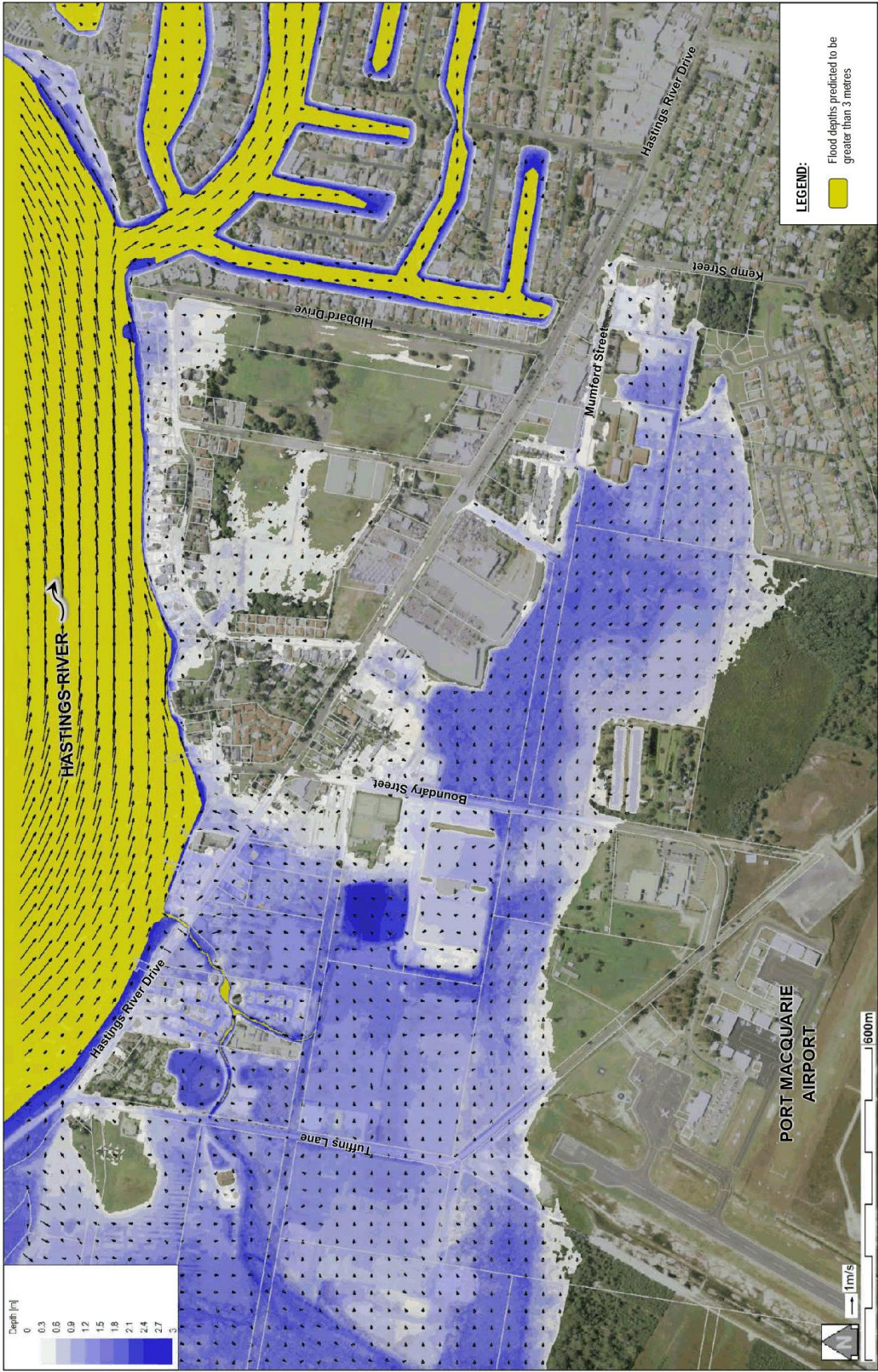
FIGURE 5.7



PREDICTED PEAK FLOOD LEVELS
DURING THE EXTREME FLOOD EVENT

Advisian
MWH | Parsons Group
300015-03826: Hibbard Floodway FRMS
49301015-03826g130108_Fig 5.7 - Extreme Event Levels.docx

FIGURE 5.8



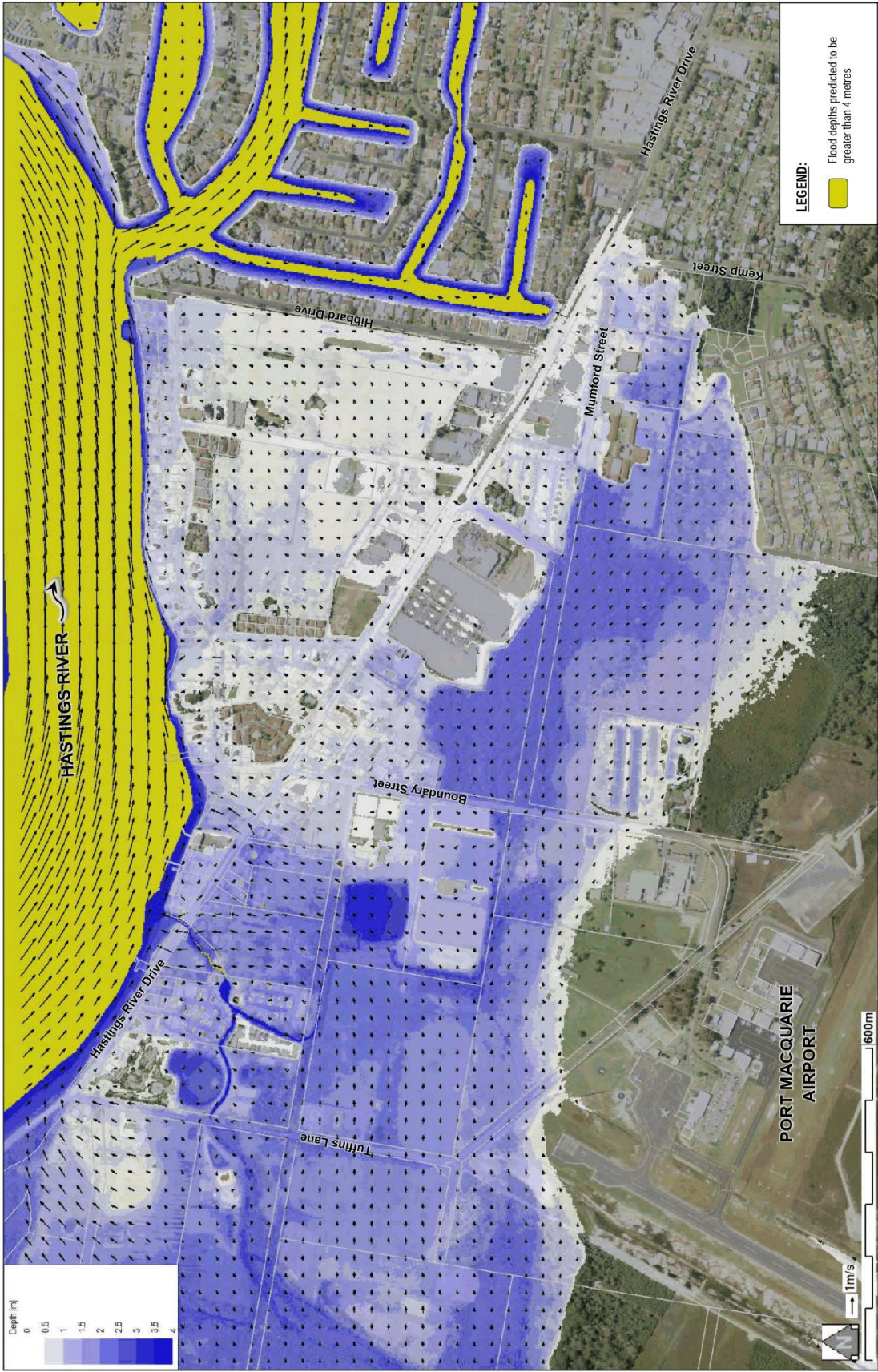
PREDICTED PEAK FLOOD DEPTHS
DURING THE 5% AEP FLOOD

Advisian

Working Partners Group

300015-03506-Hibbard Floodway FRMS
fig301015-03506fig30108_Fig 5.8 - 5% AEP Depths.docx

FIGURE 5.9



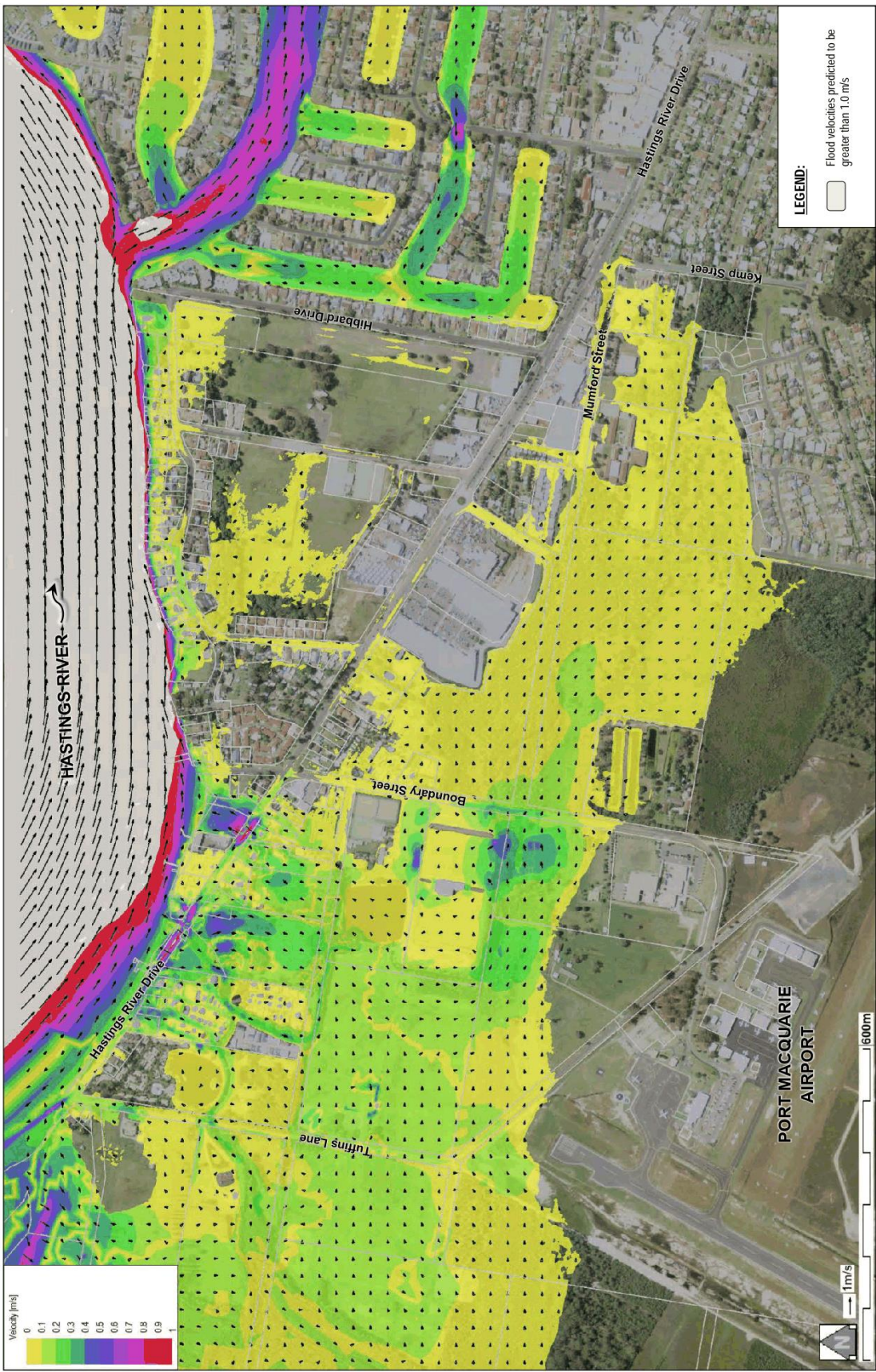
PREDICTED PEAK FLOOD DEPTHS
DURING THE 1% AEP FLOOD

FIGURE 5.10



PREDICTED PEAK FLOOD DEPTHS
DURING THE EXTREME FLOOD EVENT

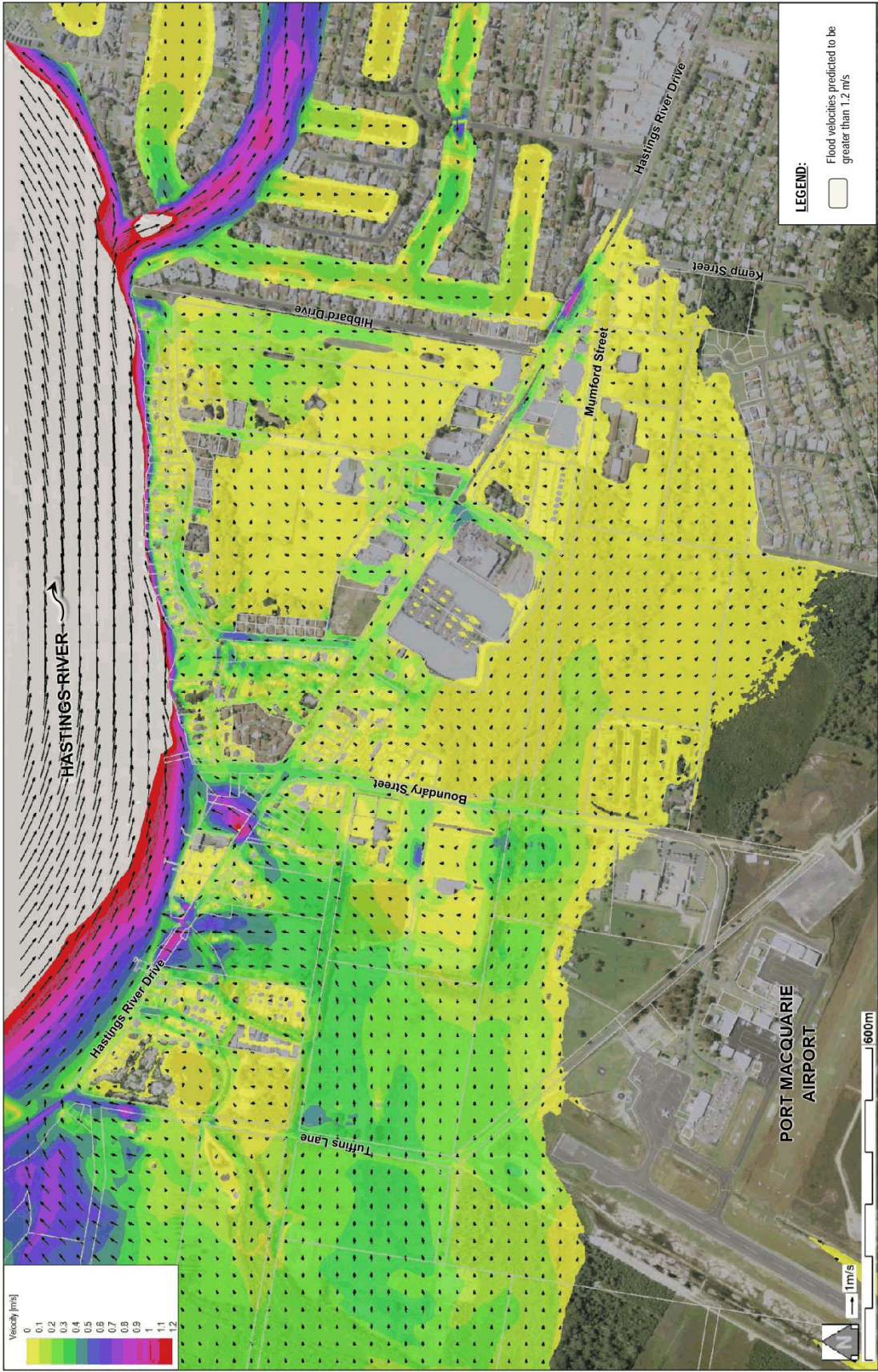
FIGURE 5.11



PREDICTED PEAK FLOW VELOCITIES
DURING THE 5% AEP FLOOD

Advisian
Wentley Parsons Group
30/01/15-03/06/15: Hibbard Floodway FRMS
fig301015-030205fig30108_Fig 5.11 - 5% AEP Velocities.docx

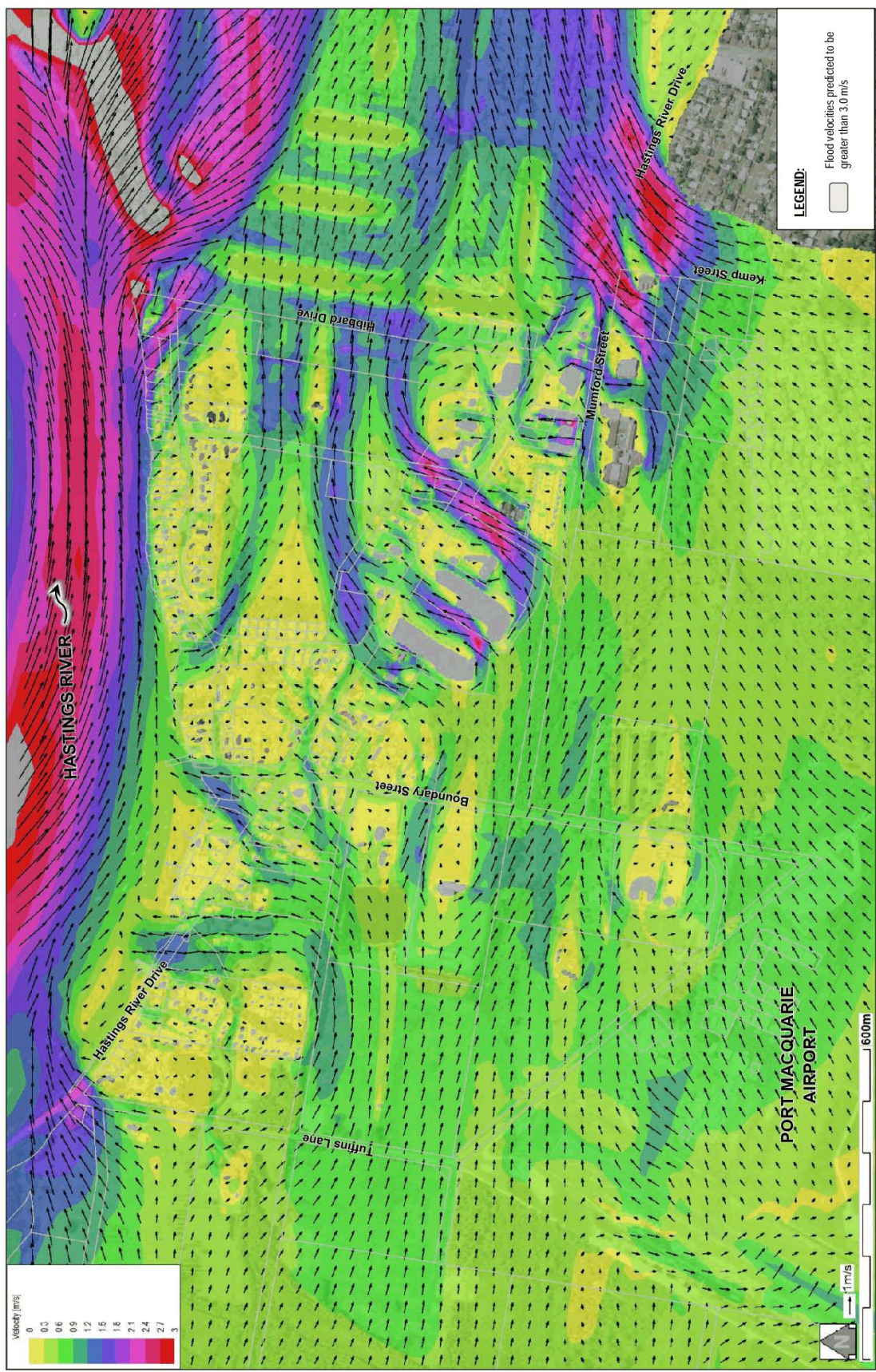
FIGURE 5.12



PREDICTED PEAK FLOW VELOCITIES
DURING THE 1% AEP FLOOD

Advisian
Working Partners Group
30/01/15-03/05-14/06/15-17/08/15-20/11/15-23/02/16-26/05/16-29/08/16-01/11/16-04/02/17-07/05/17-10/08/17-13/11/17-16/02/18-19/05/18-22/08/18-25/11/18-28/02/19-01/05/19-04/08/19-07/11/19-10/02/20-13/05/20-16/08/20-19/11/20-22/02/21-25/05/21-28/08/21-31/11/21-03/05/22-06/08/22-09/11/22-12/02/23-15/05/23-18/08/23-21/11/23-24/02/24-27/05/24-30/08/24-31/11/24-03/05/25-06/08/25-09/11/25-12/02/26-15/05/26-18/08/26-21/11/26-24/02/27-27/05/27-30/08/27-31/11/27-03/05/28-06/08/28-09/11/28-12/02/29-15/05/29-18/08/29-21/11/29-24/02/30-27/05/30-30/08/30-31/11/30-03/05/31-06/08/31-09/11/31-12/02/32-15/05/32-18/08/32-21/11/32-24/02/33-27/05/33-30/08/33-31/11/33-03/05/34-06/08/34-09/11/34-12/02/35-15/05/35-18/08/35-21/11/35-24/02/36-27/05/36-30/08/36-31/11/36-03/05/37-06/08/37-09/11/37-12/02/38-15/05/38-18/08/38-21/11/38-24/02/39-27/05/39-30/08/39-31/11/39-03/05/40-06/08/40-09/11/40-12/02/41-15/05/41-18/08/41-21/11/41-24/02/42-27/05/42-30/08/42-31/11/42-03/05/43-06/08/43-09/11/43-12/02/44-15/05/44-18/08/44-21/11/44-24/02/45-27/05/45-30/08/45-31/11/45-03/05/46-06/08/46-09/11/46-12/02/47-15/05/47-18/08/47-21/11/47-24/02/48-27/05/48-30/08/48-31/11/48-03/05/49-06/08/49-09/11/49-12/02/50-15/05/50-18/08/50-21/11/50-24/02/51-27/05/51-30/08/51-31/11/51-03/05/52-06/08/52-09/11/52-12/02/53-15/05/53-18/08/53-21/11/53-24/02/54-27/05/54-30/08/54-31/11/54-03/05/55-06/08/55-09/11/55-12/02/56-15/05/56-18/08/56-21/11/56-24/02/57-27/05/57-30/08/57-31/11/57-03/05/58-06/08/58-09/11/58-12/02/59-15/05/59-18/08/59-21/11/59-24/02/60-27/05/60-30/08/60-31/11/60-03/05/61-06/08/61-09/11/61-12/02/62-15/05/62-18/08/62-21/11/62-24/02/63-27/05/63-30/08/63-31/11/63-03/05/64-06/08/64-09/11/64-12/02/65-15/05/65-18/08/65-21/11/65-24/02/66-27/05/66-30/08/66-31/11/66-03/05/67-06/08/67-09/11/67-12/02/68-15/05/68-18/08/68-21/11/68-24/02/69-27/05/69-30/08/69-31/11/69-03/05/70-06/08/70-09/11/70-12/02/71-15/05/71-18/08/71-21/11/71-24/02/72-27/05/72-30/08/72-31/11/72-03/05/73-06/08/73-09/11/73-12/02/74-15/05/74-18/08/74-21/11/74-24/02/75-27/05/75-30/08/75-31/11/75-03/05/76-06/08/76-09/11/76-12/02/77-15/05/77-18/08/77-21/11/77-24/02/78-27/05/78-30/08/78-31/11/78-03/05/79-06/08/79-09/11/79-12/02/80-15/05/80-18/08/80-21/11/80-24/02/81-27/05/81-30/08/81-31/11/81-03/05/82-06/08/82-09/11/82-12/02/83-15/05/83-18/08/83-21/11/83-24/02/84-27/05/84-30/08/84-31/11/84-03/05/85-06/08/85-09/11/85-12/02/86-15/05/86-18/08/86-21/11/86-24/02/87-27/05/87-30/08/87-31/11/87-03/05/88-06/08/88-09/11/88-12/02/89-15/05/89-18/08/89-21/11/89-24/02/90-27/05/90-30/08/90-31/11/90-03/05/91-06/08/91-09/11/91-12/02/92-15/05/92-18/08/92-21/11/92-24/02/93-27/05/93-30/08/93-31/11/93-03/05/94-06/08/94-09/11/94-12/02/95-15/05/95-18/08/95-21/11/95-24/02/96-27/05/96-30/08/96-31/11/96-03/05/97-06/08/97-09/11/97-12/02/98-15/05/98-18/08/98-21/11/98-24/02/99-27/05/99-30/08/99-31/11/99-03/05/100-06/08/100-09/11/100-12/02/101-15/05/101-18/08/101-21/11/101-24/02/102-27/05/102-30/08/102-31/11/102-03/05/103-06/08/103-09/11/103-12/02/104-15/05/104-18/08/104-21/11/104-24/02/105-27/05/105-30/08/105-31/11/105-03/05/106-06/08/106-09/11/106-12/02/107-15/05/107-18/08/107-21/11/107-24/02/108-27/05/108-30/08/108-31/11/108-03/05/109-06/08/109-09/11/109-12/02/110-15/05/110-18/08/110-21/11/110-24/02/111-27/05/111-30/08/111-31/11/111-03/05/112-06/08/112-09/11/112-12/02/113-15/05/113-18/08/113-21/11/113-24/02/114-27/05/114-30/08/114-31/11/114-03/05/115-06/08/115-09/11/115-12/02/116-15/05/116-18/08/116-21/11/116-24/02/117-27/05/117-30/08/117-31/11/117-03/05/118-06/08/118-09/11/118-12/02/119-15/05/119-18/08/119-21/11/119-24/02/120-27/05/120-30/08/120-31/11/120-03/05/121-06/08/121-09/11/121-12/02/122-15/05/122-18/08/122-21/11/122-24/02/123-27/05/123-30/08/123-31/11/123-03/05/124-06/08/124-09/11/124-12/02/125-15/05/125-18/08/125-21/11/125-24/02/126-27/05/126-30/08/126-31/11/126-03/05/127-06/08/127-09/11/127-12/02/128-15/05/128-18/08/128-21/11/128-24/02/129-27/05/129-30/08/129-31/11/129-03/05/130-06/08/130-09/11/130-12/02/131-15/05/131-18/08/131-21/11/131-24/02/132-27/05/132-30/08/132-31/11/132-03/05/133-06/08/133-09/11/133-12/02/134-15/05/134-18/08/134-21/11/134-24/02/135-27/05/135-30/08/135-31/11/135-03/05/136-06/08/136-09/11/136-12/02/137-15/05/137-18/08/137-21/11/137-24/02/138-27/05/138-30/08/138-31/11/138-03/05/139-06/08/139-09/11/139-12/02/140-15/05/140-18/08/140-21/11/140-24/02/141-27/05/141-30/08/141-31/11/141-03/05/142-06/08/142-09/11/142-12/02/143-15/05/143-18/08/143-21/11/143-24/02/144-27/05/144-30/08/144-31/11/144-03/05/145-06/08/145-09/11/145-12/02/146-15/05/146-18/08/146-21/11/146-24/02/147-27/05/147-30/08/147-31/11/147-03/05/148-06/08/148-09/11/148-12/02/149-15/05/149-18/08/149-21/11/149-24/02/150-27/05/150-30/08/150-31/11/150-03/05/151-06/08/151-09/11/151-12/02/152-15/05/152-18/08/152-21/11/152-24/02/153-27/05/153-30/08/153-31/11/153-03/05/154-06/08/154-09/11/154-12/02/155-15/05/155-18/08/155-21/11/155-24/02/156-27/05/156-30/08/156-31/11/156-03/05/157-06/08/157-09/11/157-12/02/158-15/05/158-18/08/158-21/11/158-24/02/159-27/05/159-30/08/159-31/11/159-03/05/160-06/08/160-09/11/160-12/02/161-15/05/161-18/08/161-21/11/161-24/02/162-27/05/162-30/08/162-31/11/162-03/05/163-06/08/163-09/11/163-12/02/164-15/05/164-18/08/164-21/11/164-24/02/165-27/05/165-30/08/165-31/11/165-03/05/166-06/08/166-09/11/166-12/02/167-15/05/167-18/08/167-21/11/167-24/02/168-27/05/168-30/08/168-31/11/168-03/05/169-06/08/169-09/11/169-12/02/170-15/05/170-18/08/170-21/11/170-24/02/171-27/05/171-30/08/171-31/11/171-03/05/172-06/08/172-09/11/172-12/02/173-15/05/173-18/08/173-21/11/173-24/02/174-27/05/174-30/08/174-31/11/174-03/05/175-06/08/175-09/11/175-12/02/176-15/05/176-18/08/176-21/11/176-24/02/177-27/05/177-30/08/177-31/11/177-03/05/178-06/08/178-09/11/178-12/02/179-15/05/179-18/08/179-21/11/179-24/02/180-27/05/180-30/08/180-31/11/180-03/05/181-06/08/181-09/11/181-12/02/182-15/05/182-18/08/182-21/11/182-24/02/183-27/05/183-30/08/183-31/11/183-03/05/184-06/08/184-09/11/184-12/02/185-15/05/185-18/08/185-21/11/185-24/02/186-27/05/186-30/08/186-31/11/186-03/05/187-06/08/187-09/11/187-12/02/188-15/05/188-18/08/188-21/11/188-24/02/189-27/05/189-30/08/189-31/11/189-03/05/190-06/08/190-09/11/190-12/02/191-15/05/191-18/08/191-21/11/191-24/02/192-27/05/192-30/08/192-31/11/192-03/05/193-06/08/193-09/11/193-12/02/194-15/05/194-18/08/194-21/11/194-24/02/195-27/05/195-30/08/195-31/11/195-03/05/196-06/08/196-09/11/196-12/02/197-15/05/197-18/08/197-21/11/197-24/02/198-27/05/198-30/08/198-31/11/198-03/05/199-06/08/199-09/11/199-12/02/200-15/05/200-18/08/200-21/11/200-24/02/201-27/05/201-30/08/201-31/11/201-03/05/202-06/08/202-09/11/202-12/02/203-15/05/203-18/08/203-21/11/203-24/02/204-27/05/204-30/08/204-31/11/204-03/05/205-06/08/205-09/11/205-12/02/206-15/05/206-18/08/206-21/11/206-24/02/207-27/05/207-30/08/207-31/11/207-03/05/208-06/08/208-09/11/208-12/02/209-15/05/209-18/08/209-21/11/209-24/02/210-27/05/210-30/08/210-31/11/210-03/05/211-06/08/211-09/11/211-12/02/212-15/05/212-18/08/212-21/11/212-24/02/213-27/05/213-30/08/213-31/11/213-03/05/214-06/08/214-09/11/214-12/02/215-15/05/215-18/08/215-21/11/215-24/02/216-27/05/216-30/08/216-31/11/216-03/05/217-06/08/217-09/11/217-12/02/218-15/05/218-18/08/218-21/11/218-24/02/219-27/05/219-30/08/219-31/11/219-03/05/220-06/08/220-09/11/220-12/02/221-15/05/221-18/08/221-21/11/221-24/02/222-27/05/222-30/08/222-31/11/222-03/05/223-06/08/223-09/11/223-12/02/224-15/05/224-18/08/224-21/11/224-24/02/225-27/05/225-30/08/225-31/11/225-03/05/226-06/08/226-09/11/226-12/02/227-15/05/227-18/08/227-21/11/227-24/02/228-27/05/228-30/08/228-31/11/228-03/05/229-06/08/229-09/11/229-12/02/230-15/05/230-18/08/230-21/11/230-24/02/231-27/05/231-30/08/231-31/11/231-03/05/232-06/08/232-09/11/232-12/02/233-15/05/233-18/08/233-21/11/233-24/02/234-27/05/234-30/08/234-31/11/234-03/05/235-06/08/235-09/11/235-12/02/236-15/05/236-18/08/236-21/11/236-24/02/237-27/05/237-30/08/237-31/11/237-03/05/238-06/08/238-09/11/238-12/02/239-15/05/239-18/08/239-21/11/239-24/02/240-27/05/240-30/08/240-31/11/240-03/05/241-06/08/241-09/11/241-12/02/242-15/05/242-18/08/242-21/11/242-24/02/243-27/05/243-30/08/243-31/11/243-03/05/244-06/08/244-09/11/244-12/02/245-15/05/245-18/08/245-21/11/245-24/02/246-27/05/246-30/08/246-31/11/246-03/05/247-06/08/247-09/11/247-12/02/248-15/05/248-18/08/248-21/11/248-24/02/249-27/05/249-30/08/249-31/11/249-03/05/250-06/08/250-09/11/250-12/02/251-15/05/251-18/08/251-21/11/251-24/02/252-27/05/252-30/08/252-31/11/252-03/05/253-06/08/253-09/11/253-12/02/254-15/05/254-18/08/254-21/11/254-24/02/255-27/05/255-30/08/255-31/11/255-03/05/256-06/08/256-09/11/256-12/02/257-15/05/257-18/08/257-21/11/257-24/02/258-27/05/258-30/08/258-31/11/258-03/05/259-06/08/259-09/11/259-12/02/260-15/05/260-18/08/260-21/11/260-24/02/261-27/05/261-30/08/261-31/11/261-03/05/262-06/08/262-09/11/262-12/02/263-15/05/263-18/08/263-21/11/263-24/02/264-27/05/264-30/08/264-31/11/264-03/05/265-06/08/265-09/11/265-12/02/266-15/05/266-18/08/266-21/11/266-24/02/267-27/05/267-30/08/267-31/11/267-03/05/268-06/08/268-09/11/268-12/02/269-15/05/269-18/08/269-21/11/269-24/02/270-27/05/270-30/08/270-31/11/270-03/05/271-06/08/271-09/11/271-12/02/272-15/05/272-18/08/272-21/11/272-24/02/273-27/05/273-30/08/273-31/11/273-03/05/274-06/08/274-09/11/274-12/02/275-15/05/275-18/08/275-21/11/275-24/02/276-27/05/276-30/08/276-31/11/276-03/05/277-06/08/277-09/11/277-12/02/278-15/05/278-18/08/278-21/11/278-24/02/279-27/05/279-30/08/279-31/11/279-03/05/280-06/08/280-09/11/280-12/02/281-15/05/281-18/08/281-21/11/281-24/02/282-27/05/282-30/08/282-31/11/282-03/05/283-06/08/283-09/11/283-12/02/284-15/05/284-18/08/284-21/11/284-24/02/285-27/05/285-30/08/285-31/11/285-03/05/286-06/08/286-09/11/286-12/02/287-15/05/287-18/08/287-21/11/287-24/02/288-27/05/288-30/08/288-31/11/288-03/05/289-06/08/289-09/11/289-12/02/290-15/05/290-18/08/290-21/11/290-24/02/291-27/05/291-30/08/291-31/11/291-03/05/292-06/08/292-09/11/292-12/02/293-15/05/293-18/08/293-21/11/293-24/02/294-27/05/294-30/08/294-31/11/294-03/05/295-06/08/295-09/11/295-12/02/296-15/05/296-18/08/296-21/11/296-24/02/297-27/05/297-30/08/297-31/11/297-03/05/298-06/08/298-09/11/298-12/02/299-15/05/299-18/08/299-21/11/299-24/02/300-27/05/300-30/08/300-31/11/300-03/05/301-06/08/301-09/11/301-12/02/302-15/05/302-18/08/302-21/11/302-24/02/303-27/05/303-30/08/303-31/11/303-03/05/304-06/08/304-09/11/304-12/02/305-15/05/305-18/08/305-21/11/305-24/02/306-27/05/306-30/08/306-31/11/306-03/05/307-06/08/307-09/11/307-12/02/308-15/05/308-18/08/308-21/11/308-24/02/309-27/05/309-30/08/309-31/11/309-03/05/310-06/08/310-09/11/310-12/02/311-15/05/311-18/08/311-21/11/311-24/02/312-27/05/312-30/08/312-31/11/312-03/05/313-06/08/313-09/11/313-12/02/314-15/05/314-18/08/314-21/11/314-24/02/315-27/05/315-30/08/315-31/11/315-03/05/316-06/08/316-09/11/316-12/02/317-15/05/317-18/08/317-21/11/317-24/02/318-27/05/318-30/08/318-31/11/318-03/05/319-06/08/319-09/11/319-12/02/320-15/05/320-18/08/320-21/11/320-24/02/321-27/05/321-30/08/321-31/11/321-03/05/322-06/08/322-09/11/322-12/02/323-15/05/323-18/08/323-21/11/323-24/02/324-27/05/324-30/08/324-31/11/324-03/05/325-06/08/325-09/11/325-12/02/326-15/05/326-18/08/326-21/11/326-24/02/327-27/05/327-30/08/327-31/11/327-03/05/328-06/08/328-09/11/328-12/02/329-15/05/329-18/08/329-21/11/329-24/02/330-27/05/330-30/08/330-31/11/330-03/05/331-06/08/331-09/11/331-12/02/332-15/05/332-18/08/332-21/11/332-24/02/333-27/05/333-30/08/333-31/11/333-03/05/334-06/08/334-09/11/334-12/02/335-15/05/335-18/08/335-21/11/335-24/02/336-27/05/336-30/08/336-31/11/336-03/05/337-06/08/337-09/11/337-12/02/338-15/05/338-18/08/338-21/11/338-24/02/339-27/05/339-30/08/339-31/11/339-03/05/340-06/08/340-09/11/340-12/02/341-15/05/341-18/08/341-21/11/341-24/02/342-27/05/342-30/08/342-31/11/342-03/05/343-06/08/343-09/11/343-1

FIGURE 5.13

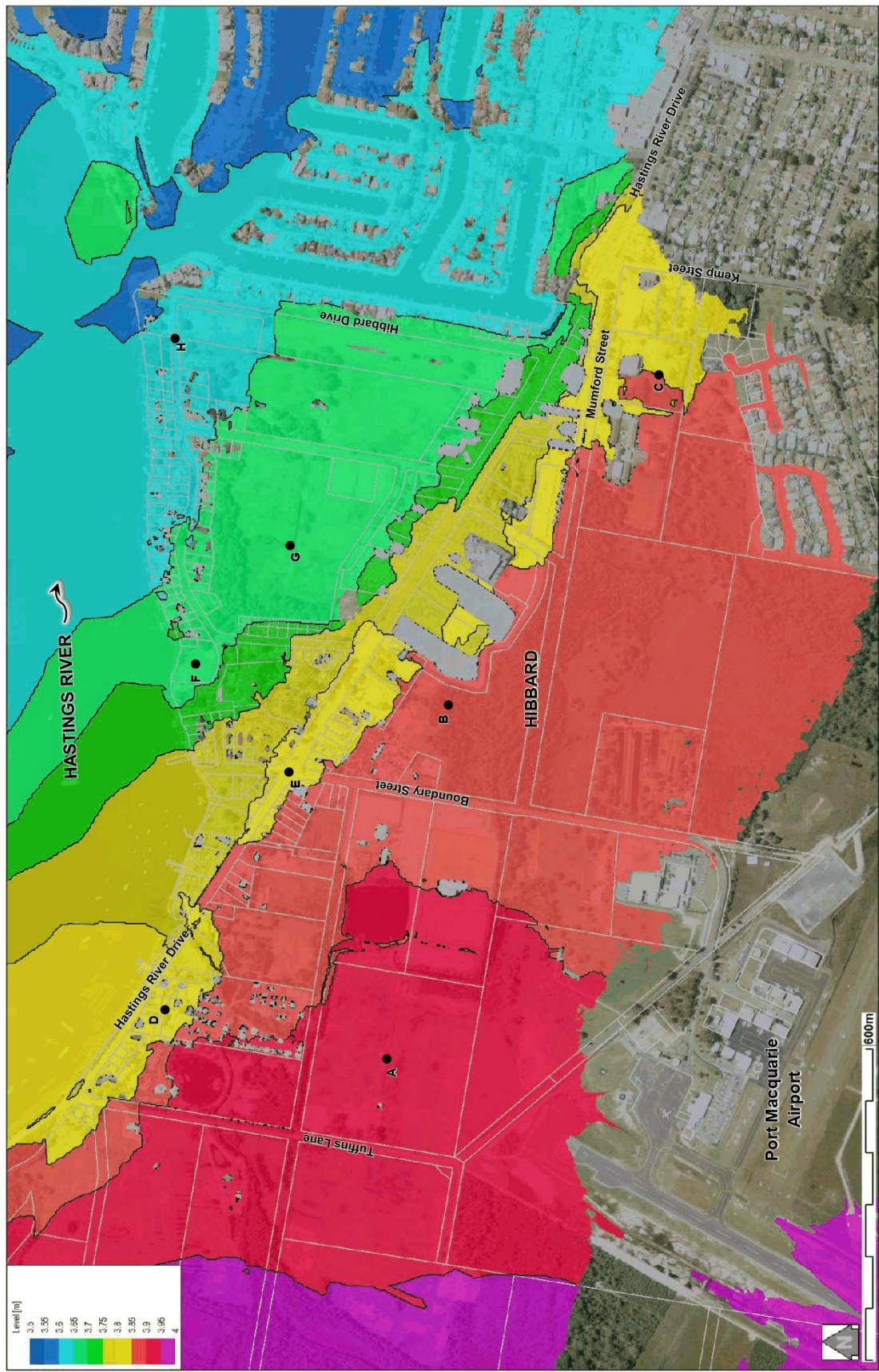


PREDICTED PEAK FLOW VELOCITIES
DURING THE EXTREME FLOOD EVENT

Advisian
McKenzie Parsons Group

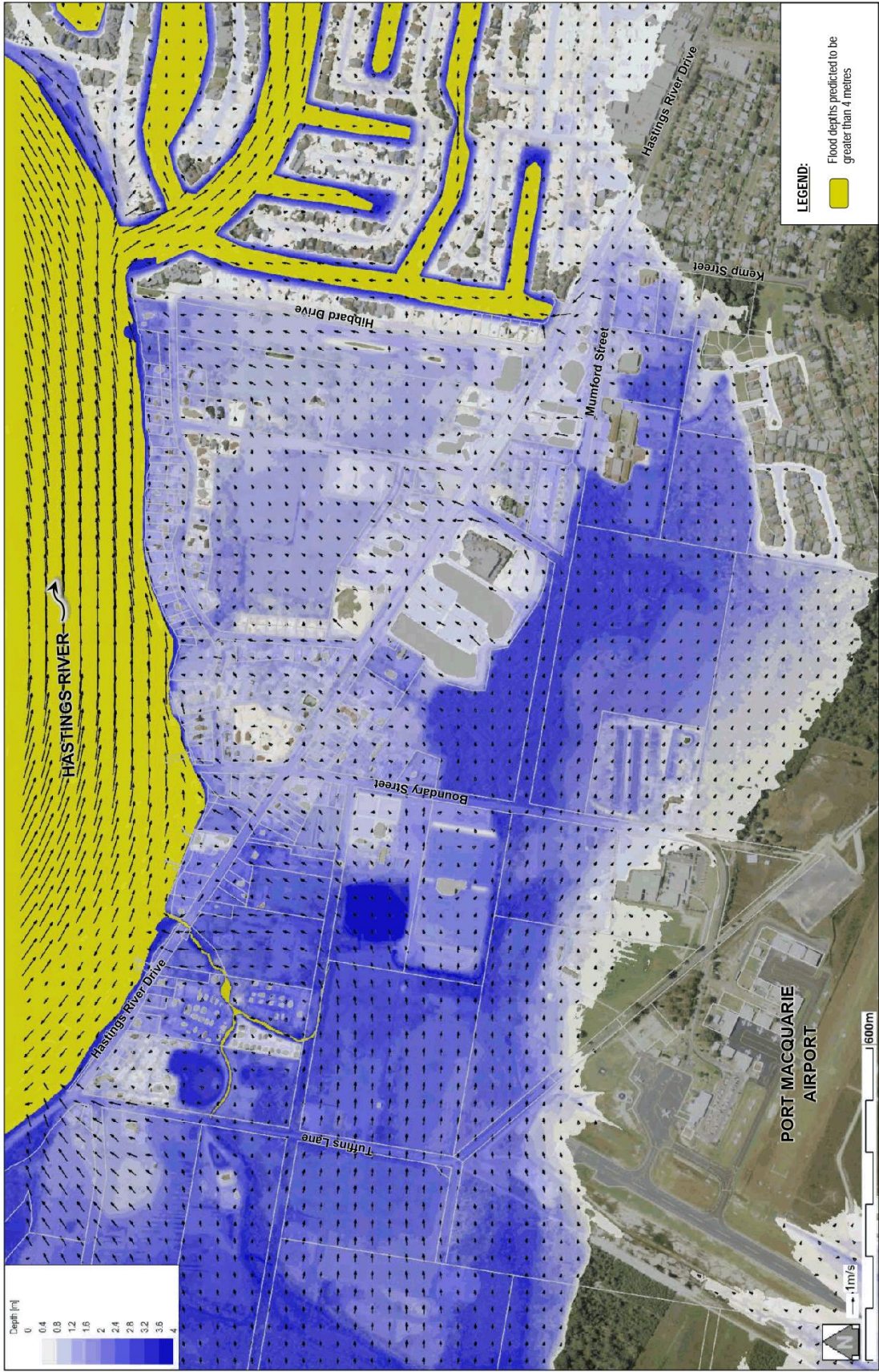
300015-03026-Hibbard Floodway FRMS
16/01/2015-03026-Fig 5.13 - Extreme Event Velocities.docx

FIGURE 6.1



PREDICTED PEAK FLOOD LEVELS
FOR THE RECOMMENDED CLIMATE CHANGE SCENARIO

FIGURE 6.2

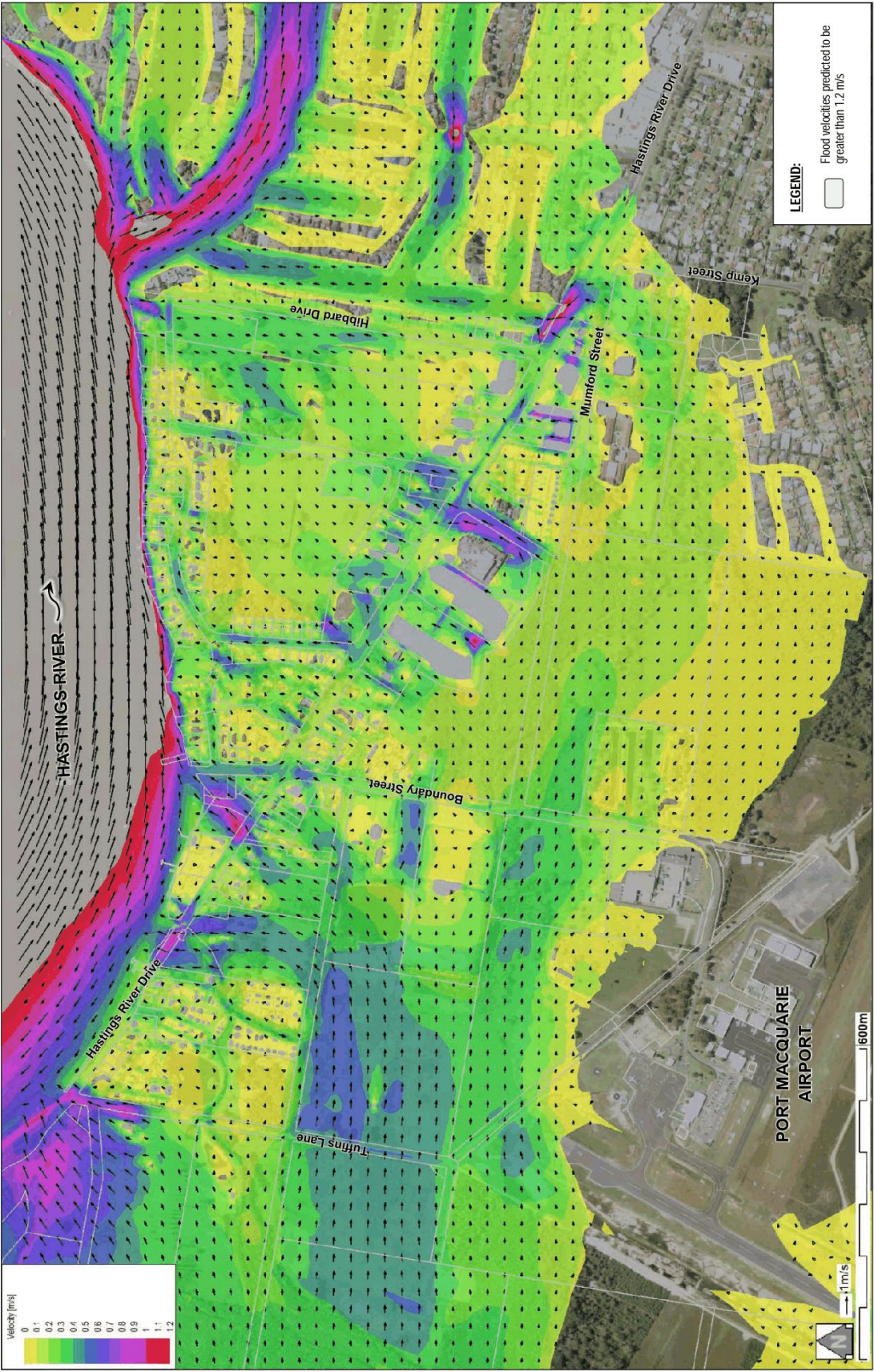


PREDICTED PEAK FLOOD DEPTHS
FOR THE RECOMMENDED CLIMATE CHANGE SCENARIO

Advisian

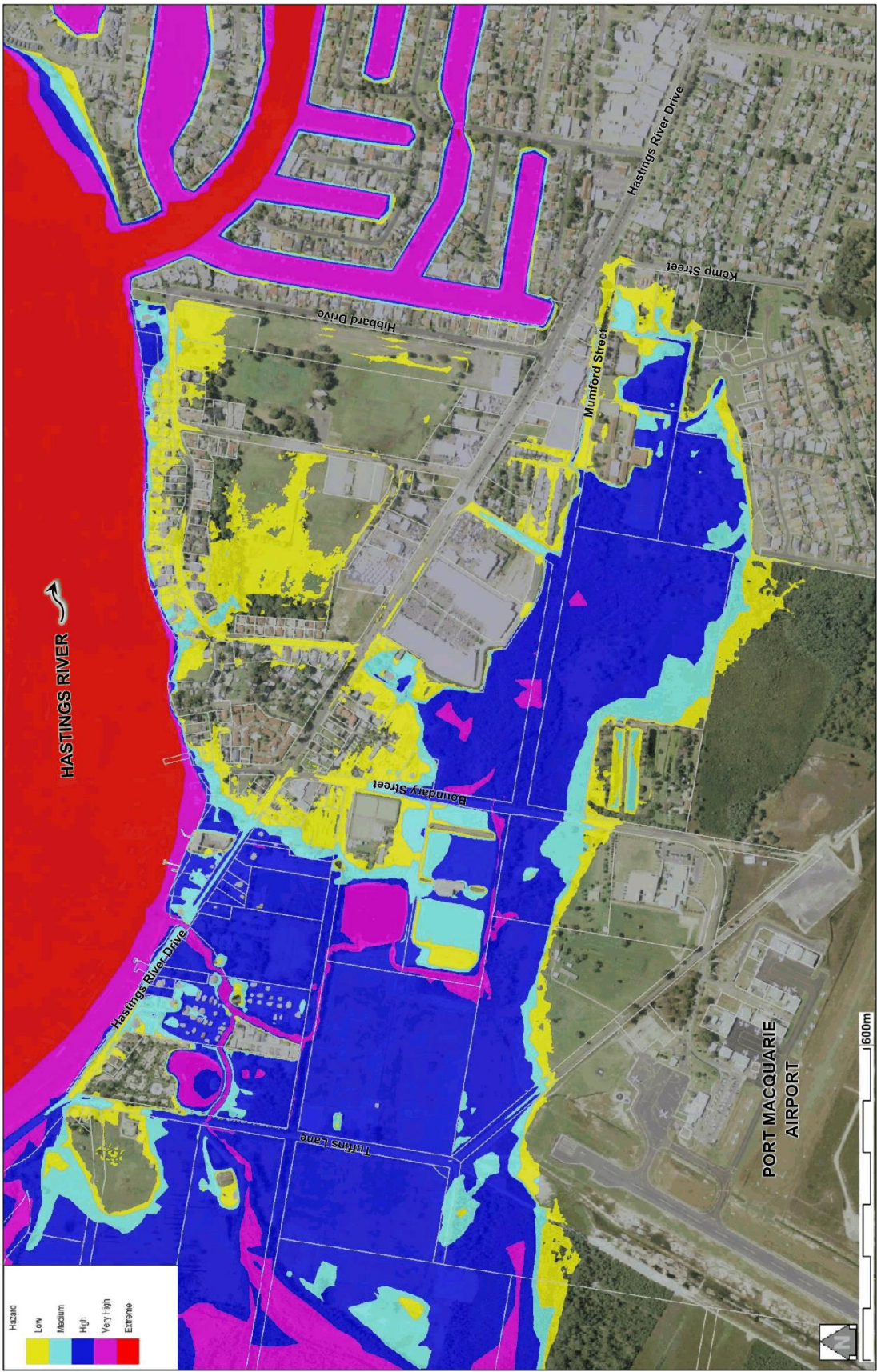
30/01/15-03/05/15: Hilliard Floodway FRMS
19/01/15-03/05/15: Fig 6.2 - CC Depths.docx

FIGURE 6.3



PREDICTED PEAK FLOW VELOCITIES
FOR THE RECOMMENDED CLIMATE CHANGE SCENARIO

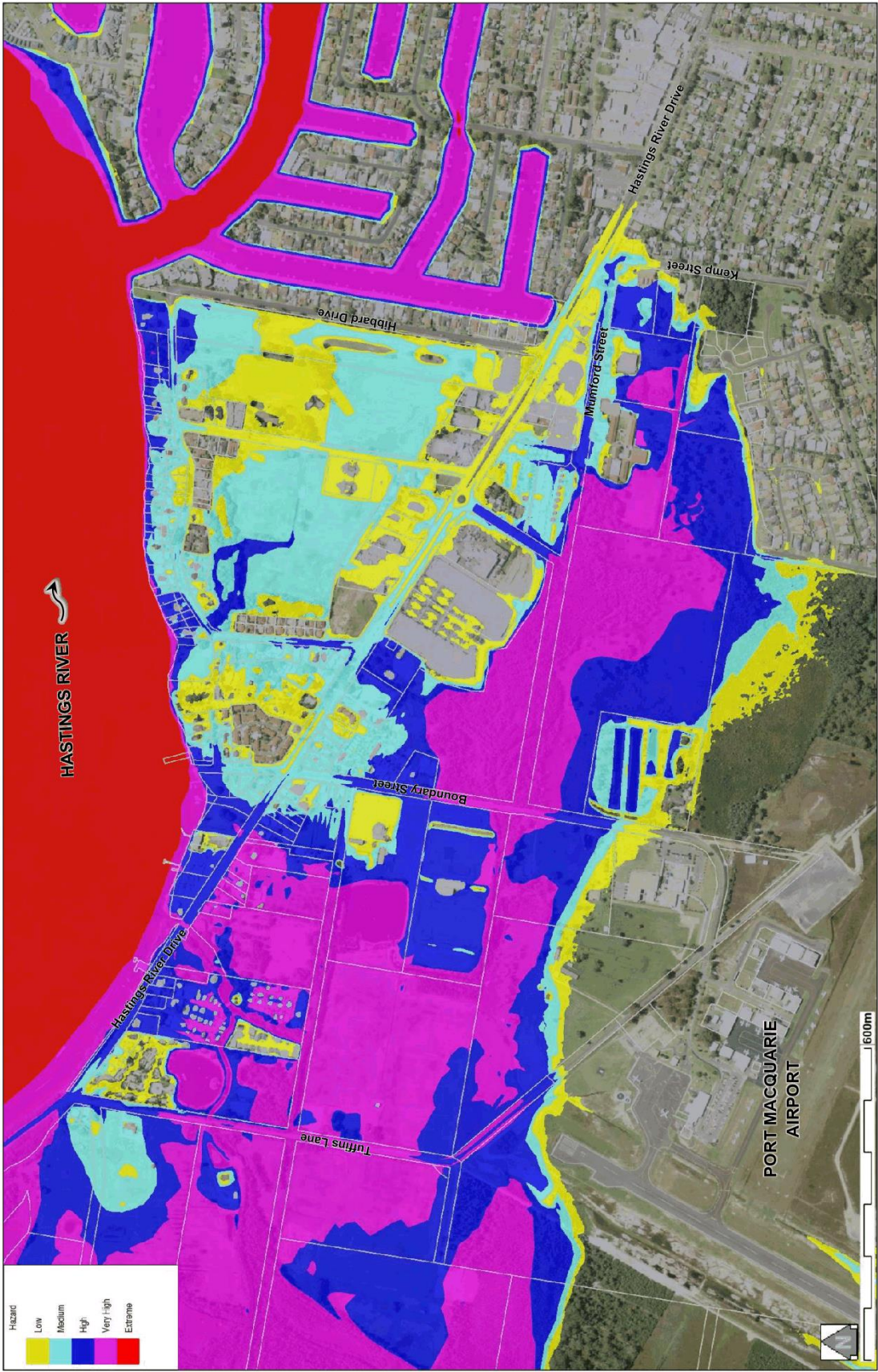
FIGURE 7.1



PREDICTED HAZARD CATEGORIES
FOR THE 5% AEP FLOOD

Advisian
Working Partners Group
30/01/15-03/05-15: Hibbard Floodway FRMS
19/01/15-03/05/15: Hibbard Floodway FRMS
19/01/15-03/05/15: Hibbard Floodway FRMS

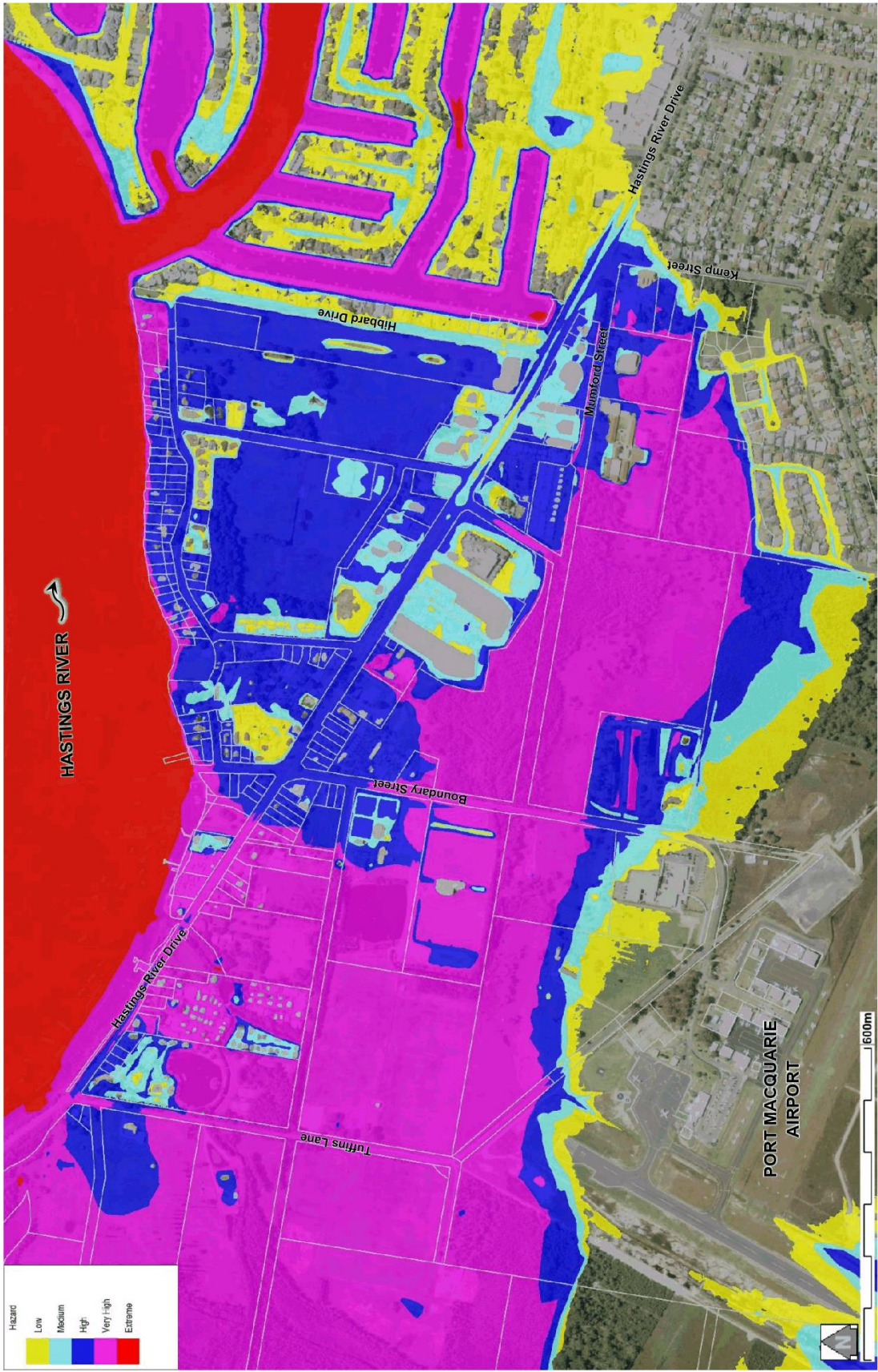
FIGURE 7.2



PREDICTED HAZARD CATEGORIES
FOR THE 1% AEP FLOOD

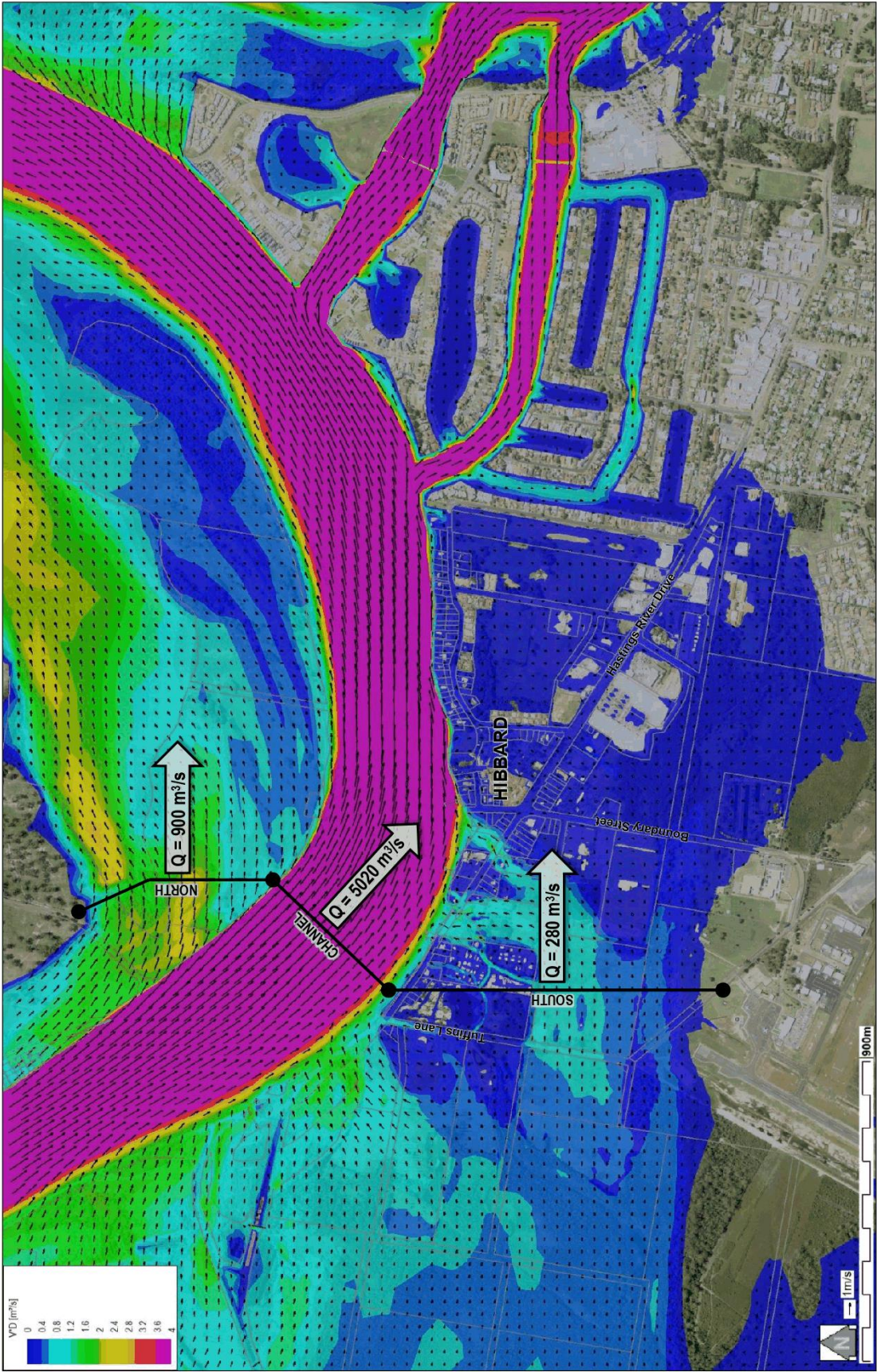
Advisian
Wentley Parsons Group
30/01/15 03:05: Hibbard Floodway FRMS
19/01/15-03:05: Hibbard Floodway FRMS
19/01/15-03:05: Hibbard Floodway FRMS

FIGURE 7.3



PREDICTED HAZARD CATEGORIES
FOR THE RECOMMENDED CLIMATE CHANGE SCENARIO

FIGURE 8.1



1% AEP FLOWS & VELOCITY-DEPTH PRODUCT
PREDICTED IN THE VICINITY OF HIBBARD

Advisian

Working Partners Group

30/01/15-03/05-15 Hibbard Floodway FRMS
15/01/15-03/05-15 Hibbard Floodway FRMS
15/01/15-03/05-15 Hibbard Floodway FRMS

FIGURE 8.2

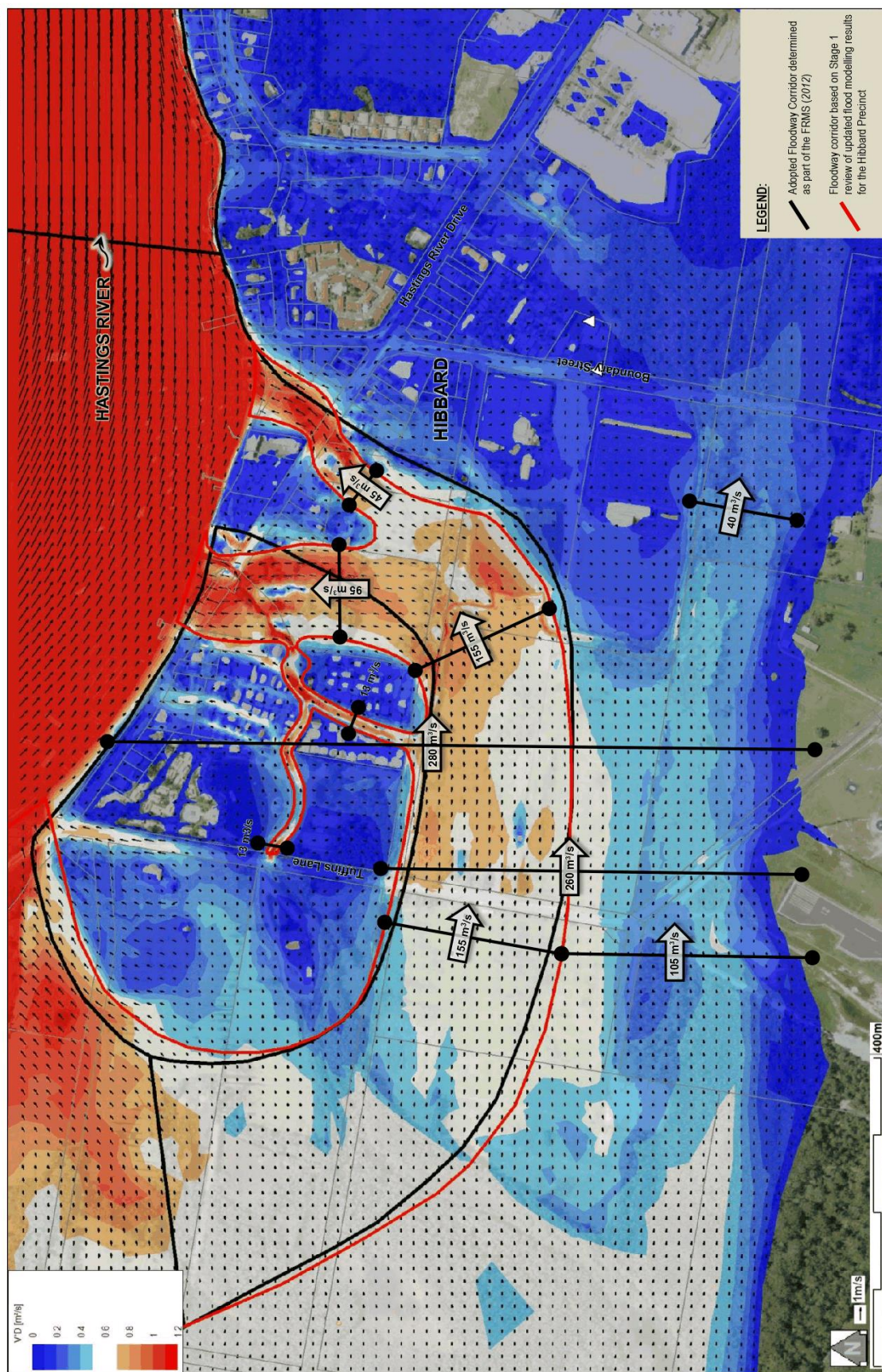
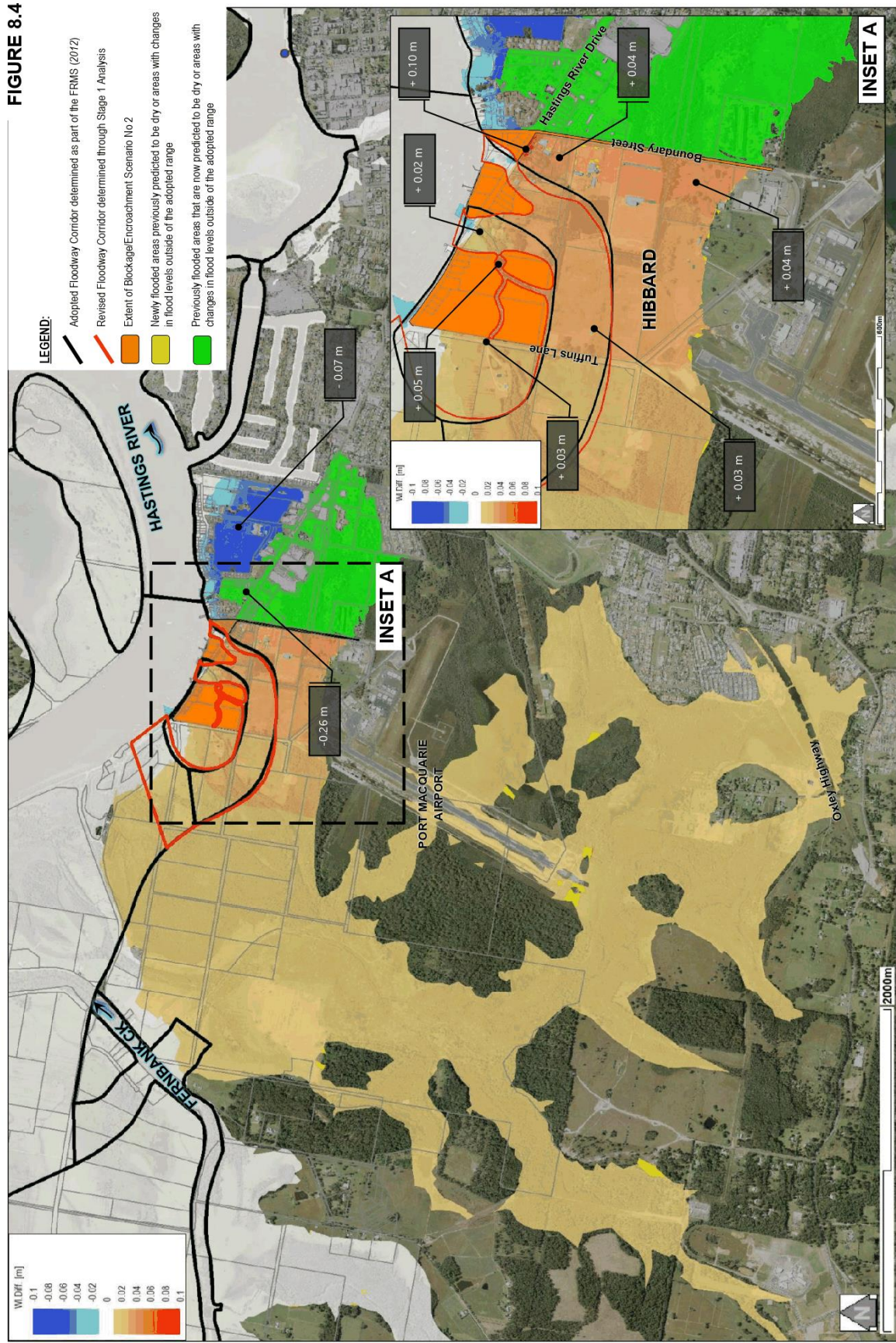


FIGURE 8.3

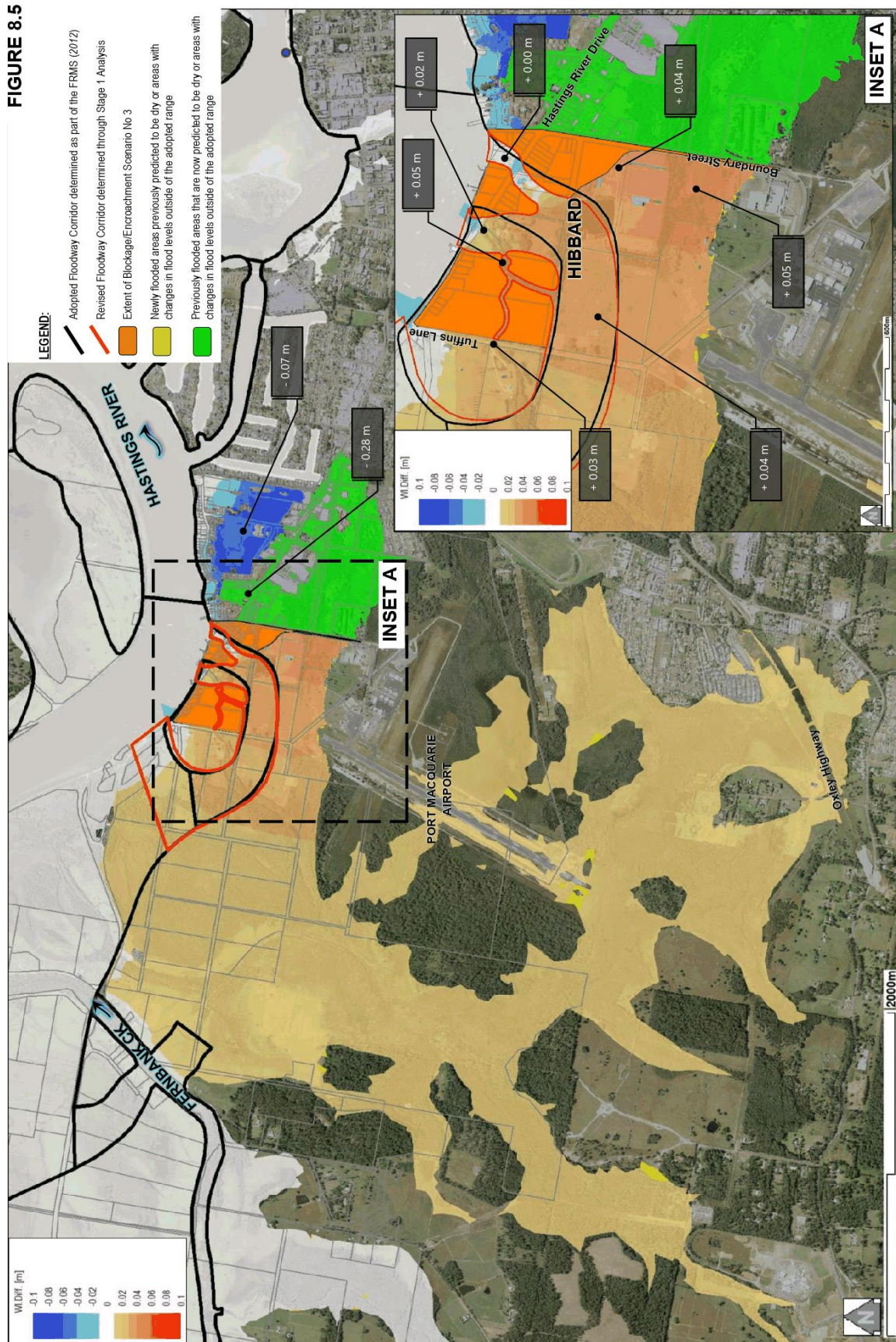


FIGURE 8.4



FLOOD LEVEL DIFFERENCE MAPPING
FOR STAGE 2 BLOCKAGE SCENARIO No 2
FOR THE 1% AEP FLOOD

FIGURE 8.5



**FLOOD LEVEL DIFFERENCE MAPPING
FOR STAGE 2 BLOCKAGE SCENARIO No 3
FOR THE 1% AEP FLOOD**

FIGURE 8.6

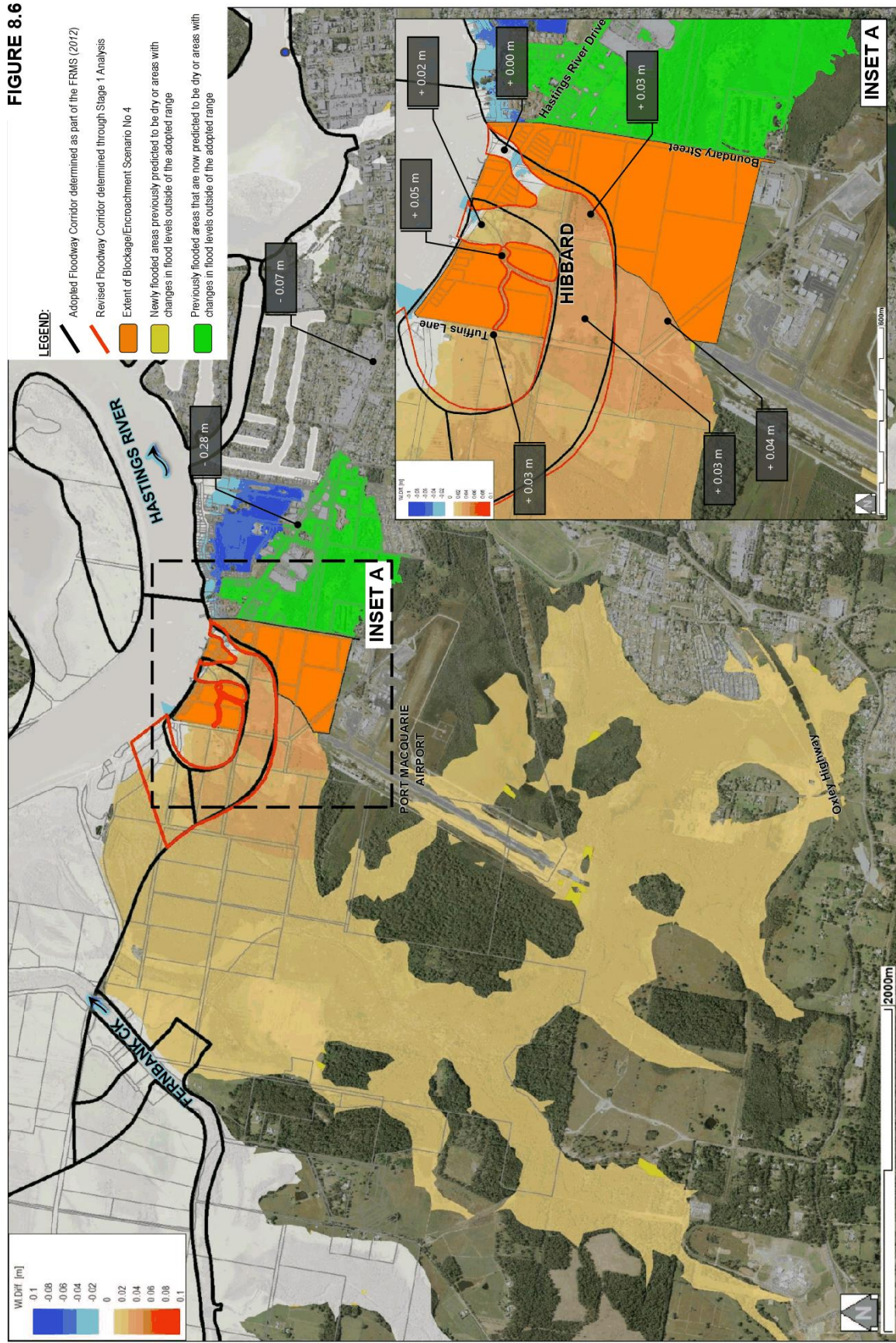
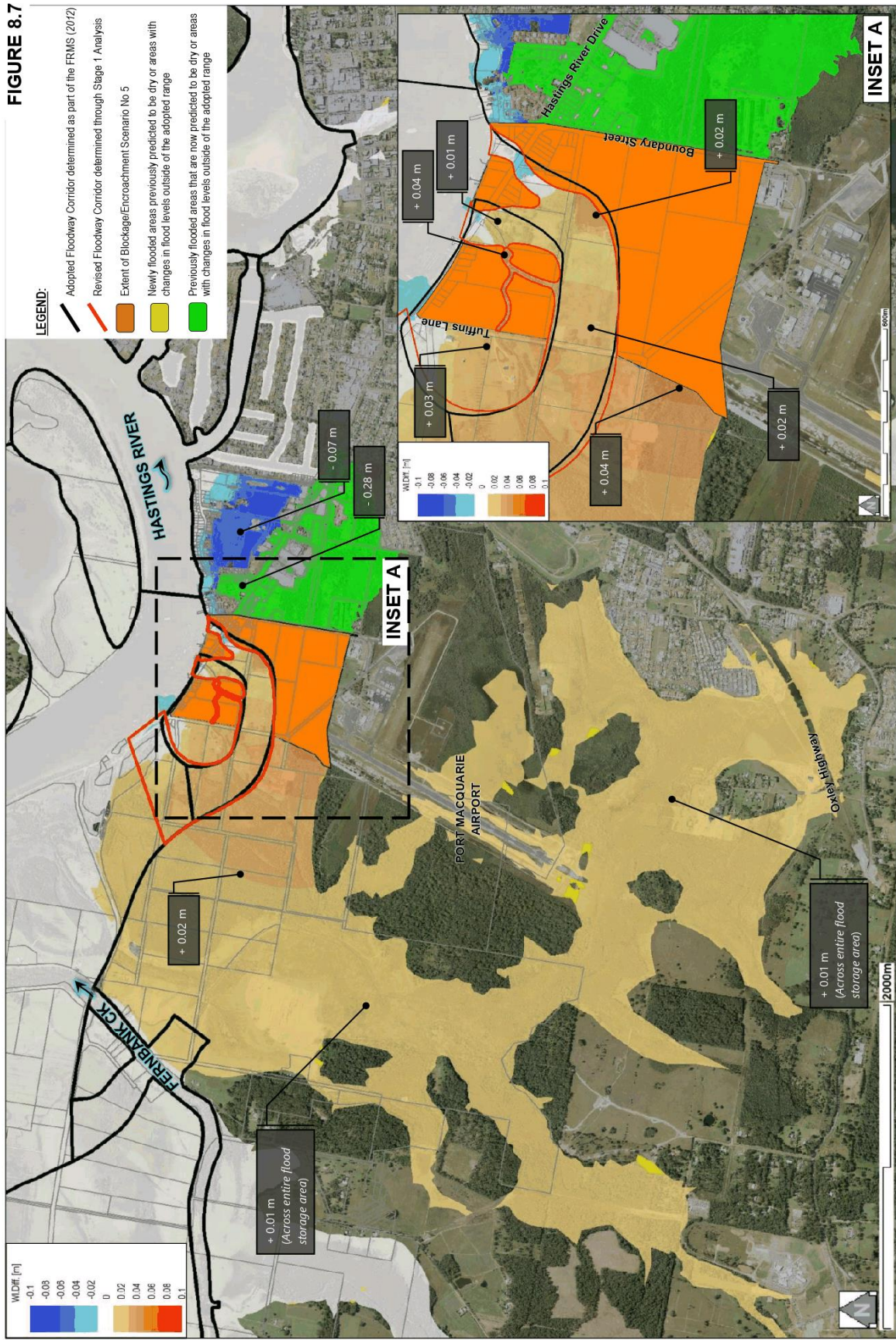


FIGURE 8.7



FLOOD LEVEL DIFFERENCE MAPPING
FOR STAGE 2 BLOCKAGE SCENARIO No 5
FOR THE 1% AEP FLOOD

FIGURE 8.8

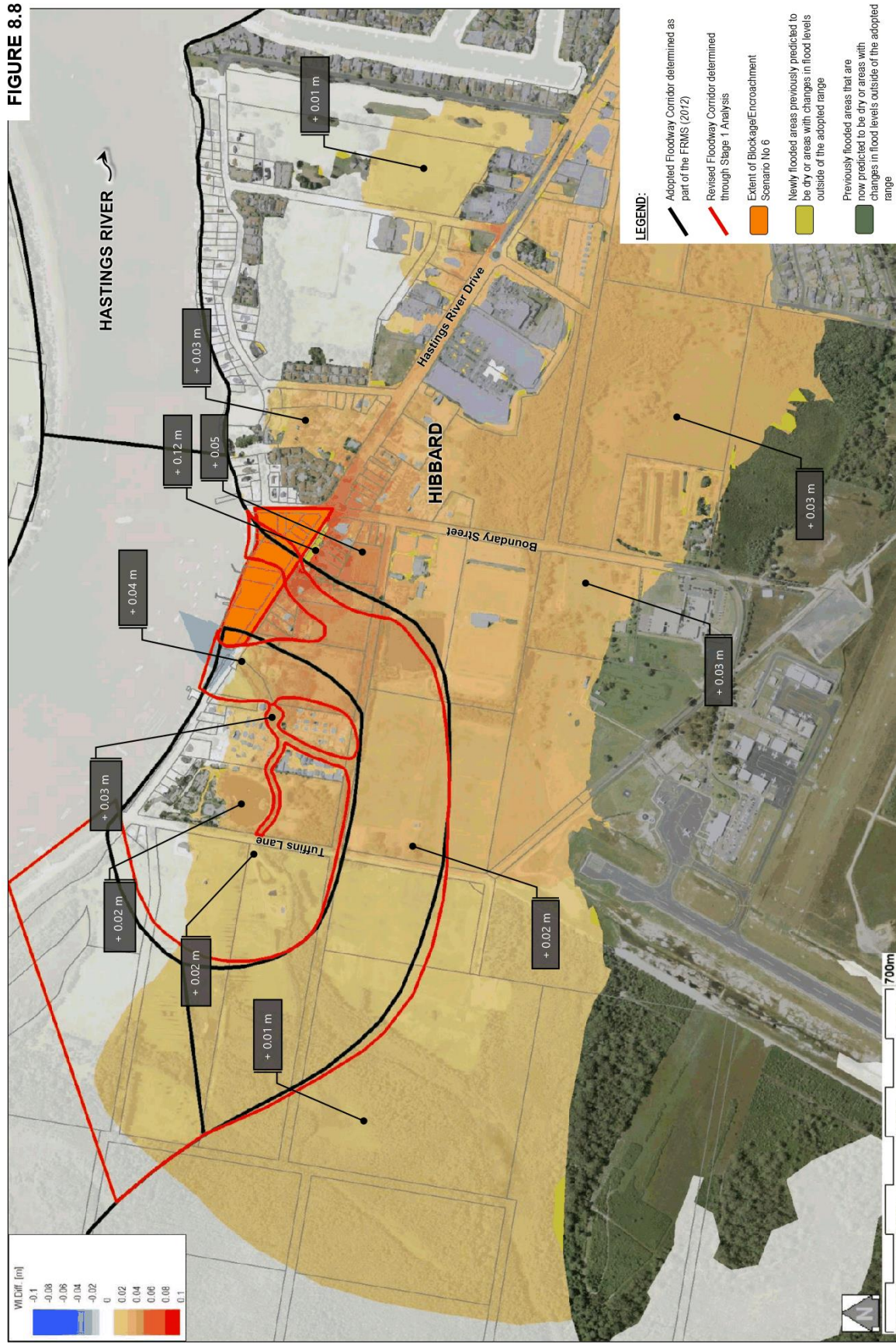
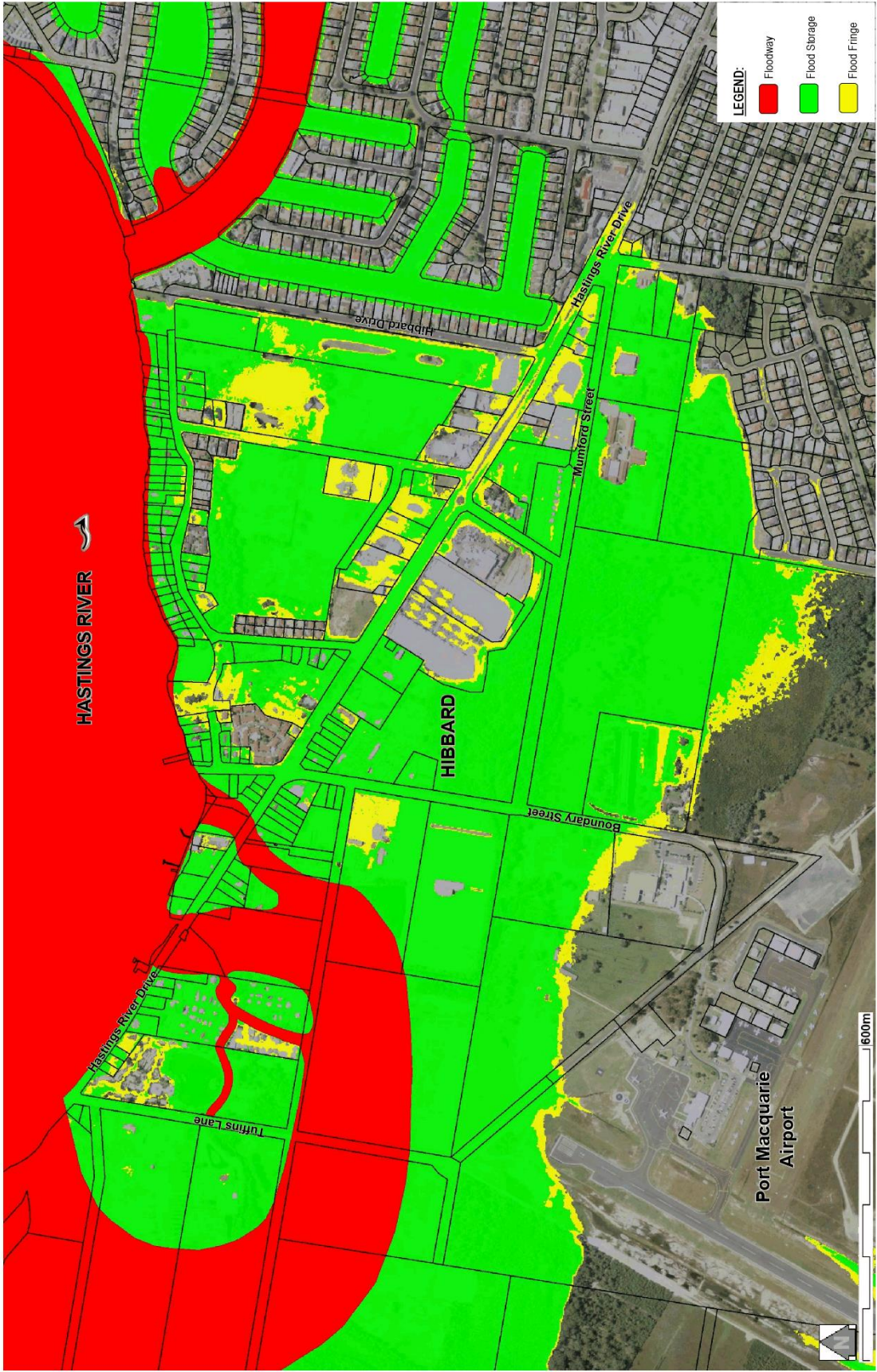


FIGURE 8.9



HYDRAULIC CATEGORIES
FOR THE 1% AEP FLOOD



Port Macquarie Hastings Council
Hibbard Precinct Flood Study

Appendix A

Comparison of 2005 ALS Survey and 2012 LiDAR Topographic Data





**COMPARISON OF 2012 LIDAR to 2005 ALS
(2012 LIDAR minus 2005 ALS)
[Low Range of Changes – Extent 1]**

FIGURE A2



COMPARISON OF 2012 LIDAR to 2005 ALS
[High Range of Changes – Extent 1]

FIGURE A3

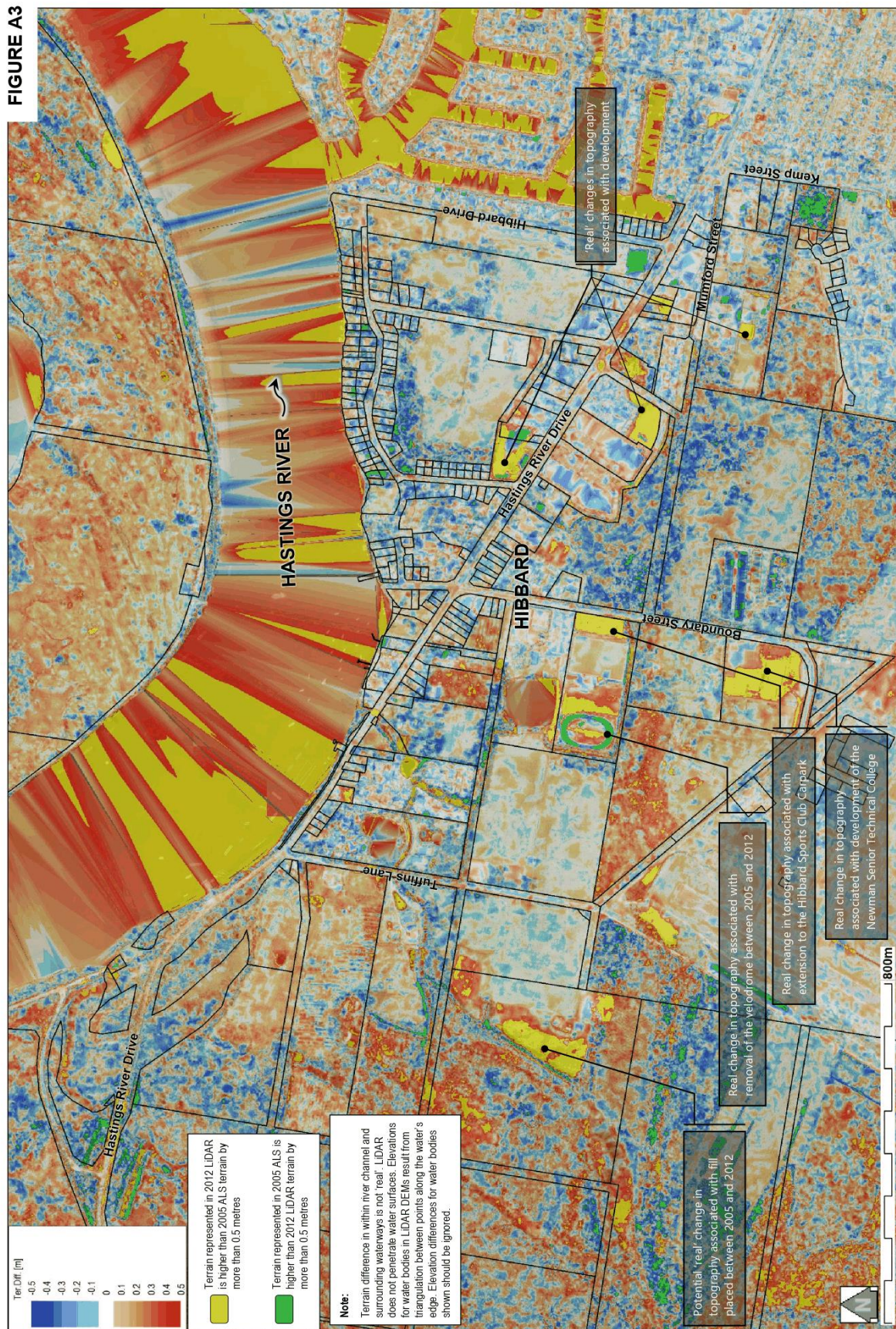


FIGURE A4



COMPARISON OF 2012 LIDAR to 2005 ALS
[High Range of Changes – Extent 2]

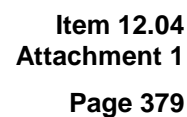


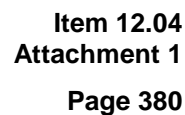
Port Macquarie Hastings Council
Hibbard Precinct Flood Study

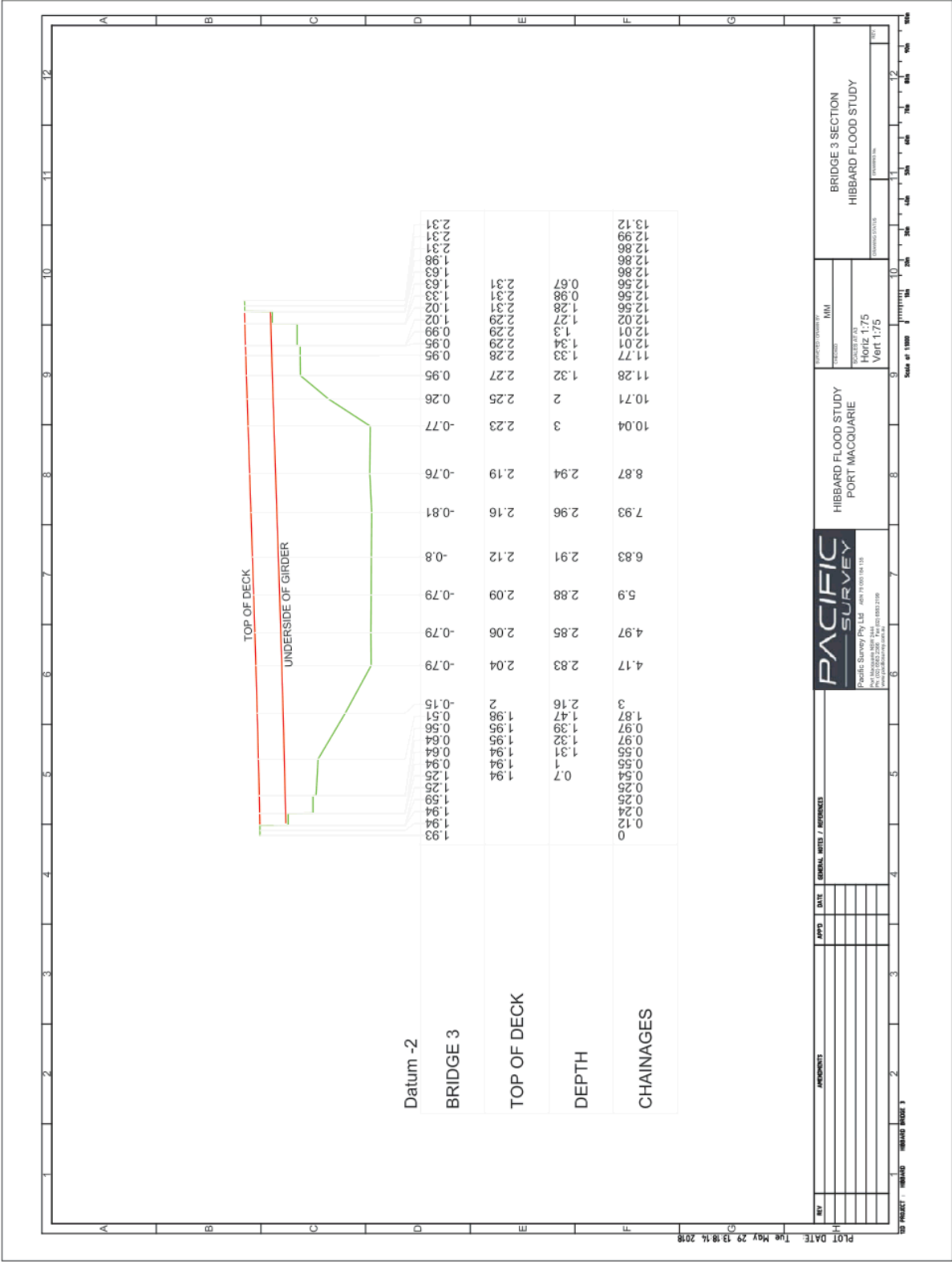
Appendix B

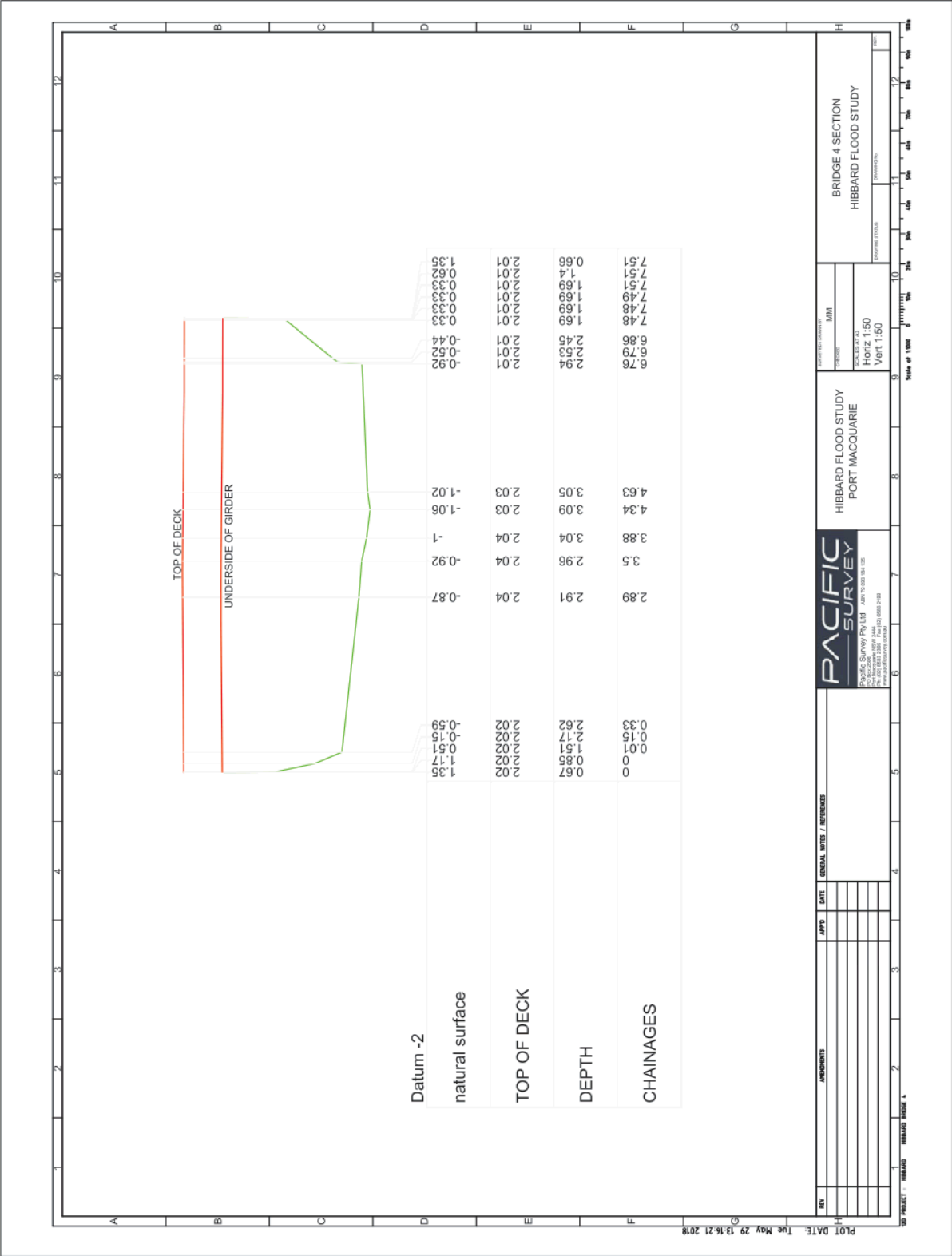
Survey Data provided by Pacific Surveys (Bridges & Creek Cross-Sections)

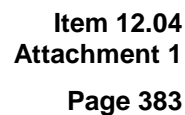


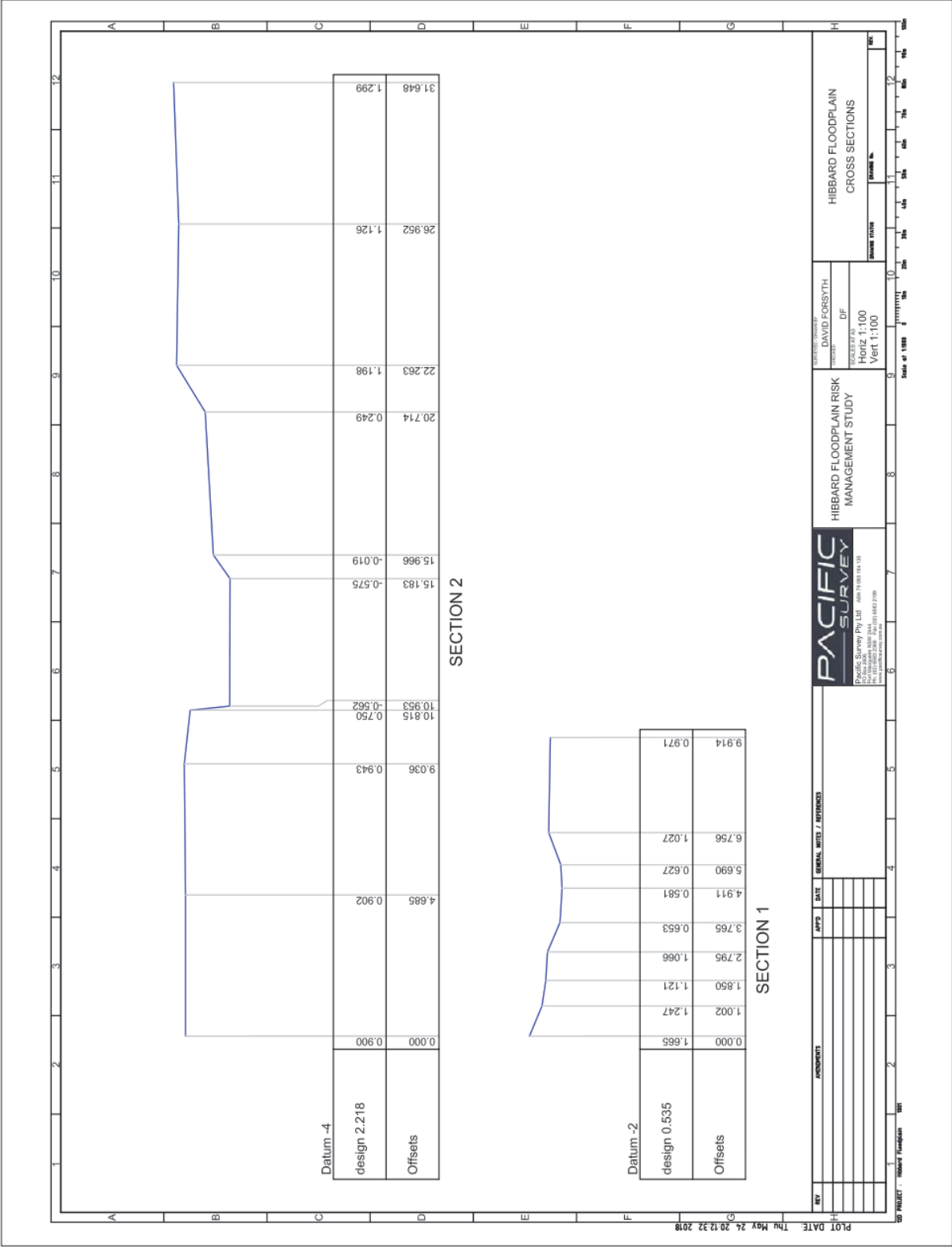


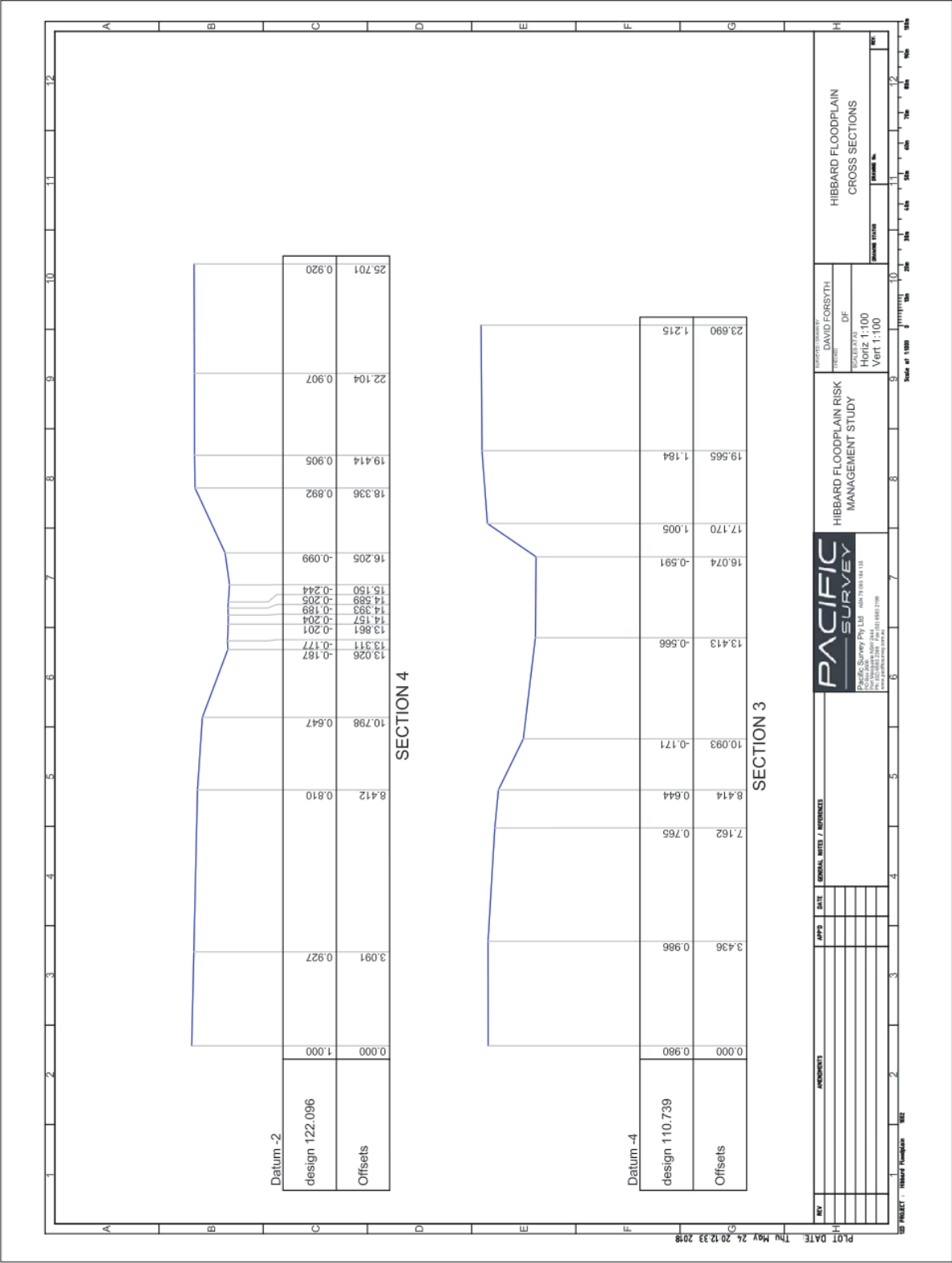


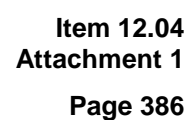


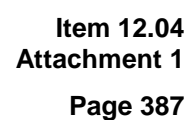


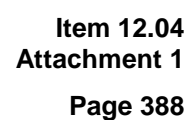


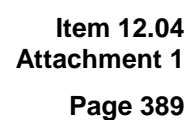


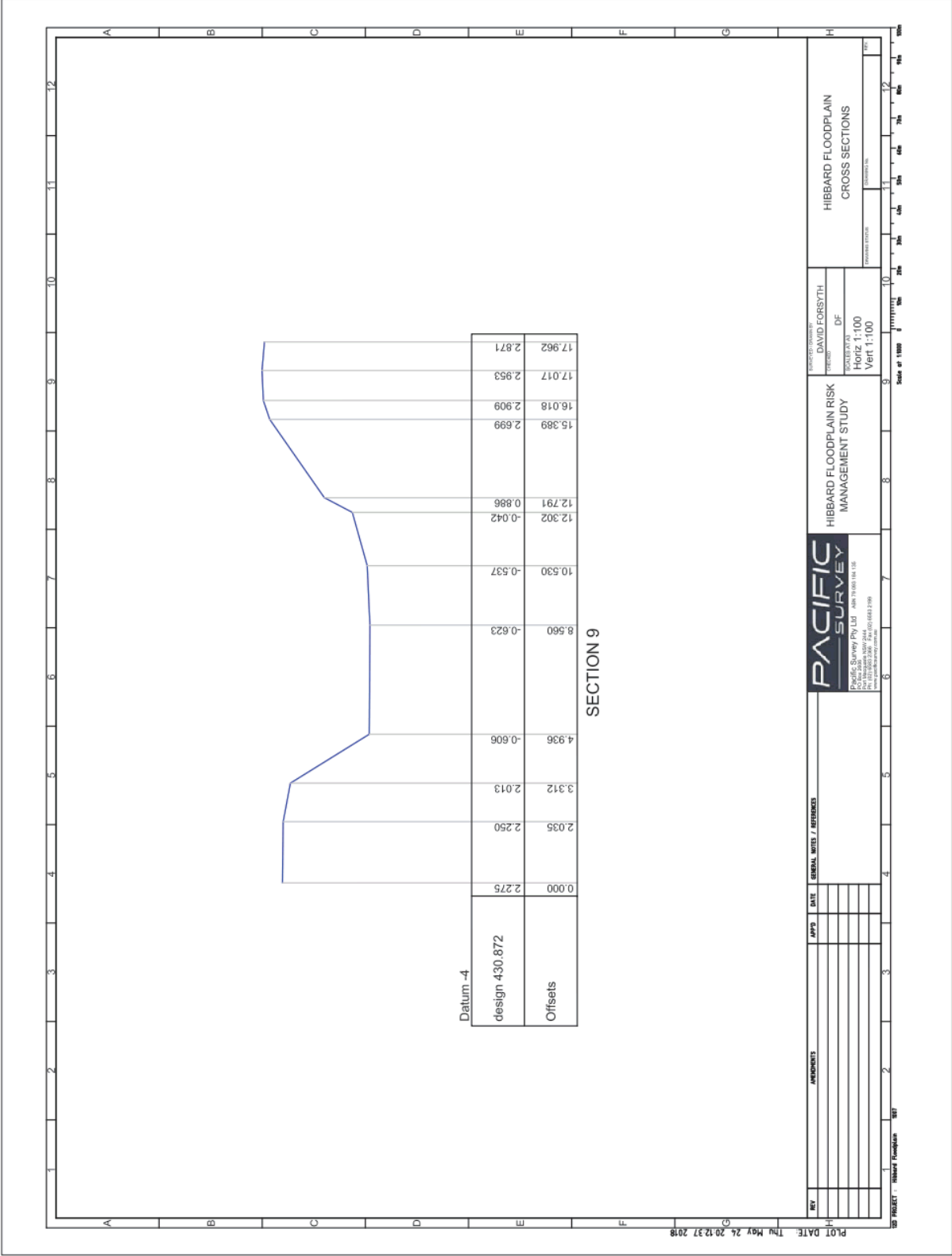


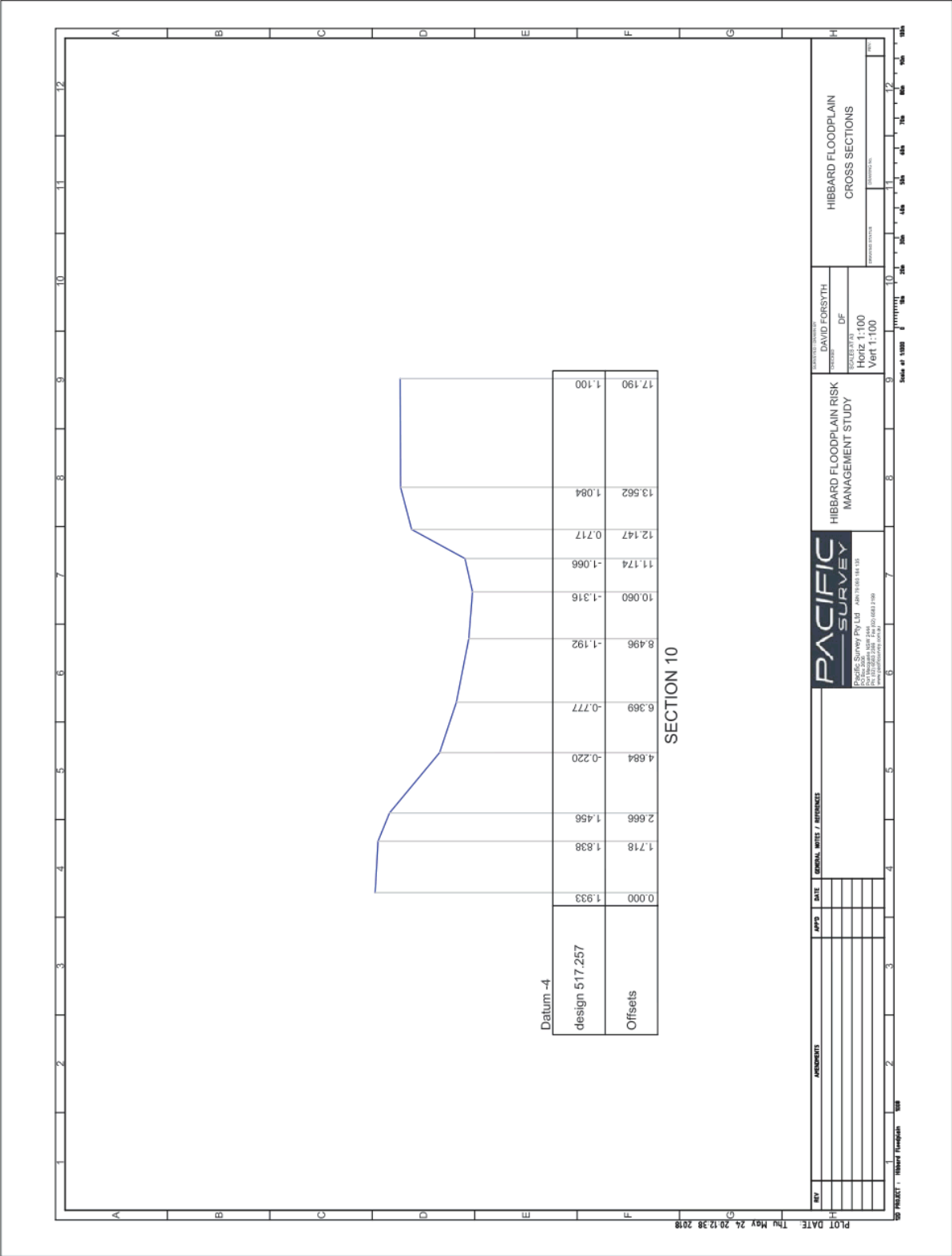


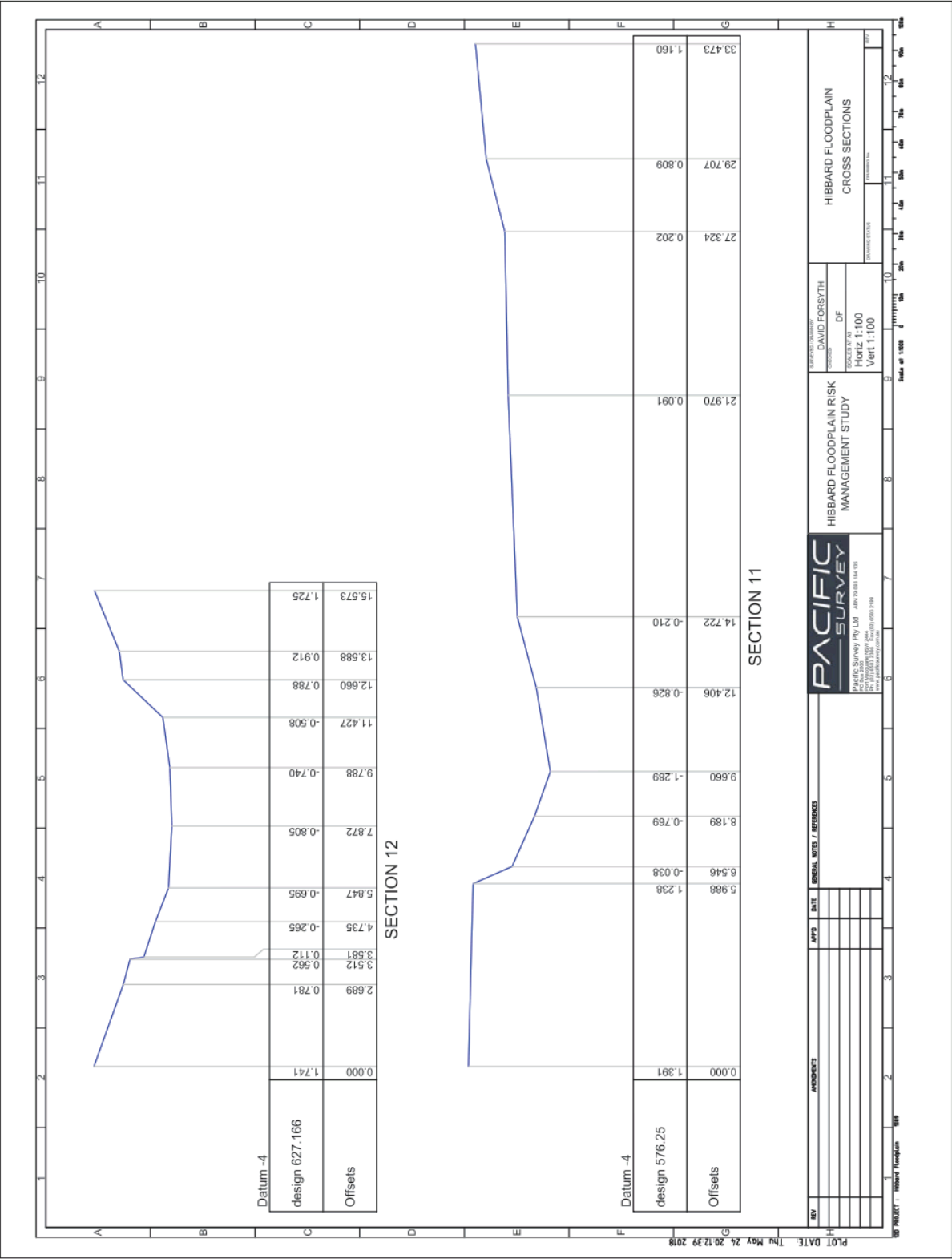


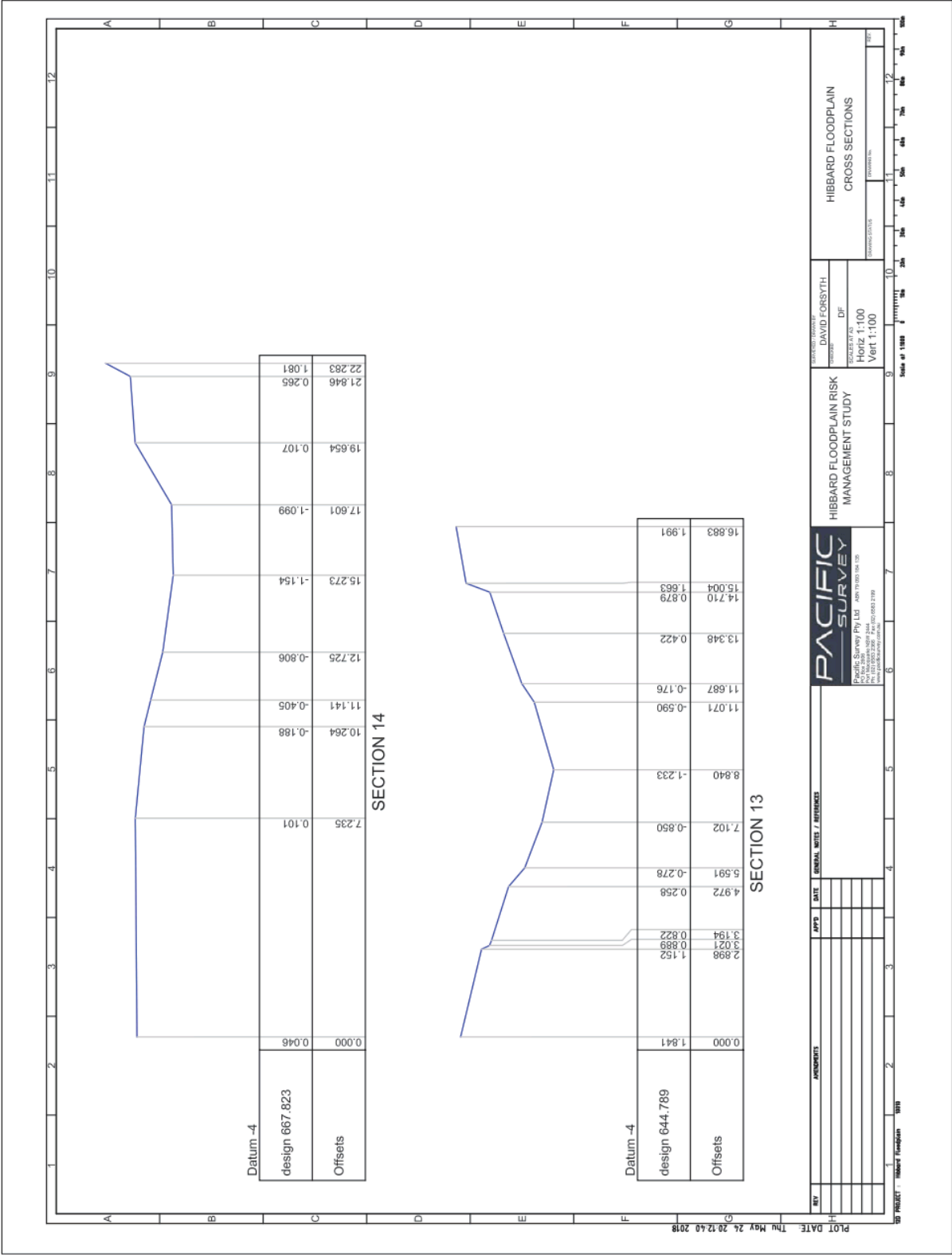














Advisian
WorleyParsons Group

Port Macquarie Hastings Council
Hibbard Precinct Flood Study

Appendix C

Comparison of Hibbard Design Flood Modelling Results to Previous Studies



FIGURE C1

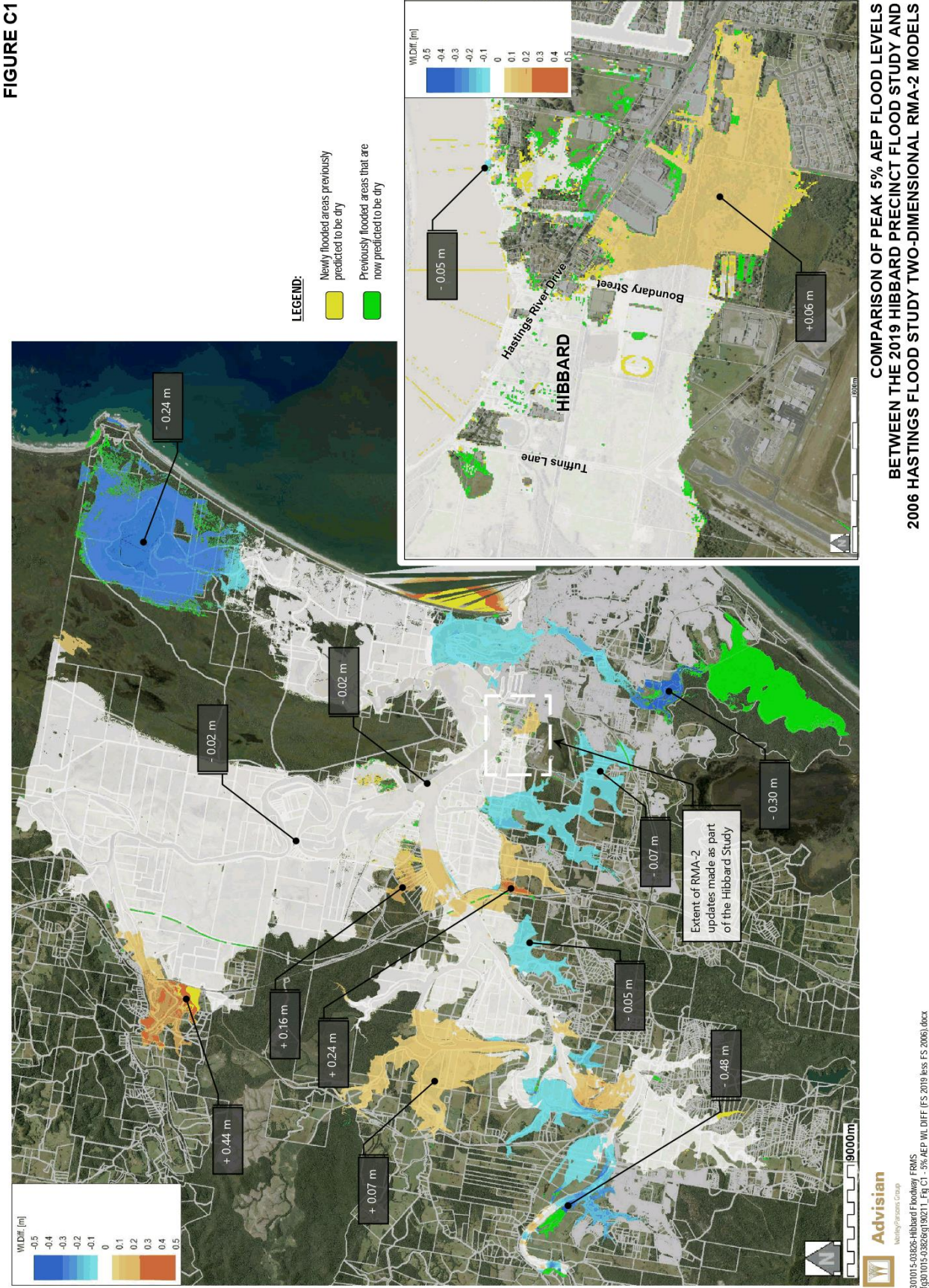


FIGURE C2

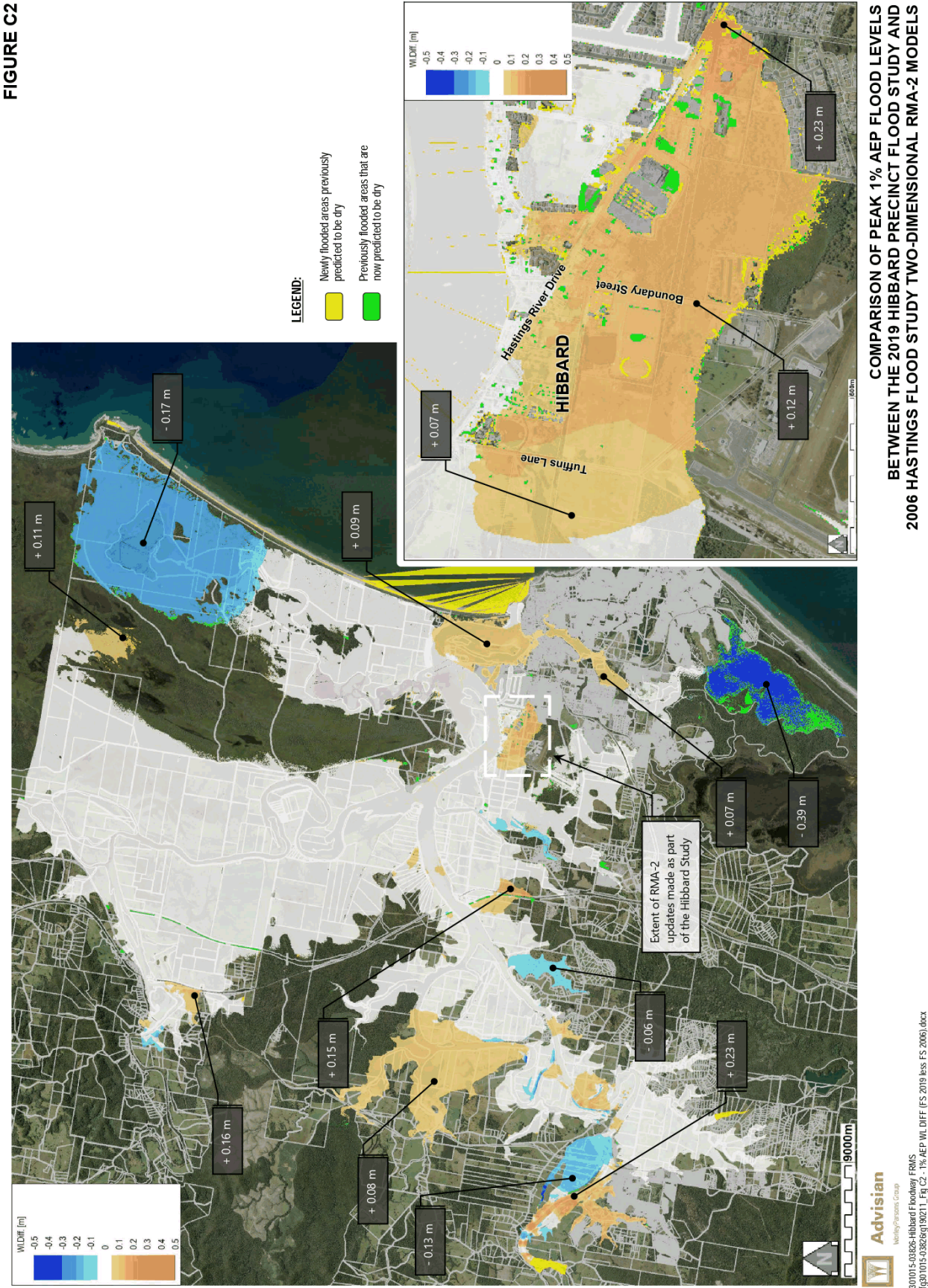


FIGURE C3

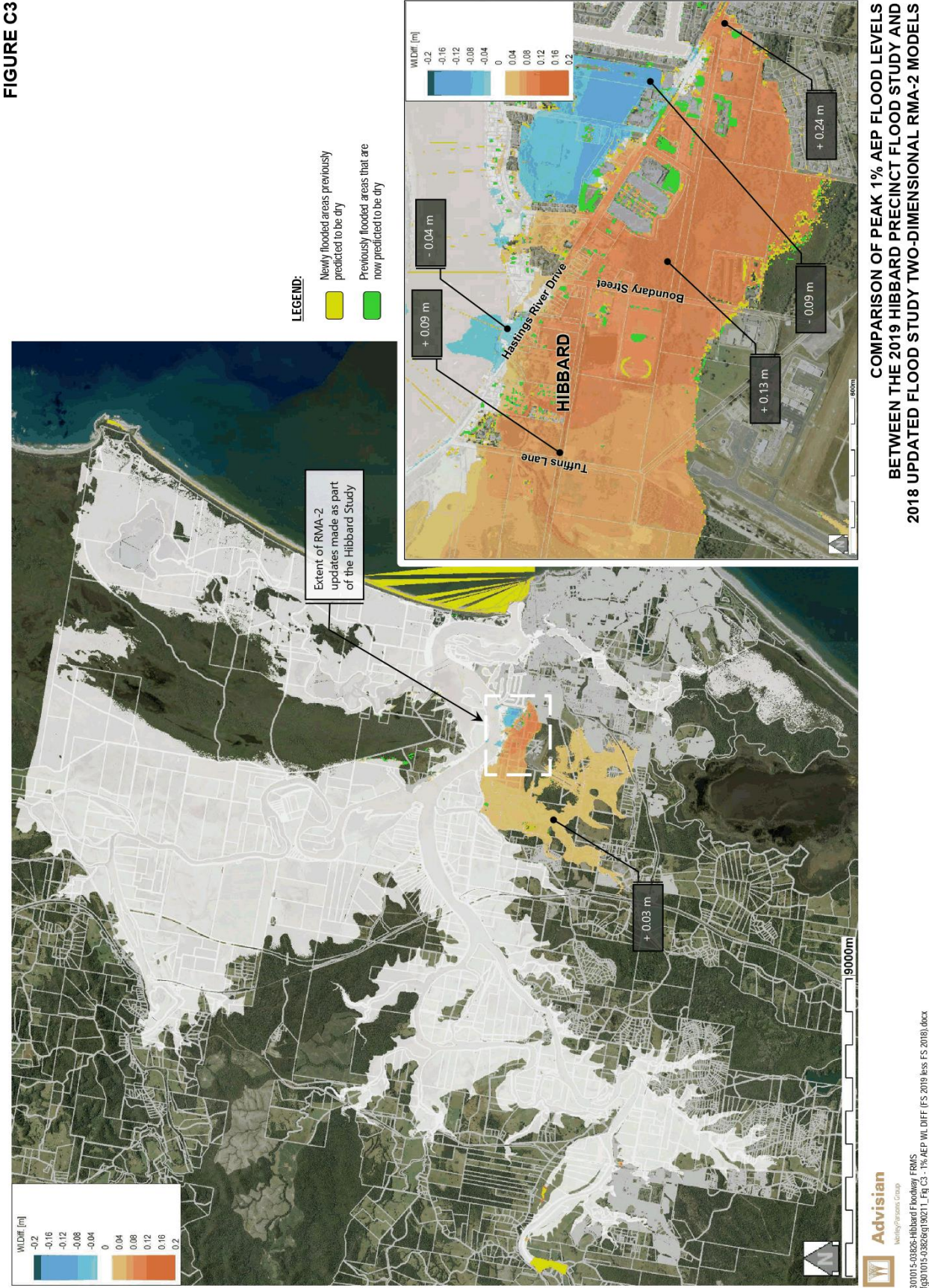


FIGURE C4

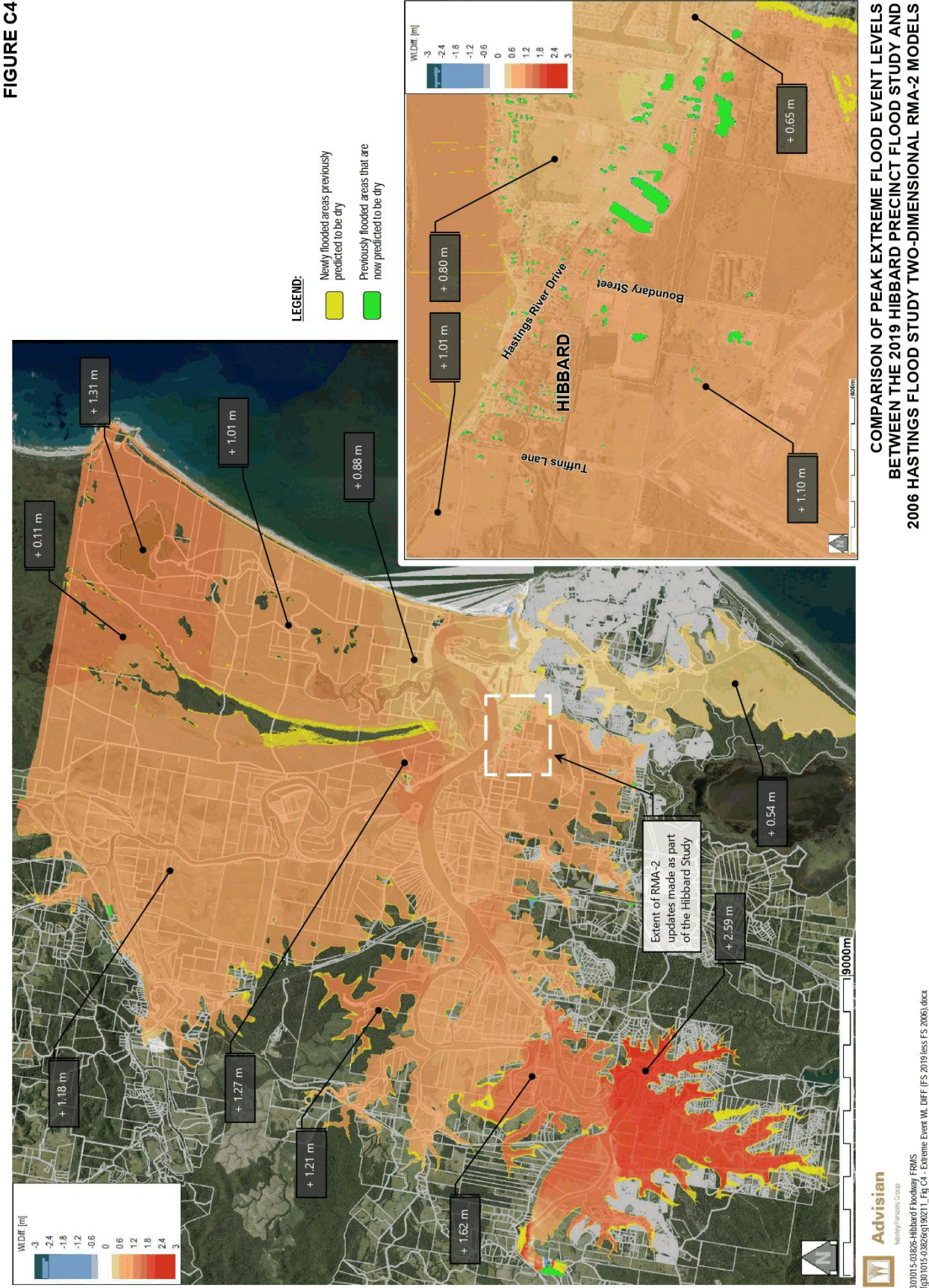
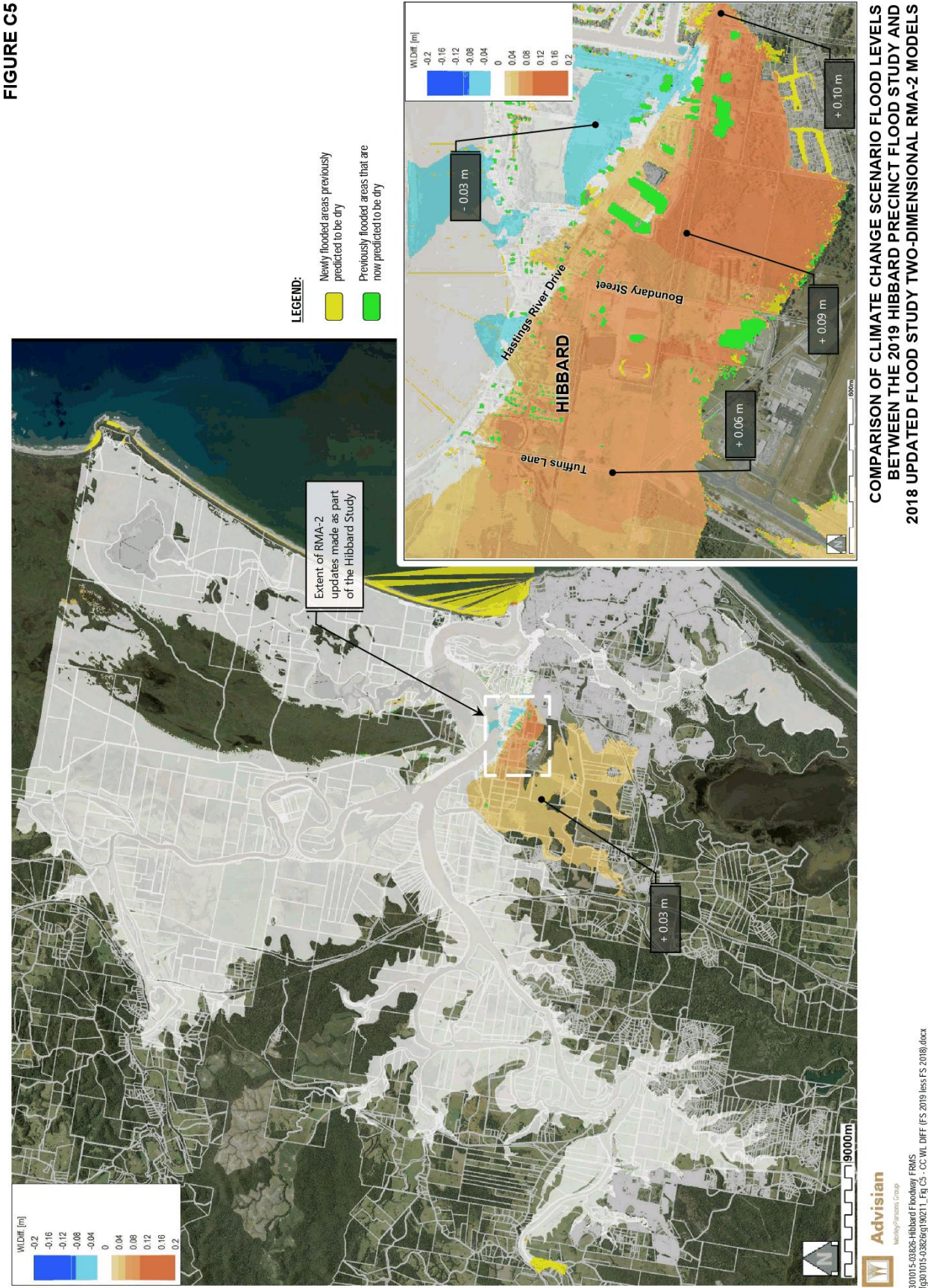


FIGURE C5





North Brother Local Catchments Flood Study

Port Macquarie Hastings Council

Draft Flood Study Report

Version A

14 January 2019

IA157500



Draft Flood Study Report**North Brother Local Catchments Flood Study**

Project no: IA157500
 Document title: Draft Flood Study Report
 Document No.: 1
 Revision: A
 Date: 14 January 2019
 Client name: Port Macquarie Hastings Council
 Project manager: Lih Chong
 Author: Lih Chong
 File name: J:\IE\Projects\04_Eastern\IA157500\21 Deliverables\R03_Draft FS\IA157500_R03 North Brother Draft Flood Study Report_A.docx

Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 177 Pacific Highway
 North Sydney NSW 2060
 PO Box 632 North Sydney NSW 2059100 Christie Street
 St Leonards NSW 2065 Australia
 PO Box 164 St Leonards NSW 2065 Australia
 T +61 2 9928 2100
 F +61 2 9928 2500
 www.jacobs.com

© Copyright 2018 Jacobs Group (Australia) Pty Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Document history and status

Revision	Date	Description	By	Review	Approved
A	14/01/2019	Draft Report	L Chong	A Hossain	A Hossain

Draft Flood Study Report

JACOBS**Contents**

Foreword	vi
Executive Summary.....	vii
1. Introduction.....	1
1.1 General.....	1
1.2 Floodplain Risk Management.....	1
1.3 Structure of this Report.....	2
2. Background on the Study Area.....	3
2.1 Catchment Description	3
2.2 Existing Development.....	3
2.3 History of Flooding.....	5
3. Review of Available Data	6
3.1 Summary of Data.....	6
3.2 Port Macquarie Hastings Council Flood Policy (2015).....	8
3.3 Previous Studies.....	9
3.3.1 GHD Stormwater Analysis and Design Studies (2007).....	9
3.3.2 Camden Haven and Lakes System Flood Study (Worley Parsons, 2013)	10
3.4 Spatial and Design Data.....	10
3.4.1 Topographic Data	10
3.4.2 Aerial Photography	12
3.4.3 Stormwater and Drainage Infrastructure	12
3.4.4 Historical Subdivision Design	13
3.4.5 Additional GIS data.....	13
3.5 Recorded Data	13
3.5.1 Rainfall Data	13
3.5.1.1 Daily Rainfall.....	13
3.5.1.2 Pluviograph data	15
3.5.2 Water Level Data	16
3.6 Topographic and Hydraulic Structures Survey.....	16
3.7 Reports and Photographs of Historic Flooding and Drainage Issues	16
3.8 Floor Level Survey.....	21
3.9 Site Inspections	21
3.10 Community Consultation	27
3.10.1 Initial Consultation	27
3.10.2 Community Survey	27
3.10.3 Community Information Sessions.....	27
4. Hydrologic Modelling	28
4.1 Modelling Approach.....	28
4.2 Sub-Catchment Data	28
4.3 Hydrologic Parameters	30
4.3.1 Rainfall Losses	30

Draft Flood Study Report

JACOBS

4.3.2	Storage Routing Factor	30
5.	Hydraulic Modelling	31
5.1	Model Selection	31
5.2	Configuration of Hydraulic Model	31
5.2.1	Extent and Structure	31
5.2.2	Model Topography	33
5.2.3	Stormwater Pits	33
5.2.4	Stormwater Conduits	33
5.2.5	Building Polygons	33
5.2.6	Surface Hydraulic Roughness	33
5.2.7	Property Fence Lines	35
5.3	Boundary Conditions and Tailwater Conditions	35
5.3.1	Model Inflows	35
5.3.2	Direct Rainfall	36
5.3.3	Tailwater Boundaries	36
6.	Model Calibration and Verification	37
6.1	Overview	37
6.2	Selection of Verification Events	37
6.3	Adopted Parameter Values for Model Verification	38
6.3.1	Rainfall Losses	38
6.3.2	Orographic Rainfall Scaling	38
6.3.3	Blockage of Hydraulic Structures	39
6.3.4	Blockages in Flow Diversion Drains	39
6.3.5	Tailwater Conditions	40
6.4	Comparison to Observed Flooding	40
6.5	Sensitivity Testing of Calibration Parameters	40
7.	Estimation of Design Floods	44
7.1	Adopted Model Parameters for Design Events	44
7.1.1	Design Rainfall	44
7.1.2	Rainfall Losses	45
7.1.3	Orographic Rain Scaling	46
7.1.4	Blockage of Hydraulic Structures	46
7.1.5	Blockages in Flow Diversion Drains	46
7.1.6	Tailwater Conditions	46
7.2	Simulated Design Events	47
8.	Design Flood Results	48
8.1	Final Model Runs and Processing of Results	48
8.2	Flood Mapping	48
8.3	Description of Flooding Conditions	48
8.3.1	Flood Depth	48
8.3.2	Flow Velocity	49

Draft Flood Study Report



8.3.3 Duration of Flooding 49

8.3.4 Climate Change Impacts 49

8.4 Summary of Flood Levels and Flow Conditions 49

8.5 Provisional Flood Hazard Mapping 50

8.6 Provisional Hydraulic Categories Mapping..... 51

8.8 Flooding Hot Spots 52

8.9 Groundwater Springs in the Study Area..... 55

9. Conclusions and Recommendations 56

9.1 Conclusions 56

9.2 Recommendations..... 57

10. Acknowledgements..... 58

11. References 59

12. Glossary 60

Draft Flood Study Report

JACOBS

Appendices

Appendix A. Analysis of Historic Rainfall Event Data

Appendix B. Summary of Topographic Survey

Appendix C. Community Consultation

Appendix D. Verification of Model Flood Behaviour

Appendix E. Design Flood Mapping

Appendix F. Summary of Flood Levels, Velocities and Flows at Specific Locations

Appendix G. Provisional Hydraulic and Hazard Mapping

Draft Flood Study Report



Foreword

The primary objective of the New South Wales Government's Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods, wherever possible. Under the Policy, the management of flood prone land remains the responsibility of local government.

The policy provides for a floodplain management system comprising the following five sequential stages:

- | | |
|--|--|
| 1. Data Collection | Involves compilation of existing data and collection of additional data |
| 2. Flood Study | Determines the nature and extent of the flood problem |
| 3. Floodplain Risk Management Study | Evaluates management options in consideration of social, ecological and economic factors relating to flood risk with respect to both existing and future development |
| 4. Floodplain Risk Management Plan | Involves formal adoption by Council of a plan of management for the floodplain |
| 5. Implementation of the Plan | Implementation of flood, response and property modification measures (including mitigation works, planning controls, flood warnings, flood preparedness, environmental rehabilitation, ongoing data collection and monitoring by Council |

Port Macquarie Hastings Council is undertaking this study for the North Brother Local Catchments study area to investigate the existing and future flood risks in accordance with the NSW Government's *Floodplain Development Manual*. The study identifies and assesses potential flood mitigation options and guides land use planning and future development on the floodplain in the study area.

This study represents Stages 1 to 4 of the management process and has been prepared for Council by Jacobs. This is the Draft Report of the Stage 1 and Stage 2 of the study.

Draft Flood Study Report



Executive Summary

Background

Jacobs was engaged by Port Macquarie Hastings Council (Council) to undertake a flood study and a floodplain risk management study of the North Brother Local Catchments area. The study area is located on the Mid North Coast of NSW, and includes parts of the villages of Kew, Lakewood, West Haven, Laurieton and Deauville which are situated at the foot of North Brother Mountain.

Study Area

The study area comprises the northern and eastern faces of the North Brother Mountain and the associated urban areas between the foot of the mountain and the adjoining receiving waters. It has an approximate area of 1,852ha, with the North Brother Mountain extending to a height of 490m AHD, dominating the landscape. The upper reaches of the study area are predominantly the Dooragan National Park, containing the North Brother Mountain itself, below which is situated the Laurieton CBD, various vegetated natural gullies and flow paths as well as significant established low and medium density residential, caravan parks and holiday accommodation precincts. The topography within the catchment varies significantly with the upper parts of the catchment being very steep in nature (grades of up to 50%), the mid zone is moderately graded (slopes in the order of 10-15%), and lower areas adjoining the Camden Haven River floodplain being reasonably flat (grades averaging 5%). The relatively short flow path lengths between the foot of the North Brother Mountain and the adjoining downstream receiving waters mean that stormwater flows are fast flowing.

Development of the study area has been occurring from the early 1900's through to the present day with the majority of development having occurred between 1970 - 2000. The construction of associated drainage infrastructure has also primarily dated from this time, with the result being that the majority of watercourses stemming from the North Brother Mountain have either been built over, filled, redirected, piped or crossed by road embankments, often resulting in urban development occurring on flood prone lands. Urban development at the foot of the Mountain is typically bounded by diversion drains and largely natural gullies which generally direct large volumes of stormwater runoff safely around developed lands and into the downstream waterways. However, developments have occurred in some locations in close proximity to natural watercourses and man-made surface drainage and are at risk to flooding when the drainage capacities are exceeded. In addition, localised flooding in some areas are exacerbated by mainstream flooding in Queens Lake, Stingray Creek and Camden Haven River.

Available Data A range of data was obtained by Jacobs or provided by Council and other agencies for this study. The data includes reports of studies that have been undertaken in the area; spatial data including stormwater assets, aerial photography and other GIS layers; recorded rainfall, water level and tide data; and flood modelling data including drainage models of West Haven. Additional topographic survey as collected of selected hydraulic structures, open channels and other topographic features in January – February 2018

Community Consultation

Community consultation undertaken for the study included overviews and updates of the study posted on Council's website, a newsletter and questionnaire mailed out to the community, and community information sessions during the calibration stage of the flood model.

Hydrologic and Hydraulic Modelling

The hydrologic modelling adopted in the study to estimate rainfall-runoff involved lumped catchment modelling approach for the watercourses draining off the mountain, and a direct rainfall approach for the more dispersed overland flow catchment areas at the foot of the mountain. The lumped catchment modelling was undertaken in DRAINS software with the RAFTS hydrologic module estimates inflow hydrographs (flow versus time) which were input into the hydraulic model for the watercourses and overland flow paths. The direct rainfall approach input rainfall versus time data onto the modelled catchment surface in the hydraulic model itself, which then generated estimated flows internally in the model.

Draft Flood Study Report

A TUFLOW combined one-dimensional (1D) and two-dimensional (2D) hydrodynamic model was developed for this study. The TUFLOW model is comprised of:

- A 2D domain of the study area surface reflecting the catchment topography, with varying roughness as dictated by land use. The watercourses are in general modelled in 2D and diversion drains are modelled in 2D.
- A 1D network of pits, pipes and culverts representing the stormwater network. The pits have a defined inflow capacity as dictated by their type and size.
- Obstructions to flow are represented as 2D objects, including existing buildings.

The flood model was calibrated and verified to the historic flood events of April 2008 and March 2013, based on residents' observations during these flood events reported in the community questionnaire.

Design flood events including the 0.2EY and 5%, 2%, 1% and 0.5% AEP and the Probable Maximum Flood (PMF) events were analysed for current climate conditions. Flood behaviour was estimated for a climate change scenario comprising the 1% AEP plus 10% increase in rainfall plus 0.9m sea level rise. Flood mapping of depth and flow velocity was undertaken for all event AEPs.

Flood Behaviour

Overland flow depths on properties are typically up to 0.3m in the 1% AEP event. Depths exceed 0.5m in a number of locations in the 0.2EY event, and exceed 1m in the 5% and 1% AEP events. Areas of deeper flows include main flow paths and drainage low points in a number of roads. During the PMF event, property and road flooding exceeding 0.5m depth is widespread, with property and road flooding of 1m depth also common. Depths of flooding exceeding 2m occur on approximately 20 properties in the study area.

Flow velocities are fast in a number of overland flow paths through properties and particularly on roads. Typical flow velocities are 0.5 – 1m/s in the 0.2EY event, and 1 – 1.5m/s in the 1% AEP event. High flow velocities of 2 – 3m/s occur in a number of locations including roads and properties. These flows are likely to be highly hazardous to people and risk significant damage to buildings and property. Flow velocities of 3 – 4m/s are commonplace in the PMF, with some locations experiencing velocities over 4m/s.

Overland flooding in the study area is generally a result of intense short-duration rainfall events. As a result, the duration of inundation of roads and built areas is typically short, limited to 1 – 2 hours in up to the 0.5% AEP event. Flood storage areas such as road sag points in Sirius Drive and Lilli Pilli Close in Lakewood may be inundated for longer durations of up to 3 hours due to constrained capacities of stormwater drainage servicing these areas. Durations of inundation are likely to be 1 – 4 hours in the PMF with longer durations affecting some flood storage locations and roads including Botanic Drive and Ocean Drive west of Lakewood shopping centre. Note that the duration of flooding for depths greater than 0.3m, at which stage floodwaters become impassable for most passenger vehicles, is generally limited to approximately 1 hour duration in most roads. A river flooding event may occur shortly after overland flooding in the study area, in which case the low-lying areas of the study area may experience extended durations of flooding.

In the climate change scenario, most areas affected by overland flow experience flood level increases of up to 0.1m due to increased rainfall and reduced drainage capacity from higher tailwater levels caused by sea level rise. Locations along the river and lakes would be impacted by 0.9m increases in flood levels directly due to sea level rise, while adjacent areas would be impacted typically by up to 0.5m increases in flood level. Note that these impacts are estimated based on the overland flooding assessment of North Brother. Increases in flood levels due to climate change effects on riverine flooding may be different, refer to the Camden Haven River and Lakes Flood Study (Worley Parsons, 2013).

Flood Hazard Mapping

The flood hazard categories were defined based on the Australian Institute of Disaster Resilience (AIDR) categories and mapped for the 1% AEP current climate and climate change scenarios. There are numerous areas of high flood hazard (>H5) typically reflect the swift overland flows in watercourses and flow paths including roadways.

North Brother Island Catchments Flood Study

Page 101

Draft Flood Study Report

Flood hydraulic categories were mapped for the 1% AEP current climate and climate change scenarios. Floodway areas are generally located within the natural watercourses and flow paths, although there are a number of roads which contain floodways throughout the study area. Floodways pass through properties on Black Swan Terrace, Koonwarra Street, Pelican Court, Elouera Place, Flinders Drive, St Joseph's School, Peach Grove, Gow Place, Kew Road and in Laurieton between Quarry Place and Bold Street, among others.

Flood Problem Areas

Flooding hot spots are identified in the flood study, confirming problem areas previously identified by Council. The hot spots are summarised in Table 1 below. Critical areas with consideration of high flood depths, velocities or hazard are highlighted with orange cell or text shading. In summary, the identified critical locations include:

- Black Swan Terrace, West Haven
- Kirmington Terrace, Koonwarra Street, Captain Cook Drive villas and Ocean Street property and Pelican Court, West Haven
- Bold Street, Laurieton
 - Laurieton Hotel and adjoining areas
 - Harbourside Crescent villas
- Lake Street property, Laurieton. Corner Seymore Street
- St Joseph's School, Laurieton
- Lilli Pilli Close, Lakewood (road flooding).
- Sirius Drive, Honeysuckle Avenue and Mahogany Close, Lakewood (road flooding).
- Ocean Drive between Fairwinds Avenue and Mission Terrace (road flooding).
- Pelican Court, West Haven (road flooding).
- Waterview Crescent, Kirmington Terrace and Koonwarra Drive, West Haven (road flooding).
- Bold Street between Laurie Street and Mill Street (road flooding).
- Lord Street at Seymour Street, Laurieton (road flooding).

Draft Flood Study Report



Table 1 Description of Flooding Hot Spots

Location	Description
Property flooding	
Black Swan Terrace, West Haven	Flow depths on properties of up to 0.5m in the 0.2EY event and up to 0.7m in the 1% AEP event. Swift flows of 2m/s. Flood hazard up to H5 rating in the 1% AEP event.
Ringtail Cl, Lakewood	Overflows from open channel onto properties with flooding in backyards to depths 0.2 – 0.3m in the 1% AEP event. Relatively low flooding impact.
Lilli Pilli Cl, Lakewood	Flooding in backyards to depths of 0.3 – 0.5m in the 1% AEP event from open drain overflows. Flooding in cul-de-sac to depths up to 0.8m. Also significant flooding of car park around Lakewood shopping centre.
Mission Terrace, Lakewood	Overflows with depths of 0.1 – 0.3m in the 1% AEP event from cul-de-sac onto downhill property. Overflows from the overland flow path on to uphill side properties with depths up to 0.2m
Kirmington Terrace to Pelican Court, West Haven	Flows through properties on low side of Koonwarra Street of 0.3m in the 0.2EY event and exceeding 0.5m in the 1% AEP event. Velocities up to 2m/s in the 1% AEP. Flood hazard up to H4 (some localised H5) rating in the 1% AEP. Flow depths 0.5m in the 0.2EY event and up to 0.8m in the 1% AEP event on Captain Cook Bicentennial Drive villas and Ocean Drive property, at dwellings. Flood hazard up to H4 rating in the 1% AEP event. Flood depths of 0.6 – 0.8m in the 0.2EY event within Pelican Court roadway and pedestrian walkway. Depths up to 0.6m at dwellings in 1% AEP event. Flood hazard up to H4 rating on properties and H5 in roadway in the 1% AEP event. Groundwater springs occur in this area but are not directly related to the surface water flood risk. These springs appear to be a spatially random occurrence.
Flinders Dr Estate, Laurieton	Overflows from drainage easement swale onto properties with depths to 0.3m in the 0.2EY event and 0.5m in the 1% AEP event. Overflows from Reliance Crescent sag point onto properties to depths of 0.2m in the 0.2EY event and 0.4m in the 1% AEP event.
Bold Street area, Laurieton	Significant flows through Laurieton Hotel with H4 hazard rating. Trapped drainage point on western side of commercial properties with significant depths, though local drainage may be present which would mitigate the flood depths. Overflows down fire trail at Norman Street/ Mill Street affecting properties with depths up to 0.3m in the 1% AEP. Overflows onto units on Harbourside Crescent from trunk drainage channel to depths exceeding 0.5m in the 1% AEP event, with H5 hazard rating.
Quarry Way, Laurieton	Overflows from flow diversion drain to depths of 0.5m in the 1% AEP event on properties. The drain is reported to be affected by significant debris blockage.

Draft Flood Study Report

JACOBS

Lake Street, Laurieton	Flood depths up to 1m in the 1% AEP event affecting dwelling corner Lake Street and Seymour Street, unsure if above floor flooding. To be confirmed. Overflows from Lake Street onto properties between Ocean Drive and Castle Street to depths of 0.3m in the 1% AEP.
St Joseph's School, Laurieton.	Swift flows in overland flow paths to depths of 0.8m and velocities exceeding 2m/s in the 1% AEP event. Flows between buildings are 0.4m in the 0.2EY event and 0.6m in the 1% AEP event, with velocities up to 2m/s. Flood hazard rating of H4 in pedestrian walkways and H5 in overland flow paths in the 1% AEP event.
Properties adjacent to Stingray Creek and Camden Haven River, Laurieton	Numerous properties on low-lying land at risk of oceanic inundation during storm surge events. Estimated depths on the flood mapping expected to be conservative due to likely attenuation of ocean inflows through the river mouth.
Blackbutt Crescent and Peach Grove, Laurieton	Overflows from flow diversion drain to depths of 0.5m in the 1% AEP event on properties. The drain form and capacity significantly reduces near its discharge point onto Peach Grove at Tunis Street. Flows into the drain originate from natural watercourse further uphill, which is significantly affected by rubble and debris blockage.
Elouera Place, West Haven	Overflows from watercourse and diversion drain. Depths over 0.3m in the 0.2EY event and 0.5m in the 1% AEP event.
Sirius Drive, Honeysuckle Avenue and Mahogany Close, Lakewood	Flood depths on properties 0.3 – 0.5m in the 1% AEP event, built up from road ponding areas.
Sirius Drive and Oak Close, Lakewood	Depths 0.3 – 0.4m and velocities 1m/s in the 1% AEP event.
Sandpiper Close	Overflows from concrete channel along Ocean Drive. Depths 0.3 – 0.4m and velocities 1m/s in the 1% AEP event.
Properties on lower side of Ocean Drive, 200m east of Hoschke Road, West Haven	Road low point overflows onto properties with depths of 0.5m and velocities of 1m/s in the 1% AEP event.
Roads	
Ocean Drive west of Lakewood shopping centre	5% AEP event flood depths of 0.4m 1% AEP event flood depths of 0.5m, H3 hazard rating
Botanic Drive, Lakewood	1% AEP event flood depths of 0.4m, H2 hazard rating
Lilli Pilli Close, Lakewood	5% AEP event flood depths of 0.6m 1% AEP event flood depths of 0.7m, H3 hazard rating
Ocean Drive east of Lakewood shopping centre	5% AEP event flood depths of 0.3m 1% AEP event flood depths of 0.35m, >H4 hazard rating
Sirius Drive, Honeysuckle Avenue and Mahogany Close, Lakewood	0.2EY event flood depths of 0.6 – 0.7m 1% AEP flood depths 1m, H3 hazard rating
Ocean Drive between Fairwinds Avenue and Mission Terrace	0.2EY events flood depths of 0.5m 1% AEP event flood depths of 0.7m, >H4 hazard rating
Ocean Drive and Mission Terrace intersection	0.2EY event flood depths of 0.4m 1% AEP event flood depths of 0.6m, H3 hazard rating
Ocean Drive near Waterview Crescent	5% AEP event flood depths of 0.2 – 0.3m

Draft Flood Study Report



	1% AEP event flood depths of 0.3m, low hazard rating but long section of flooding
Ocean Drive near Pelican Court	5% AEP event flood depths of 0.3m 1% AEP event flood depths of 0.4m, H3 hazard rating
Pelican Court, West Haven	0.2EY event flood depths 0.6m 1% AEP event flood depths of 1m, H5 hazard rating
Waterview Crescent, Kirmington Terrace and Koonwarra Drive, West Haven	0.2EY event flood depths of 0.2m with 2m/s velocity; max 0.6m depths (low velocity) 1% AEP event flood depths up to 0.7m, H5 – H6 hazard rating
Ocean Drive east of Hoshcke Road	0.2EY event flood depths of 0.4m 1% AEP event flood depths of 0.5m, H3 hazard rating
Ocean Drive east of Flinders Drive	5% AEP event flood depths of 0.3m 1% AEP event flood depths of 0.4m, H3 hazard rating
Kew Road/Bold Street near Tunis Street, Laurieton	1% AEP event flood depths of 0.5m, H2 hazard rating
Bold Street between Laurie Street and Mill Street	0.2EY event flood depths over 0.5m 1% AEP event flood depths 0.6 – 0.8m, H5 hazard rating
Bold Street north of Hanley Street, Laurieton	0.2EY event flood depths of 0.3m with 1m/s velocity 1% AEP event flood depths up to 0.5m, H3 hazard rating
Lord Street at Seymour Street, Laurieton	0.2EY event flood depths of 0.5m 1% AEP event flood depths up to 0.7m, H3 hazard rating
Flinders Drive, Laurieton Tunis Street, Laurieton Rosewood Court and Mission Terrace, Lakewood Diamantina Way, Lakewood	H5 hazard rating on steep sections of road (1% AEP event)

Recommendations

Recommendations from this flood study include:

- It is recommended that this report be reviewed by Council prior to being placed on public exhibition for feedback from the community.
- It is recommended that Council considers the adoption of this Flood Study and the outputs to guide floodplain management and land use planning in the North Brother local catchments study area. The subsequent Floodplain Risk Management Study should consider the management of flood risk in the catchment, particularly at the identified flooding “hot spots”, which may include the development of flood mitigation strategies.
- Council should consider geological and geotechnical investigations to assess the groundwater spring issues in the study area which result in surface water discharge and subsequent property damage or are otherwise nuisance occurrences.

Draft Flood Study Report**Important note about this report**

The sole purpose of this report and the associated services performed by Jacobs is to undertake a flood study for the North Brother Local Catchments study area located in New South Wales in accordance with the scope of services set out in the contract between Jacobs and Port Macquarie Hastings Council (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client, third parties, and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

Topographic data used in this study included that sourced from a LiDAR survey and ground survey which were undertaken by third parties. Undertaking independent checks on the accuracy of the data was outside Jacobs's scope of work for this study.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Draft Flood Study Report



1. Introduction

1.1 General

Jacobs was engaged by Port Macquarie Hastings Council (Council) to undertake a flood study and floodplain risk management study of the North Brother Local Catchments area. The study area is located on the Mid North Coast of NSW, and includes parts of the villages of Kew, Lakewood, West Haven, Laurieton and Deauville which are situated at the foot of North Brother Mountain. Development in the area has occurred in sometimes unsuitable locations as a result of poor drainage planning, leading to localised nuisance flooding on residential properties at a number of locations on a regular basis. Numerous gullies and watercourses drain from the North Brother Mountain through the developed areas, which over time have been piped, filled, crossed by road embankments or redirected, contributing to the existing flooding problems. Localised flooding in some areas may interact with and be exacerbated by mainstream flooding in Queens Lake, Stingray Creek and Camden Haven River.

Objectives of the study include:

- Develop and calibrate hydrologic and hydraulic models to estimate flooding conditions for a range of design events.
- Identify flood problem priority areas and identify and assess structural and non-structural mitigation measures to manage flood risk.
- Review existing planning, policy and emergency management for gaps and inconsistencies relating to floodplain planning, then develop proposed amendments to address residual flood risk.
- Prioritise the works and measures, including economic and multi criteria appraisal of options.
- Develop an implementation program for recommended works and measures including timing, responsibility and sources of funding.
- Conduct consultation with the community and key stakeholders throughout the study to obtain information and intelligence for input into the study. Gauge the perceptions of the community on flooding matters. Obtain feedback on the findings and recommendations of the study.

This Draft Flood Study Report documents the collection and review of relevant data and the development and calibration of hydrologic and hydraulic models for the purpose of defining flood behaviour for the full range of design flood events in the study area. The design flood conditions, the flood risk and flood hazard are estimated, and flooding trouble areas confirmed. Note that this study focusses on overland flooding resulting from runoff from North Brother Mountain and surrounding areas. Riverine flooding is addressed separately in the Camden Haven and Lakes System Flood Study (Worley Parsons, 2013), prepared for Council.

The outcomes from this flood study will form the basis for the identification, assessment and prioritisation of management measures during the subsequent floodplain risk management study and plan.

1.2 Floodplain Risk Management

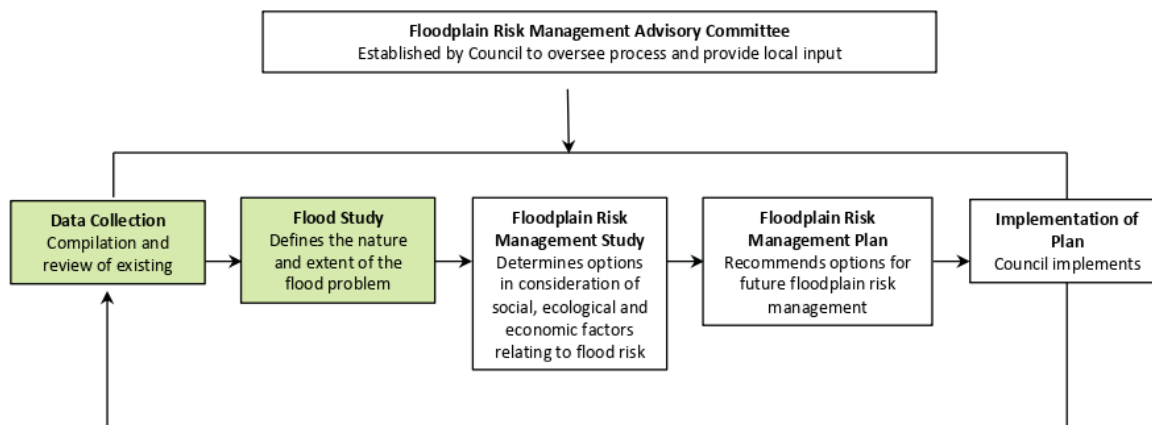
Council is responsible for managing the existing, continuing and future flood risk for its Local Government Area (LGA). The floodplain risk management planning process, as set out in the *Floodplain Development Manual* (NSW Government, 2005) has a number of steps which are illustrated in Figure 1-1. The current Flood Study phase of this study defines the flooding problem. Once the Flood Study has been endorsed by Council, the study moves to the Floodplain Risk Management Study and Plan phase, which seeks to identify and prioritise feasible options for mitigating the flood risk.

The Floodplain Risk Management Advisory Committee for Council was established in 2018 and includes a number of Council Representatives, staff from the Office of Environment and Heritage (OEH), the State Emergency Services (SES), in addition to local stakeholders including community representatives.

Draft Flood Study Report



Figure 1-1 Floodplain Risk Management Process



1.3 Structure of this Report

This report is structured by the following sections:

- Section 2 provides background on the study area.
- Section 3 reviews and describes relevant aspects of the available data
- Section 4 describes the hydrologic modelling undertaken for this study.
- Section 5 details the development of the hydraulic model.
- Section 6 discusses the calibration of the flood modelling to historic flood events, including sensitivity testing of key model parameters and assumptions.
- Section 7 discusses the approach in estimating the design flooding conditions.
- Section 8 describes the study results and flood mapping, including the scale of the flooding problem in the area.
- Section 9 provides conclusions and recommendations to this phase of the study.
- Section 10 acknowledges those agencies and organisations who assisted with the study.
- Section 11 cites the literature references.
- Section 12 provides a glossary of terms.

Draft Flood Study Report



2. Background on the Study Area

2.1 Catchment Description

The study area is shown on Figure 2-1 and generally comprises the northern and eastern faces of the North Brother Mountain and the associated urban areas between the foot of the mountain and the adjoining receiving waters.

The study area has an approximate area of 1,852ha, with the North Brother Mountain extending to a height of 490m AHD, dominating the landscape. The upper reaches of the study area is predominantly the Dooragan National Park, containing the North Brother Mountain itself, below which is situated the Laurieton CBD, various vegetated natural gullies and flow path as well as significant established low and medium density residential, caravan parks and holiday accommodation precincts.

From the North Brother Mountain, stems a number of small, steep and unnamed local catchments which discharge to one of the many waterways surrounding the mountain:

- On the north side of North Brother Mountain is Queens Lake,
- On the east is the Pacific Ocean.
- To the south is Watson Taylors Lake (through which Camden Haven River flows), and
- On the west is the Camden Haven River

The topography within the catchment varies significantly with the upper parts of the catchment being very steep in nature (grades of up to 50%), the mid zone is moderately graded (slopes in the order of 10-15%), and lower areas adjoining the Camden Haven River floodplain being reasonably flat (grades averaging 5%).

Ground cover within the study area also varies considerably and is generally varied in accordance with slope changes. The upper portions of the catchment are heavily forested, with the mid and lower areas consisting of lawns, residential gardens, pavements and roof areas. The relatively short flow path lengths between the foot of the North Brother Mountain and the adjoining downstream receiving waters mean that stormwater flows are characteristically high energy and fast flowing.

The study area experiences overland flooding originating from North Brother Mountain runoff, while areas at lower elevations are also at risk from riverine flooding from the Camden Haven River and lakes system.

2.2 Existing Development

Development of the study area has been occurring from the early 1900's through to the present day with the majority of development having occurred between 1970 - 2000. The construction of associated drainage infrastructure has also primarily dated from this time, with the result being that the majority of watercourses stemming from the North Brother Mountain have either been built over, filled, redirected, piped or crossed by road embankments, often resulting in urban development occurring in unsuitable locations.

Urban development at the foot of the North Brother Mountain is typically bounded by diversion drains and largely natural gullies which direct the large volumes of stormwater runoff generated safely around developed lands and into the downstream waterways. However as mentioned above, development has occurred in some location in close proximity to natural watercourses and man-made surface drainage and is at risk to flooding when the drainage capacity is exceeded.

Development in the study area is predominantly low-density residential, with some higher density developments located in West Haven and Laurieton, including retirement villages. Residential development is ongoing, notably in parts of Lakewood. Commercial areas are located in Lakewood and Laurieton.

Legend

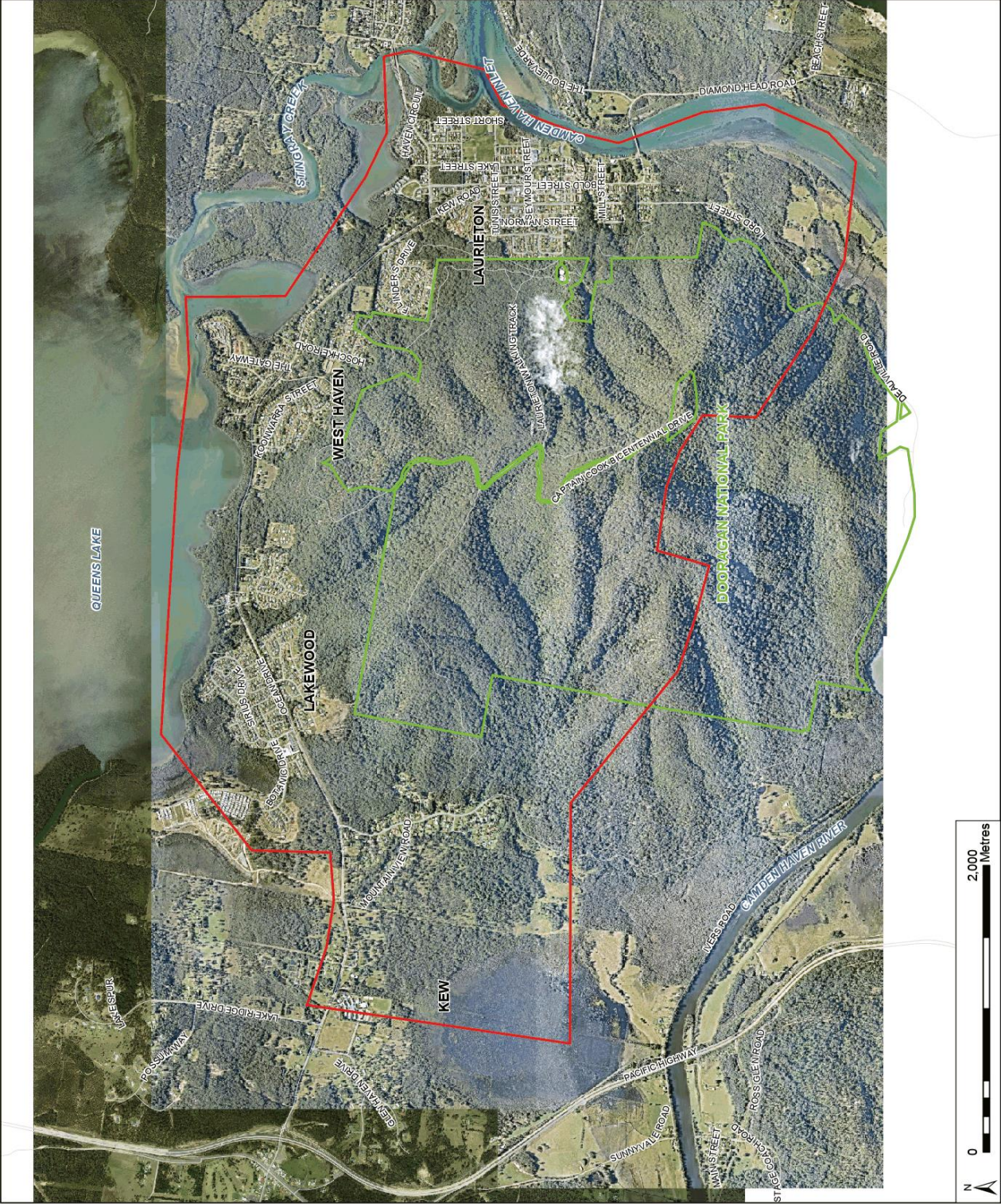
Study Area

National Park

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Study Area
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
ISSUED DATE	25/05/2017
	FIGURE 2-1



Draft Flood Study Report**2.3 History of Flooding**

A number of trouble spots and significant drainage locations were identified by Council based on previous flooding and include:

- Black Swan Terrace, West Haven
- Ringtail Cl, Lakewood
- Lilli Pilli Cl, Lakewood
- Mission Terrace, Lakewood
- Kirmington Terrace, and Pelican Ct, Westhaven
- Flinders Dr Estate, Laurieton
- Bold Street, Laurieton
- Quarry Way, Laurieton
- Lake Street, Laurieton
- St Joseph's School, Laurieton.

In several locations there are localised existing features such as open drains and diversion berms which are not currently performing properly. The heavily-vegetated upper catchments contribute significant volumes of flood debris which impacts on the capacity of the existing drainage and hydraulic structures.

Overland flooding was experienced in numerous times in recent history, with events occurring in 2002, 2004, 2008, 2011, 2013, 2015 and 2016, among others. Photos of previous flooding are shown in Section 3.7.

North-Eastern Local Catchments Flood Study

Draft Flood Study Report



3. Review of Available Data

3.1 Summary of Data

A range of data was obtained by Jacobs or provided by Council and other agencies in July/August 2017 and is summarised in Table 3-1 below. The data includes reports of studies that have been undertaken in the area, drainage models, spatial data including stormwater assets, zoning and other GIS layers, photographs and resident reports of previous flooding in the study area. Discussion on key datasets is provided in Section 2.

Table 3-1 Data inventory

Data	Description	Source
Reports		
West Haven System Analysis report	Hydrologic and hydraulic analysis of West Haven stormwater system and catchment	GHD 2007
West Haven Concept Design Report	Concept design report of proposed mitigation works in West Haven	GHD 2007
Camden Haven and Lakes System Flood Study	Mainstream flood study - river design flood levels Adopted 2013.	Worley Parsons 2013
Port Macquarie Hastings Council Flood Policy	PMHC flood policy adopted 2015. Includes guidelines for development, hydraulic classification, climate change, flood planning level allowances for different development, development controls.	PMHC
Spatial and Design Data		
Study area	Study area extent	PMHC
LiDAR data	Classified C3 LAS and thinned ground point data	NSW LPI 2012 (via PMHC)
LiDAR data	1m gridded DEM obtained for LPI dataset (available within Jacobs). Merged for study area	NSW LPI 2012 (via Jacobs)
Aerial photography	Nearmap 7cm res. Use this for existing case modelling	NearMap May 2017(via PMHC)
Aerial photography	Other older datasets available, varying resolution	NearMap, LPI (via PMHC)

Draft Flood Study Report



Stormwater infrastructure	Bridges Culverts Stormwater Box Culvert Stormwater End Structure Stormwater Junction Sideline Stormwater Open Drain Stormwater Pipe Stormwater Pit Stormwater SQID (Stormwater Quality Improvement Device)	PMHC
Zoning	Land use zoning	PMHC
Cadastre	Lot parcels	PMHC
Ecology	Endangered ecological communities 2014 Vegetation Management Plans SEPP14 Coastal Wetlands	PMHC
Erosion risk	Soil Erosion Risk	PMHC
Road feature	Road Surface (road centreline) Kerb/Gutter line Footpaths	PMHC
Flood and sea level rise	Camden Haven River flood and sea level rise extents	Flood and sea level rise
Drainage plans - Historic	Various drainage/stormwater/WQ designs, various locations and ages	PMHC
Hydrographic and Dredging Plans - Camden Haven Area - historic	River bathymetry, dredging, tidal analysis. 1970s 1980s.	PMHC
Parks and Reserve Plans	Parks and reserves layouts 1980s - 2000	PMHC
Rural roads plans	Ocean Drive - historical plans	PMHC
Subdivision plans	Historic subdivision plans dated 2006 and 2010	PMHC

Draft Flood Study Report



Urban Roads	Urban roads- historic plans	PMHC
Hydrologic Soil Group	NSW wide GIS layer on hydrologic soils group (classification A to D reflecting permeability and runoff potential)	OEH (online)
Recorded Data		
Daily Rainfall Data	Daily rainfall data for five stations in the vicinity of North Brother	BoM
Pluviograph Data	Pluviograph data 5 minute intervals 1/03/2012 to 1/02/2016 at various sewage treatment plants and pumping stations in Port Macquarie Hastings LGA. Pluviograph data is also available from Manly Hydraulics Laboratory (MHL) for Locans Crossing	PMHC MHL
Modelling Data		
West Haven DRAINS models	DRAINS models of existing and mitigated cases relating to West Haven System Analysis report and West Haven Concept Design Report	GHD 2007
Historic Flooding		
Flood mapping	Historic flood outlines and flood prone land/ flood planning mapping for mainstream flooding	PMHC
Flood marks	Historic flood marks for Camden Haven River flooding	PMHC
Photographs	Photos of previous flooding (various locations and events)	PMHC
Flooding complaints	Flooding and drainage complaints from residents and logged on Council register	PMHC

3.2 Port Macquarie Hastings Council Flood Policy (2015)

Council's Flood Policy (adopted 21 October 2015) outlines the considerations to be made by Council in exercising its environmental assessment and planning functions in relation to development in the Port Macquarie Hastings Local Government Area (LGA). It reflects the direction of flood risk management in NSW

Port Macquarie Hastings Council Flood Study

2

Draft Flood Study Report

Government's *Flood Prone Land Policy* and draws on the guidance on this provided in the *Floodplain Development Manual* (2005). It outlines a number of objectives in achieving sound flood management, namely:

- I. To maintain the existing flood regime and flow conveyance capacity;
- II. to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property;
- III. to reduce private and public losses resulting from floods;
- IV. to increase public safety with respect to flood events;
- V. to protect the operational capacity of emergency services and emergency response facilities during flood events;
- VI. to increase public awareness of the potential for flooding across the range of flood events up to the Probable Maximum Flood level;
- VII. to inform the community of Council's policy in relation to the use and development of flood prone land;
- VIII. to ensure that planning and development of essential services and land use makes appropriate provision for flood related risk;
- IX. to utilise best engineering practice for determination of flood conditions, impact and risk.
- X. to utilise ecologically positive methods of flood protection wherever possible;
- XI. to ensure that any new development or modifications to existing development must, as far as practical, result in a reduction in the existing flood risk, and in no circumstances should the flood risk be made worse; and,
- XII. to deal equitably and consistently with all matters requiring Council approval on land affected by potential floods, in accordance with the principles contained in the NSW Government's *Floodplain Development Manual* (2005).

The flood policy provides definitions for the different hydraulic classifications of the floodplain, flood planning level categories and provisions for different types of development (permissible development types, minimum floor levels), filling, fencing, boundary adjustments, rezoning and subdivision in the different hydraulic zones in the floodplain.

3.3 Previous Studies

3.3.1 GHD Stormwater Analysis and Design Studies (2007)

In response to previous poor performance of the drainage system, a stormwater hydrologic and hydraulic study was undertaken by GHD for Council for the West Haven area, and a concept design prepared for a proposed drainage upgrade and flood mitigation program. These are documented in the following reports:

- West Haven Stormwater Study Area Final Systems Analyses Report (GHD, April 2007)
- Report for Buller Street and West Haven Stormwater Catchment Studies S.600.110.05.61 Concept Design Report - West Haven Study Area (GHD, September 2007).

DRAINS models were developed for the study for the existing and proposed design cases to quantify system flows and identify/confirm system constraints. The models were not calibrated to historic flooding events. Design event flows were validated against rational method estimates. Relatively conservative hydrologic parameters were assumed for the catchment hydrology, including assumptions on the soil type (soil type 4 or D, high runoff and very low infiltration rates).

West Haven Stormwater Catchment Flood Study

Draft Flood Study Report

The existing case modelling indicated flood problem areas in the following locations

- South of No. 9 Black Swan Terrace / No. 20 Kilmington Terrace;
- Koonwarra Street drainage easement Lot 29;
- Ocean Drive cross culverts adjacent No. 374 – No. 384 Ocean Drive; and
- DRAINS also indicated problems with the Elouera Place cross culvert.

The concept design proposed a range of pit and pipe network upgrades and modifications, formalisation of two existing flood storages (referred to as “detention basins” in the GHD study) and construction of a large diversion channel upstream of Black Swan Terrace. The works were designed to achieve compliance for the minor (5 year) storm event with a review of the effect on the 100 year capacity.

The works were costed with a Net Present Value of \$4.7 million (2007 dollars) excluding GST. It has not been confirmed with Council if any of the proposed mitigation works were implemented.

Sub-catchment boundaries are not available as spatial layers. The pit and pipe names in the DRAINS model are not consistent with the drainage asset layer provided by Council. Hence, the DRAINS model data is not directly suitable for the development of flood models in this study, but the results may be useful for model validation purposes.

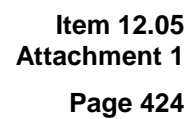
3.3.2 Camden Haven and Lakes System Flood Study (Worley Parsons, 2013)

This flood study estimated existing flooding conditions for mainstream flooding in Camden Haven River, Camden Haven Inlet, Queens Lake, Stingray Creek and Watsons Taylor Lake in the study area. The study was based on hydrologic and hydraulic modelling in XP-RAFTS and RMA-2, respectively, for the 5, 20, 50, 100 and 200 year floods and Probable Maximum Flood (PMF). The study estimated 100 year flood levels of approximately 2.9 – 3m AHD in Camden Haven Inlet, Stingray Creek and Queens Lake affecting parts of the study area, and 4.3m AHD in Camden Haven River near the Pacific Highway bridge, potentially affecting the south-western portion of the study area.

3.4 Spatial and Design Data

3.4.1 Topographic Data

Topographic data across the study area consists of LiDAR data captured by NSW Land and Property Information (LPI) in 2012. The dataset has a vertical accuracy of 0.15m (one standard deviation). Council provided classified and thinned ground point data for the study. Jacobs obtained the 1m digital elevation model (DEM) grid developed by LPI from this data, which is held in-house. The data tiles were merged together by Jacobs to form a continuous DEM across the study area and surrounds. The DEM showing the study area terrain is presented on Figure 3-1.

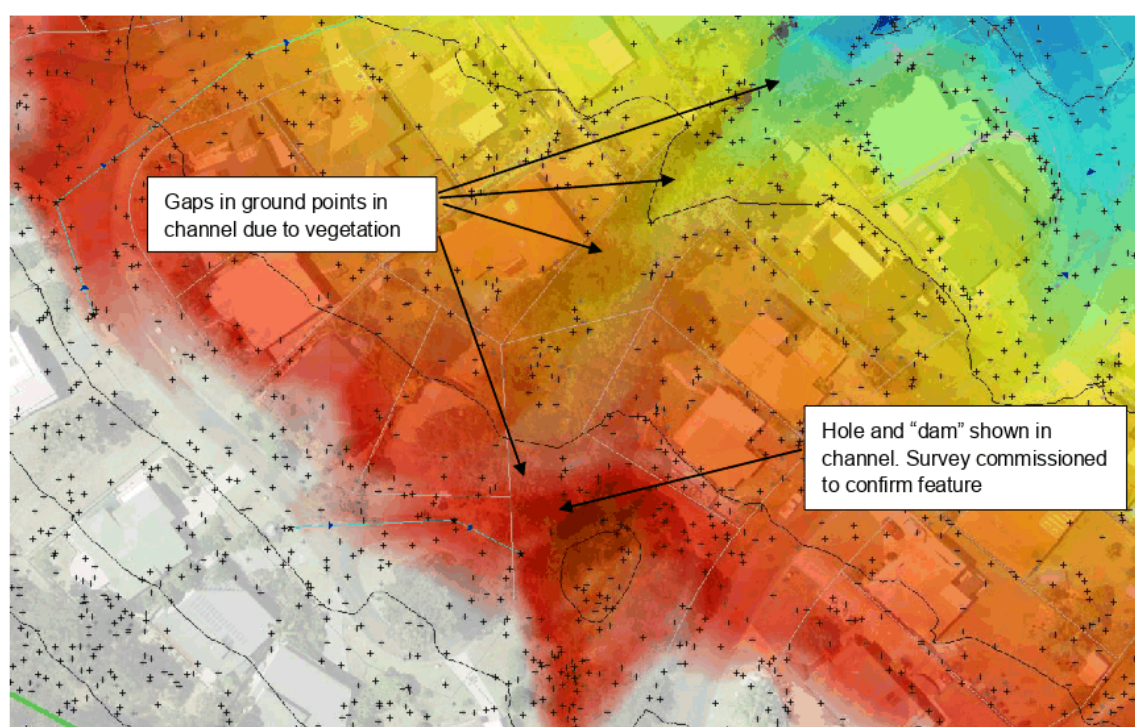


Draft Flood Study Report

JACOBS

The thinned ground points data set was reviewed for key drainage areas, and it was observed that in areas with a thick tree canopy or in-channel vegetation there was generally a low density of data points. This indicates that the LiDAR was only able to penetrate the tree canopy in sparsely spaced locations, and that the DEM is unlikely to accurately represent any drainage features which may be beneath the tree canopy. A similar issue is expected for channels with standing water or in-channel vegetation. Review of the DEM confirmed that some channel and drainage features are not represented in detail and do not match site observations. Examples are shown on Figure 3-2 below. Ground survey was commissioned to collect more accurate topographic information of the study area terrain and features.

Figure 3-2 Example – sparse LiDAR ground points in vegetated areas and potentially inaccurate channel definition. Kirmington Terrace – Koonwarra Street, West Haven



3.4.2 Aerial Photography

Several different aerial photograph data sets were provided by Council, the most recent and highest resolution being NearMap imagery (May 2017, 7cm resolution). This imagery covers the developed areas at base of North Brother Mountain, and is supplemented with other imagery supplied by Council (dated 2012 and 2013) to cover the entire study area and surrounds.

3.4.3 Stormwater and Drainage Infrastructure

Layers for a range of stormwater drainage assets and features have been provided by Council including pits, pipes, culverts, headwalls and water quality improvement devices. Details (dimensions and levels) are missing for a number of the drainage assets and require survey. The source and accuracy of those assets with details is not known, although it is noted that the network layout is consistent with recent subdivision road layouts (e.g. Fairwinds Avenue detention basin and Wedgetail Drive, both in Lakewood). Data entry dates are also observed to be recent (up to 2015). The locations and details of open drains and swales in the study area are not included in the spatial layers.

Draft Flood Study Report**3.4.4 Historical Subdivision Design**

Sub-division designs are available from Council for a number of developments in the study area as pdf files. Most are dated pre-2010 and review of the locations of these developments against recent aerial photos indicates that the majority have been constructed.

Designs for drainage features including the flow path and berms downstream of the Fairwinds Avenue detention basin are reflected in the LiDAR and stormwater spatial layers.

3.4.5 Additional GIS data

Additional GIS layers obtained include:

- Road centrelines, kerb/gutter lines, footpaths
- Cadastre
- LEP and zoning
- Land use
- Ecological features.

3.5 Recorded Data**3.5.1 Rainfall Data****3.5.1.1 Daily Rainfall**

Historic daily rainfall data was obtained from the Bureau of Meteorology's (BOM) website. Data from five sites in the vicinity of North Brother was obtained and is summarised in Table 3-2. Site locations for the selected gauges and other regional gauges are shown on Figure 3-3. It is to be noted that all five sites are located at or below RL 55m and the sites are unlikely to represent rainfall on the 490m high North Brother Mountain due to orographic effects.

The steep and smaller nature of the catchments in the study area mean that intense short duration (sub-daily) storm events or storm bursts are more likely to be critical in causing peak flooding during flash flood events. Mainstream flooding is more likely to result from multi-day duration events. Hence, the reported daily rainfall depths may not indicate the critical historic storm events which resulted in peak flash flooding. Those short (say, less than 6 hours in duration) and intense rainfall events may result in the worst flash flooding conditions but are not reflected by exceedingly high daily rainfall depths. The daily rainfall data is therefore of limited use in indicating when the worst flash flooding events occurred, although it is useful for showing general trends of when wet periods occurred, during which the critical storm events may have happened. The data is also useful for validating any recorded sub-daily rainfall data.

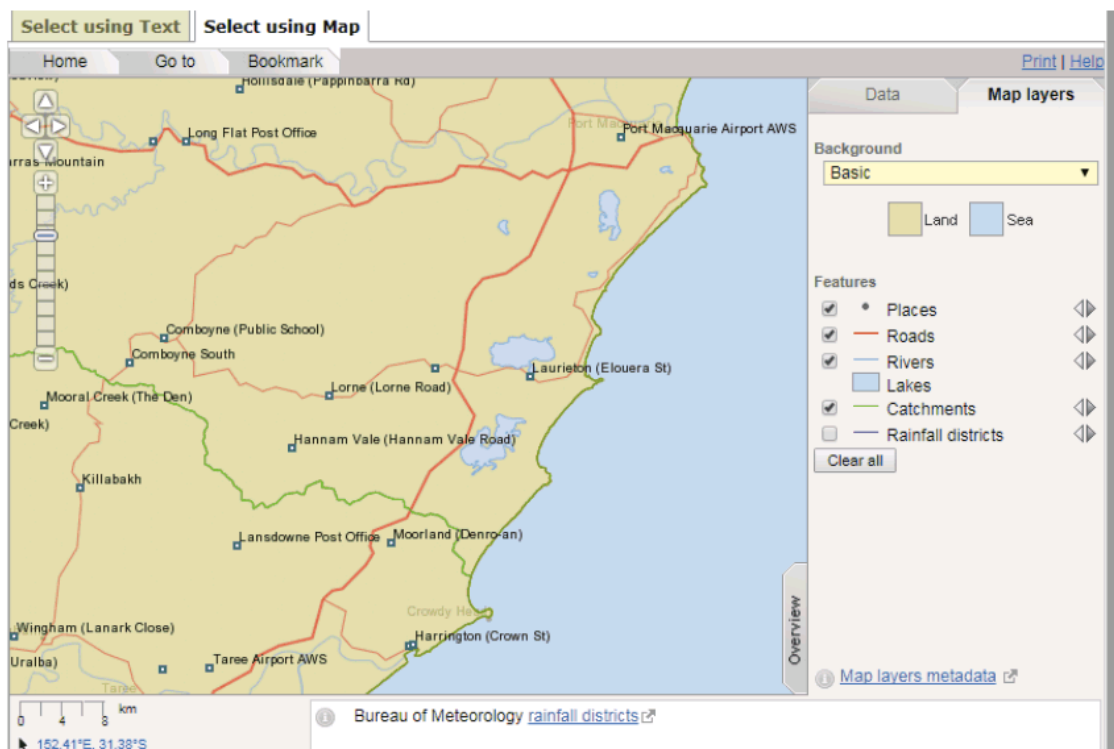
Draft Flood Study Report

JACOBS

Table 3-2 Daily Rainfall Data

Gauge Number	Gauge Name and Elevation	Distance from Study Area (km)	Start Date	End Date	Length of record (years)	Completeness (%)
060022	Laurieton (Eloura St) 12m AHD	0	1/1/1885	31/07/2017	132.7	87.0
060027	Lorne (Lorne Rd) 55m AHD	17	1/01/1938	30/06/2016	78.6	97.5
060024	Moorland (Denro-an) 5m AHD	19	1/11/1885	31/07/2017	131.8	90.3
060017	Hannam Vale (Hannam Vale Rd) 33m AHD	21	1/02/1926	31/07/2017	91.6	97.1
0600139	Port Macquarie Airport AWS 4m AHD	25	26/07/1995	17/08/2017	22.1	98.0

Figure 3-3 BOM Rainfall Gauges in Laurieton region (source: BoM website.
<http://www.bom.gov.au/climate/data/index.shtml?bookmark=136>)



Draft Flood Study Report



The daily rainfall data from the BOM Laurieton rainfall gauge was analysed and summarised for the top-ranking 1-day and 2-day recorded rainfall depths in Table 3-3. Rainfall values are based on daily rainfall recorded to 9am as per BOM convention. Hence, the peak flooding may occurred one day prior to the reported rainfall depth.

Table 3-3 Highest ranked recorded 1-day and 2-day rainfall depths at Laurieton rainfall gauge (060022).

Rank	1 day		2 day	
	Start date	Depth (mm)	Start date	Depth (mm)
1	29/04/1963	448.3	29/04/1963	462.3
2	5/01/1959	325.1	28/04/1963	448.3
3	22/1/1895	310.6	12/03/1974	389
4	20/03/1978	279.6	21/1/1895	384.8
5	28/02/1983	250	27/2/1892	377.7
6	16/3/1887	241.3	11/03/1974	368.6
7	28/03/1978	232	22/1/1895	328.4
8	6/02/2002	232	4/01/1959	325.1
9	9/11/2004	222	5/01/1959	325.1
10	6/04/1934	217.9	2/8/1899	318.7

3.5.1.2 Pluviograph data

Pluviograph data for specific historic storm events was obtained from Council for model calibration. The historic storm events of interest were identified from the responses from the community survey. Pluviograph data is available from Council-operated sewage treatment plants (STP) and sewer pumping stations (SPS), with the closest and most relevant gauge locations to the study area including:

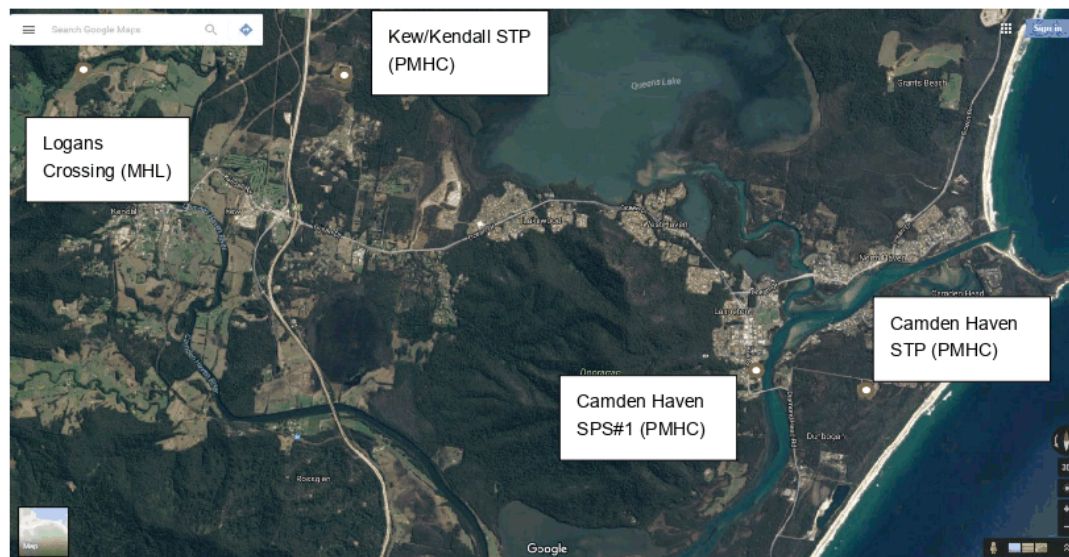
- Camden Haven SPS #1 (Wharf Street, Laurieton)
- Camden Haven STP (Dunbogan), and
- Kew – Kendall STP (Pacific Highway, Herons Creek).

The pluviograph stations are in the immediate vicinity (up to 3km) from the study area. Manly Hydraulics Laboratory (MHL) operates as pluviograph station at Logans Crossing, approximately 6km from the study area. This site is located further away from the study area than the Council STP gauge sites. The data from this gauge was obtained for selected storm events for comparison purposes. Refer to Figure 3-4 for locations of pluviograph stations in the vicinity of the study area.

Draft Flood Study Report

JACOBS

Figure 3-4 Pluviograph locations in vicinity of the study area



3.5.2 Water Level Data

Water levels are recorded by MHL at several locations in the vicinity of the study area:

- Lakewood (Queens Lake)
- West Haven (Stingray Creek)
- Laurieton (Camden Haven River).

Data from these sites will be obtained for model calibration to historic storm events.

3.6 Topographic and Hydraulic Structures Survey

Survey of drainage and topographic features and hydraulic structures was commissioned for this study and undertaken in January – February 2018. The survey data was incorporated into the hydraulic modelling of the study area. Features surveyed included selected stormwater pits, pipes and culverts, earthen diversion drains and berms, natural channels and concrete channels. A summary map of surveyed features is provided in Appendix B.

Survey of drainage and topographic features in the vicinity of Black Swan Terrace was previously undertaken and supplied by Council.

3.7 Reports and Photographs of Historic Flooding and Drainage Issues

Council provided a number of photographs and written submissions from residents reporting drainage and flooding problems during historic storm events. Dates of the reported events are listed below. The Annual Exceedance Probability (AEP) of the 2013 and 2016 storm events were estimated by Jacobs from the Council pluviograph data from Camden Haven sewer pumping station.

- 18 October 2004. 127mm recorded daily depth.
- 25 February 2008. 112mm recorded daily depth.
- 24 April 2008 (10% AEP event). 49mm in 45minutes; 65mm in 60 minutes; 136mm in 24 hours.

Draft Flood Study Report

- 14 June 2011. 96mm recorded 2-day depth.
- 2 March 2013 (20% AEP) 61mm in 1.5 hours; 152mm in 24 hours.
- 5 January 2016 (20 – 50% AEP) 54mm in 1.5 hours.

Rainfall data for the 2008, 2013 and 2016 events was analysed and is plotted in Appendix A. Notable flooding reports are from locations including:

- Black Swan Terrace and Waterview Drive. Watercourse is piped through properties. The existing pipe inlet is undersized and the inlet debris screen regularly blocks. Overflows pass through residential yards, with paling fences washed away in previous floods.
- St Josephs's School, Laurieton. Video footage taken of significant flows along walkways between school buildings in the March 2013 event, which was a relatively frequent flood event.
- Ocean Drive. Flooding in numerous locations where a number of flow paths draining off North Brother Mountain cross this main road through the study area. Significant amount of cobblestones and other debris washed from watercourses and deposited on road.
- Flooding to depths of up to 1m in low points in roads at a number of locations in the study area. This was reported at Lilli Pilli Close, Sirius Drive, Mahogany Close and Honeysuckle Avenue, Lakewood; and Pelican Court, West Haven, among others.
- Flooding through Laurieton town centre including Bold Street, Lake Street and Tunis Street.
- Kirmington Terrace. Storm flows occurring within adjacent diversion drains further up the mountain infiltrated into the soil and then resurfaced as groundwater "springs" in residential yards and under buildings. Note that the flood models developed in this study would not be able to represent this phenomenon as a flood flow. However, remediation measures may be suggested as a part of the study.
- Numerous photos of overland flooding were captured by Murray Dalton surveyors during the April 2008 storm, summarised in Table 3-4 below.

It is noted that the storm events resulting in the reported flooding and drainage complaints and problems were relatively frequent and smaller magnitude events. Local flooding events of similar frequency and magnitude to planning flood events (i.e. the 1% AEP) or even moderate frequency (e.g. 5% AEP) are yet to be experienced in the study area in recent times.

Draft Flood Study Report

JACOBS

Table 3-4 Summary list of photographs taken during 24 April 2008 storm event by Murray Dalton Surveyors

**LAURIETON LOCAL STORM EVENT
24th APRIL, 2008 @ 8 am****Photo catalogue**

2008_010	Queens Lake Village – flow down pathway
2008_011	Queens Lake Village – western grated inlet pit
2008_012	Queens Lake Village – pathway flow
2008_013	Queens Lake Village – culvert flows
2008_014	Queens Lake Village – Eastern Culvert
2008_015	Mission Terrace – Gutter in front of Anglican Rectory
2008_016	Ocean Drive looking west to Flinders Drive
2008_017	Culvert east of Flinders Drive
2008_018	2 nd Culvert east of Flinders Drive
2008_019	Creek at 416 Ocean Drive, West Haven
2008_020	Ocean Drive intersection with Mission Terrace
2008_021	Mission Terrace – gutter in front of Anglican Rectory
2008_022	Ocean Drive looking at Laurieton Cemetery
2008_023	Ocean Drive looking east at Flinders Drive, Laurieton
2008_024	Flinders Drive intersection with Ocean Drive
2008_025	Culvert at St Josephs
2008_026	Western culvert above Queens Lake Village
2008_027	Woolworths culvert at Lakewood
2008_028	Sirius Drive from temporary access to Ringtail, Lakewood
2008_029	Drain above Woolworths culvert from Ringtail Access
2008_030	Drain above Woolworths culvert
2008_031	Sag pit in Ringtail Close
2008_032	Ringtail Close looking towards cul-de-sac
2008_033	Ocean Drive culverts west of Woolworths – looking east
2008_034	Creek below Fairwinds at Ocean Drive
2008_035	Creek below Fairwinds at Ocean Drive – watermain
2008_036	Flow above Amaroo detention basin – headwall blocked by ply
2008_042	Creek at 416 Ocean Drive, West Haven
2008_043	View up driveway at 414 Ocean Drive, West Haven
2008_044	Western culvert at St Josephs
2008_045	Sewer Manhole at Laurieton Caltex
2008_046	Sewer Manhole at Caltex
2008_047	Rosewood Court and Mission Terrace intersection
2008_048	Rosewood Court at top of hill
2008_049	Queens Lake village drains

Draft Flood Study Report



Figure 3-5 Infiltrated floodwaters emanating as a “spring” from the ground in residential yard, Kirmington Terrace, June 2011.



Figure 3-6 Residents unblocking culvert inlet upstream of Black Swan Terrace properties, April 2008.



Draft Flood Study Report



Figure 3-7 Overland flows from creek across Ocean Drive, West Haven, April 2008



Figure 3-8 Overland flows, Ocean Drive at Flinders Drive, April 2008



Black Roadway and Catchments Flood Photo

Draft Flood Study Report



3.8 Floor Level Survey

Floor level survey is currently not available for residential and commercial buildings in the study area. These data are required for the flood damages assessment to be undertaken during this study, and will be collected for selected properties based on their flood affectation and historic flooding.

3.9 Site Inspections

Site inspections were undertaken on 27 July 2017. The purpose of the site inspection was to gain a further understanding of the catchment characteristics, the nature of existing development and hydraulic conditions (including flow patterns, drainage arrangements, hydraulic features etc.) in known flood problem areas, and likely flood risk. Members of the Jacobs project team were accompanied by Council officers. Locations inspected on the site visit included those flood problem areas previously identified by Council and described in Section 2.3.

Observations made during the site visit included:

- The terrain in the developed sections of the study area, at the foot of North Brother Mountain, was generally flat to moderately sloped (grades of 5 – 15%) with elevations from less than 2m AHD up to 50m AHD.
- The middle and upper catchment areas, upstream of the developed areas, were densely forested and generally within Dooragan National Park. Terrain was generally very steep, with watercourse grades of up to 50% and ground elevations up to 490m AHD.
- There were no permanently flowing watercourses observed at the time of the site visit, which occurred following a month of dry weather conditions. Most minor flow paths were piped to pass through residential development. The larger watercourses were maintained in a generally natural state and development did not encroach these watercourses. All of the flow paths and watercourses were crossed by Ocean Drive and other roads with culverts as they drain to Queens Lake and Stingray Creek.
- Many watercourses and other drainage features were covered by dense rainforest vegetation.
- Soil landscapes along watercourses were observed to include high permeability gravel and rubble beds in the stream beds and along some stream banks. Council officers described that during storm events, in some locations the stream flows infiltrate into these gravel and rubble beds, flowing sub-surface and then resurfacing in different locations. This is reflected in residents' reports and accompanying photos.

An additional site visit was undertaken on 30 April 2018 during the model setup and calibration to inspect selected drainage features and confirm the model performance and representation of flood behaviour.

Draft Flood Study Report



Figure 3-9 Eastern side of north Brother Mountain, illustrating steepness of the terrain



Figure 3-10 Shotcrete-lined informal channel in Lakewood



North Brother Island and Lakewood Flood Study

Draft Flood Study Report

JACOBS

Figure 3-11 Natural flow path through forested area in West Haven





Draft Flood Study Report

Figure 3-13 Grated trunk drainage headwall inlet, West Haven



Figure 3-12 Driveway crossing of flow path, which passes next to dwelling, West Haven



Draft Flood Study Report

JACOBS

Figure 3-14 Upstream side of flow path road crossing, West Haven



Figure 3-15 Trunk drainage open channel through property, Laurieton



North East Coast Catchments Flood Study

27

Draft Flood Study Report



Figure 3-16 Trunk drainage culvert discharging to open channel next to development, Laurieton



Figure 3-17 Flow diversion berm and swale upstream of development, Laurieton



Draft Flood Study Report**3.10 Community Consultation****3.10.1 Initial Consultation**

Community consultation was undertaken throughout this study, including distribution of newsletters and media releases and the hosting of a website on Council's webpage to announce the commencement and provide background on the study.

3.10.2 Community Survey

A community survey was mailed out to residents with the study newsletter asking residents for information on previous flooding events that they experienced in the study area, refer to Appendix B for the survey. A total of 302 responses were received. The responses assisted the project team in identifying the most significant flooding events in recent history which would be suitable for model calibration and verification. Observations including noted flood depths, flow patterns and durations of flooding were reported. Residents also submitted photographs and videos of flooding during the events.

The survey identified numerous flooding events over the past 20 years with no particular standout events. The March 2013 event was reported in six responses, while the April 2008 event, which resulted in the most intense rainfall for the storm event data available, was reported two times. The February 2002 event was reported four times, however, sub-daily rainfall data is not available for that event.

3.10.3 Community Information Sessions

Two community information sessions were held at Laurieton Library in August 2018. Residents were invited to view flood mapping for the model calibration and provide feedback on the results and other general concerns relating to flooding in the study area. Approximately 40 residents attended over the two sessions. The modelling was updated based on several resident comments for the final model calibration runs and design flood estimation.

4. Hydrologic Modelling

4.1 Modelling Approach

A hydrologic model was required to estimate storm and flood flows for the study area for the historic and design rainfall storm events. The terrain of the study area is such that:

- There are numerous natural watercourses and gullies which flow down the face of North Brother Mountain and then through the developed areas of the study area.
- On the flatter areas at and below the foot of the mountain and away from the watercourses, drainage paths are often less defined, with more dispersed overland flows affecting existing development.

The hydrologic modelling adopted involved lumped catchment modelling approach for the watercourses draining off the mountain, and a direct rainfall approach for the more dispersed overland flow catchment areas at the foot of the mountain. The lumped catchment modelling estimated inflow hydrographs (flow versus time) which were input into the hydraulic model in the watercourses. The direct rainfall approach input rainfall versus time data onto the modelled catchment surface in the hydraulic model itself, which then generated estimated flows internally in the model. This report section describes the lumped hydrologic modelling. Refer to Section 5.3.2 for further discussion.

The lumped hydrologic modelling was undertaken using the RAFTS hydrology module in the DRAINS modelling software. The RAFTS module is suitable for assessment of sub-catchments with areas up to 100 hectares and permits routing of runoff through the catchment. The DRAINS software is one of the few modelling packages that currently incorporate Australian Rainfall and Runoff 2016 (ARR 2016) design rainfalls and procedures.

4.2 Sub-Catchment Data

The catchment areas on North Brother Mountain were divided into 56 sub-catchments which drain to the gullies and watercourses running off the mountain through the study area. Mapping of the sub-catchment boundaries is shown on Figure 4-1. These sub-catchments are natural vegetated areas and a nominal impervious fraction of 5% was assumed.

Sub-catchment flow path slopes are steep to very steep, with catchment flow path slopes ranging from 15 – 70%. DRAINS/RAFTS and most other hydrologic models have an upper limited slope parameter value of 30%, and this is adopted for the sub-catchments with slopes exceeding this value. It is likely that that catchment slopes steeper than 30% would result in faster catchment flow travel times producing higher peak flows. However, limited information is available rainfall runoff generation from very steep catchments.

A PERN catchment roughness value of 0.1 was adopted for the forested sub-catchment areas.

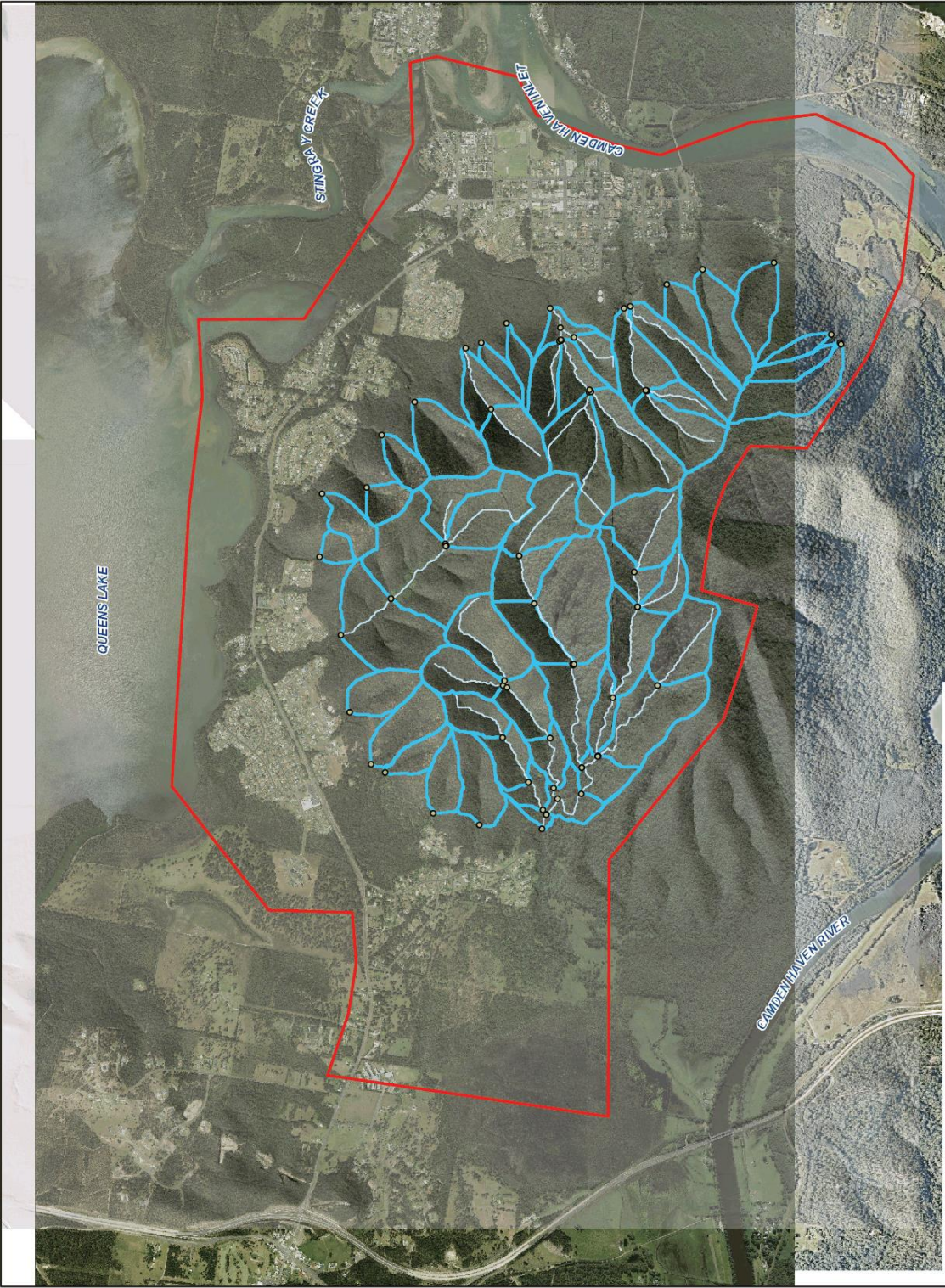
Legend

- Study Area
- Sub-Catchment Areas
- Drainage Links
- Sub-Catchment Outlets

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Hydrologic Model Sub-Catchments
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	IA 0780
DATE	18/05/2018
FIGURE 4-1	



Draft Flood Study Report



4.3 Hydrologic Parameters

4.3.1 Rainfall Losses

An initial and continuing loss model was utilised in the RAFTS module which represented rainfall losses during storm events such as depression storage and soil infiltration. The following loss values were adopted for the design event runs:

- Pervious areas: Initial loss 15mm, continuing loss 2.5mm/hr
- Impervious areas: Initial loss 1mm, continuing loss 0mm/hr.

Soil characteristics on the mountain were observed and reported to be very impermeable, and lower rainfall losses could normally be considered for such soils. Due to the steepness of the catchment areas and limited slope parameter values in the modelling these moderately low rainfall losses were retained.

Rainfall losses adopted for the calibration events are discussed in Section 6.3.1.

4.3.2 Storage Routing Factor

RAFTS includes the "Bx" storage routing factor which can be adjusted to change the runoff response of the catchment. With a default value of 1.0, the factor can be reduced to increase the runoff response, resulting in a more peaky flood. It is usually adjusted when there is sufficient data, such as flow gauging, to validate the adjustments.

Reducing the Bx value was considered to account for the very steep slopes on North Brother Mountain and the limited slope parameter value of 30% in the hydrologic modelling. However as there were no flow gauging data for the mountain, an adjustment of the Bx factor could not be justified for this study. Sensitivity runs also indicated minimal increases in peak flows for sample sub-catchments for Bx values of down to 0.2, which was not considered to be a reasonable adjusted value for this parameter. Modest increases in peak flows were observed for a Bx value of 0.1, but this was also considered a highly unreasonable value.

Draft Flood Study Report



5. Hydraulic Modelling

5.1 Model Selection

A TUFLOW combined one-dimensional (1D) and two-dimensional (2D) hydrodynamic model was developed for this study. TUFLOW is an industry-standard flood modelling platform, which was selected for this assessment as it has:

- Capability in representing complex flow patterns on the floodplain, including flows through street networks and around buildings.
- Capability in representing the stormwater drainage network, including pit inlet capacities and interflows between the network and floodplain including system surcharges.
- Capability in accurately modelling flow behaviour in 1D channel, bridge and culvert structures and interflows with adjacent 2D floodplain areas.
- Easy interfacing with GIS and capability to present the flood behaviour in easy-to-understand visual outputs.

The model was developed and run in TUFLOW 2018-03-AA-iDP-w64, in the Heavily Parallelised Compute (HPC) module. The HPC module was preferred over TUFLOW "Classic" as it permits significantly faster model run times, which was required for this relatively large model extent and with direct rainfall being applied.

5.2 Configuration of Hydraulic Model

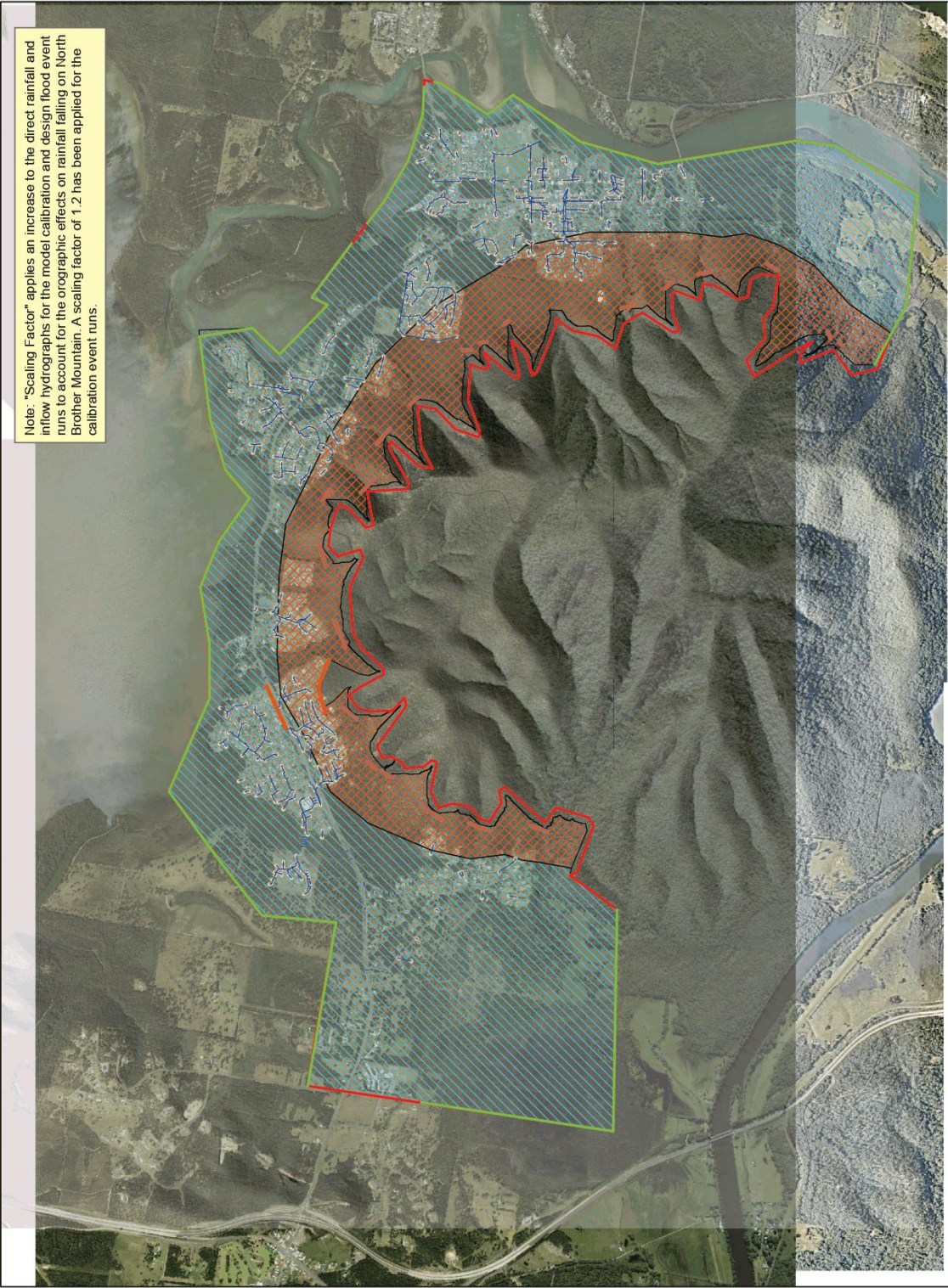
5.2.1 Extent and Structure

The TUFLOW model comprised of:

- A 2D domain of the study area surface reflecting the catchment topography, with varying roughness as dictated by land use. The watercourses were in general modelled in 2D. Diversion drains are in 2D.
- A 1D network of pits, pipes and culverts representing the stormwater network. Inflow capacities for pits were defined based on their type and size.
- Obstructions to flow are represented as 2D objects, including existing buildings.

The model extent covered an area of 12.6km² and includes the foot of the North Brother Mountain along its western, northern and eastern sides and the adjacent developed lower-lying areas down to the receiving waters at Camden Haven River, Queens Lake and Stingray Creek. Refer to the following report sections for details on these features. The model domain and locations of various features in the TUFLOW model are shown on Figure 5-1.

- Legend**
- 1D Pipes and Culverts
 - 1D Pit
 - 1D Channel
 - Tailwater Boundary
 - Inflow Hydrograph from
 - DRAINS (Scaling Factor Applied)
 - Direct Rainfall**
 - No Scaling Factor
 - Scaling Factor Applied
 - TUFLOW Extent



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

JACOBS

TITLE	TUFLOW Model Configuration
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
DATE	25/09/2018
	FIGURE 5-1

Draft Flood Study Report

**5.2.2 Model Topography**

The topography of the catchment was represented in the model using a 2m grid. This level of precision in the grid was considered necessary in order to represent detailed flood behaviour in a fully developed catchment. Finer model grid sizes such as 1m grid were not considered practical given the large size and expected excessively long computing times. The basis of the topographic grid used in the TUFLOW model was the LiDAR data set in addition to ground survey.

5.2.3 Stormwater Pits

The stormwater pits provide a dynamic linkage between the underground drainage network and the 2D TUFLOW model domain, representing the floodplain. Water is able to flow between the drainage network and floodplain, depending on the hydraulic conditions.

The location of the stormwater pits and associated attributes were available from Council in GIS format. Pit inflow relationships were defined in terms of flow depths versus pit inflow.

TUFLOW automatically calculates hydraulic energy losses in the pits based on the alignment of pipes connected to each pit and the flows in each pipe. The calculations are based on the Engelund manhole loss approach (*TUFLOW User Manual*, BMT WBM, 2017).

5.2.4 Stormwater Conduits

Stormwater pits and pipes identified in Council's data base and from survey were also modelled in the TUFLOW models. Several pipes down to a diameter of 225mm were represented but are typically larger than 300mm. The conduits were represented as circular pipes or rectangular culverts with dimensions matching those adopted in the DRAINS models.

5.2.5 Building Polygons

This study considered buildings as solid objects in the floodplain. This means that buildings form impermeable boundaries within the model, and while water would flow around buildings, it could not flow across their footprints. The building footprints in the TUFLOW model were digitised based on the 2017 aerial imagery. The building polygons were superimposed on the model grid to make model computational cells under the footprints inactive.

5.2.6 Surface Hydraulic Roughness

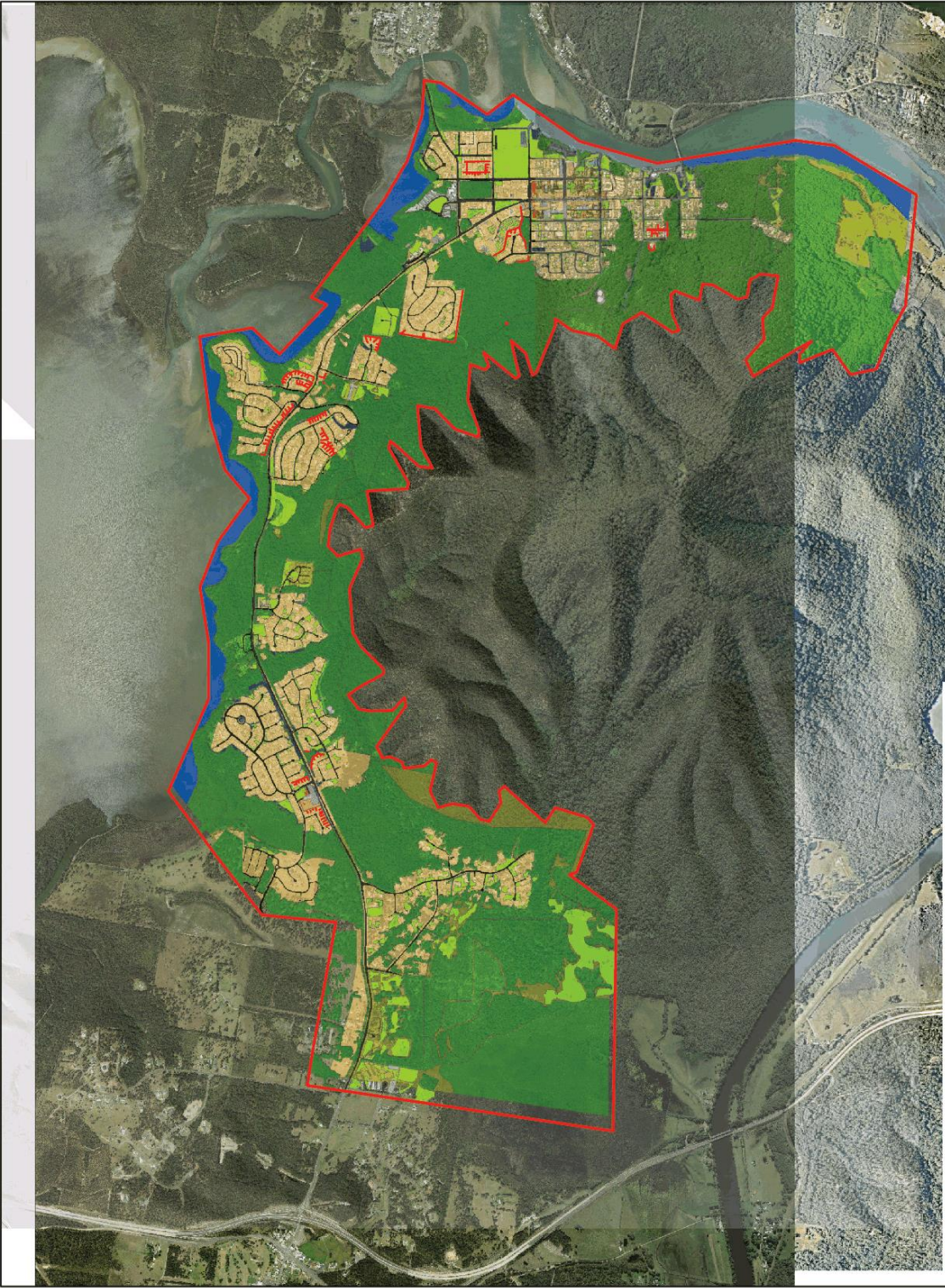
All parts of the study area within the TUFLOW model were assigned hydraulic roughness values in a "materials layer" according to the LEP zoning and ground cover. These were based on engineering experience and typical values used in previous flood studies undertaken in the Sydney Region by Jacobs and other consultants. A moderately high Manning's n value of 0.05 for the residential land use accounts for expected obstructions such as minor features (steps, planter boxes etc.) and landscaping, which are typically not detected by LiDAR survey. The adopted Manning's n values are mapped on Figure 5-2 and summarised in Table 5-1.

- Legend**
- MATERIAL**
- Commercial
 - Residential
 - Public Recreation
 - Rural
 - Special Use
 - Waterways 1
 - Waterways 2
 - Forest and Vegetated
 - Grass
 - Road
 - Fire Trail
 - Paved Areas
 - Diversion Drain
 - Diversion Drain, Blocked
 - Fence on Main Flow Path
 - TUFLOW Extent

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	TUFLOW Materials
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	IA17260
DATE	18/05/2018
FIGURE 5-2	



Draft Flood Study Report



Table 5-1 TUFLOW Model Grid Hydraulic Roughness Values

Land Use Type/Material	Manning's n	Comment
Commercial	0.035	Zoning B2, B4
Residential	0.05	Zoning R1, R2, including schools
Public Recreation	0.1	Zoning RE1
Rural	0.035	Zoning RU1
Special Use	0.05	Zoning SP2. Cemetery, water supply
Waterways 1	0.05	Zoning W1
Waterways 2	0.035	Zoning W2
Forest and vegetated areas	0.1	Zoning E1, E2, E3 and E4 and other vegetated areas
Road	0.025	Where present, overwrites land use zoning areas listed above
Paved areas	0.02	Where present, overwrites land use zoning areas listed above
Fire Trail	0.035	Where present, overwrites land use zoning areas listed above
Diversion drain	0.04	Diversion drain, maintained, clear
Diversion drain with blockages	0.20	Unmaintained, heavy vegetation and fallen trees etc. Prone to further blockages from flood-borne debris
Property fence lines	0.30	Paling and Colourbond fences which are initially solid but prone to failure and flow-through

5.2.7 Property Fence Lines

Fence lines were typically not explicitly represented in the model and floodwaters were allowed to flow across them freely. Although fences would obstruct overland flood flows in some parts of the catchment, experience indicates that representing fences in the hydraulic model requires making unvalidated assumptions about flood depths at which fences would overflow or fail.

The potential obstruction to flow caused by fences was represented in the model by increasing the cell roughness (Manning's n values) along selected property fence lines on and adjacent to main flow paths to a value of $n = 0.3$. This approach would provide some resistance to flows against and along a fence, although it probably would not represent the full obstructing effect of a fence before it fails under the force of flood flows. There are other approaches which could represent a fence as a solid obstruction which would dynamically fail in the model once flow depths become great, but this approach was considered somewhat impractical to implement on a catchment scale, requiring significant effort and detail. The adopted approach was considered a more practical means of representing the hydraulic effects on flood flows. The modelled fence lines are shown on Figure 5-2.

5.3 Boundary Conditions and Tailwater Conditions

5.3.1 Model Inflows

The inflow hydrographs from the DRAINS/RAFTS model were input into the watercourses and gullies upstream of the developed areas of the study area. The inflow boundaries are shown on Figure 5-1.

Draft Flood Study Report**5.3.2 Direct Rainfall**

A rainfall hyetograph (rainfall depth per time interval) was directly input into the TUFLOW model in the areas where direct rainfall applied. Similarly to the catchment hydrologic modelling discussed in Section 4.3.1, rainfall losses were applied in the conversion of direct rainfall to runoff in the TUFLOW model. The rainfall losses proposed for design flood estimation were:

- Pervious areas: Initial loss 15mm, continuing loss 2.5mm/hr
- Impervious areas: Initial loss 1mm, continuing loss 0mm/hr.

Most impervious areas in the study area were explicitly represented including road areas, roof areas and other large paved areas. The remaining developed areas for which impervious areas were not digitised were assumed to be 20% impervious to account for driveways and other small paved areas, and the rainfall losses were reduced accordingly to account for this partial imperviousness.

As discussed in Section 5.2.5, the model cells covering building footprints were made inactive. The rainfall falling on the roof areas of these buildings was therefore applied to the area immediately surrounding each building. Roofs were considered to be impervious areas with the corresponding rainfall losses applied.

Areas where direct rainfall was applied are shown on Figure 5-1. The areas where direct rainfall was scaled up for orographic effects (refer Section 6.3.2 for discussion) are also indicated.

5.3.3 Tailwater Boundaries

Tailwater boundaries were located along the shoreline on the receiving waterways including Camden Haven River, Stingray Creek, Queens Lake and Watsons Taylor Lake. Refer to the discussion in the subsequent model calibration section and the design event modelling section for details on the adopted tailwater levels.

6. Model Calibration and Verification

6.1 Overview

Rigorous model calibration of overland flood models cannot generally be carried out because direct measurements of overland flows and accurate measurements of flood levels are usually not available. Localised features may also be present which influence flow patterns but are not detected in the catchment-scale topographic data. Hence, overland flood models are often verified using observations of flood depths and flood behaviour as a way of “sanity-checking” the modelling and confirming its reliability.

This study relied mainly on observed depths of flooding during past flood events given by local residents. This anecdotal information was generally considered indicative as often only the general location of the observation was usually given, and approximate depths of flooding. The reported flood observations were also from numerous separate storm events, while the model calibration focussed on only two events selected based on availability and quality of observed data. However, the reported flood depths were still useful information for validating the general behaviour of flooding simulated by the flood models.

Photographs and video of flooding were also provided which offer more detailed information of the flooding behaviour at specific locations. Consideration was needed on whether the photos were taken at the peak of the flooding.

The general approach involved running the hydrologic and hydraulic models and comparing the flood depths and flow patterns to reported observations. The model configuration and parameter values were adjusted as necessary with the aim of achieving a satisfactory fit to the observations.

6.2 Selection of Verification Events

Flooding was reported for numerous individual storm events occurring over the last 20 years from the community survey responses. Two historic storm events were selected for model calibration and verification based on the number of responses for each event and the magnitude of the storm event. These events included:

- 24 April 2008. The most intense rainfall recorded based on the available data. Significant number of photographs are available with Council for this event.
- 2 March 2013. This is a relatively intense storm with the majority number of survey responses.

Characteristics of the selected storm events are provided in Table 6-1. The cumulative rainfall depths are plotted in Appendix A. A comparison of the recorded rainfall against the design IFD is also shown in Appendix A. Although the April 2008 storm event resulted in a lower daily rainfall depth than the March 2013 event, it produced a significantly more intense burst of rainfall over a period of one hour. Given the nature the flash flooding catchments in the study area these short duration bursts are the critical events for peak flooding. Hence, the April 2008 storm is considered to be a rarer and greater magnitude event than the March 2013 event, based on rainfall records.

Draft Flood Study Report



Table 6-1 Calibration storm event characteristics

Event Date	Daily Rainfall Depth	Main Storm Burst Rainfall Depth and Duration	Approximate Event AEP	Comment
24 April 2008	136mm	49mm in 45 mins 65mm in 60 mins	10% AEP	Rainfall data available from Camden Haven SPS (Laurieton)
2 March 2013	152mm	43mm in 60 mins 61mm in 1.5 hrs	20% AEP	Rainfall available from Camden Haven STP (Dunbogan)

Note that several storm events in circa 2000 and 2002 were reported by long-term residents as being the most severe that they experienced. However, suitable rainfall data for the model calibration were not available for these earlier storm events and hence these were not selected for the model calibration and verification.

6.3 Adopted Parameter Values for Model Verification

6.3.1 Rainfall Losses

Rainfall losses reflect the ability for the catchment to absorb some rainfall during a storm event due to capture on vegetation and trapped low points and from infiltration into the soil. The magnitude of the rainfall losses depends largely on how wet the catchment is due to preceding rainfall and the soil types in the catchment, with sandy soils generally being more permeable and hence water can infiltrate into the soil column at faster rates.

The assumed rainfall loss parameter values were selected based on a review of daily rainfall records and initial runs of the modelling for the calibration events. Both the April 2008 and the March 2013 storm events occurred after significant preceding rainfall:

- Approximately 200mm of rainfall was recorded in the week before the 24 April 2008 flood event.
- Over 280mm of rainfall was recorded approximately two weeks before the 2 March 2013 flood (from 17 – 27 February) followed by an additional 39mm rainfall on 28 February and 1 March, prior to the main flood event on 2 March.

Hence it is highly likely that the catchment was saturated prior to the two calibration storm events with little to no capacity to absorb further rainfall. The following rainfall loss values are therefore adopted for the model calibration and verification:

- Pervious areas: Initial loss 0mm, continuing loss 2.5mm/hr
- Impervious areas: Initial loss 0mm, continuing loss 0mm/hr.

Higher initial losses were initially tested in the hydrologic and hydraulic modelling. However, sufficiently high rates and volumes of runoff could not be produced to achieve a good match to the reported flooding at several locations. Other hydrologic factors such as the methods for representing the high catchment slopes and runoff, blockages, drainage patterns etc. were also considered and trialled but did not produce reasonable matches for observed flood behaviour, and hence were discounted from the model calibration process and informed the selection of the assumed rainfall losses.

6.3.2 Orographic Rainfall Scaling

The North Brother Mountain, being a significant topographic feature of over 450m elevation and with steep slopes, has the potential to result in orographic enhancement of rainfall during storm events as the wind flow carrying rain-bearing clouds rises over the mountain and results in increased precipitation. Hence, rainfall

Draft Flood Study Report

JACOBS

intensities on the mountain, away from the rainfall gauge locations, may be higher than those at the gauge locations situated on lower areas at some distance away from the mountain.

BMT WBM (2018) has undertaken the Coffs Creek and Park Beach Flood Study at Coffs Harbour, where the catchment is bounded by a steep escarpment along its western and north-western sides to elevations over 400m. As a part of the model calibration for that study rainfall data from numerous rain gauges in the catchment were analysed for the March/April 2009 flood event, and a marked rainfall gradient was observed between the coastal part of the catchment and the middle and upper sections of the catchment. Rainfall depths recorded for the 24 hours to 9am on 1 April 2009 ranged from 260 – 280mm in the coastal areas, up to 530mm at gauges in the upper section of the catchment, with maximum estimated rainfall depths in this zone of up to 560mm (or double the rainfall recorded in the coastal areas). Analysis of the November 1996 storm event observed rainfall depths 2.5 times higher in the upper section compared to the coastal zone.

As a result of the rainfall analyses and model calibration in the Coffs Creek study, BMT WBM (2018) adopted scaling factors of 1.2 to 1.6 for the design flood estimation in that study, whereby the design rainfall intensities adopted for the coastal areas were increased by 1.2 to 1.6 times for application on the escarpment areas and foothills of the catchment. The study cited that the previous Coffs Creek Flood Study (WMA, 2001) adopted significantly higher scaling factors of up to 2.25, depending on the ground elevation of a particular location.

The topography for the North Brother Mountain differs from Coffs Creek catchment, in that the Coffs Creek catchment is an incised valley which would funnel wind flows up the valley, concentrating the rain clouds. The same funnelling effect is unlikely to occur at the North Brother Mountain due to its shape as a peak protruding from the surrounding coastal plain rather than a valley feature. To account for the orographic effects in the study area and to provide a better calibration fit the catchment inflows from the North Brother Mountain and the rainfall on the foothills of the mountain were increased by 20% (i.e. an orographic scaling factor of 1.2), based on the recorded rainfall and design rainfall being derived for the coastal plains area. Accordingly, rainfall on the low areas below the foot of the mountain was not adjusted from the recorded depths.

As per the selection of rainfall losses, other model parameters and assumptions were initially tested and analysed in the calibration process but could not replicate the observed flooding depths and flow patterns, as the model was generally less sensitive to these other parameters. Hence these preliminary runs informed the scaling of rainfall for the model calibration. There was some uncertainty about the actual increased rainfall depths and spatial distribution of the increases during the historic events since there were no rainfall gauges on the North Brother Mountain, however, a uniform scaling factor of 1.2 appeared to provide the best fit to observed flooding across the study area for the calibration events.

6.3.3 Blockage of Hydraulic Structures

Guidance on blockage of hydraulic structures was generally sought from *Australian Rainfall and Runoff Revision Project 11– Blockage of Hydraulic Structures Stage 2* (Engineers Australia, 2013).

Culverts were generally assumed to be 50% blocked for the model calibration events. There are photos and observations during historic flood events of large gravel and rocks being washed down the watercourses and deposited in drainage lines, and recurring blockage due to debris. Blockages at a few specific structures were reduced or increased to provide a better calibration fit.

Assumed blockage of stormwater pit inlets are generally consistent with guidance in ARR 2016. The large majority of pits in the study area were observed to be combination kerb inlet and grated pits. The assumed blockages were:

- Sag pits: kerb inlet assumed clear and grate 100% blocked.
- On-grade pits: 90% of the combined kerb inlet and grate flow capacity (i.e. 10% blockage factor).

6.3.4 Blockages in Flow Diversion Drains

Several respondents reported and provided photographs of overgrown vegetation and fallen trees in adjacent flow diversion drains at the foot of the mountain contributing to the drains overflowing and causing flooding of

Draft Flood Study Report**JACOBS**

properties and dwellings. Observations on site also indicated localised build-up of rock rubble and tree trunks in the larger drains and watercourses. Blockages of these drains were represented in the model to replicate these flooding patterns.

6.3.5 Tailwater Conditions

Recorded water level hydrographs for the receiving waterways were adopted as tailwater boundaries for the calibration events.

6.4 Comparison to Observed Flooding

The community survey responses were reviewed for observations of flooding behaviour including dates of storm events, depths of flooding, flow patterns and resulting damage to property. Photos and videos provided with the responses or separately were also reviewed. Notes from Council on flooding problem spots were also considered.

The modelled flood behaviour was compared to the residents' observations and were generally found to be consistent with the observations. Refer to Table D-1 in Appendix D for comparison of modelled flood behaviour to the reported observations. Mapping of flood depths for the historic events is also shown in Appendix D.

The modelling generally produced reasonable matches to the observed flood behaviour along main flow paths and ponding/storage areas. Areas affected by shallow sheet overland flows were more difficult to replicate observations during previous storms, as such shallow flows are more sensitive to small-scale ground and built features which could not be picked up in the topographic model on a catchment-wide scale. The main flow paths and storage areas are the focus of the flood study as this is where flood risk and hazards are greatest.

There are some locations where a good match could not be achieved and this may be attributed to localised factors which may have occurred such as blockages of drains and drainage infrastructure by debris and sediment but which were omitted from the modelling if there were no specific reports of blockages. Information was sought whether any maintenance or upgrade works were conducted on the flow diversion drains uphill of the residential properties at the foot of the mountain which may have altered flow capacities and behaviour. Drains could be cleared in recent times and reflected in survey of the drains, but could be blocked by debris and vegetation at the time of historic flood events. However, Council and National Parks and Wildlife Service (NPWS) stated they did not undertake works in recent years. Council advised that Crown Lands Department may have had undertaken works but no specific information was available.

There is also some uncertainty in the exact rainfall which fell on the mountain catchments as the orographic effects are likely to have caused localised and non-uniform enhancement of rainfall. While the rainfall data is sourced from gauges which are in or relatively close to the study area, these are located relatively at lower elevations in or to the east of the study area and may have varied from rainfall in the west of the study area or on the mountain.

Overall, the TUFLOW model provides a reasonable agreement to the observed flood behaviour in the historic events and is therefore considered to be suitable for the estimation of design flood behaviour in the study area.

6.5 Sensitivity Testing of Calibration Parameters

A number of scenarios were assessed for the April 2008 flood event to test the sensitivity of the model results to changes in the adopted parameter values. The tested parameters included:

- Rainfall and flow Scaling
- Rainfall losses
- Blockage of hydraulic structures
- Surface hydraulic roughness

Draft Flood Study Report**JACOBS**

The scenarios are described and the impacts summarised in Table 6-2. Flood levels and depths are relatively sensitive in particular to the changes in rainfall scaling (both increase and decrease) with changes of $\pm 0.2\text{m}$, and to blockages (both fully open and fully blocked) with changes of up to $\pm 0.7\text{m}$, mainly upstream and downstream of culvert structures. The flood levels are also moderately sensitive to the assumed changes in Manning's n on the main flow paths, which are assumed to be of high roughness in forested areas, with resulting changes in flood levels of $\pm 0.15\text{m}$. Flood levels are typically insensitive to changes in rainfall losses ($\pm 0.03\text{m}$), although flooding in selected storage areas are more sensitive to the increased rainfall losses (-0.28m) than to the decreased losses ($+0.8\text{m}$).

Draft Flood Study Report



Table 6-2 Sensitivity Analysis Description and Results

Scenario	Description	Change in Flood Level
Rainfall and Flow Scaling – Zero	Scaling factor of 1.0. (Base case adopts scaling factor of 1.2)	<ul style="list-style-type: none"> Up to -0.15m on major flow paths Typically less than -0.05m on other flow paths.
Rainfall and Flow Scaling – Increase by 20% points	Scaling factor of 1.4. (Base case adopts scaling factor of 1.2)	<ul style="list-style-type: none"> Up to +0.15m on major flow paths (east of Ellerslie Cres and south of Brotherglen Dr) Typically less than +0.05m on other flow paths. +0.1m to +0.2m in some storage areas (between Botanic Dr and Ocean Dr, Lakewood shops car park, car park west of Laurieton Hotel) and isolated areas on some properties.
Rainfall Losses – Increase	Pervious area: 15mm initial loss (burst loss: define burst as starting at 7AM 24 April 2008. Peak intensity at 8:35AM), 4mm/hr continuing loss. Impervious area: 2mm initial loss, 0mm/hr continuing loss.	<ul style="list-style-type: none"> Typically less than -0.03m in most flow paths and overland flow areas. Up to -0.28m in storage area between Botanic Dr and Ocean Dr.
Rainfall Losses – Decrease	Pervious area: 0mm initial loss, 0mm/hr continuing loss. Impervious area: retain calibration values (0mm initial loss, 0mm/hr continuing loss.)	<ul style="list-style-type: none"> Typically less than +0.02m in most flow paths and overland flow areas. Up to +0.08m in storage area between Botanic Dr and Ocean Dr.
Blockage of Hydraulic Structures – Fully Blocked	All pipes, culverts and pits 100% blocked.	<ul style="list-style-type: none"> Typically +0.15m to +0.3m in main road low points and storage areas (between Botanic Dr and Ocean Dr, Sirius Dr, Pelican Crt, and others) Up to +0.4m in Lakewood shops car park, car park west of Laurieton Hotel. Decreases of -0.1m in some locations downstream of the storage areas

Final Report and Publications Released October 2019

Draft Flood Study Report



		<ul style="list-style-type: none"> Typically less than +/-0.05m on other flow paths.
Blockage of Hydraulic Structures – All Clear	All pipes, culverts and pits 0% blocked.	<ul style="list-style-type: none"> Typically less than +/-0.1m in affected areas. Localised reductions of up to -0.7m upstream of culverts. Localised increases of up to +0.3m downstream of culverts including on properties in Pelican Crt.
Surface Hydraulic Roughness – Plus 20%	Surface Manning's n values increased by 20%.	<ul style="list-style-type: none"> Up to +0.15m on major flow paths (east of Eilerslie Cres and south of Brotherglen Dr) Typically less than +0.05m on other flow paths. Less than +/-0.02m in other overland flow areas.
Surface Hydraulic Roughness – Minus 20%	Surface Manning's n values decreased by 20%.	<ul style="list-style-type: none"> Up to +0.05m on major flow paths (east of Eilerslie Cres and south of Brotherglen Dr) Typically less than -0.03m on other flow paths and overland flow areas.

Final Report and Publications Released

4/9

Draft Flood Study Report



7. Estimation of Design Floods

7.1 Adopted Model Parameters for Design Events

7.1.1 Design Rainfall

This flood study is based on Australian Rainfall and Runoff (ARR) 2016 design rainfalls and procedures. Each design storm AEP and duration consists of an ensemble of 10 storm temporal patterns which define the timing and intensity of rainfall throughout a given storm event. Each storm in the 10 temporal pattern ensemble has an equal probability of occurring.

Design rainfall data was downloaded from the Bureau of Meteorology website, including ARR 2016 design rainfall depths and temporal patterns relevant to the study area. The data was extracted for a representative location in the study area (West Haven; 31.6375° S, 152.7875° E).

Design rainfall time series were derived for the Probable Maximum Precipitation (PMP) events, based on the Generalised Short Duration Method (GSDM) in *The Estimation of Probable Maximum Precipitation in Australia: Generalised Short Duration Method* (BOM, 2003).

The design rainfall depths for design events up to 0.5% AEP adopted in this study are summarised in Table 7-1. The PMP depths for the events assessed with durations up to 1 hour are summarised in Table 7-2.

Table 7-1 Design Rainfall Depths for Selected Storms

Storm Duration	Rainfall Depth (mm)				
	0.2EY	5% AEP	2% AEP	1% AEP	0.5% AEP*
15 minute	28.9	39.3	46.7	52.4	57.6
30 minute	40	55.1	65.9	74.5	82.0
1 hour	52.7	73.8	89.5	102	112.2
1.5 hour	61.4	86.6	106	122	134.2
2 hour	68.4	97	119	137	150.7
3 hour	80.1	114	140	161	177.1

* Initially estimated for sub-daily durations as 10% greater than the 1% AEP design rainfall depths, based on BOM data for 24 hour and longer durations. Sub-daily design rainfall depths for the 0.5% and other rare storms were released by BOM in November 2018 which confirmed this assumption. The design rainfall depths in the above table were retained.

Draft Flood Study Report



Table 7-2 Probable Maximum Precipitation Event Rainfall Depths

Storm Duration	Rainfall Depth (mm)
15 minute	190
30 minute	280
45 minute	350
1 hour	440

7.1.2 Rainfall Losses

An initial and continuing loss model was utilised in the RAFTS module which represents rainfall losses during storm events such as depression storage and soil infiltration. The adopted loss values are summarised for the design event runs.

Table 7-3 Adopted Rainfall Losses

	Up to 1% AEP event	PMF event
Pervious areas	Initial Loss: 15mm Continuing Loss: 2.5mm/hr*	Initial Loss: 0mm Continuing Loss: 1mm/hr
Impervious areas	Initial Loss: 1mm Continuing Loss: 0mm/hr	Initial Loss: 0mm Continuing Loss: 0mm/hr

* Pervious area continuing loss estimated during model calibration and verification.

ARR 2016 recommendations for rainfall losses are also based on an initial loss/continuing loss model, with storm loss depths (pre-burst + burst losses) prescribed by the ARR Datahub for the study area as:

- Storm initial loss: 37mm, with median pre-burst loss of 0mm for a 1% AEP 1 hour storm. Therefore, burst loss = 37mm. Rainfall losses are not provided in DataHub for sub-hourly storm durations.
- Continuing loss: 5.5mm/hr.

The above rainfall losses are applicable to pervious areas in rural catchments. DataHub states that these are *not* for use in urban areas.

The initial loss values from DataHub need to be treated with caution, with consideration of the limitations of the data. The ARR 2016 losses are derived from analysis of main river catchment streamflow data, with different rainfall-runoff characteristics to local overland flow catchments such as around North Brother. The high initial loss depth of 37mm (burst only) appears exceedingly high compared to values previously used for pervious areas in similar overland flow studies (typically up to 15mm). It is not expected that in a storm event in this study area, a pervious area would only begin to generate runoff after the first 37mm of rainfall, particularly for the short-duration storm events being considered for the local overland flow areas. For these reasons the ARR 2016 initial losses are not considered appropriate for this study, and a more conservative initial loss of 15mm is adopted for pervious areas for the design flood estimation.

Similarly, the continuing loss of 5.5mm/hr from DataHub was considered relatively high for the study area. While there are likely to be areas on the mountain with highly permeable soils, the infiltrated water re-emerges as spring flows in certain locations, and hence the infiltrated water is not lost to deep groundwater and may

Draft Flood Study Report



contribute to flood flows. The adopted continuing loss of 2.5mm/hr, estimated during the model calibration and verification, attempts to strike a balance between the potentially high infiltration rates and re-emergence of spring flows.

7.1.3 Orographic Rain Scaling

As per the model calibration and verification, an orographic rain scaling factor of 1.2 was applied to areas on the North Brother mountainside, refer to Figure 5-1.

7.1.4 Blockage of Hydraulic Structures

Similar to the model verification (refer Section 6.3.3), guidance on blockage of hydraulic structures was generally sought from *Australian Rainfall and Runoff Revision Project 11– Blockage of Hydraulic Structures Stage 2* (Engineers Australia, 2013). Blockages of stormwater pits and culvert inlets were assumed as per below:

- Sag pits: kerb inlet assumed clear and grate 100% blocked.
- On-grade pits: 90% of the combined kerb inlet and grate flow capacity (i.e. 10% blockage factor).
- Culverts were generally assumed to be 50% blocked for design event runs.

7.1.5 Blockages in Flow Diversion Drains

Blockage condition of flow diversion drains due to unmanaged vegetation, based on resident reports and site observations and adopted in the model verification, was retained for the design runs.

7.1.6 Tailwater Conditions

Selection of tailwater conditions was based on the OEH guidance in “Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways” (OEH, 2015). Recommended combinations of flooding and tailwater is summarised below in Table 7-4 (excerpt from the document).

Table 7-4 Combinations of Catchment Flooding and Oceanic Inundation Scenarios

Design AEP for peak levels/velocities	Catchment Flood Scenario	Ocean Water Level Boundary Scenario	Comment/Reference
50% AEP	50% AEP	HHWS(SS)	Dynamic hydrograph can be taken from Appendix C with peak flood to coincide with HHWS(SS) highest peak for highest water levels Peak HHWS(SS) 1.25m AHD
20%	20% AEP	HHWS(SS)	
10%	10% AEP	HHWS(SS)	
5%	5% AEP	HHWS(SS)	
2%	2% AEP	5% AEP	Dynamic ocean water level boundary hydrograph Appendices A or B for relevant waterway type
1% Envelope level	5% AEP	1% AEP	Envelope provides 1% AEP design flood estimate
1% Envelope level	1% AEP	5% AEP	Dynamic ocean water level boundary hydrograph Appendices A or B for relevant waterway type
1% Envelope velocity	1% AEP	ISLW	Dynamic hydrograph can be taken from Appendix C with peak flood to coincide with ISLW lowest trough for peak velocities in entrance. Fixed ISLW approx. -0.95m AHD
0.5%	0.5% AEP	1% AEP	Dynamic ocean water level boundary hydrograph Appendices A or B for relevant waterway type
0.2%	0.2% AEP	1% AEP	
PMF	PMF	1% AEP	
1% Catchment	1%	HHWS(SS)	Suggested envelopes for analysis of catchment flooding only
PMF Catchment	PMF	HHWS(SS)	

Note: Individual projects are likely to specify the use of only a select number of AEPs outlined in the table.

In the design flood estimation for North Brother overland flooding, local catchment flood events were coincided with elevated ocean water level, rather than a coinciding river flood event. There is considered to be a higher probability that the local catchment storm would coincide with a storm surge event. Local catchment flooding

Draft Flood Study Report



occurred sometime (0.5-2 days) before the river flooding occurred or peaked during the flood events of 2008 and 2013. Hence, peak river flood levels as coinciding tailwater conditions is considered overly conservative.

The adopted tailwater levels for the local catchment flood modelling are summarised in Table 7-5. Given the short duration of the local catchment flood events, a constant tailwater level was assumed.

Table 7-5 Adopted tailwater levels for North Brother local catchment flooding

Design Flood	North Brother Local Catchment Flood Event	Tailwater Condition (Ocean Water Level)	Comment
0.2EY	0.2EY	HHWS(SS)* 1.25m AHD	HHWS in the river/lakes system is 0.2 – 0.6m AHD (ref: MHL, 2012).
5% AEP	5% AEP	HHWS(SS) 1.25m AHD	
2% AEP	2% AEP	5% AEP: 2m AHD	Estuary Type B entrance. River 5% AEP flood level is higher than adopted TWL ² , at 2.3 – 2.4m AHD.
1% AEP (local flood) ¹	1% AEP		
1% AEP (storm surge) ¹	5% AEP	1% AEP: 2.1m AHD	Estuary Type B entrance. River 1% AEP flood level is significantly higher than adopted TWL ² , at 2.9 – 3m AHD ref: Worley Parsons, 2013).
0.5% AEP	0.5% AEP	1% AEP: 2.1m AHD	
PMF	PMF	1% AEP: 2.1m AHD	
1% AEP Climate Change Scenario	1% AEP (+10% increase in rainfall)	1% AEP + 0.9m sea level rise: 3.0m AHD	

1. Maximum envelope derived from 1% AEP local catchment flood and storm surge scenarios to define 1% AEP design flood.

2. HHWS(SS) = High High Water Spring (Summer Solstice) i.e. "king" tides. TWL = Tailwater Level.

7.2 Simulated Design Events

The storm events modelled include the 0.2 Exceedances per Year ("EY"), 5%, 2%, 1% and 0.5% AEP and PMF events for current climate conditions. The storm durations that were initially assessed include the 15 and 30 minute and 1, 1.5, 2 and 3 hour durations for up to the 0.5% AEP events. The critical durations (those that gave the maximum flood levels) varied for the different AEPs.

The 15, 30 and 45 minute and 1 hour durations were modelled for the PMF event. The critical duration for the PMF varies throughout the catchment.

A climate change flood scenario was also assessed, consisting of the existing 1% AEP storm plus a 10% increase in rainfall intensity, combined with a 1% AEP ocean level with a 0.9m sea level rise.

Draft Flood Study Report



8. Design Flood Results

8.1 Final Model Runs and Processing of Results

ARR 2016 guidelines stipulate that for each ensemble of 10 storm temporal patterns it is the storm producing the just above the median flow or flood level which should be considered as the “representative” storm temporal pattern. The flood study modelling is based in part on direct rainfall hydrology, hence the selection of a median flood level from the TUFLOW results is appropriate. The TUFLOW model results for up to the 0.5% AEP were processed in the following manner:

- 1) Review the preliminary model results to identify the critical storm durations and representative temporal patterns for each AEP. That is, for each 10 storm ensemble identify the storm just-above median and the durations which give the maximum flood level. The representative storms are summarised in Table 8-1.
- 2) Undertake final model runs for the selected representative storms.
- 3) For each storm AEP, the maximum envelope of the flood level from each representative storm is derived to define the design flood level surface.
- 4) Steps 3 repeated for the flood depth, velocity and flood hazard results, and other parameters.

The PMF was run for the 15, 30 and 45 minute and 1 hour durations. Only one storm temporal pattern was applied to each PMF duration, hence only a maximum envelope of the results from each duration was derived to define the design PMF flood surface.

Table 8-1 Selected ARR 2016 Representative Storms for Design Flood Definition

AEP	Representative Storms
0.2EY	30min (TP10), 1hr (TP8), 2hr (TP10)
5%	1hr (TP10), 2hr (TP6), 3hr (TP4)
2%	30min (TP5), 1hr (TP6), 2hr (TP8)
1%	30min (TP5), 2hr (TP6) Also 5% AEP 3hr (TP4) for coincident ocean inundation flood event. Refer Table 7-5 for adopted coincident flood scenarios.
1% Climate Change	Adopt same as 1% AEP
0.5%	Adopt same as 1% AEP
PMF	All storms selected

8.2 Flood Mapping

Design flood mapping is presented in Appendix E for flood depths/extent and velocities. The flood mapping filters out areas with flood depths less than 0.05m (50mm) to exclude areas of shallow sheet flow.

8.3 Description of Flooding Conditions

8.3.1 Flood Depth

Overland flow depths on properties are typically up to 0.3m in up to the 1% AEP event. Depths exceed 0.5m in a number of locations in the 0.2EY event, and exceed 1m in the 5% and 1% AEP events. Areas of deeper flows include main flow paths and drainage low points in a number of roads.

Draft Flood Study Report

During the PMF event, property and road flooding exceeding 0.5m depth is widespread, with property and road flooding of 1m depth also common. Depths of flooding exceeding 2m occur on approximately 20 properties in the study area.

The flood depth mapping shows relatively high depths of ponding on the upstream sides of many buildings. In most cases this is due to the model terrain not allowing free drainage of water around the buildings. In real life the ground surface around buildings is usually graded to allow water to drain off and not form trapped points. There may also be property stormwater drainage present which is not included in the model. Some care therefore needs to be taken in the review of the flood depth mapping.

8.3.2 Flow Velocity

Flow velocities are swift in a number of overland flow paths through properties and particularly in roads. Typical flow velocities are 0.5 – 1m/s in the 0.2EY event, and 1 – 1.5m/s in the 1% AEP event. High flow velocities of 2 – 3m/s occur in a number of locations including roads and properties. These flows are likely to be highly hazardous to people and risk significant damage to buildings and property.

Flow velocities of 3 – 4m/s are commonplace in the PMF, with some locations experiencing velocities over 4m/s.

8.3.3 Duration of Flooding

Overland flooding in the study area is generally a result of intense short-duration rainfall events. As a result, the duration of inundation of roads and built areas is typically short, limited to 1 – 2 hours in up to the 0.5% AEP event. Storage areas such as road sag points in Sirius Drive and Lilli Pilli Close in Lakewood may be inundated for longer durations of up to 3hrs due to constrained capacity of stormwater drainage servicing these areas.

Durations of inundation are likely to be up to 4 hours in the PMF event particularly in some flood storage locations, affecting roads including Botanic Drive and Ocean Drive west of Lakewood shopping centre.

Note that the duration of flooding for depths greater than 0.3m, at which stage floodwaters become impassable for most passenger vehicles, is generally limited to approximately 1 hour duration in most roads.

A river flooding event may occur shortly after overland flooding in the study area, in which case the lower-lying areas of the study area may experience more extensive durations of flooding. River flooding was not assessed in this study.

8.3.4 Climate Change Impacts

The change in flood levels in the 1% AEP event due to climate change are presented on Figure E-15 in Appendix E. Most areas affected by overland flow experience flood level increases of up to 0.1m due to increased rainfall and reduced drainage capacity from higher tailwater levels caused by sea level rise. Locations along the river and lakes would be impacted by 0.9m increases in flood levels directly due to sea level rise, while adjacent areas would be impacted typically by up to 0.5m increases in flood level.

Note that these impacts are estimated based on the overland flooding assessment of North Brother. Increases in flood levels due to climate change effects on riverine flooding may be different, refer to the Camden Haven River and Lakes Flood Study (Worley Parsons, 2013).

8.4 Summary of Flood Levels and Flow Conditions

Table F-1 in Appendix F summarises the peak flood levels and flow velocities at locations throughout the study area. Table F-2 in Appendix F summarises the peak flow rates for selected locations in the study area.

Draft Flood Study Report

JACOBS

8.5 Provisional Flood Hazard Mapping

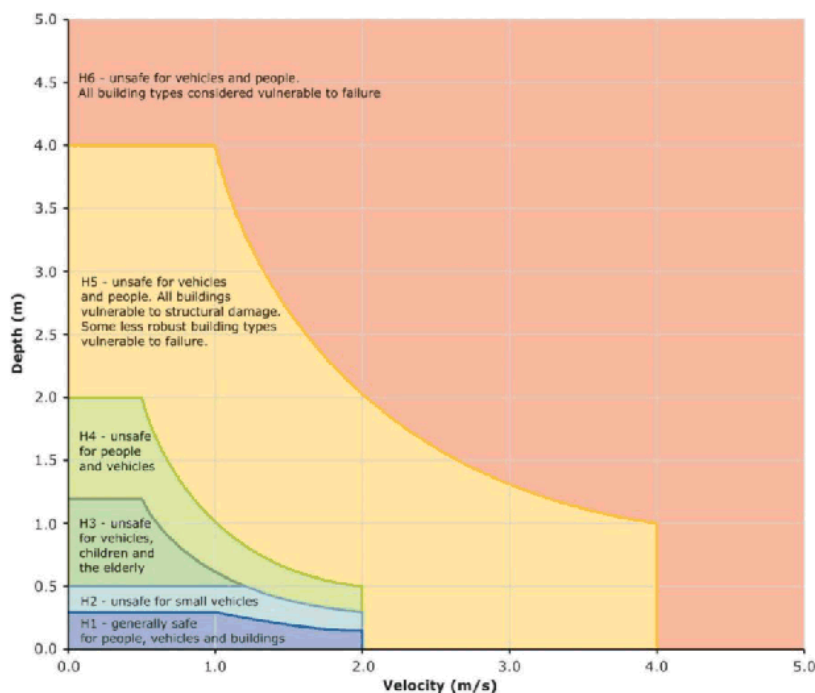
Flood hazard mapping was prepared for the 1% AEP event for current climate conditions and for the 1% AEP event under the adopted climate change scenario (increased rainfall intensity by 10% and with 0.9m sea level rise). Recent research has been undertaken into the hazard that flooding poses and the vulnerability of the public and assets when interacting with floodwaters. A combined flood hazard classification is presented in *Australian Disaster Resilience Handbook 7. Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia* (AIDR, 2017a) and *Guideline 7-3 Flood Hazard* (AIDR, 2017b) based on this research, and is illustrated in Figure 8-1. The flood hazard categories according to the AIDR definition are:

- 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 people and vehicles. Buildings require special engineering design and construction; and
- H6 – Unsafe for people or vehicles. All buildings types considered vulnerable to failure.

The flood hazard classification is more discrete and provides guidance on flood hazard thresholds to different members of the community (e.g. children and elderly) and different assets (small versus larger vehicles, standard versus specialised engineered buildings). The AIDR flood hazard definition potentially provides a more suitable guideline for assessing flood hazard on the floodplain from an emergency management perspective.

The flood hazard mapping is provided in Appendix G and is denoted provisional. The provisional mapping is based on direct flood modelling outputs and was not updated to reflect the “true” flood hazard to take into consideration evacuation, isolation and other emergency management aspects. There are numerous areas of high flood hazard (>H5) typically reflect the swift overland flows in watercourses and flow paths including roadways.

Figure 8-1 General flood hazard vulnerability curves, Australian Institute for Disaster Resilience (AIDR) definition. Reproduced from Figure 6 in *Guideline 7-3: Flood Hazard* (AIDR, 2017b)



Draft Flood Study Report



8.6 Provisional Hydraulic Categories Mapping

Three flood hydraulic categories identified in the *Floodplain Development Manual* (NSW Government, 2005). These are also defined in Council's Flood Policy (2015):

- Floodway, where significant discharge of water occurs during floods and blockage could cause redirection of flows. Generally characterised by relatively high flow rates; depths and velocities;
- Flood storage, characterised by relatively deep areas of floodwater and low flow velocities. Floodplain filling of these areas can cause adverse impacts to flood levels in adjacent areas; and
- Flood fringe, areas of the floodplain characterised by shallow flows at low velocity.

There is no firm guidance on hydraulic parameter values for defining these hydraulic categories, and appropriate parameter values may differ from catchment to catchment. For example, the minimum threshold flows and depths which might define a floodway in an overland flow catchment may be markedly lower than those for a large lowland river due to the different scale of flooding. The category definition adopted in the Hastings River Flood Study (PBP, 2006) and Hastings River Floodplain Risk Management Study (Worley Parsons, 2012) was initially considered for this study. For the Hastings River the floodways were defined as areas in the 1% AEP flood with flows greater than 2m, velocities greater than 0.5m/s and velocity x depth greater than 1m²/s. This does not agree with the flooding conditions in the North Brother study area, where 1% AEP flows are generally less than 1.5m deep. Hence, an alternative hydraulic category system is required.

Howells et. al. (2003) suggest that consideration of flow depths, velocities and velocity x depth of flood flows can be used to help define the hydraulic category areas. Various combinations of flow, depth and velocity were trialled for appropriate threshold values for the hydraulic categories. For the purposes of this study, the hydraulic categories were defined as per the criteria in Table 8-2, which were selected following trials of different criteria values and categorisation methods. These criteria are consistent with those adopted by a number of other councils in NSW for overland flooding.

Table 8-2 Hydraulic Categories Criteria

Hydraulic Category	Criteria
Floodway	Area within the flood extent where: <ul style="list-style-type: none"> • Velocity x Depth > 0.3m²/s AND • Velocity > 0.5m/s AND • Depth > 0.15m.
Flood Storage	Remaining area within 1% AEP flood extent where Depth > 0.15m
Flood Fringe	Remaining area in the floodplain (i.e. area within PMF extent) outside the Floodway and Flood Storage areas.

The provisional hydraulic categories mapping is presented in Appendix G for both the 1% AEP design flood for current climate, and for the 1% AEP event with climate change. The mapping is treated as provisional and may need to be considered in further detail to ensure a continuous floodway strip (where appropriate) and to remove/reclassify isolated areas which currently meet the floodway criteria to either flood storage or flood fringe categories. This would be achieved by manual inspection and adjustment of the mapped floodway areas.

Floodway areas are generally located within the natural watercourses and flow paths, although there are a number of roads which contain floodways throughout the study area. Floodways pass through properties on Black Swan Terrace, Koonwarra Street, Pelican Court, Elouera Place, Flinders Drive, St Joseph's School, Peach Grove, Gow Place, Kew Road and in Laurieton between Quarry Place and Bold Street, among others.

Draft Flood Study Report



8.8 Flooding Hot Spots

This study confirms flooding issues at the locations identified by Council and listed in Section 2.3. It also identifies a number of additional locations where there is elevated potential for flooding to cause a hazard to people, damage to properties and disruption to transportation routes. These are described in Table 8-3. Critical areas with consideration of high flood depths, velocities or hazard are highlighted with orange cell or text shading.

Draft Flood Study Report



Table 8-3 Description of Flooding Hot Spots. Critical locations are highlighted orange

Location	Description
Property flooding	
Black Swan Terrace, West Haven	Flow depths on properties of up to 0.5m in the 0.2EY event and up to 0.7m in the 1% AEP event. Swift flows of 2m/s. Flood hazard up to H5 rating in the 1% AEP event.
Ringtail Cl, Lakewood	Overflows from open channel onto properties with flooding in backyards to depths 0.2 – 0.3m in the 1% AEP event. Relatively low flooding impact.
Lilli Pilli Cl, Lakewood	Flooding in backyards to depths of 0.3 – 0.5m in the 1% AEP event from open drain overflows. Flooding in cul-de-sac to depths up to 0.8m. Also significant flooding of car park around Lakewood shopping centre.
Mission Terrace, Lakewood	Overflows with depths of 0.1 – 0.3m in the 1% AEP event from cul-de-sac onto downhill property. Overflows from the overland flow path on to uphill side properties with depths up to 0.2m
Kirmington Terrace to Pelican Court, West Haven	Flows through properties on low side of Koonwarra Street of 0.3m in the 0.2EY event and exceeding 0.5m in the 1% AEP event. Velocities up to 2m/s in the 1% AEP. Flood hazard up to H4 (some localised H5) rating in the 1% AEP. Flow depths 0.5m in the 0.2EY event and up to 0.8m in the 1% AEP event on Captain Cook Bicentennial Drive villas and Ocean Drive property, at dwellings. Flood hazard up to H4 rating in the 1% AEP event. Flood depths of 0.6 – 0.8m in the 0.2EY event within Pelican Court roadway and pedestrian walkway. Depths up to 0.6m at dwellings in 1% AEP event. Flood hazard up to H4 rating on properties and H5 in roadway in the 1% AEP event. Groundwater springs occur in this area but are not directly related to the surface water flood risk. These springs appear to be a spatially random occurrence.
Flinders Dr Estate, Laurieton	Overflows from drainage easement swale onto properties with depths to 0.3m in the 0.2EY event and 0.5m in the 1% AEP event. Overflows from Reliance Crescent sag point onto properties to depths of 0.2m in the 0.2EY event and 0.4m in the 1% AEP event.
Bold Street area, Laurieton	Significant flows through Laurieton Hotel with H4 hazard rating. Trapped drainage point on western side of commercial properties with significant depths, though local drainage may be present which would mitigate the flood depths. Overflows down fire trail at Norman Street/ Mill Street affecting properties with depths up to 0.3m in the 1% AEP. Overflows onto units on Harbourside Crescent from trunk drainage channel to depths exceeding 0.5m in the 1% AEP event, with H5 hazard rating.
Quarry Way, Laurieton	Overflows from flow diversion drain to depths of 0.5m in the 1% AEP event on properties. The drain is reported to be affected by significant debris blockage.

Draft Flood Study Report



Lake Street, Laurieton	<p>Flood depths up to 1m in the 1% AEP event affecting dwelling corner Lake Street and Seymour Street, unsure if above floor flooding. To be confirmed.</p> <p>Overflows from Lake Street onto properties between Ocean Drive and Castle Street to depths of 0.3m in the 1% AEP.</p>
St Joseph's School, Laurieton.	<p>Swift flows in overland flow paths to depths of 0.8m and velocities exceeding 2m/s in the 1% AEP event.</p> <p>Flows between buildings are 0.4m in the 0.2EY event and 0.6m in the 1% AEP event, with velocities up to 2m/s. Flood hazard rating of H4 in pedestrian walkways and H5 in overland flow paths in the 1% AEP event.</p>
Properties adjacent to Stingray Creek and Camden Haven River, Laurieton	Numerous properties on low-lying land at risk of oceanic inundation during storm surge events. Estimated depths on the flood mapping expected to be conservative due to likely attenuation of ocean inflows through the river mouth.
Blackbutt Crescent and Peach Grove, Laurieton	Overflows from flow diversion drain to depths of 0.5m in the 1% AEP event on properties. The drain form and capacity significantly reduces near its discharge point onto Peach Grove at Tunis Street. Flows into the drain originate from natural watercourse further uphill, which is significantly affected by rubble and debris blockage.
Elouera Place, West Haven	Overflows from watercourse and diversion drain. Depths over 0.3m in the 0.2EY event and 0.5m in the 1% AEP event.
Sirius Drive, Honeysuckle Avenue and Mahogany Close, Lakewood	Flood depths on properties 0.3 – 0.5m in the 1% AEP event, built up from road ponding areas.
Sirius Drive and Oak Close, Lakewood	Depths 0.3 – 0.4m and velocities 1m/s in the 1% AEP event.
Sandpiper Close	Overflows from concrete channel along Ocean Drive. Depths 0.3 – 0.4m and velocities 1m/s in the 1% AEP event.
Properties on lower side of Ocean Drive, 200m east of Hoschke Road, West Haven	Road low point overflows onto properties with depths of 0.5m and velocities of 1m/s in the 1% AEP event.
Roads	
Ocean Drive west of Lakewood shopping centre	<p>5% AEP event flood depths of 0.4m</p> <p>1% AEP event flood depths of 0.5m, H3 hazard rating</p>
Botanic Drive, Lakewood	1% AEP event flood depths of 0.4m, H2 hazard rating
Lilli Pilli Close, Lakewood	<p>5% AEP event flood depths of 0.6m</p> <p>1% AEP event flood depths of 0.7m, H3 hazard rating</p>
Ocean Drive east of Lakewood shopping centre	<p>5% AEP event flood depths of 0.3m</p> <p>1% AEP event flood depths of 0.35m, >H4 hazard rating</p>
Sirius Drive, Honeysuckle Avenue and Mahogany Close, Lakewood	<p>0.2EY event flood depths of 0.6 – 0.7m</p> <p>1% AEP flood depths 1m, H3 hazard rating</p>
Ocean Drive between Fairwinds Avenue and Mission Terrace	<p>0.2EY events flood depths of 0.5m</p> <p>1% AEP event flood depths of 0.7m, >H4 hazard rating</p>
Ocean Drive and Mission Terrace intersection	<p>0.2EY event flood depths of 0.4m</p> <p>1% AEP event flood depths of 0.6m, H3 hazard rating</p>
Ocean Drive near Waterview Crescent	5% AEP event flood depths of 0.2 – 0.3m

Draft Flood Study Report



	1% AEP event flood depths of 0.3m, low hazard rating but long section of flooding
Ocean Drive near Pelican Court	5% AEP event flood depths of 0.3m 1% AEP event flood depths of 0.4m, H3 hazard rating
Pelican Court, West Haven	0.2EY event flood depths 0.6m 1% AEP event flood depths of 1m, H5 hazard rating
Waterview Crescent, Kirmington Terrace and Koonwarra Drive, West Haven	0.2EY event flood depths of 0.2m with 2m/s velocity; max 0.6m depths (low velocity) 1% AEP event flood depths up to 0.7m, H5 – H6 hazard rating
Ocean Drive east of Hoshcke Road	0.2EY event flood depths of 0.4m 1% AEP event flood depths of 0.5m, H3 hazard rating
Ocean Drive east of Flinders Drive	5% AEP event flood depths of 0.3m 1% AEP event flood depths of 0.4m, H3 hazard rating
Kew Road/Bold Street near Tunis Street, Laurieton	1% AEP event flood depths of 0.5m, H2 hazard rating
Bold Street between Laurie Street and Mill Street	0.2EY event flood depths over 0.5m 1% AEP event flood depths 0.6 – 0.8m, H5 hazard rating
Bold Street north of Hanley Street, Laurieton	0.2EY event flood depths of 0.3m with 1m/s velocity 1% AEP event flood depths up to 0.5m, H3 hazard rating
Lord Street at Seymour Street, Laurieton	0.2EY event flood depths of 0.5m 1% AEP event flood depths up to 0.7m, H3 hazard rating
Flinders Drive, Laurieton Tunis Street, Laurieton Rosewood Court and Mission Terrace, Lakewood Diamantina Way, Lakewood	H5 hazard rating on steep sections of road (1% AEP event)

8.9 Groundwater Springs in the Study Area

There are a number of reports of groundwater springs occurring in the study area, with infiltrated rainwater discharging to the surface and in some cases causing damage to property. These appear to be spatially random and due to the particular soil structure on the North Brother Mountain, where accumulated groundwater causes piping through the soil and then eventually washing out the soil to form a discharge point at the ground surface. Similarly, there are locations where surface water can be observed to rapidly percolate via fissures in the ground surface.

While these groundwater springs may result in surface water discharge and subsequent property damage or are otherwise nuisance occurrences, characterising this problem was outside the scope of this flood study which deals primarily with surface runoff and flooding. Further geological and geotechnical investigations may be required to address these groundwater spring issues.

9. Conclusions and Recommendations

9.1 Conclusions

Hydrologic and hydraulic computer models for the North Brother Local Catchments study area were developed based on available data from Council and other sources, and topographic and hydraulic structures survey collected during this study. The models were developed with a focus on local catchment and overland flooding originating from runoff from the North Brother Mountain and from within the study area itself. The modelling did not focus on mainstream flooding from the Camden Haven River and other waterways.

The models were calibrated to the April 2008 and March 2013 local catchment flood events based on responses to the community consultation survey and other reports and flooding complaints lodged with Council. Model parameters were adjusted to achieve a satisfactory fit to historic flood observations include rainfall losses, hydraulic roughness of the floodplain surface and blockages of hydraulic structures and of diversion drains. An orographic scaling factor of 1.2 was adopted to increase rainfall and catchment flows by 20% to achieve a satisfactory calibration. This factor accounts for increased rainfall intensities during storm events due to the orographic effects resulting from the North Brother Mountain topography, and is relative to the unscaled recorded rainfall from gauges on the coastal plain away from the mountain.

A number of sensitivity analyses were undertaken for the April 2008 flood event to test the sensitivity of the model results to changes in the adopted parameter values. The tested parameters include:

- Rainfall and flow scaling
- Rainfall losses
- Blockage of hydraulic structures
- Surface hydraulic roughness

Flood levels and depths were relatively sensitive in particular to the changes in rainfall scaling (both increase and decrease) with changes of $\pm 0.2\text{m}$, and to blockages (both zeroed and fully blocked) with changes of up to $\pm 0.7\text{m}$, mainly upstream and downstream of culvert structures. The flood levels were also moderately sensitive to the assumed changes in Manning's n on the main flow paths, which were assumed to be of high roughness in forested areas, with resulting changes of $\pm 0.15\text{m}$. Flood levels were typically insensitive to changes in rainfall losses ($\pm 0.03\text{m}$), although flooding in selected storage areas was more sensitive to the increased rainfall losses (-0.28m) than to the decreased losses ($+0.08\text{m}$).

Community information sessions were held in August 2018 with feedback from the community incorporated into the final model calibration and design flood simulations. Design flood conditions were estimated based on the updated model for a range of flood events from the 0.2EY event up to the PMF event. A climate change scenario comprising the 1% AEP design event plus 10% increase in rainfall depth and 0.9m sea level rise was assessed.

Flood behaviour in the design events is characterised by typically swift flows with depths of flow in roads and properties of 0.3m in the 0.2 EY event and up to 1m in the 1% AEP event being common. During the PMF event, property and road flooding exceeding 0.5m depth is widespread, with property and road flooding of 1m depth also common. Depths of flooding exceeding 2m occur on approximately 20 properties in the study area.

Flow velocities are swift in a number of overland flow paths through properties and particularly in roads. Typical flow velocities are 0.5 – 1m/s in the 0.2EY event, and 1 – 1.5m/s in the 1% AEP event. High flow velocities of 2 – 3m/s occur in a number of locations including roads and properties. These flows are likely to be highly hazardous to people and risk significant damage to buildings and property. Flow velocities of 3 – 4m/s are commonplace in the PMF event, with some locations experiencing velocities over 4m/s.

Flood levels increase due to climate change by up to 0.1m in areas affected mainly by overland flows, grading up to 0.9m in low-lying areas directly impacted by sea level rise. Transition areas experience increases in flood

Draft Flood Study Report

levels between 0.1m and 0.9m due to varying degrees of interaction between increased overland flows and the increased sea levels.

Provisional flood hazard mapping and hydraulic categories mapping were prepared based on the 1% AEP design flood event and the 1% AEP event with climate change. The flood hazard mapping was based on hazard categories defined in the Australian Emergency Management Handbook which describes safe and hazardous flooding conditions for pedestrians, vehicles and buildings. The hydraulic category definitions were tailored to suit the overland flooding behaviour in the study area.

Flooding problem areas previously identified by Council were confirmed in the study and flooding behaviour described. Additional locations with flooding issues were also identified. Roads where flooding is likely to affect vehicular traffic were identified. Durations of flooding due to overland flows were identified as being short (2 – 3 hours) owing to the nature of the flash flooding which occurs in the study area.

9.2 Recommendations

- It is recommended that this Draft Report be reviewed by Council prior to being placed on public exhibition for feedback from the community.
- It is recommended that Council considers the adoption of this Flood Study and the outputs to guide floodplain management and land use planning in the North Brother local catchments study area. The subsequent Floodplain Risk Management Study should consider the management of flood risk in the catchment, particularly at the identified flooding "hot spots", which may include the development of flood mitigation strategies.
- Council should consider geological and geotechnical investigations to assess the groundwater spring issues in the study area which result in surface water discharge and subsequent property damage or are otherwise nuisance occurrences.

Draft Flood Study Report



10. Acknowledgements

This study was undertaken by Jacobs on behalf of Port Macquarie Hastings Council. Council prepared this document with financial assistance from the NSW Government through its Floodplain Management Program. This document does not necessarily represent the opinions of the NSW Government or the Office of Environment and Heritage.

A number of organisations and individuals contributed both time and valuable information to this study. The assistance of the following in providing data and/or guidance to the study is gratefully acknowledged:

- Residents of the study area;
- Manly Hydraulics Laboratory, NSW Department of Finance, Services and Innovation;
- Council officers; and
- NSW Office of Environment and Heritage.

11. References

Australian Building Code Board (1996) Building Code of Australia Volume 2 – Class 1 and Class 10 Buildings – housing Provisions – Amendment 1.

Australian Institute of Disaster Resilience (2017a) Australian Disaster Resilience Handbook 7. Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia

Australian Institute of Disaster Resilience (2017b) Guideline 7-3. Flood Hazard

BMT WBM (2018) Coffs Creek and Park Beach Flood Study, Draft Report for Public Exhibition. February 2018.

Engineers Australia (2013) *Australian Rainfall and Runoff Revision Project 11– Blockage of Hydraulic Structures Stage 2*

GHD (2007a) West Haven Stormwater Study Area Final Systems Analyses Report. April 2007.

GHD (2007b) Report for Buller Street and West Haven Stormwater Catchment Studies S.600.110.05.61 Concept Design Report - West Haven Study Area, September 2007.

Howells L, McLuckie D, Collins G, Lawson N (2003) Defining the Floodway – Can One Size Fit All? FMA NSW Annual Conference, Coffs Harbour, February 2004.

Manly Hydraulics Laboratory (2012) OEH NSW Tidal Planes Analysis 1990 – 2010 Harmonic Analysis. Report MHL2053.

Patterson Britton and Partners (2006) Hastings River Flood Study.

Port Macquarie Hastings Council (2015) Port Macquarie Hastings Council Flood Policy. Adopted 21 October 2015.

Webb McKeown and Associates (2001) Coffs Creek Flood Study.

Worley Parsons (2012) Hastings River Floodplain Risk Management Study.

Worley Parsons (2013) Camden Haven River and Lakes System Flood Study.


Draft Flood Study Report



12. Glossary

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. In this study AEP has been used consistently to define the probability of occurrence of flooding. It is to be noted that design rainfalls used in the estimation of design floods up to and including 100 year ARI (ie. 1% AEP) events was derived from 1987 Australian Rainfall and Runoff. The following relationships between AEP and ARI applies to this study (AR&R, 2016).

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	0.50
	1	63.2	1.58	1.00
Frequent	0.69	50.00	2	1.44
	0.5	39.35	2.54	2.00
	0.22	20.00	5	4.48
	0.2	18.13	5.52	5.00
	0.11	10.00	10.00	9.49
Infrequent	0.05	5.00	20	20.0
	0.02	2.00	50	50.0
	0.01	1.00	100	100
	0.005	0.50	200	200
Rare	0.002	0.20	500	500
	0.001	0.10	1000	1000
	0.0005	0.05	2000	2000
	0.0002	0.02	5000	5000
Extremely Rare				
Extreme			PMP	

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

Draft Flood Study Report

JACOBS

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 occurrences 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.
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.
Development	Is defined in Part 4 of the EP&A Act <u>In fill development</u> : 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. Eg. The urban subdivision of an area previously used for rural purposes. New developments involve re-zoning and typically require major extensions of exiting urban services, such as roads, water supply, sewerage and electric power. Redevelopment: refers to rebuilding in an area. Eg. As urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either re-zoning or major extensions to urban services.
DRAINS	DRAINS is a computer program which is used to simulate local catchment rainfall-runoff and stormwater system hydraulics and is widely used across Australia.
Effective Warning Time	The time available after receiving advise 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.
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 tsunamis.
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 susceptibility to flooding by the PMF event. Note that the term flooding liable land covers the whole floodplain, not just that part below the FPL (see flood planning area)

Draft Flood Study Report



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 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 include both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defines 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 SES.
Flood planning levels (FPLs)	Are the combination 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 "designated flood" or the "flood standard" used in earlier studies.
Flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings and structures subject to flooding, to reduce or eliminate flood damages.
Flood readiness	Readiness is an ability to react within the effective warning time.
Flood risk	<p>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.</p> <p><u>Existing flood risk</u>: the risk a community is exposed to as a result of its location on the floodplain.</p> <p><u>Future flood risk</u>: the risk a community may be exposed to as a result of new development on the floodplain.</p> <p><u>Continuing flood risk</u>: 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.</p>
Flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during 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

Draft Flood Study Report



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 flow, or a significant increase in flood levels.
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.
Hazard	A source of potential harm or 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.
Local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
m AHD	Metres Australian Height Datum (AHD)
m/s	Metres per second. Unit used to describe the velocity of floodwaters.
m ³ /s	Cubic metres per second or "cumecs". A unit of measurement of creek or river flows or discharges. It is the rate of flow of water measured in terms of volume per unit time.
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
Modification measures	Measures that modify either the flood, the property or the response to flooding.
Overland flow path	The path that floodwaters can follow as they are conveyed towards the main flow channel or if they leave the confines of the main flow channel. Overland flow paths can occur through private property or along roads.
Probable Maximum Flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation 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.
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.
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.

Draft Flood Study Report



Runoff	The amount of rainfall which actually ends up as a streamflow, also known as rainfall excess.
Stage	Equivalent to water level (both measured with reference to a specified datum)
TUFLOW	TUFLOW is a computer program which is used to simulate free-surface flow for flood and tidal wave propagation. It provides coupled 1D and 2D hydraulic solutions using a powerful and robust computation. The engine has seamless interfacing with GIS and is widely used across Australia.
XP-RAFTS	XP-RAFTS is a computer program which is used to simulate catchment rainfall-runoff and is widely used across Australia.

Draft Flood Study Report**JACOBS**

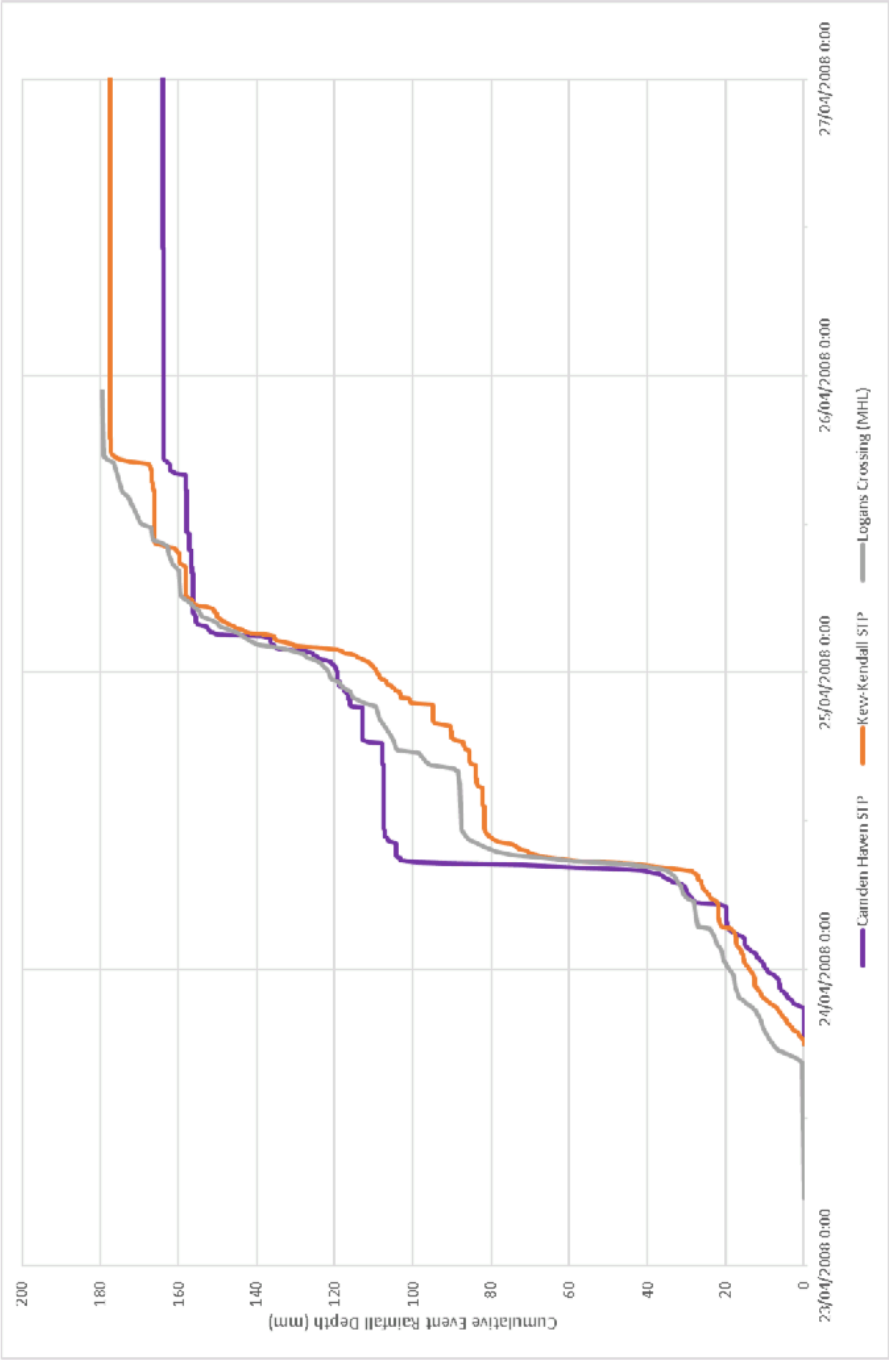
Appendix A. Analysis of Historic Rainfall Event Data

Cumulative rainfall depths have been plotted for two recent storm events for which data is currently available. These include:

- 24 April 2008 (10% AEP) 49mm in 45minutes; 65mm in 60 minutes; 136mm in 24 hours.
- 2 March 2013 (20% AEP) 61mm in 1.5 hours; 152mm in 24 hours.
- 5 January 2016 (20 – 50% AEP) 54mm in 1.5 hours.

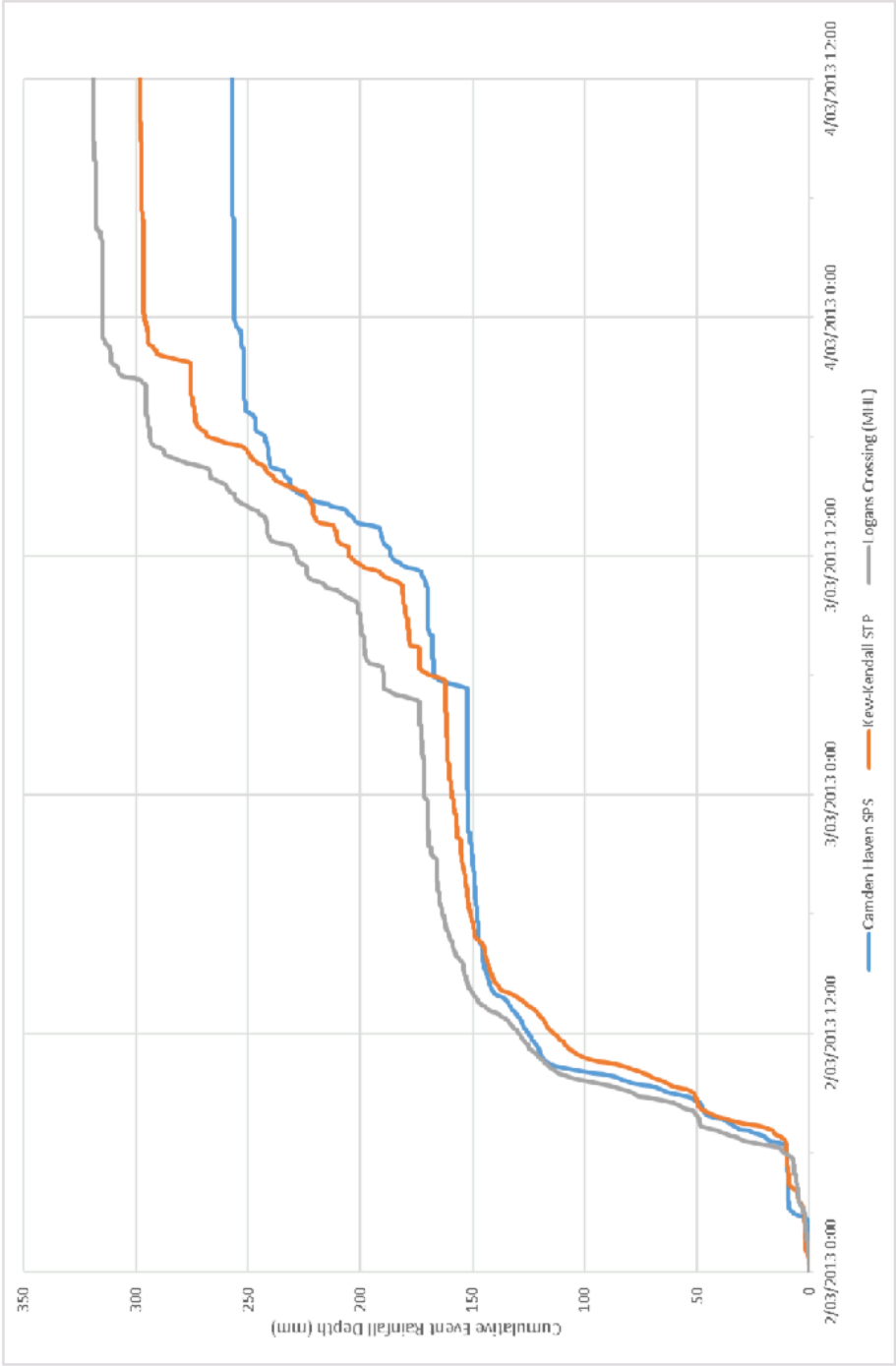
North Bedford Local Catchments Flood Study

Figure A-1 Cumulative event rainfall depth, 24 – 26 April 2008



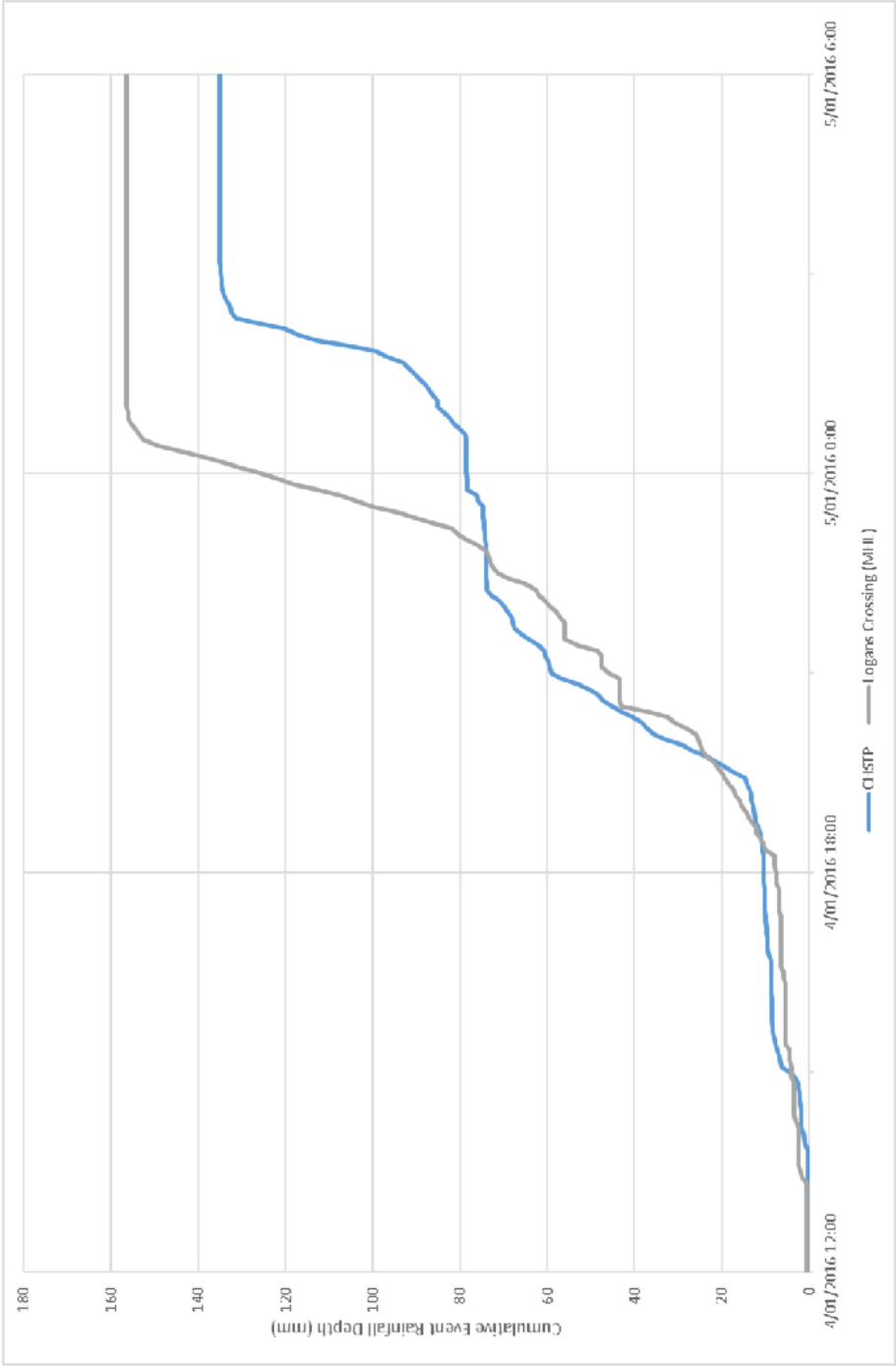
Source: Australian Bureau of Meteorology (2008)

Figure A-2 Cumulative event rainfall depth, 2-3 March 2013



Source: Australian Bureau of Meteorology, Bureau of Meteorology

Figure A-3 Cumulative event rainfall depth, 4 – 5 January 2016

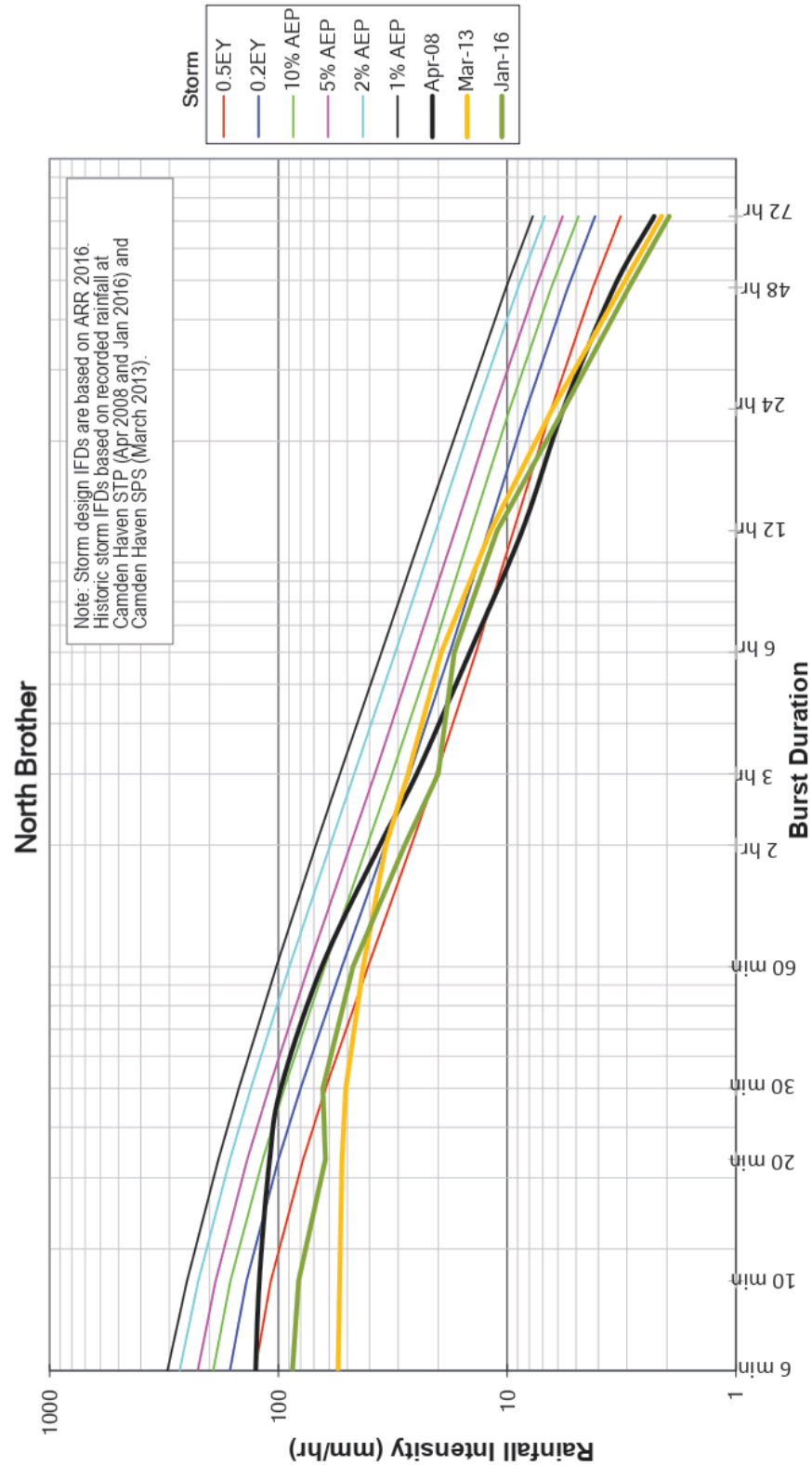


Source: Australian Bureau of Meteorology, Flood Forecasting



Draft Flood Study Report

Figure A-4 North Brother Design Rainfall Intensity-Frequency-Duration versus Historic Storm Events



Draft Flood Study Report

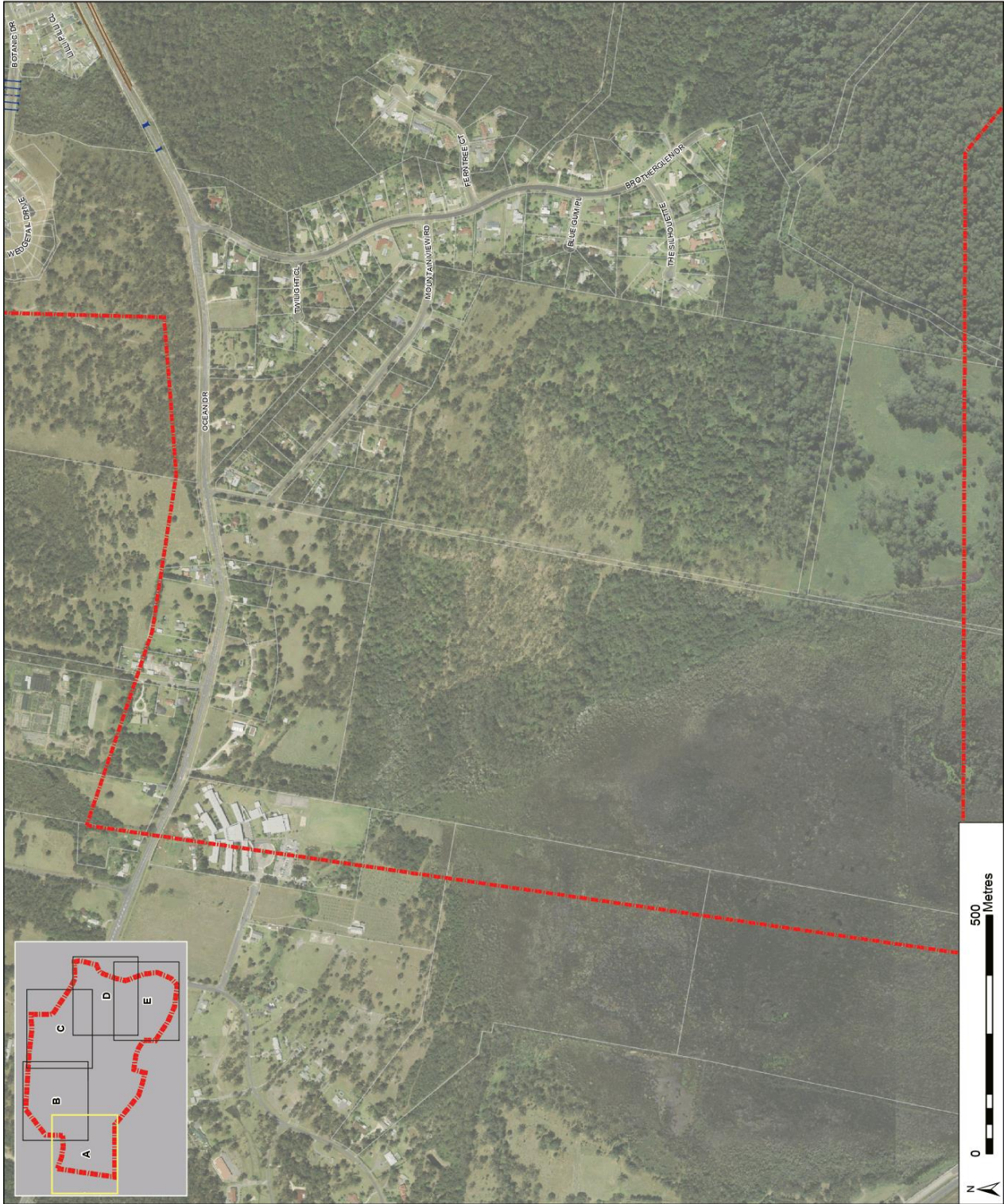
JACOBS

Appendix B. Summary of Topographic Survey

Legend

Study Area

Cadastral



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

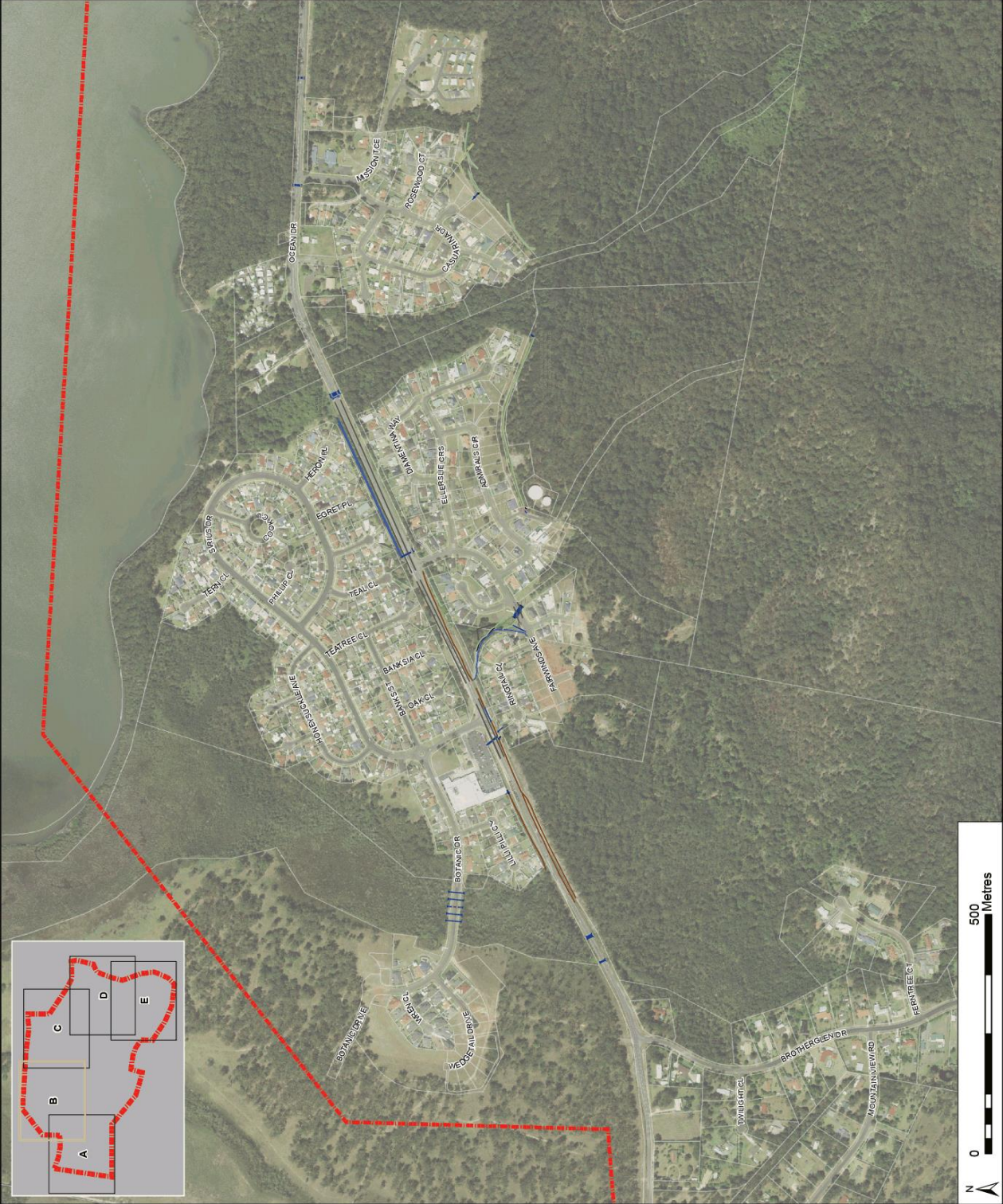


TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(A)
DATE	25/05/2018

Legend

Study Area

Cadastral



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(B)
DATE	25/05/2018

Legend

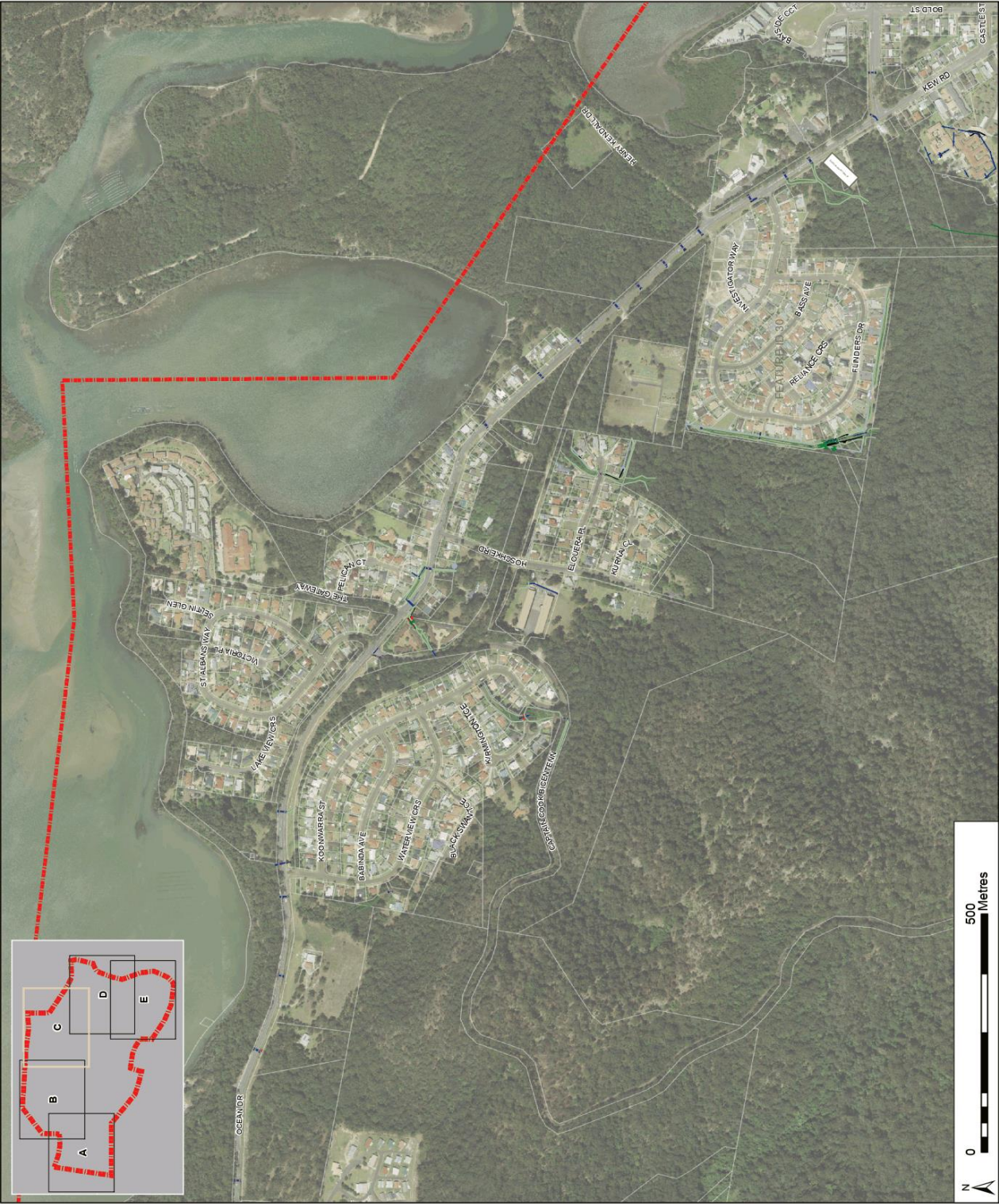
Study Area

Cadastral

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(C)
ISSUED DATE	25/09/2018



Legend

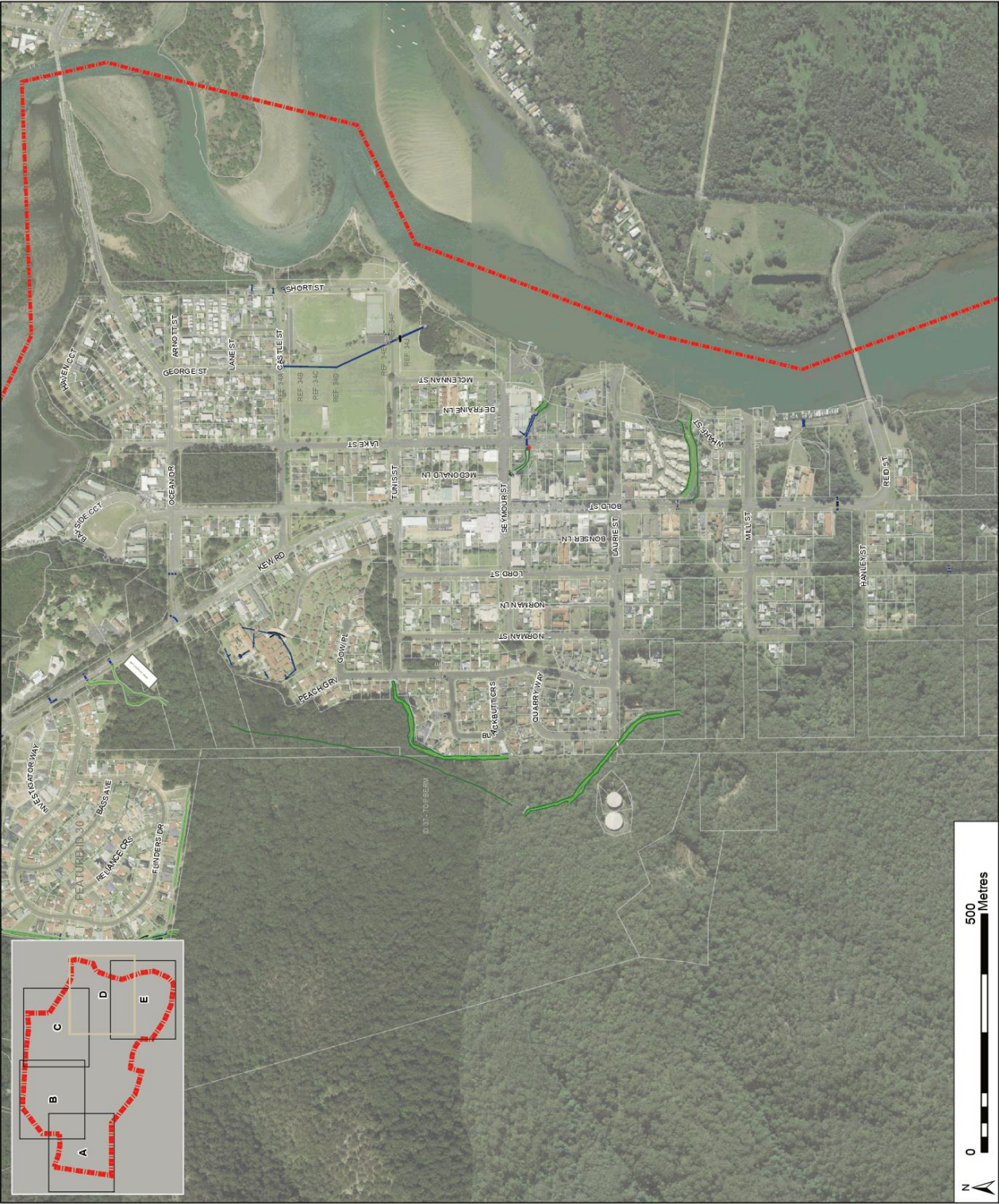
Study Area

Cadastral

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



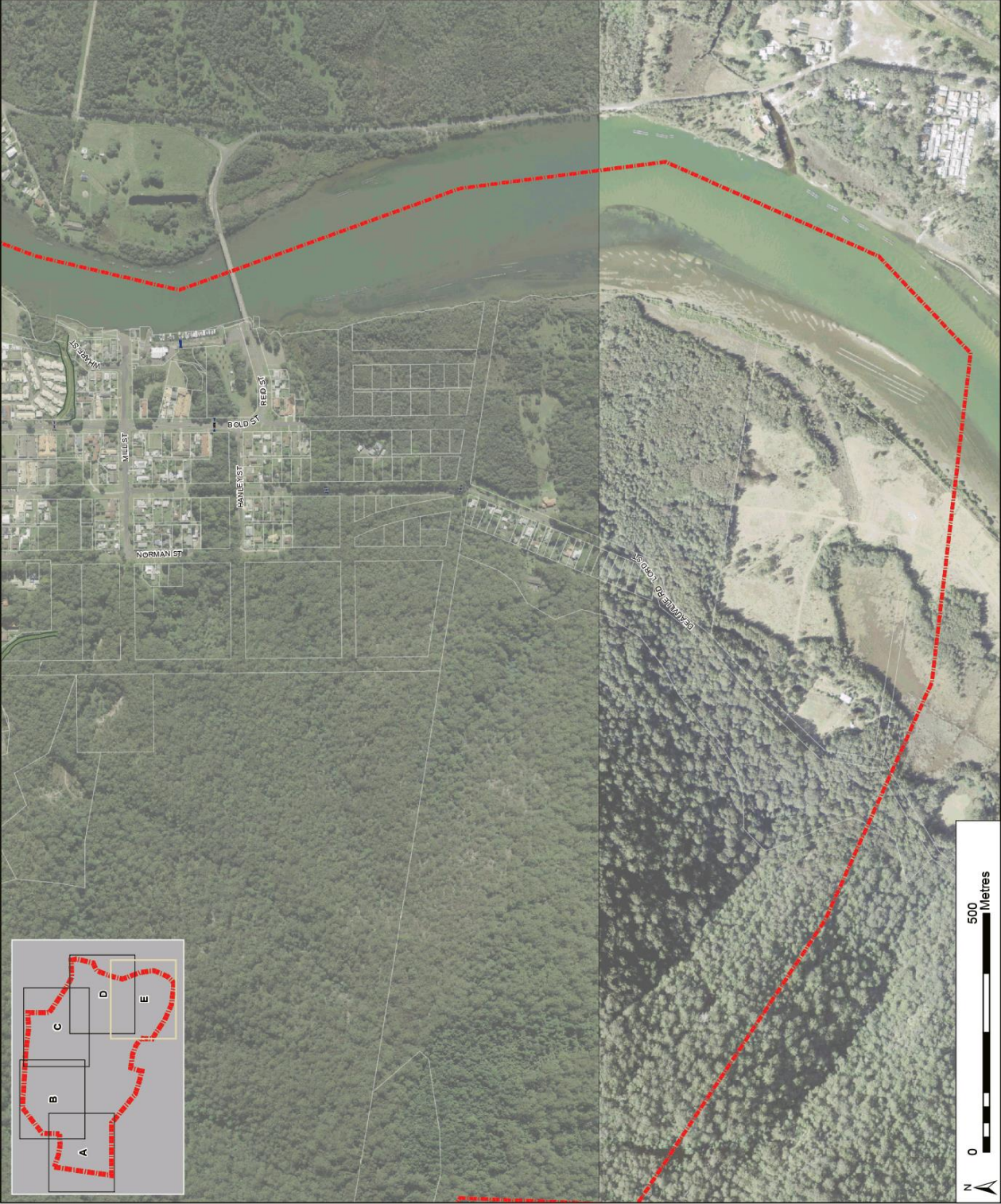
TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(D)
ISSUED DATE	25/09/2018



Legend

Study Area

Cadastral



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(E)
DATE	25/05/2018

Draft Flood Study Report

JACOBS

Appendix C. Community Consultation



Community Bulletin No. 1 - October 2017



North Brother Local Catchments Flood Study

Port Macquarie Hastings Council is currently conducting the North Brother Local Catchments Flood Study. This Community Bulletin is the first in a series of Bulletins aimed at informing residents of the status of the project and how they can be involved in the process. Council has engaged consultants, Jacobs Group Australia, to undertake the Study.

The focus of the study is to understand the behaviour of local catchment flash flooding from North Brother Mountain and the flood risk that it poses to the community. This will assist Council to develop measures to manage the impact of flooding and guide strategic planning for future development of the area. It includes areas of the villages of Laurieton, West Haven, Lakewood, Kew and Deauville.

An integral part of the study process is community consultation and involvement. This element of the process aims to inform the community of the study and invite residents to provide information on their views and experiences with flooding in the area. The management of flood prone land is primarily the responsibility of Councils and follows a number of stages as shown below. The project is currently in the Flood Study stage, and will later move to the Floodplain Risk Management Study and Floodplain Risk Management Plan stages as the project progresses.

The Stages of Floodplain Risk Management



Objectives of the Study

The objectives of the study are to:

1. Define the overland and flash flooding behaviour in the study area. Computer flood modelling will be undertaken to do this during the current flood study stage.
2. Identify and evaluate possible flood mitigation and management measures to reduce the flood risk. These may be structural and planning measures or "response" measures.
3. Develop a staged plan for implementing these measures.

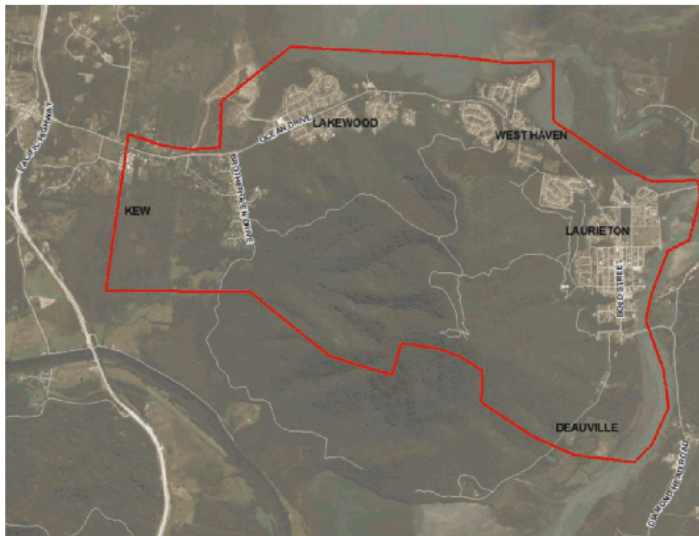


Community Survey

We are seeking feedback from the community on previous flooding events in the area and views on possible management measures via the attached survey. The results of the survey will help inform a flood study for the area, which will be placed on public exhibition in early 2018, and a subsequent floodplain risk management study. The information that you provide will improve the flood model being developed.

PAGE 1

Study Area



The Flood Problem

The study area typically experiences short duration flooding, which occurs when intense rainfall exceeds the capacity of the stormwater network or creek channel. In urbanised areas, this flooding has the potential to cause major damage to property and risk to life. Notable local flash flooding in the study area recently occurred in:

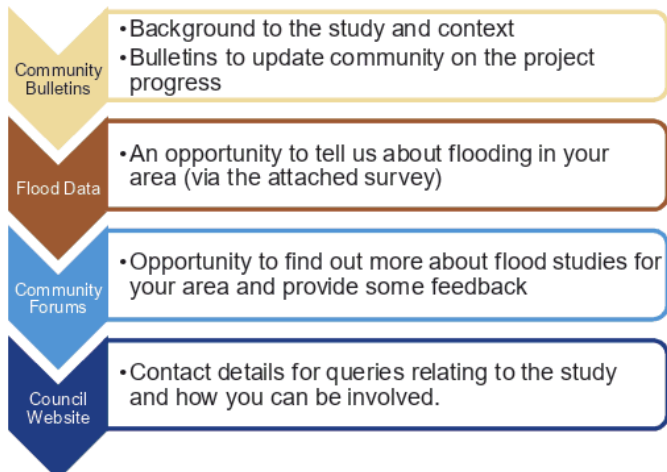
- April 2008
- June 2011
- March 2013
- January 2016.

How can you get involved?

Engagement of the community in the floodplain risk management process is very important to Council. We will be providing a number of opportunities for the community to have input during the course of this study.

Some of the most important information for the study is collected from residents and local business operators. We would be very interested to receive records of flooding in your area including photographs, observations of flood depths or some comments on your experience. You can help us with this

information by completing the questionnaire for your area and returning the completed community survey by 31 October 2017. The questionnaires can be found in Council's web site www.haveyoursay.pmhc.nsw.gov.au/ Port Macquarie Hastings Council appreciates your cooperation and will keep you informed with ongoing community bulletins.



For more information contact Port Macquarie Hastings Council on (02) 6581 8111 or visit haveyoursay.pmhc.nsw.gov.au

Draft Flood Study Report



Summary of key survey questions and responses

* Note, not all responses have been included in this summary. Responses mentioning specific locations and addresses have been omitted for privacy reasons.

Do you live in the study area?

Response	Count	% of responses
No	15	5%
Yes	276	95%

Do you own or rent in the study area?

Response	Count	% of responses
Own and occupy	280	98%
Rent	6	2%

Do you own or manage a business in the study area?

Response	Count	% of responses
No	264	94%
Yes	17	6%

What kind of business?

Response	Count
Home based	6
Shop/ commercial premises	6
Industrial	1
Other	3

Are you aware of flooding in the Study Area?

Response	Count	% of responses
Aware	136	48%
Some knowledge	77	27%
Not aware	71	25%

When have you experienced significant flooding in the area?

Response	Count	% of responses
Not affected	142	51%
Property Flooded	43	15%
Minor Disruption (roads flooded by driveable)	69	25%
House or business flooded	17	6%
Access cut off	9	3%

Draft Flood Study Report



What damage resulted from this flood in your residence?

Response	Y - no rating	Minor	Moderate	Major	None or Not Aware
Damage to garden, lawns or backyard	32	28	6	3	39
Damage to external house walls	4	1	3	1	46
Damage to internal parts of house (floor, doors, walls etc)	8	6	1	4	46
Damage to possessions (fridge, television etc)	0	0	0	5	7
Damage to car				1	49
Damage to garage	11	10	3	0	46
Other	"Minor road damage" "Back sunroom was flooded" "Had to put a drain under the garden bed to the stormwater drain" "Dirt washed into pool"				
What was the cost of repairs, if any?	Covered by insurance: 4 Up to \$1000: 7 \$1000 - \$5000: 6 \$5000 - \$10000: 2 \$10000 - \$20000: 3 >\$20000: 2 (\$50K and \$70K)				

What damage resulted from this flood in your business?

Response	Y - no rating	Minor	Moderate	Major	None or Not Aware
Damage to surroundings	3	6	1	0	24
Damage to Building	3	2	0	0	25
Damage to Stock	2	1	1	0	24
Other	1	-	-	-	25

Draft Flood Study Report



Please rank the following development types according to what you consider should be assigned greatest priority in protecting from flooding (1 = greatest priority to 7 = least priority). Please identify specific items if necessary.

Rating	Count							% of Responses						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Commercial	12	1	71	62	8	3	138	4%	0%	24%	21%	3%	1%	47%
Heritage items	13	1	12	24	43	76	28	7%	1%	6%	12%	22%	39%	14%
Residential	98	22	71	30	11	2	0	42%	9%	30%	13%	5%	1%	0%
Community Facilities	22	13	48	62	48	26	2	10%	6%	22%	28%	22%	12%	1%
Critical utilities	59	94	40	19	8	3	0	26%	42%	18%	9%	4%	1%	0%
Emergency Facilities	110	62	24	15	8	3	2	49%	28%	11%	7%	4%	1%	1%
Recreation areas and facilities	5	2	4	5	12	46	138	2%	1%	2%	2%	6%	22%	65%

Please rank the following by placing numbers from 1 to 6 (1 = greatest priority to 6 = least priority)

Rating	Count						% of Responses					
	1	2	3	4	5	6	1	2	3	4	5	6
A) Protecting residents/business from flooding	135	30	21	19	27	12	55%	12%	9%	8%	11%	5%
B) Protecting land of residents/businesses from flooding	24	60	24	31	33	63	10%	26%	10%	13%	14%	27%
C) Maintaining an emergency flood free access	55	43	73	32	29	7	23%	18%	31%	13%	12%	3%
D) Providing flood signage for public safety	16	28	26	34	43	88	7%	12%	11%	14%	18%	37%
E) Support from SES	27	44	48	63	36	16	12%	19%	21%	27%	15%	7%
F) Providing flood warning	59	28	29	46	42	31	25%	12%	12%	20%	18%	13%

Table 1: Development Priorities

Draft Flood Study Report

JACOBS

Are you aware of any works that have been carried out near you that you believe have negatively impacted on the flood behaviour at your property? (Tick all boxes that apply)

Response	Count	% of responses
A) Not aware of any measures	215	70%
B) Building or renovation activities	14	5%
C) Fencing	5	2%
D) Creek works	14	5%
E) Upgraded roads, culverts	20	6%
F) Overland flow obstructions	22	7%
G) Other (please specify)	18	6%

Comment responses

Aged Council drain does not comply with current standards & industry specification. see Council minutes 20th March, 2013.
Uphill development
Y- New bridge- sections impact on flow on Laurieton side.
Y- Rear boundary neighbour has shadehouse against back fence. This has resulted in the way the water flows, it does not follow the land contour, it hits the shadehouse and all water from surrounding properties come onto our property.
Y- We have a creek at the back of us which needs to be fixed every year this needs to be done last time they did it they enclosed the poor birds that live in the walls of the creek. We don't have enough drainage in the street of Honeysuckle.
Footpath has been raised in front of our house for the sake of the units built next door, the footpath has been partly done but still not finished and we are still getting water. Also our neighbours right through their ground floor Council was going to extend the footpath and raise the level up to the same as the units.
Y - stormwater getting into sewage pipes and overflowing sewerage problem is very bad in our Lakewood area.
Y - Laurieton reservoirs/stormwater drain - see attachments
Y - nature strip falling toward my house and not away to the main road erosion out front increasing in stormwater water drainage re rain driveway access affected from north brother runoff and subdivision runoff
Y - new developments have increased storm water runoff with NO increase in storm pipes lower in the system
Y - land use planning
Silting of Camden Haven River heads/bar
Stormwater drainage on eastern side of Quarry Way inadequate
Easement drains under property now out of alignment
Refer to my letter, apply better cleaning of drainage under Kew Road to allow flow to the lake
Road drainage and easements directed onto our property.

Draft Flood Study Report

JACOBS

Are you aware of any works that have been carried out near you that you believe have improved the flood behaviour at your property? (Tick all boxes that apply)

Response	Count	% of responses
A) Not aware of any measures	205	68%
B) Building or renovation activities	8	3%
C) Fencing	3	1%
D) Creek works	19	6%
E) Upgraded roads, culverts	39	13%
F) Overland flow obstructions	12	4%
G) Other (please specify)	15	5%

Comment responses

Council has made efforts to improve situation but so with no success.
New stormwater drain.
The creek to creek walkway has improved our access out of town
None, no work done
Water diversion swale on crown land
Y - concrete drain installed behind our property (but it is inadequate to cope with volumes of water in heavy rain)
Y - culverts in reserve, no footpath provided for elderly
Council drainage is the only time I have concern for flooding
Y - reservoirs/stormwater drain. Lack of maintenance has caused serious concerns of flooding
River walls to improve depth of river bar
Y - foot paths
Y - nearby creek cleared of plant debris and plastic bottles etc.
Cleaning of existing storm drains
Very little of any

Draft Flood Study Report



Which of the following measures do you think Council should consider for reducing the floodrisk at your property? (1 = greatest priority to 7 = least priority).

Rating	Count					% of Responses				
	1	2	3	4	5	1	2	3	4	5
A) Zoning, building & development controls, including fencing	38	46	51	23	3	24%	29%	32%	14%	2%
B) Upgrading stormwater drainage	167	33	10	0	0	80%	16%	5%	0%	0%
C) Upgrading roads	29	66	53	22	3	17%	38%	31%	13%	2%
D) Public awareness & education	13	18	36	85	7	8%	11%	23%	53%	4%
E) Other (please specify)	0	0	0	4	39	0%	0%	0%	9%	91%

Comment responses

Publish max flood line not just the 100 year flood line on maps on NSW Planning Portal.
How about a levee if there is a perceived problem
Walkway to main road for elderly who can't drive and rely on walking and mobility scooter to town along the lake and public access to main road.
MAINTAIN DRAINS, EASEMENT
Planting trees on the streetside providing more parklands.
KEEP STORM DRAINS CLEAR BY REGULAR INSPECTIONS & CLEARING IF NECESSARY
Fixing the creek so the water will flow out to the lake
Keep culverts clear of vegetation and rubbish on southern side of Ocean Drive opposite the Gateway Road
Installing kerb and gutter to our street
Clean out drains and creeks
New kerb and gutter on low side of roads.
Trees in drain behind xx, xx and xx Koonwarra Street at bend of drain blocks up. I have to keep cleaning it out, Council won't.

Draft Flood Study Report



Putting kerb and guttering from Ocean Drive into Lake Street and Castile Street. Houses have bene built about 60 years but no kerb and gutter. Would be good to have to get rid of the water instead of having stagnant water and lots of mosquitoes
Carry out drainage maintenance work as per letter dated 13/6/13 - see attached
Actually putting in place stormwater drainage
Cleaning gutters and weed growth at joints and any other blockages on a regular basis
The open drain on Lord Street Laurieton, between Laurie Street and Seymour Street should be replaced with pipes.
Dredging the river beds
Better drainage of water coming off the mountain. Something to slow the flow.
Lift/build up the verge outside my house to the equivalent height to recent building adjacent to my property
Inappropriate building on wetlands or flood prone areas
I don't believe my property is under threat of flooding
Not a risk

Standard Presentation and Publications Prepared October

Draft Flood Study Report

JACOBS

Appendix D. Verification of Model Flood Behaviour

Legend

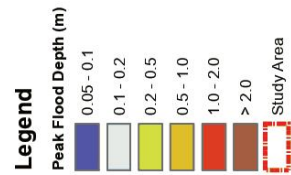
- Model Calibration and Verification Points
- Study Area

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Calibration and Verification Points
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
ISSUED DATE	25/09/2018
FIGURE D-1	

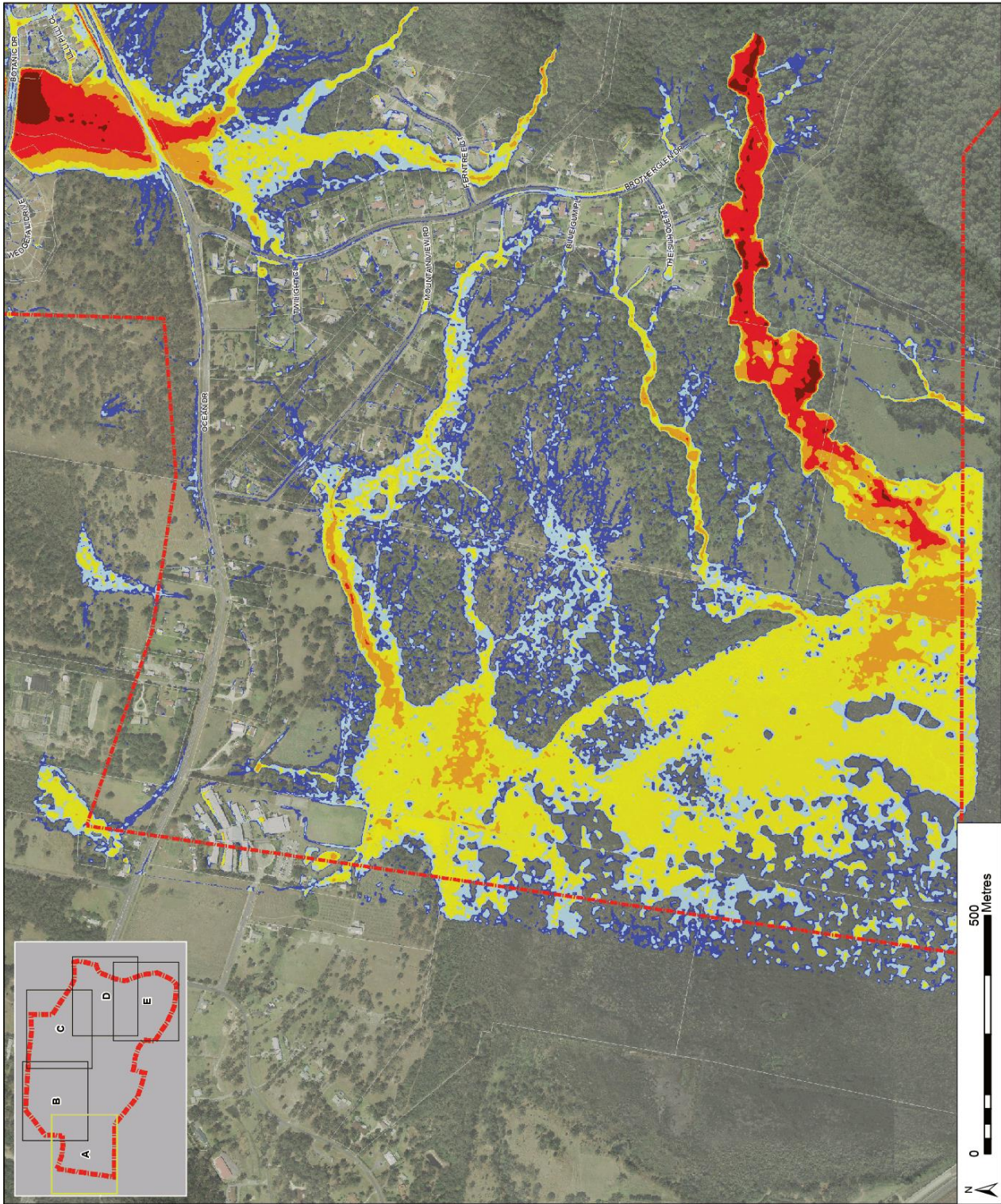


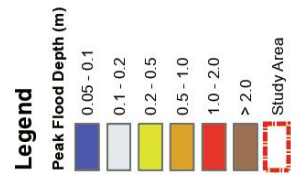


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(A)
DATE	28/12/2018

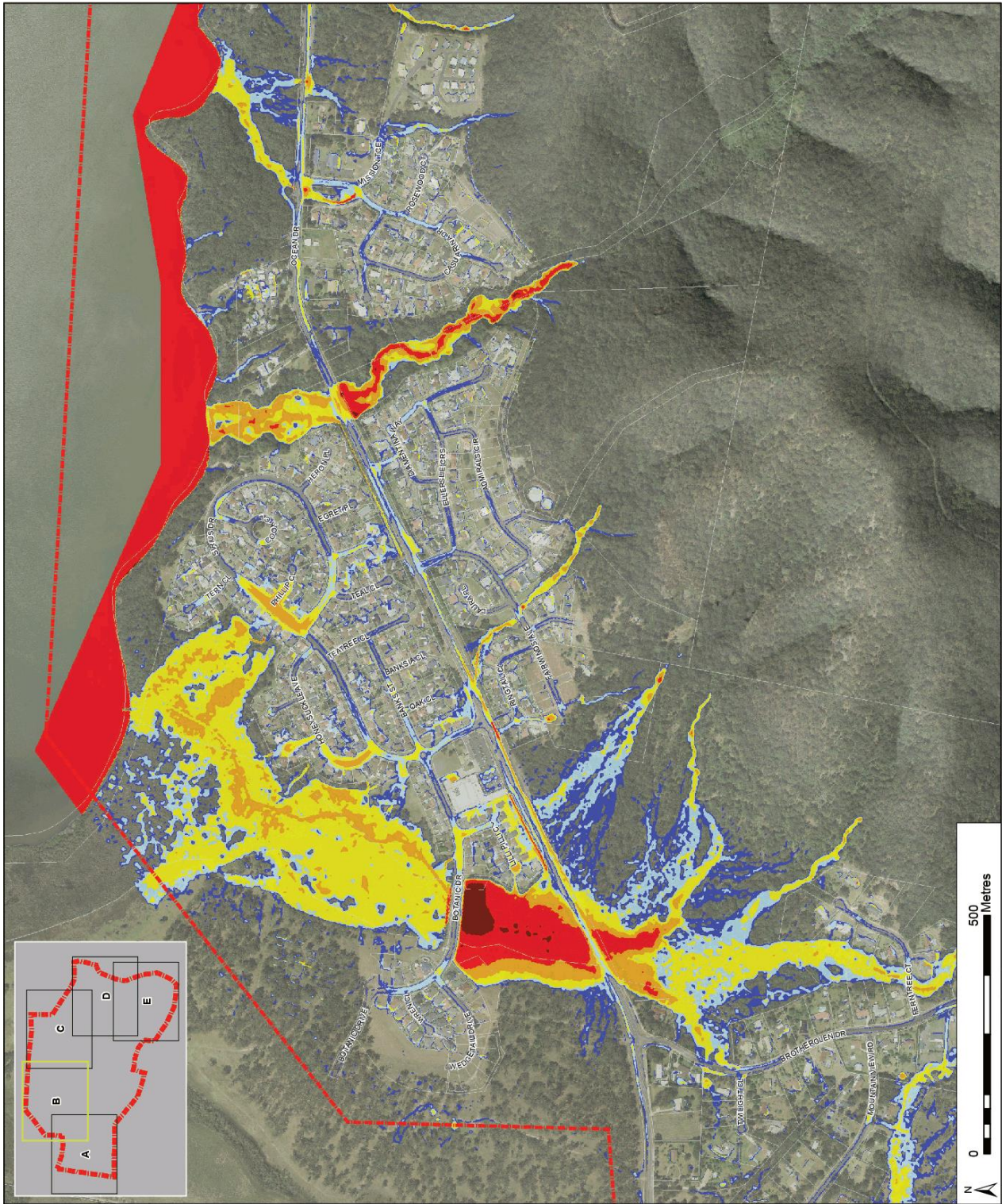


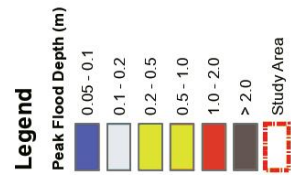


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(B)
DATE	28/12/2018

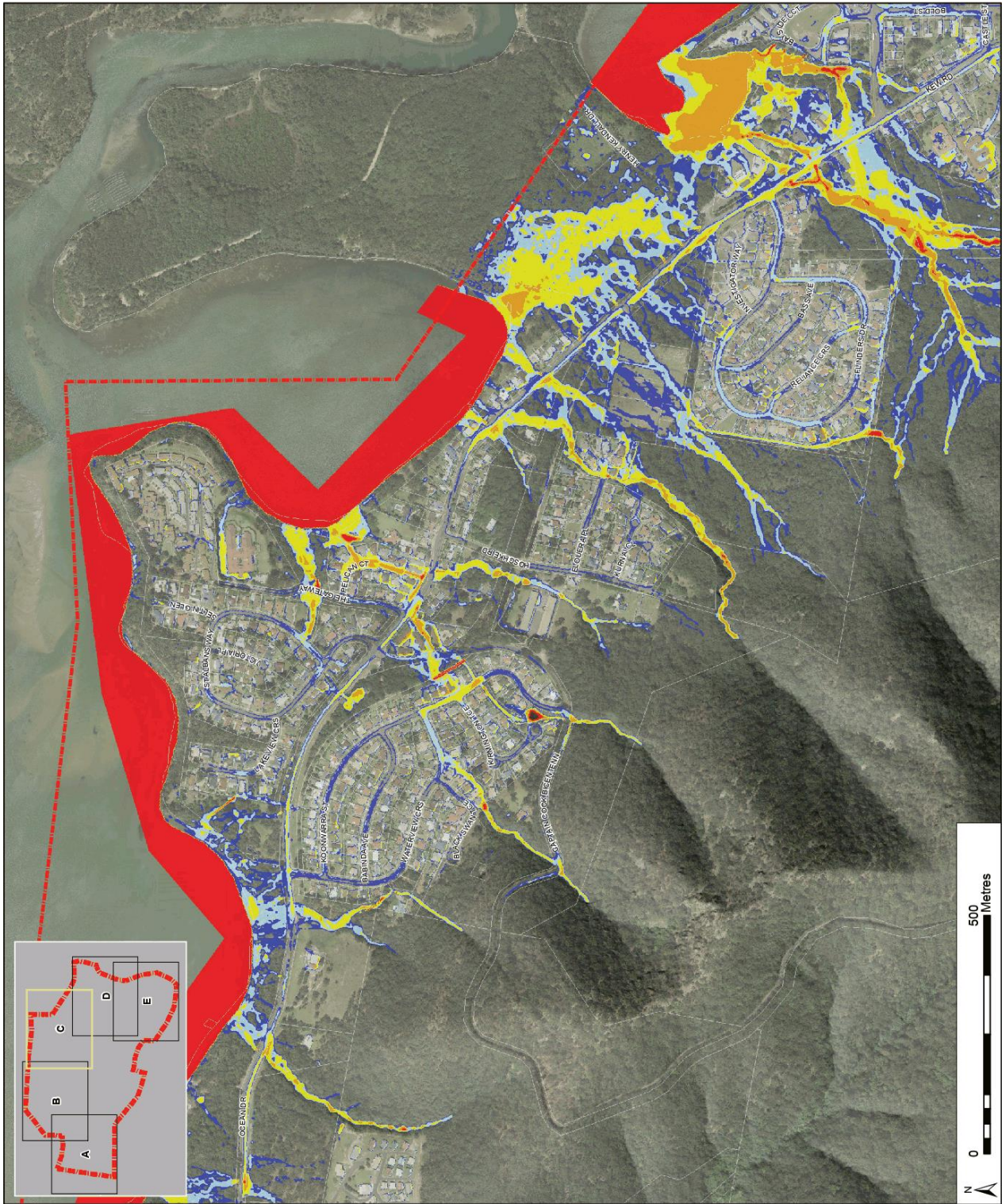


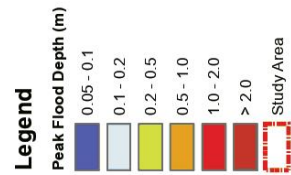


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(C)
DATE	28/12/2018

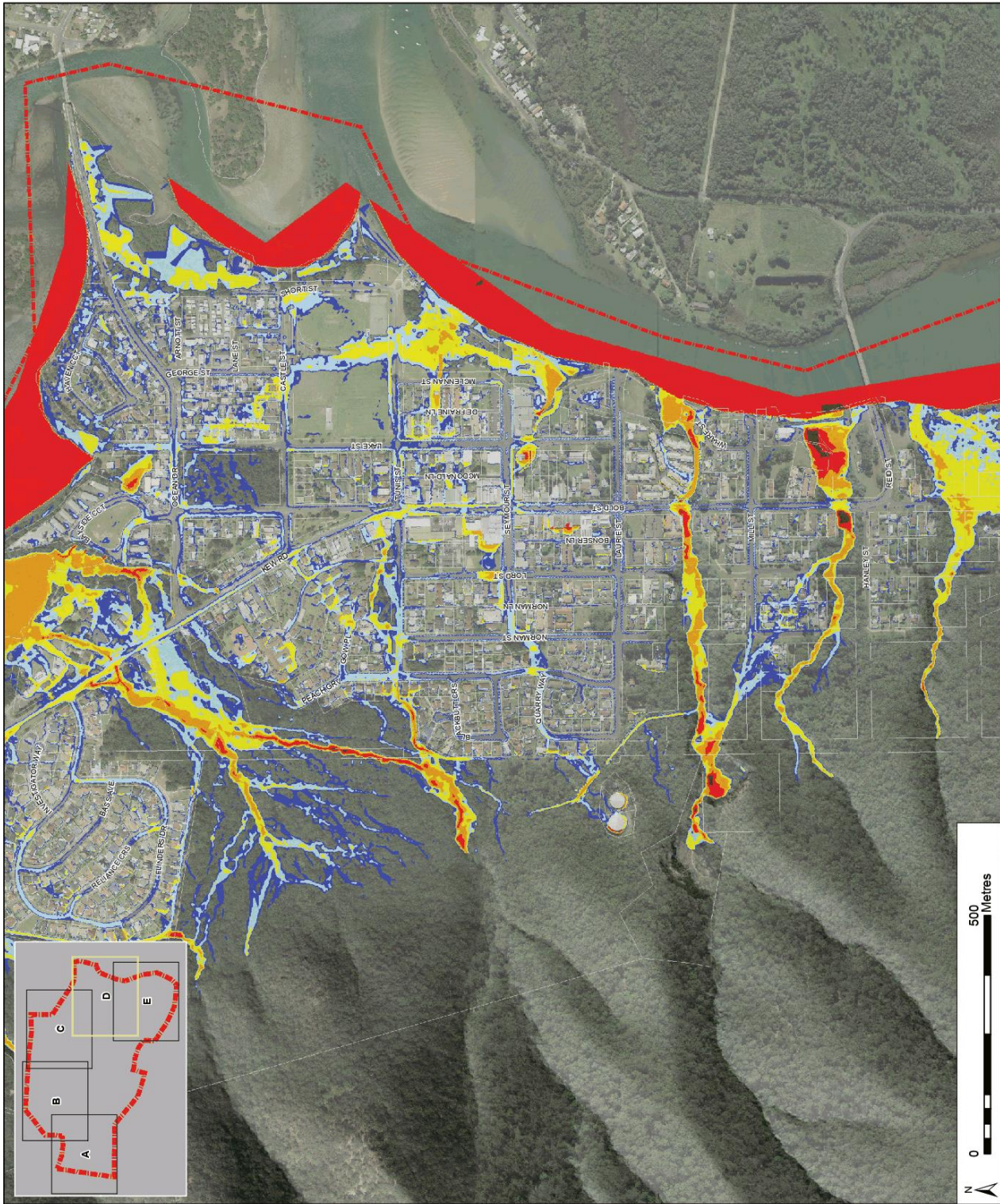


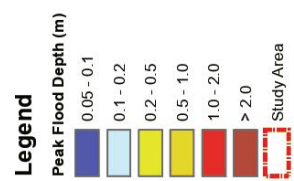


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(D)
DATE	28/12/2018

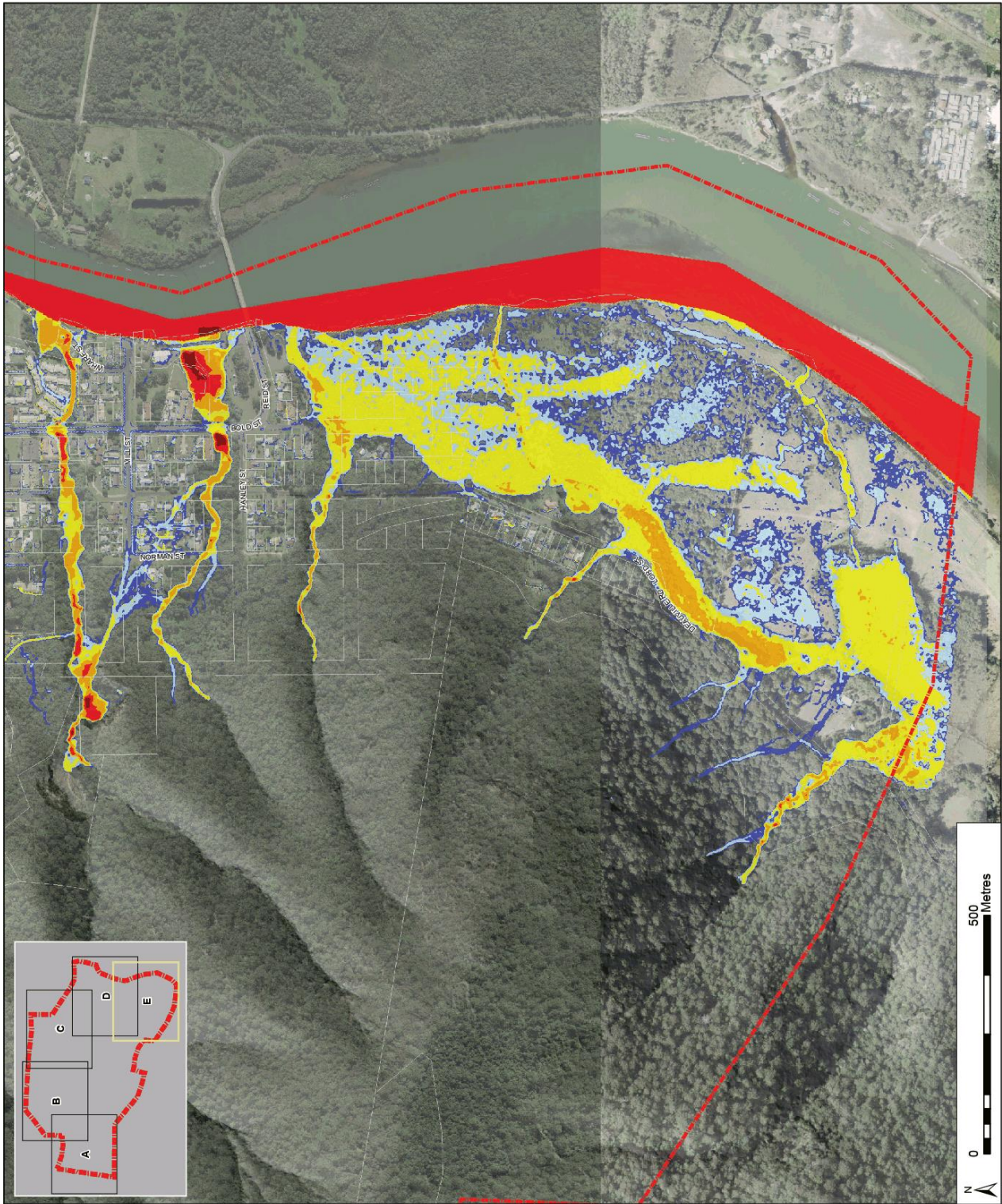


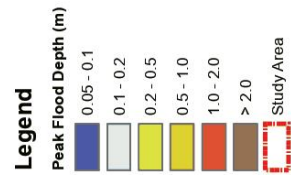


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(E)
DATE	28/12/2018

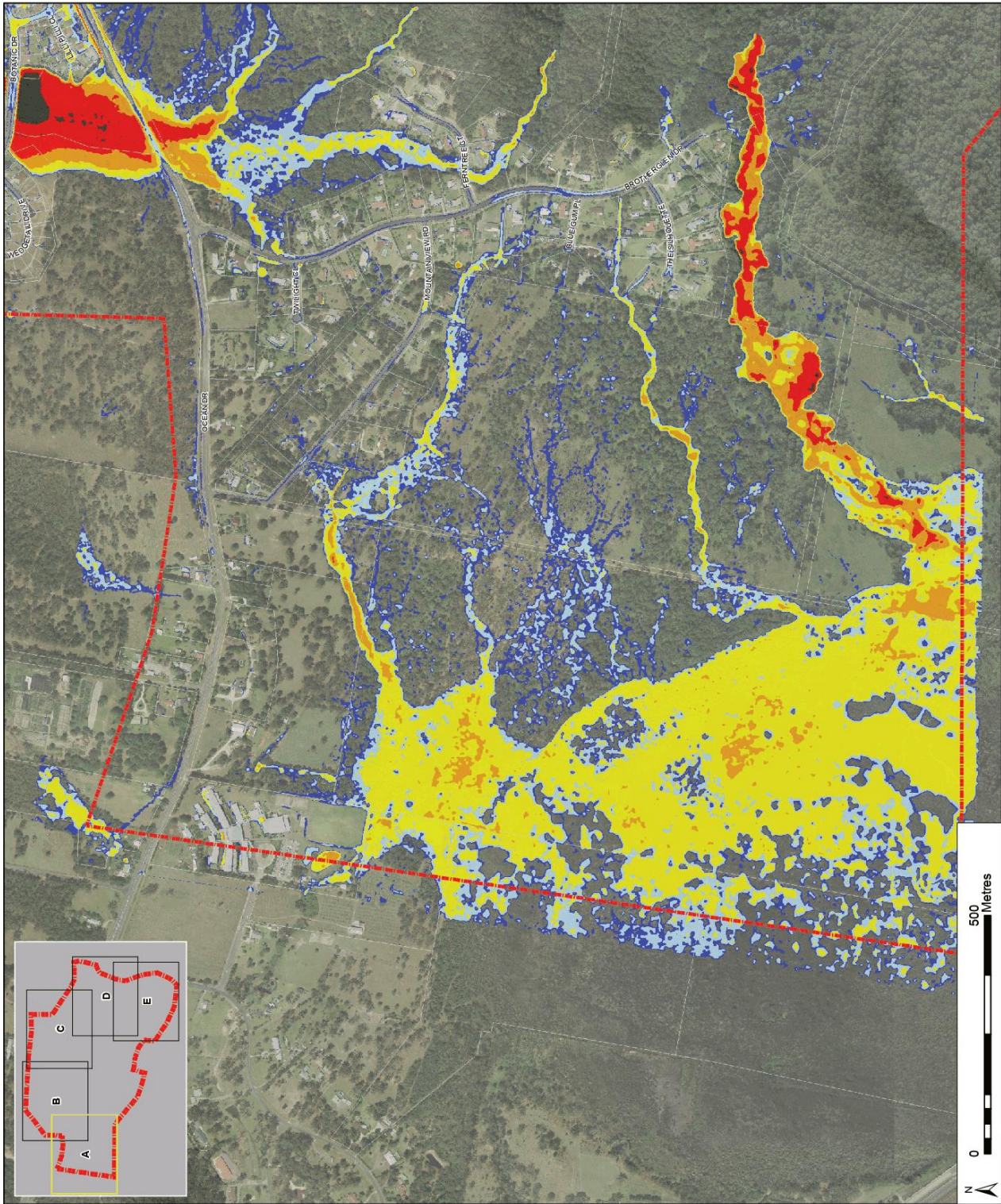


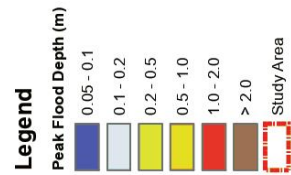


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Verification Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(A)
DATE	28/12/2018

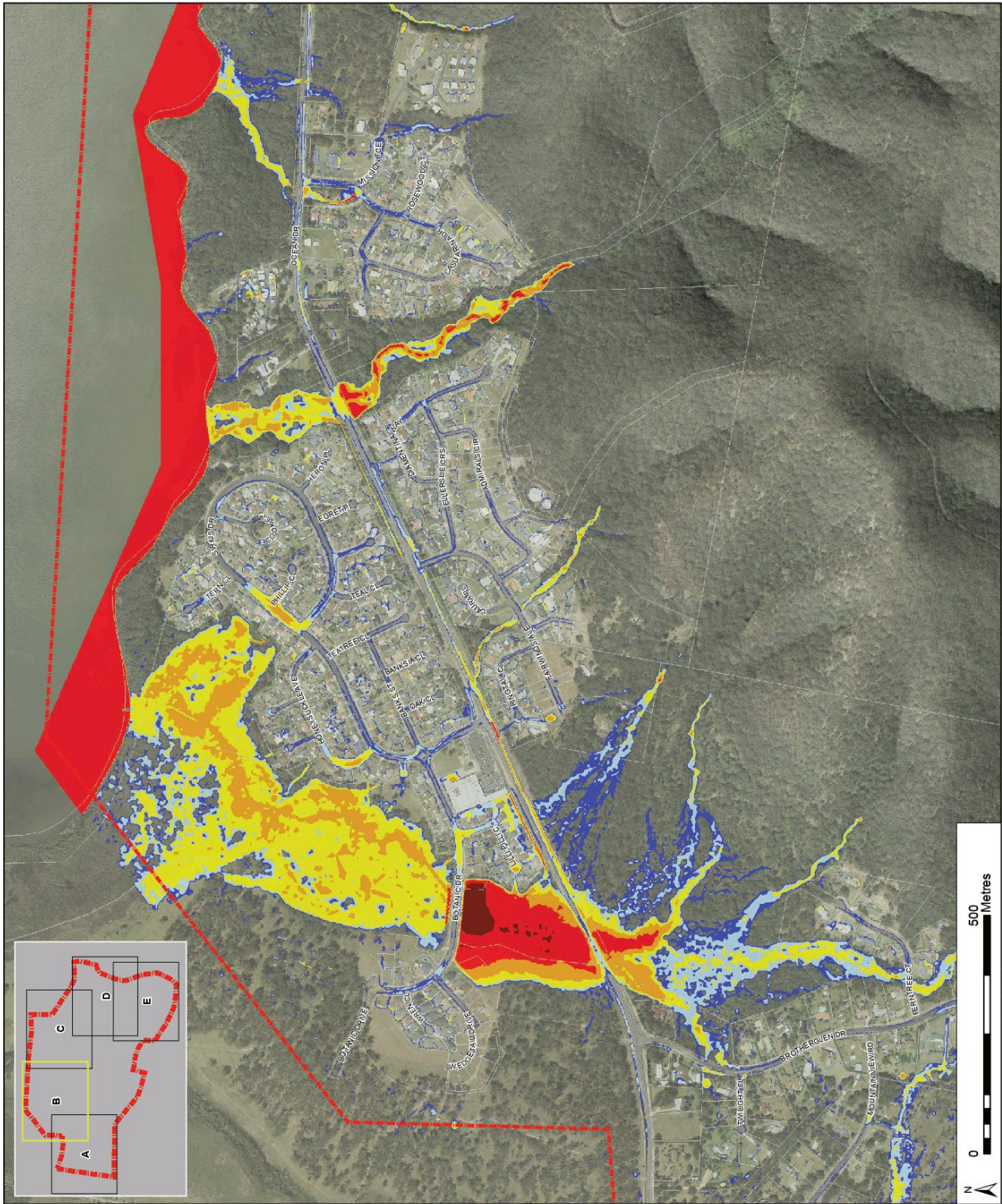


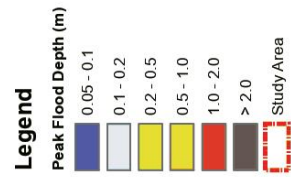


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Verification Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(B)
DATE	28/11/2018

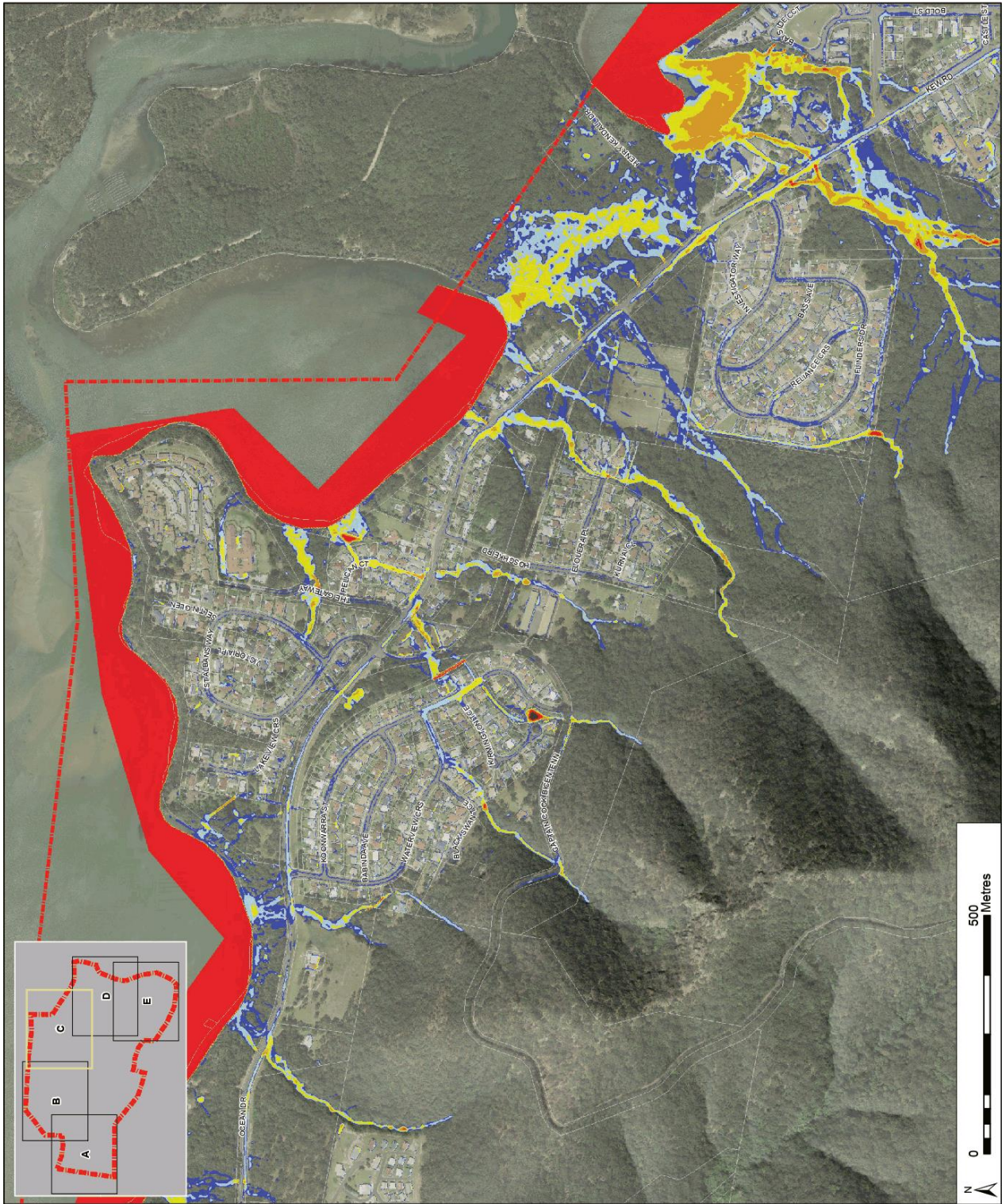


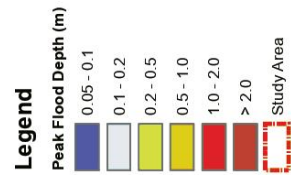


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Verification Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(C)
DATE	28/12/2018

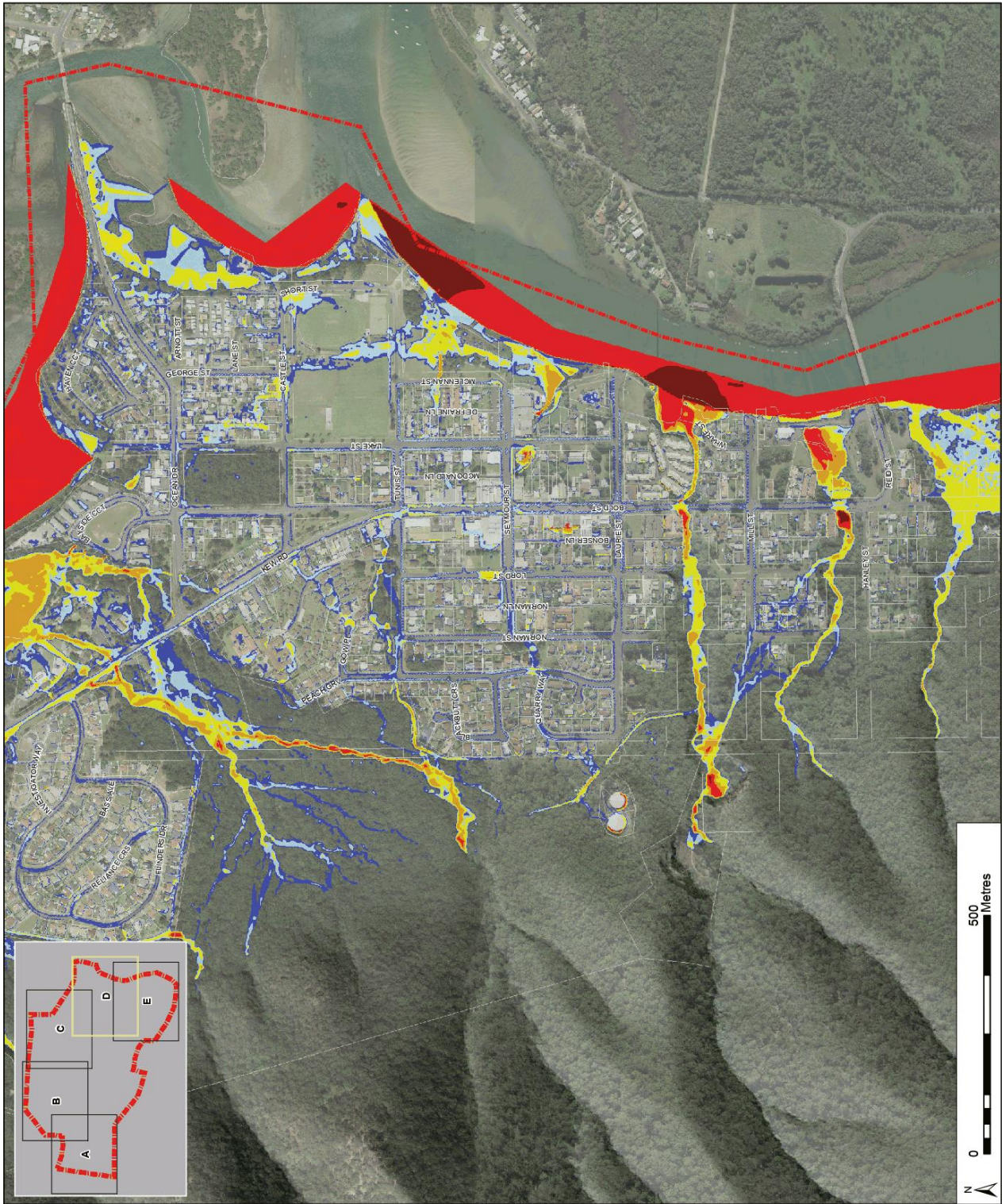




GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Verification Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(D)
DATE	28/12/2018



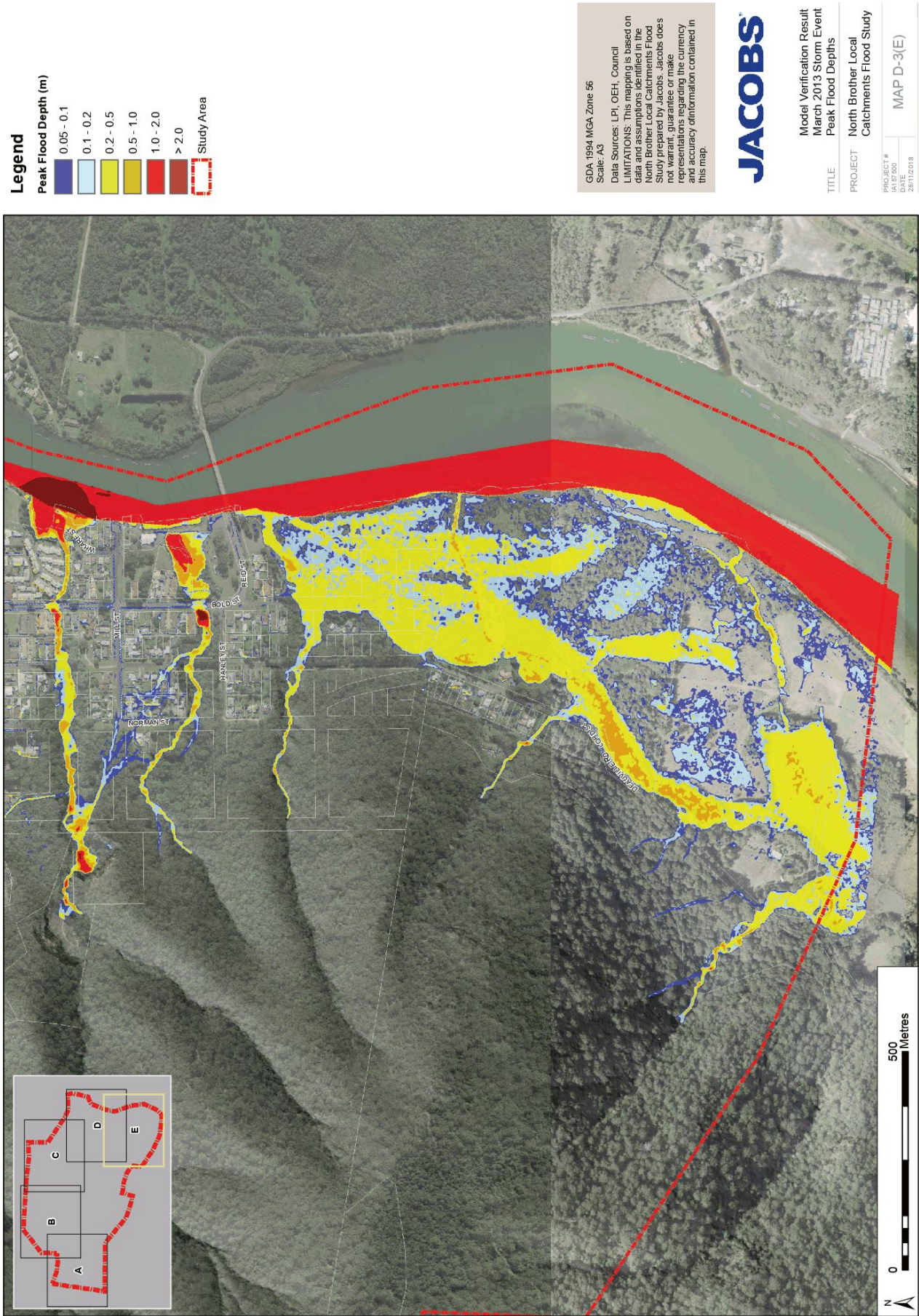


Table D-1 Verification of Model to Flooding Reports and Observations

Note – Addresses of properties with flooding generally have been suppressed in case of community sensitivity to such information being released.

ID	Event date/s	Description of Previous Flooding	Modelled Flood Behaviour
2	2004, 2008, 2011, 2013, 2015, 2016	Depths about 2/3 metre with exceedingly strong flow. Duration from 2 to 5 hours approx. depending on strength of storm. Locations from blocked drain - around and under house with sandbags keeping water out. Flooding around and in house on at least 3 occasions with major water damage	Ok, 0.55m in 2008 simulation
3	2015?	"Moderate" damage to garage, garden/yard, photos show large flow of water through garage and trying to exit via closed roller door. Door panel is bowing due to force of water. Approx. 1-2 brick courses deep at front/leeward side of house/garage	Model shows flows 0.2m deep at west side of house
4	No flood event specified	Some flood dates: 5/11/2010, 13/6/2011, 8/10/2011, 28/1/2013 Had to sandbag near garage door. Photo of 8/10/2011 shows shallow ponding, to say 50mm deep in backyard.	Model results show 0.05 - 0.12m ponding in backyard
5	No flood event specified	Property reported as flood affected	Affected by overflows from fire trail. Shallow depths
9	No flood event specified	Have installed extra drainage and downpipes and regraded concrete driveway to try to improve drainage but has not been enough.	Overflows from grassed swale in street into driveway and property
10	No flood event specified	Shallow sheet flow on front lawn. Retaining wall collapse	Model shows shallow flows on lawn. Retaining wall collapse appears to be due to slumping of saturated soil.
18	2002, 2004, 2013	Photos March 2013, 2002 and 2004 of flow through yard and down driveway of neighbouring property then down road. 100-200mm deep at hills hoist in 2004 flood. Approx. 500mm deep against fence in 2004 flood. Timber paling fence panels washed out. 100 - 200mm diameter rock rubble deposited in yard.	160mm at hills hoist, 400mm at fence in 2008 simulation. Flood patterns similar to 2013 simulation. Photos including depths and flows from front of property around side of house to back, also swift flows in next door driveway
23	5/2/2002, 11/2004, 2011, 2013	There is a creek/waterhole at the back fence and in June our yard went under as this broke its banks and flowed across the property to the drain which was in when I bought the place in 2013.	Flow breaks out of flow path and moves overland across property
26	No flood event specified	Carpets replaced in 2000 due to flooding, no flooding reported for other years.	Model shows flood depth of 0.2m at the front of the house in 2008 simulation. Ok, probably not high enough to get into house.
34	Mar 2013, June 2017	NONE- PARKED CAR MOVED WITH WATER ON ROAD- MARCH 2013	Significant depths in 2008 simulation
38	March 2013	back patio approx. 50mm depth, sandbagged to prevent ingress to house. Backyard to 100mm approx.	Modelled depth of flooding 50 - 100mm in backyard and patio

42	2001 (not consistent with BOM diary), 30/11/2011	2001- 313mm in one hour. End house (No 8) had water right through- ruined floor coverings, about 0.5m to 0.6m of water over the street, and Honeysuckle Ave as well. 30/10/2011- Hugs storm- hail and rain	0.5 - 0.6m in street in 2008 simulation, reasonable match
60	2015	There was also 2 black plastic grated pits that also could not cope with this deluge resulting in water 4 - 6 inches deep running over pebblecrete and concrete. Internal damage. The water entered through weep holes in lounge room only.	Report appears mostly property drainage related. Some localised ponding around dwelling
61	2-3/3/2013	water rushing through and down properties next door and down the street flooding, the water was coming down from across Ocean Drive into the back of said properties. Houses down the street were being	Depths 0.2 - 0.4m in the area
65	No flood event specified	Reports of significant surcharge from stormwater pit	Model shows surcharge flows of 0.9m ³ /s
68	2013?	Road was flooded approx. 6 years ago due to very heavy rain and blocked storm drains.	Flooding 0.3 - 0.5m deep in 2013 event
79	June 2008	The water from no. 7 unit 2, then streamed down in front of unit 2 and into no. 6, which together with the water from no. 1 flooded unit 2. (SES attended, leaving sandbags). Resulting in resident in 2/6 getting out of bed into 10cm of water. Carpet was replaced throughout and some lounge furniture was ruined.	Model shows overflow from drain and flooding around Unit 2 to depths of 0.3m and adjacent properties but no overflows through no 7 (or 5). Possibly improvements made to drain in recent years
86	No flood event specified	Flows emerge into yard via piping in subsoil from drain uphill of property	TUFLOW model does not simulate subsoil flows but shows surface flows overflowing from drain
87	5/02/2002	There has only been one occasion that water has gone through my yard, that was due to a cloud burst that produced around 10 inches in a short amount of time. The gully above me could not cope with this downfall. Not sure of the year, think it was either 2002 or 2003. Date of downpour 5th Feb 2002- record from local historians.	Minimal overflow in 2008 sim. Observation was 2002. Condition of gully may have changed over time
89	No flood event specified	Overflowing drainage at Ocean Drive past Christmas Cove Caravan park and before Fairwinds on Southside of road. Threatening water just east of Brother Glen Road on south side of road. See markings on map I have made to indicate where flooding has occurred.	Significant flooding over Ocean Drive west of Lake
90	2001	The February 2001 event was the worst one we have had with the stormwater rushing down the Pelican Court extension road halfway up my thighs, about 26" deep.	0.6m in walkway. unsure if current drainage was the issue
93	03/2013, 3/2014	Both March 2013 and 2014 the reserve was flooded behind us. see photos.	Model shows similar flood behaviour.
95	15/03/2017	No problems observed in 6 years of residing at this address.	No flooding - ok

100	No flood event specified	Map indicates flooding around Quarry and Mill Street area House #1 has had water lapping their premises and I have seen photo's of #3 flooded. The last flood we had seen the water lapping the fence lines and flooding the Haven Caravan Park. Everyone moved their cars in our drive. We need something done with the open gully running down the Street to the river.	Model indicates flood flows from fire trail and adjacent areas 3cumeets in 2008 simulation
102	No flood event specified		Model shows ponding and overflows from roadside drain
114	No flood event specified	The block where the units are was taking all the water into its yard, now it is coming our way more than ever.	Model replicates observed flood behaviour
124	No flood event specified	Garage floods every time there is heavy rain- suspected underground watercourse	TUFLOW model does not simulate subsoil flows but shows surface flows overflowing from drain
129	5/02/2002	As we live on the corner of Laurie Street and Quarry Way we only suffered surface water on the lawn. however, units on the corner of Lord Street and Seymour Street had a brick fence washed away, the Hotel bottle shop, as well as the shops in the arcade were flooded and Bold Street was underwater.	Significant flooding in Bold St and at Seymour/Lord St in 2008 simulation
132	No flood event specified	When heavy rain is falling consistently, our courtyard floods from the house behind our villa	Model shows overflows from Peach Grove and through adjacent property with depths over 200mm in 2008
142	No flood event specified	Property reported as flood affected. No specific observation given.	Model shows flooding of property
157	No flood event specified	Marked as property flooded but no specific report	Not on flow path. Minor ponding of local runoff on uphill side of house
159	No flood event specified	Marked as property flooded but no specific report	Not on flow path. Minor ponding of local runoff on uphill side of house
167	No flood event specified	In the past damage has occurred to the cyclone mesh fence parallel to the gateway Rd in the vicinity	Significant depths of flow against fence likely to result in damage
170	No flood event specified	Trees and debris in drain behind house contribute to flooding into backyard	Model shows flooding into backyard and also overflows from street, ok
176	April 2000	April 2000. Approx. 1/2 metre deep in roadway. Did not get into our house but came close	1m in road in 2008 sim
183	No flood event specified	Flooded several times in the past. Washed away reconstructed bitumen driveway next door.	Whole property flooded including depths of up to 0.3m around the dwelling in 2008, 0.2 in 2013. Ok
187	No flood event specified	Property Almost flooded - top side of land adjoining house about 15cm deep in water	Not on flow path. Model shows ponding to 0.2m on high side of house
199	No flood event specified	In 10 years of living in the said address I have experienced flooding of the road on 2 occasions. Water to the base of my dwelling to a depth of 1m on the road.	Flood depths to 1m in road sag nearby. Minor ponding at subject house.

Draft Flood Study Report



202	No flood event specified	Overflows from laneway resulting in damage and damp in the house	Not adjacent to a flow path or significant drain. May be local or road runoff directed to the path a
205	March 2016	March 2016 the street outside my property was under approx. 500mm water. The easement down the side was a river. This occurred about 2am. By 9am the water had subsided. Following the drain being cleared of debris the drain has been flowing OK since then however the event happened again around the same time this year.	0.5-0.6m in street 2008, significant flow in easement, ok
209	No flood event specified	Creek through property between villas breaks banks and floods through properties, debris blockages of channel.	Model replicates flooding of property in each calibration event
215	No flood event specified	Property reported as flood affected.	Flooding of property and road
218	2011 2013	The fire trail behind this property was flooded twice after two separate rain storms when 250mm of rain fell about 2011 and 2013. The fire trail was overgrown with vegetation and tree branches which resulted in water about 100mm deep running over the bank and into adjacent properties. This runoff ran under the homes and into the garages, the water in the side of my house banked up and ran into the weep holes in the brickwork.	Flows down side of house. Shallow to 0.1m, some localised higher depths
219	No flood event specified	Stormwater drain on Peach Grove (located on the kerb closest to the reserve and opposite the intersection often floods in heavy rain	Sag is flooded to depths of 0.3m in the 2008 simulation
222	No flood event specified	Stormwater overflows from road	Model reflects observations
228	No flood event specified	Nuisance flooding apart from river flooding	Shallow ponding and model matches observations
232	No flood event specified	Flooding damage required repairs by insurer	Model shows flooding at rear of house to 0.3m
252	No flood event specified	Photos will show as the watercourse is not sufficient to handle the amount of water and bursts its banks and floods several properties	Model replicates this flood behaviour in 2008 and 2013 simulations.
256	No flood event specified	Property flood affected - minor	Shallow ponding in backyard 0.05 - 0.1m
262	No flood event specified	The corner intersection of Tunis Street and Lake Street always has problems with flooding.	Widespread shallow flooding at intersection of Lake St and Tunis St and flooding of adjacent property
280	No flood event specified	Creek through property between villas breaks banks and floods through properties	Model replicates flooding of property in each calibration event
285	No flood event specified	Property flooded	Significant flooding of property
1001	March 2013 daytime	Swift flows in walkways between buildings. Approx. 300mm deep, >1m/s down walkway	Flow depths 0.3m and velocities 1.5-2m/s in 2013 simulation

JACOBS CONSULTANTS AND ENGINEERS PTY LTD

Flinders Drive Laurielton	No flood event specified	Previous work done with drainage and regrading verge. Flooding Feb 2008 into garage and nearly front door. Concern that runoff from next door new development is being directed to subject property.	Overflows from road and ponding in driveway and front yard to 0.3-0.4m. in April 2008 simulation.
Lake Street Laurielton	No flood event specified	Water covering Lake Street, Ocean Drive. 50-100mm in car port of property. Five properties in Lake St and Laurielton Gardens Caravan Park also Ocean Dr affected. Photos provided.	100mm flood depths in the driveway of property and car port
Lake Street Laurielton	No flood event specified	Property has flooded 4 times since 2010. Not until units next door were built 2 properties up the street.	Model replicates observed flood behaviour
Flinders Drive Laurielton	2008	Photos attached. Significant flows in rear swale and through fences into property, rubble deposited	Model results of flow depths up to 0.3 – 0.5m with flow patterns (flows through fence) match the April 2008 photos.
Quarry Way Laurielton	2013	Heavily overgrown, many trees down in drain. Reported up to 1m depths in March 2013 on adjacent properties. Sections very porous with springs popping up	Flows in drain immediately behind properties to 0.2m in the March 2013 event, maximum depths of 0.7m on properties.
Castle Street Laurielton	No flood event specified	Excessive stormwater onto property, lapping at back steps and under house	Flood depths 0.2 – 0.3m on low side of house. Reasonable match to observation.
Dalton photo 2008_010 to 2008_014, 049	2008	Flows in swales draining to Pelican Court appear to be 0.3 – 0.5m deep but after peak of storm	Model shows depths of 0.7 – 1.2m at peak of storm.
Dalton photo 2008_015	2008	Photo shows flooding over road verge to property fence line, depths of 0.1-0.2m against brick wall	Model shows depths to 0.1m and similar extent
Dalton photo 2008_019	2008	Photo shows large quantity of rubble and gravel deposited on driveway from adjacent creek	Good match by model to observed flood behaviour with depths 0.3-0.4m in peak
Dalton photo 2008_016	2008	Photo shows S/W side of Ocean Drive east of Flinders Drive flooded, flows just overtopping crown of road, after peak of storm	Peak depths overtopping crown are 0.15m in 2008 simulation
Dalton photo 2008_024	2008	Flooding of Flinders Drive/Ocean Drive intersection to estimated 0.2-0.3m after peak of storm	Peak depths overtopping crown are 0.3-0.4m in 2008 simulation
Dalton photo 2008_047	2008	Rosewood Court at Mission Terrace, flows in road up to approx. 0.2m	Peak depths in intersection 0.3-0.4m in 2008 simulation

Draft Flood Study Report



Appendix E. Design Flood Mapping

Figure E-1 – 0.2EY Design Flood - Peak Flood Depths

Figure E-2 – 5% AEP Design Flood - Peak Flood Depths

Figure E-3 – 2% AEP Design Flood - Peak Flood Depths

Figure E-4 – 1% AEP Design Flood - Peak Flood Depths

Figure E-5 – 0.5% AEP Design Flood - Peak Flood Depths

Figure E-6 – Probable Maximum Flood - Peak Flood Depths

Figure E-7 – 1% AEP Design Flood - Climate Change Scenario Peak Flood Depths

Figure E-8 – 0.2EY Design Flood - Peak Flow Velocity

Figure E-9 – 5% AEP Design Flood - Peak Flow Velocity

Figure E-10 – 2% AEP Design Flood - Peak Flow Velocity

Figure E-11 – 1% AEP Design Flood - Peak Flow Velocity

Figure E-12 – 0.5% AEP Design Flood - Peak Flow Velocity

Figure E-13 – Probable Maximum Flood - Peak Flow Velocity

Figure E-14 – 1% AEP Design Flood - Climate Change Scenario Peak Flow Velocity

Figure E-15 - 1% AEP Design Flood - Climate Change Impact : Change in Flood Level

Draft Flood Study Report

JACOBS

Insert flood mapping

North Berkeley Local Catchments Flood Study

Legend

Peak Flood Depth (m)

- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- > 2.0

Study Area

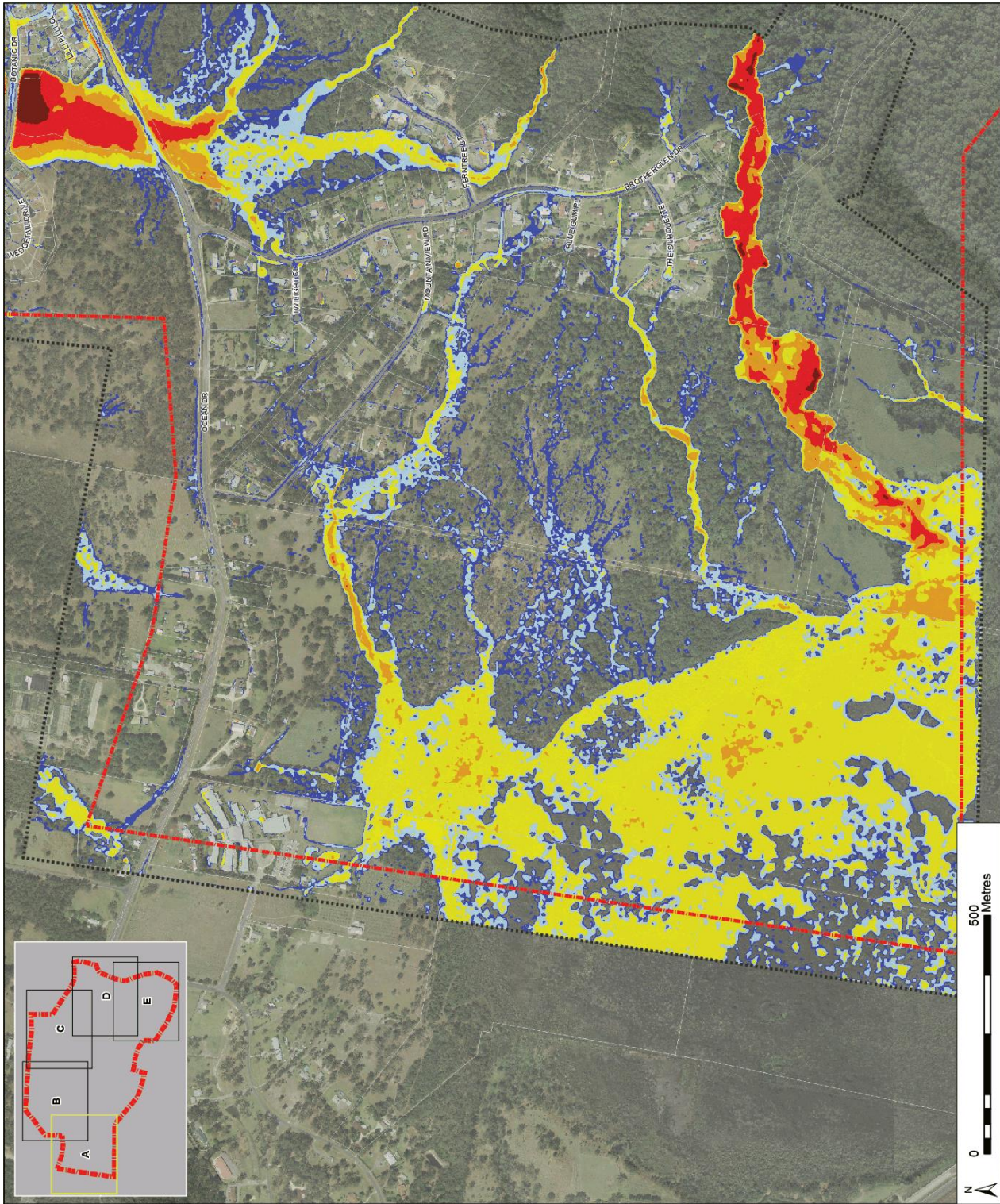
Limit of Mapping

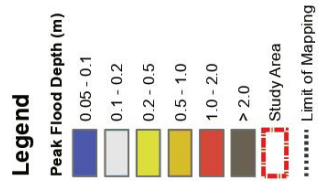
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	0.2EY Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-1(A)
DATE	28/12/2018



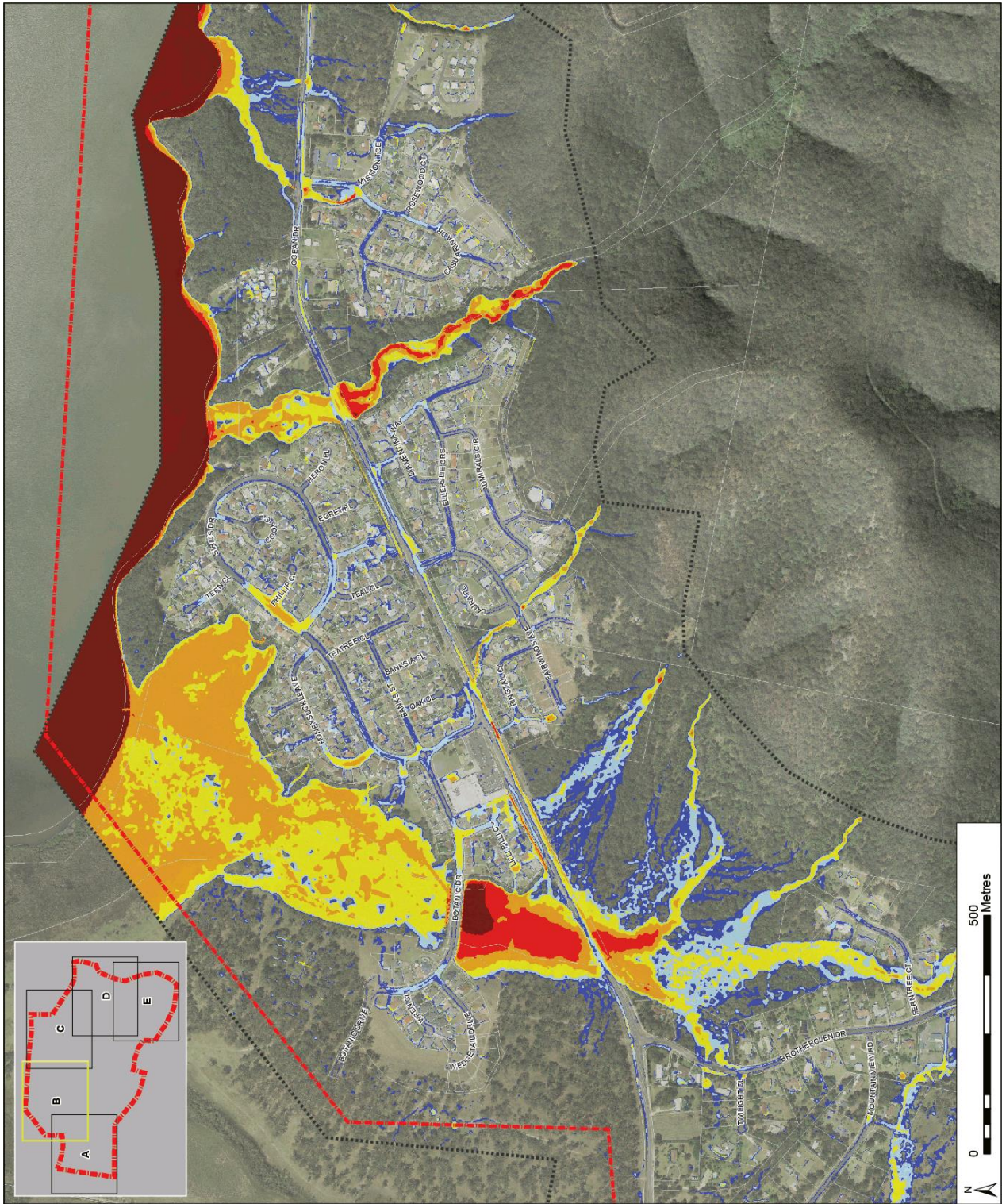


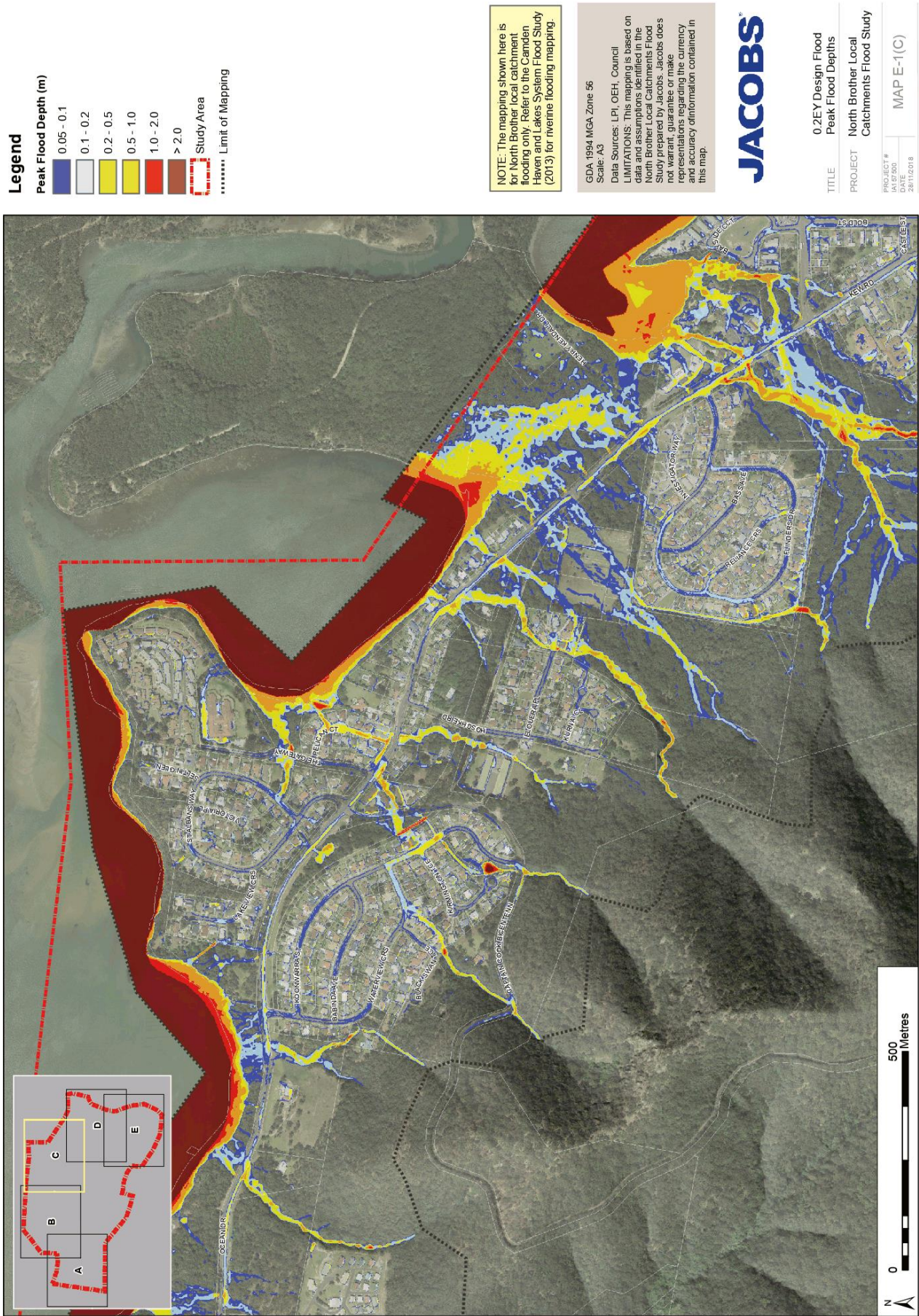
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

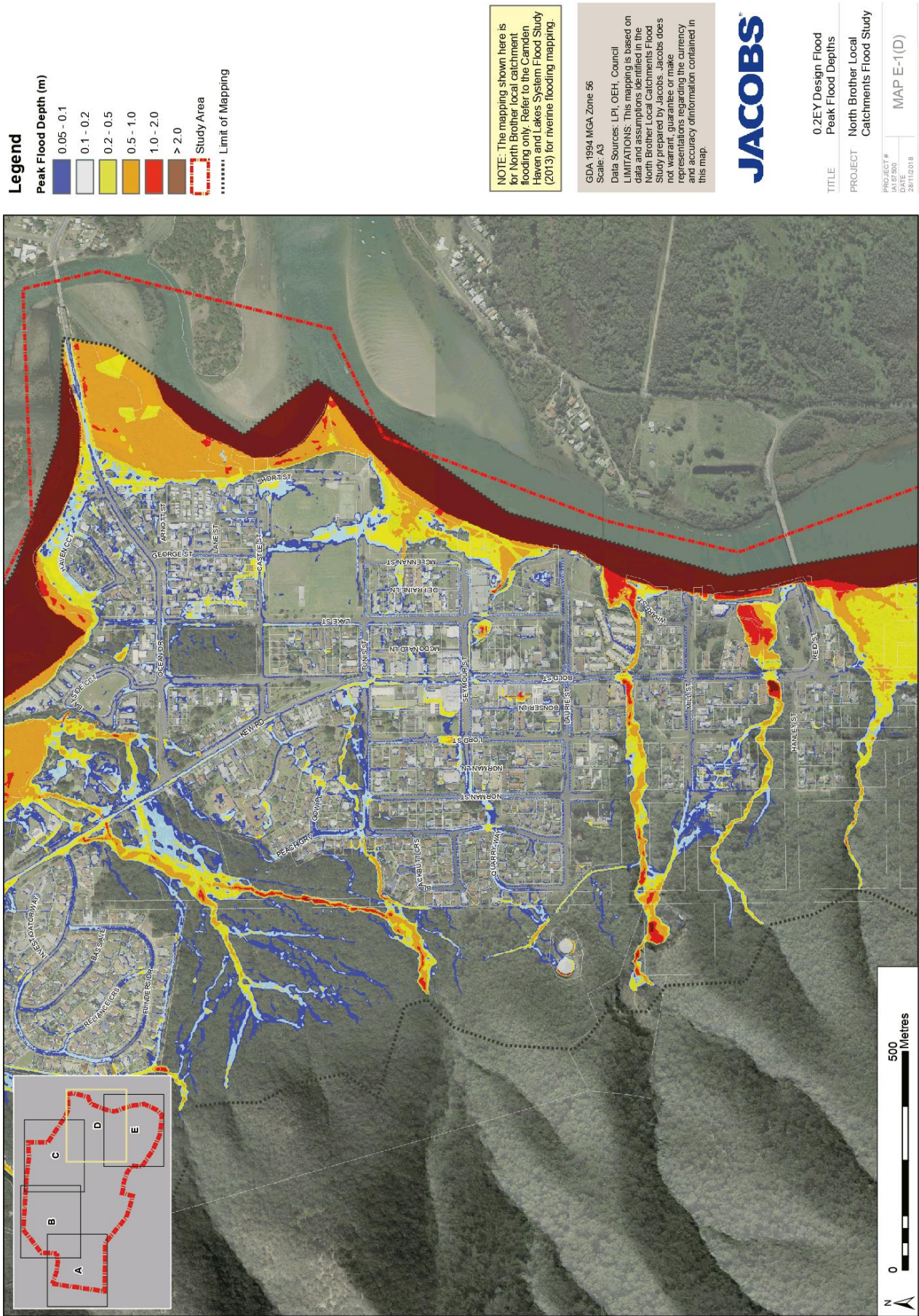
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

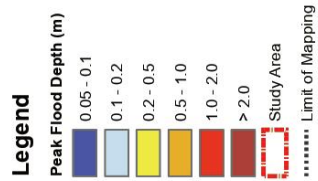


TITLE	0.2EY Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-1(B)
DATE	28/12/2018







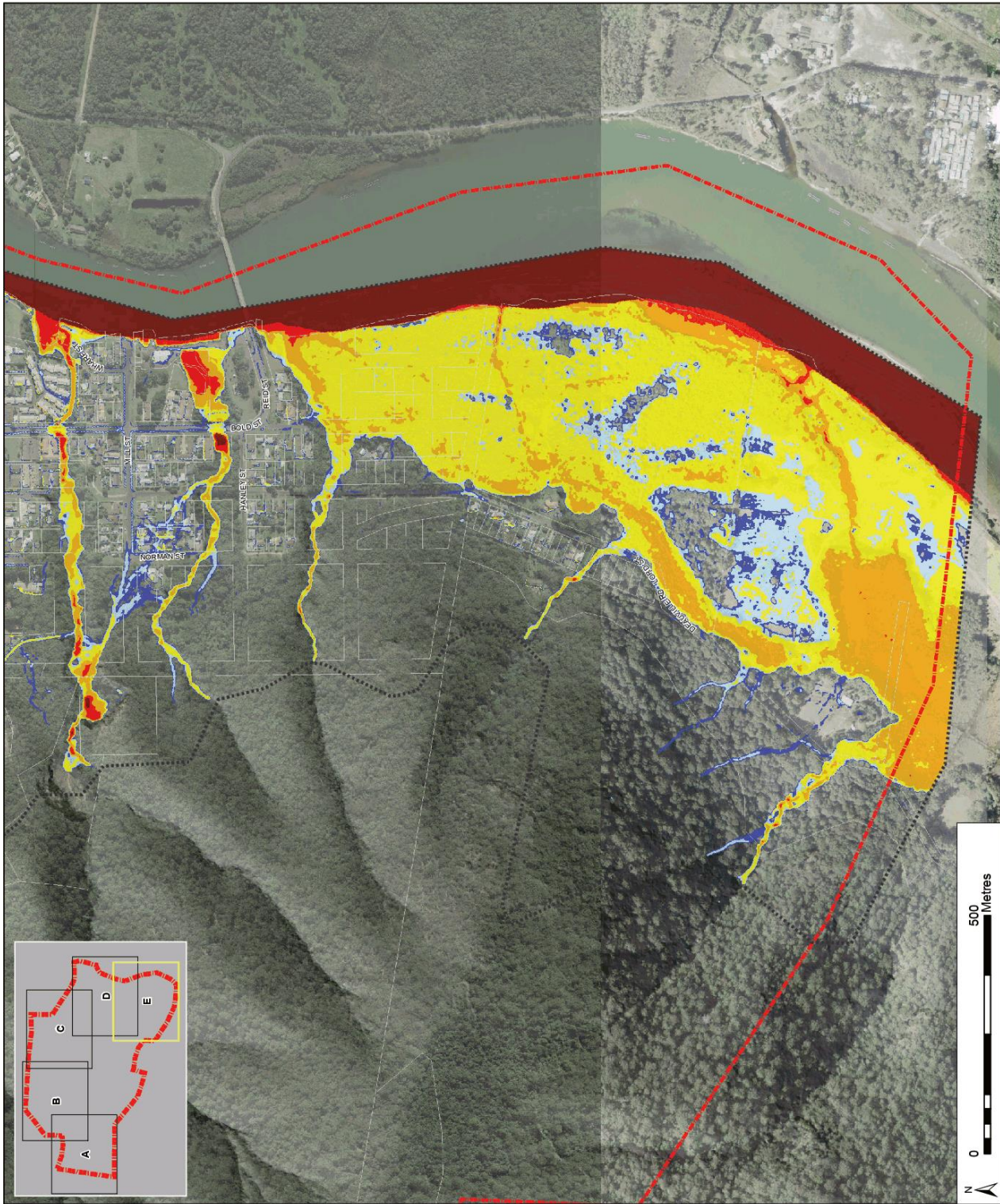


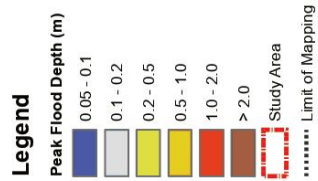
NOTE: The mapping shown here is for North Brother Local Catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	0.2EY Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-1(E)
DATE	28/11/2018



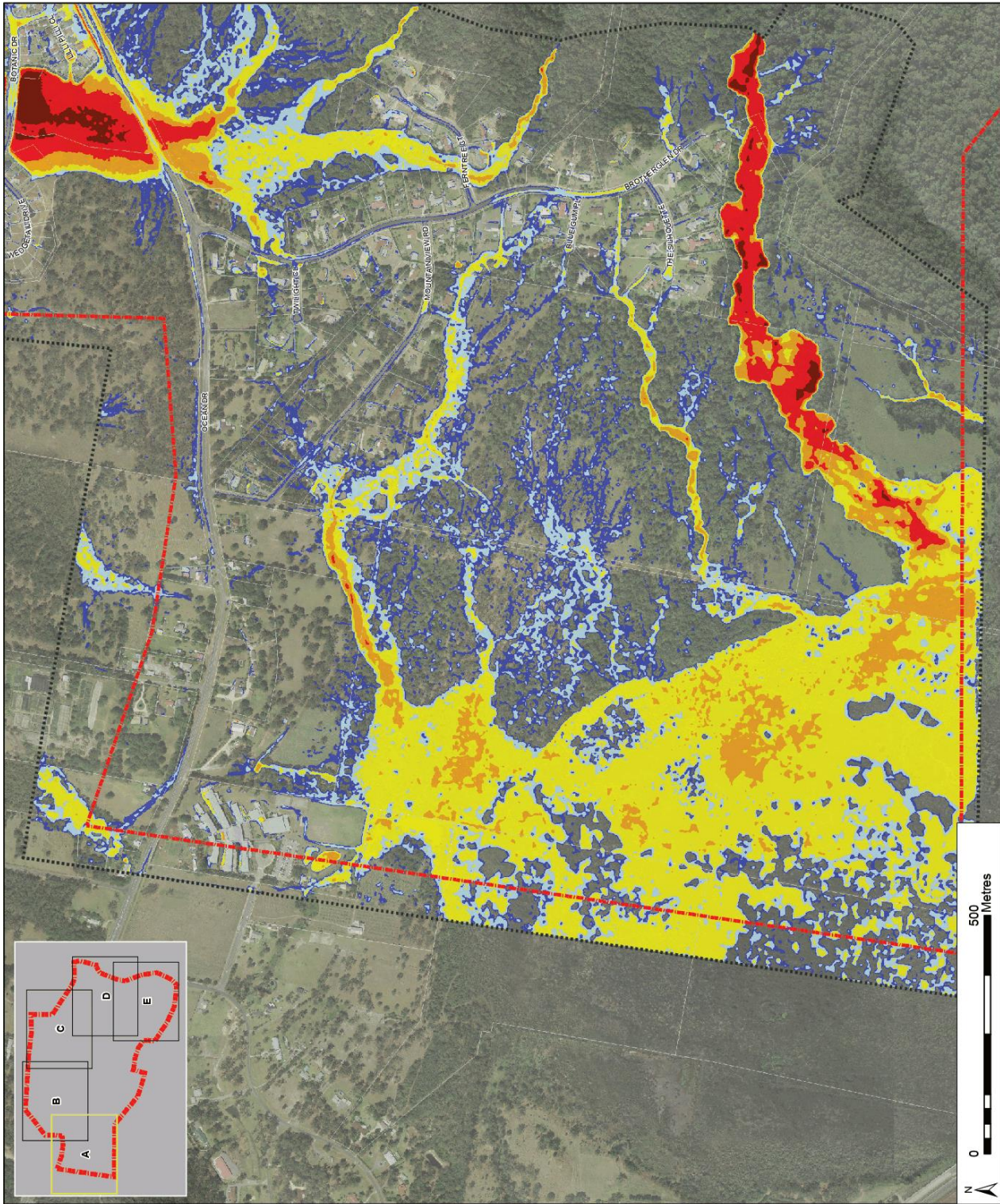


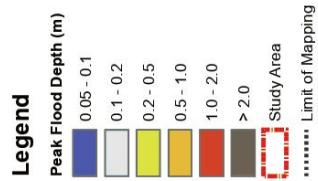
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	20% AEP Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-2(A)
DATE	28/12/2018



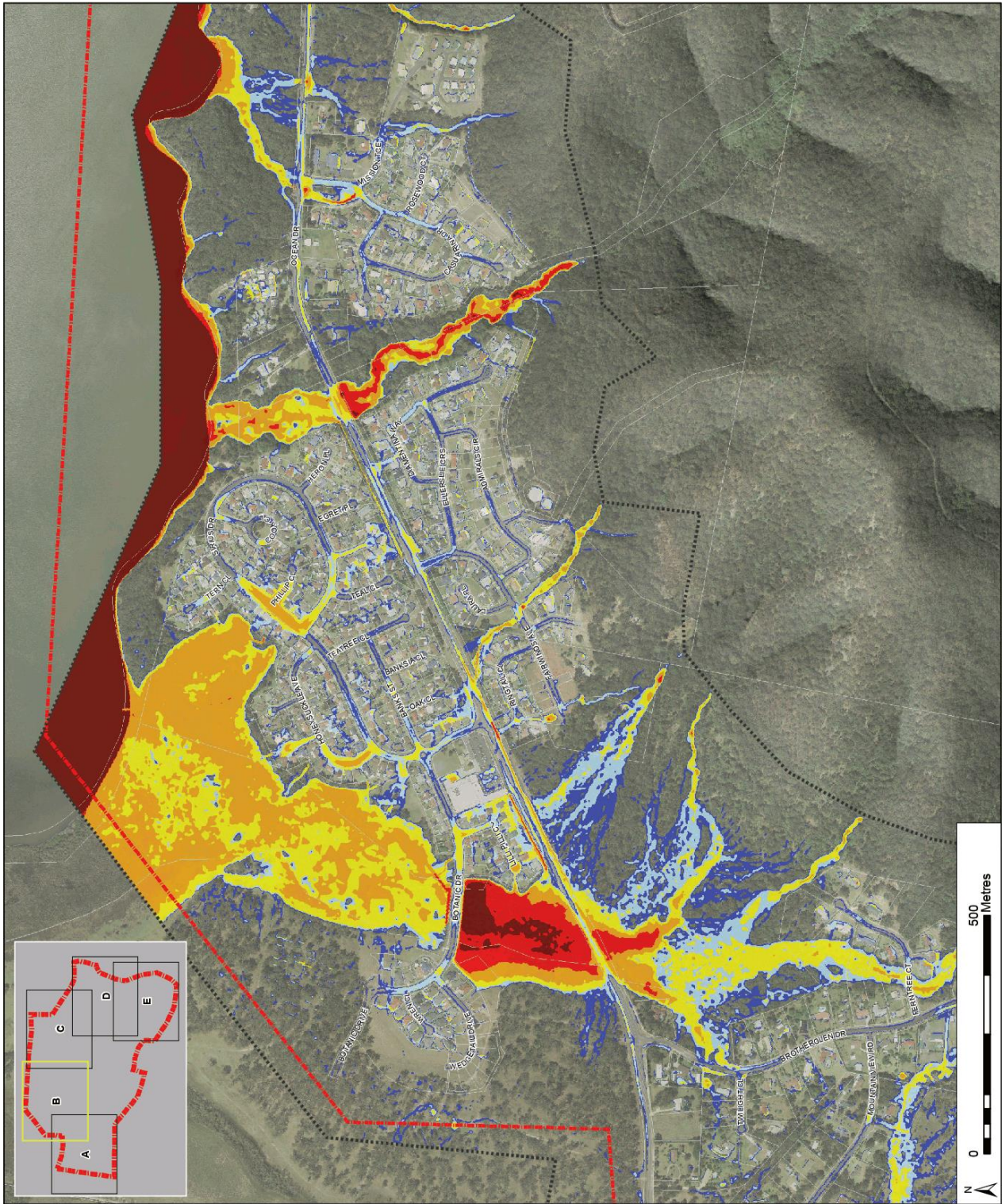


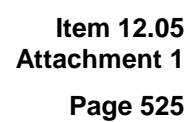
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

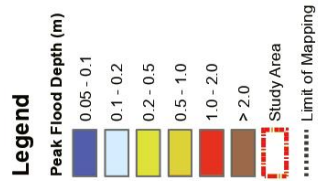
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	20% AEP Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-2(B)
DATE	28/12/2018





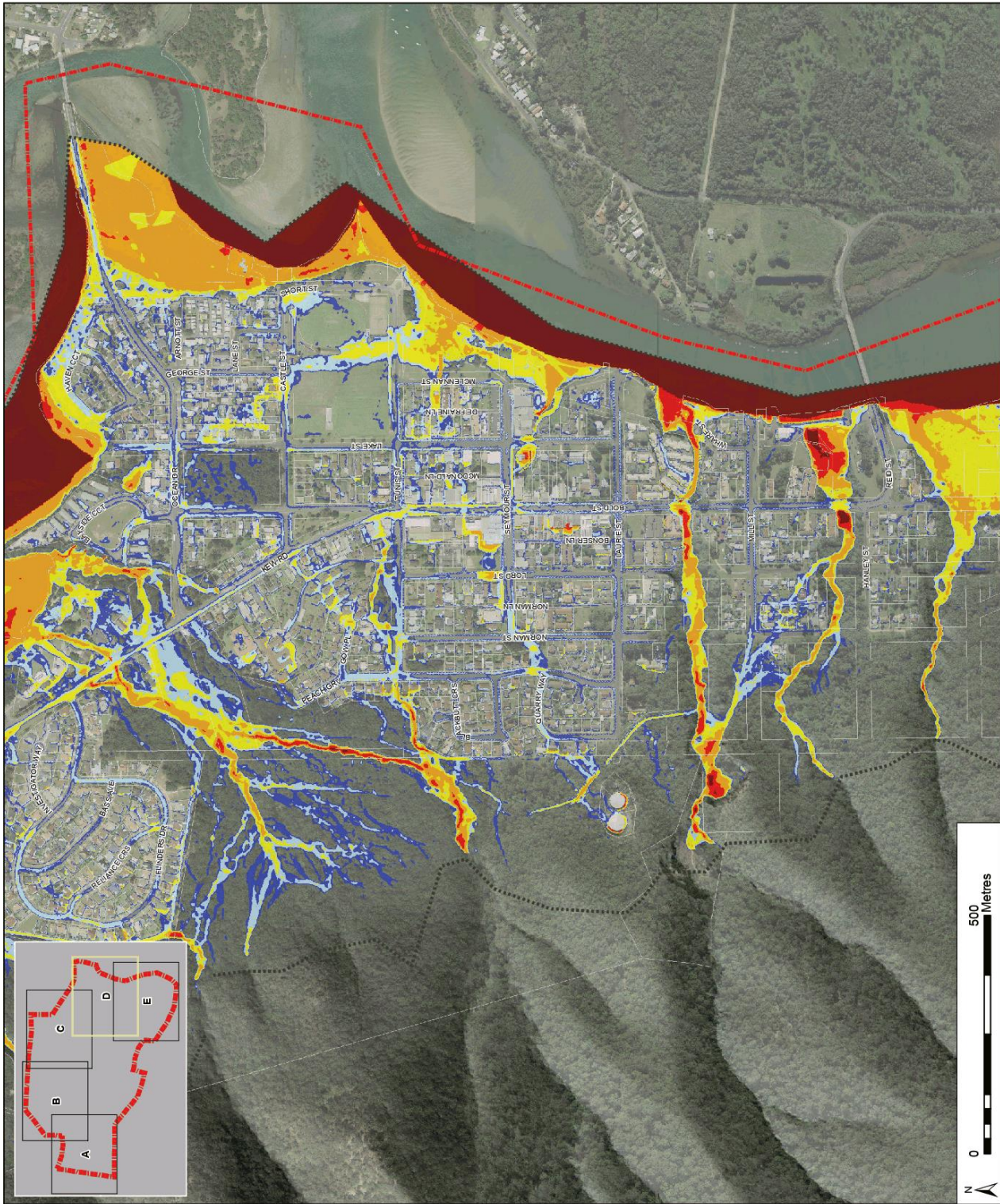


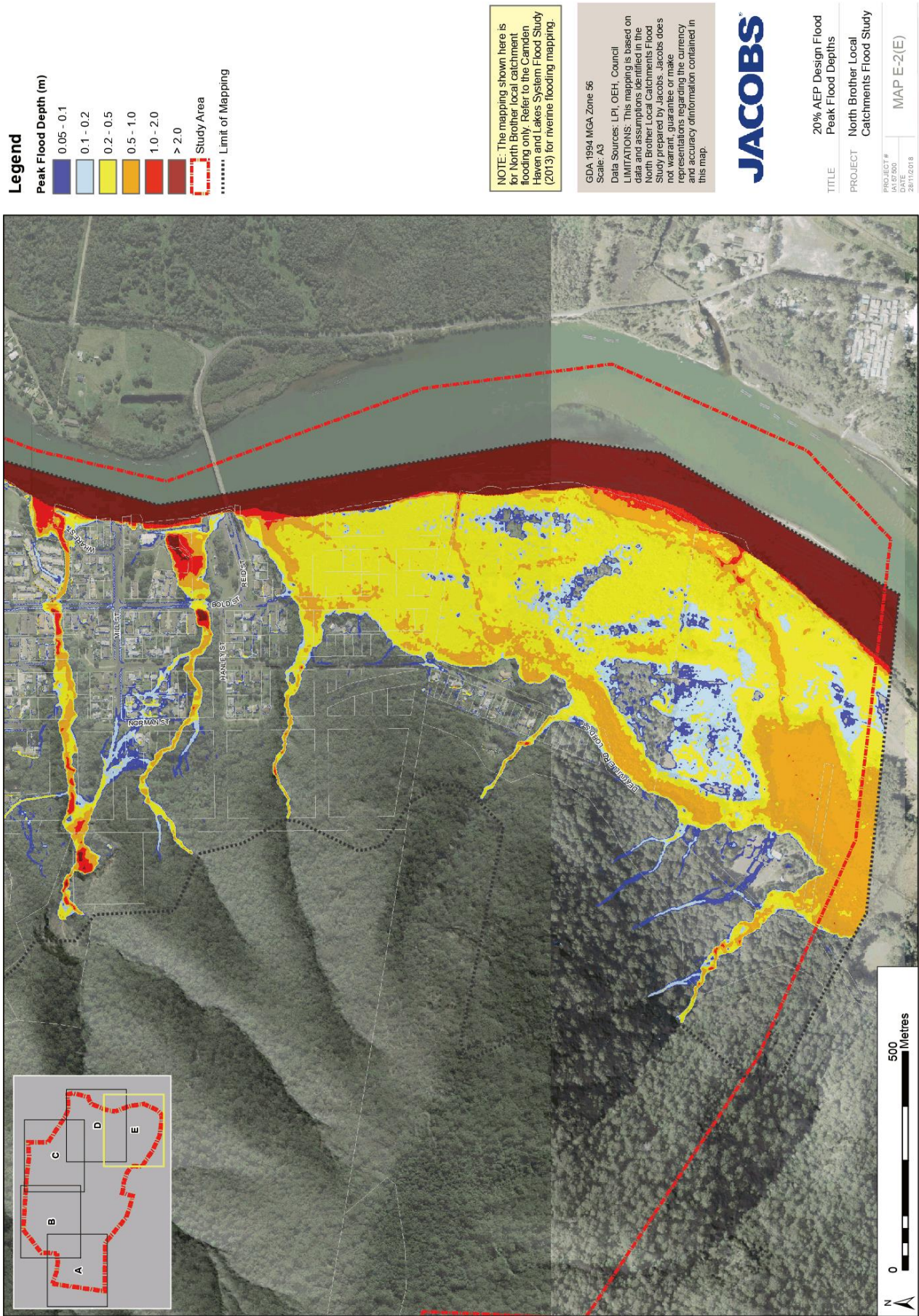
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

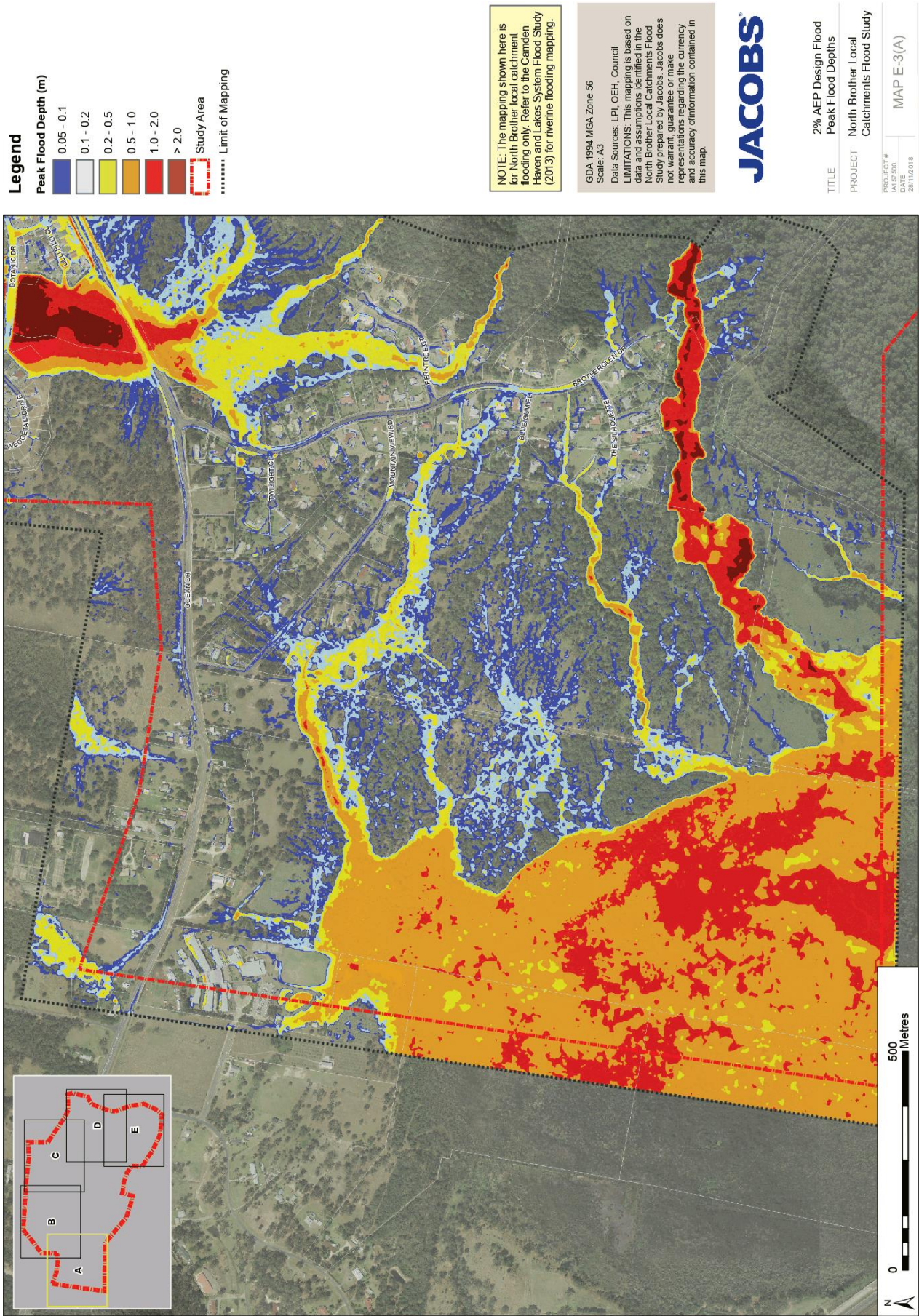
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

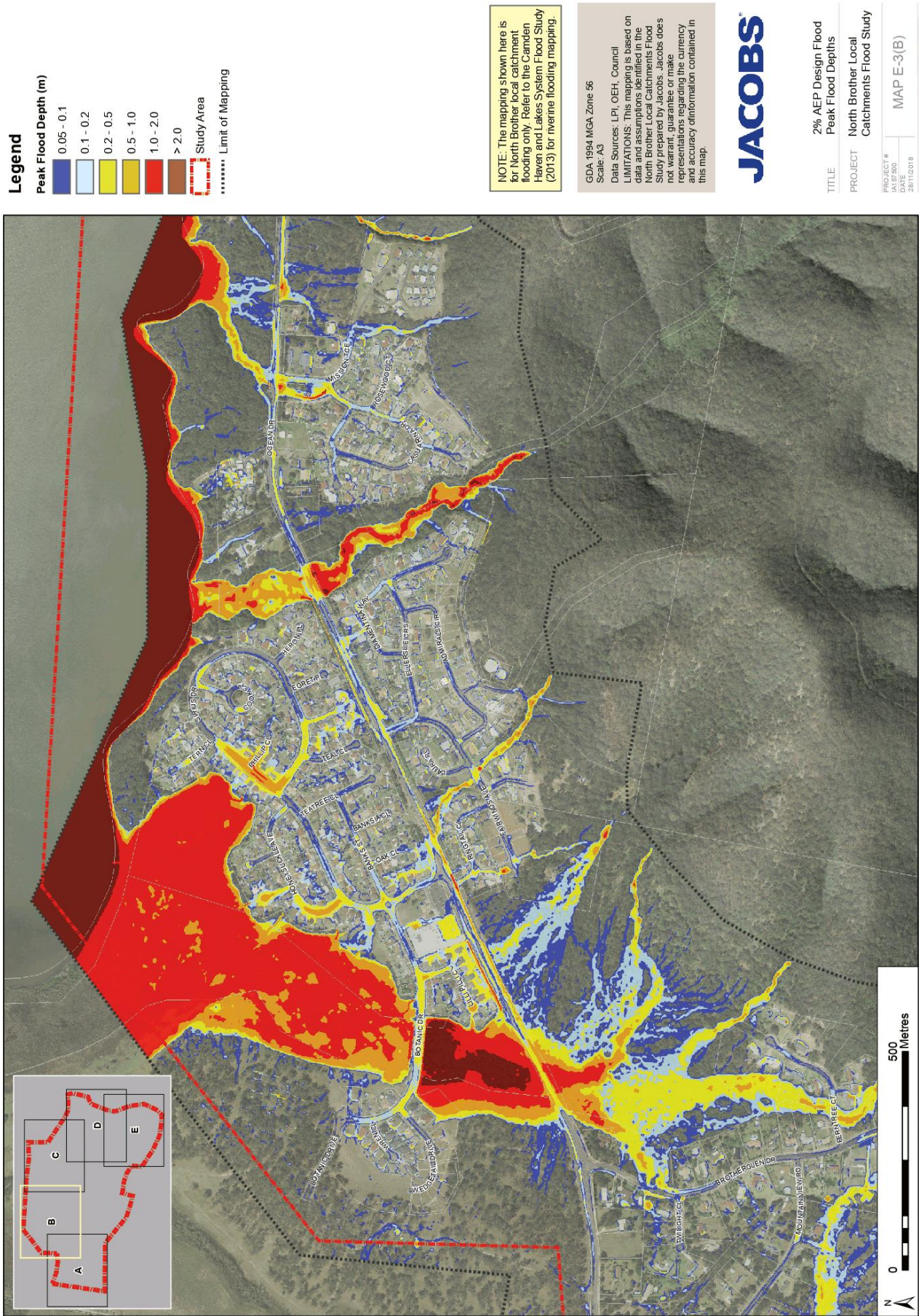


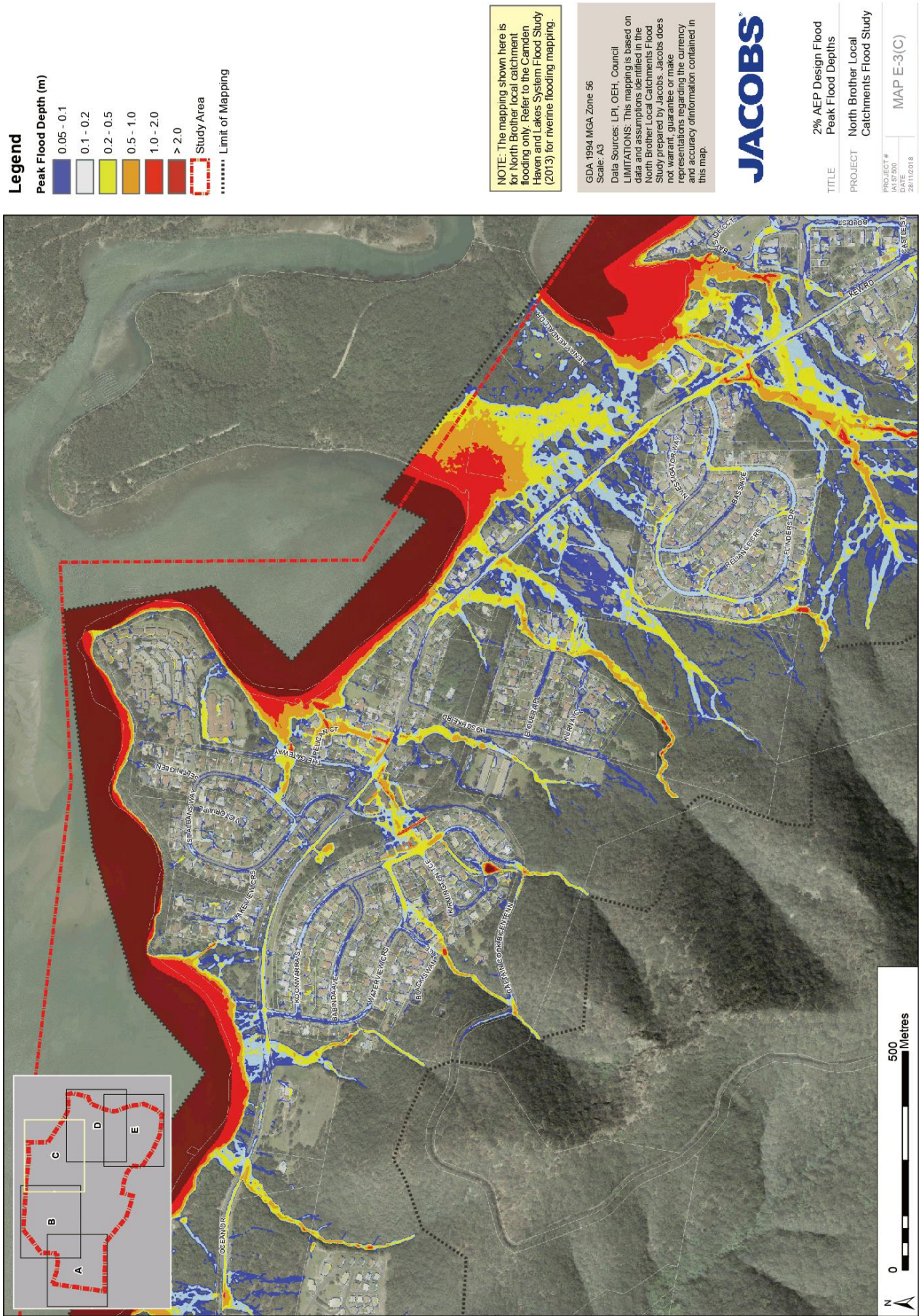
TITLE	20% AEP Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-2(D)
DATE	28/12/2018

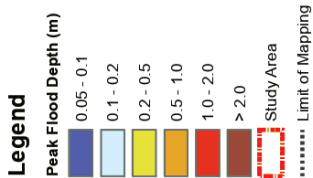










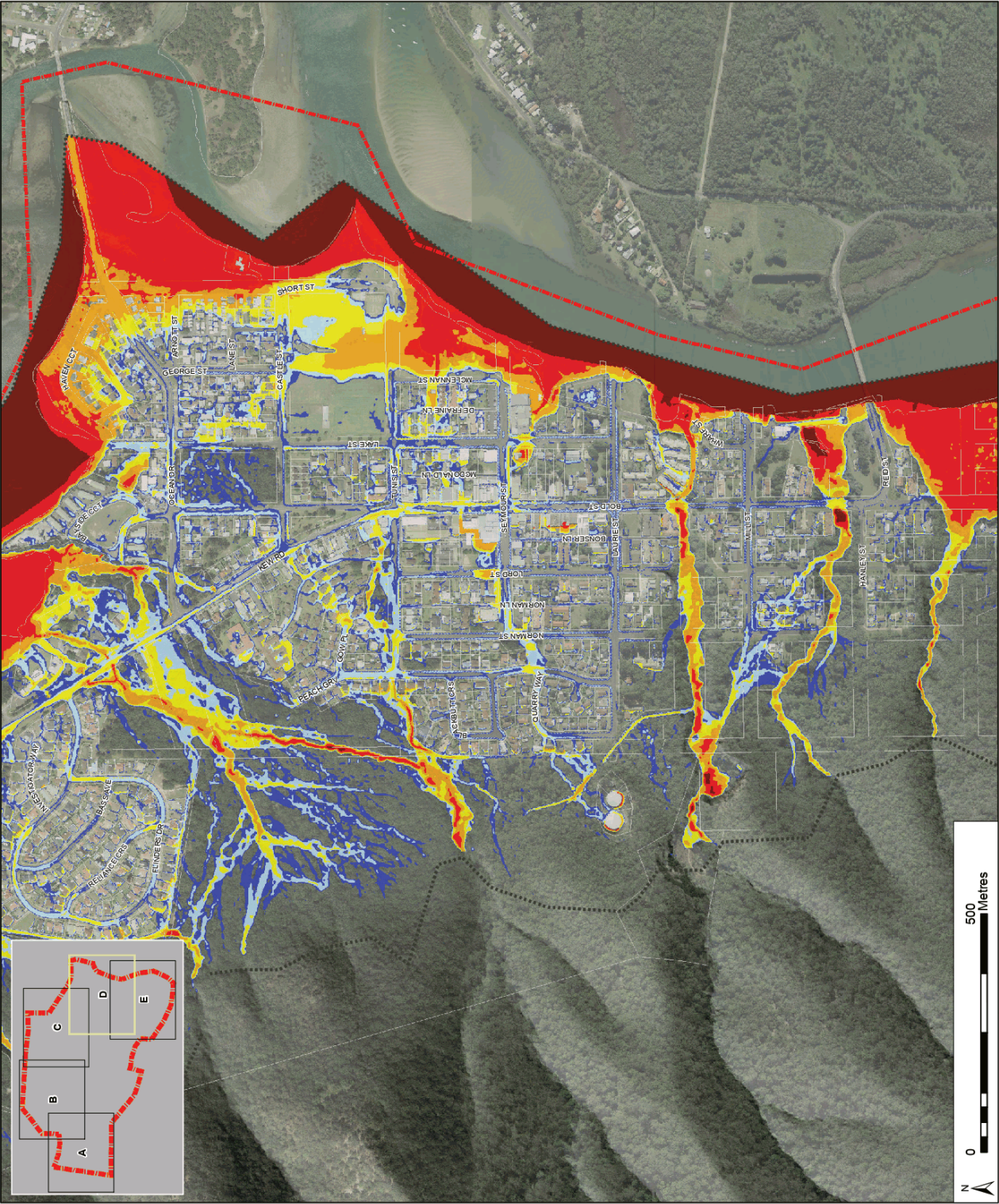


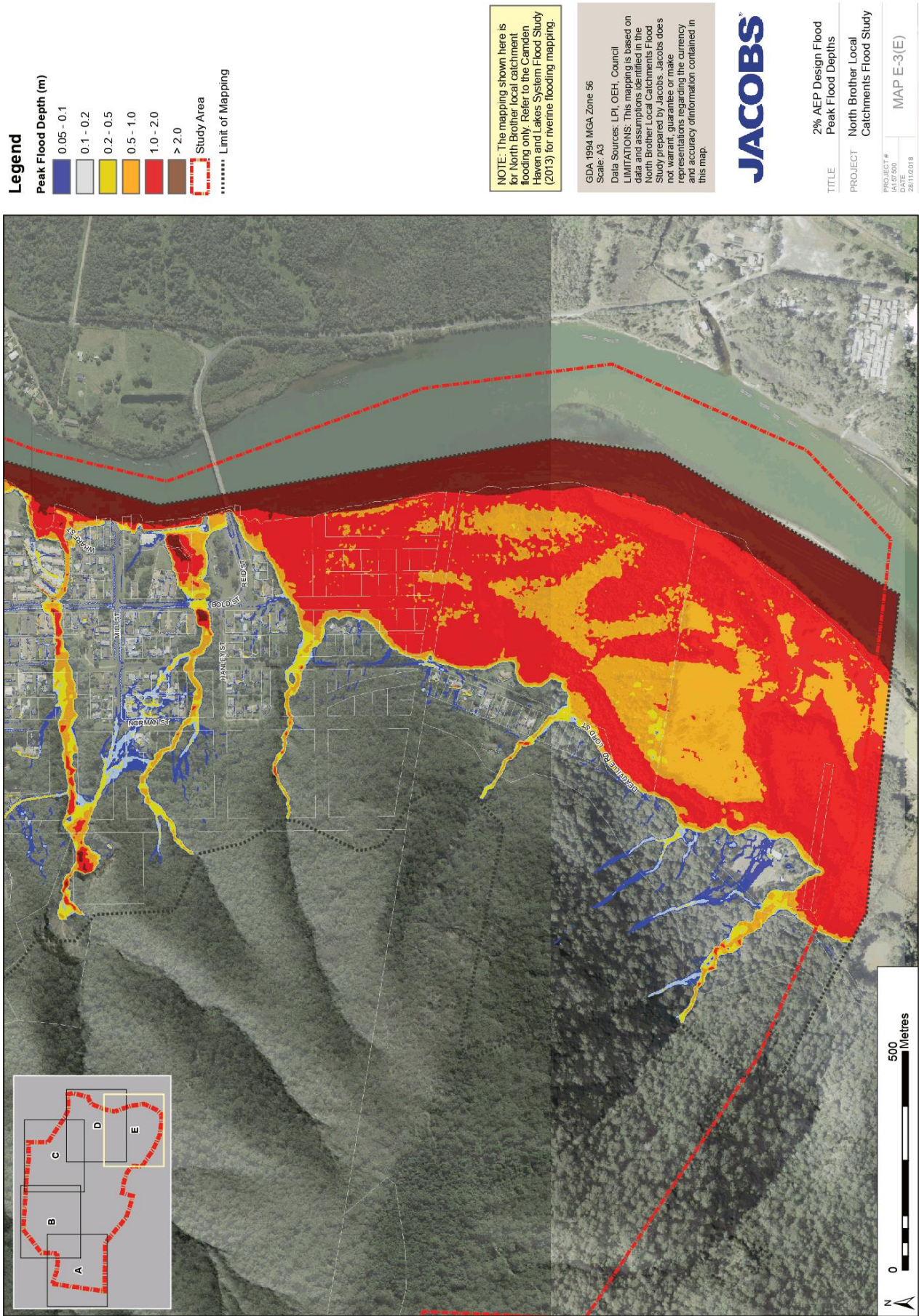
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

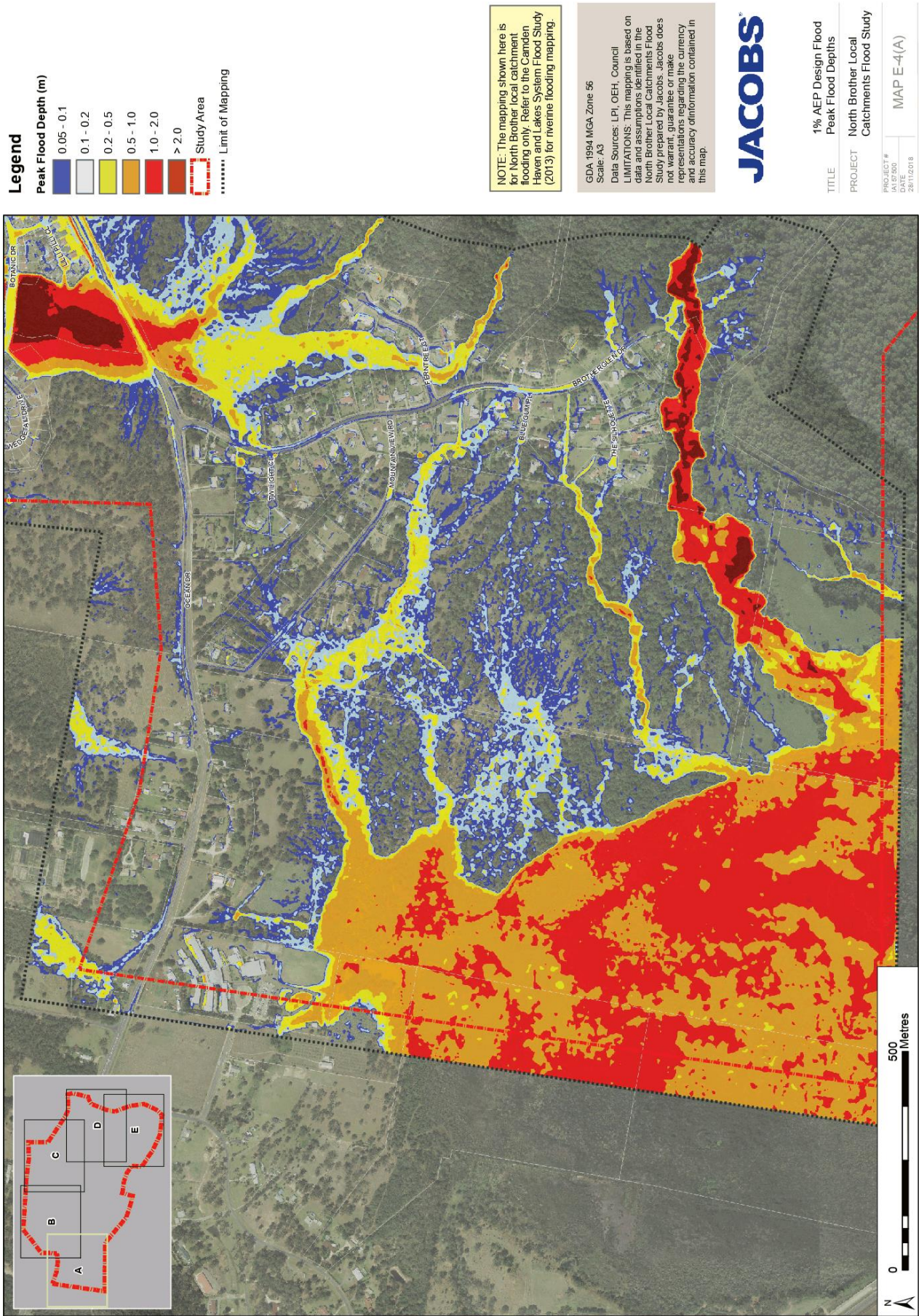
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

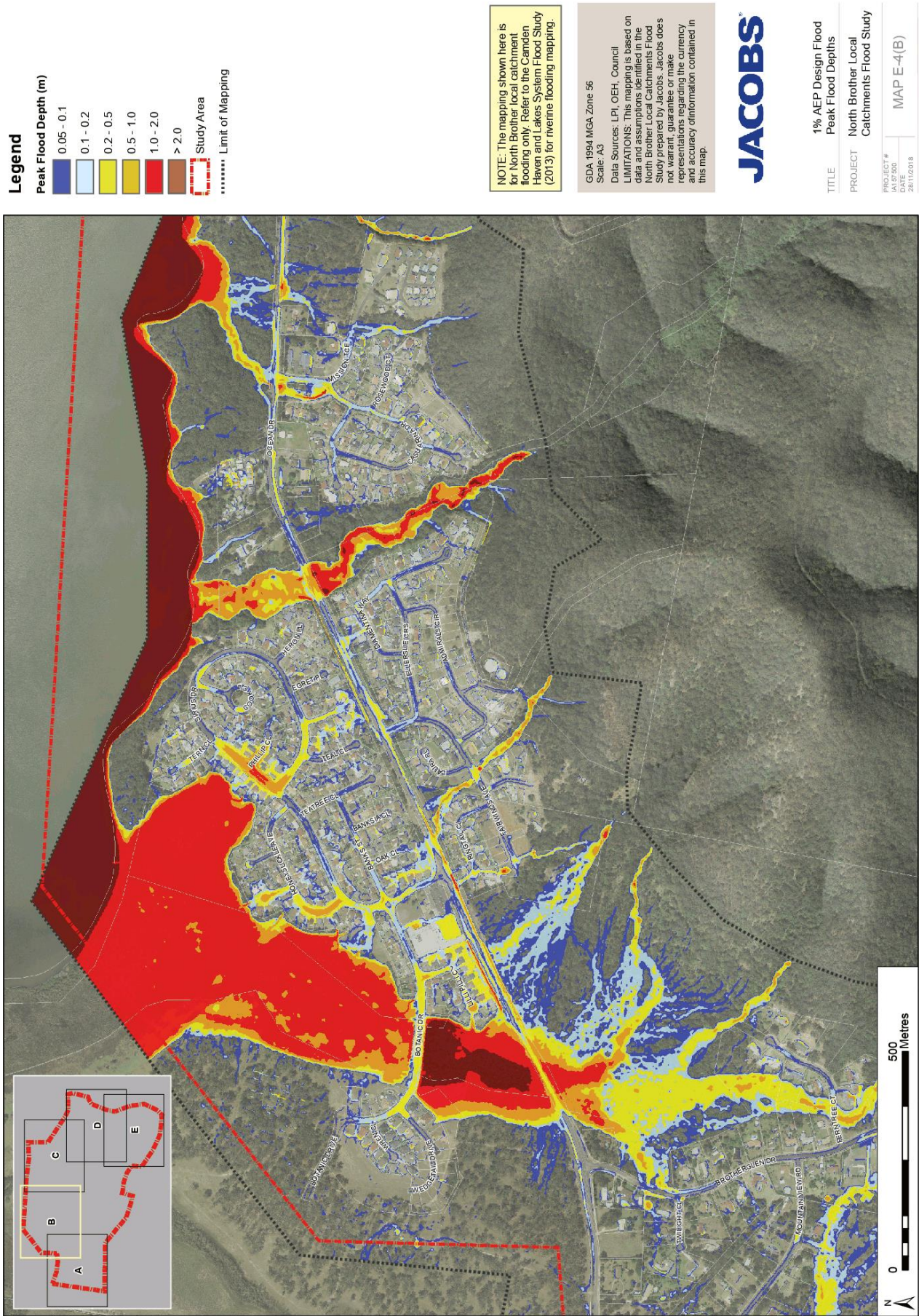


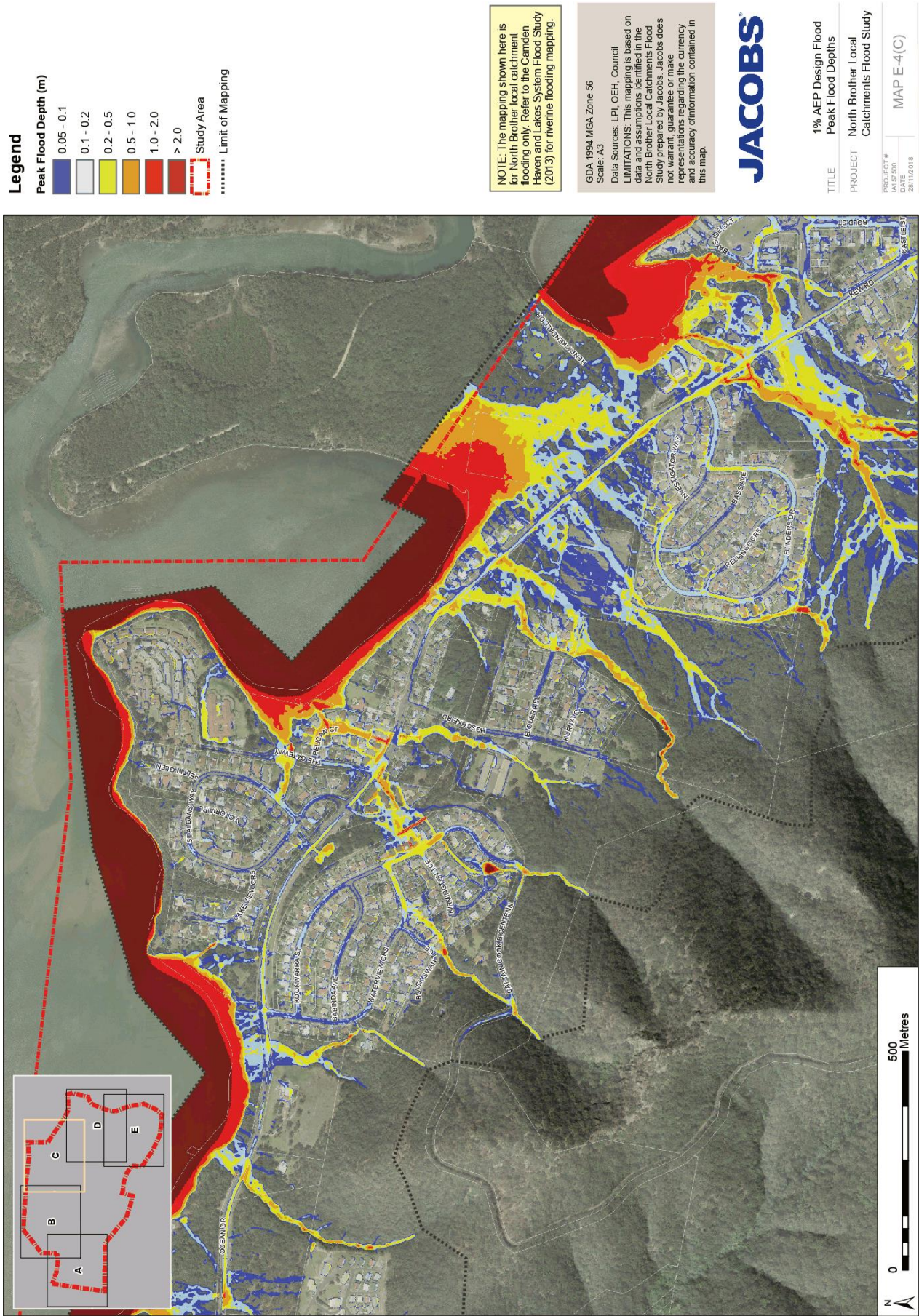
TITLE	2% AEP Design Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-3(D)
DATE	28/11/2018

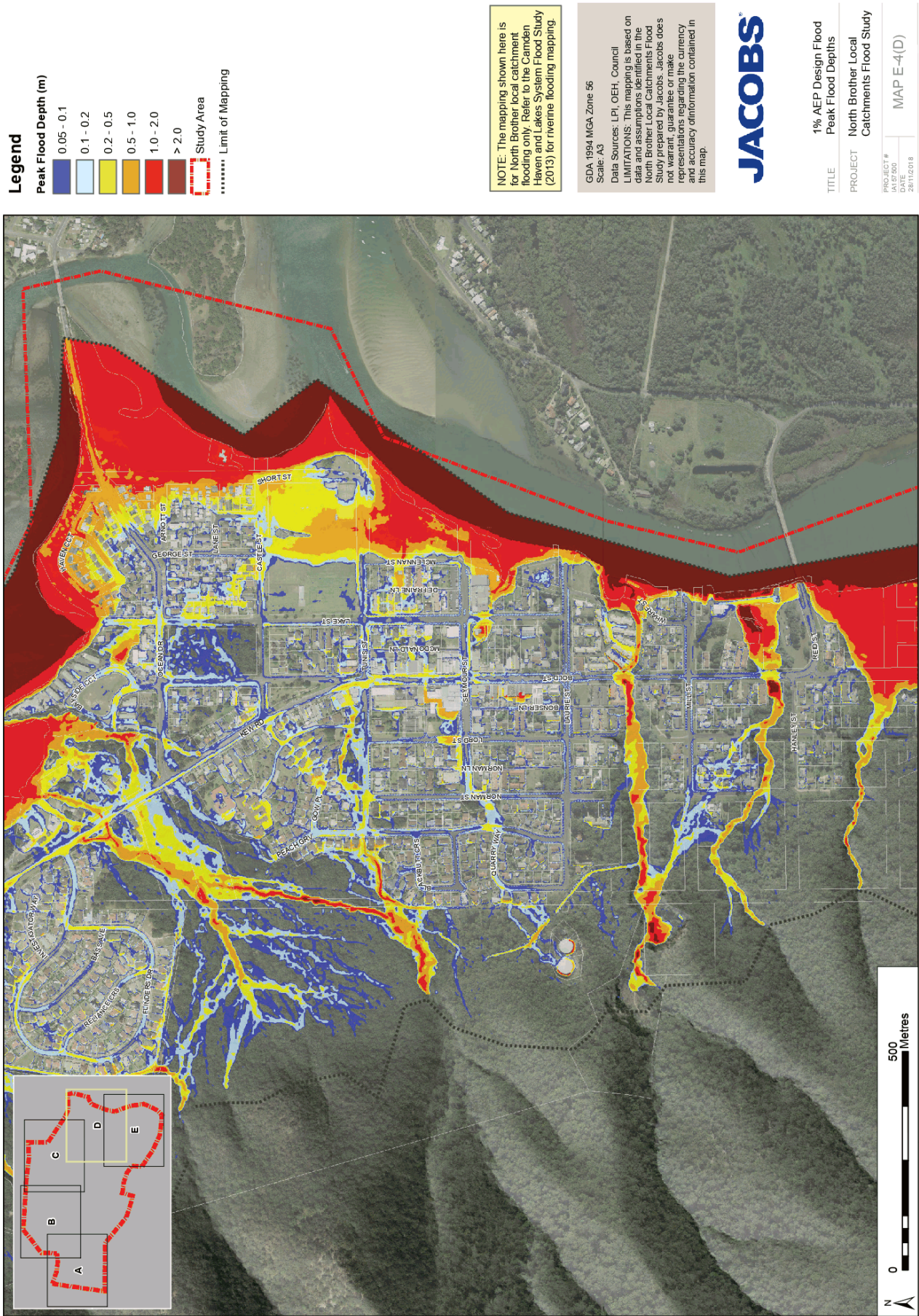


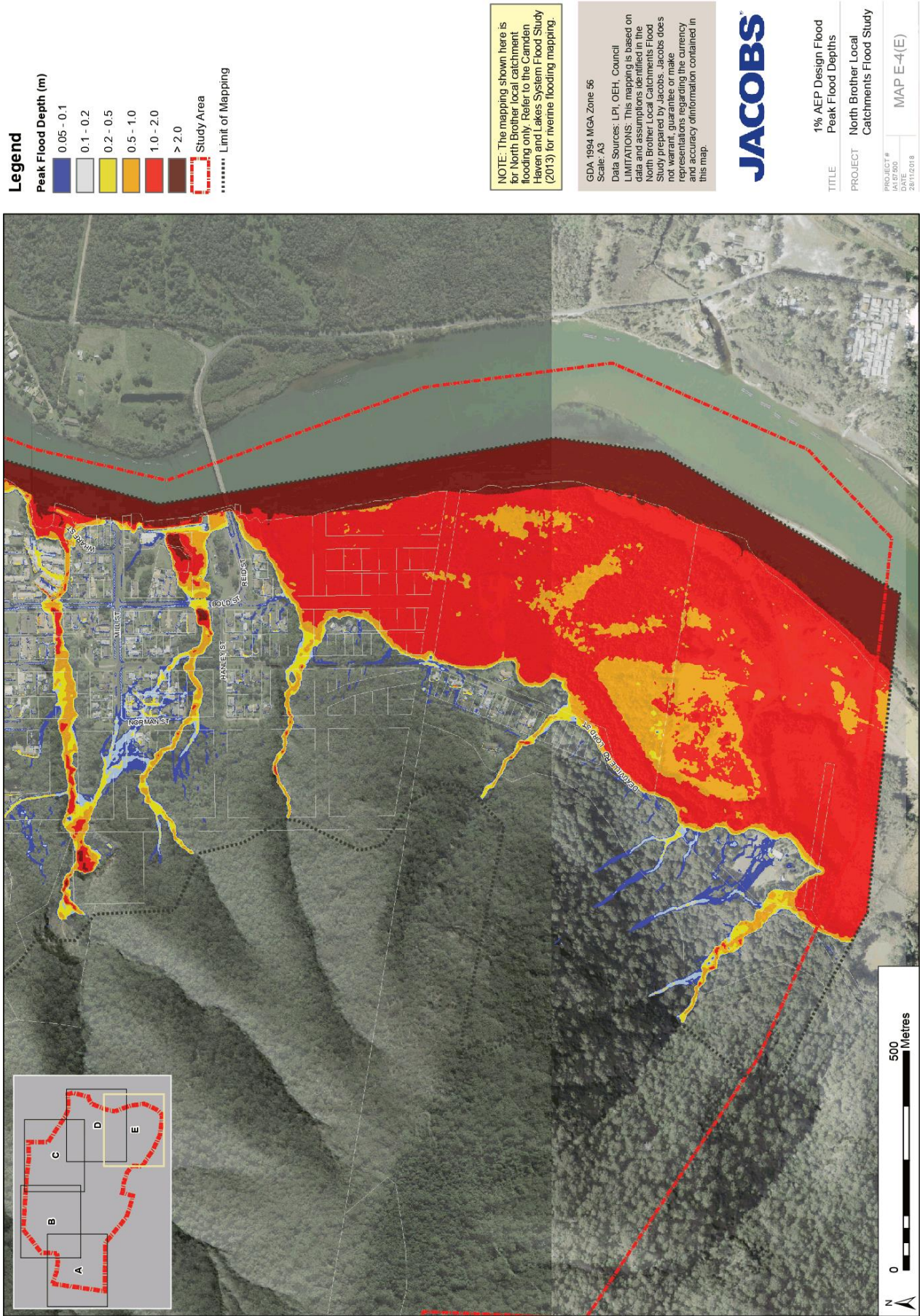


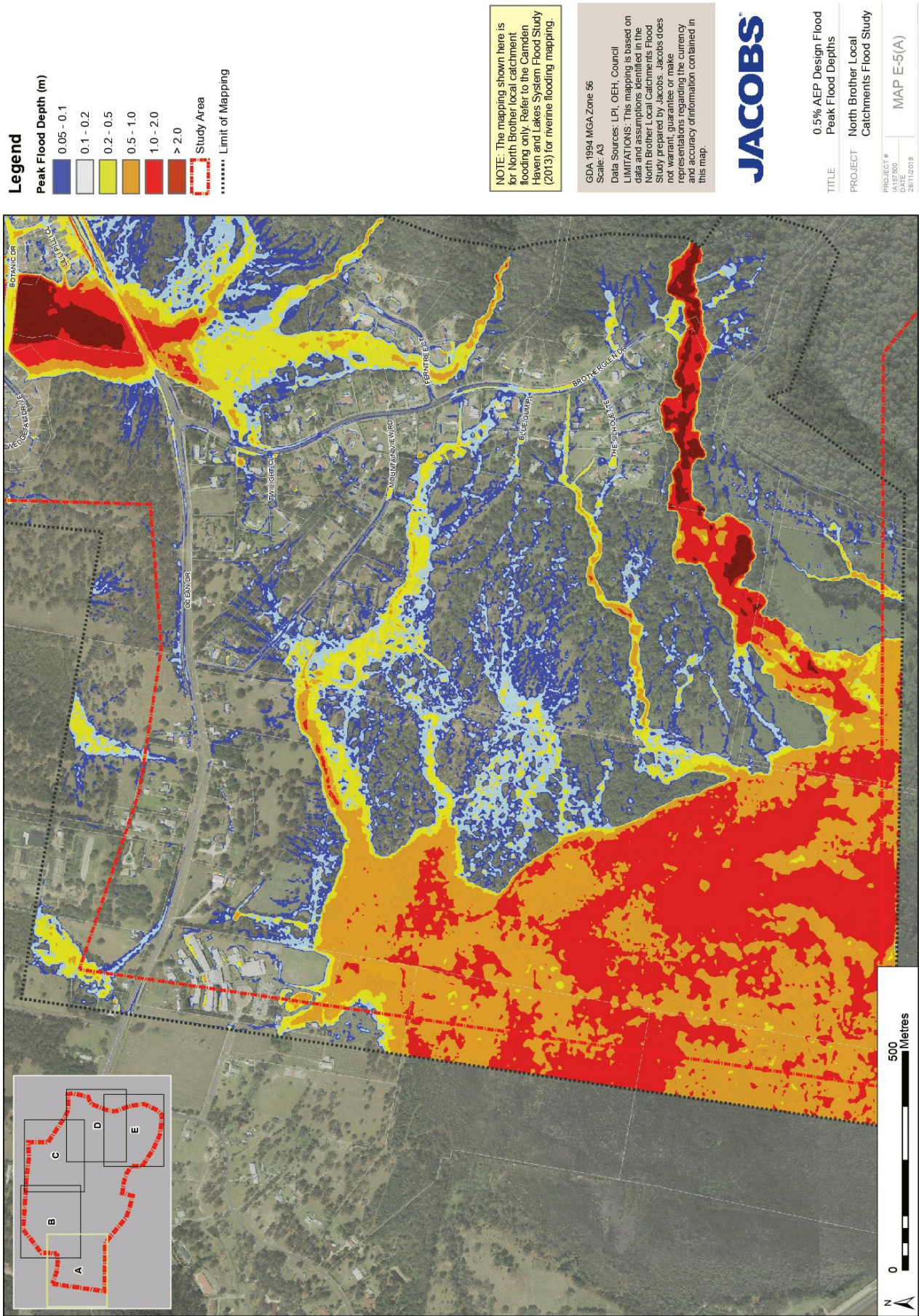


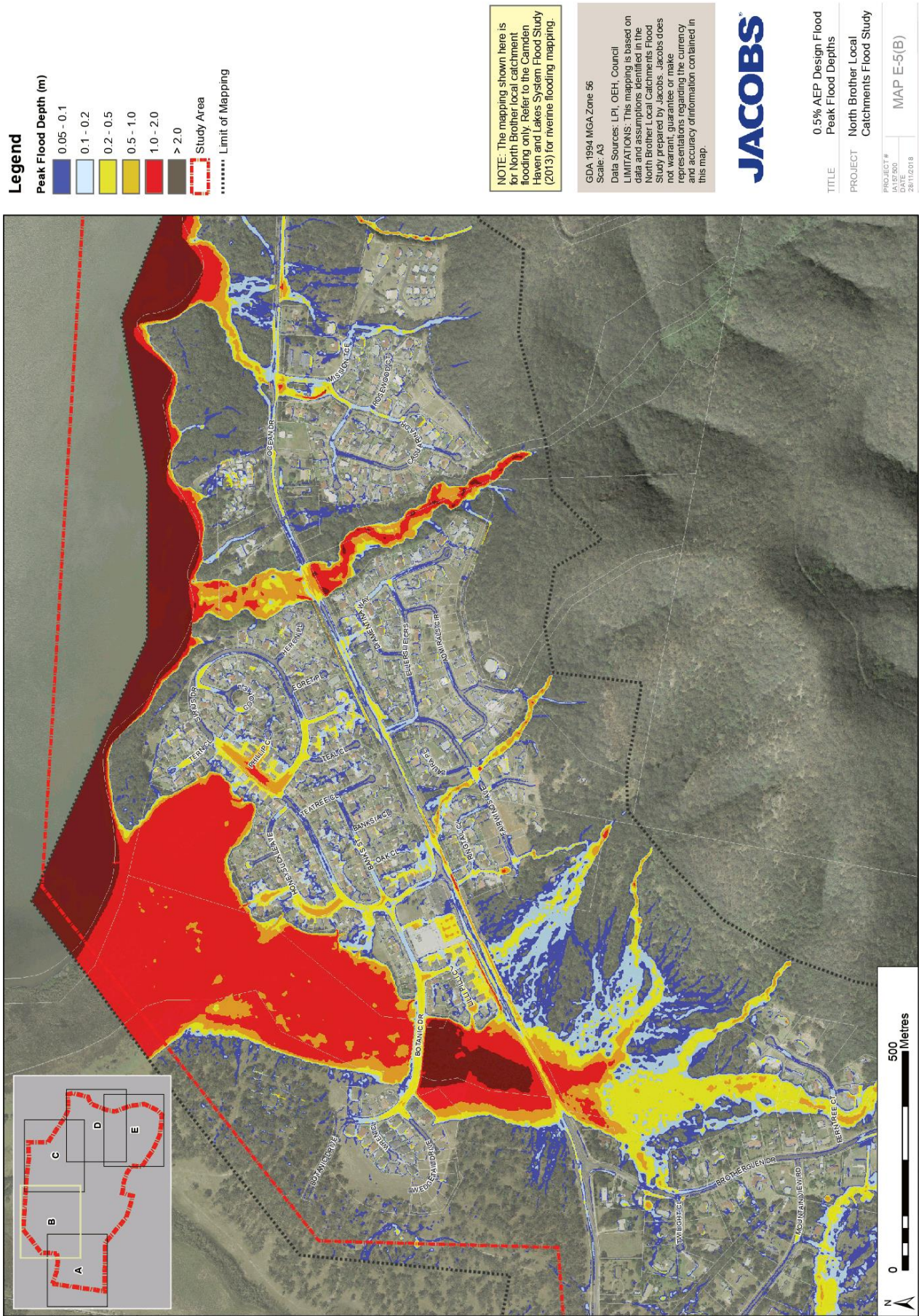


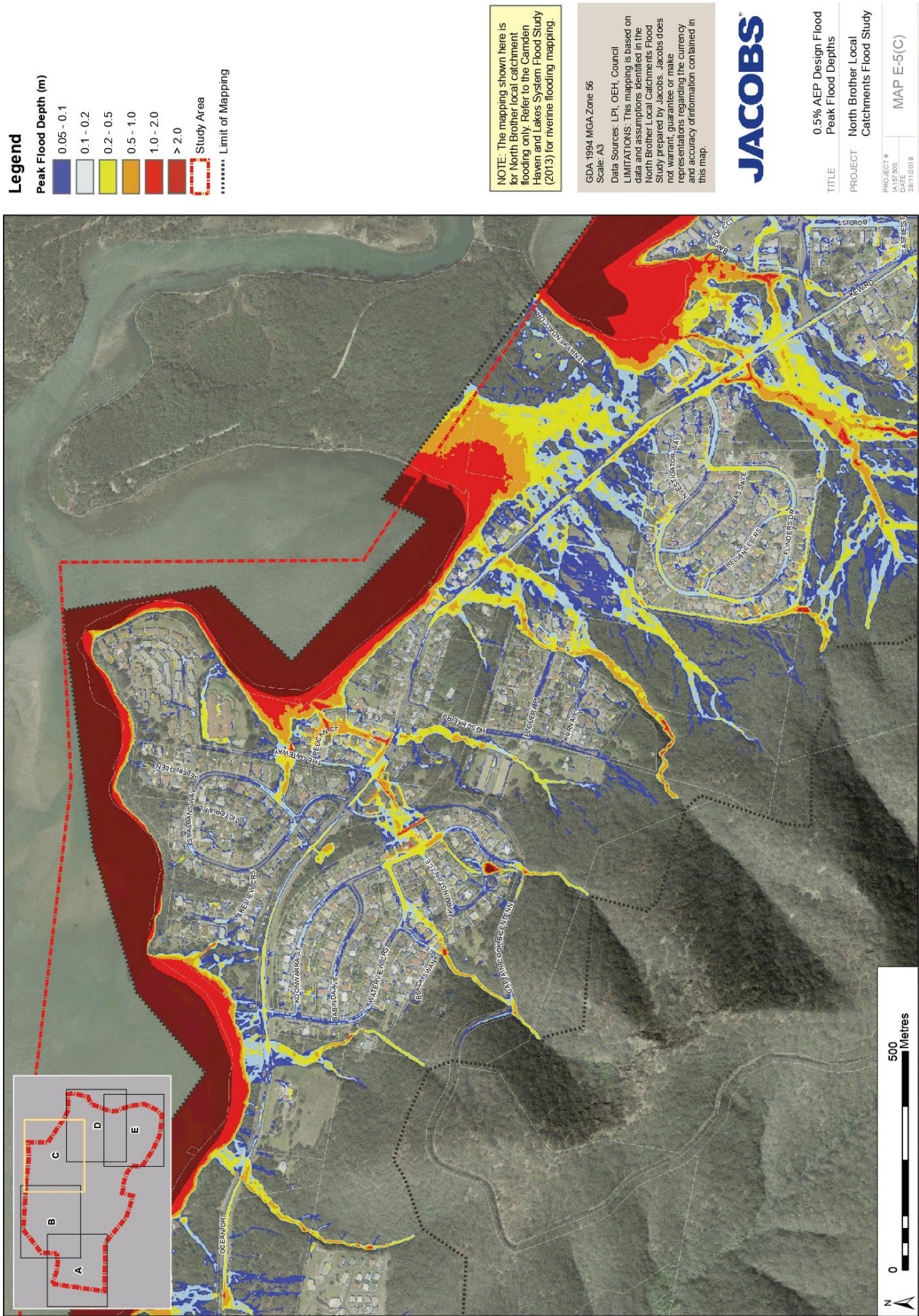


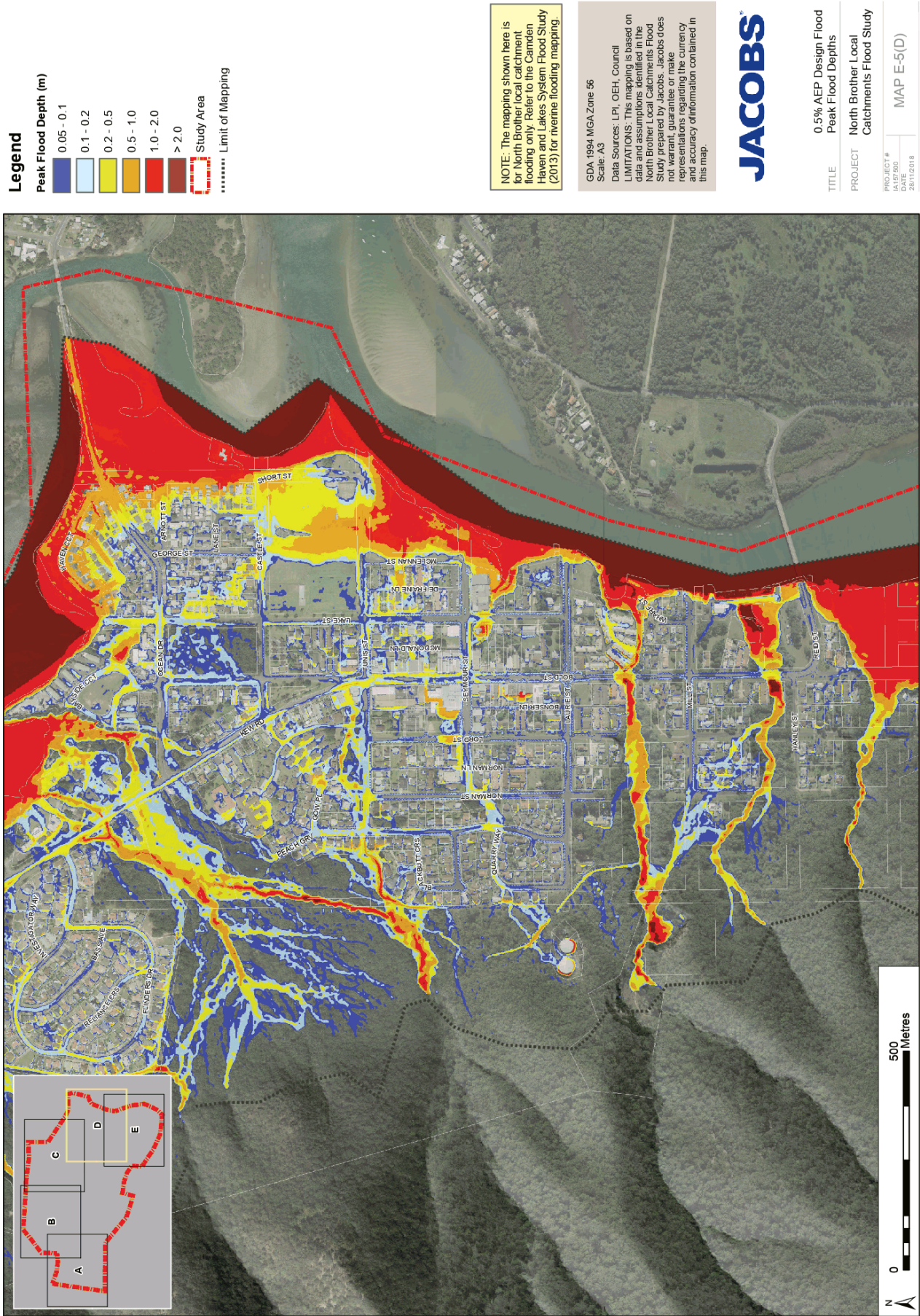


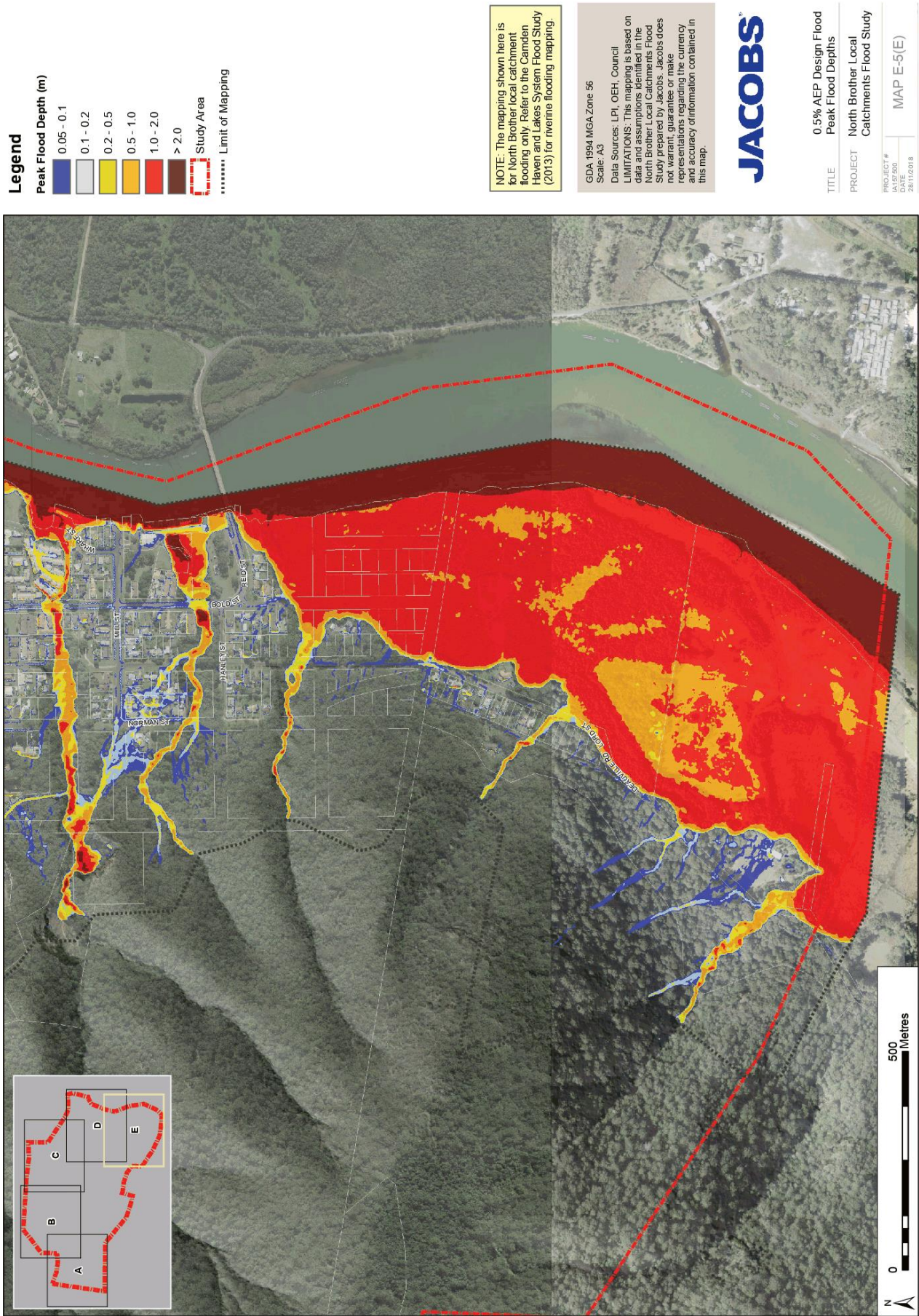


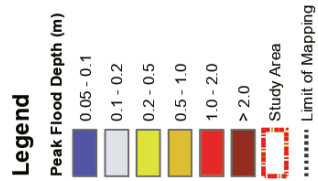










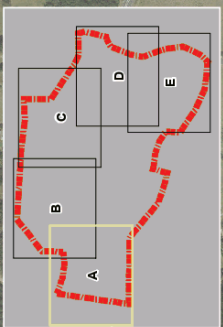
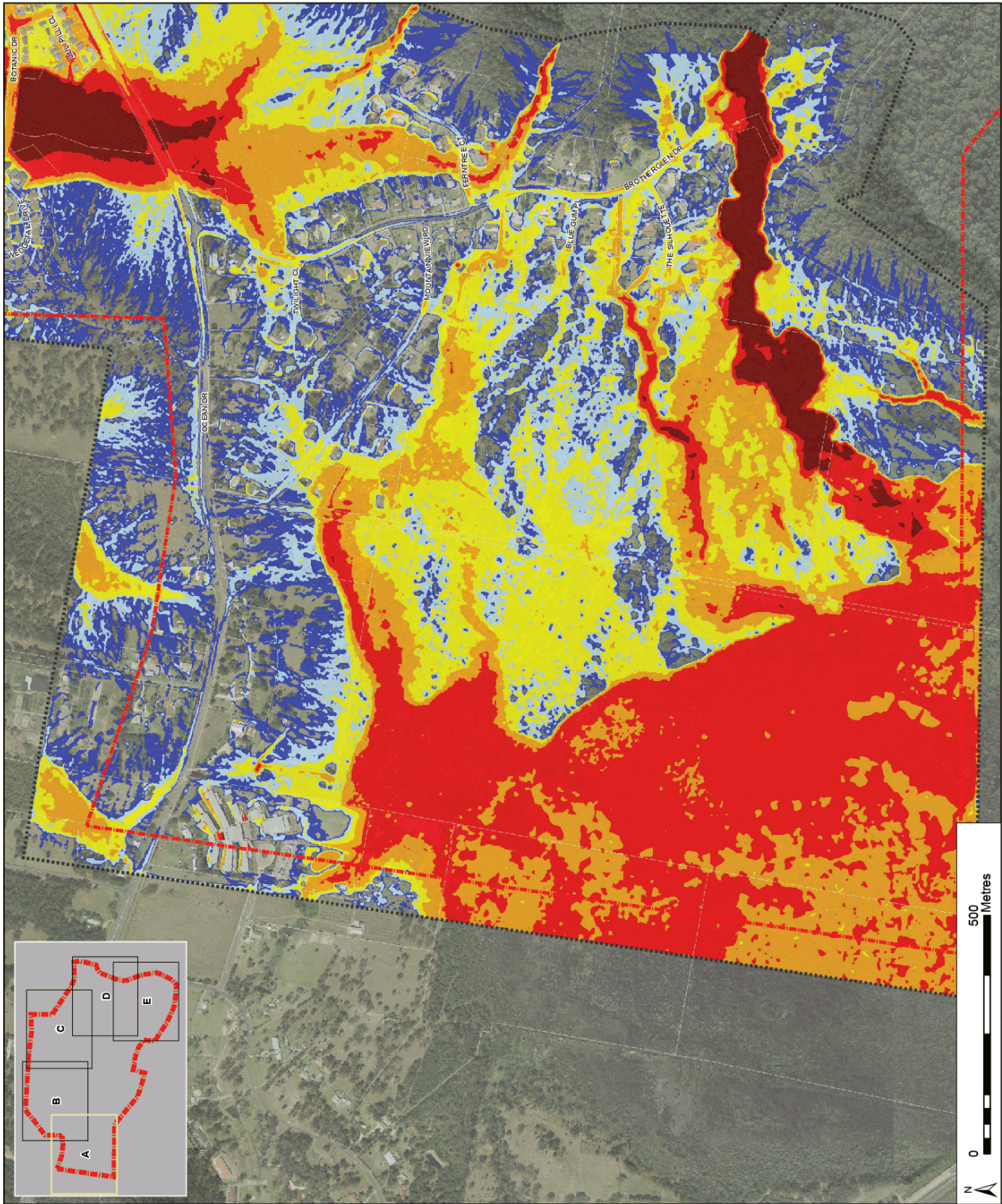


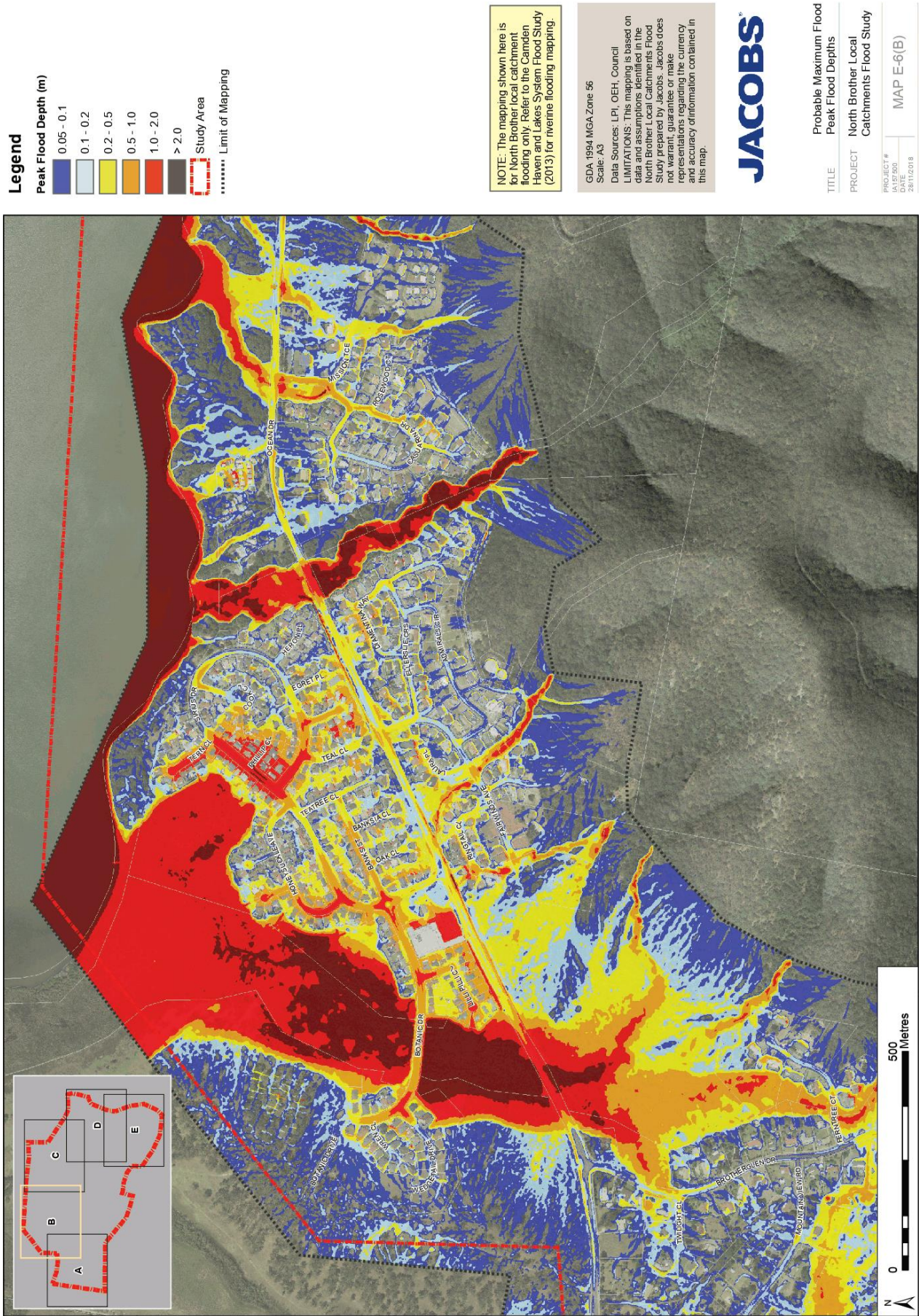
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

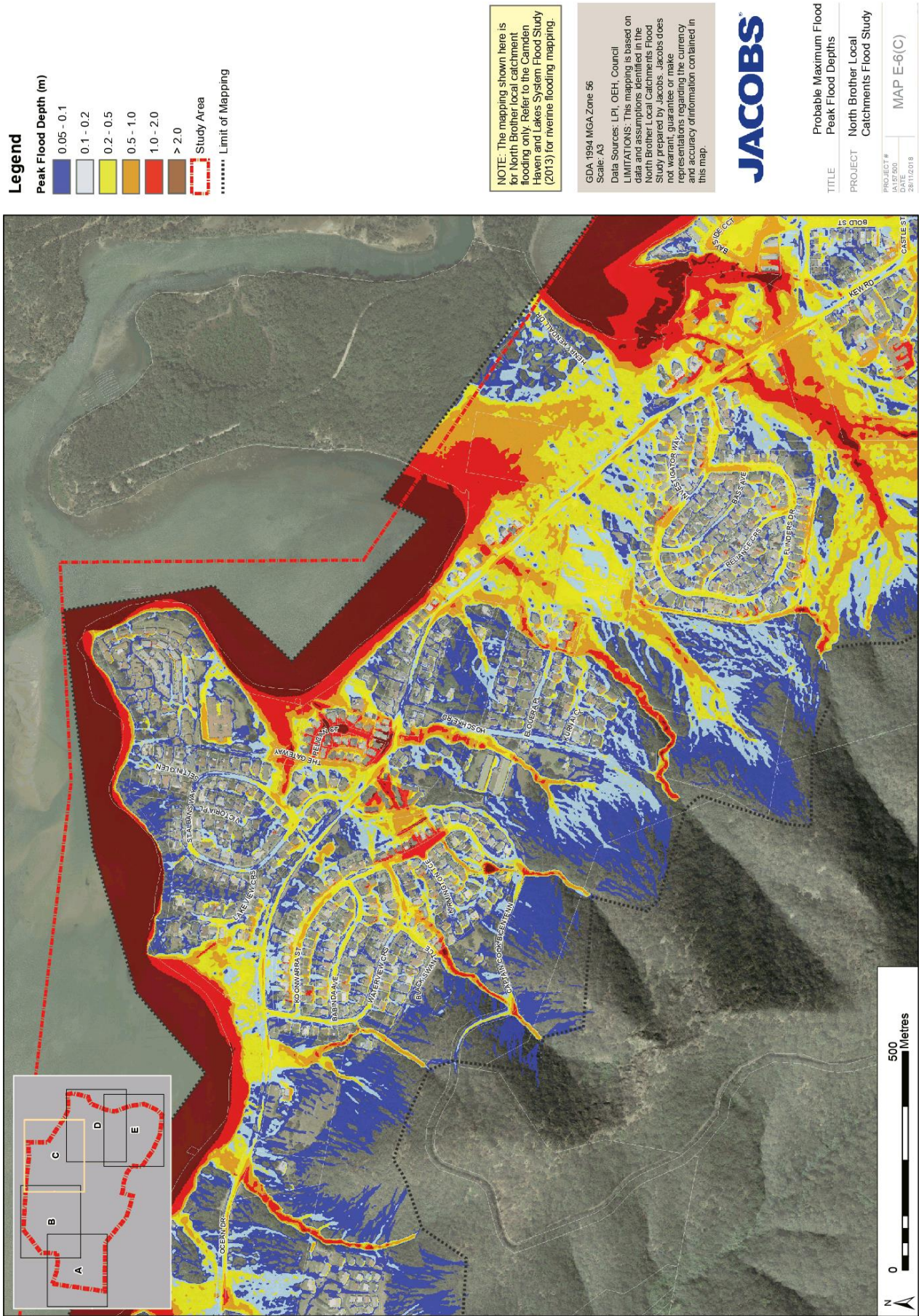
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

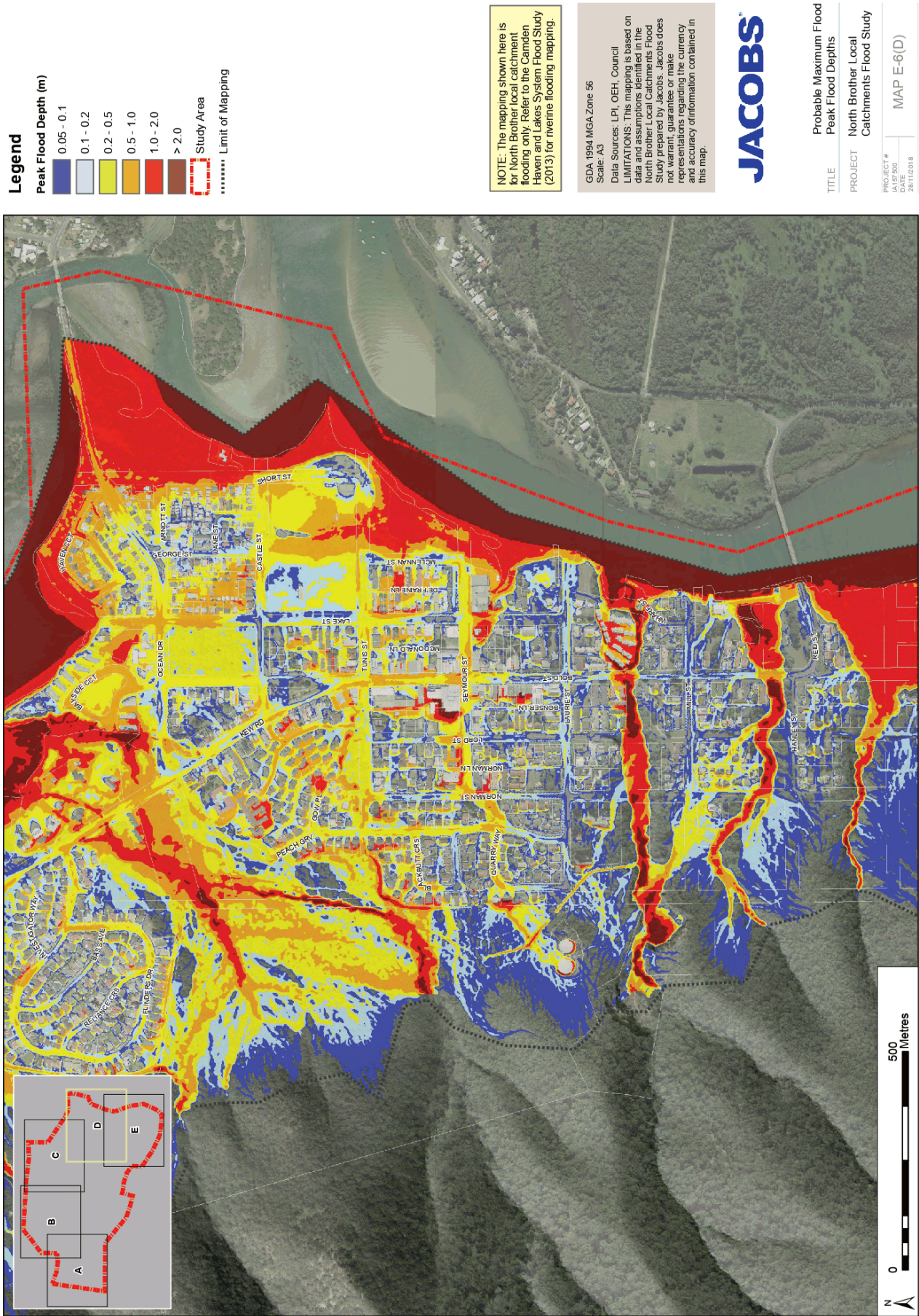


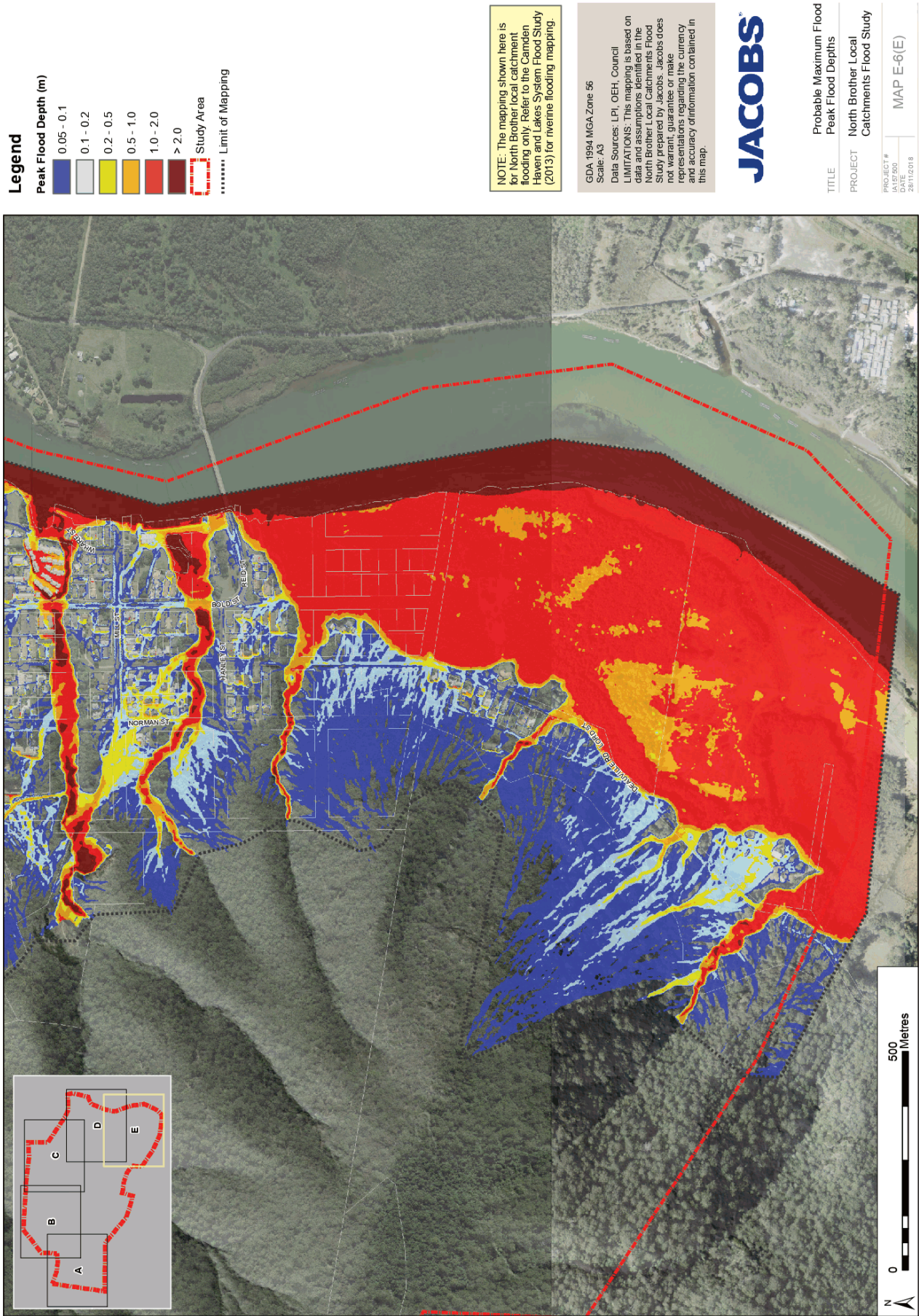
TITLE	Probable Maximum Flood Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-6(A)
ISSUED	
DATE	28/11/2018

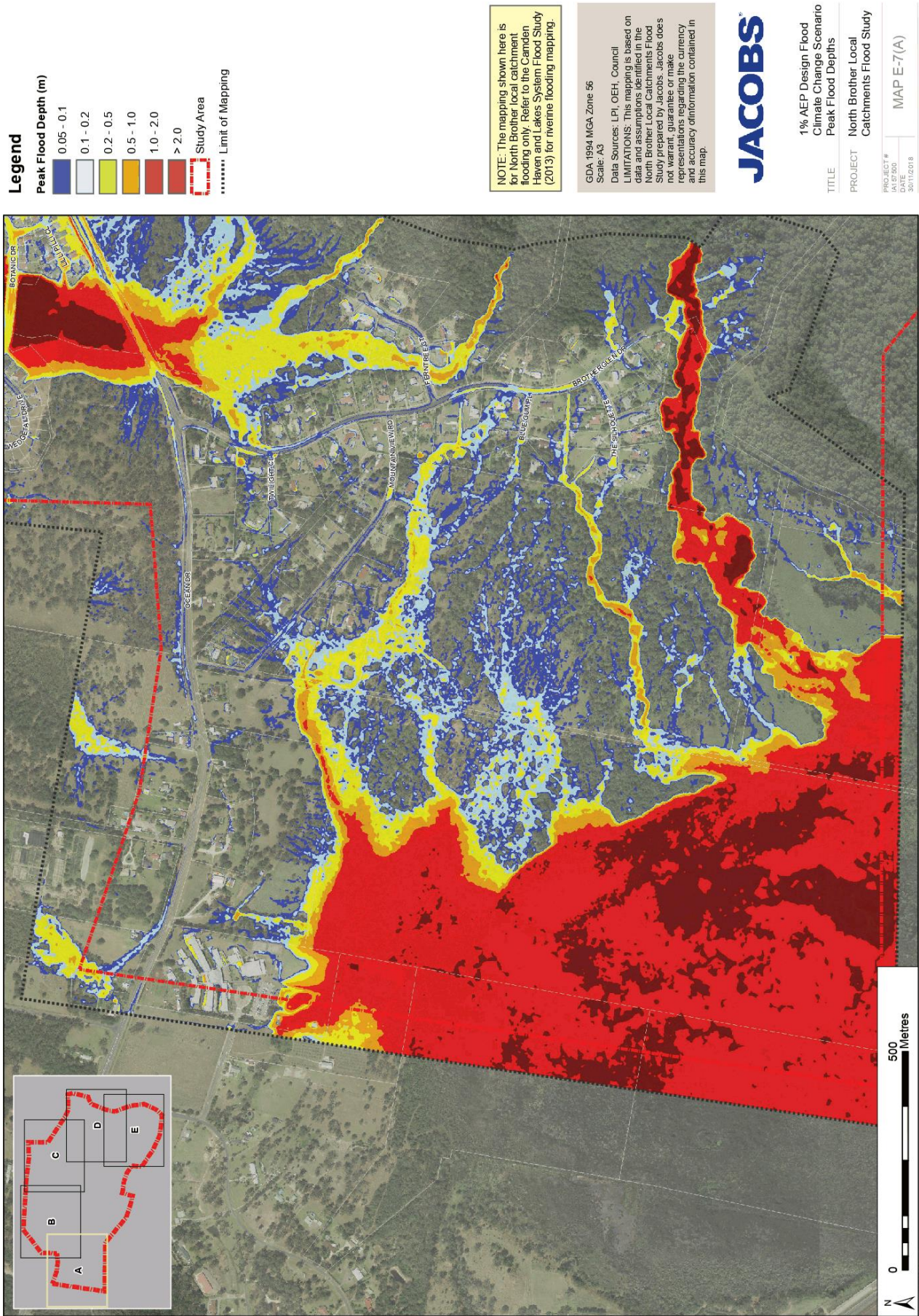


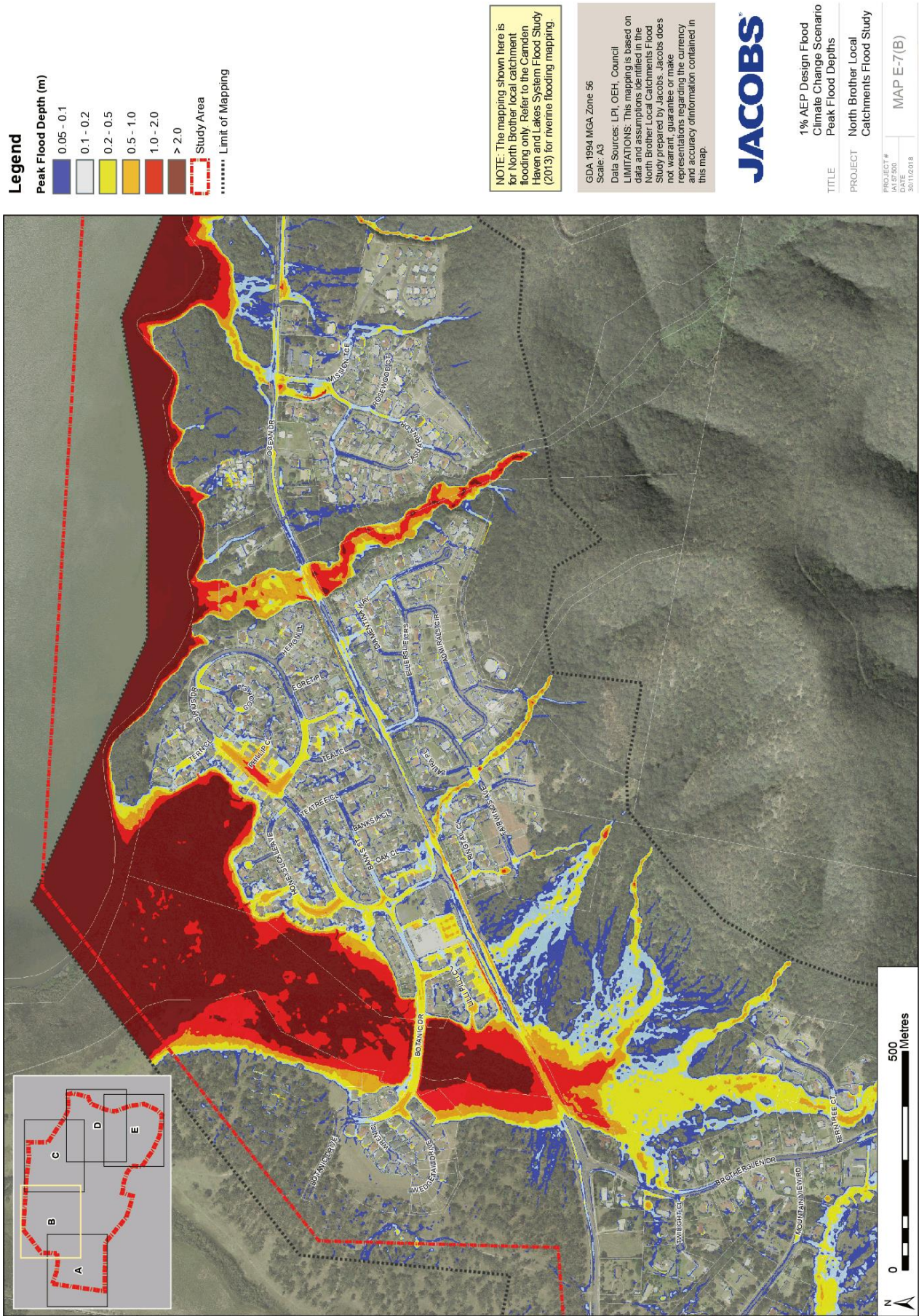


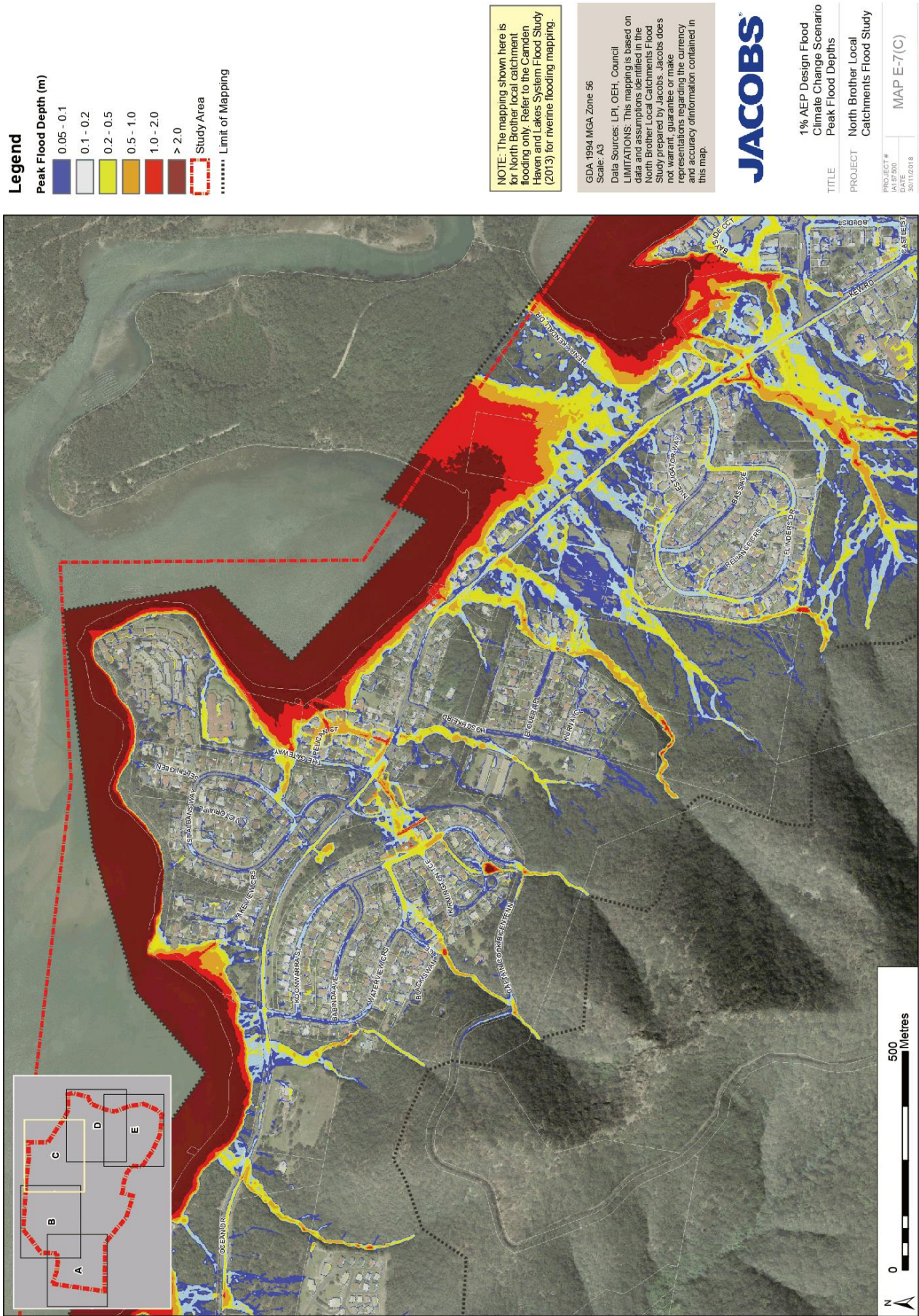












Legend

Peak Flood Depth (m)

0.05 - 0.1

0.1 - 0.2

0.2 - 0.5

0.5 - 1.0

1.0 - 2.0

> 2.0

Study Area

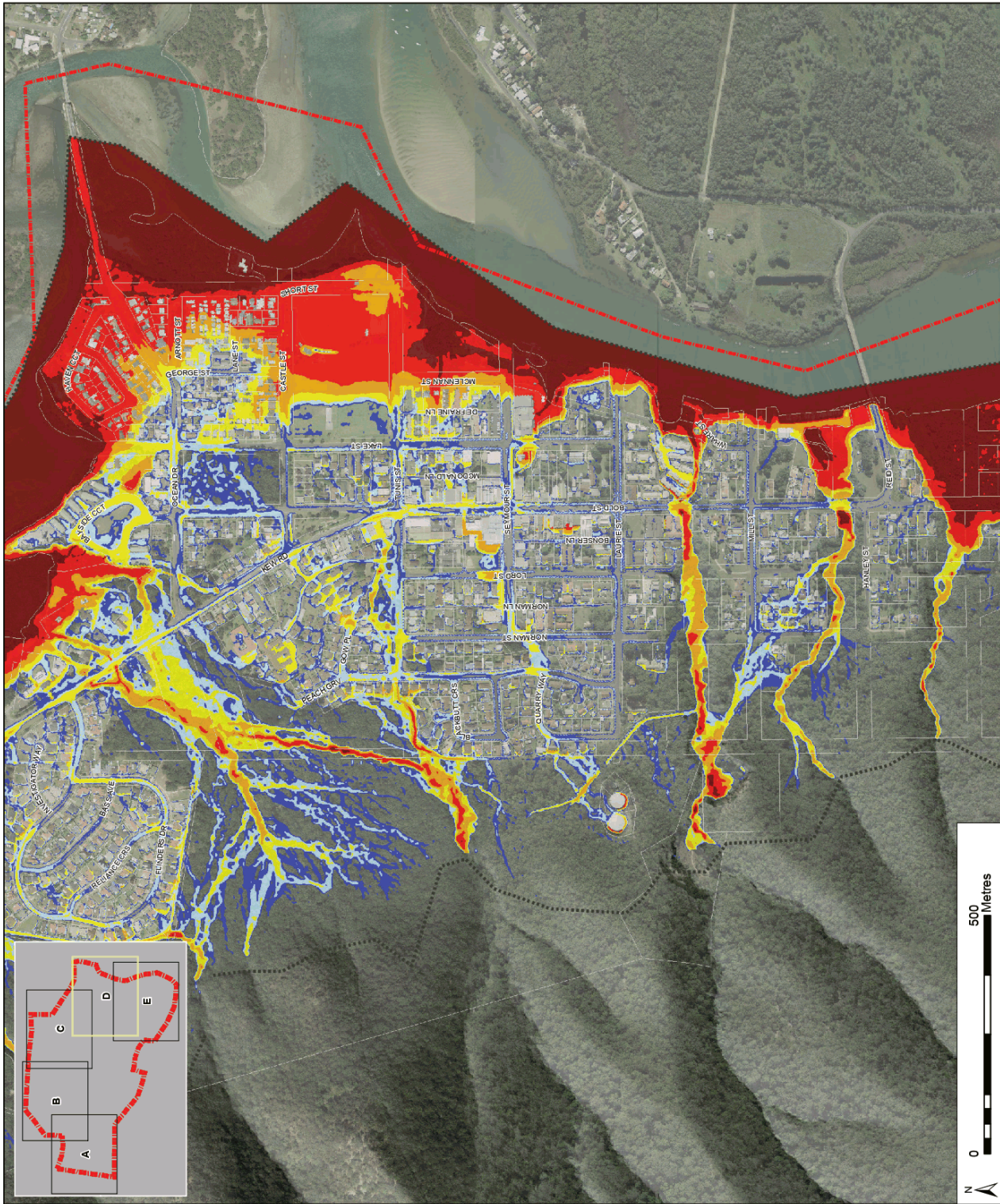
Limit of Mapping

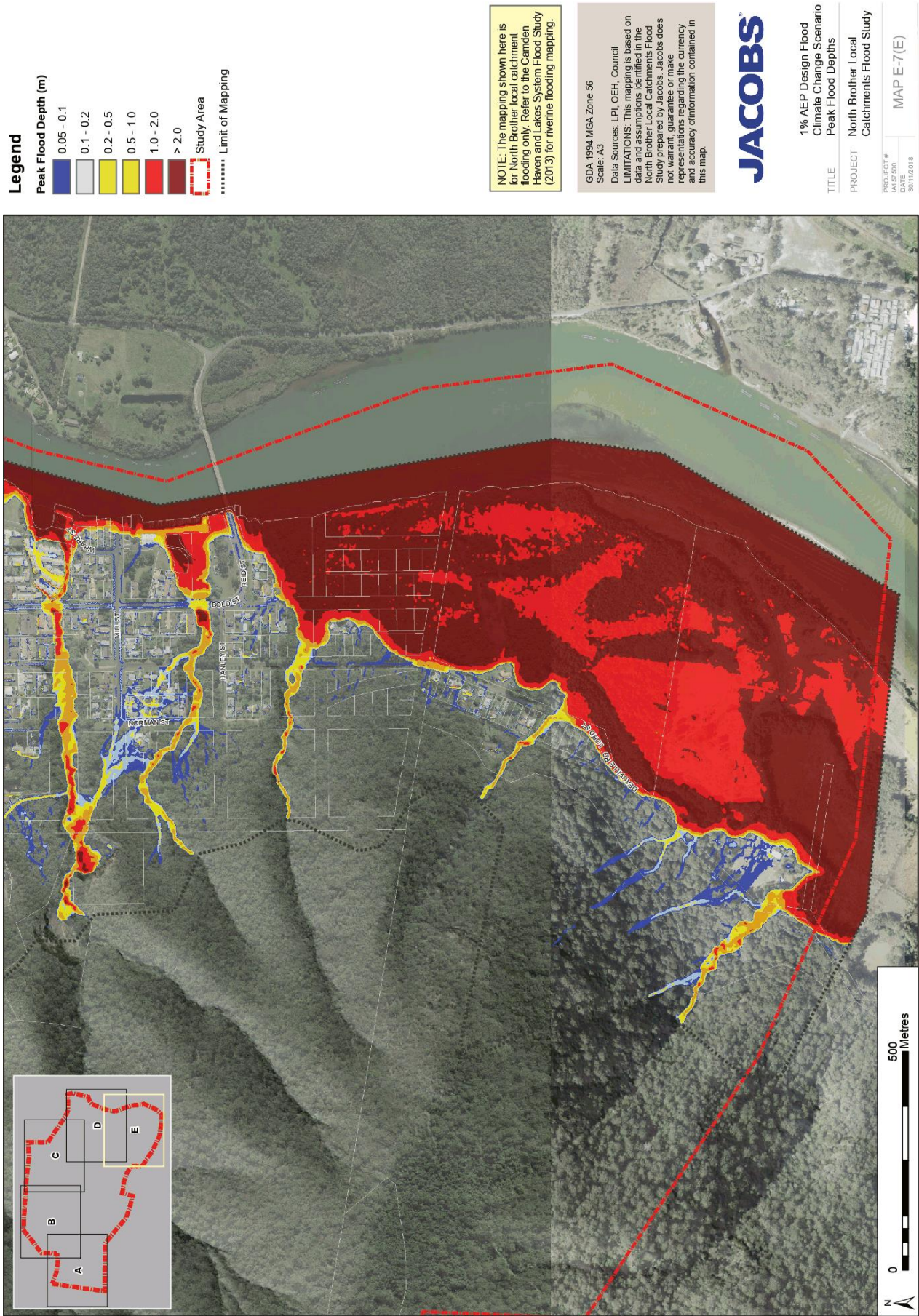
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



1% AEP Design Flood Climate Change Scenario Peak Flood Depths
TITLE
PROJECT
North Brother Local Catchments Flood Study
PROJECT #
DATE
30/11/2018
MAP E-7(D)





Legend

Flow Velocity (m/s)

0 - 0.25

0.25 - 0.5

0.5 - 0.75

0.75 - 1.0

1.0 - 1.5

1.5 - 2.0

> 2.0

Study Area

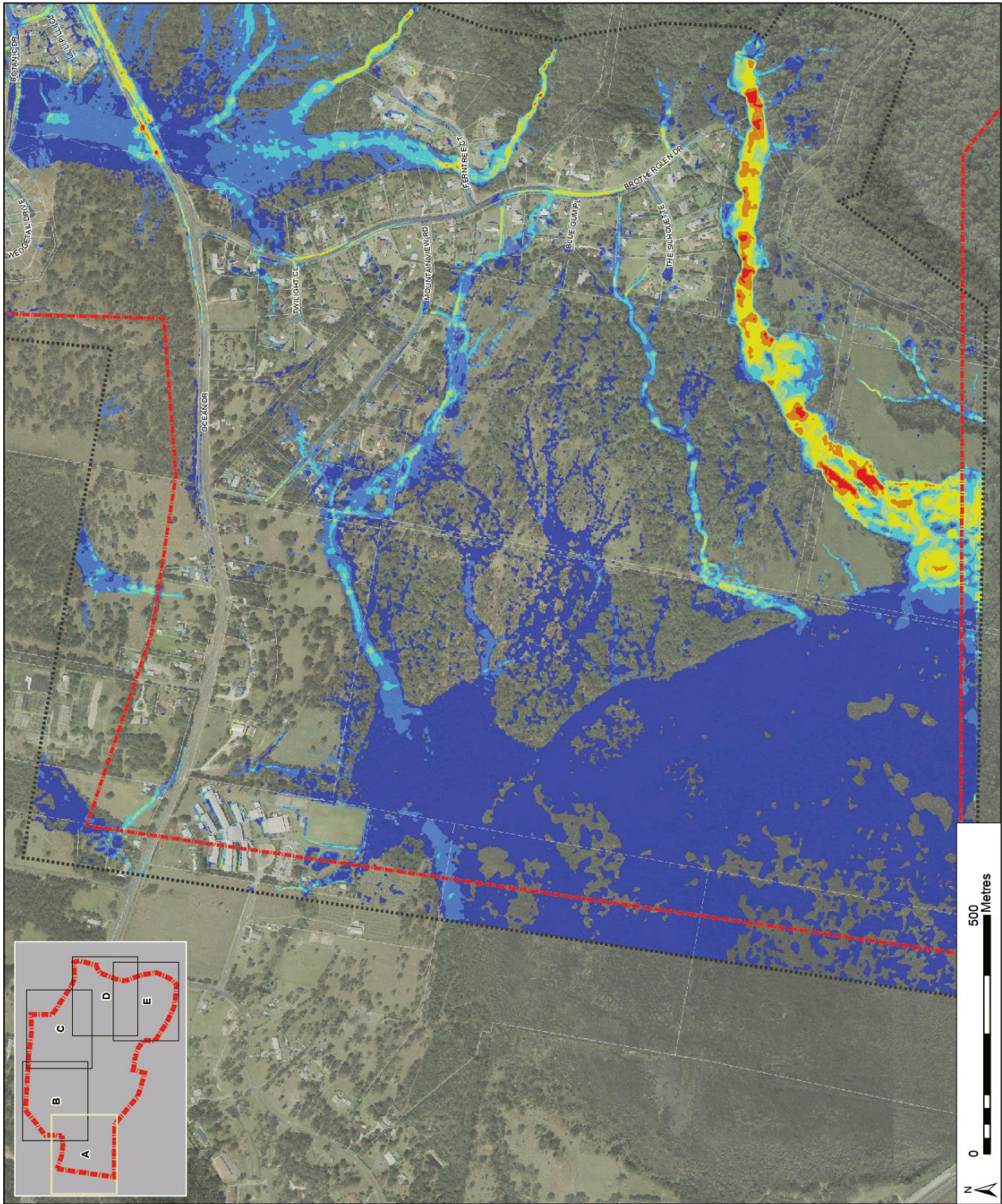
Limit of Mapping

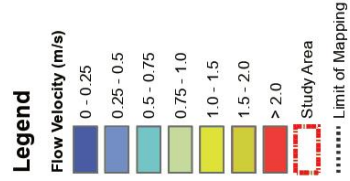
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	0.2EY Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-8(A)
DATE	8/12/2018



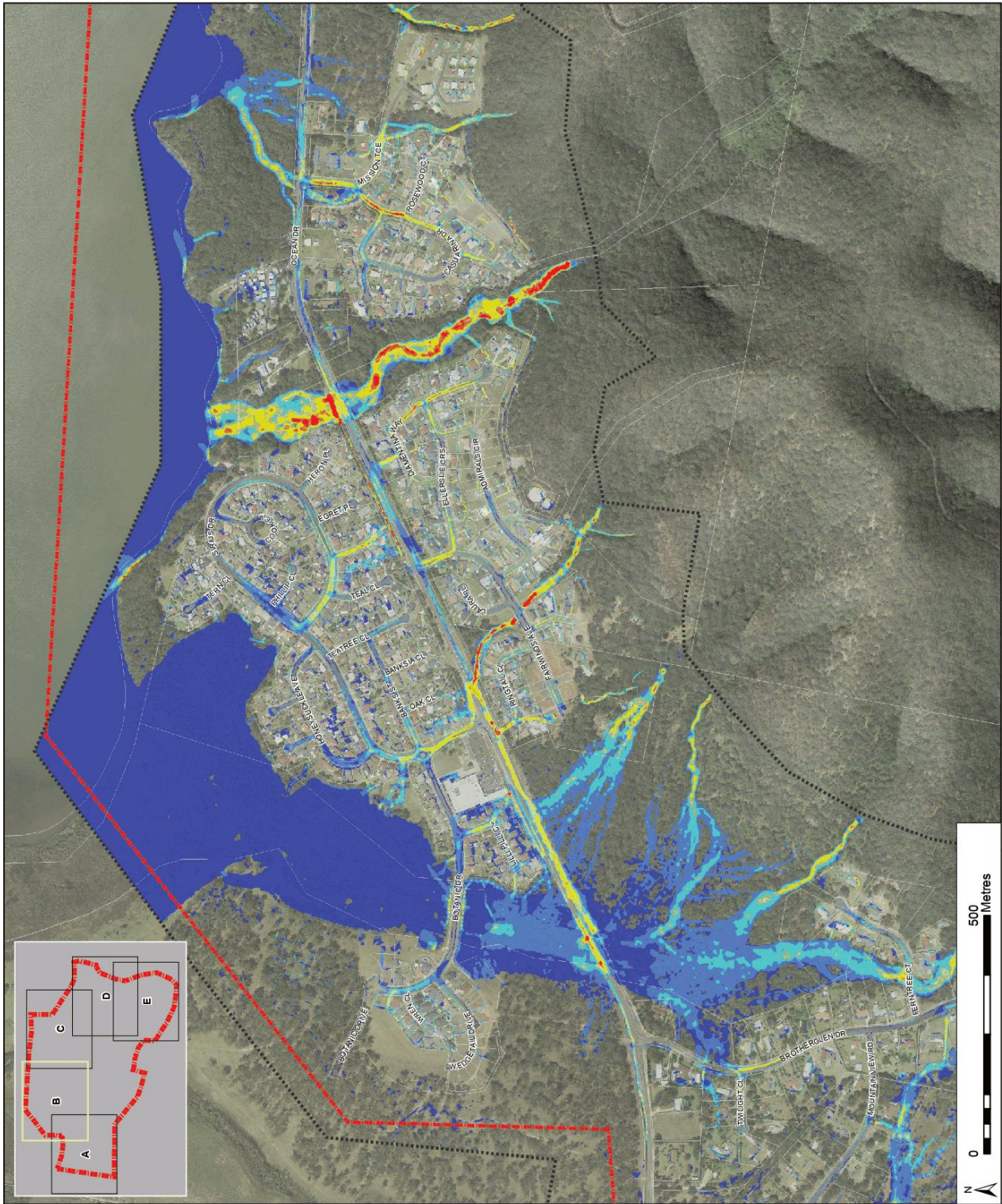


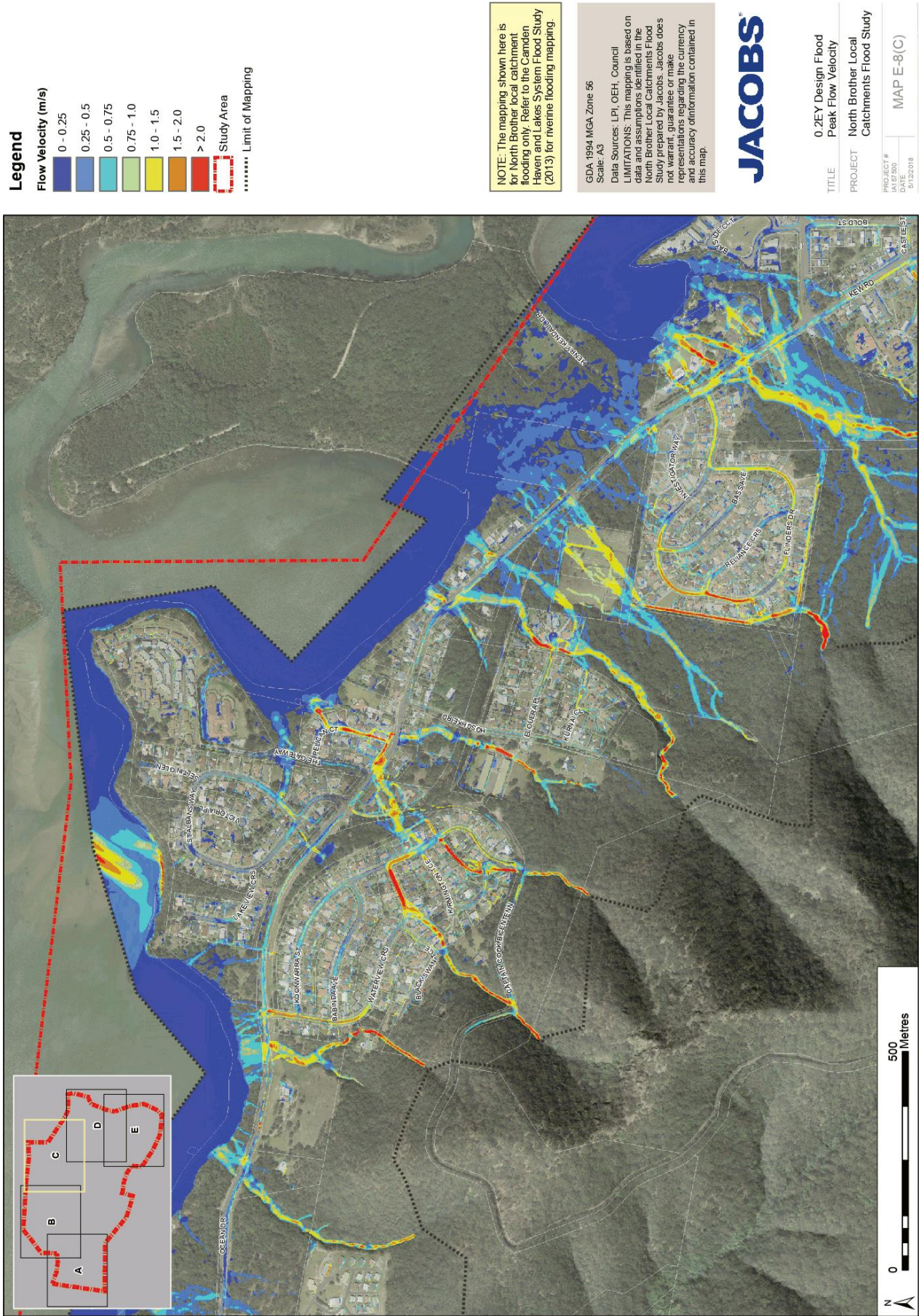
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

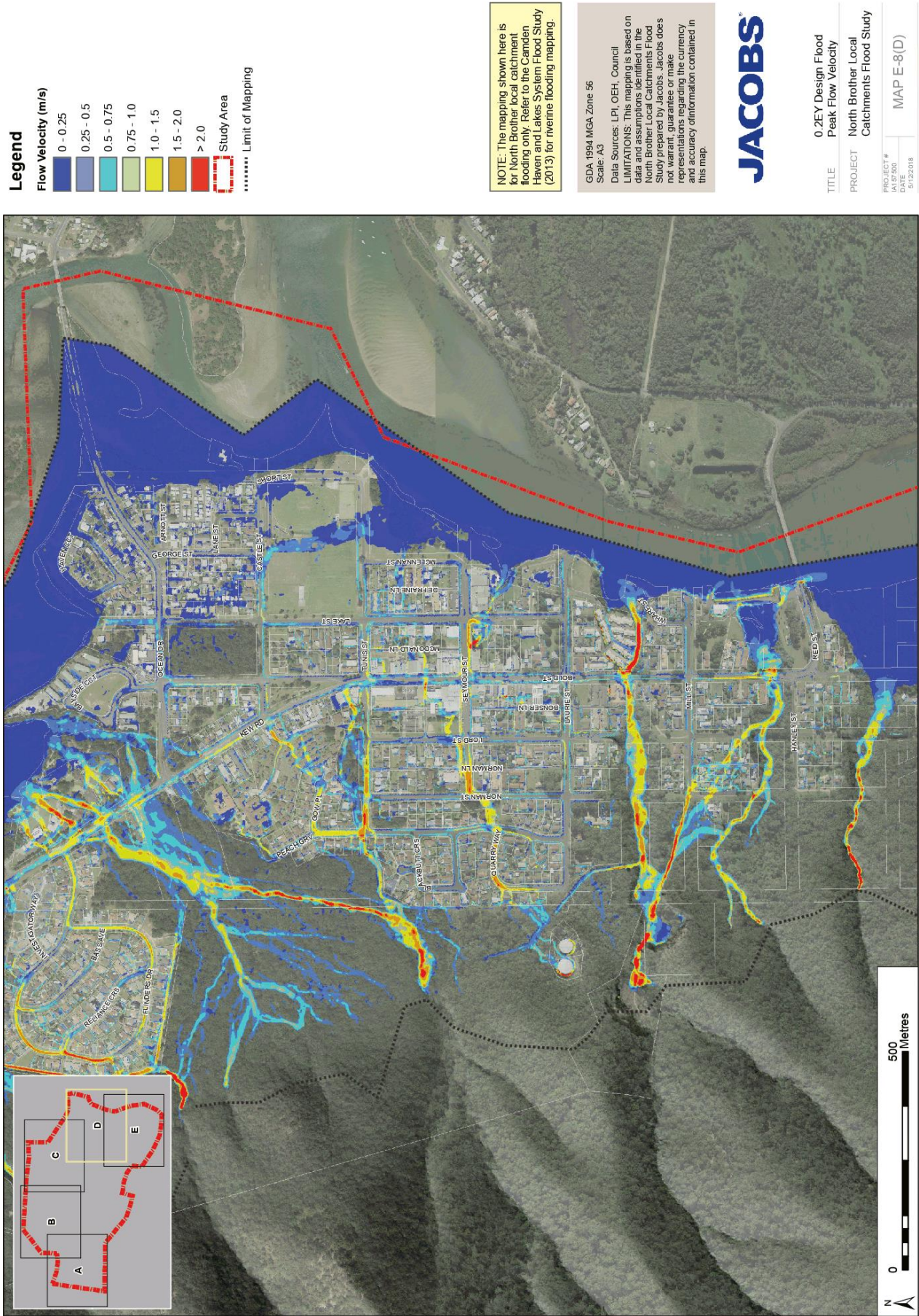
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

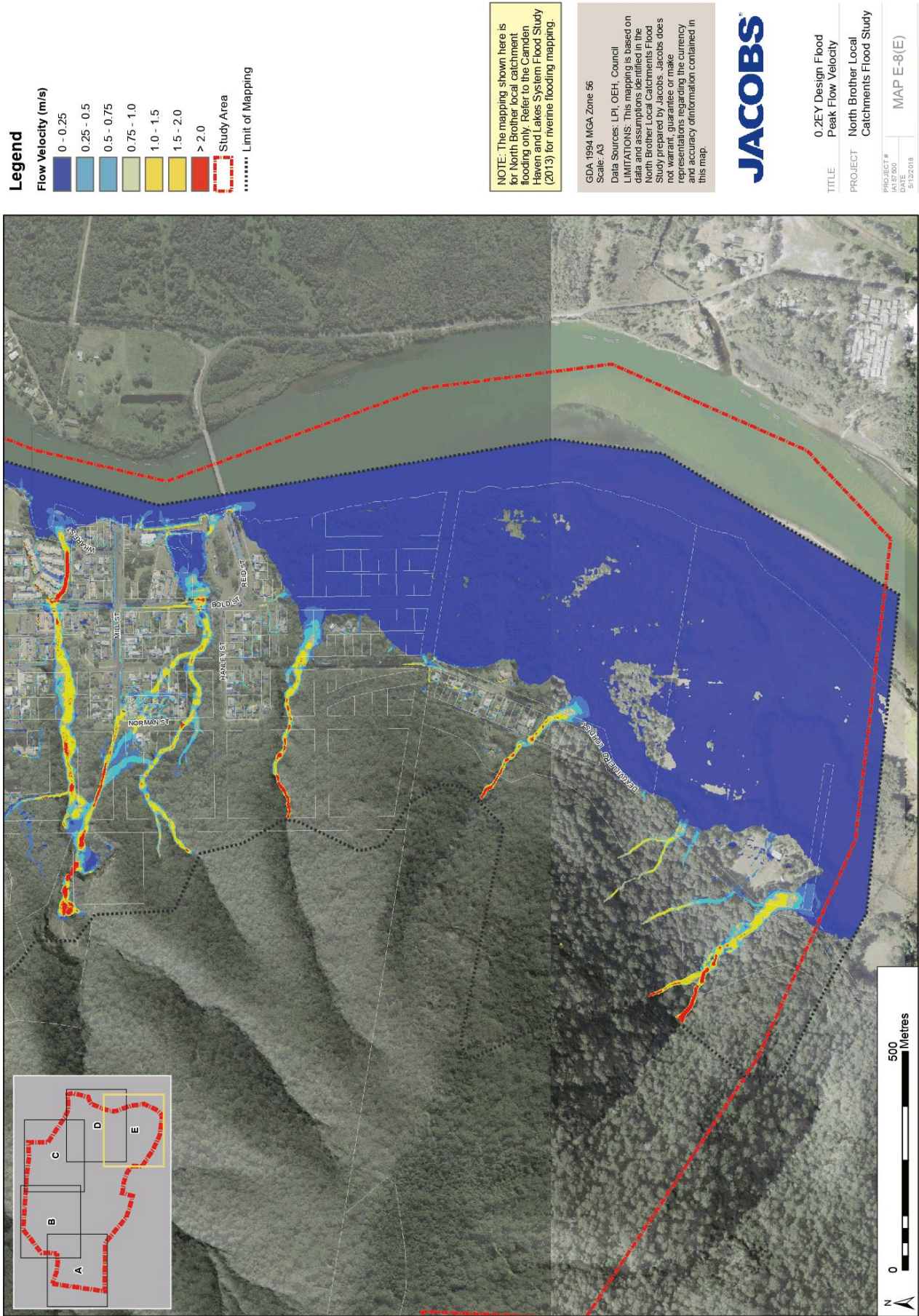


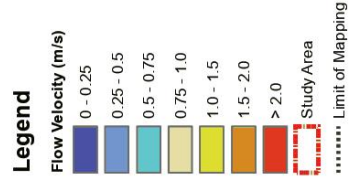
TITLE	0.2EY Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-8(B)
DATE	8/12/2018









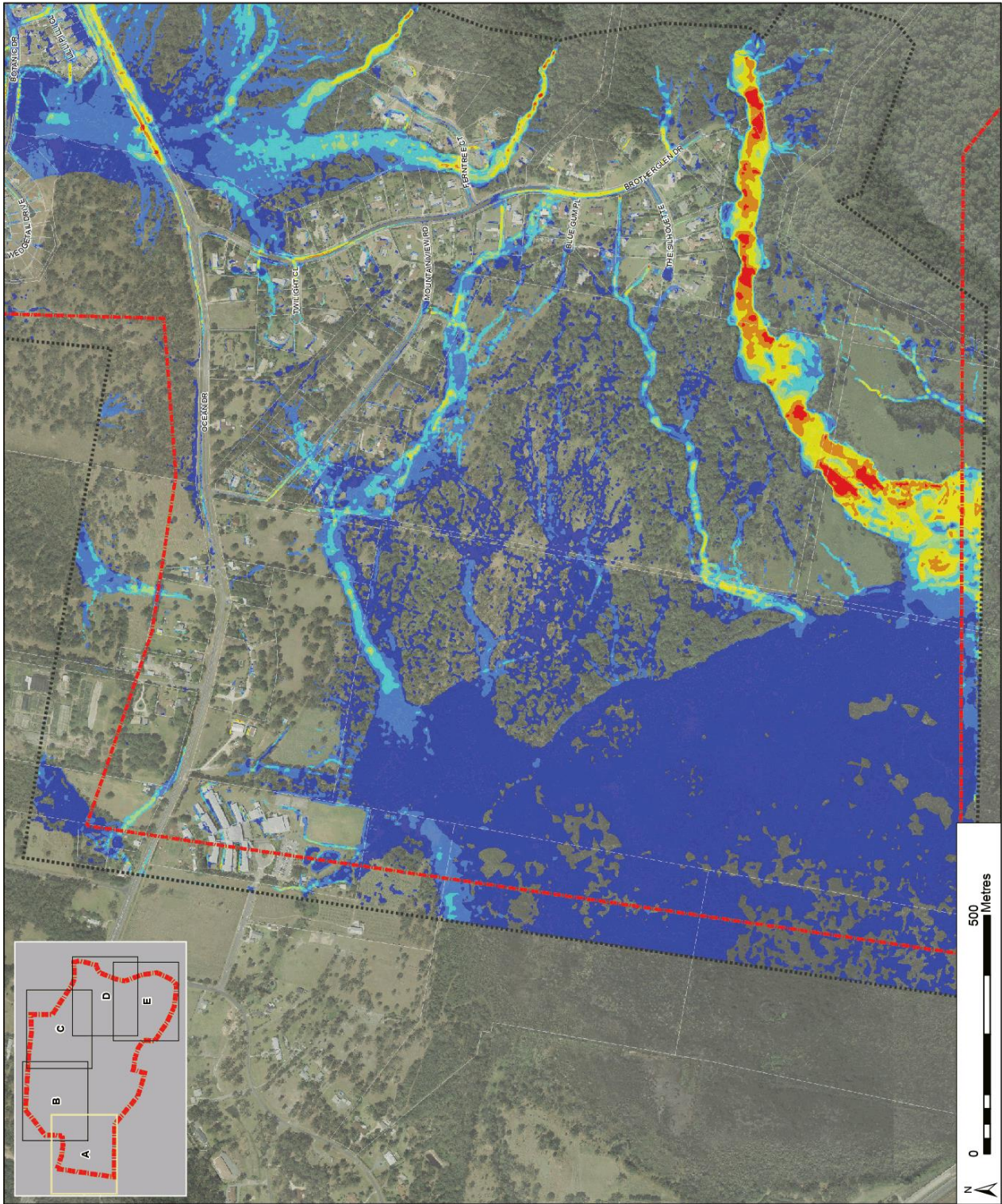


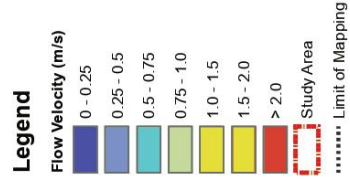
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	5% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-9(A)
DATE	8/12/2018



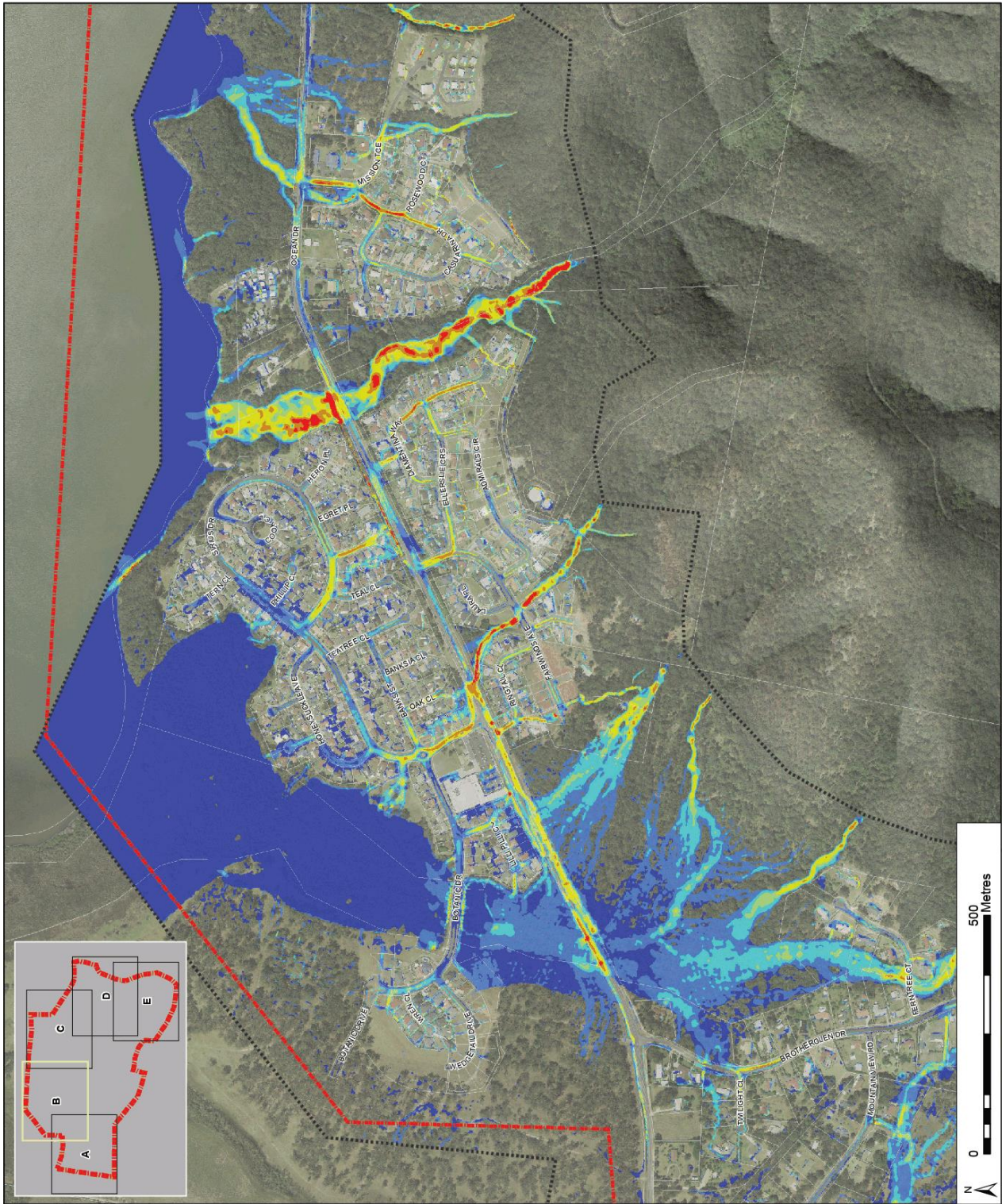


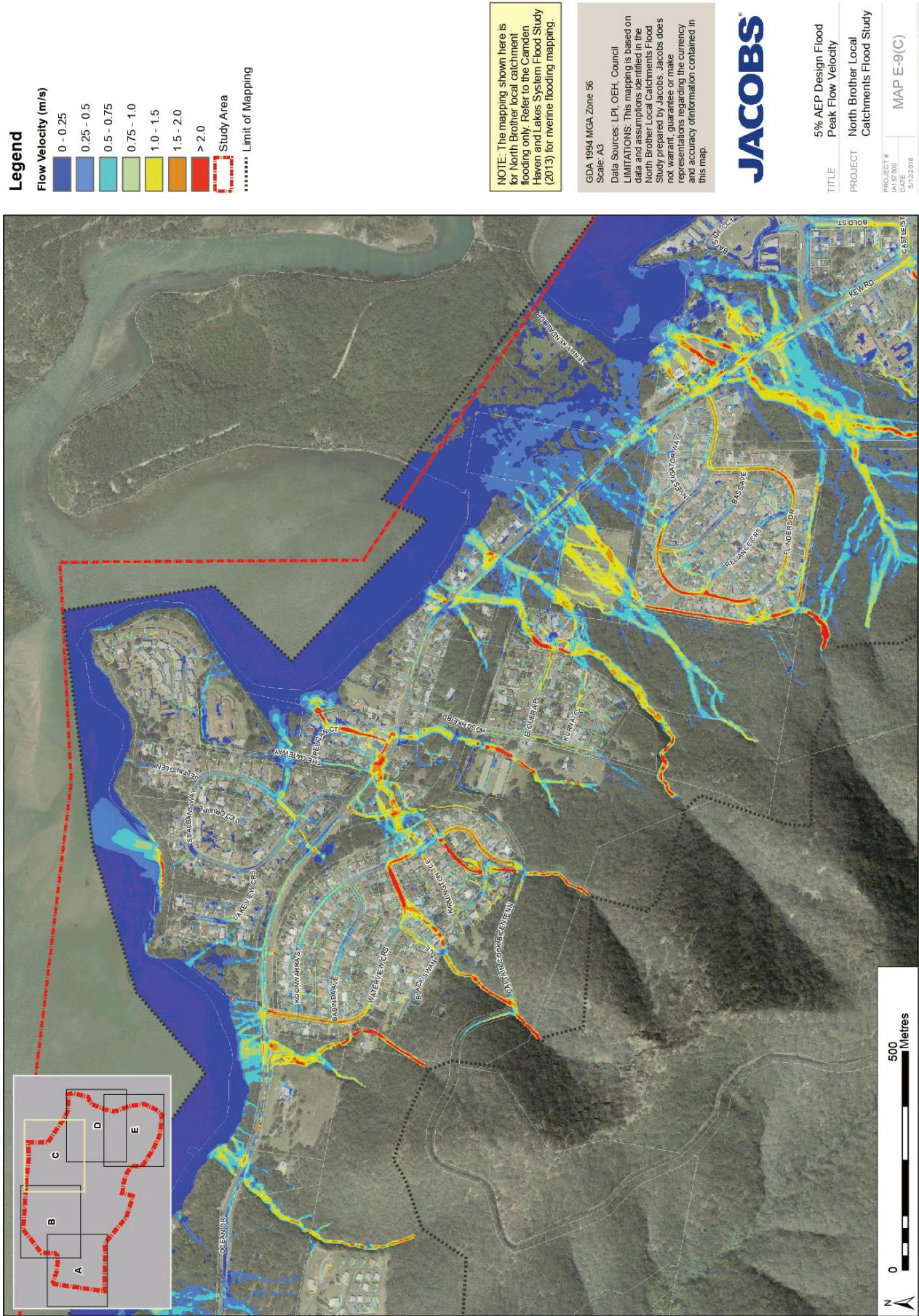
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	5% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-9(B)
DATE	8/12/2018





Legend

Flow Velocity (m/s)

0 - 0.25

0.25 - 0.5

0.5 - 0.75

0.75 - 1.0

1.0 - 1.5

1.5 - 2.0

> 2.0

Study Area

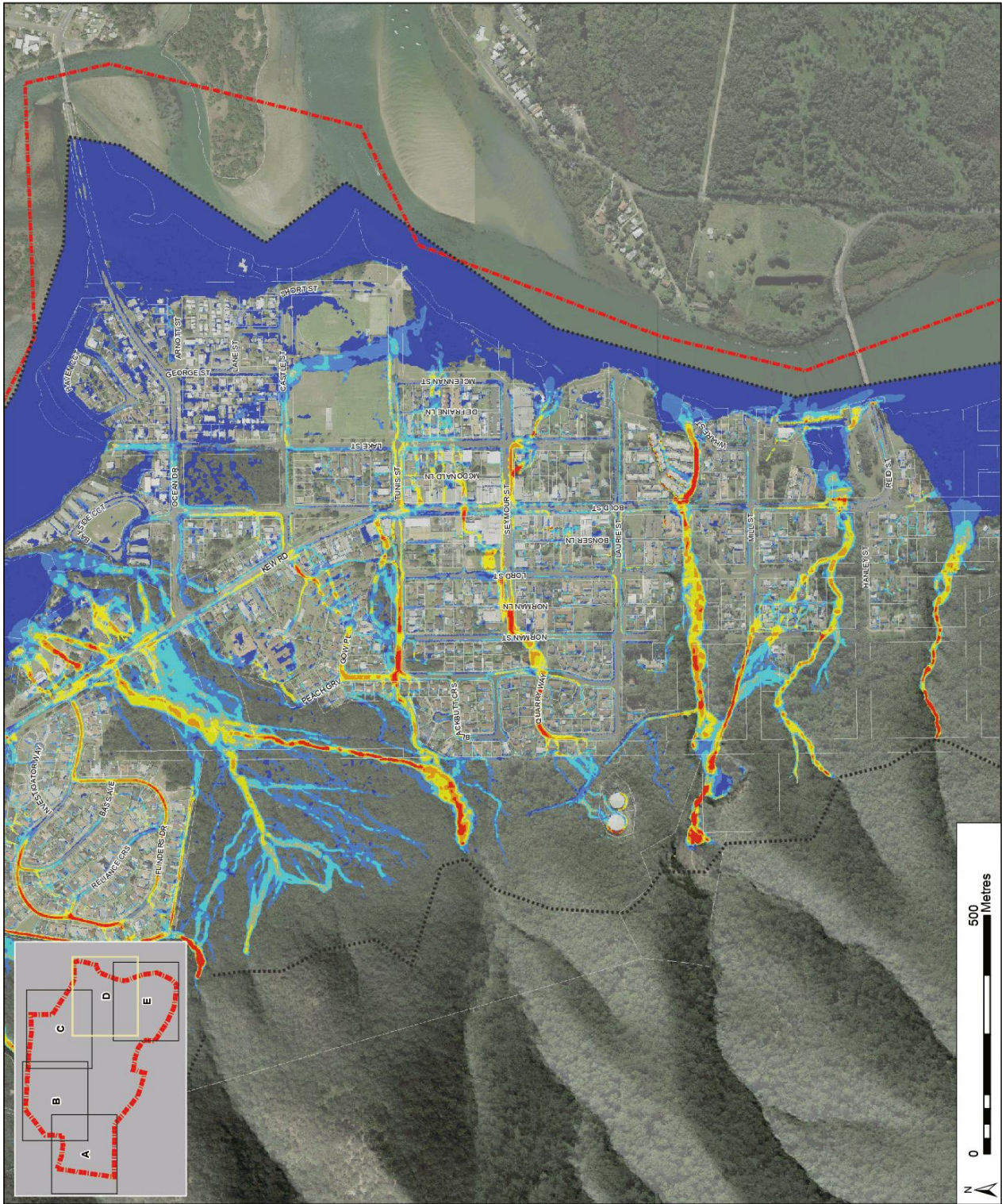
Limit of Mapping

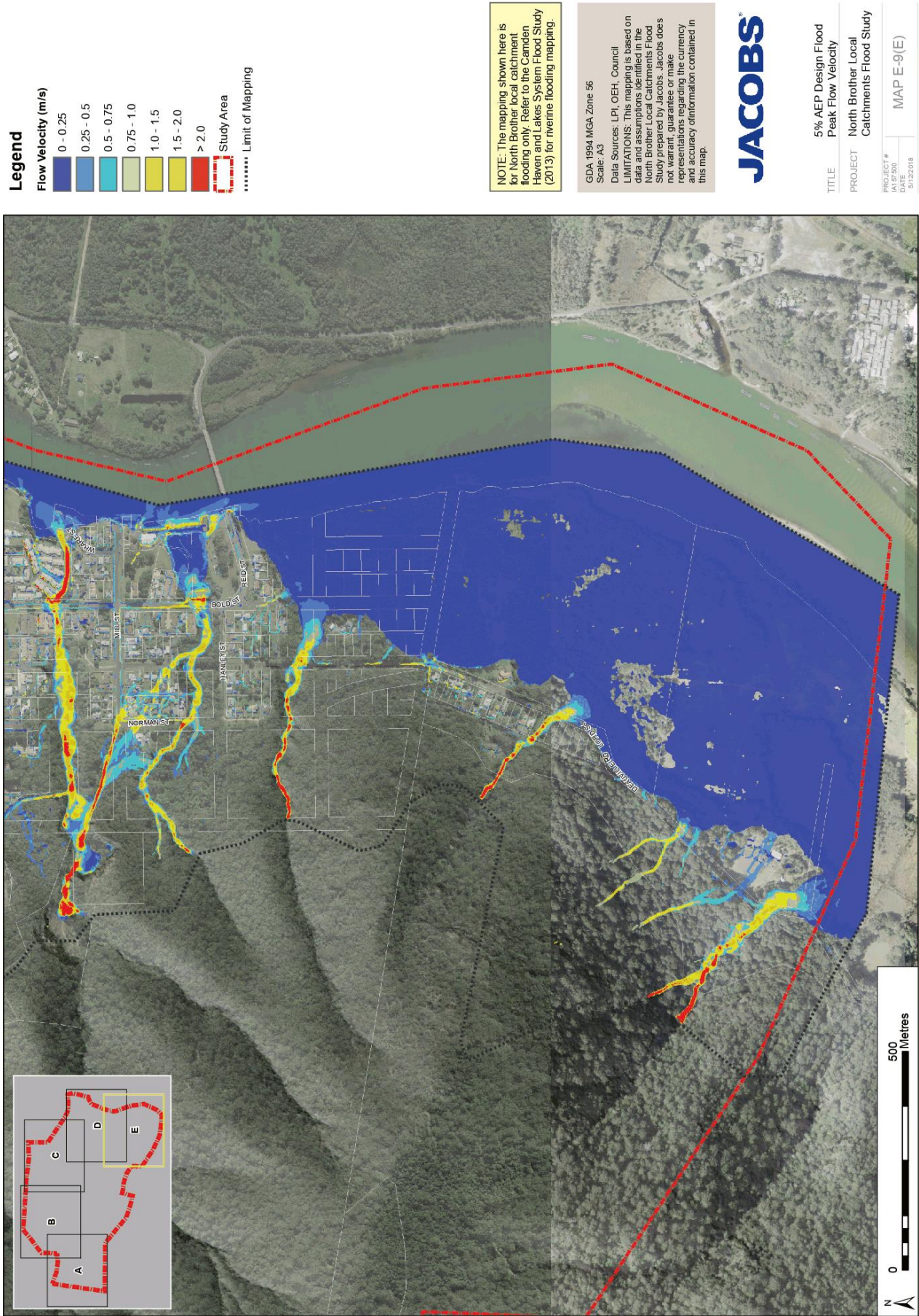
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

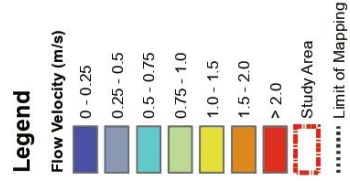
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	5% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-9(D)
DATE	8/12/2018





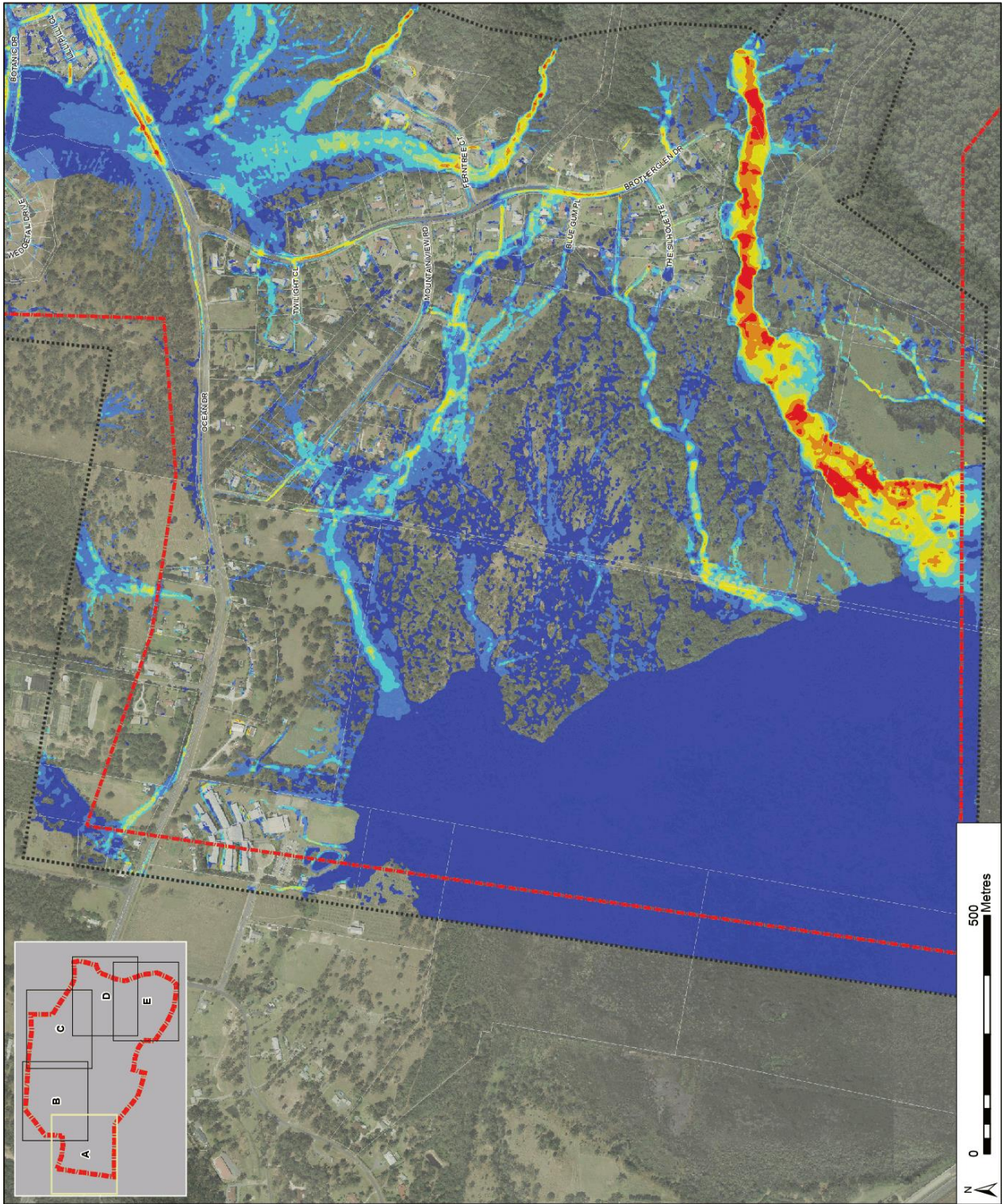


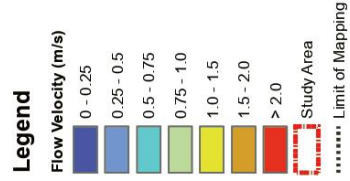
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	2% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJ. EST. #	MAP E-10(A)
DATE	8/12/2018



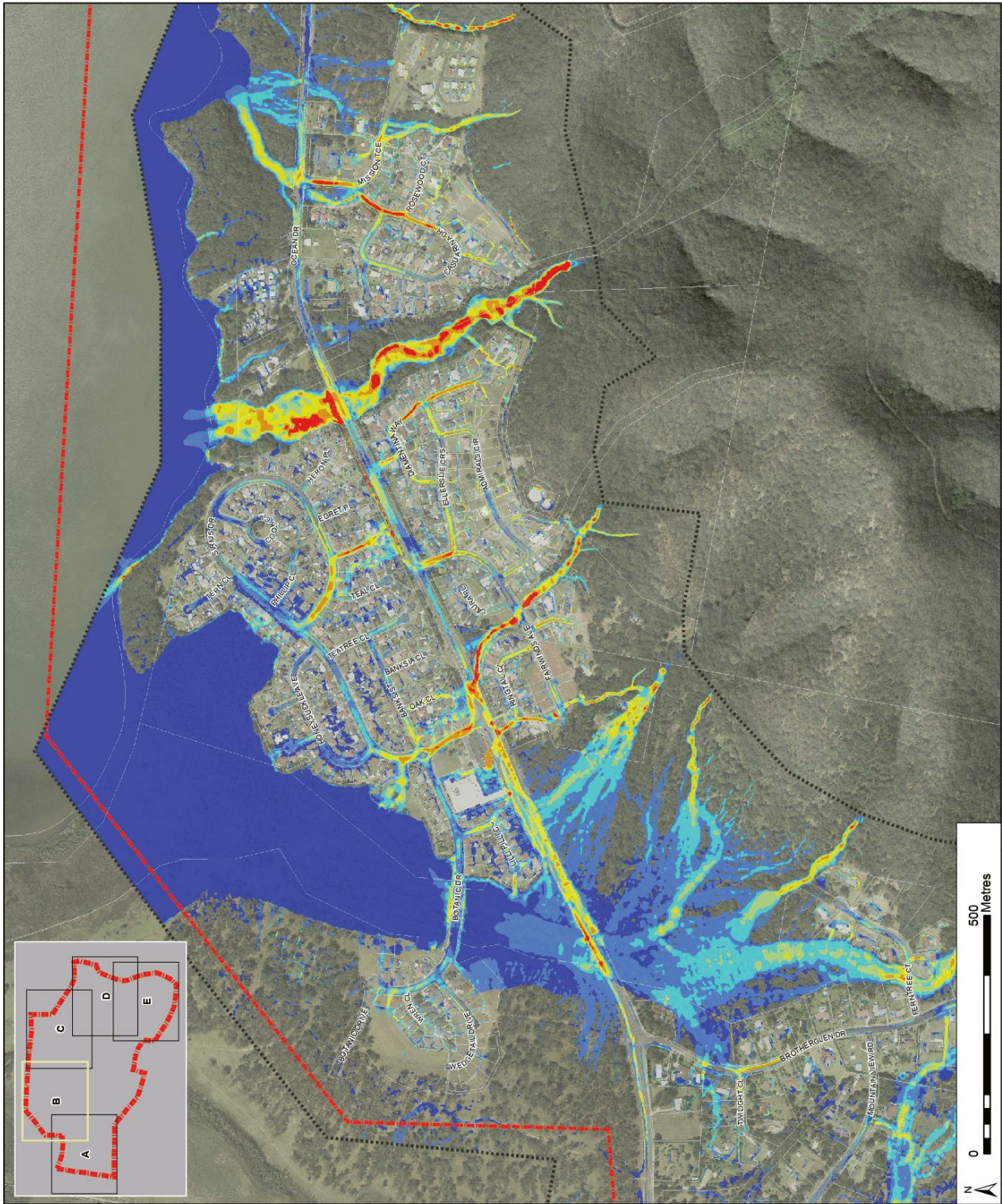


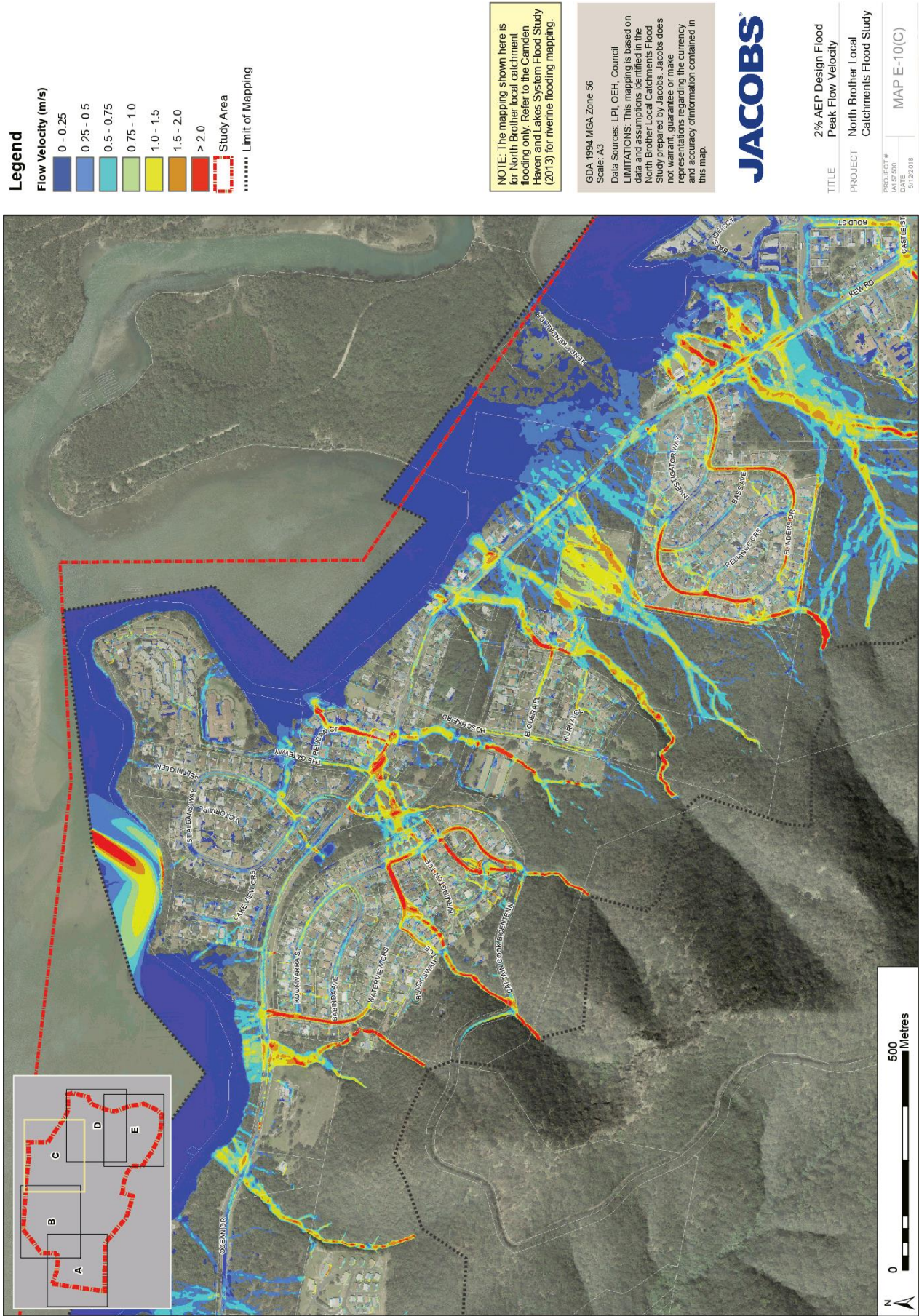
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

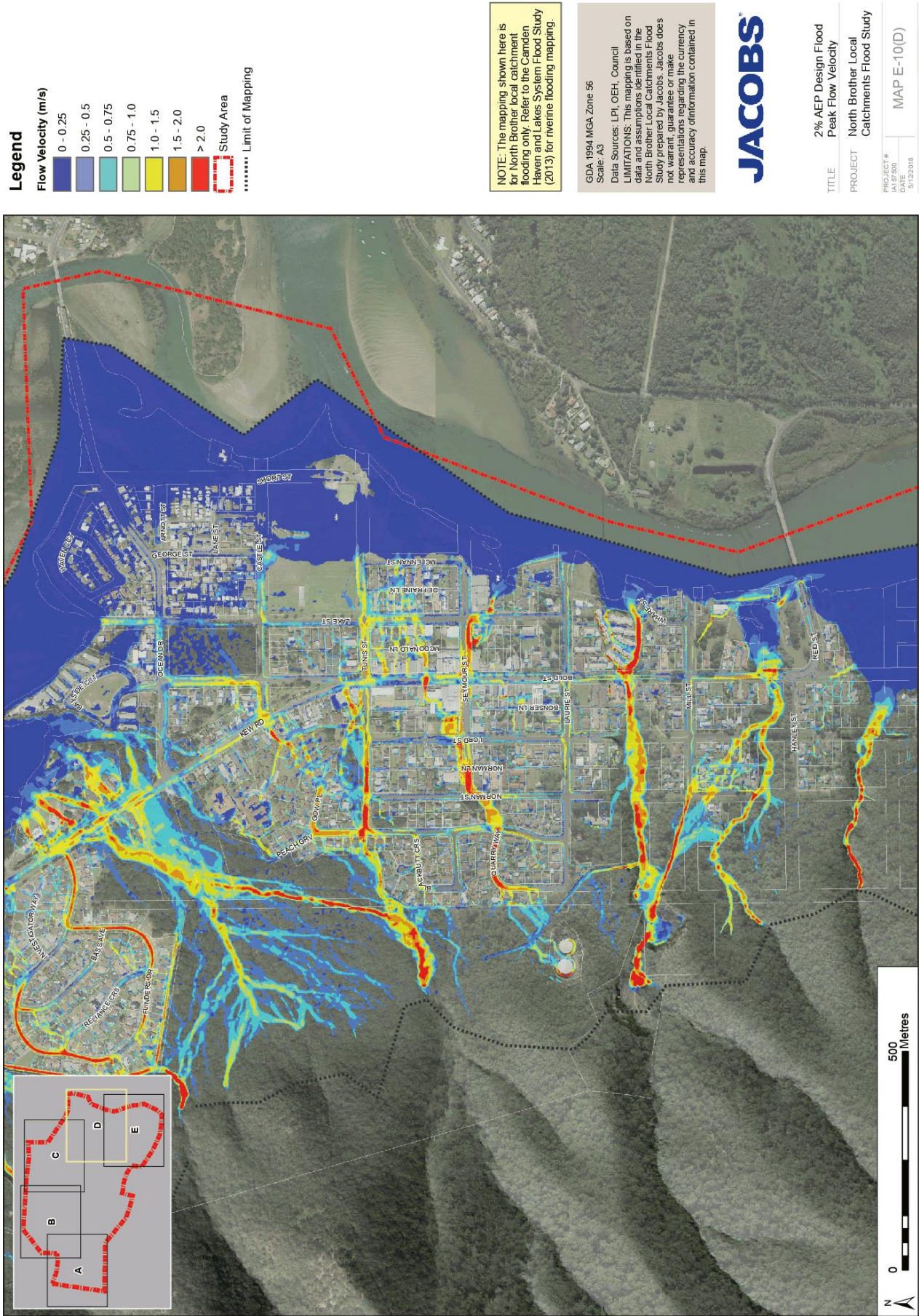
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

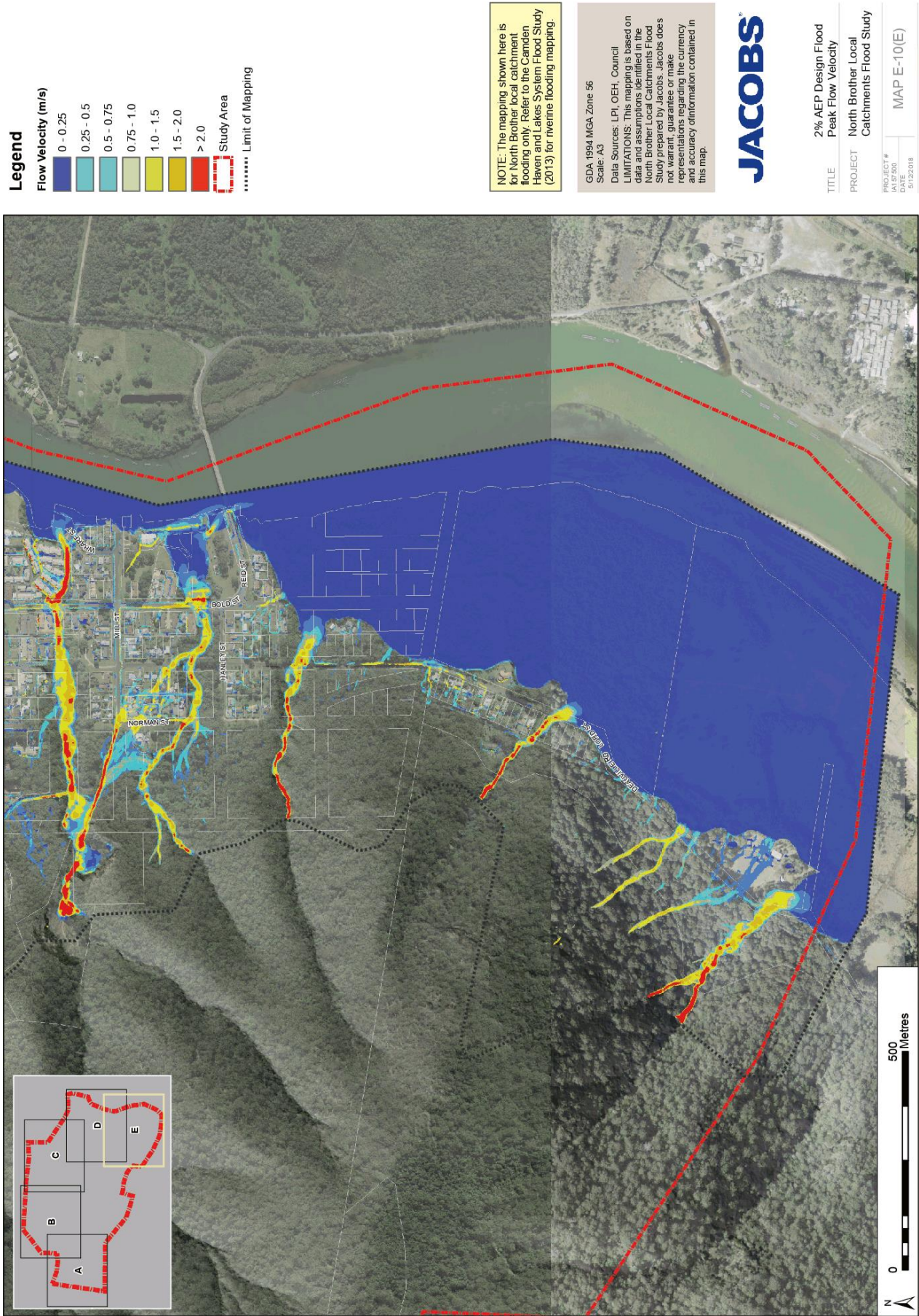


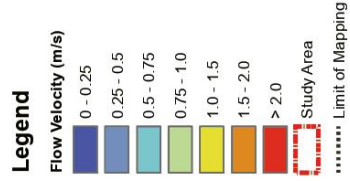
TITLE	2% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-10(B)
DATE	8/12/2018









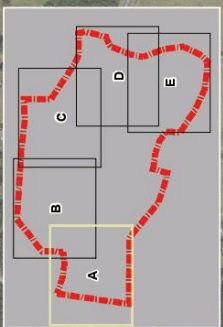
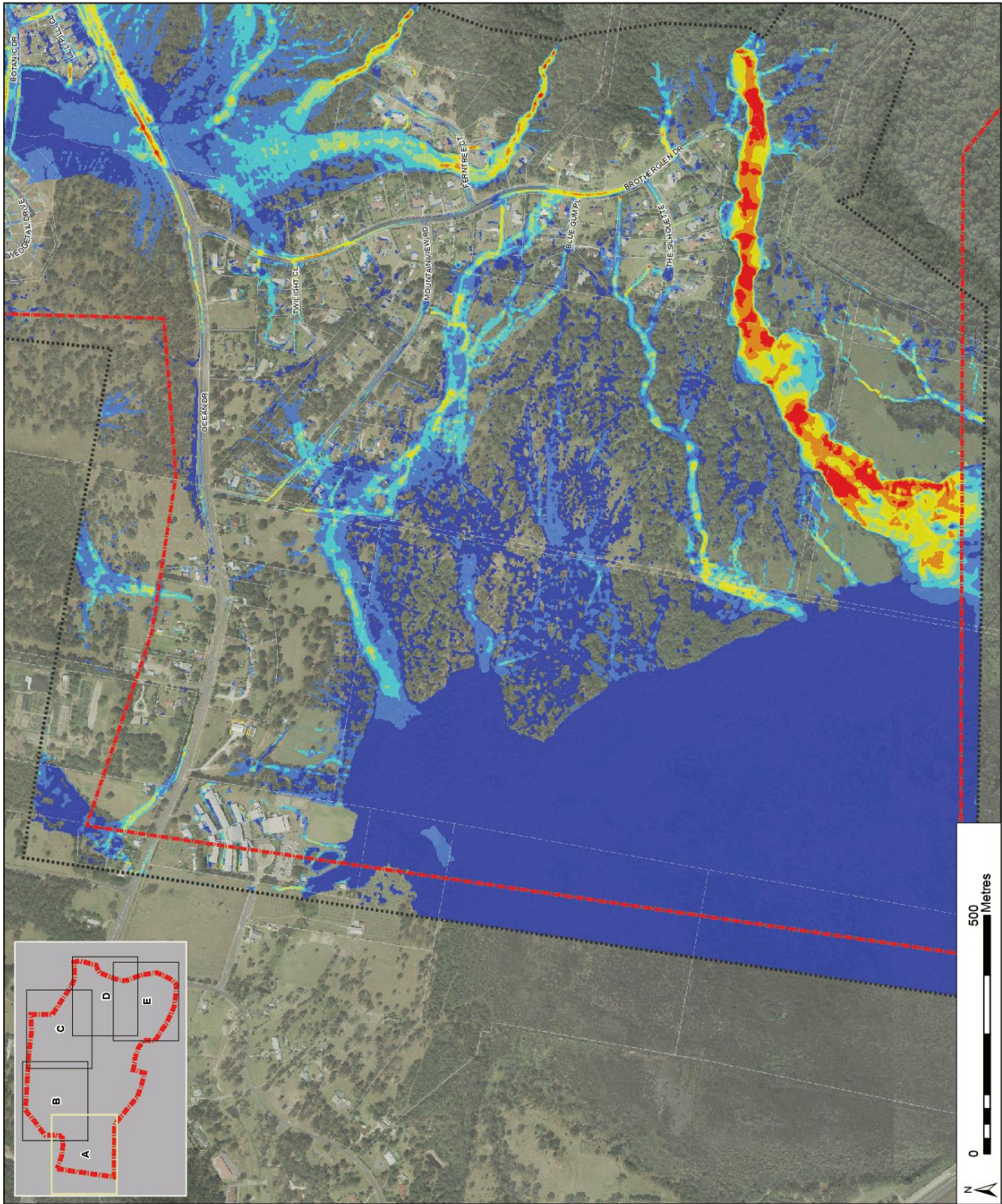


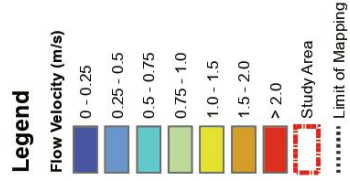
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-11(A)
DATE	8/12/2018



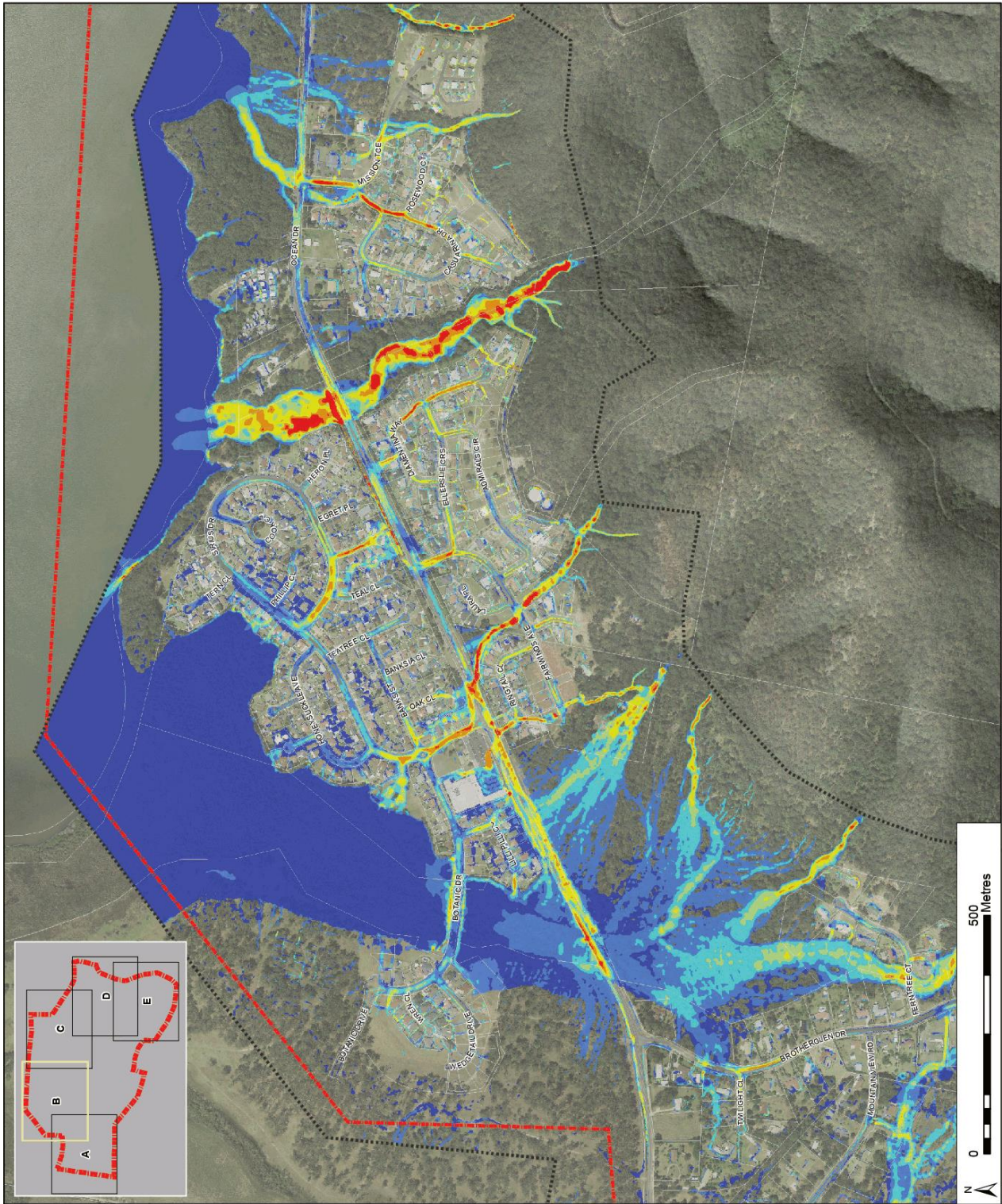


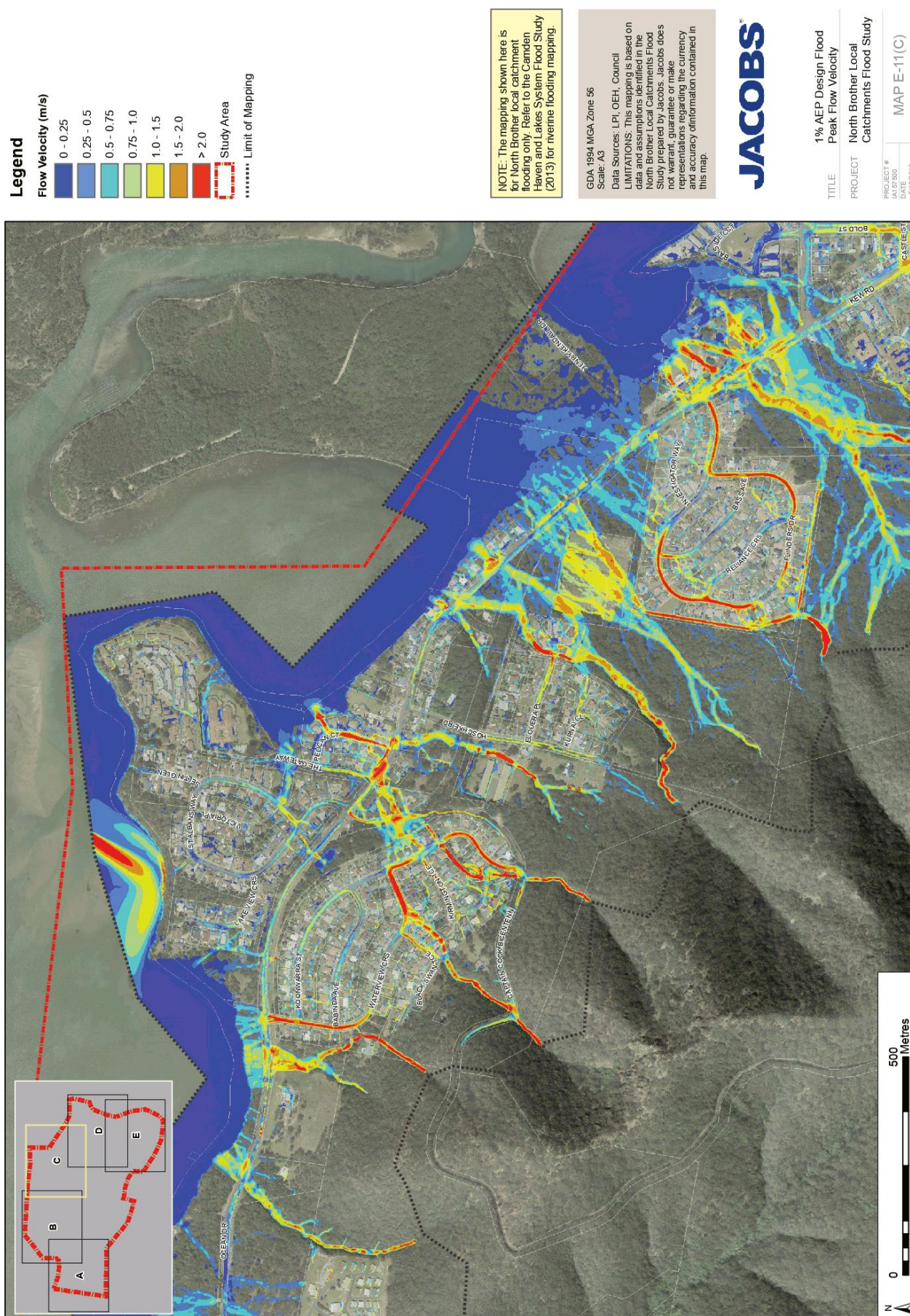
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

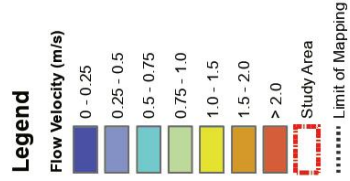
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-11(B)
DATE	8/12/2018





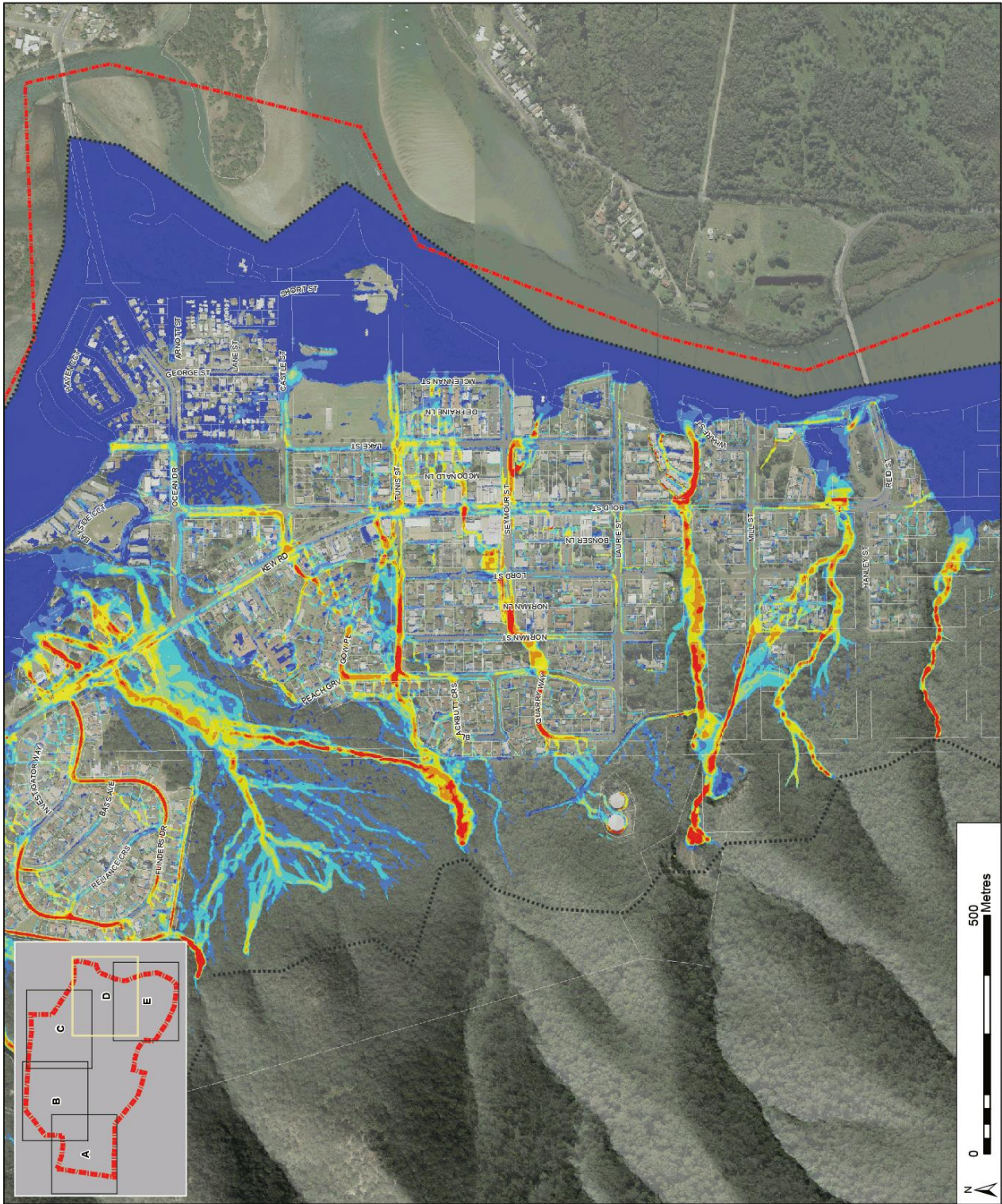


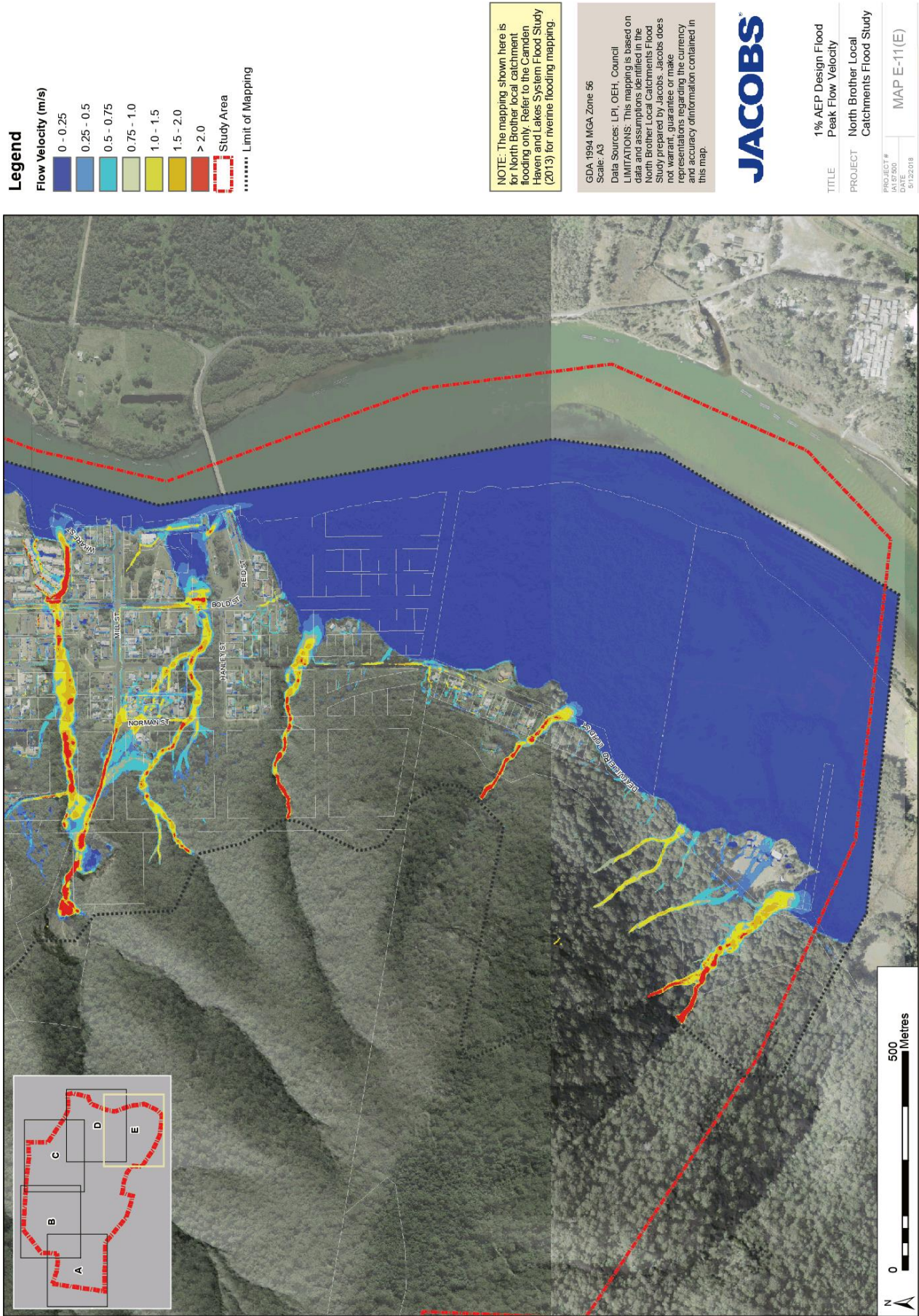
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

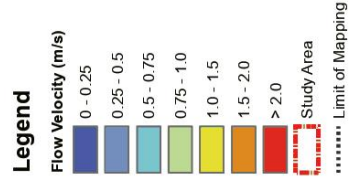
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-11(D)
DATE	8/12/2018





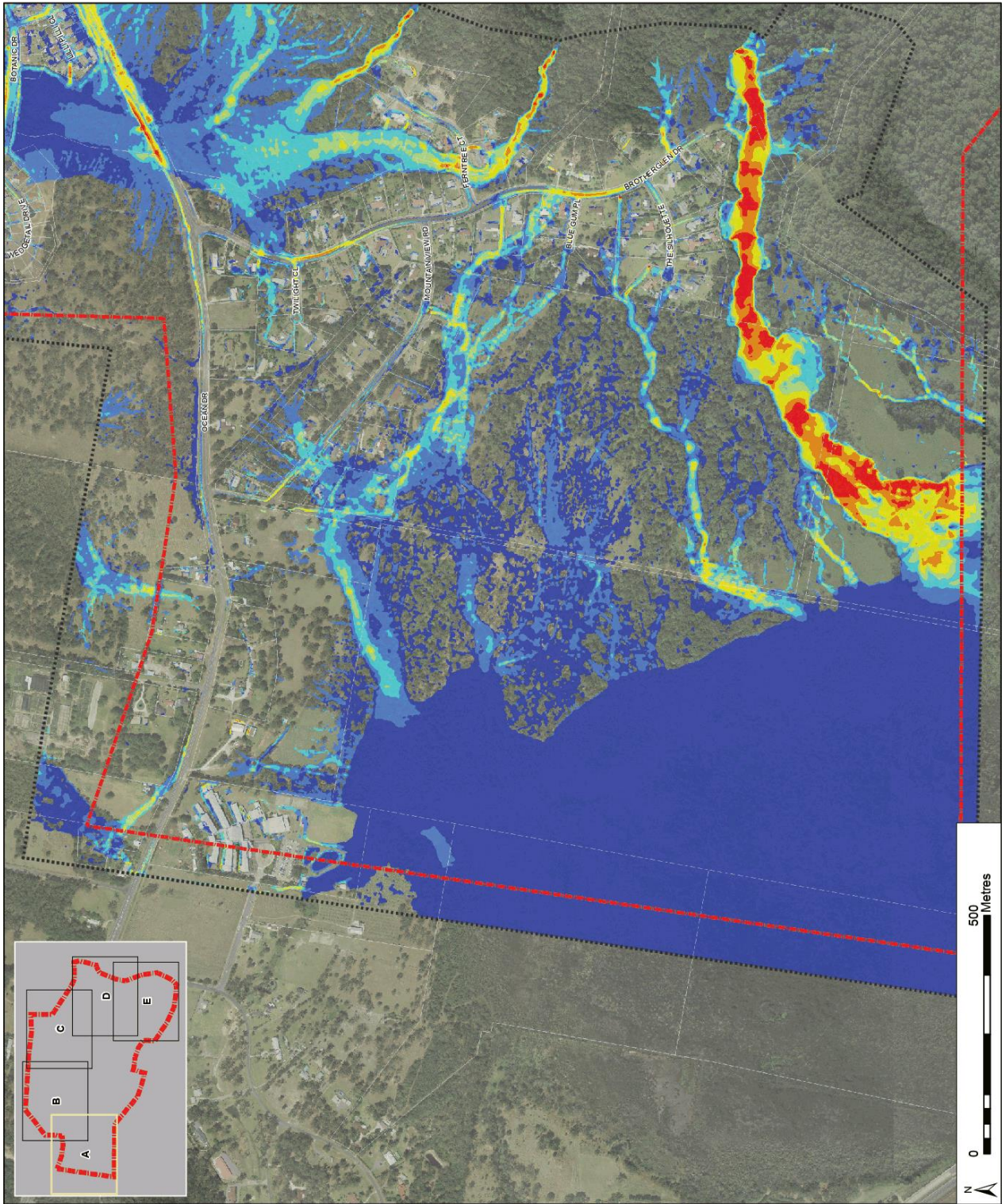


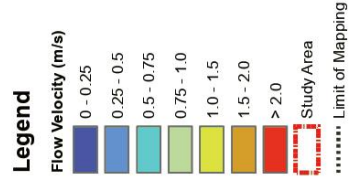
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	0.5% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJ. EST. #	MAP E-12(A)
DATE	8/12/2018



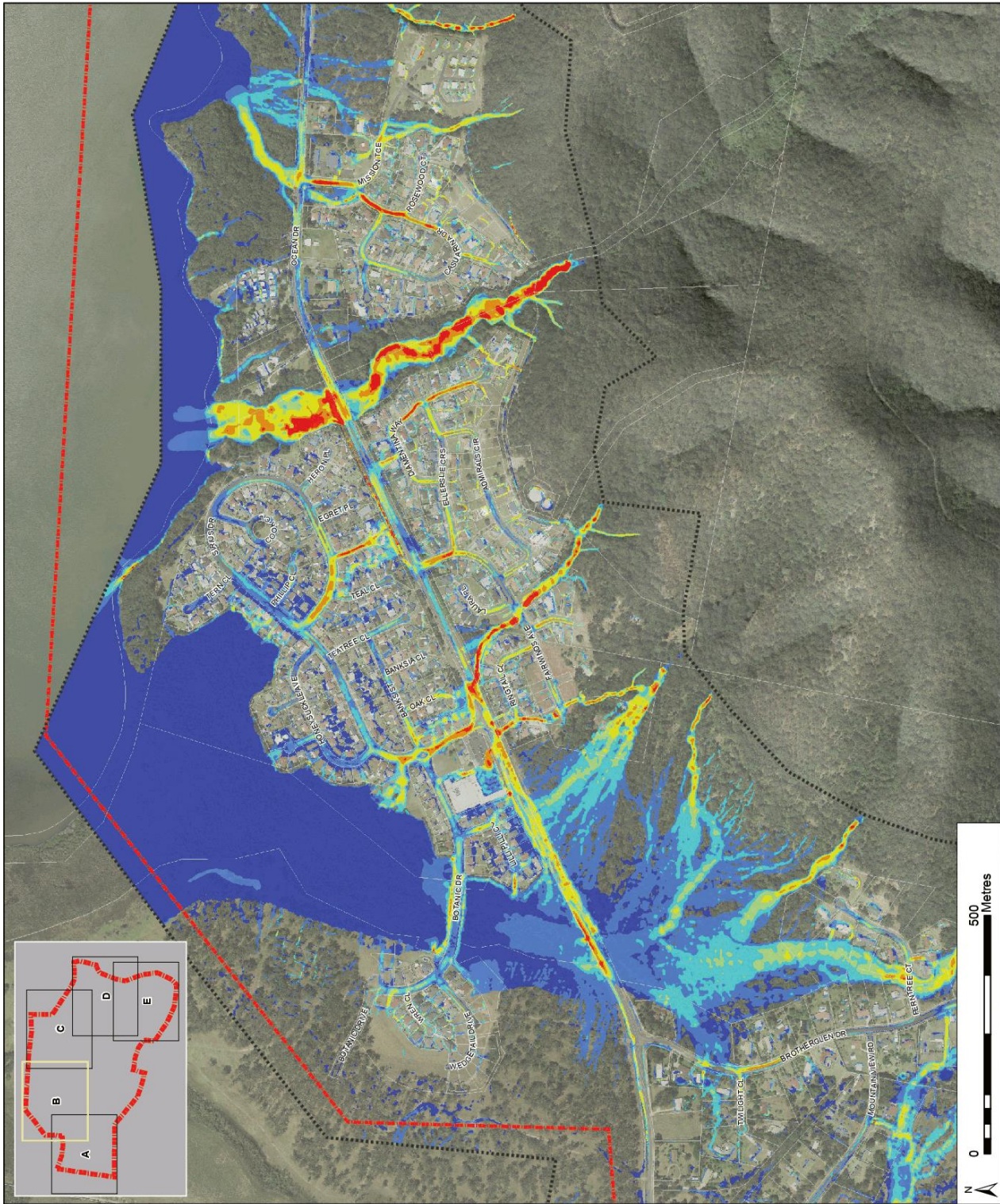


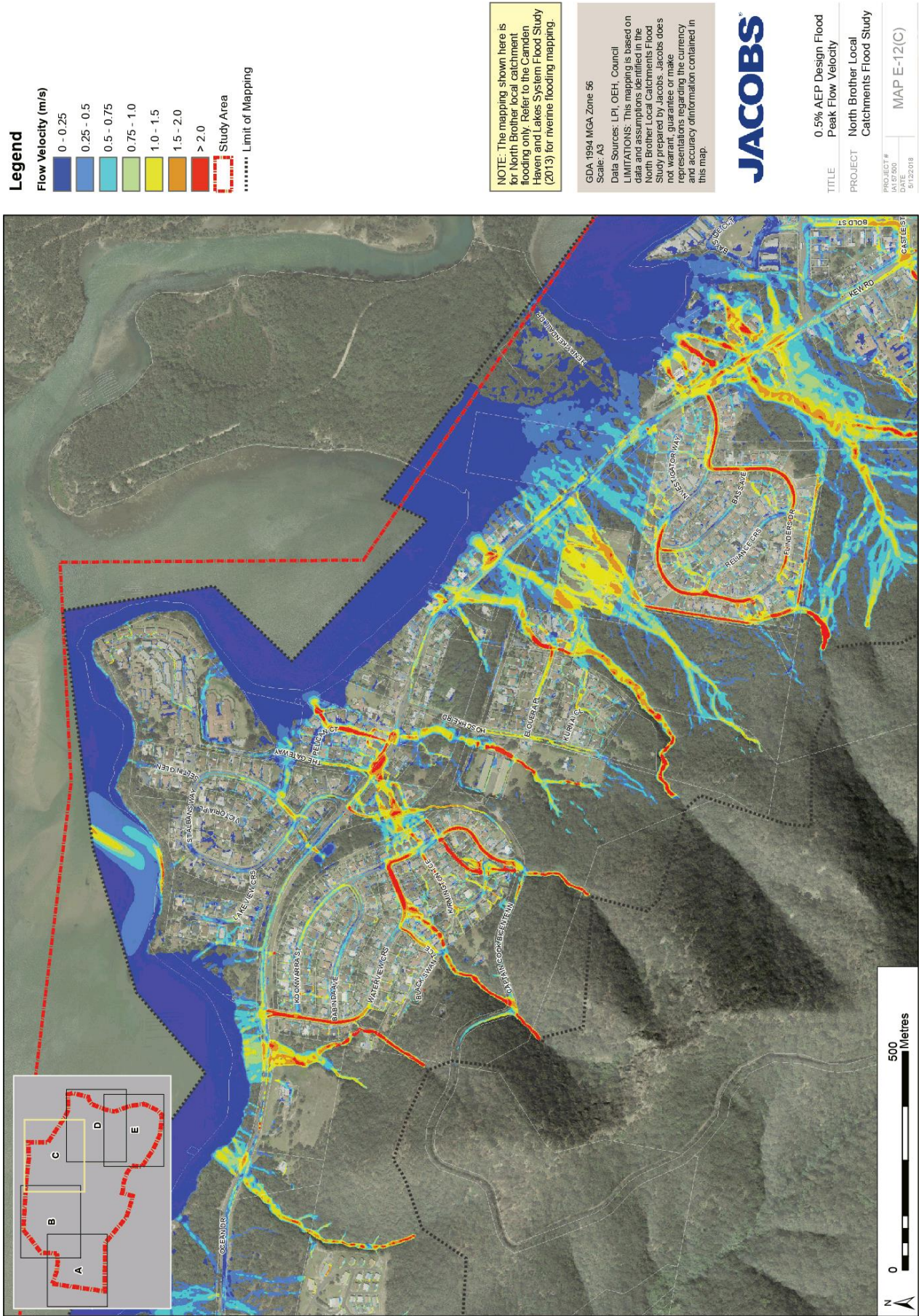
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

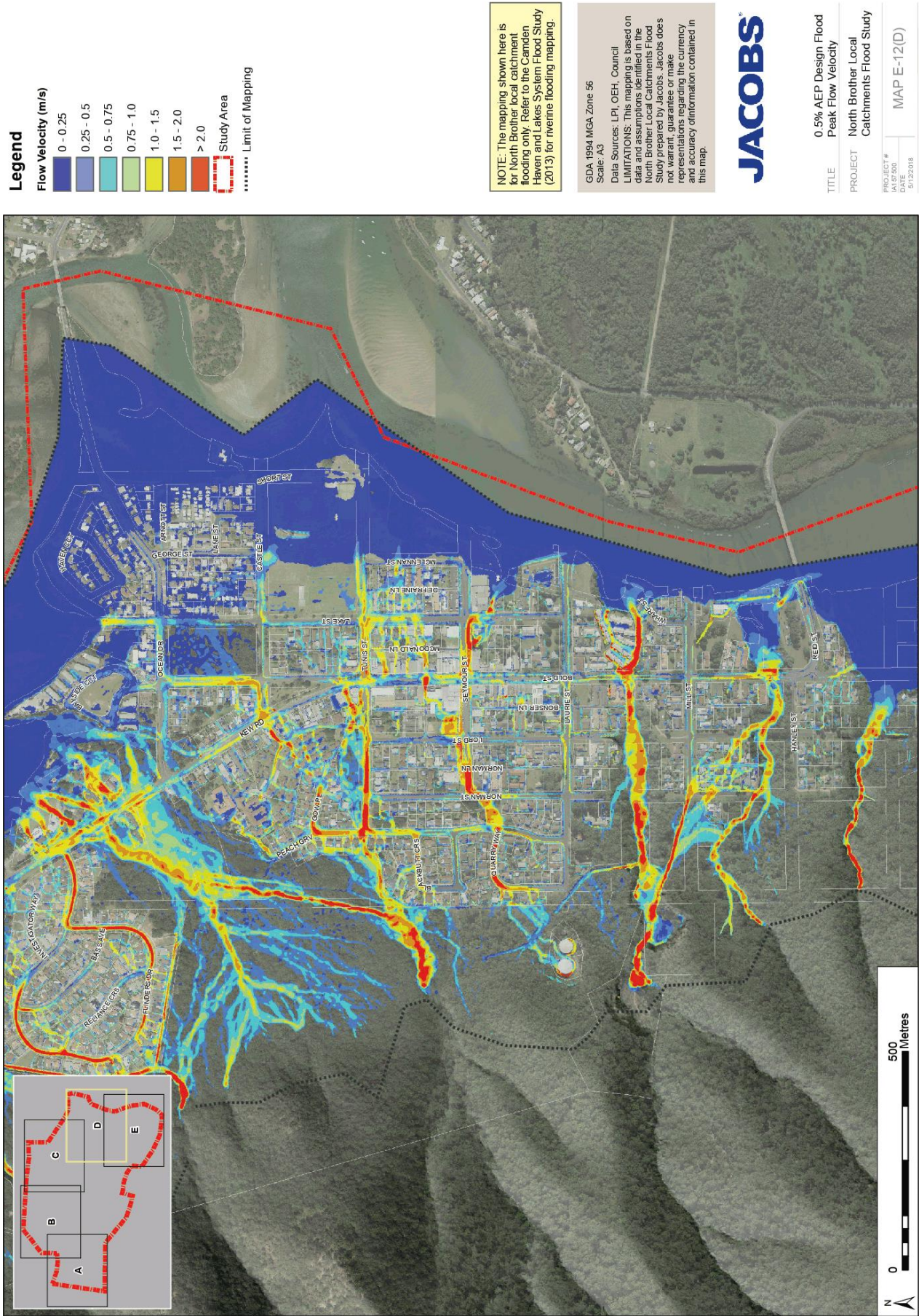
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

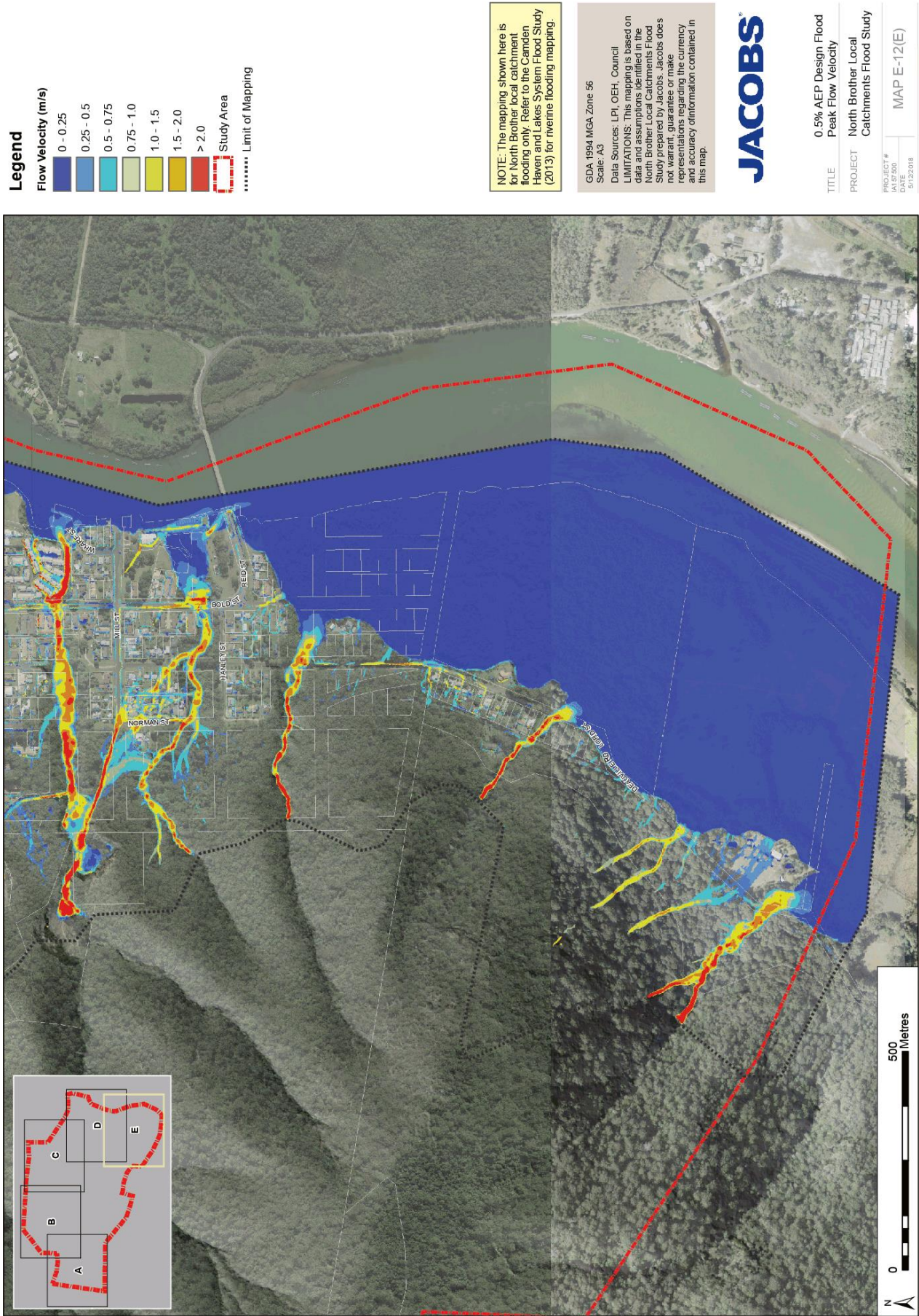


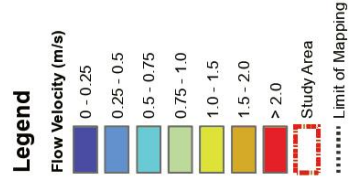
TITLE	0.5% AEP Design Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-12(B)
DATE	8/12/2018









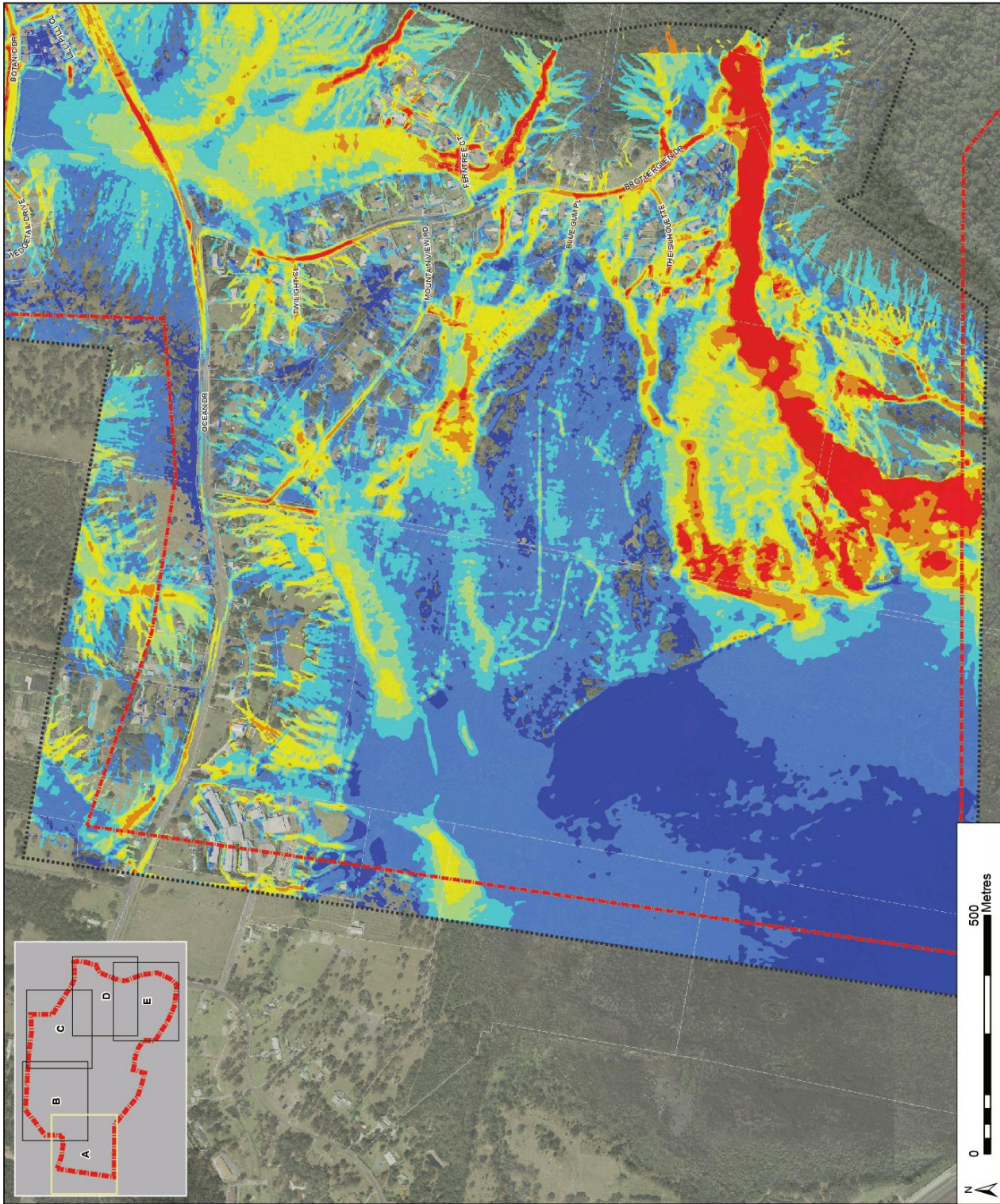


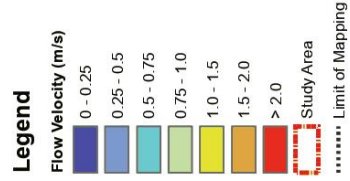
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Probable Maximum Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-13(A)
DATE	5/12/2018



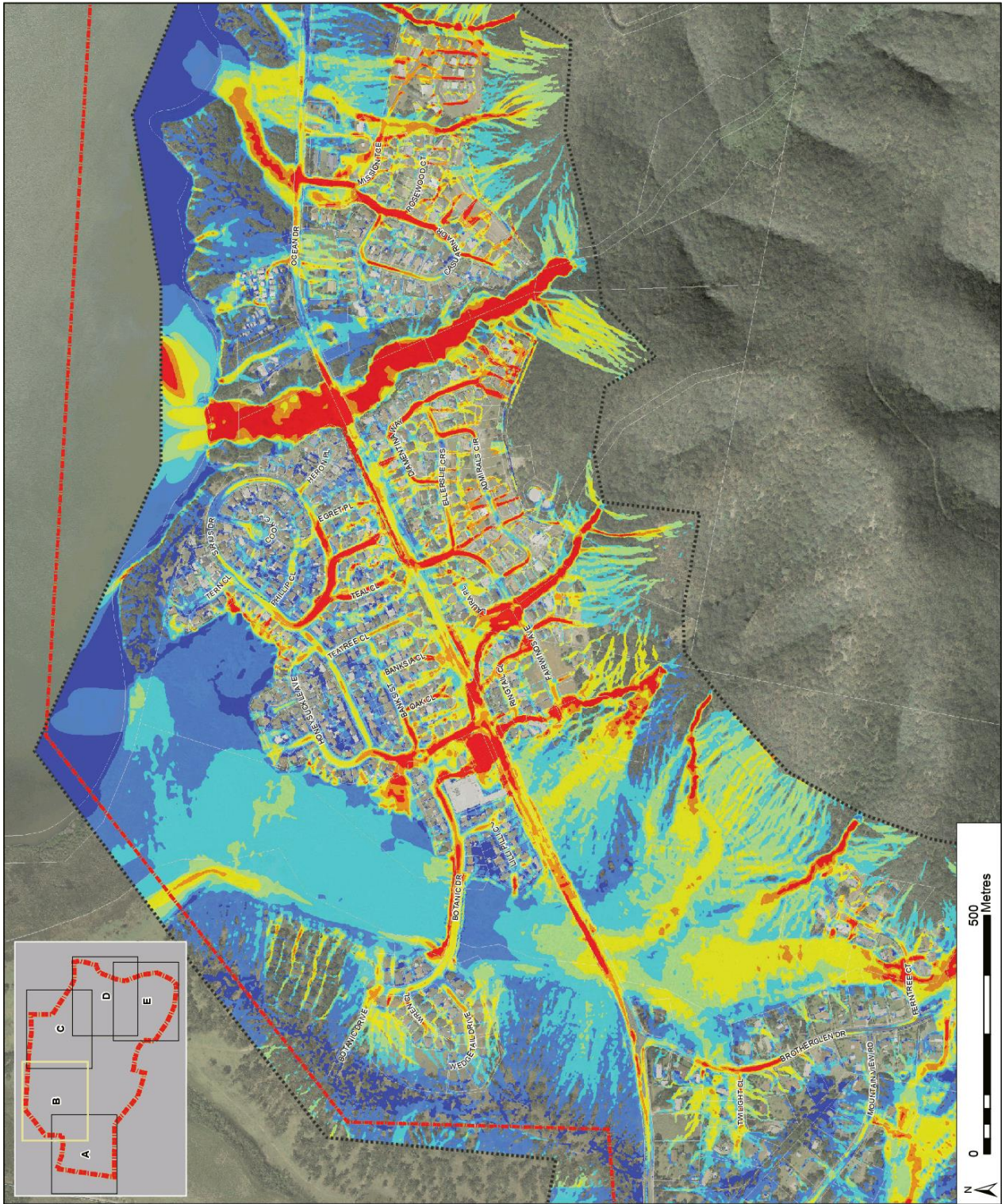


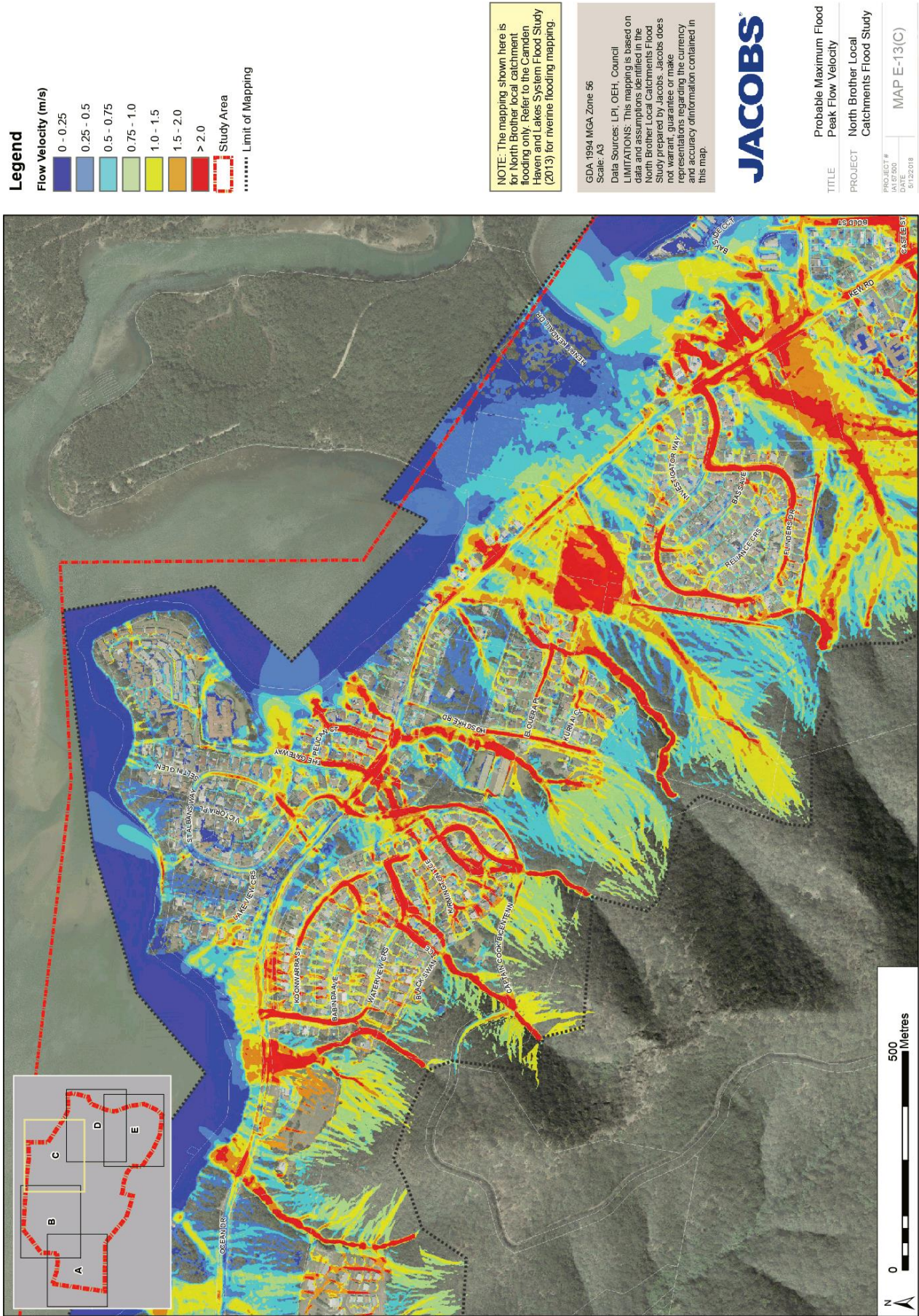
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

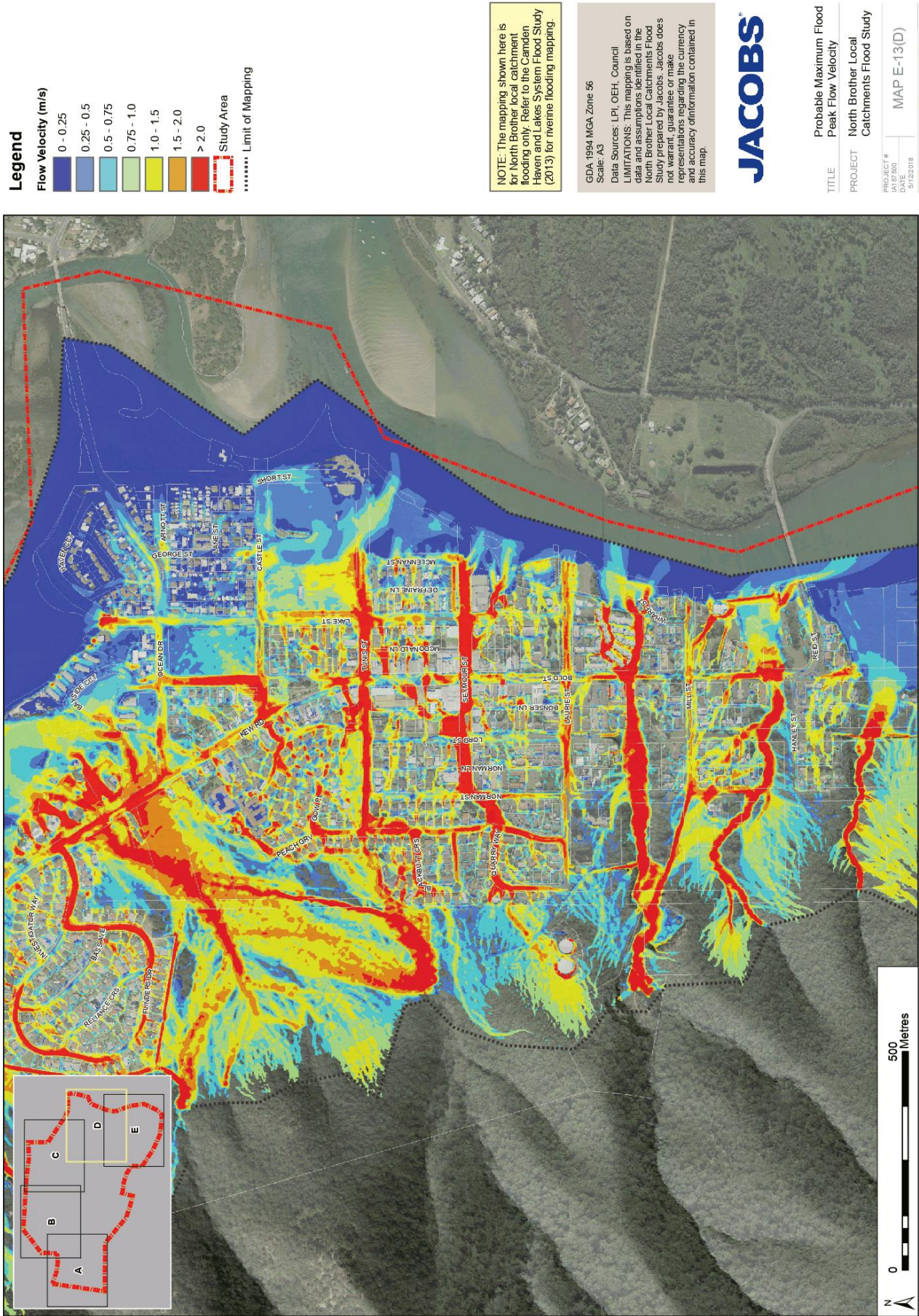
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

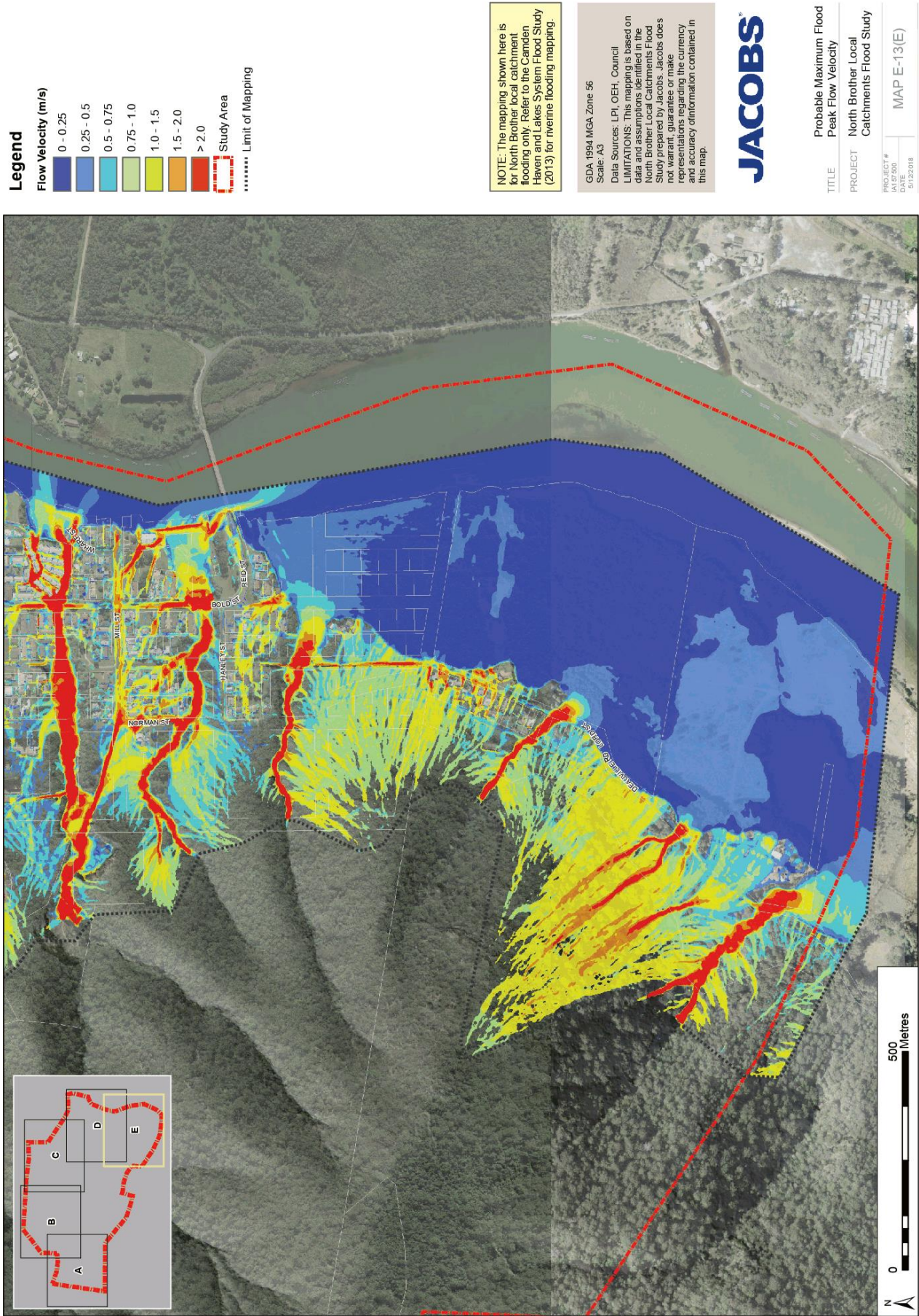


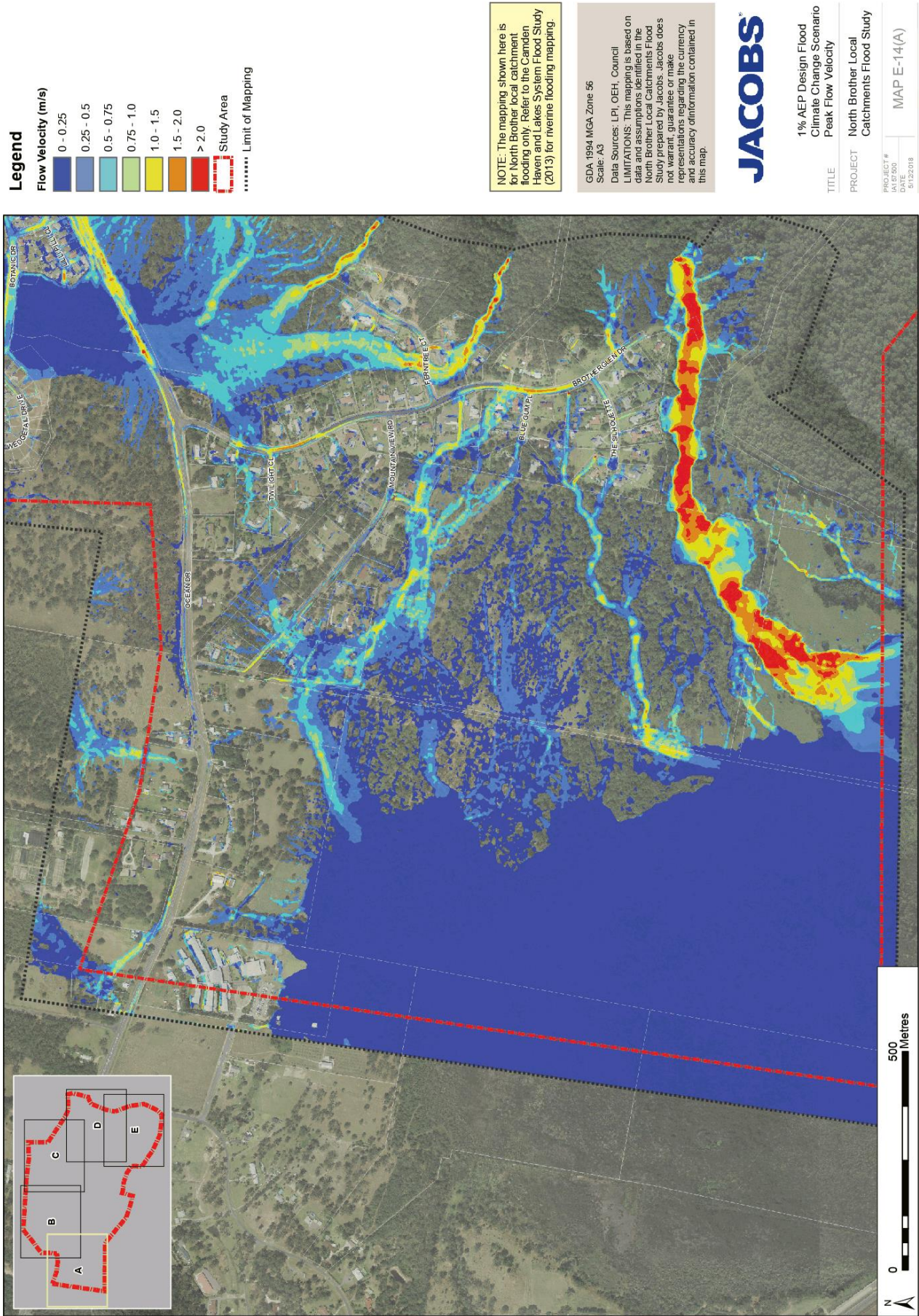
TITLE	Probable Maximum Flood Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-13(B)
DATE	8/12/2018

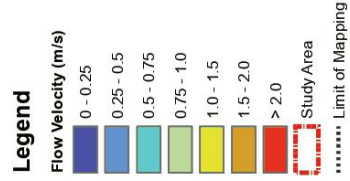










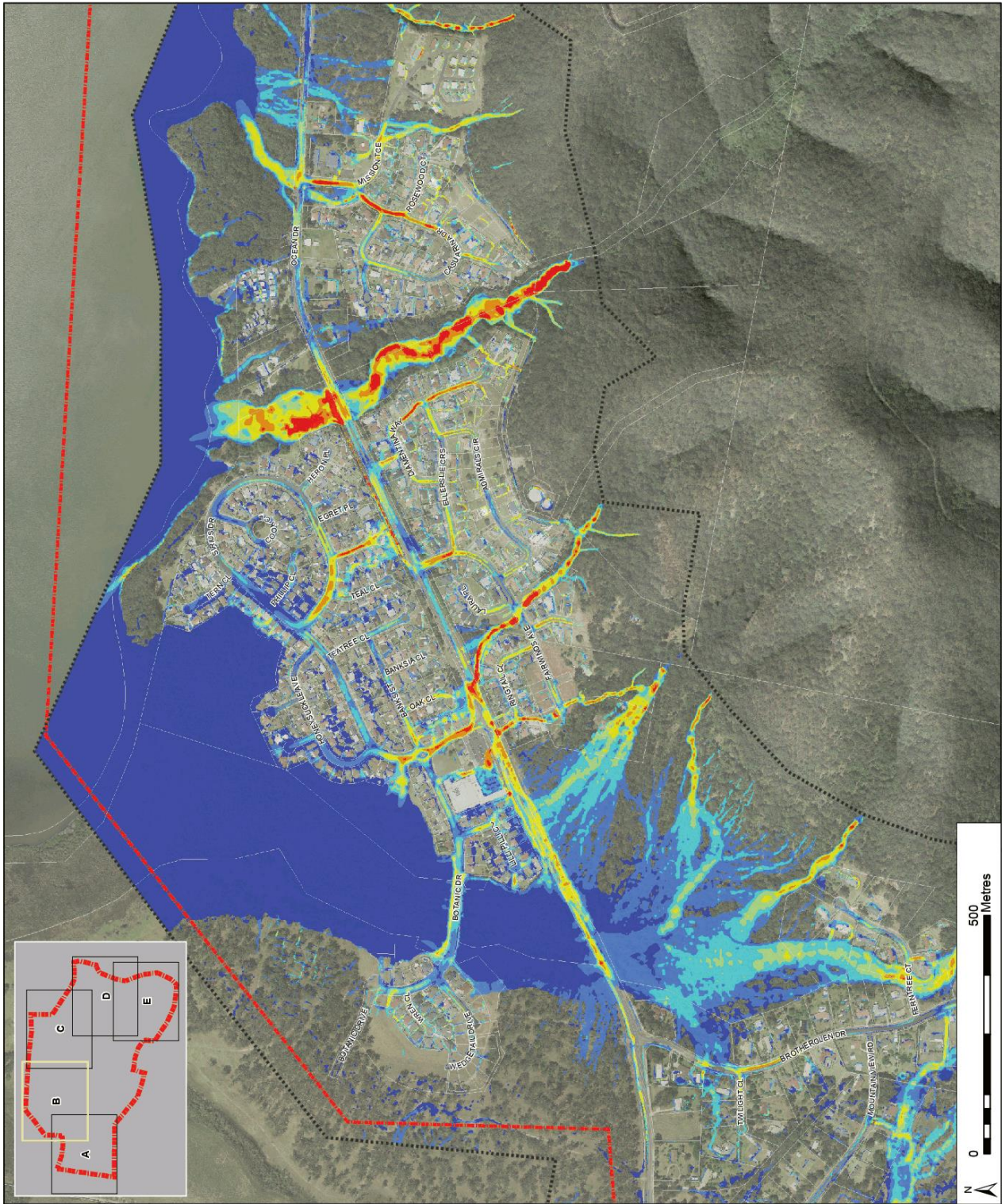


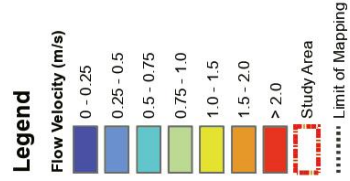
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Climate Change Scenario Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-14(B)
DATE	8/12/2018



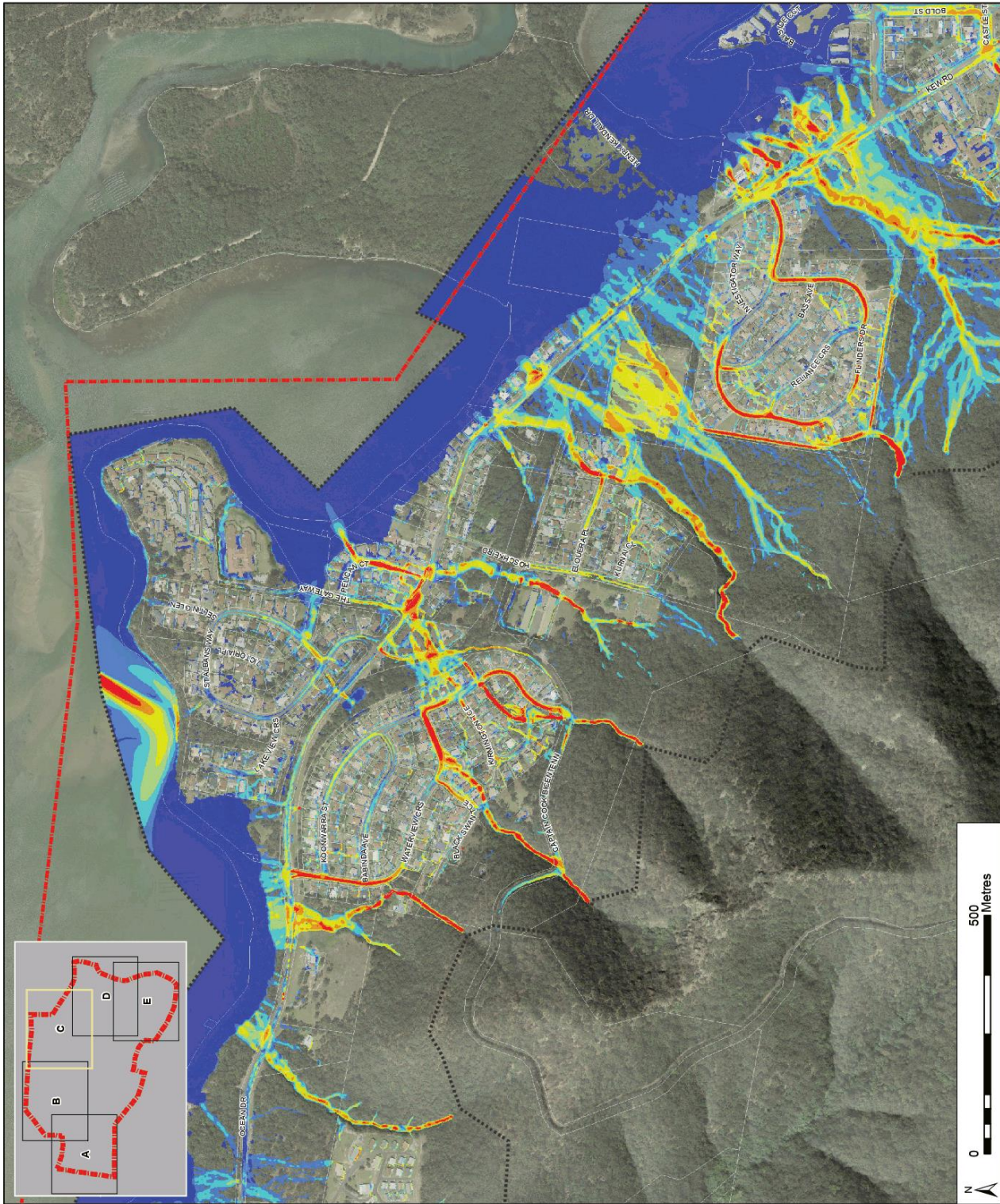


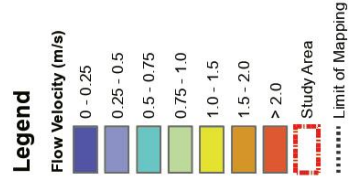
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Climate Change Scenario Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-14(C)
DATE	8/12/2018



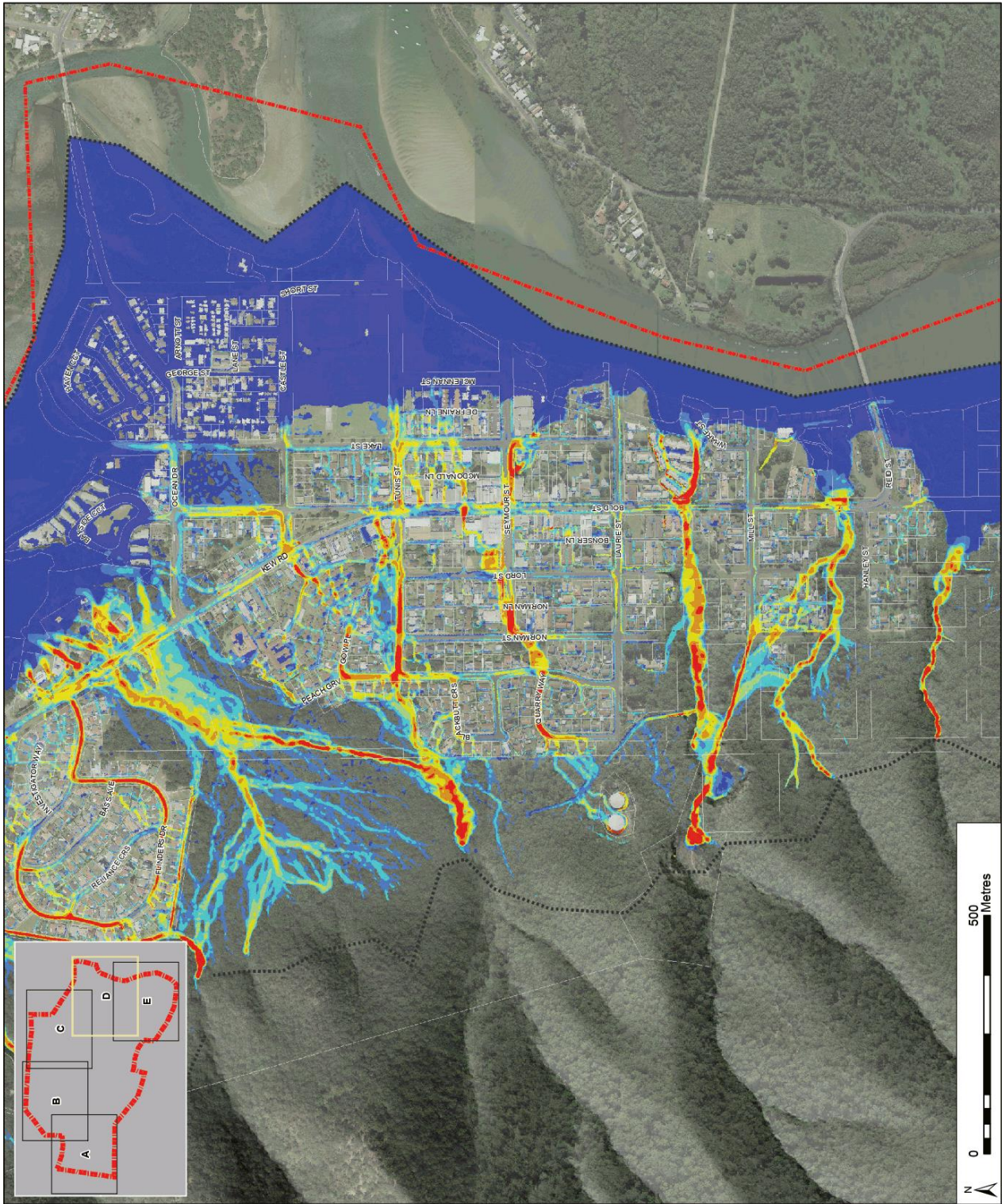


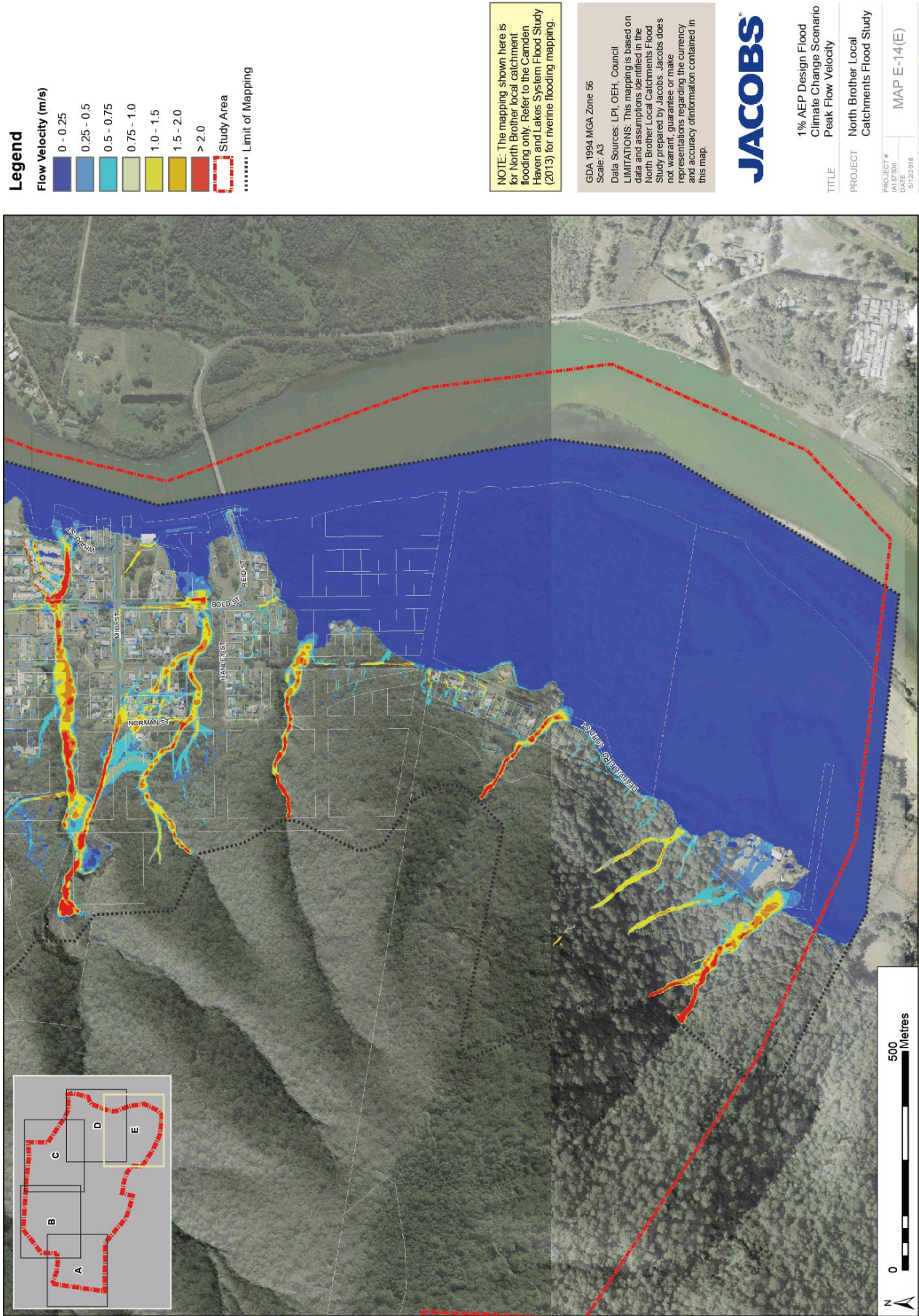
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

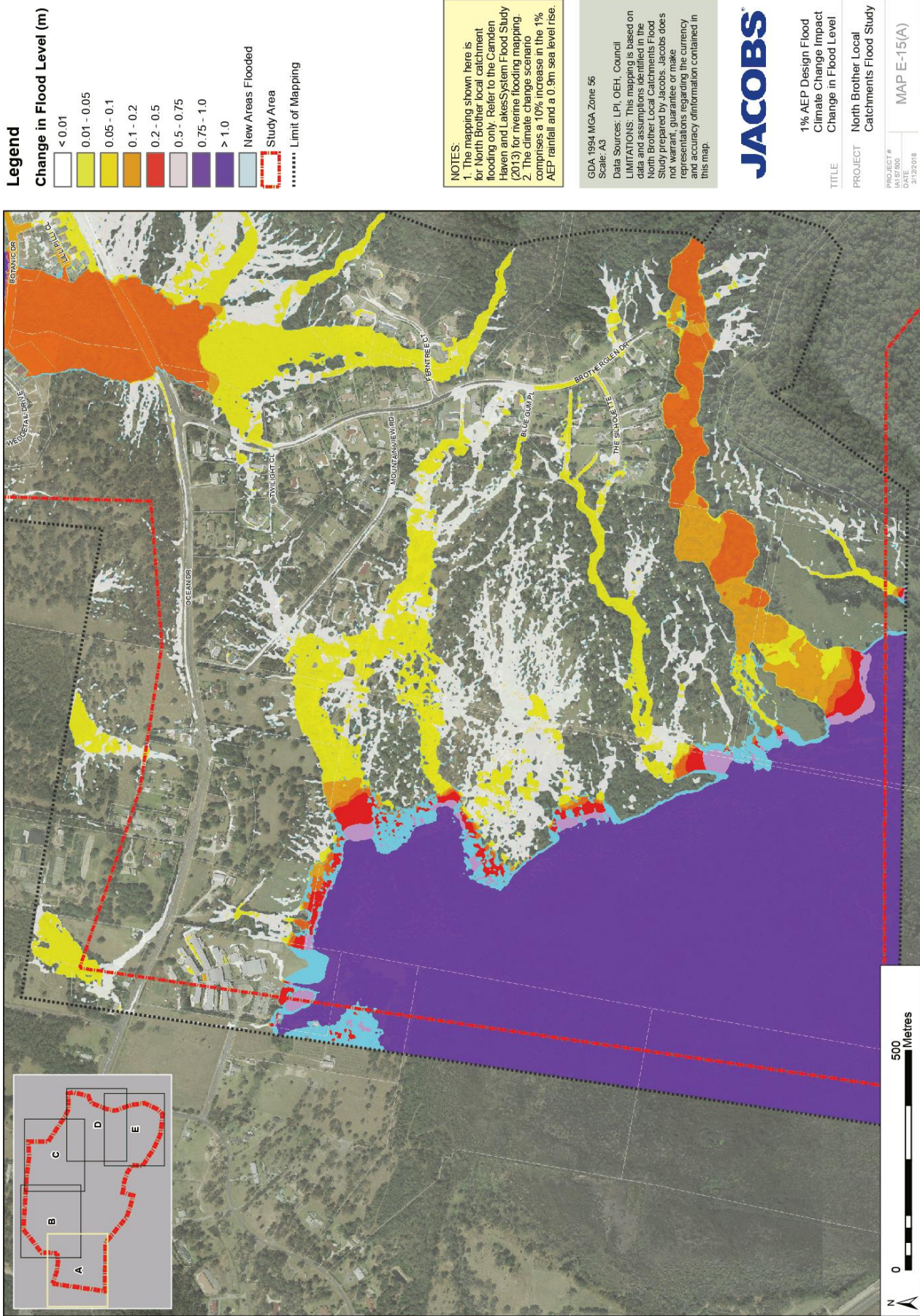
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

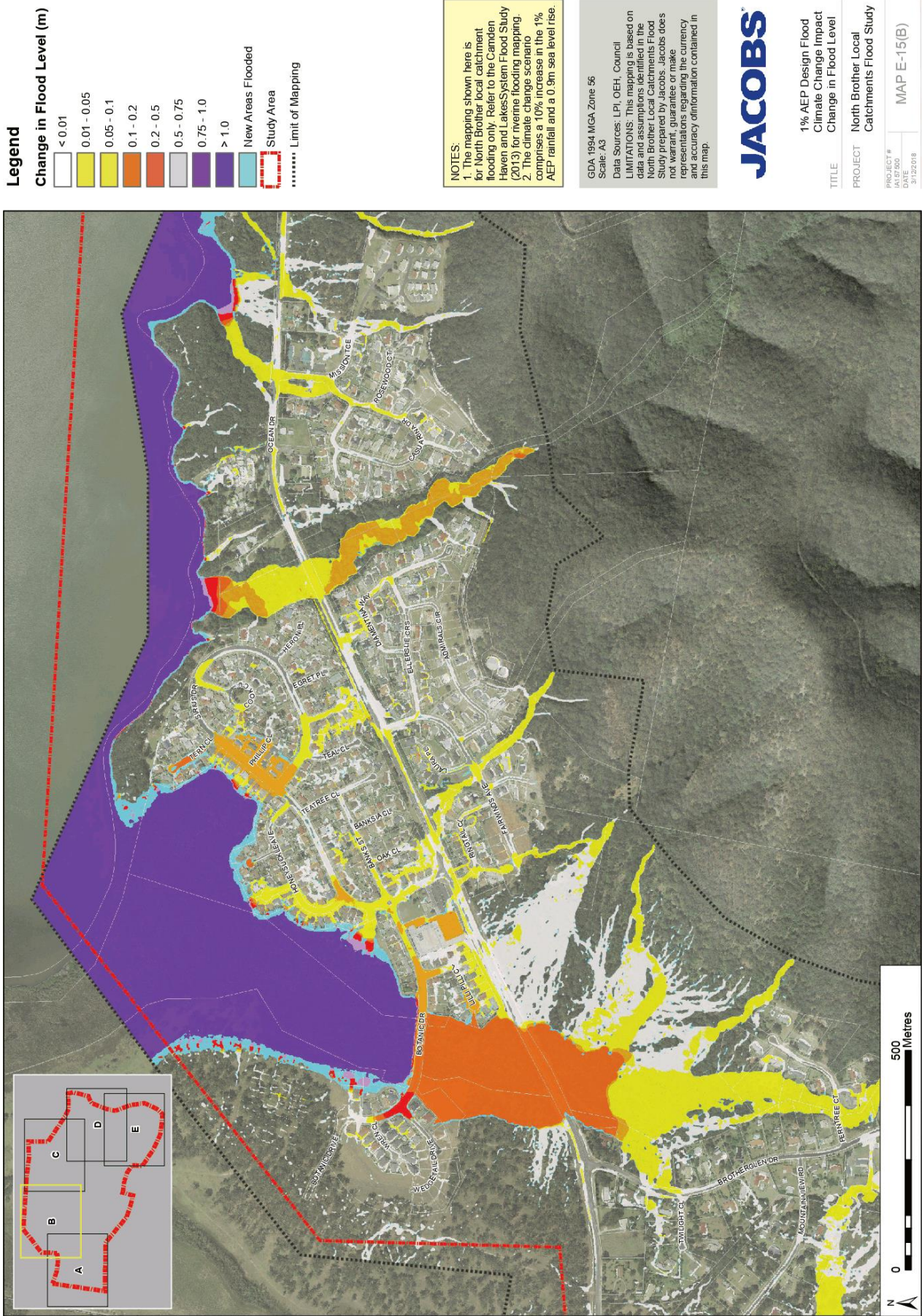


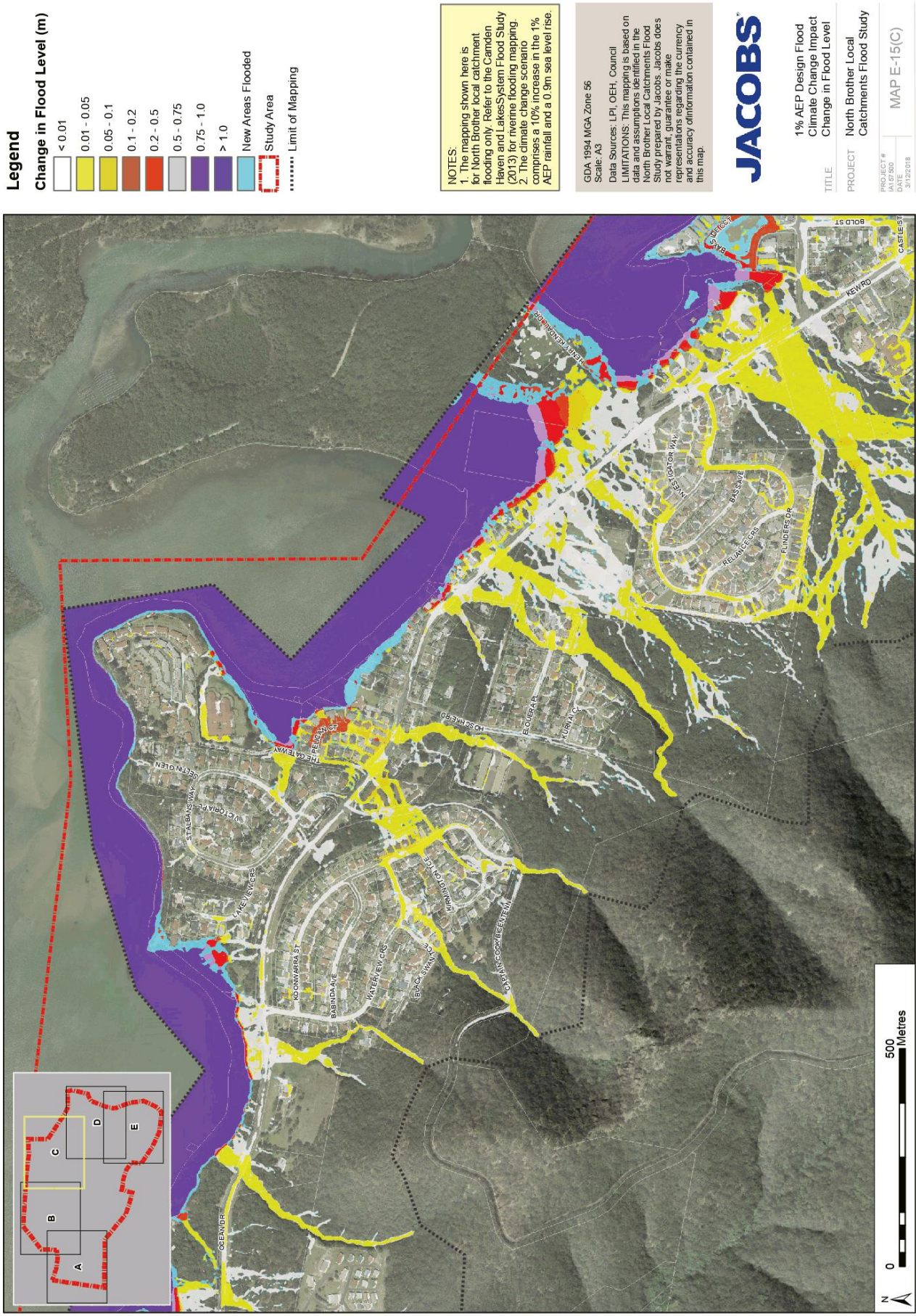
TITLE	1% AEP Design Flood Climate Change Scenario Peak Flow Velocity
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP E-14(D)
DATE	8/12/2018

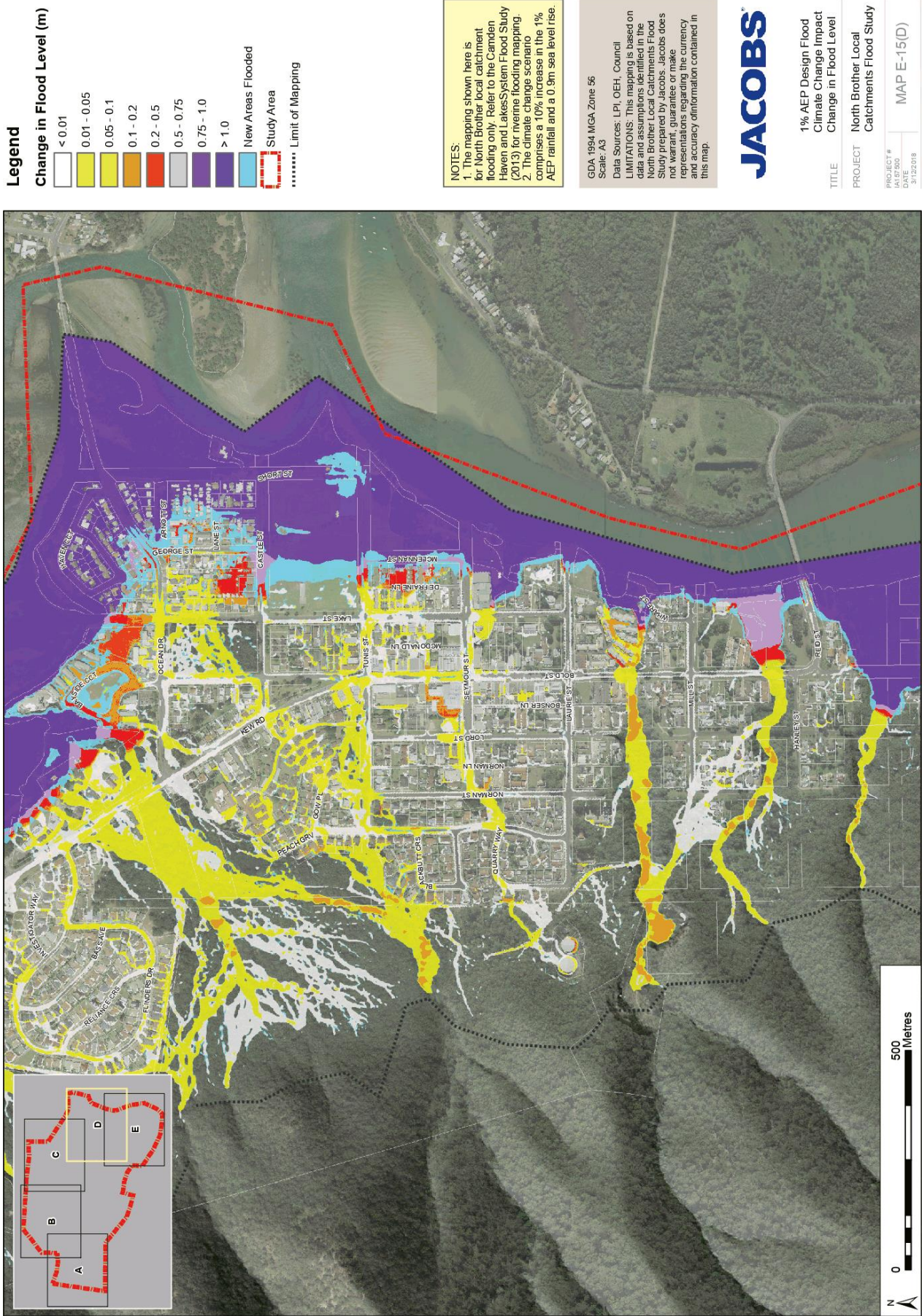


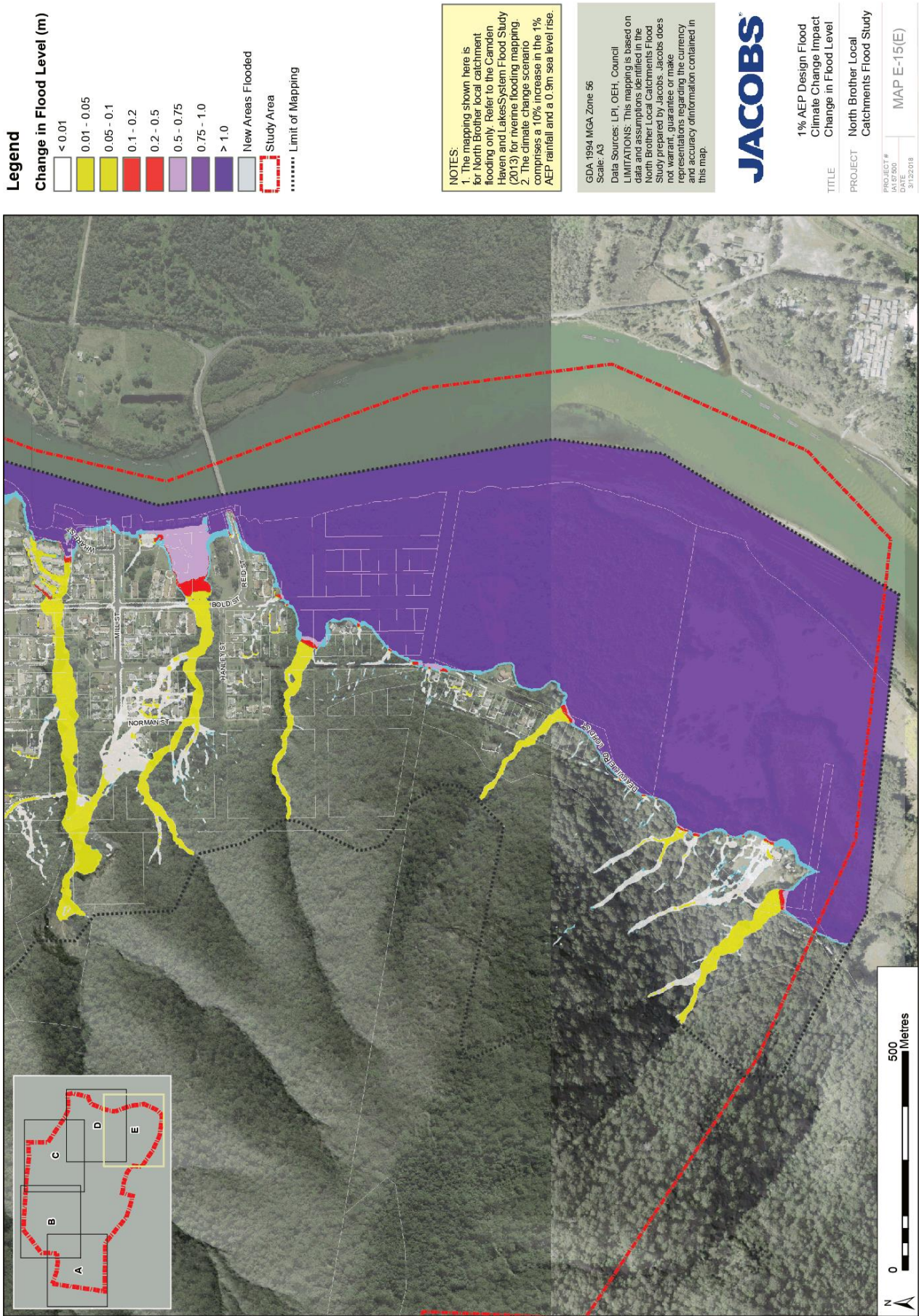












Draft Flood Study Report

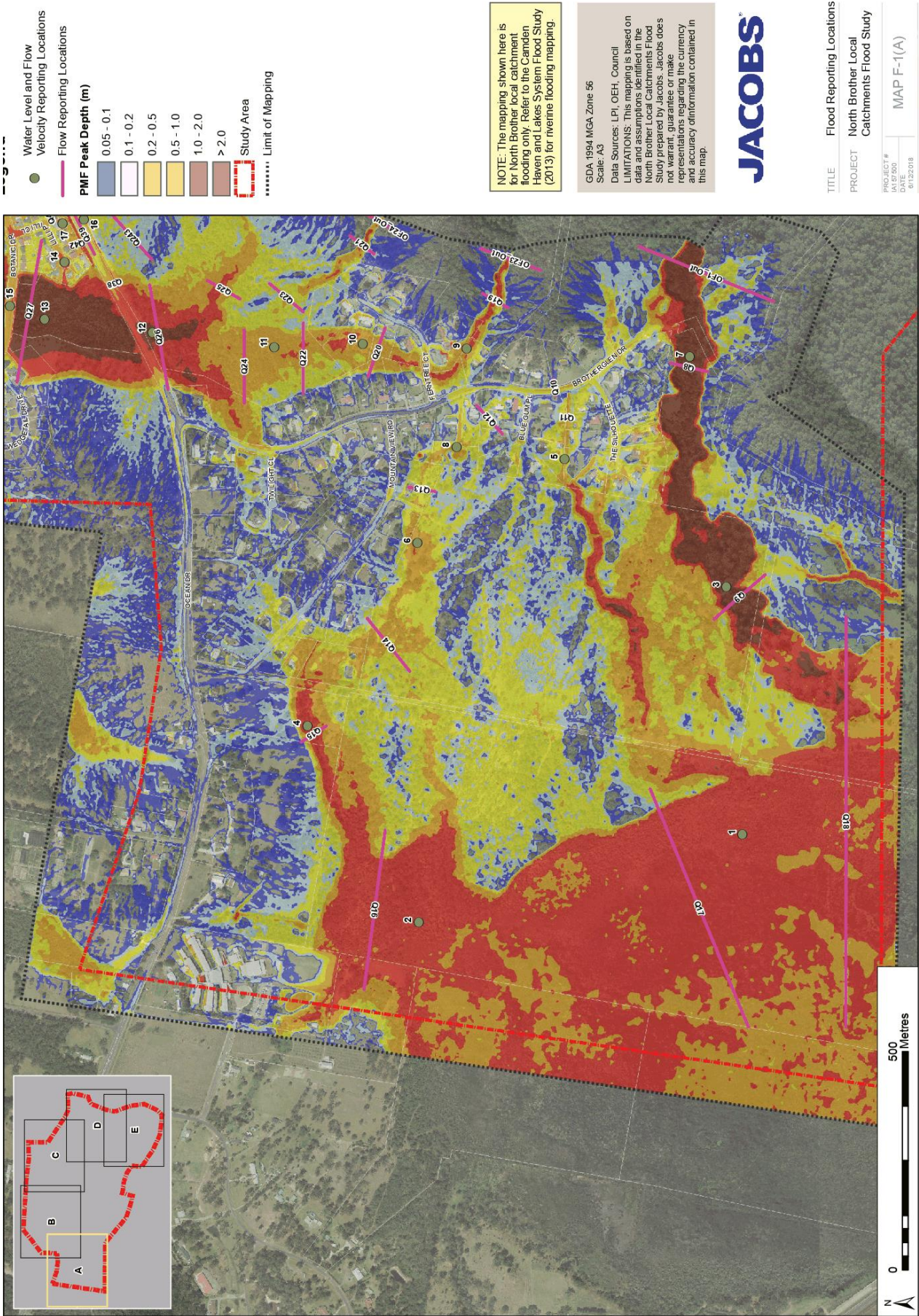


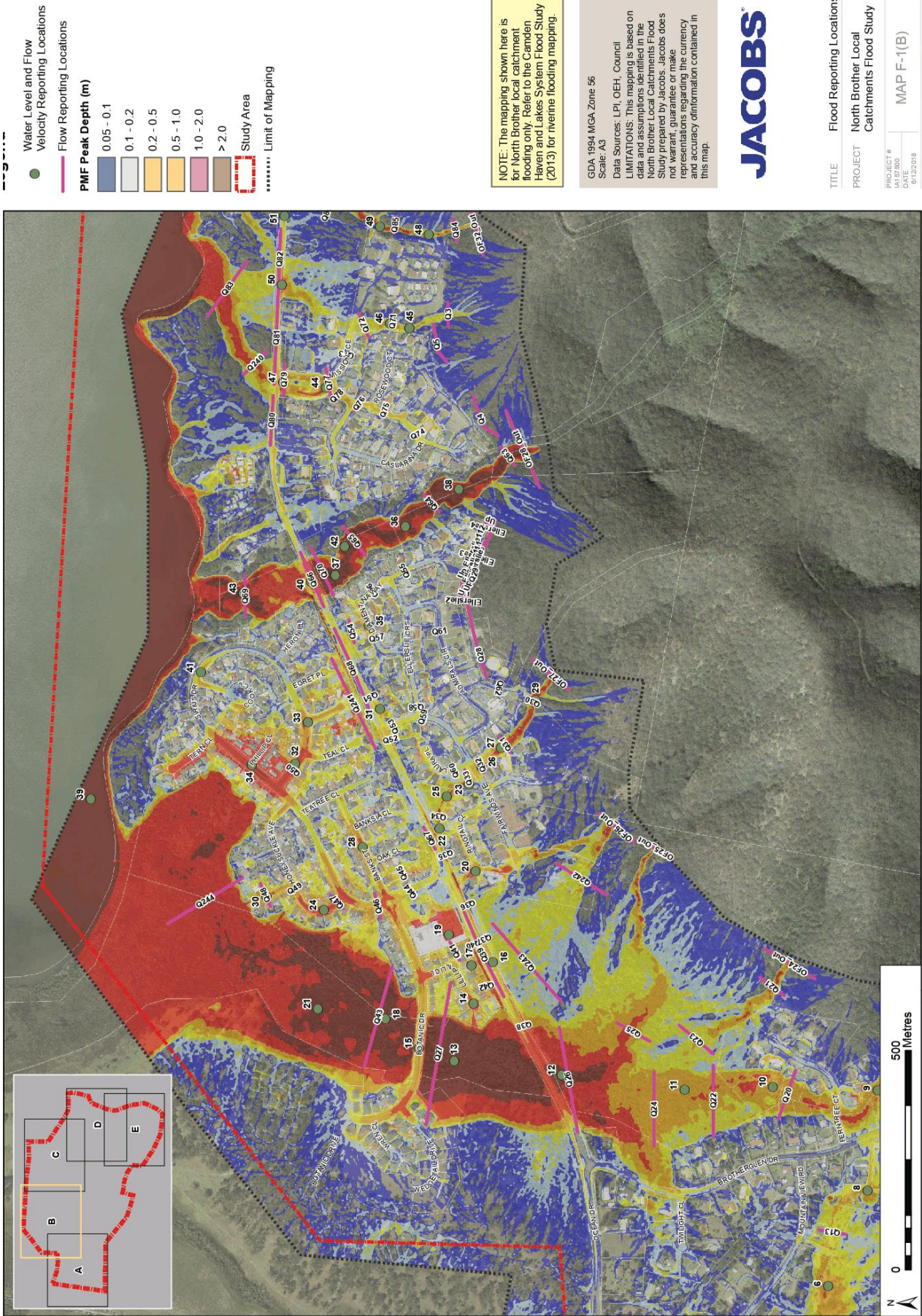
Appendix F. Summary of Flood Levels, Velocities and Flows at Specific Locations

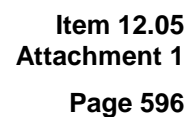
Figure F-1 Flood Level, Velocity and Flow Reporting Locations

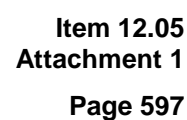
Table F-1 Summary of Peak Flood Level and Velocity at Selected Locations

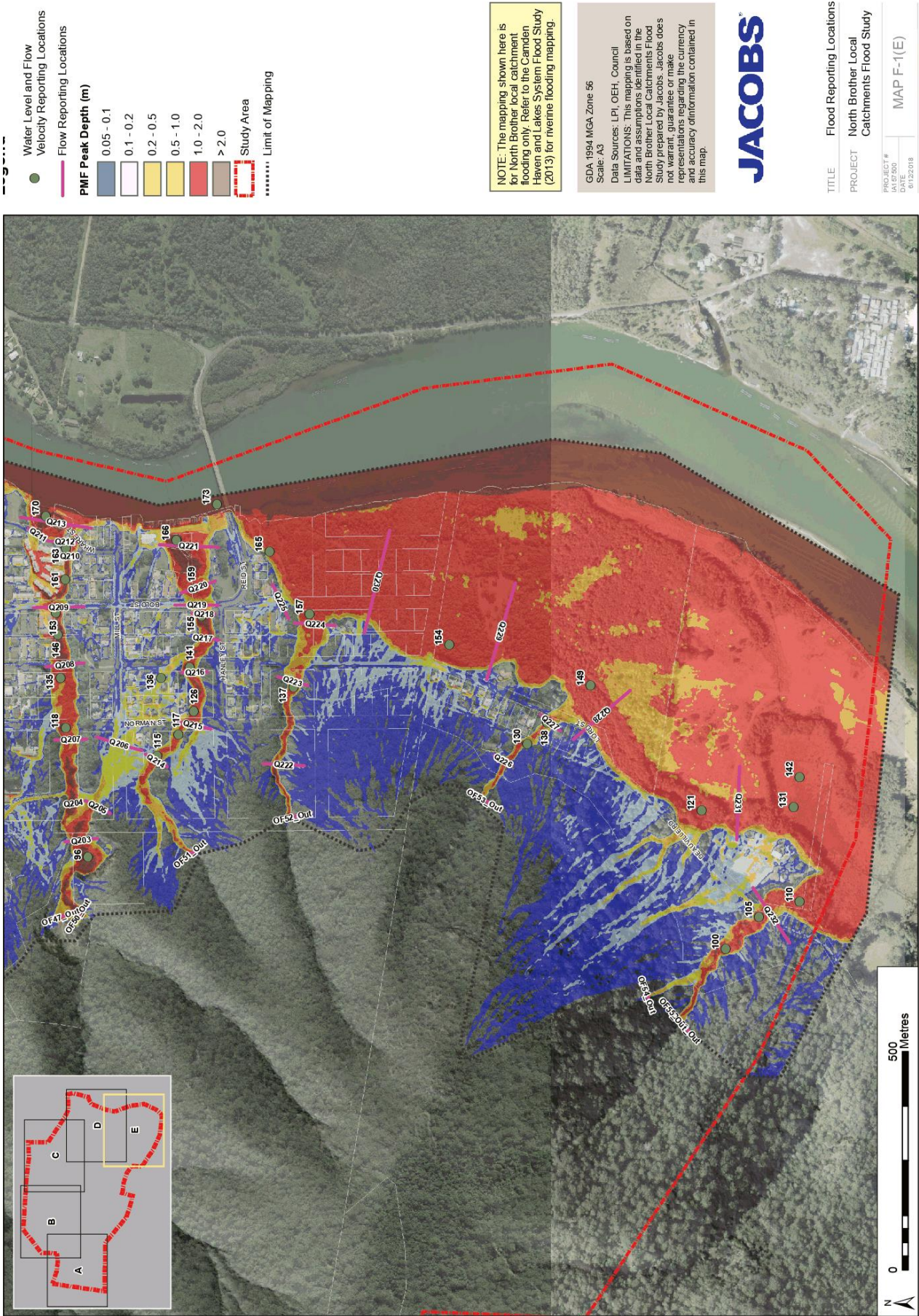
North Harbour Local Catchments Flood Study











ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1%AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
1	1.39	0.1	1.43	0.1	2.01	0.0	2.11	0.0	2.11	0.0	2.39	0.4	3.02	0.0
2	1.52	0.1	1.58	0.1	2.01	0.1	2.11	0.1	2.12	0.1	2.48	0.4	3.02	0.0
3	9.71	1.5	9.96	1.7	10.11	1.8	10.23	1.9	10.32	2.0	11.47	2.9	10.33	2.0
4	4.17	0.4	4.29	0.5	4.35	0.5	4.40	0.5	4.44	0.6	5.12	1.0	4.44	0.6
5	15.67	0.5	15.69	0.5	15.71	0.5	15.70	0.5	15.72	0.5	16.13	1.1	15.72	0.5
6	9.78	0.3	9.84	0.4	9.90	0.4	9.90	0.4	9.92	0.4	10.38	0.9	9.91	0.5
7	19.33	1.1	19.60	1.3	19.78	1.4	19.92	1.5	20.02	1.6	22.39	2.8	20.02	1.6
8	13.99	0.5	14.06	0.6	14.11	0.7	14.10	0.7	14.12	0.7	14.49	1.2	14.12	0.7
9	19.68	1.2	19.74	1.4	19.79	1.5	19.80	1.6	19.82	1.6	20.25	2.7	19.82	1.6
10	11.01	0.6	11.07	0.7	11.11	0.8	11.12	0.8	11.14	0.8	11.55	1.4	11.15	0.8
11	6.82	0.5	6.88	0.6	6.94	0.7	6.96	0.7	6.98	0.7	7.48	1.2	6.98	0.7
12	3.47	0.2	3.53	0.3	3.62	0.4	3.69	0.4	3.76	0.4	4.54	1.2	3.85	0.4
13	2.83	0.8	3.42	0.7	3.61	0.2	3.68	0.2	3.74	0.2	4.39	0.5	3.82	0.2
14	3.64	0.4	3.73	0.5	3.81	0.6	3.84	0.4	3.87	0.4	4.41	0.7	3.89	0.3
15	3.28	0.0	3.38	0.1	3.54	0.3	3.59	0.4	3.64	0.5	4.14	1.3	3.71	0.6
16	5.62	1.1	5.65	1.2	5.68	1.2	5.69	1.2	5.70	1.2	5.86	1.4	5.70	1.2
17	4.44	0.2	4.51	0.2	4.58	0.2	4.60	0.2	4.62	0.2	5.21	0.5	4.62	0.2
18	1.40	0.1	1.47	0.2	2.04	0.2	2.11	0.2	2.19	0.2	3.15	0.7	3.03	0.2
19	-	-	4.44	0.2	4.77	0.3	4.81	0.2	4.89	0.2	5.97	0.7	4.90	0.2
20	10.87	0.5	10.91	0.6	10.98	0.9	10.98	0.9	11.01	1.0	11.67	2.9	11.00	1.0
21	1.35	0.1	1.40	0.1	2.03	0.1	2.11	0.1	2.16	0.1	2.98	0.5	3.02	0.1
22	11.55	1.3	11.57	2.0	11.60	2.3	11.61	2.3	11.62	2.4	11.87	3.4	11.62	2.4
23	17.21	0.9	17.30	1.0	17.40	1.0	17.41	1.0	17.44	1.0	18.18	2.2	17.44	1.1
24	3.05	0.2	3.19	0.2	3.28	0.3	3.31	0.3	3.34	0.3	3.95	1.4	3.36	0.3
25	14.79	1.6	14.87	1.8	14.93	1.8	14.93	1.8	14.95	1.9	15.32	2.5	14.96	1.9
26	19.01	1.3	19.20	1.3	19.33	2.0	19.34	1.3	19.38	1.3	20.01	3.3	19.38	1.4
27	23.19	1.2	23.25	1.4	23.31	1.5	23.31	1.5	23.33	1.6	23.85	2.7	23.36	1.6
28	5.00	0.1	5.04	0.1	5.09	0.1	5.09	0.1	5.11	0.2	5.76	0.5	5.11	0.2
29	31.26	0.6	31.37	0.7	31.45	0.7	31.47	0.8	31.51	0.8	32.29	1.5	31.51	0.8
30	2.64	0.2	3.08	0.3	3.17	0								

ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1%AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
33	4.67	0.8	4.72	1.1	4.77	1.3	4.77	1.3	4.78	1.4	5.52	2.7	4.78	1.4
34	3.22	0.2	3.47	0.2	3.58	0.3	3.62	0.3	3.67	0.3	4.58	0.9	3.69	0.2
35	12.81	0.4	12.85	0.4	12.89	0.4	12.88	0.4	12.89	0.4	13.51	0.7	12.90	0.4
36	16.90	1.6	17.04	1.7	17.13	1.8	17.20	1.9	17.26	2.0	18.52	3.0	17.25	2.0
37	10.13	0.9	10.26	1.0	10.36	1.1	10.42	1.2	10.48	1.3	11.68	2.7	10.47	1.3
38	22.15	1.4	22.27	1.6	22.35	1.8	22.41	1.9	22.46	2.0	23.57	4.1	22.44	2.0
39	1.26	0.0	1.26	0.0	2.01	0.0	2.11	0.0	2.11	0.0	2.14	0.1	3.01	0.0
40	9.90	0.9	9.98	1.1	10.05	1.2	10.09	1.3	10.13	1.4	10.87	2.8	10.12	1.4
41	5.35	0.1	5.40	0.1	5.48	0.1	5.47	0.1	5.50	0.1	5.79	0.3	5.50	0.2
42	12.00	1.3	12.22	1.4	12.36	1.7	12.46	1.6	12.54	1.7	14.09	2.8	12.54	1.7
43	4.10	1.1	4.23	1.3	4.33	1.4	4.40	1.5	4.45	1.6	5.64	2.7	4.47	1.6
44	13.43	0.7	13.47	0.7	13.51	0.7	13.50	0.9	13.51	0.8	14.00	1.2	13.51	0.8
45	29.75	1.1	29.77	1.2	29.81	1.4	29.81	1.4	29.83	1.4	30.22	2.7	29.84	1.4
46	25.40	0.9	25.43	1.0	25.48	1.1	25.47	1.1	25.49	1.1	25.87	1.9	25.47	1.1
47	10.65	0.4	10.73	0.4	10.81	0.4	10.81	0.4	10.83	0.4	11.35	0.7	10.83	0.4
48	32.85	0.4	32.93	0.4	33.01	0.5	33.00	0.5	33.03	0.5	33.70	1.6	33.03	0.5
49	20.46	1.3	20.55	1.5	20.61	1.6	20.60	1.6	20.63	1.6	21.52	3.3	20.63	1.6
50	8.55	0.8	8.82	0.8	9.02	0.8	9.01	0.8	9.04	0.8	9.36	0.6	9.04	0.7
51	8.73	0.1	8.80	0.1	8.86	0.2	8.85	0.2	8.87	0.2	9.06	0.2	8.87	0.2
52	8.91	0.4	8.96	0.5	9.03	0.6	9.02	0.6	9.04	0.6	9.66	1.6	9.05	0.6
53	33.43	1.9	33.45	2.1	33.48	2.3	33.48	2.4	33.49	2.5	33.87	4.8	33.48	2.5
54	14.96	0.8	15.02	0.9	15.06	1.0	15.07	1.0	15.09	1.1	15.53	1.9	15.08	1.1
55	23.68	0.8	23.78	0.9	23.88	0.8	23.90	0.9	23.94	1.1	24.55	2.4	23.95	1.1
56	8.29	0.9	8.32	1.0	8.35	1.0	8.35	1.0	8.36	1.1	8.62	1.6	8.38	1.1
57	-	-	19.17	2.0	19.20	2.5	19.19	2.4	19.20	2.6	19.35	4.7	19.24	2.5
58	39.69	0.4	39.80	0.5	39.91	1.0	39.91	0.6	39.94	0.6	41.00	1.6	39.94	0.6
59	20.79	0.4	20.81	0.4	20.83	0.5	20.83	0.5	20.84	0.5	20.99	0.7	20.83	0.5
60	32.40	1.4	32.46	1.5	32.51	1.7	32.51	1.7	32.52	1.7	32.93	2.7	32.58	1.6
61	40.13	0.6	40.25	0.6	40.34	0.8	40.35	0.7	40.39	0.7	41.05	1.7	40.39	0.7
62	7.45	0.8	7.50	0.8	7.53	0.9	7.52	0.9	7.53	0.9	7.74	0.9	7.53	0.9
63	30.43	1.7	30.46	2.0	30.50	2.2	30.49	2.2	30.50	2.2	30.76	3.7	30.53	2.2
64	32.17	0.8	32.21	0.7	32.23	1.2	32.24	0.6	32.25	0.6	32.47	1.1	32.25	0.7
65	25.34	3.0	25.38	3.3	25.42	3.7	25.42	3.7	25.43	3.8	25.71	5.1	25.45	3.8

ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1%AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
66	20.15	1.2	20.22	1.5	20.29	2.0	20.29	1.9	20.31	2.1	20.54	5.4	20.30	2.1
67	18.81	0.7	18.89	0.7	18.94	0.8	18.94	0.7	18.96	0.7	20.05	1.8	18.96	0.7
68	18.81	0.7	18.87	0.7	18.91	0.7	18.92	0.7	18.94	0.5	19.91	1.2	18.94	0.6
69	16.71	0.7	16.78	0.9	16.84	1.0	16.84	1.0	16.87	1.1	17.32	2.2	16.91	1.1
70	13.79	1.4	13.83	1.6	13.87	1.7	13.87	1.7	13.88	1.7	14.24	2.5	13.87	1.7
71	21.66	0.8	21.71	0.9	21.77	1.1	21.77	1.0	21.79	1.1	22.33	3.4	21.79	1.1
72	28.98	1.5	29.05	1.7	29.10	1.8	29.13	1.9	29.15	1.9	29.63	3.0	29.14	2.0
73	9.53	0.9	9.68	1.0	9.79	1.1	9.80	1.1	9.85	1.1	10.84	1.8	9.85	1.1
74	13.80	0.4	13.86	0.4	13.92	0.5	13.91	0.5	13.94	0.6	14.54	1.7	13.94	0.5
75	3.97	0.9	4.07	0.9	4.15	0.9	4.14	0.9	4.16	0.9	4.72	1.1	4.16	0.9
76	7.77	0.9	7.85	0.9	7.91	1.0	7.90	1.0	7.92	1.0	8.38	3.0	7.92	1.0
77	6.03	1.3	6.27	1.3	6.46	1.3	6.46	1.3	6.53	1.3	8.16	1.2	6.55	1.3
78	37.51	2.3	37.56	2.5	37.60	2.6	37.62	2.7	37.64	2.7	37.82	3.2	37.63	2.7
79	39.08	0.7	39.17	0.8	39.22	1.0	39.26	1.0	39.28	1.1	39.55	2.4	39.28	1.1
80	21.40	1.2	21.51	1.4	21.58	1.5	21.62	1.6	21.65	1.7	22.32	2.6	21.66	1.6
81	4.16	1.8	4.36	2.1	4.50	2.3	4.50	2.3	4.55	2.4	5.37	3.8	4.56	2.3
82	3.11	0.4	3.16	0.5	3.20	0.6	3.20	0.6	3.21	0.6	3.93	1.1	3.21	0.6
83	23.85	0.7	23.89	0.8	23.94	0.9	23.93	0.9	23.95	1.0	24.34	1.8	23.94	1.0
84	28.44	2.4	28.47	2.6	28.48	2.7	28.49	2.7	28.50	2.7	28.74	3.5	28.49	2.7
85	16.16	0.9	16.23	1.1	16.29	1.0	16.30	1.2	16.32	0.9	16.67	4.0	16.30	1.1
86	28.63	1.9	28.69	2.2	28.72	2.4	28.73	2.5	28.75	2.6	28.93	3.6	28.74	2.5
87	3.30	1.5	3.59	1.5	3.80	1.6	3.80	1.6	3.89	1.6	5.12	2.5	3.91	1.4
88	19.93	0.8	20.00	0.9	20.05	1.0	20.06	1.0	20.08	1.0	20.57	1.6	20.09	1.0
89	12.78	0.8	12.84	1.0	12.88	1.2	12.89	1.2	12.90	1.3	13.26	2.3	12.89	1.3
90	14.98	0.6	15.04	0.8	15.08	0.9	15.10	0.9	15.12	1.0	15.53	1.7	15.16	0.9
91	1.89	0.5	1.78	0.7	2.04	0.8	2.11	0.8	2.12	0.9	2.41	2.3	3.01	0.6
92	28.37	0.8	28.42	1.0	28.46	1.1	28.48	1.1	28.50	1.2	28.94	1.9	28.51	1.3
93	27.50	0.9	27.54	1.0	27.57	1.2	27.58	1.2	27.60	1.3	27.99	2.5	27.61	1.3
94	3.85	0.8	3.90	0.8	3.95	0.9	3.96	0.8	3.97	0.8	4.28	1.1	3.97	0.7
95	24.51	0.3	24.55	0.3	24.58	0.2	24.58	0.3	24.59	0.2	24.76	0.2	24.59	0.2
96	40.96	0.3	41.10	0.3	41.17	0.3	41.24	0.3	41.29	0.3	42.44	1.3	41.29	0.3
97	1.26	0.0	1.26	0.0	2.01	0.0	2.11	0.0	2.11	0.0	2.11	0.1	3.01	0.0
98	37.78	1.3	37.88	1.4	37.95	1.5	38.00	1.6	38.04	1.6	38.59	2.3	38.04	1.6

ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1%AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
100	11.55	0.3	11.68	0.6	11.77	0.8	11.80	0.8	11.84	0.9	12.66	2.2	11.83	0.9
102	15.35	0.4	15.38	0.5	15.41	0.6	15.42	0.7	15.44	0.7	15.93	1.3	15.44	0.7
103	5.22	0.5	5.32	0.5	5.38	0.6	5.40	0.6	5.43	0.7	5.97	1.4	5.43	0.7
104	33.62	0.9	33.86	1.2	33.99	1.4	34.07	1.5	34.13	1.6	34.73	2.4	34.13	1.6
105	5.85	1.3	5.95	1.5	6.02	1.6	6.04	1.7	6.07	1.7	6.80	3.0	6.07	1.7
106	14.87	1.2	14.93	1.6	15.01	2.0	15.04	2.2	15.06	2.3	15.53	3.4	15.06	2.3
107	19.86	0.7	19.91	0.7	19.95	0.8	19.98	0.9	19.99	0.9	20.51	1.7	19.99	0.9
108	29.88	0.8	30.07	1.0	30.14	1.1	30.18	1.1	30.20	1.1	30.49	1.5	30.17	1.2
109	5.48	0.5	5.58	0.5	5.64	0.5	5.65	0.6	5.66	0.6	5.89	0.6	5.66	0.6
110	1.42	0.6	1.50	0.8	2.04	0.5	2.11	0.5	2.13	0.5	2.47	1.6	3.01	0.2
111	-	-	26.93	0.7	27.03	0.8	27.09	0.9	27.14	1.0	27.65	1.5	27.13	1.0
112	13.92	0.7	14.00	0.9	14.08	1.0	14.11	1.0	14.15	1.1	14.99	2.2	14.15	1.1
113	1.26	0.1	1.26	0.2	2.01	0.1	2.10	0.1	2.11	0.1	2.14	0.5	3.01	0.1
114	25.69	0.5	25.74	0.6	25.78	0.8	25.77	0.7	25.79	0.8	26.15	1.2	25.79	0.8
115	22.98	0.7	23.13	0.8	23.19	0.8	23.23	0.9	23.28	0.9	24.17	1.9	23.28	1.0
116	6.03	0.5	6.05	0.5	6.06	0.5	6.06	0.5	6.07	0.5	6.20	0.8	6.07	0.5
117	18.86	1.1	19.05	1.3	19.13	1.4	19.16	1.4	19.22	1.5	20.32	2.6	19.23	1.5
118	19.73	1.0	19.86	1.1	19.95	1.2	20.01	1.3	20.06	1.4	21.09	2.5	20.06	1.4
119	22.43	1.5	22.50	1.7	22.55	1.8	22.54	1.8	22.56	1.8	23.13	3.0	22.56	1.8
120	6.72	1.0	6.75	1.0	6.78	1.1	6.80	1.1	6.82	1.1	7.10	3.7	6.82	1.1
121	1.33	0.1	1.38	0.1	2.01	0.1	2.11	0.1	2.12	0.1	2.21	0.3	3.02	0.0
122	22.58	0.9	22.64	1.2	22.67	1.4	22.70	1.5	22.73	1.6	23.03	2.9	22.73	1.6
123	10.03	0.7	10.10	0.7	10.19	0.8	10.24	0.8	10.28	0.8	11.35	1.4	10.27	0.9
124	7.06	0.4	7.09	0.4	7.13	0.5	7.14	0.6	7.16	0.7	7.63	1.5	7.16	0.6
125	15.98	0.2	16.06	0.2	16.12	0.2	16.15	0.3	16.20	0.3	16.98	0.8	16.20	0.3
126	15.10	1.1	15.26	1.3	15.35	1.4	15.36	1.4	15.41	1.4	16.57	2.6	15.40	1.4
127	7.40	0.9	7.44	0.9	7.48	1.3	7.50	1.4	7.52	1.5	8.06	2.7	7.52	1.5
128	19.11	0.4	19.18	0.4	19.24	0.5	19.29	0.6	19.33	0.7	20.13	1.4	19.33	0.7
129	20.07	0.4	20.14	0.6	20.18	0.6	20.21	0.7	20.23	0.7	20.58	1.2	20.24	0.7
130	13.58	0.5	13.69	0.7	13.77	0.8	13.79	0.8	13.83	0.9	14.61	1.7	13.83	0.9
131	1.25	0.0	1.25	0.0	2.01	0.0	2.11	0.0	2.11	0.0	2.15	0.0	3.01	0.0

ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1%AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
132	3.80	1.7	3.86	1.8	3.93	2.0	3.96	2.0	3.98	2.1	4.55	3.9	3.98	2.1
133	18.15	1.1	18.25	1.3	18.34	1.5	18.32	1.5	18.36	1.6	19.20	3.8	18.37	1.5
134	5.91	1.0	5.95	1.1	5.99	1.2	6.01	1.2	6.03	1.3	6.50	2.1	6.03	1.3
135	14.14	0.6	14.23	0.8	14.30	0.9	14.34	1.0	14.38	1.1	15.22	2.0	14.38	1.1
136	17.44	0.8	17.46	0.9	17.49	0.9	17.50	0.9	17.51	0.9	17.69	1.2	17.51	0.9
137	9.89	1.0	9.98	1.2	10.05	1.3	10.06	1.3	10.09	1.4	10.79	2.8	10.09	1.4
138	6.61	1.4	6.69	1.6	6.76	1.8	6.77	1.8	6.80	1.9	7.35	3.3	6.77	1.9
139	5.85	0.6	5.91	0.7	5.97	0.7	6.00	0.8	6.03	0.8	6.79	1.5	6.03	0.8
140	16.29	0.3	16.34	0.4	16.37	0.5	16.37	0.5	16.38	0.5	16.64	0.9	16.38	0.5
141	10.78	0.7	10.92	0.9	11.00	1.0	11.03	1.0	11.07	1.1	12.10	2.6	11.07	1.0
142	1.25	0.0	1.25	0.0	2.01	0.0	2.11	0.0	2.11	0.0	2.15	0.2	3.01	0.0
143	15.48	0.4	15.59	0.4	15.65	0.4	15.70	0.4	15.73	0.5	16.27	1.2	15.73	0.5
144	13.16	0.3	13.41	0.4	13.65	0.7	13.59	0.6	13.70	0.7	15.18	1.6	13.70	0.7
145	1.28	0.1	1.30	0.2	2.01	0.1	2.11	0.2	2.11	0.2	2.41	0.8	3.01	0.1
146	10.36	1.6	10.52	1.7	10.65	1.9	10.73	2.0	10.80	2.0	12.68	3.1	10.81	2.0
147	11.24	0.8	11.27	1.0	11.30	1.2	11.31	1.3	11.32	1.3	11.48	2.8	11.31	1.3
148	13.98	0.7	14.08	0.7	14.13	0.7	14.14	0.8	14.17	0.9	15.14	1.3	14.17	0.9
149	1.33	0.1	1.38	0.2	2.02	0.1	2.12	0.1	2.12	0.1	2.23	0.3	3.03	0.0
150	2.41	0.4	2.55	0.4	2.72	0.4	2.79	0.4	2.85	0.5	4.33	1.2	3.11	0.4
151	11.64	1.0	11.71	1.3	11.76	1.5	11.79	1.6	11.82	1.7	12.40	2.4	11.82	1.7
152	9.59	0.2	9.72	0.2	9.79	0.3	9.82	0.3	9.85	0.3	10.30	0.3	9.85	0.3
153	10.17	1.5	10.29	1.8	10.39	2.2	10.43	1.5	10.48	1.5	11.30	4.4	10.47	1.5
154	1.28	0.0	1.30	0.0	2.02	0.0	2.11	0.0	2.12	0.0	2.19	0.2	3.02	0.0
155	6.40	0.2	6.49	0.2	6.57	0.2	6.60	0.2	6.63	0.2	7.56	1.2	6.63	0.3
156	11.19	0.5	11.28	0.7	11.32	0.8	11.35	0.9	11.36	1.0	11.70	2.0	11.36	1.0
157	1.37	0.3	1.44	0.4	2.02	0.2	2.11	0.2	2.12	0.2	2.38	0.9	3.01	0.1
158	10.73	0.7	10.83	0.9	10.94	1.0	10.92	1.0	10.97	1.0	11.51	1.5	10.96	1.0
159	2.30	0.4	2.48	0.4	2.58	0.4	2.61	0.4	2.65	0.4	3.52	1.2	3.03	0.3
160	4.25	0.4	4.29	0.3	4.29	0.3	4.31	0.3	4.32	0.4	4.49	0.7	4.32	0.4
161	4.40	2.8	4.55	3.2	4.66	3.4	4.72	3.6	4.77	3.8	5.81	6.2	4.78	3.8
162	4.18	0.7	4.27	0.7	4.31	0.8	4.31	0.8	4.33	0.8	5.04	1.3	4.33	0.8
163	1.93	1.7	2.04	2.1	2.22	2.1	2.27	2.2	2.33	2.3	3.30	4.5	3.05	1.5
164	2.16	0.1	2.54	0.1	2.84	0.0	2.90	0.0	2.93	0.0	3.37	0.3	3.03	0.0

ID	0.2 EY		5% AEP		2% AEP		1% AEP		0.5% AEP		PMF		1% AEP + Climate Change	
	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity	Water Level	Velocity
165	1.26	0.1	1.26	0.1	2.01	0.0	2.11	0.0	2.11	0.0	2.14	0.4	3.01	0.1
166	2.19	0.1	2.37	0.1	2.47	0.1	2.49	0.1	2.51	0.2	3.05	0.7	3.01	0.1
167	4.45	0.5	4.56	0.5	4.60	0.5	4.64	0.5	4.67	0.5	5.27	1.1	4.67	0.5
168	1.48	0.2	1.53	0.4	2.01	0.2	2.11	0.2	2.11	0.2	2.15	2.4	3.01	0.1
169	3.17	0.2	3.21	0.2	3.24	0.2	3.29	0.2	3.32	0.2	3.78	0.8	3.32	0.2
170	1.26	0.2	1.27	0.3	2.02	0.2	2.11	0.2	2.12	0.2	2.20	0.9	3.01	0.1
171	2.28	0.2	2.55	0.4	2.67	0.5	2.73	0.5	2.78	0.5	3.50	0.6	3.07	0.3
172	3.02	0.1	3.07	0.1	3.10	0.1	3.14	0.1	3.16	0.1	3.55	0.3	3.17	0.1
173	1.27	0.1	1.27	0.3	2.01	0.2	2.11	0.2	2.11	0.2	2.12	0.4	3.01	0.0
174	1.26	0.2	1.26	0.3	2.01	0.1	2.11	0.1	2.11	0.1	2.12	0.9	3.01	0.1
175	2.33	0.2	2.38	0.2	2.40	0.2	2.41	0.2	2.43	0.2	2.66	0.5	3.02	0.0
176	1.26	0.1	1.30	0.3	2.01	0.1	2.11	0.1	2.11	0.1	2.15	0.4	3.01	0.1
177	1.45	0.1	1.46	0.2	2.01	0.0	2.11	0.0	2.11	0.0	2.13	0.1	3.01	0.0
178	-	-	-	-	2.01	0.0	2.11	0.0	2.11	0.0	2.12	0.2	3.01	0.0
179	1.25	0.0	1.26	0.0	2.01	0.0	2.11	0.0	2.11	0.0	2.11	0.2	3.01	0.0

Table F-2 Summary of Peak Flow (m³/s) at Selected Locations

ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change	ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change
Q2	0.1	0.1	0.1	0.1	0.1	0.4	0.1	Q33	6.0	8.7	10.9	11.4	12.5	31.8	12.5
Q3	0.8	1.0	1.4	1.4	1.6	6.2	1.6	Q34	6.0	8.1	10.2	10.4	11.1	21.1	11.1
Q4	0.2	0.2	0.3	0.3	0.3	1.2	0.3	Q35	3.7	4.8	5.7	5.7	6.1	10.6	6.1
Q5	0.3	0.4	0.5	0.5	0.6	2.3	0.6	Q36	2.6	3.6	4.5	4.5	4.8	8.4	4.8
Q6	1.2	1.6	2.2	2.2	2.5	9.7	2.5	Q37	2.2	2.6	2.8	2.9	2.9	4.7	2.9
Q7	2.9	4.1	5.5	5.4	6.1	25.3	6.1	Q38	5.2	5.9	6.4	6.6	6.7	10.4	6.7
Q8	73.8	106.3	131.0	151.4	169.8	521.8	169.8	Q39	1.2	3.4	5.5	6.1	7.1	26.4	7.1
Q9	70.5	102.9	125.6	147.2	164.1	437.7	164.1	Q40	1.2	1.3	1.5	1.5	1.6	2.3	1.6
Q10	1.6	2.4	3.2	3.2	3.5	7.1	3.5	Q41	1.8	2.1	2.5	2.5	2.7	7.2	2.7
Q11	0.9	1.0	1.1	1.1	1.2	8.7	1.2	Q42	1.1	2.1	3.0	3.3	3.7	12.3	3.7
Q12	1.1	1.8	2.5	2.5	2.8	7.3	2.8	Q43	8.6	12.2	25.5	34.3	44.9	249.4	56.0
Q13	1.9	3.0	4.4	4.3	4.7	15.4	4.7	Q44	1.6	2.8	4.1	4.3	4.8	13.6	4.8
Q14	3.6	5.9	8.4	8.8	9.8	40.8	9.8	Q45	0.4	1.0	1.6	1.8	2.0	6.8	2.0
Q15	5.9	9.6	11.6	14.1	15.5	61.0	15.5	Q46	2.0	4.1	6.7	7.2	8.5	46.1	8.7
Q16	8.3	12.4	17.1	23.1	26.1	117.0	21.9	Q47	0.9	1.8	3.1	3.5	4.3	27.8	4.6
Q17	1.5	1.9	2.8	3.2	2.9	7.6	5.2	Q48	0.2	0.8	1.6	2.0	2.3	11.0	2.4
Q18	62.1	94.5	124.5	143.6	160.6	540.7	158.6	Q49	0.1	0.9	1.7	2.0	2.3	13.0	2.6
Q19	5.6	7.9	10.3	11.1	12.2	32.4	12.2	Q50	1.6	3.9	6.2	6.0	7.2	37.3	7.5
Q20	6.3	9.5	13.3	13.8	15.2	47.7	15.2	Q51	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Q21	3.5	5.1	6.3	6.8	7.6	20.0	7.6	Q52	0.3	0.4	0.5	0.5	0.7	2.5	0.7
Q22	7.1	10.5	15.0	15.8	18.0	65.8	18.0	Q53	1.0	1.5	2.2	2.1	2.4	10.5	2.4
Q23	3.7	5.3	7.0	7.4	8.1	20.4	8.1	Q54	1.3	2.1	2.9	2.8	3.2	11.2	3.2
Q24	9.0	13.1	18.1	19.4	22.0	80.8	22.0	Q55	0.6	0.7	1.0	1.0	1.1	4.2	1.1
Q25	4.9	7.3	10.6	10.4	11.5	43.5	11.5	Q56	1.3	1.7	2.3	2.2	2.5	9.3	2.5
Q26	16.4	25.7	34.0	37.3	41.0	182.7	40.9	Q57	0.3	0.4	0.5	0.5	0.6	1.6	0.6
Q27	10.4	11.7	22.9	31.7	41.3	234.3	54.9	Q58	0.6	0.8	1.1	1.0	1.2	4.3	1.2
Q28	0.2	0.2	0.3	0.3	0.3	1.4	0.3	Q59	0.3	0.6	0.9	0.9	1.0	4.9	1.0
Q29	1.3	1.8	2.5	2.5	2.7	10.9	2.7	Q60	0.1	0.1	0.2	0.3	0.5	6.5	0.5
Q30	4.9	6.9	8.7	9.2	10.3	28.2	10.3	Q61	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q31	5.7	8.0	10.7	11.1	12.2	35.9	12.2	Q62	0.1	0.1	0.1	0.1	0.1	0.5	0.1
Q32	5.7	8.4	11.1	11.5	12.7	37.2	12.7	Q63	34.4	45.4	53.5	61.0	67.3	179.7	67.3

ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change	ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change
Q69	358	49.9	61.4	70.0	78.0	231.4	78.0	Q101	3.4	5.1	7.3	7.2	8.0	23.3	8.0
Q70	34.1	47.2	57.9	65.5	72.8	214.7	72.8	Q102	3.0	4.2	6.3	6.1	6.8	17.1	6.8
Q71	1.3	1.8	2.5	2.4	2.7	9.7	2.7	Q103	3.5	7.0	10.2	10.7	12.1	37.5	12.1
Q72	1.6	2.1	3.0	2.9	3.3	13.4	3.3	Q104	1.4	2.5	3.3	3.4	3.9	21.9	3.9
Q73	1.0	1.3	1.7	1.6	1.8	5.0	1.8	Q105	0.4	1.0	1.6	1.7	2.0	9.1	2.0
Q74	0.7	0.9	1.2	1.2	1.3	5.9	1.3	Q106	3.5	4.9	6.1	6.5	7.0	20.4	7.0
Q75	1.3	1.8	2.5	2.4	2.7	12.6	2.7	Q107	0.5	1.0	1.5	1.6	1.9	7.3	1.9
Q76	1.4	1.9	2.7	2.6	3.0	16.9	3.0	Q108	3.0	4.4	5.4	5.8	6.4	18.0	6.4
Q77	3.3	4.7	6.9	6.6	7.5	32.6	7.5	Q109	3.0	4.1	5.1	5.2	5.6	15.4	5.6
Q78	1.8	2.8	4.3	4.1	4.8	20.3	4.8	Q110	0.5	0.9	1.5	1.5	1.7	5.5	1.7
Q79	5.4	7.3	9.7	9.6	10.7	41.1	10.7	Q111	7.0	11.3	15.4	15.6	17.6	60.6	17.6
Q80	0.5	0.7	0.9	0.9	1.0	3.9	1.0	Q112	5.8	10.7	14.9	15.7	17.5	61.9	17.5
Q81	1.7	3.8	6.5	6.2	7.5	38.7	7.5	Q113	2.2	3.0	4.1	4.0	4.5	19.1	4.5
Q82	0.0	0.0	0.6	0.4	1.0	13.9	1.0	Q114	2.8	3.9	5.2	5.0	5.6	20.2	5.6
Q83	7.7	11.3	15.6	15.2	16.8	73.7	16.4	Q115	3.3	4.6	6.5	6.3	7.1	31.1	7.1
Q84	1.7	2.4	3.1	3.2	3.6	9.9	3.6	Q116	3.7	5.4	7.6	7.3	8.3	36.2	8.3
Q85	2.9	4.0	5.4	5.2	5.8	19.9	5.8	Q117	0.4	1.9	4.0	3.7	4.7	33.6	4.7
Q86	4.0	5.2	7.6	7.1	7.8	29.6	7.8	Q118	7.4	13.7	20.0	20.1	23.2	74.0	23.4
Q87	4.0	5.7	7.9	7.6	8.4	32.1	8.4	Q119	6.6	12.5	18.0	18.2	20.8	70.3	21.6
Q88	0.4	0.7	1.0	0.9	1.0	2.8	1.0	Q120	2.3	3.7	5.0	4.8	5.2	23.4	5.2
Q89	2.7	4.3	6.4	6.1	7.0	26.3	7.0	Q121	3.4	5.2	7.7	7.5	8.5	62.1	8.4
Q90	3.0	4.5	5.4	6.0	6.6	16.6	6.6	Q122	0.4	0.7	0.9	0.8	0.9	3.8	0.9
Q91	3.6	5.2	6.3	6.6	7.4	16.8	7.4	Q123	6.8	9.7	12.1	13.6	15.0	37.5	15.0
Q92	5.0	6.8	9.0	8.9	9.9	28.1	9.9	Q124	6.9	9.9	12.8	14.1	15.5	41.6	15.5
Q93	4.2	5.5	7.1	7.1	7.7	19.5	7.7	Q125	4.2	6.0	7.5	8.0	8.7	21.1	8.7
Q94	6.3	9.1	12.5	12.5	13.8	43.7	13.8	Q126	1.2	1.8	2.2	2.4	2.7	6.0	2.7
Q95	0.8	1.0	1.2	1.2	1.3	1.9	1.3	Q127	1.9	3.3	4.7	5.3	6.2	22.9	6.2
Q96	0.6	0.8	0.9	0.8	0.9	2.8	0.9	Q128	5.5	8.2	10.6	11.1	12.2	31.7	12.2
Q97	3.9	5.5	7.1	7.2	8.0	24.9	8.0	Q129	2.5	4.4	6.3	7.1	8.0	31.0	8.0
Q98	4.6	6.3	8.7	8.4	9.3	32.1	9.3	Q130	3.3	4.7	6.5	6.5	7.3	30.9	7.3
Q99	3.8	5.1	7.0	6.8	7.4	21.4	7.4	Q131	5.8	8.4	11.4	11.5	12.6	49.3	12.6
Q100	3.3	4.6	6.0	6.0	6.5	17.2	6.5	Q132	2.6	3.3	3.8	3.9	4.2	10.4	4.2

ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1% AEP + Climate Change	ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1% AEP + Climate Change
Q195	4.6	6.4	8.4	8.1	9.0	54.7	9.0	Q226	5.2	7.5	9.1	10.0	11.2	29.6	11.2
Q196	1.0	2.8	4.7	4.6	5.4	52.7	5.4	Q227	5.8	8.1	10.9	11.5	12.6	35.5	12.6
Q197	4.0	5.0	6.5	6.5	7.1	39.5	6.2	Q228	1.1	1.4	3.1	3.2	4.0	10.6	3.2
Q198	0.8	1.8	2.4	2.4	2.5	5.9	3.1	Q229	1.2	1.1	2.8	3.0	3.2	2.0	4.9
Q199	4.9	7.0	8.8	9.0	9.9	44.7	9.2	Q230	1.5	1.4	4.6	5.1	5.7	8.2	6.3
Q200	1.3	4.3	5.9	7.1	8.2	50.7	8.2	Q231	3.1	4.6	7.7	6.5	7.0	24.8	8.8
Q201	0.9	3.3	4.8	5.6	6.3	19.6	6.1	Q232	12.0	17.8	22.6	24.4	27.0	77.1	27.0
Q202	1.4	4.3	6.1	7.1	7.9	29.0	8.2	Q233	18.3	23.6	27.5	30.4	32.5	68.6	32.5
Q203	19.2	26.2	31.2	35.2	39.1	105.8	39.1	Q234	18.5	23.7	27.3	30.2	32.7	78.3	32.7
Q204	13.9	19.2	22.7	26.3	29.3	82.4	29.3	Q235	1.2	2.4	3.6	3.7	3.8	25.5	3.5
Q205	4.9	6.4	7.4	8.3	9.0	22.9	9.0	Q236	0.4	0.6	0.8	1.0	1.2	3.9	1.2
Q206	3.4	4.3	5.1	5.6	6.0	13.7	6.0	Q237	4.6	6.3	7.8	8.2	9.0	21.7	9.0
Q207	15.0	21.4	26.5	29.9	33.5	98.4	33.5	Q238	0.4	0.6	1.0	0.8	1.1	17.8	1.1
Q208	15.2	21.8	27.5	31.4	35.0	108.6	35.0	Q239	1.1	1.6	2.1	2.0	2.1	7.8	2.1
Q209	11.5	18.4	25.0	28.8	32.4	110.4	32.4	Q240	5.1	7.2	10.0	9.7	10.9	44.5	10.9
Q210	15.0	21.4	27.0	30.9	33.9	101.7	34.0	Q241	1.9	3.7	5.5	5.3	6.4	41.0	6.5
Q211	0.3	0.7	1.6	2.4	3.1	19.1	3.4	Q242	5.2	7.2	8.8	9.5	10.3	20.8	10.3
Q212	14.8	21.4	27.1	30.9	34.2	104.8	34.5	Q243	5.1	7.2	9.3	10.1	10.9	27.4	10.9
Q213	15.1	22.0	30.2	32.0	37.8	125.6	38.0	Q244	4.2	5.5	10.4	13.8	18.0	113.7	23.9
Q214	5.1	8.0	9.6	10.2	11.6	39.5	11.6	Q245	18.5	23.9	27.0	30.2	32.5	68.1	32.5
Q215	6.2	10.0	12.4	12.8	14.4	55.2	14.4	Q246	24.0	33.9	40.8	46.3	51.6	131.4	51.6
Q216	6.8	10.8	13.6	14.4	16.2	65.1	16.2	Q247	0.5	0.6	0.7	0.7	0.7	2.0	0.7
Q217	9.6	13.7	17.6	19.5	21.5	80.2	21.5	OF1_Out	55.7	96.5	117.5	132.8	146.1	446.6	146.1
Q218	9.6	13.7	17.6	19.6	21.7	81.5	21.7	OF23_Out	5.1	7.3	8.6	9.9	10.9	26.2	10.9
Q219	6.3	10.4	14.6	16.4	18.6	79.8	18.6	OF24_Out	0.8	1.4	1.8	2.1	2.4	8.6	2.4
Q220	10.1	14.3	18.7	20.5	22.9	87.5	22.9	OF25_Out	2.4	3.4	4.2	4.6	5.1	12.2	5.1
Q221	7.8	13.1	18.4	20.7	23.1	92.6	23.8	OF26_Out	1.9	2.3	2.7	3.3	3.6	6.7	3.6
Q222	6.0	8.7	10.8	11.6	12.9	34.8	12.9	OF27_Out	0.7	1.7	2.0	2.3	2.6	5.6	2.6
Q223	6.8	9.9	13.0	13.8	15.3	44.1	15.3	OF28_Out	3.0	5.3	7.1	8.8	10.2	6.7	10.2
Q224	7.4	10.7	14.7	15.2	16.9	52.4	17.5	OF32_Out	1.7	2.4	3.1	3.2	3.5	8.8	3.5
Q225	0.8	1.1	1.4	1.4	1.5	6.3	1.5	OF33_Out	0.2	0.5	0.8	0.9	1.0	4.0	1.0

ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change	ID	0.2 EY	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF	1%AEP + Climate Change
OF34_Out	0.1	0.2	0.3	0.3	0.3	1.2	0.3	OF55_Out	0.1	0.1	0.2	0.2	0.2	0.8	0.2
OF35_Out	0.2	0.2	0.3	0.3	0.5	4.0	0.5	OF56_Out	1.1	1.8	2.2	2.6	2.9	7.7	2.9
OF36_Out	5.0	6.7	7.8	8.8	9.9	30.5	9.9	OF41_Out	24.1	34.2	40.0	46.9	52.1	137.2	52.1
OF37_Out	1.0	2.8	4.0	5.1	5.9	12.6	5.9	Up Ellerslie	0.7	0.9	1.3	1.3	1.4	5.5	1.4
OF39_Out	0.1	0.1	0.2	0.1	0.2	0.8	0.2	Up Ellerslie2	0.0	0.0	0.0	0.0	0.0	0.1	0.0
OF40_Out	0.1	0.2	0.3	0.4	0.4	1.9	0.4	Up Ellerslie3	0.0	0.0	0.0	0.0	0.0	0.2	0.0
OF47_Out	1.3	1.9	2.5	2.8	5.3	6.6	5.3	Up Ellerslie4	0.0	0.0	0.0	0.0	0.0	0.7	0.0
OF50_Out	1.5	2.4	3.1	3.3	3.2	10.4	3.2	Q248	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF51_Out	1.6	1.6	1.9	2.4	2.6	4.8	2.6	Q249	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF52_Out	1.1	2.3	2.9	3.7	4.4	15.9	4.4	Q250	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF53_Out	0.4	1.1	1.5	1.8	2.0	8.1	2.0	Up Ellerslie111	0.8	1.1	1.5	1.5	1.6	6.6	1.6
OF54_Out	0.0	0.1	0.1	0.1	0.1	0.7	0.1	Up Ellerslie112	0.5	0.7	0.9	0.9	1.0	4.5	1.0

Draft Flood Study Report

JACOBS

Appendix G. Provisional Hydraulic and Hazard Mapping

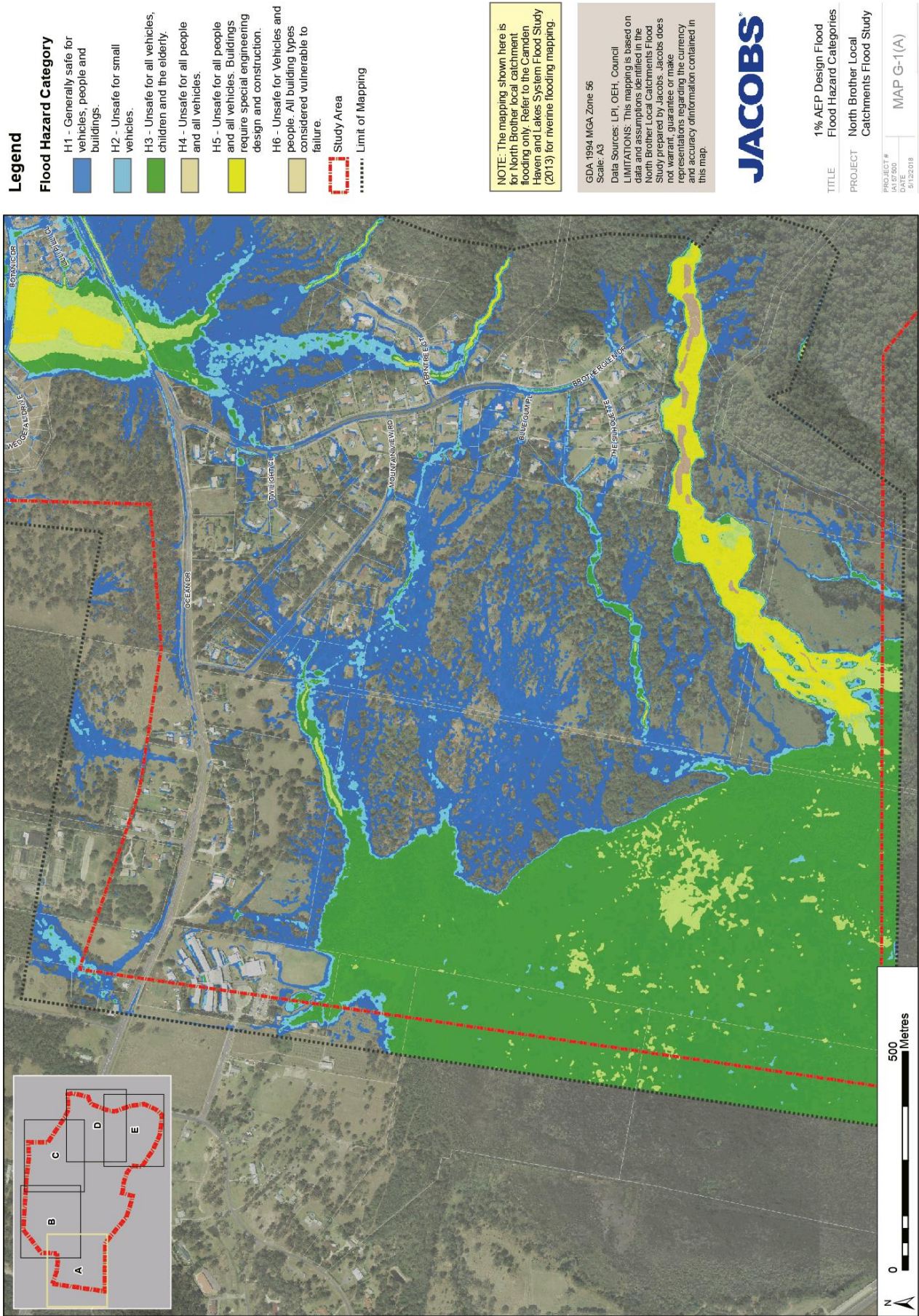
Figure G-1 – 1% AEP Flood - Provisional Flood Hazard

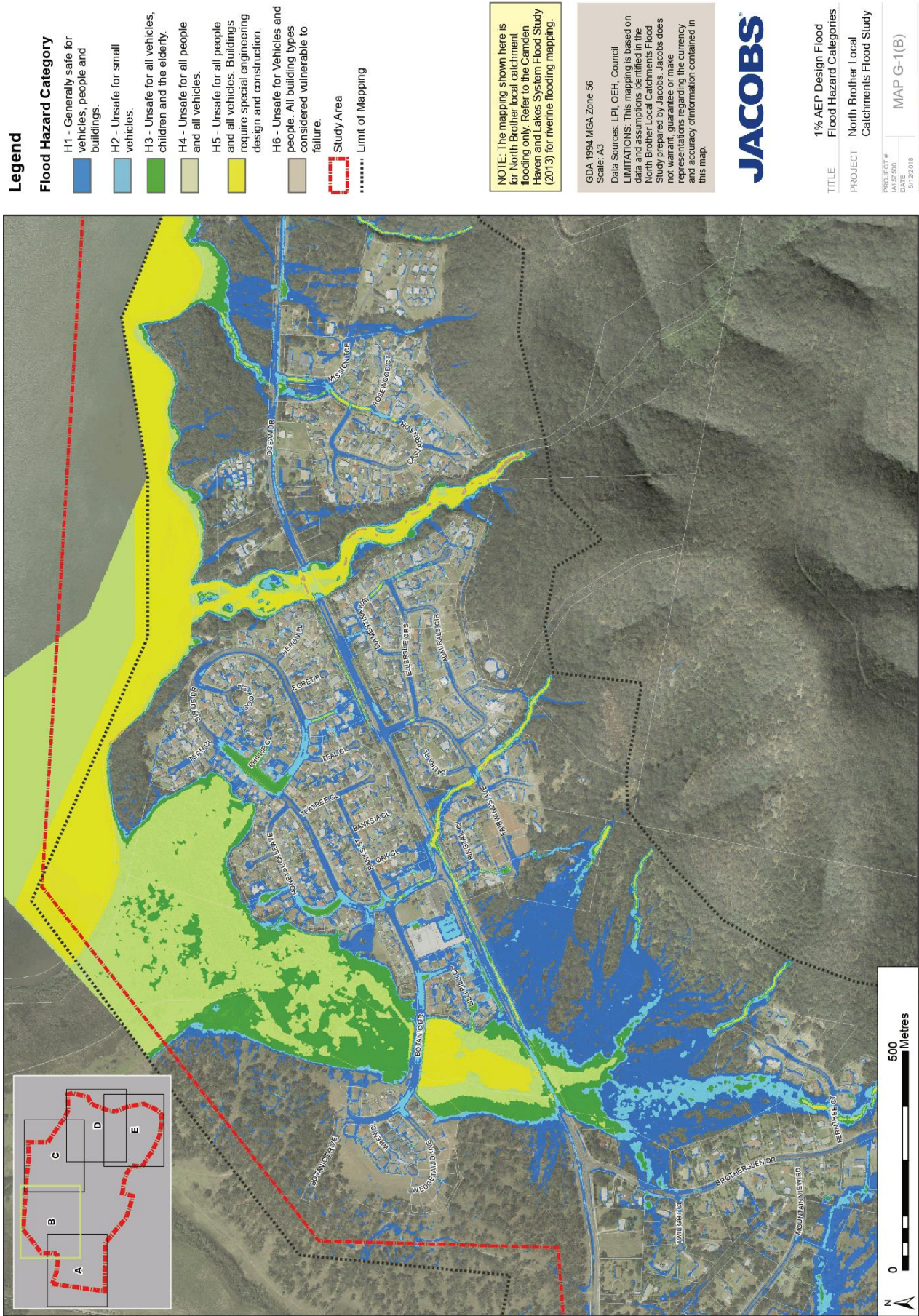
Figure G-2 – 1% AEP Flood - Climate Change Scenario Provisional Flood Hazard

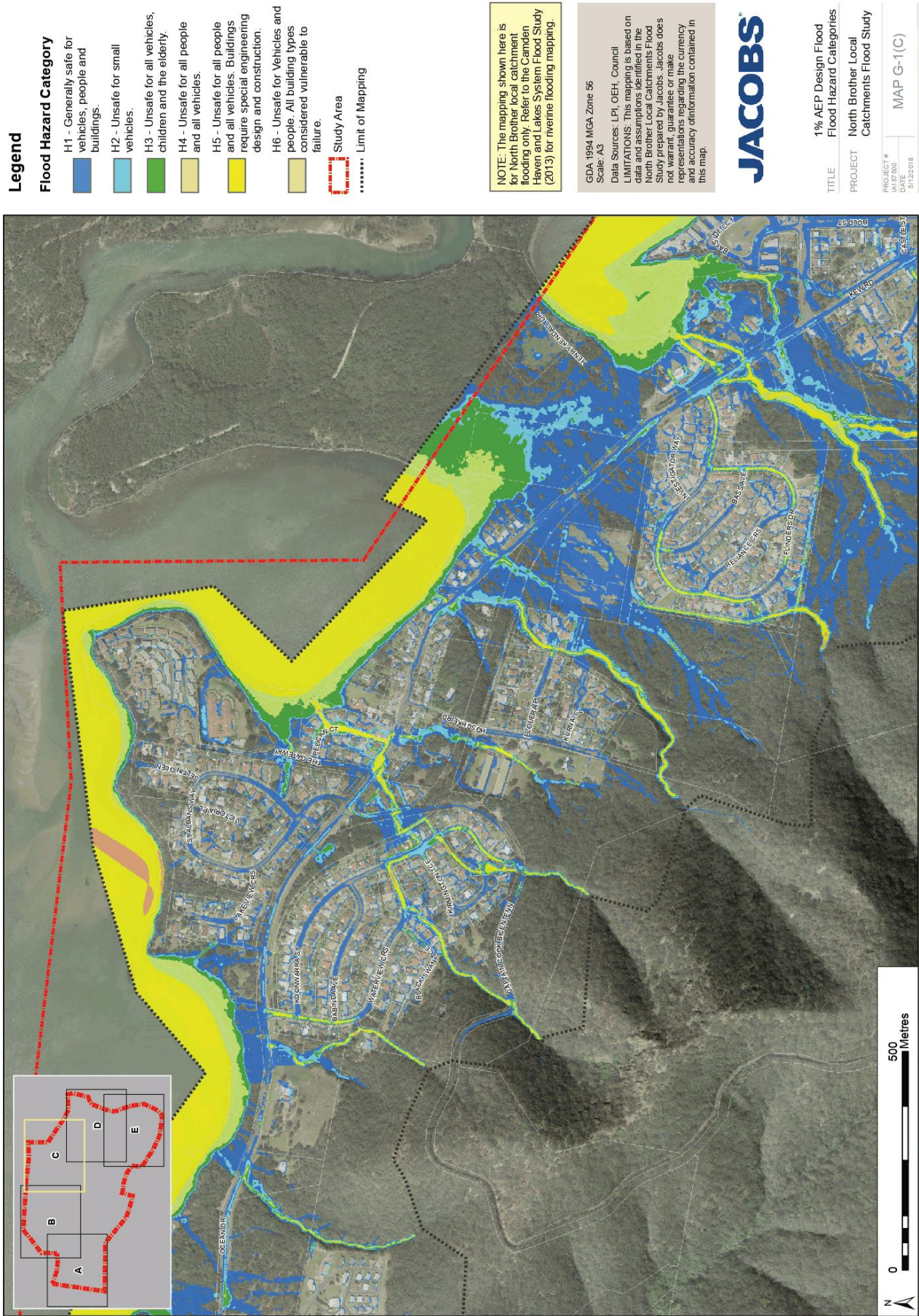
Figure G-3 – 1% AEP Flood - Provisional Hydraulic Categories

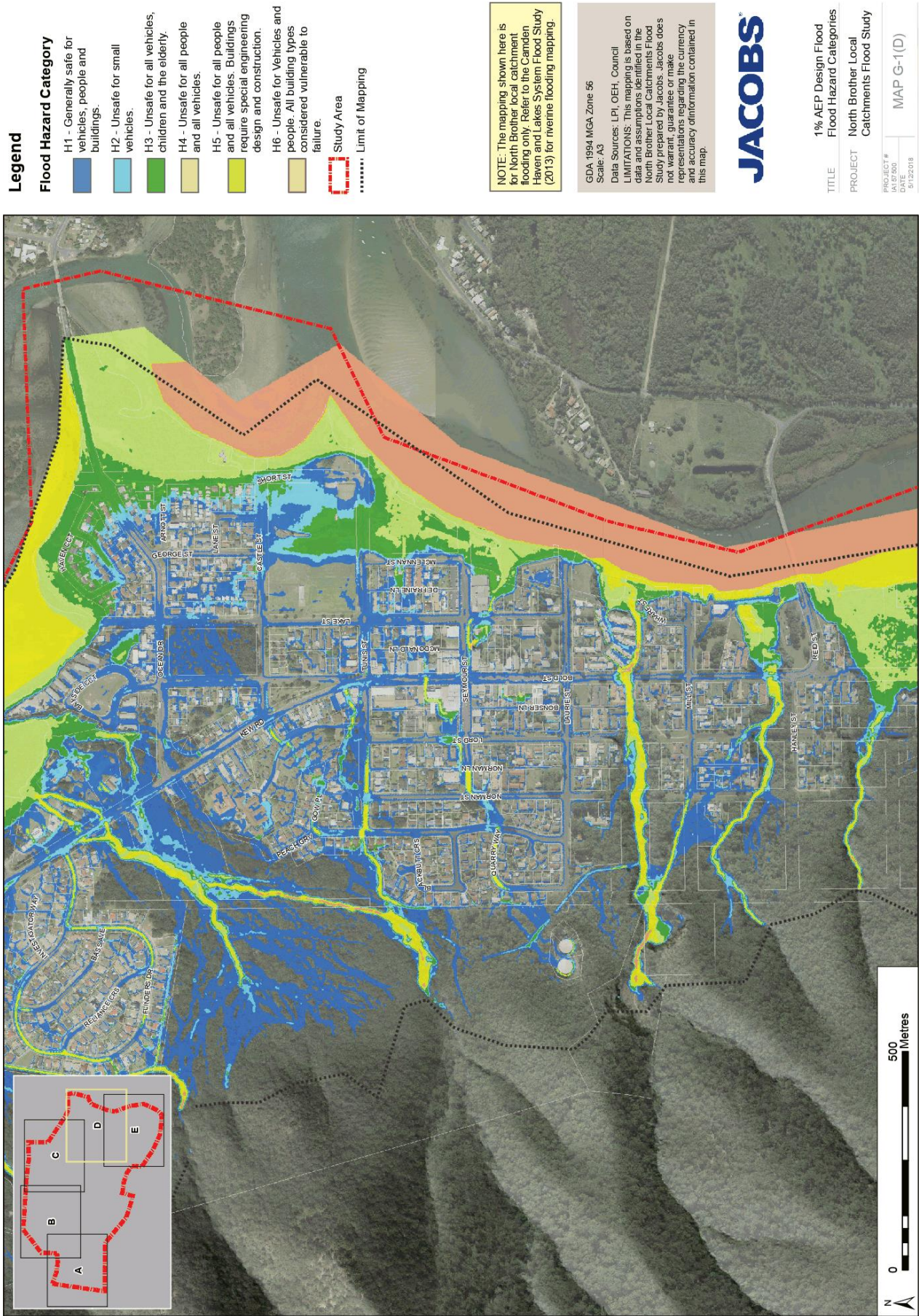
Figure G-4 – 1% AEP Flood - Climate Change Scenario Provisional Hydraulic Categories

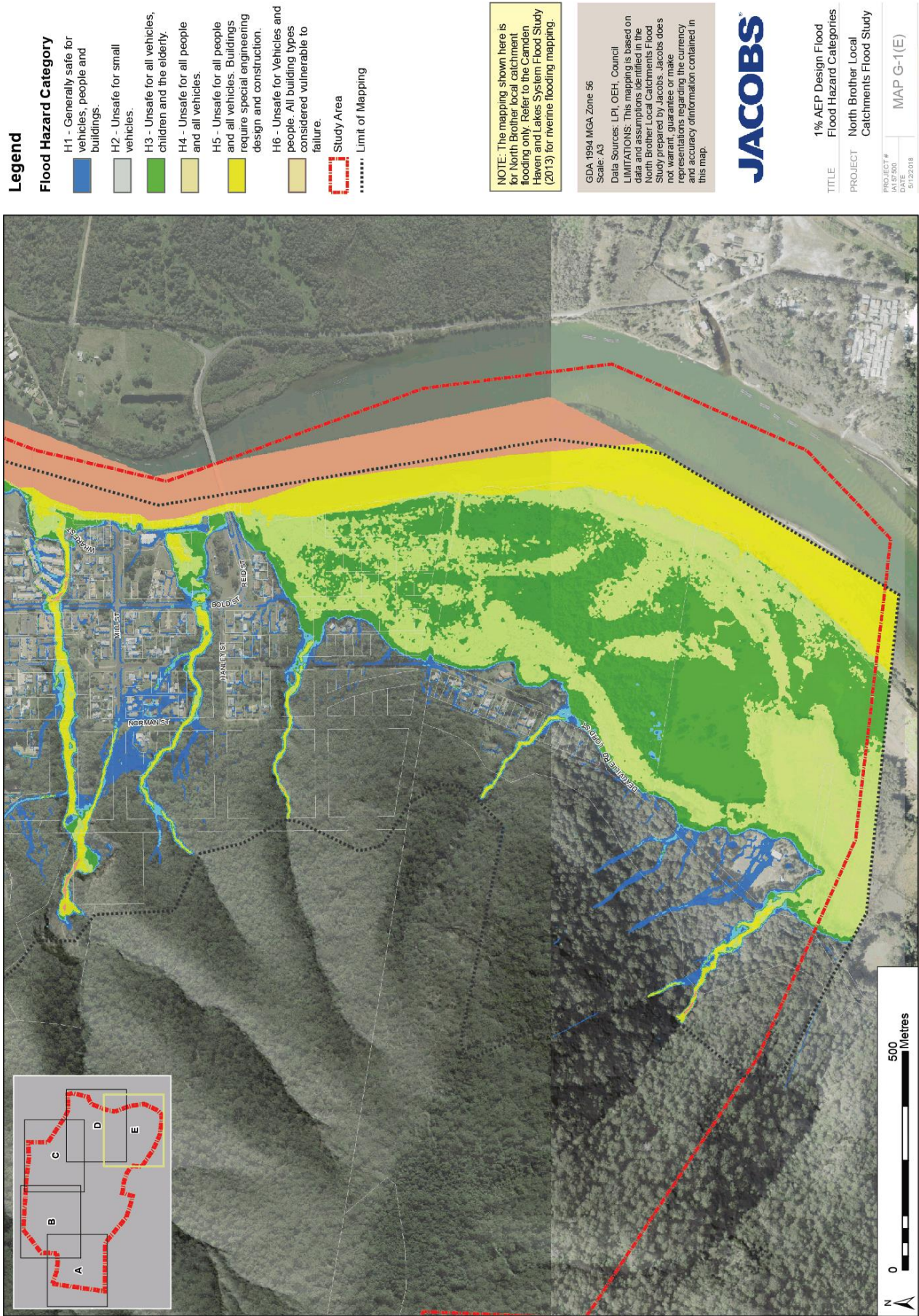
North Harbour Local Catchments Flood Study











Legend

Hydraulic Categories

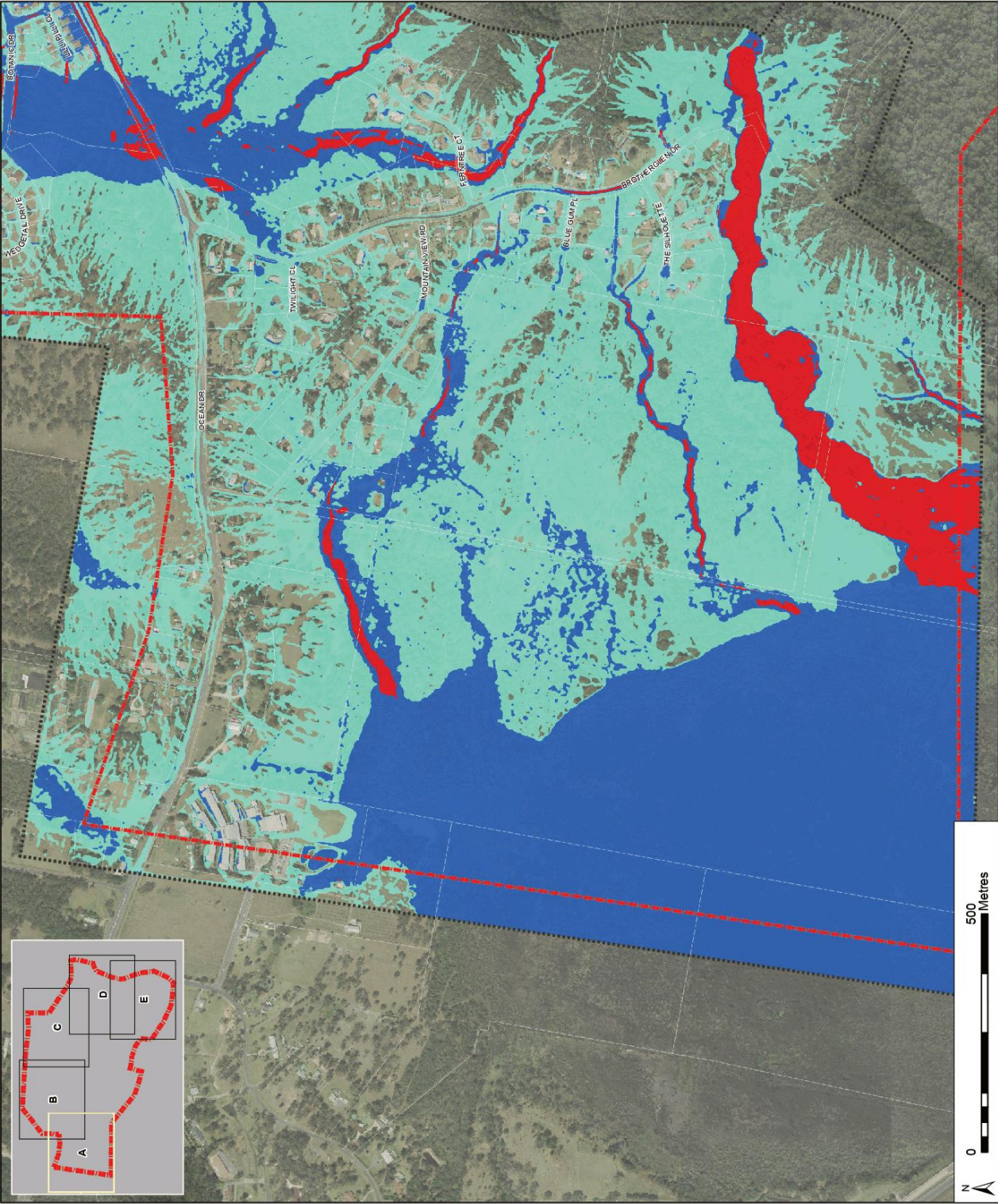
- Floodway
- Flood Storage
- Flood Finge
- Watercourse
- Limit of Mapping
- Study Area

NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-2(A)
DATE	8/12/2018



Legend

Hydraulic Categories

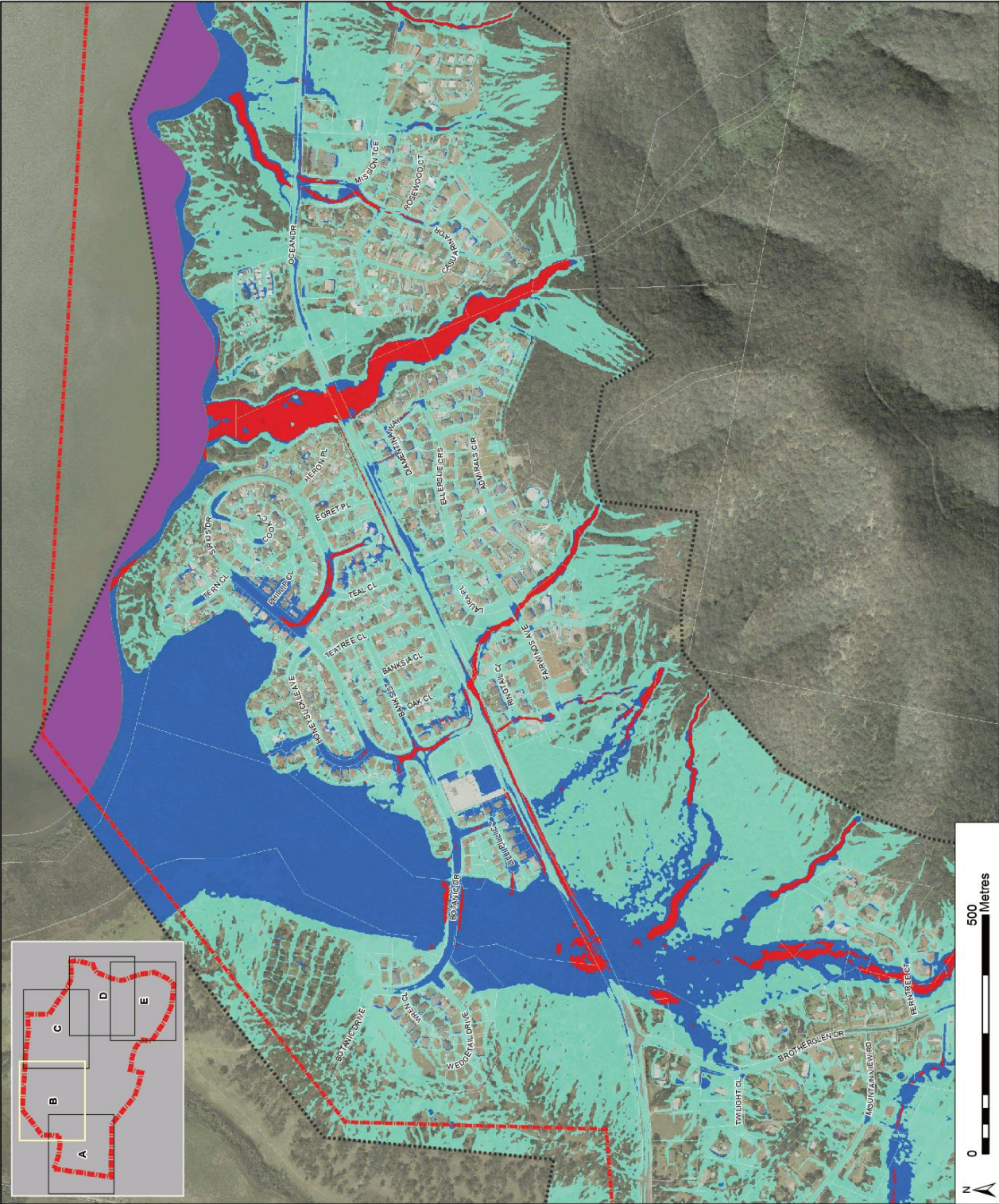
- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Limit of Mapping
- Study Area

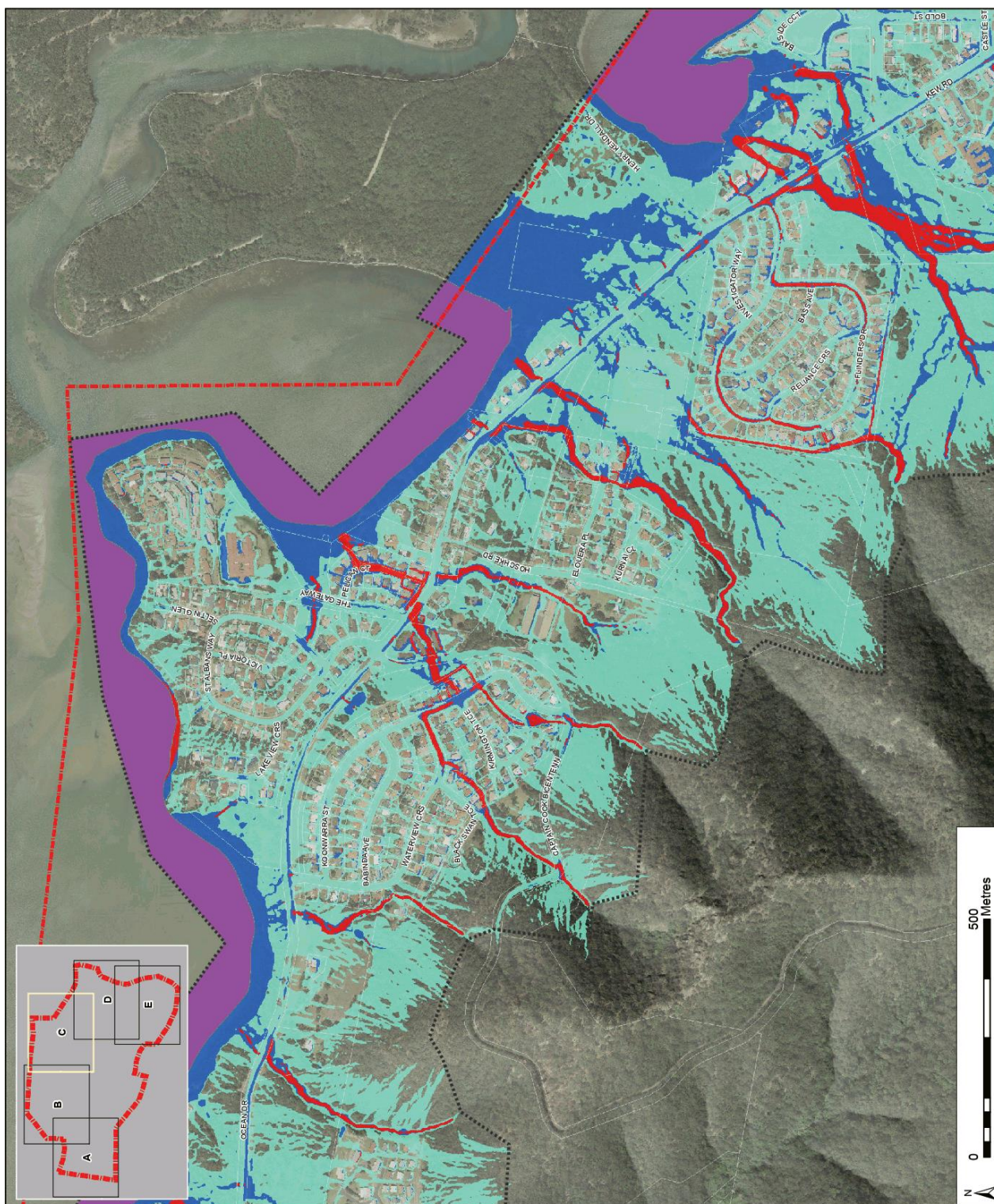
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-2(B)
DATE	8/12/2018





Legend

Hydraulic Categories

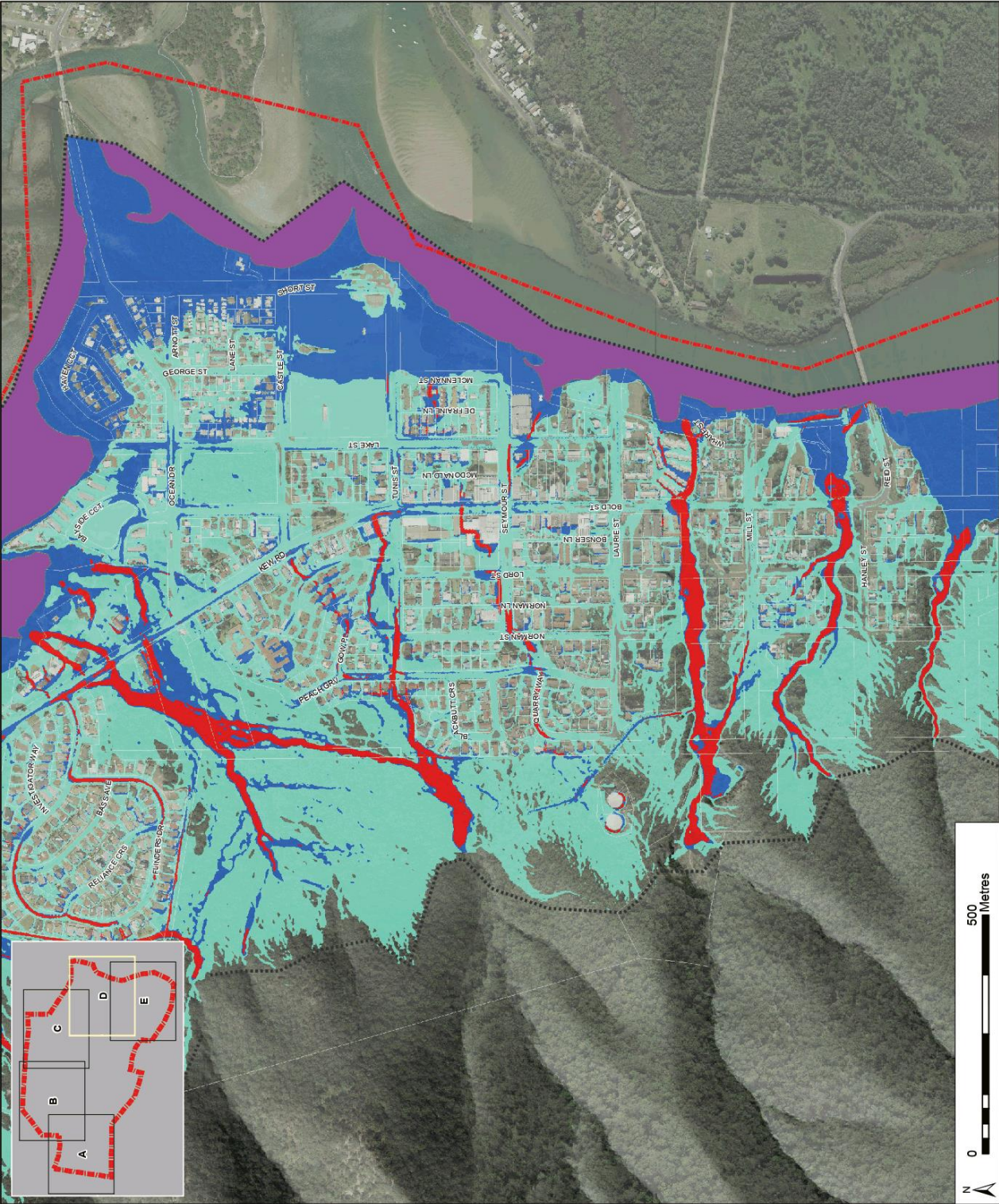
- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Limit of Mapping
- Study Area

NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-2(D)
DATE	8/12/2018



Legend

Hydraulic Categories

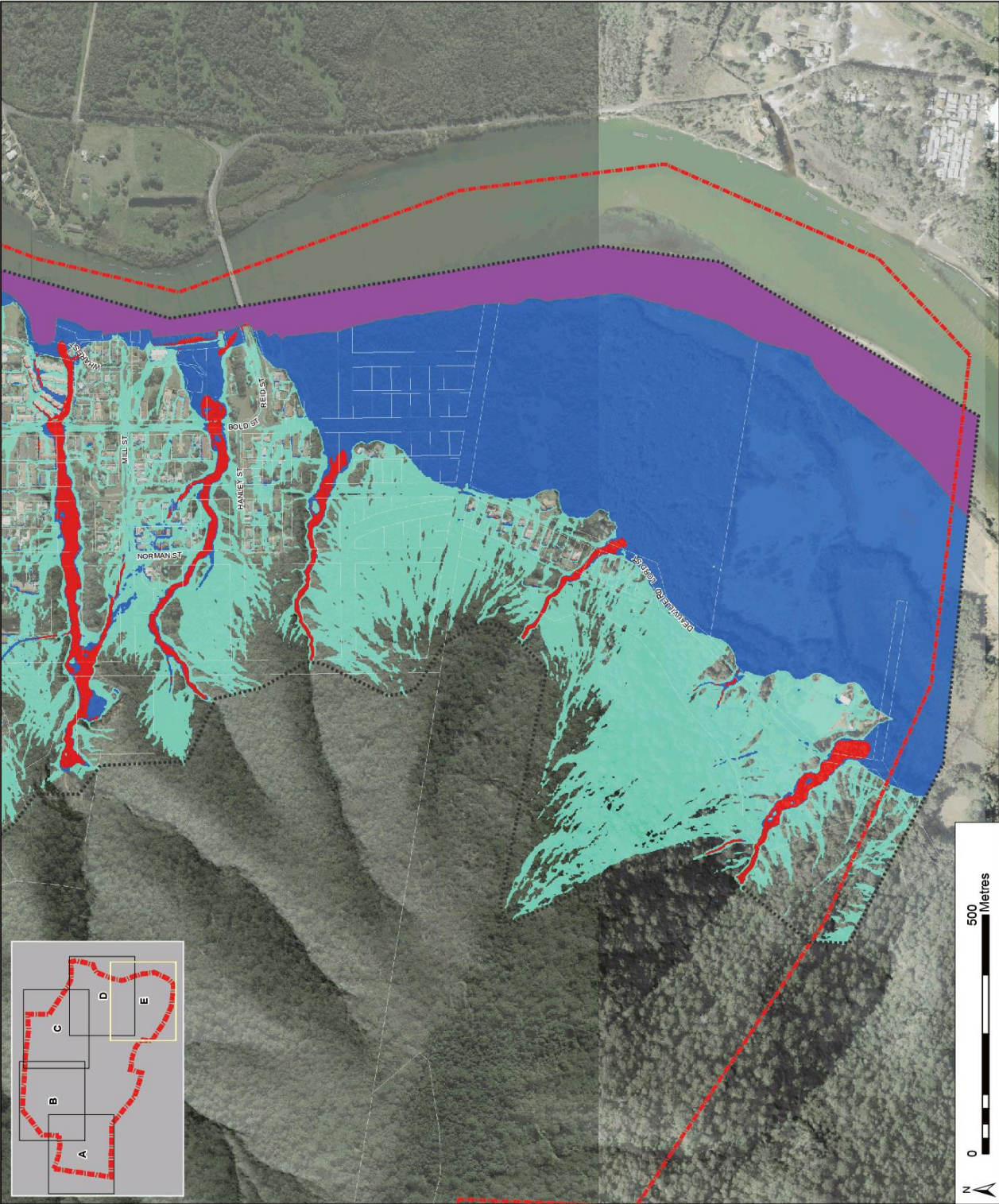
- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Limit of Mapping
- Study Area

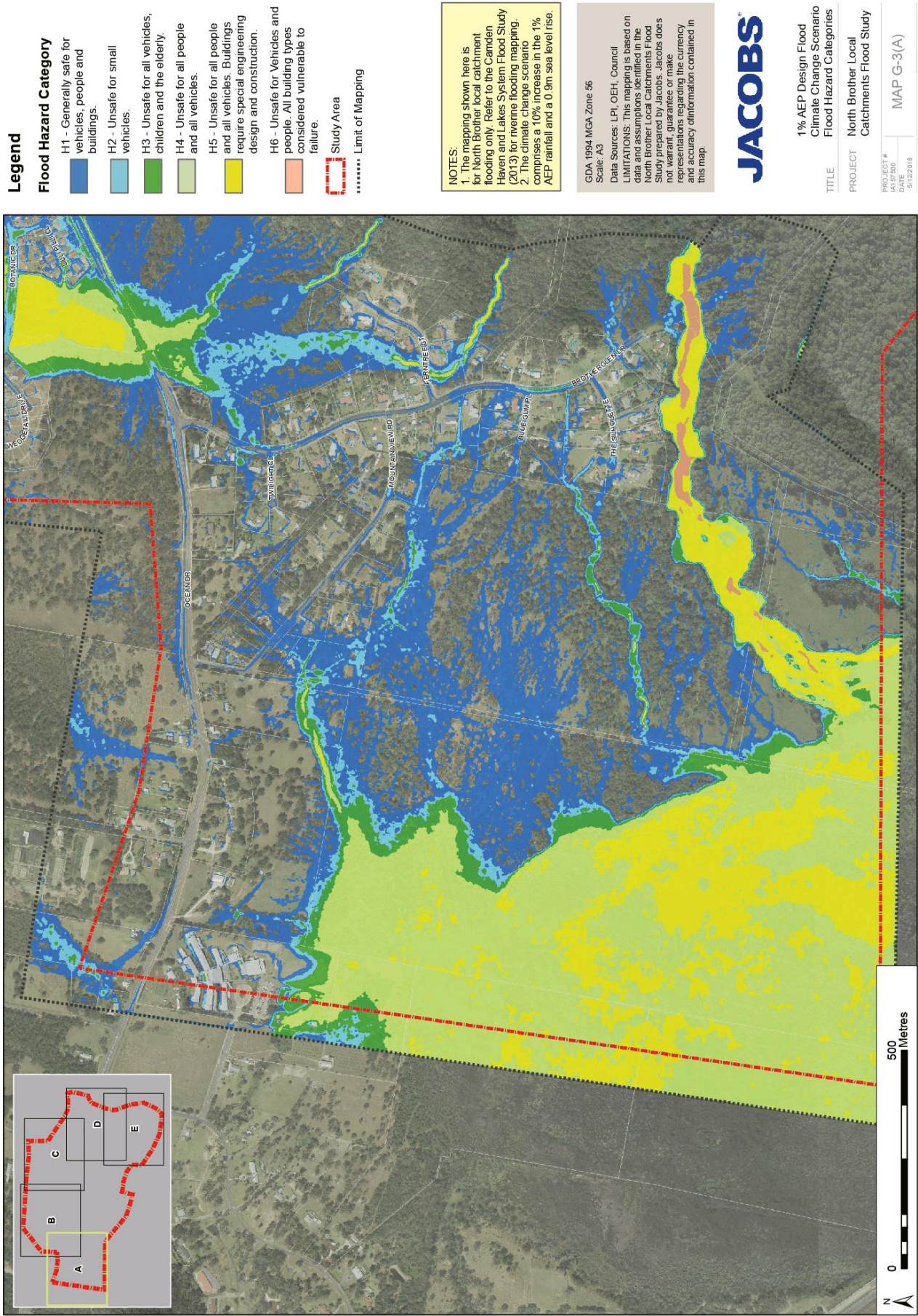
NOTE: The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

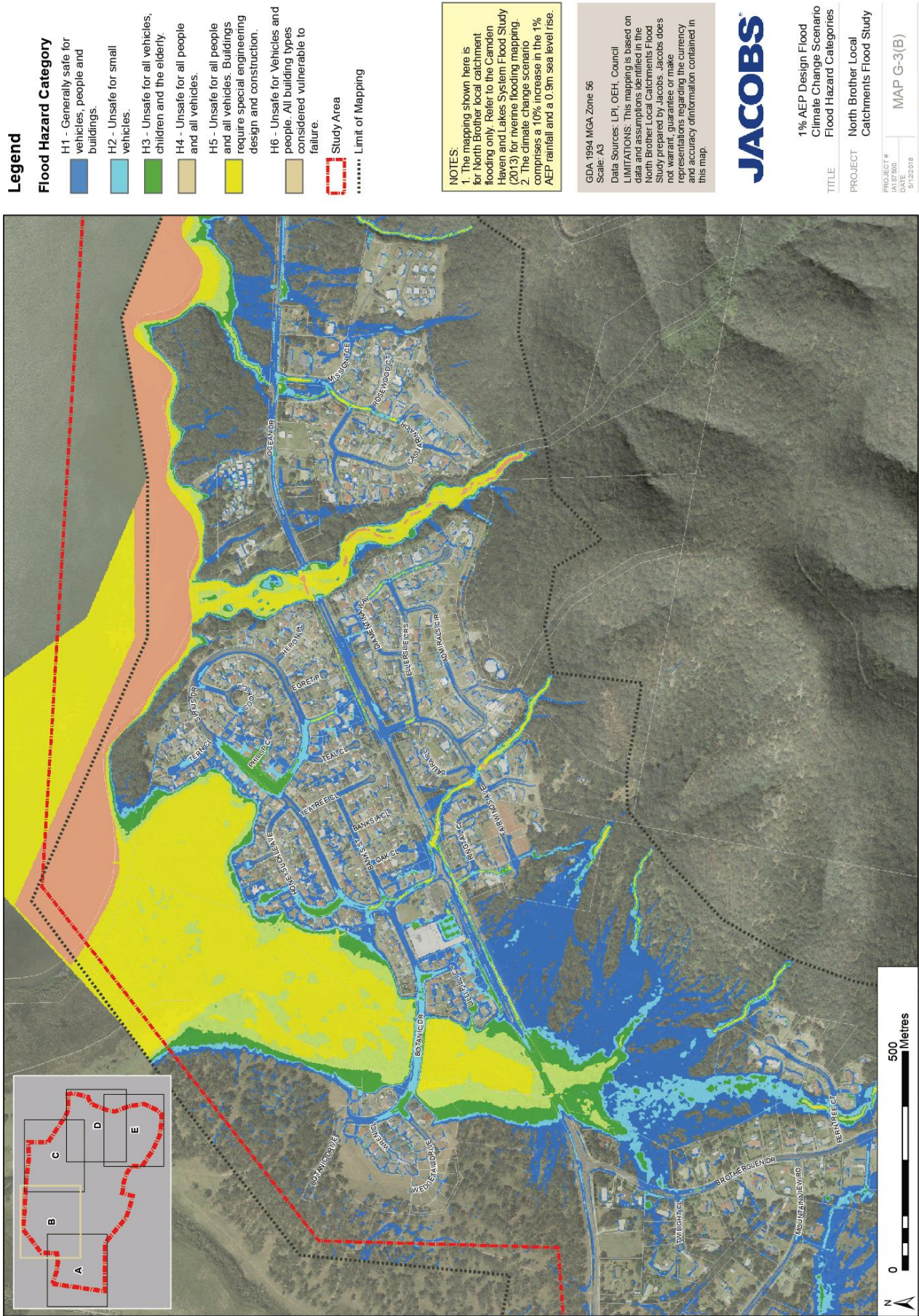
GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

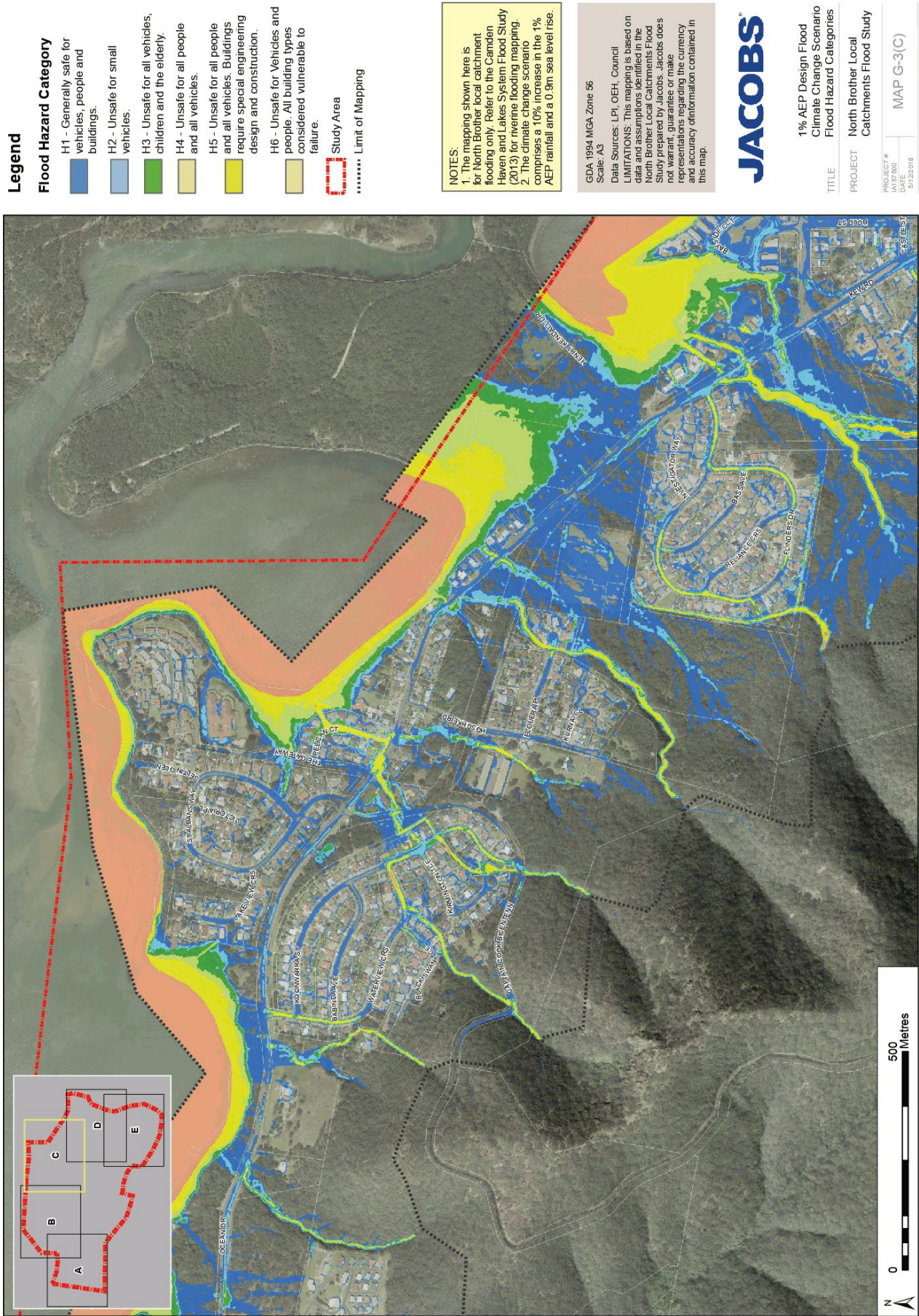


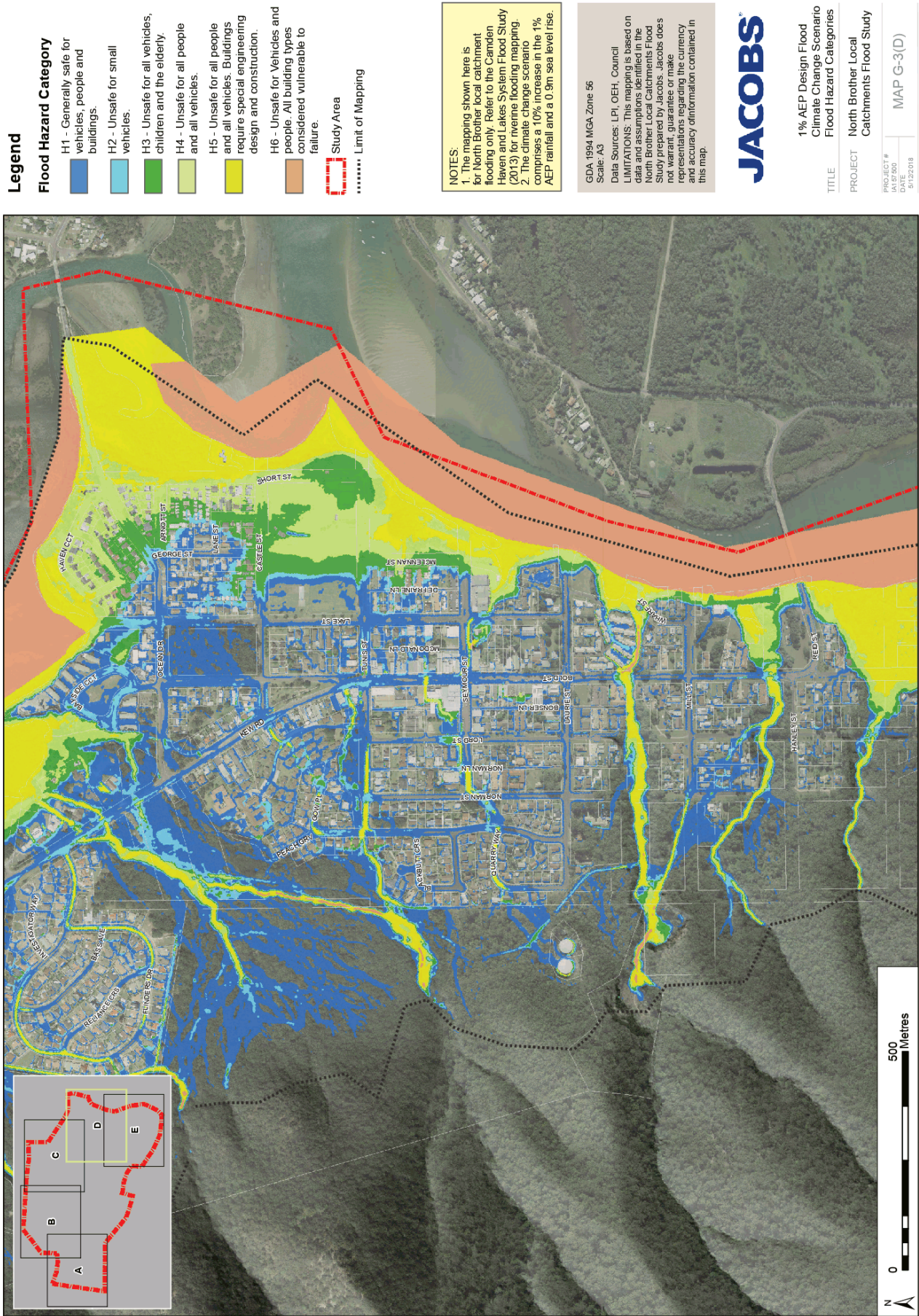
TITLE	1% AEP Design Flood Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJ. DES. #	MAP G-2(E)
DATE	5/12/2018

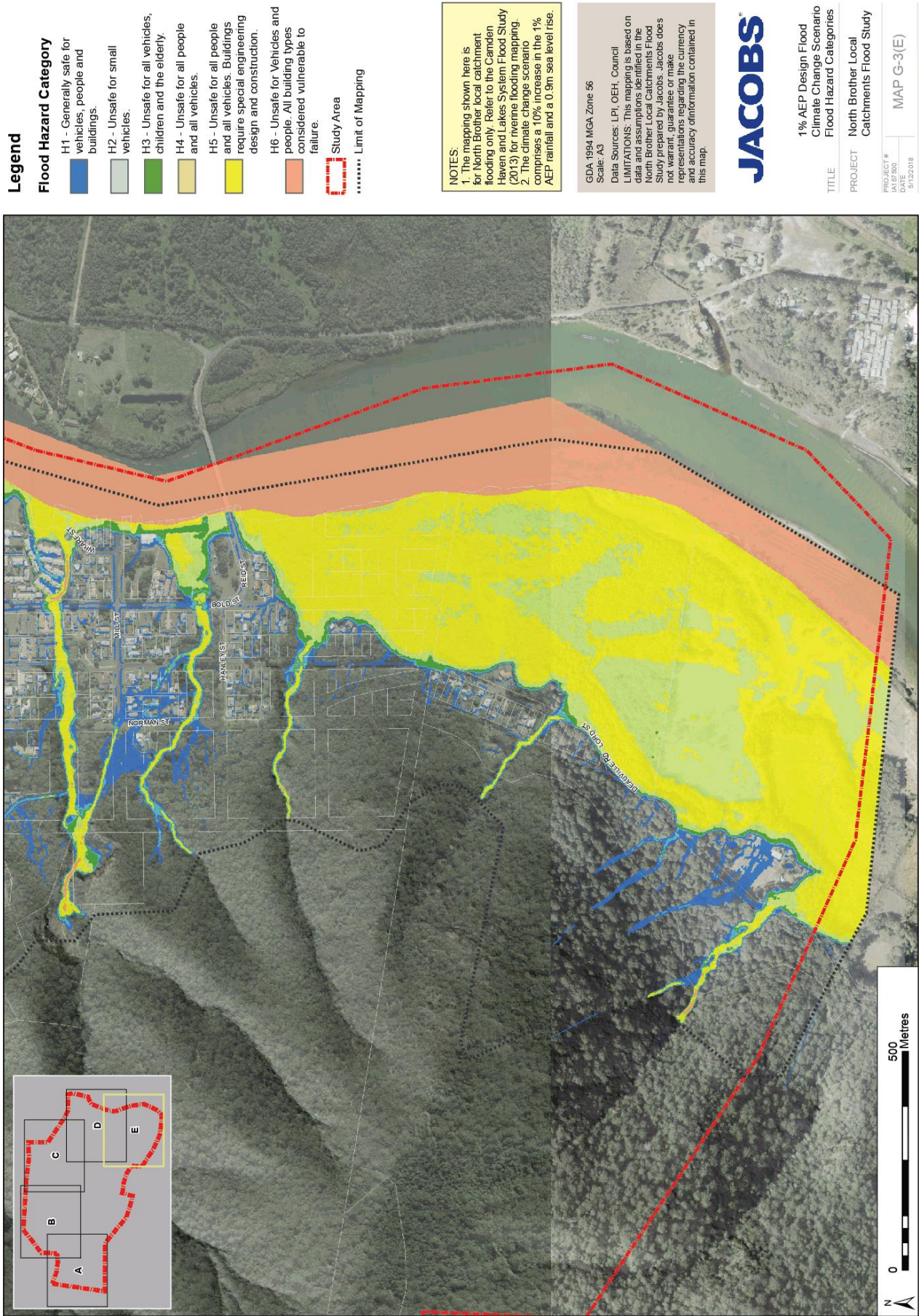












Legend

Hydraulic Categories

Floodway

Flood Storage

Flood Fringe

Watercourse

Study Area

Limit of Mapping

NOTES:

1. The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

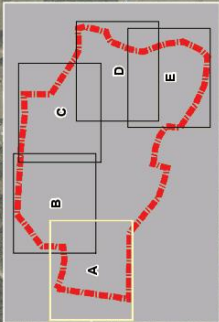
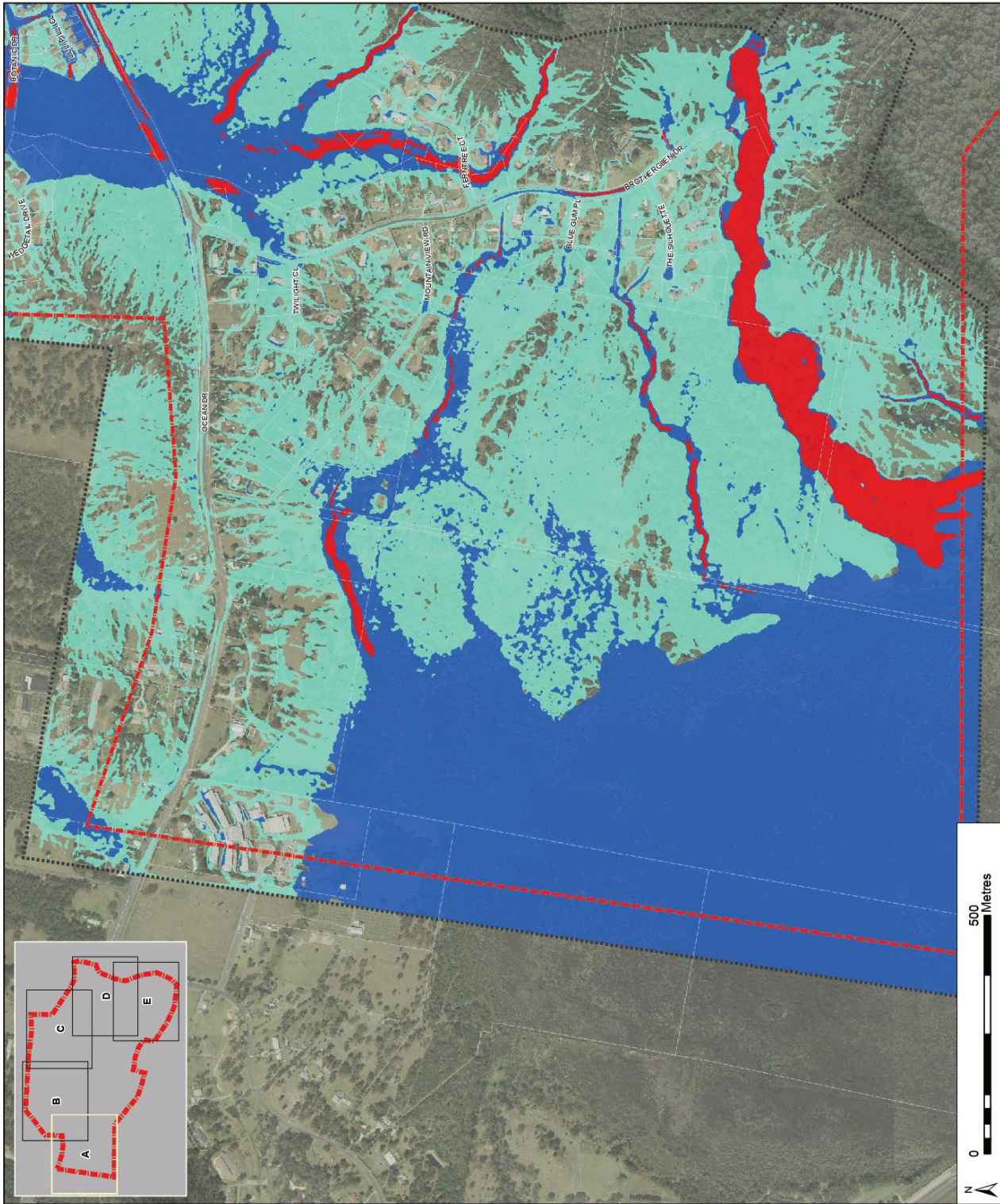
2. The climate change scenario comprises a 10% increase in the 1% AEP rainfall and a 0.9m sea level rise.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council

LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Climate Change Scenario Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
DATE	9/12/2018
	MAP G-4(A)



Legend

Hydraulic Categories

- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Study Area
- Limit of Mapping

NOTES:

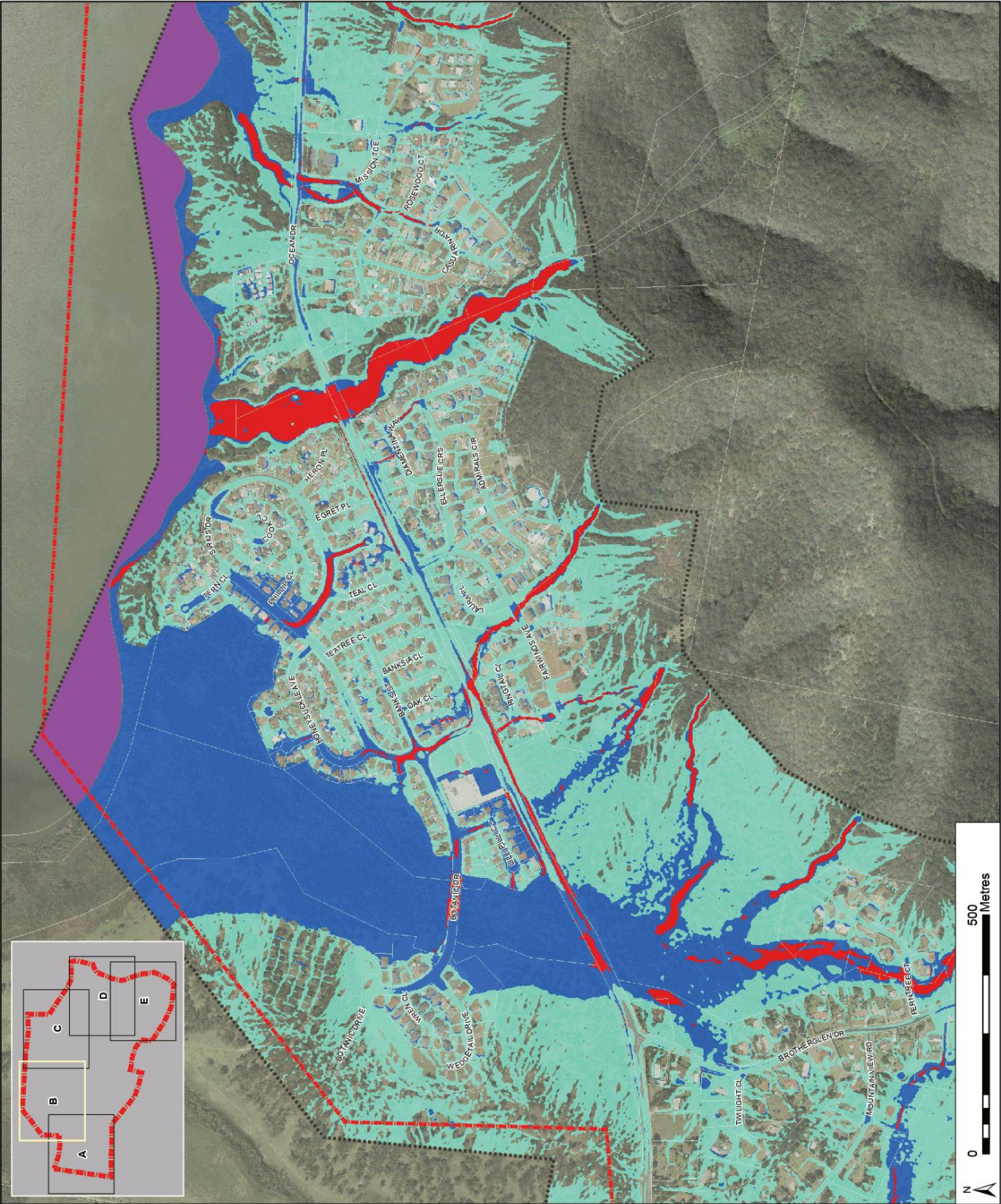
1. The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

2. The climate change scenario comprises a 10% increase in the 1% AEP rainfall and a 0.9m sea level rise.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Climate Change Scenario Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-4(B)
DATE	9/12/2018



Legend

Hydraulic Categories

- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Study Area
- Limit of Mapping

NOTES:

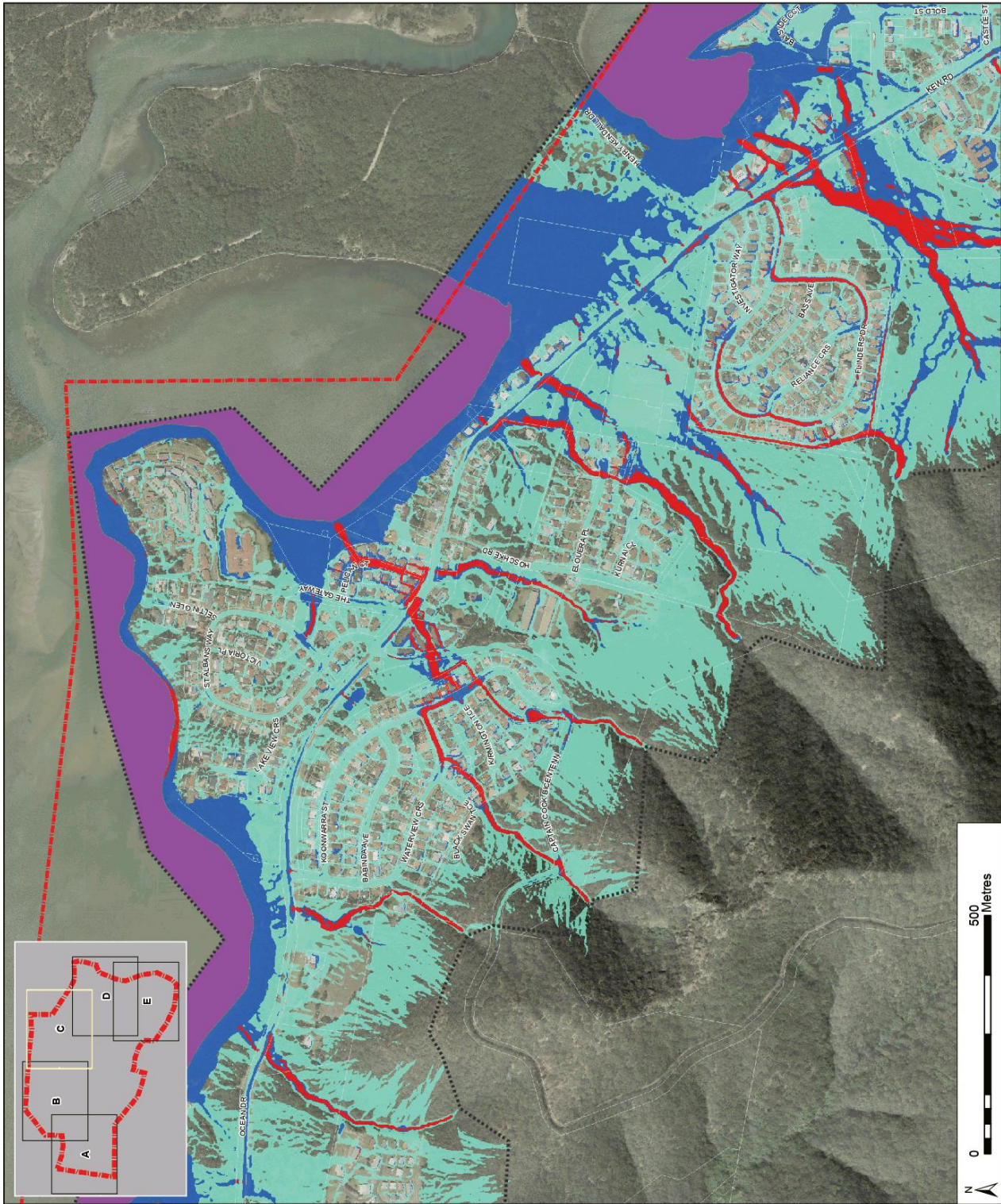
1. The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

2. The climate change scenario comprises a 10% increase in the 1% AEP rainfall and a 0.9m sea level rise.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



1% AEP Design Flood Climate Change Scenario	
TITLE	Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-4(C)
DATE	9/12/2018



Legend

Hydraulic Categories

- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Study Area
- Limit of Mapping

NOTES:

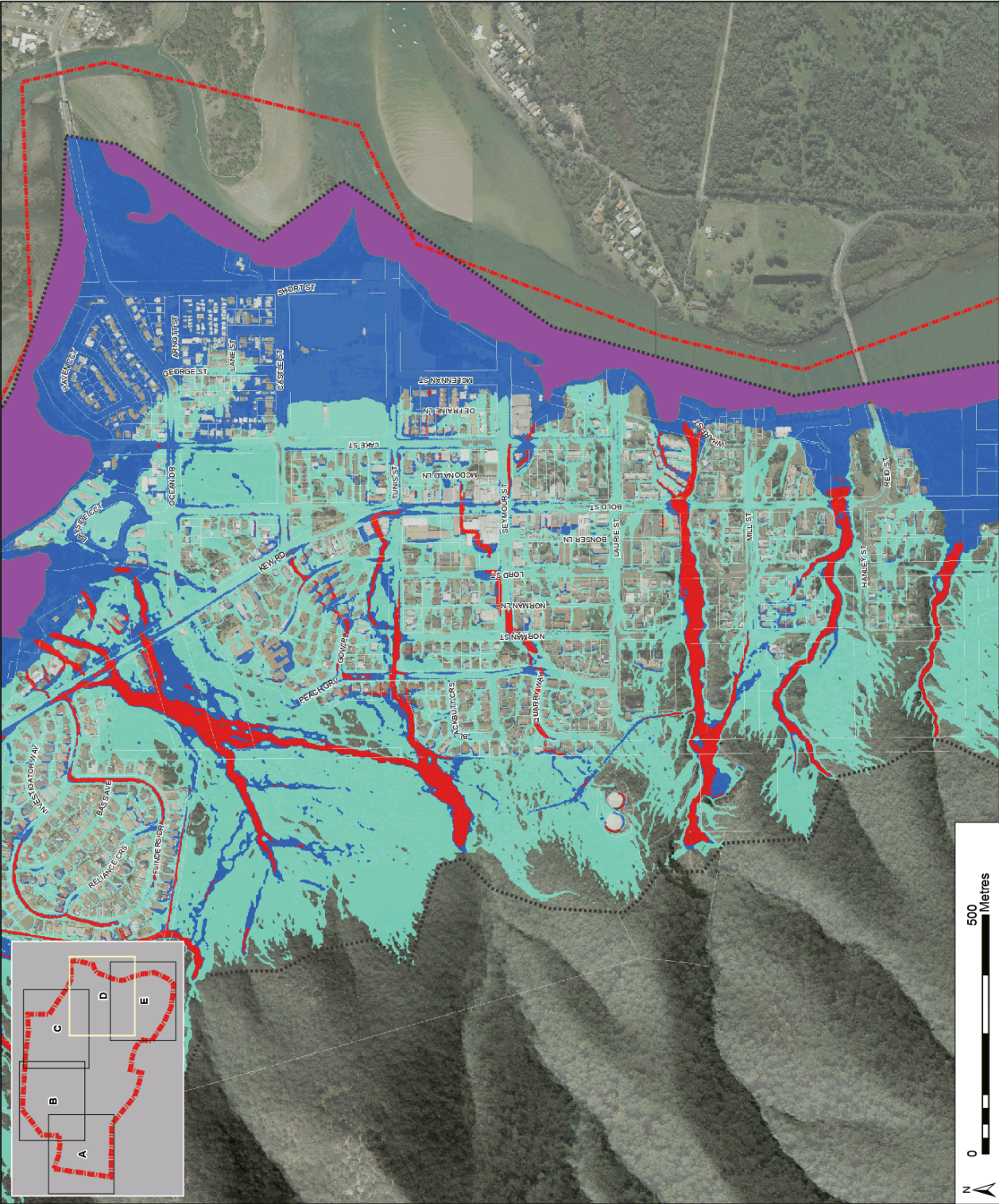
1. The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

2. The climate change scenario comprises a 10% increase in the 1% AEP rainfall and a 0.9m sea level rise.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	1% AEP Design Flood Climate Change Scenario Hydraulic Categories
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP G-4(D)
DATE	9/12/2018



Legend

Hydraulic Categories

- Floodway
- Flood Storage
- Flood Fringe
- Watercourse
- Study Area
- Limit of Mapping

NOTES:

1. The mapping shown here is for North Brother local catchment flooding only. Refer to the Camden Haven and Lakes System Flood Study (2013) for riverine flooding mapping.

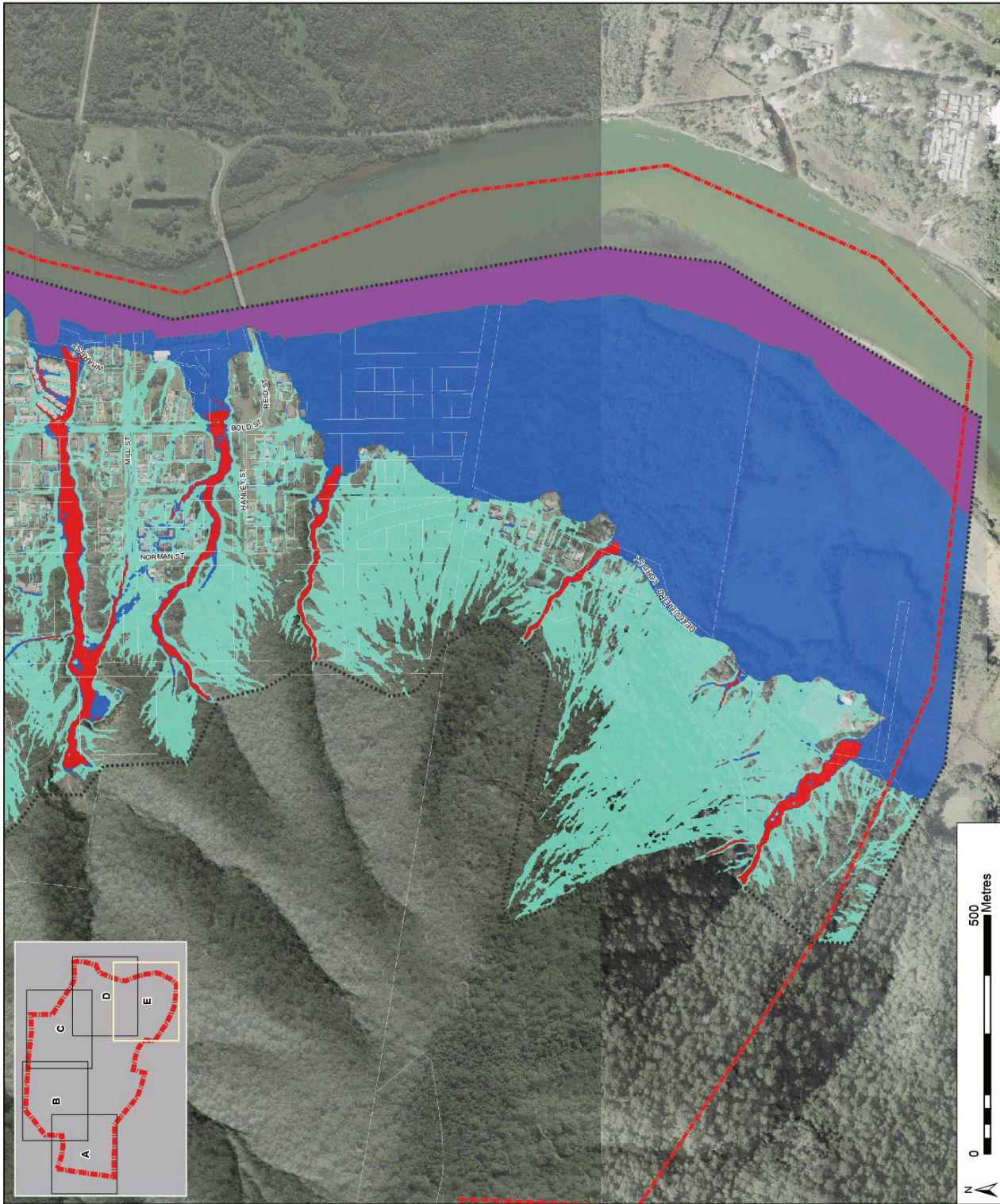
2. The climate change scenario comprises a 10% increase in the 1% AEP rainfall and a 0.9m sea level rise.

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council

LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



1% AEP Design Flood Climate Change Scenario Hydraulic Categories	
TITLE	
PROJECT	
North Brother Local Catchments Flood Study	
DRAWN BY #	MAP G-4(E)
DATE	9/12/2018





North Brother Local Catchments Flood Study

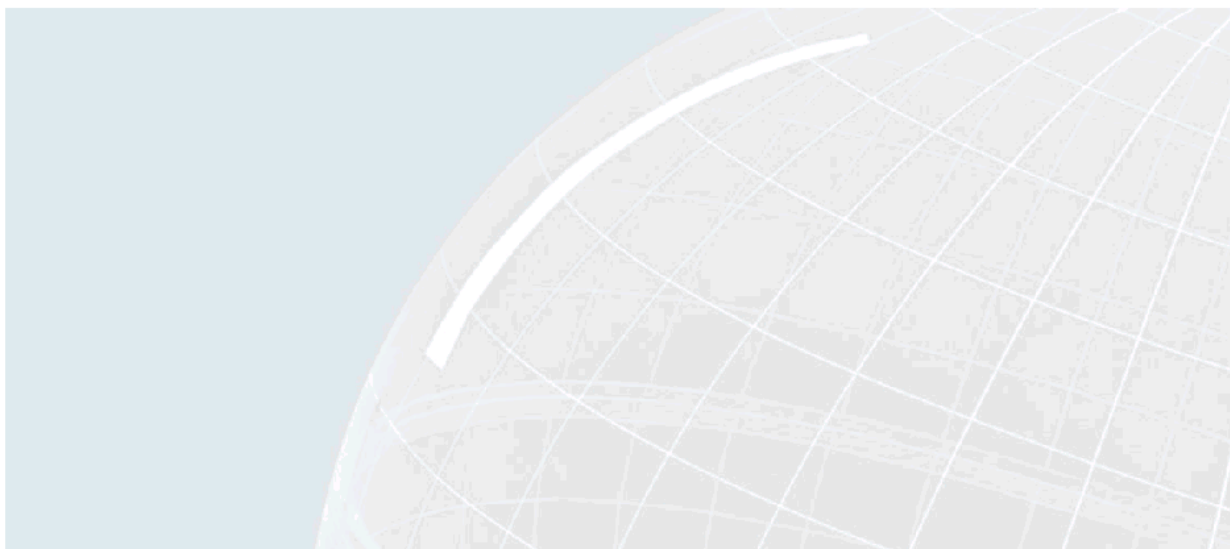
Port Macquarie Hastings Council

Model Calibration and Verification Report

Version A

25 June 2018

IA157500



Model Calibration and Verification Report



North Brother Local Catchments Flood Study

Project no: IA157500
 Document title: Model Calibration and Verification Report
 Document No.: 1
 Revision: A
 Date: 25 June 2018
 Client name: Port Macquarie Hastings Council
 Project manager: Lih Chong
 Author: Lih Chong
 File name: J:\IE\Projects\04_Eastern\IA157500\21 Deliverables\R02 Calibration report\IA157500_R02 North Brother Model Calibration Report_A.docx

Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 177 Pacific Highway
 North Sydney NSW 2060
 PO Box 632 North Sydney NSW 2059100 Christie Street
 St Leonards NSW 2065 Australia
 PO Box 164 St Leonards NSW 2065 Australia
 T +61 2 9928 2100
 F +61 2 9928 2500
 www.jacobs.com

© Copyright 2018 Jacobs Group (Australia) Pty Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Document history and status

Revision	Date	Description	By	Review	Approved
A	25/06/2018	Draft	L Chong	A Hossain	A Hossain

Model Calibration and Verification Report



Contents

Foreword	5
1. Introduction	7
1.1 Background	7
1.2 Structure of this Report	7
2. Available Data	9
3. Site Visit	12
4. Review of Available Data	18
4.1 Port Macquarie Hastings Council Flood Policy (2015)	18
4.2 Previous Studies	18
4.2.1 GHD Stormwater Analysis and Design Studies (2007)	18
4.2.2 Camden Haven River and Lakes System Flood Study (Worley Parsons, 2013)	19
4.3 Spatial and Design Data	19
4.3.1 Topographic Data	19
4.3.2 Aerial Photography	21
4.3.3 Stormwater and Drainage Infrastructure	21
4.3.4 Historical Subdivision Design	22
4.3.5 Additional GIS data	22
4.4 Recorded Data	22
4.4.1 Rainfall Data	22
4.4.1.1 Daily Rainfall	22
4.4.1.2 Pluviograph data	24
4.4.2 Water Level Data	25
4.5 Topographic and Hydraulic Structures Survey	25
4.6 Reports and Photographs of Historic Flooding and Drainage Issues	25
4.7 Floor Level Survey	30
4.8 Community Consultation	30
4.8.1 Initial Consultation	30
4.8.2 Community Survey	30
5. Hydrologic Modelling	31
5.1 Modelling Approach	31
5.2 Sub-Catchment Data	31
5.3 Hydrologic Parameters	33
5.3.1 Rainfall Losses	33
5.3.2 Storage Routing Factor	33
6. Hydraulic Modelling	34
6.1 Model Selection	34
6.2 Configuration of Hydraulic Model	34
6.2.1 Extent and Structure	34
6.2.2 Model Topography	36
6.2.3 Stormwater Pits	36

Model Calibration and Verification Report**JACOBS**

6.2.4	Stormwater Conduits.....	36
6.2.5	Building Polygons.....	36
6.2.6	Surface Hydraulic Roughness	36
6.2.7	Property Fence Lines.....	38
6.3	Boundary Conditions and Tailwater Conditions.....	38
6.3.1	Model Inflows.....	38
6.3.2	Direct Rainfall.....	38
6.3.3	Tailwater Boundaries.....	39
7.	Model Calibration and Verification	40
7.1	Overview.....	40
7.2	Selection of Verification Events	40
7.3	Adopted Parameter Values for Model Verification.....	41
7.3.1	Rainfall Losses.....	41
7.3.2	Orographic Rainfall Scaling	41
7.3.3	Blockage of Hydraulic Structures.....	42
7.3.4	Blockages in Flow Diversion Drains.....	42
7.3.5	Tailwater Conditions.....	42
7.4	Comparison to Observed Flooding	42
7.5	Sensitivity Testing of Calibration Parameters	43
8.	Conclusions and Recommendations	46
9.	References	47
10.	Glossary	48

Model Calibration and Verification Report

JACOBS

Appendices

Appendix A. Analysis of Historic Rainfall Event Data

Appendix B. Summary of Topographic Survey

Appendix C. Community Consultation

Appendix D. Verification of Model Flood Behaviour

Model Calibration and Verification Report



Foreword

The primary objective of the New South Wales Government's Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods, wherever possible. Under the Policy, the management of flood prone land remains the responsibility of local government.

The policy provides for a floodplain management system comprising the following five sequential stages:

1. **Data Collection** Involves compilation of existing data and collection of additional data
2. **Flood Study** Determines the nature and extent of the flood problem
3. **Floodplain Risk Management Study** Evaluates management options in consideration of social, ecological and economic factors relating to flood risk with respect to both existing and future development
4. **Floodplain Risk Management Plan** Involves formal adoption by Council of a plan of management for the floodplain
5. **Implementation of the Plan** Implementation of flood, response and property modification measures (including mitigation works, planning controls, flood warnings, flood preparedness, environmental rehabilitation, ongoing data collection and monitoring by Council)

Port Macquarie Hastings Council is undertaking this study for the North Brother Local Catchments study area to investigate the existing and future flood risks in the study area in accordance with the NSW Government's *Floodplain Development Manual*. The study will also identify and assess potential flood mitigation options and guide land use planning and future development on the floodplain in the study area.

This study represents Stages 1 to 4 of the management process and has been prepared for Council by Jacobs. This report is a progress report of Stage 2 Flood Study.

Model Calibration and Verification Report**Important note about this report**

The sole purpose of this report and the associated services performed by Jacobs is to undertake a flood study for the North Brother Local Catchments study area located in New South Wales in accordance with the scope of services set out in the contract between Jacobs and Port Macquarie Hastings Council (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client, third parties, and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

Topographic data used in this study included that sourced from a LiDAR survey and ground survey which were undertaken by third parties. Undertaking independent checks on the accuracy of the data was outside Jacobs's scope of work for this study.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Model Calibration and Verification Report



1. Introduction

1.1 Background

Jacobs has been engaged by Port Macquarie Hastings Council (Council) to undertake a flood study and floodplain risk management study of the North Brother Local Catchments area. The study area is located on the Mid North Coast of NSW, and includes parts of the villages of Kew, Lakewood, West Haven, Laurieton and Deauville which are situated at the foot of North Brother Mountain (Figure 1-1). Development in the area has occurred in sometimes unsuitable locations as a result of poor drainage planning, leading to localised nuisance flooding on residential properties at a number of locations on a regular basis. Numerous gullies and watercourses drain from North Brother Mountain through the developed areas, which over time have been piped, filled, crossed by road embankments or redirected, contributing to the existing flooding problems. Localised flooding in some areas may interact with and be exacerbated by mainstream flooding in Queens Lake, Stingray Creek and Camden Haven River.

Objectives of the study include:

- ☐ Develop and calibrate hydrologic and hydraulic modelling to estimate flooding conditions for a range of design events
- ☐ Identify flood problem priority areas and identify and assess structural and non-structural mitigation measures to manage flood risk.
- ☐ Review existing planning, policy and emergency management for gaps and inconsistencies relating to floodplain planning, then develop proposed amendments to address residual flood risk
- ☐ Prioritise the works and measures, including economic and multi criteria appraisal of options.
- ☐ Develop an implementation program for recommended works and measures including timing, responsibility and sources of funding.
- ☐ Conduct consultation with the community and key stakeholders throughout the study to obtain information and intelligence for input into the study. Gauge the perceptions of the community on flooding matters. Obtain feedback on the findings and recommendations of the study.

This report documents the development, calibration and verification of hydrologic and hydraulic models for estimating flooding behaviour in the study area. Sensitivity testing of model parameter values is also discussed. The models will be used in the subsequent estimation of design flooding conditions and in the identification and assessment of flood mitigation works.

1.2 Structure of this Report

This report is structured by the following sections:

- ☐ Section 2 lists the available data
- ☐ Section 3 describes the site visits undertaken for the study
- ☐ Section 4 reviews and describes relevant aspects of the available data
- ☐ Section 5 describes the hydrologic modelling approach
- ☐ Section 6 details the development of the hydraulic model
- ☐ Section 7 discusses the calibration of the flood modelling to historic flood events, including sensitivity testing of key model parameters and assumptions
- ☐ Section 8 provides conclusions and recommendations to this phase of the study.

Legend

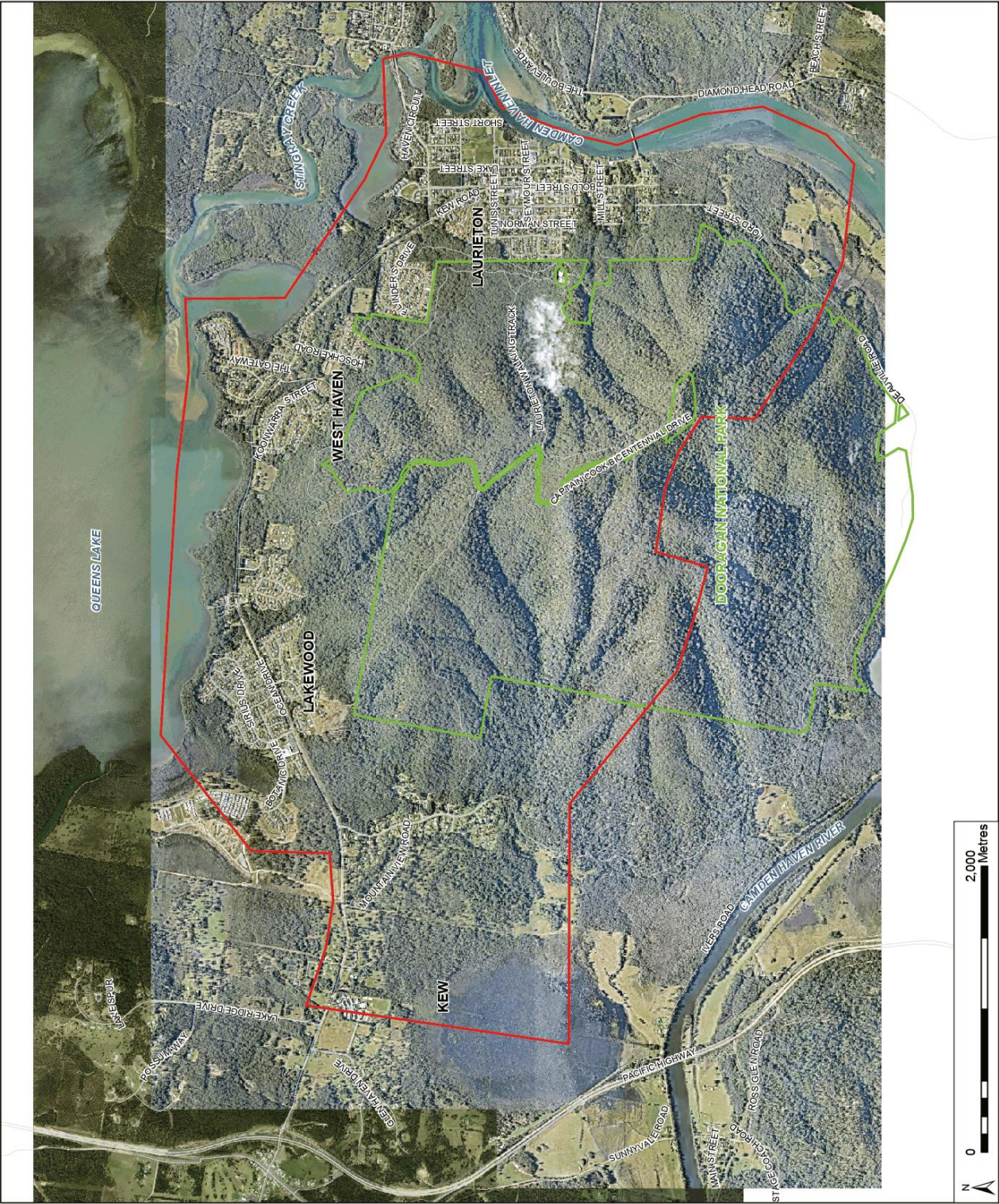
Study Area

National Park

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Study Area
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
ISSUED DATE	25/05/2017
	FIGURE 1-1



Model Calibration and Verification Report



2. Available Data

A range of data was obtained by Jacobs or provided by Council and other agencies in July/August 2017 and is summarised in **Table 2-1** below. The data includes reports of studies that have been undertaken in the area, drainage models, spatial data including stormwater assets, zoning and other GIS layers, photographs and resident reports of previous flooding in the study area. Discussion on key datasets is provided in Section 4.

Table 2-1 Data inventory

Data	Description	Source
Reports		
West Haven System Analysis report	Hydrologic and hydraulic analysis of West Haven stormwater system and catchment	GHD 2007
West Haven Concept Design Report	Concept design report of proposed mitigation works in West Haven	GHD 2007
Camden Haven and Lakes System Flood Study	Mainstream flood study - river design flood levels Adopted 2013.	Worley Parsons 2013
Port Macquarie Hastings Council Flood Policy	PMHC flood policy adopted 2015. Includes guidelines for development, hydraulic classification, climate change, flood planning level allowances for different development, development controls.	PMHC
Spatial and Design Data		
Study area	Study area extent	PMHC
LiDAR data	Classified C3 LAS and thinned ground point data	NSW LPI 2012 (via PMHC)
LiDAR data	1m gridded DEM obtained for LPI dataset (available within Jacobs). Merged for study area	NSW LPI 2012 (via Jacobs)
Aerial photography	Nearmap 7cm res. Use this for existing case modelling	NearMap May 2017(via PMHC)
Aerial photography	Other older datasets available, varying resolution	NearMap, LPI (via PMHC)
Stormwater infrastructure	Bridges Culverts	PMHC

Model Calibration and Verification Report



	Stormwater Box Culvert Stormwater End Structure Stormwater Junction Sideline Stormwater Open Drain Stormwater Pipe Stormwater Pit Stormwater SQID (Stormwater Quality Improvement Device)	
Zoning	Land use zoning	PMHC
Cadastre	Lot parcels	PMHC
Ecology	Endangered ecological communities 2014 Vegetation Management Plans SEPP14 Coastal Wetlands	PMHC
Erosion risk	Soil Erosion Risk	PMHC
Road feature	Road Surface (road centreline) Kerb/Gutter line Footpaths	PMHC
Flood and sea level rise	Camden Haven River flood and sea level rise extents	Flood and sea level rise
Drainage plans - Historic	Various drainage/stormwater/WQ designs, various locations and ages	PMHC
Hydrographic and Dredging Plans - Camden Haven Area - historic	River bathymetry, dredging, tidal analysis. 1970s 1980s.	PMHC
Parks and Reserve Plans	Parks and reserves layouts 1980s - 2000	PMHC
Rural roads plans	Ocean Drive - historical plans	PMHC
Subdivision plans	Historic subdivision plans dated 2006 and 2010	PMHC
Urban Roads	Urban roads- historic plans	PMHC

Model Calibration and Verification Report



Hydrologic Soil Group	NSW wide GIS layer on hydrologic soils group (classification A to D reflecting permeability and runoff potential)	OEH (online)
Recorded Data		
Daily Rainfall Data	Daily rainfall data for five stations in the vicinity of North Brother	BoM
Pluviograph Data	Pluvio data 5 minute intervals 1/03/2012 to 1/02/2016 at various sewage treatment plants and pumping stations in Port Macquarie Hastings LGA. Pluvio data is also available from Manly Hydraulics Laboratory (MHL) for Locans Crossing	PMHC MHL
Modelling Data		
West Haven DRAINS models	DRAINS models of existing and mitigated cases relating to West Haven System Analysis report and West Haven Concept Design Report	GHD 2007
Historic Flooding		
Flood mapping	Historic flood outlines and flood prone land/ flood planning mapping for mainstream flooding	PMHC
Flood marks	Historic flood marks for Camden Haven River flooding	PMHC
Photographs	Photos of previous flooding (various locations and events)	PMHC
Flooding complaints	Flooding and drainage complaints from residents and logged on Council register	PMHC

Model Calibration and Verification Report



3. Site Visit

Site inspections were undertaken on 27 July 2017. The purpose of the site inspection was to gain a further understanding of the catchment characteristics, the nature of existing development and hydraulic conditions (including flow patterns, drainage arrangements, hydraulic features etc.) in known flood problem areas, and likely flood risk. Members of the Jacobs project team were accompanied by Council officers. Locations inspected on the site visit included trouble spots identified by Council and significant drainage locations:

- ☐ Black Swan Terrace, West Haven
- ☐ Ringtail Cl, Lakewood
- ☐ Lilli Pilli Cl, Lakewood
- ☐ Mission Terrace, Lakewood
- ☐ Kirmington Terrace, and Pelican Ct, Westhaven
- ☐ Flinders Dr Estate, Laurieton
- ☐ Bold Street, Laurieton
- ☐ Quarry Way, Laurieton
- ☐ Lake Street, Laurieton
- ☐ St Joseph's School, Laurieton.

Observations made during the site visit included:

- ☐ The terrain in the developed sections of the study area, at the foot of North Brother Mountain, is generally flat to moderately sloped (grades of 5 – 15%) with elevations from less than 2m AHD up to 50m AHD.
- ☐ The middle and upper catchment areas, upstream of the developed areas, are densely forested and generally within Dooragan National Park. Terrain is generally very steep, with watercourse grades of up to 50% and ground elevations up to 490m AHD.
- ☐ There were no permanently flowing watercourses observed at the time of the site visit, which occurred following a month of dry weather conditions. Most minor flow paths have been piped to pass through residential development. The larger watercourses have been maintained in a generally natural state and development has not encroached on these watercourses. All of the flow paths and watercourses are crossed by Ocean Drive and other roads with culverts as they drain to Queens Lake and Stingray Creek.
- ☐ Many watercourses and other drainage features are covered by dense rainforest vegetation.
- ☐ Soil landscapes along watercourses were observed to include high permeability gravel and rubble beds in the stream beds and along some stream banks. Council officers described that during storm events, in some locations the stream flows infiltrate into these gravel and rubble beds, flowing sub-surface and then resurfacing in different locations. This is reflected in residents' reports and accompanying photos.

An additional site visit was undertaken on 30 April 2018 during the model setup and calibration to inspect selected drainage features and confirm the model performance and representation of flood behaviour.

Model Calibration and Verification Report



Figure 3-1 Eastern side of north Brother Mountain, illustrating steepness of the terrain

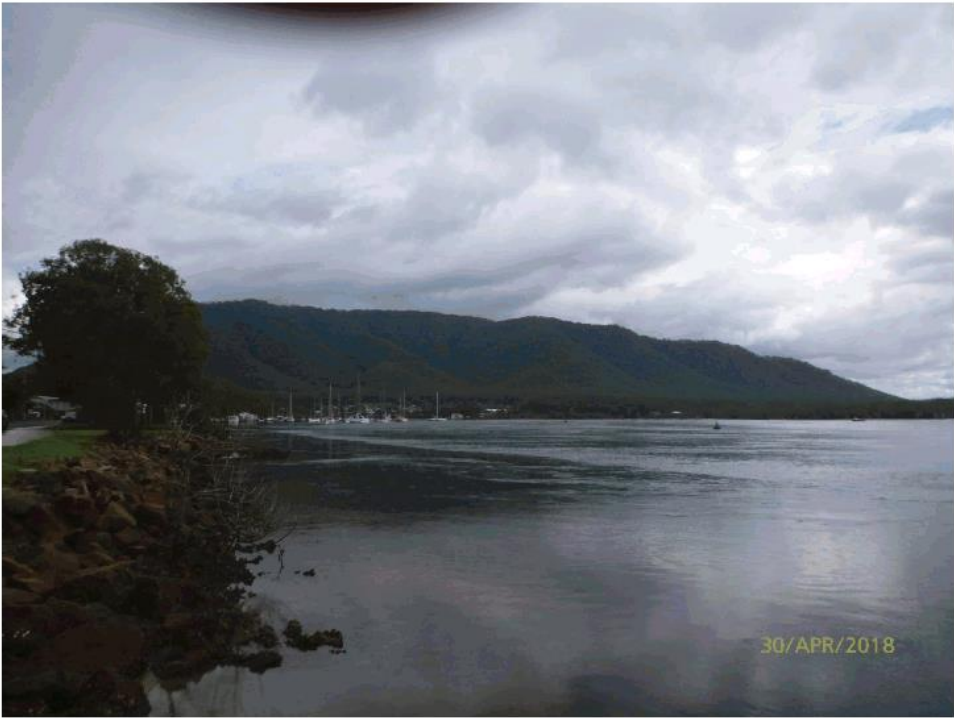


Figure 3-2 Shotcrete-lined informal channel in Lakewood



North Lakewood and Oakbrook Flood Study

40

Model Calibration and Verification Report

JACOBS

Figure 3-3 Natural flow path through forested area in West Haven





Model Calibration and Verification Report

Figure 3-5 Grated trunk drainage headwall inlet, West Haven



Figure 3-4 Driveway crossing of flow path, which passes next to dwelling, West Haven



Model Calibration and Verification Report



Figure 3-6 Upstream side of flow path road crossing, West Haven



Figure 3-7 Trunk drainage open channel through property, Laurieton



Model Results and Calibration Flood Study

40

Model Calibration and Verification Report

JACOBS

Figure 3-8 Trunk drainage culvert discharging to open channel next to development, Laurieton



Figure 3-9 Flow diversion berm and swale upstream of development, Laurieton



Model Results and Calibration Flood Study

27

Model Calibration and Verification Report



4. Review of Available Data

4.1 Port Macquarie Hastings Council Flood Policy (2015)

Council's Flood Policy (adopted 21 October 2015) outlines the considerations to be made by Council in exercising its environmental assessment and planning functions in relation to development in the Port Macquarie Hastings Local Government Area (LGA). It reflects the direction of flood risk management in NSW Government's *Flood Prone Land Policy* and draws on the guidance on this provided in the *Floodplain Development Manual* (2005). It outlines a number of objectives in achieving sound flood management, namely:

- I. To maintain the existing Flood regime and flow conveyance capacity;
- II. to reduce the impact of Flooding and Flood liability on individual owners and occupiers of Flood prone property;
- III. to reduce private and public losses resulting from Floods;
- IV. to increase public safety with respect to Flood events;
- V. to protect the operational capacity of emergency services and emergency response facilities during Flood events;
- VI. to increase public awareness of the potential for Flooding across the range of Flood events up to the Probable Maximum Flood level;
- VII. to inform the community of Council's policy in relation to the use and Development of Flood Prone Land;
- VIII. to ensure that planning and Development of essential services and land use makes appropriate provision for Flood related risk;
- IX. to utilise best engineering practice for determination of Flood conditions, impact and risk.
- X. to utilise ecologically positive methods of Flood protection wherever possible;
- XI. to ensure that any New Development or modifications to existing Development must, as far as practical, result in a reduction in the existing Flood Risk, and in no circumstances should the Flood Risk be made worse; and,
- XII. to deal equitably and consistently with all matters requiring Council approval on land affected by potential floods, in accordance with the principles contained in the NSW Government's Floodplain Development Manual (2005).

The flood policy provides definitions for the different hydraulic classifications of the floodplain, flood planning level categories and provisions for different types of development (permissible development types, minimum floor levels), filling, fencing, boundary adjustments, rezoning and subdivision in the different hydraulic zones in the floodplain.

4.2 Previous Studies

4.2.1 GHD Stormwater Analysis and Design Studies (2007)

In response to previous poor performance of the drainage system, a stormwater hydrologic and hydraulic study was undertaken by GHD for Council for the West Haven area, and a concept design prepared for a proposed drainage upgrade and flood mitigation program. These are documented in the following reports:

- West Haven Stormwater Study Area Final Systems Analyses Report (GHD, April 2007)

Model Calibration and Verification Report

- Report for Buller Street and West Haven Stormwater Catchment Studies S.600.110.05.61 Concept Design Report - West Haven Study Area (GHD, September 2007).

DRAINS models were developed for the study for the existing and proposed design cases to quantify system flows and identify/confirm system constraints. The models were not calibrated to historic flooding events. Design event flows were validated against rational method estimates. Relatively conservative hydrologic parameters were assumed for the catchment hydrology, including assumptions on the soil type (soil type 4 or D, high runoff and very low infiltration rates).

The existing case modelling indicated flood problem areas in the following locations

- South of No. 9 Black Swan Terrace / No. 20 Kimington Terrace;
- Koonwarra Street drainage easement Lot 29;
- Ocean Drive cross culverts adjacent No. 374 – No. 384 Ocean Drive; and
- DRAINS also indicated problems with the Elouera Place cross culvert.

The concept design proposed a range of pit and pipe network upgrades and modifications, formalisation of two existing flood storages (referred to as “detention basins” in the GHD study) and construction of a large diversion channel upstream of Black Swan Terrace. The works were designed to achieve compliance for the minor (5 year) storm event with a review of the effect on the 100 year capacity.

The works were costed with a Net Present Value of \$4.7 million (2007 dollars) excluding GST. It has not been confirmed with Council if any of the proposed mitigation works were implemented.

Sub-catchment boundaries are not available as spatial layers. The pit and pipe names in the DRAINS model are not consistent with the drainage asset layer provided by Council. Hence, the DRAINS model data is not directly suitable for the development of flood models in this study, but the results may be useful for model validation purposes.

4.2.2 Camden Haven River and Lakes System Flood Study (Worley Parsons, 2013)

This flood study estimated existing flooding conditions for mainstream flooding in Camden Haven River, Camden Haven Inlet, Queens Lake, Stingray Creek and Watsons Taylor Lake in the study area. The study was based on hydrologic and hydraulic modelling in XP-RAPTS and RMA-2, respectively, for the 5, 20, 50, 100 and 200 year floods and Probable Maximum Flood (PMF). The study estimated 100 year flood levels of approximately 2.9 – 3m AHD in Camden Haven Inlet, Stingray Creek and Queens Lake affecting parts of the study area, and 4.3m AHD in Camden Haven River near the Pacific Highway bridge, potentially affecting the south-western portion of the study area.

4.3 Spatial and Design Data

4.3.1 Topographic Data

Topographic data across the study area consists of LiDAR data captured by NSW Land and Property Information (LPI) in 2012. The dataset has a vertical accuracy of 0.15m (one standard deviation). Council provided classified and thinned ground point data for the study. Jacobs obtained the 1m digital elevation model (DEM) grid developed by LPI from this data, which is held in-house. The data tiles were merged together by Jacobs to form a continuous DEM across the study area and surrounds. The DEM showing the study area terrain is presented on Figure 4-1.

Legend

LIDAR Elevation (m AHD)

High : 80

Low : 0

Culverts

StormwaterPipe

StormwaterPit

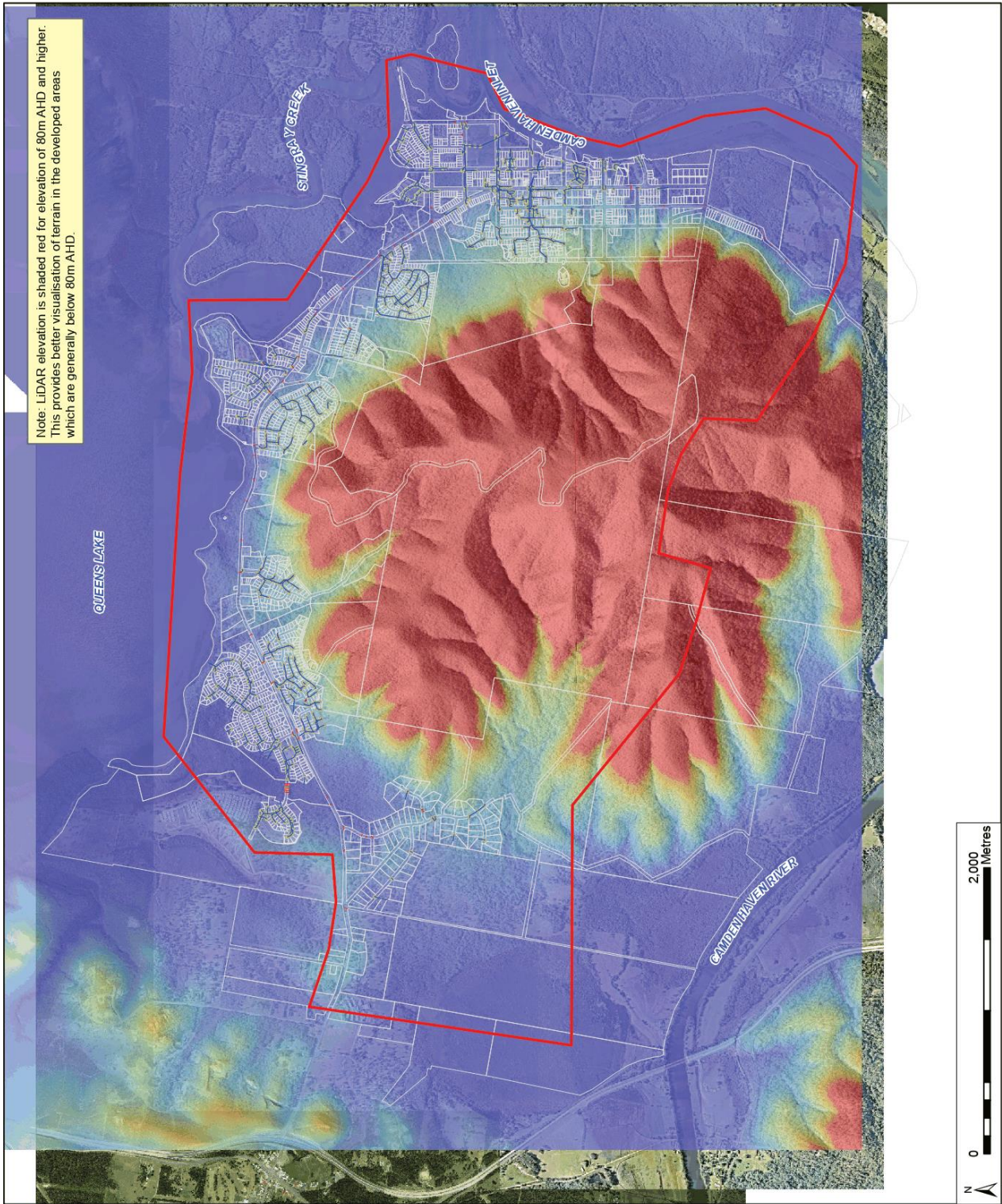
Study Area

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Terrain and Drainage
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	18/05/2018
DATE	18/05/2018

FIGURE 4-1

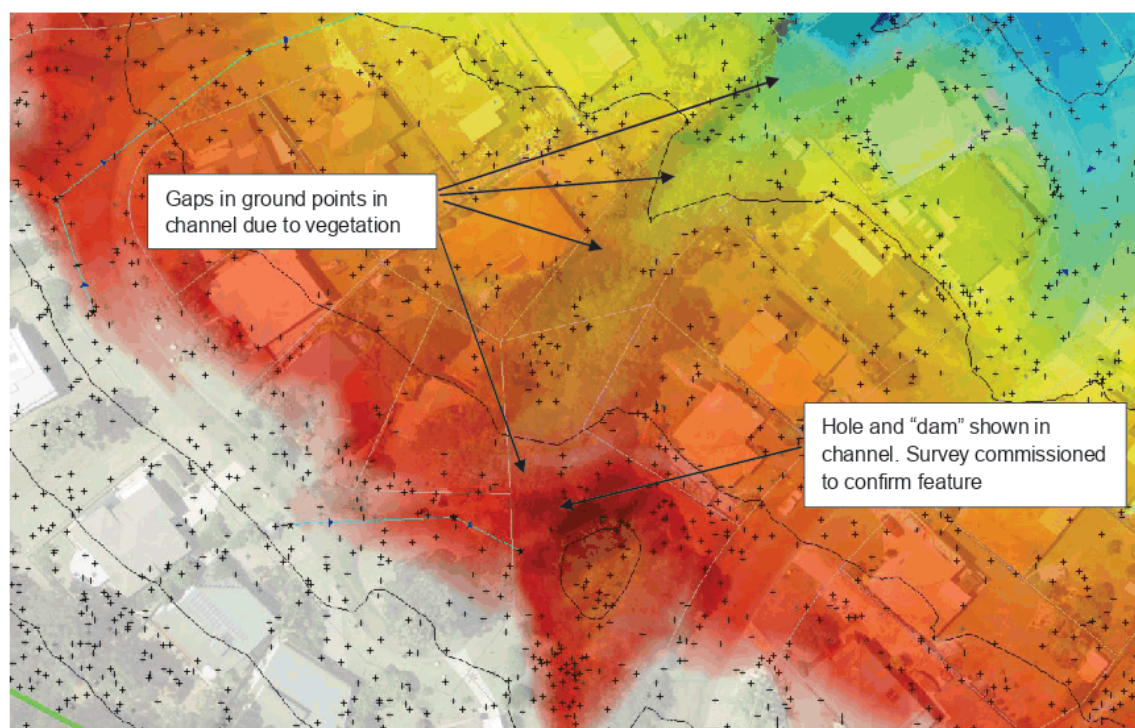


Model Calibration and Verification Report

JACOBS

The thinned ground points data set was reviewed for key drainage areas, and it was observed that in areas with a thick tree canopy or in-channel vegetation there was generally a low density of data points. This indicates that the LiDAR was only able to penetrate the tree canopy in sparsely spaced locations, and that the DEM is unlikely to accurately represent any drainage features which may be beneath the tree canopy. A similar issue is expected for channels with standing water or in-channel vegetation. Review of the DEM confirmed that some channel and drainage features are not represented in detail and do not match site observations. Examples are shown on Figure 4-2 below. Ground survey was commissioned to collect more accurate topographic information of the study area terrain and features.

Figure 4-2 Example – sparse LiDAR ground points in vegetated areas and potentially inaccurate channel definition. Kirmington Terrace – Koonwarra Street, West Haven



4.3.2 Aerial Photography

Several different aerial photograph data sets were provided by Council, the most recent and highest resolution being NearMap imagery (May 2017, 7cm resolution). This imagery covers the developed areas at base of North Brother Mountain, and is supplemented with other imagery supplied by Council (dated 2012 and 2013) to cover the entire study area and surrounds.

4.3.3 Stormwater and Drainage Infrastructure

Layers for a range of stormwater drainage assets and features have been provided by Council including pits, pipes, culverts, headwalls and water quality improvement devices. Details (dimensions and levels) are missing for a number of the drainage assets and require survey. The source and accuracy of those assets with details is not known, although it is noted that the network layout is consistent with recent subdivision road layouts (e.g. Fairwinds Avenue detention basin and Wedgetail Drive, both in Lakewood). Data entry dates are also observed to be recent (up to 2015). The locations and details of open drains and swales in the study area are not included in the spatial layers.

Model Calibration and Verification Report**4.3.4 Historical Subdivision Design**

Sub-division designs are available from Council for a number of developments in the study area as pdf files. Most are dated pre-2010 and review of the locations of these developments against recent aerial photos indicates that the majority have been constructed.

Designs for drainage features including the flow path and berms downstream of the Fairwinds Avenue detention basin are reflected in the LiDAR and stormwater spatial layers.

4.3.5 Additional GIS data

Additional GIS layers obtained include:

- ☐ Road centrelines, kerb/gutter lines, footpaths
- ☐ Cadastre
- ☐ LEP and zoning
- ☐ Land use
- ☐ Ecological features.

4.4 Recorded Data**4.4.1 Rainfall Data****4.4.1.1 Daily Rainfall**

Historic daily rainfall data was obtained from the Bureau of Meteorology's (BOM) website. Data from five sites in the vicinity of North Brother was obtained and is summarised in Table 4-1: Site locations for the selected gauges and other regional gauges are shown on Figure 4-3. It is to be noted that all five sites are located at or below RL 55m and the sites are unlikely to represent rainfall on the 490m high North Brother Mountain due to orographic effects.

The steep and smaller nature of the catchments in the study area mean that intense short duration (sub-daily) storm events or storm bursts are more likely to be critical in causing peak flooding during flash flood events. Mainstream flooding is more likely to result from multi-day duration events. Hence, the reported daily rainfall depths may not indicate the critical historic storm events which resulted in peak flash flooding. Those short (say, less than 6 hours in duration) and intense rainfall events may result in the worst flash flooding conditions but are not reflected by exceedingly high daily rainfall depths. The daily rainfall data is therefore of limited use in indicating when the worst flash flooding events occurred, although it is useful for showing general trends of when wet periods occurred, during which the critical storm events may have happened. The data is also useful for validating any recorded sub-daily rainfall data.

Model Calibration and Verification Report

JACOBS

Table 4-1 Daily Rainfall Data

Gauge Number	Gauge Name and Elevation	Distance from Study Area (km)	Start Date	End Date	Length of record (years)	Completeness (%)
060022	Laurieton (Eloura St) 12m AHD	0	1/1/1885	31/07/2017	132.7	87.0
060027	Lorne (Lorne Rd) 55m AHD	17	1/01/1938	30/06/2016	78.6	97.5
060024	Moorland (Denro-an) 5m AHD	19	1/11/1885	31/07/2017	131.8	90.3
060017	Hannam Vale (Hannam Vale Rd) 33m AHD	21	1/02/1926	31/07/2017	91.6	97.1
0600139	Port Macquarie Airport AWS 4m AHD	25	26/07/1995	17/08/2017	22.1	98.0

Figure 4-3 BOM Rainfall Gauges in Laurieton region (source: BoM website.
<http://www.bom.gov.au/climate/data/index.shtml?bookmark=136>)

Model Calibration and Verification Report



The daily rainfall data from the BOM Laurieton rainfall gauge has been analysed and summarised for the top-ranking 1-day and 2-day recorded rainfall depths in Table 4-2. Rainfall values are based on daily rainfall recorded to 9am as per BOM convention. Hence, the peak flooding may have occurred a day previous to the reported rainfall depth.

Table 4-2 Highest ranked recorded 1-day and 2-day rainfall depths at Laurieton rainfall gauge (060022).

Rank	1 day		2 day	
	Start date	Depth (mm)	Start date	Depth (mm)
1	29/04/1963	448.3	29/04/1963	462.3
2	5/01/1959	325.1	28/04/1963	448.3
3	22/1/1895	310.6	12/03/1974	389
4	20/03/1978	279.6	21/1/1895	384.8
5	28/02/1983	250	27/2/1892	377.7
6	16/3/1887	241.3	11/03/1974	368.6
7	28/03/1978	232	22/1/1895	328.4
8	6/02/2002	232	4/01/1959	325.1
9	9/11/2004	222	5/01/1959	325.1
10	6/04/1934	217.9	2/8/1899	318.7

4.4.1.2 Pluviograph data

Pluviograph data for specific historic storm events has been obtained from Council for model calibration. The historic storm events of interest were identified from the responses from the community survey. Pluviograph data is available from Council-operated sewage treatment plants (STP) and sewer pumping stations (SPS), with the closest and most relevant gauge locations to the study area including:

- ☐ Camden Haven SPS #1 (Wharf Street, Laurieton)
- ☐ Camden Haven STP (Dunbogan), and
- ☐ Kew – Kendall STP (Pacific Highway, Herons Creek).

The pluviograph stations are in the immediate vicinity (up to 3km) from the study area. Manly Hydraulics Laboratory (MHL) operates as pluviograph station at Logans Crossing, approximately 6km from the study area. This site is located further away from the study area than the Council STP gauge sites. The data from this gauge was obtained for selected storm events for comparison purposes. Refer to Figure 4-4 for locations of pluviograph stations in the vicinity of the study area.

Model Calibration and Verification Report

JACOBS

Figure 4-4 Pluviograph locations in vicinity of the study area



4.4.2 Water Level Data

Water levels are recorded by MHL at several locations in the vicinity of the study area:

- ☐ Lakewood (Queens Lake)
- ☐ West Haven (Stingray Creek)
- ☐ Laurieton (Camden Haven River).

Data from these sites will be obtained for model calibration to historic storm events.

4.5 Topographic and Hydraulic Structures Survey

Survey of drainage and topographic features and hydraulic structures was commissioned for this study and undertaken in January – February 2018. The survey data has been incorporated into the hydraulic modelling of the study area. Features surveyed included selected stormwater pits, pipes and culverts, earthen diversion drains and berms, natural channels and concrete channels. A summary map of surveyed features is provided in Appendix B

Survey of drainage and topographic features in the vicinity of Black Swan Terrace was previously undertaken and supplied by Council.

4.6 Reports and Photographs of Historic Flooding and Drainage Issues

Council provided a number of photographs and written submissions from residents reporting drainage and flooding problems during historic storm events. Dates of the reported events are listed below. The Annual Exceedance Probability (AEP) of the 2013 and 2016 storm events were estimated by Jacobs from the Council pluviograph data from Camden Haven sewer pumping station.

- ☐ 18 October 2004. 127mm recorded daily depth.
- ☐ 25 February 2008. 112mm recorded daily depth.
- ☐ 24 April 2008 (10% AEP event). 49mm in 45minutes; 65mm in 60 minutes; 136mm in 24 hours.

Model Calibration and Verification Report

- 14 June 2011. 96mm recorded 2-day depth.
- 2 March 2013 (20% AEP) 61mm in 1.5 hours; 152mm in 24 hours.
- 5 January 2016 (20 – 50% AEP) 54mm in 1.5 hours.

Rainfall data for the 2008, 2013 and 2016 events has been analysed and is plotted in Appendix A. Notable flooding reports are from locations including:

- Black Swan Terrace and Waterview Drive. Watercourse is piped through properties. The existing pipe inlet is undersized and the inlet debris screen regularly blocks. Overflows pass through residential yards, with paling fences having been washed away in previous floods.
- St Josephs's School, Laurieton. Video footage taken of significant flows along walkways between school buildings in the March 2013 event, which was a relatively frequent flood event.
- Ocean Drive. Flooding in numerous locations where a number of flow paths draining off North Brother Mountain cross this main road through the study area.
- Flooding to depths of up to 1m in low points in roads at a number of locations in the study area. This has been reported at Lilli Pilli Close, Sirius Drive, Mahogany Close and Honeysuckle Avenue, Lakewood; and Pelican Court, West Haven, among others.
- Flooding through Laurieton town centre including Bold Street, Lake Street and Tunis Street.
- Kirmington Terrace. Storm flows occurring within adjacent diversion drains further up the mountain have infiltrated into the soil and then resurfaced as groundwater "springs" in residential yards and under buildings. Note that the flood models developed in this study would not be able to represent this phenomenon as a flood flow. However, remediation measures may be suggested as a part of the study.
- Numerous photos of overland flooding were taken by Murray Dalton surveyors during the April 2008 storm, summarised in Table 4-3 below.

It is noted that the storm events resulting in the reported flooding and drainage complaints and problems have been relatively frequent and smaller magnitude events. Local flooding events of similar frequency and magnitude to planning flood events (i.e. the 1% AEP) or even moderate frequency (e.g. 5% AEP) have not been experienced in the study area in recent times.

Model Calibration and Verification Report



Table 4-3 Summary list of photographs taken during 24 April 2008 storm event by Murray Dalton Surveyors

LAURIETON LOCAL STORM EVENT
24th APRIL, 2008 @ 8 am

Photo catalogue

2008_010	Queens Lake Village – flow down pathway
2008_011	Queens Lake Village – western grated inlet pit
2008_012	Queens Lake Village – pathway flow
2008_013	Queens Lake Village – culvert flows
2008_014	Queens Lake Village – Eastern Culvert
2008_015	Mission Terrace – Gutter in front of Anglican Rectory
2008_016	Ocean Drive looking west to Flinders Drive
2008_017	Culvert east of Flinders Drive
2008_018	2 nd Culvert east of Flinders Drive
2008_019	Creek at 416 Ocean Drive, West Haven
2008_020	Ocean Drive intersection with Mission Terrace
2008_021	Mission Terrace – gutter in front of Anglican Rectory
2008_022	Ocean Drive looking at Laurieton Cemetery
2008_023	Ocean Drive looking east at Flinders Drive, Laurieton
2008_024	Flinders Drive intersection with Ocean Drive
2008_025	Culvert at St Josephs
2008_026	Western culvert above Queens Lake Village
2008_027	Woolworths culvert at Lakewood
2008_028	Sirius Drive from temporary access to Ringtail, Lakewood
2008_029	Drain above Woolworths culvert from Ringtail Access
2008_030	Drain above Woolworths culvert
2008_031	Sag pit in Ringtail Close
2008_032	Ringtail Close looking towards cul-de-sac
2008_033	Ocean Drive culverts west of Woolworths – looking east
2008_034	Creek below Fairwinds at Ocean Drive
2008_035	Creek below Fairwinds at Ocean Drive – watermain
2008_036	Flow above Amaroo detention basin – headwall blocked by ply
2008_042	Creek at 416 Ocean Drive, West Haven
2008_043	View up driveway at 414 Ocean Drive, West Haven
2008_044	Western culvert at St Josephs
2008_045	Sewer Manhole at Laurieton Caltex
2008_046	Sewer Manhole at Callex
2008_047	Rosewood Court and Mission Terrace intersection
2008_048	Rosewood Court at top of hill
2008_049	Queens Lake village drains

Model Calibration and Verification Report



Figure 4-5 Infiltrated floodwaters emanating as a "spring" from the ground in residential yard, Kirmington Terrace, June 2011.



Figure 4-6 Residents unblocking culvert inlet upstream of Black Swan Terrace properties, April 2008.



Model Calibration and Verification Report



Figure 4-7 Overland flows from creek across Ocean Drive, West Haven, April 2008



Figure 4-8 Overland flows, Ocean Drive at Flinders Drive, April 2008



North Harbour Local Government Flood Study

22

Model Calibration and Verification Report**4.7 Floor Level Survey**

Floor level survey is currently not available for residential and commercial buildings in the study area. These data are required for the flood damages assessment to be undertaken during this study, and will be collected for selected properties based on their flood affectation and historic flooding.

4.8 Community Consultation**4.8.1 Initial Consultation**

Community consultation has been undertaken throughout this study, including distribution of newsletters and media releases and the hosting of a website on Council's webpage to announce the commencement and provide background on the study.

4.8.2 Community Survey

A community survey was mailed out to residents with the study newsletter asking residents for information on previous flooding events that they experienced in the study area, refer to Appendix B for the survey. A total of 302 responses were received. The responses assisted the project team in identifying the most significant flooding events in recent history which would be suitable for model calibration and verification. Observations including noted flood depths, flow patterns and durations of flooding were reported. Residents also submitted photographs and videos of flooding during the events.

The survey identified numerous flooding events over the past 20 years with no particular standout events. The March 2013 event was reported in six responses, while the April 2008 event, which resulted in the most intense rainfall for the storm event data available, was reported two times. The February 2002 event was reported four times, however, sub-daily rainfall data is not available for that event.

Model Calibration and Verification Report



5. Hydrologic Modelling

5.1 Modelling Approach

A hydrologic model is required to estimate storm and flood flows for the study area for the historic and design rainfall storm events. The terrain of the study area is such that:

- There are numerous natural watercourses and gullies which flow down the face of North Brother Mountain and then through the developed areas of the study area.
- On the flatter areas at and below the foot of the mountain and away from the watercourses, drainage paths are often less defined, with more dispersed overland flows affecting existing development.

The hydrologic modelling adopted involved lumped catchment modelling approach for the watercourses draining off the mountain, and a direct rainfall approach for the more dispersed overland flow catchment areas at the foot of the mountain. The lumped catchment modelling estimates inflow hydrographs (flow versus time) which are input into the hydraulic model in the watercourses. The direct rainfall approach inputs rainfall versus time data onto the modelled catchment surface in the hydraulic model itself, which then generates estimated flows internally in the model. This report section describes the lumped hydrologic modelling. Refer to Section 6.3.2 for further discussion.

The lumped hydrologic modelling has been undertaken using the RAFTS hydrology module in the DRAINS modelling software. The RAFTS module is suitable for assessment of sub-catchments with areas up to 100 hectares and permits routing of runoff through the catchment. The DRAINS software is one of the few modelling packages that currently incorporate Australian Rainfall and Runoff 2016 (ARR 2016) design rainfalls and procedures.

5.2 Sub-Catchment Data

The catchment areas on North Brother Mountain are divided into 56 sub-catchments which drain to the gullies and watercourses running off the mountain through the study area. Mapping of the sub-catchment boundaries is shown on **Figure 5-1**. These sub-catchments are natural vegetated areas and a nominal impervious fraction of 5% is assumed.

Sub-catchment flow path slopes are steep to very steep, with catchment flow path slopes ranging from 15 – 70%. DRAINS/RAFTS and most other hydrologic models have an upper limited slope parameter value of 30%, and this is adopted for the sub-catchments with slopes exceeding this value. It is likely that that catchment slopes steeper than 30% may result in faster catchment flow travel times producing higher peak flows. However, limited information is available rainfall runoff generation from very steep catchments.

A PERN catchment roughness value of 0.1 was adopted for the forested sub-catchment areas.

Legend

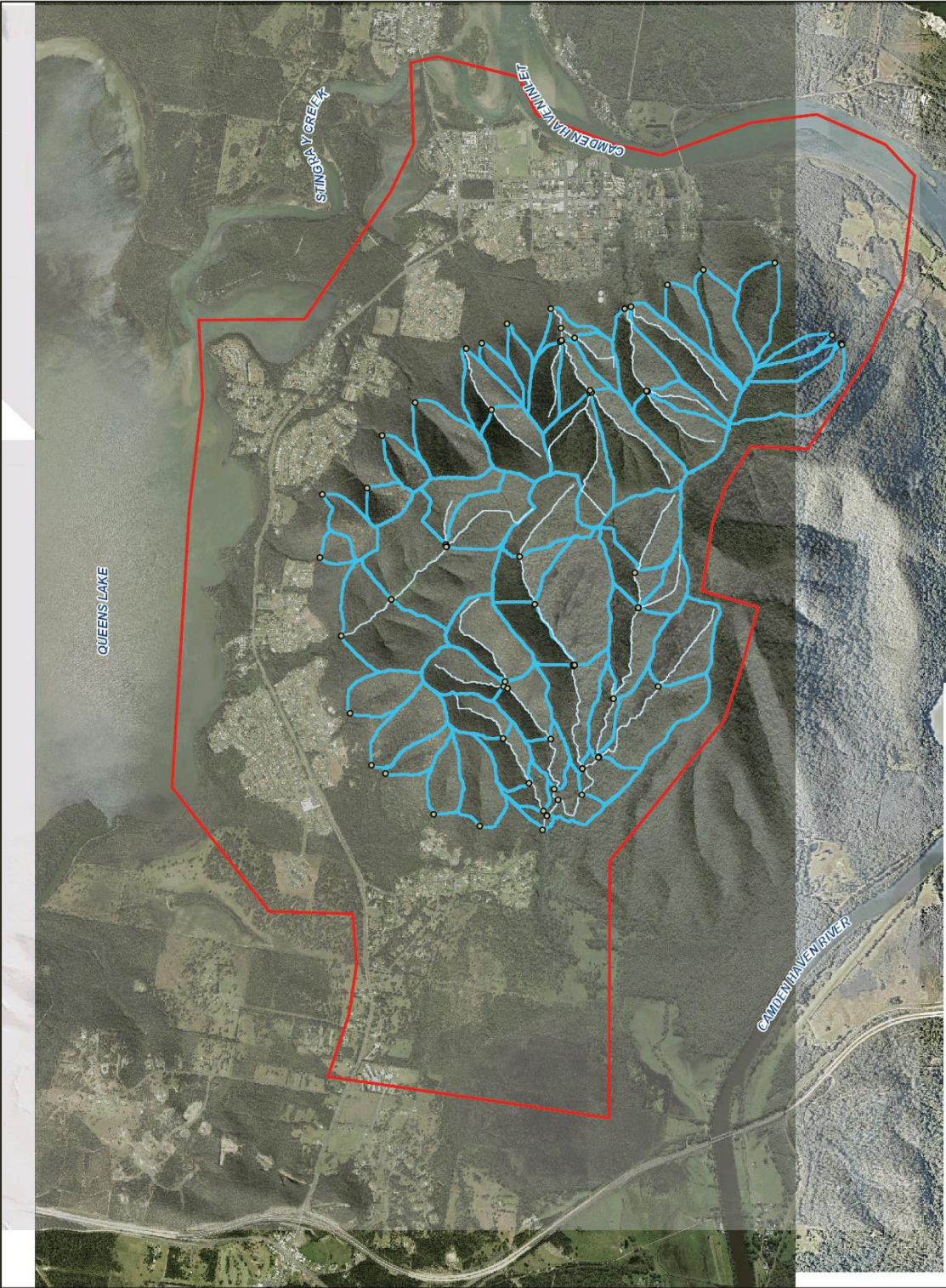
- Study Area
- Sub-Catchment Areas
- Drainage Links
- Sub-Catchment Outlets

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Hydrologic Model Sub-Catchments
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	IA 17260
DATE	18/05/2018

FIGURE 5-1



Model Calibration and Verification Report



5.3 Hydrologic Parameters

5.3.1 Rainfall Losses

An initial and continuing loss model is utilised in the RAFTS module which represents rainfall losses during storm events such as depression storage and soil infiltration. The following loss values are proposed for the design event runs:

- Pervious areas: Initial loss 15mm, continuing loss 2.5mm/hr
- Impervious areas: Initial loss 1mm, continuing loss 0mm/hr.

Soil characteristics on the mountain are observed and reported to be very impermeable, and lower rainfall losses could normally be considered for such soils. Due to the steepness of the catchment areas and limited slope parameter values in the modelling these moderately low rainfall losses were retained.

Rainfall losses adopted for the calibration events are discussed in Section 7.3.1.

5.3.2 Storage Routing Factor

RAFTS includes the "Bx" storage routing factor which can be adjusted to change the runoff response of the catchment. With a default value of 1.0, the factor can be reduced to increase the runoff response, resulting in a more peaky flood. It is usually adjusted when there is sufficient data, such as flow gauging, to validate the adjustments.

Reducing the Bx value was considered to account for the very steep slopes on North Brother Mountain and the limited slope parameter value of 30% in the hydrologic modelling. However as there is no flow gauging for the mountain an adjustment of the Bx factor could not be justified for this study. Sensitivity runs also indicated minimal increases in peak flows for sample sub-catchments for Bx values of down to 0.2, which is not considered to be a reasonable adjusted value for this parameter. Modest increases in peak flows were observed for a Bx value of 0.1, but this is also considered a highly unreasonable value.

Model Calibration and Verification Report



6. Hydraulic Modelling

6.1 Model Selection

A TUFLOW combined one-dimensional (1D) and two-dimensional (2D) hydrodynamic model has been developed for this study. TUFLOW is an industry-standard flood modelling platform, which was selected for this assessment as it has:

- Capability in representing complex flow patterns on the floodplain, including flows through street networks and around buildings.
- Capability in representing the stormwater drainage network, including pit inlet capacities and interflows between the network and floodplain including system surcharges.
- Capability in accurately modelling flow behaviour in 1D channel, bridge and culvert structures and interflows with adjacent 2D floodplain areas.
- Easy interfacing with GIS and capability to present the flood behaviour in easy-to-understand visual outputs.

The model was developed and run in TUFLOW 2018-03-AA-IDP-w64, in the Heavily Parallelised Compute (HPC) module. The HPC module was preferred over TUFLOW "Classic" as it permits significantly faster run times, which are required for this relatively large model extent and with direct rainfall being applied.

6.2 Configuration of Hydraulic Model

6.2.1 Extent and Structure

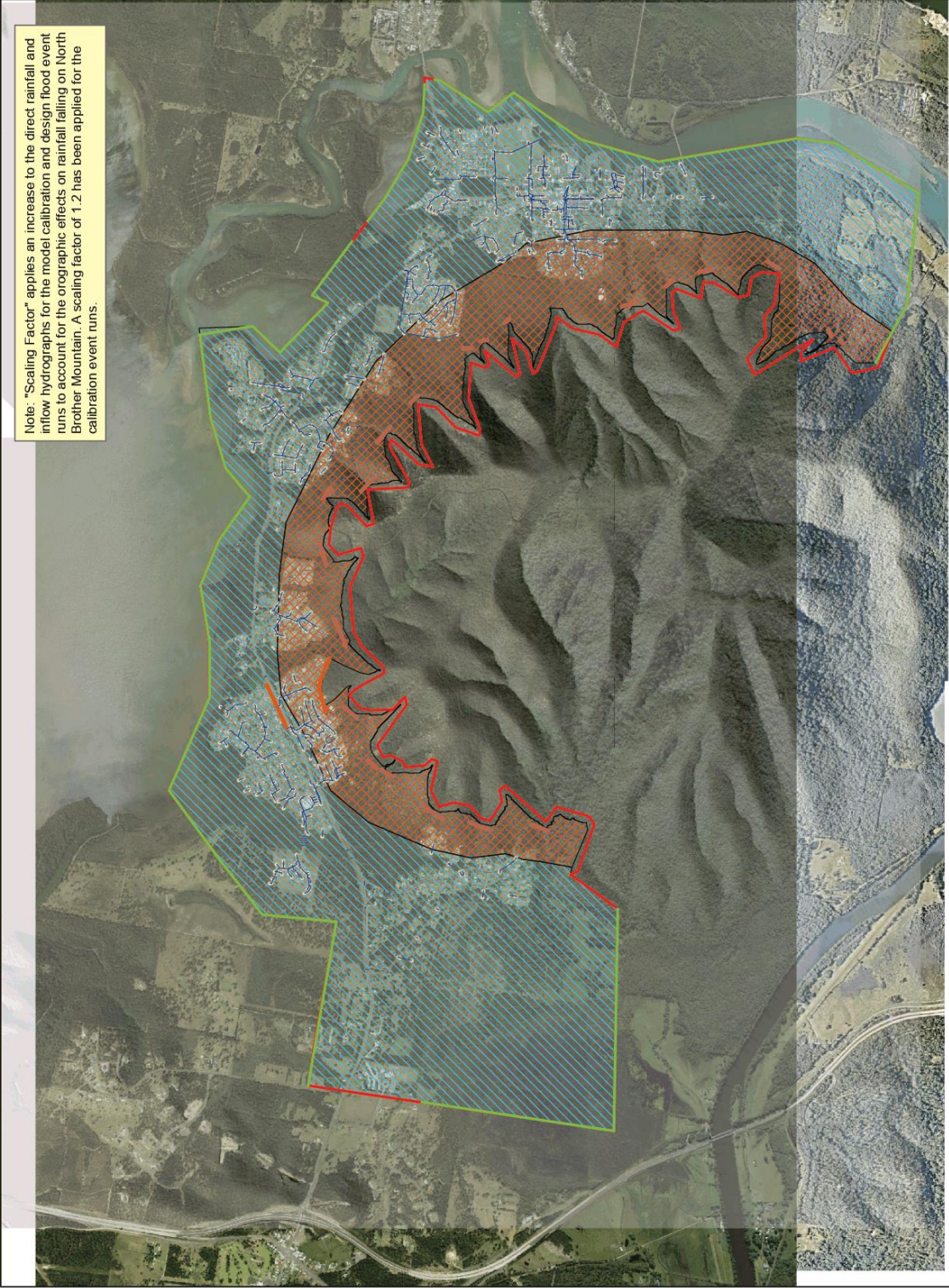
The TUFLOW model is comprised of:

- A 2D domain of the study area surface reflecting the catchment topography, with varying roughness as dictated by land use. The watercourses are in general modelled in 2D. Diversion drains are in 2D.
- A 1D network of pits, pipes and culverts representing the stormwater network. The pits have a defined inflow capacity as dictated by their type and size.
- Obstructions to flow are represented as 2D objects, including existing buildings.

The model extent covers an area of 12.6km² and includes the foot of North Brother Mountain along its western, northern and eastern sides and the adjacent developed lower-lying areas down to the receiving waters at Camden Haven River, Queens Lake and Stingray Creek. Refer to the following report sections for details on these features. The model domain and locations of various features in the TUFLOW model are shown on Figure 6-1.

- Legend**
- 1D Pipes and Culverts
 - 1D Pit
 - 1D Channel
 - Tailwater Boundary
 - Inflow Hydrograph from DRAINS (Scaling Factor Applied)
 - Direct Rainfall**
 - No Scaling Factor
 - Scaling Factor Applied
 - TUFLOW Extent

Note: "Scaling Factor" applies an increase to the direct rainfall and inflow hydrographs for the model calibration and design flood event runs to account for the orographic effects on rainfall falling on North Brother Mountain. A scaling factor of 1.2 has been applied for the calibration event runs.



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	TUFLOW Model Configuration
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
DATE	25/09/2018
	FIGURE 6-1

Model Calibration and Verification Report**6.2.2 Model Topography**

The topography of the catchment is represented in the model using a 2m grid. This level of precision in the grid is considered necessary in order to represent detailed flood behaviour in a fully developed catchment. Finer model grid sizes such as 1m grid are not considered practical given the large size and expected excessively long computing times. The basis of the topographic grid used in the TUFLOW model is the LiDAR data set in addition to ground survey.

6.2.3 Stormwater Pits

The stormwater pits provide a dynamic linkage between the underground drainage network and the 2D TUFLOW model domain, representing the floodplain. Water is able to flow between the drainage network and floodplain, depending on the hydraulic conditions.

The location of the stormwater pits and associated attributes were available from Council in GIS format. Pit inflow relationships were defined in terms of flow depths versus pit inflow.

TUFLOW automatically calculates hydraulic energy losses in the pits based on the alignment of pipes connected to each pit and the flows in each pipe. The calculations are based on the Engelund manhole loss approach (*TUFLOW User Manual*, BMT WBM, 2017).

6.2.4 Stormwater Conduits

Stormwater pits and pipes identified in Council's data base and from survey are also modelled in the TUFLOW models. Several pipes down to a diameter of 225mm are represented but are typically larger than 300mm. The conduits are represented as circular pipes or rectangular culverts with dimensions matching those adopted in the DRAINS models.

6.2.5 Building Polygons

This study considers buildings as solid objects in the floodplain. This means that buildings form impermeable boundaries within the model, and while water can flow around buildings, it cannot flow across their footprint. The building footprints in the TUFLOW model were digitised based on the 2017 aerial imagery. The building polygons were superimposed on the model grid to make model computational cells under the footprints inactive.

6.2.6 Surface Hydraulic Roughness

All parts of the study area within the TUFLOW model were assigned hydraulic roughness values in a "materials layer" according to the LEP zoning and ground cover. These are based on engineering experience and typical values used in previous flood studies undertaken in the Sydney Region by Jacobs and other consultants. A moderately high Manning's n value of 0.05 for the residential land use accounts for expected obstructions such as minor features (steps, planter boxes etc.) and landscaping, which are typically not detected by LiDAR survey. The adopted Manning's n values are mapped on and summarised in Table 6-1.

Legend

MATERIAL

- Commercial
- Residential
- Public Recreation
- Rural
- Special Use
- Waterways 1
- Waterways 2
- Forest and Vegetated
- Grass
- Road
- Fire Trail
- Paved Areas
- Diversion Drain
- Diversion Drain, Blocked
- Fence on Main Flow Path
- TUFLOW Extent

GDA 1994 MGA Zone 56

Scale: A3

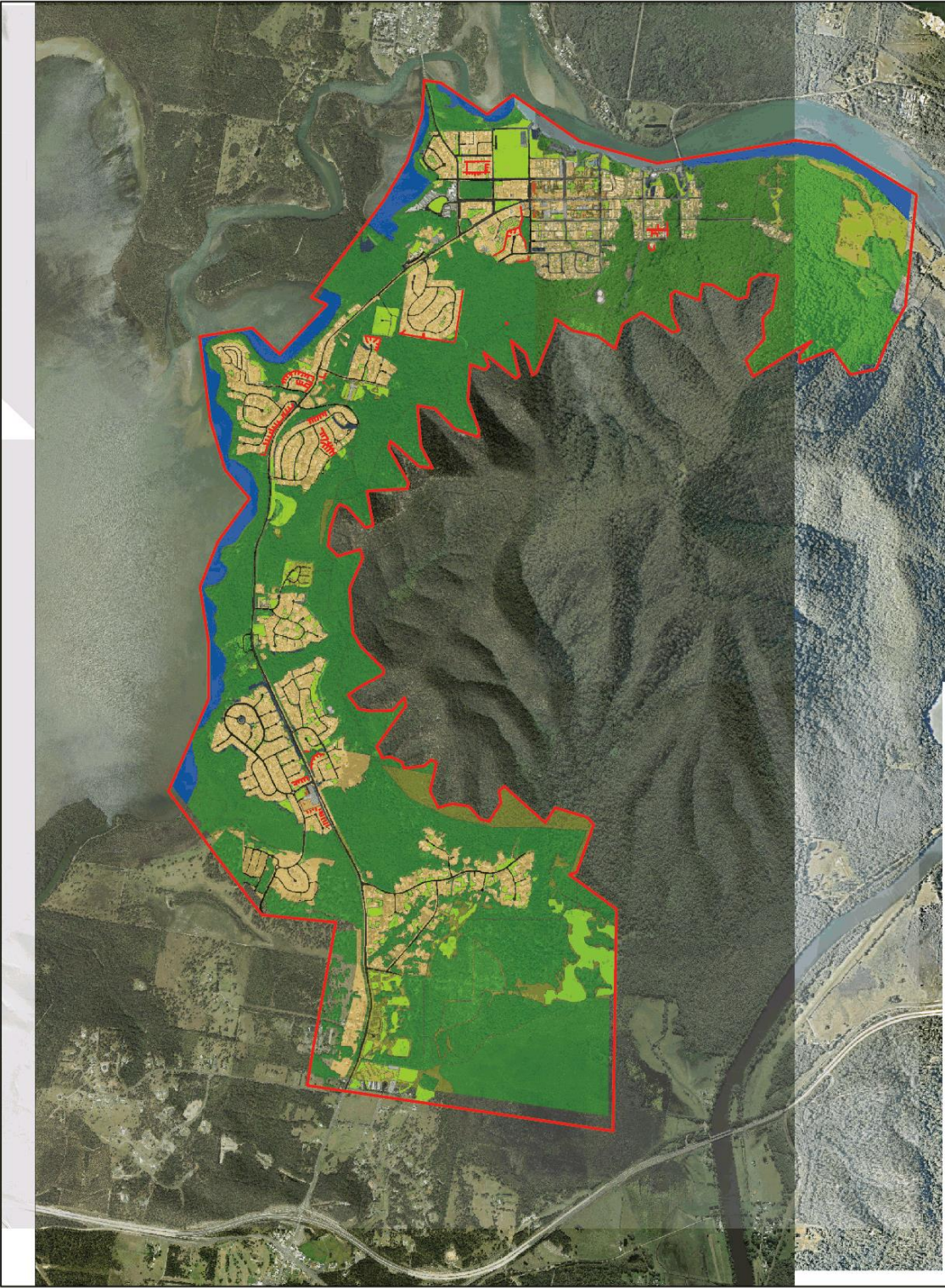
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

JACOBS

TITLE TUFLOW Materials

PROJECT North Brother Local Catchments Flood Study

PROJECT #
DATE 18/05/2018
FIGURE 6-2



Model Calibration and Verification Report



Table 6-1 TUFLOW Model Grid Hydraulic Roughness Values

Land Use Type/Material	Manning's n	Comment
Commercial	0.035	Zoning B2, B4
Residential	0.05	Zoning R1, R2, including schools
Public Recreation	0.1	Zoning RE1
Rural	0.035	Zoning RU1
Special Use	0.05	Zoning SP2. Cemetery, water supply
Waterways 1	0.05	Zoning W1
Waterways 2	0.035	Zoning W2
Forest and vegetated areas	0.1	Zoning E1, E2, E3 and E4 and other vegetated areas
Road	0.025	Where present, overwrites land use zoning areas listed above
Paved areas	0.02	Where present, overwrites land use zoning areas listed above
Fire Trail	0.035	Where present, overwrites land use zoning areas listed above
Diversion drain	0.04	Diversion drain, maintained, clear
Diversion drain with blockages	0.20	Unmaintained, heavy vegetation and fallen trees etc. Prone to further blockages from flood-borne debris
Property fence lines	0.30	Paling and Colourbond fences which are initially solid but prone to failure and flow-through

6.2.7 Property Fence Lines

Fence lines have typically not been explicitly represented in the model and floodwaters are allowed to flow across them freely. Although fences may obstruct overland flood flows in some parts of the catchment, experience indicates that representing fences in the hydraulic model requires making unvalidated assumptions about depths at which fences overflow or fail.

The potential obstruction to flow caused by fences was represented in the model by increasing the cell roughness (Manning's n values) along selected property fence lines on and adjacent to main flow paths to a value of $n = 0.3$. This approach provides some resistance to flows against and along a fence, although it probably does not represent the full obstructing effect of a fence before it fails under the force of flood flows. There are other approaches which can represent a fence as a solid obstruction which dynamically fails in the model once flow depths become great, but this approach is somewhat impractical to implement on a catchment scale, requiring significant effort and detail. The adopted approach was considered a more practical means of representing the hydraulic effects on flood flows. The modelled fence lines are shown on .

6.3 Boundary Conditions and Tailwater Conditions

6.3.1 Model Inflows

The inflow hydrographs from the DRAINS/RAFTS model are input into the watercourses and gullies upstream of the developed areas of the study area. The inflow boundaries are shown on Figure 6-1.

6.3.2 Direct Rainfall

A rainfall hyetograph (rainfall depth per time interval) is directly input into the TUFLOW model in the areas where direct rainfall applies. Similarly to the catchment hydrologic modelling discussed in Section 5.3.1, rainfall losses are applied in the conversion of direct rainfall to runoff in the TUFLOW model. The rainfall losses proposed for design flood estimation are:

Model Calibration and Verification Report

- ☐ Pervious areas: Initial loss 15mm, continuing loss 2.5mm/hr
- ☐ Impervious areas: Initial loss 1mm, continuing loss 0mm/hr.

Most impervious areas in the study area are explicitly represented including road areas, roof areas and other large paved areas. The remaining developed areas for which impervious areas have not been digitised are assumed to be 20% impervious to account for driveways and other small paved areas, and the rainfall losses have been accordingly reduced to account for this partial imperviousness.

As discussed in Section 6.2.5, the model cells covering building footprints are made inactive. The rainfall falling on the roof areas of these buildings is therefore applied to the area immediately surrounding each building. Roofs are considered to be impervious areas with the corresponding rainfall losses applied.

Areas where direct rainfall is applied are shown on Figure 6-1. The areas where direct rainfall is scaled up for orographic effects (refer Section 7.3.2 for discussion) are also indicated.

6.3.3 Tailwater Boundaries

Tailwater boundaries are located along the shoreline on the receiving waterways including Camden Haven River, Stingray Creek, Queens Lake and Watsons Taylor Lake. Refer to the discussion in the subsequent model calibration section and the design event modelling section for details on the adopted tailwater levels.

Model Calibration and Verification Report



7. Model Calibration and Verification

7.1 Overview

Rigorous model calibration of overland flood models cannot generally be carried out because direct measurements of overland flows and accurate measurements of flood levels are usually not available. Localised features may also be present which influence flow patterns but are not detected in the catchment-scale topographic data. Hence, overland flood models are often verified using observations of flood depths and flood behaviour as a way of "sanity-checking" the modelling and confirming its reliability.

This study has relied mainly on observed depths of flooding during past flood events given by local residents. This anecdotal information is generally considered indicative as often only the general location of the observation is usually given, and approximate depths of flooding. The reported flood observations are also from numerous separate storm events, while the model calibration focusses on only two events selected based on availability and quality of data. However, the reported flood depths are still useful information for validating the general behaviour of flooding simulated by the flood models.

Photographs and video of flooding have also been provided which offer more detailed information of the flooding behaviour at specific locations. Consideration is needed on whether the photos were taken at the peak of the flooding.

The general approach involved running the hydrologic and hydraulic models and comparing the flood depths and flow patterns to reported observations. The model configuration and parameter values were adjusted as necessary with the aim of achieving a satisfactory fit to the observations.

7.2 Selection of Verification Events

Flooding was reported for numerous individual storm events occurring over the last 20 years from the community survey responses. Two historic storm events were selected for model calibration and verification based on the number of responses for each event and the magnitude of the storm event. These events included:

- 24 April 2008. The most intense rainfall recorded based on the available data. Significant number of photographs are available with Council for this event.
- 2 March 2013. This is a relatively intense storm with the majority number of survey responses.

Characteristics of the selected storm events are provided in Table 7-1. The cumulative rainfall depths are plotted in Appendix A. A comparison of the recorded rainfall against the design IFD is also shown in Appendix A. Although the April 2008 storm event resulted in a lower daily rainfall depth than the March 2013 event, it produced a significantly more intense burst of rainfall over a period of one hour. Given the nature the flash flooding catchments in the study area these short duration bursts are the critical events for peak flooding. Hence, the April 2008 storm is considered to be a rarer and greater magnitude event than the March 2013 event, based on rainfall records.

Table 7-1 Calibration storm event characteristics

Event Date	Daily Rainfall Depth	Main Storm Burst Rainfall Depth and Duration	Approximate Event AEP	Comment
24 April 2008	136mm	49mm in 45 mins 65mm in 60 mins	10% AEP	Rainfall data available from Camden Haven SPS (Laurieton)
2 March 2013	152mm	43mm in 60 mins 61mm in 1.5 hrs	20% AEP	Rainfall available from Camden Haven STP (Dunbogan)

Model Calibration and Verification Report



Note that several storm events in circa 2000 and 2002 were reported by long-term residents as being the most severe that they have experienced. However, suitable rainfall data for the model calibration were not available for these earlier storm events and hence these were not selected for the model calibration and verification.

7.3 Adopted Parameter Values for Model Verification

7.3.1 Rainfall Losses

Rainfall losses reflect the ability for the catchment to absorb some rainfall during a storm event due to capture on vegetation and trapped low points and from infiltration into the soil. The magnitude of the rainfall losses depends largely on how wet the catchment is due to preceding rainfall and the soil types in the catchment, with sandy soils generally being more permeable and hence water can infiltrate into the soil column at faster rates.

The assumed rainfall loss parameter values are selected based on a review of daily rainfall records and initial runs of the modelling for the calibration events. Both the April 2008 and the March 2013 storm events occurred after significant preceding rainfall:

- Approximately 200mm of rainfall fell in the week before the 24 April 2008 flood event.
- Over 280mm of rainfall fell in approximately the two weeks before the 2 March 2013 flood (from 17 – 27 February) followed by an additional 39mm on 28 February and 1 March, prior to the main flood event on 2 March.

Hence it is highly likely that the catchment was saturated prior to the two calibration storm events with little to no capacity to absorb further rainfall. The following rainfall loss values are therefore adopted for the model calibration and verification:

- Pervious areas: Initial loss 0mm, continuing loss 2.5mm/hr
- Impervious areas: Initial loss 0mm, continuing loss 0mm/hr.

Higher initial losses were initially tested in the hydrologic and hydraulic modelling. However, sufficiently high rates and volumes of runoff could not be produced to achieve a good match to the reported flooding at several locations. Other hydrologic factors such as the methods for representing the high catchment slopes and runoff, blockages, drainage patterns etc. were also considered and trialled but did not produce reasonable matches for observed flood behaviour, and hence were discounted from the model calibration process and informed the selection of the assumed rainfall losses.

7.3.2 Orographic Rainfall Scaling

North Brother Mountain, being a significant topographic feature of over 450m elevation and with steep slopes, has the potential to result in orographic enhancement of rainfall during storm events as the wind flow carrying rain-bearing clouds rises over the mountain and results in increased precipitation. Hence, rainfall intensities on the mountain, away from the rainfall gauge locations, may be higher than those at the gauge locations situated on lower areas at some distance away from the mountain.

BMT WBM (2018) has undertaken the Coffs Creek and Park Beach Flood Study at Coffs Harbour, where the catchment is bounded by a steep escarpment along its western and north-western sides to elevations over 400m. As a part of the model calibration for that study rainfall data from numerous rain gauges in the catchment were analysed for the March/April 2009 flood event, and a marked rainfall gradient was observed between the coastal part of the catchment and the middle and upper sections of the catchment. Rainfall depths recorded for the 24 hours to 9am on 1 April 2009 ranged from 260 – 280mm in the coastal areas, up to 530mm at gauges in the upper section of the catchment, with maximum estimated rainfall depths in this zone of up to 560mm (or double the rainfall recorded in the coastal areas). Analysis of the November 1996 storm event observed rainfall depths 2.5 times higher in the upper section compared to the coastal zone.

As a result of the rainfall analyses and model calibration in the Coffs Creek study, BMT WBM (2018) adopted scaling factors of 1.2 to 1.6 for the design flood estimation in that study, whereby the design rainfall intensities adopted for the coastal areas were increased by 1.2 to 1.6 times for application on the escarpment areas and

Model Calibration and Verification Report



foothills of the catchment. The study cited that the previous Coffs Creek Flood Study (WMA, 2001) adopted significantly higher scaling factors of up to 2.25, depending on the ground elevation of a particular location.

The topography for North Brother Mountain differs from Coffs Creek catchment, in that the Coffs Creek catchment is an incised valley which would funnel wind flows up the valley, concentrating the rain clouds. The same funnelling effect is unlikely to occur at North Brother Mountain due to its shape as a peak protruding from the surrounding coastal plain rather than a valley feature. To account for the orographic effects in the study area and to provide a better calibration fit the catchment inflows from North Brother Mountain and the rainfall on the foothills of the mountain were increased by 20% (i.e. an orographic scaling factor of 1.2), based on the recorded rainfall and design rainfall being derived for the coastal plains area. Accordingly, rainfall on the low areas below the foot of the mountain was not adjusted from the recorded depths.

As per the selection of rainfall losses, other model parameters and assumptions were initially tested and analysed in the calibration process but could not replicate the observed flooding depths and flow patterns, as the model is generally less sensitive to these other parameters. Hence these preliminary runs informed the scaling of rainfall for the model calibration. There is some uncertainty about the actual increased rainfall depths and spatial distribution of the increases during the historic events since there are no rainfall gauges on North Brother Mountain, however, a uniform scaling factor of 1.2 appeared to provide the best fit to observed flooding across the study area for the calibration events. A higher scaling factor could be considered appropriate for the design event runs.

7.3.3 Blockage of Hydraulic Structures

Guidance on blockage of hydraulic structures has generally been sought from *Australian Rainfall and Runoff Revision Project 11– Blockage of Hydraulic Structures Stage 2* (Engineers Australia, 2013).

Culverts were generally assumed to be 50% blocked for the model calibration events. There are photos and observations during historic flood events of large gravel and rocks being washed down the watercourses and deposited in drainage lines, and recurring blockage due to debris. Blockages at a few specific structures were reduced or increased to provide a better calibration fit.

Assumed blockage of stormwater pit inlets are generally consistent with guidance in ARR 2016. The large majority of pits in the study area are observed to be combination kerb inlet and grated pits. The assumed blockages are:

- ☐ Sag pits: kerb inlet assumed clear and grate 100% blocked.
- ☐ On-grade pits: 90% of the combined kerb inlet and grate flow capacity (i.e. 10% blockage factor).

7.3.4 Blockages in Flow Diversion Drains

Several respondents reported and provided photographs of overgrown vegetation and fallen trees in adjacent flow diversion drains at the foot of the mountain contributing to the drains overflowing and causing flooding of properties and dwellings. Observations on site also indicated localised build-up of rock rubble and tree trunks in the larger drains and watercourses. Blockages of these drains are represented in the model to replicate these flooding patterns.

7.3.5 Tailwater Conditions

Recorded water level hydrographs for the receiving waterways are adopted as tailwater boundaries for the calibration events.

7.4 Comparison to Observed Flooding

The community survey responses were reviewed for observations of flooding behaviour including dates of storm events, depths of flooding, flow patterns and resulting damage to property. Photos and videos provided with the responses or separately were also reviewed. Notes from Council on flooding problem spots were also considered.

Model Calibration and Verification Report**JACOBS**

The modelled flood behaviour was compared to the residents' observations and were generally found to be consistent with the observations. Refer to Table C-1 in Appendix D for comparison of modelled flood behaviour to the reported observations. Mapping of flood depths for the historic events is also shown in Appendix D.

The modelling generally produced reasonable matches to the observed flood behaviour along main flow paths and ponding/storage areas. Areas affected by shallow sheet overland flows were more difficult to replicate observations during previous storms, as such shallow flows are more sensitive to small-scale ground and built features which could not be picked up in the topographic model on a catchment-wide scale. The main flow paths and storage areas are the focus of the flood study as this is where flood risk and hazards are greatest.

There are some locations where a good match could not be achieved and this may be attributed to localised factors which may have occurred such as blockages of drains and drainage infrastructure by debris and sediment but which were omitted from the modelling if there were no specific reports of blockages. Information was sought whether any maintenance or upgrade works were conducted on the flow diversion drains uphill of the residential properties at the foot of the mountain which may have altered flow capacities and behaviour. Drains may have been cleared in recent times and reflected in survey of the drains, but may have been blocked by debris and vegetation at the time of historic flood events. However, Council and National Parks and Wildlife Service (NPWS) stated they did not undertake works in recent years. Council advised that Crown Lands Department may have undertaken works but no specific information was available.

There is also some uncertainty in the exact rainfall which fell on the mountain catchments as the orographic effects are likely to have caused localised and non-uniform enhancement of rainfall. While the rainfall data is sourced from gauges which are in or relatively close to the study area, these are located relatively at lower elevations in or to the east of the study area and may have varied from rainfall in the west of the study area or on the mountain.

Overall, the TUFLOW model provides a reasonable match to the observed flood behaviour in the historic events and is therefore considered to be suitable for the estimation of design flood behaviour in the study area.

7.5 Sensitivity Testing of Calibration Parameters

A number of scenarios have been assessed for the April 2008 flood event to test the sensitivity of the model results to changes in the adopted parameter values. The tested parameters include:

- ☐ Rainfall and flow Scaling
- ☐ Rainfall losses
- ☐ Blockage of hydraulic structures
- ☐ Surface hydraulic roughness

The scenarios are described and the impacts summarised in Table 7-2. Flood levels and depths are relatively sensitive in particular to the changes in rainfall scaling (both increase and decrease) with changes of +/- 200mm, and to blockages (both fully open and fully blocked) with changes of up to +/- 700mm, mainly upstream and downstream of culvert structures. The flood levels are also moderately sensitive to the assumed changes in Manning's n on the main flow paths, which are assumed to be of high roughness in forested areas, with resulting changes in flood levels of +/- 150mm. Flood levels are typically insensitive to changes in rainfall losses (+/- 30mm), although flooding in selected storage areas are more sensitive to the increased rainfall losses (-280mm) than to the decreased losses (+80mm).

Model Calibration and Verification Report



Table 7-2 Sensitivity Analysis Description and Results

Scenario	Description	Change in Flood Level
Rainfall and Flow Scaling – Zero	Scaling factor of 1.0. (Base case adopts scaling factor of 1.2)	<input type="checkbox"/> Up to -150mm on major flow paths <input type="checkbox"/> Typically less than -50mm on other flow paths.
Rainfall and Flow Scaling – Increase by 20% points	Scaling factor of 1.4. (Base case adopts scaling factor of 1.2)	<input type="checkbox"/> Up to +150mm on major flow paths (east of Ellerslie Cres and south of Brotherglen Dr) <input type="checkbox"/> Typically less than +50mm on other flow paths. <input type="checkbox"/> +100mm to +200mm in some storage areas (between Botanic Dr and Ocean Dr, Lakewood shops car park, car park west of Laurieton Hotel) and isolated areas on some properties.
Rainfall Losses – Increase	Pervious area: 15mm initial loss (burst loss: define burst as starting at 7AM 24 April 2008. Peak intensity at 8:35AM), 4mm/hr continuing loss. Impervious area: 2mm initial loss, 0mm/hr continuing loss.	<input type="checkbox"/> Typically less than -30mm in most flow paths and overland flow areas. <input type="checkbox"/> Up to -280mm in storage area between Botanic Dr and Ocean Dr.
Rainfall Losses – Decrease	Pervious area: 0mm initial loss, 0mm/hr continuing loss. Impervious area: retain calibration values (0mm initial loss, 0mm/hr continuing loss.)	<input type="checkbox"/> Typically less than +20mm in most flow paths and overland flow areas. <input type="checkbox"/> Up to +80mm in storage area between Botanic Dr and Ocean Dr.
Blockage of Hydraulic Structures – Fully Blocked	All pipes, culverts and pits 100% blocked.	<input type="checkbox"/> Typically +150mm to +300mm in main road low points and storage areas (between Botanic Dr and Ocean Dr; Sirius Dr, Pelican Crt, and others) <input type="checkbox"/> Up to +400mm in Lakewood shops car park, car park west of Laurieton Hotel. <input type="checkbox"/> Decreases of -100mm in some locations downstream of the storage areas <input type="checkbox"/> Typically less than +/-50mm on other flow paths.

Model Results and Sensitivity Analysis Report

Model Calibration and Verification Report



Blockage of Hydraulic Structures – All Clear	All pipes, culverts and pits 0% blocked.	<input type="checkbox"/> Typically less than +/-100mm in affected areas. <input type="checkbox"/> Localised reductions of up to -700mm upstream of culverts. <input type="checkbox"/> Localised increases of up to +300mm downstream of culverts including on properties in Pelican Crt.
Surface Hydraulic Roughness – Plus 20%	Surface Manning's n values increased by 20%.	<input type="checkbox"/> Up to +150mm on major flow paths (east of Ellerslie Cres and south of Brotherglen Dr) <input type="checkbox"/> Typically less than +50mm on other flow paths. <input type="checkbox"/> Less than +/-20mm in other overland flow areas.
Surface Hydraulic Roughness – Minus 20%	Surface Manning's n values decreased by 20%.	<input type="checkbox"/> Up to +50mm on major flow paths (east of Ellerslie Cres and south of Brotherglen Dr) <input type="checkbox"/> Typically less than -30mm on other flow paths and overland flow areas.

Model Calibration and Verification Report



8. Conclusions and Recommendations

Hydrologic and hydraulic models for the North Brother Local Catchments study area have been developed based on available data from Council and other sources, and topographic and hydraulic structures survey collected during this study. The models have been developed with a focus on local catchment and overland flooding originating from runoff from North Brother Mountain and from within the study area itself. The modelling does not focus on mainstream flooding from the Camden Haven River and other waterways.

The models have been calibrated to the April 2008 and March 2013 local catchment flood events based on responses to the community consultation survey and other reports and flooding complaints lodged with Council. Model parameters adjusted to achieve a satisfactory fit to historic flood observations include rainfall losses, hydraulic roughness of the floodplain surface and blockages of hydraulic structures and of diversion drains. An orographic scaling factor of 1.2 has been adopted to increase rainfall and catchment flows by 20% to achieve a satisfactory calibration. This factor accounts for increased rainfall intensities during storm events due to the orographic effects resulting from the North Brother Mountain topography, and is relative to the unscaled recorded rainfall from gauges on the coastal plain away from the mountain.

A number of scenarios have been assessed for the April 2008 flood event to test the sensitivity of the model results to changes in the adopted parameter values. The tested parameters include:

- ☐ Rainfall and flow scaling
- ☐ Rainfall losses
- ☐ Blockage of hydraulic structures
- ☐ Surface hydraulic roughness

Flood levels and depths are relatively sensitive in particular to the changes in rainfall scaling (both increase and decrease) with changes of +/- 200mm, and to blockages (both zeroed and fully blocked) with changes of up to +/- 700mm, mainly upstream and downstream of culvert structures. The flood levels are also moderately sensitive to the assumed changes in Manning's n on the main flow paths, which are assumed to be of high roughness in forested areas, with resulting changes of +/- 150mm. Flood levels are typically insensitive to changes in rainfall losses (+/- 30mm), although flooding in selected storage areas is more sensitive to the increased rainfall losses (-280mm) than to the decreased losses (+80mm).

It is recommended that the community be consulted to obtain concurrence on the model calibration. The calibrated hydrologic and hydraulic models would then be used for the estimation of flood behaviour for the selected design flood events.

Model Calibration and Verification Report



9. References

BMT WBM (2018) Coffs Creek and Park Beach Flood Study, Draft Report for Public Exhibition. February 2018.

Engineers Australia (2013) *Australian Rainfall and Runoff Revision Project 11– Blockage of Hydraulic Structures Stage 2*

GHD (2007a) West Haven Stormwater Study Area Final Systems Analyses Report. April 2007.

GHD (2007b) Report for Buller Street and West Haven Stormwater Catchment Studies S.600.110.05.61 Concept Design Report - West Haven Study Area, September 2007.

Port Macquarie Hastings Council (2015) Port Macquarie Hastings Council Flood Policy. Adopted 21 October 2015.

Worley Parsons (2013) Camden Haven River and Lakes System Flood Study.

Webb McKeown and Associates (2001) Coffs Creek Flood Study.

Model Calibration and Verification Report



10. Glossary

Annual Exceedance Probability (AEP)	<p>The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. In this study AEP has been used consistently to define the probability of occurrence of flooding. It is to be noted that design rainfalls used in the estimation of design floods up to and including 100 year ARI (ie. 1% AEP) events was derived from 1987 Australian Rainfall and Runoff. Hence the flowing relationship between AEP and ARI applies to this study.</p> <p>20% AEP = 5 year ARI; 10% AEP = 10 year ARI; 5% AEP = 20 year ARI; 2% AEP = 50 year ARI; 1% AEP = 100 year ARI.</p>
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 occurrences 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.
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.
Development	<p>Is defined in Part 4 of the EP&A Act</p> <p><u>In fill development</u>: 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.</p> <p>New development: refers to development of a completely different nature to that associated with the former land use. Eg. The urban subdivision of an area previously used for rural purposes. New developments involve re-zoning and typically require major extensions of exiting urban services, such as roads, water supply, sewerage and electric power.</p> <p>Redevelopment: refers to rebuilding in an area. Eg. As urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either re-zoning or major extensions to urban services.</p>
Effective Warning Time	The time available after receiving advise 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.

Model Calibration and Verification Report



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 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 susceptibility to flooding by the PMF event. Note that the term flooding liable land covers the whole floodplain, not just that part below the FPL (see flood planning area)
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 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 include both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defines 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 SES.
Flood planning levels (FPLs)	Are the combination 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 "designated flood" or the "flood standard" used in earlier studies.
Flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings and structures subject to flooding, to reduce or eliminate flood damages.
Flood readiness	Readiness is an ability to react within the effective warning time.
Flood risk	<p>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.</p> <p><u>Existing flood risk</u>: the risk a community is exposed to as a result of its location on the floodplain.</p> <p><u>Future flood risk</u>: the risk a community may be exposed to as a result of new development on the floodplain.</p>

Model Calibration and Verification Report



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 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 flow, or a significant increase in flood levels.
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.
Hazard	A source of potential harm or 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.
Local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
m AHD	Metres Australian Height Datum (AHD)
m/s	Metres per second. Unit used to describe the velocity of floodwaters.
m ³ /s	Cubic metres per second or "cumecs". A unit of measurement of creek or river flows or discharges. It is the rate of flow of water measured in terms of volume per unit time.
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
Modification measures	Measures that modify either the flood, the property or the response to flooding.
Overland flow path	The path that floodwaters can follow as they are conveyed towards the main flow channel or if they leave the confines of the main flow channel. Overland flow paths can occur through private property or along roads.
Probable Maximum Flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically

Model Calibration and Verification Report



	<p>possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.</p>
<p>Probable Maximum Precipitation (PMP)</p>	<p>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.</p>
<p>Risk</p>	<p>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.</p>
<p>Runoff</p>	<p>The amount of rainfall which actually ends up as a streamflow, also known as rainfall excess.</p>
<p>Stage</p>	<p>Equivalent to water level (both measured with reference to a specified datum)</p>
<p>TUFLOW</p>	<p>TUFLOW is a computer program which is used to simulate free-surface flow for flood and tidal wave propagation. It provides coupled 1D and 2D hydraulic solutions using a powerful and robust computation. The engine has seamless interfacing with GIS and is widely used across Australia.</p>
<p>XP-RAFTS</p>	<p>XP-RAFTS is a computer program which is used to simulate catchment rainfall-runoff and is widely used across Australia.</p>

Model Calibration and Verification Report

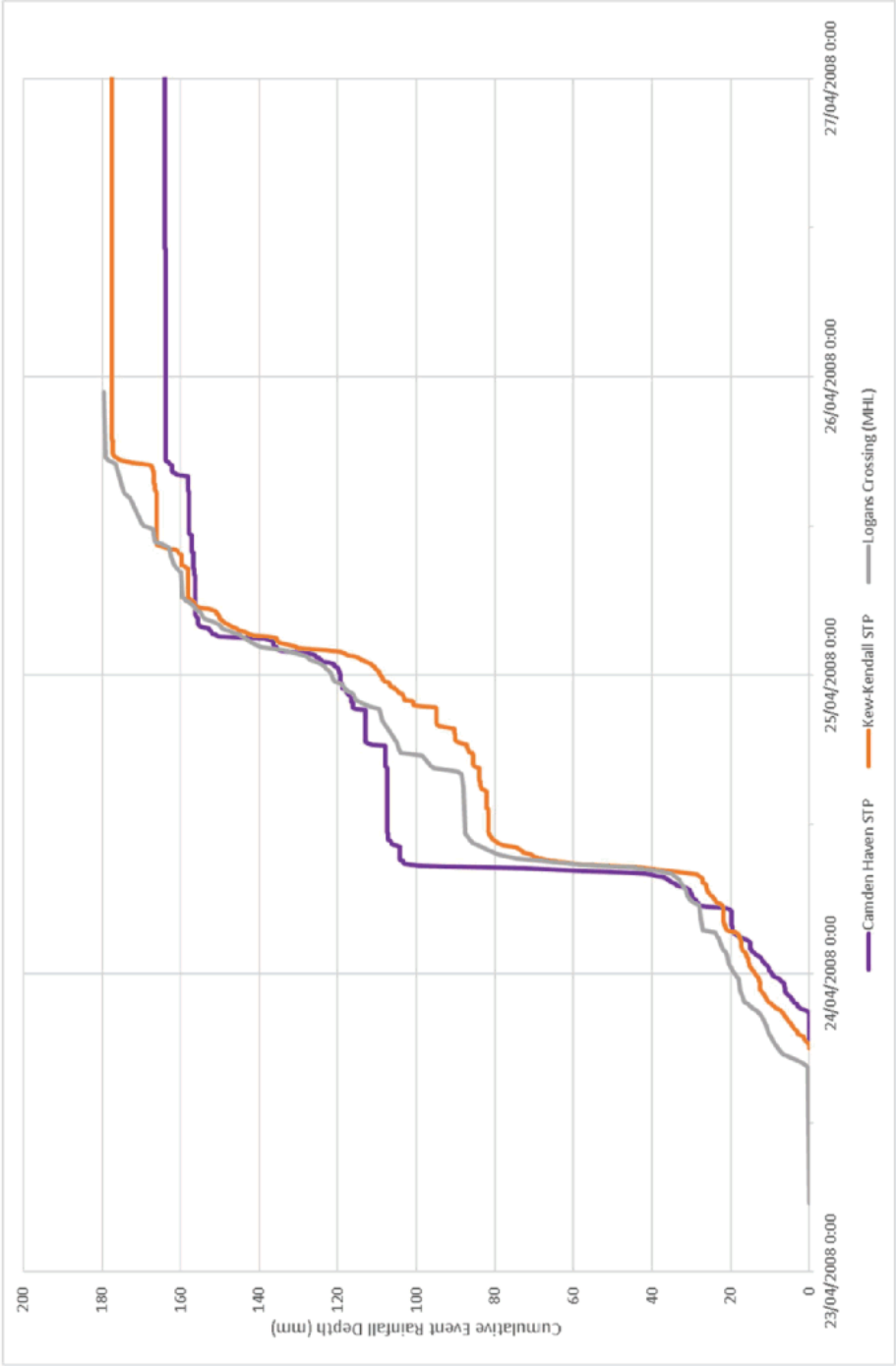


Appendix A. Analysis of Historic Rainfall Event Data

Cumulative rainfall depths have been plotted for two recent storm events for which data is currently available. These include:

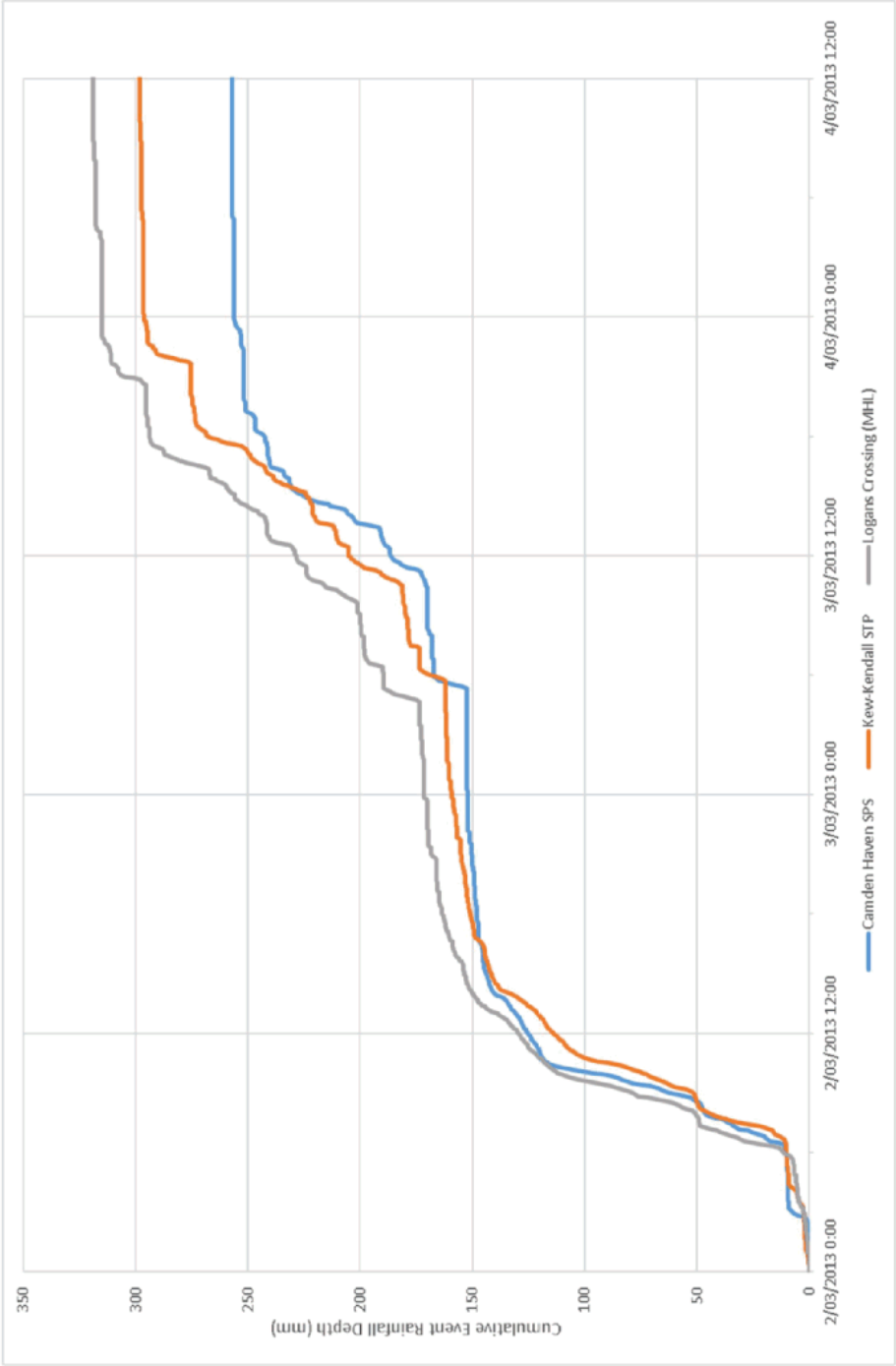
- 24 April 2008 (10% AEP) 49mm in 45minutes; 65mm in 60 minutes; 136mm in 24 hours.
- 2 March 2013 (20% AEP) 61mm in 1.5 hours; 152mm in 24 hours.
- 5 January 2016 (20 – 50% AEP) 54mm in 1.5 hours.

Figure A-1 Cumulative event rainfall depth, 24 – 26 April 2008



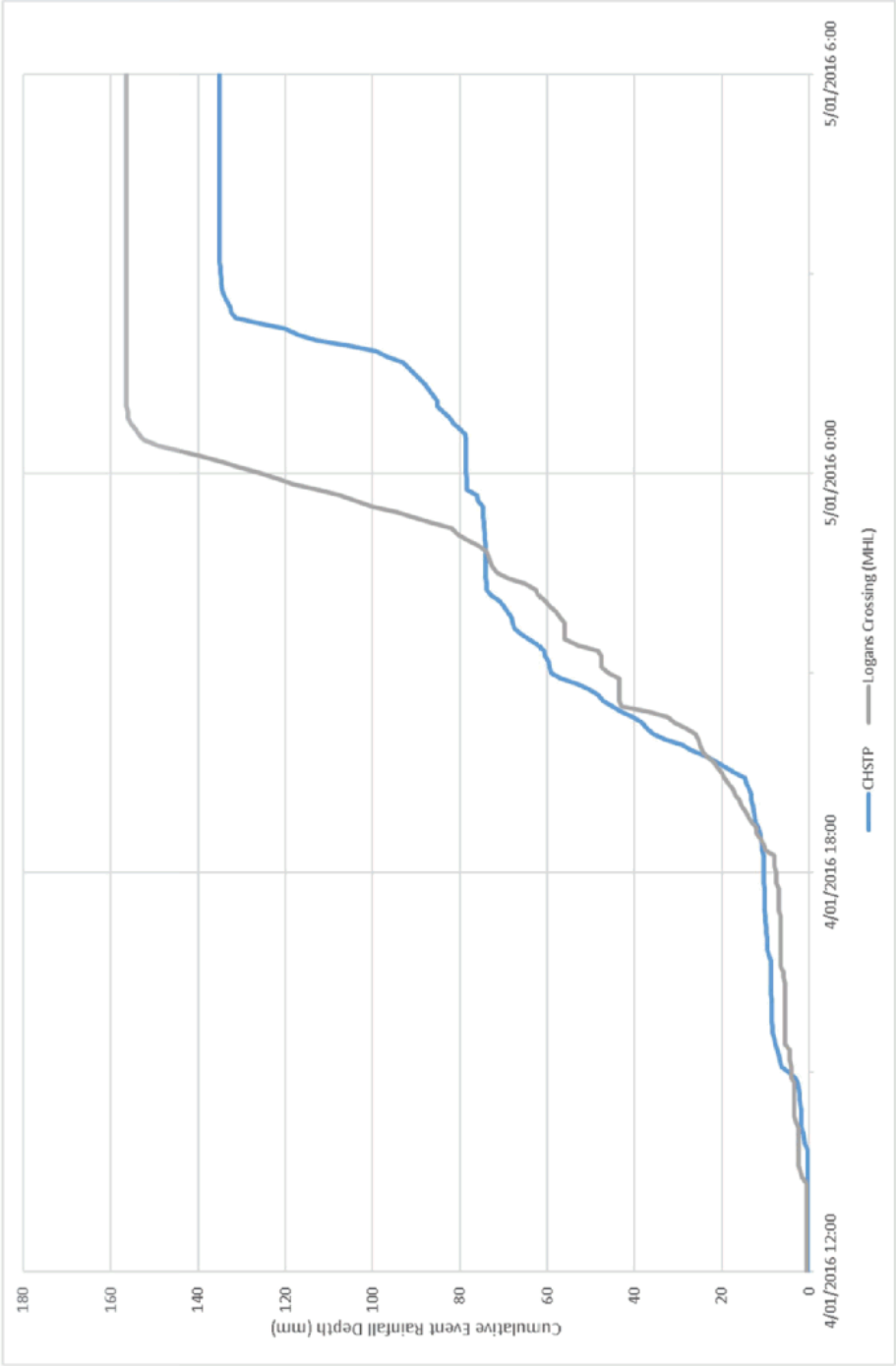
Model Calibration and Verification Report

Figure A-2 Cumulative event rainfall depth, 2-3 March 2013



Source: Camden Haven SPS, Kew-Kendall STP, Logans Crossing (MHL)

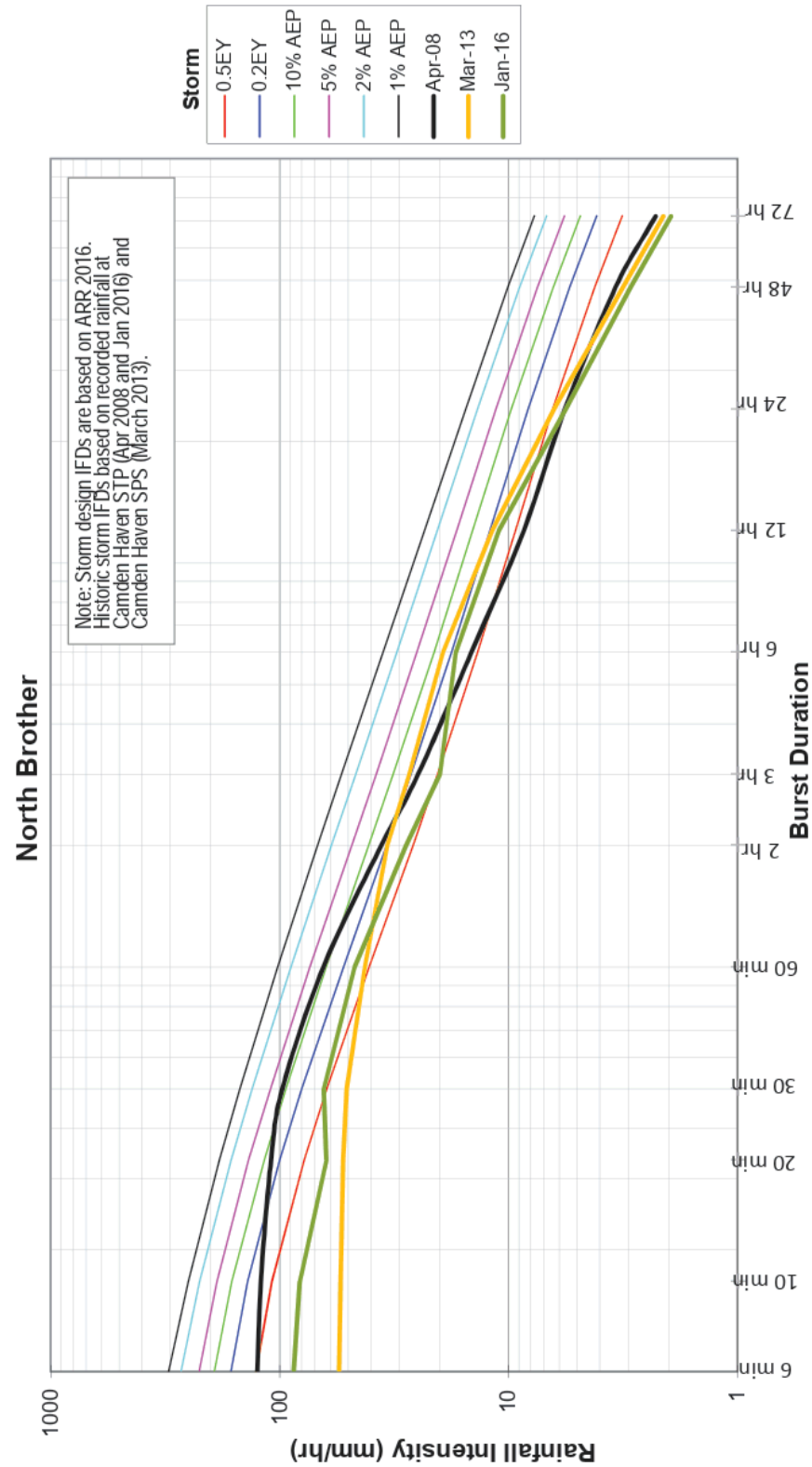
Figure A-3 Cumulative event rainfall depth, 4 – 5 January 2016





Model Calibration and Verification Report

Figure A-4 North Brother Design Rainfall Intensity-Frequency-Duration versus Historic Storm Events



Model Calibration and Verification Report

JACOBS

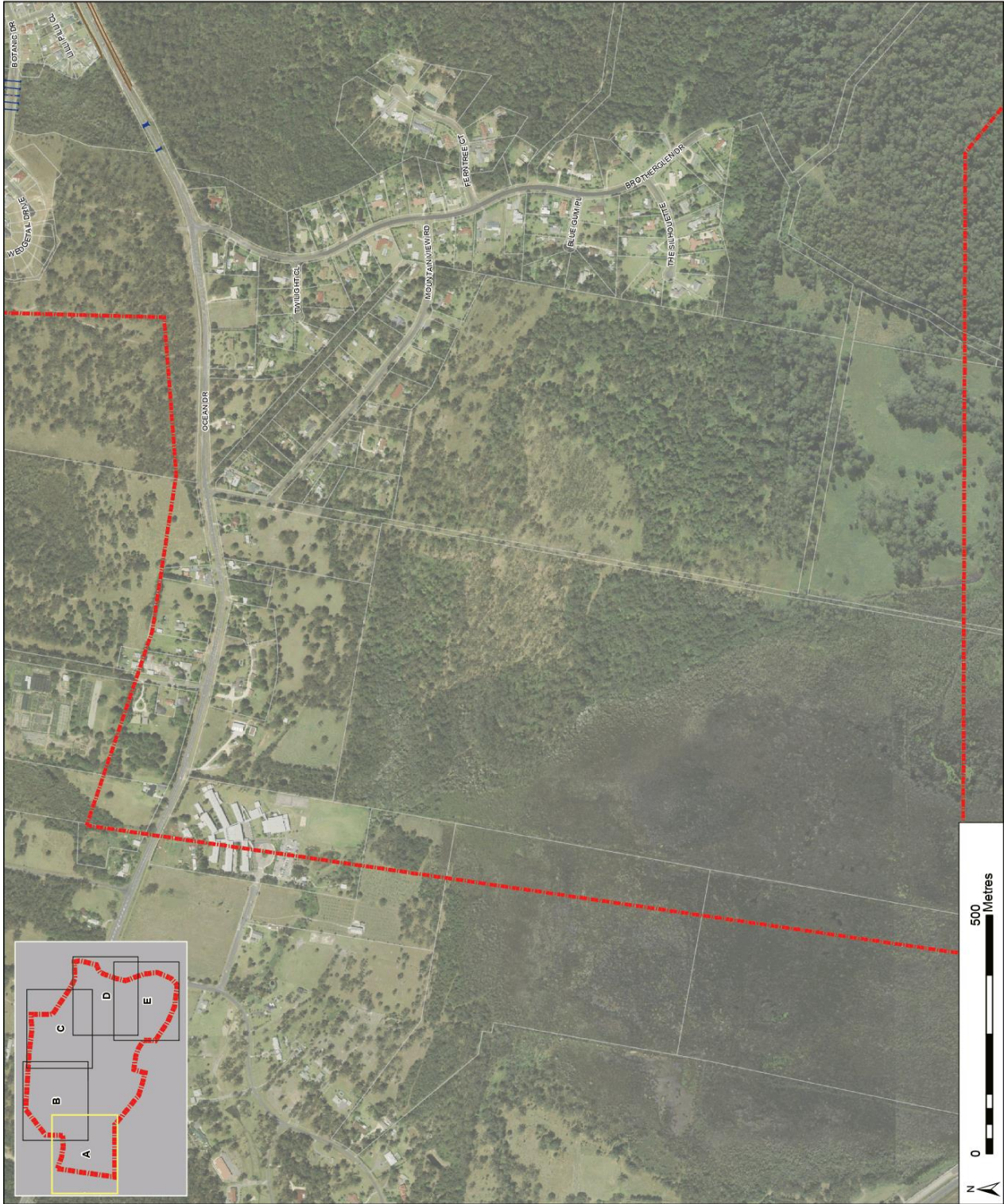
Appendix B. Summary of Topographic Survey

Model Calibration and Verification Report

Legend

Study Area

Cadastral



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(A)
DATE	25/05/2018

Legend

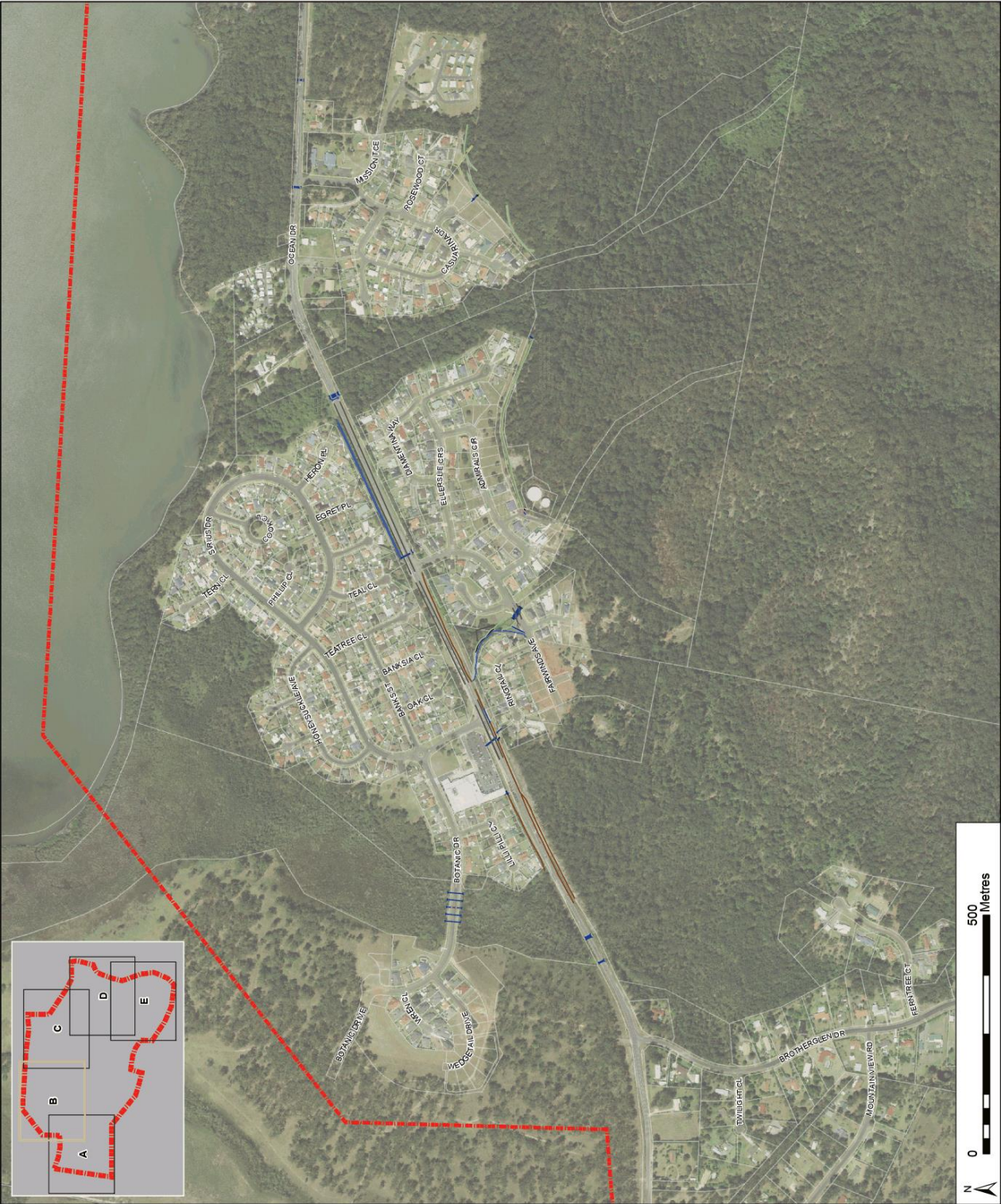
Study Area

Cadastral

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(B)
DATE	25/05/2018



Legend

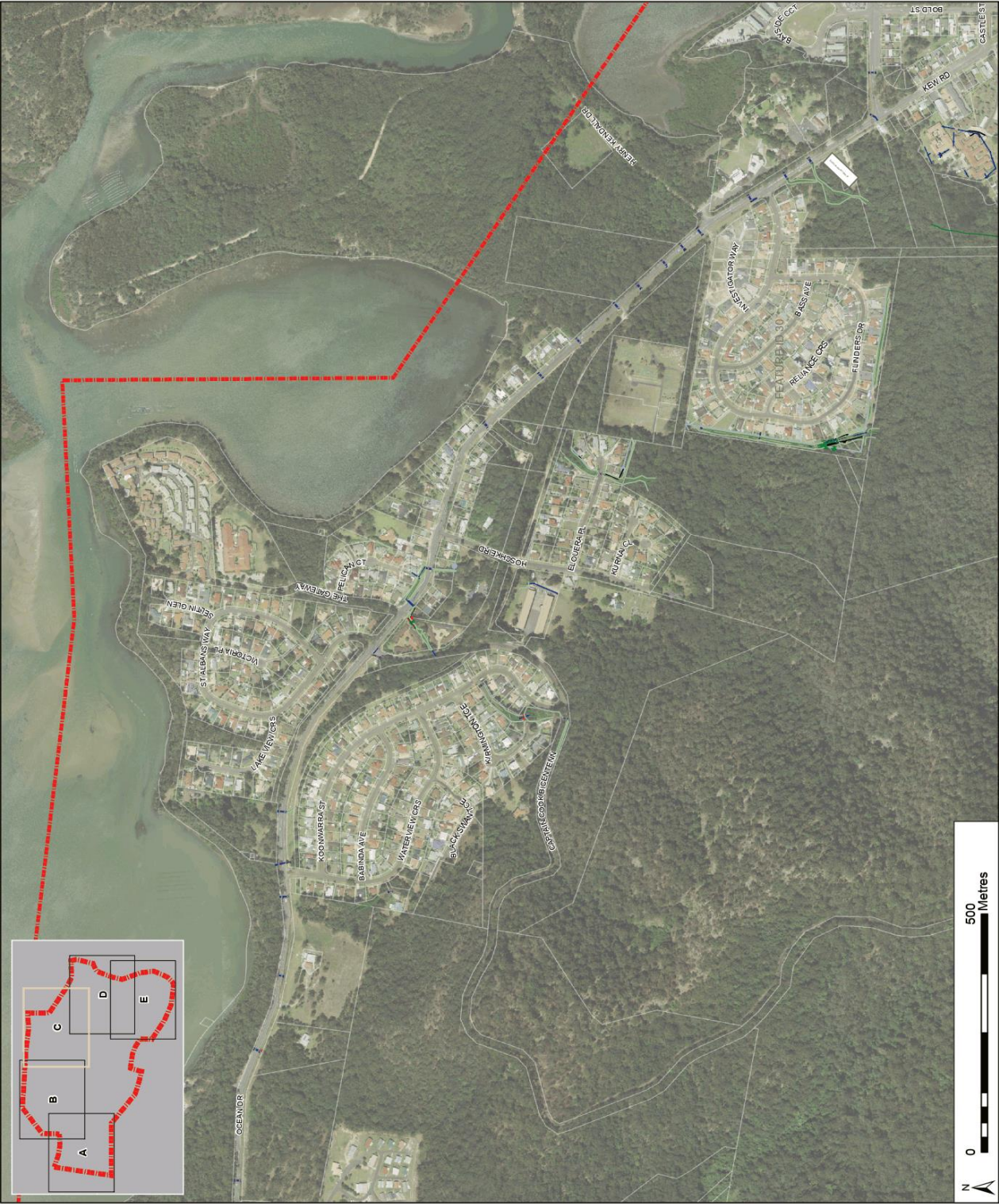
Study Area

Cadastral

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(C)
ISSUED DATE	25/09/2018



Legend

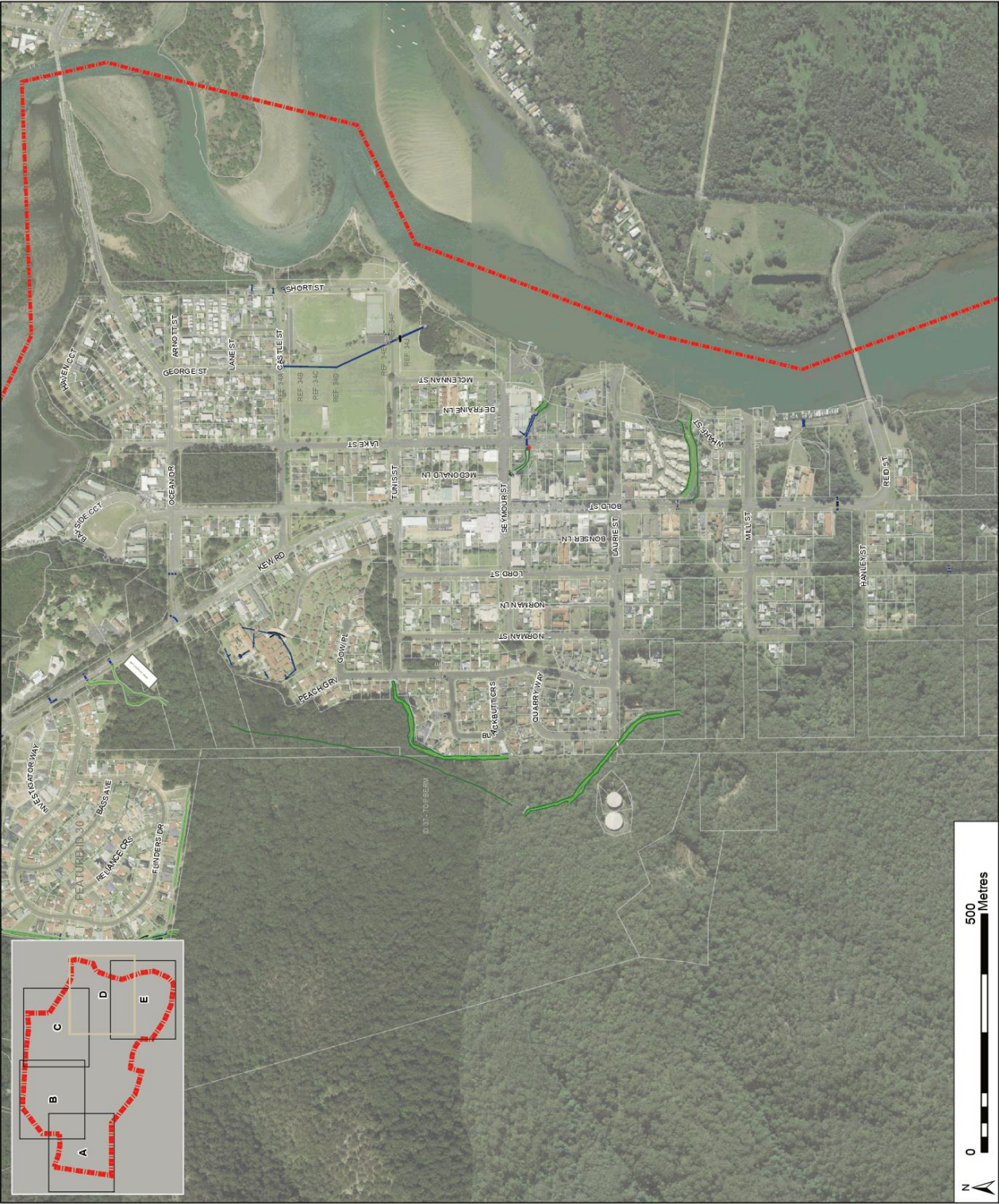
Study Area

Cadastral

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



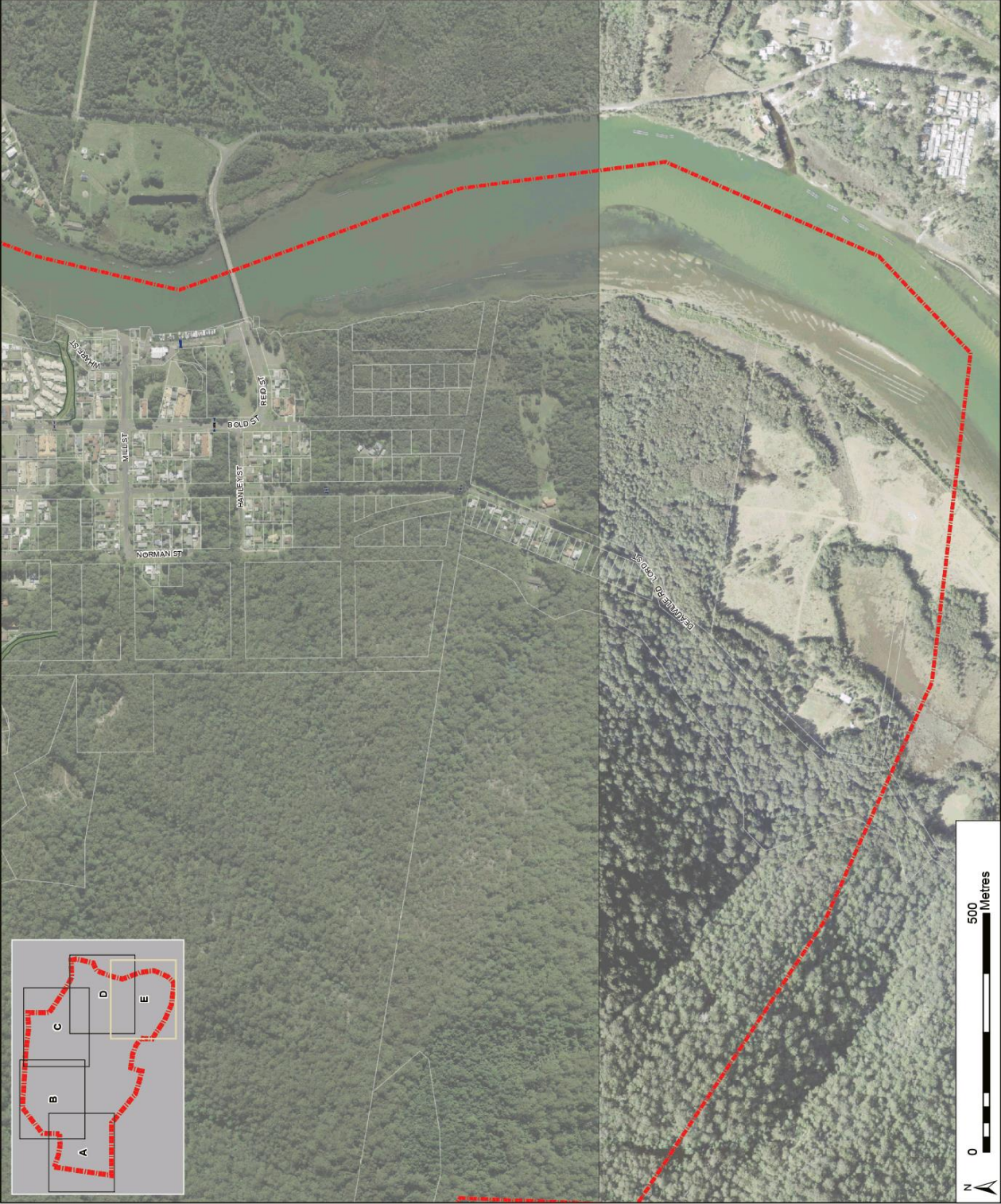
TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(D)
ISSUED DATE	25/09/2018



Legend

Study Area

Cadastral



GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Overview of Surveyed Features
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP B-1(E)
DATE	25/05/2018

Model Calibration and Verification Report

JACOBS

Appendix C. Community Consultation

Model Calibration and Verification Report



Community Bulletin No. 1 - October 2017



North Brother Local Catchments Flood Study

Port Macquarie Hastings Council is currently conducting the North Brother Local Catchments Flood Study. This Community Bulletin is the first in a series of Bulletins aimed at informing residents of the status of the project and how they can be involved in the process. Council has engaged consultants, Jacobs Group Australia, to undertake the Study.

The focus of the study is to understand the behaviour of local catchment flash flooding from North Brother Mountain and the flood risk that it poses to the community. This will assist Council to develop measures to manage the impact of flooding and guide strategic planning for future development of the area. It includes areas of the villages of Laurieton, West Haven, Lakewood, Kew and Deauville.

An integral part of the study process is community consultation and involvement. This element of the process aims to inform the community of the study and invite residents to provide information on their views and experiences with flooding in the area. The management of flood prone land is primarily the responsibility of Councils and follows a number of stages as shown below. The project is currently in the Flood Study stage, and will later move to the Floodplain Risk Management Study and Floodplain Risk Management Plan stages as the project progresses.

The Stages of Floodplain Risk Management



Objectives of the Study

The objectives of the study are to:

1. Define the overland and flash flooding behaviour in the study area. Computer flood modelling will be undertaken to do this during the current flood study stage.
2. Identify and evaluate possible flood mitigation and management measures to reduce the flood risk. These may be structural and planning measures or "response" measures.
3. Develop a staged plan for implementing these measures.

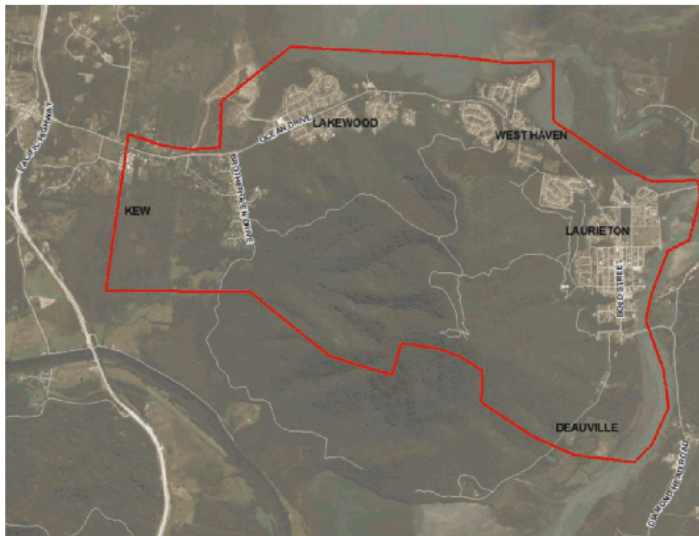


Community Survey

We are seeking feedback from the community on previous flooding events in the area and views on possible management measures via the attached survey. The results of the survey will help inform a flood study for the area, which will be placed on public exhibition in early 2018, and a subsequent floodplain risk management study. The information that you provide will improve the flood model being developed.

PAGE 1

Study Area



The Flood Problem

The study area typically experiences short duration flooding, which occurs when intense rainfall exceeds the capacity of the stormwater network or creek channel. In urbanised areas, this flooding has the potential to cause major damage to property and risk to life. Notable local flash flooding in the study area recently occurred in:

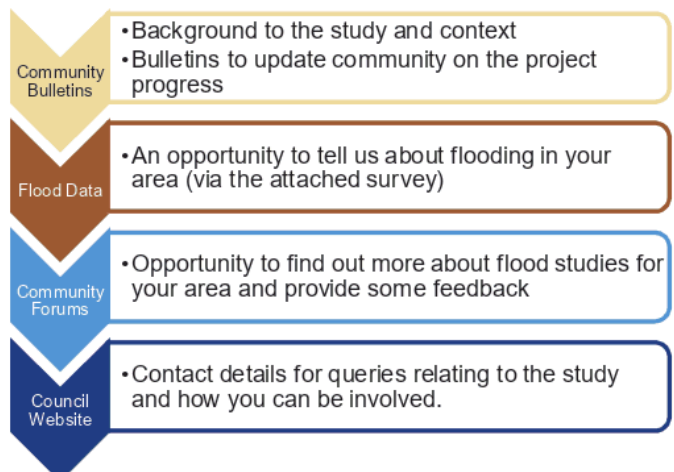
- April 2008
- June 2011
- March 2013
- January 2016.

How can you get involved?

Engagement of the community in the floodplain risk management process is very important to Council. We will be providing a number of opportunities for the community to have input during the course of this study.

Some of the most important information for the study is collected from residents and local business operators. We would be very interested to receive records of flooding in your area including photographs, observations of flood depths or some comments on your experience. You can help us with this

information by completing the questionnaire for your area and returning the completed community survey by 31 October 2017. The questionnaires can be found in Council's web site www.haveyoursay.pmhc.nsw.gov.au/ Port Macquarie Hastings Council appreciates your cooperation and will keep you informed with ongoing community bulletins.



For more information contact Port Macquarie Hastings Council on (02) 6581 8111 or visit haveyoursay.pmhc.nsw.gov.au

Model Calibration and Verification Report

JACOBS

Appendix D. Verification of Model Flood Behaviour

Model Calibration and Verification Report

Legend

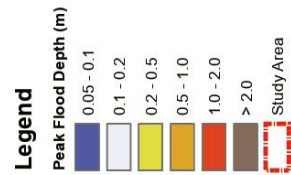
- Model Calibration and Verification Points
- Study Area

GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Calibration and Verification Points
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	
ISSUED DATE	25/09/2018
	FIGURE D-1

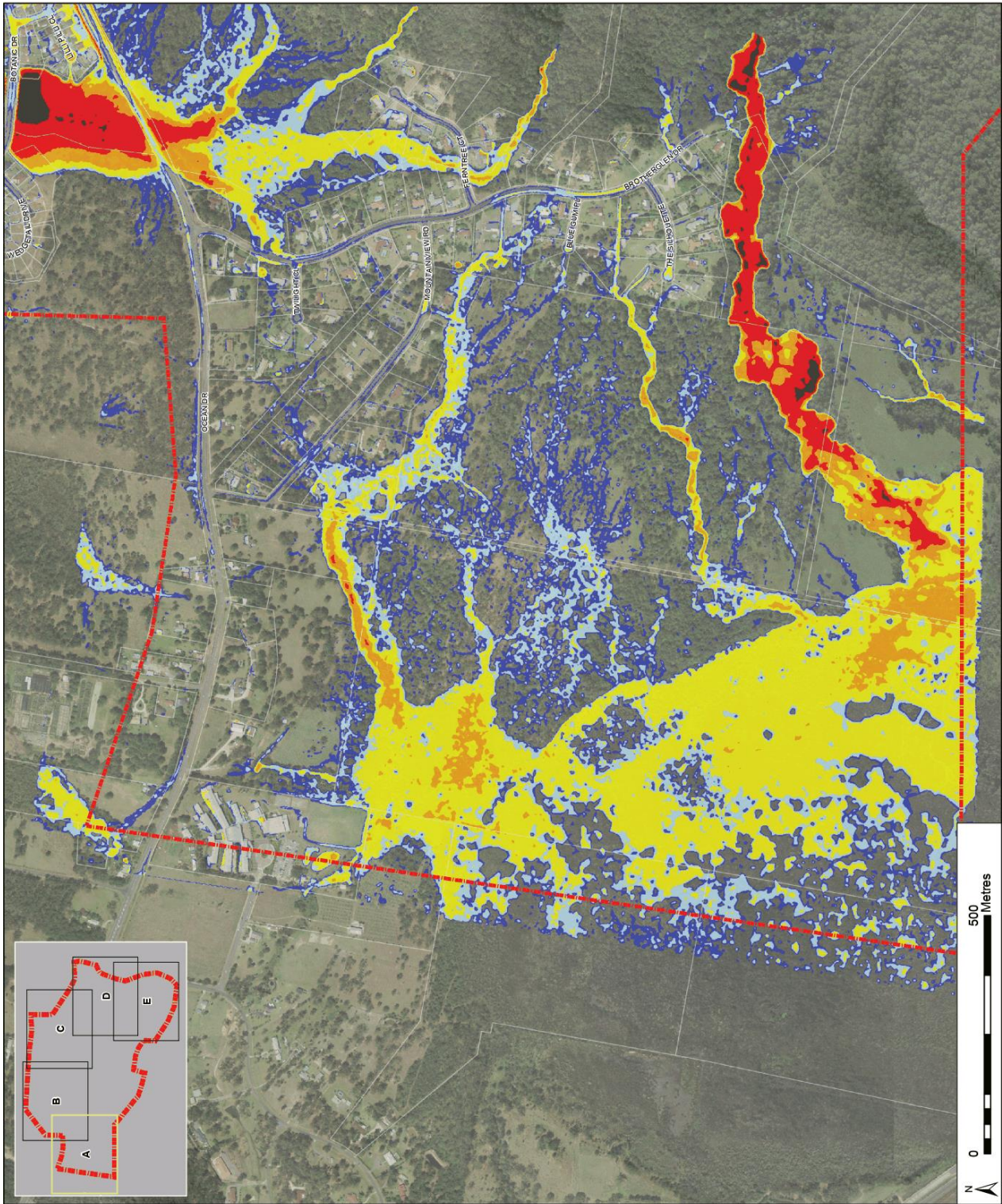


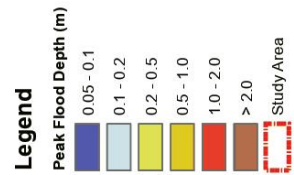


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(A)
DATE	28/09/2018

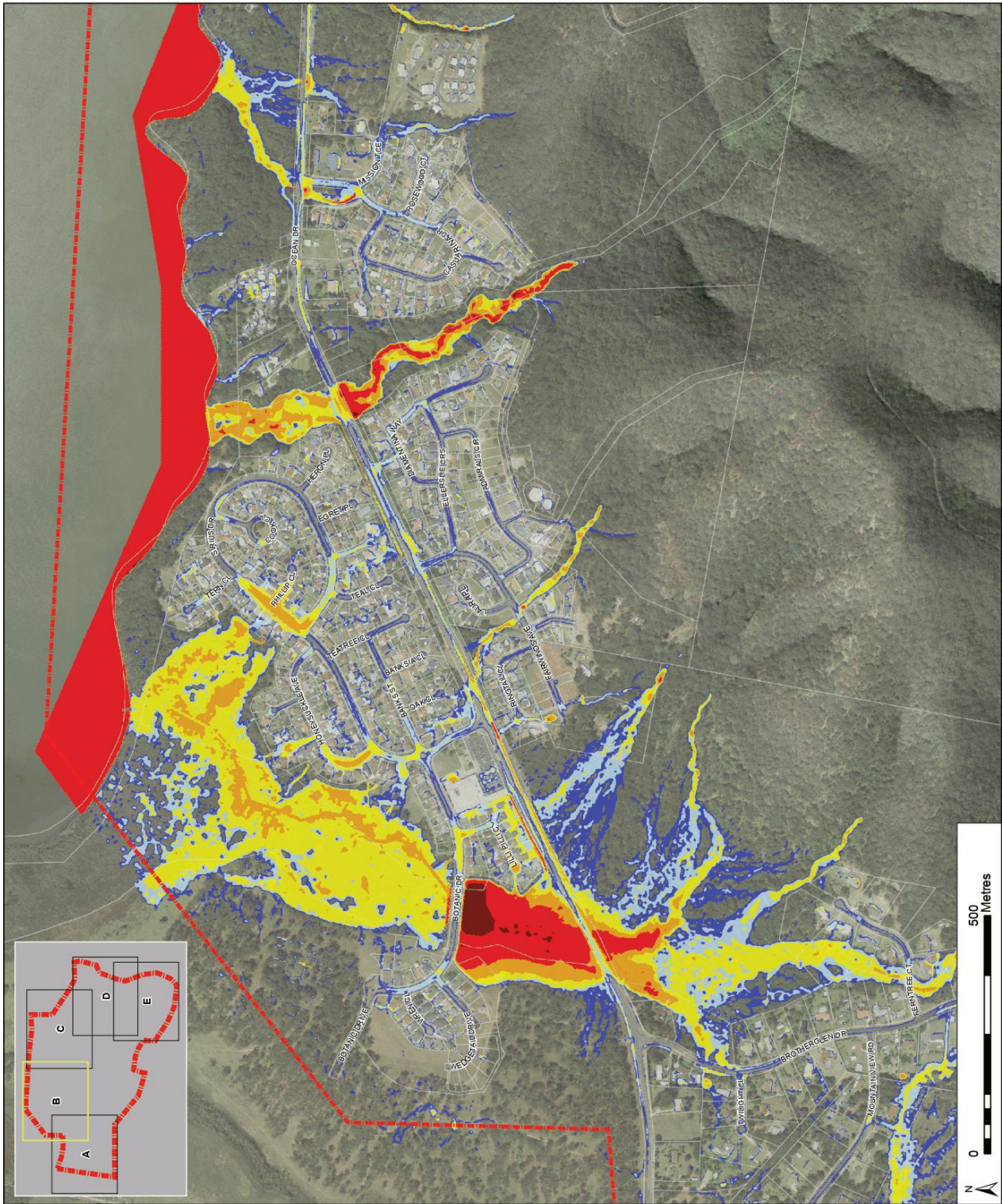


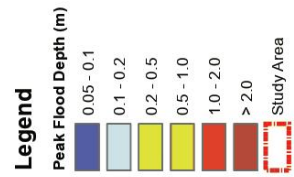


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(B)
DATE	25/09/2018

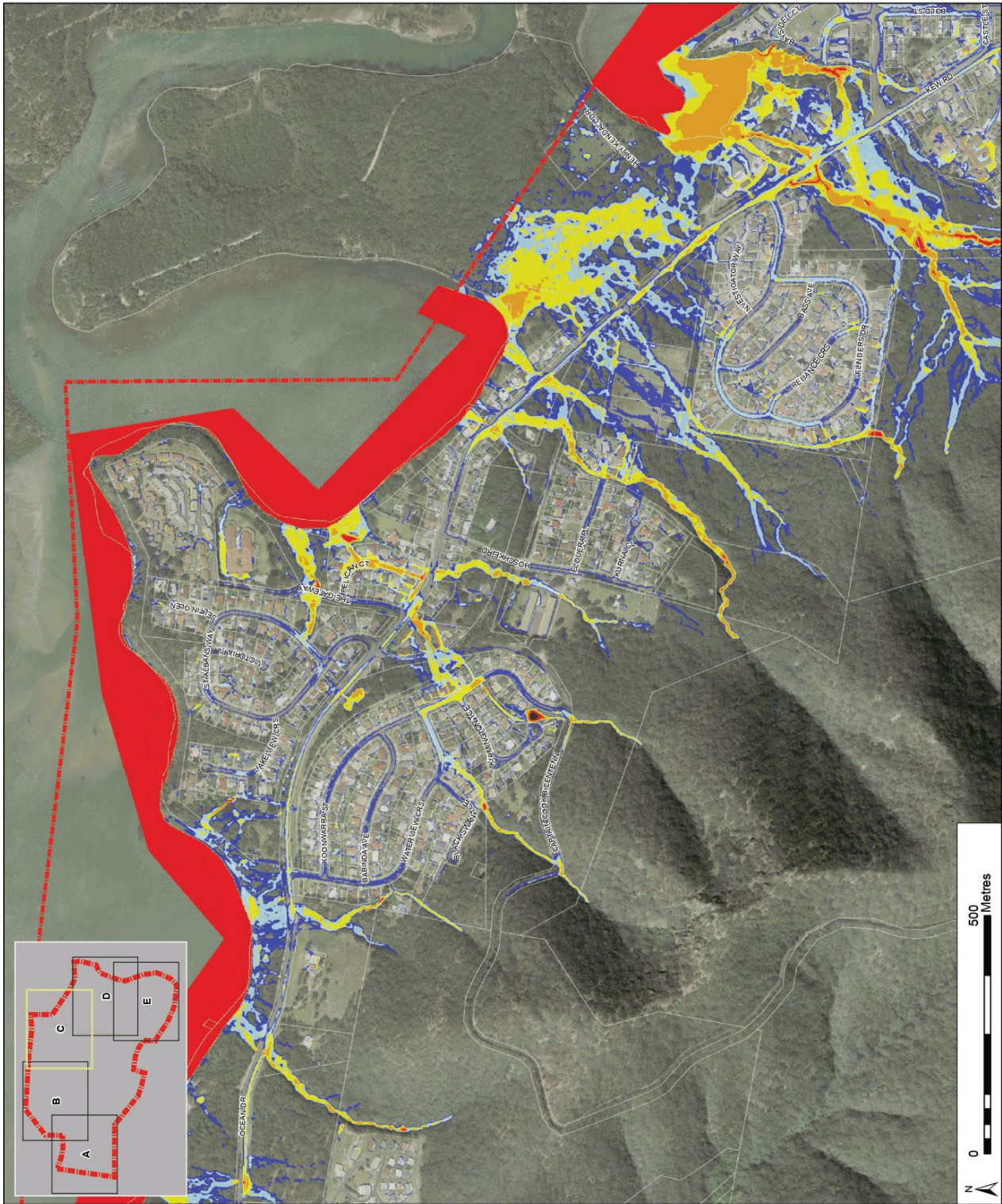


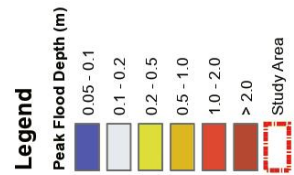


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(C)
DATE	25/09/2018

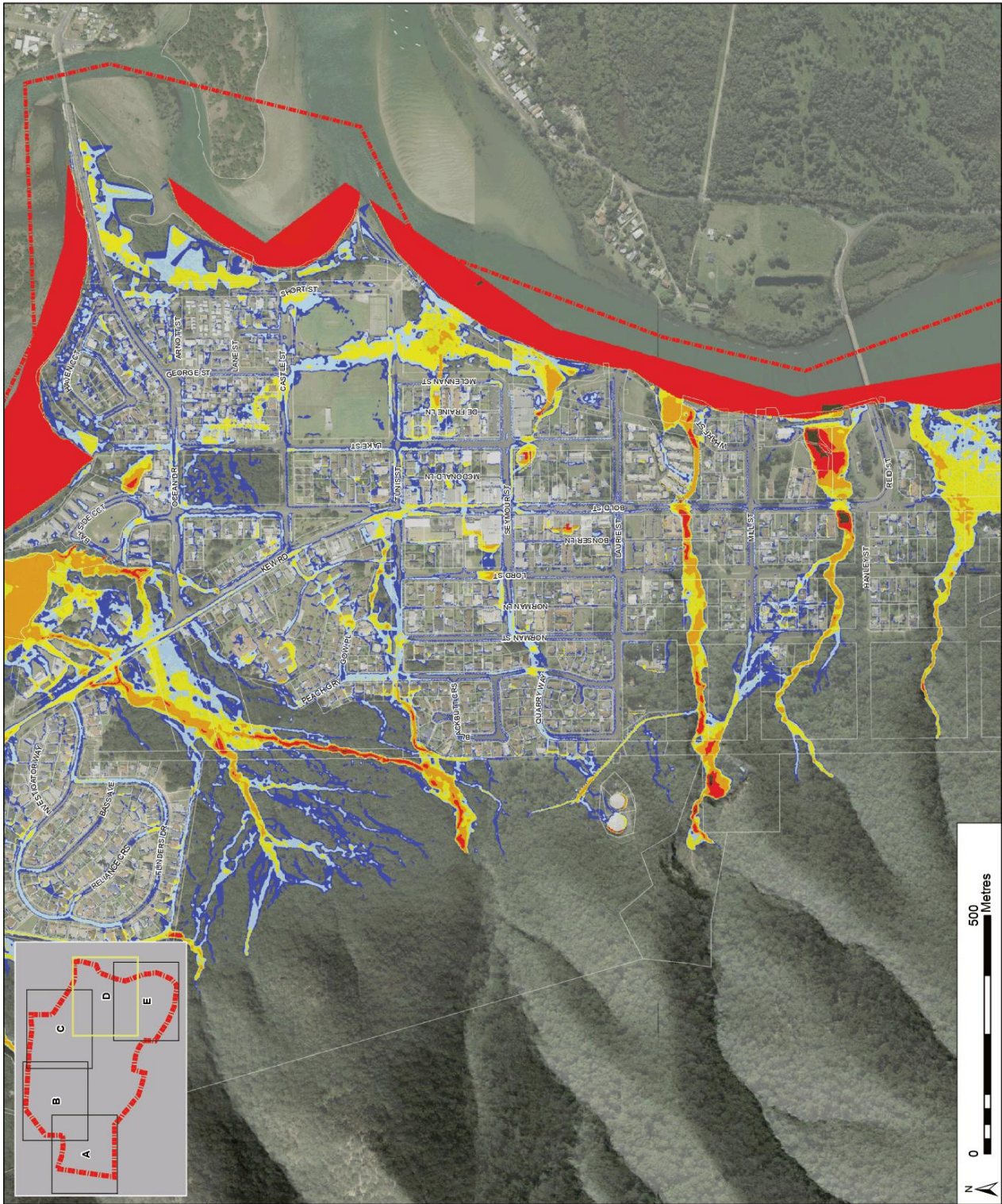


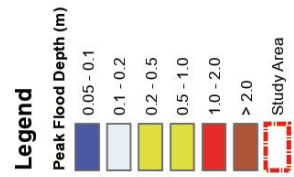


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result April 2008 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-2(D)
DATE	25/09/2018

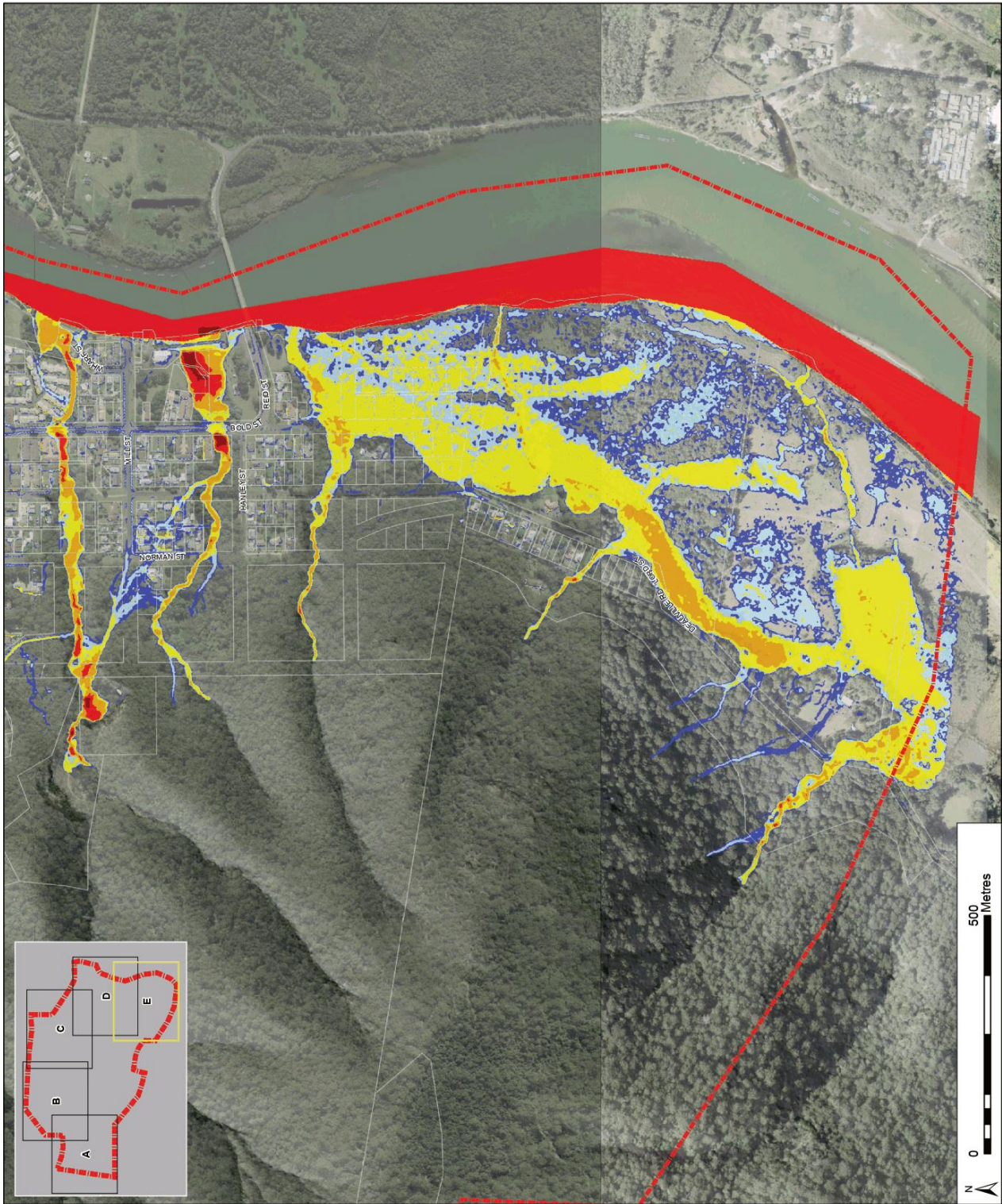


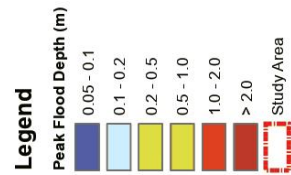


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



Model Calibration Result April 2008 Storm Event Peak Flood Depths	
TITLE	
PROJECT	North Brother Local Catchments Flood Study
PROJECT # DATE	MAP D-2(E) 25/09/2018

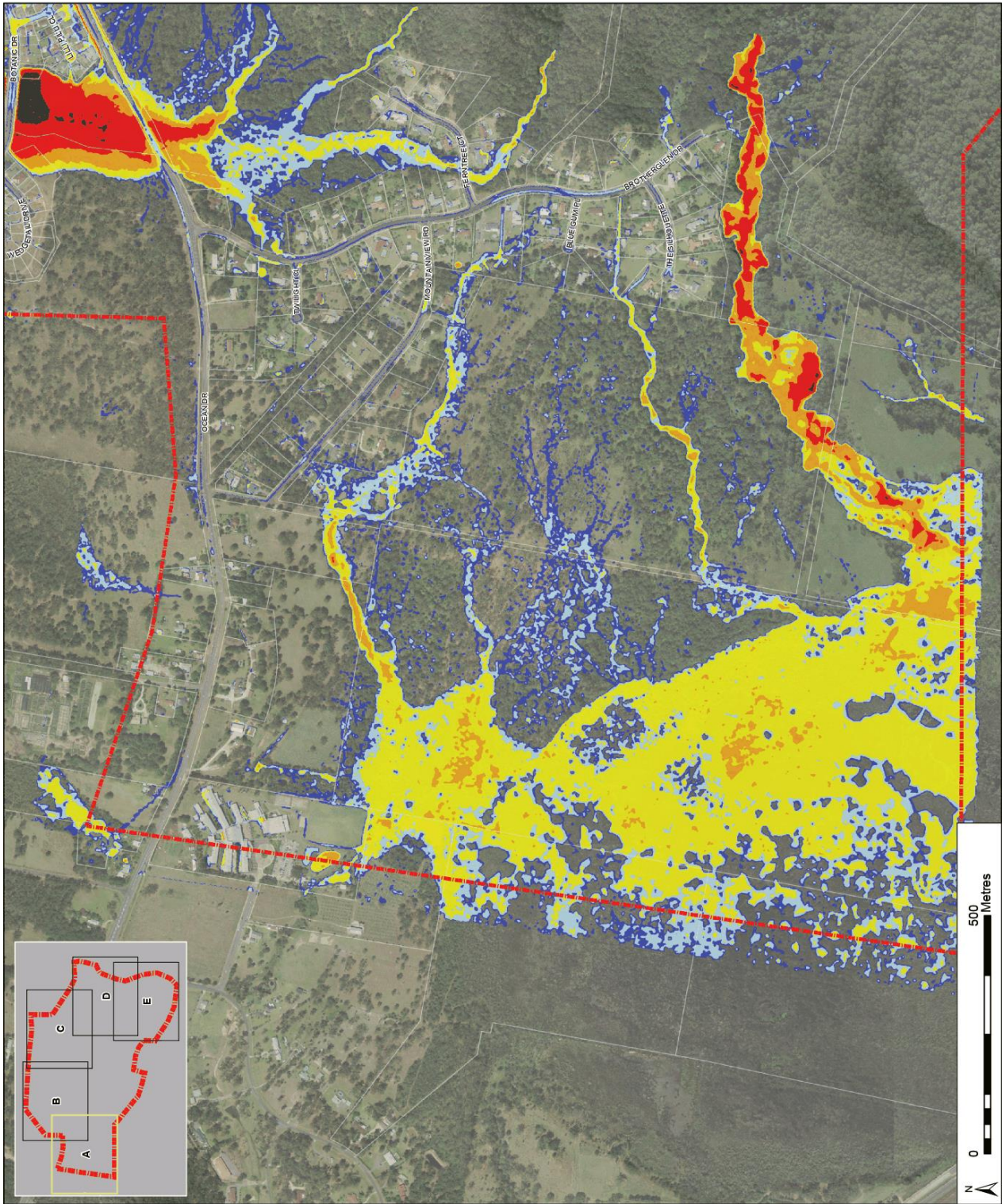


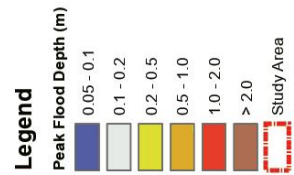


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(A)
DATE	25/09/2018

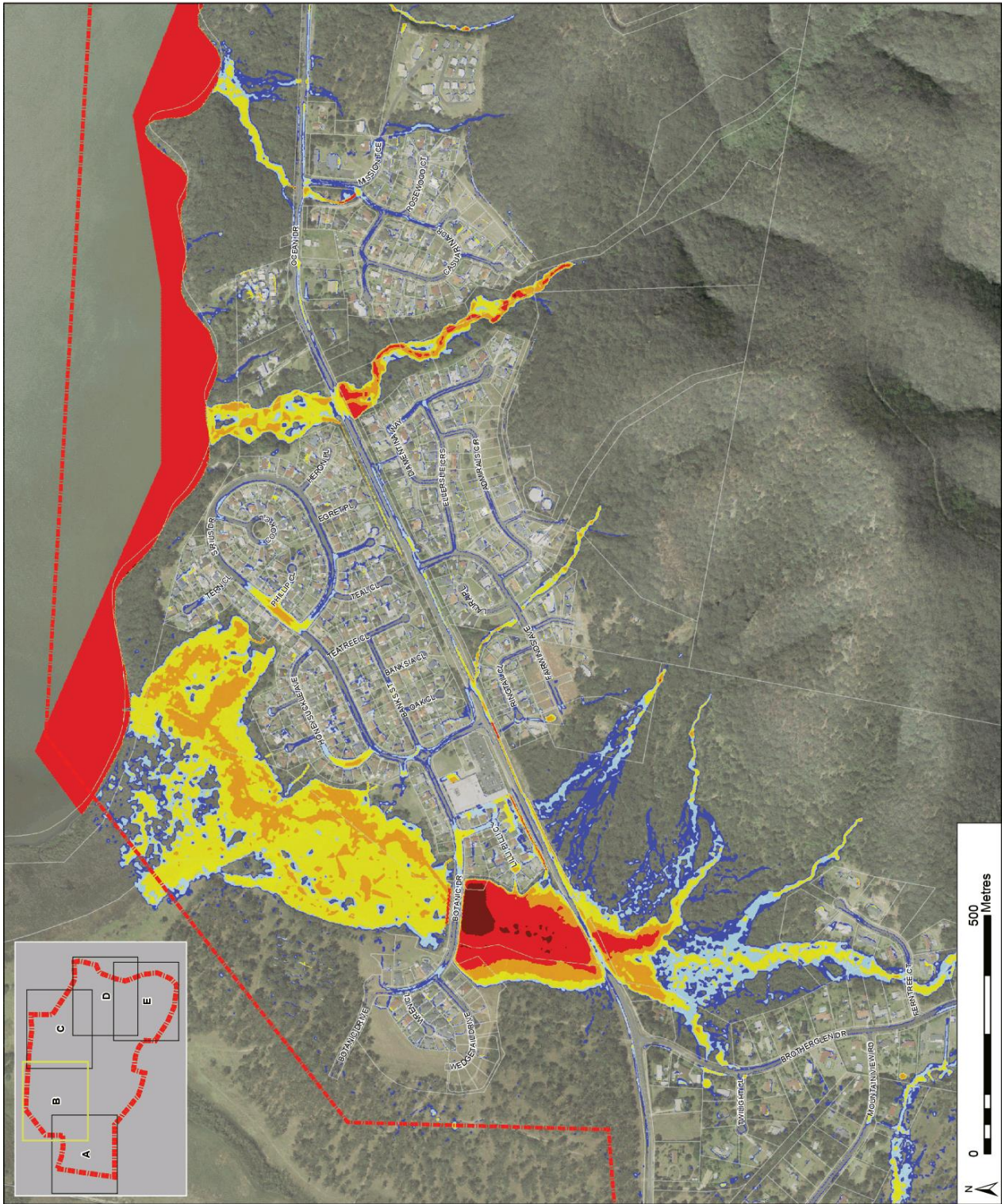


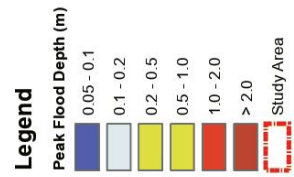


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(B)
DATE	25/09/2018

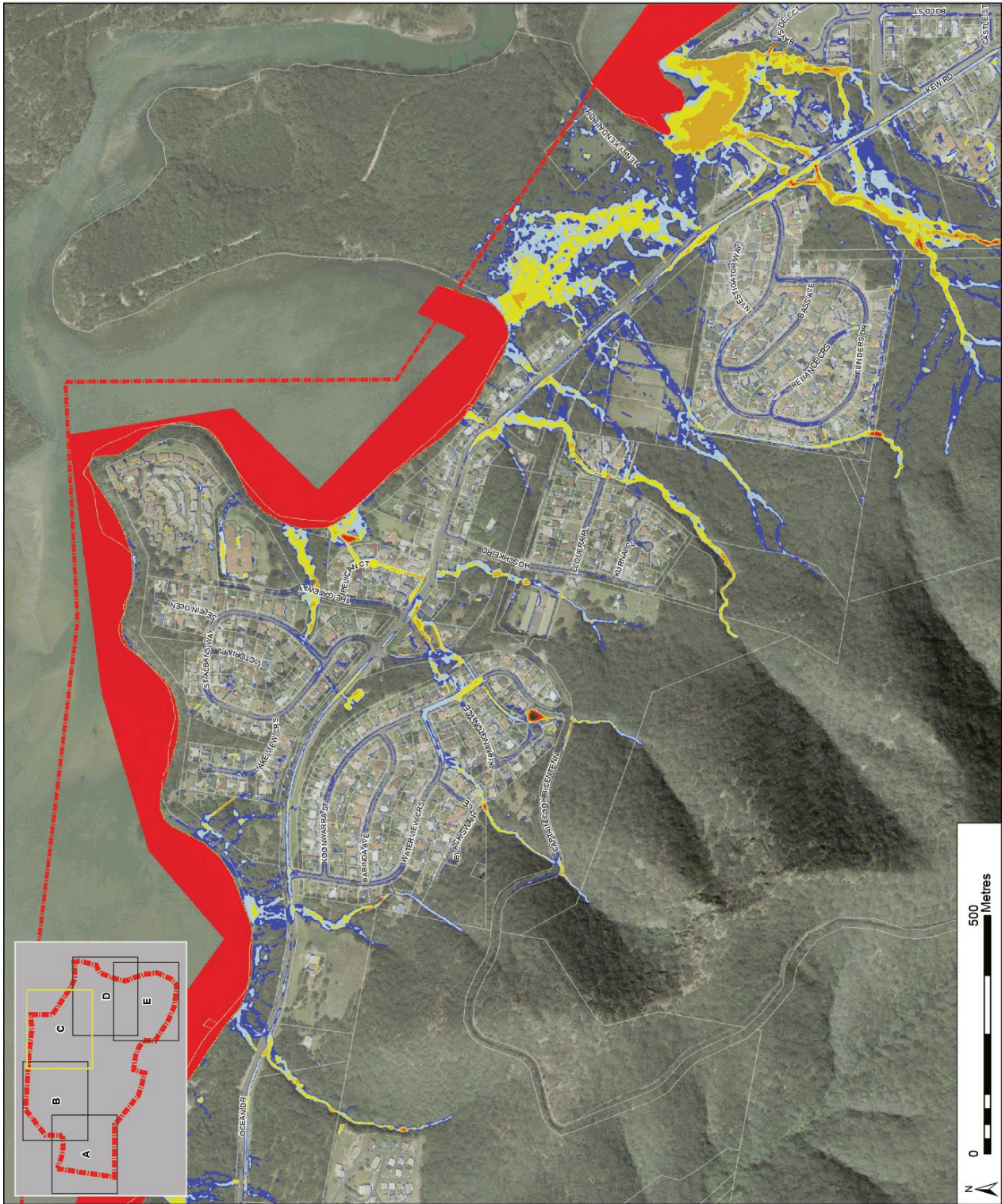


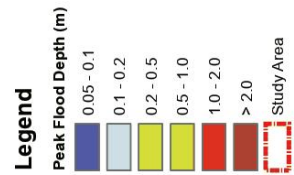


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



Model Calibration Result March 2013 Storm Event Peak Flood Depths	
TITLE	
PROJECT	North Brother Local Catchments Flood Study
PROJECT # ISSUED DATE	MAP D-3(C) 25/09/2018

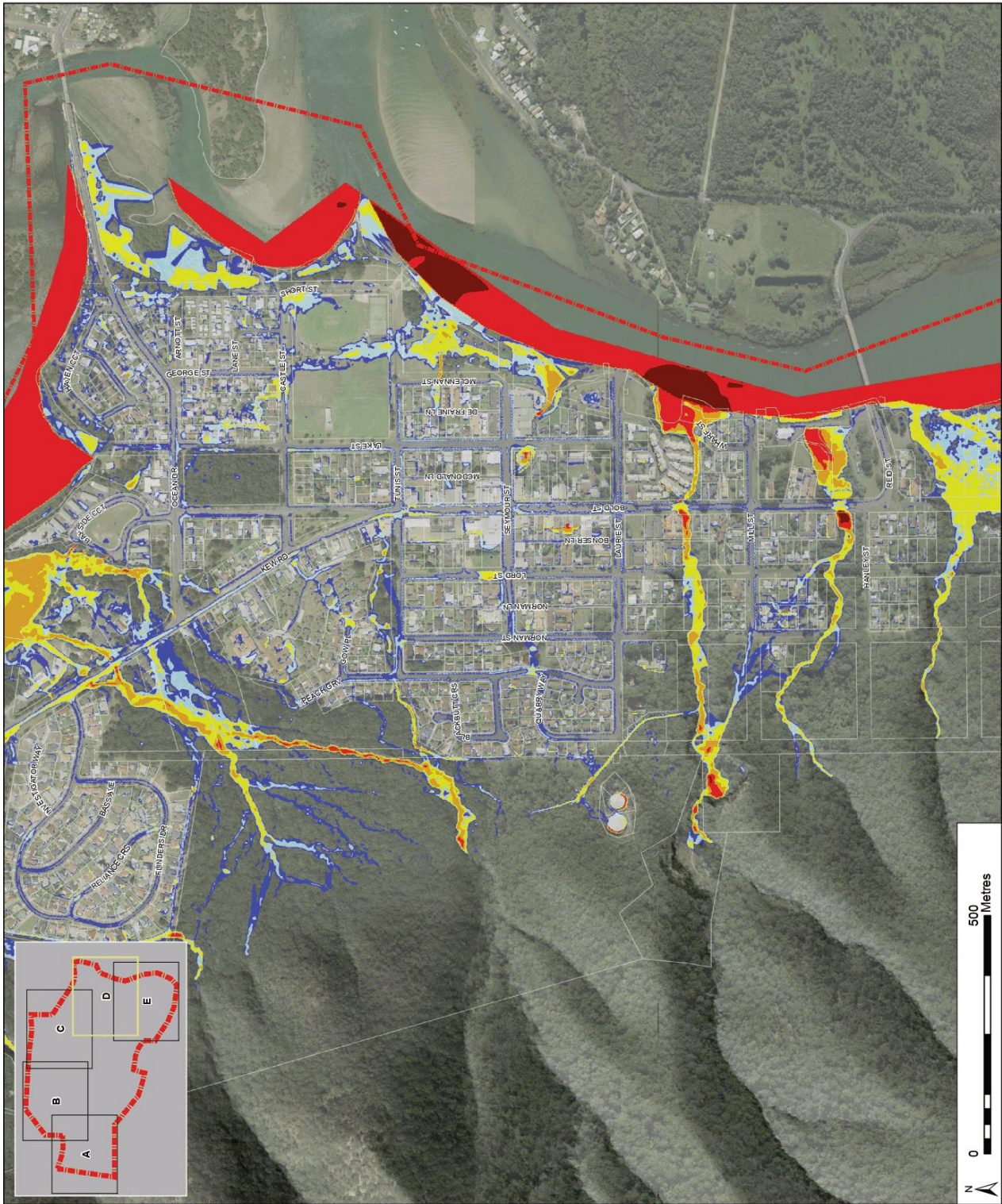


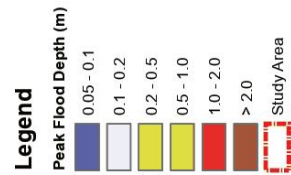


GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(D)
ISSUED DATE	25/05/2018





GDA 1994 MGA Zone 56
Scale: A3
Data Sources: LPI, OEH, Council
LIMITATIONS: This mapping is based on data and assumptions identified in the North Brother Local Catchments Flood Study prepared by Jacobs. Jacobs does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



TITLE	Model Calibration Result March 2013 Storm Event Peak Flood Depths
PROJECT	North Brother Local Catchments Flood Study
PROJECT #	MAP D-3(E)
DATE	25/09/2018

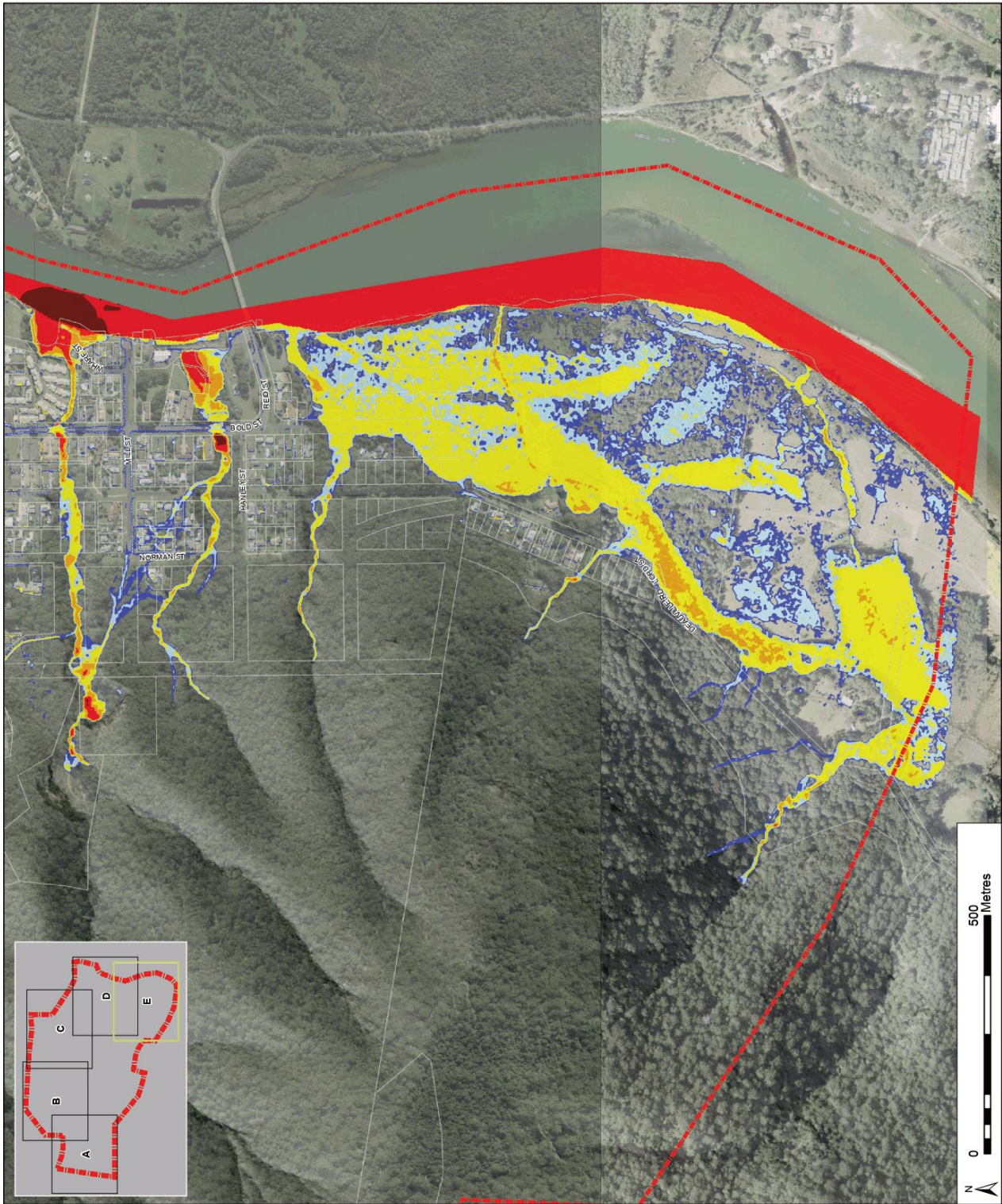


Table C-1 Verification of Model to Flooding Reports and Observations

Note – Addresses of properties with flooding generally have been suppressed in case of community sensitivity to such information being released.

ID	Event date/s	Description of Previous Flooding	Modelled Flood Behaviour
2	2004, 2008, 2011, 2013, 2015, 2016	Depths about 2/3 metre with exceedingly strong flow. Duration from 2 to 5 hours approx. depending on strength of storm. Locations from blocked drain - around and under house with sandbags keeping water out. Flooding around and in house on at least 3 occasions with major water damage	Ok, 0.55m in 2008 simulation
3	2015?	"Moderate" damage to garage, garden/yard, photos show large flow of water through garage and trying to exit via closed roller door. Door panel is bowing due to force of water. Approx. 1-2 brick courses deep at front/leeward side of house/garage	Model shows flows 0.2 m deep at west side of house
4	No flood event specified	Some flood dates: 5/11/2010, 13/6/2011, 8/10/2011, 28/1/2013. Had to sandbag near garage door. Photo of 8/10/2011 shows shallow ponding, to say 50mm deep in backyard.	Model results show 0.05 - 0.12m ponding in backyard
5	No flood event specified	Property reported as flood affected	Affected by overflows from fire trail. Shallow depths
9	No flood event specified	Have installed extra drainage and downpipes and regraded concrete driveway to try to improve drainage but has not been enough.	Overflows from grassed swale in street into driveway and property
10	No flood event specified	Shallow sheet flow on front lawn. Retaining wall collapse	Model shows shallow flows on lawn. Retaining wall collapse appears to be due to slumping of saturated soil.
18	2002, 2004, 2013	Photos March 2013, 2002 and 2004 of flow through yard and down driveway of neighbouring property then down road. 100-200mm deep at hills hoist in 2004 flood. Approx. 500mm deep against fence in 2004 flood. Timber paling fence panels washed out. 100 - 200mm diameter rock rubble deposited in yard.	160mm at hills hoist. 400mm at fence in 2008 sim. Flood patterns similar to 2013 simulation. Photos including depths and flows from front of property around side of house to back, also swift flows in next door driveway
23	5/2/2002, 11/2004, 2011, 2013	There is creek/waterhole at the back fence and in June our yard went under as this broke its banks and flowed across the property to the drain which was in when I bought the place in 2013.	Breaks out of flow path and flows across property
26	No flood event specified	Carpets replaced in 2000 due to flooding, no flooding reported for other years.	Model shows flooding at front of house 0.2m in 2008 simulation. Ok, probably not high enough to get into house.
34	Mar 2013, June 2017	NONE- PARKED CAR MOVED WITH WATER ON ROAD- MARCH 2013	Significant depths in 2008 simulation
38	March 2013	back patio approx. 50mm depth, sandbagged to prevent ingress to house. Backyard to 100mm approx.	50 - 100mm in backyard and patio

42	2001 (not consistent with BOM daily), 30/11/2011	2001 - 313mm in one hour. End house (No 8) had water right through-ruined floor coverings, about 0.5m to 0.6m of water over the street, and Honeysuckle as well. 30/10/2011- Huge storm- hall and rain	0.5 - 0.6m in street in 2008 simulation, reasonable match
60	2015	There was also 2 black plastic grated pits that also could not cope with this deluge resulting in water 4 - 6 inches deep running over pabblecrete and concrete. Internal damage. The water entered through weep holes in lounge room only.	Report appears mostly property drainage related. Some localised ponding around dwelling
61	2-3/3/2013	water rushing through and down properties next door and down the street flooding, the water was coming down from across Ocean Drive into the back of said properties. Houses down the street were being	Depths 0.2 - 0.4m in the area
65	No flood event specified	Reports of significant surcharge from stormwater pit	Model shows surcharge flows of 0.9m ³ /s
68	2013?	Road was flooded approx. 6 years ago due to very heavy rain and blocked storm drains.	Flooding 0.3 - 0.5m deep in 2013 event
79	June 2008	The water from no. 7 unit 2, then streamed down in front of unit 2 and into no. 6, which together with the water from no. 1 flooded unit 2. (SES attended, leaving sandbags). Resulting in resident in 2/6 getting out of bed into 10cm of water. Carpet was replaced throughout and some lounge furniture was ruined.	Model shows overflow from drain and flooding around Unit 2 to depths of 0.3m and adjacent properties but no overflows through no 7 (or 5). Possibly improvements made to drain in recent years
86	No flood event specified	Flows emerge into yard via piping in subsoil from drain uphill of property	TUFLOW model does not simulate subsoil flows but shows surface flows overflowing from drain
87	5/02/2002	There has only been one occasion that water has gone through my yard, that was due to a cloud burst that produced around 10 inches in a short amount of time. The gully above me could not cope with this downfall. Not sure of the year, think it was either 2002 or 2003. Date of downpour 5th Feb 2002- record from local historians.	Minimal overflow in 2008 sim. Observation was 2002. Condition of gully may have changed over time
89	No flood event specified	Overflowing drainage at Ocean Drive past Christmas Cove Caravan park and before Fairwinds on Southside of road. Threatening water just east of Brother Glen Road on south side of road. See markings on map I have made to indicate where flooding has occurred.	Significant flooding over Ocean Drive west of Lake
90	2001	The February 2001 event was the worst one we have had with the stormwater rushing down the Pelican Court extension road halfway up my thighs, about 28" deep.	0.6m in walkway. unsure if current drainage was th
93	03/2013, 3/2014	Both march 2013 and 2014 the reserve was flooded behind us, see photos.	Model shows similar flood behaviour.
95	15/03/2017	No problems observed in 6 years of residing at this address.	No flooding - ok

100	No flood event specified	Map indicates flooding around Quarry and Mill Street area House #1 has had water lapping their premises and I have seen photo's of #3 flooded. The last flood we had seen the water lapping the fence lines and flooding the Haven Caravan Park. Everyone moved their cars in our drive. We need something done with the open gully running down the Street to the river.	Model indicates flood flows from fire trail and adjacent areas 3cumeecs in 2008 simulation
102	No flood event specified	The block where the units are was taking all the water into its yard, now it is coming our way more than ever.	Model shows ponding and overflows from roadside drain
114	No flood event specified	Garage floods every time there is heavy rain- suspected underground watercourse	Model replicates observed flood behaviour
124	No flood event specified	As we live on the corner of Laurie Street and Quarry Way we only suffered surface water on the lawn, however, units on the corner of Lord Street and Seymour Street had a brick fence washed away, the Hotel bottle shop, as well as the shops in the arcade were flooded and Bold Street was under water.	TUFLOW model does not simulate subsoil flows but shows surface flows overflowing from drain
129	5/02/2002	When heavy rain is falling consistently, our courtyard floods from the house behind our villa	Significant flooding in Bold St and at Seymour/Lord St in 2008 simulation
132	No flood event specified	Property reported as flood affected. No specific observation given.	Model shows overflows from Peach Grove and through adjacent property with depths over 200mm in 2008
142	No flood event specified	Marked as property flooded but no specific report	Model shows flooding of property
157	No flood event specified	Marked as property flooded but no specific report	Not on flow path. Minor ponding of local runoff on uphill side of house
159	No flood event specified	In the past damage has occurred to the cyclone mesh fence parallel to the gateway Rd in the vicinity	Not on flow path. Minor ponding of local runoff on uphill side of house
167	No flood event specified	Trees and debris in drain behind house contribute to flooding into backyard	Significant depths of flow against fence likely to result in damage
170	No flood event specified	April 2000. Approx. 1/2 metre deep in roadway. Did not get into our house but came close	Model shows flooding into backyard and also overflows from street, ok
176	No flood event specified	Flooded several times in the past. Washed away reconstructed bitumen driveway next door.	1m in road in 2008 sim need to trial with rerun si
183	No flood event specified	Property Almost flooded - top side of land adjoining house about 15cm deep in water	Whole property flooded including depths of up to 0.3m around the dwelling in 2008, 0.2 in 2013. Ok
187	No flood event specified	In 16 years of living in the said address I have experienced flooding of the road on 2 occasions. Water to the base of my dwelling to a depth of 1m on the road.	Not on flow path. Model shows ponding to 0.2m on high side of house
199	No flood event specified		Flood depths to 1m in road sag nearby. Minor ponding at subject house.

Model Calibration and Verification Report



202	No flood event specified	Overflows from laneway resulting in damage and damp in the house	Not adjacent to a flow path or significant drain. May be local or road runoff directed to the path a
205	March 2016	March 2016 the street outside my property was under approx. 500mm water. The easement down the side was a river. This occurred about 2am. By 9am the water had subsided. Following the drain being cleared of debris the drain has been flowing OK since then however the event happened again around the same time this year.	0.5-0.6m in street 2008, significant flow in easement, ok
209	No flood event specified	Creek through property between villas breaks banks and floods through properties, debris blockages of channel.	Model replicates flooding of property in each calibration event
215	No flood event specified	Property reported as flood affected.	Flooding of property and road
218	2011 2013	The fire trail behind this property was flooded twice after two separate rain storms when 250mm of rain fell about 2011 and 2013. The fire trail was overgrown with vegetation and tree branches which resulted in water about 100mm deep running over the bank and into adjacent properties. This runoff ran under the homes and into the garages, the water in the side of my house banked up and ran into the weep holes in the brickwork.	Flows down side of house. Shallow to 0.1m, some lo
219	No flood event specified	Stormwater drain on Peach Grove (located on the kerb closest to the reserve and opposite the intersection often floods in heavy rain	Sag is flooded to depths of 0.3m in the 2008 simulation
222	No flood event specified	Stormwater overflows from road	model reflects observations
228	No flood event specified	Nuisance flooding apart from river flooding	Shallow ponding and model matches observations
232	No flood event specified	Flooding damage required repairs by insurer	Model shows flooding at rear of house to 0.3m
252	No flood event specified	Photos will show as the watercourse is not sufficient to handle the amount of water and bursts its banks and floods several properties	Model replicates this flood behaviour in 2008 and 2013 simulations.
256	No flood event specified	Property flood affected - minor	Shallow ponding in backyard 0.05 - 0.1m
262	No flood event specified	The corner intersection of Tunis Street and Lake Street always has problems with flooding.	Widespread shallow flooding at intersection of Lake St and Tunis St and flooding of adjacent property
280	No flood event specified	Creek through property between villas breaks banks and floods through properties	Model replicates flooding of property in each calibration event
285	No flood event specified	Property flooded	Significant flooding of property
1001	March 2013 daytime	Swift flows in walkways between buildings. Approx. 300mm deep, >1m/s down walkway	Flow depths 0.3m and velocities 1.5-2m/s in 2013 simulation

Model Calibration and Verification Report

Flinders Drive Laurieton	No flood event specified	Previous work done with drainage and regrading verge. Flooding Feb 2008 into garage and nearly front door. Concern that runoff from next door new development is being directed to subject property.	Overflows from road and ponding in driveway and front yard to 0.3-0.4m. in April 2008 simulation.
Lake Street Laurieton	No flood event specified	Water covering Lake Street, Ocean Drive, 50-100mm in car port of property. Five properties in Lake St and Laurieton Gardens Caravan Park also Ocean Dr affected. Photos provided.	100mm flood depths in the driveway of property and car port
Lake Street Laurieton	No flood event specified	Property has flooded 4 times since 2010. Not until units next door were built 2 properties up the street.	Model replicates observed flood behaviour
Flinders Drive Laurieton	2008	Photos attached. Significant flows in rear swale and through fences into property, rubble deposited	Model results of flow depths up to 0.3 – 0.5m with flow patterns (flows through fence) match the April 2008 photos.
Quarry Way Laurieton	2013	Heavily overgrown, many trees down in drain. Reported up to 1m depths in March 2013 on adjacent properties. Sections very porous with springs popping up	Flows in drain immediately behind properties to 0.2m in the March 2013 event, maximum depths of 0.7m on properties.
Castle Street Laurieton	No flood event specified	Excessive stormwater onto property, lapping at back steps and under house	Flood depths 0.2 – 0.3m on low side of house. Reasonable match to observation.
Dalton photo 2008_010 to 014_049	2008	Flows in swales draining to Pelican Court appear to be 0.3 – 0.5m deep but after peak of storm	Model shows depths of 0.7 – 1.2m at peak of storm.
Dalton photo 2008_015	2008	Photo shows flooding over road verge to property fence line, depths of 0.1-0.2m against brick wall	Model shows depths to 0.1m and similar extent
Dalton photo 2008_019	2008	Photo shows large quantity of rubble and gravel deposited on driveway from adjacent creek	Good match by model to observed flood behaviour with depths 0.3-0.4m in peak
Dalton photo 2008_016	2008	Photo shows SW side of Ocean Drive east of Flinders Drive flooded, flows just overtopping crown of road, after peak of storm	Peak depths overtopping crown are 0.15m in 2008 simulation
Dalton photo 2008_024	2008	Flooding of Flinders Drive/Ocean Drive intersection to estimated 0.2-0.3m after peak of storm	Peak depths overtopping crown are 0.3-0.4m in 2008 simulation
Dalton photo 2008_047	2008	Rosewood Court at Mission Terrace, flows in road up to approx. 0.2m	Peak depths in intersection 0.3-0.4m in 2008 simulation