

Flood Resilience:

Risks, Mitigation and Funding Solutions



Institute of Actuaries of Australia

HERITAGE BALLROOM, WESTIN HOTEL, SYDNEY

Monday, 16 May 2011

Estimating Flood Risk and Flood Mapping

Mark Babister
WMAwater
Engineers Australia



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Determining Probabilities of Flooding

- Australian Rainfall and Runoff –National Guidelines on design flood estimation
- Last update 1987
- 1 of the 14 books updated 1999
- 4th update underway
- \$4 Million of funding so far from DCCEE
- Large volunteer effort

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Whats new in this version

- Updated techniques
- Blockage
- Climate change
- Better understanding of interaction of ocean and rainfall flooding

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Blockage -Wollongong 1998



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Blockage Newcastle 2007



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ARR87 and climate change

- “It should be noted that no consideration has been given to the long term effects of climatic change, a topic which is receiving increasing attention in the scientific literature.”
- “As no reliable estimates of climatic change are available, it has been assumed that the statistical characteristics of heavy rainfall and floods remain constant throughout the design life of projects.”

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1999 Book 6 Update

- “If, however, procedures are subsequently developed that are shown to have a scientifically credible basis then it may be appropriate to allow for the effects of climate change in the design process.”

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New Edition

- Climate change strategy being prepared with BoM, CSIRO, DCCEE
- Higher temperatures means more moisture carrying potential in the atmosphere
- Change in antecedent conditions
- How rainfall extremes change is probably the hardest part of climate science

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New Edition

- Statistical and dynamic downscaling techniques based on GCM research
- No climate change signal detected in Australian rainfall record (95% significance)
- Not unexpected – huge variability, high signal to noise ratio

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Flood Mapping

- Wanted by
 - Council's
 - Planning agencies
 - SES
 - Insurance Companies
 - Home purchasers
- Not wanted by Home sellers
- Historically has been politically controversial

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Accuracy

- Land use planning +/- 300mm
- Councils (like to be conservative) +/- 300mm
- Insurance ???
- Public perfect

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Bias

- Land use planning = nil
- Council = some like to be conservative
- Insurance = nationally consistent

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Data Input

- LIDAR – only cost effective way for doing large areas
- Government – National program to co-ordinate and share data

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Mapping

- In Australia with our high streamflow variability only reliable way is using Hydrodynamic models
- Simple GIS techniques do not work
- Rapid evaluation techniques do not give required accuracy and have large bias

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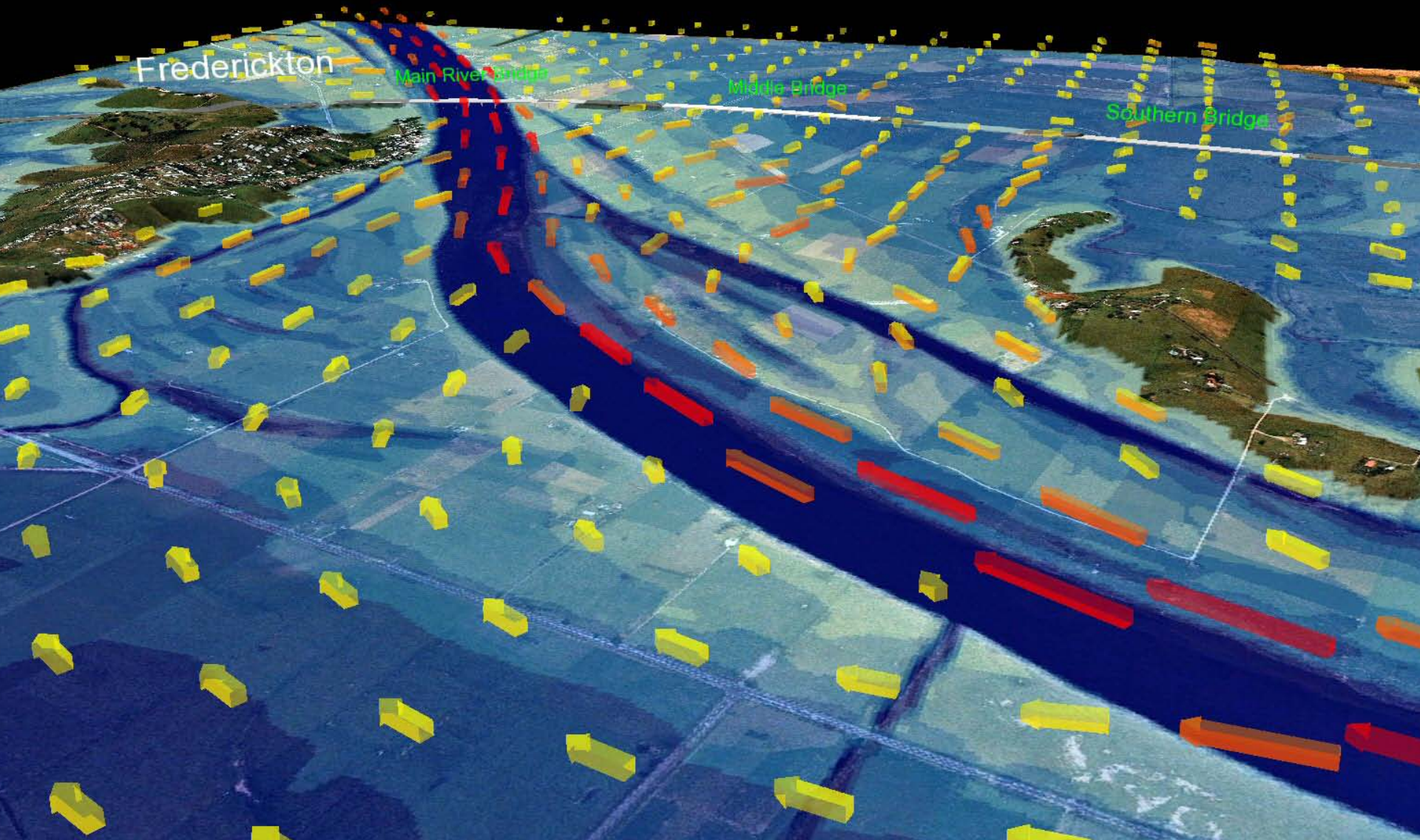
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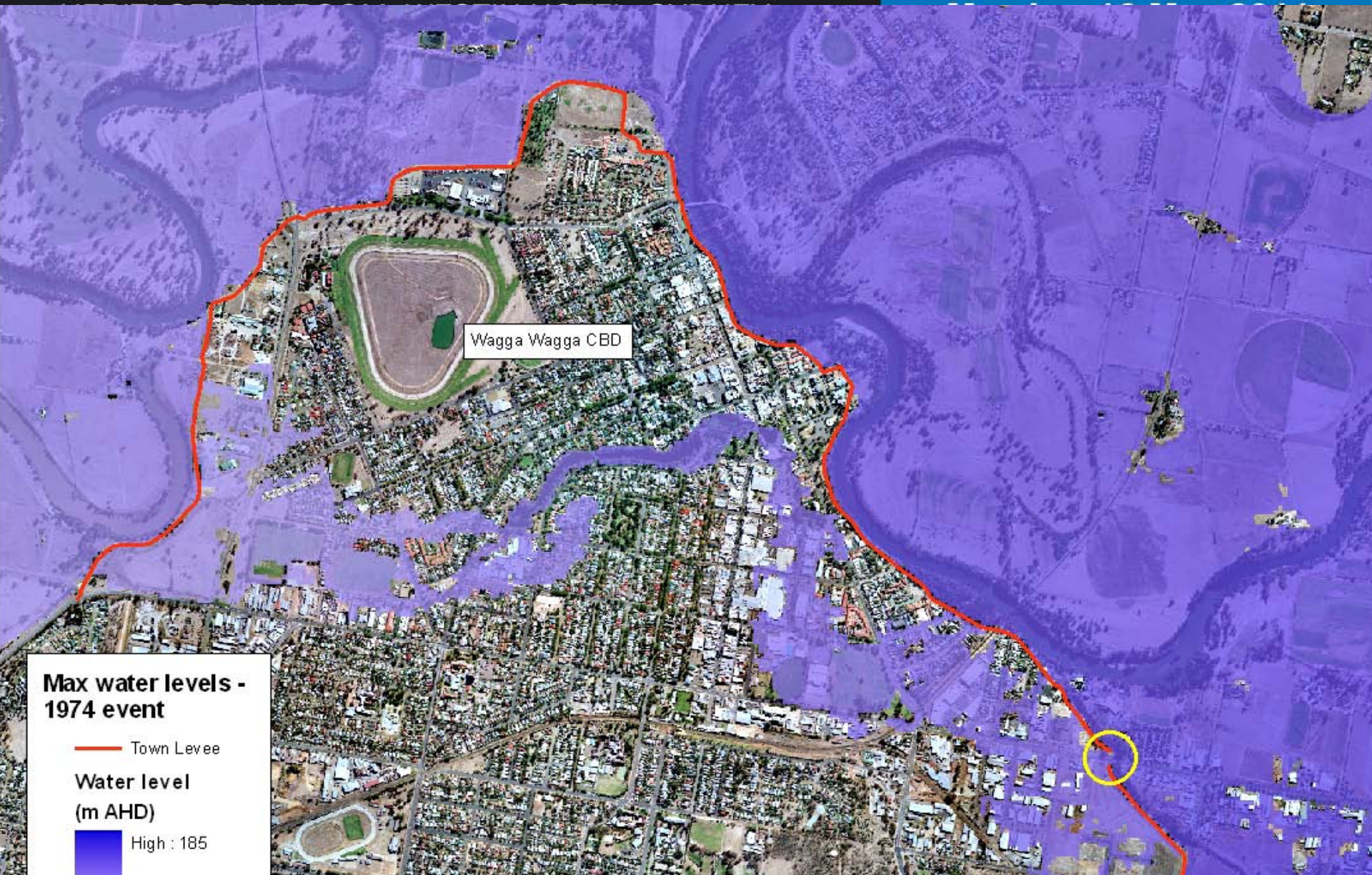
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**Max water levels -
1974 event**

— Town Levee

Water level
(m AHD)

High : 185

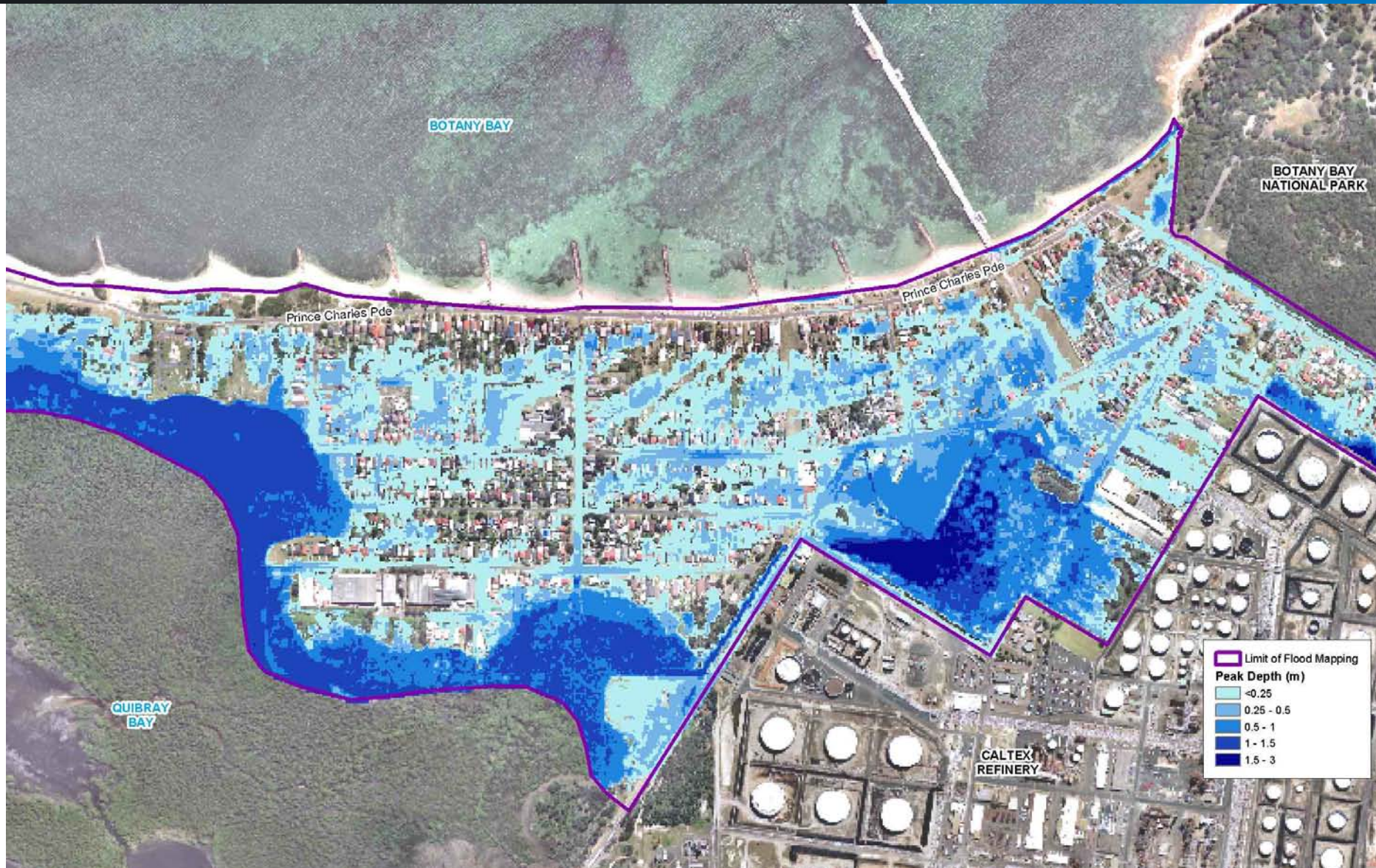
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Project 15 -2D simulation

- National guideline on 2D modelling
- The next edition of ARR will provide guidance on appropriate usage
- The aims of the project, therefore, were to develop guidance on:
 - model conceptualisation and representation of hydrological and hydraulic processes, inclusive of loss modelling;
 - influence of the conceptualisation on the input data;
 - influence of the conceptualisation on parameter estimation and the uncertainty in parameter estimation;
 - predictive uncertainty; and
 - analysis of model output.

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What should we be doing?

- Simple things
 - All houses 300mm above ground
 - Make community aware there is a real risk of flooding and big floods do occur
 - \$5million for ARR
 - Make all information public
 - High flow stream gauging

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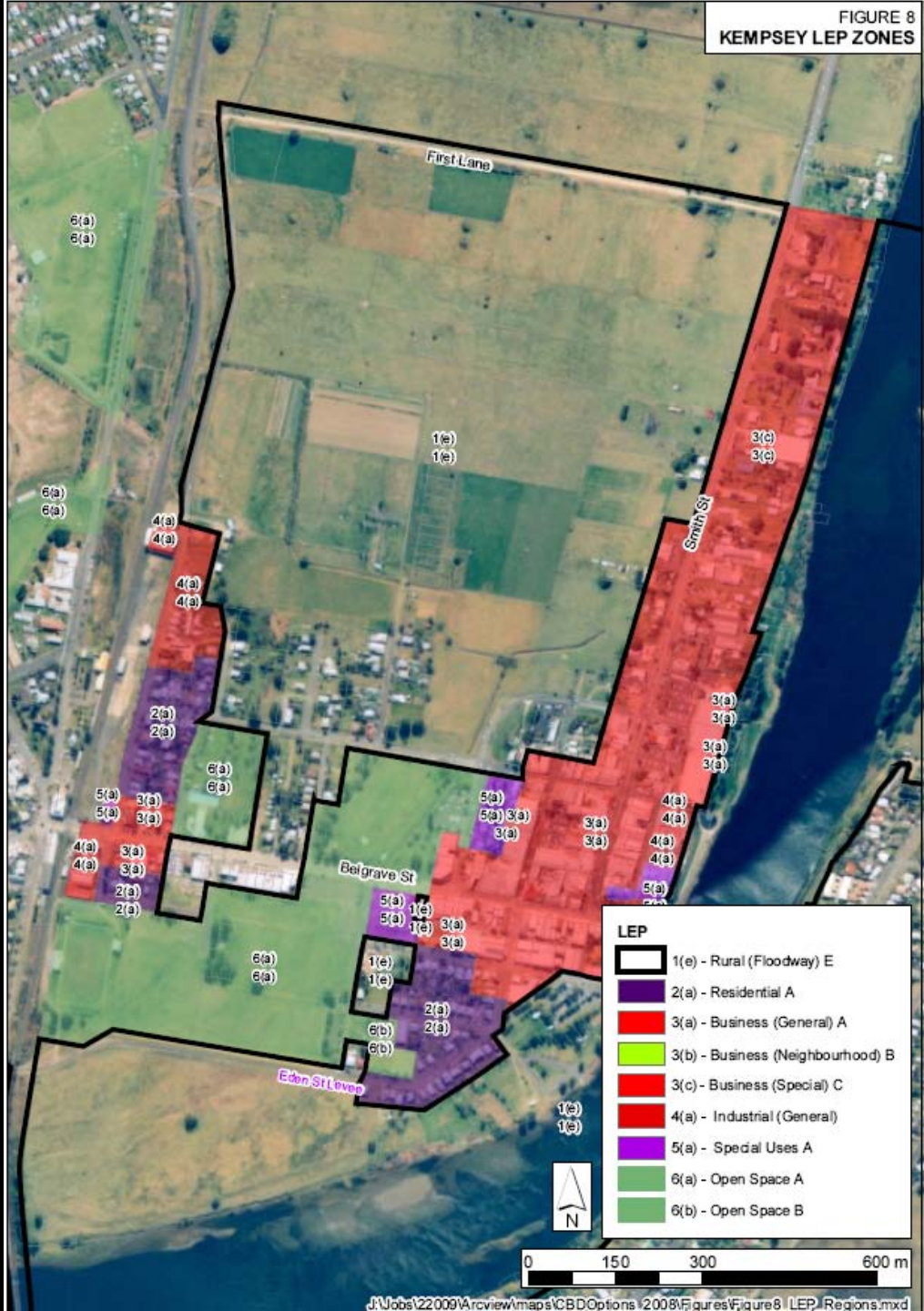
What should we be doing?

- Hard things
 - Quality flood studies
 - National mapping (\$300M at quality needed for land use planning)
 - Stop blocking urban flow paths
 - Correct land use planning (get right first time)
 - Land swap
 - Other innovative ways to remove high risk properties

LEP Zones

LEP

	1(e) - Rural (Floodway) E
	2(a) - Residential A
	3(a) - Business (General) A
	3(b) - Business (Neighbourhood) B
	3(c) - Business (Special) C
	4(a) - Industrial (General)
	5(a) - Special Uses A
	6(a) - Open Space A
	6(b) - Open Space B



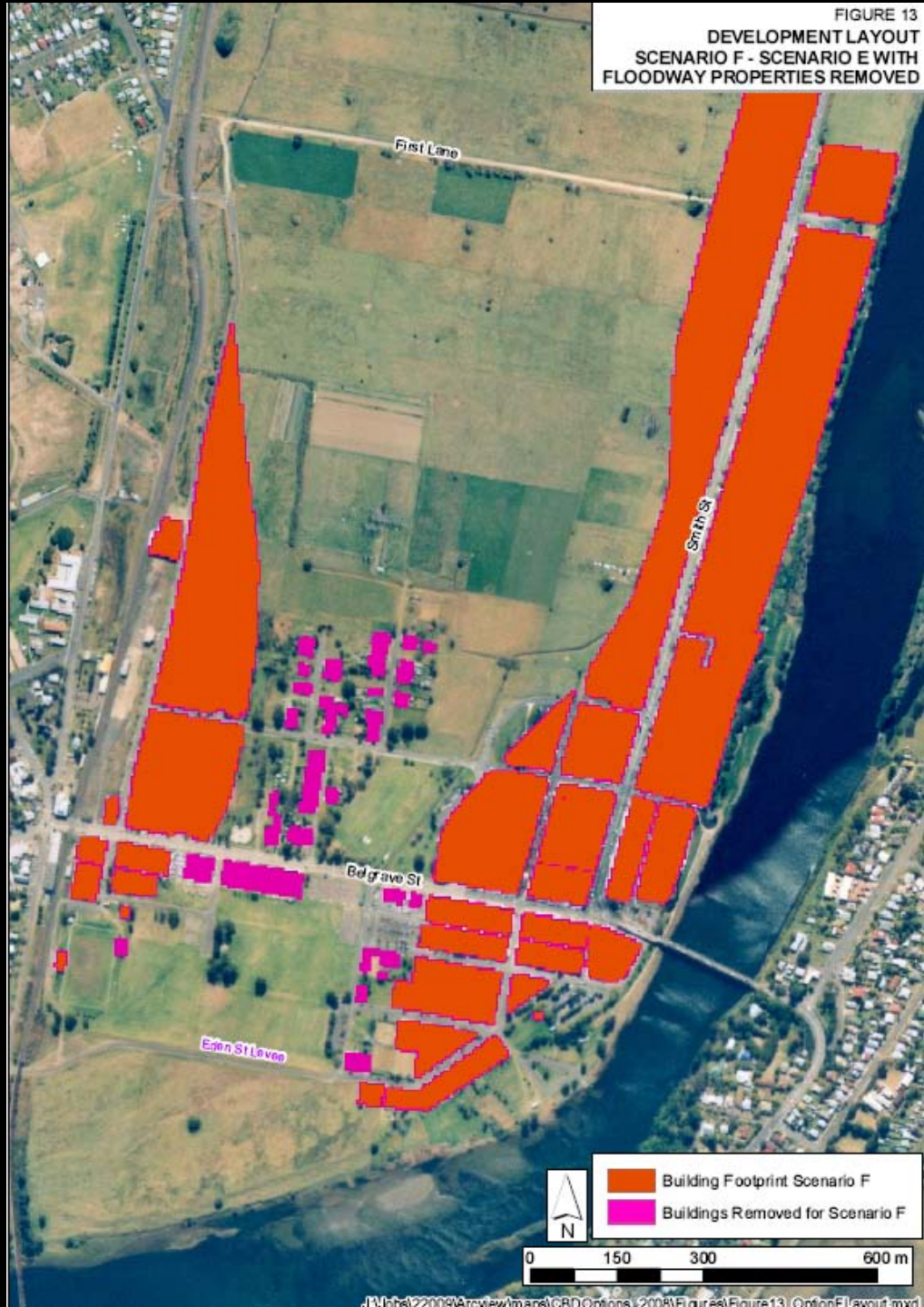
DEVELOPMENT LAYOUT

Layout with Floodway Properties
Removed— Scenario E & F

FIGURE 13
DEVELOPMENT LAYOUT
SCENARIO F - SCENARIO E WITH
FLOODWAY PROPERTIES REMOVED

Development Layout

- Orange square: Building Footprint Scenario F
- Pink square: Buildings Removed for Scenario F



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Find out more

- www.arr.org.au
- arr_admin@arr.org.au

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Projects

The projects are

1. Development of rainfall intensity-frequency-duration (IFD) information across the country
2. Spatial patterns of rainfall
3. Temporal patterns of rainfall
4. Continuous rainfall sequences at a point
5. Regional flood methods
6. Loss models for catchment simulation
7. Baseflow for catchment simulation
8. Use of continuous simulation for design flow determination
9. Urban drainage system hydraulics
10. Appropriate safety criteria for people
11. Blockage of hydraulic structures
12. Selection of an approach
13. Rational Method developments
14. *Large to extreme floods in urban areas*
15. Two-dimensional simulation in urban areas

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Projects

16. Storm patterns for use in design events
17. Channel loss models
18. Interaction of coastal processes and severe weather events
19. *Selection of climate change boundary conditions*
20. Risk assessment and design life
21. IT Delivery and Communication strategies

All projects have started with the exception of the two in italics – Projects 14 and 19.