




Workshop with editors on application of Australian Rainfall and Runoff (ARR2016) in Urban Areas

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Outline







- Overview of ARR and relationship to Urban Book
- Philosophy and objectives of ARR Urban Book (Ch 1, 2 & 3)
- Volume management and conveyance (Ch 4 & 5)
- Afternoon tea with Q & A
- Modelling guidance and approaches (Ch 6)
- Losses, pre-burst rainfall, rainfall ensembles, storm losses and climate change
- Worked examples and discussion



ARR Urban Book: Coombes, Roso, Babister 7/01/2019

ARR History

- 1958 (version 1)
- 1977 (version 2)
- 1987 (version 3)
- 1999 (version 3.1 update for extreme floods)
- 2016 (version 4)



ARR Urban Book: Coombes, Roso, Babister 7/01/2019

Background

- Guideline not a standard as Australia is too diverse
- ARR is a 8 year project that commenced in 2008 with \$9.15 Million government funding
 - Over \$30 million in-kind effort
- Project has involved:
 - BoM, Geoscience Australia, CSIRO, state agencies
 - UTS, UWS, UNSW, Uni of Newcastle, Uni of Adelaide, Melbourne Uni
 - Most consulting firms




ARR Urban Book: Coombes, Rosso, Babister




WHAT IS ARR?

- Guideline for calculation of stormwater runoff, flows and flood behaviour
- ARR is not prescriptive
- ARR is a guideline document as the nature of hydrologic problems vary everywhere




ARR Urban Book: Coombes, Rosso, Babister



Development objectives for ARR 2016

- Use Australian data
- Practitioners are the primary audience
- To better represent real systems
- Scientific evidence based approaches
- Fit with and complement the broader set of tools used to manage the water cycle
- Where possible provide the uncertainty of methods and inputs

ARR Urban Book: Coombes, Rosso, Babister



Evidence Based

Evidence based:
 30 years additional data, science and knowledge
 From slide rule to computer age

ARR Urban Book: Coombes, Rosso, Babister

New supporting data for Australian Rainfall and Runoff

600 ↗ 2280 Pluviographs

Pluviographs measure the amount of rainfall which fall and are critical to flood estimation. The 1987 version of ARR used 600 pluviographs and ARR 2016 used 2280 pluviographs.

7500 ↗ 8074 Rainfall Gauges

The 1987 version of ARR accessed 7500 daily rainfall gauges and ARR 2016 used 8074 daily rainfall gauges from a range of sources.

↗ 30 Years of Data

ARR 2016 uses an additional 30 years of data.

2000 ↗ 100 000 Storm Events

The 1987 version of ARR analysed 2000 storm events for temporal patterns. ARR 2016 analysed 100 000 storm events.

ARR Urban Book: Coombes, Rosso, Babister

Application Objectives

- Computerise simple tasks
- Design inputs should be easy to use
- Minimise human errors in map/figure/table reading
- Reproducible
- Easily updated

ARR Urban Book: Coombes, Rosso, Babister

Big Changes in Practice

- Ensemble and Monte Carlo approaches to better capture variability
- Move away from simple burst approaches
- Less reliance on the rational method
- More data
- New IFD data
- Better flow estimates of ungauged catchments

ARR
Agriculture, Rural and Environment

What does the new ARR look like?

```

    graph TD
      ARR[ARR] --- Guidelines[Guidelines]
      ARR --- Spatial[Spatial Datasets]
      ARR --- Software[Enabling Software]
      Guidelines --- EPUB[EPUB]
      Guidelines --- Website[Website/HTML]
      Guidelines --- PDF[PDF]
      Software --- RFFE[RFFE]
      Software --- Coastal[Coastal/Ocean]
  
```

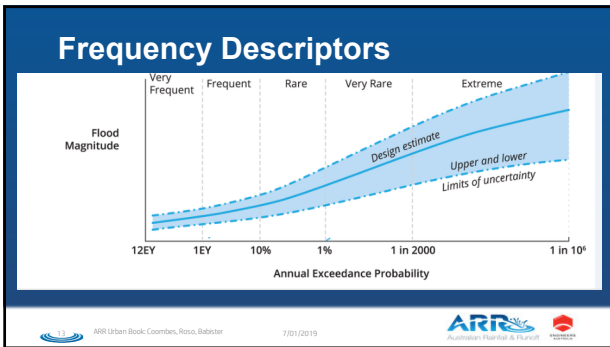
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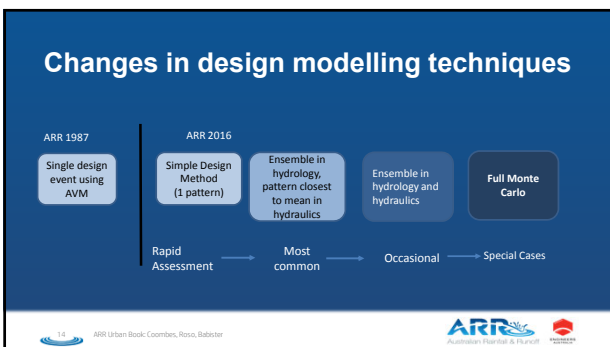
Terminology

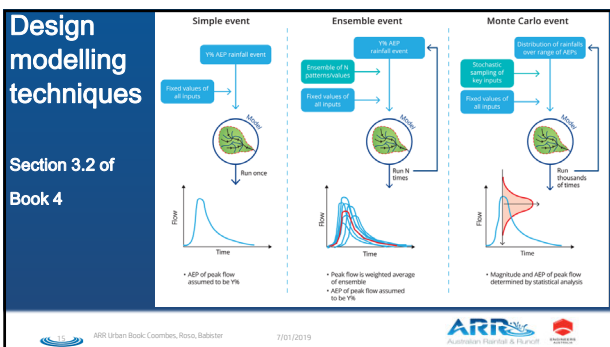
- ARI no longer recommended
- EY for frequent events to deal with seasonality

Frequency Descriptor	EY	ARF (%)	ARF (1 in N)	ARI
Very Frequent	12			
	6	99.75	1.602	0.17
	4	98.57	1.82	0.25
	3	95.91	1.96	0.33
Frequent	2	88.47	1.16	0.5
	1	63.21	1.58	1
	0.69	50	2	1.66
Rare	0.33	20.3	2.24	7
	0.22	20	5	6.88
	0.2	18.53	5.52	5
Very Rare	0.11	10	10	9.49
	0.05	5	20	20
	0.02	2	50	50
Extreme	0.01	1	100	100
	0.005	0.5	200	200
	0.002	0.2	500	500
Estimate	0.001	0.1	1000	1000
	0.0005	0.05	2000	2000
	0.0002	0.02	5000	5000

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Data online

<http://data.arr-software.org/>

Other data is being added to the databus including GSAM temporal patterns

ARR Data Hub
Enter coordinates or upload a shapefile

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Australian Rainfall & Runoff

Layers:
 ARF
 Temporal Patterns
 Pre burst
 Losses
 Climate Change
 Baseflow

ARR Urban Book: Coombes, Rosso, Babister

Data on the data hub

Data	Use
ARF	recommended
Temporal Patterns	recommended
Pre burst	recommended
Losses	In the absence of local data
Climate change factors	In the absence of location specific studies
Baseflow	In the absence of local data

ARR Urban Book: Coombes, Rosso, Babister

New enabling software

ARR
Australian Rainfall & Runoff

Interaction of River and Coastal Flooding

(Sediment Probability Modelling in Estuarine Regions)

This site implements the method developed in ARR Project 13, Interaction of Coastal Processes and Severe Marine Events.

All results derived should be considered as ARR as this is a data implementation of the method for testing and research purposes.

If this is your first time here, see Getting Started.

Input Data:

Regional Flood Frequency Estimation Model

Research project of the Regional Flood Frequency Estimation Model for the 4th edition of Australian Rainfall and Runoff

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Input Data:

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What is currently happening

Document is currently being updated

- PDF of document
- PDF by Book
- Glossary
- Web interface to include section referencing
- Examples
- Book 9 updated and almost complete

All the work is by volunteers

Ongoing work

- Climate change versus flood behaviour
- Spatial loss models
- Complete storms
- Urban flood frequency estimation
- Improved regional flood frequency estimations for rural catchments – improved rating curves for gauges
- Need more urban streamflow data

Can I keep using ARR87 ? ARR 2016 is still draft

The use of new or improved procedures is encouraged, especially where these are more appropriate than the methods described in this publication. It is certain that within the effective life of the document, new procedures and design information will be developed. ARR 87 Chapter 1, page 1 paragraph 6

