





# ARR Update


**Australian Rainfall and Runoff**  
A guide to flood estimation




## Supported by



**Australian Government**  
Department of Climate Change  
and Energy Efficiency



**Australian Government**  
Attorney-General's Department  
Geoscience Australia



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## ARR CURRENT STATUS



Important points are:

- Over 20 years since last revision with only one chapter revised in that period.
- Significantly longer records now available.
- IFD (rainfall) data over 25 years old.
- Written before a computer on every Engineers desk
- Climate change concerns
- \$4 Million in funding from DCCEE
- \$5.15 Million in funding from Geoscience Australia



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## Recent Releases:

- Areal Reduction Factors (ARF)
- Project 6 - Loss Models for Catchment Simulation- Rural Catchments
- Project 11 Stage 2 report on Blockage of Hydraulic Structures
- Project 15 (Two dimensional Modelling of Urban and Rural Floodplains)
- Monte Carlo Discussion Paper



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## Areal Reduction Factors



- Report provides a summary of ARF assessments around Australia that are recommended for current use in design practice for long duration events. It also provides a list of recommendations for future research work to further reduce any potential uncertainty in design flood estimates introduced due to uncertainties in the ARF.
- Report Available on ARR website.
- Work done by:
  - Phillip Jordan, SKM
  - Erwin Weinmann



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## Areal Reduction Factors



- Report on testing for short duration coming out next month.
- A workshop on short duration ARF's will be taking place soon.



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## Loss Models for Catchment Simulation- Rural Catchments



- Phase 1 – Pilot Study for Rural Catchments.
- Phase 2 – Collate Data for Rural Catchments.
- Phase 3 – Urban Losses.
  - Planned release in June
- Phase 4 – Analysis of Data for Catchments across Australia.



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## Loss Models for Catchment Simulation- Phase 1



- A range of conceptual loss models were considered for application to rural catchments and the following 4 models are considered most suited for further development for design flood estimation in Australia:
  1. Initial loss – constant continuing loss
  2. Initial loss – constant proportional loss
  3. Initial loss – variable continuing loss
  4. Probability distributed storage capacity loss model



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## Loss Models for Catchment Simulation- Phase 1



- This work was completed by:
  - Peter Hill (SKM)
  - Zuzanna Graszekiewicz (SKM)
  - Kristen Sih (SKM)
  - Dr Ataur Rahman (EnviroWater Sydney)
- Some work also completed by:
  - Leanne Pearce (Water Corporation)
- This report was independently reviewed by:
  - Erwin Weinmann
- Report is available on ARR website



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## Blockage of Hydraulic Structures



- The principal areas of interest within this report are culverts and bridges as cross drainage structures and the inlets and pipes of urban drainage systems.
- The issues addressed within this report include:
  - Design of drainage systems
  - Evaluation of the performance of existing systems
  - Management of blockage
- Report available on ARR website



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## Blockage of Hydraulic Structures



- Work completed by:
  - Bill Weeks, AR&R TC Project Manager, Queensland Department of Main Roads (Brisbane).
  - Grant Witheridge, Catchments & Creeks (Brisbane).
  - Ted Rigby, Rienco (Wollongong).
  - Anthony Barthelmess, Cardno Forbes Rigby (Wollongong).
  - Geoff O'Loughlin, Anstad (Sydney).
- This report was independently reviewed by:
  - Ian Joliffe, GHD



## Project 15



- At the time that the 1987 Edition of Australian Rainfall and Runoff was prepared, the use two-dimensional hydrodynamic models computationally impractical for real world problems.
- Since that time the situation has changed considerably with technological advances enabling 2D models to become the tool of choice for most hydraulic flood assessments.
- For this reason it is necessary to provide guidance on the use of 2D models as part of the updating of ARR.



## Two dimensional Modelling of Urban and Rural Floodplains



- This project aims to provide guidance to:
  - modellers,
  - those who commission studies
  - users of model results.
- document has been prepared in a collaborative approach by a team of Australian industry experts in the field of two dimensional hydrodynamic modelling.



## PROJECT TEAM




- Main contributors:
  - Mark Babister , Editor and AR&R TC manager, WMAwater
  - James Ball, UTS
  - Cathie Barton, Editor, BMT WBM,
  - Warwick Bishop, Water Technology
  - Steve Gray, WMAwater
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  - Stefan Szykarski, DHI
  - Rhys Thompson, Cardno
  - Bill Weeks, QLD Department of Transport and Main Roads
- and thank you to:
  - Roger Austin, Wallingford Software
  - Martin Lambert, University of Adelaide
  - John Macintosh, Water Solutions
  - Steve Muncaster, DSE
  - Habib Rehman, Hydrostorm
  - Chris Thomas, Worley Parsons
  - Connie Kotze and Amelia Grace for the Graphic artwork, Cardno
- Note: All project team members provided their time on an in kind basis



## Report Structure

Chapter no.	Chapter Title
1	Introduction
2	2D Conceptualisation
3	Fundamentals
4	Modelling Process
5	Data Requirements
6	Model Schematisation
7	Calibration and Sensitivity Testing
8	Interpretation of Results
9	1D/2D and 2D/2D Combinations
10	Current Issues
11	Direct Rainfall
12	Recommendations



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## Who is this report for?


- Flood modellers
  - experienced and inexperienced
- Commissioners of work
  - Council, State, Government


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- **Current work:**
  - Project 1.3 Stage 3 - Rainfall Intensity-Frequency-Duration (IFD) Relationships under Climate Change


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## IFD Relationships under Climate Change



- As part of stage 3 funding for the Climate Change component of Project 1 was received (over 1 million dollars). The project official started with an inception meeting last month between the project team including CSIRO, BoM, University of Adelaide, and UNSW.
- The goals of the project are to:
  - Quantify possible changes and uncertainties in rainfall intensity-frequency-duration (IFD) curves due to anthropogenic climate change.
  - Provide interim advice to practitioners on how these changes can be included into design and planning decisions.
- Expected to be completed in 2015



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- **Upcoming Releases:**
  - Temporal Patterns
  - Continuous Simulation
  - Position Paper on Urban Rational Method
  - Urban Losses
  - Short Term Duration ARF



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# Project 5 software demonstration

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## Test Catchments



This project is aimed at:

1. Testing and validating new methods
  2. Demonstrating how new methods work
  3. Testing the practicality of new methods
  4. Understanding implementation uncertainty
- This is where different practitioners can get significantly different answers when applying the same methods and models.



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## Test Catchment Criteria



1. One to two examples from each state
2. Good catchment data
  - high resolution rainfall data (pluvi data data)
  - long term streamflow data
  - quality rating curve
  - quality terrain data including ALS or similar
  - pipe network details in urban catchments
3. Mix or rural and urban catchments
4. Information made available for all
5. Each state will recommend their catchments



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## Participation



- Participants will need to commit to an "open process" where if you want your results included you will need to show all your work
  - Input files
  - models used
  - output
  - assumptions
- Work cant be used for promotion



## Tests



- Tests will include but arent limited to:
  - 2D modelling
  - Direct rainfall
  - Hydrologic modelling
  - New methods



## How to get Involved



- Those interested in officially reviewing projects should send an email briefly describing which projects they are interested in reviewing and what qualifications/experience they have in those practice areas.
- Also unofficial comments on projects are welcome
- Email: [arr\\_admin@arr.org.au](mailto:arr_admin@arr.org.au)
- Join LinkedIn group
- Leave your business card in the box at the back.



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## Recommendations for the Interim



- Sensitivity testing with new inputs



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