

Separating the Risk in Flood Risk Modelling



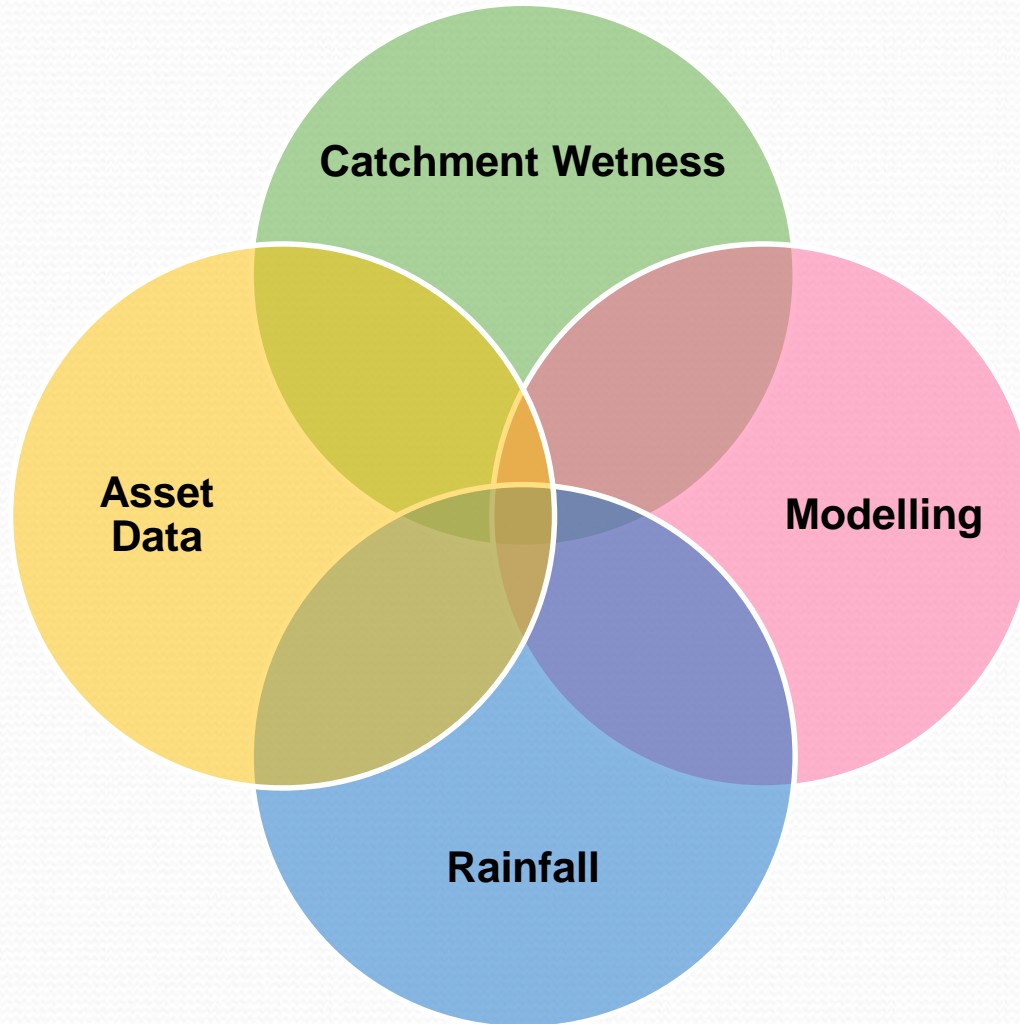
16th September 2016
BRIM Workshop
Loughborough

Richard Allitt

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Uncertainties in Flood Risk Modelling



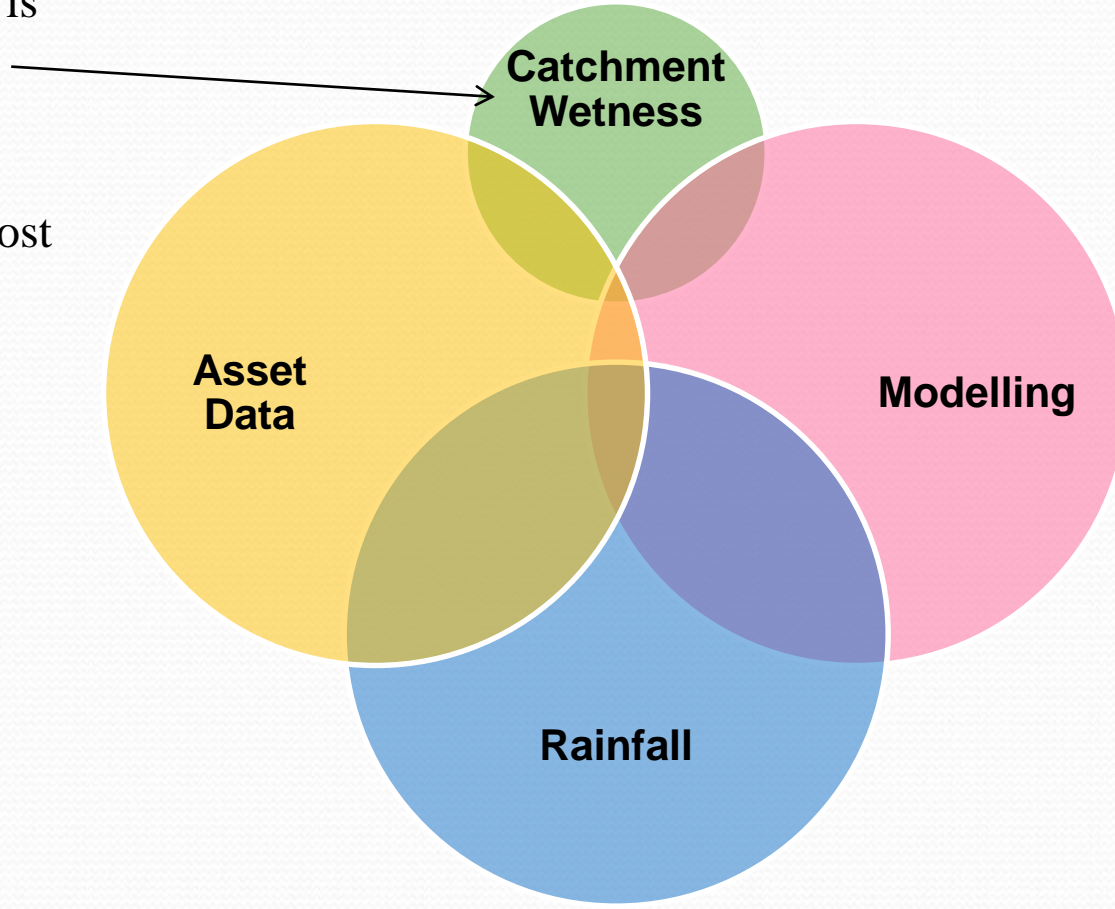
Catchment Wetness

- Particularly relevant in fluvial flooding as the bulk of the runoff is from rural pervious surfaces which are greatly influenced by the degree of saturation (ie catchment wetness).
- Less relevant in urban flooding when most flooding is from other sources (sewer, pluvial etc) as most runoff is from impermeable surfaces where the percentage runoff remains more or less constant.

Uncertainties in Flood Risk Modelling



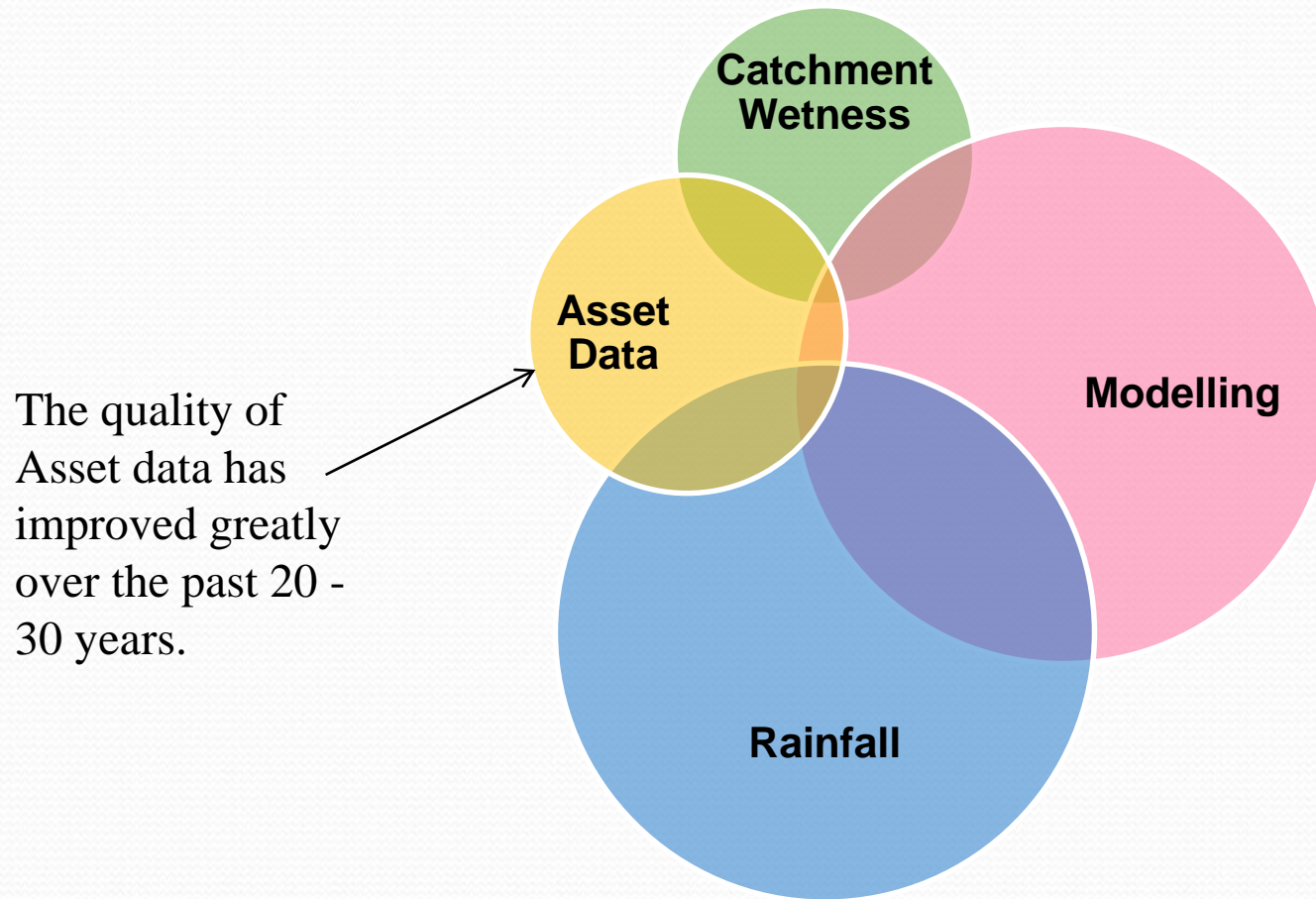
Urban runoff is not greatly affected by catchment wetness as most runoff is off impermeable surfaces.



Asset Data

- Improved records (?)
- CCTV
- GIS
- Lidar
- Inferencing & interpolation
- Improved monitoring & control

Uncertainties in Flood Risk Modelling

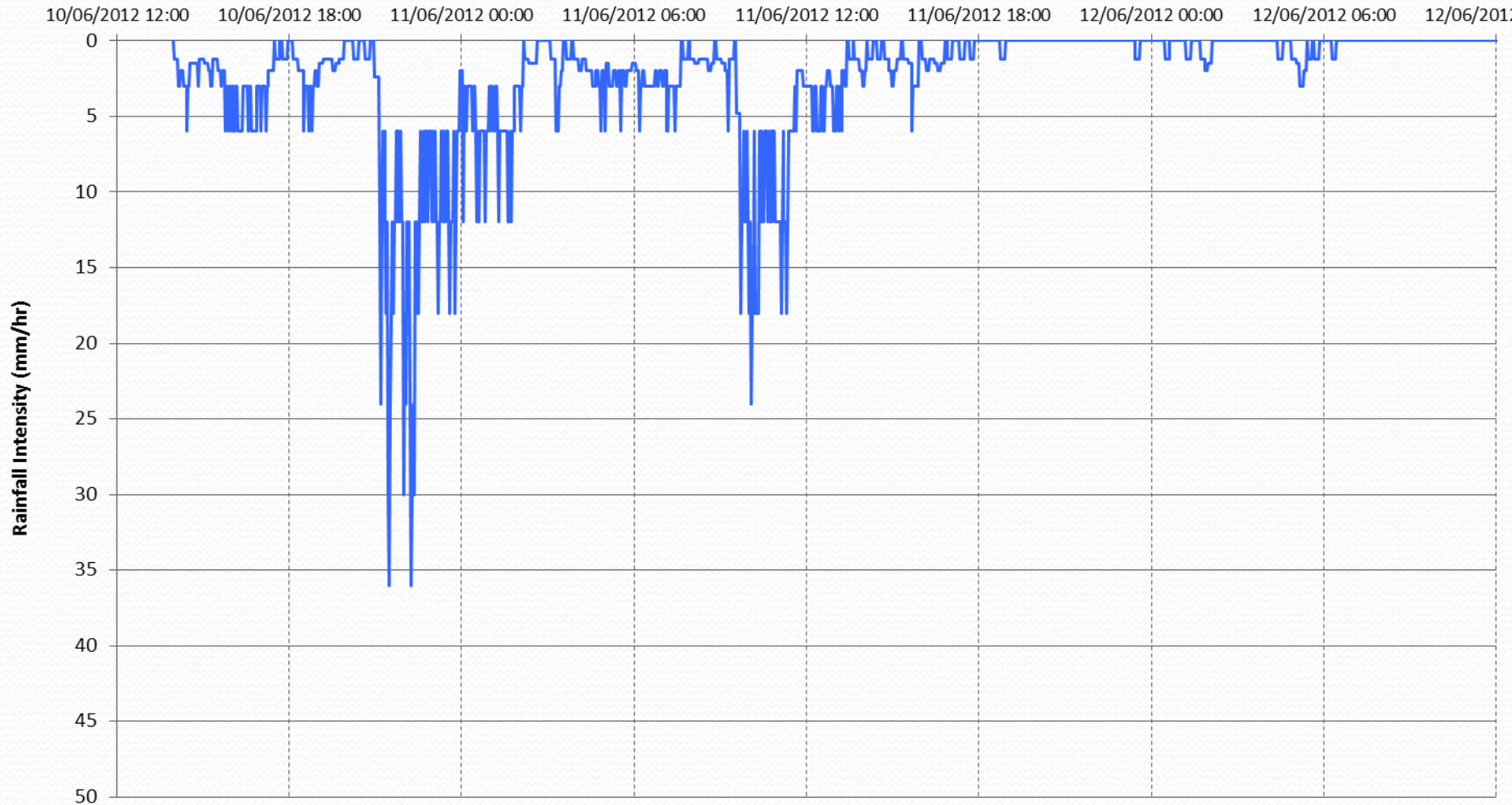


The quality of Asset data has improved greatly over the past 20 - 30 years.

Rainfall

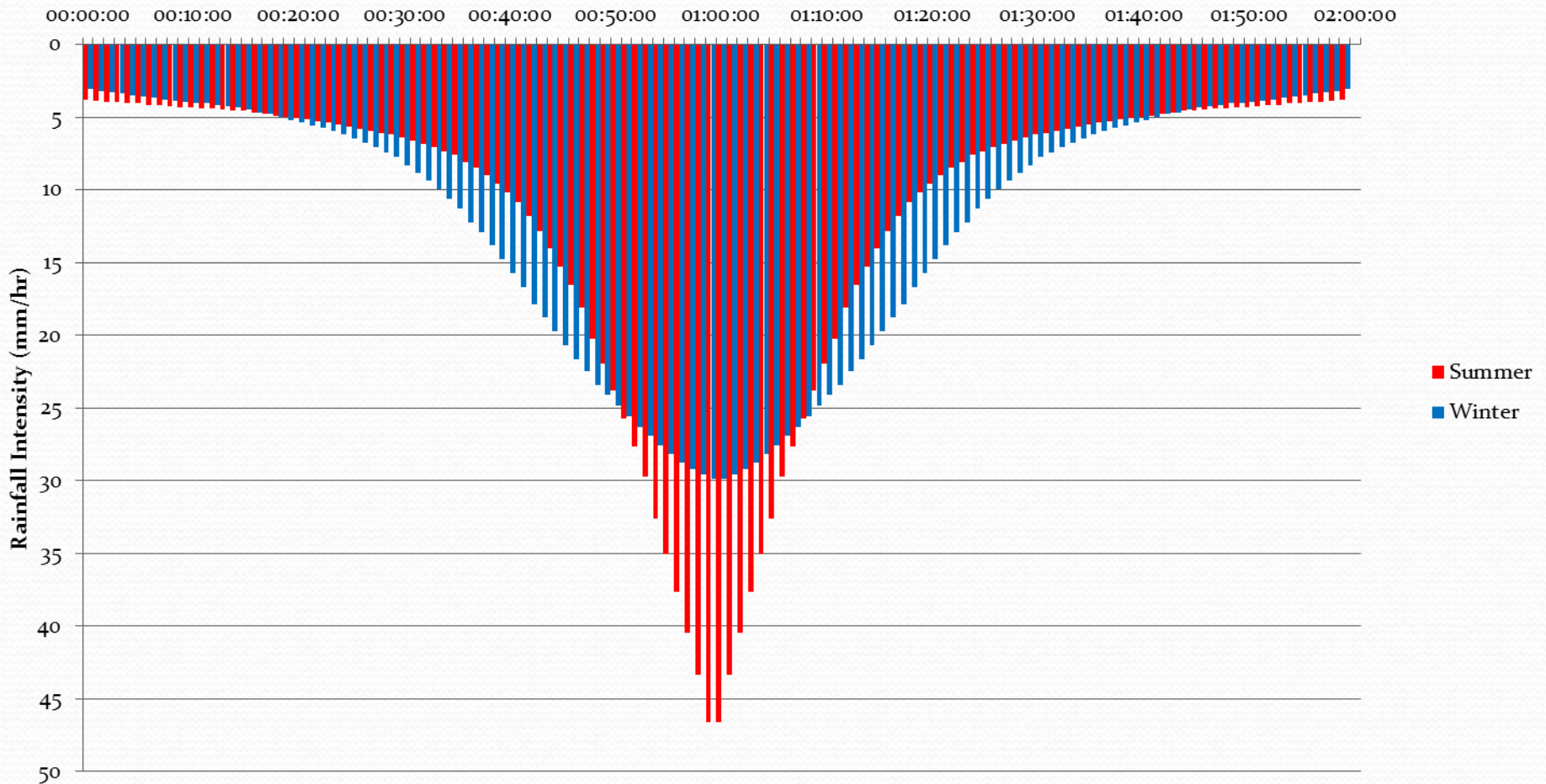
- Weather radar
- More extensive raingauge coverage
- Better global weather models
- Better understanding of weather processes
- Improved forecasting

Real Rainfall



Design Storms

Summer & Winter Rainfall Profiles

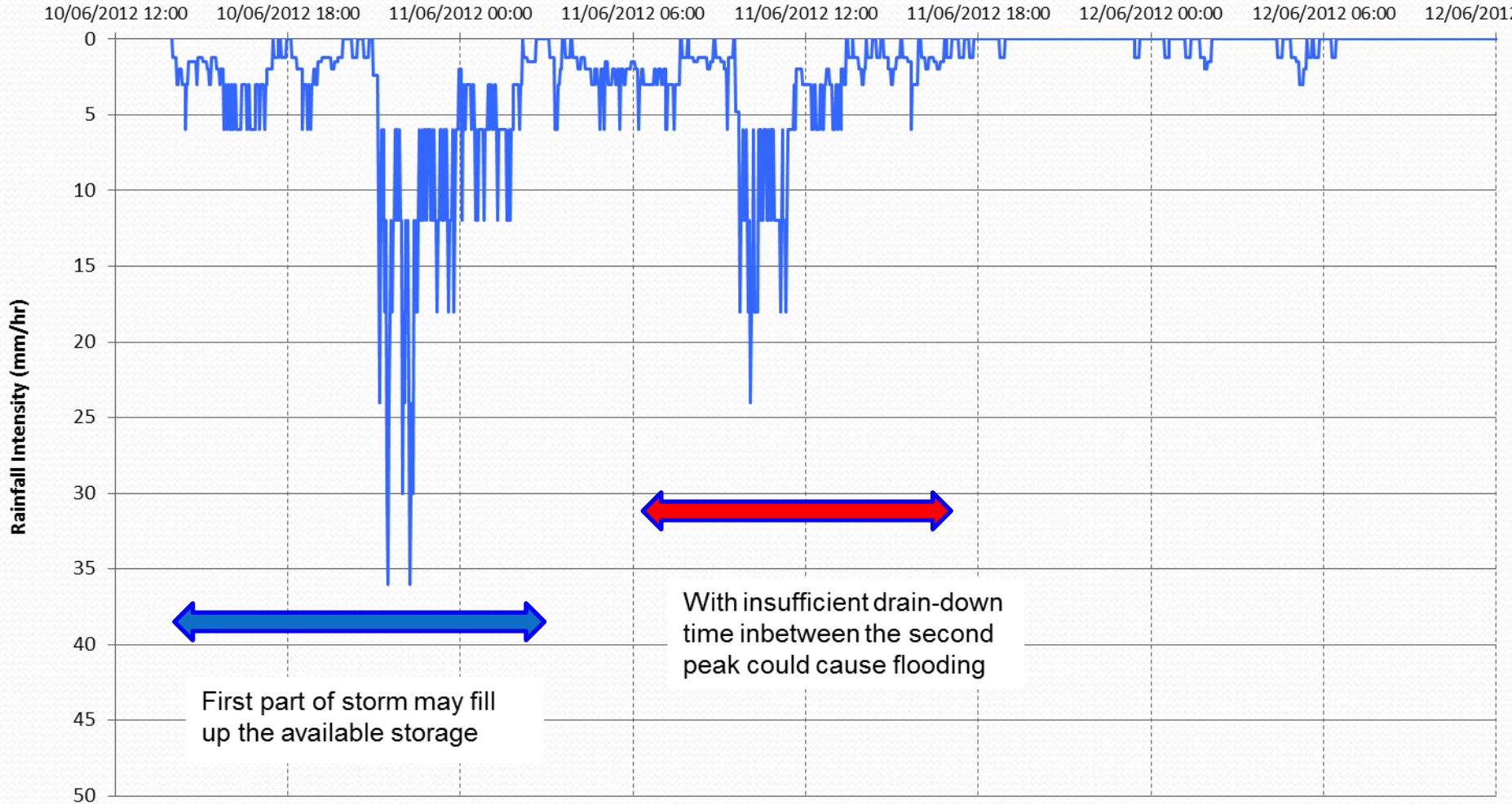


River Thames 2013-2014

A succession of minor storms caused the River Thames to flood to between the 1 in 100 year and 1 in 200 year flood level.



Real Rainfall



Named Storms

- Abigail 12-13 Nov 2015
- Barney 17-18 Nov 2015
- Clodagh 29 Nov 2015
- **Desmond 5-6 Dec 2015**
- Eva 24 Dec 2015
- Frank 29-30 Dec 2015
- Gertrude 29 Jan 2016
- Henry 1-2 Feb 2016
- Imogen 8 Feb 2016
- Jake 2 March 2016
- Katie 27-28 March 2016

Milestones in Hydraulic Modelling Software

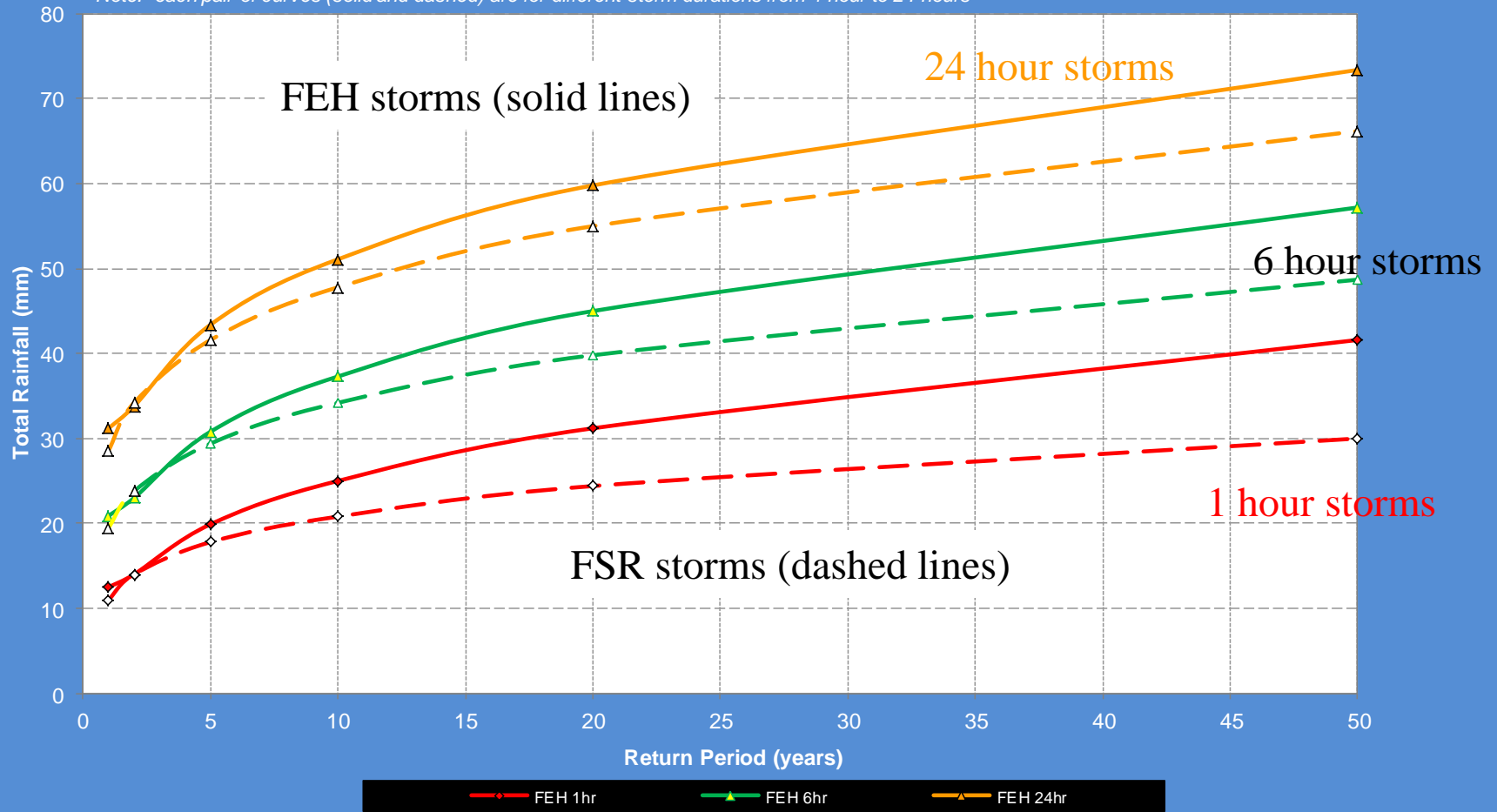


- **1975 Flood Studies Report (FSR)**
- 1981 TRRL Hydrograph
- 1981 Wallingford Procedure published
- 1982 Mainframe WASSP
- 1984 MicroWASSP
- 1989 Walrus
- 1992 SPIDA
- 1994 HydroWorks
- **1999 Flood Estimation Handbook (FEH)**
- 1998 InfoWorks
- 2010 InfoWorks ICM

READING

Compare FEH & FSR Return Periods

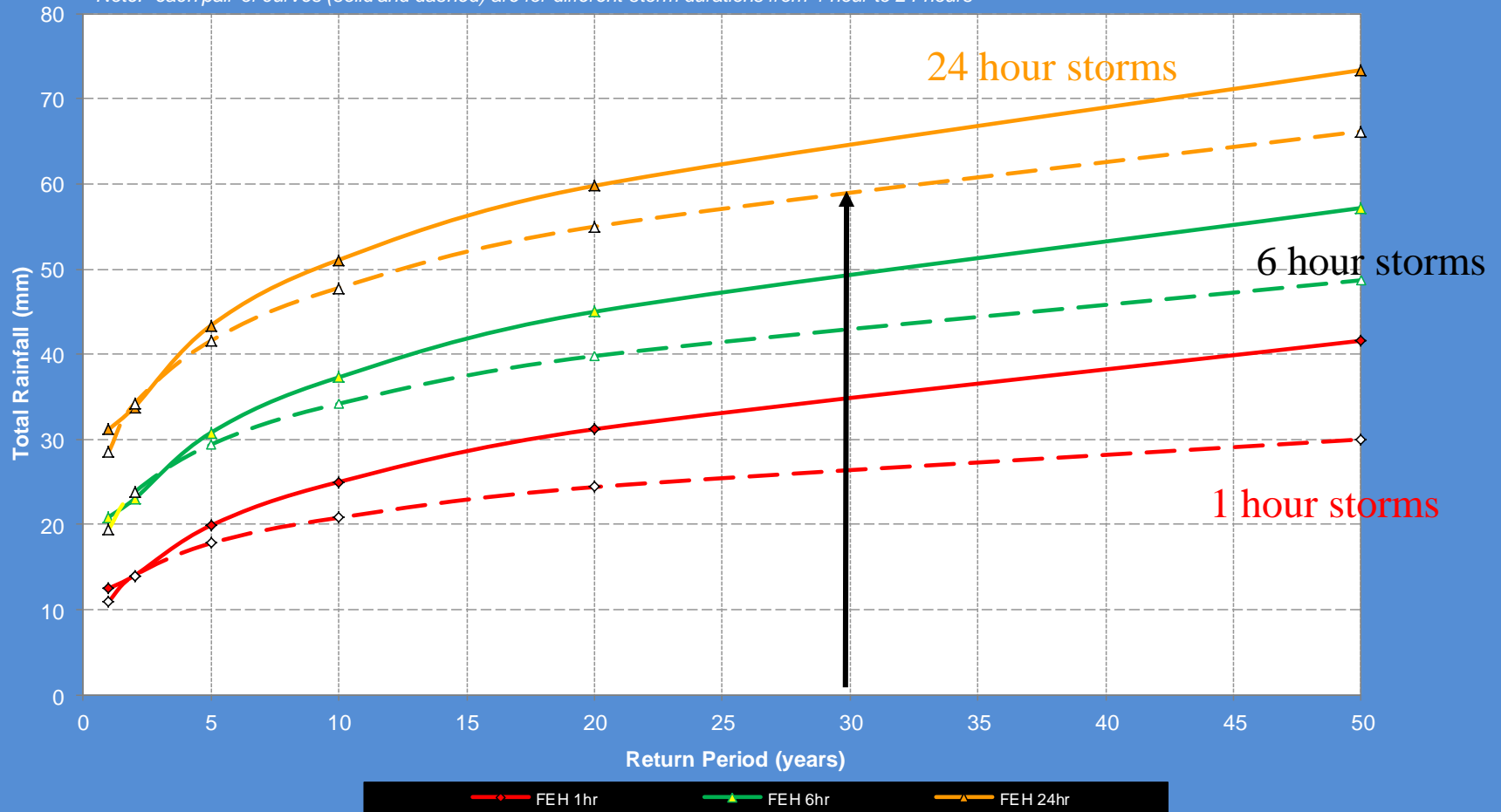
Note:- each pair of curves (solid and dashed) are for different storm durations from 1 hour to 24 hours



READING

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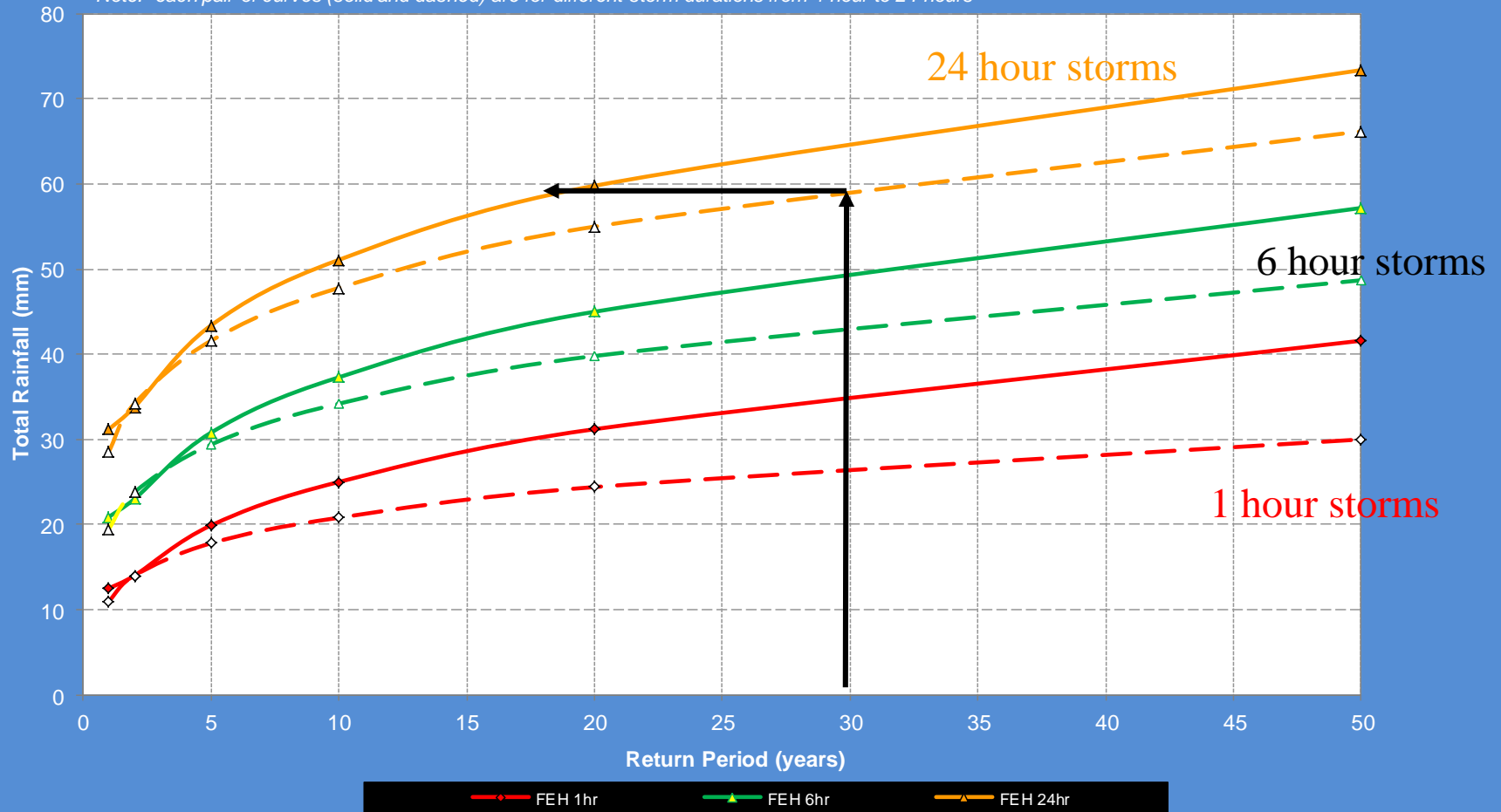
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READING

Compare FEH & FSR Return Periods

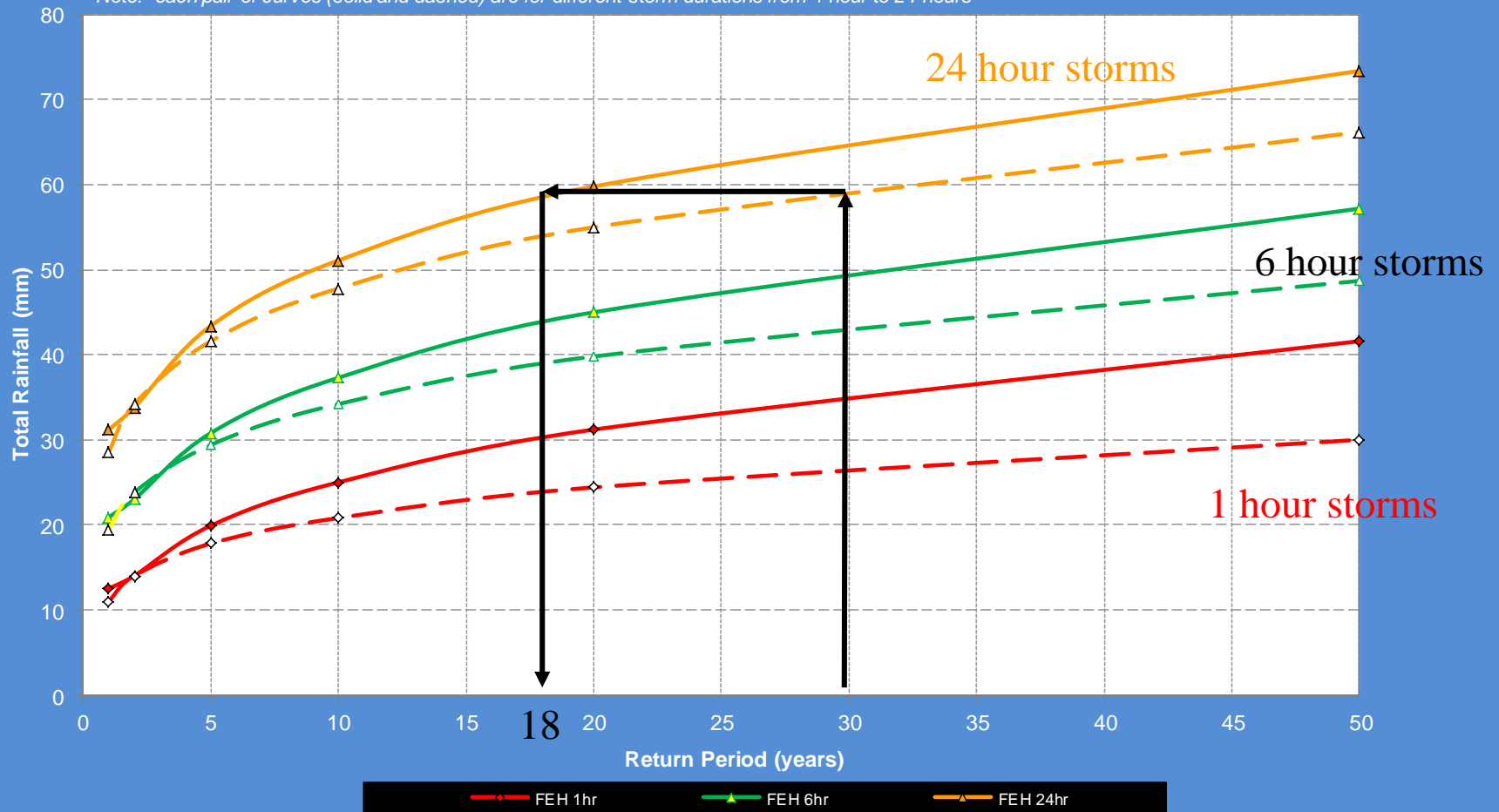
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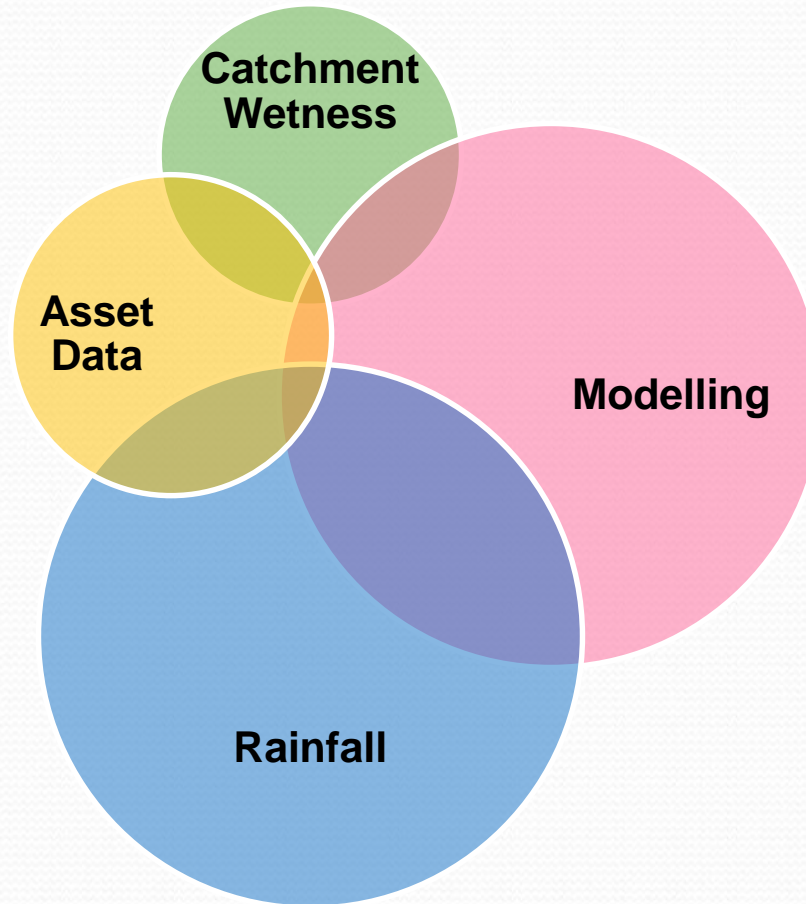
READING

Compare FEH & FSR Return Periods

Note: - each pair of curves (solid and dashed) are for different storm durations from 1 hour to 24 hours



Uncertainties in Flood Risk Modelling



Modelling

- Has developed massively over the past 35 years.
- Very active and skilled modelling community.
- However, many leading practitioners are approaching retirement (or have already retired).

Milestones in Hydraulic Modelling Software



- **1975 Flood Studies Report (FSR)**
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Modelling Limitations

- 1982 to 1989
- Tolerance of 25m³ for flooding
- 1990 to current

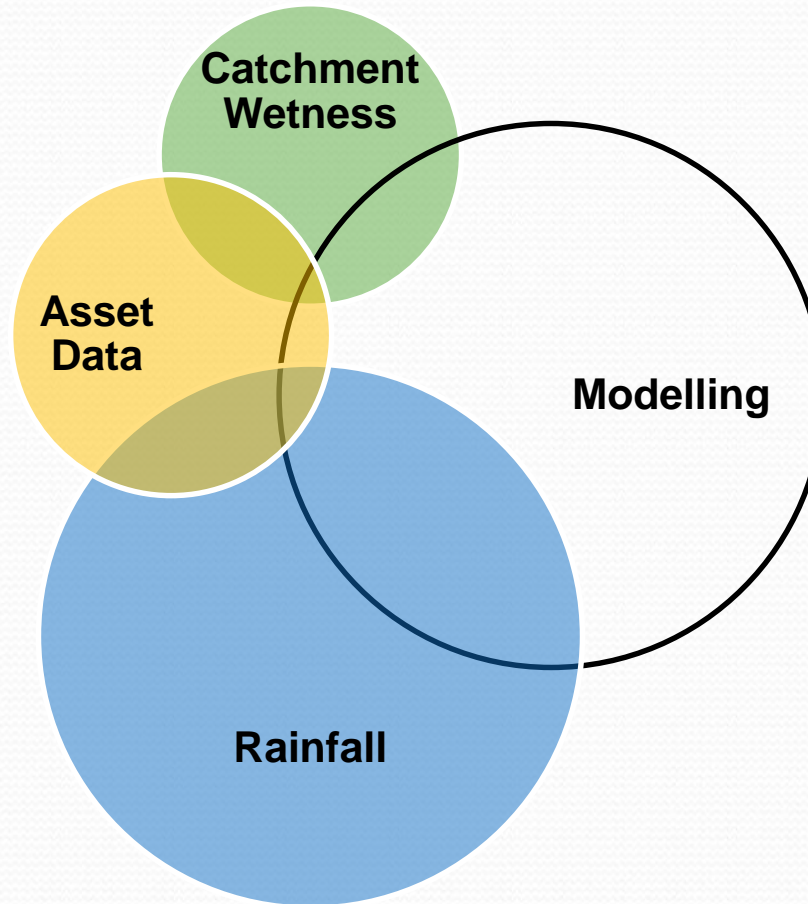


Current Day Modelling

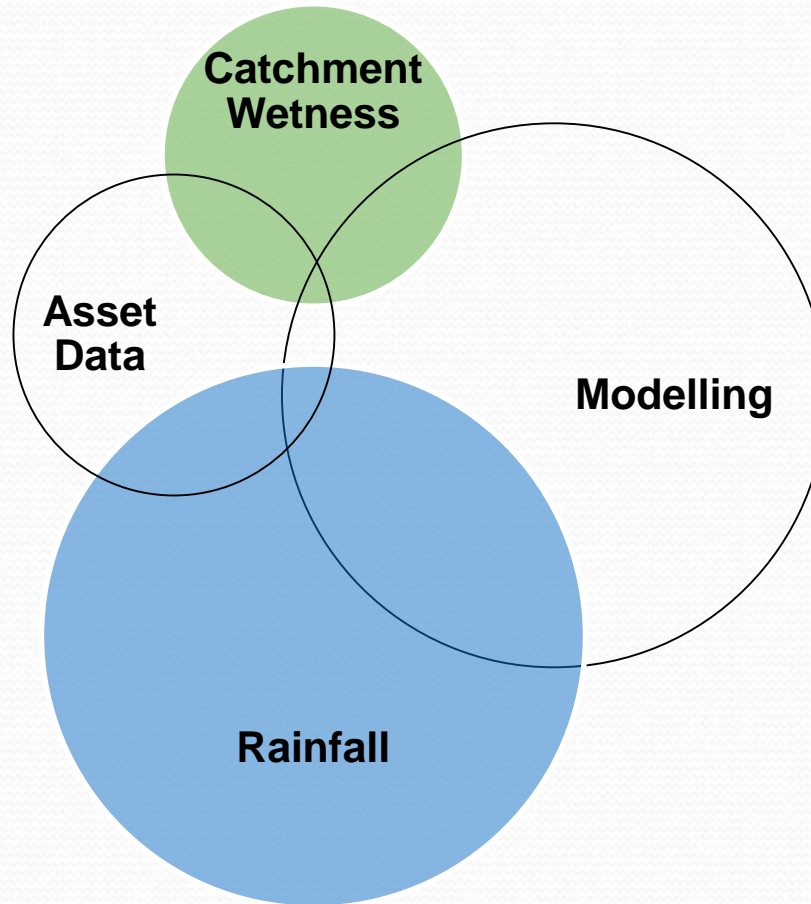
- 1D
- 1D-1D
- 1D-2D
- 1D-2D-3D
- **Highly skilled job** (undervalued ?)
- Depends on standard of **verification** (flow monitoring technology has moved on massively)
- Almost anything can now be modelled (incl road gullies).



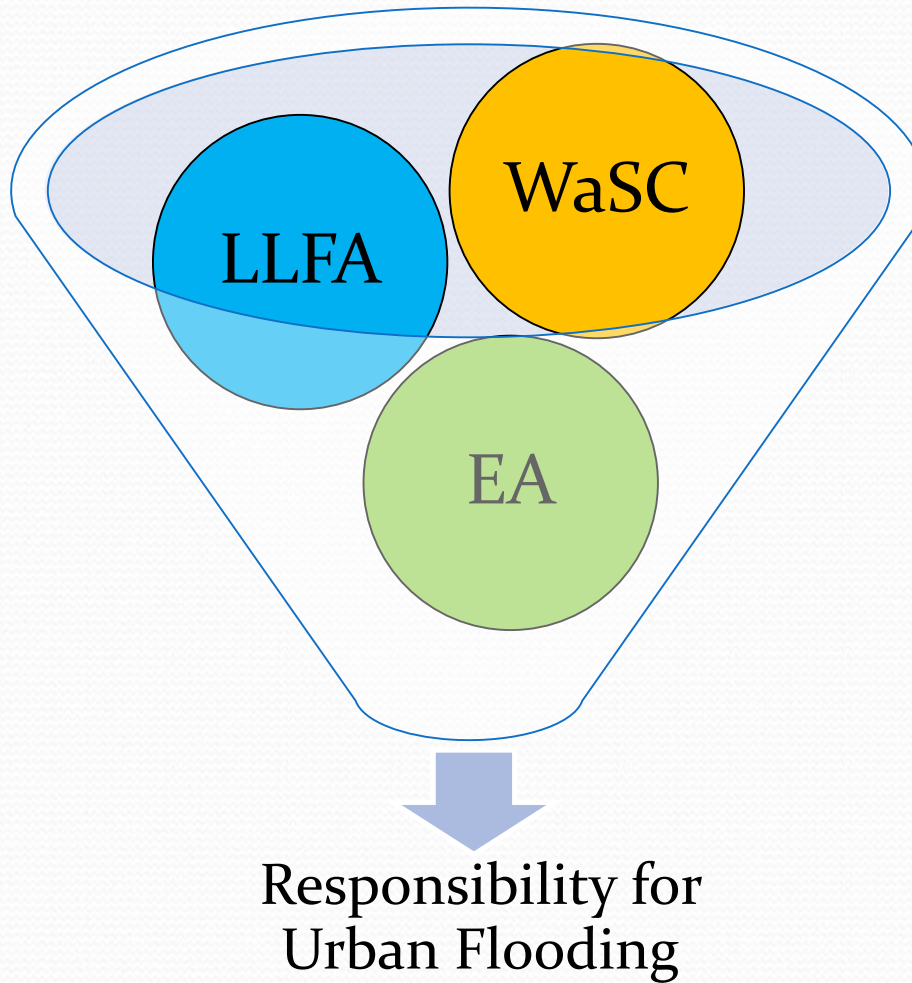
Uncertainties in Flood Risk Modelling



Uncertainties in Flood Risk Modelling



Regulatory Regime



Lead Local Flood Authority

- LLFA's formed after Pitt Review (2008) into flooding in 2007.
- Responsible for groundwater, pluvial and non-main river fluvial flooding.
- Overseen and advised by EA.
- Limitations on funding, resources and skills.
- Responsible for Surface Water Management Plans and Flood Risk Action Plans.

Environment Agency

- Responsible for coastal and main-river fluvial flooding.
- Over-arching role on all aspects of flooding and advisors to LLFA's.
- Extensive skills for fluvial flooding.
- Limited skills for urban flooding.
- Responsible for Flood Risk Maps.

Water & Sewerage Companies



AMP1 to AMP5

- Responsible for sewer flooding but only:-
 - Up to a 1 in 10 year* return period storm;
 - Alleviation costs are below cost threshold (cost-beneficial in AMP5).
- Required to accept highway drainage connections but NOT responsible for highway flooding.
- General requirement for Drainage Area Studies / Plans.
- Maintain a Flood Risk Register (actually a record of flooded properties – not ‘At Risk’ properties).

* Since “Sewers for Adoption” requires NEW sewers to meet 1 in 30 year criteria everyone FALSELY thinks that applies to all sewers.

Water & Sewerage Companies

AMP6 and beyond



- Ofwat has finally permitted genuine “At Risk” Register.
- No national limits on cost-benefit ratios or financial caps on flooding schemes – it is now a matter between the WaSC and their customers.
- Joint schemes encouraged.
- ODI incentives (and penalties).

Thoughts for the Future



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Modelling is now so advanced that it needs skilled practitioners who are valued and rewarded.

We must ensure they have a central role in urban flooding.

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We must ensure they have a central role in urban flooding.



We should not expect Modellers to determine rainfall inputs – that should be the role of **Climate Scientists**.

A decorative fountain with water spraying upwards from a circular base on a paved area. The water is clear and creates a misty spray. The fountain is set on a paved surface with a pattern of interlocking stones. The background shows a dark, possibly stone or concrete, wall and some greenery.

Thank you.

Any Questions?