Dissemination Seminar: Modelling of Urban Flood Flows

A practitioner viewpoint of urban flood modelling and industrial research needs

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25th January 2018

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Agenda

1. Research needs
2. How we use urban flood models
3. How we undertake flood modelling
4. The challenges we face
5. Research needs

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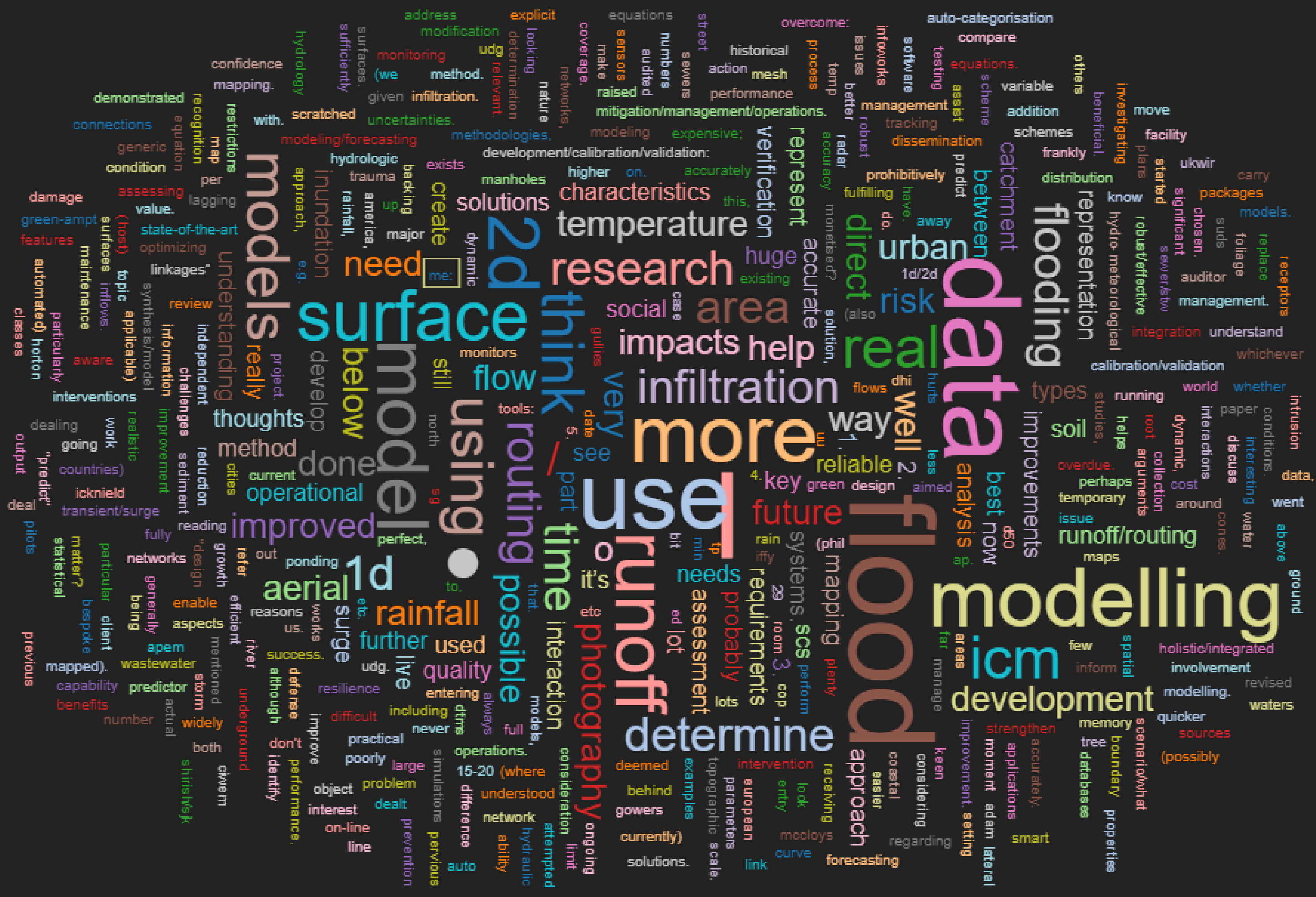

Go to….

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What are your research needs????

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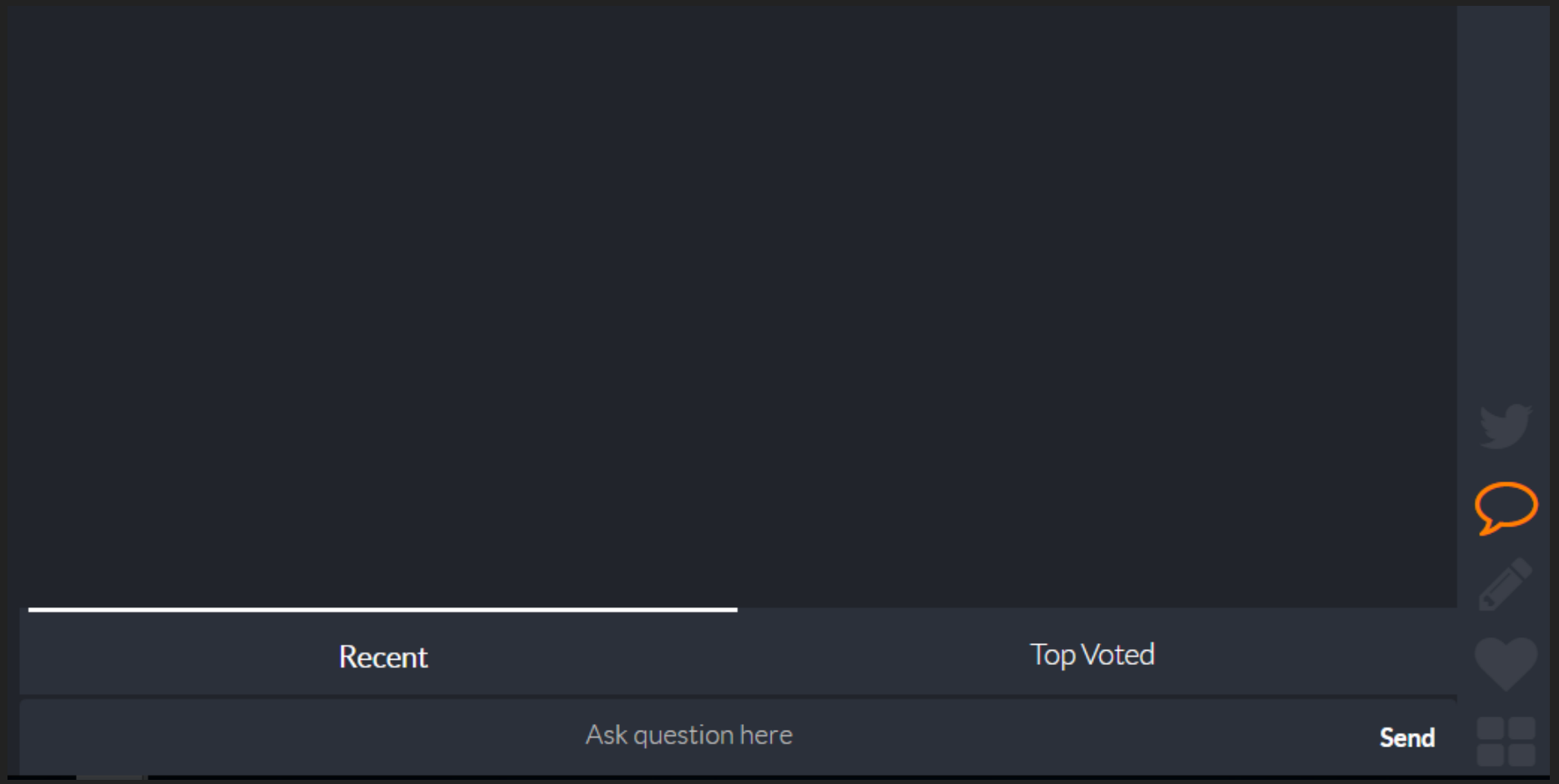

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How we use urban flood models

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How we use urban flood models

Investment decisions

Business planning

Individual scheme decisions

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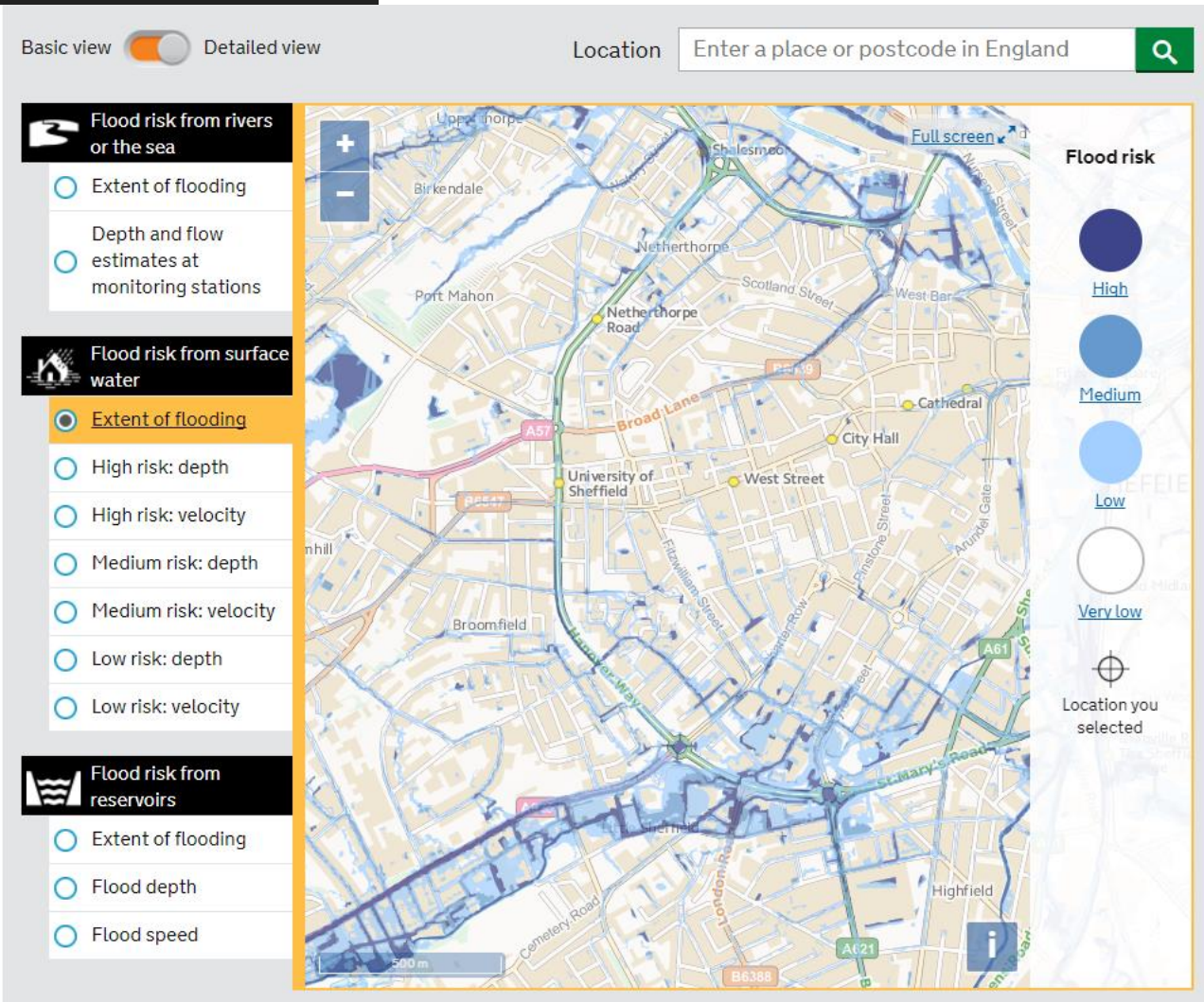
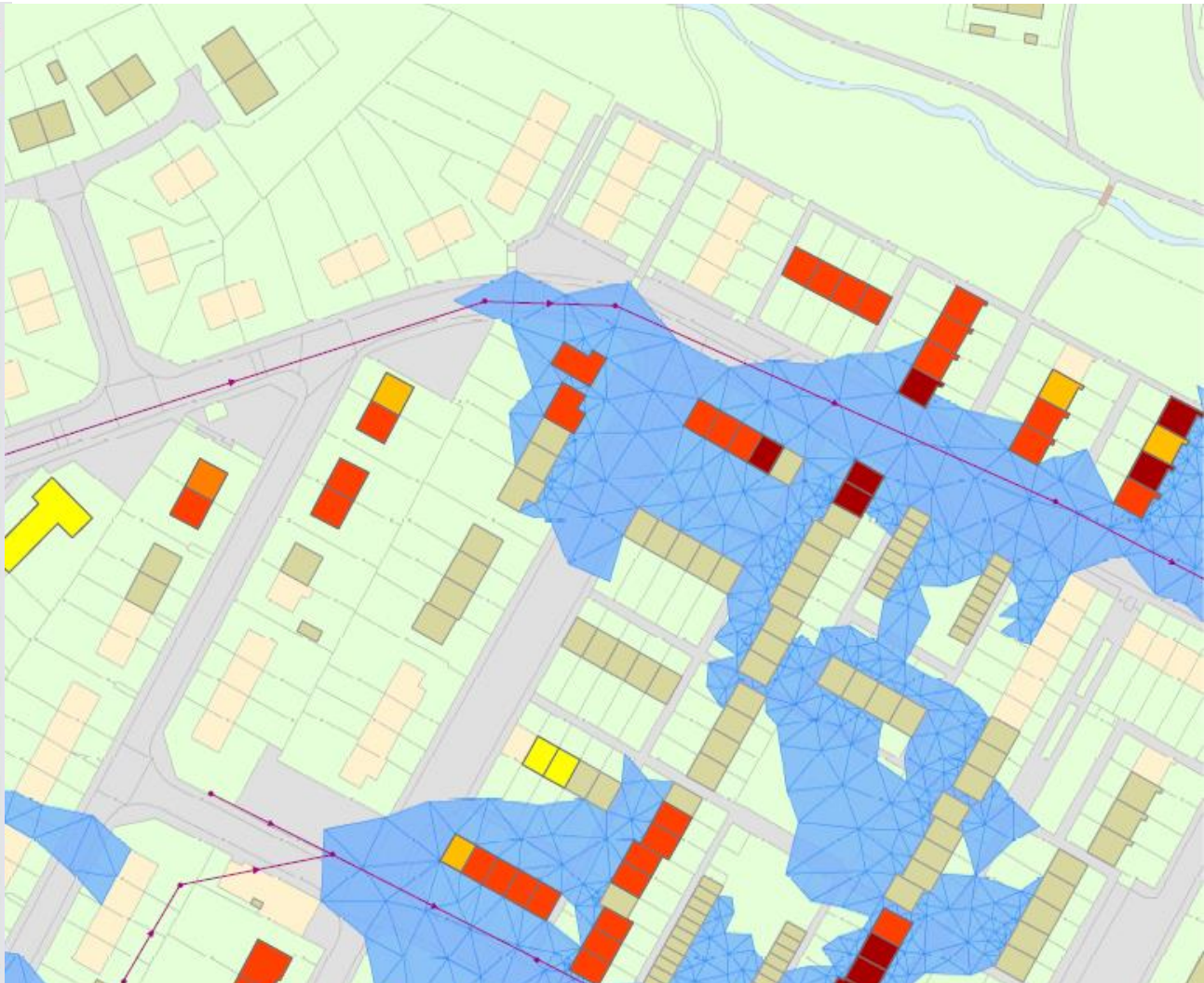
How we use urban flood models

Strategic assessment of risks – but differing levels of detail





How we use urban flood models

Understanding problems

- Help to determine the causes and mechanism
- Help to understand the extents
- Vital to ensure the right solution can be developed

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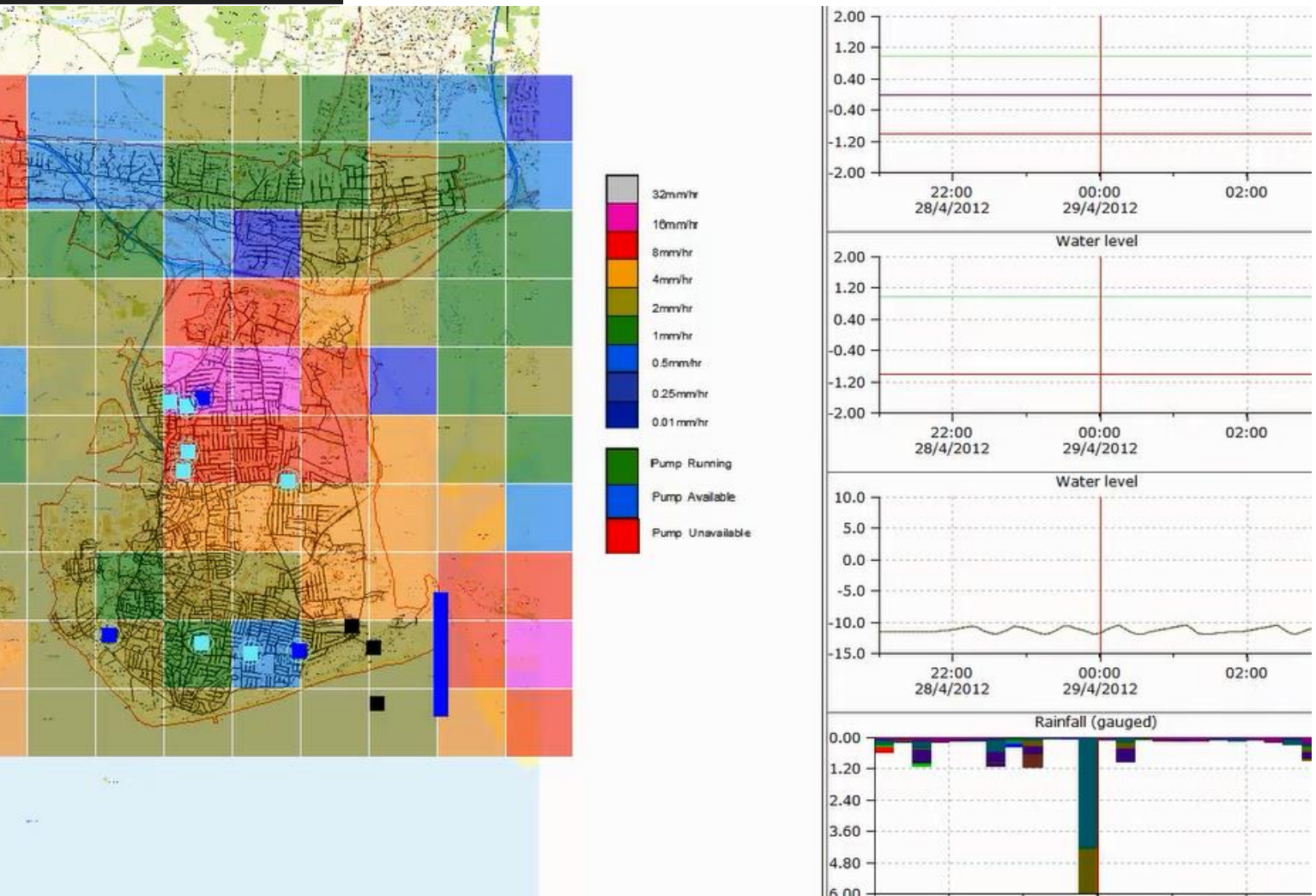
How we use urban flood models

Predicting events and incidents



- Become more proactive in our response to flooding
- Help to prepare for flooding
- Manage an event as it happens
- Efficient clean up afterwards

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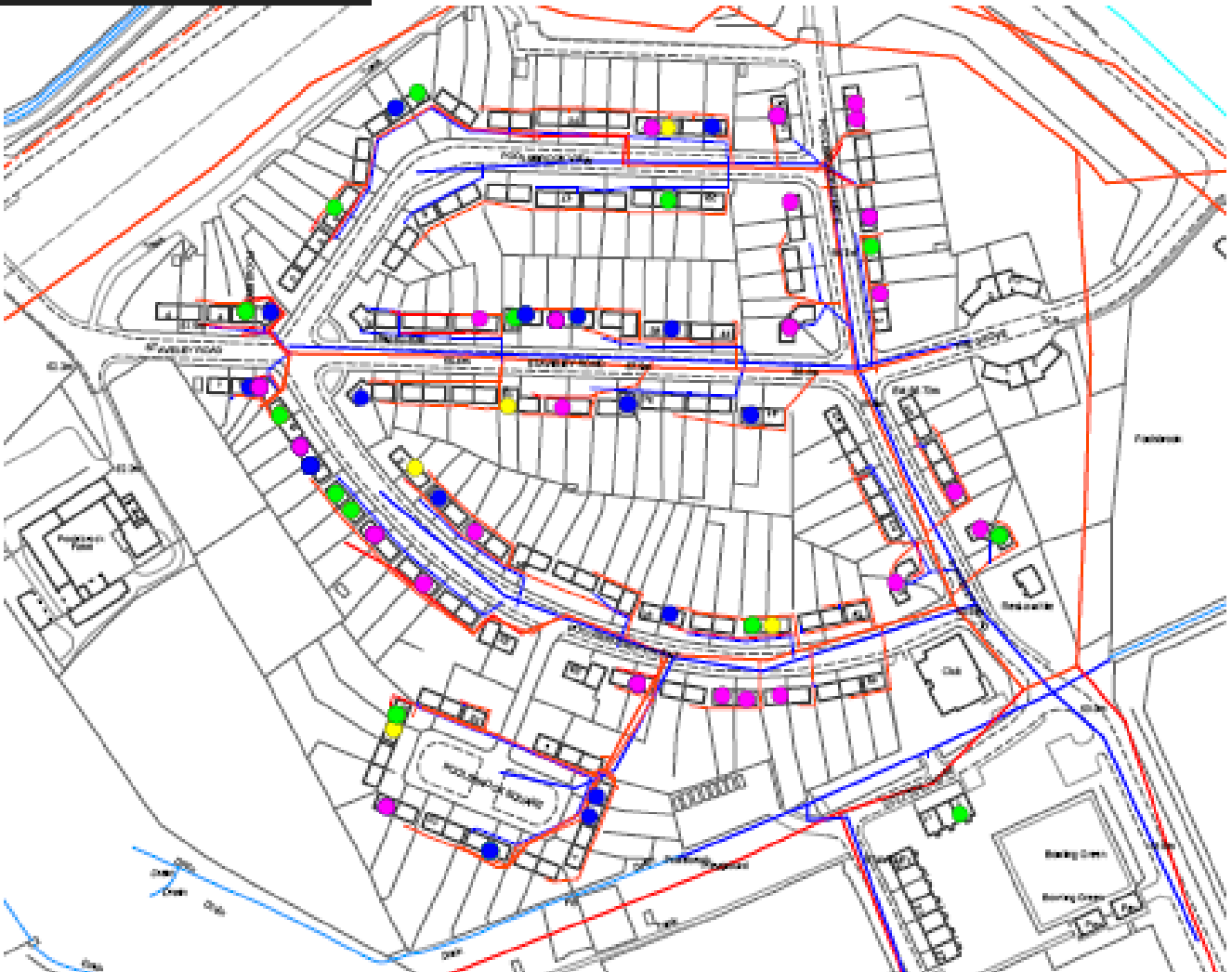
How we use urban flood models

Plan and respond to flooding due to other causes issues



How we undertake urban flood modelling

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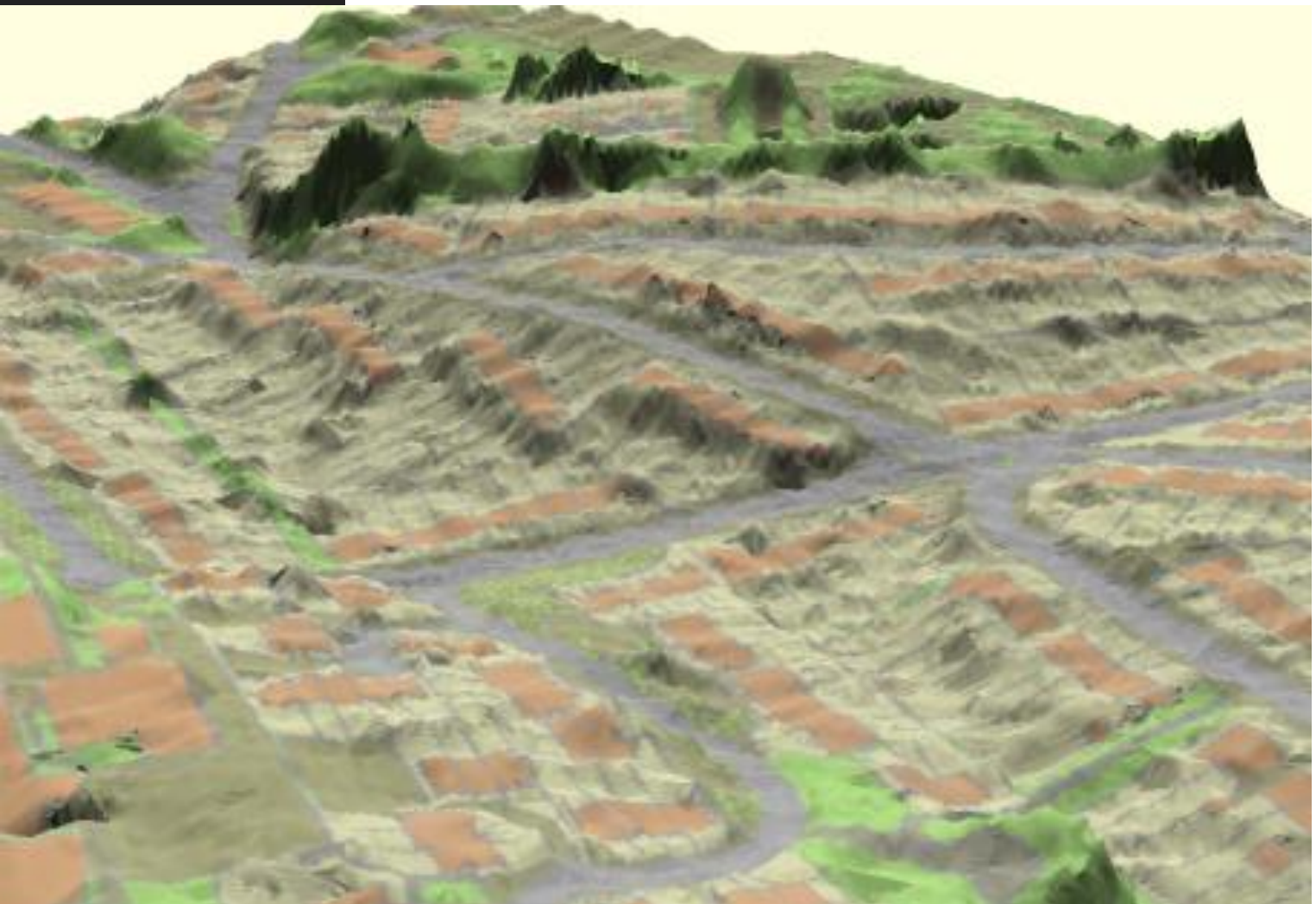
Apply rainfall to the mesh and ignore the need for interaction with the below ground system



- Above ground routing only
- Make an allowance for the below ground system performance
- Representative for more extreme events

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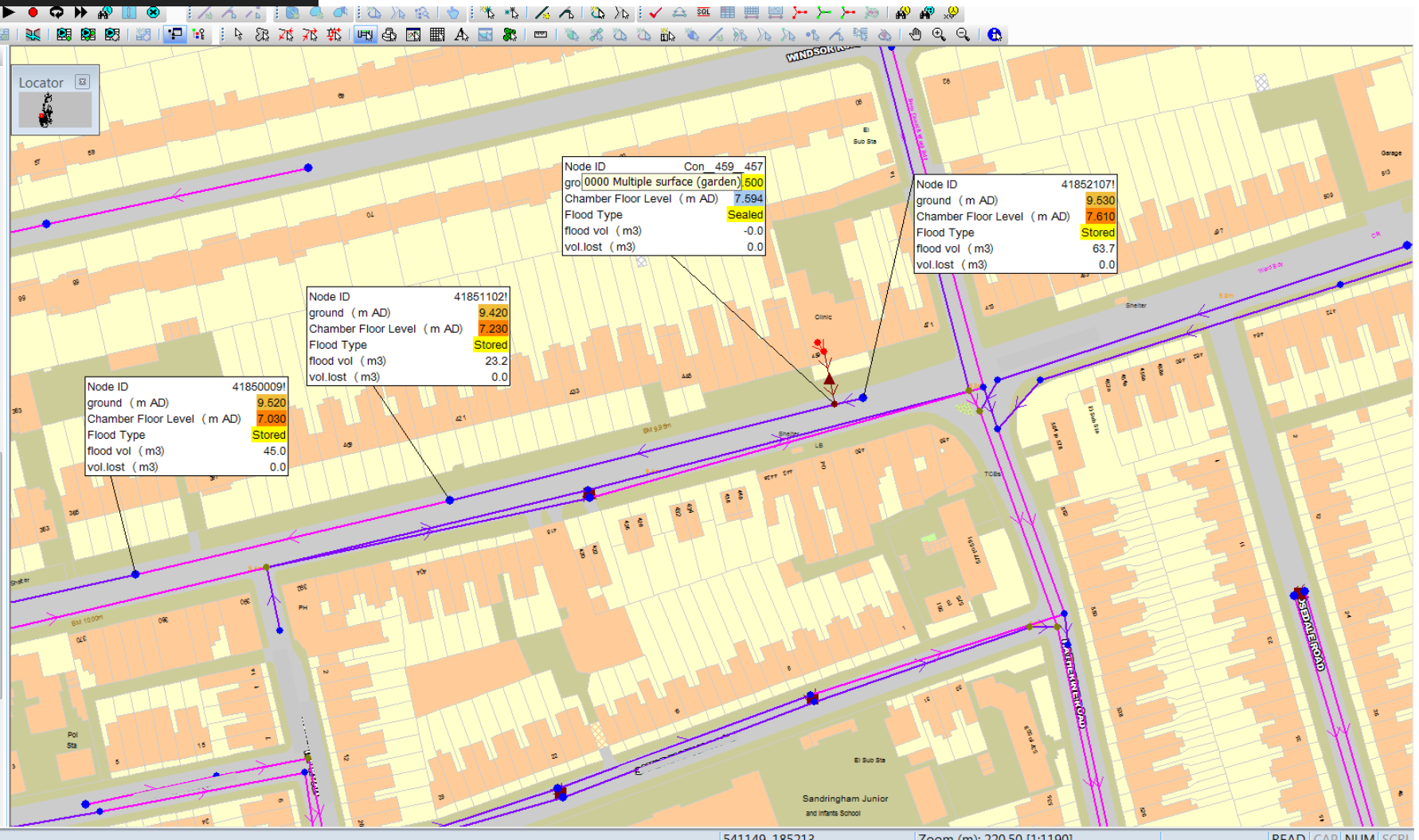
How we undertake urban flood modelling

1D simulation of below ground and stored or lost flooding at nodes



- Cones influence model performance
- Water out would not always go back in
- Creates significant uncertainties when estimating property flooding

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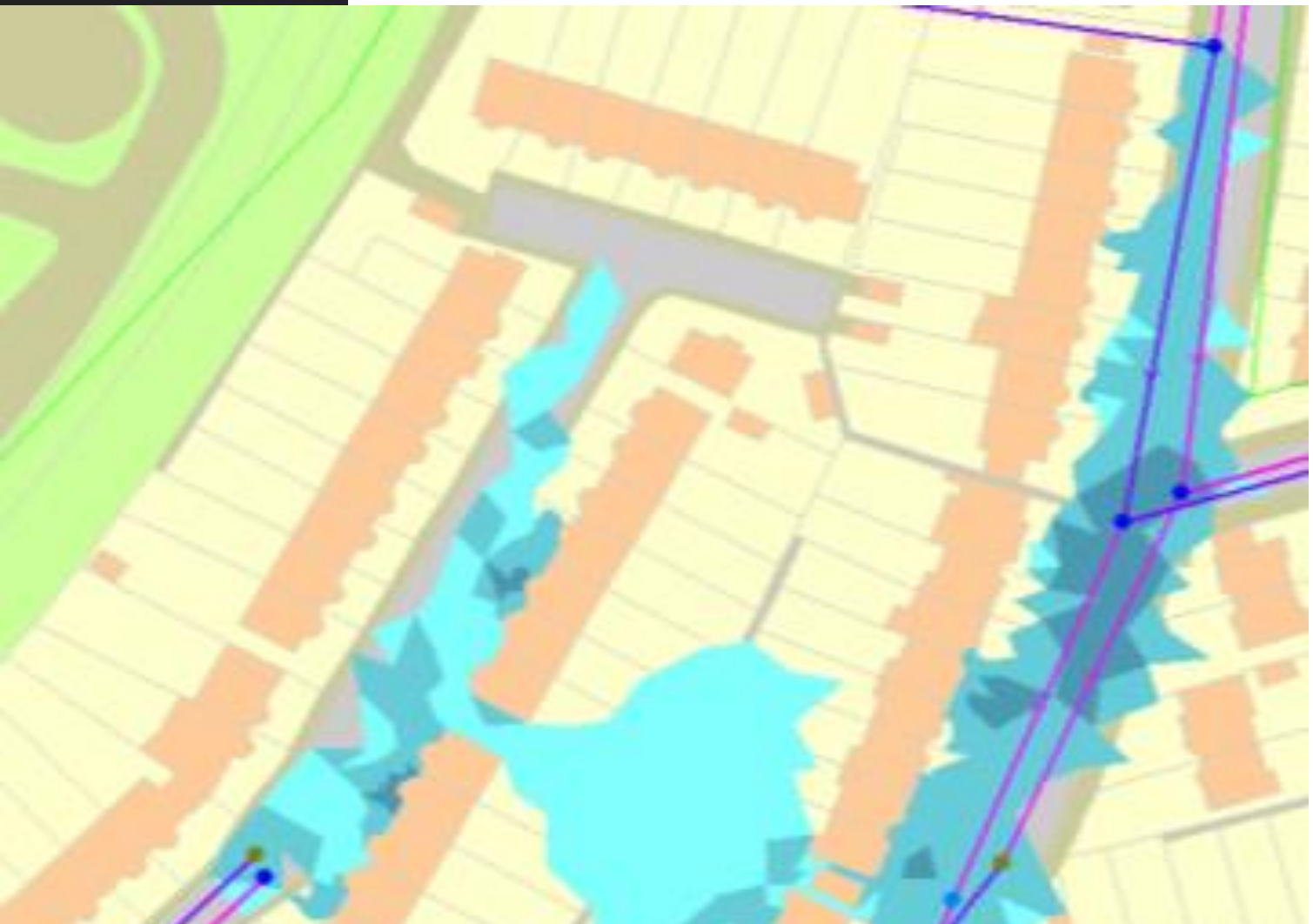
Enable the model to flood on to the mesh and back through nodes 1D-2D



- Commonly applied
- Coarse or detailed application makes it very flexible
- Typically uses nodes to enable flooding
- Still ignores some of the likely locations of interaction
- Topography granularity

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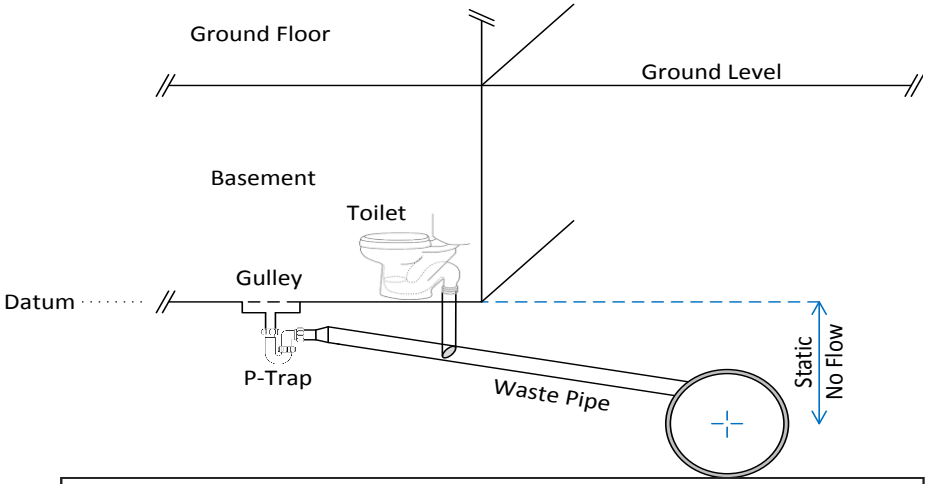
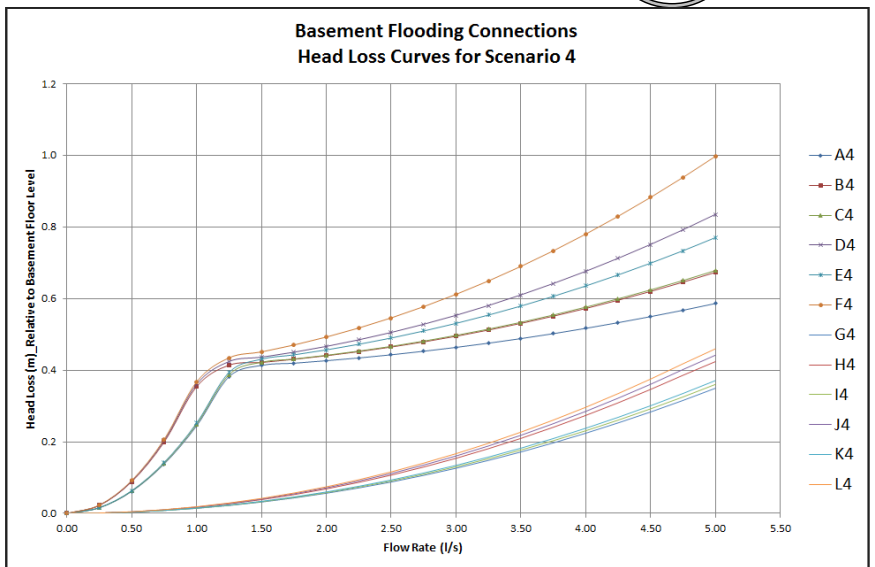
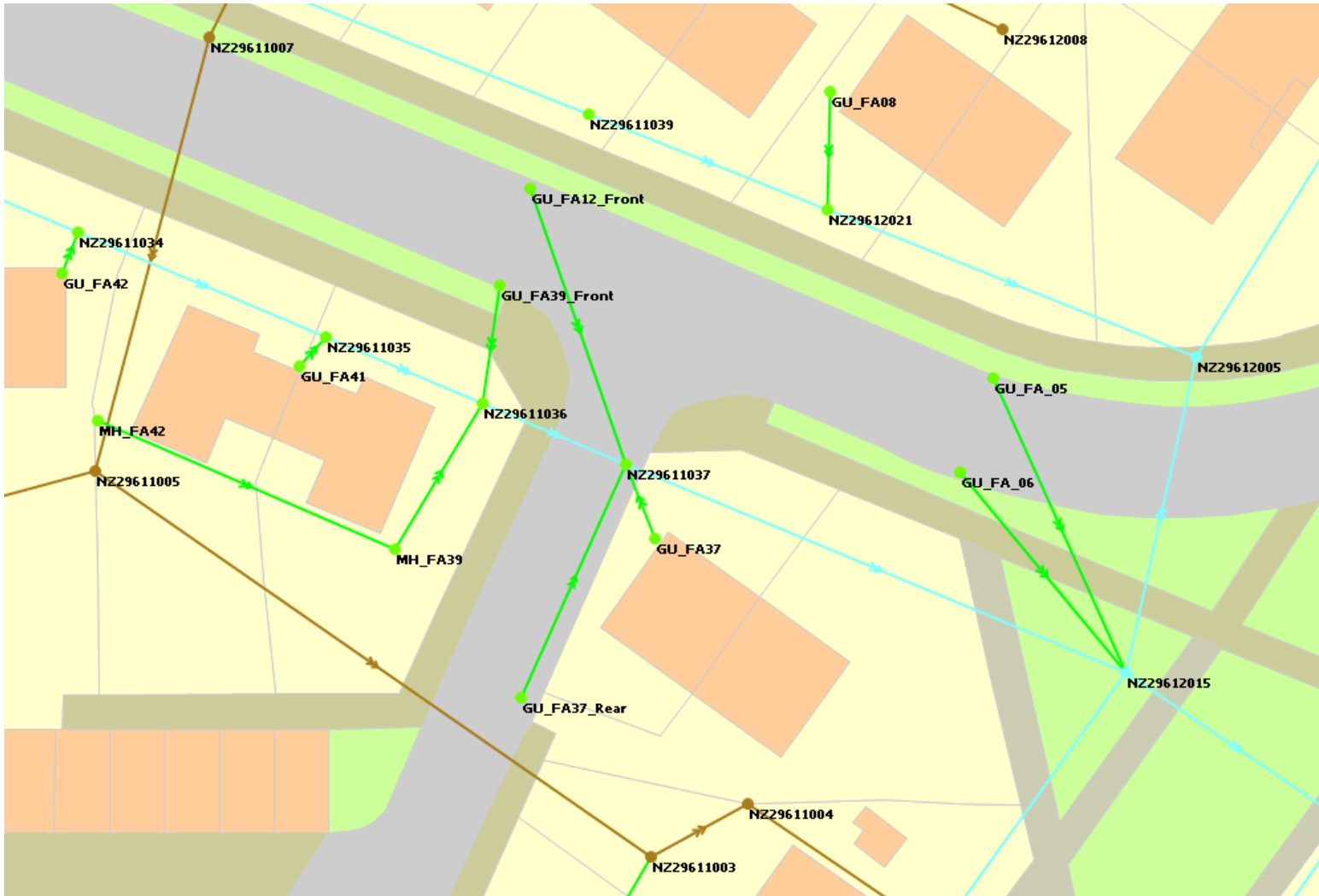
How we undertake urban flood modelling

Become more detailed with gully and connections modelled

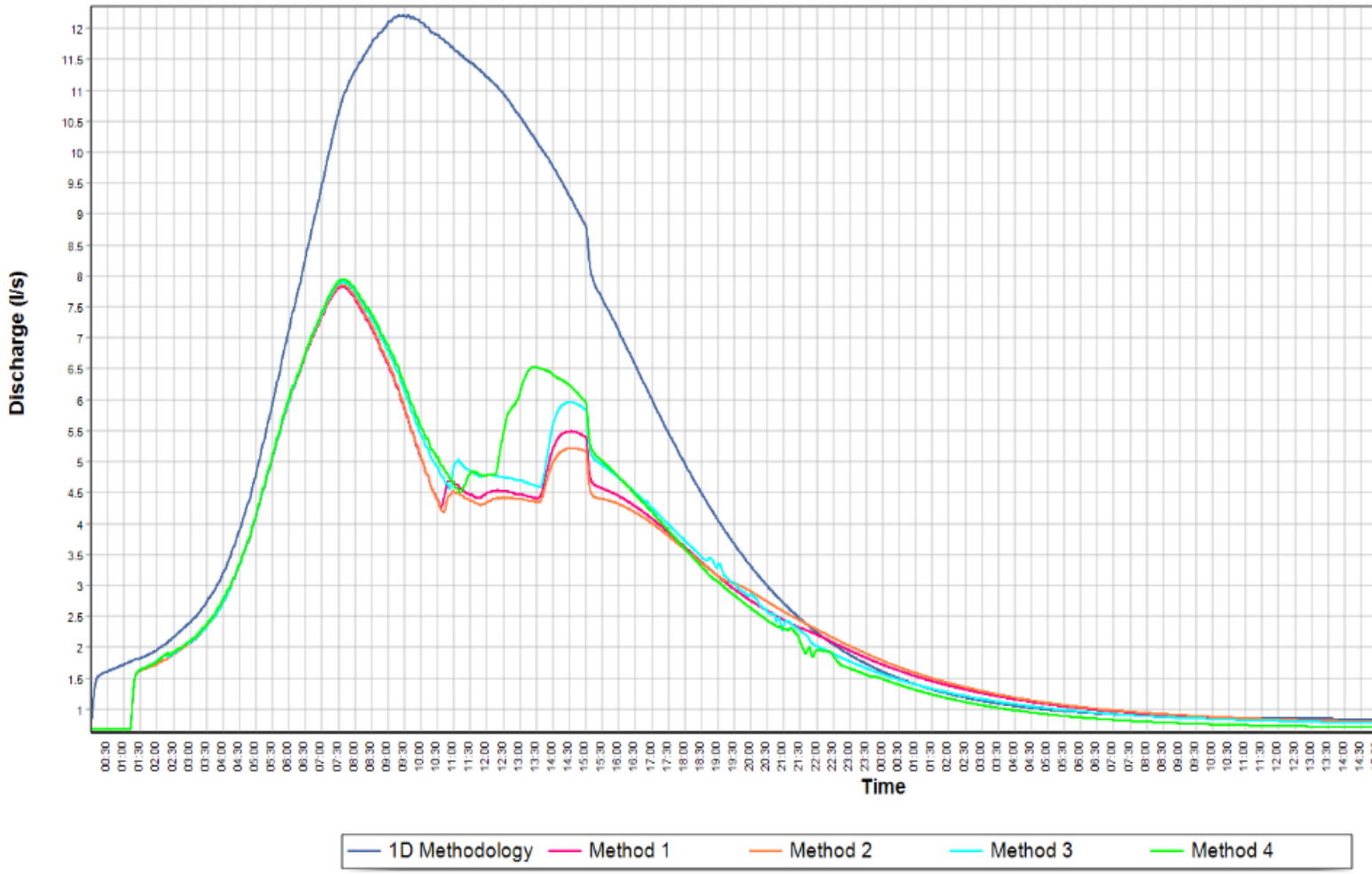






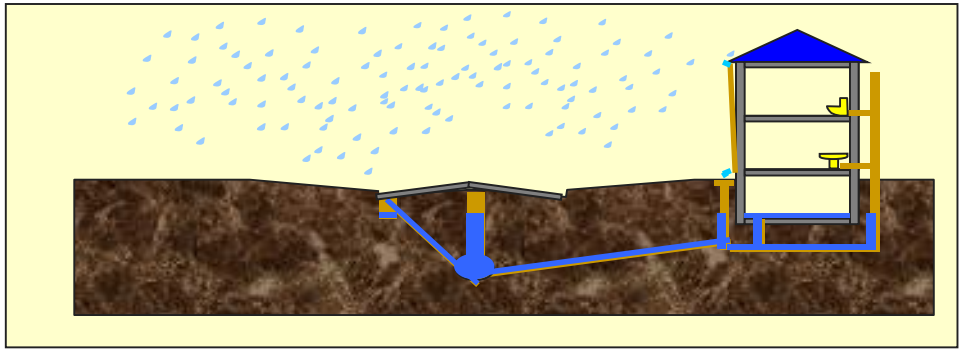
How we undertake urban flood modelling

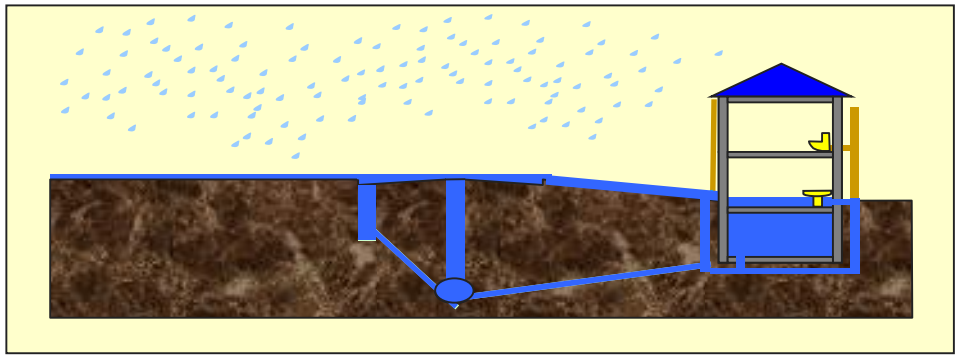
Use a 2D approach to replicate runoff on the surface

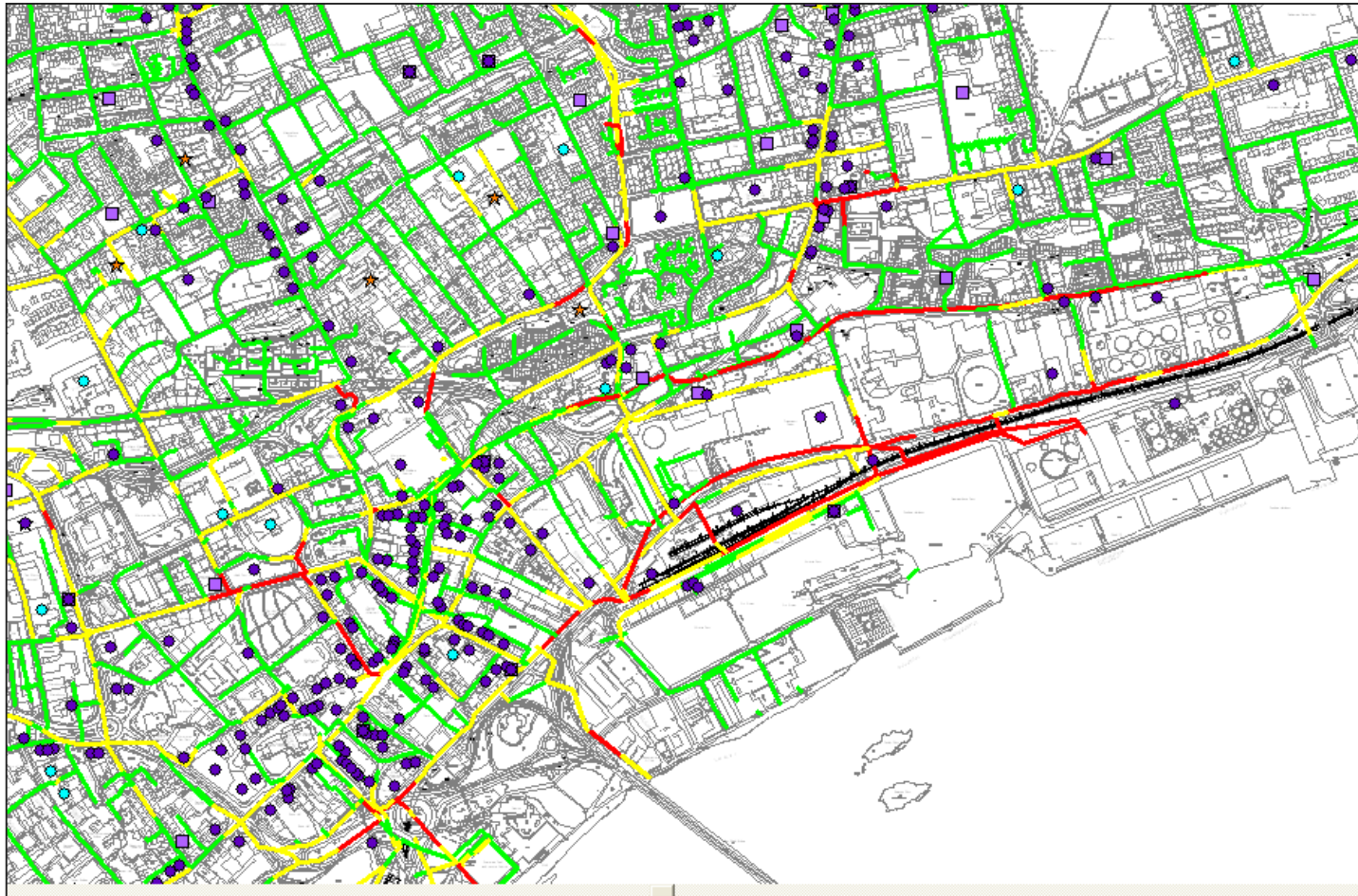


How we undertake urban flood modelling

But we should not forget the most frequent urban flooding risk







What are the challenges we face?

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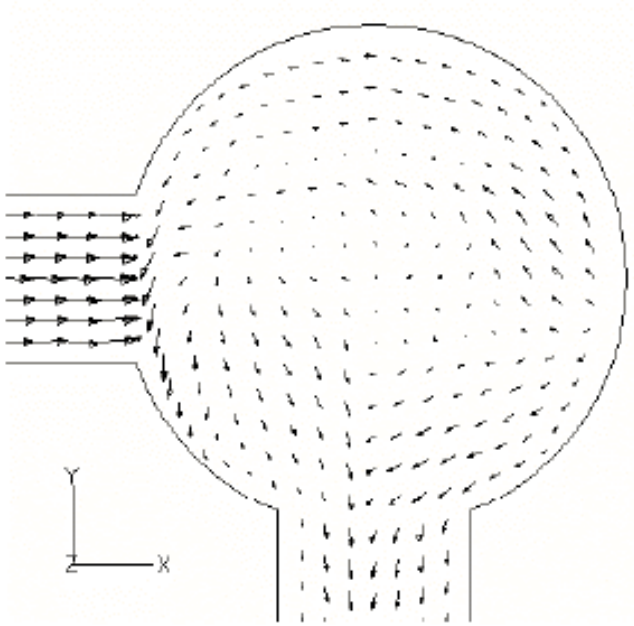
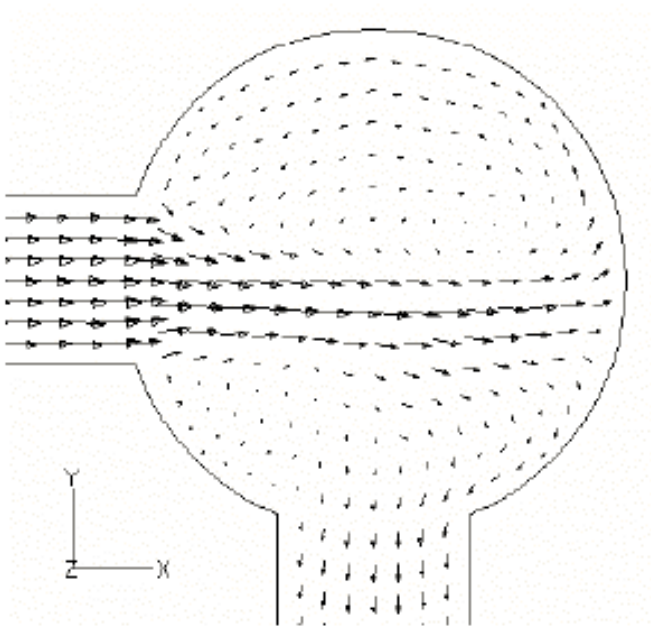
What are the challenges we face?

Computational accuracy under all conditions





- Accuracy & application of the equations for below and above ground
- Operational performance
  - Mechanical
  - Silt and sediment movement
  - Interventions

Stein et al

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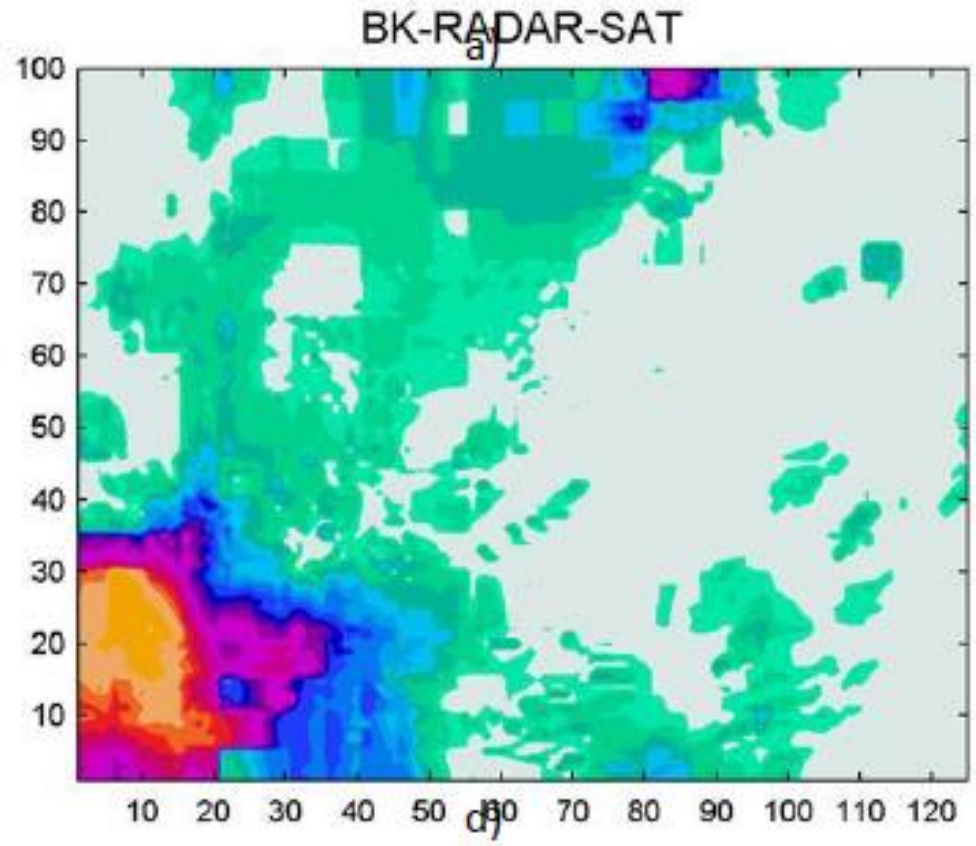
What are the challenges we face?

Spatial rainfall representation and short term forecasting



- Accurate measurement spatially for model validation and confidence
- Prediction in the next 24 hours for operational planning & response
  - Where
  - Quantity

Rain Music (2012)

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What are the challenges we face?

Getting the right level of integration to account for the appropriate level of interaction

What are the challenges we face?

Key elements in predicting flood risk rest with the quality of the data

DTM vertical and horizontal resolution and accuracy

DTM vs Model Level Correlation can be poor

The 2D surface in models are not enhanced enough with surface details

Many models are simplified with properties a considerable distance from the nearest pipe

Auto-connection of laterals not validated.

All basements have been assumed as connected to the sewers. Basement levels are assumed

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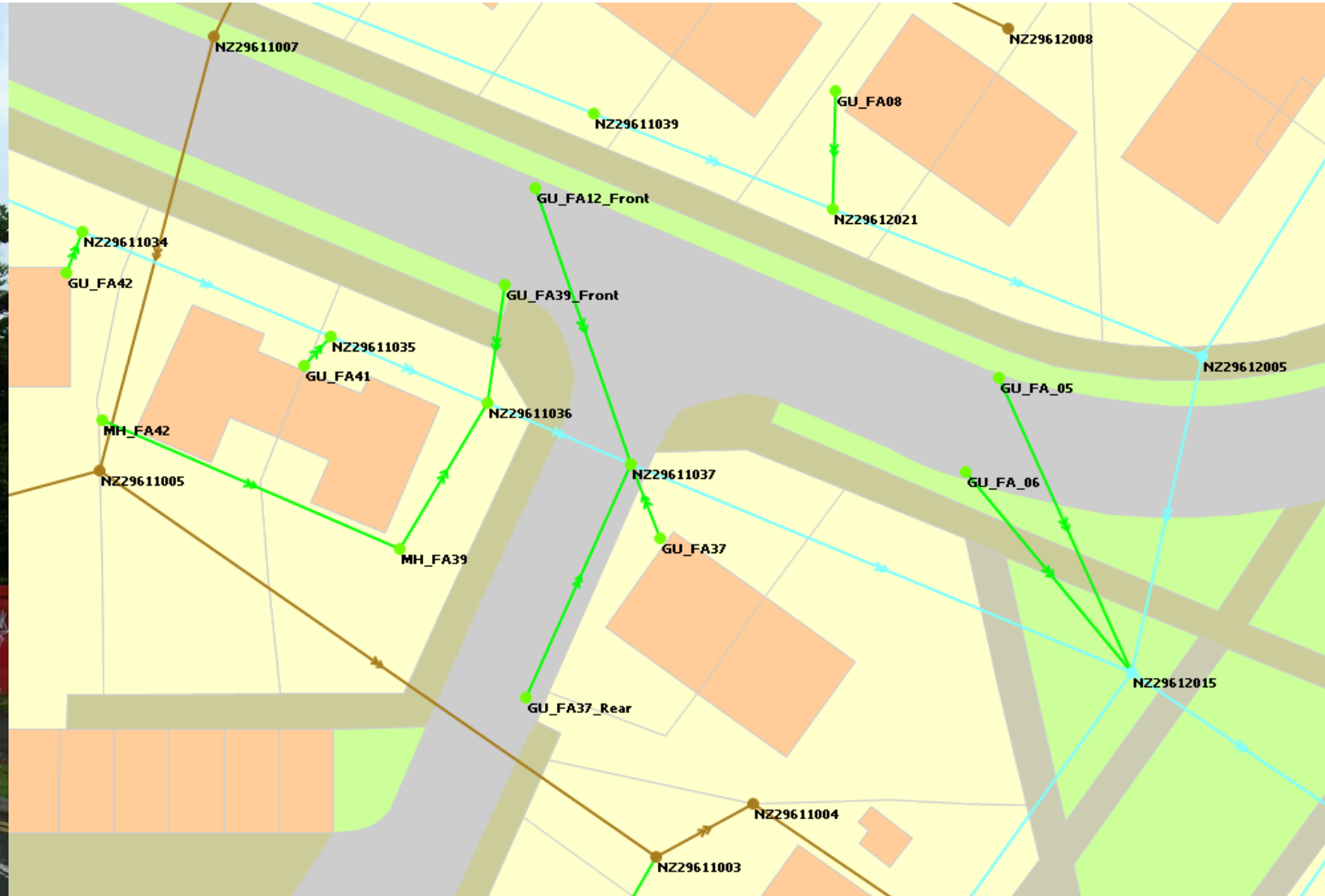
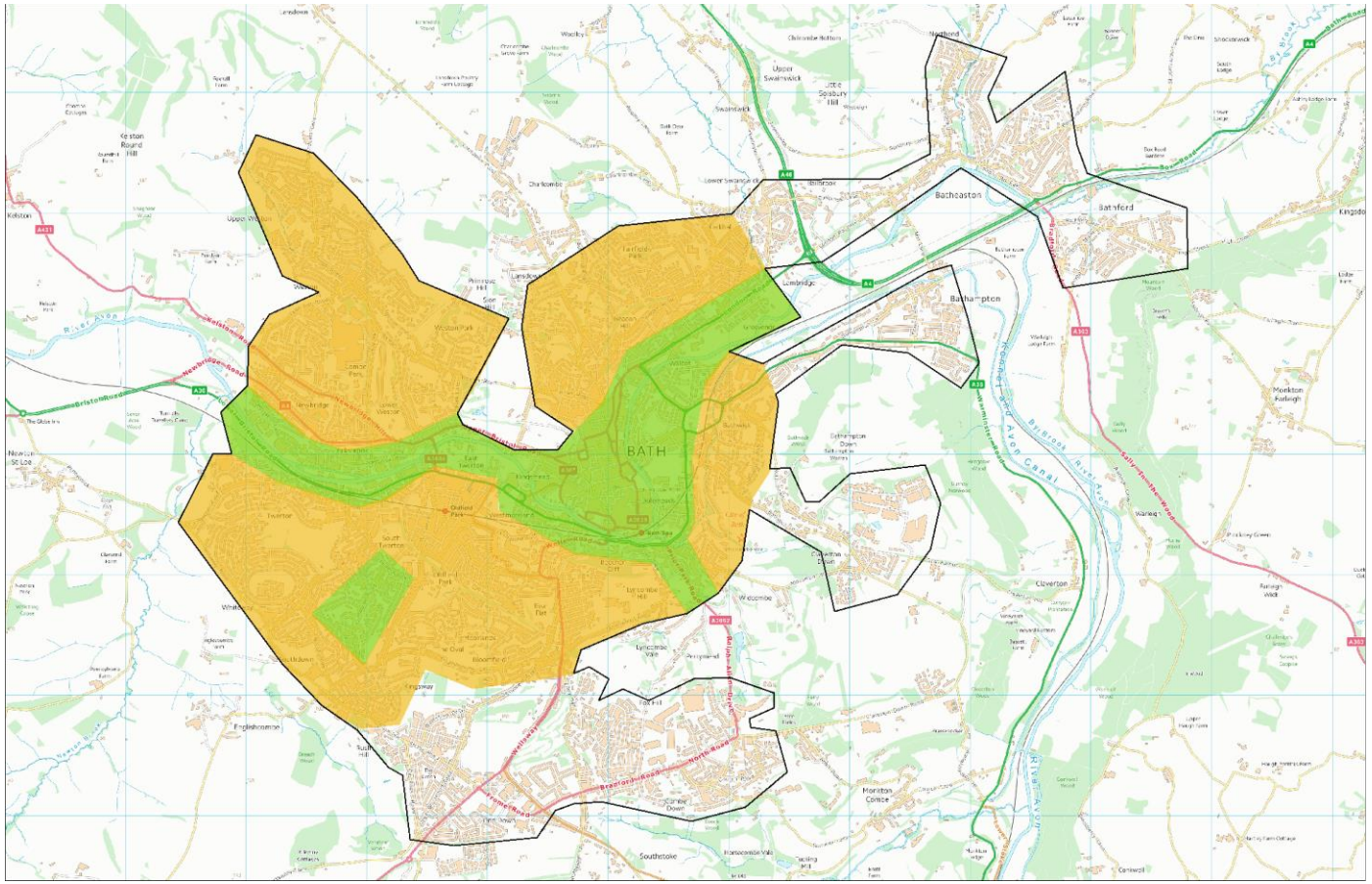
What are the challenges we face?

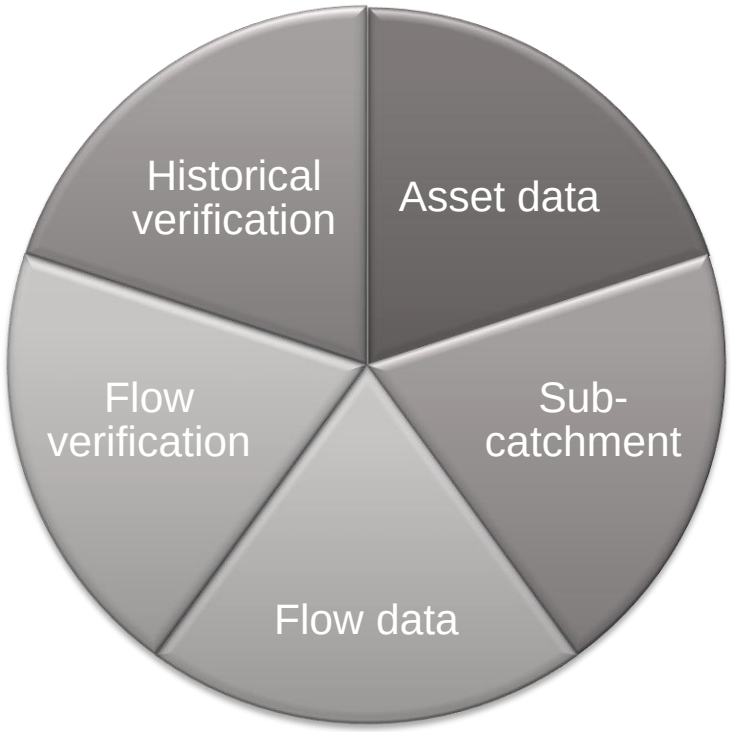
Ability to enhance accuracy automatically with the larger data sets available



What are the challenges we face?

Underlying model confidence for the purpose being used for





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Key research needs to address

Key research needs to enhance urban flood modelling

- **Runoff (for 1D and 2D models) – fundamental research**
- **Improved understanding of measurement, identification and replication of infiltration entering systems**
- **Sediment entry, tracking and movement and its impact on performance**
- **Continue to improve the replication of the interaction between the 1D and 2D (minor and major) – boundary conditions**
- **Real time dynamic modelling with self learning and uncertainty assessment/quantified**

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What were yours…….

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Questions

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