



# Urban Stormwater Modelling Approaches in NZ and the UK - Lessons Learned

Presented by Michael Arthur (Metis) and Kirsten Henden (Awa)

10 March 2021 – Water NZ – Modelling Symposium

# Presentation Outline

- Project Background
- Partnership Delivery
- Modelling Background (UK)
- Case Study – Yate & Chipping Sodbury
  - Comparison – UK vs. NZ
  - Why is there a difference?
- Lessons Learned



# Project Background

- **Purpose:** Update national Risk of Flooding from Surface Water (RoFSW) mapping in “high risk” areas
- **Funding:** Environment Agency / Defra (UK) – ‘Surface Water Management Action Plan’ - £2million (NZD\$3.8million) funding for England & Wales:
  - “High risk” in a national context
  - Significant growth or change
  - High deprivation
  - Significant historic flooding
  - **Improved confidence**
  - Value for money (and fast delivery!)



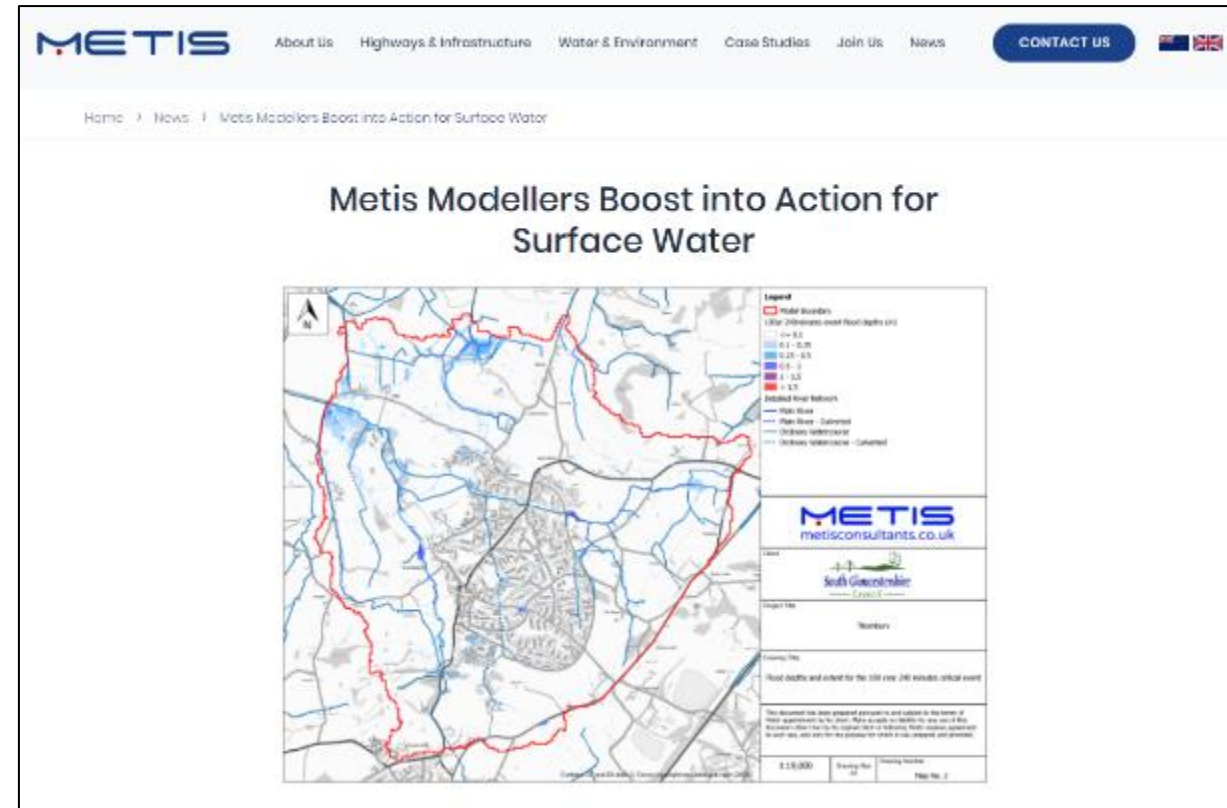
## Surface Water Management An Action Plan

July 2018



# Project Background

- Supported 7x clients secure £750k (NZD\$1.4million) in funding
  - 9x Models within Greater London
  - 2x Models in South Gloucestershire
  - Model size - 600ha to 2,000ha (12,000ha in total)
  - Mixture of urban (majority) and rural (minority) areas
- Work Scope – Detailed Urban Drainage Models
  - Data Review & Modelling Strategy
  - Asset Data Capture
  - Model Build & Validation
  - Reporting
  - Result Post-Processing





# Partnership Delivery

- **Metis** – Project management, technical leadership, data capture & model build (XP STORM)
- **Awa** – 1D Model data pre-processing (all models) / model build (ICM)



# Modelling Background (UK)

- National Risk of Flooding from Surface Water
  - Flood Map for Surface Water (FMfSW) ~2010
  - Updated Flood Map for Surface Water (uFMfSW) ~2013
  - 2D only - 2m grid resolution
  - Extent / depth / velocity (incl. flow direction) / hazard
  - No underground drainage network
  - Only major watercourse structures – 2D only
- Updates since 2013
  - Local modelling only (no further national updates)
  - Integrated Urban Drainage Models
  - 1D / 2D – drainage network, watercourses & overland flow



What is the Risk of  
Flooding from Surface  
Water map?

Report version 2.0  
April 2019



# But wait...what is 'Surface Water'?!

- In the UK there are EIGHT main types of flooding:

- Surface Water + Ordinary Watercourses
- Groundwater
- Main Rivers
- Coastal (storm surge)
- Reservoir (breach / failure)
- Sewer
- Pipe bursts (water supply)
- Highway flooding

- And FOUR organisations responsible:

- Local Authority
- Environment Agency
- Water and Sewerage Companies
- Highways Authority

**Stormwater (NZ)**

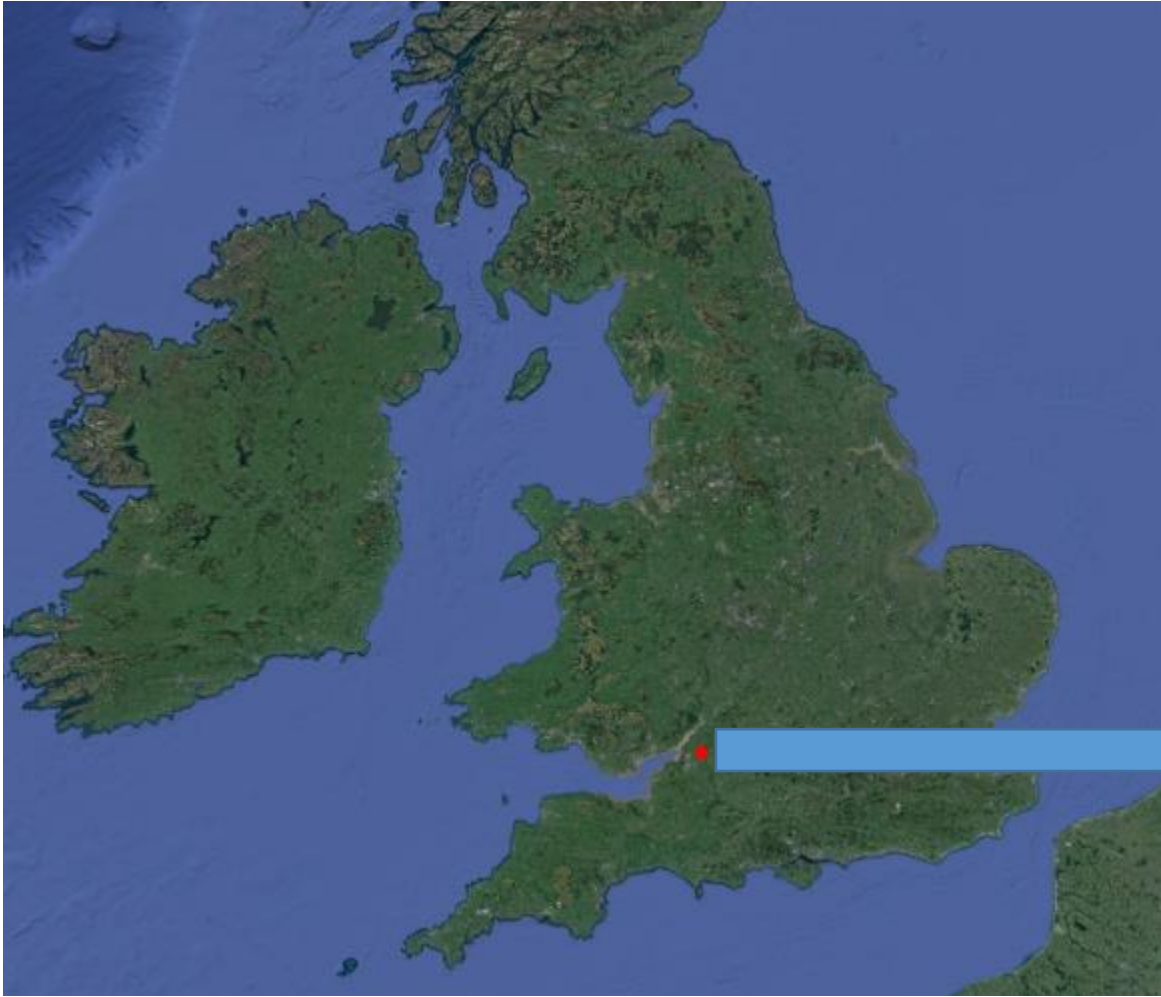
**=**

**Surface Water + Ordinary Watercourses  
(UK)**



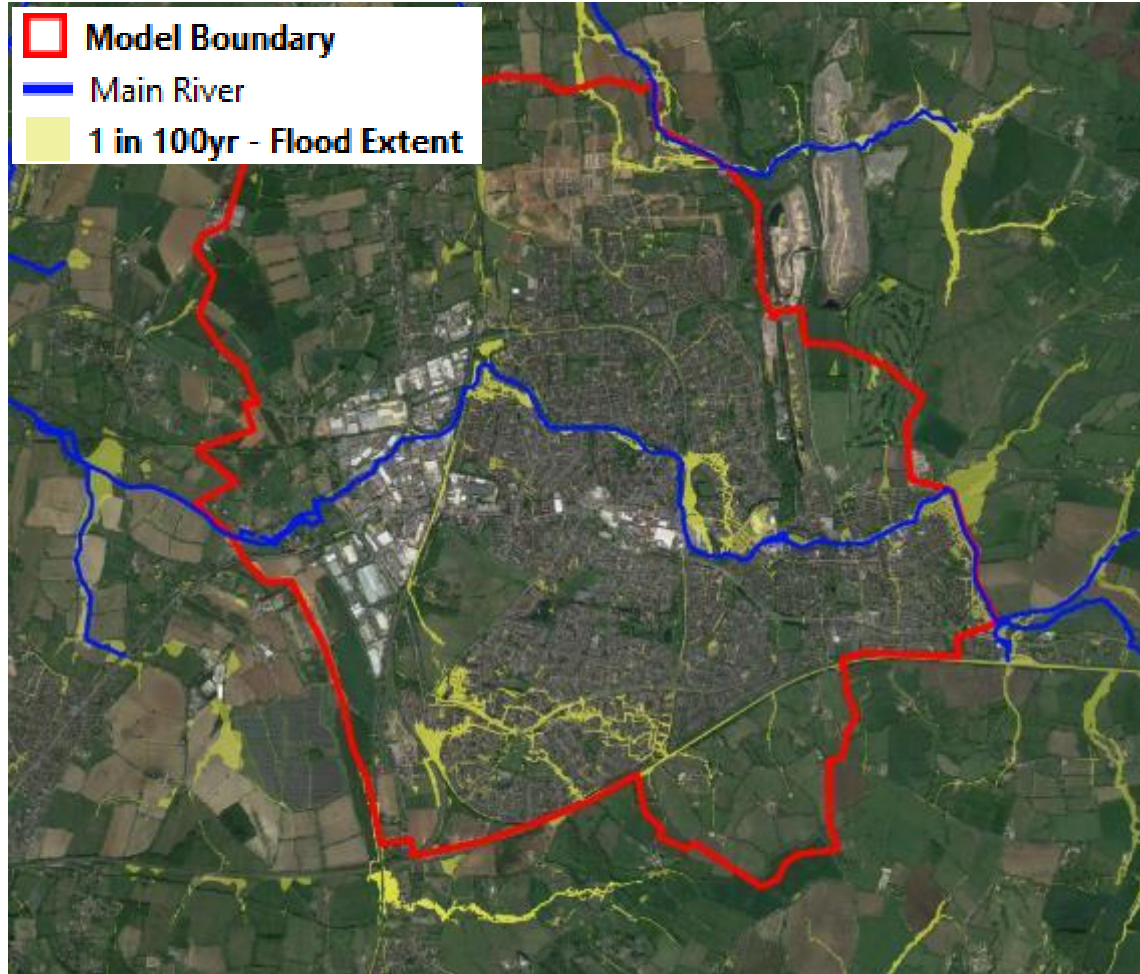


# Case Study – Yate & Chipping Sodbury





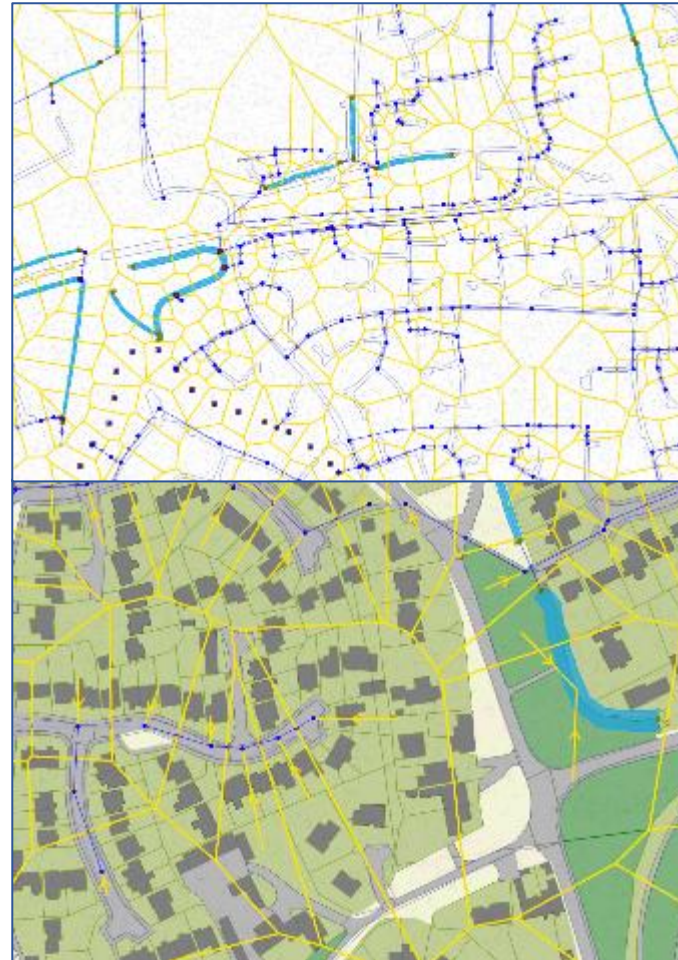
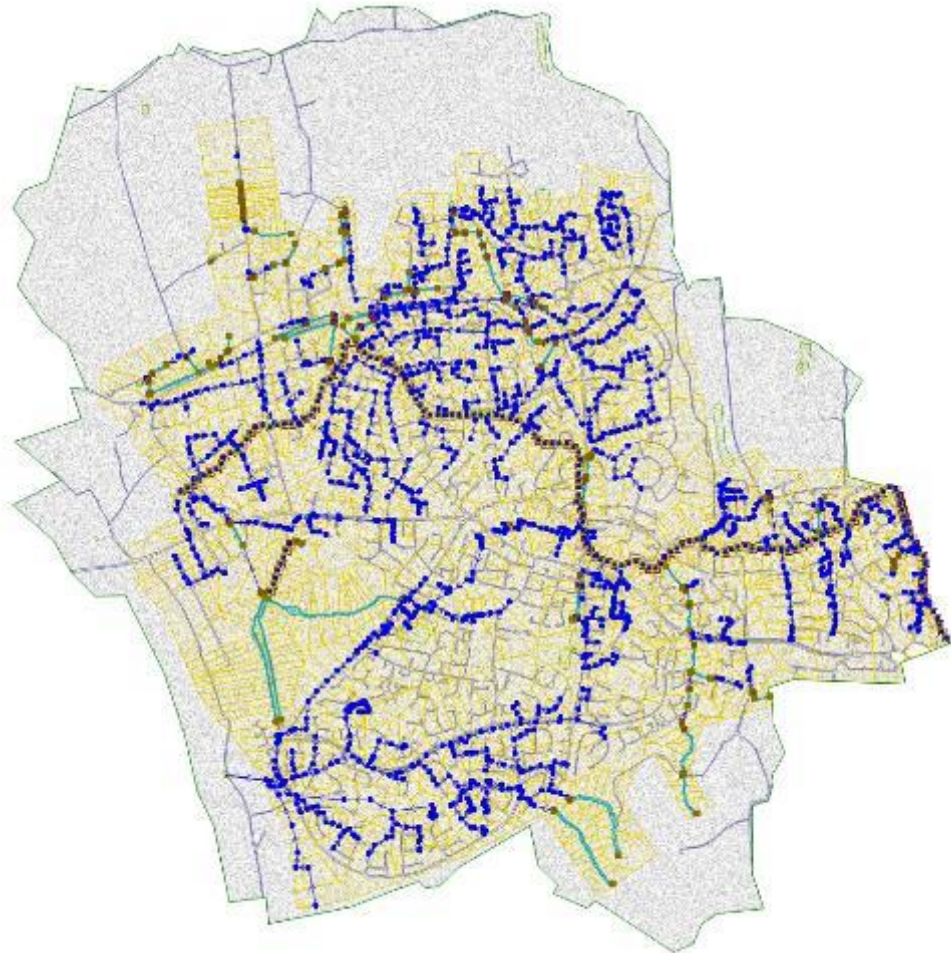
# Case Study – Yate & Chipping Sodbury



- Strategic Growth Area – 3,000 new homes by 2027
- New schools, community centres and care homes
- Upgrades to station and rail services
- Improved pedestrian and cycling connections
- 21-40% Most Deprived (city centre)
- Poor correlation of recorded incidents with RoFSW
- Overall high risk of surface water flooding



# Model Details



- Coupled 1D-2D
- Distributed rainfall & subcatchments
- Pipes > 300mm
- No gully traps
- Manhole survey
- Ordinary watercourse - 1D urban area / 2D rural area
- River Frome - 2D
- Thiessen Polygon subcatchment delineation

# Specific Approaches - UK vs. NZ

ITEM	UK	NZ
Minimum pipe diameter	300mm	150-225mm
Gully traps	No	Yes
As-built plans	No	Yes, generally
Manhole survey	Yes	Limited
Sub-catchment delineation	Thiessen Polygon methodology	Terrain and watershed analysis
Hydrology application	Distributed AND subcatchments	Distributed OR subcatchments

Fine-scale detail NOT modelled

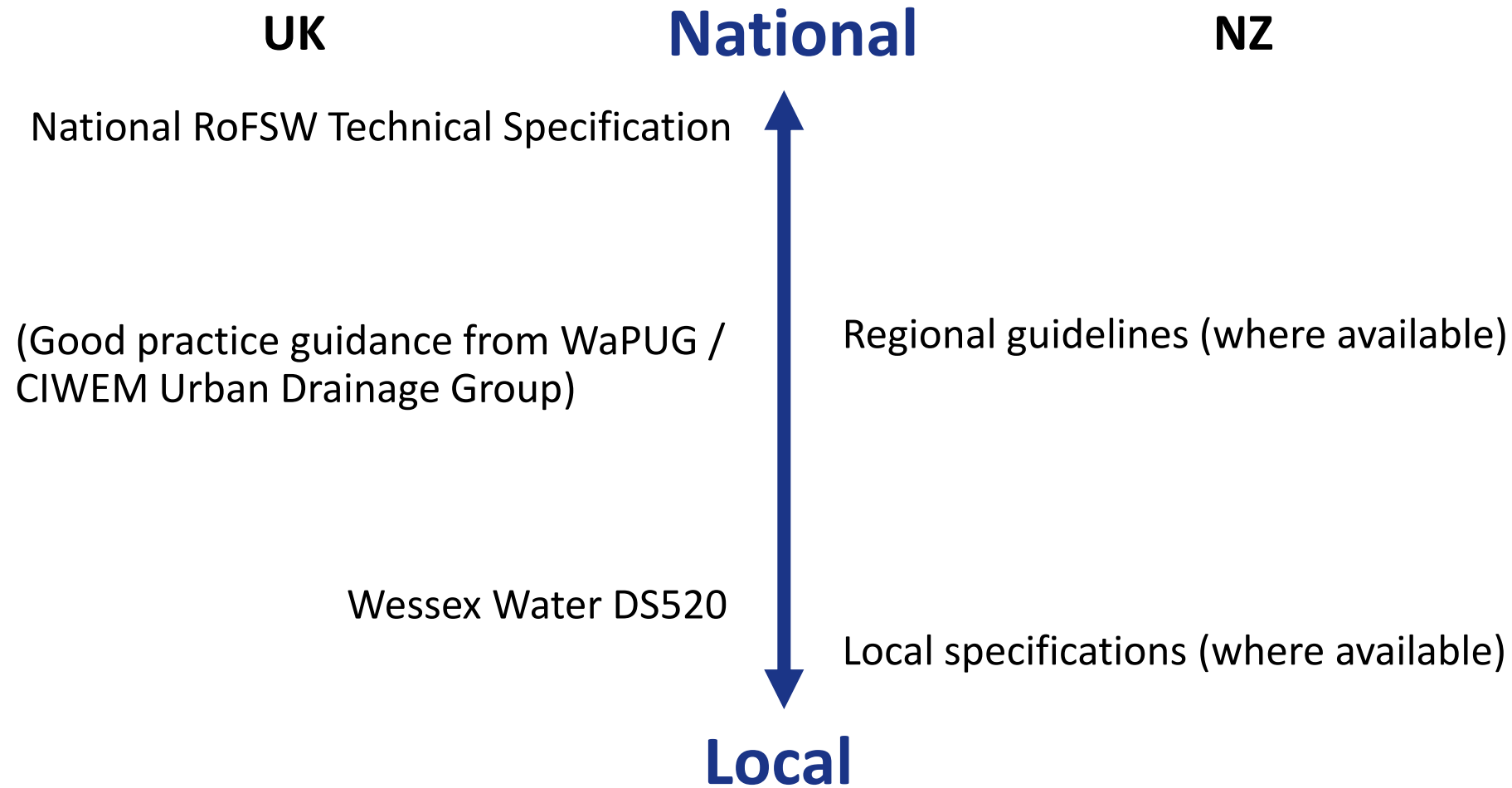
Fine-scale detail modelled

**WHY?** →

1. **Technical standards / specifications**
2. **Motivation / purpose**



# Technical Standards and Specifications - UK vs. NZ

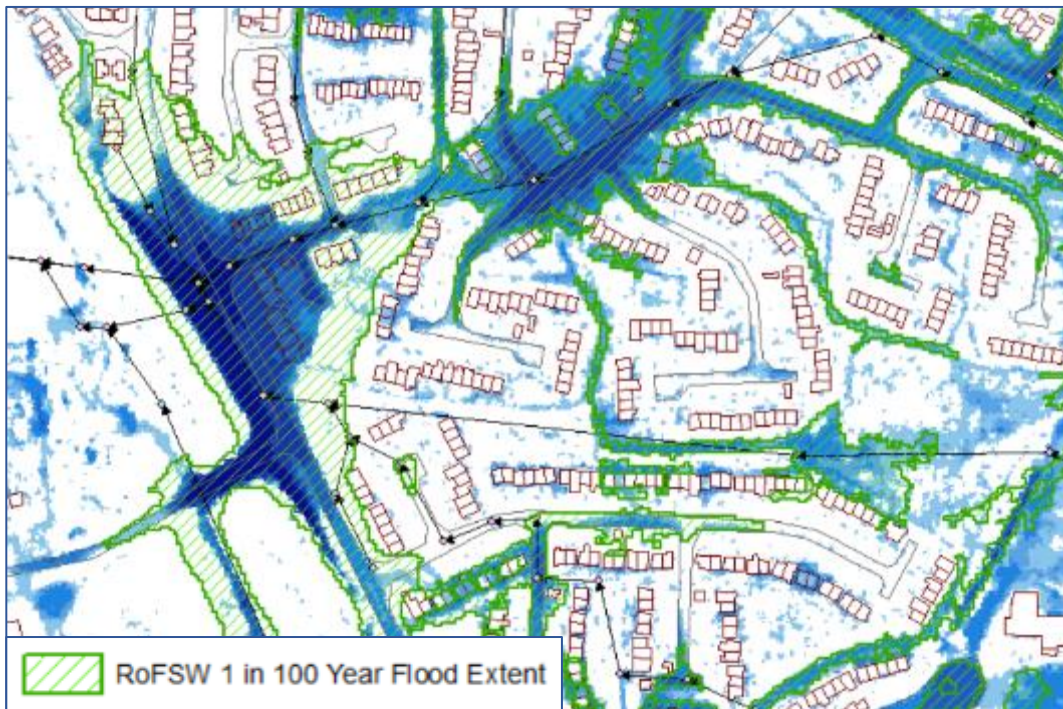




# Motivation - UK vs. NZ

## UK

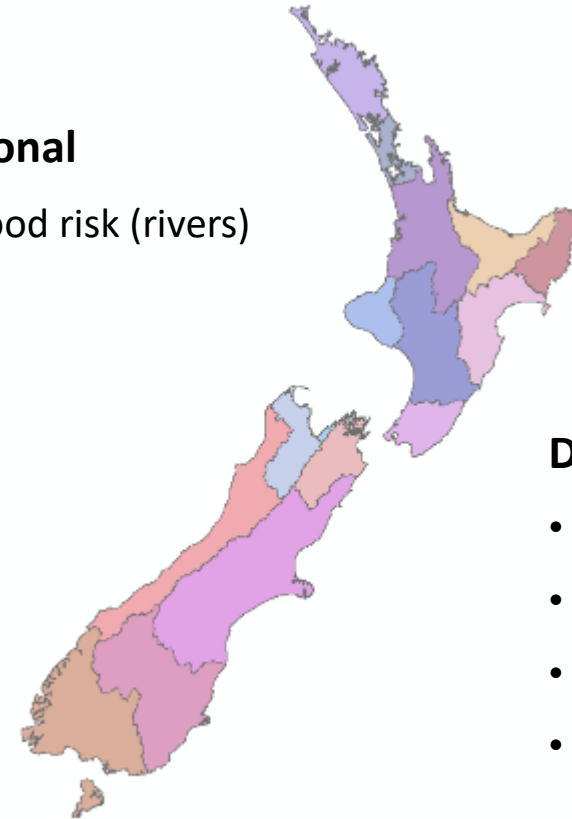
Update national RoFSW map in high risk areas



## NZ

### Regional

- Flood risk (rivers)



### District / City

- Flood risk (stormwater)
- Flood hazard
- Planning
- Property level assessments



# Lessons Learned

- National funding can be strategically, transparently and fairly allocated to local level modelling
- A national technical specification ensures all work completed to a similar technical standard
- The motivation and purpose to undertake the modelling should be considered when schematising
- Models do not always need to be built to include great amounts of detail
- It is beneficial to feed outputs from refined modelling back into a central database



# Questions?



**Michael Arthur**

[Michael@metisconsultants.co.nz](mailto:Michael@metisconsultants.co.nz)

022 071 4653

**Kirsten Henden**

[Kirsten.Henden@awa.kiwi](mailto:Kirsten.Henden@awa.kiwi)

027 366 8334

