

Coupling Calibrated Radar Rainfall and distributed Rain on Grid modelling techniques to maximise the value of hydraulic simulations in Rural and Urban catchments

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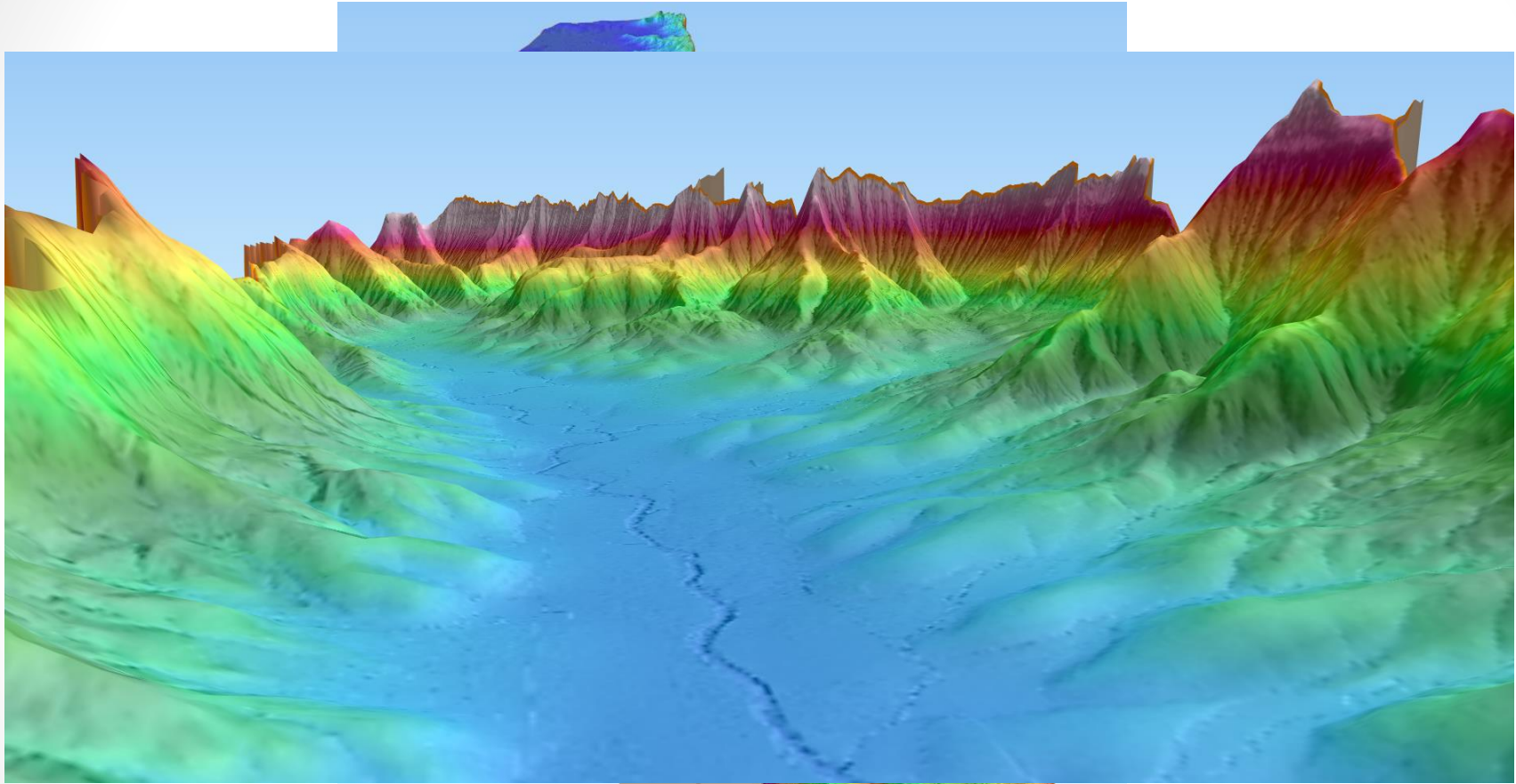
Presentation Overview

- What is 'Calibrated Radar Rainfall' and 'Rain on Grid' modelling
- What are we doing and how is this different?
 - Rural example
 - Urban example
- Conclusion and Discussion

Definitions

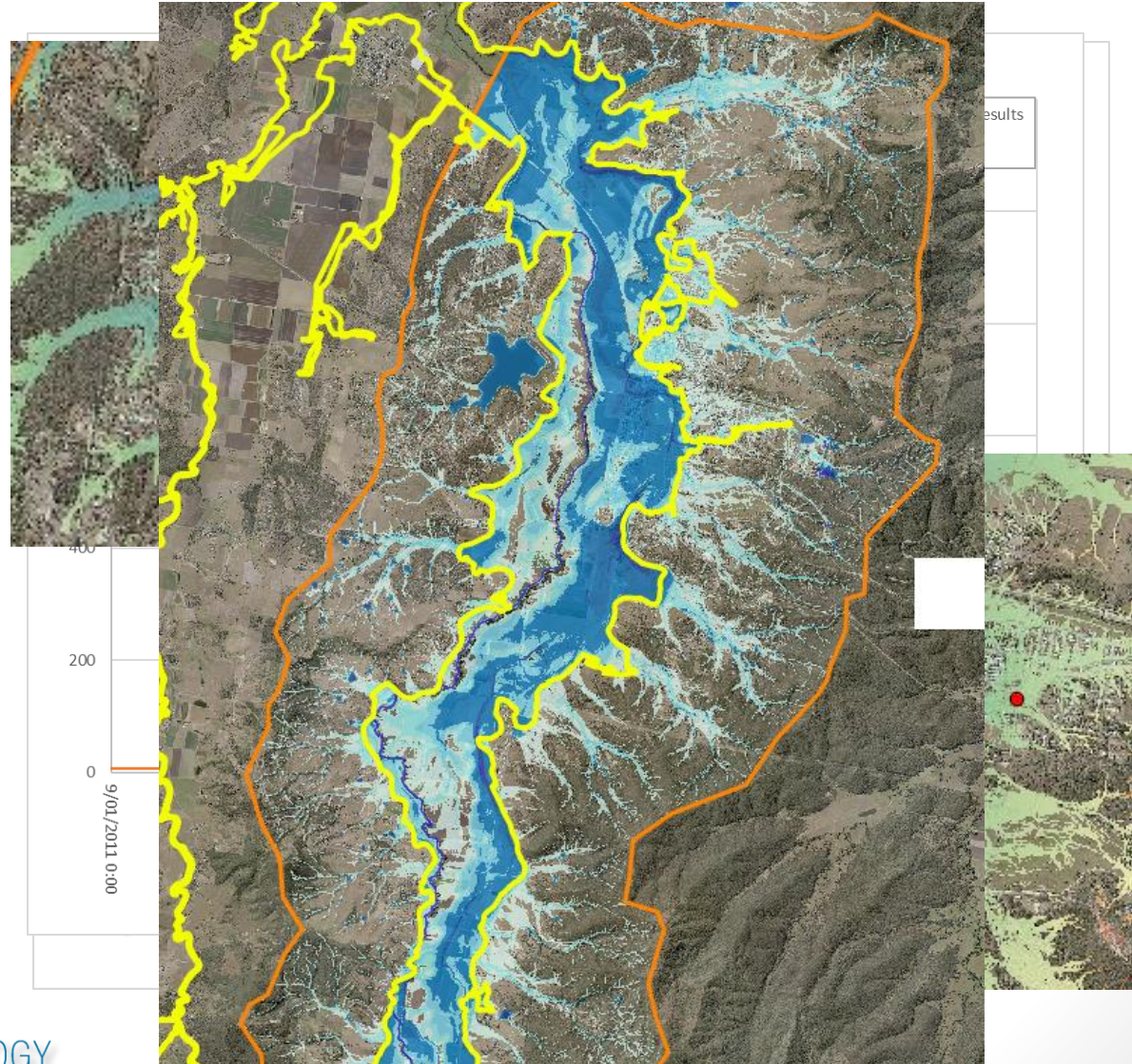
- Calibrated Radar Rainfall
 - Rain gauges accurately measure rainfall at the **points** they are situated, but don't capture variation over an area
 - Radars have a good geographic coverage, but measure precipitation in the **atmosphere** rather than the amount of rain reaching the ground
 - Radar data is calibrated with rain gauge data and is used to **fill in the "gaps"** between rain gauges
- Rain on Grid modelling
 - Applying **distributed** rainfall patterns across an **entire** model domain
 - Differs from normal where a **hydrologic** model defines inflows to a floodplain and a **hydraulic** model defines water levels and flow velocities across a floodplain
 - This enables:
 - Better representation of **spatial** rainfall influences;
 - Evaluation of a greater range of **metrics**; and
 - Simulation of **distributed** management interventions.

Building Catchment Resilience Project



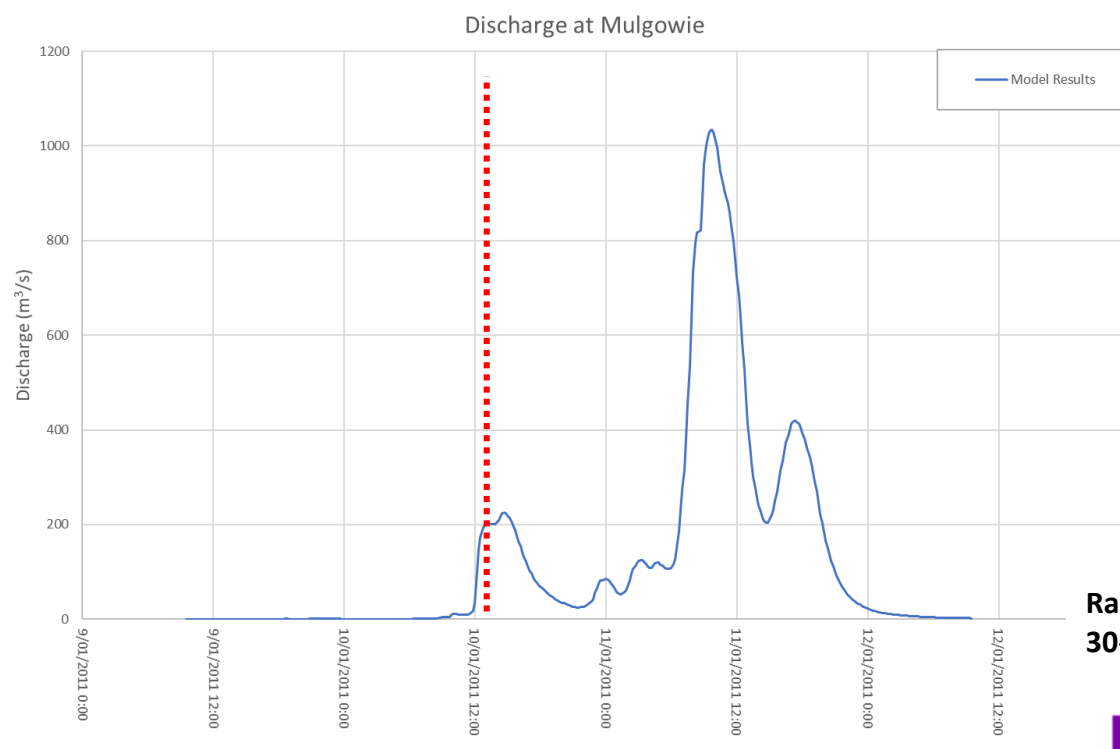
Building Catchment Resilience Project

- Gauging
- Debris
- Flood extents

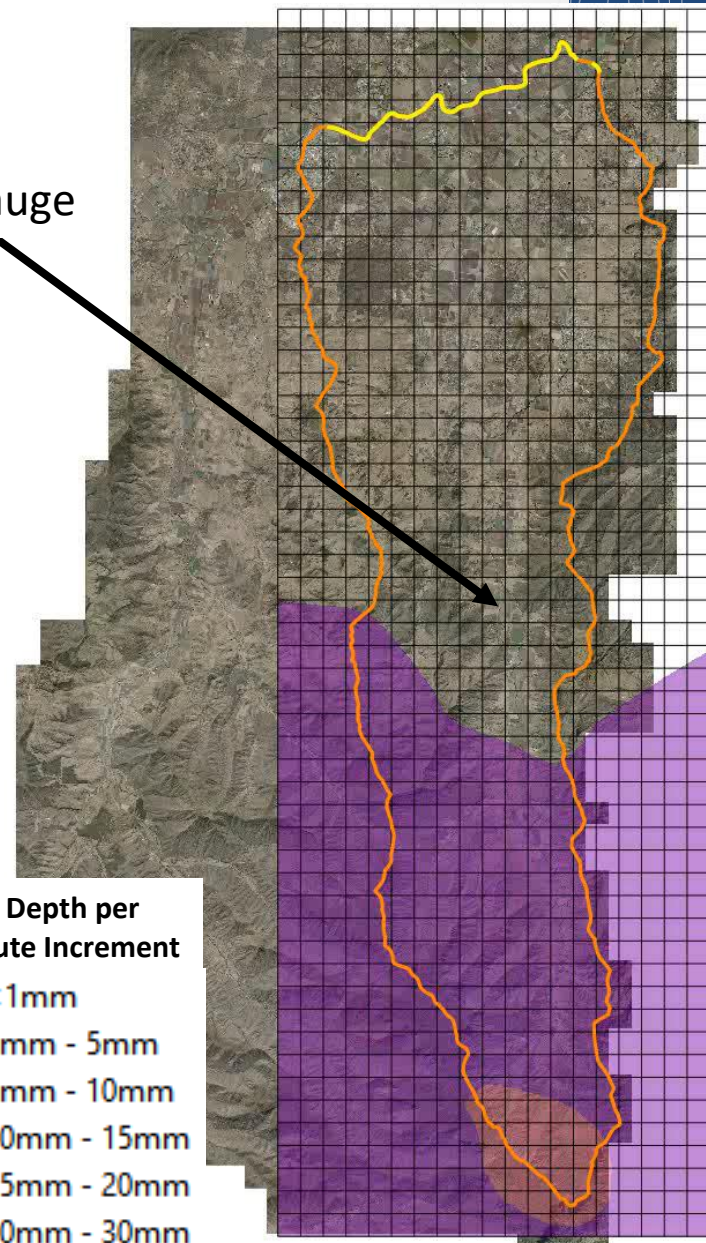


Calibrated Radar Rainfall

Mulgowie Gauge

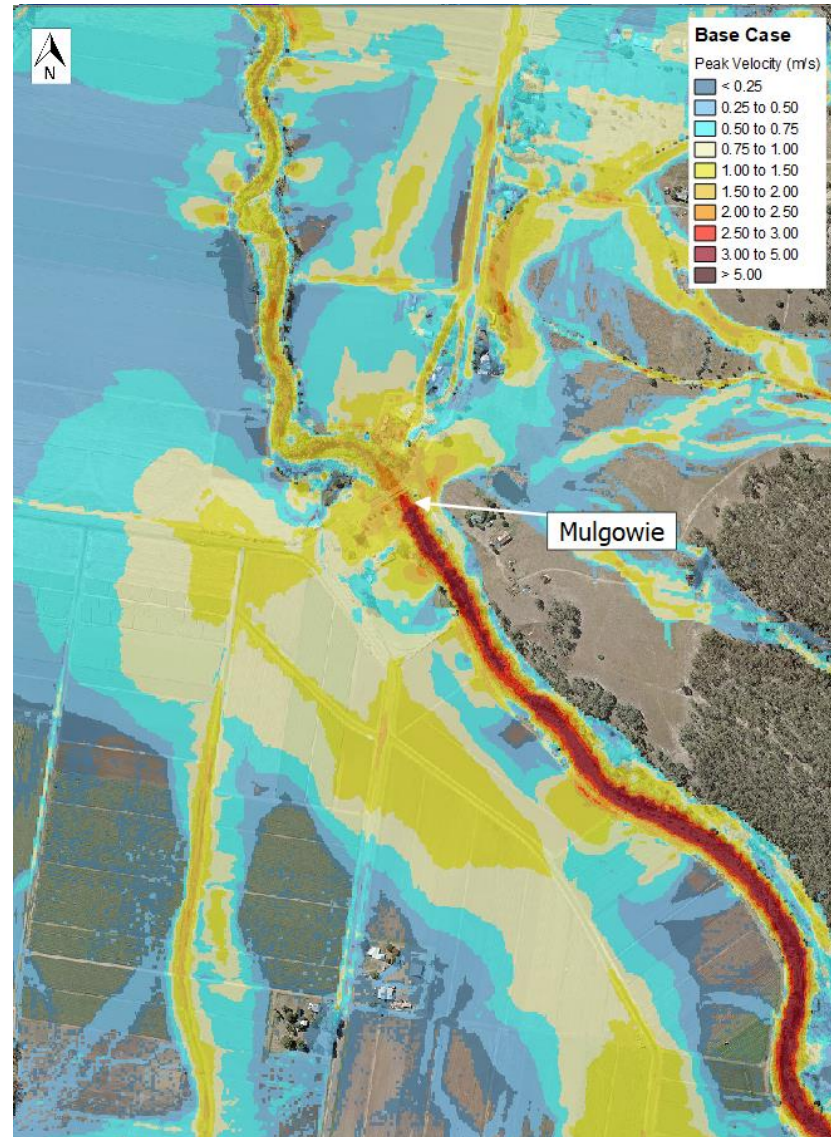
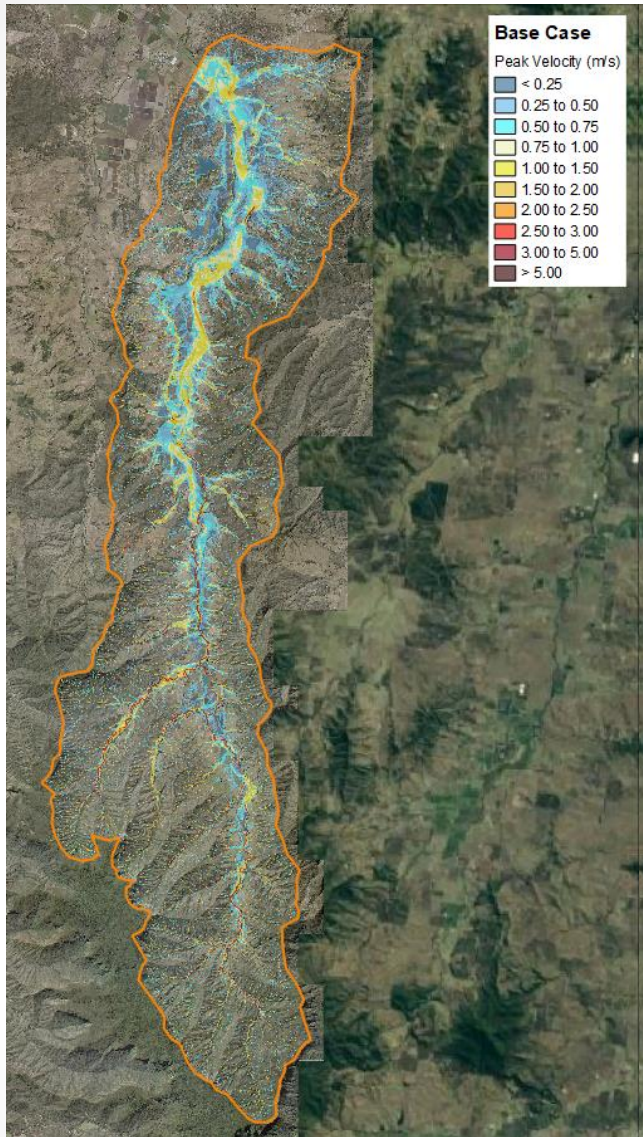


Rainfall Depth per
30-minute Increment

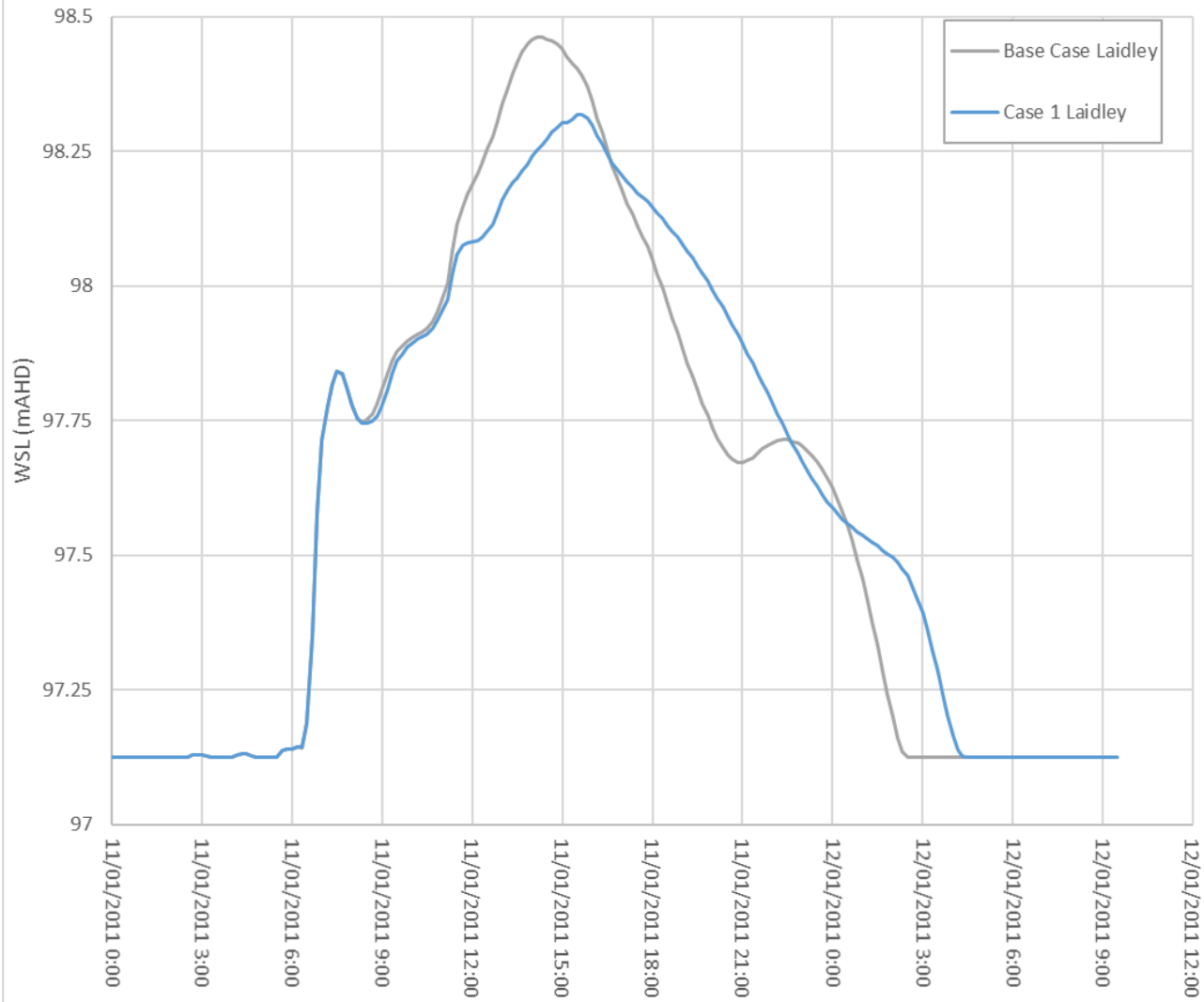


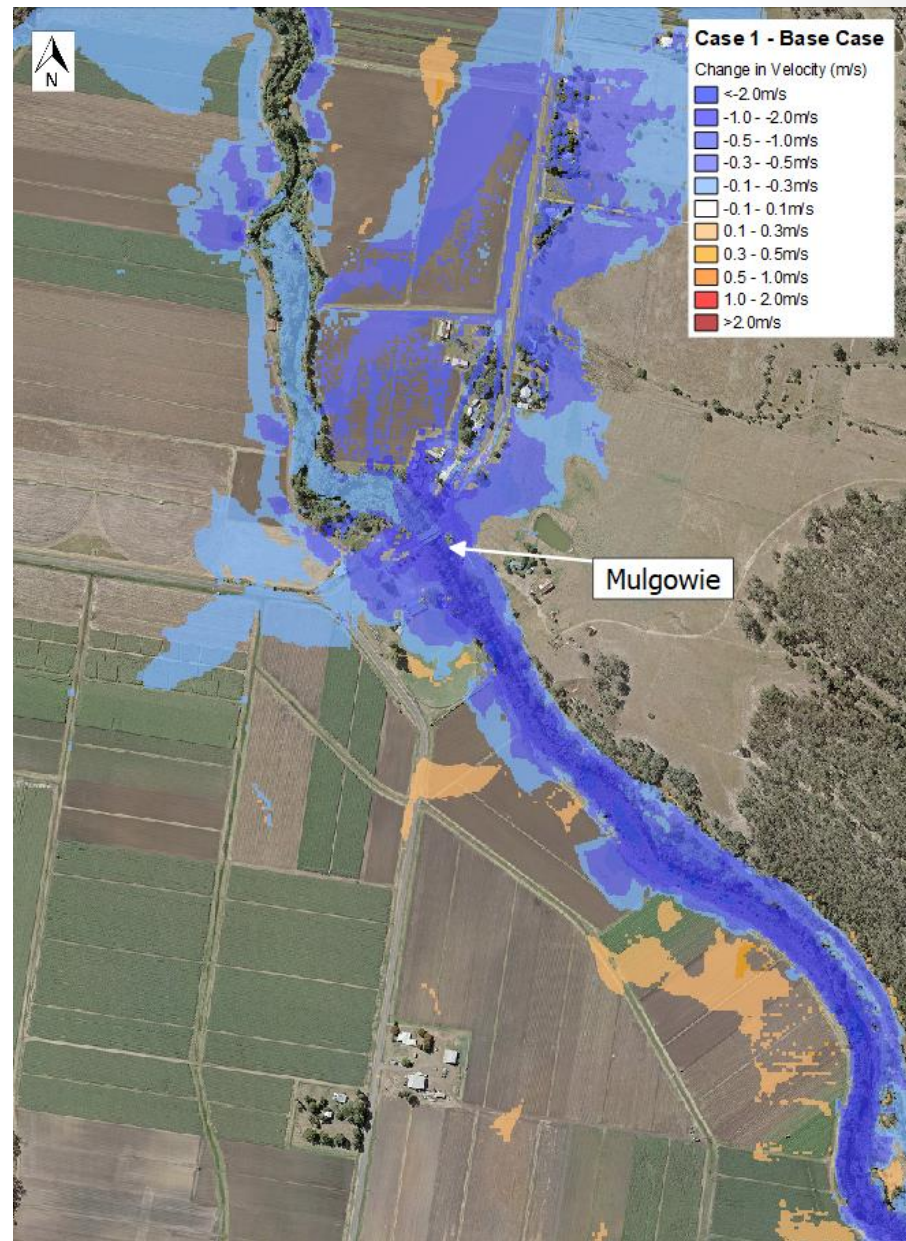
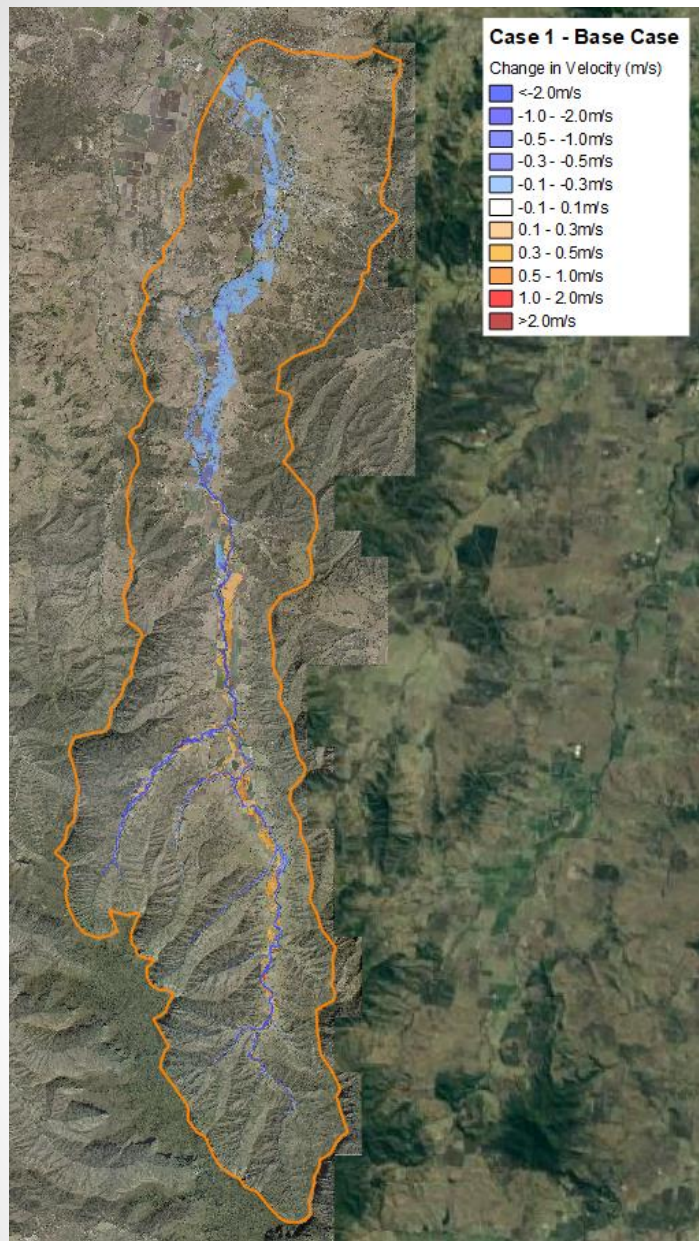
Building Catchment Resilience Project

- Provides insights into key processes within the system
- Management interventions ***across*** the catchment can also be assessed
- In this case, as a proof of concept we have assessed 30m of tree planting either side of the main branch of the creek and some roughening of the main creek channel itself



Water Level Comparison - Laidley





Urban Example

Scrubby Creek, Logan

.....Context.....

☐ Catchment: -

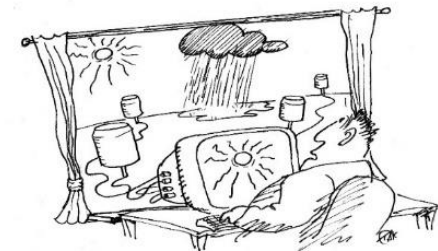
- 78km² in area – ~ <6hr response
- Located in Logan City Council
- Highly urbanised catchment
- Existing flooding issues

☐ Purpose: -

- Test & compare calibration outcomes – urban catchment
- **Pure R&D example**
- Traditional rain gauge allocation versus Calibrated RADAR Rainfall
- Not trying to re-calibrate - Comparative assessment only

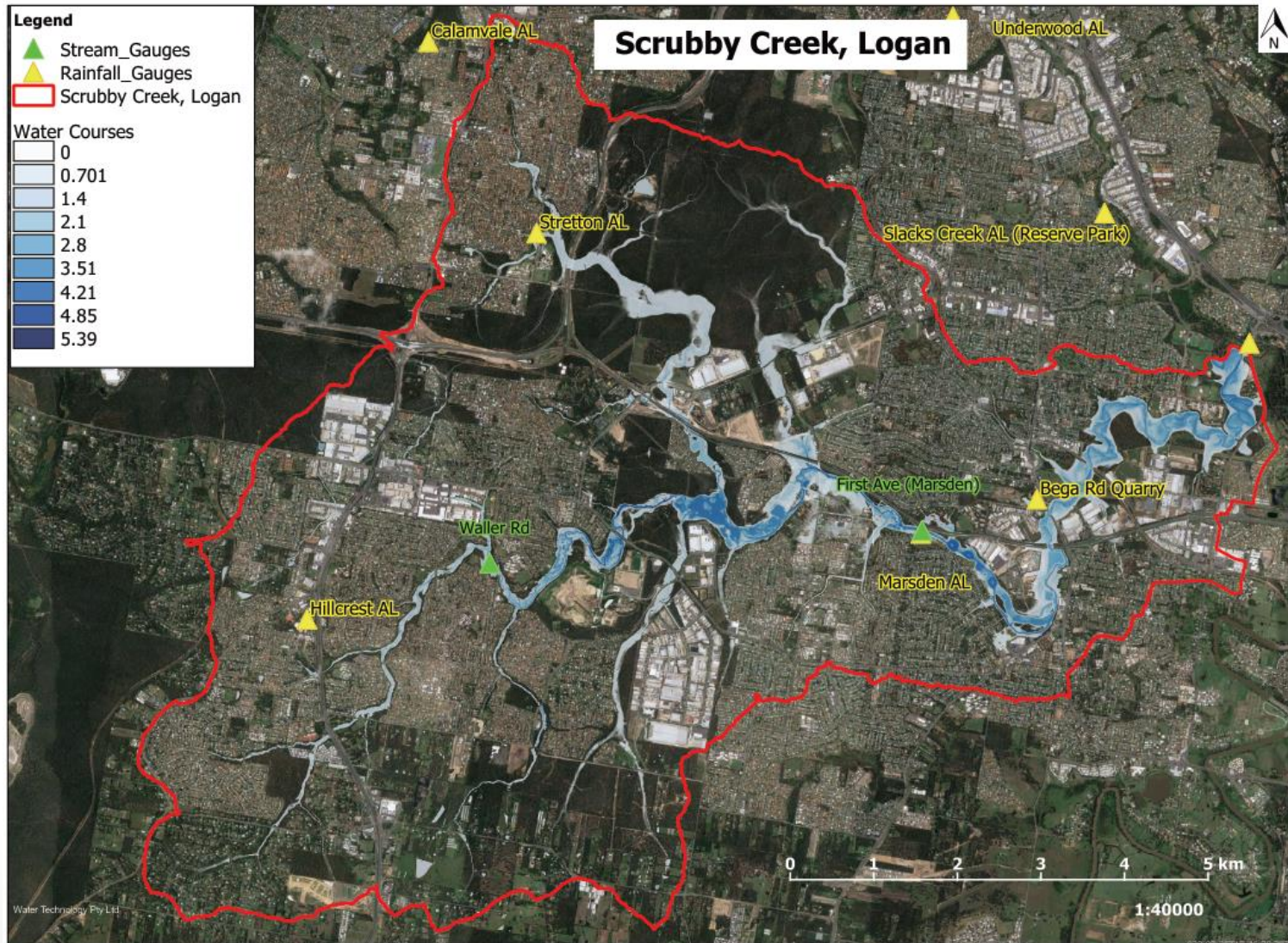
☐ Method/Process: -

- Existing hydraulic model available
- Swap out rainfall inputs to include Calibrated RADAR rainfall data only
- RADAR from HydroNET (...but other sources available)
- No other changes to model – only rainfall inputs
- Compare calibration outcomes – 3 recent historical events



Urban Example....

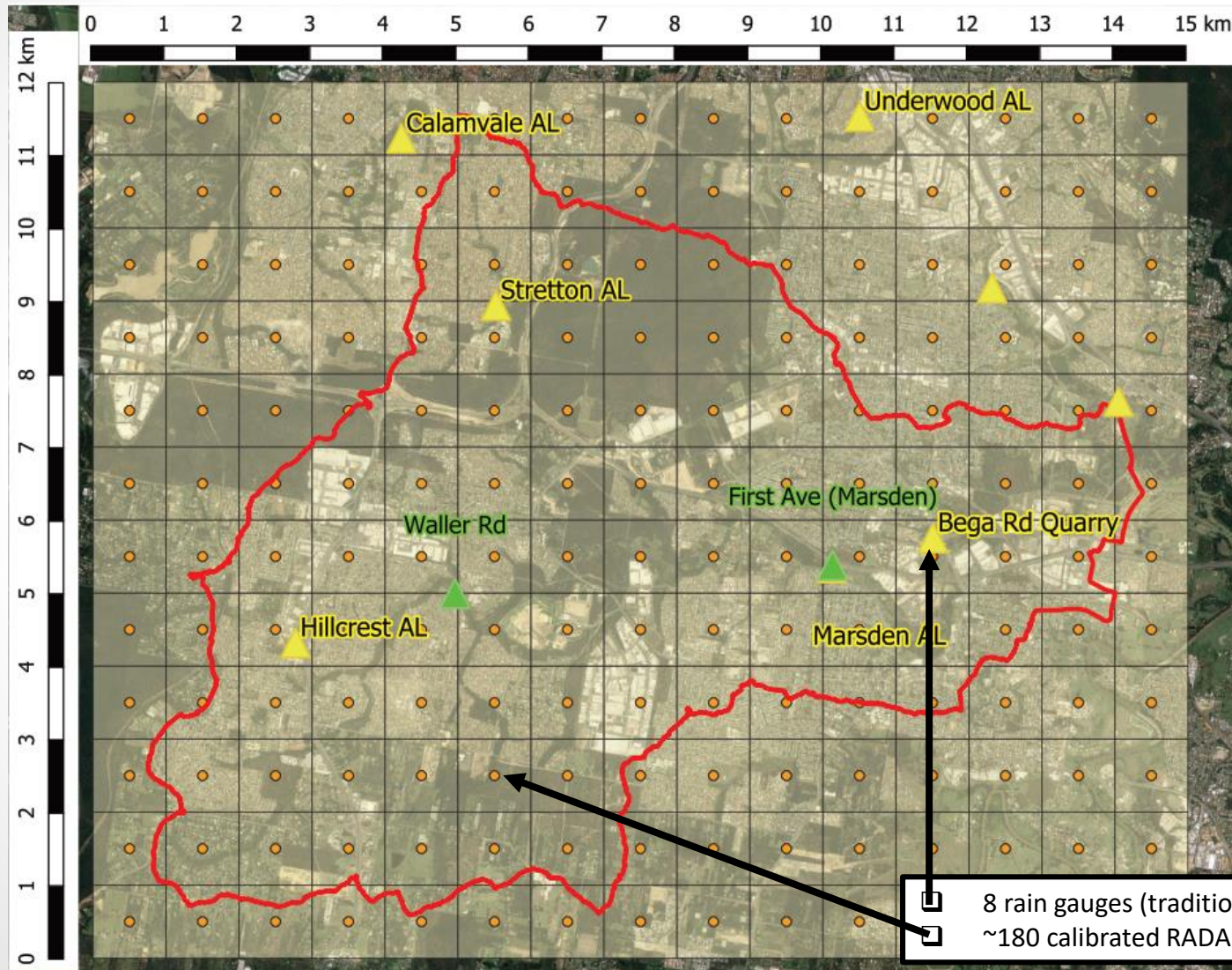
Scrubby Creek, Logan



Urban Example....

Scrubby Creek, Logan

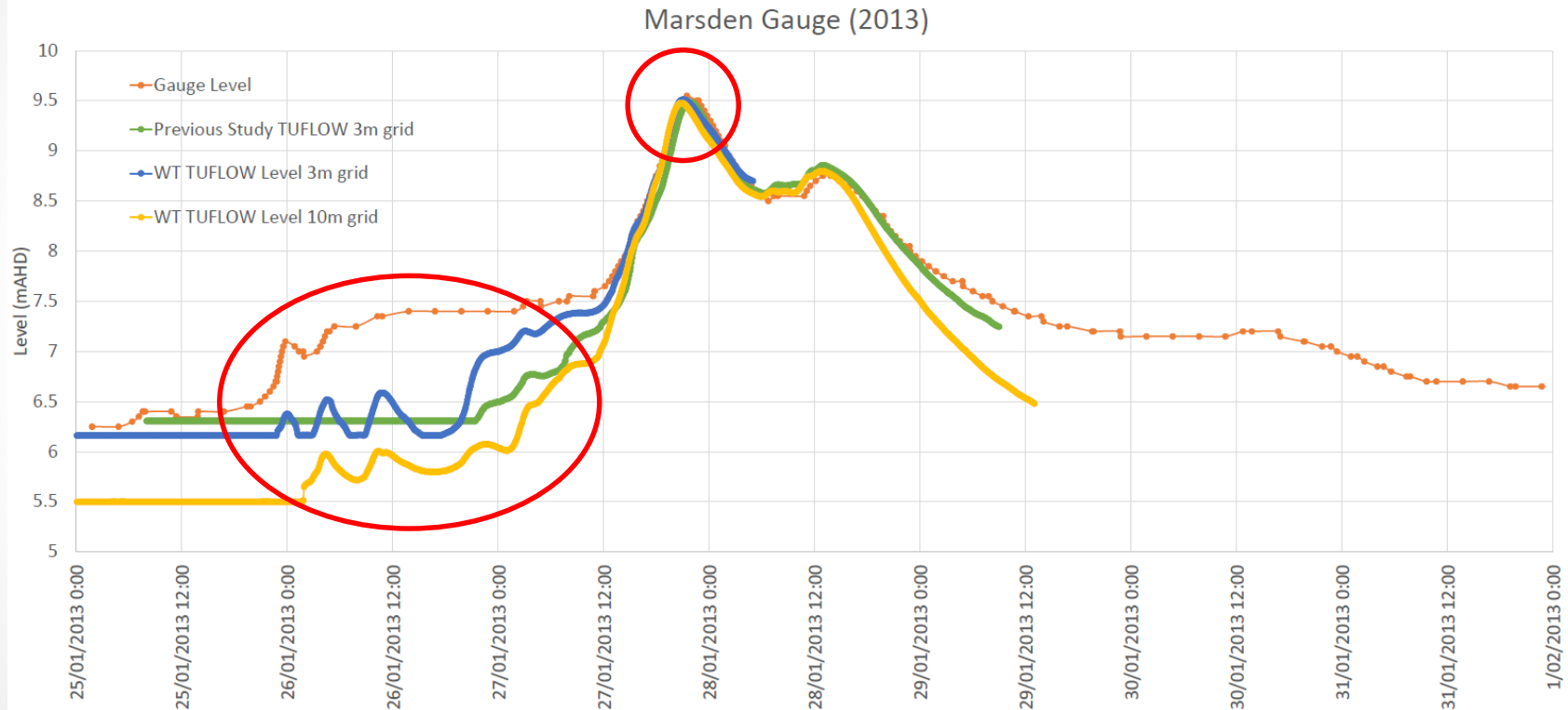
How many rain "gauges" in model....



Urban Example....

Scrubby Creek, Logan

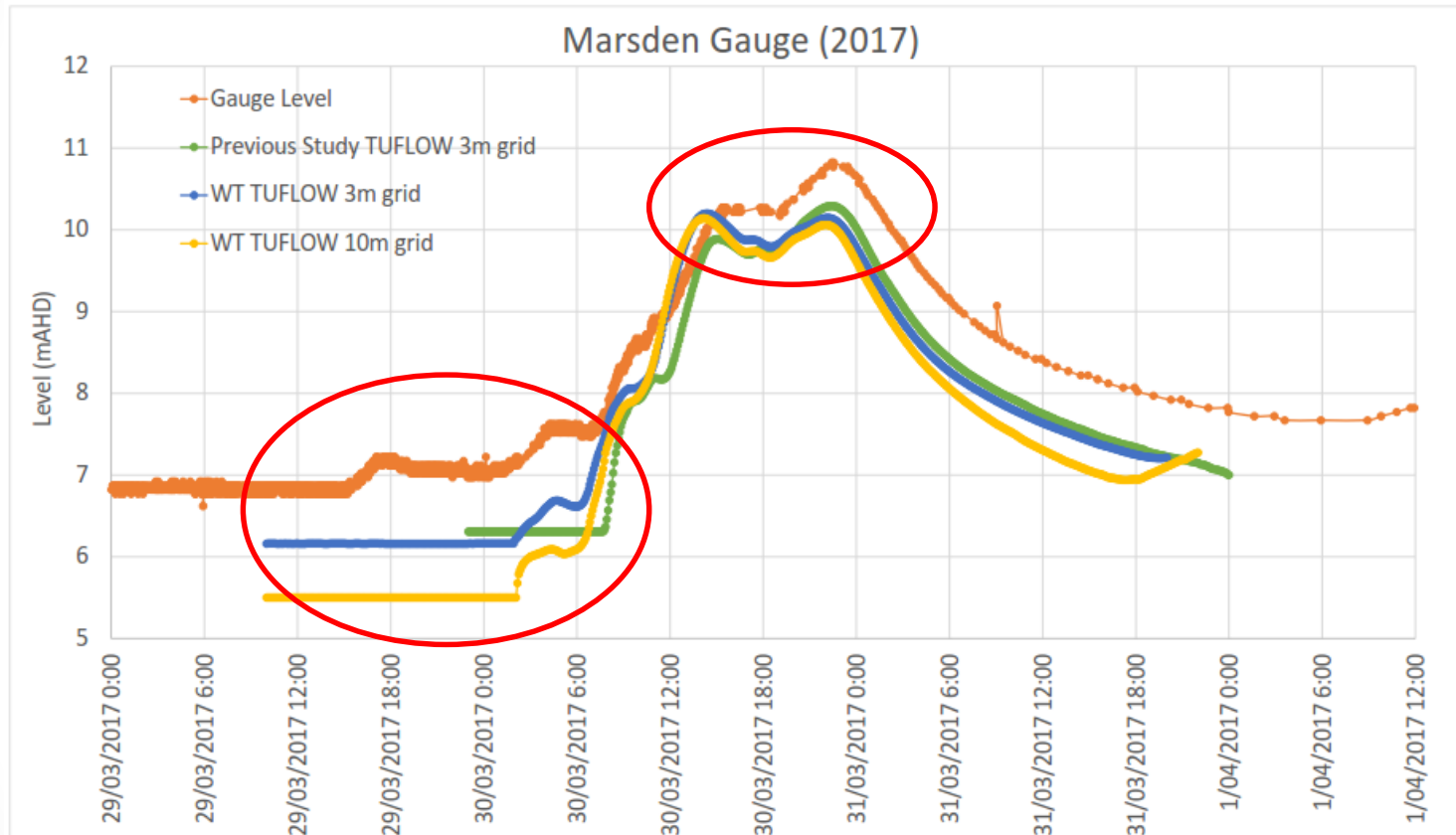
2013 Results @
Marsden Gauge



- Good match to peak
- Good match in overall shape
- Issues in lead-up...

Urban Example.... Scrubby Creek, Logan

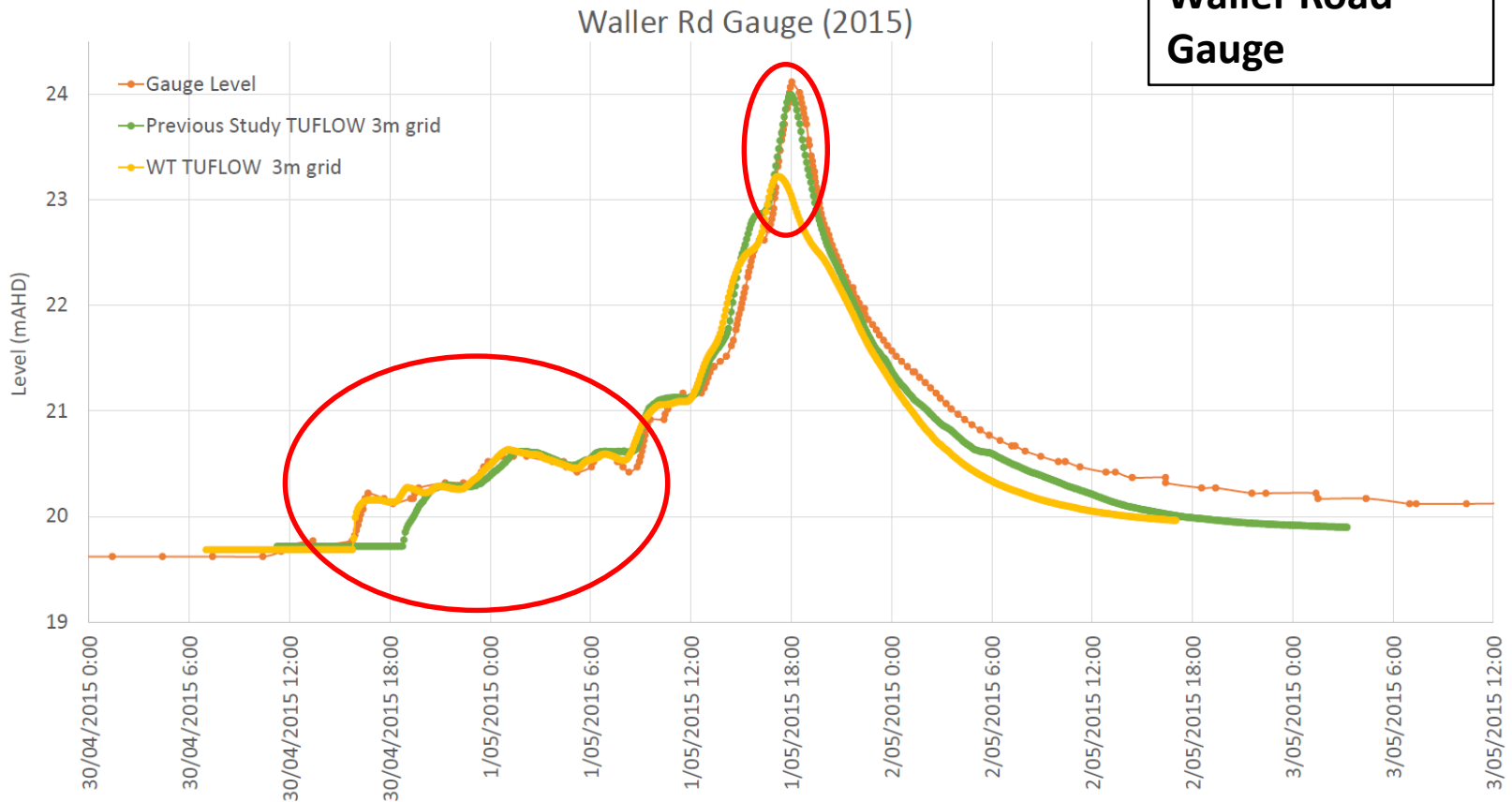
2017 Results
@ Marsden
Road Gauge



- Low on peak (but consistent with previous study results)
- Good match in overall shape
- Issues in lead-up...

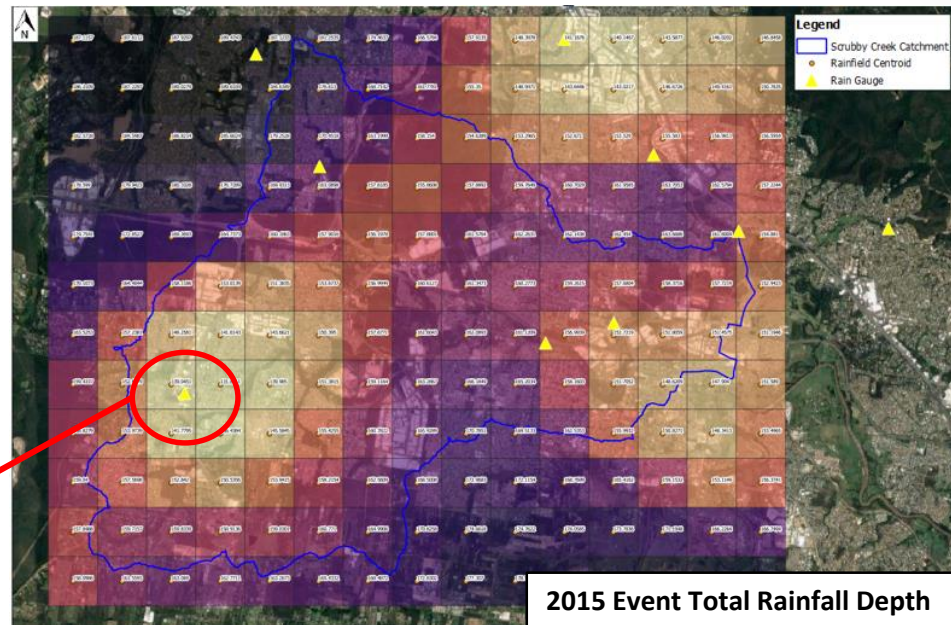
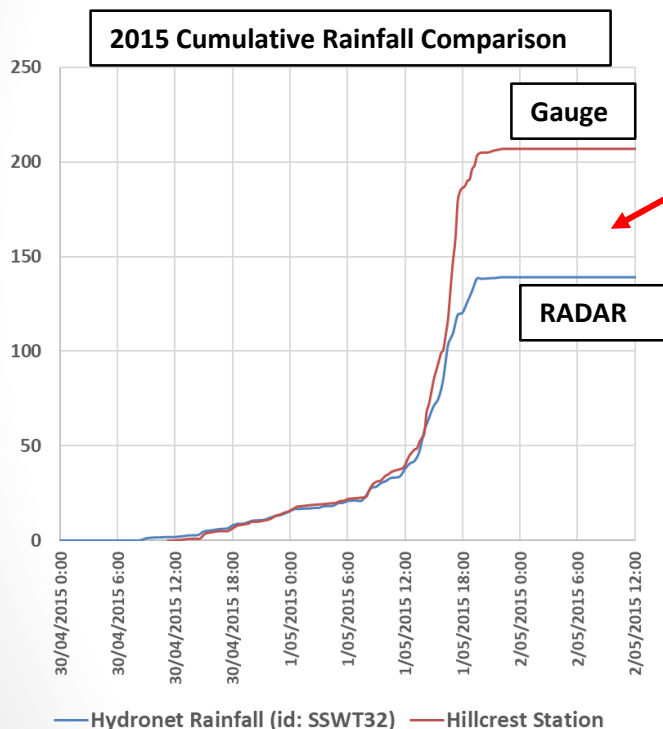
Urban Example.... Scrubby Creek, Logan

**2015 Results @
Waller Road
Gauge**



- Low on peak
- Good match in overall shape
- Great match in lead-up

Urban Example.... Scrubby Creek, Logan



- Low rainfall totals compared to gauge record – holes in RADAR?
- Calibrated RADAR Rainfall – Not calibrated using LCC gauge data (Only Automatic Weather Stations)
- Water Technology Previous R&D - know issues with May 2015 Calibrated RADAR via several catchment examples
- RADAR calibration could be improved by inclusion of more (existing) rainfall gauges

Urban Example....

Scrubby Creek, Logan

.....Observations.....

- RADAR - New and innovative approach
- Significantly improved appreciation of temporal and spatial rainfall distribution
 - Even in well gauged urban catchments !
 - Equally in rural catchments as well...possibly more relevant as generally less rain gauge coverage
- Urban examples – good/great comparative results across 3 historical events
 - Water Technology previous case studies over many catchment examples confirms the same
- RADAR - Effectively turns every 1km² grid into a “rain gauge” over entire catchment
 - Maximises spatial/temporal understanding & replication
 - Rainfall monitoring network - Do we need to expand our? Seems to be the standard approach to catchment monitoring....
 - Not practical / cost effective to replicate this via traditional rain gauges – no need based on results
 - Why don't we expand our current use of RADAR instead ? Huge cost effectiveness....(1 new rain gauge ~30k)



QUOTE - “The potential value is so great, however, that all improvements, as soon as available, should be applied in the field on a continuing basis. Here we have something so obviously useful that neglect of it is unthinkable” Ashton (1963)

- ➡ Significant investment by BoM, multiple data products available & forecasts
- ➡ RADAR is a key source of information to inform catchment studies
- ➡ Take up / realisation of benefits across the industry ????