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## Floodplain Risk Management in Dungog after the April 2015 Super Storm

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FMA 2017 – Preparing for the Next Great Flood  
17<sup>th</sup> May 2017

### Presentation Outline

- Background and Flood Mechanisms in Dungog
- The April 2015 “Super Storm”
- Model Development and Calibration
- FRMS - Mitigation Options Assessment
- Outline of a Suitable Flood Warning System
- What can we Learn from the Dungog Tragedy?

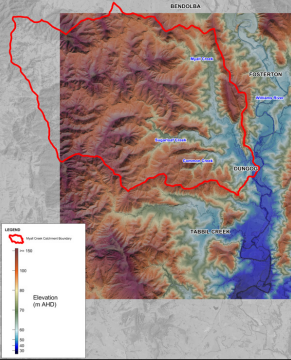
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### Background

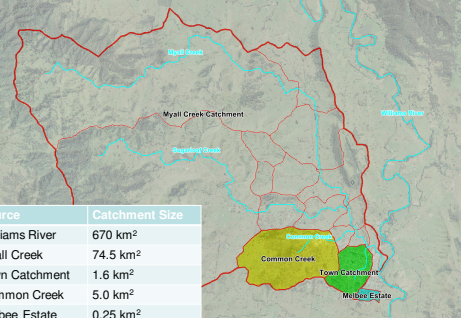
**Dungog is located:**

- in the Upper Hunter Region of New South Wales,
- approximately 60 km north of Newcastle, and
- 70 km inland from the coastline.
- Situated at the confluence of the Williams River and Myall Creek.
- Population is ~3,000



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### Flood Mechanisms in Dungog (Myall Ck. Catchment Detail)



Source	Catchment Size
Williams River	670 km <sup>2</sup>
Myall Creek	74.5 km <sup>2</sup>
Town Catchment	1.6 km <sup>2</sup>
Common Creek	5.0 km <sup>2</sup>
Melbee Estate	0.25 km <sup>2</sup>

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### Property Inundation in Dungog

- Out of ~1200, properties in Dungog,
  - 122 could be flooded above floor level in the PMF
  - In the 1% AEP (100yr ARI) only 22 properties are flooded.
  - In the 5% AEP (20yr ARI) only 9 properties are flooded.

Source	Catchment Size	Number of Properties
Williams River	670 km <sup>2</sup>	1 property in the 1% AEP (100yr ARI) & 12 properties in PMF (east of railway)
Myall Creek (backwater inundation)	74.5 km <sup>2</sup>	20 properties in the 100yr ARI & 89 properties in PMF
Town Catchment	1.6 km <sup>2</sup>	1 property in the 1% AEP (100yr ARI) & 12 properties in PMF
Common Creek	5.0 km <sup>2</sup>	no properties in the 1% AEP, 9 properties flooded in April 2015 & PMF
Melbee Estate	0.25 km <sup>2</sup>	2 properties (d/s of railway embankment) flooded in PMF

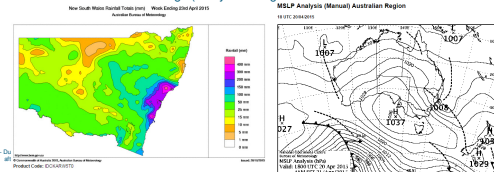
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### April 2015 "Super Storm"

- The April 2015 "Super Storm" was driven by a low pressure system on the coast of NSW (i.e. an East Coast Low)
- The storm produced intense rainfall, high winds & damaging waves
- Widespread heavy rain occurred from Monday 20th until Wednesday 22nd, with the most intense falls occurring on the morning of Tuesday 21st April
- Localised "super storm" cells developed affecting: Stroud, Dungog, Cessnock and Maitland
- In Dungog, the storm caused three fatalities, washed 5 houses away and flooded some 80 dwellings (many to ceiling level).



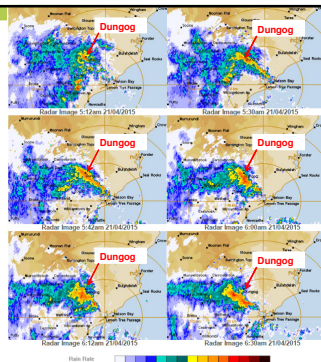
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### Radar Images

Intense rain between  
5am and 7am 21/4/2015

Source:  
<http://www.theweatherheraser.com/radar-loop/>

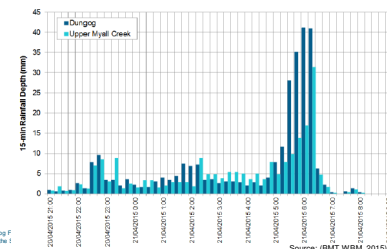


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### Temporal Variation in Rainfall

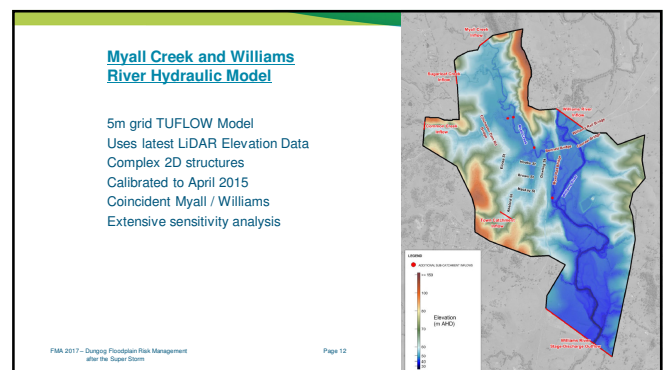
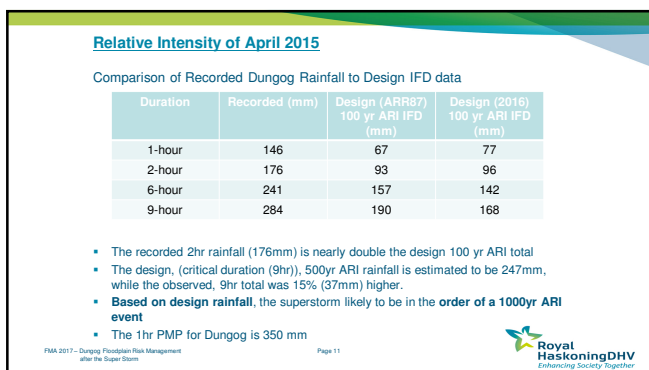
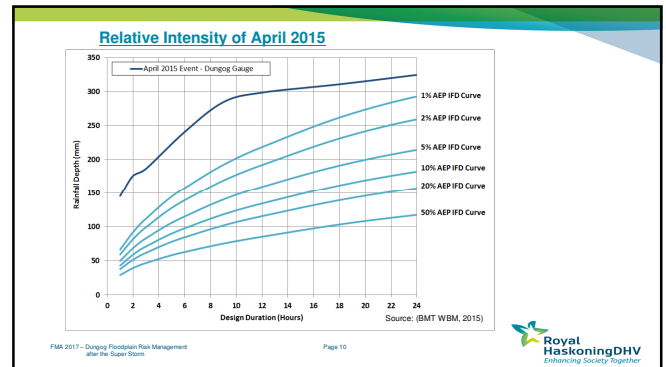
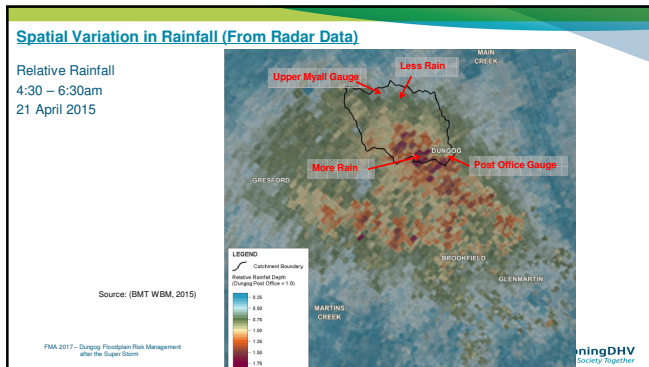
Below graph shows 15 minute rainfall totals for:  
Dungog Post Office (24hr to 9am total is 312mm, 5am to 7am = 175mm)  
Upper Myall Creek (24hr to 9am total is 190mm, 5am to 7am = 93mm)

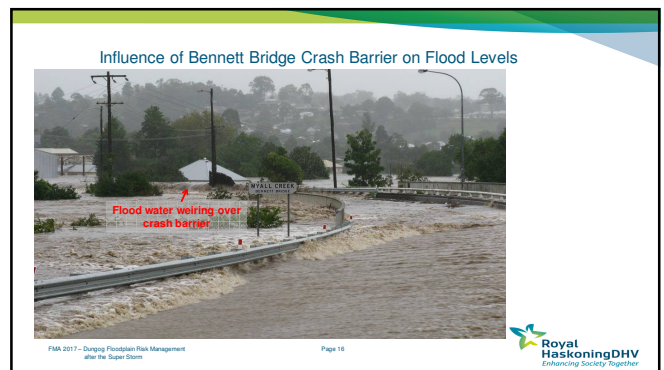
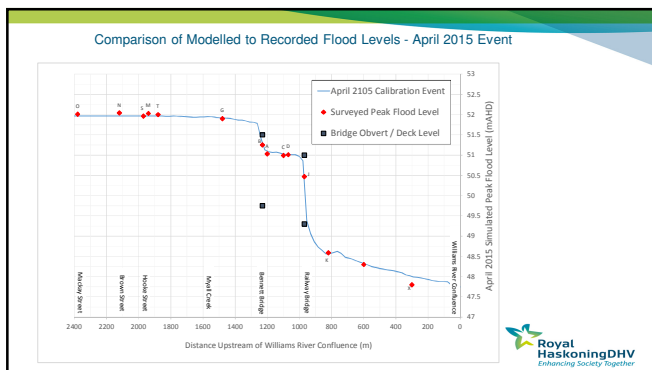
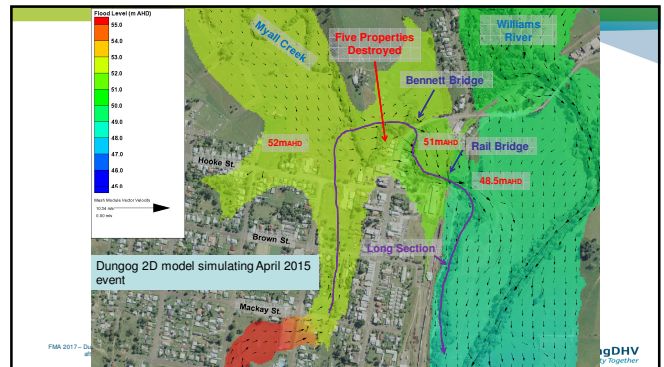
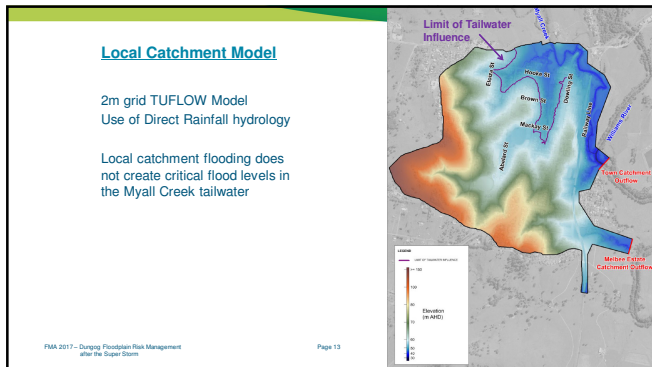


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Source: (BMT WBM, 2015)


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### Relative Magnitude of April 2015 Flood

Comparison of April 2015 Water Levels and Flow to Myall Ck. Design Events

AEP / ARI	Hooke St Peak Flood Level (m AHD)	Bennett Bridge Peak Discharge (m <sup>3</sup> /s)
5% / 20yr	49.41	256
2% / 50yr	49.82	324
1% / 100yr	50.2	383
0.5% / 200yr	50.64	444
0.2% / 500yr	51.11	533
PMF (3 x 100yr)	53.00	1174
April 2015	52.00	722
June 2007	49.4 (observed)	250 (est.)

April 2015 water level was nearly 1m higher than Myall Ck. 500yr ARI Event

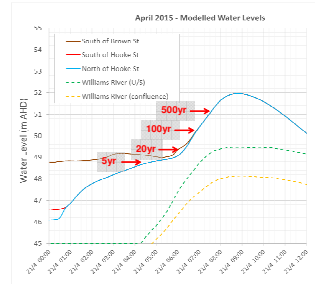
April 2015 water level was 1m lower than Myall Ck. PMF Event

April 2015 discharge was 1.9 x 100yr ARI discharge

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### Rate of Rise of April 2015 Flood



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### Dungog FRMS Mitigation Options Summary

#### Flood modification measures

- O1) Major Myall Creek (Road and Rail) Bridge Modifications
- O2) Minor Myall Creek (Road and Rail) Bridge Modifications
- O3) Myall Creek Levee with Pumps
- O4) Myall Creek Levee with Diversion Culverts
- O5) Vegetation Removal with Scour Protection
- O6) Dungog Showground Detention Basin Augmentation
- O7) Dungog North-West Detention Basin

#### Property modification measures

- O8) Voluntary House Raising (VHR)
- O9) Voluntary House Purchase (VP)

#### Response modification measures

- O10) Flood Warning System

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### Dungog FRMS Mitigation Options Summary

Summary of Peak Flood Levels

Design Conditions AEP / ARI	BC Existing / Base Case	O1 Major Bridge Upgrade	O2 Minor Bridge Upgrade	O3 Levee with Pumping	O4 Levee with Diversion Culvert	O5 Channel Vegetation Clearance
20% / 5yr	48.78	48.51	48.57	47.13	48.48	48.56
5% / 20yr	49.41	49.03	49.07	48.31	49.05	49.10
2% / 50yr	49.82	49.31	49.34	48.79	49.23	49.45
1% / 100yr	50.2	49.84	49.89	49.16	49.84	49.99
0.5% / 200yr	50.64	50.25	50.30	49.59	50.05	50.43
0.2% / 500yr	51.11	50.70	50.72	50.12	50.40	50.90
PMF	53.22	53.18	53.18	53.22	53.22	53.21
April 2015	51.98	50.61	50.82	51.48	51.20	51.61

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**Thank you**

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OEH (Angela Halcrow)  
Dungog Council (Paul Minett)  
Members of the Dungog Floodplain Management Committee  
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