June 2007 Long Weekend Storm Event in Lake Macquarie City

Presented by: Greg D Jones

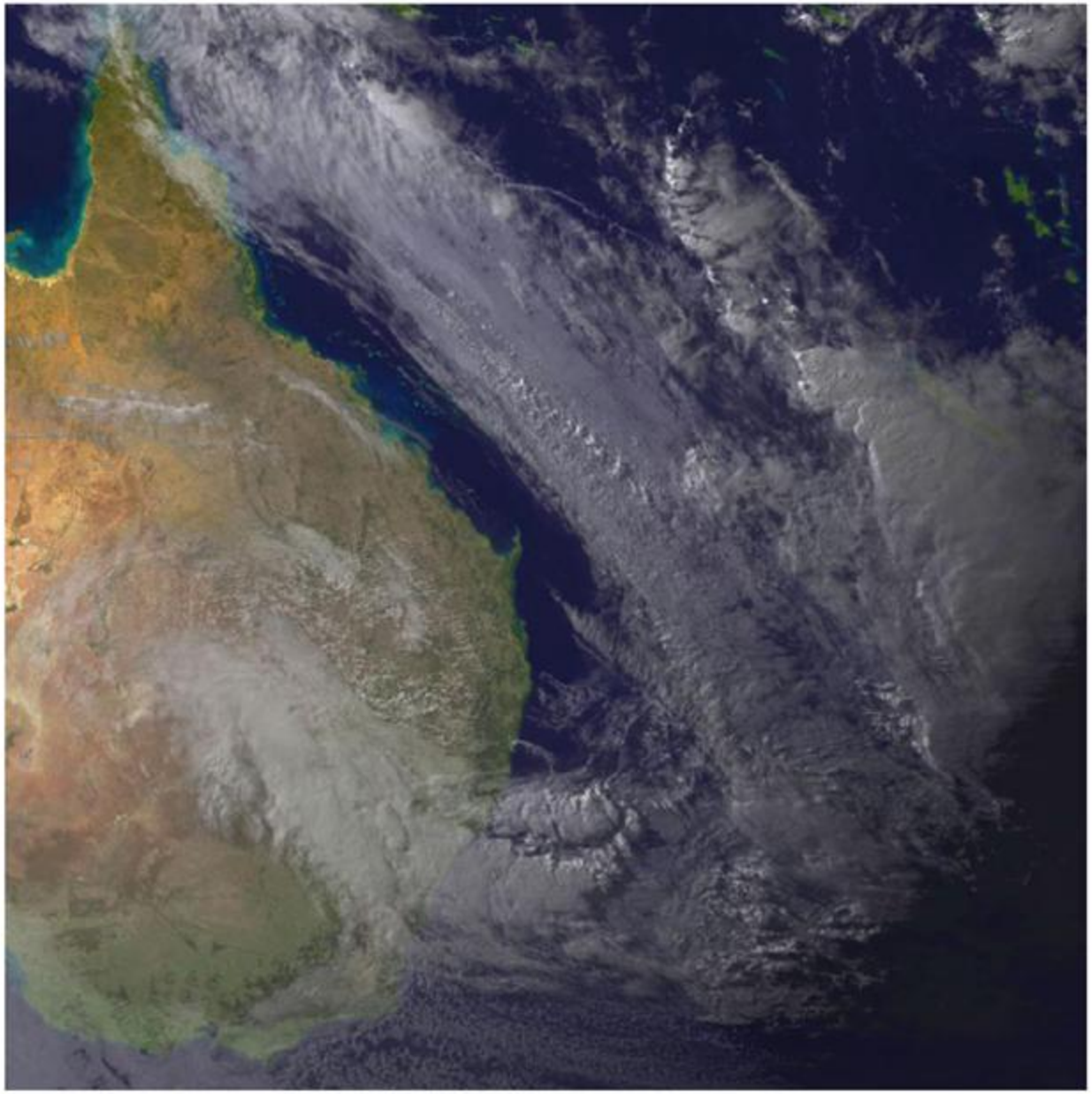
Coordinator Floodplain Management and Climate Change Adaptation

Lake Macquarie City Council

Satellite Image of Eastern Australia at 1530 hours on 08/06/07

FIGURE 8: SATELLITE IMAGE OF EASTERN AUSTRALIA AT 15:30 ON 8 JUNE 2007

Source: Bureau of Meteorology from the Geostationary Meteorological Satellite MTSAT-1R of the Japan Meteorological Agency



Conclusions and Lessons to be Learnt

- Storm event caused considerable tangible and intangible costs and social disruption to the Lake Macquarie community at large.
- Considerable damages to infrastructure and unprecedented deployment of personnel and allied equipment resources to assist with combat activities (road closures, evacuations, electricity restoration, tree lopping, cleanups)
- Impacts may be partially compensated for, as a result of the NSW Government declaring the storm event as a 'natural disaster'.

Conclusions and Lessons to be Learnt

- Potential for future flood losses should be contained by the application of ecologically sensitive planning and development controls
- Floodplain management strategies - flood study and plan reports for prioritised City catchments
- Council is fulfilling its obligations in the floodplain risk management process as outlined in the New South Wales Government's *Floodplain Development Manual, April 2005*.

Risk Management

- MORTALITY – there were 9 deaths attributed to the storm event (none recorded in Lake Macquarie City)
- MORBIDITY – no statistics available relative to illnesses caused as a result of the storm/flood event
- PROPERTY – infrastructure property damage in Lake Macquarie City estimated in excess of $19M (not including personal insurance claims)
- LIVELIHOODS – there has been considerable hardship suffered by residential and commercial entities,
  eg. Boolaroo/Teralba residences affected; Cardiff CBD and Barnsley Industries affected
- NATURAL SYSTEMS – flooding and wind caused considerable damage to the natural environment

Floods and Severe Storms are the two most expensive and damaging of all natural hazards

Source: Bureau of Transport Economics 2001

Hazard type	Average annual cost (A$m)
Flood	314
Severe Storm (Including Hail)	284
Tropical Cyclone	266
Earthquake	144
Bushfire	77
Landslide	1
Total	**1088**

Table above shows the annual average economic cost for each natural hazard and includes direct and indirect costs resulting from destruction or damages to buildings, infrastructure, vehicles and crops

Pasha Bulker at Nobbys Beach, Newcastle

Thank You - Questions ?

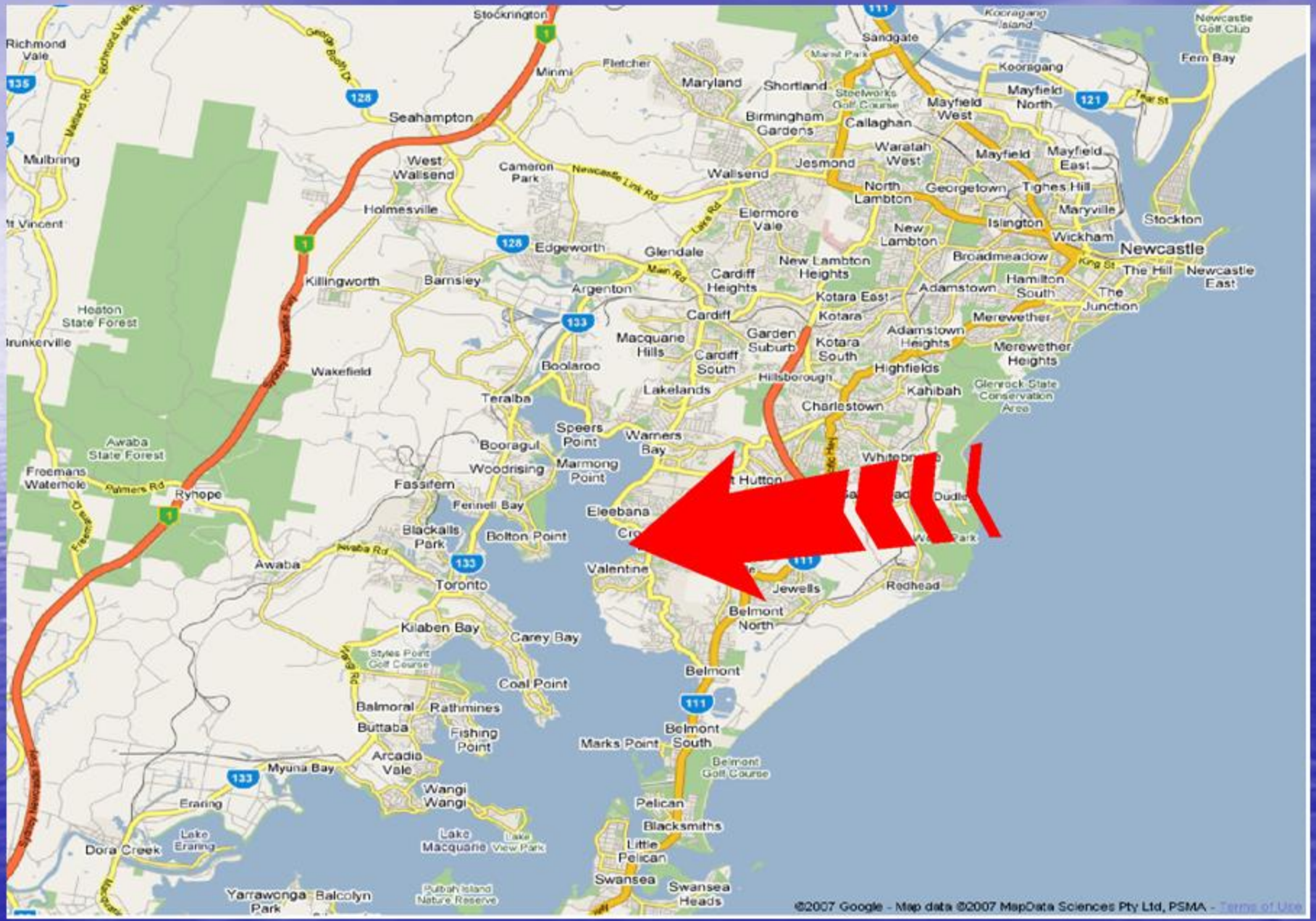
Acknowledgements

- Slides 5, 6, 7, 8, 12, 16, 90 – courtesy Gordon Mackay, Bureau of Meteorology
- Slide 13 – Photo by Lucia Wilcox - Courtesy ABC Newcastle
- Slide 17 - Photo courtesy Jim Bodycott
- Slides 19, 20, 21, 22, 24,25, 26 – Photos courtesy Narelle Stone
- Slide 27 – Photo by Jim Bell - Courtesy ABC Newcastle
- Slide 34 – Photo by Paul Boyd – Courtesy ABC Newcastle
- Slide 35 – Photo by Bill Browhn - Courtesy ABC Newcastle
- Slide 36 – Photo by Reinhold Wieland - Courtesy ABC Newcastle
- Slides 37, 38 – Photos by Oleksander Motkya - Courtesy ABC Newcastle
- Slide 39 – Photo by Sandra Jarvie - Courtesy ABC Newcastle
- Slide 40 – Photo by Ron Grudnoff - Courtesy ABC Newcastle
- Slides 41, 42 - Photos by Chris Gaven - Courtesy ABC Newcastle
- Slide 43 – Photo by Kay Burgess - Courtesy ABC Newcastle
- Slide 45 – Photo by Will Wright – Courtesy ABC Newcastle
- Slide 44 – Photo by Sandra Evans - Courtesy ABC Newcastle
- Slide 64 – Photo by Stephen Baldwin
- Slide 66 – Photo courtesy David Wainright, WBM
- Slide 67 – Photo by David Cobbin - Courtesy ABC Newcastle
- Slide 68 – Photo by Charlene Ingram - Courtesy ABC Newcastle
- Slides 69, 70 – Photos courtesy Craig Manhood LMCC
- Slide 88 – courtesy Emma Abraham LMCC
- Slides 3, 10 – Graeme Hill LMCC
- Mapping – Graeme Hill and Riki Davidson LMCC

Storm Overview – Lake Macquarie City

- Intense East Coast low – wind speeds averaged 93km/h
- Maximum recorded wind gust = 135 km/h during early hours of Saturday 9 June 2007
- 340mm of rain recorded at Croudace Bay in 24 hr period 12.00am Friday 08/06/07 to 12.00am Saturday 09/06/07
- 80mm rain recorded at Croudace Bay (storm epicentre) between 5.00pm and 6.00pm on Friday 8 June 2007
- Highest intensity rainfall was recorded between 6.00pm and 8.00 pm on Friday 8 June 2007
- Worst local storm event in 33 years (1974 east coast low)

Storm direction and Croudace Bay epicentre at storm peak
5.00pm – 6.00pm Friday 8 June 2007



Next Slide

Elapsed real time montage showing rainfall intensities for the June long weekend event commencing AM Friday 08/06/07 through to AM Sunday 10/06/07

Courtesy: Bureau of Meteorology

Friday 0010am

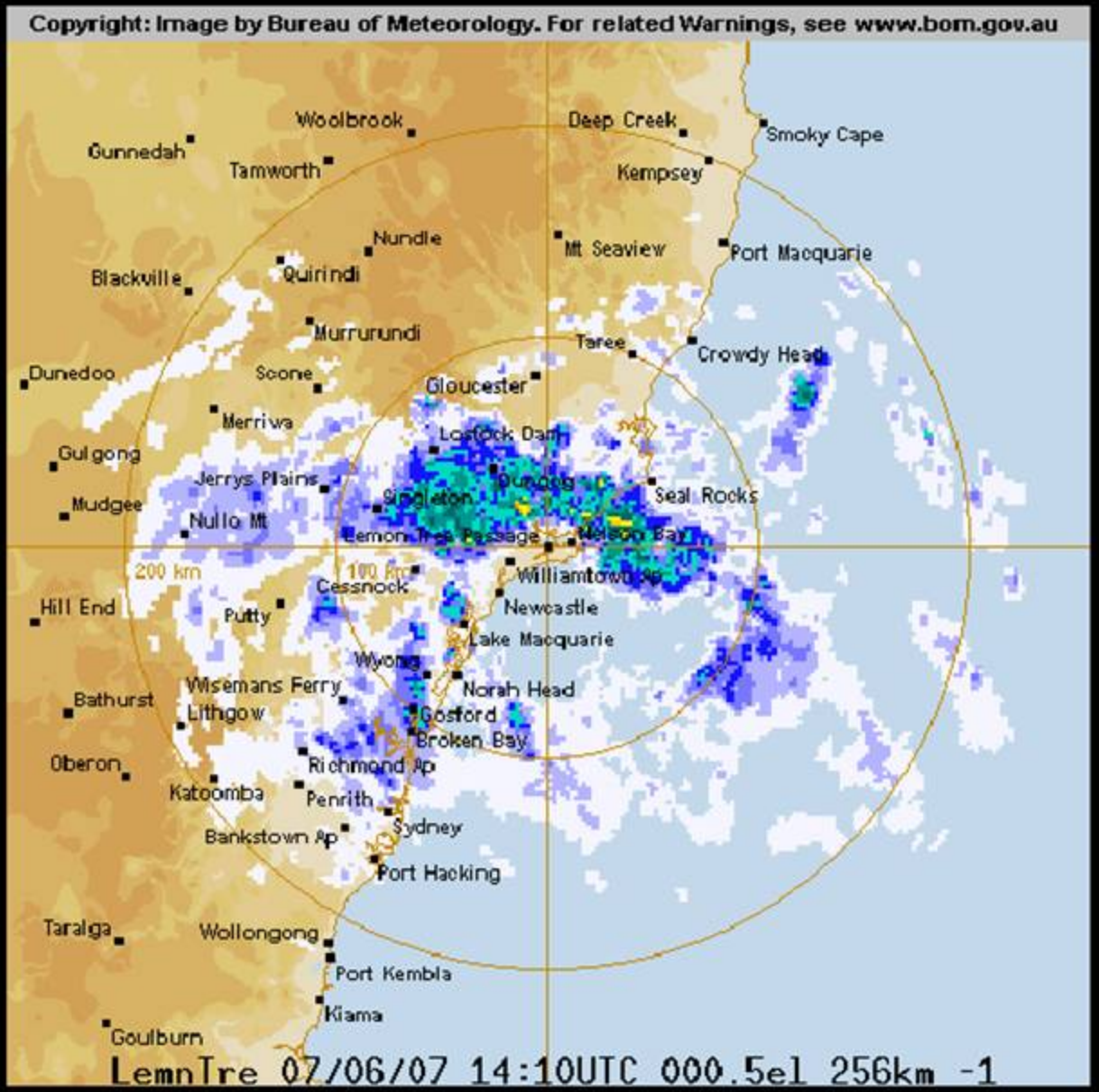
Friday AM

Friday PM

Saturday AM

Saturday PM

Sunday AM



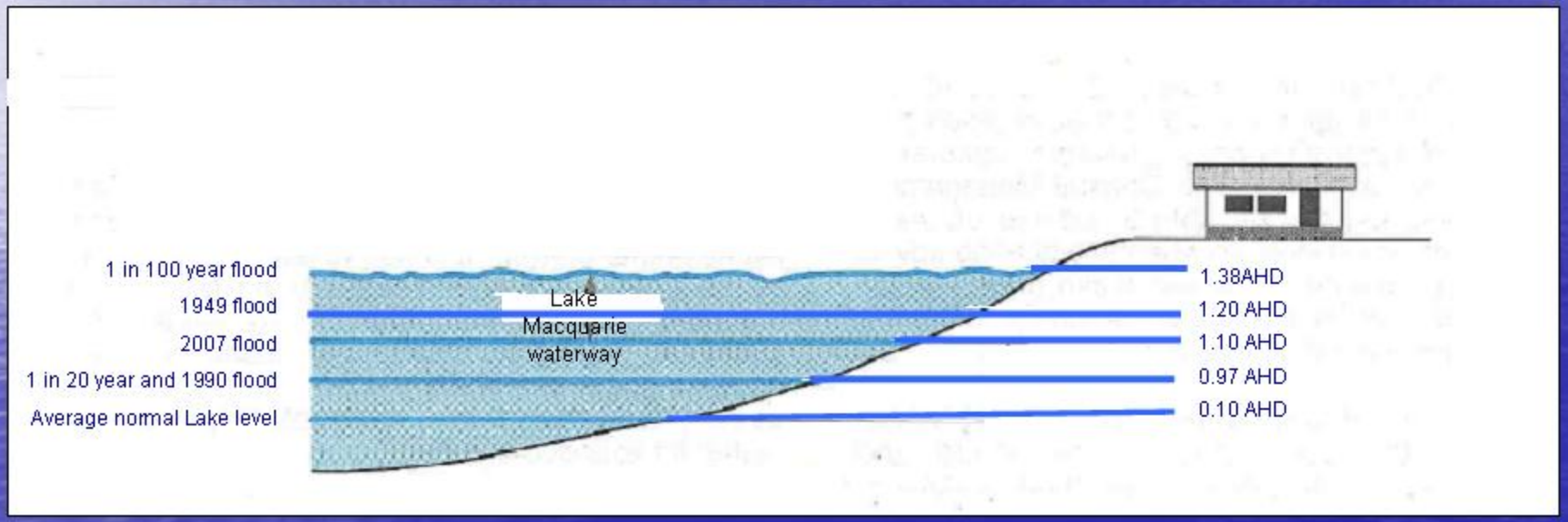
NSW Premier Morris Iemma at 9.30pm on Friday 8 June 2007, declared as a natural disaster, the flood/storm event in the Hunter and Central Coast regions, starting Thursday 7 June 2007

Photo: Lucia Wilcox Courtesy: ABC Newcastle

Flood – Lake Macquarie waterway

- Lake waterway flood level peaked at around 6.00am on Saturday 9 June 2007
- Peak June 2007 Lake flood level = 1.10m AHD
- Equates to a 1 in 35 year ARI probable flood level event
- Average normal Lake level = 0.10m AHD
- 1:100 year Lake flood level = 1.38m AHD
- 1:20 year Lake flood level = 0.97m AHD
- Highest observed Lake flood = 1.20m AHD (1949)

Lake flood level comparisons - diagrammatic



Flood – Lake Macquarie waterway

- Low lying areas at Swansea, Pelican, Marks Point, Belmont South and Belmont inundated by Lake flood
- Lake waterway rose overnight on Friday 8 June and peaked at 6.00am Saturday 9 June
- Peak recorded Lake flood level was 1 metre above normal lake level
- Properties inundated but most dwelling habitable floors constructed above the June event flood level
- Extensive Lake foreshore and revetment damages due to wind/wave action and erosion eg. Foreshore cycleways
- Lake recession by late afternoon Saturday 9 June

Aerial view of Lake looking south to Marks Point, Pelican, Swansea

Introduction

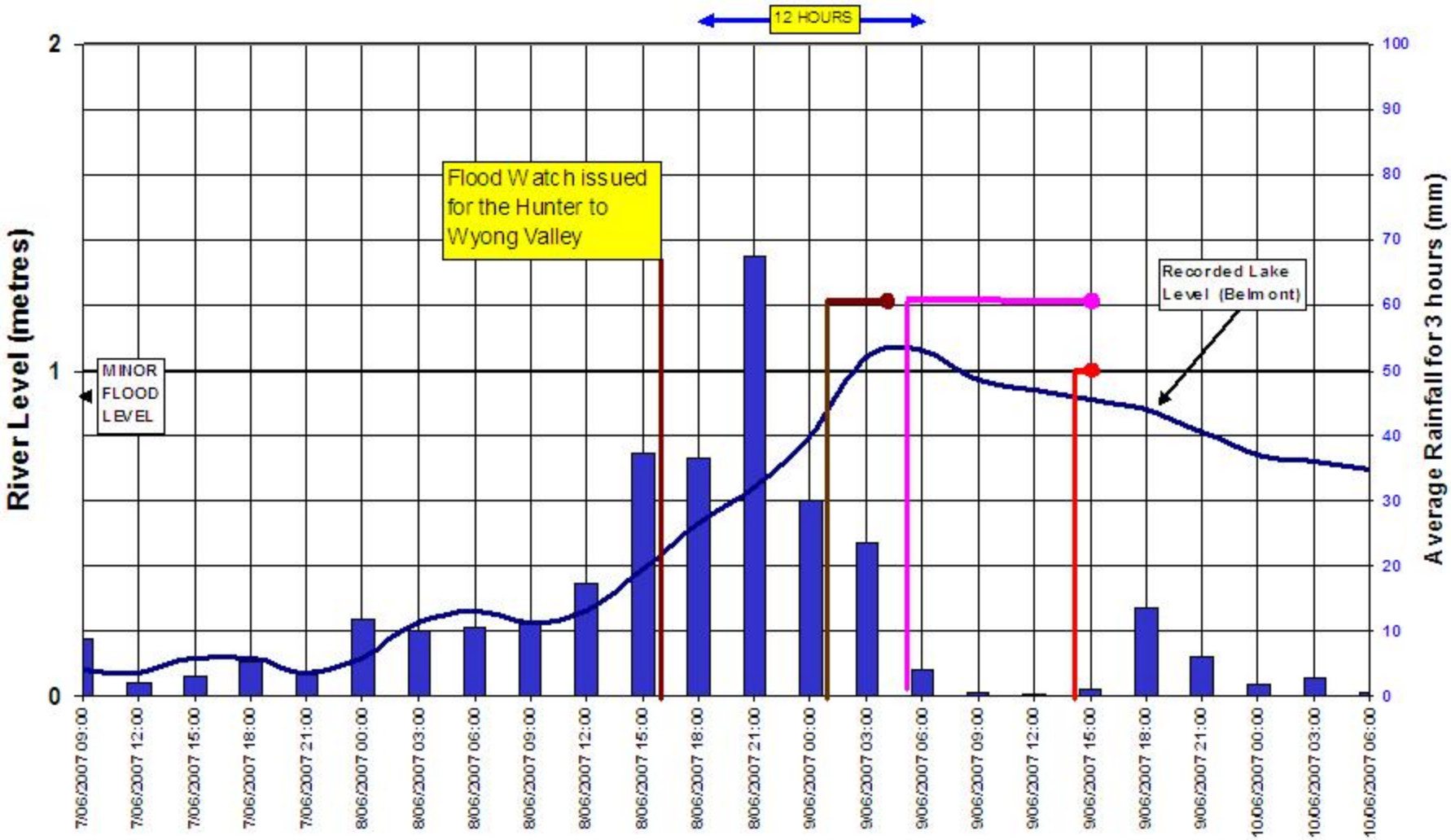
History of Flooding in Lake Macquarie City

- Approx. 10,000 low lying land parcels in Lake Macquarie City LGA
- Flood records dating back to 1927
- Average Lake waterway water level 0.1m AHD
- Lake Macquarie waterway - highest observed floods: 1949 = 1.2 AHD, 1990 = 0.97 AHD; 2007 = 1.1 AHD
- Major creek catchments flowing into Lake are:

  Dora Creek, Stony Creek, L T Creek,

  Cockle Creek, Winding Creek, North Creek, South Creek, Sheppards Creek

FLOOD WARNINGS - LAKE MACQUARIE JUNE 2007



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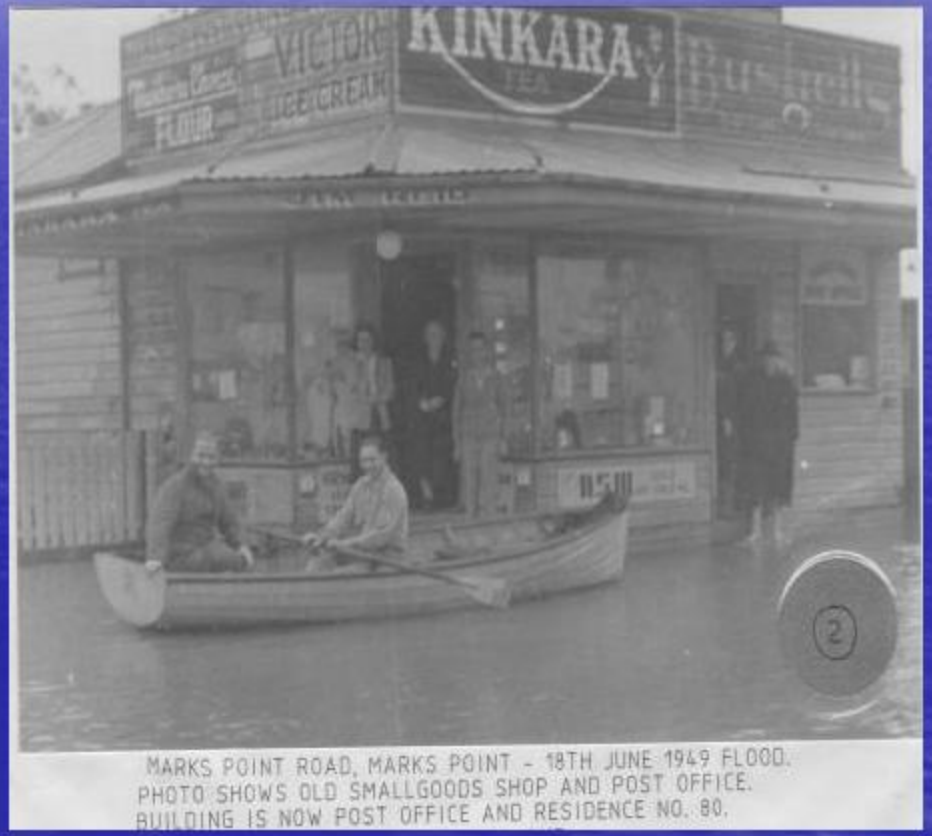
Laneway at Marks Point Sat 09/06/07

Photo: Jim Bodycott

Swan Street, Marks Point looking north 09/06/07

Photo: Narelle Stone

Smallgoods Store at intersection Swan Street & Marks Pt Road, Marks Point – Floods 9 June 2007 and 18 June 1949



MARKS POINT ROAD, MARKS POINT - 18TH JUNE 1949 FLOOD.
PHOTO SHOWS OLD SMALLGOODS SHOP AND POST OFFICE.
BUILDING IS NOW POST OFFICE AND RESIDENCE NO. 80.

Corner of Swan Street & Marks Point Road, Marks Point Saturday morning 09/06/07

Photo: Narelle Stone

Swan Street, Marks Point
9 June 2007 and 18 June 1949 flood comparisons

MARKS POINT ROAD, MARKS POINT - 18TH JUNE 1949 FLOOD.
VIEWED FROM INTERSECTION WITH SWAN STREET LOOKING

June 2007 and Easter 1949 flood comparisons
Lake frontage at properties Marks Pde. Marks Point

Harry St, Belmont South looking west to Lake 09/06/07

Photo: Narelle Stone

Lake flood *Squids Ink* restaurant Belmont South 09/06/07

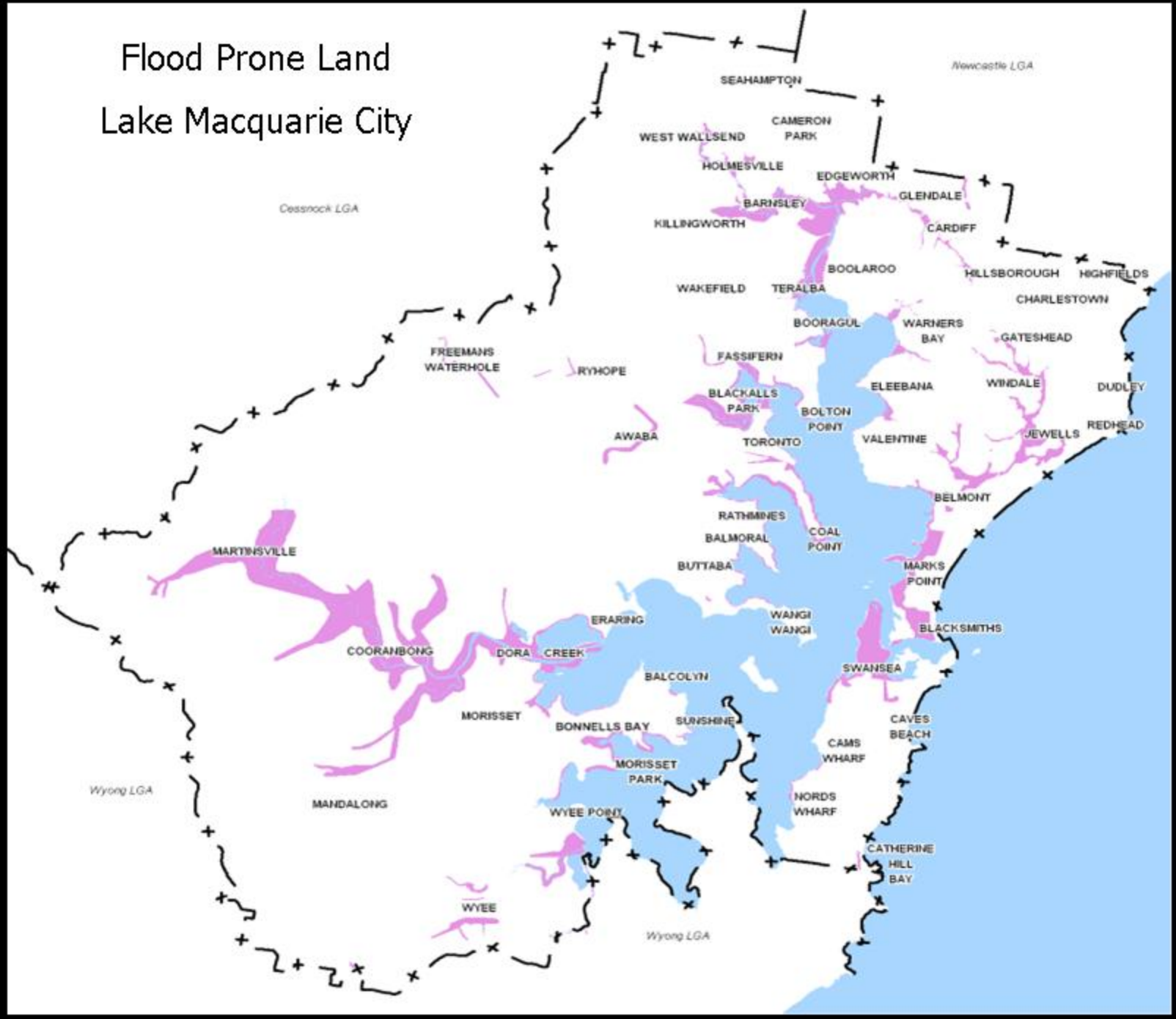
Photo: Narelle Stone

Lake at Belmont foreshore circa midday Sat 09/06/07

Photo: Narelle Stone

Flood Prone Land

Lake Macquarie City



Lake at Belmont foreshore baths - early Sat morning 09/06/07

Photo: Jim Bell Courtesy: ABC Newcastle

Belmont Jetty looking west across Lake 09/06/07

Lake flood at Belmont Pines Caravan Park circa 10am Sat 09/06/07

Lake flood at Belmont Pines Caravan Park 10am Sat 09/06/07

Lake flood at Belmont Pines Caravan Park 10am on 09/06/07

Jetty at Lake foreshore Kilaben Bay 09/06/07

Burke Street, Swansea Sat morn 09/06/07

Burke Street, Swansea Sat morn 09/06/07

Lake at James Boyd Reserve Swansea looking west to Wangi Wangi Sat 9/06/07

Photo: Paul Boyd Courtesy: ABC Newcastle

Lake at Warners Bay esplanade f/shore opposite shopping centre Sat 09/06/07

Photo: Bill Brohwn Courtesy: ABC Newcastle

Regional Overview
June 2007 Storm / Flood Event

- Intense east coast low-pressure system formed Thurs 7 June 2007, producing cyclonic winds & accompanying torrential rainfall over next 2 days, resulting in extreme storm/flood event
- Flood Watch alert for the Hunter Region issued by Bureau of Meteorology @ 1726 hrs on Thursday 07/06/07
- On-shore cyclonic winds - maximum gust recorded by Bureau of Meteorology = 124 km/h at 01.32am on Saturday 9 June 2007
- Accompanying heavy rainfall - 253.2 mm of rainfall recorded at Maryville in the 24 hours to 9.00am on Saturday 9 June 2007

Lake at Warners Bay foreshore Sat 09/06/07

Photo: Reinhold Wieland Courtesy: ABC Newcastle

Sheppards Creek at Valentine Saturday 09/06/07

Photo: Oleksander Motkya Courtesy: ABC Newcastle

Valentine Scouts Hall Saturday 09/06/07

Photo: Oleksander Motyka Courtesy: ABC Newcastle

Lake at front of Valentine Bowling Club Sat 09/06/07

Photo: Sandra Jarvie Coyrtesy: ABC Newcastle

"Absolute waterfront" property – Lake Eraring at Dora Creek 09/06/07

Photo: Ron Grudnoff Courtesy: ABC Newcastle

Narenta Street, Dora Creek on Saturday morning 09/06/07

Photo: Chris Gaven Courtesy: ABC Newcastle

Pamela Ave. Dora Creek on Saturday morn. 09/06/07

Photo: Chris Gaven Courtesy: ABC Newcastle

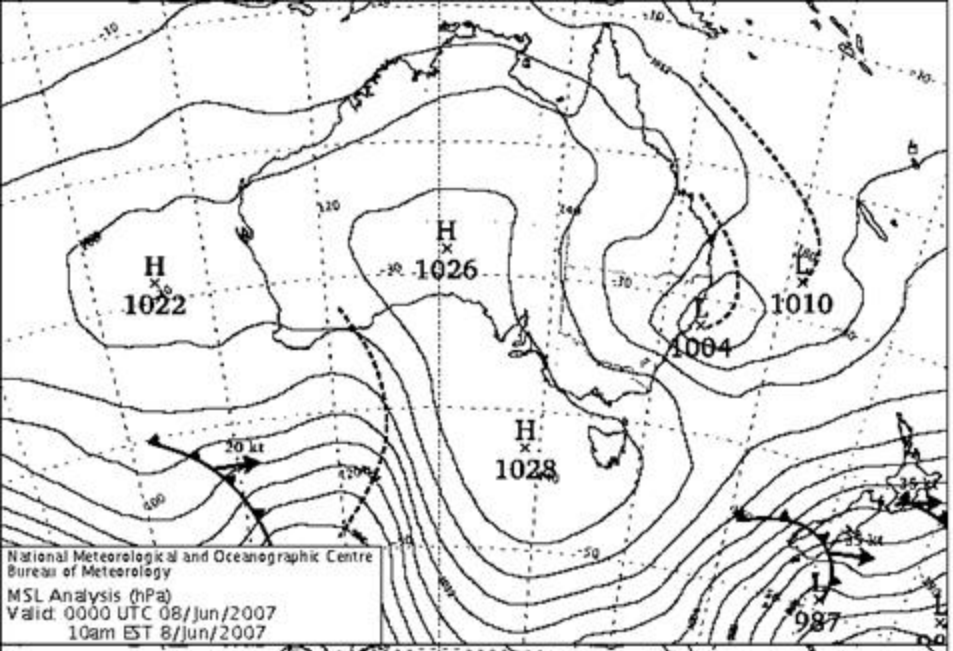
Lake waterfront properties at Toronto on Saturday morn 09/06/07

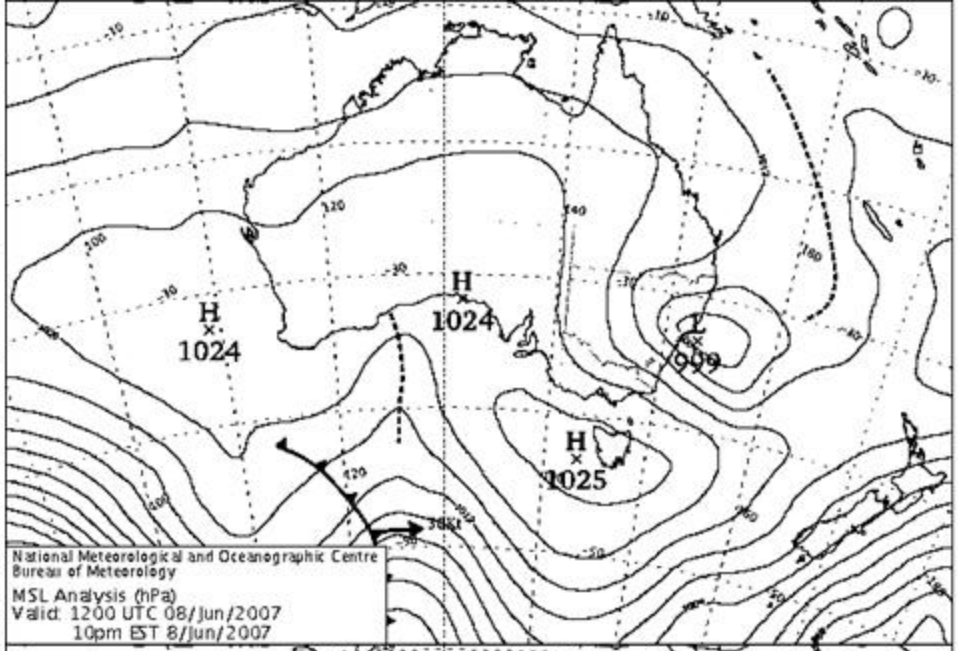
Photo: Kay Burgess Courtesy: ABC Newcastle

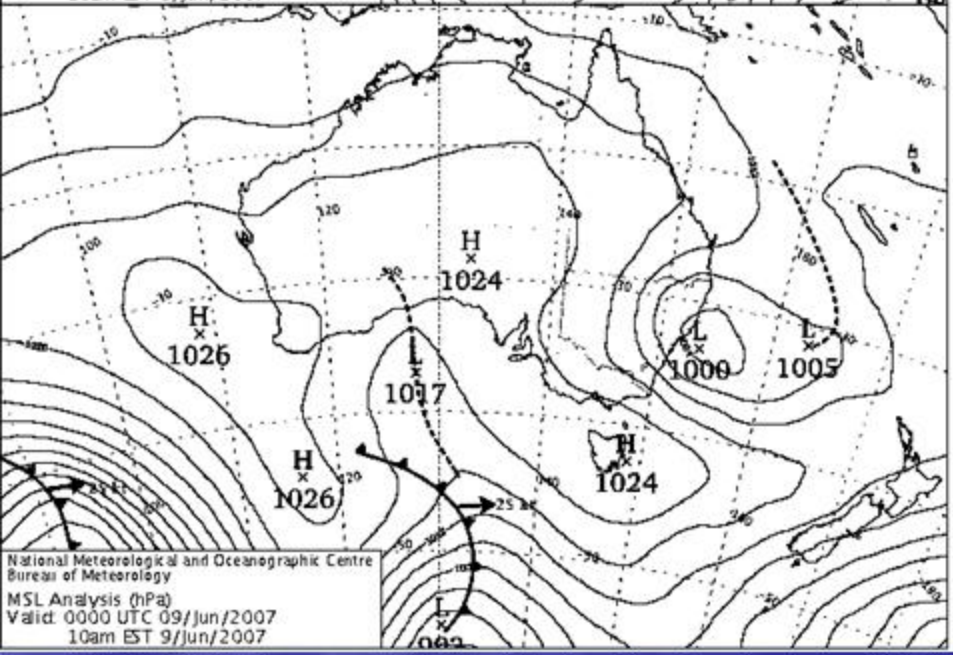
Absolute waterfront – Lake foreshore scene at Toronto 09/06/07

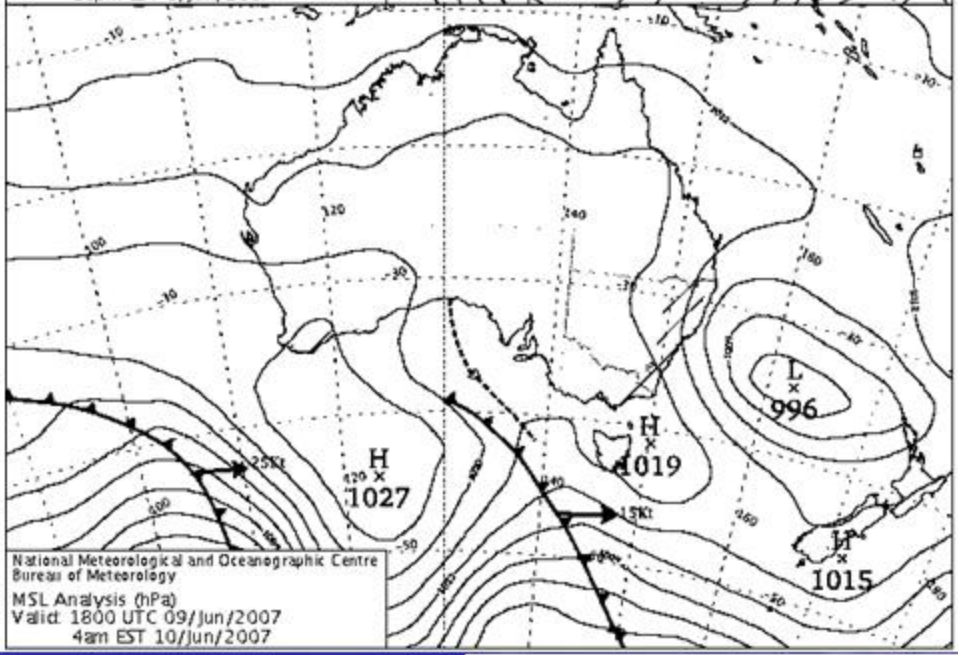
Lake at Rathmines jetty Saturday morn. 09/06/07

Photo: Sandra Evans Courtesy: ABC Newcastle









Synoptic situation 8 – 10 June 2007

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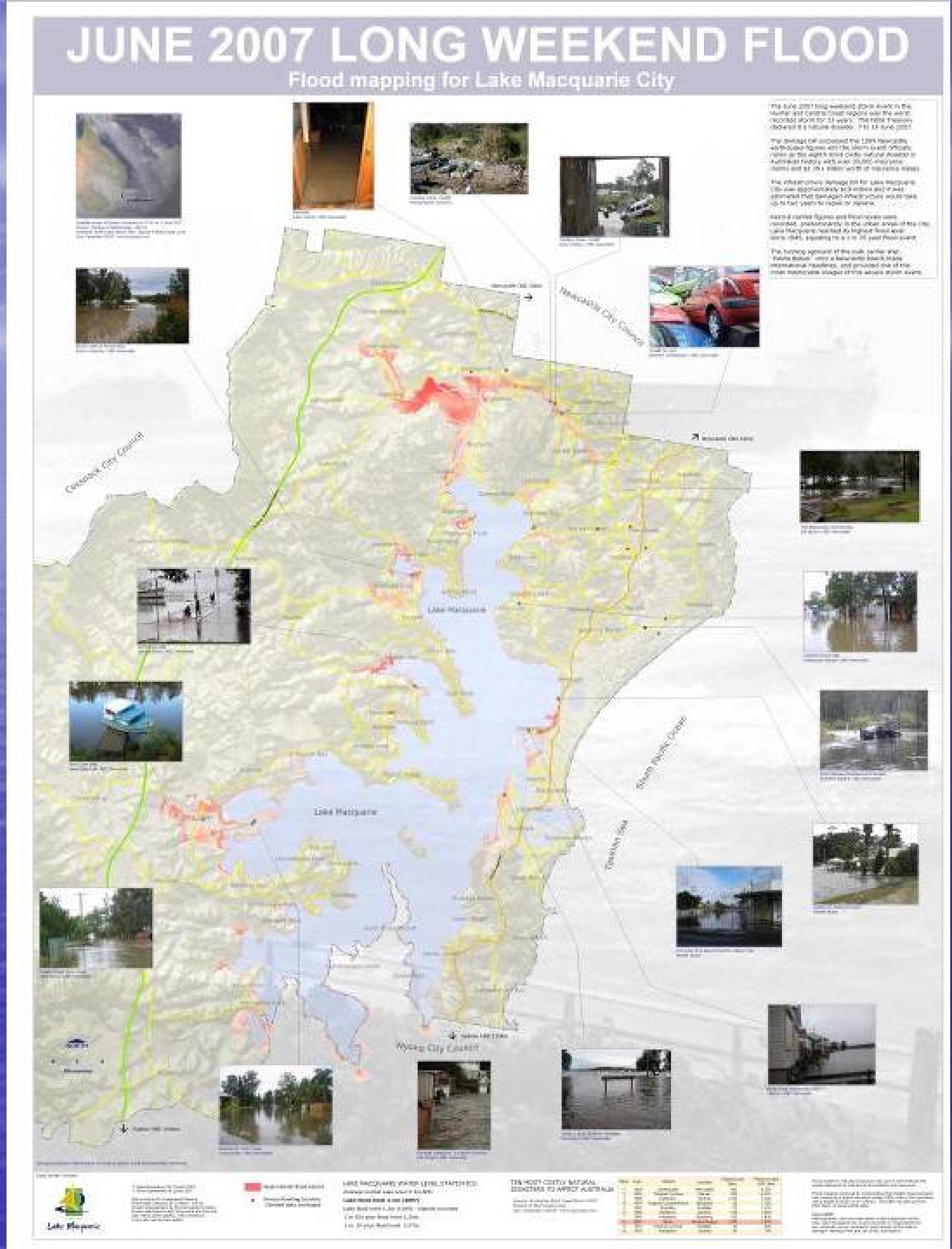
Lake Catchment Areas - Flooding

- All Lake waterway feeder catchments recorded near-record or above-record flood levels
- Catchments affected by flooding included (but were not restricted to):

- **Dora Creek at Dora Creek township (less than a 1:20 year flood event)**
- **Stony Creek at Blackalls/Toronto**
- **L T Creek at Fassifern**
- **Flaggy Creek at Barnsley**
- **Cockle Creek at Edgeworth/Boolaroo (in excess of 1:100 year flood event)**
- **Brush Creek at Glendale**
- **Cocked Hat Creek at Edgeworth**
- **Winding Creek at Cardiff/Glendale (in excess of a 1:100 year flood event)**
- **North Creek at Warners Bay (approximating to a 1:100 year flood event)**
- **South Creek at Warners Bay**
- **Sheppards Creek at Valentine**
- **Scrubby Creek at Mt Hutton/Windale (in excess of 1:100 year flood event)**
- **Jewells Crossing and Swamp at Jewells**


JUNE 2007 LONG WEEKEND FLOOD
Flood mapping for Lake Macquarie City
Newcastle City Council
Cessnock City Council
Lake Macquarie
Wyong City Council
Tasman Sea
South Pacific Ocean

Urban Areas - Flooding

- Main urban areas affected were Cardiff, Glendale, West Wallsend, Warners Bay, Windale and Gateshead
- Urban stormwater drain systems experienced major flash flooding due to high flow velocities and extreme rainfall intensities (est 1:100 year rainfall event)
- Culvert/Bridge blockages by numerable objects (cars, containers etc) exacerbated flooding
- Bridges at Cardiff, Glendale & Wakefield damaged
- Cardiff CBD worst affected area ($2M estimated damage losses to businesses – source *"The Star"* newspaper 25/10/07)

Typical urban road scene Friday night 08/06/07

Photo: Graham Prichard

Charles Street, Warners Bay 7.00pm on Friday 08/06/07

Photo: Graham Prichard

Charles Street, Warners Bay Friday 08/06/07 circa 7.00pm.
Note the silhouetted figure in near waist deep floodwater

Photo: Graham Prichard

Charles Street, Warners Bay 08/06/07

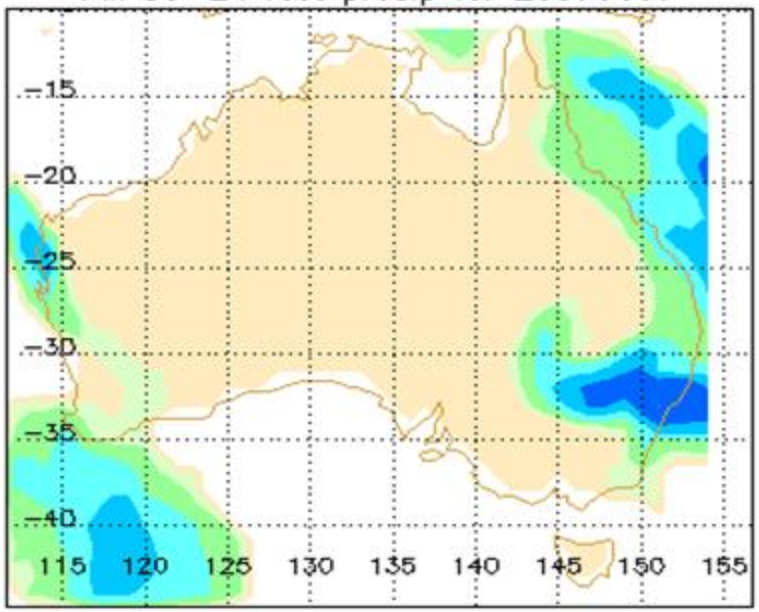
Photo: Graham Prichard

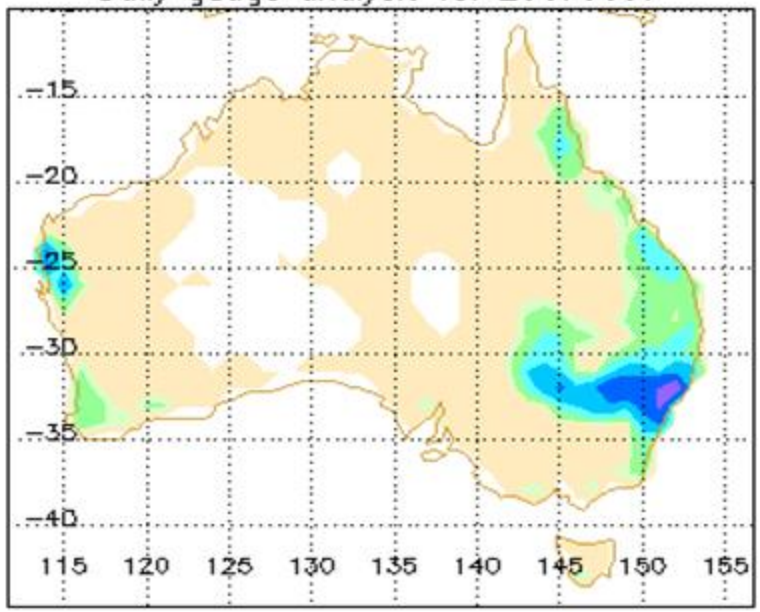
Warners Bay roundabout adjacent to *McDonalds* Fri 08/06/07

At roundabout Hillsborough Rd. Warners Bay 7pm on 08/06/07

No speeding tickets issued along Hillsborough Rd. Warners Bay on 08/06/07

Rainfall Predictions Thursday 7 June 2007
Global NWP Models





No data
<1 mm
1–2 mm
2–5 mm
5–10 mm
10–20 mm
20–50 mm
50–100 mm
100–150 mm
150–200 mm

Observed \ Forecast	<1	≧1
<1	444	37
≧1	22	105

Validation statistics for 20070607 n=608 Verif. grid=1.00

	Analysed	Forecast
# gridpoints raining	127	142
Average rainrate (mm/d)	8.32	6.16
Rain volume (km^3)	10.42	8.62
Maximum rain (mm/d)	81.27	50.52
Max 0.25° rain (mm/d)	106.85	

Mean abs error = 0.79 mm/d
RMS error = 2.60 mm/d
Correlation coeff = 0.917
Bias score = 1.118
Probability of detection = 0.827
False alarm ratio = 0.261
Hanssen & Kuipers score = 0.750
Equitable threat score = 0.561

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Marshalls Timber Yard west side Macquarie Rd. Cardiff 08/06/07

Kelly Holden car showroom at Macquarie Rd. Cardiff 08/06/07

Car Showroom at Macquarie Rd. Cardiff on 08/06/07

Bi-Lo Grocery building Cardiff CBD 08/06/07

Macquarie Rd. Cardiff between *Bi-Lo* and *BP* Servo 08/06/07

Garage scene - 20 View Street, Cardiff 08/07/07

Photo: Stephen Baldwin

Culvert Blockage

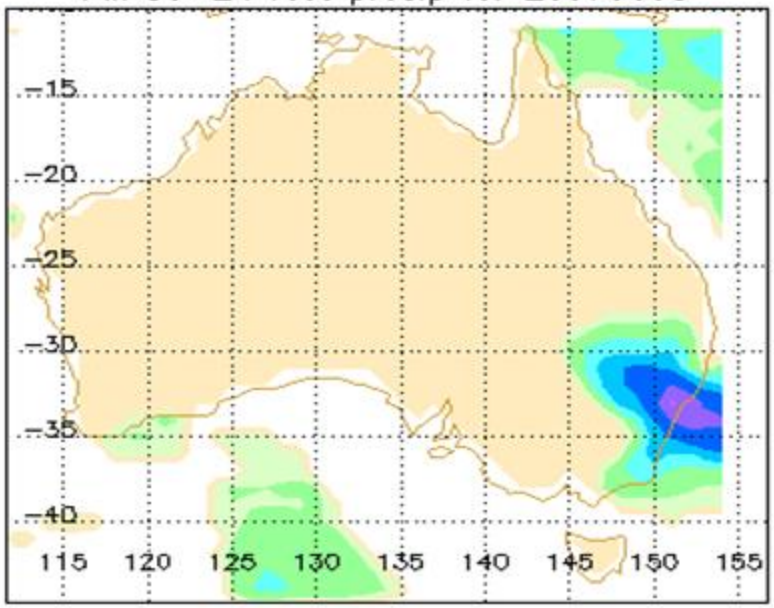
Stormwater Drain Blockage

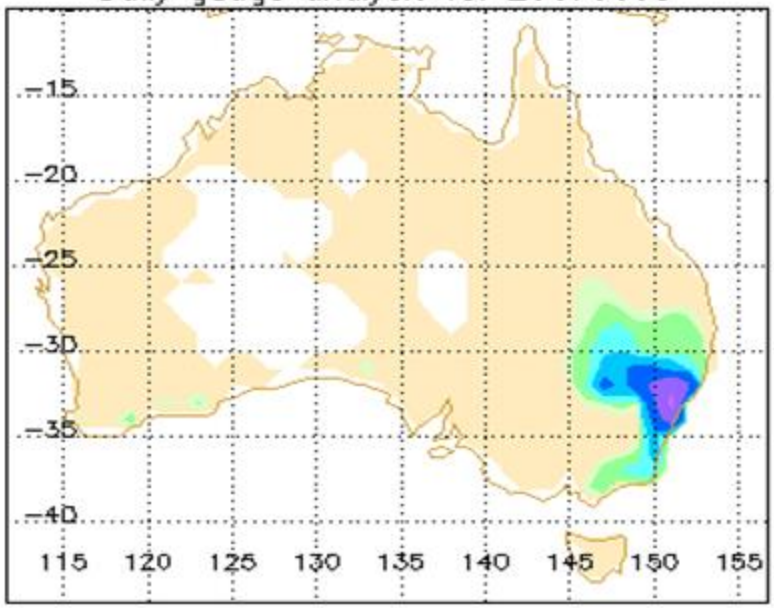
The force of the floodwaters – Winding Creek, Cardiff

Photo: David Cobbin Courtesy: ABC Newcastle

Car Bodies in Winding Creek at Cardiff 09/06/07

Rainfall Predictions Friday 8 June 2007
Global NWP Models





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1–2 mm
2–5 mm
5–10 mm
10–20 mm
20–50 mm
50–100 mm
100–150 mm
150–200 mm

Observed \ Forecast	<1	≧1
<1	533	5
≧1	15	55

Validation statistics for 20070608 n=608 Verif. grid=1.00

	Analysed	Forecast
# gridpoints raining	70	60
Average rainrate (mm/d)	12.60	11.79
Rain volume (km³)	8.70	6.97
Maximum rain (mm/d)	123.64	114.05
Max 0.25° rain (mm/d)	169.14	

Mean abs error = 0.51 mm/d
RMS error = 2.50 mm/d
Correlation coeff = 0.967
Bias score = 0.857
Probability of detection = 0.786
False alarm ratio = 0.083
Hanssen & Kuipers score = 0.776
Equitable threat score = 0.706

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Car bodies in Winding Creek at Cardiff 09/06/07

Cardiff post-flood caryard scene – up close and personal

Aftermath - Cardiff CBD Saturday 09/06/07

Aftermath – Shops in Cardiff CBD with distinct flood line – 1m deep

Photo: Courtesy: David Wainwright WBM

Scouring at bridge Newcastle Street, Cardiff

Photo: David Cobbin Courtesy: ABC Newcastle

Jewells Crossing at Kalaroo Road Sat 09/06/07

Photo: Charlene Ingram Courtesy: ABC Newcastle

Post flood scene inside Council's Worm Farm at Teralba. Worm Farm is located adjacent to Cockle Creek

Photo: Courtesy Craig Manhood

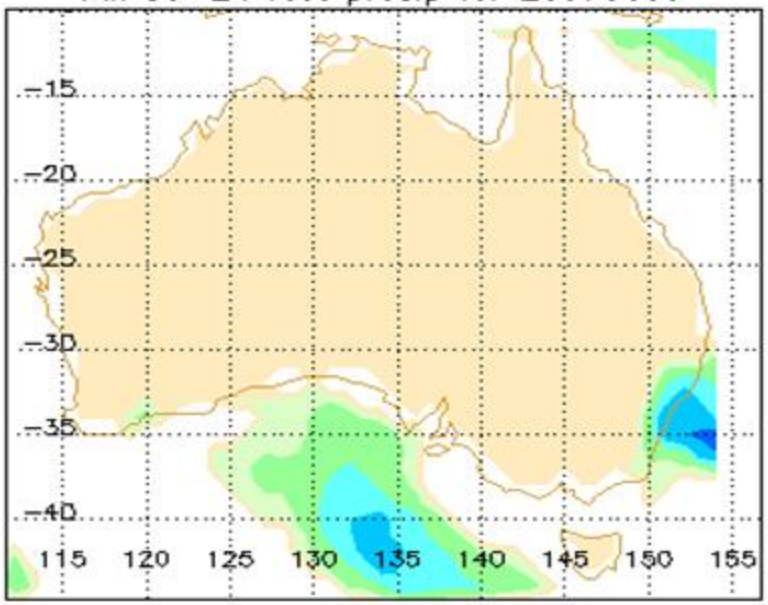
Teralba Worm Farm kitchen – 1.2m depth of water at flood peak circa 9.00 pm on Friday 08/06/07

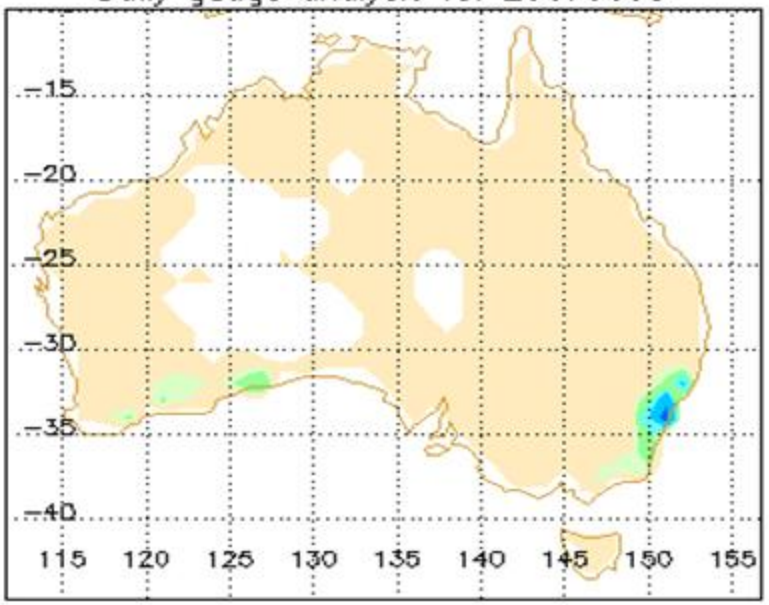
Photo: Courtesy Craig Manhood

West Wallsend "Swimming" Pool 08/06/07

Lake Macquarie Council Chambers 08/06/07

Rainfall Predictions Saturday 9 June 2007
Global NWP Models





No data
<1 mm
1–2 mm
2–5 mm
5–10 mm
10–20 mm
20–50 mm
50–100 mm
100–150 mm
150–200 mm

Observed	Forecast <1	Forecast ≥1
<1	578	3
≥1	13	14

Validation statistics for 20070609 n=608 Verif. grid=1.00

	Analysed	Forecast
# gridpoints raining	27	17
Average rainrate (mm/d)	5.13	3.95
Rain volume (km³)	1.37	0.66
Maximum rain (mm/d)	25.96	17.86
Max 0.25° rain (mm/d)	41.10	

Mean abs error = 0.14 mm/d
RMS error = 0.69 mm/d
Correlation coeff = 0.940
Bias score = 0.630
Probability of detection = 0.519
False alarm ratio = 0.176
Hanssen & Kuipers score = 0.513
Equitable threat score = 0.453

Australian Government
Bureau of Meteorology

Garden View Room @ Council's Administration Building 08/06/07

Infrastructure and Property Damage

Tree on house and vehicle at Jewells

Common scene - Power lines down

Post-storm damage at Council Caravan Park

Council Caravan Park - post storm damage

Typical Caravan Park damage scene - post storm

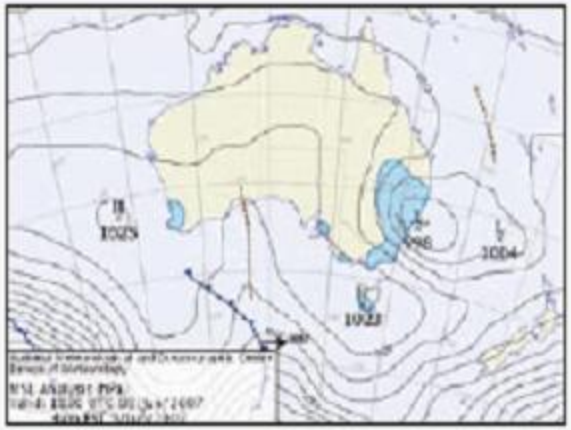
Wind Damage

Kilaben Bay Community Hall – tree damage

Wind/Wave Damage – Lake foreshore

East Coast Low Pressure System

Courtesy: Bureau of Meteorology

ECL features	Lowest Pressure (hPa) Estimated (e) Recorded (r)	Synoptic Development	Wind, Rainfall, Wave Statistics	Comments
 First ECL, 8-9 June 2007	992*e* 994*r*	Formed in easterly trough off NSW coast	Strongest wind gust: 135 kmph (85 mph) Norah Head Highest 24-hour rainfall: 293.6 mm (11.5 inches) Mangrove Mountain Max wave height: 14.1m (46 feet)	Pasha Bulker grounded, 9 deaths, flooding in Newcastle, Hunter region and Central Coast

Wind/Wave action

Wind/Wave action – Lake foreshore

Wind/Wave damage – Lake foreshore

Historical Significance

- Unlike previous floods on record at Council, the June 2007 long weekend flooding affected the entire City
- Damage bill surpassed the 1989 Newcastle earthquake figures
- June 2007 storm event officially ranked as the eighth most costly natural disaster in Australian history
- 90,000 insurance claims to date (Source *ICA*)
- $1.35 billion + worth of insurance losses

Natural Disasters – 2007 Storm ranked at number 8

TABLE 2: TEN MOST COSTLY NATURAL DISASTERS TO AFFECT AUSTRALIA

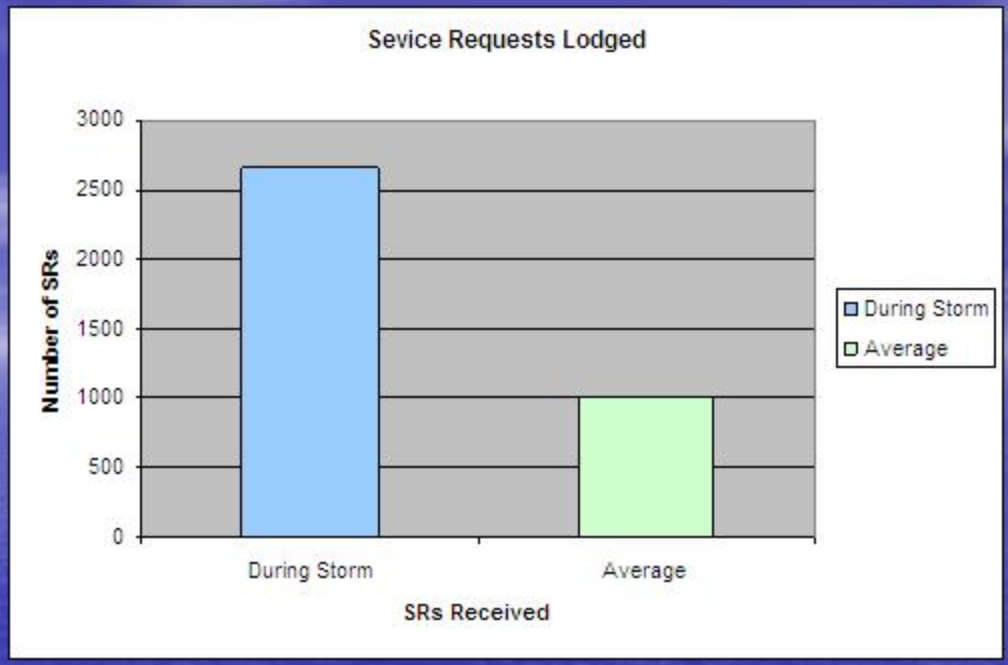
Source: A Century of Damage – Property Losses due to Natural Perils. Journal of the Australian and New Zealand Institute of Insurance and Finance Volume 30(3):16-22. McAneney, J., Crompton, R., Chen, K. and Hunter, L. 2007

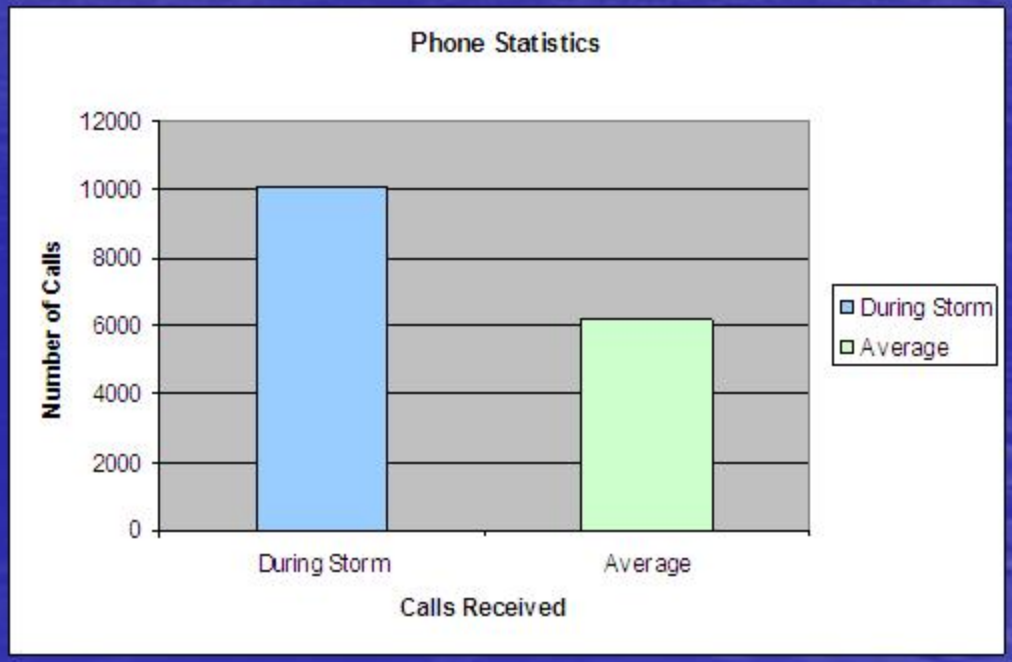
Rank	Year	Peril	Location	Original Loss (ASm)	Adjusted Loss 2006 (ASm)
1	1989	Earthquake	Newcastle	862	4,300
2	1974	Tropical Cyclone	Darwin	200	4,070
3	1999	Hailstorm	Sydney	1,700	3,300
4	1974	Tropical Cyclone/Flood	Brisbane	68	1,790
5	1983	Bushfire	Multiple	176	1,610
6	1990	Hailstorm	Sydney	319	1,480
7	1985	Hailstorm	Brisbane	180	1,430
8	2007	Storm	Hunter Regions	1,350	1,350
9	1973	Tropical Cyclone	Multiple	30	820
10	1976	Hailstorm	Sydney	40	740

Statistics for Lake Macquarie Region

- 3,552 calls for assistance recorded in Lake Macquarie SES precinct over June long weekend
- Estimates of 200+ people Cardiff/Barnsley region evacuated to Club Macquarie
- 60 residents Dora Creek evacuated to Morisset Country Club
- Approx 40 reports of landslip affecting private/public property received
- 2,200 truck loads of green waste taken to 4 designated sites to shred
- 2,000+ tonnes of green waste taken to Awaba Tip
- 3,000+ tonnes of household waste taken to Awaba Tip
- Infrastructure/Cleanup damage bill for City = est. $19 Million
- Damaged infrastructure may take up to two years to repair/replace
- Worst local storm event in 33 years

Storm related Service Requests lodged with Council's Customer Service Centre from
8 June to 22 June 2007

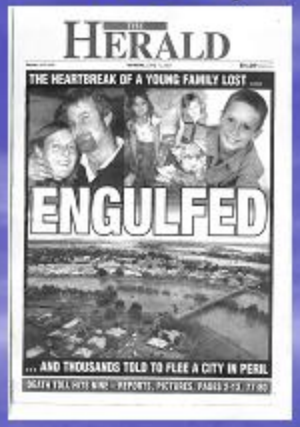




Statistics for Hunter Region

- 6,000 SES volunteers deployed & responded to 10,000 calls for assistance
- SES evacuation orders for 4,000+ residents
- SES performed 19,951 storm tasks
- 9 deaths recorded – 8 flood related
- 500+ rescued from floodwaters
- 3,800 calls to DOCS assistance line
- 93,000 calls for assistance to Energy Australia in 24 hour period mid-Fri to Sat – the most calls in history
- Energy Australia reported 100,000 homes/businesses without power by Saturday morning 09/06/07

Media Clippings – Courtesy *Newcastle Herald*



Rainfall June 2007