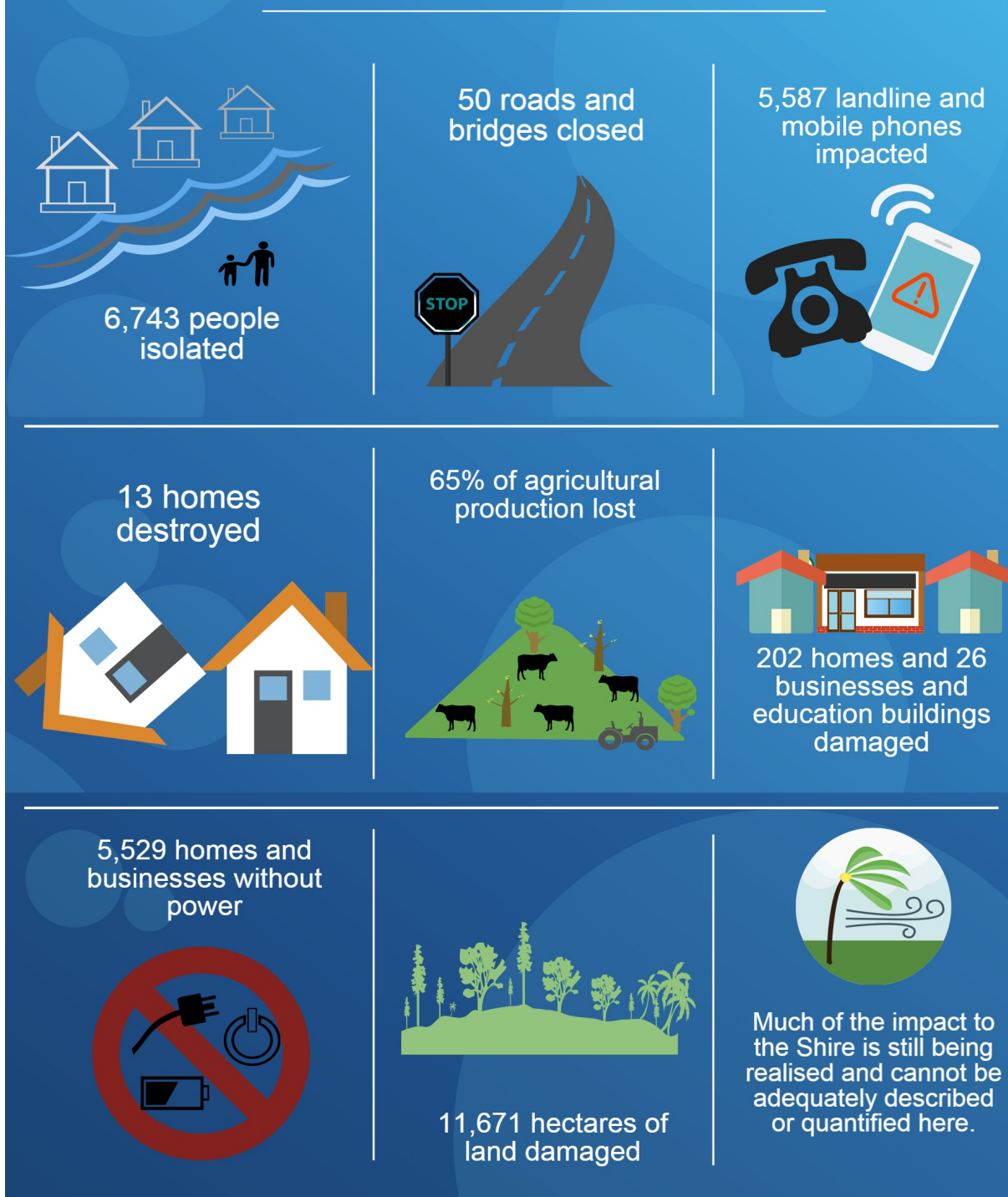


The event

Tropical Cyclone Marcia

Impacts on the Banana Shire





Above: Jambin township.
Banana Shire Council

Images on this page are also numbered so they may be located on the study area map on the facing page.

Below: Burnett Highway, rail overpass.
Banana Shire Council

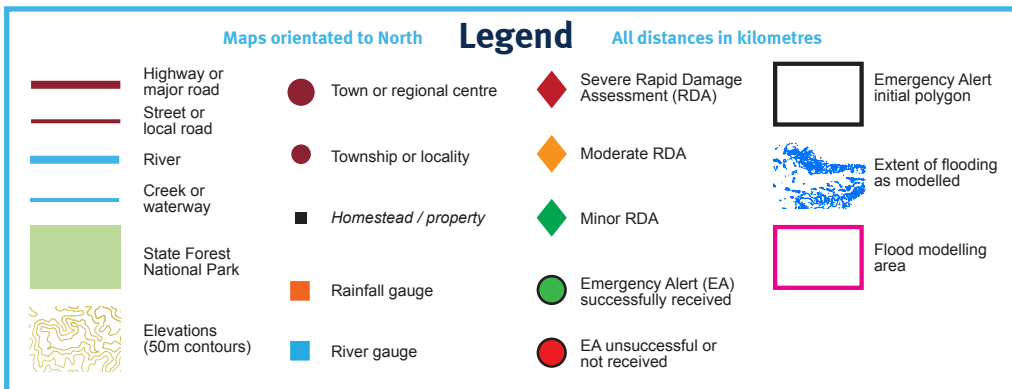
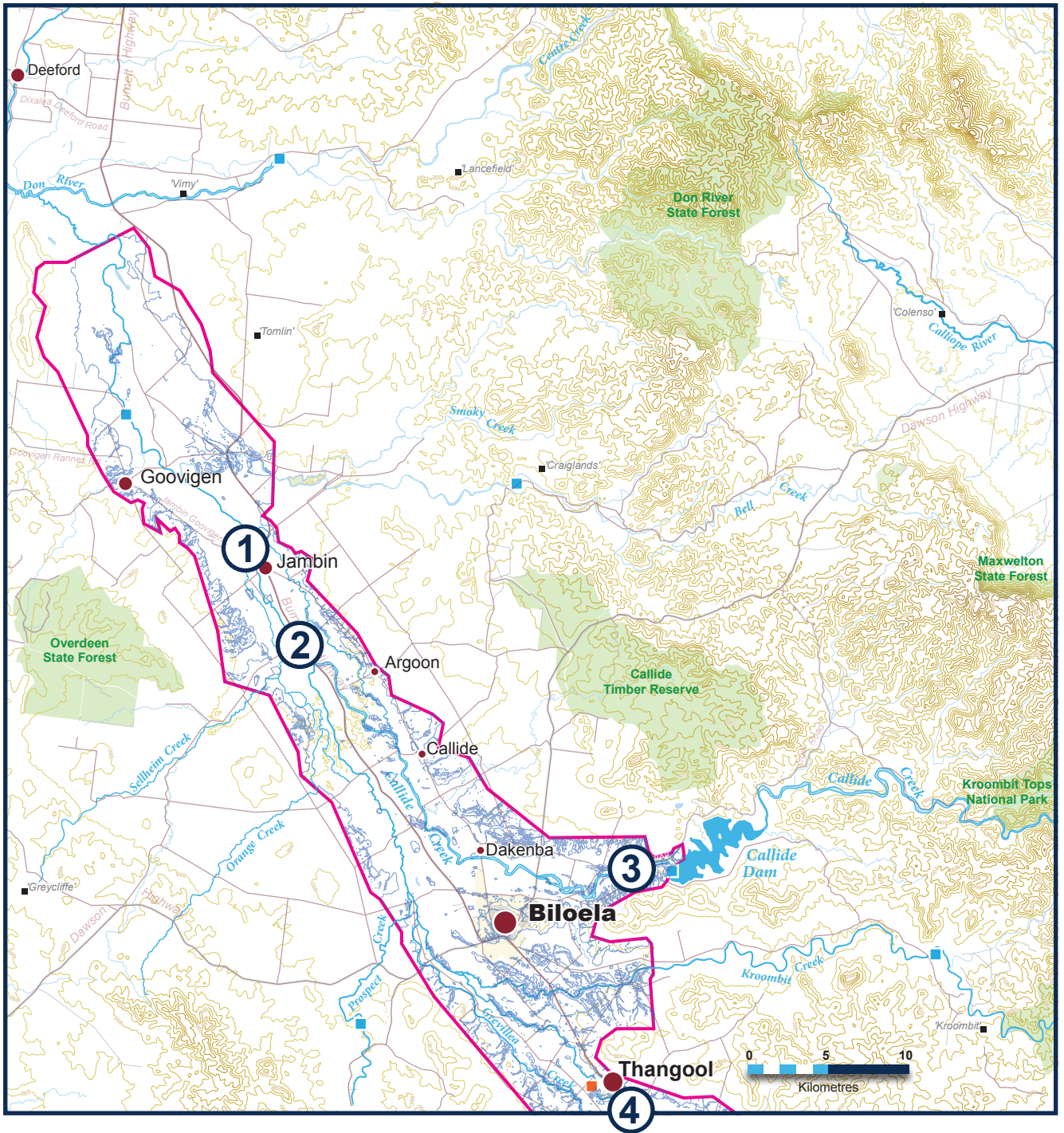


Below: Thangool aerodrome.
Banana Shire Council



**Above: Linkes Road,
Callide Creek.**
Banana Shire Council





Above: Close-up map of the study region, with overlays showing (a) in pink, the outline of the flood modelling area, and (b) in darker blue, the modelled extent of the flooding.

Inspector-General Emergency Management



Above: Mung bean crop damage.

Images on this page are also numbered so they may be located on the study area map on the facing page.

Below: Residential property flood damage and debris.

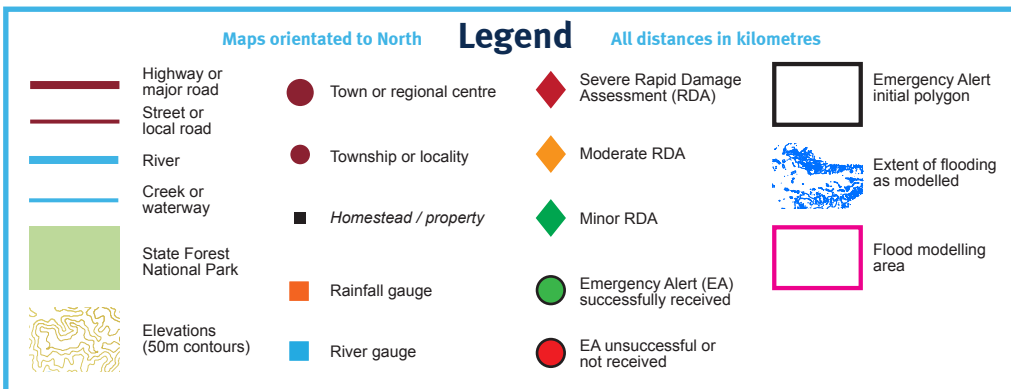
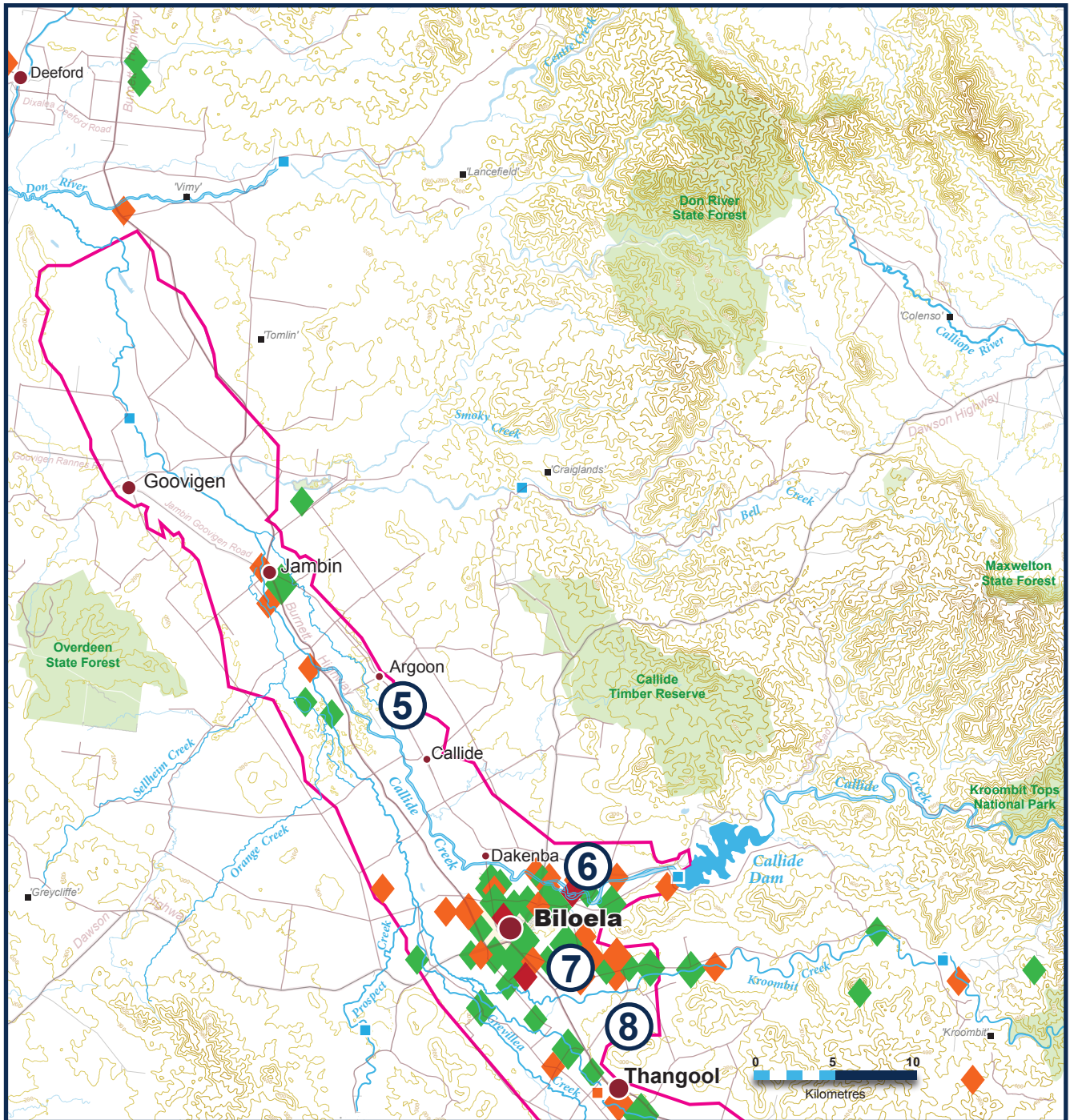


Below: Residential property – tree with level marks for three major flood events.
SunWater



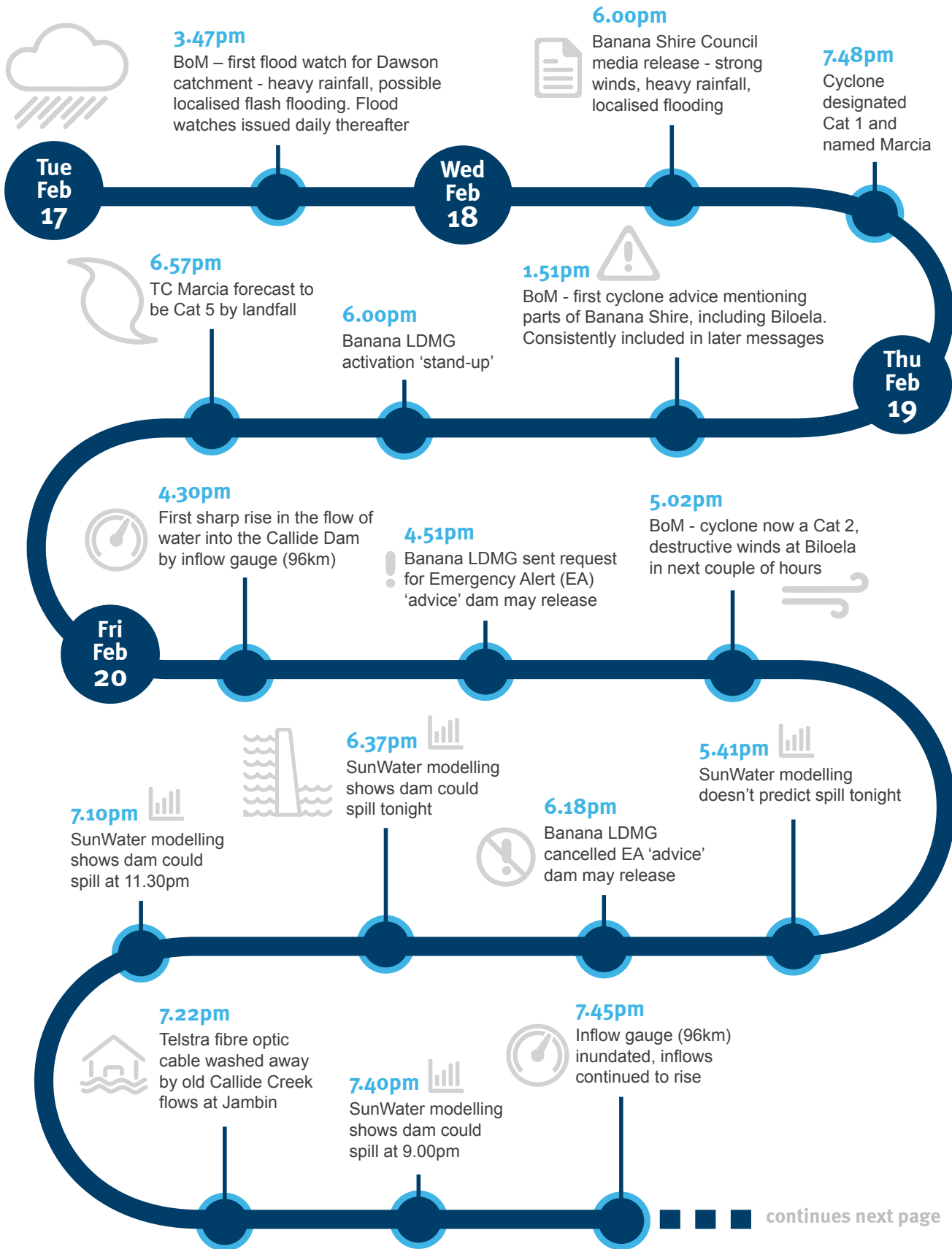
Above: Residential property inundation.
Photo by E. Barsby

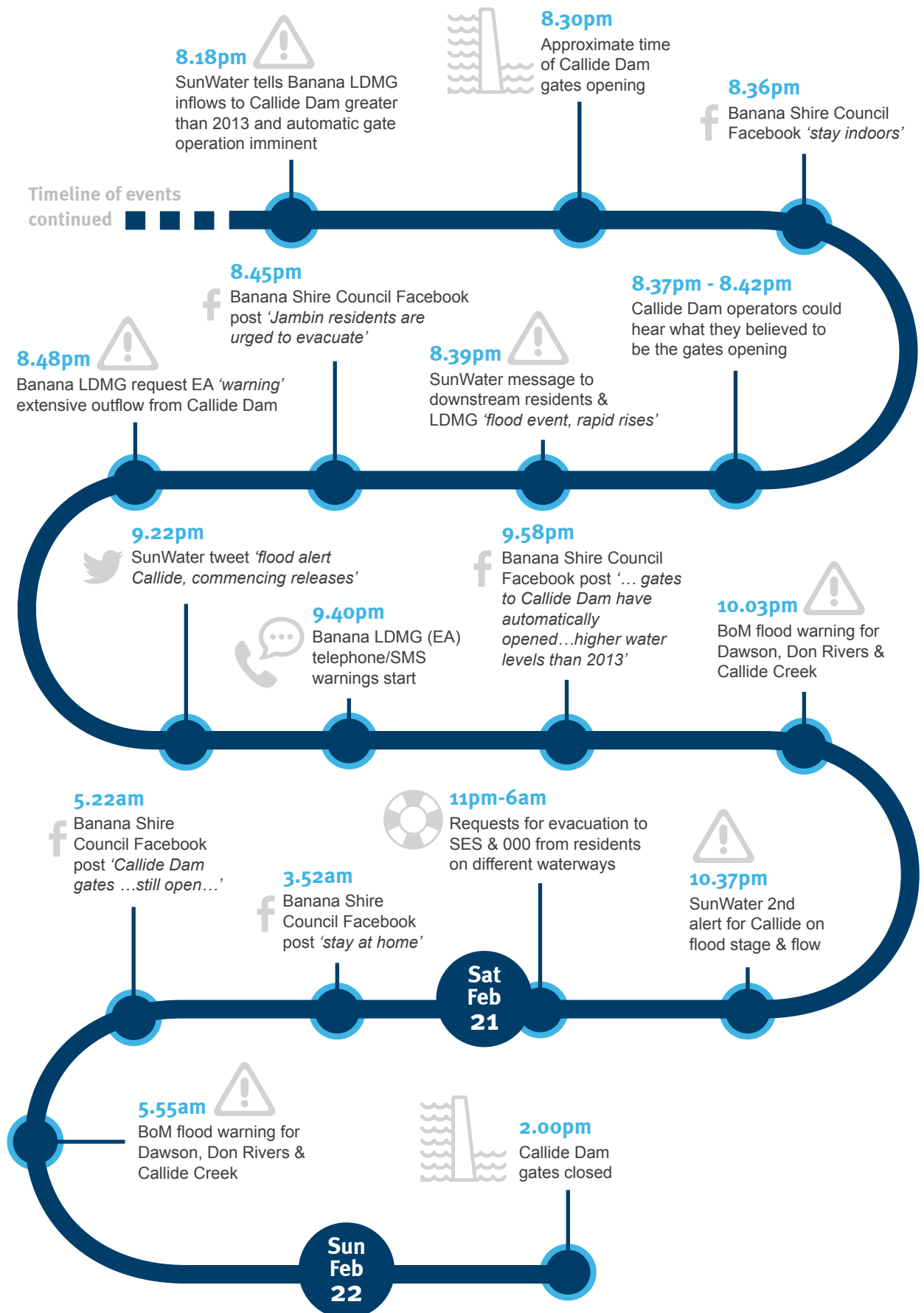




Above: Rapid Damage Assessment for the study area (note: these data are not definitive and provide an estimate of damage only). Queensland Reconstruction Authority RDA Data

Timeline of events





Summary of the Callide Creek flood event

The following summary includes key events in the lead up to, and during the February 2015 flood event. It is not an exhaustive chronology.

Cyclone forecast

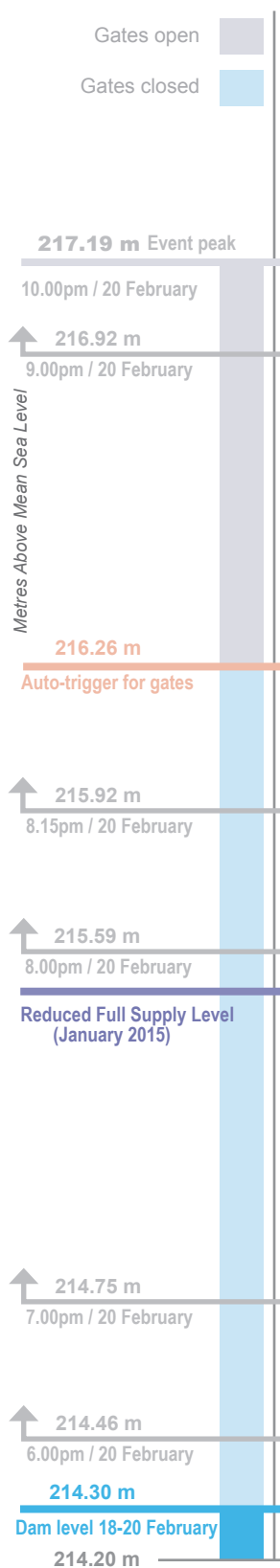
On Sunday 15 February 2015, a Tropical Low developed off the coast of Queensland.¹ The Bureau of Meteorology (BoM) forecast the Tropical Low would develop into a Category 1 cyclone bringing 200-300mm of rain from Rockhampton to the New South Wales north coast on Friday 20 February 2015.²

Wednesday 18 February 2015

On the evening of Wednesday 18 February 2015, the cyclone was designated Category 1 and named Marcia.³ The BoM issued regular updates on the cyclone and it was widely covered in print, television, radio and social media.⁴ The BoM also issued flood watches for the Dawson Catchment, which is part of the Banana Shire.⁵ These notifications mentioned the chance of flash flooding.⁶ The Banana Shire Council (the Council) issued a media release warning of heavy rainfall, localised flooding and strong winds in the Banana Shire.⁷

Many organisations and individuals began to prepare for the forecast bad weather. Disaster management groups at the local, district and state level began monitoring the weather system. At 4.00pm the Banana Local Disaster Management Group (LDMG) held its first meeting, discussing the dams, and developing a communication strategy for the event, including that it would utilise media releases, Facebook and warnings.⁸

SunWater checked its unmanned facilities, and ensured its generators and river height gauges were operable.⁹



Above: Graphic depicting indicative water levels, based on the gauge reading nearest the Callide Dam, as at the date / time of the sequence of events presented on this two-page spread.

Data from SunWater

Thursday 19 February 2015

On Thursday 19 February 2015, the agencies that are members of the LDMG were preparing individually. Queensland Fire and Emergency Services assigned swift water rescue teams to Biloela and they arrived that afternoon.¹⁰ The Queensland Police Service contacted evacuation centres, and visited vulnerable areas (e.g. aged care facilities) to check emergency action plans for evacuation.¹¹ The Department of Agriculture and Fisheries liaised with the community and primary producers about animal welfare.¹² The State Emergency Services assisted residents with sandbags.¹³

SunWater and the LDMG were in regular contact about the levels of the Callide and Kroombit dams, which were 84% and 98% respectively.¹⁴ SunWater provided reports to the State Disaster Coordination Centre (SDCC) and the dam safety regulator, the Department of Energy and Water Supply. These reports identified there was a high likelihood that the Emergency Action Plans (EAP) would be activated at both dams, meaning water would be released from Callide Dam and spill from Kroombit Dam.¹⁵

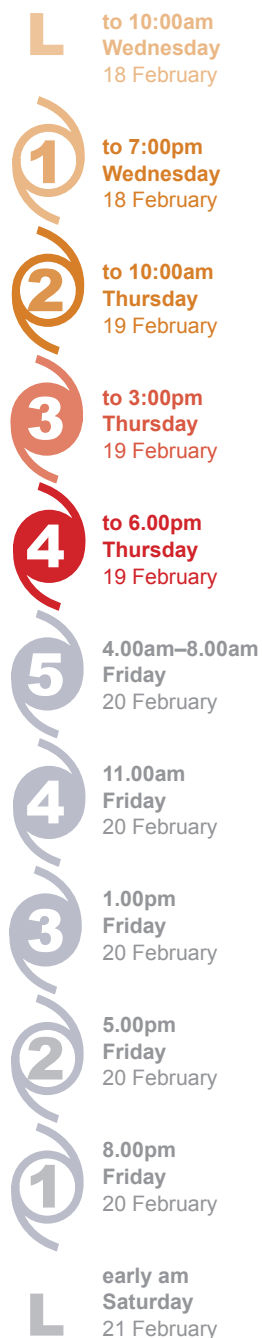
The LDMG met several times during the day.¹⁶ At its 1.00pm meeting, a SunWater representative suggested to the LDMG that if SunWater expected to release water overnight, it would activate its EAP and give the LDMG and downstream residents early advice during daylight hours.¹⁷

A risk assessment for Tropical Cyclone Marcia was prepared by Banana Shire Local Disaster Coordination Centre (LDCC) staff.¹⁸ It noted risks, including release of water from the Callide and Kroombit dams, and heavy rainfall leading to potential flooding.¹⁹ There was also concern about damaging winds and localised flooding.²⁰ The document was provided to the Council’s decision-makers.²¹ Although circulated to the LDMG,²² the risk assessment was not tabled or discussed at its meetings.²³

The Banana Shire Disaster Management Information Facebook page was updated, advising residents in low lying areas to prepare for flooding and informing them where to get sandbags.²⁴

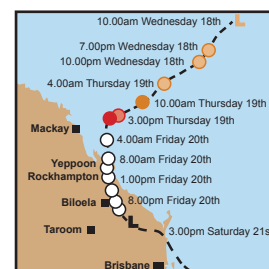
Several residents contacted SunWater to ask if it was possible to release water prior to the forecast rain.²⁵

During the day, Tropical Cyclone Marcia intensified from a Category 1 to a Category 4.²⁶ At 6.00pm, the LDMG moved to ‘stand up’ status, meaning they were fully activated with a staffed LDCC operating.²⁷



Cyclone strength (above) and position (below) at the date / time of the sequence of events presented on this two-page spread.

Bureau of Meteorology



Friday 20 February 2015

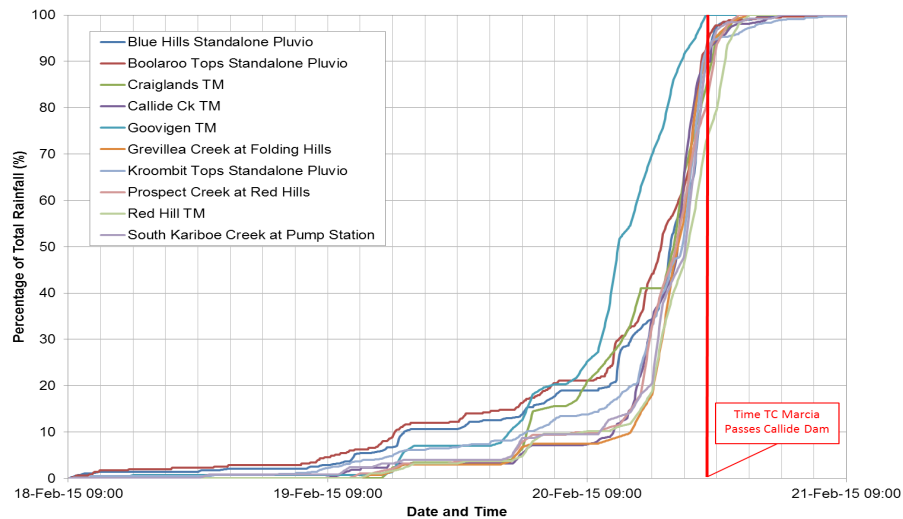
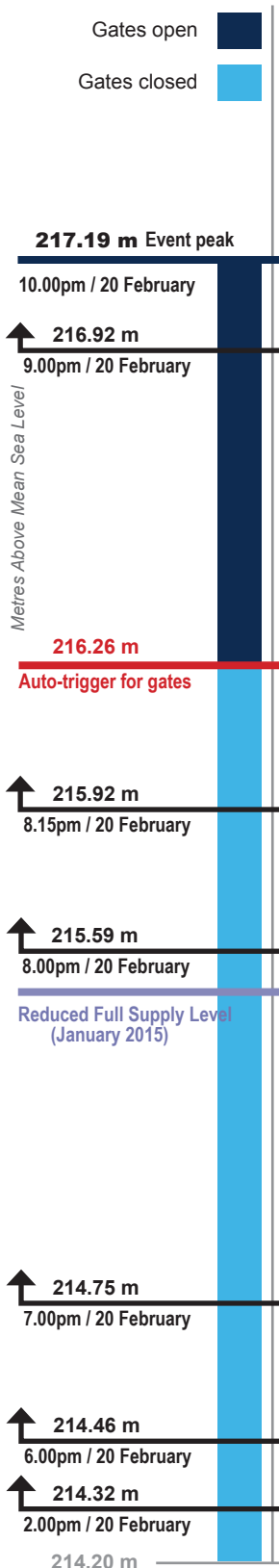
On Friday 20 February 2015 in the early hours of the morning, Tropical Cyclone Marcia was upgraded to a Category 5 system.²⁸ It was predicted to impact the Biloela area between 7.00pm to 9.00pm that night, although by that time it was expected to be a Category 2.²⁹

The BoM continued to issue flood watches for the Dawson Catchment, predicting widespread heavy rainfall of 200-300mm and possible flash flooding.³⁰ The BoM also issued cyclone warnings throughout the day, with the warning zone including parts of the Banana Shire.³¹

During the morning, both SunWater and the Council were posting dam-related information on social media.³² The LDCC stated that there were no issues with the water levels in the Callide Dam.³³ SunWater tweeted that its dams weren't for flood mitigation.³⁴

The LDMG had prepared draft 'trigger points' for the Callide Dam, to guide its decision making for issuing warnings.³⁵ We did not find evidence of trigger points for the issuing of warnings to the rest of the Banana Shire.

Heavy rainfall commenced at the Goovigen TM gauge from 10.00am.³⁶ From about 12.00pm, intense rainfall was recorded at the other gauges to the south of the cyclone.³⁷



Above: Cumulative normalised rainfall chart for the 24 hours from 9.00am Friday 20 February to 9.00am Saturday 21 February. BMT WBM report with Bureau of Meteorology data

4.30pm Friday

At 4.30pm the river gauge upstream from the Callide Dam showed the first sharp increase.³⁸ After stabilising for a period, the gauge showed a rapid rise from around 6.00pm.³⁹ This data was publicly available on the BoM website, with a link provided via SunWater's website.⁴⁰

4.51pm Friday

At 4.51pm, the LDCC sent a request to the SDCC for an Emergency Alert (location based SMS notification).⁴¹ The alert was intended to give early advice that the Callide Dam gates may need to be opened. There were problems with the compatibility of the map files that the LDCC sent to the SDCC.⁴² After multiple attempts to address this, at 6.18pm the LDCC told the SDCC to cancel the message before anything was sent out, saying it would soon issue a warning message.⁴³

Above: Graphic depicting indicative water levels, based on the gauge reading nearest the Callide Dam, as at the date / time of the sequence of events presented on this two-page spread.

Data from SunWater

5.00pm Friday

At the 5.00pm meeting of the LDMG, a SunWater representative said that if the rain continued in the catchment, there was every chance that the gates would open in the next 24 hours.⁴⁴ There was subsequent discussion regarding the consequences of water releases being known and that there was close, ongoing liaison with SunWater.⁴⁵

Over the course of the afternoon and into the evening, SunWater used modelling to predict the water levels and possible gate opening times for the Callide Dam. By 6.37pm, this modelling showed there was potential for the Callide Dam to fill that evening based on inflow rates, but the amount of rainfall at the time made it uncertain.⁴⁶ At 7.03pm, the LDCC was advised that the reduced full supply level trigger may be reached that evening and that the inflows were still rising, but rainfall needed to be monitored.⁴⁷ The LDCC representative asked if height and flows could be added to the SunWater SMS messages.⁴⁸

7.22pm Friday

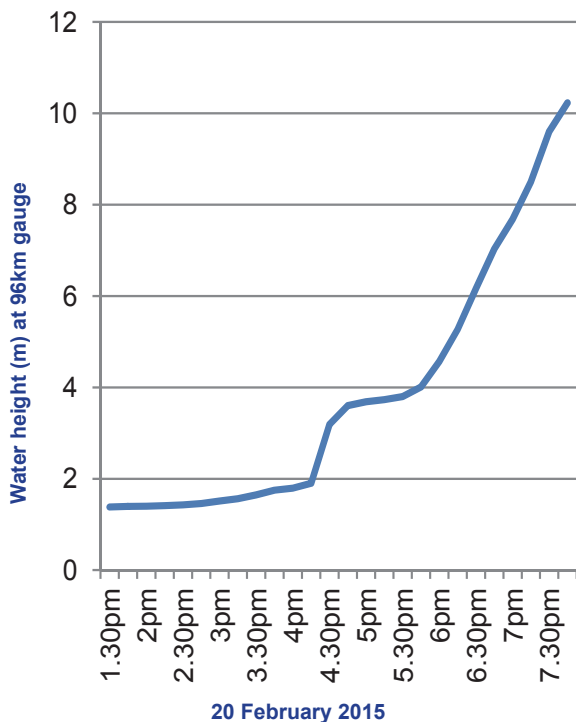
At 7.22pm, the flow in the Callide Creek (old channel) washed away a section of Telstra fibre optic cable just north of the intersection at Argoon and Jambin Dakenba Roads in Jambin.⁴⁹ This contributed to telecommunication difficulties in the Banana Shire, particularly for 3G and 4G mobile services.

7.40pm Friday

By 7.40pm, SunWater modelling showed that the Callide Dam gates could operate as early as 9.00pm.⁵⁰ The LDMG was notified at 7.52pm that gate operation would be 'within hours'.⁵¹

7.45pm Friday

The '96 kilometre gauge' that measures the inflow to the Callide Dam had been rising rapidly since 6.00pm.⁵² The gauge last read 10.231m at 7.45pm when flood water inundated the equipment.⁵³ Debris around the gauging station suggests the water level peaked above 11m.⁵⁴



8.18pm Friday

SunWater continued to update its modelling predictions for the gate opening. By 8.18pm Friday, when the LDMG called SunWater, they were told that modelling showed that automatic gate operation was imminent and that inflows to the Callide Dam were greater than those in the 2013 flood event.⁵⁵ As a result, SunWater 'activated' the Emergency Action Plan for Callide Dam and commenced the notification process.

Left: Data from gauge station 539111 'Callide Dam Inflow TM'. SunWater

L to 10:00am Wednesday 18 February

1 to 7:00pm Wednesday 18 February

2 to 10:00am Thursday 19 February

3 to 3:00pm Thursday 19 February

4 6.00pm Thursday 19 February

5 4.00am–8.00am Friday 20 February

4 11.00am Friday 20 February

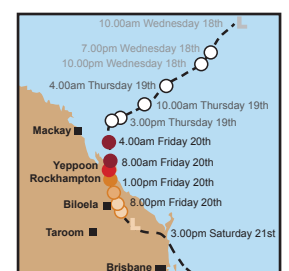
3 1.00pm Friday 20 February

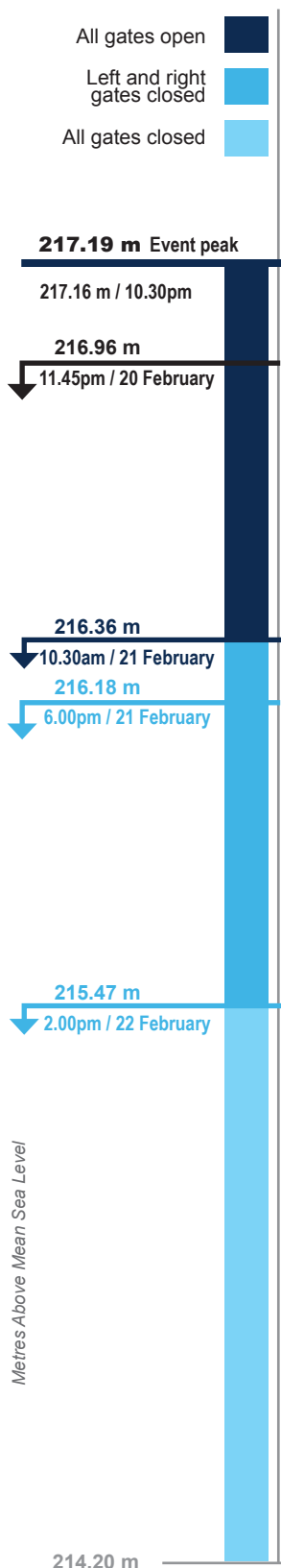
2 5.00pm Friday 20 February

1 8.00pm Friday 20 February

L early am Saturday 21 February

Cyclone strength (above) and position (below) at the date / time of the sequence of events presented on this two-page spread. Bureau of Meteorology





Above: Graphic depicting the progressive closing sequence of the pairs of gates on the Callide Dam as water levels began to subside from late evening on Friday 20 February.
Data from SunWater

8.30pm Friday

The Callide Dam gates opened at approximately 8.30pm.⁵⁶ The exact time of gate opening cannot be confirmed as there is no equipment connected to the gates that records this information.⁵⁷

The estimation is a theoretical calculation based on the known storage levels and the rate of rise in the storage level at the time.⁵⁸ A dam operator assumed a ‘rumble in the spillway’ between 8.37pm and 8.42pm was the sound of the dam gates opening.⁵⁹

8.39pm Friday

At 8.39pm, SunWater sent a text message warning to residents within 10km downstream of the Callide Dam who were subscribed to SunWater’s notification system.⁶⁰ SunWater also attempted to telephone 13 residents immediately downstream.⁶¹ SunWater tweeted that the dam gates were open at 9.22pm.⁶²

8.45pm Friday

At 8.45pm, the LDCC posted a Facebook warning urging Jambin residents to evacuate due to high water levels coming into the Callide Dam: ‘SunWater has advised to expect water to be released from the dam in the very near future’.⁶³ At 9.58pm the LDCC confirmed on its public Facebook page that the Callide Dam gates were open and urged people in low lying areas to self-evacuate.⁶⁴

8.56pm Friday

At 8.56pm, the LDCC provided the details for an Emergency Alert warning message via the SDCC.⁶⁵ The Emergency Alert text message to mobile phones and voice messages to landlines began at 9.40pm.⁶⁶ Delays were due to time taken to approve the message content and load the message and map into the Emergency Alert system.⁶⁷

10.03pm Friday

At 10.03pm, the BoM issued a ‘minor’ flood warning for parts of the Banana Shire.⁶⁸ This was the BoM’s first flood warning for the event.

SunWater and the LDMG continued to converse during the evening. Around 10.36pm, SunWater advised the LDMG that the Callide Dam gates had closed slightly.⁶⁹

10.37pm Friday

SunWater sent a second SMS ‘alert notification’ at 10.37pm,⁷⁰ warning subscribers within 10km downstream of Callide Dam about the escalation of the event to a Stage 4 flood, with 298,000ML per day outflow from the dam.⁷¹

Saturday 21 February 2015

Throughout the night and into Saturday morning, numerous calls were made to the LDCC, State Emergency Services and Queensland Police Service by residents seeking assistance to evacuate.⁷² Some residents spoke of rising waters being close to inundating their homes, while others already had water inside.⁷³ Many of the calls did not result in residents being evacuated. Poor weather and an inability for flood boats to navigate floodwaters to access properties were factors preventing evacuation.⁷⁴

Around 45 Jambin residents sought shelter at the Jambin State School after receiving Emergency Alert warnings. As water rose around the school, some elected to be evacuated by helicopter in the early hours of the morning.⁷⁵ Twenty-four residents were evacuated by air to the Biloela Civic Centre whilst 17 residents remained at Jambin at their request.⁷⁶

Throughout Saturday, SunWater continued to monitor the storage levels at Callide Dam and provide updates to the LDMG.⁷⁷ The gates were manually operated to allow the storage level to be safely reduced, which, by the evening, was a rate of about 40mm (storage height) per hour.⁷⁸

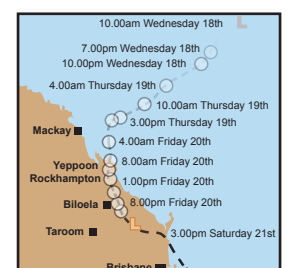
Sunday 22 February 2015

The Callide Dam gates closed at around 2.00pm when the lake level was around the normal operating level.⁷⁹ Small releases from the river valves continued in order to maintain the level of the dam.⁸⁰ At 3.41pm, SunWater advised the LDMG of the gate closure and continued minor releases.⁸¹



Cyclone strength (above) and position (below) at the date / time of the sequence of events presented on this two-page spread.

Bureau of Meteorology



Endnotes Chapter 03

1. Bureau of Meteorology, *Severe Tropical Cyclone Marcia*, 2015, <http://www.bom.gov.au/announcements/sevwx/qld/qldtc20150218.shtml>, accessed April 2015.
2. *ibid.*
3. *ibid.*
4. Bureau of Meteorology letter to Office of the Inspector-General Emergency Management dated 13 May 2015, p. 7.
5. Bureau of Meteorology, *Summary of Flood Watches 17 to 21 February 2015 and Fitzroy Flood Warnings 20 February to 25 February 2015* provided for Callide Review.
6. *ibid.*
7. Banana Shire Council, Media Release, *Stay Informed and Be Prepared*, 18 February 2015.
8. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recording, 18 February 2015, 4.00pm.
9. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 1), SunWater internal emails, pp. 50, 52.
10. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recording, 19 February 2015, 1.00pm.
11. *ibid.*
12. *ibid.*
13. *ibid.*
14. Sunwater Limited, *Callide Dam Emergency Event Report 20-22 February 2015*, EEC Communications details (Part 1), SunWater EEC email to Banana Shire LDC, p. 62.
15. SunWater Limited, Request for Information – DEWS 18 February 2015, p. 1; SunWater Limited, situation reports 19-20 February 2015.
16. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recordings, 19 February 2015, 1.00pm and 5.00pm.
17. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recording, 19 February 2015, 1.00pm.
18. Banana Local Disaster Coordination Centre (internal) email and attachment, 20 February 2015, 11.32am.
19. *ibid.*
20. *ibid.*
21. Banana Local Disaster Coordination Centre (internal) email and attachment, 20 February 2015, 11.32am.
22. Banana Shire Council email to Banana Shire Local Disaster Management Group, 20 February 2015, 3.32pm.
23. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recordings, 20 February 2015, 5.00pm.
24. Banana Shire Disaster Management Information Facebook page, 20 February 2015, 11.45am, <https://www.facebook.com/Banana-Shire-Disaster-Management-Information>, accessed April 2015.
25. Exact dates and times of most calls are not available. Media reports and interviews conducted by the review team indicate residents called SunWater as early as Tuesday 17 February 2015 and some made multiple calls during the week.
26. Bureau of Meteorology, *Severe Tropical Cyclone Marcia*, 2015, <http://www.bom.gov.au/announcements/sevwx/qld/qldtc20150218.shtml>, accessed April 2015.
27. Banana Shire Council, Media Release No 3, Banana Shire Local Disaster Coordination Centre, 19 February 2015; Banana Local Disaster Coordination Centre, Situation Report No 1, 19 February 2015, 6.00pm to 7.00pm.
28. Bureau of Meteorology, *Severe Tropical Cyclone Marcia*, 2015, <http://www.bom.gov.au/announcements/sevwx/qld/qldtc20150218.shtml>, accessed April 2015.
29. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recording, 20 February 2015, 12.00pm.
30. Bureau of Meteorology, *Summary of Flood Watches 17 to 21 February 2015 and Fitzroy Flood Warnings 20 February to 25 February 2015* provided for Callide Review.
31. Bureau of Meteorology, *Summary of Tropical Cyclone Warnings 18 February to 22 February 2015* provided for Callide Review.
32. Numerous Twitter, Facebook and web postings sighted by the Office of the Inspector-General Emergency Management.
33. Banana Shire Disaster Management Information Facebook page, 20 February 2015, 8.48am, <https://www.facebook.com/Banana-Shire-Disaster-Management-Information>, accessed April 2015.
34. @SunWaterLimited, Twitter 10.39am, 20 February, <https://twitter.com/SunWaterLimited/status/568570635930062849>.
35. Banana Shire Council email to Banana Shire Local Disaster Management Group, 20 February 2015, 3.32pm.
36. Report, *Independent Review of Callide Creek Flooding, Tropical Cyclone Marcia, February 2015*, BMT WBM, p. 51.
37. *ibid.*, p. 50.
38. SunWater Limited, 96km gauge readings 1 January 2015 to 20 February 2015.
39. SunWater Limited, Callide Dam reservoir gauge readings 19 February 2015 to 24 February 2015.
40. Bureau of Meteorology, *Latest River heights for the Baffle Creek, Boyne, Calliope, Fitzroy River and tributaries*, http://www.bom.gov.au/cgi-bin/wrap_fwo.pl?IDQ60289.html, accessed April 2015; SunWater Limited, *BOM Flood Plots and Catchment Map Links*, <http://www.sunwater.com.au/home/bom-flood-plots-and-catchment-map-links>, accessed April 2015.
41. Local Disaster Coordination Centre email to State Disaster Coordination Centre, 20 February 2015, 4.51pm.

42. Local Disaster Coordination Centre email to State Disaster Coordination Centre, 20 February 2015, between 4.57pm and 6.18pm.
43. Local Disaster Coordination Centre email to State Disaster Coordination Centre, 20 February 2015, 6.18pm.
44. Banana Shire Local Disaster Management Group, extraordinary meeting minutes and audio recording, 20 February 2015, 5.00pm.
45. *ibid.*
46. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 35.
47. *ibid.*, p. 36.
48. *ibid.*
49. Interview with Telstra, 15 April 2015.
50. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 36.
51. *ibid.*
52. SunWater Limited, 96km gauge readings 1 January 2015 to 20 February 2015.
53. *ibid.*
54. SunWater Limited, Public Submission, 17 April 2015, p. 14.
55. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 36.
56. Report, *Independent Review of Callide Creek Flooding, Tropical Cyclone Marcia*, February 2015, BMT WBM, p. iii.
57. *ibid.*, p. 114.
58. *ibid.*, p. 16.
59. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 37.
60. SunWater Limited, *Report to Support Callide Dam 2015 Flood Review Request for Documents*, 1 April 2015, p. 31; Interview with resident, 18 March 2015.
61. SunWater Limited, *Callide Dam Emergency Event Report – 20-22 February 2015*, EEC Communications details (Part 3), EEC Record of Communication, pp. 111-113.
62. @SunWaterLimited, Twitter, 20 February 2015, 9.22pm, <https://twitter.com/SunWaterLimited/status/568732488652058625>.
63. Banana Shire Council, Disaster Management Information Facebook post, 20 February 2015, 8.45pm.
64. Banana Shire Council, Disaster Management Information Facebook post, 20 February 2015, 9.58pm.
65. SunWater Limited, *Callide Dam Emergency Event Report - 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 39.
66. State Disaster Coordination Centre, *Emergency Alert log - Tropical Cyclone Marcia*, February 2015.
67. Audio recording of phone call from Local Disaster Coordination Centre to State Disaster Coordination Centre, 20 February 2015, 8.56pm; Interview with a State Disaster Coordination Centre officer, April 2015.
68. Bureau of Meteorology, *Summary of Flood Watches 17 to 21 February 2015 and Fitzroy Flood Warnings 20 February to 25 February 2015* provided for Callide Review.
69. Phone call from SunWater to Banana Shire Council, 20 February 2015, 10.36pm.
70. SunWater Limited, *Report to Support Callide Dam 2015 Flood Review Request for Documents*, 1 April 2015, p. 32; Interview with resident, 18 March 2015.
71. Interview with three residents who received SunWater warning, 15 March 2015.
72. Local Disaster Coordination Centre, *Summary for Operational Cyclone Marcia* (log of jobs), February 2015.
73. *ibid.*
74. Local Disaster Coordination Centre, *State Emergency Service tasking log*, 2015.
75. Local Disaster Coordination Centre, *Situation Report Banana Local Disaster Coordination Centre, number 6*, 21 February 2015, 4.00am-12.00pm.
76. State Disaster Coordination Centre, *State Update – 21 February 2015 0500-1100*, p. 12.
77. SunWater Limited, *Callide Dam Emergency Event Report - 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, pp. 40-41.
78. *ibid.*, p. 40.
79. Observations of dam gates log shows the gates open at 1.30pm observation, but closed at 2.10pm observation; report chronology of events has 2.00pm as the closing time; communication log of SunWater representative within the Emergency Event Report has closing time of 2.30pm, p. 41.
80. SunWater Limited, *Callide Dam Emergency Event Report - 20-22 February 2015*, EEC Communications details (Part 1), EEC Record of Communication, p. 41.
81. *ibid.*, p. 41.

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