Australian Government
Bureau of Meteorology

Water Information
DATA › INFORMATION › INSIGHT

Flooding in Bungil Creek and the Balonne and Dawson Rivers

April 2011

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1. Aerial Photo of Roma taken on the 19th of April 2011 – Photo courtesy of the Maranoa Regional Council
2. Aerial Photo of Roma taken on the 19th of April 2011 – Photo courtesy of the Maranoa Regional Council

Note:

1. Data in this report has been operationally quality controlled but errors may still exist.

2. This product includes data made available to the Bureau by other agencies. Separate approval may be required to use the data for other purposes. See Appendix 1 for DERM Usage Agreement.

3. This report is not a complete set of all data that is available. It is a representation of some of the key information.

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April 2011

1. Introduction

An upper level low pressure system intensified over central Queensland during the 17th of April causing widespread and very slow moving rain areas, showers and thunderstorms between Roma and Taroom.

Rainfalls of between 100 and 140 mm were recorded in the 48 hour period to 9am on the 19th of April causing major flooding in Bungil Creek and the Upper Dawson River. Major flooding then extended along the Balonne River downstream from Bungil Creek and also through the middle Dawson River.

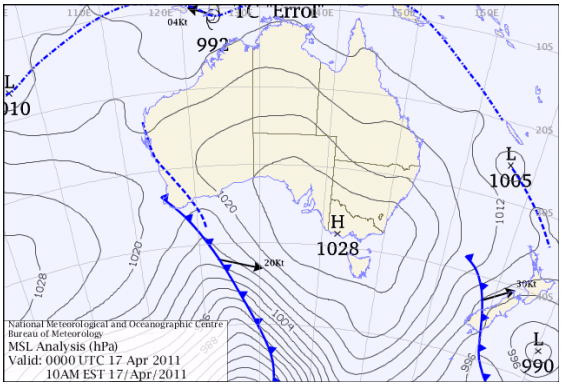
This report provides a discussion of the meteorology and hydrology of this heavy rainfall event which led to major flooding as detailed.

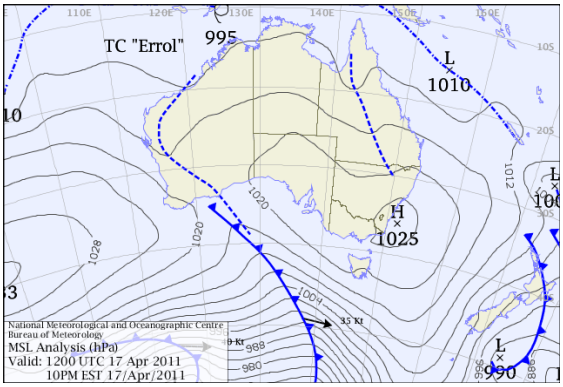
The following link provides a complete list of maps of the relevant river catchments and flood warning stations referred to in this report.

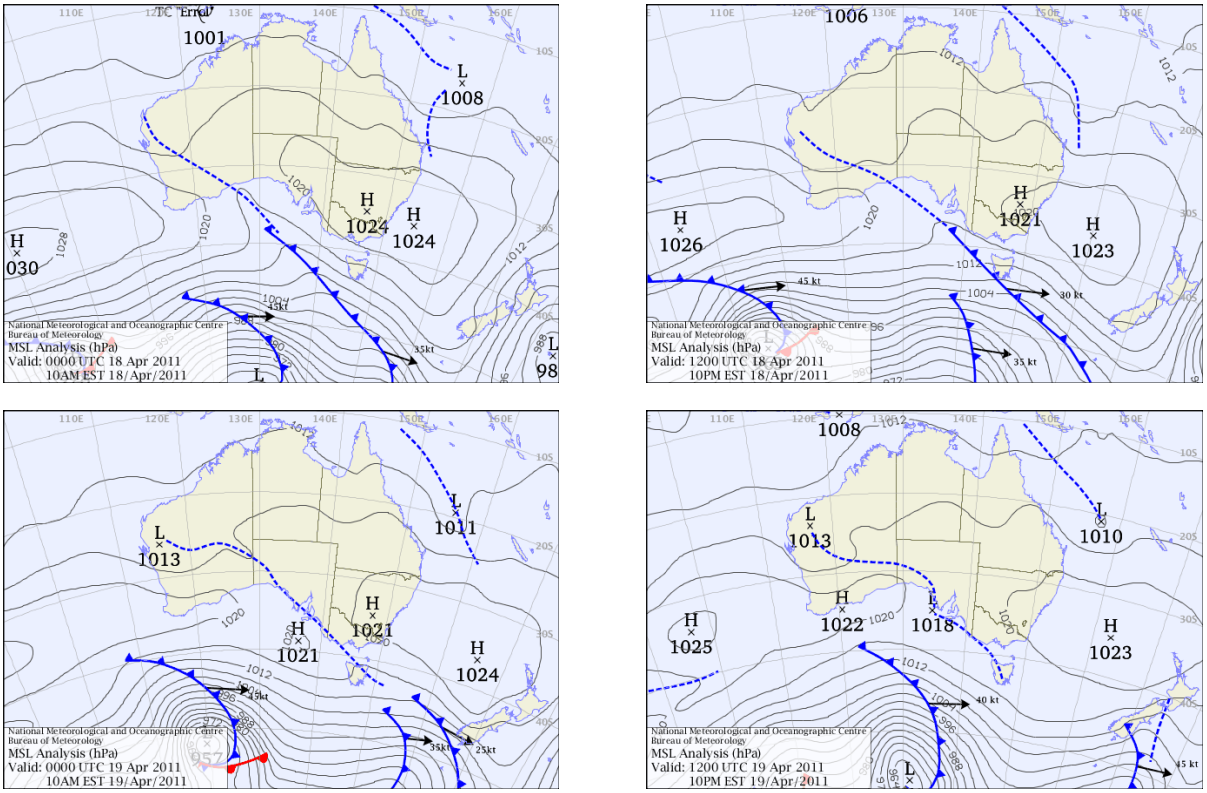
2. Meteorological Summary

Between the 17th and 19th of April the Mean Sea Level Pressure pattern over eastern Australia was dominated by a high pressure system moving eastwards into the Tasman Sea with a ridge extending along the east Queensland coast directing a moist easterly air stream across the eastern half of the state. A sequence of Mean Sea Level Pressure Charts from the 17th to the 19th of April 2011 is shown in Figure 2.1.

Figure 2.1 MSLP Charts for Australia from the 17th to the 19th of April 2011.

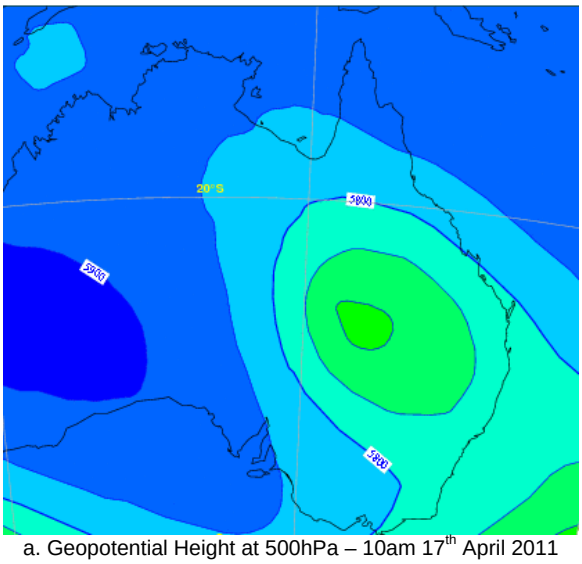




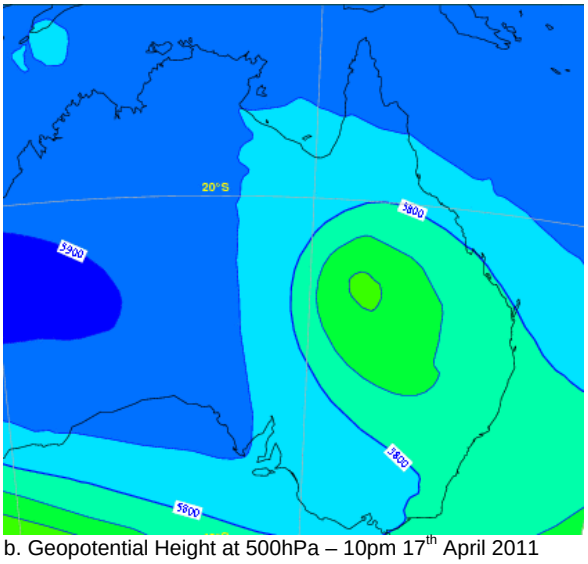


At 5,500 metres above the surface, an upper level low pressure system was intensifying over the central interior of Queensland causing increased instability and the potential for the development of moderate to heavy rainfall. The surface inland trough deepened in response to this upper level system and widespread rain with embedded thunderstorms occurred between Roma and Taroom. The system weakened rapidly on the 19th of April and moved eastward clearing the rainfall from the Bungil Creek and Dawson River catchment areas. A sequence of charts, displaying the geopotential height at 500 hectopascals is shown in Figure 2.2 and clearly shows the intensification of the upper level low pressure system during the 17th of April and the subsequent weakening of the system as it tracked eastward during the 18th.

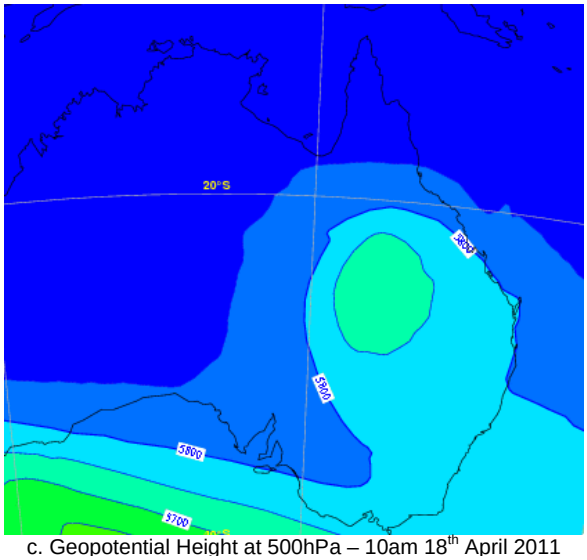
Figure 2.2 Geopotential Height at 500 hectopascals from the 17th to 18th of April 2011.



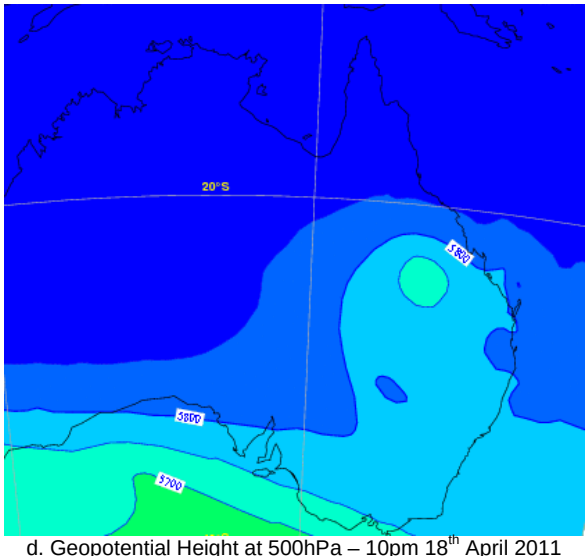
a. Geopotential Height at 500hPa – 10am 17th April 2011



b. Geopotential Height at 500hPa – 10pm 17th April 2011



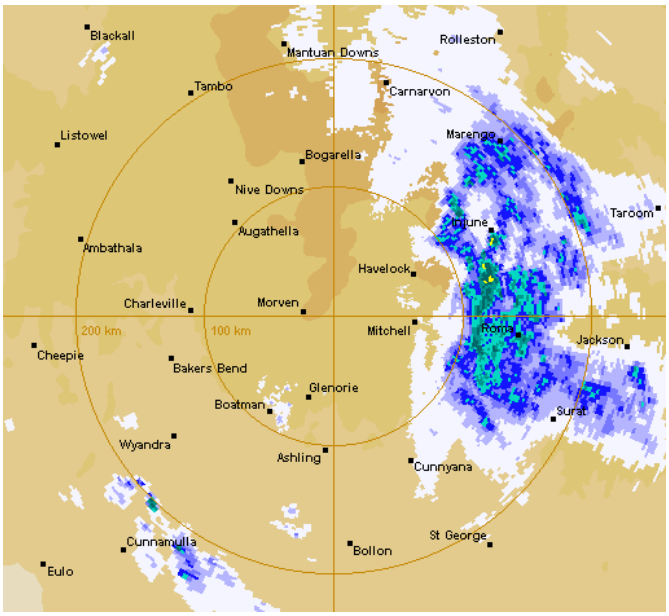
c. Geopotential Height at 500hPa – 10am 18th April 2011



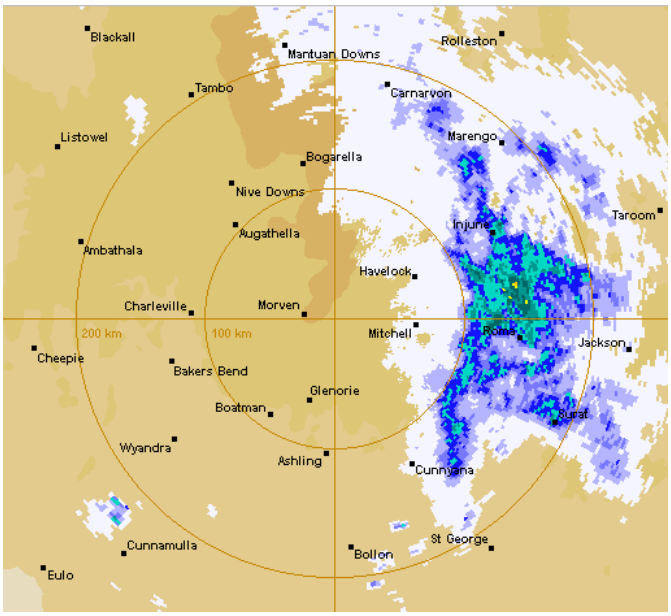
d. Geopotential Height at 500hPa – 10pm 18th April 2011

Imagery from the Warrego radar for the morning of the 18th of April 2011 is shown in Figure 2.3. The widespread area of rainfall between Roma and Taroom is clearly evident and persisted for around 24 hours producing rainfall totals between 100 and 120mm.

Figure 2.3 Images from the Warrego radar on the morning of the 18th of April 2011.



a. Warrego Radar: 8:30am EST 18 April 2011. An extensive area of rain with embedded thunderstorm cells between Roma and Taroom



b. Warrego Radar: 10:00am EST 18 April 2011, with the area of rainfall and thunderstorms persisting between Roma and Taroom.

3. Hydrology

Moderate to heavy rainfall associated with the upper level low pressure system, caused major flooding in Bungil Creek between Tabers TM to Garrabarra. The river level at Roma peaked at 7.6 metres, which is the second highest peak on record for the current river gauge site and only 0.5 metres below the record height. A new record river height was recorded at Tindarra TM (station opened in 2000). Tabers TM and Garrabarra on Bungil Creek also recorded peak river heights that rank in the top 10 highest river levels recorded for the location.

Major flooding along the Balonne River peaked at heights much lower than flood heights experienced in March 2010 and December 2010 – January 2011.

Major flooding on the Dawson River from this rainfall event extended from Tarana Crossing to Baralaba, but at levels much lower than those experienced in the record floods of December 2010 and January 2011. The river height recorded at Tarana Crossing for this event, ranks as the 4th highest on record.

This chapter provides a technical summary and analysis of the hydrology of the river flooding associated with the central Queensland upper low pressure system.

3.1 Peak River Heights

Peak river heights recorded along Bungil Creek and the Balonne and Dawson Rivers between the 18th and 29th of April 2011, resulting from the development of an upper level low, are shown in Figure 3.1.1. A comparison and ranking of the recorded peak heights with historical peak heights is shown in Table 3.1.1. A location where major flooding was recorded is displayed in red.

Figure 3.1.1 Peak height map 18th to 29th April 2011.

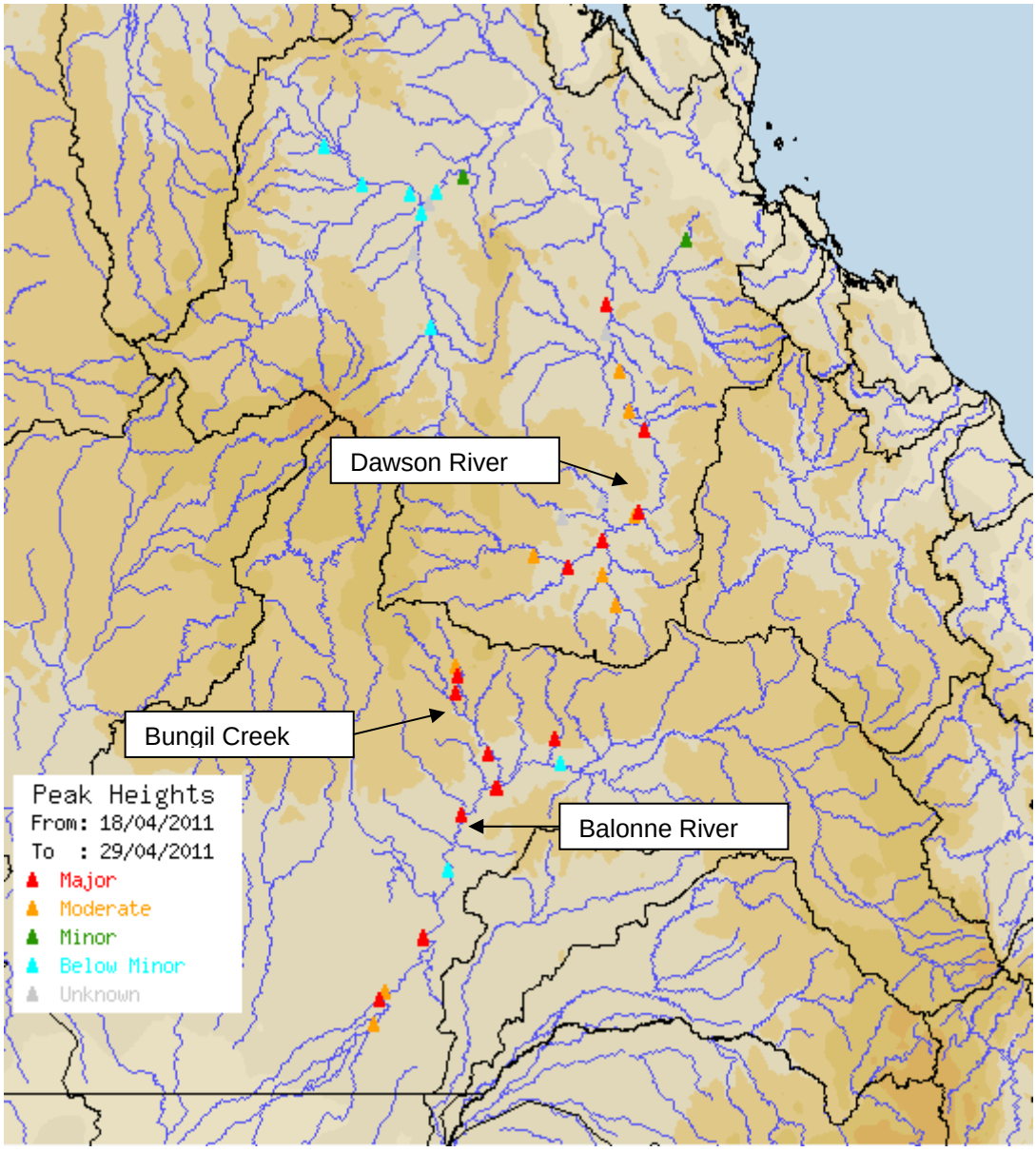


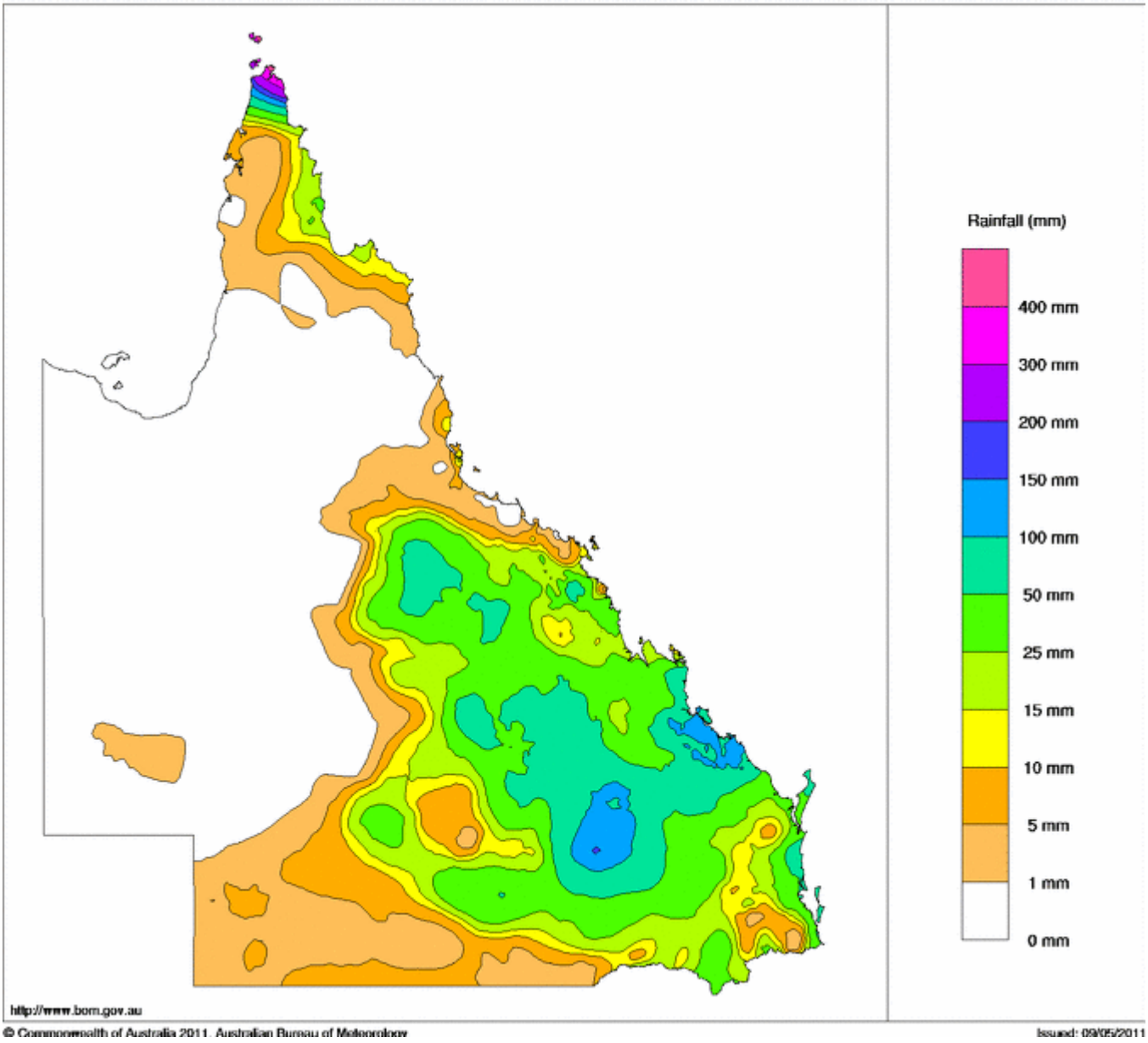
Table 3.1.1 Historical peak height comparison

Gauging Station	Jan-Feb 2010 Peaks	Flood Classification	Start of Record	Ranking	Highest Since	Highest on Record
Bungil Creek						
Tabers TM	6.63m on 19/04/2011 at 4:00pm	Moderate	1970	6th	March 2010	7.83m March 1997
Tindarra TM	7.95m on 19/04/2011 at 6:40am	Major	2000	New Record	March 2010	
Roma	7.60m on 19/04/2011 at 1:30pm	Major	1982	2nd	March 2010	8.10m March 2010
Garrabarra	8.10m on 21/04/2011 at 12 Noon	Major	1997	Equal 5th	December 2010	10.40m March 2010
Balonne River						
Surat	9.05m on 22/04/2011 at 3:00pm	Major	1943	55th	January 2011	12.75m January 2011
Weribone TM	10.16m on 23/04/2011 at 11:20pm	Major	1969	30th	January 2011	13.71m March 2010
St George	6.85m on 26/04/2011 at 6:00am	Major	1968	40th	March 2011	13.39m March 2010
Hastings TM	5.74m on 26/04/2011 at 11:50pm	Moderate	1965	22nd	January 2011	6.53m January 2011
Whyenbah TM	5.81m on 27/04/2011 at 12 Noon	Major	1965	26th	January 2011	6.54m March 2010
Dawson River						
Tarana Crossing	12.00m on 19/04/2011 at 8:45pm	Major	1983	4th	December 2010	12.50m December 2010
Taroom TM	7.15m on 21/04/2011 at 1:00am	Major	1890	21st	December 2010	10.43m December 2010
Theodore	12.10 on 25/04/2011 at 5:30am	Major	1924	19th	January 2011	14.70m January 2011
Moura	11.30m on 26/04/2011 at 10:45am	Moderate	1956	12th	January 2011	12.90 February 1956
Baralaba	10.95m on 27/04/2011 at 9:00am	Major	1978	14th	January 2011	15.25m January 2011

3.2 Rainfall Maps

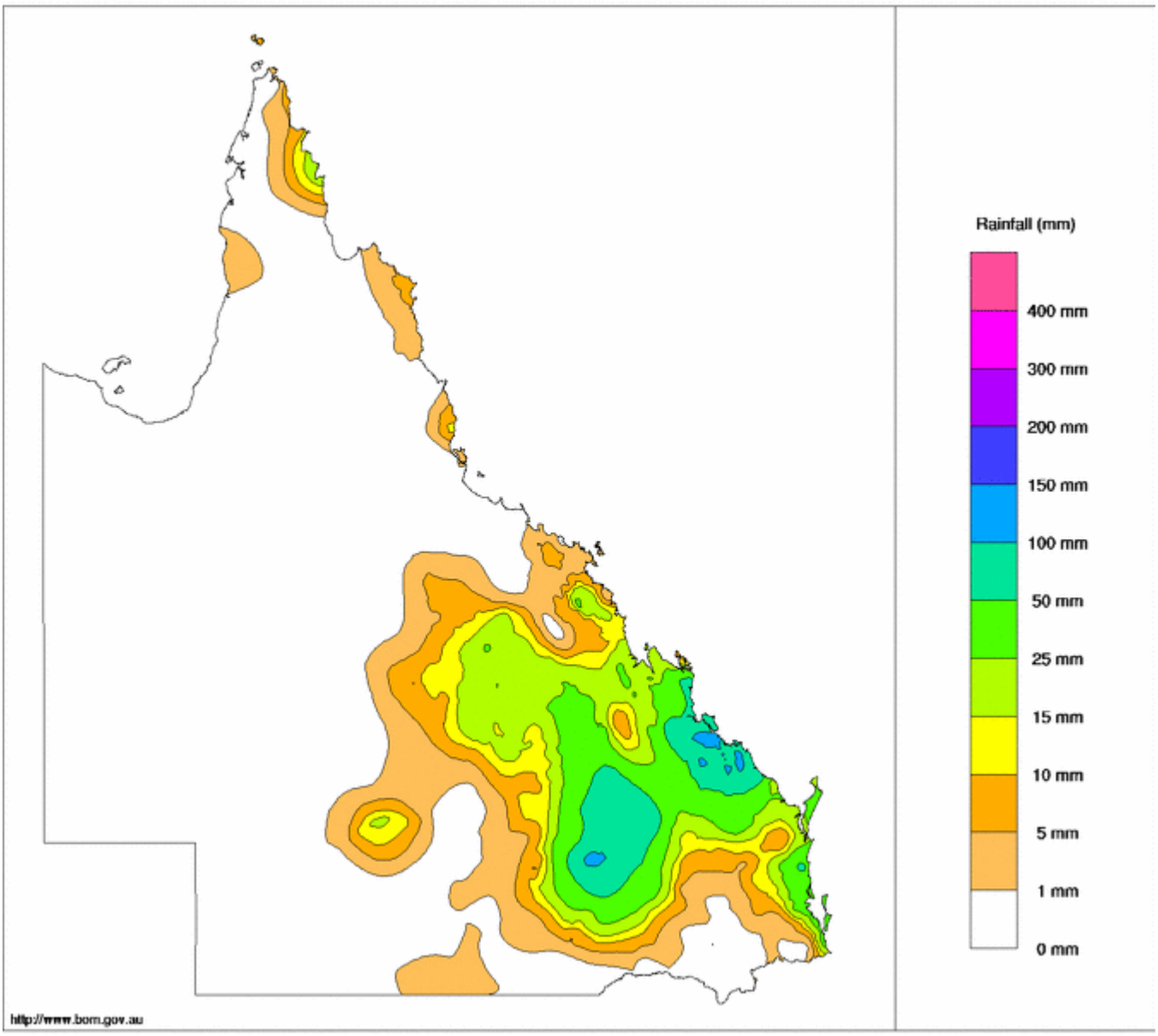
The heaviest rainfall associated with the development of the upper level low occurred between Roma in the Bungil Creek Catchment and Taroom in the Dawson River Catchment. Widespread falls of 100 to 140 mm fell over the region between 9am on the 17th and 9am on the 19th of April. Rainfall over Queensland for the week ending the 19th of April is shown in Figure 3.2.1.

Figure 3.2.1 Rainfall map of Queensland for the week ending the 19th April 2011.



The heaviest 24-hour rainfalls occurred to 9am on the 19th April with widespread falls across the Roma to Taroom region between 80 and 120 mm. Figure 3.2.2 below shows 24-hour rainfall across Queensland on the 19th April 2011.

Figure 3.2.2 Daily rainfall map of Queensland for the 19th April 2011.



3.3 Rainfall Intensity

The heaviest rainfall associated with the upper level low was recorded in the 24 hours to 9am on the 19th April 2011.

The heaviest falls in that period are listed in Table 3.3.1 below.

Table 3.3.1 Highest daily rainfalls recorded to 9am on the 19th April 2011.

Station Number	Station Name	River Catchment	24-Hour Rainfall (mm)
535066	Peekadoo TM	Dawson	119
043105	Tabers TM	Balonne	115
043006	Mooga Hills TM	Balonne	111
043051	Pine Hills TM	Dawson	99

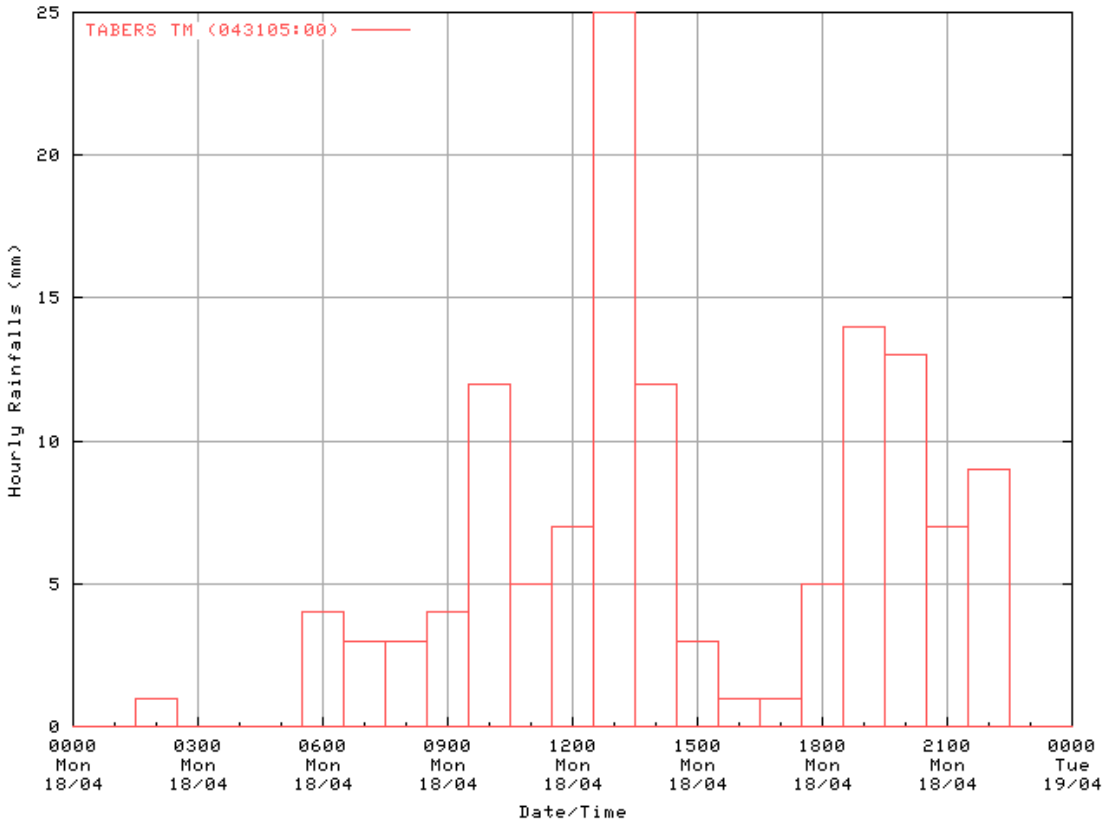
Hourly hyetographs for the 18th of April for Tabers TM and Mooga Hills TM in the Balonne River Catchment are shown in Figure 3.3.1 and for Peekadoo TM and Pine Hills TM in the Dawson River Catchment in Figure 3.3.2.

Intensity Frequency Duration data for Tabers TM and Mooga Hills TM in the Balonne River catchment are shown in Figure 3.3.3. The most statistically significant short duration rainfall occurred for the 12 hour and 24 hour rainfall durations where rainfall amounts for both stations fell between the 5 – 10% Annual Exceedance Probability (10 – 20 year Average Recurrence Interval).

Intensity Frequency Duration data for Peekadoo TM and Pine Hills TM in the Dawson River catchment are shown in Figure 3.3.4. The most statistically significant short duration rainfall at Peekadoo TM occurred for the 12 hour duration. The recorded rainfall amount for this duration was equal to the 5% Annual Exceedence Probability (20 year Average Recurrence Interval). The most statistically significant short duration rainfall at Pine Hills TM occurred for the 12 and 24 hour duration where the rainfall amount fell between the 10 – 20% Annual Exceedence Probability (5 – 10 year Average Recurrence Interval).

Note: A flood frequency analysis would be required to assess the probability of flood levels reached at each location. The frequency analysis in this report is for rainfall only.

Figure 3.3.1. Hourly hyetographs for Tabers TM and Mooga Hills TM - Balonne River Catchment.



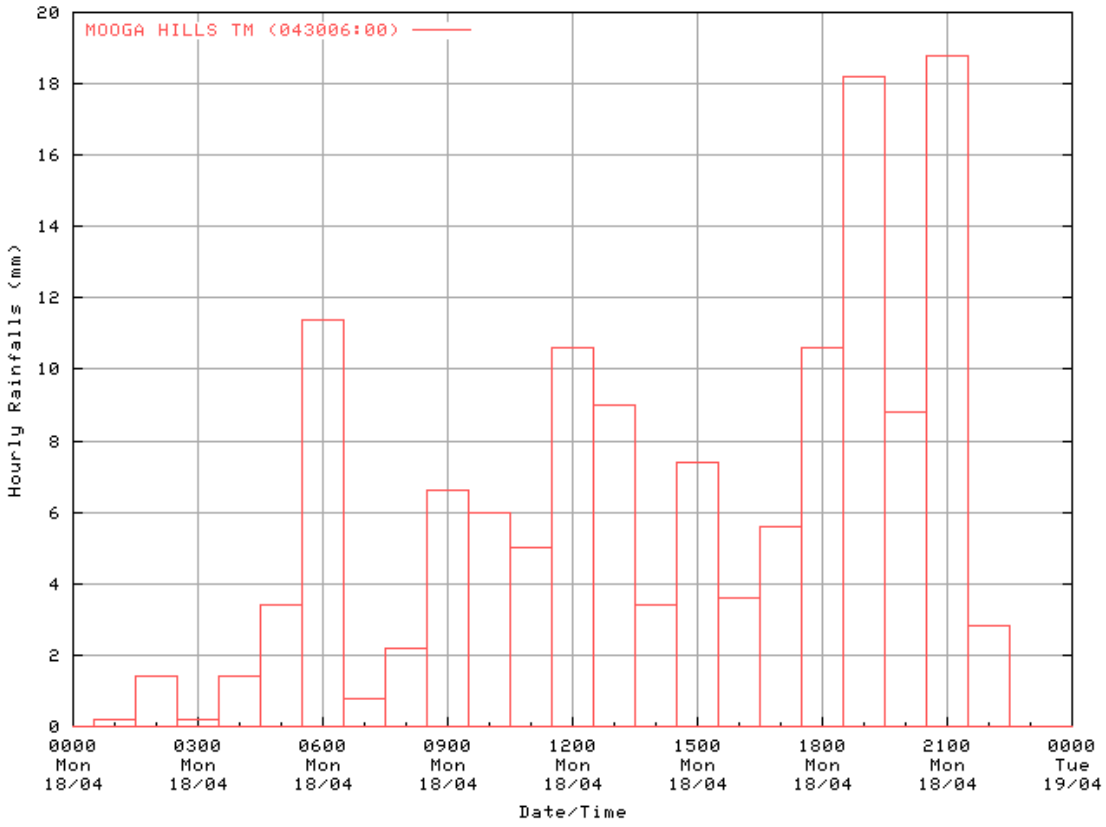
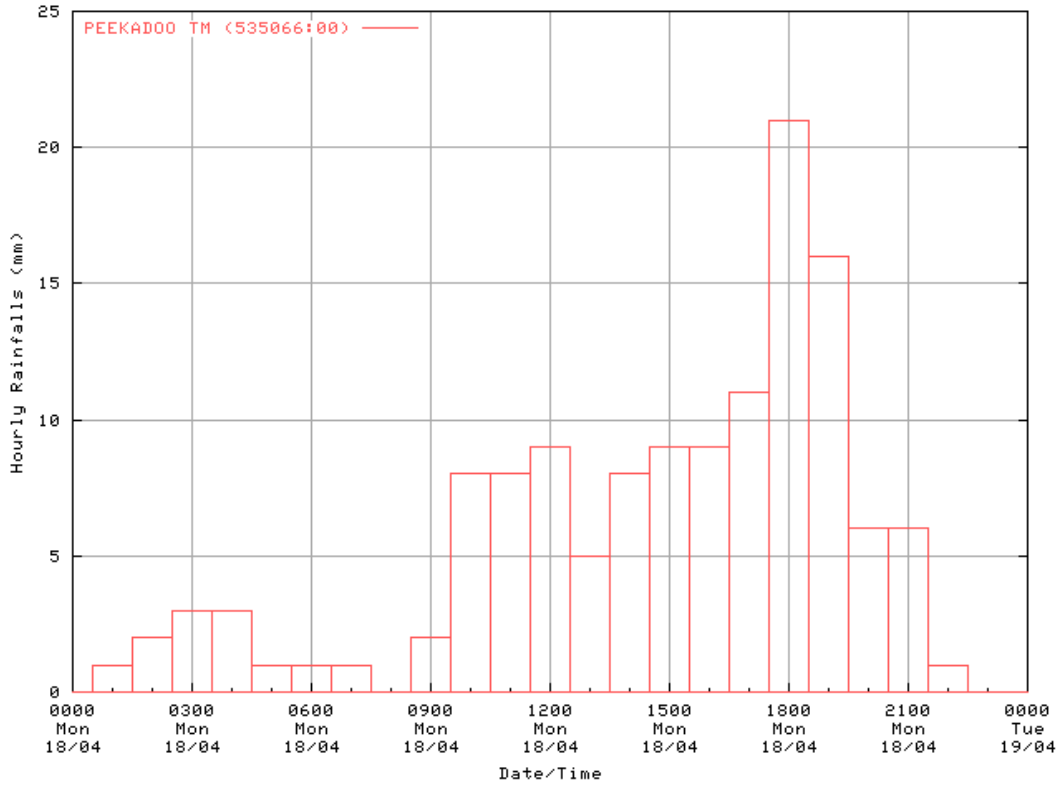


Figure 3.3.2. Hourly Hyetographs for Peekadoo TM and Pine Hills TM – Dawson River Catchment.



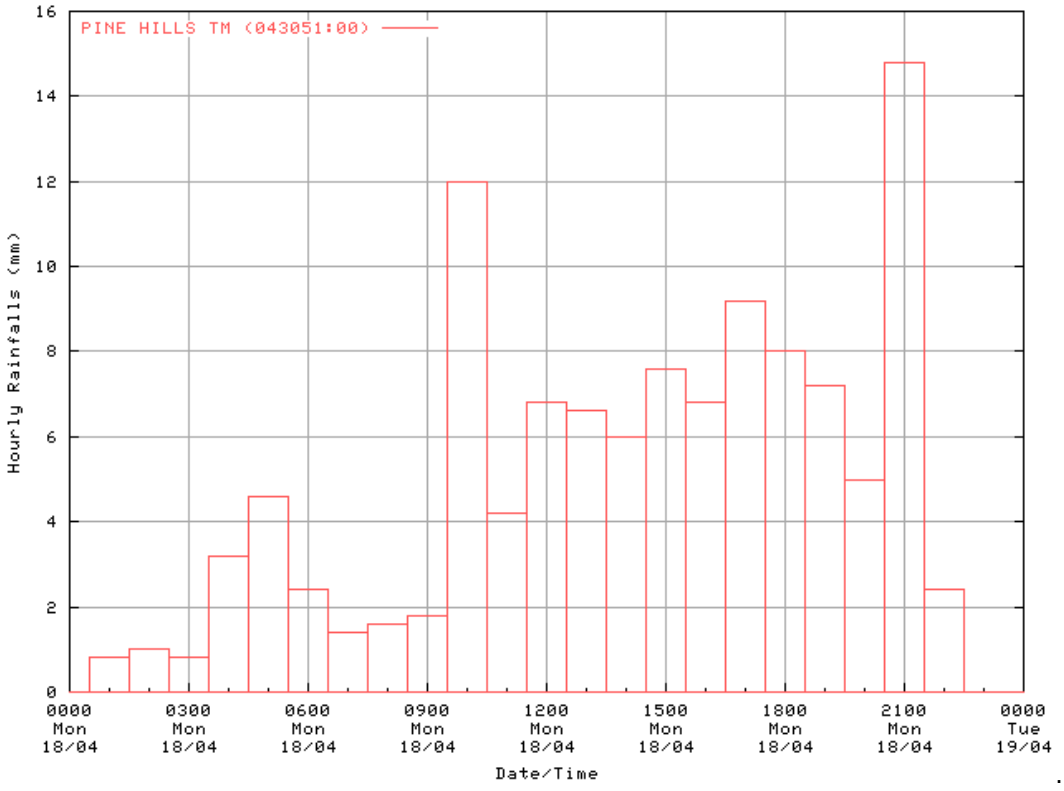


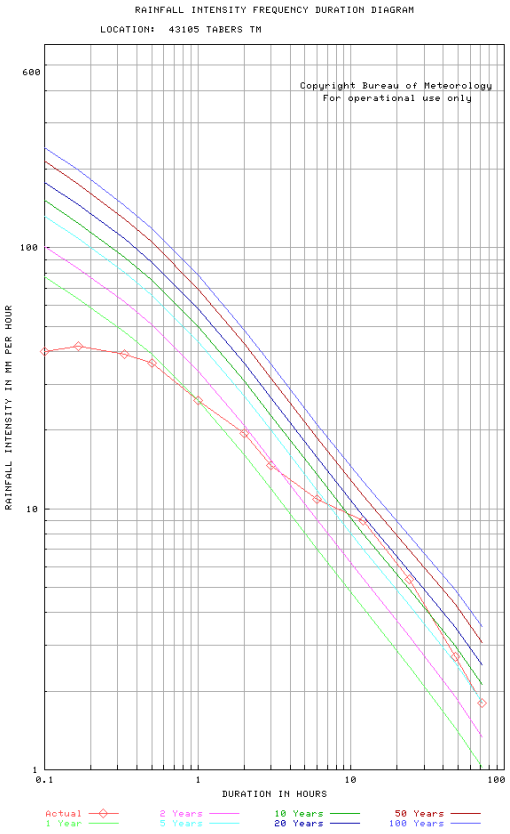
Figure 3.3.3 Rainfall IFD Analysis – Tabers TM and Mooga Hills TM in the Balonne River Catchment.

RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: 043105 TABERS TM

Analysis of the rainfall for the 96 hours to 00:00 Wed Apr 20 2011

Rain (mm)	Period Ending	ARI (years)
4	5 mins ending at 12:40:00 18/04/2011	< 1
4	6 mins ending at 12:41:00 18/04/2011	< 1
7	10 mins ending at 12:40:00 18/04/2011	< 1
13	20 mins ending at 12:45:00 18/04/2011	< 1
18	30 mins ending at 12:55:00 18/04/2011	< 1
26	60 mins ending at 13:20:00 18/04/2011	1-2
39	2 hours ending at 13:30:00 18/04/2011	1-2
44	3 hours ending at 14:25:00 18/04/2011	1-2
65	6 hours ending at 14:20:00 18/04/2011	2-5
108	12 hours ending at 21:30:00 18/04/2011	10-20
129	24 hours ending at 21:45:00 18/04/2011	10-20
130	48 hours ending at 10:15:00 19/04/2011	5-10
130	72 hours ending at 10:15:00 19/04/2011	2-5



RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: 043006 MOOGA HILLS TM

Analysis of the rainfall for the 96 hours to 00:00 Wed 20 Apr 2011

Rain (mm)	Period Ending	ARI (years)
3	5 mins ending at 20:35:00 18/04/2011	< 1
3	6 mins ending at 20:46:00 18/04/2011	< 1
6	10 mins ending at 20:35:00 18/04/2011	< 1
10	20 mins ending at 20:45:00 18/04/2011	< 1
14	30 mins ending at 20:50:00 18/04/2011	< 1
19	60 mins ending at 20:50:00 18/04/2011	< 1
29	2 hours ending at 20:50:00 18/04/2011	< 1
46	3 hours ending at 20:50:00 18/04/2011	1-2
66	6 hours ending at 21:25:00 18/04/2011	2-5
107	12 hours ending at 21:05:00 18/04/2011	10-20
137	24 hours ending at 21:50:00 18/04/2011	10-20
138	48 hours ending at 13:20:00 19/04/2011	5-10
139	72 hours ending at 00:00:00 19/04/2011	5-10

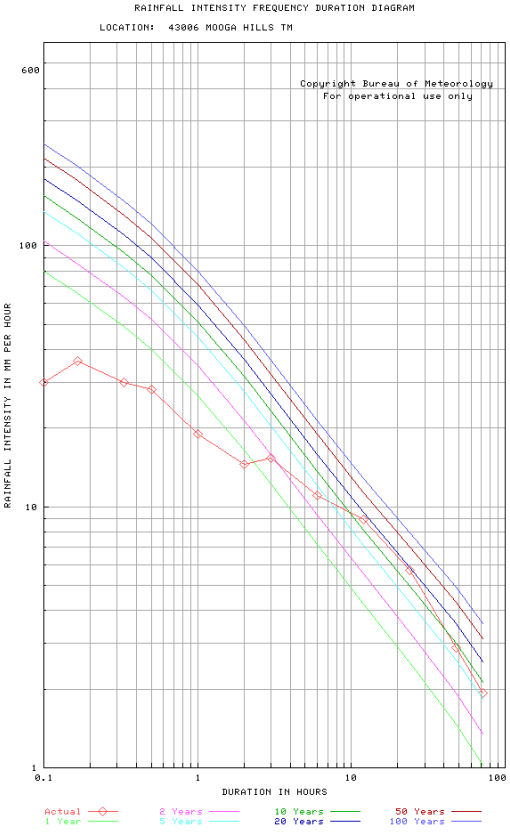


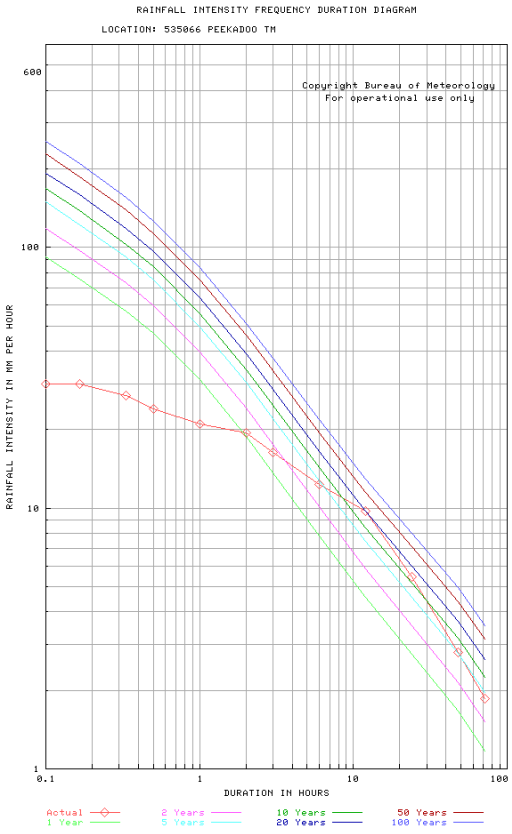
Figure 3.3.4 Rainfall IFD Analysis for Peekadoo TM and Pine Hills TM - Dawson River Catchment.

RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: 535066 PEEKADOO TM

Analysis of the rainfall for the 72 hours to 00:00 Wed Apr 20 2011

Rain (mm)	Period Ending	ARI (years)
3	5 mins ending at 17:05:00 18/04/2011	< 1
3	6 mins ending at 17:06:00 18/04/2011	< 1
5	10 mins ending at 17:10:00 18/04/2011	< 1
9	20 mins ending at 18:45:00 18/04/2011	< 1
12	30 mins ending at 18:45:00 18/04/2011	< 1
21	60 mins ending at 17:55:00 18/04/2011	< 1
39	2 hours ending at 18:45:00 18/04/2011	1-2
49	3 hours ending at 18:45:00 18/04/2011	1-2
74	6 hours ending at 18:55:00 18/04/2011	2-5
117	12 hours ending at 20:30:00 18/04/2011	20
131	24 hours ending at 21:35:00 18/04/2011	10-20
134	48 hours ending at 04:00:00 19/04/2011	5-10
134	72 hours ending at 00:00:00 20/04/2011	2-5

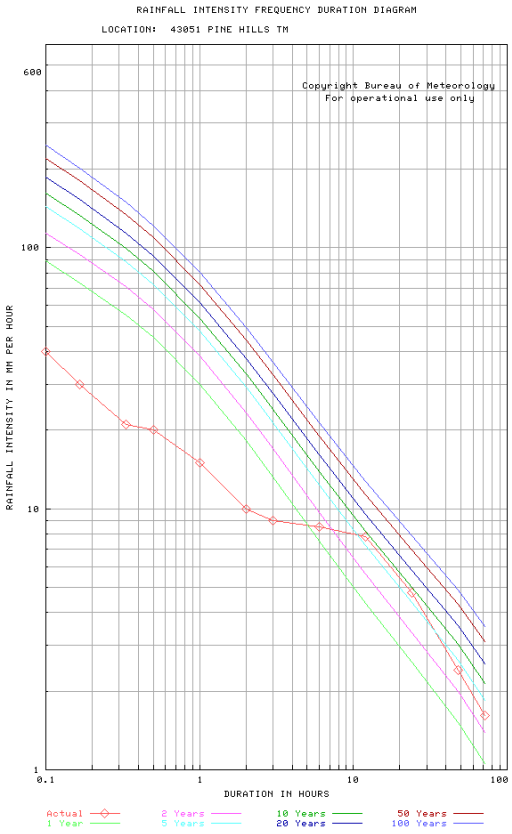


RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: 043051 PINE HILLS TM

Analysis of the rainfall for the 72 hours to 00:00 Wed Apr 20 2011

Rain (mm)	Period Ending	ARI (years)
4	5 mins ending at 09:45:00 18/04/2011	< 1
4	6 mins ending at 09:46:00 18/04/2011	< 1
5	10 mins ending at 09:50:00 18/04/2011	< 1
7	20 mins ending at 09:55:00 18/04/2011	< 1
10	30 mins ending at 10:05:00 18/04/2011	< 1
15	60 mins ending at 21:05:00 18/04/2011	< 1
20	2 hours ending at 21:15:00 18/04/2011	< 1
27	3 hours ending at 20:55:00 18/04/2011	< 1
51	6 hours ending at 21:05:00 18/04/2011	1-2
94	12 hours ending at 21:15:00 18/04/2011	5-10
114	24 hours ending at 00:20:00 19/04/2011	5-10
116	48 hours ending at 12:30:00 19/04/2011	2-5
116	72 hours ending at 00:00:00 20/04/2011	2-5



3.4 Rainfall Totals

Significant daily rainfall totals associated with the upper level low are provided below in Tables 3.4.1 and 3.4.2. The highest 24 hour rainfall of 119 mm was recorded at 9am on the 19th April at Peekadoo TM in the Dawson River catchment (Refer to Table 3.4.1).

The abbreviations used in the following tables include:

- AL - ALERT Radio Telemetry
- TM - Telephone Telemetry
- AWS - Automatic Weather Station
- SYN - Bureau Synoptic Station

Note: * signifies automatic station, N/A signifies missing data. Multiple day totals are shaded.

Refer to the complete list of maps of the relevant river catchments and flood warning stations for the rainfall locations used in Tables 3.4.1 to 3.4.4.

Table 3.4.1 Significant rainfall totals – Balonne River Catchment

Station Name	24 hours to 9am - April		Total
	18	19	
Balonne			
Wallumbilla	26	82	108
Surat SYN	3	48	51
Springdale TM *	19	76	95
Tabers TM *	15	115	130
Mooga Hills TM *	28	111	139
Tindarra TM *	15	90	105
Fairfield		75	75
Roma AWS *	13	88	101
Maximum Rainfall	**28**	**115**	**139**
Numerical Average	**17**	**86**	**101**

Table 3.4.2 Significant rainfall totals – Dawson River Catchment.

Station Name	24 hours to 9am - April		Total
	18	19	
Dawson			
Waddy Brae TM *	12	72	84
Injune SYN	10	50	60
Injune TM *	8	46	54
Utopia Downs TM *	13	92	105
Pine Hills TM *	18	99	117
Peekadoo TM *	11	119	130
Woleebee	11	52	63
Wandoan	9	46	55
Windamere TM *	3	44	47
Taroom SYN	10	86	96
Taroom TM *	3	91	94
La Palma TM *	21	65	86
Woodleigh TM *	5	44	49
Moura	8	30	38

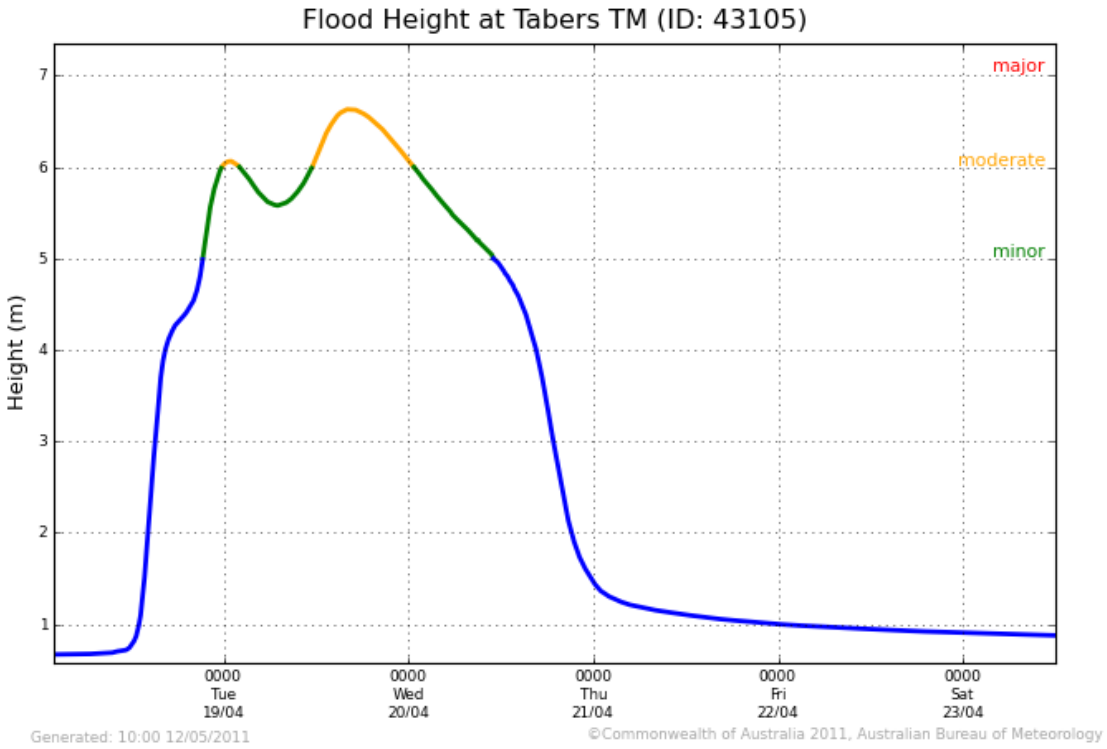
Bauhinia Downs	18	57	75
Red Hill TM *	1	34	35
Maximum Rainfall	**21**	**119**	**130**
Numerical Average	**10**	**64**	**74**

3.5 Flood hydrographs

Figures 3.5.1 through to 3.5.4 show a series of recorded hydrographs at selected locations along Bungil Creek and the Balonne and Dawson Rivers.

Figure 3.5.1 Flood hydrographs – Bungil Creek.

Bungil Creek at Tabers TM



Bungil Creek at Tindarra TM

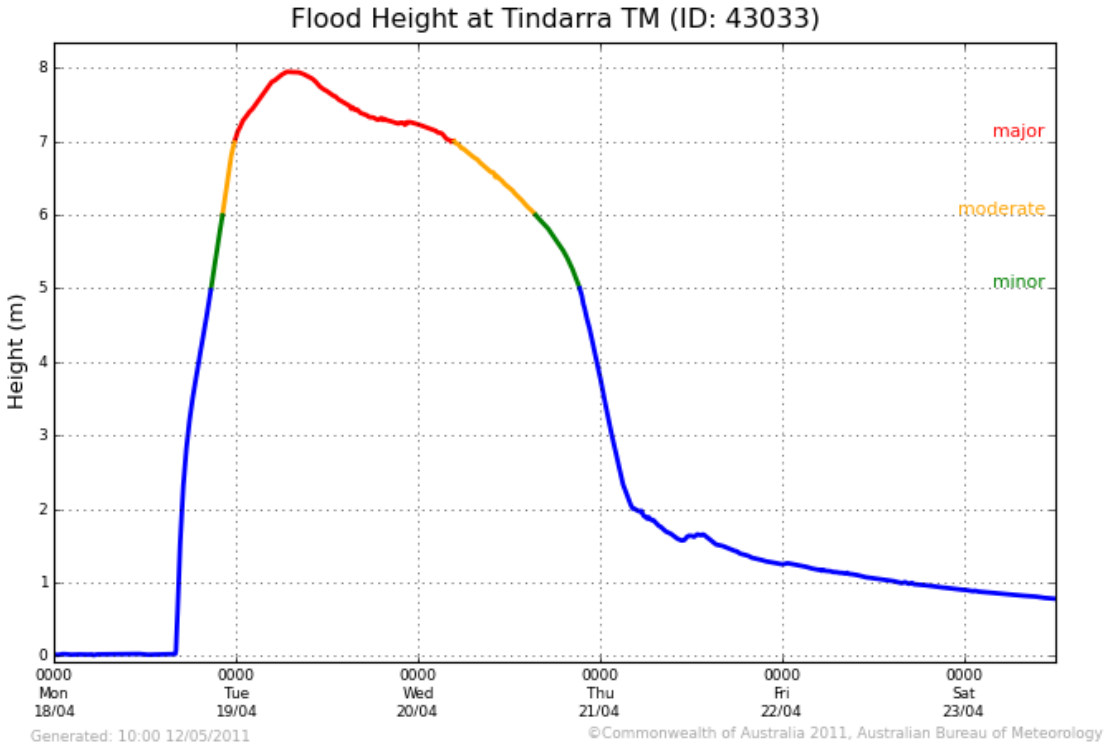
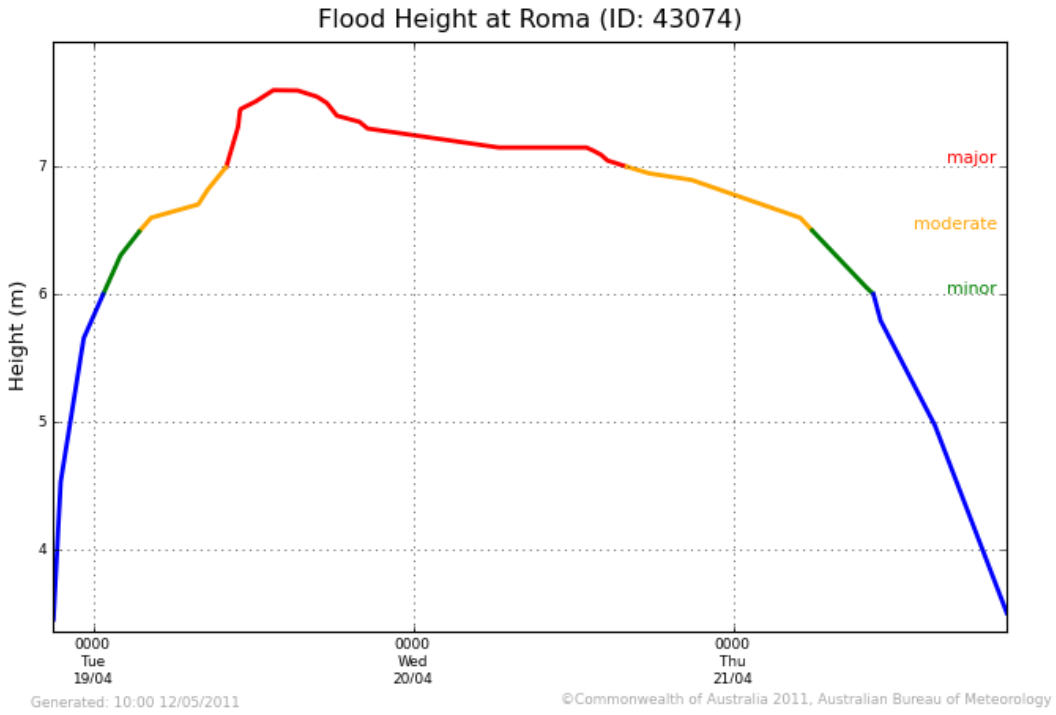


Figure 3.5.2 Flood hydrographs – Bungil Creek

Bungil Creek at Roma



Bungil Creek at Garrabarra

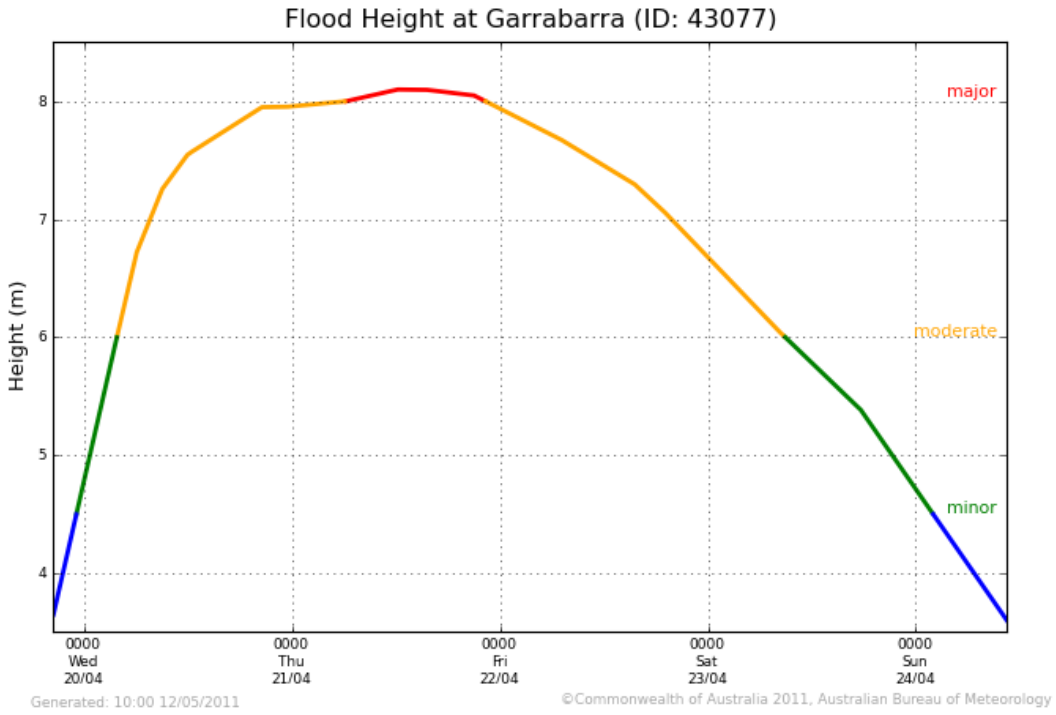
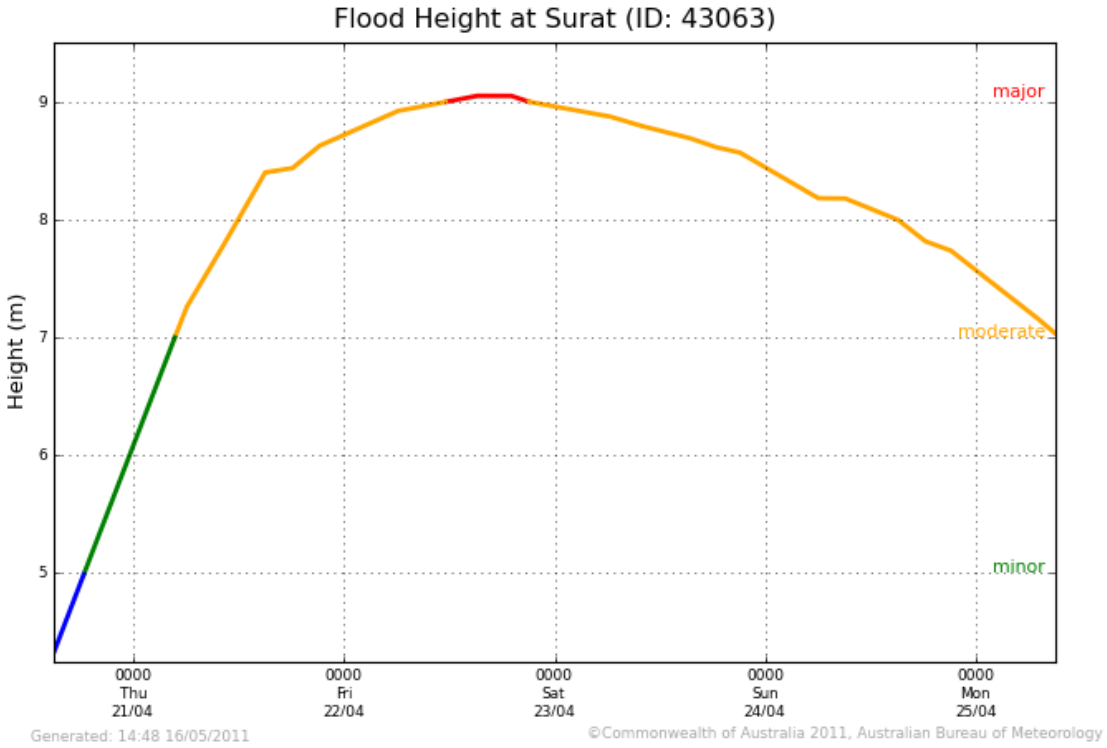


Figure 3.5.3 Flood hydrographs - Balonne River.

Balonne River at Surat



Balonne River at St George

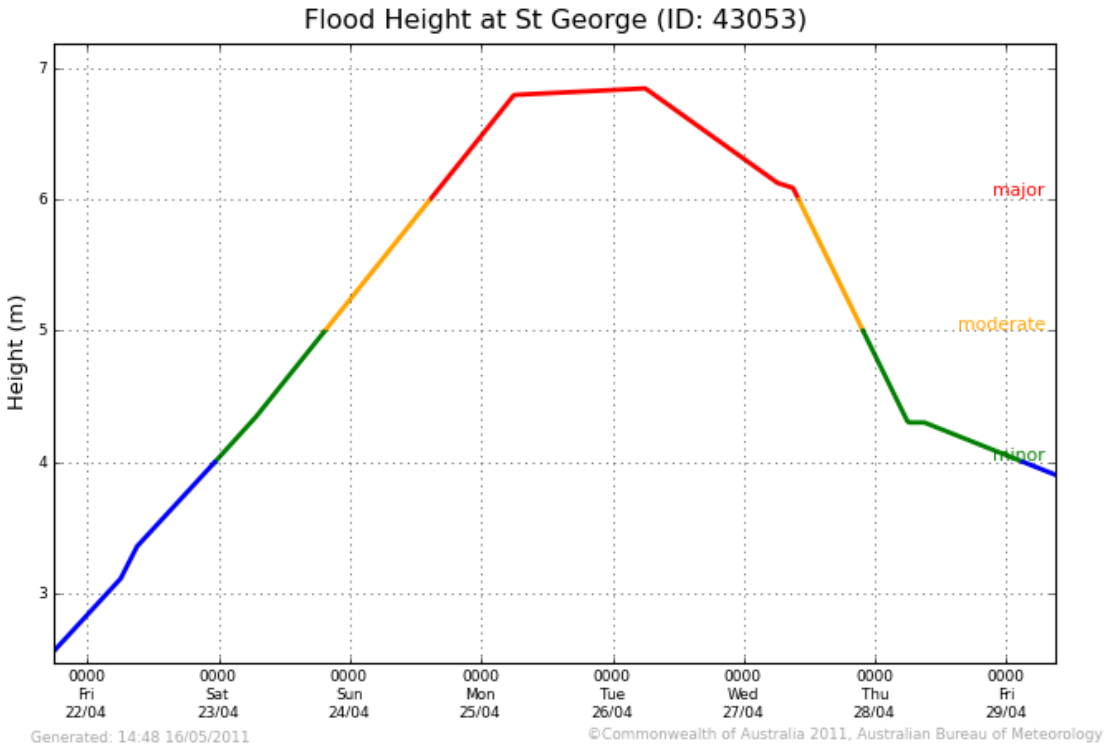
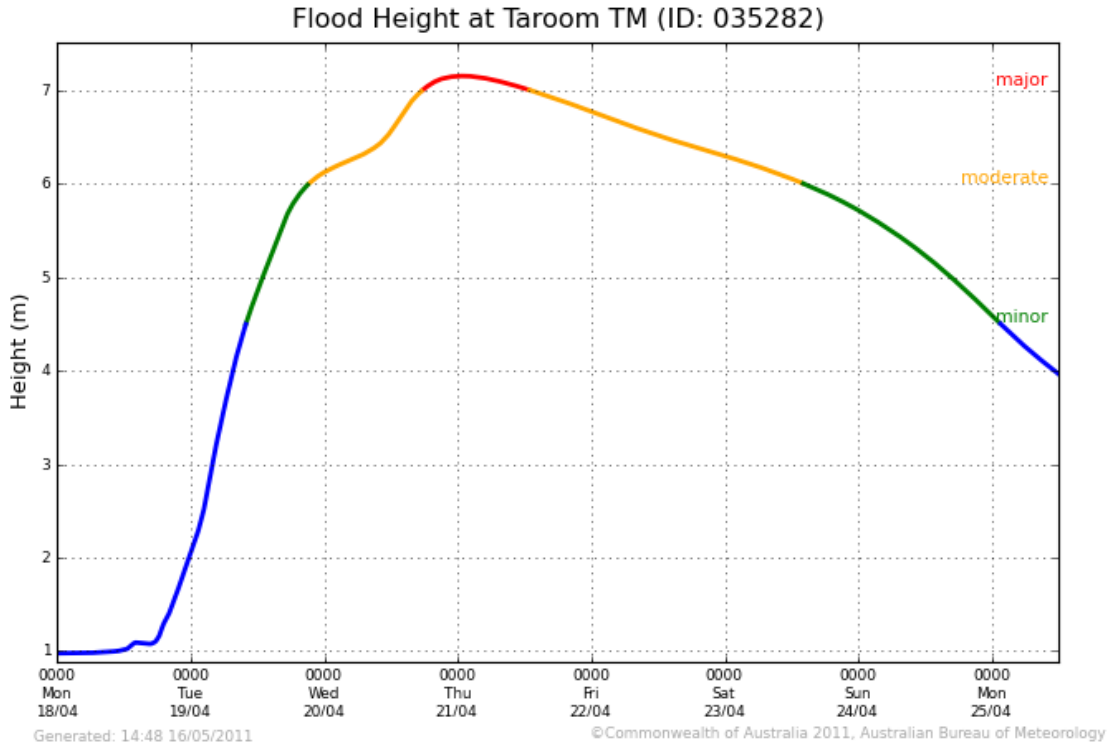
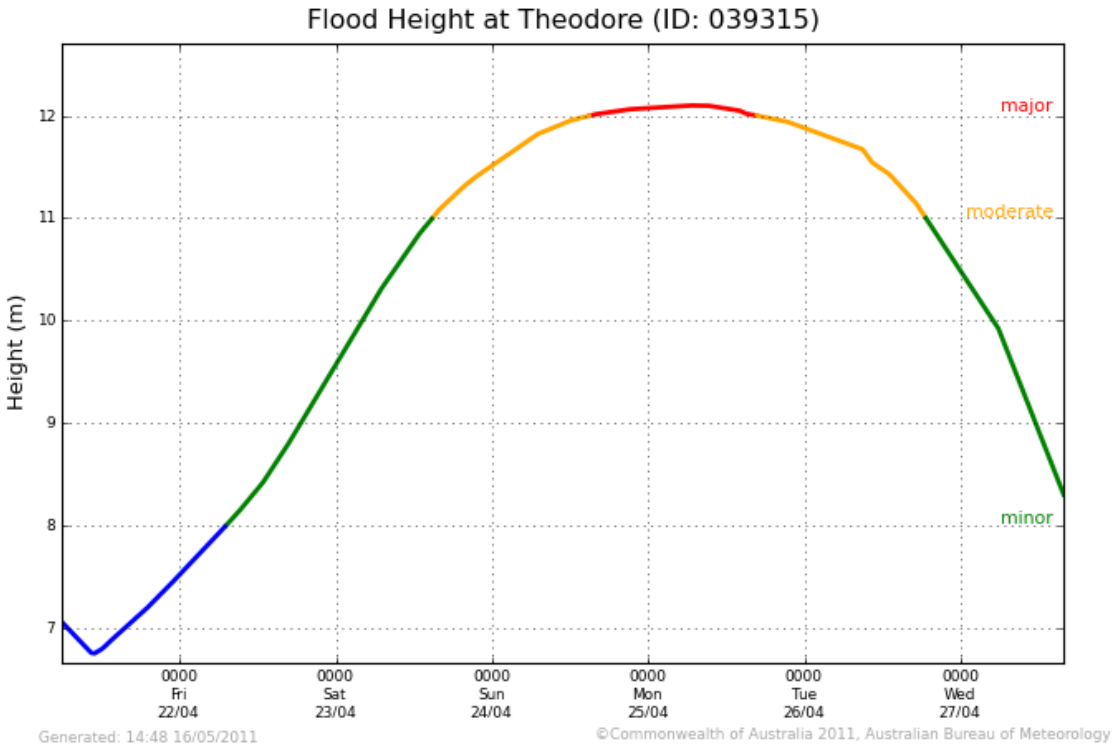


Figure 3.5.4 Flood hydrographs – Dawson River.

Dawson River at Taroom TM



Dawson River at Theodore



4. Warning Services

Severe Weather Warnings identifying the development of the upper level low and the potential for moderate to heavy rainfall over the Roma to Taroom area were first issued at 10:45am on 17th April 2011. Warnings were issued 6 hourly during the 17th April and increased to 3-hourly during the 18th April between 4am to 6pm as the heaviest rainfall occurred. A total of 11 Severe Weather Warnings were issued.

A total of 51 Flood Warnings were issued for this event, of which 36 were Major Flood Warnings. Twenty two river height predictions were made for 5 locations along Bungil Creek and the Balonne River and 39 predictions were made for 4 locations along the Dawson River. Table 4.1 provides a summary of Flood Warnings.

Table 4.1 Flood Warnings and Predictions issued – April 2011

River Basin	Number of Warnings	Number of Major Warnings	Number of Predictions	Prediction Location	First Warning	Last Warning
Qld Flood Summary	Continuous through April.					
Balonne River	28	20	5 2 3 4 8	Roma Surat St George Dirranbandi Hebel	3:15PM Mon 18/04/2011	8:21AM Tues 03/05/2011
Dawson River	23	16	8 12 9 10	Taroom Theodore Moura Baralaba	10:26AM Mon 18/04/2011	8:25AM Sat 30/04/2011
TOTAL	51					

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Last updated: 16 March 2009