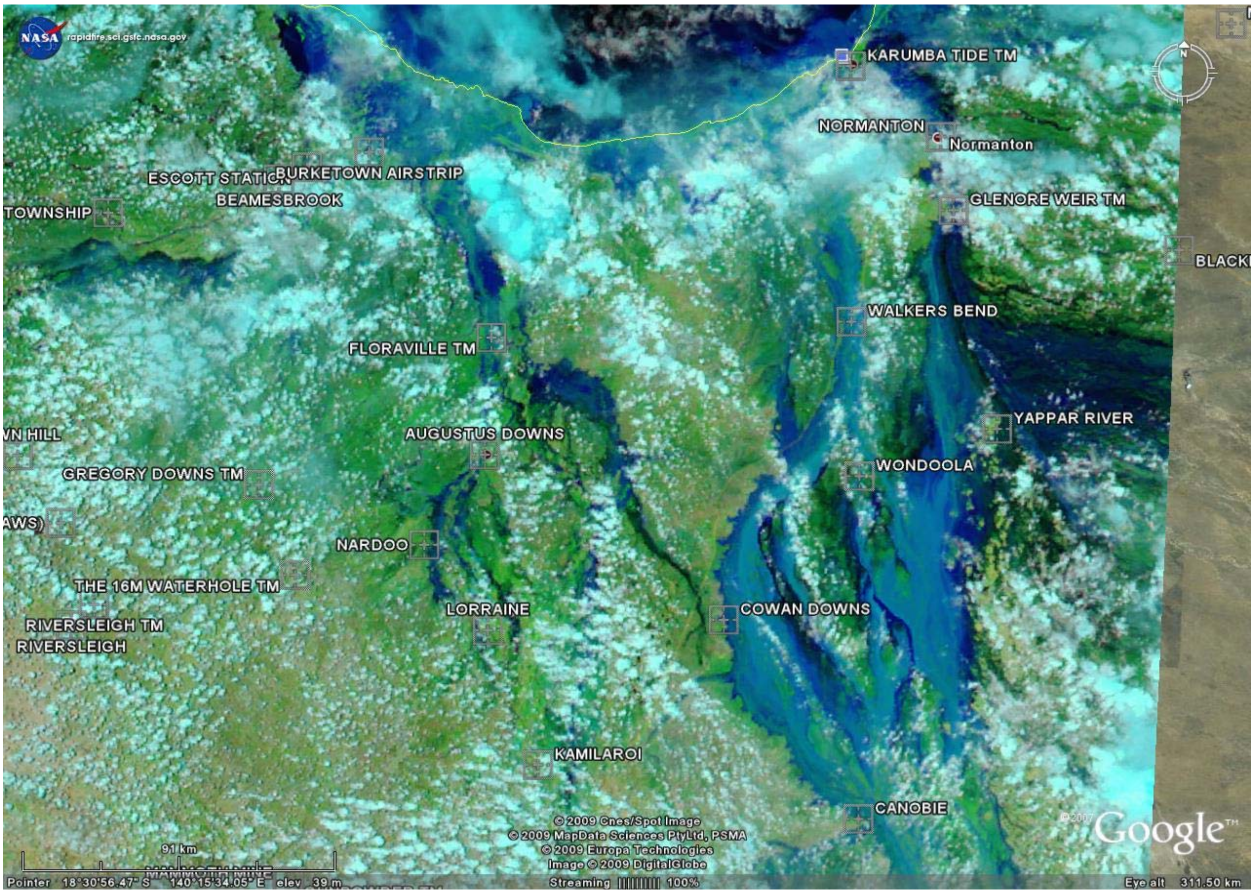
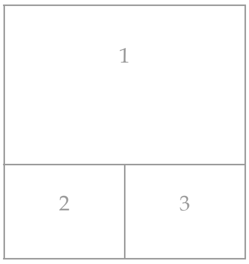
Australian Government
Bureau of Meteorology

Water Information
DATA › INFORMATION › INSIGHT

Gulf Rivers Floods

January and February 2009





Photos on the cover page:
1. A MODIS satellite image taken on 02/02/2009 over the Gulf region acquired and superimposed on the Google Earth base image by Peter Baddiley, Supervising Hydrologist, Water Division, Bureau of Meteorology. The MODIS image is sourced from NASA, USA (http://rapidfire.sci.gsfc.nasa.gov/).

2. Flood waters in a section of the Alexandra River in the Leichhardt Catchment, where the river can only be recognised by the trees growing along the river banks. Photo taken from a helicopter around 05/02/2009 and sent by Les Lever, Field Office Manager, Bureau of Meteorology, Mount Isa.

3. Stranded kangaroos trying to survive the flood by hanging on the tree trunks floating in the flood water in the Norman River catchment. Photo taken from a helicopter around 05/02/2009 and sent by Les Lever, Field Office Manager, Bureau of Meteorology, Mount Isa.

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 DNRW 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.

Table of Contents

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Gulf Rivers Floods
January and February 2009

1. Introduction

An active monsoon trough and several low pressure systems produced very heavy rainfall in the Gulf Rivers of Queensland during January and February 2009. Flood warnings commenced on 2 January 2009 and continued until 7 March 2009. The prolonged flooding was a result of several periods of intense rainfall with the rainfall falling on already saturated catchments and swollen rivers.

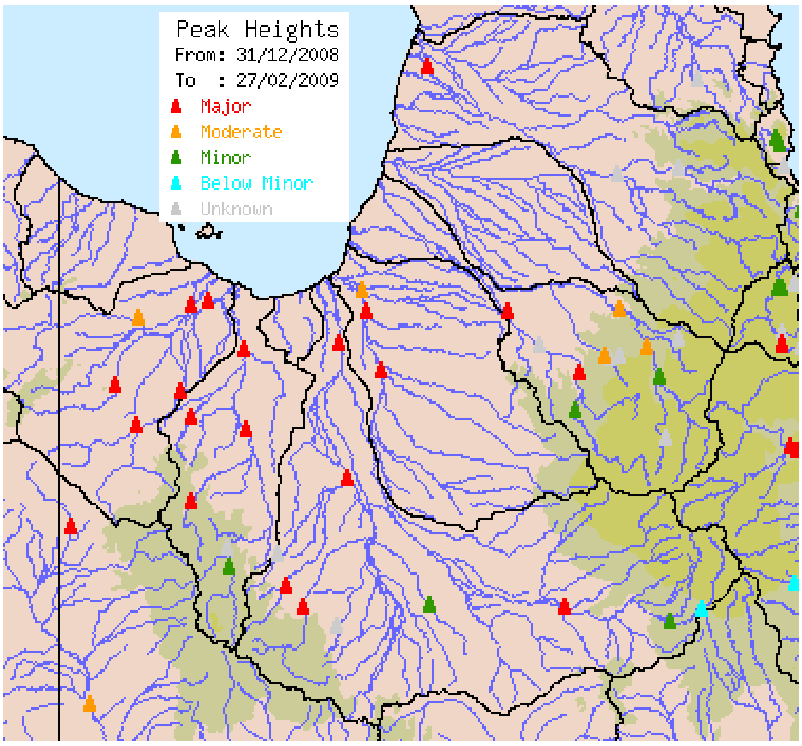
The flooding had serious impacts on the local communities in the Gulf area. Some sources estimated total cattle losses of around 100,000 head. Apart from causing damage to the local industries, the floods also cut off local communities for significant periods, causing many daily essentials to be in short supply for prolonged periods. Even clean water supply became a problem in some areas, as water supply systems were damaged by the flooding (ABC 2009a & b).

The small town of Karumba was isolated from the beginning of January until early March before supplies could be trucked in (ABC 2009a & b).

The overall extent and magnitude of the flooding in this region was estimated as the second biggest in more than 100 years, only second to the record flooding in 1974 (ABC 2009a & b).

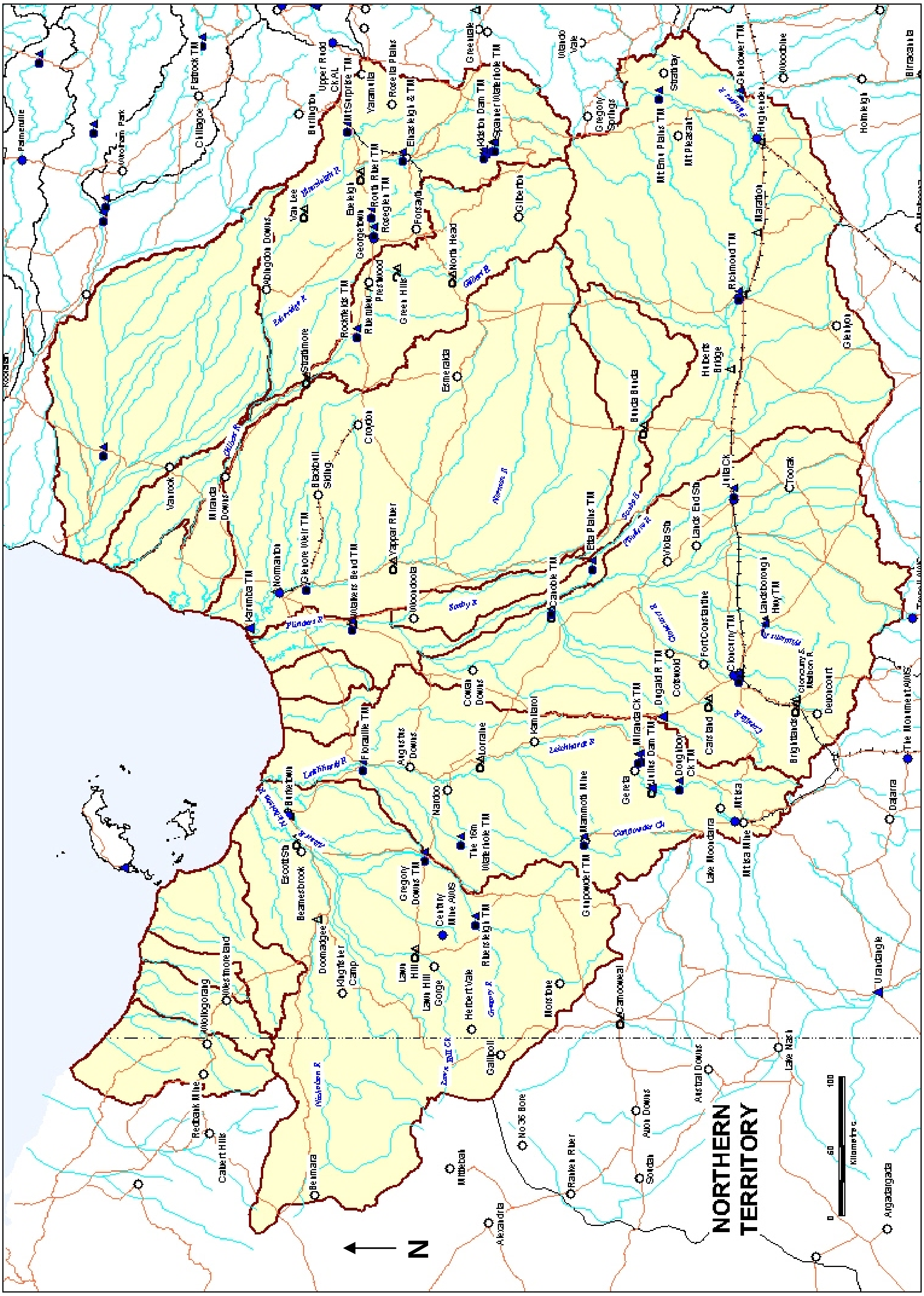
This report is a technical summary of the hydrology and meteorology for the 2009 Gulf Rivers floods. [Flood Warning Network Map of the Gulf Rivers catchments] including the Gilbert, Norman, Flinders, Leichhardt and Nicholson Rivers show the location of flood warning stations referred to in this report.

Figure 1.1 Peak flood height recorded during Jan – Feb 2009 in the Gulf catchments



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 1.2 Rainfall and flood warning observation network and major catchments in the Gulf region.



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

2. Meteorological Summary

An active monsoon trough with a series of embedded lows combined with Tropical Cyclones Charlotte and Ellie produced very much above average rainfall for the north and the west of Queensland for the 2008-2009 summer. A detailed summary of the meteorology for January to March 2009 can be found in the Queensland Floods January/February 2009.

The first heavy rainfall event for Queensland occurred in early January and resulted from an active monsoon trough extending across the north of state, linking to a low pressure system over the Northern Territory. The low pressure system remained almost stationary between the 2nd and 4th of January. Through interaction with an upper level trough, the system produced moderate to heavy rainfall over the northwest corner of Queensland.

Although the upper system weakened, the monsoon trough remained active and the surface low pressure area remained over the Northern Territory for another three days. By the 7th of January further upper instability moved over the area and interacted with the surface low to again cause further heavy shower and thunderstorm activity over the northwest of Queensland. This brought about further river height rises to Western Queensland and Gulf Rivers already in flood.

By the 8th of January, the main surface low pressure area had moved over waters of the Gulf of Carpentaria. The monsoon trough then extended from this low to a low over the central Coral Sea. The Gulf low remained stationary for several days, then drifted eastward and deepened during the 10th and 11th of January under the influence of increased southeast winds to the south of the system and strong monsoon north-west winds to the north. The system was named Tropical Cyclone Charlotte at 10am on the 11th of January.

As Charlotte developed in a proximity to the Queensland coast and tracked steadily southeast, there was little time for further intensification and the system crossed the coast near Gilbert River Mouth as a Category 1 cyclone (with maximum winds to 85 kilometres/hour close to its centre) around 4am on the 12th of January. A map showing the intensification and movement of Tropical Cyclone Charlotte is shown in Figure 2.1.

Charlotte brought more heavy rainfall on the Gulf coast, particularly in the vicinity of the coastal crossing as is evident from the rainfall maps in Figure 2.2.

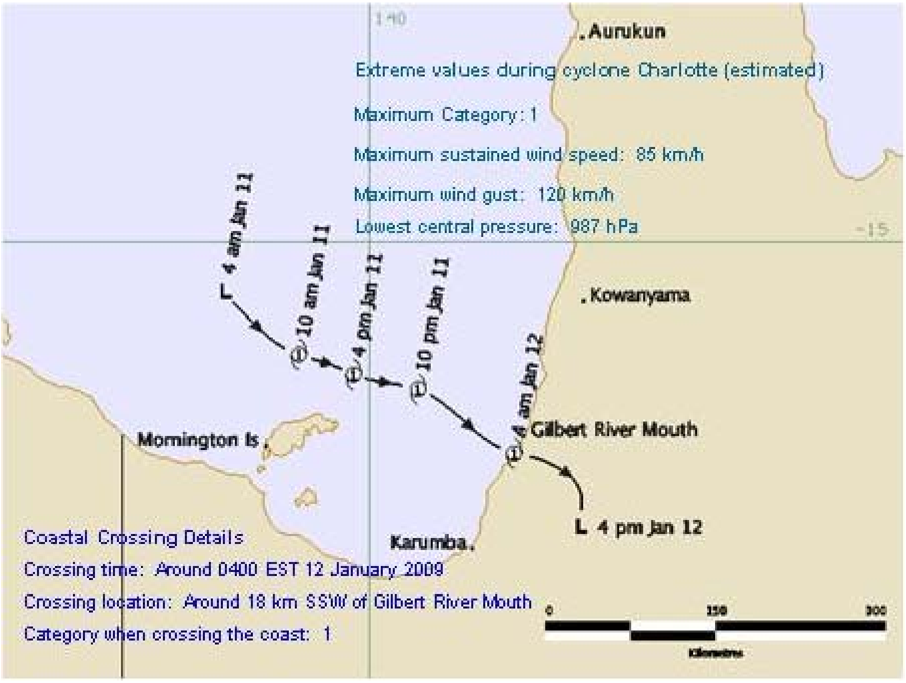
Showers and thunderstorms, developing on an active monsoon trough, continued through the northern half of the state for the remainder of the month producing isolated heavy falls and further exacerbating existing flooding around the Gulf Rivers and over the Diamantina and Georgina Rivers Catchments.

By the 27th of January, a tropical low had developed on the monsoon trough, positioned over far northwest Queensland. This low deepened slowly and drifted northeast to be positioned over the southern Gulf of Carpentaria by the 29th of January.

The result was further heavy rainfall over the Gulf Rivers Catchments, in particular the Nicholson, Leichhardt, Norman and Flinders River Catchments where scattered rainfalls of between 50 mm and 150 mm were recorded. River height rises once again occurred in the already flooded Gulf Rivers and the Georgina River in the west.

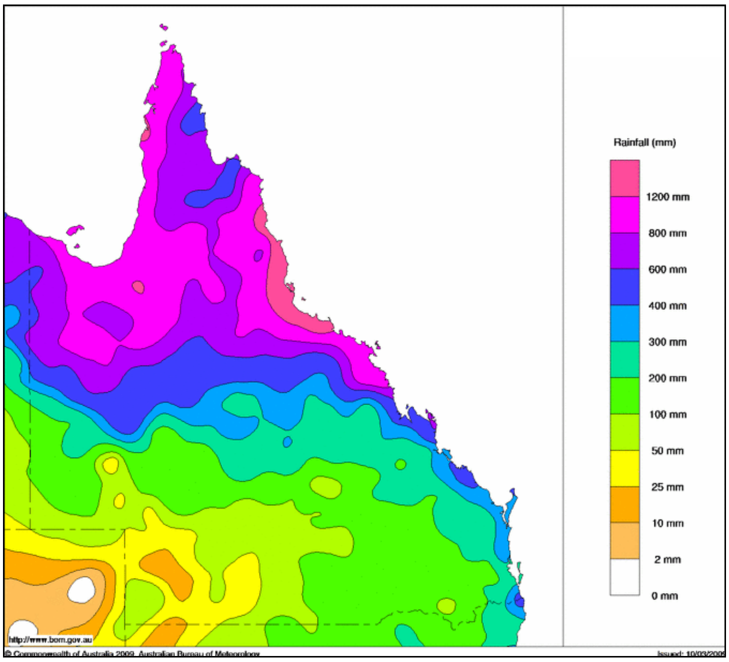
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 2.1 Description and path of the topical cyclone Charlotte



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

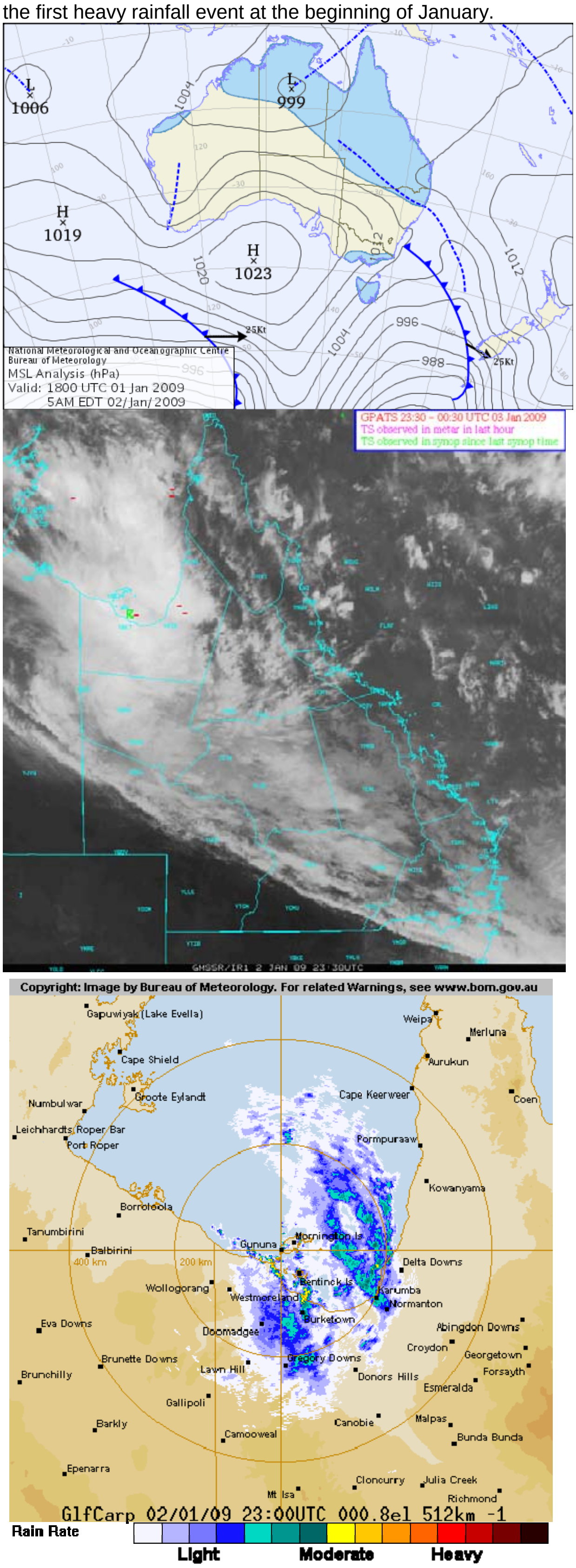
Figure 2.2 Total Rainfall for Queensland from the 1st of January to the 10th of March 2009



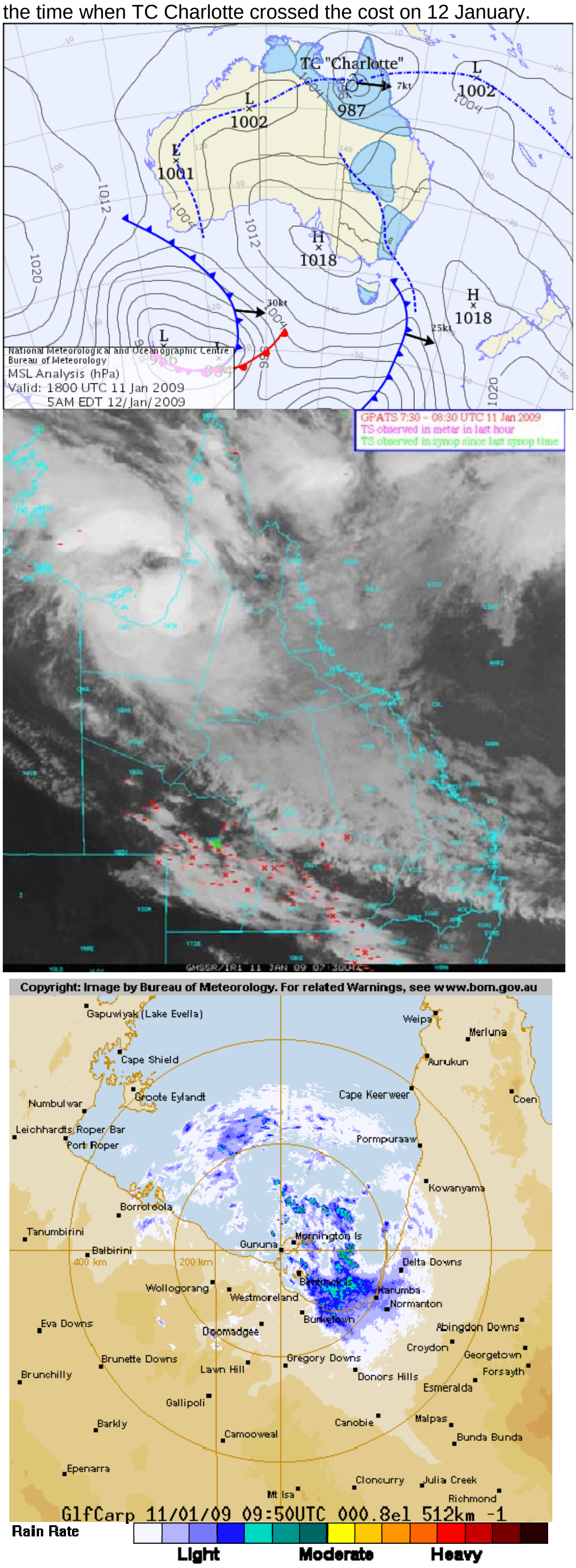
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 2.3 Mean Sea Level Pressure charts, satellite and radar images.

MSLP chart and corresponding satellite and radar images during the first heavy rainfall event at the beginning of January.



MSLP chart and corresponding satellite and radar images around the time when TC Charlotte crossed the cost on 12 January.



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3. Hydrology

The 2009 floods in the Gulf Rivers were the biggest floods since at least 1974 in many catchments and several stations recorded highest flood levels on record.

Peak flood levels recorded during the January and February and their comparisons with historical records are listed in Table 3.1 through to Table 3.5 for each of the Gulf catchments.

(Note: In Table 3.1 to 3.5, “TM” indicates Telephone Telemetry station.)

Table 3.1 Peak Height Comparison to Records – Nicholson River

Gauging Station	2009 Peak (metres)	Start of Record	Ranking	Highest Since	Highest on Record (metres)
Doomadgee Township	4.20m 06/01/2009	1993	9th	19/03/2006 (3 years)	9.15m 1974
Lawn Hill	6.50m 05/01/2009	1993	2nd	10/12/2000 (8 years)	8.50m 10/12/2000
Lawn Hill	4.60m 21/01/2009	1993	8th	05/01/2009 (2 weeks)	8.50m 10/12/2000
Lawn Hill	5.00m 29/01/2009	1993	8th	05/01/2009 (3 weeks)	8.50m 10/12/2000
Lawn Hill	6.00m 11/02/2009	1993	4th	05/01/2009 (1 month)	8.50m 10/12/2000
Riversleigh TM	8.65m 05/01/2009	1969	6th	22/02/1977 (32 years)	10.80m 05/03/1971
Riversleigh TM	8.73m 21/01/2009	1969	4th	22/02/1977 (32 years)	10.80m 05/03/1971
Gregory Downs TM	12.39m 05/01/2009	1969	5th	16/01/2004 (5 years)	13.91m 16/01/2004
Gregory Downs TM	10.73m 28/01/2009	1969	9th	05/01/2009 (2 weeks)	13.91m 16/01/2004
Gregory Downs TM	12.90 m 12/02/2009	1969	3rd	16/01/2004 (1 month)	13.91m 16/01/2004
Escott Station	10.57m 08/01/2009	1971	5th	03/03/2001 (8 years)	11.20m 06/03/1971
Escott Station	10.40m 12/01/2009	1971	6th	08/01/2009 (4 years)	11.20m 06/03/1971
Escott Station	10.95m 31/01/2009	1971	3rd	08/01/1976 (33 years)	11.20m 06/03/1971
Escott Station	10.10m 16/02/2009	1971	8th	31/01/2009 (2 weeks)	11.20m 06/03/1971
Burketown Airstrip	6.50m 09/01/2009	1998	3rd	04/03/1998 (11 years)	6.70m 04/03/1998
Burketown Airstrip	6.60m 01/02/2009	1998	2nd	04/03/1998 (11 years)	6.70m 04/03/1998
Burketown Airstrip	6.00m 16/02/2009	1998	5th	01/02/2009 (2 weeks)	6.70m 04/03/1998

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Table 3.2 Peak Height Comparison to Records – Leichhardt River

Gauging Station	2009 Peaks (metres)	Start of Record	Ranking	Highest Since	Highest on Record (metres)
Doughboy Ck TM	6.21m 04/01/2009	1981	24th	22/03/2006 (3 years)	11.57m 04/03/1997
Julius Dam TM	2.61m 04/01/2009	1981	4th	05/03/1997 (12 years)	4.50m 04/03/1997
Julius Dam TM	3.14m 30/01/2009	1981	3rd	05/03/1997 (12 years)	4.50m 04/03/1997
Gunpowder TM	8.09m 04/01/2009	1971	6th	22/03/2006 (3 years)	10.63m 22/03/2006
Gunpowder TM	8.49m 30/01/2009	1971	3rd	22/03/2006 (3 years)	10.63m 22/03/2006
Gunpowder TM	8.17m 09/02/2009	1971	5th	30/01/2009 (2 weeks)	10.63m 22/03/2006
Lorraine	16.40m 06/01/2009	1974	4th	23/03/2006 (3 years)	16.90m 23/03/2006
Lorraine	16.80m 31/01/2009	1974	2nd	23/03/2006 (3 years)	16.90m 23/03/2006
Lorraine	16.50m 12/02/2009	1974	3rd	31/01/2009 (2 weeks)	16.90m 23/03/2006
The 16m Waterhole TM	5.08m 04/01/2009	1974	4th	28/02/1998 (11 years)	5.51m 30/01/2009
The 16m Waterhole TM	5.51m 30/01/2009	1974	1st	Highest on record	5.51m 30/01/2009
The 16m Waterhole TM	4.38m 09/02/2009	1974	7th	30/01/2009 (2 weeks)	5.51m 30/01/2009
Floraville TM	10.18m 02/02/2009	1971	3rd	24/01/1974 (35 years)	10.97m 07/03/1971
Floraville TM	9.47m 14/02/2009	1971	7th	02/02/2009 (2 weeks)	10.97m 07/03/1971

Table 3.3 Peak Height Comparison to Records – Flinders River

Gauging Station	2009 Peak (metres)	Start of Record	Ranking	Highest Since	Highest on Record (metres)
Glendower TM	8.09m 04/01/2009	1971	6th	22/03/2006 (3 years)	10.63m 22/03/2006
Glendower TM	8.49m 30/01/2009	1971	3rd	22/03/2006 (3 years)	10.63m 22/03/2006
Glendower TM	8.17m 09/02/2009	1971	5th	30/01/2009 (2 weeks)	10.63m 22/03/2006
Hughenden	2.80m 17/01/2009	1942	11th	16/02/2002 (7 years)	4.70m 03/02/1967
Hughenden	2.90m 10/02/2009	1942	9th	16/02/2002 (7 years)	4.70m 03/02/1967
Richmond TM	8.13m 27/01/2009	1971	5th	12/01/1984 (25 years)	8.76m 12/01/1984
Richmond TM	8.21m 13/02/2009	1971	4th	12/01/1984 (25 years)	8.76m 12/01/1984
Cloncurry TM	8.03m 08/01/2009	1969	3rd	02/03/1997 (12 years)	10.01m 02/03/1997
Cloncurry TM	7.79m 10/02/2009	1969	6th	08/01/2009 (1 month)	10.01m 02/03/1997
Julia Creek TM	3.98m 08/01/2009	1971	11th	03/02/2004 (5 years)	5.43m 24/01/1974
Carsland	5.60m 10/02/2009	1960	7th	05/03/1997 (12 years)	7.47m 05/03/1971
Dugald River TM	6.08m 04/01/2009	1969	2nd	05/03/1971 (38 years)	6.10m 05/03/1971
Dugald River TM	5.47m 30/01/2009	1969	6th	04/01/2009 (3 weeks)	6.10m 05/03/1971
Landsborough Hwy TM	6.33m 08/01/2009	2007	2nd	N/A	6.41m 10/02/2009
Landsborough Hwy TM	6.41m 10/02/2009	2007	1st	Highest on record	6.41m 10/02/2009
Canobie	8.15m 30/01/2009	1981	6th	09/01/1999 (10 years)	8.56m 05/03/1997

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Canobie	8.55m 13/02/2009	1981	2nd	05/03/1997 (12 years)	8.56m 05/03/1997
Walkers Bend TM	15.06m 03/02/2009	1970	5th	19/01/1991 (18 years)	15.67m 02/02/1974
Walkers Bend TM	15.17m 17/02/2009	1970	4th	19/01/1991 (18 years)	15.67m 02/02/1974

Table 3.4 Peak Height Comparison to Records – Norman River

Gauging Station	2009 Peak (metres)	Start of Record	Ranking	Highest Since	Highest on Record (metres)
Yappar River	5.50m 01/02/2009	1974	2nd	1974 (35 years)	7.05m 1974
Yappar River	4.15m 16/02/2009	1974	3rd	01/02/2009	7.05m 1974
Glenore Weir TM	15.28m 04/02/2009	1974	2nd	01/1974 (35 years)	18.28m 01/1974
Glenore Weir TM	13.02m 16/02/2009	1974	7th	04/02/2009 (2 weeks)	18.28m 01/1974
Normanton	4.71m 17/01/2009	1974	5th	01/1974 (35 years)	8.80m 01/1974
Normanton	6.27m 04/02/2009	1974	2nd	01/1974 (35 years)	8.80m 01/1974

Table 3.5 Peak Height Comparison to Records – Gilbert River

Gauging Station	2009 Peak (metres)	Start of Record	Ranking	Highest Since	Highest on Record (metres)
North Head	9.00m 27/01/2009	1956	2nd	1974 (35 years)	10.94m 1974
North Head	6.50m 04/02/2009	1956	6th	04/02/2009 (1 week)	10.94m 1974
Green Hills	6.85m 26/01/2009	1974	6th	16/02/2002 (7 years)	13.45m 1974
Green Hills	10.45m 27/01/2009	1974	2nd	1974 (35 years)	13.45m 1974
Rockfields TM	10.45m 27/01/2009	1967	3rd	23/01/1974 (35 years)	12.75m 23/01/1974
Strathmore	8.10m 28/01/2009	1974	2nd	1974 (35 years)	9.80m 1974
Spanner Waterhole TM	7.58m 27/01/2009	2007	1st	14/01/2009 (2 weeks)	7.58m 27/01/2009
Einasleigh TM	12.64m 7/01/2009	1968	4th	13/01/1991 (18 years)	17.53m 23/01/1974
Eveleigh	7.55m 27/01/2009	2002	1st	Highest on record	7.55m 27/01/2009
Eveleigh	6.60m 04/02/2009	2002	2nd	27/01/2009 (1 weeks)	7.55m 27/01/2009
Mt Surprise TM	3.28m 07/01/2009	1991	1st	Highest on record	3.28m 07/01/2009
Van Lee	9.25m 27/01/2009	1956	3rd	1974 (35 years)	12.55m 1956
Routh River TM	4.94m 08/02/2009	1973	11th	9/01/1991 (18 years)	5.65m 26/04/1983
Roseglen TM	8.09m 27/01/2009	1973	2nd	23/01/1974 (35 years)	9.39m 23/01/1974
Georgetown	5.50m 27/01/2009	2002	4th	2002 (7 years)	7.50m 1956

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.1. Rainfall Maps

The January rainfall totals are very significant compared with historical records, with a number of stations recorded the highest rainfall on record. Many stations recorded rainfalls that were comparable to the rainfalls that caused the 1974 floods.

Rainfall totals recorded during January and January-February by gauging stations are shown in Figure 3.1.1 and Figure 3.1.2

Comparisons of the Jan-Feb rainfalls with historical record can be found from the following BOM web pages:

http://www.bom.gov.au/climate/data/weather-data.shtml
(all recorded monthly rainfalls and statistics);
http://www.bom.gov.au/climate/mwr/qld/mwr-qld-200901.pdf
(significant rainfalls including significant January monthly rainfalls and statistics).

Figure 3.1.3 displays the estimated spatial distribution of the January total rainfalls. More than 400mm was recorded throughout most of the Gulf catchments in January. The figure also shows that about 50% of the Gulf catchments received more than 600mm rainfalls in a single month, with some areas received more than 800mm for the month.

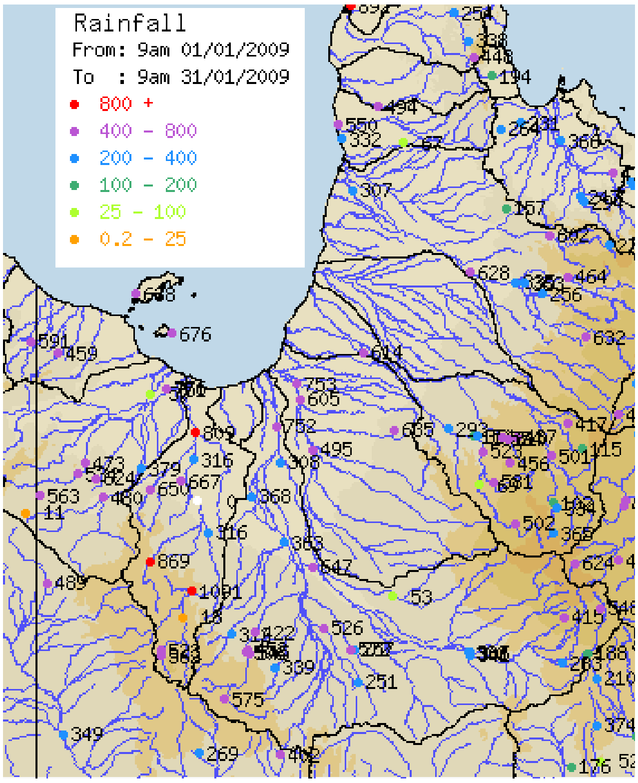
Figure 3.1.4 displays the spatial distribution of January rainfall totals as compared with the historical records for January over Queensland expressed in decile. The figure shows very much above average rainfalls were received through out the Gulf catchments during January. In some areas, the January rainfalls are the highest on record.

Figure 3.1.5 shows that almost the entire Gulf catchments received 2-4 times of the mean rainfall for January, with the mean expressed as 100%. Considerable portion of the catchments areas received rainfalls over 4 times of the January mean.

Figure 3.1.6 to Figure 3.1.8 show the February rainfalls and comparison with historical rainfall data over Queensland. Although the rainfalls eased during February as compared to January, most areas in the catchments still received above average rainfall. Considerable portions of the Leichhardt and Flinders catchments received more than twice the mean rainfall for February.

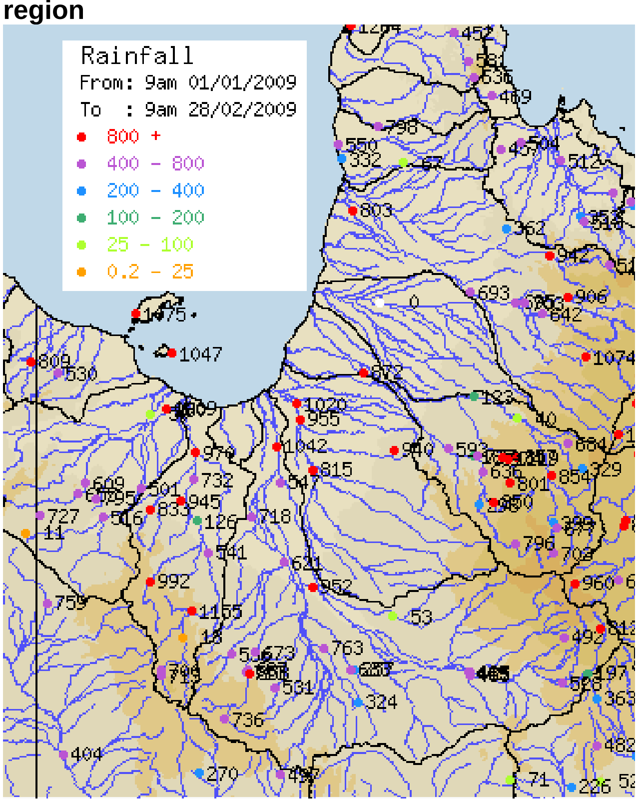
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.1.1 Recorded January rainfall totals at different locations in the Gulf region



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

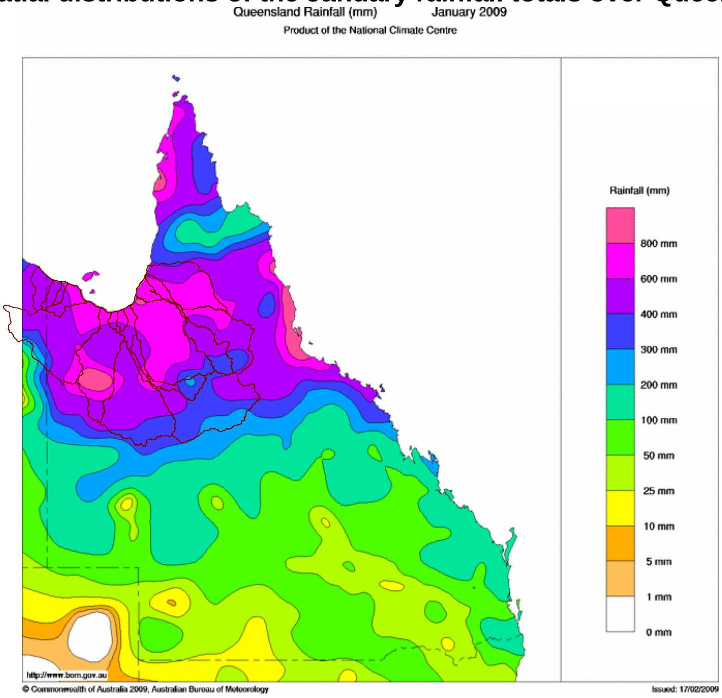
Figure 3.1.2 Recorded January-February rainfall totals at different locations in the Gulf region



(Source: **http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml**)

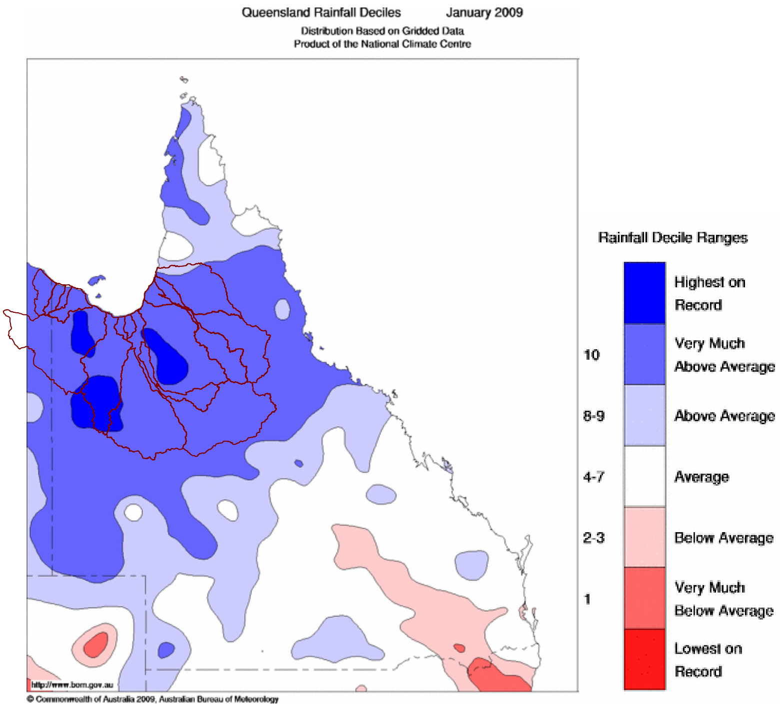
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.1.3 Spatial distributions of the January rainfall totals over Queensland



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

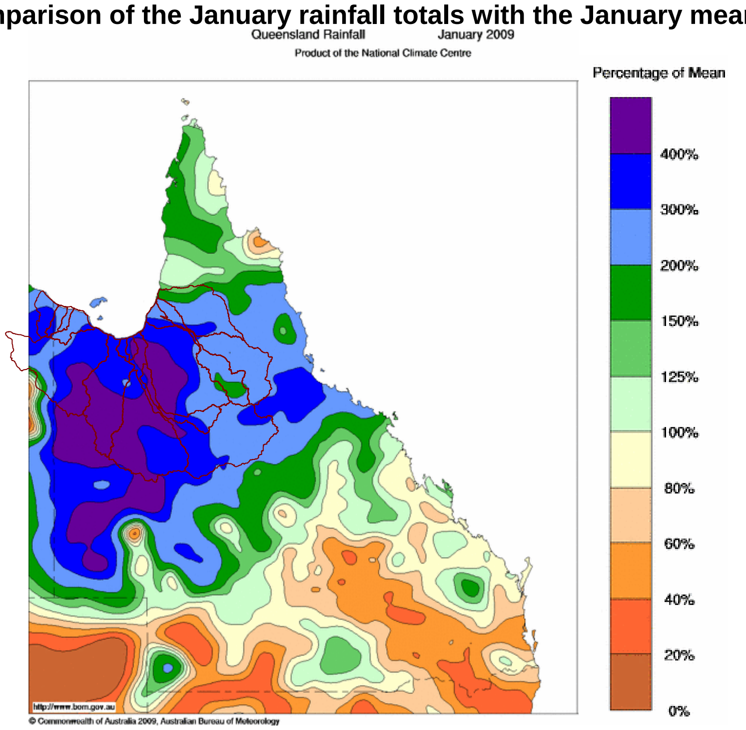
Figure 3.1.4 Comparison of the January rainfall totals with historical record expressed in decile



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

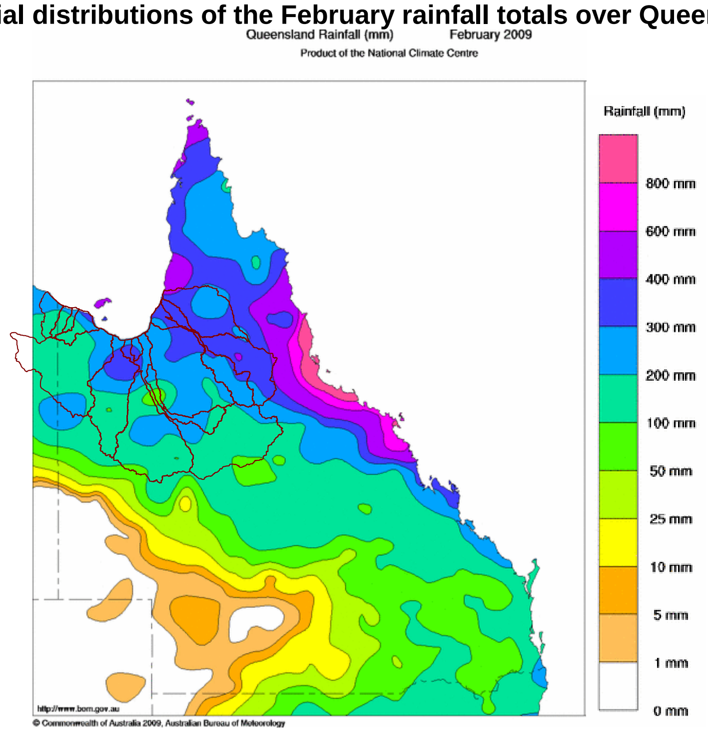
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.1.5 Comparison of the January rainfall totals with the January mean



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

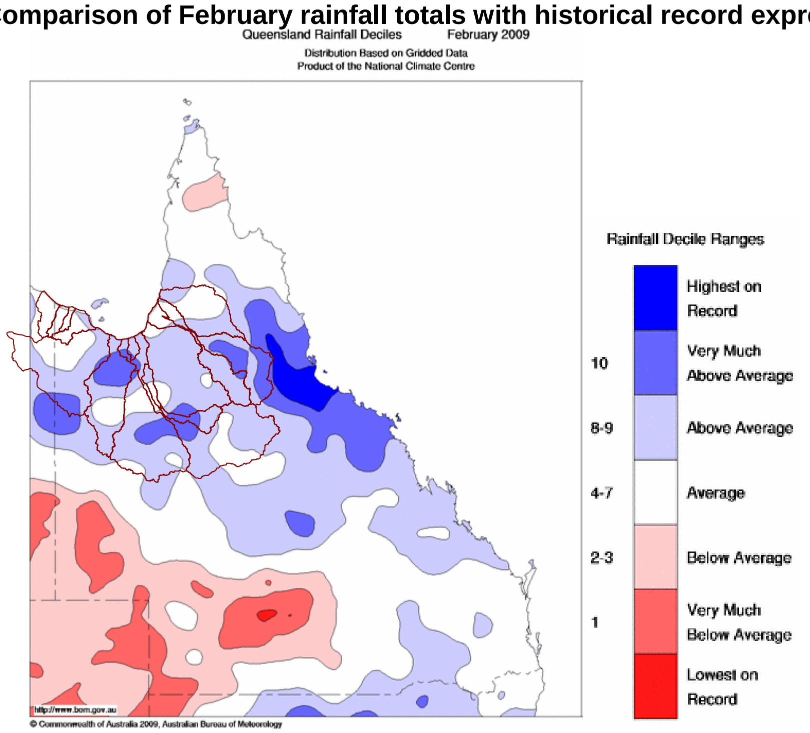
Figure 3.1.6 Spatial distributions of the February rainfall totals over Queensland



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

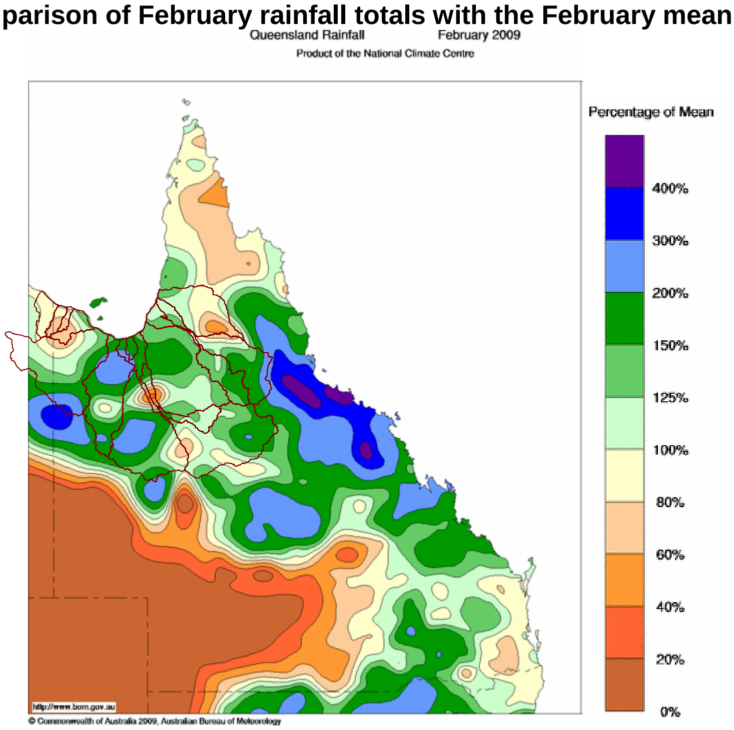
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.1.7 Comparison of February rainfall totals with historical record expressed in decile



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

Figure 3.1.8 Comparison of February rainfall totals with the February mean



(Source: http://www.bom.gov.au/announcements/sevwx/qld/qldtc20090111.shtml)

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.2 Rainfall Intensity

There were many rainfall stations in the Gulf that recorded record daily and monthly totals for January and February. A summary of the record rainfalls is available from http://www.bom.gov.au/climate/mwr/qld/mwr-qld-200901.pdf and http://www.bom.gov.au/climate/mwr/qld/mwr-qld-200902.pdf .

Figures 3.2.1 to 3.2.7 show the distribution of the rainfall over the two months and give a good illustration of how few dry days there were in the gulf catchments during this particularly wet period.

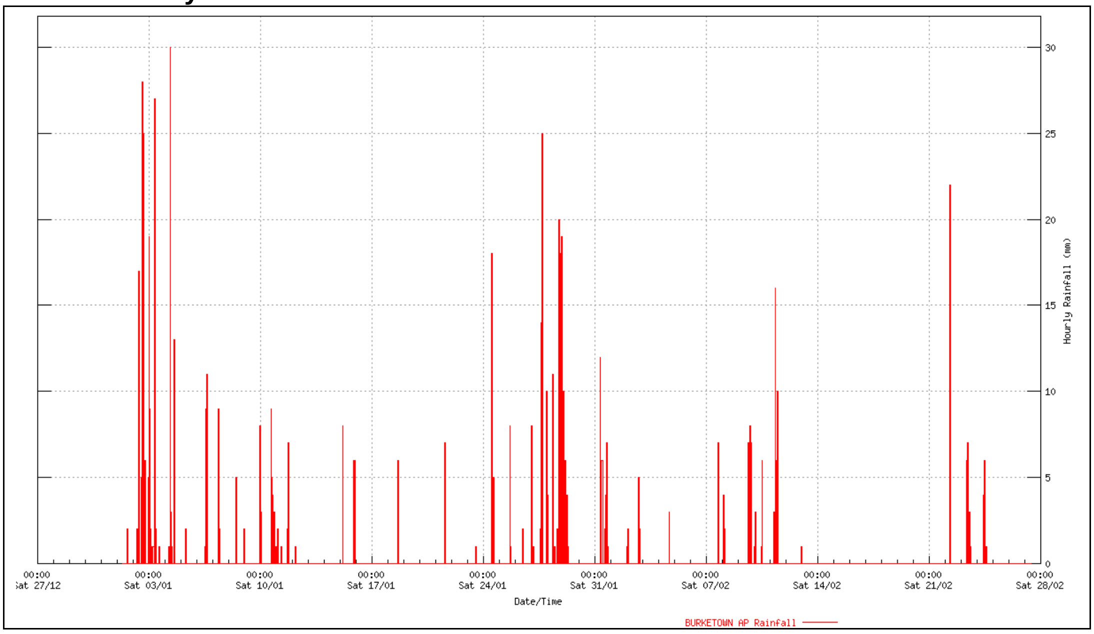
Two stations were selected for Intensity Frequency Duration analysis (AR&R 1987) and the results are available in Figures 3.2.8 and 3.2.9.

The IFD analysis for Gunpowder TM (Figure 3.2.9) indicates that the observed rainfall intensities were around 2 to 5% AEP (20 to 50 year Average Recurrence Interval)) for the 60 minute duration and 1 to 2% AEP (50 to 100 ARI) for the 12 hour duration. The 12 hour total of 200mm at Gunpowder was the most statistically significant rainfall found during this assessment.

Generally the IFD analysis indicated that the observed rainfall intensities for most stations were less than the 10% AEP (10 year ARI) design intensities for durations less than 12 hours. Rainfall intensities at some stations reached up to 2% AEP (50 year ARI) design intensities for durations from 12 to 72 hours.

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 3.2.1 Hourly rainfall recorded at Burketown in the Nicholson Catchment



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.2.2 Hourly rainfall recorded at Mt Isa in the Leichhardt Catchment

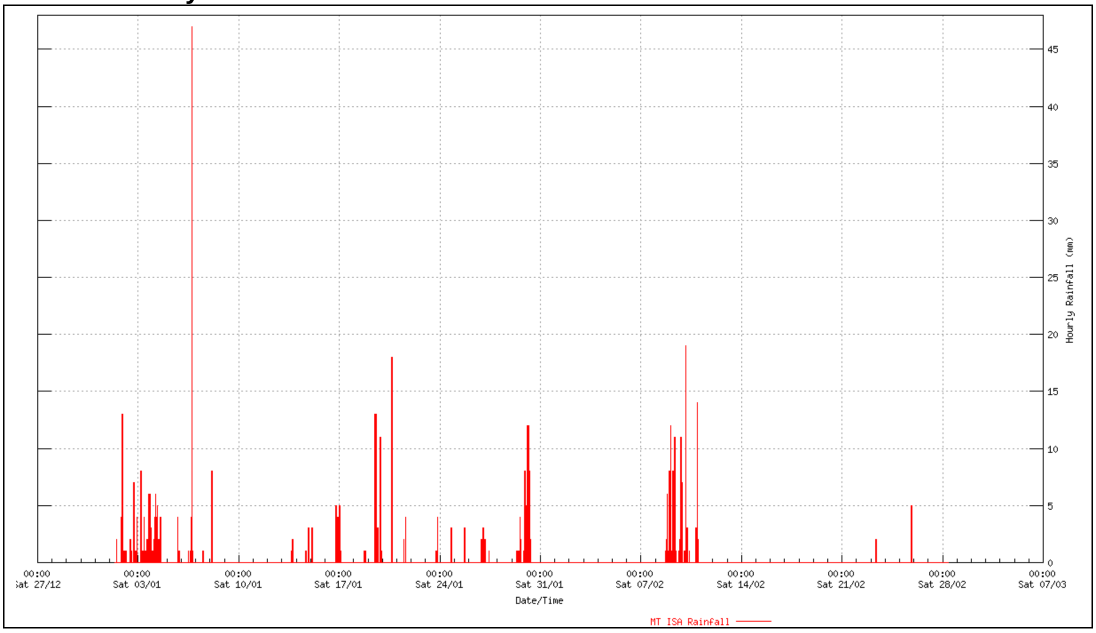
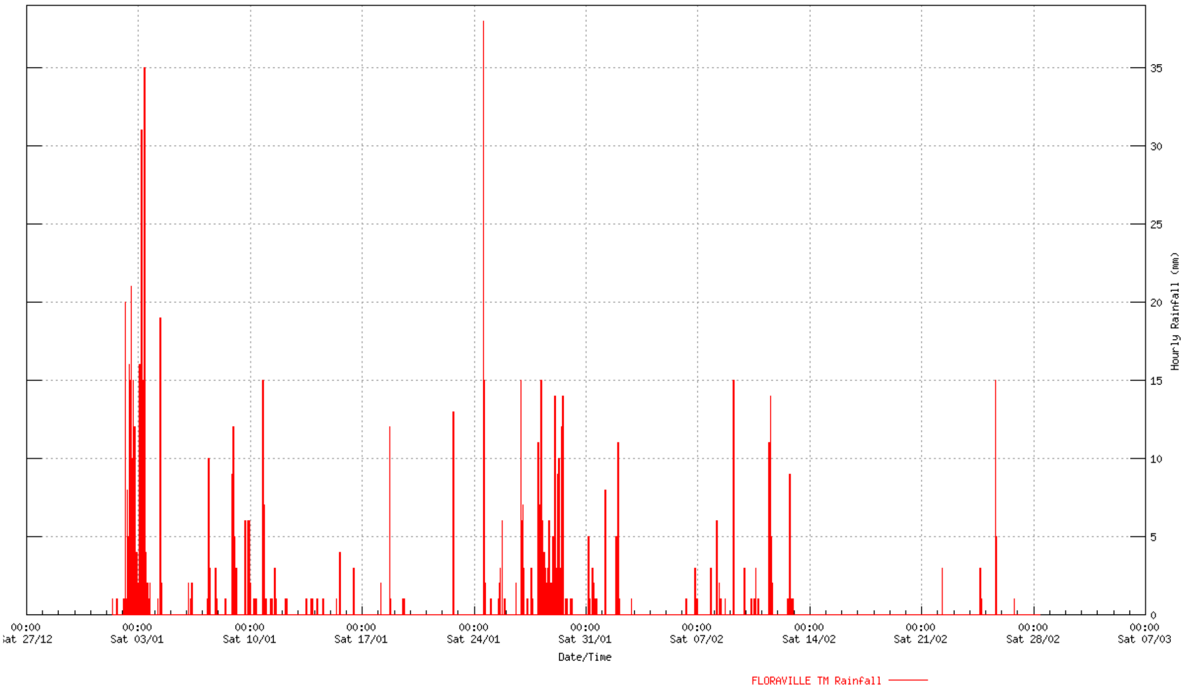


Figure 3.2.3 Hourly rainfall recorded at Floraville in the Leichhardt Catchment



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.2.4 Hourly rainfall recorded at Cloncurry in the Flinders Catchment

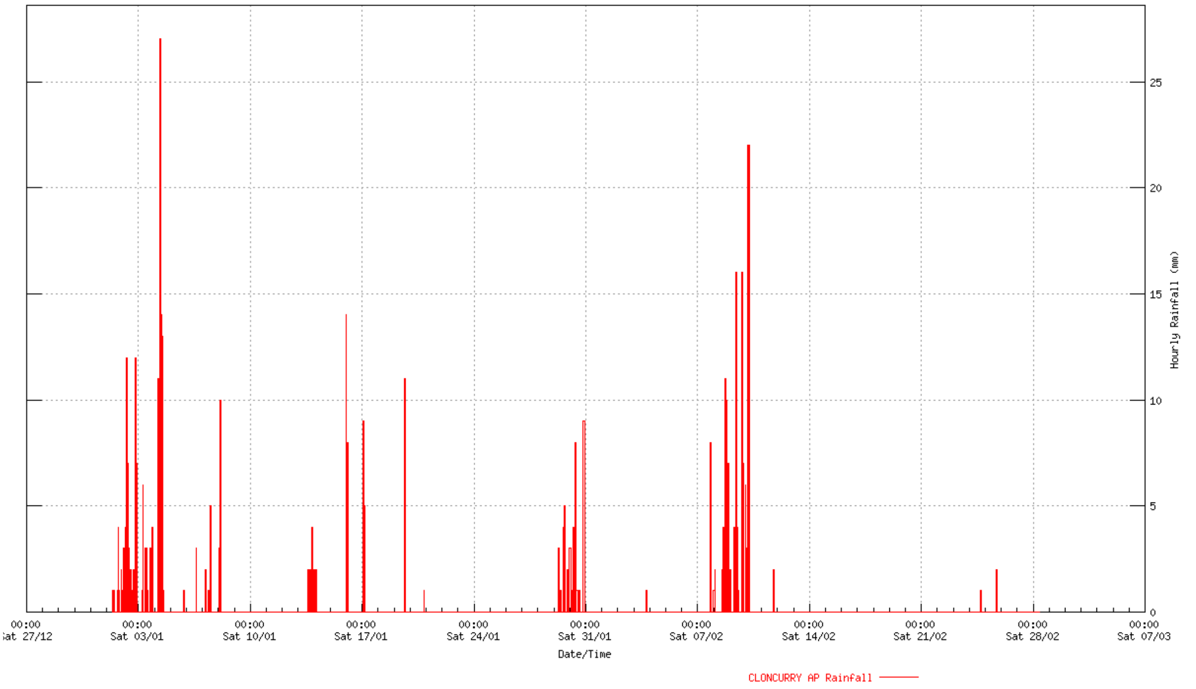
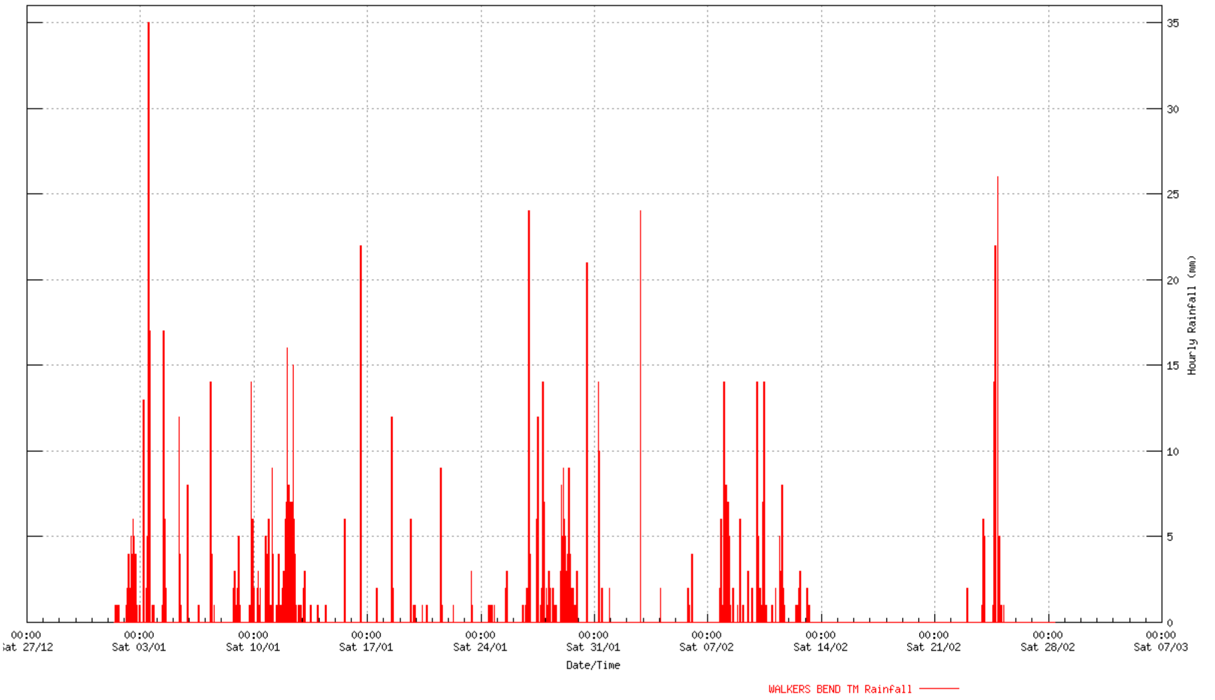


Figure 3.2.5 Hourly rainfall recorded at Walkers Bend in the Flinders Catchment



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.2.6 Hourly rainfall recorded at Normanton in the Norman Catchment

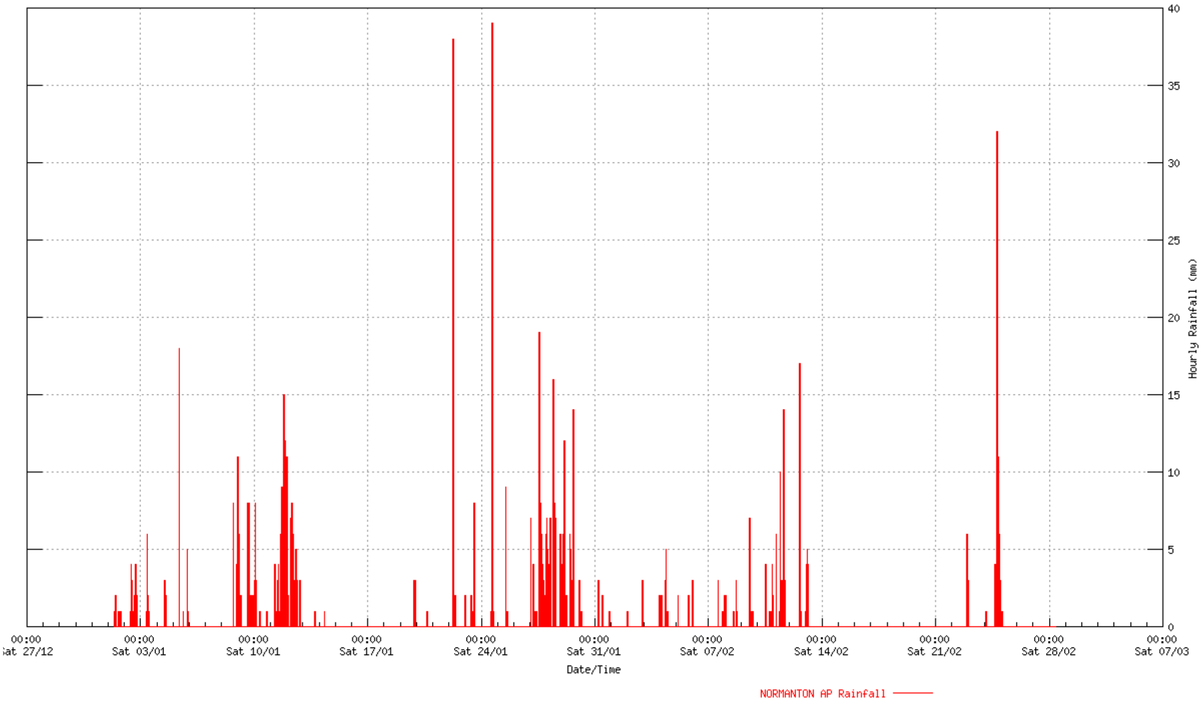
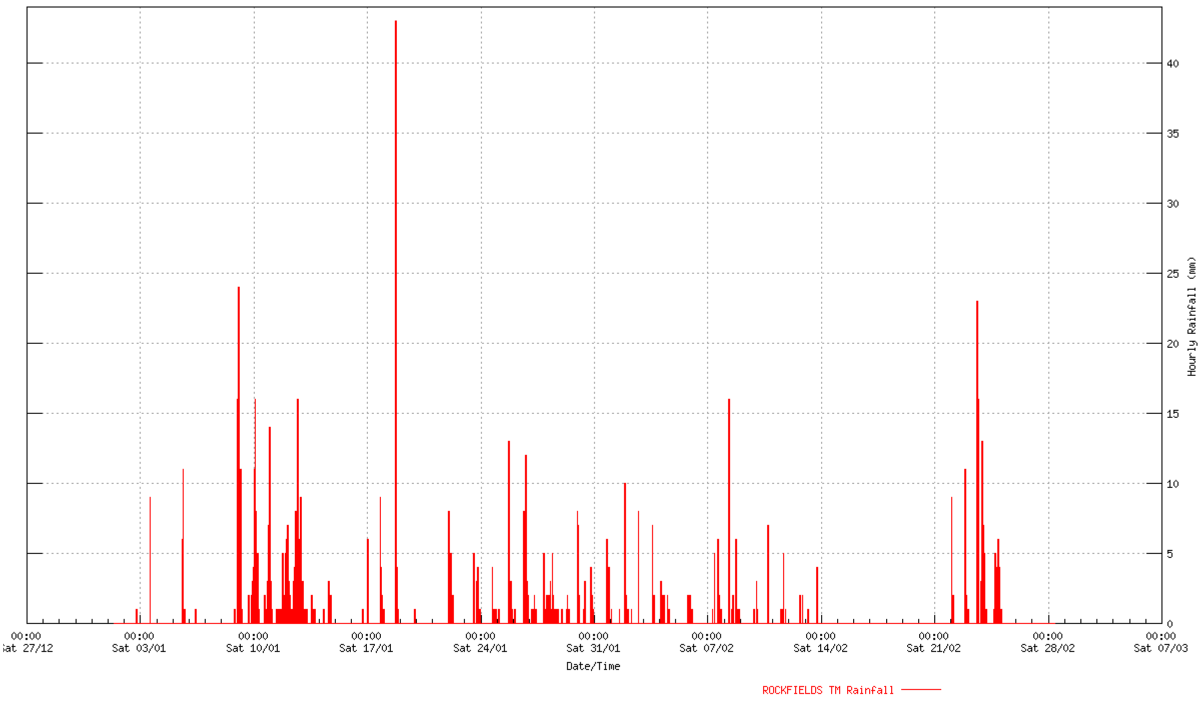


Figure 3.2.7 Hourly rainfall recorded at Rockfields in the Gilbert Catchment



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

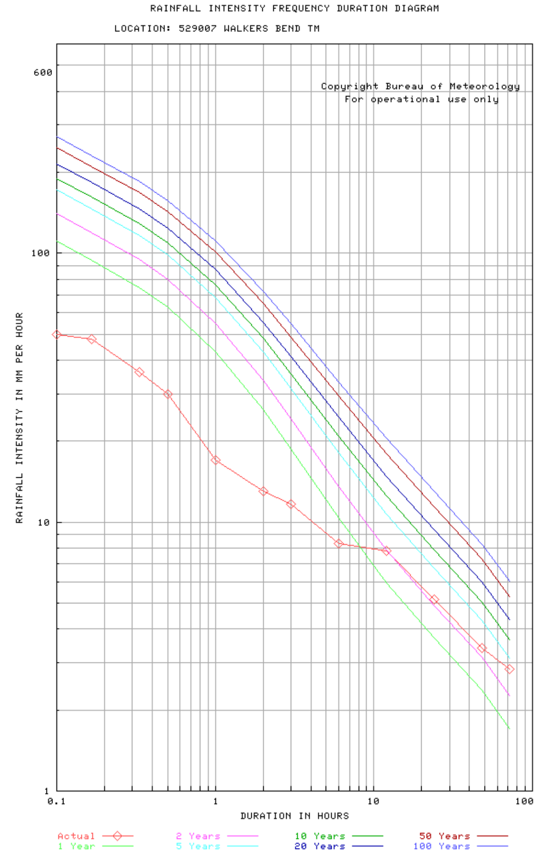
Figure 3.2.8 IFD Analysis for Walkers Bend TM and Cloncurry TM for January and February 2009

RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: Station No. 529007 Station Name Walkers Bend TM

Analysis of the rainfall for the 160 hours to Wed Jan 14 16:00:00

Rain (mm)	Period Ending	ARI (years)
5	5 mins ending at 19:45:00 09/01/2009	<1
5	6 mins ending at 19:46:00 09/01/2009	<1
8	10 mins ending at 19:50:00 09/01/2009	<1
12	20 mins ending at 19:55:00 09/01/2009	<1
15	30 mins ending at 20:05:00 09/01/2009	<1
17	60 mins ending at 20:30:00 09/01/2009	<1
26	2 hours ending at 02:10:00 12/01/2009	<1
35	3 hours ending at 02:30:00 12/01/2009	<1
50	6 hours ending at 03:55:00 12/01/2009	<1
94	12 hours ending at 10:25:00 12/01/2009	2
124	24 hours ending at 12:25:00 12/01/2009	2-5
163	48 hours ending at 13:25:00 12/01/2009	2-5
204	72 hours ending at 13:25:00 12/01/2009	2-5

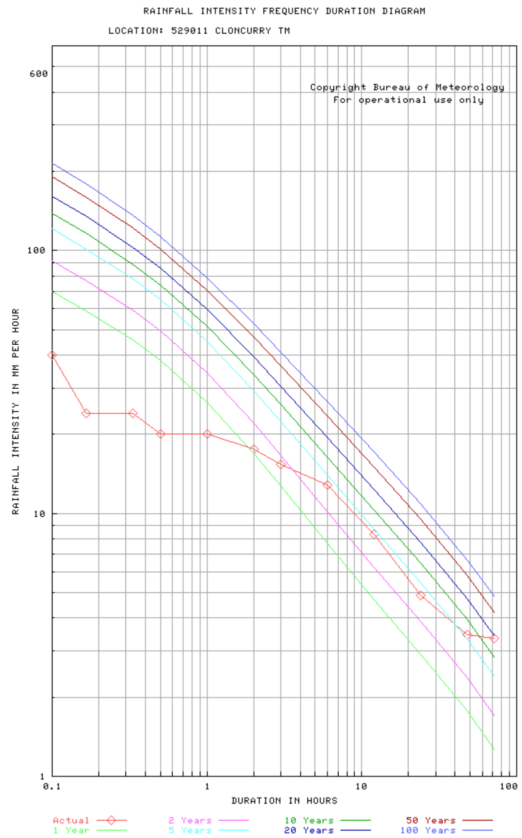


RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: Station No. 529011 Station Name Cloncurry TM

Analysis of the rainfall for the 216 hours to Sat Jan 10 00:00:00

Rain (mm)	Period Ending	ARI (years)
4	5 mins ending at 11:40:00 07/01/2009	<1
4	6 mins ending at 11:41:00 07/01/2009	<1
4	10 mins ending at 04:55:00 02/01/2009	<1
8	20 mins ending at 08:00:00 04/01/2009	<1
10	30 mins ending at 08:10:00 04/01/2009	<1
20	60 mins ending at 08:40:00 04/01/2009	<1
35	2 hours ending at 09:25:00 04/01/2009	1-2
46	3 hours ending at 10:40:00 04/01/2009	1-2
77	6 hours ending at 11:45:00 04/01/2009	2-5
100	12 hours ending at 13:45:00 04/01/2009	2-5
117	24 hours ending at 13:45:00 04/01/2009	2-5
166	48 hours ending at 13:45:00 04/01/2009	5-10
242	72 hours ending at 13:45:00 04/01/2009	10-20



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

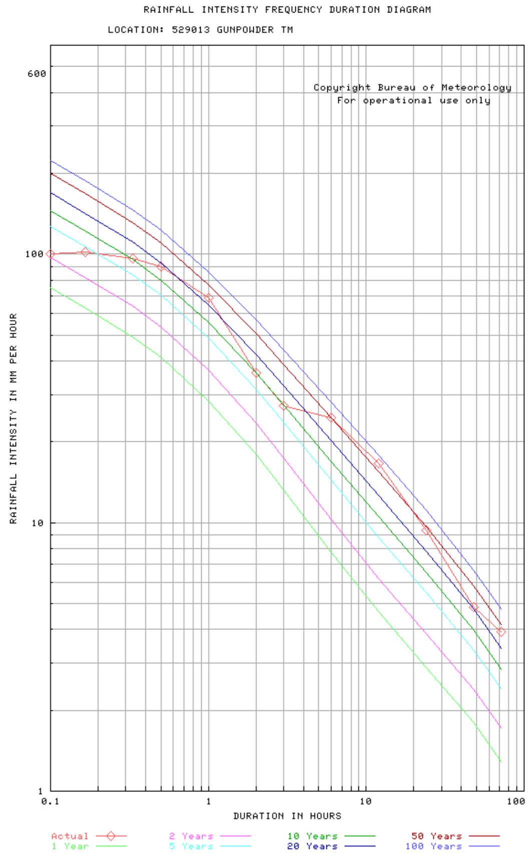
Figure 3.2.9 IFD Analysis for Gunpowder TM and Floraville TM for January and February 2009

RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: Station No. 529013 Station Name Gunpowder TM

Analysis of the rainfall for the 240 hours to Tue Feb 3 00:00:00 2009

Rain (mm)	Period Ending	ARI (years)
9	5 mins ending at 18:25:00 26/01/2009	2-5
10	6 mins ending at 18:26:00 26/01/2009	2-5
17	10 mins ending at 18:25:00 26/01/2009	5
32	20 mins ending at 18:55:00 26/01/2009	10-20
45	30 mins ending at 18:45:00 26/01/2009	10-20
69	60 mins ending at 19:15:00 26/01/2009	20-50
72	2 hours ending at 20:15:00 26/01/2009	10
82	3 hours ending at 00:35:00 30/01/2009	10
147	6 hours ending at 03:10:00 30/01/2009	50
200	12 hours ending at 03:35:00 30/01/2009	50-100
224	24 hours ending at 04:00:00 30/01/2009	20-50
232	48 hours ending at 04:00:00 30/01/2009	20-50
283	72 hours ending at 04:00:00 30/01/2009	20-50

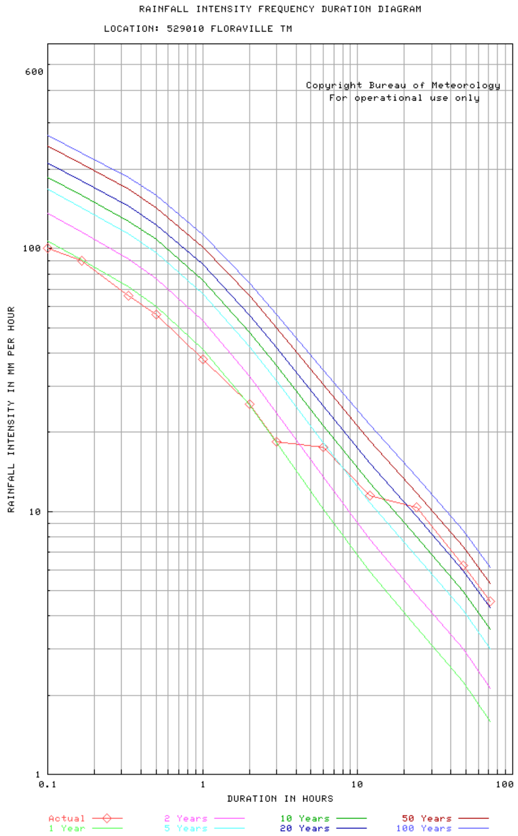


RAINFALL INTENSITY FREQUENCY DURATION ANALYSIS

LOCATION: Station No. 529010 Station Name Floraville TM

Analysis of the rainfall for the 120 hours to Tue Jan 6 00:00:00 2009

Rain (mm)	Period Ending	ARI (years)
10	5 mins ending at 00:25:00 01/01/2009	1-2
10	6 mins ending at 00:26:00 01/01/2009	1
15	10 mins ending at 04:35:00 03/01/2009	1
22	20 mins ending at 08:30:00 03/01/2009	< 1
28	30 mins ending at 08:35:00 03/01/2009	< 1
38	60 mins ending at 08:40:00 03/01/2009	< 1
51	2 hours ending at 09:05:00 03/01/2009	1-2
55	3 hours ending at 09:50:00 03/01/2009	1-2
105	6 hours ending at 08:55:00 03/01/2009	2-5
138	12 hours ending at 09:35:00 03/01/2009	5-10
248	24 hours ending at 08:55:00 03/01/2009	20-50
298	48 hours ending at 17:00:00 03/01/2009	20-50
328	72 hours ending at 00:00:00 04/01/2009	20-50



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.3. Rainfall Totals

The highest daily rainfall in the Gulf Catchments for January and February 2009 occurred at Floraville in the Leichhardt River catchment where 244mm was recorded in the 24 hours to 9am 3/1/2009. The highest daily rainfall totals are listed in Table 3.3.1.

The abbreviations used in the following tables include:

TM - Telephone Telemetry
AP – Airport

Table 3.3.1 Highest daily rainfall recorded by gauging stations during Jan-Feb 2009

NICHOLSON		
Station	**Date**	**Rain** (mm)
Riversleigh TM	2/01/2009	168
Century Mine	2/01/2009	134.2
Gregory Downs TM	28/01/2009	76
Burketown AP	3/01/2009	172.6
LEICHHARDT		
Mount Isa Mine	4/01/2009	81.2
Mt Isa	30/01/2009	83.2
Gereta Station	2/01/2009	173.2
Kamilaroi	30/01/2009	67.2
Gunpowder TM	30/01/2009	216
Nardoo	24/02/2009	110
The 16m Waterhole TM	25/01/2009	80
Floraville TM	3/01/2009	244
FLINDERS		
Strathtay	17/01/2009	144.4
Hughenden AP	11/02/2009	115
Mt Pleasant	18/01/2009	125.4
Richmond	11/02/2009	55.6
Richmond TM	4/01/2009	57
Richmond AP	11/02/2009	49.2
Devoncourt	4/01/2009	158.2

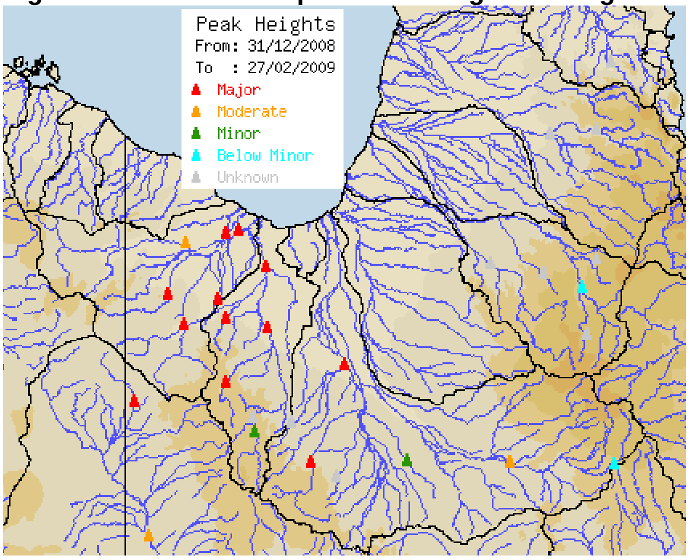
FLINDERS		
Station	**Date**	**Rain** (mm)
Cloncurry Town	10/02/2009	144.8
Cloncurry AP	10/02/2009	116.8
Cloncurry TM	10/02/2009	102
Julia Creek AP	3/01/2009	94
Julia Creek TM	3/01/2009	88
Toorak Rs	9/01/2009	74.4
Lands End Stn	11/02/2009	105.6
Cowan Downs	30/01/2009	96
Wondoola	3/01/2009	89.8
Walkers Bend TM	12/01/2009	99
NORMAN		
Normanton AP	12/01/2009	135.4
GILBERT		
Gilberton	27/01/2009	117.4
North Head	4/02/2009	44
Green Hills	9/01/2009	107
Rockfields TM	24/02/2009	82
Rosella Plains	7/01/2009	84.2
Mt Surprise TM	27/01/2009	90
Abingdon Downs	23/02/2009	61
Forsayth	25/01/2009	75
Prestwood	24/02/2009	74

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.4 Peak Heights

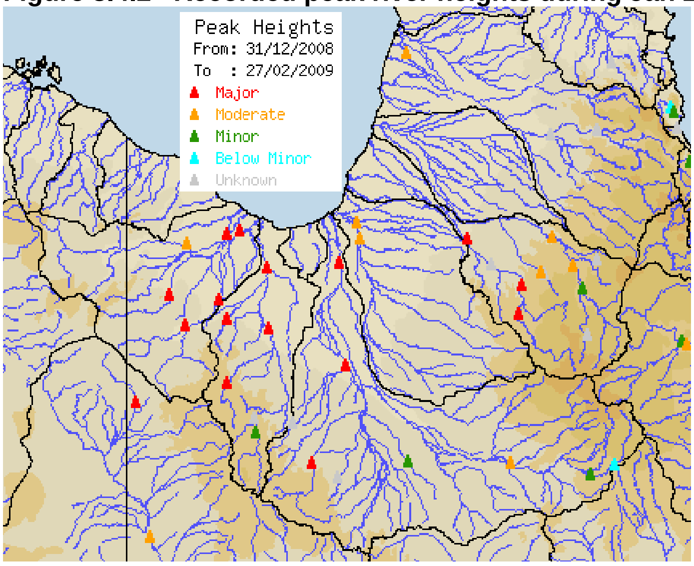
Figure 3.4.1 shows the recorded peak river height classifications during the floods resulted from the heavy rainfalls in the catchments during the first 10 days in January 2009.

Figure 3.4.1 Recorded peak river heights during 1-10 Jan 2009.



As rainfalls continued throughout the month with several more heavy rainfall events, floods spread to most parts of the catchments. Figure 3.4.2 shows the recorded peak height classifications during January.

Figure 3.4.2 Recorded peak river heights during Jan 2009.



Peak river heights and the times occurred in the Gulf catchments recorded at river height gauging stations during Jan-Feb period are listed in Table 3.4.1 to 3.4.5 together with corresponding flood classifications.

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

The abbreviations used in the following tables include:

TM - Telephone Telemetry

Table 3.4.1 Peak Flood Heights in the Nicholson River between the 01/01/09 and the 28/02/09

Station No.	Station Name	Date	Height (metres)	Flood Class
NICHOLSON				
029158	Doomadgee Township	06/01/2009 09:15	4.20	Moderate
029031	Lawn Hill	05/01/2009 06:00	6.50	Major
029031	Lawn Hill	21/01/2009 09:00	4.60	Moderate
029031	Lawn Hill	29/01/2009 09:00	5.00	Major
029031	Lawn Hill	11/02/2009 09:00	6.00	Major
029166	Riversleigh TM	05/01/2009 01:00	8.65	Major
029166	Riversleigh TM	10/01/2009 08:00	5.47	Moderate
029166	Riversleigh TM	21/01/2009 04:15	4.84	Minor
029166	Riversleigh TM	21/01/2009 20:40	8.73	Major
029166	Riversleigh TM	28/01/2009 23:15	6.49	Moderate
029166	Riversleigh TM	31/01/2009 04:00	6.33	Moderate
529009	Gregory Downs TM	05/01/2009 09:30	12.39	Major
529009	Gregory Downs TM	11/01/2009 04:00	9.20	Moderate
529009	Gregory Downs TM	28/01/2009 20:30	10.73	Major
529009	Gregory Downs TM	01/02/2009 00:30	10.31	Major
529009	Gregory Downs TM	12/02/2009 18:40	12.90	Major
029159	Escott Station	08/01/2009 15:00	10.57	Major
029159	Escott Station	12/01/2009 12:30	10.40	Major
029159	Escott Station	31/01/2009 15:00	10.95	Major
029159	Escott Station	16/02/2009 06:00	10.10	Major
029157	Burketown Airstrip	09/01/2009 07:00	6.50	Major
029157	Burketown Airstrip	01/02/2009 07:00	6.60	Major
029157	Burketown Airstrip	16/02/2009 16:00	6.00	Major

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Table 3.4.2 Peak Flood Heights in the Leichhardt River between the 01/01/09 and the 28/02/09

Station No.	Station Name	Date	Height (metres)	Flood Class
LEICHHARDT				
529014	Doughboy Ck TM	04/01/2009 11:33	6.21	Minor
529014	Doughboy Ck TM	08/01/2009 12:30	5.71	Below Minor
529019	Julius Dam TM	04/01/2009 12:00	2.61	Unknown
529019	Julius Dam TM	08/01/2009 13:30	1.59	Unknown
529019	Julius Dam TM	30/01/2009 12:30	3.14	Unknown
529019	Julius Dam TM	09/02/2009 16:15	2.35	Unknown
529013	Gunpowder TM	04/01/2009 15:10	8.09	Major
529013	Gunpowder TM	17/01/2009 11:00	5.09	Below Minor
529013	Gunpowder TM	20/01/2009 08:10	5.13	Below Minor
529013	Gunpowder TM	30/01/2009 04:30	8.49	Major
529013	Gunpowder TM	09/02/2009 12:50	8.17	Major
529013	Gunpowder TM	11/02/2009 00:01	7.17	Moderate
029032	Lorraine	06/01/2009 06:00	16.40	Major
029032	Lorraine	31/01/2009 12:00	16.80	Major
029032	Lorraine	12/02/2009 01:00	16.50	Major
529008	The 16m Waterhole TM	04/01/2009 18:50	5.08	Major
529008	The 16m Waterhole TM	21/01/2009 01:50	3.72	Minor
529008	The 16m Waterhole TM	30/01/2009 07:20	5.51	Major
529008	The 16m Waterhole TM	09/02/2009 16:50	4.38	Moderate
529008	The 16m Waterhole TM	12/02/2009 18:20	4.00	Moderate
529010	Floraville TM	08/01/2009 12:20	8.81	Major
529010	Floraville TM	02/02/2009 07:10	10.18	Major
529010	Floraville TM	14/02/2009 07:50	9.47	Major

Table 3.4.3 Peak Flood Heights in the Flinders River between the 01/01/09 and the 28/02/09

Station No.	Station Name	Date	Height (metres)	Flood Class
FLINDERS				
530006	Glendower TM	04/01/2009 04:10	3.32	Below Minor
030024	Hughenden	17/01/2009 15:00	2.80	Minor
030024	Hughenden	10/02/2009 09:00	2.90	Minor
530009	Richmond TM	06/01/2009 00:40	6.43	Minor
530009	Richmond TM	07/01/2009 21:30	6.51	Moderate
530009	Richmond TM	20/01/2009 06:00	7.54	Moderate
530009	Richmond TM	24/01/2009 16:50	7.54	Moderate
530009	Richmond TM	27/01/2009 20:00	8.13	Moderate
530009	Richmond TM	12/02/2009 01:50	7.83	Moderate
530009	Richmond TM	13/02/2009 17:50	8.21	Major
530009	Richmond TM	26/02/2009 01:10	6.55	Moderate
529011	Cloncurry TM	04/01/2009 20:00	6.57	Moderate
529011	Cloncurry TM	08/01/2009 14:30	8.03	Major

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

529011	Cloncurry TM	17/01/2009 01:24	4.54	Minor
529011	Cloncurry TM	30/01/2009 23:40	5.56	Moderate
529011	Cloncurry TM	10/02/2009 18:00	7.79	Major
529006	Julia Creek TM	08/01/2009 17:50	3.98	Minor
029105	Carsland	10/02/2009 06:00	5.60	Major
529015	Dugald River TM	04/01/2009 14:50	6.08	Unknown
529015	Dugald River TM	20/01/2009 01:10	3.39	Unknown
529015	Dugald River TM	30/01/2009 11:20	5.47	Unknown
529015	Dugald River TM	10/02/2009 10:10	4.61	Unknown
529022	Landsborough Hwy TM	04/01/2009 17:40	5.15	Unknown
529022	Landsborough Hwy TM	08/01/2009 14:40	6.33	Unknown
529022	Landsborough Hwy TM	30/01/2009 12:10	4.08	Unknown
529022	Landsborough Hwy TM	10/02/2009 10:00	6.41	Unknown
029007	Canobie	07/01/2009 15:00	7.60	Major
029007	Canobie	30/01/2009 18:00	8.15	Major
029007	Canobie	13/02/2009 07:00	8.55	Major
529007	Walkers Bend TM	12/01/2009 14:00	13.36	Major
529007	Walkers Bend TM	03/02/2009 16:20	15.06	Major
529007	Walkers Bend TM	03/02/2009 16:20	15.06	Major
529007	Walkers Bend TM	17/02/2009 23:20	15.17	Major

Table 3.4.4 Peak Flood Heights in the Norman River between the 01/01/09 and the 28/02/09

Station No.	Station Name	Date	Height (metres)	Flood Class
NORMAN				
029154	Yappar River	01/02/2009 12:00	5.50	Major
029154	Yappar River	16/02/2009 12:00	4.15	Major
029154	Yappar River	28/02/2009 07:00	3.20	Moderate
529012	Glenore Weir TM	16/01/2009 17:00	12.96	Moderate
529012	Glenore Weir TM	04/02/2009 01:15	15.28	Major
529012	Glenore Weir TM	16/02/2009 23:50	13.02	Moderate
029155	Normanton	17/01/2009 09:00	4.71	Moderate
029155	Normanton	04/02/2009 14:30	6.27	Moderate
029155	Normanton	20/02/2009 08:00	4.46	Moderate

Table 3.4.5 Peak Flood Heights in the Gilbert River between the 01/01/09 and the 28/02/09

Station No.	Station Name	Date	Height (metres)	Flood Class
GILBERT				
030112	North Head	27/01/2009 10:00	9.00	Major
030112	North Head	04/02/2009 05:00	6.50	Minor
030158	Green Hills	26/01/2009 19:00	6.85	Minor
030158	Green Hills	27/01/2009 12:30	10.45	Major
533095	Rockfields TM	08/01/2009 18:30	6.45	Unknown
533095	Rockfields TM	09/01/2009 18:00	6.99	Unknown
533095	Rockfields TM	10/01/2009 14:40	6.92	Unknown
533095	Rockfields TM	13/01/2009 14:20	8.13	Unknown
533095	Rockfields TM	27/01/2009 22:20	10.45	Unknown
533095	Rockfields TM	04/02/2009 21:20	8.20	Unknown
533095	Rockfields TM	09/02/2009 20:00	6.62	Unknown
533095	Rockfields TM	25/02/2009 20:00	7.23	Unknown
029045	Strathmore	28/01/2009 08:30	8.10	Major

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

530015	Spanner Waterhole TM	06/01/2009 08:30	5.68	Unknown
530015	Spanner Waterhole TM	14/01/2009 05:00	6.87	Unknown
530015	Spanner Waterhole TM	27/01/2009 04:40	7.58	Unknown
530015	Spanner Waterhole TM	03/02/2009 22:30	5.84	Unknown
530015	Spanner Waterhole TM	08/02/2009 13:20	5.89	Unknown
530015	Spanner Waterhole TM	13/02/2009 19:50	6.54	Unknown
530007	Einasleigh TM	07/01/2009 09:00	8.26	Below Minor
530007	Einasleigh TM	14/01/2009 21:00	9.34	Minor
530007	Einasleigh TM	27/01/2009 06:00	12.64	Minor
530007	Einasleigh TM	04/02/2009 03:50	11.19	Minor
530007	Einasleigh TM	09/02/2009 04:50	9.15	Minor
530007	Einasleigh TM	14/02/2009 06:30	9.20	Minor
030103	Eveleigh	27/01/2009 06:00	7.55	Moderate
030103	Eveleigh	04/02/2009 07:00	6.60	Minor
030103	Eveleigh	09/02/2009 06:50	5.28	Minor
030103	Eveleigh	14/02/2009 07:30	4.70	Minor
530008	Mt Surprise TM	07/01/2009 07:00	3.28	Unknown
030073	Van Lee	27/01/2009 13:00	9.25	Moderate
530011	Routh River TM	08/02/2009 21:10	4.94	Unknown
530010	Roseglen TM	07/01/2009 06:30	3.47	Unknown
530010	Roseglen TM	08/01/2009 06:00	3.52	Unknown
530010	Roseglen TM	12/01/2009 16:15	3.89	Unknown
530010	Roseglen TM	18/01/2009 09:00	4.29	Unknown
530010	Roseglen TM	27/01/2009 03:00	8.09	Unknown
530010	Roseglen TM	28/01/2009 00:30	5.96	Unknown
530010	Roseglen TM	04/02/2009 02:00	5.07	Unknown
530010	Roseglen TM	07/02/2009 20:00	5.49	Unknown
530010	Roseglen TM	08/02/2009 23:40	7.70	Unknown
030018	Georgetown	27/01/2009 04:30	5.50	Moderate

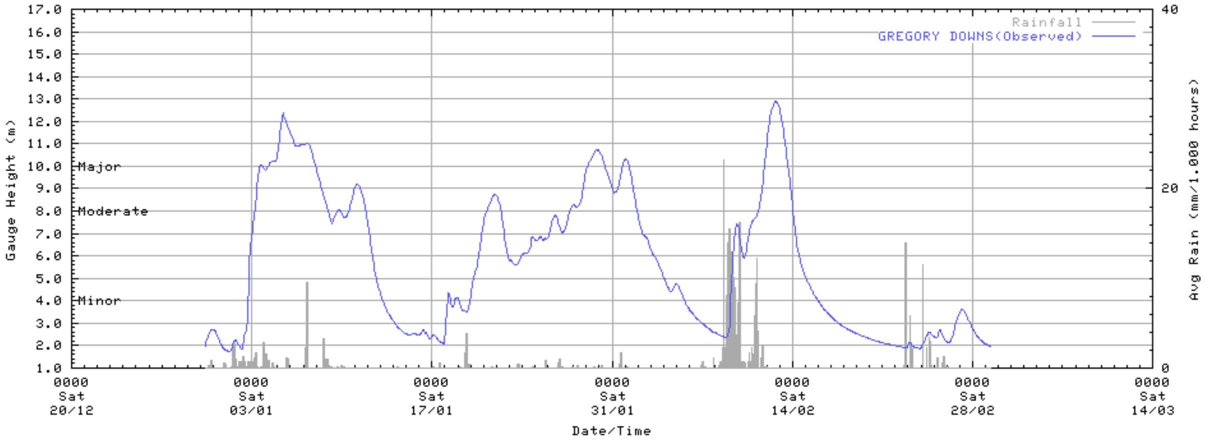
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.5 Flood Hydrographs for the Gulf Rivers

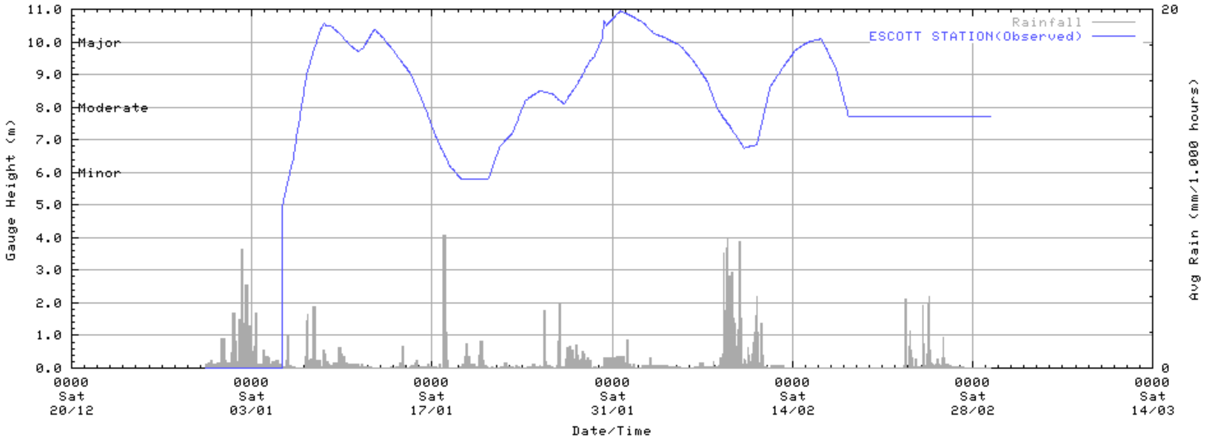
The multi-peak floods caused by a number of consecutive heavy rainfalls during the Jan-Feb period are shown in Figure 3.5.1 to Figure 3.5.5 for each of the Gulf catchments. For comparison and analysis purpose, the catchment rainfall is shown in the same figure.

Figure 3.5.1 River Heights – Nicholson River

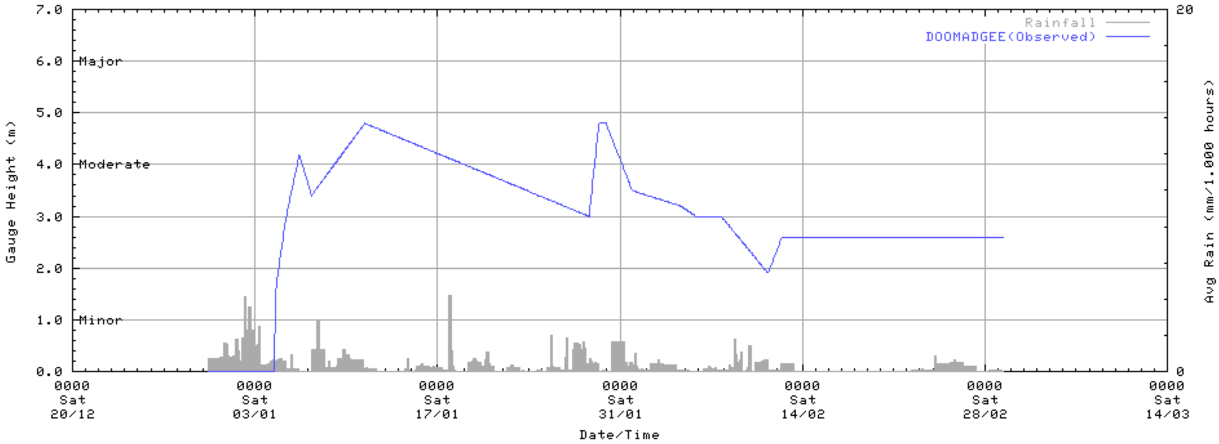
029081 Gregory Downs Station



029159 Escott Station



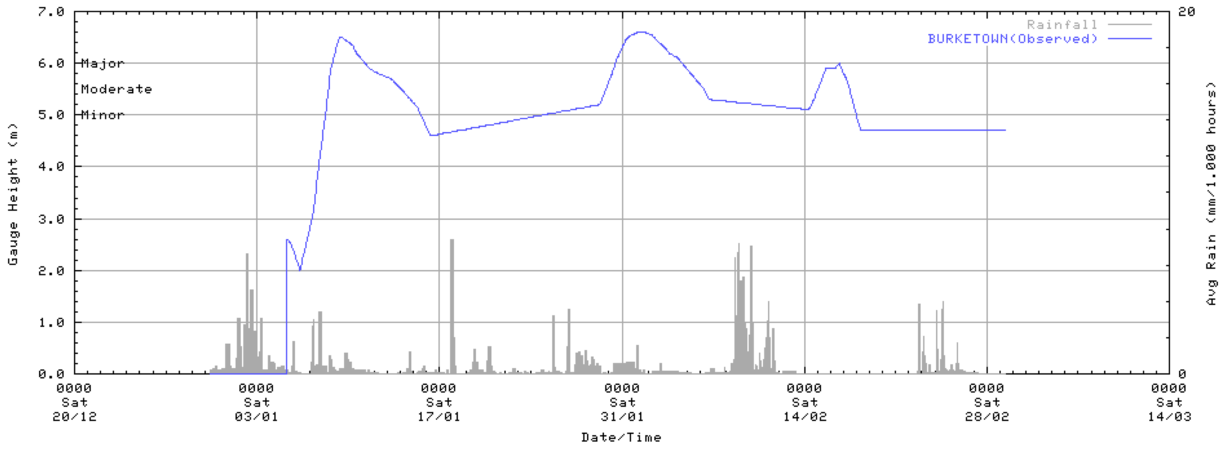
029158 Doomadgee Township



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.1 (cont) River Heights – Nicholson River

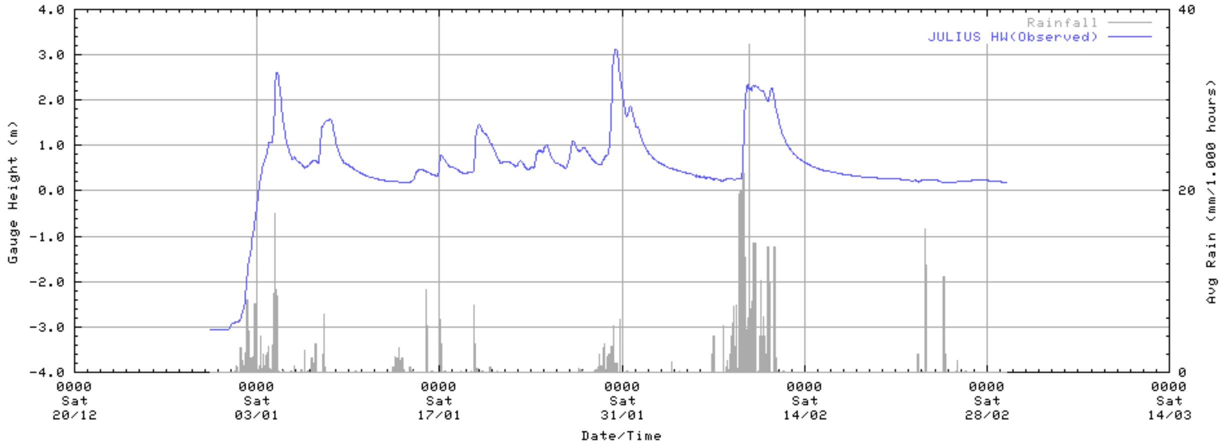
029157 Burketown Airstrip



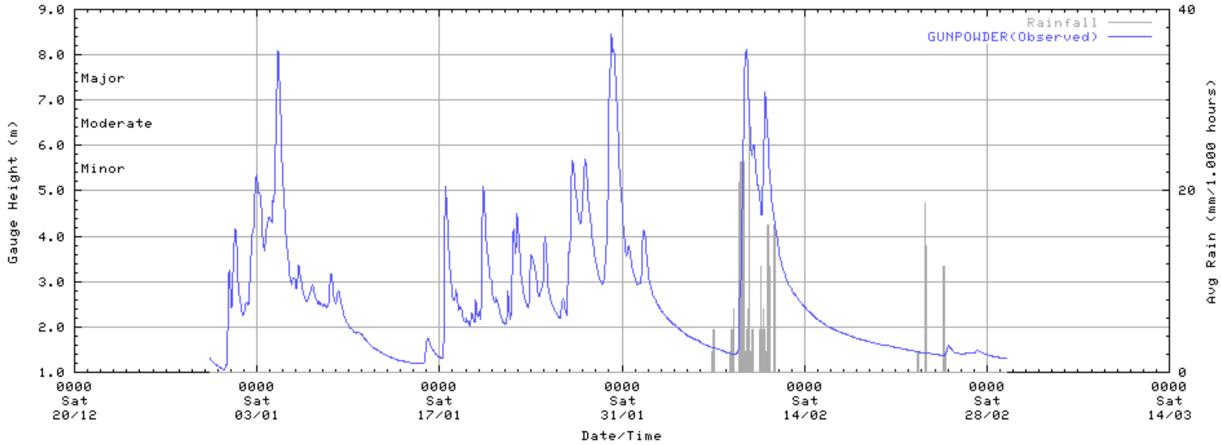
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.2 River Heights – Leichhardt River

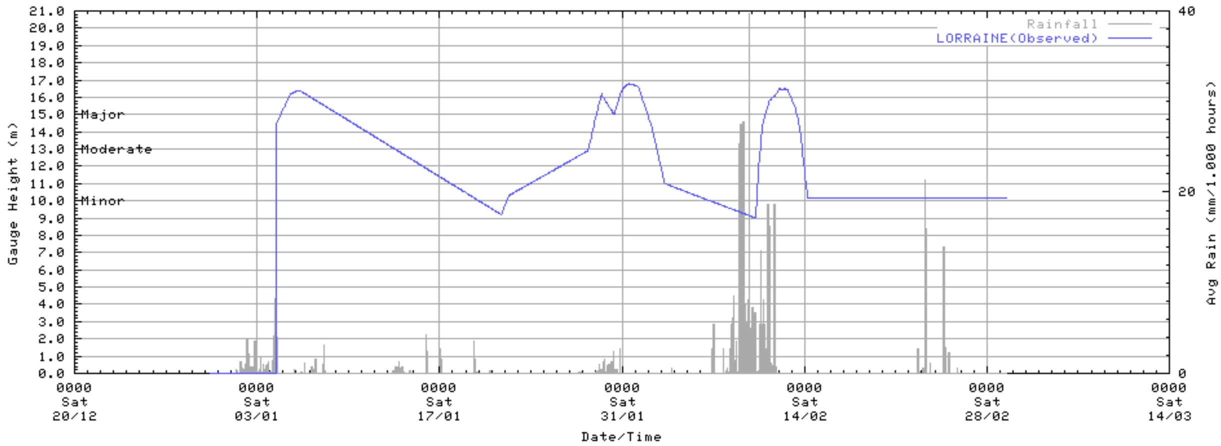
Julius Headwater



529013 Gunpowder TM



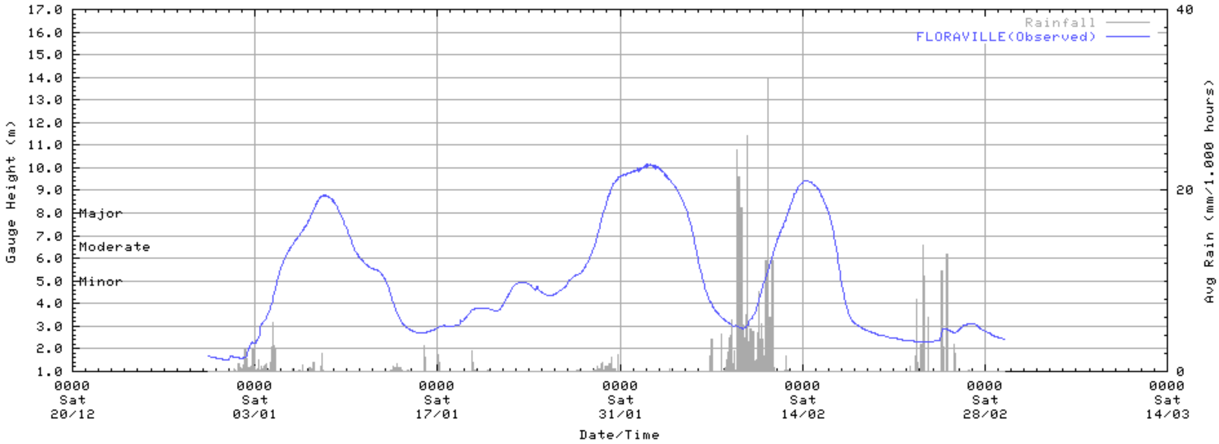
029032 Lorraine



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.2 (cont) River Heights – Leichhardt River

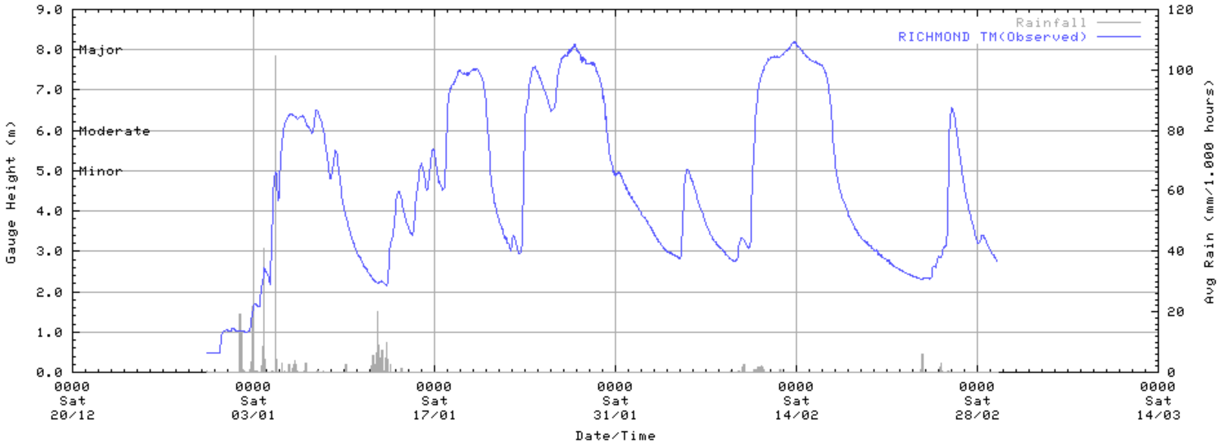
529010 Floraville TM



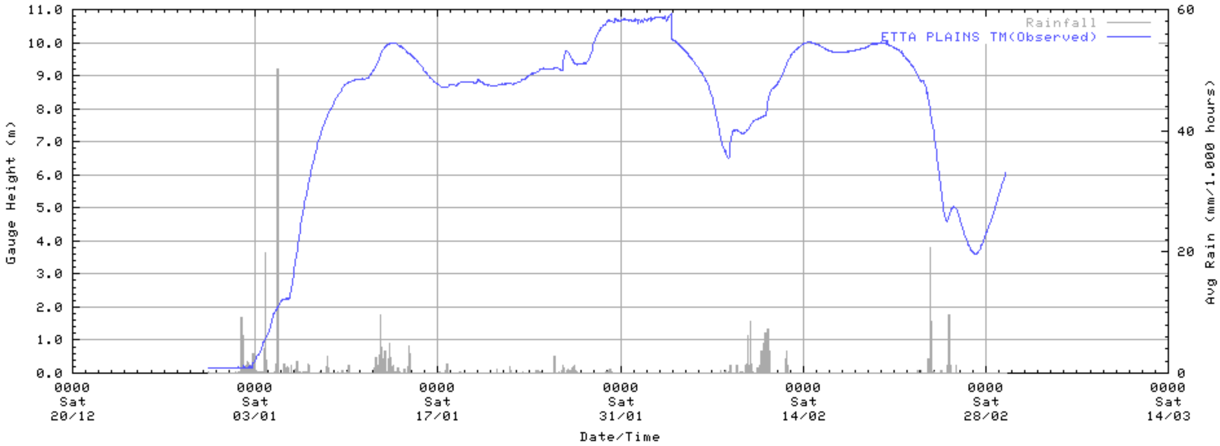
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.3 River Heights – Flinders River

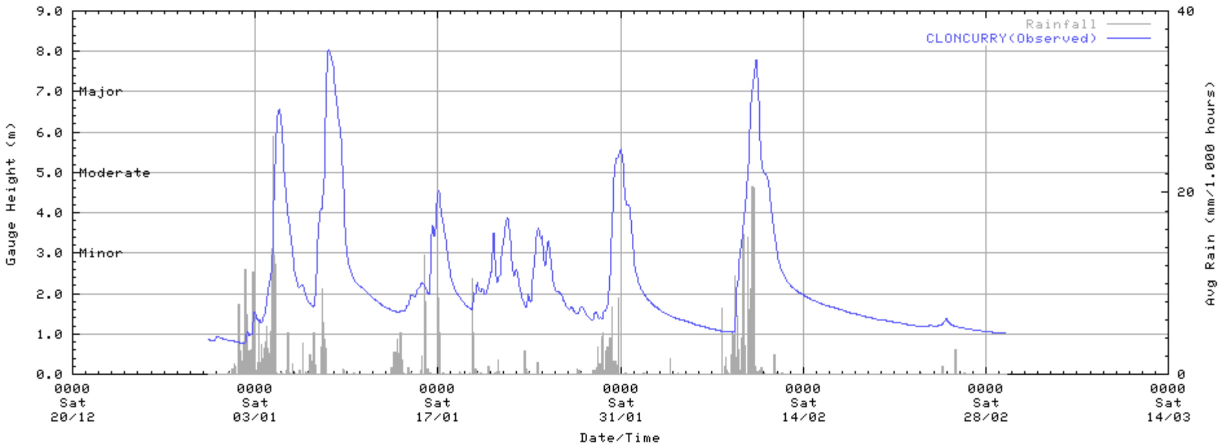
530009 Richmond TM



529018 Etta Plains TM



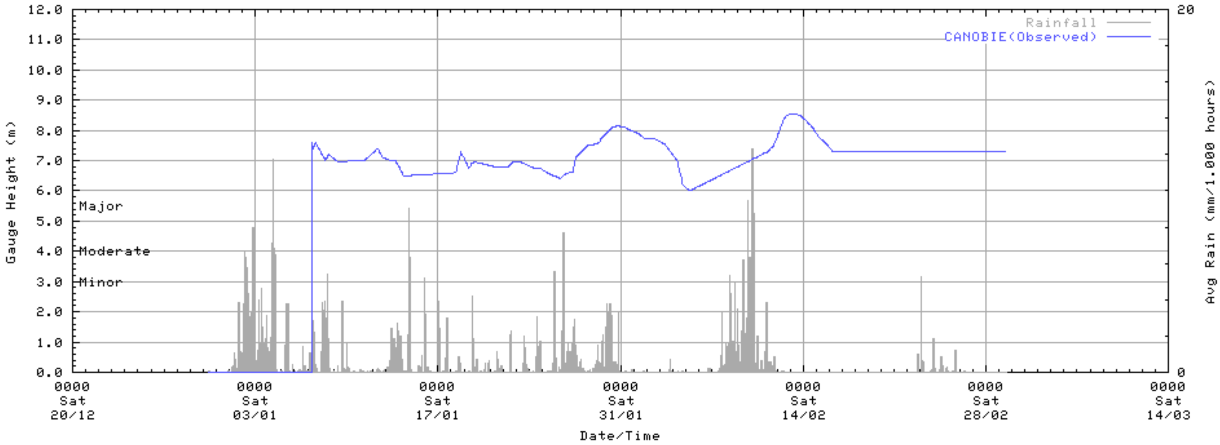
529011 Cloncurry TM



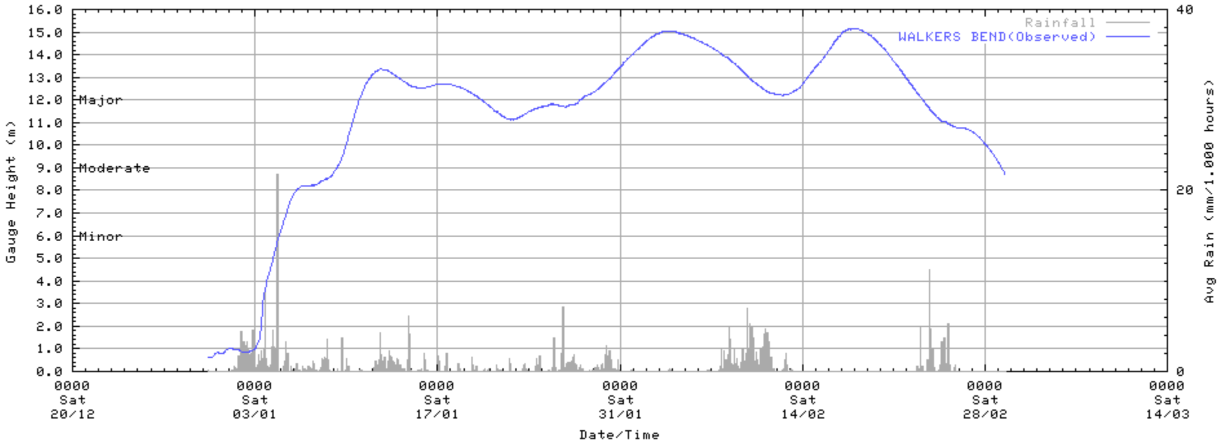
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.3 (cont) River Heights – Flinders River

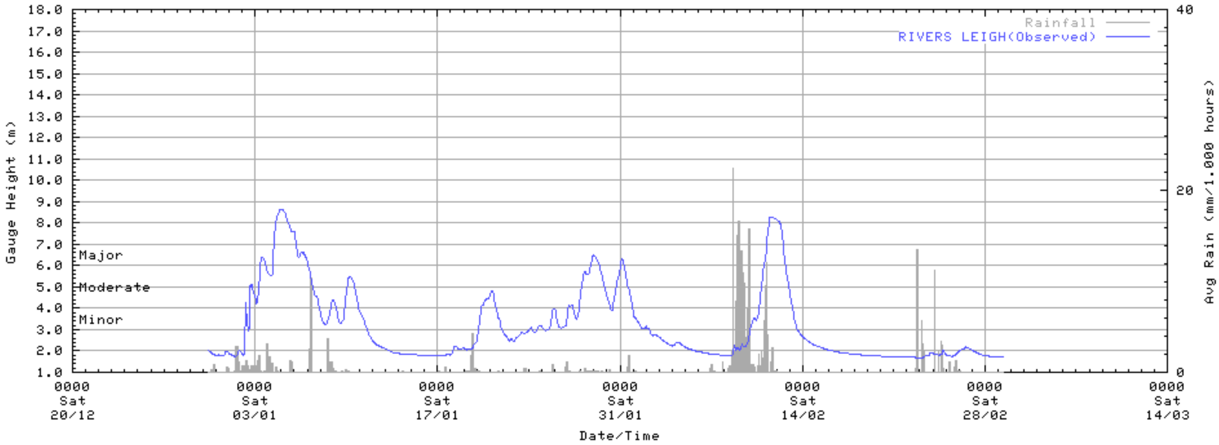
029007 Canobie



029147 Walkers Bend



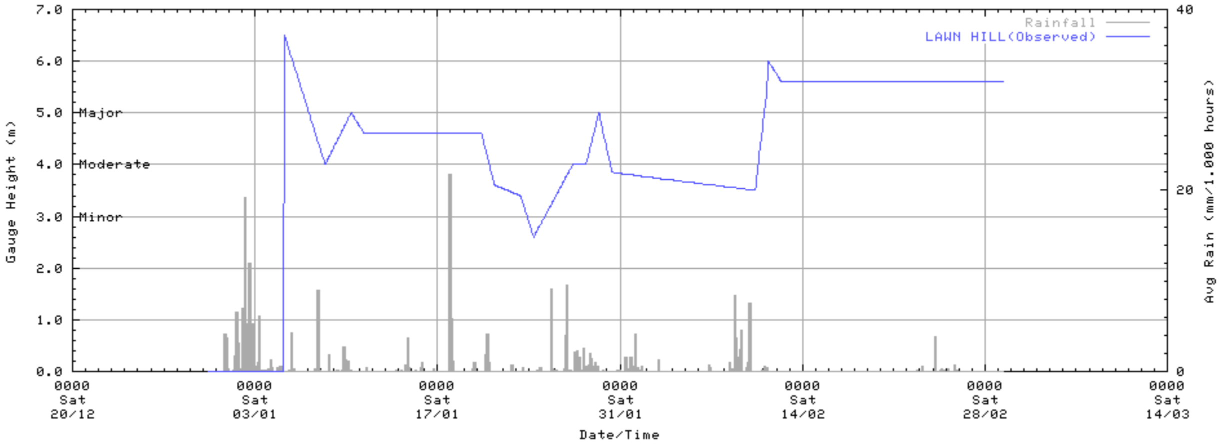
029066 Riversleigh



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.3 (cont) River Heights – Flinders River

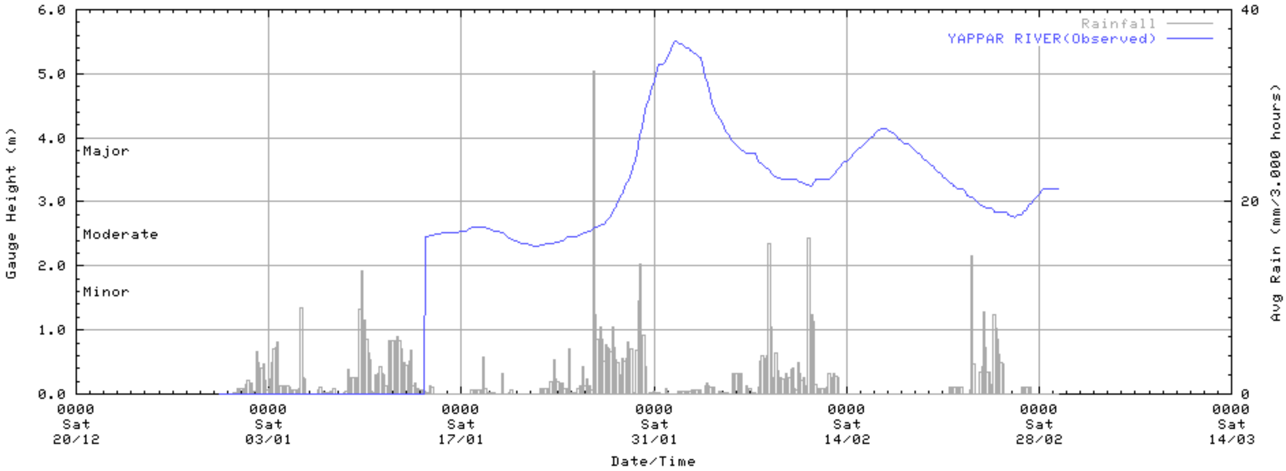
029031 Lawn Hill



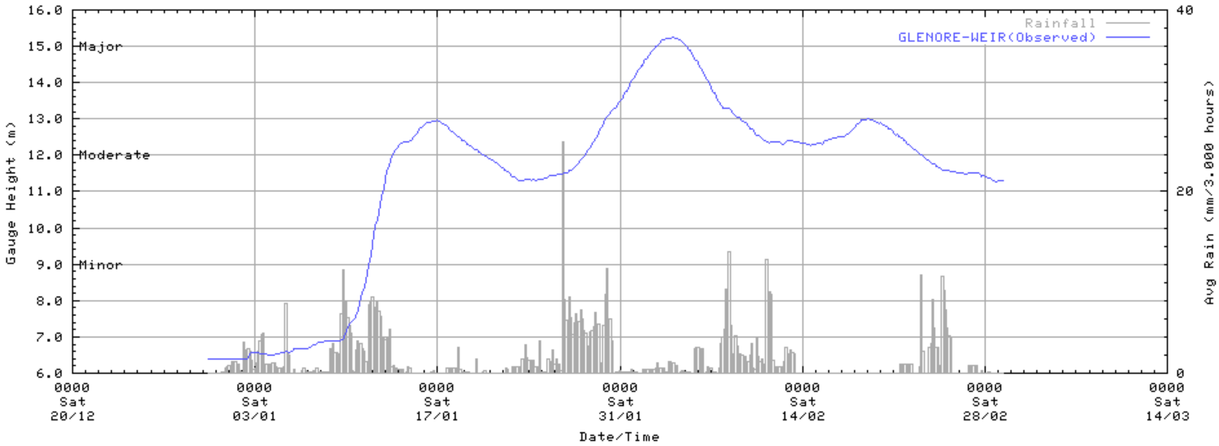
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.4 River Heights – Norman River

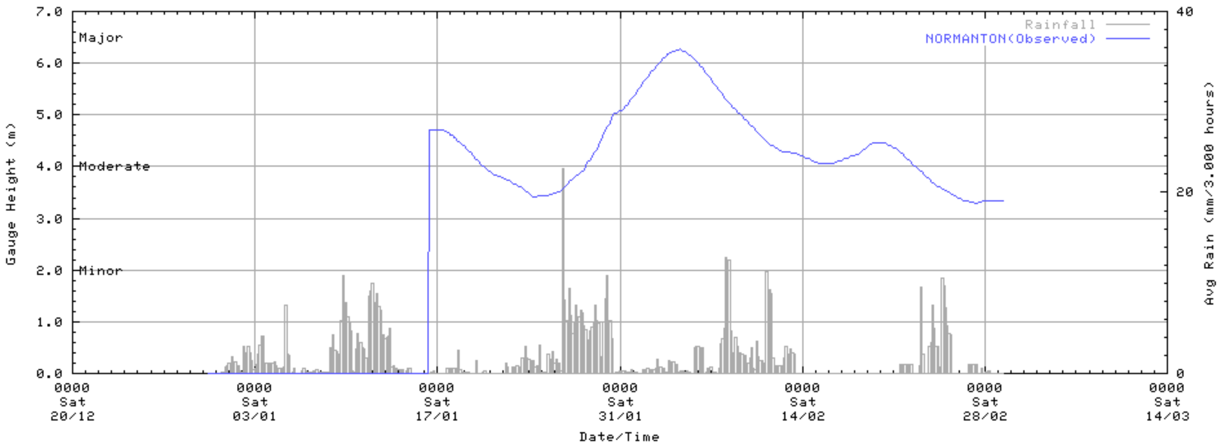
029154 Yappar River



529012 Glenore Weir TM



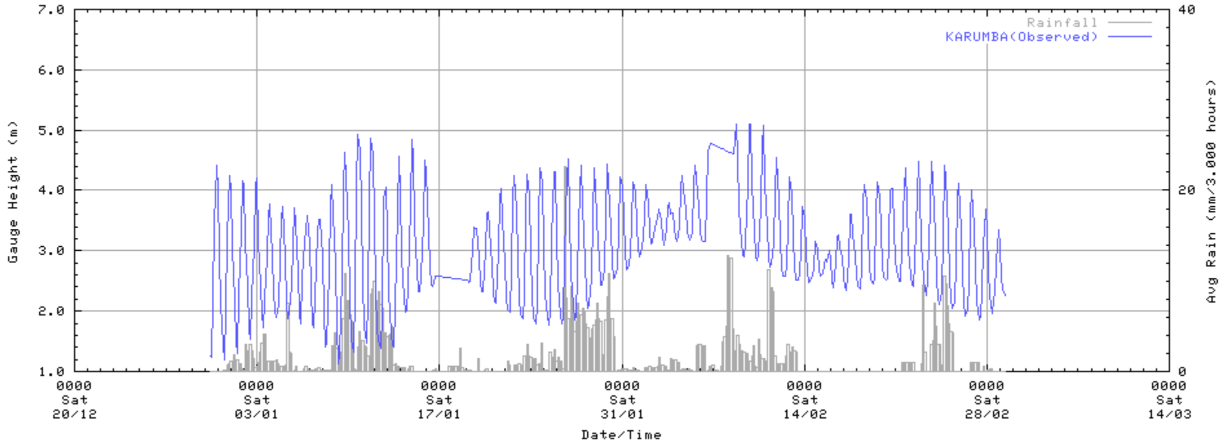
029155 Normanton



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.4 (cont) River Heights – Norman River

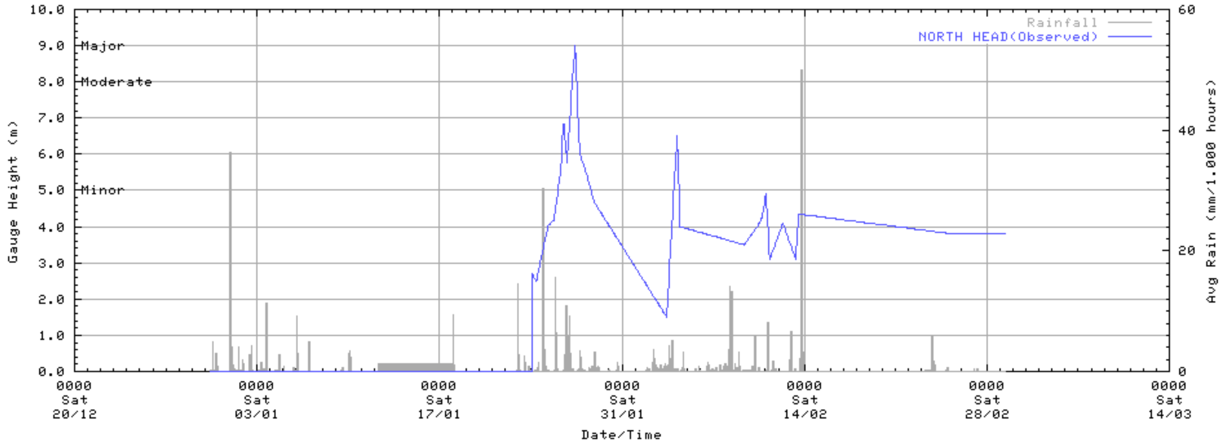
529003 Karumba Tide TM



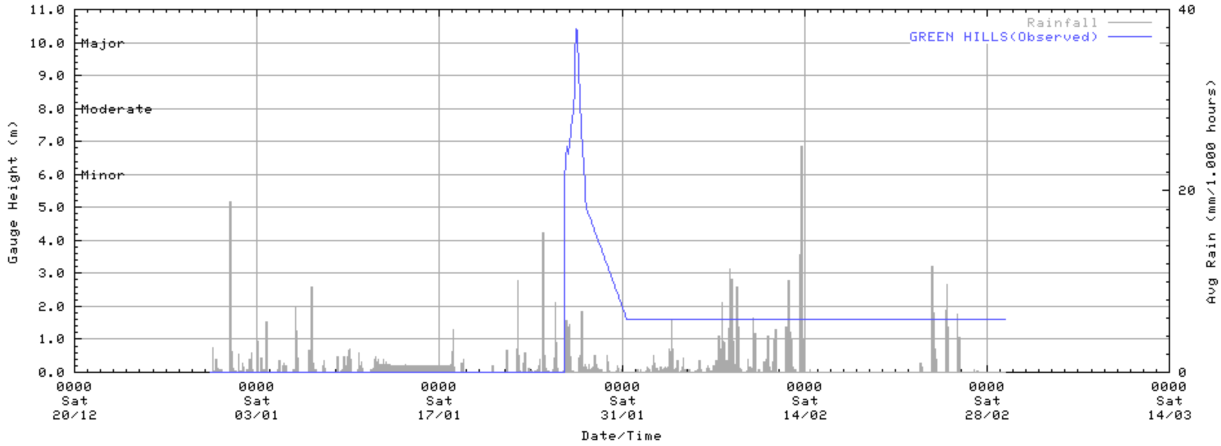
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.5 River Heights – Gilbert River

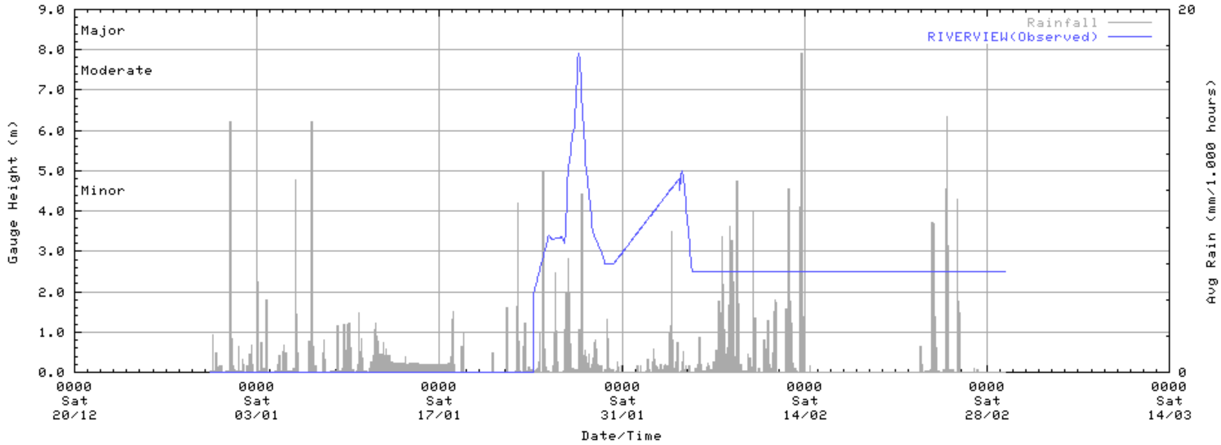
030112 North Head



030158 Green Hills



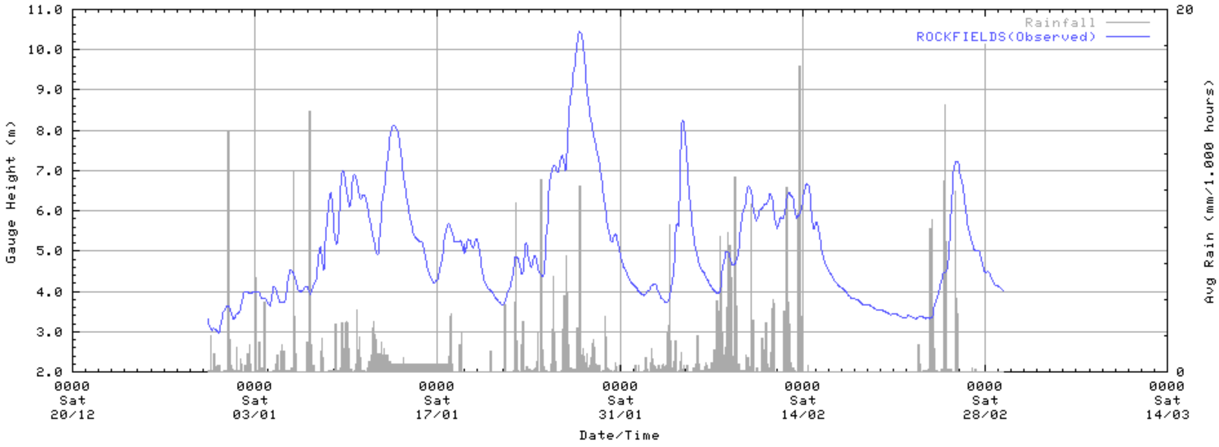
030157 Riverview



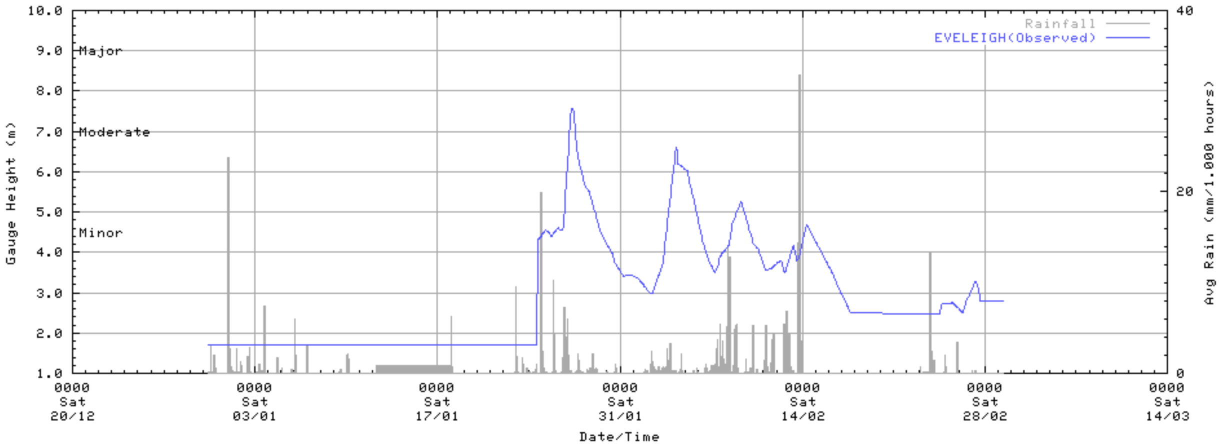
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.5 (cont) River Heights – Gilbert River

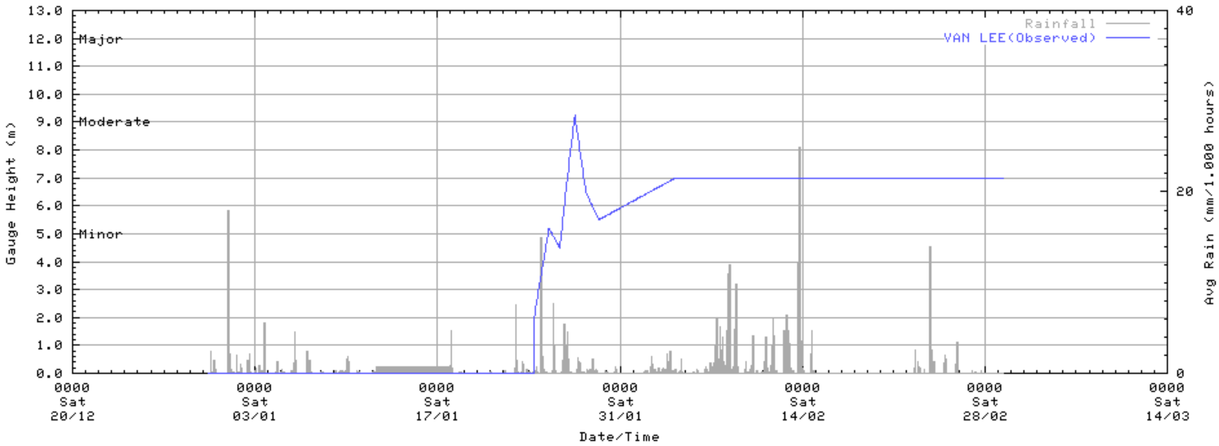
533095 Rockfields TM



030103 Eveleigh Station



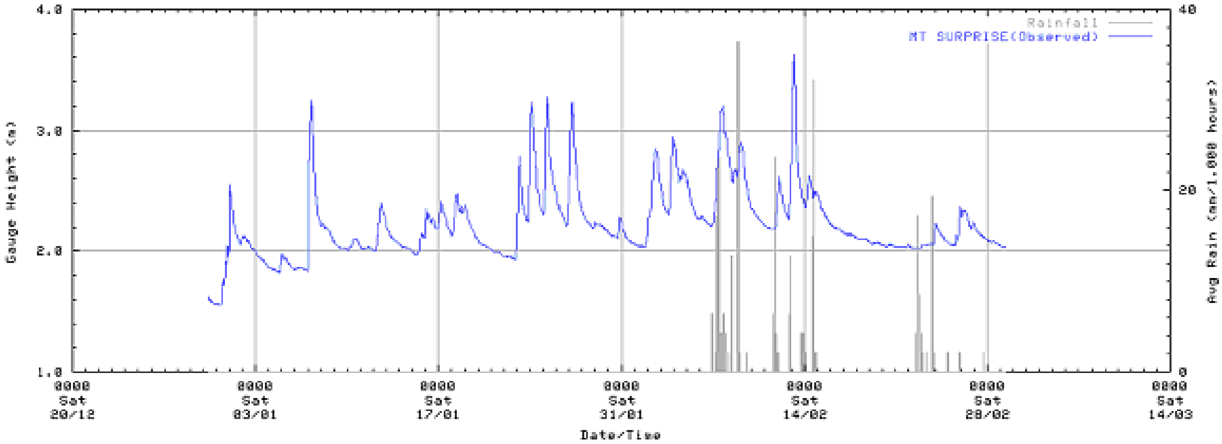
030073 Van Lee



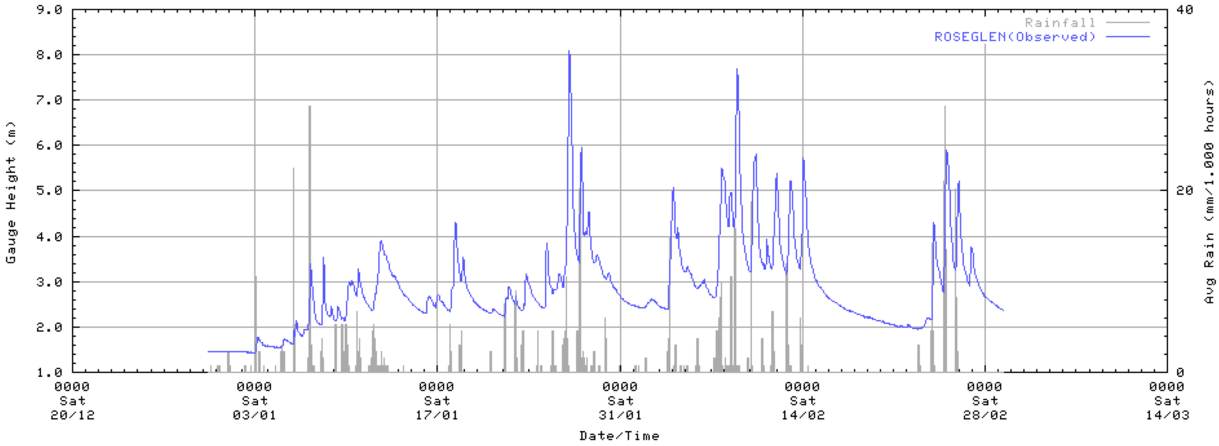
© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Figure 3.5.5 (cont) River Heights – Gilbert River

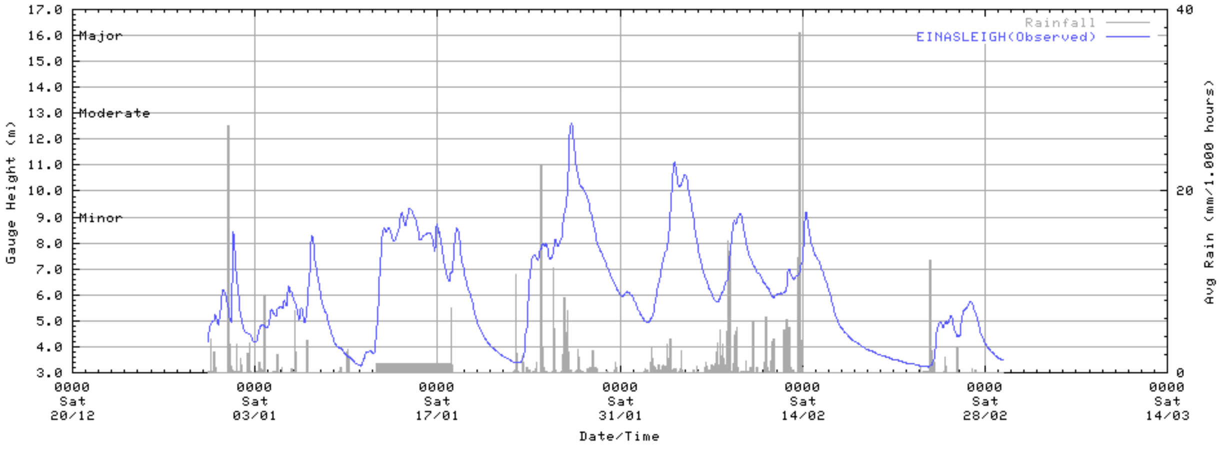
530008 Mt Surprise TM



530010 Roseglen TM



030014 Einasleigh Township



© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

3.6 Warning Services for the Gulf Rivers

A preliminary flood warning was issued for the Gulf Rivers on Friday 2 January 2009 and warnings continued for nearly 9 weeks with the final warning issued on 7 March 2009. A total of 77 flood warnings were issued for the Gulf Rivers. Table 3.6.1 lists the flood warnings that were issued.

Table 3.6.1 Flood Warnings and Predictions for the Gulf Rivers issued between 02/01/2009 and 07/03/2009

River Basin	Number of Warnings	Number of Major Warnings	Number of Predictions	Number of Locations	First Warning	Last Warning
Nicholson	42	19	40	6	5:45pm Friday 02/01/2009	10:14am Thursday 19/02/2009
Leichhardt	3	0	3	0	5:45pm Friday 02/01/2009	11:00am Monday the 16/02/2009
Flinders	21	1	8	1	10:06am Saturday 3/01/2009	10:02am Saturday 07/03/2009
Norman	6	8	6	2	10:03am Monday 12/01/2009	10:02am Saturday 07/03/2009
Gilbert	5	1	5	1	10:37am Tuesday 27/01/2009	10:44am Sunday 15/02/2009
Total	**77**	**62**	**29**	**10**		

References:

ABC 2009a: *Queensland Flood Update*. An ABC Landline TV program broadcast on Sunday 22/02/2009. (http://www.abc.net.au/landline/content/2008/s2509719.htm).

ABC 2009b: *Marooned*. An ABC Landline TV program broadcast on Sunday 8/03/2009. (http://www.abc.net.au/landline/content/2008/s2509719.htm).

AR&R 1987: *Australian Rainfall and Runoff.* A guide to flood estimation, Institution of Engineers, Australia.

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)

Appendix 1. DNRW Usage Agreement

User Licence for Digital Data

Permitted use:

- You may use the data for your own purposes (including supply to consultants for a specific consultancy project for you, but the consultants must return or destroy the data when the project is finished). You must not sell or distribute the data.
- You must display this copyright notice on any copies of the data, however altered, reformatted or redisplayed, if you supply the data to a consultant or copy it for backup purposes: "© The State of Queensland (Department of Natural Resources and Water) [year]".
- You may create and distribute hardcopy products and non-editable digital images (e.g. pdf files) based on or containing the data, provided all the following conditions are met:
    - The product(s) must be distributed at no charge, and revenue cannot be generated to offset any free distribution (e.g. advertising/sponsorship).
    - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland (Department of Natural Resources and Water) [year]. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
    - You must include metadata with the product(s) and the metadata must incorporate as a minimum the metadata supplied with this data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.
- If you wish to distribute the data or distribute product(s) for a charge you must organise a different licence, by contacting the Department of Natural Resources and Water (Email: marketing@nrw.qld.gov.au).

Ownership:

- The State of Queensland, as represented by the Department of Natural Resources and Water (NRW), is the owner of the intellectual property rights in and to the data, or has the right to make this data available under license arrangements. External contributors to data are listed on the website www.nrw.qld.gov.au/products.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the data. NRW makes no representations or warranties in relation to the data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the data are excluded or limited. You agree to continually indemnify the State of Queensland and NRW (and their officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the data or any product made from the data.

© Copyright Commonwealth of Australia 2007, Bureau of Meteorology (ABN 92 637 533 532)