January 2011
Flood Event

Report on the operation of Somerset Dam and Wivenhoe Dam

2 March 2011

seqwater
WATER FOR LIFE

EXECUTIVE SUMMARY

Somerset Dam and Wivenhoe Dam are located in the Brisbane River Basin. The Dams are dual-purpose storages that provide urban water supplies (including drinking water) to South East Queensland, as well as flood mitigation benefits to areas potentially impacted by flood flows along the Brisbane River below Wivenhoe Dam.

In the 25 days prior to Thursday 6 January 2011, above-average levels of rainfall were received in the Dam catchment areas and the Dams successfully operated as flood mitigation dams on a number of occasions during this period. Further rain fell in the Dam catchments on the morning of Thursday 6 January 2011, leading to another mobilisation of Seqwater's Flood Operations Centre. The rainfall continued in various parts of the Brisbane River Basin until Wednesday 12 January 2011, resulting in the largest inflows into both Dams ever recorded. During this time, and for a period following the peak of the floods, the Dams were operated as flood mitigation storages in accordance with ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)*** ("**the Manual**"). The Manual defines the objectives and procedures for operating Somerset Dam and Wivenhoe Dam during flood events. An understanding of the Manual is important when reading this Report.

The January 2011 Flood Event, which impacted the Dams between Thursday 6 January 2011 and Wednesday 19 January 2011, can be categorised as a large (Annual Exceedance Probability [AEP] of 1 in 100) to rare (AEP of 1 in 2,000 years) event as defined by ***Australian Rainfall and Runoff (Book 6)*** (AR&R). Studies associated with the design and operation of Wivenhoe Dam that date back to 1971 indicate a flood of this magnitude would be expected to result in urban damage below Moggill. The ***Wivenhoe - Somerset Interaction Study***, which was prepared to support the 2009 review of the Manual, is the most recent investigation undertaken that supports this expectation.

It should also be noted that during the critical period of the Event from 11 January 2011 to 14 January 2011 when the major flooding occurred in urban areas below Moggill, there were significant flood flows being generated from catchments downstream of Wivenhoe Dam. These flows alone would have resulted in damaging flooding in the urban areas of Ipswich and Brisbane.

Background

Flood events that impact Somerset Dam and Wivenhoe Dam are caused by rainfall events that vary in intensity, duration and distribution over a catchment area exceeding 7,000km^2 above the Dams. When making decisions about releasing water from the Dams during flood events, consideration is also given to rain falling in Brisbane River catchment areas not controlled by the Dams. These catchment areas, which include the Lockyer Creek and Bremer River catchments, cover an area in the order of 6,500km^2 and rain falling in these catchments will also vary in intensity, duration and distribution. Accordingly, the Manual must account for an infinite number of flood event scenarios.

As it is not possible to provide a specific procedure for Dam operation during every possible flood event, the Manual takes the approach of providing objectives and strategies to guide operational decision-making during a flood event. The objective followed and strategy chosen at any point in time depends on the actual water levels in the Dams, as well as flood modelling predictions based on the best observed rainfall, forecast rainfall and stream flow information available at the time.

It is not possible to predict the range of objectives and strategies that will be used during the course of a flood event, before or at any time during the event, prior to the event peak. Objectives and strategies change as flood events progress, as rainfall is received in the catchments and as forecast rainfall predictions change. For small floods, objectives and strategies relate to minimising flood impacts in rural areas, while as the scale of the flood increases, the emphasis changes to protecting urban areas and maintaining the structural safety of the Dams.

The primary objectives of the Manual, in order of importance, are:

- Ensure the structural safety of the Dams;
- Provide optimum protection of urbanised areas from inundation;
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers;
- Retain the storage at Full Supply Level (FSL) at the conclusion of the flood event;
- Minimise impacts to riparian flora and fauna during the drain down phase of the flood event.

While ensuring the Dams are operated during flood events within these objectives, Seqwater is aware that the safety of the public is a primary consideration when making flood releases from the Dams. Every attempt is made to ensure public roads are closed prior to inundation by Dam outflows and that authorities are provided with enough time to prepare for community isolations and to undertake evacuations. These actions are in accordance with draft Communication Protocol prepared by the Department of Environment and Resource Management and followed by Seqwater during the January 2011 Flood Event. When operating the Dams during floods, every attempt is also made to ensure urban damage is minimised, and that Dam outflows with the potential to contribute to urban damage are delayed until it is apparent no other options are available without risking the safety of the Dams.

It is also important to note that under the Manual's current operating rules, both Somerset Dam and Wivenhoe Dam are expected to fail during floods with an AEP larger than 1 in 100,000. This highlights the importance of maintaining the safety of the Dams by ensuring that the flood storage compartments of the Dams are not overfilled.

Finally, Seqwater receives rainfall forecasts for the Dam catchment areas from the Bureau of Meteorology (BoM) to assist in making operational decisions during flood events. These forecasts are derived using the best available meteorological practice, but as shown in this report are not sufficiently accurate to be used as the basis for making decisions on releasing flood water from the dams. Currently, a degree of uncertainty exists in all weather forecasts, particularly quantitative rainfall forecasts, and the longer the forecast lead times the higher the degree of uncertainty in the forecast.

Significance of the January 2011 Flood Event

The January 2011 Flood Event can be categorised as a large to rare event by the Institution of Engineers Australia (Engineers Australia) national guidelines for the estimation of design flood characteristics (AR&R). The flood level classifications adopted by the BoM also define the Event as a major flood. Relevant statistics that demonstrate this are:

- At some individual rainfall stations within the Brisbane River catchment, rainfall estimates beyond the credible limit of extrapolation (AEP of 1 in 2,000) were recorded for durations between 6 hours and 48 hours. Rainfall recorded in the catchment area above Wivenhoe Dam indicates the catchment average rainfall intensity for the 72-hour period to Tuesday 11 January 2011 at 19:00 had an AEP between 1 in 100 and 1 in 200. The catchment average rainfall intensity for the 120-hour period to Tuesday 11 January 2011 at 19:00 also had an AEP between 1 in 100 and 1 in 200.
- On the morning of Tuesday 11 January 2011, water levels in Wivenhoe Dam began rising rapidly in response to very heavy localised rainfall on and close to the Wivenhoe Dam lake area. At the time, the BoM radar indicated this rain was located in an area not containing real time rain gauges. Post flood analysis suggests the rainfall required to reproduce this rise could exceed an AEP of 1 in 2,000 and may be well into the extreme category. Rainfall of this intensity and duration over the Wivenhoe Dam lake area at such a critical stage of a flood event was unprecedented.
- The volume of total inflow into Wivenhoe Dam during the Event was 2,650,000ML. This volume is almost double (190%) the comparable volume of inflow from the January 1974 flood event, and comparable with the flood of 1893.

- The inflow into Wivenhoe Dam during the Event was characterised by two distinct flood peaks, with each peak separated by about 30 hours. The maximum flow rate at the first peak is estimated to be around 200% of the comparable flow rate calculated from the January 1974 event, while the maximum flow rate at the second peak is estimated to be approximately 230% of the comparable flow rate from the January 1974 event (Source of January 1974 flow: ***Brisbane River and Pine River Flood Study, October 1994, Report No. 23a***).
- The peak water levels recorded at gauges in the Brisbane River catchment above Wivenhoe Dam during the Event exceeded the major flood level and in many cases produced the highest levels ever recorded. This situation was repeated along in Lockyer Creek that enters the Brisbane River downstream of Wivenhoe Dam.

Operations during the January 2011 Flood Event

1. During the January 2011 Flood Event, operational decisions were made in accordance with the Manual. Dam outflows contributing to downstream flooding were delayed until it was apparent no other option was available, without risking the safety of the Dams.
2. Two distinct flood peaks entered Wivenhoe Dam during the Event. The first flood into Wivenhoe Dam was similar in nature and magnitude to the comparable flood flows of the January 1974 event. The combined mitigation effect of Somerset and Wivenhoe Dams ensured this first flood did not result in urban damage below Moggill, however achieving this result did cause significant filling of the Dams' flood storage compartments.
3. The second flood was also similar in nature and magnitude to the comparable flood flows of the January 1974 event. Rainfall that occurred directly on and near the Wivenhoe Dam lake area contributed to the second flood. Post flood analysis suggests the intensity of this rainfall could have exceeded an AEP of 1 in 2,000 and may be well into the extreme category. The location of this rainfall on and near the Wivenhoe Dam lake area reduced the available mitigation options.
4. The flood compartments of the Dams were filled to a high level by the first flood and there was not sufficient time to release this water prior to the second flood arriving. Accordingly, the second flood could not be completely contained without risking the safety of the Dams. The resulting inflow of water into the Brisbane River combined with flood water from Lockyer Creek, the Bremer River and the Lower Brisbane River to cause urban damage. However, the extent of this damage was greatly reduced by the operation of the Dams.

Rainfall forecasts in the early stages of the Event did not support flood releases being made from Wivenhoe Dam, greater than those that occurred. An increase to flood releases in the later stages of the Event (prior to the morning of Tuesday 11 January 2011) had the potential to increase urban damage, due to the possible southward movement of the prevailing weather system. Had the rainfall on Tuesday 11 January 2011 largely fallen in catchments downstream of the Dam, the transition to an operating strategy to protect the safety of the Dam may have been avoided, however urban damage would have likely increased under this scenario, due to a loss of the mitigation effects that were provided by the Dam.

Given the current level of forecasting technology available, there was an extremely high degree of difficulty in predicting the actual quantity, intensity and spatial distribution of the Event rainfall. This resulted in a high level of uncertainty in predicting the likely Dam inflows in advance of rainfall on the ground and this can be demonstrated by reviewing the one-day, three-day and five-day quantitative rainfall forecasts provided by the BoM during the Event.

The available recorded data shows the January 2011 Flood Event was unprecedented in the history of Somerset and Wivenhoe Dams and rivals the largest floods in the recorded flood history of the region. However, the successful operation of the Dams as flood mitigation storages is considered to have had a major effect on reducing flood damage in the areas downstream of the Dams.

Flood mitigation benefits of Somerset Dam and Wivenhoe Dam

Wivenhoe Dam provided clear and greatly significant flood mitigation benefits during the January 2011 Flood Event. These benefits can be demonstrated by the following factors:

- Figure 9.1.2 (below) demonstrates the significant mitigation benefits of Wivenhoe Dam during this Flood Event. The peak of the outflow from the Dam was approximately 40% lower than the peak of the inflow, meaning that just below the Dam, the maximum hourly flow rate in the Brisbane River was reduced by around 40%.
- Without the mitigating effects of Wivenhoe Dam, the peak flood height measured at the Port Office gauge near the Brisbane CBD would have been approximately 2.0m higher than was experienced.
- Based on the current damage curves, these projected reductions in the flood peak height equate to significant reductions in the potential for the loss of life as well as monetary savings in regard to property damages in the order of up to $5 billion ***(Source: Flood Damage Tables - River PMF tab; provided to Seqwater by Brisbane City Council).***
- Without the above flow rate reductions provided by Wivenhoe Dam, it is estimated up to 14,000 more properties would have been impacted by the January 2011 Flood Event ***(Source: Flood Damage Tables – River PMF tab; provided to Seqwater by Brisbane City Council).***

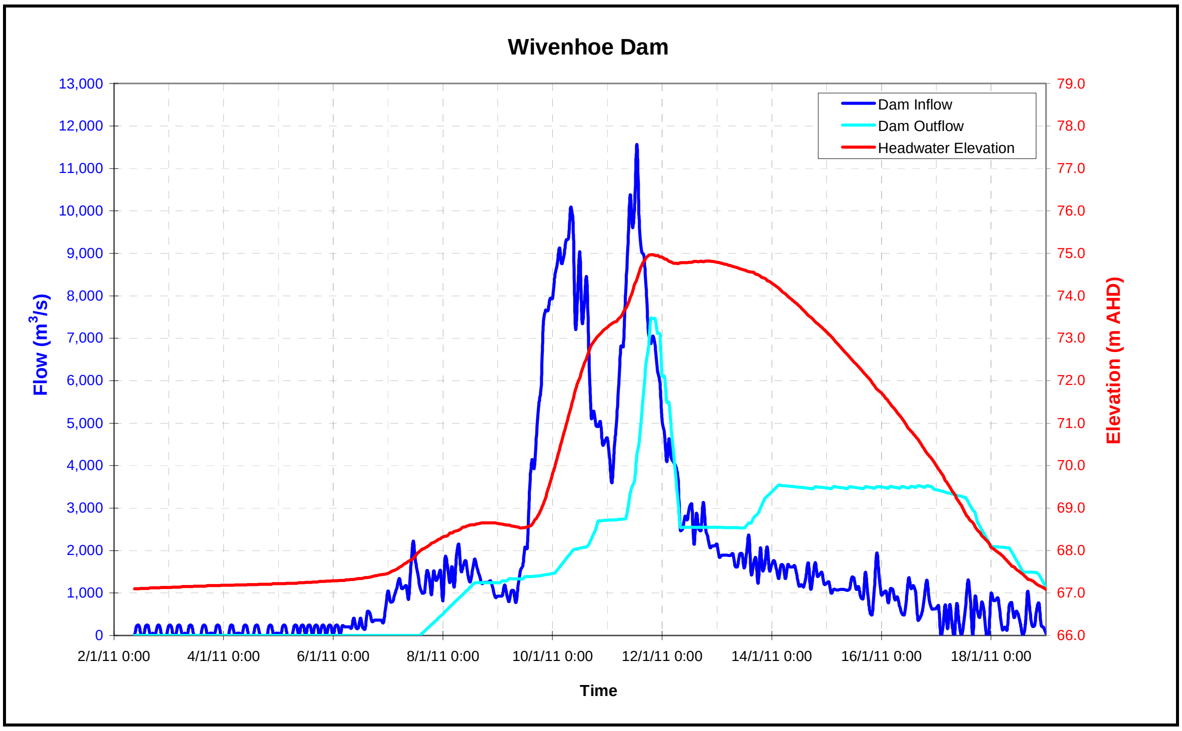

Figure 9.1.2 – Wivenhoe Dam inflow and release summary for the January 2011 Flood Event

Conclusions

The significant conclusions drawn from the information contained in this Report include:

- During the January 2011 Flood Event, Somerset Dam and Wivenhoe Dam were operated in accordance with ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)***.
- The data collection and flood modelling systems used to support decisions made during the Event performed well and assisted informed decision-making, in accordance with the Manual.
- BoM rainfall forecasts did not support the additional release of flood water early in the Event.

- During the Event, Seqwater followed the Department of Environment and Resource Management's draft Communications Protocol, which was compiled after the October 2010 flood event. This Protocol was developed to ensure effective communication between local, State and Commonwealth agencies impacted by the release of flood water from the Dams.
- The January 2011 Flood Event was a very large and rare flood event. The combined effects of Somerset Dam and Wivenhoe Dam did reduce flood damage downstream, however it was not possible to fully mitigate the impacts of the Event without putting the safety of the Dams at risk.
- Studies associated with the design and operation of Wivenhoe Dam dating back to 1971 indicate a flood of the magnitude of the January 2011 Flood Event would be expected to result in urban damage below Moggill.
- The combined effects of Somerset Dam and Wivenhoe Dam provided clear and significant flood mitigation benefits during the January 2011 Flood Event.

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1 INTRODUCTION

1.1 Preface

Given the potential significant impact on downstream populations and property, it is imperative Somerset and Wivenhoe Dams are operated during flood events in accordance with clearly defined and pre-determined procedures. The current procedures are contained in Revision 7 of ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*** ("the Manual") that was gazetted in January 2010. The Manual is an approved flood mitigation manual under the ***Queensland Water Supply (Safety and Reliability) Act 2008***. An understanding of the Manual is important when reading this Report.

The Manual requires the owner of Somerset and Wivenhoe Dams (currently Seqwater) to prepare a report after each flood event impacting the Dams. A flood event is defined as a situation where either Somerset and or Wivenhoe Dams exceed their Full Supply Level (FSL) and flood water releases are made. The report must contain details of the procedures used during the flood event, the reasons why procedures were used and other pertinent information. Seqwater must forward the report to the Director-General of the Department of Environment and Resource Management (DERM) within six weeks of the completion of the flood event.

This document and its associated volumes comprise the required report relating to the January 2011 Flood Event, which impacted Somerset and Wivenhoe Dams, commencing on Thursday 6 January 2011 and concluding on Wednesday 19 January 2011. It is due for submission by Wednesday 2 March 2011.

1.2 Meaning of terms

In this report, the following terms are defined as below:

"Act" means the Water Supply (Safety and Reliability) Act 2008;

"AEP" means Annual Exceedance Probability, the probability of a specified event being reached or exceeded in any one year. This may be expressed as a ratio (e.g. 1 in Y) or a percentage;

"Agency" includes a person, a local government and a department of State government within the meaning of the ***Acts Interpretation Act 1954***;

"AHD" means Australian Height Datum;

"ALERT" means Automated Local Evaluation in Real Time System, a system of monitoring and displaying rainfall and water level data. It is a combination of field stations, communications networks and data collection software;

"AMTD" means the Adopted Middle Thread Distance, which is the distance along the centre line of the mainstream from a junction, usually in kilometres;

"ANSI" means the American National Standards Institute;

"AR&R" means ***Australian Rainfall and Run-off (Book 6),*** The Institution of Engineers Australia (Engineers Australia) national guidelines for the estimation of design flood characteristics;

"BoM" means the Bureau of Meteorology;

"Chairperson" means the Chairperson of Seqwater;

"Chief Executive" means the Director-General of the Department of Environment and Resource Management or nominated delegate;

"Controlled Document" means a document subject to managerial control over its contents, distribution and storage. It may have legal and contractual implications;

"Dams" means Somerset Dam and Wivenhoe Dam;

"**Dam Crest Flood**" means the flood event which, when routed through the storage with the storage initially at Full Supply Level, results in the still water level in the storage reaching the lowest point in the dam embankment, excluding wind and wave effects;

"Dam Supervisor" means the senior on-site officer at Somerset or Wivenhoe Dam as the case may be;

"DERM" means the Queensland Government department, the Department of Environment and Resource Management;

"Duty Flood Operations Engineer" means the Senior Flood Operations Engineer or Flood Operations Engineer rostered on duty to be in charge of Flood Operations at the Dams;

"EL" means elevation in metres Australian Height Datum;

"Enviromon" is the Bureau of Meteorology data collection software used to collect and display rainfall and water level data;

"ERRTS" means Event Reporting Radio Telemetry System;

"Flood Event" is a situation where the Duty Flood Operations Engineer expects the water level in either of the Dams to exceed the Full Supply Level;

"FLOOD-Col" is the data collection software used in the Flood Operations Centre to collect and display rainfall and water level data;

"FLOOD-Ops" is the modelling software used in the Flood Operations Centre to model the runoff from the catchments;

"Flood Operations Centre" means the office location used by Flood Operations Engineers during a flood event to manage the event;

"Flood Operations Engineer" means a person designated to direct flood operations at the Dams in accordance with Section 2.4 of the Manual;

"Flood Operations Engineers" means the collective group of persons who individually have designation as either a **Flood Operations Engineer** or a **Senior Flood Operations Engineer**;

"**Flood Operations Manager**" means the Senior Flood Operations Engineer or Flood Operations Engineer designated responsibility for the overall management of the Flood Operations Centre leading up to or during a flood event;

"FSL" or "Full Supply Level" means the level of the water surface when the reservoir is at maximum operating level, excluding periods of flood discharge;

"Gauge" when referred to in (m) means river level referenced to AHD or a local datum, and when referred to in (m^3/s) means flow rate in cubic metres per second;

"IFD" means Intensity Frequency Duration and refers to the statistical analysis of rainfall intensities;

"**Manual**" or "**Manual of Operational Procedures for Flood Events at Wivenhoe Dam and Somerset Dam**" means the current version (Revision 7) of the Manual;

"m^3/s" means a rate of water flow being one cubic metre of water per second or 1,000 litres of water per second;

"OOA" means 'out of action' in relation to the operation of a rainfall or river height gauge that provides catchment data;

"Operating Target Line" means the Wivenhoe/Somerset Operating Target Line from Strategy S2 of the Manual;

"Power Station" means the Wivenhoe pumped storage hydro-electric power station associated with Wivenhoe Dam and Splityard Creek Dam;

"Protocol" means draft Communication Protocol prepared by DERM to ensure information is effectively communicated to the public during flood events impacting Somerset Dam and Wivenhoe Dam;

"**QPF**" means Quantitative Precipitation Forecast provided by the Bureau of Meteorology and is an estimate of the predicted rainfall in millimetres, usually in the next 24 hours;

"RTFM" means Real Time Flood Model and is a combination of Flood-Col, Flood-Ops and other ancillary software;

"SD" means State Datum, which is a level height datum that is different from AHD;

"Senior Flood Operations Engineer" means a person designated in accordance with Section 2.3 of the Manual under whose general direction the procedures in the Manual must be carried out;

"Seqwater" means the Queensland Bulk Water Supply Authority, trading as Seqwater;

"**URBS"** means Unified River Basin Simulator.

Note: Dam levels in this document represented as metres (m) are metres Australian Height Datum or (m AHD).

1.3 Background

The primary objectives of the procedures contained in the Manual, in order of importance, are:

1. Ensure the structural safety of the Dams;
2. Provide optimum protection of urbanised areas from inundation;
3. Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers;
4. Retain the storage at Full Supply Level (FSL) at the conclusion of the flood event;
5. Minimise impacts to riparian flora and fauna during the Drain Down Phase of the flood event.

In meeting these objectives, the Dams must be operated to account for the potential effects of closely spaced flood events. Normal operating procedures require stored flood waters to be emptied from the Dams within seven days of the flood event peak passing through the Dams. During flood events, Somerset Dam and Wivenhoe Dam are operated in conjunction to maximise the overall flood mitigation capabilities of the two Dams.

1.4 Wivenhoe Dam

Wivenhoe Dam is a dual-purpose storage facility that provides urban water supplies (including drinking water) to South East Queensland, as well as flood mitigation benefits to areas impacted by flood flows along the Brisbane River below the Dam. Depending on the origin, magnitude and spatial extent of the flood, Wivenhoe Dam can be operated in a number of ways to reduce flooding downstream of the Dam. Maximum overall flood mitigation can be achieved by operating Wivenhoe Dam in conjunction with Somerset Dam.

The capacity of the urban water supply compartment that relates to Wivenhoe Dam's FSL is 1,165,000ML. The reservoir volume above the FSL that is used as temporary flood storage is 1,450,000ML. How much of this flood storage compartment is utilised during a flood event depends on the initial reservoir level below the FSL, the magnitude of the flood being regulated and the procedures adopted.

Radial gates and an auxiliary spillway are the primary infrastructure used to release water during flood events at Wivenhoe Dam. The arrangement of the radial gates is shown in Figure 1.4.1.

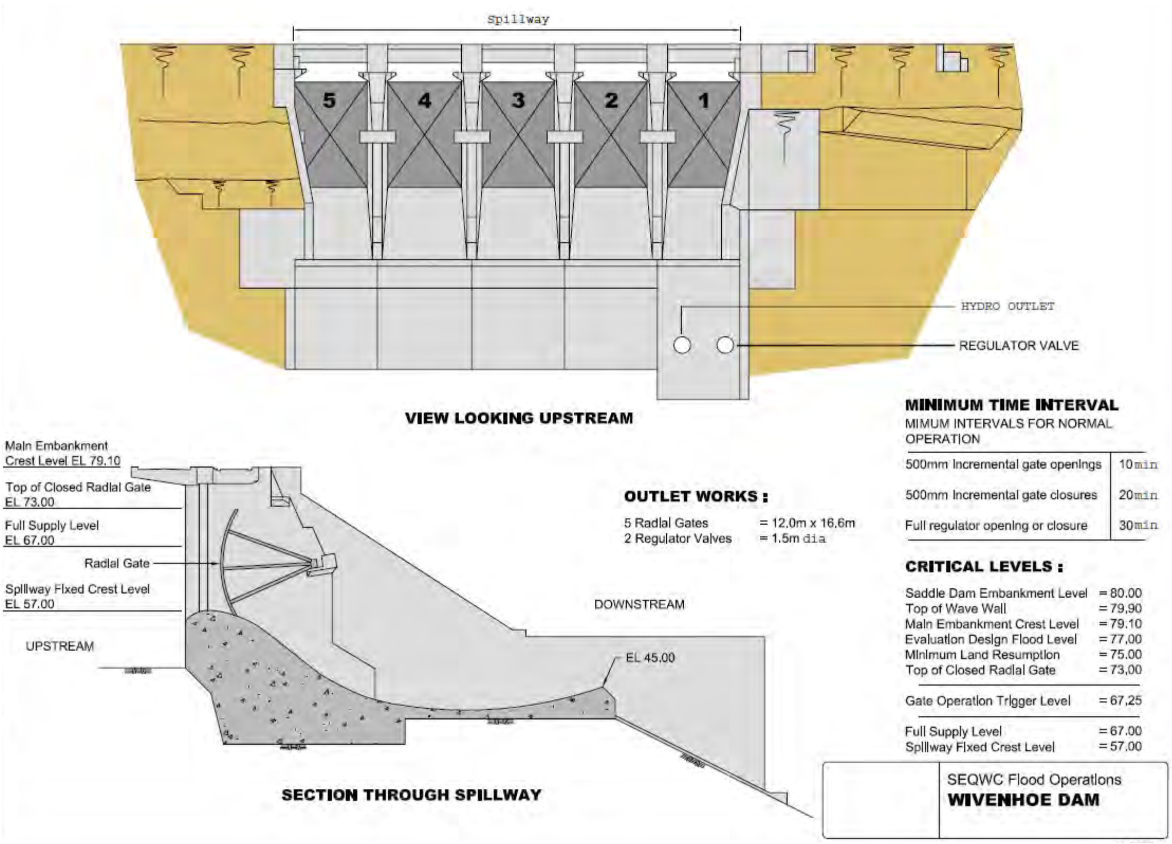


Figure 1.4.1 – Wivenhoe Dam infrastructure – arrangement of radial gates

An auxiliary spillway was constructed in 2005 as part of an upgrade to improve Wivenhoe Dam's flood adequacy. The auxiliary spillway consists of a three bay fuse plug spillway at the right abutment. In association with other constructions at the Dam, the spillway gives the Dam Crest Flood an AEP of approximately 1 in 100,000 years.

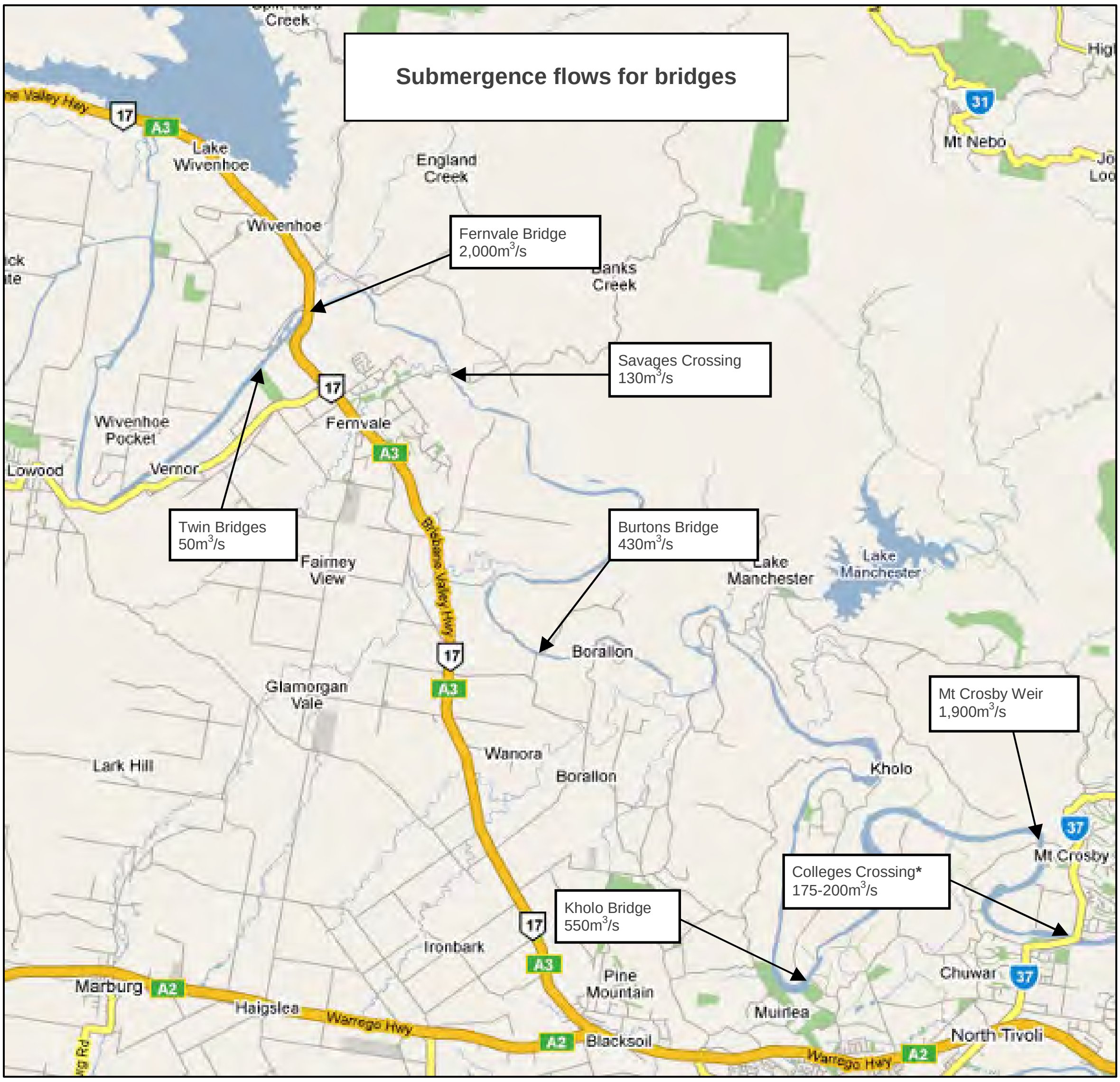
Once a flood event is declared, the magnitude of the event is assessed by predicting:

- The maximum storage levels in Somerset and Wivenhoe Dams;
- The peak flow rate at the Lowood gauge, excluding Wivenhoe Dam releases;
- The peak flow rate at the Moggill gauge, excluding Wivenhoe Dam releases.

According to the Manual, the spillway gates are not to be opened for flood control purposes prior to the reservoir level exceeding 67.25m.

The strategies contained in the Manual require significant control over Dam releases to be exercised, as well as knowledge of flows into the Brisbane River from both Lockyer Creek and the Bremer River, below Wivenhoe Dam.

In small floods, releases are controlled to ensure the combined flow from Lockyer Creek and Wivenhoe Dam is less than the limiting values contained in the strategies, to delay the submergence of bridges and to minimise disruption to rural life in the Brisbane and Stanley River valleys. Figure 1.4.2 shows the location of bridges impacted by Dam releases and the approximate river flow rate at which they are closed to traffic.



* Note: Colleges Crossing is also affected by tides

Figure 1.4.2 – Submergence flows for bridges

During larger floods, releases from Wivenhoe Dam are controlled to protect urbanised areas from inundation. The releases are controlled so the combined flows from Wivenhoe Dam, Lockyer Creek and the Bremer River are either minimised or kept below the threshold level for urban damage, which is 4,000m^3/s at Moggill.

In large flood events, releases from Wivenhoe Dam are also controlled to ensure the structural safety of the Dam is not put at risk of failure.

1.5 Somerset Dam

Somerset Dam is able to be operated in a number of ways to regulate the flood level of Stanley River. Somerset and Wivenhoe Dams are to be operated in conjunction to optimise the flood mitigation benefits downstream of Wivenhoe Dam. Radial gates, sluice gates and regulator valves are the primary infrastructure used to release water during flood events at Somerset Dam. The arrangement of this infrastructure is shown in Figure 1.5.1.

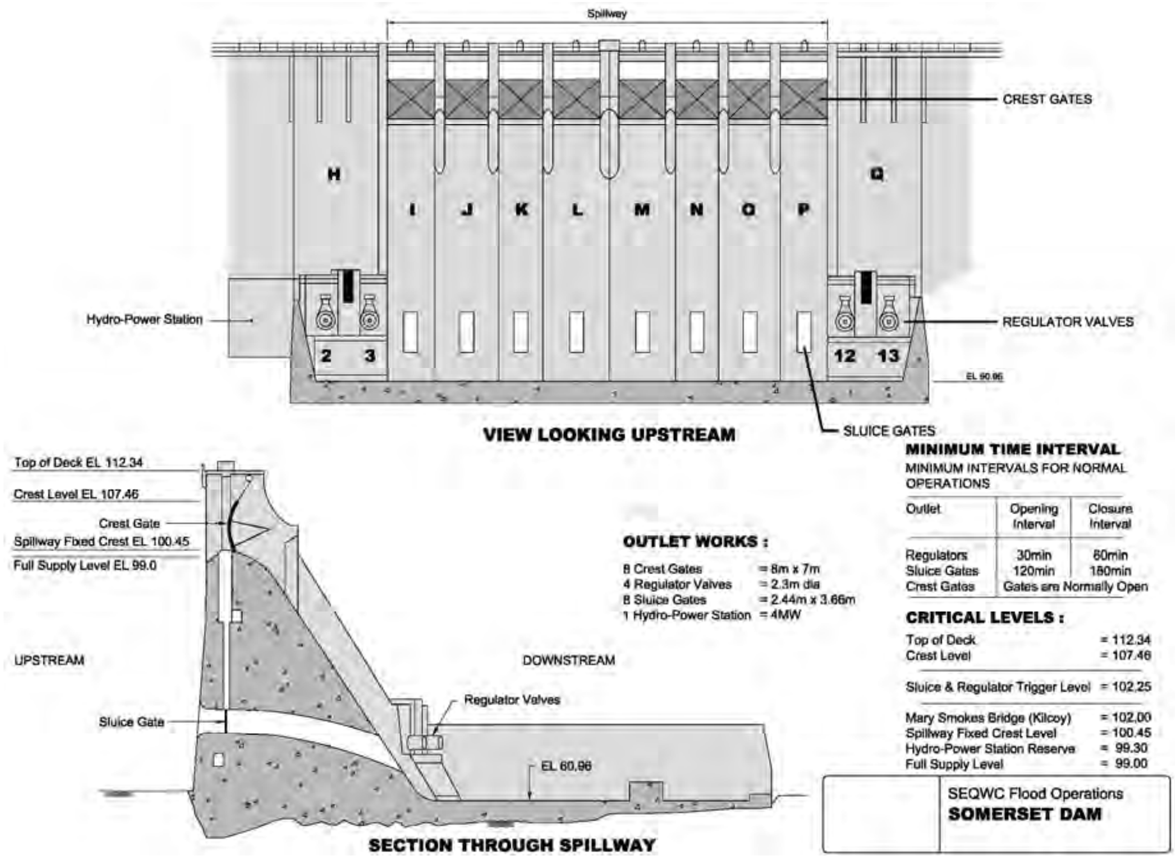


Figure 1.5.1 – Somerset Dam infrastructure – arrangement of radial gates, sluice gates and regulator valves

1.6 Operating Somerset Dam in conjunction with Wivenhoe Dam

The strategies used to operate Somerset Dam during a flood event are intended to maximise the benefits of the flood storage capabilities of the Dam while protecting the structural safety of both Somerset and Wivenhoe Dams. To achieve this, a Wivenhoe/Somerset Operating Target Line (Figure 1.6.1) is used to set a goal for balancing the use of the flood storage in each Dam.

The Wivenhoe/Somerset Operating Target Line was selected based on the following factors:

- Equal minimisation of flood level peaks in both Dams in relation to their associated failure levels;
- Minimisation of flows in the Brisbane River downstream of Wivenhoe Dam;
- Consideration of the time needed at the onset of a flood event to properly assess the magnitude of the flood event and the likely impacts. This is to ensure the likely optimal strategy to maximise the flood mitigation benefits of the storages can be selected.

Gate operations enable the progressive movement of the duty point towards the target line. The location of the duty point at any point in time is determined by the lake level in each Dam at that time. It is not necessarily possible to adjust the duty point directly towards the target line in a single gate operation. By way of explanation, if the duty point is on or near the Operating Target Line at the peak of the flood event, this reflects that the flood peaks in both Dams were equalised in relation to their respective dam failure levels. This indicates the most effective use of the combined flood storage capacities of the Dams.

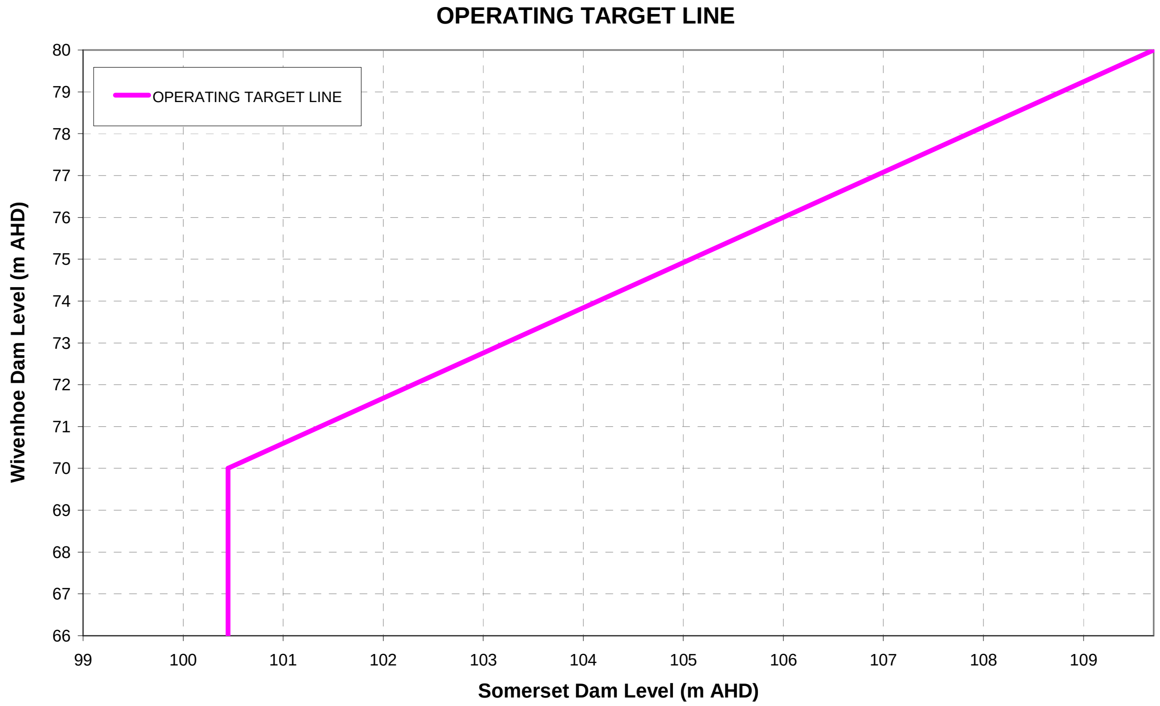


Figure 1.6.1 – Wivenhoe/Somerset Operating Target Line

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2 FLOOD EVENT SUMMARY

2.1 Summary of the January 2011 Flood Event

The following summary must be read in conjunction with ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)*** ("the Manual"). It provides a detailed summary of the operation of Somerset and Wivenhoe Dams during the January 2011 Flood Event. Each table below covers a period of the Event during which one of the following occurred:

- There was a transition or change to the flood operation strategy used, as defined by the Manual;
- There was a period of stability during which no gate operations from either Somerset Dam or Wivenhoe Dam were directed;
- There was a period of sustained gate operations (either opening or closing) at either Somerset Dam or Wivenhoe Dam.

Each table also provides a summary of relevant background information and a summary of the information that was used to make decisions during the period covered by the table. This information includes:

- Details of the time period;
- Relevant background information from the period leading up to and during the period;
- Changes in Dam conditions during the period;
- Rainfall information (including forecast rainfall) and model results available during the period;
- The strategy used and/or adopted during the period.

The source data for the information shown in the tables below can be found in the following Appendices of this Report:

- Appendix A – Model results
- Appendix B – Flood volume summary
- Appendix C – Quantitative Precipitation Forecasts (QPF)
- Appendix D – Catchment rainfall
- Appendix E – Situation reports
- Appendix G – Severe weather warnings
- Appendix H – Flood Event notification email
- Appendix L – Flood operations directives
- Appendix M – Flood Event log

Note: Dam levels in this document represented as metres (m) are in metres Australian Height Datum (m AHD).

January 2011 Flood Event – Period 1 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Thursday 06 Jan 2011 07:42
 	
Completed Friday 07 Jan 2011 02:00
	Strategy W1A and Strategy W1B; and Strategy S2
	• Catchment conditions prior to the Event are as described in Section 3.1. The Event was considered a continuation of the ongoing wet period that commenced in October 2010, 24/7 monitoring of conditions by an Engineer was occurring.
	• Little rainfall occurred in the 24 hours to 09:00 on 5 Jan 2011.
	• Catchment average rainfalls in the 24 hours to 08:00 on 6 Jan 2011 were:
	  • Wivenhoe Dam 25mm;
	  • Somerset Dam 21mm;
	  • Lockyer Creek 23mm;
	  • Bremer River 23mm.
	• Event mobilisation occurred at 07:42 on 6 Jan 2011, using Strategies W1A and S2.
	• Once mobilisation occurred, 24/7 staffing of the Flood Operations Centre and Dams continued until official de-mobilisation was announced. This occurred at 12:00 on 19 Jan 2011.
	• Duty Engineer was called back early from holidays to assist with the management of the Event.
	• Transitioned from Strategy W1A to W1B once the Wivenhoe lake level exceeded 67.50m.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 53mm;
		• Somerset Dam 44mm;
		• Lockyer Creek 53mm;
		• Bremer River 54mm.
		
		Wivenhoe Dam level rose from 67.31m to 67.52m over the 18-hour period.
		
		Somerset Dam level rose from 99.34m to 99.55m over the 18-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 28mm;
			  • Somerset Dam 23mm;
			  • Lockyer Creek 30mm;
			  • Bremer River 31mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 6 Jan 2011 was 25mm.
			• Estimated peak Wivenhoe Dam level: 68.2m (excluding forecast); 68.7m (including forecast).
			• Estimated peak Somerset Dam level: 99.7m (excluding forecast); 100.1m (including forecast).
			• Estimated total Dam inflow: 204,000ML (excluding forecast); 343,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 470m^3/s (excluding forecast); 720m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 550m^3/s (excluding forecast); 960m^3/s (including forecast).
			• These peaks were not expected to occur for more than 24 hours beyond period end. Colleges Crossing remained open in the short term. Estimated peak Wivenhoe Dam outflow: 1,220m^3/s (excluding forecast); 1,260m^3/s (including forecast).
				Strategy W1A and Strategy W1B; and Strategy S2 (Lake level greater than 67.25m, maximum release 110m^3/s)
				• Peak inflows into the Brisbane River from Lockyer Creek were estimated to be in the order of 400m^3/s. These flows would not inundate Colleges Crossing until the morning of 7 Jan 2011.
				• Lake level was not expected to reach 67.50m (Strategy W1B) until 7 Jan 2011. Lake level may not exceed 68.5m.
				• Endeavoured to keep Colleges Crossing trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175m^3/s.
				• Water was held in Wivenhoe Dam in an attempt to keep Colleges Crossing trafficable in accordance with Strategy W1A. Low level releases continued from the Mini-Hydro at this time and at various stages during the Event. However, these releases (in the order of 13m^3/s) have low relative significance and are not referred to specifically in the remainder of this summary document.
				• In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge. The low level sluices were kept closed. Some regulator releases continued from December as part of previous event drain down (in the order of 35m^3/s), and these were shut down at 18:00 on 7 Jan 2011.

January 2011 Flood Event – Period 2 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Friday 07 Jan 2011 02:00
 	
Completed Friday 07 Jan 2011 09:00
	Strategy W1B and Strategy S2
	• Transitioned from Strategy W1A to W1B due to the Wivenhoe lake level exceeding 67.50m.
	• Transitioned from Strategy W1B to W1C once the Wivenhoe lake level exceeded 67.75m.
	• Colleges Crossing was inundated by natural river flows during this period.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 64mm;
		• Somerset Dam 60mm;
		• Lockyer Creek 57mm;
		• Bremer River 60mm.
		
		Wivenhoe Dam level rose from 67.52m to 67.75m over the seven-hour period.
		
		Somerset Dam level rose from 99.55m to 99.65m over the seven-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 11mm;
			  • Somerset Dam 16mm;
			  • Lockyer Creek 4mm;
			  • Bremer River 6mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 6 Jan 2011 was 25mm.
			• Estimated peak Wivenhoe Dam level: 68.2m (excluding forecast); 68.5m (including forecast).
			• Estimated peak Somerset Dam level: 99.8m (excluding forecast); 100.2m (including forecast).
			• Estimated total Dam inflow: 242,000ML (excluding forecast); 380,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 470m^3/s (excluding forecast); 670m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 570m^3/s (excluding forecast); 970m^3/s (including forecast).
			• Estimated peak Wivenhoe Dam outflow: 1,220m^3/s (excluding forecast); 1,250m^3/s (including forecast).
				Strategy W1B and Strategy S2 (Lake level greater than 67.50m, maximum release 380m^3/s)
				• Endeavoured to keep Burtons Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430m^3/s.
				• Peak inflows into the Brisbane River from Lockyer Creek were estimated to be in the order of 470m^3/s. These flows may not be sufficient to inundate Burtons Bridge.
				• Lake level was not expected to reach 67.75m (Strategy W1C) for at least six hours. Lake level may not exceed 68.5m.
				• Water was held in Wivenhoe Dam in an attempt to keep Burtons Bridge trafficable, in accordance with Strategy W1B.
				• In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge, and the low level regulators and sluices at Somerset Dam were kept closed.

January 2011 Flood Event – Period 3 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Friday 07 Jan 2011 09:00
 	
Completed Friday 07 Jan 2011 15:00
	Strategy W1C and Strategy S2
	• At around 09:00, it became apparent flows from Lockyer Creek into the Brisbane River, combined with local Brisbane River inflows downstream of Wivenhoe Dam, would be sufficient to inundate all bridges below the Dam, with the exception of Mt Crosby Weir Bridge and Fernvale Bridge. Burtons Bridge was inundated by natural river flows near the end of this period.
	• All impacted Councils were notified of the situation and that releases would commence from Wivenhoe Dam. Releases were timed to occur at 15:00 to allow bridges to be closed and arrangements to be made to cater for rural community isolation. The impacted rural communities had been isolated over the Christmas period and time was needed for suitable arrangements to be made to allow these communities to prepare for another potentially extended period of isolation. Releases were timed to start in accordance with the Manual requirements of keeping Burtons Bridge and Kholo Bridge open to traffic when operating under Strategy W1C.
	• Transitioned from Strategy W1C to Strategy W1D once the Wivenhoe Dam lake level exceeded 68.0m.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 89mm;
		• Somerset Dam 90mm;
		• Lockyer Creek 71mm;
		• Bremer River 71mm.
		
		Wivenhoe Dam level rose from 67.75m to 68.03m over the six-hour period.
		
		Somerset Dam level rose from 99.65m to 99.94m over the six-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 25mm;
			  • Somerset Dam 30mm;
			  • Lockyer Creek 14mm;
			  • Bremer River 11mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 7 Jan 2011 was 25mm.
			• Estimated peak Wivenhoe Dam level: 68.4m (excluding forecast); 68.9m (including forecast).
			• Estimated peak Somerset Dam level: 100.3m (excluding forecast); 100.6m (including forecast).
			• Estimated total Dam inflow: 346,000ML (excluding forecast); 483,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 530m^3/s (excluding forecast); 710m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 660m^3/s (excluding forecast); 1,040m^3/s (including forecast).
			• Estimated peak Wivenhoe Dam outflow: 1,240m^3/s (excluding forecast); 1,270m^3/s (including forecast).
				Strategy W1C
				(Lake level greater than 67.75m, maximum release 500m^3/s)
				• Due to the further rain and observed stream rises, it became apparent flows from Lockyer Creek into the Brisbane River, combined with local Brisbane River inflows downstream of Wivenhoe Dam, would be sufficient to inundate all bridges downstream of the Dam, with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge.
				• Releases from Wivenhoe Dam were managed in an attempt to ensure Mt Crosby Weir Bridge and Fernvale Bridge remained trafficable, in accordance with Strategies W1D and W1E.
				• In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge, and the low level regulators and sluices at Somerset Dam were kept closed.

January 2011 Flood Event – Period 4 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Friday 07 Jan 2011 15:00
 	
Completed Saturday 08 Jan 2011 14:00
	Transition from Strategy W1D to W1E to W3; and Strategy S2 Wivenhoe Directives #1 to #4. Somerset Directives #1 to #3.
	
	• Gates opened continuously at Wivenhoe Dam for 23 hours, in accordance with standard gate opening sequence at a rate of 0.5m of individual gate opening per hour.
	• Transitioned from Strategy W1D to W1E when the Wivenhoe Dam level exceeded 68.25m (22:00 on 7 Jan 2011).
	• Transitioned from Strategy W1E to W3 as it became apparent Wivenhoe Dam level would exceed 68.50m (08:00 on 8 Jan 2011). Strategy W2 was by-passed as it was not possible to achieve this strategy by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. This is because the calculated naturally occurring peaks at Lowood and Moggill were 530m^3/s and 770m^3/s respectively, whereas the release rate from the Dam was already 940m^3/s. Limiting releases to these naturally occurring peak flows would also have compromised the Dam drain down requirements.
	• At 14:00 on 8 Jan 2011, Wivenhoe Dam discharge was 1,239m^3/s. All rural bridges below the Dam, with the exception of Mt Crosby Weir Bridge and Fernvale Bridge, were flooded.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		
		• Wivenhoe Dam 92mm;
		• Somerset Dam 95mm;
		• Lockyer Creek 72mm;
		• Bremer River 72mm.
		
		Wivenhoe Dam level rose from 68.03m to 68.61m over the 23-hour period.
		
		Somerset Dam level rose from 99.94m to 100.44m over the 23-hour period.
			• Catchment average rainfalls during this period were:
			  ◦ Wivenhoe Dam 3mm;
			  ◦ Somerset Dam 5mm;
			  ◦ Lockyer Creek 1mm;
			  ◦ Bremer River 1mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 8 Jan 2011 was 40mm.
			• Estimated peak Wivenhoe Dam level: 68.7m (excluding forecast); 69.1m (including forecast).
			• Estimated peak Somerset Dam level: 100.5m (excluding forecast); 100.6m (including forecast).
			• Estimated total Dam inflow: 420,000ML (excluding forecast); 662,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 530m^3/s (excluding forecast); 530m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 770m^3/s (excluding forecast); 940m^3/s (including forecast). This first peak was estimated to have occurred at 05:00 on 8 Jan 2011.
			• Estimated peak Wivenhoe Dam outflow: 1,480m^3/s (excluding forecast); 1,540m^3/s (including forecast).
			• This flow was significantly greater than the calculated natural peak that excluded Wivenhoe Dam releases.
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				
				• Inflows from Lockyer Creek into the Brisbane River had inundated all bridges downstream of the Dam, with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge.
				• The strategy transitioned from W1 to W3 as it became apparent Wivenhoe Dam level was likely to exceed 68.5m and Strategy W2 couldn't be applied.
				• Strategy W3 required the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved.
				• Strategy W3 also required lower level Manual objectives to be considered. Therefore, consideration was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. There was also awareness Wivenhoe Dam outflows were already more than doubling the natural peak flow at Moggill.
				• Due to rainfall on the ground, it was apparent the Somerset Dam level would exceed 100.45m. Accordingly, two sluice gates were opened during this period to allow Dam levels to move towards the Operating Target Line in accordance with Strategy S2.

January 2011 Flood Event – Period 5 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Saturday 08 Jan 2011 14:00
 	
Completed Sunday 09 Jan 2011 01:00
	Strategy W3 and Strategy S2
	• Releases maintained from both Wivenhoe and Somerset Dams to ensure Mt Crosby Weir Bridge and Fernvale Bridge remained trafficable.
	• No change to gate settings over this period. Wivenhoe Dam discharge was 1,240m^3/s. All rural bridges below the Dam, with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge, were flooded.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 100mm;
		• Somerset Dam 111mm;
		• Lockyer Creek 75mm;
		• Bremer River 75mm.
		
		Wivenhoe Dam level rose very slightly from 68.61m to 68.63m over the 13-hour period.
		
		Somerset Dam level fell from 100.44m to 100.32m over the 13-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 8mm;
			  • Somerset Dam 16mm;
			  • Lockyer Creek 3mm;
			  • Bremer River 3mm.
			• Forecasted 24-hour catchment average rainfall at 16:00 on 8 Jan 2011 was 40mm.
			• Estimated peak Wivenhoe Dam level: 68.7m (excluding forecast); 68.9m (including forecast).
			• Estimated peak Somerset Dam level: 100.5m (excluding forecast); 100.6m (including forecast).
			• Estimated total Dam inflow: 457,000ML (excluding forecast); 697,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 530m^3/s (excluding forecast); 530m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 770m^3/s (excluding forecast); 840m^3/s (including forecast). This first peak was estimated to have occurred at 05:00 on 8 Jan 2011.
			• Estimated peak Wivenhoe Dam outflow: 1,480m^3/s (excluding forecast); 1,520m^3/s (including forecast). This flow was significantly greater than the calculated natural peak that excluded Wivenhoe Dam releases.
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Strategy W3 required the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved.
				• Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels rising slightly (Wivenhoe Dam) and falling (Somerset Dam) consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.
				• Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m^3/s would have meant transitioning back to operating Strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.
				• With the Somerset Dam level still expected to exceed 100.45m, and the level in Wivenhoe Dam remaining relatively static, releases from Somerset Dam continued. Closing of the sluices would have resulted in Dam levels quickly moving under the Operating Target Line, requiring sluice re-opening within a short period.

January 2011 Flood Event – Period 6 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Sunday 09 Jan 2011 01:00
 	
Completed Sunday 09 Jan 2011 08:00
	Strategy W3 and Strategy S2 Wivenhoe Directives #5 to #7.
	• Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer Creek peak while ensuring Mt Crosby Weir Bridge and Fernvale Bridge remained trafficable.
	• Wivenhoe Dam discharge increased from 1,240m^3/s to 1,334m^3/s between 01:00 and 05:00 during this period.
	• There were no changes to Somerset Dam gate settings over this period.
	• All rural bridges below the Dam, with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge, were flooded.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 112mm;
		• Somerset Dam 146mm;
		• Lockyer Creek 76mm;
		• Bremer River 75mm.
		
		Wivenhoe Dam level fell from 68.63m to 68.56m over the seven-hour period.
		
		Somerset Dam level fell from 100.32m to 100.28m over the seven-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 12mm;
			  • Somerset Dam 35mm;
			  • Lockyer Creek 1mm;
			  • Bremer River 0mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 8 Jan 2011 was 40mm.
			• Estimated peak Wivenhoe Dam level: 68.7m (excluding forecast); 69.3m (including forecast).
			• Estimated peak Somerset Dam level: 100.5m (excluding forecast); 101.0m (including forecast).
			• Estimated total Dam inflow: 569,000ML (excluding forecast); 814,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 530m^3/s (excluding forecast); 530m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 770m^3/s (excluding forecast); 780m^3/s (including forecast). This first peak was estimated to have occurred at 05:00 on 8 Jan 2011.
			• Estimated peak Wivenhoe Dam outflow: 1,500m^3/s (excluding forecast); 1,560m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe Dam releases.
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Strategy W3 required the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved.
				• Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels falling at both Dams, consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.
				• Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m^3/s would have meant transitioning back to operating Strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.
				• With the Somerset Dam level still expected to exceed 100.45m, and the level in Wivenhoe Dam falling, releases from Somerset Dam continued. Closing of the sluices would have resulted in dam levels quickly moving under the Operating Target Line, requiring sluice re-opening within a short period, particularly given the rainfall that occurred in the Somerset Dam catchment during this period.

January 2011 Flood Event – Period 7 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Sunday 09 Jan 2011 08:00
 	
Completed Sunday 09 Jan 2011 14:00
	Strategy W3 and Strategy S2 Wivenhoe Directives #7. Somerset Directives #4 to #5.
	• Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer Creek peak while ensuring Mt Crosby Weir Bridge and Fernvale Bridge remained trafficable.
	• Wivenhoe Dam discharge increased from 1,334m^3/s to 1,386m^3/s.
	• Somerset Dam sluice gates opened progressively over this period to allow Dam levels to move towards the Operating Target Line, in accordance with Strategy S2.
	• All rural bridges below the Dam, with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge, were flooded.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 146mm;
		• Somerset Dam 199mm;
		• Lockyer Creek 94mm;
		• Bremer River 90mm.
		
		Wivenhoe Dam level rose very slightly from 68.56m to 68.58m over the six-hour period.
		
		Somerset Dam level rose from 100.28m to 100.47m over the six-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 34mm;
			  • Somerset Dam 53mm;
			  • Lockyer Creek 18mm;
			  • Bremer River 15mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 9 Jan 2011 was 50mm.
			• Estimated peak Wivenhoe Dam level: 70.0m (excluding forecast); 71.3m (including forecast).
			• Estimated peak Somerset Dam level: 100.7m (excluding forecast); 101.1m (including forecast).
			• Estimated total Dam inflow: 804,000ML (excluding forecast); 1,108,000ML (including forecast).
			• Estimated peak flow at Lowood excluding Wivenhoe Dam releases: 530m^3/s (excluding forecast); 690m^3/s (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 770m^3/s (excluding forecast); 1,210m^3/s (including forecast). This first peak was estimated to have occurred at 05:00 on 8 Jan 2011.
			• Estimated peak Wivenhoe Dam outflow: 1,490m^3/s (excluding forecast); 1,560m^3/s (including forecast). This flow was significantly greater than the calculated natural peak that excluded Wivenhoe Dam releases.
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• At 11:00, using the BoM rainfall forecasts, an assessment (see Appendix K) showed the lower limit of three-day forecast inflow to be similar to the October 2010 flood event, with the upper limit similar to the February 1999 flood event. This assessment supported consideration remaining on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable as this was the approach used during both the October 2010 the February 1999 flood events.
				• However by 14:00, it was noted that the estimated total Dam inflow of 1,108,000ML (including forecast) – had never previously been exceeded on a full dam, with the previous largest volumes being 870,000ML in April 1989 and 925,000 in February 1999. Although the inflow estimate of 1,108,000ML was based on a forecast, it resulted in an expectation that if rainfall continued there may be a need within the next six hours to transition to a situation where minimising disruption to downstream rural life was no longer considered. This would result in the closure of all bridges between the Dam and Moggill, the closure of the Brisbane Valley Highway and the further isolation of rural communities.
				• With Dam levels under the Operating Target Line at the end of this period, releases continued from Somerset Dam.

January 2011 Flood Event – Period 8 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Sunday 09 Jan 2011 14:00
 	
Completed Sunday 09 Jan 2011 19:00
	Strategy W3 and Strategy S2
	• During this period, releases continued from both Dams at a level that ensured Mt Crosby Weir Bridge and Fernvale Bridge remained trafficable. Gate settings were unchanged and the Wivenhoe Dam discharge was 1,411m^3/s.
	• Due to rainfall on the ground and the modelled rapid lake level rises, a decision was made to focus on protecting urban areas from inundation at 19:00.
	• Councils, the Dam Safety Regulator and Seqwater's CEO were notified of the decision soon after 19:00. The ramifications of the decision were that the new estimated peak flow at Moggill of 3,300m^3/s would impact properties and begin to damage urban areas below Moggill. Brisbane City Council damage tables indicated at flows of 3,000m^3/s, damage costs would exceed $5.0 million and 2,600 properties would be impacted in some way. The level of impact would increase significantly as flows increased and therefore the focus was on minimising the flow at Moggill.
	• A decision was made at 19:00 to staff the Flood Operations Centre with at least two Duty Engineers at all times until the peak of the Event had occurred.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 208mm;
		• Somerset Dam 305mm;
		• Lockyer Creek 116mm;
		• Bremer River 96mm.
		
		Wivenhoe Dam level rose from 68.58m to 68.97m over the five-hour period.
		
		Somerset Dam level rose from 100.47m to 101.43m over the five-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 62mm;
			  • Somerset Dam 106mm;
			  • Lockyer Creek 22mm;
			  • Bremer River 6mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 9 Jan 2011 was 65mm.
			• Estimated peak Wivenhoe Dam level:
			72.1m (excluding forecast);
			73.9m (including forecast).
			• Estimated peak Somerset Dam level:
			102.3m (excluding forecast);
			103.0m (including forecast).
			• Estimated total Dam inflow:
			1,272,000ML (excluding forecast);
			1,712,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases:
			770m^3/s (excluding forecast);
			1,940m^3/s (including forecast).
			This first peak was estimated to have occurred at 05:00 on 8 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe Dam releases:
			3,300m^3/s (excluding forecast);
			4,400m^3/s (including forecast).
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Lake levels were starting to rise quickly at both dams, and combined with heavy rain in the Dam catchments during this period, it was decided at the end of the period to no longer consider minimising disruption to downstream rural life and to focus only on protecting urban areas from inundation.
				• Towards the end of this period, it also became apparent Moggill was likely to experience a second naturally occurring peak on 10 Jan 2011 or later. The Manual required the flow at Moggill to be minimised prior to this peak occurring. This requirement competed with the need to protect urban areas by not allowing the Wivenhoe Dam to reach a level that invoked Strategy W4 (the strategy focused on protecting the structural safety of the Dam). It was decided the best course of action was to increase releases as quickly as possible to the limit of non-damaging flows at Moggill. However, before this could occur, Councils needed to be advised, bridges needed to be closed and actions needed to be taken to prepare rural communities for isolation and urban areas below Moggill for river flows approaching 3,500m^3/s.
				• With Dam levels under the Operating Target Line during this period, releases continued from Somerset Dam.

January 2011 Flood Event – Period 9 of 20

Date/time	Background	Dam conditions	Rainfall and model results	Strategy

Commenced Sunday 09 Jan 2011 19:00
 	
Completed Monday 10 Jan 2011 01:00
	Strategy W3 and Strategy S2
	• Agency notifications commenced at 19:00. Brisbane City Council, the Dam Safety Regulator and Seqwater's CEO were advised the likely peak flow at Moggill would exceed 3,000m^3/s.
	• Brisbane City Council damage tables indicated, at flows of 3,000m^3/s, damage costs would exceed $5.0 million and 2,600 properties would be impacted in some way. The level of impact would increase significantly as flows increased, and therefore the focus was on minimising the flow at Moggill.
	• Fernvale Bridge was closed by police at approximately 01:00 on 10 Jan 2011. A directive was issued to increase releases from Wivenhoe Dam.
	• Gate settings did not change over this period due to the potential danger to the public associated with inundating Fernvale Bridge from Wivenhoe Dam outflows prior to the bridge being closed to traffic. Councils also required time to prepare for the isolation of rural communities, the onset of urban damage below Moggill and to undertake any necessary evacuations. Wivenhoe Dam discharge was 1,473m^3/s. All rural bridges below the Dam, with the exception of Mt Crosby Weir Bridge and Fernvale Bridge, were flooded.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 232mm;
		• Somerset Dam 343mm;
		• Lockyer Creek 131mm;
		• Bremer River 102mm.
		
		Wivenhoe Dam level rose from 68.97m to 69.9m over the six-hour period.
		
		Somerset Dam level rose from 101.43m to 102.54m over the six-hour period.
			• Catchment average rainfalls during this period were:
			  ◦ Wivenhoe Dam 24mm;
			  ◦ Somerset Dam 38mm;
			  ◦ Lockyer Creek 15mm;
			  ◦ Bremer River 6mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 9 Jan 2011 was 65mm.
			• Estimated peak Wivenhoe Dam level:
			72.9m (excluding forecast);
			74.7m (including forecast).
			• Estimated peak Somerset Dam level:
			102.9m (excluding forecast);
			103.4m (including forecast).
			• Estimated total Dam inflow:
			1,468,000ML (excluding forecast);
			1,922,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases:
			820m^3/s (excluding forecast);
			2,000m^3/s (including forecast).
			This second peak was estimated to occur at 16:00 on 10 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe Dam releases:
			3,240m^3/s (excluding forecast);
			4,480m^3/s (including forecast).
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Consideration now focused on protecting urban areas from inundation. However, before releases were increased to and above the limit of non-damaging floods at Moggill, Councils and other impacted agencies were notified so appropriate actions could be taken, including any necessary evacuations and the closure of the Mt Crosby Weir Bridge and Fernvale Bridge.
				• The Manual requires the flow at Moggill to be minimised prior to its naturally occurring peak. This requirement was balanced against the need to protect urban areas by releasing water from the Dams in an attempt to keep the Wivenhoe Dam lake below a level that would invoke Strategy W4. Based on an estimated 16-hour travel time between the Dam and Moggill, the flow at Moggill was minimised prior to its naturally occurring peak.
				• With Dam levels under the Operating Target Line during this period, releases continued from Somerset Dam.
				• Although there was a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy was not to release flows that would cause high level urban inundation until it was certain it could not be avoided. Model results continued to indicate this was possible.

January 2011 Flood Event – Period 10 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Monday 10 Jan 2011 01:00
 	
Completed Monday 10 Jan 2011 09:00
	Strategy W3 and Strategy S2 Wivenhoe Directives #8 to #10.
	• Gates opened continuously at Wivenhoe Dam for eight hours in accordance with standard gate opening sequence at a rate of 0.5m of individual gate opening per hour.
	• Wivenhoe Dam discharge increased from 1,473m^3/s to 2,015m^3/s. All rural bridges below the Dam were flooded.
	• Further gate openings at Wivenhoe Dam were paused at 09:00 in an attempt to allow the Lockyer Creek and Bremer River peaks to pass Moggill, and to restrict Brisbane River flows at Moggill to 3,500m^3/s. This approach was adopted following discussions with Brisbane City Council that advised a flow of 3,500m^3/s at Moggill would fully submerge 322 properties and impact 7,000 properties.
	• No gate movements occurred at Somerset Dam during this period, with Dam levels plotting under the Operating Target Line. This meant the only gate movements allowable at Somerset Dam under Strategy S2 would be openings, and these did not happen to limit further rises in Wivenhoe Dam.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 244mm;
		• Somerset Dam 373mm;
		• Lockyer Creek 143mm;
		• Bremer River 120mm.
		
		Wivenhoe Dam level rose from 69.97m to 71.56m over the eight-hour period.
		
		Somerset Dam level rose from 102.54m to 103.08m over the eight-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 12mm;
			  • Somerset Dam 30mm;
			  • Lockyer Creek 12mm;
			  • Bremer River 18mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 9 Jan 2011 was 65mm.
			• Estimated peak Wivenhoe Dam level:
			72.9m (excluding forecast);
			74.5m (including forecast).
			• Estimated peak Somerset Dam level:
			103.1m (excluding forecast);
			103.5m (including forecast).
			• Estimated total Dam inflow:
			1,531,000ML (excluding forecast);
			1,985,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases:
			1,090m^3/s (excluding forecast);
			2,090m^3/s (including forecast).
			This second peak was estimated to occur at 16:00 on 10 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe releases:
			3,420m^3/s (excluding forecast);
			4,680m^3/s (including forecast).
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Consideration was given to protecting urban areas from inundation and minimising urban damage.
				• Due to advice received from Brisbane City Council that a flow of 3,500m^3/s at Moggill would fully submerge 322 properties and impact 7,000 properties, an attempt was made to remain below this flow level.
				• The approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s and protect urban areas from inundation, was adopted. Advice received from Brisbane City Council that the upper limit of non-damaging floods was below the 4,000m^3/s stated in the Manual was noted and taken into account in the decision making processes.
				• With Dam levels under the Operating Target Line during this period, releases continued from Somerset Dam.
				• Although there was full awareness of the rainfall forecasts and associated potential flood impacts, the strategy was not to release flows that would cause high level urban inundation until it was certain it could not be avoided. Model results continued to indicate this was possible.

January 2011 Flood Event – Period 11 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Monday 10 Jan 2011 09:00
 	
Completed Monday 10 Jan 2011 15:00
	Strategy W3 and Strategy S2
	• Gate settings at Wivenhoe Dam did not change over this period. Wivenhoe Dam discharge was 2,087m^3/s. All rural bridges below the Dam were flooded.
	• At 15:00, the attempt to restrict Brisbane River flows at Moggill to 3,500m^3/s was abandoned due to rainfall in the Dam catchments. A new target of 4,000m^3/s was set in accordance with the Manual, on the basis that Strategy W3 intends to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s and minimise urban damage.
	• Gate movements at Somerset Dam did not change during this period, with Dam levels plotting under the Operating Target Line. This meant the only gate movements allowable at Somerset Dam under Strategy S2 would be openings and these were not done to limit further rises in Wivenhoe Dam.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 274mm;
		• Somerset Dam 407mm;
		• Lockyer Creek 169mm;
		• Bremer River 149mm.
		
		Wivenhoe Dam level rose from 71.56m to 72.54m over the six-hour period.
		
		Somerset Dam level rose from 103.08m to 103.43m over the six-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 30mm;
			  • Somerset Dam 34mm;
			  • Lockyer Creek 27mm;
			  • Bremer River 29mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 10 Jan 2011 was 75mm.
			• Estimated peak Wivenhoe Dam level: 73.6m (excluding forecast); 75.2m (including forecast).
			• Estimated peak Somerset Dam level: 103.4m (excluding forecast); 103.7m (including forecast).
			• Estimated total Dam inflow: 1,708,000ML (excluding forecast); 2,162,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 1,500m^3/s (excluding forecast); 2,570m^3/s (including forecast). This second peak was estimated to occur at 20:00 on 10 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe Dam releases: 3,910m^3/s (excluding forecast); 5,180m^3/s (including forecast).
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Consideration focused on protecting urban areas from inundation and minimising urban damage.
				• It was decided at 15:00 that it was not possible to restrict Brisbane River flows at Moggill to 3,500m^3/s, accordingly a new target flow of 4,000m^3/s at Moggill was adopted. Based on information supplied by the Brisbane City Council, a flow of 4,000m^3/s at Moggill would result in damages of $47.0 million, however, this could not be avoided without putting the safety of the Dams at risk.
				• Continued to follow the approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s.
				• With Dam levels under the Operating Target Line during this period, releases continued from Somerset Dam.
				• Although there was full awareness of the rainfall forecasts and associated potential flood impacts, the strategy was not to release flows that would cause high level urban inundation until it was certain it could not be avoided. Model results continued to indicate this may be possible.

January 2011 Flood Event – Period 12 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Monday 10 Jan 2011 15:00
 	
Completed Monday 10 Jan 2011 20:00
	Strategy W3 and Strategy S2 Wivenhoe Directive #11.
	• Gates opened continuously at Wivenhoe Dam for five hours in line with standard gate opening sequence, at a rate of 1.0m of individual gate opening per hour. Wivenhoe discharge increased from 2,087m^3/s to 2,695m^3/s.
	• In accordance with the Manual, a target of 4,000m^3/s at Moggill was set, on the basis of the intent of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s and minimise urban damage.
	• Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer Creek and Bremer River peaks to pass Moggill and to restrict Brisbane River flows at Moggill to 4,000m^3/s.
	• No gate movements occurred at Somerset Dam during this period, with Dam levels plotting under the Operating Target Line. This limited further rises in Wivenhoe.
	• Initial advice on a major flash flood originating in the Lockyer headwaters was received from the BoM at 17:32. No volume or flow details were available and gauges in the area were not indicating a significant event. The event would not impact on the Brisbane River for 24 hours.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 279mm;
		• Somerset Dam 415mm;
		• Lockyer Creek 174mm;
		• Bremer River 153mm.
		
		Wivenhoe Dam level rose from 72.53m to 73.06m over the five-hour period.
		
		Somerset Dam level rose from 103.43m to 103.45m over the five-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 5mm;
			  • Somerset Dam 8mm;
			  • Lockyer Creek 5mm;
			  • Bremer River 4mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 10 Jan 2011 was 38mm.
			• Estimated peak Wivenhoe level: 73.6m (excluding forecast); 74.3m (including forecast).
			• Estimated peak Somerset level: 103.5m (excluding forecast); 103.5m (including forecast).
			• Estimated total Dam inflow: 1,731,000ML (excluding forecast); 1,982,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases: 1,500m^3/s (excluding forecast); 1,840m^3/s (including forecast). This second peak was estimated to occur at 20:00 on 10 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe Dam releases: 3,980m^3/s (excluding forecast); 4,470m^3/s (including forecast).
			• The extreme rainfall that occurred in Lockyer Creek catchment during this period was not recorded in the rain gauges in the catchment, and was not indicated on the BoM weather radar.
				Strategy W3 and Strategy S2 (Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Consideration focused on protecting urban areas from inundation and minimising urban damage.
				• The target maximum flow at Moggill was now 4,000m^3/s. The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s, continued to be followed.
				• With Dam levels under the Operating Target Line during this period, Somerset Dam releases continued.
				• The reduced rainfall forecast justified retaining the target of 4,000m^3/s at Moggill, while the Wivenhoe Dam peak of 74.3m (including forecast) indicated it may be possible to keep urban damage within tolerable limits. At the end of this period it was decided to initiate discussions with the Dam Safety Regulator to request permission to exceed a level of 74.0m in Wivenhoe Dam for a short period (maximum 12 hours) without invoking Strategy W4, provided the safety of the Dam could be guaranteed and urban damage reduced.
				• The strategy continued to be not releasing flows that would cause high level urban inundation until it was certain it could not be avoided. Model results continued to indicate this was possible.

January 2011 Flood Event – Period 13 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Monday 10 Jan 2011 20:00
 	
Completed Tuesday 11 Jan 2011 04:00
	Strategy W3 and Strategy S2
	• Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to restrict flows at Moggill to close to 4,000m^3/s. There were no changes to gate settings at Wivenhoe Dam over this period. The Dam discharge was 2,726m^3/s.
	• In accordance with the Manual, a target flow of 4,000m^3/s at Moggill was set on the basis of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s. However, Brisbane City Council damage tables indicated this would still impact 5,325 properties and cause damage exceeding $47.0 million.
	• At 17:32, initial advice was provided about a significant flash flood originating in the Lockyer Creek headwaters. Details were received at 20:00. The focus was on developing strategies to manage these potential flows, however, as any strategy would involve significantly reducing outflows from Wivenhoe Dam, the strategies were not adopted.
	• During this period, the plotted Dam levels drifted just above the Operating Target Line. This lead to a decision at 04:00 to start closing down releases from Somerset Dam to limit further rises in Wivenhoe Dam.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 323mm;
		• Somerset Dam 437mm;
		• Lockyer Creek 186mm;
		• Bremer River 167mm.
		
		Wivenhoe Dam level rose from 73.06m to 73.40m over the eight-hour period.
		
		Somerset Dam level fell from 103.45m to 103.23m over the eight-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 44mm;
			  • Somerset Dam 22mm;
			  • Lockyer Creek 12mm;
			  • Bremer River 14mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 10 Jan 2011 was 38mm.
			• Estimated peak Wivenhoe level: 74.1m (excluding forecast); 74.9m (including forecast).
			• Estimated peak Somerset level: 103.5m (excluding forecast); 103.7m (including forecast).
			• Estimated total Dam inflow: 2,016,000ML (excluding forecast); 2,267,000ML (including forecast).
			• Estimated peak flow at Moggill excluding Wivenhoe Dam releases:
			1,500m^3/s (excluding forecast);
			1,810m^3/s (including forecast).
			This second peak was estimated to have occurred at 20:00 on 10 Jan 2011.
			• Estimated peak flow at Moggill including Wivenhoe Dam releases:
			4,040m^3/s (excluding forecast);
			4,540m^3/s (including forecast).
				Strategy W3 and Strategy S2
				(Lake level greater than 68.50m, maximum release 4,000m^3/s)
				• Consideration focused on protecting urban areas from inundation and minimising urban damage. The target maximum flow at Moggill remained 4,000m^3/s. The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s, continued to be followed.
				• Model results showed a peak level in the Dam close to 74.0m was possible, but appeared increasingly unlikely.
				• With Dam levels moving above the Operating Target Line during this period, it was decided to begin closing down releases from Somerset Dam to limit further rises in Wivenhoe Dam.
				• Although there was full awareness of the rainfall forecasts and associated potential flood impacts, the strategy was not to release flows that would cause high level urban inundation until it was certain it could not be avoided. Model results continued to indicate this was possible, however, as rainfall continued, the strategy was reviewed each hour. At 21:00, the Dam Safety Regulator was asked for permission to exceed a level of 74.0m in Wivenhoe Dam for a short period (maximum 12 hours) without invoking Strategy W4, provided the safety of the Dam could be guaranteed. The Regulator agreed with this approach and provided permission. This issue was considered carefully during the period in view of the continued rainfall.

January 2011 Flood Event – Period 14 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Tuesday 11 Jan 2011 04:00
 	
Completed Tuesday 11 Jan 2011 08:00
	Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.
	
	• Extreme intense rainfall (estimated after the Event to possibly exceed **1 in 2,000 year intensities**) commenced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located further east or south, it may have been possible to avoid transition to Strategy W4.
	
	• Because the extreme intense rainfall was occurring on and close to the Dam rather than in the northern areas of the Dam catchment, response time was minimised and quick action was needed to protect the safety of the Dam. Accordingly, at 08:00, a decision was made to transition to Strategy W4 where the primary consideration was the safety of the Dam and significant urban damage could not be avoided. The Dam Safety Regulator, Seqwater's CEO and the Councils were advised.
	
	• Gate settings were not changed at Wivenhoe Dam over this period. Wivenhoe Dam discharge was 2,832m^3/s.
	
	• Sluice gate openings at Somerset Dam were reduced from five to two as the plotted dam levels had drifted just above the Operating Target Line.
		Total rainfall from 08:00 on 6 Jan2011 to the end of this period:
		
		• Wivenhoe Dam 356mm;
		• Somerset Dam 483mm;
		• Lockyer Creek 240mm;
		• Bremer River 183mm.
		
		Wivenhoe Dam level rose from 73.40m to 73.70m over the four-hour period.
		
		Somerset Dam level rose from 103.23m to 103.46m over the four-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 33mm;
			  • Wivenhoe Dam (local) 78mm;
			  • Somerset Dam 46mm;
			  • Lockyer Creek 54mm;
			  • Bremer River 16mm.
			
			• Forecast 24-hour catchment average rainfall at 16:00 on 10 Jan 2011 was 38mm.
			
			• Estimated peak Wivenhoe level: 74.5m (excluding forecast); 75.1m (including forecast).
			
			• Estimated peak Somerset Dam level: 103.9m (excluding forecast); 104.2m (including forecast).
			
			• Estimated total Dam inflow: 2,210,000ML (excluding forecast); 2,460,000ML (including forecast).
			
			• Estimated peak flow at Moggill including Wivenhoe Dam releases: 5,870m^3/s (excluding forecast).
				Strategy W4 and Strategy S2 (Lake level predicted to exceed 74.00m, no maximum release rate)
				
				• At 08:00, model results showed restricting the peak level in the Dam close to 74.0m was no longer possible due to the high intensity rainfall experienced over this period.
				
				• At 08:00, it was decided to transition to Strategy W4 and the Dam Safety Regulator, Seqwater's CEO and Councils were advised. It was now apparent significant urban damage resulting from releases from Wivenhoe Dam could not be avoided due to the extreme intense rainfall (estimated after the Event to exceed **1 in 2,000 year intensities**) that commenced on and close to the Wivenhoe Dam lake area during this period.
				
				• As Dam levels moved above the Operating Target Line during this period, releases from Somerset Dam were progressively closed down to limit further rises in Wivenhoe Dam (sluices were closed down at hourly intervals, in accordance with the Manual).

January 2011 Flood Event – Period 15 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Tuesday 11 Jan 2011 08:00
 	
Completed Tuesday 11 Jan 2011 13:00
	Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14. Somerset Directive #7.
	• Extreme intense rainfall (estimated after the Event to exceed 1 in 500 year intensities) continued on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located further east or south, it may have been possible to avoid transition to Strategy W4.
	• Because the extreme intense rainfall was occurring on and close to the Dam rather than in the northern areas of the Dam catchment, response time was minimised and quick action was needed to protect the safety of the Dam. Once Strategy W4 is invoked, the Manual requires the opening of gates in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. Accordingly, gates were opened continuously at Wivenhoe Dam for five hours in accordance with the standard gate opening sequence at an average rate of 2.0m of opening per hour. This increased the Dam discharge from 2,753m^3/s to 4,250m^3/s. The threshold limit for urban damage had been exceeded and the lake level continued to rise.
	• During this period, Somerset Dam sluice gate openings were closed to limit rises in Wivenhoe Dam, in accordance with Strategy S2.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 382mm;
		• Somerset Dam 570mm;
		• Lockyer Creek 287mm;
		• Bremer River 237mm.
		
		Wivenhoe Dam level rose from 73.70m to 74.39m over the five-hour period.
		
		Somerset Dam level rose from 103.46m to 103.83m over the five-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 26mm;
			  • Wivenhoe Dam (local) 85mm;
			  • Somerset Dam 87mm;
			  • Lockyer Creek 47mm;
			  • Bremer River 54mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 11 Jan 2011 was 100mm.
			• A portion of the extreme intense rainfall in the Dam catchment fell in an un-gauged area (e.g. on the lake area) making it difficult for the model to accurately predict lake level rises. Accordingly, operations at Wivenhoe Dam commenced gauge board readings every 30 minutes during this period and relayed this information to the Flood Operations Centre by telephone.
			• Estimated peak Wivenhoe Dam level:
			75.0m (excluding forecast);
			76.2m (including forecast).
			• Estimated peak Somerset Dam level:
			104.8m (excluding forecast);
			105.7m (including forecast).
			• Estimated total Dam inflow is:
			2,506,000ML (excluding forecast);
			3,123,000ML (including forecast).
				Strategy W4 and Strategy S2 (Lake level predicted to exceed 74.00m, no maximum release rate)
				• The strategy was to protect the structural safety of the Dam.
				• The Manual requires actions under Strategy W4 to ensure Wivenhoe Dam gate openings occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall.
				• The Dam level continued to rise at 13:00. During this period, a Dam Operator relayed Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four Duty Engineers were present in the Flood Operations Centre and flood operations decisions were made every half hour upon receipt of the gauge board readings and following a collective discussion.
				• With Dam levels above the Operating Target Line during this period, releases from Somerset Dam were closed down (all sluices closed at 10:00) to limit further rises in Wivenhoe Dam.

January 2011 Flood Event – Period 16 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Tuesday 11 Jan 2011 13:00
 	
Completed Tuesday 11 Jan 2011 19:00
	Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14.
	• Extreme rapid lake level rises in Wivenhoe Dam continued during this period. The QPF issued at 16:00 was for a catchment average rainfall of 75mm over the next 24 hours.
	• Gates were opened continuously at Wivenhoe Dam for six hours, in accordance with Strategy W4 and the standard gate opening sequence at an average rate of 4.5m of individual gate opening per hour.
	• Wivenhoe Dam discharge was increased from 4,250m^3/s to 7,464m^3/s. Significant damage to urban areas below Moggill could not be avoided. Estimated peak inflow during this period exceeded 12,000m^3/s.
	• No sluice releases were made from Somerset Dam to limit increases in Wivenhoe Dam, in accordance with Strategy S2.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 397mm;
		• Somerset Dam 610mm;
		• Lockyer Creek 325mm;
		• Bremer River 278mm.
		
		Wivenhoe Dam level rose from 74.39m to 74.97m over the six-hour period.
		
		Somerset Dam level rose from 103.83m to 104.60m over the six-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 15mm;
			  • Wivenhoe Dam (local) 35mm;
			  • Somerset Dam 40mm;
			  • Lockyer Creek 38mm;
			  • Bremer River 41mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 11 Jan 2011 was 75mm. However, catchment average rainfall totals this period were:
			  • Wivenhoe Dam 8mm;
			  • Wivenhoe Dam (local) 13mm;
			  • Somerset Dam 19mm;
			  • Lockyer Creek 9mm;
			  • Bremer River 8mm.
			• A portion of the extremely intense rainfall in the Dam catchment fell in an un-gauged area (e.g. on the Dam lake area) making it difficult for the model to accurately predict lake level rises.
			• Estimated peak Wivenhoe Dam level: 75.0m (excluding forecast); 75.2m (including forecast).
			• Estimated peak Somerset Dam level: 105.2m (excluding forecast); 105.9m (including forecast).
			• Estimated total dam inflow: 2,659,000ML (excluding forecast); 3,289,000ML (including forecast).
				Strategy W4 and Strategy S2 (Lake level predicted to exceed 74.00m, no maximum release rate)
				• The strategy was to protect the structural safety of the Dam.
				• The Manual requires actions under Strategy W4 to ensure Wivenhoe Dam gate openings occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall.
				• The lake level in both Dams continued to rise during this period. A Dam operator relayed Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four Duty Engineers were present in the Flood Operations Centre and decisions were made every half hour upon receipt of the gauge board readings.
				• With Dam levels above the Operating Target Line during this period, no sluice releases were made from Somerset Dam to limit further rises in Wivenhoe Dam.
				• The water level in Wivenhoe Dam peaked at 19:00 on 11 Jan 2011 at 74.97m.

January 2011 Flood Event – Period 17 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Tuesday 11 Jan 2011 19:00
 	
Completed Tuesday 11 Jan 2011 21:00
	Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.
	• Gate settings at Wivenhoe Dam did not change over this period. Wivenhoe Dam discharge was 7,458m^3/s.
	• The lake level in Wivenhoe Dam stabilised and then fell slightly at 21:00. At the same time, a decision was made to close down the gates as quickly as possible to reduce urban flood impacts. This decision was made in an attempt to minimise urban damage below Moggill (an objective that has to be considered under Strategy W4). This was considered to be in accordance with the Manual as the Manual states that rapid closure of radial gates is permissible when there is a requirement to reduce downstream flooding. Gates would have been re-opened if further lake level rises were experienced.
	• In accordance with Strategy S2, there were no sluice releases made from Somerset Dam.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 398mm;
		• Somerset Dam 610mm;
		• Lockyer Creek 326mm;
		• Bremer River 278mm.
		
		During this two-hour period, the lake level in Wivenhoe Dam stabilised at 74.97m and then fell slightly to 74.95m at 21:00.
		
		Somerset Dam level rose from 104.60m to 104.78m over the two-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 1mm;
			  • Somerset Dam 0mm;
			  • Lockyer Creek 1mm;
			  • Bremer River 0mm.
			• Forecast 24-hour catchment average rainfall at 16:00 on 11 Jan 2011 was 75mm.
			• A portion of the extreme intense rainfall in the Dam catchment fell in an un-gauged area (e.g. on the Dam lake area) which made it difficult for the model to accurately predict lake level rises.
			• Estimated peak Wivenhoe Dam level:
			75.0m (excluding forecast);
			75.2m (including forecast).
			• Estimated peak Somerset Dam level:
			105.2m (excluding forecast);
			105.9m (including forecast).
			• Estimated total Dam inflow:
			2,659,000ML (excluding forecast);
			3,289,000ML (including forecast).
				Strategy W4 and Strategy S2 (Lake level predicted to exceed 74.00m, no maximum release rate)
				• The strategy was to protect the structural safety of the Dam.
				• The Manual requires actions under Strategy W4 to ensure Wivenhoe Dam gate openings occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall.
				• The Dam level stabilised during this period and then fell slightly at 21:00. A Dam Operator relayed Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four Duty Engineers were present in the Flood Operations Centre and decisions were made every half hour upon receipt of the gauge board readings.
				• With Dam levels above the Operating Target Line during this period, no sluice releases were made from Somerset Dam to limit further rises in Wivenhoe Dam.
				• The water level in Wivenhoe Dam peaked at 19:00 on 11 Jan 2011 at 74.97m.

January 2011 Flood Event – Period 18 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Tuesday 11 Jan 2011 21:00
 	
Completed Wednesday 12 Jan 2011 08:00
	Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.
	• During this period, Wivenhoe Dam gates were closed as quickly as possible without causing rises in the lake level. This was done to reduce urban flood impacts downstream. This decision was made in an attempt to minimise urban damage below Moggill (an objective that must be considered under this strategy).
	• Gates were closed continuously at Wivenhoe Dam for a period of 11 hours in accordance with the standard gate closing sequence, at an average rate of just over 3.6m of individual gate opening per hour.
	• Wivenhoe Dam discharge was decreased from 7,464m^3/s to 2,547m^3/s. All rural bridges below the Dam remained flooded and significant damage to urban areas below Moggill had occurred.
	• No sluice releases were made from Somerset Dam, in accordance with Strategy S2.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 399mm;
		• Somerset Dam 613mm;
		• Lockyer Creek 328mm;
		• Bremer River 279mm.
		
		Wivenhoe Dam level fell from 74.97m to 74.78m over the 11-hour period.
		
		Somerset Dam level rose from 104.78m to 105.11m over the 11-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 1mm
			  • Somerset Dam 3mm;
			  • Lockyer Creek 2m;
			  • Bremer River 1m.
			• Forecast 24-hour catchment average rainfall at 16:00 on 11 Jan 2011 was 75mm.
			• Wivenhoe Dam level peaked at: 74.97m at 19:00 on 11 Jan 2011.
			• Somerset Dam level peaked at: 105.1m at 06:00 on 12 Jan 2011.
			• Estimated total Dam inflow: 2,650,000ML.
				Strategy W4 and Strategy S2 (Lake level predicted to exceed 74.00m, no maximum release rate)
				• The strategy was to protect the structural safety of the Dam.
				• The Manual requires actions under Strategy W4 to ensure Wivenhoe Dam gate openings occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall.
				• As the lake level was falling slightly, a decision was made to quickly reduce releases from Wivenhoe Dam to as low a level as possible, to minimise urban damage below Moggill. This was considered to be in accordance with the Manual as the Manual states that rapid closure of radial gates is permissible when there is a requirement to reduce downstream flooding.
				• It was calculated that reducing to a discharge of 2,547m^3/s from Wivenhoe Dam would:
				  • Not increase the downstream flood peak;
				  • Not cause the water level in Wivenhoe Dam to rise and;
				  • Allow the Dam to be drained back to FSL in seven days, in accordance with the Manual.
				• With Dam levels above the Operating Target Line during this period, no sluice releases were made from Somerset Dam to limit further rises in Wivenhoe Dam.

January 2011 Flood Event – Period 19 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Wednesday 12 Jan 2011 08:00
 	
Completed Thursday 13 Jan 2011 12:00
	Transition from Strategy W4 to the Drain Down Phase
	Somerset Directives #8 to #9.
	• Wivenhoe Dam gate settings did not change over this period. Wivenhoe Dam discharge was 2,534m^3/s and all rural bridges below the Dam remained flooded.
	• Releases from Somerset Dam began during this period as the plotted Dam levels fell below the Operating Target Line. These actions were undertaken in accordance with Strategy S2 and to allow the D'Aguilar Highway to be re-opened as soon as possible. Releases from Somerset Dam continued, even though plotted Dam levels later rose above the Operating Target Line during this period, to allow the Dam to be drained back to FSL in seven days, in accordance with the Manual.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		• Wivenhoe Dam 401mm;
		• Somerset Dam 619mm;
		• Lockyer Creek 330mm;
		• Bremer River 280mm.
		
		Wivenhoe Dam level fell from 74.78m to 74.61m over the 28-hour period.
		
		Somerset Dam level fell from 105.11m to 103.96m over the 28-hour period.
			• Catchment average rainfalls during this period were:
			  • Wivenhoe Dam 2mm;
			  • Somerset Dam 6mm;
			  • Lockyer Creek 2mm;
			  • Bremer River 1mm.
			• Forecast 24-hour catchment average rainfall at 10:00 on 12 Jan 2011 was 10mm.
				Drain Down Phase
				(Stored floodwaters emptied from the Dam in seven days)
				• During this period the strategy transitioned from Strategy W4 (protecting the structural safety of the Dam) to the Drain Down Phase of the Event.
				• Once the Drain Down Phase commenced, the target was to release stored floodwaters from the Dam within seven days of the flood peak passing through the Dams, while controlling downstream impacts. Considerations impacting the duration and timing of the Drain Down Phase in this instance included:
				  • Causing no renewed increases in river levels below the Dam (except where they were unavoidable due to tidal influences);
				  • Maintaining an adequate release rate to ensure temporary pumps providing water supplies to the Lowood area could continue to operate;
				  • Minimising bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested by Brisbane City Council);
				  • Re-opening Brisbane Valley Highway and key rural bridges as quickly as possible;
				  • Achieving FSL in the Dams at the conclusion of the Event.

January 2011 Flood Event – Period 20 of 20				
Date/time	**Background**	**Dam conditions**	**Rainfall and model results**	**Strategy**

Commenced Thursday 13 Jan 2011 12:00
 	
Completed Wednesday 19 Jan 2011 12:00
	Drain Down Phase
	Wivenhoe Directives #35 to #62.
	Somerset Directives #10 to #13.
	
	• During this period, releases from Wivenhoe Dam were increased as the peaks from Lockyer Creek and Bremer River subsided. Downstream impacts were controlled to ensure that, at no time during this phase, downstream water levels rose, except if impacted by tidal influences.
	
	• During this period, stored flood water in Somerset Dam was drained into Wivenhoe Dam in accordance with the drain down target of seven days. Importance was placed on opening the D'Aguilar Highway as soon as possible.
		Total rainfall from 08:00 on 6 Jan 2011 to the end of this period:
		
		• Wivenhoe Dam 415mm;
		• Somerset Dam 626mm;
		• Lockyer Creek 337mm;
		• Bremer River 288mm.
		
		Wivenhoe Dam level fell from 74.61m to 66.89m over the six-day period.
		
		Somerset Dam level fell from 103.96m to 99.00m over the six-day period.
			• Catchment average rainfalls during this six day period were:
			  • Wivenhoe Dam 14mm;
			  • Somerset Dam 7mm;
			  • Lockyer Creek 7mm;
			  • Bremer River 8mm.
				Drain Down Phase
				
				• During this period, the target was to release stored floodwaters from the Dam within seven days of the flood peak passing through the Dams, while controlling downstream impacts. Considerations impacting the duration and timing of the Drain Down Phase in this instance included:
				  • Causing no renewed increases in river levels below the Dam (except where unavoidable due to tidal influences);
				  • Maintaining an adequate release rate to ensure temporary pumps providing water supplies to the Lowood area could continue to operate;
				  • Minimising bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested by Brisbane City Council);
				  • Re-opening Brisbane Valley Highway and key rural bridges as quickly as possible;
				  • Achieving FSL in the Dams at the conclusion of the Event.
				
				• At the conclusion of the Event, fish recovery protocols were followed in accordance with standard Seqwater procedures.

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Flood Event Description

3 EVENT MOBILISATION AND STAFFING

3.1 Catchment conditions at Event commencement

In addition to the two floods occurring during the January 2011 Flood Event, in the 25 days leading up to the Event, three separate flood events impacted Somerset and Wivenhoe Dams. Flood releases were made from Wivenhoe Dam on all but five of those days. The total outflow from the three additional events was around 690,000ML and the details of these events are outlined in Table 3.1.1 following:

Event	Event start date	Event end date	Volume released (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2011	470,000

Table 3.1.1 – Outflow from three separate flood events, commencing December 2010

During these events, requests were received from Councils and residents, either isolated or adversely impacted by bridge closures downstream of the Dam, to curtail releases as soon and as quickly as possible. This was a significant issue at the time, because bridge closures had occurred over the traditional Christmas/New Year holiday period, including closures on Christmas and New Year's Day. Releases during these events were always made in accordance with the Manual.

Less than four days separated the end of Event 3 and the commencement of the January 2011 Flood Event. Due to the rainfall that had occurred in the Dam catchments throughout December 2010, at the start of the January 2011 Flood Event, the catchment conditions were near saturation. The catchment was highly responsive, with the initial loss varying between 0mm and 30mm. Continuing loss rates were also unusually low. Because the degree of catchment saturation increased as the Event progressed, very high levels of run-off generation were experienced throughout the Event.

3.2 Event mobilisation

There was no significant rainfall in the 24 hours to 09:00 on Wednesday 5 January 2011, however, in the 24 hours to 08:00, Thursday 6 January 2011, catchment average rainfall totals were:

- Wivenhoe Dam 28mm;
- Somerset Dam 21mm;
- Lockyer Creek 23mm;
- Bremer River 23mm.

This rainfall was sufficient to trigger event mobilisation at 07:42 on Thursday 6 January 2011, using Strategies W1A and S2. Based on the rainfall at that time and subsequent model runs, the Somerset lake level was forecast to peak at 99.7m (excluding forecast) and 100.0m (including forecast). The Wivenhoe lake level was forecast to peak at 68.3m (excluding forecast) and 68.4m (including forecast).

The following actions were undertaken as soon as mobilisation occurred:

- 24/7 staffing commenced at the Flood Operations Centre, with at least one Duty Flood Operations Engineer and at least one trained Flood Officer present (minimum two persons);
- 24/7 staffing commenced at the Dams, with at least two trained Dam Operators present;
- Flood Operations Engineers were called back early from annual leave to assist with the management of the Event.

Staffing of the Flood Operations Centre and the Dams continued on this basis until event de-mobilisation at 12:00 on Wednesday 19 January 2011. During critical periods, all four Flood Operations Engineers were present in the Flood Operations Centre and were actively involved in flood event decision-making processes. These Engineers lived in the Flood Operations Centre building during the critical 96 hours of the Event, as did a number of the trained Flood Officers.

3.3 Qualifications of staff on duty

Flood Operations Engineers

The four Flood Operations Engineers approved by the Chief Executive to direct the operations of Somerset and Wivenhoe Dams during flood events are:

- Flood Operations Engineer 1;
- Flood Operations Engineer 2;
- Flood Operations Engineer 3;
- Flood Operations Engineer 4.

All Engineers had demonstrated to the Chief Executive they have:

1. Knowledge of design principles related to the structural, geotechnical and hydraulic design of large dams, and;
2. At least a total of five years suitable experience, having demonstrated their expertise in at least two of the following areas:
    - Investigation, design or construction of major dams;
    - Operation and maintenance of major dams;
    - Hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology;
    - Applied hydrology with particular reference to flood forecasting and/or flood forecasting systems.

Flood Operations Engineers 1, 2 and 3 are three of the most experienced and expert Engineers in the industry, in relation to their knowledge of Brisbane River flood hydrology. Flood Operations Engineer 4 is one of the most experienced Engineers in Queensland in relation to the operation and maintenance of gated dams. The Flood Operations Engineers' resumes are included in Appendix N.

The four current Flood Operations Engineers undertake flood operations duties as an addition to the full-time roles they fill within various State Government organisations. These flood operations duties include 24/7 on call duties, 24/7 catchment monitoring during rainfall events and undertaking 12 hour shifts during flood events. **Flood Operations Engineers do not receive any additional payments or allowances to undertake flood operations duties.** This includes requirements to work extended hours on Christmas Day, Boxing Day, New Years Day and other public holidays as has occurred in recent months, and to return from annual leave if required for flood duties.

It should also be noted that the Flood Operations Engineers managed flood operations activities at North Pine Dam in conjunction with the January 2011 Flood Event which impacted Somerset Dam and Wivenhoe Dam. Preliminary indications, based on the North Pine Dam Emergency Action Plan, show the flood event impacting North Pine Dam was in the extreme range (AEP greater than 1 in 2,000).

Flood Officers

Nine Flood Officers, trained in Flood Operations Centre duties, assisted in the Flood Operations Centre during the Event.

1. Flood Officer 1;
2. Flood Officer 2;
3. Flood Officer 3;
4. Flood Officer 4;
5. Flood Officer 5;
6. Flood Officer 6;
7. Flood Officer 7;
8. Flood Officer 8;
9. Flood Officer 9.

Dam Operators

Thirteen Dam Operators, trained in Flood Operations Centre duties, operated Somerset and Wivenhoe Dams during the Event.

1. Dam Operator 1;
2. Dam Operator 2;
3. Dam Operator 3;
4. Dam Operator 4;
5. Dam Operator 5;
6. Dam Operator 6;
7. Dam Operator 7;
8. Dam Operator 8;
9. Dam Operator 9;
10. Dam Operator 10;
11. Dam Operator 11;
12. Dam Operator 12;
13. Dam Operator 13.

3.4 Flood Operations Centre staffing

Flood Operations Centre staffing details for the duration of the Event are recorded in Tables 3.4.1, 3.4.2 and 3.4.3 below. Each table has been compiled in accordance with the confirmed Event Roster.

Shift start time	Shift finish time	Flood Operations Engineers	Notes
Thu 06/01/2011 07:00	Thu 06/01/2011 19:00	Engineer 2	Standard shift handover occurred at the end of this shift in accordance with the Flood Procedure Manual.
Thu 06/01/2011 19:00	Fri 07/01/2011 07:00	Engineer 1	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Fri 07/01/2011 07:00	Fri 07/01/2011 19:00	Engineer 2	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Fri 07/01/2011 19:00	Sat 08/01/2011 07:00	Engineer 3	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sat 08/01/2011 07:00	Sat 08/01/2011 19:00	Engineer 1	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sat 08/01/2011 19:00	Sun 09/01/2011 07:00	Engineer 4	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sun 09/01/2011 07:00	Sun 09/01/2011 19:00	Engineer 2	A meeting of all four Flood Operations Engineers was held at 15:30 to discuss strategy and the developing situation. Additionally, standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.

Shift start time	Shift finish time	Flood Operations Engineers	Notes
Sun 09/01/2011 19:00	Mon 10/01/2011 07:00	Engineer 3 Engineer 1	Due to the developing rainfall scenario, Engineer 2 assisted until 22:00 on 9 January 2011 to provide an extended shift handover at the commencement of this shift. It was also decided at this time to have two Engineers on duty until the peak of the Event had passed. The handover at the end of this shift involved all four Flood Operations Engineers discussing strategy and the developing situation.
Mon 10/01/2011 07:00	Mon 10/01/2011 19:00	Engineer 2 Engineer 4	The handover at either end of this shift involved all four Flood Operations Engineers discussing strategy and the developing situation.
Mon 10/01/2011 19:00	Tue 11/01/2011 07:00	Engineer 3 Engineer 1	The handover at either end of this shift involved all four Flood Operations Engineers discussing strategy and the developing situation.
Tue 11/01/2011 07:00	Tue 11/01/2011 19:00	Engineer 2 Engineer 4	Engineer 1 and Engineer 3 assisted from 13:00 on 11 January 2011. The handover at either end of this shift involved all four Flood Operations Engineers discussing strategy and the developing situation.
Tue 11/01/2011 19:00	Wed 12/01/2011 07:00	Engineer 3 Engineer 1	Engineer 4 and Engineer 2 assisted until 23:00 on 9 January 2011. The handover at the end of this shift involved all four Flood Operations Engineers discussing strategy and the developing situation.
Wed 12/01/2011 07:00	Wed 12/01/2011 19:00	Engineer 2 Engineer 4	The handover at either end of this shift involved all four Flood Operations Engineers discussing strategy.
Wed 12/01/2011 19:00	Thu 13/01/2011 07:00	Engineer 3 Engineer 1	The handover at either end of this shift involved all four Flood Operations Engineers discussing strategy.
Thu 13/01/2011 07:00	Thu 13/01/2011 19:00	Engineer 2 Engineer 4	The handover at the commencement of this shift involved all four Flood Operations Engineers discussing strategy. A standard shift handover occurred at the end of this shift in accordance with the Flood Procedure Manual.
Thu 13/01/2011 19:00	Fri 14/01/2011 07:00	Engineer 1	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Fri 14/01/2011 07:00	Fri 14/01/2011 19:00	Engineer 2	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Fri 14/01/2011 19:00	Sat 15/01/2011 07:00	Engineer 4	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.

Shift start time	Shift finish time	Flood Operations Engineers	Notes
Sat 15/01/2011 07:00	Sat 15/01/2011 19:00	Engineer 2	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sat 15/01/2011 19:00	Sun 16/01/2011 07:00	Engineer 3	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sun 16/01/2011 07:00	Sun 16/01/2011 19:00	Engineer 1	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Sun 16/01/2011 19:00	Mon 17/01/2011 07:00	Engineer 4	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Mon 17/01/2011 07:00	Mon 17/01/2011 19:00	Engineer 3	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Mon 17/01/2011 19:00	Tue 18/01/2011 07:00	Engineer 2	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Tue 18/01/2011 07:00	Tue 18/01/2011 19:00	Engineer 1	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Tue 18/01/2011 19:00	Wed 19/01/2011 07:00	Engineer 4	Standard shift handovers occurred at either end of this shift in accordance with the Flood Procedure Manual.
Wed 19/01/2011 07:00	Wed 19/01/2011 14:00	Engineer 2	Standard shift handover occurred at the beginning of this shift in accordance with the Flood Procedure Manual.

Table 3.4.1 – Flood Operations Centre staffing – Flood Operations Engineers

Shift start times	Shift finish times	Flood Officers	Notes
Thu 06/01/2011 07:00	Thu 06/01/2011 19:00	Flood Officer 7	
Thu 06/01/2011 19:00	Fri 07/01/2011 07:00	Flood Officer 1	
Fri 07/01/2011 07:00	Fri 07/01/2011 19:00	Flood Officer 8	
Fri 07/01/2011 19:00	Sat 08/01/2011 07:00	Flood Officer 7	
Sat 08/01/2011 07:00	Sat 08/01/2011 19:00	Flood Officer 3	
Sat 08/01/2011 19:00	Sun 09/01/2011 07:00	Flood Officer 2	
Sun 09/01/2011 07:00	Sun 09/01/2011 19:00	Flood Officer 1	
Sun 09/01/2011 19:00	Mon 10/01/2011 07:00	Flood Officer 6	
Mon 10/01/2011 07:00	Mon 10/01/2011 19:00	Flood Officer 8	
Mon 10/01/2011 19:00	Tue 11/01/2011 07:00	Flood Officer 9	
Tue 11/01/2011 07:00	Tue 11/01/2011 19:00	Flood Officer 4 Flood Officer 2	Flood Officer 9 assisted as needed as he was living in the building during this period.
Tue 11/01/2011 19:00	Wed 12/01/2011 07:00	Flood Officer 3 Flood Officer 9	

Shift start times	Shift finish times	Flood Officers	Notes
Wed 12/01/2011 07:00	Wed 12/01/2011 19:00	Flood Officer 1 Flood Officer 2	Flood Officer 9 assisted as needed as he was living in the building during this period.
Wed 12/01/2011 19:00	Thu 13/01/2011 07:00	Flood Officer 7	
Thu 13/01/2011 07:00	Thu 13/01/2011 19:00	Flood Officer 9	
Thu 13/01/2011 19:00	Fri 14/01/2011 07:00	Flood Officer 4	
Fri 14/01/2011 07:00	Fri 14/01/2011 19:00	Flood Officer 1	
Fri 14/01/2011 19:00	Sat 15/01/2011 07:00	Flood Officer 2	
Sat 15/01/2011 07:00	Sat 15/01/2011 19:00	Flood Officer 3	
Sat 15/01/2011 19:00	Sun 16/01/2011 07:00	Flood Officer 4	
Sun 16/01/2011 07:00	Sun 16/01/2011 19:00	Flood Officer 6	
Sun 16/01/2011 19:00	Mon 17/01/2011 07:00	Flood Officer 7	
Mon 17/01/2011 07:00	Mon 17/01/2011 19:00	Flood Officer 8	
Mon 17/01/2011 19:00	Tue 18/01/2011 07:00	Flood Officer 9	
Tue 18/01/2011 07:00	Tue 18/01/2011 19:00	Flood Officer 5	
Tue 18/01/2011 19:00	Wed 19/01/2011 07:00	Flood Officer 1	
Wed 19/01/2011 07:00	Wed 19/01/2011 14:00	Flood Officer 2	

Table 3.4.2 – Flood Operations Centre staffing – Flood Officers

Shift start times	Shift finish times	Wivenhoe Dam Operators	Somerset Dam Operators
Thu 06/01/2011 07:00	Thu 06/01/2011 19:00	Dam Operator 10 Dam Operator 11	Dam Operator 2 Dam Operator 13
Thu 06/01/2011 19:00	Fri 07/01/2011 07:00	Dam Operator 7 Dam Operator 6	Dam Operator 4 Dam Operator 5
Fri 07/01/2011 07:00	Fri 07/01/2011 19:00	Dam Operator 10 Dam Operator 11	Dam Operator 2 Dam Operator 13
Fri 07/01/2011 19:00	Sat 08/01/2011 07:00	Dam Operator 7 Dam Operator 6	Dam Operator 4 Dam Operator 8
Sat 08/01/2011 07:00	Sat 08/01/2011 19:00	Dam Operator 10 Dam Operator 12	Dam Operator 2 Dam Operator 3
Sat 08/01/2011 19:00	Sun 09/01/2011 07:00	Dam Operator 7 Dam Operator 9	Dam Operator 4 Dam Operator 1
Sun 09/01/2011 07:00	Sun 09/01/2011 19:00	Dam Operator 10 Dam Operator 12	Dam Operator 2 Dam Operator 13
Sun 09/01/2011 19:00	Mon 10/01/2011 07:00	Dam Operator 7 Dam Operator 9	Dam Operator 4 Dam Operator 1
Mon 10/01/2011 07:00	Mon 10/01/2011 19:00	Dam Operator 10 Dam Operator 12	Dam Operator 2 Dam Operator 13
Mon 10/01/2011 19:00	Tue 11/01/2011 07:00	Dam Operator 7 Dam Operator 9	Dam Operator 4 Dam Operator 1
Tue 11/01/2011 07:00	Tue 11/01/2011 19:00	Dam Operator 10 Dam Operator 12 Dam Operator 7 from 14:00	Dam Operator 2 Dam Operator 13

Shift start times	Shift finish times	Wivenhoe Dam Operators	Somerset Dam Operators
Tue 11/01/2011 19:00	Wed 12/01/2011 07:00	Dam Operator 7 Dam Operator 6	Dam Operator 4 Dam Operator 1
Wed 12/01/2011 07:00	Wed 12/01/2011 19:00	Dam Operator 10 Dam Operator 12	Dam Operator 2 Dam Operator 13
Wed 12/01/2011 19:00	Thu 13/01/2011 07:00	Dam Operator 7 Dam Operator 6	Dam Operator 4 Dam Operator 1
Thu 13/01/2011 07:00	Thu 13/01/2011 19:00	Dam Operator 10 Dam Operator 12	Dam Operator 2 Dam Operator 13
Thu 13/01/2011 19:00	Fri 14/01/2011 07:00	Dam Operator 7 Dam Operator 6	Dam Operator 4 Dam Operator 1
Fri 14/01/2011 07:00	Fri 14/01/2011 19:00	Dam Operator 10 Dam Operator 11	Dam Operator 2 Dam Operator 13
Fri 14/01/2011 19:00	Sat 15/01/2011 07:00	Dam Operator 7 Dam Operator 5	Dam Operator 4 Dam Operator 1
Sat 15/01/2011 07:00	Sat 15/01/2011 19:00	Dam Operator 10 Dam Operator 11	Dam Operator 2 Dam Operator 13
Sat 15/01/2011 19:00	Sun 16/01/2011 07:00	Dam Operator 7 Dam Operator 5	Dam Operator 4 Dam Operator 1
Sun 16/01/2011 07:00	Sun 16/01/2011 19:00	Dam Operator 10 Dam Operator 11	Dam Operator 2 Dam Operator 13
Sun 16/01/2011 19:00	Mon 17/01/2011 07:00	Dam Operator 7 Dam Operator 5	Dam Operator 4 Dam Operator 1
Mon 17/01/2011 07:00	Mon 17/01/2011 19:00	Dam Operator 10 Dam Operator 6	Drain Down complete
Mon 17/01/2011 19:00	Tue 18/01/2011 07:00	Dam Operator 7 Dam Operator 5	Drain Down complete
Tue 18/01/2011 07:00	Tue 18/01/2011 19:00	Dam Operator 10 Dam Operator 6	Drain Down complete
Tue 18/01/2011 19:00	Wed 19/01/2011 07:00	Dam Operator 7 Dam Operator 5	Drain Down complete
Wed 19/01/2011 07:00	Wed 19/01/2011 14:00	Dam Operator 10 Dam Operator 9	Drain Down complete

Table 3.4.3 – Flood Operations Centre staffing – Somerset Dam and Wivenhoe Dam, Dam Operators

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4 FLOOD EVENT PROCEDURES

4.1 Introduction

Seqwater has prepared a Flood Procedure Manual that assigns responsibilities to Seqwater personnel for flood event preparation, mobilisation and operation, in relation to Seqwater's Dams, including Somerset and Wivenhoe Dams.

The relationship between the Flood Procedure Manual and ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*** (the Manual) is outlined in Figure 4.1.1.

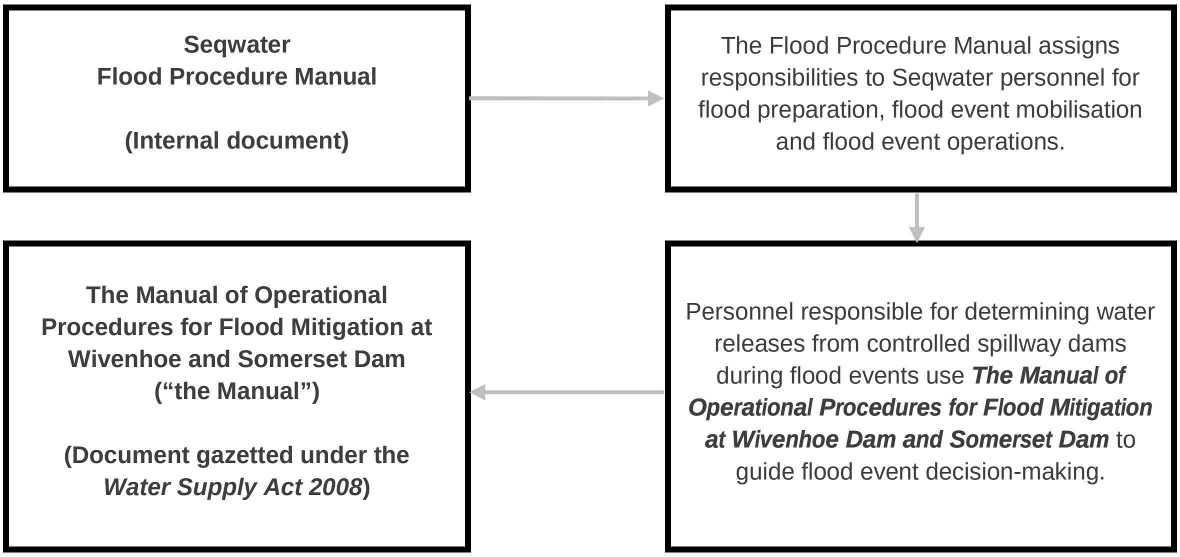

Figure 4.1.1 – Relationship between the Flood Procedure Manual and The Manual of Operations Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam

The Flood Procedure Manual is an internal document and is registered in Seqwater's internal document control system (Qpulse). Controlled hardcopies are issued to the following personnel:

Agency	Responsible person	Location
Seqwater	Dam and Source Operations Manager	Margaret Street, Brisbane
Seqwater	Principal Hydrologist	Margaret Street, Brisbane
Seqwater	Senior Flood Operations Engineer	Flood Operations Centre, Brisbane
Seqwater	Principal Engineer Dam Safety	Karalee
Seqwater	Operations Coordinator, South	Karalee
Seqwater	Operations Coordinator, North	Landers Shute
Seqwater	Operations Coordinator, Central	Wivenhoe Dam
Seqwater	Storage Supervisor	Wivenhoe Dam
Seqwater	Storage Supervisor	Leslie Harrison Dam
Seqwater	Storage Supervisor	North Pine Dam
Seqwater	Storage Supervisor	Somerset Dam

Table 4.1.2 – Allocation of controlled hardcopies of the Seqwater Flood Procedure Manual

The issue date for the current Flood Procedure Manual is January 2010.

4.2 Flood Operations Centre preparedness

Prior to the January 2011 Flood Event, Flood Operations Engineer 2 was designated the Flood Operations Manager, in accordance with the requirements of the Seqwater Flood Procedure Manual. In conjunction with Flood Operations Engineer 1 (a Senior Flood Operations Engineer), Flood Operations Engineer 2 was responsible for the overall management of the Flood Operations Centre leading up to the Event and ensured:

- A Flood Operations Engineer and three Flood Officers were on close call at all times, and ready to attend the Flood Operations Centre if called;
- Sufficient Flood Operations Engineers and Flood Officers were available to staff the Flood Operations Centre if a flood event was declared;
- Contact details for Flood Operations Engineers and Flood Officers were up-to-date;
- Current copies of the following documents were available in the Flood Operations Centre:
  - The Manual;
  - Wivenhoe Dam – Emergency Action Plan;
  - Somerset Dam – Emergency Action Plan.
- The following facilities were available in the Flood Operations Centre:
  - The data collection and modelling systems required to manage flood events at Somerset and Wivenhoe Dams;
  - Sufficient stationery and forms;
  - Landline telephone, mobile telephone, satellite telephone, Seqwater radio network, facsimile and email communication systems;
  - Power systems and back-up power systems required to ensure computer system reliability during the Flood Event.

As defined by the Seqwater Flood Procedure Manual, the role and responsibilities of the Flood Operations Manager are completely separate to the roles and responsibilities of Flood Operations Engineers. However, a single person can hold both roles at any point in time.

When one of the Flood Operations Engineers is on call, this person is referred to as the Duty Flood Operations Engineer. There is always a single designated Duty Flood Operations Engineer on call 24 hours a day, seven days a week.

When on call, the Duty Flood Operations Engineer (one of the four Flood Operations Engineers described in Section 3.3) ensured they:

- Were contactable at all times by telephone;
- Had constant access to facilities that provided appropriate real-time monitoring of dam and catchment conditions;
- Were able to travel to the Flood Operations Centre in two hours to direct the mobilisation and operation of the Flood Event, without compromising the safety of the Dams or the intent of the Manual;
- As incoming Duty Flood Operations Engineer, organised the handover from the current duty staff;
- As outgoing Duty Flood Operations Engineer, prepared a status summary sheet for Somerset and Wivenhoe Dams;
- Contacted the Flood Operations Manager if any issues arose with the potential to adversely impact the operations of the Flood Operations Centre.

When on call, the nine Flood Officers (described in Section 3.3) ensured they:

- Were contactable at all times by telephone;
- Reported to the Duty Flood Operations Engineer if at any time while being on call they became unfit for duty;
- Were able to travel to the Flood Operations Centre within two hours of being called;
- Attended the close call handover meetings organised by the Duty Flood Operations Engineers.

4.3 Flood Operations Centre mobilisation

The Seqwater Flood Procedure Manual requires the Duty Flood Operations Engineer to declare a flood event and mobilise the Flood Operations Centre, if the Duty Flood Operations Engineer considers it likely the FSL of Somerset Dam or Wivenhoe Dam will be exceeded as a result of rainfall occurring in the Dam catchments and flood releases are likely. The Flood Operations Centre is mobilised as soon as a flood event is declared. Flood Operations Engineer 2 was the Duty Flood Operations Engineer who declared the January 2011 Flood Event by email at 07:42 on Thursday 6 January 2011 (see Appendix H).

When the Flood Operations Centre was mobilised, the Duty Flood Operations Engineer ensured the following actions were undertaken:

- Notified the Senior Flood Operations Engineers of the mobilisation;
- Commenced recording significant events in the Event Log;
- Contacted the required Flood Officers to commence duty at the Flood Operations Centre;
- Contacted the Seqwater Operations Coordinator responsible for Somerset Dam and Wivenhoe Dam, and provided instructions to send Dam operations staff to the Dams. The Operations Coordinator was also advised of the expected duration of the Flood Event to allow time to organise suitable staffing arrangements for the duration of the Event;
- Established 09:00 on Sunday 2 January 2011 as the start time for the Event, for the purposes of modelling predictions;
- Established a suitable directory structure within the computer network to manage the Flood Event data;
- Examined and cleaned all rainfall and stream flow data for the Event prior to use in the flood modelling systems;
- Derived inflow hydrographs for:
  - Wivenhoe Dam;
  - Somerset Dam;
  - Lockyer Creek catchment;
  - Bremer River catchment.
- Examined these derived inflow hydrographs across a variety of appropriate rainfall scenarios;
- Inputted the derived inflow hydrographs for Somerset Dam, Wivenhoe Dam, Lockyer Creek catchment and Bremer River catchment into Somerset and Wivenhoe Dams operations spreadsheet and ran this program;
- Determined gate operations strategies for Somerset and Wivenhoe Dams based on the resulting data from the operations spreadsheet and in accordance with the strategies outlined in the Manual;
- Advised Brisbane City Council, Ipswich City Council and Somerset Regional Council of the gate operations strategies to allow roads to be closed prior to inundation;
- Directed gate operations at the Dams as appropriate by instructing the Dam Supervisors by email and facsimile of gate movements. Instructions were also given verbally by telephone prior to written instructions being released;

- Advised Seqwater's Dam and Source Operations Manager of gate operations by providing a copy of all Flood Operations Directives and regular updates, including advice of longer-term strategies to manage the Flood Event. This allowed Seqwater to provide appropriate flood event advice to the public and other stakeholders, including the Queensland Water Commission and the Water Grid Manager;
- Advised the Bureau of Meteorology (BoM), Brisbane City Council and the Dam Safety Regulator of the gate operations strategies, and actual and projected water releases from Wivenhoe Dam.

4.4 Flood Operations Centre operations

During the Flood Event, the four Flood Operations Engineers worked closely together to ensure the following took place, in accordance with the Flood Procedure Manual:

- Suitable staffing arrangements were in place for the Flood Operations Centre and the impacted Dams for the duration of the Flood Event;
- Staff working in the Flood Operations Centre during the Event signed the Flood Event Shift Log at the start and end of a shift. However, because a number of staff were living in the building housing the Flood Operations Centre during the Event, some sign on and sign off details were not properly recorded. This has been recognised as an area for improvement for future flood events.

During the Flood Event, the Senior Flood Operations Engineer set the overall strategy for the management of the Flood Event, in accordance with the Manual. The Duty Flood Operations Engineers directed the operations of the Flood Control Centre, in accordance with the overall strategy. In situations where two or more Flood Operations Engineers were on duty simultaneously, these duties were shared equally. The Duty Flood Operations Engineers ensured the following actions took place during the Event, in accordance with the Flood Procedure Manual:

- All significant events were recorded in the Event Log;
- The integrity of the ALERT System was maintained;
- Flood releases from the Dams were in accordance with the Manual, and the RTFM was used to support the decision-making processes around the releases;
- Software issues impacting on the operation of the ALERT System were identified and resolved;
- All notifications specified in the Flood Manuals and Emergency Action Plans were recorded in the Event Log;
- Accurate plots of headwater levels were maintained for each of the Dams;
- Appropriate handovers took place at the end of each shift to ensure incoming Officers had the following information:
  - Reservoir storage elevations at each Dam;
  - Radial gate, sluice gate and regulator valve openings at each Dam;
  - Flood release procedures being applied and the reason for their selection;
  - Status of compliance with the Flood Manuals and Emergency Action Plans;
  - Status of the communication systems;
  - Status of the data gathering network;
  - Status of computer systems and Flood Modelling Systems;
  - Any areas of concern associated with the management of the Flood Event;
  - Areas in which the discretion has been exercised, in accordance with the Flood Manuals.
- Flood Officers on duty in the Flood Operations Centre undertook all duties as directed by the Duty Flood Operations Engineer;

- Brisbane City Council, Ipswich City Council and Somerset Regional Council were contacted as appropriate to allow roads to be closed prior to inundation and for any necessary arrangements to be made for community isolation and/or necessary evacuations. (The Manual allows for immediate releases to be initiated if the safety of a Dam is at risk. However, in accordance with Seqwater's duty of care to public safety when making Dam releases, every attempt is made to close impacted roads prior to inundation by water outflows from gate operations, and to make appropriate arrangements for community isolation and evacuations due to the risk to public safety.);
- Gate operations were directed at the Dams as appropriate, by instructing the Dam Supervisors by email and facsimile about gate movements. Instructions were also explained verbally by telephone prior to the written instructions being released;
- Seqwater's Dam and Source Operations Manager was advised of all gate operations through the provision of a copy of all Flood Operations Directives and regular updates, including advice of longer-term strategies to manage the Flood Event. This allowed Seqwater to provide appropriate Flood Event advice to the public and other stakeholders, including the Queensland Water Commission and the Water Grid Manager;
- The BoM, Brisbane City Council and the Dam Safety Regulator were advised of the gate operation strategies, and actual and projected water releases from Wivenhoe Dam.

As the Flood Event progressed, a number of situations arose that had the potential to adversely impact on the Flood Operations Centre. All situations were managed by the Flood Operations Engineers as they arose and no issues that adversely affected the Flood Operations Centre were experienced during the Event. Details of these situations, how they were managed and the back-up facilities in place are as follows:

- The Flood Operations Engineers were aware of the potential for the Flood Operations Centre to lose both mains power and the communication link between the main (Turbot Street) and back-up (George Street) Flood Operations Centres due to the flooding impacting on Brisbane City. To resolve this issue communications were initiated with relevant agencies and personnel including ENERGEX and the building managers from both the Turbot Street and George Street locations. These communications advised of the critical role of the Flood Operations Centre in managing the Flood Event. As a result, mains power and telephone communication were maintained at the Flood Operations Centre throughout the Event, however, the back-up Centre did operate under stand-by power for the period the Brisbane CBD was impacted by flooding.

- Both the main and back-up Flood Operations Centres are connected to an uninterrupted power supply and emergency standby power facilities to ensure they can continue to operate even if mains power is lost.

- The Real Time Flood Model (RTFM) worked well over the full duration of the Flood Event. One interesting situation that was noted was that minor file corruption errors appeared in the daily routine system checks associated with the back-up Linux PC (NAMAH) that houses a duplicate of the RTFM. These minor errors were attributed to a minor failure of the file mirroring process, which ensures back-up copies of the data in the main Flood Operations Centre PC (NOAH) are captured on the back-up PC (NAMAH). This problem was easily rectified by re-booting the back-up computer but the exact cause of this issue is still under investigation.

- It was noted that during the Flood Event, when ALERT data captured in the RTFM was compared against equivalent data captured in Enviromon, the RTFM appeared to have received less total data for some sensors. Although this has no impact on modeling results, this issue is being investigated further as the reason could relate to a number of factors, including data transmission, data reception and data filtering processes. The differences detected are of no significance, however, the reason for this anomaly should be fully understood.

- During the Event, the email server in the Flood Operations Centre exceeded its size limit. This caused a short and temporary pause in email communications to and from the Flood Operations Centre and requiring the file working-space to be freed to allow email traffic to flow again. This issue arose due to a combination of the volume of email traffic during certain periods of the Event, and also the size of some of the emails being transmitted. A routine clearing of the email server's working area easily solves this problem, and actions have been taken to ensure this issue does not arise again during flood events.

- Landline phones and facsimiles at Somerset Dam and Wivenhoe Dam were unavailable for short periods of time during the Event due to physical flooding impacts in the Dam catchments. However, lines of communication were maintained between the Flood Operations Centre and the Dams at all times through the use of satellite phones, two-way radio, mobile phones and email.

- Seqwater's corporate communications were also impacted due to flooding in the CBD, which resulted in parts of the city being disconnected from mains power. Seqwater's corporate computer systems were unavailable for a period towards the end of the Event, however, this had no impact at all on the functioning of the main or back-up Flood Operations Centres.

4.5 Somerset Dam and Wivenhoe Dam preparedness

Prior to the Flood Event, the Seqwater Operations Coordinator responsible for Somerset and Wivenhoe Dams ensured the following actions took place, in accordance with the Flood Procedure Manual:

- At least two Dam Operators were on close call for both Somerset Dam and Wivenhoe Dam at all times;
- Sufficient Dam Operators were available to staff Somerset Dam and Wivenhoe Dam should a major flood event be declared;
- Contact details for the Dam Operators were up-to-date;
- Current copies of the following documents were available at Somerset Dam and Wivenhoe Dam:
  - The Manual;
  - Emergency Action Plan;
  - Standing Operating Procedures;
  - Operation and Maintenance Manual.
- The following facilities were available at Somerset Dam and Wivenhoe Dam:
  - Sufficient stationery and forms;
  - Landline telephone, mobile telephone, satellite telephone, Seqwater radio network, facsimile and email communication systems;
  - Power systems and back-up power systems to ensure computer systems and communication systems were able to operate reliably during the Flood Event.
- All preventative maintenance work was undertaken at both Dams, in accordance with the Dam Operation and Maintenance Manuals.
- The flood release infrastructure and associated back-up systems at both Dams was kept operationally ready;
- While on close call, Dam Operators ensured:
  - They were contactable at all times by telephone;
  - In the event of being "unfit for duty", they reported to the Duty Flood Operations Engineer currently on close call;
  - They were able to travel to the Dam they were assigned to within two hours of being called.

4.6 Somerset Dam and Wivenhoe Dam mobilisation

Following notification the Flood Event had been declared, the Seqwater Operations Coordinator responsible for Somerset Dam and Wivenhoe Dam ensured the following actions were completed, in accordance with the Flood Procedure Manual:

- The Principal Engineer Dam Safety was notified of the mobilisation;
- Significant events were recorded in the Event Log;
- The Dam Operators on close call were contacted and directed to travel to the Dams. Two Dam Operators were directed to each site and at least two Dam Operators remained on duty at all times during the Event;
- During each shift, a Dam Operator was nominated to be the Dam Supervisor for the purposes of managing the Flood Event.

As each Dam Supervisor arrived at their assigned Dam, the Dam Supervisor completed the following actions, in accordance with the Flood Procedure Manual:

- Checked communication existed with the Flood Operations Centre;
- Commenced recording significant events in the Event Log;
- Completed the Flood Readiness Checklist contained in the Flood Procedure Manual (see Appendix I);
- Undertook flood operations as directed by the Flood Operations Centre.

4.7 Somerset Dam and Wivenhoe Dam operations

As the Flood Event commenced, the Dam Supervisor at Somerset Dam and Wivenhoe Dam ensured the following actions took place, in accordance with the Flood Procedure Manual. At the beginning of each shift, a new Dam Supervisor was appointed.

- All significant events were recorded in the Event Log;
- Flood releases were undertaken in accordance with directions provided by the Flood Operations Centre;
- All notifications required by the Manuals and Emergency Action Plans were made;
- Handovers at the end of each shift were conducted to ensure incoming Officers were aware of:
  - Reservoir storage elevations at each Dam;
  - Radial gate, sluice gate and regulator valve openings at each Dam;
  - Status of the communication systems;
  - Any areas of concern associated with the management of the Flood Event.
- The Duty Flood Operations Engineer was advised of any issues arising during the Event, with the potential to adversely impact flood operations.

  (Note: During the Event, Wivenhoe Dam experienced a temporary loss of mains power, however, this did not impact Dam operations because the on-site, standby diesel generator provided full power during this time. Two other separate back-up power systems were also available to ensure the continued operation of the radial gates if needed.)

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5 DATA COLLECTION SYSTEM PERFORMANCE

5.1 Background

A real time flood monitoring and forecasting system has been established to monitor rainfall and water levels in the Dam catchments and to provide adequate, accurate and timely information for informed decision-making.

Field stations consisting of rainfall and water level gauges use the Event Reporting Radio Telemetry System (ERRTS) to communicate data to the Flood Operations Centre. More than one gauge may be located at an individual field station. Water level gauges are often located at the Department of Environment and Resource Management (DERM) gauging stations. DERM is responsible for the maintenance of the water level gauges and Seqwater for the ERRTS equipment.

Rainfall gauges consist of a standard tipping bucket. Water level gauges vary in type and model but include shaft encoders, wet pressure transducers and dry pressure transducers. At a rainfall gauge, an event is defined as the tip of the bucket. At a water level rainfall gauge, an event is defined as an incremental increase or decrease in water level.

When an event is triggered at a gauge, data is transmitted via VHF radio through a series of redundant radio repeaters to the Flood Operations Centre and other data collection centres. Each signal has a unique identification number. When the signal arrives at the Flood Operations Centre base station, it is relayed to computer hardware platforms serial port via a decoder. It is then time stamped, read, decoded, accepted or rejected, filtered, validated and then stored in a gauge database in the Centre's FLOOD-Col and Enviromon databases. Redundant base stations at Mineral House and the Land Centre in Brisbane's CBD are synchronised with the Flood Operations Centre database.

The FLOOD-Col and Enviromon databases contain gauge details including:

- Gauge name;
- ALERT number;
- Type of gauge;
- Calibration information;
- Alarm thresholds;
- Rating curve information, if applicable.

Both FLOOD-Col and Enviromon allow filtered gauge data to be viewed in either a text or graphical format. Information that can be viewed or edited includes height, discharge, rainfall pluviographs, rainfall hyetographs, lake levels and Dam volumes, and applications are also available for viewing groups of gauges.

The combination of ERRTS field stations, rainfall gauges and water level gauges, radio network and data collection software is referred to as an ALERT system. ALERT, or Automated Local Evaluation in Real Time System, has become a standard for flood warning systems in Australia and the United States of America, and is widely used by the Bureau of Meteorology (BoM) and other flood warning agencies throughout the world.

FLOOD-Ops is the modelling software used to analyse and produce forecast runoff. It extracts data from the FLOOD-Col database, calculates areal rainfalls and generates hydrographs of runoff. Model parameters can be adjusted and forecast rainfall included as an option. Results can be displayed and imported into gate operation models. The ALERT system, FLOOD-Ops and ancillary software make up the Real Time Flood Model (RTFM).

5.2 Field station descriptions

Seqwater operates 75 rain gauges and 71 river gauge field stations within and around the Brisbane River Basin. Of these 146 sites, 129 operate under the ALERT system and the remaining 17 operate as telephone telemeter gauging stations, but are not directly available in the operational suite.

Manual gauge board readings are taken at Somerset and Wivenhoe Dams to confirm the ALERT data received from these sites. These manual observations form the basis of gate operations.

In addition to the Seqwater owned and operated network, the Flood Operations Centre also has access to Enviromon, which collects data from an additional 225 rain gauges and nearly 200 water level gauges throughout South East Queensland.

Locations of the rainfall stations are shown in Figure 5.2.1, and the Seqwater water level network is shown in Figure 5.2.2.

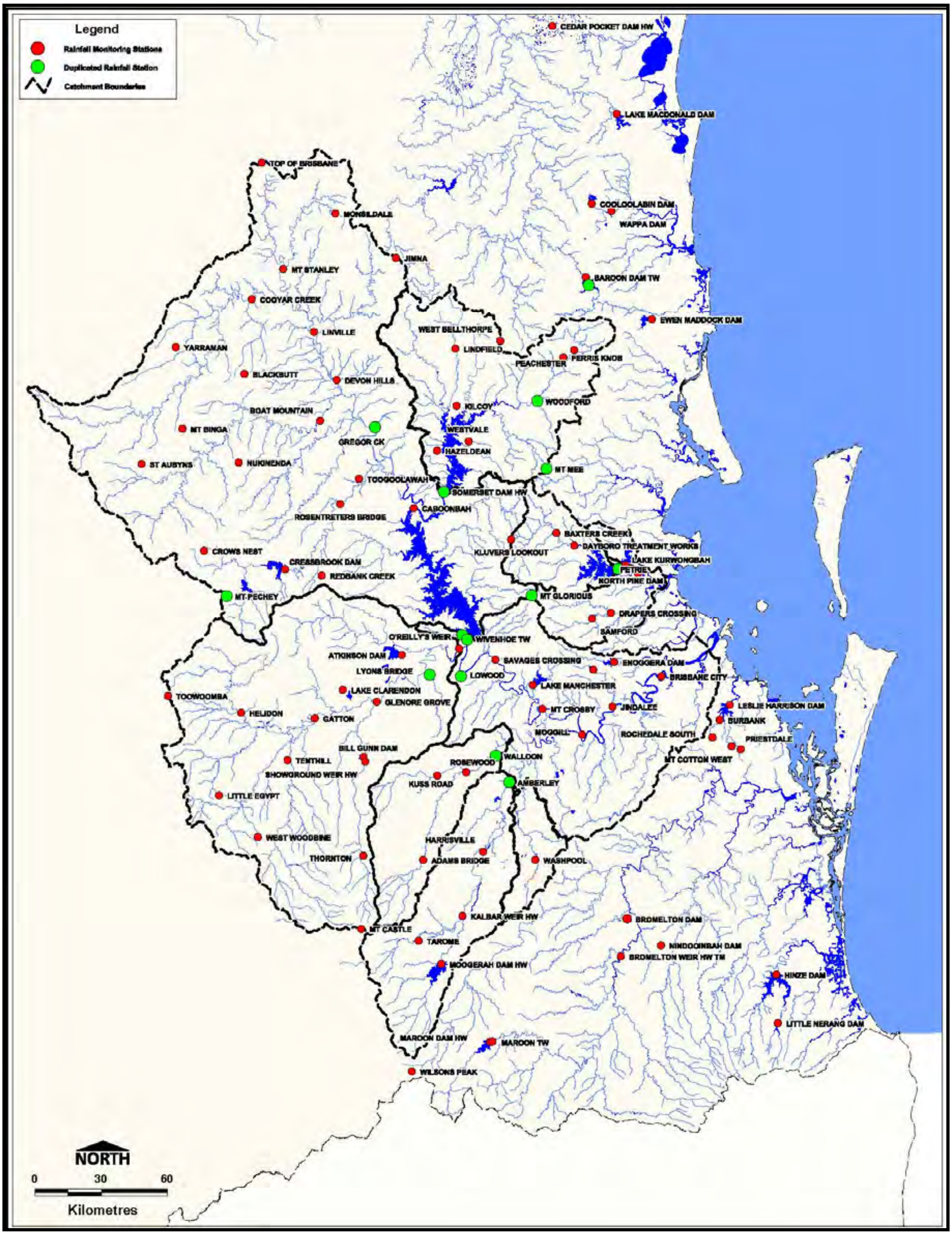

Figure 5.2.1 – Seqwater rainfall station network as at January 2011

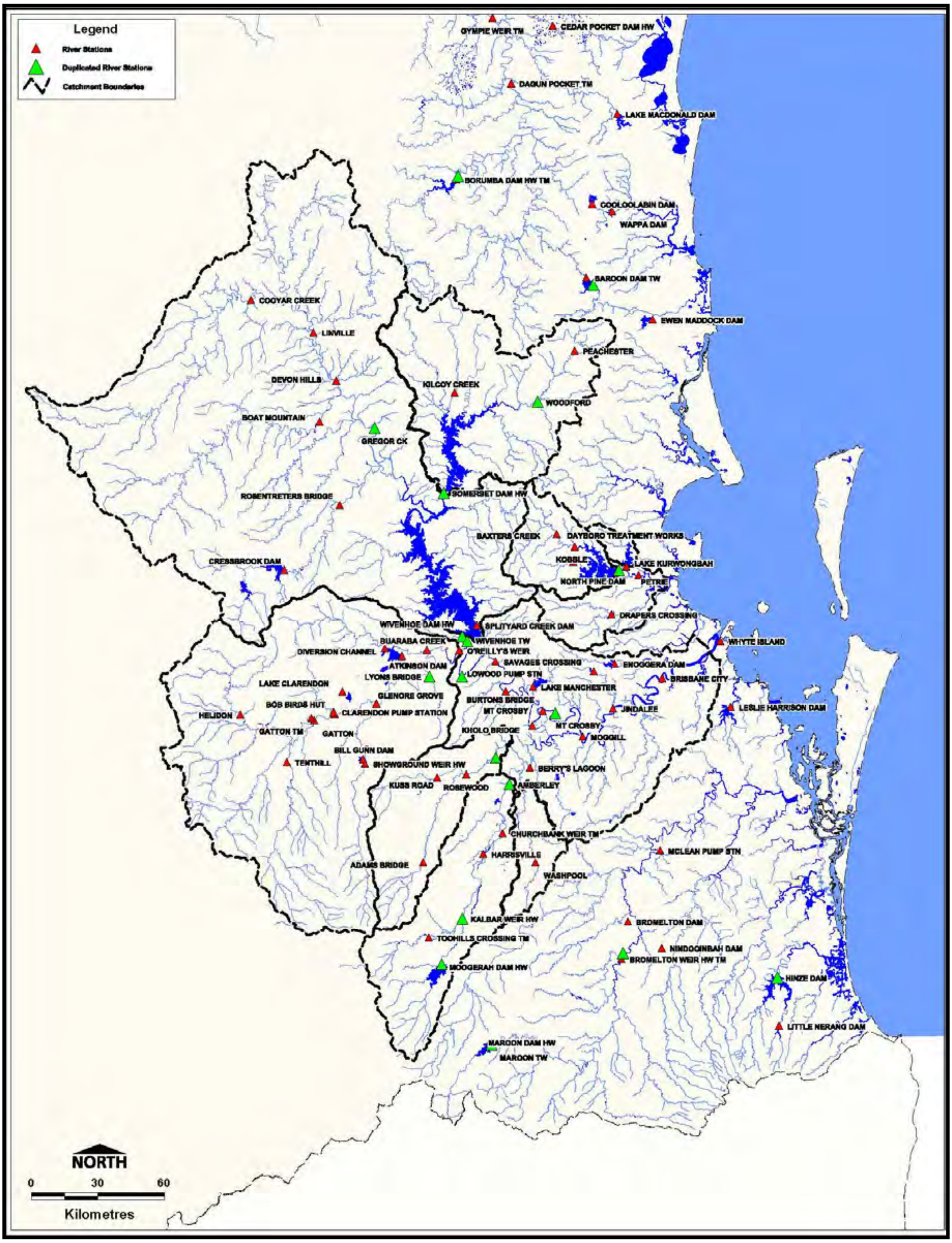

Figure 5.2.2 – Seqwater water level network as at January 2011

At all critical locations, more than one gauge is located on an individual station site to allow for the expected periodic non-operation of individual gauges that occurs due to the gauge location by necessity being in an exposed and harsh field environment. Accordingly, due to this in-built network redundancy, the presence of occasional non-operational gauges does not impact on data quality. At the commencement of the January 2011 Flood Event, four out of 75 rain gauges (95% availability) and six out of 71 river gauges (92% availability) were marked as being 'out of action'. Details of these gauges are listed in Table 5.2.3 and Table 5.2.4.

Rain ID	Site	Status date 6 Jan 2011	Comment
6517	Gregors Creek AL-B	Out of action	Redundant gauge. Another rainfall gauge is available at this site.
6526	Helidon AL	Out of action	Data from adjacent stations at Toowoomba and Gatton was used as a substitute for this data. However, data from this station was available for use through the BoM Enviromon system.
6736	Kuss Road AL	Out of action	This site is located in the Bremer River catchment and the data is of limited value in gate operations decision-making.
6744	Wilsons Peak AL	Out of action	Data from adjacent stations at Tarome and Kalbar was used as a substitute for this data.

Table 5.2.3 – Rainfall gauges marked out of action or suspect at Flood Event commencement

River ID	Site	Status date 6 Jan 2011	Comment
6654	Amberley AL-B	Out of action	Redundant gauge. Another stream height gauge is available at this site. This station has been marked for relocation.
6524	Cressbrook Dam AL	Out of action	The downstream stream height gauge at Rosentretter provides more useful information than this site.
6518	Gregors Creek AL-B	Out of action	Redundant gauge. Another river height gauge is available at this site.
6650	Lowood AL-P	Out of action	Redundant gauge. Another river height gauge is available at this site.
6566	Tenthill AL	Out of action	The downstream stream height gauge at Gatton provides more useful information than this site.
6743	Walloon AL-B	Out of action	This is a redundant gauge. Another river height gauge is available at this site.

Table 5.2.4 – Water level gauges marked out of action or suspect at Flood Event commencement

The January 2011 Flood Event damaged a number of stations. During the Event an additional four rain gauges and 10 river gauges were damaged. These gauges were damaged by a combination of water inundation, debris damage, lightening strikes and loss of power. There were also some stations completely destroyed by the flood flows. Details of the additional stations that were marked "out of action" during the Event are contained in Table 5.2.5 and Table 5.2.6.

After the Event, eight out of 75 rain gauges (89% availability) and 16 out of 71 river gauges (77% availability) were marked 'out of action'. To only lose so few gauges in such a major flood event is considered an excellent result and provides a very positive indication of the robust nature of the installed gauging network.

Rain ID	Site	Status date 19 Jan 2011	Comment
6633	Lyons Bridge AL-P	Out of action from 15:00 on 11 Jan 2011	Although this data was marked out of action in the system, it was also available for use through the BoM Enviromon system.
6630	Lyons Bridge AL-B	Out of action from 09:00 on 11 Jan 2011	Although this data was marked out of action in the system, it was also available for use through the BoM Enviromon system.
6568	O'Reillys Weir AL	Out of action from 19:34 on 11 Jan 2011	This site was severely damaged by flood water at the time indicated. This was late in the Event and rainfall after this time was minimal.
6641	Wivenhoe Dam TW AL-B	Out of action from 22:30 on 11 Jan 2011	This site was severely damaged by flood water at the time indicated. This was late in the Event and rainfall after this time was minimal. Manual readings are also available at this site.

Table 5.2.5 – Additional rainfall gauges marked out of action or suspect during the Flood Event

River ID	Site	Status date 19 Jan 2011	Comment
6756	Burtons Bridge	Out of action from 08:00 on 12 Jan 2011	The adjacent stream height gauges at Savages Crossing and Mt Crosby Weir provide more useful information than this site during high flows.
6527	Helidon	Out of action from 14:40 on 8 Jan 2011	The downstream stream height gauge at Glenore Grove was used as a substitute for this data.
6578	Gatton	Out of action from 17:31 on 10 Jan 2011	The downstream stream height gauge at Glenore Grove was used as a substitute for this data.
6757	Kholo Bridge	Out of action from 15:20 on 11 Jan 2011	The adjacent stream height gauges at Savages Crossing and Mt Crosby Weir provide more useful information than this site during high flows.
6737	Kuss Road	Out of action from 15:22 on 8 Jan 2011	This site is located in the Bremer River catchment and the data is of limited value in gate operations decision-making.
6647	Lowood AL-B	Out of action from 07:30 on 14 Jan 2011	The adjacent stream height gauge at Savages Crossing provides more useful information than this site during high flows.
6758	Mt Crosby AL-B	Out of action from 16:30 on 10 Jan 2011	This is a redundant gauge. Another river height gauge is available at this site.
6569	O'Reillys Weir	Out of action from 07:30 on 11 Jan 2011	This station is impacted by backwater from Wivenhoe Dam releases. This cannot be avoided. Data from adjacent stations at Lyons Bridge and Savages Crossing was used as a substitute for this data.
6637	Wivenhoe Dam HW AL-A	Out of action from 10:00 on 11 Jan 2011	This is a redundant gauge and manual readings are available at this site.
6638	Wivenhoe Dam HW AL-B	Out of action from 11:00 on 10 Jan 2011	This is a redundant gauge and manual readings are available at this site.

Table 5.2.6 – Additional water level gauges marked out of action or suspect during the Flood Event

For the duration of the Flood Event, around 132,000 individual observations (32,000 rainfall readings and 100,000 water level readings) were received in the Flood Operations Centre from the ALERT network. This provides an indication of the system load that is required to be managed during the Event. Table 5.2.7 below shows the number of readings received from each rainfall and water level gauge.

Alert ID	Station name	Gauge type	Number of readings
6500	Mt Glorious AL-B	RN	128
6511	Mt Pechey AL	RN	430
6514	Gregors Ck AL-P	RN	548
6517	Gregors Ck AL-B	RN	2
6520	Boat Mountain AL	RN	462
6523	Cressbrook Dam AL	RN	442
6526	Helidon AL	RN	57
6529	St Aubyns AL	RN	443
6540	Yarraman AL	RN	472
6542	Cooyar Ck AL	RN	489
6550	Walloon AL-P	RN	416
6553	Rosentretters Br AL	RN	400
6556	Glenore Grove AL	RN	456
6559	Savages Crossing AL	RN	655
6562	Kalbar Weir AL	RN	336
6565	Tenthill AL	RN	81
6568	O Reillys Weir AL	RN	527
6571	Harrisville AL	RN	300
6574	Caboonbah AL	RN	484
6577	Gatton AL	RN	447
6580	Adams Br AL	RN	437
6583	Showground Weir AL	RN	513
6590	Somerset Dam HW ALERT-B	RN	532
6593	Somerset Dam HW ALERT-P	RN	567
6596	Crows Nest AL	RN	463
6598	Toowoomba AL	RN	443
6600	Kilcoy AL	RN	551
6601	Mt Binga AL	RN	498
6602	Top of Brisbane AL	RN	221
6603	Blackbutt AL	RN	543
6604	Toogoolawah AL	RN	491
6606	West Woodbine AL	RN	330
6607	Lindfield AL	RN	688
6608	Jimna AL	RN	469
6610	Kluvers Lkt AL	RN	696
6615	Thornton AL	RN	390
6617	Little Egypt AL	RN	341
6619	Mt Castle AL	RN	583
6621	Nukinenda AL	RN	449
6623	Tarome AL-P	RN	391

Alert ID	Station name	Gauge type	Number of readings
6630	Lyons Br AL-B	RN	639
6633	Lyons Br AL-P	RN	614
6636	Wivenhoe Dam HW ALERT-B	RN	605
6641	Wivenhoe Dam TW ALERT-B	RN	515
6643	Wivenhoe Dam TW ALERT-P	RN	648
6646	Lowood AL-B	RN	538
6649	Lowood AL-P	RN	552
6651	Amberley AL-P	RN	406
6653	Amberley AL-B	RN	389
6680	Mt Glorious AL-P	RN	980
6690	Mt Mee AL-P	RN	769
6701	Mt Mee AL-B	RN	676
6702	Woodford AL-B	RN	652
6705	Woodford Al-P	RN	686
6708	Devon Hills AL	RN	523
6711	Baxters Ck AL	RN	687
6714	Ferris Knob AL	RN	587
6716	West Bellthorpe AL	RN	802
6717	Linville AL	RN	479
6730	Jindalee AL	RN	343
6733	Rosewood Al	RN	480
6736	Kuss Rd Al	RN	106
6739	Washpool AL	RN	292
6742	Walloon AL-B	RN	410
6748	Brisbane City AL	RN	382
6751	Mt Crosby AL	RN	313
6754	Moggill AL-P	RN	306
6774	Wilsons Peak AL-P	RN	1
6775	Peachester AL	RN	133
2168	Ipswich AL	WL	1763
6515	Gregors Ck AL-P	WL	1799
6521	Boat Mountain AL	WL	2177
6524	Cressbrook Dam AL	WL	1424
6527	Helidon AL	WL	407
6543	Cooyar Ck AL	WL	1529
6551	Walloon AL-P	WL	1230
6554	Rosentretters Br AL	WL	895
6557	Glenore Grove AL	WL	3666
6560	Savages Crossing AL	WL	4220
6563	Kalbar Weir AL	WL	1247

Alert ID	Station name	Gauge type	Number of readings
6566	Tenthill AL	WL	86
6569	O Reillys Weir AL	WL	1341
6572	Harrisville AL	WL	1057
6578	Gatton AL	WL	3598
6581	Adams Br AL	WL	4666
6584	Showground Weir AL	WL	1179
6591	Somerset Dam HW ALERT-B	WL	808
6594	Somerset Dam HW ALERT-P	WL	899
6595	Somerset Dam HW ALERT (test)	WL	1153
6627	Maroon Dam AL	WL	1268
6631	Lyons Br AL-B	WL	1989
6634	Lyons Br AL-P	WL	2670
6637	Wivenhoe Dam HW ALERT-B	WL	7212
6638	Wivenhoe Dam HW ALERT-B2	WL	1161
6642	Wivenhoe Dam TW ALERT-B	WL	2407
6644	Wivenhoe Dam TW ALERT-P	WL	4854
6645	Splityard Ck Dam AL	WL	918
6647	Lowood AL-B	WL	2366
6650	Lowood AL-P	WL	2

Alert ID	Station name	Gauge type	Number of readings
6652	Amberley AL-P	WL	5315
6654	Amberley AL-B	WL	1113
6655	Buaraba Creek AL	WL	2999
6703	Woodford AL-B	WL	1048
6706	Woodford AL-P	WL	1138
6709	Devon Hills AL	WL	1631
6718	Linville AL	WL	1611
6720	Kilcoy Creek AL	WL	3715
6731	Jindalee AL	WL	1465
6734	Rosewood AL	WL	1070
6737	Kuss Rd AL	WL	791
6740	Washpool AL	WL	1
6743	Walloon AL-B	WL	133
6747	Whyte Island AL	WL	4667
6749	Brisbane City AL	WL	1653
6752	Mt Crosby AL	WL	3562
6755	Moggill AL-P	WL	1569
6756	Burtons Bridge AL	WL	1716
6757	Kholo Bridge AL	WL	1324
6758	Mt Crosby AL-B	WL	555
6776	Peachester AL	WL	1714

Key: RN = Rainfall; WL = Water level

Table 5.2.7 – Number of readings received from each rainfall and water level gauge in the ALERT network

5.3 Network maintenance

Seqwater's hydrographic unit is responsible for the operation and maintenance of the rainfall and water level network. This unit is assisted by RoadTek, the commercial construction arm of the Department of Transport and Main Roads.

Most rainfall stations are stand-alone instruments or are co-located with river level stations. Where possible, ALERT water level gauges take advantage of data provided by DERM-owned and maintained gauging stations to provide a robust source of reliable water level sensing.

A number of the sites damaged during the January 2011 Flood Event have already been reinstated by Seqwater staff.

6 EVENT DATA

6.1 Introduction

A real-time flood monitoring and forecasting system has been established to monitor rainfall and water levels in the Dam catchments and to provide adequate, accurate and timely information for informed decision-making. This system is described in detail in Section 5. Following is a description of the operational rainfall and river height data collected during the January 2011 Flood Event using this system, as well as a description of other supporting information used by the Flood Operations Centre to support decision-making during the Event.

It should be noted that the data contained in this Section is operational data that was collected during the Event and upon which operational decisions were made. The data is considered accurate, however only real time validation of the data has been undertaken. Given the time constraints regarding the preparation of this Report, it is recognised that more information may become available over time to add to the Event data presented in this Section.

6.2 Forecast rainfall

A number of rainfall forecasting tools were provided by the Bureau of Meteorology (BoM) and were used to inform decision-making during the January 2011 Flood Event. Seqwater understands from experience and ongoing discussions with BoM that there are always uncertainties associated with rainfall forecasts. Previous flood event reports have discussed these uncertainties. While rainfall forecasts provide an awareness of potential flood event conditions, as shown below and in previous flood event reports, the forecasts themselves do not provide a definitive basis on which to make operational decisions on releasing flood water from the Dams. Generally, the longer the forecast lead times, the higher the degree of uncertainty in the forecast.

The BoM forecast tools examined during the event were:

- 24-hour Quantitative Precipitation Forecasts (QPF) for the Dam catchments;
- The weather radar (available through www.bom.gov.au);
- SILO meteograms forecast rainfall (based on the BoM ACCESS Model);
- Interactive weather and wave forecast rainfall maps (based on ACCESS Model);
- Water and land forecast rainfall (based on an ensemble of several numerical weather prediction models);
- Severe weather warnings.

Of these, QPFs are considered to be the primary forecast tool as they are provided by the BoM to provide specific rainfall forecast information in relation to the Dam catchment areas. QPFs leading up to and during the Event are shown in Table 6.2.1. In relation to the data shown in this table, the following observations can be made:

- QPFs provided a reasonable representation of the actual daily rainfall recorded until 16:00 on Saturday 8 January 2011. The 11 forecasts issued to 16:00 on Saturday 8 January 2001 **overestimated** rainfall during this period by only 21%. This is considered an excellent result for rainfall forecast information provided by the BoM. However, the total catchment average rainfall recorded during this five-day period was only in the order of 100mm or an average of 20mm per day. These rainfall forecasts did not support an increase in flood releases above that undertaken.
- In the five forecasts issued between 16:00 on Saturday 8 January 2011 and 10:00 on Tuesday 11 January 2011, the QPFs **underestimated** rainfall (as highlighted in red in Table 6.2.1). During this period, actual daily catchment average rainfall was between 160% and 340% of the corresponding forecast, with an average discrepancy of 225%. This was the critical rainfall period, with the catchment average rainfall recorded during this two-and-a-half day period being in the order of 300mm or an average of around 120mm per day. These underestimated rainfall forecasts did not support an increase in flood releases above that undertaken.

- For the two forecasts issued during the period between 10:00 on Tuesday 11 January 2011 and 16:00 on Tuesday 11 January 2011, the QPFs **overestimated** rainfall (as highlighted in blue in Table 6.2.1). During this period, forecast daily catchment average rainfall was between 196% and 625% of the actual rainfall recorded, with an average discrepancy of 270%. The total catchment average rainfall recorded during this period was only in the order of 45mm. If these overestimated forecasts had been adopted as a basis for flood release decision making, urban damage below the Dam would have been significantly increased.
- QPFs provided a reasonable representation of the actual rainfall recorded after 10:00 on Wednesday 13 January 2011 after the flood peak had passed through the Dam and during the Drain Down Phase of the Event.

Date / time of issue	Forecast for 24 hours to	24-hour Catchment average forecast rainfall (mm)	24-hour Catchment average actual rainfall (mm)
Mon 03/01/2011 11:36	Tue 04/01/2011 09:00	8	5
Mon 03/01/2011 16:00	Tue 04/01/2011 15:00	15	4
Tue 04/01/2011 11:30	Wed 05/01/2011 09:00	15	0
Tue 04/01/2011 16:00	Wed 05/01/2011 15:00	10	2
Wed 05/01/2011 10:03	Thu 06/01/2011 09:00	25	26
Wed 05/01/2011 16:00	Thu 06/01/2011 15:00	40	44
Thu 06/01/2011 10:21	Fri 07/01/2011 09:00	40	38
Thu 06/01/2011 16:00	Fri 07/01/2011 15:00	25	43
Fri 07/01/2011 10:03	Sat 08/01/2011 10:00	25	26
Fri 07/01/2011 16:04	Sat 08/01/2011 16:00	25	6
Sat 08/01/2011 10:03	Sun 09/01/2011 09:00	40	28
Sat 08/01/2011 16:00	Sun 09/01/2011 15:00	40	80
Sun 09/01/2011 10:03	Mon 10/01/2011 09:00	50	149
Sun 09/01/2011 16:00	Mon 10/01/2011 15:00	65	125
Mon 10/01/2011 10:03	Tue 11/01/2011 10:00	75	120
Mon 10/01/2011 16:00	Tue 11/01/2011 16:00	38	129
Tue 11/01/2011 10:13	Wed 12/01/2011 10:00	100	51
Tue 11/01/2011 16:13	Wed 12/01/2011 16:00	75	12
Wed 12/01/2011 10:03	Thu 13/01/2011 10:00	10	2
Wed 12/01/2011 16:00	Thu 13/01/2011 16:00	5	1
Thu 13/01/2011 14:25	Fri 14/01/2011 16:00	5	0
Thu 13/01/2011 16:00	Fri 14/01/2011 15:00	5	0
Fri 14/01/2011 10:03	Sat 15/01/2011 09:00	3	0
Fri 14/01/2011 16:00	Sat 15/01/2011 15:00	3	0

Table 6.2.1 – Actual and forecast rainfall comparison (BoM QPF)

As well as examining and modelling the QPFs, the ACCESS model result data provided by the BoM allowed three day and five day rainfall forecasts to be examined and considered in flood event decision-making.

A summary of this data is shown in the following table that contains translated rainfall forecasting results using ACCESS model result data provided by the BoM during the critical period of the Event (between Thursday 6 and Tuesday 11 January 2011). Following the Event, the original BoM data has been translated to forecast catchment average quantitative rainfall results, based on a derived catchment centroid rainfall, estimated by using Seqwater's FEWS system (see Appendix J).

Comparison of actual and forecast rainfall from the BoM ACCESS model

Forecast date and time	Somerset Dam catchment average rainfall				Wivenhoe Dam catchment average rainfall (excluding Somerset Dam catchment)			
	3 Days from		5 Days from		3 Days from		5 Days from	
	Forecast rainfall (mm)	Actual rainfall (mm)	Forecast rainfall (mm)	Actual rainfall (mm)	Forecast rainfall (mm)	Actual rainfall (mm)	Forecast rainfall (mm)	Actual rainfall (mm)
06/01/2011 00:00	73	90	115	403	90	79	114	275
06/01/2011 12:00	85	150	133	515	51	87	78	335
07/01/2011 00:00	189	298	206	568	133	180	144	347
07/01/2011 12:00	123	321	137	536	79	183	89	322
08/01/2011 00:00	191	332	206	527	207	205	218	309
08/01/2011 12:00	165	447	169	527	136	284	139	309
09/01/2011 00:00	230	500	231	510	267	298	268	301
09/01/2011 12:00	140	441	141	446	170	271	171	273
10/01/2011 00:00	463	278	465	280	171	169	171	170
10/01/2011 12:00	59	218	60	219	389	140	390	141
11/01/2011 00:00	19	196	19	197	231	105	231	105

Table 6.2.2 – Actual and forecast rainfall comparison (BoM ACCESS model)

Table 6.2.2 above shows:

- There are variations in excess of 700% between successive three-day catchment average rainfall forecasts made 12 hours apart. These large fluctuations between successive forecasts that overlap by two and a half days do not provide a sensible basis for proper and consistent decision-making;
- There are variations in excess of 700% between successive five-day catchment average rainfall forecasts made 12 hours apart. These large fluctuations between successive forecasts that overlap by two and a half days do not provide a sensible basis for proper and consistent decision-making;
- In the eight three-day forecasts for the Somerset Dam catchment issued between 00:00 on Thursday 6 January 2011 and 12:00 on Sunday 9 January 2011, the forecasts **underestimated** rainfall. During this period, actual three-day catchment average rainfall was between 120% and 270% of the corresponding forecast, with an average discrepancy of 215%. These underestimated rainfall forecasts did not support an increase in flood releases above that undertaken;
- In the eight five-day forecasts for the Somerset Dam catchment issued between 00:00 on Thursday 6 January 2011 and 12:00 on Sunday 9 January 2011, the forecasts **underestimated** rainfall. During this period, actual five-day catchment average rainfall was between 220% and 390% of the corresponding forecast, with an average discrepancy of 300%. These underestimated rainfall forecasts did not support an increase in flood releases above that undertaken;

- In the eight three-day forecasts for the Wivenhoe Dam catchment issued between 00:00 on Thursday 6 January 2011 and 12:00 on Sunday 9 January 2011, the forecasts **underestimated** rainfall on all but two occasions. During this period, actual three-day catchment average rainfall fluctuated between 85% and 230% of the corresponding forecast, with an average discrepancy of 140%. In hindsight it can be seen that these were the best forecasts provided during the event. In practice, the forecasts could not be used as a basis for decision-making as there was no way of determining that these individual forecasts were more accurate than any others provided. Additionally the large fluctuations between successive forecasts that overlap by two and a half days do not provide a sensible basis for proper and consistent decision-making;
- In the eight five-day forecasts for the Wivenhoe Dam catchment issued between 00:00 on Thursday 6 January 2011 and 12:00 on Sunday 9 January 2011, the forecasts **underestimated** rainfall. During this period, actual five-day catchment average rainfall was between 110% and 430% of the corresponding forecast, with an average discrepancy of 200%. These underestimated rainfall forecasts did not support an increase in flood releases above that undertaken;
- There are eight instances in which actual rainfall recorded is greater than 200% (highest is more than 1,000%) of the three-day forecast rainfall;
- There are three instances in which the three-day forecast rainfall is greater than 150% (highest is 280%) of the actual rainfall recorded;
- There are nine instances in which actual rainfall recorded is greater than 300% (highest is over 1,000%) of the five-day forecast rainfall;
- There are two instances in which the five-day forecast actual rainfall is greater than 200% (highest is 280%) of the actual rainfall recorded.

These results show that three-day and five-day forecasts only provide an indication of future rainfall and these forecasts cannot be used as a basis of flood operations decision-making where public safety in both rural and urban areas is directly impacted. This forecasting information uses the most up-to-date technology available within the BoM at the present time. Future improvements in this area will be examined with interest in order to maximise the flood mitigation benefits of the Dams.

6.3 Event rainfall totals

As discussed in Section 5, Seqwater uses a network of automated rainfall stations within the Brisbane River catchment area to gather rainfall data during flood events. Data from this network is automatically collected in real time using a radio telemetry collection system and sent in real time to the Flood Operations Centre. Every millimetre of rainfall recorded at each station is sent immediately to the Flood Operations Centre as it is recorded.

Data sent to the Flood Operations Centre in this way is operational data that has not been validated. Both manual and automatic data checking was undertaken in the Flood Operations Centre at regular and routine intervals over the course of the Event.

Table 6.3.1 shows the daily rainfall totals collected by the Flood Operations Centre (both FLOOD-Col and Enviromon) at each of the rainfall stations during the Event. Stations highlighted in **bold** are configured in the flood models and used in modelling of flows.

Alert ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6500	540184	Mt Glorious-B	-27.3120	152.7470									
6511	541057	**Mt Pechy**	-27.3167	152.0817	44	16	16	7	81	101	18	0	283
6514	540139	**Gregors Ck-P**	-26.9800	152.4040	27	39	11	25	221	77	25	1	426
6517	540140	**Gregors Ck-B**	-27.0000	152.4040									
6520	540141	**Boat Mountain**	-26.9789	152.2847	40	52	20	25	179	62	26	4	408
6523	540142	**Cressbrook Dam**	-27.2650	152.1950	32	28	14	7	94	120	11	1	307
6526	540143	**Helidon**	-27.5440	152.1130	56	42	25	6	101	33	0	0	263
6529	540144	**St Aubyns**	-27.0619	151.8944	25	26	23	20	74	123	8	2	301
6540	540145	**Yarraman**	-26.8358	151.9692	32	40	21	20	113	130	0	1	357
6542	540146	**Cooyar Ck**	-26.7417	152.1367	23	55	28	18	118	118	3	1	364
6550	540147	**Walloon-P**	-27.6170	152.6680	25	14	14	3	69	42	114	0	281
6553	540148	**Rosentretters Br**	-27.1383	152.3294	28	27	25	4	129	111	23	4	351
6555	540479	Atkinson Dam	-27.4320	152.4640	44	28	9	5	109	119	98	0	412
6556	540149	**Glenore Grove**	-27.5242	152.4081	16	24	13	4	84	77	129	0	347
6559	540150	**Savages Crossing**	-27.4410	152.6680	4	27	5	5	113	246	144	0	544
6562	540151	**Kalbar Weir**	-27.9230	152.6010	42	39	7	4	15	67	55	0	229
6565	540152	**Tenthill**	-27.6360	152.2140									
6568	540153	**O'Reillys Weir**	-27.4197	152.5892	10	36	6	2	98	146	206	0	504
6571	540154	**Harrisville**	-27.8150	152.6406	14	19	10	1	30	76	53	0	203
6574	540155	**Caboonbah**	-27.1460	152.4900	24	23	39	9	130	154	54	0	433
6577	540156	**Gatton**	-27.5564	152.2731	17	36	21	4	87	68	88	0	321
6580	540157	**Adams Br**	-27.8294	152.5108	33	30	13	2	36	93	92	1	300
6583	540158	**Showground Weir**	-27.6386	152.3844	13	27	18	1	68	103	117	0	347
6590	540160	**Somerset Dam HW-B**	-27.1200	152.5510	20	18	42	22	159	136	65	1	463

Alert ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6593	540159	**Somerset Dam HW-P**	-27.1000	152.5510									
6596	540161	**Crows Nest**	-27.2308	152.0311	44	21	15	11	115	98	18	0	322
6598	540162	**Toowoomba**	-27.5114	151.9536	44	18	27	9	81	117	24	1	321
6600	540163	**Kilcoy**	-26.9481	152.5836	12	38	18	24	179	96	61	2	430
6601	540494	Mt Binga	-26.9920	151.9850	38	39	35	22	121	118	13	2	388
6602	540164	**Top of Brisbane**	-26.4772	152.1567	45	52	70	17	41	66	0	0	291
6603	540493	Blackbutt	-26.8860	152.1020	45	75	30	33	160	107	13	0	463
6604	540165	**Toogoolawah**	-27.0858	152.3722	16	26	22	12	177	103	27	2	385
6605	540492	Eskdale	-27.1670	152.1860									
6606	540166	**West Woodbine**	-27.7847	152.1497	35	17	5	4	17	88	33	0	199
6607	540491	Lindfield	-26.8370	152.5810	50	34	18	90	271	86	65	1	615
6608	540167	**Jimna**	-26.6610	152.4510	29	44	28	42	117	47	22	1	330
6609	540490	Monsildale	-26.5820	152.3250	25	43	62	49	117	160	4	2	462
6610	540168	Kluvers Lookout	-27.2070	152.7030	4	52	24	17	126	164	191	4	582
6611	540489	Redbank Creek	-27.2770	152.2890	32	40	21	7	130	170	27	1	428
6612	540488	Mt Stanley	-26.6820	152.2050	24	61	32	32	137	160	2	1	449
6613	540487	Hazeldean	-27.0280	152.5370	9	38	32	18	204	123	90	5	519
6614	540486	Westvale	-27.0170	152.6100									
6615	540169	**Thornton**	-27.8211	152.3800	23	31	12	5	46	123	98	0	338
6617	540170	**Little Egypt**	-27.7042	152.0650	50	18	8	1	30	92	30	1	230
6619	540171	**Mt Castle**	-27.9636	152.3756	52	55	17	4	88	195	122	21	554
6621	540172	**Nukinenda**	-27.0567	152.1072	11	43	19	13	114	113	10	2	325
6623	540173	**Tarome**	-27.9867	152.5008	31	55	9	0	26	81	82	0	284
6624	540474	Moogerah Dam	-28.0310	152.5450	23	55	16	1	21	96	76	0	288

Alert ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6626	540475	Maroon Dam	-28.1840	152.6340	20	19	1	5	34	78	46	0	203
6630	540175	**Lyons Br-B**	-27.4717	152.5236	25	25	13	4	83	130	239	0	519
6633	540174	**Lyons Br-P**	-27.4717	152.5236	26	22	11	5	75	114	214	0	467
6636	540177	**Wivenhoe Dam HW-B**	-27.3550	152.5960	6	29	6	4	87	135	197	0	464
6641	540179	**Wivenhoe Dam TW-B**	-27.3900	152.5960	8	32	6	5	99	157	206	0	513
6643	540178	**Wivenhoe Dam TW-P**	-27.4100	152.5960	7	30	7	2	101	160	218	0	525
6646	540183	**Lowood-B**	-27.4700	152.5930	8	29	7	4	104	183	210	0	545
6649	540182	**Lowood-P**	-27.4900	152.5930	6	22	8	9	99	163	194	0	501
6651	540180	**Amberley-P**	-27.6780	152.6990	39	13	16	3	68	32	86	0	257
6653	540181	**Amberley-B**	-27.6783	152.6989	38	12	16	3	59	32	81	1	242
6656	540472	Bill Gunn Dam	-27.6320	152.3790	13	31	23	1	74	102	132	0	376
6658	540473	Lake Clarendon Dam	-27.5160	152.3530	21	35	20	5	88	76	134	0	379
6680	540138	**Mt Glorious-P**	-27.3220	152.7470	29	46	16	24	204	260	228	2	809
6690	540185	**Mt Mee-P**	-27.0700	152.7800	10	55	46	30	220	137	179	10	687
6701	540246	**Mt Mee-B**	-27.0700	152.7800	9	55	49	28	219	138	179	9	686
6702	540338	**Woodford-B**	-26.9300	152.7600	8	42	43	37	181	88	196	5	600
6705	540337	**Woodford-P**	-26.9500	152.7600	8	41	43	38	182	88	196	5	601
6708	540188	**Devon Hills**	-26.9000	152.3210	28	42	43	55	162	68	16	1	415
6711	540189	Baxters Ck	-27.1958	152.8000	3	37	23	17	127	170	192	0	569
6714	540190	**Ferris Knob**	-26.8542	152.8167	0	33	24	90	250	78	224	11	710
6716	540191	**West Bellthorpe**	-26.8230	152.6780	50	30	14	104	312	134	95	7	746
6717	540261	**Linville**	-26.8050	152.2720	30	39	32	37	139	51	34	0	362
6730	540192	**Jindalee**	-27.5322	152.9239	24	35	8	5	75	26	45	0	218
6733	540193	**Rosewood**	-27.6600	152.6030	21	14	17	3	67	54	152	0	328

Alert ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6736	540194	**Kuss Rd**	-27.6658	152.5414									
6739	540195	**Washpool**	-27.8290	152.7550	12	20	11	1	24	60	38	0	166
6742	540196	**Walloon-B**	-27.6100	152.6680	26	16	14	6	67	42	113	0	284
6748	540198	**Brisbane City**	-27.4730	153.0300	49	36	12	15	105	20	41	0	278
6751	540199	**Mt Crosby**	-27.5300	152.7980	4	39	11	6	86	25	73	0	244
6754	540200	**Moggill-P**	-27.5950	152.8630	3	39	6	5	60	35	52	0	200
6759	540277	North Pine Dam-B	-27.2750	152.9300	4	45	4	9	82	53	67	0	264
6760	540202	North Pine Dam	-27.2650	152.9300	3	45	4	8	83	52	65	0	260
6763	540203	Petrie	-27.2700	152.9750	6	57	5	12	121	63	55	0	319
6766	540204	Lake Kurwongbah	-27.2500	152.9500	7	52	7	10	127	60	72	1	336
6769	540205	Drapers Crossing	-27.3500	152.9167	2	47	8	9	123	47	84	2	322
6774	540207	**Wilsons Peak-P**	-28.2440	152.4860									
6775	540059	Peachester	-26.8400	152.8406									
6778	540060	Samford	-27.3610	152.8790	21	41	6	9	131	51	99	2	360

Table 6.3.1 – Daily rainfall totals by station for the duration of the January 2011 Flood Event

The following maps (Figure 6.3.2 to Figure 6.3.11) illustrate the data in Table 6.3.1. The word "**None**" on a map signifies that no reports were received from the station during the period, however, it may not necessarily mean that the Station is Out of Action (OOA). Figures in red also indicate possible errors in the data. The 24-hour totals in Table 6.3.1 were created after the Event with the full data record for the Event present. The 24-hours totals for each day on the map may be slightly different as they represent the data as it was at that point in time. If a data signal is not received then the interpolations to 09:00 will vary from the complete data set.

Rainfall in the 24 hours to 09:00 on Wednesday 5 January 2011

In the 24 hours to 09:00 on Wednesday 5 January 2011, only small rainfall totals, generally less than 5mm, were recorded in the Brisbane Basin.

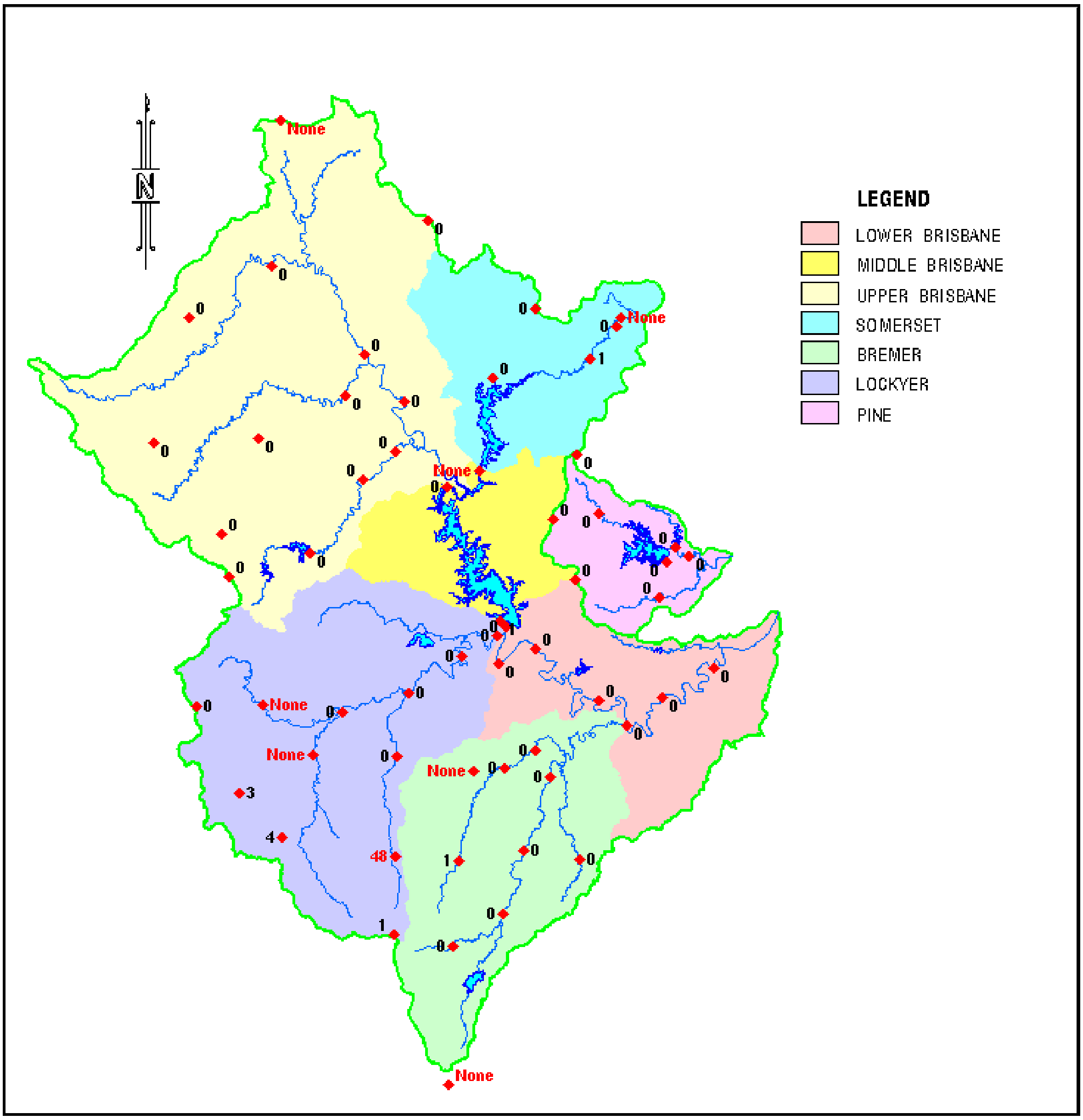

Figure 6.3.2 – Rainfall in the 24 hours to 09:00 on Wednesday 5 January 2011

Rainfall in the 24 hours to 09:00 on Thursday 6 January 2011

In the 24 hours to 09:00 on Thursday 6 January 2011, widespread rainfall was recorded throughout the area, with totals ranging from 20mm to 56mm. The highest totals in this period were concentrated in the Upper Brisbane catchment, around Boat Mountain and Cooyar.

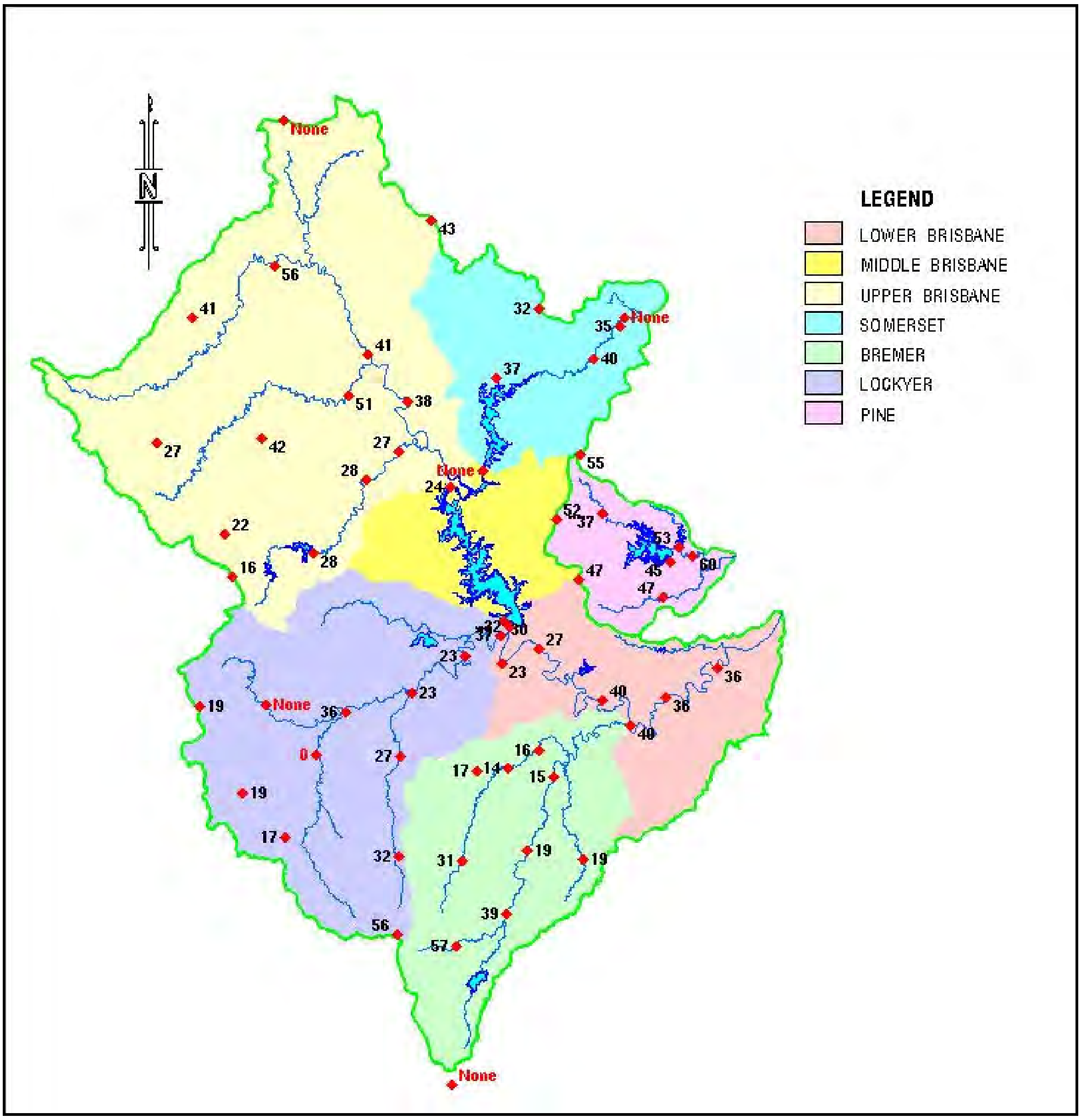

Figure 6.3.3 - Rainfall in the 24 hours to 09:00 on Thursday 6 January 2011

Rainfall in the 24 hours to 09:00 on Friday 7 January 2011

Compared to the previous period, rainfall generally eased in the 24 hours to 09:00 on Friday 7 January 2011. Rainfall in the period was again wide-spread, however, totals were generally between 10mm to 30mm, with an occasional isolated higher total in the Upper Brisbane River and Stanley River catchments.

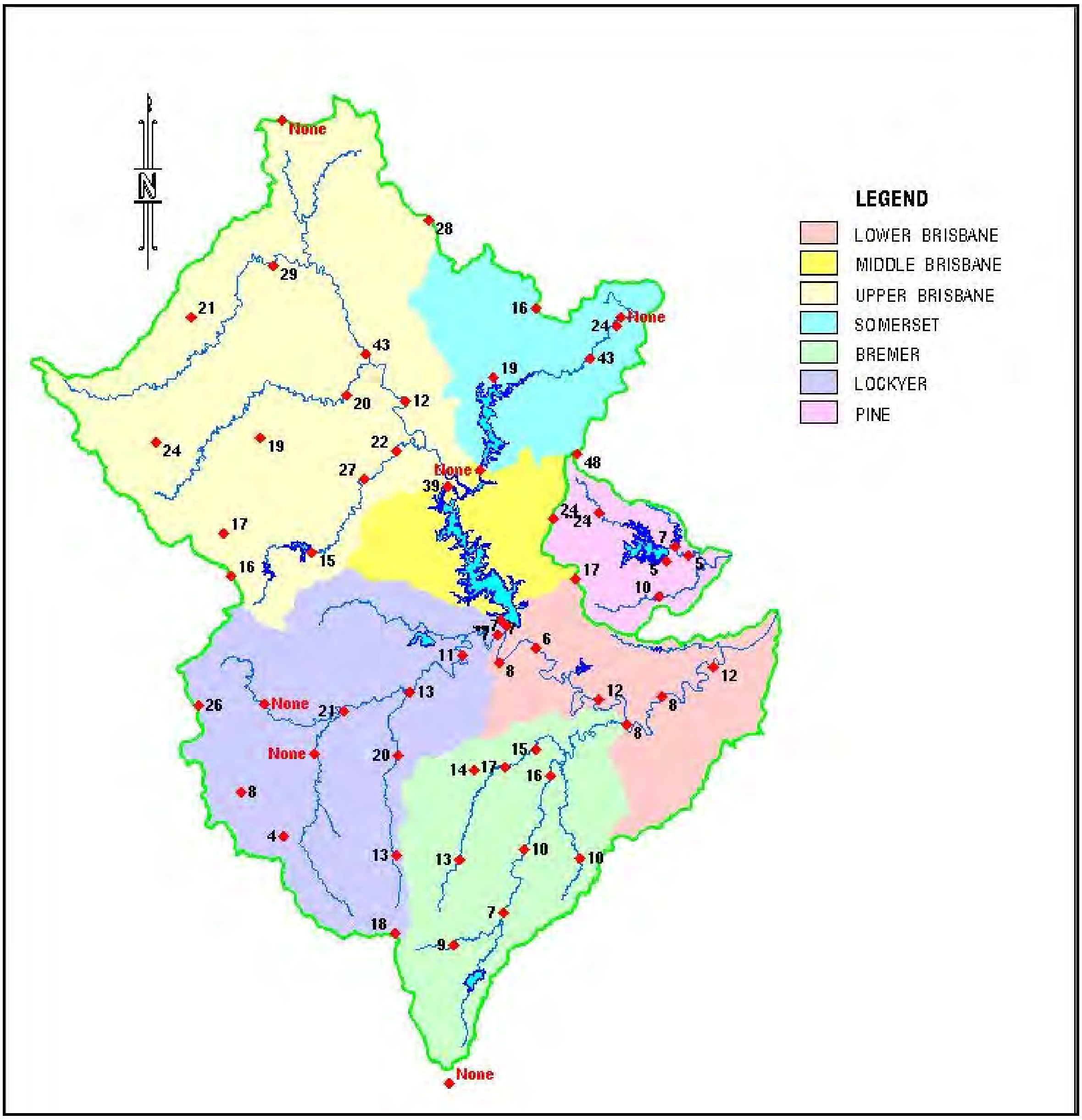

Figure 6.3.4 - Rainfall in the 24 hours to 09:00 on Friday 7 January 2011

Rainfall in the 24 hours to 09:00 on Saturday 8 January 2011

The highest totals in the 24 hours to 09:00 on Saturday 8 January 2011 were recorded in the headwater areas around Ferris Knob and Bellthorpe West, with totals around 100mm. High rainfall continued to be recorded in the Upper Brisbane River around Devon Hills. Elsewhere in the basin downstream of Wivenhoe Dam, totals were generally less than 10mm.

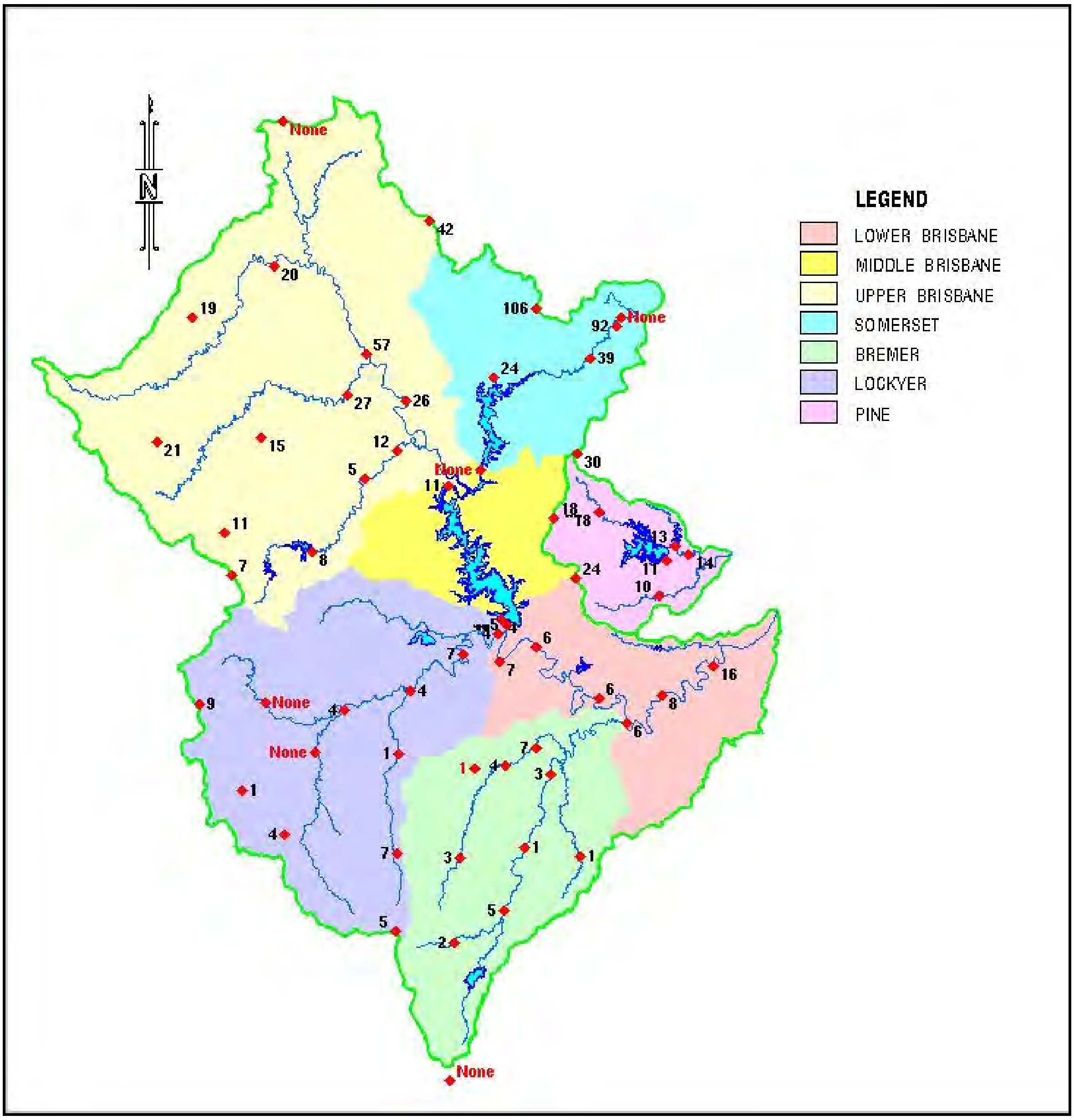

Figure 6.3.5 - Rainfall in the 24 hours to 09:00 on Saturday 8 January 2011

Rainfall in the 24 hours to 09:00 on Sunday 9 January 2011

Rainfall throughout the basin was widespread in the 24 hours to 09:00 on Sunday 9 January 2011. Totals were generally below 30mm, but with isolated higher totals just over 40mm in the upper reaches of the Stanley River catchments around Ferris Knob and around the centre of the Upper Brisbane River catchment around Devon Hills.

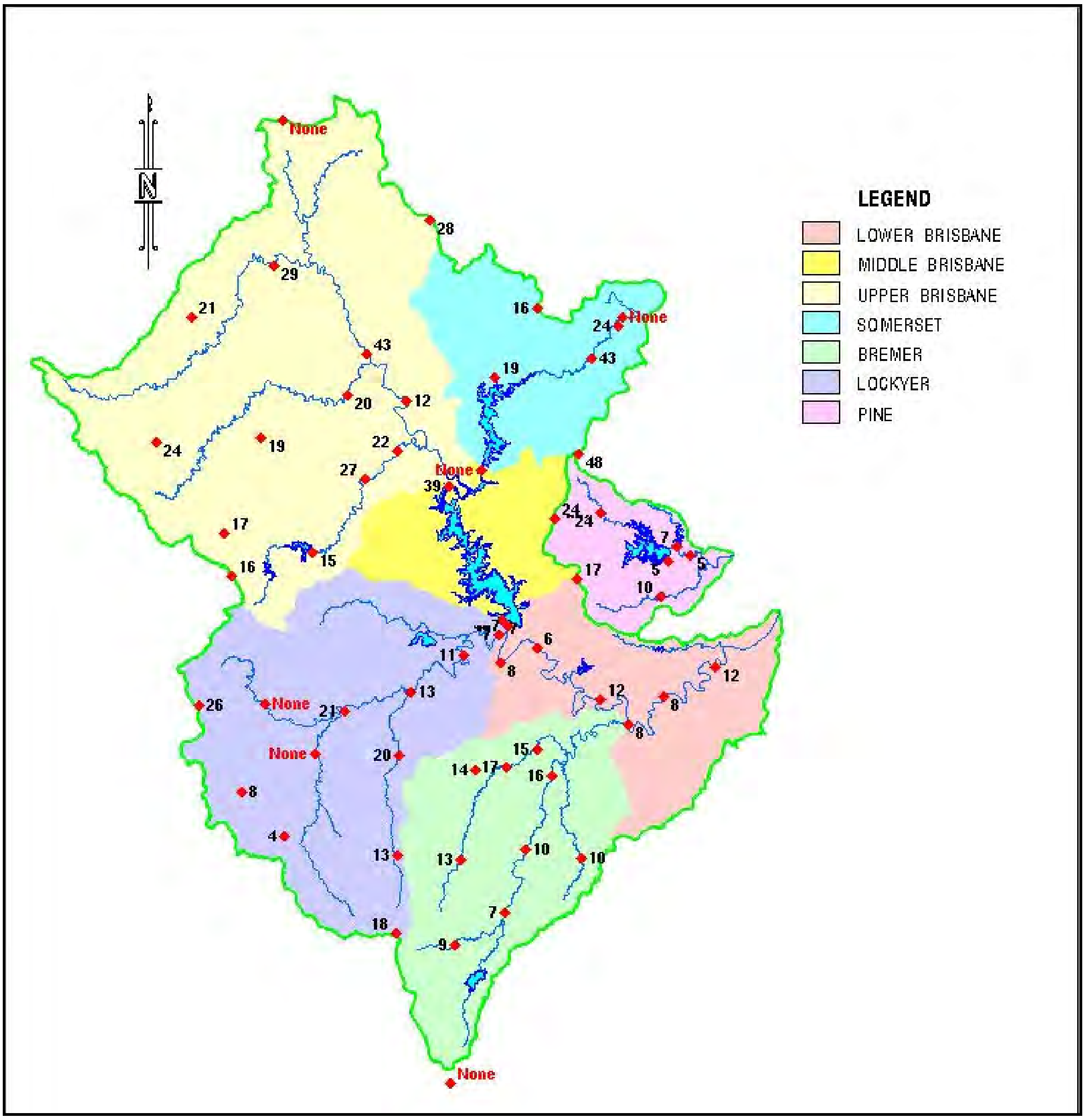

Figure 6.3.6 - Rainfall in the 24 hours to 09:00 on Sunday 9 January 2011

Rainfall in the 24 hours to 09:00 on Monday 10 January 2011

The rainfall in the 24 hours to 09:00 on Monday 10 January 2011 was especially high in the Stanley River catchment. The highest daily Event total of 310mm was recorded at Bellthorpe West. Falls in other parts of the Stanley River catchment ranged from 180mm to 250mm in the same period. In the Upper and Middle Brisbane River catchments, 24-hour totals ranged from 73mm at St Aubins to 284mm at Mt Glorious just east of Wivenhoe Dam. Widespread rain between 100mm and 200mm was recorded in other parts of the catchment.

Rainfall in the Lockyer Creek catchment ranged from 15mm at Woodbine West to nearly 80mm at Toowoomba. The heaviest falls in the Bremer River system were concentrated in the lower reaches, with totals of up to 70mm recorded. In the headwater of the Bremer River, totals were much lower. This was the first day since the start of the Event that heavy rainfall was recorded in the Lower Brisbane River catchment, with 24 hour totals up to 113mm.

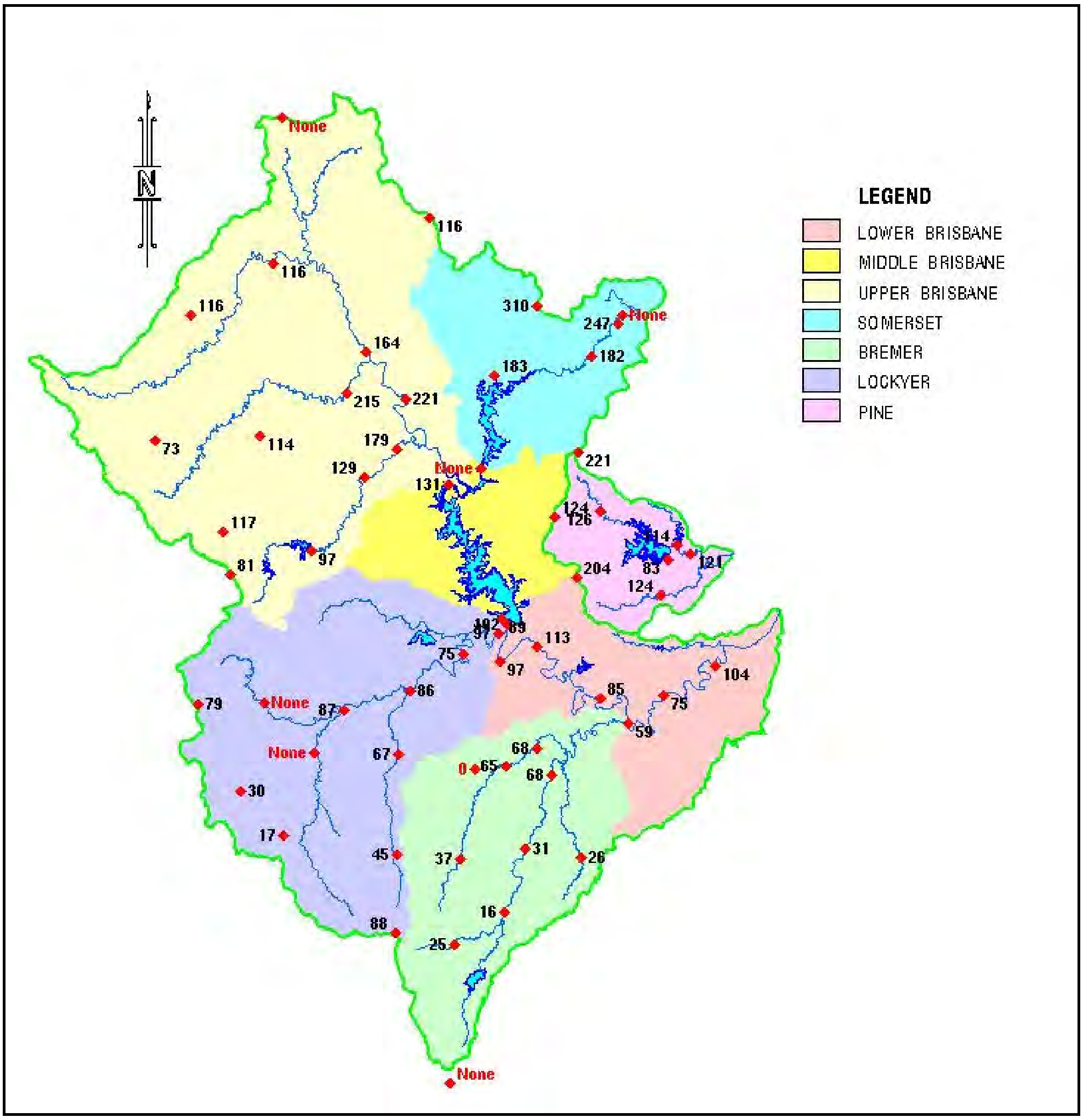

Figure 6.3.7 - Rainfall in the 24 hours to 09:00 on Monday 10 January 2011

Rainfall in the 24 hours to 09:00 on Tuesday 11 January 2011

Heavy rain continued to be recorded throughout the Brisbane Basin in the 24 hours to 09:00 on Tuesday 11 January 2011, with the highest totals in the area around the lower Middle Brisbane River and upper reaches of the Lower Brisbane River catchment, with totals up to 262mm at Mt Glorious. In the Stanley River catchment, totals between 80mm and 130mm were again reported widely throughout the catchment.

Particularly heavy rainfall was recorded in the upper reaches of Lockyer Creek around Toowoomba, which recorded 116mm in the period, with most of this falling the previous afternoon. Very large totals were also recorded in the headwater area of Laidley Creek, where nearly 200mm was reported at Mount Castle. In the Bremer River catchment, rainfall was still widespread, although totals were generally below 70mm.

Totals in the Lower Brisbane River area were generally below 30mm, although there were very high totals around Fernvale.

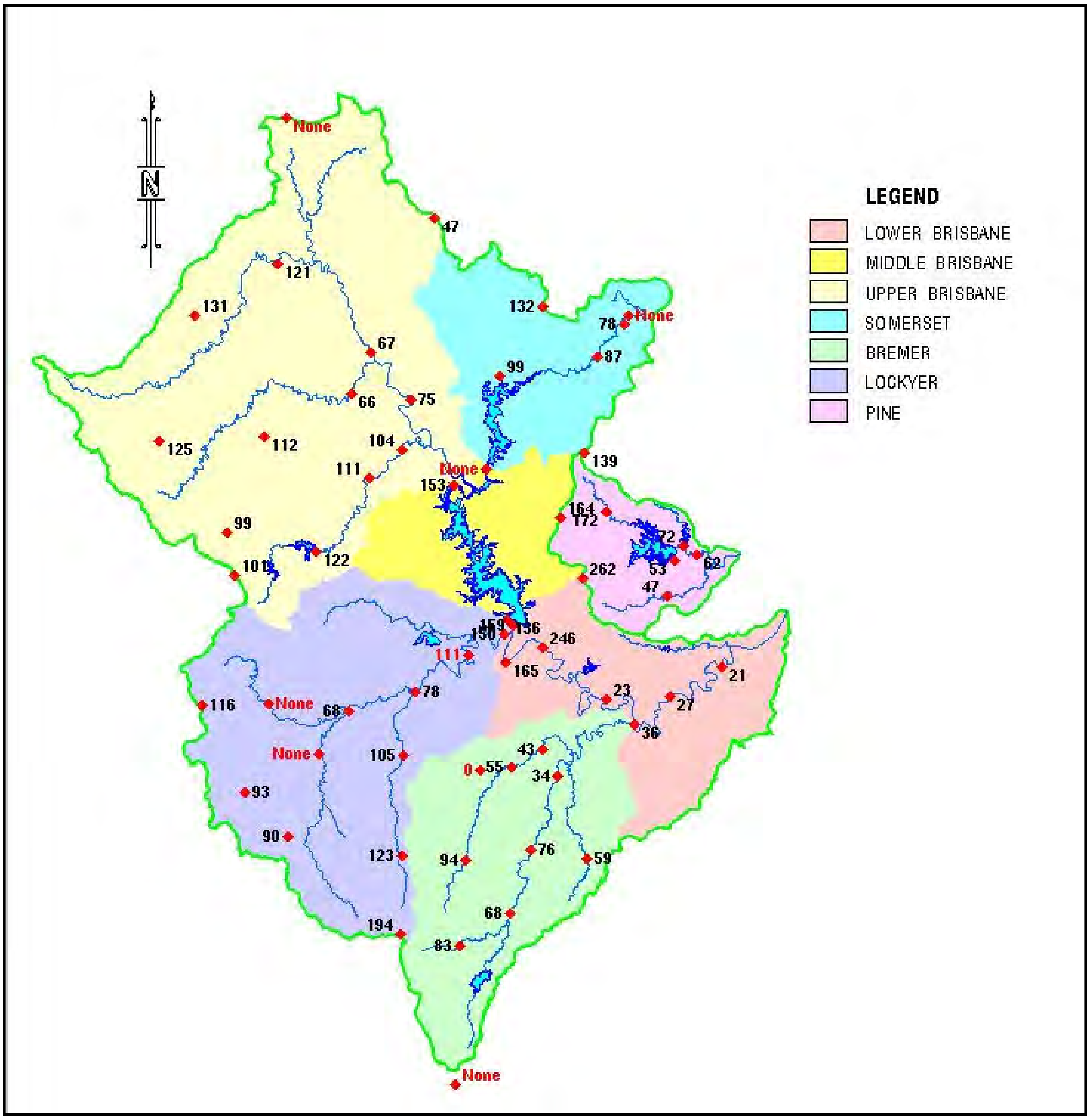

Figure 6.3.8 - Rainfall in the 24 hours to 09:00 on Tuesday 11 January 2011

Rainfall in the 24 hours to 09:00 on Wednesday 12 January 2011

High rainfall continued to be recorded in the upper reaches of the Stanley River, with falls in excess of 220mm in the 24 hours to 09:00 on Thursday 12 January 2011.

In the Upper Brisbane River catchment, rainfall had eased with 24-hour totals generally less than 30mm. However, heavy rainfall continued in the area around Wivenhoe Dam and just south, with totals between 150mm and 230mm in the area, most of which fell in the previous afternoon.

Heavy rain continued in the Laidley Creek, Bremer River and Warrill Creek catchments, with totals up to 120mm.

Elsewhere in the Lower Brisbane River catchment, totals ranged from 40mm to 70mm.

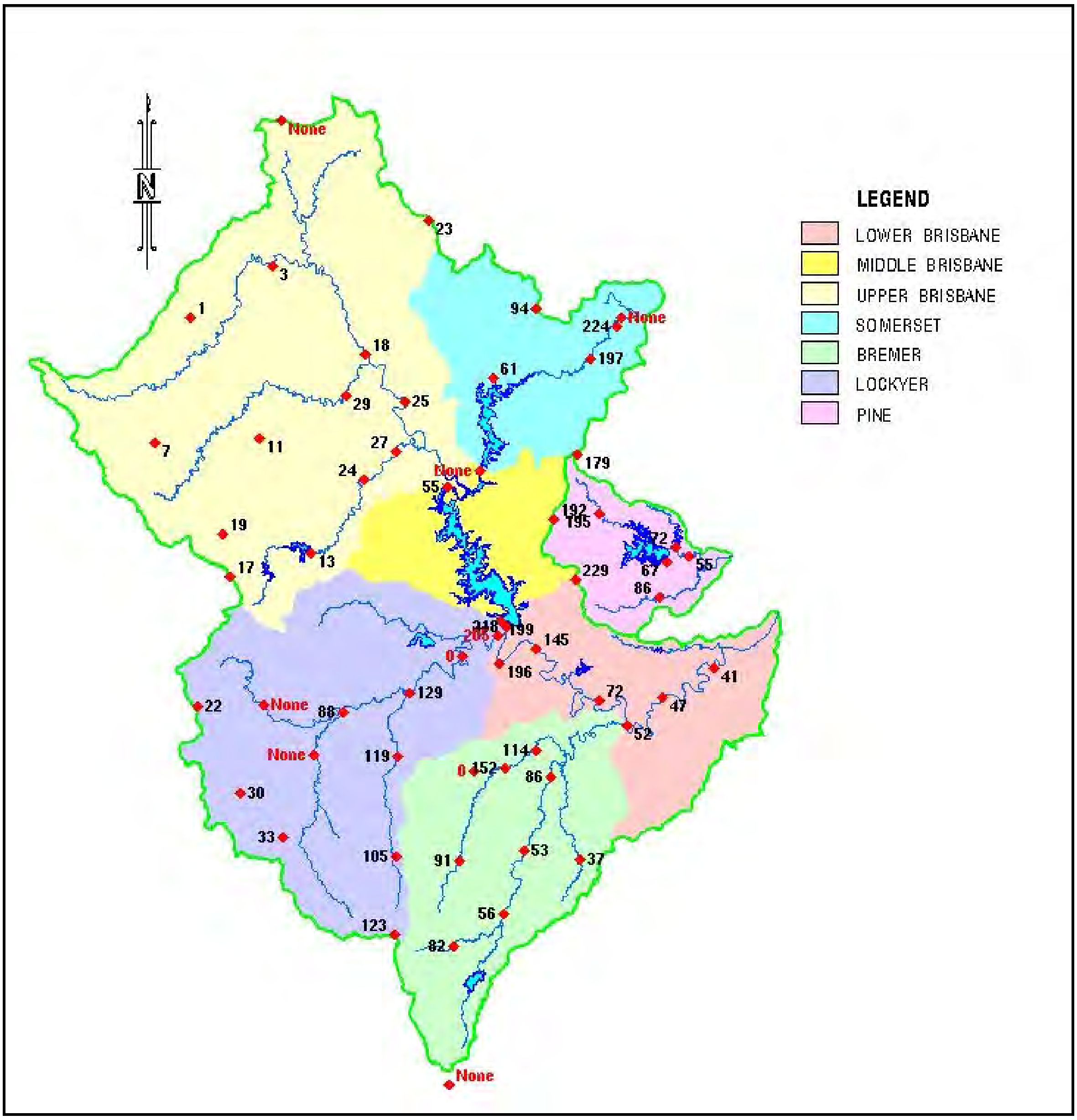

Figure 6.3.9 – Rainfall in the 24 hours to 09:00 on Wednesday 12 January 2011

Rainfall in the 24 hours to 09:00 on Thursday 13 January 2011

By 09:00 on Thursday 13 January 2011, the rainfall event was virtually complete, with totals generally below 10mm in the 24-hour period, with only an isolated higher total of 22mm at Mount Castle in Upper Laidley Creek.

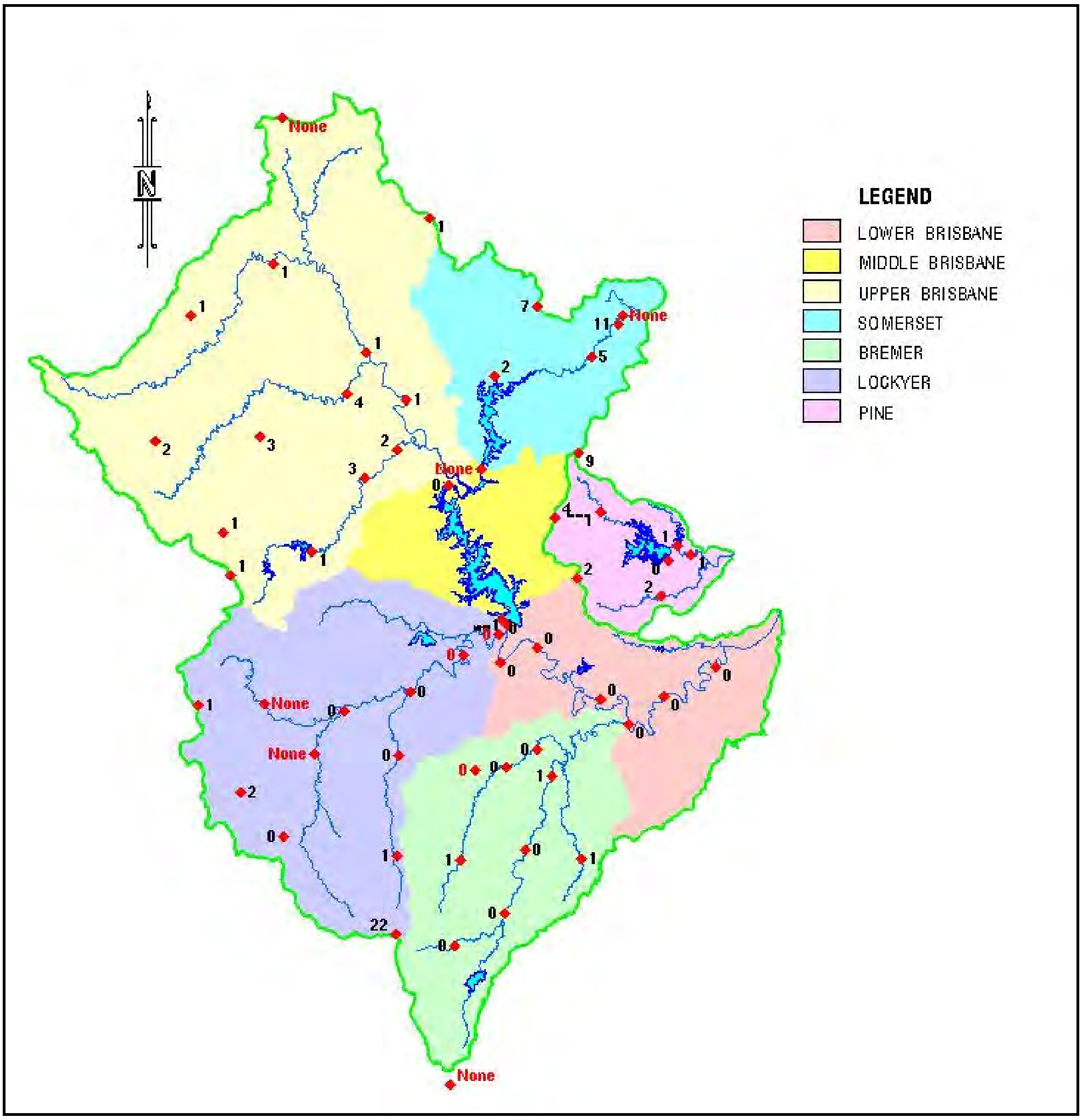

Figure 6.3.10 - Rainfall in the 24 hours to 09:00 on Thursday 13 January 2011

Rainfall in the six days to 09:00 on Thursday 13 January 2011

Figure 6.2.11 below shows the rainfall distribution during the six-day period to 09:00 on Thursday 13 January 2011.

The highest totals were recorded in the headwater ridges in the Stanley River catchment and along the D'Aguilar Range from Mt Mee to Mt Glorious. Elsewhere through the Stanley, Upper Brisbane River and Middle Brisbane River catchments, rainfall totals – while still significant – were half those recorded at elevated stations.

This effect was not as pronounced in the Lockyer Creek and Bremer River catchments, where the totals over the period tended to be more uniform. In the Lower Brisbane River area, totals in urban areas were half of those recorded around Fernvale and Lowood.

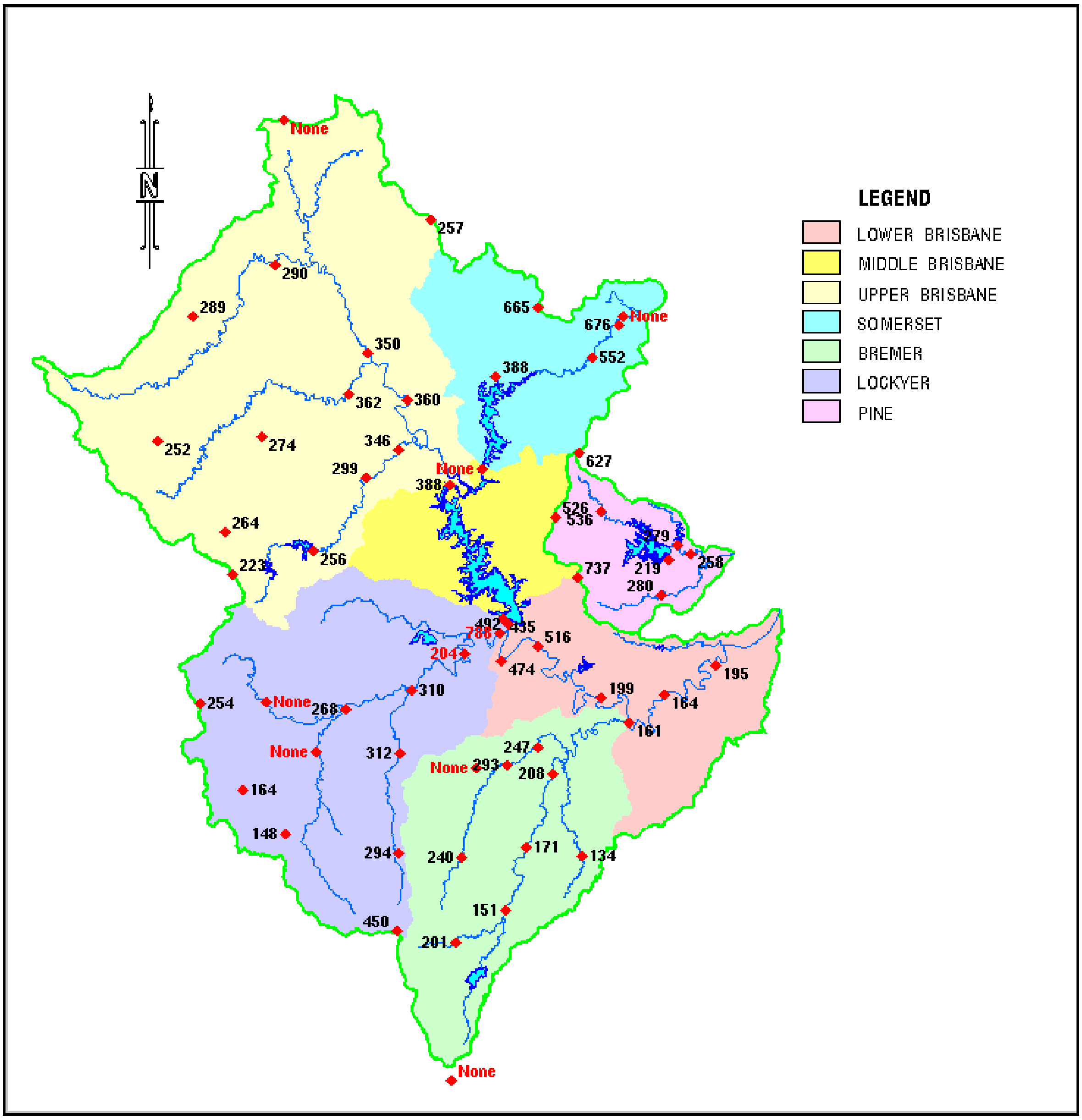

Figure 6.3.11 - Rainfall in the six days to 09:00 on Thursday 13 January 2011

Over the nine-day period ending 09:00 on Thursday 13 January 2011, the highest rainfall total in any of the Seqwater-operated gauges was 814mm at the Mt Glorious gauge, just to the east of Wivenhoe Dam.

Individual highest daily (24 hours to 09:00 on the date indicated) rainfall included:

- Bellthorpe West 106mm on Sunday 9 January 2011;
- Bellthorpe West 310mm on Monday 10 January 2011;
- Mt Glorious 262mm on Tuesday 11 January 2011;
- Lyons Bridge 242mm on Wednesday 12 January 2011.

Average rainfall for each subcatchment in the Brisbane Basin is determined by applying a weighting to the rainfall depth at each available station within the subcatchment. Within the operational system, the Brisbane Basin is divided into the five subcatchments shown in the table below.

The Somerset catchment represents the average catchment rainfall in the Stanley River to Somerset Dam.

The Upper Brisbane River catchment, as represented in Table 6.3.12, represents the total Wivenhoe Dam catchment, excluding the Somerset Dam catchment, and is a weighted average of the Upper and Middle Brisbane River catchments shown in Figure 6.3.13. For example, the weighted average of the Upper Brisbane River catchment (359mm) and Middle Brisbane River catchment (525mm) shown on the map, gives a catchment average of 401mm for the Event.

Daily catchment rainfall										
Period ending 09:00	**Stanley**		**Upper Brisbane**		**Lockyer**		**Bremer**		**Lower**	
	Period	**Σ**	**Period**	**Σ**	**Period**	**Σ**	**Period**	**Σ**	**Period**	**Σ**
	mm	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**
06/01/2011	21	21	27	27	30	30	28	28	20	20
07/01/2011	38	59	38	65	27	57	31	59	35	55
08/01/2011	32	91	27	92	15	72	12	71	10	65
09/01/2011	56	147	21	113	5	77	3	74	9	74
10/01/2011	225	372	131	244	66	143	45	119	90	164
11/01/2011	113	485	117	361	102	245	75	194	73	237
12/01/2011	128	613	38	399	84	329	84	278	82	319
13/01/2011	5	618	2	401	2	331	2	280	0	319

Table 6.3.12 – Daily rainfall throughout the total Brisbane River

The following map (Figure 6.3.13) illustrates the data contained in Table 6.3.12, summarised over the period of the Event during which significant rainfall was recorded.

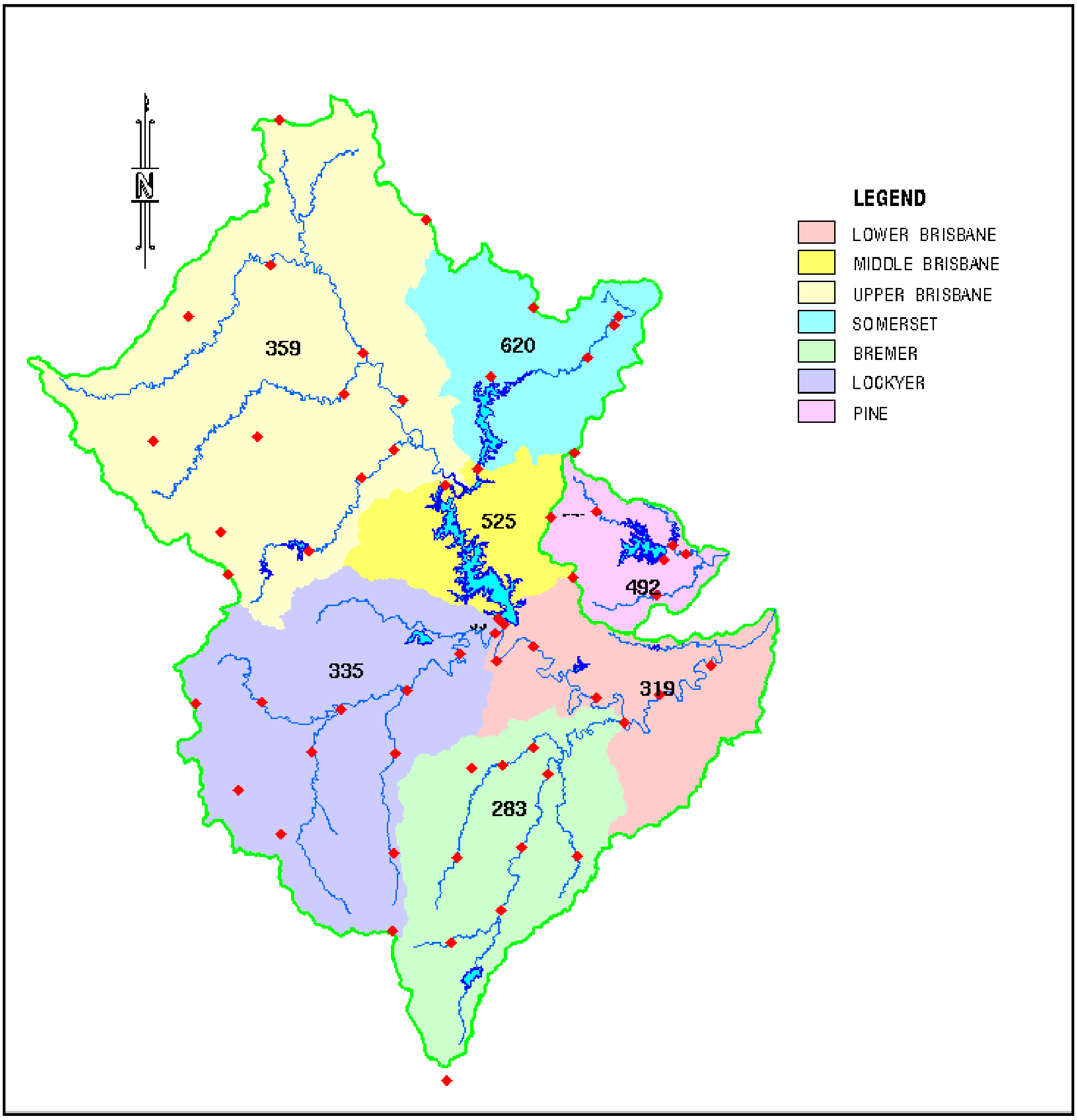

Figure 6.3.13 - Catchment rainfall in the eight days to 09:00 on Thursday 13 January 2011

The following catchment average rainfall hyetographs (Figure 6.2.14 to Figure 6.2.19) do not necessarily reflect the localised high intensity rainfall recorded throughout the Basin at various times and locations.

Catchment rainfalls can include hourly intensities at individual stations which can be up to five times the catchment average.

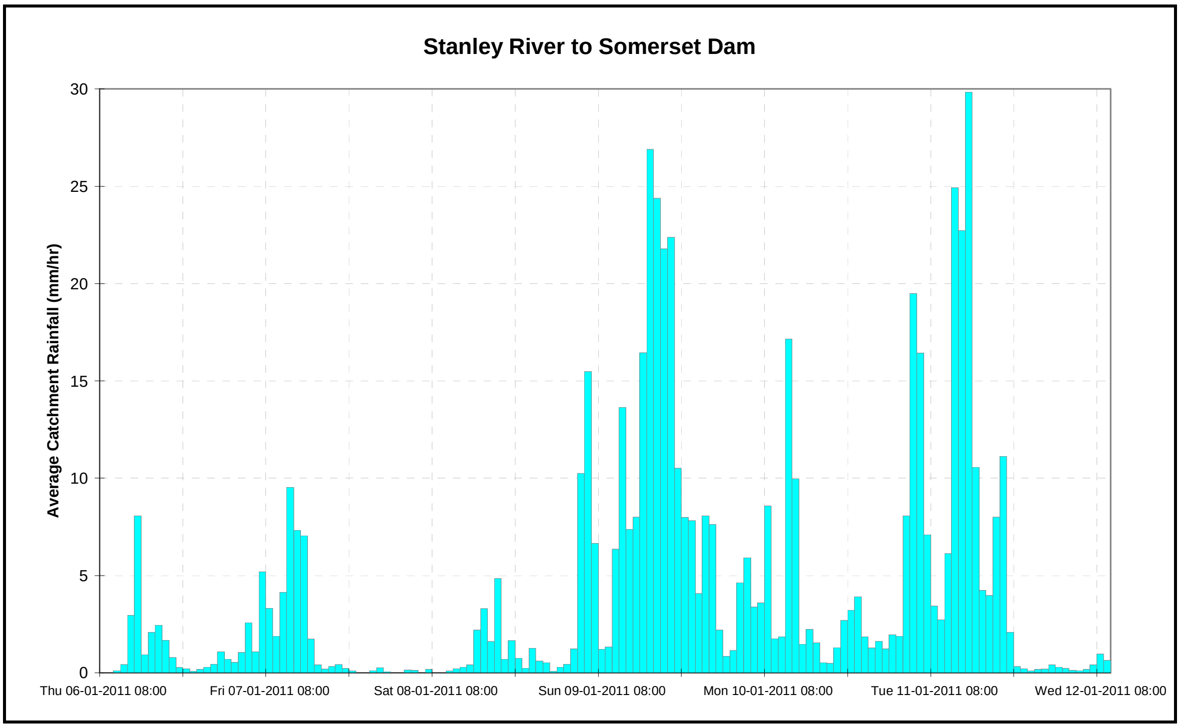

Figure 6.3.14 – Stanley River average hourly rainfalls

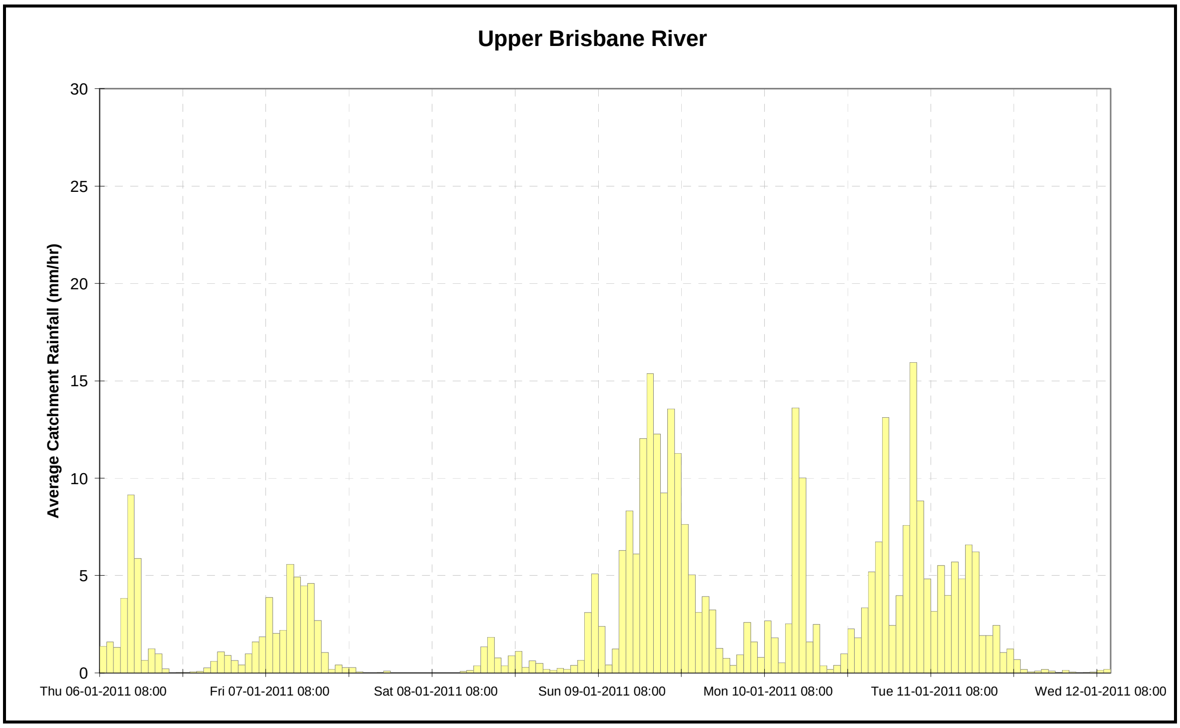

Figure 6.3.15 – Upper Brisbane River average hourly rainfalls

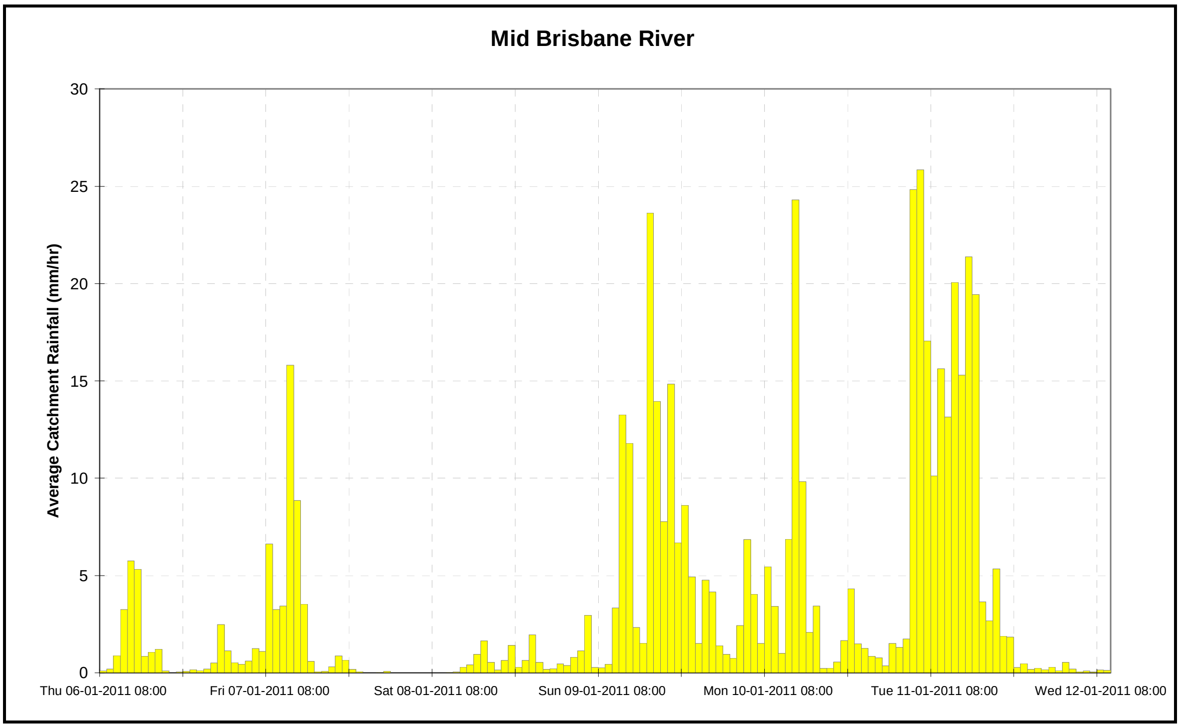

Figure 6.3.16 – Middle Brisbane River average hourly rainfalls

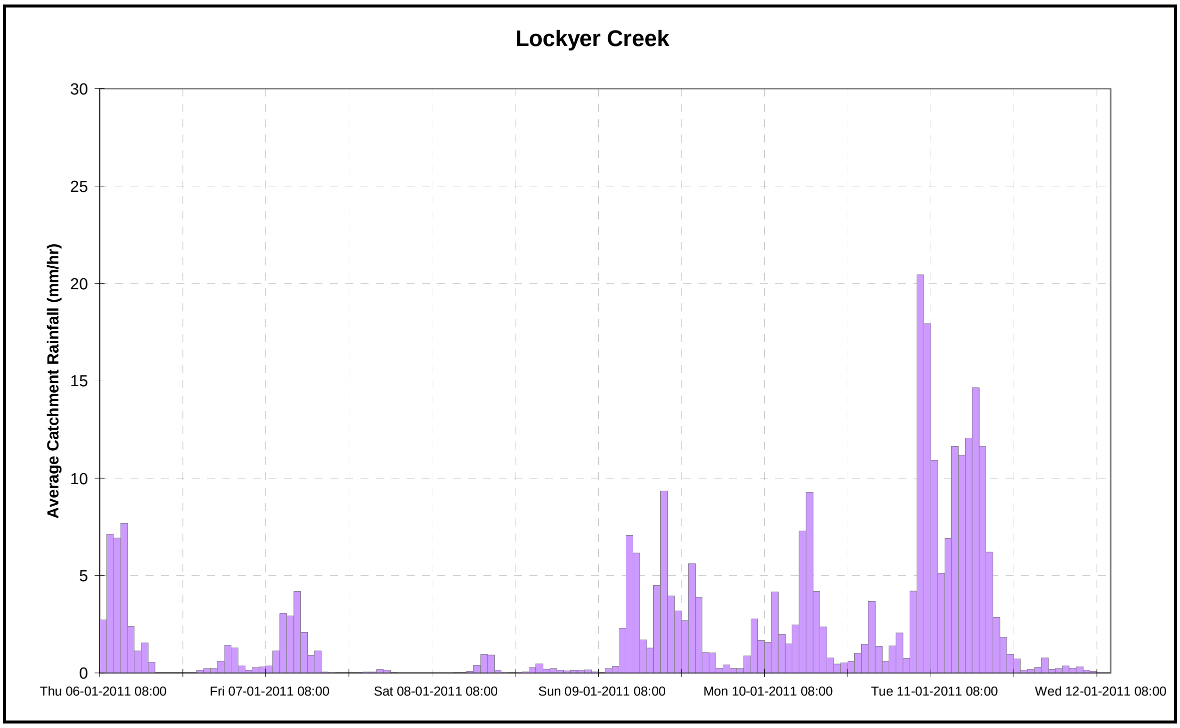

Figure 6.3.17 – Lockyer Creek average hourly rainfalls

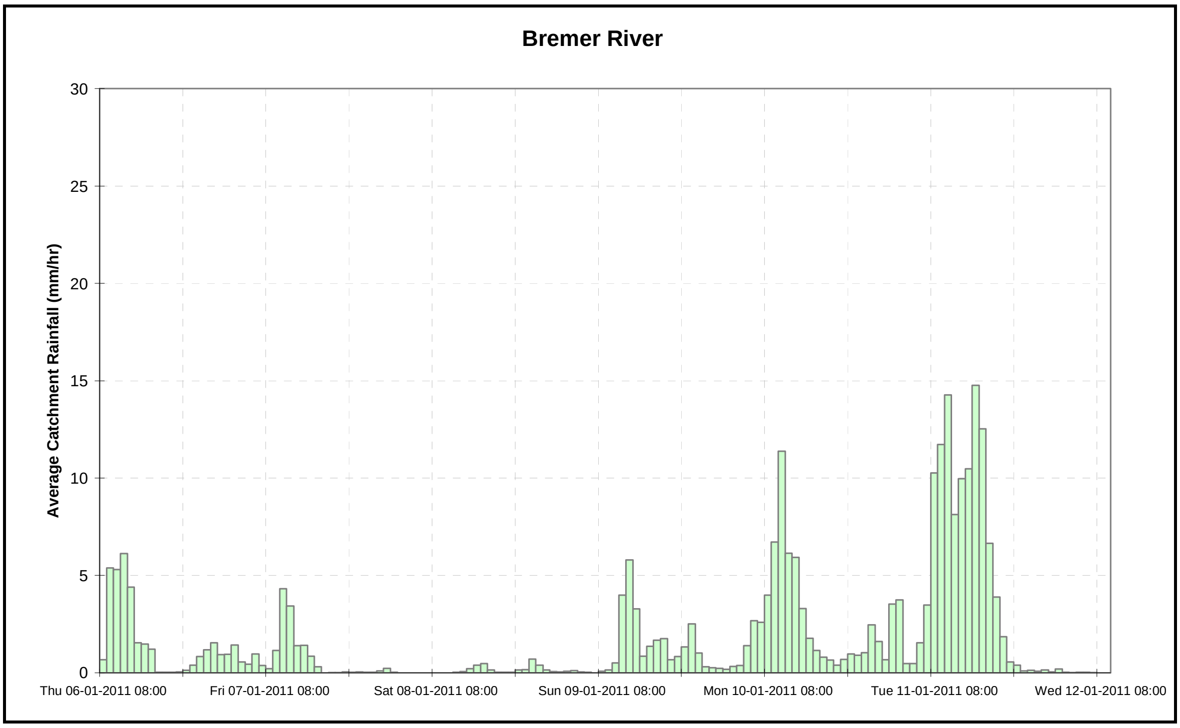

Figure 6.3.18 – Bremer River average hourly rainfalls

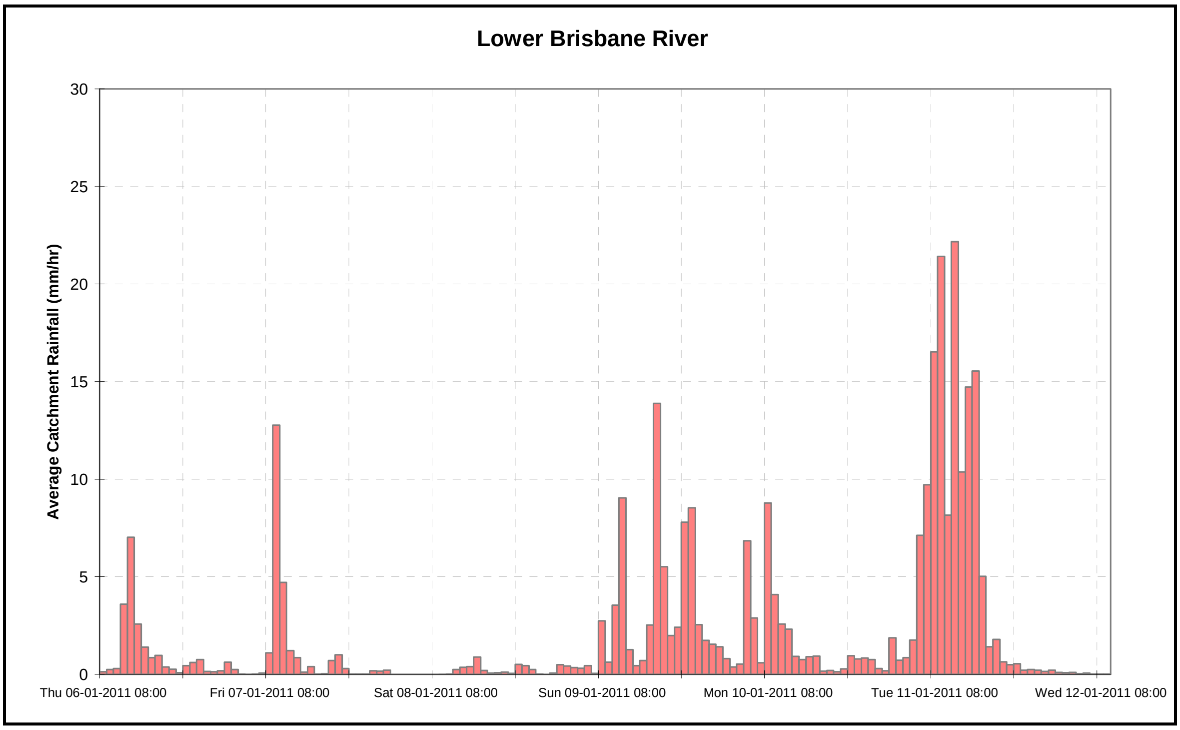

Figure 6.3.19 – Lower Brisbane River average hourly rainfalls

The average catchment rainfall graphs clearly show a number of individual and linked rainfall bursts over the duration of the Event. The two most intense bursts occurred relatively late in the Event between the following periods:

- The morning and evening of Sunday 9 January 2011;
- The early morning and afternoon of Tuesday 11 January 2011, interspersed with a period of lower rainfall.

An intense burst at the end of the Event, followed by a relatively sudden end to the rainfall, is characteristic of most of these temporal patterns. Tables of hourly rainfall for all stations used during the Event (demonstrating this pattern) are contained in Appendix O, with one table per day during the period of Wednesday 5 January 2011 to Thursday 13 January 2011.

Significant hourly rainfall totals include:

Location	**Time and date**	**Hourly rainfall (mm)**
Lindfield in the upper reaches of Sheepstation Creek	14:00 on Sunday 9 January 2011	54
Blackbutt in the upper reaches of the Brisbane River	16:00 on Sunday 9 January 2011	54
Savages Crossing on the Brisbane River near Fernvale	09:00 on Tuesday 11 January 2011	93
Ferris Knob in the upper reaches of the Stanley River	11:00 on Wednesday 12 January 2011	69

Table 6.3.20 – Significant hourly rainfall totals

6.4 Event rainfall temporal patterns

Temporal patterns are critical to the flood modelling process and the resulting inflow hydrographs. They define the distribution of the rainfall with time, and indicate the distinct periods of heavy rainfall that occurred throughout the Brisbane Basin. Temporal patterns for selected representative stations are contained in Appendix T. The following conclusions can be drawn from examining this data:

- For this Event, the West Bellthorpe gauge represents the temporal pattern of the Somerset Dam catchment;
- For this Event, the Gregors Creek gauge represents the temporal pattern of the catchment area in the upper reaches of the Brisbane River;
- The period of heaviest rainfall recorded in both the West Bellthorpe gauge and the Gregors Creek gauge occurred on the afternoon and evening of Sunday 9 January 2011;
- At Toowoomba, near the headwaters of Lockyer Creek, high intensity rainfall occurred on the afternoon of Monday 10 January 2011 and resulted in flash flooding. This rainfall was not closely reflected in the catchment average rainfall patterns;
- Around the time flood waters (resulting from the first period of heavy rainfall) arrived at Wivenhoe Dam from the upper reaches of the Brisbane River, the next critical period of heavy rainfall fell on the morning of Tuesday 11 January 2011 in the area immediately around the Wivenhoe Dam reservoir. This huge burst of inflow into the Dam required immediate action to avoid a situation that would risk the safety of the Dam;
- Hourly rainfall totals during the critical period of heavy rainfall, on the morning of Tuesday 11 January 2011, in the area immediately around Wivenhoe Dam, are summarised in Table 6.4.1 (highest hourly values are highlighted in red). The table shows heavy rainfall commenced about 05:00 and continued until 14:00 with totals of nearly 400mm. This is believed to have contributed to the very high level inflows into Wivenhoe Dam during this period.

Hourly rainfall stations around Wivenhoe Dam reservoir											
Hour ending	Lowood	Savages Crossing	Wivenhoe Dam	Mt Glorious	Kluvers Lookout	Mt Mee	Somerset Dam	Caboonbah	Toogoolawah	Rosentretters	Cressbrook Dam
	6646	6559	6636	6680	6610	6690	6590	6574	6604	6553	6523
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
05:00 11 Jan	3	1	3	14	12	14	37	**32**	**23**	**19**	13
06:00 11 Jan	16	16	20	27	26	24	**40**	24	3	4	**18**
07:00 11 Jan	43	31	32	28	46	29	4	6	2	1	0
08:00 11 Jan	53	86	35	57	7	9	3	10	0	0	0
09:00 11 Jan	**56**	**93**	38	**71**	40	15	0	4	0	0	0
10:00 11 Jan	19	18	32	51	36	16	0	0	0	2	0
11:00 11 Jan	51	36	31	50	**50**	24	8	2	3	0	1
12:00 11 Jan	34	18	36	39	33	33	3	4	5	5	3
13:00 11 Jan	39	33	**52**	28	33	**59**	24	11	2	0	1
14:00 11 Jan	**56**	33	39	28	20	9	19	24	3	0	2

Table 6.4.1 – Hourly rainfall totals recorded between 03:00 and 15:00 on Tuesday 11 January 2011

6.5 Event water levels

Seqwater uses a network of 34 automated stream height stations within the Brisbane River catchment area to gather Dam level and stream height data during flood events. Data from this network is automatically collected in real time using a radio telemetry collection system and is sent in real time to the Flood Operations Centre. Every recorded change in water level at each station is also sent directly to the Flood Operations Centre as it is recorded.

Data sent to the Flood Operations Centre in this way is operational data and is not validated. Both manual and automatic data checking is undertaken in the Flood Operations Centre at regular and routine intervals over the course of the Event.

While the vast majority of the water level data contained in this Report was collected automatically via the Seqwater ALERT network, manual observations of gauge boards at Somerset and Wivenhoe Dams were also collected via email and phone during the Event. These gauge board observations are more reliable than the automatically provided readings and, therefore, provided the basis for gate operations at the Dams.

Table 6.5.1 includes details of the peak heights recorded by the automatic gauging stations used during the Event. Multiple peaks were recorded at a number of stations through the period and are shown in the table in descending order. The table is based on data received in the Flood Operations Centre during the Event and has not been verified by field survey. The figures identified in ***italics*** are the maximum heights recorded prior to failure of the gauge.

Primary ALERT ID	Watercourse	Station	Gauge zero		Date and time	Peak heights	
			m	Datum		Elevation	GH
6776	Stanley River	Peachester	125.03	AHD	09/01/2011 20:28	134.07	9.04
					11/01/2011 15:19	133.99	8.96
					08/01/2011 22:37	129.07	4.04
	Stanley River	Woodford	107.51	AHD	11/01/2011 18:35	116.95	9.44
					10/01/2011 05:56	116.09	8.58
					07/01/2011 19:26	112.61	5.1
6591	Stanley River	Somerset Dam	0.00	AHD	12/01/2011 04:57	104.99	104.99
					10/01/2011 19:42	103.39	103.39
					08/01/2011 07:54	100.43	100.43
6543	Cooyar Creek	Dam Site	160.68	SD	11/01/2011 02:06	170.90	10.22
					09/01/2011 17:28	170.14	9.46
					06/01/2011 15:13	168.56	7.88
6718	Brisbane River	Linville	115.30	AHD	11/01/2011 04:09	126.34	11.04
					09/01/2011 21:00	125.44	10.14
					07/01/2011 23:15	122.18	6.88
6709	Brisbane River	Devon Hills	99.00	AHD	09/01/2011 21:24	110.25	11.25
					11/01/2011 08:55	109.89	10.89
					08/01/2011 00:58	106.15	7.15
6521	Emu Creek	Boat Mountain	107.84	SD	11/01/2011 08:28	118.94	11.1
					10/01/2011 00:16	118.86	11.02
					10/01/2011 18:04	113.82	5.98
6515	Brisbane River	Gregors Creek	82.40	AHD	09/01/2011 22:17	96.89	14.5
					11/01/2011 11:20	95.69	13.3
					08/01/2011 03:35	90.25	7.86
6524	Cressbrook Creek	Cressbrook Dam	0.00	AHD	11/01/2011 10:29	284.18	284.18
6554	Cressbrook Creek	Rosentretters	102.00	AHD	10/01/2011 16:27	108.80	6.8
					11/01/2011 14:12	108.12	6.12
					09/01/2011 19:03	107.70	5.7
6638	Brisbane River	Wivenhoe Dam	0.00	AHD	11/01/2011 19:00	74.97	74.94
6527	***Lockyer Creek***	***Helidon***	***128.65***	***AHD***	***10/01/2011 14:53***	***141.39***	***12.74***
6566	Tenthill Creek	Tenthill	123.85	AHD			
6578	***Lockyer Creek***	***Gatton***	***87.54***	***AHD***	***10/01/2011 17:43***	***102.34***	***14.8***
6584	Laidley Creek	Showground Weir	97.00	AHD	11/01/2011 16:07	106.36	9.36
					10/01/2011 19:13	106.30	9.3
					06/01/2011 17:10	106.26	9.26
6557	Lockyer Creek	Glenore Grove	67.12	AHD	11/01/2011 17:02	82.45	15.34
					10/01/2011 23:33	81.73	14.62
					10/01/2011 07:04	80.13	13.02

Primary ALERT ID	Watercourse	Station	Gauge zero		Date and time	Peak heights	
			m	Datum		Elevation	GH
6634	Lockyer Creek	Lyons Bridge	47.53	AHD	11/01/2011 17:27	64.84	17.31
					07/01/2011 03:12	60.54	13.01
					08/01/2011 05:21	59.70	12.17
6569	***Lockyer Creek***	***O'Reilly's Weir***	***23.62***	***AHD***	***11/01/2011 19:41***	***47.30***	***23.68***
6642	***Brisbane River***	***Wivenhoe Dam Tailwater***	***0.00***	***AHD***	***11/01/2011 15:35***	***46.64***	***46.64***
6647	Brisbane River	Lowood Pump Station	23.07	AHD	11/01/2011 23:46	45.98	22.91
6560	Brisbane River	Savages Crossing	18.43	AHD	12/01/2011 2:11	42.66	24.23
6756	Brisbane River	Burtons Bridge	15.06	AHD	12/01/2011 01:26	33.88	18.82
6757	***Brisbane River***	***Kholo Bridge***			***11/01/2011 15:28***		***12.77***
6752	Brisbane River	Mt Crosby Weir	0.00	AHD	12/01/2011 10:03	26.12	26.12
6581	Bremer River	Adams Bridge	75.50	AHD	11/01/2011 19:00	80.55	5.05
					10/01/2011 14:45	80.05	4.55
					06/01/2011 14:16	80.01	4.51
6737	Weston Creek	Kuss Road	45.06	AHD			
6734	Bremer River	Rosewood	35.42	SD	11/01/2011 15:32	40.33	4.91
					10/01/2011 23:32	38.63	3.21
					07/01/2011 00:17	38.41	2.99
6551	Bremer River	Walloon	22.97	AHD	11/01/2011 16:54	31.87	8.9
					11/01/2011 03:15	29.37	6.4
					07/01/2011 04:18	28.83	5.86
6563	Warrill Creek	Kalbar Weir	74.60	AHD	11/01/2011 19:36	80.29	5.69
					10/01/2011 16:15	79.19	4.59
					06/01/2011 15:39	77.35	2.75
6572	Warrill Creek	Harrisville	45.69	SD	11/01/2011 19:44	51.60	5.91
					10/01/2011 22:59	50.80	5.11
					07/01/2011 18:41	50.00	4.31
6652	Warrill Creek	Amberley	19.87	AHD	12/01/2011 08:26	27.99	8.12
					08/01/2011 02:47	25.07	5.2
2168	Bremer River	Ipswich	0.00	AHD	12/01/2011 12:58	15.96	15.96
6755	Brisbane River	Moggill	0.00	AHD	12/01/2011 14:47	17.72	17.72
6731	Brisbane River	Jindalee	0.00	AHD	12/01/2011 17:50	12.90	12.9
6749	Brisbane River	City Gauge	0.00	AHD	13/01/2011 02:57	4.45	4.45

Table 6.5.1 – Peak heights recorded at automatic gauging stations during the January 2011 Flood Event

Height hydrographs (Figure 6.5.2 to Figure 6.5.12) for selected key stations within the Brisbane River Basin are plotted below. During the Event, Flood Officers were responsible for basic data checking. A full set of the heights recorded at each flood monitoring station is contained in Appendix Q.

Stanley River at Woodford

The Stanley River at Woodford is a key gauging station upstream of Somerset Dam, however, it only represents around 20% of the catchment to the Dam. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

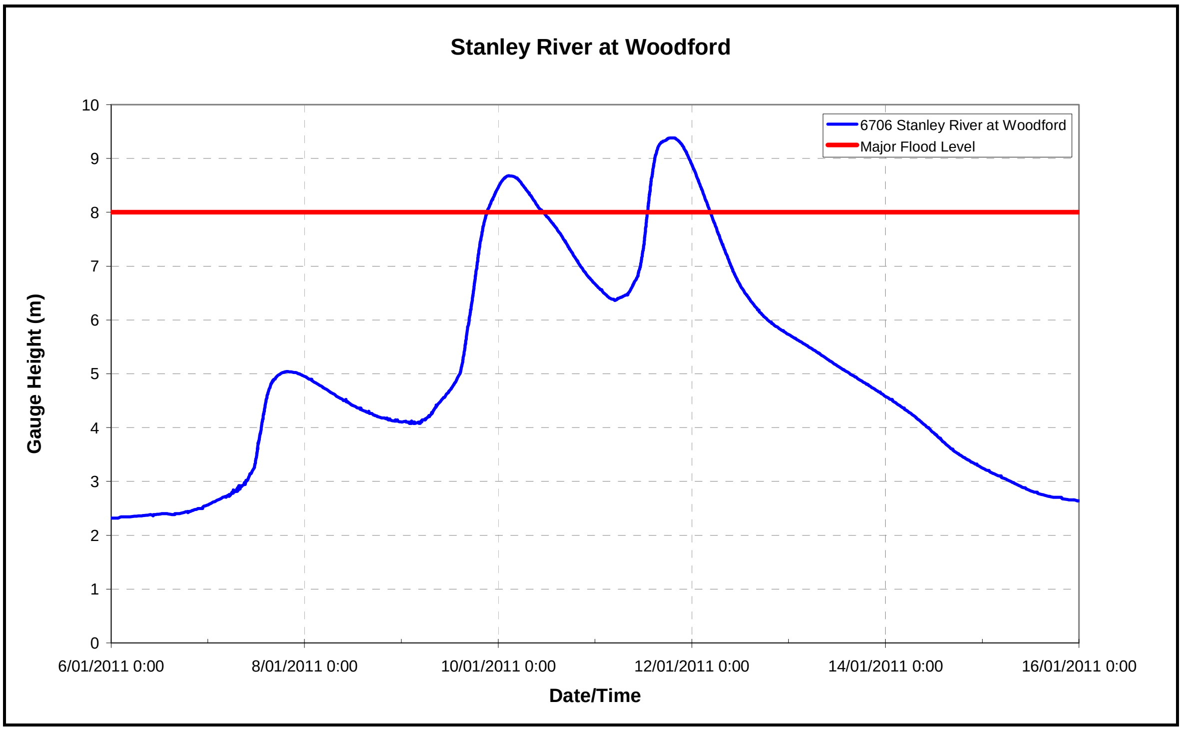

Figure 6.5.2 – Gauge height, Stanley River at Woodford

Somerset Dam

There are two automatic gauges at Somerset Dam, which provided readings slightly under the manual gauge board readings. As discussed previously, Dam operations were based on the data provided by gauge board readings.

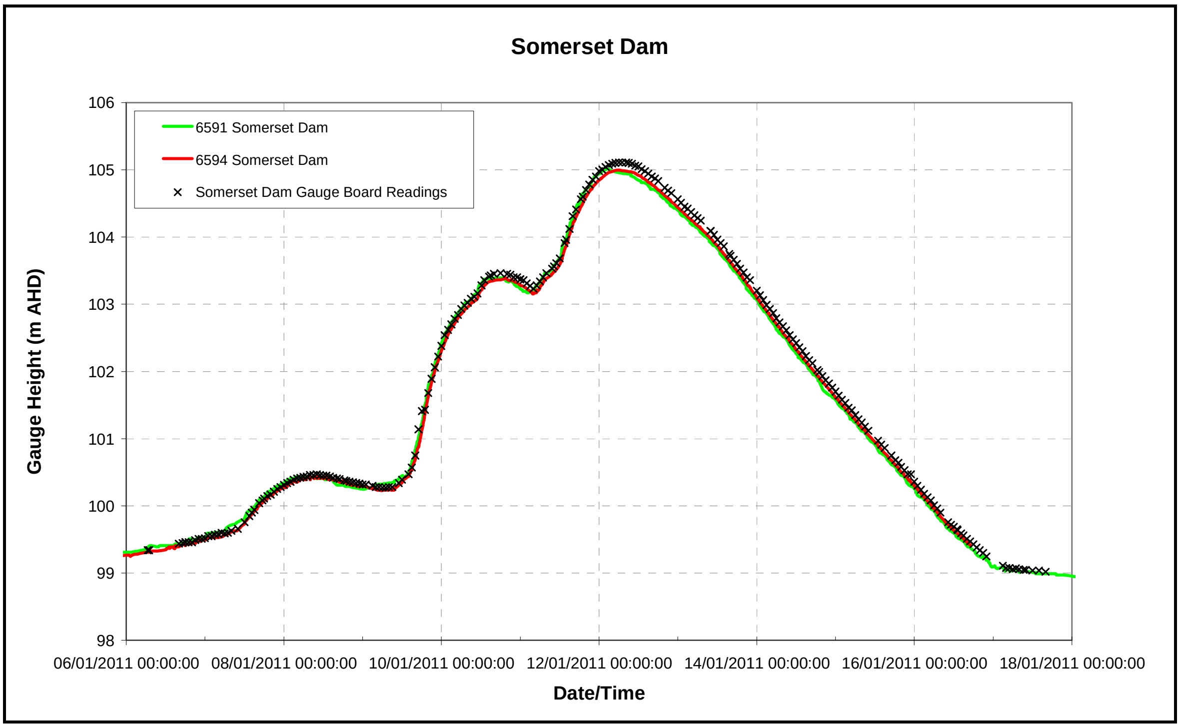

Figure 6.5.3 – Gauge height, Somerset Dam

Brisbane River at Gregors Creek

The Brisbane River at Gregors Creek is the key gauging station upstream of Wivenhoe Dam. When combined with the outflow from Somerset Dam, this gauge represents almost 75% of the catchment to the Dam. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

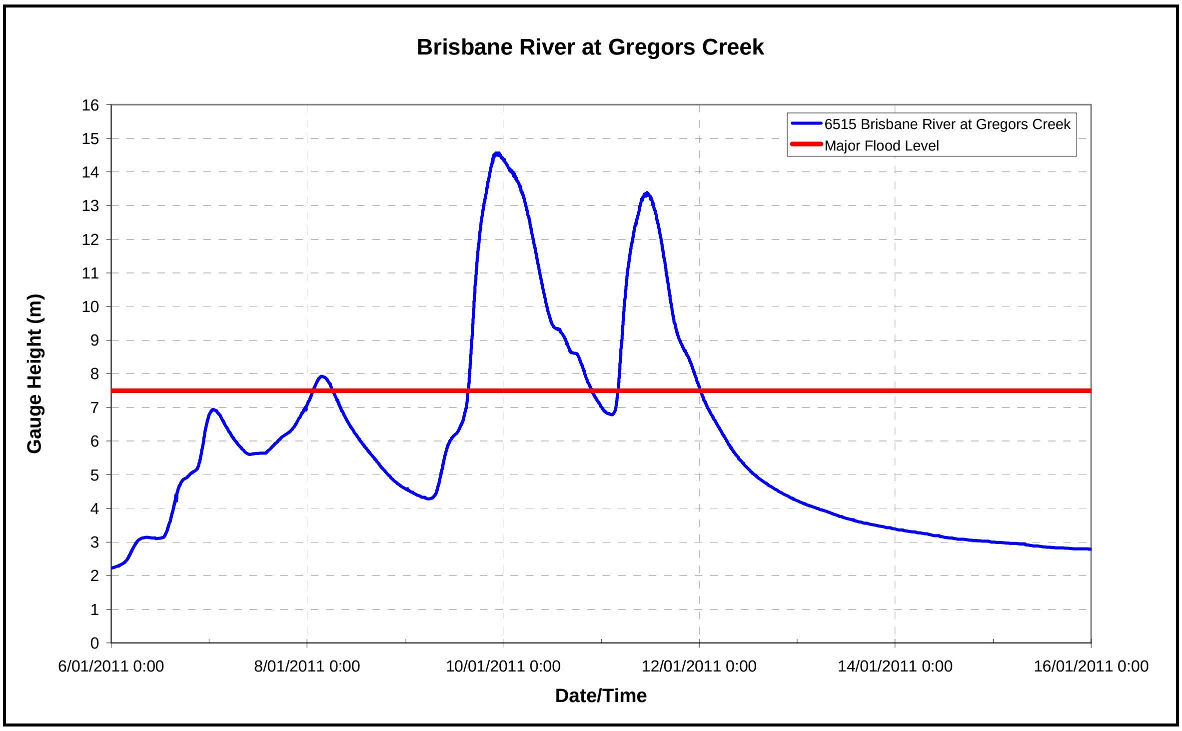

Figure 6.5.4 – Gauge height, Brisbane River at Gregors Creek

Wivenhoe Dam

The manual read gauge board used during this event is located on the outside of wing wall of the spillway approach. There are two automatic gauges at Wivenhoe Dam. Sensor 6638 was marked as OOA for the Event. The other sensor 6637, located around 50m upstream of the gates, matched the manual gauge board readings until around midday on Tuesday 11 January 2011. It was at this point the large gate openings began to cause noticeable drawdown and surging in the spillway approach. The automatic lake level gauge 6637 is located within the approach and was impacted by this surging and drawdown. This discrepancy combined with a possible sensor blockage resulted in readings which were up to 0.8m lower than the observed manual readings during this period. It should be noted that as previously discussed, gate operations were undertaken based on the accurate manual gauge board observations. The discrepancy is shown clearly in Figure 6.5.5 and Figure 6.5.6.

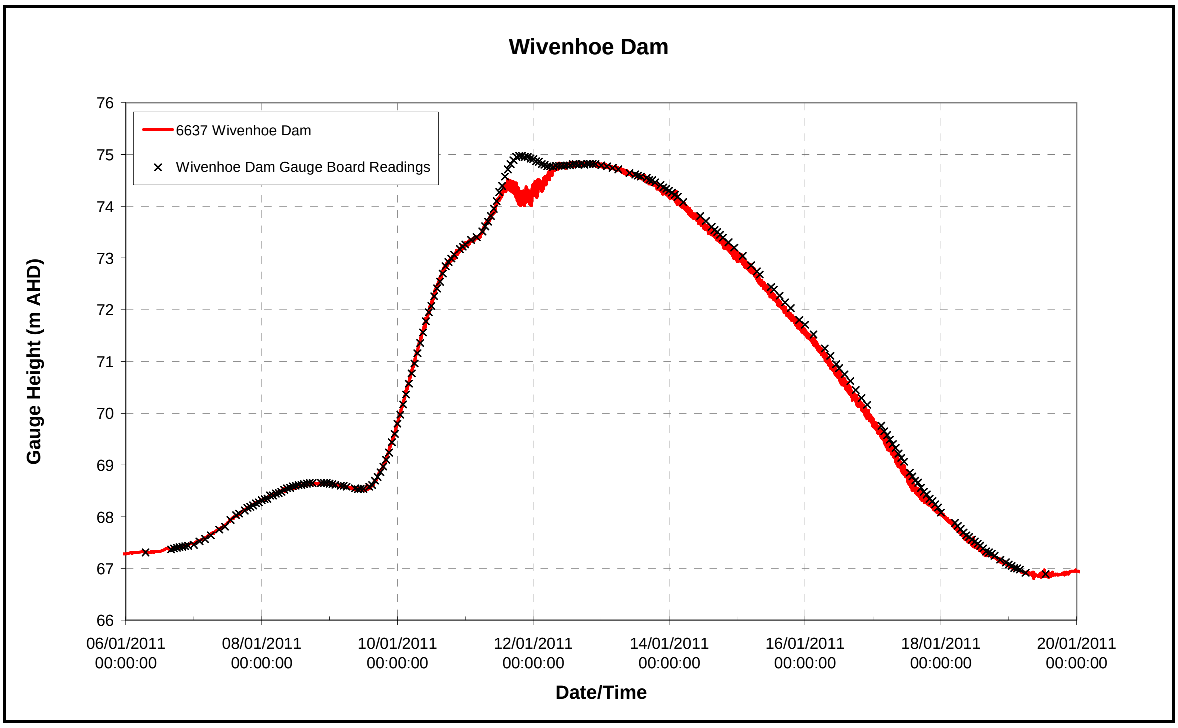

Figure 6.5.5 – Gauge height, Wivenhoe Dam, 6-20 January 2011

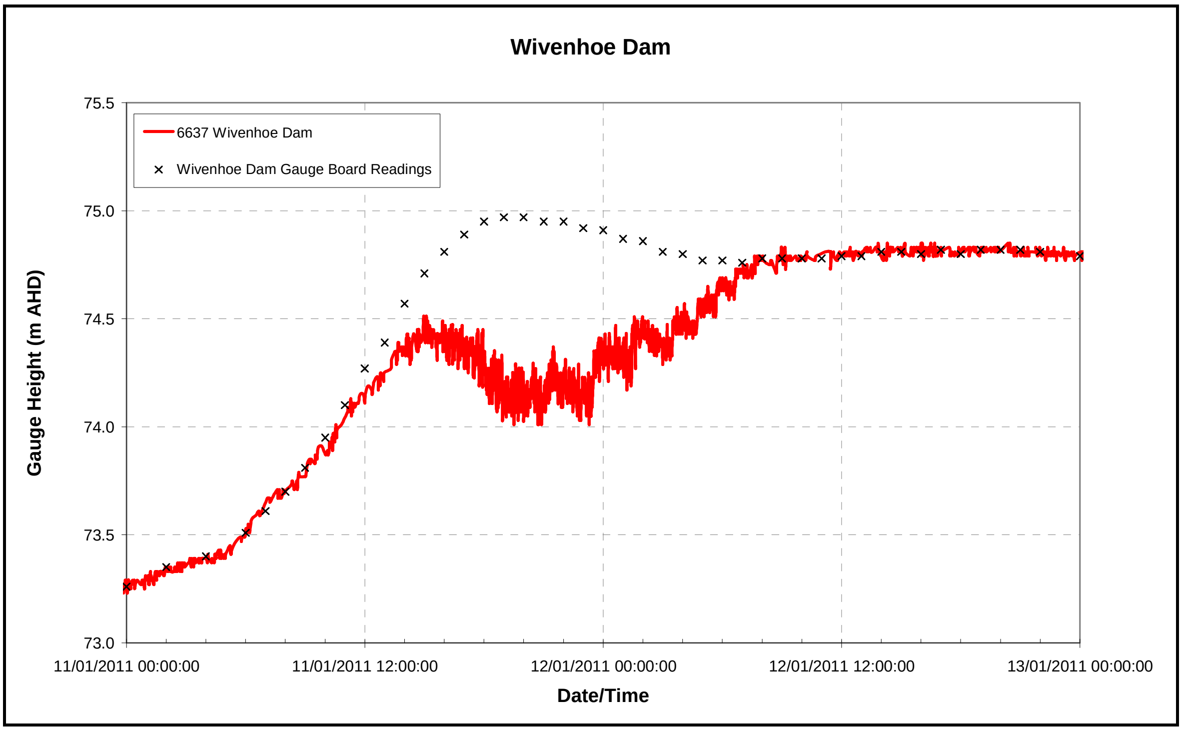

Figure 6.5.6 – Gauge height, Wivenhoe Dam 11-13 January 2011

Lockyer Creek at Lyons Bridge

Lockyer Creek at Lyons Bridge is a key gauging station for determining outflows from Lockyer Creek into the Brisbane River. While the O'Reillys Weir gauge is located further down the catchment, it is influenced by backwater due to releases from Wivenhoe Dam. Therefore, readings from the O'Reillys Weir gauge during a large event are not considered reliable. The Lyons Bridge gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

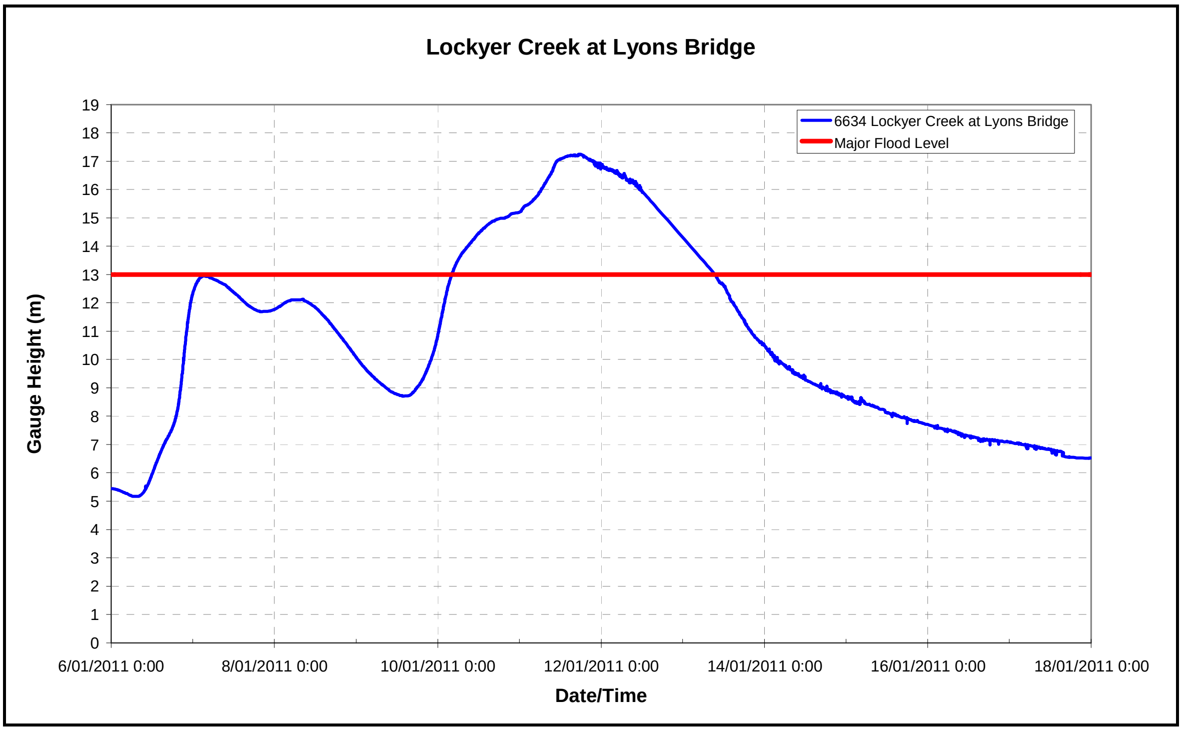

Figure 6.5.7 – Gauge height, Lockyer Creek at Lyons Bridge

Brisbane River at Savages Crossing

Savages Crossing is located just downstream from the junction of the Brisbane River and Lockyer Creek. This gauge is considered to more accurately represent the combined Lockyer and Brisbane flow than the upstream station at Lowood. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

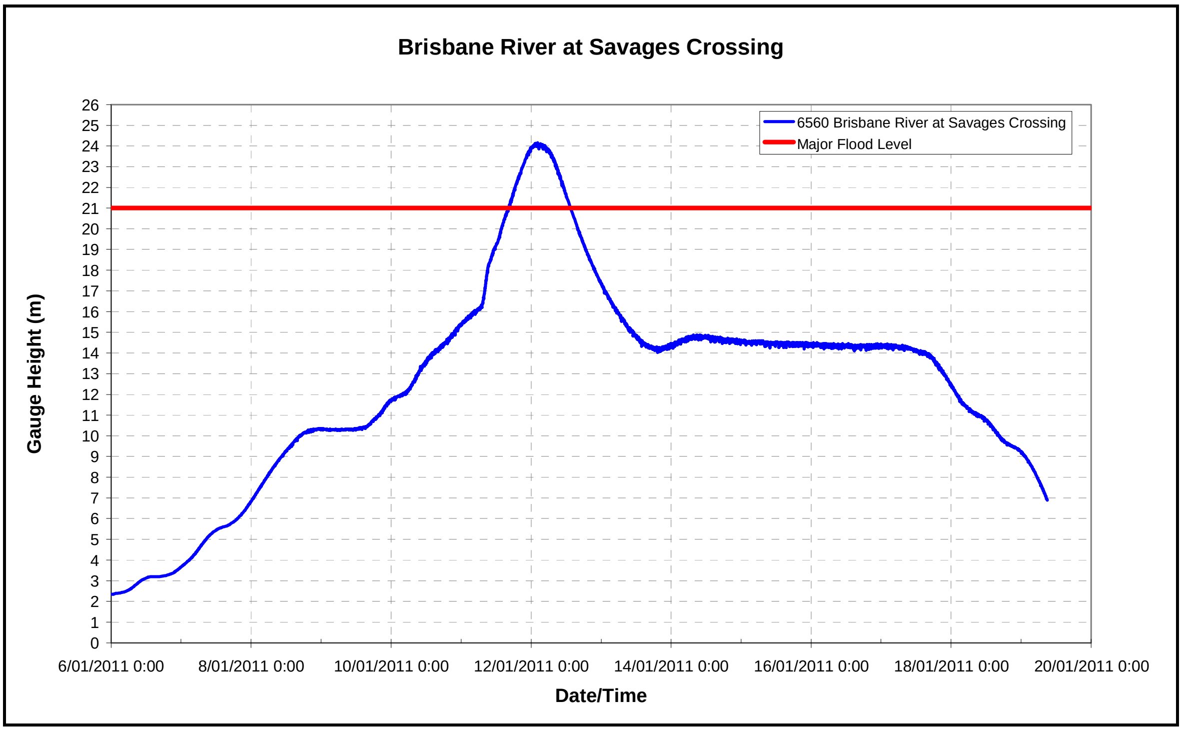

Figure 6.5.8 – Gauge height, Brisbane River at Savages Crossing

Bremer River at Walloon

Walloon is a key gauging station used to determine total outflow from the Bremer River. It operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

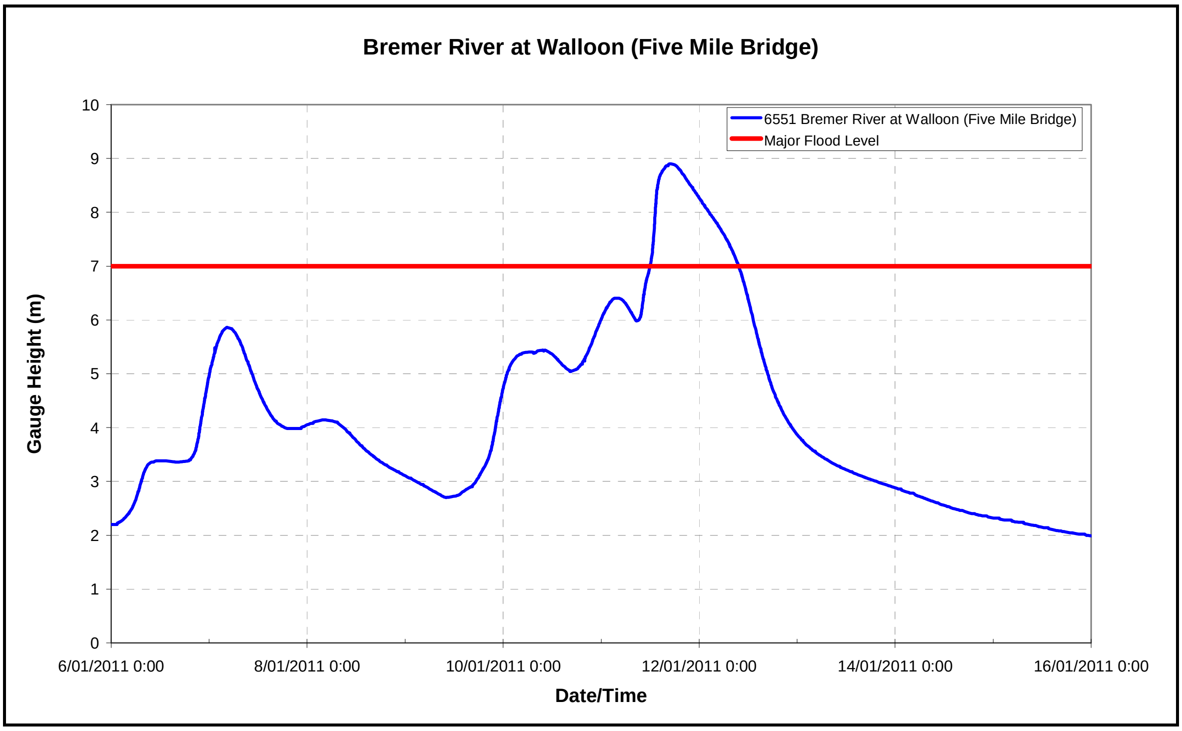

Figure 6.5.9 – Gauge height, Bremer River at Walloon

Warrill Creek at Amberley

Amberley is a key gauging station on Warrill Creek, and when combined with Walloon, it is a key gauging station used to determine total outflow from the Bremer River. This station operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

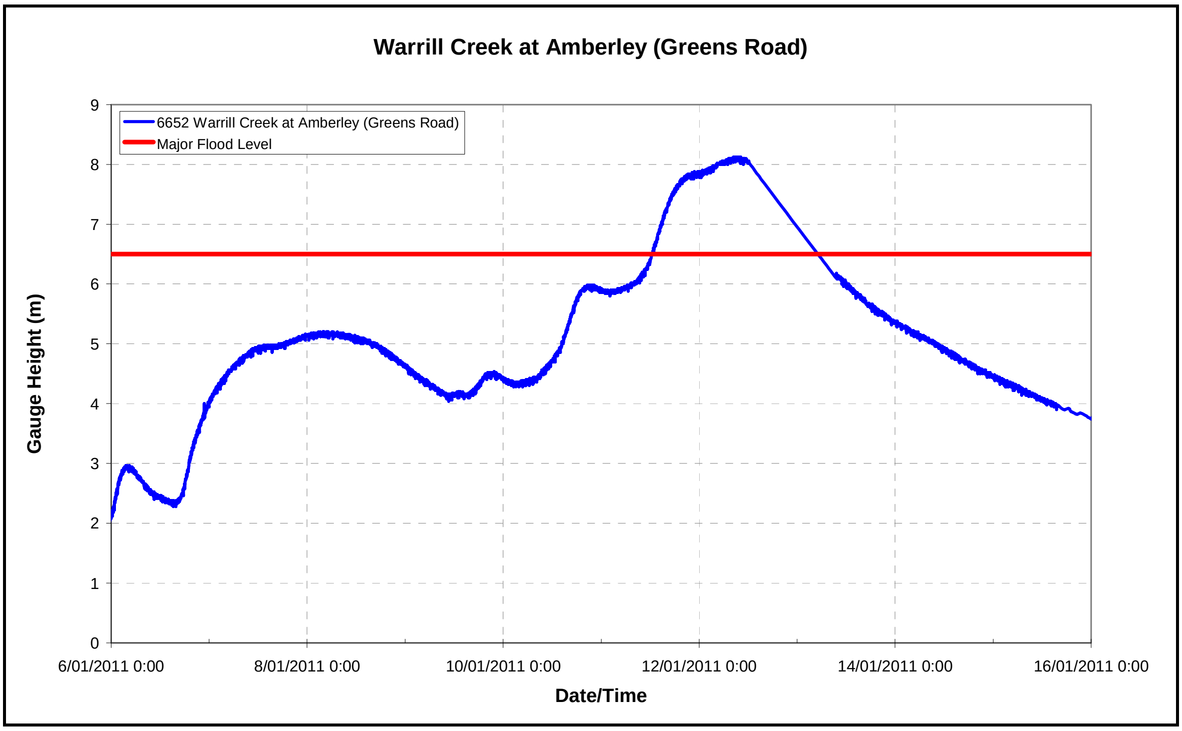

Figure 6.5.10 – Gauge height, Warrill Creek at Amberley

Bremer River at Ipswich

Ipswich is located on the lower reaches of the Bremer just above its junction with the Brisbane River. It should be noted that water levels at this gauge are affected by backwater from high water levels in the Brisbane River. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

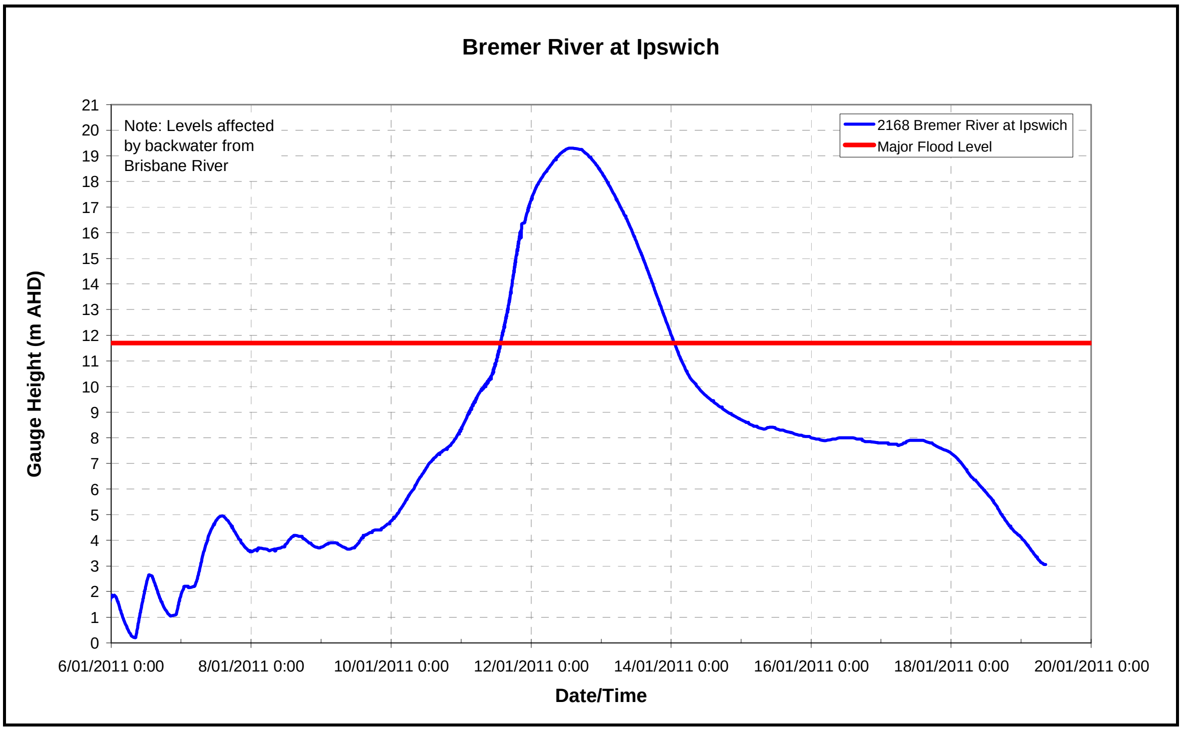

Figure 6.5.11 – Gauge height, Bremer River at Ipswich

Brisbane River at Moggill

Moggill is the key gauging station at the junction of the Brisbane and Bremer Rivers. It represents the combined flow of these two rivers. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

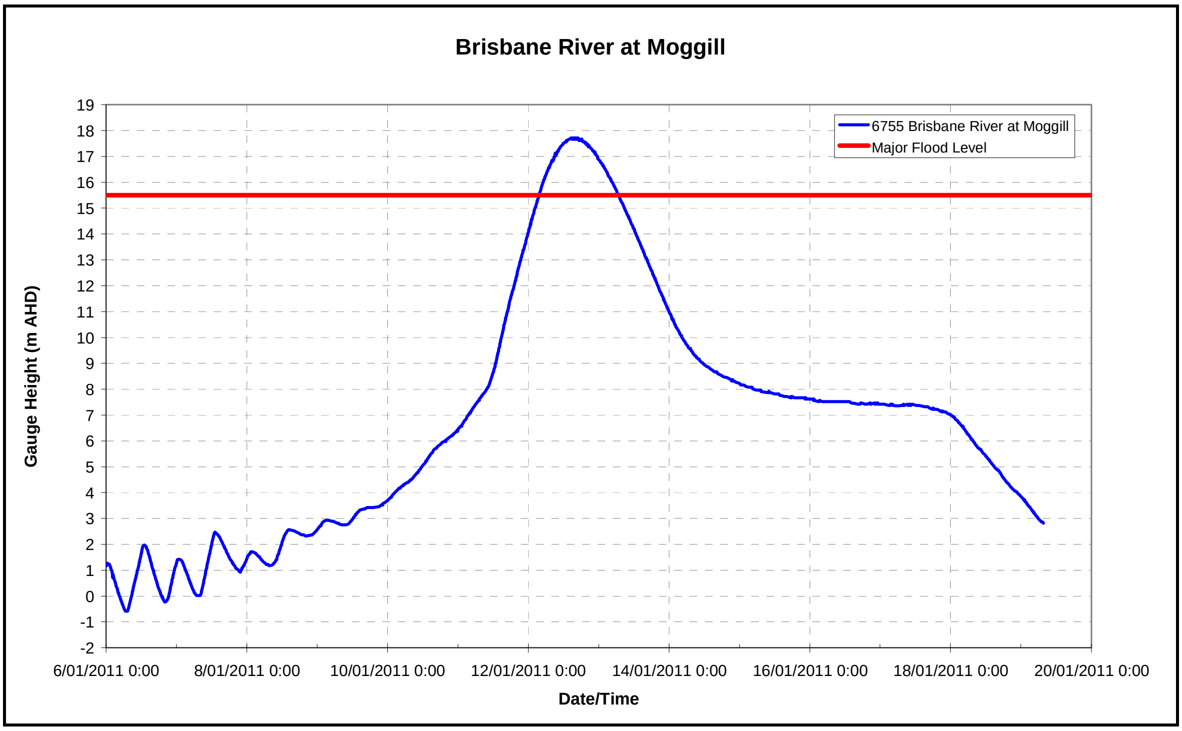

Figure 6.5.12 – Gauge height, Brisbane River at Moggill

Brisbane River at Port Office

The Port Office gauge has the longest flood record of any water level gauge in the Brisbane River and is the key gauging station for the Brisbane City area. This gauge operated reliably and provided sufficiently accurate operational data for modelling purposes during the Event.

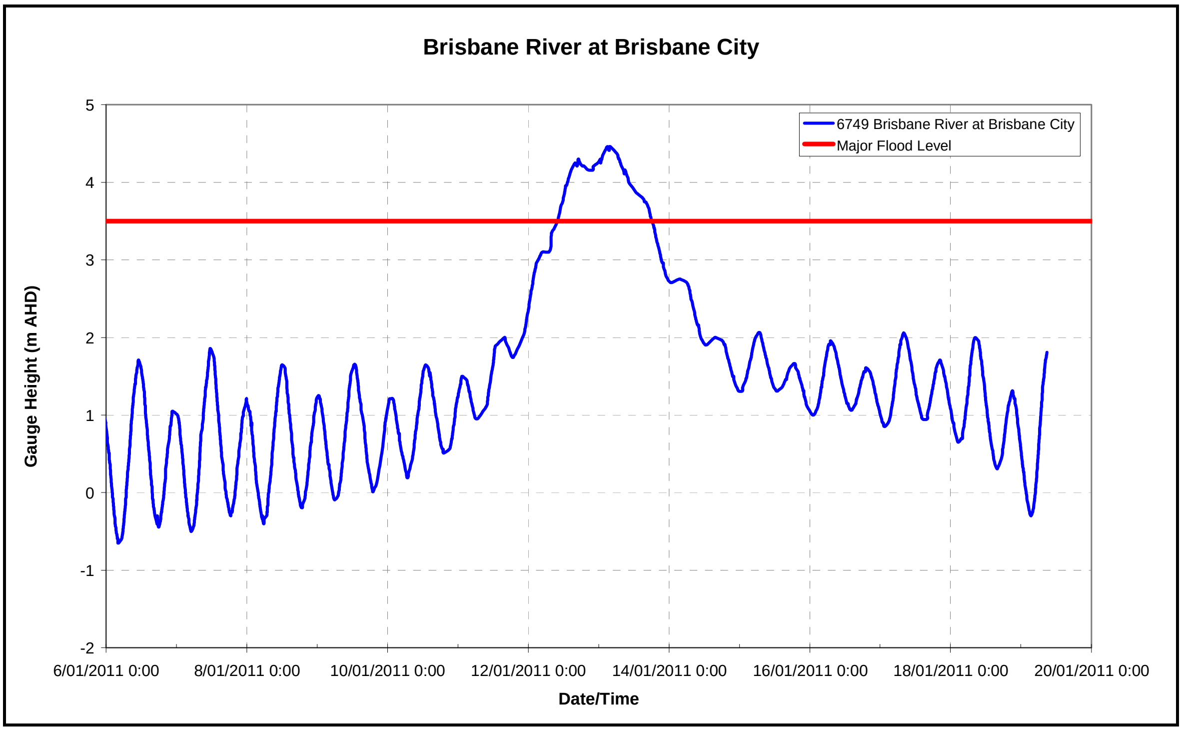

Figure 6.5.13 – Gauge height, Brisbane River at Port Office

Brisbane River at Whyte Island

The Brisbane River gauge at Whyte Island is located near to the mouth of the river and records tide levels. While tide levels do not directly impact dam operations, flood levels in the Lower Brisbane River are tide dependent and the Flood Operations Centre needs to be cognisant of the tides.

During the January 2011 Flood Event, recorded tides at Whyte Island were up to 0.5m lower than the previous week.

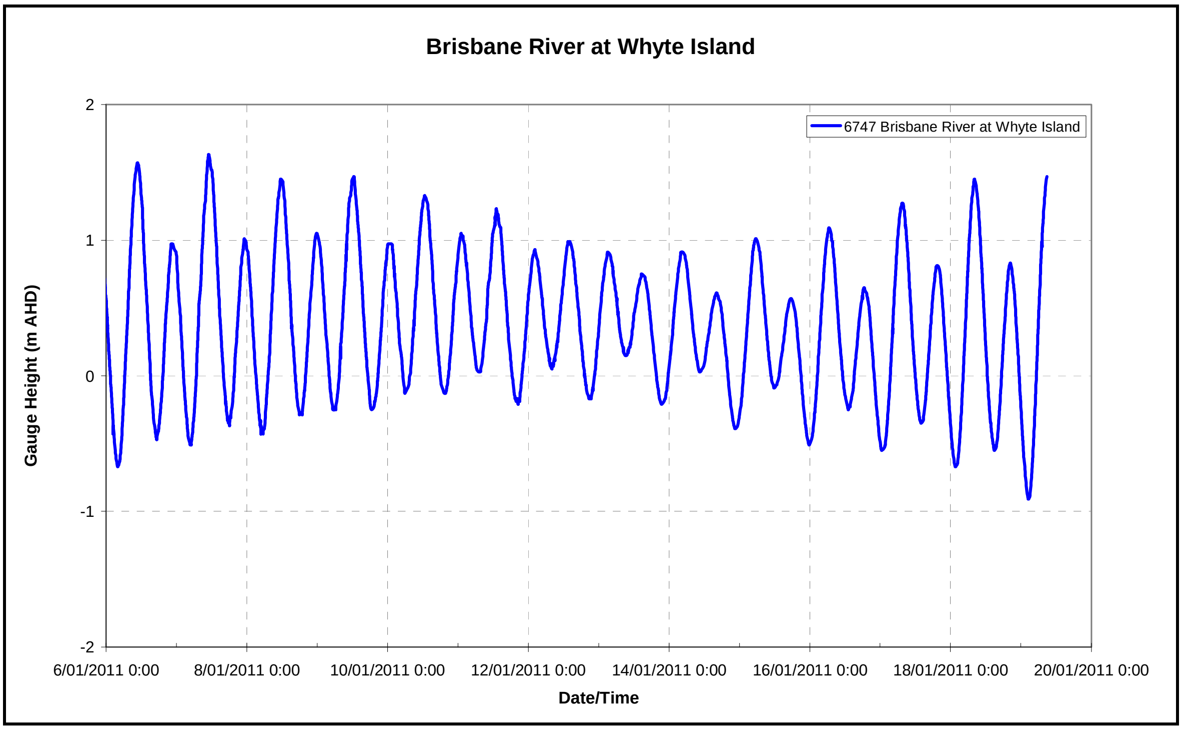

Figure 6.5.14 – Gauge height, Brisbane River at Whyte Island

6.6 Dam inflows and outflows

The inflows and outflows from Somerset and Wivenhoe Dams appear in Table 6.6.1 and are shown in more detail in Section 9 and Appendix B. Dam inflow is estimated by reverse routing. Reverse routing is calculating the rate of change of the storage and adding the Dam outflow.

Item	Unit	Somerset Dam	Wivenhoe Dam*
Inflow volume	ML	825,000	2,650,000
Outflow volume	ML	820,000	2,650,000
Inflow peaks	m^3/s	5,350 on 09/01/2011 15:00 4,170 on 11/01/2011 14:00	10,100 on 10/01/2011 08:00 11,600 on 11/01/2011 13:00
Outflow peaks	m^3/s	1,690 on 10/01/2011 16:00 1,460 on 12/01/2011 11:00	7,460 on 11/01/2011 19:00
Peak water level	m AHD	105.11 on 12/01/2011 06:00	74.97 on 11/01/2011 19:00

* Wivenhoe Dam inflow figures include Somerset Dam outflows

Table 6.6.1 – Summary inflows and outflows for Somerset and Wivenhoe Dams

The inflow into Somerset Dam is characterised by dual peaks; the first peak on the afternoon of Sunday 9 January 2011 being higher than the second on the afternoon of Tuesday 11 January 2011 (nearly 48 hours apart). The peak of the outflow occurred late on Monday 10 January 2011 when five sluices were opened. These were quickly closed on the morning of Tuesday 11 January 2011 when Wivenhoe Dam levels began rising quickly. Somerset Dam's maximum water level of 105.11m was reached on the morning of Wednesday 12 January 2011. This information is summarised in Figure 6.6.2.

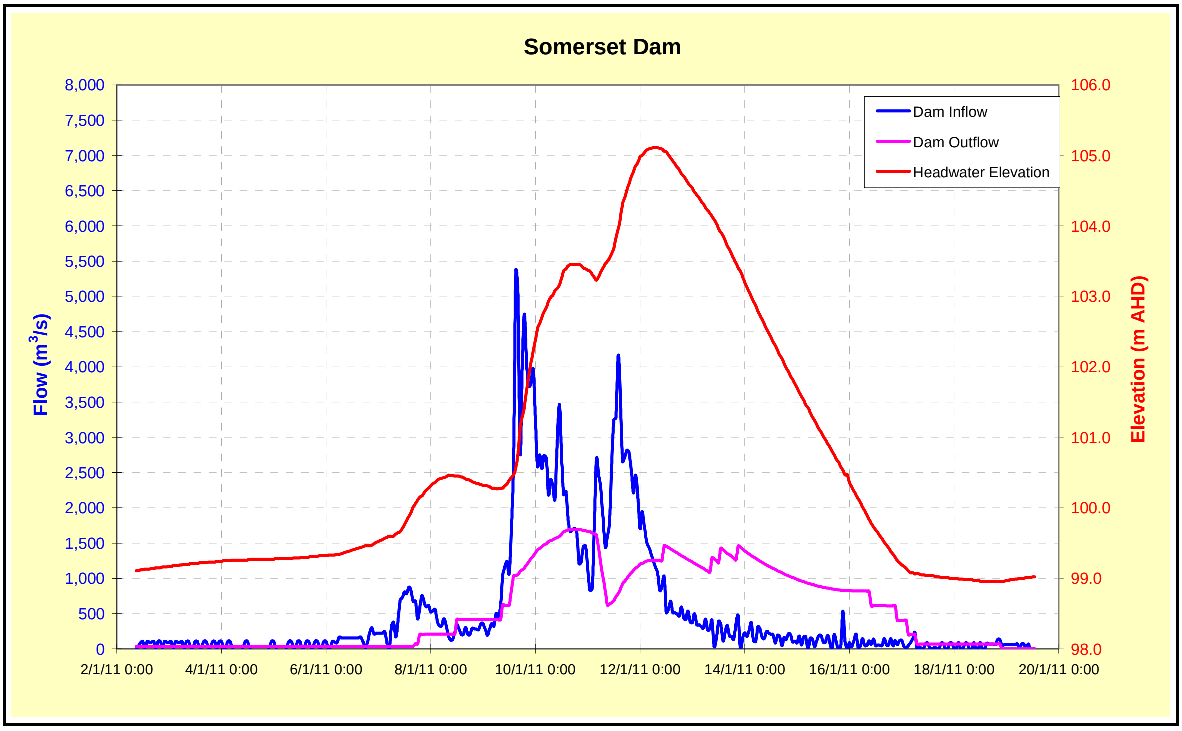

Figure 6.6.2 – Somerset Dam water levels, January 2011 Flood Event

Similar to Somerset Dam, the inflow into Wivenhoe Dam is also characterised by dual peaks. The first peak on the morning of Monday 10 January 2011 was lower than the second on the afternoon of Tuesday 11 January 2011 (30 hours apart). The peak of the outflow occurred at 19:00 on Tuesday 11 January 2011. Flow was reduced quickly later that night as the Dam water level stabilised, however, it was increased again during Thursday 13 January 2011 to achieve the drainage required within seven days after the flood peak passed below Moggill. Wivenhoe Dam's peak water level of 74.97m was reached at 19:00 on Tuesday 11 January 2011. This information is summarised in Figure 6.6.3.

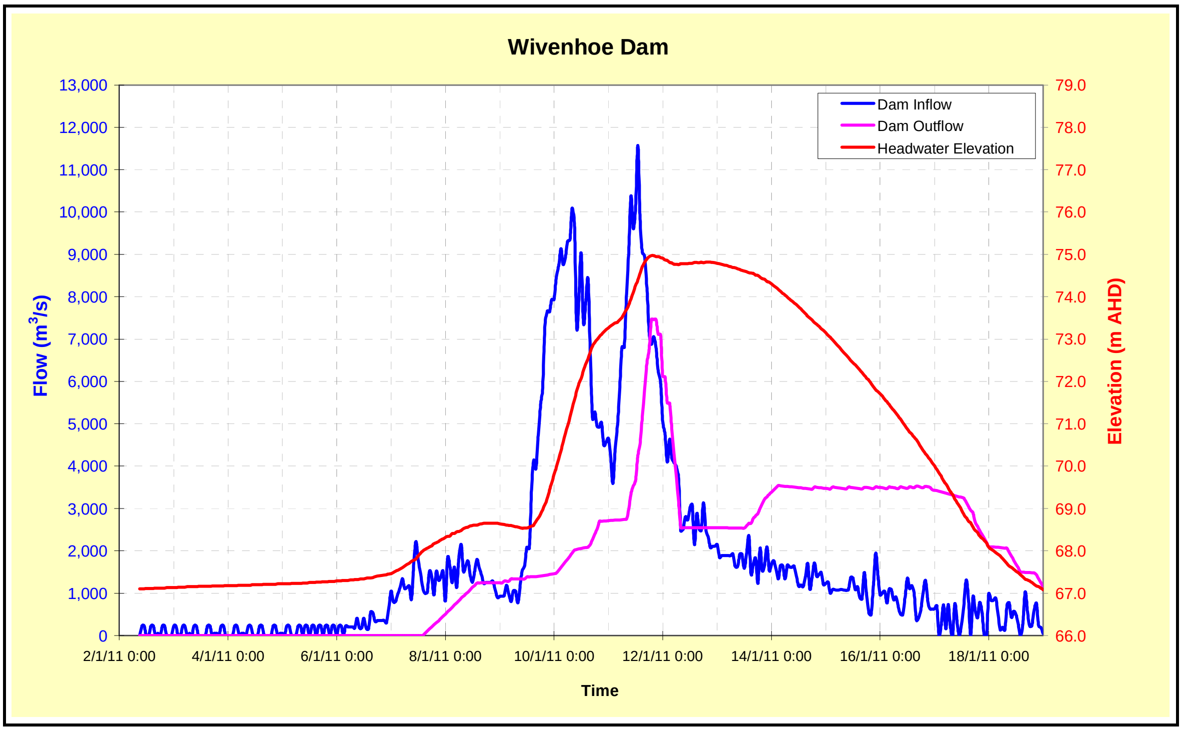

Figure 6.6.3 – Wivenhoe Dam water levels, January 2011 Flood Event

6.7 Other data sources

Other decision-making support tools examined and considered in conjunction with the modelling results include:

- Flood model results (available via the BoM registered user service);
- Enviromon, the BoM replacement software for FLOOD-Col (including all available ALERT stations in South East Queensland, including a large number of non-Seqwater stations).

During the Event, detailed discussions were also held with the BoM Flood Warning Centre. These discussions centred around model results, rainfall forecast information, and actual and projected Dam inflows and outflows. The BoM also provided Lockyer Creek and Bremer River outflows to compare against modelled results generated by the Flood Operations Centre. Generally, Flood Operations Centre modelling correlated well with the BoM modelling results.

Similar discussions were held with Brisbane City Council and the Council also provided stage damage data for consideration by the Flood Operations Centre during the Event.

In addition to the sources listed above, for comparison purposes, the DERM website (www.derm.qld.gov.au) was used to examine and check river height and flow estimations at selected gauging stations.

7 FLOOD MODEL VALIDITY AND PERFORMANCE

7.1 Background

A real-time flood monitoring and forecasting system is used to monitor rainfall and water levels in the Dam catchments and to provide adequate, accurate and timely information to inform decision-making. This system is described in detail in Section 5.

As the real-time rainfall and river height data is received in the Flood Operations Centre, a Real Time Flood Model (RTFM) is used to estimate likely Dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the Dam catchments. It comprises a suite of hydrologic computer programs that process real-time data. This data is used by Flood Operations Engineers to operate the Dams during flood events, in accordance with the Manual. The Manual's objectives and procedures ensure Dam releases are optimised in order to minimise the impact of flooding.

Seqwater is responsible for providing and maintaining the RTFM and to ensure sufficient data is available for the model to operate effectively during a flood event.

Seqwater is continually improving the operation of the RTFM by:

- Implementing improvements based on flood event audits and reviews;
- Improving RTFM calibration as further data becomes available;
- Updating software in line with modern day standards;
- Improving the coverage and reliability of the data collection network to optimise data availability during flood events.

This Section describes the RTFM in detail and assesses its performance during the January 2011 Flood Event.

7.2 Model description

The current RTFM was developed in 1994 as part of the ***Brisbane River and Pine River Flood Study, (DNR, 1994***) and consists of two integrated modules:

- FLOOD-Col;
- FLOOD-Ops.

FLOOD-Col is the data capture module, while FLOOD-Ops is the data analysis module of the RTFM. The System is accessed through a flexible Graphical User Interface (GUI), which was developed under a UNIX operating environment using OSF/Motif GFUI under the XWindows system. In 2008, the system was ported to a LINUX operating environment and is currently running on a DELL PowerEdge 1800 Server.

The RTFM:

- Automatically and continuously collects, filters and stores rainfall and water level data in real time;
- Assigns temporal and spatial distributions of actual and forecast rainfall for extension into the future;
- Evaluates the spatial and temporal distribution of antecedent catchment soil moisture conditions on a daily basis;
- Performs hydrologic routing of stream flows in an integrated environment;
- Provides estimates of storage performance and resulting downstream releases;
- Prepares summary output in textual and graphical format for storage operation and resulting downstream flood levels and flows.

As described in Section 5, the rainfall and water level gauges located within and around the Dam catchments provide the primary sources of the RTFM's raw data.

Data collection is completely independent to data analysis within the RTFM system. Filtered gauge data from individual or groups of gauges can be viewed in either a textual or graphical format. The types of information that can be viewed or edited include height, discharge, rainfall pluviographs, rainfall hyetographs, lake levels and Dam volumes.

Regions, Process and Cases

The data analysis system and modelling within the RTFM has been developed with reference to the concepts of Regions, Processes and Cases. A Region is an area of land above a stream gauge station. A Process is a computer-generated model of a physical hydrologic mechanism, such as soil moisture accounting, runoff-routing, reservoir routing and base flow. A Case is an event-based sequence of processes applied to Regions.

Regions

Regions – land above gauging stations – can be assigned Processes depending on the nature of the Region. For example, a sub-catchment Region is assigned a soil moisture accounting Process and a runoff-routing Process, whereas a reservoir Region is only assigned a reservoir routing Process. Regions' relationships with neighbouring Regions are defined for each Process associated with the Region. Generally, outflow from one Region is inflow into its adjoining downstream Region.

The Region database contains the following information:

- Extent and location of sub-areas within Regions and Regions within catchments;
- Connectivity of sub-areas within Regions and Regions with catchments;
- The list of Processes associated with each Region;
- Process module input definitions.

Figure 7.2.1 shows the Region layout adopted in the RTFM system.

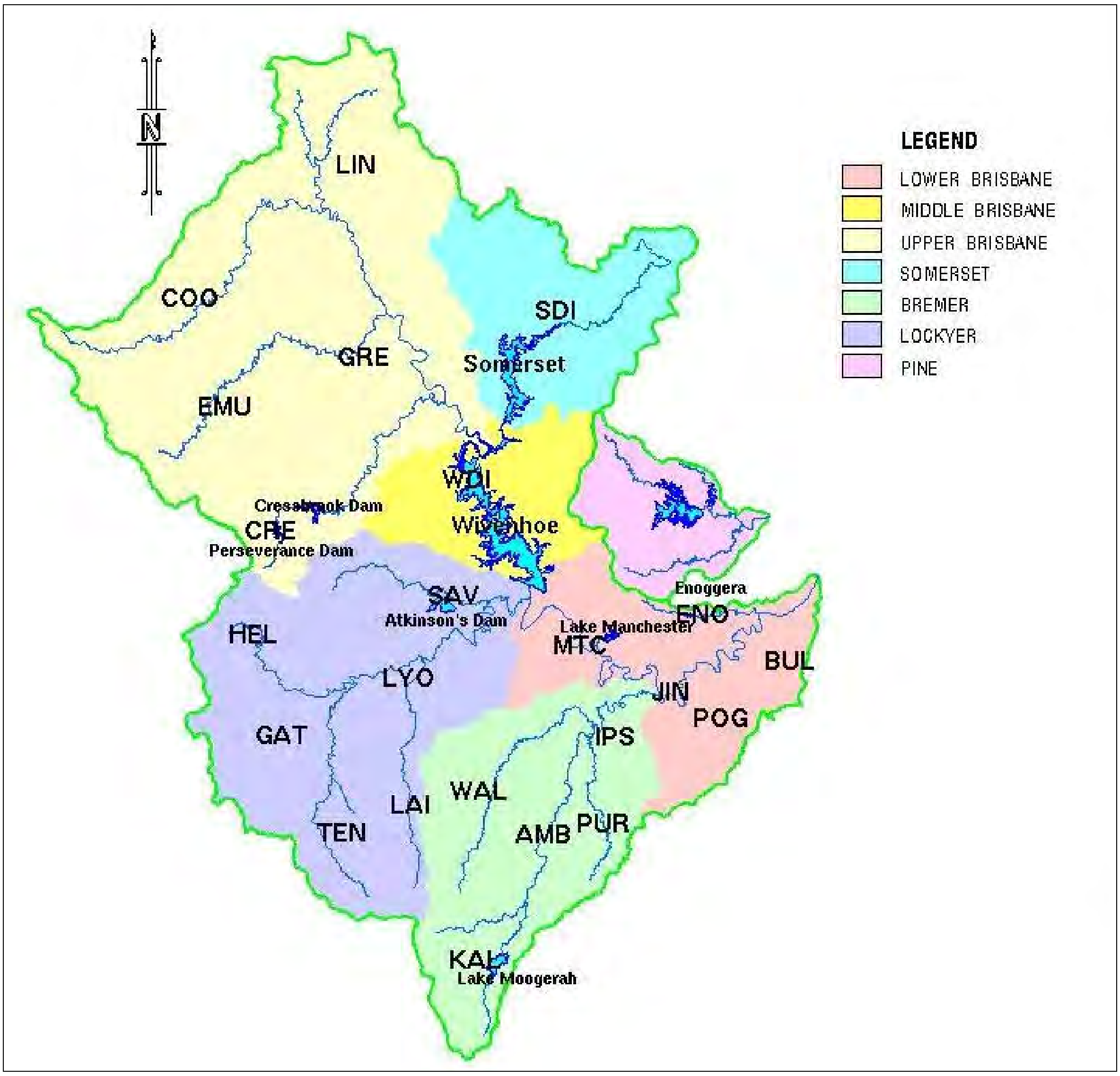

Figure 7.2.1 – RTFM Regions

Relevant statistics relating to each Region as defined in the RTFM are shown in Table 7.2.2.

Region Code	Stream gauge	AMTD (km)	Area (km^2)	Distance to outlet (km)
Upper Brisbane River				
COO	Cooyar Creek at Dam site	12.2	980	28.1
LIN	Brisbane River at Linville	282.4	1,061	23.2
EMU	Emu Creek at Boat Mountain	9.3	913	42.1
CRE	Cressbrook Creek at Cressbrook Dam	58.6	317	15.9
GRE	Brisbane River at Gregors Creek	251.7	973	25.0
Stanley River				
SDI	Stanley River at Somerset Dam	7.2	1,328	42.6
Middle Brisbane River				
WDI	Brisbane River at Wivenhoe Dam	150.4	1,429	49.1
SAV	Brisbane River at Savages Crossing	130.8	728	43.7
MTC	Brisbane River at Mt Crosby Weir	90.8	358	31.3
Lockyer Creek				
HEL	Lockyer Creek at Helidon	96.6	377	23.8
TEN	Tenthill Creek at Tenthill	14.6	465	37.7
LAI	Laidley Creek at Showground Weir	17.6	285	23.6
GAT	Lockyer Creek at Gatton	72.0	706	27.7
LYO	Lockyer Creek at Lyons Bridge	27.2	602	30.2
Bremer River				
WAL	Bremer River at Walloon	37.2	626	30.3
KAL	Warrill Creek at Kalbar	49.7	469	21.8
AMB	Warrill Creek at Amberley	8.7	449	25.0
PUR	Purga Creek at Loamside	6.8	223	23.6
IPS	Bremer River at Ipswich	16.9	265	23.4
Lower Brisbane River				
JIN	Brisbane River at Jindalee	49.1	390	21.0
POG	Brisbane River at Port Office Gauge	22.7	339	36.9
ENO	Enoggera Creek at Junction	0.0	82	16.4
BUL	Bulimba Creek at Junction	0.0	130	18.8

Table 7.2.2 – RTFM Region statistics

Processes

A Process is a computer-generated model of a physical hydrologic mechanism. The Processes contained in the RTFM are soil moisture accounting, runoff-routing, reservoir routing and base flow. These are explained in detail below:

- **Soil moisture accounting**

  Soil moisture accounting is used to indicate catchment saturation at the commencement of a flood event. Relationships have been derived that relate conceptual soil moisture storage volumes to rainfall loss rates. The RTFM contains a number of different Process models that perform similar functions. For example, the soil moisture accounting module consists of several different types of models, including:

  - Antecedent Precipitation Index (API);
  - Residual Baseflow Index;
  - SACRAMENTO Model.

  These models are described in detail in the ***Brisbane River and Pine River Flood Study Report Series, (DNR, 1994), Report on Regional Loss Model Relationships, June 1994.***

  During the January 2011 Flood Event, the API model was used to derive initial estimates of rainfall loss rates during the early period of the Event. These initial estimates were updated as initial stream rises were detected. This allowed the Event loss rates to be closely estimated by matching model results with the actual data received from the water level gauges in the Dam catchments. Relationships were derived by the Bureau of Meteorology (BoM) linking API and initial loss rates during the Event, using the following equations:

  Initial Loss (summer period)

  - IL = 62.5 - 0.4386*API

  Where:

  - IL = Initial Loss (mm);
  - API = Antecedent Precipitation Index based upon 30 day rainfalls (mm);
  - Minimum API = 5mm;
  - Maximum API = 150mm.

- **Runoff-routing**

  Runoff-routing is used to estimate the surface runoff from rainfall within a Region. This Process uses concentrated storages distributed over a Region, which have a non-linear storage-discharge relationship. This Process originated as model WT42 but was rewritten in ANSI C to be included in the RTFM. This allowed the system to use improved structures to access data more efficiently, in real time. The Process was also modified to operate in a manner that allowed separate Regions to be run as a series of linked cascading models, allowing for the more effective use of spatially varying data.

  The runoff-routing Process was calibrated using ten historical flood events (up to 1994) and was used to successfully simulate operational floods in February 1999, March 1999, February 2001, February 2010, March 2010 and October 2010. The calibration of these models are described in detail in the ***Brisbane River and Pine River Flood Study Report Series, (DNR, 1994), Brisbane River Flood Hydrology Report Volume I Report on Runoff Routing Model Calibration, September 1992.***

  Table 7.2.3 below shows the Region runoff-routing parameters the RTFM uses.

Region code	Kc	m
Upper Brisbane River		
COO	43.6	0.8
LIN	20.6	0.8
EMU	37.2	0.8
CRE	34.3	0.8
GRE	20.1	0.8
Stanley River		
SDI	60.3	0.8
Middle Brisbane River		
WDI	108.5	0.8
SAV	40.0	0.8
MTC	47.0	0.8
Lockyer Creek		
HEL	15.0	0.8
TEN	19.0	0.8
LAI	42.1	0.8
GAT	61.9	0.8
LYO	53.9	0.8
Bremer River		
WAL	44.0	0.8
KAL	34.0	0.8
AMB	35.0	0.8
PUR	49.0	0.8
IPS	15.7	0.8
Lower Brisbane River		
JIN	29.4	0.8
POG	19.3	0.8
ENO	9.1	0.8
BUL	10.5	0.8

Table 7.2.3 – Region runoff-routing parameters

- **Reservoir routing**

Reservoir routing is used to estimate the outflow from a reservoir within a Region. The RTFM incorporates this Process based on level pool routing algorithms. The development of this Process to account for Somerset Dam and Wivenhoe Dam was complex. It needed to fully account for the rules used to operate these Dams during flood events, including the requirement for the Dams to be operated in conjunction to maximise the flood mitigation benefits of the Dams.

The original Process incorporated into the RTFM was an adaptation of a stand-alone computer program known as WIVOPS, which incorporates the flood operation objectives described in the October 2004 Version 6 of the ***Manual of Operational Procedures for Flood Mitigation for Wivenhoe Dam and Somerset Dam***. WIVOPS was further modified in May 2005 to incorporate the Stage I auxiliary spillway works as defined in the Wivenhoe Dam Alliance Report entitled, ***Design Discharges and Downstream Impacts of Wivenhoe Dam Upgrade, Report Number Q1091, June 2004.***

The current reservoir-routing operational Process in the RTFM uses Dam inflow estimates and catchment stream flow extracted from the FLOOD-Ops. This data is imported into customised gate operation spreadsheets to determine appropriate gate operation strategies, in accordance with the Manual. This system has been proven to work very effectively.

- **Base flow**

Base flow is used to estimate residual stream flow, additional to surface runoff. FLOOD-Ops only estimates surface runoff, which is generally the major component of the total runoff. Accurate assessment of the total runoff is required to accurately model rises in Dam storage levels.

The base flow component was introduced to more accurately determine the total inflow volumes into the Dams.

The base flow model (after Boughton) has the form:

- Base $Flow_t$ = ((Base $Flow_{t-1}$ x BR) + (BC x Q_t)^BM))

Where:

- Base $Flow_t$ = Baseflow at time t (m^3/s);
- BR = Base Flow Recession Constant (~0.975 or less than unity);
- Q_t = Modelled Surface Runoff at time t (m^3/s);
- BC = Surface Runoff Factor (~0.002);
- BM = Exponent (~1.0).

As stated above, FLOOD-Ops only estimates surface runoff and does not calculate base flow, as this is added in the gate operations spreadsheets. This should be noted when comparing output data from FLOOD-Ops to the final estimated Dam inflow volumes. Base flow coefficients can be adjusted during flood events to allow matching of model results with actual data.

At the start of the January 2011 Flood Event, there was a residual base flow into the Dams, resulting from the post-Christmas flood. As a result, the starting base flow used in the RTFM was relatively high and was adjusted to match the water level rises in the Dams in the absence of surface runoff. As surface runoff increased during the Event, the base flow component of the total runoff hydrograph decreased, and by the end of the Event, was between 8% and 10% of the total inflow volume into the Dams. Final Event estimates of base flow, in terms of volume for the two Dams, were 114,000ML for Somerset Dam and 250,000ML for Wivenhoe Dam, out of a total event inflow volume of 2,650,000 ML. Figure 7.2.4 below shows the estimated base flow component in comparison to the total surface runoff into Wivenhoe Dam from the Upper Brisbane River.

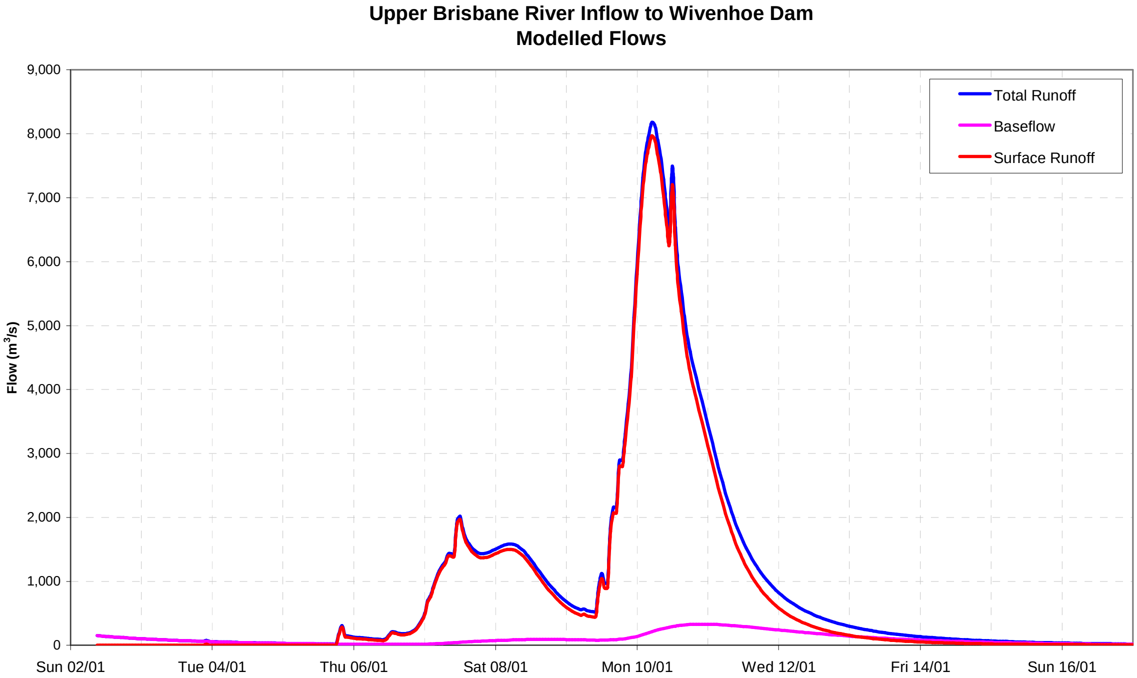

Figure 7.2.4 – Upper Brisbane River inflow to Wivenhoe Dam

Cases

A Case is an event-based sequence of processes applied to a number of Regions. Generally, all Regions are included in a Case, which is identified by a unique Case name. The following items are required to define a Case:

- Name and description of Case;
- Simulation start time, current time, simulation finish time and computational time step;
- Rainfall from simulation start time to the current time;
- Rainfall loss model type, required rainfall loss rates and spatial distribution;
- Forecast rainfall duration, depth, spatial and temporal distribution;
- Regions included in Case;
- Hydrologic model routing parameters;
- Reservoir start volume and operating procedure.

In determining appropriate operational strategies, reference is made within these simulation Cases to model estimates at the following locations:

- Wivenhoe Dam Inflow;
- Somerset Dam Inflow;
- Lockyer Creek at O'Reillys Weir (6569);
- Bremer River at David Trumpy Bridge (2168);
- Brisbane River at Lowood (A-6650 and B-6647);
- Brisbane River at Moggill (6755).

The output from a Case provides model results that are used in flood event decision-making.

7.3 Model performance during the Event

Data

As discussed in detail in Section 5 and Section 6, there were no significant issues observed with the RTFM data collection system during the January 2011 Flood Event.

Ratings

A Rating is a unique relationship between height and flow at a water level recording station. A Rating is used to convert the recorded water level to an estimated flow rate. A full list of the Ratings in the RTFM is provided in Appendix R.

Ratings are generally derived from field measurements of flow, and extrapolated by a variety of techniques for flows that are beyond the range of available field measurements. This allows for coverage of a full range of potential gauge heights. Therefore, there can be considerable uncertainty in the estimation of high flows from recorded water level data, especially at heights such as those experienced during the January 2011 Flood Event.

Actual water levels exceeded the range of available field measurements at a number of gauges during the January 2011 Flood Event. This factor caused additional uncertainty to be associated with the RTFM results, however, this could not be avoided. However, overall this factor did not have a major impact on Flood Event decision-making.

Soil moisture accounting model

The spring and early summer rainfall totals were above average for all Regions. Flood-producing rainfall was recorded in October 2010 and again throughout late November 2010 and December 2010. Four separate flood events were experienced during this period, with the Boxing Day flood event finishing on Sunday 2 January 2011. As a consequence of these flood events, the catchments were close to saturation at the commencement of the January 2011 Flood Event, as evidenced by the estimates of initial loss shown in the table below.

The Tenthill (TEN) and Laidley (LAI) regions in the Upper Lockyer Creek catchment, along with the Kalbar (KAL), Amberley (AMB) and Purga (PUR) regions in the Bremer River catchment, show the effect of isolated storm rainfalls that fell between Tuesday 4 and Wednesday 5 January 2011. The values shown in Table 7.3.1 were used as a starting point for the calibration of the runoff-routing Process.

Loss rate estimates of regions – 5 January 2011			
Region code	**API Initial loss (mm)**	**SACREMENTO Initial loss (mm)**	**SACREMENTO Continuing loss (mm/hr)**
Upper Brisbane River			
COO	28.0	26.5	3.5
LIN	22.6	13.6	3.3
EMU	30.7	25.2	2.1
CRE	33.3	29.6	3.3
GRE	29.2	23.7	3.9
Stanley River			
SDI	22.2	12.3	2.5
Middle Brisbane River			
WDI	23.5	31.7	2.8
SAV	34.2	37.3	3.0
MTC	33.1	33.0	3.8
Lockyer Creek			
HEL	30.4	25.0	4.0
TEN	24.1	0.0	3.5
LAI	14.8	0.0	4.3
GAT	29.3	21.8	3.6
LYO	28.8	20.9	4.2
Bremer River			
WAL	27.8	28.1	2.9
KAL	24.1	0.0	2.0
AMB	27.6	0.0	2.0
PUR	34.3	0.0	2.1
IPS	33.4	0.0	2.0
Lower Brisbane River			
JIN	33.5	34.0	3.8
POG	33.6	33.4	3.8
ENO	30.3	25.2	1.2
BUL	33.2	26.6	4.2

Table 7.3.1 – Region loss rate estimates at 5 January 2011

During the Event, continuing loss rates were changed to ensure the overall shape and volume of the Flood Event was being matched to an acceptable level. Given the multi-peaked nature of the hydrographs and the prolonged duration of the Event, the continuing loss rates tended to reduce as the Event progressed. Table 7.3.2 shows the final Event values used in the RTFM.

To continue producing accurate modelling outputs, the final continuing loss rates adopted were substantially lower than the initial values. This clearly indicates the increasing impact of catchment saturation over the duration of the Flood Event.

Adopted loss rate estimates of regions – January 2001 (final)		
Region code	**Initial loss (mm)**	**Continuing loss (mm/hr)**
Upper Brisbane River		
COO	30	0.5
LIN	30	0.5
EMU	30	0.5
CRE	10	2.5
GRE	40	0.5
Stanley River		
SDI	15	0.5
Middle Brisbane River		
WDI	0	2.5
SAV	5	2.5
MTC	5	2.5
Lockyer Creek		
HEL	10	1.5
TEN	10	1.5
LAI	10	1.5
GAT	10	1.5
LYO	10	1.5
Bremer River		
WAL	15	1.0
KAL	15	1.0
AMB	30	1.0
PUR	10	1.0
IPS	10	1.0
Lower Brisbane River		
JIN	30	2.5
POG	30	2.5
ENO	30	2.5
BUL	30	2.5

Table 7.3.2 – Region loss rates (final) January 2011

The continuing loss rates in Table 7.3.2 are well within the range of those used to model historic flood events, including the January 1974 event, and are certainly within the calibration range of the RTFM. However, while the continuing loss rate has some physical basis, the continuing loss rate is also an indicator of the quality of the recorded data. The consistency of continuing loss rate estimates between events positively indicate the rainfall network provides adequate coverage and that stream gauge ratings are relatively reliable.

7 FLOOD MODEL VALIDITY AND PERFORMANCE (continued)

Cases

Two basic Case scenarios were examined during the event:

- No Forecast Rainfall – accounted for rainfall on the ground to the time of the simulation run;
- Forecast Rainfall – included an extension of rainfall based upon the BoM forecasts (either QPF or SILO).

As is standard practice, a number of simulations were conducted during the initial phases of the Event to develop an understanding of the Event. During this period, between rainfall commencing and runoff being recorded at water level gauges, the modelling is focused on matching the rising limb of the hydrographs. Once the start of the rise of the hydrograph is matched sufficiently, modelling focuses on estimating the peak flow and the volume of the flood, especially for stations located above the Dams. Normally, peak flow rates and flood volumes are matched to at least within 20% of recorded values.

The No Forecast Rain and Forecast Rain scenarios are examined to establish appropriate operational strategies within lower and upper bound model estimates. Attempts are made to match flows at all available gauging stations, with emphasis placed on the key locations. These key locations for each catchment (with associated ALERT sensor identification numbers) are:

- **Upper Brisbane River**
  Brisbane River at Gregors Creek (A) 6515 and (B) 6518
- **Middle Brisbane River**
  Brisbane River at Wivenhoe Dam Headwater (A) 6637 and (C) 6638
- **Stanley River**
  Stanley River at Woodford (A) 6706 and (B) 6703
  Stanley River at Somerset Dam Headwater (A) 6594, (B) 6591 and (C) 6592
- **Lockyer Creek**
  Lockyer Creek at Lyons Bridge (A) 6634 and (B) 6631
- **Bremer River**
  Bremer River at Walloon (A) 6551 and (B) 6743
  Warrill Creek at Amberley (A) 6652 and (B) 6654

The recorded headwater levels and gate settings at each of the Dams are also used to ensure the modelled inflows are appropriate, before using projected inflows to determine future gate operations. Manually-read gauge board readings obtained from the storage operators are used to validate the automatic gauge information at the Dams and are used in preference to automatic gauge information for operational decision-making.

Further points to note in regard to the field stations are as follows:

- At Lyons Bridge, both the (A) and (B) stations are subject to bypass flows at flow magnitudes greater than 600m^3/s. Therefore, the recorded flows are considered to underestimate larger flood magnitudes. There is also an inconsistency between the (A) and (B) site rating curves. The (A) station was adopted in this Event;
- There is an inconsistency between the Amberley (A) and Amberley (B) site rating curves. The (A) station was adopted in this Event;
- David Trumpy Bridge is a height only station as it is also impacted by tidal flows and it too is affected by backwater from large flows in the Brisbane River.

During this Event, some Cases were over-written. This occurred because Cases are generally created by using the most recent Case as a base. If the Case being used as a base is not explicitly saved, it will be lost. This does not present a problem from an operational sense as historical Cases quickly become “out of date” as further rain falls in the Dam catchments. “Out of date” Cases have little bearing on current time operational decision-making as they do not consider all of the rain that has fallen since the commencement of the flood event to the current time. Cases can also easily be re-created at any time during or after the flood event as all Case data is archived. Table 7.3.3 provides a list of preserved Cases developed during the Flood Event.

Run number	Run date and time	Case name	Case description
A	18:00 6/01/2011	201101061800	No Forecast Rain
B	21:00 6/01/2011	201101062100	No Forecast Rain
C	01:00 7/01/2011	201101070100	No Forecast Rain
D	18:00 7/01/2011	201101071800	No Forecast Rain
E	22:00 7/01/2011	201101072200	No Forecast Rain
Efs	22:00 7/01/2011	201101072200-72h	SILO – Forecast Rain
F	09:00 8/01/2011	201101080900	No Forecast Rain
Ffs	09:00 8/01/2011	201101080900-72h	SILO – Forecast Rain
G	15:00 8/01/2011	201101081500	No Forecast Rain
Gfq	15:00 8/01/2011	201101081500-72h	SILO – Forecast Rain
H	09:00 9/01/2011	201101090900	No Forecast Rain
I	14:00 9/01/2011	201101091400	No Forecast Rain
J	16:00 9/01/2011	201101091600	No Forecast Rain
K	18:00 9/01/2011	201101091800	No Forecast Rain
Kfq	18:00 9/01/2011	201101091800-12h	QPF Forecast Rain
L	20:00 9/01/2011	201101092000	No Forecast Rain
Lfq	20:00 9/01/2011	201101092000-24h	QPF Forecast Rain
M	22:00 9/01/2011	201101092200	No Forecast Rain
Mfq	22:00 9/01/2011	201101092200-24h	SILO Forecast Rain
N	01:00 10/01/2011	201101100100	No Forecast Rain
O	03:00 10/01/2011	201101100300	No Forecast Rain
P	05:00 10/01/2011	201101100500	No Forecast Rain
Q	10:00 10/01/2011	201101101000	No Forecast Rain
Qfq	10:00 10/01/2011	201101101000-24hq	QPF Forecast Rain
Qfs	10:00 10/01/2011	201101101000-24hs	SILO Forecast Rain
R	13:00 10/01/2011	201101101300	No Forecast Rain
S	20:00 10/01/2011	201101102000	No Forecast Rain
T	00:00 11/01/2011	201101110000	No Forecast Rain
U	03:00 11/01/2011	201101110300	No Forecast Rain
Ufq	03:00 11/01/2011	201101110300-24h	QPF Forecast Rain
V	11:00 11/01/2011	201101111100	No Forecast Rain
W	11:00 13/01/2011	201101131100	No Forecast Rain
X	09:00 19/01/2011	201101190900	No Forecast Rain
Y	12:00 20/01/2011	201101201200	No Forecast Rain
Z	00:00 21/01/2011	201101210000-1893	No Forecast Rain

Table 7.3.3 – Preserved model runs, January 2011 Flood Event

Table 7.3.4 presents a summary of Cases associated with the periods contained in Section 2. A post-event naming convention was developed to facilitate presentation of these model runs. The mapping of this convention to preserve event model runs is summarised in Table 7.3.4.

Post-event run number	Date and time of run	Corresponding or previous event run number
2	08:00 Thu 6 Jan 2011	A
5	02:00 Fri 7 Jan 2011	C
7	09:00 Fri 7 Jan 2011	C
8	14:00 Fri 7 Jan 2011	C
10	14:00 Sat 8 Jan 2011	F
12	01:00 Sun 9 Jan 2011	G
14	08:00 Sun 9 Jan 2011	G
17	14:00 Sun 9 Jan 2011	I
21	19:00 Sun 9 Jan 2011	K
23	01:00 Mon 10 Jan 2011	N
26	09:00 Mon 10 Jan 2011	P
28	15:00 Mon 10 Jan 2011	R
31	20:00 Mon 10 Jan 2011	S
35	04:00 Tue 11 Jan 2011	U
37	08:00 Tue 11 Jan 2011	U
39	13:00 Tue 11 Jan 2011	V
41	19:00 Tue 11 Jan 2011	V
43	08:00 Wed 12 Jan 2011	V
45	12:00 Wed 19 Jan 2011	X

Table 7.3.4 – Model run naming convention

RTFM results

Overall, the RTFM provided sufficient information to support flood operations decision-making. Water level estimates and approximate recorded gauge water levels did not require significant scaling to match recorded lake levels. Generally, there was agreement that the flows estimated by the BoM were made available via their registered user service. An example of this is shown in Figure 7.3.5.

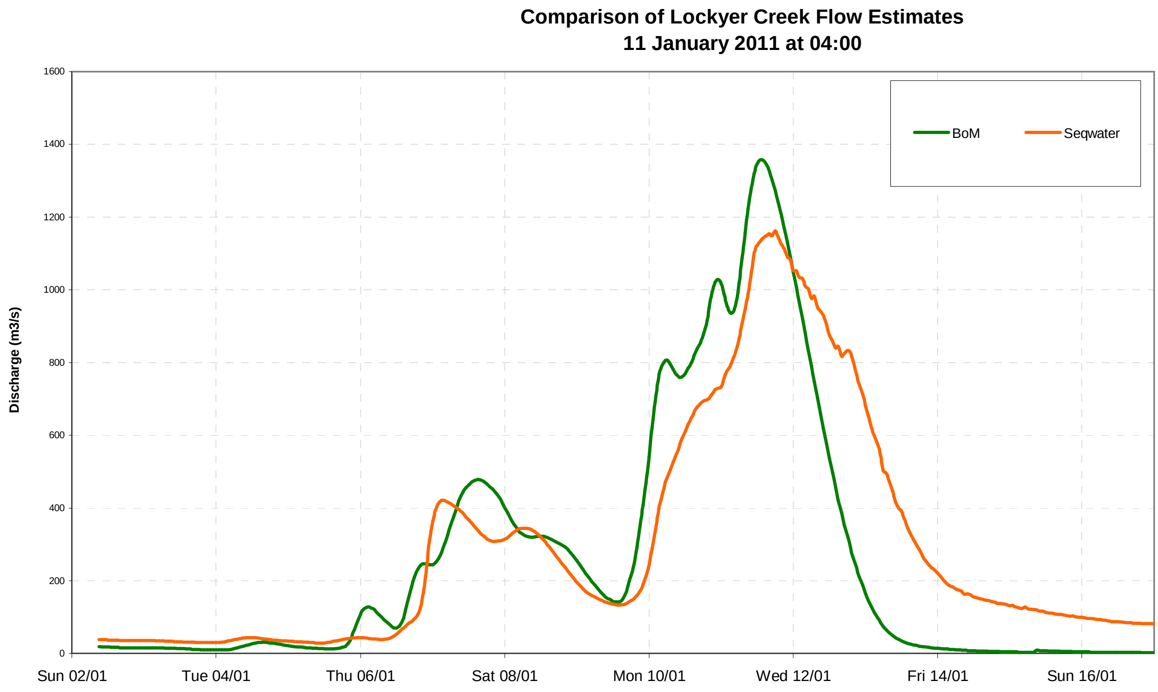

Figure 7.3.5 – Comparison of model estimates

The results provided by the RTFM correlated with the results provided by the back-up RTFM system, using the URBS models.

The model performance also reflects the robustness of the original model calibrations, which were biased towards the larger historical flood events, such as January 1974. The January 2011 Flood Event has a magnitude that requires extrapolation of the model parameters beyond previous benchmarks. The availability of numerous rainfall stations in the catchment significantly and positively contributes to the overall model performance.

With respect to the application of the runoff-routing models in a forecasting model, it should be noted the projected flows are not updated using the recorded flows to the time of the simulation, but rather, the projected flows are derived from recorded rainfalls with or without a forecast rainfall extension.

Summaries of the results across the four key catchments are contained below.

- **Upper Brisbane River Catchment Model**
  The Upper Brisbane River Catchment Model performed well at all locations, as evidenced by the comparisons at Gregors Creek. Some difficulties were encountered in the modelling of flows in the Upper and Middle Brisbane Rivers when trying to match the rapid lake level rise in Wivenhoe Dam that occurred on Tuesday 11 January 2011. However, this was due to an absence of data rather than a flaw in the model, as back calculations showed the intense rainfall during this period was not adequately captured in the available rain gauges. This issue is discussed in more detail in Section 6.

- **Stanley River Catchment Model**
  The Stanley River Catchment Model performed adequately, and accurate inflow estimates into Somerset Dam were obtained from the modelling results. However, because the Woodford gauge only commands a relatively low percentage (20%) of the total catchment area of Somerset Dam, some scaling was needed to match estimated inflow volumes to recorded lake levels. This is because substantial event runoff was generated on the Jimna and D'Aguilar Ranges that flowed directly into Lake Somerset. Therefore, the flow at Woodford did not completely represent all the contributing catchment of the Stanley River. Again, this is a data availability issue rather than a modelling issue.

- **Lockyer Creek Catchment Model**
  The Lockyer Creek Catchment Model performed well and generally matched with catchment flows estimated by the BoM. The flash flooding episode, experienced on the Toowoomba Range escarpment on the afternoon of Monday 10 January 2011, showed the intense rainfall during this period was not adequately captured in the available rain gauges.

  Two stream gauges in the Upper Lockyer Creek catchment failed during the course of the Event due to overtopping, while the most downstream gauge became backwater affected before it failed. Therefore, stream flow matching of the modelling results was undertaken at Glenore Grove and Lyons Bridge. For flows larger than 600m^3/s, Lyons Bridge suffers from bypass flows and therefore tends to underestimate larger flood events. This is evident of the results contained in the following tables and was accounted for during the Event when estimating flows at Moggill. Comparisons between model results shared with the BoM confirm the peak flow in Lockyer Creek was in excess of 3,000m^3/s.

- **Bremer River and Warrill Creek Catchment Model**
  The Bremer River and Warrill Creek Catchment Model performed well and generally matched with catchment flows estimated by the BoM. Some timing differences were noted, particularly on Warrill Creek. The rating of the Bremer River at Walloon was exceeded during the event and so this curve will need to be extrapolated post-event to define the peak flow at this location. Upstream stations on the Bremer River indicated good matching for the Event.

Table 7.3.5 contains calibration results showing the values of peak flow and flood volume to the date and time of the model run. Timing issues result in over or underestimation of peak values, and in many instances, the recorded values are not necessarily peak values, but rather the latest value on the rising limb. Plots of comparisons between recorded and modelled hydrographs are presented in Appendix S.

It should be noted the results in Table 7.3.6 are surface runoff results only and contain no baseflow. Therefore, the values shown in this table will be lower than those shown in the gate operations spreadsheets and the final modelling results.

Finally, the results shown in Table 7.3.6 are based on unverified stream height data and associated Ratings. Although the values shown in the Tables are presented to the nearest m^3/s or ML, the level of precision should be not be inferred from this level of reporting.

Run 2 – 08:00 on Thursday 6 January 2011

This run was completed soon after mobilisation of the Flood Operations Centre. Rainfall commenced the previous day, with the largest falls occurring in the Upper Brisbane River and Lockyer Creek catchments.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	117	13,381	357	15,847	240	2,466
Woodford	4	1,998	8	125	3	-1,874
Lyons Bridge	44	12,257	95	4,860	52	-7,397
Walloon	38	480	116	6,426	77	5,946
Amberley	26	6,084	203	5,471	177	-612

Run 5 – 02:00 on Friday 7 January 2011

This run was completed 19 hours after mobilisation of the Flood Operations Centre. Flows in the Upper Brisbane River had just peaked, while the Lockyer Creek and Bremer River catchments continued to rise.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	40,737	1,302	67,830	316	27,093
Woodford	14	2,227	44	797	30	-1,430
Lyons Bridge	412	22,230	315	14,327	-97	-7,903
Walloon	336	7,429	88	6,291	-248	-1,138
Amberley	73	8,125	124	4,893	51	-3,232

Run 7 – 09:00 on Friday 7 January 2011

This run was completed 26 hours after mobilisation of the Flood Operations Centre. Warrill Creek continued to rise but all other streams had peaked and were receding.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	59,062	1,302	84,378	316	25,316
Woodford	14	2,394	63	1,446	49	-948
Lyons Bridge	422	32,566	447	24,429	25	-8,137
Walloon	412	16,791	89	8,449	-323	-8,342
Amberley	117	10,629	124	6,938	7	-3,691

Run 8 – 14:00 on Friday 7 January 2011

This run was completed 31 hours after mobilisation of the Flood Operations Centre. Rainfall in the Upper Brisbane River and Stanley River had resulted in renewed rises at Gregors Creek, with Woodford now starting to rise as a result of the rainfall.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	69,618	1,302	93,636	316	24,018
Woodford	43	2,792	124	2,939	81	148
Lyons Bridge	422	39,179	484	32,904	61	-6,275
Walloon	412	20,384	126	10,418	-286	-9,965
Amberley	137	12,941	130	8,730	-7	-4,212

Run 10 – 14:00 on Saturday 8 January 2011

This run was completed 55 hours after mobilisation of the Flood Operations Centre. The Upper Brisbane River had peaked for a second time and was now receding. The Stanley River and Warrill Creek were also falling. Secondary peaks in Lockyer Creek and Bremer River were now falling.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	150,518	1,767	209,354	381	58,837
Woodford	79	8,356	134	7,628	55	-728
Lyons Bridge	422	67,238	485	65,809	62	-1,429
Walloon	412	30,148	181	24,936	-231	-5,212
Amberley	164	25,976	210	24,026	46	-1,950

Run 12 – 01:00 on Sunday 9 January 2011

This run was completed 66 hours after mobilisation of the Flood Operations Centre. All streams appeared to be receding, although heavy rainfall falling on all catchments suggested another rise was likely to occur.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	168,163	1,767	224,123	381	55,960
Woodford	79	9,905	134	9,993	55	88
Lyons Bridge	422	76,656	485	74,942	62	-1,714
Walloon	412	32,134	251	29,399	-161	-2,734
Amberley	164	30,702	210	26,004	46	-4,697

Run 14 – 08:00 on Sunday 9 January 2011

This run was completed 73 hours after mobilisation of the Flood Operations Centre. Large increases in flows were expected in the Upper Brisbane River, Stanley River and Bremer River as a result of continuing rainfall. Inflows into Somerset Dam and Wivenhoe Dam were expected to exceed 500,000ML.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	175,953	1,767	235,715	381	59,761
Woodford	79	10,863	229	13,359	150	2,496
Lyons Bridge	422	80,713	485	79,538	62	-1,175
Walloon	412	32,737	412	38,411	0	5,674
Amberley	164	32,719	210	27,172	46	-5,547

Run 17 – 14:00 on Sunday 9 January 2011

This run was completed 79 hours after mobilisation of the Flood Operations Centre. Rapid rises occurred in the Upper Brisbane River, with associated increased runoff volumes into both Somerset Dam and Wivenhoe Dam.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	190,752	1,767	265,570	381	74,818
Woodford	79	12,165	313	19,195	233	7,030
Lyons Bridge	422	83,681	485	82,959	62	-722
Walloon	412	33,088	551	48,994	139	15,906
Amberley	164	34,158	210	29,641	46	-4,517

Run 21 – 19:00 on Sunday 9 January 2011

This run was completed 84 hours after mobilisation of the Flood Operations Centre. Heavy rainfall in the Upper Brisbane River and Stanley River catchments suggested peak flow rates similar to February 1999. Inflows into Somerset Dam and Wivenhoe Dam were expected to exceed 1,000,000ML.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	5,156	243,878	6,877	350,681	1,720	106,803
Woodford	333	15,543	682	30,089	349	14,547
Lyons Bridge	422	86,218	485	86,639	62	420
Walloon	412	33,624	551	58,159	139	24,535
Amberley	164	35,441	210	31,218	46	-4,223

Run 23 – 01:00 on Monday 10 January 2011

This run was completed 90 hours after mobilisation of the Flood Operations Centre. Upper Brisbane River catchment peaked at a level in excess of January 1974. Lockyer Creek and Bremer River catchments were rising again.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	392,566	7,594	504,062	243	111,496
Woodford	430	27,101	685	43,826	255	16,725
Lyons Bridge	422	90,773	485	94,213	62	3,440
Walloon	412	36,585	570	70,093	158	33,508
Amberley	164	37,275	210	33,052	46	-4,223

Run 26 – 09:00 on Monday 10 January 2011

This run was completed 98 hours after mobilisation of the Flood Operations Centre. All catchments had peaked or had started to recede.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	543,591	7,594	631,209	243	87,618
Woodford	820	48,307	685	58,068	-135	9,762
Lyons Bridge	548	103,946	485	106,479	-63	2,533
Walloon	412	45,320	635	86,481	223	41,160
Amberley	164	39,540	218	35,975	54	-3,566

Run 28 – 15:00 on Monday 10 January 2011

This run was completed 104 hours after mobilisation of the Flood Operations Centre. Rainfall again caused rises in the Upper Brisbane River and Lockyer Creek. Flash flooding was reported in Toowoomba and Upper Lockyer Creek. Inflows into Somerset and Wivenhoe Dams were approaching 1,500,000ML.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	594,300	7,594	687,321	243	93,021
Woodford	820	60,211	685	66,084	-135	5,873
Lyons Bridge	661	117,298	485	116,464	-176	-833
Walloon	412	51,673	652	99,571	239	47,897
Amberley	164	42,069	590	47,022	426	4,953

Run 31 – 20:00 on Monday 10 January 2011

This run was completed 109 hours after mobilisation of the Flood Operations Centre. Lockyer Creek and the Bremer River catchments were continuing to rise. Gauging stations Helidon and Gatton in the Upper Lockyer Creek stopped reporting (later found to be destroyed by flood flows) during this period.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	624,406	7,594	725,005	243	100,599
Woodford	820	60,211	685	70,357	-135	10,146
Lyons Bridge	701	129,738	485	124,839	-216	-4,898
Walloon	412	56,377	664	110,975	252	54,598
Amberley	277	46,268	590	55,414	313	9,146

Run 35 – 04:00 on Tuesday 11 January 2011

This run was completed 117 hours after mobilisation of the Flood Operations Centre. Heavy rainfall overnight in the Upper Brisbane River catchment lead to renewed rises; Lockyer Creek continued to rise due to flash flooding near the escarpment during the previous afternoon and Bremer River also continued to rise.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	655,136	7,594	767,802	243	112,666
Woodford	820	73,389	685	75,235	-135	1,846
Lyons Bridge	808	151,461	591	139,841	-217	-11,620
Walloon	575	69,710	707	131,038	132	61,327
Amberley	280	53,921	590	63,642	310	9,720

Run 37 – 08:00 on Tuesday 11 January 2011

This run was completed 121 hours after mobilisation of the Flood Operations Centre. Heavy rainfall adjacent to Wivenhoe Dam lead to rapid increases in the lake level from 04:00. Lockyer Creek continued to rise quickly and the Bremer River catchment appeared steady. Inflows into Somerset Dam and Wivenhoe Dam were approaching 2,000,000ML.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	702,824	7,594	832,903	243	130,079
Woodford	820	76,158	685	78,289	-135	2,131
Lyons Bridge	944	164,264	1,096	174,591	152	10,327
Walloon	575	77,138	707	140,897	132	63,759
Amberley	288	57,916	590	67,321	303	9,405

Run 39 – 13:00 on Tuesday 11 January 2011

This run was completed 126 hours after mobilisation of the Flood Operations Centre. The Upper Brisbane River catchment had peaked, however, continuing heavy rainfall adjacent to Wivenhoe Dam caused further rapid increases in the lake level. Somerset Dam inflows also increased rapidly. Lockyer Creek continued to rise quickly and the Bremer River catchment also experienced substantial renewed rises.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	801,607	7,594	951,452	243	149,845
Woodford	820	82,317	844	87,121	24	4,805
Lyons Bridge	1,128	183,678	1,861	202,421	733	18,743
Walloon	1,210	90,488	903	66,984	-307	-23,504
Amberley	394	63,991	968	80,639	574	16,648

Run 41 – 19:00 on Tuesday 11 January 2011

This run was completed 132 hours after mobilisation of the Flood Operations Centre. Wivenhoe Dam had peaked. The Stanley River at Woodford was rising rapidly and Somerset Dam inflows also increased. Lockyer Creek appeared to have peaked, but the recorded water level was beyond the accuracy limit of the rating, however, comparisons with the BoM estimates indicate the modelled flows could be reasonable. The Bremer River at Walloon exceeded its rating curve, while Warrill Creek continued to rise.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	871,338	7,594	1,035,877	243	164,538
Woodford	1,341	108,327	844	103,130	-496	-5,198
Lyons Bridge	1,162	208,518	3,733	268,192	2,571	59,675
Walloon	1,210	116,624	1,408	94,997	198	-21,628
Amberley	622	75,667	1,138	104,382	516	28,715

Run 43 – 08:00 on Wednesday 12 January 2011

This run was completed 145 hours after mobilisation of the Flood Operations Centre. All streams had peaked, except for Warrill Creek.

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	923,781	7,594	1,112,372	243	188,591
Woodford	1,341	147,688	844	123,271	-496	-24,417
Lyons Bridge	1,162	257,121	4,013	435,463	2,851	178,342
Walloon	1,210	172,307	1,408	139,207	198	-33,100
Amberley	730	107,495	1,138	133,975	408	26,479

Run 45 – 12:00 on Wednesday 19 January 2011

This run was completed 317 hours after mobilisation of the Flood Operations Centre. Gate operations ceased at Wivenhoe Dam. Little rain fell on the catchment in the week following the peak on Tuesday 11 January 2011. This was the final simulation run. Minor adjustments to loss parameters resulted in minor changes to the model calibration results compared to Run 43. Inflows into Somerset Dam and Wivenhoe Dam approached 2,350,000ML (excluding base flow).

Stream gauge	Estimated		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	1,000,750	8,098	1,150,594	746	149,844
Woodford	1,341	169,736	844	132,950	-496	-36,786
Lyons Bridge	1,162	384,482	2,904	518,567	1,742	134,085
Walloon	1,210	198,434	1,408	158,052	198	-40,383
Amberley	736	193,908	1,138	175,781	402	-18,127

Table 7.3.6 – Model run peak flow and flood volume values

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8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE

8.1 Introduction

The significance of this Event can be determined by comparing rainfall, water levels and flood volumes measured during the period with historical records, and then undertaking a statistical analysis of this information. Australian Rainfall and Runoff (AR&R) categorises events according to their Annual Exceedance Probability (AEP), as illustrated in Figure 8.1.1. The Bureau of Meteorology (BoM) adopts a flood classification system based on minor, moderate and major flood levels which are defined by the BoM in conjunction with local Councils.

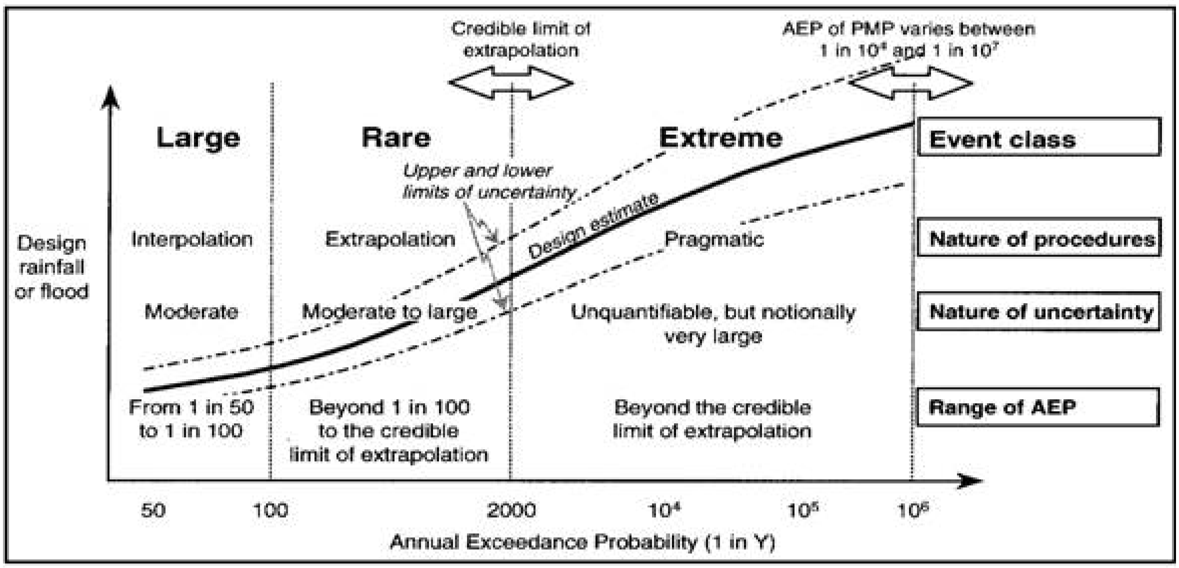

Figure 8.1.1 – Annual Exceedance Probability (AEP)

It should be noted the assessments carried out in this Section of the Report are preliminary only and are based upon operational data collected during the Event. Given the time constraints regarding the preparation of this Report, it is recognised more information may become available over time on which to base a more rigorous assessment of the Event magnitude.

Rainfall totals and intensities can be compared with those recorded during other significant events to determine the significance of the January 2011 Flood Event. Rainfall stations in the Brisbane catchment have good record lengths that, in some cases, are greater than 100 years and, therefore, provide an effective basis for analysis. The analysis of rainfall intensity rather than depth provides a good indicator of the magnitude of floods in terms of peak flows and volumes.

Water level stations generally have shorter record lengths than rainfall stations, leading to a greater level of uncertainty when comparing recorded and historic water level data to determine event significance. Automatic stations have only been in widespread use since the 1960s, so continuous water level records are generally only available for maximum periods of approximately 50 years.

Detailed flood frequency analysis, consisting of at-station statistical analysis of flow records, requires extensive investigation based on a reassessment of station ratings to account for the current Event. This reassessment work is currently being undertaken by the Department of Environment and Resource Management (DERM) and was not available at the time of writing this Report. However, some preliminary flood frequency analysis was undertaken using available records, and this information is included in this Report.

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

8.2 Rainfall depth and intensity comparison

In the four weeks prior to Thursday 6 January 2011, rainfall in South East Queensland had been well above the December average. In some areas, rainfall exceeded the December average by as much as 400mm. These results can be seen in the following map (Figure 8.2.1) provided by the BoM:

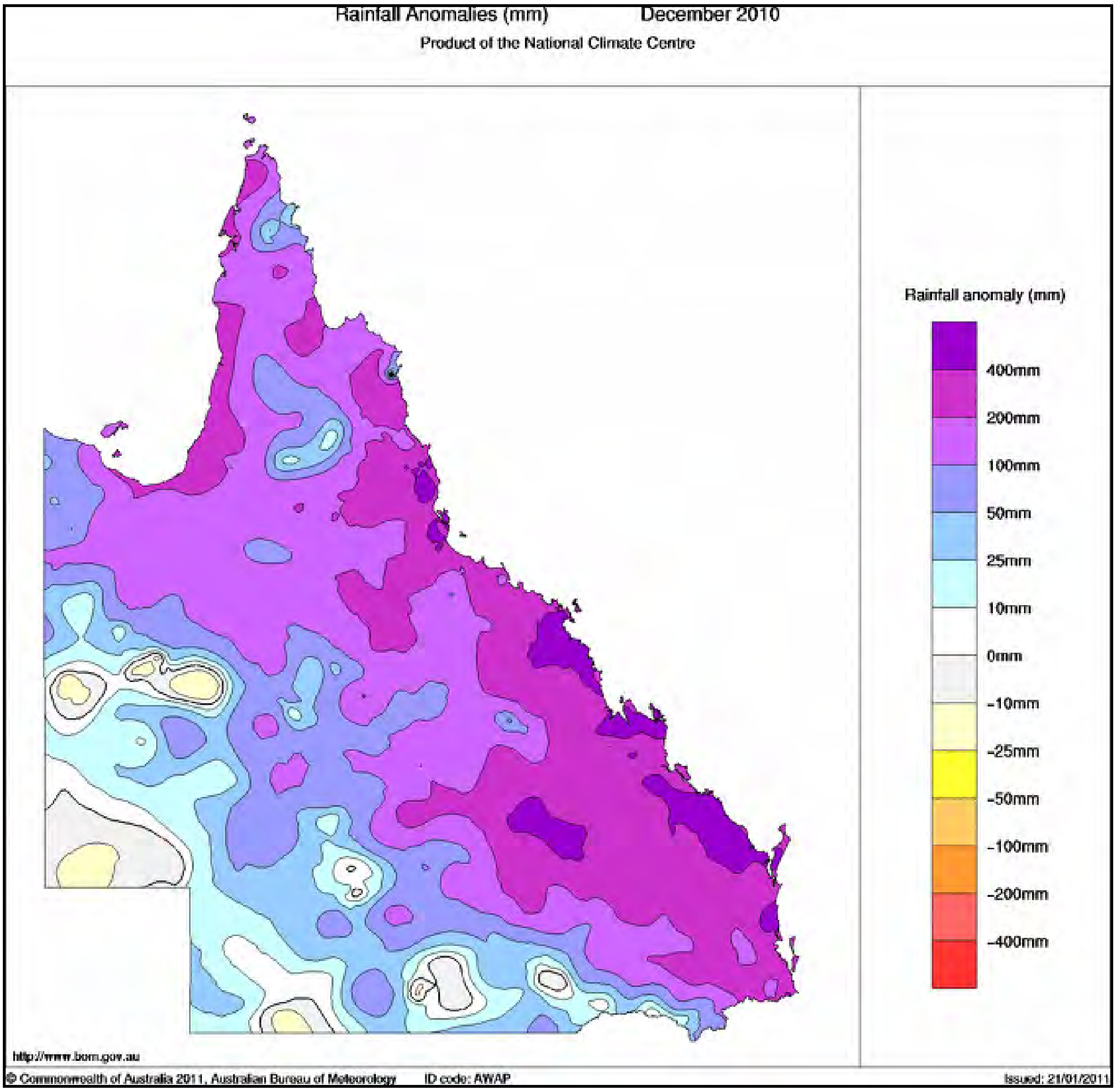

Figure 8.2.1 – Queensland rainfall (mm), December 2010

There had already been two significant rainfall events in mid and late December 2010 which required large releases from Somerset and Wivenhoe Dams. As a result of these events and the above average rainfall that had been experienced, the Brisbane catchment was wetter than would normally be expected at this time of year and primed to generate runoff from relatively low rainfall events.

Historic comparison

Table 8.2.2 shows a comparison between the event rainfall totals from the January 1974, February 1999 and January 2011 flood events. The comparison could not include the February 1893 events as the available rainfall records are inadequate to allow a proper comparison.

The first feature to notice in Table 8.2.2 is the duration of the events vary from three days to eight days. This has implications for the runoff generating efficiency of the rainfall, as the longer the event duration, the closer to full saturation the catchment becomes and the greater the proportion of runoff per period. This was particularly relevant for the January 2011 Flood Event as the catchment was already close to full saturation at the beginning of the Event.

Table 8.2.2 also shows that the depth of rainfall in the February 1999 flood is much less than the other two events. While the five day totals in the January 1974 and January 2011 events are quite similar, the distribution of rainfall with time is quite different, and this had a major impact on the volume of runoff generated during each event.

Daily catchment average rainfalls (mm) January 1974							
24 hours to	**Stanley**	**Upper**	**Lockyer**	**Bremer**	**Warrill**	**Purga**	**Lower**
24/01/1974 09:00	0	0	0	0	0	0	0
25/01/1974 09:00	129	70	57	57	44	67	89
26/01/1974 09:00	187	141	172	211	181	188	318
27/01/1974 09:00	398	290	346	465	410	428	530
28/01/1974 09:00	471	339	410	536	468	502	574
29/01/1974 09:00	479	344	412	536	470	503	577

Daily catchment average rainfalls (mm) February 1999							
24 hours to	**Stanley**	**Upper**	**Lockyer**	**Bremer**	**Warrill**	**Purga**	**Lower**
08/02/1999 09:00	0	0	0	0	0	0	0
09/02/1999 09:00	294	223	138	131	102	107	129
10/02/1999 09:00	350	245	150	145	115	119	137
11/02/1999 09:00	355	248	152	148	117	121	140
12/02/1999 09:00	355	248	153	148	117	121	141

Daily catchment average rainfalls (mm) January 2011							
24 hours to	**Stanley**	**Upper**	**Lockyer**	**Bremer**	**Warrill**	**Purga**	**Lower**
06/01/2011 09:00	0	0	0	0	0	0	0
07/01/2011 09:00	20	27	25	26	24	20	19
08/01/2011 09:00	50	64	65	61	75	43	45
09/01/2011 09:00	80	98	85	76	89	57	71
10/01/2011 09:00	129	117	90	80	92	60	76
11/01/2011 09:00	328	254	163	121	118	94	152
12/01/2011 09:00	423	371	275	182	196	163	202
13/01/2011 09:00	541	424	363	337	299	227	310

Table 8.2.2 – Comparison of daily catchment average rainfalls (mm); January 1974, February 1999 and January 2011

Table 8.2.3 compares the most intense periods of rainfall recorded for the January 1974, February 1999 and January 2011 flood events during various time periods, with the highest totals for each period highlighted in red. Generally, the January 2011 Event contains the highest rainfall totals of the three events.

Rainfall totals for selected durations (mm)						
Duration	Somerset Dam catchment			Wivenhoe Dam catchment (excluding Somerset Dam catchment)		
Hours	Jan 1974	Feb 1999	Jan 2011	Jan 1974	Feb 1999	Jan 2011
1	19	21	25	9	11	14
3	51	53	68	25	28	40
6	90	81	118	47	51	74
12	152	134	162	90	87	114
18	193	186	199	127	135	135
24	220	230	221	152	156	144
48	299	325	342	225	231	255
72	421	351	446	295	246	292
96	474	356	464	341	248	307
120	482	357	529	345	250	389

Table 8.2.3 – Comparison of rainfall totals for selected durations (mm); January 1974, February 1999 and January 2011

Figures 8.2.4 and 8.2.5 show a comparison of the average hourly catchment rainfall patterns in the Somerset Dam and Wivenhoe Dam catchments during the January 1974, February 1999 and January 2011 flood events. Each of the graphs have been plotted on the same horizontal (eight days) and vertical (25mm/hr) scales to enable direct comparison.

The plots of the January 1974 and February 1999 flood events use all available rainfall data, including daily rainfall records, while the plots of the January 2011 Flood Event only use the operational data collected during the Event. All three plots use the same approach of weighting the four nearest rainfall stations to estimate the average catchment rainfall for each subarea in Seqwater's Unified River Basin Simulator (URBS) model. Weights were determined using the inverse distanced squared method. The catchment average rainfall is then calculated by weighting each sub-area in relation to the total catchment area.

Somerset Dam catchment (Figure 8.2.4)

In the Somerset Dam catchment, the rainfall intensities in the 1974 flood were generally between 3mm/hr to 8mm/hr over the four-day duration of the event. By comparison, intensities in the February 1999 flood were slightly higher but over a much shorter period. In January 2011, there are several bursts of rainfall between 5mm/hr and 10mm/hr over short durations, leading up to a prolonged period of heavy rain where two periods of very intense rain were experienced (in the 12 hours ending 18:00 on Sunday 9 January 2011 and the 12 hours ending 18:00 on Tuesday 11 January 2011). During these periods, intensities were more than double those recorded in 1974 and 1999.

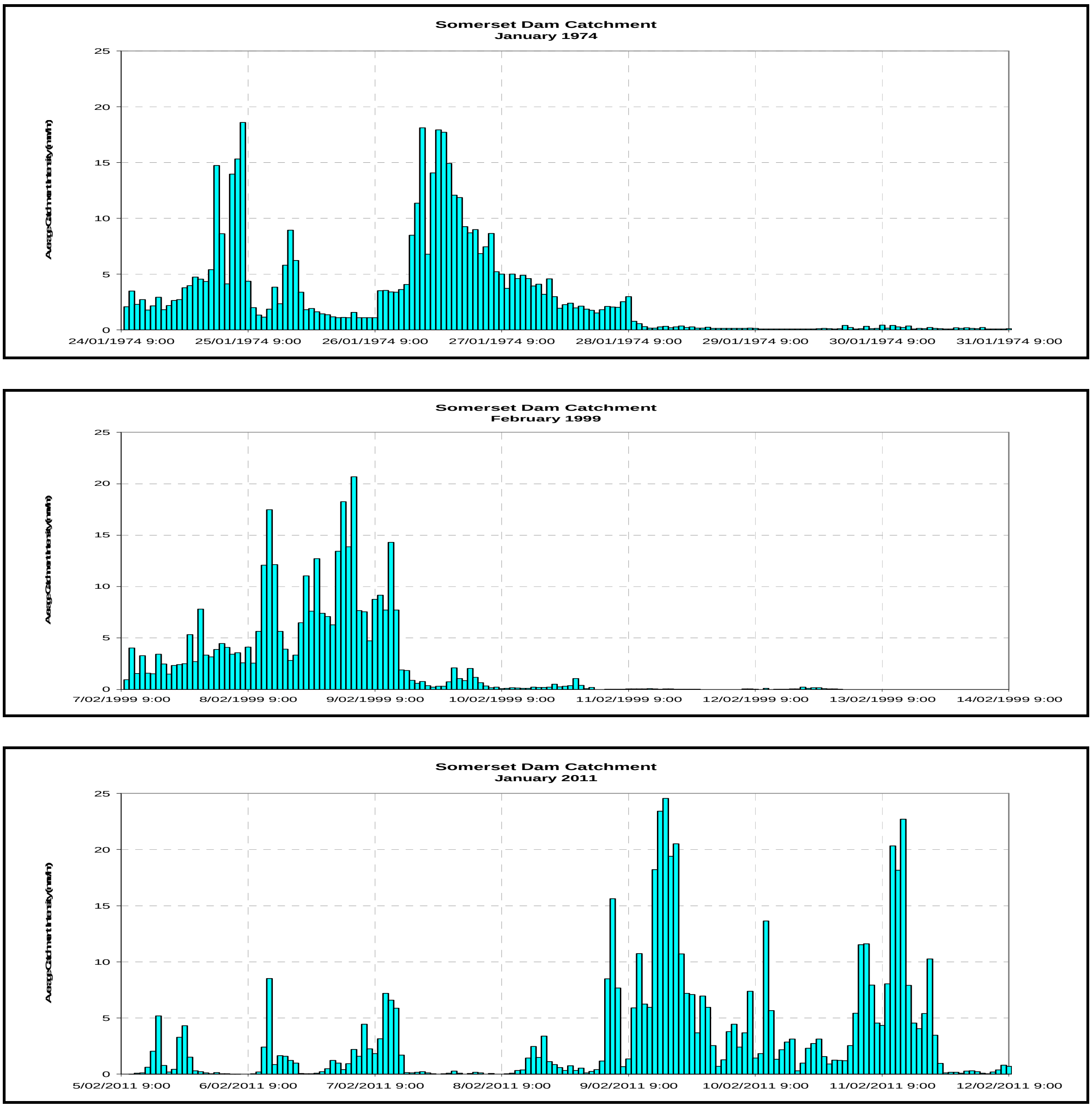

Figure 8.2.4 – Comparison of Somerset Dam catchment rainfall patterns (mm/hr); January 1974, February 1999 and January 2011

Wivenhoe Dam catchment (excluding the Somerset Dam catchment) (Figure 8.2.5)

In the Wivenhoe Dam catchment, the rainfall intensities during the 1974 flood were generally between 3mm/hr to 8mm/hr over the four-day duration of the event. By comparison, intensities in the February 1999 flood were slightly higher but over a much shorter period. In January 2011, the average catchment rainfall tended to build up slowly over the first four days, during which time a number of small floods were experienced. The first burst of heavy rainfall occurred in the 12 hours to 00:00 on Monday 10 January 2011. This was followed by a shorter two-hour burst on the afternoon of Monday 10 January 2011. The final and heaviest catchment burst occurred in the early hours of Tuesday 11 January 2011. Rainfall intensities in the January 2011 Event were nearly double those of January 1974.

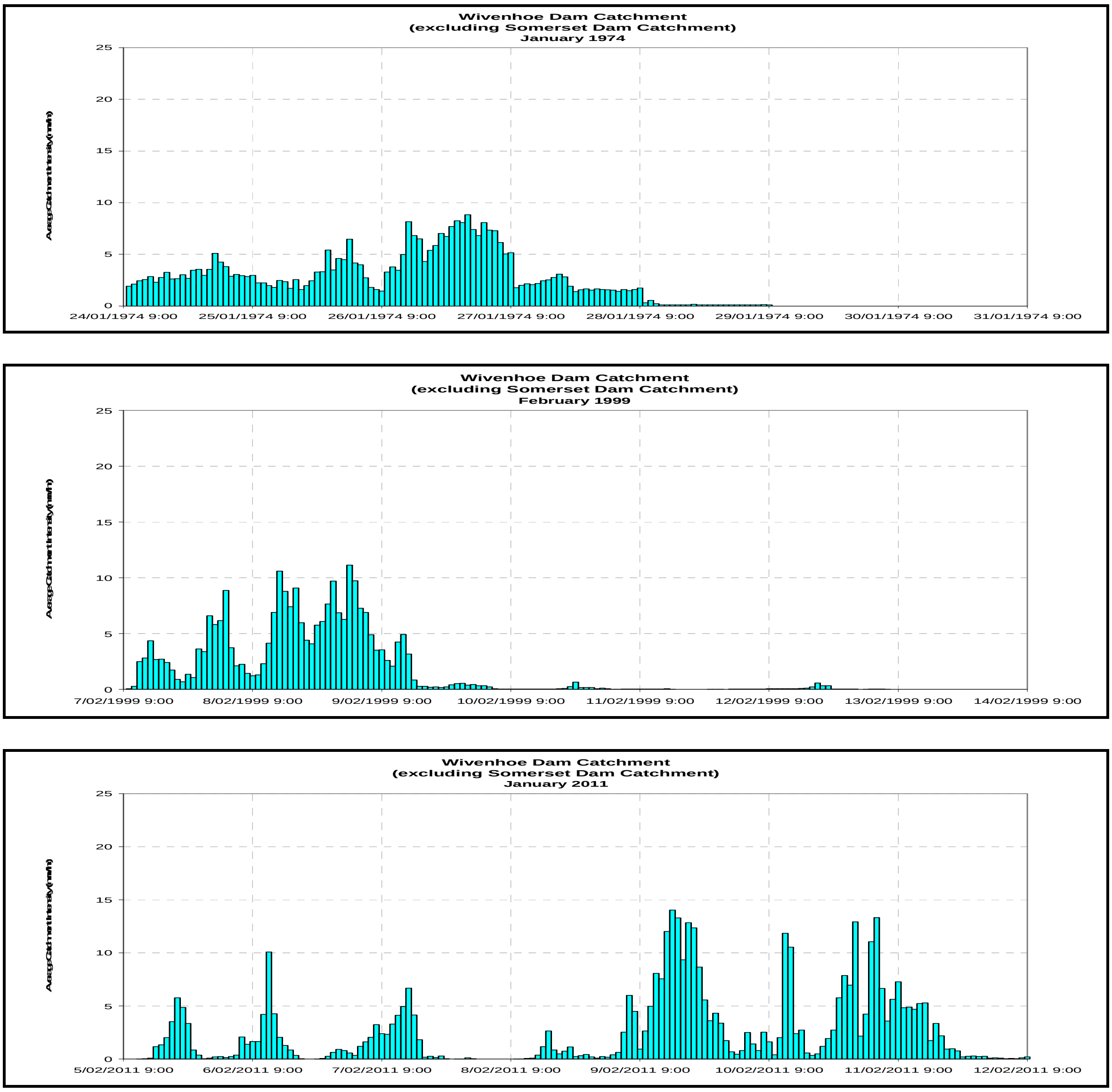

Figure 8.2.5 – Comparison of Wivenhoe Dam catchment rainfall patterns (mm/hr); January 1974, February 1999 and January 2011

8.3 Rainfall Intensity Frequency Duration analysis

Intensity Frequency Duration (IFD) analysis refers to the statistical analysis of rainfall intensities. Rainfall is typically described as depth in millimetres (mm) falling over a specified duration or period in hours. The rainfall rate or intensity is usually defined as the depth of rainfall per hour.

To determine the severity of a particular rainfall event, the intensity over particular periods of interest is compared with historical records to determine its frequency of occurrence. The Annual Exceedance Probability (AEP) is used to define this frequency of occurrence and is defined by the BoM as "***the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year***".

Depth and intensity may be used in IFD analysis, however, the BoM prefers to simply use rainfall intensity (mm/h). There are two generally accepted methods for IFD analysis:

- Australian Rainfall and Runoff (AR&R) (IEAust 1987);
- CRC-FORGE (Hargraves, 2004 & 2005).

Appendix B contains the analysis for both of these methodologies for a range of rainfall gauges in the Dam catchments for the January 2011 Flood Event. The AR&R (IEAust 1987) results are also available in real time within the Real Time Flood Model (RTFM) and are used to assess the progression of flood events.

In the Brisbane River Catchment, the CRC-FORGE method and AR&R produce similar estimates for 1% AEP for durations from 24 hours to 72 hours. The CRC-FORGE method is the only IFD method used in relation to dams that provides design rainfall estimates for durations up to 120 hours.

The CRC-FORGE method is based upon a regional rainfall frequency analysis that derives rainfall depth estimates of large to rare flood events and uses the concept of an expanding region focused at the site of interest. When using CRC-FORGE, design rainfall estimates for frequent events (1 in 50 and 1 in 100 AEP) are based on pooled data from a few stations around the focal point, while design rainfall estimates at the AEP limit of extrapolation (1 in 2,000) are based on pooled rainfall data from up to several hundred stations. Before data from different sites can be pooled, maximum annual rainfalls from each site need to be standardised by dividing by an index variable. The index variable may be the mean annual maximum for the site, or rainfall of any specified AEP that is reasonable and accurately determined from a short record. An Areal Reduction Factor (ARF) is also introduced to correct the variation of rainfall intensity over a large catchment area and to convert point rainfall estimates to areal estimates.

The CRC-FORGE method was developed using daily rainfall totals. It should be noted there is some uncertainty in the AEP estimates of the recorded rainfall produced by the CRC-FORGE method for durations less than 24 hours. The shorter durations are extrapolated using ratios calculated from AR&R. There are experimental techniques available for investigating the AEP for the shorter duration rainfalls, but time constraints associated with the preparation of this Report have not allowed this to be included in the analysis. Given the focus of this IFD analysis is mostly on longer duration storms, the approach undertaken for this Report is considered appropriate.

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

Point IFD Analysis

For the January 2011 Event, the CRC-FORGE method was used to derive rainfall estimates for frequent to rare flood events for storm durations from 15 minutes to 120 hours, for both point and areal estimates. As discussed above, there is some uncertainty associated with design rainfall estimates below 24-hour duration so there curves are shown dotted in the plots below. Point IFD analysis was carried out for each gauge in the rainfall network listed in Table 8.3.1.

ALERT	Station	Location	
ID		Latitude	Longitude
6511	Mount Pechey	-27.3170	152.0820
6514	Gregors Creek	-26.9800	152.4040
6520	Boat Mountain	-26.9789	152.2847
6523	Cressbrook Dam	-27.2650	152.1950
6529	Saint Aubins	-27.0619	151.8944
6540	Yarraman	-26.8358	151.9692
6542	Dam Site	-26.7417	152.1367
6550	Walloon	-27.6170	152.6680
6553	Rosentretters	-27.1383	152.3294
6556	Glenore Grove	-27.5242	152.4081
6559	Savages Crossing	-27.4410	152.6680
6571	Harrisville	-27.8150	152.6406
6574	Caboonbah	-27.1460	152.4900
6577	Gatton	-27.5564	152.2731
6580	Adams Bridge	-27.8294	152.5108
6583	Showground Weir	-27.6386	152.3844
6596	Crows Nest	-27.2308	152.0311
6598	Toowoomba	-27.5114	151.9536
6600	Kilcoy	-26.9481	152.5836
6604	Toogoolawah	-27.0858	152.3722
6606	Woodbine West	-27.7847	152.1497
6608	Jimna	-26.6610	152.4510
6610	Kluvers Lookout	-27.2070	152.7030
6615	Thorton	-27.8211	152.3800
6617	Little Egypt	-27.7042	152.0650

ALERT	Station	Location	
ID		Latitude	Longitude
6619	Mount Castle	-27.9636	152.3756
6621	Nukinenda	-27.0567	152.1072
6623	Tarome	-27.9867	152.5008
6636	Wivenhoe Dam	-27.3550	152.5960
6643	Wivenhoe Dam Tailwater	-27.4100	152.5960
6649	Lowood	-27.4900	152.5930
6651	Amberley	-27.6780	152.6990
6680	Mount Glorious	-27.3220	152.7470
6705	Woodford	-26.9500	152.7600
6708	Devon Hills	-26.9000	152.3210
6711	Baxters Creek	-27.1958	152.8000
6714	Ferris Knob	-26.8542	152.8167
6716	Bellthorpe West	-26.8230	152.6780
6730	Jindalee	-27.5322	152.9239
6733	Rosewood	-27.6600	152.6030
6739	Washpool	-27.8290	152.7550
6748	Brisbane City Gauge	-27.4730	153.0300
6751	Mount Crosby	-27.5300	152.7980
6754	Moggill	-27.5950	152.8630
6760	North Pine Dam	-27.2650	152.9300
6763	Petrie	-27.2700	152.9750
6766	Lake Kurwongbah	-27.2500	152.9500
6769	Drapers Crossing	-27.3500	152.9167
6778	Samford	-27.3610	152.8790

Table 8.3.1 – Rainfall stations IFD analysis

Significant stations in each catchment were selected for inclusion in this section of the Report. The remainder of the IFD tables and curves for other stations are included in Appendix P.

Table 8.3.2 summarises the highest AEPs at particular stations, estimated from an IFD analysis of the entire list of stations in the tables above. The table shows that for durations of more than three hours, the highest AEPs of the recorded rainfall were 1 in 500 or greater.

January 2011 Flood Event – Highest rainfall intensities					
Duration	**ALERT ID**	**Station**	**Recorded intensity mm/hr**	**End time**	**AEP 1 in Y**
3 H	6559	Savages Crossing	70.5	11/01/2011 09:34	500 - 1000
6 H	6559	Savages Crossing	47.8	11/01/2011 12:49	> 2000
	6649	Lowood	40.0	11/01/2011 14:04	
12 H	6559	Savages Crossing	30.7	11/01/2011 14:34	> 2000
	6643	Wivenhoe Dam	29.4	11/01/2011 16:29	
	6649	Lowood	29.0	11/01/2011 14:49	
18 H	6649	Lowood	19.6	11/01/2011 19:34	> 2000
24 H	6649	Lowood	14.8	11/01/2011 19:19	> 2000
48 H	6649	Lowood	9.0	11/01/2011 14:49	> 2000
72 H	6649	Lowood	6.4	12/01/2011 01:19	1000 - 2000
96 H	6649	Lowood	4.9	12/01/2011 01:19	500 - 1000
120 H	6649	Lowood	4.0	12/01/2011 01:04	500 - 1000

Table 8.3.2 – Highest AEP rainfall intensities, January 2011 Flood Event

IFD results for significant individual stations are defined further in this section. Discussions on temporal patterns are also contained in Section 6. Overall, there was significant spatial variation in the rainfall intensities. Intensities were generally very high in the catchment above Somerset and Wivenhoe Dams, however, they were not statistically significant at stations below the Dams. It should also be noted the rainfall which caused the Lockyer Creek flash flood was not recorded in any of the Seqwater stations.

Gregors Creek

This station is located near the Brisbane River approximately 49km north of Wivenhoe Dam, and is close to the centre of the Wivenhoe Dam catchment. Figure 8.3.3 below shows the heaviest rainfall up to 18 hours was recorded on the afternoon of Sunday 9 January 2011. For durations less than three hours, the AEP was not particularly significant, however, between 18 and 24 hours, the AEP of the rainfall was in the 1 in 100 to 1 in 200 range. By 20:00 on Tuesday 11 January 2011, the longer rainfall periods up to 120 hours are consistently in the 1 in 100 to 1 in 200 range.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	70.0	09/01/2011 15:20	< 5
30 M	52.6	09/01/2011 15:35	< 5
1 H	42.2	09/01/2011 16:05	< 5
3 H	30.4	09/01/2011 18:05	20
6 H	25.0	09/01/2011 19:05	50 - 100
12 H	16.0	09/01/2011 22:20	100 - 200
18 H	12.1	09/01/2011 23:35	100 - 200
24 H	10.0	10/01/2011 12:35	100 - 200
48 H	6.6	11/01/2011 05:05	100 - 200
72 H	4.8	11/01/2011 20:20	100 - 200
96 H	3.6	11/01/2011 20:20	50 -100
120 H	3.2	11/01/2011 20:20	100 - 200

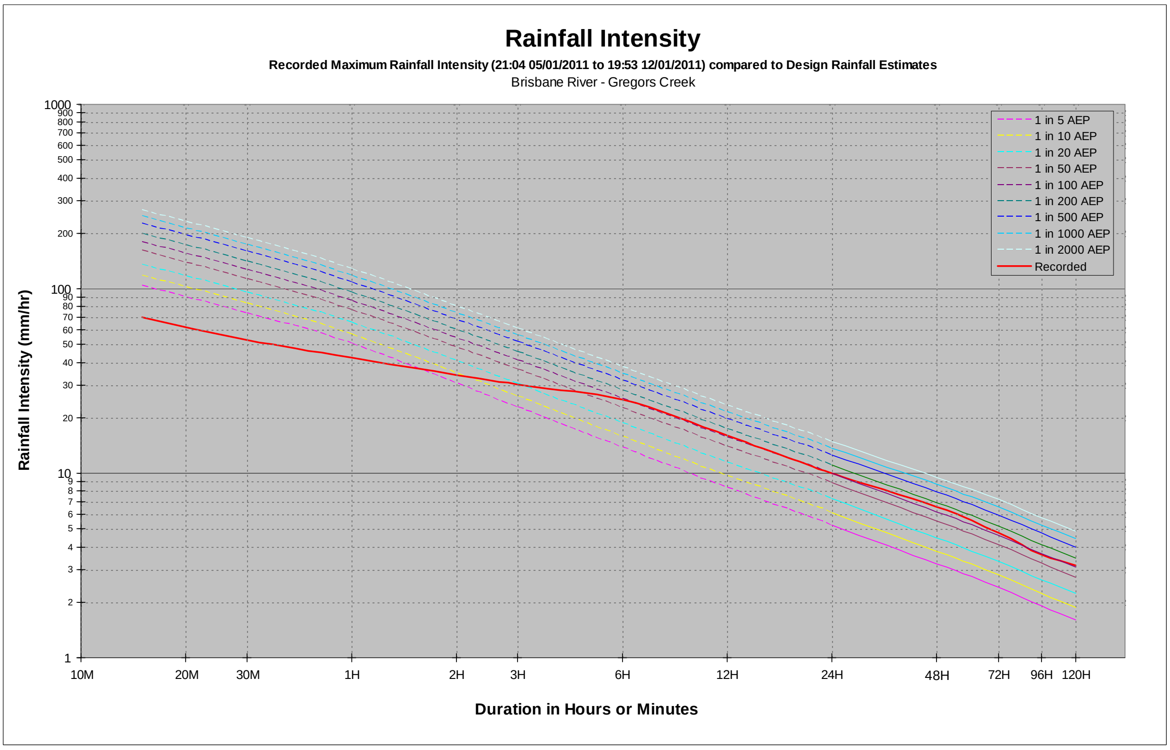

Figure 8.3.3 – Rainfall intensity, Gregors Creek

Cooyar Creek Dam Site

This station is located within the lower reaches of Cooyar Creek, approximately 85km north north-west of Wivenhoe Dam, near the northern boundary of the Wivenhoe Dam catchment. Figure 8.3.4 below shows the shorter duration rainfall up to 24 hours was not statistically significant and mostly occurred in the period up to late Monday 10 January 2011 to early Tuesday 11 January 2011. By Tuesday 11 January 2011, the longer rainfall periods up to 120 hours are consistently in the 1 in 50 to 1 in 100 range.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	60.4	10/01/2011 23:04	< 5
30 M	55.6	10/01/2011 23:19	< 5
1 H	38.2	10/01/2011 23:49	< 5
3 H	22.2	11/01/2011 00:49	< 5
6 H	16.3	11/01/2011 04:49	20
12 H	9.8	11/01/2011 05:49	20
18 H	6.9	09/01/2011 23:49	20
24 H	5.4	10/01/2011 02:04	20
48 H	5.2	11/01/2011 05:49	50 - 100
72 H	3.6	11/01/2011 14:49	50 - 100
96 H	3.0	11/01/2011 04:49	50 - 100
120 H	2.9	11/01/2011 07:34	200 - 500

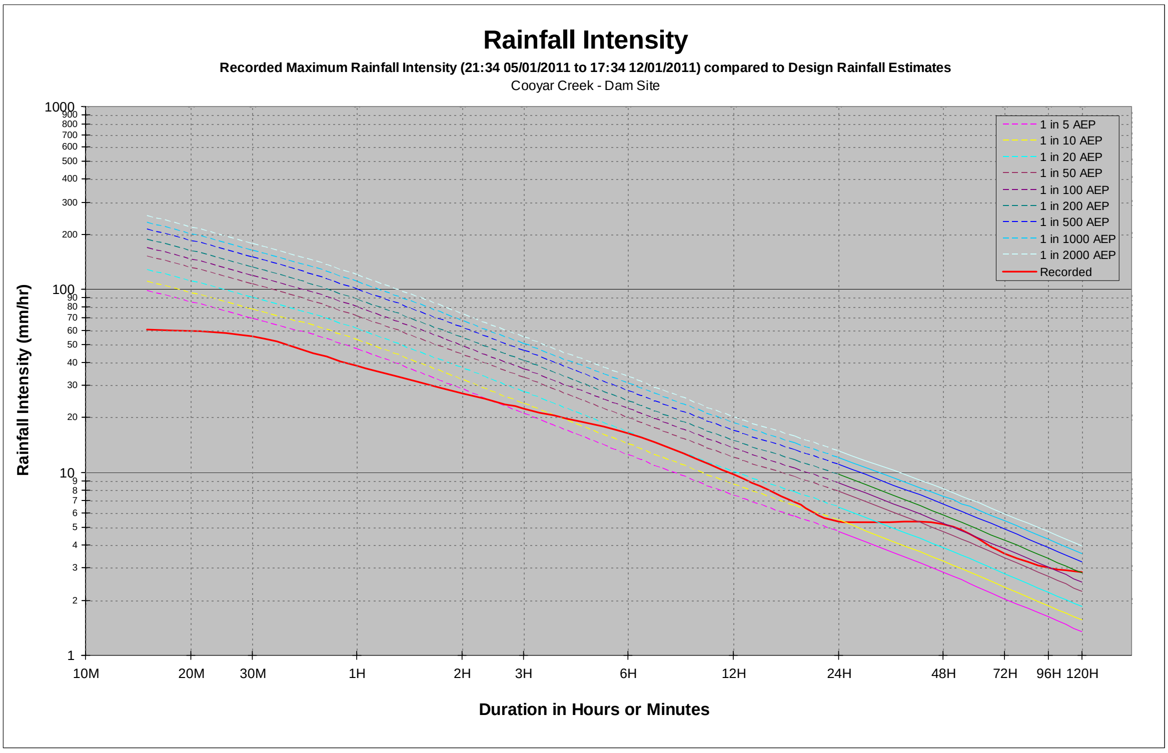

Figure 8.3.4 – Rainfall intensity, Cooyar Creek

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

Glenore Grove

This station is located within the lower reaches of Lockyer Creek, approximately 24km south west of Wivenhoe Dam. Figure 8.3.5 below shows the most intense rainfall for all durations ended in the evening of Tuesday 11 January 2011. The rainfall which fell in the afternoon of that day was up to 1 in 500 AEP and coincided with the arrival of floodwaters from the previous afternoon's heavy rainfall in the upper reaches.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	87.2	11/01/2011 06:18	< 5
30 M	76.0	11/01/2011 06:18	< 5
1 H	54.7	11/01/2011 06:48	< 5
3 H	26.0	11/01/2011 13:48	20
6 H	21.2	11/01/2011 15:18	50 - 100
12 H	16.6	11/01/2011 15:18	200 - 500
18 H	11.2	11/01/2011 19:33	100 - 200
24 H	8.4	11/01/2011 19:48	50 - 100
48 H	5.7	11/01/2011 15:18	100 - 200
72 H	4.1	11/01/2011 19:48	100 - 200
96 H	3.1	11/01/2011 19:48	50 - 100
120 H	2.6	11/01/2011 19:48	50 - 100

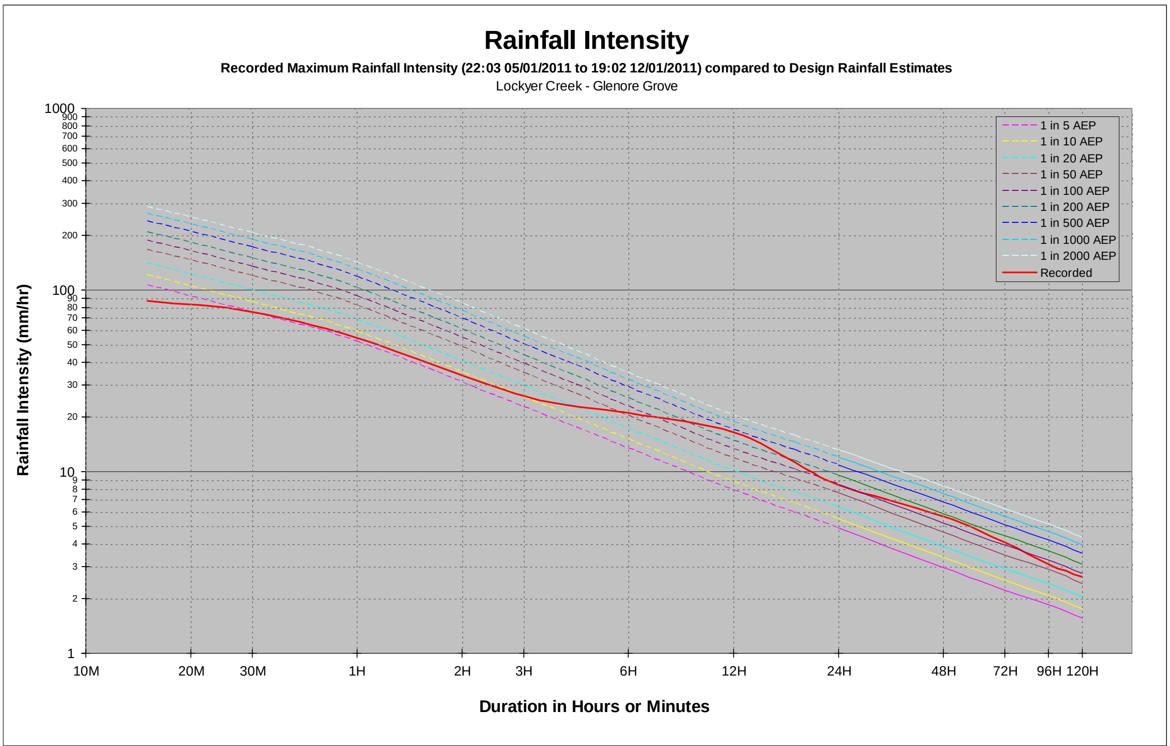

Figure 8.3.5 – Rainfall intensity, Glenore Grove

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

Toowoomba

This station is located within the watershed of the Condamine River Basin and Lockyer Creek, approximately 66km south-west of Wivenhoe Dam. Figure 8.3.6 below shows the most intense rainfall for periods of less than 12 hours ended on the afternoon of Monday 10 January 2011. The rainfall for these durations is not particularly significant, being in the frequent to large range. However, despite its location, the rainfall at this gauge is not considered to accurately represent the rainfall which caused the flash flood in the Lockyer Valley on the afternoon of Monday 10 January 2011.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	81.2	10/01/2011 14:04	< 5
30 M	72.8	10/01/2011 14:04	10 - 20
1 H	57.9	10/01/2011 14:04	20 - 50
3 H	22.6	10/01/2011 15:49	10 - 20
6 H	12.7	10/01/2011 17:19	5 - 10
12 H	7.3	10/01/2011 17:19	5 - 10
18 H	6.2	11/01/2011 06:19	5 - 10
24 H	5.6	10/01/2011 16:19	10 - 20
48 H	4.1	11/01/2011 11:34	20 - 50
72 H	3.0	12/01/2011 05:34	10 - 20
96 H	2.4	11/01/2011 09:49	10 - 20
120 H	2.3	11/01/2011 06:19	20 - 50

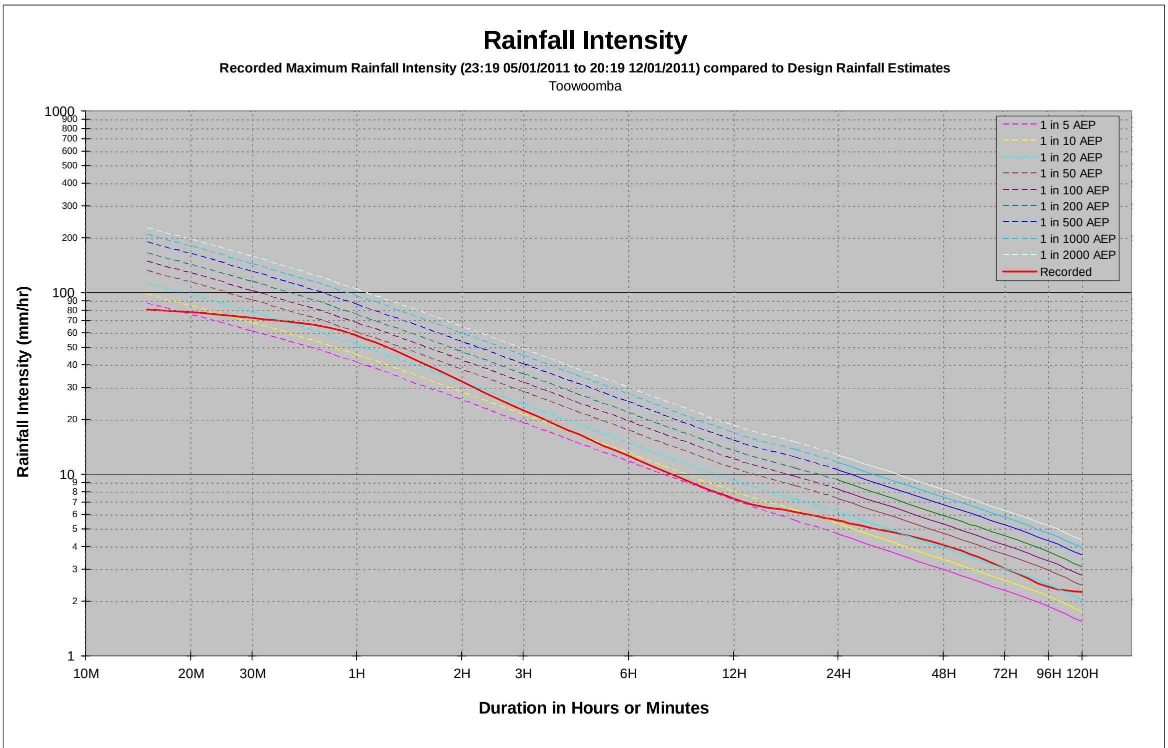

Figure 8.3.6 – Rainfall intensity, Toowoomba

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

Lowood

This station is located only 8.5km south of Wivenhoe Dam, in the area which recorded some of the highest Event rainfall totals. Figure 8.3.7 below shows the rainfall at this location had AEPs for durations above six to 48 hours to be above 1 in 2,000 and is estimated to be in the rare range. The IFD graph shows the 12-hour duration rainfall was significantly above the 1 in 2,000 AEP and extended into the extreme range. The timing of the short duration rainfall should also be noted. On the afternoon of Tuesday 11 January 2011, this rainfall coincided with the arrival of floodwaters from the upper Brisbane River into Wivenhoe Dam, and the arrival of the Lockyer Creek floodwaters into the Brisbane River.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	90.4	11/01/2011 13:34	< 5
30 M	83.0	11/01/2011 13:34	5 - 10
1 H	66.3	11/01/2011 13:49	10 - 20
3 H	45.4	11/01/2011 09:34	100 - 200
6 H	40.0	11/01/2011 14:04	> 2000
12 H	29.0	11/01/2011 14:49	> 2000
18 H	19.6	11/01/2011 19:34	> 2000
24 H	14.8	11/01/2011 19:19	> 2000
48 H	9.0	11/01/2011 14:49	> 2000
72 H	6.4	12/01/2011 01:19	1000 - 2000
96 H	4.9	12/01/2011 01:19	500 - 1000
120 H	4.0	12/01/2011 01:04	500 - 1000

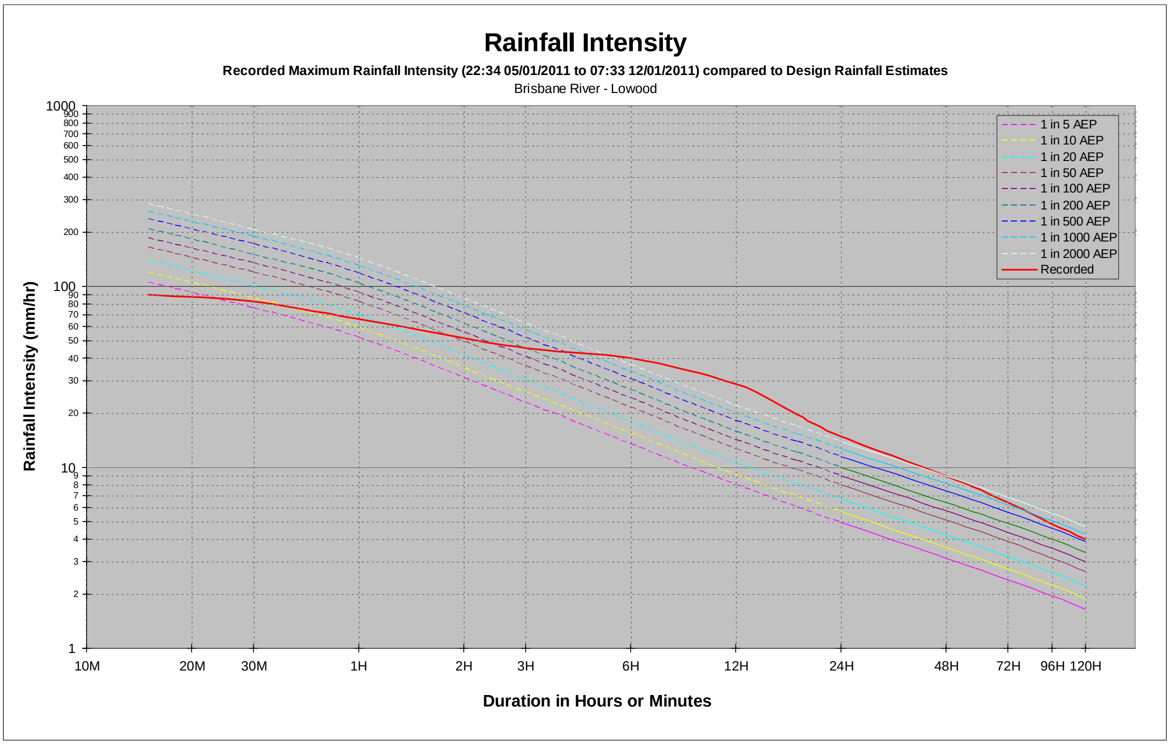

Figure 8.3.7 – Rainfall intensity, Lowood

Bellthorpe West

This station is located in the northern part of the Stanley River catchment, approximately 35km north-east of Somerset Dam on the catchment boundary with the Mary River. The table in Figure 8.3.8 below highlights that for durations of between six and 48 hours, the AEP of the recorded rainfall was between 1 in 50 and 1 in 100. Beyond 48 hours, AEPs were between the 1 in 100 and 1 in 200 range.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	73.2	09/01/2011 13:49	< 5
30 M	59.8	09/01/2011 13:49	< 5
1 H	49.9	09/01/2011 14:04	< 5
3 H	30.4	09/01/2011 16:04	5 - 10
6 H	30.1	09/01/2011 19:04	50 - 100
12 H	20.4	09/01/2011 22:19	50 - 100
18 H	18.0	09/01/2011 23:04	50 - 100
24 H	14.6	10/01/2011 04:34	50 - 100
48 H	10.0	11/01/2011 05:04	50 - 100
72 H	8.4	12/01/2011 01:34	100 - 200
96 H	6.7	12/01/2011 13:19	100 - 200
120 H	5.6	11/01/2011 19:49	100 - 200

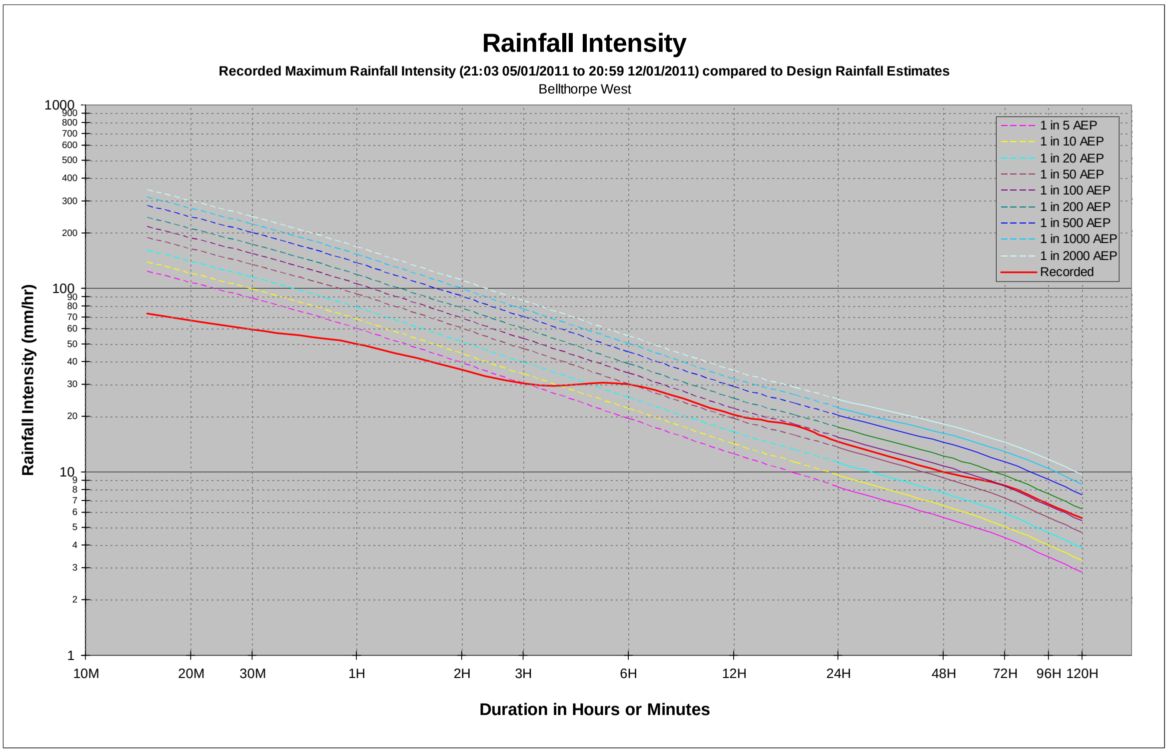

Figure 8.3.8 – Rainfall intensity, Bellthorpe West

8.4 Catchment rainfall IFD analysis

While Point IFD analysis demonstrates the rainfall intensity in the immediate vicinity of the station, it does not indicate the significance of the rainfall over the entire catchment. The catchment average rainfall is determined by applying a weighting to each station in the network, then adding up the weighted station rainfall for each period of the analysis. Catchment IFD analysis derived using CRC-FORGE is based upon assumed idealised spatial and temporal patterns, which can be quite different to the actual Event rainfall distributions.

By their nature, catchment average rainfall intensities tend to be lower than Point intensities, due to the spatial variation of rainfall through the catchment, with some areas recording higher rainfall than others. This is particularly true for relatively large catchments such as the total Wivenhoe Dam catchment (including Somerset Dam). However, the AEPs for the total Wivenhoe Dam catchment were between the 1 in 100 and 1 in 200 range for rainfall durations between 72 hours and 120 hours, and this fact certainly highlights the significance of the Event.

Somerset Dam catchment

Although the catchment average rainfall intensities in this catchment were generally less intense than that in the Wivenhoe Dam catchment, AEPs for the Somerset Dam catchment in the 1 in 50 to 1 in 100 range for rainfall durations greater than 48 hours certainly highlight the significance of the Event.

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
1 H	29.8	11/01/2011 13:00	< 5
3 H	25.8	11/01/2011 13:00	< 5
6 H	20.4	09/01/2011 19:00	10-20
12 H	14.5	09/01/2011 21:00	20-50
18 H	11.8	09/01/2011 22:00	20-50
24 H	9.9	10/01/2011 04:00	20-50
48 H	8.1	11/01/2011 13:00	50-100
72 H	7.0	11/01/2011 19:00	50-100
96 H	5.5	12/01/2011 13:00	50-100
120 H	4.7	11/01/2011 21:00	50-100

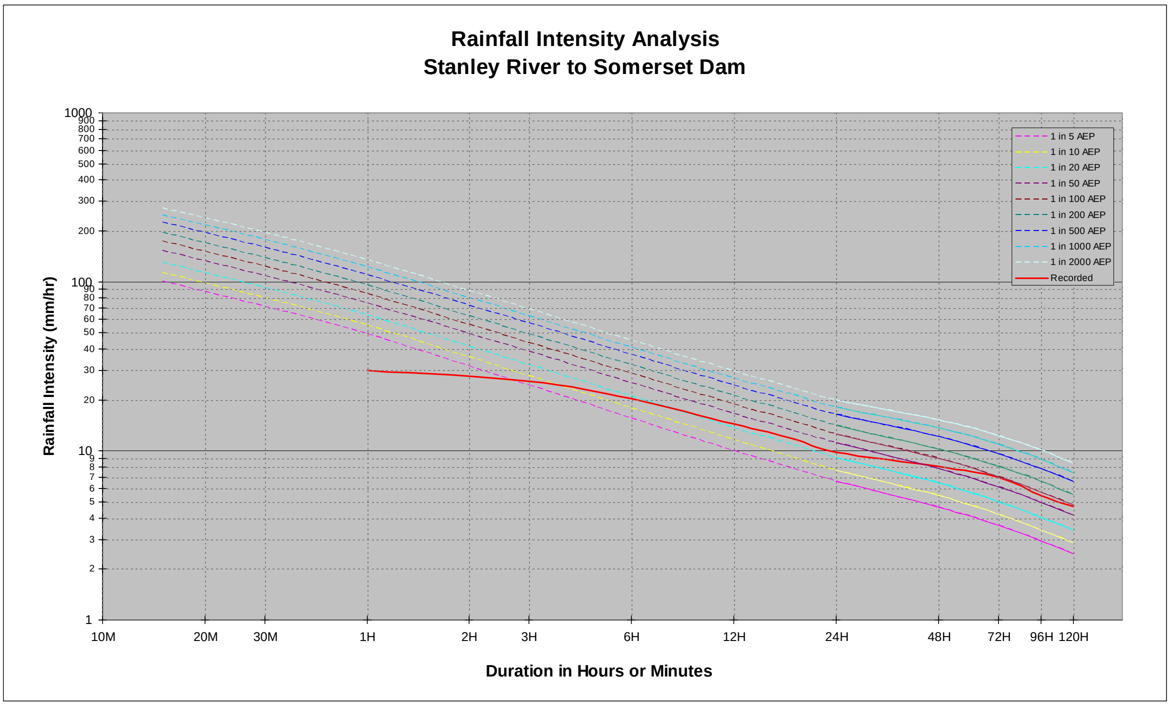

Figure 8.4.1 – Rainfall intensity, Somerset Dam

Wivenhoe Dam catchment (excluding the Somerset Dam catchment)

The AEPs for the Upper Brisbane River to Wivenhoe Dam (excluding the Somerset Dam) catchment were between the 1 in 100 and 1 in 200 range for rainfall durations between 48 hours and 120 hours.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
1 H	15.9	11/01/2011 05:00	<5
3 H	13.2	09/01/2011 16:00	<5
6 H	12.3	09/01/2011 19:00	10-20
12 H	9.2	09/01/2011 22:00	20-50
18 H	7.0	09/01/2011 23:00	20-50
24 H	5.7	10/01/2011 04:00	20-50
48 H	5.2	11/01/2011 10:00	100-200
72 H	4.2	11/01/2011 19:00	100-200
96 H	3.2	12/01/2011 12:00	100
120 H	2.9	11/01/2011 21:00	100-200

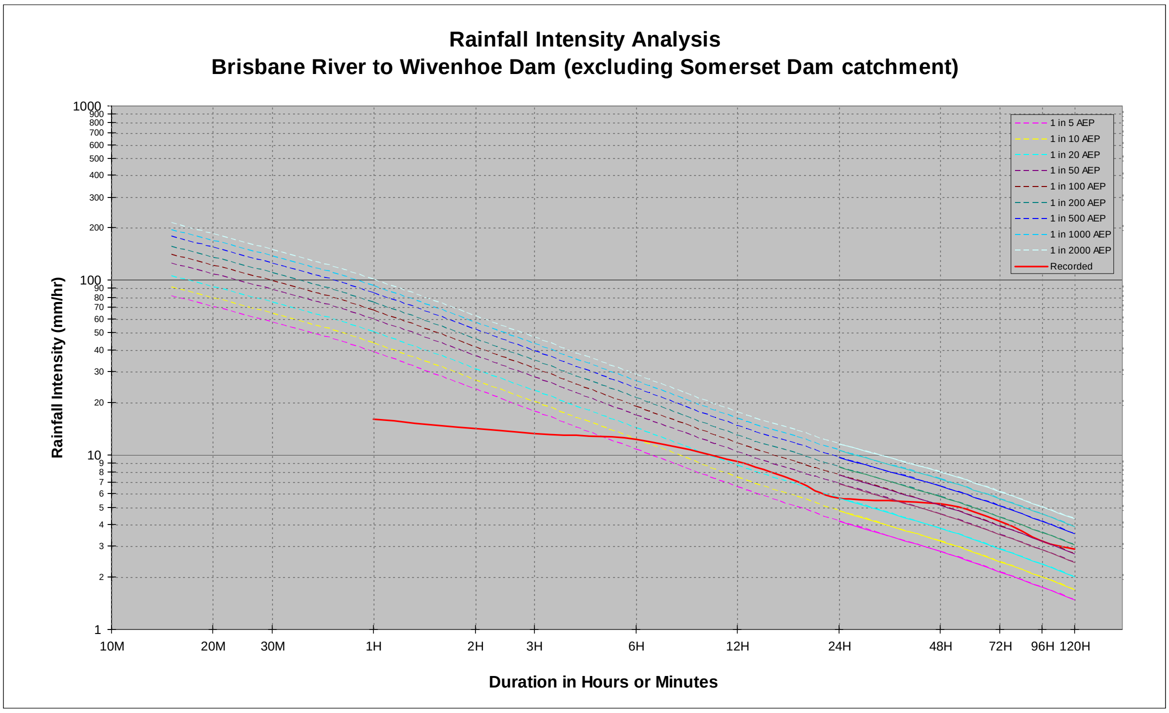

Figure 8.4.2 – Rainfall intensity, Wivenhoe Dam (excluding Somerset Dam catchment)

Wivenhoe Dam catchment (including the Somerset Dam catchment)

The AEPs for the Wivenhoe Dam catchment were between the 1 in 100 and 1 in 200 range for rainfall durations between 72 hours and 120 hours. This is consistent with the results of the Upper Brisbane to Wivenhoe, excluding the Somerset Dam catchment analysis.

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
1 H	17.5	09/01/2011 15:00	<5
3 H	15.0	09/01/2011 16:00	<5
6 H	13.8	09/01/2011 19:00	10-20
12 H	10.1	09/01/2011 22:00	20-50
18 H	7.9	09/01/2011 23:00	20-50
24 H	6.4	10/01/2011 04:00	20-50
48 H	5.7	11/01/2011 13:00	50-100
72 H	4.7	11/01/2011 19:00	100-200
96 H	3.6	12/01/2011 13:00	100
120 H	3.2	11/01/2011 21:00	100-200

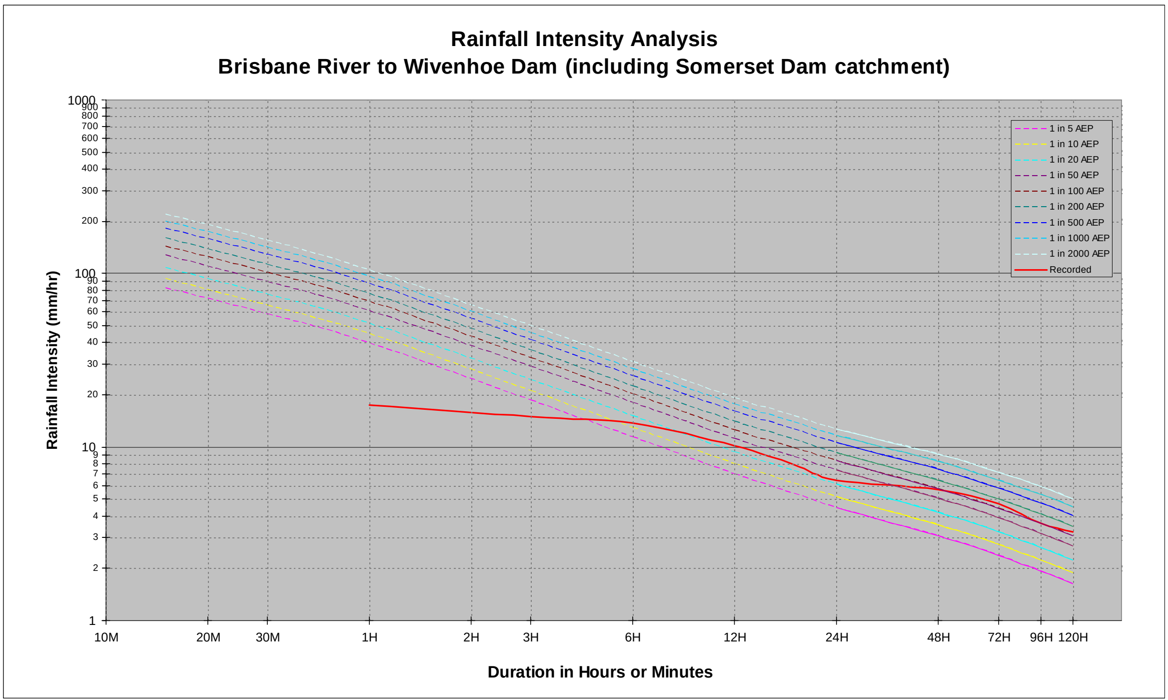

Figure 8.4.3 – Rainfall intensity, Wivenhoe Dam (including Somerset Dam catchment)

8.5 Comparison of flood volumes

While flood peaks are an important feature for the comparison of events, flood volumes are especially critical in the operation of dams. For this reason, flood volumes were compared. Table 8.5.1 below compares flood volumes across a selection of recent and historical events in the Brisbane River at the location of Wivenhoe Dam. It should be noted these events occur over different time periods.

Dams have a significant mitigating impact. The construction dates for each Dam in the Basin is:

- Somerset Dam 1955;
- Cressbrook Dam 1982;
- Wivenhoe Dam 1985.

Table 8.5.1 shows the volume of the January 2011 Flood Event is almost double (190%) the volume of the January 1974 flood and rivals the February 1893 flood. The volumes of pre-1968 floods are estimated from models studies of these events.

Event	Somerset Dam			Wivenhoe Dam			
	Peak elevation	Stanley River	Outflow	Peak elevation	Upper Brisbane River only	Total	Outflow
	m AHD	ML	ML	m AHD	ML	ML	ML
Feb 1893[1]		1,361,000			1,383,000	2,744,000	
Feb1931		150,000			570,000	720,000	
Mar 1955	103.47	390,000	340,000		560,000	900,000	
Jan 1968	na	540,000	380,000		440,000	820,000	
Jan 1974	106.57	620,000	450,000		960,000	1,410,000	
Jun 1983	101.58	260,000	280,000		800,000	1,080,000	470,000
Mar 1989	102.59	370,000	380,000	69.78	310,000	690,000	660,000
Apr 1989	102.69	340,000	350,000	71.45	520,000	870,000	820,000
Feb 1999	102.96	450,000	280,000	70.45	940,000	1,220,000	900,000
May 2009	99.62	110,000	110,000	62.19	125,000	235,000	0
Mar 2010	99.41	210,000	200,000	66.43	190,000	390,000	0
Oct 2010	101.37	250,000	270,000	69.61	360,000	630,000	630,000
Mid Dec 2010	100.42	150,000	140,000	67.50	220,000	360,000	330,000
Late Dec 2010	99.98	120,000	130,000	69.35	370,000	500,000	460,000
Jan 2011	105.11	825,000	820,000	74.97	1,830,000	2,650,000	2,650,000

[1] Only includes first flood and largest flood peak.

Table 8.5.1 – Recent and historical event flood volumes in the Brisbane River at Wivenhoe Dam

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

8.6 Comparison of flood levels

Table 8.6.1 compares the peak water levels reached during the January 2011 Flood Event with historical floods. The flood of February 1893 is generally regarded as one of the largest on record. Estimates exist of possible larger floods occurring in 1841 and 1867 at the Brisbane Port Office gauge, however, there are no records at upstream stations to enable any comparison to be undertaken.

The flood of 1974 is certainly the best documented major flood event impacting Brisbane and provides a useful comparison. The February 1999 flood was larger than the January 1974 flood in the upper Brisbane River, however, its impact on the urban areas of Ipswich and Brisbane was mitigated by Somerset and Wivenhoe Dams.

A number of points in the table stand out as being significant:

- The peak levels reached at stations in the upper Brisbane River above Wivenhoe Dam were the highest on record;
- Peak water levels reached in the Lockyer Creek area were the highest on record at Gatton, Glenore Grove and Lyons Bridge, easily exceeding the levels reached in the January 1974 and perhaps even the 1893 flood;
- Below Wivenhoe Dam, the level reached at Savages Crossing was approximately 0.36m higher than in 1974, however, the peak level reached at Mt Crosby was approximately 0.62m lower;
- With a few exceptions, most water levels stations in the Brisbane River Basin recorded peak water levels well above major flood level.

ALERT ID	Station	Feb 1893	Jan 1974	Feb 1999	Jan 2011	Jan 2011 flood classification	Comments
		m	m	m	m		
6776	Peachester		8.43	8.72	9.04	Major	
6703	Woodford	11.73	8.60	9.00	9.44	Major	
6591	Somerset Dam		106.57	102.96	105.11		
6543	Dam Site		9.33	6.06	12.02	Major	Different sites
6718	Linville		8.90	8.93	11.04	Major	Highest on record in 47 years
6709	Devon Hills			10.80	11.25	Major	Highest on record in 24 years
6521	Boat Mountain		9.61	9.22	11.10	Major	Highest on record in 46 years
6515	Gregors Creek		13.65	14.14	14.50	Major	Highest on record in 49 years
6554	Rosentretters			4.64	6.80	Major	Impacted by Cressbrook Dam
6638	Wivenhoe Dam			70.45	74.97		Highest on record
6578	Gatton	16.33	14.63	8.50	>16	Major	May be highest on record
6584	Showground Weir			5.97	9.36	Major	
6557	Glenore Grove		14.94	10.68	15.34	Major	Highest on record in 56 years
6634	Lyons Bridge		16.54	12.55	17.31	Major	Highest on record in 56 years

ALERT ID	Station	Feb 1893	Jan 1974	Feb 1999	Jan 2011	Jan 2011 flood classification	Comments
		m	m	m	m		
6647	Lowood Pump Station	26.39	22.02	11.17	22.91		Different sites
6560	Savages Crossing		23.79	11.40	24.15	Major	Higher than 1974
6752	Mt Crosby Weir	32.00	26.74	12.06	26.12	Major	Lower than 1974
6581	Adams Bridge		5.29	3.18	5.05	Moderate	
6734	Rosewood		7.62	5.30	4.91	Minor	
6551	Walloon		8.70	5.66	8.90	Major	ALERT site
6572	Harrisville		6.18	4.20	5.91	Major	
6652	Amberley		10.18	5.34	8.12	Major	ALERT site
2168	Ipswich	24.50	20.70	6.40	15.96	Major	
6755	Moggill		19.95	3.53	17.72	Major	Lower than 1974
6731	Jindalee	17.90	14.10	<4.00	12.90	Major	Lower than 1974
6749	City Gauge	8.35	5.45	<1.70	4.45	Major	Lower than 1974

Table 8.6.1 – January 2011 peak water levels compared with other historical floods

Until the construction of Wivenhoe Dam was completed, the BoM operated a flood warning station at Caboonbah, just below the junction of the Stanley and Brisbane Rivers, well upstream of Wivenhoe Dam. Records show levels at this station reached 22.63m in 1893 and 16.32m in 1974, with estimated peak flows of approximately 13,000m^3/s and 5,500m^3/s respectively. The estimated peak flow at this location in the January 2011 Event was at least 8,500m^3/s.

8.7 Flood frequency analysis

The annual flood series showing the largest flood in a water year (1 October to 30 September in South East Queensland) was extracted from the DERM website at 143007a Linville (1966-2005) and 143009a Gregors Creek (1962-2005). A Generalised Extreme Value (GEV) flood frequency analysis of these flows was undertaken, with the results shown below. This analysis is preliminary and is subject to reassessment of the rating at these sites and inclusion of post-2005 records, including records from the January 2011 Flood Event.

The two peaks at each of Linville and Gregors Creek stations associated with the January 2011 Flood Event were significantly higher than any other flood on record. Individually, the pre-January 2011 peaks at both stations are considered to be significantly rarer than the AEP of the 1974 flood of 1 in 75. The probability of two new higher flood peaks occurring within 36 hours of each other as occurred during the January 2011 Flood event is considered to be appreciably uncommon and demonstrates the rarity of the January 2011 Flood Event.

Brisbane River at Linville

Analysis of the data at Linville suggests the 1974 flood had an AEP of around 1 in 75. The fact the January 2011 flood peak was more than 2.0m higher than the 1974 flood suggests the January 2011 flood peak was significantly rarer than 1 in 100 AEP.

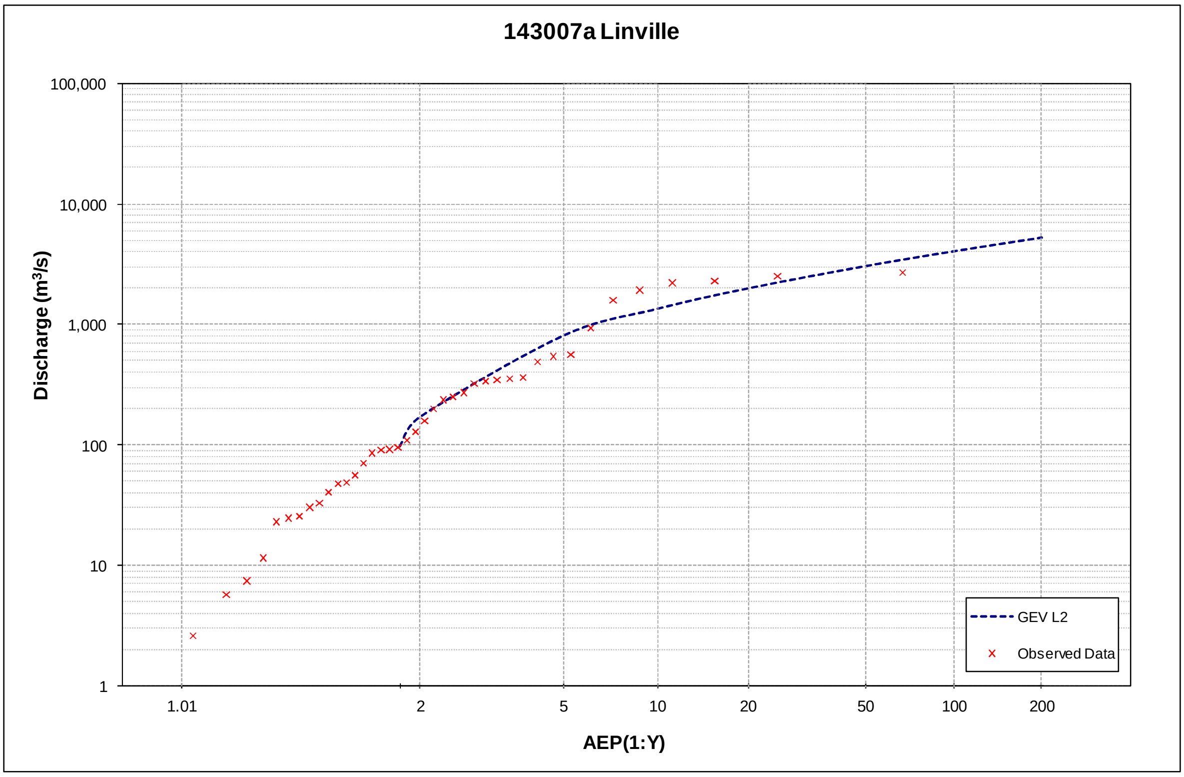

Figure 8.7.1 – Flood frequency analysis, Linville

Brisbane River at Gregors Creek

Prior to January 2011, the largest recorded flood at Gregors Creek was the January 1974 flood which reached a gauge height of 14.14m. The flood frequency analysis suggests this flood peak had an AEP of approximately 1 in 75. The January 2011 flood peak at Gregors Creek was some 0.35m higher than 1974, suggesting an AEP rarer than 1 in 75.

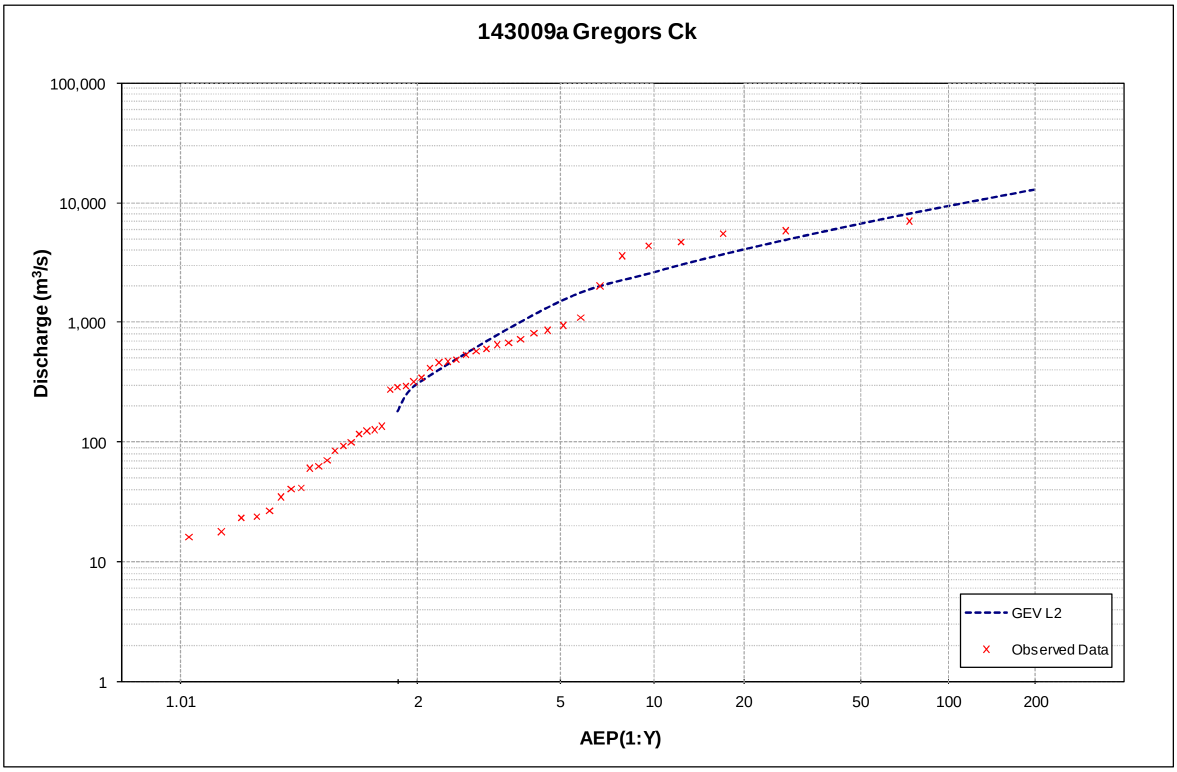

Figure 8.7.2 – Flood frequency analysis, Gregors Creek

8.8 Design flood comparisons

Care should be exercised when comparing actual flows and volumes with design flows and volumes. The latter is based upon idealised design storms distributed in time and space combined with average catchment conditions. These circumstances are not necessarily directly comparable with actual events, such as the 2011 Event, however, these design cases do provide an indicative comparison.

Somerset Dam

Seqwater undertook a review of the design flood hydrology for Somerset Dam in October 2009 (***Somerset Dam Design Flood Hydrology, Draft Report, October 2009***).

A 48-hour design storm generated a peak inflow of 5,000m^3/s and an inflow volume of approximately 770,000ML, reaching a peak level of 105.19m in a 1 in 1,000 AEP event. This compares with the January 2011 Event that produced a similar peak inflow of approximately 5,000m^3/s, an inflow volume of 825,000ML and reached a peak level of 105.11m.

Wivenhoe Dam

The design flood hydrology for Wivenhoe Dam was reviewed and upgraded in 2005 (***Wivenhoe Alliance, Design Discharges and Downstream Impacts of the Wivenhoe Dam Upgrade, Q1091, 2005***) as part of the spillway augmentation. Using this report, significant comparisons with the January 2011 Event can be made:

- The report indicates the 36-hour design storm generates the highest peak inflow for all AEPs. The estimated peak inflow of the January 2011 Event was estimated to be approximately 12,000m^3/s, equating to an AEP of approximately 1 in 1,000.
- The report also indicates the first fuse would be initiated in an event with an AEP of 1 in 6,000. This is consistent with the peak water level of 74.97m, which was reached during the January 2011 Event.
- The report estimated the volumes of the design inflow hydrographs for a range of durations and AEPs. For an AEP of 1 in 2,000, the design inflow volumes range from 2,000,000ML to 2,225,000ML, for durations of between 48 and 120 hours. Given the January 2011 Event inflow volume to Wivenhoe Dam was estimated to be 2,650,000ML over eight days, the AEP of the flood volume is approximately 1 in 2,000.

The design inflow and outflows derived from the Wivenhoe Alliance report are illustrated in Figure 8.8.1 below.

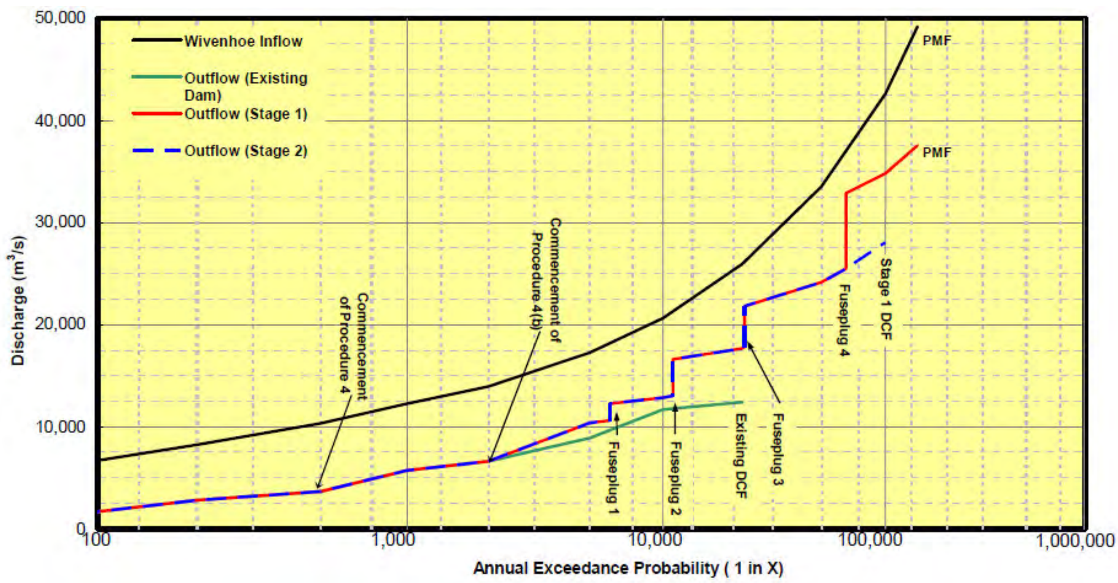

Figure 8.8.1 – Wivenhoe Alliance report, design inflow and outflows

The 48-hour design flows for Somerset Dam and Upper Brisbane only flows are contained in Appendix G of the Manual. Comparison of the actual flows with the flows shown in this Appendix G also indicates the Event inflows could be considered a rare occurrence.

8.9 Impact of intense rainfall occurring on Tuesday 11 January 2011

As discussed in Section 6, heavy, localised, intense rainfall around the Wivenhoe lake area commenced in the early hours of Tuesday 11 January 2011 and continued into the afternoon.

This rainfall was recorded in the rain gauges to the east and south of Lake Wivenhoe (around Mt Glorious and Lowood), however, it was not recorded in gauges to the north and west of Wivenhoe Dam. There is a large, unmonitored area between these gauges, which covers a large component of the Lake area. For modelling purposes, this area is treated as impervious and generates 100% runoff. Radar images at the time indicated rain was falling continuously in this area over the period. Rainfall totals in the 12 hours to 15:00 ranged from 410mm at Mt Glorious on the eastern side of the lake, to only 32mm at Rosentretters on the western side of Lake Wivenhoe.

The real time modelling undertaken with the available recorded rainfall data did not reproduce the rapid rise in Lake level recorded that afternoon. This inferred very heavy rain fell within and around the Wivenhoe Dam Lake area immediately upstream of the Dam. This suggestion was tested using the Seqwater Unified River Basin Simulator (URBS) model using the following methodology.

The recorded Mt Glorious rainfall was transposed to a dummy station at the centre of the Lake and, for the period of heavy rainfall, scaled up the URBS model re-run, and the resultant flows imported into the gate operations spreadsheet. The modelled water levels were then compared with the recorded water levels. Figure 8.9.1 below shows the impact of the scaled rainfall on the modelled upper Brisbane River inflow to Wivenhoe Dam. The peak of the inflow is both much higher and earlier with the transposed dummy rainfall station than without.

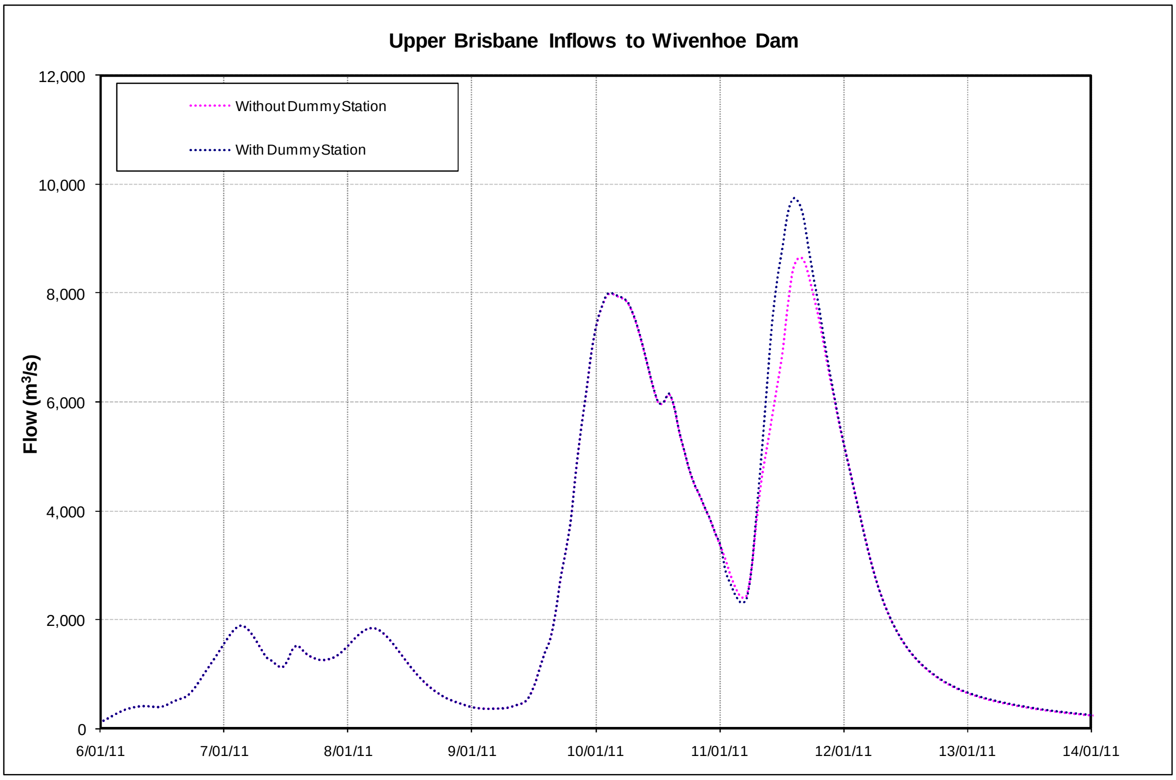

Figure 8.9.1 – Impact of scaled rainfall on the upper Brisbane River inflow to Wivenhoe Dam

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

The recalculated inflows with the dummy rainfall station more accurately reproduced the recorded water levels than the originally modelled inflows, as shown in Figure 8.9.2.

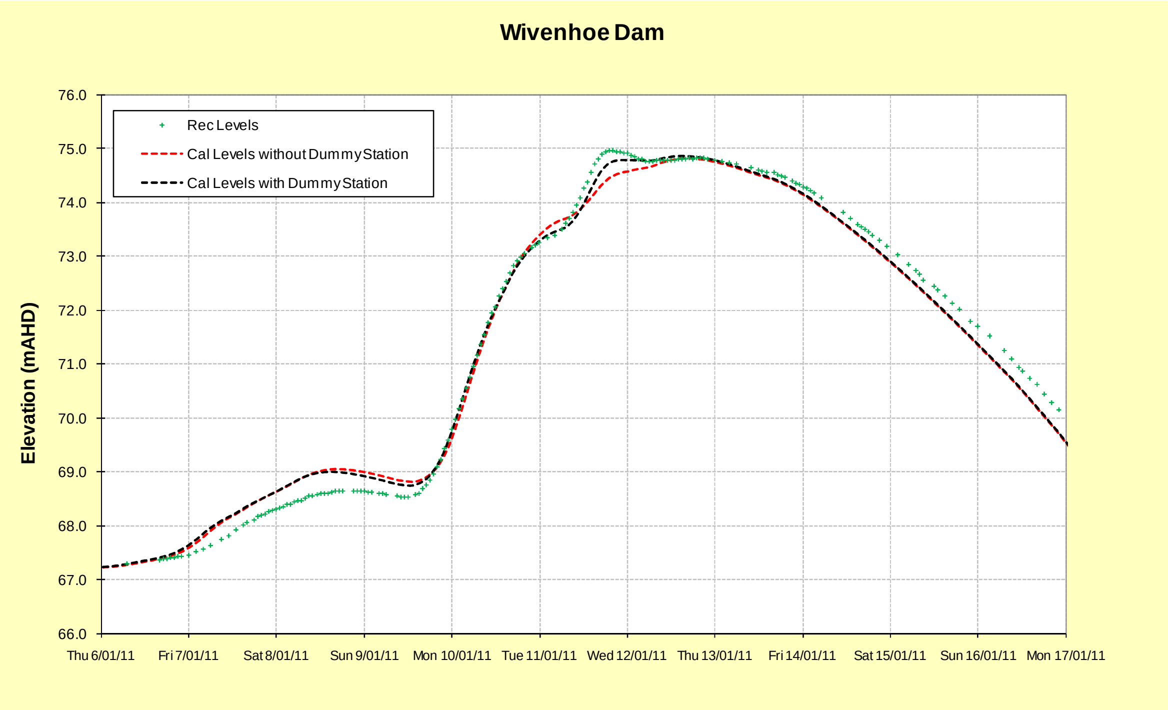

Figure 8.9.2 – Recalculated inflows to Wivenhoe Dam

In order to reproduce the recorded Wivenhoe Dam levels, it was necessary to scale the rainfall of the transposed Mt Glorious data by a factor of two for the period between 03:00 to and 15:00 on Tuesday 11 January 2011, indicating the significance of the heavy rainfall in the ungauged area immediately upstream of the Dam.

IFD analysis of the rainfall record at Mt Glorious shows the 12 hours to 15:00 on Tuesday 11 January 2011 had an average intensity of 33.9mm/hr and was in the range 1 in 500 to 1 in 1,000 AEP, between the large and rare categories.

To model the rapid rise of the recorded Wivenhoe Dam levels between 03:00 to 15:00 on Tuesday 11 January 2011, the Mt Glorious rainfall data was repositioned to the ungauged area immediately upstream of the Dam, where the BoM radar indicated was the centre of the heavy rainfall during that period. It was then necessary to scale this rainfall up by a factor of two to match the rapid lake level rises. This factored Mt Glorious rainfall data had an average intensity of 68mm/hr, which exceeds an annual recurrence interval of 1 in 2,000 years and may be well into the extreme category. Rainfall of this intensity and duration over the Wivenhoe Dam lake area at such a critical stage of a Flood Event was unprecedented. The resulting runoff could not be contained without transition to Strategy W4, as discussed in Section 2 and Section 10.

8.10 Wivenhoe Dam and Somerset Dam flood mitigation in Brisbane City

Seqwater's URBS hydrologic model was used to assess the flood mitigation impact of Somerset and Wivenhoe Dams on flows and water levels at the Port Office gauge in Brisbane City. This hydrologic model consists of seven linked models representing various catchments within the Basin.

During the January 2011 Event, the model overestimated the heights and flows in the lower Brisbane River due to a lack of adequate flood plain storage along the mainstream. The model was adjusted to take into account this flood plain storage and recalibrated on several floods from January 1974 to January 2011, to satisfactorily reproduce recorded heights and estimated flows at gauging stations.

It should be noted that the behaviour of the Brisbane River downstream of Wivenhoe Dam is better simulated using a hydraulic model. However, in the absence of a fully calibrated hydraulic model and due to time constraints regarding the preparation of this Report, the URBS hydrologic model has been used to enable relative comparison of various scenarios. The model was run under five cases, as explained in the following Table 8.10.1.

Case number	Case description
1	Actual Wivenhoe Dam outflows combined with Lockyer Creek, Bremer River and other non-controlled catchment flows from the January 2011 Flood Event.
2	Lockyer Creek, Bremer River and other non-controlled catchment flows from the January 2011 Flood Event only.
3	Actual Wivenhoe Dam outflows from the January 2011 Flood Event only.
4	Assumes Wivenhoe Dam removed and uses estimated flows in the Brisbane River at the location of Wivenhoe Dam combined with Lockyer Creek, Bremer River and other non-controlled catchment flows from the January 2011 Flood Event. This case provides an indication of the impacts of the January 2011 Flood Event at Brisbane City if Wivenhoe Dam had not been constructed.
5	Assumes both Wivenhoe Dam and Somerset Dam removed and uses estimated flows in the Brisbane River at the location of Wivenhoe Dam combined with Lockyer Creek, Bremer River and other non-controlled catchment flows from the January 2011 Flood Event. This case provides an indication of the impacts of the January 2011 Flood Event at Brisbane City if both Somerset Dam and Wivenhoe Dam had not been constructed.

Table 8.10.1 – Comparison of modelled flood scenarios

For Case 4 and Case 5, the models containing the Dams were modified to remove the impervious fractions representing the reservoir areas. In addition, the reach length factors for the drowned reaches in the post Dam models were removed, as appropriate for each case.

While the model does not replicate levels in the normal tidal ranges, it does replicate the higher flood stages under tidal conditions reasonably well. For all cases, the downstream tidal conditions recorded during the Event were adopted.

The results of the model runs containing these five cases are displayed in the following graphs, Figure 8.10.2 and Figure 8.10.3. Points not in relation to these results are:

- Inflows to the river system can not be directly added together due to the storage and routing impact of the flood plain and the river channels;
- The peak height at Brisbane City (Port Office gauge) generally coincides with the highest tide of the day, in the cases investigated;
- Even if the flood flows in the Stanley River and upper Brisbane River had been contained, and there were no releases from Wivenhoe Dam (Case 2), the flows from Lockyer Creek, Bremer River and other uncontrolled catchment flows would still have exceeded the threshold of urban damage;

8 PRELIMINARY ASSESSMENT OF EVENT MAGNITUDE (continued)

- If there had not been any flows from Lockyer Creek, Bremer River and the other uncontrolled catchments, the actual releases from Wivenhoe Dam (Case 3) would have caused only minor flooding in Brisbane City;
- Without Wivenhoe Dam (Case 4), the peak flow would have been of the order of 12,000m^3/s and the peak height would have been in the order of 2.0m higher at Brisbane City;
- Without Somerset and Wivenhoe Dams (Case 5), the peak flow would have been of the order of 14,000m^3/s and the peak height would have been approximately 2.5m higher at the Port Office gauge.

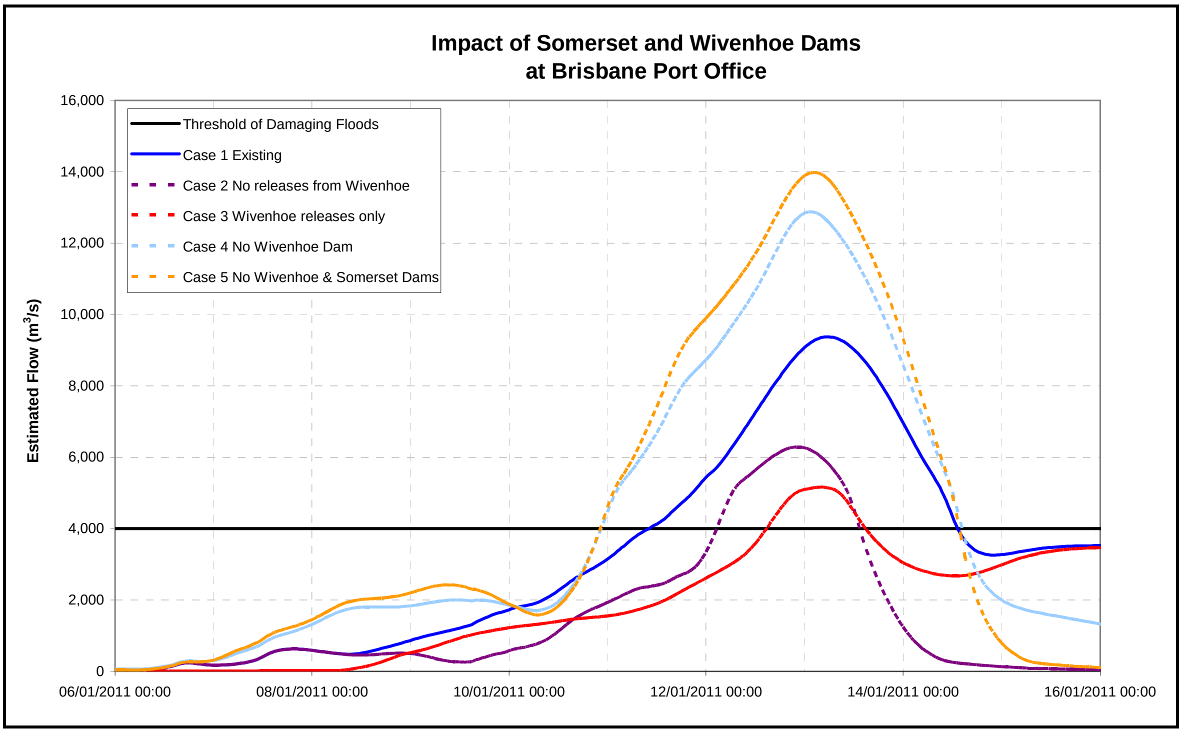

Figure 8.10.2 – Impact of Somerset and Wivenhoe Dams at Brisbane Port Office, showing estimated flow

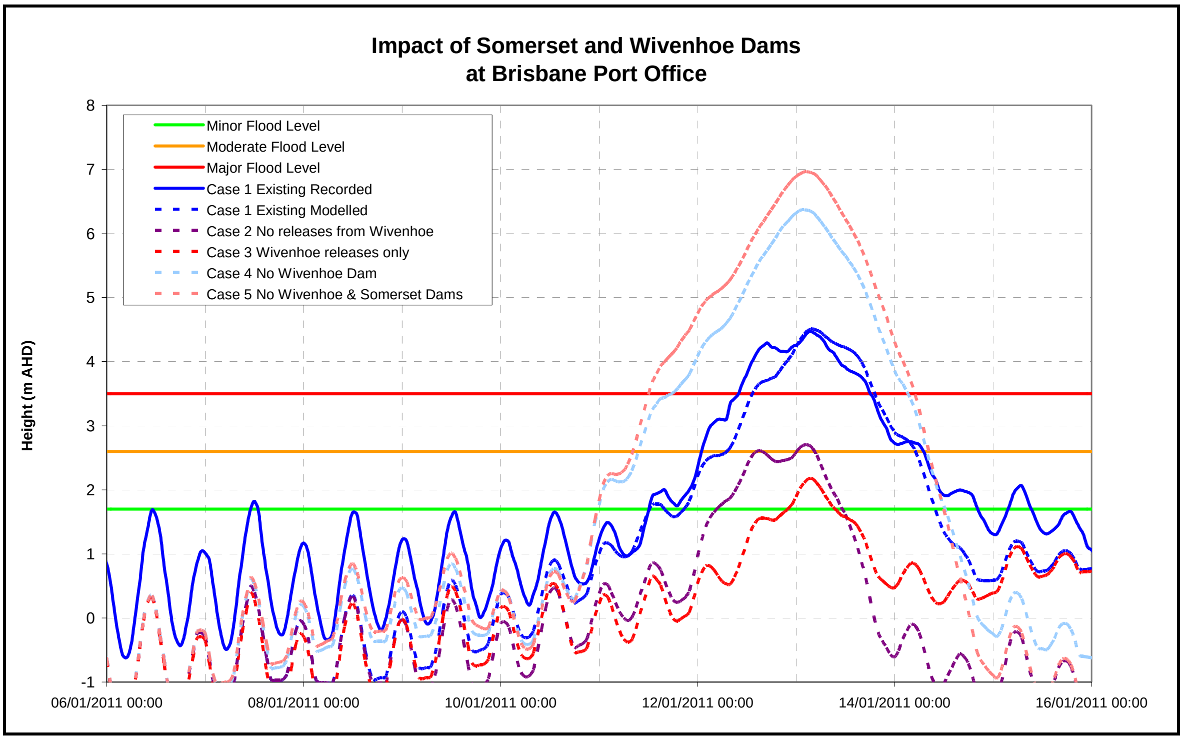

Figure 8.10.3 – Impact of Somerset and Wivenhoe Dams at Brisbane Port Office, showing peak height

The duration above selected thresholds was also extracted from the model runs, as duration of flooding has an adverse impact on flood damages, with longer durations causing greater costs for the same peak flow.

The threshold of damaging floods in the lower Brisbane River is defined in the Flood Procedure Manual as 4,000m^3/s, and this has been adopted for comparative purposes. The flow of 9,500m^3/s is the estimated peak flow of the January 2011 Flood Event at the Port Office gauge.

In Cases 4 and 5, the duration of flooding at the Port Office gauge would have been much longer than actually occurred. The duration above 4,000m^3/s is appreciably longer than recorded. However, the duration of the flow above the peak of the January 2011 Flood Event would have been as much as two days longer.

Table 8.10.4 shows the duration of flooding above the selected threshold for the cases investigated.

Case	Duration above flow threshold (Hours)			
	4,000 m3/s	6,000 m3/s	8,000 m3/s	9,500 m3/s
Case 1 Existing	75	48	26	0
Case 2 No releases from Wivenhoe	35	12	0	0
Case 3 Wivenhoe releases only	24	0	0	0
Case 4 No Wivenhoe Dam	88	72	55	39
Case 5 No Somerset Dam or Wivenhoe Dam	87	75	61	51

Table 8.10.4 – Duration of flooding above the flow threshold

8.11 Conclusion

Based on the information contained in this Section, the following conclusions can be made in relation to the significance of the January 2011 Flood Event:

- The rainfall intensities varied significantly in the catchment areas above the Dams, although at some locations – especially around Wivenhoe Dam – the AEP of the short duration rainfalls may be classified as extreme;
- The AEPs for the Wivenhoe Dam average catchment rainfall were between the 1 in 100 and the 1 in 200 range for durations between 72 hours and 120 hours, clearly highlighting the significance of the Event;
- When compared with historical events, flood volumes indicate the volume of the January 2011 Event was almost double that of the January 1974 flood, and rivals the February 1893 flood;
- Peak water levels at gauging stations in the Brisbane River above Wivenhoe Dam were the highest on record. In the Lockyer Valley, peak water levels exceeded the 1974 levels and may well have been larger than those of 1893;
- Preliminary flood frequency analysis of records at Linville and Gregors Creek indicated there were two peaks of similar magnitude in the January 2011 Event at both Linville and Gregors Creek. Preliminary flood frequency analysis indicates the highest peak at both stations were significantly rarer than the generally accepted AEP of the 1974 flood of 1 in 75 (approaching 1 in 100). The probability of two such flood peaks within 36 hours of each other is considered to be appreciably uncommon and demonstrates the rarity of the January 2011 Flood Event;
- A comparison of the recorded peaks, volumes and peak levels at Somerset and Wivenhoe Dams indicate the January 2011 Flood Event easily exceeds 1 in 100 AEP;
- Below Wivenhoe Dam, the flood had an AEP similar to that of the post-Wivenhoe 1974 flood and may be as high as 1 in 1,000;
- Overall, the January 2011 Flood Event is considered to represent a rare event as defined by AR&R in terms of rainfall, flood peaks, inflow volume and peak heights.

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9 DAM INFLOW AND FLOOD RELEASE DETAILS

9.1 Introduction

Studies associated with the design and operation of Wivenhoe Dam that date back to 1971 indicate a flood of the magnitude of the January 2011 Flood Event would be expected to result in urban damage below Moggill (see Appendix U). ***The Wivenhoe - Somerset Interaction Study***, which was prepared to support the 2009 review of the Manual, is the most recent investigation undertaken that supports this expectation.

It is also important to note that under the Manual's current operating rules, both Somerset Dam and Wivenhoe Dam are expected to fail during floods with an AEP larger than 1 in 100,000. This highlights the importance of maintaining the safety of the Dams by ensuring the flood storage compartments of the Dams are not overfilled and flood releases are made in accordance with the Manual.

The following sections provide details of the inflows to the Dams and the flood releases made from the Dams during the January 2011 Flood Event.

9.2 Wivenhoe Dam

Table 9.1.1 provides full details of inflows into and releases from Wivenhoe Dam for the duration of the January 2011 Flood Event. Details of the strategies used in determining these releases and how these strategies comply with the Manual are contained in Sections 2 and 10 of this Report. Table 9.1.1 also shows the gate operation sequence was in accordance with the Manual over the duration of the Event.

Some points to note in relation to Table 9.1.1 are:

- Inflow and flood release calculations are based on manual gauge board readings shown in the table that provide the lake level. During the Event, these manual gauge board readings were provided by the Dam operators to the Flood Operations Centre on an hourly basis. Any missed readings have been interpolated from the closest available actual readings.
- Release calculations are based on the discharge rating tables contained in the Manual.
- Inflow calculations are derived using a reverse routing technique assuming level pool. For each time step, inflow is based on the rate of change of the storage calculated from the manual gauge board readings and the Dam storage curve plus the releases. The method tends to underestimate the rising limb and overestimate the falling limb of the inflow. The erratic shape of the inflow is due to small level differences resulting in large inflow volumes.
- The table shows inflow rates and releases on the hour through the event. In some instances, gate operations may have occurred between hours or at less than one-hourly intervals. In these instances, the table shows the actual gate openings as they were at the time indicated.
- The flood release from Wivenhoe Dam associated with the flood event prior to the January 2011 Flood Event was completed at 09:00 on 2 January 2011. The lake level in Wivenhoe Dam at this time was 67.10m or 0.15m below the gate opening trigger level. At this level, 16,250ML of inflow is needed before trigger level is reached. Following gate closure, the Dam continued to release over 4,000ML per day to account for base flow into the dam from the previous flood event, with the expectation being the dam would slowly fall below Full Supply Level (FSL) in the days following 2 January 2011. However, due to rainfall and further dam inflows, the lake level rose steadily after 2 January 2011 and was above gate trigger level at the commencement of the Event. However in accordance with Strategy W1 and the intent of that Strategy, releases did not immediately commence to ensure that bridges downstream of the Dam were not prematurely submerged.

Although the values shown in the Tables below are presented to the nearest m^3/s or ML, no level of precision should be inferred from this level of reporting.

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
06/01/2011 09:00	67.32	1200019	458	127	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	406	0
06/01/2011 10:00	67.33	1201119	1283	356	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	177	0
06/01/2011 11:00	67.34	1202219	458	127	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	177	0
06/01/2011 12:00	67.34	1202219	458	127	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	406	0
06/01/2011 13:00	67.35	1203319	1283	356	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	177	0
06/01/2011 14:00	67.36	1204418	458	127	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	152	0
06/01/2011 15:00	67.36	1204418	367	102	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	559	0
06/01/2011 16:00	67.37	1205518	1833	509	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	534	0
06/01/2011 17:00	67.39	1207718	1741	484	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	330	0
06/01/2011 18:00	67.40	1208817	1008	280	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	355	0
06/01/2011 19:00	67.41	1209917	1100	305	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	355	0
06/01/2011 20:00	67.42	1211017	1100	305	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	355	0
06/01/2011 21:00	67.43	1212117	1100	305	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	355	0
06/01/2011 22:00	67.44	1213216	1100	305	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	305	0
06/01/2011 23:00	67.45	1214316	916	255	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	660	0
07/01/2011 00:00	67.46	1215416	2197	610	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1047	0
07/01/2011 01:00	67.49	1218715	3590	997	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	798	0
07/01/2011 02:00	67.52	1222047	2692	748	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	800	0
07/01/2011 03:00	67.54	1224279	2698	750	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	980	0
07/01/2011 04:00	67.57	1227627	3348	930	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1135	0
07/01/2011 05:00	67.60	1230975	3906	1085	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1342	100
07/01/2011 06:00	67.64	1235438	4650	1292	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1109	0
07/01/2011 07:00	67.68	1239902	3813	1059	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1134	0
07/01/2011 08:00	67.71	1243250	3902	1084	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1167	0
07/01/2011 09:00	67.75	1247714	4023	1117	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	864	0

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
07/01/2011 10:00	67.78	1251110	2930	814	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1648	389
07/01/2011 11:00	67.81	1254506	5754	1598	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	2225	970
07/01/2011 12:00	67.88	1262429	7829	2175	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1778	528
07/01/2011 13:00	67.94	1269221	6222	1728	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1472	11
07/01/2011 14:00	67.99	1274881	5118	1422	50	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	1139	0
07/01/2011 15:00	68.03	1279457	3920	1089	13	0.0	0.0	0.5	0.0	0.0	0	0	51	0	0	51	995	0
07/01/2011 16:00	68.06	1282901	3350	930	13	0.0	0.0	1.0	0.0	0.0	0	0	103	0	0	103	1020	0
07/01/2011 17:00	68.09	1286345	3253	904	13	0.0	0.0	1.5	0.0	0.0	0	0	154	0	0	154	1523	124
07/01/2011 18:00	68.12	1289789	4879	1355	13	0.0	0.0	2.0	0.0	0.0	0	0	205	0	0	205	1360	0
07/01/2011 19:00	68.17	1295530	4114	1143	13	0.0	0.0	2.5	0.0	0.0	0	0	255	0	0	255	958	0
07/01/2011 20:00	68.19	1297826	2486	691	13	0.0	0.0	3.0	0.0	0.0	0	0	303	0	0	303	1514	173
07/01/2011 21:00	68.22	1301270	4312	1198	13	0.0	0.0	3.5	0.0	0.0	0	0	351	0	0	351	1300	0
07/01/2011 22:00	68.26	1305878	3371	936	13	0.0	0.5	3.5	0.0	0.0	0	52	351	0	0	403	1387	85
07/01/2011 23:00	68.28	1308206	3496	971	13	0.0	0.5	3.5	0.5	0.0	0	52	352	52	0	456	1519	234
08/01/2011 00:00	68.32	1312862	3783	1051	13	0.0	1.0	3.5	0.5	0.0	0	104	352	52	0	509	818	0
08/01/2011 01:00	68.34	1315190	1067	296	13	0.0	1.0	3.5	1.0	0.0	0	104	353	104	0	561	1841	593
08/01/2011 02:00	68.35	1316354	4559	1266	13	0.5	1.0	3.5	1.0	0.0	52	104	353	104	0	614	1624	393
08/01/2011 03:00	68.41	1323339	3589	997	13	0.5	1.0	3.5	1.0	0.5	52	105	354	105	52	667	1246	36
08/01/2011 04:00	68.41	1323339	2037	566	13	0.5	1.5	3.5	1.0	0.5	52	156	354	105	52	719	1622	428
08/01/2011 05:00	68.45	1327995	3201	889	13	0.5	1.5	3.5	1.5	0.5	52	157	354	157	52	773	1135	0
08/01/2011 06:00	68.46	1329159	1258	350	13	1.0	1.5	3.5	1.5	0.5	105	157	355	157	52	825	1867	709
08/01/2011 07:00	68.48	1331487	3701	1028	13	1.0	1.5	3.5	1.5	1.0	105	157	355	157	105	879	2144	1003
08/01/2011 08:00	68.52	1336176	4509	1253	13	1.0	1.5	4.0	1.5	1.0	105	157	402	157	105	927	1515	393
08/01/2011 09:00	68.55	1339718	2069	575	13	1.0	2.0	4.0	1.5	1.0	105	209	403	157	105	980	1649	543
08/01/2011 10:00	68.56	1340899	2361	656	13	1.0	2.0	4.0	2.0	1.0	105	209	403	209	105	1031	1755	665

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
08/01/2011 11:00	68.59	1344441	2558	711	13	1.5	2.0	4.0	2.0	1.0	158	209	404	209	105	1085	1399	109
08/01/2011 12:00	68.60	1345622	1082	301	13	1.5	2.0	4.0	2.0	1.5	158	209	404	209	158	1138	1260	0
08/01/2011 13:00	68.61	1346802	394	109	13	1.5	2.5	4.0	2.0	1.5	158	260	404	209	158	1189	1530	279
08/01/2011 14:00	68.61	1346802	1181	328	13	1.5	2.5	4.0	2.5	1.5	158	260	404	260	158	1239	1799	574
08/01/2011 15:00	68.63	1349164	1968	547	13	1.5	2.5	4.0	2.5	1.5	158	260	404	260	158	1240	1581	157
08/01/2011 16:00	68.64	1350345	1181	328	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1241	1418	12
08/01/2011 17:00	68.65	1351525	590	164	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1227	0
08/01/2011 18:00	68.65	1351525	-98	-27	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1255	0
08/01/2011 19:00	68.65	1351525	0	0	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1255	0
08/01/2011 20:00	68.65	1351525	0	0	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1255	0
08/01/2011 21:00	68.65	1351525	0	0	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1282	0
08/01/2011 22:00	68.65	1351525	98	27	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	1091	0
08/01/2011 23:00	68.65	1351525	-590	-164	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1242	899	0
09/01/2011 00:00	68.64	1350345	-1279	-355	13	1.5	2.5	4.0	2.5	1.5	158	260	405	260	158	1241	926	0
09/01/2011 01:00	68.63	1349164	-1181	-328	13	1.5	2.5	4.0	2.5	1.5	158	260	404	260	158	1240	925	0
09/01/2011 02:00	68.62	1347983	-1181	-328	13	1.5	2.5	4.5	2.5	1.5	158	260	450	260	158	1286	943	0
09/01/2011 03:00	68.61	1346802	-1279	-355	13	1.5	2.5	4.5	2.5	1.5	158	260	450	260	158	1285	1189	0
09/01/2011 04:00	68.60	1345622	-394	-109	13	1.5	2.5	4.5	2.5	1.5	158	260	450	260	158	1285	970	0
09/01/2011 05:00	68.60	1345622	-1181	-328	13	2.0	2.5	4.5	2.5	1.5	209	260	450	260	158	1336	802	0
09/01/2011 06:00	68.58	1343260	-1968	-547	13	2.0	2.5	4.5	2.5	1.5	209	259	449	259	158	1335	1047	0
09/01/2011 07:00	68.57	1342080	-1082	-301	13	2.0	2.5	4.5	2.5	1.5	209	259	449	259	158	1334	1046	0
09/01/2011 08:00	68.56	1340899	-1082	-301	13	2.0	2.5	4.5	2.5	1.5	209	259	449	259	157	1334	773	0
09/01/2011 09:00	68.55	1339718	-2066	-574	13	2.0	2.5	4.5	2.5	1.5	209	259	449	259	157	1333	1182	0
09/01/2011 10:00	68.53	1337357	-590	-164	13	2.0	2.5	4.5	2.5	1.5	209	259	448	259	157	1332	1536	310
09/01/2011 11:00	68.54	1338538	689	191	13	2.0	2.5	4.5	2.5	1.5	209	259	448	259	157	1332	1646	438

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
09/01/2011 12:00	68.54	1338538	1082	301	13	2.0	2.5	4.5	2.5	2.0	209	259	448	259	209	1384	2080	891
09/01/2011 13:00	68.56	1340899	2460	683	13	2.0	2.5	4.5	2.5	2.0	209	259	449	259	209	1385	2054	882
09/01/2011 14:00	68.58	1343260	2361	656	13	2.0	2.5	4.5	2.5	2.0	209	259	449	259	209	1386	3448	2292
09/01/2011 15:00	68.61	1346802	7377	2049	13	2.0	2.5	4.5	2.5	2.0	209	260	450	260	209	1388	4136	2996
09/01/2011 16:00	68.70	1357429	9846	2735	13	2.0	2.5	4.5	2.5	2.0	210	261	452	261	210	1394	3946	2821
09/01/2011 17:00	68.77	1365725	9139	2539	13	2.0	2.5	4.5	2.5	2.0	211	262	453	262	211	1398	4733	3624
09/01/2011 18:00	68.86	1376494	11959	3322	13	2.0	2.5	4.5	2.5	2.0	212	263	455	263	212	1404	5454	4362
09/01/2011 19:00	68.97	1389656	14533	4037	13	2.0	2.5	4.5	2.5	2.0	213	264	458	264	213	1411	5848	4768
09/01/2011 20:00	69.10	1405370	15925	4424	13	2.0	2.5	4.5	2.5	2.0	214	265	461	265	214	1419	7338	6276
09/01/2011 21:00	69.24	1422345	21263	5906	13	2.0	2.5	4.5	2.5	2.0	215	267	464	267	215	1428	7659	6610
09/01/2011 22:00	69.44	1446897	22385	6218	13	2.0	2.5	4.5	2.5	2.0	217	269	468	269	217	1440	7646	6611
09/01/2011 23:00	69.60	1466712	22294	6193	13	2.0	2.5	4.5	2.5	2.0	218	271	471	271	218	1450	7935	6913
10/01/2011 00:00	69.80	1491685	23298	6472	13	2.0	2.5	4.5	2.5	2.0	220	273	475	273	220	1462	7936	6925
10/01/2011 01:00	69.97	1513125	23260	6461	13	2.0	2.5	4.5	2.5	2.0	222	275	479	275	222	1473	8449	7451
10/01/2011 02:00	70.17	1538617	25068	6963	13	2.5	2.5	4.5	2.5	2.0	277	277	483	277	223	1539	8732	7746
10/01/2011 03:00	70.36	1563055	25850	7181	13	2.5	2.5	4.5	2.5	2.5	280	280	487	280	280	1605	9133	8159
10/01/2011 04:00	70.57	1590316	27054	7515	13	2.5	3.0	4.5	2.5	2.5	282	336	491	282	282	1672	8759	7797
10/01/2011 05:00	70.77	1616520	25465	7074	13	2.5	3.0	4.5	3.0	2.5	284	338	495	338	284	1740	8933	7980
10/01/2011 06:00	70.96	1641685	25847	7180	13	2.5	3.5	4.5	3.0	2.5	286	395	499	341	286	1806	9312	8372
10/01/2011 07:00	71.16	1668426	26972	7492	13	2.5	3.5	4.5	3.5	2.5	288	398	503	398	288	1875	9351	8418
10/01/2011 08:00	71.36	1695406	26868	7463	13	3.0	3.5	4.5	3.5	2.5	346	401	507	401	290	1944	10095	9174
10/01/2011 09:00	71.56	1722624	29297	8138	13	3.0	3.5	4.5	3.5	3.0	349	404	511	404	349	2015	9731	8820
10/01/2011 10:00	71.78	1752854	27732	7703	13	3.0	3.5	4.5	3.5	3.0	351	407	515	407	351	2031	7267	6363
10/01/2011 11:00	71.95	1776448	18801	5222	13	3.0	3.5	4.5	3.5	3.0	353	409	518	409	353	2044	8059	7165
10/01/2011 12:00	72.07	1793215	21609	6002	13	3.0	3.5	4.5	3.5	3.0	355	411	521	411	355	2053	9026	8139

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
10/01/2011 13:00	72.26	1819906	25055	6960	13	3.0	3.5	4.5	3.5	3.0	357	414	524	414	357	2067	7384	6504
10/01/2011 14:00	72.41	1841210	19096	5304	13	3.0	3.5	4.5	3.5	3.0	359	416	527	416	359	2077	7856	6983
10/01/2011 15:00	72.54	1859739	20755	5765	13	3.0	3.5	4.5	3.5	3.0	361	418	529	418	361	2087	8411	7544
10/01/2011 16:00	72.70	1882728	22719	6311	13	3.0	4.0	4.5	3.5	3.0	363	477	532	420	363	2155	6568	5708
10/01/2011 17:00	72.84	1902994	15842	4401	13	3.0	4.0	5.0	4.0	3.0	364	479	590	479	364	2277	5116	4262
10/01/2011 18:00	72.92	1914623	10174	2826	13	3.5	4.0	5.0	4.0	3.5	423	480	592	480	423	2399	5286	4437
10/01/2011 19:00	72.99	1924798	10347	2874	13	3.5	4.5	5.0	4.5	3.5	424	538	593	538	424	2517	4946	4102
10/01/2011 20:00	73.06	1935072	8697	2416	13	4.5	4.5	5.0	4.5	4.0	539	539	595	539	483	2695	4920	4081
10/01/2011 21:00	73.11	1942421	7963	2212	13	4.5	4.5	5.0	4.5	4.0	540	540	596	540	484	2699	5026	4189
10/01/2011 22:00	73.17	1951241	8328	2313	13	4.5	4.5	5.0	4.5	4.0	541	541	597	541	484	2705	4488	3656
10/01/2011 23:00	73.22	1958590	6372	1770	13	4.5	4.5	5.0	4.5	4.0	542	542	598	542	485	2709	4574	3745
11/01/2011 00:00	73.26	1964486	6666	1852	13	4.5	4.5	5.0	4.5	4.0	543	543	599	543	486	2713	4654	3827
11/01/2011 01:00	73.31	1971917	6940	1928	13	4.5	4.5	5.0	4.5	4.0	544	544	600	544	487	2717	4175	3349
11/01/2011 02:00	73.35	1977862	5202	1445	13	4.5	4.5	5.0	4.5	4.0	544	544	601	544	487	2721	3594	2769
11/01/2011 03:00	73.38	1982321	3096	860	13	4.5	4.5	5.0	4.5	4.0	545	545	601	545	488	2724	4388	3564
11/01/2011 04:00	73.40	1985294	5944	1651	13	4.5	4.5	5.0	4.5	4.0	545	545	602	545	488	2726	4974	4151
11/01/2011 05:00	73.46	1994211	8046	2235	13	4.5	4.5	5.0	4.5	4.0	546	546	603	546	489	2731	5866	5043
11/01/2011 06:00	73.51	2001658	11238	3122	13	4.5	4.5	5.0	4.5	4.0	547	547	604	547	490	2736	6817	5995
11/01/2011 07:00	73.61	2016681	14644	4068	13	4.5	4.5	5.0	4.5	4.0	549	549	606	549	492	2745	6802	5981
11/01/2011 08:00	73.70	2030202	14560	4044	13	4.5	4.5	5.0	4.5	4.0	551	551	608	551	493	2753	8060	7240
11/01/2011 09:00	73.81	2046825	19060	5294	0	4.5	5.0	5.5	5.0	4.5	553	610	666	610	553	2991	9165	8346
11/01/2011 10:00	73.95	2068085	22223	6173	0	5.5	5.5	5.5	5.5	5.5	669	669	669	669	669	3347	10376	9558
11/01/2011 11:00	74.10	2091030	25305	7029	0	5.5	6.0	6.0	6.0	5.5	673	729	729	729	673	3533	9606	8789
11/01/2011 12:00	74.27	2117163	21862	6073	0	6.0	6.0	6.0	6.0	6.0	733	733	733	733	733	3667	10120	9508
11/01/2011 13:00	74.39	2135795	23231	6453	0	7.0	7.0	7.0	7.0	7.0	850	850	850	850	850	4250	11561	10950

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
11/01/2011 14:00	74.57	2163861	26320	7311	0	7.5	7.5	7.5	7.5	7.5	912	912	912	912	912	4562	9739	9128
11/01/2011 15:00	74.71	2185835	18638	5177	0	8.5	8.5	8.5	8.5	8.5	1033	1033	1033	1033	1033	5167	9055	8444
11/01/2011 16:00	74.81	2201636	13999	3889	0	9.5	9.5	9.5	9.5	9.5	1157	1157	1157	1157	1157	5786	8947	8337
11/01/2011 17:00	74.89	2214333	11380	3161	0	10.5	10.5	10.5	10.5	10.5	1286	1286	1286	1286	1286	6432	8196	7586
11/01/2011 18:00	74.95	2223855	6348	1763	0	11.0	11.0	11.0	11.0	11.0	1355	1355	1355	1355	1355	6774	7141	6532
11/01/2011 19:00	74.97	2227030	1323	367	0	12.0	12.0	12.0	12.0	12.0	1493	1493	1493	1493	1493	7464	6876	6267
11/01/2011 20:00	74.97	2227030	-2116	-588	0	12.0	12.0	12.0	12.0	12.0	1493	1493	1493	1493	1493	7464	7060	6451
11/01/2011 21:00	74.95	2223855	-1455	-404	0	12.0	12.0	12.0	12.0	12.0	1492	1492	1492	1492	1492	7458	6797	6189
11/01/2011 22:00	74.95	2223855	-2381	-661	0	11.5	11.5	11.5	11.5	11.5	1422	1422	1422	1422	1422	7111	6229	5622
11/01/2011 23:00	74.92	2219094	-3174	-882	0	11.5	11.5	11.5	11.5	11.5	1421	1421	1421	1421	1421	7103	5964	5357
12/01/2011 00:00	74.91	2217507	-4100	-1139	0	10.0	10.0	10.0	10.0	10.0	1224	1224	1224	1224	1224	6118	5052	4648
12/01/2011 01:00	74.87	2211158	-3836	-1065	0	10.0	10.0	10.0	10.0	10.0	1222	1222	1222	1222	1222	6109	4750	4346
12/01/2011 02:00	74.86	2209571	-4894	-1359	0	9.0	9.0	9.0	9.0	9.0	1098	1098	1098	1098	1098	5492	4096	3692
12/01/2011 03:00	74.81	2201636	-5026	-1396	0	9.0	9.0	9.0	9.0	9.0	1097	1097	1097	1097	1097	5483	4638	4234
12/01/2011 04:00	74.80	2200049	-3042	-845	0	8.0	8.0	8.0	8.0	8.0	978	978	978	978	978	4888	4190	3787
12/01/2011 05:00	74.77	2195287	-2513	-698	0	7.0	7.0	7.0	7.0	7.0	861	861	861	861	861	4304	4083	3882
12/01/2011 06:00	74.77	2195287	-794	-220	0	6.0	6.0	6.0	6.0	6.0	745	745	745	745	745	3727	3984	3783
12/01/2011 07:00	74.76	2193700	926	257	0	5.0	5.0	5.0	5.0	5.0	629	629	629	629	629	3143	3694	3493
12/01/2011 08:00	74.78	2196874	1984	551	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	2473	2272
12/01/2011 09:00	74.78	2196874	-265	-73	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	2510	2441
12/01/2011 10:00	74.78	2196874	-132	-37	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	2804	2735
12/01/2011 11:00	74.78	2196874	926	257	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	2730	2662
12/01/2011 12:00	74.79	2198461	661	184	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	3025	2956
12/01/2011 13:00	74.79	2198461	1719	478	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	3098	3030
12/01/2011 14:00	74.81	2201636	1984	551	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2549	2145	2076

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
12/01/2011 15:00	74.81	2201636	-1455	-404	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2549	2880	2811
12/01/2011 16:00	74.80	2200049	1190	331	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2548	2511	2443
12/01/2011 17:00	74.82	2203223	-132	-37	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2550	2476	2408
12/01/2011 18:00	74.80	2200049	-265	-73	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2548	3136	3067
12/01/2011 19:00	74.82	2203223	2116	588	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2550	2513	2444
12/01/2011 20:00	74.82	2203223	-132	-37	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2550	2329	2261
12/01/2011 21:00	74.82	2203223	-794	-220	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2550	2072	2003
12/01/2011 22:00	74.81	2201636	-1719	-478	0	3.5	4.0	5.0	4.0	3.5	449	510	630	510	449	2549	2108	2039
12/01/2011 23:00	74.80	2200049	-1587	-441	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2548	2107	2039
13/01/2011 00:00	74.79	2198461	-1587	-441	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	2143	2075
13/01/2011 01:00	74.78	2196874	-1455	-404	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2547	1848	1780
13/01/2011 02:00	74.77	2195287	-2514	-698	0	3.5	4.0	5.0	4.0	3.5	449	510	629	510	449	2546	1887	1818
13/01/2011 03:00	74.75	2192113	-2373	-659	0	3.5	4.0	5.0	4.0	3.5	449	509	628	509	449	2544	1891	1823
13/01/2011 04:00	74.74	2190543	-2351	-653	0	3.5	4.0	5.0	4.0	3.5	448	509	628	509	448	2544	1890	1821
13/01/2011 05:00	74.72	2187404	-2354	-654	0	3.5	4.0	5.0	4.0	3.5	448	509	628	509	448	2542	1888	1819
13/01/2011 06:00	74.71	2185835	-2354	-654	0	3.5	4.0	5.0	4.0	3.5	448	509	628	509	448	2541	1887	1819
13/01/2011 07:00	74.69	2182696	-2354	-654	0	3.5	4.0	5.0	4.0	3.5	448	508	627	508	448	2540	1922	1853
13/01/2011 08:00	74.68	2181126	-2224	-618	0	3.5	4.0	5.0	4.0	3.5	448	508	627	508	448	2539	1631	1562
13/01/2011 09:00	74.66	2177987	-3270	-908	0	3.5	4.0	5.0	4.0	3.5	447	508	627	508	447	2537	1629	1560
13/01/2011 10:00	74.64	2174848	-3270	-908	0	3.5	4.0	5.0	4.0	3.5	447	508	626	508	447	2536	1918	1850
13/01/2011 11:00	74.62	2171709	-2224	-618	0	3.5	4.0	5.0	4.0	3.5	447	507	626	507	447	2534	1917	1848
13/01/2011 12:00	74.61	2170139	-2224	-618	0	3.5	4.0	5.0	4.0	3.5	447	507	626	507	447	2534	1589	1520
13/01/2011 13:00	74.59	2167000	-3401	-945	0	3.5	4.5	5.0	4.0	3.5	446	567	625	507	446	2592	1938	1869
13/01/2011 14:00	74.57	2163861	-2354	-654	0	3.5	4.5	5.0	4.5	3.5	446	566	625	566	446	2650	2359	2290
13/01/2011 15:00	74.56	2162291	-1046	-291	0	4.0	4.5	5.0	4.0	3.5	506	566	625	506	446	2650	1451	1382

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
13/01/2011 16:00	74.55	2160722	-4316	-1199	0	4.0	4.5	5.0	4.5	4.0	506	566	625	566	506	2769	1677	1609
13/01/2011 17:00	74.51	2154444	-3930	-1092	0	4.5	4.5	5.0	4.5	4.0	565	565	624	565	506	2825	1817	1749
13/01/2011 18:00	74.50	2152874	-3627	-1008	0	4.5	4.5	5.0	4.5	4.5	565	565	624	565	565	2883	1231	1162
13/01/2011 19:00	74.46	2146663	-5950	-1653	0	4.5	5.0	5.0	5.0	4.5	564	623	623	623	564	2997	2062	1994
13/01/2011 20:00	74.43	2142006	-3364	-934	0	5.0	5.0	5.0	5.0	5.0	622	622	622	622	622	3111	1530	1461
13/01/2011 21:00	74.41	2138900	-5693	-1581	0	5.0	5.5	5.5	5.0	5.0	622	680	680	622	622	3225	1679	1611
13/01/2011 22:00	74.36	2131137	-5564	-1545	0	5.0	5.5	5.5	5.5	5.0	621	678	678	678	621	3277	2091	2022
13/01/2011 23:00	74.34	2128032	-4270	-1186	0	5.5	5.5	5.5	5.5	5.0	678	678	678	678	620	3332	1534	1466
14/01/2011 00:00	74.30	2121821	-6474	-1798	0	5.5	5.5	5.5	5.5	5.5	677	677	677	677	677	3386	1667	1667
14/01/2011 01:00	74.26	2115611	-6186	-1718	0	5.5	5.5	6.0	5.5	5.5	676	676	733	676	676	3438	1767	1767
14/01/2011 02:00	74.22	2109452	-6017	-1671	0	5.5	6.0	6.0	5.5	5.5	675	732	732	675	675	3491	1572	1572
14/01/2011 03:00	74.18	2103312	-6907	-1919	0	5.5	6.0	6.0	6.0	5.5	675	731	731	731	675	3543	1339	1339
14/01/2011 04:00	74.13	2095636	-7932	-2203	0	5.5	6.0	6.0	6.0	5.5	673	730	730	730	673	3537	1653	1653
14/01/2011 05:00	74.08	2087960	-6782	-1884	0	5.5	6.0	6.0	6.0	5.5	672	729	729	729	672	3531	1648	1648
14/01/2011 06:00	74.04	2081819	-6778	-1883	0	5.5	6.0	6.0	6.0	5.5	671	728	728	728	671	3526	1338	1338
14/01/2011 07:00	73.99	2074159	-7879	-2189	0	5.5	6.0	6.0	6.0	5.5	670	727	727	727	670	3521	1659	1659
14/01/2011 08:00	73.94	2066566	-6702	-1862	0	5.5	6.0	6.0	6.0	5.5	669	725	725	725	669	3515	1616	1616
14/01/2011 09:00	73.90	2060492	-6834	-1898	0	5.5	6.0	6.0	6.0	5.5	668	724	724	724	668	3510	1612	1612
14/01/2011 10:00	73.85	2052899	-6834	-1898	0	5.5	6.0	6.0	6.0	5.5	667	723	723	723	667	3504	1640	1640
14/01/2011 11:00	73.81	2046825	-6713	-1865	0	5.5	6.0	6.0	6.0	5.5	666	722	722	722	666	3499	1399	1399
14/01/2011 12:00	73.76	2039232	-7563	-2101	0	5.5	6.0	6.0	6.0	5.5	665	721	721	721	665	3493	1163	1163
14/01/2011 13:00	73.71	2031704	-8390	-2331	0	5.5	6.0	6.0	6.0	5.5	664	720	720	720	664	3488	1193	1193
14/01/2011 14:00	73.65	2022690	-8261	-2295	0	5.5	6.0	6.0	6.0	5.5	663	718	718	718	663	3480	1151	1151
14/01/2011 15:00	73.60	2015179	-8388	-2330	0	5.5	6.0	6.0	6.0	5.5	662	717	717	717	662	3475	1386	1386
14/01/2011 16:00	73.54	2006165	-7518	-2088	0	5.5	6.0	6.0	6.0	5.5	660	716	716	716	660	3467	1705	1705

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
14/01/2011 17:00	73.50	2000156	-6346	-1763	0	5.5	6.0	6.0	6.0	5.5	659	715	715	715	659	3463	1090	1090
14/01/2011 18:00	73.45	1992725	-8541	-2372	0	5.5	6.0	6.0	6.0	5.5	658	713	713	713	658	3457	1392	1392
14/01/2011 19:00	73.39	1983807	-7431	-2064	0	6.0	6.0	6.0	6.0	5.5	712	712	712	712	657	3504	1715	1715
14/01/2011 20:00	73.35	1977862	-6440	-1789	0	6.0	6.0	6.0	6.0	5.5	711	711	711	711	656	3500	1399	1399
14/01/2011 21:00	73.30	1970431	-7562	-2101	0	6.0	6.0	6.0	6.0	5.5	710	710	710	710	655	3493	1441	1441
14/01/2011 22:00	73.25	1963000	-7390	-2053	0	6.0	6.0	6.0	6.0	5.5	708	708	708	708	654	3487	1482	1482
14/01/2011 23:00	73.20	1955650	-7220	-2006	0	6.0	6.0	6.0	6.0	5.5	707	707	707	707	653	3481	1202	1202
15/01/2011 00:00	73.15	1948301	-8207	-2280	0	6.0	6.0	6.0	6.0	5.5	706	706	706	706	651	3475	1229	1229
15/01/2011 01:00	73.09	1939481	-8087	-2246	0	6.0	6.0	6.0	6.0	5.5	704	704	704	704	650	3468	1259	1259
15/01/2011 02:00	73.04	1932132	-7951	-2209	0	6.0	6.0	6.0	6.0	5.5	703	703	703	703	649	3462	997	997
15/01/2011 03:00	72.98	1923345	-8874	-2465	0	6.0	6.0	6.0	6.0	6.0	702	702	702	702	702	3508	1087	1087
15/01/2011 04:00	72.92	1914623	-8716	-2421	0	6.0	6.0	6.0	6.0	6.0	700	700	700	700	700	3501	1078	1078
15/01/2011 05:00	72.86	1905902	-8723	-2423	0	6.0	6.0	6.0	6.0	6.0	699	699	699	699	699	3493	1071	1071
15/01/2011 06:00	72.80	1897180	-8720	-2422	0	6.0	6.0	6.0	6.0	6.0	697	697	697	697	697	3485	1079	1079
15/01/2011 07:00	72.74	1888475	-8661	-2406	0	6.0	6.0	6.0	6.0	6.0	696	696	696	696	696	3478	1085	1085
15/01/2011 08:00	72.68	1879854	-8614	-2393	0	6.0	6.0	6.0	6.0	6.0	694	694	694	694	694	3470	1075	1075
15/01/2011 09:00	72.62	1871234	-8621	-2395	0	6.0	6.0	6.0	6.0	6.0	693	693	693	693	693	3463	1066	1066
15/01/2011 10:00	72.56	1862613	-8629	-2397	0	6.0	6.0	6.5	6.0	6.0	691	691	744	691	691	3507	1094	1094
15/01/2011 11:00	72.50	1853992	-8689	-2414	0	6.0	6.0	6.5	6.0	6.0	689	689	742	689	689	3500	1365	1365
15/01/2011 12:00	72.44	1845471	-7685	-2135	0	6.0	6.0	6.5	6.0	6.0	688	688	740	688	688	3492	1355	1355
15/01/2011 13:00	72.39	1838369	-7693	-2137	0	6.0	6.0	6.5	6.0	6.0	687	687	739	687	687	3485	1084	1084
15/01/2011 14:00	72.33	1829848	-8645	-2401	0	6.0	6.0	6.5	6.0	6.0	685	685	737	685	685	3477	1151	1151
15/01/2011 15:00	72.27	1821326	-8375	-2326	0	6.0	6.0	6.5	6.0	6.0	684	684	735	684	684	3469	899	899
15/01/2011 16:00	72.21	1812870	-9253	-2570	0	6.0	6.0	6.5	6.0	6.0	682	682	734	682	682	3462	862	862
15/01/2011 17:00	72.14	1803043	-9357	-2599	0	6.0	6.5	6.5	6.0	6.0	680	732	732	680	680	3504	1487	1487

9 DAM INFLOW AND FLOOD RELEASE DETAILS (continued)

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
15/01/2011 18:00	72.08	1794619	-7260	-2017	0	6.0	6.5	6.5	6.0	6.0	679	730	730	679	679	3496	971	971
15/01/2011 19:00	72.03	1787600	-9088	-2524	0	6.0	6.5	6.5	6.0	6.0	677	729	729	677	677	3489	527	527
15/01/2011 20:00	71.95	1776448	-10662	-2962	0	6.0	6.5	6.5	6.0	6.0	675	726	726	675	675	3478	491	491
15/01/2011 21:00	71.88	1766733	-10752	-2987	0	6.0	6.5	6.5	6.0	6.0	673	724	724	673	673	3469	1154	1154
15/01/2011 22:00	71.80	1755630	-8333	-2315	0	6.0	6.5	6.5	6.5	6.0	671	722	722	722	671	3509	1943	1943
15/01/2011 23:00	71.76	1750078	-5638	-1566	0	6.0	6.5	6.5	6.5	6.0	670	721	721	721	670	3503	1406	1406
16/01/2011 00:00	71.71	1743202	-7549	-2097	0	6.0	6.5	6.5	6.5	6.0	669	719	719	719	669	3496	956	956
16/01/2011 01:00	71.65	1734971	-9145	-2540	0	6.0	6.5	6.5	6.5	6.0	667	718	718	718	667	3488	1009	1009
16/01/2011 02:00	71.58	1725368	-8924	-2479	0	6.0	6.5	6.5	6.5	6.0	665	716	716	716	665	3478	1043	1043
16/01/2011 03:00	71.52	1717137	-8766	-2435	0	6.0	6.5	6.5	6.5	6.0	664	714	714	714	664	3469	767	767
16/01/2011 04:00	71.45	1707612	-9730	-2703	0	6.5	6.5	6.5	6.5	6.0	712	712	712	712	662	3509	1093	1093
16/01/2011 05:00	71.38	1698119	-8700	-2417	0	6.5	6.5	6.5	6.5	6.0	710	710	710	710	660	3499	1080	1080
16/01/2011 06:00	71.32	1689981	-8712	-2420	0	6.5	6.5	6.5	6.5	6.0	708	708	708	708	658	3491	838	838
16/01/2011 07:00	71.25	1680488	-9550	-2653	0	6.5	6.5	6.5	6.5	6.0	706	706	706	706	657	3481	908	908
16/01/2011 08:00	71.18	1671107	-9260	-2572	0	6.5	6.5	6.5	6.5	6.0	704	704	704	704	655	3470	677	677
16/01/2011 09:00	71.11	1661725	-10058	-2794	0	6.5	6.5	6.5	6.5	6.5	702	702	702	702	702	3509	510	510
16/01/2011 10:00	71.03	1651004	-10798	-2999	0	6.5	6.5	6.5	6.5	6.5	699	699	699	699	699	3497	488	488
16/01/2011 11:00	70.95	1640361	-10834	-3009	0	6.5	6.5	6.5	6.5	6.5	697	697	697	697	697	3486	911	911
16/01/2011 12:00	70.87	1629765	-9267	-2574	0	6.5	6.5	6.5	6.5	6.5	695	695	695	695	695	3474	1355	1355
16/01/2011 13:00	70.81	1621818	-7625	-2118	0	6.5	6.5	7.0	6.5	6.5	693	693	741	693	693	3513	1106	1106
16/01/2011 14:00	70.75	1613871	-8663	-2406	0	6.5	6.5	7.0	6.5	6.5	691	691	739	691	691	3503	1173	1173
16/01/2011 15:00	70.68	1604711	-8389	-2330	0	6.5	6.5	7.0	6.5	6.5	689	689	737	689	689	3493	1007	1007
16/01/2011 16:00	70.62	1596859	-8949	-2486	0	6.5	7.0	7.0	6.5	6.5	687	735	735	687	687	3531	360	360
16/01/2011 17:00	70.54	1586390	-11415	-3171	0	6.5	7.0	7.0	6.5	6.5	685	732	732	685	685	3518	428	428
16/01/2011 18:00	70.45	1574691	-11124	-3090	0	6.5	7.0	7.0	6.5	6.5	682	729	729	682	682	3504	602	602

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
16/01/2011 19:00	70.37	1564348	-10449	-2902	0	6.5	7.0	7.0	6.5	6.5	680	726	726	680	680	3491	1010	1010
16/01/2011 20:00	70.29	1554005	-8933	-2482	0	6.5	7.0	7.0	7.0	6.5	677	724	724	724	677	3525	1301	1301
16/01/2011 21:00	70.23	1546279	-8008	-2224	0	6.5	7.0	7.0	7.0	6.5	675	722	722	722	675	3515	827	827
16/01/2011 22:00	70.16	1537340	-9679	-2689	0	6.5	7.0	7.0	7.0	6.5	673	719	719	719	673	3504	634	634
16/01/2011 23:00	70.08	1527124	-10333	-2870	0	6.5	7.0	7.0	7.0	6.0	671	717	717	717	624	3445	624	624
17/01/2011 00:00	70.00	1516908	-10153	-2820	0	6.5	7.0	7.0	7.0	6.0	668	714	714	714	622	3432	632	632
17/01/2011 01:00	69.92	1506819	-10079	-2800	0	6.5	7.0	7.0	7.0	6.0	666	711	711	711	620	3419	700	700
17/01/2011 02:00	69.84	1496729	-9788	-2719	0	6.5	7.0	7.0	7.0	6.0	663	708	708	708	617	3406	0	0
17/01/2011 03:00	69.76	1486640	-12314	-3421	0	6.5	7.0	7.0	7.0	6.0	661	706	706	706	615	3393	253	253
17/01/2011 04:00	69.65	1472934	-11304	-3140	0	6.5	7.0	7.0	7.0	6.0	657	702	702	702	612	3375	724	724
17/01/2011 05:00	69.58	1464223	-9542	-2651	0	6.5	7.0	7.0	7.0	6.0	655	699	699	699	610	3363	160	160
17/01/2011 06:00	69.49	1453039	-11531	-3203	0	6.5	7.0	7.0	7.0	6.0	652	696	696	696	607	3348	734	734
17/01/2011 07:00	69.40	1441983	-9411	-2614	0	6.5	7.0	7.0	7.0	6.0	649	693	693	693	605	3333	239	239
17/01/2011 08:00	69.33	1433384	-11141	-3095	0	6.5	7.0	7.0	7.0	6.0	647	691	691	691	603	3322	0	0
17/01/2011 09:00	69.22	1419920	-11987	-3330	0	6.5	7.0	7.0	7.0	6.0	643	687	687	687	599	3303	751	751
17/01/2011 10:00	69.14	1410220	-9189	-2552	0	6.5	7.0	7.0	7.0	6.0	641	684	684	684	597	3290	293	293
17/01/2011 11:00	69.06	1400521	-10788	-2997	0	6.5	7.0	7.0	7.0	6.0	638	681	681	681	595	3276	0	0
17/01/2011 12:00	68.96	1388460	-13207	-3669	0	6.5	7.0	7.0	7.0	6.0	635	678	678	678	592	3259	268	268
17/01/2011 13:00	68.85	1375298	-10768	-2991	0	6.5	7.0	7.0	7.0	6.0	631	674	674	674	588	3241	759	759
17/01/2011 14:00	68.78	1366922	-8933	-2481	0	6.5	6.5	6.5	6.5	6.5	629	629	629	629	629	3145	1309	1309
17/01/2011 15:00	68.70	1357429	-6611	-1836	0	6.0	6.5	6.5	6.5	6.0	584	626	626	626	584	3047	806	806
17/01/2011 16:00	68.66	1352706	-8067	-2241	0	6.0	6.0	6.5	6.0	6.0	583	583	625	583	583	2956	0	0
17/01/2011 17:00	68.56	1340899	-11499	-3194	0	6.0	6.0	6.0	6.0	6.0	580	580	580	580	580	2898	919	919
17/01/2011 18:00	68.48	1331487	-7126	-1979	0	5.5	5.5	5.5	5.5	5.5	535	535	535	535	535	2673	574	574
17/01/2011 19:00	68.43	1325667	-7558	-2099	0	5.0	5.5	5.5	5.5	5.0	490	533	533	533	490	2580	424	424

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
17/01/2011 20:00	68.35	1316354	-7762	-2156	0	5.0	5.0	5.5	5.0	5.0	488	488	531	488	488	2483	786	786
17/01/2011 21:00	68.30	1310534	-6110	-1697	0	5.0	5.0	5.0	5.0	4.5	487	487	487	487	443	2390	545	545
17/01/2011 22:00	68.24	1303566	-6641	-1845	0	4.5	5.0	5.0	4.5	4.5	442	485	485	442	442	2295	0	0
17/01/2011 23:00	68.18	1296678	-9752	-2709	0	4.5	4.5	5.0	4.5	4.0	440	440	484	440	396	2200	0	0
18/01/2011 00:00	68.08	1285197	-8419	-2339	0	4.0	4.5	5.0	4.5	3.5	394	438	481	438	348	2099	981	981
18/01/2011 01:00	68.04	1280605	-4023	-1118	0	4.0	4.5	5.0	4.5	3.5	393	437	480	437	347	2095	828	828
18/01/2011 02:00	68.00	1276013	-4560	-1267	0	4.0	4.5	5.0	4.5	3.5	392	436	479	436	347	2090	834	834
18/01/2011 03:00	67.96	1271485	-4522	-1256	0	4.0	4.5	5.0	4.5	3.5	391	435	478	435	346	2086	881	881
18/01/2011 04:00	67.92	1266957	-4339	-1205	0	4.0	4.5	5.0	4.5	3.5	390	434	477	434	345	2082	510	510
18/01/2011 05:00	67.88	1262429	-5660	-1572	0	4.0	4.5	5.0	4.5	3.5	390	433	476	433	345	2077	136	136
18/01/2011 06:00	67.82	1255638	-6987	-1941	0	4.0	4.5	5.0	4.5	3.5	388	432	475	432	344	2071	195	195
18/01/2011 07:00	67.76	1248846	-6753	-1876	0	4.0	4.5	5.0	4.5	3.5	387	431	473	431	343	2064	126	126
18/01/2011 08:00	67.70	1242134	-6976	-1938	0	4.0	4.5	5.0	4.5	3.5	386	429	471	429	342	2058	715	715
18/01/2011 09:00	67.64	1235438	-4834	-1343	0	3.5	4.5	5.0	4.0	3.5	341	428	470	385	341	1964	775	775
18/01/2011 10:00	67.61	1232091	-4278	-1188	0	3.5	4.0	5.0	4.0	3.0	340	384	469	384	295	1872	425	425
18/01/2011 11:00	67.56	1226511	-5211	-1447	0	3.0	4.0	4.5	4.0	3.0	294	383	426	383	294	1780	570	570
18/01/2011 12:00	67.52	1222047	-4357	-1210	0	3.0	3.5	4.5	3.5	3.0	293	338	425	338	293	1688	488	488
18/01/2011 13:00	67.48	1217615	-4321	-1200	0	2.5	3.5	4.5	3.5	2.5	246	338	424	338	246	1592	243	243
18/01/2011 14:00	67.44	1213216	-4855	-1348	0	2.5	3.0	4.5	3.0	2.5	246	292	423	292	246	1499	0	0
18/01/2011 15:00	67.39	1207718	-6507	-1807	0	2.5	3.0	4.5	3.0	2.5	245	291	422	291	245	1495	247	247
18/01/2011 16:00	67.33	1201119	-4491	-1247	0	2.5	3.0	4.5	3.0	2.5	244	290	421	290	244	1490	1032	1032
18/01/2011 17:00	67.31	1198920	-1650	-458	0	2.5	3.0	4.5	3.0	2.5	244	290	420	290	244	1488	570	570
18/01/2011 18:00	67.29	1196720	-3305	-918	0	2.5	3.0	4.5	3.0	2.5	244	290	420	290	244	1487	223	223
18/01/2011 19:00	67.25	1192321	-4549	-1264	0	2.5	3.0	4.5	3.0	2.5	243	289	419	289	243	1484	231	231
18/01/2011 20:00	67.21	1187988	-4508	-1252	0	2.5	3.0	4.5	3.0	2.5	243	288	418	288	243	1480	603	603

Date/time	Lake level	Storage volume	Net inflow (outflow deducted)		Hydro	Gate settings					Gate discharges					Total outflow	Total inflow	Total inflow minus Somerset outflow
						1	2	3	4	5	1	2	3	4	5			
	m AHD	ML	ML	m^3/s	m^3/s	m	m	m	m	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s	m^3/s
18/01/2011 21:00	67.17	1183654	-3160	-878	0	2.5	3.0	4.5	2.5	2.5	242	288	417	242	242	1432	755	755
18/01/2011 22:00	67.15	1181488	-2437	-677	0	2.5	2.5	4.5	2.5	2.0	242	242	416	242	195	1338	235	235
18/01/2011 23:00	67.12	1178238	-3972	-1103	0	2.0	2.5	4.5	2.5	1.5	195	242	416	242	147	1241	188	188
19/01/2011 00:00	67.08	1173905	-3792	-1053	0	1.5	2.5	4.0	2.5	1.5	147	241	373	241	147	1150	46	46
19/01/2011 01:00	67.05	1170655	-3972	-1103	0	1.5	2.0	4.0	2.0	1.5	147	194	373	194	147	1055	302	302
19/01/2011 02:00	67.01	1166321	-2711	-753	0	1.0	2.0	4.0	2.0	1.0	98	194	372	194	98	956	609	609
19/01/2011 03:00	67.00	1165238	-1248	-347	0	1.0	1.5	4.0	1.5	1.0	98	146	372	146	98	860	96	96
19/01/2011 04:00	66.98	1163105	-2753	-765	0	0.5	1.5	4.0	1.5	0.5	49	146	371	146	49	762	0	0
19/01/2011 05:00	66.95	1159906	-3554	-987	0	0.5	1.0	4.0	1.0	0.5	49	98	370	98	49	664	244	244
19/01/2011 06:00	66.92	1156707	-1511	-420	0	0.0	1.0	4.0	1.0	0.0	0	98	370	98	0	565	466	466
19/01/2011 07:00	66.92	1156707	-355	-99	0	0.0	0.5	4.0	0.5	0.0	0	49	370	49	0	468	319	319
19/01/2011 08:00	66.91	1155641	-533	-148	0	0.0	0.5	3.5	0.0	0.0	0	49	327	0	0	376	228	228
19/01/2011 09:00	66.91	1155641	-533	-148	0	0.0	0.0	3.0	0.0	0.0	0	0	284	0	0	284	136	136

Table 9.1.1 – Wivenhoe Dam inflow and release data for the January 2011 Flood Event

A summary of the data in Table 9.1.1 is illustrated in Figure 9.1.2. The considerable flood mitigation benefits provided by Wivenhoe Dam over the duration of the Event is clearly demonstrated in Figure 9.1.2 and can be seen in considerable differences between Dam inflow and outflow.

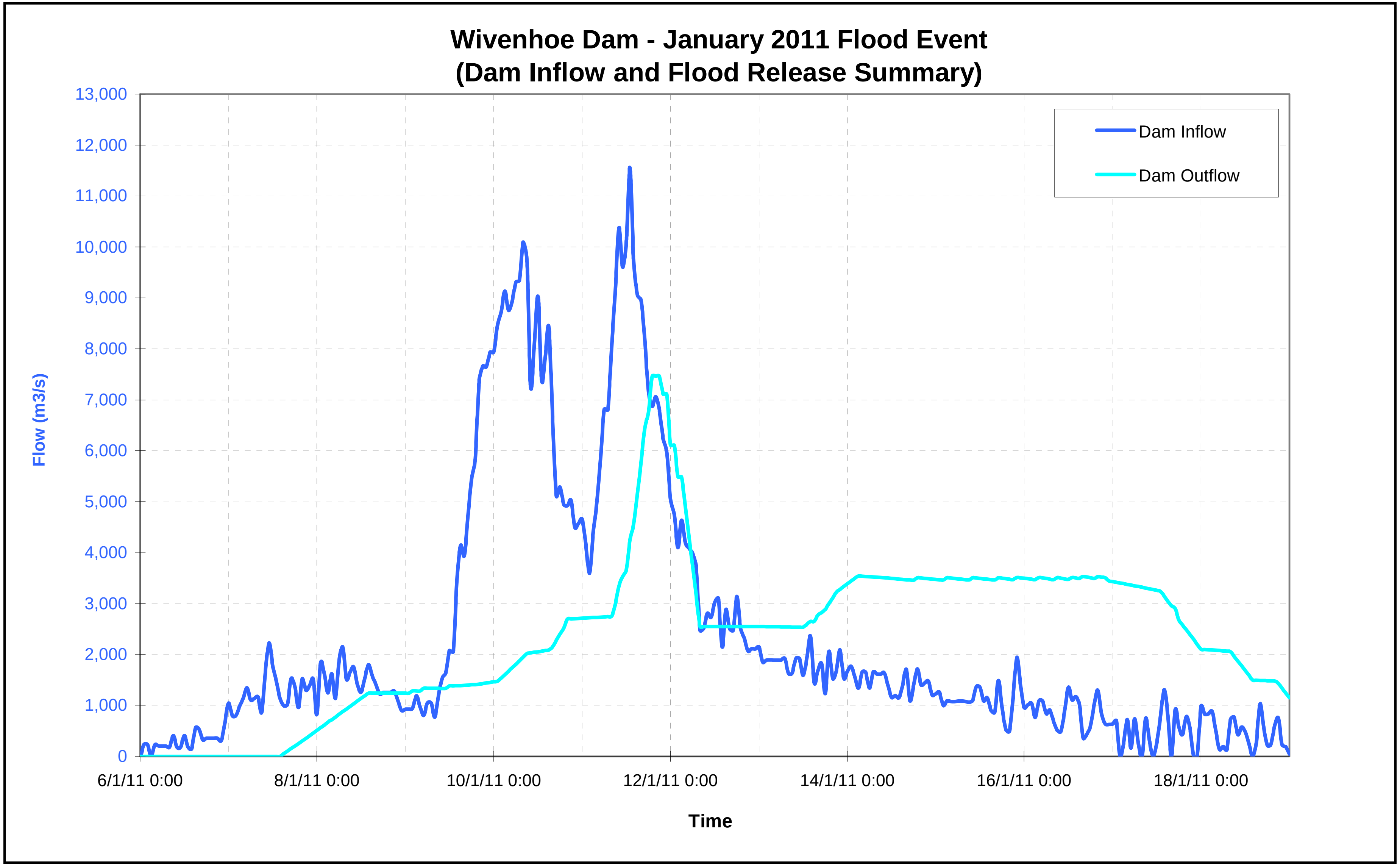

Figure 9.1.2 – Wivenhoe Dam inflow and release summary for the January 2011 Flood Event

9.3 Somerset Dam

Table 9.2.1 provides full details of inflows into and releases from Somerset Dam over the duration of the Flood Event. Details of the strategies used in determining these releases and how these strategies comply with the Manual are contained in Section 7 of this Report. Table 9.2.1 also shows the gate operation sequence was in accordance with the Manual over the duration of the Event.

Some points to note in relation to Table 9.2.1 are:

- Inflow and flood release calculations are based on manual gauge board readings shown in the table that provide the lake level. During the Event, these manual gauge board readings were normally provided by the Dam operators to the Flood Operations Centre on an hourly basis. However, with prior approval from the Flood Operations Centre, during non-critical periods, the operators occasionally would miss a reading to complete higher priority site activities. In these instances, the table value has been interpolated from the closest available actual readings.
- Release calculations use the discharge rating formulae contained in the Manual.
- Inflow calculations are derived using a reverse routing technique assuming level pool. For each time step, inflow is based on the rate of change of the storage calculated from the manual gauge board readings and the Dam storage curve plus the releases. The method tends to underestimate the rising limb and overestimate the falling limb of the inflow. The erratic shape of the inflow is due to small level differences resulting in large inflow volumes.
- The table shows inflow rates and releases on the hour throughout the event. In some instances, gate operations may have occurred between hours or at less than one-hourly intervals. In these instances, the table shows the actual gate openings as at the time indicated.
- The flood release from Somerset Dam associated with the flood event prior to the January 2011 Flood Event was completed at 13:00 on 31 December 2010. The lake level in Somerset Dam at this time was 98.99m or 0.01m below the FSL. The Dam continued to release 3,000ML per day to account for base flow into the Dam from the previous flood event, with the expectation being that the Dam would slowly fall below FSL in the days following 31 December 2011. However, due to rainfall and further Dam inflows, the lake level rose steadily after 31 December 2011 and was above FSL at the commencement of the Event.

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
06/01/2011 09:00	99.37	395716	435	121	0.5	0	8	0	35	155
06/01/2011 10:00	99.38	396151	435	121	0.5	0	8	0	35	155
06/01/2011 11:00	99.39	396587	435	121	0.5	0	8	0	35	155
06/01/2011 12:00	99.40	397022	435	121	0.5	0	8	0	35	155
06/01/2011 13:00	99.41	397457	435	121	0.5	0	8	0	35	155
06/01/2011 14:00	99.42	397893	435	121	0.5	0	8	0	35	156
06/01/2011 15:00	99.43	398328	435	121	0.5	0	8	0	35	156
06/01/2011 16:00	99.44	398764	472	131	0.5	0	8	0	35	166
06/01/2011 17:00	99.45	399199	218	60	0.5	0	8	0	35	95
06/01/2011 18:00	99.46	399634	-73	-20	0.5	0	8	0	35	14
06/01/2011 19:00	99.46	399634	181	50	0.5	0	8	0	35	85
06/01/2011 20:00	99.46	399634	689	191	0.5	0	8	0	35	226
06/01/2011 21:00	99.47	400070	948	263	0.5	0	8	0	35	298
06/01/2011 22:00	99.49	400941	627	174	0.5	0	8	0	35	209
06/01/2011 23:00	99.51	401821	669	186	0.5	0	8	0	35	220
07/01/2011 00:00	99.52	402267	668	186	0.5	0	8	0	35	220
07/01/2011 01:00	99.54	403157	668	186	0.5	0	8	0	35	220
07/01/2011 02:00	99.55	403603	668	186	0.5	0	8	0	35	220
07/01/2011 03:00	99.57	404493	742	206	0.5	0	8	0	35	241
07/01/2011 04:00	99.58	404939	186	52	0.5	0	8	0	35	86
07/01/2011 05:00	99.60	405829	-186	-52	0.5	0	8	0	35	0
07/01/2011 06:00	99.59	405384	1002	278	0.5	0	8	0	35	313
07/01/2011 07:00	99.60	405829	1225	340	0.5	0	8	0	35	375
07/01/2011 08:00	99.63	407165	482	134	0.5	0	8	0	35	169
07/01/2011 09:00	99.65	408056	1298	361	0.5	0	8	0	35	395
07/01/2011 10:00	99.66	408501	2339	650	0.5	0	8	0	35	684
07/01/2011 11:00	99.71	410728	2485	690	0.5	0	8	0	35	725
07/01/2011 12:00	99.76	412964	2774	770	0.5	0	8	0	35	805
07/01/2011 13:00	99.82	415697	2694	748	0.5	0	8	0	35	783
07/01/2011 14:00	99.88	418429	3038	844	0.5	0	8	0	35	879
07/01/2011 15:00	99.94	421162	2803	779	0.5	0	8	0	35	814
07/01/2011 16:00	100.01	424360	2297	638	0.5	0	8	0	35	673
07/01/2011 17:00	100.06	426690	2175	604	1.0	0	8	0	70	674
07/01/2011 18:00	100.11	429020	1282	356	1.0	0	8	0	70	426
07/01/2011 19:00	100.15	430885	1320	367	0.0	1	8	0	205	572
07/01/2011 20:00	100.17	431817	1978	549	0.0	1	8	0	206	755
07/01/2011 21:00	100.21	433681	1648	458	0.0	1	8	0	206	663
07/01/2011 22:00	100.25	435545	1395	388	0.0	1	8	0	206	593
07/01/2011 23:00	100.28	436976	1471	409	0.0	1	8	0	206	615

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
08/01/2011 00:00	100.31	438408	1153	320	0.0	1	8	0	206	526
08/01/2011 01:00	100.34	439839	1193	331	0.0	1	8	0	206	538
08/01/2011 02:00	100.36	440794	1272	353	0.0	1	8	0	206	560
08/01/2011 03:00	100.39	442225	676	188	0.0	1	8	0	206	394
08/01/2011 04:00	100.41	443180	437	121	0.0	1	8	0	206	328
08/01/2011 05:00	100.42	443657	437	121	0.0	1	8	0	206	328
08/01/2011 06:00	100.43	444134	795	221	0.0	1	8	0	207	427
08/01/2011 07:00	100.44	444611	517	144	0.0	1	8	0	207	350
08/01/2011 08:00	100.46	445565	-40	-11	0.0	1	8	0	207	196
08/01/2011 09:00	100.46	445565	-278	-77	0.0	1	8	0	207	129
08/01/2011 10:00	100.46	445565	-278	-77	0.0	1	8	0	207	129
08/01/2011 11:00	100.45	445088	80	22	0.0	1	8	0	207	229
08/01/2011 12:00	100.45	445088	-239	-66	0.0	2	8	0	413	347
08/01/2011 13:00	100.45	445088	-477	-133	0.0	2	8	0	413	281
08/01/2011 14:00	100.44	444611	-756	-210	0.0	2	8	0	413	203
08/01/2011 15:00	100.43	444134	-756	-210	0.0	2	8	0	413	203
08/01/2011 16:00	100.41	443180	-398	-110	0.0	2	8	0	413	302
08/01/2011 17:00	100.40	442702	-756	-210	0.0	2	8	0	413	203
08/01/2011 18:00	100.39	442225	-756	-210	0.0	2	8	0	413	203
08/01/2011 19:00	100.37	441271	-437	-121	0.0	2	8	0	413	291
08/01/2011 20:00	100.36	440794	-477	-133	0.0	2	8	0	413	280
08/01/2011 21:00	100.35	440317	-477	-133	0.0	2	8	0	412	280
08/01/2011 22:00	100.34	439839	-517	-144	0.0	2	8	0	412	269
08/01/2011 23:00	100.33	439362	-199	-55	0.0	2	8	0	412	357
09/01/2011 00:00	100.32	438885	-199	-55	0.0	2	8	0	412	357
09/01/2011 01:00	100.32	438885	-477	-133	0.0	2	8	0	412	280
09/01/2011 02:00	100.31	438408	-795	-221	0.0	2	8	0	412	191
09/01/2011 03:00	100.30	437931	-477	-133	0.0	2	8	0	412	280
09/01/2011 04:00	100.28	436976	-199	-55	0.0	2	8	0	412	357
09/01/2011 05:00	100.28	436976	-318	-88	0.0	2	8	0	412	324
09/01/2011 06:00	100.27	436499	318	88	0.0	2	8	0	412	500
09/01/2011 07:00	100.27	436499	159	44	0.0	2	8	0	412	456
09/01/2011 08:00	100.28	436976	676	188	0.0	2	8	0	412	600
09/01/2011 09:00	100.28	436976	1471	409	0.0	3	8	0	618	1027
09/01/2011 10:00	100.31	438408	1948	541	0.0	3	8	0	618	1159
09/01/2011 11:00	100.34	439839	2227	619	0.0	3	8	0	619	1237

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
09/01/2011 12:00	100.39	442225	1624	451	0.0	3	8	0	619	1070
09/01/2011 13:00	100.43	444134	3050	847	0.0	4	8	0	826	1673
09/01/2011 14:00	100.47	446043	6159	1711	0.0	5	8	0	1034	2744
09/01/2011 15:00	100.57	450891	15529	4314	0.0	5	8	0	1038	5352
09/01/2011 16:00	100.75	459677	14602	4056	0.0	5	8	0	1052	5108
09/01/2011 17:00	101.14	479305	6013	1670	0.0	5	8	0	1098	2768
09/01/2011 18:00	101.29	487007	10402	2890	0.0	5	8	0	1121	4011
09/01/2011 19:00	101.43	494310	12977	3605	0.0	5	8	0	1145	4750
09/01/2011 20:00	101.68	507564	10237	2844	0.0	5	8	0	1193	4037
09/01/2011 21:00	101.89	518935	8954	2487	0.0	5	8	0	1238	3725
09/01/2011 22:00	102.06	528282	8964	2490	0.0	5	8	0	1277	3768
09/01/2011 23:00	102.22	537207	9522	2645	0.0	5	8	0	1317	3962
10/01/2011 00:00	102.38	546296	6927	1924	0.0	5	8	0	1359	3283
10/01/2011 01:00	102.54	555472	4284	1190	0.0	5	8	0	1403	2593
10/01/2011 02:00	102.62	560135	4775	1327	0.0	5	8	0	1426	2752
10/01/2011 03:00	102.70	564798	3989	1108	0.0	5	8	0	1449	2557
10/01/2011 04:00	102.78	569498	4566	1268	0.0	5	8	0	1473	2741
10/01/2011 05:00	102.84	573067	4361	1211	0.0	5	8	0	1491	2703
10/01/2011 06:00	102.93	578421	2387	663	0.0	5	8	0	1519	2182
10/01/2011 07:00	102.98	581395	3125	868	0.0	5	8	0	1535	2403
10/01/2011 08:00	103.02	583798	2731	759	0.0	5	8	0	1548	2306
10/01/2011 09:00	103.08	587437	2021	561	0.0	5	8	0	1567	2128
10/01/2011 10:00	103.11	589257	4647	1291	0.0	5	8	0	1577	2868
10/01/2011 11:00	103.16	592289	6747	1874	0.0	5	8	0	1593	3468
10/01/2011 12:00	103.26	598367	3979	1105	0.0	5	8	0	1627	2732
10/01/2011 13:00	103.36	604553	1908	530	0.0	5	8	0	1661	2191
10/01/2011 14:00	103.39	606410	2011	559	0.0	5	8	0	1672	2230
10/01/2011 15:00	103.43	608884	516	143	0.0	5	8	0	1686	1829
10/01/2011 16:00	103.45	610122	-103	-29	0.0	5	8	0	1693	1664
10/01/2011 17:00	103.45	610122	0	0	0.0	5	8	0	1693	1693
10/01/2011 18:00	103.45	610122	52	14	0.0	5	8	0	1693	1707
10/01/2011 19:00	103.45	610122	-155	-43	0.0	5	8	0	1693	1650
10/01/2011 20:00	103.45	610122	-1753	-487	0.0	5	8	0	1693	1206
10/01/2011 21:00	103.44	609503	-1650	-458	0.0	5	8	0	1689	1231
10/01/2011 22:00	103.40	607028	-825	-229	0.0	5	8	0	1675	1446
10/01/2011 23:00	103.39	606410	-773	-215	0.0	5	8	0	1672	1457
11/01/2011 00:00	103.37	605172	-1856	-516	0.0	5	8	0	1665	1149
11/01/2011 01:00	103.36	604553	-2992	-831	0.0	5	8	0	1661	830
11/01/2011 02:00	103.31	601460	-2871	-797	0.0	5	8	0	1644	847

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m^3/s	Total regulators	Total sluices	Total radial	Hydro	Total m^3/s	m^3/s
11/01/2011 03:00	103.27	598985	258	72	0.0	5	8	0	1630	1702
11/01/2011 04:00	103.23	596535	3851	1070	0.0	5	8	0	1617	2686
11/01/2011 05:00	103.28	599604	3766	1046	0.0	4	8	0	1417	2463
11/01/2011 06:00	103.34	603316	3815	1060	0.0	3	8	0	1220	2280
11/01/2011 07:00	103.40	607028	3089	858	0.0	2	8	0	1023	1881
11/01/2011 08:00	103.46	610740	2239	622	0.0	1	8	0	826	1448
11/01/2011 09:00	103.50	613215	3477	966	0.0	0	8	0	622	1588
11/01/2011 10:00	103.54	615741	4149	1152	0.0	0	8	0	636	1788
11/01/2011 11:00	103.61	620161	7098	1972	0.0	0	8	0	660	2631
11/01/2011 12:00	103.68	624582	9233	2565	0.0	0	8	0	684	3249
11/01/2011 13:00	103.83	634158	9145	2540	0.0	0	8	0	738	3278
11/01/2011 14:00	103.96	642535	12173	3381	0.0	0	8	0	786	4167
11/01/2011 15:00	104.12	652997	9800	2722	0.0	0	8	0	846	3569
11/01/2011 16:00	104.31	665556	6259	1739	0.0	0	8	0	921	2659
11/01/2011 17:00	104.41	672250	6365	1768	0.0	0	8	0	961	2729
11/01/2011 18:00	104.51	678957	6540	1817	0.0	0	8	0	1001	2818
11/01/2011 19:00	104.60	685093	6264	1740	0.0	0	8	0	1039	2779
11/01/2011 20:00	104.70	691910	5179	1439	0.0	0	8	0	1081	2519
11/01/2011 21:00	104.78	697401	3938	1094	0.0	0	8	0	1115	2208
11/01/2011 22:00	104.85	702259	4742	1317	0.0	0	8	0	1145	2462
11/01/2011 23:00	104.90	705729	3524	979	0.0	0	8	0	1167	2145
12/01/2011 00:00	104.98	711281	1818	505	0.0	0	8	0	1202	1707
12/01/2011 01:00	105.00	712669	2650	736	0.0	0	8	0	1211	1947
12/01/2011 02:00	105.04	715493	1765	490	0.0	0	8	0	1228	1719
12/01/2011 03:00	105.07	717612	1000	278	0.0	0	8	0	1242	1520
12/01/2011 04:00	105.09	719024	706	196	0.0	0	8	0	1251	1447
12/01/2011 05:00	105.10	719730	353	98	0.0	0	8	0	1255	1353
12/01/2011 06:00	105.11	720436	0	0	0.0	0	8	0	1260	1260
12/01/2011 07:00	105.11	720436	-353	-98	0.0	0	8	0	1260	1162
12/01/2011 08:00	105.11	720436	-647	-180	0.0	0	8	0	1260	1080
12/01/2011 09:00	105.10	719730	-1530	-425	0.0	0	8	0	1255	830
12/01/2011 10:00	105.09	719024	-1353	-376	0.0	0	8	0	1251	875
12/01/2011 11:00	105.06	716906	-1593	-442	0.0	1	8	0	1461	1018
12/01/2011 12:00	105.05	716200	-3389	-941	0.0	1	8	0	1456	515
12/01/2011 13:00	105.01	713375	-3184	-884	0.0	1	8	0	1438	554
12/01/2011 14:00	104.96	709893	-2659	-739	0.0	1	8	0	1416	677
12/01/2011 15:00	104.92	707117	-3181	-884	0.0	1	8	0	1398	515
12/01/2011 16:00	104.88	704341	-3124	-868	0.0	1	8	0	1380	513
12/01/2011 17:00	104.83	700871	-3120	-867	0.0	1	8	0	1359	492

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m^3/s	Total regulators	Total sluices	Total radial	Hydro	Total m^3/s	m^3/s
12/01/2011 18:00	104.79	698095	-3149	-875	0.0	1	8	0	1341	466
12/01/2011 19:00	104.74	694637	-2609	-725	0.0	1	8	0	1320	595
12/01/2011 20:00	104.70	691910	-3125	-868	0.0	1	8	0	1303	435
12/01/2011 21:00	104.66	689183	-3125	-868	0.0	1	8	0	1286	418
12/01/2011 22:00	104.61	685774	-2615	-727	0.0	1	8	0	1264	538
12/01/2011 23:00	104.57	683047	-3114	-865	0.0	1	8	0	1248	382
13/01/2011 00:00	104.53	680320	-3086	-857	0.0	1	8	0	1231	374
13/01/2011 01:00	104.48	676936	-2563	-712	0.0	1	8	0	1210	498
13/01/2011 02:00	104.44	674258	-3068	-852	0.0	1	8	0	1194	342
13/01/2011 03:00	104.40	671581	-3012	-837	0.0	1	8	0	1177	341
13/01/2011 04:00	104.35	668233	-3016	-838	0.0	1	8	0	1157	320
13/01/2011 05:00	104.31	665556	-3051	-847	0.0	1	8	0	1141	294
13/01/2011 06:00	104.26	662208	-2521	-700	0.0	1	8	0	1121	421
13/01/2011 07:00	104.22	659568	-3010	-836	0.0	1	8	0	1105	269
13/01/2011 08:00	104.18	656940	-2902	-806	0.0	1	8	0	1090	284
13/01/2011 09:00	104.13	653655	-3180	-883	0.0	2	8	0	1290	407
13/01/2011 10:00	104.09	651026	-4466	-1240	0.0	2	8	0	1275	34
13/01/2011 11:00	104.03	647084	-3936	-1093	0.0	2	8	0	1251	158
13/01/2011 12:00	103.96	642535	-3004	-835	0.0	2	8	0	1225	390
13/01/2011 13:00	103.91	639313	-3870	-1075	0.0	3	8	0	1425	350
13/01/2011 14:00	103.86	636091	-4656	-1293	0.0	3	8	0	1406	113
13/01/2011 15:00	103.79	631580	-4127	-1146	0.0	3	8	0	1380	233
13/01/2011 16:00	103.72	627108	-3679	-1022	0.0	3	8	0	1354	332
13/01/2011 17:00	103.66	623319	-4160	-1156	0.0	3	8	0	1332	176
13/01/2011 18:00	103.60	619530	-4090	-1136	0.0	3	8	0	1311	175
13/01/2011 19:00	103.53	615109	-4139	-1150	0.0	3	8	0	1286	136
13/01/2011 20:00	103.47	611359	-3245	-901	0.0	3	8	0	1265	363
13/01/2011 21:00	103.40	607028	-3562	-990	0.0	4	8	0	1458	468
13/01/2011 22:00	103.36	604553	-5179	-1439	0.0	4	8	0	1444	6
13/01/2011 23:00	103.28	599604	-4562	-1267	0.0	4	8	0	1417	150
14/01/2011 00:00	103.20	594715	-4193	-1165	0.0	4	8	0	1390	225
14/01/2011 01:00	103.13	590470	-4295	-1193	0.0	4	8	0	1367	174
14/01/2011 02:00	103.06	586224	-3901	-1084	0.0	4	8	0	1344	261
14/01/2011 03:00	102.99	581990	-3415	-949	0.0	4	8	0	1322	374
14/01/2011 04:00	102.93	578421	-4265	-1185	0.0	4	8	0	1303	119
14/01/2011 05:00	102.87	574852	-4255	-1182	0.0	4	8	0	1285	103
14/01/2011 06:00	102.79	570093	-3420	-950	0.0	4	8	0	1261	311
14/01/2011 07:00	102.73	566547	-3445	-957	0.0	4	8	0	1243	286
14/01/2011 08:00	102.67	563050	-3840	-1067	0.0	4	8	0	1226	159

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
14/01/2011 09:00	102.61	559552	-3829	-1064	0.0	4	8	0	1208	145
14/01/2011 10:00	102.54	555472	-3397	-944	0.0	4	8	0	1189	245
14/01/2011 11:00	102.48	551999	-3418	-949	0.0	4	8	0	1172	223
14/01/2011 12:00	102.42	548577	-3423	-951	0.0	4	8	0	1156	205
14/01/2011 13:00	102.36	545155	-3375	-937	0.0	4	8	0	1140	202
14/01/2011 14:00	102.30	541733	-3749	-1041	0.0	4	8	0	1124	83
14/01/2011 15:00	102.24	538323	-3295	-915	0.0	4	8	0	1109	194
14/01/2011 16:00	102.17	534418	-3302	-917	0.0	4	8	0	1091	174
14/01/2011 17:00	102.12	531629	-3718	-1033	0.0	4	8	0	1079	46
14/01/2011 18:00	102.05	527724	-3256	-905	0.0	4	8	0	1062	158
14/01/2011 19:00	101.99	524390	-3313	-920	0.0	4	8	0	1049	128
14/01/2011 20:00	101.93	521117	-2955	-821	0.0	4	8	0	1035	214
14/01/2011 21:00	101.87	517844	-2960	-822	0.0	4	8	0	1022	199
14/01/2011 22:00	101.82	515116	-3289	-914	0.0	4	8	0	1011	97
14/01/2011 23:00	101.76	511843	-3202	-889	0.0	4	8	0	998	109
15/01/2011 00:00	101.70	508631	-3244	-901	0.0	4	8	0	986	85
15/01/2011 01:00	101.64	505430	-2849	-791	0.0	4	8	0	974	182
15/01/2011 02:00	101.58	502230	-3266	-907	0.0	4	8	0	962	55
15/01/2011 03:00	101.53	499562	-2841	-789	0.0	4	8	0	953	164
15/01/2011 04:00	101.46	495875	-2779	-772	0.0	4	8	0	940	168
15/01/2011 05:00	101.42	493789	-3566	-990	0.0	4	8	0	933	0
15/01/2011 06:00	101.35	490137	-2781	-773	0.0	4	8	0	921	149
15/01/2011 07:00	101.29	487007	-2785	-774	0.0	4	8	0	912	138
15/01/2011 08:00	101.24	484410	-3144	-873	0.0	4	8	0	904	30
15/01/2011 09:00	101.18	481347	-2807	-780	0.0	4	8	0	895	115
15/01/2011 10:00	101.12	478284	-2512	-698	0.0	4	8	0	886	188
15/01/2011 11:00	101.07	475732	-2496	-693	0.0	4	8	0	879	186
15/01/2011 12:00	101.02	473180	-2796	-777	0.0	4	8	0	873	96
15/01/2011 13:00	100.97	470661	-2786	-774	0.0	4	8	0	867	93
15/01/2011 14:00	100.91	467665	-2413	-670	0.0	4	8	0	860	190
15/01/2011 15:00	100.86	465169	-2752	-764	0.0	4	8	0	855	90
15/01/2011 16:00	100.81	462673	-3085	-857	0.0	4	8	0	850	0
15/01/2011 17:00	100.75	459677	-2313	-642	0.0	4	8	0	844	201
15/01/2011 18:00	100.69	456748	-2685	-746	0.0	4	8	0	839	93
15/01/2011 19:00	100.65	454796	-3013	-837	0.0	4	8	0	836	0
15/01/2011 20:00	100.58	451379	-2828	-786	0.0	4	8	0	832	46
15/01/2011 21:00	100.53	448938	-1048	-291	0.0	4	8	0	829	538
15/01/2011 22:00	100.47	446043	-2582	-717	0.0	4	8	0	827	110
15/01/2011 23:00	100.47	446043	-4494	-1248	0.0	4	8	0	827	0

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m^3/s	Total regulators	Total sluices	Total radial	Hydro	Total m^3/s	m^3/s
16/01/2011 00:00	100.36	440794	-2663	-740	0.0	4	8	0	825	85
16/01/2011 01:00	100.30	437931	-2862	-795	0.0	4	8	0	824	29
16/01/2011 02:00	100.24	435079	-2559	-711	0.0	4	8	0	823	113
16/01/2011 03:00	100.18	432283	-2214	-615	0.0	4	8	0	822	207
16/01/2011 04:00	100.13	429953	-2877	-799	0.0	4	8	0	822	22
16/01/2011 05:00	100.08	427622	-2816	-782	0.0	4	8	0	821	39
16/01/2011 06:00	100.01	424360	-2429	-675	0.0	4	8	0	820	145
16/01/2011 07:00	99.96	422072	-2769	-769	0.0	4	8	0	819	50
16/01/2011 08:00	99.90	419340	-2772	-770	0.0	4	8	0	818	48
16/01/2011 09:00	99.84	416608	-2534	-704	0.0	4	8	0	817	113
16/01/2011 10:00	99.78	413875	-1979	-550	0.0	3	8	0	612	62
16/01/2011 11:00	99.73	411618	-1705	-473	0.0	3	8	0	612	138
16/01/2011 12:00	99.69	409837	-2041	-567	0.0	3	8	0	611	44
16/01/2011 13:00	99.65	408056	-2004	-557	0.0	3	8	0	611	54
16/01/2011 14:00	99.60	405829	-2006	-557	0.0	3	8	0	610	53
16/01/2011 15:00	99.56	404048	-2027	-563	0.0	3	8	0	610	47
16/01/2011 16:00	99.51	401821	-1671	-464	0.0	3	8	0	609	145
16/01/2011 17:00	99.47	400070	-1995	-554	0.0	3	8	0	609	55
16/01/2011 18:00	99.43	398328	-1996	-554	0.0	3	8	0	608	54
16/01/2011 19:00	99.38	396151	-1669	-464	0.0	3	8	0	608	144
16/01/2011 20:00	99.34	394410	-2034	-565	0.0	3	8	0	607	42
16/01/2011 21:00	99.30	392668	-1763	-490	0.0	3	8	0	607	117
16/01/2011 22:00	99.25	390491	-1238	-344	0.0	2	8	0	404	60
16/01/2011 23:00	99.22	389214	-1029	-286	0.0	2	8	0	404	118
17/01/2011 00:00	99.19	387937	-1029	-286	0.0	2	8	0	404	118
17/01/2011 01:00	99.17	387086	-1313	-365	0.0	2	8	0	403	39
17/01/2011 02:00	99.14	385809	-1383	-384	0.0	2	8	0	403	19
17/01/2011 03:00	99.11	384531	-568	-158	0.0	1	8	0	202	44
17/01/2011 04:00	99.08	383254	-426	-118	0.0	1	8	0	201	83
17/01/2011 05:00	99.08	383254	-213	-59	0.0	1	8	0	201	142
17/01/2011 06:00	99.06	382403	106	30	0.0	1	8	0	201	231
17/01/2011 07:00	99.07	382829	-532	-148	1.0	0	8	0	69	0
17/01/2011 08:00	99.06	382403	-177	-49	1.0	0	8	0	69	19
17/01/2011 09:00	99.05	381977	-213	-59	1.0	0	8	0	69	10
17/01/2011 10:00	99.05	381977	-248	-69	1.0	0	8	0	69	0
17/01/2011 11:00	99.04	381552	35	10	1.0	0	8	0	69	79
17/01/2011 12:00	99.04	381552	35	10	1.0	0	8	0	69	79
17/01/2011 13:00	99.04	381552	-213	-59	1.0	0	8	0	69	10
17/01/2011 14:00	99.04	381552	-497	-138	1.0	0	8	0	69	0

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
17/01/2011 15:00	99.03	381126	-177	-49	1.0	0	8	0	69	19
17/01/2011 16:00	99.02	380700	-213	-59	1.0	0	8	0	69	10
17/01/2011 17:00	99.02	380700	-248	-69	1.0	0	8	0	69	0
17/01/2011 18:00	99.01	380275	35	10	1.0	0	8	0	69	78
17/01/2011 19:00	99.01	380275	35	10	1.0	0	8	0	69	78
17/01/2011 20:00	99.01	380275	-248	-69	1.0	0	8	0	69	0
17/01/2011 21:00	99.01	380275	-248	-69	1.0	0	8	0	69	0
17/01/2011 22:00	99.00	379849	35	10	1.0	0	8	0	69	78
17/01/2011 23:00	99.00	379849	35	10	1.0	0	8	0	69	78
18/01/2011 00:00	99.00	379849	-243	-68	1.0	0	8	0	69	1
18/01/2011 01:00	99.00	379849	-243	-68	1.0	0	8	0	69	1
18/01/2011 02:00	98.99	379432	69	19	1.0	0	8	0	69	88
18/01/2011 03:00	98.99	379432	-243	-68	1.0	0	8	0	69	1
18/01/2011 04:00	98.99	379432	-243	-68	1.0	0	8	0	69	1
18/01/2011 05:00	98.98	379016	35	10	1.0	0	8	0	69	78
18/01/2011 06:00	98.98	379016	35	10	1.0	0	8	0	69	78
18/01/2011 07:00	98.98	379016	-243	-68	1.0	0	8	0	69	1
18/01/2011 08:00	98.98	379016	-243	-68	1.0	0	8	0	69	1
18/01/2011 09:00	98.97	378599	69	19	1.0	0	8	0	69	88
18/01/2011 10:00	98.97	378599	-243	-68	1.0	0	8	0	69	1
18/01/2011 11:00	98.97	378599	-243	-68	1.0	0	8	0	69	1
18/01/2011 12:00	98.96	378182	69	19	1.0	0	8	0	69	88
18/01/2011 13:00	98.96	378182	-243	-68	1.0	0	8	0	69	1
18/01/2011 14:00	98.96	378182	-243	-68	1.0	0	8	0	69	1
18/01/2011 15:00	98.95	377766	35	10	1.0	0	8	0	69	78
18/01/2011 16:00	98.95	377766	0	0	1.0	0	8	0	69	69
18/01/2011 17:00	98.95	377766	0	0	1.0	0	8	0	69	69
18/01/2011 18:00	98.95	377766	0	0	1.0	0	8	0	69	69
18/01/2011 19:00	98.95	377766	-35	-10	1.0	0	8	0	69	59
18/01/2011 20:00	98.95	377766	243	68	1.0	0	8	0	69	136
18/01/2011 21:00	98.95	377766	208	58	1.0	0	8	0	69	126
18/01/2011 22:00	98.96	378182	208	58	0.0	0	8	0	0	58
18/01/2011 23:00	98.96	378182	208	58	0.0	0	8	0	0	58
19/01/2011 00:00	98.97	378599	208	58	0.0	0	8	0	0	58
19/01/2011 01:00	98.97	378599	208	58	0.0	0	8	0	0	58
19/01/2011 02:00	98.98	379016	208	58	0.0	0	8	0	0	58
19/01/2011 03:00	98.98	379016	208	58	0.0	0	8	0	0	58
19/01/2011 04:00	98.99	379432	208	58	0.0	0	8	0	0	58
19/01/2011 05:00	98.99	379432	243	68	0.0	0	8	0	0	68

Date/time	Lake level	Storage	Incremental inflow		Outflow					Inflow
	m AHD	ML	ML	m³/s	Total regulators	Total sluices	Total radial	Hydro	Total m³/s	m³/s
19/01/2011 06:00	99.00	379849	-70	-19	0.0	0	8	0	0	0
19/01/2011 07:00	99.00	379849	248	69	0.0	0	8	0	0	69
19/01/2011 08:00	99.00	379849	248	69	0.0	0	8	0	0	69
19/01/2011 09:00	99.01	380275	-71	-20	0.0	0	8	0	0	0

Table 9.2.1 – Somerset Dam inflow and release data for the January 2011 Flood Event

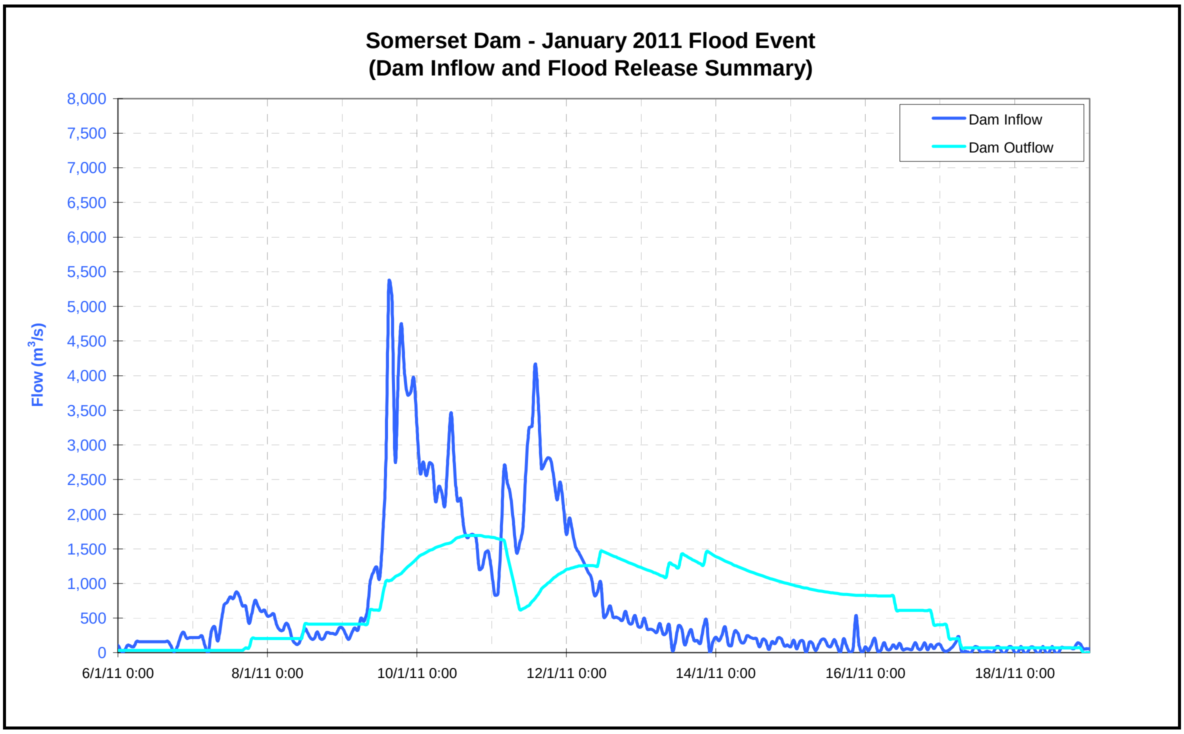

Figure 9.2.2 – Somerset Dam inflow and release summary for the January 2011 Flood Event

9.4 Inflow volumes

Figure 9.3.1 shows the increase in inflow volume in both Dams over the duration of the Event. The total combined inflow for the Event was 2,650,000ML between 2 and 19 January 2011. Of this total, nearly 820,000ML was generated in the Stanley River to Somerset Dam catchment while the remaining 1,830,000ML was generated in the Upper Brisbane River catchment.

The Somerset Dam catchment accounts for slightly less than 20% of the total Wivenhoe catchment, but nearly 31% of the Event runoff was generated in this catchment.

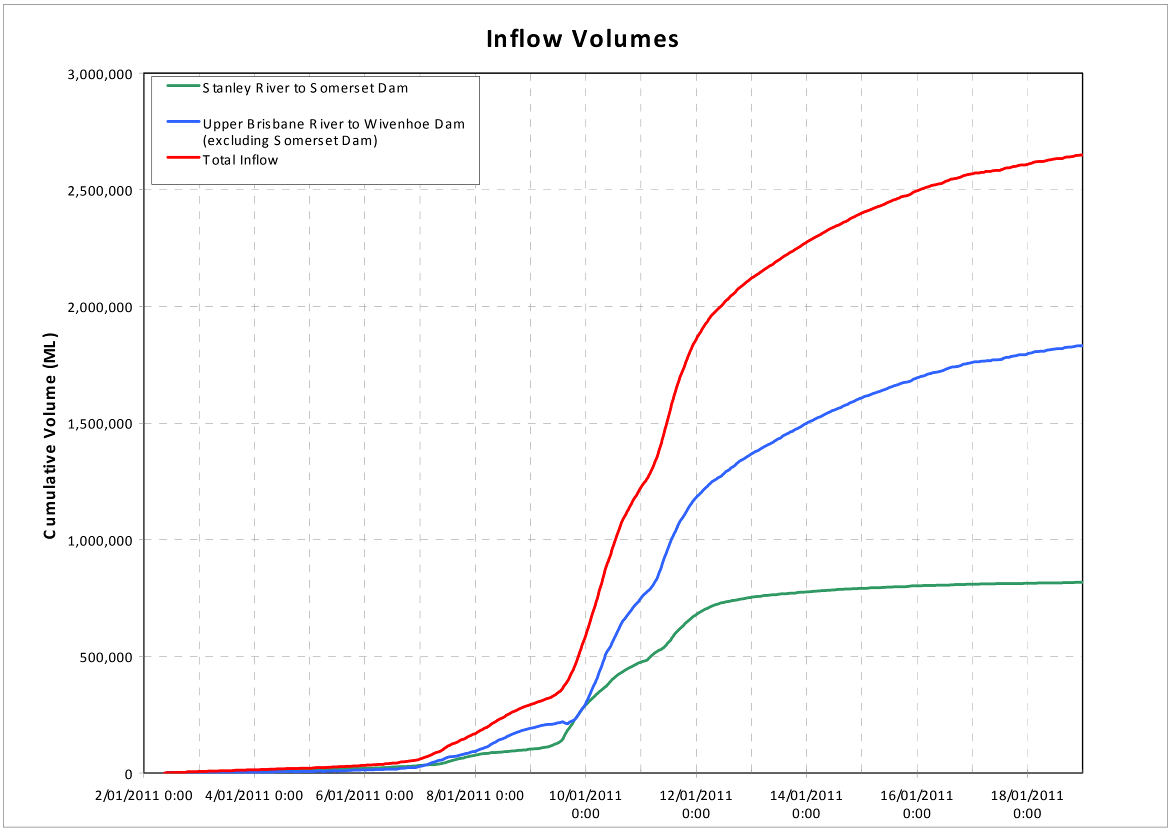

Figure 9.3.1 – Event inflow volume

Figure 9.3.2 shows the cumulative inflow volume of the Event over its duration. At 13:00 on 9 January 2011, only 13% of the Event inflow volume had been generated. Within the relatively short space of two and a half days, this had increased to nearly 70% of the total Event inflow volume.

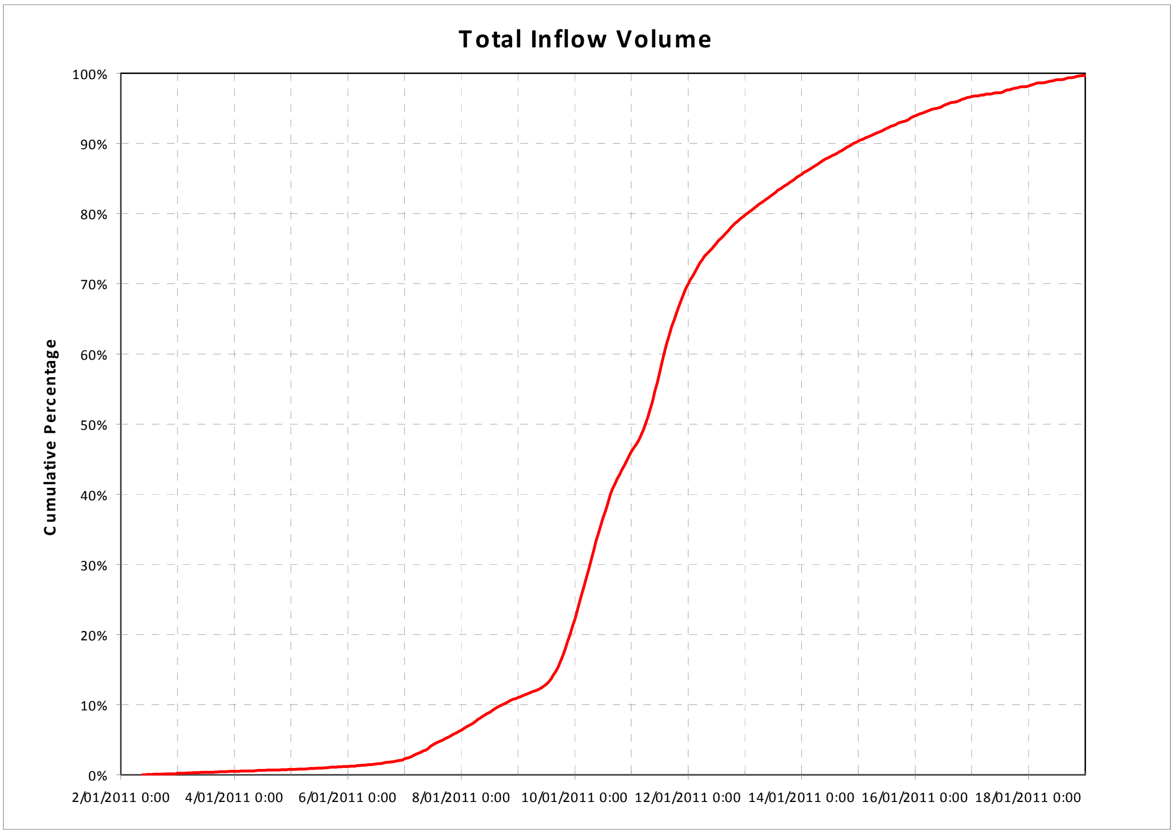

Figure 9.3.2 – Total Event inflow volume

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10 FLOOD MANAGEMENT STRATEGIES AND MANUAL COMPLIANCE

10.1 Manual objectives

Flood events that impact Somerset Dam and Wivenhoe Dam are caused by rainfall events that vary in intensity, duration and distribution over a catchment area exceeding 7,000km^2 above the Dams. When making decisions about releasing water from the Dams during flood events, consideration is also given to rain falling in Brisbane River catchment areas not controlled by the Dams. These catchment areas, which include the Lockyer Creek and Bremer River catchments, cover an area in the order of 6,500km^2 and rain falling in these catchments will also vary in intensity, duration and distribution. Accordingly, the Manual must account for an infinite number of flood event scenarios.

As it is not possible to provide a specific procedure for Dam operation during every possible flood event, the Manual takes the approach of providing objectives and strategies to guide operational decision-making during a flood event. The objective followed and strategy chosen at any point in time depends on the actual water levels in the Dams, as well as flood modelling predictions based on the best observed rainfall, forecast rainfall and stream flow information available at the time.

It is not possible to predict the range of objectives and strategies that will be used during the course of a flood event, before or at any time during the event, prior to the event peak. Objectives and strategies change as flood events progress, as rainfall is received in the catchments and as forecast rainfall predictions change. For small floods, objectives and strategies relate to minimising flood impacts in rural areas, while as the scale of the flood increases, the emphasis changes to protecting urban areas and maintaining the structural safety of the Dams.

The primary objectives of the Manual, in order of importance, are:

- Ensure the structural safety of the Dams;
- Provide optimum protection of urbanised areas from inundation;
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers;
- Retain the storage at Full Supply Level (FSL) at the conclusion of the flood event;
- Minimise impacts to riparian flora and fauna during the drain down phase of the flood event.

While ensuring the Dams are operated during flood events within these objectives, Seqwater is aware the safety of the public is a primary consideration when making flood releases from the Dams. Every attempt is made to ensure public roads are closed prior to inundation by Dam outflows and that authorities are provided with enough time to prepare for community isolations and to undertake evacuations. These actions are in accordance with the draft Communication Protocol prepared by the Department of Environment and Resource Management and followed by Seqwater during the January 2011 Flood Event. When operating the Dams during floods, every attempt is also made to ensure urban damage is minimised, and that Dam outflows with the potential to contribute to urban damage are delayed until it is apparent no other options are available without risking the safety of the Dams.

10.2 Wivenhoe Dam flood mitigation strategies

Wivenhoe Dam is capable of being operated in a number of ways to reduce flooding in the Brisbane River downstream of the Dam, depending on the origin, magnitude and spatial extent of the rainfall. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam.

There are four strategies (W1 to W4) used when operating Wivenhoe Dam during a flood event. The strategy chosen at any point in time depends on the actual levels in the Dams and the following predictions, which are to be made using the best recorded and forecast rainfall and stream flow information available at the time:

- Maximum storage levels in Wivenhoe and Somerset Dams;
- Peak flow rate at the Lowood gauge (excluding Wivenhoe Dam releases);

- Peak flow rate at the Moggill gauge (excluding Wivenhoe Dam releases).

Strategies change during a flood event as rain is received in the catchments and forecasts change. It is not possible to predict the range of strategies that will be used during the course of a flood event at the commencement of the event. Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the Dams.

The four Strategies (W1 to W4) used when operating Wivenhoe Dam during a flood event are summarised below.

Strategy W1 - The primary consideration is minimising disruption to downstream rural life	
Conditions	• Wivenhoe storage level predicted to be less than 68.50m. • Maximum release predicted to be less than 1,900m^3/s. • The primary consideration is minimising disruption to downstream rural life.

Strategy W1 intends to ensure the seven bridges between the Dam and Moggill are not submerged prematurely. The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge, which occurs at approximately 1,900m^3/s.

This strategy requires a great deal of control over releases and knowledge of discharges from Lockyer Creek. In general, the releases from Wivenhoe Dam are controlled to ensure the combined flow from Lockyer Creek and Wivenhoe Dam is less than the limiting values to delay the submergence of a particular bridge.

Strategy W2 - A transition strategy where the primary consideration changes from minimising impact to downstream rural life to protecting urban areas from inundation.	
Conditions	• Wivenhoe storage level predicted to be between 68.50m and 74.00m. • Maximum release predicted to be less than 3,500m^3/s. • This is a transition strategy in which the primary consideration changes from minimising disruption to downstream rural life to protecting urban areas from inundation. • Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance.

Strategy W2 intends to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3,500m^3/s).

Strategy W3 - The primary consideration is protecting urban areas from inundation	
Conditions	• Wivenhoe storage level predicted to be between 68.50m and 74.00m. • Maximum release should not exceed 4,000m^3/s. • The primary consideration is protecting urban areas from inundation. • Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance.

Strategy W3 intends to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s, noting that 4,000m^3/s at Moggill is the upper limit of non-damaging floods downstream defined in the Manual. The combined peak river flow targets for Strategy W3 are shown in the table below. In relation to these targets, it should be noted that, depending on natural flows from the Lockyer and Bremer catchments, it may not be possible to limit the flow at Moggill to below 4,000m^3/s. In these instances, the flow at Moggill is to be kept as low as possible.

Timing	Target maximum flow in the Brisbane River
Prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases).	The flow at Moggill is to be minimised.
After the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases).	The flow at Moggill is to be lowered to 4,000m^3/s as soon as possible.

Strategy W4 - The primary consideration is protecting the structural safety of the Dam	
Conditions	• Wivenhoe storage level predicted to exceed 74.00m. • No limit on maximum release rate. • The primary consideration is protecting the structural safety of the Dam. • Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance.

Strategy W4 intends to ensure the safety of the Dam while limiting downstream impacts as much as possible. This strategy generally comes into effect when the water level in Wivenhoe Dam reaches 74.0m. However, the Senior Flood Operations Engineer may seek to invoke the discretionary powers of Section 2.8 if the earlier commencement of Strategy W4 is able to prevent a fuse plug being triggered.

Under Strategy W4, the release rate is increased as the safety of the Dam becomes the priority. The gates are generally opened until the storage level of Wivenhoe Dam begins to fall. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds 74.0m, as the safety of the Dam is of primary concern at these storage levels.

10.3 Somerset Dam flood mitigation strategies

Somerset Dam is capable of being operated in a number of ways to regulate Stanley River floods. Somerset Dam and Wivenhoe Dam are to be operated in conjunction to optimise the flood mitigation benefits downstream of Wivenhoe Dam. Once a flood event is declared, an assessment is made of the magnitude of the flood event, including a prediction of the maximum storage levels in Somerset and Wivenhoe Dams.

Three strategies, based on the objectives of the Manual, are used when operating Somerset Dam during a flood event. The strategy selected at any point in time depends on predictions of the maximum storage levels in Somerset and Wivenhoe Dams, made using the best actual and forecast rainfall and stream flow information available at the time.

Strategies are likely to change during a flood event as rain is received in the catchments and forecasts change. It is not possible to predict the range of strategies that will be used during the course of a flood event when the event begins. Strategies are changed in response to changing rainfall and stream flow conditions to maximise the flood mitigation benefits of the Dams.

The three Strategies (S1 to S3) used when operating Somerset Dam during a flood event are summarised below.

Strategy S1 - Minimising impact on rural life upstream	
Conditions	• Somerset Dam level expected to exceed 99.0m and Wivenhoe Dam not expected to reach 67.0m (FSL) during the course of the flood event.

Strategy S1 intends to return the Dam to full supply level while minimising the impact on rural life upstream of the Dam. Consideration is also given to minimising the downstream environmental impacts from the release.

The crest gates at Somerset Dam are raised to enable uncontrolled discharge. The regulator valves and sluice gates are to be used to maintain the level in Somerset Dam below 102.0m (deck level of Mary Smokes Bridge). The Somerset Dam release rate is not to exceed the peak inflow into the Dam.

Strategy S2 - Minimise impacts below Wivenhoe Dam	
Conditions	• Somerset Dam level expected to exceed 99.0m and Wivenhoe Dam level expected to exceed 67.0m (FSL) but not exceed 75.5m (fuse plug initiation) during the course of the flood event.

Strategy S2 intends to maximise the benefits of the flood storage capabilities of the Dam, while protecting the structural safety of both Dams. Table 10.3.1 contains the operating conditions and actions for Strategy S2.

Condition	Action
Wivenhoe Dam rising and Somerset Dam level below 100.45m	• The crest gates are raised to enable uncontrolled discharge. • The low-level regulators and sluices are generally kept closed.
Wivenhoe Dam rising and Somerset Dam level above 100.45m	• The crest gates are raised to enable uncontrolled discharge. • Operations aim to achieve a correlation of water levels in Somerset Dam and Wivenhoe Dam, as set out in Figure 10.2.2. The Operating Target Line shown on this graph is to generally be followed as the flood event progresses. • The release rate from Somerset Dam is generally not to exceed the peak inflow into the Dam.
Wivenhoe Dam falling and Somerset Dam level above 100.45m	• The opening of the regulators and sluices generally should not cause Wivenhoe Dam to rise significantly. • The release rate from Somerset Dam is generally not to exceed the peak inflow into the Dam.
The flood event has emanated mainly from the Stanley River catchment without significant runoff in the Upper Brisbane River catchment	• The crest gates at Somerset Dam are raised to enable uncontrolled discharge. • The regulator valves and sluice gates are to be used to maintain the level in Somerset Dam below 102.0m (deck level of Mary Smokes Bridge). • The release rate from Somerset Dam is generally not to exceed the peak inflow into the Dam.

Table 10.3.1 – Somerset Dam operating conditions for flood strategy S2

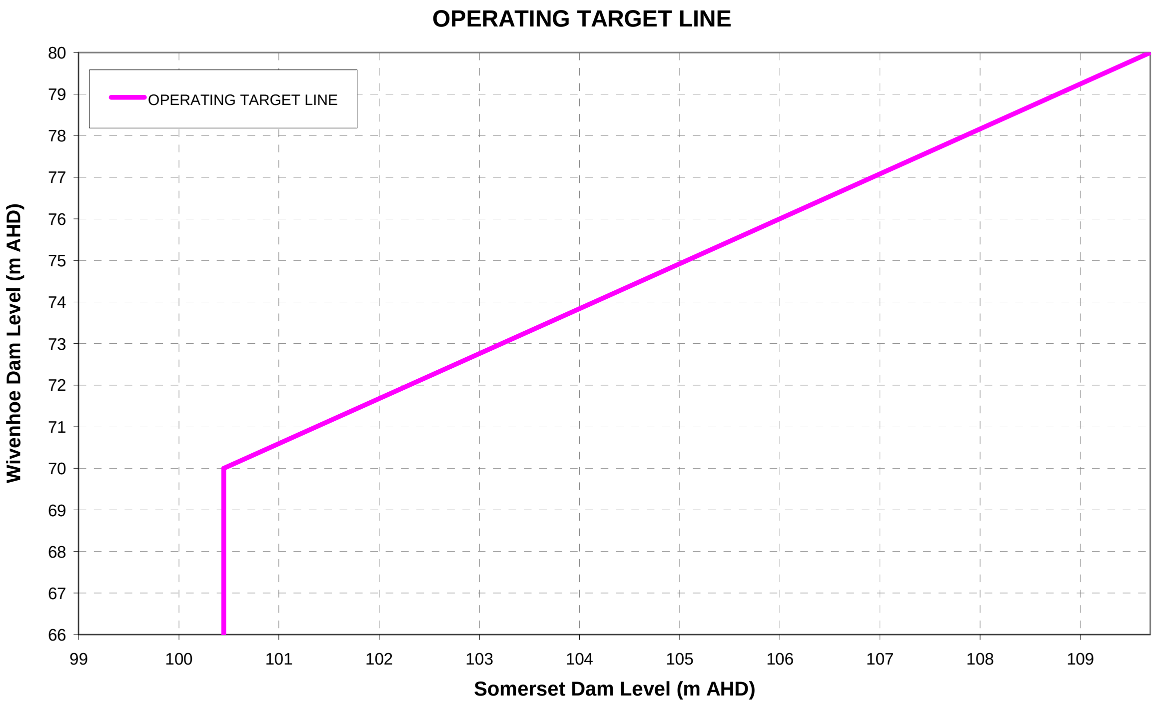

Figure 10.3.2 – Strategy S2, Wivenhoe / Somerset Operating Target Line

Notes on Figure 10.3.2:

- The Operating Target Line was selected following an optimisation study and considering the following factors:
  - Equal minimisation of flood level peaks in both Dams in relation to their associated Dam failure levels;
  - Minimisation of flows in the Brisbane River downstream of Wivenhoe Dam;
  - Consideration of the time needed at the onset of a flood event to properly assess the magnitude of the event and the likely impacts. This is to ensure the optimal strategy to maximise the flood mitigation benefits of the storages can be selected.
- The target point on the Operating Target Line at any point in time is based on the maximum storage levels in Somerset and Wivenhoe Dams, using the best forecast rainfall and stream flow information available at the time;
- Gate operations enable the progressive movement of the duty point towards the target line. It is not necessarily possible to adjust the duty point directly towards the target line in a single gate operation.

Strategy S3 - Protect the structural safety of the Dam	
Conditions	• Somerset Dam level expected to exceed 99.0m and Wivenhoe Dam level expected to exceed the fuse plug initiation level during the course of the flood event.

Strategy S3 intends to maximise the benefits of the flood storage capabilities of the Dam while protecting the structural safety of both Dams. In addition to the operating protocols used in Strategy S2 to prevent fuse plug initiation, consideration can be given to temporary departure from the operating protocols contained in this strategy under the following conditions:

- The safety of Somerset Dam is the primary consideration and cannot be compromised;
- The peak level in Somerset Dam cannot exceed 109.7m.

10.4 Wivenhoe Dam – Manual compliance

Table 10.4.1 summarises the strategies used in the operation of Wivenhoe Dam during the January 2011 Flood Event and provides explanations of how the use of these strategies complies with the Manual.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Thursday 06 Jan 2011 07:42 (Lake level 67.31m) Completed Friday 07 Jan 2011 02:00 (Lake level 67.52m)	Strategy W1A	• At the start of the Event, Strategy W1A was used because the lake level was between 67.25m and 67.50m. • The strategy during this period was to ensure Colleges Crossing remained trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175m^3/s. Because of the inflows into the Brisbane River from Lockyer Creek, there were no releases from the Dam during this period. • Based on flows recorded at Mt Crosby Weir, Colleges Crossing remained trafficable during this period. • The strategy transitioned from Strategy W1A to Strategy W1B once the lake level exceeded 67.50m.	Use Strategy W1A when the lake level is between 67.25m and 67.50m. (Maximum release 110m^3/s). Under Strategy W1A, the Manual requirement is to endeavour to ensure Colleges Crossing remains trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175m^3/s. Use Strategy W1B when the lake level is between 67.50m and 67.75m. (Maximum release 380m^3/s).
Commenced Friday 07 Jan 2011 02:00 (Lake level 67.52m) Completed Friday 07 Jan 2011 09:00 (Lake level 67.75m)	Strategy W1B	• The strategy transitioned from Strategy W1A to Strategy W1B once the lake level exceeded 67.50m. • Based on flows recorded at Mt Crosby Weir, Colleges Crossing was inundated during this period. • The strategy during this period was to ensure Burtons Bridge remained trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430m^3/s. Because of the inflows into the Brisbane River from Lockyer Creek, there were no releases from the Dam during this period. • Based on flows recorded at Savages Crossing, Burtons Bridge remained trafficable during this period. • The strategy transitioned from Strategy W1B to Strategy W1C once the lake level exceeded 67.75m.	Use Strategy W1B when the lake level is between 67.50m and 67.75m. (Maximum release 380m^3/s). Under Strategy W1B, the Manual requires that once Colleges Crossing is closed to traffic, endeavour to ensure Burtons Bridge remains trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430m^3/s. Use Strategy W1C when the lake level is between 67.75m and 68.00m. (Maximum release 500m^3/s).

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Friday 07 Jan 2011 09:00 (Lake level 67.75m) Completed Friday 07 Jan 2011 15:00 (Lake level 68.03m)	Strategy W1C	• The strategy transitioned from Strategy W1B to Strategy W1C once the lake level exceeded 67.75m. • The strategy during this period was to ensure Burtons Bridge remained trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430m^3/s. Once Burtons Bridge was closed to traffic, endeavour to keep Kholo Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 550m^3/s. Because of the inflows into the Brisbane River from Lockyer Creek, there were no releases from the Dam during this period. • Based on flows recorded at Savages Crossing, Burtons Bridge was inundated near the end of this period. • Based on flows recorded at Mt Crosby Weir, Kholo Bridge remained trafficable during this period. • As well as being in accordance with the Manual, delaying releases until 15:00 allowed bridges to be closed by the relevant authorities and arrangements to be made to cater for rural community isolation. The impacted rural communities had been isolated over the Christmas period and time was needed to make suitable arrangements to allow these communities to prepare for another potentially extended isolation period. • The strategy transitioned from Strategy W1C to Strategy W1D once the lake level exceeded 68.00m.	Use Strategy W1C when the lake level is between 67.75m and 68.00m. (Maximum release 500m^3/s). Under Strategy W1C, the Manual requirement is to endeavour to keep Burtons Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430m^3/s. Under Strategy W1C, the Manual also requires that once Burtons Bridge is closed to traffic (occurred around 13:00 during this period) endeavour to keep Kholo Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 550m^3/s. Use Strategy W1D when the lake level is between 68.00m and 68.25m. (Maximum release 1,900m^3/s).

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Friday 07 Jan 2011 15:00 (Lake level 68.03m) Completed Friday 07 Jan 2011 22:00 (Lake level 68.26m)	Strategy W1D	• The strategy transitioned from Strategy W1C to Strategy W1D once the lake level exceeded 68.00m. • At the start of this period, it became apparent Kholo Bridge would be inundated by natural Brisbane River flows (excluding Wivenhoe Dam releases). Therefore, the strategy adopted was to advise Council to close Kholo Bridge in daylight hours for public safety, and then assume – for the purposes of Strategy W1D – that Kholo Bridge was closed to traffic. Based on flows recorded at Mt Crosby Weir, Kholo Bridge was inundated near the end of this period (middle of the night). • Accordingly, the strategy during this period was to keep Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1,900m^3/s. • During this period, releases were increased from 50m^3/s to 403m^3/s. Radial gates were opened continuously at Wivenhoe Dam, in accordance with the standard gate opening sequence at a rate of 0.5 metres of individual gate opening per hour. • Mt Crosby Weir Bridge remained trafficable during the period. • The strategy transitioned from Strategy W1D to Strategy W1E once the lake level exceeded 68.25m.	Use Strategy W1D when the lake level is between 68.00m and 68.25m. (Maximum release 1,900m^3/s). Under Strategy W1D, the Manual requires that once Kholo Bridge is closed to traffic, endeavour to keep Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1,900m^3/s. Use Strategy W1E when the lake level is between 68.25m and 68.50m. (Maximum release 1,900 m^3/s).
Commenced Friday 07 Jan 2011 22:00 (Lake level 68.26m) Completed Saturday 08 Jan 2011 08:00 (Lake level 68.52m)	Strategy W1E	• The strategy transitioned from Strategy W1D to Strategy W1E once the lake level exceeded 68.25m. • The strategy during this period was to keep Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1,900m^3/s. • During this period, releases were increased to 927m^3/s. Radial gates were opened continuously at Wivenhoe Dam, in accordance with the standard gate opening sequence at a rate or 0.5 metres of individual gate opening per hour. • Mt Crosby Weir Bridge remained trafficable during the period. • The strategy transitioned from Strategy W1E to Strategy W2 once the lake level reached 68.50m.	Use Strategy W1E when the lake level is between 68.25m and 68.50m. (Maximum release 1,900m^3/s). Under Strategy W1E, the Manual requirement is to endeavour to keep Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1,900m^3/s. Use Strategy W2 or Strategy W3 as appropriate when the lake level reaches 68.50m.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Saturday 08 Jan 2011 08:00 (Lake level 68.52m)	Attempt to transition to Strategy W2	• The lake level at this time was 68.52m and the release rate from the Dam at this time was 927m^3/s. • At this time, it was not possible to satisfy Strategy W2 by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. The calculated naturally occurring peaks at Lowood and Moggill were 530m^3/s and 800m^3/s respectively, whereas the release rate from the Dam at this time was 927m^3/s. • Accordingly, it was not appropriate to switch to Strategy W2, and Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011.	The Manual states, "If the level reaches EL 68.5m in Wivenhoe Dam, switch to Strategy W2 or W3 as appropriate". Use Strategy W2 when the lake level is predicted to be between 68.50m and 74.00m. (Maximum release 3,500m^3/s). Strategy W2 is a transition strategy in which the primary consideration changes from minimising disruption to downstream rural life to protecting urban areas from inundation. Lower level objectives are still considered under Strategy W2 when making decisions on water releases. Objectives are always considered in order of importance. The intent of Strategy W2 is to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3,500m^3/s).

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Saturday 08 Jan 2011 08:00 (Lake level 68.52m) Completed Sunday 09 Jan 2011 08:00 (Lake level 68.56m)	Strategy W3	• The lake level at the start of this period was 68.52m and the release rate from the Dam was 927m^3/s. The lake level at the end of this period was 68.56m and the release rate from the Dam was 1,334m^3/s. The lake level rose 40mm during this 24-hour period. • The catchment average rainfall experienced in the Wivenhoe Dam catchment (excluding the Somerset Dam catchment) during this 24-hour period was 21mm. • The latest Quantitative Precipitation Forecast (QPF) available at the end of this period was for 40mm in the Dam catchments in the next 24 hours (issued at 16:00 on 8 January 2011). • At the end of this period, model results estimated the Wivenhoe Dam peak at 68.7m (excluding forecast) and 69.3m (including forecast). The estimated peak of 69.3m (including forecast) had previously been exceeded in March 1989, April 1989, February 1999, October 2010 and December 2010. On each of these occasions, no known urban damage had occurred downstream of Moggill as a result of Dam releases. • At the end of this period, model results estimate total Dam inflow at 569,000ML (excluding forecast) and 814,000ML (including forecast). The estimated total Dam inflow of 814,000ML (including forecast) on a full Dam had previously been exceeded in April 1989 and February 1999. On each of these occasions, no known urban damage had occurred downstream of Moggill as a result of Dam releases. • Estimated peak flow at Moggill (including Wivenhoe Dam releases) was 1,720m^3/s (excluding forecast) and 2,220m^3/s (including forecast). • On the basis of the information above, the available data did not indicate there would be a need to increase releases from Wivenhoe Dam above the current modelled levels to protect urban areas from inundation, either during the current period or in the 24 hours following the current period. • The naturally occurring peak at Moggill was estimated to have occurred at 05:00 on 08 January 2011 (i.e. in the past). Strategy W3 requires the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives, and on the basis of this requirement, consideration during this period was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m^3/s would have meant transitioning back to operating Strategy W1 in approximately 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.	Use Strategy W3 when the intent of Strategy W2 cannot be met and the lake level is predicted to be between 68.50m and 74.00m. (Maximum release 4,000m^3/s). The primary consideration is protecting urban areas from inundation, however the Manual also requires lower level objectives to be considered when making decisions on water releases. Objectives are always considered in order of importance. The intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s. After the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases), the flow at Moggill is to be lowered to 4,000 m^3/s as soon as possible.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Sunday 09 Jan 2011 08:00 (Lake level 68.58m) Completed Sunday 09 Jan 2011 19:00 (Lake level 68.97m)	Strategy W3	• The lake level at the start of this period was 68.56m and the release rate from the Dam was 1,334m^3/s. The lake level at the end of this period was 68.97m and the release rate from the Dam was 1,411m^3/s. The lake level rose 410mm during this 11-hour period. • The catchment average rainfall experienced in the Wivenhoe Dam catchment (excluding the Somerset Dam catchment) during this 24-hour period was 96mm, the bulk of which (62mm) occurred in the last five hours of the period. • The latest QPF forecast available at the end of this period was for 65mm in the Dam catchments in the next 24 hours (issued at 16:00 on 9 January 2011). • At the mid-point of this period (14:00), model results estimated Wivenhoe Dam to peak at 70.0m (excluding forecast) and 71.3m (including forecast). The estimated peak of 71.3m (including forecast) had previously been exceeded in April 1989, and on this occasion, no known urban damage had occurred downstream of Moggill as a result of Dam releases. • At the mid-point of this period (14:00), model results estimated total Dam inflow at 804,000ML (excluding forecast) and 1,108,000ML (including forecast). The estimated total Dam inflow of 1,108,000ML (including forecast) – on a full Dam – had never previously been exceeded, with the previous largest volumes being 870,000ML in April 1989 and 925,000 in February 1999. Although the inflow estimate of 1,108,000ML was based on a forecast, it resulted in an expectation that there may be a need within the next six hours to transition to a situation where minimising disruption to downstream rural life was no longer considered. This would result in the closure of all bridges between the Dam and Moggill, and the closure of Brisbane Valley Highway. • At the mid-point of this period (14:00), estimated peak flow at Moggill (including Wivenhoe Dam releases) was 1,850m^3/s (excluding forecast) and 2,590m^3/s (including forecast). • On the basis of the information above, the available data at the mid-point of this period did not indicate there would be a definite need to increase releases from Wivenhoe Dam above the current modelled levels, to protect urban areas from inundation in the six hours from 14:00. • At the end of this period, model results estimated Wivenhoe Dam to peak at 72.1m (excluding forecast) and 73.9m (including forecast). These values had never been previously exceeded. • At the end of this period, model results estimated total Dam inflow at 1,272,000ML (excluding forecast) and 1,712,000ML (including forecast). These values had never been previously exceeded. • On the basis of the estimated Wivenhoe Dam peak levels and inflow volumes from the model results undertaken towards the end of this period, the decision was made at 19:00 on 09 January 2011 to transition to a situation where minimising disruption to downstream rural life was no longer a consideration.	Use Strategy W3 when the intent of Strategy W2 cannot be met and the lake level is predicted to be between 68.50m and 74.00m. (Maximum release 4,000m^3/s). The primary consideration is protecting urban areas from inundation, however the Manual also requires lower level objectives to be considered when making decisions on water releases. Objectives are always considered in order of importance. The intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s. After the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases), the flow at Moggill is to be lowered to 4,000m^3/s as soon as possible.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Sunday 09 Jan 2011 19:00 (Lake level 68.97m) Completed Tuesday 11 Jan 2011 08:00 (Lake level 73.70m)	Strategy W3	• On the basis of the information from the previous period, at the start of this period, it was decided to transition to a situation where minimising disruption to downstream rural life was no longer considered. • The lake level at the start of this period was 68.97m and the release rate from the Dam was 1,411m^3/s. The lake level at the end of this period was 73.70m and the release rate from the Dam was 2,753m^3/s. The lake level rose 4,730mm during this 37-hour period. • The catchment average rainfall experienced in the Wivenhoe Dam catchment (excluding Somerset Dam catchment) during this 24-hour period was 115mm, the bulk of which (77mm) occurred in the last twelve hours of this 37-hour period. • The latest QPF forecast available at the end of this period was for 65mm in the Dam catchments in the next 24 hours (issued at 16:00 on 10 January 2011). • By two thirds of the way through this period (20:00, 10 January 2011), model results estimated Wivenhoe Dam to peak at 73.6m (excluding forecast) and 74.3m (including forecast). A discussion with the Dam Safety Regulator was held at 21:00 to obtain permission to exceed a level of 74.0m in Wivenhoe Dam for a short period without invoking Strategy W4 (provided the safety of the Dam could be guaranteed). This issue was considered carefully at all times during the period in view of the continued rainfall. • At 04:00 on 11 January 2011, a period of intense rainfall commenced within the Wivenhoe Dam catchment area. By 08:00, model results estimated Wivenhoe Dam would peak at 74.5m (excluding forecast) and 75.1m (including forecast). A decision was made to transition to Strategy W4 and the Dam Safety Regulator, Seqwater CEO and the Councils were advised of this decision. The Wivenhoe lake level was 73.70m.	Use Strategy W3 when the intent of Strategy W2 cannot be met and the lake level is predicted to be between 68.50m and 74.00m. (Maximum release 4,000m^3/s). The primary consideration is protecting urban areas from inundation, however the Manual also requires lower level objectives to still be considered when making decisions on water releases. Objectives are always considered in order of importance. The intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s. After the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases), the flow at Moggill is to be lowered to 4,000m^3/s as soon as possible. Use Strategy W4 when Wivenhoe Dam's storage level is likely to exceed 74.00m. (No limit on maximum release rate). The primary consideration of Strategy W4 is to protect the structural safety of the Dam, however lower level objectives are still considered in order of importance when making decisions on water releases. Under Strategy W4, gates are opened until the storage level of Wivenhoe Dam begins to fall.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements

Commenced Tuesday 11 Jan 2011 08:00 (Lake level 73.70m)
 	
Completed Thursday 13 Jan 2011 12:00 (Lake level 74.61m)
	Strategy W4	• On the basis of the information from the previous period, at the start of this period it was decided to transition to Strategy W4.
		• The lake level at the start of this period was 73.70m and the release rate from the Dam was 2,753m^3/s. The lake level at the end of this period was 74.61m and the release rate from the Dam was 2,534m^3/s. During this period, at 19:00 on 11 January 2011, the lake level peaked at 74.97m and the release rate peaked at 7,464m^3/s.
		• The lake level stabilised at 20:00 on 11 January 2011 and then dropped slightly at 21:00. A decision was made at 21:00 to commence closing the gates as quickly as possible to reduce urban flood impacts. This decision was made in an attempt to minimise urban damage below Moggill, which is an objective that must be considered under Strategy W4. Gates would have been re-opened if further lake level rises were experienced.
		• Following a decision to close the gates, it was calculated that reducing to a discharge of 2,547m^3/s from Wivenhoe Dam would:
		    • Not increase the downstream flood peak;
		    • Not cause the water level in Wivenhoe Dam to rise; and
		    • Allow the dam to be drained back to FSL in seven days, in accordance with the Manual.
		• On this basis, this target release rate was adopted.
		• At the end of this period, it was apparent the flood peak had passed and therefore the operational strategy transitioned to the Drain Down Phase.
			Use Strategy W4 when Wivenhoe Dam's storage level is likely to exceed 74.00m. (No limit on maximum release rate).
			
			The primary consideration of Strategy W4 is to protect the structural safety of the Dam, however, lower level objectives are still considered in order of importance when making decisions on water releases.
			
			Under Strategy W4, gates are opened until the storage level of Wivenhoe Dam begins to fall.
			
			The Manual states that rapid closure of radial gates is permissible when there is a requirement to reduce downstream flooding.
			
			Drain Down operations require stored floodwaters to be emptied from the Dams within seven days of the flood event peak passing through the Dams.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements

Commenced Thursday 13 Jan 2011 08:00 (Lake level 74.61m)
 	
Completed Wednesday 19 Jan 2011 12:00 (Lake level 66.89m)
	Drain Down	• On the basis of the information from the previous period, a decision was made at the start of this period to transition to the Drain Down Phase.
		• The lake level at the start of this period was 74.61m and the release rate from the Dam was 2,534m^3/s. The lake level at the end of this period was 66.89m and only operational water supply releases were being made from the Dam.
		• Considerations that impacted the duration and timing of the Drain Down Phase in this instance included:
		  • Causing no additional increases in river levels below the Dam (except where they were unavoidable due to tidal influences);
		  • Maintaining an adequate release rate to ensure the temporary pumps providing water supplies to the Lowood area could continue to operate;
		  • Minimising bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested by Brisbane City Council);
		  • Re-opening Brisbane Valley Highway, the D'Agular Highway and key rural bridges as quickly as possible;
		  • Achieving Full Supply Levels in the Dams at the conclusion of the Event.
		• The Flood Event concluded on Wednesday 19 January 2011 at 12:00.
			Drain Down operations require stored floodwaters to be emptied from the Dams within seven days of the flood event peak passing through the Dams.

Table 10.4.1 – Wivenhoe Dam operating strategies for the January 2011 Flood Event, in compliance with the Manual

10.5 Somerset Dam – Manual compliance

The table that commences on the following page (Table 10.5.2) summarises the strategies used to operate Somerset Dam during the January 2011 Flood Event, and outlines how the use of these strategies complies with the Manual.

A graph showing the track of the Wivenhoe/Somerset Operating Target Line over the course of the Event is shown at the end of the Table 10.5.3. The Dam levels tracked very close to and on the line, in the hours leading up to and following the Event peak at 19:00 on 11 January 2011. This is demonstrated in Table 10.5.1.

Date	Actual Dam level coordinates		Interaction line coordinates		Comments
10/01/2011 23:00	103.39	73.22	103.39	73.18	Moved above interaction line
11/01/2011 00:00	103.37	73.26	103.37	73.16	
11/01/2011 01:00	103.36	73.31	103.36	73.15	
11/01/2011 02:00	103.31	73.35	103.31	73.09	
11/01/2011 03:00	103.27	73.38	103.27	73.05	
11/01/2011 04:00	103.23	73.40	103.23	73.01	
11/01/2011 05:00	103.28	73.46	103.28	73.06	
11/01/2011 06:00	103.34	73.51	103.34	73.12	
11/01/2011 07:00	103.40	73.61	103.40	73.19	
11/01/2011 08:00	103.46	73.70	103.46	73.25	
11/01/2011 09:00	103.50	73.81	103.50	73.30	
11/01/2011 10:00	103.54	73.95	103.54	73.34	
11/01/2011 11:00	103.61	74.10	103.61	73.42	
11/01/2011 12:00	103.68	74.27	103.68	73.49	
11/01/2011 13:00	103.83	74.39	103.83	73.65	
11/01/2011 14:00	103.96	74.57	103.96	73.79	
11/01/2011 15:00	104.12	74.71	104.12	73.97	
11/01/2011 16:00	104.31	74.81	104.31	74.17	
11/01/2011 17:00	104.41	74.89	104.41	74.28	
11/01/2011 18:00	104.51	74.95	104.51	74.39	
11/01/2011 19:00	104.60	74.97	104.60	74.49	Wivenhoe Dam Event peak
11/01/2011 20:00	104.70	74.97	104.70	74.59	
11/01/2011 21:00	104.78	74.95	104.78	74.68	
11/01/2011 22:00	104.85	74.95	104.85	74.76	
11/01/2011 23:00	104.90	74.92	104.90	74.81	
12/01/2011 00:00	104.98	74.91	104.98	74.90	
12/01/2011 01:00	105.00	74.87	105.00	74.92	Moved below interaction line

Table 10.5.1 – Somerset Dam levels as tracking against the Wivenhoe / Somerset Operating Target Line for the January 2011 Flood Event

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Thursday 06 Jan 2011 07:42 (Lake level 99.34m) Completed Friday 07 Jan 2011 17:00 (Lake level 100.06m)	Strategy S2	• During this nine-hour period, the Wivenhoe Dam level was rising (67.31m at the start of the period, rising to 68.03m by the end of the period) and the Somerset Dam level was below 100.45m. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised at the start of the Event to enable uncontrolled discharge, and the low-level sluices were kept closed. Some regulated releases continued from December as part of previous event drain down, (in the order of $35m^3/s$) and these continued during this period.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the event. If Wivenhoe Dam is rising and the Somerset Dam level is below 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are **generally** kept closed.
Commenced Thursday 07 Jan 2011 17:00 (Lake level 100.06m) Completed Friday 08 Jan 2011 07:00 (Lake level 100.44m)	Strategy S2	• During this 15-hour period, the Wivenhoe Dam level was rising (68.03m at the start of the period, rising to 68.48m by the end of the period) and the Somerset Dam level was below 100.45m. • At 17:00, it was apparent that unless releases began at Somerset Dam, the Somerset lake level would exceed 100.45m within 12 hours. Accordingly, one sluice gate was opened during this period to allow Dam levels to move towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the event. If Wivenhoe Dam is rising and the Somerset Dam level is below 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are **generally** kept closed.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Friday 08 Jan 2011 07:00 (Lake level 100.06m) Completed Friday 08 Jan 2011 13:00 (Lake level 100.45m)	Strategy S2	• During this six-hour period, the Wivenhoe Dam level was rising (68.48m at the start of the period, rising to 68.61m by the end of the period) and the Somerset Dam level moved above 100.45m (this occurred between 07:00 and 08:00 on 8 January 2011) and then stayed above 100.45m for the remainder of the period. • A second sluice was opened during this period to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** allow the Wivenhoe/Somerset Operating Target Line to be followed.
Commenced Friday 08 Jan 2011 13:00 (Lake level 100.45m) Completed Friday 08 Jan 2011 17:00 (Lake level 100.40m)	Strategy S2	• During this four-hour period, the Wivenhoe Dam level was rising (68.61m at the start of the period, rising to 68.65m by the end of the period). The Somerset Dam level moved to just below 100.45m (this occurred between 13:00 and 14:00 on 8 January 2011) and then stayed below 100.45m for the remainder of the period. • At the beginning of this period, it was apparent the Somerset lake level would exceed 100.45m within four hours. Accordingly, two sluices remained open during this period to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising, and the Somerset Dam level is below 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are **generally** kept closed.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Friday 08 Jan 2011 17:00 (Lake level 100.40m) Completed Saturday 09 Jan 2011 10:00 (Lake level 100.31m)	Strategy S2	• During this 17-hour period, the Wivenhoe Dam level was falling (68.65m at the start of the period, falling to 68.53m by the end of the period). The Somerset Dam level remained below 100.45m. • Strategy S2 does not provide specific guidance for this situation, however Strategy S2 intends to maximise the benefits of the flood storage capabilities of the Dams. Accordingly, two sluices remained open during this period and a third sluice was opened near the end of the period as modelling results indicated rapidly increasing inflows into Somerset Dam occurring soon after the end of the period and continuing. Increasing the sluice gate release would ultimately allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. Strategy S2 intends to maximise the benefits of the flood storage capabilities of the Dams.
Commenced Saturday 09 Jan 2011 10:00 (Lake level 100.31m) Completed Saturday 09 Jan 2011 13:00 (Lake level 100.43m)	Strategy S2	• During this three-hour period, the Wivenhoe Dam level was rising (68.53m at the start of the period, rising to 68.56m by the end of the period). The Somerset Dam level remained below 100.45m, but rose rapidly. • Three sluices remained open during this period, and a fourth sluice was opened near the end of the period to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising, and the Somerset Dam level is below 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are **generally** kept closed.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Saturday 09 Jan 2011 13:00 (Lake level 100.43m) Completed Tuesday 11 Jan 2011 04:00 (Lake level 103.23m)	Strategy S2	• During this 63-hour period, the Wivenhoe Dam level was rising (68.56m at the start of the period, rising to 73.40m by the end of the period). The Somerset Dam level moved above 100.45m (this occurred between 13:00 and 14:00 on 9 January 2011) and then stayed above 100.45m for the remainder of the period. • Four sluices remained open during this period, and a fifth sluice was opened near the beginning of the period to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising, and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** allow the Wivenhoe/Somerset Operating Target Line to be followed.
Commenced Tuesday 11 Jan 2011 04:00 (Lake level 103.23m) Completed Tuesday 11 Jan 2011 09:00 (Lake level 103.50m)	Strategy S2	• During this five-hour period, the Wivenhoe Dam level was rising (73.40m at the start of the period, rising to 73.81m by the end of the period). The Somerset Dam level remained above 100.45m. • During this period, all sluice gates were closed to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line and limit rises in Wivenhoe Dam.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising, and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** allow the Wivenhoe/Somerset Operating Target Line to be followed.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Tuesday 11 Jan 2011 09:00 (Lake level 103.50m) Completed Tuesday 11 Jan 2011 19:00 (Lake level 104.60m)	Strategy S2	• During this 10-hour period, the Wivenhoe Dam level was rising (73.81m at the start of the period, rising to 74.97m by the end of the period). The Somerset Dam level remained above 100.45m. • During this period, all sluice gates remained closed to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line and limit rises in Wivenhoe Dam.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is rising, and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** allow the Wivenhoe/Somerset Operating Target Line to be followed.
Commenced Tuesday 11 Jan 2011 19:00 (Lake level 104.60m) Completed Wednesday 12 Jan 2011 10:00 (Lake level 105.09m)	Strategy S2	• During this 15-hour period, the Wivenhoe Dam level was falling (74.97m at the start of the period, falling to 74.78m by the end of the period). The Somerset Dam level remained above 100.45m. • During this period, all sluice gates remained closed to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line and limit rises in Wivenhoe Dam.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m, but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is falling, and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** not cause Wivenhoe Dam to rise significantly.

Period	Strategies used during the period	Explanation of strategies used during the period	Manual requirements
Commenced Wednesday 12 Jan 2011 10:00 (Lake level 105.09m) Completed Thursday 13 Jan 2011 12:00 (Lake level 103.96m)	Strategy S2	• During this 26-hour period, the Wivenhoe Dam level was falling (74.78m at the start of the period, falling to 74.61m by the end of the period). The Somerset Dam level remained above 100.45m. • During this period, two sluice gates were opened to allow Dam levels to track towards the Wivenhoe/Somerset Operating Target Line. The timing of these openings was calculated to ensure the Wivenhoe lake level did not rise. • At the end of this period, it was apparent the flood peak had passed and therefore the operational strategy transitioned to the Drain Down Phase.	Use Strategy S2 when the Somerset Dam level is expected to exceed 99.0m, and the Wivenhoe Dam level is expected to exceed 67.0m but not exceed 75.5m (fuse plug initiation) during the course of the Event. If Wivenhoe Dam is falling, and the Somerset Dam level is above 100.45m, Strategy S2 requires the crest gates to be raised, and the low-level regulators and sluices are used to **generally** not cause Wivenhoe Dam to rise significantly. Drain Down operations require stored floodwaters to be emptied from the Dams within seven days of the flood event peak passing through the Dams.

Commenced Thursday 13 Jan 2011 08:00 (Lake level 103.96m)
 	
Completed Wednesday 19 Jan 2011 12:00 (Lake level 99.02m)
	Drain down	• On the basis of the information contained above, it was decided to transition to the Drain Down Phase at the beginning of this period.
		• Considerations that impacted on the duration and timing of the Drain Down Phase in this instance included:
		  • Causing no renewed increases in the Wivenhoe Dam lake level;
		  • Re-opening D'Aguilar Highway and other impacted rural bridges as quickly as possible;
		  • Achieving Full Supply Levels in the Dams at the conclusion of the Event.
		• The Flood Event concluded on Wednesday 19 January 2011 at 12:00.
			Drain Down operations require stored floodwaters to be emptied from the Dams within seven days of the flood event peak passing through the Dams.

Table 10.5.2 – Somerset Dam operating strategies for the January 2011 Flood Event, in compliance with the Manual

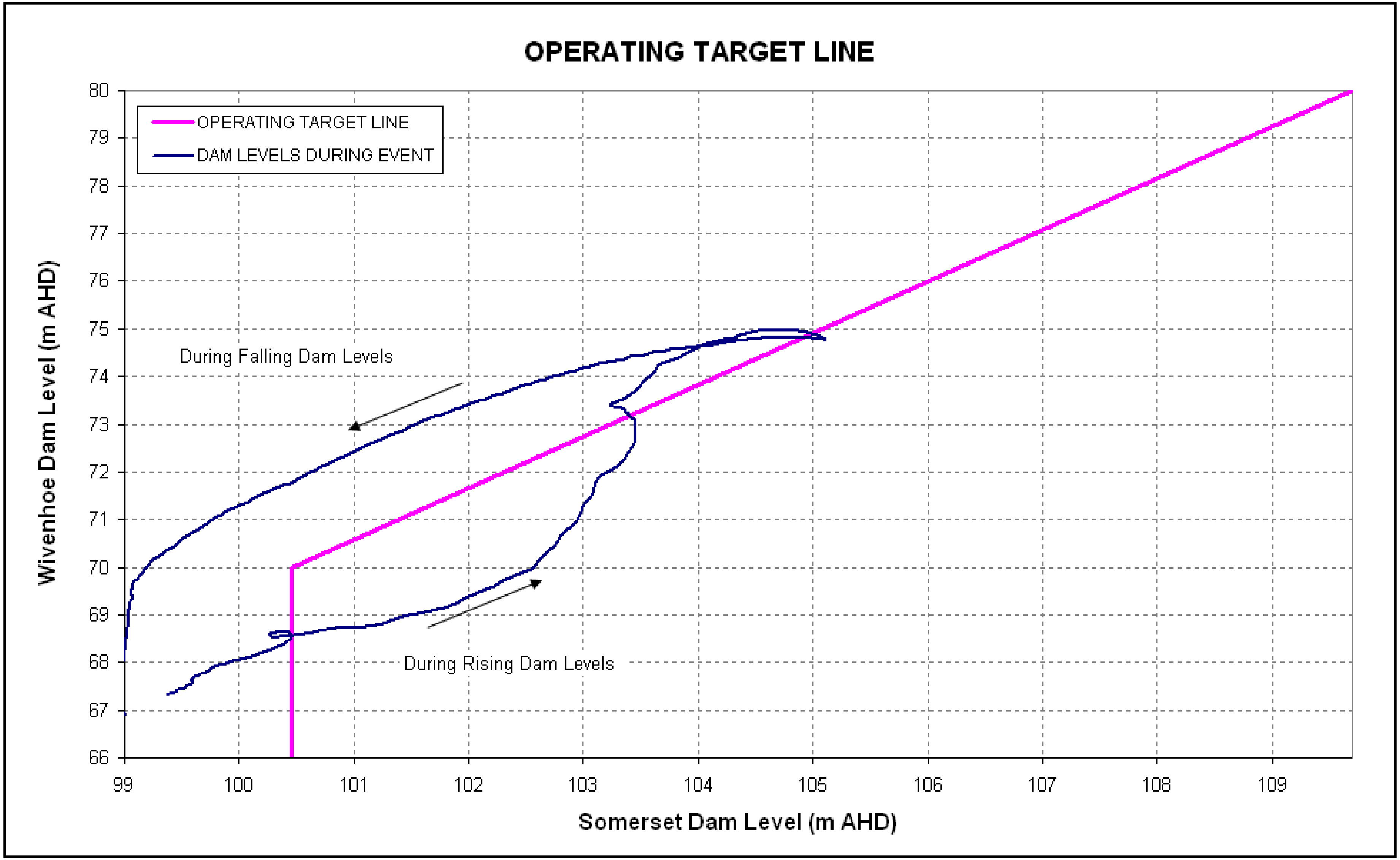

Figure 10.5.3 – Wivenhoe/Somerset Operating Target Line throughout the January 2011 Flood Event

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11 EVENT COMMUNICATION

Queensland's disaster management response is provided at local, district and State levels by various specialist agencies. This collaborative approach ensures the effective and timely coordination of information and support services state-wide.

Disaster management and hazard-specific response plans provide details of arrangements and processes to be followed in times of crisis. They also identify the need for all public communication to be coordinated during these critical times.

Following the flood event impacting Somerset and Wivenhoe Dams in October 2010, a draft Communication Protocol ("the Protocol") was developed by the Department of Environment and Resource Management (DERM) to ensure effective communication between local, State and Commonwealth agencies impacted by the release of floodwater from the Dams. It aims to ensure that consistent and harmonised information is successfully communicated to the public during flood events.

The Protocol outlines the communication processes to be followed during flood events by the following agencies:

- Brisbane City Council;
- Ipswich City Council;
- Somerset Regional Council;
- Seqwater;
- Water Grid Manager;
- Queensland Police Service;
- Department of Community Safety;
- DERM;
- Department of Premier and Cabinet;
- Bureau of Meteorology (BoM).

The Protocol divides the communication process into three key stages:

1. Monitoring and assessment;
2. Briefing and activation;
3. Public communications.

The application of the Protocol to the January 2011 Flood Event is summarised below.

1. Monitoring and assessment

During the January 2011 Flood Event, all information communicated to the public – including information about floodwater releases from Wivenhoe Dam – was based on a continuous process of monitoring and technical assessment of the developing situation. During the Event, Seqwater understands the following monitoring and assessment activities were undertaken by external agencies, in accordance with the Protocol:

- Weather events and Dam levels were routinely monitored by relevant agencies using established systems and procedures;
- The BoM was the primary agency responsible for providing weather forecasts and warnings to the public. The BoM participated in technical discussions and shared modelling results with Seqwater, Brisbane City Council, Ipswich City Council and Somerset Regional Council as necessary. These discussions lead to the development of a technical agreement on the flood situation, which formed the basis for all public communications;
- Councils monitored creek levels, local runoff and flash flooding within their areas of responsibility;

- Councils with the necessary resources and expertise undertook modelling, formed predictions, identified flood inundation areas, assessed impacts for their communities and shared this information with relevant stakeholders. Councils without the necessary resources and expertise relied on information they received from other agencies to complete the impact assessment for their communities;
- Technical staff from relevant agencies held regular teleconferences to clarify and agree modelling inputs and results. Regular teleconferences were held between Seqwater and the BoM.

To support the activities undertaken by external agencies, and in accordance with the Protocol, Seqwater:

- Modelled implications of the inflows on the necessary floodwater releases from Somerset Dam and/or Wivenhoe Dam. (The floodwater release strategy balances releasing water from the Dams quickly enough to ensure the flood storage capacity is available if another major rain event occurs, and minimising downstream flooding impacts to people and property);
- Calculated floodwater releases according to the Manual and regularly provided actual and projected release information to the BoM and Brisbane City Council. The dates and times when this information was provided are shown in Table 11.1.1 below. The BoM used this information to model the Brisbane River catchment and its river systems;

Date/time of issue
07/01/2011 10:23
08/01/2011 14:58
09/01/2011 08:44
09/01/2011 17:55
09/01/2011 21:08
10/01/2011 01:56
10/01/2011 06:05
10/01/2011 09:07

Date/time of issue
10/01/2011 13:56
11/01/2011 05:48
11/01/2011 08:06
11/01/2011 11:32
11/01/2011 13:28
11/01/2011 16:59
11/01/2011 18:06
11/01/2011 21:07

Date/time of issue
11/01/2011 22:00
12/01/2011 03:48
12/01/2011 05:51
12/01/2011 18:07
12/01/2011 20:10
13/01/2011 14:31
18/01/2011 13:28

Table 11.1.1 – Timing of information provided by Seqwater to the BoM and Brisbane City Council regarding floodwater releases

- Issued Situation Reports to the BoM, Councils and internal Seqwater recipients up to four times each day during the formative stages of the Event. The frequency of issue reduced following the peak of the Event at Wivenhoe Dam. Details of these reports are contained in Appendix E.

- Compiled Technical Situation Reports (TSR) regarding the floodwater release from Wivenhoe Dam and provided these to the Water Grid Manager. TSRs were provided more frequently during critical periods of the Flood Event. Appendix F contains a copy of all TSRs issued during the Event.

2. Briefing and activation

If public safety is considered to be at risk during a flood event, disaster management arrangements may be activated. Seqwater understands the following actions were undertaken, in accordance with the Protocol, during the January 2011 Flood Event:

- The Brisbane City Council, Ipswich City Council and Somerset Regional Council activated their Local Disaster Management Groups;
- Local Disaster Management Groups informed the relevant District Disaster Coordinators of the situation;
- The Queensland Police Service initiated disaster management actions, as provided for under the ***Disaster Management Act 2003***;
- The Water Grid Manager alerted the Director-General of the Department of Community Safety and the Director-General of DERM, as well as the Brisbane City, Ipswich City and Somerset Regional Councils;

- The Director-General of the Department of Community Safety informed the Director-General of the Department of Premier and Cabinet, the Chair of the State Disaster Management Group and activated the State Disaster Coordination Centre. The Director-General of the Department of Community Safety also informed the Minister for Police, Corrective Services and Emergency Services;
- The Director-General of DERM informed the Minister for Natural Resources, Mines and Energy;
- The Director-General of the Department of Premier and Cabinet informed the Premier;
- The Crisis Communications Network, chaired by the Department of Premier and Cabinet, was activated at the direction of the State Disaster Management Group Chair to coordinate public messaging from the BoM, Seqwater, the Water Grid Manager, Queensland Police Service, relevant Councils and the Department of Community Safety.

3. Public communication issues

The Protocol allows each agency to initiate public communication and engage disaster management processes as they deem appropriate. The trigger points for initiating public communication during a flood event are defined according to an agency's responsibilities. During the January 2011 Flood Event, as it became apparent public impacts were likely, local, State and Commonwealth agencies increased the frequency of their communication with the community.

The Protocol states that each agency is responsible for publicly communicating information commensurate with their role, which can be done without prior approval. However, during the January 2011 Flood Event, agencies shared information prior to its public release to ensure the information provided was always consistent.

Under the requirements of the Manual, Seqwater is responsible for issuing information to the public and media regarding storage conditions and Dam releases. However, in relation to the Water Grid, the Water Grid Manager is the State's designated lead communication agency on floodwater releases. During the Flood Event, Seqwater provided relevant and timely information to the Water Grid Manager, who then communicated this information to the public and media.

Seqwater understands the following agencies were responsible for communicating specific information during the Event, in accordance with the Protocol:

- **BoM –** Communicated flood warnings broadly using the BoM website (www.bom.gov.au), through other agencies and the media. Representatives from the BoM also participated in media (radio, television, newspaper) interviews to provide factual information regarding observed and forecast weather conditions, rainfalls and water levels.
- **Local governments / Local Disaster Management Groups –** Communicated the effects of weather-related events and the potential safety impacts for local communities, residents, and Council-owned assets. Local governments were primarily responsible for communicating within their community.
- **Water Grid Manager –** Publicly communicated aspects of floodwater release timing and the expected duration of the impacts. Seqwater operational staff ensured supporting technical information was provided to the Water Grid Manager and the Water Grid Manager took responsibility for liaising with local governments and coordinating any public communication in relation to the flood releases.

To support the above processes, Seqwater provided regular situation updates to the Water Grid Manager, Brisbane City Council, Ipswich City Council and Somerset Regional Council. In addition, Seqwater also provided regular updates to mid-Brisbane irrigators during the Event. All updates were also provided to the Water Grid Manager.

The primary communications from the BoM, local governments and the Water Grid Manager were augmented by:

- **Department of Premier and Cabinet –** Ensured consistent messages were provided to the media and other relevant agencies.

- **Queensland Police Service** – Provided specific community safety messaging during operations.
- **Department of Community Safety** – Communicated general safety matters regarding flooding.

Information was released to the public as required throughout the Event. The timing of media releases was guided by the frequency with which technical reports became available and the content of these reports. Report frequency ranged from once a day to an appropriate higher frequency during the critical stages of the Event.

Seqwater understands the Water Grid Manager's Communications Unit centrally tracked and shared all communications and liaised with the following agencies in regard to public safety messages:

- BoM;
- Seqwater;
- Councils' Media Directors;
- The Queensland Police Service Media Director;
- The Department of Community Safety Media Director.

Overall, the public and agency communication undertaken by Seqwater throughout the Event was in accordance with the procedures outlined in the Protocol.

Flood Event Review

12 REVIEW OF DATA COLLECTION SYSTEMS

12.1 Review of data collection system performance during the Event

Due to the rarity of flood events the size of the January 2011 Flood Event, the rainfall and stream height field stations used to collect data had never been tested by a flood of this size. As a result, some field failures did occur during the January 2011 Flood Event, however, such failures would be expected in all systems of this type world-wide when impacted by an event of this magnitude. Some stations were completely destroyed by the volume and magnitude of the flood flows and, in surveying the aftermath of the flood and its impacts along the river channels, it is easy to see how this occurred.

Following the Event, 14 out of 75 rain stations, and 31 out of 71 river height stations were not operating correctly. This is considered a relatively good result that demonstrates the generally robust nature of the network, particularly as the gauge redundancy system that Seqwater has in place within the network almost fully mitigating the impacts of these failures. Certainly, any data omissions or errors resulting from these failures did not adversely impact operational decision-making.

The only significant gap in the recording of rainfall data occurred on Tuesday 11 January 2011, during the period of intense rainfall that resulted in the extreme and rapid rises in the level of Wivenhoe Dam. The rainfall experienced during this time was not recorded in the rain gauge network as it fell directly on and near the Wivenhoe Dam lake, in an area where there are no catchment rain gauges. A similar scenario occurred the previous day when extreme rainfall lead to flash flooding in the Lockyer Valley . This extreme rainfall was also not recorded in the catchment rain gauges.

In order to counteract this issue for future events, a solution may be to expand the network and install additional rain gauges in the Brisbane Basin. This issue will be examined in detail in conjunction with the BoM and other relevant agencies as soon as practical. However, it should be noted that, within an area the size of the Brisbane Basin, it is not considered practically possible to guarantee that any extensive rain gauge network will detect all instances of rainfall that occur within the Basin area.

12.2 Future of the data collection system

The current ALERT data collection network has been operational since 1995. Overall, the performance of the system has been satisfactory, with the following improvements made in recent times:

- Seqwater employed a dedicated hydrographic team to enhance and maintain the data collection network. This team continues to be supported by the RoadTek technicians who have been maintaining the network since its initial installation.
- In 2008/09, approximately 30 stations were upgraded with new generation ALERT Event Reporting Radio Telemetry System (ERRTS) equipment. Following the upgrading of a further 55 sites in 2009/10, almost all the ERRTS equipment in the Seqwater ALERT network has now been upgraded.
- In 2008/09 and 2009/10, new rainfall stations were constructed and installed at the following locations:
  - Lindfield;
  - Westvale;
  - Hazeldean;
  - Monsildale;
  - Mt Stanley;
  - Mt Binga;
  - Blackbutt;
  - Redbank Creek.
- In 2008/09 and 2009/10, new or upgraded rain/river height stations were constructed and installed at the following locations:
  - Atkinson Dam;
  - Bill Gunn Dam;
  - Lake Clarendon Dam;
  - Moogerah Dam;
  - North Pine River at Dayboro Waste Water Treatment Plant.

- In 2008/09 and 2009/10, new river height stations were installed at the following locations:
  - Kilcoy Creek downstream of Kilcoy Weir;
  - Kobble Creek at Mt Samson.

The network will undergo further upgrades and enhancements over the coming years as Seqwater looks to maximise the System's overall reliability. In conjunction with the BoM, Seqwater is continually seeking ways to improve the network, particularly in line with the advancement of available technology.

13 REVIEW OF FLOOD OPERATIONS CENTRE MOBILISATION AND STAFFING

13.1 Flood Operations Engineers

The four Flood Operations Engineers approved by the Chief Executive Officer to direct the operations of Somerset and Wivenhoe Dams during flood events are:

1. Engineer 1;
2. Engineer 2;
3. Engineer 3;
4. Engineer 4.

As previously stated, the four current Flood Operations Engineers undertake flood operations duties as an addition to the full-time roles they fill within various State Government organisations. These flood operations duties include 24/7 on call duties, 24/7 catchment monitoring during rainfall events and undertaking 12 hour shifts during flood events. **Flood Operations Engineers do not receive any additional payments or allowances to undertake flood operations duties.** This includes requirements to work extended hours on Christmas Day, Boxing Day, New Years Day and other public holidays as has occurred in recent months, and to return from annual leave if required for flood duties..This arrangement is in contrast to the approach of the BoM who employ a dedicated team of full time permanent staff to undertake flood forecasting duties.

During the Event, the Flood Operations Engineers worked long hours and functioned on a limited amount of sleep, particularly during the critical period of the Event between Sunday 9 January 2011 and Wednesday 12 January 2011. These demands are expected with this work and decision making was not adversely impacted by these requirements.

As also previously stated, it should also be noted that the Flood Operations Engineers managed flood operations activities at North Pine Dam in conjunction with managing the January 2011 Flood Event impacting on Somerset Dam and Wivenhoe Dam. Preliminary indications based on the North Pine Dam Emergency Action Plan, are that the flood event impacting North Pine Dam was in the extreme range (AEP greater than 1 in 2000).

Number of Flood Operations Engineers

The appropriate number of Flood Operations Engineers required to work during an event has been widely considered and discussed over the past 15 years. From the perspective of event management continuity and coordination, a small team of very expert and experienced staff working closely together is preferred. However, this must be considered in line with the potential impact of fatigue during larger events or extended periods of operation and subsequent report writing.

From 1996 to date, engaging four Flood Operations Engineers has proven to be sufficient when managing flood events impacting the Dams. There are currently also three professionally qualified engineers working within the flood officer team who gain valuable event experience that will eventually enable them to transition to a Flood Operations Engineer role should this be deemed appropriate. Factors that could assist in managing fatigue will be examined further in conjunction with the Dam Safety Regulator at an appropriate time following the submission of this Report.

Work hours

While the work hours during the Event were long, they were not considered excessive or to be at a level that adversely impacted on operational decision making. Natural disaster emergency management requires efforts above and beyond normal day-to-day operations, and the Flood Operations Engineers fully accept and understand that this is a responsibility of their role.

13.2 Flood Officers

The nine Flood Officers that assisted in the Flood Operations Centre during the Event were:

1. Flood Officer 1;
2. Flood Officer 2;
3. Flood Officer 3;
4. Flood Officer 4;
5. Flood Officer 5;
6. Flood Officer 6;
7. Flood Officer 7;
8. Flood Officer 8;
9. Flood Officer 9.

Similar to the role of the Flood Operations Enginers, Flood Officers fill their roles on an “as needed” basis only, as they fill full-time roles within their various organisations and only undertake flood operations duties when “on call” (average on one week in four) or during flood events. All Officers have been trained in Flood Operations Centre duties and completed their allocated tasks efficiently, correctly and with a high degree of professionalism over the full duration of the Event. A team of around nine to 10 persons has proven appropriate for this role.

Flood Officers generally work on paid overtime arrangements in accordance with their respective industrial awards when undertaking flood operations duties.

14 REVIEW OF DAM SITE MOBILISATION AND STAFFING

The 13 Dam Operators that operated Somerset and Wivenhoe Dams during the Event were:

1. Dam Operator 1;
2. Dam Operator 2;
3. Dam Operator 3;
4. Dam Operator 4;
5. Dam Operator 5;
6. Dam Operator 6;
7. Dam Operator 7;
8. Dam Operator 8;
9. Dam Operator 9;
10. Dam Operator 10;
11. Dam Operator 11;
12. Dam Operator 12;
13. Dam Operator 13.

All Operators have been trained in Flood Operations Centre duties and all completed their allocated tasks efficiently, correctly and with a high degree of professionalism over the duration of the Event. Dam Operators are either full time Seqwater Dam site staff or full time Seqwater field personnel working on and around the Dam sites. All Dam Operators have been trained in their required duties and completed their allocated tasks efficiently, correctly and with a high degree of professionalism over the full duration of the Event. A team of around 13 to 15 persons has proven appropriate for this role. Dam Operators work on paid overtime arrangements in accordance with their respective industrial awards when undertaking flood operations duties.

The following is a list of suggestions that will help to ensure the Dam Operators are fully supported and can continue to perform their roles with a high level of effectiveness in future events:

- Housing arrangements that provide for trained operators living on site should continue, as this was shown to be critically important during extreme events of this nature to ensure a timely response to developing situations;
- Local staff members working on site during flood events need to be able to maintain contact with their family and friends to provide reassurance they are safe and secure while on duty. This is an issue that may have caused some anxiety at certain stages of the January 2011 Event and will be addressed;
- There were no equipment breakdowns during this Flood Event, and multi-level operational back-up systems are provided to release flood water if breakdowns do occur. However further investigations will be undertaken to determine if it is appropriate to provide additional trade support to site above the current level provided during flood events. This is to ensure the risks associated with all possible equipment failure scenarios during extreme events are fully managed.

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15 REVIEW OF FLOOD MODELLING SYSTEMS

15.1 Review of system performance during the Event

The Real Time Flood Model (RTFM) and associated systems performed well during the Event as described in detail in Section 8. No system failures occurred during the Event and, generally, the systems closely modelled actual stream flow.

The only significant modeling anomaly encountered was during the period of intense rainfall that occurred on Tuesday 11 January 2011, when there were extreme and rapid rises in the level of Wivenhoe Dam. The very intense rainfall generally fell directly on and near the Wivenhoe Dam lake and was not recorded in rain gauges. This resulted in the RTFM not accurately modelling the rapid rises in the Dam level due to a lack of input data. This scenario was similar to the flash flooding experienced in the Lockyer Valley the previous day. As previously discussed, this is a data collection issue rather than a modelling issue, and a review of the existing data collection network will be undertaken, as discussed in Section 12.

In summary, there were no operational flaws or errors detected in the existing RTFM system that adversely impacted Event decision-making.

15.2 Future of the RTFM

The RTFM was originally developed more than 15 years ago and primarily resides on the Linux Fedora Core Operating System. Although there were no system failures experienced during previous flood events or the January 2011 Flood Event, the age of the software is such that Seqwater commenced developing a replacement RTFM in 2008 in conjunction with the Dam Safety Regulator and other key stakeholders, including the BoM. This new system is expected to be implemented and operational in 2011 following approval from the Dam Safety Regulator. The updated system uses the same hydrologic models but operates under a more robust platform that provides an enhanced user interface. This work has been undertaken in accordance with Seqwater's policy of continual improvement of the system in line with advances in technology.

Independent of the RTFM, Seqwater has developed a series of URBS flood models for all of its storages, including Somerset Dam and Wivenhoe Dam. These models are linked to the BoM Enviromon data collection system and can be run in real time. This system provides a backup to the RTFM software in the Flood Operations Centre and was used as a verification tool during the Event. Generally, this system provided very similar modelling results to the RTFM and experienced similar difficulties to the RTFM in accurately modelling the rapid rises in the Wivenhoe Dam lake level that occurred on Tuesday 11 January 2011, as described in Section 15.1.

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16 REVIEW OF THE MANUAL'S OBJECTIVES AND STRATEGIES

16.1 The Manual

The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7) (the Manual) defines the objectives and procedures for operating the Dams during flood events.

The Manual is an approved Flood Mitigation Manual under Chapter 4, Part 2 of the ***Water Supply (Safety and Reliability) Act 2008*** (the Act). The Manual is approved by the Chief Executive of the Department of Environment and Resource Management in accordance with the Act. An owner of a dam who observes the operational procedures in an approved flood mitigation manual, does not incur civil liability for an act done, or omission made, honestly and without negligence in observing the manual procedures.

16.2 Manual objectives

The primary objectives of the procedures contained in the Manual, in order of importance, are:

1. Ensure the structural safety of the Dams;

2. Provide urbanised areas with optimum protection from inundation;

3. Minimise the disruption to rural life in the valleys of the Brisbane River and Stanley River;

4. Retain the storage at Full Supply Level (FSL) at the conclusion of the flood event;

5. Minimise impacts to riparian flora and fauna during the drain down phase of the flood event.

To meet these objectives, the Dams must be operated in a manner that considers the potential effects of closely spaced flood events. Accordingly, normal procedures require stored floodwaters to be emptied from the Dams within seven days of the flood event peak passing through the Dams.

Throughout the duration of this Event, the Manual objectives were always considered in order of importance, and the requirement to empty the stored floodwaters within seven days of the flood event peak passing through the Dams was also achieved.

While ensuring the Dams are operated during flood events within these Manual objectives, Seqwater is aware the safety of the public is a primary consideration when making flood releases from the Dams. Every attempt is made to ensure public roads are closed prior to inundation by Dam outflows and authorities are provided with enough time to prepare for community isolations and to undertake evacuations. These actions are in accordance with draft Communication Protocol prepared by the Department of Environment and Resource Management to to ensure information is effectively communicated to the public and all relevant agencies during flood events impacting the Dams. Every attempt is also made to ensure urban damage is minimised, and that Dam outflows with the potential to contribute to urban damage are delayed until it is apparent no other options are available without risking the safety of the Dams.

Following the Event, some discussions occurred in the public arena in relation to lowering the emphasis on minimising disruption to rural life in the valleys of the Brisbane and Stanley Rivers for anything but very minor events. The Dams could be operated in this way if desired. However, changing the emphasis of the objectives would also require a change to the current version of the Manual.

16.3 Manual strategies

As discussed in detail in Section 10, a range of strategies were used during the Event, in accordance with the Manual. Having to apply the strategies during such an extremely large and rare event provided the opportunity to consider how the strategies are worded from a practical sense.

The strategies provided a good guide in responding to the full range of scenarios presented by this Event, however some situations may benefit from the provision of additional guidance, and this will be reviewed in conjunction with the Dam Safety Regulator following the submission of this report. It should be noted however, that due to the high degree of scenario variability, improving the Manual in this regard may not be possible. Certainly, any changes to the Manual in the areas discussed below would require extensive and detailed engineering and hydrological investigations prior to any changes being formally adopted:

- Under Strategy W3, it would be useful for additional guidance to be provided as to the extent to which the flow at Moggill should be minimised prior to the natural peak occurring at that location.
- Under Strategy W3, it would be useful for additional guidance to be provided on the consideration to be given to lower level Manual objectives.
- Under Strategy W3, it would be useful to provide guidance on the acceptability of increasing the flood at Moggill above its naturally occurring peak (excluding Wivenhoe releases) but within the upper limit of non-damaging floods downstream.
- Under Strategy W3, it would be useful to clarify the flow at Moggill that defines the upper limit of non-damaging floods downstream. During the Event, Brisbane City Council provided information and damage curves to the Flood Operations Centre indicating the upper limit flow at Moggill was as low as 2,000m^3/s, whereas the Manual specifies the flow as 4,000m^3/s. This number must be agreed as it defines the intent of Strategy W3.
- Under Strategy W4, it would be useful to provide additional guidance on gate opening and closing rates.

17 REVIEW OF WIVENHOE DAM FULL SUPPLY LEVEL

Following the January 2011 Flood Event, there has been significant public discussion regarding the appropriate Full Supply Level (FSL) of the Dams and whether the FSL should be lowered.

The FSL of Somerset Dam and Wivenhoe Dam are contained in the Moreton Resource Operations Plan (see pages 91 and 93), which was developed by the Department of Environment and Resource Management (DERM) in accordance with the ***Water Act 2000***. DERM is responsible for developing and approving all resource operations plans in Queensland, and the current Moreton Resource Operations Plan was approved by Governor-in-Council in December 2009. It is publicly available on the DERM website (www.derm.qld.gov.au). Seqwater's Resource Operations Licence requires compliance with the relevant parts of the Moreton Resource Operations Plan, including the prescribed FSL.

The Manual states:

1. That an explicit objective is to ***"retain the storage at full supply level at the conclusion of the Flood Event"***. In Section 3.5 of the Manual, it states ***"as the dams are the primary urban water supply for South East Queensland, it is important that all opportunities to fill the dams are taken. There should be no reason why the dams should not be full following a Flood Event";***
2. In Section 8.3, ***"the spillway gates are not to be opened for flood control purposes prior to the reservoir level exceeding EL 67.25",*** which is 0.25 metres above FSL***.***

In view of the above, it can be seen that Flood Operations Engineers do not set the FSL of the Dams and they are not authorised to make decisions in relation to setting or changing the FSL of the Dams at any time, either during or following Flood Events.

If a decision is to be made by DERM to permanently lower the FSL, detailed consideration will need to be given to the procedures in the Manual, as the procedures assume the existing FSL.

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18 REVIEW OF AGENCY COMMUNICATION

As discussed in Section 11, Queensland's disaster management response is provided by various disaster management groups at local, district and State levels. This collaborative approach to disaster response ensures an effective and timely coordination of information and services state-wide, whenever disaster strikes.

Under the requirements of the Manual, Seqwater is responsible for issuing information to the public and media regarding storage conditions and Dam releases. During the January 2011 Flood Event, Seqwater followed the draft Communication Protocol that was developed by DERM for this purpose. From Seqwater's perspective, the Protocol worked well and communications were managed effectively. However, to properly assess communications, detailed feedback on the effectiveness of Seqwater communications during the Flood Event must be obtained from the following agencies:

- Brisbane City Council;
- Ipswich City Council;
- Somerset Regional Council;
- Water Grid Manager;
- Queensland Police Service;
- Department of Community Safety;
- Department of Environment and Resource Management;
- Department of Premier and Cabinet;
- Bureau of Meteorology (BoM).

To date, this process has not commenced, however, this work will proceed as soon as appropriate personnel are available to undertake the necessary review. In the interim, Seqwater has provided comment below and suggested preliminary recommendations to improve communication during flood events, based on the experiences of the January 2011 Event. The comments and preliminary recommendations are made in accordance with the three stages in the communication process contained in the Protocol, which are:

1. Monitoring and assessment;
2. Briefing and activation;
3. Public communication.

The comments and preliminary recommendations are summarised below.

1. Monitoring and assessment

- Seqwater discussions with the BoM relating to modelling result comparisons, and actual and projected Dam outflows were beneficial to both parties;
- Seqwater also provided modelling results to Brisbane City Council. It remains unclear how Council used this information or if it proved beneficial. Generally, it appears the most relevant information required by the Council was projected flood height data, and this is estimated and issued by the BoM. It is recommended the provision of technical data from Seqwater to Brisbane City Council be examined further with Council, with a view to ensuring only useful data is provided to avoid any potential confusion associated with the provision of superfluous data;
- It is also recommended that investigations be undertaken to explore the benefits of a more formal arrangement with the BoM in relation to the provision of rainfall forecast information during flood events. While sufficient rainfall forecasting information was available to the Flood Operations Centre during the Flood Event, and regular informal discussions were held with the BoM in relation to the forecasts, there may be an opportunity to improve this process by including some appropriate procedures in the Communication Protocol.

2. Briefing and activation

Situation Reports and Technical Situation Reports were provided to relevant government agencies at regular intervals over the duration of the Event. There has not been any specific feedback received to date indicating whether this process worked well. However, as previously discussed, Seqwater will seek detailed feedback on the effectiveness of its communication with the agencies involved, with a view to implementing any suggested improvements arising from these discussions.

3. Public communication issues

There were no specific public communication made by Seqwater during the January 2011 Flood Event, as the Water Grid Manager was assigned the responsibility of being the State's lead communication agency on floodwater release information. Seqwater operational staff ensured technical information was communicated to the Water Grid Manager, as requested, to support all public communication.

It is understood the Water Grid Manager is currently reviewing the effectiveness of these processes.

Flood Event Outcomes

19 REPORT CONCLUSIONS

The significant conclusions drawn from the information contained in this Report are:

- During the January 2011 Flood Event, Somerset Dam and Wivenhoe Dam were operated in accordance with ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)***;
- The data collection and flood modelling systems used to support decisions made during the Event performed well and assisted informed decision-making, in accordance with the Manual;
- The BoM rainfall forecasts did not support the additional release of flood water early in the Event;
- During the Event, Seqwater followed the Department of Environment and Resource Management's draft Communications Protocol, which was compiled after the October 2010 flood event. This Protocol was developed to ensure effective communication between local, State and Commonwealth agencies impacted by the release of flood water from the Dams;
- The January 2011 Flood Event was a very large and rare flood event. The combined effects of Somerset Dam and Wivenhoe Dam did reduce flood damage downstream, however it was not possible to fully mitigate the impacts of the Event without putting the safety of the Dams at risk;
- Studies associated with the design and operation of Wivenhoe Dam dating back to 1971 indicate a flood of the magnitude of the January 2011 Flood Event would be expected to result in urban damage below Moggill;
- The combined effects of Somerset Dam and Wivenhoe Dam provided clear and significant flood mitigation benefits during the January 2011 Flood Event.

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20 REPORT RECOMMENDATIONS

Following is a summary of the key recommendations contained in this Report:

- In conjunction with the Bureau of Meteorology (BoM) and other relevant agencies, it is recommended an investigation be undertaken to determine whether additional rain gauges should be installed in the Brisbane River Basin to improve the level of data recorded during flood events. It is recognised that installing additional gauges may not guarantee the rain gauge network will detect all instances of very intense or extreme rainfall that could occur in the Basin area;
- Given that a rare and very large flood event occurred, it is recommended a formal review of ***The Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)*** (the Manual) be undertaken. This is a requirement of the Manual when an event of this nature is experienced. The issues raised in Section 16 should be considered in this process;
- In conjunction with the BoM and other relevant agencies, it is recommended Seqwater participate in a review of the Agency Communications Protocol used during the Flood Event. This Event was the first major test of the Protocol since its development in October 2010 and, therefore, a full review at this time would be appropriate.

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APPENDIX 1

January 2011 Flood Event

Report on the operation of Somerset Dam and Wivenhoe Dam

2 March 2011

seqwater
WATER FOR LIFE

APPENDIX A – MODEL RESULTS

The following table and associated graphs represent a summary of the model results used to support operational decision-making during the Event. Only model runs at the critical times corresponding to the Flood Event Summary contained in Section 2 of this Report, are included in the summary, however, model runs between these times are also available. Model run numbers have been edited to provide a sequential list. An indication of the number of additional runs that are available between individually presented runs can be determined by examining these model run numbers.

During the Event, some model runs were over-written as new model runs are generally created by using the most recent model run as a base. If the run being used as a base is not explicitly saved, it will be lost. This does not present a problem from an operational sense because historical model runs, which do not consider the effects of rainfall between the time of a decision and the time the historical run was created, have little bearing on operational decision-making.

For the purpose of this Report, any over-written model runs have been re-created. It is possible to re-create a model run as they are based on actual rainfall recorded in the relevant rain gauges at the time the model run was created. This information is contained in a data archive and, if required, can also be obtained separately and independently from the BoM for verification purposes.

The BoM catchment average Quantitative Precipitation Forecasts (QPFs) in Appendix C have been used to re-create model runs based on forecast rainfall. The forecast rainfall model results apply the full 24-hour catchment average rainfall forecast from the BoM QPFs to the model run. This is regardless of the model run time in relation to the issue time of the forecast, and is regardless of the rainfall since the forecast was issued. In effect, this provides a “worst case” 24-hour scenario.

The values and graphs contained in this Appendix are obtained from the flood-modelling spreadsheets. Similar to the model runs, the saved spreadsheets in this Appendix correspond to the critical times in the Flood Event Summary contained in Section 2.0. During the Event, the spreadsheets were updated continuously with both updated model results and hourly manual water level readings from the Dams, with a single “live” spreadsheet always available for flood operations decision-making. During the Event, spreadsheets were not necessarily saved at times corresponding to the Flood Event Summary. Similar to the re-creation of model runs, where the spreadsheets were not explicitly saved at the exact time corresponding the periods in the Flood Event Summary, the spreadsheets have been re-created from archived data.

Summary of operational runs

Without forecast rainfall

RUN DATE	RUN	SOMERSET				WIVENHOE											With Wivenhoe				Without Wivenhoe			
		Current	Predicted			Current	Predicted					Total inflow volume	Lockyer		Bremer		Lowood		Moggill		Lowood		Moggill	
		Level	Peak flow	Inflow vol	Predicted peak	Level	Peak flow	Inflow vol	Predicted peak	Predicted peak outflow			Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted
		m AHD	m^3/s	ML	m AHD	m AHD	m^3/s	ML	m AHD	m^3/s	dd/mm hh	ML	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh
Fri 07/01/2011 02:00	5	99.59	280	46,000	99.7	67.52	1,110	158,000	68.2	1,220	08/01 23	204,000	470	07/01 19	200	07/01 07	1,430	09/01 01	1,460	09/01 14	470	07/01 22	550	08/01 06
Fri 07/01/2011 09:00	7	99.63	280	56,000	99.8	67.75	1,270	186,000	68.2	1,220	08/01 15	242,000	470	07/01 19	230	07/01 10	1,510	08/01 17	1,550	09/01 06	470	07/01 22	570	08/01 06
Fri 07/01/2011 15:00	8	99.94	790	86,000	100.3	68.03	1,790	260,000	68.4	1,240	08/01 13	346,000	530	07/01 21	250	07/01 15	1,610	08/01 17	1,660	09/01 06	530	08/01 00	660	08/01 08
Sat 08/01/2011 14:00	10	100.44	1,110	111,000	100.5	68.61	1,910	309,000	68.7	1,480	10/01 01	420,000	530	07/01 21	410	07/01 16	1,620	08/01 17	1,720	09/01 06	530	08/01 00	770	08/01 05
Sun 09/01/2011 01:00	12	100.32	1,110	128,000	100.5	68.63	1,890	329,000	68.7	1,480	10/01 01	457,000	530	07/01 21	410	07/01 16	1,620	08/01 17	1,720	09/01 06	530	08/01 00	770	08/01 05
Sun 09/01/2011 08:00	14	100.28	1,110	173,000	100.5	68.55	1,930	396,000	68.7	1,500	10/01 01	569,000	530	07/01 21	410	07/01 16	1,620	08/01 17	1,720	09/01 06	530	08/01 00	770	08/01 05
Sun 09/01/2011 14:00	17	100.47	1,700	243,000	100.7	68.58	2,860	561,000	70.0	1,490	10/01 22	804,000	530	07/01 21	410	07/01 16	1,680	11/01 03	1,850	09/01 21	530	08/01 00	770	08/01 05
Sun 09/01/2011 19:00	21	101.43	3,800	387,000	102.3	68.86	6,960	886,000	72.1	2,880	11/01 08	1,272,000	530	07/01 21	410	07/01 16	3,240	11/01 11	3,300	12/01 00	530	08/01 00	770	08/01 05
Mon 10/01/2011 01:00	23	102.51	3,910	448,000	102.9	69.97	8,050	1,020,000	72.9	2,700	11/01 07	1,468,000	620	10/01 04	410	07/01 16	3,180	11/01 08	3,240	11/01 21	620	10/01 07	820	10/01 16
Mon 10/01/2011 09:00	26	103.08	3,910	485,000	103.1	71.56	8,180	1,046,000	72.9	2,690	11/01 06	1,531,000	630	10/01 07	470	10/01 16	3,240	11/01 02	3,420	11/01 12	630	10/01 10	1,090	10/01 16
Mon 10/01/2011 15:00	28	103.43	3,910	530,000	103.4	72.54	8,180	1,178,000	73.6	2,750	11/01 12	1,708,000	780	10/01 23	870	10/01 20	3,490	11/01 02	3,910	11/01 13	780	11/01 02	1,500	10/01 20
Mon 10/01/2011 20:00	31	103.46	3,950	544,000	103.5	73.06	8,180	1,187,000	73.6	2,760	11/01 14	1,731,000	780	10/01 23	870	10/01 20	3,490	11/01 02	3,930	11/01 13	780	11/01 02	1,500	10/01 20
Tue 11/01/2011 04:00	35	103.28	3,950	570,000	103.5	73.40	8,180	1,446,000	74.1	2,970	12/01 14	2,016,000	780	11/01 21	870	10/01 20	3,570	12/01 01	4,040	11/01 14	780	12/01 00	1,500	10/01 20
Tue 11/01/2011 08:00	37	103.46	3,910	628,000	103.9	73.70	8,180	1,582,000	74.5	3,700	12/01 06	2,210,000	1,750	11/01 15	870	10/01 20	5,430	12/01 04	5,870	12/01 06	1,750	11/01 18	2,320	12/01 02
Tue 11/01/2011 13:00	39	103.91	3,910	748,000	104.8	74.39	8,590	1,758,000	75.0	5,220	12/01 03	2,506,000	3,000	11/01 16	2,120	11/01 18	8,130	11/01 19	9,180	12/01 07	3,000	11/01 19	4,410	12/01 03
Tue 11/01/2011 19:00	41	104.60	3,910	801,000	105.2	74.97	8,830	1,858,000	75.0	5,480	11/01 22	2,659,000	3,540	11/01 18	2,790	11/01 21	11,000	11/01 22	12,260	12/01 11	3,540	11/01 21	5,530	12/01 04
Wed 12/01/2011 08:00	43	104.83	3,910	803,000	105.2	74.82	8,180	1,724,000	74.7	7,300	11/01 21	2,527,000	3,540	11/01 18	2,790	11/01 21	10,830	11/01 22	12,090	12/01 11	3,540	11/01 21	5,530	12/01 04

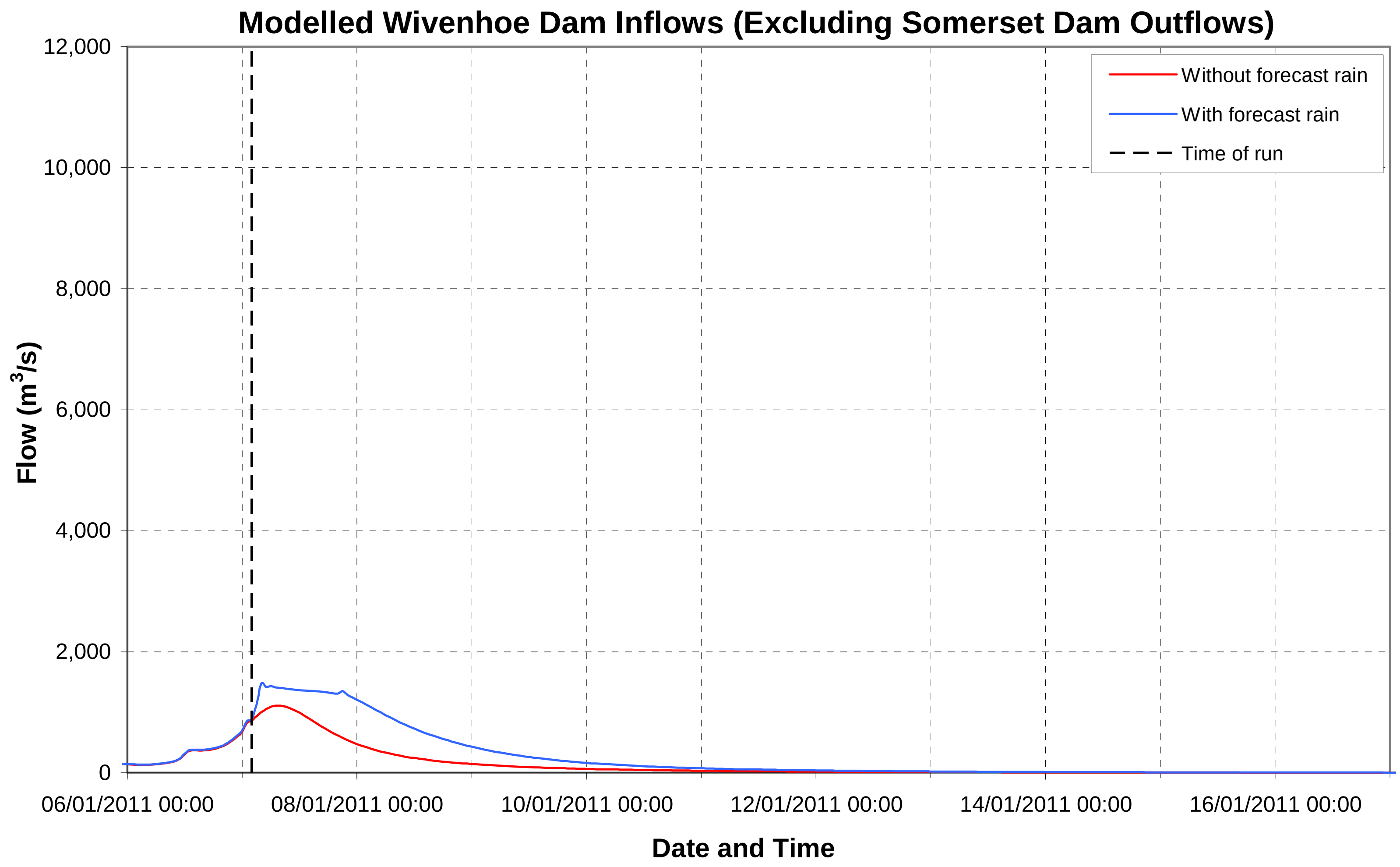
With forecast rainfall

RUN DATE	RUN	SOMERSET				WIVENHOE											With Wivenhoe				Without Wivenhoe			
		Current	Predicted			Current	Predicted					Total inflow volume	Lockyer		Bremer		Lowood		Moggill		Lowood		Moggill	
		Level	Peak flow	Inflow vol	Predicted peak	Level	Peak flow	Inflow vol	Predicted peak	Predicted peak outflow			Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted	Peak flow	Predicted
		m AHD	m^3/s	ML	m AHD	m AHD	m^3/s	ML	m AHD	m^3/s	dd/mm hh	ML	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh	m^3/s	dd/mm hh
Fri 07/01/2011 02:00	5	99.59	430	77,000	100.1	67.52	1,470	266,000	68.7	1,260	08/01 22	343,000	720	07/01 22	440	07/01 13	1,720	09/01 01	1,800	09/01 14	720	08/01 01	960	08/01 05
Fri 07/01/2011 09:00	7	99.63	500	87,000	100.2	67.75	1,650	293,000	68.5	1,250	08/01 14	380,000	670	07/01 21	390	07/01 21	1,830	08/01 17	1,960	09/01 06	670	08/01 00	970	08/01 08
Fri 07/01/2011 15:00	8	99.94	790	120,000	100.6	68.03	1,790	364,000	68.9	1,270	09/01 02	483,000	710	08/01 01	440	08/01 02	1,890	08/01 20	2,050	09/01 06	710	08/01 04	1,040	08/01 12
Sat 08/01/2011 14:00	10	100.44	1,110	165,000	100.6	68.61	1,910	497,000	69.1	1,540	10/01 01	662,000	530	07/01 21	540	09/01 04	1,940	10/01 04	2,220	09/01 15	530	08/01 00	940	09/01 10
Sun 09/01/2011 01:00	12	100.32	1,110	182,000	100.6	68.63	1,890	515,000	68.9	1,520	10/01 14	697,000	530	07/01 21	510	09/01 16	1,890	10/01 15	2,220	10/01 03	530	08/01 00	840	10/01 00
Sun 09/01/2011 08:00	14	100.28	1,110	227,000	101.0	68.55	2,320	586,000	69.3	1,560	11/01 00	814,000	530	07/01 21	490	10/01 04	1,900	11/01 00	2,220	10/01 10	530	08/01 00	780	10/01 07
Sun 09/01/2011 14:00	17	100.47	1,990	311,000	101.1	68.58	4,720	798,000	71.3	1,560	11/01 09	1,108,000	690	10/01 23	790	10/01 04	2,240	11/01 02	2,590	10/01 15	690	11/01 02	1,210	10/01 12
Sun 09/01/2011 19:00	21	101.43	3,940	482,000	103.0	68.86	8,810	1,231,000	73.9	3,070	11/01 13	1,712,000	1,250	11/01 00	1,100	10/01 09	4,160	11/01 11	4,400	12/01 00	1,250	11/01 03	1,940	10/01 17
Mon 10/01/2011 01:00	23	102.51	3,910	546,000	103.4	69.97	8,890	1,376,000	74.7	2,860	11/01 19	1,922,000	1,290	11/01 04	1,090	10/01 13	4,110	11/01 08	4,480	11/01 21	1,290	11/01 07	2,000	10/01 23
Mon 10/01/2011 09:00	26	103.08	3,910	583,000	103.5	71.56	8,180	1,401,000	74.5	2,840	12/01 04	1,985,000	1,220	11/01 12	1,310	10/01 20	4,020	11/01 15	4,680	11/01 12	1,220	11/01 15	2,090	11/01 07
Mon 10/01/2011 15:00	28	103.43	3,910	628,000	103.7	72.54	8,180	1,533,000	75.2	2,900	12/01 08	2,162,000	1,590	11/01 18	1,710	11/01 01	4,460	11/01 22	5,180	11/01 15	1,590	11/01 21	2,570	11/01 11
Mon 10/01/2011 20:00	31	103.46	3,950	601,000	103.5	73.06	8,180	1,381,000	74.3	2,820	12/01 06	1,982,000	1,060	11/01 21	1,120	11/01 06	3,870	12/01 01	4,470	11/01 15	1,060	12/01 00	1,840	11/01 12
Tue 11/01/2011 04:00	35	103.28	3,950	626,000	103.7	73.40	8,180	1,641,000	74.9	3,050	12/01 14	2,267,000	1,050	12/01 00	1,050	11/01 15	3,900	12/01 04	4,540	11/01 15	1,050	12/01 03	1,810	11/01 14
Tue 11/01/2011 08:00	37	103.46	3,910	684,000	104.2	73.70	8,180	1,776,000	75.1	3,760	12/01 11	2,460,000	2,130	12/01 04	1,210	11/01 20	5,870	12/01 07	6,540	12/01 07	2,130	12/01 07	3,000	12/01 04
Tue 11/01/2011 13:00	39	103.91	3,980	875,000	105.7	74.39	8,680	2,248,000	76.2	5,430	12/01 20	3,123,000	3,560	11/01 21	3,300	11/01 22	8,860	12/01 11	10,650	12/01 10	3,560	12/01 00	5,770	12/01 05
Tue 11/01/2011 19:00	41	104.60	3,910	928,000	105.9	74.97	8,830	2,362,000	75.2	7,520	12/01 15	3,289,000	4,020	12/01 04	3,530	12/01 02	11,530	12/01 07	13,470	12/01 11	4,020	12/01 07	6,910	12/01 04
Wed 12/01/2011 08:00	43	104.83				74.82																		

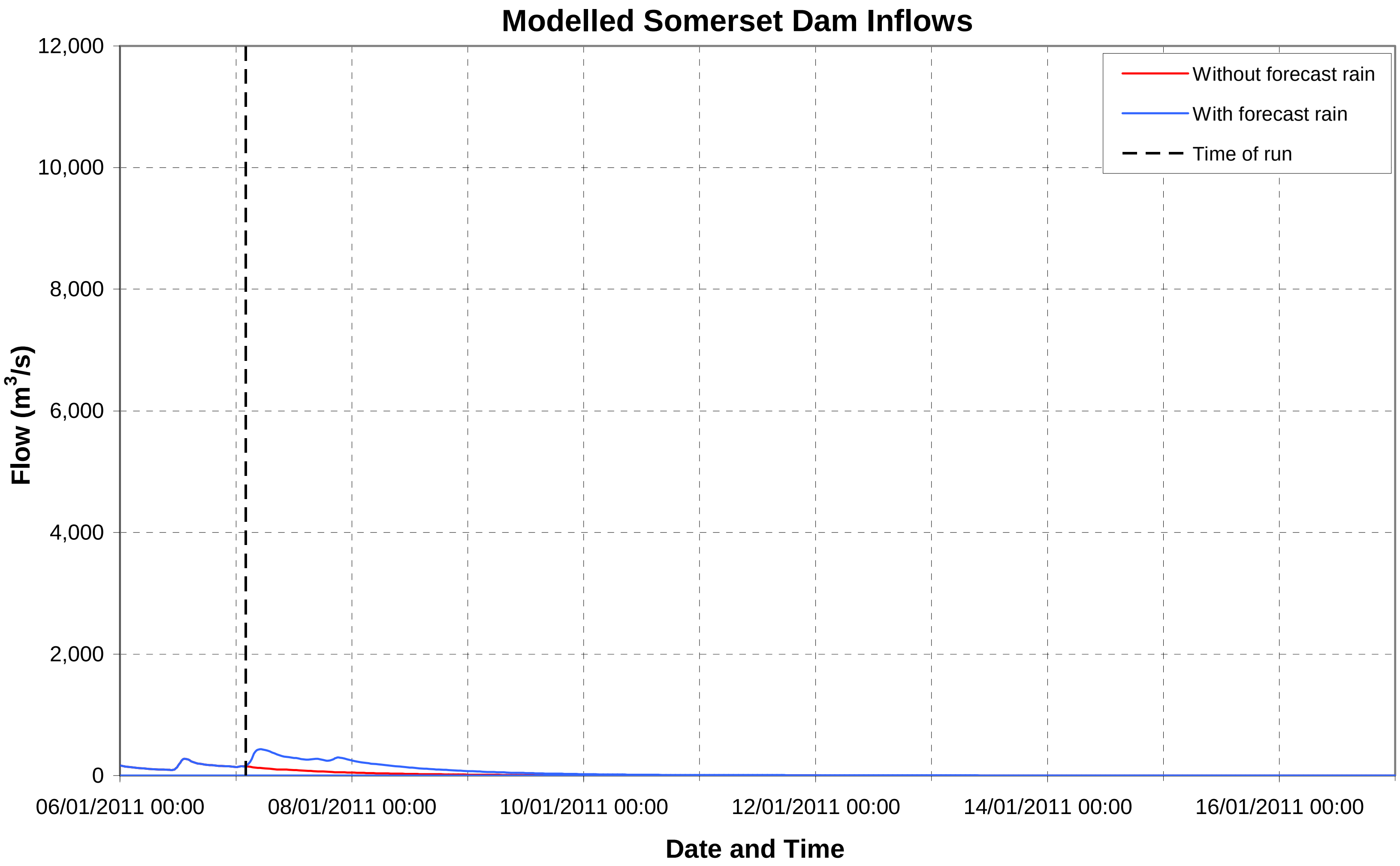
Run 5

Date: Friday 7 January 2011

Time: 02:00



Run 5: Friday 7 January 2011, 02:00



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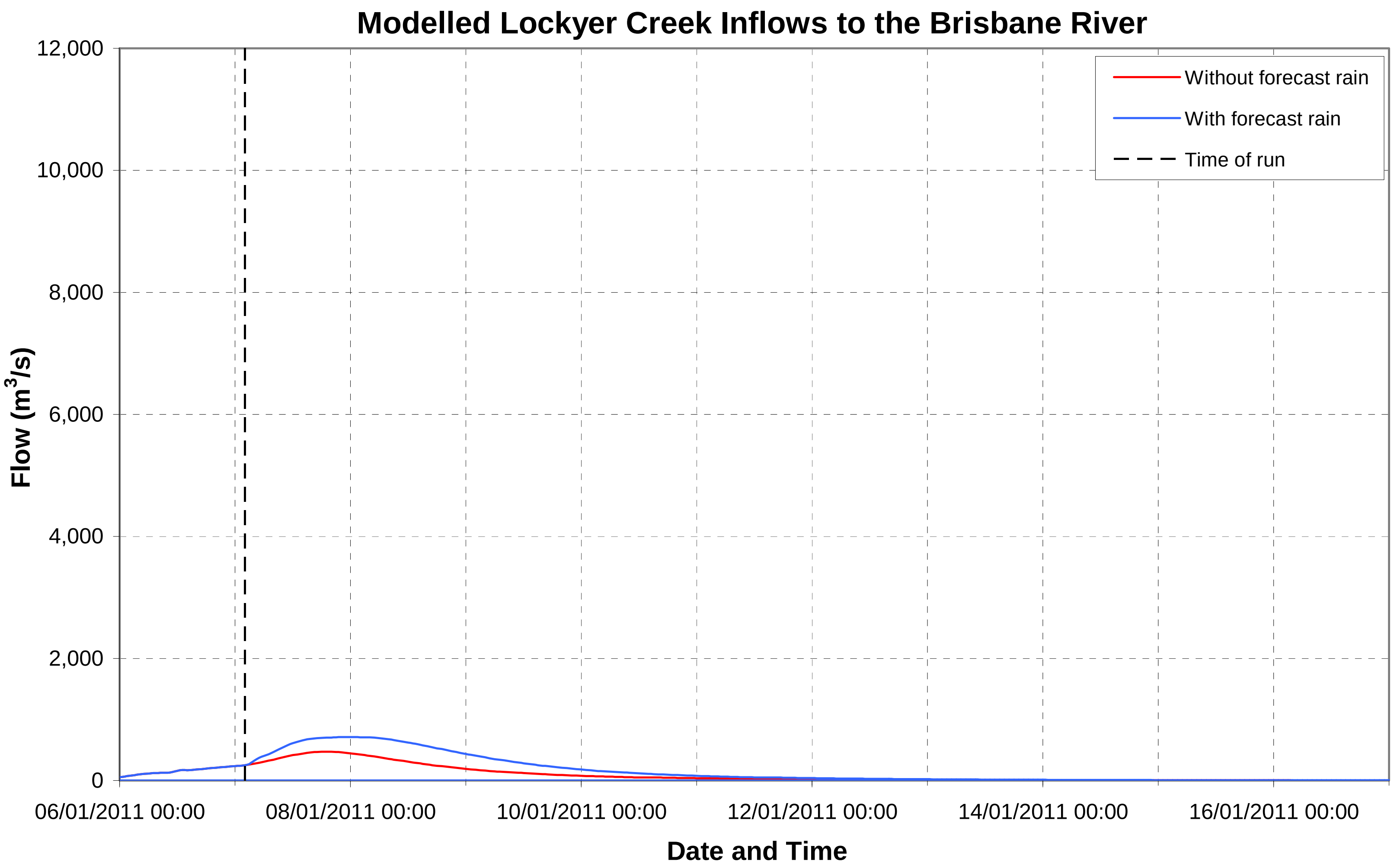

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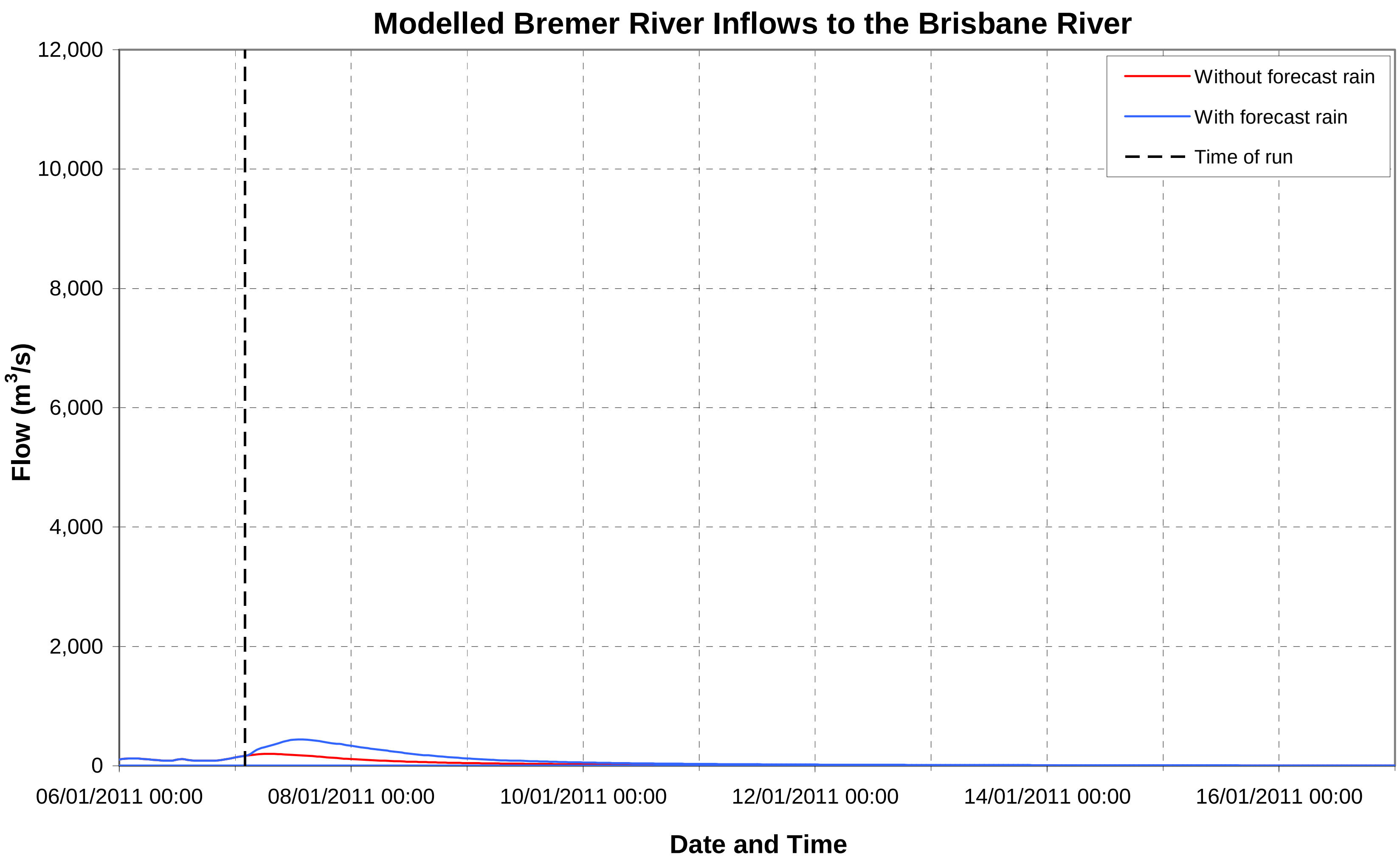

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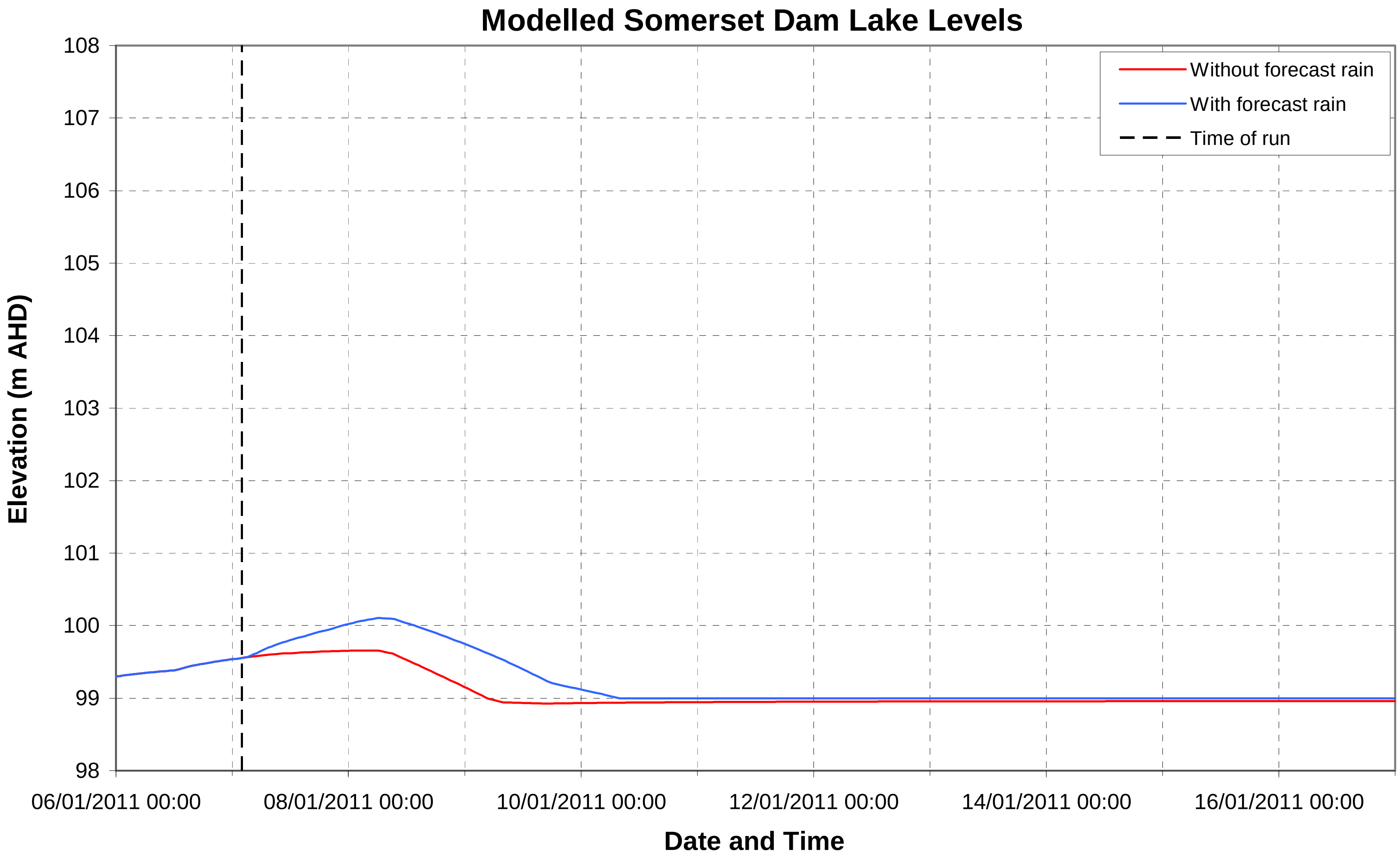

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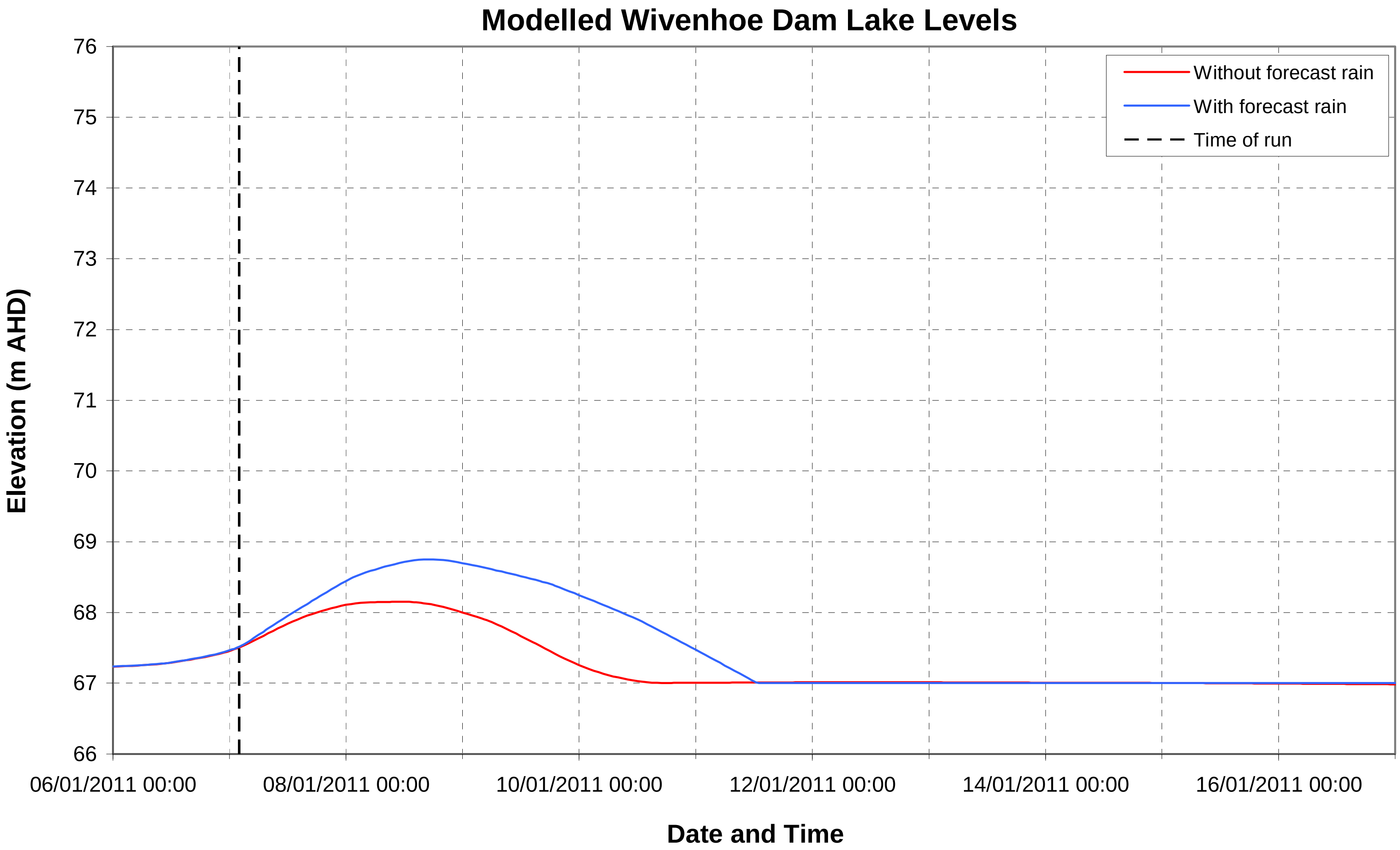

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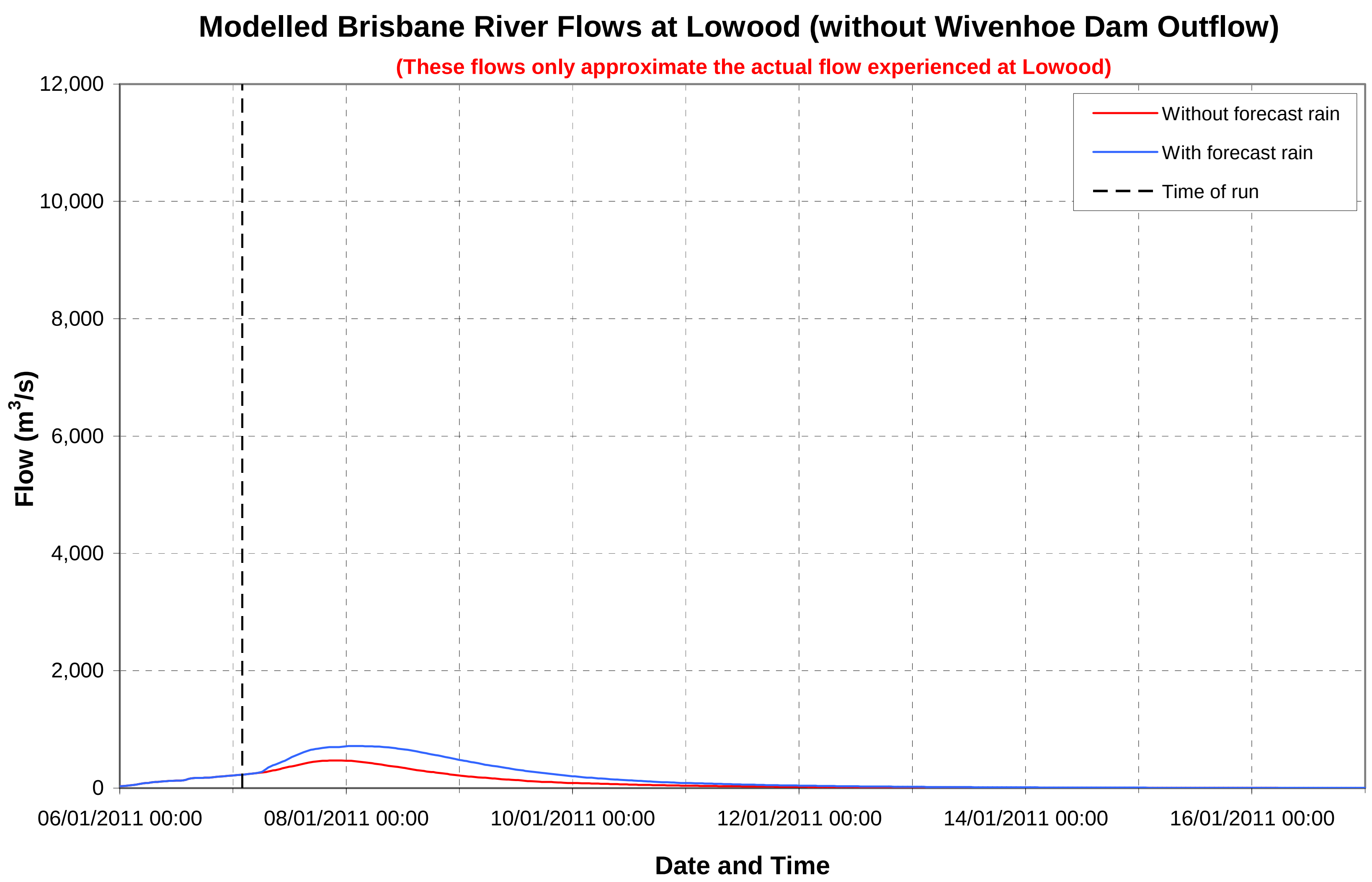
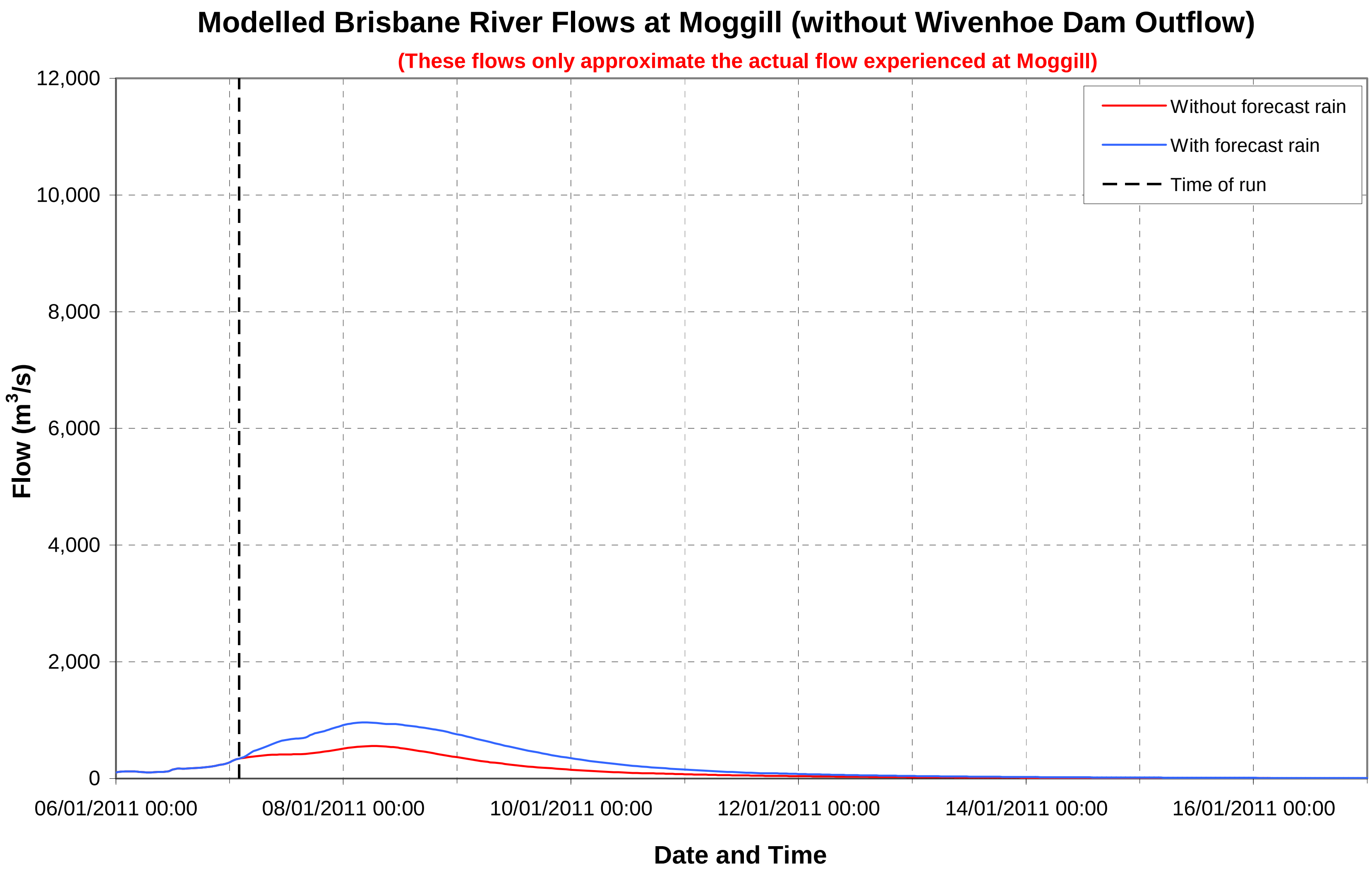


Run 5: Friday 7 January 2011, 02:00

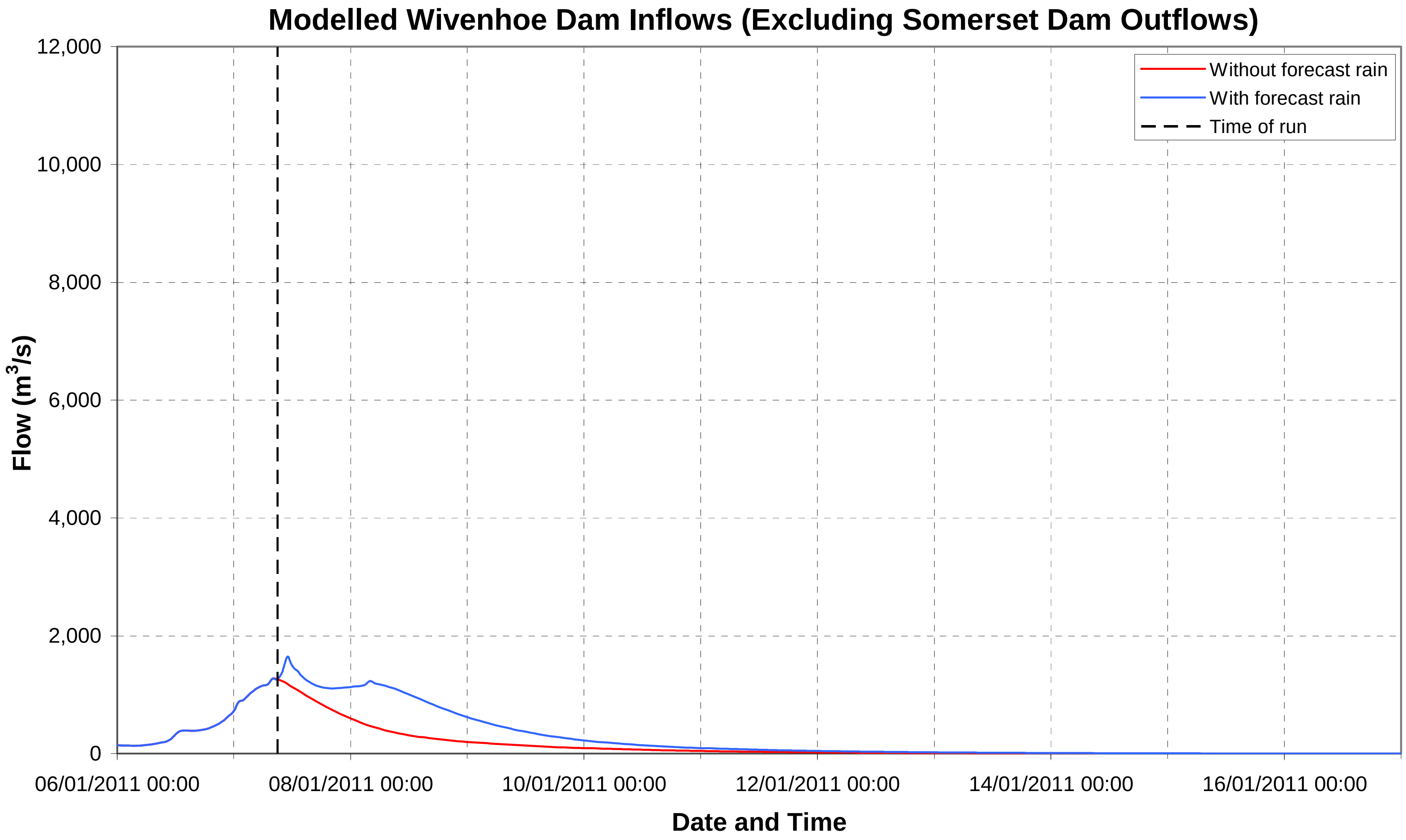


Run 5: Friday 7 January 2011, 02:00

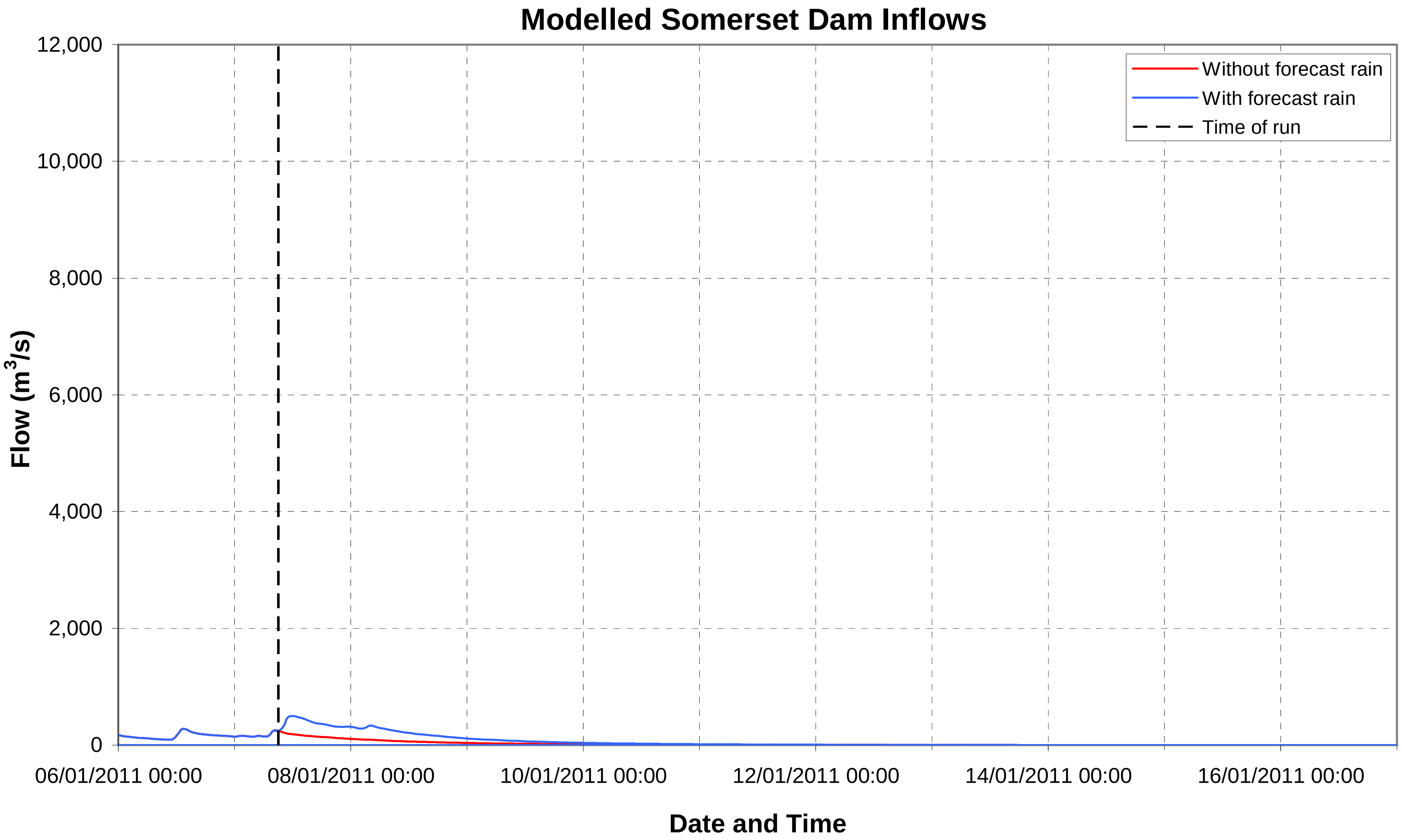
Run 7

Date: Friday 7 January 2011

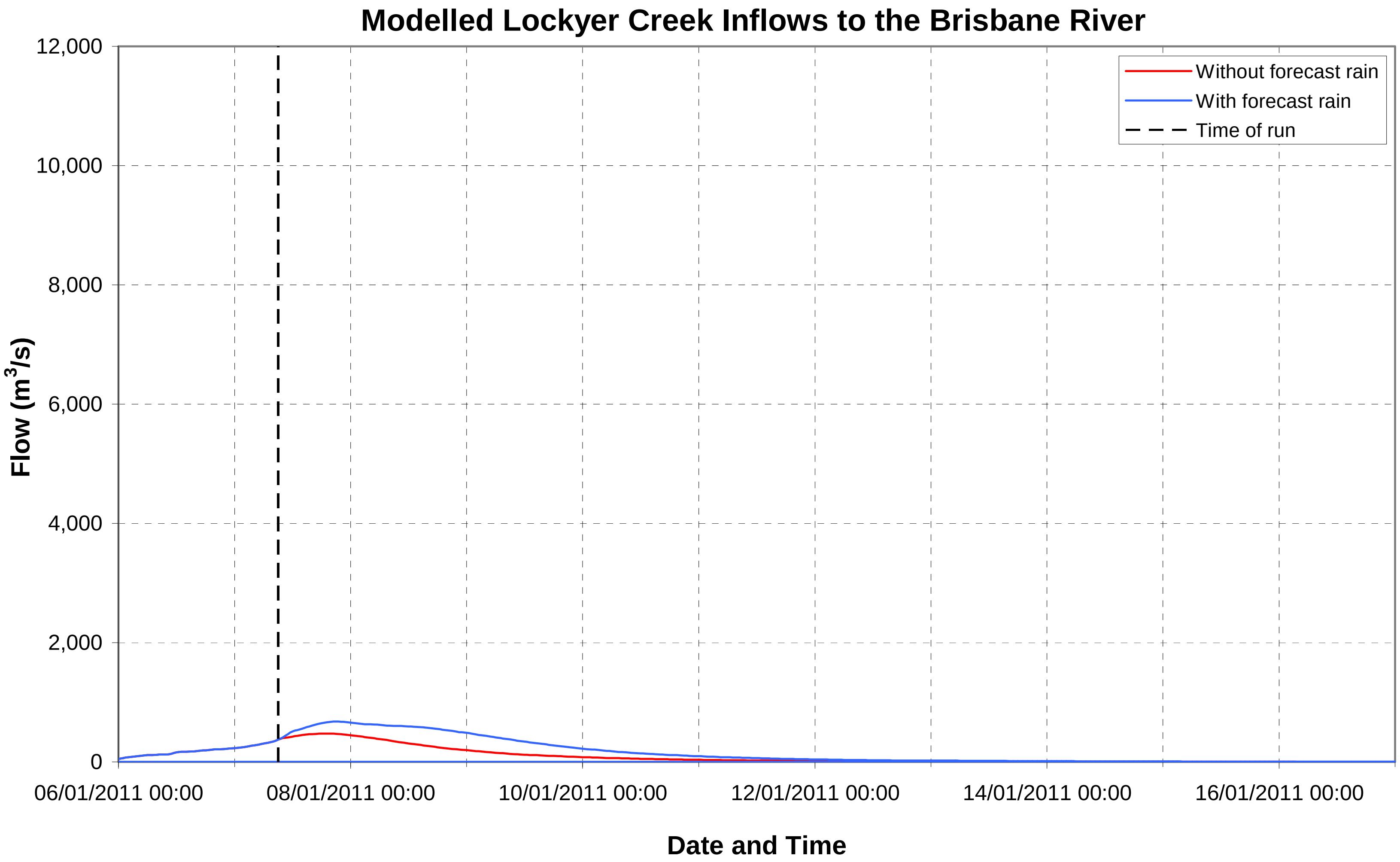
Time: 09:00



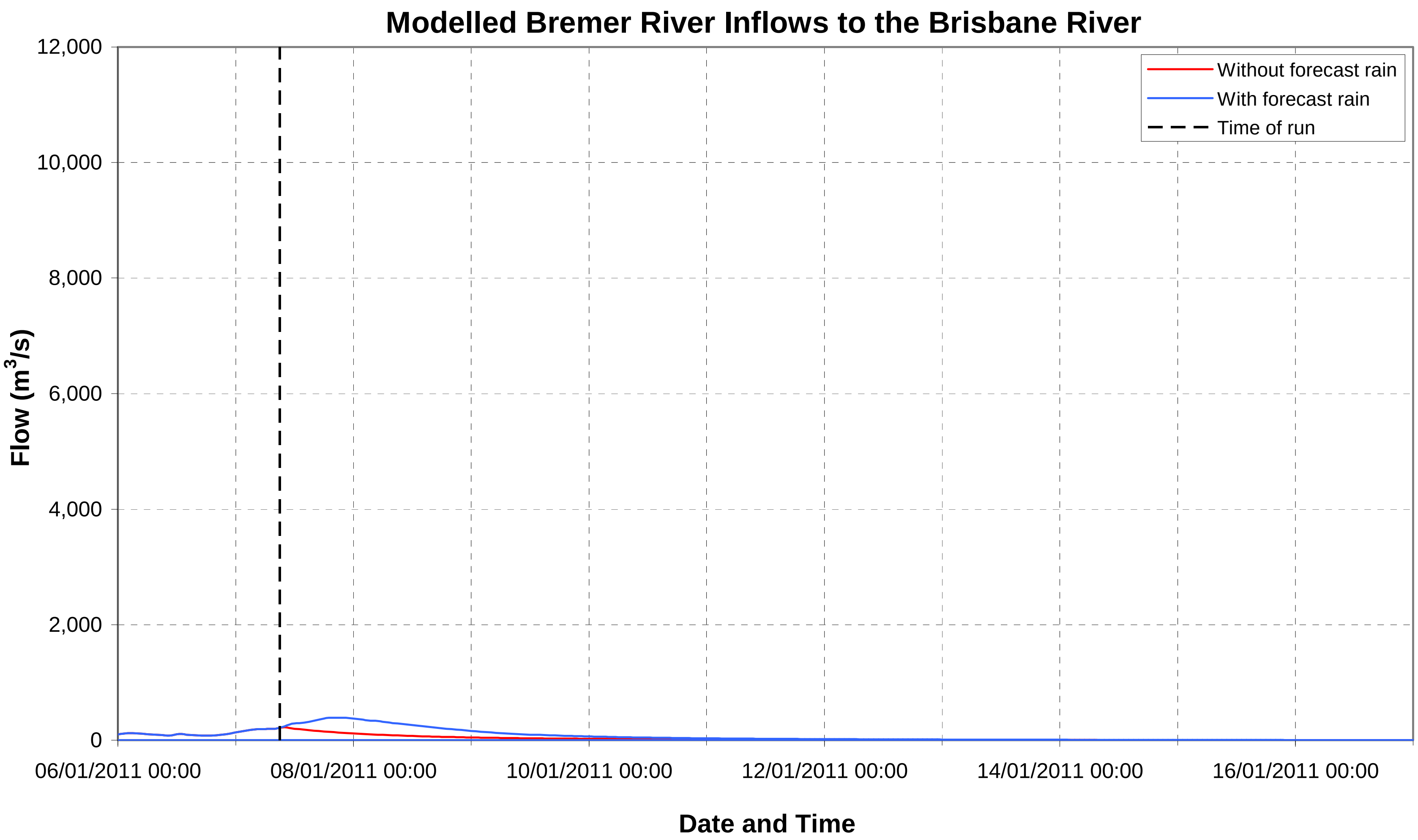
Run 7: Friday 7 January 2011, 09:00



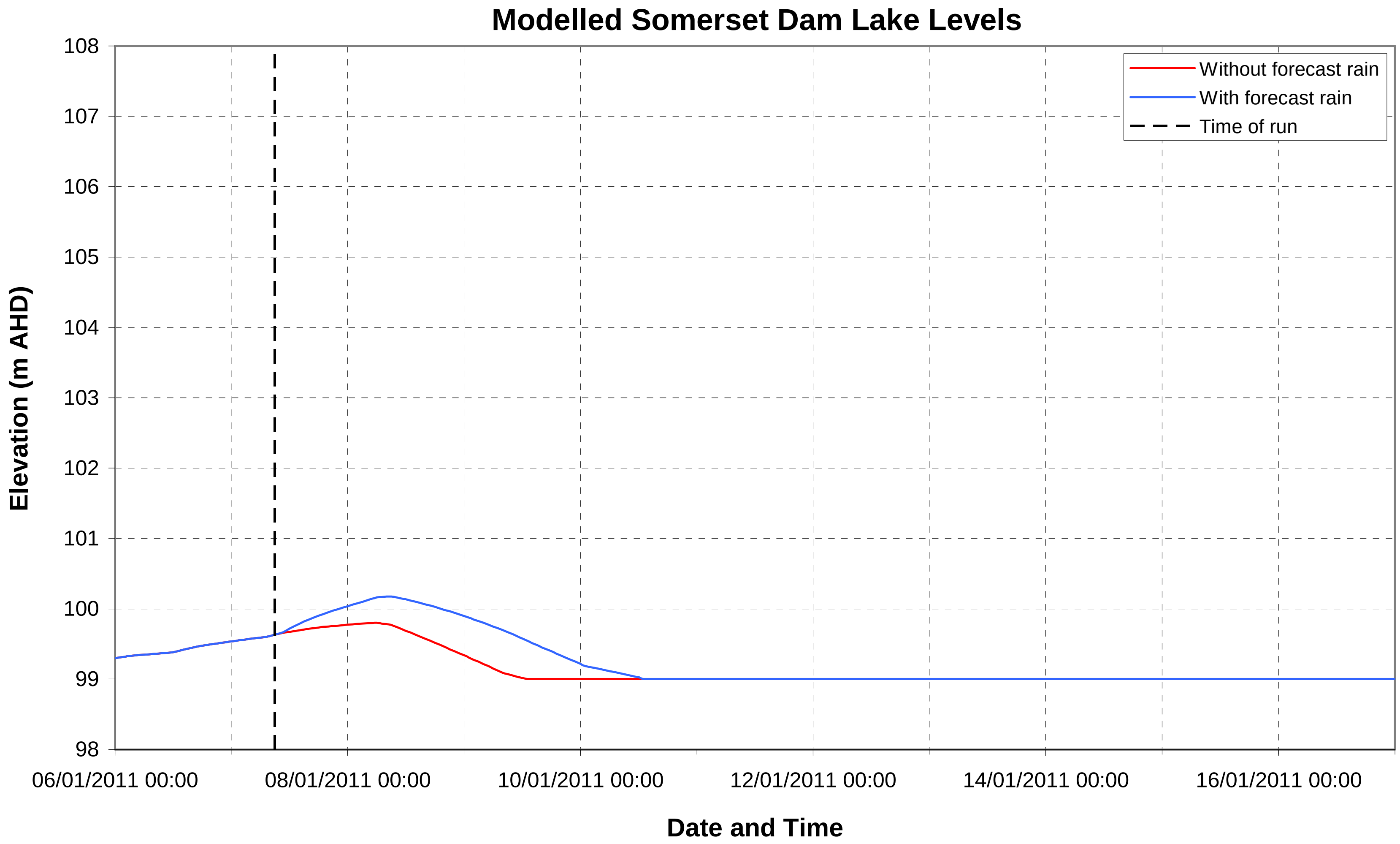
Run 7: Friday 7 January 2011, 09:00



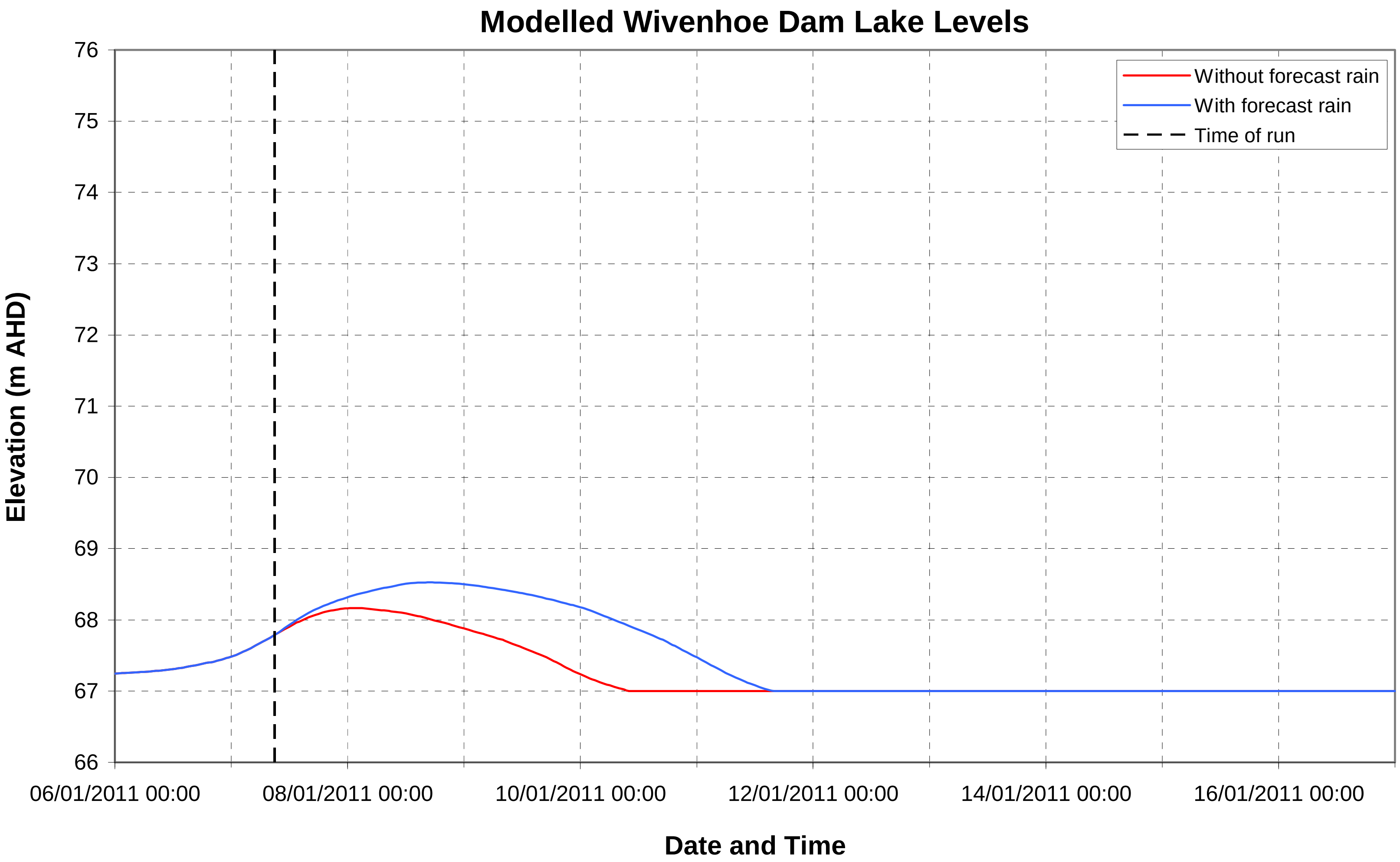
Run 7: Friday 7 January 2011, 09:00



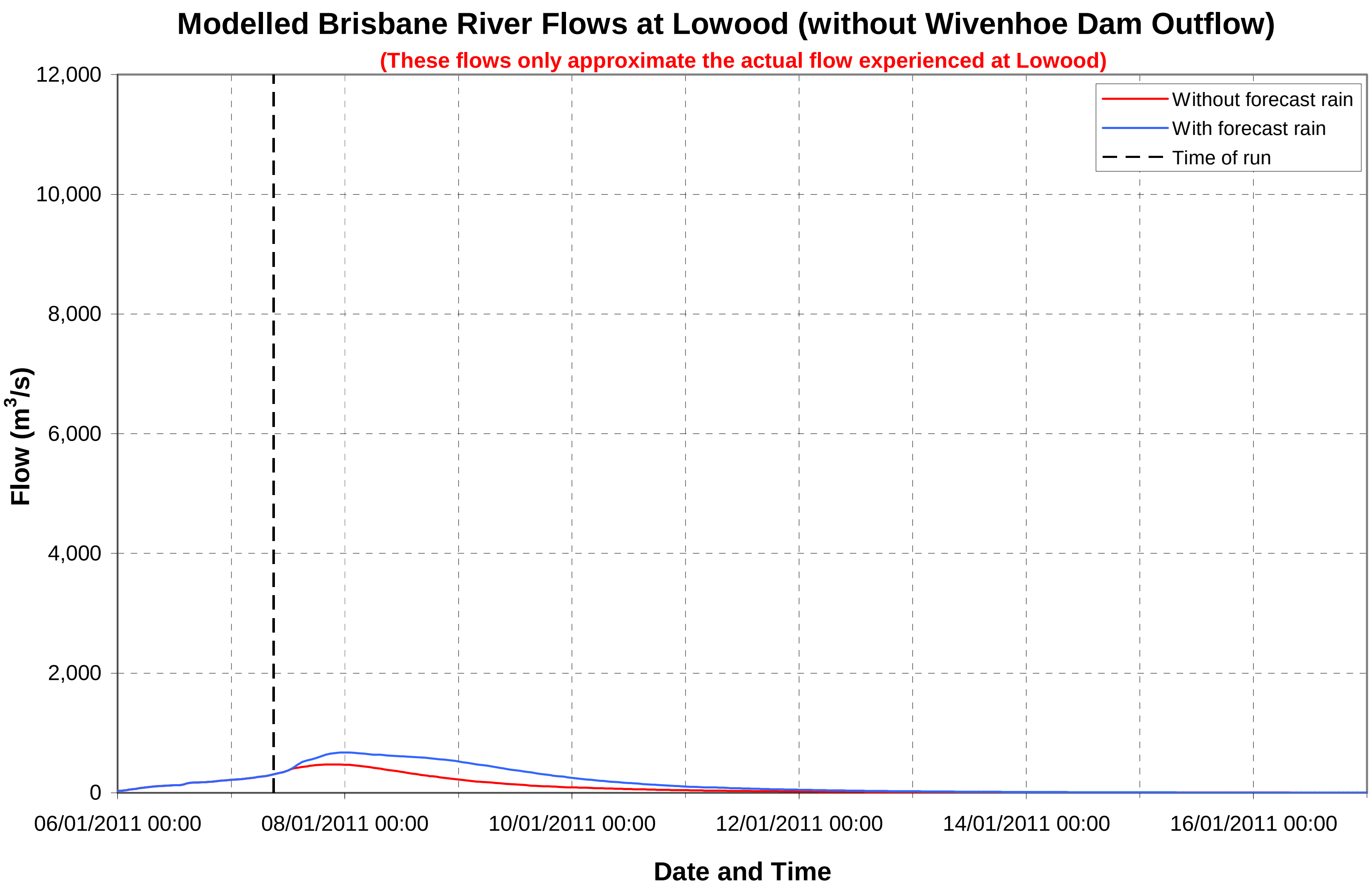
Run 7: Friday 7 January 2011, 09:00



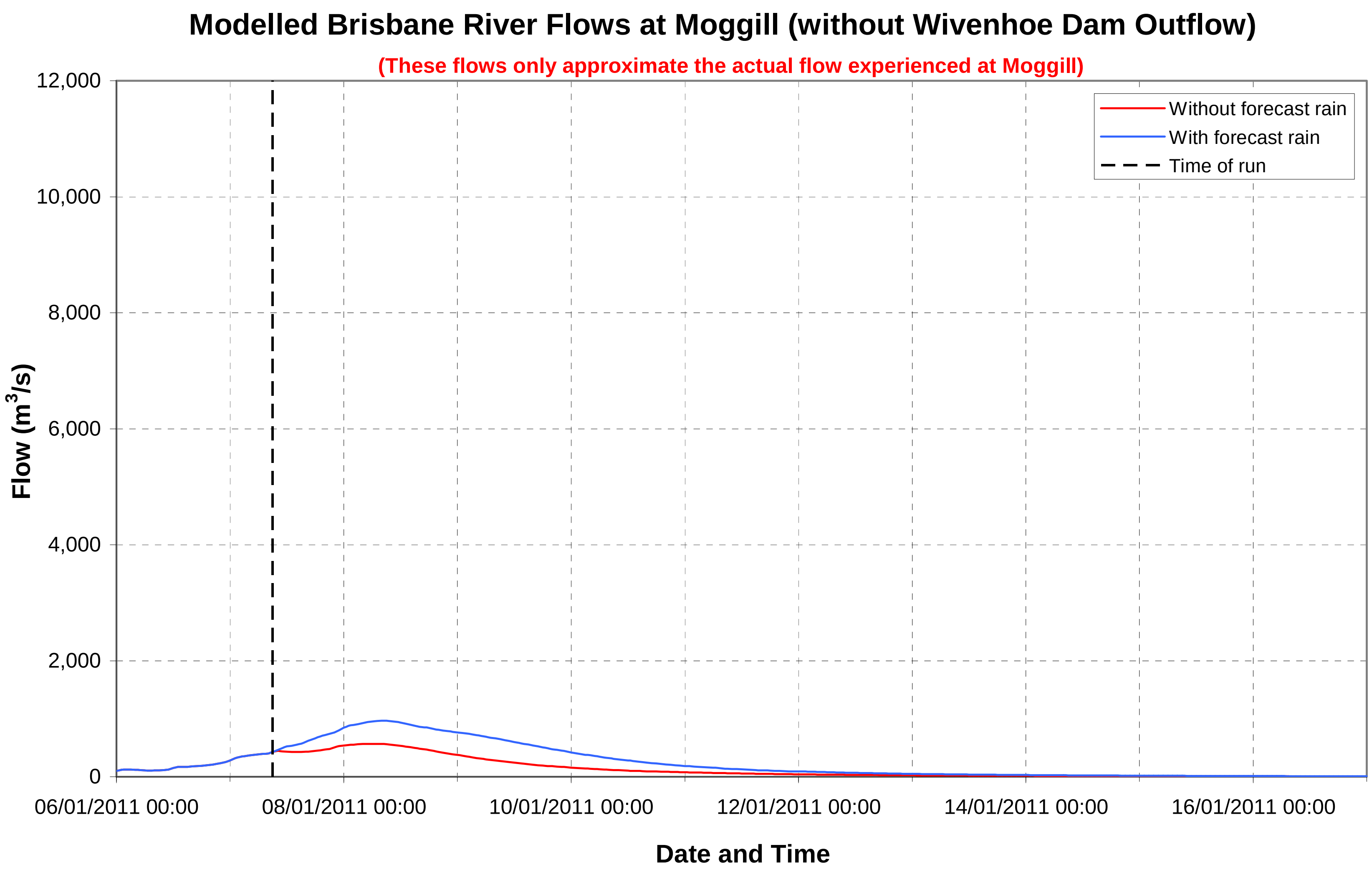
Run 7: Friday 7 January 2011, 09:00



Run 7: Friday 7 January 2011, 09:00



Run 7: Friday 7 January 2011, 09:00

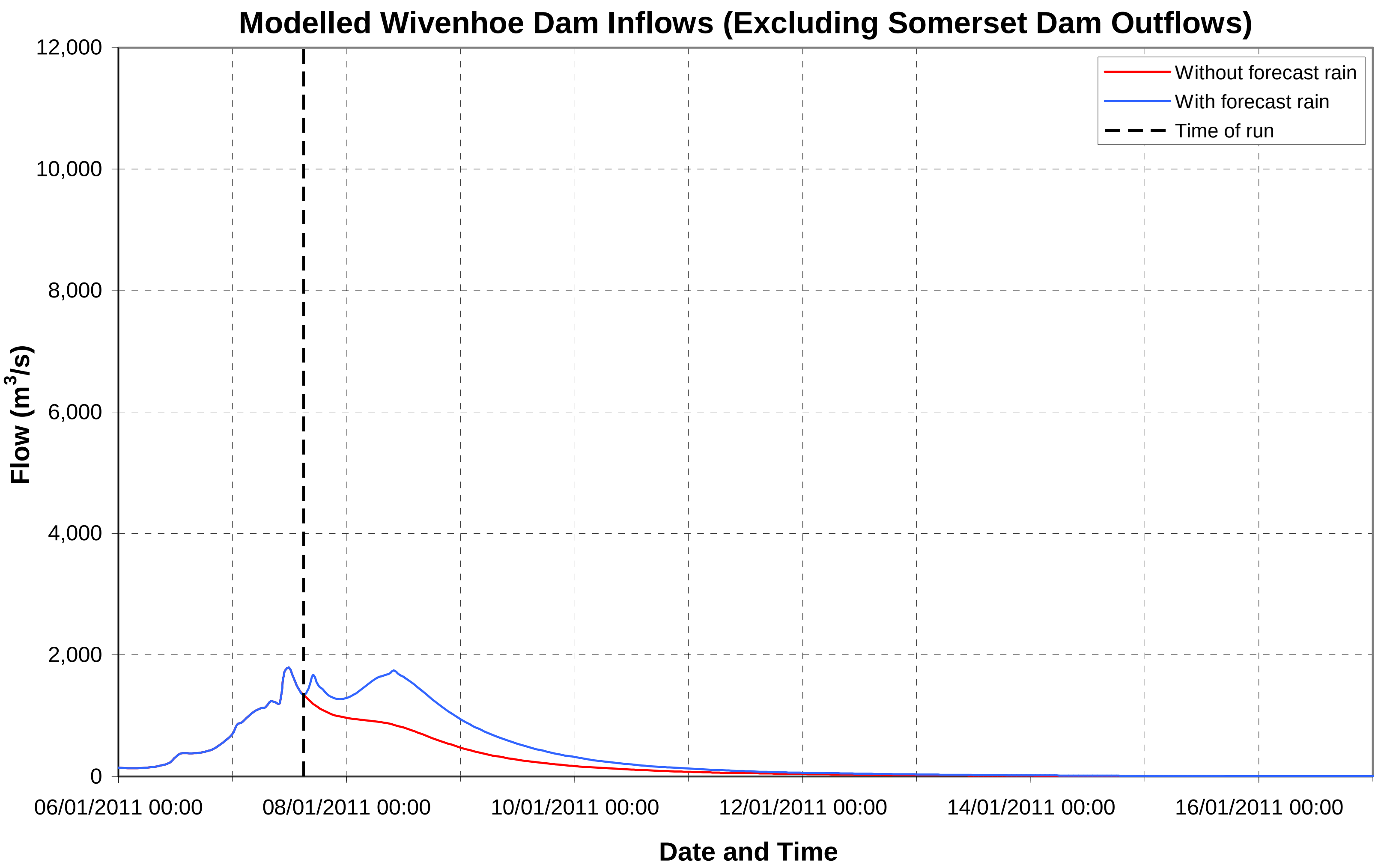


Run 7: Friday 7 January 2011, 09:00

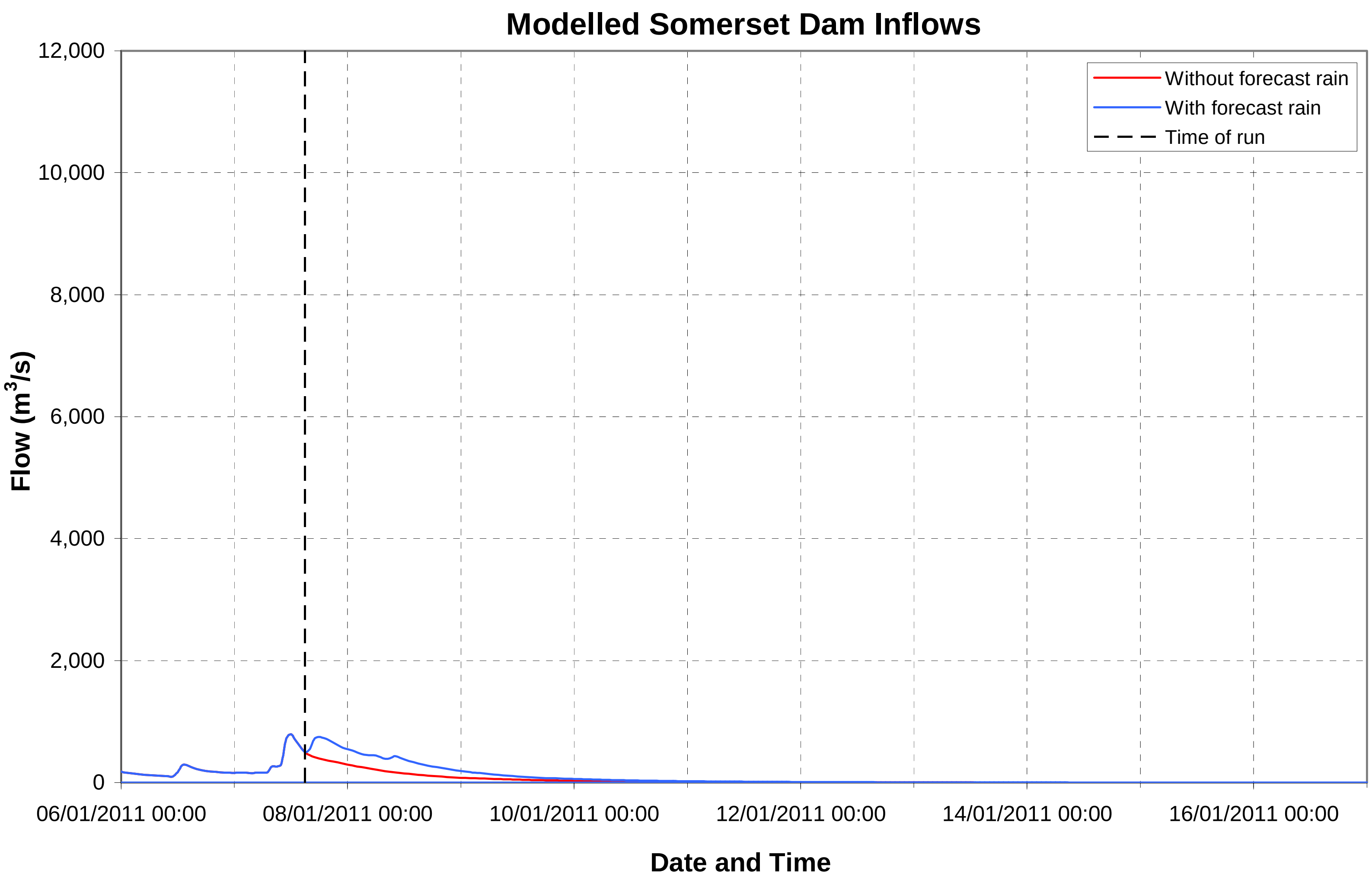
Run 8

Date: Friday 7 January 2011

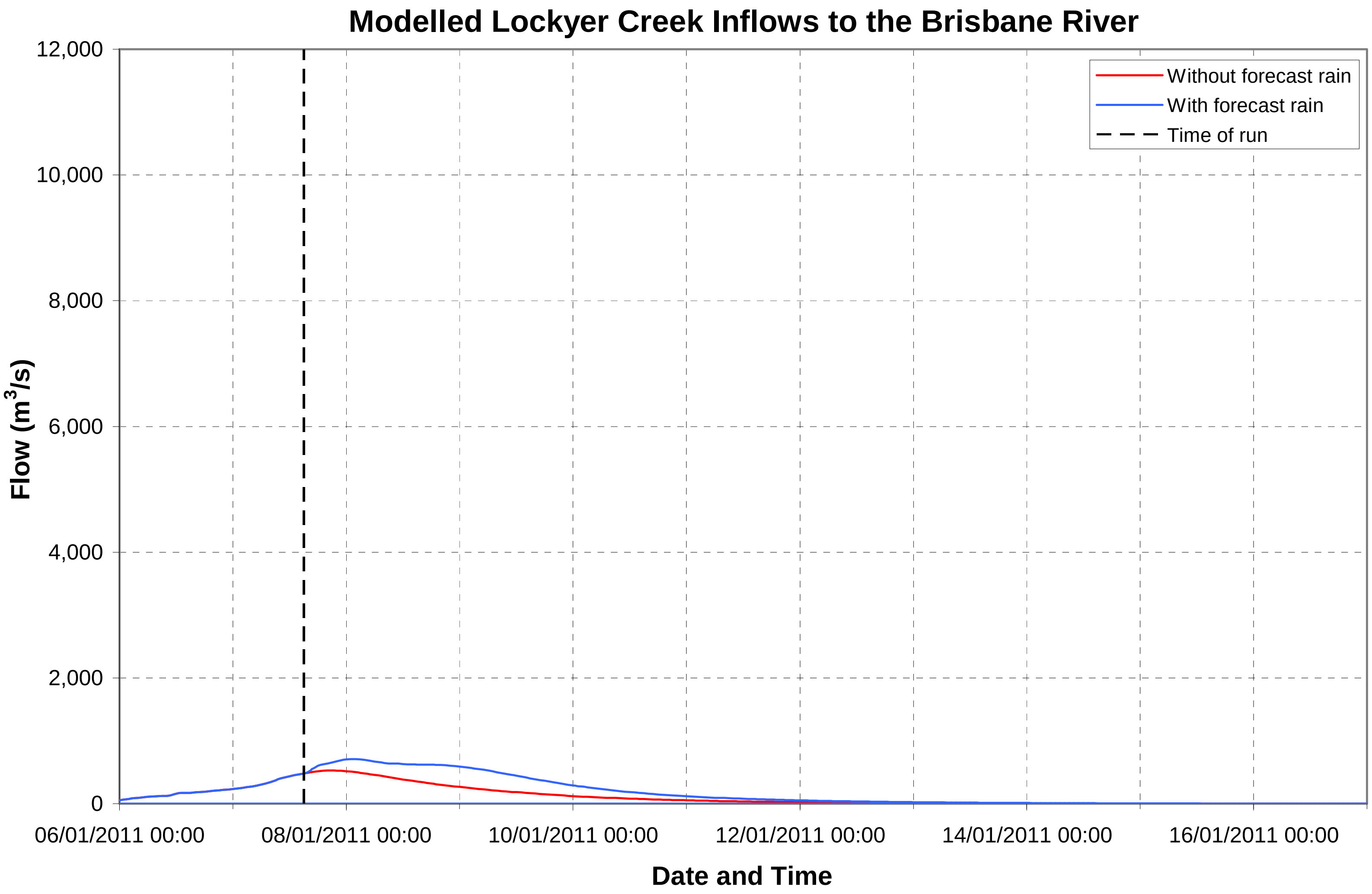
Time: 15:00



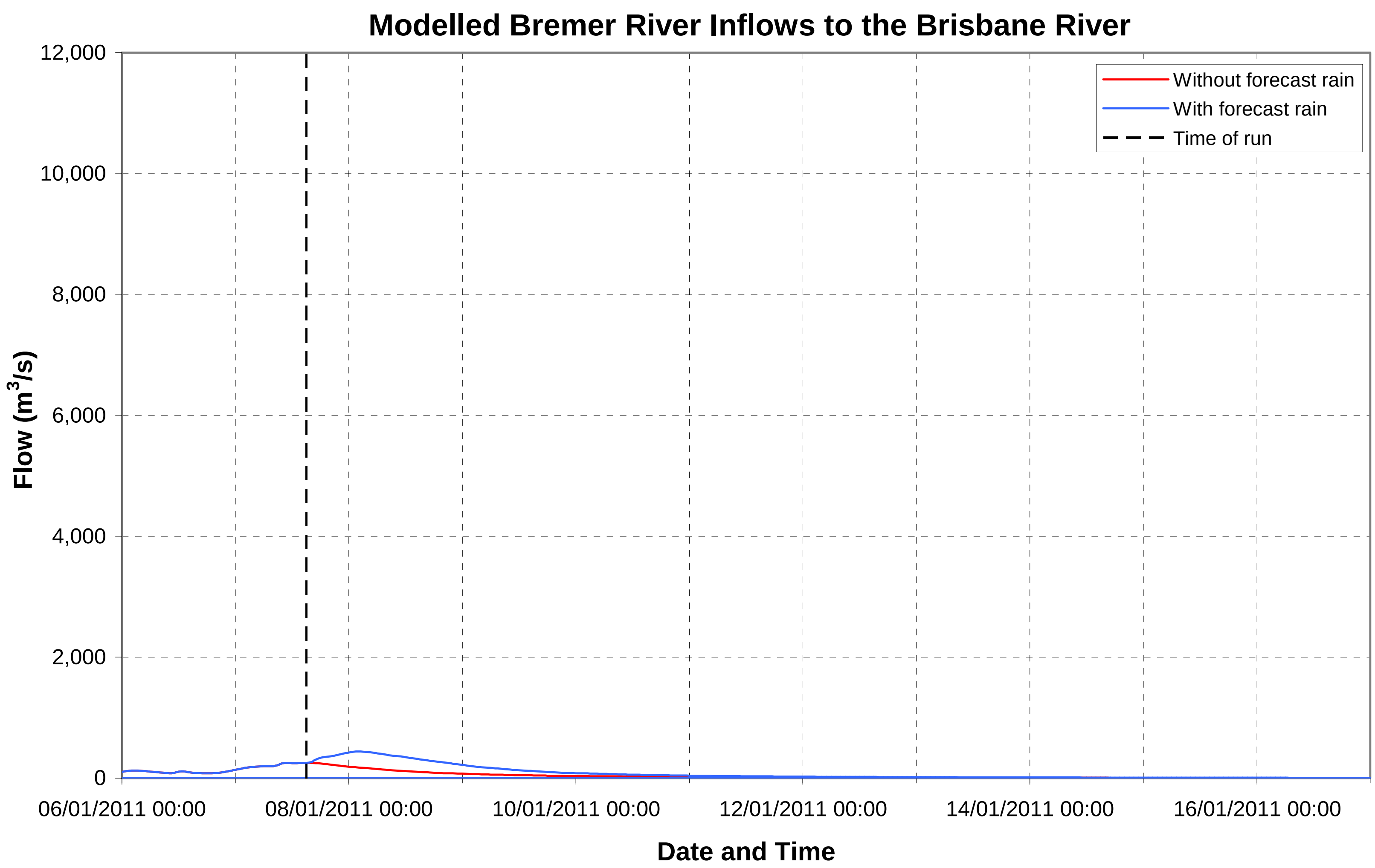
Run 8: Friday 7 January 2011, 15:00



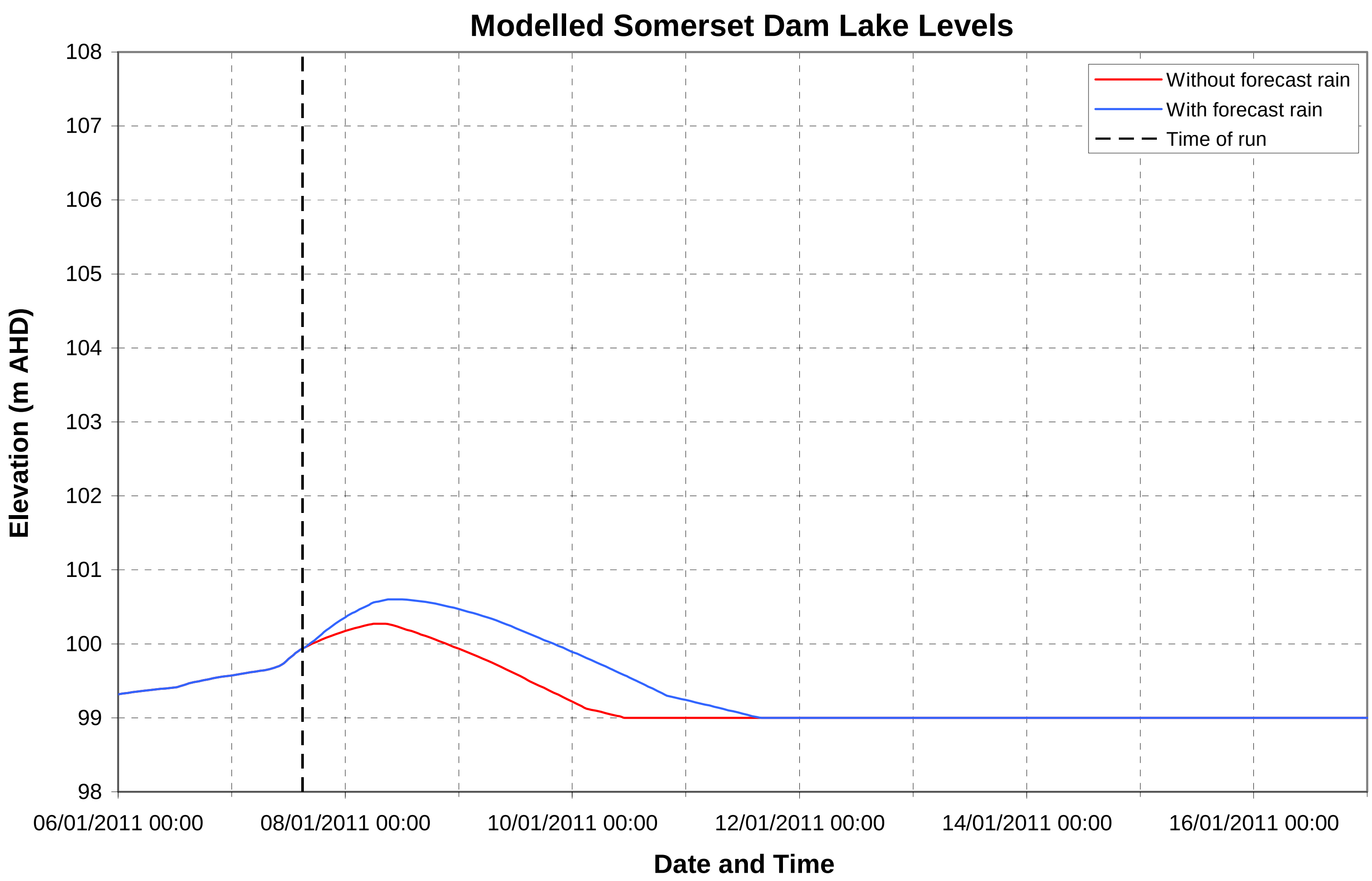
Run 8: Friday 7 January 2011, 15:00



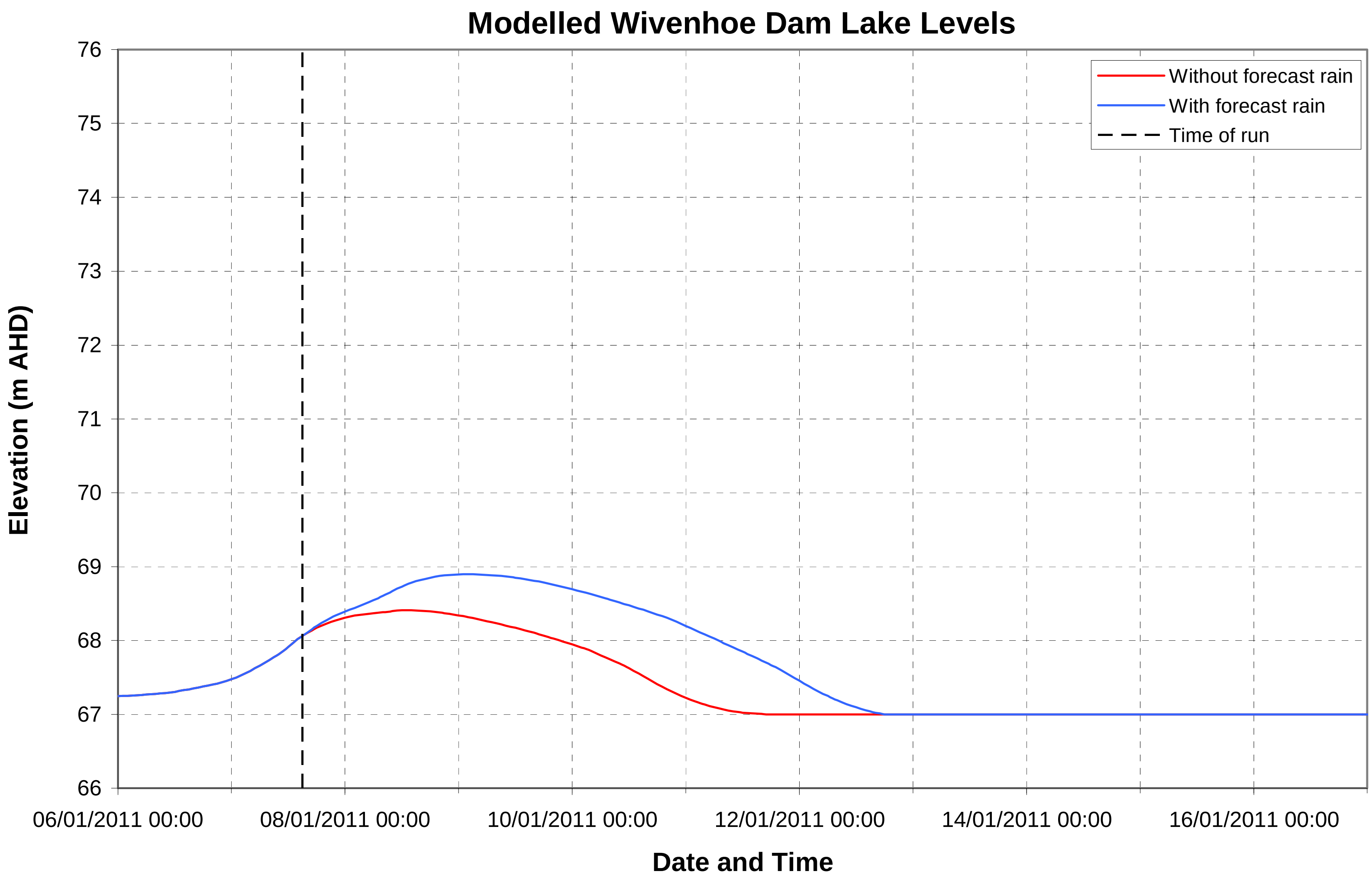
Run 8: Friday 7 January 2011, 15:00



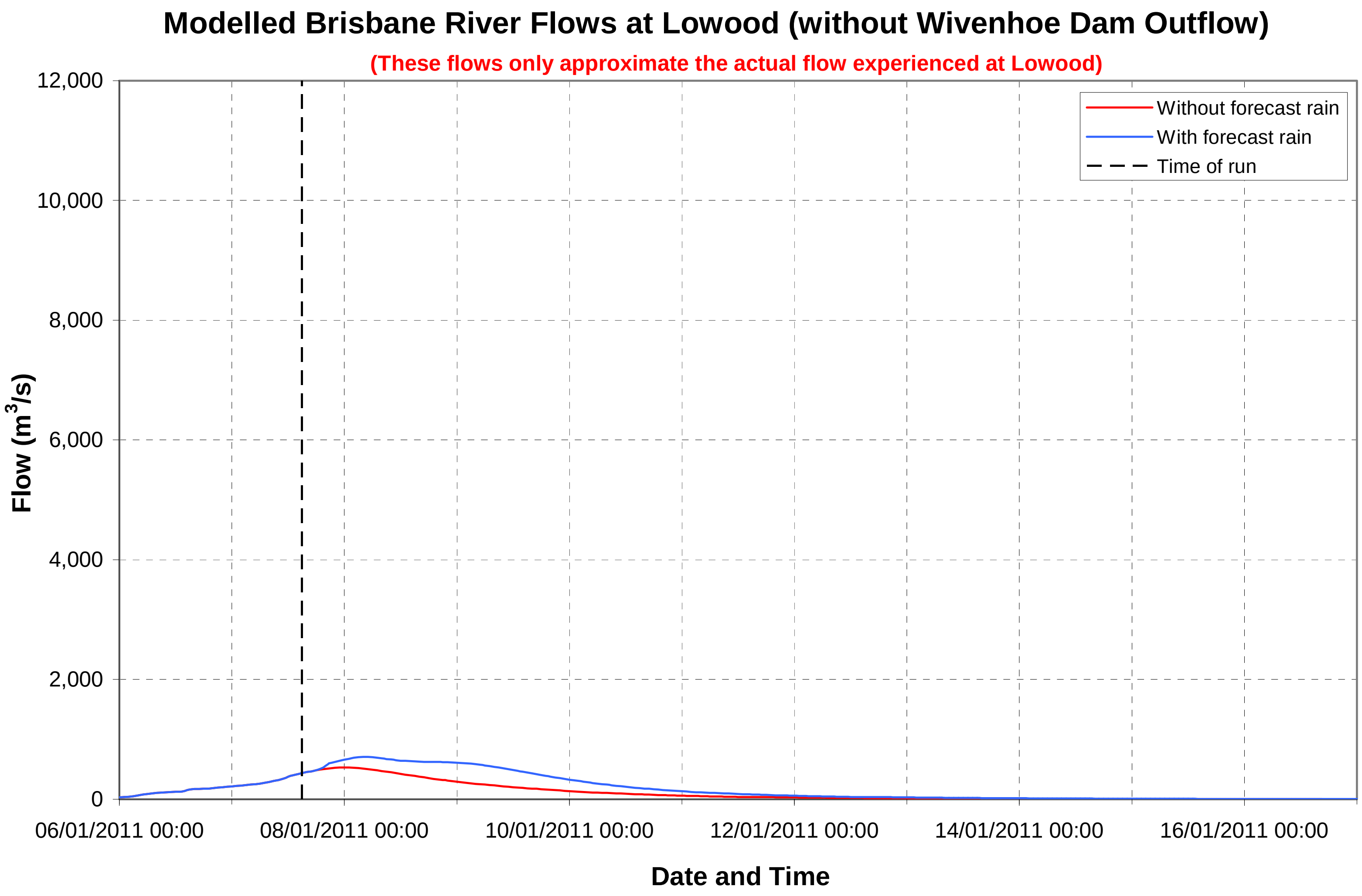
Run 8: Friday 7 January 2011, 15:00



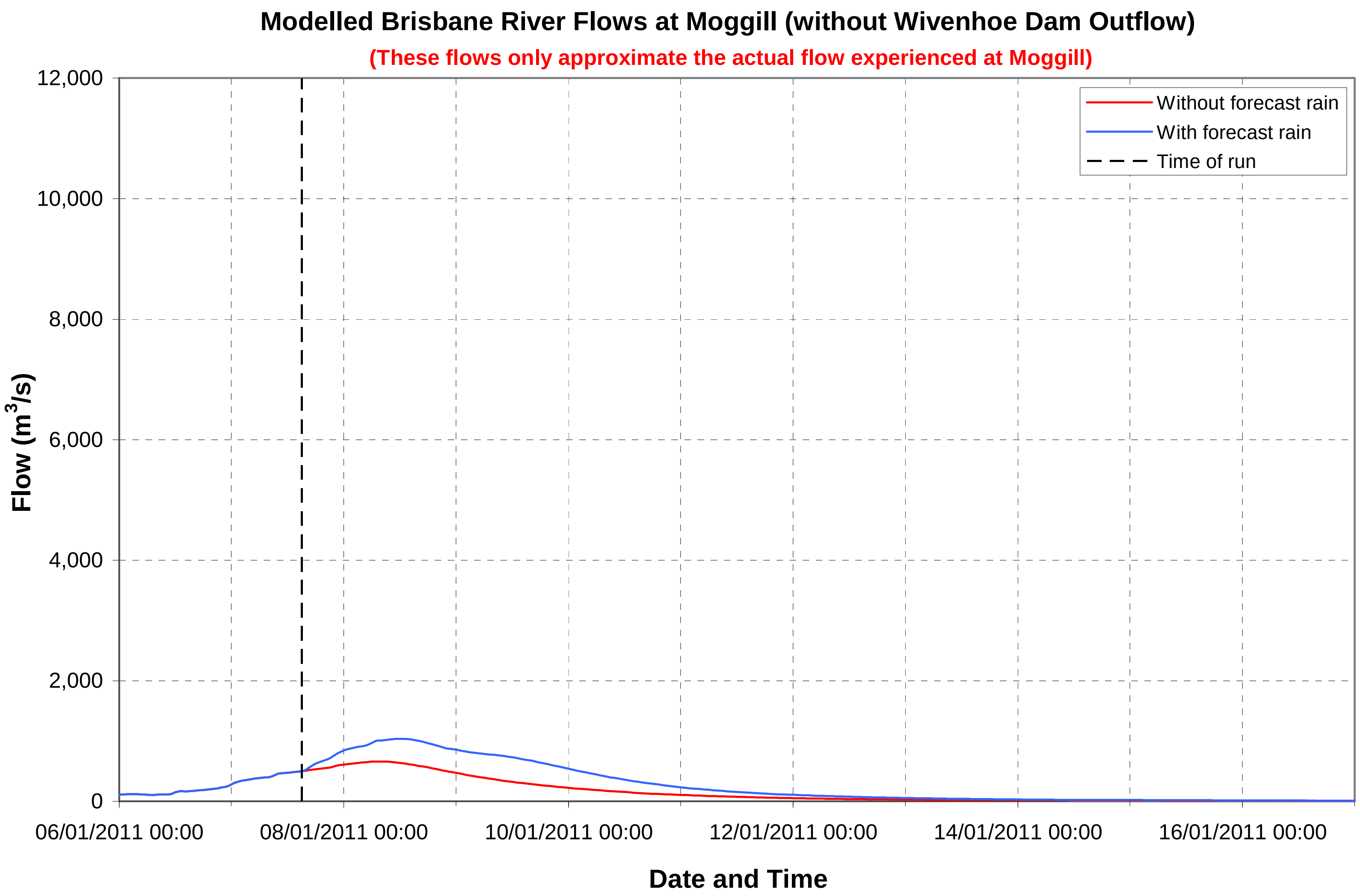
Run 8: Friday 7 January 2011, 15:00



Run 8: Friday 7 January 2011, 15:00



Run 8: Friday 7 January 2011, 15:00

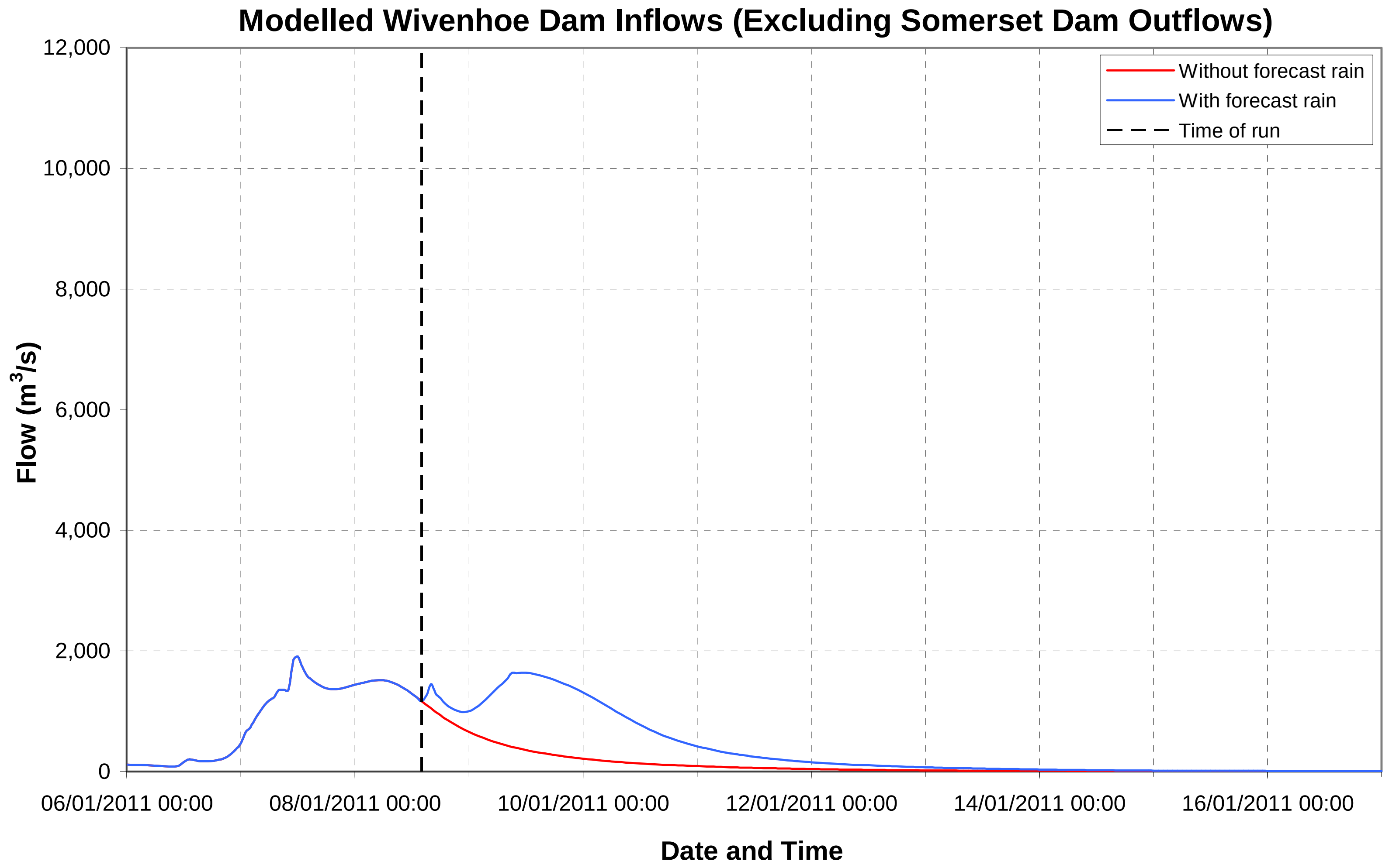


Run 8: Friday 7 January 2011, 15:00

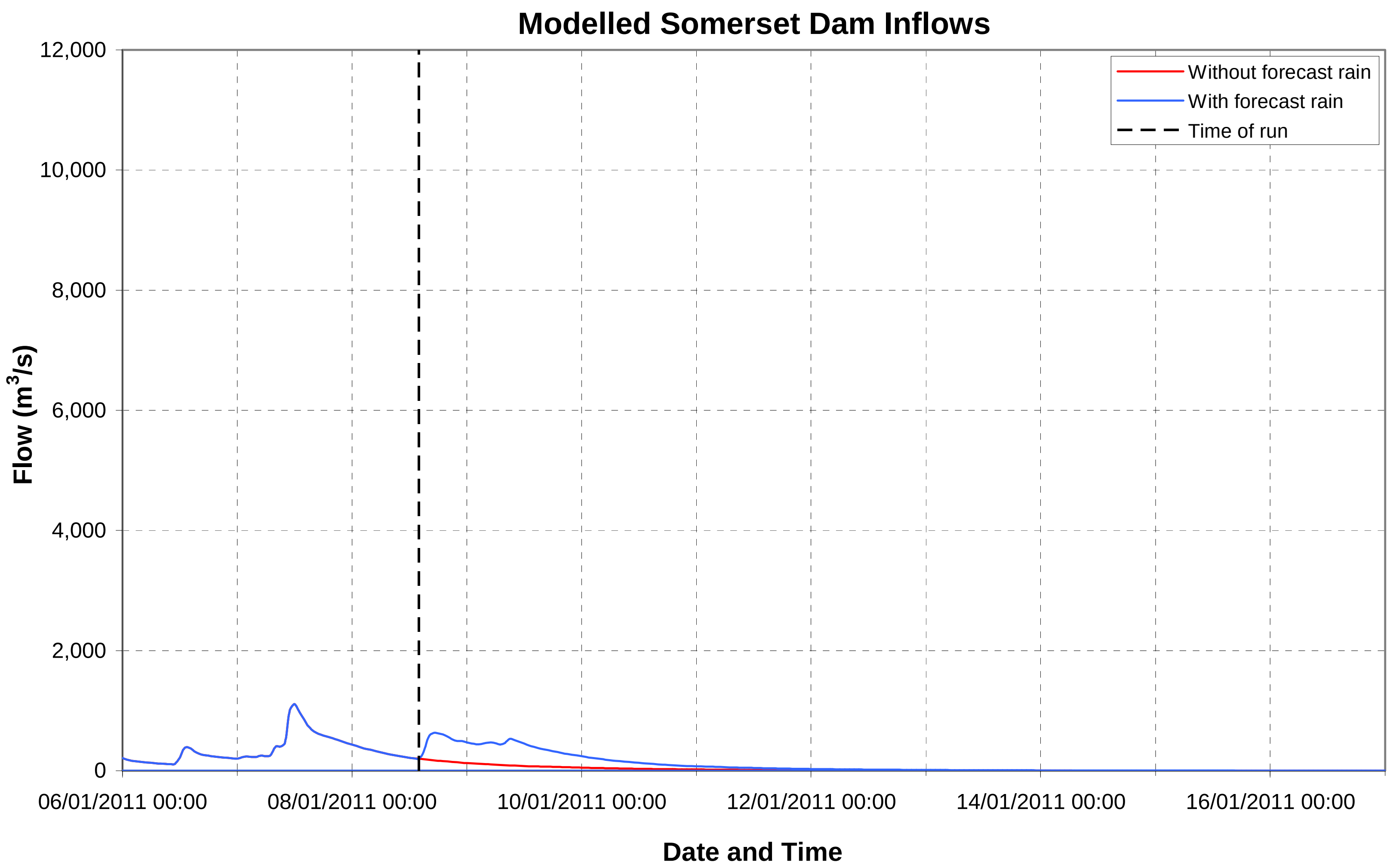
Run 10

Date: Saturday 8 January 2011

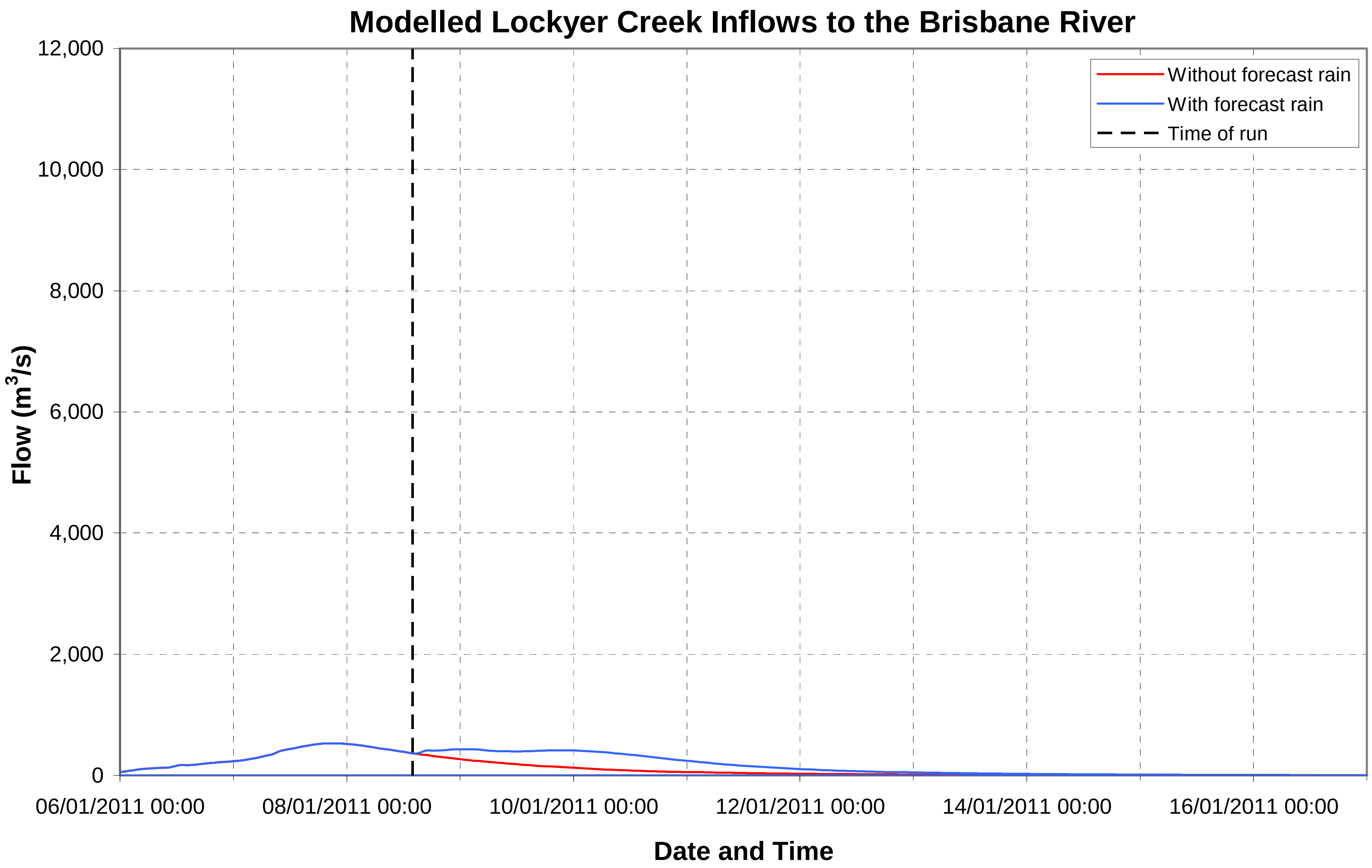
Time: 14:00



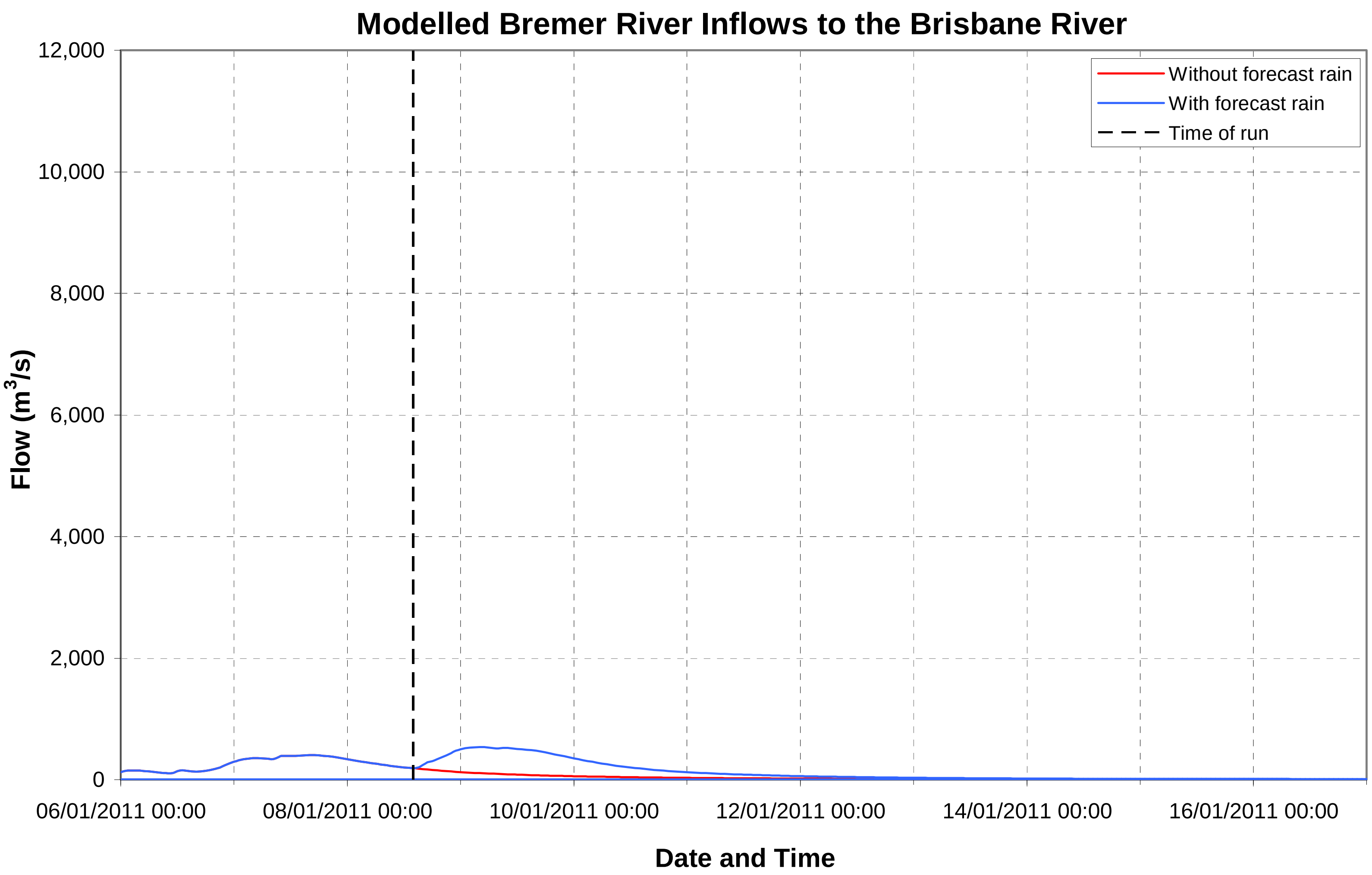
Run 10: Saturday 8 January 2011, 14:00



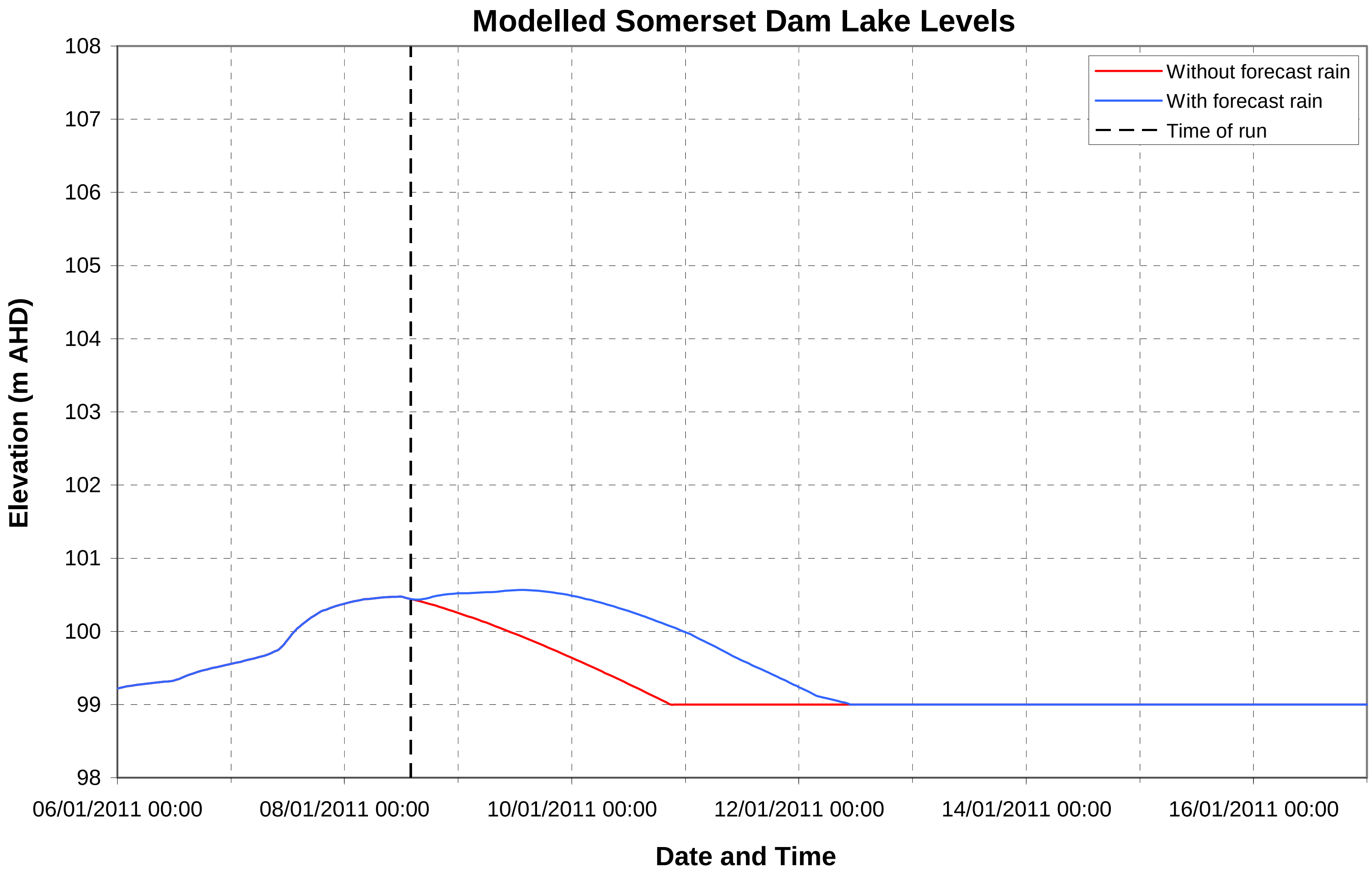
Run 10: Saturday 8 January 2011, 14:00



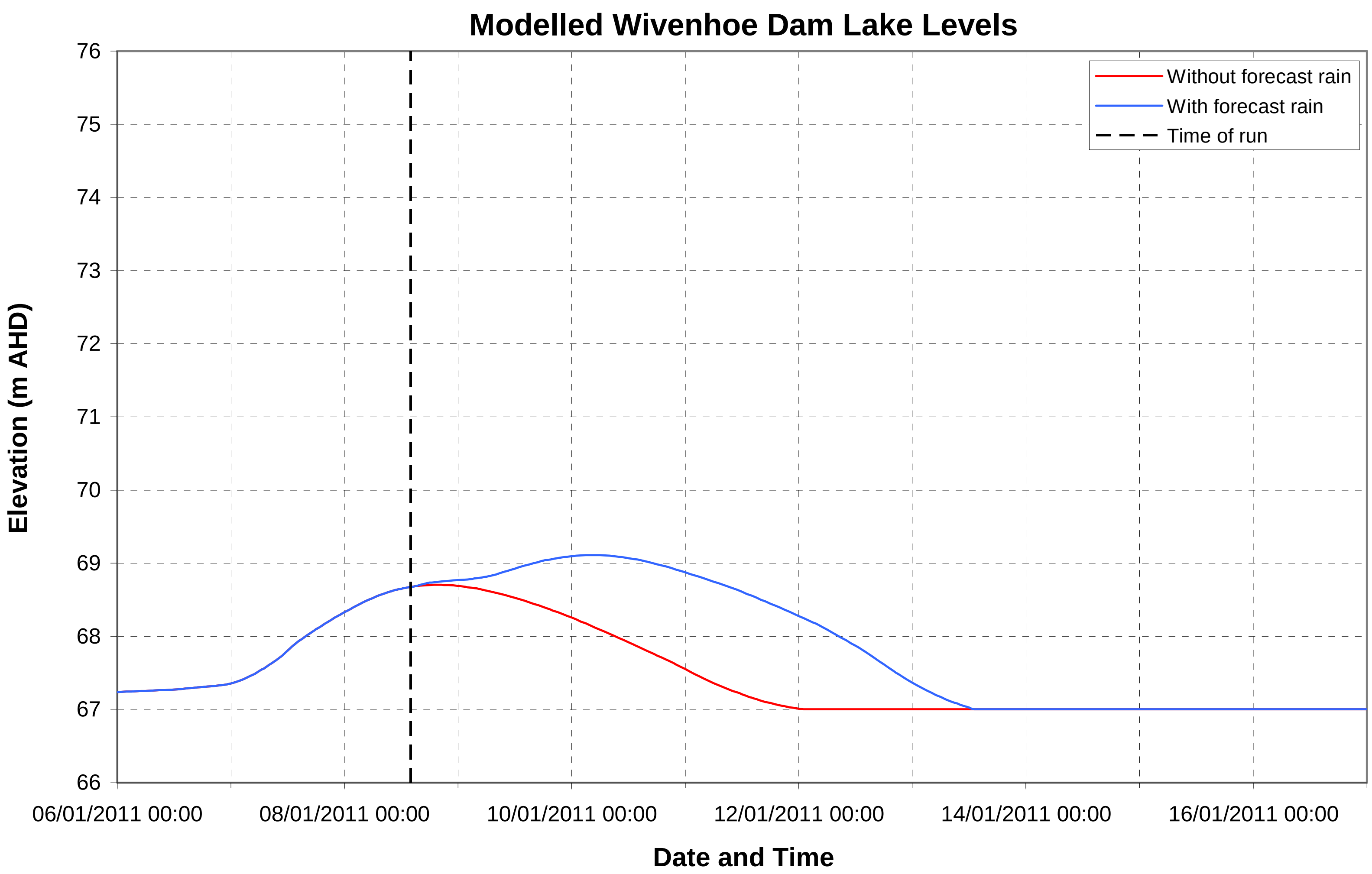
Run 10: Saturday 8 January 2011, 14:00



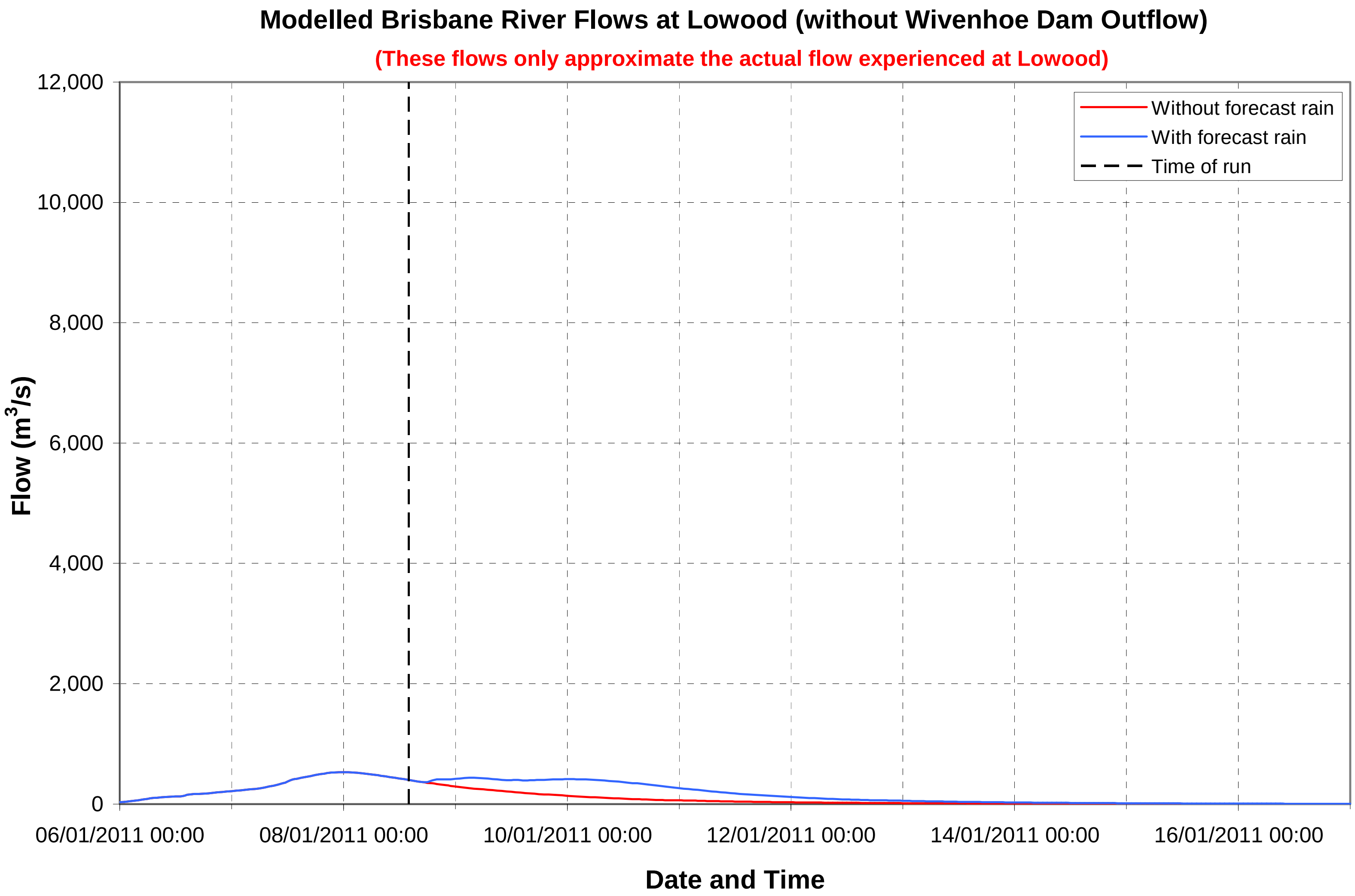
Run 10: Saturday 8 January 2011, 14:00



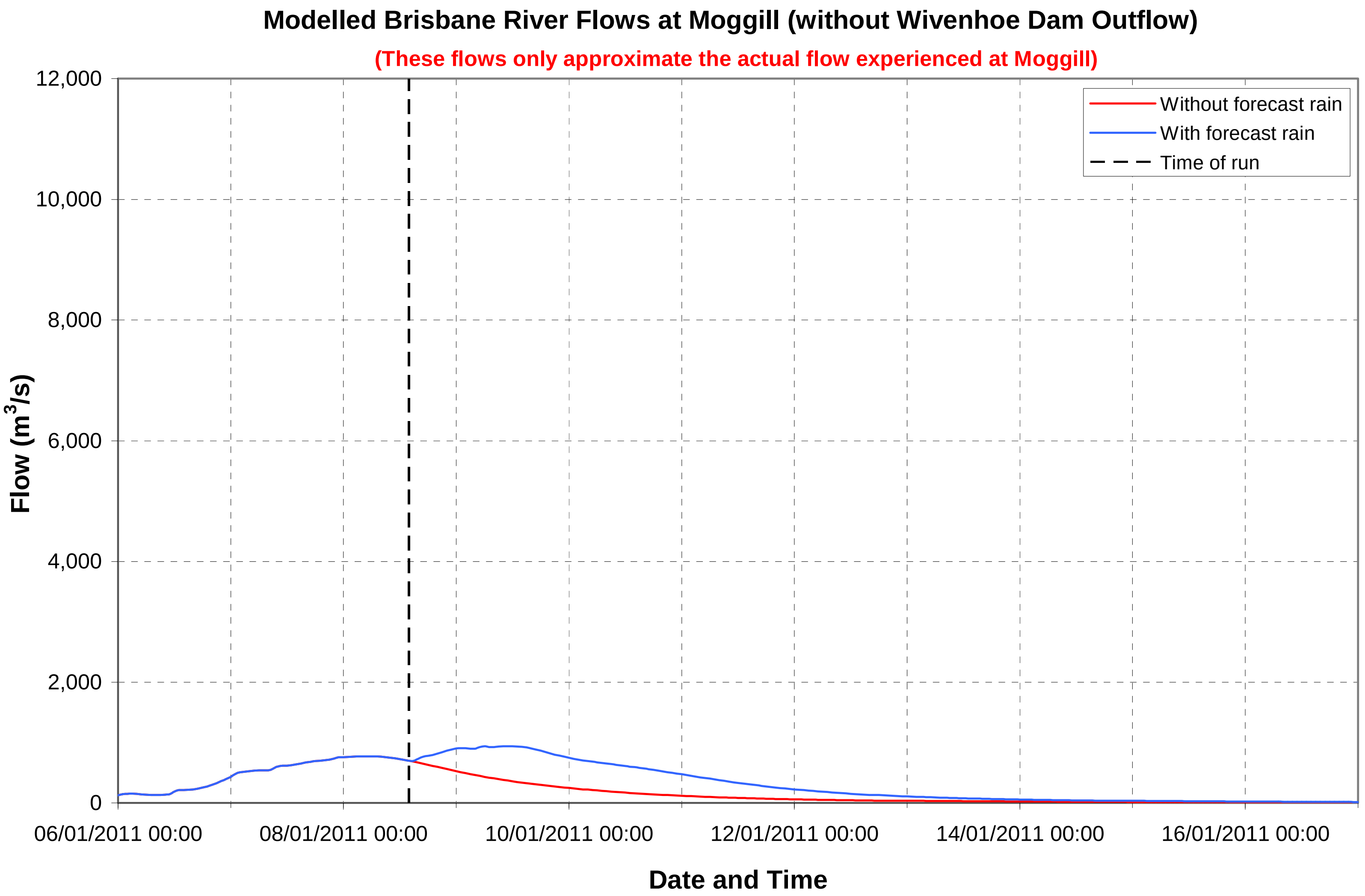
Run 10: Saturday 8 January 2011, 14:00



Run 10: Saturday 8 January 2011, 14:00



Run 10: Saturday 8 January 2011, 14:00

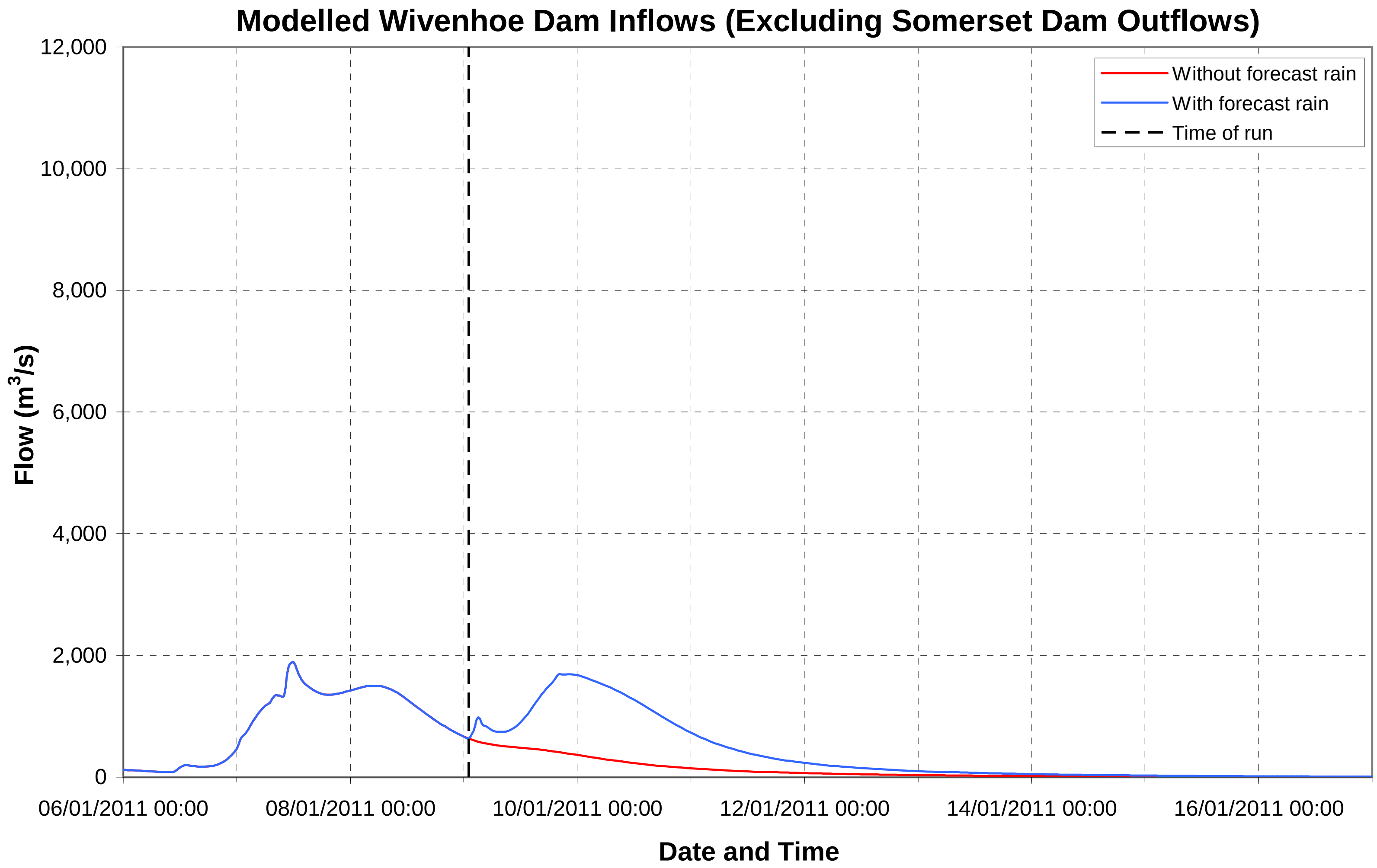


Run 10: Saturday 8 January 2011, 14:00

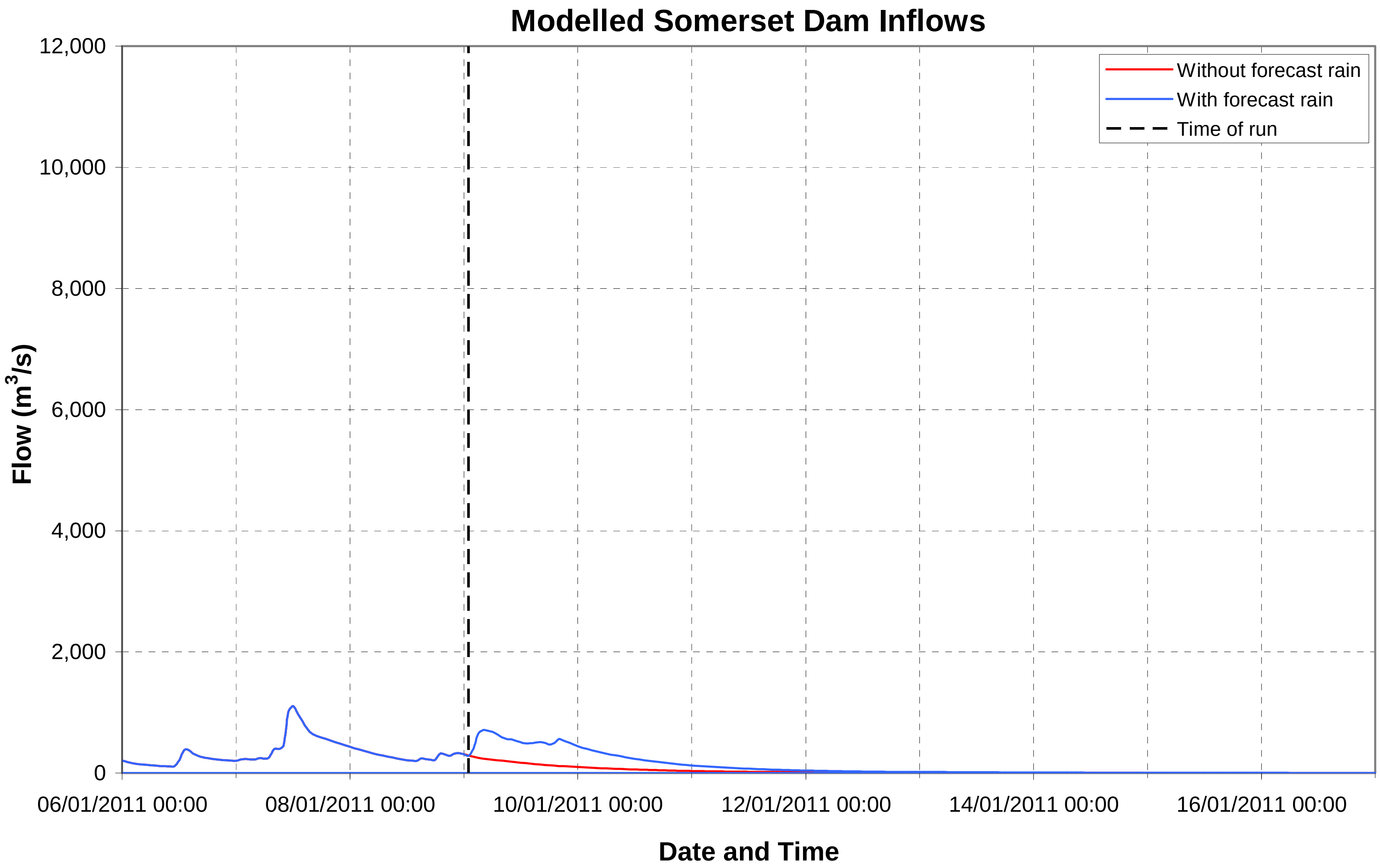
Run 12

Date: Sunday 9 January 2011

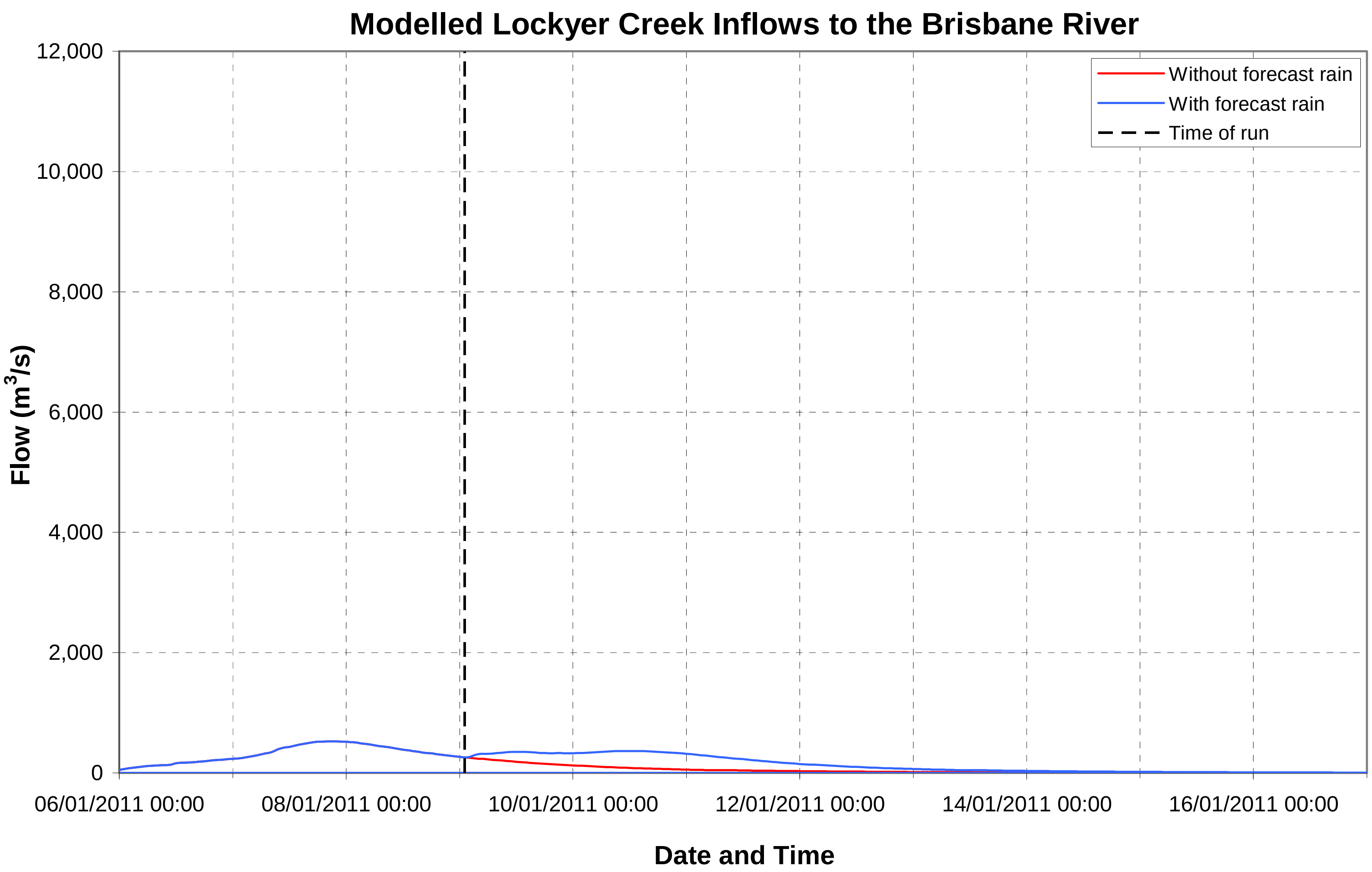
Time: 01:00



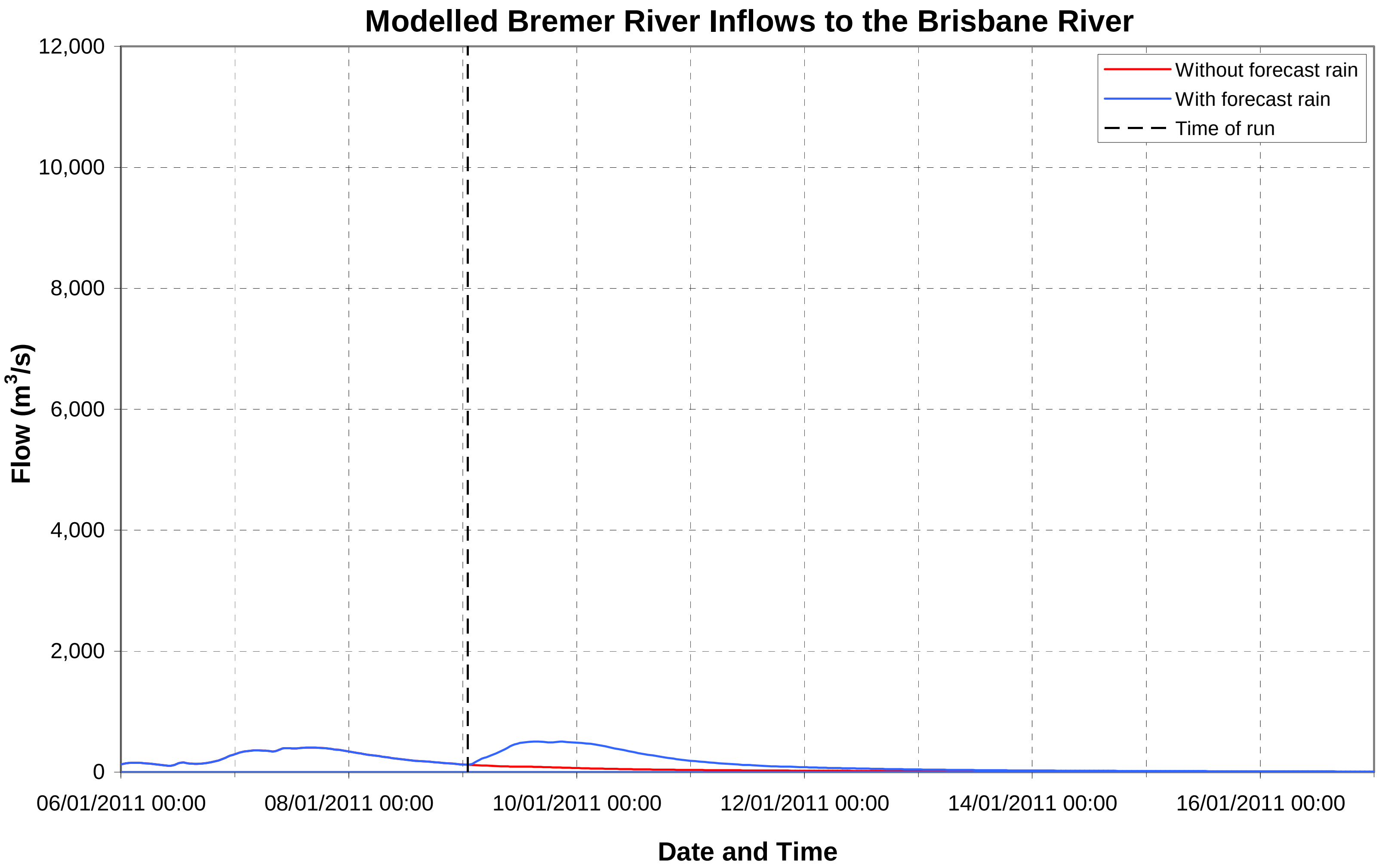
Run 12: Sunday 9 January 2011, 01:00



Run 12: Sunday 9 January 2011, 01:00



Run 12: Sunday 9 January 2011, 01:00



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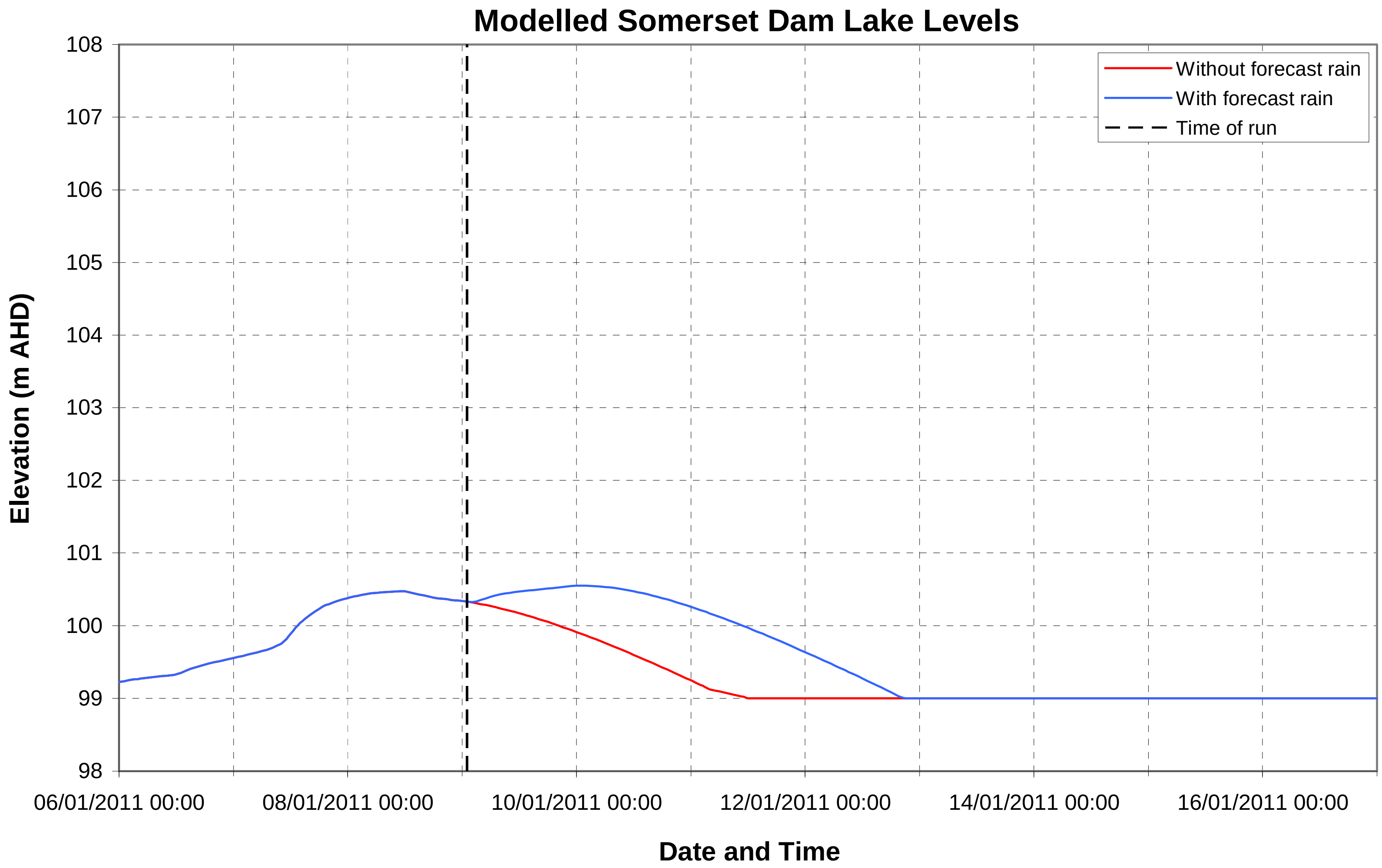
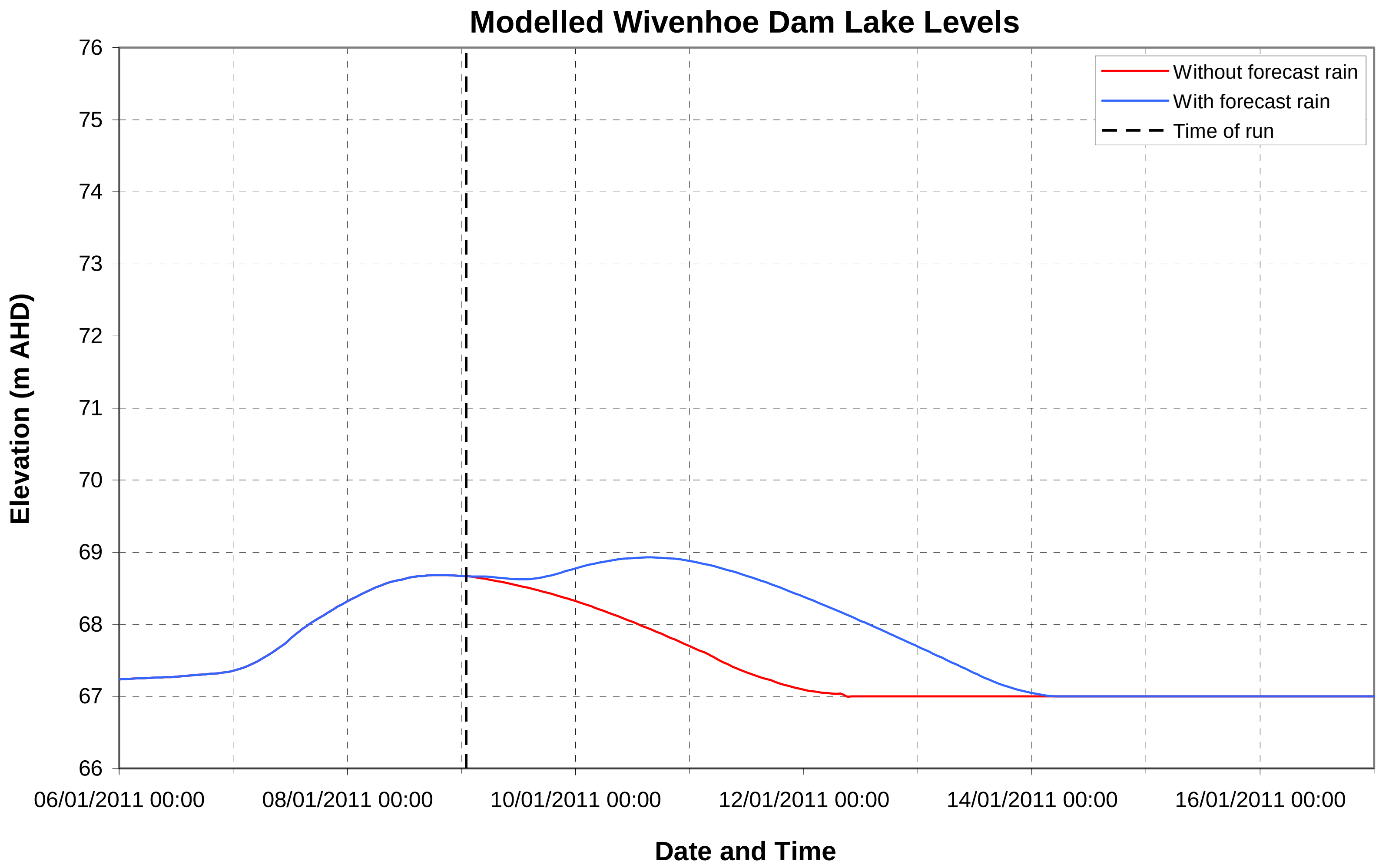


Run 12: Sunday 9 January 2011, 01:00



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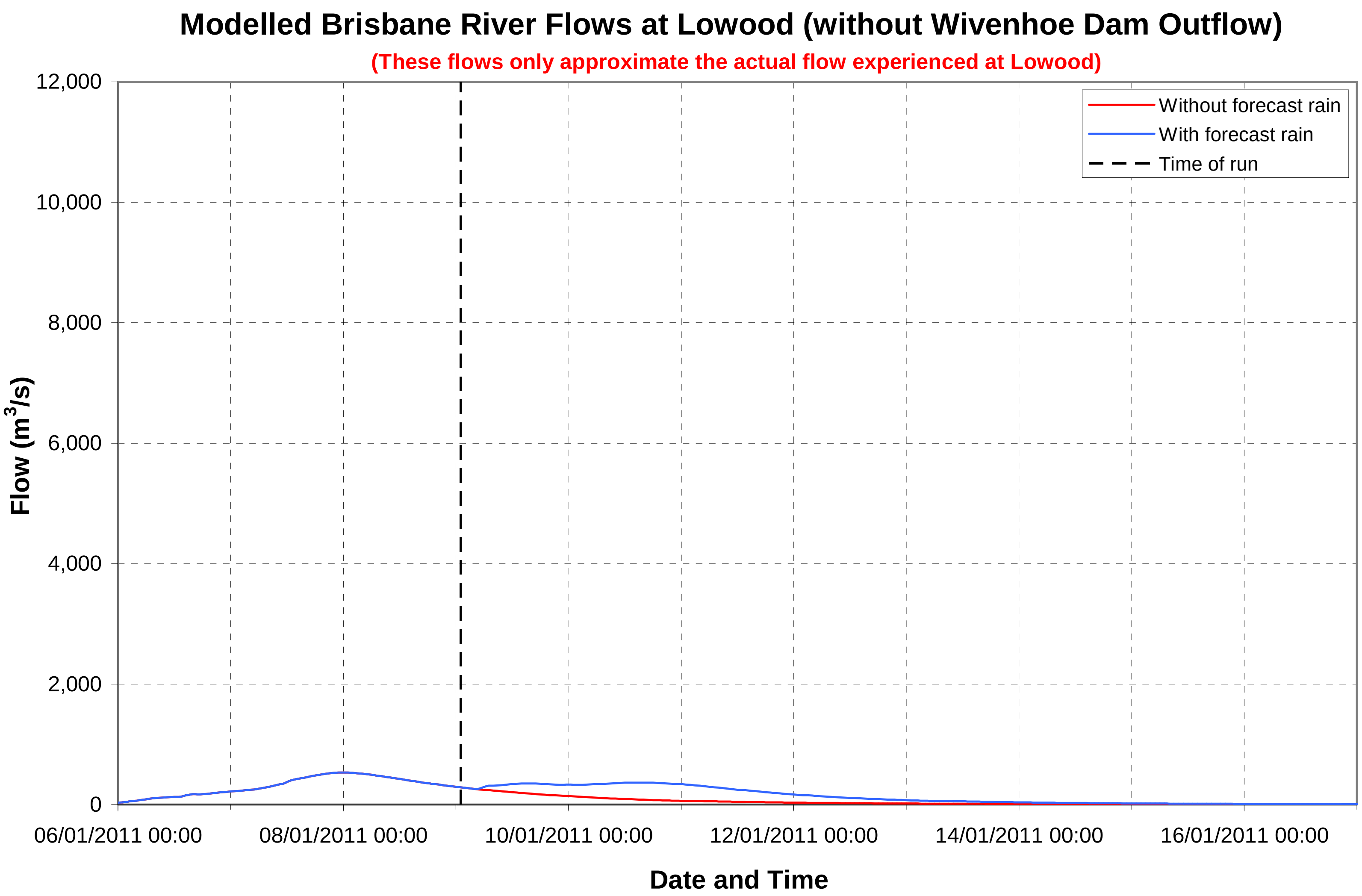

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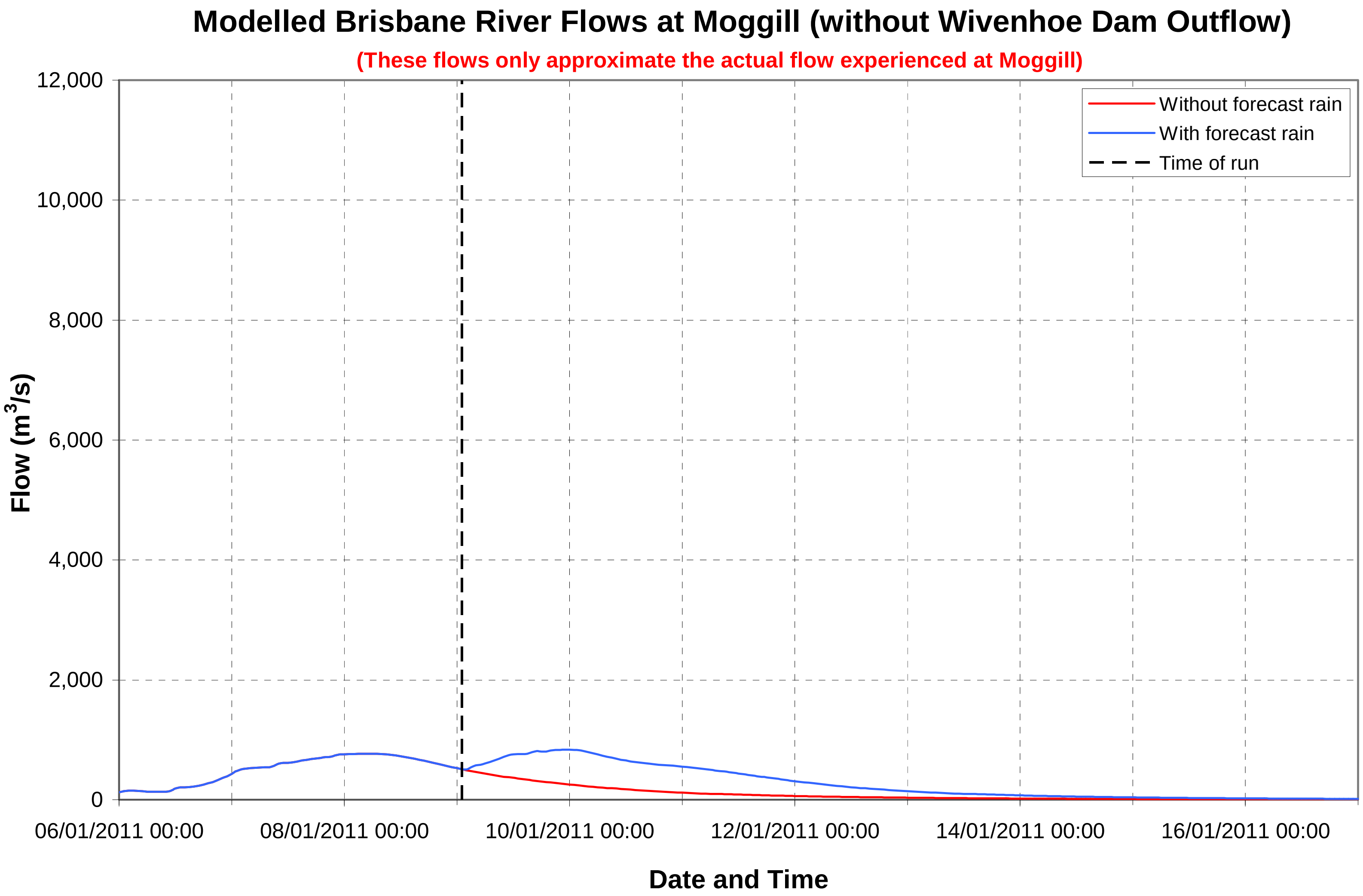
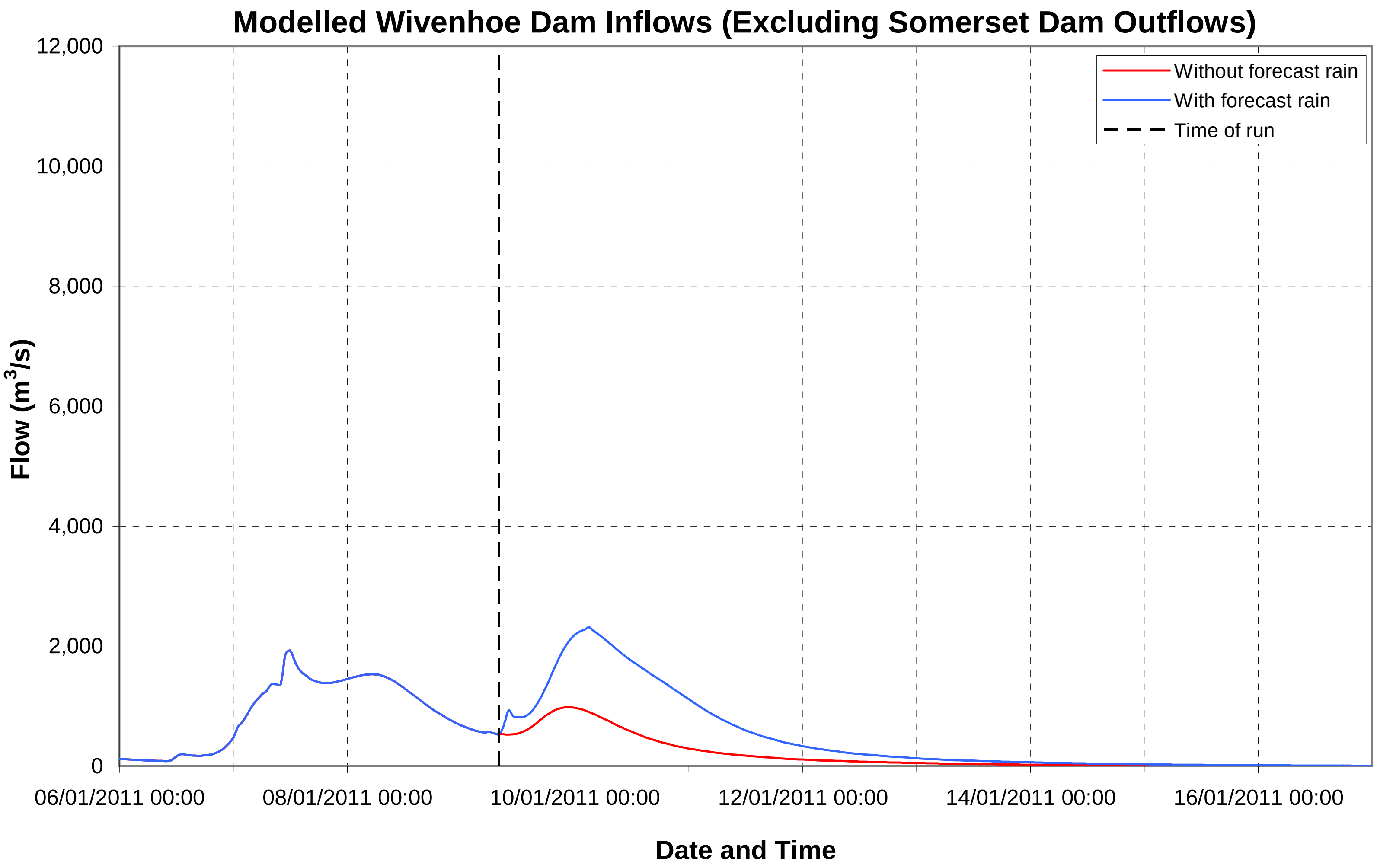


Run 12: Sunday 9 January 2011, 01:00

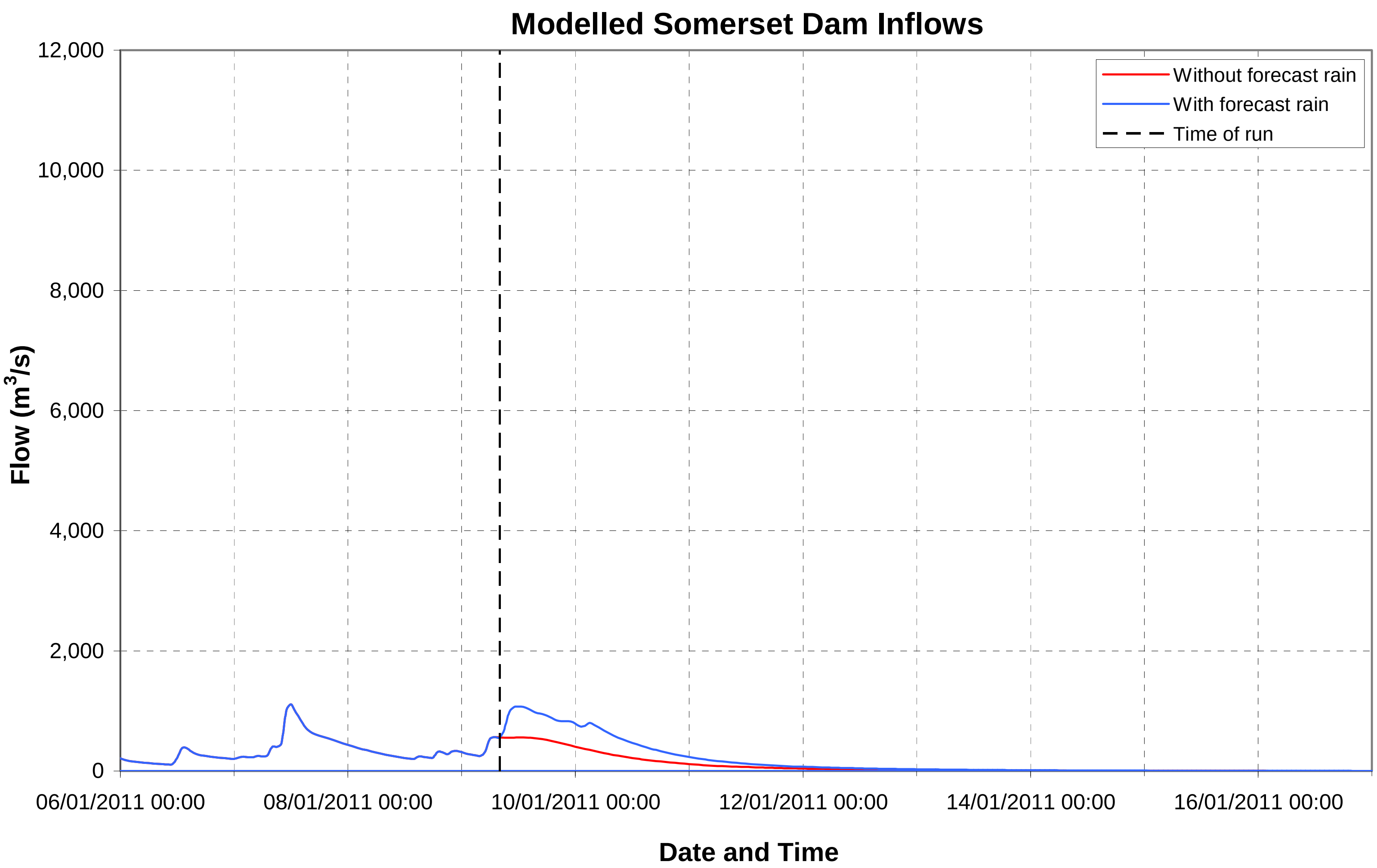
Run 14

Date: Sunday 9 January 2011

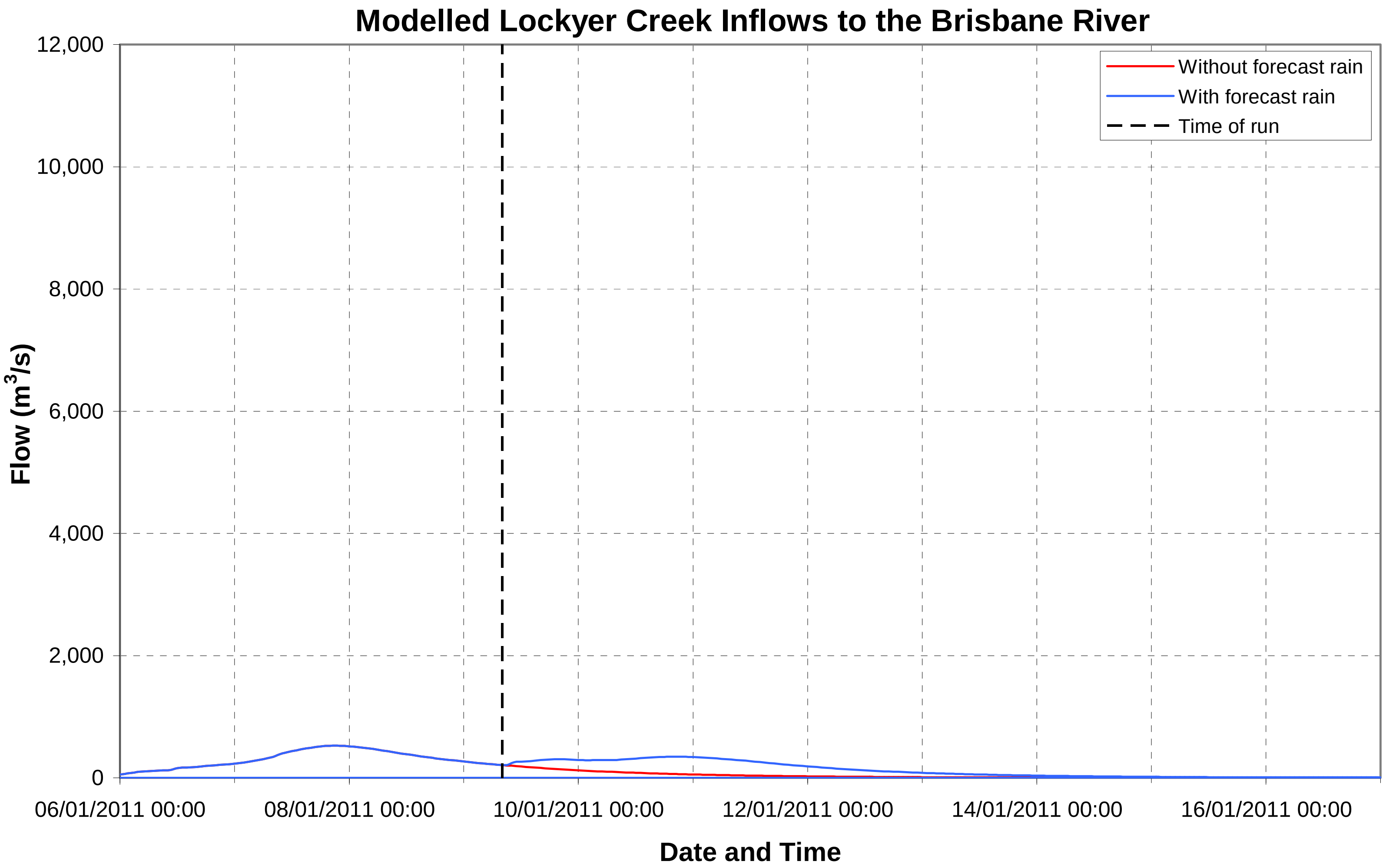
Time: 08:00



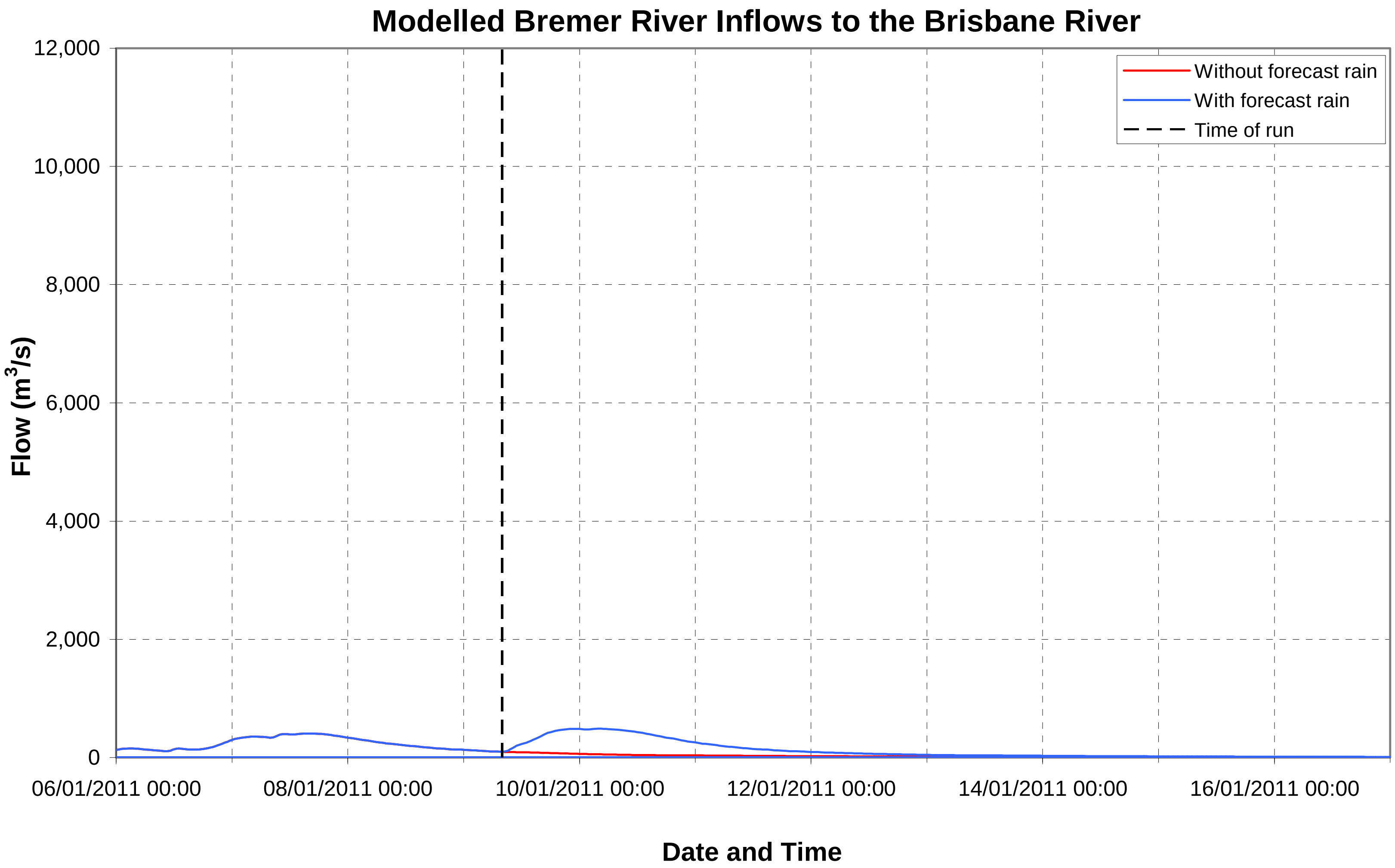
Run 14: Sunday 9 January 2011, 08:00



Run 14: Sunday 9 January 2011, 08:00



Run 14: Sunday 9 January 2011, 08:00



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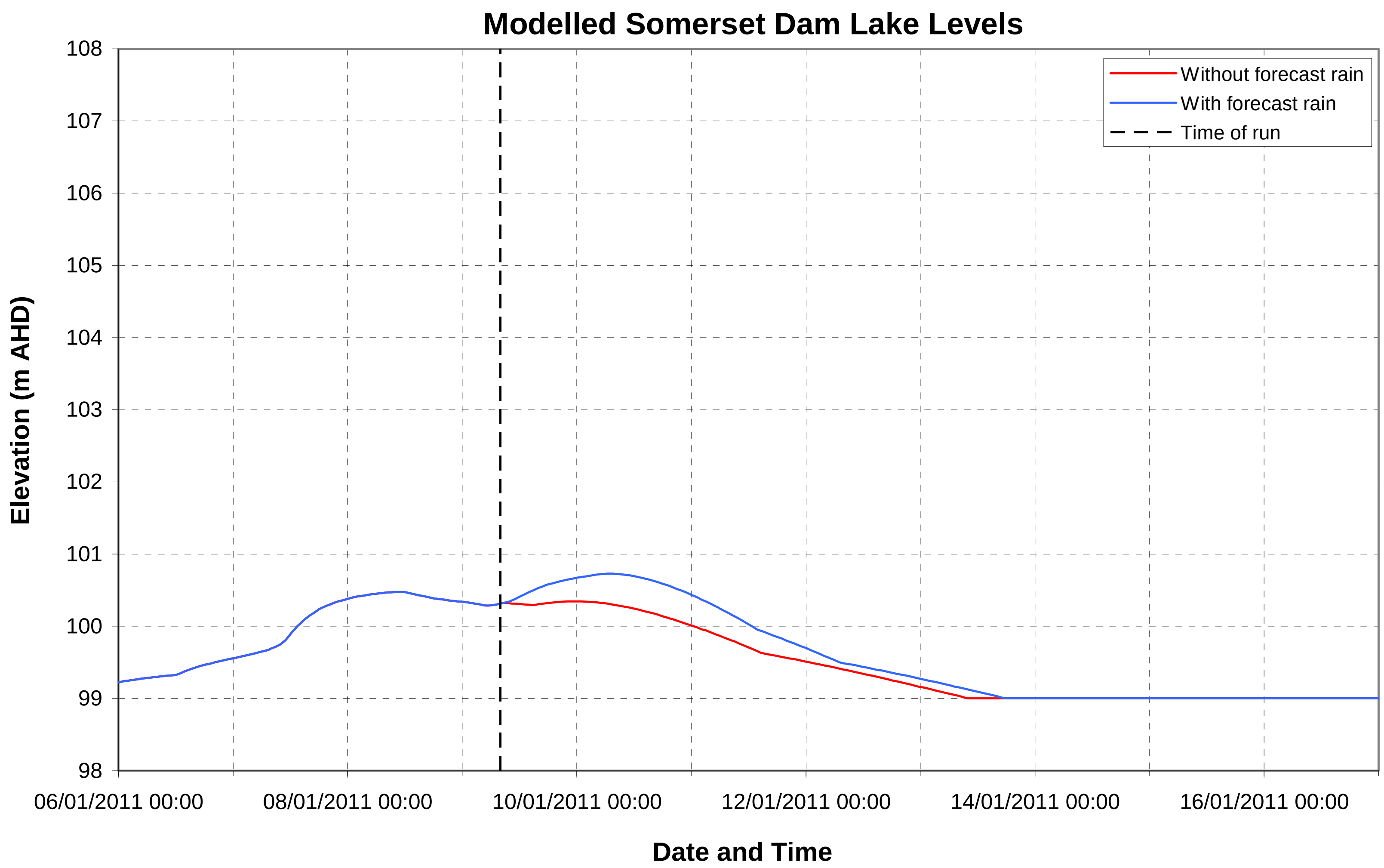

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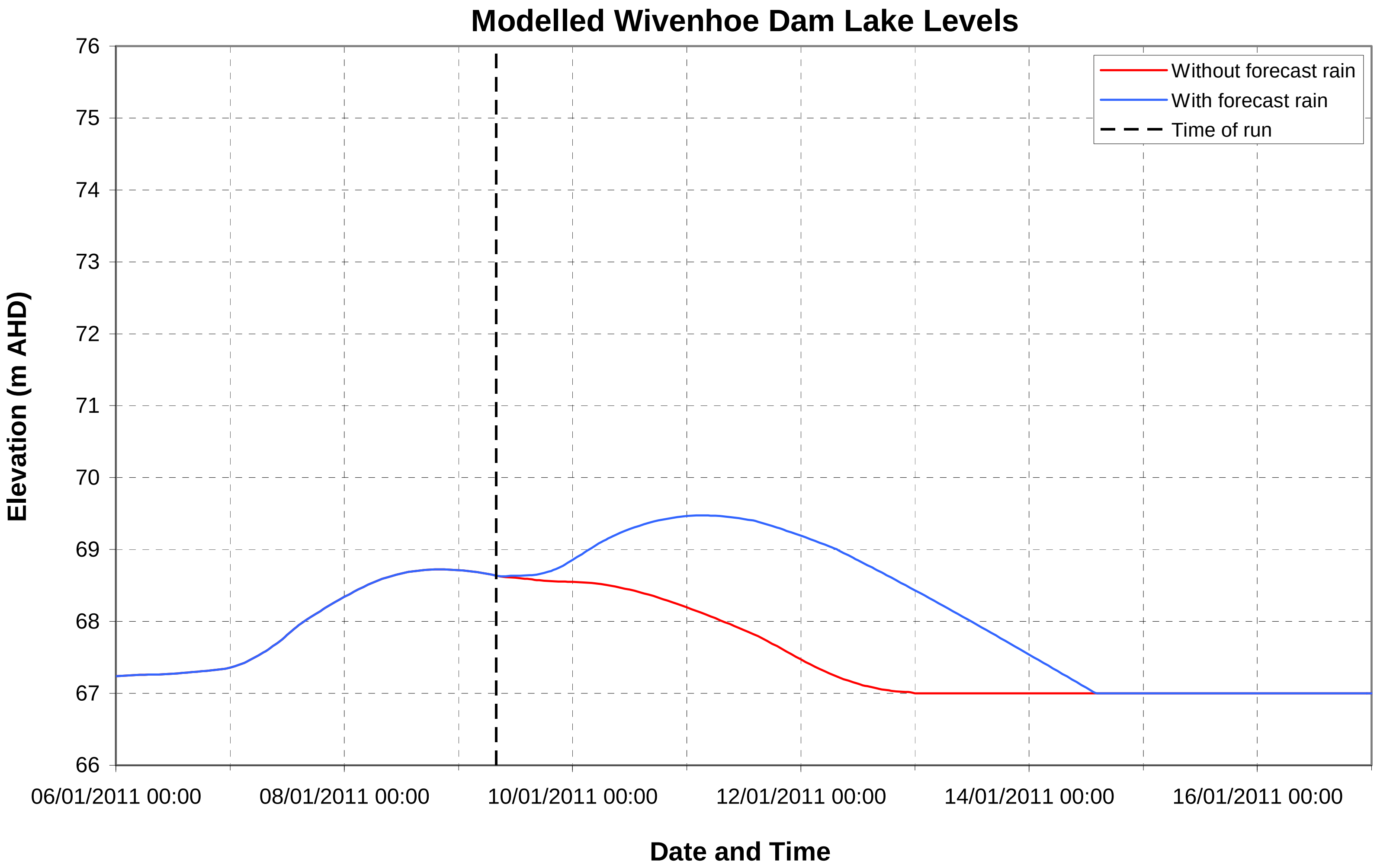

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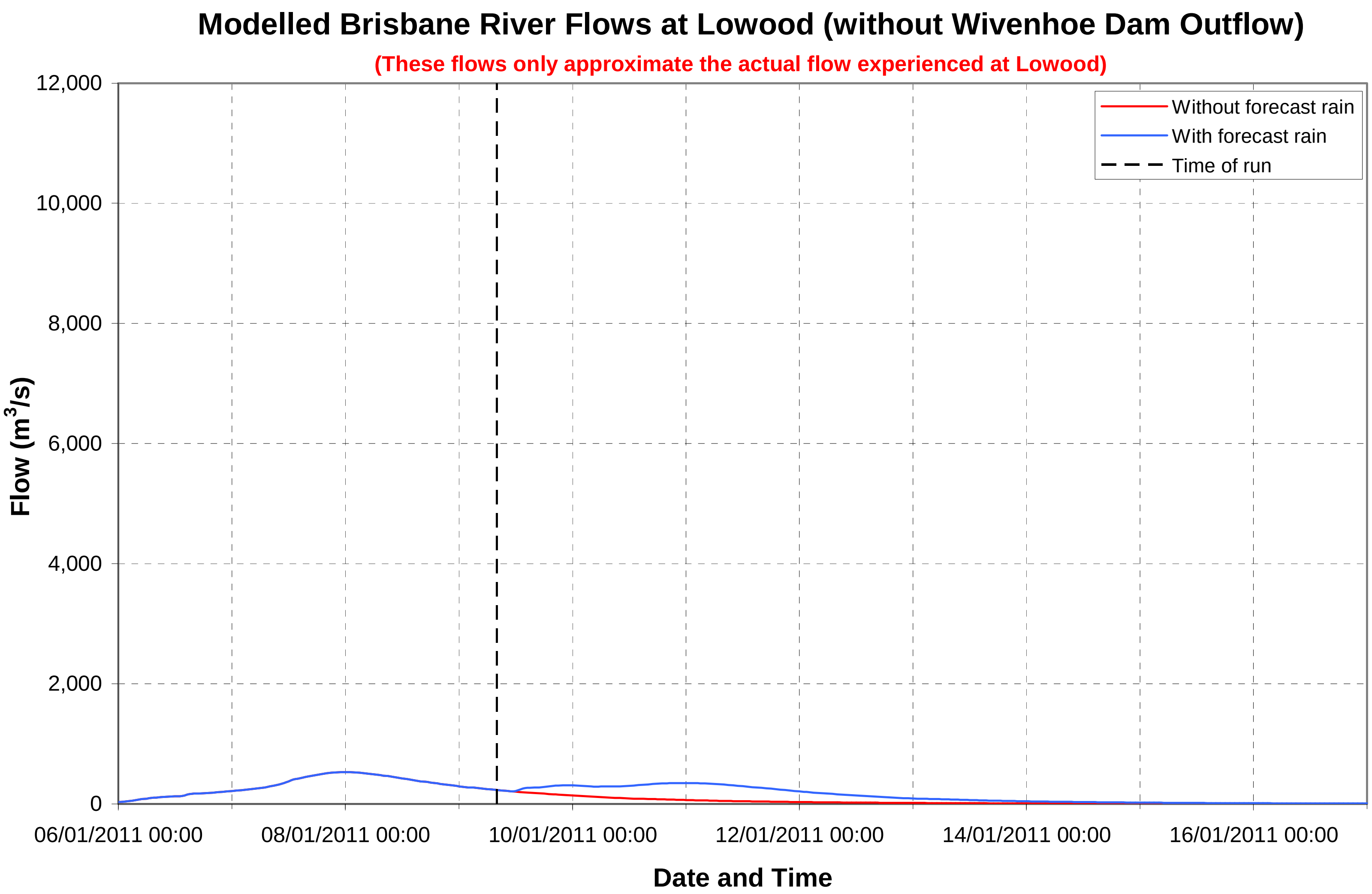
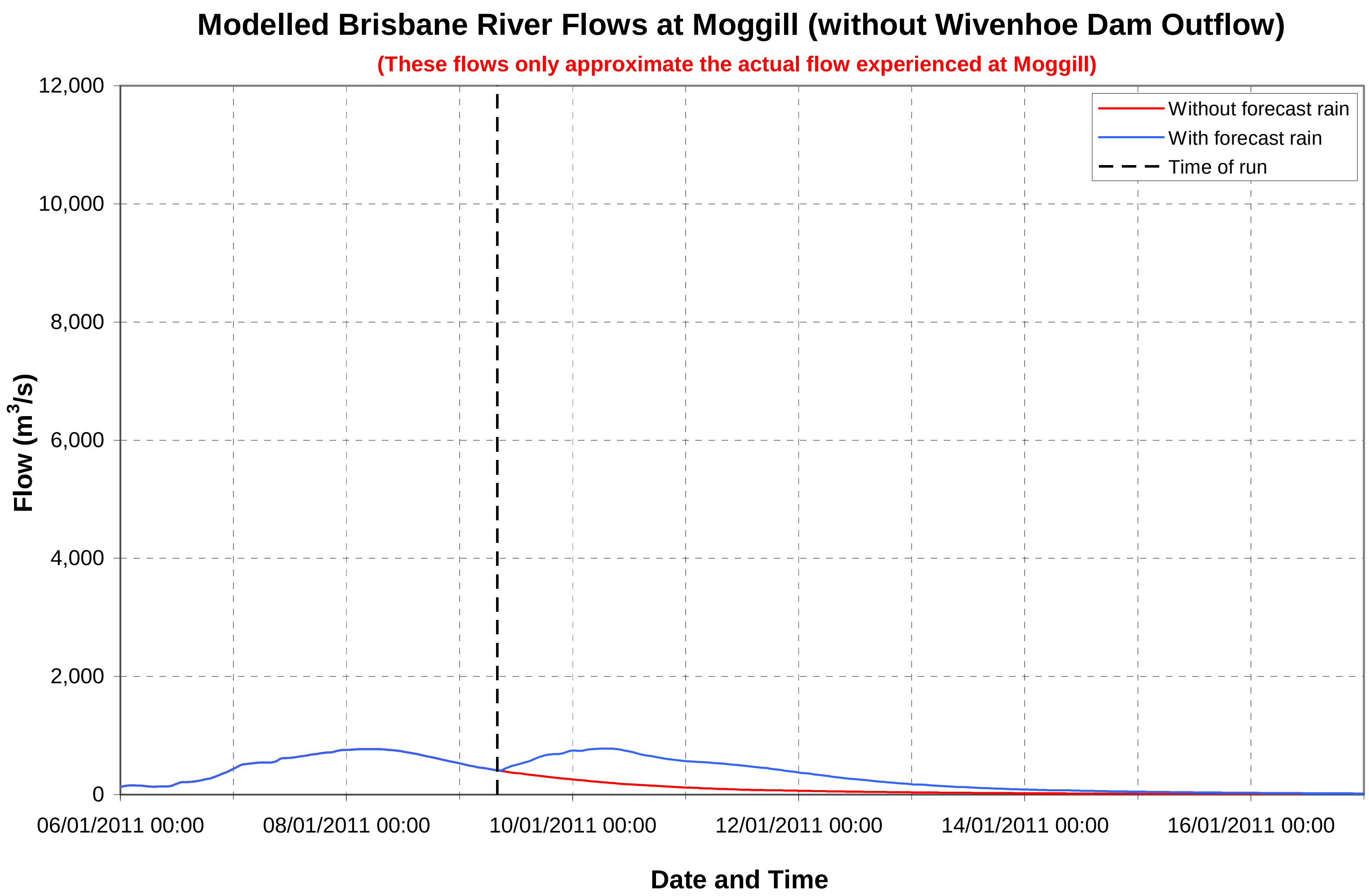


Run 14: Sunday 9 January 2011, 08:00

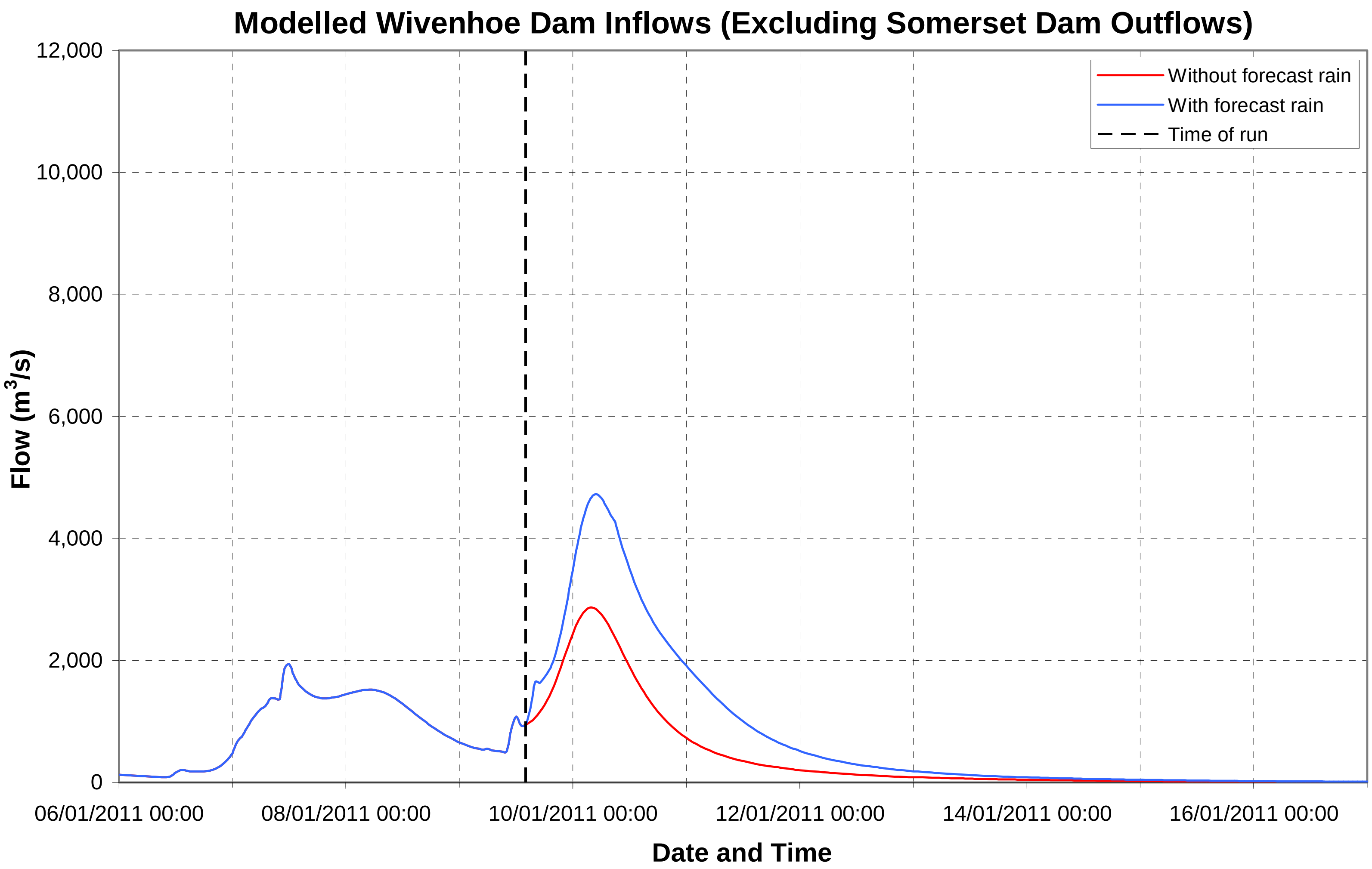


Run 14: Sunday 9 January 2011, 08:00

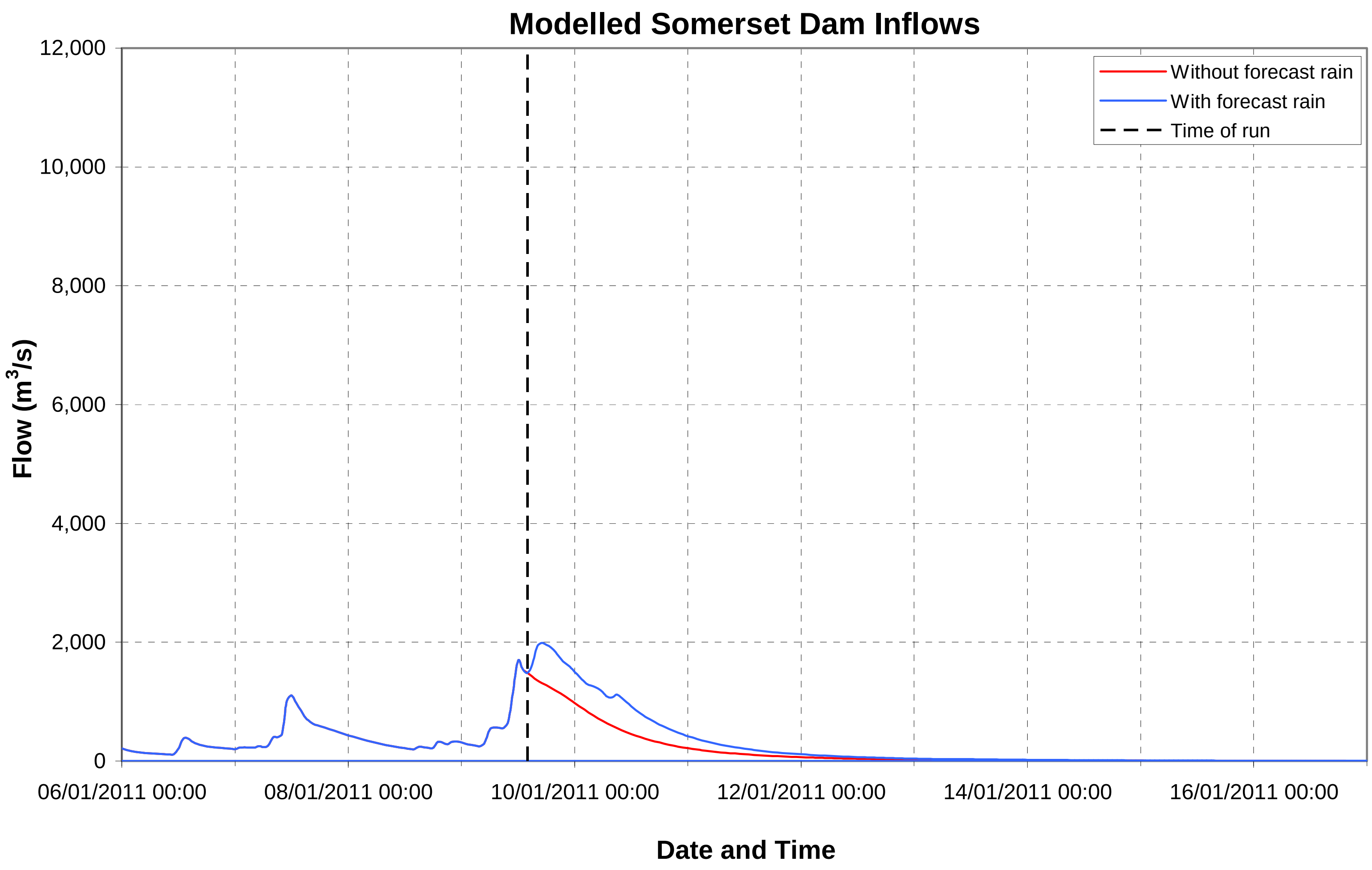
Run 17

Date: Sunday 9 January 2011

Time: 14:00



Run 17: Sunday 9 January 2011, 14:00



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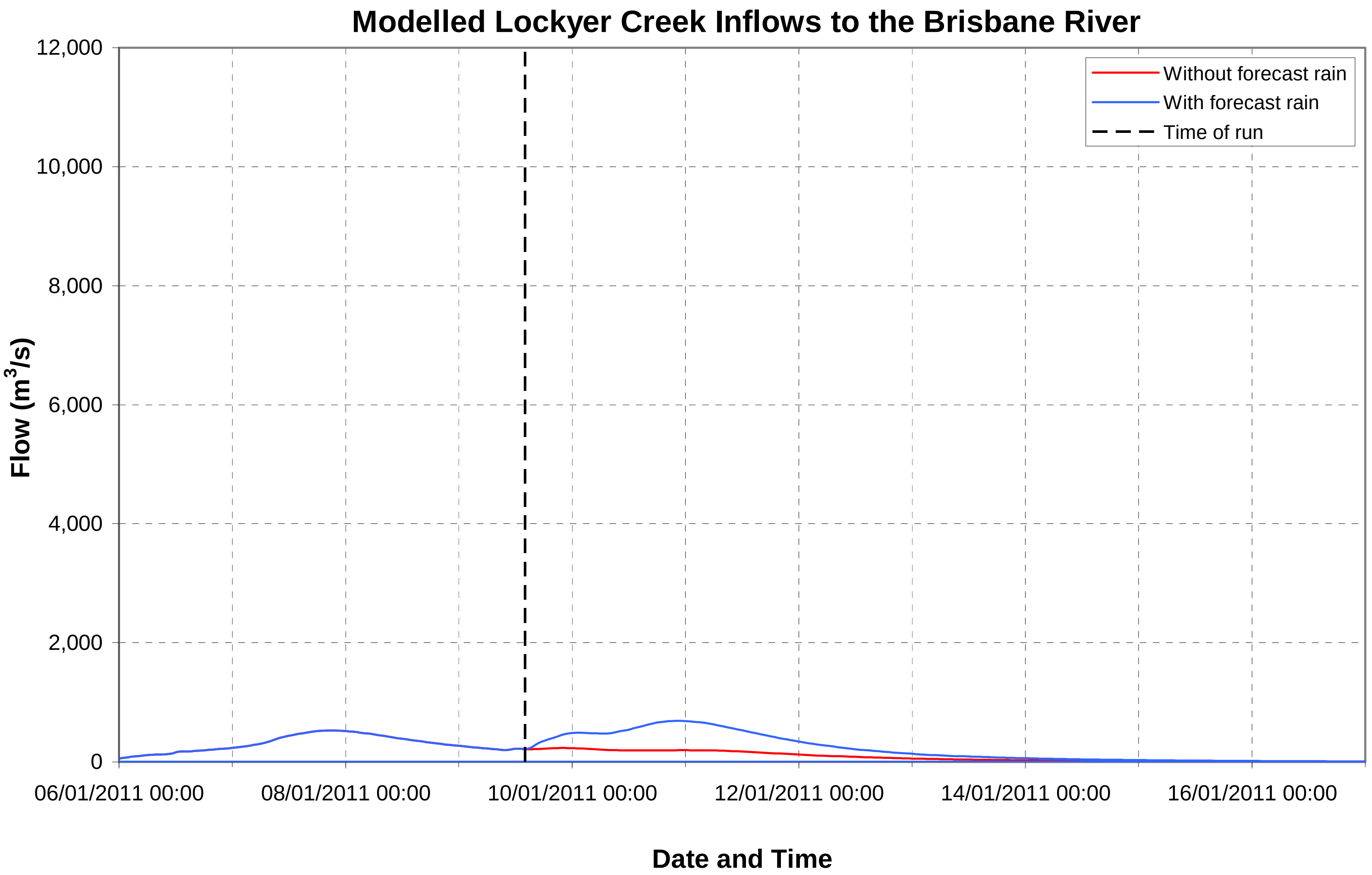

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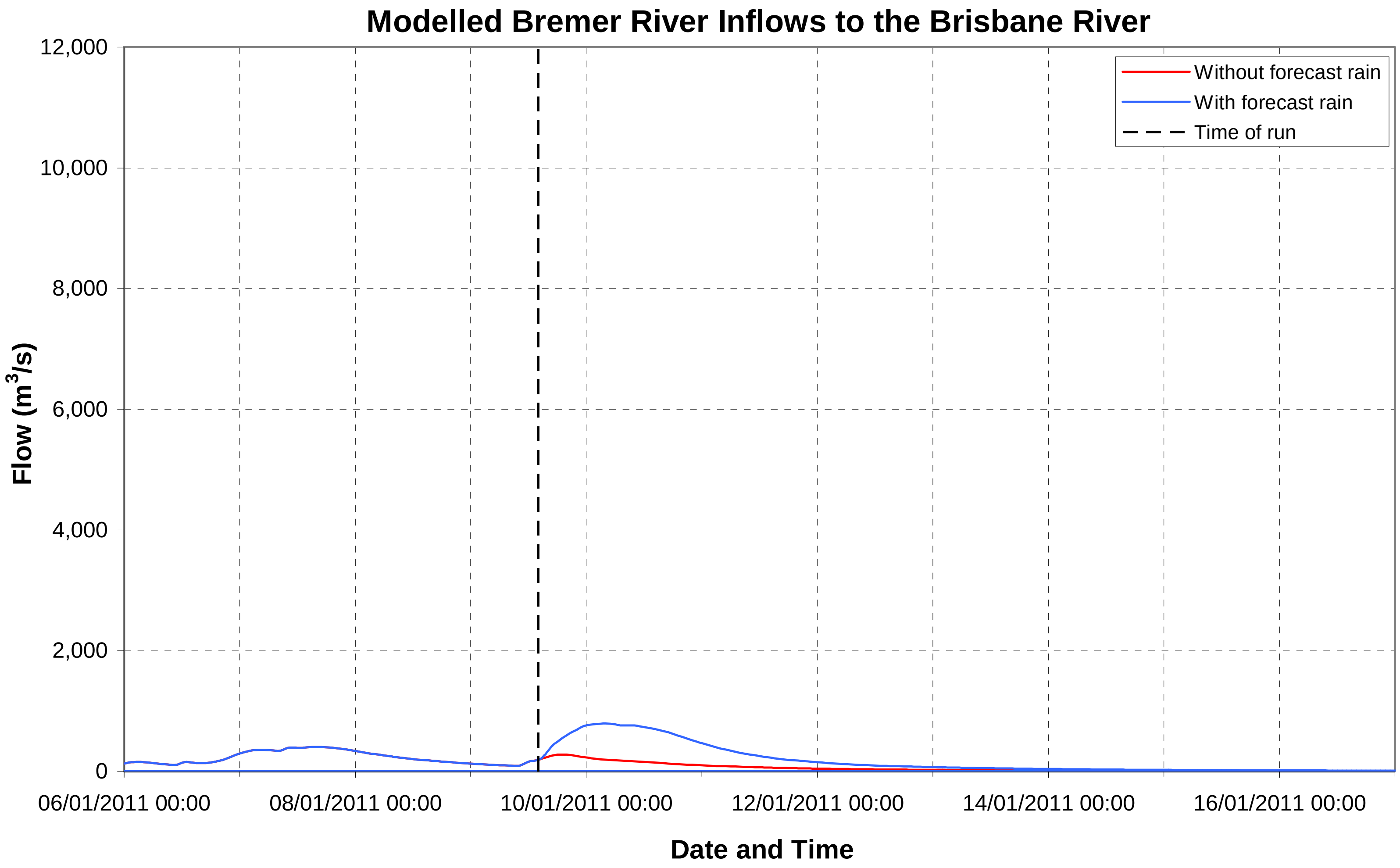

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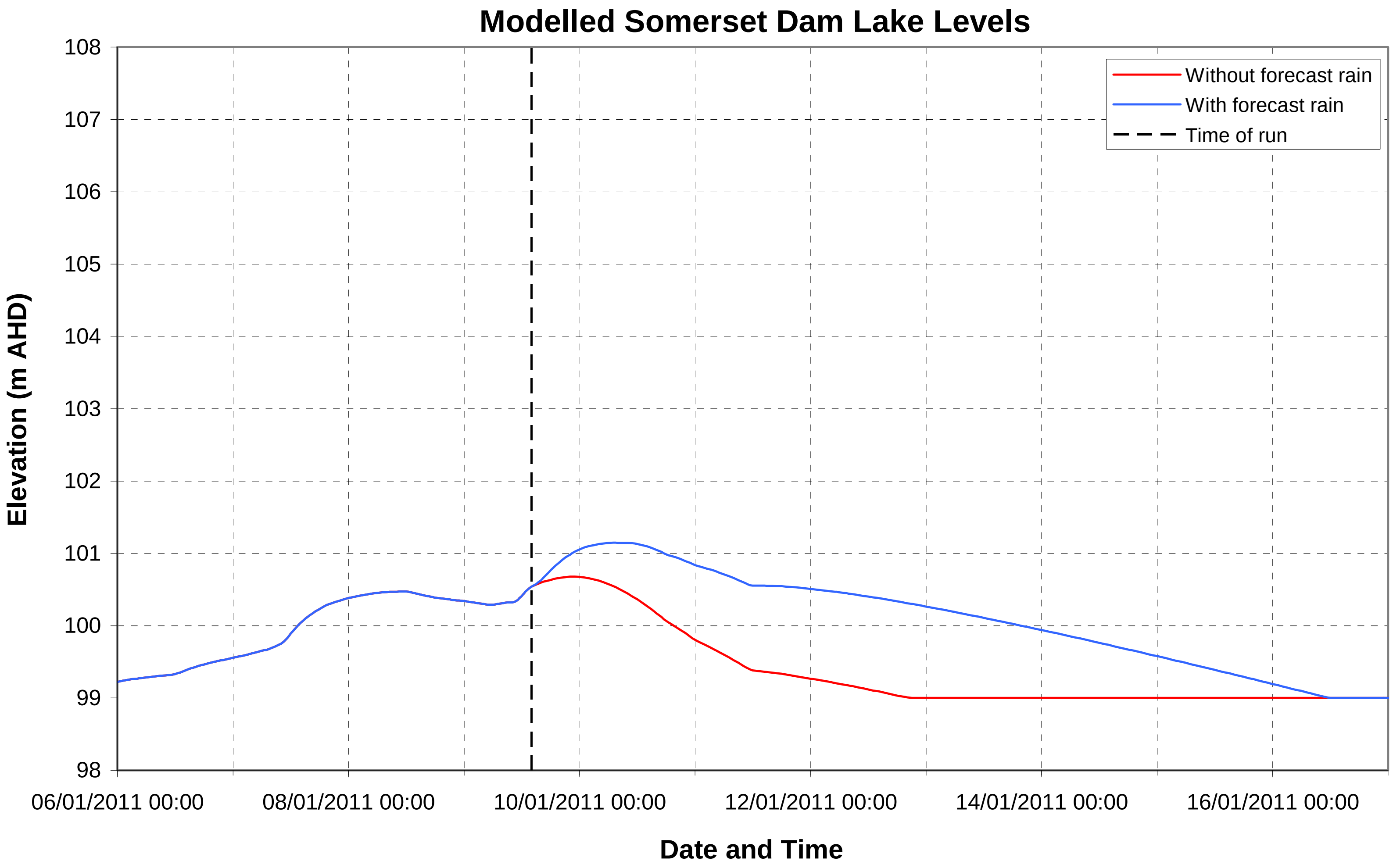
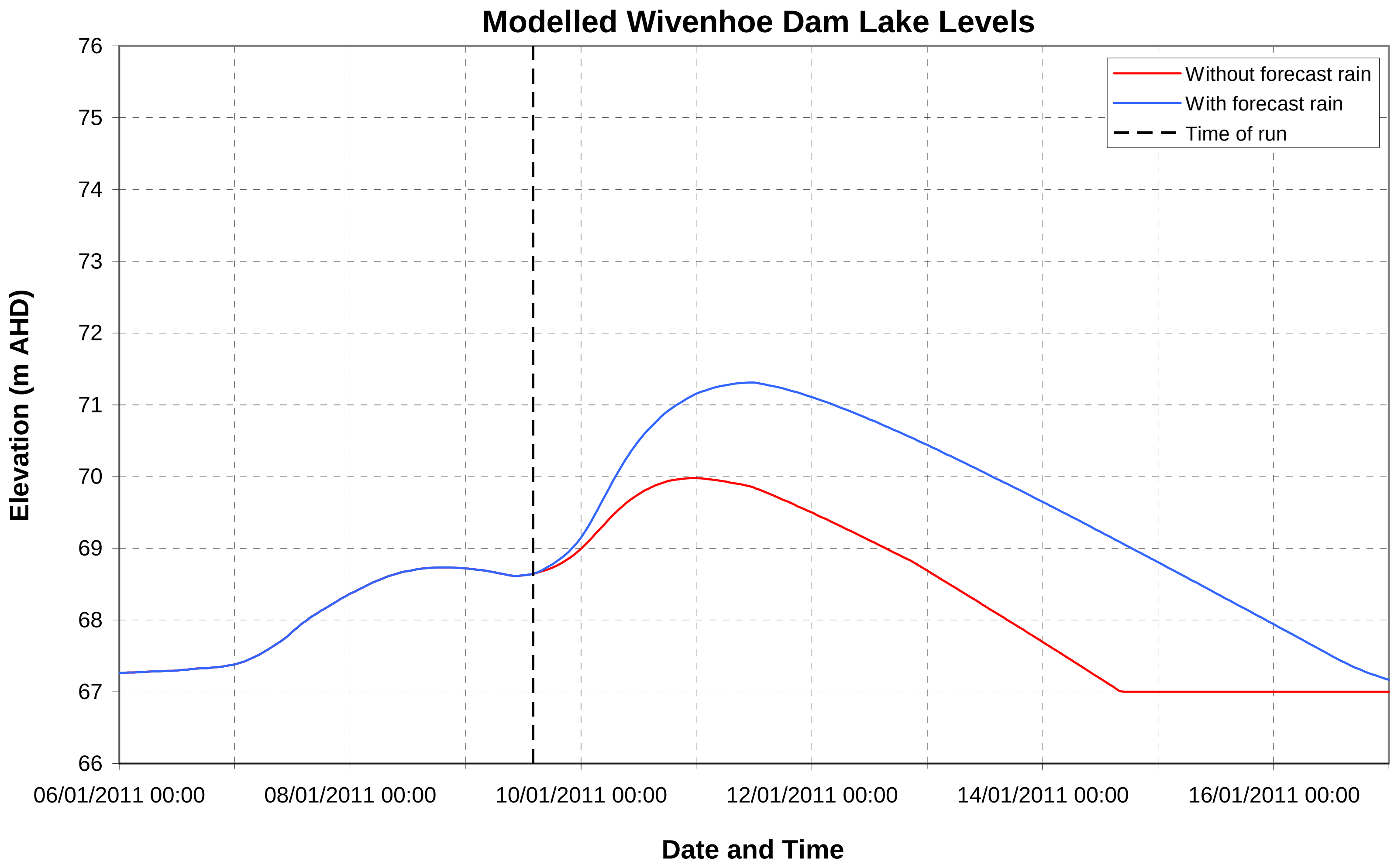
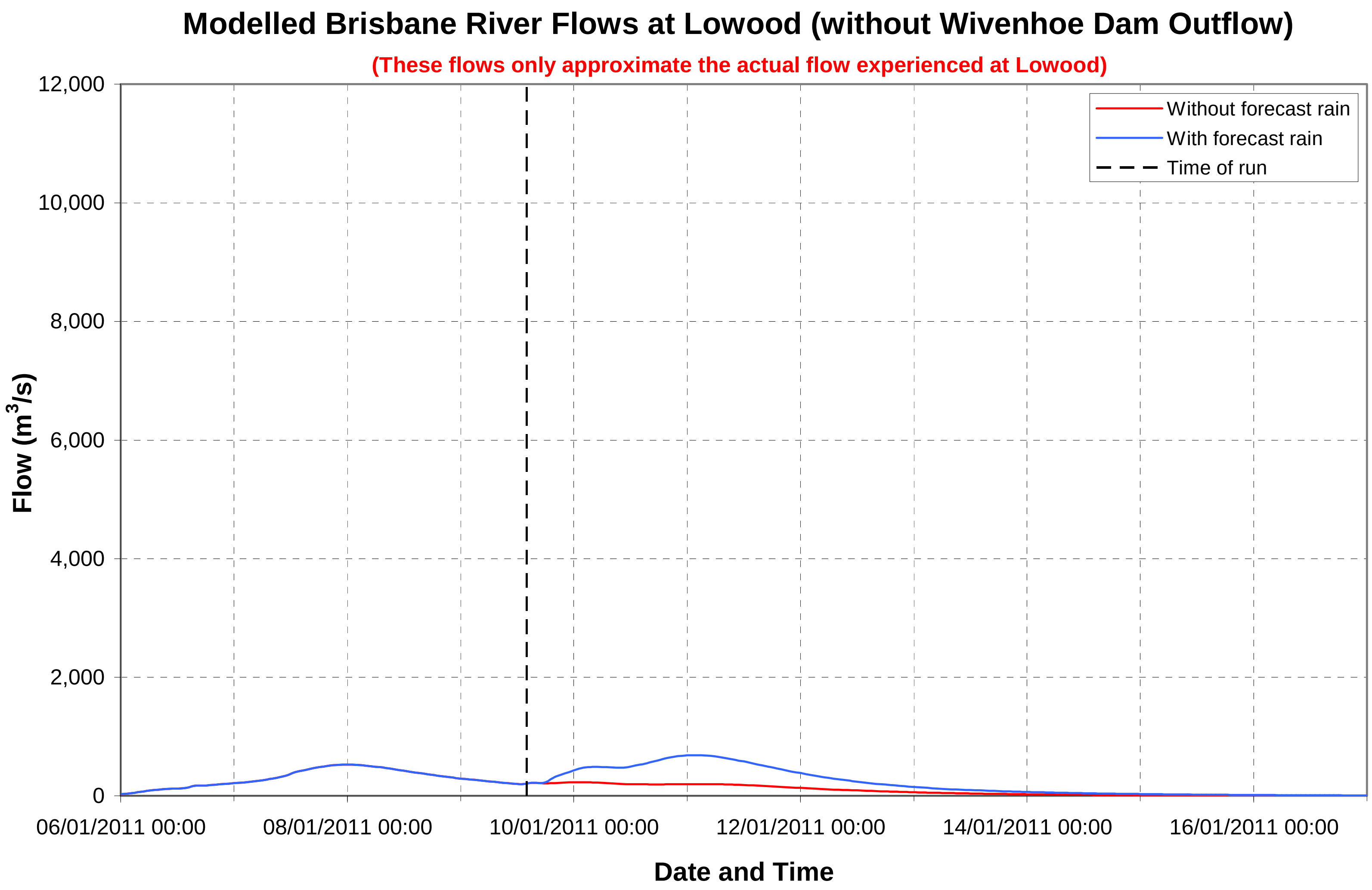


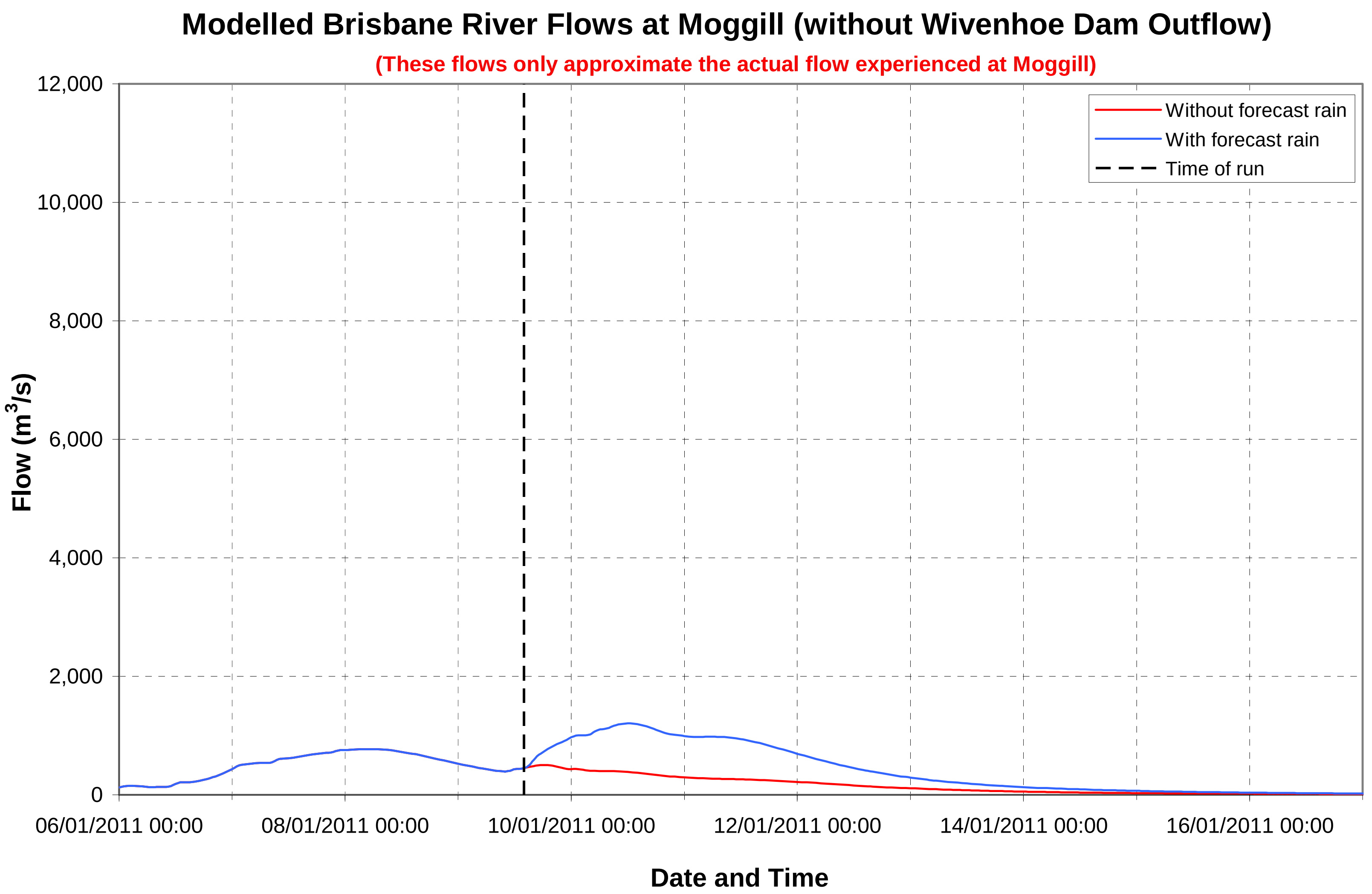
Run 17: Sunday 9 January 2011, 14:00



Run 17: Sunday 9 January 2011, 14:00



Run 17: Sunday 9 January 2011, 14:00

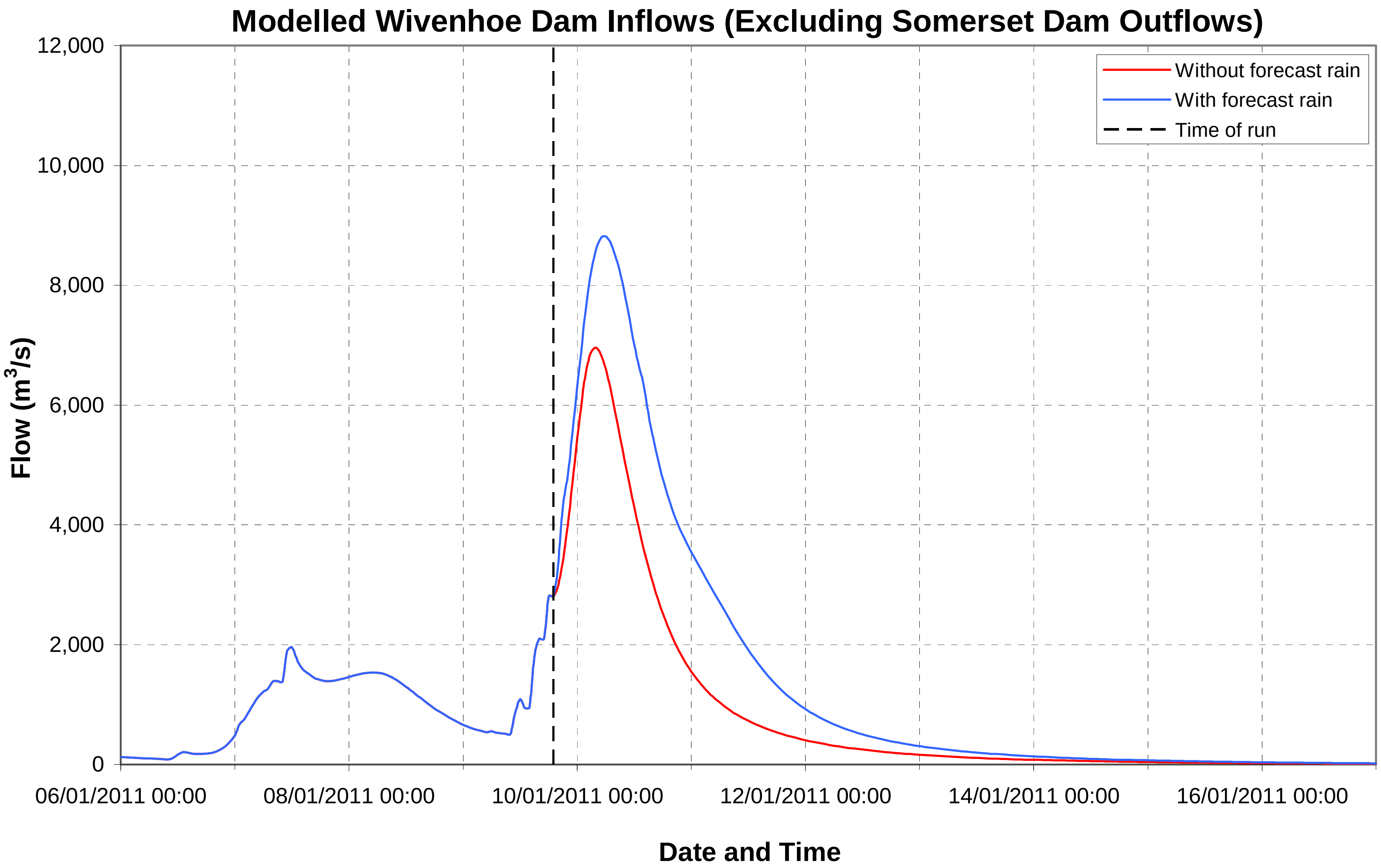


Run 17: Sunday 9 January 2011, 14:00

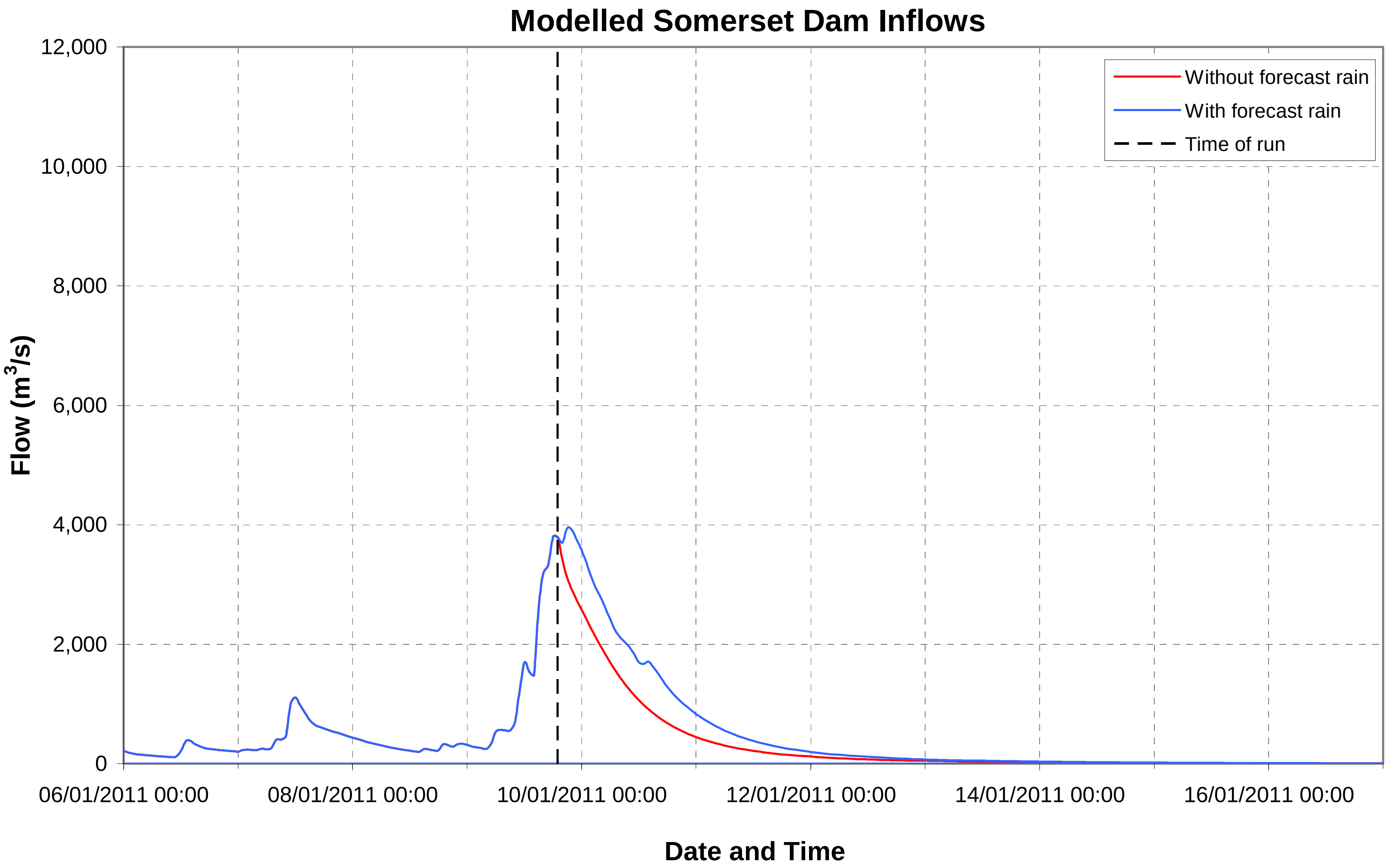
Run 21

Date: Sunday 9 January 2011

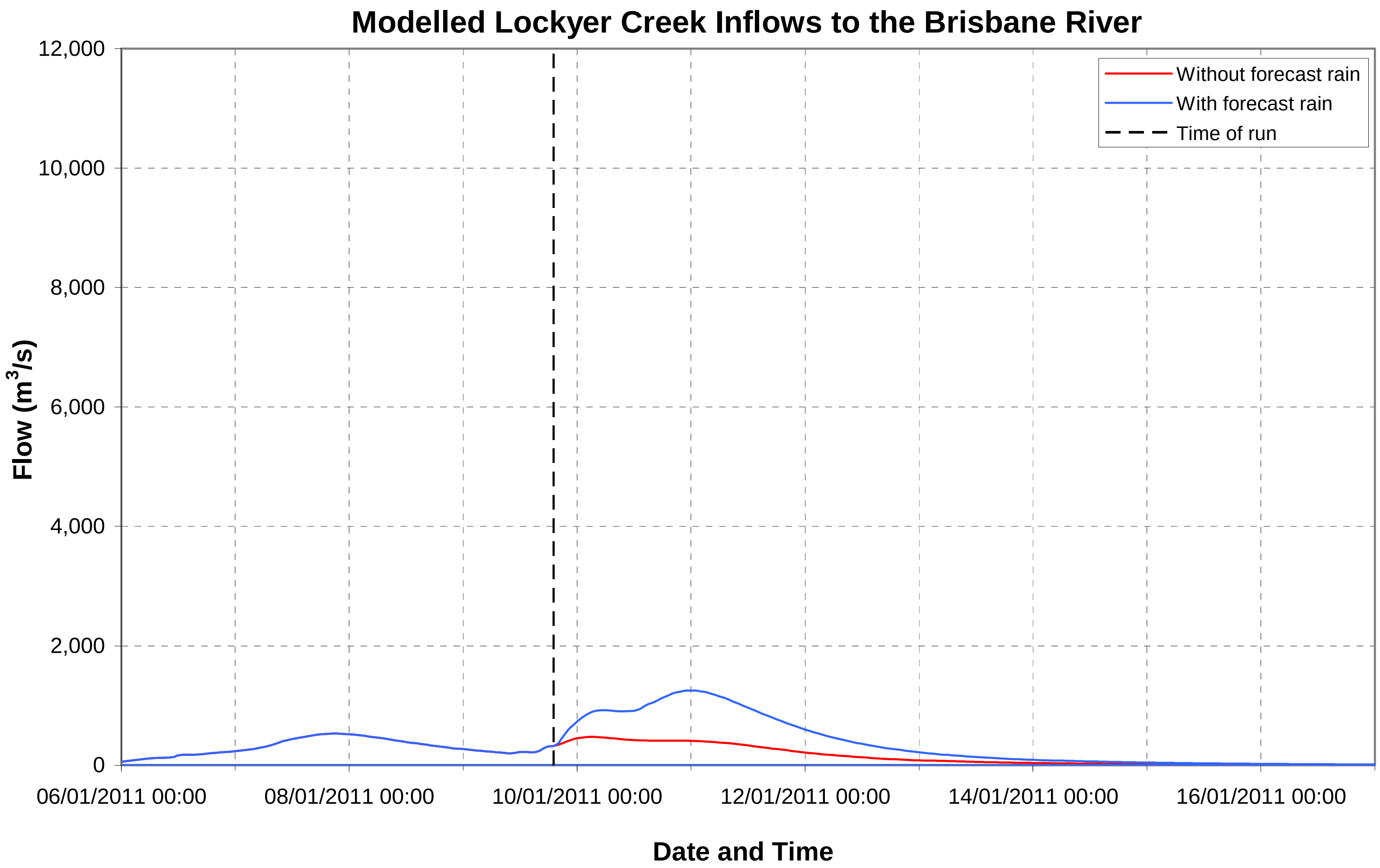
Time: 19:00



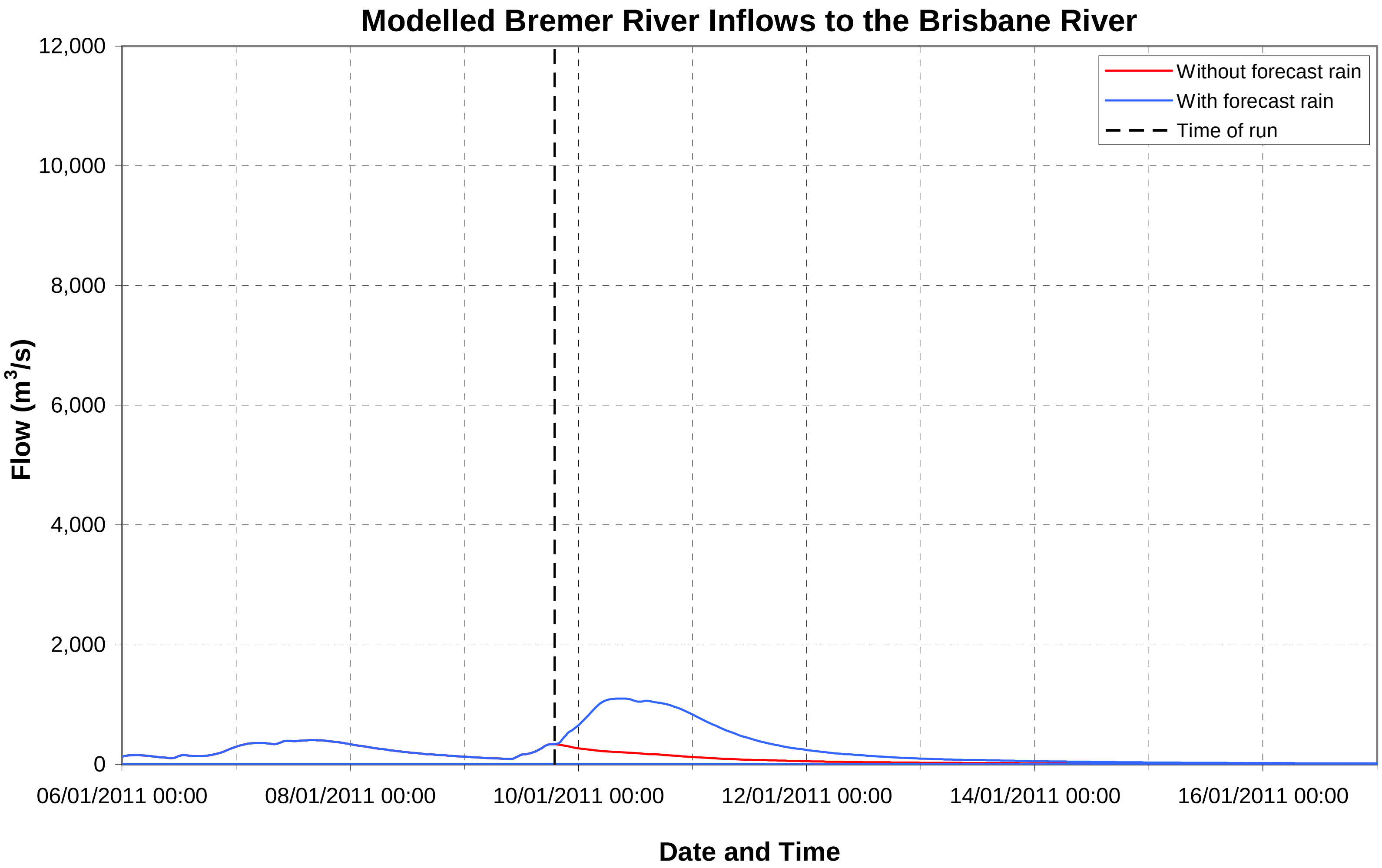
Run 21: Sunday 9 January 2011, 19:00



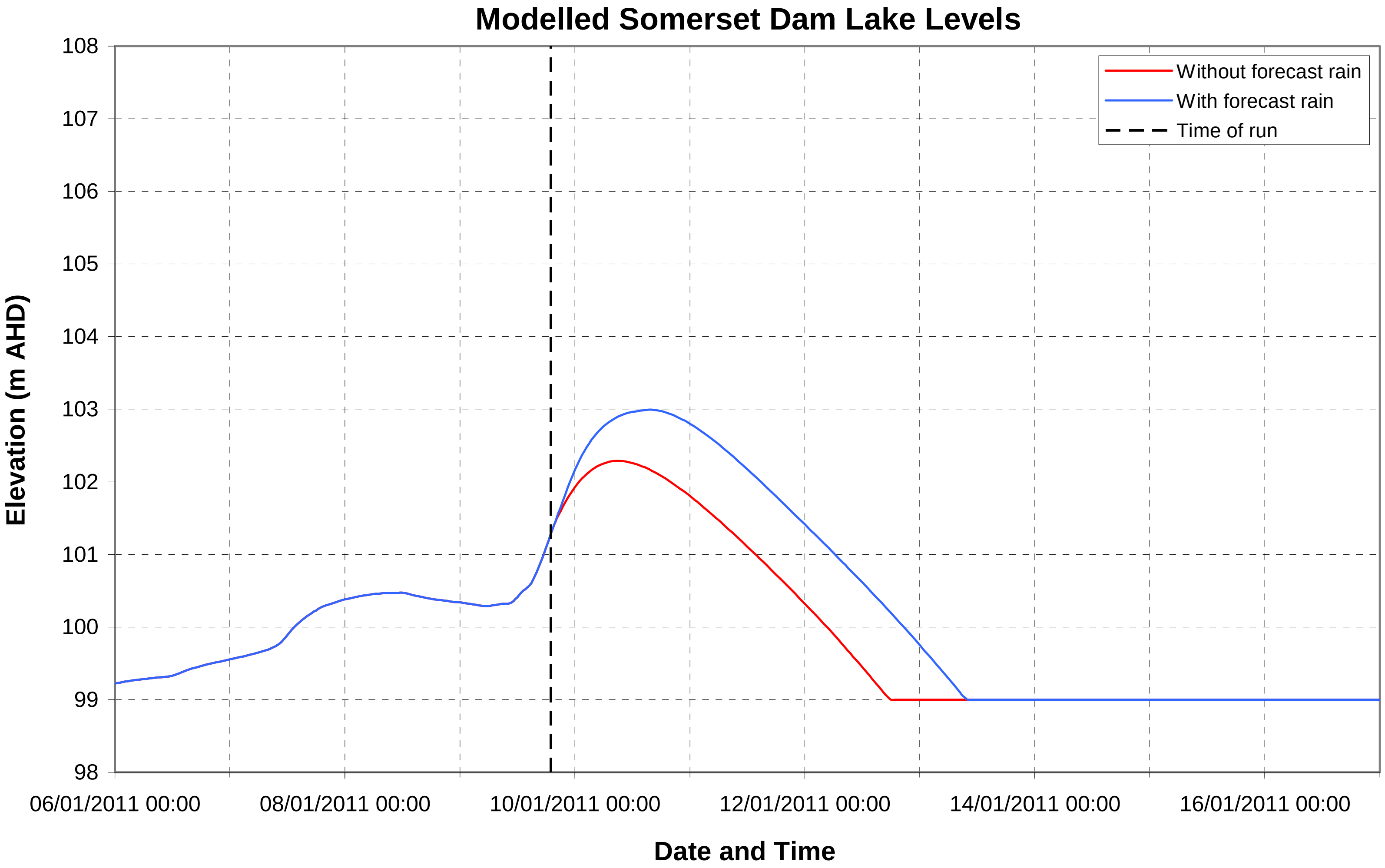
Run 21: Sunday 9 January 2011, 19:00



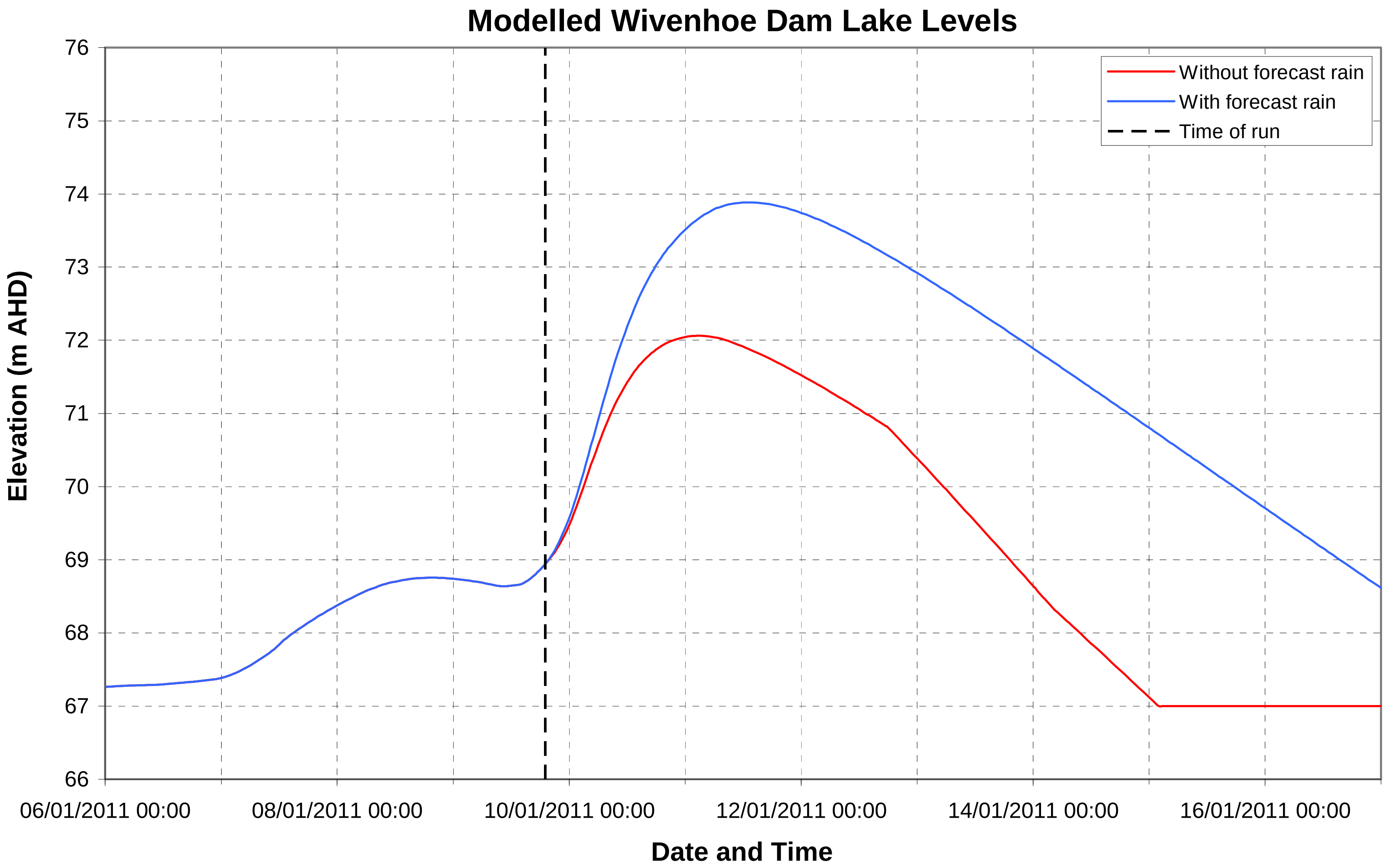
Run 21: Sunday 9 January 2011, 19:00



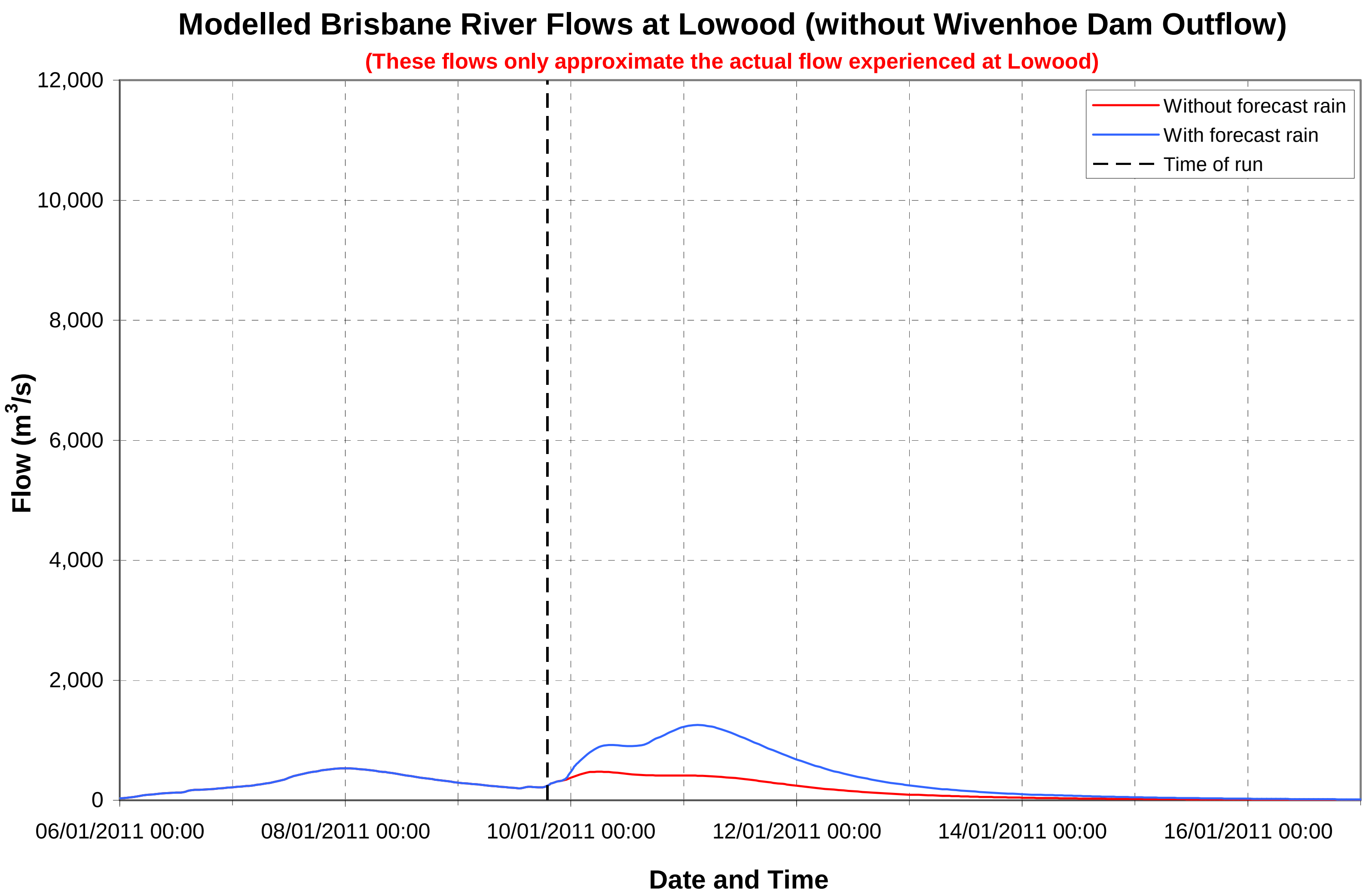
Run 21: Sunday 9 January 2011, 19:00



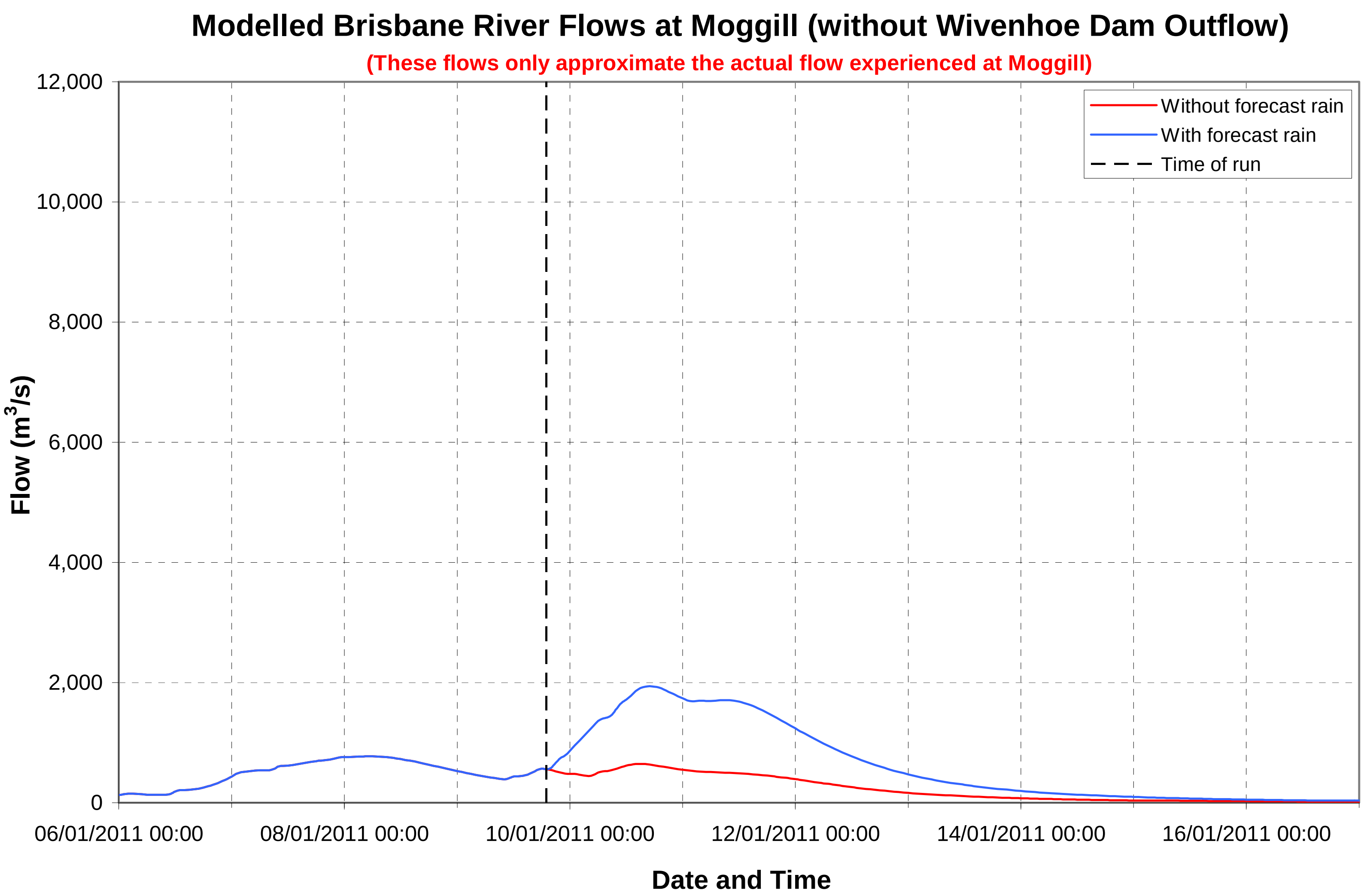
Run 21: Sunday 9 January 2011, 19:00



Run 21: Sunday 9 January 2011, 19:00



Run 21: Sunday 9 January 2011, 19:00

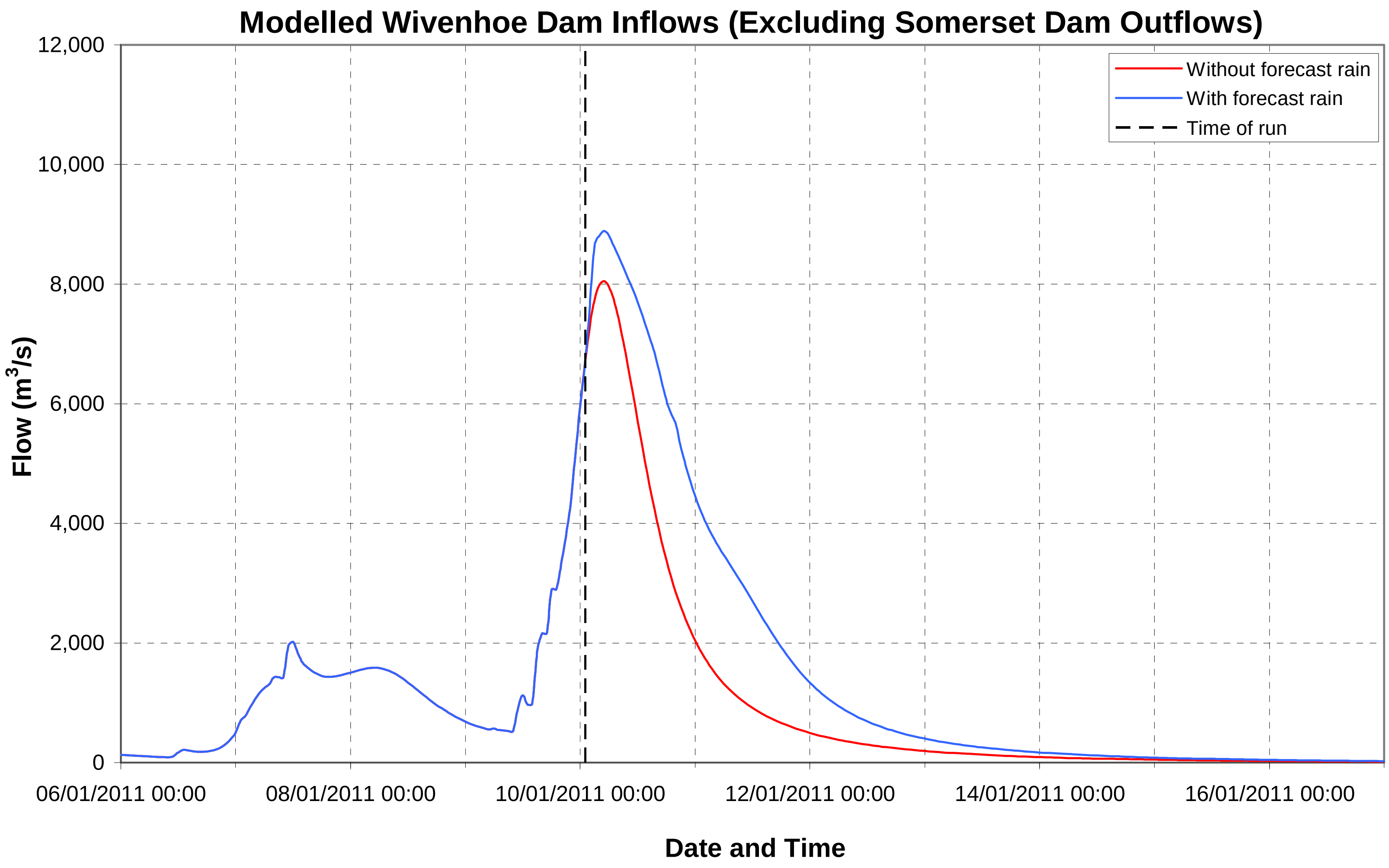


Run 21: Sunday 9 January 2011, 19:00

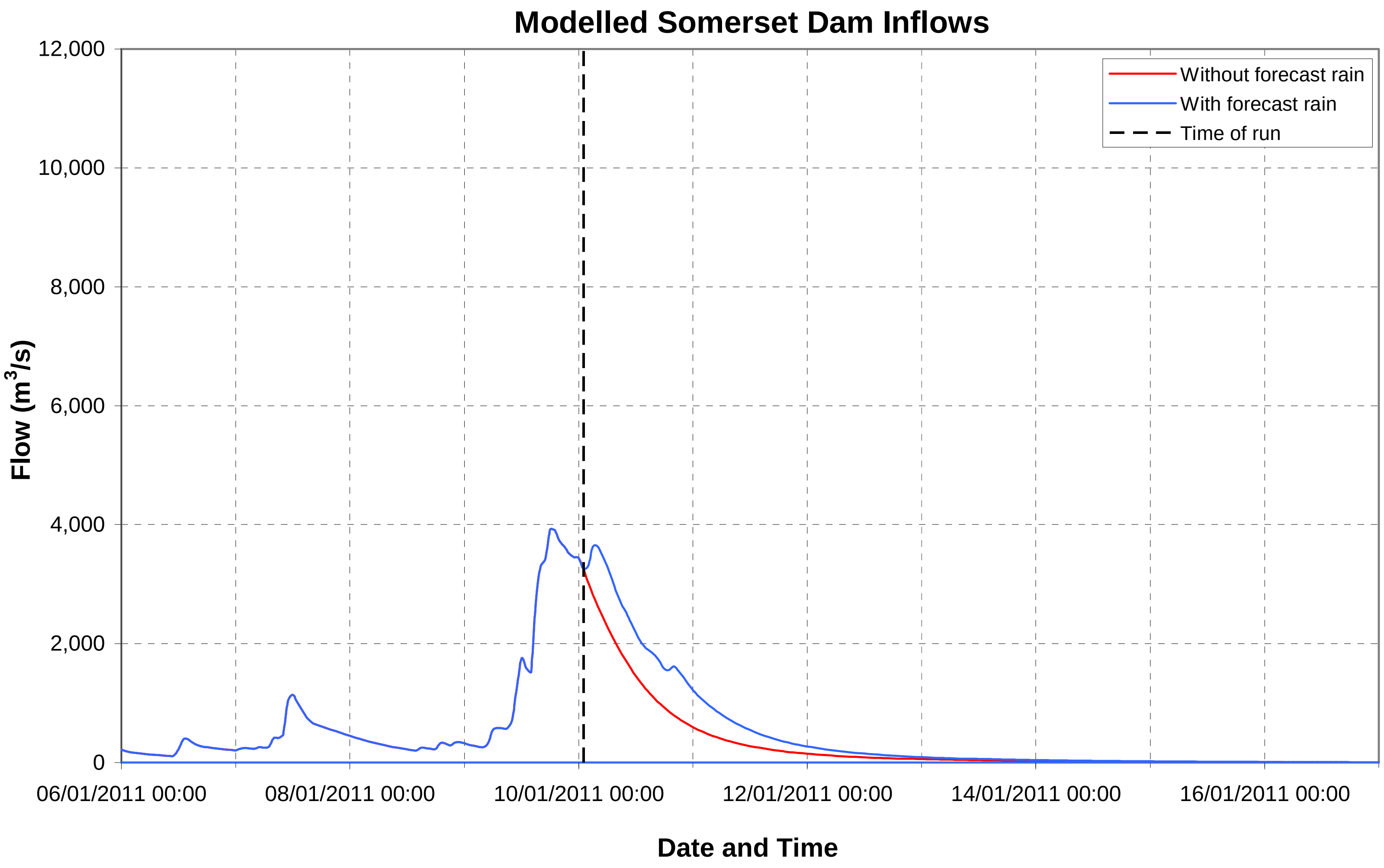
Run 23

Date: Monday 10 January 2011

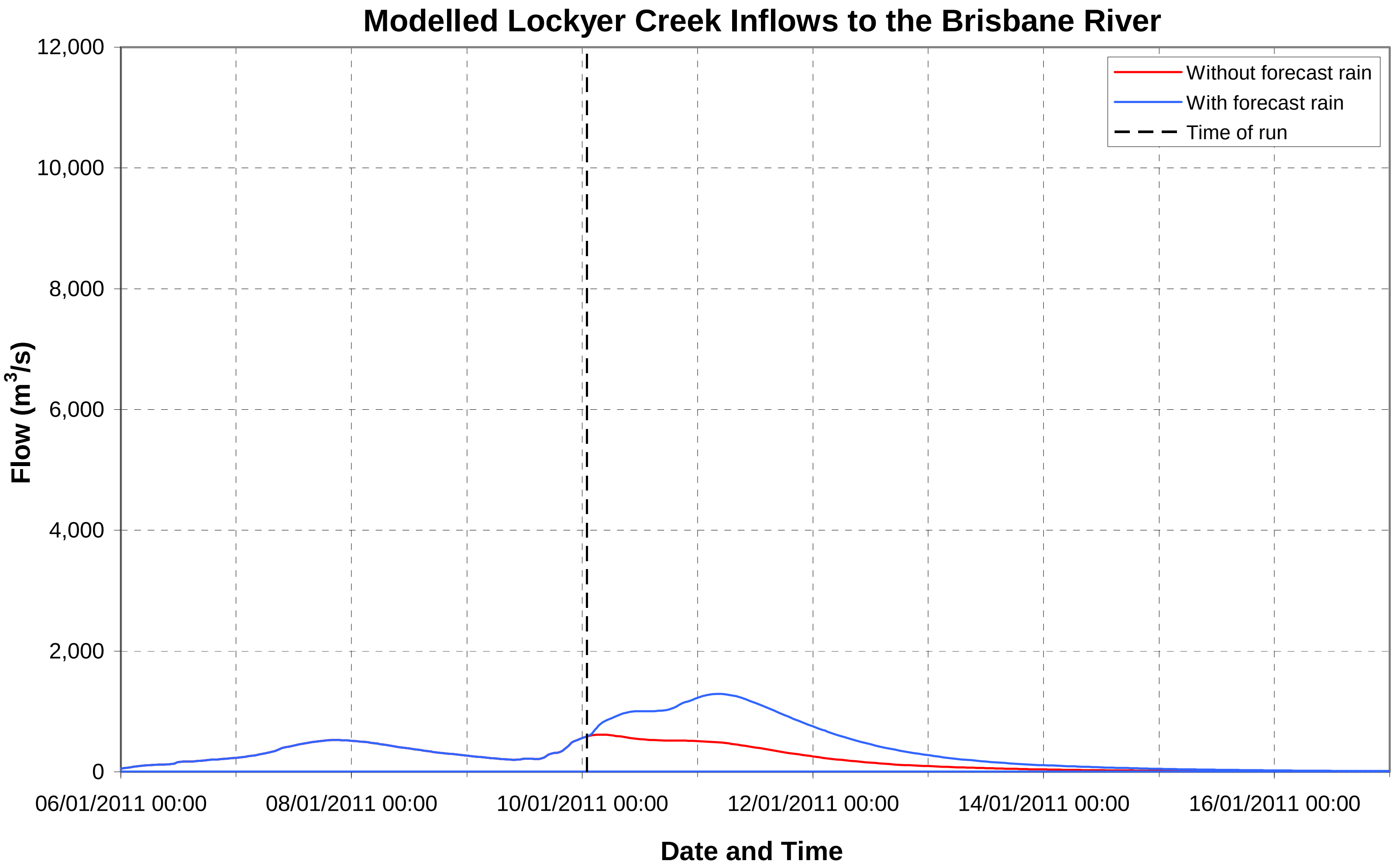
Time: 01:00



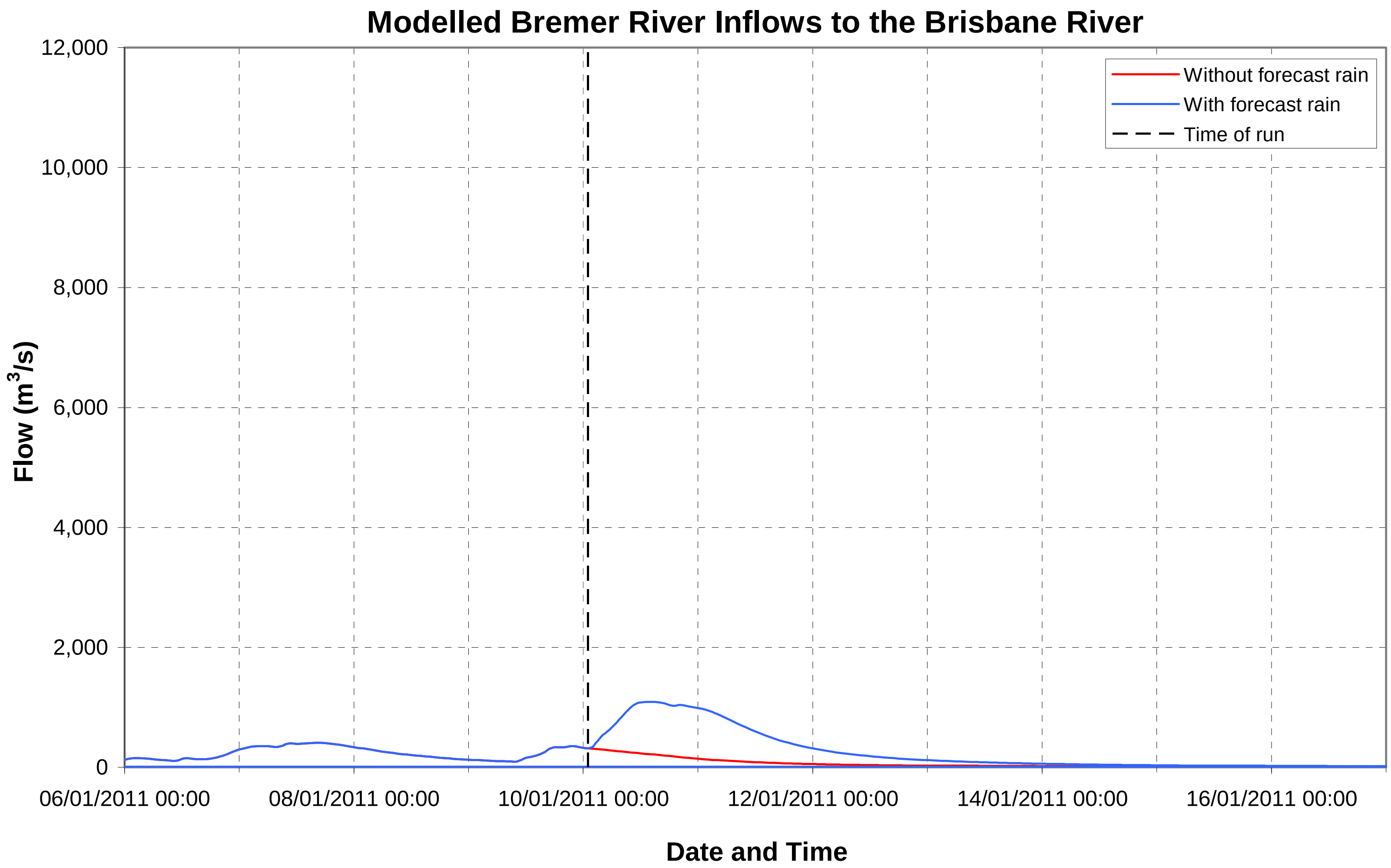
Run 23: Monday 10 January 2011, 01:00



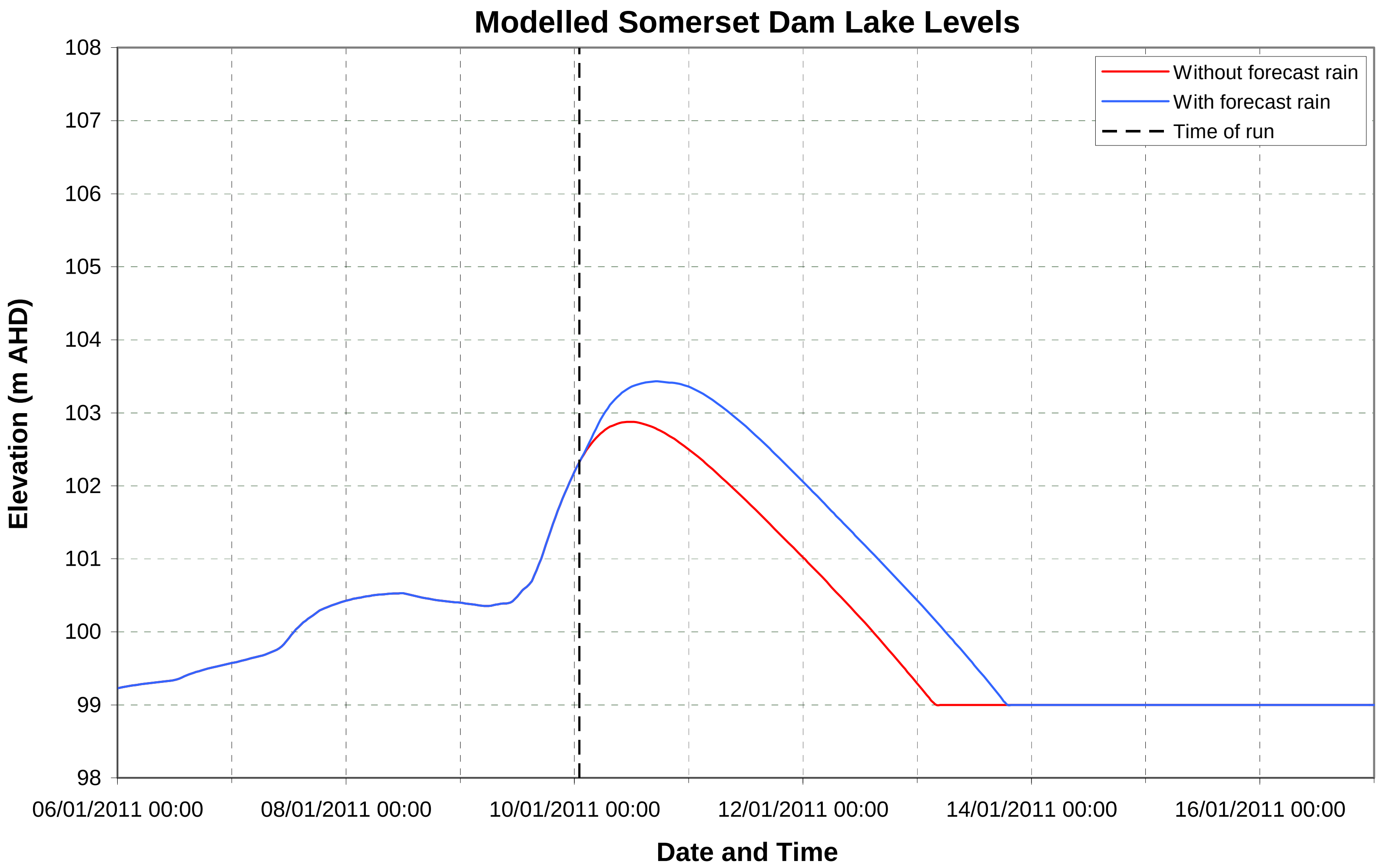
Run 23: Monday 10 January 2011, 01:00



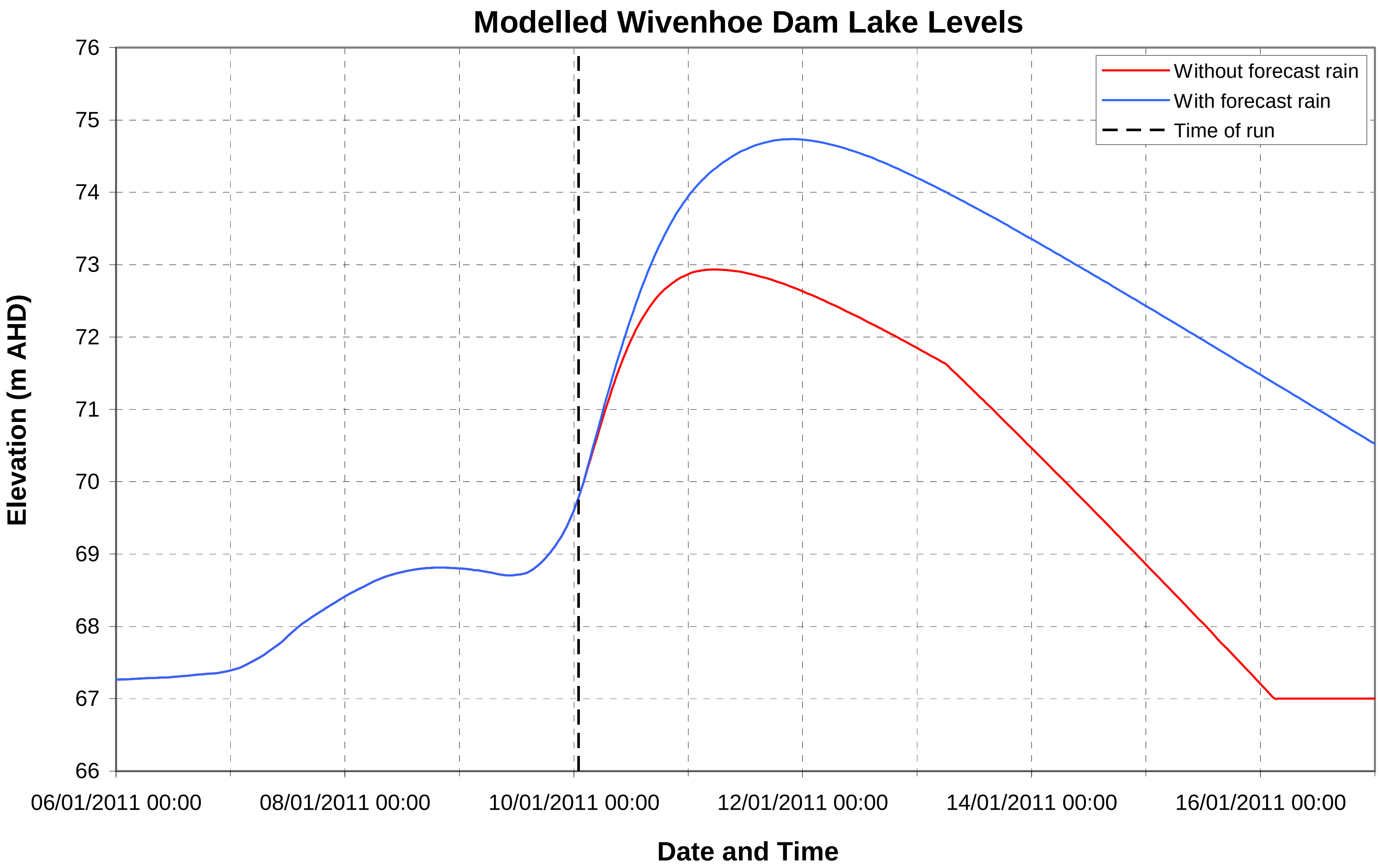
Run 23: Monday 10 January 2011, 01:00



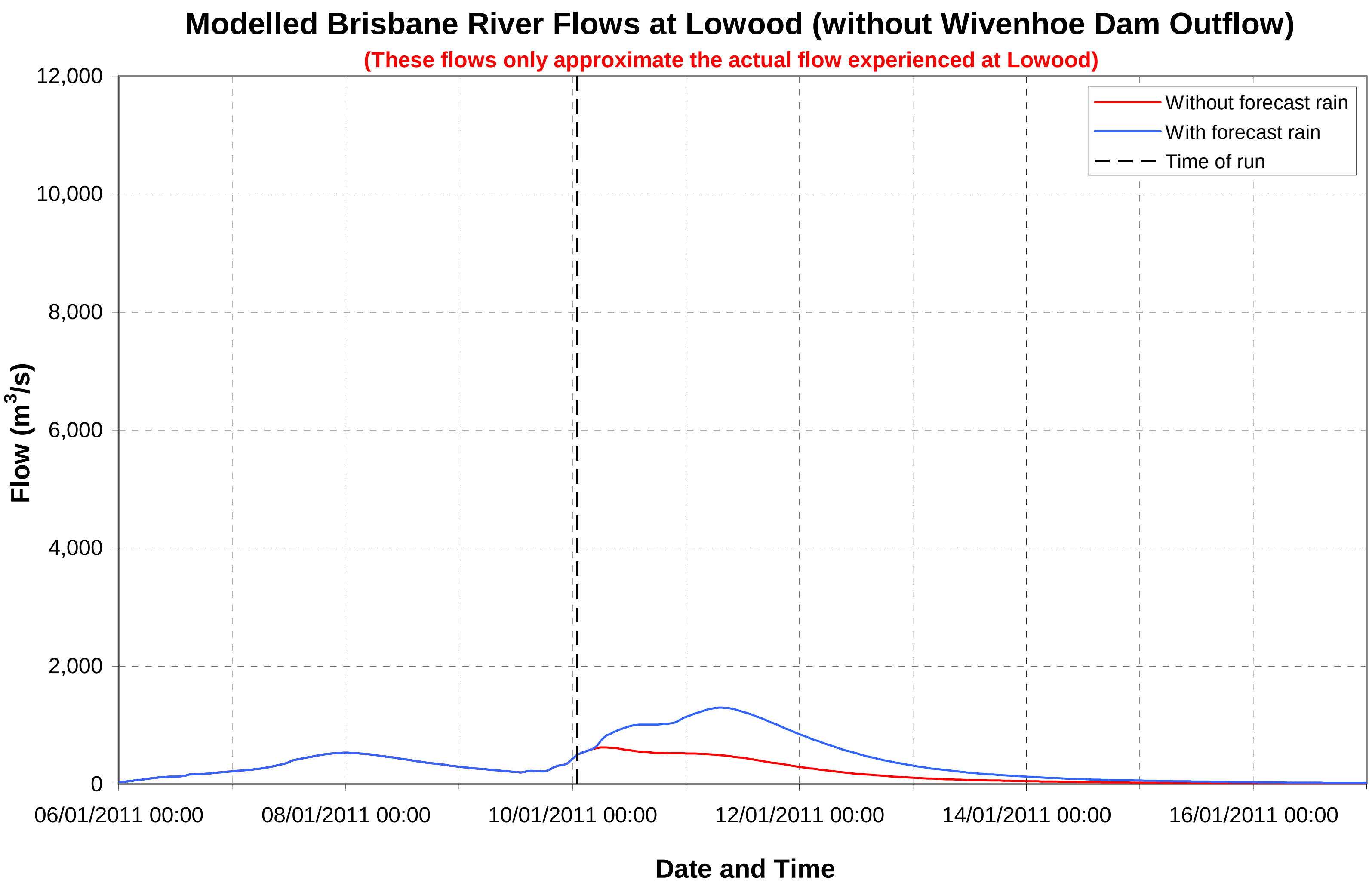
Run 23: Monday 10 January 2011, 01:00



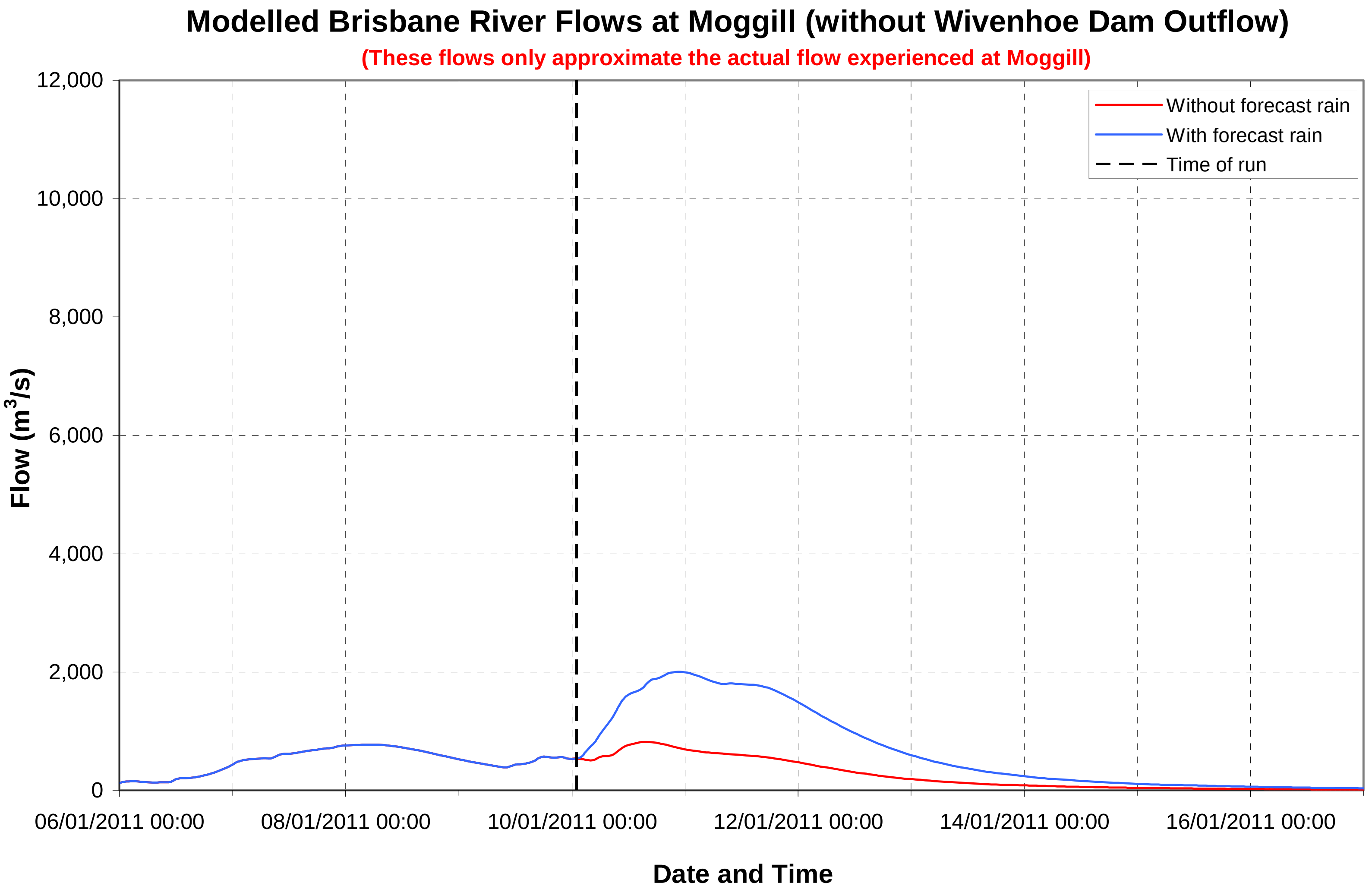
Run 23: Monday 10 January 2011, 01:00



Run 23: Monday 10 January 2011, 01:00



Run 23: Monday 10 January 2011, 01:00

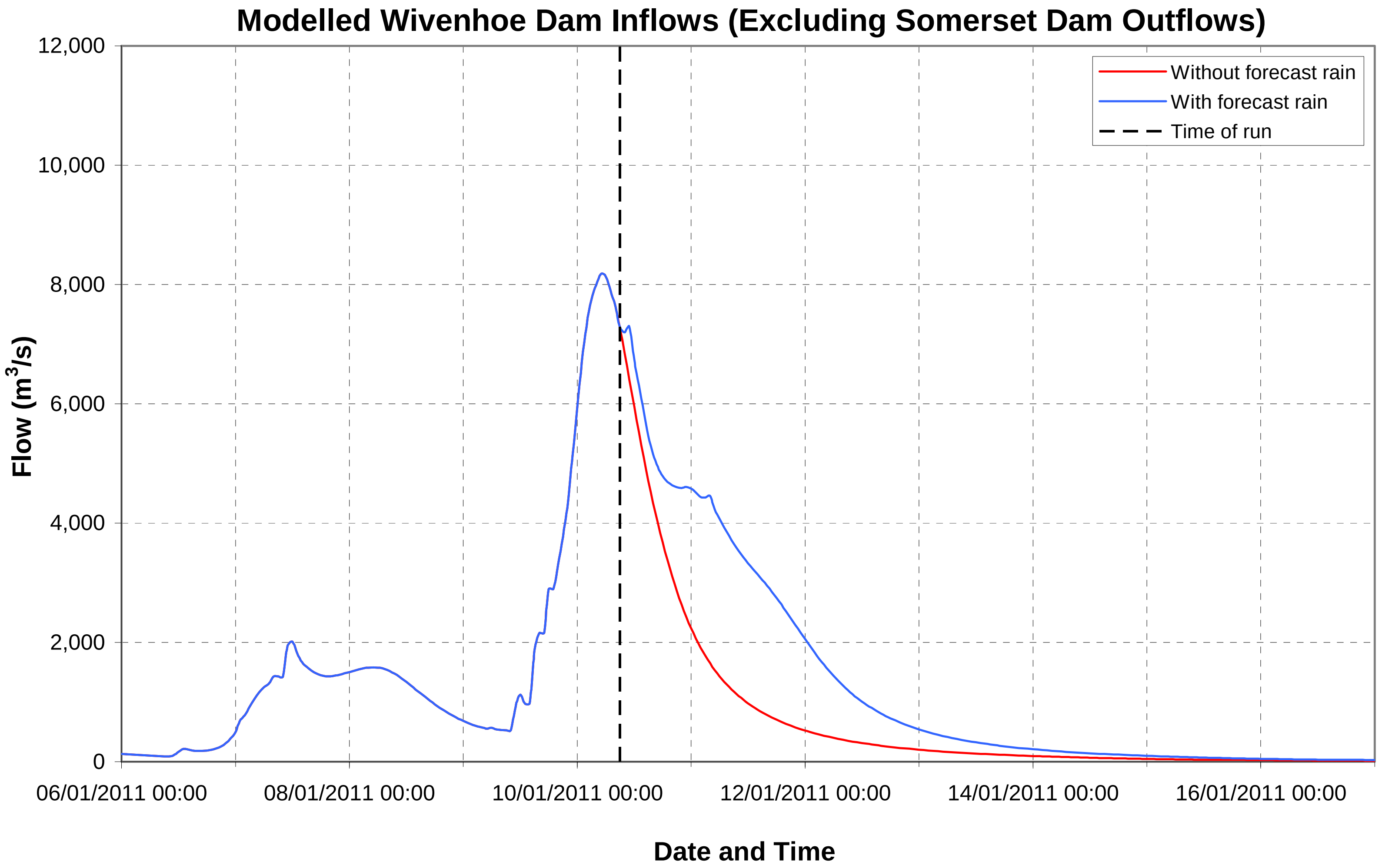


Run 23: Monday 10 January 2011, 01:00

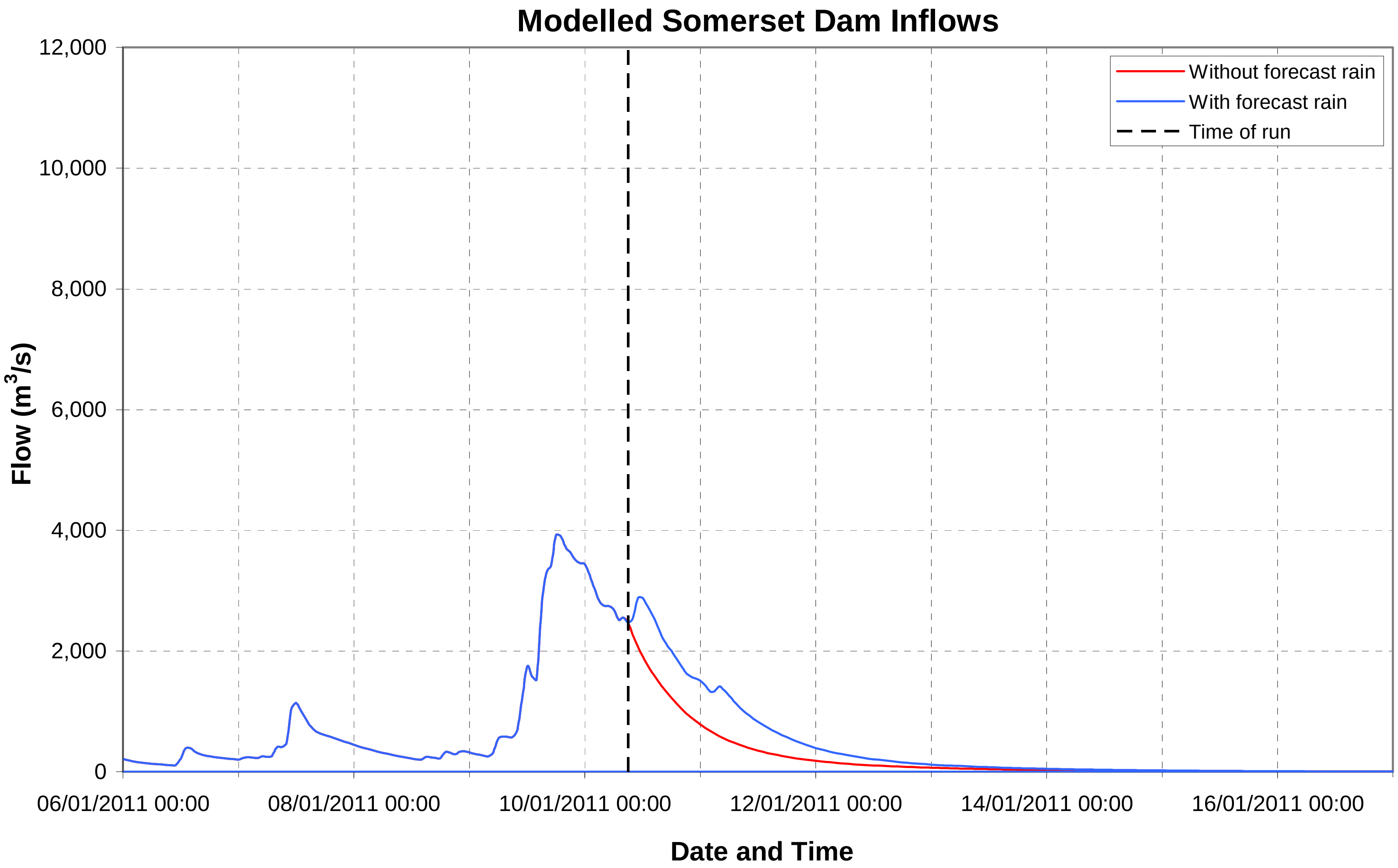
Run 26

Date: Monday 10 January 2011

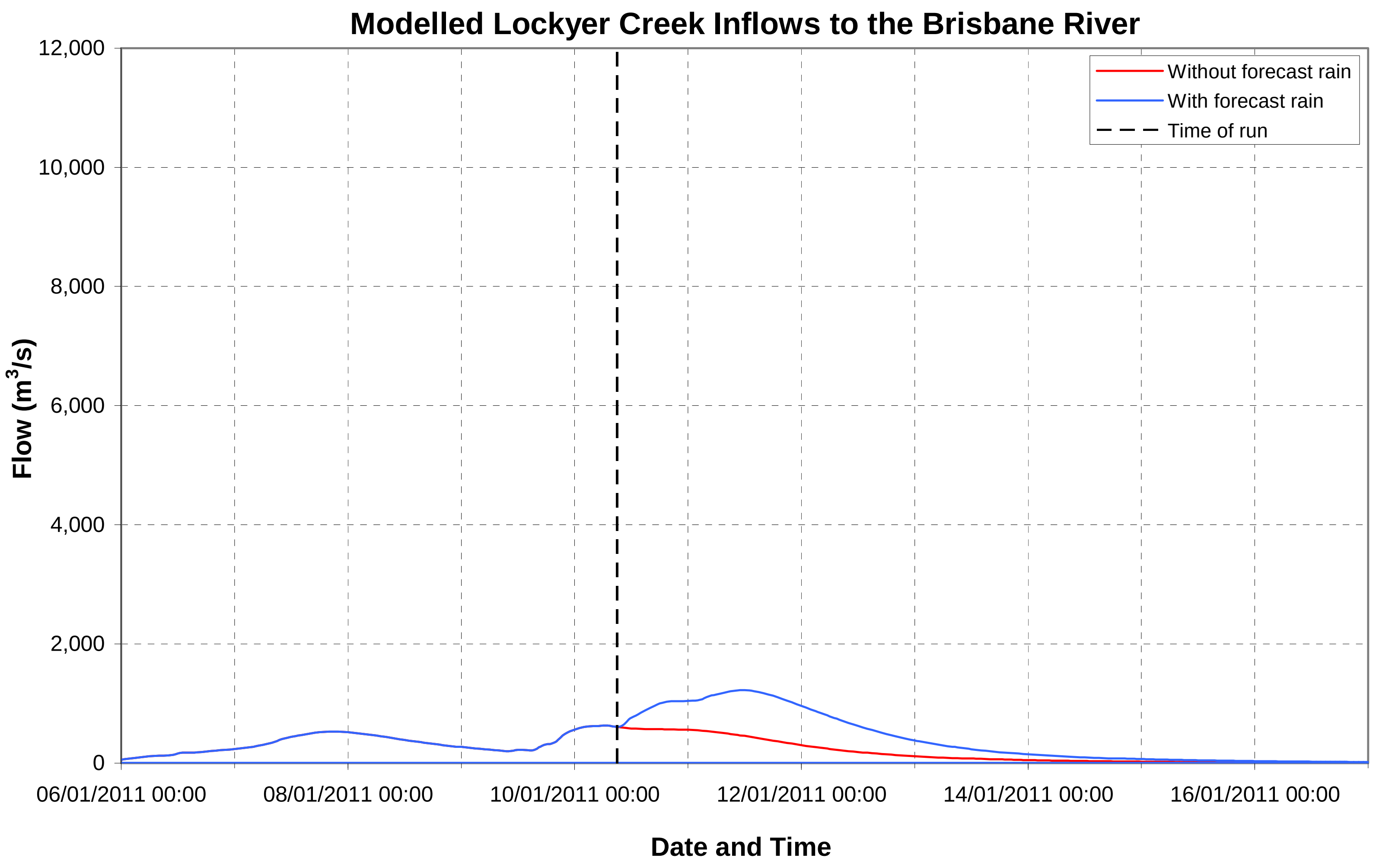
Time: 09:00



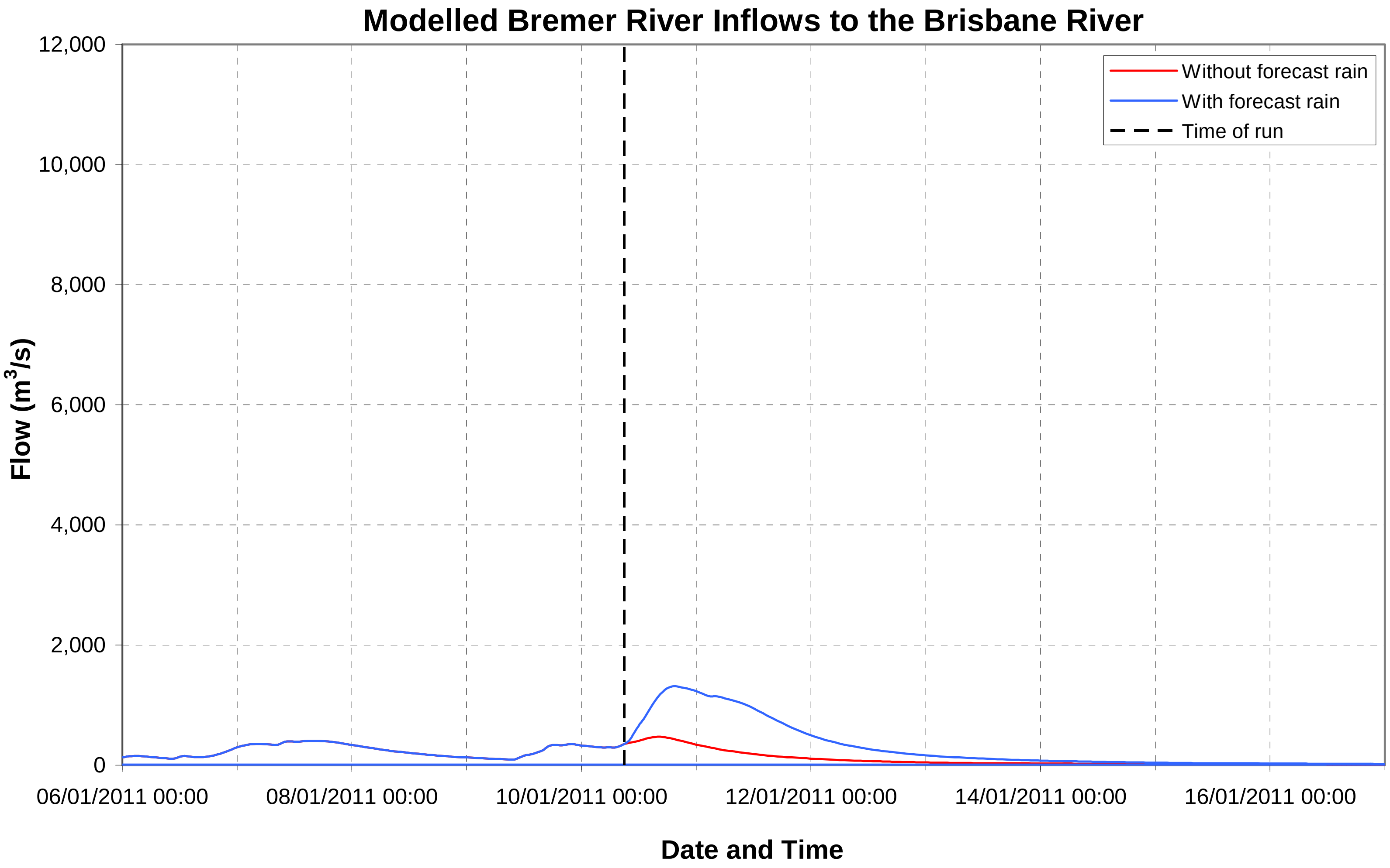
Run 26: Monday 10 January 2011, 09:00



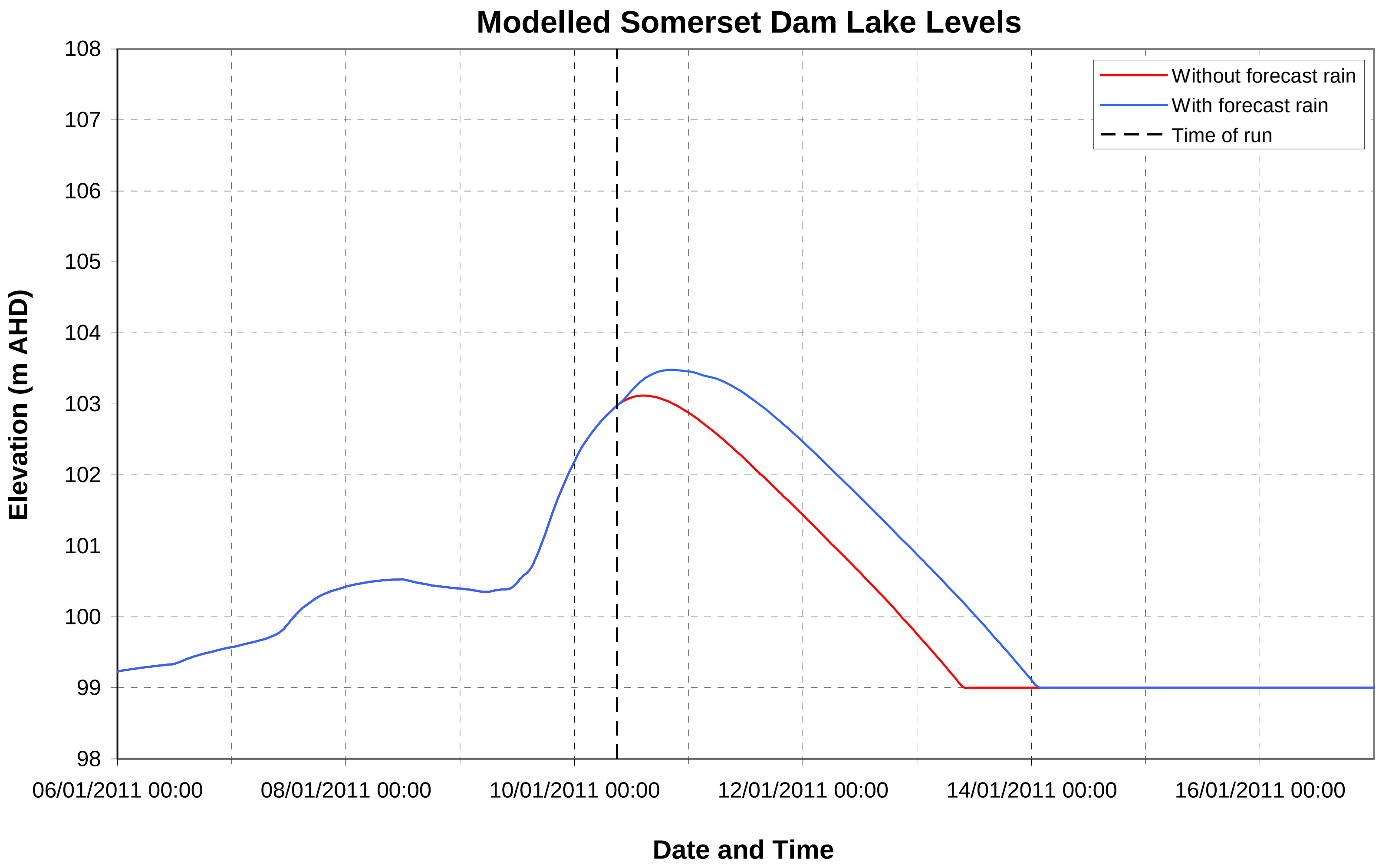
Run 26: Monday 10 January 2011, 09:00



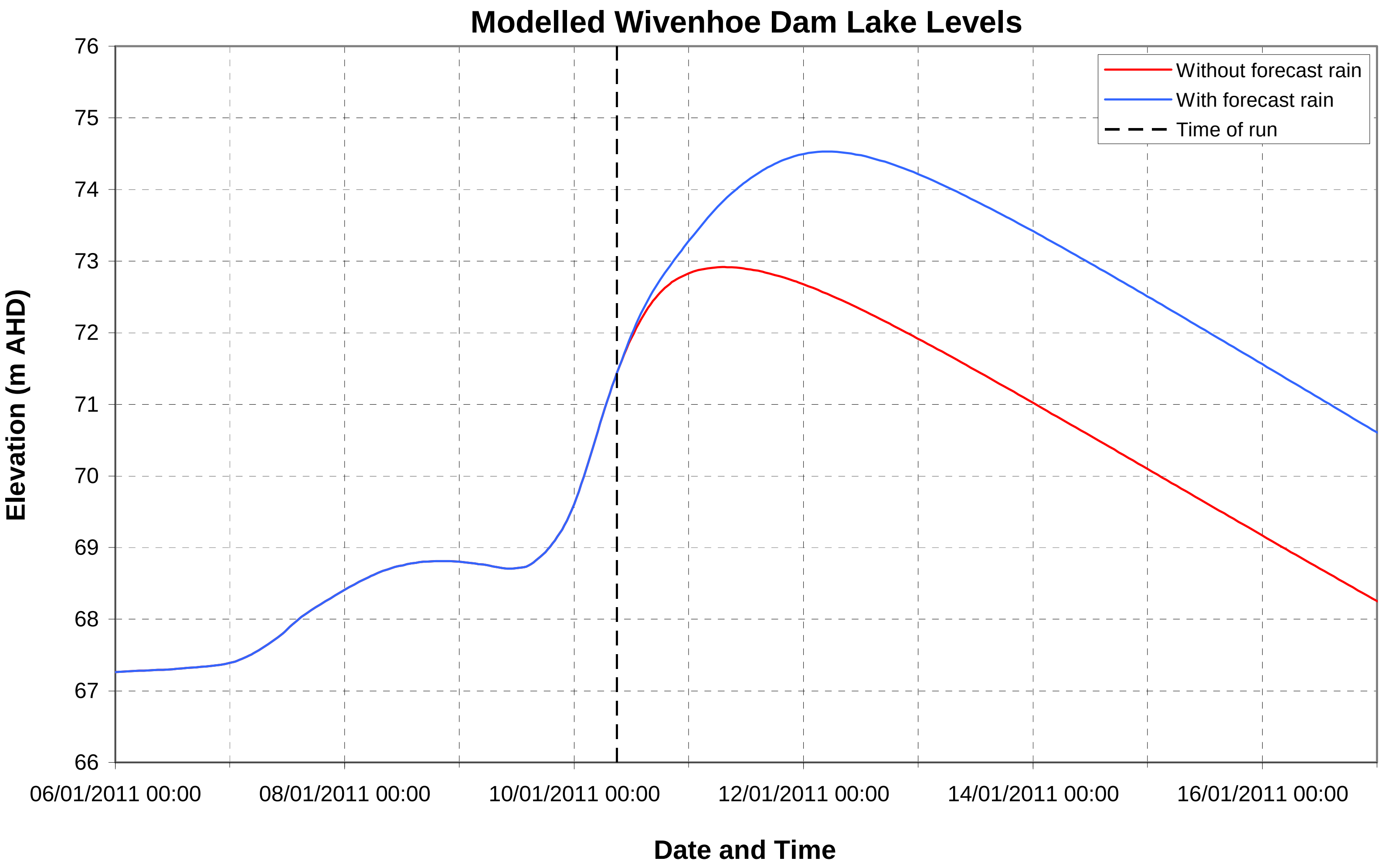
Run 26: Monday 10 January 2011, 09:00



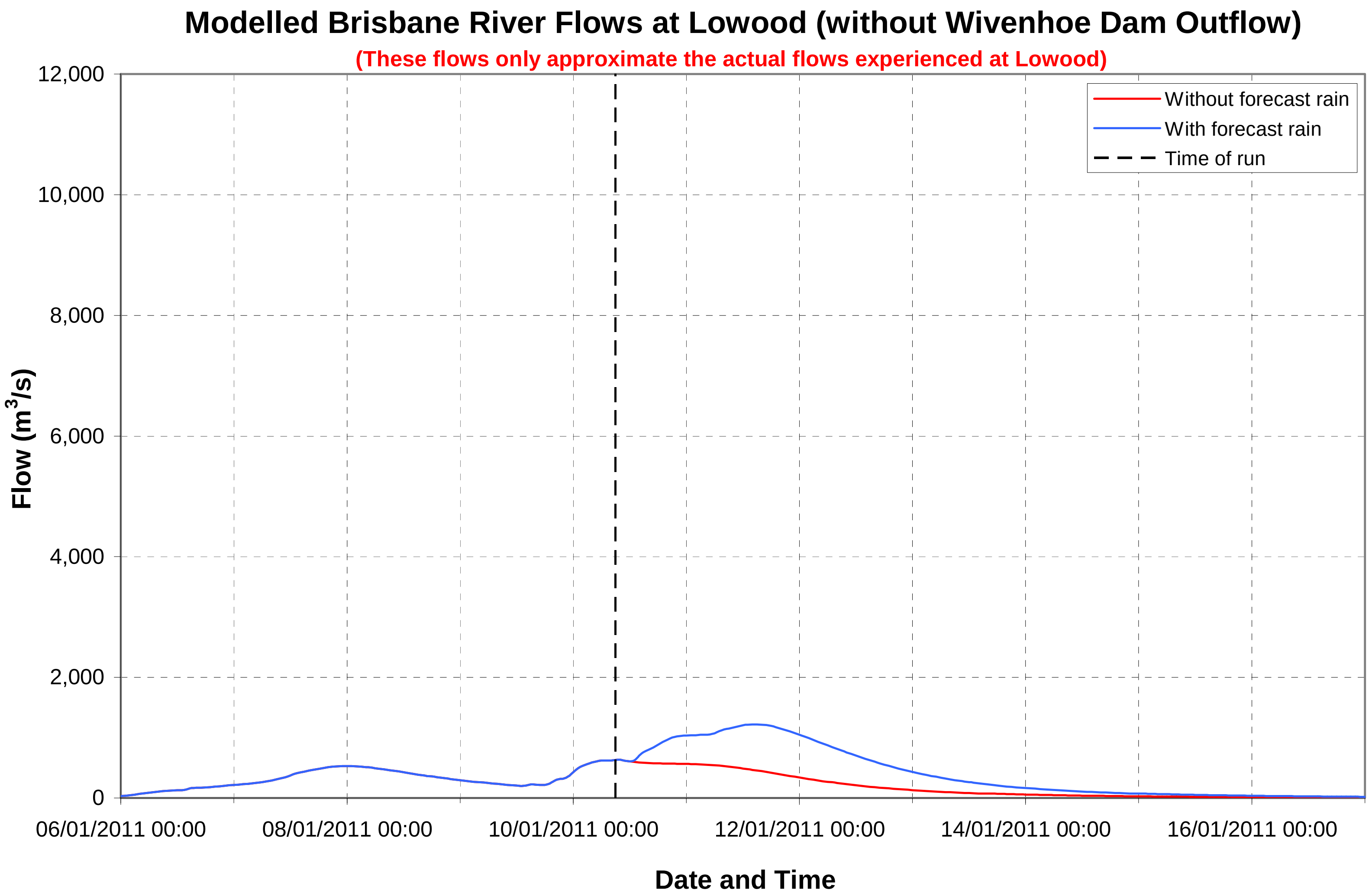
Run 26: Monday 10 January 2011, 09:00



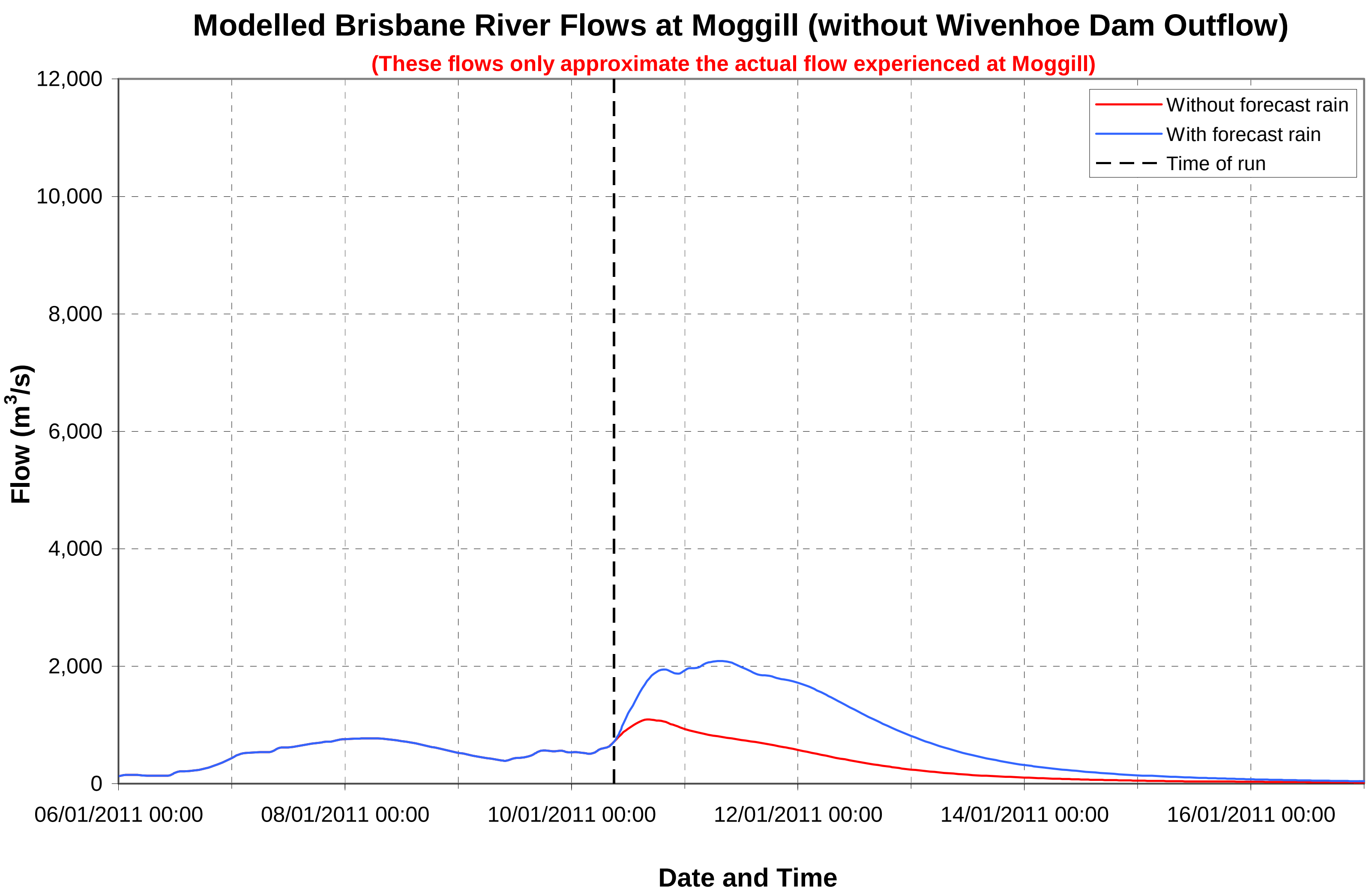
Run 26: Monday 10 January 2011, 09:00



Run 26: Monday 10 January 2011, 09:00



Run 26: Monday 10 January 2011, 09:00

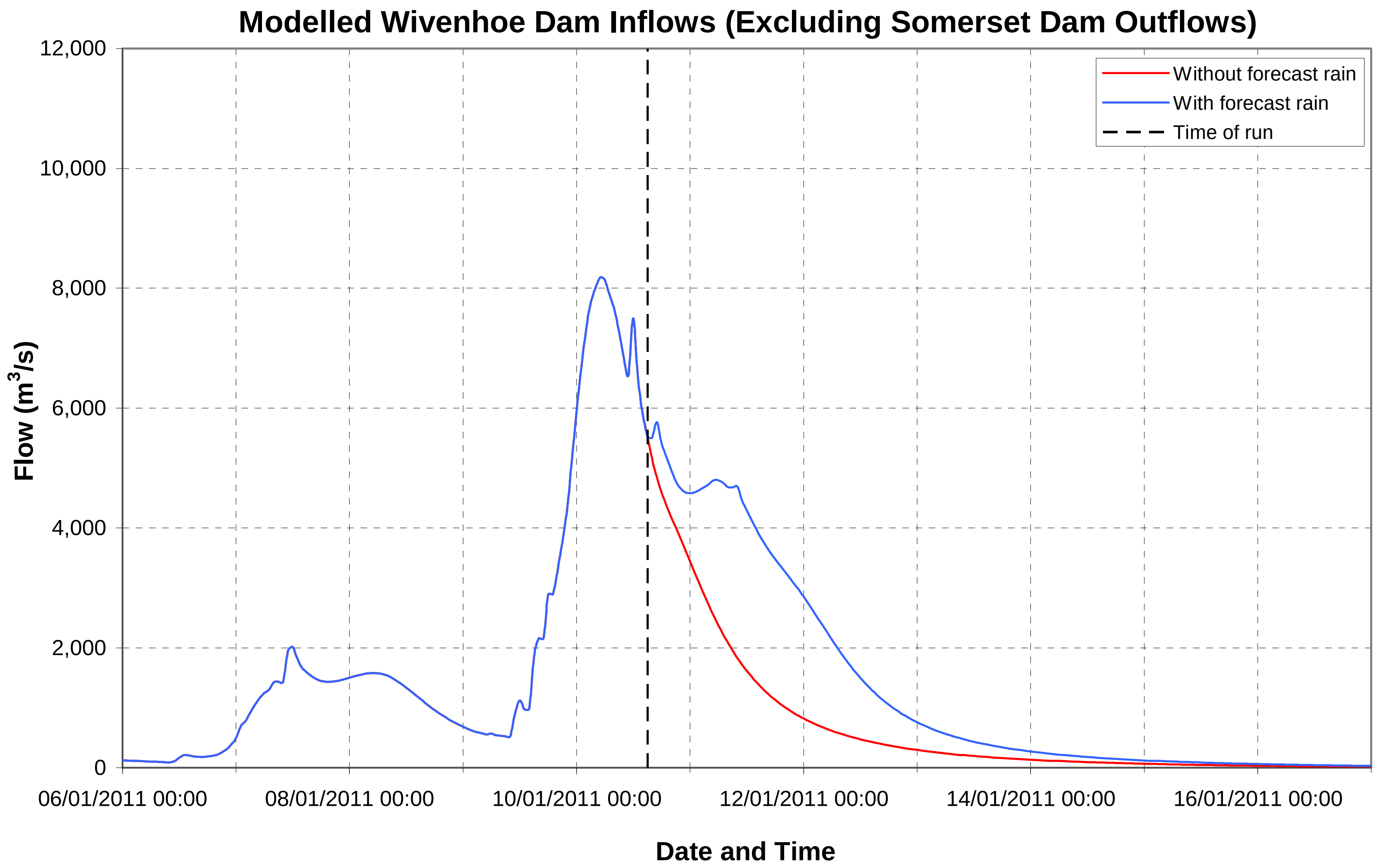


Run 26: Monday 10 January 2011, 09:00

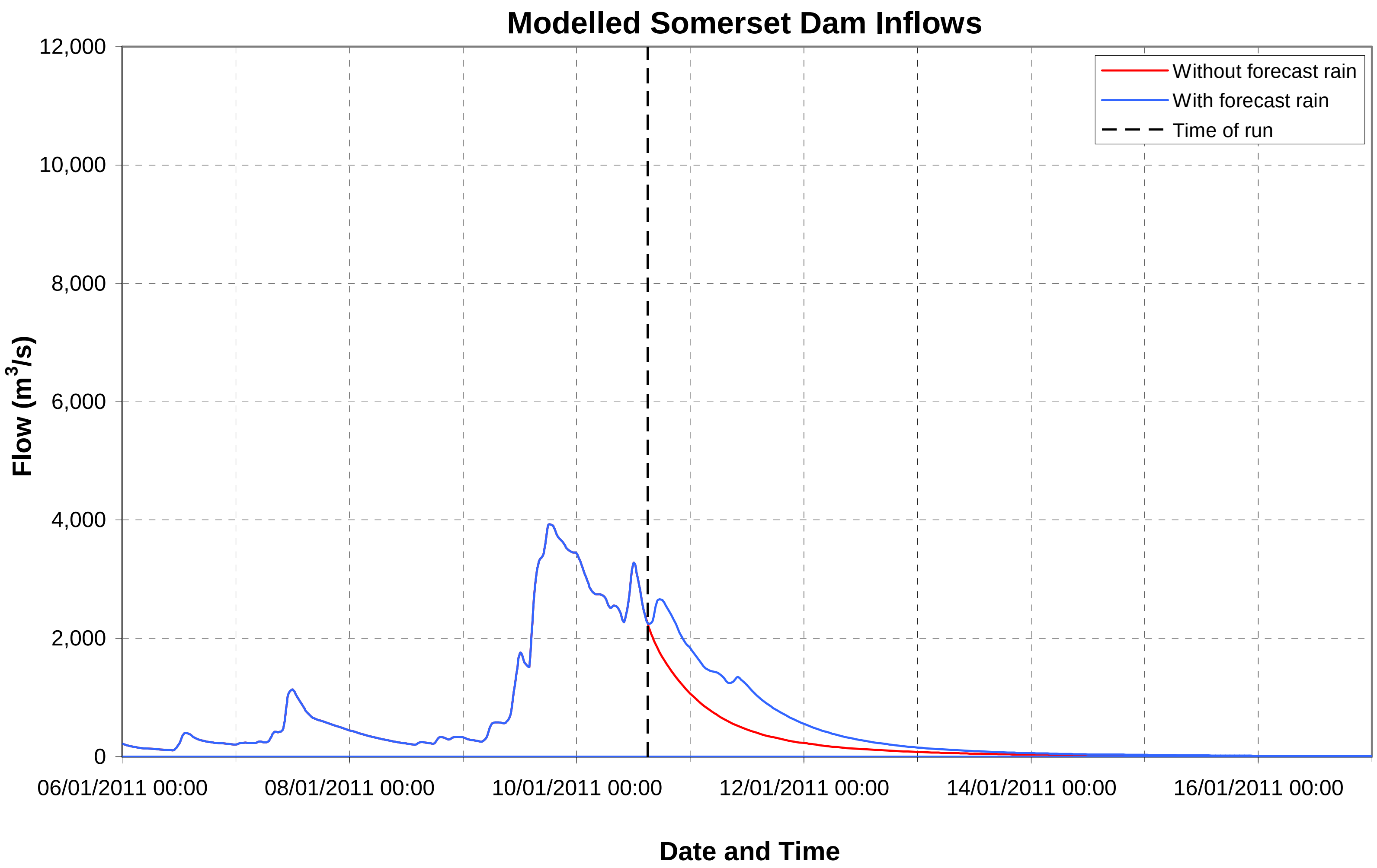
Run 28

Date: Monday 10 January 2011

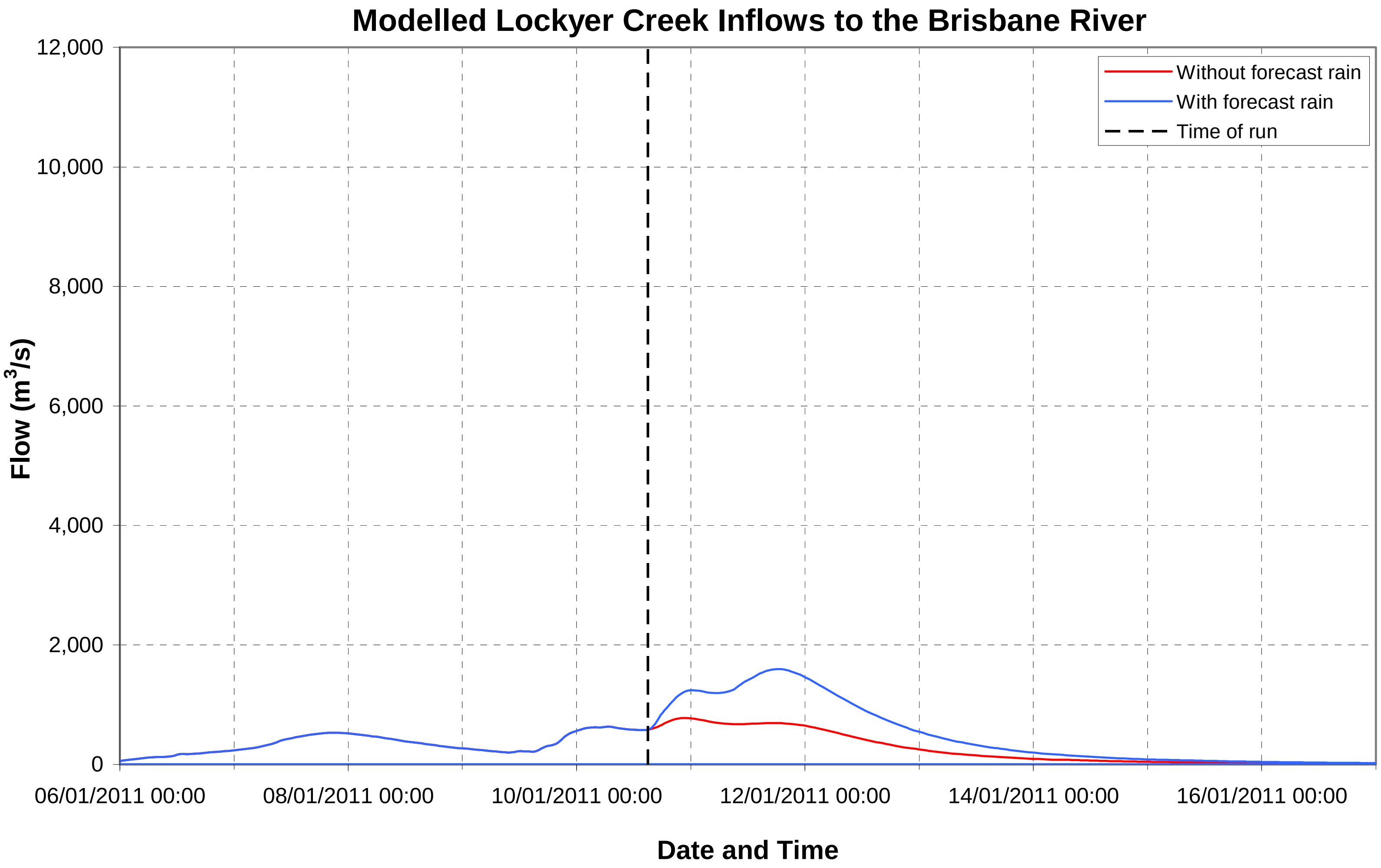
Time: 15:00



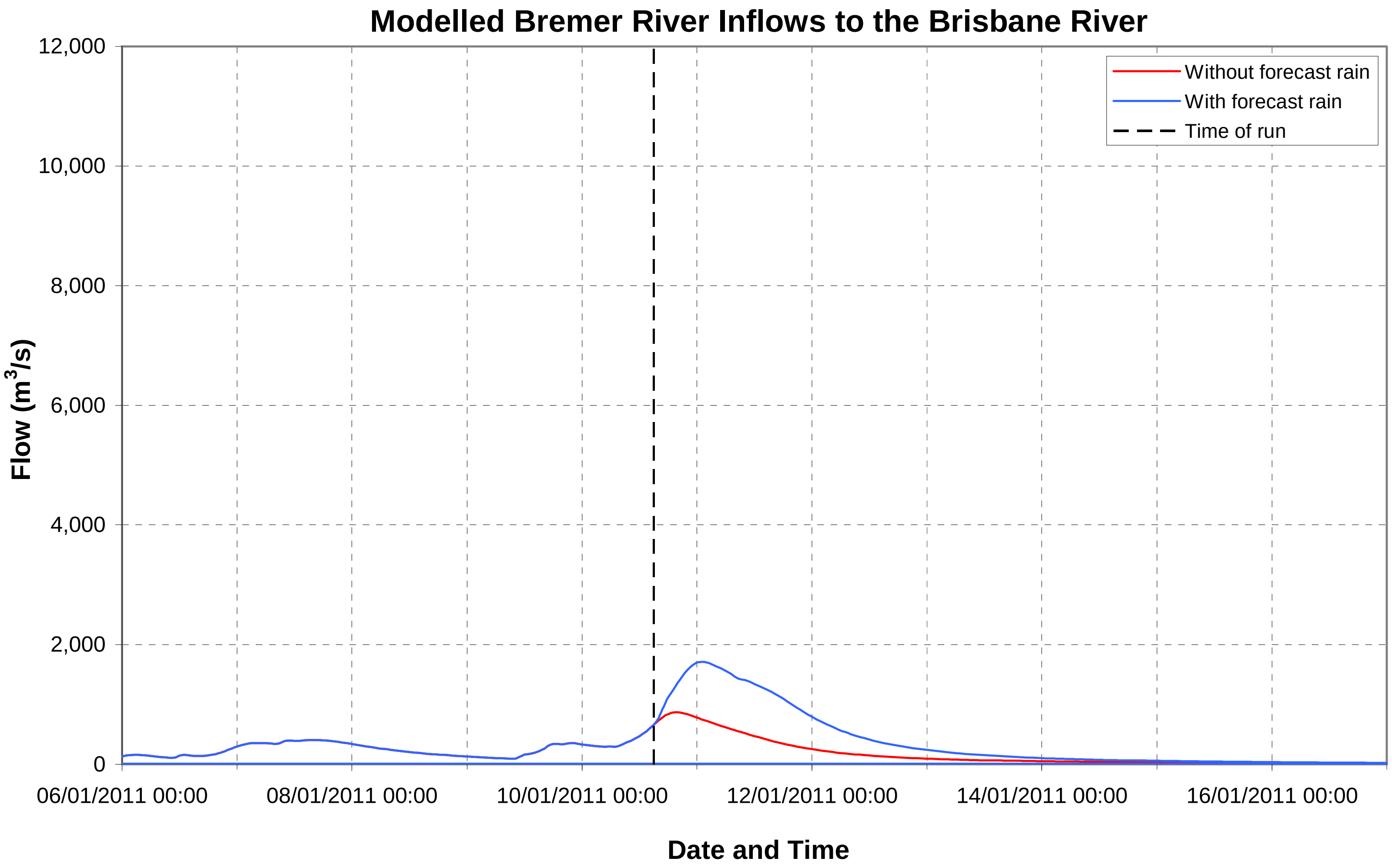
Run 28: Monday 10 January 2011, 15:00



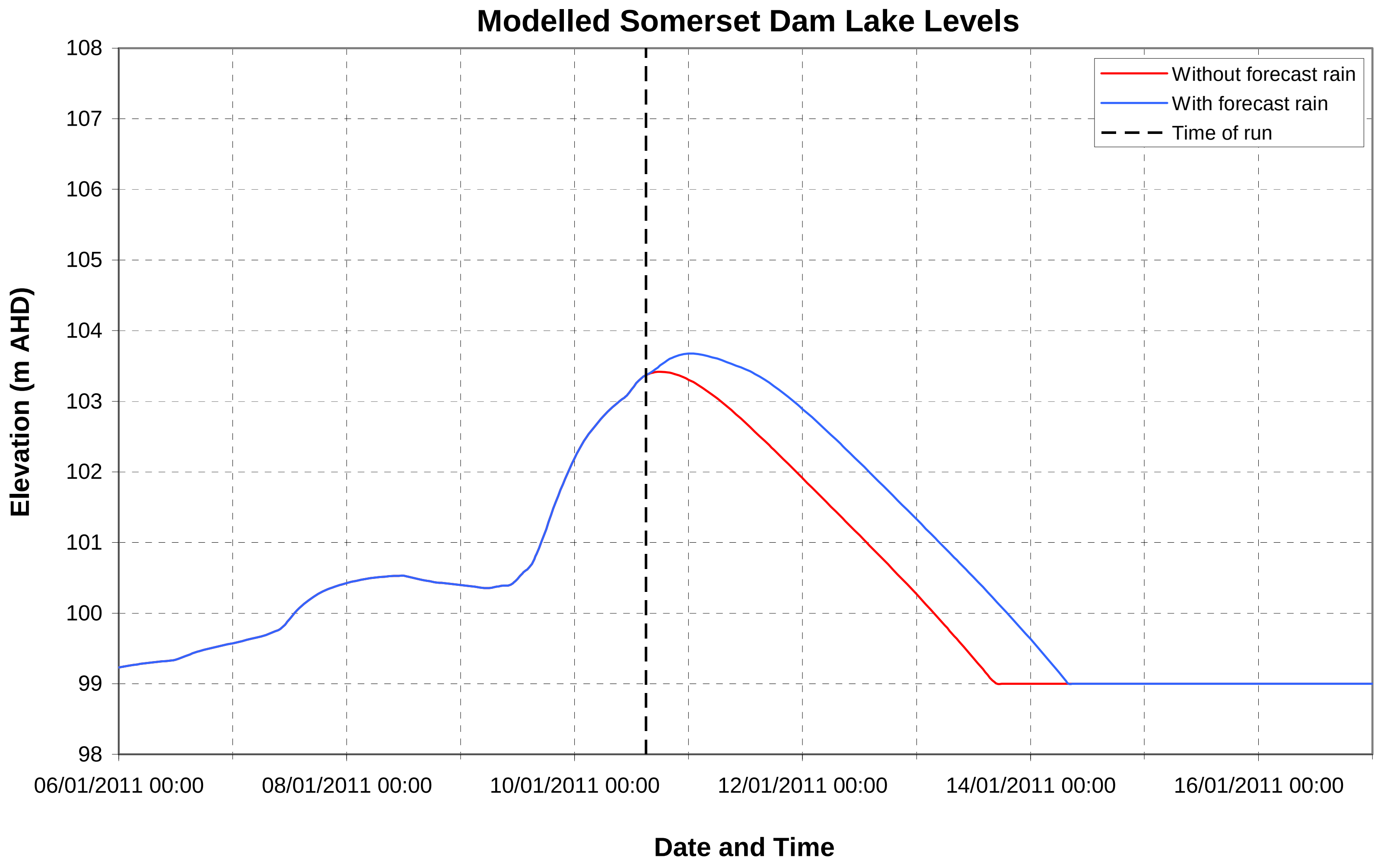
Run 28: Monday 10 January 2011, 15:00



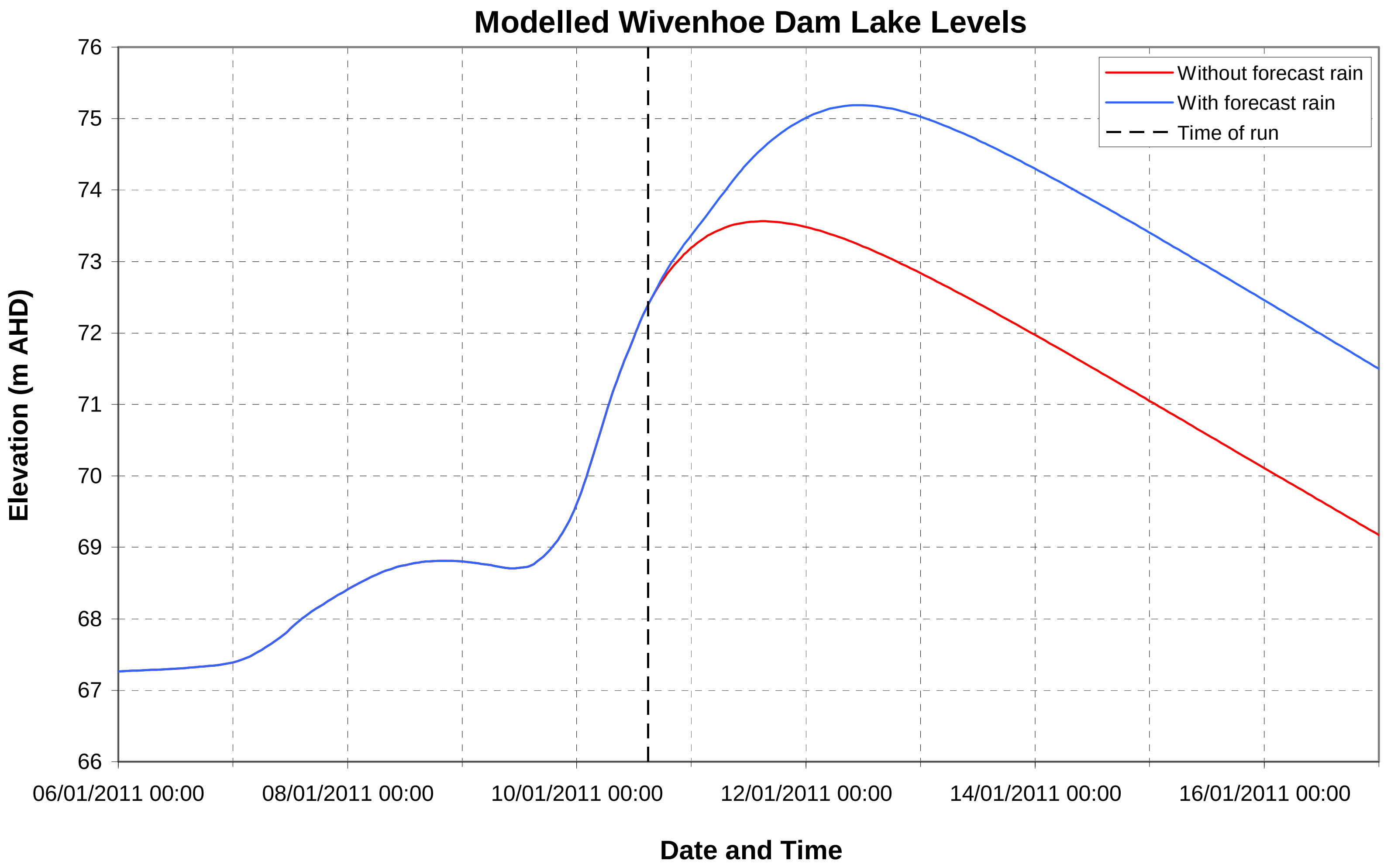
Run 28: Monday 10 January 2011, 15:00



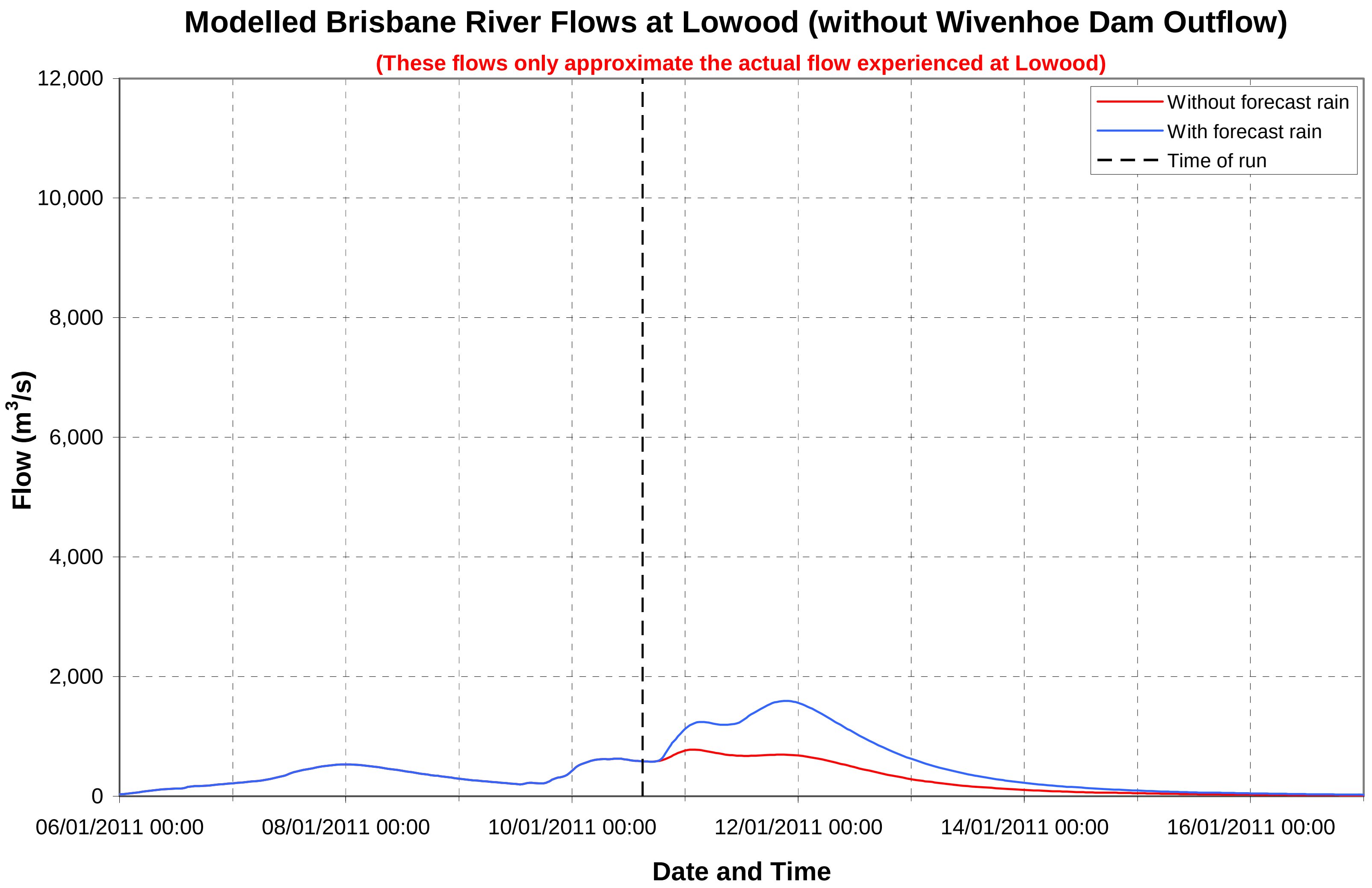
Run 28: Monday 10 January 2011, 15:00



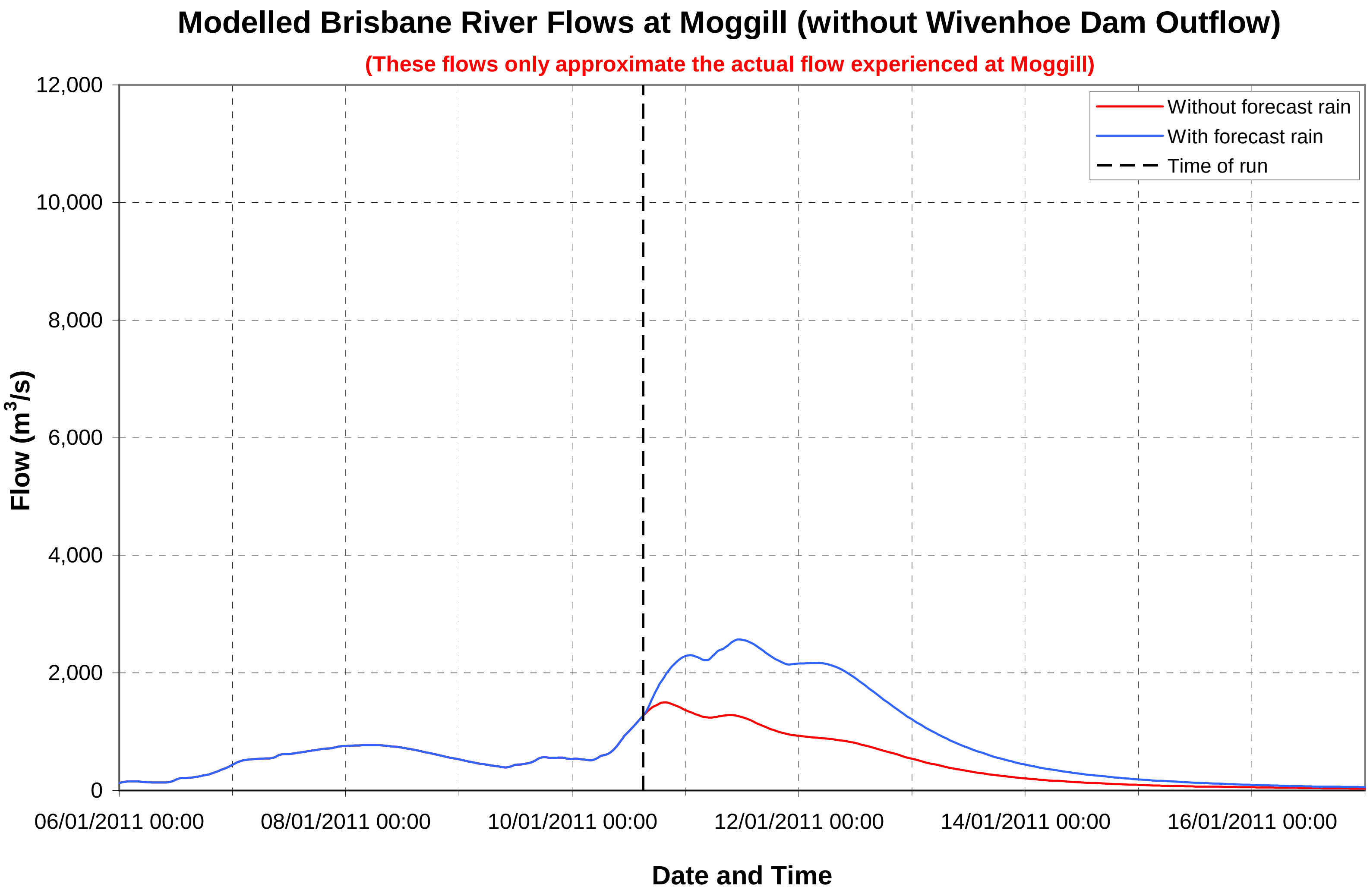
Run 28: Monday 10 January 2011, 15:00



Run 28: Monday 10 January 2011, 15:00



Run 28: Monday 10 January 2011, 15:00

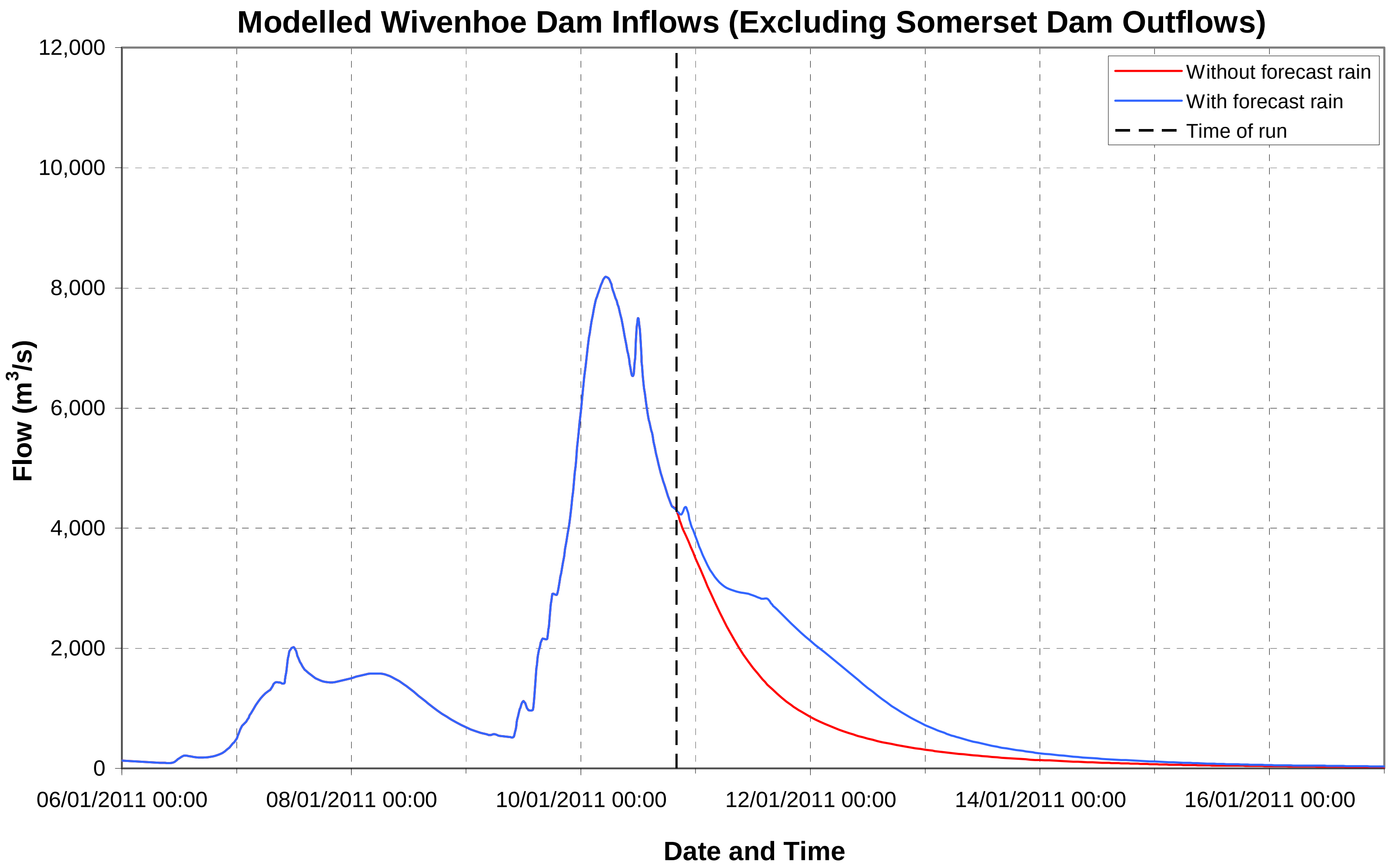


Run 28: Monday 10 January 2011, 15:00

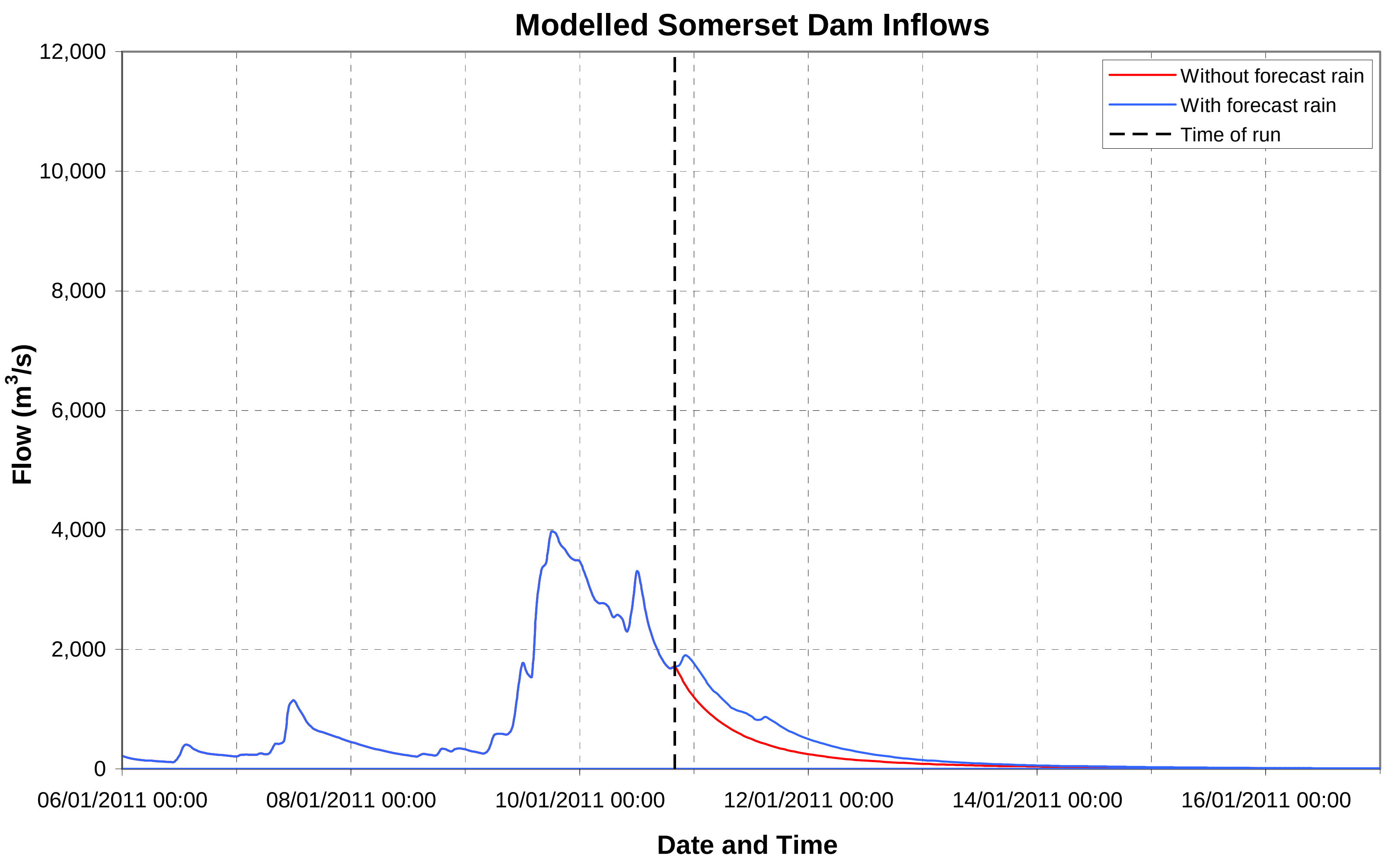
Run 31

Date: Monday 10 January 2011

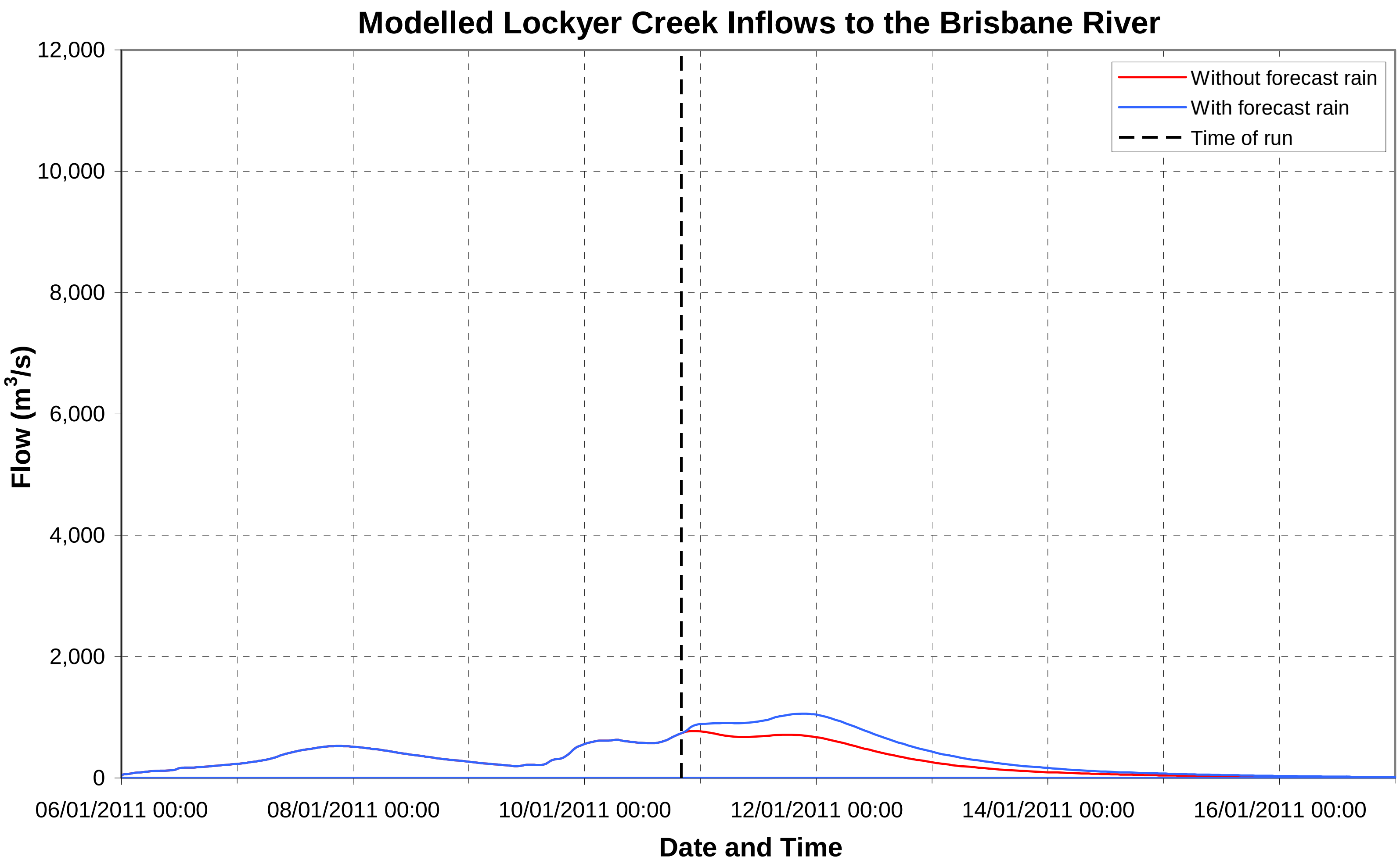
Time: 20:00



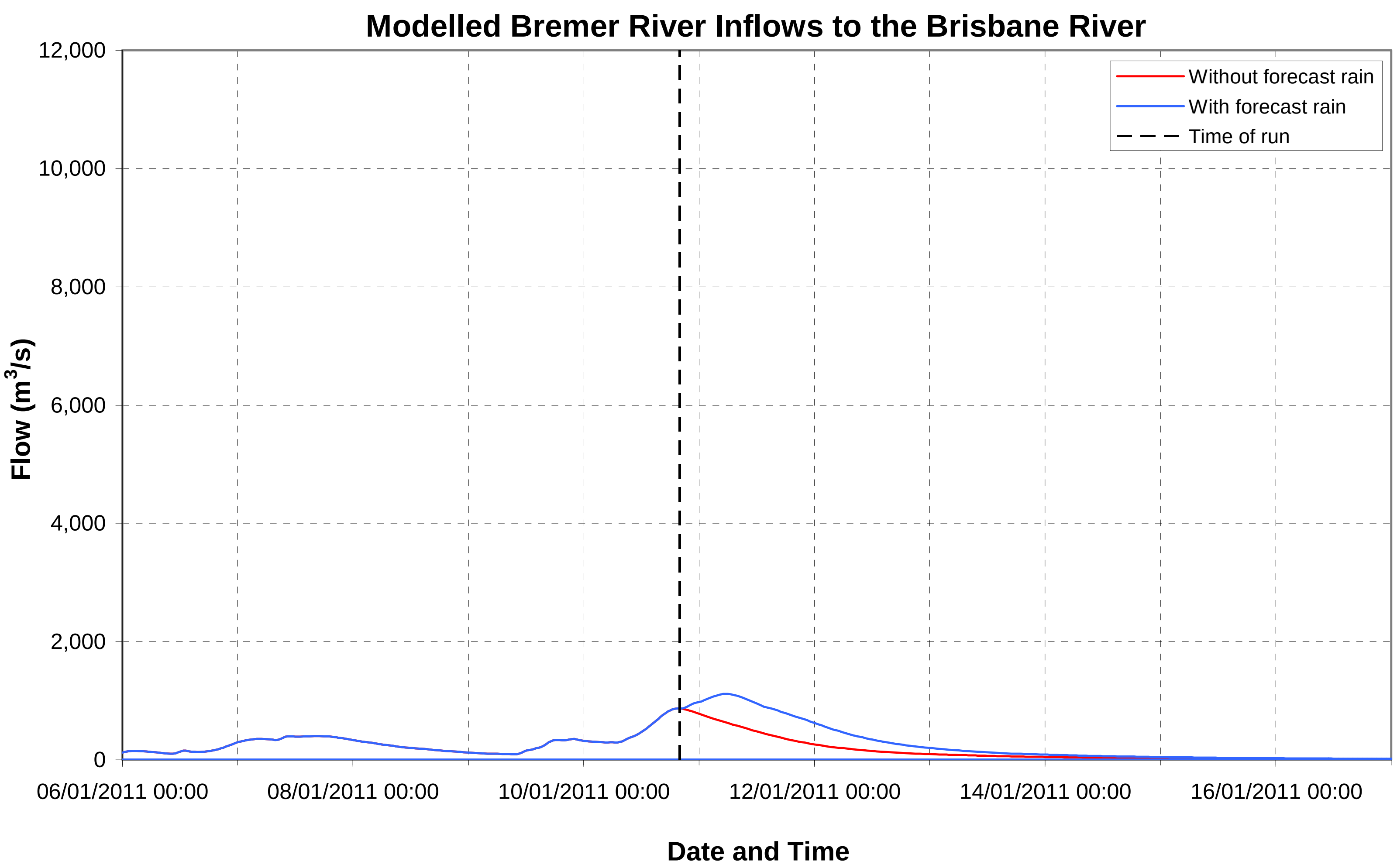
Run 31: Monday 10 January 2011, 20:00



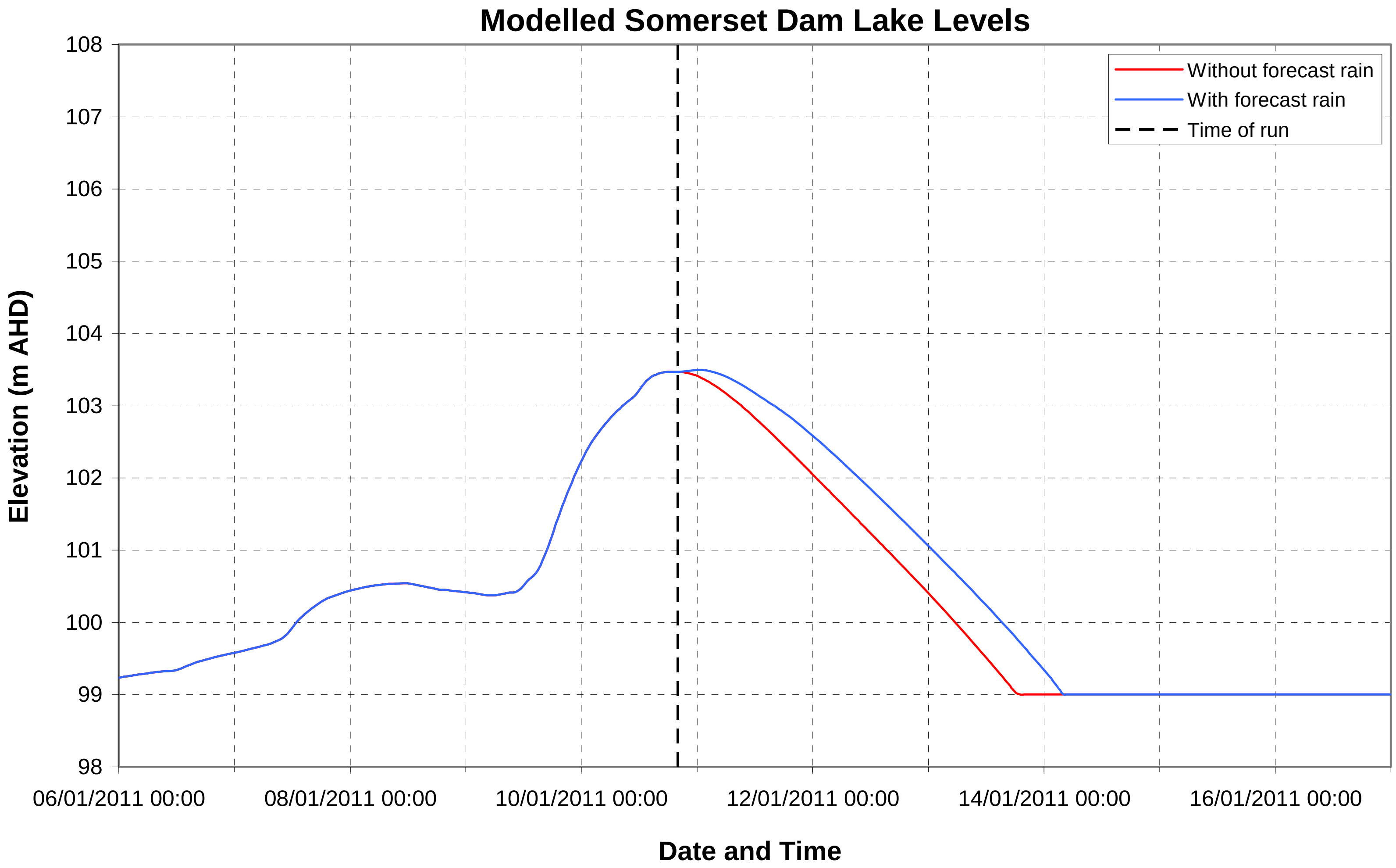
Run 31: Monday 10 January 2011, 20:00



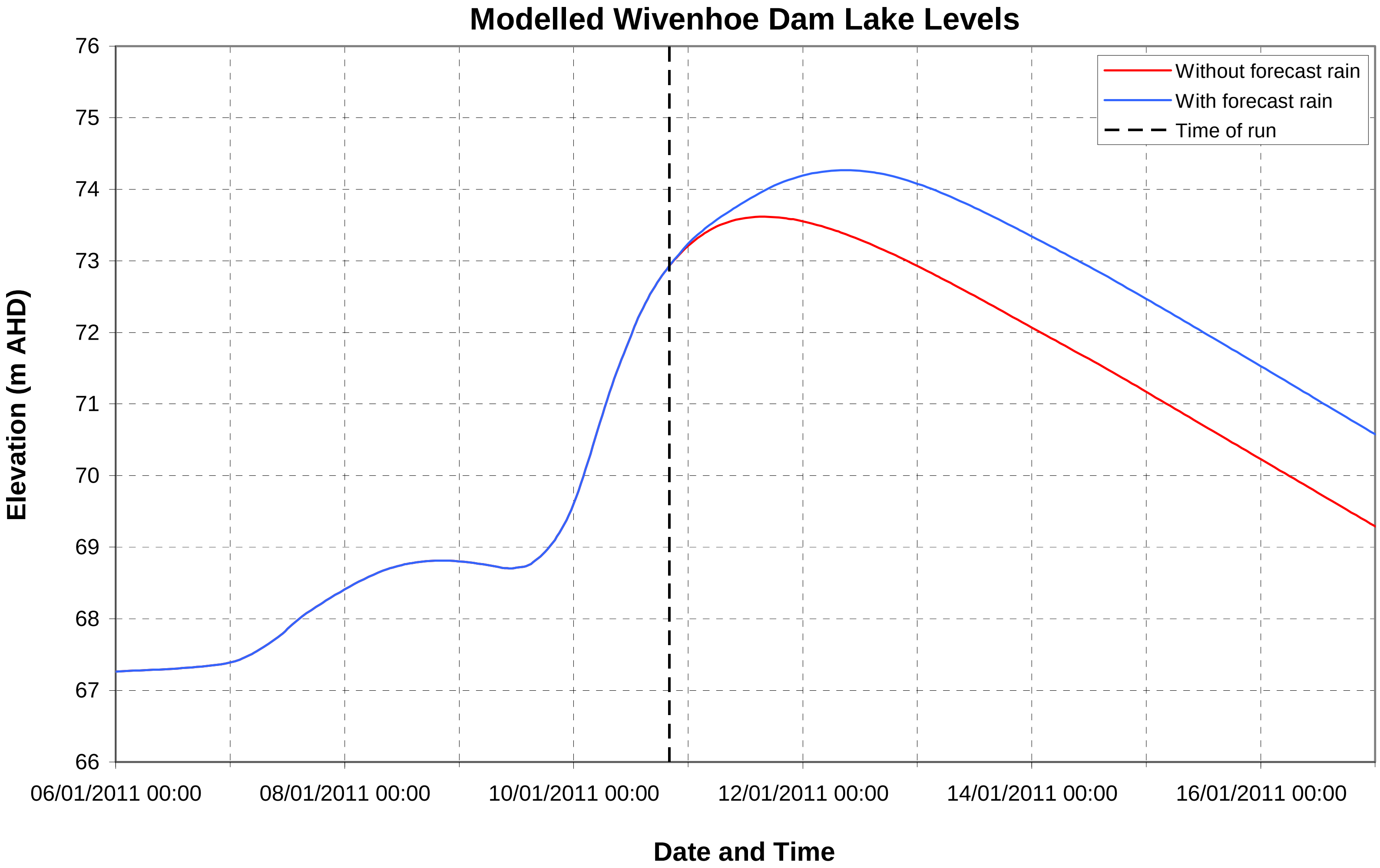
Run 31: Monday 10 January 2011, 20:00



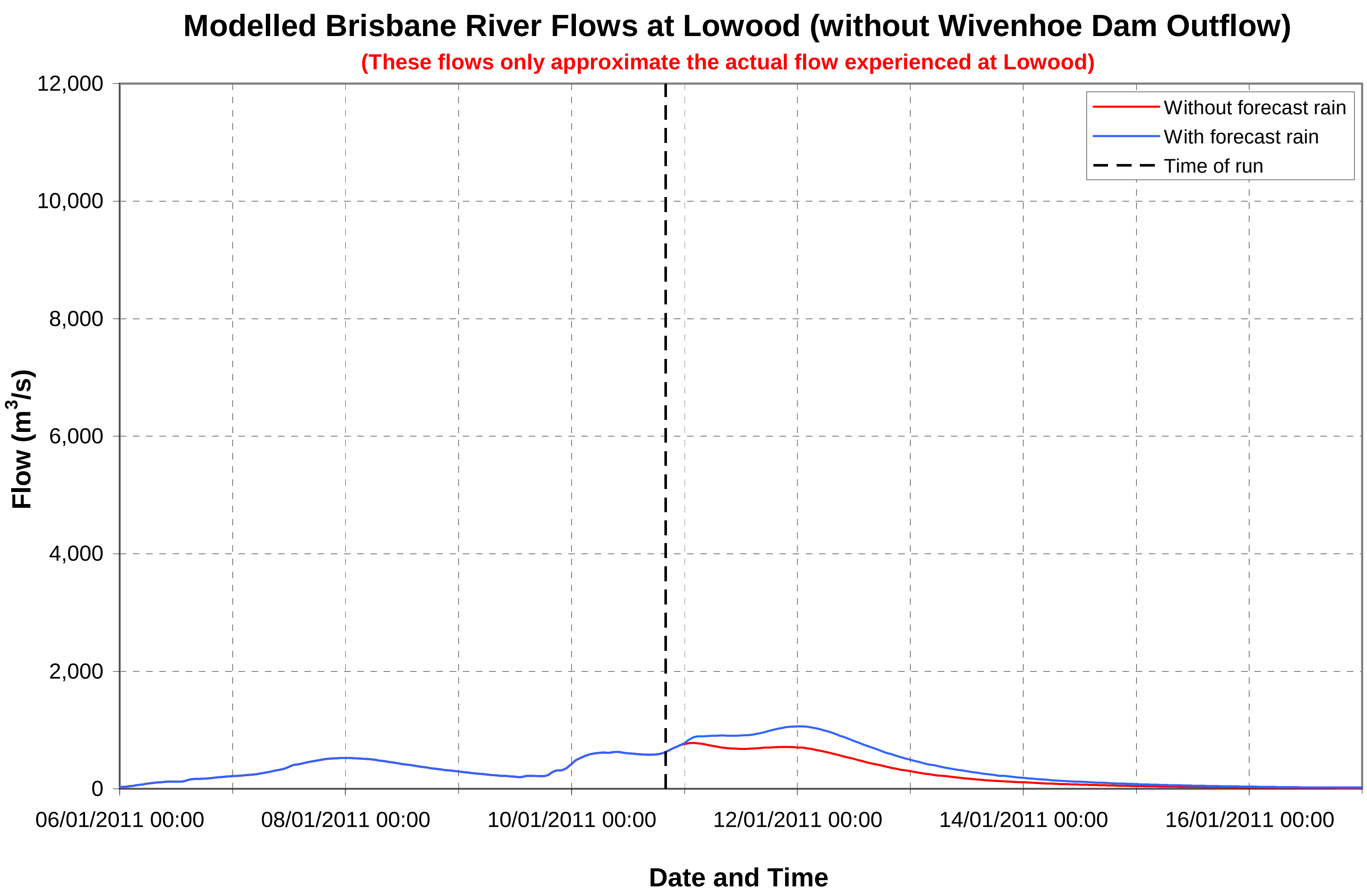
Run 31: Monday 10 January 2011, 20:00



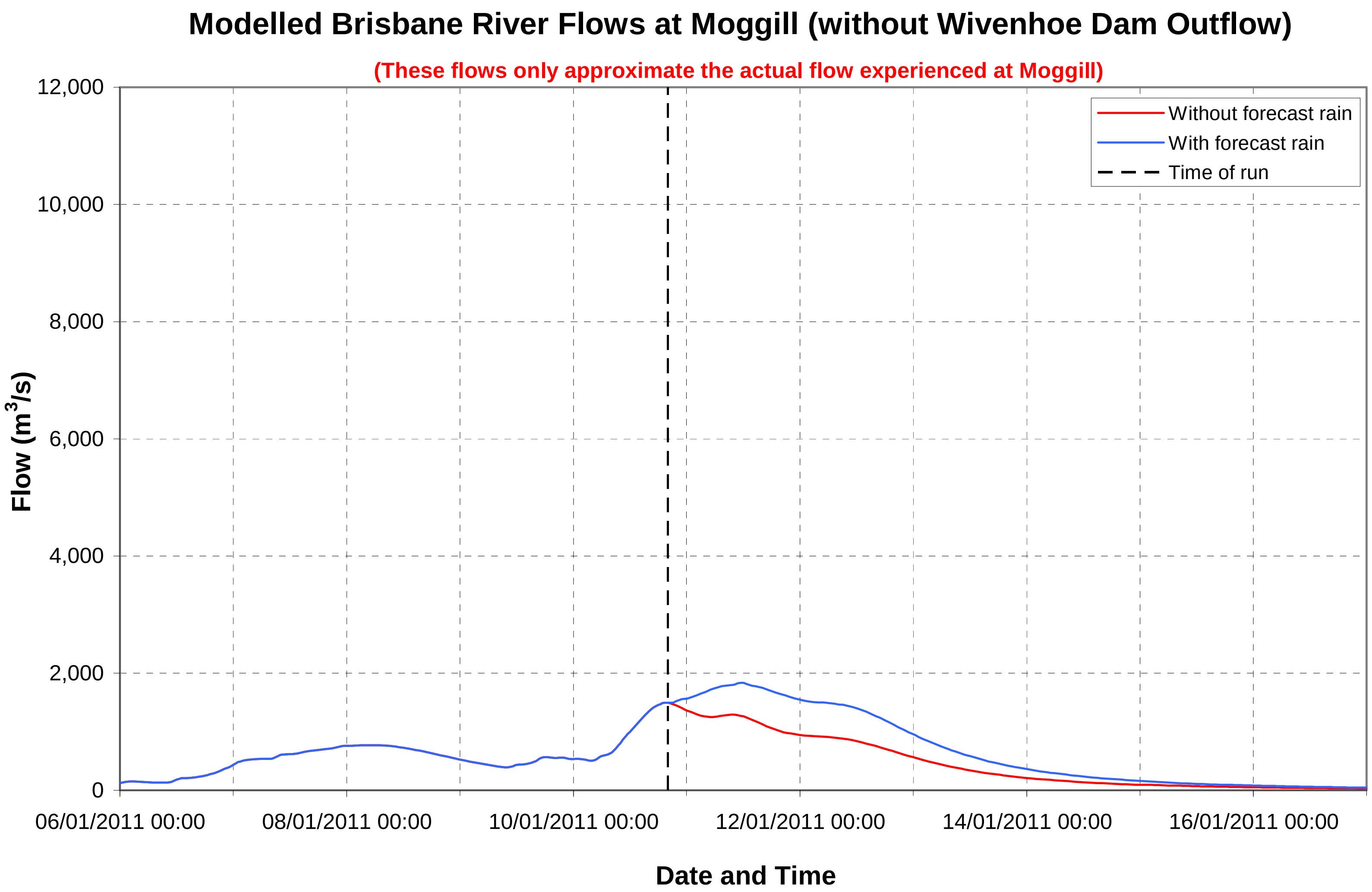
Run 31: Monday 10 January 2011, 20:00



Run 31: Monday 10 January 2011, 20:00



Run 31: Monday 10 January 2011, 20:00

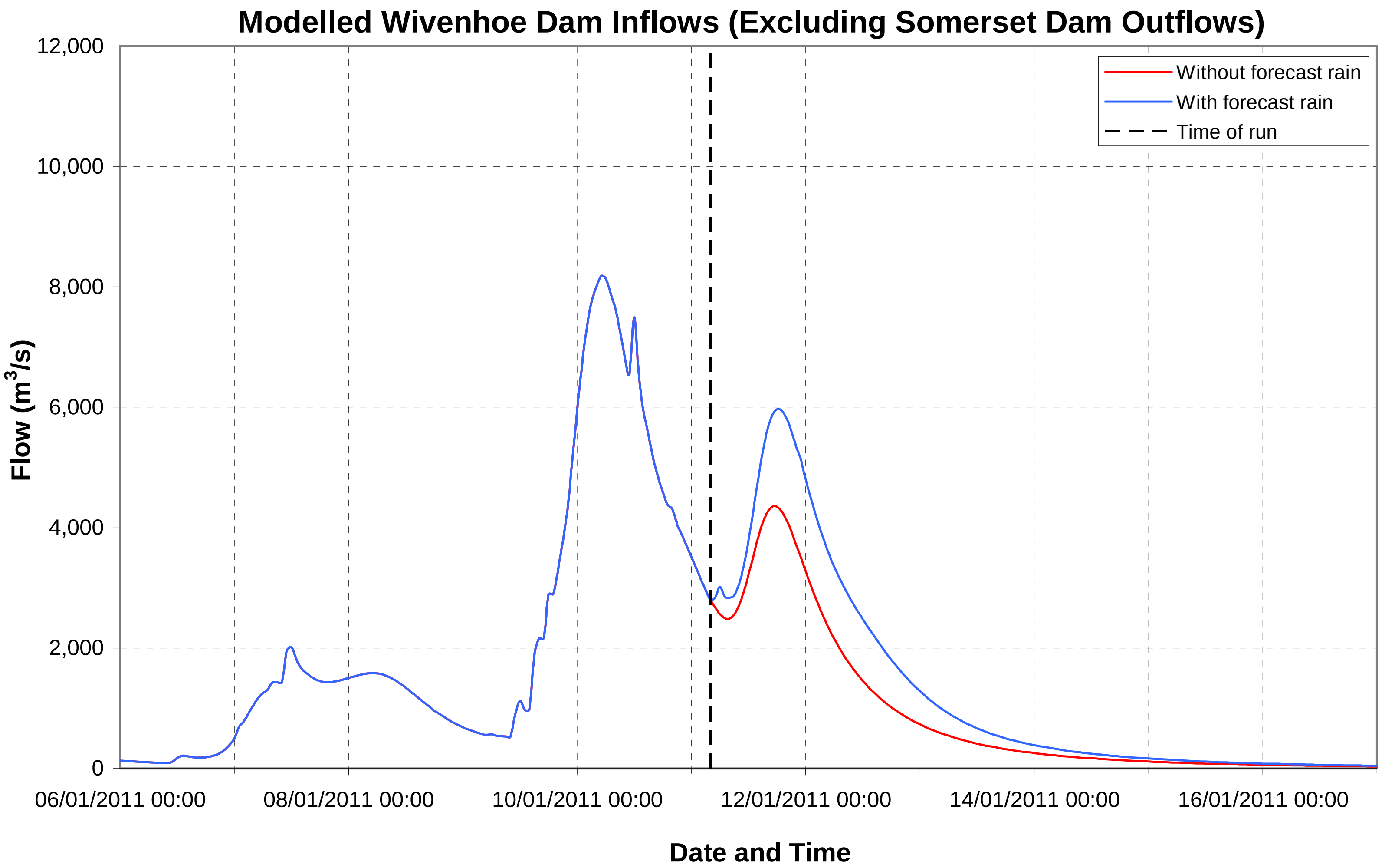


Run 31: Monday 10 January 2011, 20:00

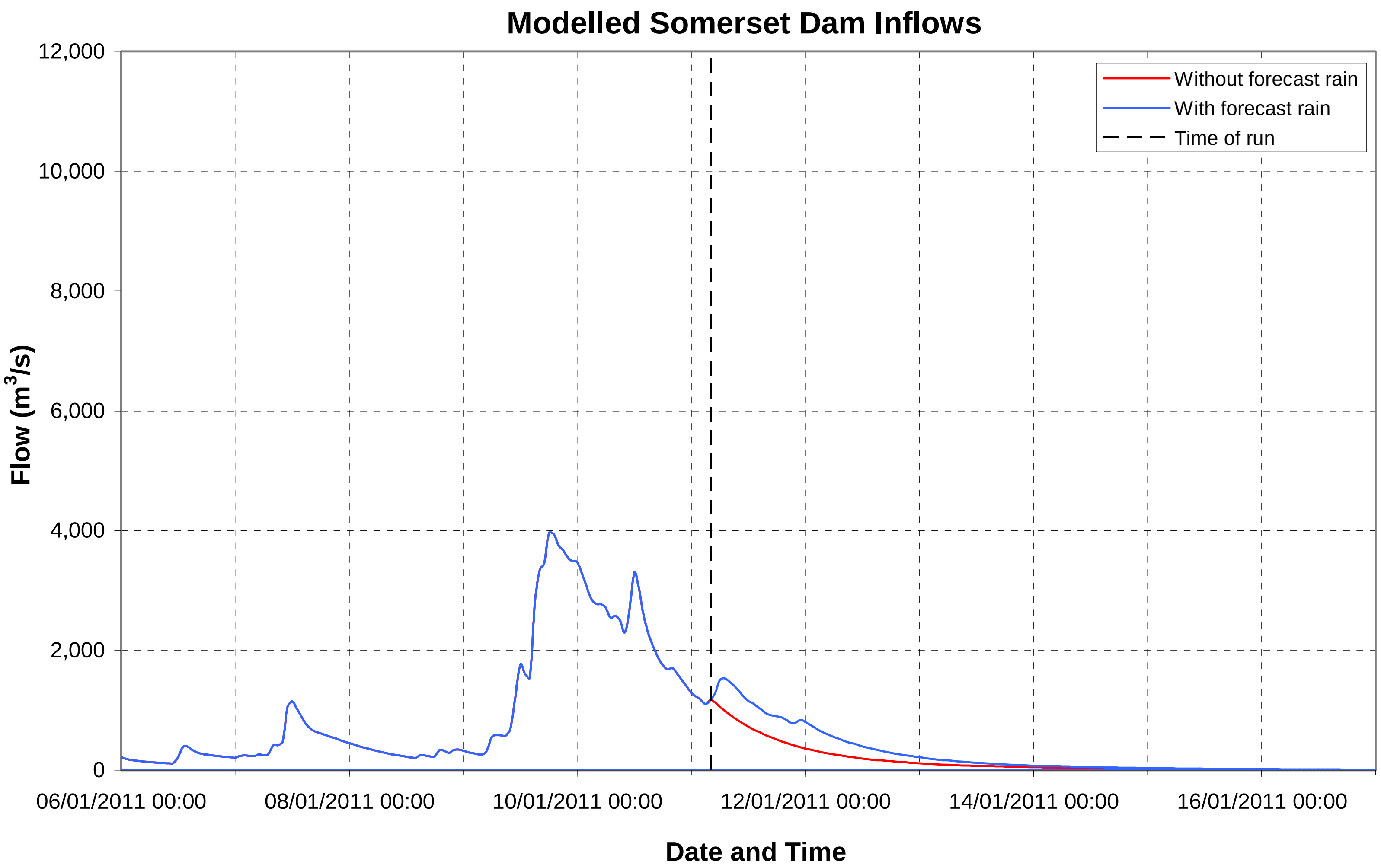
Run 35

Date: Tuesday 11 January 2011

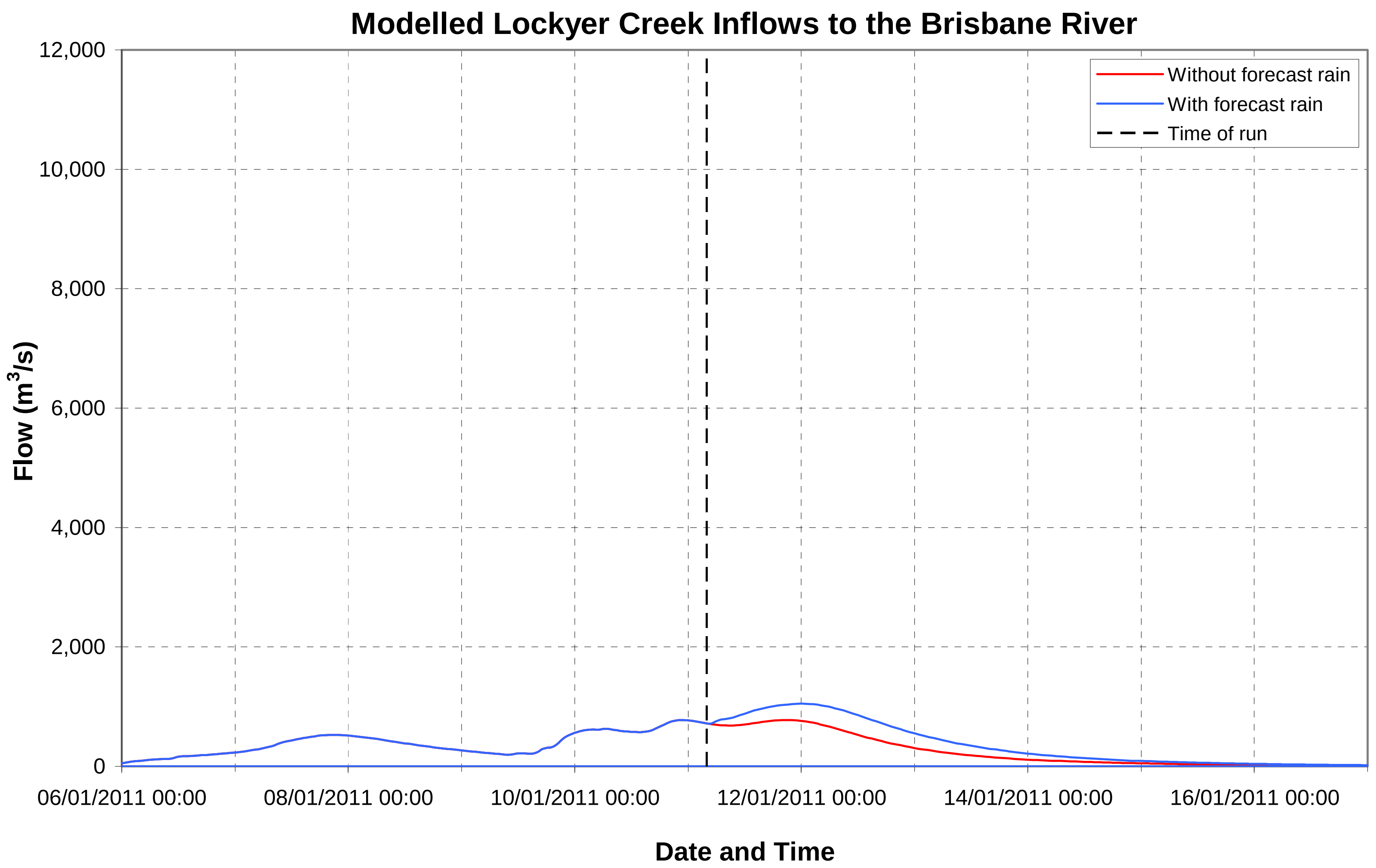
Time: 04:00



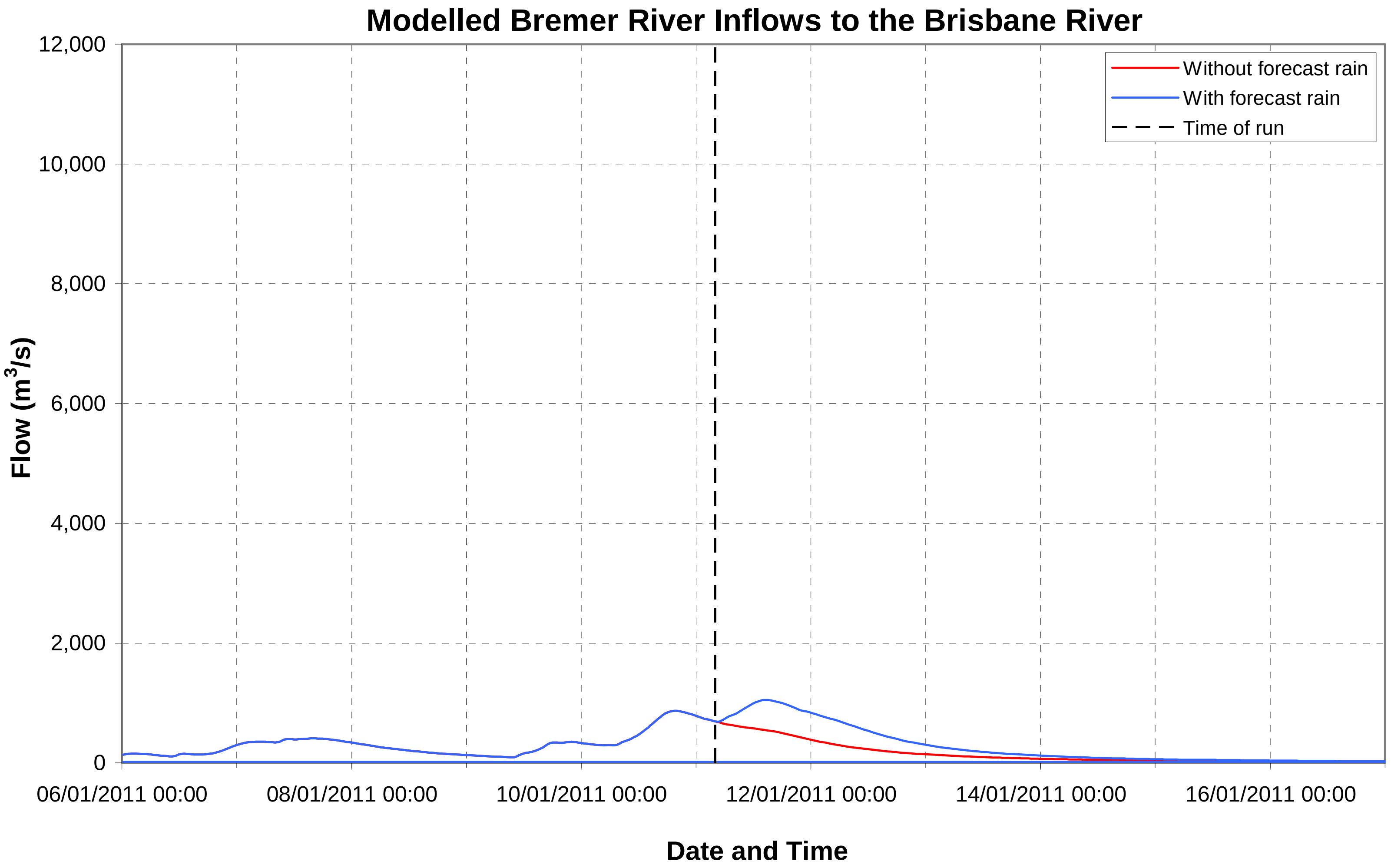
Run 35: Tuesday 11 January 2011, 04:00



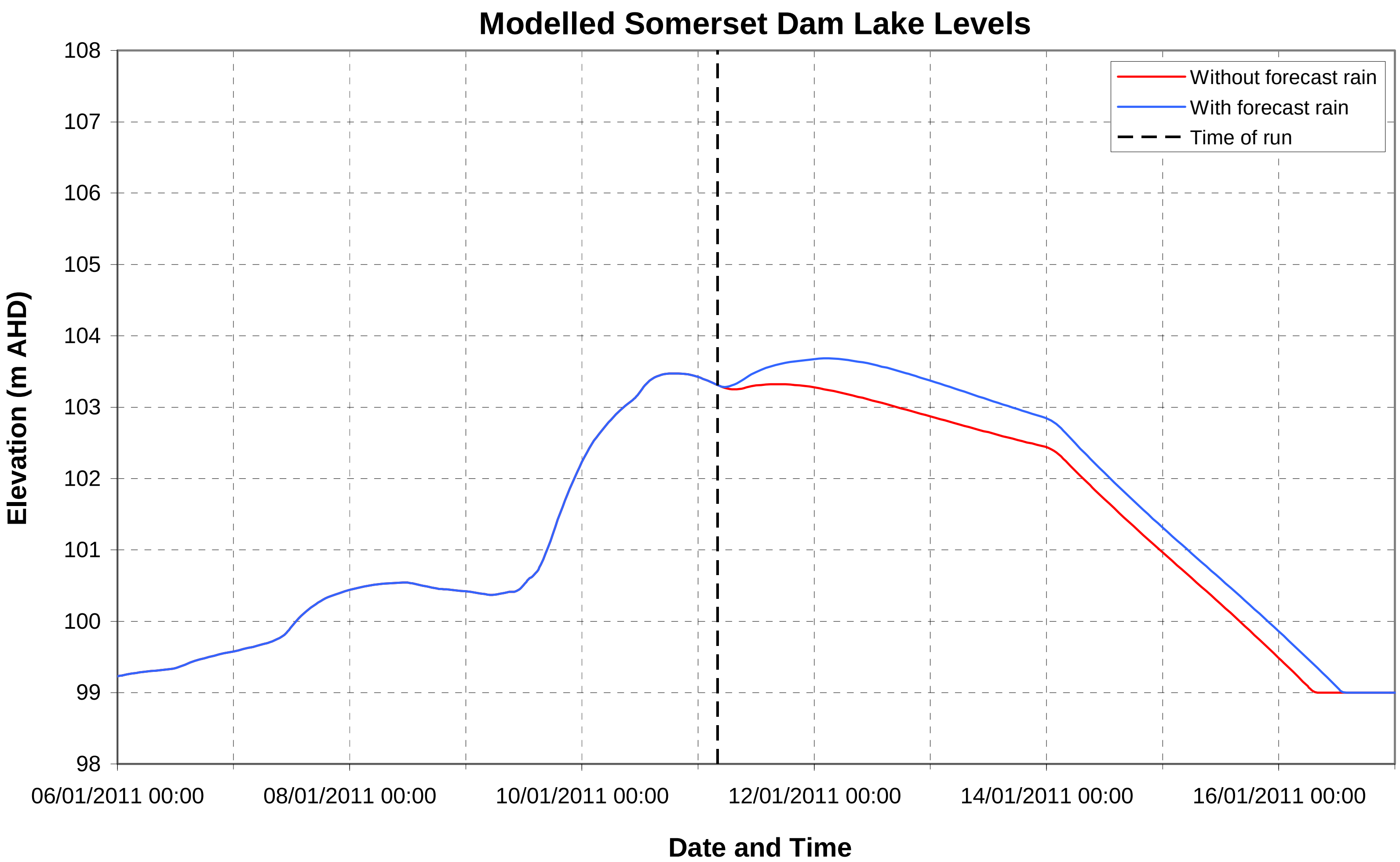
Run 35: Tuesday 11 January 2011, 04:00



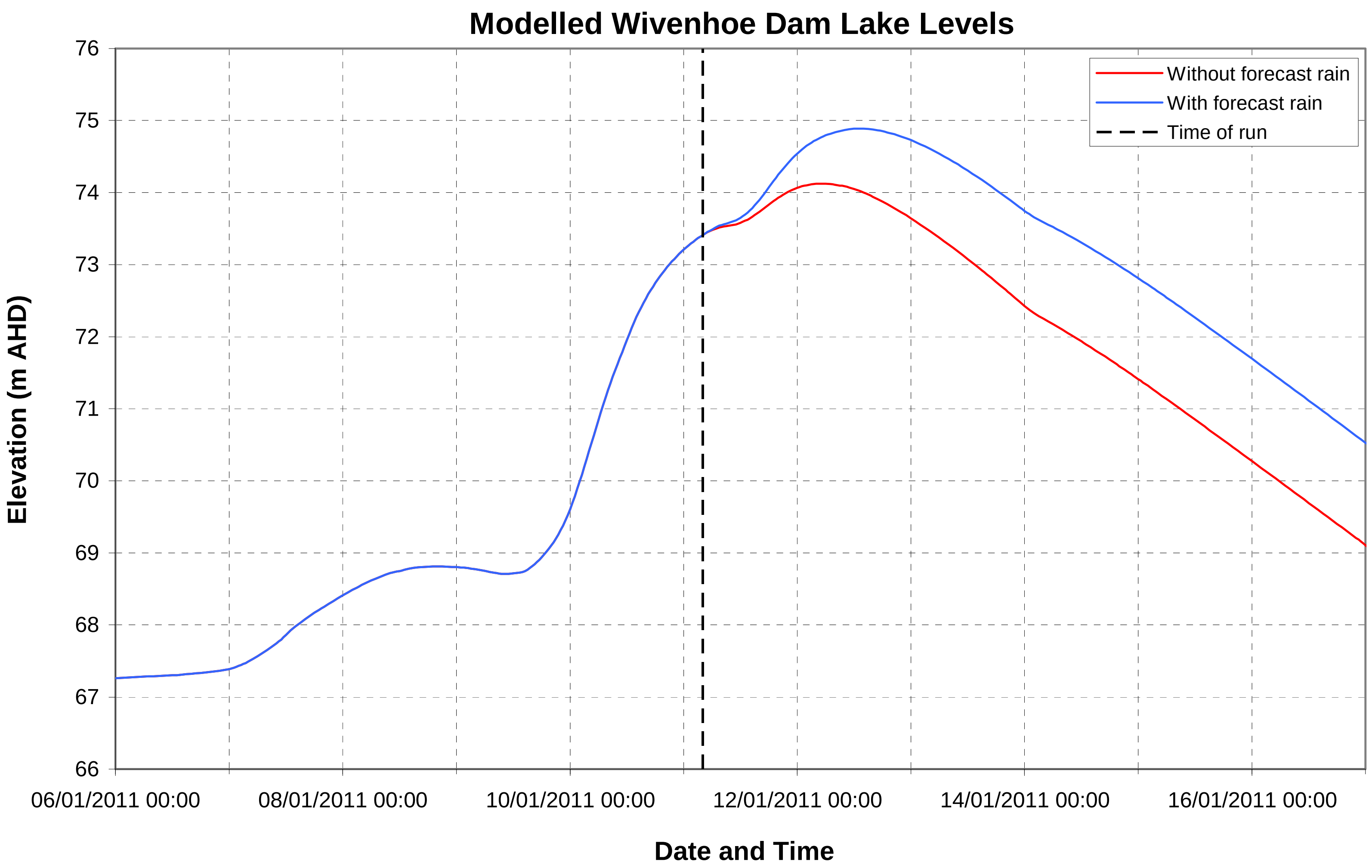
Run 35: Tuesday 11 January 2011, 04:00



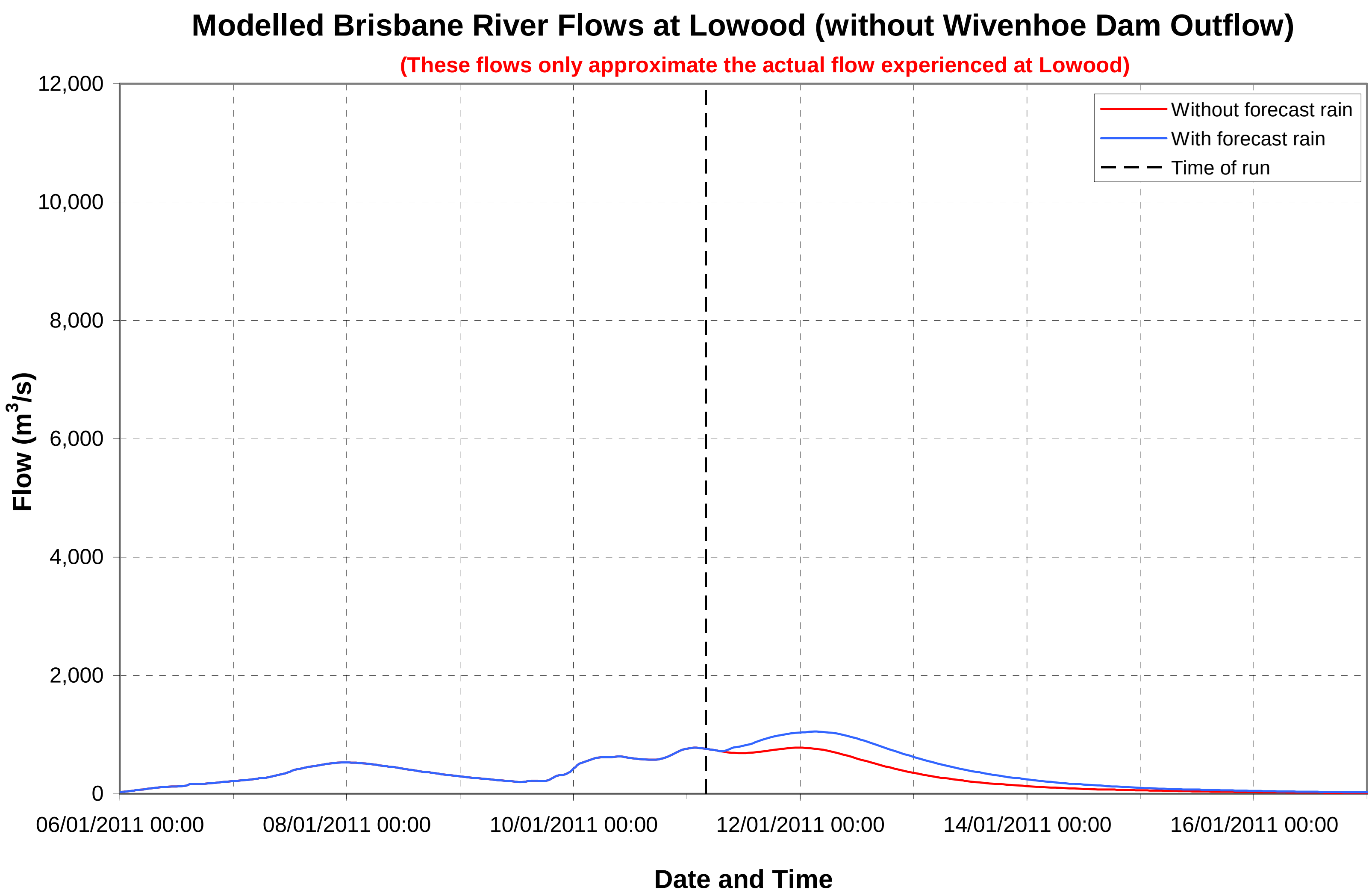
Run 35: Tuesday 11 January 2011, 04:00



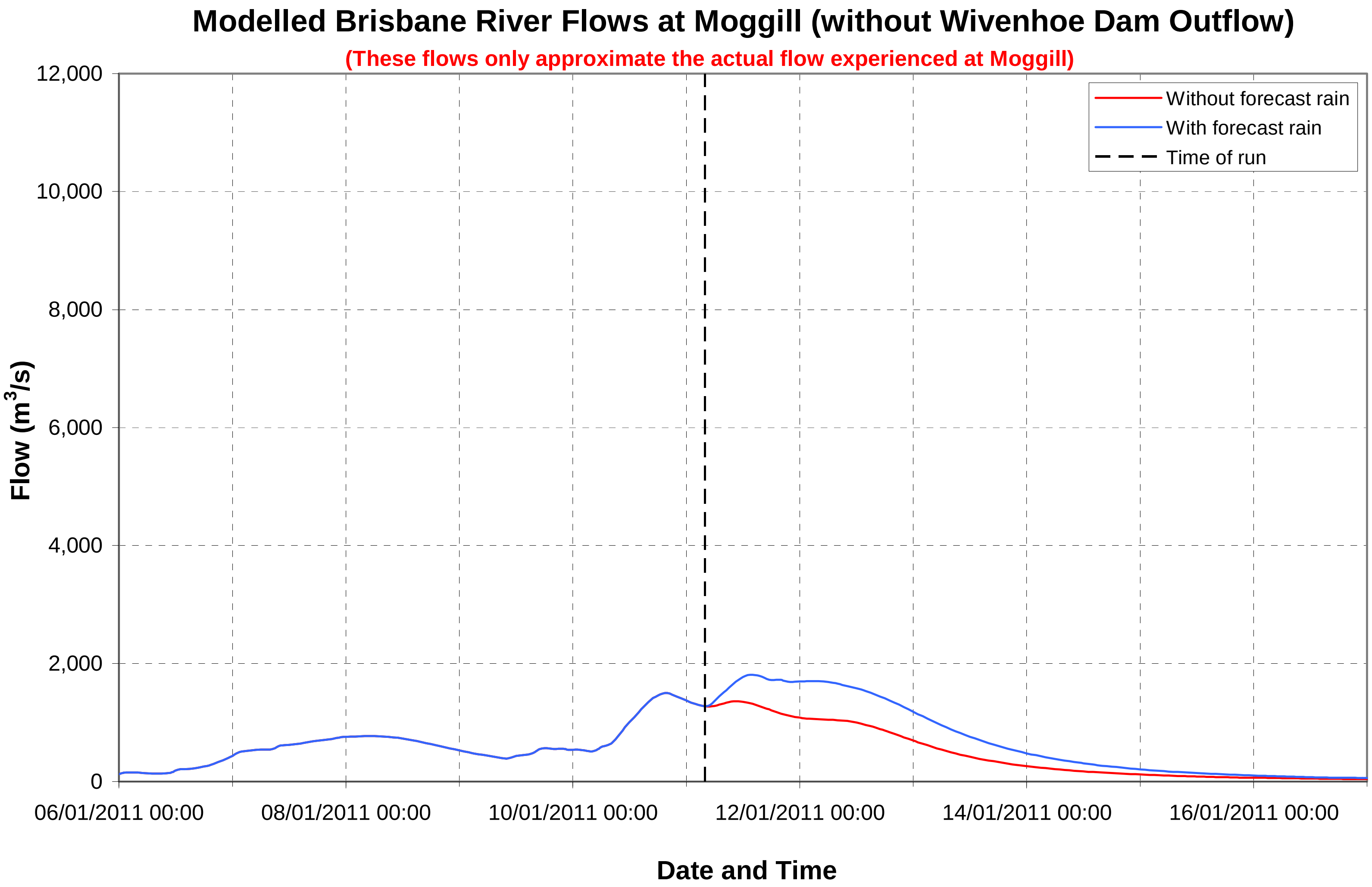
Run 35: Tuesday 11 January 2011, 04:00



Run 35: Tuesday 11 January 2011, 04:00



Run 35: Tuesday 11 January 2011, 04:00

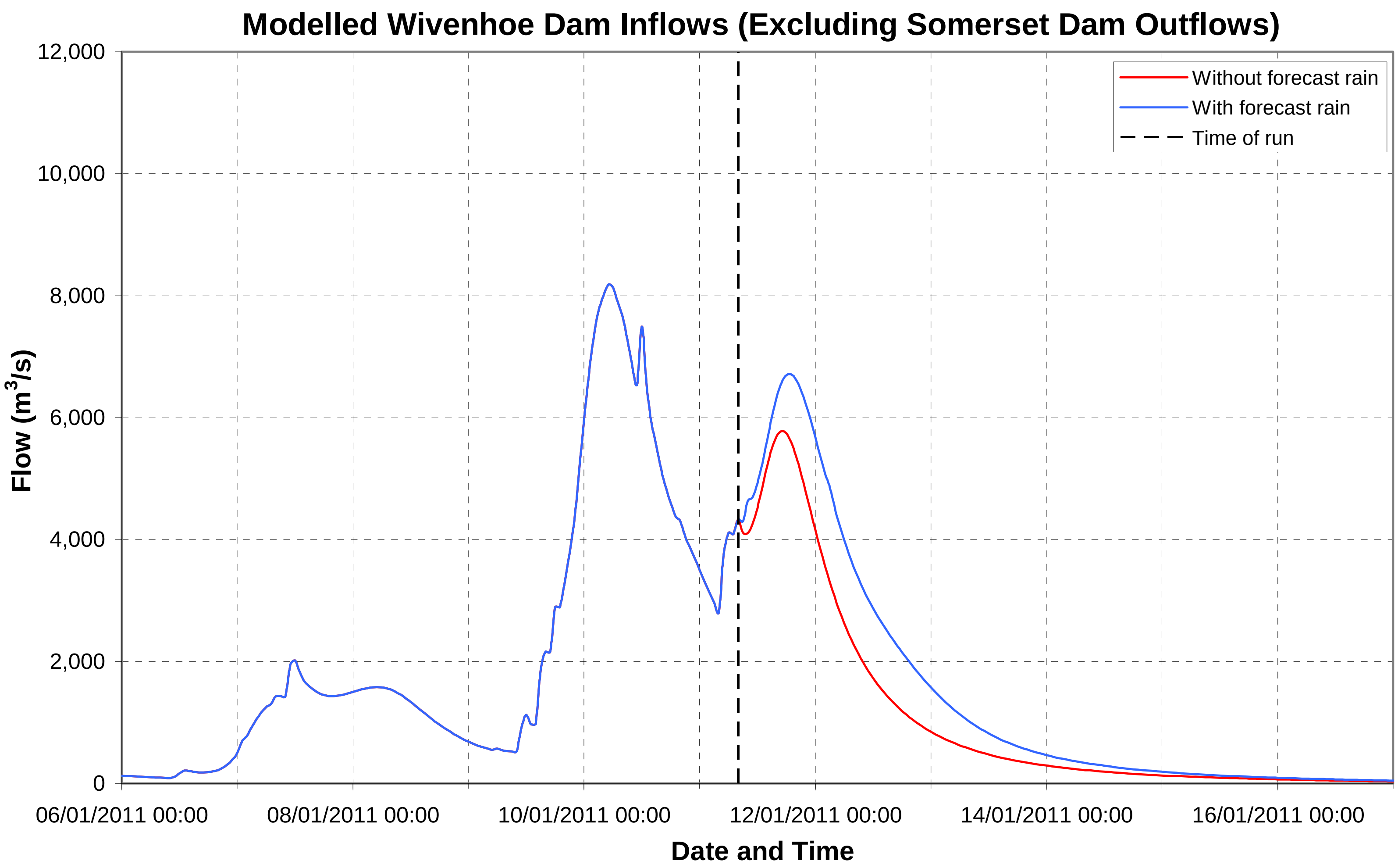


Run 35: Tuesday 11 January 2011, 04:00

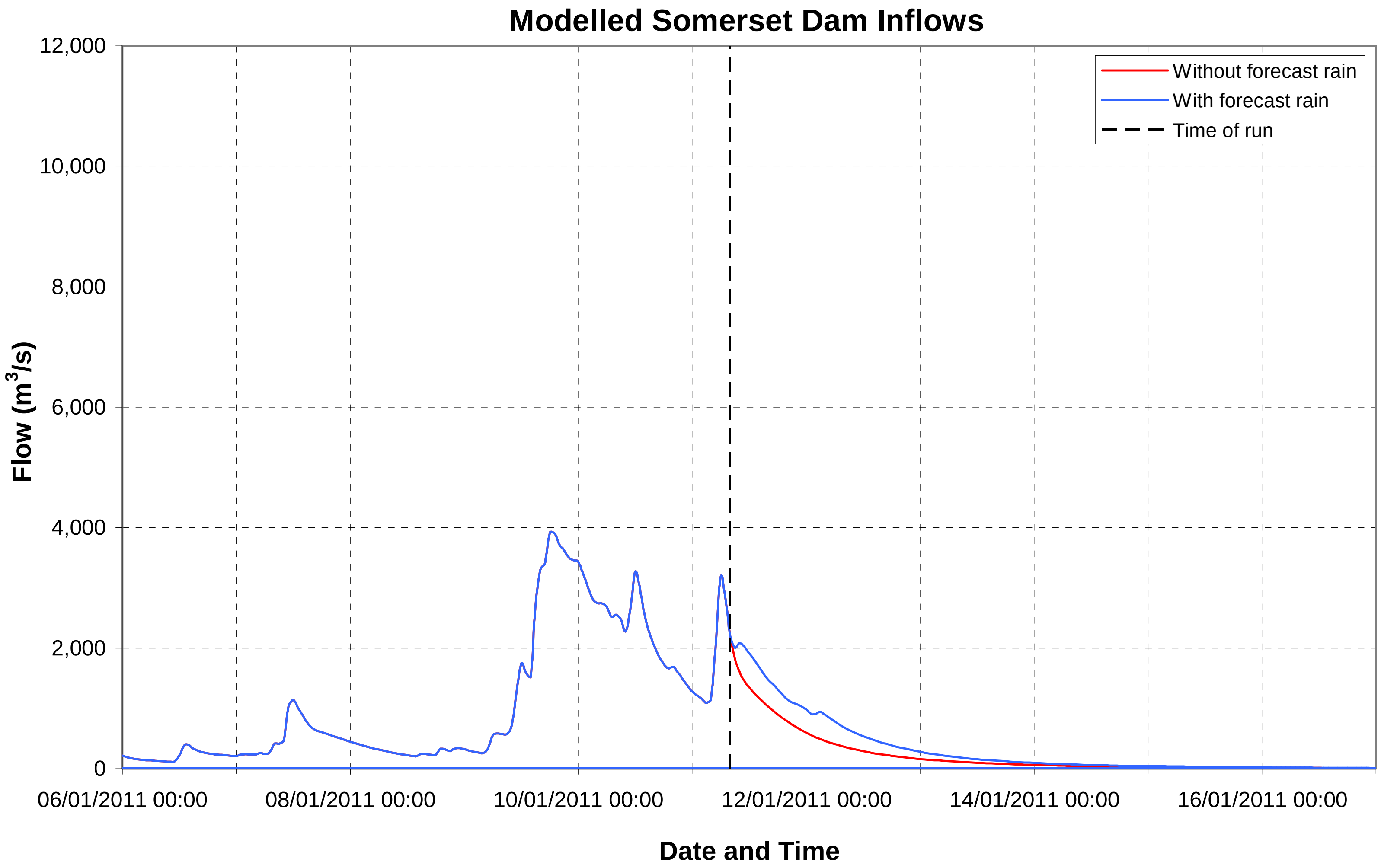
Run 37

Date: Tuesday 11 January 2011

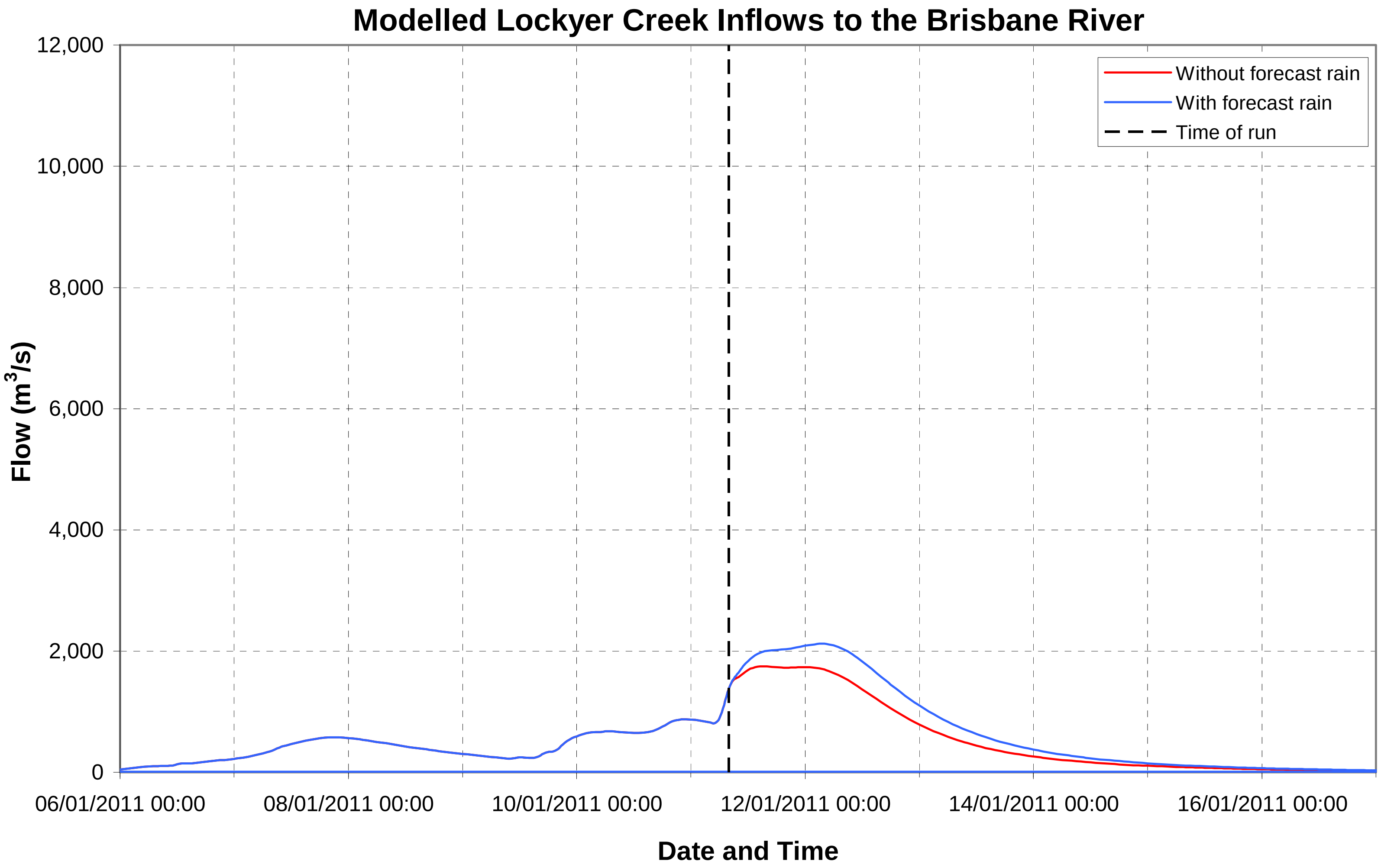
Time: 08:00



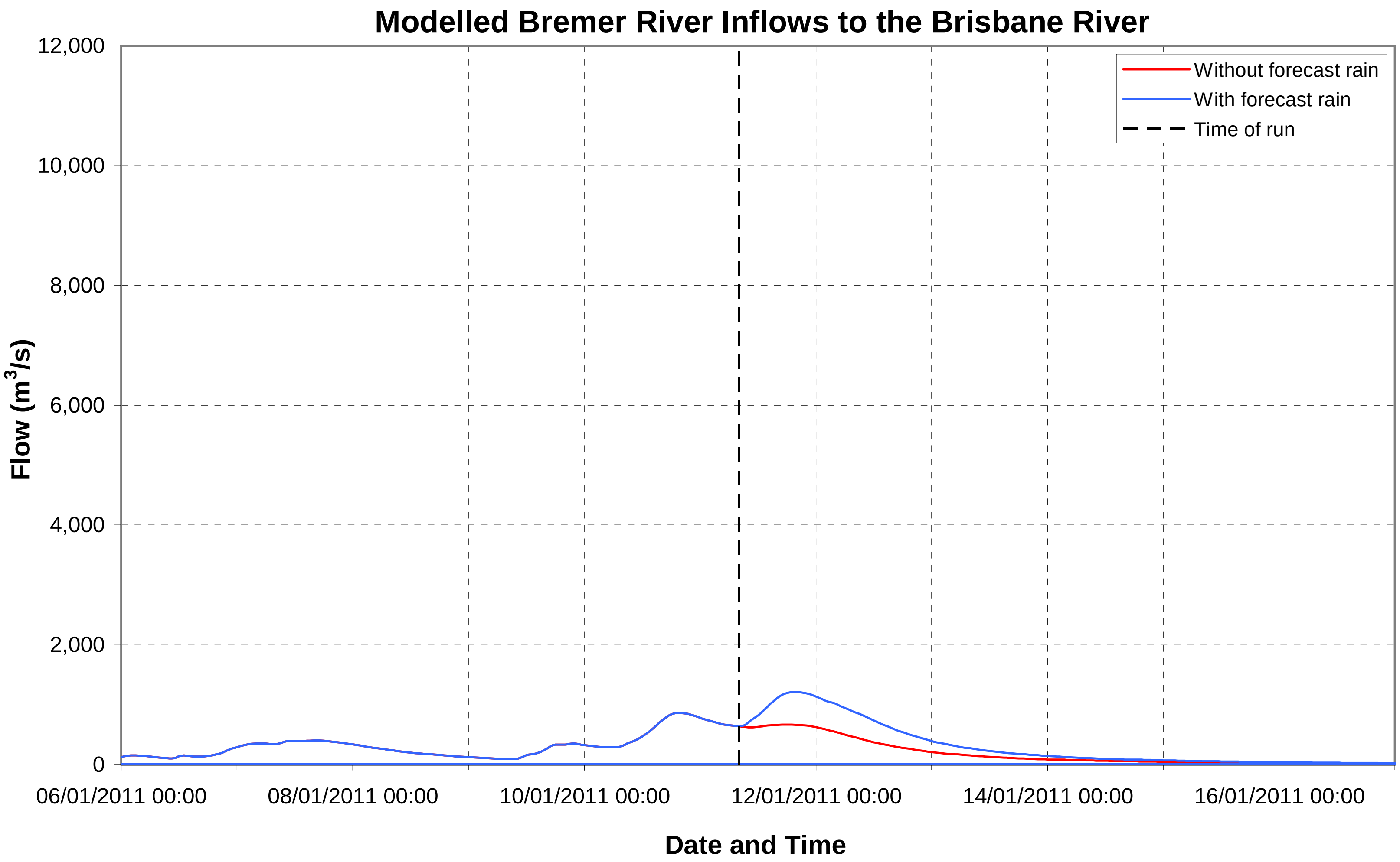
Run 37: Tuesday 11 January 2011, 08:00



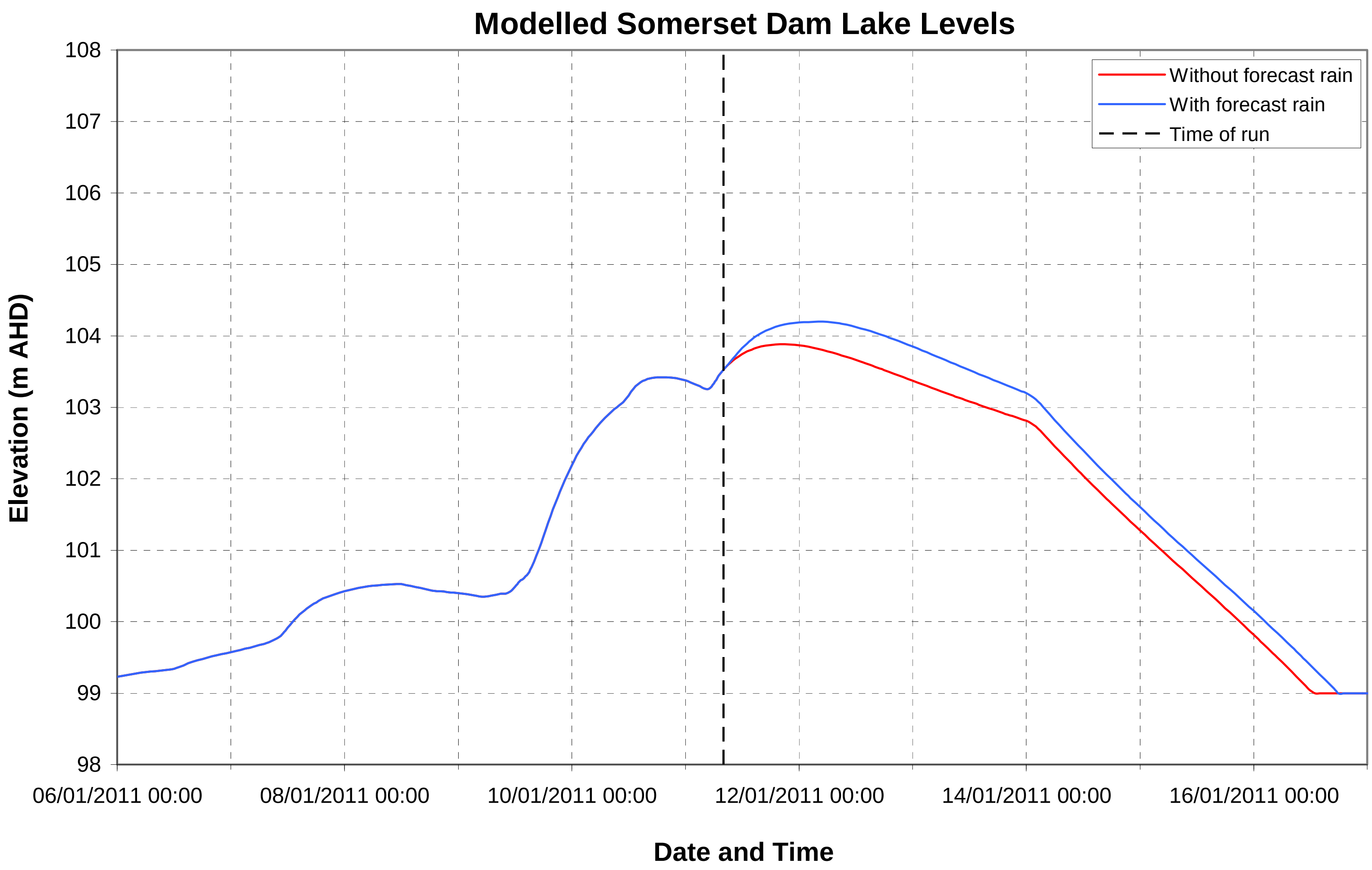
Run 37: Tuesday 11 January 2011, 08:00



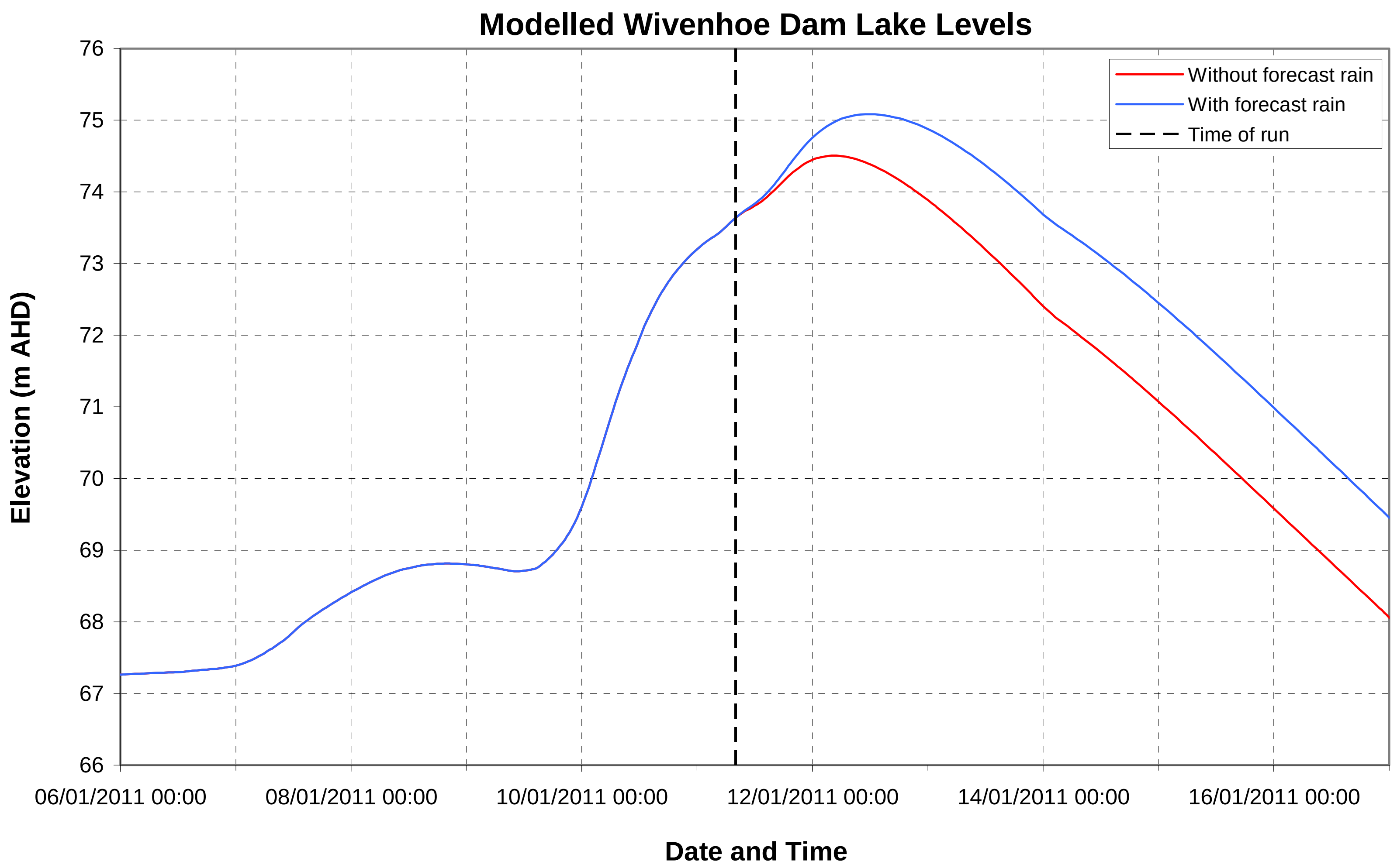
Run 37: Tuesday 11 January 2011, 08:00



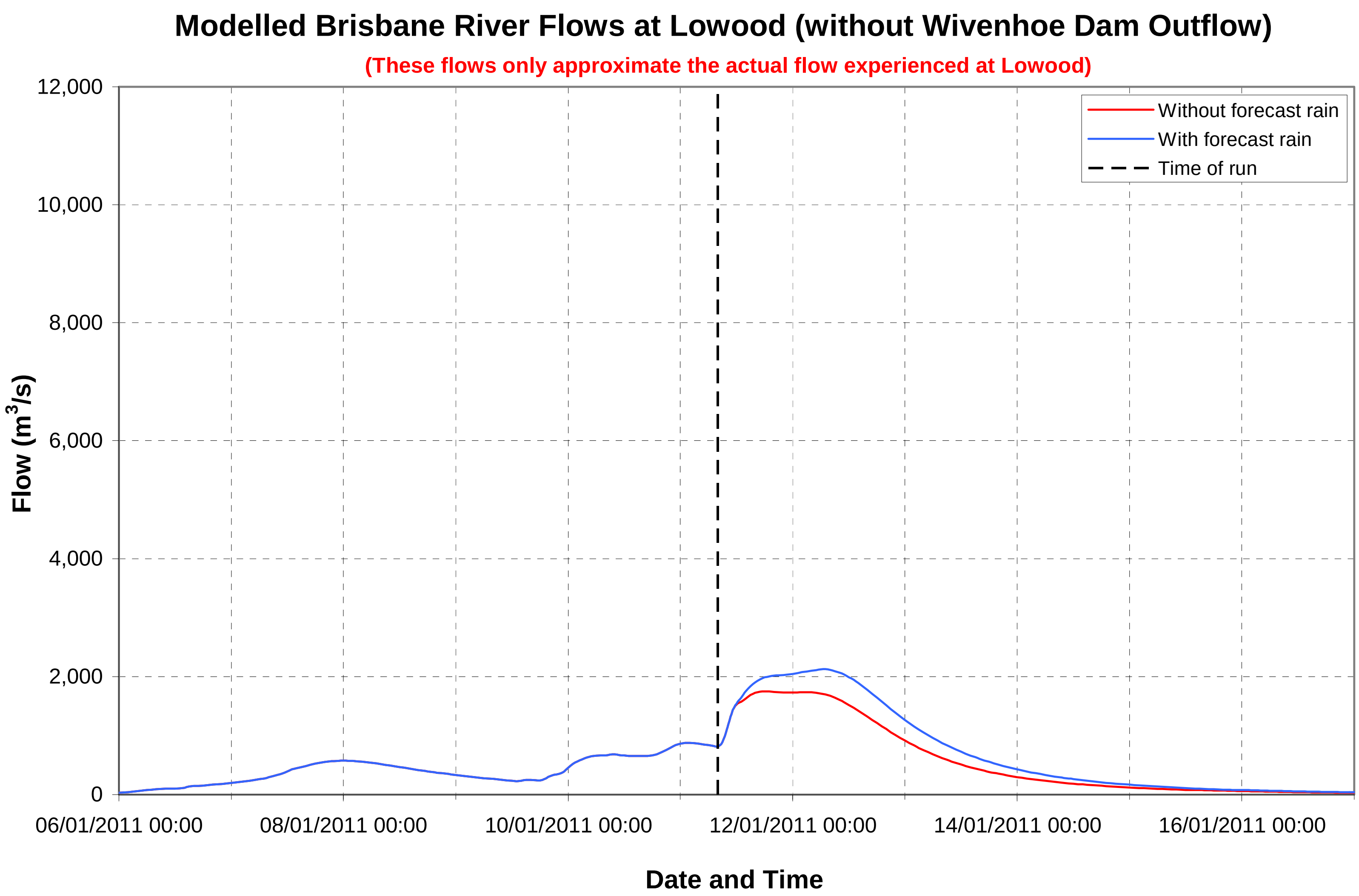
Run 37: Tuesday 11 January 2011, 08:00



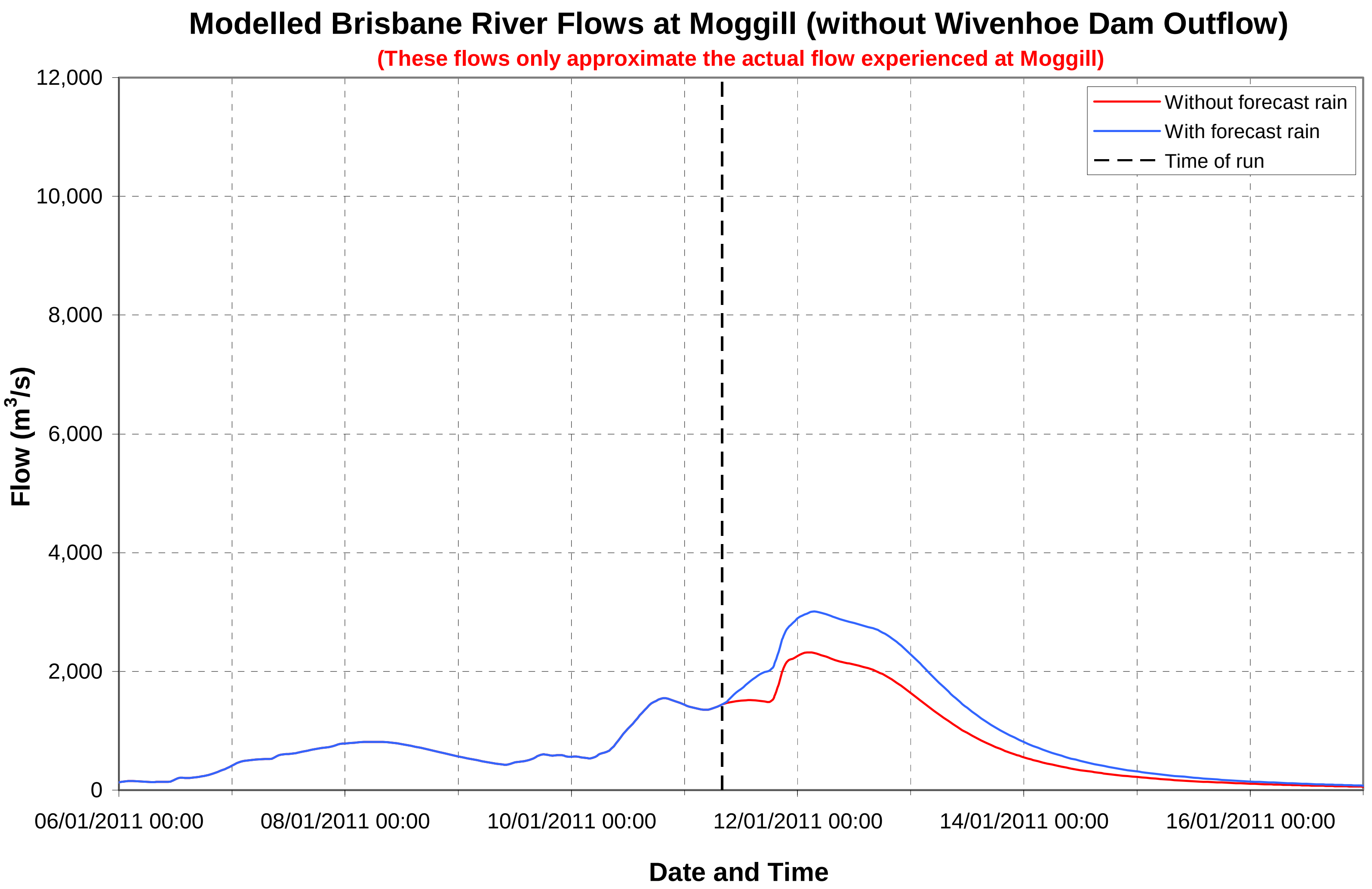
Run 37: Tuesday 11 January 2011, 08:00



Run 37: Tuesday 11 January 2011, 08:00



Run 37: Tuesday 11 January 2011, 08:00

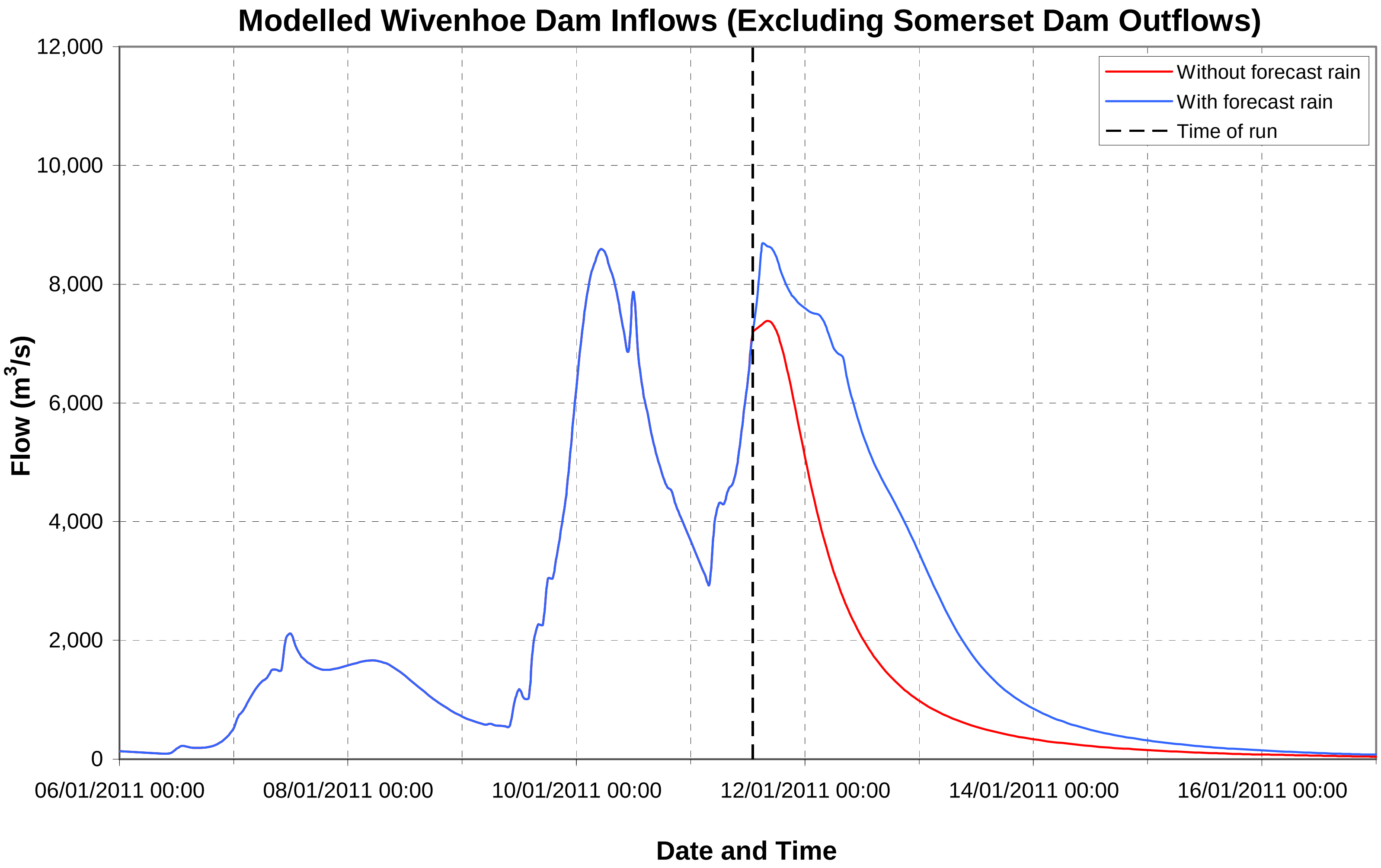


Run 37: Tuesday 11 January 2011, 08:00

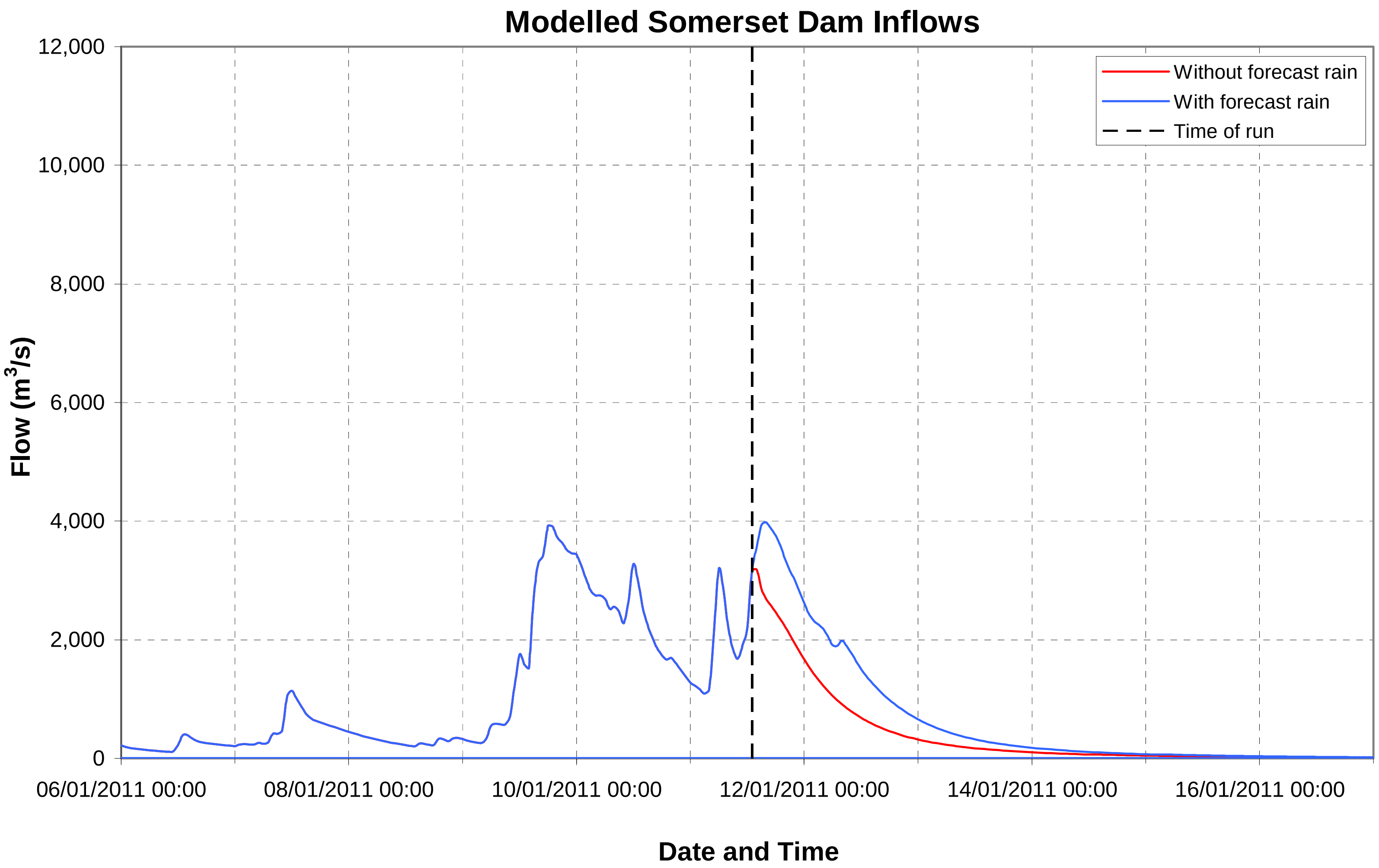
Run 39

Date: Tuesday 11 January 2011

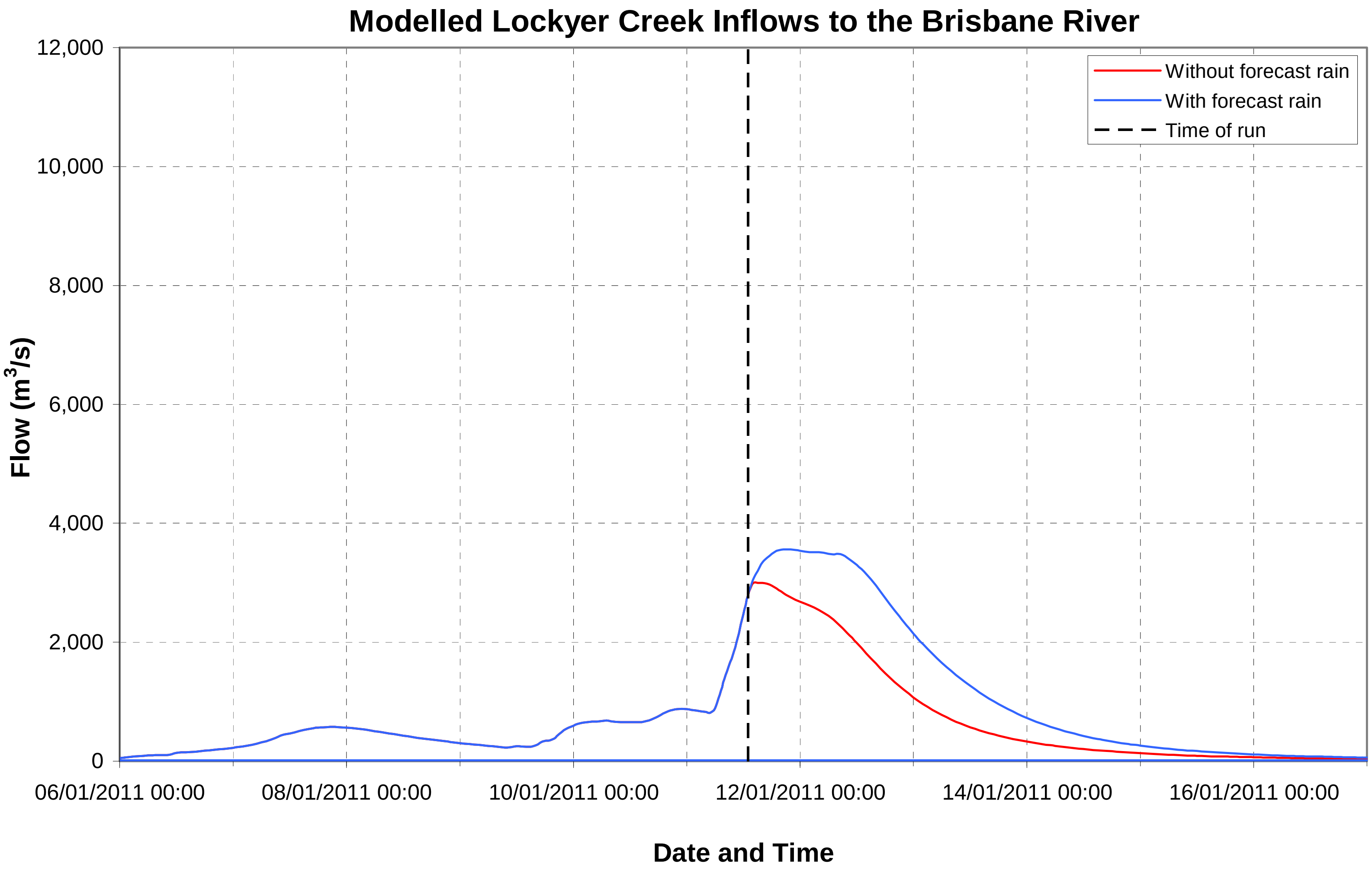
Time: 13:00



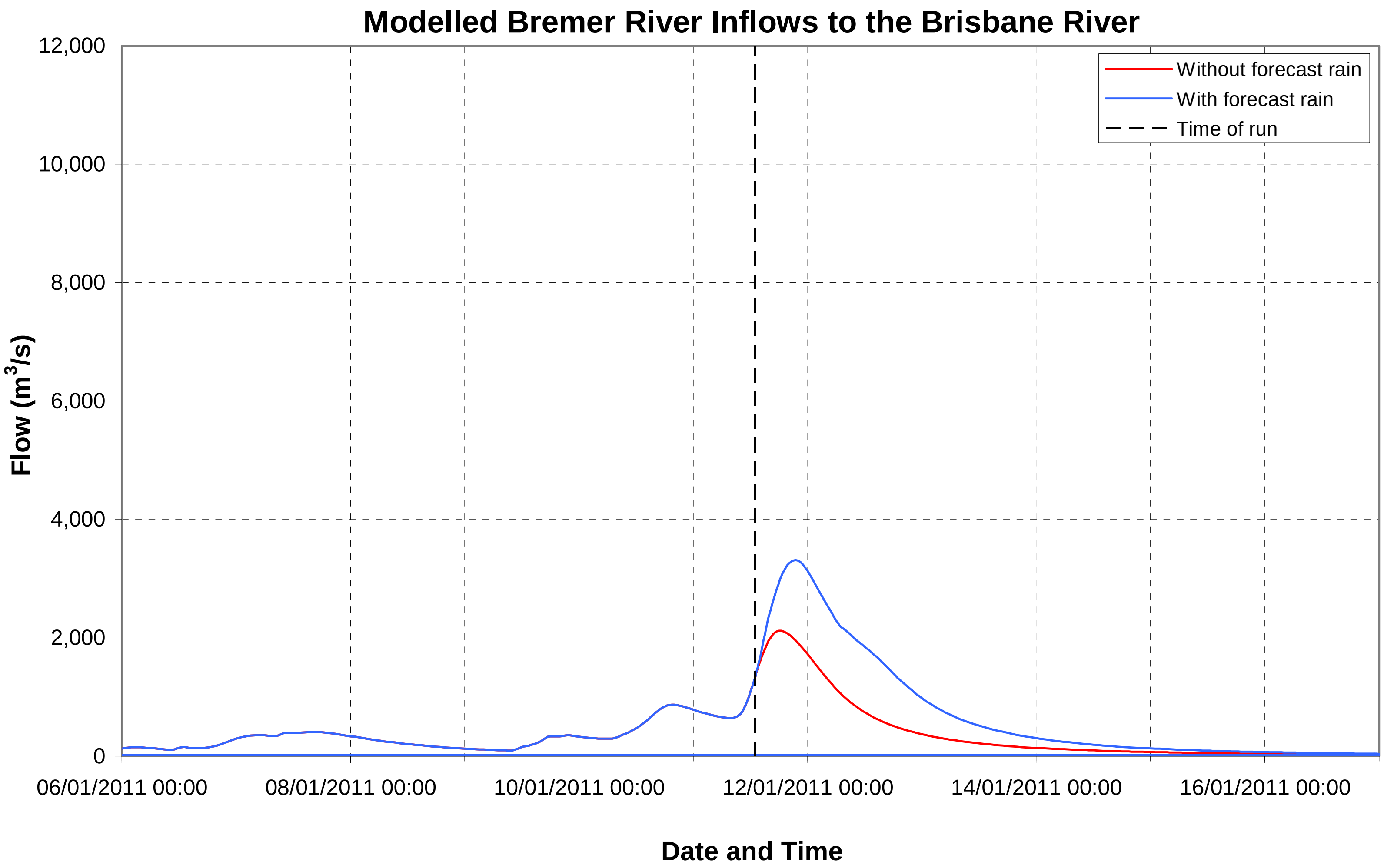
Run 39: Tuesday 11 January 2011, 13:00



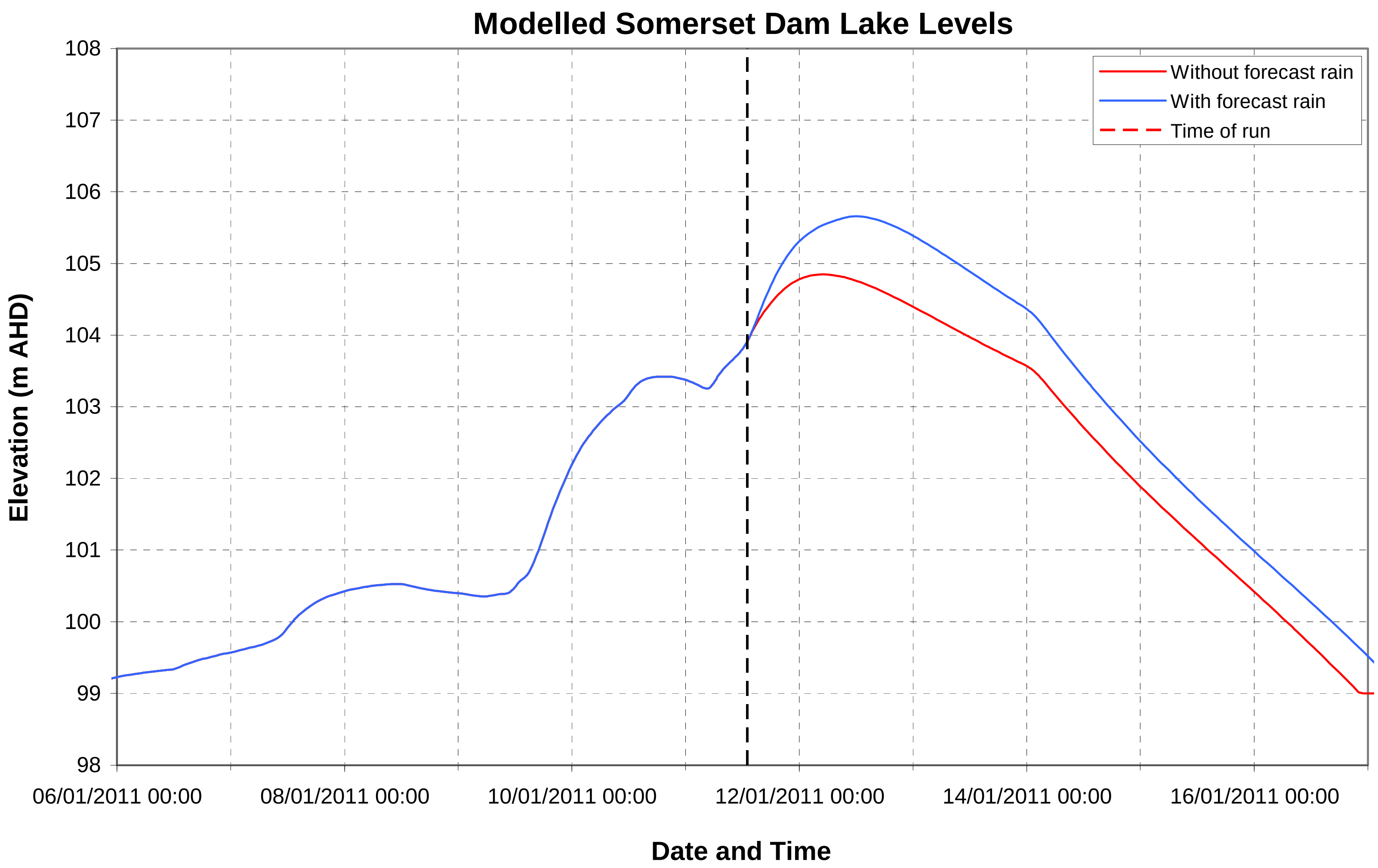
Run 39: Tuesday 11 January 2011, 13:00



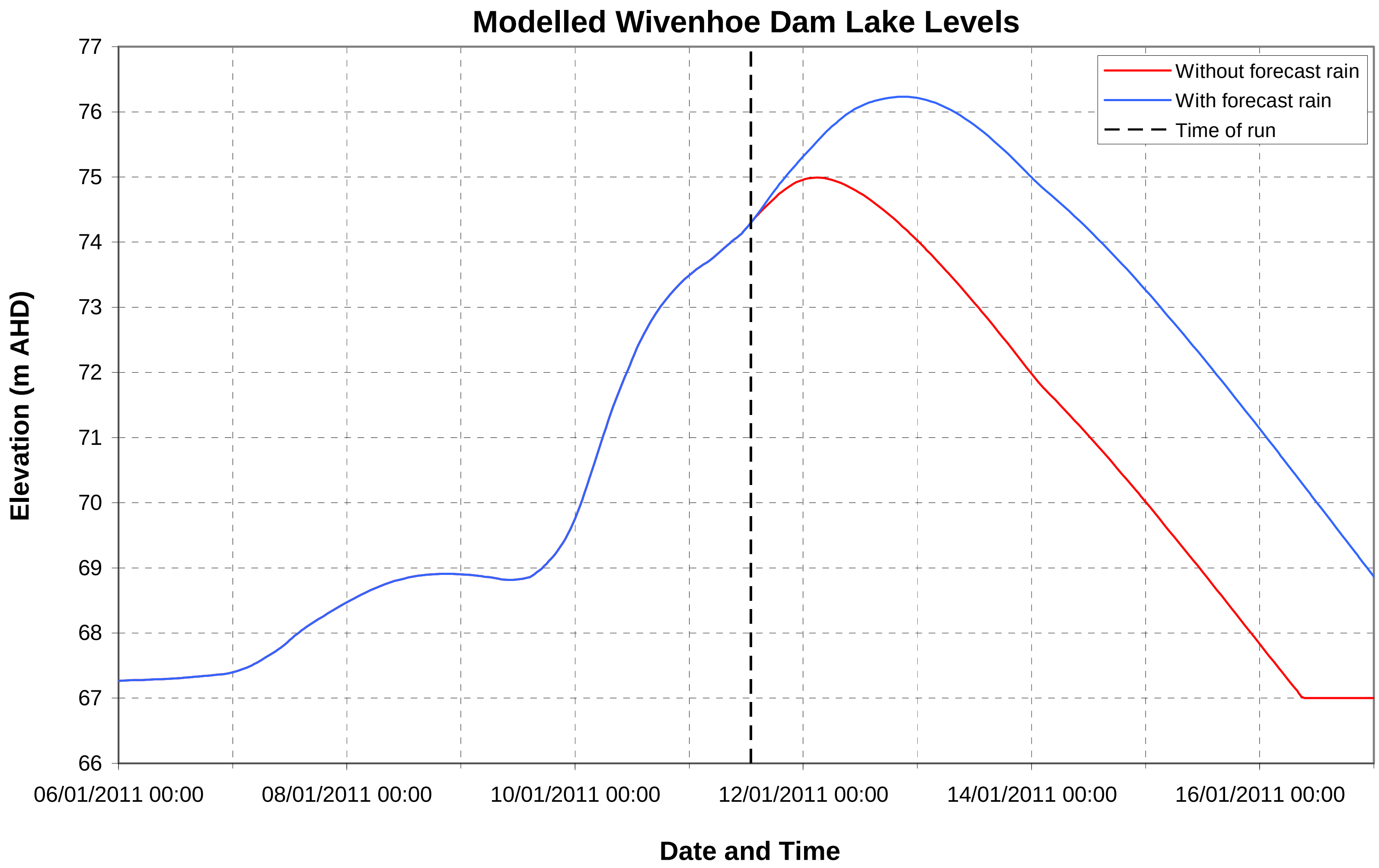
Run 39: Tuesday 11 January 2011, 13:00



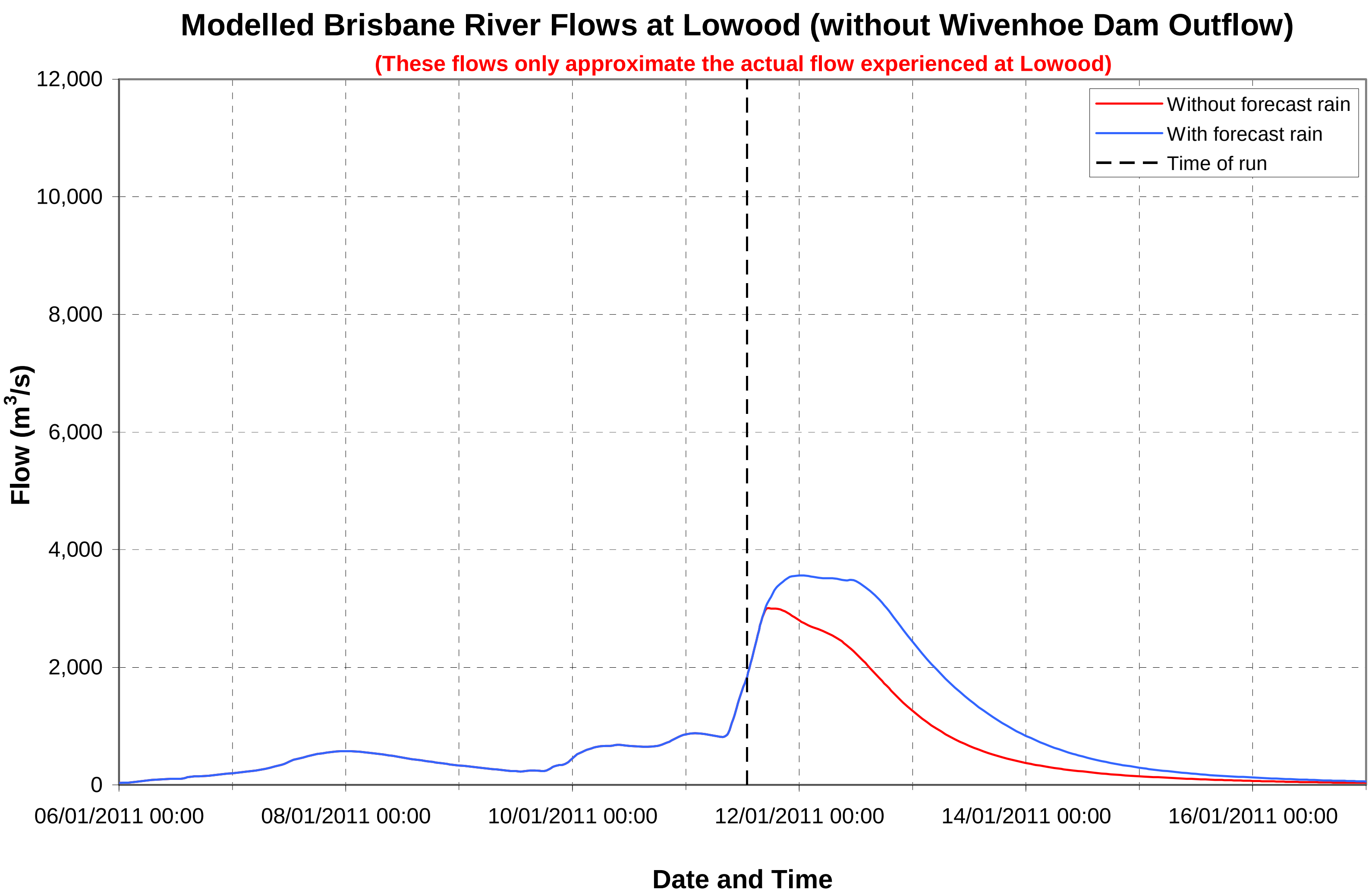
Run 39: Tuesday 11 January 2011, 13:00



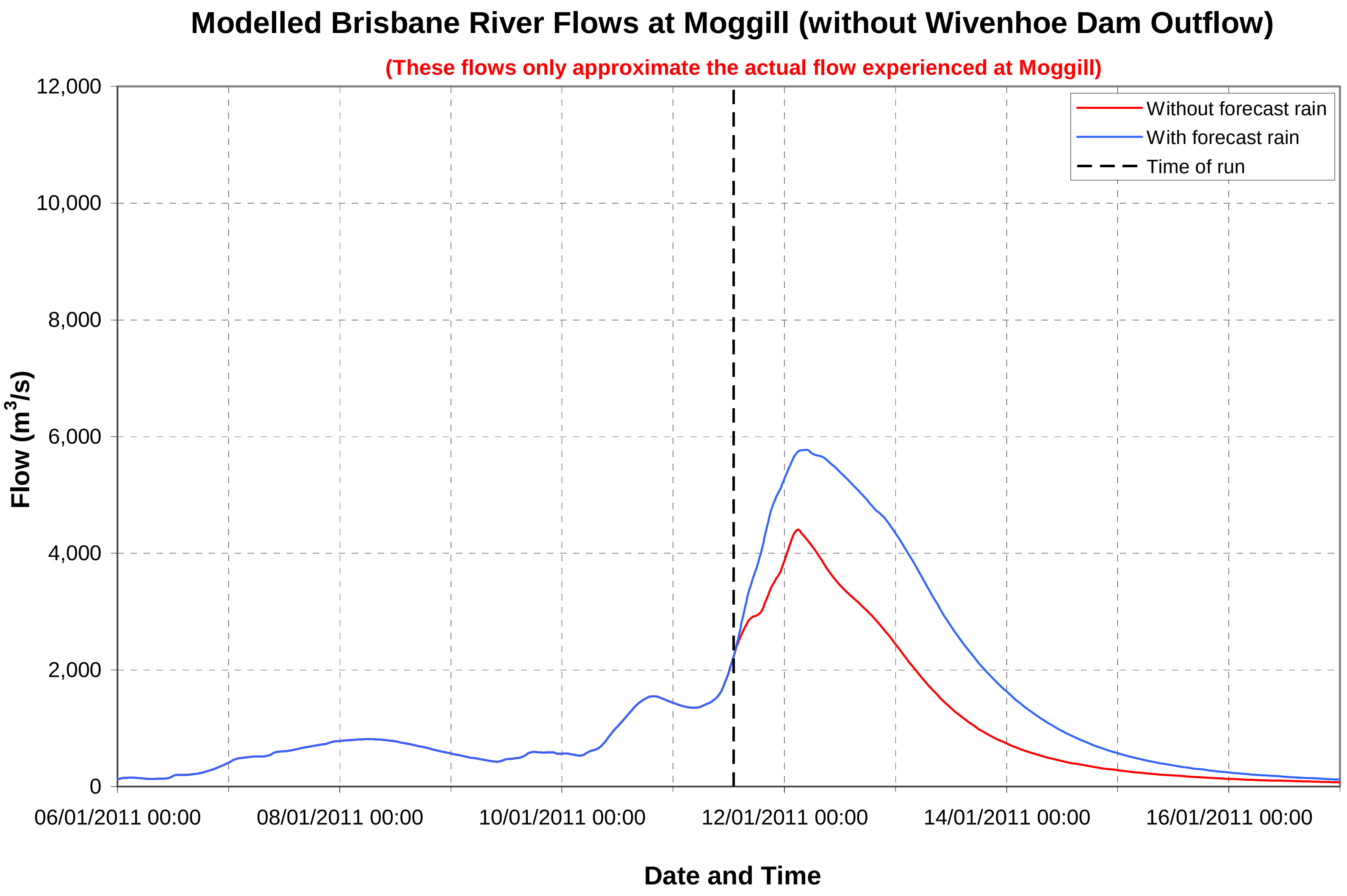
Run 39: Tuesday 11 January 2011, 13:00



Run 39: Tuesday 11 January 2011, 13:00



Run 39: Tuesday 11 January 2011, 13:00

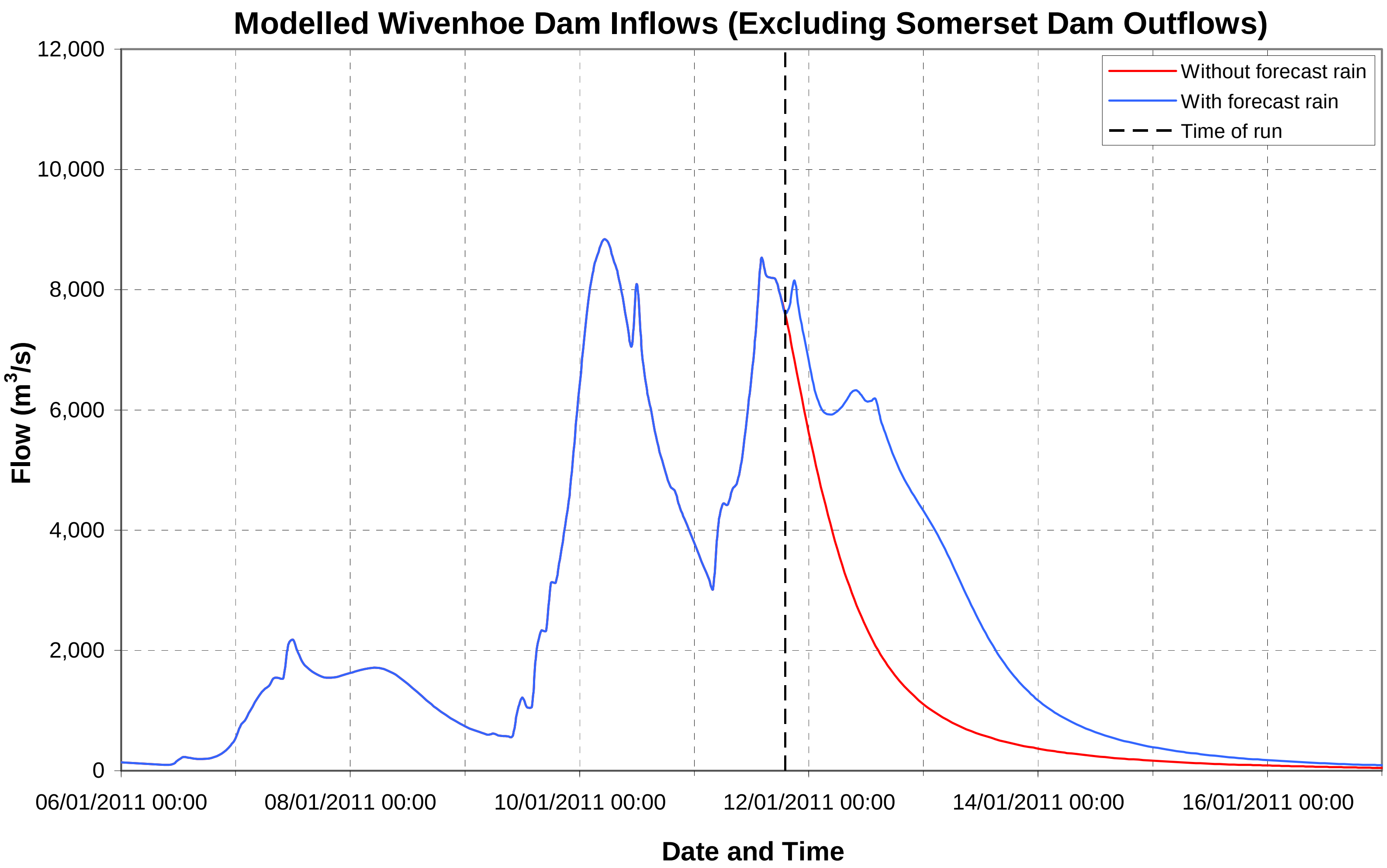


Run 39: Tuesday 11 January 2011, 13:00

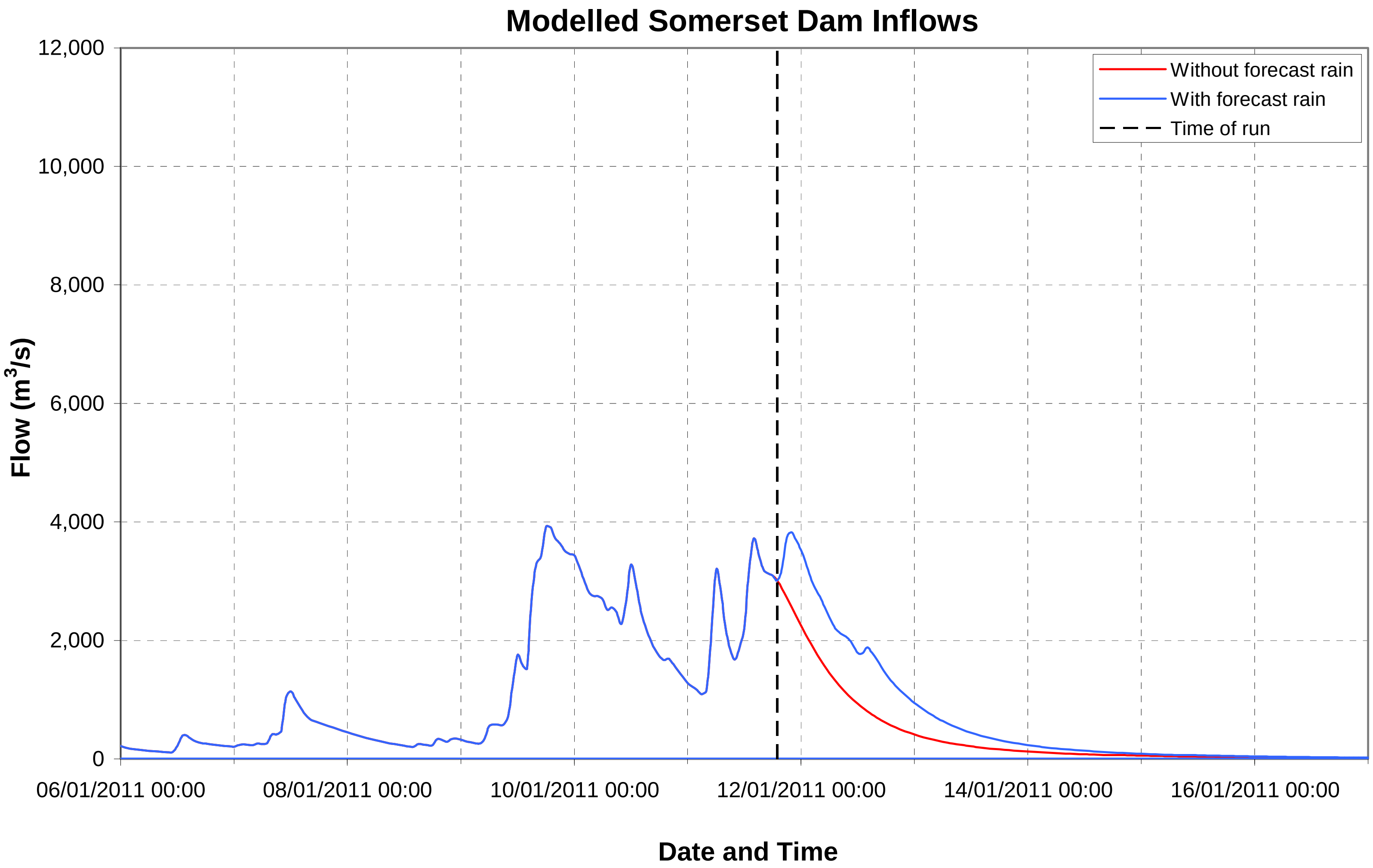
Run 41

Date: Tuesday 11 January 2011

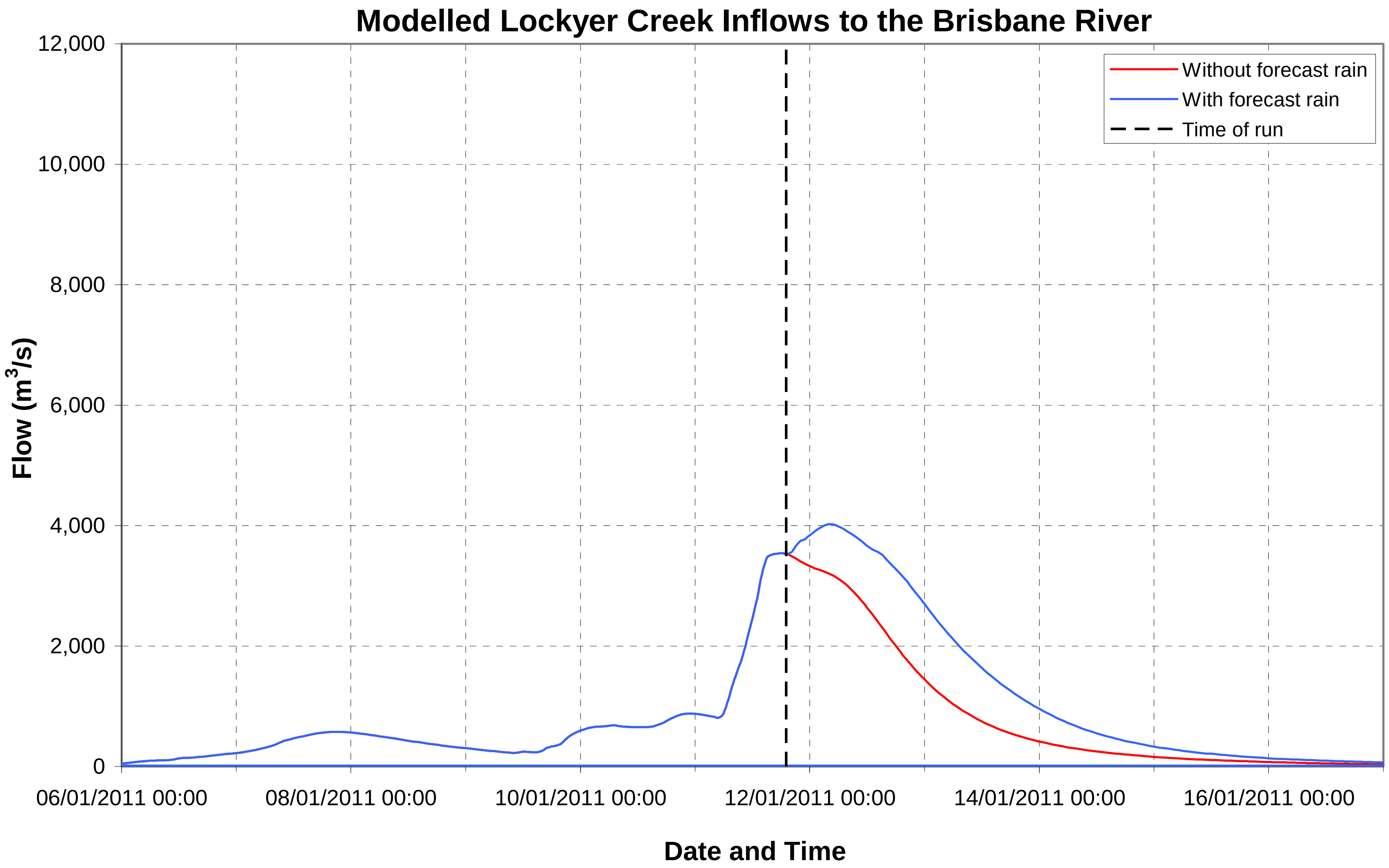
Time: 19:00



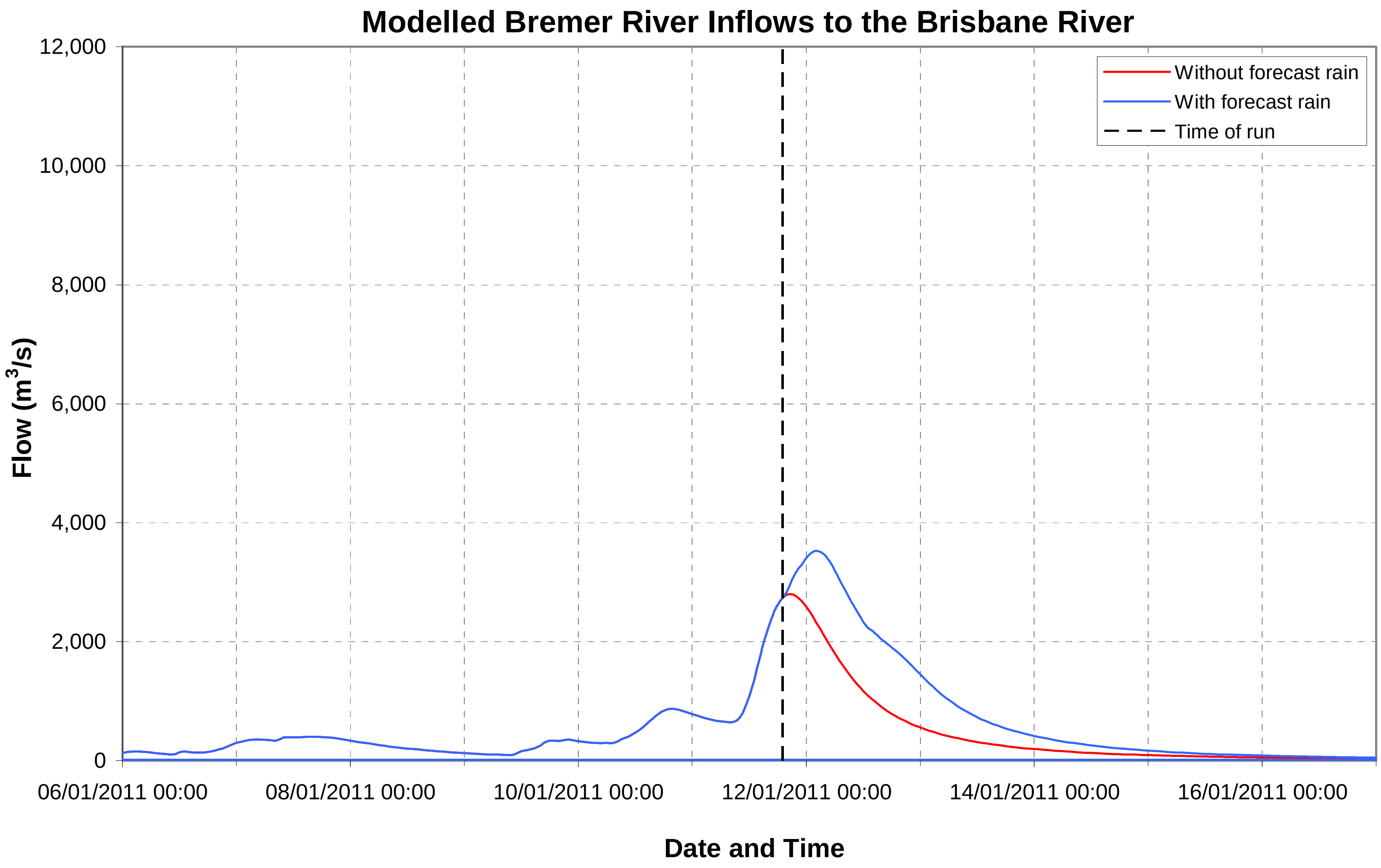
Run 41: Tuesday 11 January 2011, 19:00



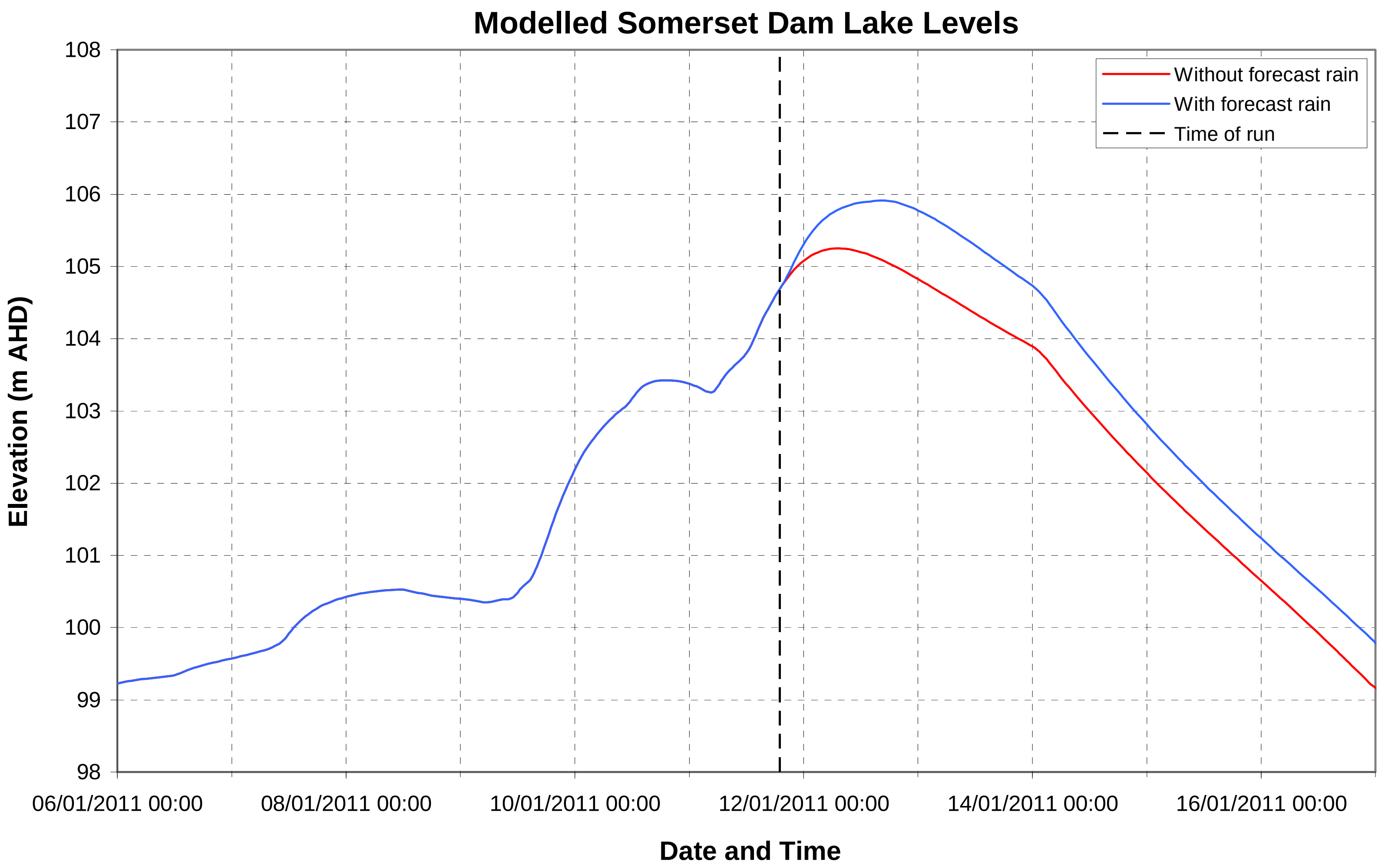
Run 41: Tuesday 11 January 2011, 19:00



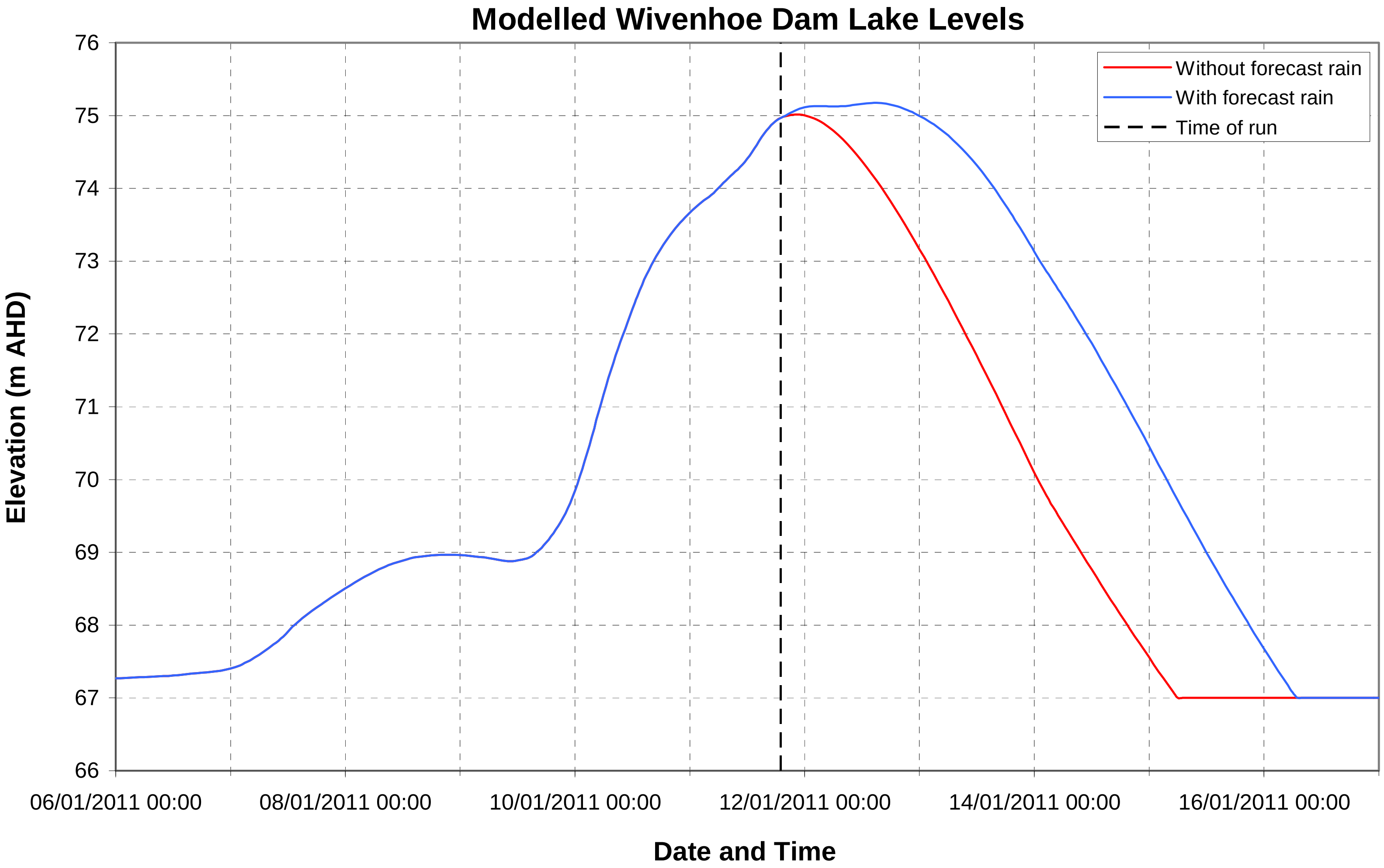
Run 41: Tuesday 11 January 2011, 19:00



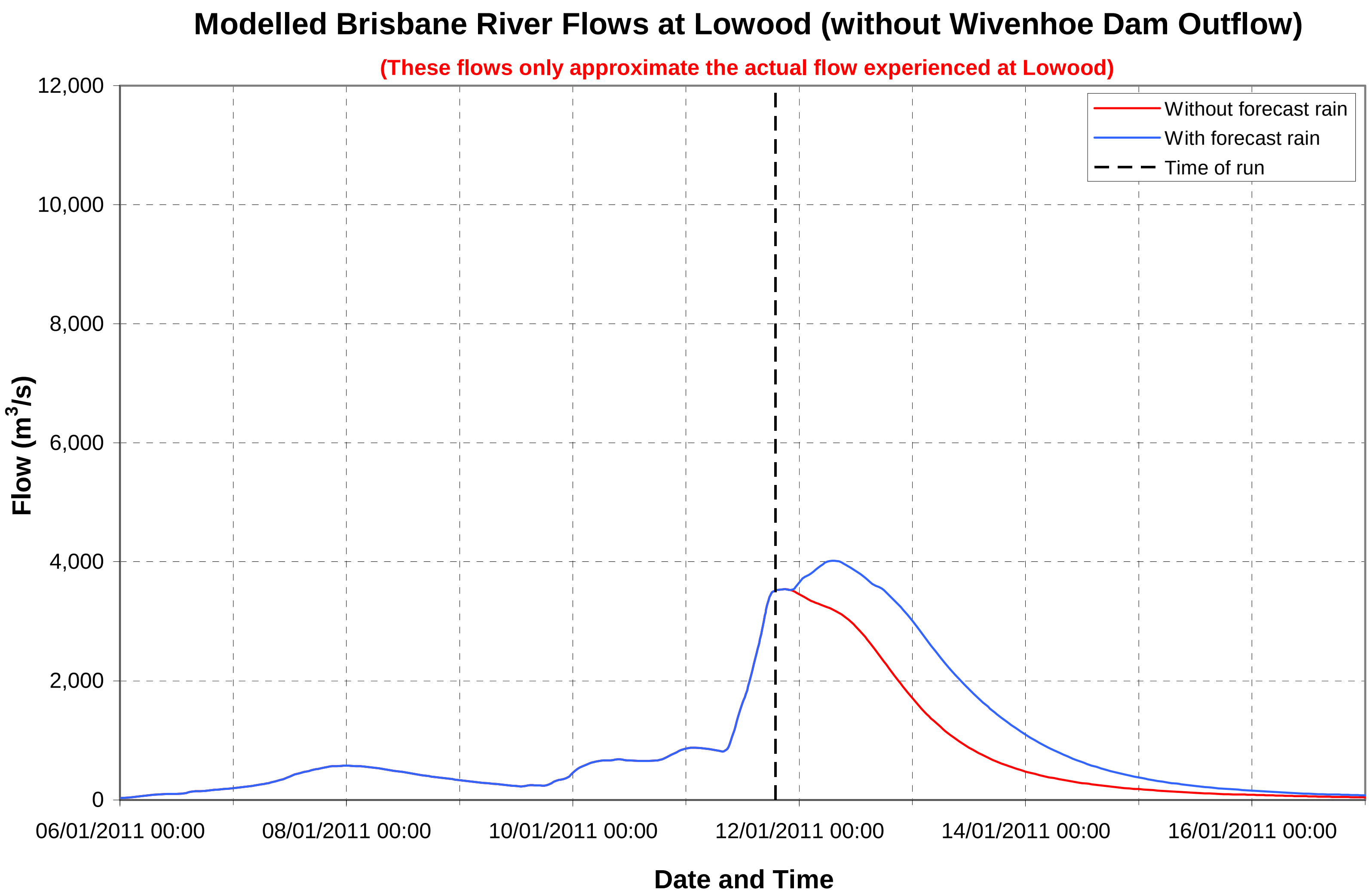
Run 41: Tuesday 11 January 2011, 19:00



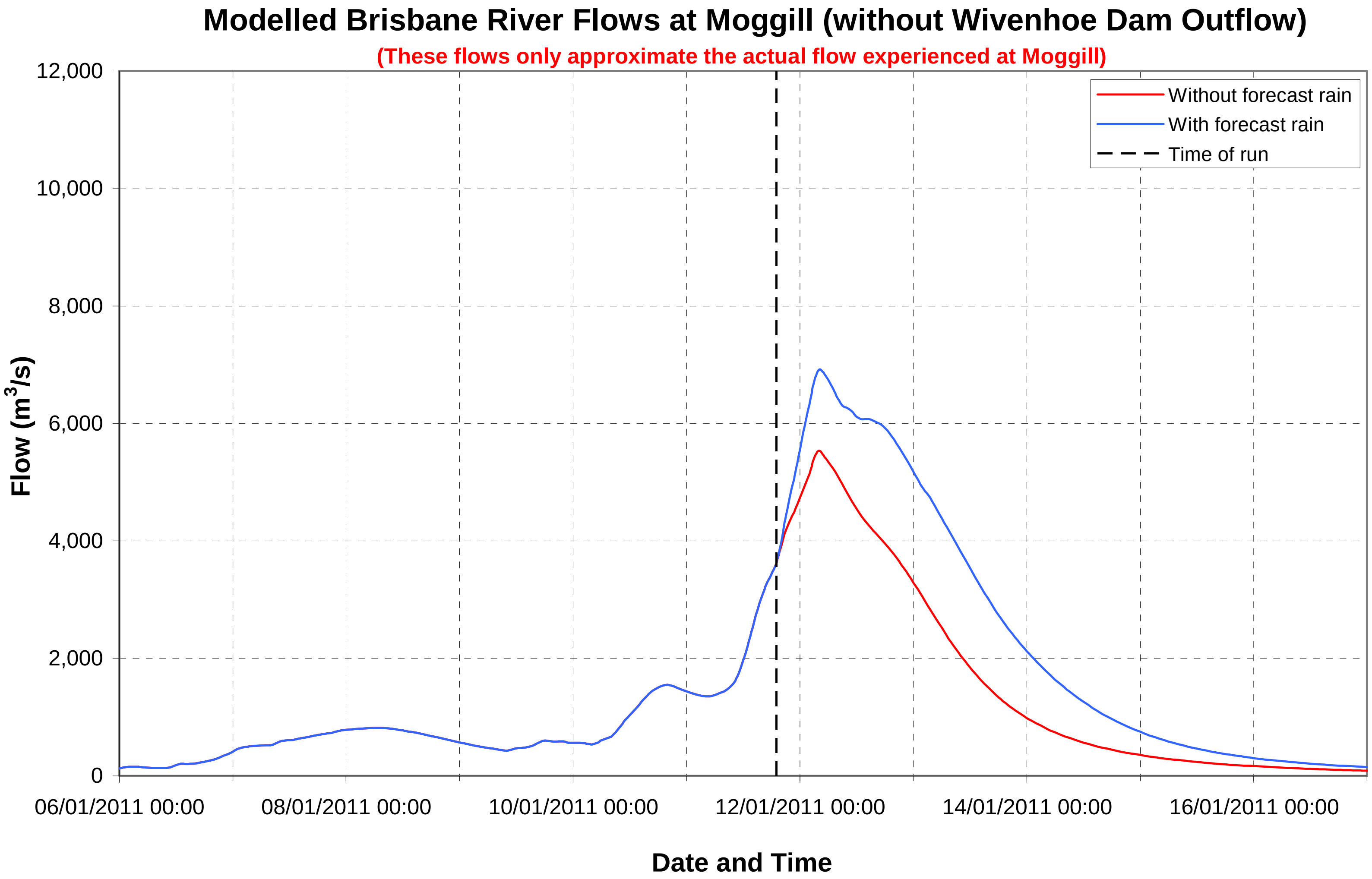
Run 41: Tuesday 11 January 2011, 19:00



Run 41: Tuesday 11 January 2011, 19:00



Run 41: Tuesday 11 January 2011, 19:00

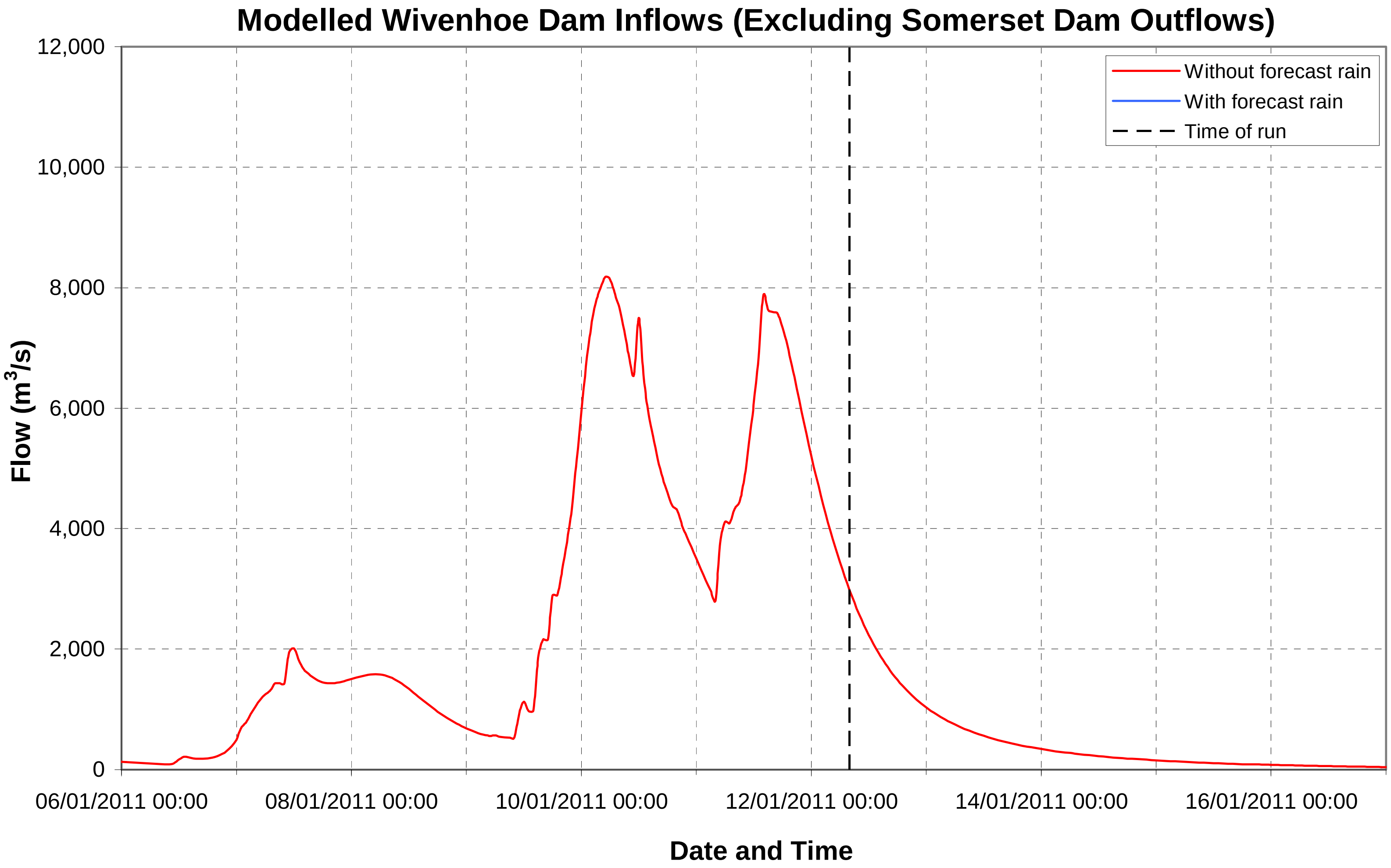


Run 41: Tuesday 11 January 2011, 19:00

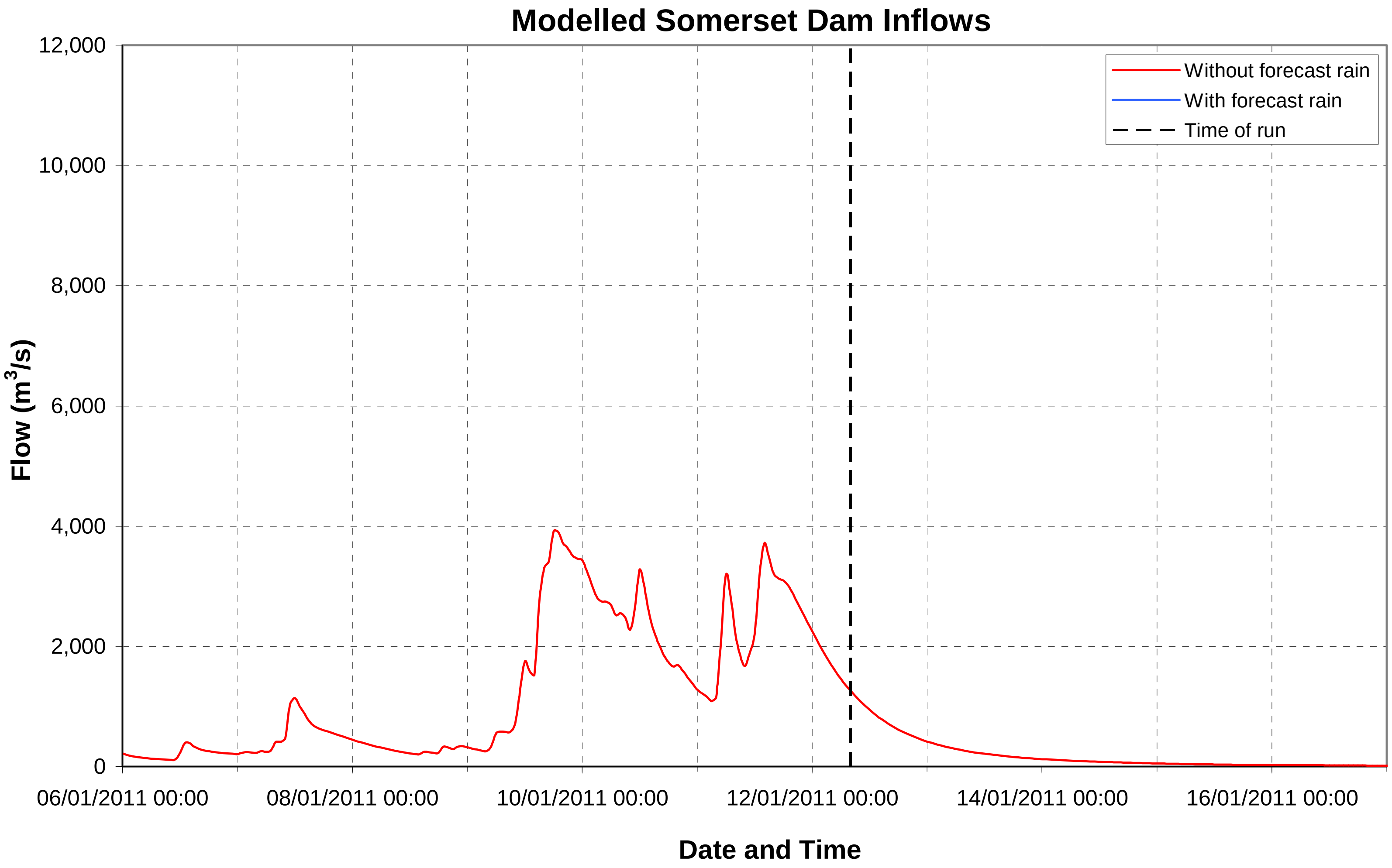
Run 43

Date: Wednesday 12 January 2011

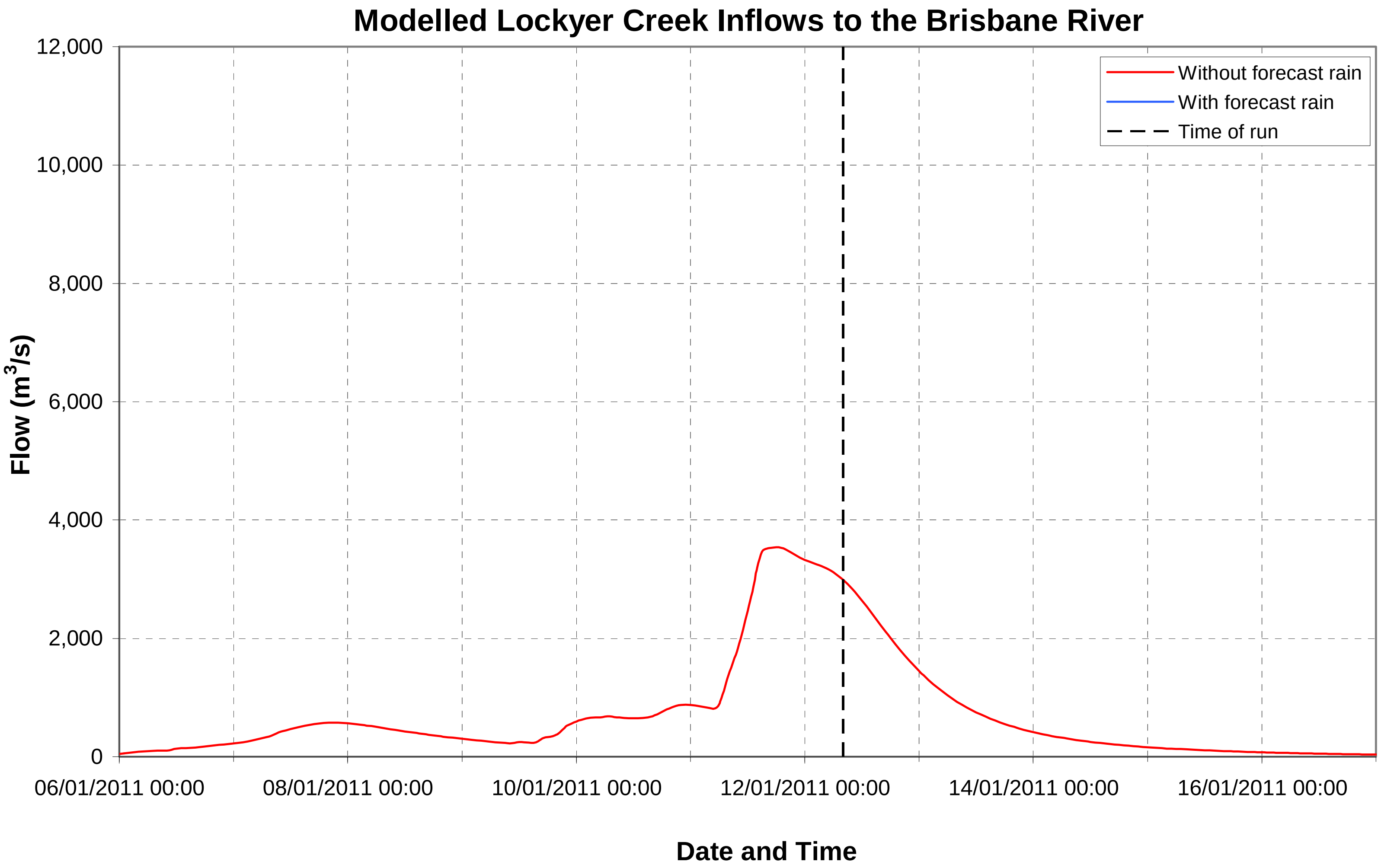
Time: 08:00



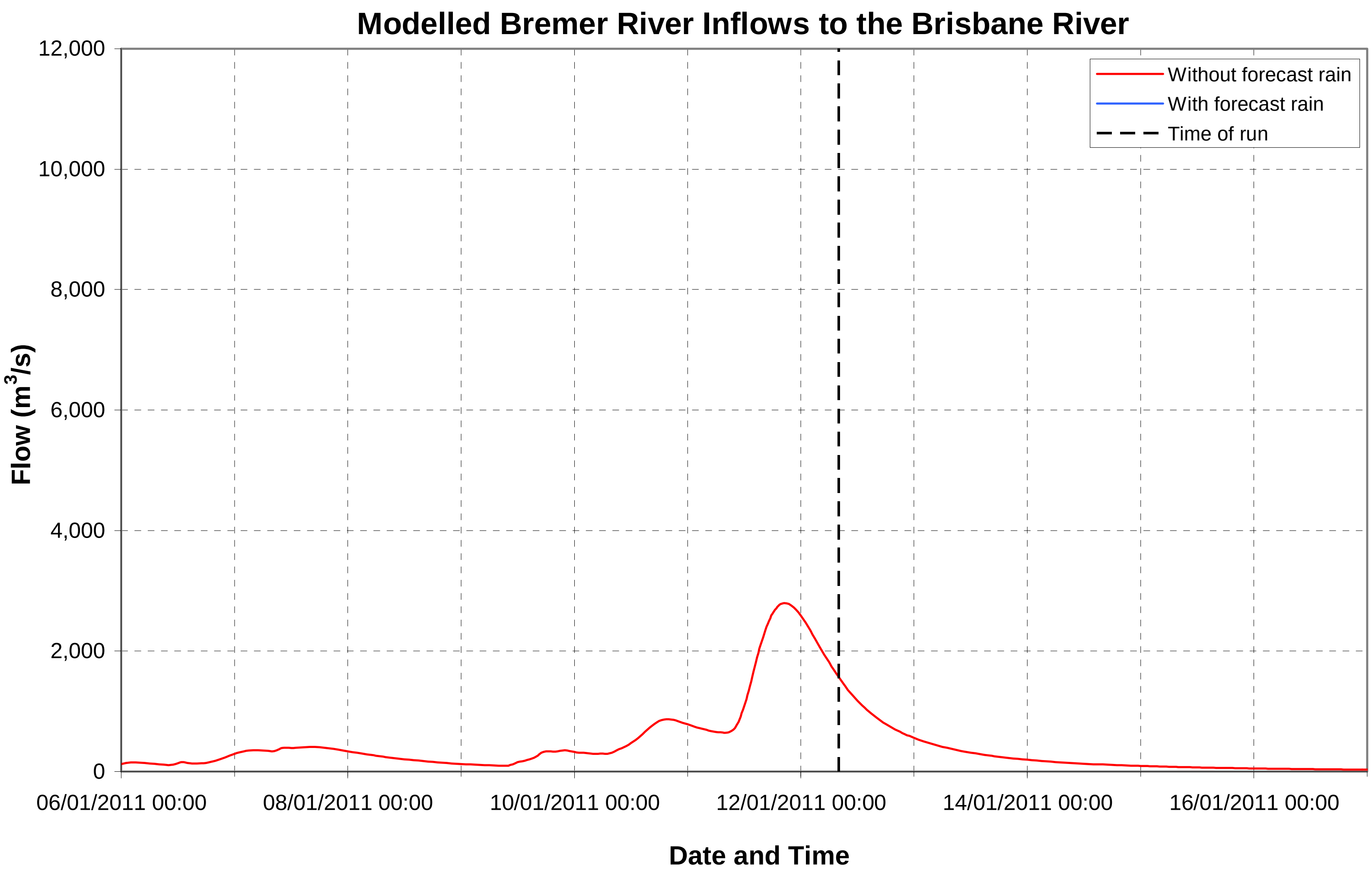
Run 43: Wednesday 12 January 2011, 08:00



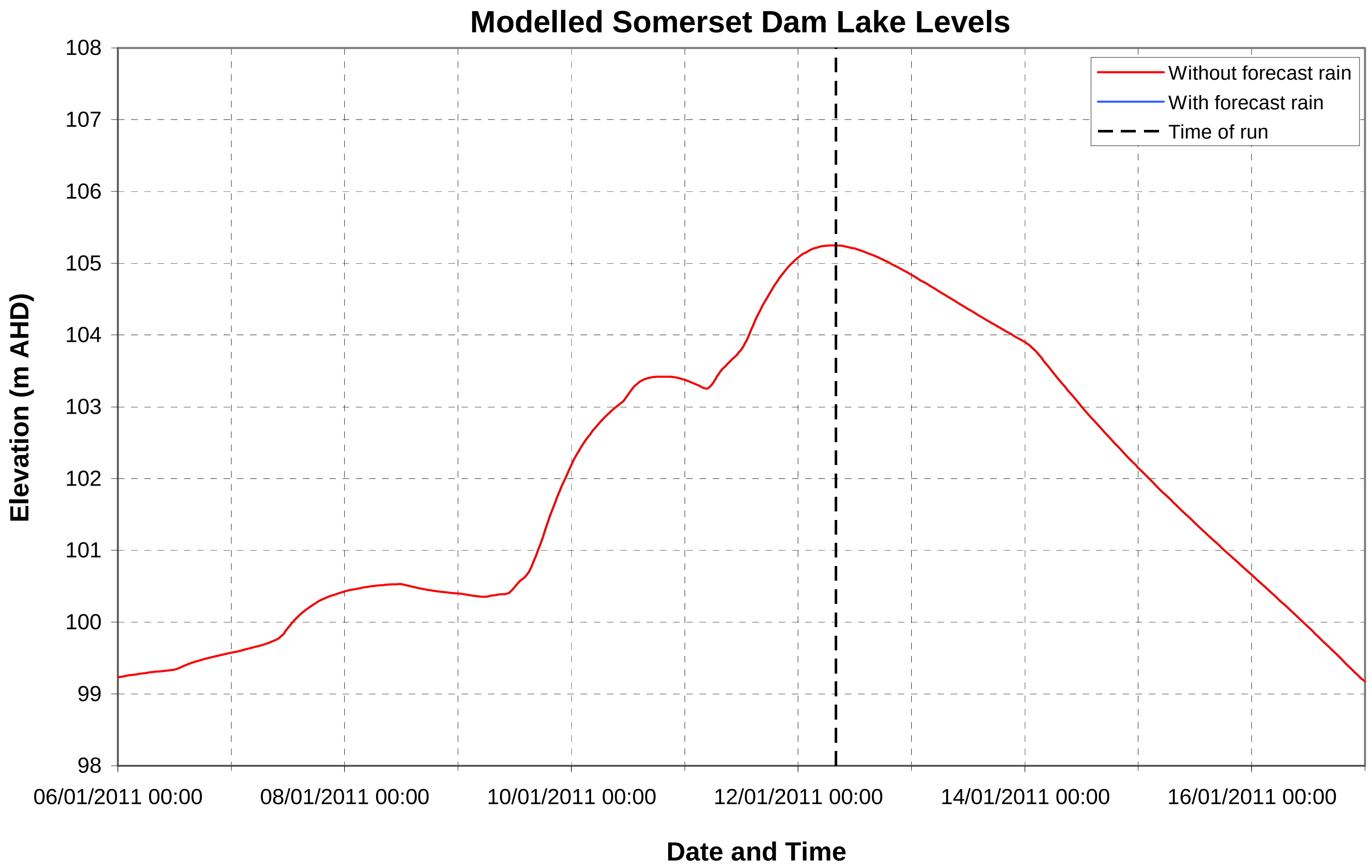
Run 43: Wednesday 12 January 2011, 08:00



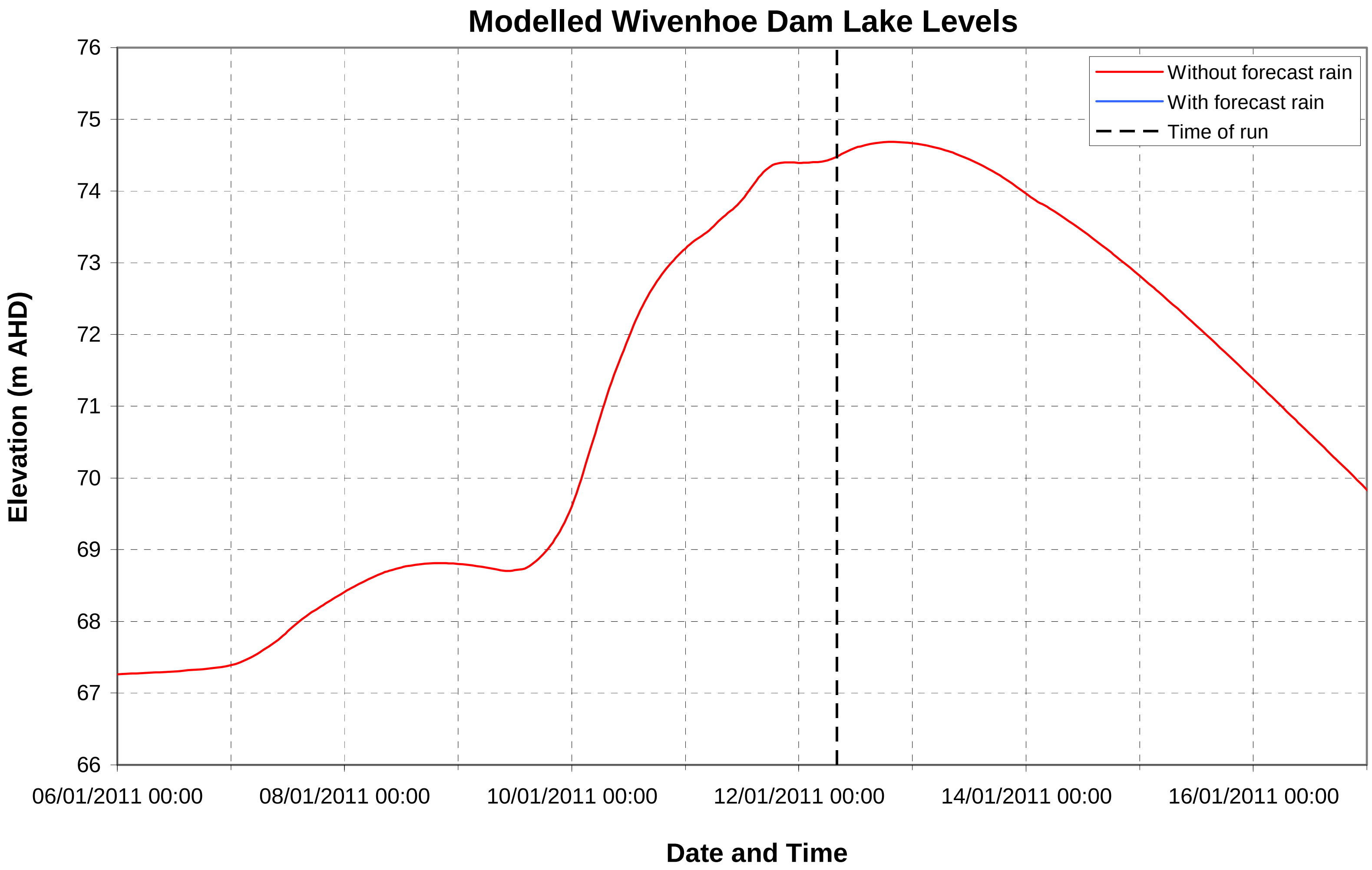
Run 43: Wednesday 12 January 2011, 08:00



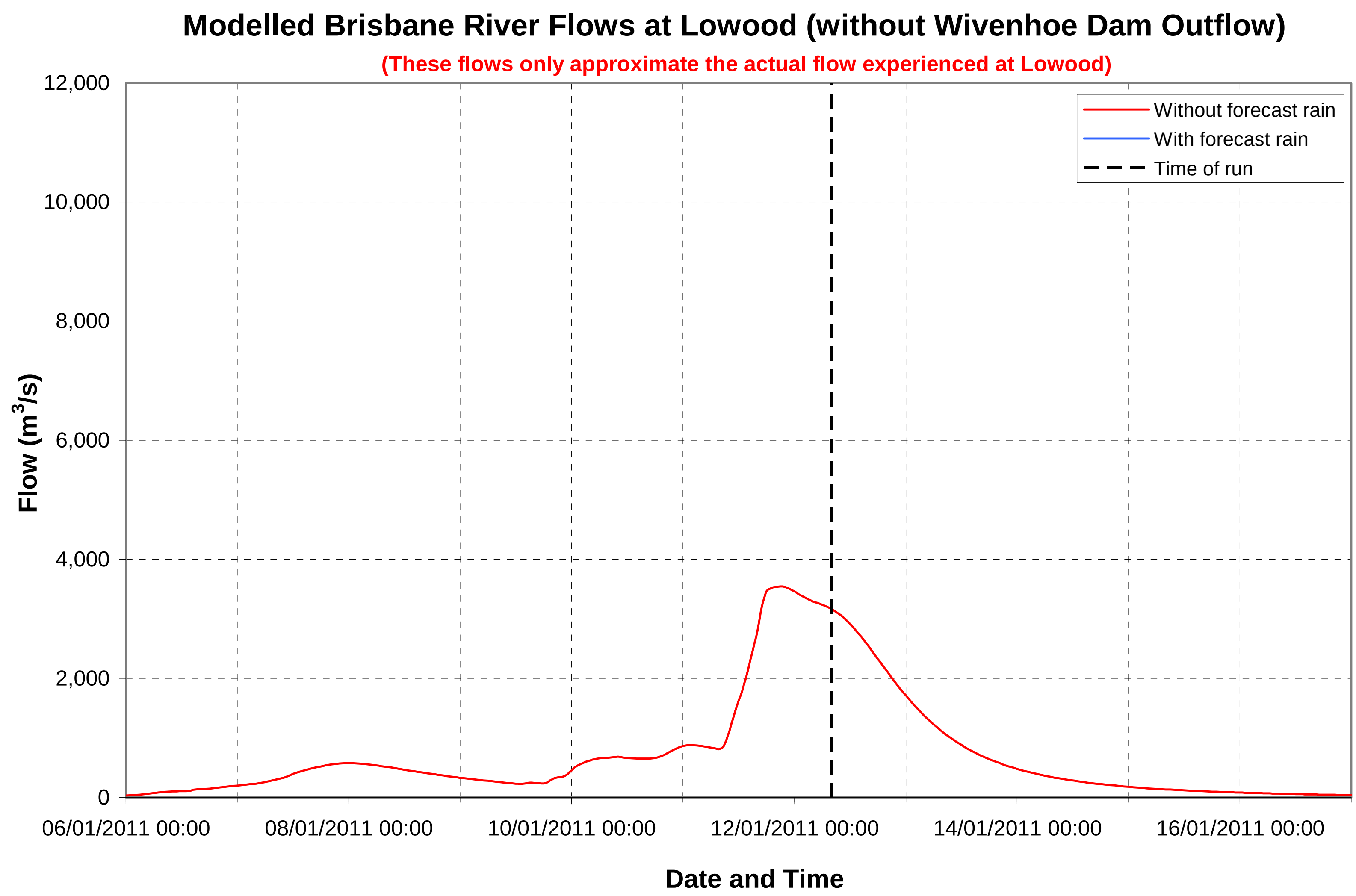
Run 43: Wednesday 12 January 2011, 08:00



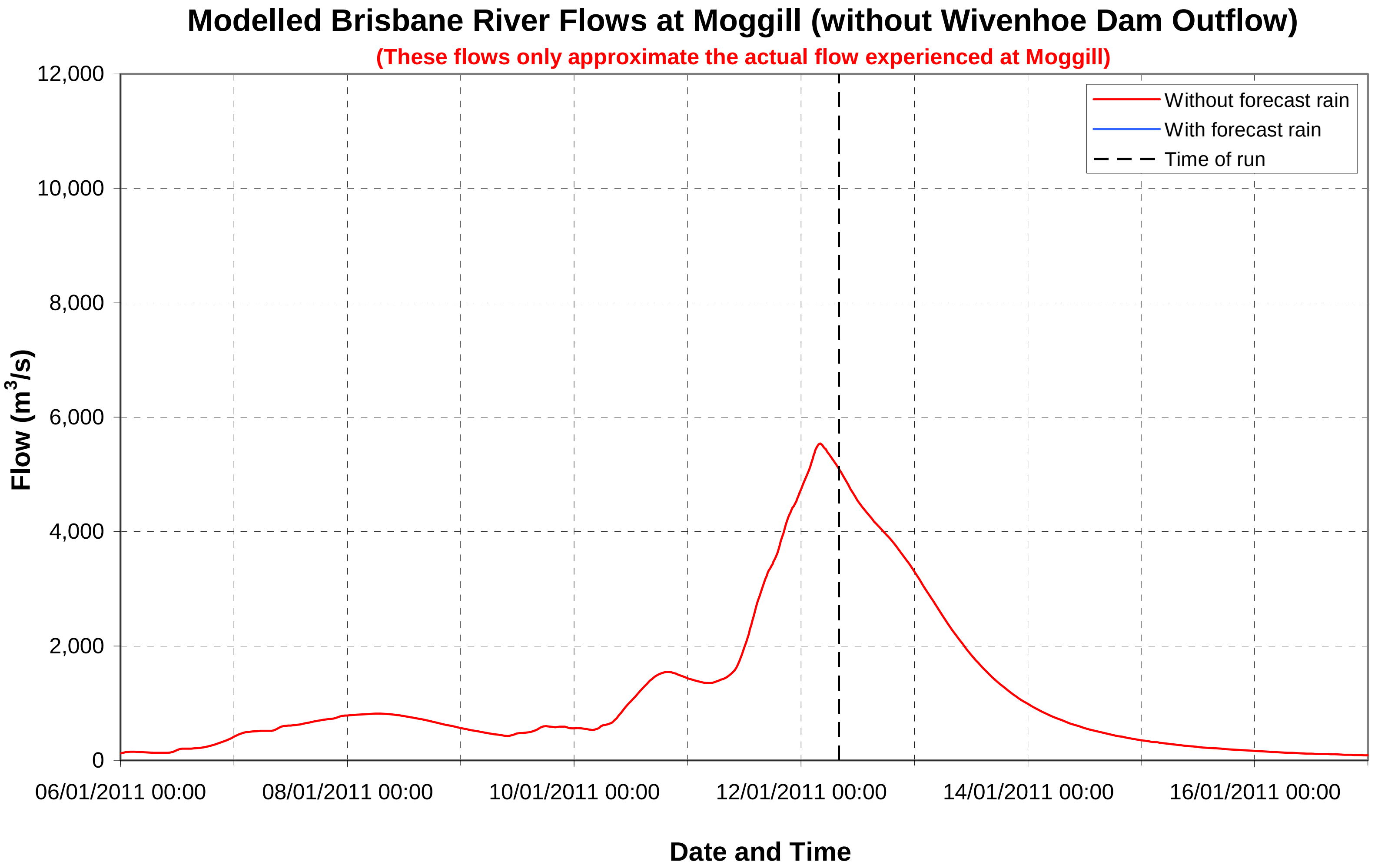
Run 43: Wednesday 12 January 2011, 08:00



Run 43: Wednesday 12 January 2011, 08:00



Run 43: Wednesday 12 January 2011, 08:00

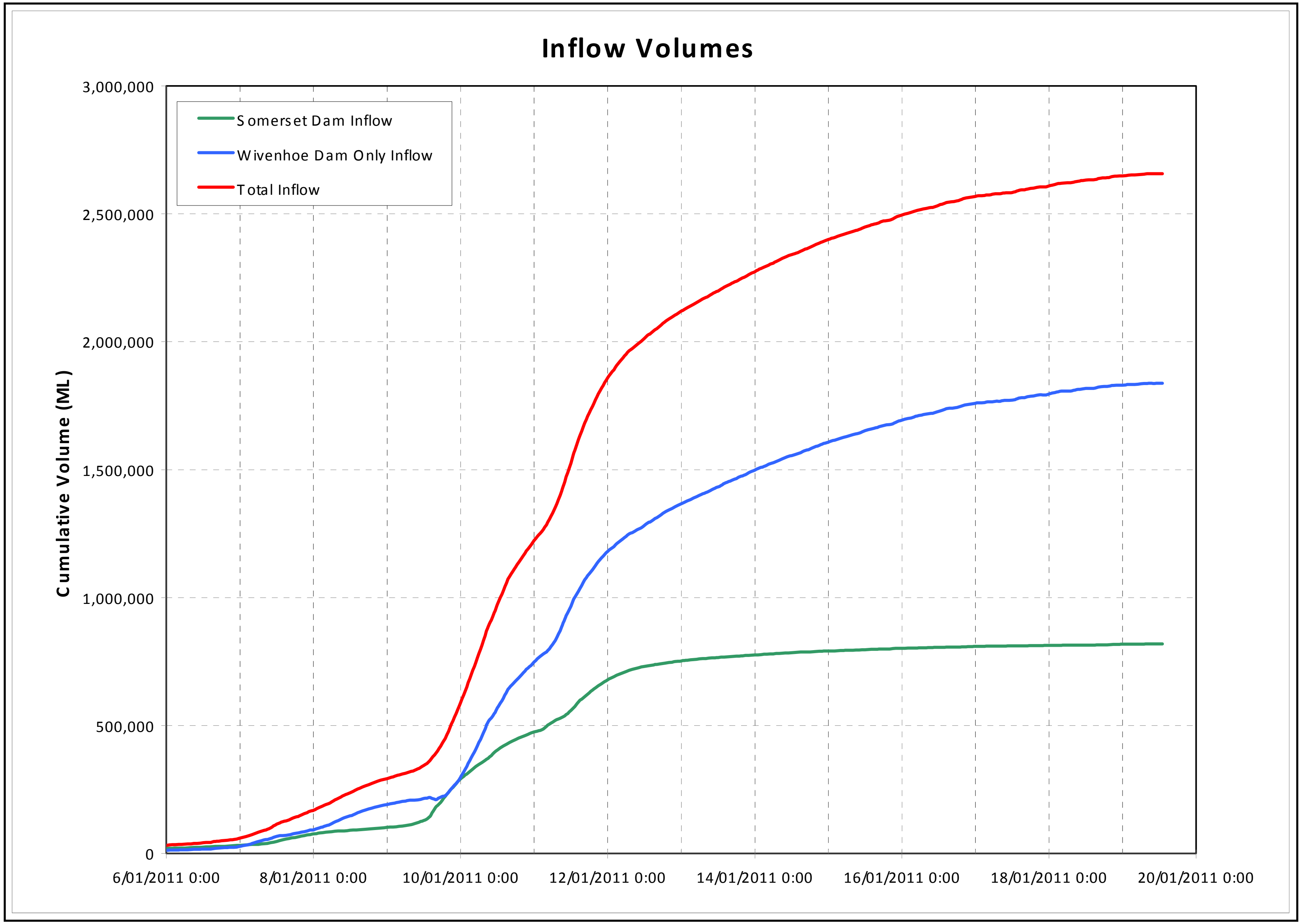


Run 43: Wednesday 12 January 2011, 08:00

APPENDIX B – FLOOD VOLUME SUMMARY

Event	Somerset Dam			Wivenhoe Dam			
	Peak elevation	Stanley River	Outflow	Peak elevation	Upper Brisbane River only	Total	Outflow
	m AHD	ML	ML	m AHD	ML	ML	ML
Feb 1893[1]		1,361,000			1,383,000	2,744,000	
Feb1931		150,000			570,000	720,000	
Mar 1955	103.47	390,000	340,000		560,000	900,000	
Jan 1968	na	540,000	380,000		440,000	820,000	
Jan 1974	106.57	620,000	450,000		960,000	1,410,000	
Jun 1983	101.58	260,000	280,000		800,000	1,080,000	470,000
Mar 1989	102.59	370,000	380,000	69.78	310,000	690,000	660,000
Apr 1989	102.69	340,000	350,000	71.45	520,000	870,000	820,000
Feb 1999	102.96	450,000	280,000	70.45	940,000	1,220,000	900,000
May 2009	99.62	110,000	110,000	62.19	125,000	235,000	0
Mar 2010	99.41	210,000	200,000	66.43	190,000	390,000	0
Oct 2010	101.37	250,000	270,000	69.61	360,000	630,000	630,000
Mid Dec 2010	100.42	150,000	140,000	67.50	220,000	360,000	330,000
Late Dec 2010	99.98	120,000	130,000	69.35	370,000	500,000	460,000
Jan 2011	105.11	825,000	820,000	74.97	1,830,000	2,650,000	2,650,000

[1] Only includes first flood and largest flood peak.


Inflow Volumes
Somerset Dam Inflow
Wivenhoe Dam Only Inflow
Total Inflow
Cumulative Volume (ML)
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00

APPENDIX C – QUANTITATIVE PRECIPITATION FORECASTS

Somerset and Wivenhoe catchments
Catchment average rainfall

Date / time of issue	Forecast for 24 hours to	Forecast rainfall				Recorded for 24 hours to	Recorded
		Min	Max	Isolated	Average		
		mm	mm	mm	mm		mm
Mon 03-01-2011 11:36	04/01/2011 09:00	5	10		8	04/01/2011 09:00	5
Mon 03-01-2011 16:00	04/01/2011 15:00	10	20		15	04/01/2011 15:00	4
Tue 04-01-2011 11:30	05/01/2011 09:00	10	20		15	05/01/2011 09:00	0
Tue 04-01-2011 16:00	05/01/2011 15:00	5	15		10	05/01/2011 15:00	2
Wed 05-01-2011 10:03	06/01/2011 09:00	20	30		25	06/01/2011 09:00	26
Wed 05-01-2011 16:00	06/01/2011 15:00	30	50		40	06/01/2011 15:00	44
Thu 06-01-2011 10:21	07/01/2011 09:00	30	50		40	07/01/2011 09:00	38
Thu 06-01-2011 16:00	07/01/2011 15:00	20	30		25	07/01/2011 15:00	43
Fri 07-01-2011 10:03	08/01/2011 10:00	20	30		25	08/01/2011 10:00	26
Fri 07-01-2011 16:04	08/01/2011 16:00	20	30		25	08/01/2011 16:00	6
Sat 08-01-2011 10:03	09/01/2011 09:00	30	50		40	09/01/2011 09:00	28
Sat 08-01-2011 16:00	09/01/2011 15:00	30	50		40	09/01/2011 15:00	80
Sun 09-01-2011 10:03	10/01/2011 09:00	40	60		50	10/01/2011 09:00	149
Sun 09-01-2011 16:00	10/01/2011 15:00	50	80		65	10/01/2011 15:00	125
Mon 10-01-2011 10:03	11/01/2011 10:00	50	100		75	11/01/2011 10:00	120
Mon 10-01-2011 16:00	11/01/2011 16:00	25	50	100	38	11/01/2011 16:00	129
Tue 11-01-2011 10:13	12/01/2011 10:00		>100		100	12/01/2011 10:00	51
Tue 11-01-2011 16:13	12/01/2011 16:00	50	100		75	12/01/2011 16:00	12
Wed 12-01-2011 10:03	13/01/2011 10:00	10	10		10	13/01/2011 10:00	2
Wed 12-01-2011 16:00	13/01/2011 16:00	5	5		5	13/01/2011 16:00	1
Thu 13-01-2011 14:25	14/01/2011 16:00	5	5		5	14/01/2011 16:00	0
Thu 13-01-2011 16:00	14/01/2011 15:00	5	5		5	14/01/2011 15:00	0
Fri 14-01-2011 10:03	15/01/2011 09:00	3	3		3	15/01/2011 09:00	0
Fri 14-01-2011 16:00	15/01/2011 15:00	3	3		3	15/01/2011 15:00	0

Forecast 1

Date: Sunday 2 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Sunday, January 02, 2011 10:03:07 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Sunday the 2nd of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Monday.. Less than 5-10mm

NORTH PINE DAM CATCHMENT
Forecast of catchment average rainfall for the 24 hour period to
9am Monday.. 5-10mm

Forecast 2

Date: Sunday 2 January 2011

Time: 16:04

From: Aifs Operational Manager
Sent: Sunday, January 02, 2011 4:04:11 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:04pm EST on Sunday the 2nd of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Monday.. 5-10mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Monday.. 5-10mm

Forecast 3

Date: Monday 3 January 2011

Time: 11:36

From: Aifs Operational Manager
Sent: Monday, January 03, 2011 11:36:29 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 11:36am EST on Monday the 3rd of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Tuesday .. 5-10mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Tuesday 5-10mm

Forecast 4

Date: Monday 3 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Monday, January 03, 2011 4:00:34 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Monday the 3rd of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Tuesday .. 10-20mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Tuesday 10-20mm

Forecast 5

Date: Tuesday 4 January 2011

Time: 11:30

From: Aifs Operational Manager
Sent: Tuesday, January 04, 2011 11:30:30 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 11:30am EST on Tuesday the 4th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Wednesday 10-20mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Wednesday 10-20mm

Forecast 6

Date: Tuesday 4 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Tuesday, January 04, 2011 4:00:03 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Tuesday the 4th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Wednesday 5-15mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Wednesday 5-15mm

Forecast 7

Date: Wednesday 5 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 10:03:06 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Wednesday the 5th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Thursday 20-30mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Thursday 20-30mm

Forecast 8

Date: Wednesday 5 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 4:00:05 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Wednesday the 5th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Thursday 30-50mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Thursday 30-50mm

Forecast 9

Date: Thursday 6 January 2011

Time: 10:21

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 10:21:18 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:21am EST on Thursday the 6th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Friday 30-50mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Friday 30-50mm

Forecast 10

Date: Thursday 6 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 4:00:06 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Thursday the 6th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Friday 20-30mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Friday 20-30mm

Forecast 11

Date: Friday 7 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 10:03:06 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Friday the 7th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Saturday: 20-30mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Saturday: 40-50mm

Forecast 12

Date: Friday 7 January 2011

Time: 16:04

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 4:04:23 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:04pm EST on Friday the 7th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Saturday: 20-30mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Saturday: 40-50mm

Forecast 13

Date: Saturday 8 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 10:03:04 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Saturday the 8th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Sunday: 30-50mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Sunday: 40-60mm

Forecast 14

Date: Saturday 8 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 4:00:05 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Saturday the 8th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Sunday: 30-50mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Sunday: 40-60mm

Forecast 15

Date: Sunday 9 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 10:03:02 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Sunday the 9th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Monday: 40-60mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Monday: 40-60mm

Forecast 16

Date: Sunday 9 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 4:00:06 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Sunday the 9th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Monday: 50-80mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Monday: 60-100mm

Forecast 17

Date: Monday 10 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 10:03:02 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Monday the 10th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Tuesday: 50-100mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Tuesday: 75-150mm

Forecast 18

Date: Monday 10 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 4:00:04 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Monday the 10th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Tuesday: 25-50mm, isolated falls to 100mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Tuesday: 25-50mm, isolated falls to 100mm

Forecast 19

Date: Tuesday 11 January 2011

Time: 10:14

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 10:14:02 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:13am EST on Tuesday the 11th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Wednesday: Falls in excess of 100mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Wednesday: Falls in excess of 100mm

Forecast 20

Date: Tuesday 11 January 2011

Time: 16:13

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 4:13:12 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

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Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:13pm EST on Tuesday the 11th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Wednesday: 50 to 100mm this evening and overnight, easing to less than 30mm during Wednesday

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Wednesday: 50 to 100mm this evening and overnight, easing to less than 30mm

during Wednesday

Forecast 21

Date: Wednesday 12 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Wednesday, January 12, 2011 10:03:07 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Wednesday the 12th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Thursday: 10mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Thursday: 10mm

Forecast 22

Date: Wednesday 12 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Wednesday, January 12, 2011 4:00:02 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Wednesday the 12th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Thursday: 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Thursday: 5mm

Forecast 23

Date: Thursday 13 January 2011

Time: 14:25

From: Aifs Operational Manager
Sent: Thursday, January 13, 2011 2:25:34 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 2:25pm EST on Thursday the 13th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Friday 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Friday 5mm

Forecast 24

Date: Thursday 13 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Thursday, January 13, 2011 4:00:05 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Thursday the 13th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Friday 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Friday 5mm

Forecast 25

Date: Friday 14 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Friday, January 14, 2011 10:03:06 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Friday the 14th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Saturday <3mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Saturday <3mm

Forecast 26

Date: Friday 14 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Friday, January 14, 2011 4:00:05 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Friday the 14th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Saturday <3mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Saturday <3mm

Forecast 27

Date: Saturday 15 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Saturday, January 15, 2011 10:03:03 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Saturday the 15th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Sunday: < 3mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Sunday: < 3mm

Forecast 28

Date: Saturday 15 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Saturday, January 15, 2011 4:00:02 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Saturday the 15th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Sunday: < 3mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Sunday: < 3mm

Forecast 29

Date: Sunday 16 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Sunday, January 16, 2011 10:03:02 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Sunday the 16th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Monday: < 2mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Monday: < 2mm

Forecast 30

Date: Sunday 16 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Sunday, January 16, 2011 4:00:07 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Sunday the 16th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Monday: 2 to 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

4pm Monday: < 2mm

Forecast 31

Date: Monday 17 January 2011

Time: 10:03

From: Aifs Operational Manager
Sent: Monday, January 17, 2011 10:03:03 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:03am EST on Monday the 17th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Tuesday: to 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Tuesday: to 5mm

Forecast 32

Date: Monday 17 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Monday, January 17, 2011 4:00:03 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Monday the 17th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Tuesday: to 5mm

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Tuesday: to 5mm

Forecast 33

Date: Tuesday 18 January 2011

Time: 10:50

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 10:50:09 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:50am EST on Tuesday the 18th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
9am Wednesday: 10-15mm generally, isolated heavier falls [-40mm]

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

9am Wednesday: 10-15mm, isolated heavier falls [-40mm]

Forecast 34

Date: Tuesday 18 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 4:00:05 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Tuesday the 18th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
3pm Wednesday: 20-25mm generally, isolated heavier falls [40-50mm]

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

3pm Wednesday: 20-25mm, isolated heavier falls [40-50mm]

Forecast 35

Date: Wednesday 19 January 2011

Time: 10:43

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 10:43:15 AM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 10:43am EST on Wednesday the 19th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
10am Thursday: 15-25mm generally, heavier falls to about 50mm with storms

NORTH PINE DAM CATCHMENT

Forecast of catchment average rainfall for the 24 hour period to

10am Thursday: 15-25mm generally, heavier falls to about 50mm with storms

Forecast 36

Date: Wednesday 19 January 2011

Time: 16:00

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 4:00:04 PM
To: weather
Subject: BOM: SEQWB Quantitative Precipitation [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

IDQ10003
BUREAU OF METEOROLOGY
Queensland Region
Brisbane Office

QUANTITATIVE PRECIPITATION FORECAST FOR SEQWB/SUNWATER)
Issued at 4:00pm EST on Wednesday the 19th of January 2011

SOMERSET DAM AND WIVENHOE DAM CATCHMENTS:
Forecast of catchment average rainfall for the 24 hour period to
4pm Thursday: 15-25mm generally, heavier falls to about 50mm with storms

NORTH PINE DAM CATCHMENT
Forecast of catchment average rainfall for the 24 hour period to
4pm Thursday: 15-25mm generally, heavier falls to about 50mm with storms

APPENDIX D – CATCHMENT RAINFALL

Within the operational system, the Brisbane Basin is divided into the sub-catchments shown in Figure 1. Average rainfall for each sub-catchment in the Brisbane Basin is determined by applying a weighting to the rainfall depth at each available station within the sub-catchment.

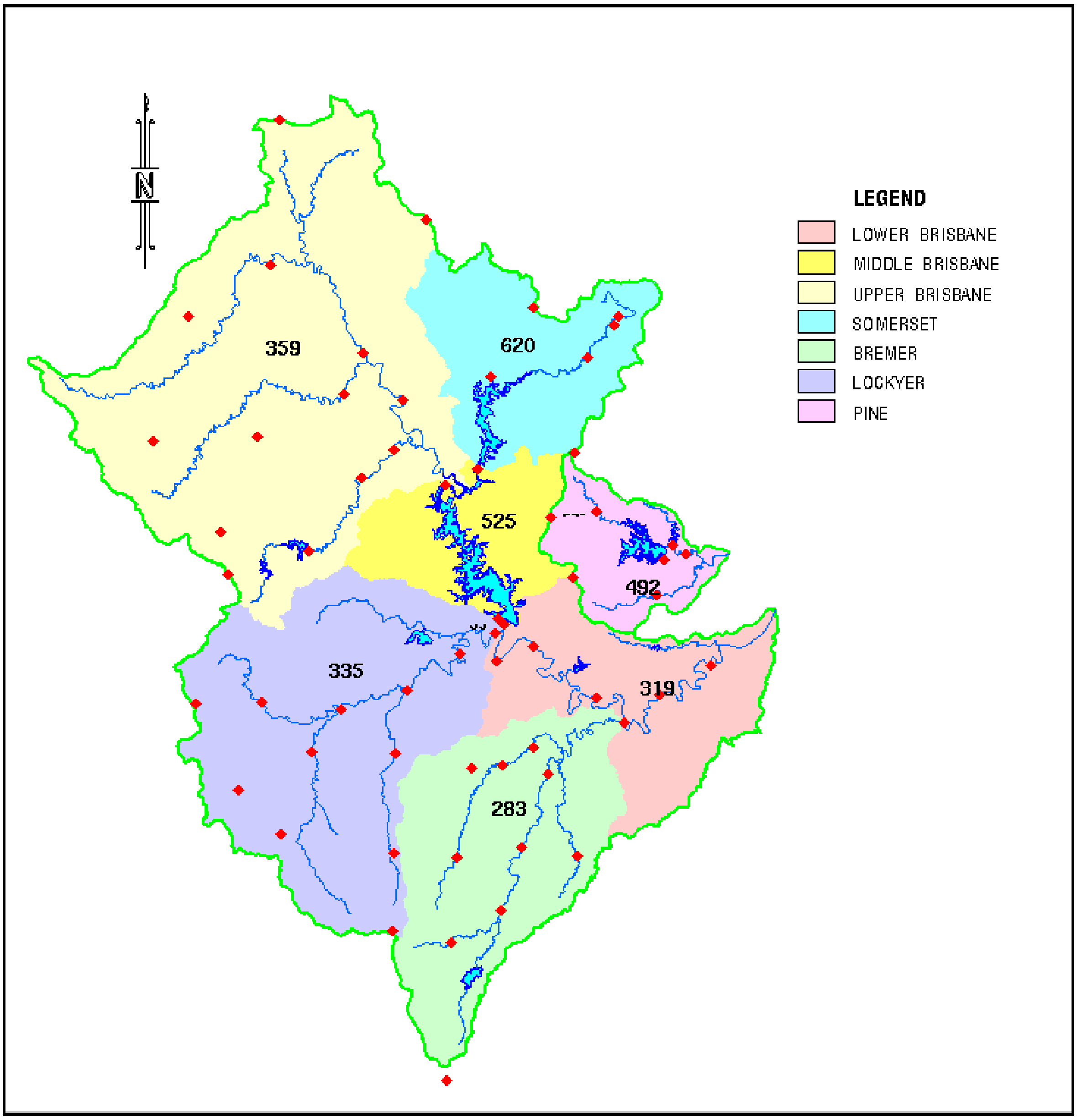

Figure 1 Brisbane Basin Sub-Catchments

Table 1 below summarises catchment rainfall during the January 2011 Flood Event. The table contains 24 hour catchment rainfall to 09:00 on the date shown. The Somerset catchment represents the average catchment rainfall in the Stanley River to Somerset Dam. The Wivenhoe catchment represents the average catchment rainfall in the Wivenhoe Dam catchment, excluding the Somerset Dam catchment.

Period ending 09:00	Somerset		Wivenhoe		Lockyer		Bremer		Lower	
	Period	Σ	Period	Σ	Period	Σ	Period	Σ	Period	Σ
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
6/01	21	21	27	27	30	30	28	28	20	20
7/01	38	60	38	64	27	57	31	60	35	54
8/01	32	92	27	91	15	72	12	72	10	65
9/01	56	147	21	112	5	76	3	75	9	74
10/01	225	373	131	244	66	143	45	120	90	164
11/01	113	486	117	361	102	245	75	195	73	237
12/01	128	614	38	399	84	328	84	279	82	319
13/01	5	619	2	401	2	330	2	280	0	319

Table 1 Daily catchment rainfall

Figures 2 – 7 below show hours catchment average rainfall over the duration of the Event.

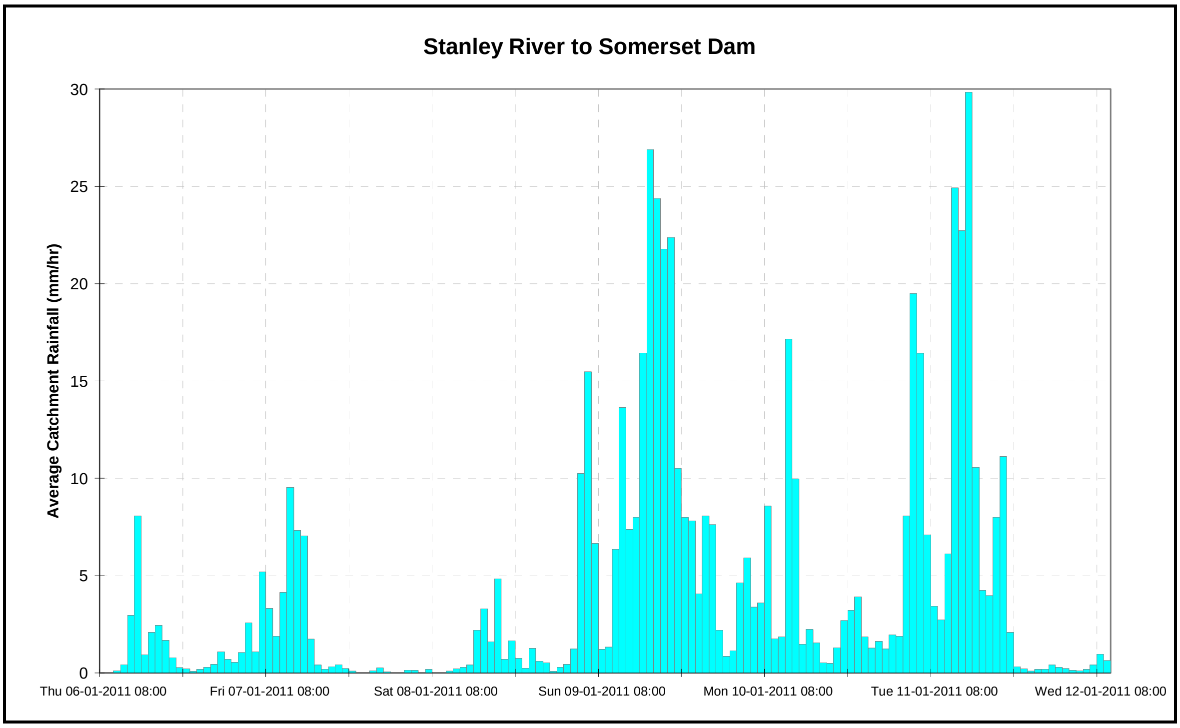

Figure 2 Stanley River average hourly rainfall

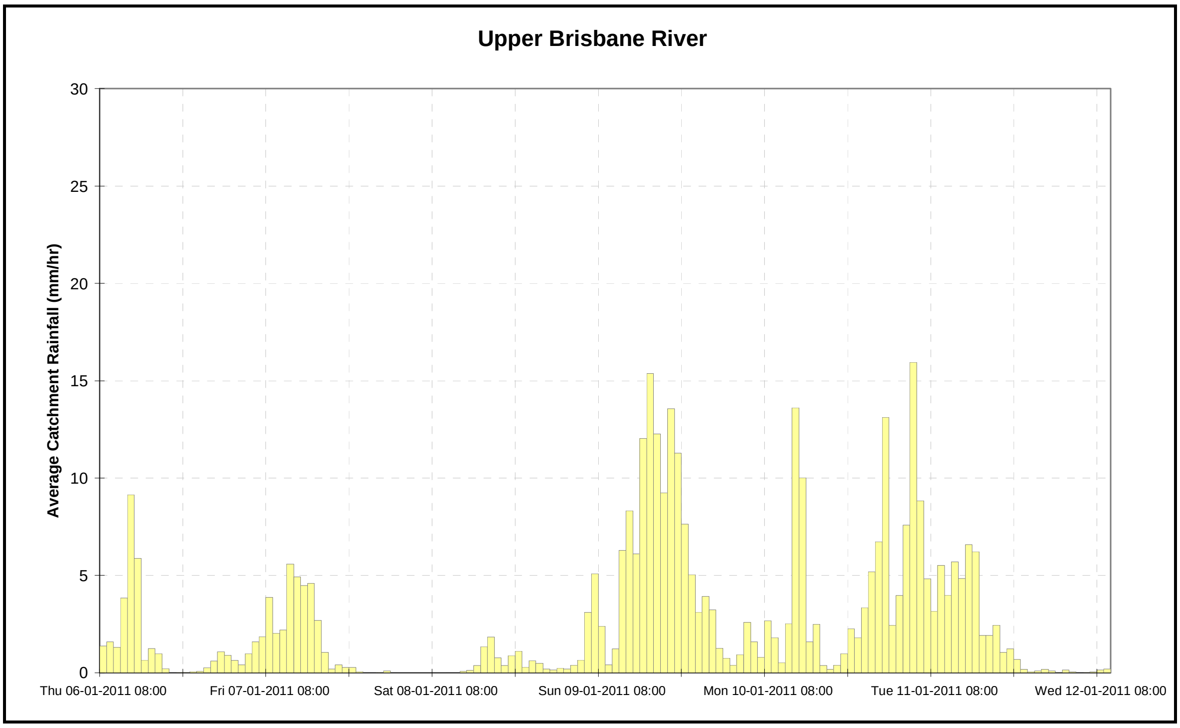

Figure 3 Upper Brisbane River average hourly rainfall

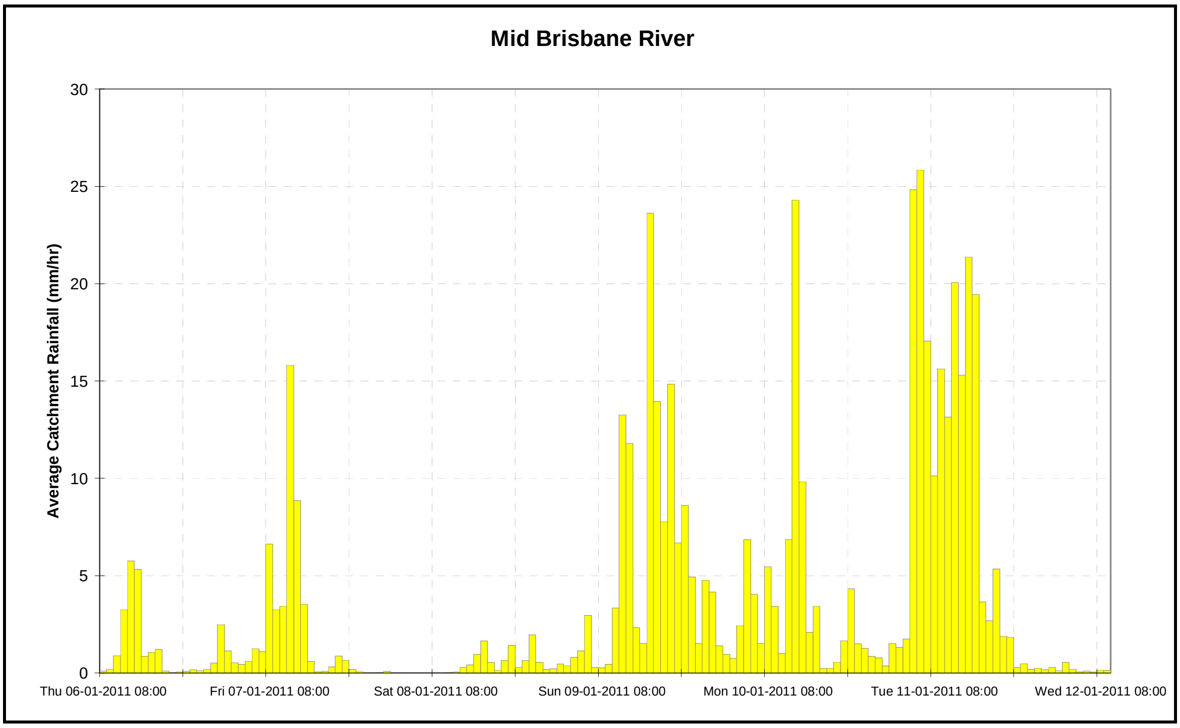

Figure 4 Mid Brisbane River average hourly rainfall

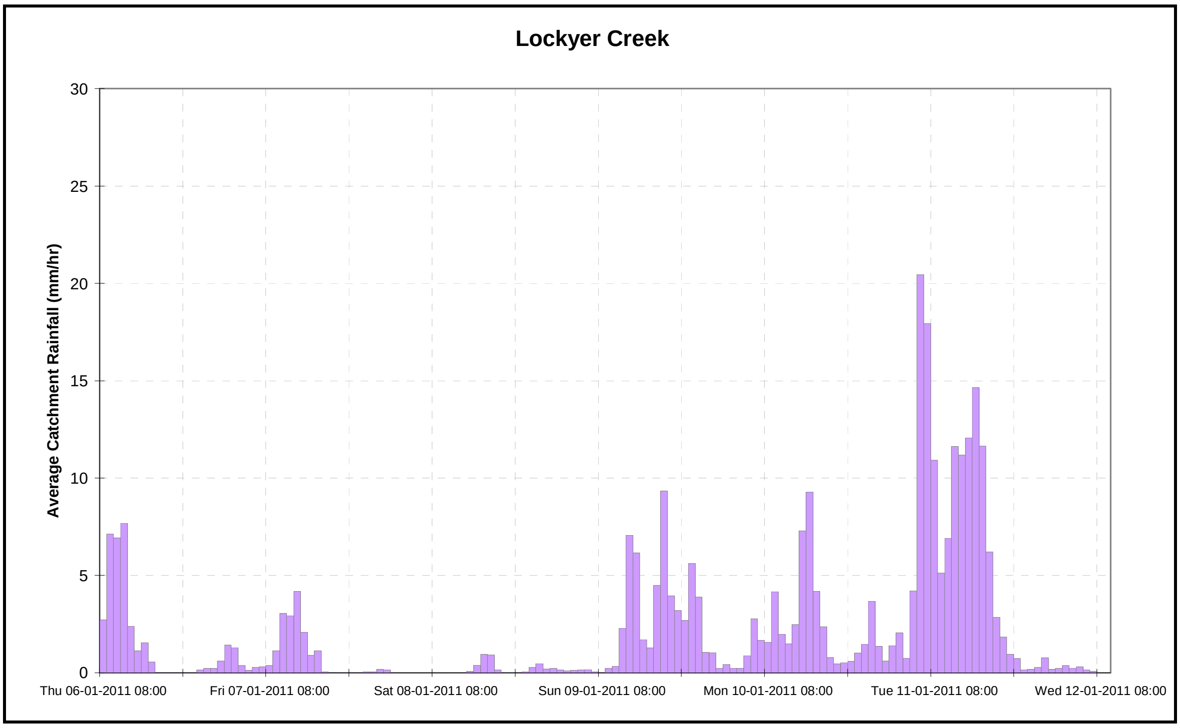

Figure 5 Lockyer Creek average hourly rainfall

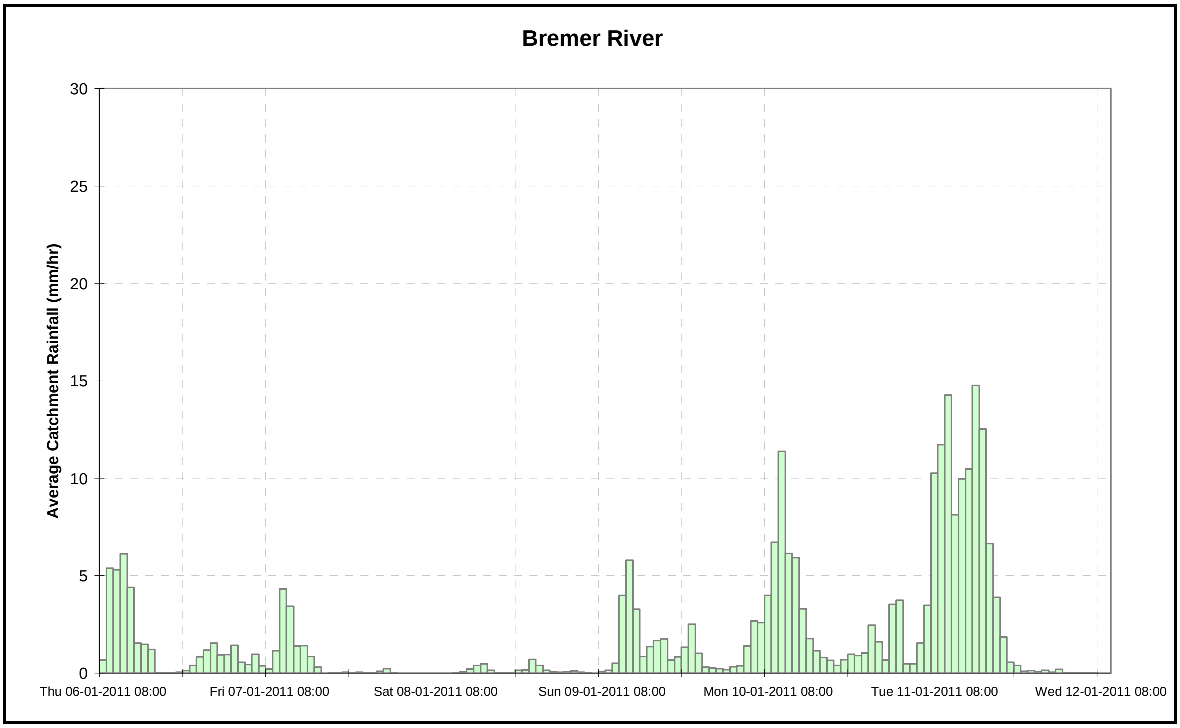

Figure 6 Bremer River average hourly rainfall

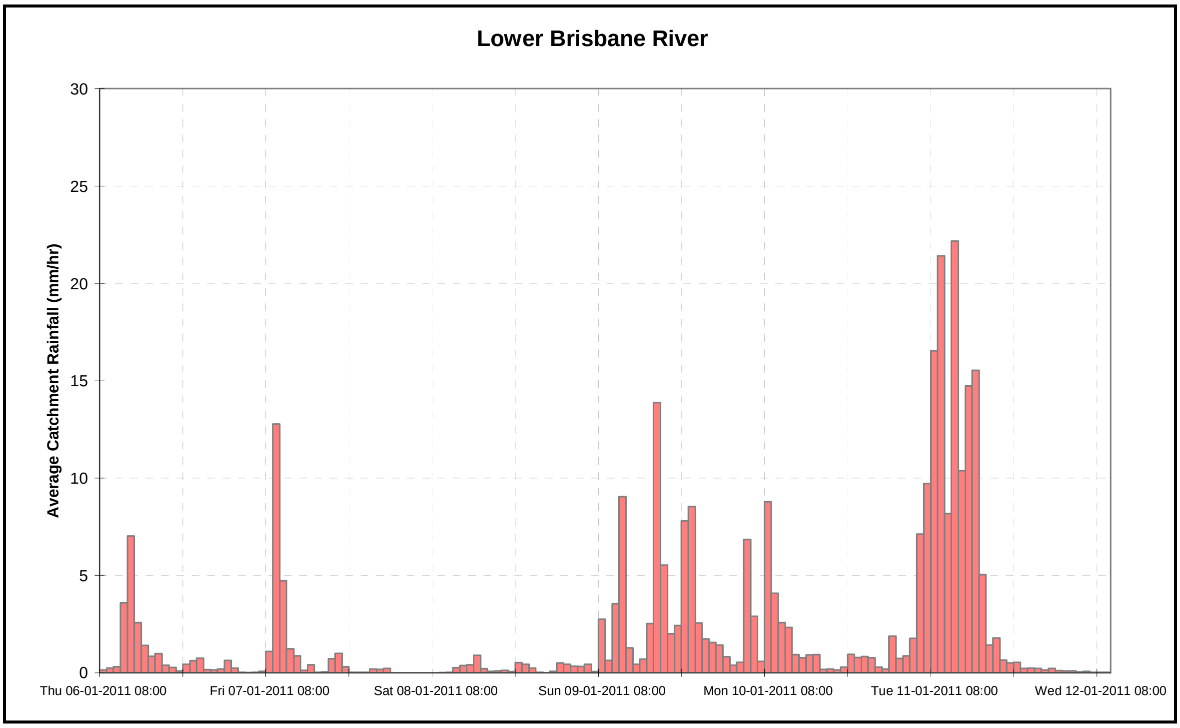

Figure 7 Lower Brisbane River average hourly rainfall

APPENDIX 2

January 2011 Flood Event

Report on the operation of Somerset Dam and Wivenhoe Dam

2 March 2011

APPENDIX E – SITUATION REPORTS

Situation Report 1

Date: Thursday 6 January 2011

Time: 08:14

From: Duty Engineer
Sent: Thursday, 6 January 2011 8:14 AM
To: Distribution List
Subject: Situation Report 0800 06/01/2011

Rainfall

Since 9am Wednesday, there have been widespread falls of 30mm with isolated heavy falls up to 50mm in the Somerset and Wivenhoe catchments. Totals in the North Pine catchment have generally been below 10mm. Falls up to 60mm were recorded in the Leslie Harrison catchment.

The forecast for the next 24 to 48 hours is for totals up to 150mm in SE Qld.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

North Pine Dam

At 0700 Thursday, North Pine Dam was 39.60m, 0.05m below gate trigger level and having risen 0.18m since 2/1/2011 due to a combination of baseflow and runoff from rain in the last 24 hours.

Given the forecast rain, gate operations will commence tonight. MBRC will be advised this morning

Somerset Dam

At 0700 Thursday, Somerset Dam was 99.34m, 0.34m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the upper Stanley but there have been significant rises in Kilcoy Ck. Further regulator operations will be required later Thursday.

Wivenhoe Dam

At 0700 Thursday, Wivenhoe Dam was 67.31m and rising slowly. This is 0.31m above FSL and above the gate trigger level of 67.25m. There have been rises recorded at rivers and stream upstream of Wivenhoe Dam. Gates will be opened in the next 24 hours to manage the inflows from the upper Brisbane River and the outflow from Somerset.

Impacts of Wivenhoe Dam Releases

Somerset Regional, Ipswich City and Brisbane City Councils will be advised of the potential for gate operations after a full assessment of the situation this morning. At this stage it is anticipated that peak releases from Wivenhoe will be below 500m3/s but this will depend on the forecast rain and flows downstream of the dam.
The expected Wivenhoe release and local flows will at least impact upon Twin Bridges, Savages Crossing, Kholo Bridge and Colleges Crossing for several days. At this stage, there are not expected to be any adverse impacts upon Fernvale Bridge, Burtons Bridge or Mt Crosby Weir Bridge

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing. Given the forecast rainfall, gate operations are expected to continue for the next 24 to 48 hours.

The next situation report will be issued at 1800 Thursday 6/1/2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 2

Date: Thursday 6 January 2011

Time: 14:54

From: Duty Engineer
Sent: Thursday, 6 January 2011 14:54
To: Distribution List
Cc: Distribution List
Subject: Situation Report 1500 06/02/2011

Rainfall

In the 6 hours since 9am Wednesday, there have been general totals around 30mm with isolated heavy falls up to 60mm in the Somerset and Wivenhoe catchments. Totals in the North Pine catchment have generally been between 20 and 30mm. Falls between 20 and 30mm were recorded in the Leslie Harrison catchment.

The forecast for the next 24 to 48 hours is for totals up to 100mm in SE Qld.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

North Pine Dam

At 1400 Thursday, North Pine Dam was 39.66m, 0.01m above gate trigger level. Gate operations will commence at 1900 Thursday and will impact upon Youngs Crossing. MBRC have been advised and will confirm closure of Youngs Crossing prior to gate operations. Given the forecast rainfall during Friday, gate operations may continue into Saturday.

Somerset Dam

At 0700 Thursday, Somerset Dam was 99.34m, 0.34m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the upper Stanley but there have been significant rises in Kilcoy Ck, adding to the Somerset inflows. Further regulator/sluice operations will be required in the next 24 to 48 hours. The estimated event inflow volume into Somerset Dam is 50,000ML.

Wivenhoe Dam

At 0700 Thursday, Wivenhoe Dam was 67.31m and rising slowly. This is 0.31m above FSL and above the gate trigger level of 67.25m. There have been rises recorded at rivers and stream upstream of Wivenhoe Dam. The estimated event inflow volume into Wivenhoe Dam is 180,000ML including Somerset Dam outflow.

There has been significant rainfalls in the Lockyer Ck catchment since 0900 Thursday and a peak of about 600m3/s is expected from the Lockyer late Friday. Wivenhoe gates will be opened after flood levels in the lower Lockyer subside. At this stage Wivenhoe releases during Saturday may be as high as 1,500m3/s and continue for a couple of days.

Impacts of Wivenhoe Dam Releases

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the potential for gate operations during the next 24 hours.

The will at least impact upon Twin Bridges, Savages Crossing, Kholo Bridge and Colleges Crossing for several days. The relatively high Lockyer flows will at least impact upon Twin Bridges, Savages Crossing, Kholo Bridge and Colleges Crossing for several days and may impact upon Burtons Bridge early Saturday. At this stage, there are not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing. Given the forecast rainfall, gate operations are expected to continue for the next 24 to 48 hours.

The next situation report will be issued at 1800 Thursday 6/1/2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 3

Date: Thursday 6 January 2011

Time: 06:07

From: Duty Engineer
Sent: Friday, 7 January 2011 06:07 AM
To: Distribution List
Subject: FOC Situation Report at 06:00 on Friday 7 January 2011

Rainfall

There have been general totals around 30 to 50 mm with isolated heavy falls up to 75mm in the Somerset and Wivenhoe catchments since the event commenced on Wednesday 5 January 2011. There have been significant rainfalls in the Lockyer Ck catchment in the last 72 hours with widespread falls of 50mm and isolated falls up to 100mm.

Totals in the North Pine catchment have generally been about 35mm.

Falls between 20 and 30mm were recorded in the Leslie Harrison catchment.

The forecast for the next five days is for totals between 100 and 200mm in SE Qld. Given the saturated condition of the catchments further runoff will most likely be generated from this rainfall.

North Pine Dam

At 0600 Friday, North Pine Dam was at 39.48m, 0.12m below FSL. Gate operations commenced at 1915 on Thursday 6 January and are expected to continue until at least mid-day Friday 7 January when North Pine Dam is expected to be at 39.40m. These releases have impacted upon Youngs Crossing. Moreton Bay Regional Council was advised and they closed Youngs Crossing prior to gate operations commencing. Based upon the forecast rainfall, gate operations may continue into Saturday, but at this stage it is anticipated that gate operations will cease at around mid-day on Friday 7 January 2011.

Somerset Dam

At 0600 Friday, Somerset Dam was at 99.59m, 0.59m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the Upper Stanley but there have been significant rises in Kilcoy Creek, contributing to the Somerset inflows. Somerset Dam is currently releasing at a rate of 35 cumecs and further regulator/sluice operations will be required in the next 24 to 72 hours.

The estimated event inflow volume into Somerset Dam is around 50,000ML.

Wivenhoe Dam

At 0600 Friday, Wivenhoe Dam was at 67.64m and rising slowly. This is 0.64m above FSL and above the gate trigger level of 67.25m. Upstream of the dam river levels have peaked at the Linville and Gregors Ck gauges. The estimated event inflow volume into Wivenhoe Dam is 230,000ML including Somerset Dam outflow.

A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon on Friday 7 January. At this stage there is some uncertainty associated with this estimate but it may be of sufficient magnitude to inundate Burtons Bridge.

Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside. It is proposed that Wivenhoe releases will commence late Friday/early Saturday and may be as high as 1,200 cumecs, (similar but slightly smaller to recent events), and the releases are expected to continue over the weekend though to Monday or Tuesday.

Impacts of Downstream of Wivenhoe

Somerset Regional Council, Ipswich City Council and Brisbane City Council have been advised of the potential for gate operations during the next 24 hours.

The relatively high Lockyer flows will adversely impact upon Twin Bridges, Savages Crossing, and Colleges Crossing for several days and may impact upon Burtons Bridge from Friday mid-day and Kholo Bridge later on Friday evening. At this stage, there are not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing. Given the forecast rainfall, gate operations are expected to continue for the next 24 to 48 hours.

The next situation report will be issued at 1800 Friday 7 January 2011.

Regards

Engineer1

Duty Engineer
Flood Operations Centre

Phone: [redacted]

Fax: [redacted]

Situation Report 4

Date: Thursday 6 January 2011

Time: 17:33

From: Duty Engineer
Sent: Thursday, 6 January 2011 5:33 PM
To: Distribution List
Subject: Situation Report 1800 06/01/2011

Rainfall

In the 8 hours since 9am Wednesday, there have been general totals around 30mm with isolated heavy falls up to 60mm in the Somerset and Wivenhoe catchments. There have been significant rainfalls in the Lockyer Ck catchment in the last 24 hours with widespread falls of 50mm and isolated falls up to 75mm. Totals in the North Pine catchment have generally been about 30mm. Falls between 20 and 30mm were recorded in the Leslie Harrison catchment.

The forecast for the next 24 to 48 hours is for totals up to 100mm in SE Qld.

North Pine Dam

At 1700 Thursday, North Pine Dam was 39.68m, 0.03m above gate trigger level. Gate operations will commence at 1900 Thursday and will impact upon Youngs Crossing. Moreton Bay Regional Council has been advised and will confirm closure of Youngs Crossing prior to gate operations. Given the forecast rainfall during Friday, gate operations may continue into Saturday.

Somerset Dam

At 1700 Thursday, Somerset Dam was 99.45m, 0.45m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the upper Stanley but there have been significant rises in Kilcoy Ck, adding to the Somerset inflows. Further regulator/sluice operations will be required in the next 24 to 48 hours. The estimated event inflow volume into Somerset Dam is 50,000ML.

Wivenhoe Dam

At 1700 Thursday, Wivenhoe Dam was 67.39m and rising slowly. This is 0.39m above FSL and above the gate trigger level of 67.25m. Upstream of the dam river levels are still rising at the Linville and Gregors Ck gauges. The estimated event inflow volume into Wivenhoe Dam is 180,000ML including Somerset Dam outflow.

A peak of about 600m3/s is expected from the Lockyer late Friday. At this stage there is some uncertainty associated with this estimate and it may or may not impact Burtons Bridge. Wivenhoe gates will be opened after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside. At this stage Wivenhoe releases will commence late Friday/early Saturday and may be as high as 1,500m3/s, similar to recent events, and continue for a couple of days.

Impacts of Downstream of Wivenhoe

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the potential for gate operations during the next 24 hours.

The relatively high Lockyer flows will adversely impact upon Twin Bridges, Savages Crossing, Kholo Bridge and Colleges Crossing for several days and may impact upon Burtons Bridge early Saturday. At this stage, there are not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing. Given the forecast rainfall, gate operations are expected to continue for the next 24 to 48 hours.

The next situation report will be issued at 0600 Friday 7/1/2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 5

Date: Friday 7 January 2011

Time: 12:15

From: Duty Engineer
Sent: Friday, 7 January 2011 12:15 PM
To: Distribution List
Subject: SitRep

There has been falls between 15 and 30mm in the North Pine catchment in the last 3 hours. This will cause renew rises and increased inflows.

There are no gate movements projected for the next 3 hours.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 6

Date: Friday 7 January 2011

Time: 17:57

From: Duty Engineer
Sent: Friday, 7 January 2011 5:57 PM
To: Distribution List
Subject: Situation Report 1800 Friday 07/01/2011

Rainfall

Since 0900 Friday, there has been widespread 20 to 40mm throughout North Pine, Somerset and Wivenhoe catchments with isolated higher totals of 70mm in the upper reaches of the Brisbane R.

Advice from BoM indicates that SE Qld can expect further high rainfall totals over the next 4 days.

Saturday: Rain light at times 15-50mm with higher falls along the coast
Sunday: Widespread rain with totals between 50-100mm
Monday: Widespread rain again with totals between 50-100mm
Tuesday: Rain easing with totals between 25-50mm

Given the saturated conditions of the catchments, significant inflows to Seqwater dams will be generated, especially following the forecast rainfall on Sunday/Monday

North Pine (Full Supply Level 39.60 m AHD)

At 1700 Friday, North Pine currently has 5 gates open releasing runoff from rain on Wed/Thursday. Given the very high likelihood of significant runoff during the next 4 days, gates will be keep open to match inflows over the next few days, rather than opening and closing at various times with short notice. Youngs Crossing will remain adversely impacted for the duration of the gates being open. Moreton Bay Regional Council has been advised and concurs with this strategy.

Somerset (Full Supply Level 99.00 m AHD)

At 1700 Friday, Somerset Dam level was 100.04m AHD and rising steadily with one regulator open 100%. However, as the Wivenhoe headwater level is rising and may impact upon the operation of the regulator, this will be closed in the next few hours and a sluice gate opened. However, this strategy may need to be reviewed if significant runoff occurs in the Stanley and Upper Brisbane. Under circumstances of high inflows to Somerset and Wivenhoe, it is the usual practice to hold flood water in Somerset until there is a high level of confidence in the estimated inflows to Wivenhoe.

Since the commencement of the event on 02/01/2011, approximately 55,000ML has flowed into Somerset Dam with a further 25,000ML expected based on the recorded rainfall to date. Approximately 16,000ML has been released into Wivenhoe.

Wivenhoe (Full Supply Level 67.00 m AHD)

At 1700 Friday, Wivenhoe Dam was 68.10 m AHD and rising steadily with one gate open to 1.5 metres and releasing about 168m3/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam It is intended to ramp up the release from Wivenhoe to about 1,200m3/s during the next 18 hours. However, given the high likelihood of significant inflows in the next week, this may be increased later on the weekend.

Since the commencement of the event on 02/01/2011, approximately 140,000ML has flowed into Wivenhoe Dam with a further 160,000ML expected (including Somerset release) based on the recorded rainfall to date. Approximately 24,000ML has been released from Wivenhoe via the hydro and regulator at about 50m3/s.

Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected.

Discussions were held with Brisbane City Council and BoM with all agencies agreeing that the combined flow in the lower Brisbane R will only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Leslie Harrison

Given its proximity to the coast Leslie Harrison is likely to be most impacted by the forecast rain over the next 4 days.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 7

Date: Friday 7 January 2011

Time: 18:59

From: Duty Engineer
Sent: Friday, 7 January 2011 6:59 PM
To: Distribution List
Cc: Distribution List
Subject: SitRep Clarification

BCC pointed out that they have not done any analysis and do not necessarily agree with the 50 to 100mm but have accepted the BoM and Seqwater estimate.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 8

Date: Saturday 8 January 2011

Time: 06:32

From: Duty Engineer
Sent: Saturday, 8 January 2011 6:32 AM
To: Distribution List
Subject: Situation Report 0600 Saturday 08/01/2011

Rainfall

Since 0900 Friday, there has been widespread 20 to 40mm throughout North Pine, Somerset and Wivenhoe catchments with isolated higher totals of 70mm in the upper reaches of the Brisbane R. No significant rain has fallen in the past 12 hours.

Advice from BoM indicates that SE Qld can expect further high rainfall totals over the next 4 days.

Saturday:	Rain light at times 5-50mm with higher falls along the coast
Sunday:	Widespread rain with totals between 50-100mm
Monday:	Widespread rain again with totals between 50-100mm
Tuesday:	Rain easing with totals between 25-50mm

Given the saturated conditions of the catchments, significant inflows to Seqwater dams will be generated, especially following the forecast rainfall on Sunday/Monday

North Pine (Full Supply Level 39.60 m AHD)

At 0600 Saturday, North Pine Lake Level was 39. 46 m AHD and slowly rising. Currently 3 gates are open to release runoff from rain on Wed/Thursday/Friday. Given the very high likelihood of significant runoff during the next 4 days, gates will be keep open to match inflows over the next few days, rather than opening and closing at various times with short notice. Youngs Crossing will remain adversely impacted for the duration of the gates being open. Moreton Bay Regional Council has been advised and concurs with this strategy.

Somerset (Full Supply Level 99.00 m AHD)

At 0500 Saturday, Somerset Dam level was 100.42m AHD and rising. The Dam is releasing into Wivenhoe through one open sluice gate. Water will be temporarily held in Somerset to allow the inflow from the upper Brisbane is passed through the system. However, this strategy may need to be reviewed if significant runoff occurs in the Stanley and Upper Brisbane. Under circumstances of high inflows to Somerset and Wivenhoe, it is the usual practice to hold flood water in Somerset until there is a high level of confidence in the estimated inflows to Wivenhoe.

Since the commencement of the event on 02/01/2011, approximately 85,000ML has flowed into Somerset Dam with a further 20,000ML expected based on the recorded rainfall to date. Approximately 25,000ML has been released into Wivenhoe.

Wivenhoe (Full Supply Level 67.00 m AHD)

At 0600 Saturday, Wivenhoe Dam was 68.45 m AHD and rising steadily with all five gates open and releasing about 890 m3/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam It is intended to ramp up the release from Wivenhoe to 1,200m3/s by midday Saturday 08/01/2011. Further assessments will be undertaken to determine increases above this level. However, given the high likelihood of significant inflows in the next week, this may be increased.

Since the commencement of the event on 02/01/2011, approximately 200,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 180,000ML expected based on the recorded rainfall to date. Approximately 50,000ML has been released from Wivenhoe via the hydro and regulator at about 50m3/s.

Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.

The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane Rive. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Engineer 3
Duty Engineer
Flood Operations Centre

Situation Report 9

Date: Saturday 8 January 2011

Time: 14:22

From: Duty Engineer
Sent: Saturday, 8 January 2011 2:22 PM
To: Distribution List
Subject: Seqwater Situation Report at 12:00 on Saturday 8 January 2011

Dam Safety Regulator

I have added you to the distribution list of the Situation Report for Seqwater dams. This is distributed every 12 hours (approximately) during gate releases. Let me know if you do not wish to get this.

Rainfall

No significant rain has fallen over the dam catchments in the past 18 hours.

Advice from BoM indicates that SE Qld can expect further high rainfall totals over the next 4 days.

Saturday:	Rain light at times 5-50mm with higher falls along the coast
Sunday:	Widespread rain with totals between 50-100mm
Monday:	Widespread rain again with totals between 50-100mm
Tuesday:	Rain easing with totals between 25-50mm

Given the saturated conditions of the catchments, significant inflows to Seqwater dams will be generated, especially following the forecast rainfall on Sunday/Monday.

North Pine (Full Supply Level 39.60 m AHD)

At 1200 Saturday, North Pine Lake Level was 39.46 m AHD and is steady. Currently 2 gates are open to release runoff generated from rainfall over the last three days. Given the very high likelihood of significant runoff during the next 4 days, gates will be kept open to match inflows over the next few days, rather than opening and closing at various times with short notice. Lake Kurwongbah spillway flows are also contributing to the adverse impacts experienced at Youngs Crossing.

Youngs Crossing will remain adversely impacted for the duration of the gates being open.

Moreton Bay Regional Council has been advised and concurs with this strategy.

Somerset (Full Supply Level 99.00 m AHD)

At 1000 Saturday, Somerset Dam level peaked at 100.47m AHD and is now slowly falling. At 1200 it is now 100.45m. Somerset Dam is releasing into Wivenhoe through two open sluice gates and over the fixed crest at a rate of about 415 m3/s.

Since the commencement of the event on 02/01/2011, approximately 91,000ML has flowed into Somerset Dam with a further 20,000ML expected based on the recorded rainfall to date. Approximately 29,000ML has been released into Wivenhoe.

Wivenhoe (Full Supply Level 67.00 m AHD)

At 1200 Saturday, Wivenhoe Dam was 68.60 m AHD and rising steadily with all five gates open and releasing about 1,150 m3/s. River levels upstream of Wivenhoe Dam have peaked and are now receding. However the further inflows into the dam has led to elevated levels It is intended to increase the release from Wivenhoe to 1,250 m3/s by 14:00 on Saturday 08/01/2011. This will maintain flows of up to 1,600 m3/s in the mid-Brisbane River throughout the afternoon.
Further assessments will be undertaken to determine increases above this level given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment will also be assessed to determine an appropriate release strategy. Projections based upon the forecast rainfalls suggest flows of up to 1,200 m3/s will emanate from the Bremer River catchment.

Since the commencement of the event on 02/01/2011, approximately 202,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 210,000ML expected based on the recorded rainfall to date. Approximately 66,000ML has been released from Wivenhoe via the radial gates, hydro and regulator.

Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,250m3/s and combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but they could potentially be affected if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

The current available assessments indicate that the combined flow in the lower Brisbane River would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides. The tide level at the Port Office Gauge at 1200 Saturday was 1.56 m and rising.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Regards

Engineer 1
Duty Engineer
Flood Operations Centre

Situation Report 10

Date: Sunday 9 January 2011

Time: 06:15

From: Duty Engineer
Sent: Sun 9/01/2011 6:15 AM
To: Distribution List
Subject: FOC Situation Report at 06:00 on Sunday 9 January 2011

Rainfall

Catchment average rainfall for the past 12 hours is; North Pine Dam (less than 10 mm); Somerset Dam (40 mm); Wivenhoe Dam (less than 10 mm). The bulk of the rain that has fallen in the Somerset Dam catchment has occurred in the last two hours, with recorded falls exceeding 60mm in some areas. The BOM forecast for the next seven days issued at 0450 this morning is:-

Sunday:	Rain periods.
Monday:	Rain periods.
Tuesday:	Rain periods.
Wednesday	A few showers.
Thursday	A shower or two.
Friday	A shower or two.
Saturday	Mostly fine.

A severe whether warning remains current for heavy rainfall in the dam catchment areas. The dam catchments are relatively saturated and significant inflows will be generated if the forecast rainfall eventuates.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is currently 39.47 m AHD and steady. Two radial gates remain open to release runoff generated from recent rainfall. Based on rainfall forecasts, the radial gates have been kept open in anticipation of further inflows over the next few days. However unless significant rain falls today, consideration will be given to closing the gates late this afternoon or early tomorrow morning and discussions to finalise a decision on the timing of radial gate closure will be held with the Moreton Bay Regional Council later today. Youngs crossing will remain closed while releases are in progress.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is currently falling slowly, with the current level being 100.27m AHD. However the rain that has fallen in the dam catchment over the last two hours (recorded falls exceed 60mm in some areas) will result in significant inflows later today. The current release rate into Wivenhoe Dam is 35,000ML/day. Since the commencement of the event on 02/01/2011approximately 56,000ML has been released from the dam, with a total of at least 150,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase significantly over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Tuesday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently falling slowly, with the current level being 68.58m AHD. River levels upstream of the dam are receding, however further inflows will result from any additional rainfall. The current gate operation strategy will maintain flows of around 1,600m^3/s in the mid-Brisbane River. The current release rate from Wivenhoe Dam is 116,000ML/day. Since the commencement of the event on 02/01/2011approximately 150,000ML has been released from the dam, with a total of at least 450,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Wednesday.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Engineer 4
Duty Engineer
Flood Operations Centre

Phone: [redacted]

Fax: [redacted]

Situation Report 11

Date: Sunday 9 January 2011

Time: 17:51

From: Duty Engineer
Sent: Sunday, 9 January 2011 5:51 PM
To: Distribution List
Cc: Distribution List
Subject: Situation Report 1700 Sunday 9/1/2011

Rainfall

Catchment average rainfall for the past 12 hours is; North Pine Dam (60 mm); Somerset Dam (150 mm); Wivenhoe Dam (80 mm). The bulk of the rain that has fallen in the upper reaches of the Stanley and Brisbane Rivers.

The BOM rainfall forecast for the next few days is:-

Monday:	Very heavy rain periods with totals up to 300mm centred around North Pine.
Tuesday:	Rain periods with totals up to 150mm centred around North Pine.
Wednesday	A few showers less than 10mm
Thursday	A shower or two.
Friday	A shower or two.
Saturday	Mostly fine.

A severe whether warning remains current for heavy rainfall in the dam catchment areas. The dam catchments are relatively saturated and significant inflows will be generated if the forecast rainfall eventuates.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is currently 39.65 m AHD and rising at 1600. Following the rain in the 9 hours, the number of open gates has been increased from 2 to 5 which are expected to remain open for the next 12 hours. Youngs Crossing will remain closed while releases are in progress.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 100.75 m AHD and rising quickly. Estimated peak inflow to the dam is about 3,000m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 101.5 during early Tuesday morning.

Since the commencement of the event on 02/01/2011approximately 80,000ML has been released from the dam, with an event total of at least 320,000ML based on the recorded rainfall to date. The event total is expected to increase significantly due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Wednesday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently rising again, with the current level being 68.70m AHD. Estimated peak inflow to the dam just from the Upper Brisbane R is about 5,000m3/s and, at this stage, the dam will reach at least 72.5 m AHD during Wednesday morning. River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. The current gate operation strategy will maintain flows of around 1,600m^3/s in the mid-Brisbane River for the next 24 hours. This may mean temporarily reducing releases from Wivenhoe Dam as Lockyer flows increase. However, releases may have to be increased significantly during Monday depending on the rain in the next 12 to 24 hours. The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day).

Since the commencement of the event on 02/01/2011 approximately 210,000ML has been released from the dam, with an event total approaching 1,000,000ML (including Somerset outflow) based on the recorded rainfall to date. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Saturday 15th January 2011.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Saturday 15 January.

At this stage Fernvale and Mt Crosby Weir Bridge will not be affected for the next 24 hours but there is a strong possibility that, if the predicted rainfall totals eventuate in the next 12 to 24 hours, higher releases from Wivenhoe Dam will be necessary. This may adversely impact upon Fernvale and Mt Crosby Weir Bridges as early as Tuesday morning.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 12

Date: Sunday 9 January 2011

Time: 21:04

From: Duty Engineer
Sent: Sunday, 9 January 2011 9:04 PM
To: Distribution List
Cc: Distribution List
Subject: Situation Report 2100 9/01/2011
Importance: High

Rainfall

Very heavy rainfall has been recorded in the upper reaches of the Brisbane and Stanley in the last 6 hours with totals up 100 to 140mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours, especially around the Bremer/Warrill catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 101.68 m AHD (about 500,000ML currently in storage) and rising quickly. Peak inflow to the dam is estimated to be about 4,000 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 early Tuesday morning which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 100,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This may increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor’s Ck have already reached 6,700m3/s and the river is still rising.

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,00 of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m3/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased from noon Monday and the release is expected increase to at least 2,600m3/s during Tuesday morning.

Since the commencement of the event on 02/01/2011 approximately 220,000ML has been released from the dam, with an event total approaching 1,000,000ML without further rain and as much as 1,500,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 13

Date: Monday 10 January 2011

Time: 01:14

From: Duty Engineer
Sent: Monday, 10 January 2011 1:14 AM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

Rainfall

Very heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up 100 to 240mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.95 m and steady. Five gates are open releasing 445 m3/s. The inflow into the dam since the commencement of the event is 42,000 ML. Estimated event volume is 57,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 102.22 m AHD and rising quickly (storing 157,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 on Monday afternoon which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 115,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m3/s and the river has just peaked at 23:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed or are in the process of being closed.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased during early Monday morning and the release is expected to increase to at least 2,600m3/s.

Since the commencement of the event on 02/01/2011 approximately 240,000ML has been released from the dam, with an event total approaching 1,500,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Regards

Engineer 3
Duty Engineer
Flood Operations Centre

Situation Report 14

Date: Monday 10 January 2011

Time: 06:30

From: Duty Engineer
Sent: Monday, 10 January 2011 6:30 AM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 06:00 on Monday 10 January 2011

Rainfall

Moderate to heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up to 90 mm. Totals for the last 24 hours range from 100 to 325mm.

Mt Glorious recorded 100 mm in the last 12 hours.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.97 m and steady. Five gates are open releasing 475 m3/s. The inflow into the dam since the commencement of the event is 52,000 ML. Estimated event volume is 72,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level at 05:00 was 102.84 m AHD and rising (storing 193,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5 mAHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 142,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam have peaked and are falling slowly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have peaked at 7,350m3/s at 23:00 on Sunday 9 January. This peak is bigger than January 1974 and February 1999 at this location.

The dam level is rising quickly, with the current level being 70.77m AHD (storing 450,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R is around 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it was necessary to start to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed.

The current release rate from Wivenhoe Dam is 1,753m3/s (150,000ML/day). Gate opening will continue to be increased during Monday and the release is expected to increase to at least 2,600m3/s in the next 12 to 24 hours.

Since the commencement of the event on 02/01/2011 approximately 275,000ML has been released from the dam, with an event total approaching 1,600,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels. Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Engineer 3
Duty Engineer
Flood Operations Centre

error please contact the sender immediately and delete the material from your email system. QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

Situation Report 15

Date: Monday 10 January 2011

Time: 12:16

From: Duty Engineer
Sent: Monday, 10 January 2011 12:16 PM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 12:00 on Monday 10 January 2011

Rainfall

Rainfall has continued in the dam catchments over the last 6 hours, with approximate catchment averages as follows: North Pine (30mm); Wivenhoe Dam (20mm); Somerset Dam (40mm). A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 40.00m AHD and relatively steady (storing 9,000ML above FSL). Five gates are open and releasing 500 m3/s. The inflow into the dam since the commencement of the event is 63,000 ML. Estimated event volume is 77,000 ML assuming no further rainfall. Gate operations will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.11m AHD and rising (storing 210,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000ML/day) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5m AHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 182,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday 13 January 2011.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 71.95m AHD and rising quickly (storing 610,000 ML above FSL). Peak inflow to the dam is estimated to be about 8,800m3/s. Five radial gates are open releasing about 2000m3/s (170,000ML/day) into the Brisbane River. At this stage, the dam will reach about 73.5m AHD during Tuesday morning. Flows in the Brisbane River above the dam at Gregor's Creek peaked at 7,350m3/s and this peak is bigger than both the January 1974 and February 1999 flood events at this location.

The objective for dam operations is to minimise the impact of urban flooding in areas downstream of the dam and the current aim is to keep river flows in the lower Brisbane River below 3,500m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s.

Since the commencement of the event on 02/01/2011 approximately 325,000ML has been released from the dam, with an event total approaching 1,600,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16 January 2011.

The volume between the expected peak (73.5m AHD) and the level at which the safety of the dam becomes the primary objective in managing flood releases (74.0m AHD) is 75,000ML. The volume between the expected peak (73.5m AHD) and initiation of the first Fuse Plug is 330,000ML.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 16

Date: Monday 10 January 2011

Time: 18:43

From: Duty Engineer
Sent: Monday, 10 January 2011 6:43 PM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 18:00 on Monday 10 January 2011

Rainfall

Only minor rainfall has been experienced in the North Pine Dam and Somerset Dam catchments with a catchment averages of less than 20mm.

However, significant rain has fallen in the Wivenhoe Dam catchment over the last 6 hours, with isolated falls exceeding 100mm. This rainfall has significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.84m AHD and falling slowly (storing 9,000ML above FSL). Five gates are open and releasing 362 m3/s. The inflow into the dam since the commencement of the event is 72,000 ML. Estimated event volume is 84,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.46m AHD and rising slowly. Peak inflow to the dam is estimated to be about 4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1700m3/s and this discharge will decrease slowly in the next 24 hours to be around 1200m3/s late Tuesday. The dam level will peak at 103.5m AHD in the next few hours, unless further significant rainfall is experienced. Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 72.92m AHD and rising quickly. Releases from the dam have been increased over the last 3 hours in accordance with Flood Mitigation procedures and to ensure that a fuse plug is not initiated. The initiation of a fuse plug will result in a rapid uncontrolled outflow from the dam of 2,000m3/s being added to the gate release outflow. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing. The flash flooding experienced in the upper areas of Lockyer Creek have been examined and are not expected to significantly increase Brisbane River flows above the current projection of 4000m3/s at Moggill.

Five radial gates are currently open at the dam releasing about 2,400m3/s into the Brisbane River and this will need to be increased steadily to an outflow of 2,800m3/s. At this stage, the dam will reach about 73.8m AHD during Tuesday morning.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 17

Date: Monday 10 January 2011

Time: 23:56

From: Duty Engineer
Sent: Monday, 10 January 2011 11:56 PM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 00:00 Tuesday 11 January 2011

Rainfall

Rainfall continues in the North Pine Dam, Somerset Dam and Wivenhoe Dam catchments with falls of generally less than 20mm since 18:00 today. However, some isolated falls in the Upper Brisbane River of up to 110 mm have been recorded at Monsildale in this time. This rainfall will increase inflows into the dam.

A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 16:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.80m AHD and falling slowly (storing 4,400ML above FSL). Five gates are open, releasing 153 m3/s. The inflow into the dam since the commencement of the event is 74,000 ML. Estimated event volume is 84,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.40m AHD and falling slowly. Peak inflow to the dam is estimated to be about 4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1700m3/s and this discharge will decrease slowly in the next 24 hours to be around 1200m3/s late Tuesday. The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, unless further significant rainfall is experienced. Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 73.22m AHD and rising at about 50 mm/hour. Releases from the dam have been held at a rate of 2,750 m3/s since 19:30 hours. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

The BoM has provided further advice about the flash flooding experienced in the upper areas of Lockyer Creek. The rainfall responsible for this event was not observed at any rainfall stations but it is considered to be very significant. Flood levels in the Lockyer Creek catchment will exceed maximum recorded levels in some stations in the upper catchment. This flow may result in increases in Brisbane River levels below the junction of Lockyer Creek.

Five radial gates are currently open at the dam releasing about 2,750m3/s into the Brisbane River. At this stage, the dam will reach about 73.8m AHD during Tuesday afternoon.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

The BoM will provide further information regarding the magnitude of the flash flood event occurring in Lockyer Creek early Tuesday morning. Consideration will be given to modifying the releases from Wivenhoe Dam to try to moderate the peak flows emanating from Lockyer Creek.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Regards

Engineer 1
Duty Engineer
Flood Operations Centre

Situation Report 18

Date: Tuesday 11 January 2011

Time: 06:12

From: Duty Engineer
Sent: Tuesday, 11 January 2011 6:12 AM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 06:00 on Tuesday 11 January 2011

Rainfall

Rainfall continues in the North Pine Dam, Somerset Dam and Wivenhoe Dam catchments. Isolated falls in the Upper Brisbane River of up to 125 mm have been recorded with widespread falls of 40 to 70 mm in the Somerset Dam catchment. This rainfall will increase inflows into the dam.

There has also been 20 to 60 mm in the Lockyer Creek catchment in the last 12 hours with falls of up to 30 mm in the Bremer River.

A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 16:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.80m AHD and has commenced rising again (storing 4,400ML above FSL). Five gates are open releasing 177 m3/s. The inflow into the dam since the commencement of the event is 77,000 ML. Estimated event volume is 88,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.27m AHD and falling slowly. Peak inflow to the dam is estimated to be about 4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1400 m3/s and this discharge will be decreased in the next few hours to be around 500 m3/s later on Tuesday. This is to ensure that the combined flood mitigation capacity in Somerset and Wivenhoe Dam is maximized.

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 73.51m AHD and rising at about 25 mm/hour. Releases from the dam have been held at a rate of 2,750 m3/s since 19:30 hours on Monday 10 January 2011. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

The BoM has provided further advice about the flash flooding experienced in the upper areas of Lockyer Creek. The rainfall responsible for this event was not observed at any rainfall stations but it is considered to be extreme. Flood levels in the Lockyer Creek catchment will exceed maximum recorded levels in some stations in the upper catchment. This flow will result in increases in Brisbane River levels below the junction of Lockyer Creek.

Five radial gates are currently open at the dam releasing about 2,750m3/s into the Brisbane River. At this stage, the dam will reach just over 74.0m AHD during Tuesday evening.

Above EL 74.0m AHD the objective for dam operations is to maintain the security of the dam and minimise downstream flood flows if possible.

If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

The BoM will provide further information regarding the magnitude of the flash flood event occurring in Lockyer Creek early Tuesday morning. Consideration was given to modifying the releases from Wivenhoe Dam to try to moderate the peak flows emanating from Lockyer Creek but the rainfall in the past 12 hours in the catchment above the dam makes this option not possible. Therefore instead of decreasing releases to accommodate the Lockyer Creek flows, the strategy will endeavour to maintain the current releases until Lockyer Creek peaks.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Duty Engineer
Flood Operations Centre

Situation Report 19

Date: Tuesday 11 January 2011

Time: 12:11

From: Duty Engineer
Sent: Tuesday, 11 January 2011 12:11 PM
To: Distribution List
Subject: SitRep 1200 11/1/2011

Somerset/Wivenhoe

Our current strategy revolves around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 4,500 to 5,000m3/s at the time. However, it may be that fuse plug initiation might provide a lower outflow than increasing the gate outflow to protect it. In this case, we would adopt an alternate scenario.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy.

1. With no further rainfall, Wivenhoe will approach 75.0m AHD and there will be an attempt to limit the dam outflow to 4,500m3/s, however this strategy currently being reviewed on an hour by hour basis. The release will be 4,000m3/s by 1300.
2. With 50mm rainfall in the Stanley and Upper Brisbane in the next 12 to 24 hours, the release will need to be significantly increased to be in the order 6,000m3/s.

It should be noted that the flow in the lower Brisbane River in 1974 was about 9,500m3/s

Wivenhoe has lost incoming mains power and are on backup power. Energex are attempting to rectify.

North Pine

Inflows and outflows are increasing very rapid and will exceed 2,000m3/s.

Duty Engineer
Flood Operations Centre

Situation Report 20

Date: Tuesday 11 January 2011

Time: 18:00

From: Duty Engineer
Sent: Tuesday, 11 January 2011 6:00 PM
To: Distribution List
Subject: Situation Report 1800 12 January 2011

In the last twelve hours totals of up to 370mm have fallen in the area around Wivenhoe Dam. In the last hour, rainfalls between 15 and 30mm have been recorded in the same area. At 1600, the BoM advised that falls between 50 to 100mm are still forecast for the 24hrs to 1600 Wednesday 12 January 2011 for the North Pine and Somerset/Wivenhoe catchments.

At 1730 Wivenhoe Dam was 74.92m AHD and rising slowly and releasing about 6,700m3/s.

The current expectation is that the dam will reach a steady state (outflow equals inflow) within the next 3 hours without further significant rainfall. At this time, release from the dam will be about 8,000 m3/s.

If there is no further rainfall, it may be possible to then slowly reduce this release overnight.

The dam is expected to peak below 75.5m AHD which is 100mmm below the first fuse plug initiation level.

Note that the automatic recorder as indicated on the BoM website is affected by drawdown and is not reflecting the actual lake level and tendency.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

The next report will be issued at 2100 12 January 2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 21

Date: Wednesday 12 January 2011

Time: 05:49

From: Duty Engineer
Sent: Wednesday, 12 January 2011 5:49 AM
To: Distribution List
Subject: Situation Report 0600 Wed 12/01/2011

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Wivenhoe Dam peaked on the 11th January, Tuesday night at 19:00 at 74.97 mAHD with a corresponding discharge of 7,450 m3/s. The release have now been scaled back to 4,300m3/s at 05:00 am. Wivenhoe Dam is currently 74.77 m AHD and falling slowly.

The releases from Wivenhoe Dam will be temporarily reduced to 2,500 m3/s to allow the peak of Lockyer Creek to enter the Brisbane River, after which they will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

Somerset Dam is at 105.10 mAHD and slowly rising. The dam is discharging 1,230 m3/s over the spillway. The dam is expected to peak this morning near its current level. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing on Thursday.The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine Dam is currently releasing 105 m3/s through five gates. At 17:00 the lake was 39.78 mAHD. The event has a volume of around 200,000 ML. The peak discharge from the dam was 2,800 m3/s. This is categorised as an extreme event in the order of 1 in 10,000.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

The next report will be issued at 08:00 12 January 2011.

Regards

Engineer 1
Duty Engineer
Flood Operations Centre

Situation Report 22

Date: Wednesday 12 January 2011

Time: 07:57

From: Duty Engineer
Sent: Wednesday, 12 January 2011 7:57 AM
To: Distribution List
Subject: RE: Situation Report 0800 Wed 12/01/2011

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011 and the dam is discharging 1,230 m3/s over the spillway. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing later Wednesday.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.75 m AHD at 07:30 and generally falling slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine

At 07:00 North Pine Dam was 39.78 mAHD falling and releasing about 105 m3/s. North Pine has peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be close later Wednesday or early Thursday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

The next report will be issued at 12:00 12 January 2011.

Regards

Engineer 2

Duty Engineer
Flood Operations Centre

Situation Report 23

Date: Wednesday 12 January 2011

Time: 15:18

From: Duty Engineer
Sent: Wednesday, 12 January 2011 3:18 PM
To: Distribution List
Cc: Distribution List
Subject: Situation Report 1500 Wed 12/01/2011

Rainfall

Rainfall in the last 12 hours is generally below 5mm with a couple of 10mm falls in the Stanley and North Pine catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. One sluice was opened at 1030 12 January 2011 and the dam is discharging 1,440 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.81 m AHD at 15:00 and steady.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine

At 15:00 North Pine Dam was 39.74 mAHD falling with all gates open 1 increment, releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be closed on Thursday or Thursday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

The next report will be issued at 18:00 12 January 2011.

Regards

Engineer 2

Duty Engineer
Flood Operations Centre

Situation Report 24

Date: Wednesday 12 January 2011

Time: 17:57

From: Duty Engineer
Sent: Wednesday, 12 January 2011 5:57 PM
To: Distribution List
Cc: Distribution List
Subject: Situation Report 1800 Wed 12/01/2011

Rainfall

Rainfall in the last 12 hours is generally below 5mm with a couple of 10mm falls in the Stanley and North Pine catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. One sluice was opened at 1030 12 January 2011. Somerset Dam was 104.87 mAHD at 1700 12 January 2011 and discharging 1,410 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.82 m AHD at 17:00 and steady.

The release from Wivenhoe Dam was reduced to 2,500 m3/s at 07:30 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River and this release has been maintained since. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. The release is expected to commence Thursday and then be maintained at this level to drain the flood storage component within the required 7 days. The releases will not result in any renewed rises at downstream locations.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be 2.6 million megalitres.

North Pine

At 17:00 North Pine Dam was 39.74 mAHD steady with all gates open 1 increment, releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be closed on Thursday or Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy regularly. The FOC is maintaining close contact with warning agencies and local councils.

The next report will be issued at 06:00 13 January 2011.

Regards

Engineer 2

Duty Engineer
Flood Operations Centre

Situation Report 25

Date: Thursday 13 January 2011

Time: 05:43

From: DutyEngineer
Sent: Thursday, 13 January 2011 5:43 AM
To: DutyEngineer '
Subject: Situation Report 0600 13 January 2011

Rainfall

Rainfall in the last 12 hours is generally below 5mm with isolated falls of up to 15mm in the Stanley, Lockyer and Pine River catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 06:00 on Wednesday 12 January 2011. The current level is 104.34 mAHD. One sluice was opened at 10:30 on 12 January 2011 and the dam is currently discharging 1,130 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.72 m AHD at 06:00 and commence to fall slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 on Wednesday 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River. The Brisbane River has peaked at the Port Office Gauge early Thursday morning. Releases from Wivenhoe Dam will be managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 06:00 North Pine Dam was 39.70 mAHD falling with all gates open 1 increment, releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that all gates will be closed on Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and reviewing operating strategy. The FOC will continue to maintain close contact with warning agencies and local councils.

The next report will be issued at 18:00 on Thursday 13 January 2011.

Regards

Engineer 1

Duty Engineer
Flood Operations Centre

Situation Report 26

Date: Thursday 13 January 2011

Time: 18:43

From: Duty Engineer
Sent: Thursday, 13 January 2011 6:43 PM
To: Distribution List
Subject: Situation Report 1830 13 January 2011

Rainfall

There has been no significant rainfall in the last 12 hours and none is expected for the next 5 days.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011. The current level is 103.60 mAHD and falling. Four sluices are open and the dam is currently discharging 1,528 m3/s.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.5 mAHD at 18:00 and continuing to fall slowly.

The releases from Wivenhoe Dam are currently 2,888 m3/s and are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 18:00 North Pine Dam was 39.60 mAHD and falling with 5 gates open, releasing about 151 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

All gates will be closed at 05:00 Friday to enable MMRC to consider reopening Youngs Crossing.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and reviewing operating strategy. The FOC will continue to maintain close contact with warning agencies and local councils.

The next report will be issued at 06:00 on Friday 14 January 2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 27

Date: Friday 14 January 2011

Time: 05:35

From: Duty Engineer
Sent: Friday, 14 January 2011 5:35 AM
To: Distribution List
Subject: FOC Situation Report at 06:00 on Friday 14 January 2011

Rainfall

There has been no significant rainfall in the last 12 hours and falls of only 5mm is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011. The current level is 102.87 mAHD and falling. Four sluices are open and the dam is currently discharging about 1,300 m3/s.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s. At 05:00 Wivenhoe Dam was 74.74.08 mAHD and continuing to fall.

The releases from Wivenhoe Dam are currently about 3,500 m3/s and are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component by Wednesday.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 05:00 North Pine Dam was 39.40 mAHD and gate operations have ceased. The current level is expected to increase to just over 39.5 mAHD in the next few days due to base-flow. This could be higher if further rainfall occurs.
Fish recovery has commenced and MBRC have been advised that the gates have been closed. MBRC will inspect Youngs Crossing to determine if the crossing can be re-opened.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments. The FOC will continue to maintain close contact with warning agencies and local councils.

The next report will be issued at 18:00 on Friday 14 January 2011.

Regards

Engineer 1
Duty Engineer
Flood Operations Centre

Situation Report 28

Date: Saturday 15 January 2011

Time: 06:36

From: Duty Engineer
Sent: Saturday, 15 January 2011 6:36 AM
To: Distribution List
Subject: Situation Report 0630 Saturday 15 January 2011

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

At 06:00 Somerset Dam was 101.35 mAHD and falling. Four sluices are open and the dam is currently discharging about 920 m3/s. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011.

At 05:00 Wivenhoe Dam was 72.86 mAHD and continuing to fall. The releases from Wivenhoe Dam are currently about 3,500 m3/s and are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release level is being maintained to drain the flood storage component by Wednesday.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 05:00 North Pine Dam was 39.40 mAHD and gate operations have ceased. This level is expected to increase to just over 39.5 mAHD in the next few days due to base-flow. This could be higher if further rainfall occurs.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils.

The next report will be issued at 18:00 on Saturday 15 January 2011.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 29

Date: Sunday 16 January 2011

Time: 06:09

From: Duty Engineer
Sent: Sunday, 16 January 2011 6:09 AM
To: Distribution List
Subject: Situation Report 0600 Sunday 16 January 2011

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

At 06:00 Somerset Dam was 100.01 mAHD and falling. Four sluices are open and the dam is currently discharging about 820 m3/s. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011.

At 06:00 Wivenhoe Dam was 71.3 mAHD and continuing to fall. The releases from Wivenhoe Dam are currently about 3,477 m3/s and are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release level is being maintained to drain the flood storage component by Wednesday.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 06:00 North Pine Dam was 39.46 mAHD. All gates are closed. The lake level is expected to increase to just over 39.5 mAHD in the next few days due to base-flow. This could be higher if further rainfall occurs.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils.

The next report will be issued at 18:00 on Sunday 16 January 2011.

Engineer 3
Duty Engineer
Flood Operations Centre

Situation Report 30

Date: Monday 17 January 2011

Time: 16:56

From: Duty Engineer
Sent: Monday, 17 January 2011 4:56 PM
To: Distribution List
Subject: Situation Report 1700 Monday 16 January 2011

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

At 16:00 Somerset Dam was 99.02 mAHD and steady. The last sluice gate was closed at 7:00 17/01/2011 and one regulator was opened the base-flow into the Dam. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011.

At 16:00 Wivenhoe Dam was 68.66 mAHD and continuing to fall. The releases from Wivenhoe Dam are currently about 2946 m3/s. Releases will be steadily reduced before final closure on Thursday morning. The Dam will be near full supply and releases will be made through the regulator to account for ongoing base-flow.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

It should be noted that the automatic recorder currently being reported on the BoM website is currently incorrect and has been since early Tuesday 11 2011.

North Pine

At 09:00 North Pine Dam was 39.5 mAHD. All gates are closed. No further gate operations are expected unless additional rainfall falls.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils. Councils have been informed of the current release strategy. The bridges below Wivenhoe Dam will progressively come out of water over the next few days.

Engineer 3
Duty Engineer

Flood Operations Centre

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Situation Report 31

Date: Tuesday 18 January 2011

Time: 06:17

From: Duty Engineer
Sent: Tuesday, 18 January 2011 6:17 AM
To: Distribution List
Subject: Situation Report 0615 Tuesday 18 January 2011

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

At 16:00 Monday Somerset Dam was 99.02 mAHD and steady. The last sluice gate was closed at 07:00 17/01/2011 and one regulator remains open managing the base-flow into the Dam. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011.

At 06:00 Tuesday Wivenhoe Dam was 67.82 mAHD and continuing to fall slowly. Releases were held constant overnight at about 2,050 m3/s to assist water supply pumping at Lowood. Following discussions with water supply operators, it has been decided to resume closing gates at 09:00 Tuesday before final closure on Thursday morning. The Dam will be near full supply and releases will be made through the regulator to account for ongoing base-flow.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

It should be noted that the Seqwater water level gauge currently being reported on the BoM website is currently slightly under reading by about 50mm.

North Pine

At 09:00 North Pine Dam was 39.5 mAHD. All gates are closed. No further gate operations are expected unless additional rainfall falls.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils. Councils have been informed of the current release strategy.

At 05:00, the Wivenhoe Dam operator reported that the Fernvale Bridge was out of water but water remained over the approaches from Fernvale. He also advised that there were power lines on the bridge and that Energex was advised.

The remaining bridges below Wivenhoe Dam will progressively come out of water over the next few days.

Engineer 2
Duty Engineer
Flood Operations Centre

Situation Report 32

Date: Tuesday 18 January 2011

Time: 17:40

From: Duty Engineer
Sent: Tuesday, 18 January 2011 5:40 PM
To: Distribution List
Cc: Distribution List
Subject: FOC Situation Report at 18:00 on Tuesday 18 January 2011

Rainfall

Severe thunderstorms are passing over Wivenhoe, Somerset and North Pine Dams this afternoon. To 17:00 falls of 20 to 30 mm where recorded at isolated locations including Mt Pechey and Kluvers Lookout.

A severe thunderstorm warning remains in place for the Stanley River Valley near Kilcoy.

Somerset/Wivenhoe

At 16:00 Tuesday Somerset Dam was 98.95 mAHD and steady. The last sluice gate was closed at 07:00 17/01/2011 and one regulator remains open managing the base-flow into the Dam. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011.

At 16:00 Tuesday Wivenhoe Dam was 67.31 mAHD and continuing to fall slowly. Releases were held constant since 15:00 at about 1,450 m3/s to assist water supply pumping at Lowood. The shutdown sequence is scheduled to re-commence at 03:00 on Wednesday 19 January 2011 morning before final closure on Thursday morning. The Dam will be lowered to 66.5 mAHD (95% capacity) and releases will be made through the regulator to account for ongoing base-flow.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

It should be noted that the Seqwater water level gauge currently being reported on the BoM website is currently slightly under reading by about 50mm.

North Pine

At 09:00 North Pine Dam was 39.56 mAHD and rising slowly. All gates are closed. No further gate operations are expected unless additional rainfall falls. This situation will be closely monitored whilst storms remain in the vicinity.

North Pine peaked at 41.11 mAHD at 14:00 on Tuesday 11 January 2011 with a peak release of 2,800 m3/s. The flood event volume is estimated to be around 200,000 ML.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils. Councils have been informed of the current release strategy.

The remaining bridges below Wivenhoe Dam will progressively come out of water over the next few days.

Regards

Engineer 1
Duty Engineer
Flood Operations Centre

Situation Report 33

Date: Wednesday 19 January 2011

Time: 05:28

From: Duty Engineer
Sent: Wednesday, 19 January 2011 5:28 AM
To: Distribution List
Cc: Distribution List)
Subject: FOC Situation Report at 06:00 on Wednesday 19 January 2011

Rainfall

Severe thunderstorms passed over the Wivenhoe, Somerset and North Pine dam catchments yesterday afternoon and evening. Falls of 20mm to 30mm where recorded at isolated locations.

North Pine

A decision was made at 1900 yesterday to drain the dam down to 39.40m AHD overnight to cater for the inflow resulting from yesterday's storms and ensure that Youngs Crossing remains open during the day today. All gates were closed at 0500 today and a fish recovery operation also commenced at this time. Youngs Crossing will be reopened by the MBRC at around 0700. The dam level will rise slowly during the day and further releases may be required again tonight with more rainfall forecast. The current lake level is 39.42m AHD.

Somerset Dam

All regulators were closed at 2000 yesterday. The dam level is currently 98.95m AHD and rising slowly. Further regulator releases will take place today and again over the next few days to maintain the dam at the full supply level. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011; all sluice gates were closed on Monday 17 January 2011.

Wivenhoe Dam

The Lowood temporary pump station was relocated at 2100 yesterday. This relocation removed the need to continue high flow releases from the dam to ensure treated water supplies to Lowood are maintained. Discussions with BCC last night also concluded that tidal variations are primarily back to normal patterns and having a greater impact on the foundation conditions of Coronation Drive than the tapering of releases from the dam. Accordingly the radial gate close down sequence recommenced at 21:45 last night and all gates will be closed by 1600 today. The dam level when the last gate is closed will be around 66.90m AHD and a fish recovery operation will continue through most of the day during the close down sequence. Releases will continue through the regulator cone valve and possibly the Mini-Hydro (depending on when it can be re-started) to account for ongoing base-flow once all radial gates are closed.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s. The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres. It should be noted that the Seqwater water level gauge currently being reported on the BoM website is currently slightly under reading by about 50mm.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils. Councils have been informed of the current release strategy. A summary of the bridge status along the Brisbane River between Wivenhoe Dam and Moggill is as follows, with the exact timing of water coming clear of bridges depending on how the radial gate close down sequence progresses during the day:

- Water is clear of Fernvale Bridge and Mt Crosby Weir Bridge.
- Water should be clear of Burtons Bridge, Kholo Bridge and Savages Crossing tonight.
- Water should be clear of Colleges Crossing tomorrow.
- It is not yet certain when water will be clear of Twin Bridges as this will depend on base flow draining requirements and a decision will be made on this later today. The earliest that Twin Bridges would be clear of water is late this afternoon.

Engineer 4
Duty Engineer
Flood Operations Centre

Situation Report 34

Date: Wednesday 19 January 2011

Time: 13:45

From: Duty Engineer
Sent: Wednesday, 19 January 2011 1:45 PM
To: Distribution List
Subject: Situation Report 1345 Wednesday 2011

Rainfall

No significant rainfall has been recorded in Wivenhoe, Somerset and North Pine dam catchments since 0900 Thursday. The forecast rainfall indicates that falls between 15 to 25mm with isolated heavier falls to 50mm are expected in the next 24 hours.

North Pine

A decision was made at 1900 Wednesday to drain the dam down to 39.40m AHD overnight to cater for the inflow resulting from Wednesday's storms and ensure that Youngs Crossing remains open during the day Thursday. All gates were closed at 0500 Thursday and a fish recovery operation also commenced at this time. Youngs Crossing was expected to be reopened by the MBRC at around 0700. The dam level will rise slowly during the day and further releases may be required again tonight with more rainfall forecast. The lake level was 39.43m AHD at 0700.

Somerset Dam

All regulators were closed at 2000 Wednesday. The dam level was 99.00 m AHD at 0700 Thursday and rising slowly. Further regulator releases may take place over the next few days to maintain the dam at the full supply level. Somerset Dam peaked at 105.11 mAHD at 18:00 on Wednesday 12 January 2011; all sluice gates were closed on Monday 17 January 2011.

Wivenhoe Dam

All gates were closed at Wivenhoe at 1200 Thursday, with the dam level at 66.89m AHD at 1300. Following fish recovery and inspections, minor ongoing releases will be made for through the centre gate to account for ongoing small inflows. It is intended to drain down to 95%, approximately 66.5 m AHD.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on Tuesday 11 January 2011 with a corresponding discharge of 7,450 m3/s. The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

Strategy

A summary of the bridge status along the Brisbane River between Wivenhoe Dam and Moggill is as follows, with the exact timing of water coming clear of bridges depending on how the radial gate close down sequence progresses during the day:

- Water is clear of Fernvale Bridge and Mt Crosby Weir Bridge.

- Water should be clear of Burtons Bridge, Kholo Bridge and Savages Crossing tonight.
- Water should be clear of Colleges Crossing tomorrow.
- It is not yet certain when water will be clear of Twin Bridges as this will depend on base flow draining requirements and a decision will be made on this later Thursday.

The Flood Operations Centre is now closed and control of the dams has reverted to normal Seqwater operations. However, the FOC will continue to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments.

Engineer 2
Duty Engineer
Flood Operations Centre

APPENDIX F – COMMUNICATION PROTOCOL TECHNICAL SITUATION REPORTS

Technical Situation Report 1

Date: Monday 27 December 2010

Time: 08:14

The Flood Centre will keep you informed or leave messages on your phones.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

Reasonably significant rainfalls in the order of 40 to 50 mm have been experienced in the dam catchments in the last 24 hours, but the rainfall has only been in the order of 5 to 10mm in the last 6 hours. The QPF issued at 1600 yesterday was for 50 to 100mm and the severe weather warning associated with possible widespread rainfall in the dam catchments remains current and was re-issued by BOM at 0445 today. The current BOM forecast is:

Monday 27 December Rain periods
Tuesday 28 December Rain at times
Wednesday 29 December Rain at times
Thursday 30 December Shower or two
Friday 31 December Fine
Saturday 31 December Fine
Sunday 1 January Fine

With the current wet catchments, there is a high probability that the forecast rain will result in further flood releases from the dams over the coming week.

Somerset Dam

Two regulators were opened yesterday morning, to provide a release of 12000ML/day. Since that time the lake has continued to rise steadily to currently be around 99.60m or 600mm above the full supply level. Another regulator was opened this morning. Further gate operations may be necessary today if forecast rainfall results in subsequent river rises. Draining will take at least until Wednesday. The next update will be provided at around 1200 today.

Currently at 107.7% with 30,000ML over FSL.

Wivenhoe Dam

Radial Gate operations recommenced yesterday at 0900 and since that time the lake has risen steadily to currently be around 67.57m or 570mm above the full supply level. Because of outflows from Lockyer Creek, outflows from Wivenhoe Dam have been steadily reduced during the night to ensure Burtons Bridge remained open (current river levels have water at Burtons Bridge deck level and falling slowly). Radial gates at Wivenhoe Dam are being progressively wound back this morning as the Lockyer Creek outflows into the Brisbane River increase above 250 cumecs. This will keep Burtons Bridge open until late this afternoon. However it is anticipated that Lockyer Creek outflows will peak above 500 cumecs later today or early tomorrow and these flows will inundate Burtons Bridge. As this occurs, outflows from Wivenhoe Dam will be increased to drain the lake to near full supply level. Draining will take at least until Thursday. Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Wivenhoe is around 105.6% and 65,000ML over FSL.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing and Colleges Crossing are currently closed and will remain so until at least Thursday. Burtons Bridge is currently open, but will be closed late today or early tomorrow and is likely to remain closed until at least Wednesday. However, the length of time that Burtons Bridge will be closed is dependant upon the rainfall experienced over the next several days. Kholo Bridge remains unserviceable due to flood damage. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event.

An updated estimate of the time of closure of Burtons Bridge this afternoon will be provided to Council, but at this stage it is not expected to be before 1600 today. This may change as rainfall is experienced during the day.

Tide levels in Brisbane are decreasing generally so Wivenhoe releases should have minimal impact.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 2

Date: Tuesday 28 December 2010

Time: 07:12

The Flood Centre will keep you informed or leave messages on your phones.

Below is the current strategy.
Any comments or assessments let me know.

Basically with all the rain in the Lockyer we have not ramped up until it peaks and starts to drop to ensure there is no impact on Fernvale or Mt Crosby bridges.
This should still be later today as the Lockyer starts to drop.

Rainfall

Rainfalls in the order of 20 to 40 mm have been experienced in the dam catchments in the last 24 hours, but the rainfall has only been in the order of 5 mm in the last 12 hours. The QPF issued at 1600 yesterday was reduced to 25 to 35mm and the severe weather warning associated with possible widespread rainfall in the dam catchments is no longer current. The current BOM forecast is:

Tuesday 28 December Shower or two.
Wednesday 29 December Shower or two.
Thursday 30 December Fine.
Friday 31 December Fine
Saturday 31 December Mostly Fine
Sunday 1 January Few showers
Monday 27 December Showers

Although the dam catchments are saturated, BOM forecasts are currently indicating that dam inflows have peaked for the current event.

North Pine Dam – Just FYI

A flood release commenced at 2000 on Sunday 26 December 2010 and is now likely to continue until 0500 on Wednesday 29 December 2010 (tomorrow morning). This will allow Youngs Crossing to reopen by 0700 on Wednesday. Current outflows from Lake Kurwongbah would also be sufficient to inundate Youngs Crossing, regardless of releases from North Pine Dam, but these outflows should also subside by Wednesday morning. The current level in North Pine Dam is around 39.72 m AHD and falling, with all gates currently open. The situation will be reviewed throughout today, with the next update to be provided at around 1600 today.

Somerset Dam

A flood release through the regulator cone valves at the dam commenced at 0900 on Sunday 26 December 2010. The current release rate is 18000ML/day. Since commencing the release the lake has continued to rise steadily to currently be around 99.96m AHD or 960mm above the full supply level. Inflows into the dam are subsiding and unless further rainfall in the dam catchment is experienced, the lake will soon start to fall slowly to be back near the dam full supply level by Thursday. Sluice gate operations will commence this morning as Wivenhoe levels are approaching the point at which the regulator cone valves should not be used due to back water impacts. The total volume of water released since the release commenced on 26 December 2010 is 37,000ML, with the current projected total release volume for this event being 80,000ML.

Wivenhoe Dam

Radial Gate operations for the current event commenced at 0900 on Sunday 26 December 2010. After scaling up to an initial release rate of 30,000ML/day, the release was scaled back yesterday to the minimum radial gate release rate of 4,000ML/day to ensure that Burtons Bridge remained open until yesterday afternoon and to reduce flooding impacts in the Brisbane River caused by outflows into the river from Lockyer Creek. The current release rate remains at 4,000ML/day, but will be scaled up later today as Lockyer Creek flows subside. The current lake level is 68.55m AHD or 1550mm above the full supply level. Inflows into the dam are subsiding and unless further rainfall in the dam catchment is experienced, the lake will fall slowly once to release rate is scaled up, for the level to be back near the dam full supply level by around Sunday. The total volume of water released since the release commenced on 26 December 2010 is 28,000ML, with the current projected total release volume for this event being in the order of 375,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed and will remain so until at least Friday. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event, but Lockyer Creek outflows are being closely monitored and will come close to impacting upon the Mt Crosby Weir Bridge. An updated estimate of the likely time of opening of Burtons Bridge will be provided tomorrow.

Tide levels in Brisbane are decreasing generally so Wivenhoe releases should have minimal impact. BoM advice confirms this. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 3

Date: Wednesday 29 December 2010

Time: 07:16

The Flood Centre will keep you informed or leave messages on your phones.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

No rainfall has fallen in the past 12 hours to 0600 Wednesday with the exception of 2-4 mm in the upper Somerset Dam catchment.
The rainfall forecast issued by BOM at 1600 Tuesday indicated only 3-5 mm in the Somerset and Wivenhoe catchments and 5-10mm in the North Pine catchment for the next 24 hours. The current BOM forecast for SE Qld over the next few days is mostly fine with a few showers

However, catchments remain saturated and are primed for additional runoff in the event of rain.

Somerset Dam

A flood release through the regulator cone valves at the dam commenced at 0900 on Sunday 26 December 2010. Early Tuesday the regulators were closed and sluices progressively opened throughout the day. At 1800 Tuesday 2 sluices were open, releasing about 35,000 ML/day into Wivenhoe. A further two sluice gates where opened overnight in an attempt to bring the lake level down to 99.75 to enable recreational use of Somerset water activities to resume on Wednesday. At 1800, the lake level was 99.83m AHD and falling slowly. Two sluice gates will be closed by 12:00 29/12/2010 and two sluice gates are expected to remain open until Thursday and will be closed when the lake returns to the full supply level of 99m AHD. The total volume of water released since the event commenced on 26 December 2010 is 66,000ML, with the current projected total release volume for this event approaching 110,000ML.

Wivenhoe Dam

Radial gate operations for the current event commenced at 0900 on Sunday 26 December 2010. After scaling up to an initial release rate of 30,000ML/day, the release was scaled back Monday to the minimum radial gate release rate of 4,000ML/day to ensure that Burtons Bridge remained open and to reduce flooding impacts in the Brisbane River caused by flows from Lockyer Creek. Lockyer Ck outflow peaked at midday Tuesday and Wivenhoe gates were commenced to be re-opened at 1500 Tuesday, releasing on the back of the Lockyer recession. It is intended to gradually increase the Wivenhoe releases during Tuesday and Wednesday so that the combined release and Lockyer flow is maintained at about 1600m3/s (140,000 ML/day) in the mid Brisbane R. Note this is similar to the flows in the mid Brisbane in mid October and mid December 2010. This will be maintained until at least Saturday when it is expected that shut down procedure will commence. Gate closure sequencing will be such that the releases will mimic the natural pre-dam flows.

At 0600, the Wivenhoe water level was 69.26m AHD and rising slowly with the current release rate at 60,000ML/day. Inflows into the dam are subsiding and the lake will fall slowly once the release rate is scaled up 130,000 ML/day during Wednesday. It is aimed to return the dam to full supply level by Sunday. The total volume of water released since the event commenced on 26 December 2010 is 56,000ML, with the current projected total release volume for this event being in the order of 385,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed and will remain so until at least Sunday. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Tide levels in Brisbane are decreasing generally so Wivenhoe releases should have minimal impact. BoM advice confirms this. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 4

Date: Thursday 30 December 2010

Time: 07:03

The Flood Centre will keep you informed or leave messages on your phones.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

There has been no significant rainfall in the North Pine, Somerset and Wivenhoe catchments since 09:00 on Wednesday 29 December 2010. The current BOM forecast for SE Qld over the next few days is mostly fine with a few light showers, although there is a chance of storms on Tuesday and Wednesday next week.

The catchments remain saturated and are primed for additional runoff in the event of rain.

Somerset Dam

At 06:00 Thursday 30 December 2010, two sluices remain open, releasing about 35,000 ML/d into Lake Wivenhoe and are expected to remain open until Thursday afternoon when the lake returns to the full supply level of 99.00m AHD. The total volume of water released since the event commenced on 26 December 2010 is 104,000ML, with the current projected total release volume for this event approaching 123,000ML.

Wivenhoe Dam

Releases were gradually increased during Wednesday and Thursday morning until the combined release and Lockyer flow reached about 1,600m3/s (140,000 ML/d) in the middle Brisbane River. (Note this is similar to the flows in the releases made in mid-October and earlier in December 2010). This release will be maintained until mid-day Friday 31 December 2010, when the shut down procedure will commence and gates are expected to be fully closed by Sunday morning 2 January 2010. The proposed gate closure sequence will be such that the releases will mimic the natural pre-dam recessional flows.

Gauge board readings indicate that the Wivenhoe dam water level peaked at 69.33m at noon Wednesday 29 December 2010, about 2.3m above the full supply level. At this level, the dam was temporarily storing over 270,000ML of flood water. At 06:00 on Thursday 30 December 2010, the level had fallen slightly to 69.07m AHD and was releasing about 1,530m3/s (132,000ML/d). The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 160,000ML, with the current projected total release volume for this event being in the order of 425,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation and will remain so until at least Sunday 2 January 2011. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale

Bridge will be impacted by this event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.
Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this earlier in the week. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 5

Date: Friday 31 December 2010

Time: 06:51

The Flood Centre will keep you informed or leave messages on your phones of any issues or major changes.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

There has been no significant rainfall in the North Pine, Somerset and Wivenhoe catchments since 0900 on Wednesday 29 December 2010. The current BOM forecast for SE Qld over the next few days is mostly fine with a few light showers, although there is a chance of storms on Tuesday and Wednesday next week.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

Somerset Dam

At 0500 on Friday 31 December 2010, the lake level was 99.01m AHD falling from a peak of 100.0m AHD reached around noon Tuesday 28 December 2010. Two regulators are currently operating and will remain open until the lake returns to the full supply level of 99.00m AHD. The total volume of water released since the event commenced on 26 December 2010 is 126,000 ML, with the current projected total release volume for this event approaching 130,000ML.

Wivenhoe Dam

Releases were gradually increased during Wednesday and Thursday morning until the combined release and Lockyer flow reached about 1,600m3/s (140,000 ML/d) in the middle Brisbane River. (Note this is similar to the flows in the releases made in mid-October and earlier in December 2010). Flow measurement carried out by the Department of Environment and Heritage during Thursday has confirmed this flow. This release will be maintained until late Friday 31 December 2010, when the shut down procedure will commence and gates are expected to be fully closed by Sunday 2 January 2010. The proposed gate closure sequence will be such that the releases will mimic the natural pre-dam recessional flows.

Gauge board readings indicate that the Wivenhoe dam water level peaked at 69.33m at noon Wednesday 29 December 2010, about 2.3m above the full supply level. At this level, the dam was temporarily storing over 270,000ML of flood water. At 0500 on Friday 31 December 2010, the level had fallen slightly to 68.40m AHD and was releasing about 1,550m3/s (132,000ML/d). The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 293,000ML, with the current projected total release volume for this event being in the order of 450,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation and will remain so until at least Sunday 2 January 2011. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by this event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this earlier in the week. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 6

Date: Sunday 2 January 2011

Time: 09:37

This is the last update.
Let me know of any issues.

Many thanks for everyone's support.

Rainfall

There has been light falls of up to 30mm in the North Pine and Somerset Dam catchments in the 24 hours to 06:00 Sunday 2 January 2011 which has resulted in some runoff in the Stanley and Pine Rivers. The current BOM forecast for SE Qld over the next week is for light showers, although there is a chance of storms on Wednesday and Thursday next week.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

Somerset Dam

The rain in the Stanley River catchment has produced minor inflows and one regulator is partially open, managing the small inflows.

At 07:30 on Sunday 2 January 2010, the lake level was EL 99.10m AHD and rising slowly. The peak of the event occurred around noon on Tuesday 28 December 2010 with a level of EL 100.0 m. The total volume of water released since the event commenced on 26 December 2010 is 135,000 ML.

Wivenhoe Dam

At 09:00 on Sunday 2 January 2011, Wivenhoe Dam level was EL 67.10 m and gates are fully closed and fish recovery has commenced. Upon completion of this operation, a regulator will be fully opened to manage continuing low inflows to the dam.

The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 480,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the closure.

It is expected that the flow in the mid Brisbane R will fall below Burtons Bridge on Sunday morning and below Colleges Crossing by Monday morning. Twin Bridge will continue to be impact by the continuing low releases for several days.

Technical Situation Report 7

Date: Thursday 6 January 2011

Time: 12:16

The Flood Centre will keep you informed or leave messages on your phones.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

Since 9am Wednesday, there have been widespread falls of 30mm with isolated heavy falls up to 50mm in the Somerset and Wivenhoe catchments. Totals in the North Pine catchment have generally been below 10mm. Falls up to 60mm were recorded in the Leslie Harrison catchment.

The forecast for the next 24 to 48 hours is for totals up to 150mm in SE Qld.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

North Pine Dam

At 0700 Thursday, North Pine Dam was 39.60m, 0.05m below gate trigger level and having risen 0.18m since 2/1/2011 due to a combination of baseflow and runoff from rain in the last 24 hours.

Given the forecast rain, gate operations will commence tonight. MBRC will be advised this morning

Somerset Dam

At 0700 Thursday, Somerset Dam was 99.34m, 0.34m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the upper Stanley but there have been significant rises in Kilcoy Ck. Further regulator operations will be required later Thursday.

Wivenhoe Dam

At 0700 Thursday, Wivenhoe Dam was 67.31m and rising slowly. This is 0.31m above FSL and above the gate trigger level of 67.25m. There have been rises recorded at rivers and stream upstream of Wivenhoe Dam. Gates will be opened in the next 24 hours to manage the inflows from the upper Brisbane River and the outflow from Somerset.

Impacts of Wivenhoe Dam Releases

Based upon rain to date, expecting about 70,000ML from upper Brisbane. Lockyer Ck peak of about 100m3/s Friday afternoon. This will take out Twin Bridges and nearly inundate Savages Crossing. Colleges Crossing could be taken out by a combined Lockyer and local runoff.

Current strategy is to keep Burton Bridge free. On this basis, we will commence opening Wivenhoe at 1800 Thursday and ramp up to about 300m3/s by 2200. This would limit mid Brisbane flows to just under 400m3/s (Burtons capacity 450m3/s).
If rainfall increases and Lockyer and local runoff also increase, we can close/reduce Wivenhoe accordingly to ensure that that 450m3/s is not exceeded unless necessary.

Councils have been advised of this strategy and are contacting residents

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 8

Date: Saturday 8 January 2011

Time: 07:51

The Flood Centre will keep you informed or leave messages on your phones. Give them a call if you need further information.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

Since 0900 Friday, there has been widespread 20 to 40mm throughout North Pine, Somerset and Wivenhoe catchments with isolated higher totals of 70mm in the upper reaches of the Brisbane R. No significant rain has fallen in the past 12 hours.

Advice from BoM indicates that SE Qld can expect further high rainfall totals over the next 4 days.

Saturday:	Rain light at times 5-50mm with higher falls along the coast
Sunday:	Widespread rain with totals between 50-100mm
Monday:	Widespread rain again with totals between 50-100mm
Tuesday:	Rain easing with totals between 25-50mm

Given the saturated conditions of the catchments, significant inflows to Seqwater dams will be generated, especially following the forecast rainfall on Sunday/Monday.

North Pine (Full Supply Level 39.60 m AHD)

At 0600 Saturday, North Pine Lake Level was 39. 46 m AHD and slowly rising. Currently 3 gates are open to release runoff from rain on Wed/Thursday/Friday. Given the very high likelihood of significant runoff during the next 4 days, gates will be keep open to match inflows over the next few days, rather than opening and closing at various times with short notice. Youngs Crossing will remain adversely impacted for the duration of the gates being open. Moreton Bay Regional Council has been advised and concurs with this strategy.

Somerset (Full Supply Level 99.00 m AHD)

At 0500 Saturday, Somerset Dam level was 100.42m AHD and rising.   The Dam is releasing into Wivenhoe through one open sluice gate. Water will be temporarily held in Somerset to allow the inflow from the upper Brisbane is passed through the system. However, this strategy may need to be reviewed if significant runoff occurs in the Stanley and Upper Brisbane. Under circumstances of high inflows to Somerset and Wivenhoe, it is the usual practice to hold flood water in Somerset until there is a high level of confidence in the estimated inflows to Wivenhoe.

Since the commencement of the event on 02/01/2011, approximately 85,000ML has flowed into Somerset Dam with a further 20,000ML expected based on the recorded rainfall to date. Approximately 25,000ML has been released into Wivenhoe.

Wivenhoe (Full Supply Level 67.00 m AHD)

At 0600 Saturday, Wivenhoe Dam was 68.45 m AHD and rising steadily with all five gates open and releasing about 890 m3/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam It is intended to ramp up the release from Wivenhoe to 1,200m3/s by midday Saturday 08/01/2011. Further assessments will be undertaken to determine increases above this level. However, given the high likelihood of significant inflows in the next week, this may be increased.

Since the commencement of the event on 02/01/2011, approximately 200,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 180,000ML expected based on the recorded rainfall to date. Approximately 50,000ML has been released from Wivenhoe via the hydro and regulator at about 50m3/s.

Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.

The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 9

Date: Sunday 9 January 2011

Time: 07:32

The Flood Centre will keep you informed or leave messages on your phones. Give them a call if you need further information.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

Catchment average rainfall for the past 12 hours is; North Pine Dam (less than 10 mm); Somerset Dam (40 mm); Wivenhoe Dam (less than 10 mm). The bulk of the rain that has fallen in the Somerset Dam catchment has occurred in the last two hours, with recorded falls exceeding 60mm in some areas. The BOM forecast for the next seven days issued at 0450 this morning is:-

Sunday:	Rain periods.
Monday:	Rain periods.
Tuesday:	Rain periods.
Wednesday	A few showers.
Thursday	A shower or two.
Friday	A shower or two.
Saturday	Mostly fine.

A severe whether warning remains current for heavy rainfall in the dam catchment areas. The dam catchments are relatively saturated and significant inflows will be generated if the forecast rainfall eventuates.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is currently 39.47 m AHD and steady. Two radial gates remain open to release runoff generated from recent rainfall. Based on rainfall forecasts, the radial gates have been kept open in anticipation of further inflows over the next few days. However unless significant rain falls today, consideration will be given to closing the gates late this afternoon or early tomorrow morning and discussions to finalise a decision on the timing of radial gate closure will be held with the Moreton Bay Regional Council later today. Youngs crossing will remain closed while releases are in progress.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is currently falling slowly, with the current level being 100.27m AHD. However the rain that has fallen in the dam catchment over the last two hours (recorded falls exceed 60mm in some areas) will result in significant inflows later today. The current release rate into Wivenhoe Dam is 35,000ML/day. Since the commencement of the event on 02/01/2011approximately 56,000ML has been released from the dam, with a total of at least 150,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase significantly over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Tuesday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently falling slowly, with the current level being 68.58m AHD. River levels upstream of the dam are receding, however further inflows will result from any additional rainfall. The current gate operation strategy will maintain flows of around 1,600m^3/s in the mid-Brisbane River. The current release rate from Wivenhoe Dam is 116,000ML/day. Since the commencement of the event on 02/01/2011approximately 150,000ML has been released from the dam, with a total of at least 450,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Wednesday.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 10

Date: Monday 10 January 2011

Time: 06:23

The Flood Centre has kept you informed (and discussed with the BCC Flood Centre) of where we are at but below is a summary as at 1am this morning.

I will send off another Technical Report this morning so if you have any assessments or actions you are undertaking that you want included send them in.

Rainfall

Very heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up 100 to 240mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.95 m and steady. Five gates are open releasing 445 m3/s. The inflow into the dam since the commencement of the event is 42,000 ML. Estimated event volume is 57,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 102.22 m AHD and rising quickly (storing 157,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 on Monday afternoon which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 115,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m3/s and the river has just peaked at 23:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during

Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.
The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed or are in the process of being closed.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased during early Monday morning and the release is expected to increase to at least 2,600m3/s.

Since the commencement of the event on 02/01/2011 approximately 240,000ML has been released from the dam, with an event total approaching 1,500,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.
Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 11

Date: Monday 10 January 2011

Time: 15:27

The Flood Centre will keep you informed or leave messages on your phones. Give them a call if you need further information.

Below is the current strategy.
Any comments or assessments let me know.

Rainfall

Significant rainfall has fallen in the Wivenhoe Dam catchment over the last 3 hours, with falls exceeding 100mm. This rainfall will significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.41m AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000ML/day) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5m AHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 72.41m AHD and rising quickly. The rainfall experienced over the last 2 to 3 hours will result in significant further inflows into the dam and releases from the dam will need to be increased in accordance with Flood Mitigation procedures and to ensure that a fuse plug is not initiated. The initiation of a fuse plug will result in a rapid uncontrolled outflow from the dam of 2,000m3/s being added to the gate release outflow. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

Five radial gates are currently open at the dam releasing about 2,000m3/s into the Brisbane River and this will need to be increased steadily to an outflow of 2,800m3/s over the next 9 hours (commencing at 1500). At this stage, the dam will reach about 73.8m AHD during Tuesday morning.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 12

Date: Tuesday 11 January 2011

Time: 06:38

The Flood Centre has kept you informed (and discussed with the BCC Flood Centre) of where we are at but below is a summary as at 6am this morning.

I will send off another Technical Report this morning so if you have any assessments or actions you are undertaking that you want included send them in.

Rainfall

Rainfall continues in the North Pine Dam, Somerset Dam and Wivenhoe Dam catchments. Isolated falls in the Upper Brisbane River of up to 125 mm have been recorded with widespread falls of 40 to 70 mm in the Somerset Dam catchment. This rainfall will increase inflows into the dam.

There has also been 20 to 60 mm in the Lockyer Creek catchment in the last 12 hours with falls of up to 30 mm in the Bremer River.

A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 16:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.80m AHD and has commenced rising again (storing 4,400ML above FSL). Five gates are open releasing 177 m3/s. The inflow into the dam since the commencement of the event is 77,000 ML. Estimated event volume is 88,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.27m AHD and falling slowly. Peak inflow to the dam is estimated to be about 4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1400 m3/s and this discharge will be decreased in the next few hours to be around 500 m3/s later on Tuesday. This is to ensure that the combined flood mitigation capacity in Somerset and Wivenhoe Dam is maximized.

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 73.51m AHD and rising at about 25 mm/hour. Releases from the dam have been held at a rate of 2,750 m3/s since 19:30 hours on Monday 10 January 2011. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

The BoM has provided further advice about the flash flooding experienced in the upper areas of Lockyer Creek. The rainfall responsible for this event was not observed at any rainfall stations but it is considered to be extreme. Flood levels in the Lockyer Creek catchment will exceed maximum recorded levels in some stations in the upper catchment. This flow will result in increases in Brisbane River levels below the junction of Lockyer Creek.

Five radial gates are currently open at the dam releasing about 2,750m3/s into the Brisbane River. At this stage, the dam will reach just over 74.0m AHD during Tuesday evening.

Above EL 74.0m AHD the objective for dam operations is to maintain the security of the dam and minimise downstream flood flows if possible.

If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

The BoM will provide further information regarding the magnitude of the flash flood event occurring in Lockyer Creek early Tuesday morning. Consideration was given to modifying the releases from Wivenhoe Dam to try to moderate the peak flows emanating from Lockyer Creek but the rainfall in the past 12 hours in the catchment above the dam makes this option not possible. Therefore instead of decreasing releases to accommodate the Lockyer Creek flows, the strategy will endeavour to maintain the current releases until Lockyer Creek peaks.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 13

Date: Wednesday 12 January 2011

Time: 11:30

I haven't been sending many of these as the Flood Centre has been forwarding all their sit reps to you directly which are the same.

However will keep sending these in case there are other issues that may come up or issues you want to raise.

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam is discharging over the spillway.
One Sluice gate has been opened around 11am to assist the draining of the flood storage compartment. Further sluices may be opened during the day to relieve upstream impacts.
At 11am Somerset was 105.06m and 716,900ML at 188.7% and dropping slightly.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.
At 11am Wivenhoe Dam was 74.78 m AHD at 2,197,000ML and 188.5% and generally steady.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be around 2.3 million megalitres.

North Pine

At 11:00 North Pine Dam was 39.77 mAHD and falling and still releasing from 5 gates. North Pine has peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will now not close until Thursday or Friday.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 14

Date: Thursday 13 January 2011

Time: 12:46

Attached is an update as at 12pm.

Again let me know of any issues.

Will send one each day.

Rainfall

Rainfall in the last 12 hours is generally below 5mm with isolated falls of up to 15mm in the Stanley, Lockyer and Pine River catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. Three sluices are opened as at 1300 12 January 2011 and discharging 1,250 m3/s into Wivenhoe Dam. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days. Water levels in Somerset Dam will fall slowly in the next 24 hours.

At 12pm Somerset was 103.96m and 642,535ML at 169.2%.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam had been temporarily reduced to 2,500 m3/s at 07:30 on Wednesday 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River. The Brisbane River has peaked at the Port Office Gauge early Thursday morning. Releases from Wivenhoe Dam will now be managed gradually from 1pm Thursday 13.1.2011 to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be managed to drain the flood storage component within the required 7 days. This will not cause renewed rises downstream.

At 12pm Wivenhoe Dam was 74.61 m AHD at 2,170,100ML and 186.2% and dropping slowly.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine
At 12pm North Pine Dam still gates open. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML
At12pm North Pine Dam was 39.64mAHD and 215,179ML and 100.4% and slowly falling. It is expected that gates will be closed early Friday morning.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gates closed.

Hinze Dam:
A release of around 8,000megalitres a day is being made through the emergency gates. The Lake Level is dropping. There is no public access to the spillway.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 15

Date: Friday 14 January 2011

Time: 05:38

Update as of this morning.
As usual, let us know if there are any issues or concerns.
And feel free to contact the Flood Centre for details or discuss.

Rainfall

There has been no significant rainfall in the last 12 hours and none is expected for the next 5 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. Four sluices are opened. Sluice gates will be utilised to drain of the flood storage compartment during the next 4 days.   Water levels in Somerset Dam will fall slowly in the next 24 hours.

At 5am Somerset was 102.87m and 574,852ML at 151.3% and discharging 1,277cumecs.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component within the required 7 days.

At 5am Wivenhoe Dam was 74.08 m AHD at 2,087,960ML and 179.22% and dropping slowly and discharging around 3,500cumecs and this flow will be maintained until early next week.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 5am North Pine Dam was 39.4mAHD and 210,040ML and 98.0% and all gates were closed.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.
The FOC is maintaining close contact with warning agencies and local councils.

Technical Situation Report 16

Date: Saturday 15 January 2011

Time: 07:08

Attached is an update as at 6am today.

Again let me know of any issues.

The FOC and the BCC have kept up discussions re any impacts of release strategy. If there are any concerns re effects on houses or recovery that arrive get back to the FOC any time.

Will send one each day.

Aiming to have most of flood storage drained by Wednesday but will have better idea of closing times over next few days. Then may have better idea as to when bridges will come out. But again contact the FOC if you want.

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. Four sluices are opened. Sluice gates will be utilised to drain of the flood storage compartment during the next 4 days. Water levels in Somerset Dam will fall slowly in the next 24 hours.

At 6am Somerset was 101.35m and 490,137ML at 129.0% and discharging 920cumecs.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component by around Wednesday 19th January.

At 5am Wivenhoe Dam was 72.86 m AHD at 1,905,900ML and 163.6% and dropping slowly and discharging around 3,500cumecs and this flow will be maintained.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML
At closure North Pine Dam was 39.4mAHD and 210,040ML and 98.0% and all gates were closed. The current level is expected to increase to just over 39.5 mAHD in the next few days due to base-flow. This could be higher if further rainfall occurs.

MBRC will inspect Youngs Crossing to determine if the crossing can be re-opened

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gates closed.

Hinze Dam:
A release of around 6,800megalitres a day is being made through the emergency gates. The Lake Level is dropping and the gate should be closed around Tuesday next week. There is no public access to the spillway.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 17

Date: Sunday 16 January 2011

Time: 06:39

Attached is an update as at 6am today.

Again let me know of any issues.

The FOC and the BCC have kept up discussions re any impacts of release strategy. If there are any concerns re effects on houses or recovery that arrive get back to the FOC any time.

Will send one each day.

Aiming to have most of flood storage drained by Wednesday but will have better idea of closing times over next few days. Then may have better idea as to when bridges will come out. But again contact the FOC if you want.

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. Four sluices are opened. Sluice gates will be utilised to drain of the flood storage compartment during the next 4 days. Water levels in Somerset Dam will fall slowly in the next 24 hours.

At 6am Somerset was 100.01m and 424,360ML at 111.7% and discharging 820cumecs.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component by around Wednesday 19th January.

At 6am Wivenhoe Dam was 71.3 m AHD at 1,687,269ML and 144.8% and dropping slowly and discharging around 3,477cumecs and this flow will be maintained.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 6am North Pine Dam was 39.46mAHD and 211,319ML and 98.6% and all gates were closed. The current level is expected to increase to just over 39.5 mAHD in the next few days due to base-flow. This could be higher if further rainfall occurs.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 18

Date: Monday 17 January 2011

Time: 09:46

The FOC is planning to initiate a closing sequence some time this afternoon if levels of the dam are tracking properly.
With final closure Wednesday, probably in the morning at this stage.

They will give you a call later today once they have a better idea of timing.

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 06:00 on 12 January 2011.

At 6am Somerset was 99.07m and 382,829ML at 100.8% and discharging through cone valves. All sluices are shut.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam are being managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component by around Wednesday 19th January with a closing sequence to start today some time.

At 6am Wivenhoe Dam was 69.4 m AHD at 1,441,983ML and 123.8% and dropping and discharging around 3,477cumecs and this flow will be maintained until the closing sequence begins. Aim is for final closure on Wednesday.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 6am North Pine Dam was 39.54mAHD and 213,024ML and 99.4% and all gates were closed. The current level is expected to increase to stay around this level. This could be higher if further rainfall occurs.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 19

Date: Monday 17 January 2011

Time: 16:37

The FOC initiated closing of the gates at Wivenhoe at 2pm this afternoon.

They will have advised you of this.

Any issues let us know.
Give them a call to discuss the closing sequence if you want.

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 06:00 on 12 January 2011.

At 4pm Somerset was 99.02m and 380,700ML at 100.2% and discharging through cone valves. All sluices are shut.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

At 4pm Wivenhoe Dam was 68.66 m AHD at 1,352,706ML and 116.1% and dropping. The closing sequence started at 2pm today and releases will be slowly decreased through gate closures over the next few days to reach FSL around Thursday morning.

Discussions with BCC indicated they would prefer a Thursday closure to increase release time and minimize possible impacts re slumping along Coronation Drive. They also would like closure no later than Thursday prior to predicted high tides late this week.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 4pm North Pine Dam was 39.54mAHD and 213,024ML and 99.4% and all gates were closed. The current level is expected to increase to stay around this level. This could be higher if further rainfall occurs.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and is maintaining close contact with warning agencies and local councils.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

Technical Situation Report 20

Date: Tuesday 18 January 2011

Time: 06:51

The FOC initiated closing of the gates at Wivenhoe at 2pm this afternoon aiming at final closure Thursday morning.

Any issues let us know.

Give them a call to discuss the closing sequence if you want.

Rainfall

There has been no significant rainfall in the last 24 hours and no significant rainfall is expected in the next twenty-four hours. Mostly fine conditions are expected over the weekend, but showers will return early next week.

Somerset/Wivenhoe

Somerset Dam peaked at 105.11 mAHD at 06:00 on 12 January 2011.

At 6am Somerset was 98.98m and 379,016ML at 99.8% and discharging through one cone valve. All sluices are shut.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

At 6am Wivenhoe Dam was 67.82 m AHD at 1,255,638ML and 107.8% and dropping.

Releases were held constant overnight at about 2,050 m3/s to assist water supply pumping at Lowood. Following discussions with water supply operators, it has been decided to resume closing gates at 09:00 Tuesday before final closure on Thursday morning. The Dam will be near full supply and releases will be made through the regulator to account for ongoing base-flow.

Discussions with BCC indicated they would prefer a Thursday closure to increase release time and minimize possible impacts re slumping along Coronation Drive. They also would like closure no later than Thursday prior to predicted high tides late this week.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

It should be noted that the Seqwater water level gauge currently being reported on the BoM website is currently slightly under reading by about 50mm.

Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority ***trading as*** Seqwater

APPENDIX G – SEVERE WEATHER WARNINGS

THUNDERSTORM WARNINGS

Thunderstorm Warning 1

Date: Wednesday 5 January 2011

Time: 16:22

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 4:22:08 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the BRISBANE CITY, LOCKYER VALLEY, MORETON BAY and SOMERSET Council Areas.

Issued at 4:19 pm Wednesday, 5 January 2011.

The Bureau of Meteorology warns that, at 4:20 pm, severe thunderstorms were detected on weather radar near Esk and northern Lake Wivenhoe.

They are forecast to affect the area south of Esk by 4:50 pm and southern Lake Wivenhoe by 5:20 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:20 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 2

Date: Wednesday 5 January 2011

Time: 17:12

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 5:12:36 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

CANCELLATION SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND

Issued at 5:11 pm Wednesday, 5 January 2011.

Severe thunderstorms are no longer affecting the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe].

The immediate threat of severe thunderstorms has passed, but further severe thunderstorms are possible and the situation will continue to be monitored and further warnings will be issued if necessary.

Emergency Management Queensland advises that people should:
 * Beware of fallen trees and powerlines.
 * Avoid driving, walking or riding through flood waters.
 * For emergency assistance contact the SES on 132 500.

Thunderstorm Warning 3

Date: Tuesday 18 January 2011

Time: 12:48

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 12:48:39 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the SCENIC RIM Council Area.

Issued at 12:47 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 12:50 pm, severe thunderstorms were detected on weather radar near Mount Barney and the NSW border. These thunderstorms are slow moving. Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 1:50 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 4

Date: Tuesday 18 January 2011

Time: 13:22

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 1:22:54 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the GOLD COAST CITY and SCENIC RIM Council Areas.

Issued at 1:22 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 1:25 pm, severe thunderstorms were detected on weather radar near Mount Barney and Rathdowney.

These thunderstorms are moving towards the east.

They are forecast to affect Border Ranges National Park and the area south of Canungra by 1:55 pm and Numinbah Valley, Little Nerang Dam and Laravale by 2:25 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Thunderstorm Warning 5

Date: Tuesday 18 January 2011

Time: 13:57

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 1:57:21 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the SCENIC RIM and parts of the GOLD COAST CITY and LOGAN CITY Council Areas.

Issued at 1:56 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 2:00 pm, severe thunderstorms were detected on weather radar near Boonah, the area between Boonah and Beaudesert and Laravale. These thunderstorms are slow moving. They are forecast to affect the McPherson Range and the area south of Canungra by 2:30 pm and Beaudesert, Springbrook and Numinbah Valley by 3:00 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 3:00 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 6

Date: Tuesday 18 January 2011

Time: 14:32

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 2:32:04 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOGAN CITY and parts of the GOLD COAST CITY, IPSWICH CITY and SCENIC RIM Council Areas.

Issued at 2:31 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 2:35 pm, severe thunderstorms were detected on weather radar near the area between Boonah and Beaudesert.

These thunderstorms are moving towards the northeast.

They are forecast to affect Jimboomba by 3:05 pm and Logan Village, Bundamba Lagoon and Greenbank by 3:35 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 3:30 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 7

Date: Tuesday 18 January 2011

Time: 14:53

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 2:53:40 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOGAN CITY and parts of the BRISBANE CITY, GOLD COAST CITY, IPSWICH CITY and SCENIC RIM Council Areas.

Issued at 2:52 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 2:55 pm, very dangerous thunderstorms were detected on weather radar near the area between Boonah and Beaudesert and Peak Crossing.

These thunderstorms are slow moving.

Very dangerous thunderstorms are forecast to affect Tamborine, Jimboomba and Bundamba Lagoon by 3:25 pm and Greenbank, Redbank Plains and Amberley by 3:55 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 3:55 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 8

Date: Tuesday 18 January 2011

Time: 15:05

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 3:05:26 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOGAN CITY, IPSWICH CITY and parts of the BRISBANE CITY, GOLD COAST CITY, MORETON BAY, SOUTHERN DOWNS, SCENIC RIM, SOMERSET and REDLAND Council Areas.

Issued at 3:04 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 3:05 pm, very dangerous thunderstorms were detected on weather radar near Peak Crossing and Amberley.

These thunderstorms are moving towards the north to northeast.

Very dangerous thunderstorms are forecast to affect Ipswich and Bundamba Lagoon by 3:35 pm and Redbank Plains, Lake Manchester and Fernvale by 4:05 pm.

Other severe thunderstorms were located near Jimboomba.

They are forecast to affect Logan Village by 3:35 pm and Beenleigh, Logan City and Sunnybank Hills by 4:05 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 4:05 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 9

Date: Tuesday 18 January 2011

Time: 15:41

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 3:41:19 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the BRISBANE CITY and parts of the LOGAN CITY, MORETON BAY, IPSWICH CITY, SOMERSET and REDLAND Council Areas.

Issued at 3:40 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 3:45 pm, severe thunderstorms were detected on weather radar near Ipswich and Upper Brookfield.

These thunderstorms are moving towards the north.

They are forecast to affect Brisbane CBD, Albany Creek and the D'Aguilar Ranges by 4:15 pm and Strathpine, Redcliffe and Mount Mee by 4:45 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 4:40 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 10

Date: Tuesday 18 January 2011

Time: 15:48

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 3:48:32 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the BRISBANE CITY and parts of the LOCKYER VALLEY, LOGAN CITY, MORETON BAY, IPSWICH CITY, SOMERSET, TOOWOOMBA and REDLAND Council Areas.

Issued at 3:47 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 3:55 pm, severe thunderstorms were detected on weather radar near Toowoomba, Highfields and Sunnybank Hills.

These thunderstorms are moving towards the north to northeast.

They are forecast to affect Brisbane CBD, Logan City and the area north of Toowoomba by 4:25 pm and Cleveland, Albany Creek and Crows Nest by 4:55 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 4:50 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 11

Date: Tuesday 18 January 2011

Time: 16:17

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 4:17:23 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the MORETON BAY and parts of the BRISBANE CITY, LOCKYER VALLEY, IPSWICH CITY, SOMERSET and TOOWOOMBA Council Areas.

Issued at 4:16 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 4:25 pm, severe thunderstorms were detected on weather radar near Brisbane CBD, the area south of Esk and Highvale.

These thunderstorms are moving towards the north to northeast.

They are forecast to affect Strathpine, Esk and Dayboro by 4:55 pm and Redcliffe, Caboolture and Wamuran by 5:25 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley at 3:01pm 2cm hail reported at Gatton at 3:42pm

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:20 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 12

Date: Tuesday 18 January 2011

Time: 16:19

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 4:19:21 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the MORETON BAY and parts of the BRISBANE CITY, LOCKYER VALLEY, SUNSHINE COAST, SOMERSET and TOOWOOMBA Council Areas.

Issued at 4:18 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 4:25 pm, severe thunderstorms were detected on weather radar near Brisbane CBD, the area south of Esk, the D'Aguilar Ranges and the area north of Toowoomba.

These thunderstorms are moving towards the north to northeast.

They are forecast to affect Strathpine, Esk and the area southwest of Esk by 4:55 pm and Redcliffe, Caboolture and the area northwest of Esk by 5:25 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley at 3:01pm 2cm hail reported at Gatton at 3:42pm

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:20 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 13

Date: Tuesday 18 January 2011

Time: 16:43

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 4:43:06 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY, MORETON BAY, IPSWICH CITY, SOMERSET and parts of the BRISBANE CITY, LOGAN CITY, SUNSHINE COAST, SCENIC RIM, SOUTH BURNETT and TOOWOOMBA Council Areas.

Issued at 4:41 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 4:40 pm, severe thunderstorms were detected on weather radar near Esk, the area south of Esk, Hampton and the area northwest of Cunninghams Gap. These thunderstorms are moving towards the north to northeast. They are forecast to affect the area southwest of Esk, the area west of Kilcoy and Lake Somerset by 5:10 pm and Ipswich, Kilcoy and the area northwest of Esk by 5:40 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley at 3:01pm 2cm hail reported at Gatton at 3:42pm
3-4 cm hail reported at Bridgeman Downs

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:45 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 14

Date: Tuesday 18 January 2011

Time: 17:28

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 5:28:43 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the MORETON BAY, SUNSHINE COAST and SOMERSET Council Areas.

Issued at 5:28 pm Tuesday, 18 January 2011.

The Bureau of Meteorology warns that, at 5:35 pm, severe thunderstorms were detected on weather radar near Kilcoy.

These thunderstorms are moving towards the north.

They are forecast to affect the area west of Kilcoy and Mount Kilcoy by 6:05 pm and the ranges south of Jimna and the area west of Conondale by 6:35 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Wind gust of 95km/hr was observed at Amberley at 3:01pm 2cm hail reported at Gatton at 3:42pm
3-4 cm hail reported at Bridgeman Downs

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:30 pm.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 15

Date: Tuesday 18 January 2011

Time: 18:56

From: Aifs Operational Manager
Sent: Tuesday, January 18, 2011 6:56:49 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

CANCELLATION SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND

Issued at 6:55 pm Tuesday, 18 January 2011.

Severe thunderstorms are no longer affecting the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe].

The immediate threat of severe thunderstorms has passed, but the situation will continue to be monitored and further warnings will be issued if necessary.

Wind gust of 95km/hr was observed at Amberley at 3:01pm 2cm hail reported at Gatton at 3:42pm
3-4 cm hail reported at Bridgeman Downs

Emergency Management Queensland advises that people should:
* Beware of fallen trees and powerlines.
* Avoid driving, walking or riding through flood waters.
* For emergency assistance contact the SES on 132 500.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 16

Date: Tuesday 18 January 2011

Time: 14:57

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 2:57:16 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett and parts of the Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast Forecast Districts.

Issued at 2:56 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Roma, Goondiwindi, Warwick, Toowoomba, Dalby, Gympie, Bundaberg, Rockhampton, Kingaroy and Stanthorpe.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:00 pm.

At 2:56 pm Wednesday, 19 January 2011 a separate, more detailed Severe Thunderstorm Warning was current for the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe]. Refer to this product for more information.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 17

Date: Wednesday 19 January 2011

Time: 15:27

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 3:27:28 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

CANCELLATION SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND

Issued at 3:26 pm Wednesday, 19 January 2011.

Severe thunderstorms are no longer affecting the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe].

The immediate threat of severe thunderstorms has passed, but the situation will continue to be monitored and further warnings will be issued if necessary.

Emergency Management Queensland advises that people should:
* Beware of fallen trees and powerlines.
* Avoid driving, walking or riding through flood waters.
* For emergency assistance contact the SES on 132 500.

A more general severe thunderstorm warning remains current for the Wide Bay and Burnett and parts of the Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 18

Date: Wednesday 19 January 2011

Time: 15:28

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 3:28:14 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett and parts of the Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast Forecast Districts.

Issued at 3:27 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Roma, Goondiwindi, Warwick, Toowoomba, Dalby, Gympie, Bundaberg, Rockhampton, Kingaroy and Stanthorpe.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:30 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 19

Date: Wednesday 19 January 2011

Time: 15:39

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 3:39:20 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the TOOWOOMBA Council Area.

Issued at 3:38 pm Wednesday, 19 January 2011.

Thunderstorms are moving towards the southeast. They are forecast to affect Oakey by 4:05 pm and the area northwest of Toowoomba by 4:35 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 4:40 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett and parts of the Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 20

Date: Wednesday 19 January 2011

Time: 15:49

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 3:49:36 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett and parts of the Northern Tropical Coast and Tablelands, Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego, Darling Downs and Granite Belt and Southeast Coast Forecast Districts.

Issued at 3:48 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Roma, Goondiwindi, Warwick, Toowoomba, Dalby, Gympie, Bundaberg, Rockhampton, Kingaroy, Stanthorpe, Cairns and Port Douglas.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:50 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 21

Date: Wednesday 19 January 2011

Time: 16:28

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 4:28:22 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the LOCKYER VALLEY, IPSWICH CITY, SOUTHERN DOWNS, SCENIC RIM and TOOWOOMBA Council Areas.

Issued at 4:27 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 4:25 pm, severe thunderstorms were detected on weather radar near the area northwest of Toowoomba and Oakey.

They are forecast to affect Toowoomba and the area west of Toowoomba by 4:55 pm and the area south of Toowoomba, the area southwest of Toowoomba and Cambooya by 5:25 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:30 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Northern Tropical Coast and Tablelands, Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 22

Date: Wednesday 19 January 2011

Time: 16:36

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 4:36:52 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in parts of the GOLD COAST CITY, LOCKYER VALLEY, IPSWICH CITY, SOUTHERN DOWNS, SCENIC RIM and TOOWOOMBA Council Areas.

Issued at 4:36 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 4:35 pm, severe thunderstorms were detected on weather radar near Little Nerang Dam, Tallebudgera and Numinbah Valley.

They are forecast to affect Coolangatta, the area northwest of Toowoomba and Mudgeeraba by 5:05 pm and Toowoomba, Maroon Dam and Miami by 5:35 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:35 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Northern Tropical Coast and Tablelands, Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 23

Date: Wednesday 19 January 2011

Time: 16:48

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 4:48:25 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the SCENIC RIM and parts of the GOLD COAST CITY, LOCKYER VALLEY, IPSWICH CITY, SOUTHERN DOWNS and TOOWOOMBA Council Areas.

Issued at 4:47 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 4:50 pm, severe thunderstorms were detected on weather radar near Coolangatta, the area southwest of Toowoomba, Border Ranges National Park and the NSW border.

These thunderstorms are moving towards the east to northeast.

They are forecast to affect the area northwest of Toowoomba, Laravale and Miami by 5:20 pm and Toowoomba, the area south of Toowoomba and Highfields by 5:50 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 5:50 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Northern Tropical Coast and Tablelands, Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 24

Date: Wednesday 19 January 2011

Time: 17:26

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 5:26:17 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY and parts of the IPSWICH CITY, SCENIC RIM and SOMERSET Council Areas.

Issued at 5:25 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 5:30 pm, severe thunderstorms were detected on weather radar near the area northwest of Cunninghams Gap and the area south of Helidon. These thunderstorms are moving towards the northeast.
They are forecast to affect Gatton, Mulgowie and Helidon by 6:00 pm and Boonah, Laidley and Hatton Vale by 6:30 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:25 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Northern Tropical Coast and Tablelands, Central Highlands and Coalfields, Central West, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 25

Date: Wednesday 19 January 2011

Time: 17:32

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 5:32:18 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt Forecast Districts.

Issued at 5:31 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Roma, Goondiwindi, Warwick, Gold Coast, Toowoomba, Brisbane, Maroochydore, Gympie, Bundaberg, Rockhampton and Kingaroy.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 8:35 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 26

Date: Wednesday 19 January 2011

Time: 17:55

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 5:55:02 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY, IPSWICH CITY, SCENIC RIM and parts of the LOGAN CITY, SOMERSET and TOOWOOMBA Council Areas.

Issued at 5:54 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 5:55 pm, severe thunderstorms were detected on weather radar near Mulgowie, Helidon, Maroon Dam and Rosevale.

These thunderstorms are moving towards the northeast.

They are forecast to affect Boonah, Laidley and Gatton by 6:25 pm and Beaudesert, the area between Boonah and Beaudesert and Hampton by 6:55 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 6:55 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 27

Date: Wednesday 19 January 2011

Time: 18:13

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 6:13:13 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY, IPSWICH CITY, SCENIC RIM and parts of the LOGAN CITY, SOUTHERN DOWNS, SOMERSET and TOOWOOMBA Council Areas.

Issued at 6:12 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 6:15 pm, very dangerous thunderstorms were detected on weather radar near Laidley and Gatton.

These thunderstorms are moving towards the northeast.

Very dangerous thunderstorms are forecast to affect Rosewood, Hatton Vale and the area north of Gatton by 6:45 pm and Amberley, Marburg and Hampton by 7:15 pm.

Other severe thunderstorms were located near Boonah, the area between Boonah and Beaudesert and the area southwest of Stanthorpe.

They are forecast to affect Beaudesert and Aratula by 6:45 pm and Rathdowney, Cunninghams Gap and Canungra by 7:15 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 7:15 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 28

Date: Wednesday 19 January 2011

Time: 18:16

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 6:16:35 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY, IPSWICH CITY, SCENIC RIM and parts of the LOGAN CITY, SOUTHERN DOWNS, SOMERSET and TOOWOOMBA Council Areas.

Issued at 6:15 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 6:15 pm, very dangerous thunderstorms with intense rainfall were detected on weather radar near Laidley and Gatton.
These thunderstorms are moving towards the northeast. Very dangerous thunderstorms are forecast to affect Rosewood, Hatton Vale and the area north of Gatton by 6:45 pm and Amberley, Marburg and Hampton by 7:15 pm.

Other severe thunderstorms were located near Boonah, the area between Boonah and Beaudesert and the area southwest of Stanthorpe. They are forecast to affect Beaudesert and Aratula by 6:45 pm and Rathdowney and Canungra by 7:15 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

2cm hail was observed at Oakey

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 7:15 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 29

Date: Wednesday 19 January 2011

Time: 18:21

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 6:21:44 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOCKYER VALLEY, IPSWICH CITY, SCENIC RIM and parts of the LOGAN CITY, SOUTHERN DOWNS, SOMERSET and TOOWOOMBA Council Areas.

Issued at 6:20 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 6:15 pm, a very dangerous thunderstorm with intense rainfall was detected on weather radar near Laidley and Gatton.
This thunderstorm is moving towards the northeast. This very dangerous thunderstorm is forecast to affect Rosewood, Hatton Vale and the area north of Gatton by 6:45 pm and Amberley, Marburg and Hampton by 7:15 pm.

Other severe thunderstorms were located near Boonah, the area between Boonah and Beaudesert and the area southwest of Stanthorpe. They are forecast to affect Beaudesert and Aratula by 6:45 pm and Rathdowney and Canungra by 7:15 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Rainfall rates of 60mm/hr and 40mm/30 min have been observed near Tenthill [southwest of Gatton]

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 7:15 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 30

Date: Wednesday 19 January 2011

Time: 19:08

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 7:08:44 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOGAN CITY, IPSWICH CITY and parts of the BRISBANE CITY, GOLD COAST CITY, LOCKYER VALLEY, SCENIC RIM, SOMERSET and REDLAND Council Areas.

Issued at 7:07 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 7:05 pm, very dangerous thunderstorm with intense rainfall was detected on weather radar near Amberley, Rosewood, Hatton Vale, Marburg and Harrisville. This thunderstorm is moving towards the northeast. This thunderstorm is forecast to affect Ipswich, Redbank Plains, Lowood and Fernvale by 7:35 pm and Beenleigh, Logan City, Enoggera Reservoir and Mount Nebo by 8:05 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Rainfall rates of 52mm in 30 minutes has been observed at Romani, SSE of Ipswich.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 8:05 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 31

Date: Wednesday 19 January 2011

Time: 19:14

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 7:14:44 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Maranoa and Warrego and Darling Downs and Granite Belt Forecast Districts.

Issued at 7:13 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Warwick, Gold Coast, Toowoomba, Brisbane, Maroochydore, Gympie, Bundaberg, Kingaroy and Roma.

Rainfall rates of 52mm in 30 minutes has been observed at Romani, SSE of Ipswich.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 10:15 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 32

Date: Wednesday 19 January 2011

Time: 19:26

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 7:26:20 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND, FLASH FLOODING and LARGE HAILSTONES For people in the LOGAN CITY, IPSWICH CITY and parts of the BRISBANE CITY, LOCKYER VALLEY, MORETON BAY, SCENIC RIM and SOMERSET Council Areas.

Issued at 7:25 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 7:05 pm, very dangerous thunderstorms were detected on weather radar near Ipswich, Amberley, Rosewood and Marburg.

These thunderstorms are moving towards the north.

Very dangerous thunderstorms are forecast to affect Wacol, Lake Manchester, Lowood and Fernvale by 7:35 pm and Logan City, the area south of Esk, southern Lake Wivenhoe and the D'Aguilar Ranges by 8:05 pm.

Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

Rainfall rates of 52mm in 30 minutes has been observed at Romani, SSE of Ipswich.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 8:25 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Maranoa and Warrego and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 33

Date: Wednesday 19 January 2011

Time: 20:02

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 8:02:11 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the
Wide Bay and Burnett,
Southeast Coast and parts of the
Darling Downs and Granite Belt Forecast Districts.

Issued at 8:01 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Warwick, Gold Coast, Toowoomba, Brisbane, Maroochydore, Gympie, Bundaberg, Kingaroy and Hervey Bay waters.

Rainfall rates of 52mm in 30 minutes has been observed at Romani, SSE of Ipswich.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 11:05 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 34

Date: Wednesday 19 January 2011

Time: 20:04

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 8:04:45 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND and FLASH FLOODING For people in the BRISBANE CITY, MORETON BAY and parts of the IPSWICH CITY and SOMERSET Council Areas.

Issued at 8:03 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 8:05 pm, severe thunderstorms were detected on weather radar near Enoggera Reservoir, Mount Nebo, Highvale, Samford and Wacol.

These thunderstorms are moving towards the north to northeast.

They are forecast to affect Albany Creek, the D'Aguilar Ranges, Lake Samsonvale and Dayboro by 8:35 pm and Brisbane CBD, Strathpine, Burpengary and Mount Mee by 9:05 pm.

Damaging winds, very heavy rainfall and flash flooding are likely.

Rainfall rates of 52mm in 30 minutes has been observed at Romani, SSE of Ipswich.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 9:05 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 35

Date: Wednesday 19 January 2011

Time: 20:36

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 8:36:25 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND for DAMAGING WIND and FLASH FLOODING For people in the MORETON BAY and parts of the BRISBANE CITY, SUNSHINE COAST and SOMERSET Council Areas.

Issued at 8:35 pm Wednesday, 19 January 2011.

The Bureau of Meteorology warns that, at 8:35 pm, a severe thunderstorm is detected on weather radar near Strathpine, Kallangur, Narangba and Dayboro. This thunderstorm is moving towards the northeast. This thunderstorm is forecast to affect Redcliffe, Caboolture, Mount Mee and Wamuran by 9:05 pm and Deception Bay waters, Bribie Island, Beerburrum and Woodford by 9:35 pm.

Damaging winds, very heavy rainfall and flash flooding are likely.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 9:35 pm.

A more general severe thunderstorm warning is also current for the Wide Bay and Burnett, Southeast Coast and parts of the Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 36

Date: Wednesday 19 January 2011

Time: 20:38

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 8:38:33 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the
Wide Bay and Burnett,
Southeast Coast and parts of the
Darling Downs and Granite Belt Forecast Districts.

Issued at 8:37 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Warwick, Gold Coast, Toowoomba, Brisbane, Maroochydore, Gympie, Bundaberg, Kingaroy and Fraser Island.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 11:40 pm.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 37

Date: Wednesday 19 January 2011

Time: 21:12

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 9:12:39 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20041
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

SEVERE THUNDERSTORM WARNING
for DAMAGING WIND and FLASH FLOODING
For people in the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia and Darling Downs and Granite Belt Forecast Districts.

Issued at 9:11 pm Wednesday, 19 January 2011.

Severe thunderstorms are likely to produce damaging winds, very heavy rainfall and flash flooding in the warning area over the next several hours. Locations which may be affected include Warwick, Toowoomba, Brisbane, Dalby, Maroochydore, Gympie, Bundaberg and Kingaroy.

Emergency Management Queensland advises that people should:
* Move your car under cover or away from trees.
* Secure loose outdoor items.
* Avoid driving, walking or riding through flood waters.
* Seek shelter, preferably indoors and never under trees.
* Avoid using the telephone during a thunderstorm.
* Beware of fallen trees and powerlines.
* For emergency assistance contact the SES on 132 500.

The next warning is due to be issued by 12:15 am Thursday.

If severe thunderstorms develop in the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe], a more detailed Severe Thunderstorm Warning will be issued to people in this area.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

Thunderstorm Warning 38

Date: Wednesday 19 January 2011

Time: 21:13

From: Aifs Operational Manager
Sent: Wednesday, January 19, 2011 9:13:49 PM
To: weather
Subject: BOM: Severe Thunderstorm Warning - SE Qld 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20038
Bureau of Meteorology
Queensland Regional Office

TOP PRIORITY FOR IMMEDIATE BROADCAST

CANCELLATION SEVERE THUNDERSTORM WARNING - SOUTHEAST QUEENSLAND

Issued at 9:12 pm Wednesday, 19 January 2011.

Severe thunderstorms are no longer affecting the Southeast Queensland area [east of Dalby from Rainbow Beach to Stanthorpe].

The immediate threat of severe thunderstorms has passed, but the situation will continue to be monitored and further warnings will be issued if necessary.

Emergency Management Queensland advises that people should:
* Beware of fallen trees and powerlines.
* Avoid driving, walking or riding through flood waters.
* For emergency assistance contact the SES on 132 500.

A more general severe thunderstorm warning remains current for the Wide Bay and Burnett, Southeast Coast and parts of the Central Highlands and Coalfields, Capricornia and Darling Downs and Granite Belt districts.

Warnings are also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and Emergency Management Queensland would appreciate warnings being broadcast regularly.

WEATHER WARNINGS

Weather Warning 1

Date: Wednesday 5 January 2011

Time: 16:59

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 4:59:15 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Darling Downs and Granite Belt, Southeast Coast, Wide Bay and Burnett, Capricornia and Central Highlands and Coalfields district.

Issued at 5:00 pm on Wednesday 5 January 2011

Synoptic Situation: At 4pm EST, a trough extended from northwestern Queensland into the Darling Downs. The trough is expected to intensify as it moves slowly east over the next 24 hours.

Thundery rain areas with some heavy falls are occurring over the Darling Downs and Granite Belt, Southeast Coast districts and southern parts of the Wide Bay and Burnett and Central Highlands and Coalfields districts. This heavy rain is expected to extend to the Capricornia and remaining parts of the Wide Bay and Burnett and eastern Central Highlands and Coalfields during Thursday. The rain will ease over the western Darling Downs and southwestern Central Highlands and Coalfields on Thursday.

Heavy rainfall may lead to localised flash flooding and/or worsen current river flooding.

Heavy rainfall has eased over the Maranoa District and a Severe Weather Warning for this area is no longer current.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11:00 pm Wednesday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 2

Date: Wednesday 5 January 2011

Time: 23:27

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 11:27:31 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding, this may add to the existing river flood situation For people in the Eastern Darling Downs, Granite Belt, Southeast Coast, Wide Bay and Burnett and the Capricornia districts.

Issued at 11:30 pm on Wednesday 5 January 2011

Synoptic Situation: At 11pm EST, a developing upper level low over southern Queensland and a surface trough will combine to concentrate heavier weather over the SE region during Thursday morning which will then contract towards the Capricorn and Wide Bay coasts later in the day.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11:00 pm Wednesday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 3

Date: Wednesday 5 January 2011

Time: 23:55

From: Aifs Operational Manager
Sent: Wednesday, January 05, 2011 11:55:13 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding, this may add to the existing river flood situation For people in the Eastern Darling Downs, Granite Belt, Southeast Coast, Wide Bay and Burnett and the Capricornia districts.

Issued at 11:55 pm on Wednesday 5 January 2011

Synoptic Situation: At 11pm EST, a developing upper level low over southern Queensland and a surface trough will combine to concentrate heavier weather over the SE region during Thursday morning which will then contract towards the Capricorn and Wide Bay coasts later in the day.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 4

Date: Thursday 6 January 2011

Time: 03:38

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 3:38:41 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding, this may add to the existing river flood situation For people in the Southeast Coast, Wide Bay and Burnett and the Capricornia districts.

Issued at 3:40 am on Thursday 6 January 2011

Synoptic Situation: At 0330AM EST, a developing upper level low over southern Queensland and a surface trough will combine to concentrate heavier weather over the SE region during Thursday which will then contract towards the Capricorn, Wide Bay and Sunshine coasts later in the day.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 5

Date: Thursday 6 January 2011

Time: 08:33

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 8:33:11 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district and eastern parts of the Wide Bay and Burnett District.

Issued at 8:30 am on Thursday 6 January 2011

Synoptic Situation: At 8am EST, an upper level low was developing over the southeastern interior of Queensland. A slow moving surface trough extended from northwestern Queensland into the Darling Downs.

Rain areas and thunderstorms are expected to increase through the Southeast Coast District and eastern parts of the Wide Bay and Burnett District this afternoon. Some heavy falls are expected which may lead to localised flash flooding and/or worsen existing river flooding.

Isolated thunderstorms are expected through the Capricornia and remaining parts of the Wide Bay and Burnett District. Locally heavy falls may occur with these thunderstorms and Severe Thunderstorm Warnings will be issued as necessary.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 6

Date: Thursday 6 January 2011

Time: 10:46

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 10:46:04 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast District and eastern parts of the Wide Bay and Burnett District.

Issued at 10:45 am on Thursday 6 January 2011

Synoptic Situation: At 10am EST, an upper level low was developing over the southeastern interior of Queensland. A slow moving surface trough extended from northwestern Queensland into eastern Darling Downs.

Rain areas and thunderstorms will increase further through the Southeast Coast District and eastern parts of the Wide Bay and Burnett District today. Some heavy falls are expected which may lead to localised flash flooding and/or worsen existing river flooding.

Rainfall is expected to ease about the Southeast Coast District during Friday.

Isolated thunderstorms are expected through the Capricornia and remaining parts of the Wide Bay and Burnett District. Locally heavy falls may occur today with these thunderstorms and Severe Thunderstorm Warnings will be issued as necessary.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5pm Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 7

Date: Thursday 6 January 2011

Time: 16:50

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 4:50:02 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and eastern parts of the Wide Bay and Burnett districts.

Issued at 4:50 pm on Thursday 6 January 2011

Synoptic Situation: At 4pm EST, an upper level low was developing over the southeastern interior of Queensland and is forecast to move in a north northeast direction overnight. A slow moving surface trough extended from northwestern parts of the state down into the southeast.

Rain areas and thunderstorms will continue through parts of the Southeast Coast district north of Brisbane and eastern parts of the Wide Bay and Burnett district this evening and overnight. Some heavy falls are expected which may lead to localised flash flooding and/or worsen existing river flooding.

Rain areas and thunderstorms have eased in parts of the Southeast Coast district south of Brisbane but may redevelop overnight. Heavy rain areas are forecast to contract into eastern parts of the Wide Bay and Burnett district on Friday.

Isolated thunderstorms are expected through the Capricornia and remaining parts of the Wide Bay and Burnett District. Locally heavy falls may occur today with these thunderstorms and Severe Thunderstorm Warnings will be issued as necessary.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 8

Date: Thursday 6 January 2011

Time: 22:54

From: Aifs Operational Manager
Sent: Thursday, January 06, 2011 10:54:22 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and eastern parts of the Wide Bay and Burnett districts.

Issued at 10:55 pm on Thursday 6 January 2011

Synoptic Situation: At 1030pm EST, an upper level low over the southeastern interior will move north into the Capricorn district during Friday. Current rain areas near the coast will develop back inland over the SE region during Friday.

Some heavy falls may occur about the eastern Burnett, Wide Bay and northern parts of the Sunshine coast later on Friday with the potential for flash flooding and this may contribute to existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 9

Date: Friday 7 January 2011

Time: 05:25

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 5:25:51 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and eastern parts of the Wide Bay and Burnett districts.

Issued at 5:25 am on Friday 7 January 2011

Synoptic Situation: At 0420am EST, an upper level low occurs over the Capricorn region at present and will contribute to further rain areas over southeastern
region today.

Some heavy falls may occur about the eastern Burnett, Wide Bay and northern parts of the Sunshine coast later today with the potential for flash flooding and this may contribute to existing flooding situation.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 10

Date: Friday 7 January 2011

Time: 08:26

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 8:26:56 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett forecast districts.

Issued at 8:25 am on Friday 7 January 2011

Synoptic Situation: At 7am EST, an upper level low was located over the Capricornia district while a low level trough was located off the Capricorn coast. These systems will combine to produce further rain areas and thunderstorms over the Southeast Coast and Wide Bay and Burnett forecast districts.

Some heavy falls are currently occurring about southern parts of the Southeast Coast District. Heavy rainfall is also expected to develop further north about the Sunshine Coast and Wide Bay and Burnett district through today. Rainfalls should ease south of the Sunshine Coast later today.

Heavy rainfalls may lead to localised flash flooding and/or worsen existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 11

Date: Friday 7 January 2011

Time: 11:25

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 11:25:01 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 11:25 am on Friday 7 January 2011

Synoptic Situation: At 10am EST, an upper level low was located over the Capricornia district while a low level trough was located near the Queensland east coast. These systems will combine to produce further rain areas and thunderstorms over the Southeast Coast and Wide Bay and Burnett districts.

Heavy rain and isolated thunderstorms are currently occurring about the Southeast Coast district. These conditions are expected to develop in the Wide Bay and Burnett district during this afternoon and evening. Rainfall is expected to ease south of the Sunshine Coast later today.

Heavy rainfall may lead to localised flash flooding and/or worsen existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5pm Thursday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 12

Date: Friday 7 January 2011

Time: 15:32

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 3:32:35 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 3:35 pm on Friday 7 January 2011

Synoptic Situation: At 3pm EST, an upper level low was located over the Capricornia district while a low level trough was located near the Queensland east coast. The upper level low is forecast to move off the Capricornia coast on Saturday while the low level trough remains slow moving.

Heavy rain and isolated thunderstorms are currently occurring about the Wide Bay and Burnett and Southeast Coast districts north of Brisbane. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

These conditions are expected to persist about the Wide Bay and Burnett district on Saturday while redeveloping throughout the Southeast Coast district during the afternoon and evening.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Friday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 13

Date: Friday 7 January 2011

Time: 15:37

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 3:37:06 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 3:40 pm on Friday 7 January 2011

Synoptic Situation: At 3pm EST, an upper level low was located over the Capricornia district while a low level trough was located near the Queensland east coast. The upper level low is forecast to move off the Capricornia coast on Saturday while the low level trough remains slow moving.

Heavy rain and isolated thunderstorms are currently occurring about the Wide Bay and Burnett and Southeast Coast districts north of Brisbane. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

These conditions are expected to persist in these areas on Saturday while redeveloping throughout the Southeast Coast district during the afternoon and evening.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Friday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 14

Date: Friday 7 January 2011

Time: 22:50

From: Aifs Operational Manager
Sent: Friday, January 07, 2011 10:50:00 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 10:50 pm on Friday 7 January 2011

Synoptic Situation: At 10pm EST, an upper level low was located offshore from the Capricornia district while a low level trough was located near the Wide Bay coast.

Heavy rain and isolated thunderstorms are currently occurring about the southern Wide Bay and Burnett district and are forecast to develop about the Sunshine Coast during Saturday morning, and remaining parts of the Southeast Coast district on Saturday afternoon. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Saturday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 15

Date: Saturday 8 January 2011

Time: 04:52

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 4:52:00 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 4:55 am on Saturday 8 January 2011

Synoptic Situation: At 10pm EST, an upper level low was located offshore from the Capricornia district while a low level trough was located near the Wide Bay coast.

Heavy rain and isolated thunderstorms are currently occurring about the southern Wide Bay and Burnett district and are forecast to develop about the Sunshine Coast during Saturday morning, and remaining parts of the Southeast Coast district on Saturday afternoon. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: Rainfall of up to 220mm over the Mary River catchment since 9am Friday has caused rapid river rises there, see separate Flood Warning for details.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Saturday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 16

Date: Saturday 8 January 2011

Time: 11:00

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 11:00:01 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 11:00 am on Saturday 8 January 2011

Synoptic Situation: At 10am EST, an upper level low was located offshore from the Capricornia district while a low level trough was located off the southern coast.

Heavy rain overnight has weakened recently to showers and isolated thunderstorms. Rain areas are expected to return to the Southeast Coast and Wide Bay and Burnett districts from this afternoon, and increase to moderate to heavy falls at times tonight and Sunday. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: Rainfall of up to 304mm over the Mary River catchment in the 24 hours to 9am Saturday. A Flood Warning is current for this area.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5pm Saturday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 17

Date: Saturday 8 January 2011

Time: 17:12

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 5:12:38 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast and Wide Bay and Burnett districts.

Issued at 5:15 pm on Saturday 8 January 2011

Synoptic Situation: At 4pm EST, an upper level low was located offshore from the Capricornia district while a low level trough was located off the southern coast.

Rain areas are expected to return to the Southeast Coast and Wide Bay and Burnett districts tonight, and are likely to increase to moderate to heavy falls at times during Sunday. Heavy rain may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: Rainfall of up to 304mm over the Mary River catchment in the 24 hours to 9am Saturday. A Flood Warning is current for this area.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Saturday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 18

Date: Saturday 8 January 2011

Time: 22:18

From: Aifs Operational Manager
Sent: Saturday, January 08, 2011 10:18:13 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district and southern parts of the Wide Bay and Burnett.

Issued at 10:20 pm on Saturday 8 January 2011

Synoptic Situation: At 10pm EST, an upper level low was located offshore of the Capricorn coast. A surface trough was located well offshore of the Fraser coast.
Both of these systems are expected to move closer to the coast overnight and during Sunday.

Rain areas and thunderstorms are expected to increase through the Southeast Coast district and southern parts of the Wide Bay and Burnett district from early Sunday. Some heavy falls are likely which may lead to localised flash flooding and/or worsen existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Sunday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 19

Date: Sunday 9 January 2011

Time: 04:40

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 4:40:04 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district and southern parts of the Wide Bay and Burnett.

Issued at 4:40 am on Sunday 9 January 2011

Synoptic Situation: At 4am EST, an upper level low was located offshore of the Capricorn coast. A surface trough was located offshore of the southern Queensland coast. Both of these systems are expected to move closer to the coast today.

Rain areas and thunderstorms are expected to increase further through the Southeast Coast district and southern parts of the Wide Bay and Burnett district today. Some heavy falls are likely which may lead to localised flash flooding and/or worsen existing river flooding.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Sunday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 20

Date: Sunday 9 January 2011

Time: 10:54

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 10:54:34 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett, and eastern Darling Downs and Granite Belt District.

Issued at 10:55 am on Sunday 9 January 2011

Synoptic Situation: At 10am EST, an upper level low was located offshore of the Capricorn coast. A surface trough was located offshore of the southern Queensland coast. Both of these systems are expected to move closer to the coast today.

Rain areas and thunderstorms are expected to increase further through the Southeast Coast district and southern parts of the Wide Bay and Burnett district today. The heavy rain areas are expected to move into the eastern parts of the Darling Downs and Granite Belt District overnight. Some heavy falls are likely which may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: Rainfall over 100mm was recorded in the last 24 hours about parts of the Sunshine Coast and Hinterland.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5pm Sunday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 21

Date: Sunday 9 January 2011

Time: 16:55

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 4:55:08 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett, and eastern Darling Downs and Granite Belt District.

Issued at 4:55 pm on Sunday 9 January 2011

Synoptic Situation: At 4pm EST, an upper level low was located near the Wide Bay coast. A surface trough was located near the southern Queensland coast. Both of these systems are moving towards the west and southwest.

Rain areas and thunderstorms are expected to continue about the northern and central parts of the Southeast Coast District, southern parts of the Wide Bay and Burnett District, and northeastern parts of the Darling Downs and Granite Belt district. The heavy rain areas are expected to move into the southern parts towards the border with New South Wales and west to the Granite Belt overnight.
Heavy falls are likely which may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: In the past 24 hours, Maleny has recorded 239mm, West Bellthorpe 233mm and Lindfield 226mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Sunday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 22

Date: Sunday 9 January 2011

Time: 22:58

From: Aifs Operational Manager
Sent: Sunday, January 09, 2011 10:58:25 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett district and eastern parts of the Darling Downs and Granite Belt district.

Issued at 11:00 pm on Sunday 9 January 2011

Synoptic Situation: At 10pm EST, an upper level low was located over the southern Capricornia. A surface trough was located near the Fraser coast. Both of these systems are moving slowly west.

Heavy rain areas and thunderstorms are expected to continue about northern and central parts of the Southeast Coast District, southern parts of the Wide Bay and Burnett District, and northeastern parts of the Darling Downs and Granite Belt district. The heavy rain areas are expected to extend further south to the New South Wales border and west to the Granite Belt overnight. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: In the past 24 hours, Maleny has recorded 336mm, West Bellthorpe 331mm and Lindfield 301mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Monday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 23

Date: Monday 10 January 2011

Time: 16:58

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 4:58:14 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett district and eastern parts of the Darling Downs and Granite Belt district.

Issued at 5:00 am on Monday 10 January 2011

Synoptic Situation: At 4am EST, an upper level low was located over the southern Capricornia. A surface trough was located near the Fraser coast. Both of these systems are moving slowly west.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast district, far southern parts of the Wide Bay and Burnett District and eastern parts of the Darling Downs and Granite Belt district. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

Recent events: In the past 24 hours, West Bellthorpe recorded 343mm, Maleny 337mm, and Lindfield 313mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Monday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 24

Date: Monday 10 January 2011

Time: 11:01

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 11:01:52 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett district and eastern parts of the Darling Downs and Granite Belt district.

Issued at 11:00 am on Monday 10 January 2011

Synoptic Situation: At 10am EST, an upper level low was located over the southwest of the Capricornia District. A surface trough was located off the southeast coast. Both of these systems are moving slowly west.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast district, far southern parts of the Wide Bay and Burnett District and eastern parts of the Darling Downs and Granite Belt district. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract southwards into the Southeast Coast district and southeast parts of the Darling Downs and Granite Belt district during Tuesday.

Recent events: In the 24 hours to 9am EST Monday morning, Maleny received 321mm, West Bellthorpe 310 mm and Peachester 298 mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Monday

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 25

Date: Monday 10 January 2011

Time: 11:04

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 11:04:39 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, southern parts of the Wide Bay and Burnett district and eastern parts of the Darling Downs and Granite Belt district.

Issued at 11:05 am on Monday 10 January 2011

Synoptic Situation: At 10am EST, an upper level low was located over the southwest of the Capricornia District. A surface trough was located off the southeast coast. Both of these systems are moving slowly west.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast district, far southern parts of the Wide Bay and Burnett District and eastern parts of the Darling Downs and Granite Belt district. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract southwards into the Southeast Coast district and southeast parts of the Darling Downs and Granite Belt district during Tuesday.

Recent events: In the 24 hours to 9am EST Monday morning, Maleny received 321mm, West Bellthorpe 310 mm and Peachester 298 mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5 pm Monday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 26

Date: Monday 10 January 2011

Time: 17:06

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 5:06:14 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast district, far southern parts of the Wide Bay and Burnett district and eastern parts of the Darling Downs and Granite Belt district.

Issued at 5:05 pm on Monday 10 January 2011

Synoptic Situation: At 4pm EST, an upper level low was located over the west of the Wide Bay and Burnett district. A surface trough was located off the east Queensland coast. The upper low is forecast to move southwest over the southern interior of Queensland while the surface trough remains slow moving.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast district and eastern parts of the Darling Downs and Granite Belt district. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract southwards and gradually ease in the Southeast Coast district and eastern parts of the Darling Downs and Granite Belt district later on Tuesday.

Rainfall has eased in far southern parts of the Wide Bay and Burnett district and therefore the warning for this district is now CANCELLED.

Recent events: In the 24 hours to 9am EST Monday, Maleny received 321mm, West Bellthorpe 310 mm and Peachester 298 mm.
In the 7 hours since 9am EST Monday, Redbank Creek received 126mm, Toowoomba Airport 88mm and Mt Castle 80mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Monday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 27

Date: Monday 10 January 2011

Time: 18:29

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 6:29:54 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast, Darling Downs and Granite Belt and eastern parts of the Maranoa and Warrego districts.

Issued at 6:30 pm on Monday 10 January 2011

Synoptic Situation: At 6pm EST, an upper level low was located over the west of the Wide Bay and Burnett district. A surface trough was located off the east Queensland coast. The upper low is forecast to move southwest over the southern interior of Queensland while the surface trough remains slow moving.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast, Darling Downs and Granite Belt and eastern parts of the Maranoa and Warrego districts this evening. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract into the Southeast Coast and eastern parts of the Darling Downs and Granite Belt districts during Tuesday. These conditions should gradually ease later in the day.

Recent events: In the 24 hours to 9am EST Monday, Maleny received 321mm, West Bellthorpe 310 mm and Peachester 298 mm.
In the 7 hours since 9am EST Monday, Redbank Creek received 126mm, Toowoomba Airport 88mm and Mt Castle 80mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Monday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 28

Date: Monday 10 January 2011

Time: 19:51

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 7:51:20 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts.

Issued at 7:50 pm on Monday 10 January 2011

Synoptic Situation: At 7pm EST, an upper level low was located over the west of the Wide Bay and Burnett district. A surface trough was located off the east Queensland coast. The upper low is forecast to move southwest over the southern interior of Queensland while the surface trough remains slow moving.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts this evening and overnight. Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract into the Southeast Coast and eastern parts of the Darling Downs and Granite Belt districts during Tuesday. These conditions should gradually ease later in the day.

Recent events: In the 24 hours to 9am EST Monday, Maleny received 321mm, West Bellthorpe 310 mm and Peachester 298 mm.
In the 7 hours since 9am EST Monday, Redbank Creek received 126mm, Toowoomba Airport 88mm and Mt Castle 80mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11pm Monday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 29

Date: Monday 10 January 2011

Time: 22:57

From: Aifs Operational Manager
Sent: Monday, January 10, 2011 10:57:26 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts.

Issued at 11:00 pm on Monday 10 January 2011

Synoptic Situation: At 10pm EST, an upper level low was located over the far southeast of the Central Highlands and Coalfields district. The upper low is forecast to move southwest over the southern interior of Queensland while weakening during Tuesday.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts tonight.
Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract into the Southeast Coast and eastern parts of the Darling Downs and Granite Belt districts during Tuesday. These conditions should gradually ease later in the day.

Recent events: In the 1 hour to 11pm EST Monday, Monsildale and Mt Stanley [situated in northern parts of the Southeast Coast district] both received 58mm.
In the 13 hours since 9am EST Monday, Redbank Creek received 132mm, Ballon 124mm and Mt Castle 103mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5am Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 30

Date: Tuesday 11 January 2011

Time: 05:04

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 5:04:24 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and potentially worsening the existing river flood situation For people in the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts.

Issued at 5:05 am on Tuesday 11 January 2011

Synoptic Situation: At 4am EST, an upper level low was located over the Darling Downs and Granite Belt district. The upper low is forecast to move southwest over the southern interior of Queensland while weakening during the day.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast, Darling Downs and Granite Belt, far southern parts of the Wide Bay and Burnett and eastern parts of the Maranoa and Warrego districts today.
Heavy falls may lead to localised flash flooding and/or worsen existing river flooding.

The heavy rain areas and thunderstorms are expected to contract to the south by late today, before gradually easing.

Recent events: Rainfall since 9am Monday Monsildale 160mm, Mt Stanley 135mm, and Redbank Creek 134mm.

Flood warnings are current for various rivers and streams in these districts; refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 31

Date: Tuesday 11 January 2011

Time: 07:59

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 7:59:22 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

Transmitters in the areas of the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING.

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to localised flash flooding and worsening the existing river flood situation For people in the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi.

Issued at 8:00 am on Tuesday 11 January 2011

Synoptic Situation: At 8am AEST, an upper level low was located over the Darling Downs and Granite Belt district and is forecast to move to the southwest and slowly weaken.

Heavy rain areas and thunderstorms are expected to continue through the Southeast Coast and Darling Downs and Granite Belt today. Heavy falls will lead to localised flash flooding and will worsen existing river flooding.

Currently, an intense slow moving band of rainfall extends from about Maroochydore to Warwick. Rainfall rates in this band are reaching 80 to 100 mm per hour.

Flood warnings are current for various rivers and streams in these districts.
Please refer to these products [www.bom.gov.au/qld] for further information.

The Severe Weather Warning for the southern parts of Wide Bay and Burnett and eastern Maranoa and Warrego and northwestern parts of Darling Downs and Granite Belt districts has been cancelled. However showers and thunderstorms will persist through the area and may produce heavy rainfall in these parts.

The State Emergency Service advises that people in the affected area should:
 avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11am Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 32

Date: Tuesday 11 January 2011

Time: 10:59

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 10:59:37 AM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

Transmitters in the areas of the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING.

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to flash flooding and worsening the existing river flood situation
For people in the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi.

Issued at 11:00 am on Tuesday 11 January 2011

Synoptic Situation: At 10am AEST, an upper level low was located over the southern Queensland interior and is forecast to move to the southwest and continue weakening. A surface trough lying over the Southeast Queensland Coast is expected to weaken overnight.

Heavy rain areas and local thunderstorms are expected to continue through the Southeast Coast and Darling Downs and Granite Belt today. Heavy falls will lead to flash flooding and will worsen existing river flooding.

Currently, an intense band of rainfall extends from about Tewantin to Warwick.
Recent rainfall rates in this band have reached 80 to 100 mm per hour, particularly about the Brisbane and Lockyer Valleys. This rainfall band is expected to remain slow moving during the remainder of today.

Flood warnings are current for various rivers and streams in these districts.
Please refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 2pm AEST Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 33

Date: Tuesday 11 January 2011

Time: 13:59

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 1:59:04 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

Transmitters in the areas of the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING.

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to flash flooding and worsening the existing river flood situation
For people in the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi.

Issued at 2:00 pm on Tuesday 11 January 2011

Synoptic Situation: At 2 pm AEST, a surface trough was lying over the Southeast Queensland Coast and is expected to weaken overnight.

Heavy rain areas and local thunderstorms are expected to continue through the Southeast Coast and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi. Heavy falls will lead to flash flooding and will worsen existing river flooding.

Currently the focus of the heaviest rainfall extends from about Maroochydore to Warwick, including the Brisbane and Lockyer Valleys and Ipswich area. Recent rainfall rates in this band have reached 60 to 80 mm per hour. This rainfall band is expected to remain slow moving during the remainder of today and gradually weaken overnight and during Wednesday morning.

Flood warnings are current for various rivers and streams in these districts.
Please refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 5 pm AEST Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 34

Date: Tuesday 11 January 2011

Time: 17:00

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 5:00:33 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

Transmitters in areas of the Southeast Coast district and the Darling Downs and Granite Belt district southeast of Dalby to Goondiwindi are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING.

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE WEATHER WARNING
for heavy rainfall leading to flash flooding and worsening the existing river flood situation
For people in the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi.

Issued at 5:00 pm on Tuesday 11 January 2011

Synoptic Situation: At 4 pm AEST, southeast Queensland was under the influence of a deep moist easterly airstream, with an upper trough located over the Darling Downs.

Heavy rain areas and local thunderstorms are expected to continue tonight through the Southeast Coast and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi. Heavy falls will lead to further localised flash flooding and will worsen existing river flooding.

The heavy rain areas are expected to gradually weaken overnight and during Wednesday morning.

Flood warnings are current for various rivers and streams in these districts.
Please refer to these products [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters take care on the roads, especially in heavy downpours avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

The next warning is due to be issued by 11 pm AEST Tuesday.

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Weather Warning 35

Date: Tuesday 11 January 2011

Time: 21:59

From: Aifs Operational Manager
Sent: Tuesday, January 11, 2011 9:59:57 PM
To: weather
Subject: BOM: Severe Weather Warning 1 [SEC=UNCLASSIFIED] Auto forwarded by a Rule

IDQ20032
Australian Government Bureau of Meteorology Queensland

Note: The Standard Emergency Warning Signal is no longer required.

TOP PRIORITY FOR IMMEDIATE BROADCAST
CANCELLATION - SEVERE WEATHER WARNING

For people in the Southeast Coast District and the Darling Downs and Granite Belt District southeast of Dalby to Goondiwindi.

Issued at 10:00 pm on Tuesday 11 January 2011

Synoptic Situation: At 10 pm AEST, southeast Queensland was under the influence of a deep moist east to northeast airstream. A weakening upper trough was moving south.

Heavy rain areas have eased during the past few hours and further flash flooding due to rainfall is no longer expected.

Note that an extremely serious river and stream flood situation still exists.
Refer to flood warnings [www.bom.gov.au/qld] for further information.

The State Emergency Service advises that people in the affected area should:
avoid driving, walking or riding through flood waters avoid swimming in swollen rivers and creeks

Contact the SES on 132 500 for emergency assistance if required.

No further warnings are expected to be issued for this event

This warning is also available through TV and Radio broadcasts; the Bureau's website at www.bom.gov.au or call 1300 659 219. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

APPENDIX H – FLOOD EVENT NOTIFICATION EMAIL

Date: Thursday 6 January 2011

Time: 07:42

From: Duty Engineer
Sent: Thursday, 6 January 2011 7:42 AM
To: Distribution List
Cc: Distribution List
Subject: Mobilisation 06/01/2011

With Wednesday nights rainfall and further totals up to 150mm expected during the next 2 days, please mobilise staff for gate operations at North Pine, Somerset and Wivenhoe Dams.

First operations are expected later today and will continue at least until Saturday morning.

Engineer 2

Duty Engineer
Flood Operations Centre

WIVENHOE DAM FLOOD READINESS CHECKLIST

Date: __________ Time: __________

Duty Officer in Charge: ____________

Rainfall (mm):____________________

Lake Level: ____________________Gauge Board

Lake Level:______________________Auto dialler [redacted]

Tail Level:______________________Gauge Board

Tail Level:______________________Recorder [redacted]

Security Alarm code on key ring - Rain gauge adjacent to office - Lake Gauge board on western end of wall (RB) - Tail gauge board down Spillway Common road at Atkinson Crossing.

Outlet Works

Sump Pumps operational: No. 1 ❐ No. 2 ❐

High Level Alarm operations: ❐

V-Notch weirs clean: ❐

Dam Underground Complex

Standby Generator operations: ❐

Mode Selector switch to Automatic: ❐

Monitor Telemetry: ❐

Winch Room

Electric Hydraulic Units operational: ❐

Diesel Hydraulic operational: ❐

Electric Hydraulic Unit Pumps mode: Separated ❐ Connected ❐

Oil Return Valve Position: Electric Vertical ❐ Diesel Horizontal ❐

Note: Check all valves are in position for mode selected. Key No. 5 is required for opening hydraulic cabinets as well as the Radial Gate local control panel on Pier.

SOMERSET DAM FLOOD READINESS CHECKLIST

Date: __________ Time: __________

Duty Officer in Charge: ____________

Rainfall (mm):_____________________

Lake Level Somerset: ______________Gauge Board

Lake Level Somerset: ______________Recorder

Lake Level Wivenhoe: ______________Gauge Boards at bridge

Lake Level Wivenhoe: ______________Phone Recorder

Communications Phone: ___________

Local Phones: ____________________

Fax Lines: _______________________ Mobiles: _____________________________

Hand held Radios: ________________

Satellite Phone: __________________

GENERATORS

1. ***Fixed Standby Diesel above office (Top Deck)***

Check:

Oil	❒	Water	❒	Fuel	❒
Battery	❒	Auto Switch	❒		

Test run by following the **Manual Operation Instruction Sheet** in the Generator Control Panel, run for at least 15 min.

2. ***Mobile Stand-by Diesel in shed at far end of Top Deck***

Check:

Oil	❒	Water	❒	Fuel	❒
Battery	❒	Auto Start	❒		

Test run by following the **Manual Operation Instruction Sheet** in the Generator Control Panel, run for at least 15 min.

3. Portable 5.5 Honda

Check:

Petrol ❐ Oil ❐ Test run ❐

Moved to Cone Valve Control Room ❐

SUMP PUMPS are located in the Regulator Cone Valve chambers on both left and right banks. Test by turning auto/manual switch (on wall) to "ON" position or by flooding shaft. Follow the operation procedures on the attached form.

Tested Manual ❐ Tested Auto ❐

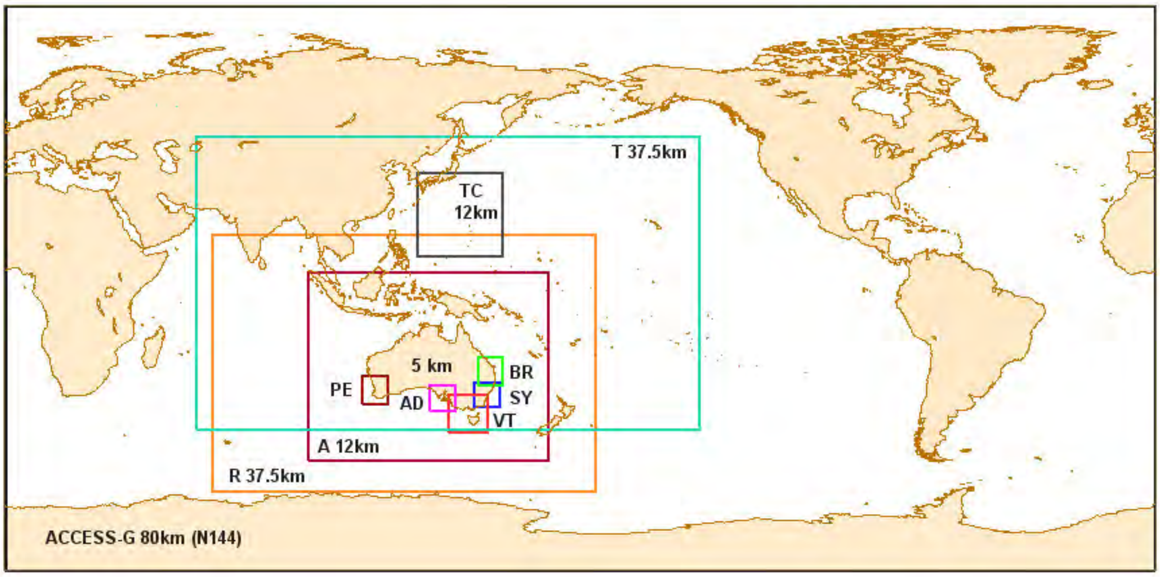
DOORS: all external doors are to remain closed at all times.

- CHECK all lower galleries for any excessive leaks or irregular colour. ❐ ***Follow the instructions in the Flood Manual for inspection intervals.***
- Clean all drains that may become blocked. ❐
- Cyclonic conditions secure crane to tie down points. ❐

Signed: ______________________________

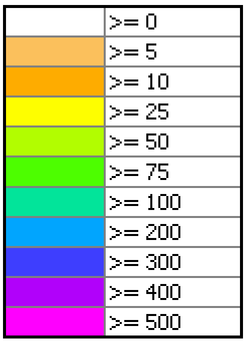
APPENDIX J – FORECAST RAINFALL COMPARISON

Seqwater commenced development of a new flood modelling system, FEWS, in March 2010. A prototype was delivered in early November 2010 at which time forecast rainfall from the Bureau of Meteorology's (BoM) ACCESS Numerical Weather Prediction models was imported into the system several times per day. These models provide coverage at varying resolutions and are generated at different times of the day. The results of the models are merged, downscaled to the Brisbane area and gridded to produce the forecast images on the following pages. The grid of the actual rainfall is based upon all available ALERT stations in the Enviromon data collection system and is generated by FEWS using surface fitting techniques.



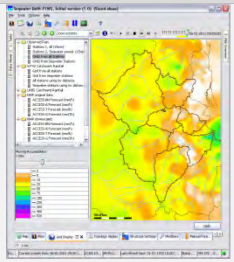
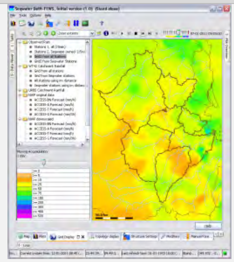
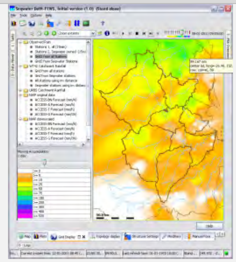
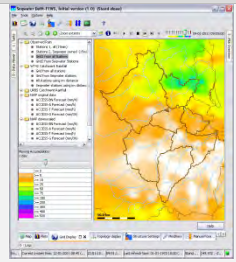
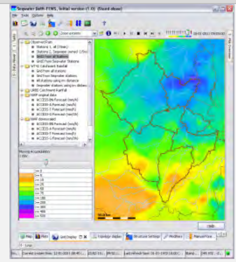
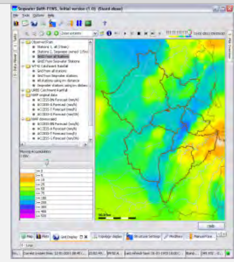
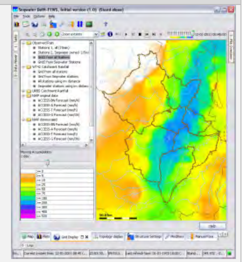
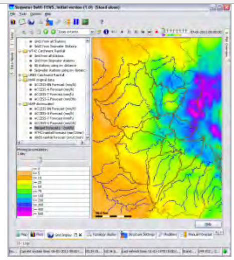
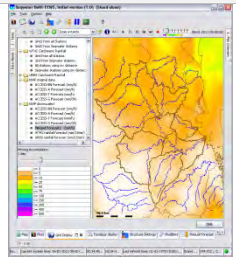
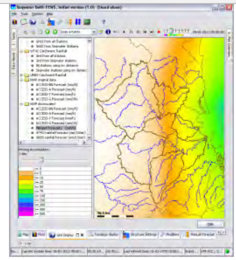
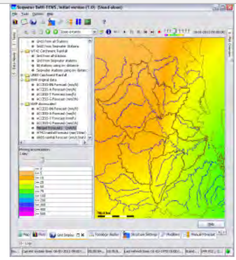
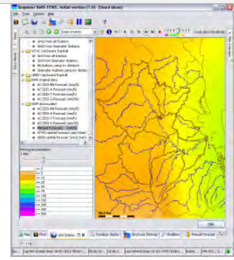
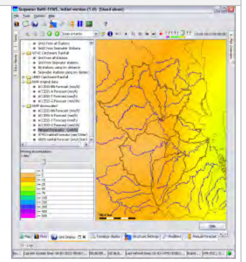
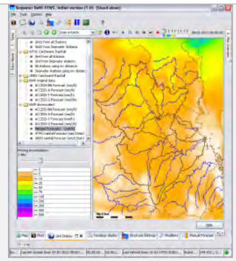
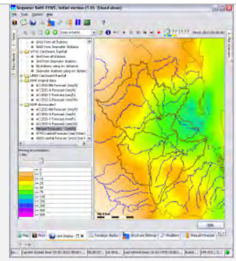
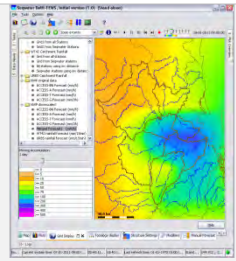
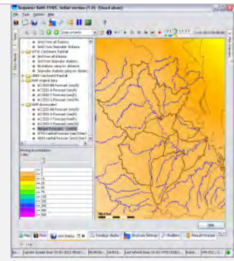
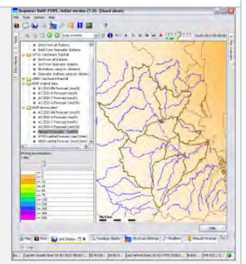
Model	Domain	Resolution (km)	Duration (hours)	Runs (UTC)
ACCESS-G	Global	~80	+240	00,12
ACCESS-R	Regional	~37.5	+72	00,12
ACCESS-T	Tropical	~37.5	+72	00,12
ACCESS-A	Australia	~12	+48	00,06,12,18
ACCESS-BR	Brisbane	~5	+36	00,12

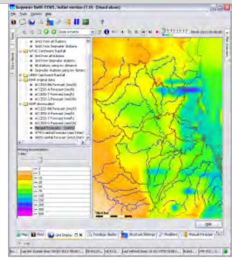
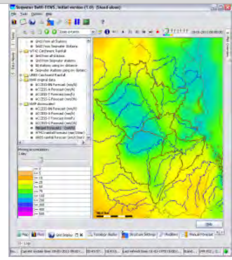
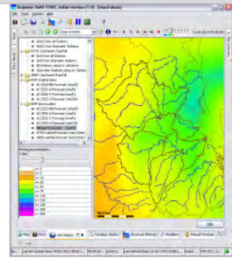
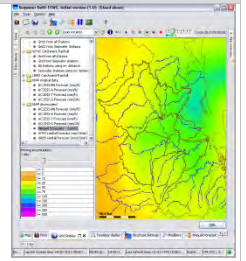
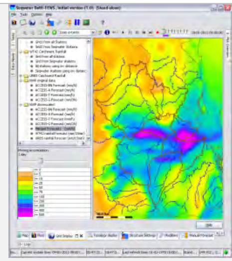
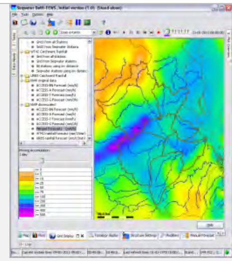
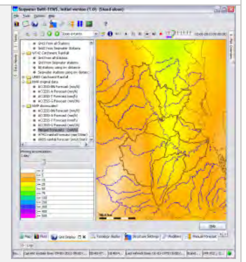
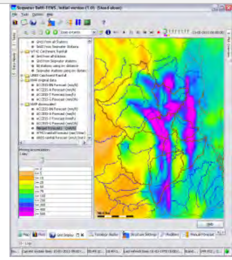
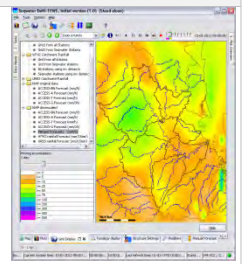
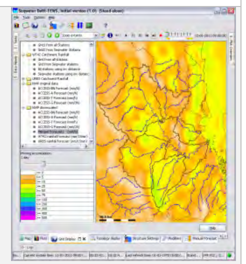
A full description of the ACCESS Numerical Weather Prediction models can be found on BoM's web site. While FEWS outputs were not available during the Event, the forecast rainfalls used (QPF, Silo and Interactive Weather and Wave Maps) are based upon the ACCESS model outputs. The scale shown below has been adopted in all of the maps below and indicates the rainfall depth in millimeters (mm). The following maps have been transformed into the quantitative forecasts contained in Table 6.2.2 in the body of the Report.



The table below shows a comparison of the progressive forecast and recorded rainfall fields for 24 hour periods commencing at 09:00 on Wednesday 5 January 2011. The first row shows the actual rainfall for the 24 hours at the end of the forecast period while the row below shows the rainfall that was forecast for the 24 hour periods for the days following the start date.

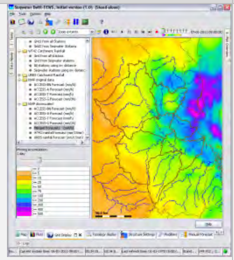
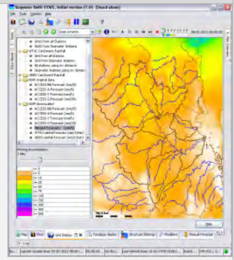
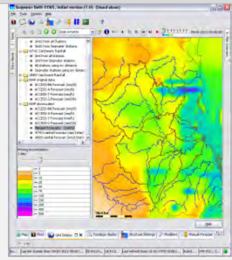
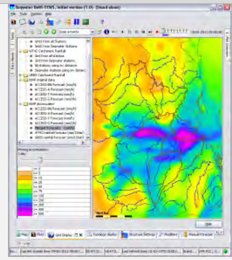
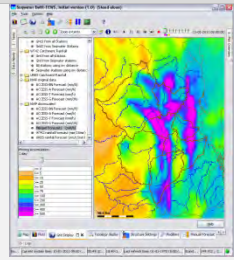
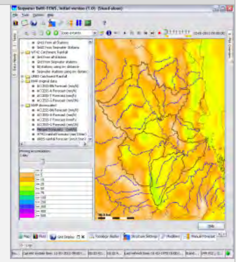
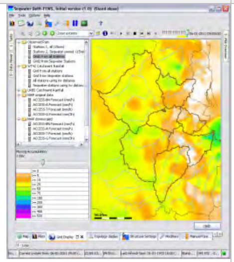
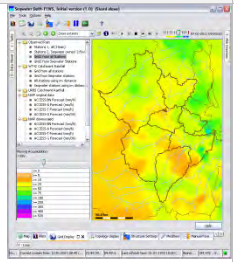
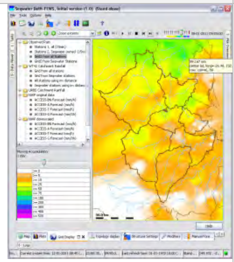
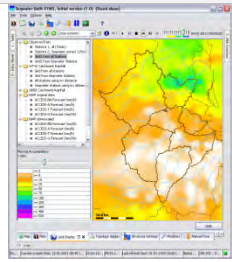
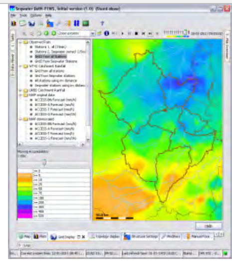
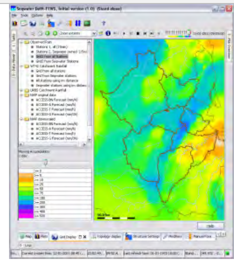
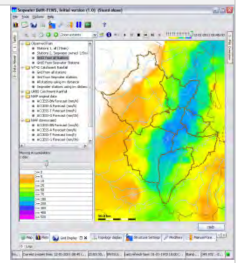
Table of progressive 24 hour forecast and actual rainfalls

Period	09:00 05/01/2011 to 09:00 06/01/2011	09:00 06/01/2011 to 09:00 07/01/2011	09:00 07/01/2011 to 09:00 08/01/2011	09:00 08/01/2011| to 09:00 09/01/2011	09:00 09/01/2011 to 09:00 10/01/2011	09:00 10/01/2011 to 09:00 11/01/2011	09:00 11/01/2011 to 09:00 12/01/2011
Actual at end of period							
Forecast made on 06/01/2011 for 24 hours ending							
Forecast made on 07/01/2011 for 24 hours ending							

Period	09:00 05/01/2011 to 09:00 06/01/2011	09:00 06/01/2011 to 09:00 07/01/2011	09:00 07/01/2011 to 09:00 08/01/2011	09:00 08/01/2011| to 09:00 09/01/2011	09:00 09/01/2011 to 09:00 10/01/2011	09:00 10/01/2011 to 09:00 11/01/2011	09:00 11/01/2011 to 09:00 12/01/2011
Forecast made on 08/01/2011 for 24 hours ending							
Forecast made on 09/01/2011 for 24 hours ending							
Forecast made on 10/01/2011 for 24 hours ending							
Forecast made on 11/01/2011 for 24 hours ending							

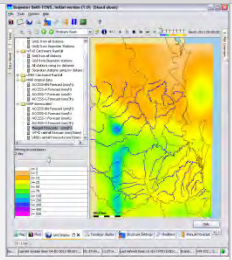
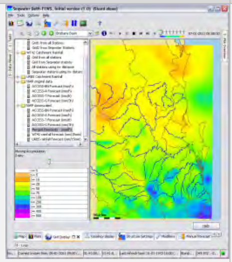
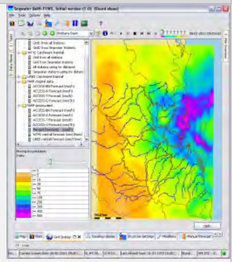
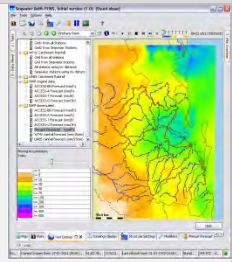
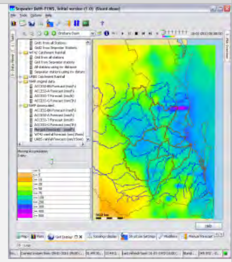
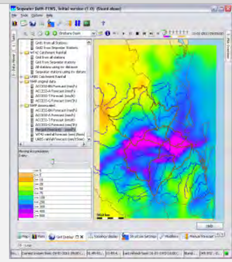
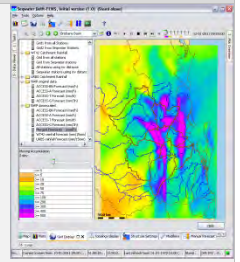
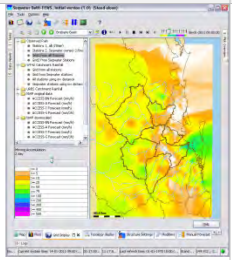
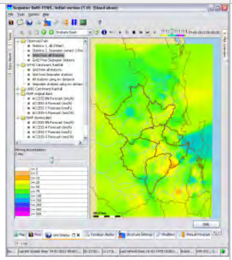
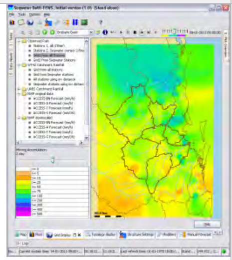
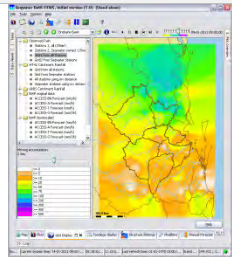
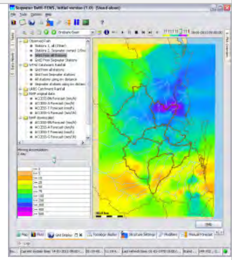
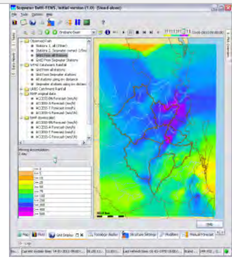
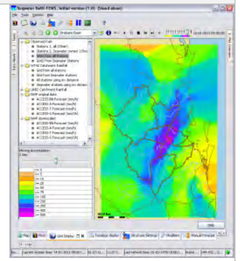
The table below shows a comparison of the forecast and recorded rainfall fields for 24 hour periods. The first row shows the forecast rainfall for the 24 hours at the start of the forecast period while the row below shows the rainfall that was actually recorded by the end of period.

Table of 24 hours forecast and actual rainfalls

Period	09:00 05/01/2011 to 09:00 06/01/2011	09:00 06/01/2011 to 09:00 07/01/2011	09:00 07/01/2011 to 09:00 08/01/2011	09:00 08/01/2011| to 09:00 09/01/2011	09:00 09/01/2011 to 09:00 10/01/2011	09:00 10/01/2011 to 09:00 11/01/2011	09:00 11/01/2011 to 09:00 12/01/2011
Forecast at start of period							
Actual at end of period							

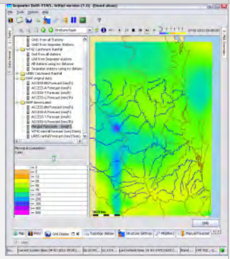
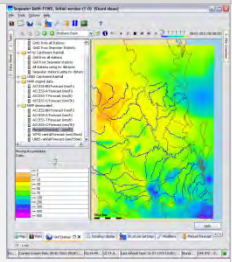
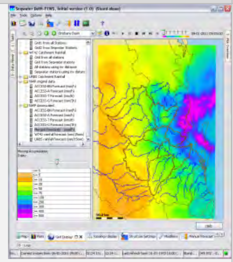
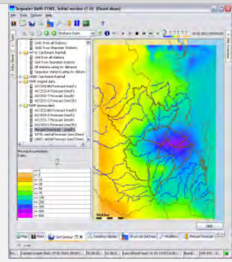
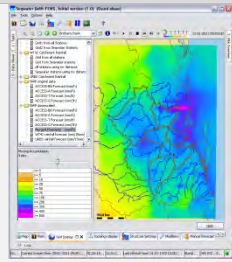
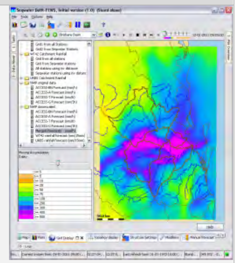
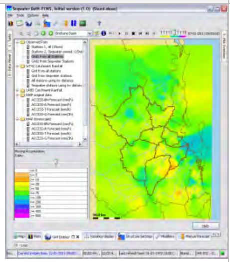
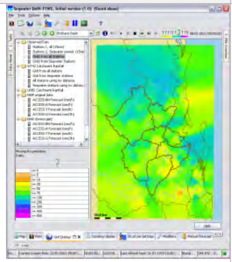
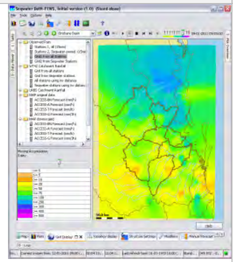
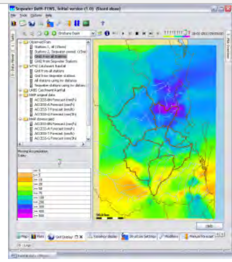
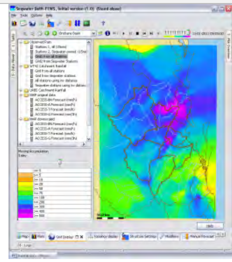
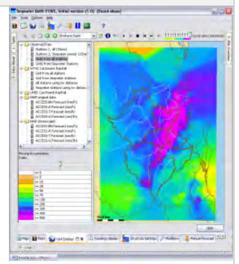
The table below shows a comparison of the forecast and recorded rainfall fields for 48 hour periods. The first row shows the forecast rainfall for the 48 hours at the start of the forecast period while the row below shows the rainfall that was actually recorded by the end of period.

Table of 48 hour forecast and actual rainfalls

Period	09:00 04/01/2011 to 09:00 06/01/2011	09:00 05/01/2011 to 09:00 07/01/2011	09:00 06/01/2011 to 09:00 08/01/2011	09:00 07/01/2011 to 09:00 09/01/2011	09:00 08/01/2011 to 09:00 10/01/2011	09:00 09/01/2011 to 09:00 11/01/2011	09:00 10/01/2011 to 09:00 12/01/2011
Forecast at start of period							
Actual at end of period							

The table below shows a comparison of the forecast and recorded rainfall fields for 72 hour periods. The first row shows the forecast rainfall for the 72 hours at the start of the forecast period while the row below shows the rainfall that was actually recorded by the end of period.

Table of 72 hour forecast and actual rainfalls

Period	09:00 04/01/2011 to 09:00 07/01/2011	09:00 05/01/2011 to 09:00 08/01/2011	09:00 06/01/2011 to 09:00 09/01/2011	09:00 07/01/2011 to 09:00 10/01/2011	09:00 08/01/2011 to 09:00 11/01/2011	09:00 09/01/2011 to 09:00 12/01/2011
Forecast at start of period						
Actual at end of period						

APPENDIX K – THREE-DAY ASSESSMENTS AND MODEL RESULTS

Date: Sunday 9 January 2011
Time: 11:02

From: Duty Engineer
Sent: Sunday, 9 January 2011 11:02 AM
To: Distribution List
Cc: Distribution List
Subject: Forecast Rainfall and Possible Runoff

Forecast Rainfall

The forecast for the next few days is for heavy rainfall, particularly for period 10pm Sunday to 10pm Monday with totals between 200-300mm. The areas mostly heavily impacted will be the North Pine, Somerset and Leslie Harrison catchments with less rain in the upper Brisbane
http://www.bom.gov.au/jsp/watl/rainfall/pme.jsp

The rain contracts to the area around North Pine for the period 10pm Monday to 10pm Tuesday with totals in the order of 100 to 150mm.

The interactive model at http://www.bom.gov.au/australia/charts/viewer/index.shtml shows the heaviest falls during the next 48 hours are likely to be overnight Sunday/Monday and overnight Monday/Tuesday.

The QPF for the period 24 hours to 9am show totals between 40- 60mm for both North Pine and Somerset/Wivenhoe catchments. Note that this is only half the period of the above forecast durations.

Recorded Runoff

To date recorded inflows to the dams since 02/01/2011 have been
North Pine 23,000ML
Somerset 120,000ML
Wivenhoe 380,000ML (including Somerset outflow)

Presently, the conversion rate between rainfall and runoff is about 0.45 for Wivenhoe, 0.60 for North Pine and 0.75 for Somerset.

Expected Runoff

Based on the approximate runoff conversion rates and the forecast rainfall, estimated runoff volumes (ML) generated could be of the order of:

Catchment	Monday	Tuesday	Wednesday	Three Day Total
North Pine	10,000-20,000	35,000-55,000	25,000-35,000	70,000-110,000
Somerset	50,000-100,000	200,000-300,000	75,000-150,000	325,000-550,000
Wivenhoe	125,000-250,000	250,000-500,00	125,000-250,000	500,000-1,000,000

The lower limit of the inflow to Somerset and Wivenhoe will be similar to the October 2010 flood while the upper limit is similar to the February 1999 floods. However, the starting level of the dams is much higher than in these historical events.

This points to continued flood operations for Somerset and Wivenhoe until at least the weekend of 15/16 Jan and maybe a shorter time for North Pine.

It should be noted that these estimates are based upon forecast rainfall which may or may not eventuate.

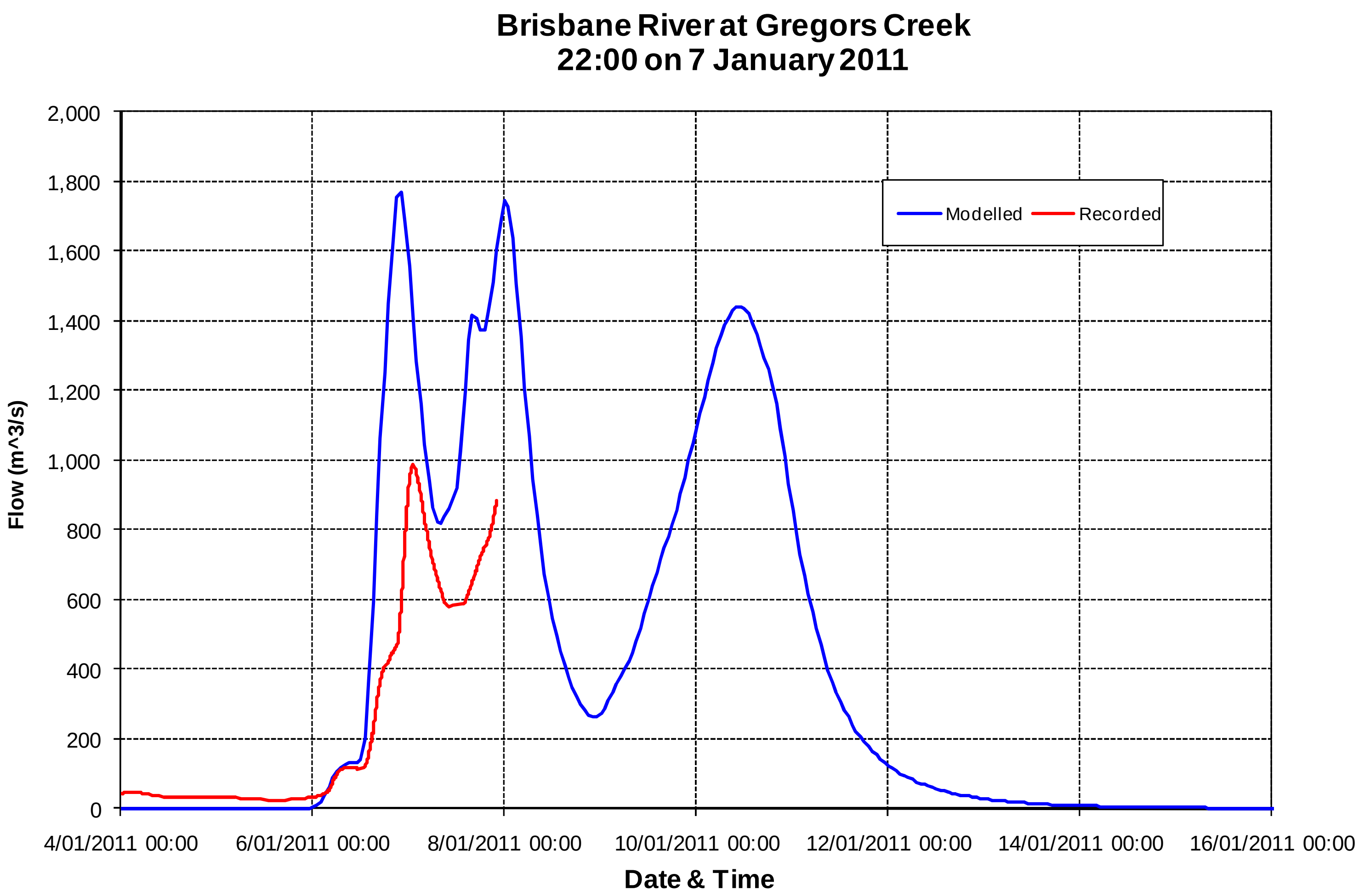
Engineer 2
Duty Engineer
Flood Operations Centre

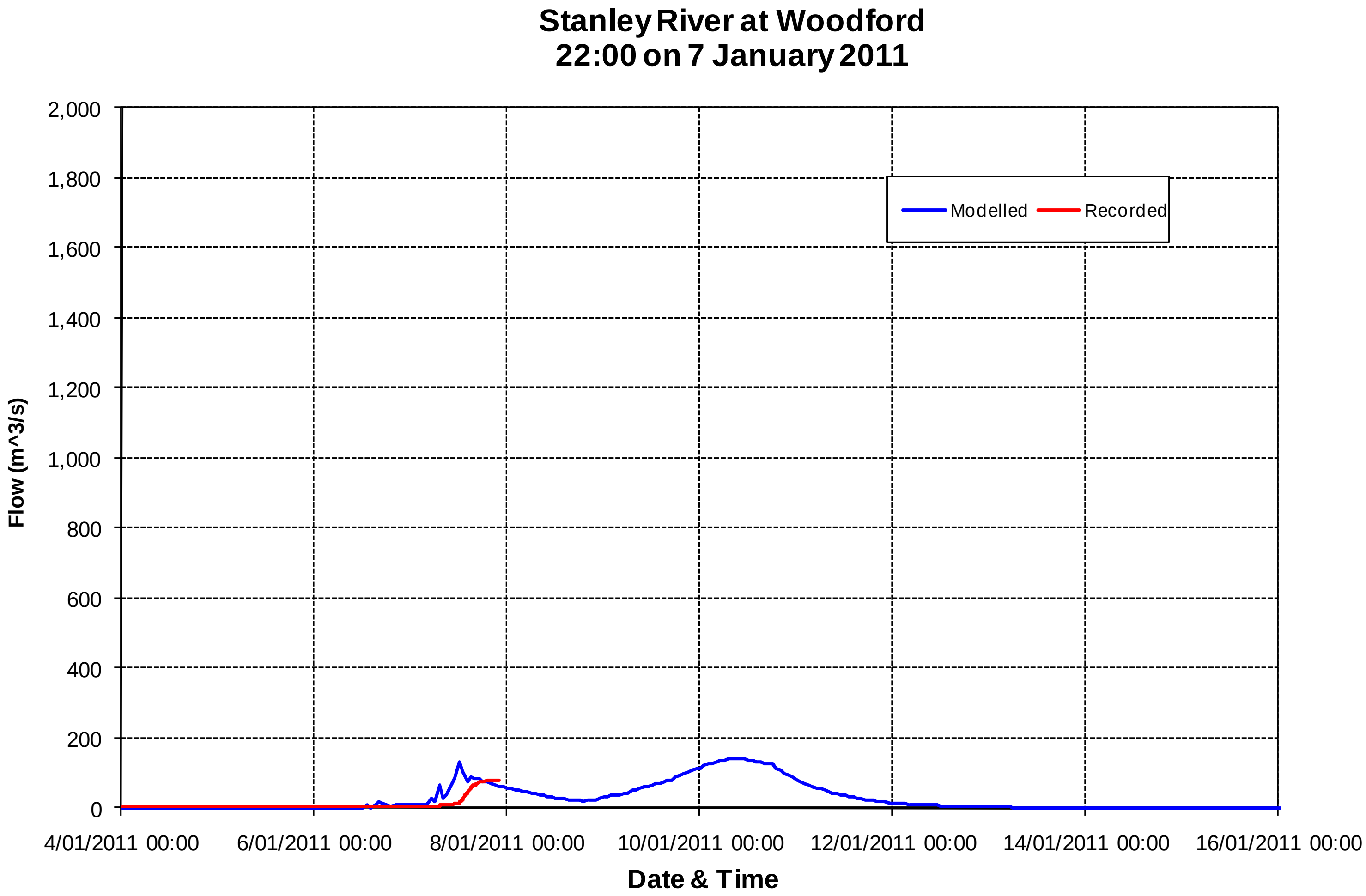
Run Efs – SILO-Forecast Rain

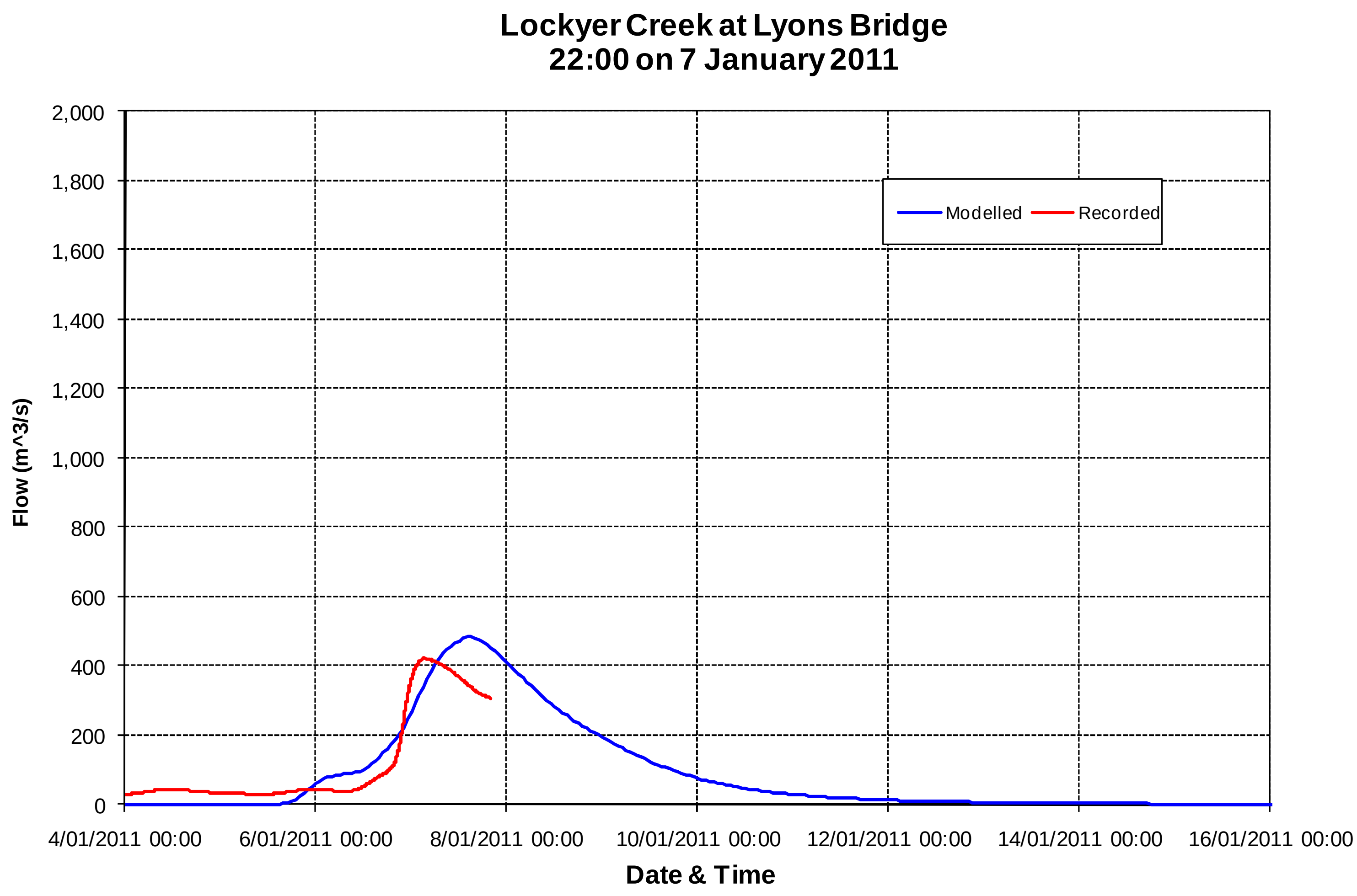
Date: Friday 7 January 2011

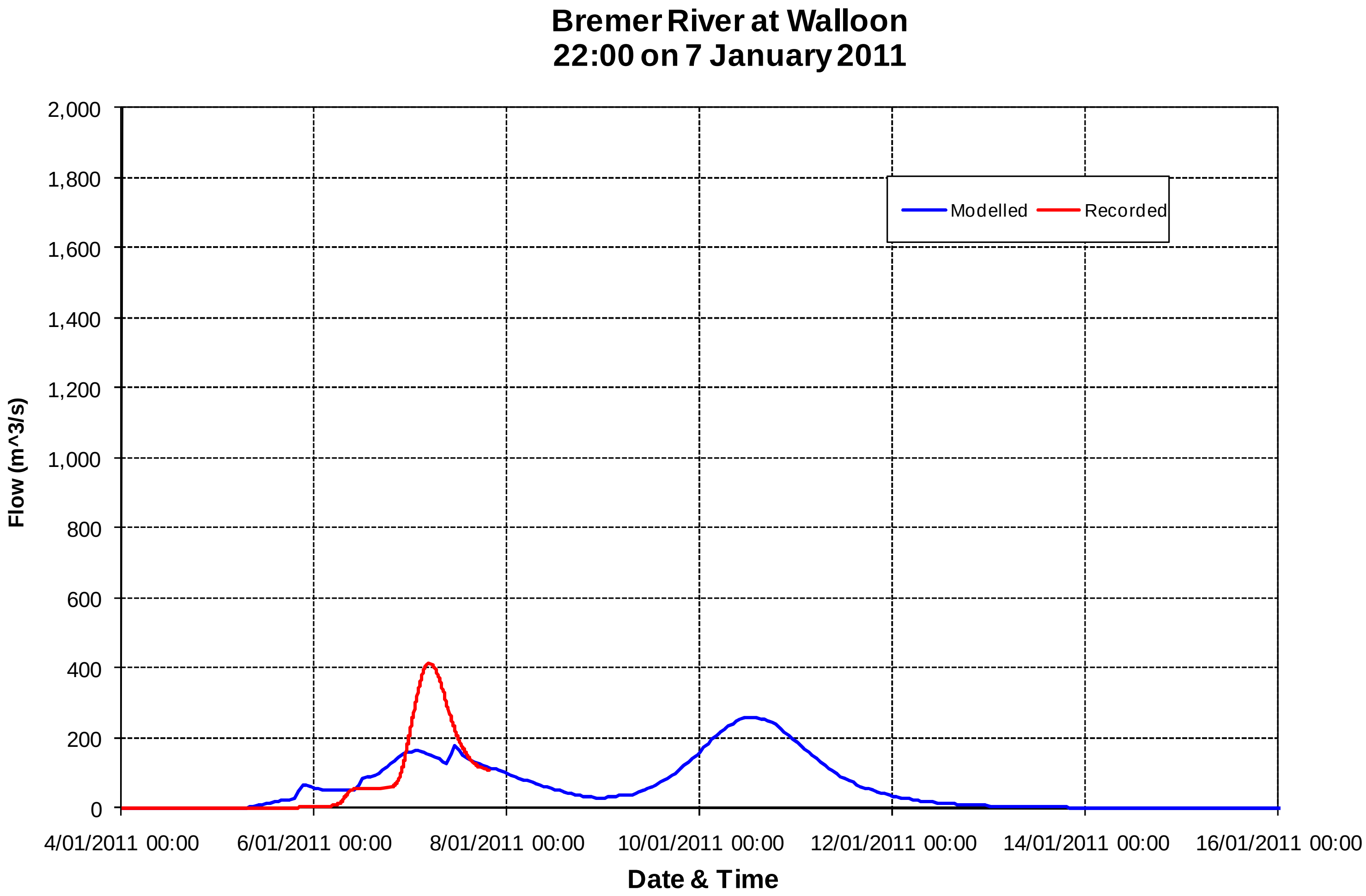
Time: 22:00

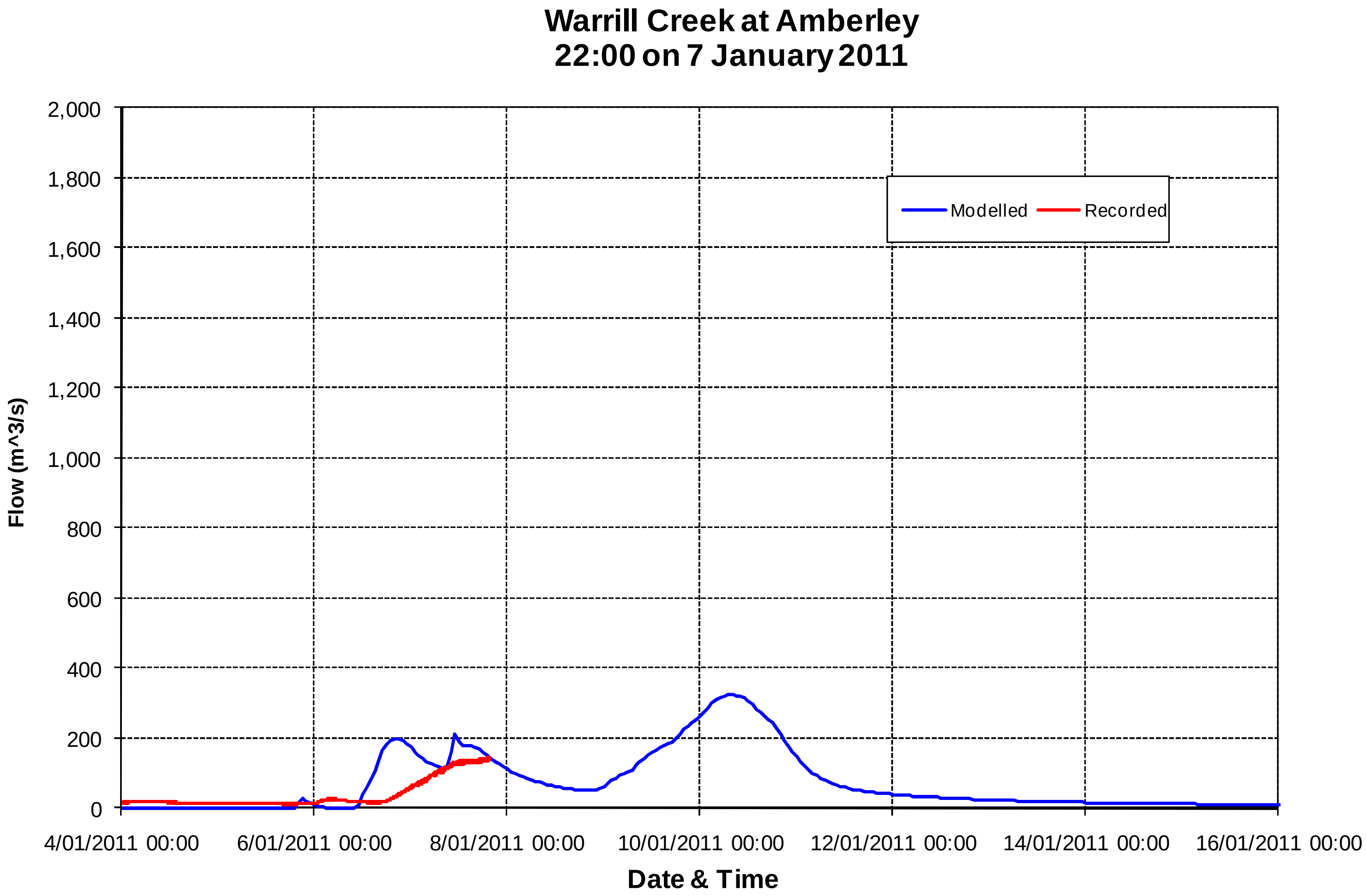
Location	Recorded peak flow (m^3/s)	Recorded flood volume (ML)	Modelled peak flow (m^3/s)	Modelled flood volume (ML)	Percent difference (%) peak flow	Percent difference (%) flood volume	Difference peak flow (m^3/s)	Difference flood volume (ML)
To run date and time								
Brisbane River at Gregors Creek	986	91,006	1,767	146,965	79.2	61.5	781	55,959
Stanley River at Woodford	79	4,920	134	5,066	68.7	3.0	55	146
Lockyer Creek at Lyons Bridge	44	12,257	485	46,210	1013.9	277.0	441	33,953
Bremer R at Walloon	412	23,755	181	20,719	-56.1	-12.8	-231	-3,036
Warrill Creek at Amberley	144	16,993	210	19,265	46.3	13.4	67	2,272
Somerset Dam Inflow			1,120	67,297				
Wivenhoe Dam Inflow			2,010	129,498				
			Combined	196,795				
To end of event simulation								
Somerset Dam Inflow			1,120	225,591				
Wivenhoe Dam Inflow			2,010	481,807				
			Combined	707,397				

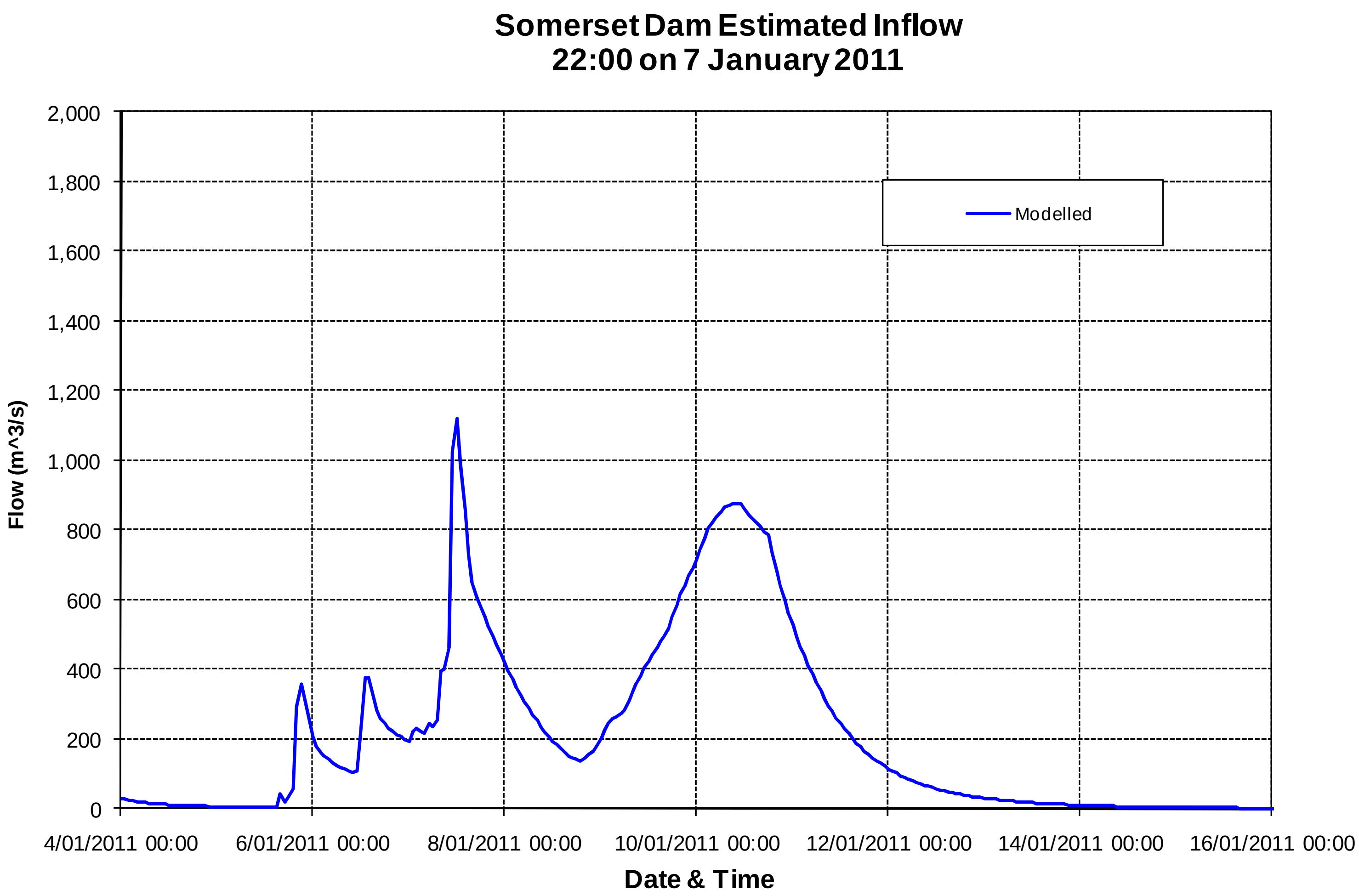

Brisbane River at Gregors Creek
22:00 on 7 January 2011
Modelled
Recorded
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

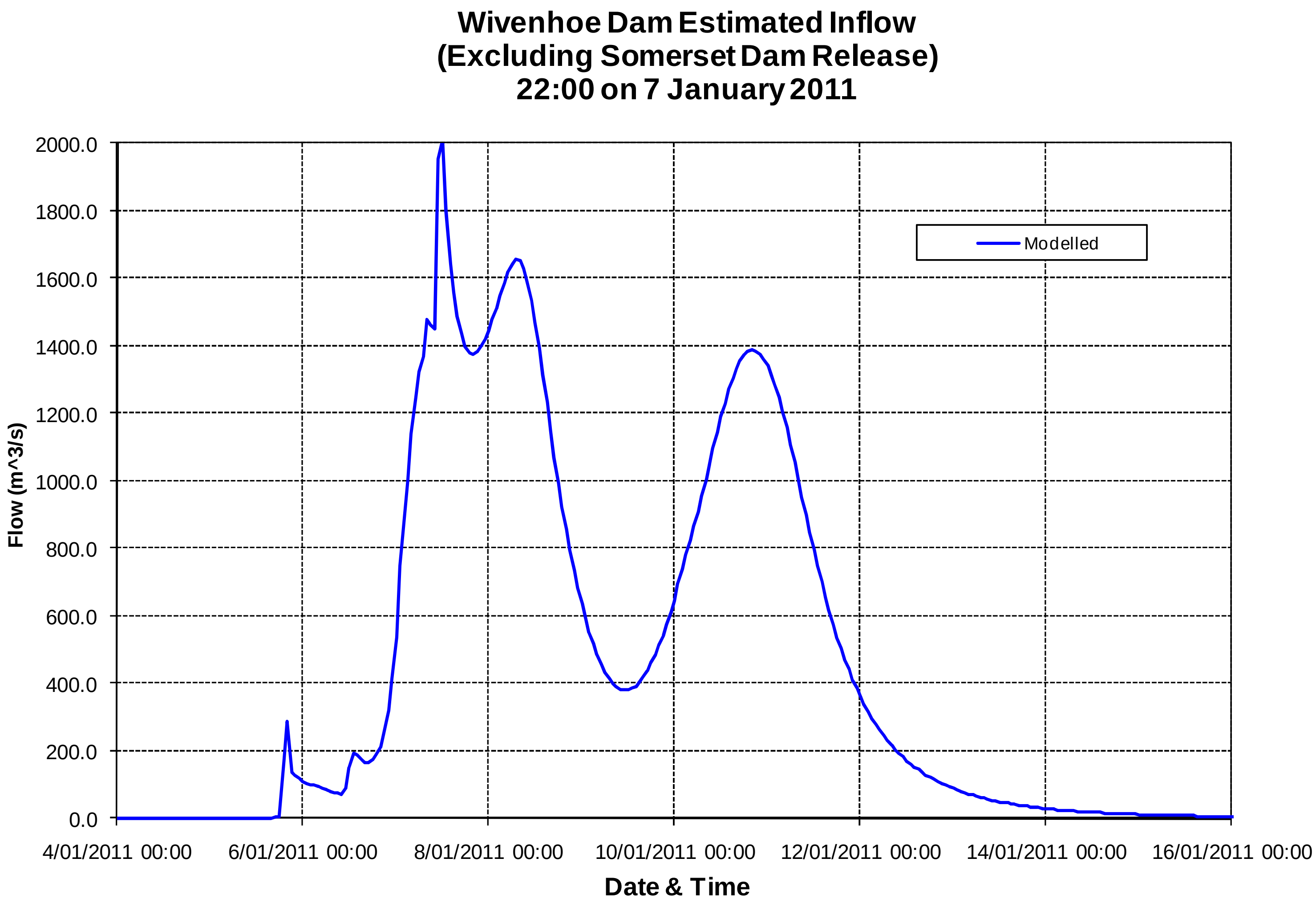

Stanley River at Woodford
22:00 on 7 January 2011
Modelled
Recorded
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Lockyer Creek at Lyons Bridge
22:00 on 7 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Bremer River at Walloon
22:00 on 7 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Warrill Creek at Amberley
22:00 on 7 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled
Recorded


Somerset Dam Estimated Inflow
22:00 on 7 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

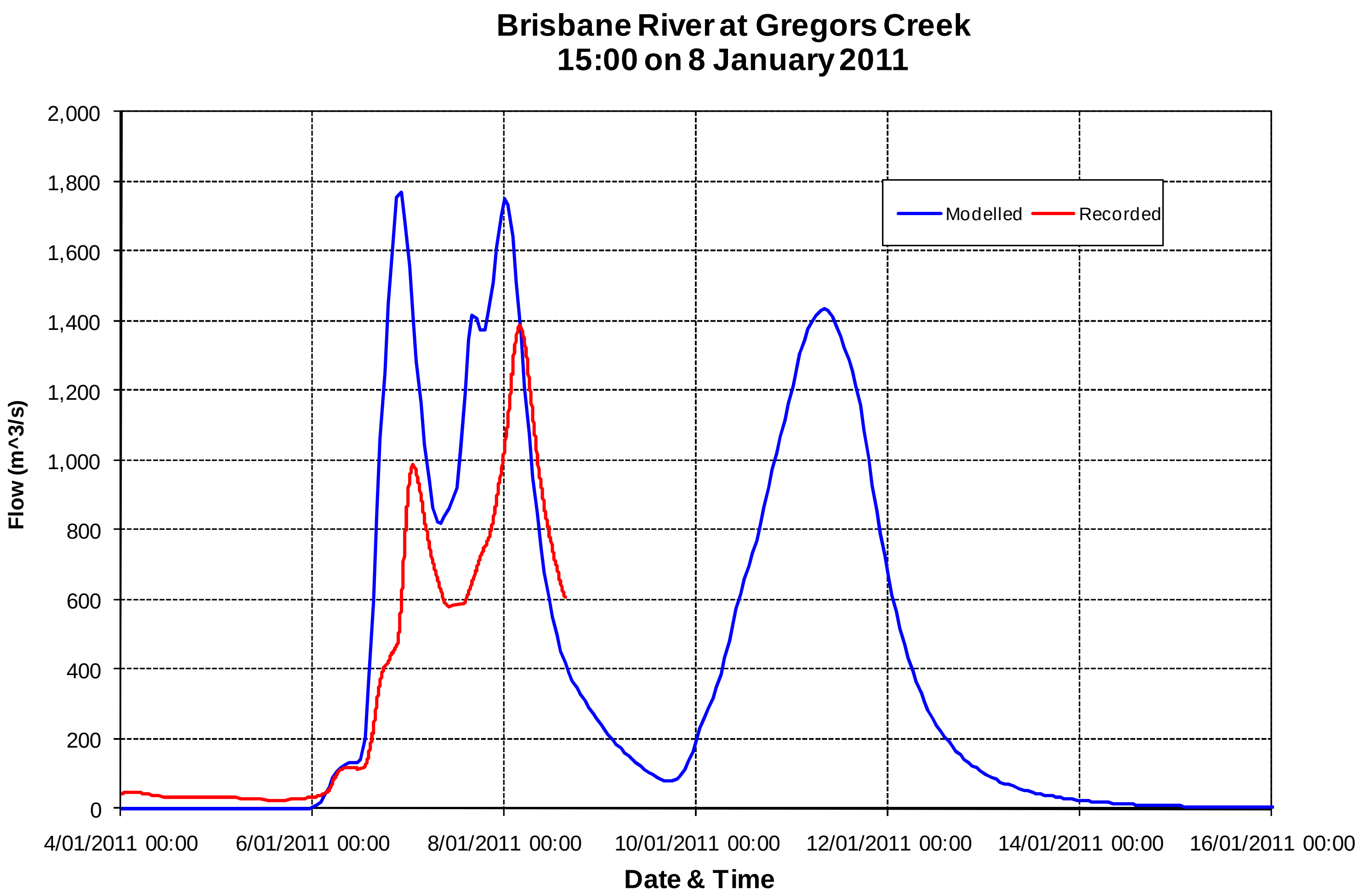

Wivenhoe Dam Estimated Inflow
(Excluding Somerset Dam Release)
22:00 on 7 January 2011
Modelled
Flow (m^3/s)
2000.0
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

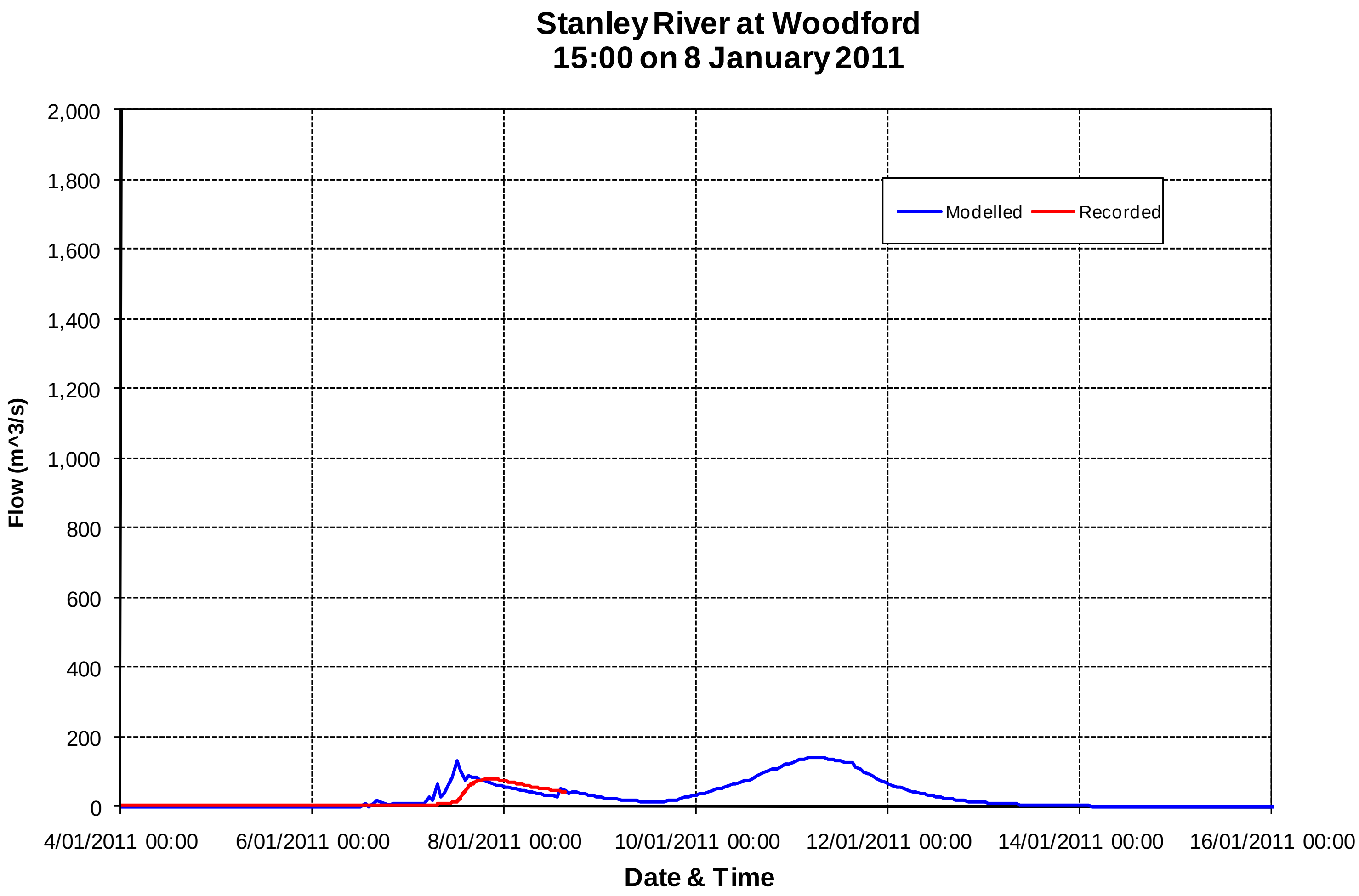
Run Gfs – SILO-Forecast Rain

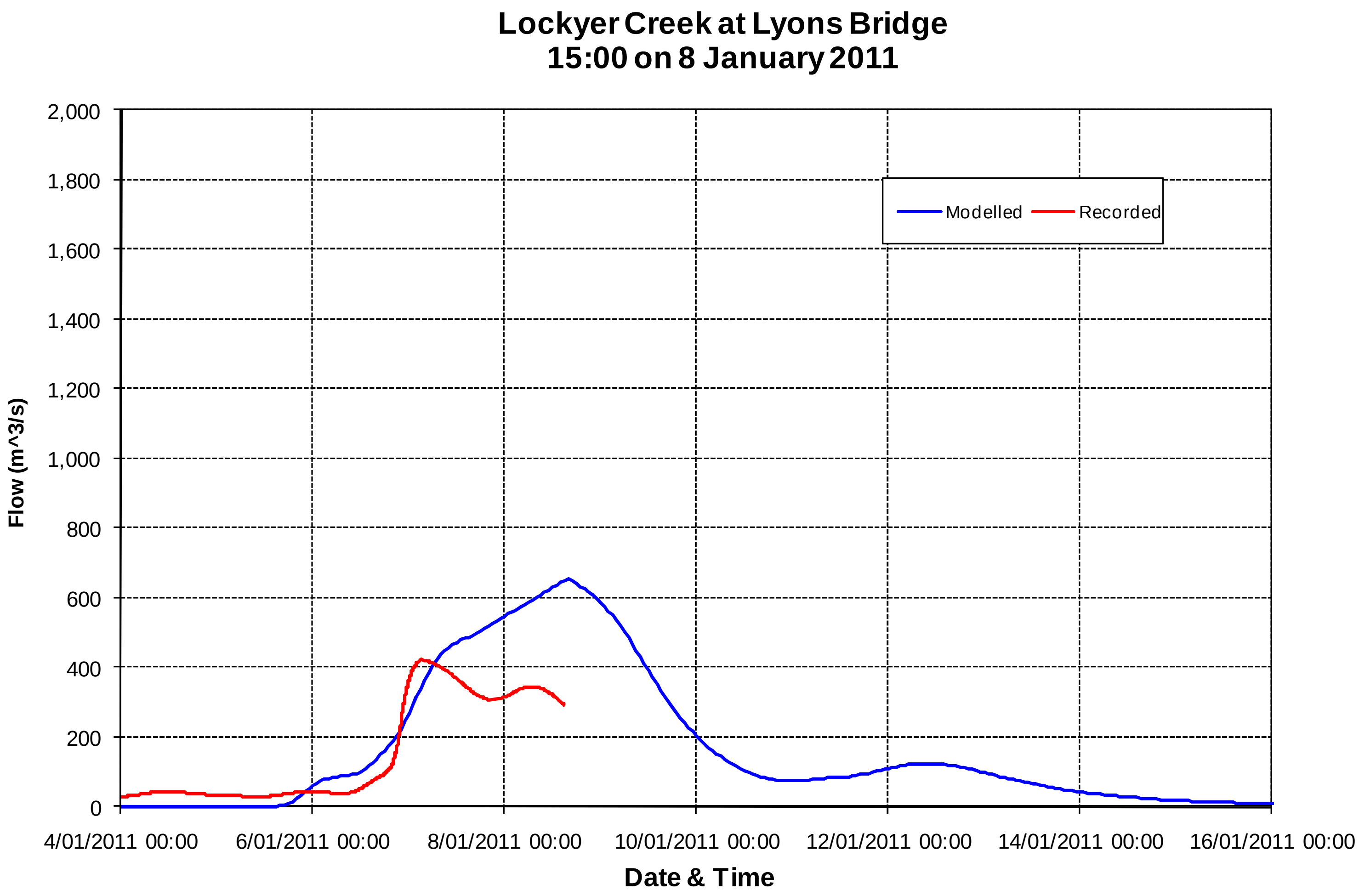
Date: Saturday 8 January 2011

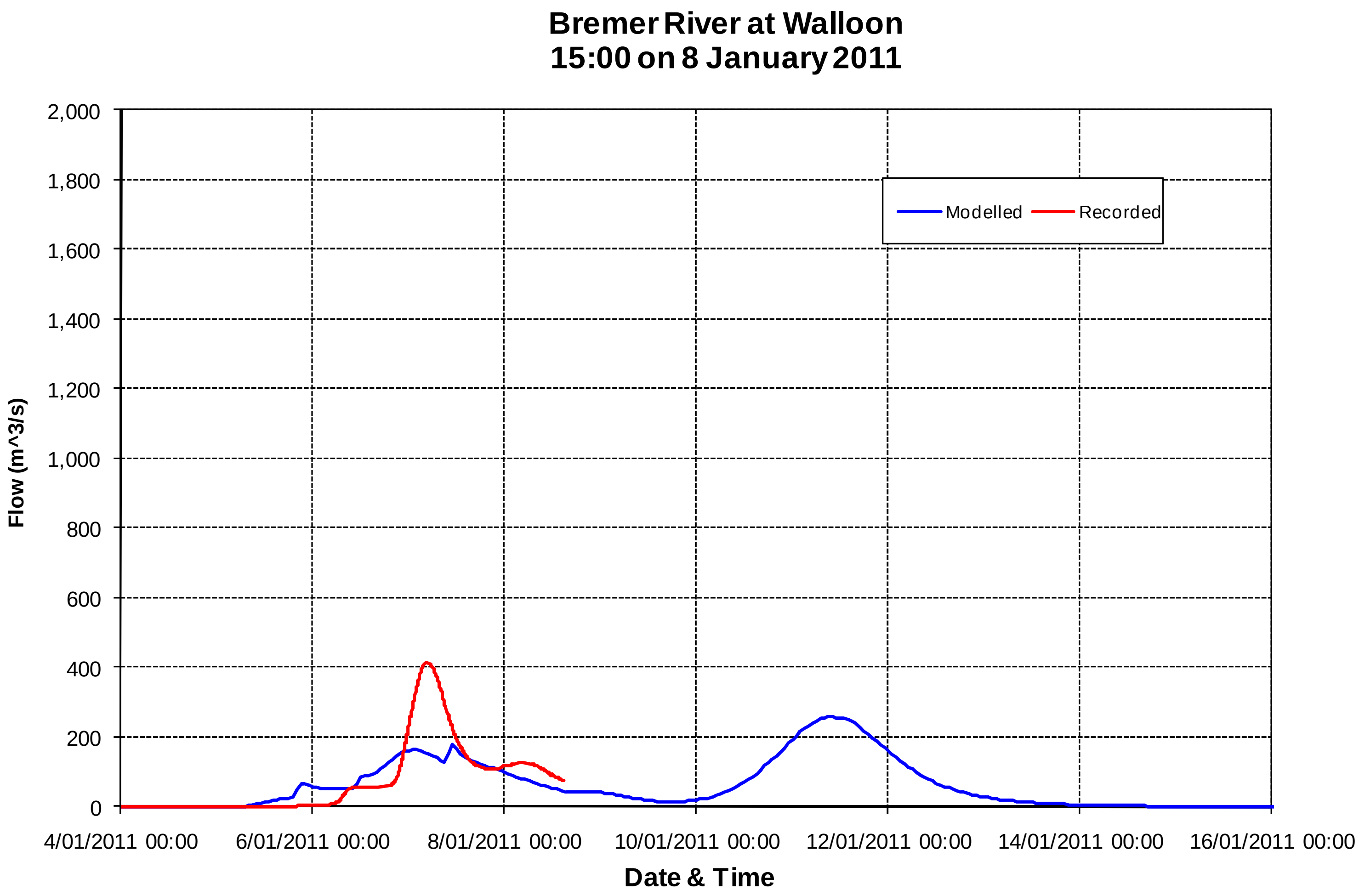
Time: 15:00

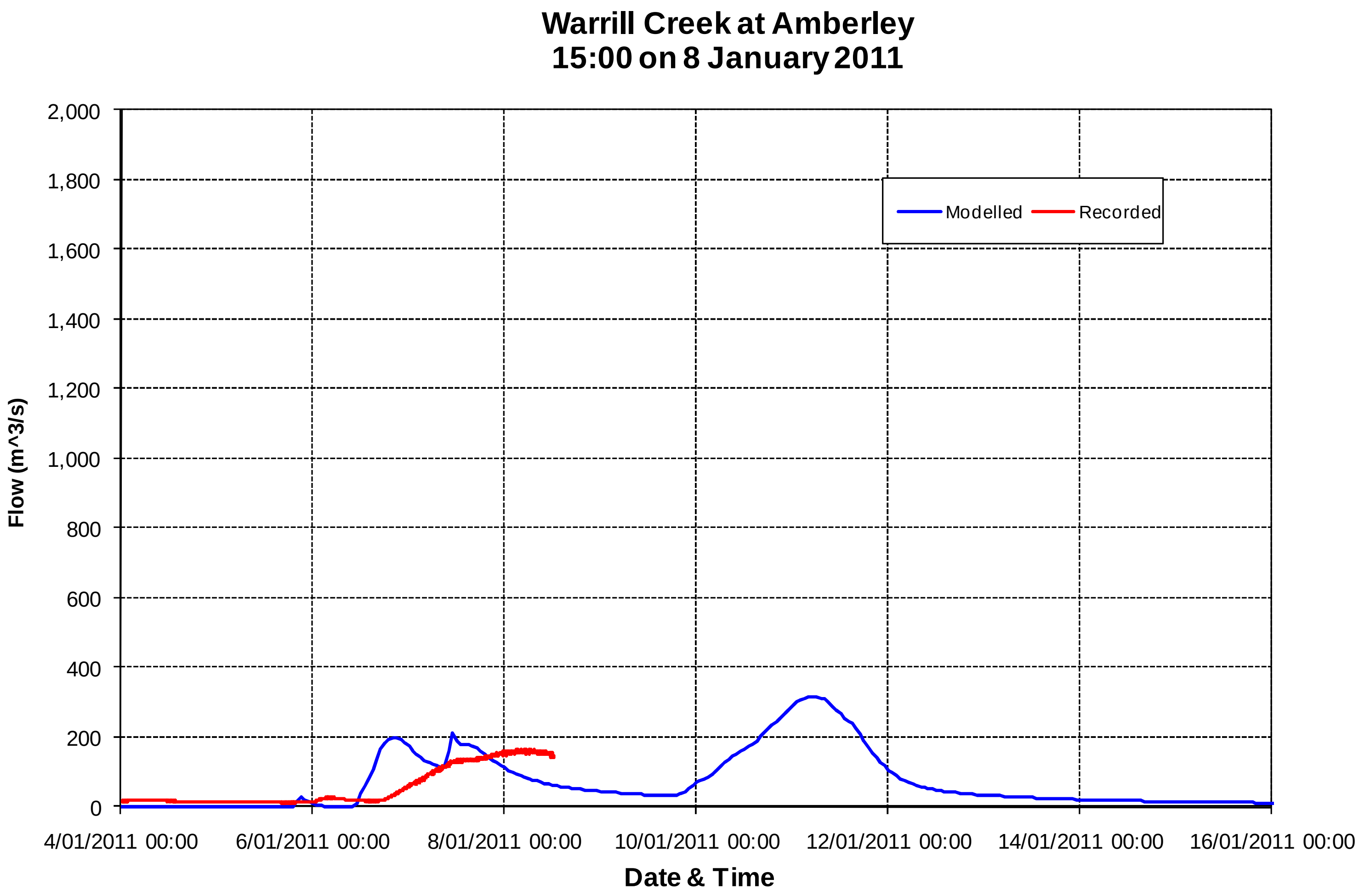
Location	Recorded peak flow (m^3/s)	Recorded flood volume (ML)	Modelled peak flow (m^3/s)	Modelled flood volume (ML)	Percent difference (%) peak flow	Percent difference (%) flood volume	Difference peak flow (m^3/s)	Difference flood volume (ML)
To run date and time								
Brisbane River at Gregors Creek	1,387	152,695	1,767	210,857	27.5	38.1	381	58,162
Stanley River at Woodford	79	8,514	134	7,794	68.7	-8.5	55	-720
Lockyer Creek at Lyons Bridge	422	68,288	649	83,938	53.8	22.9	227	15,650
Bremer R at Walloon	412	30,414	181	25,097	-56.1	-17.5	-231	-5,317
Warrill Creek at Amberley	164	26,500	210	24,231	28.3	-8.6	46	-2,269
Somerset Dam Inflow			1,120	84,940				
Wivenhoe Dam Inflow			2,010	222,269				
			Combined	307,209				
To end of event simulation								
Somerset Dam Inflow			1,120	232,043				
Wivenhoe Dam Inflow			2,010	484,998				
			Combined	717,041				

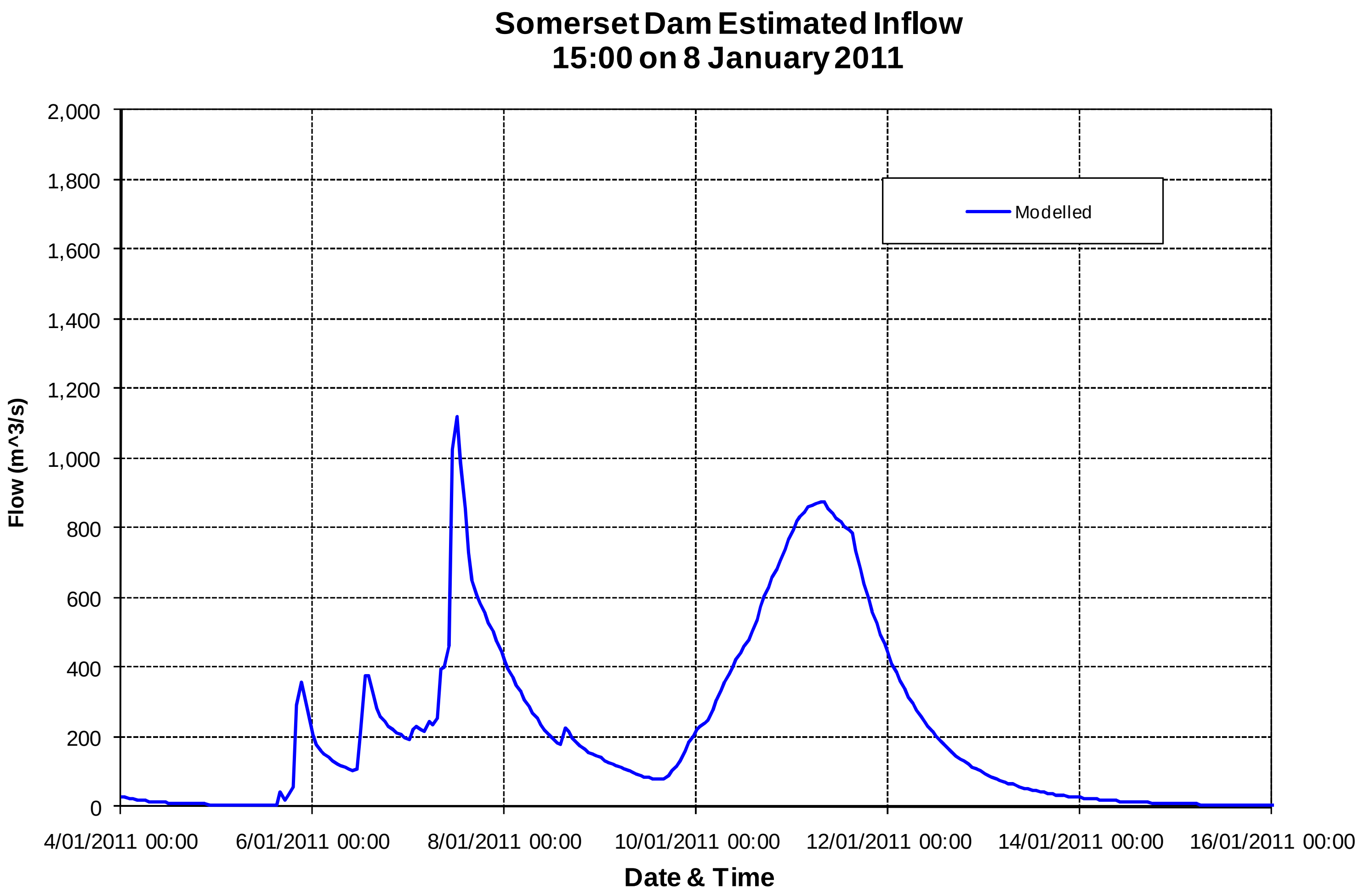

Brisbane River at Gregors Creek
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

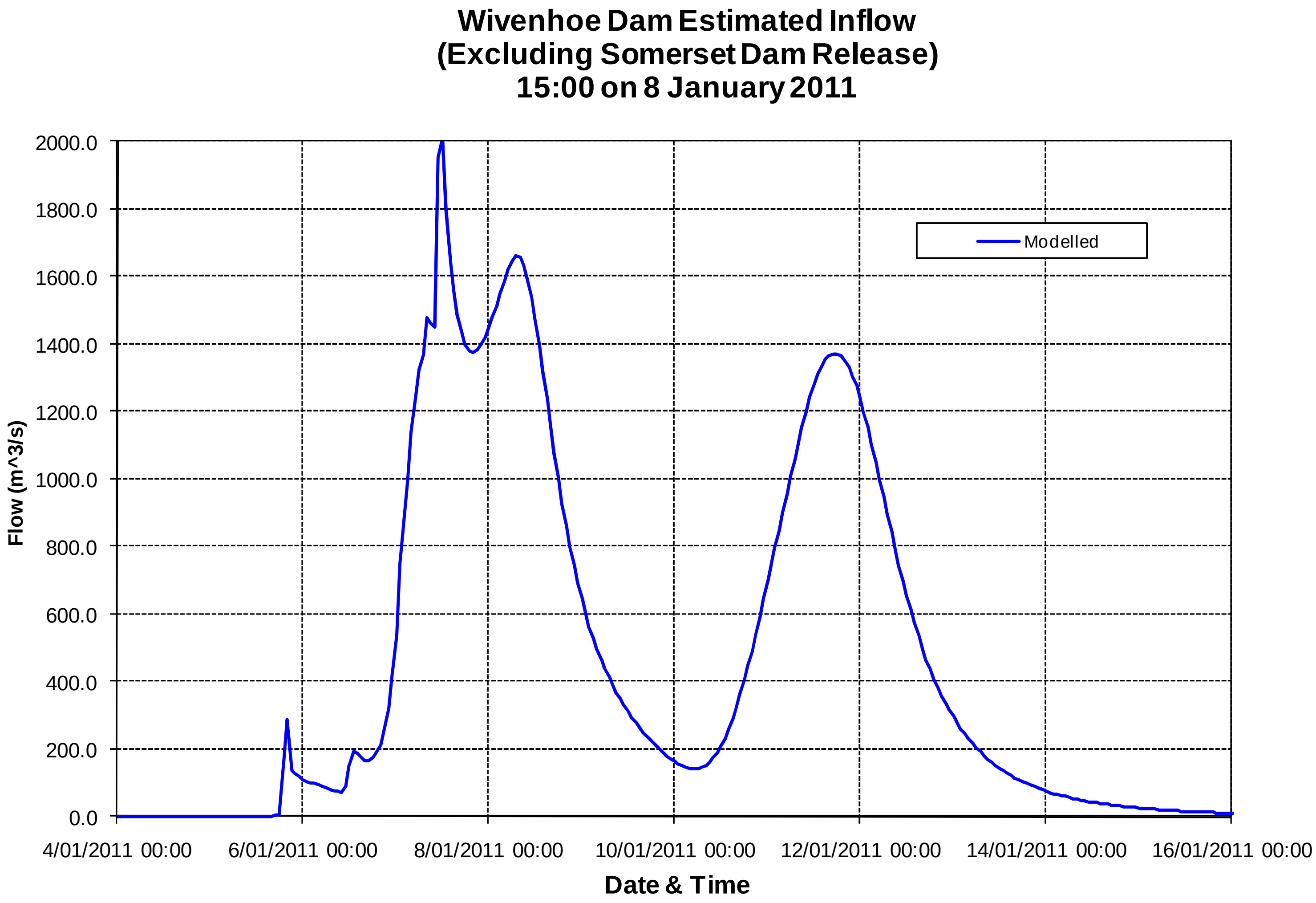

Stanley River at Woodford
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Lockyer Creek at Lyons Bridge
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Bremer River at Walloon
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Warrill Creek at Amberley
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Somerset Dam Estimated Inflow
15:00 on 8 January 2011
Flow (m^3/s)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Modelled
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

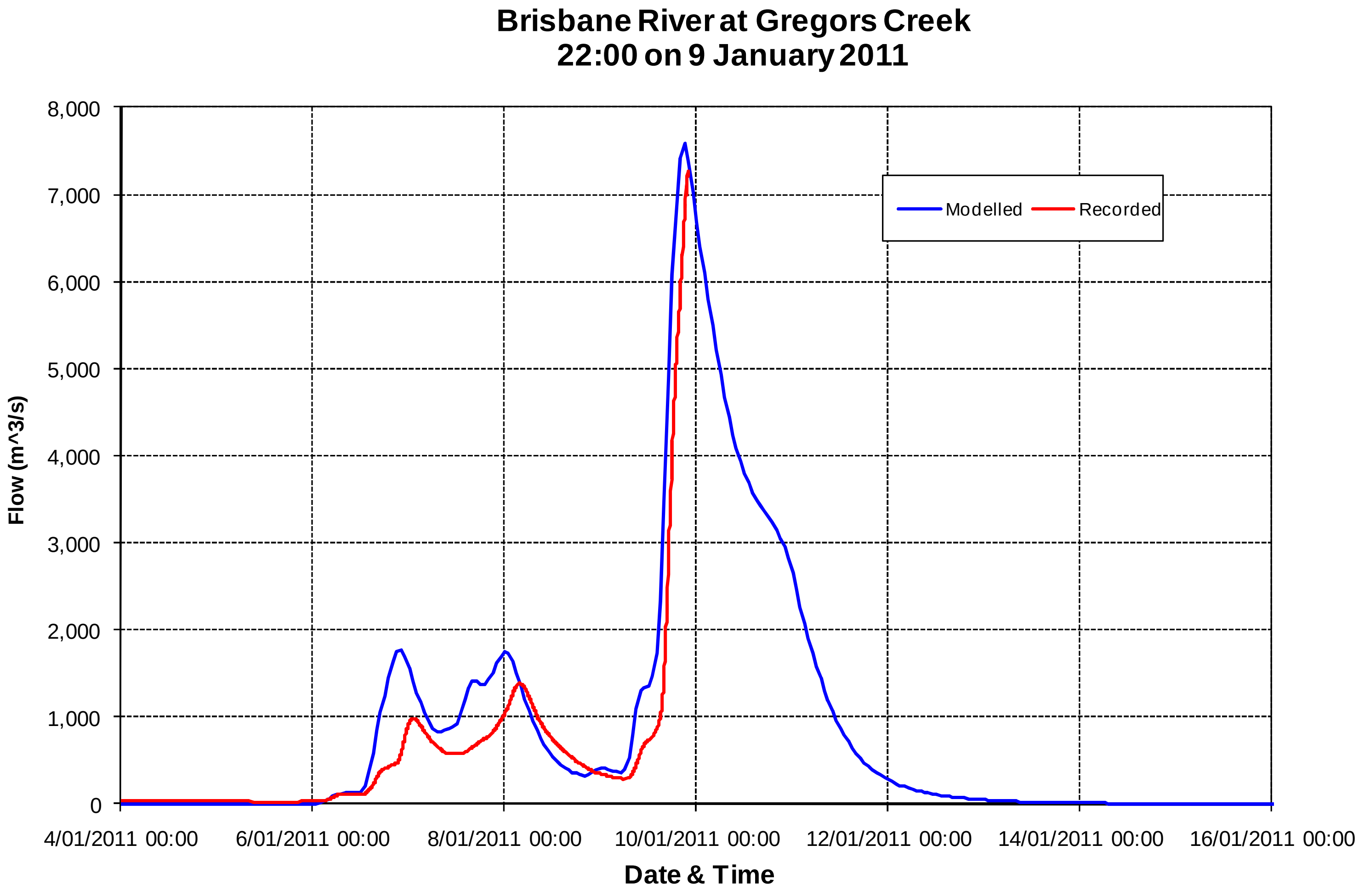

Wivenhoe Dam Estimated Inflow
(Excluding Somerset Dam Release)
15:00 on 8 January 2011
Flow (m^3/s)
2000.0
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled

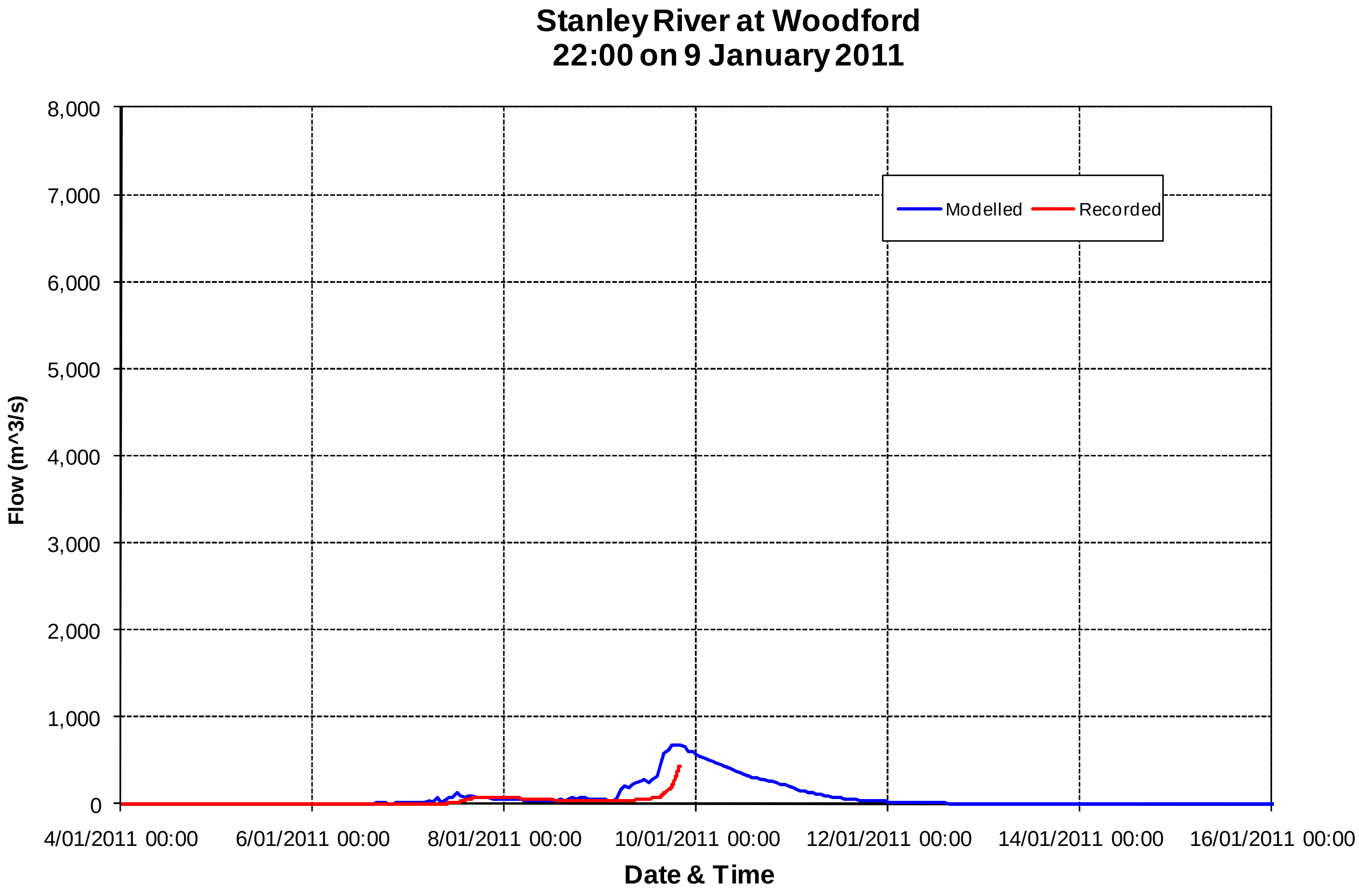
Run Mfq – SILO-Forecast Rain

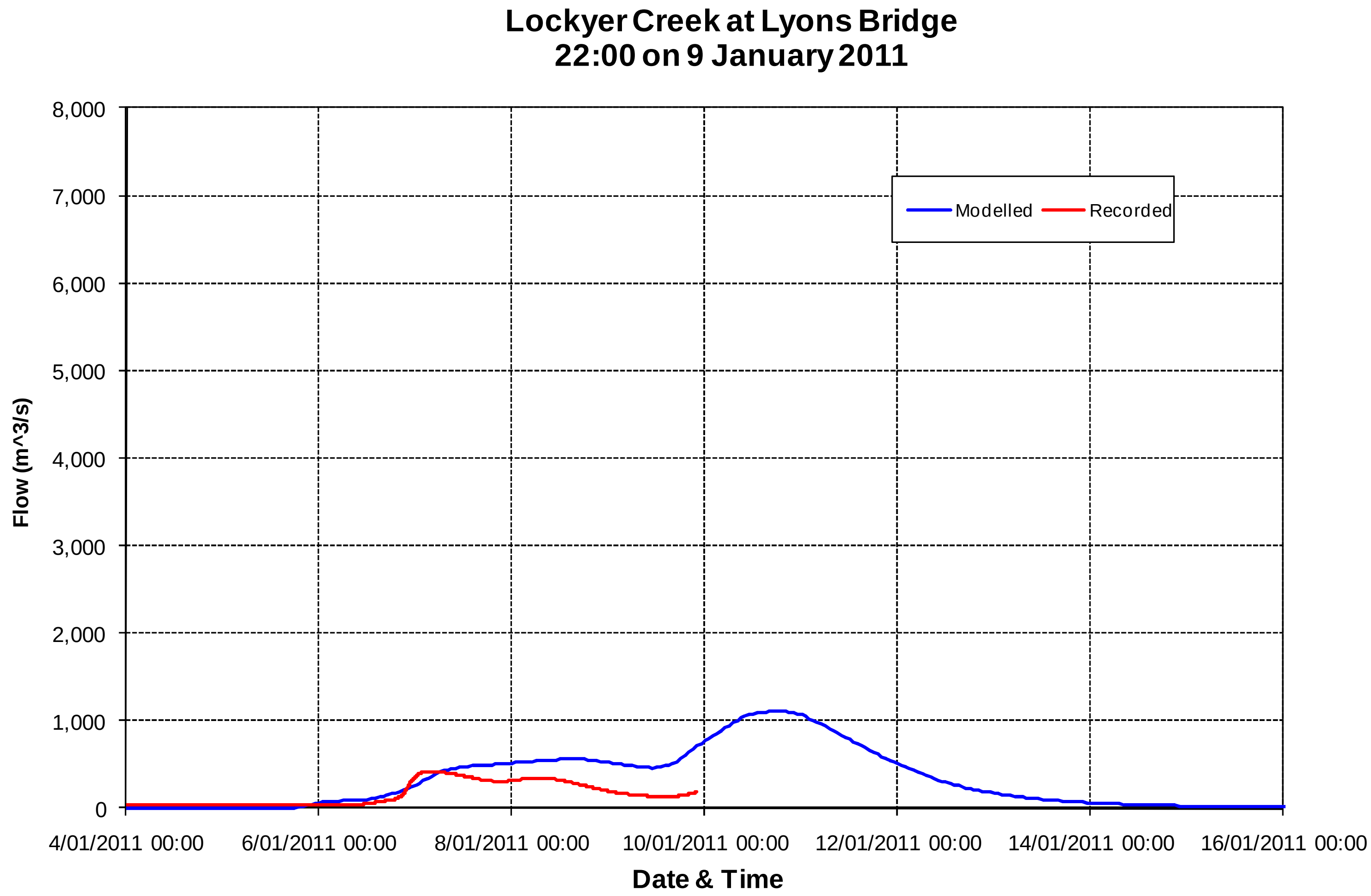
Date: Sunday 9 January 2011

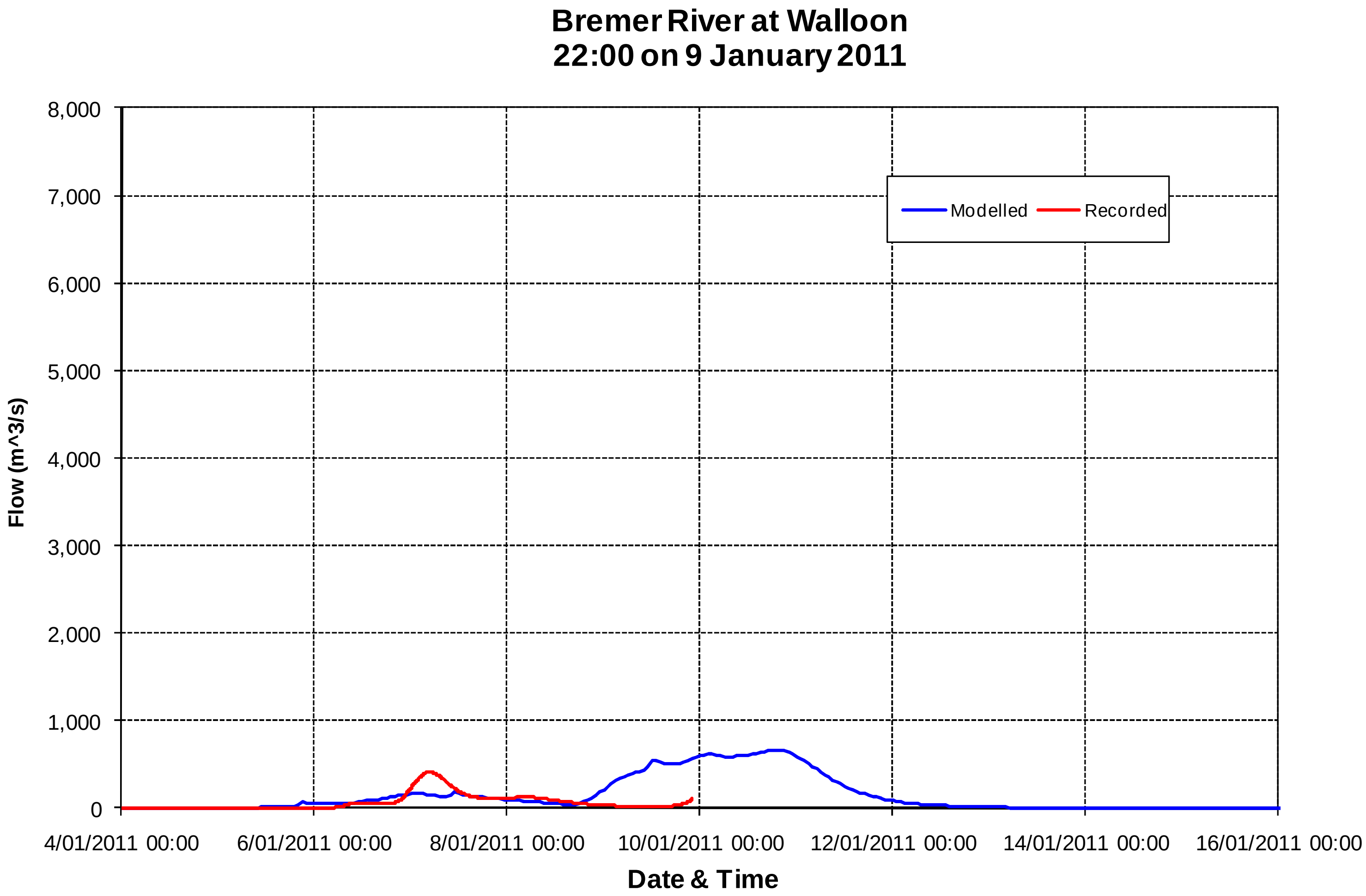
Time: 22:00

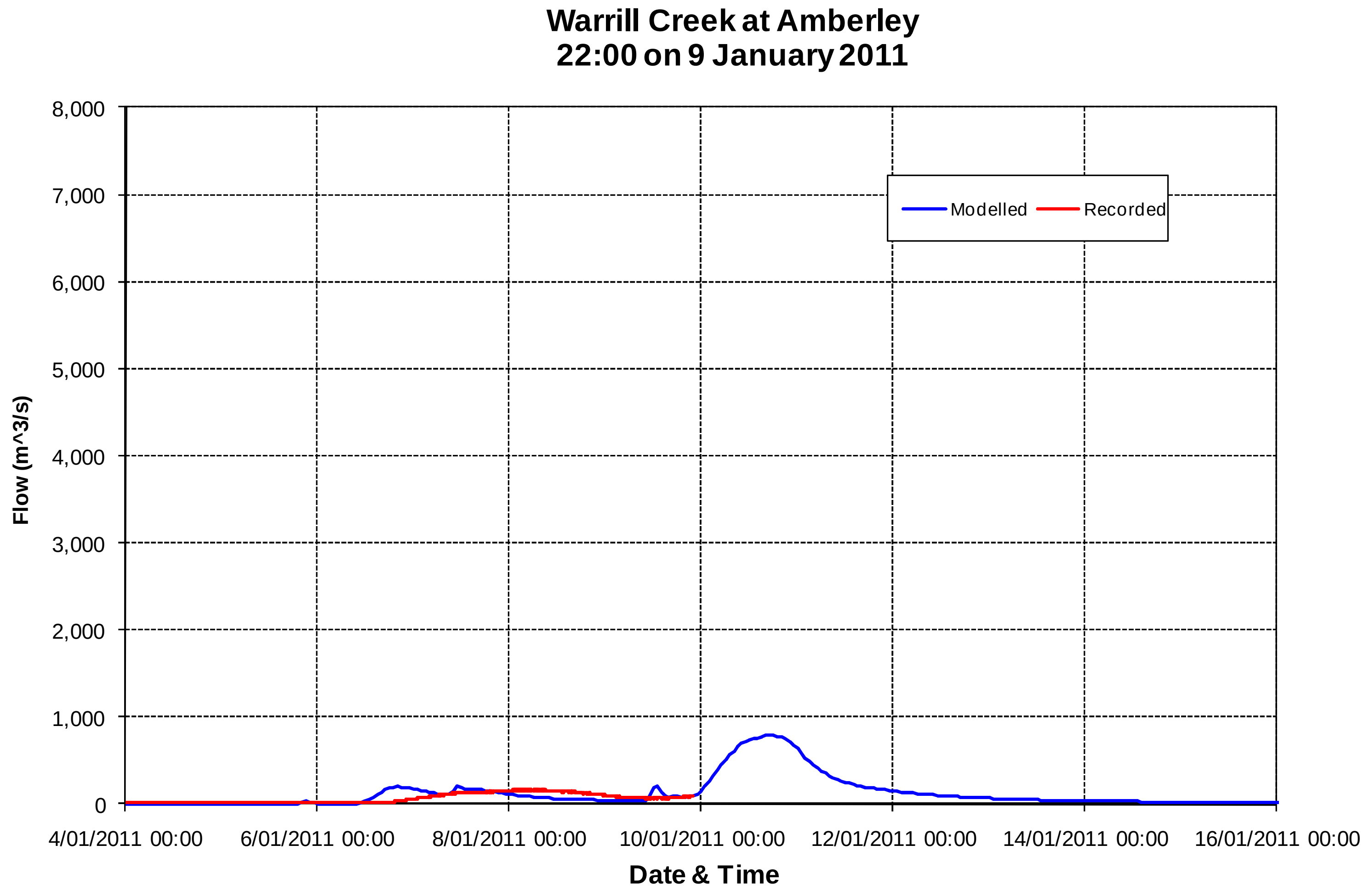
Location	Recorded peak flow (m^3/s)	Recorded flood volume (ML)	Modelled peak flow (m^3/s)	Modelled flood volume (ML)	Percent difference (%) peak flow	Percent difference (%) flood volume	Difference peak flow (m^3/s)	Difference flood volume (ML)
To run date and time								
Brisbane River at Gregors Creek	7,270	315,829	7,594	431,321	4.5	36.6	325	115,492
Stanley River at Woodford	430	20,709	685	37,143	59.3	79.4	255	16,434
Lockyer Creek at Lyons Bridge	422	88,098	708	139,309	67.6	58.1	285	51,211
Bremer R at Walloon	412	34,475	570	64,037	38.3	85.7	158	29,562
Warrill Creek at Amberley	164	36,381	210	32,163	28.3	-11.6	46	-4,218
Somerset Dam Inflow			3,856	229,714				
Wivenhoe Dam Inflow			4,128	363,662				
			Combined	593,376				
To end of event simulation								
Somerset Dam Inflow			3,856	502,189				
Wivenhoe Dam Inflow			7,913	1,202,803				
			Combined	1,704,992				

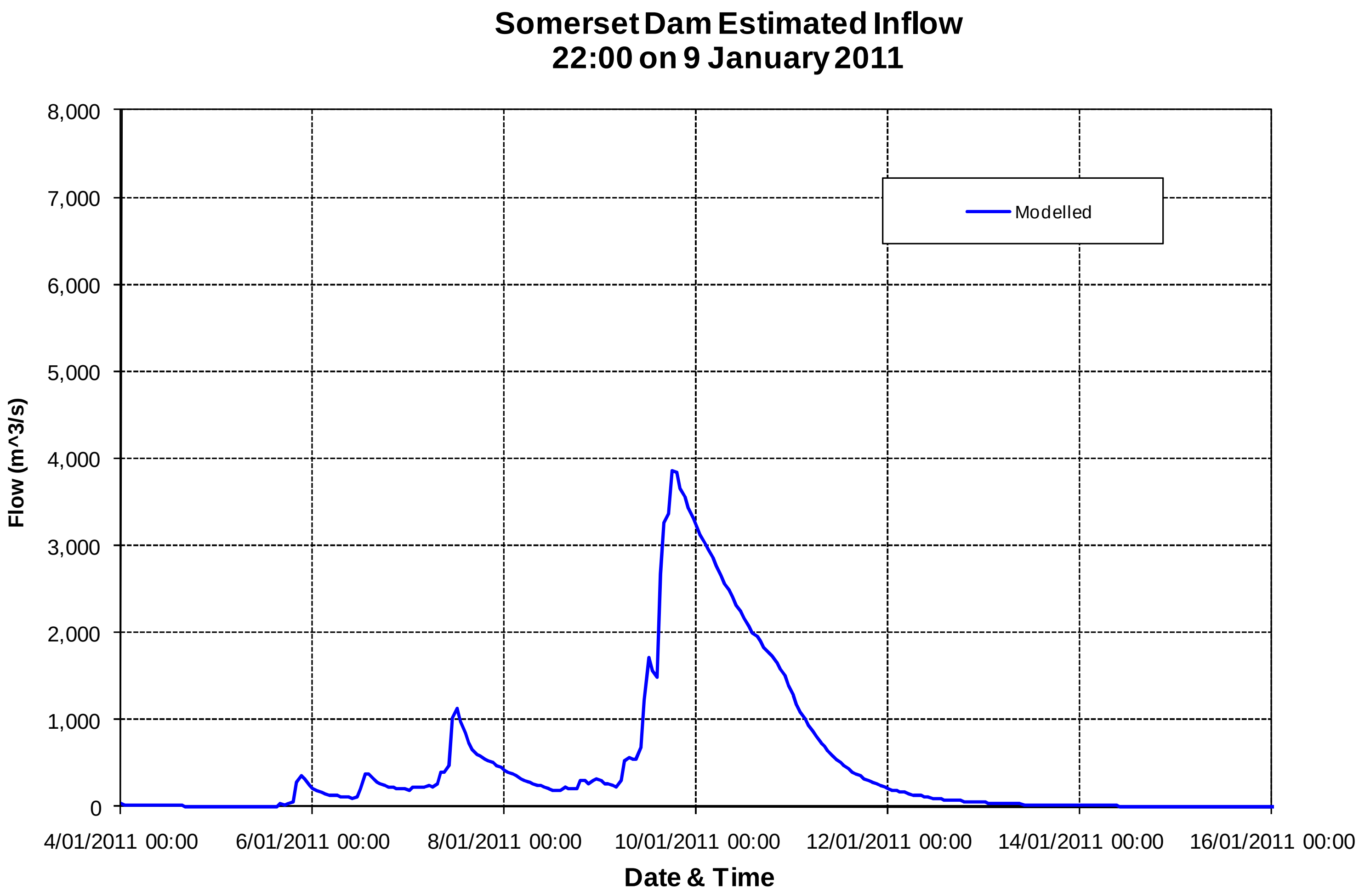

Brisbane River at Gregors Creek
22:00 on 9 January 2011
Flow (m^3/s)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled
Recorded

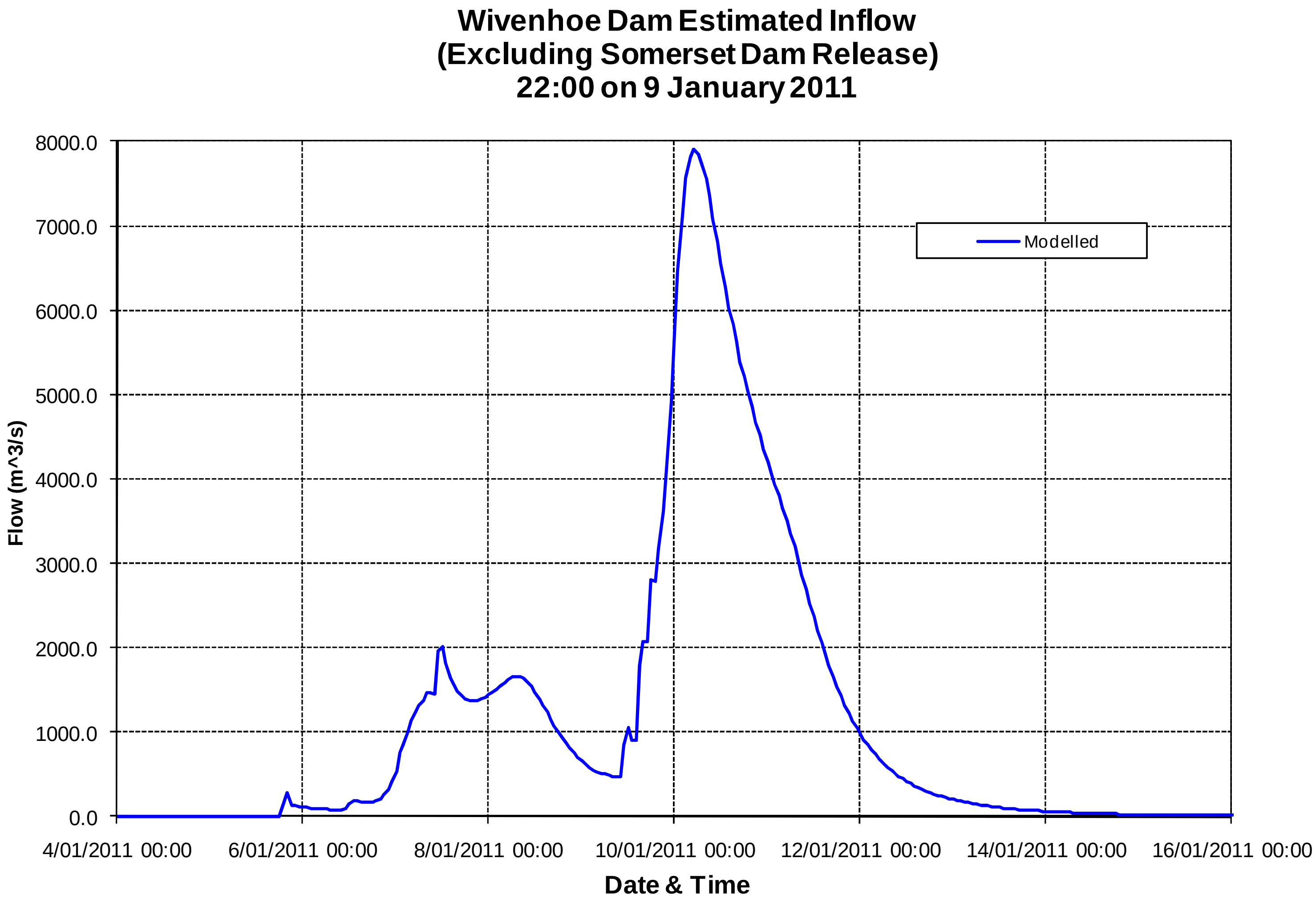

Stanley River at Woodford
22:00 on 9 January 2011
Modelled
Recorded
Flow (m^3/s)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Lockyer Creek at Lyons Bridge
22:00 on 9 January 2011
Flow (m^3/s)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled
Recorded


Bremer River at Walloon
22:00 on 9 January 2011
Modelled
Recorded
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Flow (m^3/s)
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Warrill Creek at Amberley
22:00 on 9 January 2011
Flow (m^3/s)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Somerset Dam Estimated Inflow
22:00 on 9 January 2011
Flow (m^3/s)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Modelled
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time


Wivenhoe Dam Estimated Inflow
(Excluding Somerset Dam Release)
22:00 on 9 January 2011
Flow (m^3/s)
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled

APPENDIX 3

January 2011 Flood Event

Report on the operation of Somerset Dam and Wivenhoe Dam

2 March 2011

APPENDIX L – FLOOD OPERATIONS DIRECTIVES

WIVENHOE DAM

Wivenhoe Directive 1

Date: Friday 7 January 2011

Time: 12:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 07/01/2011** **Time: 12:00** **Directive No: 01**

This transmission comprises of this page and 0 other pages.

Message:

The Wivenhoe Dam lake level was 67.81m AHD and rising slowly at 11:00 Friday 07/01/2011.

Prior to gate operations, please close the regulator.

The following gate operations should be undertaken commencing at 15:00 07/01/2011

07/01/2011 15:00	Open Gate	3	from	0.0	metres	to	0.5	metres
07/01/2011 16:00	Open Gate	3	from	0.5	metres	to	1.0	metres
07/01/2011 17:00	Open Gate	3	from	1.0	metres	to	1.5	metres
07/01/2011 18:00	Open Gate	3	from	1.5	metres	to	2.0	metres
07/01/2011 19:00	Open Gate	3	from	2.0	metres	to	2.5	metres
07/01/2011 20:00	Open Gate	3	from	2.5	metres	to	3.0	metres
07/01/2011 21:00	Open Gate	3	from	2.5	metres	to	3.5	metres

By 21:30, Gate 3 will be open 3.5 metres and releasing approximately 400m^3/s.

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 2

Date: Friday, 7 January 2011

Time: 21:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 07/01/2011** **Time: 21:45** **Directive No: 02**

This transmission comprises of this page and 0 other pages.

Message:

The following gate operations should be undertaken commencing at 22:00 07/01/2011

07/01/2011 22:00	Open Gate	2	from	0.0	metres	to	0.5	metres
07/01/2011 23:00	Open Gate	4	from	0.0	metres	to	0.5	metres
08/01/2011 00:00	Open Gate	2	from	0.5	metres	to	1.0	metres
08/01/2011 01:00	Open Gate	4	from	0.5	metres	to	1.0	metres
08/01/2011 02:00	Open Gate	1	from	0.0	metres	to	0.5	metres
08/01/2011 03:00	Open Gate	5	from	0.0	metres	to	0.5	metres
08/01/2011 04:00	Open Gate	2	from	1.0	metres	to	1.5	metres

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 3

Duty Engineer

Wivenhoe Directive 3

Date: Saturday 8 January 2011

Time: 04:50

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 08/01/2011** **Time: 04:50** **Directive No: 03**

This transmission comprises of this page and 0 other pages.

Message:

The following gate operations should be undertaken commencing at 05:00 07/01/2011

08/01/2011 05:00	Open Gate	4	from	1.0	metres	to	1.5	metres
08/01/2011 06:00	Open Gate	1	from	0.5	metres	to	1.0	metres
08/01/2011 07:00	Open Gate	5	from	0.5	metres	to	1.0	metres
08/01/2011 08:00	Open Gate	3	from	3.5	metres	to	4.0	metres

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 3

Duty Engineer

Wivenhoe Directive 4

Date: Saturday 8 January 2011

Time: 08:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 08/01/2011** **Time: 08:15** **Directive No: 04**

This transmission comprises of this page and 0 other pages.

Message:

The following gate operations should be undertaken commencing at 09:00 08/01/2011

08/01/2011 09:00	Open Gate	2	from	1.5	metres	to	2.0	metres
08/01/2011 10:00	Open Gate	4	from	1.5	metres	to	2.0	metres
08/01/2011 11:00	Open Gate	1	from	1.0	metres	to	1.5	metres
08/01/2011 12:00	Open Gate	5	from	1.0	metres	to	1.5	metres
08/01/2011 13:00	Open Gate	2	from	2.0	metres	to	2.5	metres
08/01/2011 14:00	Open Gate	4	from	2.0	metres	to	2.5	metres

It is noted that the hydro will continuing releasing 13 m^3/s. At the completion of these gate operations the dam will be releasing 1,247 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 1

Duty Engineer

Wivenhoe Directive 5

Date: Sunday 9 January 2011

Time: 01:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 09/01/2011** **Time: 01:00** **Directive No: 05**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operation at 01:30 on 09/01/2011

Open Gate 3 from 4.0 metres to 4.5 metres

It is noted that the hydro will continuing releasing 13 m^3/s. Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 4

Duty Engineer

Wivenhoe Directive 6

Date: Sunday 9 January 2011

Time: 04:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 09/01/2011** **Time: 04:30** **Directive No: 06**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operation at 05:00 on 09/01/2011

Open Gate 1 from 1.5 metres to 2.0 metres

It is noted that the hydro will continuing releasing 13 m^3/s. Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 4
Duty Engineer

Wivenhoe Directive 7

Date: Sunday 9 January 2011

Time: 10:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 09/01/2011** **Time: 10:30** **Directive No: 07**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operation at 11:00 on 09/01/2011

Open Gate 5 from 1.5 metres to 2.0 metres

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 8

Date: Monday 10 January 2011

Time: 02:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 10/01/2011** **Time: 02:00** **Directive No: 08**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations at 02:00 on 10/01/2011

Open Gate	1	from	2.0	metres	To	2.5	metres	At 02:00
Open Gate	5	from	2.0	metres	To	2.5	metres	At 03:00
Open Gate	2	from	2.5	metres	To	3.0	metres	At 04:00
Open Gate	4	from	2.5	metres	To	3.0	metres	At 05:00
Open Gate	2	from	3.0	metres	To	3.5	metres	At 06:00

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 3

Duty Engineer

Wivenhoe Directive 9

Date: Monday 10 January 2011

Time: 06:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 10/01/2011** **Time: 06:30** **Directive No: 09**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations at 07:00 on 10/01/2011

Open Gate	4	from	3.0	metres	To	3.5	metres	At 07:00
Open Gate	1	from	2.5	metres	To	3.0	metres	At 08:00
Open Gate	5	from	2.5	metres	To	3.0	metres	At 09:00
Open Gate	2	from	3.5	metres	To	4.0	metres	At 10:00
Open Gate	4	from	3.5	metres	To	4.0	metres	At 11:00

It is noted that the hydro will continuing releasing 13 m^3/s. At the end of these operations the dam will be releasing around 2,180 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2
Duty Engineer

Wivenhoe Directive 10

Date: Monday 10 January 2011

Time: 08:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 10/01/2011** **Time: 08:30** **Directive No: 10**

This transmission comprises of this page and 0 other pages.

Message:

This directive replaces Directive #9

Please undertake the following gate operations at 07:00 on 10/01/2011

Open Gate	4	from	3.0	metres	To	3.5	metres	at 07:00
Open Gate	1	from	2.5	metres	To	3.0	metres	at 08:00
Open Gate	5	from	2.5	metres	To	3.0	metres	at 09:00

Following the gate movement at 09:00 10/01/2011 gate will be held at the levels below until further advised.

Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
3.0	3.5	4.5	3.5	3.0

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 11

Date: Monday 10 January 2011

Time: 15:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 10/01/2011** **Time: 15:00** **Directive No: 11**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations at 15:00 on 10/01/2011

- Open Gate 2 to 4.0 m at 15:00
- Open Gate 4 to 4.0 m at 15:30
- Open Gate 3 to 5.0 m at 16:00
- Open Gate 1 to 3.5 m at 16:30
- Open Gate 5 to 3.5 m at 17:00
- Open Gate 2 to 4.5 m at 17:30
- Open Gate 4 to 4.5 m at 18:00
- Open Gate 1 to 4.0 m at 18:30
- Open Gate 5 to 4.0 m at 19:00
- Open Gate 1 to 4.5 m at 19:30

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 12

Date: Tuesday 11 January 2011

Time: 08:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 08:00** **Directive No: 12**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations at 08:00 on 11/01/2011

- Open Gate 5 to 4.5 m at 08:00
- Open Gates 2 and 4 to 5.0 m at 08:30
- Open Gate 3 to 5.5 m at 09:00

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 4

Duty Engineer

Wivenhoe Directive 13

Date: Tuesday 11 January 2011

Time: 09:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 09:00** **Directive No: 13**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 09:30 on 11/01/2011

- Open Gates 2 and 4 to 5.5 m at 09:30
- Open Gates 1 and 5 to 5.5 m at 10:00
- Open Gate 3 to 6.0 m at 10:30
- Open Gates 2 and 4 to 6.0 m at 11:00
- Open Gates 1 and 5 to 6.0 m at 11:30

It is noted that the hydro will continuing releasing 13 m^3/s.

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 4

Duty Engineer

Wivenhoe Directive 14

Date: Tuesday 11 January 2011

Time: 12:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 12:00** **Directive No: 14**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 12:00 on 11/01/2011

- Open Gates 2, 3 and 4 to 6.5 m at 12:00
- Open Gates 1 and 5 to 6.5 m at 12:30
- Open Gate 3 to 7.0 m at 13:00

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 4

Duty Engineer

Wivenhoe Directive 15

Date: Tuesday 11 January 2011

Time: 13:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 13:00** **Directive No: 15**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 13:15 on 11/01/2011

- Open Gates 1,2, 4 and 5 to 7.0 m at 13:15

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2
Duty Engineer

Wivenhoe Directive 16

Date: Tuesday 11 January 2011

Time: 13:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 13:00** **Directive No: 16**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 14:00 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 7.5 m

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 17

Date: Tuesday 11 January 2011

Time: 14:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 14:00** **Directive No: 17**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 14:15 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 8.0 m

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2
Duty Engineer

Wivenhoe Directive 18

Date: Tuesday 11 January 2011

Time: 14:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 14:15** **Directive No: 18**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 15:00 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 8.5 m

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 19

Date: Tuesday 11 January 2011

Time: 15:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 15:15** **Directive No: 19**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 15:30 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 9.0 m

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 20

Date: Tuesday 11 January 2011

Time: 15:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 15:30** **Directive No: 20**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 16:00 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 9.5 m

Please advise the Flood Operations Centre by fax once you have opened the radial gate to each of the required opening.

Engineer 2

Duty Engineer

Wivenhoe Directive 21

Date: Tuesday 11 January 2011

Time: 16:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 16:15** **Directive No: 21**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 16:30 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 10.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 2

Duty Engineer

Wivenhoe Directive 22

Date: Tuesday 11 January 2011

Time: 16:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 16:45** **Directive No: 22**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 17:00 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 10.5 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 2

Duty Engineer

Wivenhoe Directive 23

Date: Tuesday 11 January 2011

Time: 17:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 17:15** **Directive No: 23**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 17:30 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 11.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 24

Date: Tuesday 11 January 2011

Time: 18:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 18:00** **Directive No: 24**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 18:15 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 12.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 25

Date: Tuesday 11 January 2011

Time: 21:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3 | **Senior Flood Operations Engineer 1** | **Flood Operations Engineer 2** | **Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 21:00** **Directive No: 25**

This transmission comprises of this page and 0 other pages.

Message:

Please open all gates to undertake the following gate operations commencing at 21:15 on 11/01/2011

- Close Gates 1,2, 3, 4 and 5 to 11.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 26

Date: Tuesday 11 January 2011

Time: 21:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 21:30** **Directive No: 26**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 21:45 on 11/01/2011

- Open Gates 1,2, 3, 4 and 5 to 11.5 m

Please use a time interval

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 27

Date: Tuesday 11 January 2011

Time: 23:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 23:00** **Directive No: 27**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 11:30 on 11/01/2011

- Close Gates 5,1,4,2 and 3 to 10.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 28

(DIRECTIVE NOT SENT)

Date: Tuesday 11 January 2011

Time: 23:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 11/01/2011** **Time: 23:00** **Directive No: 28**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 11:30 on 11/01/2011

- Close Gates 5,1,4,2 and 3 to 10.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 29

Date: Wednesday 12 January 2011

Time: 01:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 12/01/2011** **Time: 01:15** **Directive No: 29**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 01:30 on 12/01/2011

- Close Gates 5,1,4,2 and 3 to 9.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 30

Date: Wednesday 12 January 2011

Time: 03:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3 **Senior Flood Operations Engineer 1** **Flood Operations Engineer 2** **Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date: 12/01/2011** **Time: 03:15** **Directive No: 30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 03:30 on 12/01/2011

- Close Gates 5,1,4,2 and 3 to 8.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 31

Date: Wednesday 12 January 2011

Time: 04:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**12/01/2011**
	Directive No:	**31**
	Time:	**04:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 04:45 on 12/01/2011

- Close Gates 5,1,4,2 and 3 to 7.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 1

Duty Engineer

Wivenhoe Directive 32

Date: Wednesday 12 January 2011

Time: 05:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	Date:	12/01/201
	Directive No:	32
	Time:	05:30

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 05:45 on 12/01/2011

- Close Gates 5,1,4,2 and 3 to 6.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 33

Date: Wednesday 12 January 2011

Time: 05:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**12/01/201**
	Directive No:	**33**
	Time:	**05:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 06:45 on 12/01/2011

- Close Gates 5,1,4,2 and 3 to 5.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 34

Date: Wednesday 12 January 2011

Time: 07:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**12/01/201**
	Directive No:	**34**
	Time:	**07:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 07:30 on 12/01/2011

- Close Gates 1 and 5 to 3.5 m
- Close Gates 2 and 4 to 4.0 m

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 35

Date: Thursday 13 January 2011

Time: 12:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**13/01/201**
	Directive No:	**35**
	Time:	**12:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 13:00 on 13/01/2011

- Open Gate 2 from 4.0 metres to 4.5 metres at 1300.
- Open Gate 4 from 4.0 metres to 4.5 metres at 1400.

Please advise the Flood Operations Centre by fax once you have completed this operation.

Engineer 4

Duty Engineer

Wivenhoe Directive 36

Date: Thursday 13 January 2011

Time: 14:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO:	**Wivenhoe Dam Operators**	**Date:**	**13/01/201**
		Directive No:	**36**
		Time:	**14:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 1500 on 13/01/2011

- Open Gate 1 from 3.5 metres to 4.0 metres at 1500.
- Open Gate 5 from 3.5 metres to 4.0 metres at 1600.
- Open Gate 1 from 4.0 metres to 4.5 metres at 1700.
- Open Gate 5 from 4.0 metres to 4.5 metres at 1800.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 37

Date: Thursday 13 January 2011

Time: 18:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**13/01/201**
	Directive No:	**37**
	Time:	**18:00**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 1830 on 13/01/2011

- Open Gate 2 from 4.5 metres to 5.0 metres at 1830.
- Open Gate 4 from 4.5 metres to 5.0 metres at 1900.
- Open Gate 1 from 4.5 metres to 5.0 metres at 1930.
- Open Gate 5 from 4.5 metres to 5.0 metres at 2000.
- Open Gate 3 from 5.0 metres to 5.5 metres at 2030.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 38

Date: Thursday 13 January 2011

Time: 20:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**13/01/201**
	Directive No:	**38**
	Time:	**20:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 2030 on 13/01/2011

- Open Gate 2 from 5.0 metres to 5.5 metres at 2100.
- Open Gate 4 from 5.0 metres to 5.5 metres at 2200.
- Open Gate 1 from 5.0 metres to 5.5 metres at 2300.
- Open Gate 5 from 5.0 metres to 5.5 metres at 0000 on 14/01/2011

- Open Gate 3 from 5.5 metres to 6.0 metres at 0100 on 14/01/2011
- Open Gate 2 from 5.5 metres to 6.0 metres at 0200.
- Open Gate 4 from 5.5 metres to 6.0 metres at 0300.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 1

Duty Engineer

Wivenhoe Directive 39

Date: Friday 14 January 2011

Time: 19:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**14/01/201**
	Directive No:	**39**
	Time:	**19:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 1930 on 14/01/2011

- Open Gate 1 from 5.5 metres to 6.0 metres at 1930.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 4
Duty Engineer

Wivenhoe Directive 40

Date: Saturday 15 January 2011

Time: 02:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**15/01/201**
	Directive No:	**40**
	Time:	**02:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 02:30 on 15/01/2011

- Open Gate 5 from 5.5 metres to 6.0 metres at 0230.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 41

Date: Saturday 15 January 2011

Time: 10:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**15/01/201**
	Directive No:	**41**
	Time:	**10:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 10:30 on 15/01/2011

- Open Gate 3 from 6.0 metres to 6.5 metres at 1030.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 2

Duty Engineer

Wivenhoe Directive 42

Date: Saturday 15 January 2011

Time: 15:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**15/01/201**
	Directive No:	**42**
	Time:	**15:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 17:00 on 15/01/2011

- Open Gate 2 from 6.0 metres to 6.5 metres at 17:00.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 43

Date: Saturday 15 January 2011

Time: 22:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**15/01/201**
	Directive No:	**43**
	Time:	**22:00**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 22:00 on 15/01/2011

- Open Gate 4 from 6.0 metres to 6.5 metres at 22:00.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 44

Date: Sunday 16 January 2011

Time: 02:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	Date:	16/01/201
	Directive No:	44
	Time:	02:45

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 04:00 on 16/01/2011

- Open Gate 1 from 6.0 metres to 6.5 metres at 04:00 on 16/01/2011.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 45

Date: Sunday 16 January 2011

Time: 08:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**16/01/201**
	Directive No:	**45**
	Time:	**08:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 09:00 on 16/01/2011

- Open Gate 5 from 6.0 metres to 6.5 metres at 09:00 on 16/01/2011.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 1

Duty Engineer

Wivenhoe Directive 46

Date: Sunday 16 January 2011

Time: 12:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**16/01/201**
	Directive No:	**46**
	Time:	**12:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 13:00 on 16/01/2011

- Open Gate 3 from 6.5 metres to 7.0 metres at 13:00 on 16/01/2011.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 1

Duty Engineer

Wivenhoe Directive 47

Date: Sunday 16 January 2011

Time: 15:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**16/01/201**
	Directive No:	**47**
	Time:	**15:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 16:00 on 16/01/2011

- Open Gate 2 from 6.5 metres to 7.0 metres at 16:00 on 16/01/2011.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 1

Duty Engineer

Wivenhoe Directive 48

Date: Sunday 16 January 2011

Time: 18:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**16/01/201**
	Directive No:	**48**
	Time:	**18:45**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 20:00 on 16/01/2011

- Open Gate 4 from 6.5 metres to 7.0 metres at 20:00 on 16/01/2011.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 1
Duty Engineer

Wivenhoe Directive 49

Date: Monday 17 January 2011

Time: 13:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO:	**Wivenhoe Dam Operators**	**Date:**	**17/01/201**
		Directive No:	**49**
		Time:	**13:45**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 14:00 on 17/01/2011

- Close Gate 4 from 7.0 metres to 6.5 metres at 14:00 on 17/01/2011.
- Close Gate 2 from 7.0 metres to 6.5 metres at 14:20 on 17/01/2011
- Close Gate 3 from 7.0 metres to 6.5 metres at 14:40 on 17/01/2011
- Close Gate 5 from 6.5 metres to 6.0 metres at 15:00 on 17/01/2011

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 50

Date: Monday 17 January 2011

Time: 14:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**17/01/201**
	Directive No:	**50**
	Time:	**14**
		14:45

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 15:15 on 17/01/2011

- Close Gate 4 from 6.5 metres to 6.0 metres at 15:20 on 17/01/2011.
- Close Gate 2 from 6.5 metres to 6.0 metres at 15:40 on 17/01/2011

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 51

Date: Monday 17 January 2011

Time: 15:50

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO:	**Wivenhoe Dam Operators**	**Date:**	**17/01/201**
		Directive No:	**51**
		Time:	**15:50**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 16:00 on 17/01/2011

- Close Gate 1 from 6.5 metres to 6.0 metres at 16:00 on 17/01/2011
- Close Gate 3 from 6.5 metres to 6.0 metres at 16:20 on 17/01/2011.
- Close Gate 5 from 6.0 metres to 5.5 metres at 16:40 on 17/01/2011
- Close Gate 1 from 6.0 metres to 5.5 metres at 17:00 on 17/01/2011
- Close Gate 4 from 6.0 metres to 5.5 metres at 17:20 on 17/01/2011
- Close Gate 2 from 6.0 metres to 5.5 metres at 17:40 on 17/01/2011
- Close Gate 3 from 6.0 metres to 5.5 metres at 18:00 on 17/01/2011

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 52

Date: Monday 17 January 2011

Time: 17:50

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**17/01/201**
	Directive No:	**52**
	Time: 17:50	

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 18:30 on 17/01/2011

- Close Gate 5 from 5.5 metres to 5.0 metres at 18:30 on 17/01/2011
- Close Gate 1 from 5.5 metres to 5.0 metres at 19:00 on 17/01/2011.
- Close Gate 4 from 5.5 metres to 5.0 metres at 19:30 on 17/01/2011
- Close Gate 2 from 5.5 metres to 5.0 metres at 20:00 on 17/01/2011
- Close Gate 3 from 5.5 metres to 5.0 metres at 20:30 on 17/01/2011
- Close Gate 5 from 5.0 metres to 4.5 metres at 21:00 on 17/01/2011
- Close Gate 1 from 5.0 metres to 4.5 metres at 21:30 on 17/01/2011
- Close Gate 2 from 5.0 metres to 4.5 metres at 22:00 on 17/01/2011
- Close Gate 4 from 5.0 metres to 4.5 metres at 22:30 on 17/01/2011
- Close Gate 5 from 4.5 metres to 4.0 metres at 22:00 on 17/01/2011

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 3

Duty Engineer

Wivenhoe Directive 53

Date: Monday 17 January 2011

Time: 21:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**17/01/201**
	Directive No:	**53**
	Time:	**21:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 23:00 on 17/01/2011

- Close Gate 5 from 4.5 metres to 4.0 metres at 23:00 on 17/01/2011
- Close Gate 1 from 4.5 metres to 4.0 metres at 23:30 on 17/01/2011
- Close Gate 5 from 4.0 metres to 3.5 metres at 00:00 on 18/01/2011
- Close Gate 1 from 4.0 metres to 3.5 metres at 00:30 on 18/01/2011
- Close Gate 4 from 4.5 metres to 4.0 metres at 01:00 on 18/01/2011
- Close Gate 2 from 4.5 metres to 4.0 metres at 01:30 on 18/01/2011
- Close Gate 5 from 3.5 metres to 3.0 metres at 02:00 on 18/01/2011
- Close Gate 1 from 3.5 metres to 3.0 metres at 03:00 on 18/01/2011
- Close Gate 3 from 5.0 metres to 4.5 metres at 04:00 on 18/01/2011
- Close Gate 4 from 4.0 metres to 3.5 metres at 05:00 on 18/01/2011
- Close Gate 2 from 4.0 metres to 3.5 metres at 06:00 on 18/01/2011
- Close Gate 5 from 3.0 metres to 2.5 metres at 07:00 on 18/01/2011
- Close Gate 1 from 3.0 metres to 2.5 metres at 08:00 on 18/01/2011

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 2

Duty Engineer

Wivenhoe Directive 54

Date: Tuesday 18 January 2011

Time: 00:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**18/01/2011**
	Directive No:	**54**
	Time:	**00:45**

This transmission comprises of this page and 0 other pages.

Message:

Please cease all gate operations as at 00:45 on 18/01/2011 until further notice.

The last gate operation undertaken from the previous directive (#53) should be as follows:

- Close Gate 1 from 4.0 metres to 3.5 metres at 00:30 on 18/01/2011

This directive supersedes all previous directives.

Please advise the Flood Operations Centre by fax once you have completed these operations.

Engineer 2

Duty Engineer

Wivenhoe Directive 55

Date: Tuesday 18 January 2011

Time: 08:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**18/01/2011**
	Directive No:	**55**
	Time:	**08:45**

This transmission comprises of this page and 0 other pages.

Message:

Please re-commence gate operations as at 09:00 on 18/01/2011.

- Close Gate 4 from 4.5 metres to 4.0 metres at 09:00 on 18/01/2011
- Close Gate 2 from 4.5 metres to 4.0 metres at 09:30 on 18/01/2011
- Close Gate 5 from 3.5 metres to 3.0 metres at 10:00 on 18/01/2011
- Close Gate 1 from 3.5 metres to 3.0 metres at 10:30 on 18/01/2011
- Close Gate 3 from 5.0 metres to 4.5 metres at 11:00 on 18/01/2011
- Close Gate 4 from 4.0 metres to 3.5 metres at 11:30 on 18/01/2011
- Close Gate 2 from 4.0 metres to 3.5 metres at 12:00 on 18/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Please continue to report levels at hourly intervals.

Engineer 1

Duty Engineer

Wivenhoe Directive 56

Date: Tuesday 18 January 2011

Time: 12:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO:	**Wivenhoe Dam Operators**	**Date:**	**18/01/2011**
		Directive No:	**56**
		Time:	**12:15**

This transmission comprises of this page and 0 other pages.

Message:

Please re-commence gate operations as at 12:30 on 18/01/2011.

- Close Gate 5 from 3.0 metres to 2.5 metres at 12:30 on 18/01/2011
- Close Gate 1 from 3.0 metres to 2.5 metres at 13:00 on 18/01/2011
- Close Gate 4 from 3.5 metres to 3.0 metres at 14:00 on 18/01/2011
- Close Gate 2 from 3.5 metres to 3.0 metres at 14:30 on 18/01/2011
- Close Gate 4 from 3.0 metres to 2.5 metres at 15:00 on 18/01/2011
- Close Gate 2 from 3.0 metres to 2.5 metres at 15:30 on 18/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Please continue to report levels at hourly intervals.

Engineer 1

Duty Engineer

Wivenhoe Directive 57

Date: Tuesday 18 January 2011

Time: 15:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	Date:	18/01/2011
	Directive No:	57
	Time:	15:15

This transmission comprises of this page and 0 other pages.

Message:

Please cease gate operations as at 15:00 on 18/01/2011 so as to accommodate the repairs at Lowood pump station.

Current gate settings of :-

Gate 1 – Open 2.5 metres
Gate 2 – Open 3.0 metres
Gate 3 – Open 4.5 metres
Gate 4 – Open 3.0 metres
Gate 5 – Open 2.5 metres

Please confirm these current settings. It is expected these settings will be maintained for up to 12 hours.

Please continue to report levels at hourly intervals.

Engineer 1
Duty Engineer

Wivenhoe Directive 58

Date: Tuesday 18 January 2011

Time: 20:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO:	**Wivenhoe Dam Operators**	**Date:**	**18/01/2011**
		Directive No:	**58**
		Time:	**20:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 20:45 on 18/01/2011.

- Close Gate 4 from 3.0 metres to 2.5 metres at 20:45 on 18/01/2011
- Close Gate 2 from 3.5 metres to 2.5 metres at 21:15 on 18/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 59

Date: Tuesday 18 January 2011

Time: 21:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**18/01/2011**
	Directive No:	**59**
	Time:	**21:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 21:30 on 18/01/2011.

- Close Gate 5 from 2.5 metres to 2.0 metres at 22:00 on 18/01/2011
- Close Gate 1 from 2.5 metres to 2.0 metres at 22:30 on 18/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 60

Date: Tuesday 18 January 2011

Time: 22:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	Date:	18/01/2011
	Directive No:	60
	Time:	22:30

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 23:00 on 18/01/2011.

- Close Gate 5 from 2.0 metres to 1.5 metres at 23:00 on 18/01/2011
- Close Gate 1 from 2.0 metres to 1.5 metres at 23:30 on 18/01/2011
- Close Gate 3 from 4.5 metres to 4.0 metres at 00:00 on 19/01/2011
- Close Gate 4 from 2.5 metres to 2.0 metres at 00:30 on 19/01/2011
- Close Gate 2 from 2.5 metres to 2.0 metres at 01:00 on 19/01/2011
- Close Gate 5 from 1.5 metres to 1.0 metres at 01:30 on 19/01/2011
- Close Gate 1 from 1.5 metres to 1.0 metres at 02:00 on 19/01/2011
- Close Gate 4 from 2.0 metres to 1.5 metres at 02:30 on 19/01/2011
- Close Gate 2 from 2.0 metres to 1.5 metres at 03:00 on 19/01/2011
- Close Gate 5 from 1.0 metres to 0.5 metres at 03:30 on 19/01/2011
- Close Gate 1 from 1.0 metres to 0.5 metres at 04:00 on 19/01/2011
- Close Gate 4 from 1.5 metres to 1.0 metres at 04:30 on 19/01/2011
- Close Gate 2 from 1.5 metres to 1.0 metres at 05:00 on 19/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 61

Date: Wednesday 19 January 2011

Time: 05:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**19/01/2011**
	Directive No:	**61**
	Time:	**05:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 05:30 on 19/01/2011.

- Close Gate 5 from 0.5 metres to fully closed at 05:30 on 19/01/2011
- Close Gate 1 from 0.5 metres to fully closed at 06:00 on 19/01/2011
- Close Gate 4 from 1.0 metres to 0.5 metres at 06:30 on 19/01/2011
- Close Gate 2 from 1.0 metres to 0.5 metres at 07:00 on 19/01/2011
- Close Gate 3 from 4.0 metres to 3.5 metres at 07:30 on 19/01/2011
- Close Gate 4 from 0.5 metres to fully closed at 08:00 on 19/01/2011
- Close Gate 2 from 0.5 metres to fully closed at 08:30 on 19/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Engineer 4

Duty Engineer

Wivenhoe Directive 62

Date: Wednesday 19 January 2011

Time: 08:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Wivenhoe Dam Operators	**Date:**	**19/01/2011**
	Directive No:	**62**
	Time:	**08:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following gate operations commencing at 09:00 on 19/01/2011:

Time between successive gate movements is 30 minutes.

- Close Gate 3 from 3.5 metres to 3.0 metres at 09:00 on 19/01/2011
- Close Gate 3 from 3.0 metres to 2.5 metres at 09:30 on 19/01/2011
- Close Gate 3 from 2.5 metres to 2.0 metres at 10:00 on 19/01/2011
- Close Gate 3 from 2.0 metres to 1.5 metres at 10:30 on 19/01/2011
- Close Gate 3 from 1.5 metres to 1.0 metres at 11:00 on 19/01/2011
- Close Gate 3 from 1.0 metres to 0.5 metres at 11:30 on 19/01/2011
- Close Gate 3 from 0.5 metres to fully closed at 12:00 on 19/01/2011

Please advise the Flood Operations Centre by fax/email once you have completed these operations.

Engineer 2

Duty Engineer

SOMERSET DAM

Somerset Directive 1

Date: Friday 7 January 2011

Time: 17:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3 | **Senior Flood Operations Engineer 1** | **Flood Operations Engineer 2** | **Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 07/01/2011** **Time: 17:00** **Directive No: 01**

This transmission comprises of this page and 0 other pages.

Message:

Please open a regulator 100%

Engineer 2

Duty Engineer

Somerset Directive 2

Date: Friday 7 January 2011

Time: 18:00

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 07/01/2011** **Time: 18:00** **Directive No: 2**

This transmission comprises of this page and 0 other pages.

Message:

Given the headwater level in Wivenhoe is still rising and may impact upon the open regulator at Somerset in the next 12 hours, it is preferable to close the regulator and open a sluice.

At 19:00, close Regulator #3 and open Sluice L.

Regards

Engineer 2

Duty Engineer

Somerset Directive 3

Date: Saturday 8 January 2011

Time: 11:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 08/01/2011** **Time: 11:30** **Directive No: 3**

This transmission comprises of this page and 0 other pages.

Message:

Somerset Dam is expected to peak at around mid-day at about EL 100.48 m. As we have exceeded EL 100.45 m (fixed crest level), but Wivenhoe Dam is still rising we will need to implement Strategy S2.

This strategy is aimed at maximising the benefits of the mitigation storage in both Somerset and Wivenhoe dams. Consequently we will endeavour to follow the target line as defined in the manual.

- Please open Sluice M to 100% at 12:00.

Please confirm this gate operation by fax once you have completed the opening.

Regards

Engineer 1

Duty Engineer

Somerset Directive 4

Date: Sunday 9 January 2011

Time: 08:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 09/01/2011** **Time: 08:15** **Directive No: 4**

This transmission comprises of this page and 0 other pages.

Message:

Inflows to Somerset Dam are expected to increase in the next few hours due to rain in the last 6 hours with falls up to 75mm

- Please open Sluice K to 100% at 09:00.

Please confirm this gate operation by fax once you have completed the opening.

Regards

Engineer 2

Duty Engineer

Somerset Directive 5

Date: Sunday 9 January 2011

Time: 12:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 09/01/2011** **Time: 12:30** **Directive No: 5**

This transmission comprises of this page and 0 other pages.

Message:

Inflows to Somerset Dam are expected to increase in the next few hours due to rain in the last 6 hours with falls up to 75mm

- Please open Sluice N to100% at 13:00
- Please open Sluice J to 100% at 14:00

Please confirm this gate operation by fax once you have completed the opening.

Regards

Engineer 2

Duty Engineer

Somerset Directive 6

Date: Tuesday 11 January 2011

Time: 04:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date: 11/01/2011** **Time: 04:30** **Directive No: 6**

This transmission comprises of this page and 0 other pages.

Message:

Significant rainfall has fallen in the Upper Brisbane River in the last 12 hours. This has resulted in further inflows into Wivenhoe Dam. To prevent Wivenhoe Dam exceeding the trigger level for implementation of strategy W4 (EL74.00 m AHD) we will need to store floodwater in Somerset Dam.

Therefore we need to reduce releases from Somerset Dam so as to equalise the relative volumes in flood storage.

Please undertake the following operations:-

- Please close Sluice J at 05:00
- Please close Sluice N at 06:00
- Please close Sluice K at 07:00

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 1

Duty Engineer

Somerset Directive 7

Date: Tuesday 11 January 2011

Time: 10:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**12/01/2011**
	Directive No:	**7**
	Time:	**10:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Open Sluice L at 10:30.

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 4
Duty Engineer

Somerset Directive 8

Date: Wednesday 12 January 2011

Time: 10:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	Senior Flood Operations Engineer 1	Flood Operations Engineer 2	Flood Operations Engineer 4

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**12/01/2011**
	Directive No:	**8**
	Time:	**10:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Open Sluice L at 10:30.

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 4

Duty Engineer

Somerset Directive 9

Date: Thursday 13 January 2011

Time: 08:15

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**13/01/2011**
	Directive No:	**9**
	Time:	**8:15**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Open Sluice M at 08:30.

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 4

Duty Engineer

Somerset Directive 10

Date: Thursday 13 January 2011

Time: 12:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**13/01/2011**
	Directive No:	**10**
	Time:	**12:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Open Sluice K at 13:00.

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 4

Duty Engineer

Somerset Directive 11

Date: Thursday 13 January 2011

Time: 20:45

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**13/01/2011**
	Directive No:	**11**
	Time:	**20:45**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Open Sluice N at 21:00.

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 1

Duty Engineer

Somerset Directive 12

Date: Sunday 16 January 2011

Time: 09:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**16/01/2011**
	Directive No:	**12**
	Time:	**09:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Close Sluice N at 10:00

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 1

Duty Engineer

Somerset Directive 13

Date: Sunday 16 January 2011

Time: 21:30

SEQWATER FLOOD OPERATIONS CENTRE

FACSIMILE MESSAGE

Senior Flood Operations Engineer 3	**Senior Flood Operations Engineer 1**	**Flood Operations Engineer 2**	**Flood Operations Engineer 4**

Flood Event - Operations Directive

TO: Somerset Dam Operators	**Date:**	**16/01/2011**
	Directive No:	**13**
	Time:	**21:30**

This transmission comprises of this page and 0 other pages.

Message:

Please undertake the following operations:-

- Fully Close Sluice K at 22:00 on 16/01/2011
- Fully Close Sluice M at 03:00 on 17/01/2011
- Fully Close Sluice L at 07:00 on 17/01/2011
- Fully Open Regulator 12 at 07:15 on 17/01/2011

Please confirm this gate operation by fax once you have completed the requested operations.

Regards

Engineer 4

Duty Engineer

APPENDIX M – FLOOD EVENT LOG

Note: The names of individuals have been removed from this version of the Flood Event log. Gate Operation Directives have also been removed for clarity and a full list of all Gate Operations Directives can be found in Appendix L.

Date	Time	Action	Category	Title
Thursday 6 January 2011	7:00 AM	Engineer 2 Duty Engineer. Rainfall and water had been remote monitored to this point in time. Engineer 2 advises Senior Duty Engineer that Flood Operations are required at Somerset, Wivenhoe and North Pine Dams. Engineer 2 arrived at FOC to assess strategies and mobilised FOC, Wivenhoe, Somerset and North Pine Dam. <u>North Pine Dam</u> At 07:00hrs Thursday, North Pine Dam was 39.60m, 0.05m below gate trigger level and having risen 0.18m since 2/1/2011 due to a combination of base flow and runoff from rain in the last 24 hours. Given the forecast rain, gate operations will commence tonight. MBRC will be advised this morning. <u>Somerset Dam</u> At 07:00hrs Thursday, Somerset Dam was 99.34m, 0.34m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the upper Stanley but there have been significant rises in Kilcoy Ck. Further regulator operations will be required later Thursday. <u>Wivenhoe Dam</u> The regulator and hydro were discharging at 50 cumecs to manage baseflow recession from previous flow event. At 07:00hrs Thursday, Wivenhoe Dam was 67.31m and rising slowly. This is 0.31m above FSL and above the gate trigger level of 67.25m. There have been rises recorded at rivers and stream upstream of Wivenhoe Dam. Gates will be opened in the next 24 hours to manage the inflows from the upper Brisbane River and the outflow from Somerset.	Situation Report	Flood Officer 7
	8:00 AM	SDWD Model Updated - SDWD-201101060800.xls.	Model Run	Flood Officer 7
	8:00 AM	NPD model updated - NPD-201101060800.xls.	Model Run	Flood Officer 7
	8:14 AM	Situation Report – 08:00 Thursday 6 January 2011.	Situation Report	Engineer 2
	8:30 AM	Flood Officer 7 spoke with Stand-in Central Coordinator about readiness of staff for flood operations. He confirms that staff have been rostered and are ready.	Correspondence	Flood Officer 7
	8:50 AM	SRC called to query about possible flows and Fernvale Bridge. Engineer 2 provided an update for possible gate operations.	Correspondence	Flood Officer 7
	9:05 AM	Seqwater Area Manager called to inform that North Pine Dam staff are rostered on shift and are ready for gate operations.	Correspondence	Flood Officer 7
	9:40 AM	Dam Operations Manager called to inform that Ipswich City Council (ICC) has returned to the office and is contactable. They also requested for a situation update.	Correspondence	Flood Officer 7
	10:27 AM	Operational Strategy – 10:30 Thursday 6 January 2011.	Correspondence	Engineer 2
	11:00 AM	ICC called for a situation update. Engineer 2 shared the release strategy for tonight.	Correspondence	Flood Officer 7
	11:49 AM	Engineer 2 advised MBRC Call Centre that North Pine Dam will commence gate operations tonight. He requested for MBRC to call him.	Correspondence	Flood Officer 7

Date	Time	Action	Category	Title
	12:00 PM	SDWD Model Updated - SDWD-201101061200.xls.	Model Run	Flood Officer 7
	12:04 PM	MBRC called. Engineer 2 advised her that the latest North Pine Dam gates may be opened will be 7:00pm today. FOC will advise them accordingly.	Correspondence	Flood Officer 7
	12:43 PM	SRC called. Engineer 2 advised that water will be over Savages Crossing until end of the week.	Correspondence	Flood Officer 7
	12:46 PM	Engineer 2 advised BCC Wivenhoe Dam will commence gate operations later today.	Correspondence	Flood Officer 7
	1:30 PM	Revised Operating Strategy 12:00 Thursday 6 January 2011.	Correspondence	Engineer 2
	1:32 PM	Engineer 2 left message for SRC to return his call.	Correspondence	Flood Officer 7
	1:35 PM	Engineer 2 advised SRC Wivenhoe gate operations will be delayed to Saturday morning. This is due to higher than expected inflows from Lockyer.	Correspondence	Flood Officer 7
	1:45 PM	Engineer 2 advised ICC Wivenhoe's gate operations will be delayed till Saturday morning. This is due to higher than expected inflows from Lockyer.	Correspondence	Flood Officer 7
	1:46 PM	Engineer 2 left message for BCC to return his call.	Correspondence	Flood Officer 7
	1:47 PM	Engineer 2 left message for BCC to return his call.	Correspondence	Flood Officer 7
	2:41 PM	SRC asked for Engineer 2's mobile. He wanted to share SRC's text message informing people living downstream from Wivenhoe Dam.	Correspondence	Flood Officer 7
	2:45 PM	BCC called for situation update. Engineer 2 provided an update.	Correspondence	Flood Officer 7
	3:00 PM	SDWD Model Updated - SDWD-201101061500.xls.	Model Run	Flood Officer 7
	3:00 PM	NPD Model Updated – NPD-201101061500.xls.	Model Run	Flood Officer 7
	3:00 PM	Situation Report – 15:00 Thursday 6 January 2011.	Situation Report	Engineer 2
	3:11 PM	BoM called to discuss with Engineer 2 about readings from Upper Brisbane & Lockyer. They are in agreement on readings.	Correspondence	Flood Officer 7
	3:19 PM	MBRC called. Engineer 2 advised her North Pine Dam will commence gates operations from 19:00 hrs.	Correspondence	Flood Officer 7
	4:00 PM	SDWD Model Updated - SDWD-201101061600.xls.	Model Run	Flood Officer 7
	4:00 PM	NPD model updated - NPD-201101061600.xls.	Model Run	Flood Officer 7
	5:33 PM	Situation Report – 18:00 Thursday 6 January 2011.	Situation Report	Engineer 2
	6:57 PM	North Pine Dam Operator called to inform that MBRC workmen were waiting until 19:00 hrs to close Young's Crossing boom gates. This delayed dam gate opening by 15 minutes.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	7:45 PM	Somerset Dam called to enquire about the release strategy. Engineer 1 advised the impacts of the Lockyer flow were being monitored. Communication by e-mail was O.K.	Correspondence	Flood Officer 1
	9:00 PM	NPD model updated - NPD-201101062100.xls.	Model Run	Flood Officer 1
	9:00 PM	SDWD Model Updated - SDWD-201101062100.xls.	Model Run	Flood Officer 1
Friday 7 January 2011	6:07 AM	Situation Report - 06:00 Friday 7 January 2011.	Situation Report	Engineer 1
	7:00 AM	Engineer 2 and Flood Officer 8 commenced day shift.	Other	Flood Officer 8
	8:00 AM	NPD model updated - NPD-201101070800.xls.	Model Run	Flood Officer 8
	8:00 AM	Advice from BoM indicates that SEQ can expect some high rainfall totals over the next 5 days up to Tuesday 11/1/11 with the largest falls predicted for Sunday and Monday.	Correspondence	Flood Officer 8
	8:05 AM	Situation Report - 08:00 Friday 7 January 2011.	Situation Report	Engineer 2
	8:21 AM	Engineer 2 called SRC to inform him that the Lockyer is running - all bridges in Somerset Region will be cut off this morning. Wivenhoe gates will be opened once the Lockyer peak is through.	Correspondence	Flood Officer 8
	8:40 AM	FOC called MBRC to inform them that North Pine will be operational for the next few days - probably till Tuesday.	Correspondence	Flood Officer 8
	8:44 AM	Engineer 2 called BCC to inform that Wivenhoe gates will be opened again this afternoon and releases might peak at 1,500 cumecs. This might continue until the end of next week.	Correspondence	Flood Officer 8
	8:47 AM	Engineer 2 called ICC to inform him that Wivenhoe gates will be opened again this afternoon and releases might peak at 1,500 cumecs. This might continue until the end of next week.	Correspondence	Flood Officer 8
	10:12 AM	Called BCC to provide situation report.	Correspondence	Flood Officer 8
	12:00 PM	NPD model updated - NPD-201101071200.xls.	Model Run	Flood Officer 8
	12:00 PM	SDWD Model Updated - SDWD-201101071200.xls.	Model Run	Flood Officer 8
	12:15 PM	Situation Report – 12:00 Friday 7 January 2011.	Situation Report	Engineer 2
	3:02 PM	BCC called FOC with concerns that dam release will add another 200mm on top of abnormal high tide. Engineer 2 spoke to BoM who advised that the effect could be around 50mm - if that can be measured.	Correspondence	Flood Officer 8
	5:57 PM	Situation Report – 18:00 Friday 7 January 2011.	Situation Report	Engineer 2
	6:00 PM	SDWD Model Updated - SDWD-201101071800.xls.	Model Run	Flood Officer 7
	9:00 PM	NPD model updated - NPD-201101062100.xls.	Model Run	Flood Officer 7
	9:00 PM	SDWD Model Updated - SDWD-201101062100.xls.	Model Run	Flood Officer 7

Date	Time	Action	Category	Title
Saturday 8 January 2011	6:32 AM	Situation Report – 06:00 on Saturday 8 January 2011.	Situation Report	Engineer 4
	7:55 AM	Dam Operator 2 from Somerset Dam rang enquiring on Somerset's strategy. Engineer 1 advised possibly opening a sluice gate later today.	Correspondence	Flood Officer 3
	8:10 AM	Engineer 1 advised Dam Operator 10 (Wivenhoe Dam) on directive #4 and discussed strategy.	Correspondence	Flood Officer 3
	8:20 AM	Engineer 1 rang North Pine Dam Operator and advised on strategy.	Correspondence	Flood Officer 3
	9:00 AM	SDWD Model Updated - SDWD-201101080900.xls.	Model Run	Flood Officer 3
	9:00 AM	Dam Operator 2 (Somerset Dam) rang to advise he is going into Kilcoy to see the treatment plant and will be off-site for a couple of hours.	Correspondence	Flood Officer 3
	10:00 AM	NPD model updated - NPD-201101081000.xls.	Model Run	Flood Officer 3
	10:50 AM	Dam Operations Manager rang. Engineer 1 advised current status and strategy.	Correspondence	Flood Officer 3
	11:30 AM	BCC rang asking about combined flows down the Brisbane River (Wivenhoe, Warrill Creek and Bremer River). Flood Officer 3 advised that at this stage flows would not exceed 1,500 cumecs	Correspondence	Flood Officer 3
	12:16 PM	Situation Report – 12:00 on Saturday 8 January 2011.	Situation Report	Engineer 1
	3:00 PM	NPD model updated - NPD-201101081500.xls.	Model Run	Flood Officer 3
	3:00 PM	SDWD Model Updated - SDWD-201101081500.xls, SDWD-201101081500-Forecast72hr.xls.	Model Run	Flood Officer 3
	5:53 PM	Situation Report – 18:00 on Saturday 8 January 2011.	Situation Report	Engineer 1
Sunday 9 January 2011	6:15 AM	Situation Report – 06:00 Sunday 9 January 2011.	Situation Report	Engineer 4
	6:50 AM	Dam Operations Manager rang. Engineer 4 advised Dam Operations Manager on current release strategy based on recent heavy overnight rainfall.	Correspondence	Flood Officer 1
	7:00 AM	SDWD Model Updated - SDWD-201101090700.xls.	Model Run	Flood Officer 9
	8:40 AM	Engineer 2 called BoM regarding advice received that widespread rain was expected to continue in the catchment areas over the next 24 - 48 hours.	Correspondence	Flood Officer 1
	9:00 AM	SDWD Model Updated - SDWD-201101090900.xls.	Model Run	Flood Officer 1
	9:00 AM	NPD model updated - NPD-201101090900.xls.	Model Run	Flood Officer 1
	11:02 AM	Situation Report – 11:00 Sunday 9 January 2011.	Situation Report	Engineer 2
	12:00 PM	SDWD Model Updated - SDWD-201101091200.xls.	Model Run	Flood Officer 1
	12:00 PM	Engineer 1 scheduled meeting of Duty Engineers this afternoon to discuss current situation and forward release strategies.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	2:00 PM	SDWD Model Updated - SDWD-201101091400.xls.	Model Run	Flood Officer 1
	2:00 PM	NPD model updated - NPD-201101091400.xls.	Model Run	Flood Officer 1
	2:30 PM	Flood Officer 1 called Dam Operator 2 (Somerset Dam) and requested status readings be faxed to the FOC on an hourly basis until advised otherwise. Current Somerset lake level is EL 100.54 and rising fast.	Correspondence	Flood Officer 1
	2:42 PM	FOC called North Pine Dam Operator advising of impending gate openings due to recent heavy rainfall and subsequent projected inflows.	Correspondence	Flood Officer 1
	3:00 PM	NPD model updated - NPD-201101091500.xls.	Model Run	Flood Officer 1
	3:30 PM	Duty Engineer Conference. Attended by all Duty Engineers (Engineer 4 by Telephone). At this stage operating at top end of W1 and bottom of W2. Storing Approximately 300,000 ML at present (above Wivenhoe Dam) with an additional 500,000 ML expected to flow into the dams from rainfall on the ground. The rainfall producing system is currently in the N-E part of the catchment and expected to travel south over next 24-36 hours according to BoM forecasts. This has the potential to significantly increase flows in Lockyer Creek and the Bremer River which will potentially close Fernvale Bridge and Mt Crosby Weir Bridge and increase the risk of flooding in the Lower Brisbane. Releases will be maintained at current level of 1,400 cumecs. If required, releases from Wivenhoe Dam will be reduced to contain flow in the Mid- Brisbane to 1,600 cumecs. And 3,000 cumecs in the Lower Brisbane. At this stage it is anticipated that levels below 102.5 m in Somerset and 72.5 in Wivenhoe Dam can be attained.	Situation Report	Engineer 1
	4:00 PM	SDWD Model Updated - SDWD-201101091600.xls.	Model Run	Flood Officer 1
	4:15 PM	Engineer 2 called SRC advising that the current strategy was to maintain a flow in the Brisbane River such that the Fernvale Bridge and the Mount Crosby Bridge could be kept open. However, future rainfall could well impact on those roads remaining open. Closure next Tuesday is a real possibility at this stage.	Correspondence	Flood Officer 1
	4:20 PM	Engineer 2 phoned ICC advising that the current strategy was to maintain flow in the Brisbane River such that the Fernvale Bridge and the Mount Crosby Bridge could be kept open. However, future rainfall could well impact on those roads remaining open. Closure next Tuesday is a real possibility at this stage.	Correspondence	Flood Officer 1
	4:25 PM	Engineer 2 called BCC. A message was left to phone FOC.	Correspondence	Flood Officer 1
	4:26 PM	Engineer 2 called BCC. A message was left to phone FOC.	Correspondence	Flood Officer 1
	4:27 PM	BCC returned phone call. BCC was advised by Engineer 2 that the current strategy was to maintain a flow in the Brisbane River such that the Fernvale Bridge and the Mount Crosby Bridge could be kept open. However, future rainfall could well impact on those roads remaining open. Closure next Tuesday is a real possibility at this stage. Flow in the Lower Brisbane potentially might reach 3,000 cumecs by next Wednesday or Thursday.	Correspondence	Flood Officer 1
	5:18 PM	Flood Officer 1 left a message with Dam Operator 9 (A/Co-ord) regarding the potential for Fernvale Bridge and Mount Crosby Bridge to be closed, possibly from Tuesday. This may impact on staffing issues for both Wivenhoe and Somerset Dams during this flood event. Request for Dam Operator 9 to contact the FOC ASAP.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	5:25 PM	BCC returned call to Engineer 2. Engineer 2 advised potential for releasing up to 2,500 cumecs by Tuesday. With further heavy rainfall, as forecast, the flow in the Lower Brisbane could increase to 3,000 cumecs with potential for closure of Fernvale Bridge and Mount Crosby Bridge by Thursday (possibly Wednesday). Releases from Wivenhoe are dependant on flows from Lockyer Ck and inflow into Wivenhoe. FOC will continue to update BCC.	Correspondence	Flood Officer 1
	5:32 PM	NPD Operator phoned the FOC with a manual reading of EL 20.660 at Lake Kurwongbah. He noted that should NPD gates be closed in the near future, the Lake Kurwongbah tailwater would impact on Youngs Crossing.	Correspondence	Flood Officer 1
	5:40 PM	Dam Operations Manager phoned Engineer 2 for an update on the current situation.	Correspondence	Flood Officer 1
	5:45 PM	Dam Operator 9 returned call and Flood Officer 1 advised that Engineer 2 had requested Dam Operator 9 to factor into his staffing roster of Wivenhoe and Somerset Dams the potential for the Fernvale bridge and the Mount Crosby Bridge to be closed from mid-week sometime, depending on the likelihood of further heavy rainfall.	Correspondence	Flood Officer 1
	5:51 PM	Situation Report – 17:00 Sunday 9 January 2011.	Situation Report	Engineer 2
	5:58 PM	Engineer 2 called BoM to discuss Wivenhoe Dam's release strategy i.e. Major bridge open strategy Vs increased inflow into Wivenhoe resulting from current heavy rainfall. Situation will become clearer in 24 hours time.	Correspondence	Flood Officer 1
	6:00 PM	SDWD Model Updated - SDWD-201101091800.xls.	Model Run	Flood Officer 1
	6:00 PM	NPD model updated - NPD-201101091800.xls.	Model Run	Flood Officer 1
	6:35 PM	The caretaker from the house at the Colleges Crossing Reserve rang FOC to enquire about predicted flood height at the Colleges Crossing Bridge. Engineer 2 referred him to ICC for an update on flood information affecting the Ipswich area. Advised no change in Wivenhoe releases at this stage and the future options were presently unknown.	Correspondence	Flood Officer 1
	7:00 PM	SDWD Model Updated - SDWD-201101091900.xls, SDWD-201101091900norain.xls, SDWD-201101091900withrain.xls.	Model Run	Flood Officer 6
	7:10 PM	FOC called SRC advising him that high releases from Wivenhoe (3000 cumecs) are expected to be necessary in view of heavy rain over the last 3 hours.	Correspondence	Flood Officer 6
	7:15 PM	FOC called Seqwater CEO advising him that high rainfall is expected overnight and releases from Wivenhoe causing damaging flooding are likely to be necessary.	Correspondence	Flood Officer 6
	7:15 PM	FOC called Director Dam Safety advising him that FOC is now looking at much larger flows and will have to ramp up releases to around 3000 cumecs as by as early as midnight which is likely to have flooding impacts on low-lying areas of Brisbane.	Correspondence	Flood Officer 6
	7:20 PM	Engineer 2 called BCC advising him of potential for high releases sooner than previously expected.	Correspondence	Flood Officer 6
	7:25 PM	NPD Operator called to advise dam level is at 39.82mAHD, 3 gates are at increment 2 and two are at increment 1. The two at increment 1 are currently being raised to increment 2 (next few minutes).	Correspondence	Flood Officer 6
	8:00 PM	SDWD Model Updated - SDWD-201101092000withnorain.xls.	Model Run	Flood Officer 6

Date	Time	Action	Category	Title
	8:05 PM	Engineer 1 called NPD Operator to confirm last directive is completed. All gates at increment 2.	Correspondence	Flood Officer 6
	8:30 PM	ICC returned call and spoke to Engineer 3. He was informed of current situation and the likelihood of high releases tomorrow causing flood damage.	Correspondence	Flood Officer 6
	8:50 PM	Engineer 1 called BCC to request copy of flood damages curve from 2007 study. BCC will send a copy tomorrow.	Correspondence	Engineer 1
	8:55 PM	BCC called back and spoke with Engineer 3. Confirmed BCC mobilisation triggers need to be in place. Status report is in preparation and will be emailed out shortly.	Correspondence	Flood Officer 6
	9:05 PM	Situation Report – 21:00 Sunday 9 January 2011.	Situation Report	Engineer 2
	9:10 PM	Dam Operations Manager called and spoke with Engineer 1. Dam Operations Manager confirmed that releases will need to be ramped up from current 1,400 cumecs to 2,500 cumecs which will cause flooding in low lying areas of Brisbane. Brisbane Flood Information Centre has not yet been mobilised. Somerset RC has no DTMR A/H contacts and will be contacting them in the morning. Dam Operations Manager will locate DTMR contacts. Confirmed volumes getting close to 1974 levels. Confirmed situation report has gone out.	Correspondence	Flood Officer 6
	9:15 PM	BoM called and spoke with Engineer 2. They discussed on rainfall expectations and flood warning requirements for Brisbane. Bremer/Warrill situation being monitored. Actual and projected flows sent to BoM.	Correspondence	Flood Officer 6
	9:20 PM	ICC spoke with Engineer 1. Emailing DTMR A/H contact to flood room. Kiosk caretaker at Colleges Crossing is being evacuated.	Correspondence	Flood Officer 6
	10:00 PM	SDWD Model Updated - SDWD-201101092200withnorain.xls, SDWD-201101092200-Forecast24hr.xls.	Model Run	Flood Officer 6
	10:00 PM	NPD model updated - NPD-201101092200.xls.	Model Run	Flood Officer 6
	10:00 PM	Engineer 3 called Wivenhoe operator (Dam Operator 7) and confirmed current flooding expectations based on rainfall predictions and expected impacts.	Correspondence	Flood Officer 6
	10:15 PM	FOC called SRC. A situation update was provided. Fernvale Bridge closure likely to be required in view of probable releases from Somerset to Wivenhoe.	Correspondence	Flood Officer 6
	10:20 PM	Dam Operations Manager called and spoke with Engineer 1. A teleconference with Water Grid Manager and DERM was completed. Explained 9:00pm situation report. Water Grid Manager will be distributing media release in the morning regarding closure of bridges.	Correspondence	Flood Officer 6
	10:30 PM	Mt Crosby WTP Manager called and spoke with Engineer 1. He was concerned the guardrails need to be taken off bridge before bridge goes over. Engineer 1 recommended getting the rails straight off in view of increasing flow expectations overnight. Flow expected to get to 2,000 cumecs by morning.	Correspondence	Flood Officer 6
	10:30 PM	Engineer 3 called Wivenhoe Dam operator (Dam Operator 7) requesting for a visual inspection of Fernvale Bridge.	Correspondence	Flood Officer 6
	10:40 PM	Dam Operator 7 (Wivenhoe Dam) called discussed Fernvale Bridge situation with Engineer 3. Water was lapping the bridge girders.	Correspondence	Flood Officer 6

Date	Time	Action	Category	Title
	10:45 PM	Dam Operations Manager called and spoke with Engineer 1. Dam Operations Manager will be contacting Dan Spiller to confirm closure of Mt Crosby Weir Bridge. Police are on site.	Correspondence	Flood Officer 6
	11:20 PM	Engineer 3 called ICC and left message regarding rates of rise at Mt Crosby. Bridge will be inundated within the next couple of hours.	Correspondence	Flood Officer 6
	11:25 PM	Engineer 3 called ICC regarding rates of rise at Mt Crosby (approx 200 mm from going over) - will be inundated within the next couple of hours. Confirmed more rain is on the way and releases will need to be increased.	Correspondence	Flood Officer 6
	11:25 PM	Engineer 1 spoke with Dam Operator 7 (Wivenhoe Dam). Water is up to the centreline of the Chine Gully approach to Fernvale Bridge. Esk Police are on site and are considering placing road closure signs in Fernvale. Dam operators living in Fernvale will be mobilised to the dam by Police prior to closure.	Correspondence	Flood Officer 6
	11:30 PM	Engineer 3 called SRC and left message advising of situation.	Correspondence	Flood Officer 6
	11:35 PM	Engineer 1 called DTMR and left message regarding current road closure situation.	Correspondence	Flood Officer 6
	11:35 PM	Engineer 3 called SRC and left message for call to be returned re Fernvale Bridge situation.	Correspondence	Flood Officer 6
	11:38 PM	Engineer 3 called SRC CEO and left message regarding Fernvale Bridge situation and requested call be returned ASAP.	Correspondence	Flood Officer 6
	11:40 PM	SRC called back and spoke with Engineer 3. Engineer 3 confirmed the high flow levels and anticipated further level rises will impacts road crossings. Fernvale Bridge was about to go out. Informed of the levels and inflows to Wivenhoe and Somerset and the expectation for more rain.	Correspondence	Flood Officer 6
Monday 10 January 2011	12:00 AM	SRC called again and spoke with Engineer 3. Engineer 3 confirmed Police were on site at Fernvale Bridge and were contemplating road closure signs at Fernvale. Confirmed message has been left with DTMR but call not yet returned.	Correspondence	Flood Officer 6
	12:15 AM	Mt Crosby WTP Manager called to confirm Mt Crosby Weir road is closed (call taken by Flood Officer 6). Confirmed that ICC has been notified and message left with DTMR.	Correspondence	Flood Officer 6
	12:45 AM	BCC called and spoke with Engineer 3. Indicated that 3500 cumecs is the damaging flow level for Brisbane urban areas. The manual documents 4000 cumecs as the damaging level. Engineer 3 undertook to take this into consideration when preparing the current situation report, and would not refer to damage levels.	Correspondence	Flood Officer 6
	12:55 AM	Engineer 3 called Dam Operations Manager to discuss BCC's view on damaging flow. Engineer 3 confirmed that if flows were kept below 3500 the fuse plug would be triggered. Agreed that situation reports will not allude to damage levels - the councils can make decisions on what to report in this regard.	Correspondence	Flood Officer 6
	1:00 AM	SDWD Model Updated - SDWD-201101100100withnorain.xls.	Model Run	Flood Officer 6
	1:00 AM	Situation Report – 01:00 Monday 10 January 2011.	Situation Report	Engineer 3
	1:00 AM	Engineer 1 called Dam Operator 1 (Somerset Dam) regarding purported dam stability issues (via ICC - two reports received). Dam Operator 1 confirmed that inspection had revealed no issues.	Correspondence	Flood Officer 6

Date	Time	Action	Category	Title
	3:00 AM	SDWD Model Updated - SDWD-201101100300withnorain.xls.	Model Run	Flood Officer 6
	3:00 AM	NPD model updated - NPD-201101100300.xls.	Model Run	Flood Officer 6
	4:10 AM	Engineer 3 discussed Wivenhoe status and release strategy with Dam Operator 7.	Correspondence	Flood Officer 6
	5:00 AM	SDWD Model Updated - SDWD-201101100500withnorain.xls.	Model Run	Flood Officer 6
	5:00 AM	Dam Operator 4 called and discussed Somerset situation with Engineer 1.	Correspondence	Flood Officer 6
	5:00 AM	NPD model updated - NPD-201101100500.xls.	Model Run	Flood Officer 6
	5:05 AM	Dam Operations Manager called and received situation update from Engineer 3.	Correspondence	Flood Officer 6
	5:20 AM	Engineer 1 called BoM regarding next forecast update - due at 9:00 am.	Correspondence	Flood Officer 6
	6:00 AM	Send out situation report for this morning.	Correspondence	Flood Officer 8
	6:30 AM	Situation Report – 06:00 Monday 10 January 2011.	Situation Report	Engineer 3
	7:40 AM	Talked to BoM - we are in general agreement about current flows in the Brisbane River.	Correspondence	Flood Officer 8
	8:30 AM	FOC left a message for BCC to call back.	Correspondence	Flood Officer 8
	8:38 AM	Talked to BoM to discuss our planned strategy i.e. to maintain gate openings for the next 24 hrs. This increases flood storage by 75 000ML which is equivalent to 0.2m rise and limits flows in the Brisbane to 3 000 m3/s this provides a buffer for potential runoff for the next 24 hrs.	Correspondence	Flood Officer 8
	9:38 AM	Conference call with BCC - informed them that release from Wivenhoe will be maintained at 2,000 cumecs for the next 24 hrs. This will be revised in 24 hrs. The strategy is to limit the flows to 3,000 – 3,500cumecs. At 3,500 cumecs about 322 (the whole property) will be submerged and about 7,000 properties will be affected somehow damage bill $7mil). If the rainfall in the Bremer and Lockyer increases substantially - it is likely the flows from these catchments can peak at 1,000 cumecs (on top of Wivenhoe release).	Correspondence	Flood Officer 8
	9:55 AM	Engineer 2 advised Dam Operations manager of current strategy.	Correspondence	Engineer 2
	10:08 AM	Received QPF - 100mm in Brisbane and 150mm North Pine catchment.	Other	Flood Officer 8
	10:10 AM	Updated Dam Operations manager with projected flows for Lockyer Creek, Bremer River and Lower Brisbane.	Correspondence	Engineer 2
	10:15 AM	Received phone call from EMQ and Logan/Scenic Rim District Disaster Coordinator - gave them the same information as what we gave BCC before.	Correspondence	Flood Officer 8
	10:46 AM	BoM to inform that Engineer 2 can do the model and with 600 cumecs in the Bremer the flows in Brisbane will go up to 3,600 cumecs. BoM will discuss with BCC.	Correspondence	Flood Officer 8
	11:14 AM	ICC called to clarify our strategy. Gave him the same info as above.	Correspondence	Flood Officer 8
	1:00 PM	SDWD Model Updated - SDWD-201101101300withnorain.xls.	Model Run	Flood Officer 8

Date	Time	Action	Category	Title
	12:02 PM	Spoke with Seqwater CEO to answer elaborate on Situation Report and inform him of large rainfalls currently occurring in the Wivenhoe catchment.	Correspondence	Flood Officer 8
	12:16 PM	Situation Report – 12:00 Monday 10 January 2011.	Situation Report	Engineer 2
	12:33 PM	Called BCC twice. No answer, left messages.	Correspondence	Flood Officer 8
	12:36 PM	Spoke with ICC, informed them that we are moving strategy from urban damage control to dam safety priority	Correspondence	Flood Officer 8
	12:41 PM	NPD operator called to inform FOC the level is dropping. Instructed them not to close gates - heavy rain fell in catchment.	Correspondence	Flood Officer 8
	2:00 PM	Send out third situation report for today.	Correspondence	Flood Officer 8
	2:30 PM	Called BCC 3 times before getting through to Flood Information Centre (FIC). Discussed latest strategy with them i.e. changing from "Flood Mitigation" to "Dam Safety". We will start opening Wivenhoe gates from 15:00.	Correspondence	Flood Officer 8
	2:58 PM	Situation Report – 15:00 Monday 10 January 2011 (Note Incorrect Time on Original)	Correspondence	Engineer 2
	3:00 PM	Called Disaster Coordinator. No answer.	Correspondence	Flood Officer 8
	4:00 PM	NPD model updated - NPD-201101101600.xls.	Model Run	Flood Officer 8
	3:15 PM	Had conference call with BoM. They agree with FOC on model discharge results. However, BoM included 6hrs of additional rain which takes the discharge to 4,600 cumecs.	Correspondence	Flood Officer 8
	4:09 PM	Engineer 2 spoke to a Police Officer about Cressbrook Dam - advising that FOC does not manage Cressbrook but gave him a contact at Toowoomba RC.	Correspondence	Flood Officer 8
	5:00 PM	SDWD Model Updated - SDWD-201101101700withnorain.xls, SDWD-201101101700with50mmrain.xls.	Model Run	Flood Officer 9
	5:09 PM	Dam Operator 2 phoned and reported water from Wivenhoe is getting into the mini-hydro.	Correspondence	Flood Officer 8
	6:06 PM	Obtained weather update from BoM - the forecast now is - still more of the same of what we had today.	Other	Flood Officer 8
	6:43 PM	Situation Report – 18:00 Monday 10 January 2011.	Situation Report	Engineer 2
	6:45 PM	North Pine Dam operator raised concerns with school groups using Lake Kurwongbah for rowing exercise while water is running over the spillway at 500mm. He was referred to Rangers.	Correspondence	Flood Officer 8
	7:30 PM	Dam Operator 2 (Somerset) called to inform that Somerset hydro is inundated with water. He believes he has located source of leak, has tightened seals to prevent further leakage. He also noted that there is oil in the water.	Correspondence	Flood Officer 9
	8:00 PM	SDWD Model Updated - SDWD-201101102000withnorain.xls, SDWD-201101102000-Lockyer.xls, SDWD-201101102000-TMinflows.xls.	Model Run	Flood Officer 9

Date	Time	Action	Category	Title
	8:00 PM	BoM called to advise of situation regarding flows in Lockyer. Estimated very heavy localised rainfall (e.g. 600mm in few hours) on Toowoomba escarpment to cause observed flood flooding. Will monitor via Glenore Grove gauging station.	Correspondence	Flood Officer 9
	8:20 PM	Spoke to BoM regarding reducing Wivenhoe release to accommodate peak of Lockyer flash flood.	Correspondence	Flood Officer 9
	8:45 PM	Seqwater Mt Crosby WTP Manager called to get situation update. Advised that at 20m there will be issues at Mt Crosby WTP. FOC to advise WTP Manager if likely to reach that level.	Correspondence	Flood Officer 9
	9:00 PM	Engineer 1 and Engineer 3 spoke to Director Dam Safety regarding strategies for reducing Wivenhoe release to mitigate latest event in Lockyer. He endorsed variation to manual to operate at minimum gate settings to create gap to allow peak of flash flood to pass. Also endorsed concept allowing Wivenhoe HW to rise above 74.0 mAHD briefly (less than 12 hours) providing levels did not rise too high (ie. less than 74.2 mAHD).	Correspondence	Flood Officer 9
	9:30 PM	Provided ICC with situation update.	Correspondence	Flood Officer 9
	11:20 PM	Spoke to Dam Operations Manager to give situation update. He agreed that if possible to reduce flow from Wivenhoe to accommodate Lockyer flash flood peak.	Correspondence	Flood Officer 9
	11:56 PM	Situation Report – 00:00 Tuesday 11 January 2011.	Situation Report	Engineer 1
Tuesday 11 January 2011	12:00 AM	SDWD Model Updated - SDWD-201101110000withnorain.xls.	Model Run	Flood Officer 9
	12:00 AM	NPD model updated - NPD-201101110000.xls.	Model Run	Flood Officer 9
	12:15 AM	Spoke to BCC to update on current release strategy.	Correspondence	Flood Officer 9
	1:30 AM	Spoke to SRC. Somerset Regional Council offices were flooded and email addresses are no longer working. Tony can be emailed on an alternative email address, which has been recorded.	Correspondence	Flood Officer 9
	2:15 AM	BCC called to confirm forecast peak height of 3.1m at Brisbane city gauge for Wednesday high tide. This is based on 4600 cumecs modelled by BoM. Provided James with update on current release strategy.	Correspondence	Flood Officer 9
	3:00 AM	SDWD Model Updated - SDWD-201101110300withnorain.xls.	Model Run	Flood Officer 9
	3:15 AM	BCC has provided inundation forecast for Brisbane city to assist with devising strategy to manage Wivenhoe releases.	Correspondence	Flood Officer 9
	5:15 AM	Spoke to BoM regarding reducing Wivenhoe release to accommodate peak of Lockyer flash flood. Update: Consensus was that reducing release from Wivenhoe would no longer be feasible due to attenuation of Lockyer peak and significant additional rainfall in upper Brisbane during the night.	Correspondence	Flood Officer 9
	6:12 AM	Situation Report – 06:00 Tuesday 11 January 2011.	Situation Report	Engineer 3
	7:00 AM	SDWD Model Updated - SDWD-201101110700withnorain.xls.	Model Run	Flood Officer4
	7:00 AM	NPD model updated - NPD-201101110700.xls.	Model Run	Flood Officer 4

Date	Time	Action	Category	Title
	7:20 AM	Engineer 2 called Seqwater CEO to appraise of latest situation of Wivenhoe and Lower Brisbane.	Correspondence	Flood Officer 4
	7:22 AM	Engineer 2 called BoM to appraise of situation. BoM unable to talk and will call back.	Correspondence	Flood Officer 4
	7:35 AM	BoM called back. Full appraisal of Seqwater strategy. Both Seqwater and BoM models results were discussed in detail, and generally agreed with each other.	Correspondence	Flood Officer 4
	7:51 AM	Called Dam Operator 10 (Wivenhoe Dam) advised that gates opening at Wivenhoe are imminent.	Correspondence	Flood Officer 4
	7:56 AM	Engineer 2 called BoM. Advised BoM that Wivenhoe will ramp up to a minimum release of 3,700 cumecs.	Correspondence	Flood Officer 4
	7:59 AM	Engineer 4 called Seqwater CEO and advised that releases from Wivenhoe will reach 3700m3/s at a minimum, and BoM has been informed. Likely to affect Moggill 24 hours later. Phone call terminated due to bad connection.	Correspondence	Flood Officer 4
	8:01 AM	Seqwater CEO returned call. Engineer 4 advised that model to be run for BoM first and results to be past to BoM and BCC immediately. Rain likely to continue today.	Correspondence	Flood Officer 4
	8:05 AM	NPD Operator informed that levels are still rising and another directive is required. Engineer 4 advised to proceed as per operations manual.	Correspondence	Flood Officer 4
	8:09 AM	Advised Dam Operator 10 (Wivenhoe Dam) that Wivenhoe Directive was coming through in a matter of minutes.	Correspondence	Flood Officer 4
	8:10 AM	Engineer 4 called Director Dam Safety to advise of current Wivenhoe situation - Will exceed EL74m. Ramping up gate opening to a minimum of 3,700 cumecs and gate operations will progress.	Correspondence	Flood Officer 4
	8:11 AM	Engineer 2 called BCC flood information centre (Duty Officer). Wivenhoe releases will reach 3,700 cumecs at a minimum and higher flows are possible.	Correspondence	Flood Officer 4
	8:15 AM	Engineer 4 called Dam Operations Manager to advise of the situation that Wivenhoe will increase to 3,700 cumecs as a minimum.	Correspondence	Flood Officer 4
	8:16 AM	Engineer 2 called SRC and left a message.	Correspondence	Flood Officer 4
	8:20 AM	Engineer 4 Called Dam Operator 10 (Wivenhoe Dam) and advised more gate opening directives are coming.	Correspondence	Flood Officer 4
	8:21 AM	Engineer 2 called ICC to advise of situation and that Wivenhoe releases to be at a minimum of 3,700 cumecs.	Correspondence	Flood Officer 4
	8:25 AM	Engineer 4 called North Pine Dam operator. Verbal directive to open gates, faxed directive to follow before 9am.	Correspondence	Flood Officer 4
	8:50 AM	Seqwater CEO called Engineer 2 mobile requesting 'worst case' scenario.	Correspondence	Flood Officer 4
	8:50 AM	Dam Operator 7 from Wivenhoe called informing that Wivenhoe has lost power, high voltage fuse blown. Hydro outlet is shut off.	Correspondence	Flood Officer 4
	9:09 AM	Engineer 4 called Seqwater Tactical Maintenance Planner, advised that Wivenhoe has lost power, possibly blown high voltage fuses. Maintenance Planner to resolve issue.	Correspondence	Flood Officer 4
	9:12 AM	NPD Operator called, NPD at 40.140 m HAD all gates at 6, currently heading to setting 7.	Correspondence	Flood Officer 4

Date	Time	Action	Category	Title
	9:13 AM	Energex called. All incoming power has been lost at Wivenhoe.	Correspondence	Flood Officer 4
	9:16 AM	Engineer 4 called MBRC and left message: very large inflows into North Pine Dam has resulted in steep gate openings. Flood downstream can be expected.	Correspondence	Flood Officer 4
	9:17 AM	Engineer 4 called MBRC and informed that very large inflows into North Pine Dam have resulted in steep gate openings. Flood downstream can be expected. Strathpine Rd (Old Gympie Rd) to be flooded within next hour.	Correspondence	Flood Officer 4
	9:21 AM	Dam Operator 2 from Somerset called Engineer 2. Water ingress through doors at the bottom of dam.	Correspondence	Flood Officer 4
	9:22 AM	Engineer 4 advised NPD Operator that Strathpine Rd is expected to be closed.	Correspondence	Flood Officer 4
	9:26 AM	Engineer 4 advised NPD Operator verbally that all gates can go to 9 increments based on water level as per manual.	Correspondence	Flood Officer 4
	9:40 AM	Engineer 2 called Flood Officer 7 and requested a technically knowledgeable person be dispatched to test HF radio links and satellite phone are in working condition.	Correspondence	Flood Officer 4
	9:51 AM	Voicemail: Tactical Maintenance Planner left message. He's contacted Energex and Energex suspect a dirty feed. Currently all helicopters are grounded. Specialist Trade Technician is lead at Mt Crosby. Energex will get as close as they can and get helicopter lift when possible.	Correspondence	Flood Officer 4
	10:00 AM	NPD model updated - NPD-201101111000.xls.	Model Run	Flood Officer 9
	10:00 AM	Email to Seqwater CEO Possible Operational Strategy – Wivenhoe Dam.	Correspondence	Engineer 2
	10:25 AM	North Pine Dam Operator called to report Lake level at EL 40.490mAHD. All gates currently at setting No. 10.	Correspondence	Flood Officer 4
	10:29 AM	Seqwater called Engineer 2, in conference with Principal Dams and Weirs Planning. Internal questioning of release strategy. Internal discussion regarding current approved strategy.	Correspondence	Flood Officer 4
	10:45 AM	Engineer 4 advised MBRC of current situation.	Correspondence	Flood Officer 4
	10:54 AM	Dam Operations Manager called. Bad line and disconnected.	Correspondence	Flood Officer 4
	11:00 AM	SDWD Model Updated - SDWD-201101111100withnorain.xls.	Model Run	Flood Officer 9
	11:01 AM	Message received by Engineer 4. Kilcoy Police rang Somerset, Engineer 4 advised general status information to be provided by dam operators, predictions to go through FOC.	Correspondence	Flood Officer 4
	11:02 AM	Seqwater CEO requested update on situation.	Correspondence	Flood Officer 4
	11:04 AM	Engineer 4 called Dam Operator 7. Discussed that if forecast rain falls, fuse plug likely to go.	Correspondence	Flood Officer 4
	11:06 AM	FAX not working at Wivenhoe!	Other	Flood Officer 4
	11:07 AM	BoM called. Inflow into NPD of 1500cumecs. Advised Wivenhoe strategy to be revised.	Correspondence	Flood Officer 4

Date	Time	Action	Category	Title
	11:17 AM	Principal Dams and Weirs Planning called Engineer 2 - on the way to talk to Grid Manager. Engineer 2 advised current strategy is 3 hourly.	Correspondence	Flood Officer 4
	11:19 AM	Engineer 4 called MBRC. Advised North Pine still rising. Current releases to exceed 2000cumces.	Correspondence	Flood Officer 4
	11:30 AM	North Pine Dam operator called to report lake level EL 40.740 mAHD. Water level rising slowly. All gates now at setting 14.	Correspondence	Flood Officer 4
	11:38 AM	Engineer 2 called BoM. Unable to contact BoM. Will call back.	Correspondence	Flood Officer 4
	11:38 AM	Engineer 4 called Seqwater CEO and advised that releases at Wivenhoe will be ramped up to 4000cumecs and strategy will be revised on an hourly basis. In reality releasing slightly less than the Flood Ops manual.	Correspondence	Flood Officer 4
	11:51 AM	Incoming Phone call from Engineer 1. Advised SS that Wivenhoe will ramp up to 4000cumecs. Also advised that staff likely to stay in offices overnight.	Correspondence	Flood Officer 4
	11:56 AM	Engineer 4 called MBRC and left message again. Outflow will exceed 2000cumecs.	Correspondence	Flood Officer 4
	11:57 AM	Engineer 4 called MBRC. Left message: North Pine Dam outflow likely to exceed 2000cumecs.	Correspondence	Flood Officer 4
	11:59 AM	Engineer 4 called MBRC. Left message, outflow from North Pine Dam will exceed 2000cumces.	Correspondence	Flood Officer 4
	12:04 PM	North Pine Dam Operator called to report lake level at EL 40.883 mAHD. Gates are currently set at setting 16.	Correspondence	Flood Officer 4
	12:10 PM	Flood Officer 2 called from FOC satellite phone. Made contact with Somerset and North Pine. Connection issues with Landline to Wivenhoe.	Correspondence	Flood Officer 4
	12:11 PM	Situation Report – 12:00 Tuesday 11 January 2011.	Situation Report	Engineer 2
	12:17 PM	MBRC called. Engineer 2 advised discharge in excess of 1989 flood (1500cumecs). Current releases in excess of 2000cumecs.	Correspondence	Flood Officer 4
	12:30 PM	North Pine Dam Operator called to report lake level is now at EL 40.950mAHD and rising. Gate settings at 17.	Correspondence	Flood Officer 4
	12:42 PM	Redlands Shire Council called requesting information for Lesley Harrison. Was told to call Operations Coordinator South.	Correspondence	Flood Officer 4
	12:42 PM	Call from Mary Valley Lead Operator. Asked what is required of the Northern dams. Was advised to monitor dams more closely when/if 1 in 50 year event occurs.	Correspondence	Flood Officer 4
	1:02 PM	North Pine Dam Operator called to report Lake level EL 41.040 m AHD. Gate settings at setting 18.	Correspondence	Flood Officer 4
	1:26 PM	Seqwater CEO called and requested the FOC request the BoM to consider if Wivenhoe is releasing 9,000 cumecs.	Correspondence	Flood Officer 4
	1:44 PM	North Pine Dam called on Satellite phone to confirm it is operational.	Correspondence	Flood Officer 4
	1:50 PM	North Pine Dam Operator called to report lake level at EL 41.105mAHD. Gates currently at setting 19.	Correspondence	Flood Officer 4
	1:56 PM	Dam Operations Manager requesting status update.	Correspondence	Flood Officer 4

Date	Time	Action	Category	Title
	2:00 PM	SDWD Model Updated - SDWD-201101111400withnorain.xls.	Model Run	Flood Officer 9
	2:19 PM	Situation report – 14:00 Tuesday 11 January 2011.	Situation Report	Engineer 2
	2:24 PM	Seqwater Wivenhoe Admin Officer called to pass on message. QLD Fire Rescue called to enquire about Wivenhoe Releases. Unable to call at this stage.	Correspondence	Flood Officer 4
	2:37 PM	Seqwater CEO called to discuss current situation.	Correspondence	Flood Officer 4
	2:19 PM	Email to various agencies advising Wivenhoe ALERT gauge is reading low.	Correspondence	Engineer 2
	2:46 PM	North Pine Dam Operator called to report lake level steady at 41.110 for last 30 minutes.	Correspondence	Flood Officer 4
	2:53 PM	North Pine Dam is isolated as per conversation with operator.	Correspondence	Flood Officer 4
	3:00 PM	NPD model updated - NPD-20110111500.xls.	Model Run	Flood Officer 9
	3:06 PM	Manager WTP Operations North (Seqwater) called to enquire about the current release rate from Wivenhoe Dam.	Correspondence	Flood Officer 4
	3:14 PM	Seqwater CEO called to discuss the proposed release of 10,000 cumecs. Engineer 4 and Engineer 2 explained release strategy is constantly being revised.	Correspondence	Flood Officer 4
	3:49 PM	BoM had a conference with Engineer 1, 2, 3 and 4 about current release strategy and possible maximum release scenario of 10000m3/s. This would be of a similar magnitude to the 1893 event (~8.36m in Brisbane Port Office)	Correspondence	Flood Officer 4
	3:54 PM	Manager WTP Operations North (Seqwater) called and talked to Engineer 4 regarding current inflow strategy.	Correspondence	Flood Officer 4
	3:58 PM	Called NPD Operator (at Wivenhoe Dam) to check if all is ok, levels are slowly reducing.	Correspondence	Flood Officer 4
	4:29 PM	Lowood Police rang to request water level of Wivenhoe and discuss the current release strategy with respect to the fuse plug (conversed with Flood Officer 9).	Correspondence	Flood Officer 4
	4:33 PM	Phone call with Engineer 2 and Seqwater CEO. Discussed that even though the magnitude flood in Brisbane is similar to 1974 flood event, the no-dam flood would be significantly larger without Wivenhoe.	Correspondence	Flood Officer 4
	4:41 PM	Director Dam Safety phone call. He requested more technical information in the status reports released by Duty Engineers. Director Dam Safety will send through an example of the technical data requested in the report.	Correspondence	Flood Officer 4
	4:46 PM	Principal Incident and Emergency Management (Seqwater) called to request update in inflow/outflow of Wivenhoe Dam.	Correspondence	Flood Officer 4
	5:00 PM	SDWD Model Updated - SDWD-201101111700withnorain.xls.	Model Run	Flood Officer 9
	5:12 PM	Engineer 4 called North Pine Dam operator regarding gate operating strategy. Engineer 4 advised to keep gates at current setting until water is clear of the controls. Gate closing strategy then to follow Flood Manual.	Correspondence	Flood Officer 4
	5:22 PM	BoM, Engineer 2 and Engineer 3 discussed current Wivenhoe inflows and anticipated outflows. Engineer 2 confirmed that 7500cumecs is still likely early tonight.	Correspondence	Flood Officer 4

Date	Time	Action	Category	Title
	5:27 PM	North Pine Dam operator called to report of NPD level EL 40.7 m AHD. Engineer 4 verbally advised 10 minute gate closure intervals is ok until 39.9 m AHD - then back to 15 min intervals.	Correspondence	Flood Officer 4
	5:48 PM	Dam Operations Manager phone call asking Tarong Energy to hold off releasing water from Splityard Creek.	Correspondence	Flood Officer 4
	6:00 PM	NPD model updated - NPD-20110111800.xls, NPD-20110111800 Final.xls.	Model Run	Flood Officer 9
	6:00 PM	SDWD Model Updated - SDWD-201101111800withnorain.xls.	Model Run	Flood Officer 9
	6:00 PM	Situation Report – 18:00 Tuesday 11 January 2011.	Situation Report	Engineer 2
	6:04 PM	Mary Valley Lead Operator called to advise he is unable to reach Lake Macdonald to take readings.	Correspondence	Flood Officer 4
	6:07 PM	Recap of current release strategy amongst Duty Engineers. Current Wivenhoe scenario: 74.9 m - all gates at 12m. Won't go to 13m settings until level reaches 75.0 m AHD.	Situation Report	Flood Officer 4
	6:35 PM	Dam Operator 2 (Somerset Dam) called to confirm all is good.	Correspondence	Flood Officer 4
	6:36 PM	Flood Officer 6 called to inform team he is cut off due to flood waters and unable to come in.	Correspondence	Flood Officer 4
	6:41 PM	Tarong Energy confirmed releases from Splityard Creek have stopped.	Correspondence	Flood Officer 4
	6:56 PM	Informed that tailwater gauge appears to be OOA. Confirmed by Engineer 2.	Correspondence	Flood Officer 4
	7:00 PM	Spoke to NPD operator who confirmed that North Pine gate settings were at 17, with level of 40.5. Closing sequence was still to close in 10 minute increments down to level 39.9, at which time increments would increase to 15 minutes.	Correspondence	Flood Officer 9
	7:10 PM	NPD Operator rang, is concerned that the level is dropping too fast.	Correspondence	Flood Officer 3
	7:30 PM	Dam Operator 7 (Wivenhoe Dam) called to report that Wivenhoe Level 74.97mAHD is holding.	Correspondence	Flood Officer 3
	7:30 PM	North Pine Dam Operator rang to say he is behind in gate settings.	Correspondence	Flood Officer 3
	7:25 PM	Engineer 3 called North Pine Dam Operator to advise that a directive will be sent to move all gates down to 11m.	Correspondence	Flood Officer 3
	7:45 PM	North Pine Dam Operator called FOC. Engineer 4 clarified directive #19 to drop gates from 16 to 11 in one go, at 15 minutes intervals.	Correspondence	Flood Officer 3
	8:00 PM	BoM rang. Unofficially, Engineer 2 advised that things have stabilised. Also advised predicted peaks at various sites.	Correspondence	Flood Officer 3
	8:25 PM	Tactical Maintenance Planner rang to advise that the high voltage feeder to Wivenhoe will not be restored for the duration of this event. Engineer 4 advised that Wivenhoe is operating successfully on the generator, and they have a fair bit of diesel. There are still 2 other backups to operate the gates.	Correspondence	Flood Officer 3
	8:25 PM	Colliers Building Services rang back. Engineer 1 asked about power supply to [redacted] urbot Street. Colliers Building Services said to email our power requirements.	Correspondence	Flood Officer 3

Date	Time	Action	Category	Title
	8:30 PM	Dam Operator 7 (Wivenhoe Dam) called to advise that Wivenhoe's level is 5mm down.	Correspondence	Flood Officer 3
	8:30 PM	Engineer 1 called Colliers Building Services and left a message to call back (regarding loss of power to the FOC)	Correspondence	Flood Officer 3
	8:30 PM	Engineer 1 rang Building Services Manager to advise that power will be shutting down in the CBD tomorrow morning.	Correspondence	Flood Officer 3
	8:35 PM	Engineer 1 rang Building Services Manager to advise the power situation.	Correspondence	Flood Officer 3
	8:35 PM	Seqwater CEO called FOC to speak with all duty engineers on the operating strategies for Wivenhoe releases.	Correspondence	Flood Officer 3
	8:40 PM	Flood Officer 7 called FOC to ensure we received the Energex message regarding power shutdown to the CBD.	Correspondence	Flood Officer 3
	8:45 PM	Senior Systems Engineer rang. Engineer 1 advised that Energex will be cutting power to the CBD in the morning. Senior Systems Engineer will call Manager ICT and the Security for Back-up FOC.	Correspondence	Flood Officer 3
	8:50 PM	North Pine Dam Operator called to report NPD Level at EL 40.07mAHD. Gates are all at 11 increments.	Correspondence	Flood Officer 3
	8:55 PM	Seqwater CEO rang asking about possibly reducing releases. Engineer 2 advised that we are seriously considering it, but this would have little effect on the levels in Brisbane River. CEO would like technical reports every hour throughout the night.	Correspondence	Flood Officer 3
	9:00 PM	Engineer 1 emailed Colliers Building Services with our building power requirements.	Correspondence	Flood Officer 3
	9:05 PM	Engineer 2 rang BoM to advise that power to the CBD may be cut and sent him actual and releases report.	Correspondence	Flood Officer 3
	9:10 PM	Building Services Manager called Engineer 1. Advised he spoke to Colliers Building Services and is getting an Energex contact.	Correspondence	Flood Officer 3
	9:20 PM	Senior Systems Engineer rang. Manager ICT told them we may not be able to have air conditioning but other IT services are ok.	Correspondence	Flood Officer 3
	9:25 PM	Engineer 1 called Building Services Manager. Colliers Building Services got back to him and has Electrical Contractor lined up for tomorrow morning.	Correspondence	Flood Officer 3
	9:30 PM	North Pine Dam Operator called. They are still behind in gate closures.	Correspondence	Flood Officer 3
	9:35 PM	Engineer 4 rang to discuss the latest directive to raise Wivenhoe Dam. Engineer 4 suggested not raising.	Correspondence	Flood Officer 3
	9:40 PM	Flood Officer 9 called Dam Operator 7 (Wivenhoe Dam) to obtain a current level EL 74.9. Gates have been raised to 11.5m.	Correspondence	Flood Officer 3
	10:00 PM	SDWD Model Updated - SDWD-201101112200withnorain.xls.	Model Run	Flood Officer 9
	10:00 PM	Building Services Manager rang to advise the phone number for Energex.	Correspondence	Flood Officer 3
	10:00 PM	Building Services Manager rang requesting Engineer 1 mobile number to pass on onto Energex.	Correspondence	Flood Officer 3

Date	Time	Action	Category	Title
	10:30 PM	Building Services Manager rang to say A/CEO SunWater has pleaded our case with the CEO of Energex and it is likely FOC will not lose power.	Correspondence	Flood Officer 3
	10:35 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.94mAHD @ 10:30hrs.	Correspondence	Flood Officer 3
	11:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.92mAHD @ 11:00hrs.	Correspondence	Flood Officer 3
	11:10 PM	Dam Operations Manager rang to request discharge from Wivenhoe when the gates are lowered to 10m. Advised 6,100 cumecs.	Correspondence	Flood Officer 3
	11:30 PM	Flood Officer 9 called Dam Operator 7 (Wivenhoe Dam) to obtain a current level EL 74.9. Gates have been raised to 11.5m.	Correspondence	Flood Officer 3
Wednesday 12 January 2011	12:30 AM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.88mAHD @ 12:30hrs.	Correspondence	Flood Officer 3
	1:00 AM	Building Services Manager called to provide Energex contact details. Energex indicated that they didn't believe FOC would be disconnected from power grid in the morning.	Correspondence	Flood Officer 9
	1:15 AM	Engineer 1 rang Dam Operator 7 (Wivenhoe Dam) advising next directive. We want to get releases down as quick as possible while still lowering lake levels. Advised that we may possibly have a communications problem in the morning if power to 179 Turbot Street is cut.	Correspondence	Flood Officer 3
	2:10 AM	BCC rang enquiring about a release strategy. Advised one will be issued at about 3:00am. Talked about the activities of the last 24 hours.	Correspondence	Flood Officer 3
	3:10 AM	Engineer 3 rang NPD Operator and advised no changes to gate settings planned for the next hour or so.	Correspondence	Flood Officer 3
	3:30 AM	Seqwater Mt Crosby WTP Manager called enquiring about levels at Mt Crosby.	Correspondence	Flood Officer 3
	3:50 AM	Engineer 1 called BoM advising him that because inflows are not as much as earlier anticipated, the releases from Wivenhoe are less than previously suggested.	Correspondence	Flood Officer 3
	4:05 AM	OIC of Lowood Police rang enquiring about the Wivenhoe fuse plug. Flood Officer 9 advised that there is no danger of the fuse plug failing, and that current releases from Wivenhoe Dam are about 4,900 cumecs.	Correspondence	Flood Officer 3
	4:40 AM	Seqwater Mt Crosby WTP Manager rang to check that his emails with the Mt Crosby levels were being received. They are.	Correspondence	Flood Officer 3
	5:15 AM	Dam Operations Manager rang enquiring current storage levels and releases. Engineer 3 advised.	Correspondence	Flood Officer 3
	5:30 AM	Dam Operations Manager rang enquiring estimated time for closing North Pine Dam. Engineer 1 advised possible today, but it has not yet been decided. Also advised the inflows into North Pine Dam were equivalent to a 1:10,000 event.	Correspondence	Flood Officer 3
	5:30 AM	Engineer 3 called Wivenhoe Dam for the current level. Dropped 2 cm in 30 minutes.	Correspondence	Flood Officer 3
	5:50 AM	Engineer 2 called BoM advising him that we have significantly scaled back releases from Wivenhoe Dam, and will probably continue to scale back more. Agreed that Savages Crossing has peaked.	Correspondence	Flood Officer 3

Date	Time	Action	Category	Title
	6:00 AM	SDWD Model Updated - SDWD-201101120600withnorain.xls.	Model Run	Flood Officer 9
	6:00 AM	North Pine Dam rang enquiring about closing down. Engineer 4 advised that we have not yet decided.	Correspondence	Flood Officer 3
	6:00 AM	Situation Report – 06:00 Wednesday 12 January 2011.	Situation Report	Engineer 1
	6:10 AM	Dam Operations Manager rang and suggested that the fish recovery may be a fairly big job. Engineer 4 suggested that our staff can check this morning and then decide.	Correspondence	Flood Officer 3
	6:15 AM	BCC rang enquiring the level of the pump station at Mt Crosby. Engineer 4 said we can't help, but that he should contact the treatment plant Manager.	Correspondence	Flood Officer 3
	6:30 AM	Engineer 4 rang Dam Operator 7 (Wivenhoe Dam) advising that a directive will soon follow to lower gates to 5m.	Correspondence	Flood Officer 3
	6:35 AM	DERM Hydrographer rang. Engineer 4 discussed current strategy.	Correspondence	Flood Officer 3
	7:00 AM	Liaised with Bureau regarding expected peak in lower Brisbane.	Correspondence	Flood Officer 9
	7:50 AM	Building Services Manager called to confirm that FOC had power and will not lose it.	Correspondence	Flood Officer 9
	7:57 AM	Situation Report – 08:00 Wednesday 12 January 2011.	Situation Report	Engineer 2
	8:20 AM	Dam Operations Manager rang enquiring current storage levels and releases. Engineer 4 advised.	Correspondence	Flood Officer 2
	9:20 AM	North Pine Dam Operator rang wanting to speak to Engineer 4.	Correspondence	Flood Officer 2
	9:50 AM	Lowood Police rang enquiring current storage releases from Wivenhoe Dam. Engineer 4 advised.	Correspondence	Flood Officer 2
	10:20 AM	Dam Operator 2 (Somerset Dam) called querying whether FOC have received fax and email regarding storage level. He was checking the walls before and will be at his desk for the next 30 minutes. Dam Operator 13 is there with him.	Correspondence	Flood Officer 2
	10:50 PM	Seqwater rang wanting to thank Flood Officer 1 for his and Flood Officer 9 heroic effort in clearing Seqwater basement.	Correspondence	Flood Officer 2
	11:20 AM	Flood Officer 7 called to inform that he and Senior Hydrographer (Seqwater) are not able to access Enviromon. He asked if Engineer 2 can check the system.	Correspondence	Flood Officer 2
	11:50 AM	Seqwater CEO called to ask that all communications be forwarded to him.	Correspondence	Flood Officer 9
	12:20 PM	Flood Officer 1 called Dam Operator 10 (Wivenhoe Dam) to advise that Seqwater comms are to be switched off due to flooding of the Head Office. Please send all future hourly bulletins to the FOC via fax, or alternatively, phone or TPG link.	Correspondence	Flood Officer 1
	12:25 PM	Flood Officer 1 called North Pine Dam advising that Seqwater comms are to be switched off due to flooding of the Head Office. Please send all future hourly bulletins to the FOC via fax, or alternatively, phone or TPG link.	Correspondence	Flood Officer 1

APPENDIX M – FLOOD EVENT LOG (continued)

Date	Time	Action	Category	Title
	12:32 PM	Leslie Harrison Dam Operator called Engineer 4. Due to the failure of Seqwater comms, he was seeking direction on how to submit a final report on operations at approx. 1600 today. Engineer 4 said to phone in to the FOC.	Correspondence	Flood Officer 1
	12:55 PM	BoM visited FOC to liaise with the Duty Engineers.	Correspondence	Flood Officer 1
	1:10 PM	Principal Dams and Weirs Planning called to request electronic copy of Wiv - Som Flood Ops manual to be forwarded to him.	Correspondence	Flood Officer 1
	1:15 PM	Dam Operator 10 (Wivenhoe Dam) called to report lake level: 74.79mAHD @13:00hrs. Note: Reading taken in surging water. Wivenhoe fax appears to have failed.	Correspondence	Flood Officer 1
	2:05 PM	North Pine Dam Operator called to inform that North Pine level was 39.74mAHD and based on this level he is recommending at least one gate closure.	Correspondence	Flood Officer 1
	2:10 PM	Dam Operator 9 phoned from Wivenhoe Dam. The SES (and irrigators) at Fernvale have concerns that a flood peak might be coming down the Lockyer within the next couple of hours. Engineer 1 assured Dam Operator 9 that the flood heights have reduced by up to 3 metres and any increase would be less than 1 metre.	Correspondence	Flood Officer 1
	2:25 PM	Dam Operator 10 (Wivenhoe Dam) called to report lake level: 74.81mAHD @14:00hrs. Note: Reading taken in surging water. Wivenhoe fax confirmed as failed.	Correspondence	Flood Officer 1
	2:30 PM	North Pine Dam Operator called to advise that the automatic height gauge is drifting further from the manual gauge board readings. He will continue to provide both versions at hourly intervals but will rely on the manual gauge readings for gate operations.	Correspondence	Flood Officer 1
	3:05 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.81mAHD @ 15:00hrs.	Correspondence	Flood Officer 1
	3:18 PM	Situation Report – 15:00 Wednesday 12 January 2011.	Situation Report	Engineer 2
	3:30 PM	BoM called Engineer 2 to discuss re-appraisal of the expected flood peak in Brisbane. Peak now may be 5.2 metres early on Thursday 13/12011.	Correspondence	Flood Officer 1
	4:00 PM	SDWD Model Updated - SDWD-201101121600.xls.	Model Run	Flood Officer 9
	4:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.80mAHD @16:00hrs.	Correspondence	Flood Officer 1
	4:00 PM	North Pine Dam Operator called to report that Sideling Creek Dam is spilling at 20.560mAHD. Spillway level is 20.37mAHD.	Correspondence	Flood Officer 1
	4:20 PM	BCC called FOC and had phone conference with Duty Engineers. He was seeking update for briefing with Lord Mayor.	Correspondence	Flood Officer 1
	4:22 PM	Email to Seqwater CEO and Dam Operations Manager - Wivenhoe Dam Operational Strategy.	Correspondence	Engineer 2
	4:52 PM	DERM called FOC and left message for Engineer 2. DERM will be gauging at Jindalee all night to catch the peak. Senior Hydrographer (Seqwater) has been contacted and will be joining the crew.	Correspondence	Flood Officer 1
	5:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.82mAHD @17:00hrs.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	5:57 PM	Situation Report – 18:00 Wednesday 12 January 2011.	Situation Report	Engineer 2
	6:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.80mAHD @18:00hrs.	Correspondence	Flood Officer 1
	7:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level of 74.82 @19:00hrs.	Correspondence	Flood Officer 7
	7:45 PM	Engineer 1 & Engineer 3 advised BoM that FOC will be sending updated projected releases from Wivenhoe Dam. This has been prepared with the aim of limiting flows at Moggill to 3,500 cumecs.	Correspondence	Flood Officer 7
	8:00 PM	Engineer 1 & Engineer 3 advised BCC Flood Information Centre that FOC will be sending updated projected releases from Wivenhoe Dam. This has been prepared with the aim of limiting flows at Moggill to 3,500 cumecs.	Correspondence	Flood Officer 7
	8:55 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level 74.82mAHD @ 21:00hrs. They will now report levels every 2 hours.	Correspondence	Engineer 1
	9:15 PM	Dam Operator 7 (Wivenhoe Dam) called to inform that Energex restored power at Wivenhoe Dam at 21:15 hours.	Correspondence	Flood Officer 7
	9:50 PM	Mt Crosby WTP Manager provided an update on Kholo & Mt Crosby: Kholo 19:15hrs 20.0m Mt Crosby 21:00 23.5m He asked for a situation update. Engineer 1 shared Wivenhoe Dam's release strategy.	Correspondence	Flood Officer 7
	10:00 PM	Dam Operator 7 (Wivenhoe Dam) called to report lake level 74.81mAHD @22:00hrs. Will now report levels every 2 hours.	Correspondence	Flood Officer 7
Thursday 13 January 2011	12:00 AM	Dam Operator 7 (Wivenhoe Dam) called to report lake level 74.79mAHD @ 00:00.	Correspondence	Flood Officer 7
	1:00 AM	BCC called FOC to enquire if Wivenhoe Dam has been compromised. Engineer 3 assured him that that is not the case.	Correspondence	Flood Officer 7
	1:05 AM	Engineer 1 called BoM hotline number to check communications.	Correspondence	Flood Officer 7
	1:10 AM	BCC called the FOC regarding a viral text rumour that Wivenhoe Dam has failed. Engineer 3 assured him that that is not true and will speak with Dam Operations Manager about this matter.	Correspondence	Flood Officer 7
	1:20 AM	Queensland Police called to inform of rumours that Wivenhoe Dam has been compromised.	Correspondence	Flood Officer 7
	1:25 AM	Engineer 3 called Dam Operator 7 (Wivenhoe Dam) to confirm Wivenhoe Dam has not been compromised.	Correspondence	Flood Officer 7
	1:30 AM	Engineer 3 called Dam Operations Manager advising him about the rumours that Wivenhoe Dam has been compromised. Engineer 3 will send him the BCC contact details.	Correspondence	Flood Officer 7
	2:00 AM	Dam Operator 7 (Wivenhoe Dam) called to report level 74.765mAHD @ 2:00hrs.	Correspondence	Flood Officer 7
	4:00 AM	Dam Operator 7 (Wivenhoe Dam) called to report lake level 74.74mAHD @4:00hrs. Will now report levels every 2 hours.	Correspondence	Flood Officer 7

Date	Time	Action	Category	Title
	5;45 AM	Situation Report – 06:00 Thursday 13 January 2011.	Situation Report	Engineer 1
	6:00 AM	Dam Operator 7 (Wivenhoe Dam) called to report lake level 74.71mAHD @6:00hrs. Will now report levels every 2 hours.	Correspondence	Flood Officer 7
	6:43 AM	BoM called to inform that BoM has lost their telephone system. He provided 2 contact numbers. Thornton St 4.45m.Telemeter 4.20m.	Correspondence	Flood Officer 7
	7:30 AM	Dam Operator 2 has been advising Kilcoy Police of the FOC strategy for lower Somerset during the next 24 hours of opening sluice later today.	Correspondence	Engineer 1
	7:50 AM	BOM called to ask heights 3,500m3/s would be at Savages and Mt Crosby. Engineer 2 advised 34.5m AHD and 16.5m AHD respectively.	Correspondence	Engineer 2
	8:05 AM	MBRC wanted to know when NPD gates will be closed. Advised to be closed by 05:00 Friday.	Correspondence	Engineer 2
	9:00 AM	Dam Operations Manager wants to know when gates setting are changed on Wivenhoe and Somerset. Advised that NPD will be closed at 05 Friday.	Correspondence	Engineer 1
	9:00 AM	Dam Operator 2 advised of projected level for Somerset, 103.5 by 2000 Thursday and 102.8 early Friday morning. Will open another sluice this afternoon.	Correspondence	Engineer 2
	10:10 AM	Dam Operations Manager called to inform that power and IT services have been restored at Seqwater.	Correspondence	Flood Officer 9
	10:30 AM	Dam Operations Manager called to request if he could be notified of any changes to releases from Wivenhoe.	Correspondence	Flood Officer 9
	11:00 AM	SDWD Model Updated - SDWD-201101131100.xls	Model Run	Flood Officer 9
	1:00 PM	SRC rang to enquire about Kilcoy Creek and Mary Smokes Bridge. Duty Engineers advised that it may be out of water tonight, certainly by tomorrow morning.	Correspondence	Flood Officer 9
	1:15 PM	Dam Operations Manager called to advise that Police had called to ask when Kilcoy would be accessible. Engineer 4 advised Dam Operations Manager that it would be by 6am tomorrow morning (14/1).	Correspondence	Flood Officer 9
	1:40 PM	Mt Crosby WTP Manager called for update on Mt Crosby. Engineer 2 informed him that level would be maintained at 17.5 metres for next 7 days.	Correspondence	Flood Officer 9
	2:15 PM	Phone call from MBRC. Advice as follows: • Damage to Gympie Rd abutments • No evacuations • No suburban flooding • Not aware of any over floor flooding. Pine Shire had 0.75m freeboard.	Correspondence	Flood Officer 9

Date	Time	Action	Category	Title
	2:30 PM	Wivenhoe directive #36 issued • Open Gate 1 from 3.5 metres to 4.0 metres at 1500. • Open Gate 5 from 3.5 metres to 4.0 metres at 1600. • Open Gate 1 from 4.0 metres to 4.5 metres at 1700. • Open Gate 5 from 4.0 metres to 4.5 metres at 1800.	Correspondence	Flood Officer 9
	3:50 PM	NPD Operator called to confirm if FOC received Dam Observation report for North Pine Dam. Approx 6 of 40 uplift pressure gauges has abnormal readings.	Correspondence	Flood Officer 9
	4:45 PM	MBRC was advised that NPD gates will be closed at 0500 Friday.	Correspondence	Engineer 2
	6:43 PM	Situation Report – 18:00 13 January 2011.	Situation Report	Engineer 2
	7:37 PM	Building Services Manager called to confirm building services were working and all in order.	Correspondence	Flood Officer 4
	7:51 PM	Engineer 1 called North Pine Dam Operator to discuss the current drainage strategy to close all gates by 5am tomorrow. Water level in North Pine Dam will be frequently monitored against the predictive model results, and gate opening will be adjusted accordingly if required.	Correspondence	Flood Officer 4
	8:30 PM	Engineer 1 called Somerset Dam Operator 4 to advise of directive #11.	Correspondence	Flood Officer 4
	8:41 PM	Engineer 1 called Dam Operations Manager to advise of current release rates from Wivenhoe, Somerset and North Pine Dams.	Correspondence	Flood Officer 4
Friday 14 January 2011	12:46 AM	Ipswich District (Fernvale) Police rang to enquire into the integrity of Somerset Dam, based on information received by the Police. Engineer 1 indicated that surveillance procedures are in place to monitor the integrity of the Dam, and that Engineer 1 will confirm with the operators.	Correspondence	Flood Officer 4
	12:47 AM	Engineer 1 called Dam Operator 1 at Somerset to enquire to the integrity of Somerset Dam. Operator indicated all was good and no anomalies have been detected.	Correspondence	Flood Officer 4
	12:49 AM	Engineer 1 called Ipswich District Police back to confirm that Somerset was recently inspected and all was ok.	Correspondence	Flood Officer 4
	5:13 AM	Fax received from North Pine Dam confirming closure of all gates.	Correspondence	Flood Officer 4
	5:15 AM	Engineer 1 called MBRC to advise that North Pine Dam has closed the final gate at 5am.	Correspondence	Flood Officer 4
	5:16 AM	North Pine Dam Operator called to confirm that all gates are closed, and Young's Crossing should be passable within 2 hours. Lake Kurwongbah level is 20.43 m.	Correspondence	Flood Officer 4
	5:28 AM	Dam Operations Manager called to obtain a situation report. Engineer 1 provided the key information.	Correspondence	Flood Officer 4
	5:35 AM	Situation Report – 06:00 Friday 14 January 2011.	Situation Report	Engineer 1
	5:37 AM	BCC called requesting information for Wivenhoe Dam and checking sit-rep data. Enquired about flows throughout the event, Engineer 2 advised that not currently in a position to discuss these.	Correspondence	Flood Officer 4

Date	Time	Action	Category	Title
	7:40 AM	Dam Operations Manager rang FOC to enquire about river levels at Lowood. Pumps required to be installed to supply Lowood WTP. Engineer 2 advised RD that no significant rises were expected in the Brisbane River levels in the foreseeable future.	Correspondence	Flood Officer 1
	7:45 AM	ICC phoned the FOC. Enquiring about renewed rises in the Brisbane / Bremer River systems. He cannot contact BOM for an update. Engineer 2 advised that no significant rises were expected at Moggill. A constant flow in the river was the plan as a consequence of Wivenhoe releases.	Correspondence	Flood Officer 1
	8:20 AM	Principal Dams and Weirs Planning phoned Engineer 2. Enquiry regarding the Wivenhoe Dam fuse plugs (design calcs/parameters).	Correspondence	Flood Officer 1
	8:21 AM	Seqwater CEO phoned the FOC. Engineer 2 discussed with CEO the release strategy from Wivenhoe Dam with a view to opening the Fernvale Bridge and Mt Crosby Bridge at the earliest possible time. Engineer 2 also updated CEO on the projected City Gauge height over the next few days. This being ~2.5 metres due to continuous releases from Wivenhoe Dam.	Correspondence	Flood Officer 1
	8:30 AM	Engineer 2 returned call back to Principal Dams and Weirs Planning. Engineer 2 extended an invitation to him and others to pay a visit to the FOC to inspect operations.	Correspondence	Flood Officer 1
	10:10 AM	Dam Operator 2 rang from Somerset Dam. Checking that all comms avenues (faxes & e-mails) are functioning. All good.	Correspondence	Flood Officer 1
	10:25 AM	BCC rang Engineer 2. Enquiring if any chance of cutting back Wivenhoe releases to lower flows than the current figure of 3,500 cumecs. Engineer 2 response was NO!	Correspondence	Flood Officer 1
	10:40 AM	Manager of Asset Management SunWater transmitted a message to Principal Dams and Weirs Planning that the right bank abutment to Mt Crosby Bridge has suffered some erosion due to the flooding and there are concerns that the abutment may be further affected by piping once the water level falls.	Correspondence	Flood Officer 1
	10:50 AM	Operations Coordinator North rang from North Pine. The dam ceased flood operations at 5:00am this morning and fish recovery and clean-up has been completed. Approx. 31 lung fish were rescued. Quite a number of dead lung fish and other species. Erosion damage downstream of the dam is severe with loss of vegetation, stripped and fallen trees, bank erosion, and many dead fish caught within the root ball of fallen trees. He is organising back hoes and front end loader machinery to clear the debris between the NP dam wall and Grant Street.	Correspondence	Flood Officer 1
	12:33 PM	Flood Officer 7 phoned Engineer 2. Request from Seqwater Corp Comms about hourly updates. Particular concern about NPD which ceased flood operations at 5:00am this morning!! Engineer 3 advised that updates from the dams would continue to be channeled solely through the FOC.	Correspondence	Flood Officer 1
	12:35 PM	DERM phoned Engineer 2. Re: Gauging exercise at Jindalee: Soundtek M9 from boat (6 passes) Jindalee gauging result:- 4,300 cumecs at 6:45 metres AHD at 12:00 hrs	Correspondence	Flood Officer 1
	12:37 PM	Seqwater CEO rang Engineer 2. Discussion about mis-informed reporting.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	1:45 PM	Engineer 2 rang BCC seeking clarification on BCC's flood mapping. BCC advised that at 3,500 cumecs, BCC records indicate that 220 properties will have water on the property. Engineer 2 confirmed that 'water on the property' did not mean water above floor level i.e. Likely to be land inundation only.	Correspondence	Flood Officer 1
	1:53 PM	Dam Operations Manager rang Engineer 2. Routine call. Update on current status.	Correspondence	Flood Officer 1
	2:45 PM	Dam Operations Manager rang Engineer 2. Routine call. Update on current status.	Correspondence	Flood Officer 1
	3:30 PM	Dam Operator 10 rang from Wivenhoe Dam with concerns about some 'swirling' apparent in the downstream tailwater opposite 'The Common'. Dam Operator 10 thought there could be some erosion occurring under the flow. Dam Operator 10 forwarded a marked photo of the phenomenon to Engineer 2. The consensus reached was that the phenomenon was the result of a 'hydraulic jump'. The matter would be referred to Engineer 4 for further investigation.	Correspondence	Flood Officer 1
	3:55 PM	Engineer 2 rang Engineer 4 to discuss the 'swirling' phenomenon identified by Dam Operator 10. Effect is at D/S end of plunge pool and is almost certainly a 'hydraulic jump'. Engineer 4 advised the issue was not of concern unless the phenomenon moves toward the flip bucket.	Correspondence	Flood Officer 1
	4:05 PM	Engineer 4 phoned Dam Operator 10 at Wivenhoe Dam to pass on advice that Engineer 4 had no concerns about the 'hydraulic jump' phenomenon identified by him earlier today.	Correspondence	Flood Officer 1
	4:50 PM	Mt Crosby WTP Manager phoned the FOC. Engineer 2 advised him that the current release strategy from Wivenhoe Dam (and therefore flows past the Mount Crosby WTPs) would be maintained until at least Monday (17/1).	Correspondence	Flood Officer 1
	5:50 PM	Dam Operations Manager rang Engineer 4 enquiring when the bridges to the east of Lake Wivenhoe would be clear of floodwater. Engineer 4 advised all but the Sandy Ck - A&PM Conroy Bridge on the Wivenhoe Somerset Rd would be clear by tomorrow (Sat) morning.	Correspondence	Flood Officer 1
	7:00 PM	FOC change over.	Other	Flood Officer 2
Saturday 15 January 2011	6:36 AM	Situation Report – 06:30 Saturday 15 January 2011.	Situation Report	Engineer 2
	8:40 AM	Dam Operations Manager rang. Engineer 2 advised strategy to possibly go below FSL at Wivenhoe by Thursday.	Correspondence	Flood Officer 3
	8:42 AM	Seqwater CEO rang to advise that the media come into the FOC today to take photos.	Correspondence	Flood Officer 3
	11:30 AM	Dam Operations Manager rang to request a summary of the Operations Manual for Wivenhoe. Engineer 2 to provide after checking with all duty engineers.	Correspondence	Flood Officer 3
	12:12 PM	Dam Operations Manager rang to advise of a phone hook-up with the Minister and Seqwater CEO at 2:00pm, and requested that Engineer 1 be in at the FCO at that time.	Correspondence	Flood Officer 3
	12:20 PM	Seqwater CEO rang to confirm a phone hook-up with the Minister and CEO at 2:00pm.	Correspondence	Flood Officer 3
	12:55 PM	Engineer 2 advised Engineer 1 to come into the FOC for the phone hook-up at 2:00pm.	Correspondence	Flood Officer 3

Date	Time	Action	Category	Title
	1:10 PM	Director Dam Safety phoned about the Wivenhoe Flood manual summary. Engineer 2 told Director Dam Safety that the summary is with the other duty engineers for checking before issuing.	Correspondence	Flood Officer 3
	1:15 PM	Dam Operations Manager rang with some questions on the Wivenhoe Flood manual summary.	Correspondence	Flood Officer 3
	1:45 PM	Engineer 1 and Engineer 4 arrived at the FOC for the 2:00pm phone hook-up.	Correspondence	Flood Officer 3
	2:00 PM	Phone hook-up with Engineer 2, Engineer 1, Engineer 4 with Dam Operations Manager, Director Dam Safety, Seqwater CEO, DG DERM and General Manager, Office of Water Supply Regulator DERM to discuss a report for the Minister by COB Sunday.	Correspondence	Flood Officer 3
	5:00 PM	Dam Operations Manager arrived to help write report for ministerial briefing paper.	Correspondence	Flood Officer 3
	7:30 PM	Dam Operator 7 from Wivenhoe called to discuss strategy for the next 12 hours.	Correspondence	Flood Officer 4
Sunday 15 January 2011	4:12 AM	Called Dam Operator 7 at Wivenhoe to confirm directive received via email. Directive being actioned ASAP.	Correspondence	Flood Officer 4
	6:09 AM	Situation Repot – 06:00 Sunday 16 January 2011.	Situation Report	Engineer 3
	7:10 AM	Dam Operator 2 (Somerset Dam) emailed flood centre indicating he believed flood centre phones were out. Tried to contact Dam Operator 2 by office and mobile phones with no success (Telstra message bank on office phone and Dam Operator 2's message on mobile). Flood centre phones were checked - working OK. Problem is with Somerset phones. Believe fax also not receiving. Dam Operator 2 emailed to confirm they have local calls but no STD. Continued checking mobile - no response.	Correspondence	Flood Officer 6
	8:20 AM	Called Dam Operator 10 at Wivenhoe to confirm directive 45 received. Confirmed not received - busy status on fax confirmation. Confirmed directive received via email.	Correspondence	Flood Officer 6
	9:40 AM	Retried all phones at Somerset - no response. Dam Operator 2 emailed to confirm that all phones are down at Wivenhoe. Email is still working and he will be checking emails every hour on the hour.	Correspondence	Flood Officer 6
	10:20 AM	Email confirmation received that Somerset Directive #12 implementation has been completed.	Correspondence	Flood Officer 6
	11:30 AM	FOC contacted by Ipswich/Somerset District Disaster Coordinator notifying that the Wivenhoe viewing area has been damaged. Engineer 1 unable to contact Wivenhoe staff (Dam Operator 10) - message left. Then contacted Dam Operator 7, who confirmed that the area is damaged and has been locked off and 2 security guards are on site. It won't be opened until the water level falls and a full inspection of the structure has been completed. Engineer 1 confirmed this with Police, who reported that there was damage to safety rails and water supply to toilets. Dam Operator 10 also responded to Engineer 1's call and confirmed the details.	Correspondence	Flood Officer 6
	12:30 PM	Phone call from Dam Operator 10 (Wivenhoe) - neither fax nor email received. Verbal instruction given to implement gate operation as per Directive #46 and email resent.	Correspondence	Flood Officer 6

Date	Time	Action	Category	Title
	12:40 PM	Contract programmer called to advise that the back-up Linux box "Namah" at Back-up FOC is showing file system corruption errors, so the FOC is effectively without backup at the moment. The hydraulic model in the RTFM is not operational because two Fortran programs "Modcom 2" and "Modef" have not been ported to the Linux box as a suitable Fortran compiler was not available at the time.	Correspondence	Flood Officer 6
	12:55 PM	Engineer 1 advised Senior Systems Engineer about the situation at Back-up FOC, and they will visit the backup operations centre ASAP.	Correspondence	Flood Officer 6
	1:10 PM	Dam Operator 2 (Somerset) called to report that the phones are now working.	Correspondence	Flood Officer 6
	2:40 PM	Engineer 2 spoke to Engineer 1. SEQ Grid manager wants a summary of flood volumes and peak discharges.	Correspondence	Flood Officer 6
	3:00 PM	Senior Systems Engineer called - confirmed with Engineer 1 that the computer system at Back-up FOC has been rebooted and is now fully functional.	Correspondence	Flood Officer 6
	3:10 PM	Dam Operations Manager rang to confirm current releases. Engineer 1 confirmed 600 cumecs for Somerset and 3,500 cumecs for Wivenhoe (approx).	Correspondence	Flood Officer 6
	6:52 PM	Engineer 1 spoke with Dam Operator 7 (Wivenhoe Dam) about Directive #48 Wivenhoe strategy. Dam Operator 7 confirmed receipt of Directive.	Correspondence	Flood Officer 7
	7:00 PM	FOC change over.	Other	Flood Officer 7
	10:00 PM	Dam Operator 7 (Wivenhoe Dam) called to inform 3 floor panels missing from baulks in intake structure.	Correspondence	Flood Officer 7
Monday 17 January 2011	7:15 AM	Dam Operations Manager called to get Sit Rep. Advised that Somerset should remain mobilised until further notice.	Correspondence	Flood Officer 8
	7:35 AM	Dam Operator 2 called - discussed strategy i.e. operate cone valves only from now on.	Correspondence	Flood Officer 8
	9:15 AM	Mt Crosby WTP Manager called to find out about strategy for Wivenhoe shut down. Informed him that we will start closing down mid afternoon and aiming to have it closed by Wednesday.	Correspondence	Flood Officer 8
	9:35 AM	Dam Operations Manager called to enquire when closing down will start and reminded us to inform Councils.	Correspondence	Flood Officer 8
	10:00 AM	Advise Director Dam Safety about inconsistency between readings from BoM (automatic ALERT gauge data) and actual manually read HW observations.	Correspondence	Flood Officer 8
	10:15 AM	SRC was contacted and advised gate close will commence this afternoon and Fernvale Bridge will be out of the water sometime Tuesday morning.	Correspondence	Flood Officer 8
	10:20 PM	BCC was contacted (left message) advising gate close will commence this afternoon.	Correspondence	Flood Officer 8
	10:20 PM	ICC was contacted (left message) advising gate close will commence this afternoon.	Correspondence	Flood Officer 8
	11:15 PM	Called Mt Crosby WTP Manager to inform him that flow in Lockyer is 75m3/s and falling.	Correspondence	Flood Officer 8

Date	Time	Action	Category	Title
	11:15 PM	Spoke to BCC. Advised him about gate closure. He mentioned that BCC will not provide any info on flood recurrence until they discussed with FOC.	Correspondence	Flood Officer 8
	11:20 AM	Dam Operations Manager called - Council wants to know draw down rates, so they can determine the effects on Coronation Dr. Engineer 3 informed Dam Operations Manager that BCC did not raise this when they spoke 10 mins before.	Correspondence	Flood Officer 8
	11:20 AM	Seqwater CEO called saying he will email a revised copy of response document	Correspondence	Flood Officer 8
	12:20 PM	Engineer 3 contacted BCC to get an update on Coronation Dr situation. Engineer 3 spoke to BCC. BCC advised he had spoken to BCC Geotechnical Officers and they had advised that at this stage as Coronation Dr was back within the banks that they could not see an immediate problem. Some bank slumping have been identified further up the river. Council would like the recession of flow to be as flat as practicable but also that releases be as small as possible at the Port Office gauge by the time of the high tide on Friday. This is consistent with our current strategy of closing releases by Wednesday 20 Jan 2010.	Correspondence	Flood Officer 8
	12:30 PM	Dam Operations Manager called, requesting an update on discussions with BCC. He requested that BCC confirm the discussion of 12:20 in writing.	Correspondence	Flood Officer 8
	1:01 PM	Dam Operations Manager called, saying MBRC wanted to know if there will be any more releases from NPD. Engineer 3 said none planned unless we get more rain.	Correspondence	Flood Officer 8
	2:15 PM	Dam Operations Manager called, asking for dates and times for Wivenhoe operations at the peak of the flood.	Correspondence	Flood Officer 8
	3:15 PM	BoM called to confirm that they received the information on the discrepancy in the auto level recorder.	Correspondence	Flood Officer 8
	4:15 PM	BoM - they have not received manual observations for days.	Correspondence	Flood Officer 8
	4:56 PM	Situation Report -17:00 Monday 17 January 2011.	Situation Report	Engineer 3
Tuesday 18 January 2011	12:30 AM	Seqwater CEO called to inform that rapidly dropping water level at Lowood was causing issues with pumping for WTP. Asked if FOC could call Esk WTP Team Leader and then notify him via txt of the outcome.	Correspondence	Flood Officer 9
	12:35 AM	FOC contacted Esk WTP Team Leader in regards to pumping issues at Lowood. Engineer 3 decided to halt all further gate closure operations until further notice in order to ensure security of water supply to Lowood.	Correspondence	Flood Officer 9
	1:00 AM	Text message sent to Seqwater CEO to advise of cessation of gate closure sequence of Wivenhoe gate operations until further notice.	Correspondence	Flood Officer 9
	2:00 AM	BCC advise that the recession at Coronation Drive is not an issue with regards to bank stability	Correspondence	Flood Officer 9
	5:00 AM	Dam Operator 7 called to advise that Fernvale Bridge was emerging from river. Current release 2,054 cumecs.	Correspondence	Flood Officer 9
	5:40 AM	Dam Operator 7 called to advise that the approach to the Fernvale Bridge from the Fernvale side was still underwater due to water backed up in the quarry.	Correspondence	Flood Officer 9

Date	Time	Action	Category	Title
	5:45 AM	Called Esk WTP Team Leader to advise that Wivenhoe gate operations would recommence close down sequence from 9:00 AM as per original strategy. He to advise FOC if pumping operation at Lowood would benefit from additional 3 - 6 hours delay in gate operations.	Correspondence	Flood Officer 9
	6:17 AM	Situation Report – 06:15 Tuesday 18 January 2011.	Situation Report	Engineer 2
	7:25 AM	Dam Operator 7 (Wivenhoe) called to advise that a Surveyor is taking a routine deformation survey.	Correspondence	Flood Officer 5
	7:35 AM	BCC enquired about preliminary assessment of magnitude of flood. BCC suggested that Seqwater, BOM and BCC should arrive at a consensus regarding any assessment on the magnitude of the event. Engineer 1 agreed. BCC also enquired if we had done an assessment of the effects of the dam on peak flow. Engineer 1 indicated that our preliminary figure was a 13,000 cumec peak at City Gauge without the Dams.	Correspondence	Flood Officer 5
	8:25 AM	Dam Operator 10 (Wivenhoe) called to acknowledge Directive 55.	Correspondence	Flood Officer 5
	10:10 AM	Seqwater at Mt Crosby has requested some forward projections for flows at Mt Crosby Weir for the next 48 hours. They are looking at sludge dilution.	Correspondence	Flood Officer 5
	10:15 AM	Engineer 1 called West Bank WTP back to provide the following info re projected flows at Mt Crosby Weir: 18/1/2011 10:00 – 2,300 cumecs 19/1/2011 10:00 – 1,130 cumecs 20/1/2011 10:00 - 360 cumecs.	Correspondence	Flood Officer 5
	10:19 AM	BCC Flood Information Centre called to advise that Campbell Newman wants an indication of what the flood would have been without dams and asked if the figure of 13,000 cumecs provided to BCC earlier could be released to the public.	Correspondence	Flood Officer 5
	10:24 AM	Engineer 1 spoke to Dam Operations Manager to ask Seqwater's policy re release of information above. Dam Operations Manager to confirm with his communications people.	Correspondence	Flood Officer 5
	10:30 AM	Seqwater communications officer called to advise that the minister's office has recommended that no information regarding releases from WD be released to anybody. He will now communicate this response to the BCC Flood Information Centre.	Correspondence	Flood Officer 5
	10:38 AM	SRC requested information relating to when Burtons Bridge is expected to be free from inundation. Under our current shutdown sequence, Engineer 1 advised that we expect Burtons to be free around midnight on Wednesday evening. SRC also advised that the bridge on New England Creek will become flood free at around the same time. SRC indicated that at 8:00am today the approaches to Fernvale were clear of water. However, power lines and silt need to be removed. He expects the bridge to be open this afternoon.	Correspondence	Flood Officer 5
	10:55 AM	Principal Dams and Weirs Planning (Seqwater) called to confirm that we received the hydraulic model from WRM. (affirmative).	Correspondence	Flood Officer 5
	12:05 PM	Seqwater CEO called to advise that he and DERM representatives will come and visit the FOC at 2:30 PM this afternoon.	Correspondence	Flood Officer 5

Date	Time	Action	Category	Title
	12:26 PM	Dam Operations Manager called to confirm programmed final shutdown. Engineer 1 advised scheduled for 9:00AM Thursday 20/1 2011. Dam Operations Manager to confirm fish recovery.	Correspondence	Flood Officer 5
	1:22 PM	Confirmed with Dam Operator 10 that gate closure sequence was in accordance with directive as email received from WD re 13:00 closure was incorrect.	Correspondence	Flood Officer 5
	2:00 PM	Engineer 4 called for an update of the closedown sequence.	Correspondence	Flood Officer 5
	2:15 AM	Engineer 1 called WRM re access to hydraulic model of Brisbane River…login and password not working…assistance not available at present.	Correspondence	Flood Officer 5
	2:30 PM	Seqwater CEO and DERM representatives visited FOC to check current situation and to pass on thanks for job performed so far. Also requested that we hold further gate operations until problems at Lowood Pump Station are resolved.	Other	Flood Officer 5
	4:05 PM	Engineer 1 called NPD Operator to alert him to the possibility of operating North Pine Dam with incoming storms.	Correspondence	Flood Officer 5
	4:30 PM	Dam Operations Manager rang noting the current storms and requested that Engineer 1 call MBRC to advise of the possibility of operating North Pine Dam.	Correspondence	Flood Officer 5
	4:34 PM	Email from Seqwater CEO containing approval to vary the flood release regime to enable a constant flow for the Lowood WTP off-take.	Correspondence	Flood Officer 5
	4:45 PM	Engineer 1 rang MBRC to advise of the possibility of operating North Pine Dam in the next day or so if predicted falls of up to 50mm occurred.	Correspondence	Flood Officer 5
	5;40 PM	Situation Report – 18:00 Tuesday 18 January 2011.	Situation Report	Engineer 1
	6:25 PM	Dam Operations Manager called to discuss situation report for North Pine.	Correspondence	Flood Officer 5
	6:57 PM	Engineer 4 phoned MBRC. Message left regarding plans to open NPD gates this evening as the lake level is approaching trigger level with more rain / showers forecast.	Correspondence	Flood Officer 1
	7:02 PM	Engineer 4 phoned NPD Operator regarding mobilising for NPD gate opening this evening. Tentative plan is for commencement of gate opening at 20:30.	Correspondence	Flood Officer 1
	7:05 PM	Engineer 4 phoned the Duty Officer at MBRC regarding the planned imminent opening of the NPD gates. Target time is 20:30 if Council has the barriers in place closing Youngs Crossing Road and the dam is fully manned.	Correspondence	Flood Officer 1
	7:05 PM	Flood Officer 1 phoned Dam Operations Manager to provide an update on the NPD mobilisation and proposed gate openings.	Correspondence	Flood Officer 1
	7:07 PM	Engineer 4 phoned Operations Coordinator North to advise of planned gate opening of NPD this evening. Cessation of operations (i.e. gate closure) is expected to be arranged for tomorrow morning (19/1) in order for Youngs Crossing Road to be opened to peak hour traffic. Engineer 4 advised Operations Coordinator North to plan for an early morning fish recovery exercise at NPD.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	7:10 PM	MBRC returned phone call to Engineer 4. Engineer 4 repeated information already conveyed to MBRC Duty Officer - regarding requirement for Youngs Crossing Road to be closed to traffic to allow NPD gates to be operated by 20:30 if possible.	Correspondence	Flood Officer 1
	7:15 PM	Engineer 4 phoned Seqwater regarding Engineer 4 inability to access Citrix. Outage (?). Message left.	Correspondence	Flood Officer 1
	7:15 PM	Engineer 4 phoned Dam Operations Manager regarding Citrix comms outage. Message left requesting Dam Operations Manager to intervene to have the problem fixed.	Correspondence	Flood Officer 1
	7:20 PM	IT (Seqwater) rang and 'reset' Citrix for Engineer 4.	Correspondence	Flood Officer 1
	7:30 PM	Engineer 4 phoned NPD Operator to confirm gate opening arrangements for 20:30 if Youngs Crossing Road has been closed to traffic by Council at that time.	Correspondence	Flood Officer 1
	7:40 PM	Dam Operations Manager rang the FOC to enquire if the Citrix issue was sorted. Citrix connection now functioning. Engineer 4 expressed concern about the current release strategy for Wivenhoe Dam. If the current release rate is maintained (set to accommodate Lowood temporary raw water pumps), the model indicates that the lake level could fall well below FSL.	Correspondence	Flood Officer 1
	7:42 PM	Engineer 4 phoned Executive GM Water Delivery (Seqwater) to seek advice on who could supply the most up-to-date status report on the current situation at Lowood regarding river levels and pumping activities to supply the WTP. He suggested Water Treatment Team Leader (Seqwater).	Correspondence	Flood Officer 1
	7:45 PM	Engineer 4 phoned Principal Strategic Asset Maintenance Engineer (Seqwater) seeking info Re: Lowood. Maintenance Engineer referred Engineer 4 to Strategic Asset Maintenance Engineer (Civil).	Correspondence	Flood Officer 1
	7:50 PM	Engineer 4 phoned Maintenance Engineer (Civil). - Reportedly on site at Lowood PS. No answer. Message left.	Correspondence	Flood Officer 1
	7:52 PM	Engineer 4 phoned Lowood WTP Operator to enquire as to current status regarding temporary pumping arrangements of raw water from the Brisbane River.	Correspondence	Flood Officer 1
	7:55 PM	Dam Operator 2 (Somerset Dam operator) phoned the FOC from home seeking the Duty Engineer's intentions for operations at Somerset Dam overnight. Engineer 4 requested a Gauge Board reading of the lake level and advised that an operations strategy for Somerset Dam would be addressed within 30 minutes - following satisfactory mobilisation of NPD.	Correspondence	Flood Officer 1
	8:00 PM	Seqwater IT phoned Engineer 4 to check status of Citrix connection. Citrix connection is functioning.	Correspondence	Flood Officer 1
	8:05 PM	Dam Operator 2 phoned from Somerset Dam. Current lake level is EL 98.95 unchanged from lake level at 15:35 today.	Correspondence	Flood Officer 1
	8:05 PM	Engineer 4 phoned Dam Operator 9 at home. Engineer 4 requested Dam Operator 9 to visit Lowood pumping intake site and report on status as unable to contact Maintenance Engineer (Civil).	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	8:11 PM	Engineer 4 phoned Dam Operator 2 (Somerset). Dam Operator 2 to send fax in with lake level. Likely strategy will be to close off the regulator overnight and re-assess the situation in the morning.	Correspondence	Flood Officer 1
	8:12 PM	Engineer 4 conversed with Manager Strategic Maintenance (Seqwater). He advised that arrangements are in hand to move the temporary pumps at the Brisbane River site at Lowood. The pumps are being re-located downhill to maintain extraction of raw water from the river to supply the Lowood WTP.	Correspondence	Flood Officer 1
	8:15 PM	Maintenance Engineer (Civil) contacted Engineer 4. The temporary raw water pumps at Lowood are being moved closer to the river - chasing the anticipated lower level in the river due to reduced releases from Wivenhoe.	Correspondence	Flood Officer 1
	8:18 PM	Dam Operations Manager rang the FOC to seek an update on operations at all 3 storages.	Correspondence	Flood Officer 1
	8:25 PM	Engineer 4 confirmed on-site manning arrangements at Lowood with Dam Operator 9.	Correspondence	Flood Officer 1
	8:30 PM	Somerset Dam Operator advised FOC by fax that Regulator #12 had been closed as per verbal advice from Engineer 4.	Information	Flood Officer 1
	8:35 PM	Engineer 4 contacted Dam Operator 7 at Wivenhoe. Gate closing directive pending.	Correspondence	Flood Officer 1
	8:55 PM	NPD Operator phoned the FOC. MBRC have only just closed off Youngs Crossing Road. By the time the siren is sounded, the gate openings in Directive 31 scheduled to commence at 20:30 will be delayed by 45 minutes.	Correspondence	Flood Officer 1
	9:00 PM	Duty Officer at MBRC rang Engineer 4 to advise that Youngs Crossing Road was now closed. Engineer 4 advised Duty Officer that it was intended to maintain releases from NPD through until 5:00am Wednesday 19/1. With this operating strategy, Young's Crossing Road should be able to be re-opened to traffic by 7:00am tomorrow.	Correspondence	Flood Officer 1
	9:05 PM	Note: Wivenhoe Dam fax machine is still inoperative	Correspondence	Flood Officer 1
	9:08 PM	Engineer 4 phoned Operations Coordinator North to advise of planned gate opening of NPD this evening.	Correspondence	Flood Officer 1
	9:15 PM	Dam Operations Manager phoned Engineer 4 to discuss the Wivenhoe release strategy and its potential to effect bank slumping at Coronation Drive. The changed situation at Lowood means that the reduction in Brisbane River levels will now be far more even. Dam Operations Manager advised that Coronation Drive is no longer a concern.	Correspondence	Flood Officer 1
	9:30 PM	Flood Officer 1 phoned BCC and made contacted with BCC's Flood Operations (Disaster Management) Centre. Engineer 4 requested confirmation that Coronation Drive would not be adversely affected by way of bank slumping if releases from Wivenhoe were terminated on Wednesday afternoon. Engineer 4 requested BCC to investigate and call back the FOC.	Correspondence	Flood Officer 1
	9:38 PM	Flood Officer 1 contacted Dam Operator 7 at Wivenhoe Dam by 2-way radio to confirm his receipt of e-mail containing Directive #59. Dam Operator 7 also confirmed that the Wivenhoe fax machine is still inoperative. All written comms to be by e-mail.	Correspondence	Flood Officer 1

Date	Time	Action	Category	Title
	9:50 PM	Engineer 4 phoned Dam Operations Manager. Wivenhoe release strategy discussed regarding Lowood WTP temporary offtake level, concerns about Coronation Drive bank slumping and lake level at cessation of releases if targeted for tomorrow afternoon.	Correspondence	Flood Officer 1
	9:53 PM	BCC's Flood Operations (Disaster Management) Centre phoned Engineer 4. Wivenhoe release strategy and effect on Coronation Drive discussed. BCC have no concerns about imminent cessation of Wivenhoe releases. Engineer 4 explained that it was more likely that the tidal variation at Toowong would have a greater impact on the river banks than the Wivenhoe releases.	Correspondence	Flood Officer 1
	10:00 PM	Engineer 4 phoned NPD Operator to discuss release strategy i.e. planned gate openings to setting #2 followed by closure sequence to be completed by early tomorrow morning (19/1).	Correspondence	Flood Officer 1
	10:02 PM	Dam Operations Manager phoned Engineer 4. Release strategy and final lake level at gate closure at Wivenhoe discussed.	Correspondence	Flood Officer 1
	10:14 PM	Dam Operator 9 phoned Engineer 4. Situation at Lowood is under control. Engineer 4 advised Dam Operator 9 that the releases at Wivenhoe are planned to cease by early afternoon tomorrow (19/1).	Correspondence	Flood Officer 1
Wednesday 19 January 2011	3:30 AM	Engineer 4 phoned the Mount Crosby WTP to obtain an update on the status of the Mount Crosby Weir Bridge. It is currently clear of water and came out of inundation approx 14:00 yesterday (18/1). The bridge has reportedly suffered some damage. Details unknown.	Correspondence	Flood Officer 1
	4:38 AM	Engineer 4 advised Dam Operator 7 at Wivenhoe Dam that the strategy for further gate closures after 0500 was dependant on the outcome of a discussion with Seqwater CEO anticipated within the hour. Dam Operator 7 advised that the Fernvale Bridge was clear of floodwater but that it had power lines down on /around it.	Correspondence	Flood Officer 1
	5:05 AM	Dam Operator 7 from Wivenhoe Dam phoned the FOC to report that some erosion has occurred in the vicinity of the plunge pool downstream of the flip bucket. This has become evident now that the gate releases have been reduced. Some large boulders (~ 10t) are evident piled up against the bench D/S of the flip bucket. Engineer 4 will need to inspect the damage ASAP.	Correspondence	Flood Officer 1
	5:10 AM	Engineer 4 phoned Seqwater CEO to obtain a Govt. view on how long to maintain releases and to where the lake level should be held following closure of all gates. Timing of the gate closure might be dependant on the erosion issue.	Correspondence	Flood Officer 1
	5:15 AM	Engineer 4 phoned Engineer 2 to arrange for Engineer 2 to relieve Engineer 4 ASAP in the FOC as he is required to inspect the reported damage at Wivenhoe Dam.	Correspondence	Flood Officer 1
	5:20 AM	Engineer 4 phoned Principal Dams and Weirs Planning (Seqwater) to arrange a joint inspection of the erosion damage at Wivenhoe Dam as reported by Dam Operator 7.	Correspondence	Flood Officer 1
	5:25 AM	Dam Operations Manager phoned Engineer 4 to obtain an update. Engineer 4 advised Dam Operations Manager that damage has been reported to the area D/S of the flip bucket at Wivenhoe. An inspection ASAP is warranted.	Correspondence	Flood Officer 1
	5:28 AM	Situation Report – 06:00 Wednesday 19 January 2011.	Situation Report	Engineer 4

Date	Time	Action	Category	Title
	5:30 AM	Engineer 4 phoned Director Dam Safety to advise that damage had been reported at Wivenhoe Dam by the recent operations. Initial information indicates that large boulders are piled up in the plunge pool D/S of the flip bucket. The source of these boulders is unknown as releases are still continuing from the gates. Engineer 4 has arranged to inspect the site with Principal Dams and Weirs Planning in a few hours and an invitation was extended to Director Dam Safety as an interested party to attend the inspection. Engineer 4 will provide updates as they come to hand.	Correspondence	Flood Officer 1
	5:35 AM	Dam Operator 7 phoned Engineer 4 on his mobile phone with an update report.	Correspondence	Flood Officer 1
	8:08 AM	Engineer 4 phoned Engineer 2. Things seem to be O.K. but we will continue to close all gates by this afternoon.	Correspondence	Flood Officer 2
	8:20 AM	Engineer 2 phoned Flood Warning Centre advising that flood operation for current event will be shut down around lunch time.	Correspondence	Flood Officer 2
	9:23 AM	Engineer 4 phoned Engineer 2 asking whether we should run a regulator.	Correspondence	Flood Officer 2
	9:51 AM	Engineer 2 phoned Engineer 4 regarding modelling results.	Correspondence	Flood Officer 2
	10:00 AM	Engineer 2 phoned Engineer 4 regarding modelling results. Engineer 2 wants to advise Dam Operator 7 to stop at Gate 3 at 1 metre, but they agree to close as planned and maintain operational release instead of flood release.	Correspondence	Flood Officer 2
	10:15 AM	Engineer 4 has discussed the event closure with Director Dam Safety. It was agreed that the flood will be considered closed with the closure of the gates at 1200. At that time, control of the dam will revert to Seqwater. As the low flow channel to the regulator is blocked, the centre gate will be opened to 1 metre to manage on-going inflows with the aim of getting to 95% (EL 66.5).	Correspondence	Engineer 2
	10:43 AM	Received QPF - 15mm-25mm generally, heavier falls to about 50mm in Brisbane and North Pine catchments.	Other	Flood Officer 2
	11:14 AM	Engineer 3 phoned Engineer 2 - Still operational until tonight.	Correspondence	Flood Officer 2
	11:28 AM	Seqwater at Mt Crosby phoned FOC requesting for peak flow at Mt Crosby Weir during the latest event.	Correspondence	Flood Officer 2
	11:36 AM	Engineer 2 phoned Engineer 4 confirming that Engineer 3 and Flood Officer 8 will be on tonight.	Correspondence	Flood Officer 2
	11:45 AM	Engineer 2 phoned Mt Crosby advising that peak flow over Mt Crosby Weir was about 9150 cumecs.	Correspondence	Flood Officer 2
	11:51 AM	Engineer 2 phoned (left message with) MBRC regarding potential for closing operation tonight.	Correspondence	Flood Officer 2
	11:52 AM	Engineer 2 phoned (left message with) Operations Coordinator North to call him back.	Correspondence	Flood Officer 2
	11:59 AM	Engineer 4 phoned Engineer 2 stating that divers will investigate erosion d/s Wivenhoe Dam today.	Correspondence	Flood Officer 2
	12:00 PM	Gate operations ceased at Wivenhoe Dam.	Correspondence	Flood Officer 2
	1:25 PM	Mt Crosby phoned Engineer 2 discussing about the information which Engineer 2 sent.	Correspondence	Flood Officer 2
	1:39 PM	Dam Operator 10 phoned Engineer 2 advising Wivenhoe Dam EL is 66.89 m AHD.	Correspondence	Flood Officer 2

Date	Time	Action	Category	Title
	1:57 PM	Situation Report - 14:00 Wednesday 19 January 2011.	Situation Report	Engineer 2
	3:21 PM	MBRC phoned wanting AJ Wyllie Bridge to be closed at 9:00 PM rather than 7:00 PM, and stating that she will update 24 hour call centre number. They will send email to confirm all this.	Correspondence	Flood Officer 2
	4:00 PM	Received QPF - 15mm-25mm generally, heavier falls to about 50mm in Brisbane and North Pine catchments.	Other	Flood Officer 2
	7:30 PM	MBRC called to say that the alternate route at Petrie is open (sooner than the 9:00 PM forecast).	Correspondence	Flood Officer 8
	9:10 PM	Called Operations Coordinator North to inform him that NPD will be mobilised.	Correspondence	Flood Officer 8
	9:10 PM	Called NPD Operator to mobilise. The lake level is approaching trigger level for gate opening.	Correspondence	Flood Officer 8
	9:20 PM	Called MBRC call centre to inform them that NPD will be operated. They called back and advised that they can close Young's crossing by 11:00 PM. They will confirm once road is closed.	Correspondence	Flood Officer 8
	9:38 PM	NPD Operator called to confirm they are ready. The gauge reading was 39.54 at 9:30PM.	Correspondence	Flood Officer 8
	2:15 AM	MBRC called regarding release at NPD. He was advised that the gates will be open for a while yet.	Correspondence	Flood Officer 8
	6:50 AM	MBRC called to find out when the gates on NPD will be shut. They were advised that the gates will only be closed in time for the afternoon peak.	Correspondence	Flood Officer 8
	7:20 AM	Engineer 1 called SRC to advise of flow in Lockyer Creek. SRC concerned about Burtons Bridge but Engineer 1 indicated that we will endeavour to keep flows below 400 m3/s.	Correspondence	Engineer 1
	7:25 AM	Engineer 1 called ICC and advised of renewed flows in Lockyer Creek and Middle Brisbane River.	Correspondence	Engineer 1
	7:40 AM	Engineer 1 called BCC and advised of increased flows in Lockyer Creek and Middle Brisbane. Advised that Savages Crossing and/will be Colleges Crossing are inundated. Estimated travel time 30 to 36 hours.	Correspondence	Engineer 1
	7:55 AM	Engineer 1 called NPD and spoke to Dam Operator 7. Discussed proposed strategy to drain until around 2:00 PM with current gate settings. Requested hourly readings so as to monitor model performance.	Correspondence	Engineer 1
	8:00 AM	NPD Operator called to discuss proposed operations. Engineer 1 indicated that we will continue as is until 10:00am when QPF comes in and then decide from there as to closure strategy.	Correspondence	Engineer 1
	8:40 AM	Dam Operations Manager called enquiring about the timeliness of the notice we gave to MBRC. Engineer 1 advised of the timing of notifications.	Correspondence	Flood Officer 2
	8:45 AM	Flood Officer 9 called (re Lowood pump station) enquiring the time to peak (height and discharge). FOC response indicated it was about 9 hours with height of about 3.7 m corresponding to 300 cumecs.	Correspondence	Flood Officer 2
	8:50 AM	Flood Officer 9 called (re Lowood pump station) enquiring current height and discharge. Together it was estimated that it was about 150 cumecs (50 from Lockyer Creek and 100 from Wivenhoe Dam) corresponding to about 2.4m.	Correspondence	Flood Officer 2
	9:45 AM	Dam Operations Manager advised Wivenhoe will not be drained to 66.5 m AHD, but will be maintained at or just below FSL.	Correspondence	Flood Officer 2

Date	Time	Action	Category	Title
	10:21 AM	Received QPF - 15mm-25mm generally, heavier falls to about 50mm in Brisbane and North Pine catchments.	Other	Flood Officer 2
	10:30 AM	Dam Operations Manager called enquiring whether closing all releases in Wivenhoe Dam will cause level to exceed gate trigger in the next three day. Engineer 1 advised that with rain on the ground he expects it not to, however forecast as per QPF is 15-25 mm, so we may need to review that decision tomorrow.	Correspondence	Flood Officer 2
	11:12 AM	MBRC called. Engineer 1 advised all gates will be closed at 2:00 PM.	Correspondence	Flood Officer 2
	11:14 AM	Engineer 1 phoned Operations Coordinator North. Decided to close NPD by 2:00PM to allow MBRC to open Young's Crossing for afternoon peak.	Correspondence	Flood Officer 2
	11:15 AM	Flood Officer 9 called enquiring peak height and discharge at Lowood with Wivenhoe Dam gates closed. Decided to just subtract 100 cumecs from previous estimate. He also wants FOC to email him the Lowood rating curve.	Correspondence	Flood Officer 2
	11:33 AM	Engineer 1 called NPD Operator (re Directive 36).	Correspondence	Flood Officer 2
	11:36 AM	Engineer 1 called Engineer 2. Engineer 2 will monitor situation overnight and Engineer 1 will become Duty Engineer again tomorrow.	Correspondence	Flood Officer 2
	11:44 AM	Communications Advisor, Media and Ministerial (Seqwater) called to confirm whether we have closed all gates at Wivenhoe Dam. Flood Officer 2 indicated they had been closed.	Correspondence	Flood Officer 2
	1:07 PM	Dam Operations Manager called confirming NPD closure.	Correspondence	Flood Officer 2
	1:35 PM	Communications Advisor, Media and Ministerial (Seqwater) called about Lowood pump motor sitting on the platform and wanting to know what flow will come down from Lockyer. Engineer 1 said the peak flow was about 300 cumecs.	Correspondence	Flood Officer 2
	1:37 PM	Engineer 2 called. Flood Officer 8 will be on tonight (Flood Officer 2 should ring him this afternoon). Mt Crosby Weir gauge is broken so Water Treatment boys will give manual readings via BoM website. City gauge is currently reading 0.3 m high.	Correspondence	Flood Officer 2
	2:10 PM	Engineer 1 advised MBRC that North Pine Dam gate operations had ceased at 14:00 and that Youngs Crossing should be clear of water within the next hour to an hour and half.	Correspondence	Engineer 1
	2:15 PM	Engineer 1 called NPD Operator and indicated that Engineer 2 will be on call tonight monitoring the situation. NPD Operator advised that the tree branch snagged on Gate C had swung around and was now resting on pier - therefore okay. However a 75mm branch was caught in the ropes of Gate B and may need to be removed before another operation. Operations Coordinator North has organised for the Rangers to examine tomorrow.	Correspondence	Engineer 1
	2:40 PM	Dam Operator 2 called from Somerset Dam and enquired as to proposed operational release strategy. Engineer 1 advised that no releases planned for now until Wivenhoe spillway issues are resolved.	Correspondence	Engineer 1
	3:20 PM	Engineer 1 called MBRC Call Centre to provide ‘heads up’ on possible gate operations tonight. Indicated that with 25mm over catchment we will commence gate operations at 21:00. FOC would contact MBRC again if this rainfall eventuates.	Correspondence	Engineer 1

APPENDIX N – FLOOD OPERATIONS ENGINEERS' RESUMES

Engineer 1

Engineer 1 has a Bachelor of Engineering (Civil) and a Post Grad Certificate in Hydrology. He has over 26 years experience in water engineering and expertise in hydrology and water resource studies. He is currently Manager of a major design group which provides civil design services for a range of water supply infrastructure projects including dams, weirs and fish transfer systems. Engineer 1 is responsible for the group's 20 professional and technical staff in relation to service delivery to clients.

Engineer 1's main areas of expertise includes design flood estimation and hydraulic modelling of flood plain flows and project management. He is proficient in the use of numerous hydrologic and hydraulic modelling packages and leads a number of project teams. He has authored numerous technical reports and publications and has served on technical panels within the water industry.

Engineer 2

Engineer 2 holds a Bachelor of Engineering and a Master of Engineering Science. He has held senior positions in well recognised major modelling groups. His core specialist skills are in hydrological modelling including real-time forecasting and design flood hydrology. He is recognised in the area of flood forecasting and has authored/co-authored many papers in the field.

His hydrological modelling skills have been developed over 25 years experience in the water industry which included developing major hydrological models and flood forecasting systems in Australia and overseas. He has delivered training programs to both national and international flood forecasting agencies and has authored numerous flood management reports.

Engineer 2 has provided advice and expertise in the field of flood forecasting to interstate and international agencies.

He has also served on technical panels within the water industry.

He is currently managing the development of a major flood forecasting package.

Engineer 3

Engineer 3 has a Degree in Engineering and a post graduate qualification in Engineering with a focus on hydrology. He is an experienced hydrologist with almost 30 years' experience in the water industry. He has broad range of expertise in hydrology which includes topics such as catchment hydrology, erosion, flood hydrology, hydraulic modelling, water security, real-time flood management and design flood hydrology. He has authored numerous technical reports and papers covering these topics.

Engineer 3 has been involved in a number of national projects which have developed some of the methodologies associated with design flood hydrology for dam design and floodplain management.

Engineer 3 is currently managing a large group of professionals working in the water industry.

He has also served on technical panels within the water industry.

Engineer 4

Engineer 4 has a Degree in Civil Engineering with almost 30 years' experience in the Queensland Water Industry. Engineer 4 has held roles in design, construction and operations working on major bulk water supply projects throughout Queensland. Engineer 4 is one of Australia's most experienced civil engineers in relation to the management of flood operations at gated dams.

As well as being an experienced civil engineer, Engineer 4 holds complementary tertiary qualifications in environmental impact assessment, infrastructure management, operations management, electrical engineering and computing.

Engineer 4 is currently responsible for dam safety management programs.

APPENDIX O – DAILY AND HOURLY RAINFALL TABLES

ALERT ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6500	540184	Mt Glorious-B	-27.3120	152.7470									
6511	541057	Mt Pechy	-27.3167	152.0817	44	16	16	7	81	101	18	0	283
6514	540139	Gregors Ck-P	-26.9800	152.4040	27	39	11	25	221	77	25	1	426
6517	540140	Gregors Ck-B	-27.0000	152.4040									
6520	540141	Boat Mountain	-26.9789	152.2847	40	52	20	25	179	62	26	4	408
6523	540142	Cressbrook Dam	-27.2650	152.1950	32	28	14	7	94	120	11	1	307
6526	540143	Helidon	-27.5440	152.1130	56	42	25	6	101	33	0	0	263
6529	540144	St Aubyns	-27.0619	151.8944	25	26	23	20	74	123	8	2	301
6540	540145	Yarraman	-26.8358	151.9692	32	40	21	20	113	130	0	1	357
6542	540146	Cooyar Ck	-26.7417	152.1367	23	55	28	18	118	118	3	1	364
6550	540147	Walloon-P	-27.6170	152.6680	25	14	14	3	69	42	114	0	281
6553	540148	Rosentretters Br	-27.1383	152.3294	28	27	25	4	129	111	23	4	351
6555	540479	Atkinson Dam	-27.4320	152.4640	44	28	9	5	109	119	98	0	412
6556	540149	Glenore Grove	-27.5242	152.4081	16	24	13	4	84	77	129	0	347
6559	540150	Savages Crossing	-27.4410	152.6680	4	27	5	5	113	246	144	0	544
6562	540151	Kalbar Weir	-27.9230	152.6010	42	39	7	4	15	67	55	0	229
6565	540152	Tenthill	-27.6360	152.2140									
6568	540153	O'Reillys Weir	-27.4197	152.5892	10	36	6	2	98	146	206	0	504
6571	540154	Harrisville	-27.8150	152.6406	14	19	10	1	30	76	53	0	203
6574	540155	Caboonbah	-27.1460	152.4900	24	23	39	9	130	154	54	0	433
6577	540156	Gatton	-27.5564	152.2731	17	36	21	4	87	68	88	0	321
6580	540157	Adams Br	-27.8294	152.5108	33	30	13	2	36	93	92	1	300
6583	540158	Showground Weir	-27.6386	152.3844	13	27	18	1	68	103	117	0	347
6590	540160	Somerset Dam HW-B	-27.1200	152.5510	20	18	42	22	159	136	65	1	463

ALERT ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6593	540159	Somerset Dam HW-P	-27.1000	152.5510									
6596	540161	Crows Nest	-27.2308	152.0311	44	21	15	11	115	98	18	0	322
6598	540162	Toowoomba	-27.5114	151.9536	44	18	27	9	81	117	24	1	321
6600	540163	Kilcoy	-26.9481	152.5836	12	38	18	24	179	96	61	2	430
6601	540494	Mt Binga	-26.9920	151.9850	38	39	35	22	121	118	13	2	388
6602	540164	Top of Brisbane	-26.4772	152.1567	45	52	70	17	41	66	0	0	291
6603	540493	Blackbutt	-26.8860	152.1020	45	75	30	33	160	107	13	0	463
6604	540165	Toogoolawah	-27.0858	152.3722	16	26	22	12	177	103	27	2	385
6605	540492	Eskdale	-27.1670	152.1860									
6606	540166	West Woodbine	-27.7847	152.1497	35	17	5	4	17	88	33	0	199
6607	540491	Lindfield	-26.8370	152.5810	50	34	18	90	271	86	65	1	615
6608	540167	Jimna	-26.6610	152.4510	29	44	28	42	117	47	22	1	330
6609	540490	Monsildale	-26.5820	152.3250	25	43	62	49	117	160	4	2	462
6610	540168	Kluvers Lookout	-27.2070	152.7030	4	52	24	17	126	164	191	4	582
6611	540489	Redbank Creek	-27.2770	152.2890	32	40	21	7	130	170	27	1	428
6612	540488	Mt Stanley	-26.6820	152.2050	24	61	32	32	137	160	2	1	449
6613	540487	Hazeldean	-27.0280	152.5370	9	38	32	18	204	123	90	5	519
6614	540486	Westvale	-27.0170	152.6100									
6615	540169	Thornton	-27.8211	152.3800	23	31	12	5	46	123	98	0	338
6617	540170	Little Egypt	-27.7042	152.0650	50	18	8	1	30	92	30	1	230
6619	540171	Mt Castle	-27.9636	152.3756	52	55	17	4	88	195	122	21	554
6621	540172	Nukinenda	-27.0567	152.1072	11	43	19	13	114	113	10	2	325
6623	540173	Tarome	-27.9867	152.5008	31	55	9	0	26	81	82	0	284
6624	540474	Moogerah Dam	-28.0310	152.5450	23	55	16	1	21	96	76	0	288

ALERT ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6626	540475	Maroon Dam	-28.1840	152.6340	20	19	1	5	34	78	46	0	203
6630	540175	Lyons Br-B	-27.4717	152.5236	25	25	13	4	83	130	239	0	519
6633	540174	Lyons Br-P	-27.4717	152.5236	26	22	11	5	75	114	214	0	467
6636	540177	Wivenhoe Dam HW-B	-27.3550	152.5960	6	29	6	4	87	135	197	0	464
6641	540179	Wivenhoe Dam TW-B	-27.3900	152.5960	8	32	6	5	99	157	206	0	513
6643	540178	Wivenhoe Dam TW-P	-27.4100	152.5960	7	30	7	2	101	160	218	0	525
6646	540183	Lowood-B	-27.4700	152.5930	8	29	7	4	104	183	210	0	545
6649	540182	Lowood-P	-27.4900	152.5930	6	22	8	9	99	163	194	0	501
6651	540180	Amberley-P	-27.6780	152.6990	39	13	16	3	68	32	86	0	257
6653	540181	Amberley-B	-27.6783	152.6989	38	12	16	3	59	32	81	1	242
6656	540472	Bill Gunn Dam	-27.6320	152.3790	13	31	23	1	74	102	132	0	376
6658	540473	Lake Clarendon Dam	-27.5160	152.3530	21	35	20	5	88	76	134	0	379
6680	540138	Mt Glorious-P	-27.3220	152.7470	29	46	16	24	204	260	228	2	809
6690	540185	Mt Mee-P	-27.0700	152.7800	10	55	46	30	220	137	179	10	687
6701	540246	Mt Mee-B	-27.0700	152.7800	9	55	49	28	219	138	179	9	686
6702	540338	Woodford-B	-26.9300	152.7600	8	42	43	37	181	88	196	5	600
6705	540337	Woodford-P	-26.9500	152.7600	8	41	43	38	182	88	196	5	601
6708	540188	Devon Hills	-26.9000	152.3210	28	42	43	55	162	68	16	1	415
6711	540189	Baxters Ck	-27.1958	152.8000	3	37	23	17	127	170	192	0	569
6714	540190	Ferris Knob	-26.8542	152.8167	0	33	24	90	250	78	224	11	710
6716	540191	West Bellthorpe	-26.8230	152.6780	50	30	14	104	312	134	95	7	746
6717	540261	Linville	-26.8050	152.2720	30	39	32	37	139	51	34	0	362
6730	540192	Jindalee	-27.5322	152.9239	24	35	8	5	75	26	45	0	218
6733	540193	Rosewood	-27.6600	152.6030	21	14	17	3	67	54	152	0	328

ALERT ID	BoM ID	Station	Location		Rainfall (mm) 24 hours ending 09:00								8 day total
			Latitude	Longitude	6/01	7/01	8/01	9/01	10/01	11/01	12/01	13/01	
6736	540194	Kuss Rd	-27.6658	152.5414									
6739	540195	Washpool	-27.8290	152.7550	12	20	11	1	24	60	38	0	166
6742	540196	Walloon-B	-27.6100	152.6680	26	16	14	6	67	42	113	0	284
6748	540198	Brisbane City	-27.4730	153.0300	49	36	12	15	105	20	41	0	278
6751	540199	Mt Crosby	-27.5300	152.7980	4	39	11	6	86	25	73	0	244
6754	540200	Moggill-P	-27.5950	152.8630	3	39	6	5	60	35	52	0	200
6759	540277	North Pine Dam-B	-27.2750	152.9300	4	45	4	9	82	53	67	0	264
6760	540202	North Pine Dam	-27.2650	152.9300	3	45	4	8	83	52	65	0	260
6763	540203	Petrie	-27.2700	152.9750	6	57	5	12	121	63	55	0	319
6766	540204	Lake Kurwongbah	-27.2500	152.9500	7	52	7	10	127	60	72	1	336
6769	540205	Drapers Crossing	-27.3500	152.9167	2	47	8	9	123	47	84	2	322
6774	540207	Wilsons Peak-P	-28.2440	152.4860									
6775	540059	Peachester	-26.8400	152.8406									
6778	540060	Samford	-27.3610	152.8790	21	41	6	9	131	51	99	2	360

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 7 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	3	8	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	2	17
6514	Gregors Ck-P	0	0	9	7	1	0	0	0	0	0	0	0	0	0	1	2	2	2	0	2	4	3	4	0	37
6517	Gregors Ck-B																									
6520	Boat Mountain	0	0	23	7	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	6	3	4	2	50
6523	Cressbrook Dam	8	10	3	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	2	28
6526	Helidon	28	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	42
6529	St Aubyns	2	5	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	5	8	2	27
6540	Yarraman	0	7	22	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	1	4	40
6542	Cooyar Ck	0	0	16	27	2	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	2	0	2	1	56
6550	Walloon-P	1	5	4	0	1	1	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0	0	16
6553	Rosentretters Br	3	0	13	1	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	1	1	3	2	29
6555	Atkinson Dam	4	9	6	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	29
6556	Glenore Grove	2	6	3	2	3	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0	2	23
6559	Savages Crossing	0	6	4	1	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	12	27
6562	Kalbar Weir	6	13	4	2	1	1	0	0	0	0	0	0	0	1	4	1	2	0	0	1	3	0	0	0	39
6565	Tenthill																									
6568	O'Reillys Weir	0	10	11	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	37
6571	Harrisville	1	9	4	1	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	19
6574	Caboonbah	0	0	2	2	2	1	0	0	0	0	0	0	0	0	0	6	2	0	0	1	2	0	4	1	23
6577	Gatton	9	18	1	2	1	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	1	36
6580	Adams Br	9	9	5	3	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	31
6583	Showground Weir	4	11	2	1	4	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	27

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 7 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6590	Somerset Dam HW-B	0	0	0	4	2	1	0	0	0	0	0	0	0	0	0	2	1	0	0	0	3	0	5	1	19
6593	Somerset Dam HW-P																									
6596	Crows Nest	2	11	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	2	1	1	21
6598	Toowoomba	9	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	1	0	19
6600	Kilcoy	0	0	9	9	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	3	0	2	5	1	37
6601	Mt Binga	1	9	6	2	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	5	4	4	4	39
6602	Top of Brisbane	0	0	0	12	15	0	3	0	0	0	0	0	0	0	0	0	0	0	6	0	2	1	3	4	46
6603	Blackbutt	0	7	43	7	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	2	3	1	5	5	76
6604	Toogoolawah	1	0	5	3	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	1	2	5	4	1	28
6605	Eskdale																									
6606	West Woodbine	9	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	18
6607	Lindfield	0	0	0	11	2	3	2	1	2	0	0	0	0	0	1	1	2	0	0	2	0	3	1	4	35
6608	Jimna	0	0	0	4	1	15	10	3	0	0	0	0	0	0	3	1	1	0	0	2	0	2	0	0	42
6609	Monsildale	0	0	2	2	17	7	3	2	1	0	0	0	0	0	0	1	0	0	0	3	1	1	0	2	42
6610	Kluvers Lookout	0	7	6	12	0	2	4	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	14	4	52
6611	Redbank Creek	13	12	5	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	5	41
6612	Mt Stanley	0	0	7	22	21	0	0	0	0	0	0	0	0	1	0	0	1	0	0	4	2	1	0	1	60
6613	Hazeldean	0	0	2	14	1	1	0	0	0	0	0	0	0	0	0	4	5	0	0	1	6	2	4	0	40
6614	Westvale																									
6615	Thornton	17	5	3	2	2	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	33
6617	Little Egypt	6	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0	0	0	0	0	19
6619	Mt Castle	8	5	7	0	2	3	0	0	0	0	0	0	2	4	0	5	4	9	1	0	2	3	1	0	56
6621	Nukinenda	3	7	19	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	2	3	3	2	42
6623	Tarome	12	4	7	2	2	2	0	0	0	0	0	0	1	2	5	3	3	5	3	1	3	2	0	0	57

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 7 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6624	Moogerah Dam	8	5	5	5	0	3	0	0	0	0	0	0	0	1	3	5	2	2	6	1	5	6	0	0	57
6630	Lyons Br-B	1	7	5	1	2	4	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	3	25
6633	Lyons Br-P	1	6	4	1	2	4	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3	23
6636	Wivenhoe Dam HW-B	0	9	3	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	30
6641	Wivenhoe Dam TW-B	0	9	5	2	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	12	32
6643	Wivenhoe Dam TW-P	0	9	5	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	32
6646	Lowood-B	0	7	8	0	3	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	7	28
6649	Lowood-P	0	4	6	0	2	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	7	23
6651	Amberley-P	0	3	5	0	1	1	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	14
6653	Amberley-B	1	1	4	1	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	12
6656	Bill Gunn Dam	4	10	2	2	4	1	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	1	0	0	31
6658	Clarendon Dam	5	16	2	4	3	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	34
6680	Mt Glorious-P	0	0	13	6	0	1	3	2	0	0	0	0	0	0	0	1	2	1	0	0	0	0	7	10	46
6690	Mt Mee-P	0	0	0	16	0	1	3	1	0	0	0	0	0	0	0	1	1	0	3	4	1	12	7	4	54
6701	Mt Mee-B	0	0	0	16	0	1	3	1	0	0	0	0	0	0	0	1	1	0	3	4	1	12	7	4	54
6702	Woodford-B	0	0	0	13	0	2	2	2	2	0	0	0	0	0	0	0	0	0	1	5	2	9	0	2	40
6705	Woodford-P	0	0	0	13	0	2	2	2	2	0	0	0	0	0	0	0	0	0	1	5	2	9	0	2	40
6708	Devon Hills	0	0	14	11	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2	1	8	0	41
6711	Baxters Ck	0	0	0	6	1	2	4	2	1	0	0	0	0	0	0	0	0	0	1	0	0	1	15	4	37
6714	Ferris Knob	0	0	0	1	1	0	5	2	5	0	1	0	0	0	1	0	0	1	1	2	2	9	1	2	34
6716	West Bellthorpe	0	0	0	8	1	3	3	2	2	0	0	0	0	0	1	1	1	0	0	1	1	4	0	4	32
6717	Linville	0	0	17	7	5	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3	0	2	1	2	39
6730	Jindalee	1	2	10	3	1	2	1	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	13	36
6733	Rosewood	2	5	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	14

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 7 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6736	Kuss Rd	1	7	2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	16
6739	Washpool	2	2	1	1	2	2	0	0	0	0	0	0	1	5	3	0	0	0	0	0	0	0	0	0	19
6742	Walloon-B	1	5	4	0	0	2	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0	0	16
6748	Brisbane City	0	1	0	7	2	0	3	1	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	17	35
6751	Mt Crosby	0	10	12	4	0	1	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	8	39
6754	Moggill-P	1	1	10	1	1	1	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	20	40
6759	North Pine Dam-B	0	0	0	10	2	1	4	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	18	2	44
6760	North Pine Dam	0	0	0	11	1	1	4	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	18	2	44
6763	Petrie	0	0	8	12	5	0	4	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	22	2	60
6766	Lake Kurwongbah	0	0	0	7	7	0	5	4	1	2	0	0	0	0	0	0	0	0	0	0	0	1	12	0	39
6769	Drapers Crossing	0	11	1	7	1	0	3	4	1	0	0	0	0	0	0	1	0	0	0	0	0	0	12	6	47
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	0	0	0	14	1	0	3	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8	9	40

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 8 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	6	2	3	2	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	16
6514	Gregors Ck-P	1	0	1	7	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	13
6517	Gregors Ck-B																									
6520	Boat Mountain	4	0	4	10	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	21
6523	Cressbrook Dam	1	2	6	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
6526	Helidon	5	5	6	3	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
6529	St Aubyns	0	2	2	5	7	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	24
6540	Yarraman	2	1	0	0	7	5	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	21
6542	Cooyar Ck	0	0	0	5	9	10	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
6550	Walloon-P	12	2	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	16
6553	Rosentretters Br	0	4	14	5	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	27
6555	Atkinson Dam	4	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
6556	Glenore Grove	6	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
6559	Savages Crossing	2	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
6562	Kalbar Weir	1	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
6565	Tenthill																									
6568	O'Reillys Weir	1	2	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
6571	Harrisville	3	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
6574	Caboonbah	2	17	14	5	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
6577	Gatton	6	5	6	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	21
6580	Adams Br	1	6	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
6583	Showground Weir	6	7	3	1	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	20
6590	Somerset Dam HW-B	4	26	6	4	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	44

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 8 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	2	1	2	5	5	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	18
6598	Toowoomba	1	4	7	5	2	7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	27
6600	Kilcoy	2	3	3	5	2	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	19
6601	Mt Binga	3	1	4	4	15	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
6602	Top of Brisbane	6	0	0	0	4	11	32	15	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	71
6603	Blackbutt	3	3	3	3	13	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	31
6604	Toogoolawah	0	4	9	5	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	22
6605	Eskdale																									
6606	West Woodbine	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
6607	Lindfield	0	3	3	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	19
6608	Jimna	2	3	3	3	11	5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
6609	Monsildale	7	0	1	7	18	16	13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
6610	Kluvers Lookout	3	14	4	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
6611	Redbank Creek	4	5	9	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
6612	Mt Stanley	3	1	0	9	7	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
6613	Hazeldean	2	15	6	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
6614	Westvale																									
6615	Thornton	1	4	1	5	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	13
6617	Little Egypt	0	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
6619	Mt Castle	0	1	5	3	6	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	18
6621	Nukinenda	2	0	4	3	7	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
6623	Tarome	0	4	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
6624	Moogerah Dam	0	6	0	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 8 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	5	1	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
6633	Lyons Br-P	5	1	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
6636	Wivenhoe Dam HW-B	0	1	3	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
6641	Wivenhoe Dam TW-B	1	1	3	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
6643	Wivenhoe Dam TW-P	0	1	3	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
6646	Lowood-B	5	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	9
6649	Lowood-P	5	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
6651	Amberley-P	12	3	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	17
6653	Amberley-B	12	3	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	17
6656	Bill Gunn Dam	8	9	3	1	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	24
6658	Lake Clarendon Dam	9	2	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
6680	Mt Glorious-P	4	2	8	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	17
6690	Mt Mee-P	13	28	4	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	49
6701	Mt Mee-B	13	28	4	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	49
6702	Woodford-B	8	11	17	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	43
6705	Woodford-P	8	11	17	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	43
6708	Devon Hills	7	7	8	11	5	2	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	43
6711	Baxters Ck	1	19	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
6714	Ferris Knob	1	1	10	12	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	25
6716	West Bellthorpe	0	0	2	10	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	16
6717	Linville	1	1	0	9	9	9	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	32
6730	Jindalee	5	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
6733	Rosewood	12	4	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	18
6736	Kuss Rd	10	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 8 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	5	2	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11
6742	Walloon-B	13	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	16
6748	Brisbane City	5	0	0	0	1	1	0	2	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	13
6751	Mt Crosby	6	3	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	13
6754	Moggill-P	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8
6759	North Pine Dam-B	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
6760	North Pine Dam	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
6763	Petrie	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
6766	Lake Kurwongbah	1	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
6769	Drapers Crossing	1	4	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	2	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 9 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7
6514	Gregors Ck-P	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	9	12	0	0	25
6517	Gregors Ck-B																									
6520	Boat Mountain	0	0	0	0	0	1	1	0	0	1	2	0	0	0	0	0	0	1	0	0	7	13	1	0	27
6523	Cressbrook Dam	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	8
6526	Helidon	0	0	0	0	0	3	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6
6529	St Aubyns	0	0	0	0	0	0	5	3	0	0	2	0	0	0	0	1	0	0	0	0	0	9	1	0	21
6540	Yarraman	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	0	0	0	0	0	1	2	7	3	19
6542	Cooyar Ck	0	0	0	0	0	1	2	1	0	0	1	1	0	0	0	0	0	0	0	0	2	4	8	0	20
6550	Walloon-P	0	0	0	0	3	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	6
6553	Rosentretters Br	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	2	0	0	0	5
6555	Atkinson Dam	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	5
6556	Glenore Grove	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4
6559	Savages Crossing	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	6
6562	Kalbar Weir	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5
6565	Tenthill																									
6568	O'Reillys Weir	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
6571	Harrisville	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6574	Caboonbah	0	0	0	0	0	2	1	0	0	1	0	0	1	0	0	0	0	0	0	1	4	0	0	0	10
6577	Gatton	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	4
6580	Adams Br	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3
6583	Showground Weir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
6590	Somerset Dam HW-B	0	0	0	0	0	4	0	0	0	7	0	0	2	2	1	0	1	0	0	1	5	1	0	0	24

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 9 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11
6598	Toowoomba	0	0	0	0	0	0	4	0	0	0	0	0	0	0	1	2	1	0	0	0	0	1	0	0	9
6600	Kilcoy	0	0	0	0	1	0	0	1	0	0	0	0	4	0	2	0	0	0	0	6	8	0	1	0	23
6601	Mt Binga	0	0	0	0	0	0	3	0	0	0	2	0	0	1	0	0	1	0	0	0	1	13	1	0	22
6602	Top of Brisbane	0	0	0	0	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0	0	1	2	2	4	16
6603	Blackbutt	0	0	0	0	0	0	1	0	0	0	9	0	0	0	3	0	0	0	0	0	1	12	9	0	35
6604	Toogoolawah	0	0	0	0	0	1	0	0	0	4	0	0	1	0	1	0	0	0	0	0	3	1	1	0	12
6605	Eskdale																									
6606	West Woodbine	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
6607	Lindfield	0	0	0	0	2	3	2	7	4	0	0	1	0	0	0	0	0	1	0	4	35	28	1	1	89
6608	Jimna	0	0	0	0	0	3	3	6	2	0	0	0	0	0	0	0	0	0	0	1	8	10	8	0	41
6609	Monsildale	0	0	0	0	0	0	10	2	3	0	0	0	0	0	0	0	0	0	1	0	0	8	18	9	51
6610	Kluvers Lookout	0	0	0	1	2	0	0	1	0	1	0	0	5	1	0	0	1	0	1	2	1	0	1	0	17
6611	Redbank Creek	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	8
6612	Mt Stanley	0	0	0	0	0	0	4	1	4	1	0	0	0	0	0	0	0	0	0	0	4	5	12	0	31
6613	Hazeldean	0	0	0	0	0	3	0	1	0	3	0	0	0	0	1	0	0	0	0	1	8	2	0	0	19
6614	Westvale																									
6615	Thornton	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	1	0	0	7
6617	Little Egypt	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6619	Mt Castle	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	0	0	0	0	0	0	5
6621	Nukinenda	0	0	0	0	0	0	1	0	0	0	2	0	0	3	0	0	1	1	0	0	0	7	0	0	15
6623	Tarome	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2
6624	Moogerah Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 9 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	6
6633	Lyons Br-P	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6
6636	Wivenhoe Dam HW-B	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	4
6641	Wivenhoe Dam TW-B	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	5
6643	Wivenhoe Dam TW-P	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	5
6646	Lowood-B	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	6
6649	Lowood-P	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	1	7
6651	Amberley-P	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6653	Amberley-B	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
6656	Bill Gunn Dam	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
6658	Lake Clarendon Dam	0	0	0	0	0	2	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6
6680	Mt Glorious-P	0	1	1	1	4	0	0	1	0	1	0	3	3	0	0	0	1	1	1	0	4	0	1	0	23
6690	Mt Mee-P	0	0	0	0	1	0	0	1	4	1	0	1	2	1	0	0	0	1	3	6	7	0	0	1	29
6701	Mt Mee-B	0	0	0	0	1	0	0	1	4	1	0	1	2	1	0	0	0	0	4	6	7	0	0	1	29
6702	Woodford-B	0	0	1	0	3	2	0	2	1	1	3	0	0	0	1	0	0	0	1	13	7	1	0	1	37
6705	Woodford-P	0	0	1	0	3	2	0	2	1	1	3	0	0	0	1	0	0	0	1	13	7	1	0	1	37
6708	Devon Hills	0	0	0	0	0	3	0	0	0	4	4	0	1	1	0	1	0	0	1	1	13	24	4	0	57
6711	Baxters Ck	0	0	0	2	2	0	0	1	3	1	0	1	0	0	0	0	0	1	3	2	1	0	0	0	17
6714	Ferris Knob	0	0	0	0	8	2	6	7	0	0	0	0	0	0	0	0	0	2	1	26	33	3	0	3	91
6716	West Bellthorpe	0	0	1	0	3	10	1	17	1	2	0	0	0	0	0	0	0	0	2	11	27	28	2	1	106
6717	Linville	0	0	0	0	0	1	2	0	1	2	1	0	1	0	0	0	0	0	1	0	3	8	17	1	38
6730	Jindalee	0	0	0	1	0	0	0	0	0	1	0	2	0	0	0	0	1	0	1	0	0	0	1	0	7
6733	Rosewood	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
6736	Kuss Rd	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 9 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6742	Walloon-B	0	0	0	0	3	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	6
6748	Brisbane City	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	10	1	16
6751	Mt Crosby	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	6
6754	Moggill-P	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	5
6759	North Pine Dam-B	0	0	1	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	2	1	0	0	1	0	11
6760	North Pine Dam	0	0	1	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	2	1	0	0	1	0	11
6763	Petrie	0	0	2	1	5	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	13
6766	Lake Kurwongbah	0	0	1	1	4	0	0	0	0	0	0	0	1	0	0	0	0	0	4	0	0	1	0	0	12
6769	Drapers Crossing	0	0	1	0	3	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	2	0	10
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	0	0	1	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	1	0	3	0	12

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 10 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	0	1	2	9	6	2	4	19	3	3	4	10	1	7	3	0	0	0	0	2	1	1	0	3	81
6514	Gregors Ck-P	1	10	5	5	11	24	37	24	27	25	9	5	10	3	7	0	0	1	2	5	1	2	6	2	222
6517	Gregors Ck-B																									
6520	Boat Mountain	0	4	17	3	14	4	39	8	13	16	7	3	9	5	11	0	0	2	0	1	0	0	7	3	166
6523	Cressbrook Dam	0	1	8	10	0	3	8	18	5	5	8	12	1	4	2	1	0	0	0	2	3	1	1	4	97
6526	Helidon	0	0	8	11	4	3	5	11	14	11	4	7	9	2	0	1	0	0	0	0	5	3	1	2	101
6529	St Aubyns	0	0	2	2	5	6	13	5	8	14	7	3	2	2	1	2	0	0	0	1	0	0	0	1	74
6540	Yarraman	0	1	1	10	37	21	5	4	6	9	6	3	5	3	1	2	1	0	0	0	0	1	0	0	116
6542	Cooyar Ck	0	8	1	12	34	10	5	2	7	8	10	5	3	5	1	2	3	0	0	0	0	0	0	0	116
6550	Walloon-P	1	13	5	0	0	0	1	3	1	2	2	7	3	1	0	1	1	0	0	0	7	0	10	10	68
6553	Rosentretters Br	0	9	13	7	1	11	17	11	16	11	6	4	1	2	3	1	0	0	0	5	3	1	4	3	129
6555	Atkinson Dam	0	8	8	0	0	0	10	13	1	1	6	31	5	2	4	0	0	0	1	3	11	0	4	2	110
6556	Glenore Grove	0	5	9	1	2	0	3	31	1	4	2	8	4	1	2	0	1	0	0	1	4	2	1	4	86
6559	Savages Crossing	0	10	2	0	0	1	18	14	0	2	16	8	7	4	2	4	0	0	1	7	5	1	9	2	113
6562	Kalbar Weir	0	0	3	1	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	2	1	1	15
6565	Tenthill																									
6568	O'Reillys Weir	0	11	1	0	0	0	12	12	1	0	12	13	5	4	3	1	0	0	0	5	10	1	6	1	98
6571	Harrisville	0	0	3	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	2	3	4	9	5	30
6574	Caboonbah	1	10	13	0	0	22	15	5	22	6	7	4	1	5	4	0	0	0	1	5	4	0	3	3	131
6577	Gatton	0	0	18	2	1	2	5	10	9	8	2	7	6	1	1	1	0	0	0	1	5	2	1	4	86
6580	Adams Br	0	0	10	0	0	2	1	0	0	0	1	2	0	0	1	0	0	0	0	0	3	4	0	13	37
6583	Showground Weir	0	2	11	2	1	1	8	3	8	3	0	10	7	0	1	1	0	0	0	0	3	1	0	5	67
6590	Somerset Dam HW-B	2	17	22	1	0	41	5	9	16	5	4	4	1	4	5	1	1	0	3	5	4	0	5	3	158

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 10 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	0	0	6	7	2	8	11	32	13	9	6	10	1	3	1	1	0	0	0	2	1	0	1	3	117
6598	Toowoomba	0	0	2	12	3	2	2	16	7	5	4	4	9	1	1	0	0	1	0	0	3	3	1	3	79
6600	Kilcoy	8	10	3	4	12	16	28	20	24	8	7	6	6	4	4	1	0	0	4	4	3	2	9	1	184
6601	Mt Binga	0	0	4	5	21	9	23	5	6	16	10	3	3	3	5	3	0	1	0	0	0	0	2	3	122
6602	Top of Brisbane	8	0	0	6	0	6	4	3	2	5	1	1	5	1	0	0	0	0	0	0	0	0	0	0	42
6603	Blackbutt	0	3	1	7	17	54	5	4	5	20	8	4	5	5	10	1	2	1	0	0	1	0	5	2	160
6604	Toogoolawah	0	9	25	7	3	22	26	18	30	7	6	3	2	3	3	0	1	0	1	3	2	2	4	2	179
6605	Eskdale																									
6606	West Woodbine	0	0	2	7	1	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	3	18
6607	Lindfield	4	10	12	4	54	25	23	20	33	14	9	12	4	8	3	6	0	1	5	1	2	5	13	1	269
6608	Jimna	3	4	12	15	16	8	3	5	12	9	9	6	4	5	1	1	0	0	0	0	0	2	2	0	117
6609	Monsildale	23	4	13	24	7	4	5	2	10	5	4	7	4	4	1	0	0	0	0	0	0	1	0	0	118
6610	Kluvers Lookout	7	10	7	1	2	18	11	5	6	5	9	2	1	5	4	2	2	1	3	8	4	2	6	4	125
6611	Redbank Creek	0	2	14	11	1	3	16	15	4	6	14	13	1	5	4	2	0	0	1	3	4	1	3	5	128
6612	Mt Stanley	8	25	8	14	26	6	7	2	7	7	12	6	3	6	1	1	0	0	0	0	0	1	0	0	140
6613	Hazeldean	1	19	10	5	1	33	36	18	20	21	10	4	6	4	3	2	1	0	0	2	2	1	2	2	203
6614	Westvale																									
6615	Thornton	0	0	12	6	0	1	4	0	1	0	2	1	1	0	1	0	0	0	0	0	3	2	0	12	46
6617	Little Egypt	0	0	2	9	0	0	0	4	3	0	1	1	4	1	0	0	1	0	0	0	0	1	1	2	30
6619	Mt Castle	1	3	0	24	5	6	9	1	3	4	0	4	1	0	0	0	0	0	1	0	2	5	4	14	87
6621	Nukinenda	0	0	16	2	8	3	13	9	22	17	6	3	3	2	1	4	0	0	0	1	1	0	0	2	113
6623	Tarome	0	0	1	8	1	1	2	1	0	0	0	1	0	0	0	0	0	1	0	0	2	3	2	2	25
6624	Moogerah Dam	0	0	0	5	1	2	0	0	0	0	0	2	0	0	0	0	0	1	0	0	2	3	5	1	22

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 10 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	0	8	6	1	0	0	15	11	1	1	4	11	5	1	3	1	1	0	0	2	6	1	2	5	85
6633	Lyons Br-P	0	8	6	0	1	0	11	8	1	1	4	11	5	1	3	0	1	0	0	2	6	1	1	5	76
6636	Wivenhoe Dam HW-B	0	8	1	1	0	0	12	6	1	1	13	7	6	8	3	1	1	0	0	7	8	0	4	1	89
6641	Wivenhoe Dam TW-B	0	9	1	1	0	0	13	9	0	2	13	8	7	7	4	2	0	0	0	7	11	0	5	1	100
6643	Wivenhoe Dam TW-P	0	9	1	1	0	1	13	9	1	1	13	8	8	6	4	1	1	0	0	8	10	1	5	1	102
6646	Lowood-B	0	11	6	2	2	0	15	11	0	1	9	16	7	1	2	2	0	0	0	4	6	0	6	4	105
6649	Lowood-P	0	12	6	1	0	0	13	9	1	1	8	13	6	1	3	1	1	0	0	4	6	1	7	3	97
6651	Amberley-P	0	13	15	2	0	1	0	7	0	1	2	3	2	0	1	0	1	0	0	2	3	0	7	7	67
6653	Amberley-B	0	11	14	2	0	0	0	7	0	0	3	2	2	0	1	0	1	0	0	2	3	0	6	7	61
6656	Bill Gunn Dam	0	2	12	2	2	0	9	5	9	2	2	10	7	0	2	0	0	1	0	0	3	1	1	4	74
6658	Lake Clarendon Dam	0	2	10	1	4	0	3	31	1	3	3	10	3	1	2	0	1	0	0	1	4	3	1	4	88
6680	Mt Glorious-P	5	22	5	1	2	17	25	4	8	8	30	1	3	9	9	3	4	1	3	23	5	3	9	4	204
6690	Mt Mee-P	18	18	6	4	13	41	10	8	20	7	7	10	1	9	10	3	2	2	6	10	3	4	6	4	222
6701	Mt Mee-B	18	18	6	4	13	41	10	8	20	7	7	10	1	9	10	3	2	2	6	10	3	4	6	4	222
6702	Woodford-B	6	8	3	6	9	27	32	19	11	7	5	5	2	8	6	2	1	2	5	5	1	5	6	2	183
6705	Woodford-P	6	8	3	6	9	27	32	19	11	7	5	5	2	8	6	2	1	2	5	5	1	5	6	2	183
6708	Devon Hills	0	5	5	7	21	32	5	6	19	17	8	4	8	5	10	1	1	1	1	0	1	1	5	1	164
6711	Baxters Ck	6	11	4	1	2	20	5	8	6	6	6	2	1	8	6	4	6	0	4	8	2	3	5	3	127
6714	Ferris Knob	8	11	0	13	8	25	36	31	21	7	10	8	3	10	15	4	1	3	4	13	1	8	5	2	247
6716	West Bellthorpe	3	18	8	15	46	19	18	34	34	22	11	13	7	12	8	4	0	1	6	4	4	4	18	1	310
6717	Linville	1	2	2	9	29	22	3	4	10	13	11	7	5	6	3	5	1	0	0	0	1	0	4	0	138
6730	Jindalee	4	5	0	0	0	3	12	1	1	3	5	12	2	1	0	1	2	0	1	6	2	0	11	3	75
6733	Rosewood	0	8	16	1	0	0	1	3	0	1	2	5	4	0	1	0	0	1	0	0	4	0	3	15	65
6736	Kuss Rd																									

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 10 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	0	1	2	0	0	1	1	0	0	0	2	2	0	0	0	0	1	0	0	4	4	4	1	2	25
6742	Walloon-B	1	13	5	0	0	0	1	3	1	2	2	7	3	1	0	1	1	0	0	1	6	0	10	10	68
6748	Brisbane City	8	7	0	0	1	3	29	0	2	3	9	9	1	1	1	2	2	0	1	10	2	0	9	5	105
6751	Mt Crosby	1	10	0	1	0	0	13	11	3	2	4	9	4	1	2	0	1	1	0	3	3	0	12	4	85
6754	Moggill-P	4	12	0	0	0	0	2	9	2	2	1	8	1	0	1	0	0	0	0	4	2	0	6	6	60
6759	North Pine Dam-B	0	5	1	0	0	13	6	2	2	4	3	0	1	8	3	2	2	1	4	13	1	3	7	1	82
6760	North Pine Dam	0	5	1	0	0	13	6	2	2	4	3	0	1	7	4	2	2	1	4	13	1	3	7	1	82
6763	Petrie	1	10	1	0	0	13	5	2	4	3	8	1	0	10	3	4	3	1	4	16	2	4	26	1	122
6766	Lake Kurwongbah	1	7	0	3	0	20	6	0	0	9	6	1	1	11	4	4	3	1	0	0	2	1	0	0	80
6769	Drapers Crossing	4	19	0	0	0	11	8	2	4	6	19	1	0	5	3	3	2	1	3	13	1	2	16	1	124
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	5	17	1	0	0	12	11	2	3	5	27	1	0	5	3	2	3	0	2	14	1	2	15	1	132

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 11 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	0	0	2	35	12	2	2	1	0	0	0	3	1	0	3	0	7	4	7	12	8	0	1	1	101
6514	Gregors Ck-P	0	1	33	2	1	1	1	0	0	2	3	1	1	1	0	1	1	7	6	10	0	2	0	1	75
6517	Gregors Ck-B																									
6520	Boat Mountain	0	1	25	9	0	2	0	0	0	2	0	0	1	0	0	2	1	7	5	7	0	2	0	2	66
6523	Cressbrook Dam	0	1	5	54	3	14	0	0	0	0	2	5	0	0	1	0	4	2	0	13	18	0	0	0	122
6526	Helidon	0	2	2	13	11	1	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	33
6529	St Aubyns	0	0	2	9	1	2	1	0	0	2	2	0	2	3	8	59	2	6	17	5	2	0	0	1	124
6540	Yarraman	0	0	1	1	0	1	2	0	0	0	0	0	8	15	40	45	1	8	6	2	0	0	0	0	130
6542	Cooyar Ck	0	0	1	0	0	1	1	0	0	0	1	0	14	28	15	19	0	0	15	25	0	0	1	0	121
6550	Walloon-P	1	2	1	0	1	1	0	0	1	0	0	0	2	1	0	0	3	2	0	0	1	1	4	22	43
6553	Rosentretters Br	0	1	33	29	0	2	0	0	0	0	9	1	0	0	1	0	8	0	1	19	4	1	0	0	109
6555	Atkinson Dam	1	1	6	1	1	0	2	0	0	0	0	0	2	0	0	0	1	2	0	9	34	22	8	30	120
6556	Glenore Grove	0	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	5	39	22	5	0	77
6559	Savages Crossing	0	3	1	1	1	5	0	0	1	0	0	0	2	1	0	1	0	2	0	1	16	32	85	93	245
6562	Kalbar Weir	11	8	12	1	0	0	2	0	0	2	0	0	1	2	2	0	11	4	0	0	0	0	3	8	67
6565	Tenthill																									
6568	O'Reillys Weir	0	1	4	0	3	0	0	0	0	0	0	1	1	0	0	0	1	0	0	4	20	37	41	36	149
6571	Harrisville	24	13	6	4	2	0	1	0	0	1	0	2	0	2	2	0	2	1	0	0	0	6	2	9	77
6574	Caboonbah	0	6	44	8	1	6	0	0	0	2	6	2	0	1	0	0	1	0	0	32	24	6	10	4	153
6577	Gatton	1	0	1	6	1	1	2	0	0	1	0	0	0	1	0	0	1	2	1	4	34	8	3	1	68
6580	Adams Br	15	7	6	9	2	0	2	1	0	2	0	2	0	4	1	0	4	0	1	0	3	1	18	16	94
6583	Showground Weir	0	2	1	1	6	2	1	3	0	1	0	0	6	4	1	0	0	4	1	1	4	43	21	3	105
6590	Somerset Dam HW-B	1	9	25	2	4	0	0	0	0	2	6	0	0	1	1	0	0	1	0	37	40	4	3	0	136

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 11 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	1	0	3	9	1	1	0	1	0	0	3	8	0	2	3	0	7	9	6	34	4	0	5	2	99
6598	Toowoomba	2	0	0	10	55	2	8	1	0	0	0	1	2	1	3	1	0	1	0	4	22	1	0	2	116
6600	Kilcoy	0	24	10	0	1	1	2	0	3	1	6	1	1	2	0	2	2	0	9	11	9	10	3	1	99
6601	Mt Binga	0	0	3	7	3	5	2	0	0	5	0	0	3	5	12	30	0	12	17	12	1	0	0	3	120
6602	Top of Brisbane	0	0	0	0	0	0	0	0	0	0	0	0	19	8	23	13	0	0	0	6	0	0	0	0	69
6603	Blackbutt	0	0	8	0	2	3	1	0	0	1	0	0	8	3	28	14	0	5	17	15	0	0	0	3	108
6604	Toogoolawah	0	1	34	18	0	1	0	0	0	0	7	0	0	0	0	0	12	0	1	23	3	2	0	0	102
6605	Eskdale																									
6606	West Woodbine	0	0	1	0	7	9	2	0	1	2	0	0	0	12	6	0	0	0	1	5	7	29	6	0	88
6607	Lindfield	0	18	7	0	3	7	0	1	0	2	0	4	2	1	3	1	2	9	1	0	6	10	5	3	85
6608	Jimna	0	2	10	0	2	1	0	0	0	1	0	7	4	1	2	0	2	4	6	1	2	0	2	0	47
6609	Monsildale	0	0	0	0	10	3	0	0	1	1	1	14	33	58	10	0	0	0	29	2	0	0	1	0	163
6610	Kluvers Lookout	1	7	4	3	0	4	1	0	0	2	0	2	2	0	2	0	1	2	1	12	26	46	7	40	163
6611	Redbank Creek	0	0	36	75	6	6	3	0	0	0	1	4	1	0	2	0	0	0	0	19	15	2	2	0	172
6612	Mt Stanley	0	0	0	0	2	0	1	0	0	0	0	2	12	68	21	0	0	0	29	24	0	0	1	0	160
6613	Hazeldean	2	1	3	4	5	8	28	0	0	1	7	0	1	0	0	1	1	0	0	10	13	13	13	12	123
6614	Westvale																									
6615	Thornton	3	6	6	4	10	2	2	1	1	1	0	3	1	7	1	0	4	3	0	0	4	6	35	17	117
6617	Little Egypt	0	0	1	1	9	7	6	0	0	1	0	0	1	6	0	0	1	5	0	3	28	22	1	0	92
6619	Mt Castle	21	11	16	11	7	5	5	5	1	2	5	5	5	15	4	7	4	6	0	0	9	6	34	11	195
6621	Nukinenda	1	0	11	9	2	3	1	0	0	2	0	1	1	0	2	14	6	8	23	13	0	1	0	15	113
6623	Tarome	8	7	10	5	0	1	1	0	0	1	2	0	0	1	5	0	4	14	2	0	0	0	13	9	83
6624	Moogerah Dam	14	8	10	5	1	0	3	1	0	1	1	1	1	1	3	4	0	15	0	0	0	0	3	23	95

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 11 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	0	1	2	0	1	2	2	0	0	0	0	0	0	0	0	0	0	1	0	2	32	43	22	20	128
6633	Lyons Br-P	0	0	2	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	2	29	41	21	15	114
6636	Wivenhoe Dam HW-B	0	3	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	20	32	35	38	136
6641	Wivenhoe Dam TW-B	0	3	4	1	0	0	0	0	0	1	0	1	3	0	0	1	0	1	0	2	22	33	39	46	157
6643	Wivenhoe Dam TW-P	1	2	4	1	0	1	0	0	0	0	1	0	4	0	1	0	0	1	0	3	22	33	39	46	159
6646	Lowood-B	0	1	2	2	1	3	0	0	0	0	0	0	1	0	0	0	0	1	2	3	16	43	53	55	183
6649	Lowood-P	1	1	1	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0	1	4	16	37	45	53	165
6651	Amberley-P	14	2	0	0	0	2	0	0	0	0	1	0	1	0	0	1	1	1	0	0	2	2	1	6	34
6653	Amberley-B	13	2	0	0	1	1	1	0	0	0	0	0	1	1	0	0	1	1	0	0	2	2	1	4	31
6656	Bill Gunn Dam	1	2	1	2	7	4	1	1	0	0	0	1	4	3	1	0	0	2	1	2	6	46	14	1	100
6658	Lake Clarendon Dam	0	1	1	3	1	0	2	0	1	0	0	0	1	3	0	0	1	3	0	9	31	9	4	8	78
6680	Mt Glorious-P	1	20	1	3	3	3	2	1	0	3	1	3	9	1	1	0	1	3	9	14	27	28	57	71	262
6690	Mt Mee-P	0	8	5	2	5	1	0	0	1	1	5	3	1	2	1	0	0	4	9	14	24	29	9	15	139
6701	Mt Mee-B	0	8	5	2	5	1	0	0	1	1	5	3	1	2	1	0	0	4	9	14	24	29	9	15	139
6702	Woodford-B	1	19	2	1	1	2	0	0	0	7	3	3	2	1	0	1	0	0	7	21	12	1	1	1	86
6705	Woodford-P	1	19	2	1	1	2	0	0	0	7	3	3	2	1	0	1	0	0	7	21	12	1	1	1	86
6708	Devon Hills	0	2	19	0	3	1	1	0	0	0	0	0	6	0	4	4	0	5	6	9	0	3	0	4	67
6711	Baxters Ck	1	2	3	1	1	3	0	0	0	1	1	1	1	0	0	0	10	0	7	6	30	37	28	39	172
6714	Ferris Knob	5	13	1	1	1	1	0	0	2	1	0	8	2	2	0	2	0	1	12	8	10	1	5	0	76
6716	West Bellthorpe	2	21	8	2	4	4	0	1	1	3	0	7	2	1	7	0	7	5	8	26	8	7	3	5	132
6717	Linville	0	0	9	0	2	1	0	0	0	0	0	0	8	1	6	0	0	1	8	13	0	0	1	2	52
6730	Jindalee	1	2	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	2	0	1	4	6	1	6	27
6733	Rosewood	1	2	1	0	1	1	0	0	0	0	0	0	1	1	0	1	2	2	0	0	1	1	11	29	55
6736	Kuss Rd																									

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 11 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	22	10	6	2	2	2	0	0	0	1	1	1	0	1	0	0	3	1	0	0	0	4	2	1	59
6742	Walloon-B	1	2	1	0	1	1	0	0	1	0	0	0	2	1	0	0	1	4	0	0	1	1	4	22	43
6748	Brisbane City	4	0	1	1	1	0	0	0	0	0	1	1	1	0	0	0	2	0	0	0	4	3	0	0	19
6751	Mt Crosby	1	2	0	1	0	2	0	0	0	0	1	0	1	2	0	1	1	0	0	1	0	2	3	3	21
6754	Moggill-P	2	1	0	0	1	2	0	0	0	0	1	0	0	1	1	0	3	2	0	0	6	6	0	10	36
6759	North Pine Dam-B	5	25	0	0	0	1	0	0	0	2	0	0	0	0	0	0	3	1	0	0	2	3	3	9	54
6760	North Pine Dam	5	25	0	0	0	1	0	0	0	2	0	0	0	0	0	0	3	1	0	0	2	3	3	8	53
6763	Petrie	24	8	0	0	0	1	0	0	0	0	1	3	0	0	0	0	0	4	0	1	0	8	3	9	62
6766	Lake Kurwongbah	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	2	0	0	0	2	6	5	12	30
6769	Drapers Crossing	4	13	0	0	1	0	0	1	0	0	0	3	0	0	0	0	3	2	1	1	1	9	0	8	47
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	2	16	0	0	0	0	0	1	0	1	0	3	0	1	0	0	0	5	1	1	3	11	1	8	54

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 12 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	0	0	6	1	0	2	3	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	17
6514	Gregors Ck-P	0	4	3	4	1	0	2	4	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	25
6517	Gregors Ck-B																									
6520	Boat Mountain	0	0	0	0	0	9	0	8	0	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	29
6523	Cressbrook Dam	0	1	3	1	2	0	1	3	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	13
6526	Helidon																									
6529	St Aubyns	0	0	0	2	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	6
6540	Yarraman	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
6542	Cooyar Ck	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6550	Walloon-P	26	11	14	12	23	9	0	17	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115
6553	Rosentretters Br	2	0	5	0	0	0	0	8	4	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	26
6555	Atkinson Dam	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	5	7	97
6556	Glenore Grove	5	29	24	21	27	22	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	130
6559	Savages Crossing	18	36	18	34	33	2	0	1	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	146
6562	Kalbar Weir	6	4	6	13	11	13	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	57
6565	Tenthill																									
6568	O'Reillys Weir	31	39	25	45	49	8	0	1	1	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	207
6571	Harrisville	10	3	7	8	11	9	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
6574	Caboonbah	0	2	4	11	24	2	3	5	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	55
6577	Gatton	2	3	13	20	21	13	10	0	2	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	89
6580	Adams Br	17	4	5	11	9	15	25	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92
6583	Showground Weir	4	19	13	17	22	25	8	2	2	0	3	0	0	0	2	0	1	1	0	0	0	0	0	0	119
6590	Somerset Dam HW-B	0	8	3	24	19	2	3	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	67

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 12 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	8	1	2	1	1	1	1	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	19
6598	Toowoomba	1	0	1	3	3	3	0	2	3	1	1	0	0	0	0	1	0	0	1	2	0	1	0	0	23
6600	Kilcoy	0	7	10	20	2	6	2	1	6	4	0	0	1	0	0	0	0	0	1	0	0	0	1	0	61
6601	Mt Binga	0	1	0	4	3	1	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	14
6602	Top of Brisbane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6603	Blackbutt	0	1	0	0	0	3	1	5	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	13
6604	Toogoolawah	0	3	5	2	3	0	1	6	1	6	1	0	0	0	0	0	0	0	0	0	0	0	0	1	29
6605	Eskdale																									
6606	West Woodbine	1	1	15	2	1	3	7	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
6607	Lindfield	12	8	11	1	2	2	5	0	11	10	4	1	0	0	0	0	0	0	0	0	0	0	1	0	68
6608	Jimna	0	2	1	0	3	9	7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	23
6609	Monsildale	0	1	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	5
6610	Kluvers Lookout	36	50	33	33	20	7	1	6	1	3	0	1	0	0	1	0	0	1	0	0	0	0	0	0	193
6611	Redbank Creek	0	0	3	0	5	2	6	4	5	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	29
6612	Mt Stanley	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
6613	Hazeldean	9	6	7	9	18	16	10	5	1	6	2	0	0	0	0	0	0	0	1	0	0	0	0	1	91
6614	Westvale																									
6615	Thornton	21	3	8	8	4	14	21	12	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101
6617	Little Egypt	2	0	1	1	3	9	5	1	0	1	1	1	0	0	1	0	0	2	1	1	0	1	0	0	31
6619	Mt Castle	23	4	11	7	9	25	14	15	2	4	3	1	1	0	1	0	2	0	0	0	0	1	0	0	123
6621	Nukinenda	1	0	0	4	1	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	11
6623	Tarome	12	4	6	8	25	17	6	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	82
6624	Moogerah Dam	11	4	2	14	7	17	8	0	1	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	67

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 12 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	26	48	34	49	59	22	0	0	2	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	242
6633	Lyons Br-P	21	45	28	47	50	20	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	214
6636	Wivenhoe Dam HW-B	32	31	36	52	39	3	1	1	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	199
6641	Wivenhoe Dam TW-B	33	37	34	50	43	4	1	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	207
6643	Wivenhoe Dam TW-P	35	37	36	51	45	5	1	2	1	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	218
6646	Lowood-B	19	51	34	39	56	9	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	211
6649	Lowood-P	19	40	32	39	53	10	0	0	2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	197
6651	Amberley-P	17	12	17	14	15	9	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87
6653	Amberley-B	17	11	16	14	13	9	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	83
6656	Bill Gunn Dam	6	20	17	23	25	28	7	1	3	0	1	0	0	0	2	0	0	2	0	0	0	0	0	0	135
6658	Lake Clarendon Dam	4	10	33	22	32	21	4	0	2	0	1	0	0	1	4	0	0	0	0	0	0	0	0	0	134
6680	Mt Glorious-P	51	50	39	28	28	5	3	4	2	3	0	2	0	2	1	4	0	1	3	0	2	1	0	0	229
6690	Mt Mee-P	16	24	33	59	9	5	4	13	5	1	0	0	2	2	1	3	0	1	0	0	0	0	0	2	180
6701	Mt Mee-B	16	24	33	59	9	5	4	13	5	1	0	0	2	2	1	3	0	1	0	0	0	0	0	2	180
6702	Woodford-B	8	51	42	47	15	3	1	5	20	1	0	0	0	0	0	0	1	0	0	0	0	0	3	0	197
6705	Woodford-P	8	51	42	47	15	3	1	5	20	1	0	0	0	0	0	0	1	0	0	0	0	0	3	0	197
6708	Devon Hills	0	0	1	1	2	1	6	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	18
6711	Baxters Ck	70	43	28	26	22	3	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	195
6714	Ferris Knob	7	69	33	46	17	2	5	23	17	2	0	0	0	0	0	1	0	1	0	0	0	0	2	2	227
6716	West Bellthorpe	13	3	27	5	3	5	5	5	19	5	1	0	0	0	0	0	1	0	0	0	0	0	1	1	94
6717	Linville	0	0	3	0	1	2	23	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	35
6730	Jindalee	0	21	4	5	6	4	3	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	47
6733	Rosewood	39	9	20	23	26	18	0	6	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	152
6736	Kuss Rd																									

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 12 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	3	4	11	5	6	5	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	38
6742	Walloon-B	26	11	15	11	23	10	1	15	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115
6748	Brisbane City	0	15	1	10	4	7	2	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	43
6751	Mt Crosby	6	16	10	16	10	7	2	4	0	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	75
6754	Moggill-P	0	24	5	7	10	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
6759	North Pine Dam-B	22	2	18	14	6	2	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	68
6760	North Pine Dam	22	2	18	14	6	2	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	68
6763	Petrie	21	3	6	12	6	2	2	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	55
6766	Lake Kurwongbah	24	0	15	19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	59
6769	Drapers Crossing	25	9	14	17	7	5	1	0	3	0	0	0	0	0	2	3	0	0	1	0	0	0	0	0	87
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	19	19	22	17	7	3	3	0	3	1	1	0	0	0	0	3	1	0	0	0	0	0	0	0	99

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 13 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6500	Mt Glorious-B																									
6680	Mt Glorious-P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6514	Gregors Ck-P	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6517	Gregors Ck-B																									
6520	Boat Mountain	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	5
6523	Cressbrook Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6526	Helidon																									
6529	St Aubyns	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6540	Yarraman	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6542	Cooyar Ck	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6550	Walloon-P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6553	Rosentretters Br	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6555	Atkinson Dam																									
6556	Glenore Grove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6559	Savages Crossing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6562	Kalbar Weir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6565	Tenthill																									
6568	O'Reillys Weir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6571	Harrisville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6574	Caboonbah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6577	Gatton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6580	Adams Br	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6583	Showground Weir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6590	Somerset Dam HW-B	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 13 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6593	Somerset Dam HW-P																									
6596	Crows Nest	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6598	Toowoomba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
6600	Kilcoy	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
6601	Mt Binga	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
6602	Top of Brisbane	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6603	Blackbutt	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6604	Toogoolawah	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6605	Eskdale																									
6606	West Woodbine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6607	Lindfield	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
6608	Jimna	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6609	Monsildale	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
6610	Kluvers Lookout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4
6611	Redbank Creek	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6612	Mt Stanley	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6613	Hazeldean	2	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
6614	Westvale																									
6615	Thornton	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6617	Little Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
6619	Mt Castle	0	0	0	0	0	0	0	2	1	9	1	0	0	0	0	0	7	1	0	1	0	0	0	0	22
6621	Nukinenda	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
6623	Tarome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6624	Moogerah Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 13 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6630	Lyons Br-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6633	Lyons Br-P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6636	Wivenhoe Dam HW-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6641	Wivenhoe Dam TW-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6643	Wivenhoe Dam TW-P	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
6646	Lowood-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6649	Lowood-P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6651	Amberley-P	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6653	Amberley-B	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6656	Bill Gunn Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6658	Lake Clarendon Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6680	Mt Glorious-P	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	3
6690	Mt Mee-P	0	1	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
6701	Mt Mee-B	0	1	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
6702	Woodford-B	1	1	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
6705	Woodford-P	1	1	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
6708	Devon Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
6711	Baxters Ck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6714	Ferris Knob	2	0	1	4	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	11
6716	West Bellthorpe	0	1	0	1	2	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	7
6717	Linville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6730	Jindalee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6733	Rosewood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6736	Kuss Rd																									

ALERT ID	Station	Hourly rainfall (mm) ending 09:00 13 January 2011																								Daily total
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	mm
6739	Washpool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
6742	Walloon-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6748	Brisbane City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6751	Mt Crosby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6754	Moggill-P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6759	North Pine Dam-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6760	North Pine Dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6763	Petrie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6766	Lake Kurwongbah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
6769	Drapers Crossing	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
6774	Wilsons Peak-P																									
6775	Peachester																									
6778	Samford	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2

APPENDIX P – RAINFALL INTENSITY FREQUENCY DURATION

Site Summary

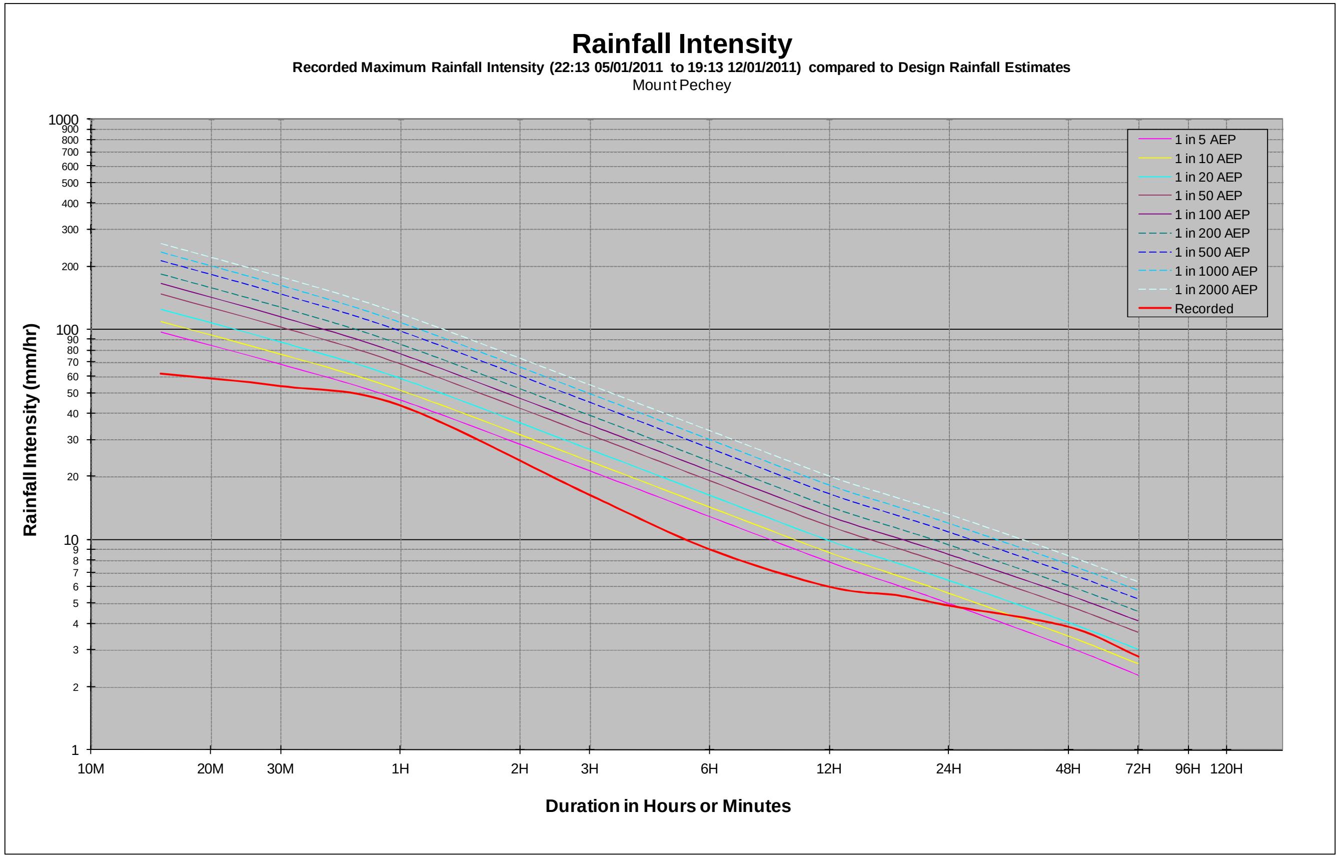
ALERT ID	Station	Location	
		Latitude	Longitude
6511	Mount Pechey	-27.3170	152.0820
6514	Brisbane River at Gregors Creek	-26.9800	152.4040
6520	Emu Creek at Boat Mountain	-26.9789	152.2847
6523	Cressbrook Dam	-27.2650	152.1950
6526	Helidon	-27.55	152.1
6529	Saint Aubyns	-27.0619	151.8944
6540	Yarraman	-26.8358	151.9692
6542	Cooyar Creek at Dam Site	-26.7417	152.1367
6550	Bremer River at Walloon	-27.6170	152.6680
6553	Cressbrook Creek at Rosentretters	-27.1383	152.3294
6556	Lockyer Creek at Glenore Grove	-27.5242	152.4081
6559	Savages Crossing	-27.4410	152.6680
6568	O'Reilly's Weir	-27.4167	152.5833
6571	Warrill Creek at Harrisville	-27.8150	152.6406
6574	Caboonbah	-27.1460	152.4900
6577	Lockyer Creek at Gatton	-27.5564	152.2731
6580	Bremer River at Adams Bridge	-27.8294	152.5108
6583	Laidley Creek at Showground Weir	-27.6386	152.3844
6596	Crows Nest	-27.2308	152.0311
6598	Toowoomba	-27.5114	151.9536
6600	Kilcoy	-26.9481	152.5836
6604	Toogoolawah	-27.0858	152.3722
6606	Woodbine West	-27.7847	152.1497
6608	Jimna	-26.6610	152.4510
6610	Kluvers Lookout	-27.2070	152.7030
6615	Thorton	-27.8211	152.3800
6617	Little Egypt	-27.7042	152.0650
6619	Mount Castle	-27.9636	152.3756
6621	Nukinenda	-27.0567	152.1072
6623	Tarome	-27.9867	152.5008
6630	Lyons Bridge	-27.47	152.53
6633	Lyons Bridge	-27.47	152.53
6636	Wivenhoe Dam	-27.3550	152.5960
6643	Wivenhoe Dam Tailwater	-27.4100	152.5960
6649	Brisbane River at Lowood	-27.4900	152.5930
6651	Warrill Creek at Amberley	-27.6780	152.6990
6680	Mount Glorious	-27.3220	152.7470

ALERT ID	Station	Location	
		Latitude	Longitude
6705	Stanley River at Woodford	-26.9500	152.7600
6708	Brisbane River at Devon Hills	-26.9000	152.3210
6711	North Pine River at Baxters Creek	-27.1958	152.8000
6714	Ferris Knob	-26.8542	152.8167
6716	Bellthorpe West	-26.8230	152.6780
6730	Brisbane River at Jindalee	-27.5322	152.9239
6733	Bremer River at Rosewood	-27.6600	152.6030
6739	Purga Creek at Washpool	-27.8290	152.7550
6748	Brisbane River at City Gauge	-27.4730	153.0300
6751	Brisbane River at Mount Crosby	-27.5300	152.7980
6754	Brisbane River at Moggill	-27.5950	152.8630
6760	North Pine Dam	-27.2650	152.9300
6763	North Pine River at Petrie	-27.2700	152.9750
6766	Lake Kurwongbah	-27.2500	152.9500
6769	South Pine River at Drapers Crossing	-27.3500	152.9167
6778	South Pine River at Samford	-27.3610	152.8790

Site Plots – Australian Rainfall and Runoff (1987)

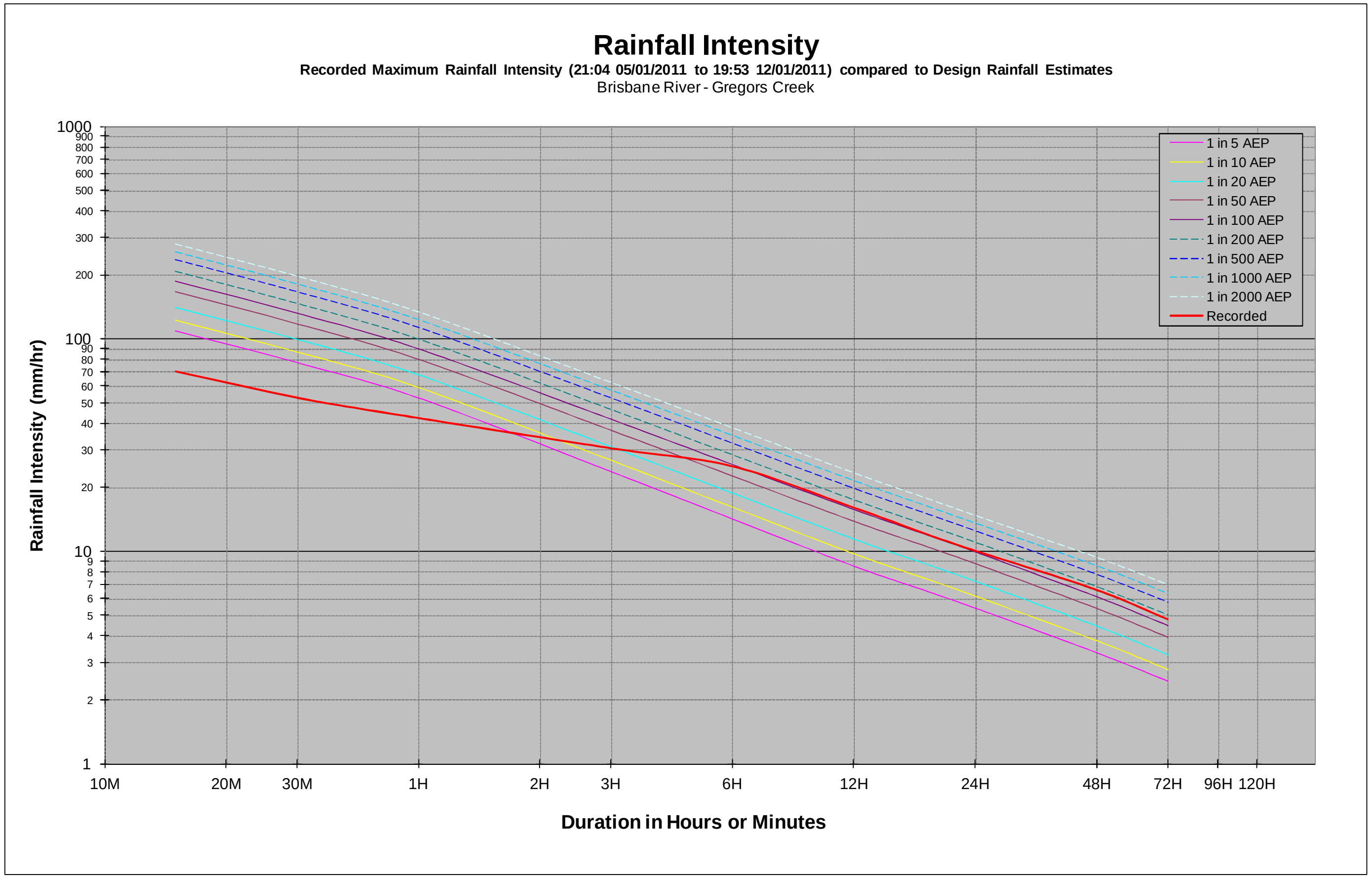
6511 – Mount Pechey

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	61.6	13:13 10/01/2011	< 5
30 M	53.8	13:13 10/01/2011	< 5
1 H	43.5	13:28 10/01/2011	< 5
3 H	16.3	14:43 10/01/2011	< 5
6 H	9.0	16:28 10/01/2011	< 5
12 H	6.0	23:58 09/01/2011	< 5
18 H	5.4	05:58 11/01/2011	< 5
24 H	4.9	13:43 10/01/2011	< 5
48 H	3.8	12:13 11/01/2011	10 - 20
72 H	2.8	20:28 11/01/2011	10 - 20



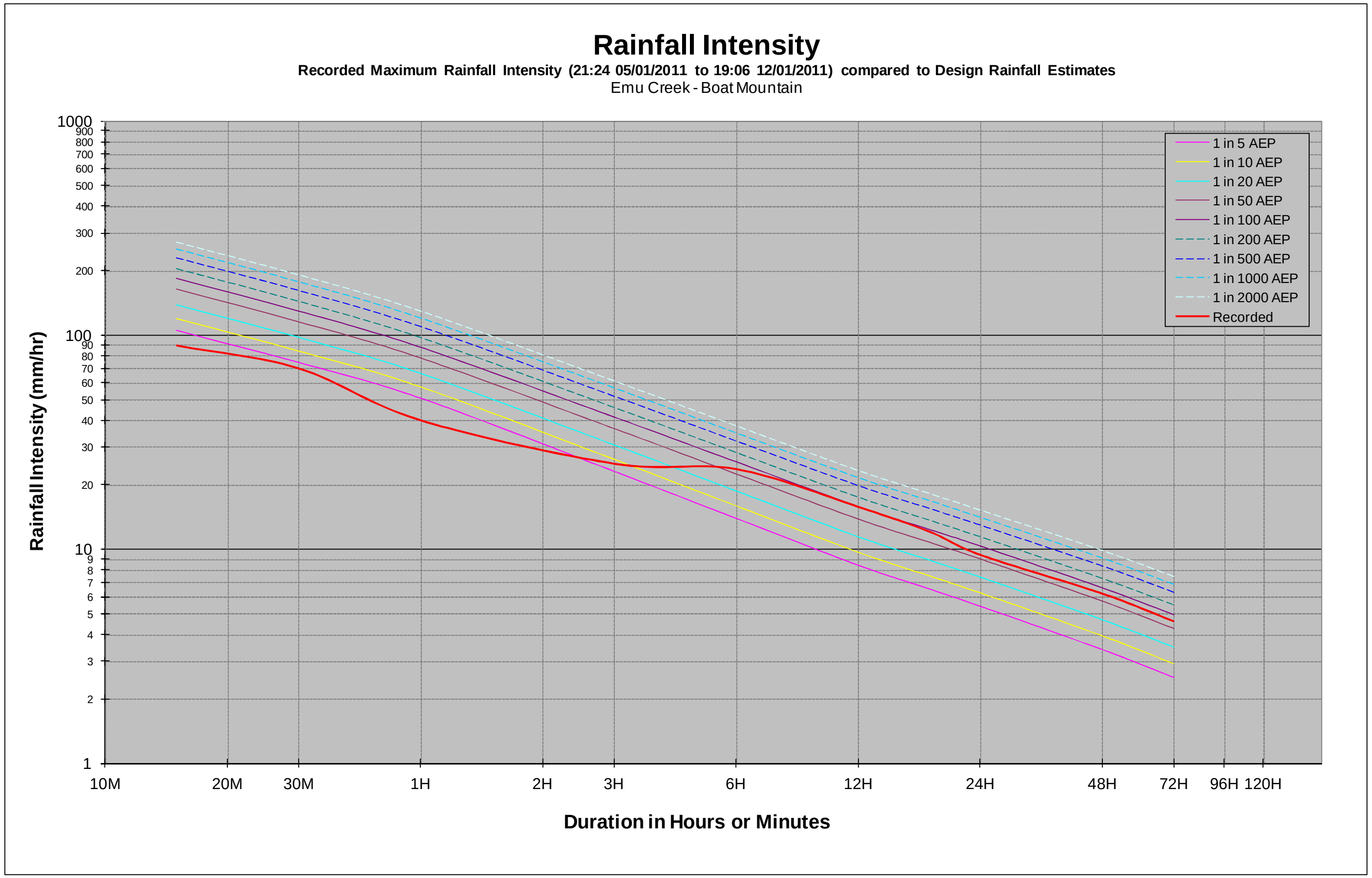
6514 – Brisbane River – Gregors Creek

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	70.0	15:20 09/01/2011	< 5
30 M	52.6	15:35 09/01/2011	< 5
1 H	42.2	16:05 09/01/2011	< 5
3 H	30.4	18:05 09/01/2011	10 - 20
6 H	25.0	19:05 09/01/2011	50 - 100
12 H	16.0	22:20 09/01/2011	100 - 200
18 H	12.1	23:35 09/01/2011	100 - 200
24 H	10.0	12:35 10/01/2011	100 - 200
48 H	6.6	05:05 11/01/2011	100 - 200
72 H	4.8	20:20 11/01/2011	100 - 200



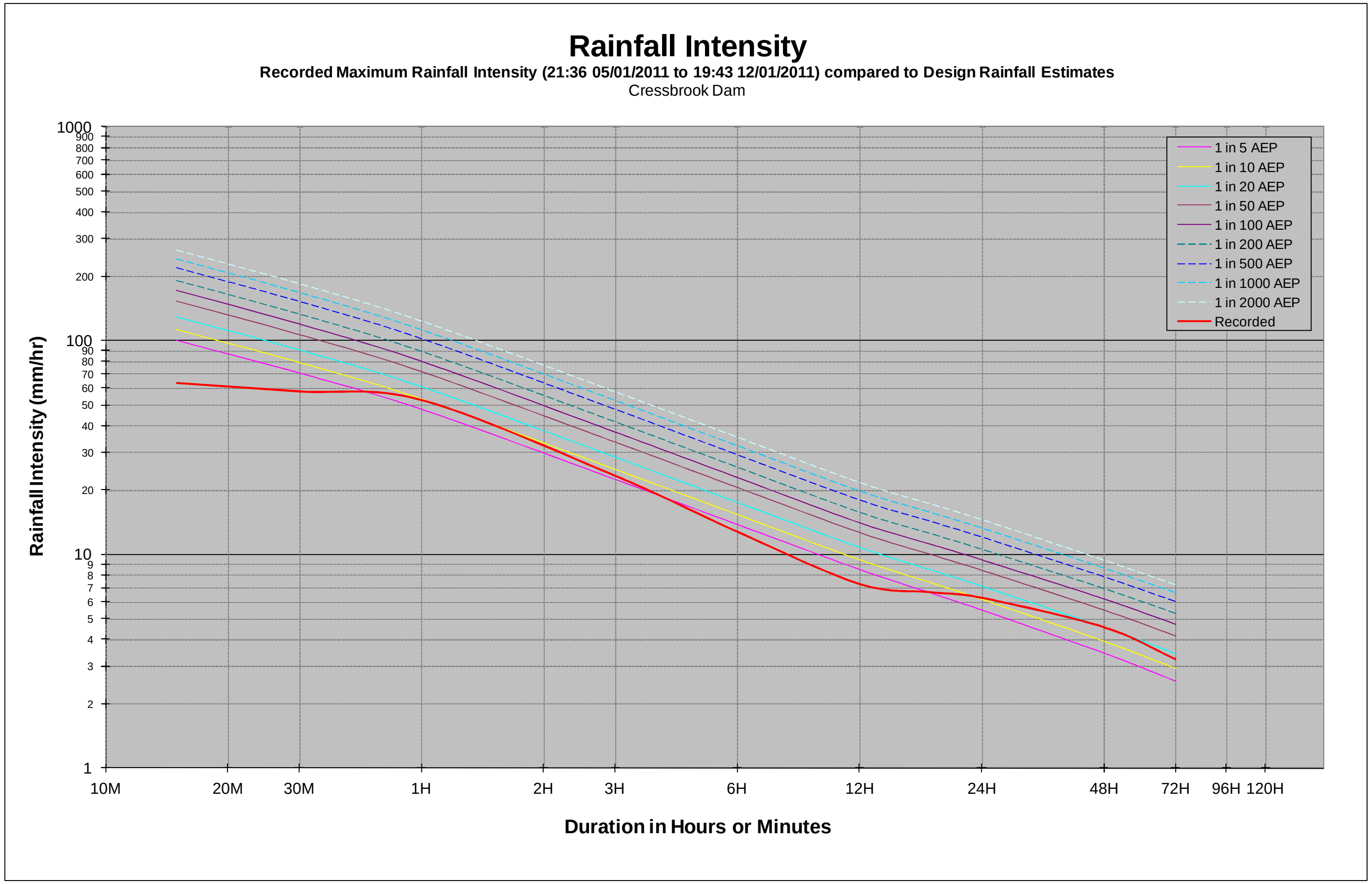
6520 – Emu Creek – Boat Mountain

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	89.2	15:25 09/01/2011	< 5
30 M	69.8	15:40 09/01/2011	< 5
1 H	39.9	16:10 09/01/2011	< 5
3 H	25.1	18:10 09/01/2011	5 - 10
6 H	23.6	19:25 09/01/2011	50 - 100
12 H	15.8	22:40 09/01/2011	50 - 100
18 H	12.1	00:10 10/01/2011	50 - 100
24 H	9.4	04:25 10/01/2011	50 - 100
48 H	6.2	05:40 11/01/2011	50 - 100
72 H	4.6	22:25 11/01/2011	50 - 100



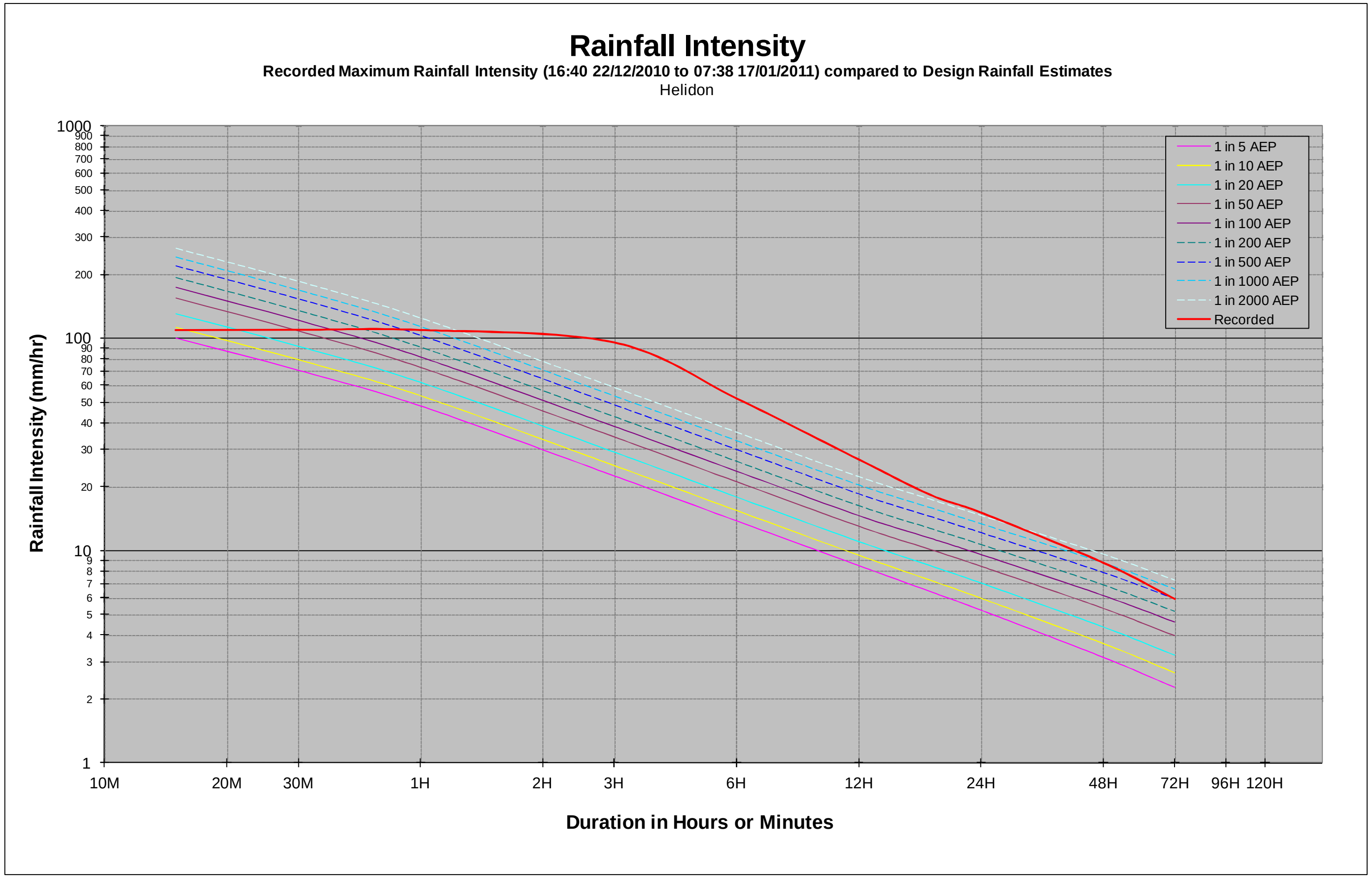
6523 – Cressbrook Dam

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	63.2	12:37 10/01/2011	< 5
30 M	57.8	12:52 10/01/2011	< 5
1 H	52.7	13:22 10/01/2011	5 - 10
3 H	23.3	15:07 10/01/2011	5 - 10
6 H	12.8	15:22 10/01/2011	< 5
12 H	7.3	15:22 10/01/2011	< 5
18 H	6.7	05:52 11/01/2011	5 - 10
24 H	6.3	15:22 10/01/2011	10 - 20
48 H	4.6	11:22 11/01/2011	20 - 50
72 H	3.3	00:37 12/01/2011	10 - 20



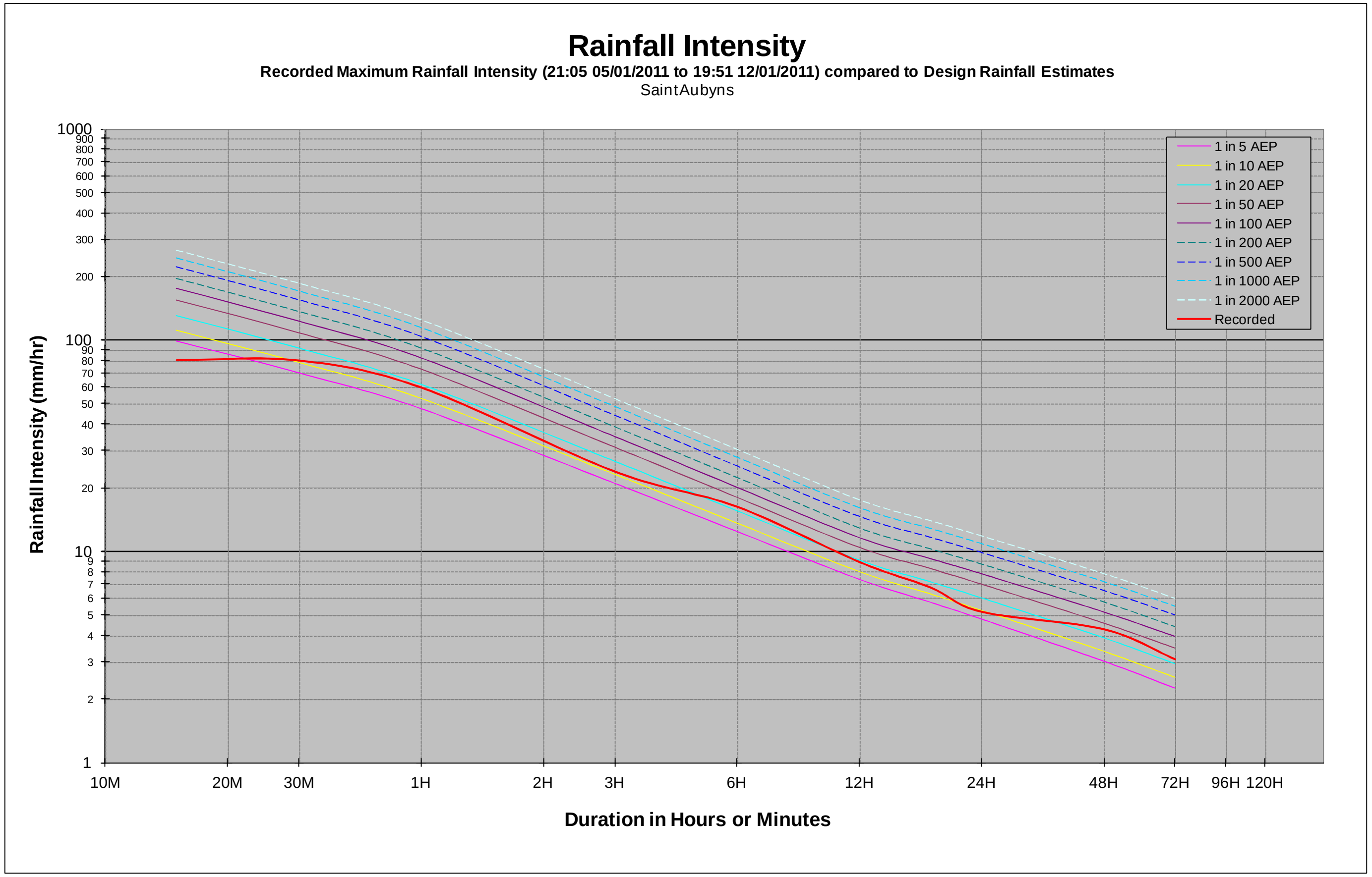
6526 – Helidon

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	109.6	16:10 10/01/2011	5 - 10
30 M	109.8	16:10 10/01/2011	50 - 100
1 H	109.7	16:25 10/01/2011	500 - 1000
3 H	95.8	18:10 10/01/2011	> 2000
6 H	52.2	18:10 10/01/2011	> 2000
12 H	26.9	18:10 10/01/2011	> 2000
18 H	18.3	19:55 10/01/2011	> 2000
24 H	15.1	18:10 10/01/2011	> 2000
48 H	8.8	19:55 10/01/2011	1000 - 2000
72 H	5.9	19:55 10/01/2011	200 - 500



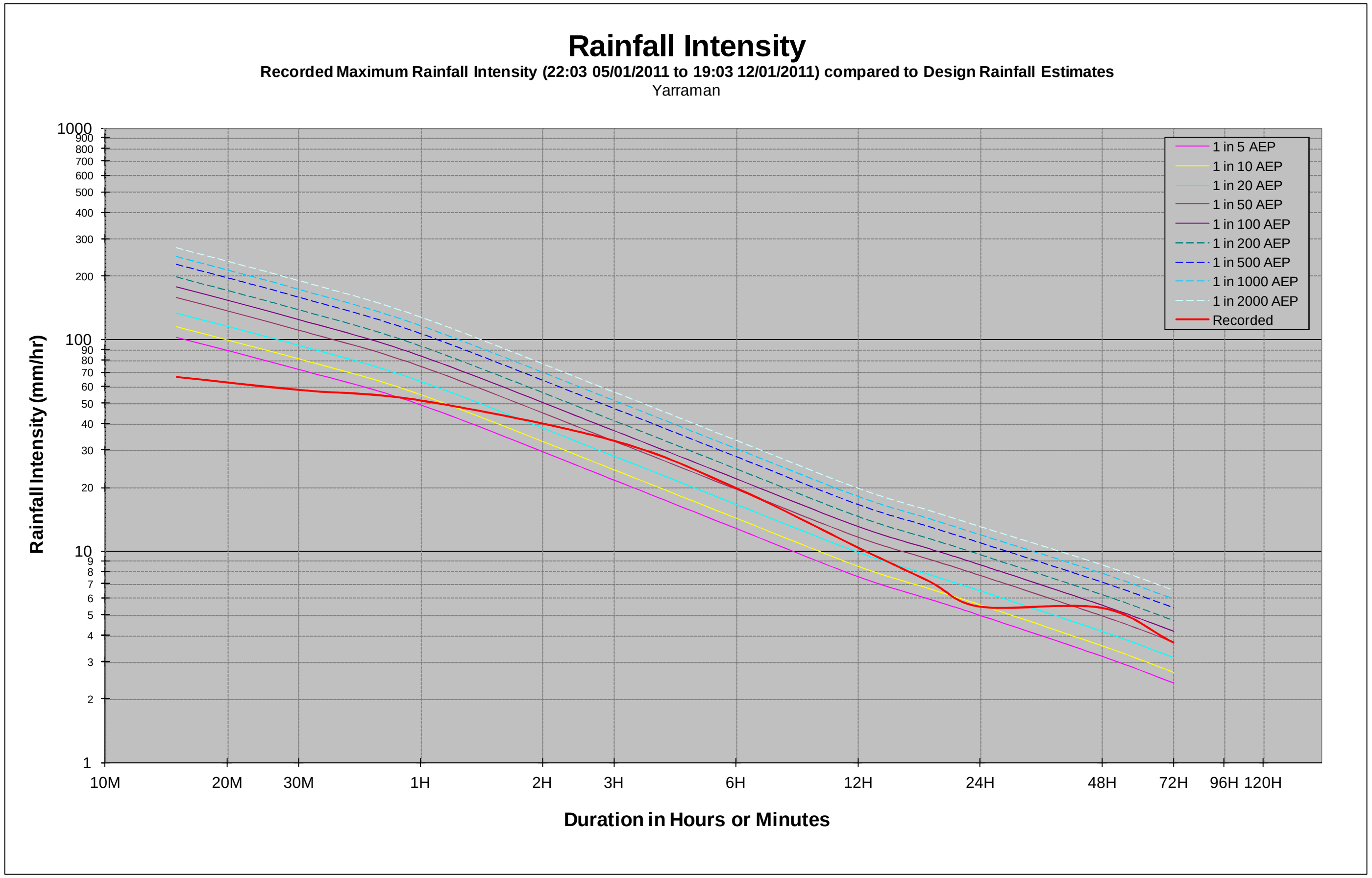
6529 – Saint Aubyns

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	80.8	00:50 11/01/2011	< 5
30 M	80.4	01:05 11/01/2011	10 - 20
1 H	59.9	01:20 11/01/2011	10 - 20
3 H	24.0	03:35 11/01/2011	10 - 20
6 H	16.3	05:05 11/01/2011	20 - 50
12 H	9.0	06:20 11/01/2011	10 - 20
18 H	6.8	05:50 11/01/2011	10 - 20
24 H	5.2	09:05 11/01/2011	5 - 10
48 H	4.3	06:20 11/01/2011	20 - 50
72 H	3.1	15:35 11/01/2011	20 - 50



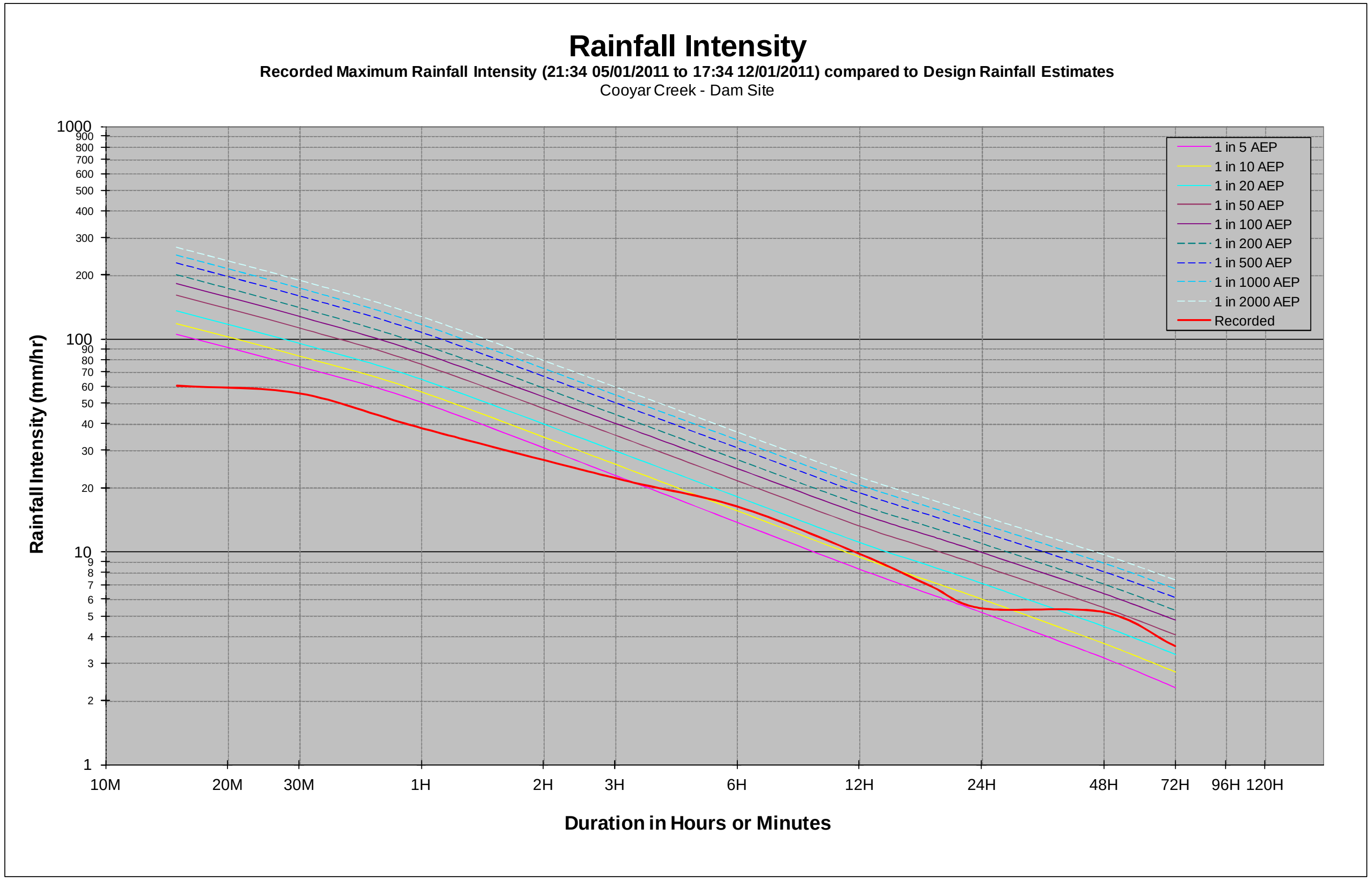
6540 – Yarraman

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	66.8	00:49 11/01/2011	< 5
30 M	58.0	00:49 11/01/2011	< 5
1 H	51.7	01:04 11/01/2011	5 - 10
3 H	33.3	01:19 11/01/2011	50 - 100
6 H	19.9	03:34 11/01/2011	50 - 100
12 H	10.4	09:34 11/01/2011	20 - 50
18 H	7.2	05:19 11/01/2011	10 - 20
24 H	5.5	10:19 11/01/2011	5 - 10
48 H	5.4	05:19 11/01/2011	50 - 100
72 H	3.7	10:19 11/01/2011	20 - 50



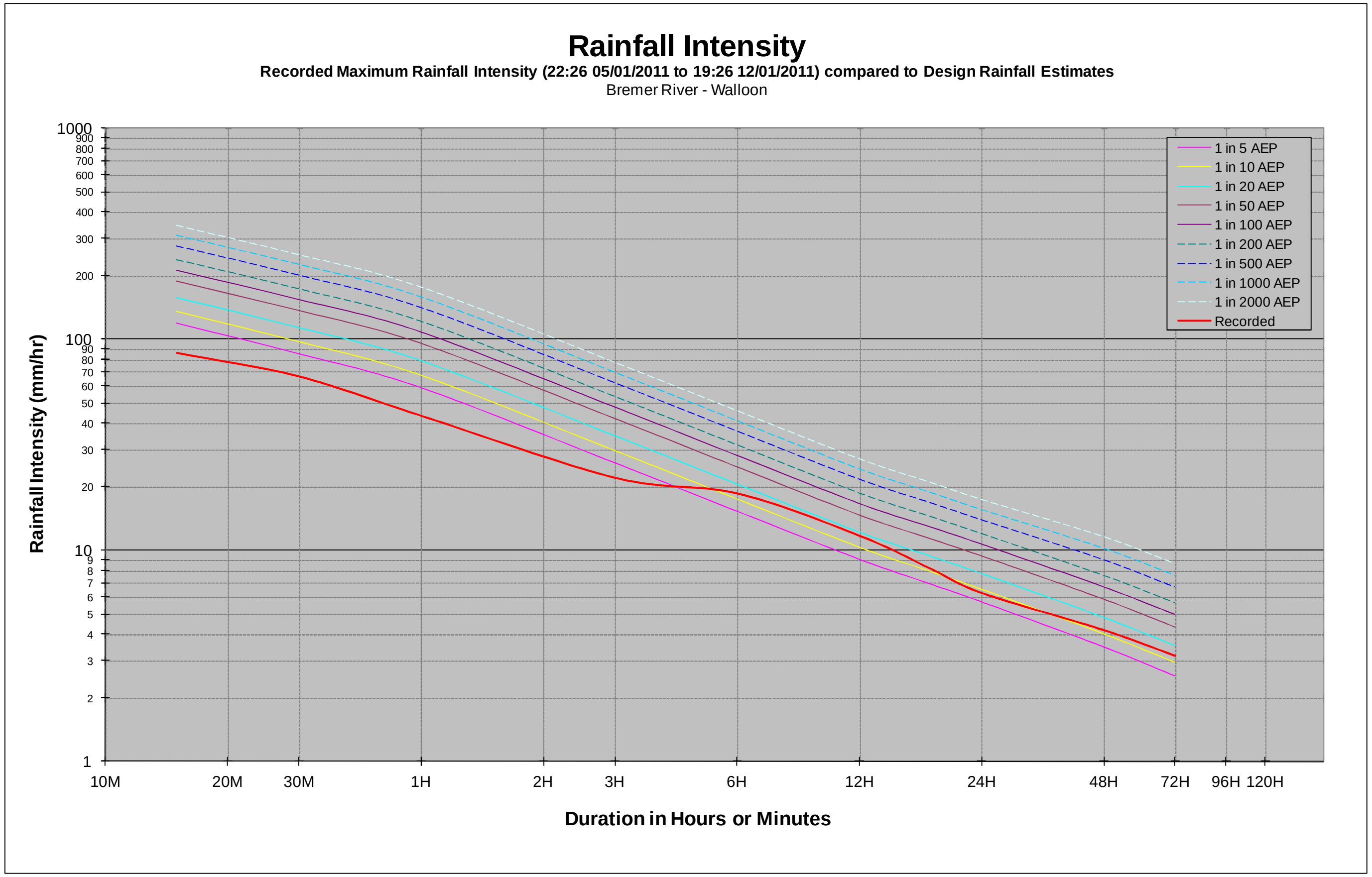
6542 – Cooyar Creek Dam Site

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	60.4	23:04 10/01/2011	< 5
30 M	55.6	23:19 10/01/2011	< 5
1 H	38.2	23:49 10/01/2011	< 5
3 H	22.2	00:49 11/01/2011	< 5
6 H	16.3	04:49 11/01/2011	10 - 20
12 H	9.8	05:49 11/01/2011	10 - 20
18 H	6.9	23:49 09/01/2011	5 - 10
24 H	5.4	02:04 10/01/2011	5 - 10
48 H	5.2	05:49 11/01/2011	20 - 50
72 H	3.6	14:49 11/01/2011	20 - 50



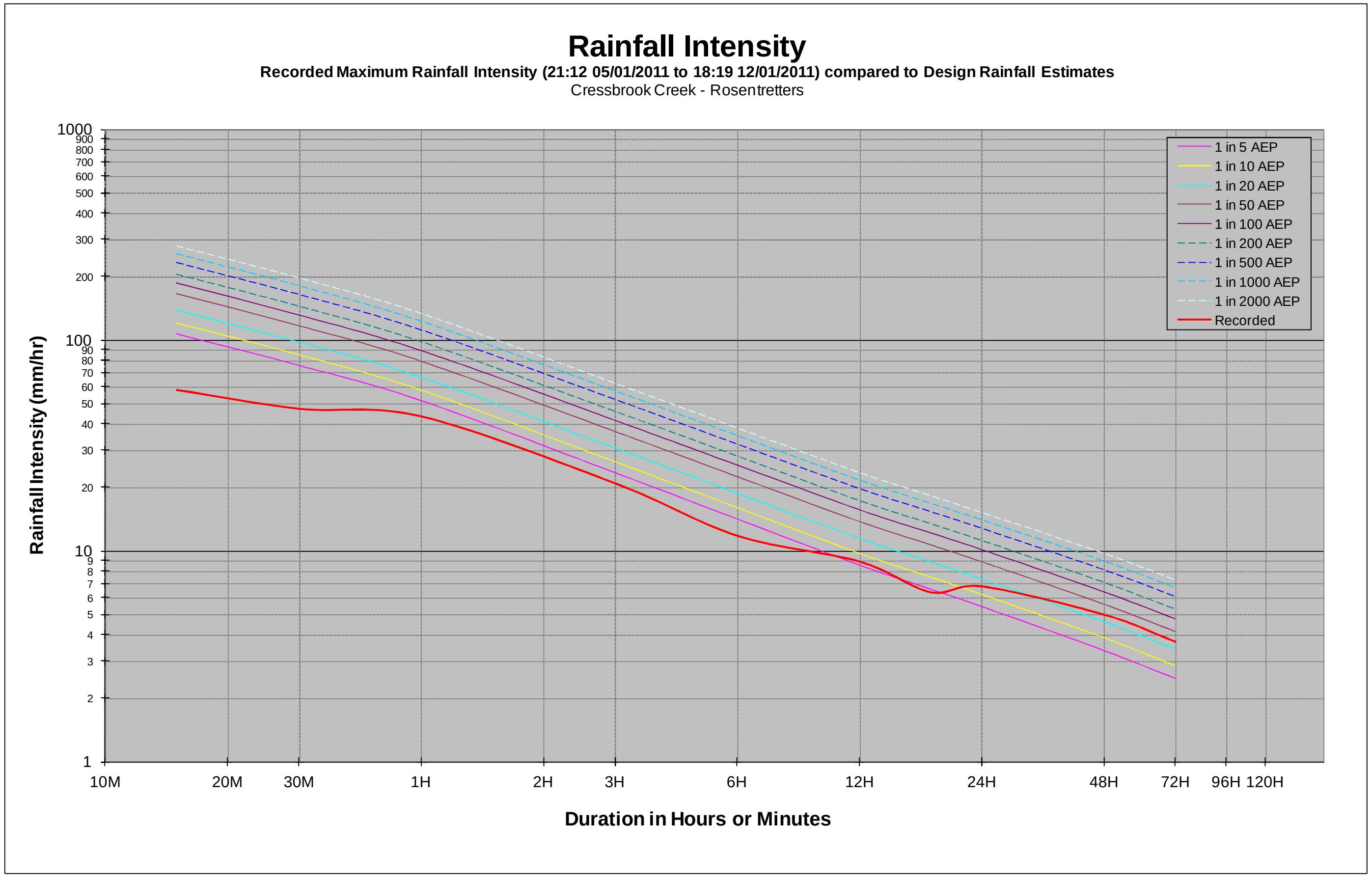
6550 – Bremer River – Walloon

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	86.4	09:27 11/01/2011	< 5
30 M	66.8	09:27 11/01/2011	< 5
1 H	43.5	09:42 11/01/2011	< 5
3 H	22.1	11:57 11/01/2011	< 5
6 H	18.7	14:57 11/01/2011	10 - 20
12 H	11.8	18:27 11/01/2011	10 - 20
18 H	8.2	18:42 11/01/2011	10 - 20
24 H	6.3	18:42 11/01/2011	5 - 10
48 H	4.2	18:12 11/01/2011	10 - 20
72 H	3.2	18:42 11/01/2011	10 - 20



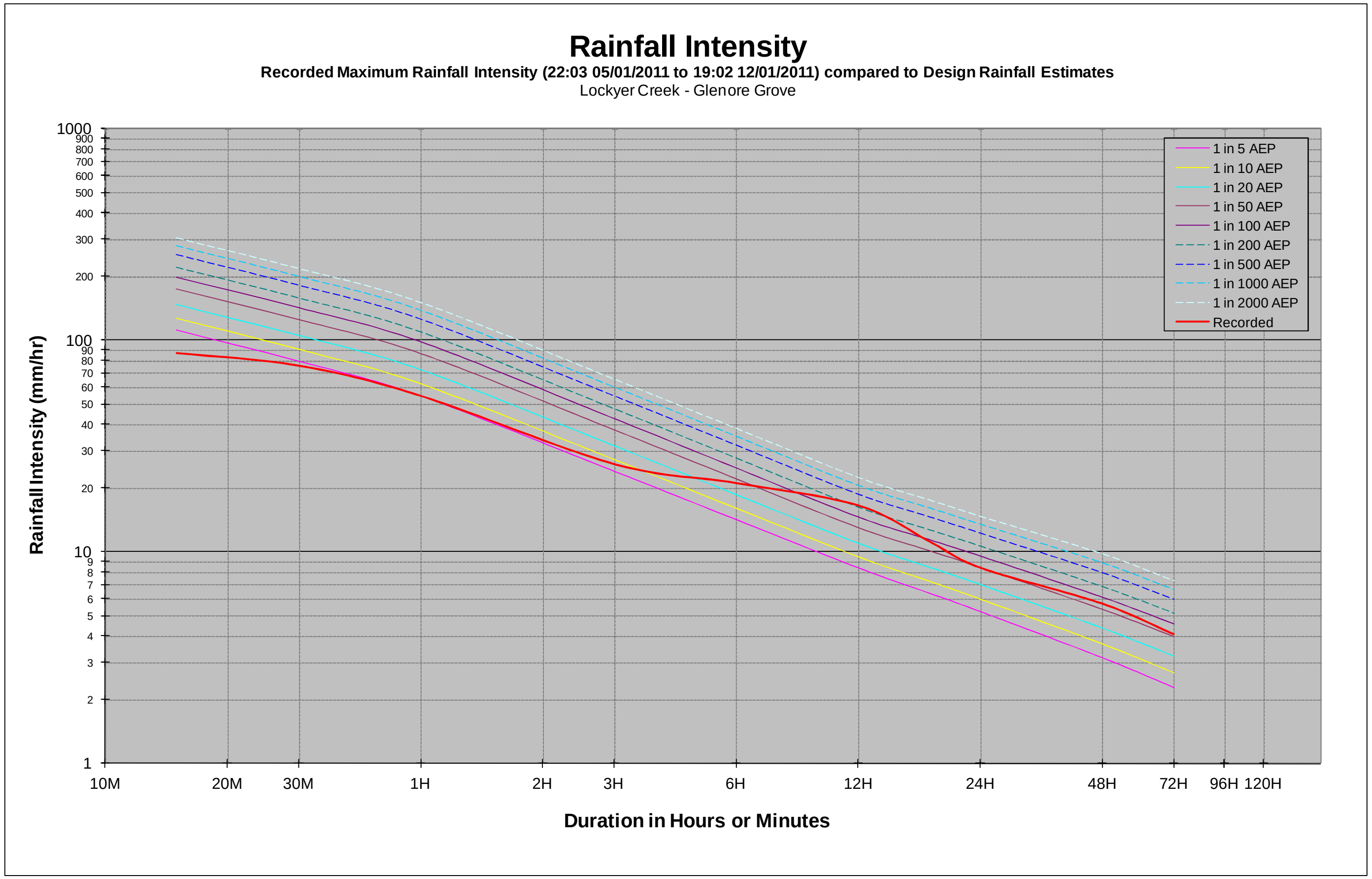
6553 – Cressbrook Dam – Rosentretters

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	58.0	12:43 10/01/2011	< 5
30 M	47.2	12:43 10/01/2011	< 5
1 H	43.4	12:43 10/01/2011	< 5
3 H	20.9	14:13 10/01/2011	< 5
6 H	11.8	20:13 09/01/2011	< 5
12 H	8.9	21:43 09/01/2011	5 - 10
18 H	6.4	04:43 10/01/2011	< 5
24 H	6.8	13:13 10/01/2011	10 - 20
48 H	5.0	09:43 11/01/2011	20 - 50
72 H	3.7	19:13 11/01/2011	20 - 50



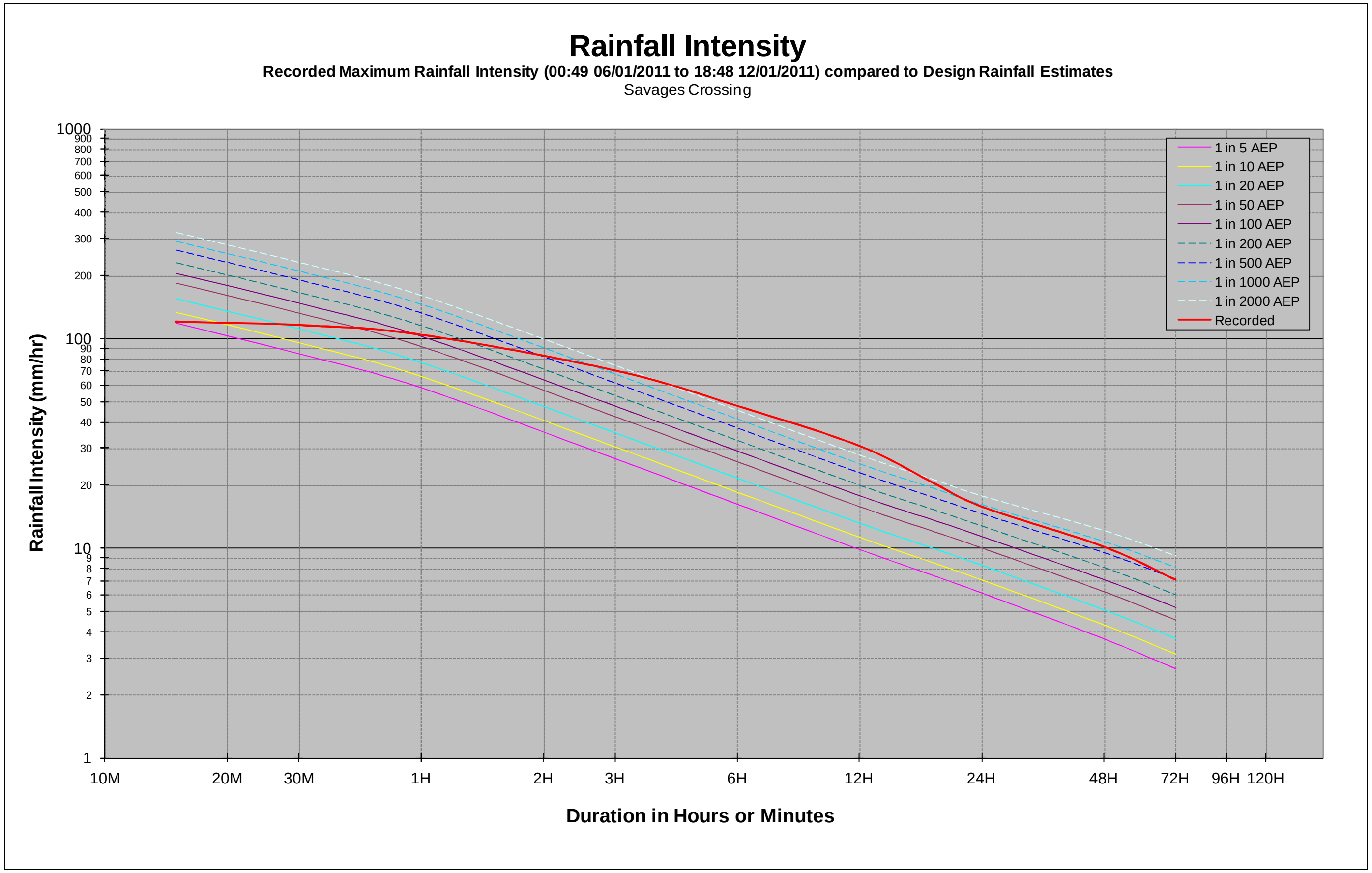
6556 – Lockyer Creek – Glenore Grove

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	87.2	06:18 11/01/2011	< 5
30 M	76.0	06:18 11/01/2011	< 5
1 H	54.7	06:48 11/01/2011	5 - 10
3 H	26.0	13:48 11/01/2011	5 - 10
6 H	21.2	15:18 11/01/2011	20 - 50
12 H	16.6	15:18 11/01/2011	200 - 500
18 H	11.2	19:33 11/01/2011	50 - 100
24 H	8.4	19:48 11/01/2011	50 - 100
48 H	5.7	15:18 11/01/2011	50 - 100
72 H	4.1	19:48 11/01/2011	50 - 100



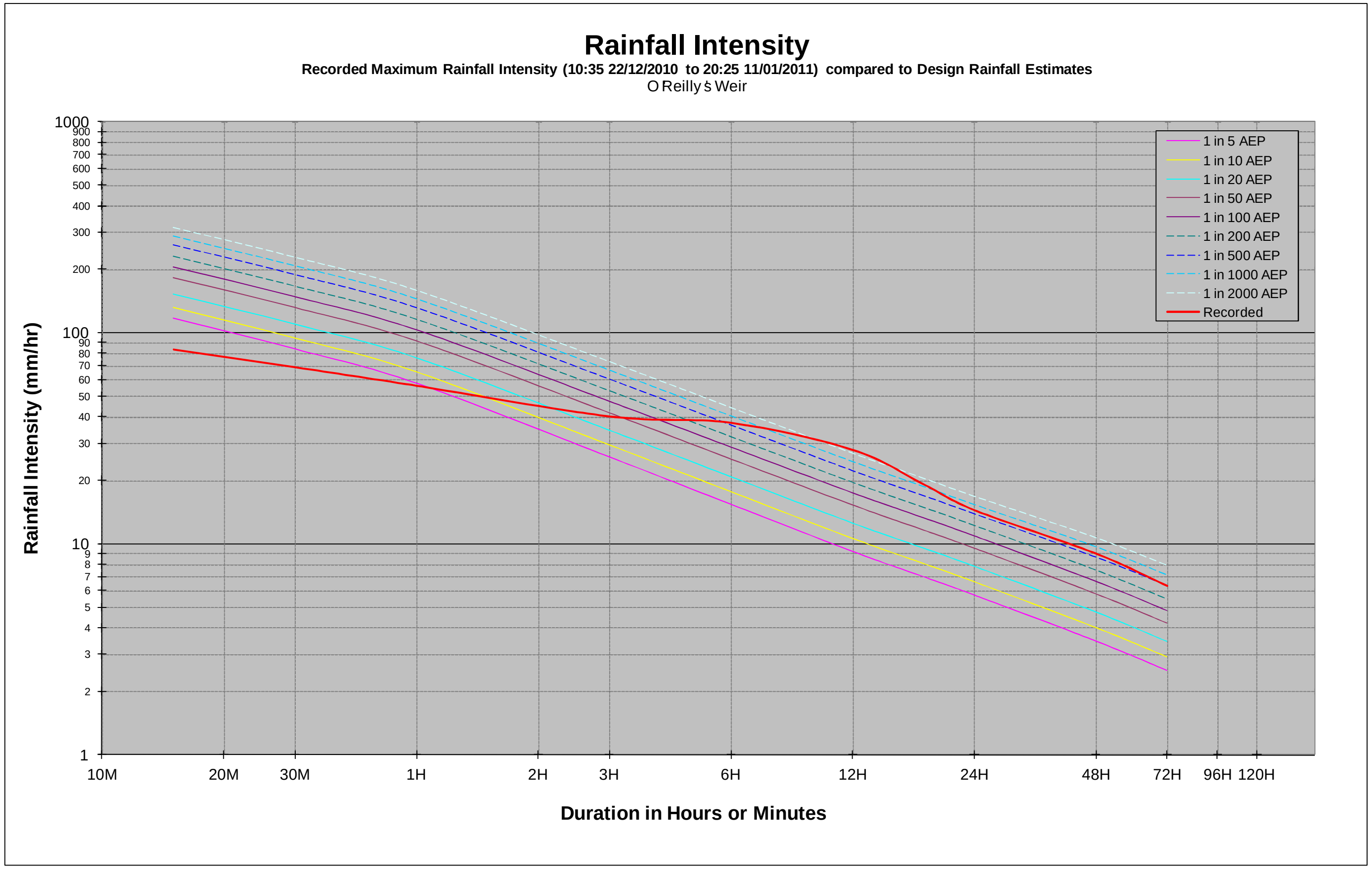
6559 – Savages Crossing

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	120.4	08:34 11/01/2011	5 - 10
30 M	116.0	08:49 11/01/2011	20 - 50
1 H	104.4	09:04 11/01/2011	100 - 200
3 H	70.5	09:34 11/01/2011	1000 - 2000
6 H	47.8	12:49 11/01/2011	> 2000
12 H	30.7	14:34 11/01/2011	> 2000
18 H	20.7	14:34 11/01/2011	1000 - 2000
24 H	15.8	14:19 11/01/2011	500 - 1000
48 H	10.1	14:34 11/01/2011	500 - 1000
72 H	7.0	02:19 12/01/2011	200 - 500



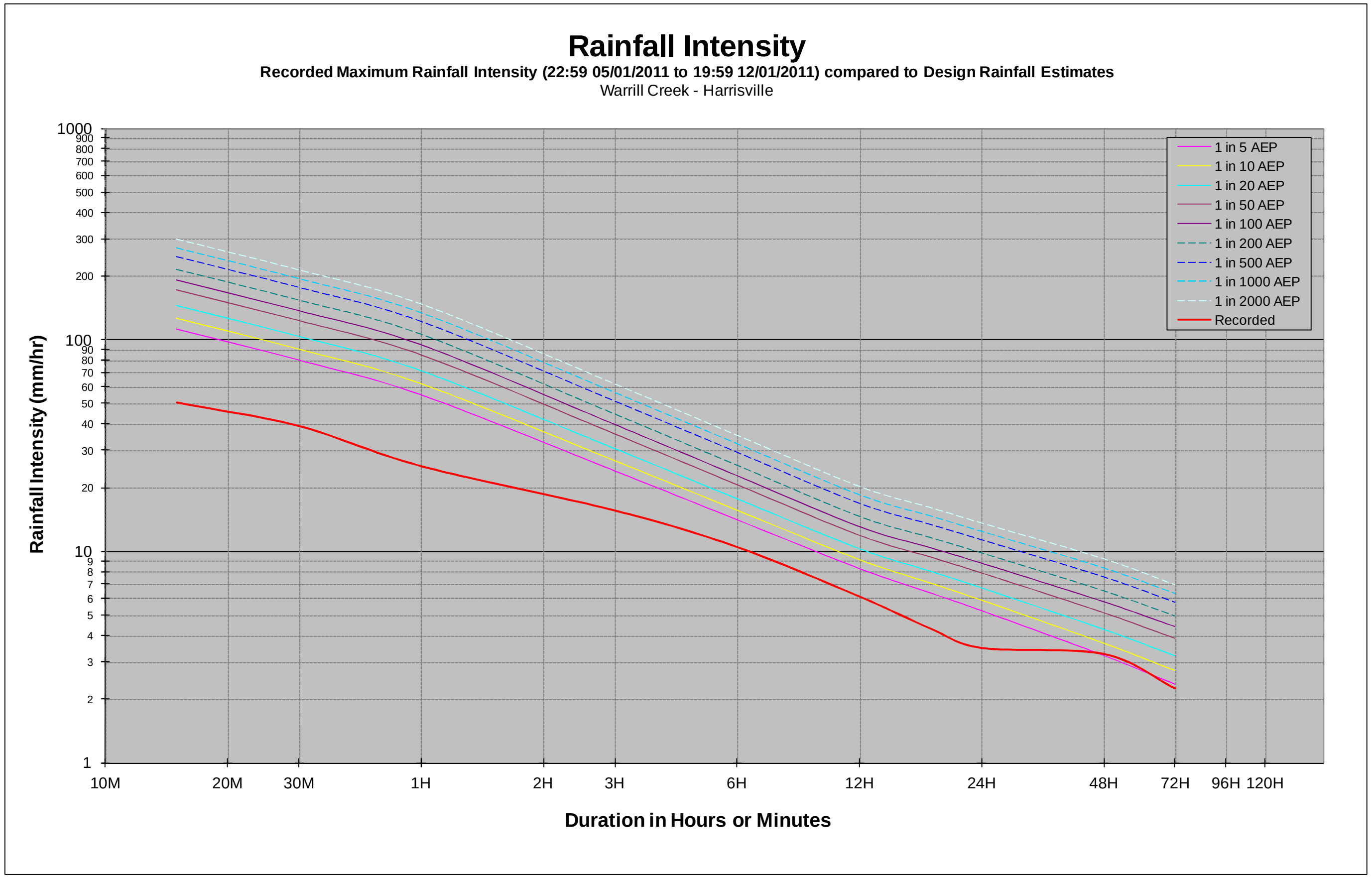
6568 – O'Reillys Weir

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	83.6	13:21 11/01/2011	< 5
30 M	68.8	13:36 11/01/2011	< 5
1 H	56.2	13:36 11/01/2011	< 5
3 H	40.2	14:21 11/01/2011	20 - 50
6 H	37.5	14:21 11/01/2011	500 - 1000
12 H	27.9	16:06 11/01/2011	> 2000
18 H	19.1	20:21 11/01/2011	1000 - 2000
24 H	14.5	20:21 11/01/2011	500 - 1000
48 H	9.0	14:51 11/01/2011	500 - 1000
72 H	6.3	20:21 11/01/2011	200 - 500



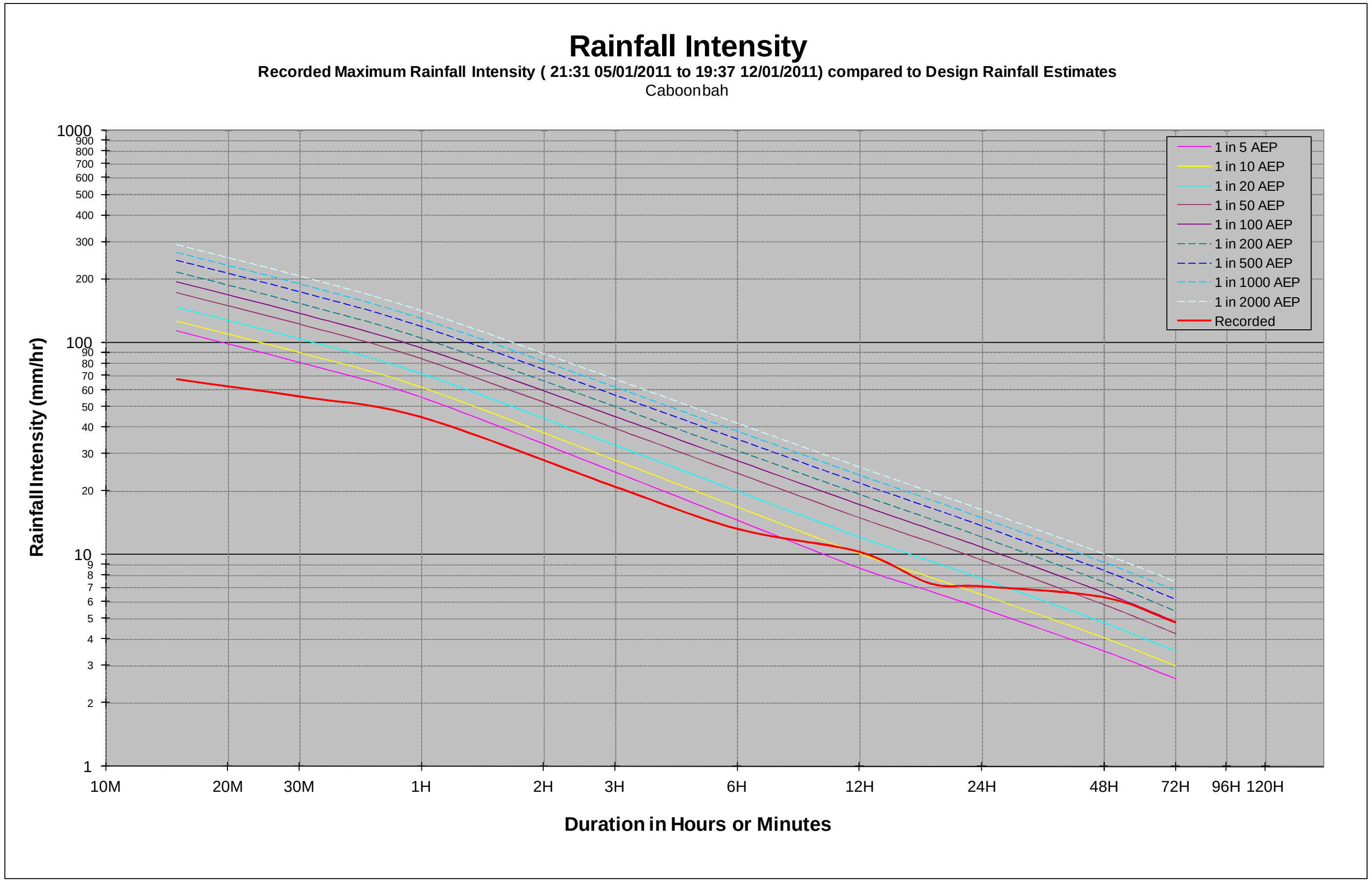
6571 – Warrill Creek – Harrisville

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.4	09:45 10/01/2011	< 5
30 M	39.0	09:60 10/01/2011	< 5
1 H	25.2	09:60 10/01/2011	< 5
3 H	15.5	10:45 10/01/2011	< 5
6 H	10.4	12:30 10/01/2011	< 5
12 H	6.1	13:60 10/01/2011	< 5
18 H	4.3	21:45 10/01/2011	< 5
24 H	3.5	02:60 11/01/2011	< 5
48 H	3.3	15:45 11/01/2011	5 - 10
72 H	2.2	15:45 11/01/2011	< 5



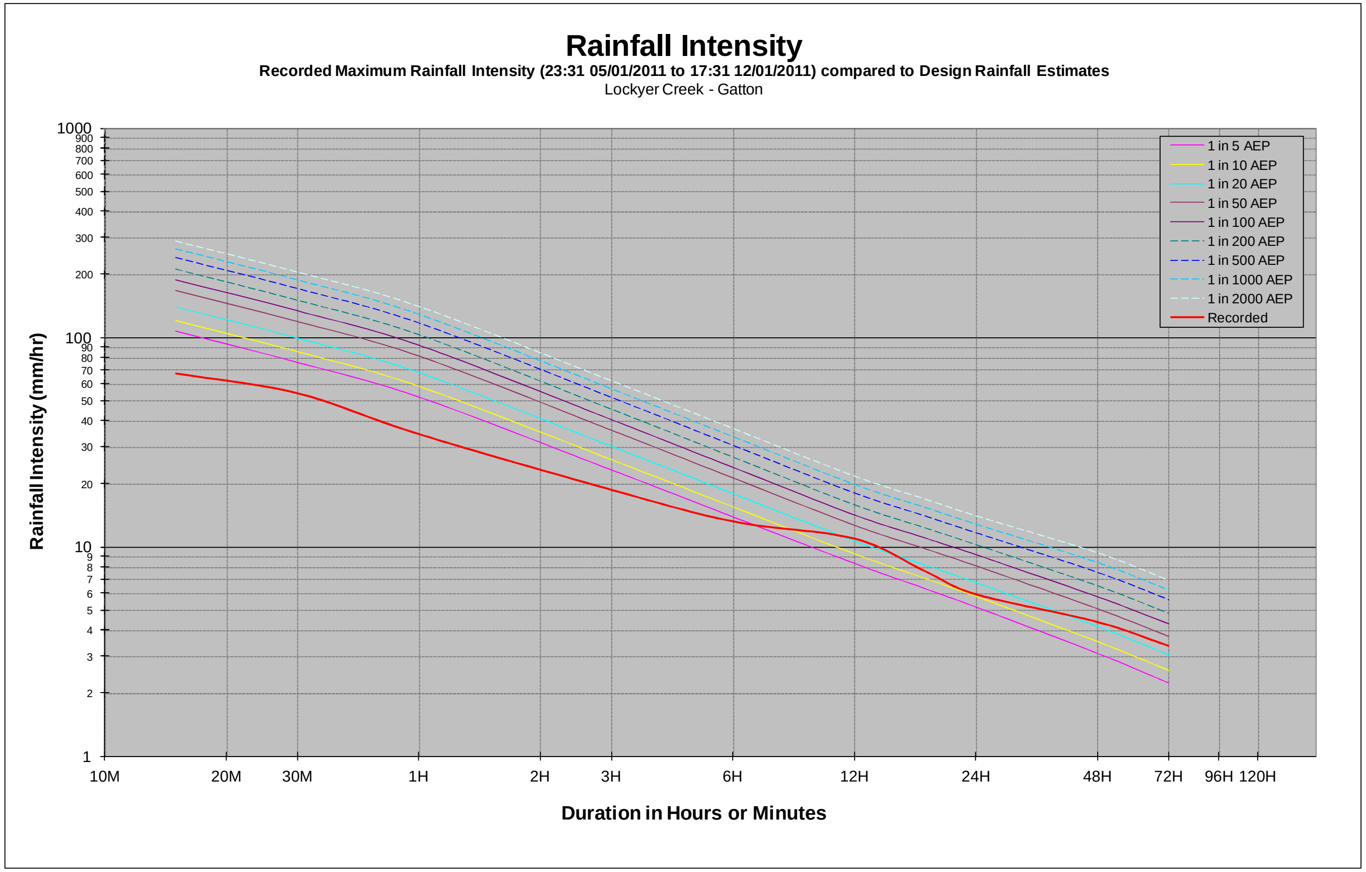
6574 – Caboonbah

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	67.2	11:46 10/01/2011	< 5
30 M	55.8	11:46 10/01/2011	< 5
1 H	44.5	05:31 11/01/2011	< 5
3 H	20.9	07:31 11/01/2011	< 5
6 H	13.2	20:31 09/01/2011	< 5
12 H	10.3	16:31 11/01/2011	10 - 20
18 H	7.3	19:46 11/01/2011	5 - 10
24 H	7.1	14:31 10/01/2011	10 - 20
48 H	6.3	14:31 11/01/2011	50 - 100
72 H	4.8	19:46 11/01/2011	50 - 100



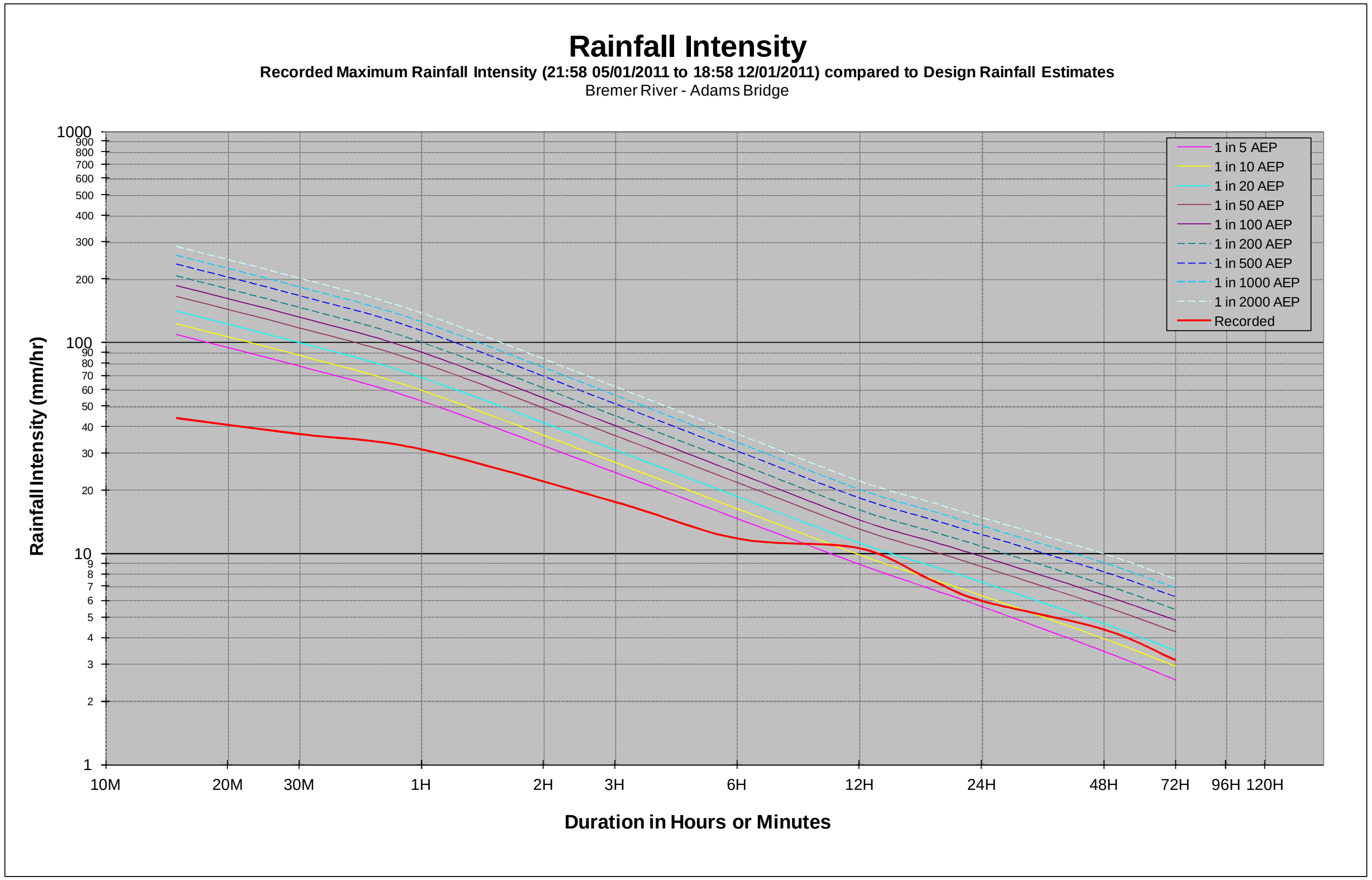
6577 – Lockyer Creek – Gatton

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	67.2	06:02 11/01/2011	< 5
30 M	54.0	06:17 11/01/2011	< 5
1 H	34.5	06:17 11/01/2011	< 5
3 H	18.7	14:32 11/01/2011	< 5
6 H	13.3	16:02 11/01/2011	< 5
12 H	11.0	16:02 11/01/2011	20 - 50
18 H	7.7	18:17 11/01/2011	10 - 20
24 H	6.0	23:47 11/01/2011	10 - 20
48 H	4.4	15:47 11/01/2011	20 - 50
72 H	3.4	23:47 11/01/2011	20 - 50



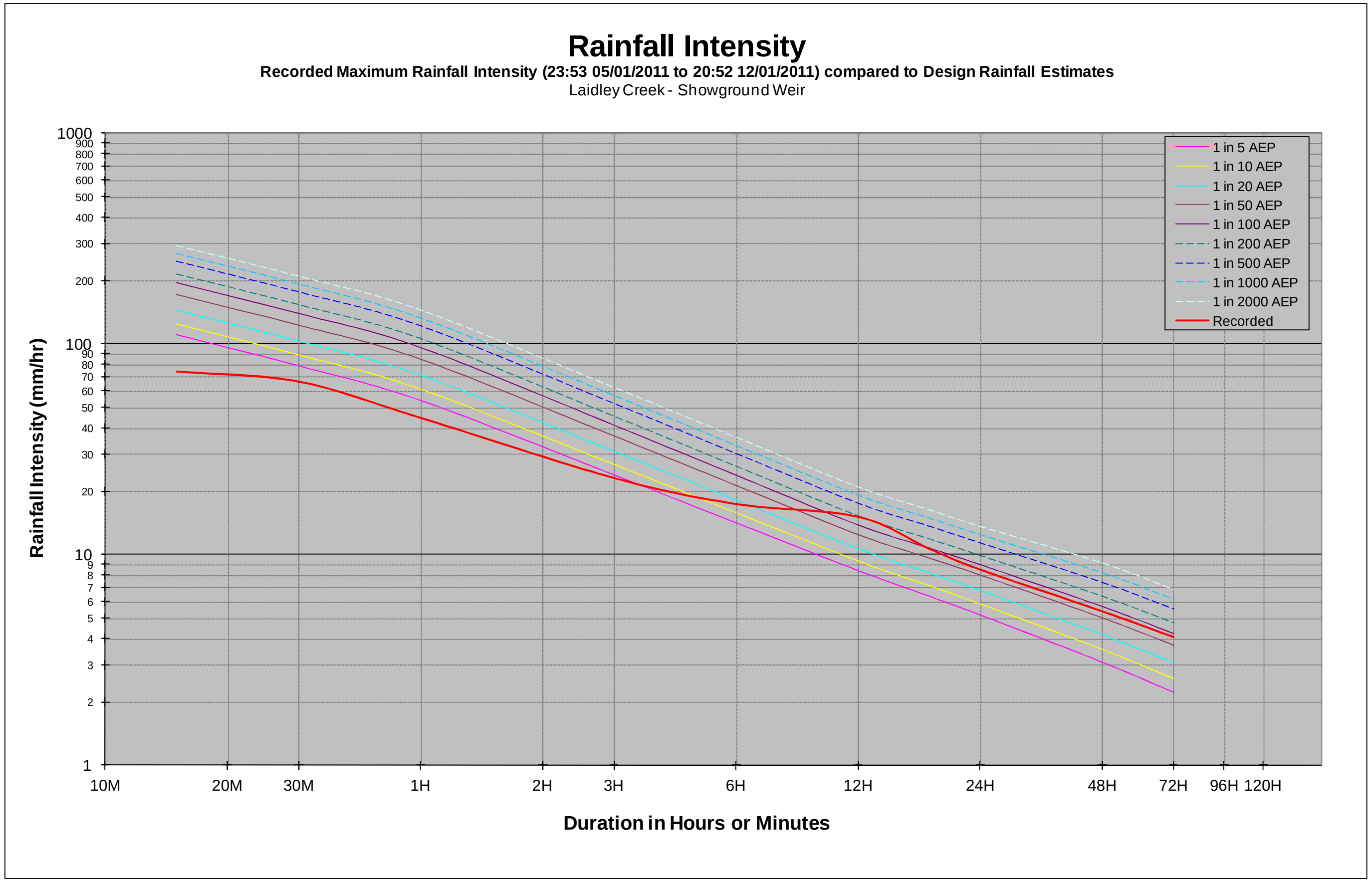
6580 – Bremer River – Adams Bridge

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	44.0	15:29 11/01/2011	< 5
30 M	37.0	15:44 11/01/2011	< 5
1 H	31.3	15:59 11/01/2011	< 5
3 H	17.6	15:59 11/01/2011	< 5
6 H	11.8	13:14 11/01/2011	< 5
12 H	10.6	18:14 11/01/2011	10 - 20
18 H	7.5	18:29 11/01/2011	5 - 10
24 H	6.0	18:14 11/01/2011	5 - 10
48 H	4.4	18:14 11/01/2011	10 - 20
72 H	3.1	18:29 11/01/2011	10 - 20



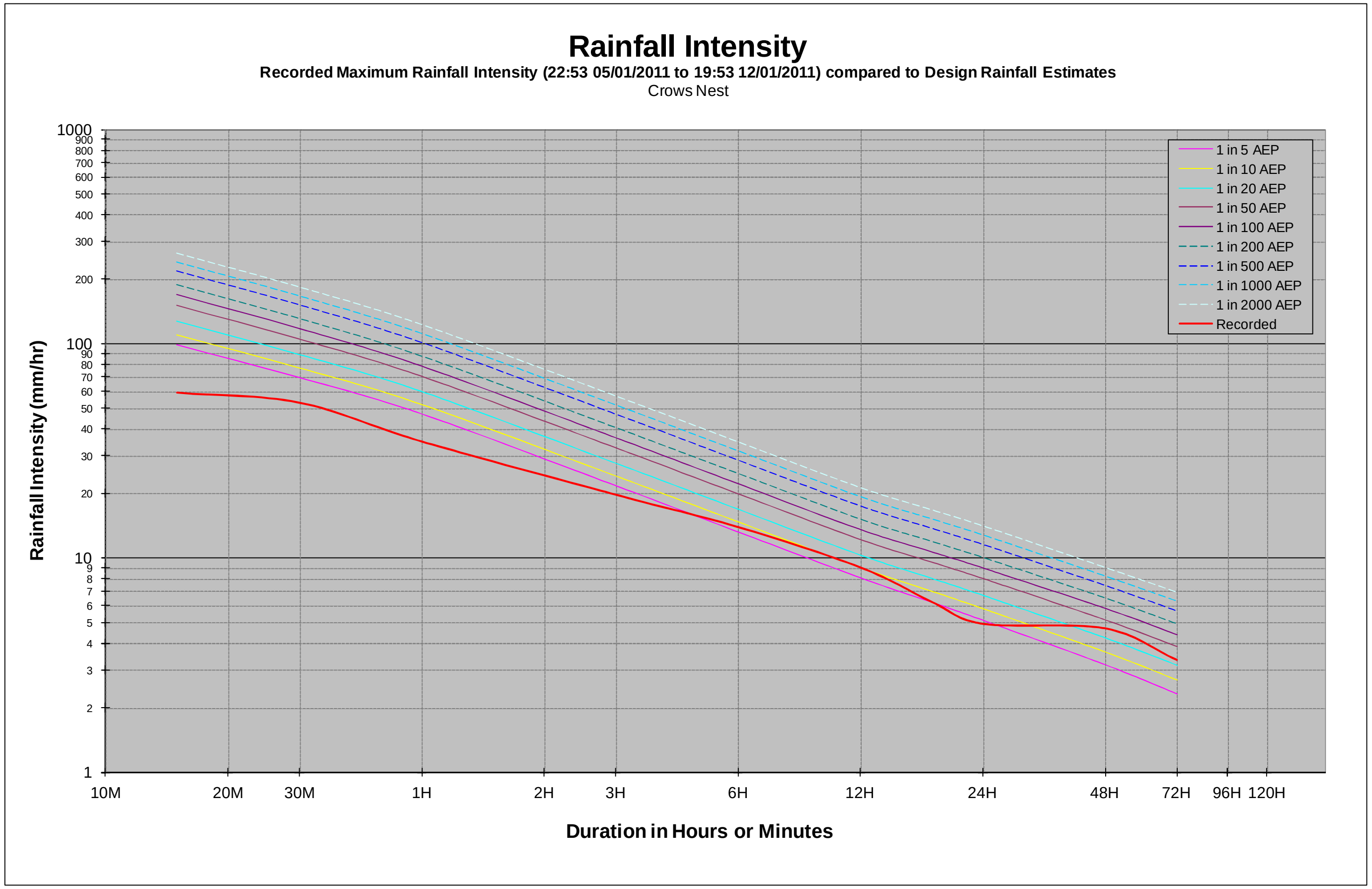
6583 – Laidley Creek – Showground Weir

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	74.0	07:08 11/01/2011	< 5
30 M	66.2	07:08 11/01/2011	< 5
1 H	44.5	07:38 11/01/2011	< 5
3 H	23.1	08:38 11/01/2011	< 5
6 H	17.4	16:38 11/01/2011	10 - 20
12 H	15.1	16:38 11/01/2011	100 - 200
18 H	10.6	20:53 11/01/2011	50 - 100
24 H	8.5	21:08 11/01/2011	50 - 100
48 H	5.4	15:38 11/01/2011	50 - 100
72 H	4.1	03:23 12/01/2011	50 - 100



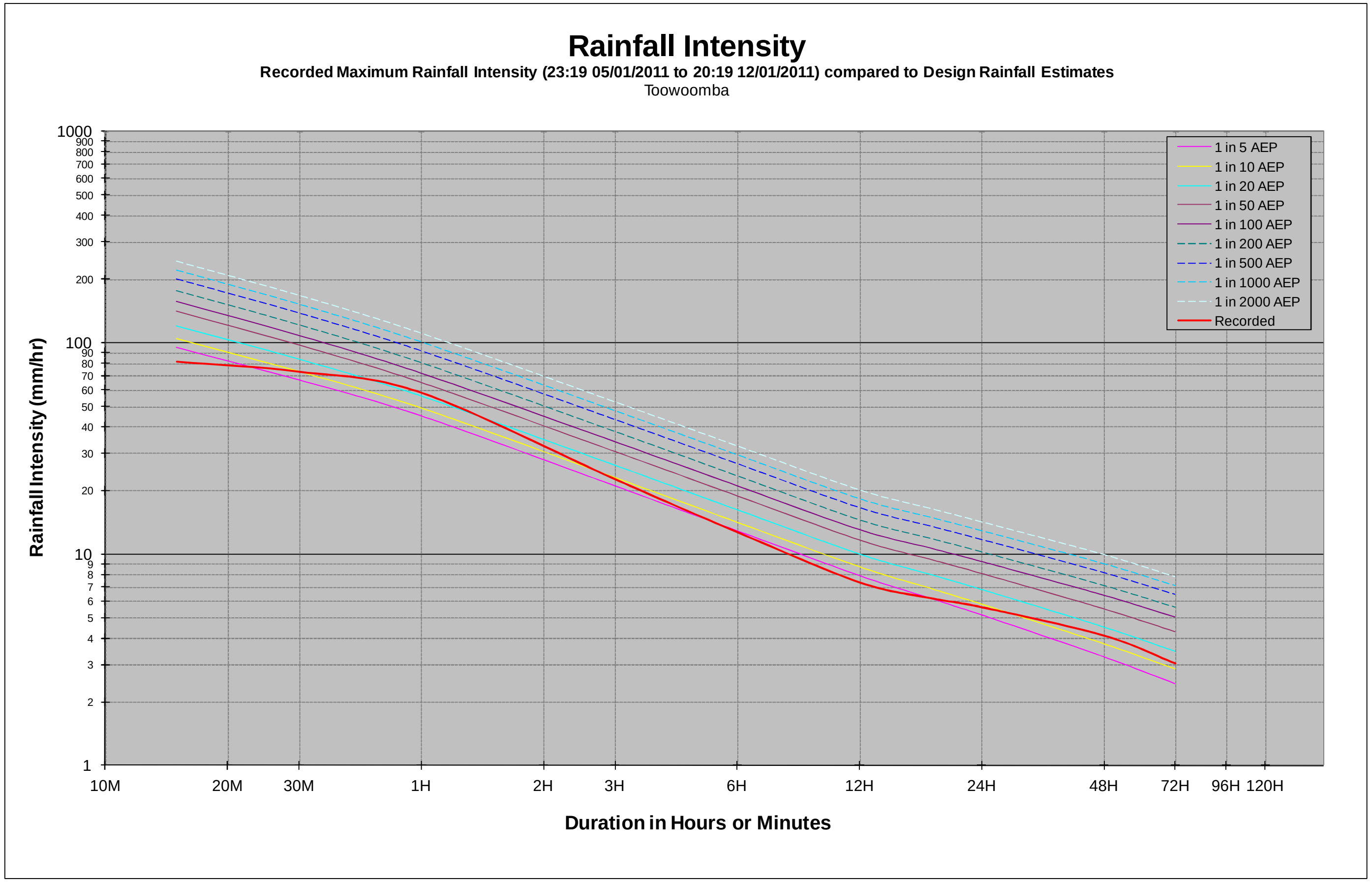
6596 – Crows Nest

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	58.8	16:38 09/01/2011	< 5
30 M	52.8	05:08 11/01/2011	< 5
1 H	34.8	05:23 11/01/2011	< 5
3 H	19.7	17:53 09/01/2011	< 5
6 H	13.9	20:53 09/01/2011	5 - 10
12 H	9.0	23:23 09/01/2011	10 - 20
18 H	6.2	05:08 10/01/2011	5 - 10
24 H	4.9	13:08 10/01/2011	< 5
48 H	4.7	10:53 11/01/2011	20 - 50
72 H	3.3	14:23 11/01/2011	20 - 50



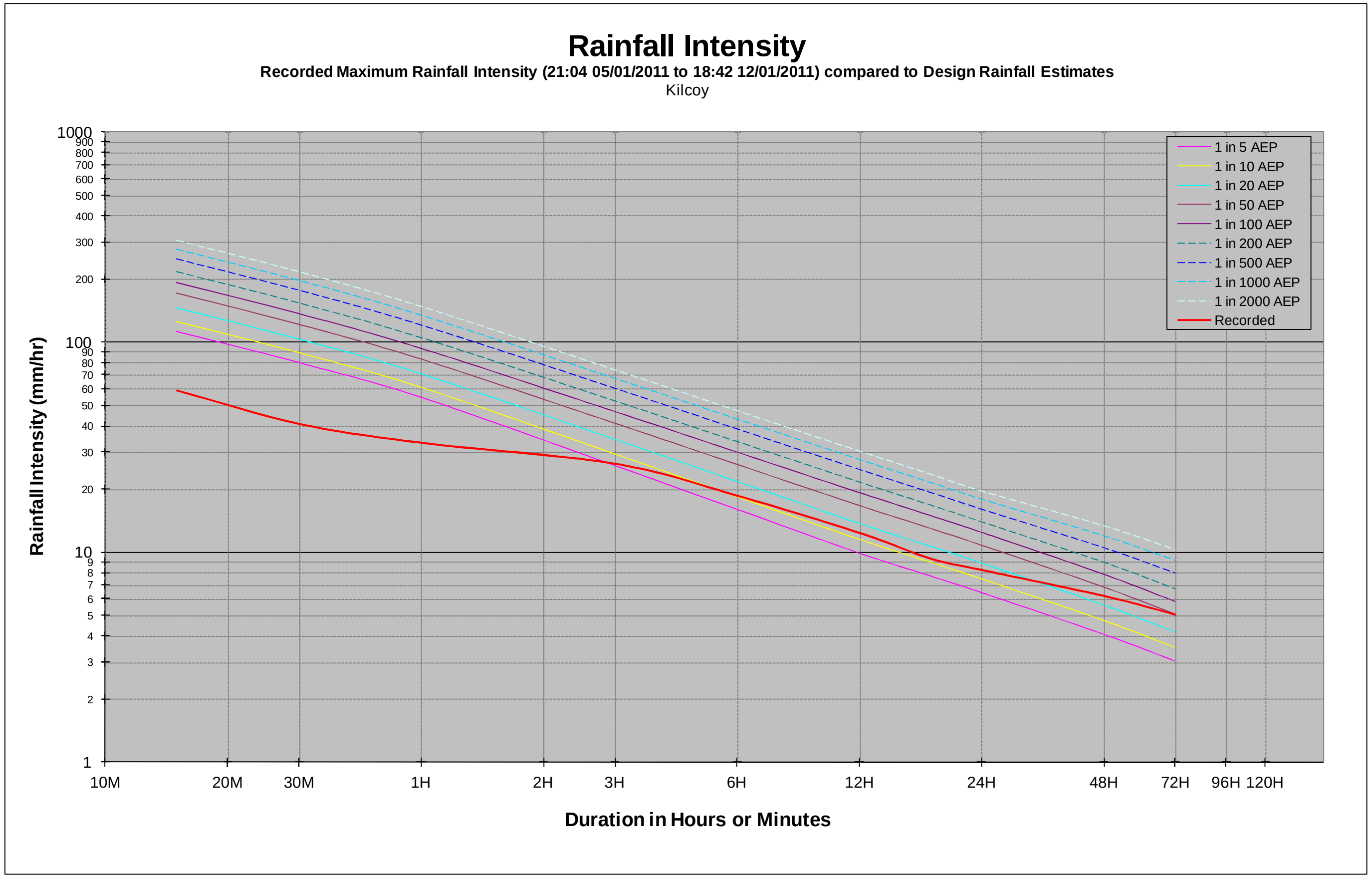
6598 – Toowoomba

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	81.2	14:04 10/01/2011	< 5
30 M	72.8	14:04 10/01/2011	5 - 10
1 H	57.9	14:04 10/01/2011	20 - 50
3 H	22.6	15:49 10/01/2011	5 - 10
6 H	12.7	17:19 10/01/2011	< 5
12 H	7.3	17:19 10/01/2011	< 5
18 H	6.2	06:19 11/01/2011	5 - 10
24 H	5.6	16:19 10/01/2011	5 - 10
48 H	4.1	11:34 11/01/2011	10 - 20
72 H	3.0	05:34 12/01/2011	10 - 20



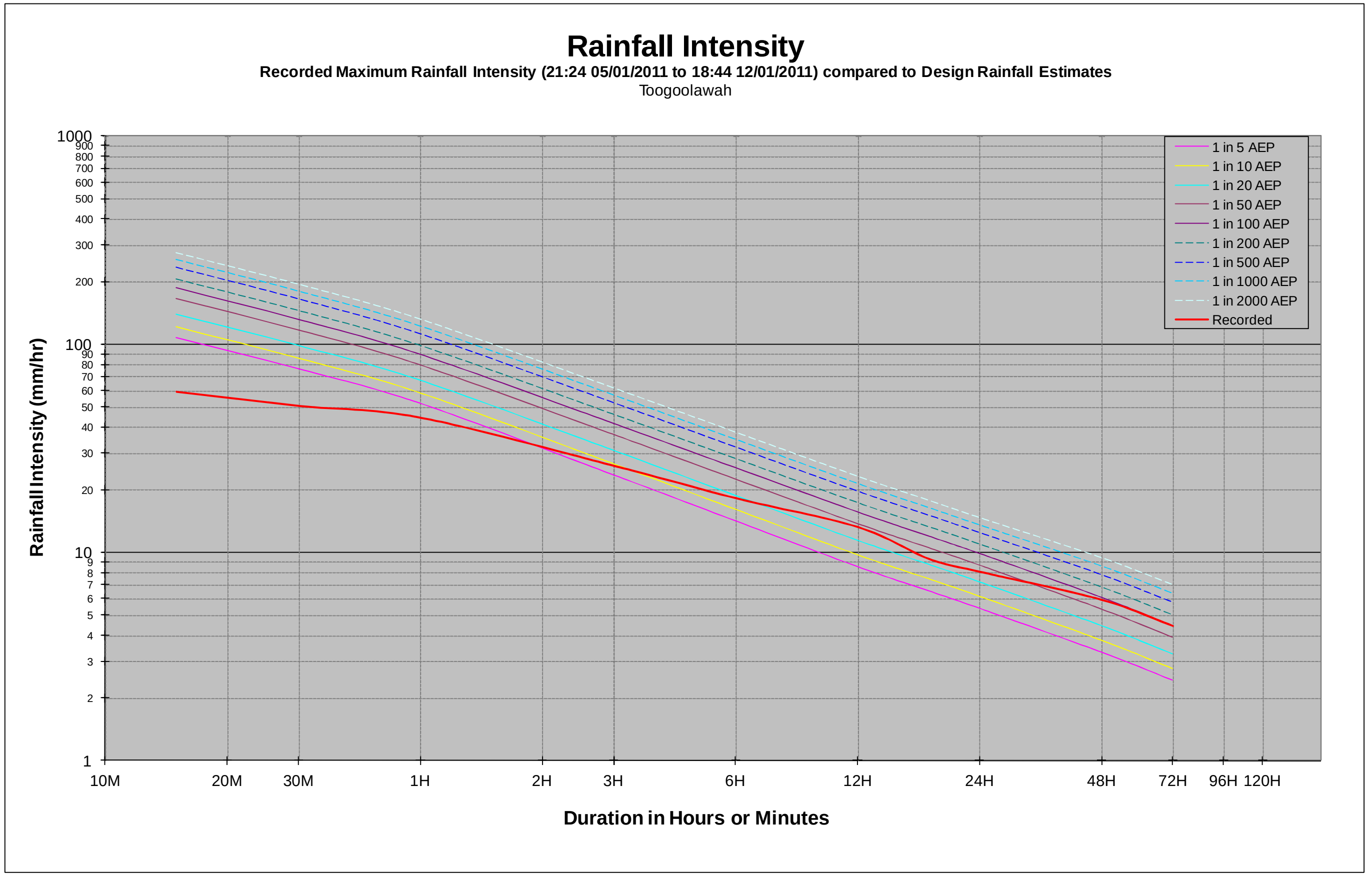
6600 – Kilcoy

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	58.8	11:04 10/01/2011	< 5
30 M	40.8	11:19 10/01/2011	< 5
1 H	33.1	16:04 09/01/2011	< 5
3 H	26.3	17:49 09/01/2011	5 - 10
6 H	18.5	19:49 09/01/2011	10 - 20
12 H	12.3	21:34 09/01/2011	10 - 20
18 H	9.3	22:34 09/01/2011	10 - 20
24 H	8.2	12:04 10/01/2011	10 - 20
48 H	6.2	13:34 11/01/2011	20 - 50
72 H	5.0	19:04 11/01/2011	20 - 50



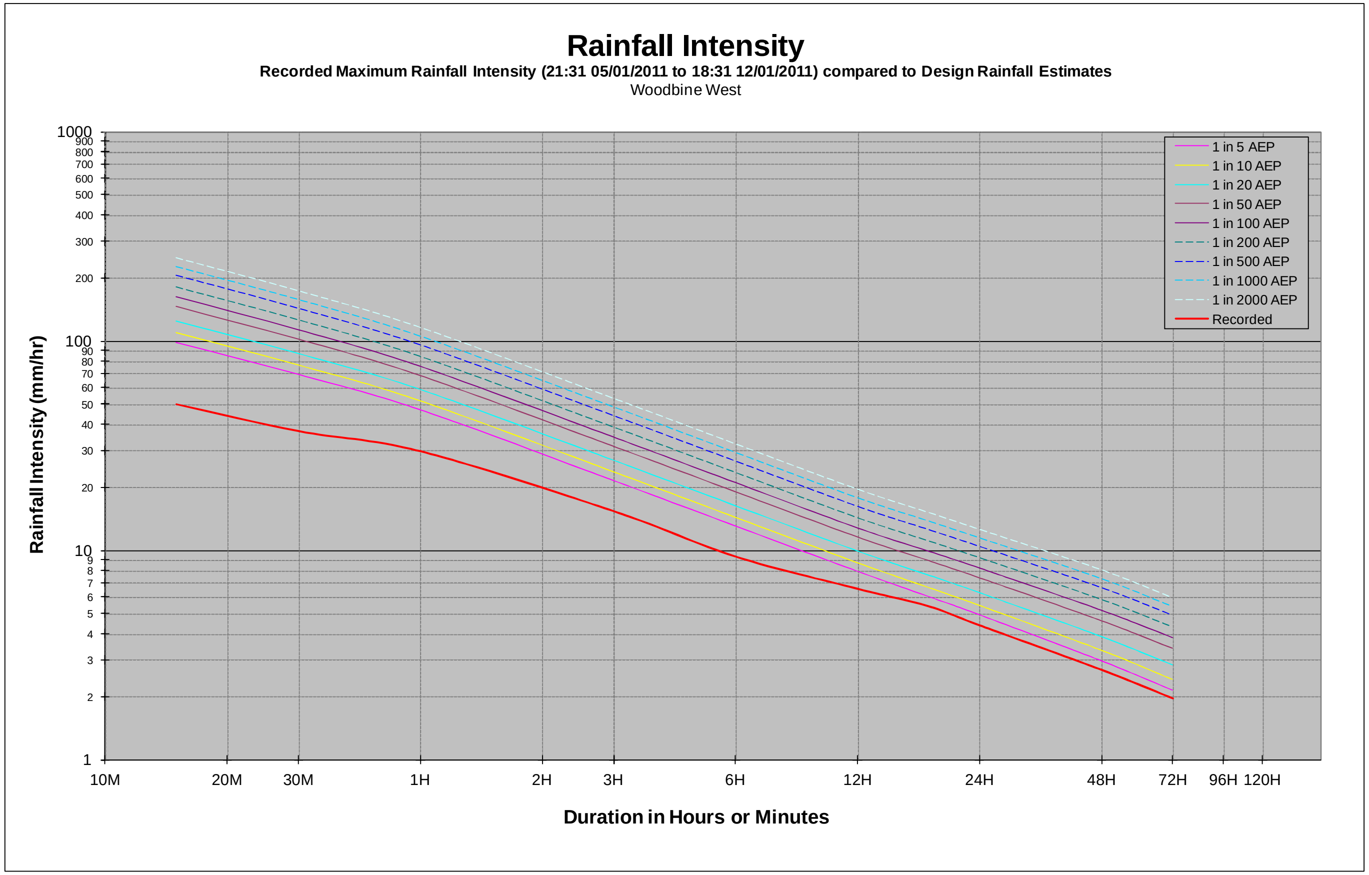
6604 – Toogoolawah

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	59.2	12:24 10/01/2011	< 5
30 M	50.6	12:24 10/01/2011	< 5
1 H	44.4	12:24 10/01/2011	< 5
3 H	26.1	17:54 09/01/2011	5 - 10
6 H	18.2	20:39 09/01/2011	10 - 20
12 H	13.2	22:39 09/01/2011	20 - 50
18 H	9.3	04:39 10/01/2011	20 - 50
24 H	8.1	12:54 10/01/2011	20 - 50
48 H	5.9	05:39 11/01/2011	50 - 100
72 H	4.4	18:54 11/01/2011	50 - 100



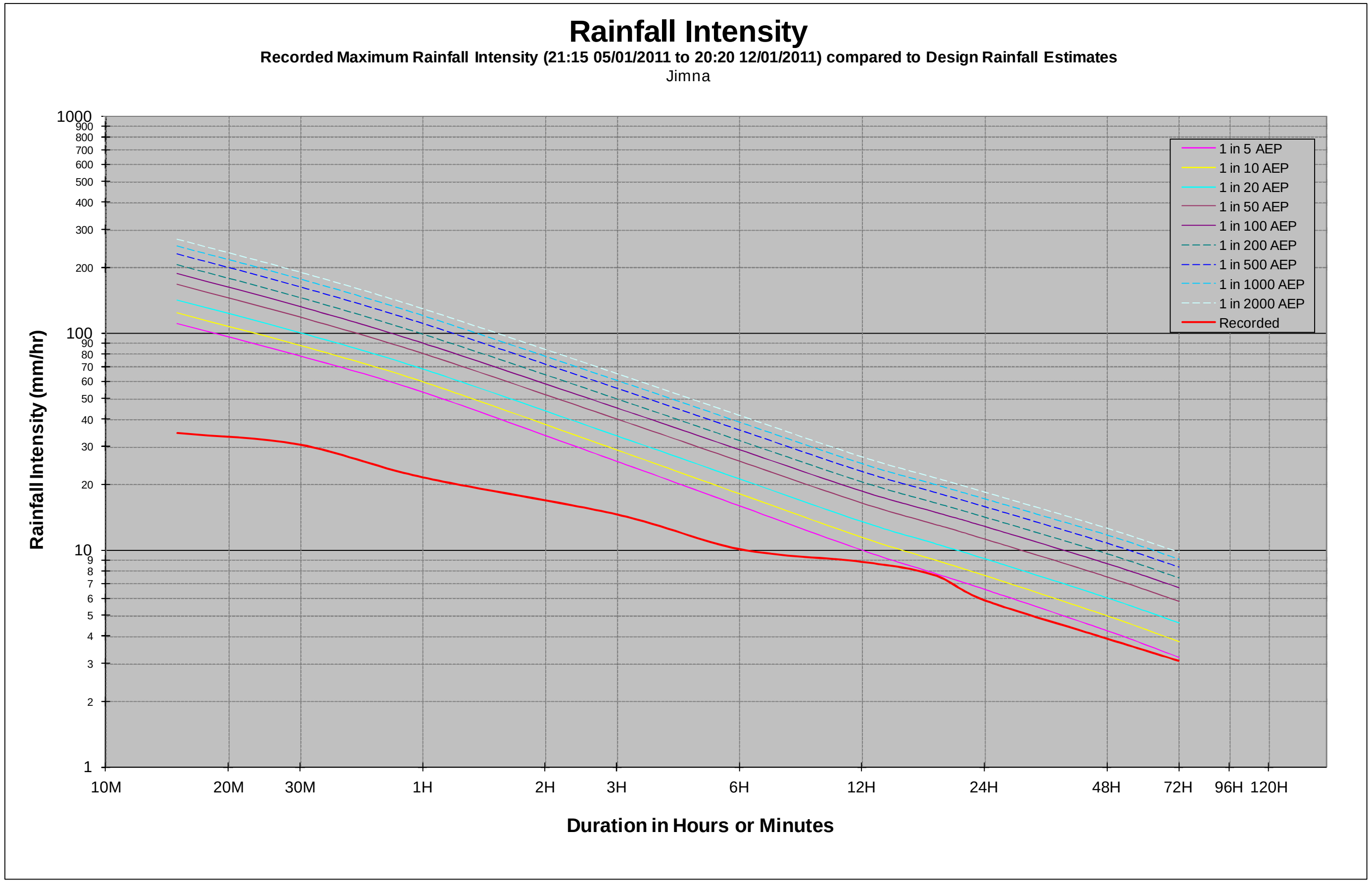
6606 – Woodbine West

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.0	07:17 11/01/2011	< 5
30 M	37.2	07:17 11/01/2011	< 5
1 H	29.8	07:17 11/01/2011	< 5
3 H	15.4	08:02 11/01/2011	< 5
6 H	9.3	12:02 11/01/2011	< 5
12 H	6.6	17:02 11/01/2011	< 5
18 H	5.4	16:17 11/01/2011	< 5
24 H	4.4	13:17 11/01/2011	< 5
48 H	2.7	19:02 11/01/2011	< 5
72 H	2.0	19:17 11/01/2011	< 5



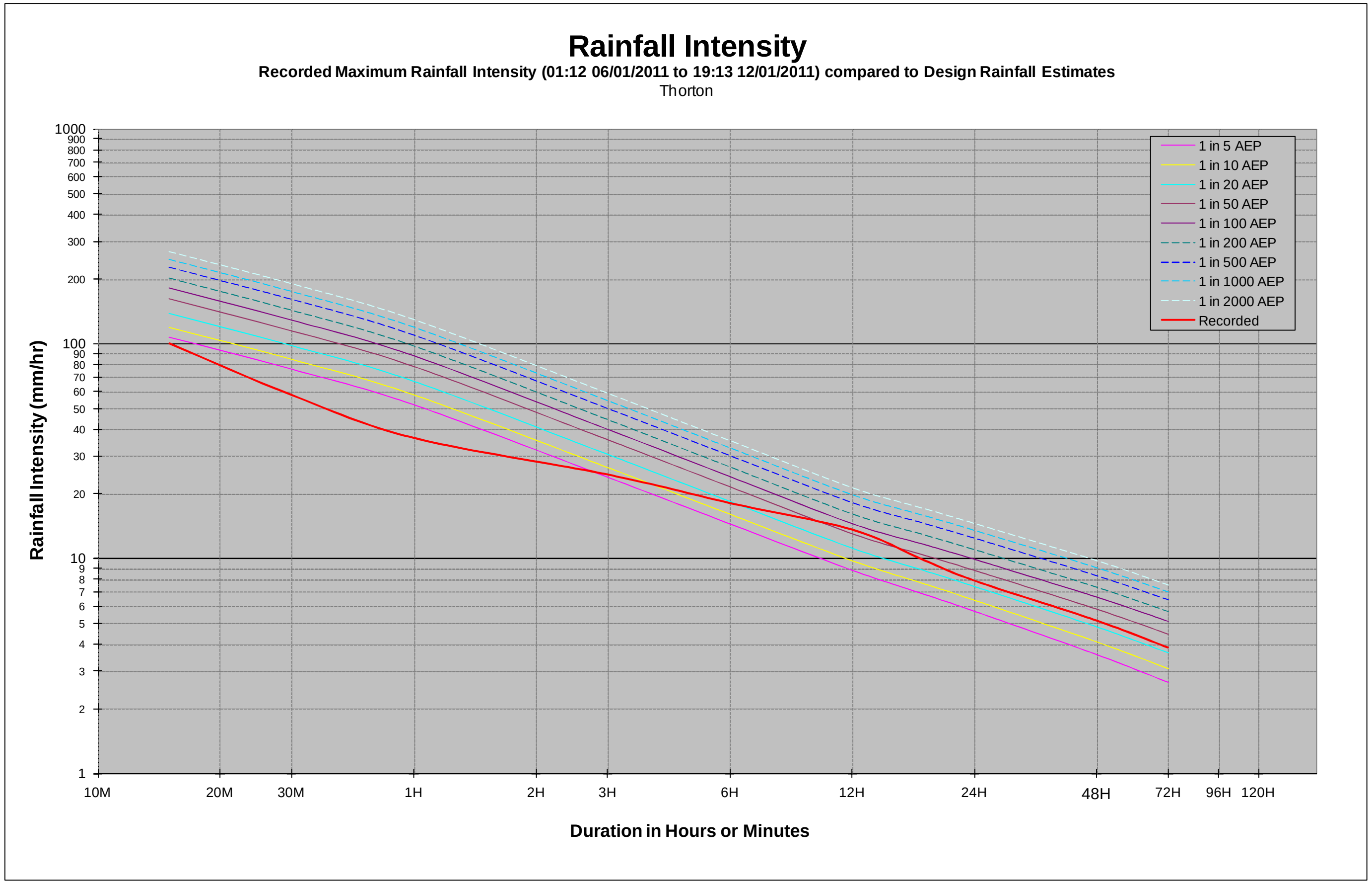
6608 – Jimna

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	34.4	13:31 09/01/2011	< 5
30 M	30.4	13:31 09/01/2011	< 5
1 H	21.5	13:46 09/01/2011	< 5
3 H	14.5	14:01 09/01/2011	< 5
6 H	10.0	18:01 09/01/2011	< 5
12 H	8.8	23:01 09/01/2011	< 5
18 H	7.6	23:16 09/01/2011	< 5
24 H	5.8	01:16 10/01/2011	< 5
48 H	3.9	04:31 11/01/2011	< 5
72 H	3.1	16:01 11/01/2011	< 5



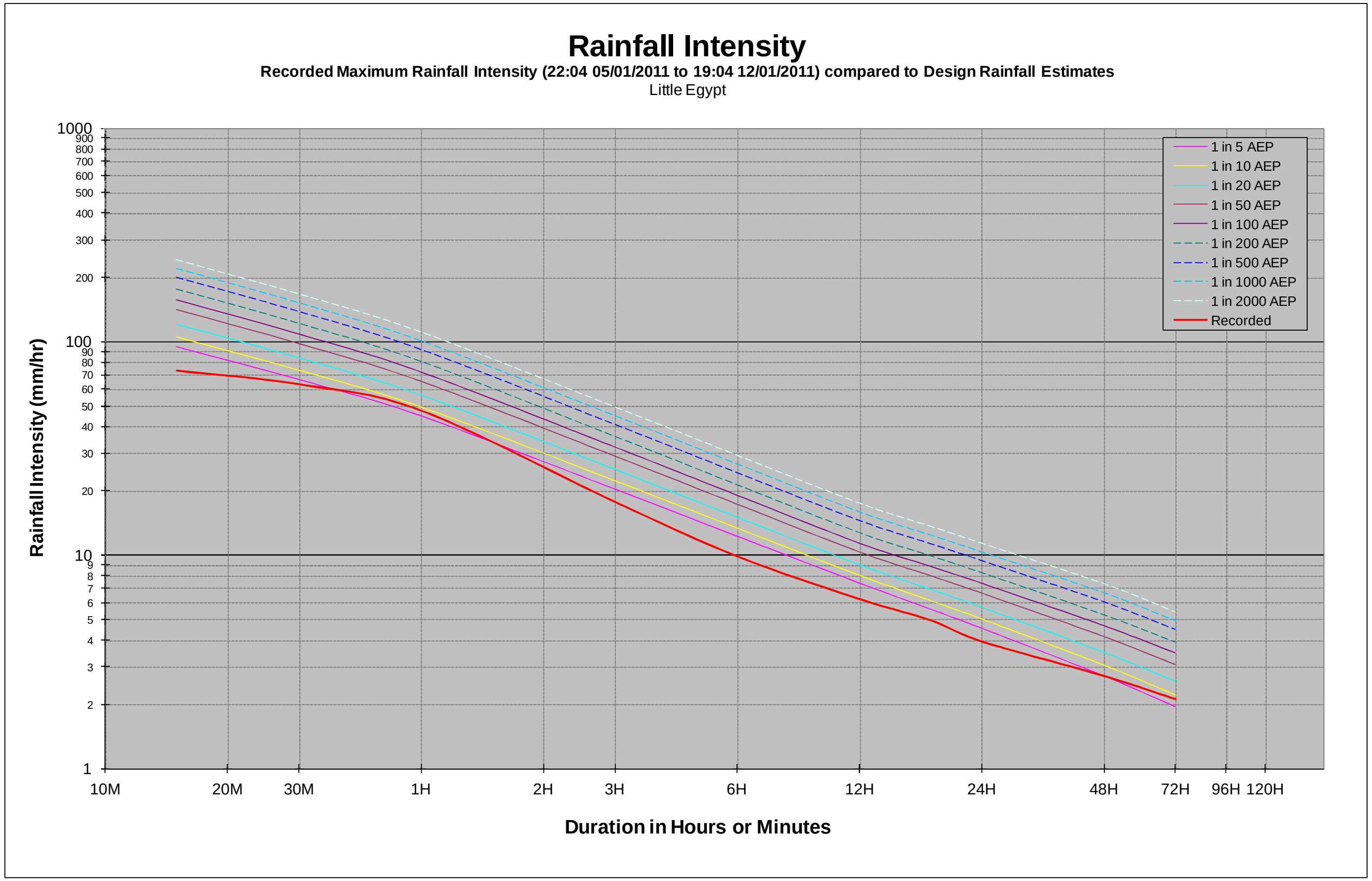
6615 – Thorton

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	82.0	07:01 11/01/2011	< 5
30 M	66.0	07:01 11/01/2011	< 5
1 H	51.3	07:01 11/01/2011	< 5
3 H	43.9	11:46 11/01/2011	20 - 50
6 H	36.5	12:01 11/01/2011	200 - 500
12 H	26.0	15:01 11/01/2011	200 - 500
18 H	18.0	20:31 11/01/2011	100 - 200
24 H	13.8	19:16 11/01/2011	50 - 100
48 H	9.0	14:31 11/01/2011	50 - 100
72 H	6.8	20:31 11/01/2011	50 - 100



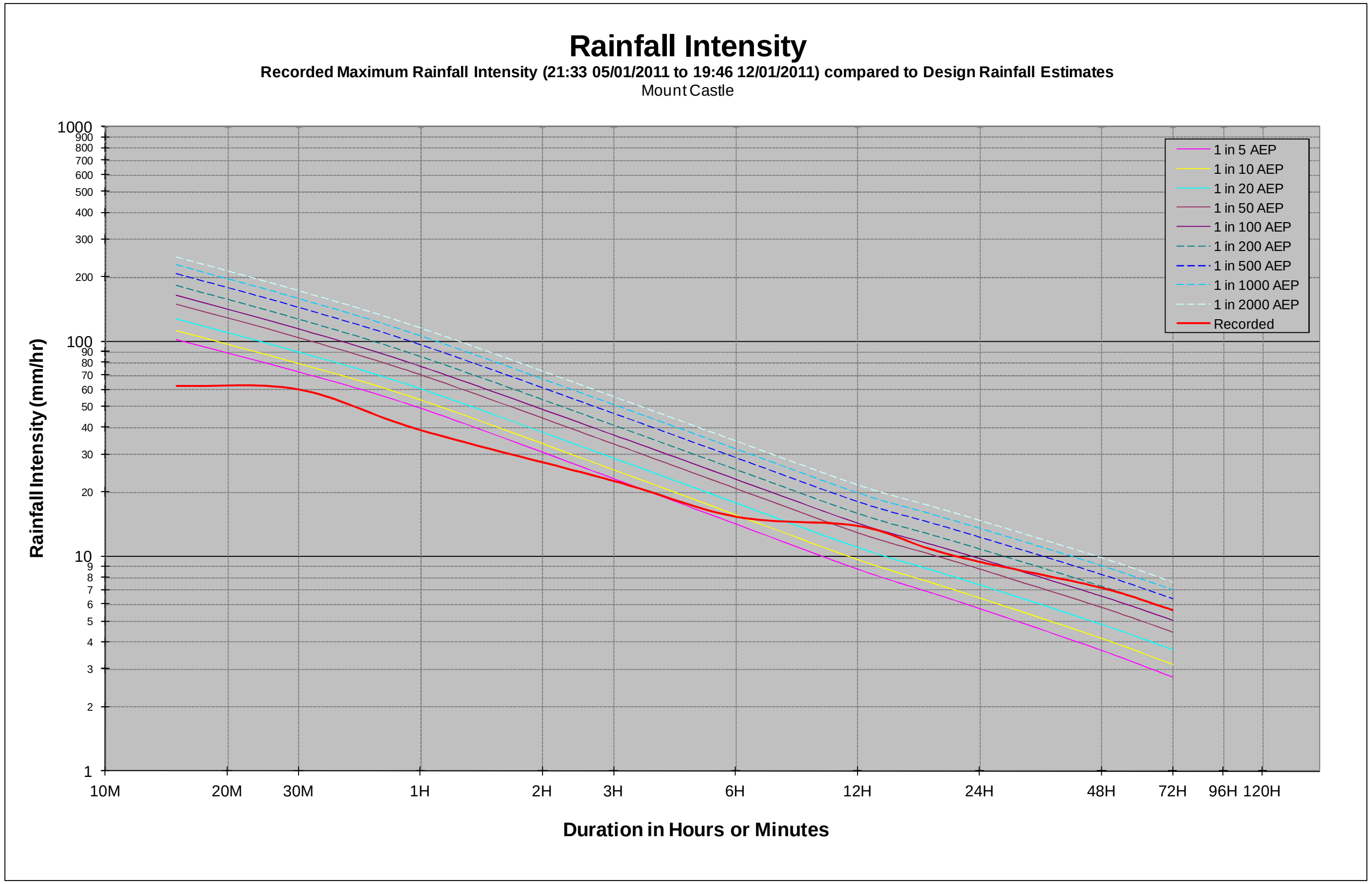
6617 – Little Egypt

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	73.2	06:19 11/01/2011	< 5
30 M	63.2	06:34 11/01/2011	< 5
1 H	47.6	06:34 11/01/2011	5 - 10
3 H	17.8	07:19 11/01/2011	< 5
6 H	9.9	07:19 11/01/2011	< 5
12 H	6.3	16:04 11/01/2011	< 5
18 H	5.0	07:19 11/01/2011	< 5
24 H	4.0	13:19 11/01/2011	< 5
48 H	2.7	16:04 11/01/2011	5 - 10
72 H	2.1	06:49 12/01/2011	5 - 10



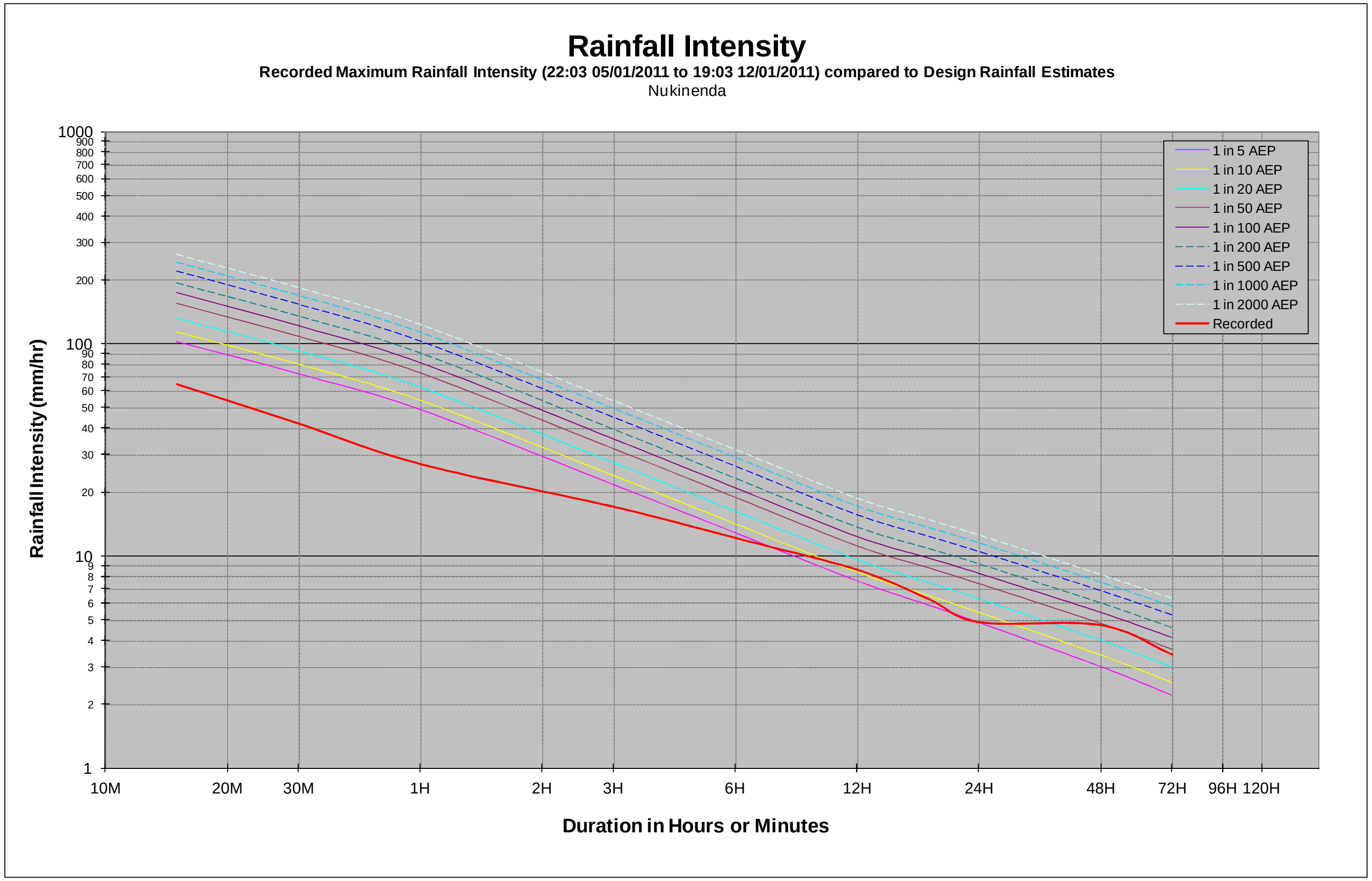
6619 – Mount Castle

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	62.0	08:04 11/01/2011	< 5
30 M	59.6	08:19 11/01/2011	< 5
1 H	38.6	08:19 11/01/2011	< 5
3 H	22.4	10:19 11/01/2011	< 5
6 H	15.3	13:19 11/01/2011	5 - 10
12 H	13.9	17:19 11/01/2011	50 - 100
18 H	10.9	16:34 11/01/2011	50 - 100
24 H	9.4	19:04 11/01/2011	50 - 100
48 H	7.1	19:49 11/01/2011	100 - 200
72 H	5.6	06:49 12/01/2011	200 - 500



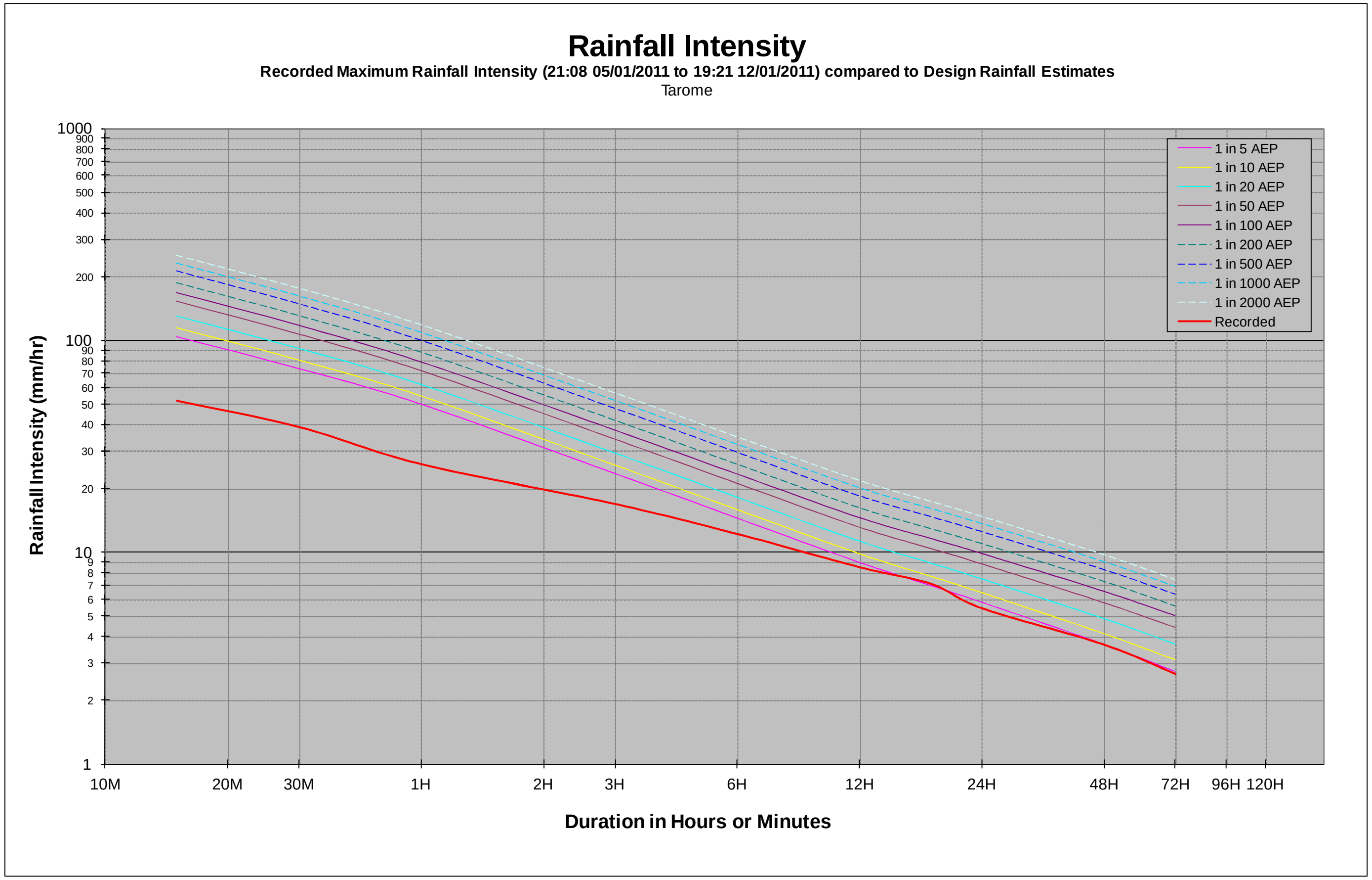
6621 – Nukinenda

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	64.4	04:19 11/01/2011	< 5
30 M	42.0	04:34 11/01/2011	< 5
1 H	27.1	04:49 11/01/2011	< 5
3 H	17.1	18:49 09/01/2011	< 5
6 H	12.2	19:19 09/01/2011	< 5
12 H	8.6	23:19 09/01/2011	10 - 20
18 H	6.3	00:19 10/01/2011	5 - 10
24 H	4.9	00:34 10/01/2011	5 - 10
48 H	4.7	10:19 11/01/2011	20 - 50
72 H	3.4	19:49 11/01/2011	20 - 50



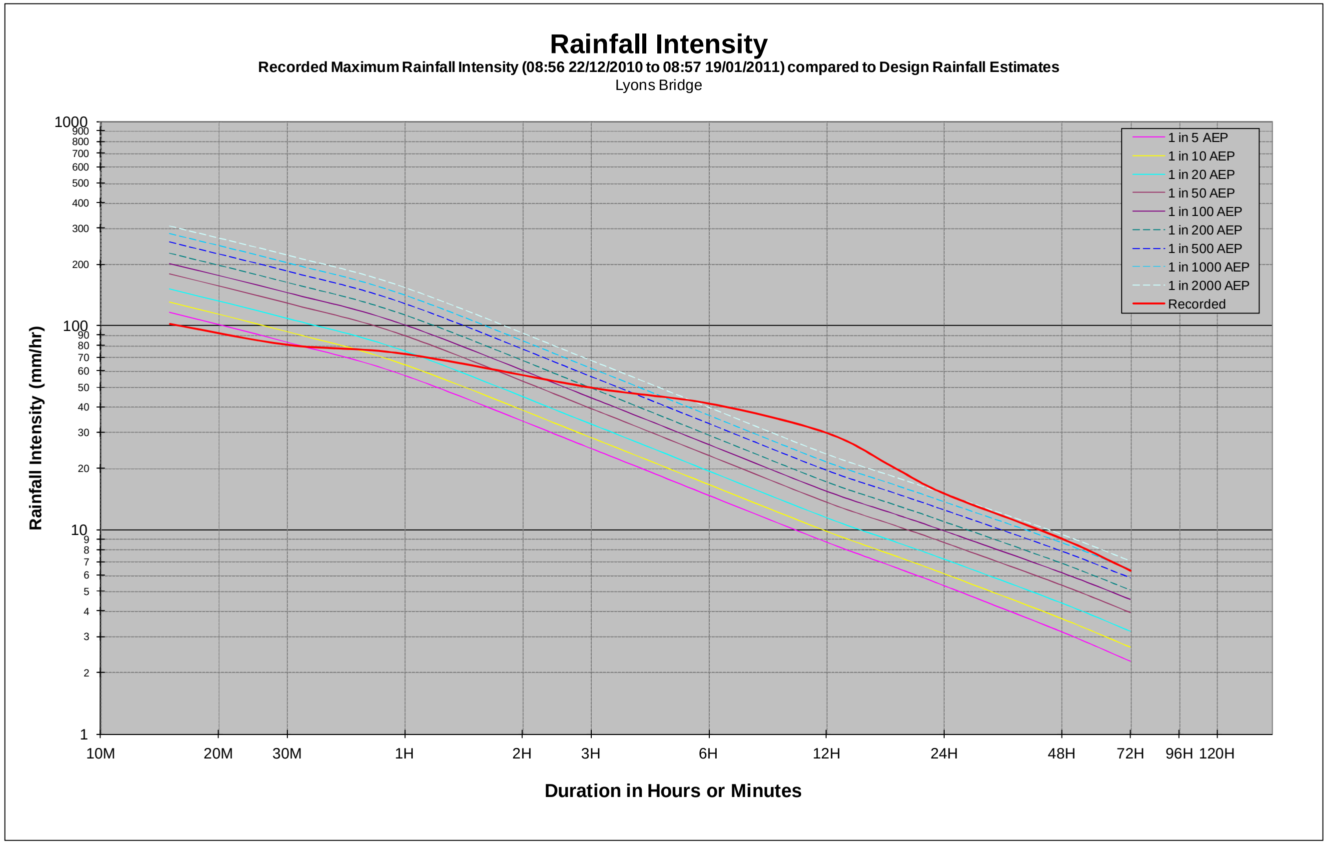
6623 – Tarome

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	51.6	13:38 11/01/2011	< 5
30 M	38.8	13:53 11/01/2011	< 5
1 H	25.9	13:53 11/01/2011	< 5
3 H	16.8	15:38 11/01/2011	< 5
6 H	12.1	14:53 11/01/2011	< 5
12 H	8.5	19:23 11/01/2011	< 5
18 H	7.1	16:23 11/01/2011	5 - 10
24 H	5.4	19:08 11/01/2011	< 5
48 H	3.6	00:08 12/01/2011	< 5
72 H	2.7	19:38 11/01/2011	< 5



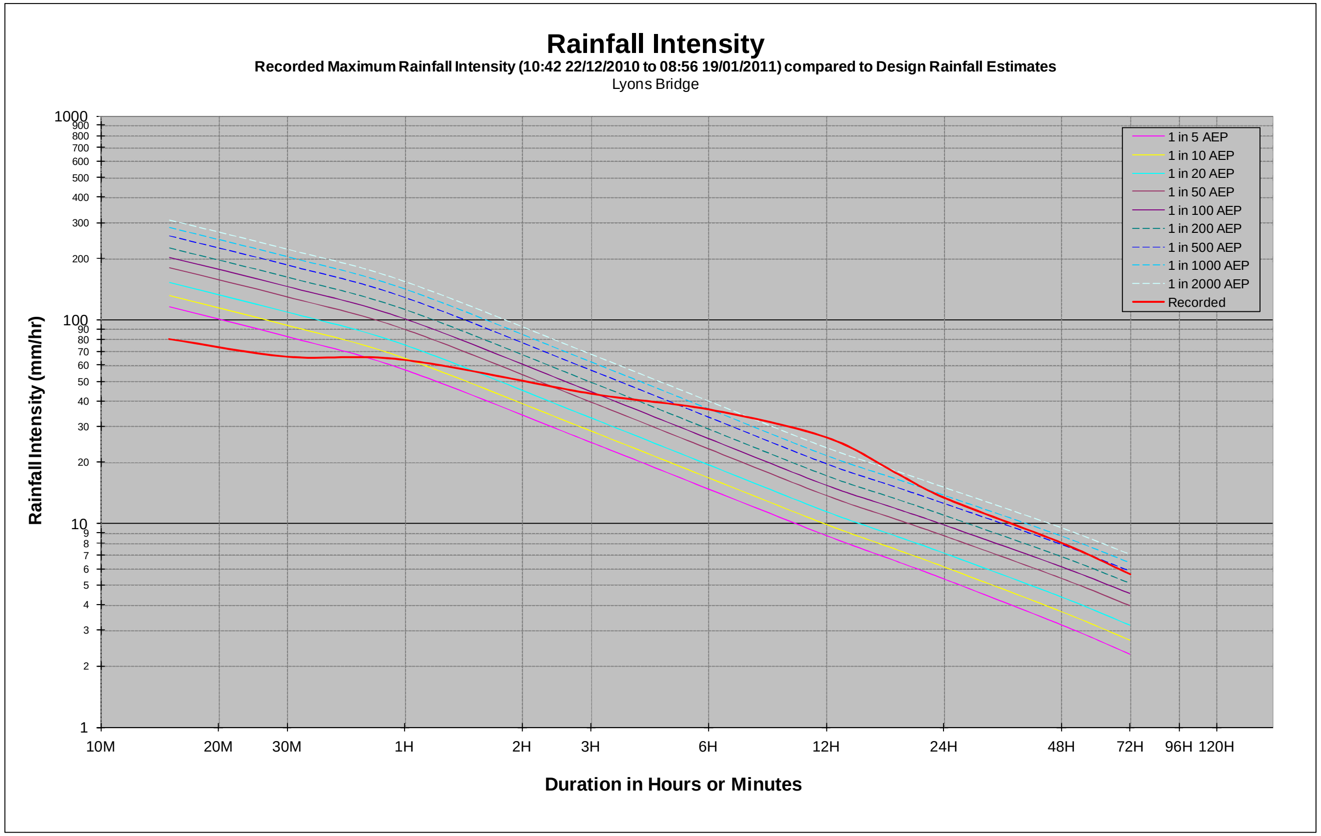
6630 – Lyons Bridge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	101.6	13:42 11/01/2011	< 5
30 M	80.4	13:57 11/01/2011	< 5
1 H	72.5	13:42 11/01/2011	10 - 20
3 H	49.6	13:57 11/01/2011	200 - 500
6 H	41.5	14:42 11/01/2011	> 2000
12 H	29.8	14:57 11/01/2011	> 2000
18 H	20.0	20:57 11/01/2011	> 2000
24 H	15.1	02:57 12/01/2011	> 2000
48 H	9.1	14:57 11/01/2011	1000 - 2000
72 H	6.3	03:27 12/01/2011	500 - 1000



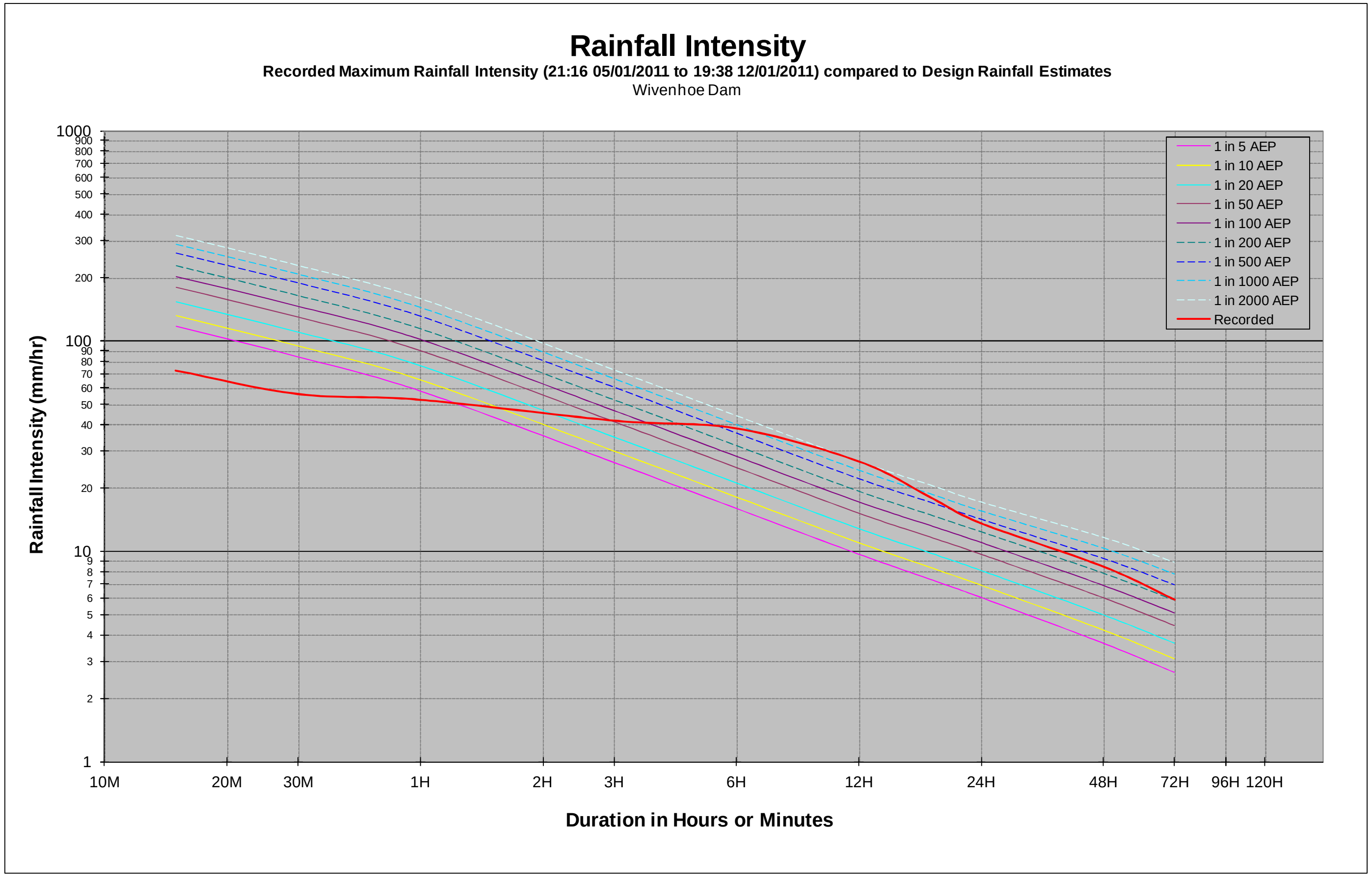
6633 – Lyons Bridge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	80.8	12:57 11/01/2011	< 5
30 M	66.2	13:57 11/01/2011	< 5
1 H	63.8	13:42 11/01/2011	5 - 10
3 H	43.6	13:57 11/01/2011	50 - 100
6 H	36.4	14:42 11/01/2011	500 - 1000
12 H	26.6	16:12 11/01/2011	> 2000
18 H	17.8	18:27 11/01/2011	1000 - 2000
24 H	13.4	18:27 11/01/2011	500 - 1000
48 H	8.0	14:57 11/01/2011	500 - 1000
72 H	5.6	01:27 12/01/2011	200 - 500



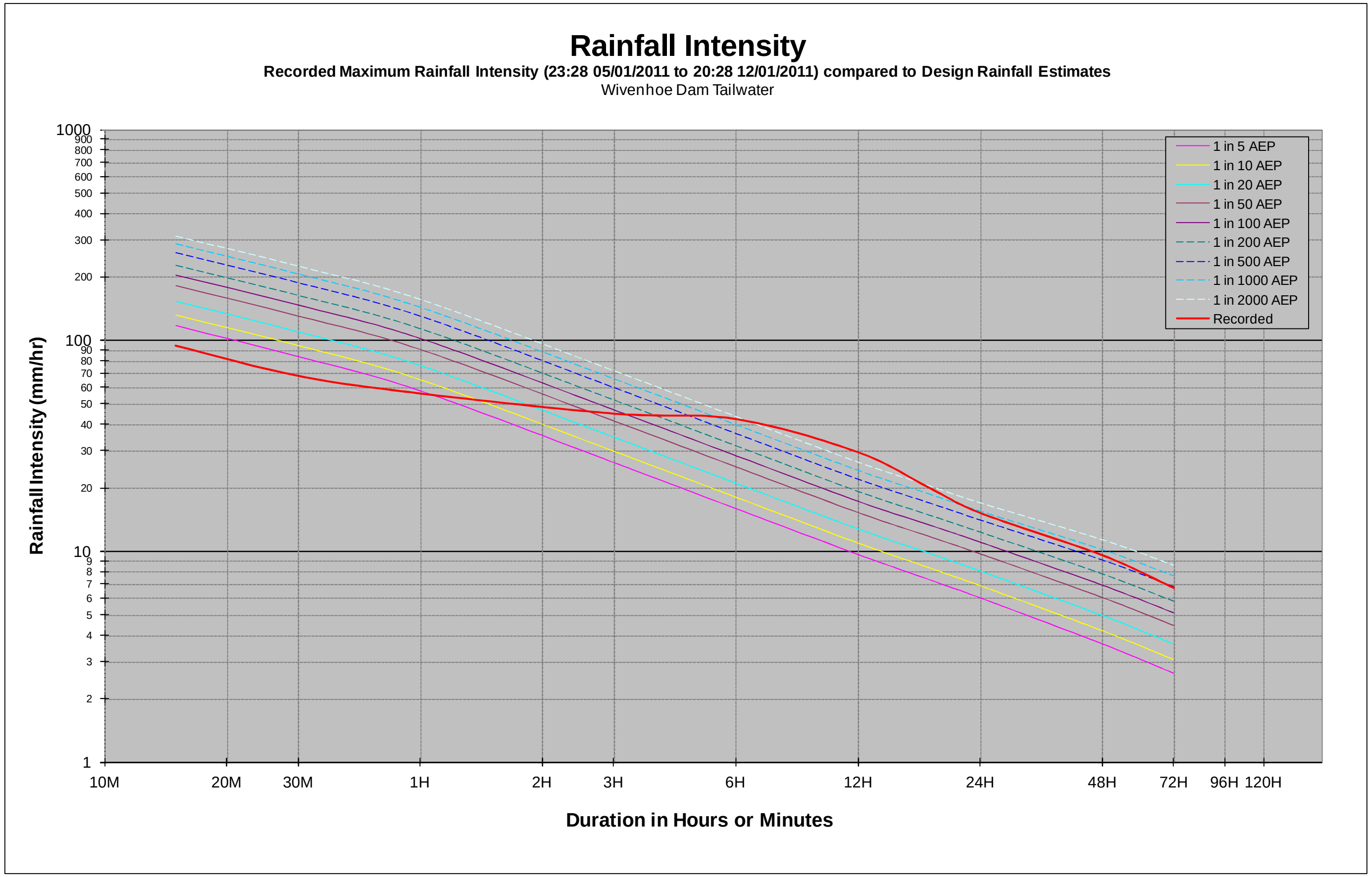
6636 – Wivenhoe Dam

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	72.4	13:17 11/01/2011	< 5
30 M	56.0	13:32 11/01/2011	< 5
1 H	52.6	13:17 11/01/2011	< 5
3 H	41.9	14:17 11/01/2011	50 - 100
6 H	38.5	14:02 11/01/2011	500 - 1000
12 H	26.8	16:32 11/01/2011	> 2000
18 H	18.1	19:47 11/01/2011	500 - 1000
24 H	13.6	19:47 11/01/2011	200 - 500
48 H	8.5	15:17 11/01/2011	200 - 500
72 H	5.9	23:17 11/01/2011	200 - 500



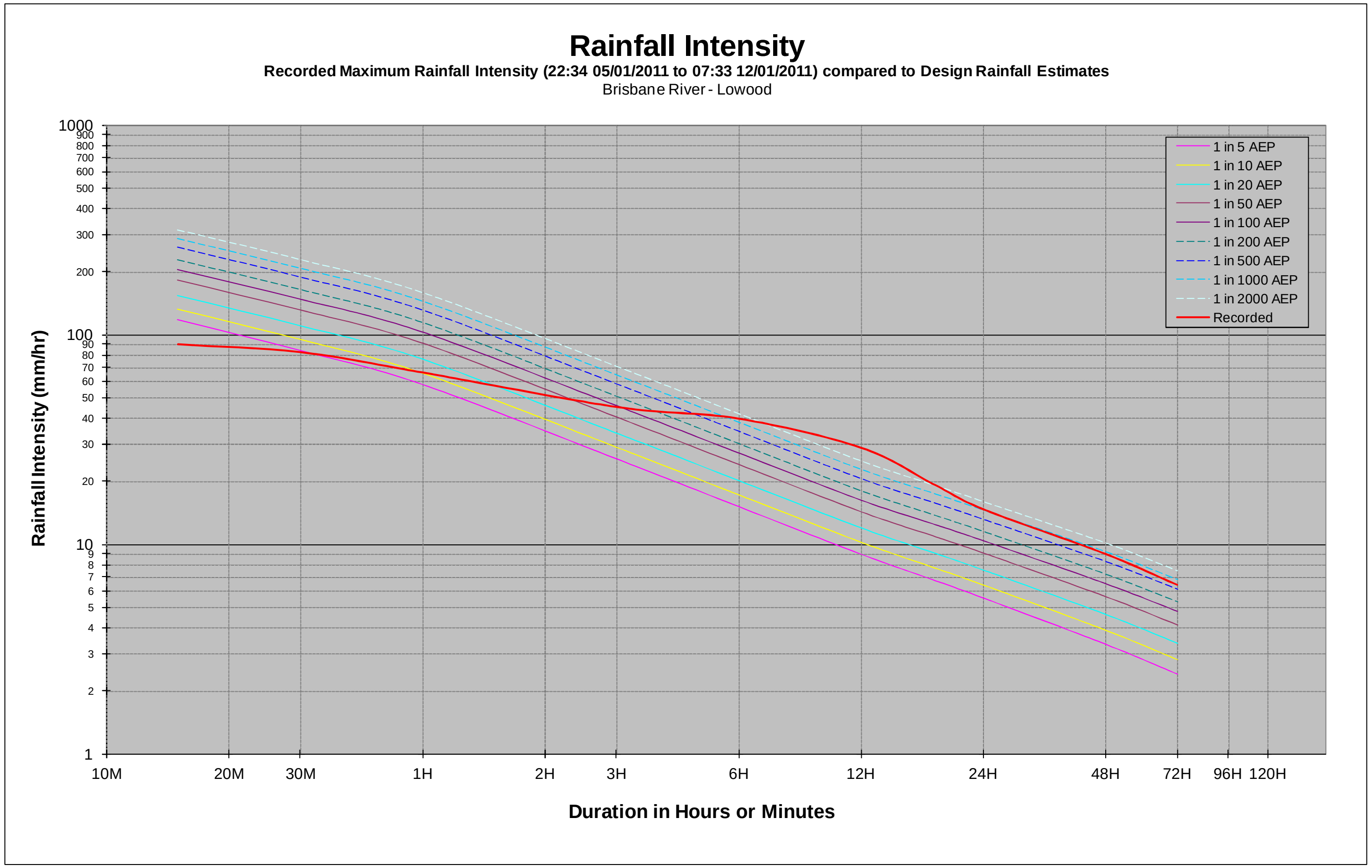
6643 – Wivenhoe Dam Tailwater

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	94.0	09:14 11/01/2011	< 5
30 M	67.6	13:29 11/01/2011	< 5
1 H	55.8	13:29 11/01/2011	< 5
3 H	44.8	13:44 11/01/2011	50 - 100
6 H	42.2	13:59 11/01/2011	1000 - 2000
12 H	29.4	16:29 11/01/2011	> 2000
18 H	19.9	19:29 11/01/2011	1000 - 2000
24 H	15.1	19:14 11/01/2011	500 - 1000
48 H	9.5	14:44 11/01/2011	500 - 1000
72 H	6.7	02:59 12/01/2011	200 - 500



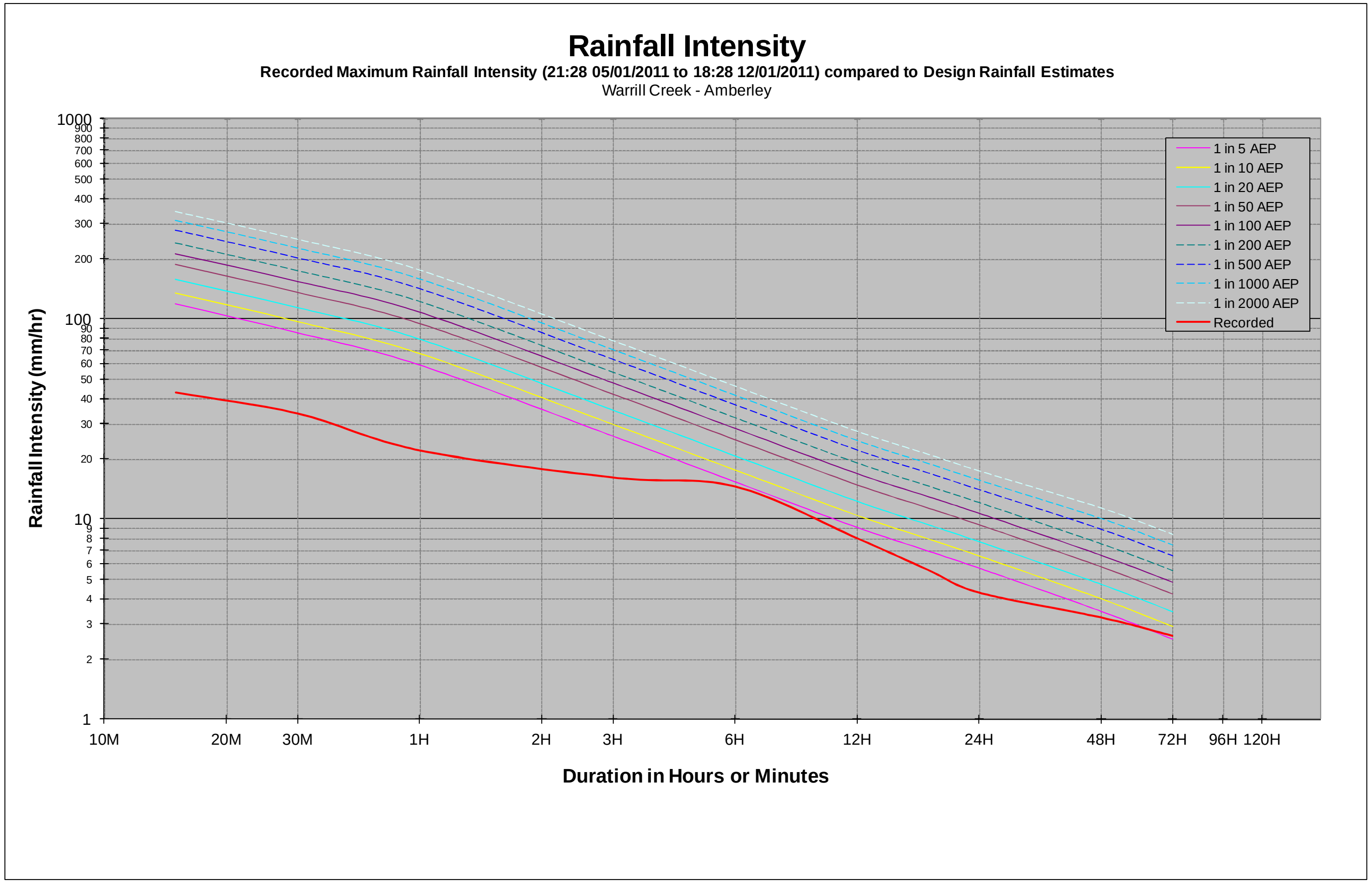
6649 – Brisbane River – Lowood

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	90.4	13:34 11/01/2011	< 5
30 M	83.0	13:34 11/01/2011	< 5
1 H	66.3	13:49 11/01/2011	10 - 20
3 H	45.4	09:34 11/01/2011	50 - 100
6 H	40.0	14:04 11/01/2011	1000 - 2000
12 H	29.0	14:49 11/01/2011	> 2000
18 H	19.6	19:34 11/01/2011	> 2000
24 H	14.8	19:19 11/01/2011	1000 - 2000
48 H	9.0	14:49 11/01/2011	500 - 1000
72 H	6.4	01:19 12/01/2011	500 - 1000



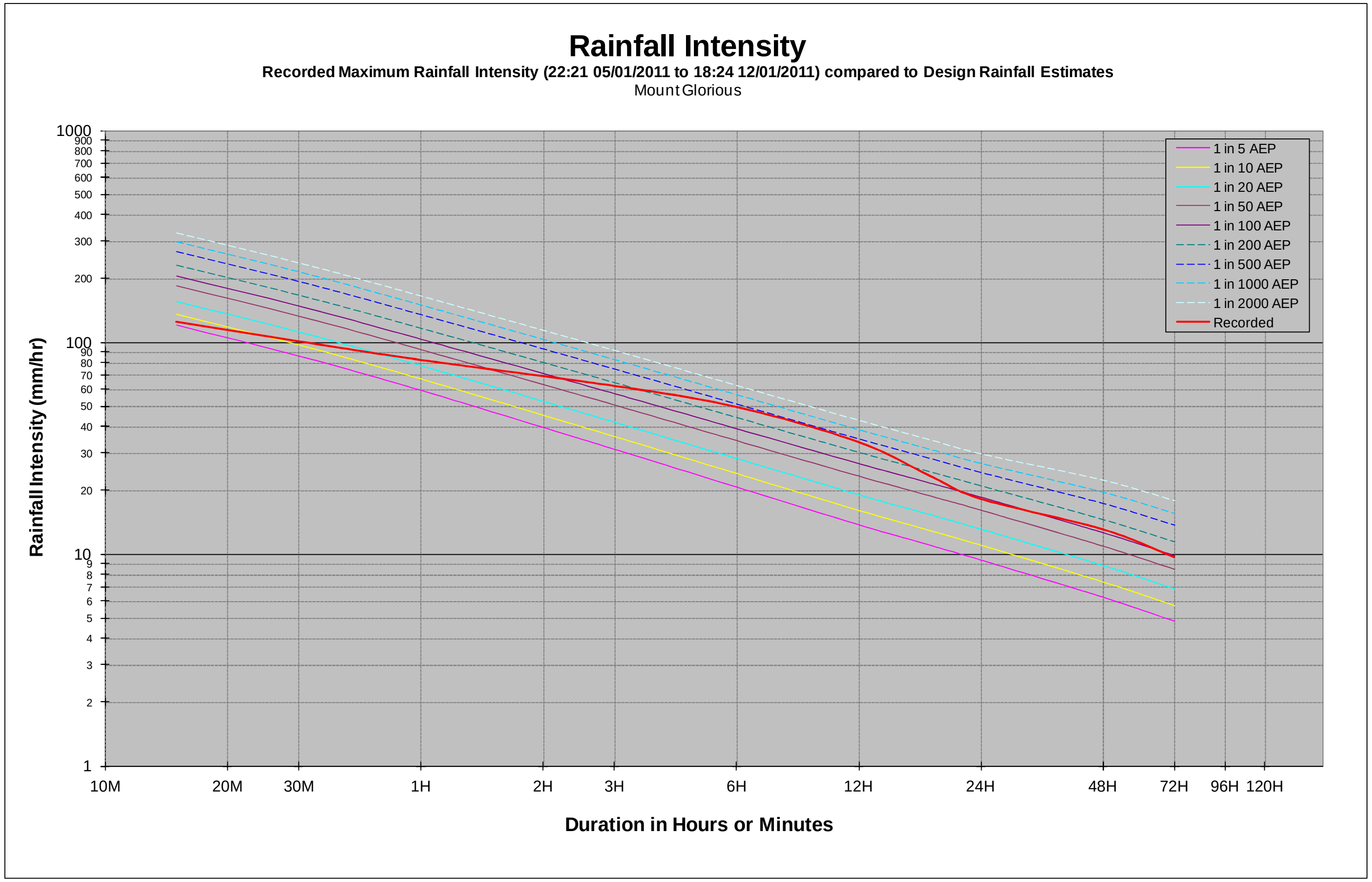
6651 – Warrill Creek – Amberley

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	42.8	11:29 11/01/2011	< 5
30 M	33.6	11:29 11/01/2011	< 5
1 H	22.0	11:44 09/01/2011	< 5
3 H	16.1	11:59 11/01/2011	< 5
6 H	14.5	14:59 11/01/2011	< 5
12 H	8.0	17:14 11/01/2011	< 5
18 H	5.6	18:44 11/01/2011	< 5
24 H	4.3	18:44 11/01/2011	< 5
48 H	3.2	16:44 11/01/2011	< 5
72 H	2.6	18:44 11/01/2011	5 - 10



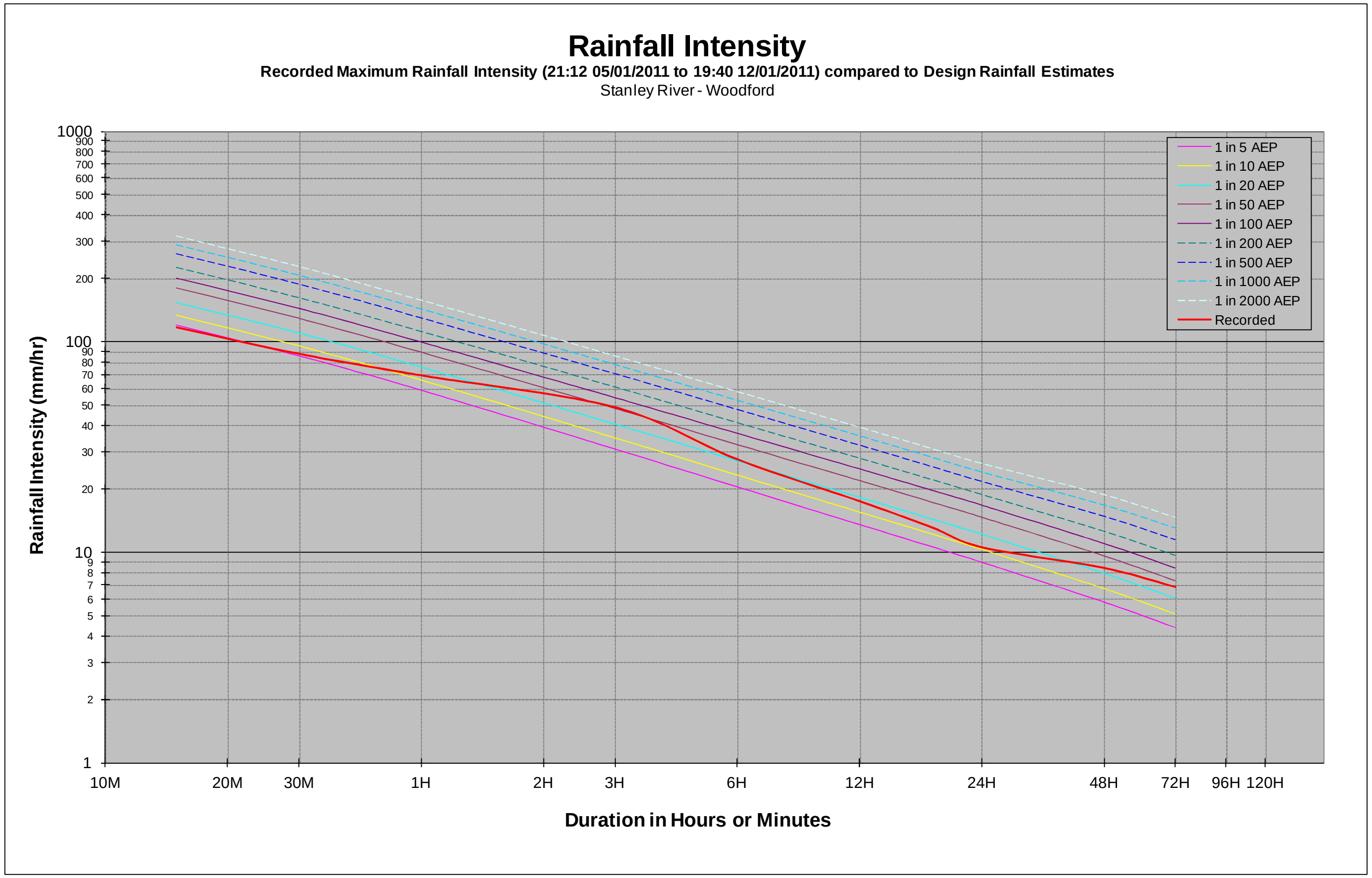
6680 – Mount Glorious

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	125.6	08:52 11/01/2011	5 - 10
30 M	101.6	08:52 11/01/2011	10 - 20
1 H	82.9	08:52 11/01/2011	20 - 50
3 H	62.5	10:37 11/01/2011	100 - 200
6 H	49.7	12:52 11/01/2011	200 - 500
12 H	33.9	15:37 11/01/2011	200 - 500
18 H	23.5	19:22 11/01/2011	100 - 200
24 H	18.3	19:07 11/01/2011	50 - 100
48 H	13.1	14:37 11/01/2011	100 - 200
72 H	9.7	05:22 12/01/2011	50 - 100



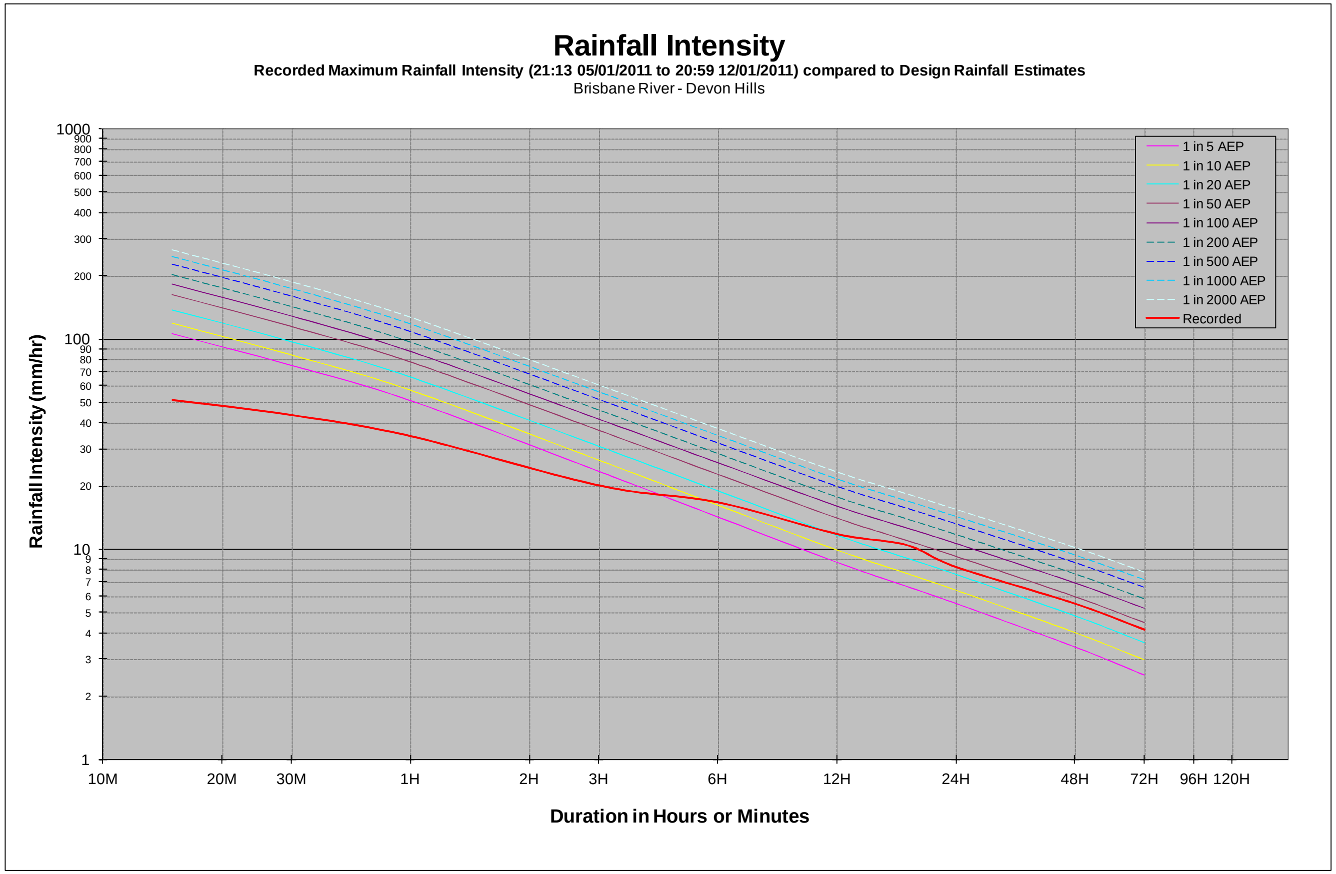
6705 – Stanley River – Woodford

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	116.8	10:58 11/01/2011	< 5
30 M	87.4	11:13 11/01/2011	5 - 10
1 H	69.0	11:43 11/01/2011	10 - 20
3 H	48.6	13:28 11/01/2011	50 - 100
6 H	27.5	15:13 11/01/2011	20 - 50
12 H	17.4	15:58 11/01/2011	10 - 20
18 H	13.1	18:28 11/01/2011	10 - 20
24 H	10.5	18:28 11/01/2011	10 - 20
48 H	8.4	13:28 11/01/2011	20 - 50
72 H	6.8	18:28 11/01/2011	20 - 50



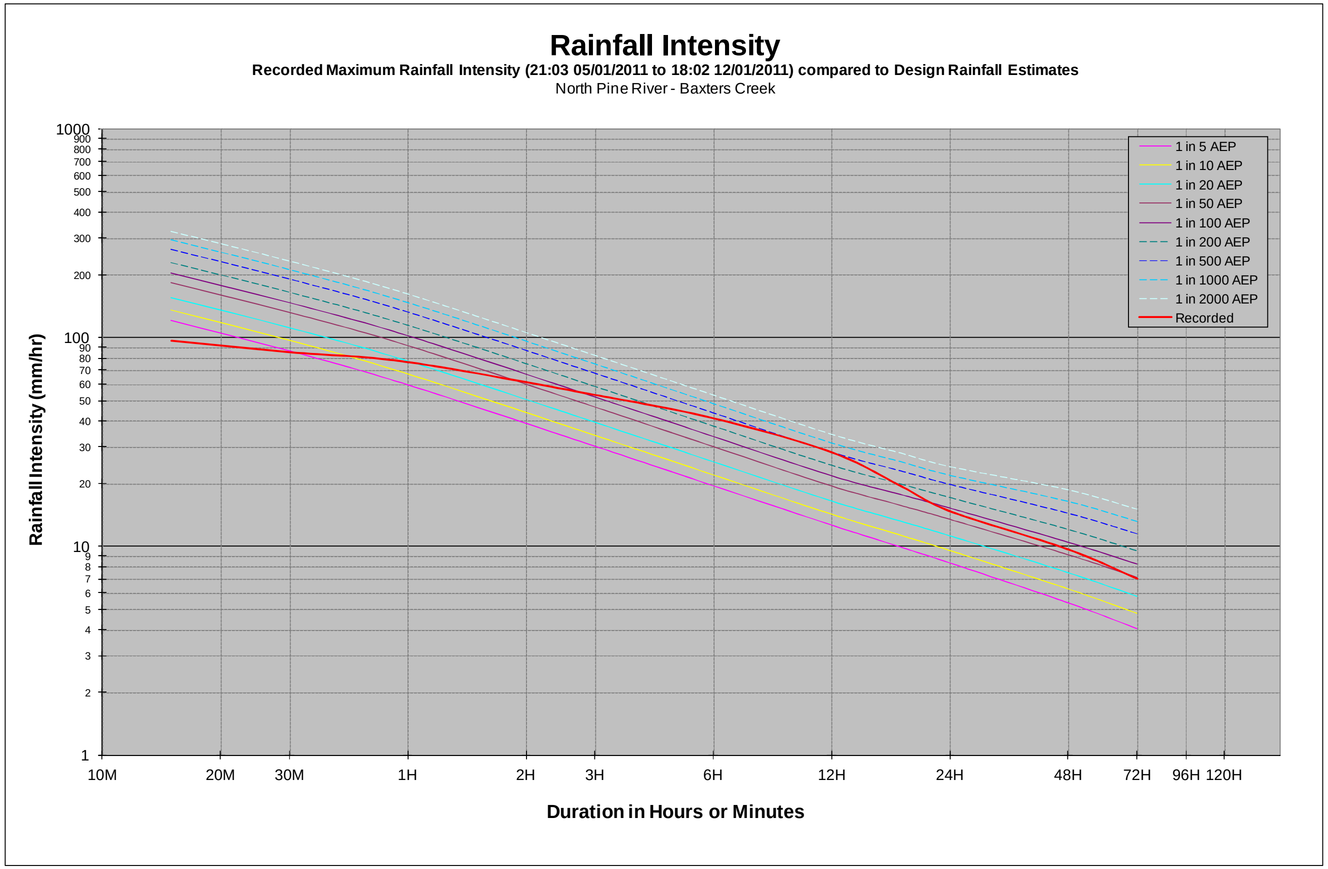
6708 – Brisbane River – Devon Hills

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	51.2	14:28 09/01/2011	< 5
30 M	43.4	14:43 09/01/2011	< 5
1 H	34.5	14:58 09/01/2011	< 5
3 H	20.1	15:13 09/01/2011	< 5
6 H	16.7	18:58 09/01/2011	10 - 20
12 H	11.8	00:13 10/01/2011	20 - 50
18 H	10.5	23:58 09/01/2011	20 - 50
24 H	8.3	02:43 10/01/2011	20 - 50
48 H	5.5	04:58 11/01/2011	20 - 50
72 H	4.2	18:43 11/01/2011	20 - 50



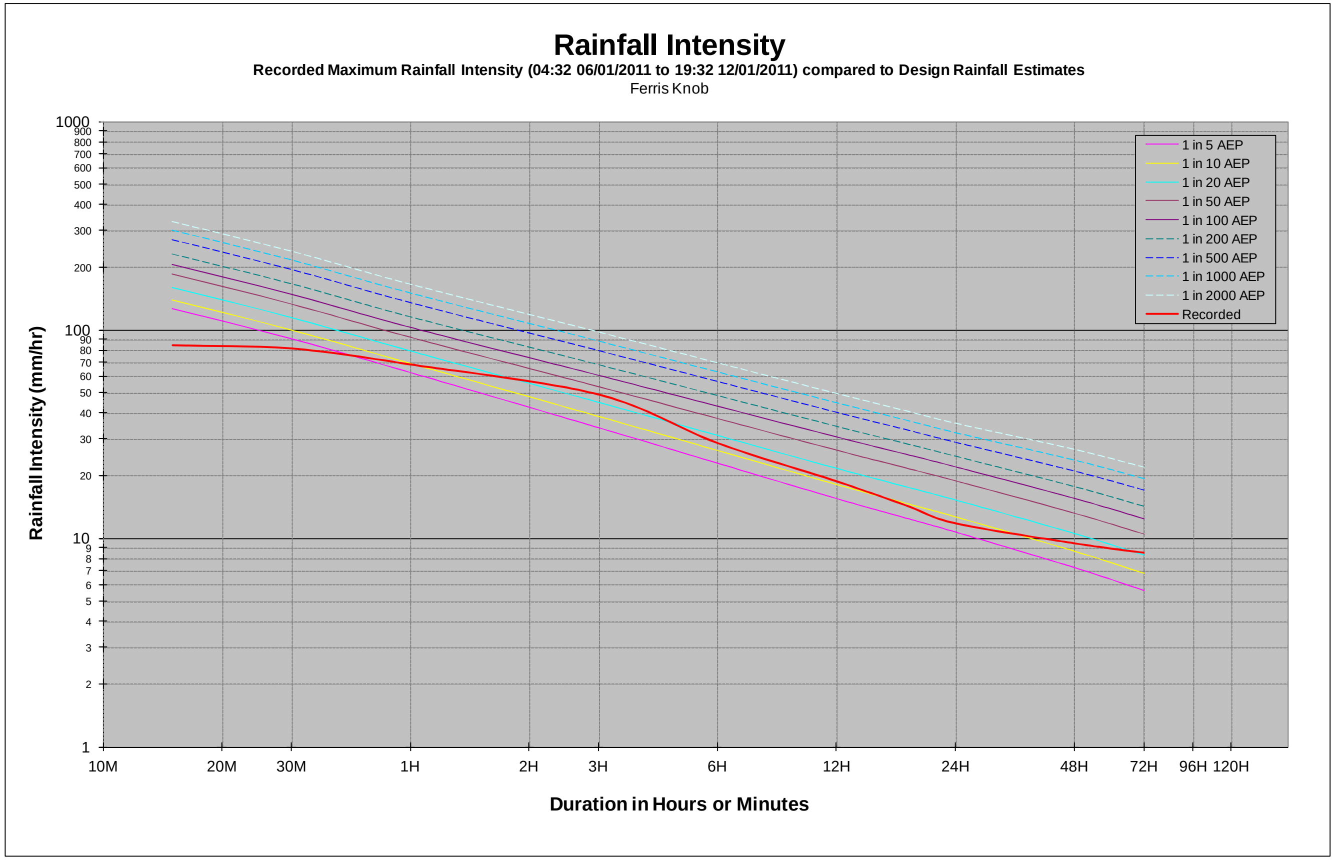
6711 – North Pine River – Baxters Creek

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	96.8	09:48 11/01/2011	< 5
30 M	85.4	09:48 11/01/2011	< 5
1 H	76.5	10:03 11/01/2011	10 - 20
3 H	53.2	11:48 11/01/2011	100 - 200
6 H	41.2	11:18 11/01/2011	200 - 500
12 H	28.3	15:03 11/01/2011	200 - 500
18 H	19.5	18:48 11/01/2011	100 - 200
24 H	14.8	17:48 11/01/2011	50 - 100
48 H	9.7	14:18 11/01/2011	50 - 100
72 H	7.0	15:03 11/01/2011	20 - 50



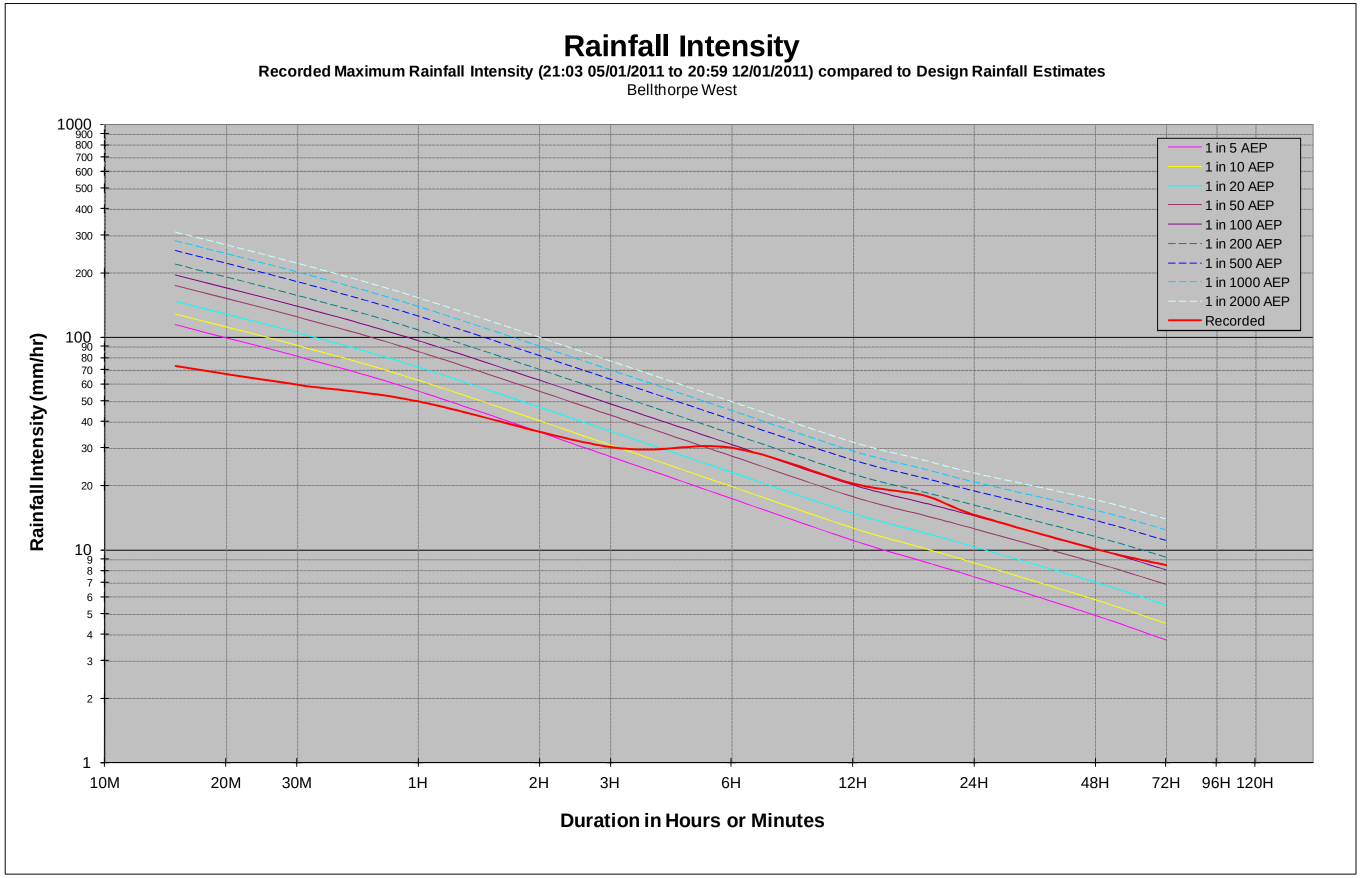
6714 – Ferris Knob

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	84.4	10:48 11/01/2011	< 5
30 M	81.4	11:03 11/01/2011	< 5
1 H	68.3	11:18 11/01/2011	5 - 10
3 H	48.9	13:18 11/01/2011	20 - 50
6 H	28.6	14:33 11/01/2011	10 - 20
12 H	18.8	18:48 11/01/2011	10 - 20
18 H	14.4	18:48 11/01/2011	5 - 10
24 H	11.8	04:18 10/01/2011	5 - 10
48 H	9.5	14:18 11/01/2011	10 - 20
72 H	8.5	02:33 12/01/2011	20 - 50



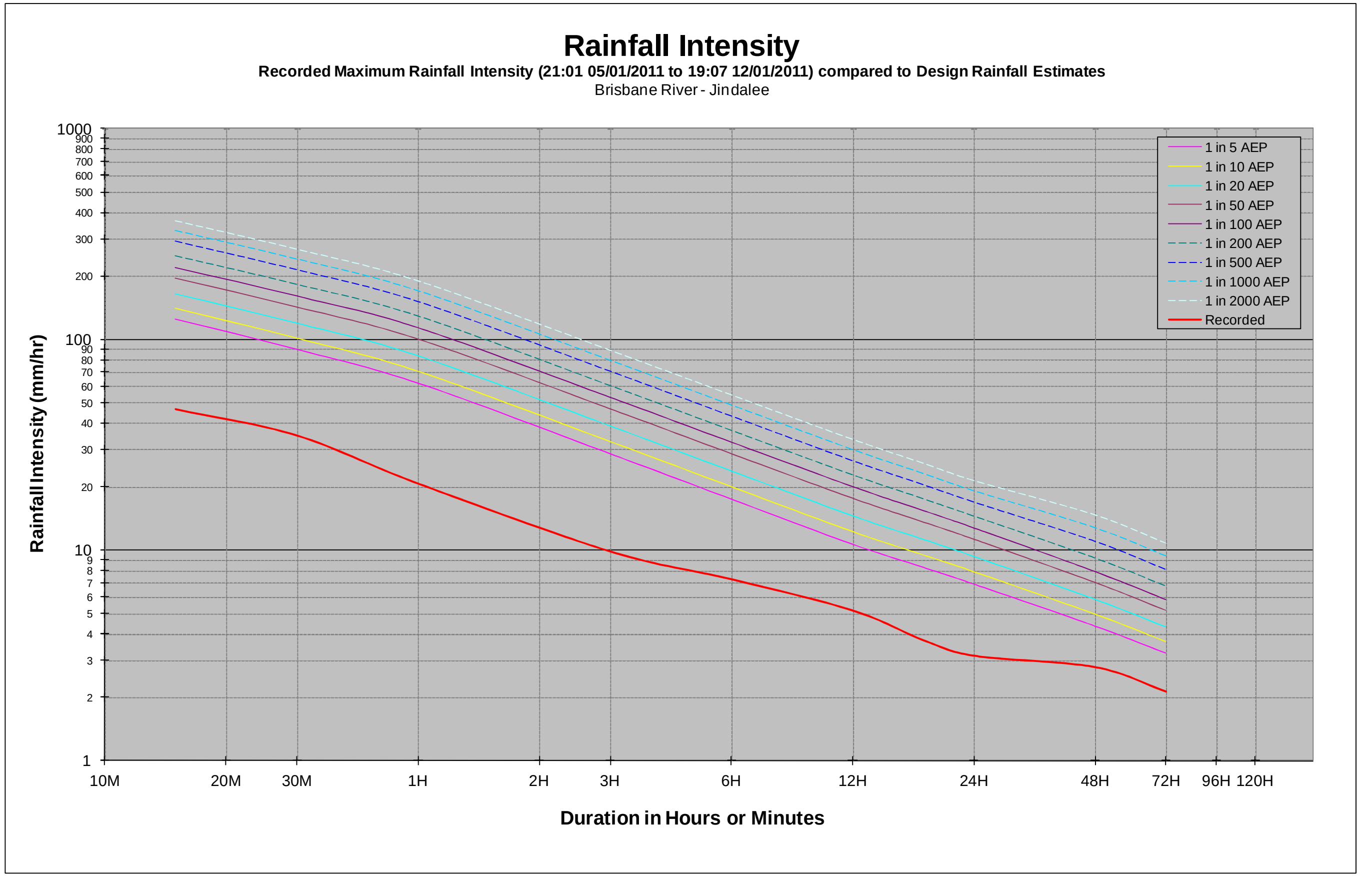
6716 – Bellthorpe West

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	73.2	13:49 09/01/2011	< 5
30 M	59.8	13:49 09/01/2011	< 5
1 H	49.9	14:04 09/01/2011	< 5
3 H	30.4	16:04 09/01/2011	5 - 10
6 H	30.1	19:04 09/01/2011	50 - 100
12 H	20.4	22:19 09/01/2011	100 - 200
18 H	18.0	23:04 09/01/2011	100 - 200
24 H	14.6	04:34 10/01/2011	100 - 200
48 H	10.0	05:04 11/01/2011	50 - 100
72 H	8.4	01:34 12/01/2011	100 - 200



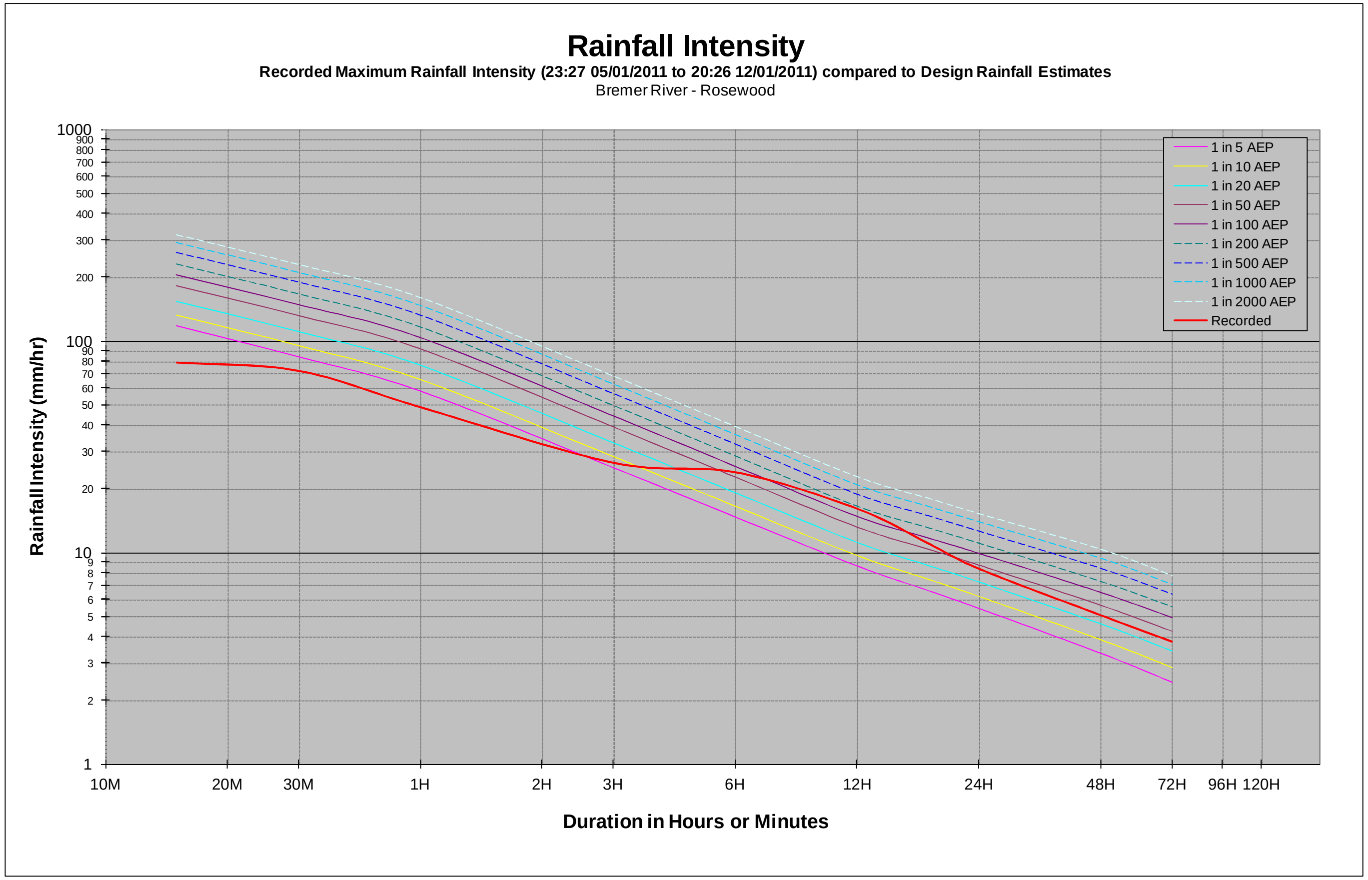
6730 – Brisbane River – Jindalee

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	46.4	10:46 11/01/2011	< 5
30 M	34.8	10:46 11/01/2011	< 5
1 H	20.6	11:16 11/01/2011	< 5
3 H	9.8	13:16 11/01/2011	< 5
6 H	7.3	14:31 11/01/2011	< 5
12 H	5.2	16:16 11/01/2011	< 5
18 H	3.7	19:46 11/01/2011	< 5
24 H	3.2	10:01 10/01/2011	< 5
48 H	2.8	15:01 11/01/2011	< 5
72 H	2.1	19:46 11/01/2011	< 5



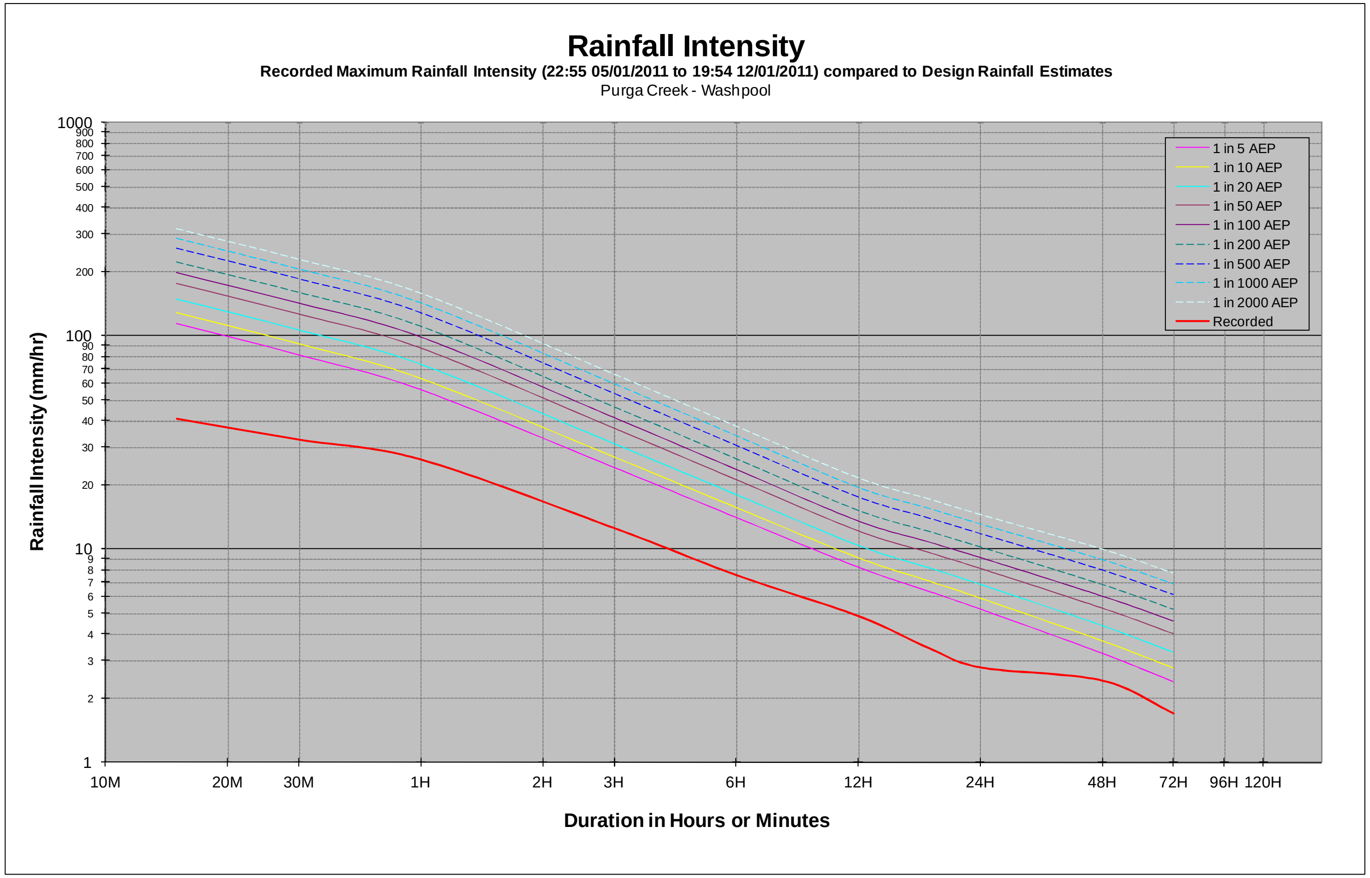
6733 – Bremer River – Rosewood

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	78.8	09:27 11/01/2011	< 5
30 M	72.0	09:42 11/01/2011	< 5
1 H	48.5	09:57 11/01/2011	< 5
3 H	26.5	10:12 11/01/2011	5 - 10
6 H	23.9	14:12 11/01/2011	50 - 100
12 H	16.1	17:57 11/01/2011	100 - 200
18 H	11.0	18:12 11/01/2011	50 - 100
24 H	8.4	18:12 11/01/2011	20 - 50
48 H	5.1	18:12 11/01/2011	20 - 50
72 H	3.8	18:12 11/01/2011	20 - 50



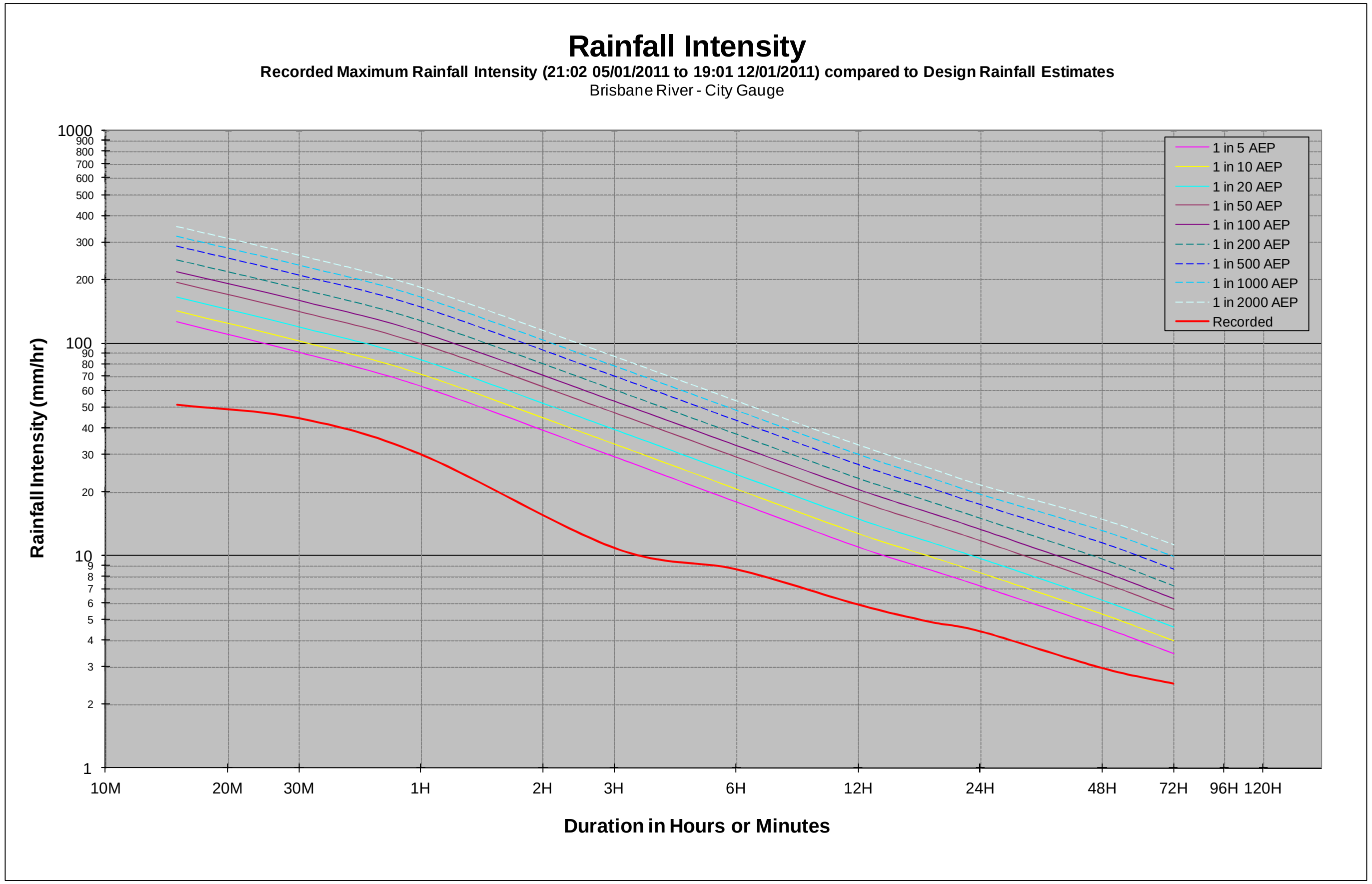
6739 – Purga Creek – Washpool

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	40.8	09:55 10/01/2011	< 5
30 M	32.6	10:10 10/01/2011	< 5
1 H	26.3	10:25 10/01/2011	< 5
3 H	12.5	12:10 10/01/2011	< 5
6 H	7.6	12:10 10/01/2011	< 5
12 H	4.9	15:10 10/01/2011	< 5
18 H	3.4	20:55 10/01/2011	< 5
24 H	2.8	02:25 11/01/2011	< 5
48 H	2.4	17:25 11/01/2011	< 5
72 H	1.7	00:10 12/01/2011	< 5



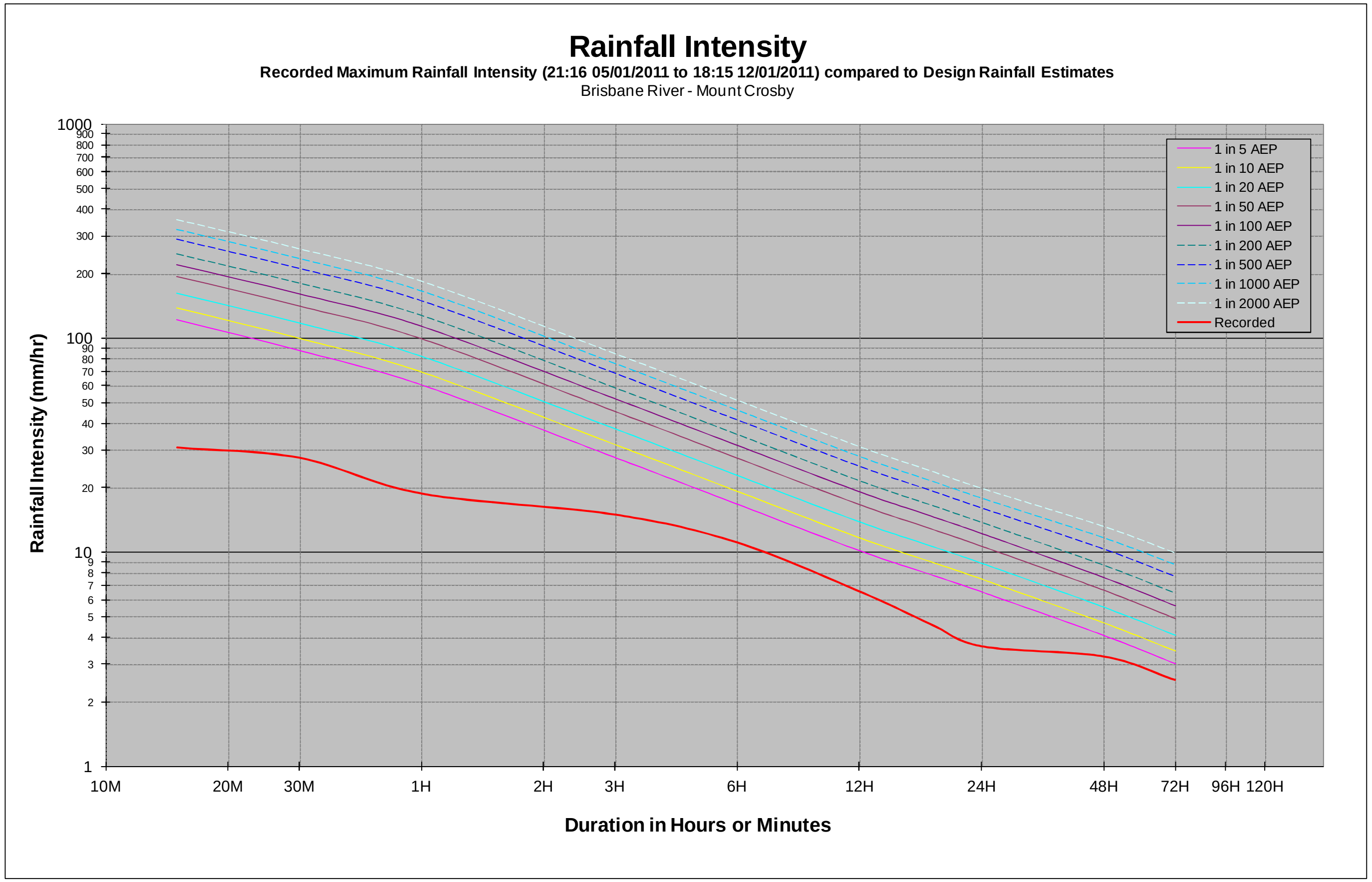
6748 – Brisbane River – City Gauge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	51.2	15:47 09/01/2011	< 5
30 M	44.2	16:02 09/01/2011	< 5
1 H	29.9	16:02 09/01/2011	< 5
3 H	10.9	17:47 09/01/2011	< 5
6 H	8.6	21:17 09/01/2011	< 5
12 H	5.9	21:17 09/01/2011	< 5
18 H	4.9	01:17 10/01/2011	< 5
24 H	4.4	09:32 10/01/2011	< 5
48 H	3.0	15:17 11/01/2011	< 5
72 H	2.5	18:17 11/01/2011	< 5



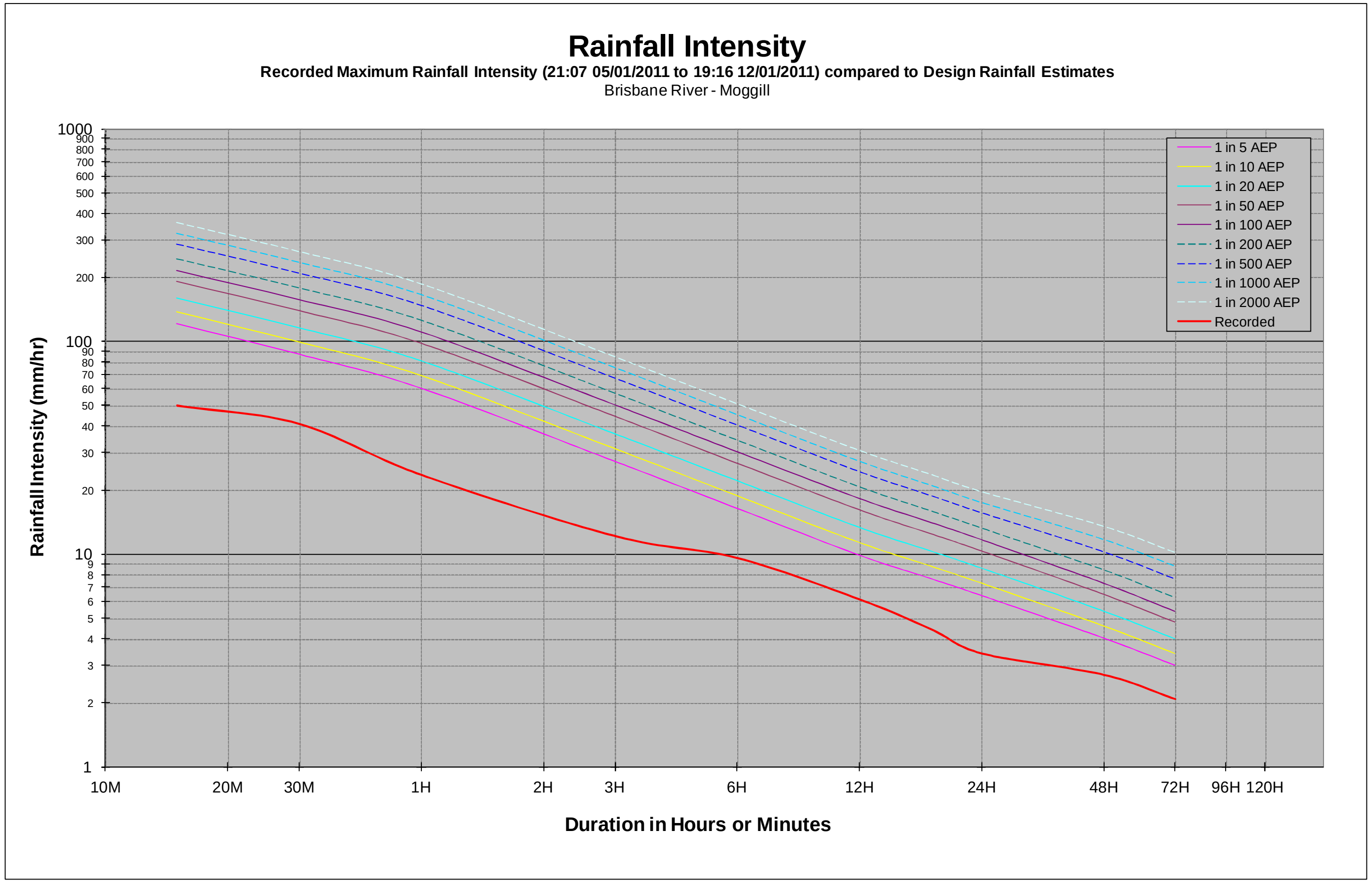
6751 – Brisbane River – Mount Crosby

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	30.8	08:01 10/01/2011	< 5
30 M	27.6	12:31 11/01/2011	< 5
1 H	18.8	12:31 11/01/2011	< 5
3 H	15.0	13:31 11/01/2011	< 5
6 H	11.1	14:46 11/01/2011	< 5
12 H	6.6	16:46 11/01/2011	< 5
18 H	4.6	20:31 11/01/2011	< 5
24 H	3.7	18:46 11/01/2011	< 5
48 H	3.3	15:16 11/01/2011	< 5
72 H	2.5	21:31 11/01/2011	< 5



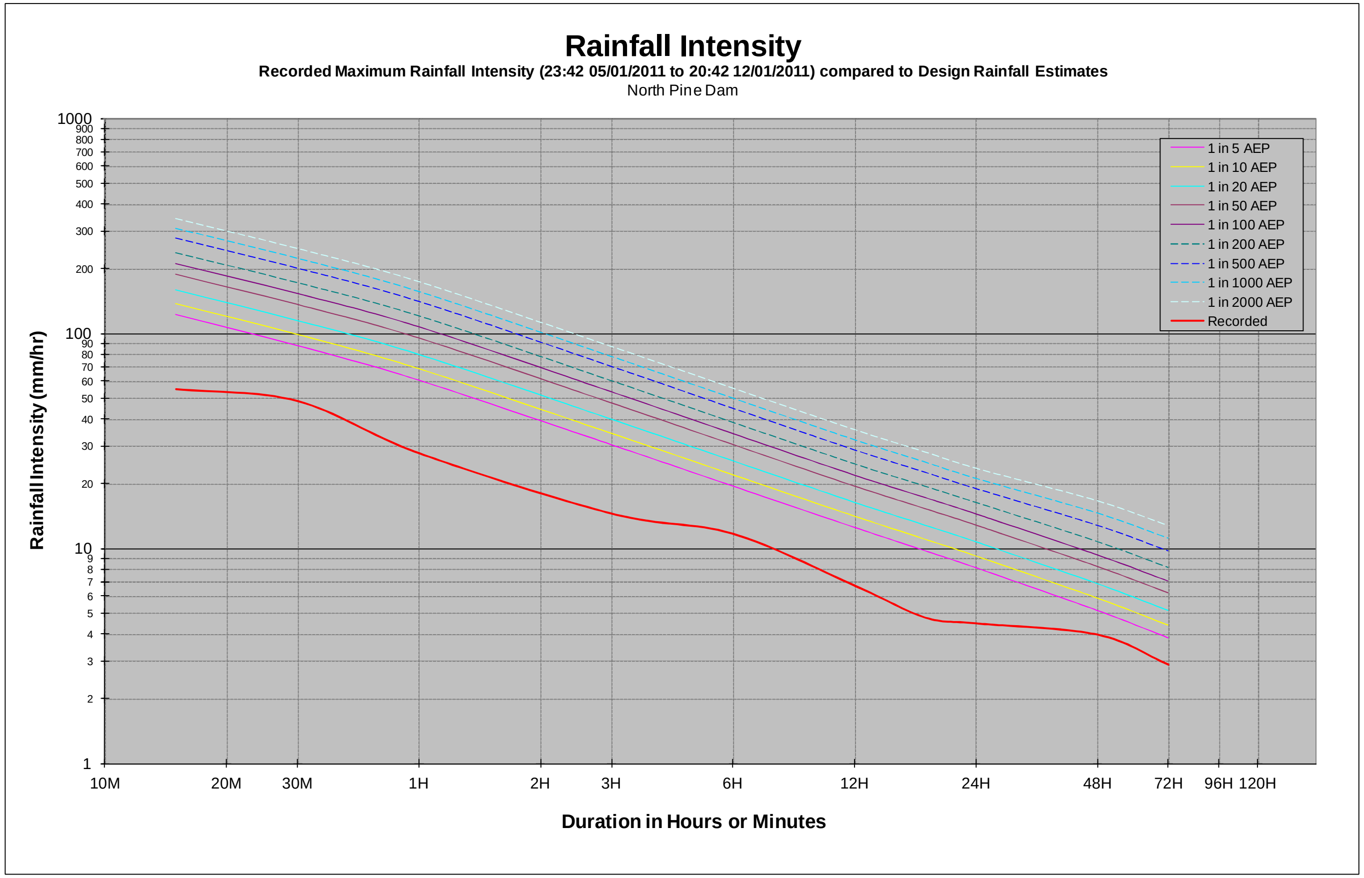
6754 – Brisbane River – Moggill

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.0	09:07 07/01/2011	< 5
30 M	41.0	09:22 07/01/2011	< 5
1 H	23.6	11:22 11/01/2011	< 5
3 H	12.2	13:37 11/01/2011	< 5
6 H	9.6	14:37 11/01/2011	< 5
12 H	6.1	16:52 11/01/2011	< 5
18 H	4.4	15:07 11/01/2011	< 5
24 H	3.4	16:52 11/01/2011	< 5
48 H	2.7	15:07 11/01/2011	< 5
72 H	2.1	16:52 11/01/2011	< 5



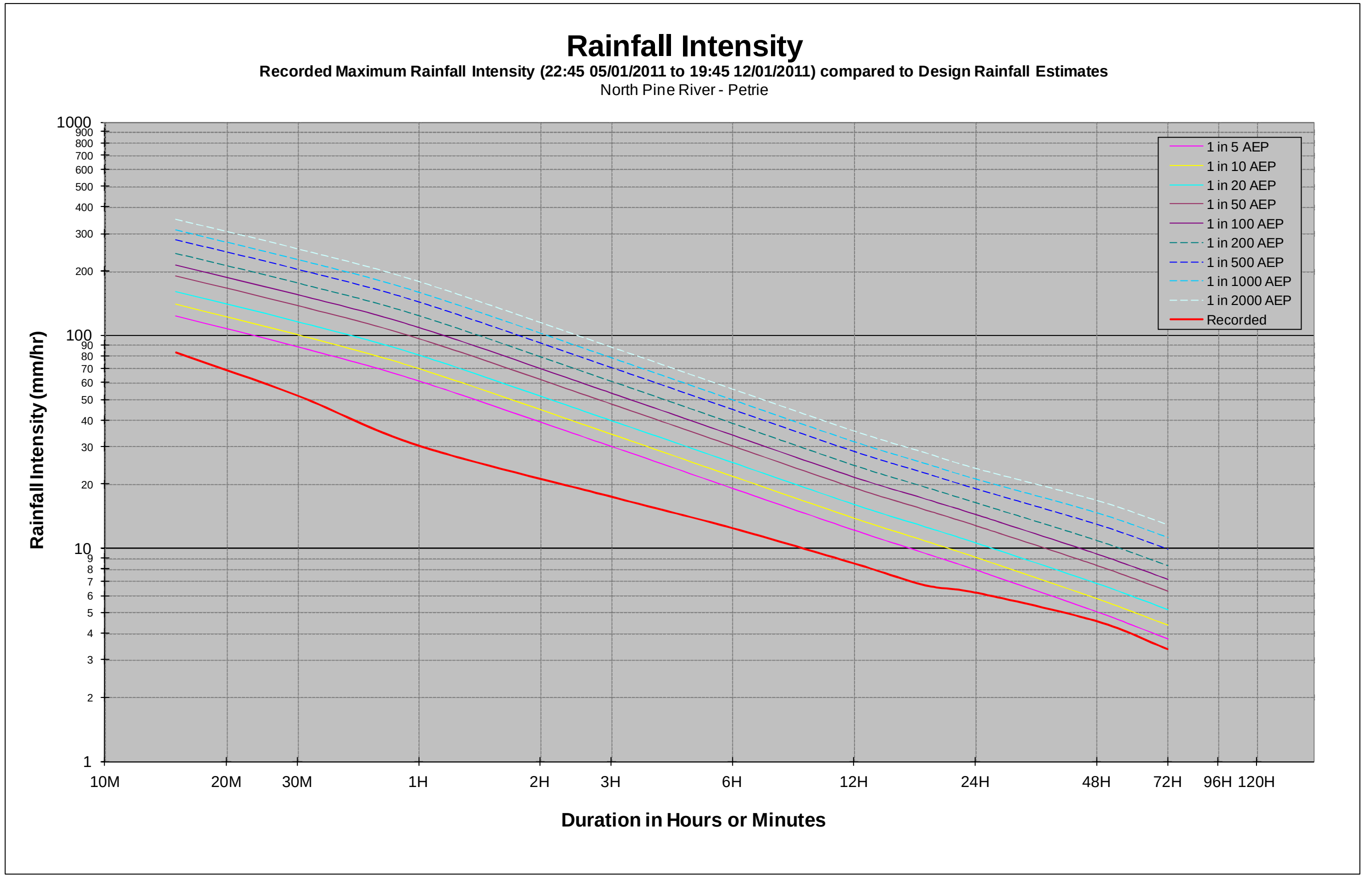
6760 – North Pine Dam

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	54.8	10:28 10/01/2011	< 5
30 M	48.2	10:43 10/01/2011	< 5
1 H	27.6	10:43 10/01/2011	< 5
3 H	14.5	12:43 11/01/2011	< 5
6 H	11.7	14:13 11/01/2011	< 5
12 H	6.7	16:13 11/01/2011	< 5
18 H	4.8	18:43 11/01/2011	< 5
24 H	4.5	10:43 10/01/2011	< 5
48 H	4.0	14:13 11/01/2011	< 5
72 H	2.9	02:43 12/01/2011	< 5



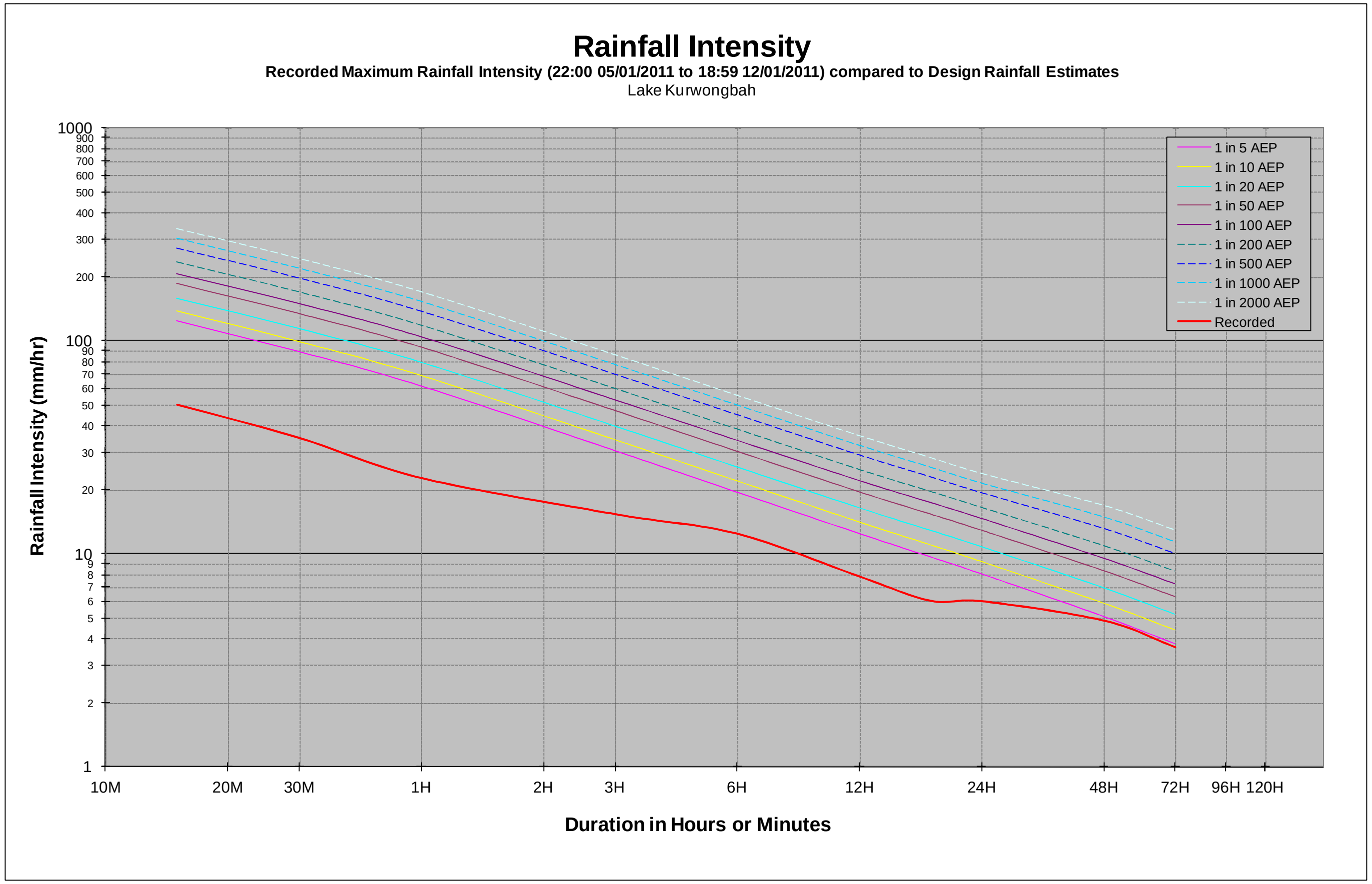
6763 – North Pine River – Petrie

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	82.8	10:16 10/01/2011	< 5
30 M	52.0	10:31 10/01/2011	< 5
1 H	30.3	10:31 10/01/2011	< 5
3 H	17.5	10:16 10/01/2011	< 5
6 H	12.5	10:31 10/01/2011	< 5
12 H	8.5	10:31 10/01/2011	< 5
18 H	6.7	10:31 10/01/2011	< 5
24 H	6.2	10:31 10/01/2011	< 5
48 H	4.6	14:16 11/01/2011	< 5
72 H	3.4	21:46 11/01/2011	< 5



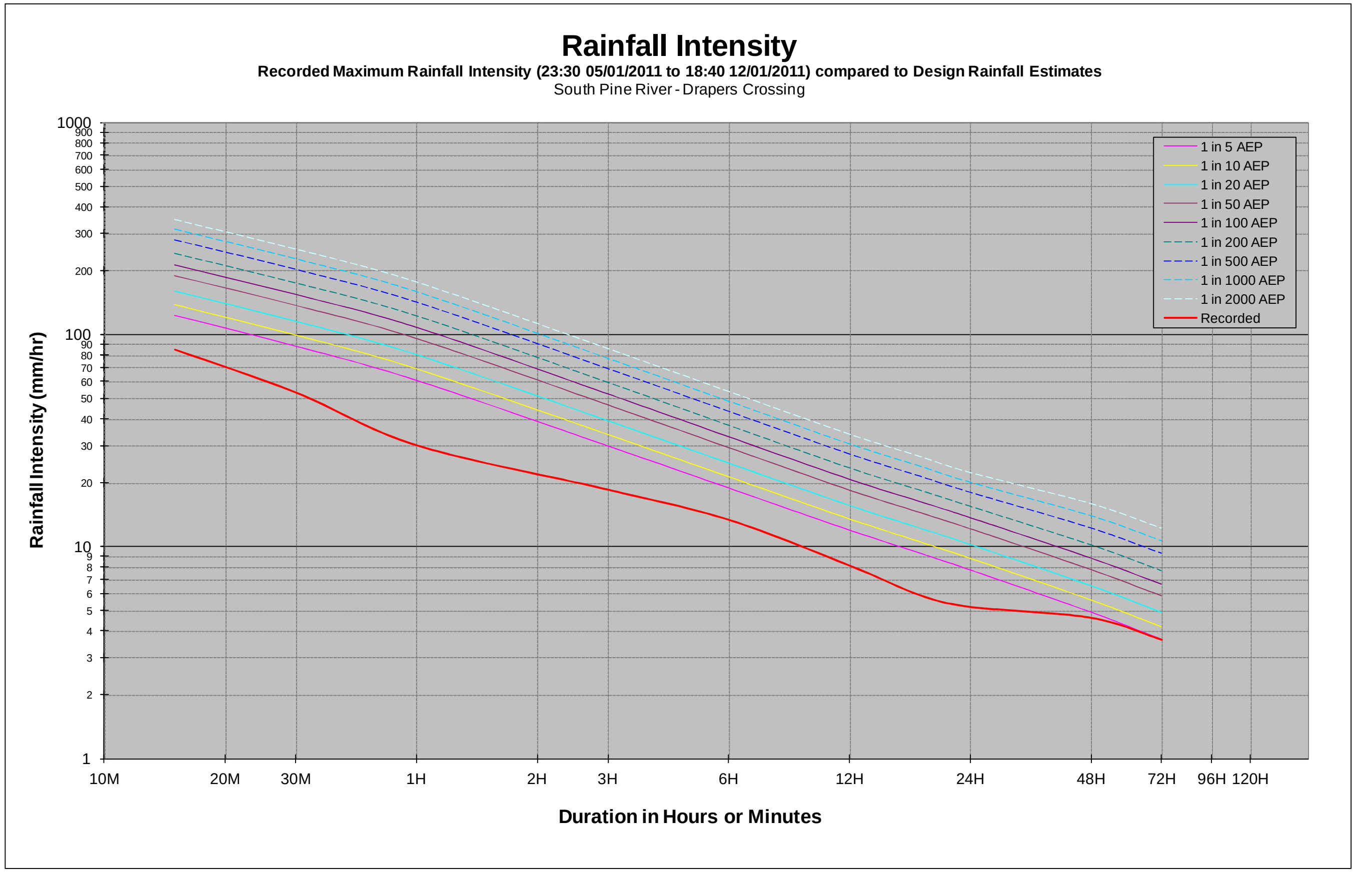
6766 – Lake Kurwongbah

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.4	10:00 11/01/2011	< 5
30 M	35.2	10:15 11/01/2011	< 5
1 H	22.8	10:30 11/01/2011	< 5
3 H	15.4	12:30 11/01/2011	< 5
6 H	12.5	14:00 11/01/2011	< 5
12 H	7.9	18:15 11/01/2011	< 5
18 H	6.0	12:30 10/01/2011	< 5
24 H	6.0	12:45 10/01/2011	< 5
48 H	4.9	14:15 11/01/2011	< 5
72 H	3.7	01:15 12/01/2011	< 5



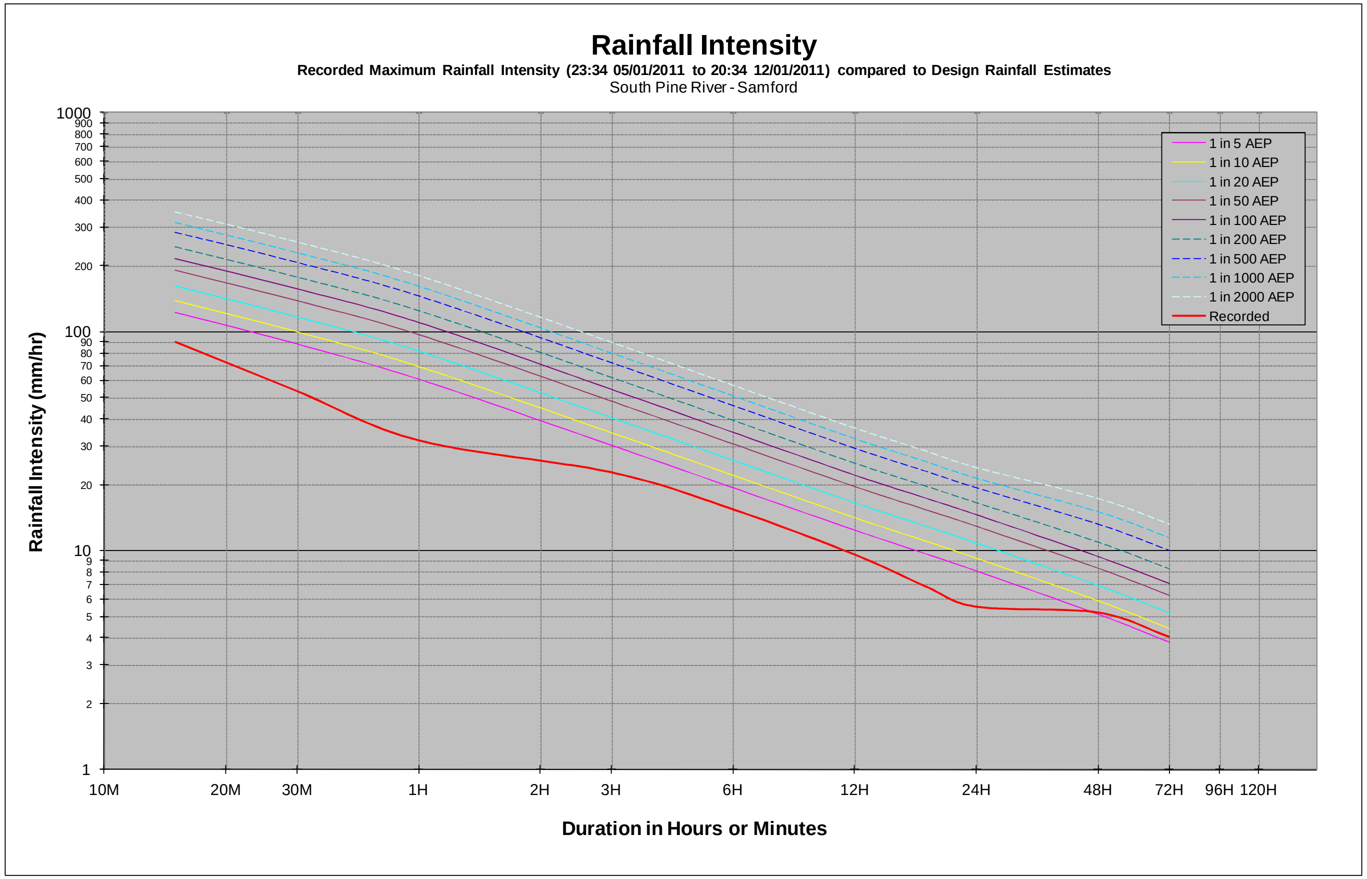
6769 – South Pine River – Drapers Crossing

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	84.4	10:15 11/01/2011	< 5
30 M	53.0	10:30 11/01/2011	< 5
1 H	29.9	10:30 11/01/2011	< 5
3 H	18.5	12:45 11/01/2011	< 5
6 H	13.3	14:15 11/01/2011	< 5
12 H	8.1	15:45 11/01/2011	< 5
18 H	5.9	18:15 11/01/2011	< 5
24 H	5.2	10:15 10/01/2011	< 5
48 H	4.6	14:45 11/01/2011	< 5
72 H	3.6	01:00 12/01/2011	< 5



6788 – South Pine River – Samford

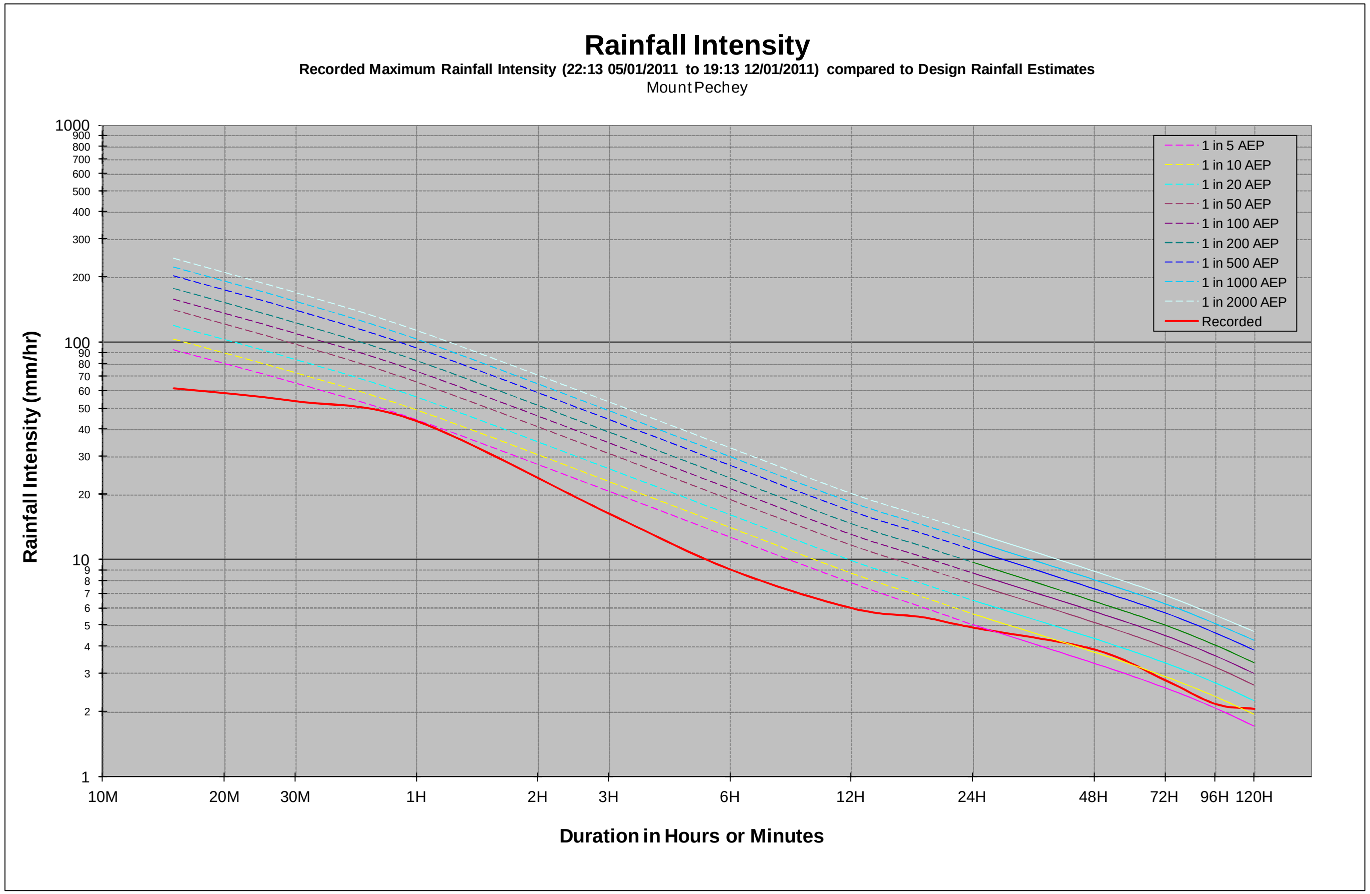
Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	89.6	10:20 11/01/2011	< 5
30 M	53.4	10:20 11/01/2011	< 5
1 H	31.8	10:50 11/01/2011	< 5
3 H	22.7	12:50 11/01/2011	< 5
6 H	15.4	14:20 11/01/2011	< 5
12 H	9.6	14:35 11/01/2011	< 5
18 H	6.8	18:05 11/01/2011	< 5
24 H	5.5	09:50 10/01/2011	< 5
48 H	5.2	14:35 11/01/2011	5 - 10
72 H	4.0	02:05 12/01/2011	5 - 10



Site Plots – CRC FORGE

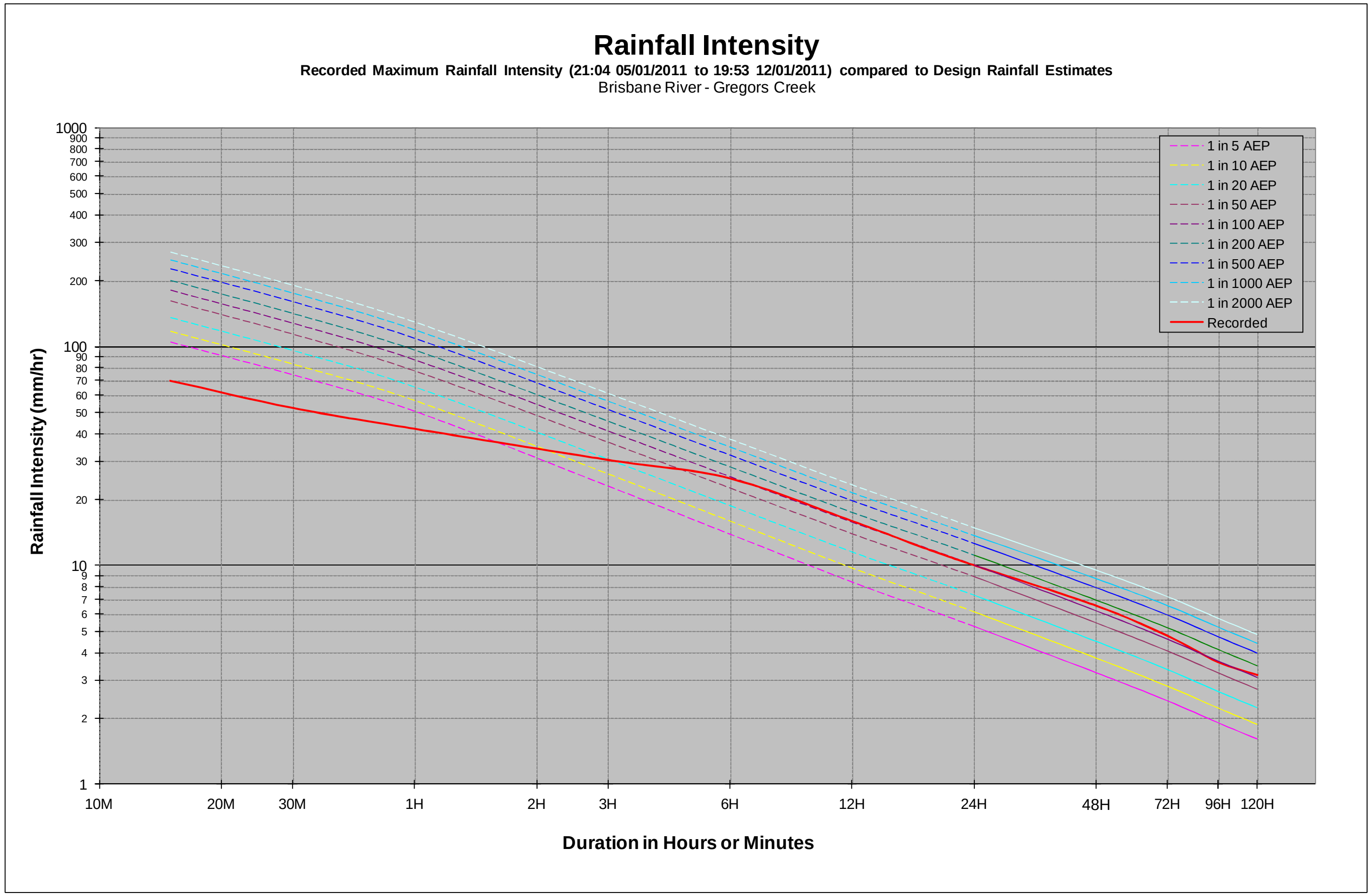
6511 – Mount Pechey

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	61.6	13:13 10/01/2011	< 5
30 M	53.8	13:13 10/01/2011	< 5
1 H	43.5	13:28 10/01/2011	< 5
3 H	16.3	14:43 10/01/2011	< 5
6 H	9.0	16:28 10/01/2011	< 5
12 H	6.0	23:58 09/01/2011	< 5
18 H	5.4	05:58 11/01/2011	< 5
24 H	4.9	13:43 10/01/2011	< 5
48 H	3.8	12:13 11/01/2011	10 - 20
72 H	2.8	20:28 11/01/2011	5 - 10
96 H	2.2	20:28 11/01/2011	5 - 10
120 H	2.0	05:58 11/01/2011	10 - 20



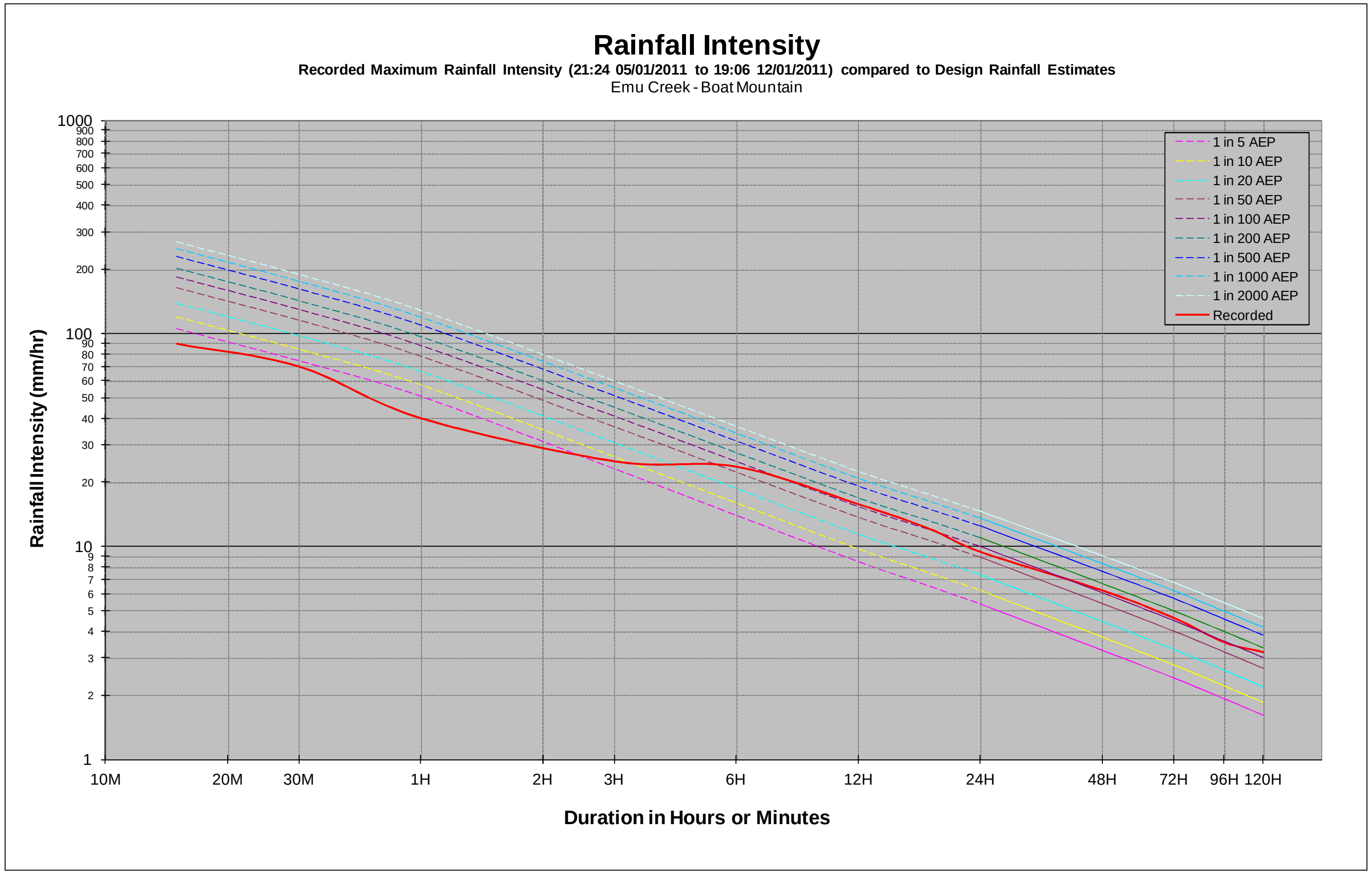
6514 – Brisbane River – Gregors Creek

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	70.0	15:20 09/01/2011	< 5
30 M	52.6	15:35 09/01/2011	< 5
1 H	42.2	16:05 09/01/2011	< 5
3 H	30.4	18:05 09/01/2011	10 - 20
6 H	25.0	19:05 09/01/2011	50 - 100
12 H	16.0	22:20 09/01/2011	100 - 200
18 H	12.1	23:35 09/01/2011	100 - 200
24 H	10.0	12:35 10/01/2011	100 - 200
48 H	6.6	05:05 11/01/2011	100 - 200
72 H	4.8	20:20 11/01/2011	100 - 200
96 H	3.6	20:20 11/01/2011	50 -100
120 H	3.2	20:20 11/01/2011	100 - 200



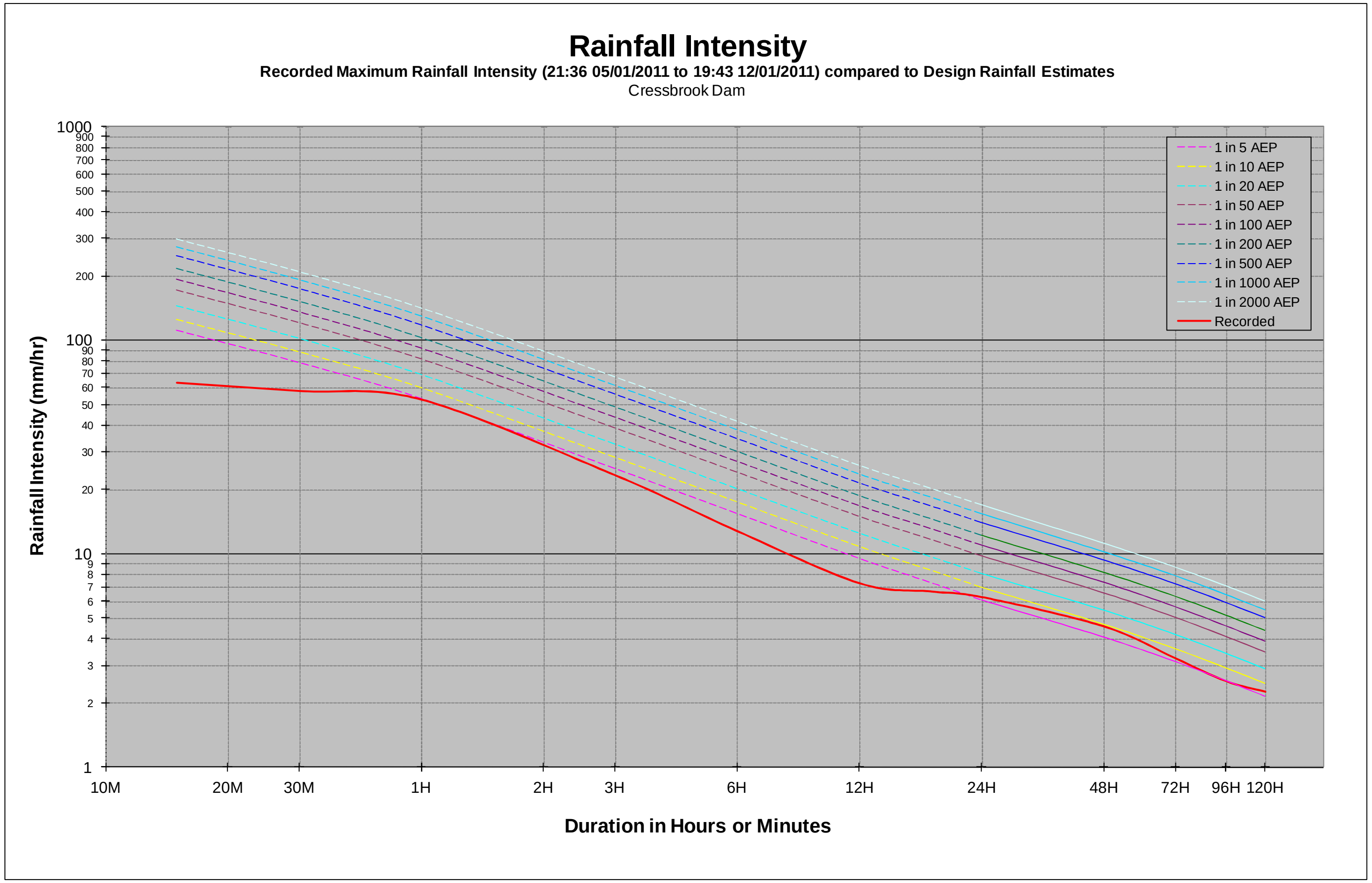
6520 – Emu Creek – Boat Mountain

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	89.2	15:25 09/01/2011	< 5
30 M	69.8	15:40 09/01/2011	< 5
1 H	39.9	16:10 09/01/2011	< 5
3 H	25.1	18:10 09/01/2011	5 - 10
6 H	23.6	19:25 09/01/2011	50 - 100
12 H	15.8	22:40 09/01/2011	100 - 200
18 H	12.1	00:10 10/01/2011	100 - 200
24 H	9.4	04:25 10/01/2011	50 - 100
48 H	6.2	05:40 11/01/2011	100 - 200
72 H	4.6	22:25 11/01/2011	100 - 200
96 H	3.5	05:10 11/01/2011	50 - 100
120 H	3.2	11:40 11/01/2011	100 - 200



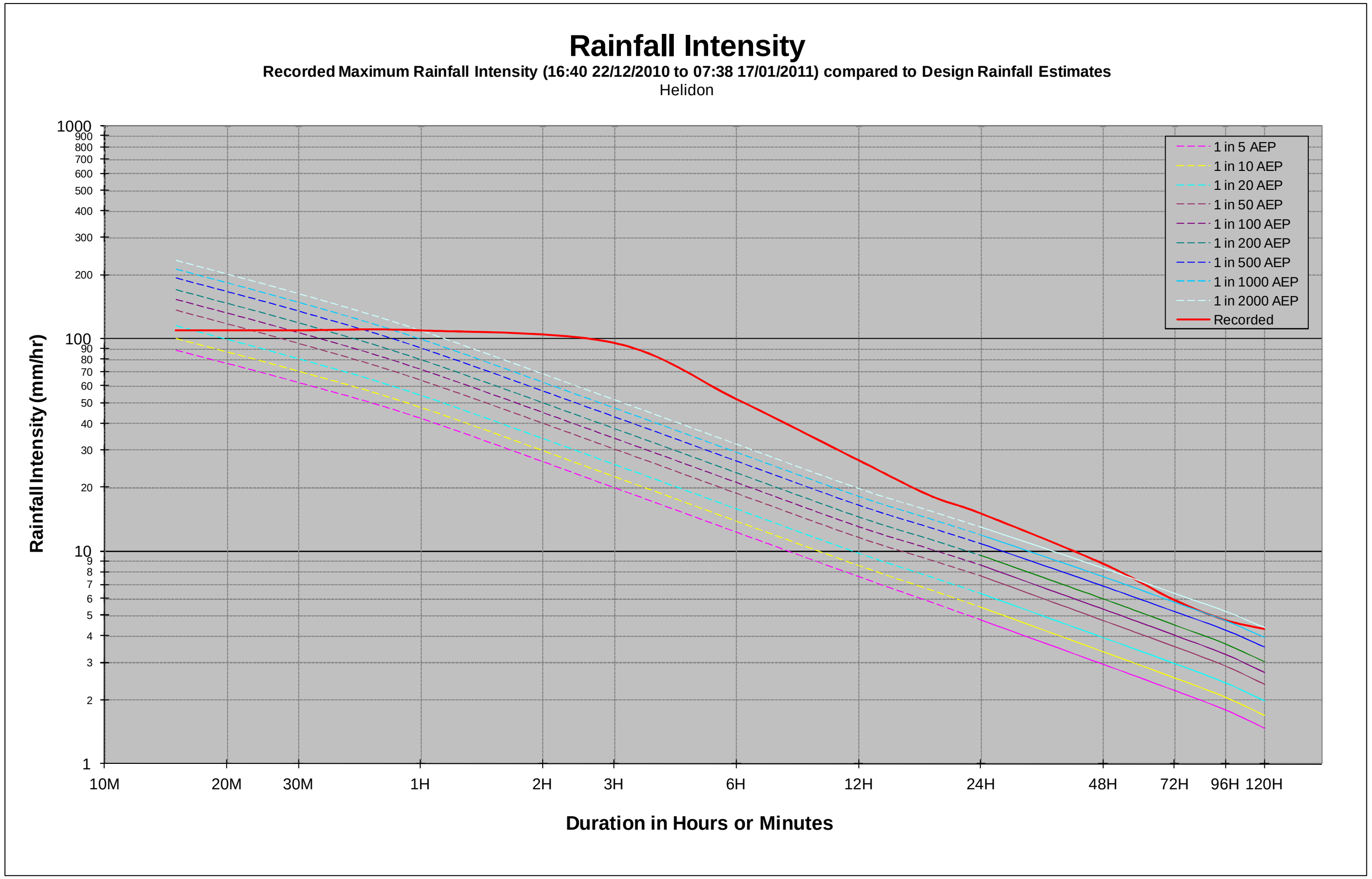
6523 – Cressbrook Dam

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	63.2	12:37 10/01/2011	< 5
30 M	57.8	12:52 10/01/2011	< 5
1 H	52.7	13:22 10/01/2011	< 5
3 H	23.3	15:07 10/01/2011	< 5
6 H	12.8	15:22 10/01/2011	< 5
12 H	7.3	15:22 10/01/2011	< 5
18 H	6.7	05:52 11/01/2011	< 5
24 H	6.3	15:22 10/01/2011	5 - 10
48 H	4.6	11:22 11/01/2011	5 - 10
72 H	3.3	00:37 12/01/2011	5 - 10
96 H	2.5	05:52 11/01/2011	< 5
120 H	2.3	05:52 11/01/2011	5 - 10



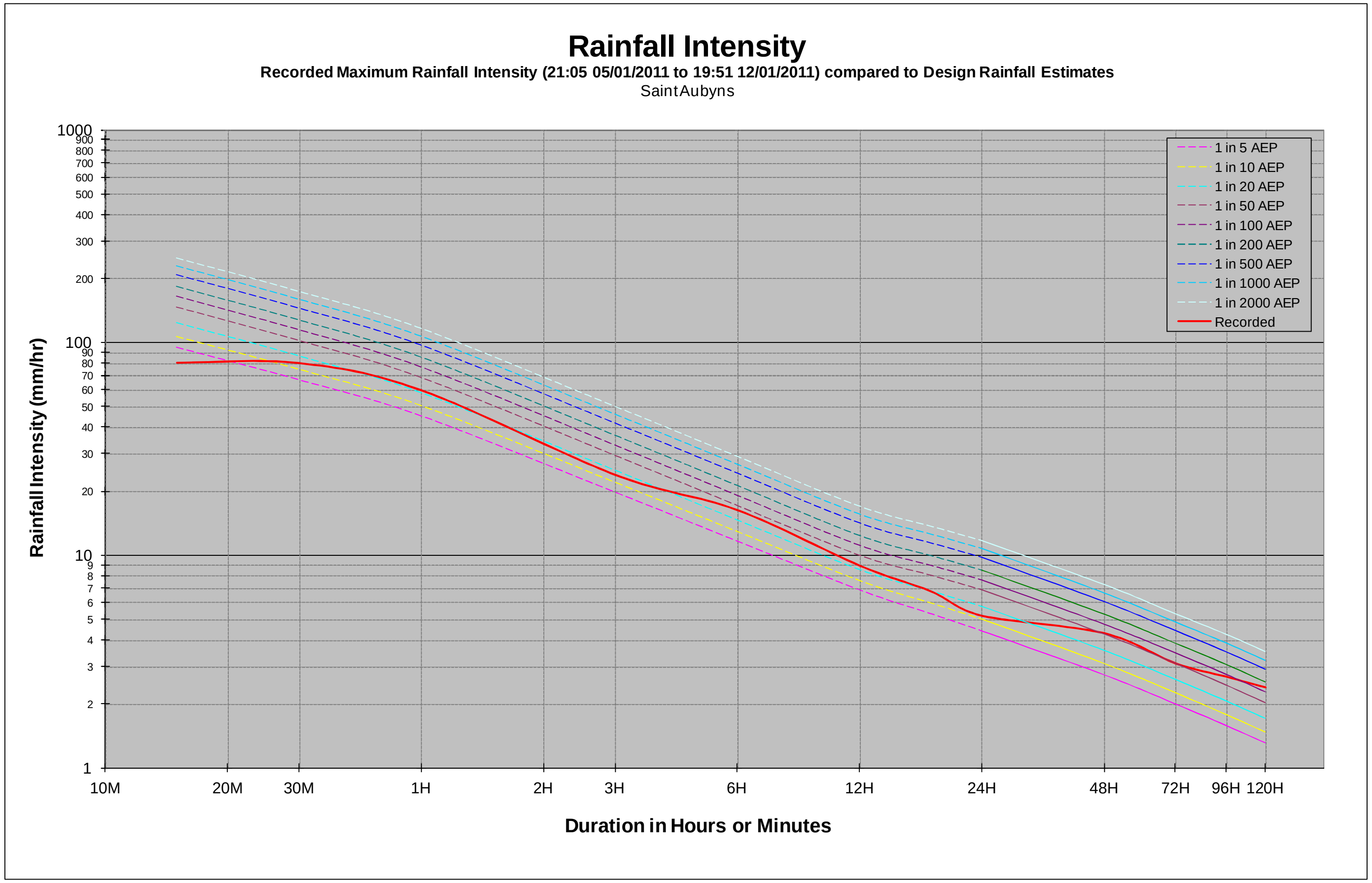
6526 – Helidon

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	109.6	16:10 10/01/2011	10 - 20
30 M	109.8	16:10 10/01/2011	100 - 200
1 H	109.7	16:25 10/01/2011	> 2000
3 H	95.8	18:10 10/01/2011	> 2000
6 H	52.2	18:10 10/01/2011	> 2000
12 H	26.9	18:10 10/01/2011	> 2000
18 H	18.3	19:55 10/01/2011	> 2000
24 H	15.1	18:10 10/01/2011	> 2000
48 H	8.8	19:55 10/01/2011	> 2000
72 H	5.9	19:55 10/01/2011	1000 - 2000
96 H	4.8	19:55 10/01/2011	1000 - 2000
120 H	4.3	18:10 10/01/2011	1000 - 2000



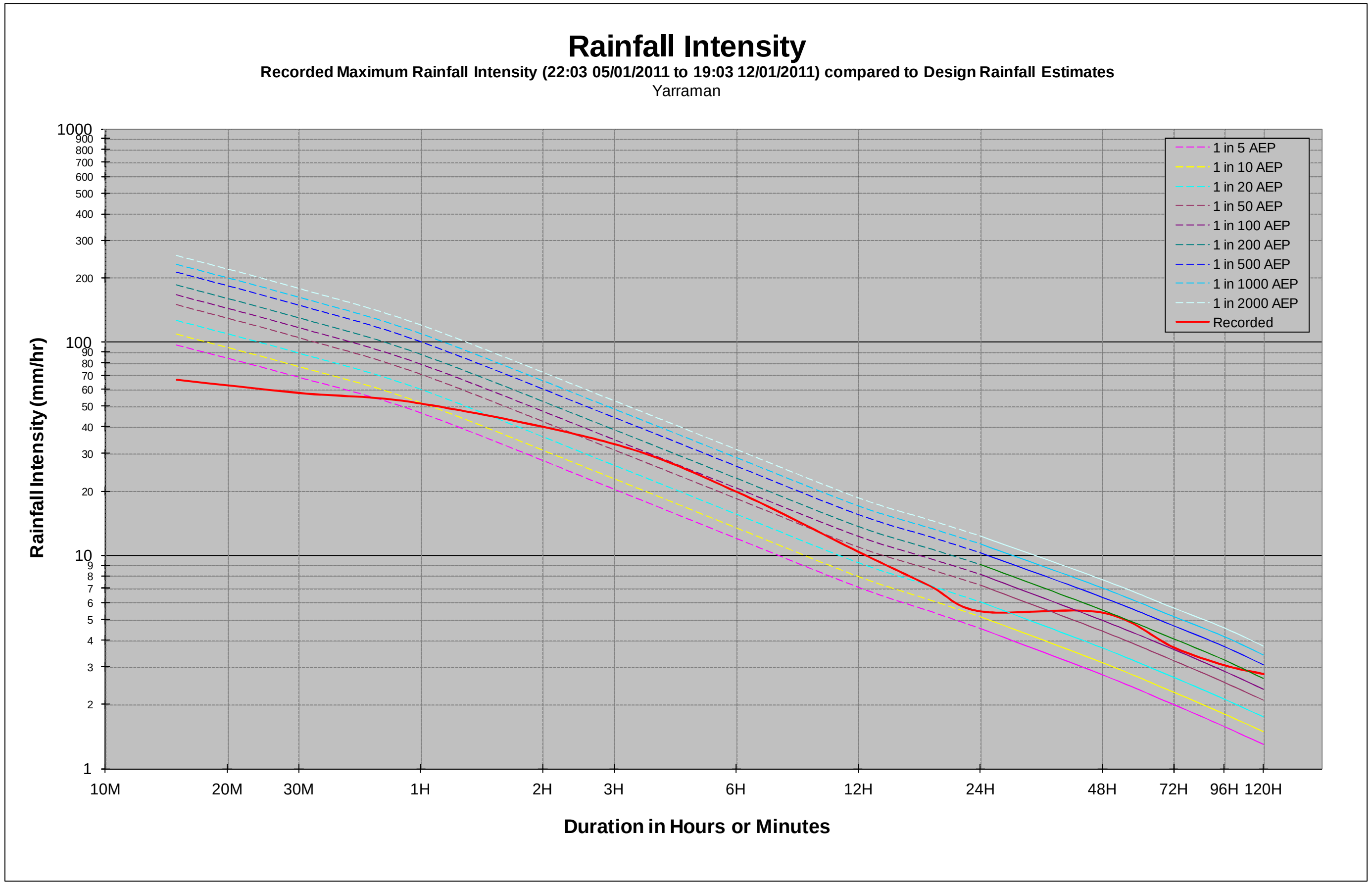
6529 – Saint Aubyns

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	80.8	00:50 11/01/2011	< 5
30 M	80.4	01:05 11/01/2011	10 - 20
1 H	59.9	01:20 11/01/2011	20 - 50
3 H	24.0	03:35 11/01/2011	10 - 20
6 H	16.3	05:05 11/01/2011	20 - 50
12 H	9.0	06:20 11/01/2011	20 - 50
18 H	6.8	05:50 11/01/2011	10 - 20
24 H	5.2	09:05 11/01/2011	10 - 20
48 H	4.3	06:20 11/01/2011	50 - 100
72 H	3.1	15:35 11/01/2011	20 - 50
96 H	2.7	05:05 11/01/2011	50 - 100
120 H	2.4	06:05 11/01/2011	100 - 200



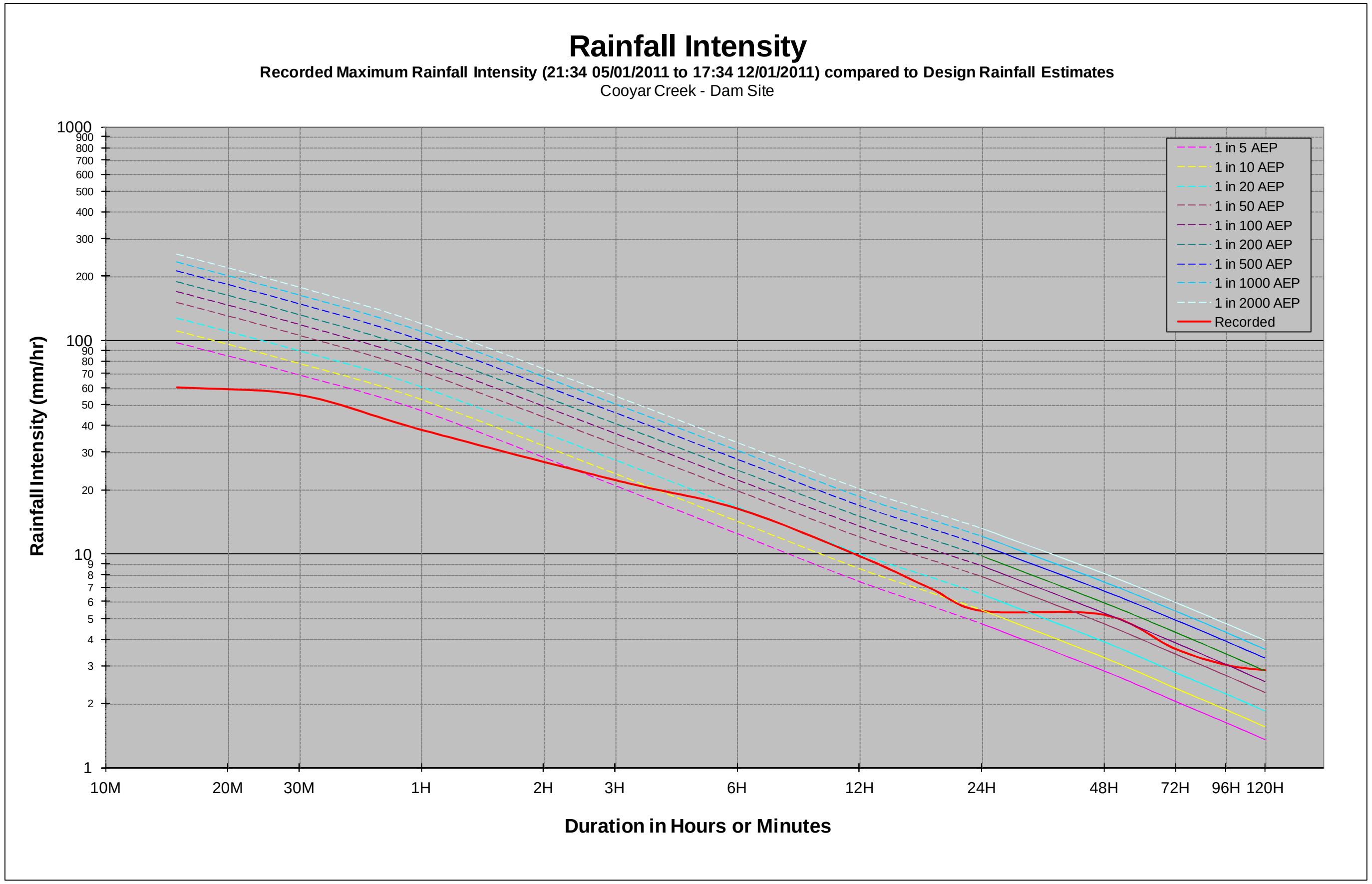
6540 – Yarraman

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	66.8	00:49 11/01/2011	< 5
30 M	58.0	00:49 11/01/2011	< 5
1 H	51.7	01:04 11/01/2011	5 - 10
3 H	33.3	01:19 11/01/2011	50 - 100
6 H	19.9	03:34 11/01/2011	50 - 100
12 H	10.4	09:34 11/01/2011	20 - 50
18 H	7.2	05:19 11/01/2011	10 - 20
24 H	5.5	10:19 11/01/2011	10 - 20
48 H	5.4	05:19 11/01/2011	100 - 200
72 H	3.7	10:19 11/01/2011	100 - 200
96 H	3.0	04:34 11/01/2011	100 - 200
120 H	2.8	05:19 11/01/2011	200 - 500



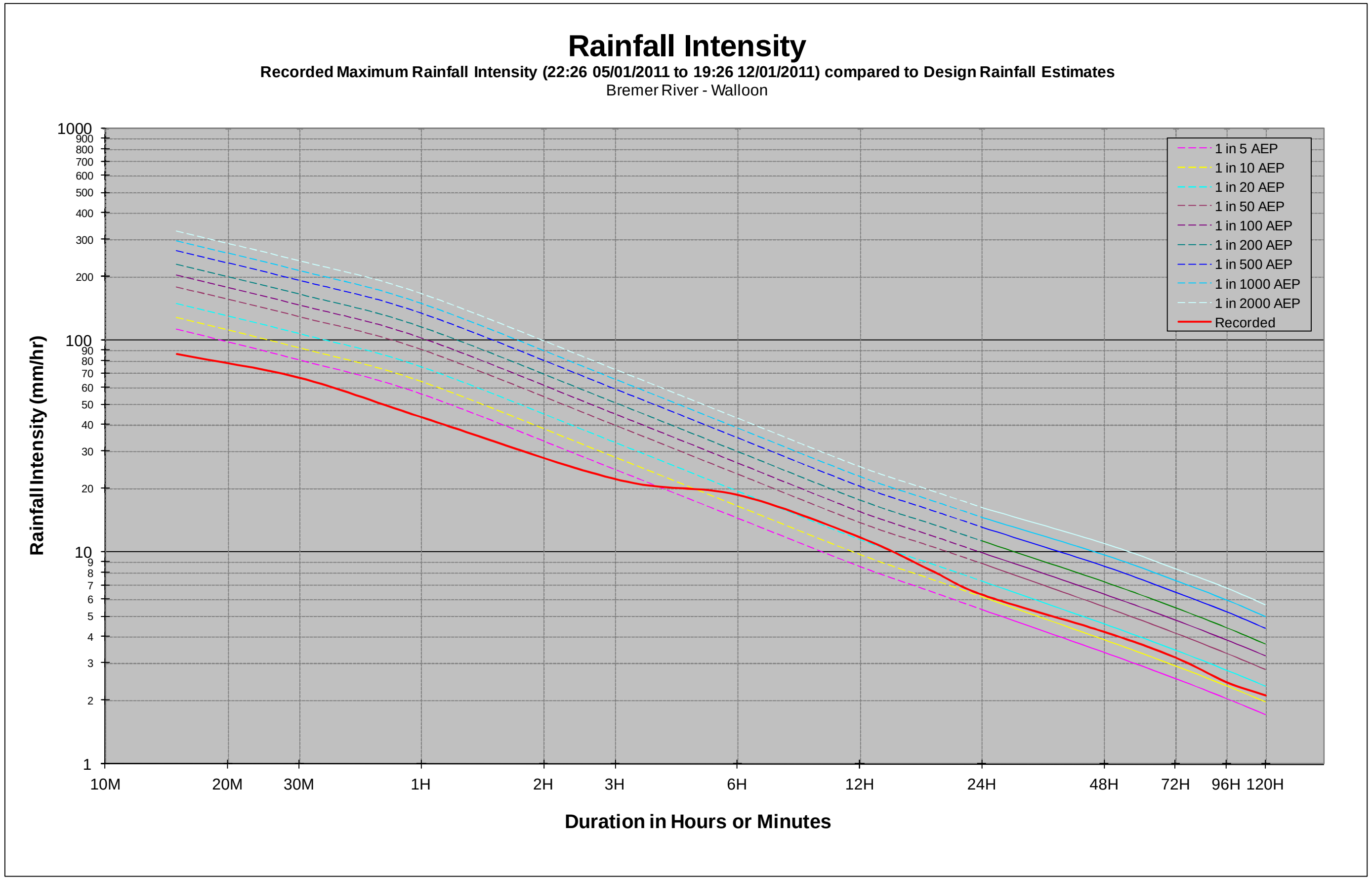
6542 – Cooyar Creek – Dam Site

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	60.4	23:04 10/01/2011	< 5
30 M	55.6	23:19 10/01/2011	< 5
1 H	38.2	23:49 10/01/2011	< 5
3 H	22.2	00:49 11/01/2011	5 - 10
6 H	16.3	04:49 11/01/2011	10 - 20
12 H	9.8	05:49 11/01/2011	10 - 20
18 H	6.9	23:49 09/01/2011	10 - 20
24 H	5.4	02:04 10/01/2011	5 - 10
48 H	5.2	05:49 11/01/2011	50 - 100
72 H	3.6	14:49 11/01/2011	50 - 100
96 H	3.0	04:49 11/01/2011	50 - 100
120 H	2.9	07:34 11/01/2011	200 - 500



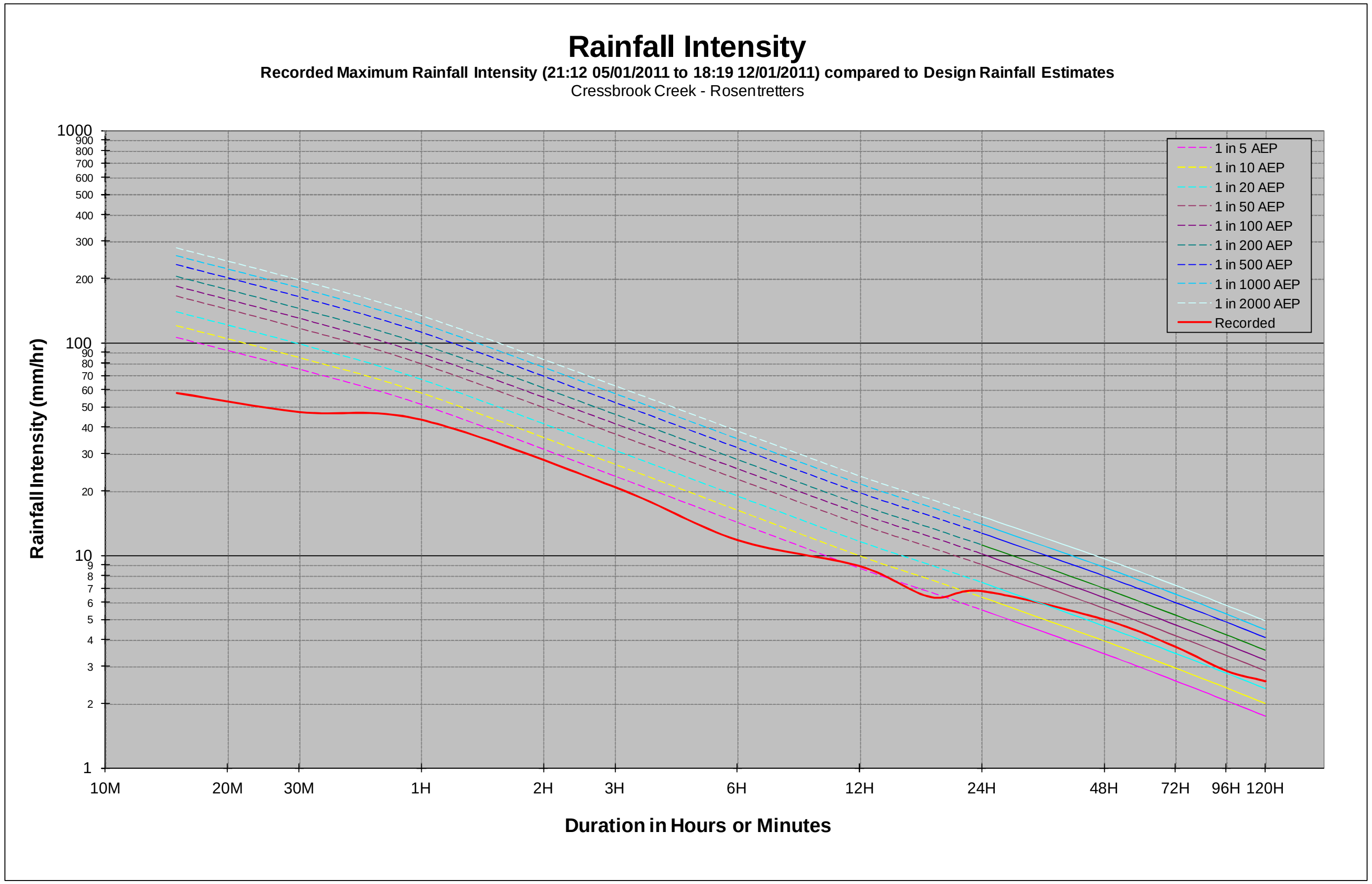
6550 – Bremer River – Walloon

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	86.4	09:27 11/01/2011	< 5
30 M	66.8	09:27 11/01/2011	< 5
1 H	43.5	09:42 11/01/2011	< 5
3 H	22.1	11:57 11/01/2011	< 5
6 H	18.7	14:57 11/01/2011	10 - 20
12 H	11.8	18:27 11/01/2011	20 - 50
18 H	8.2	18:42 11/01/2011	10 - 20
24 H	6.3	18:42 11/01/2011	10 - 20
48 H	4.2	18:12 11/01/2011	10 - 20
72 H	3.2	18:42 11/01/2011	10 - 20
96 H	2.4	18:42 11/01/2011	10 - 20
120 H	2.1	18:42 11/01/2011	10 - 20



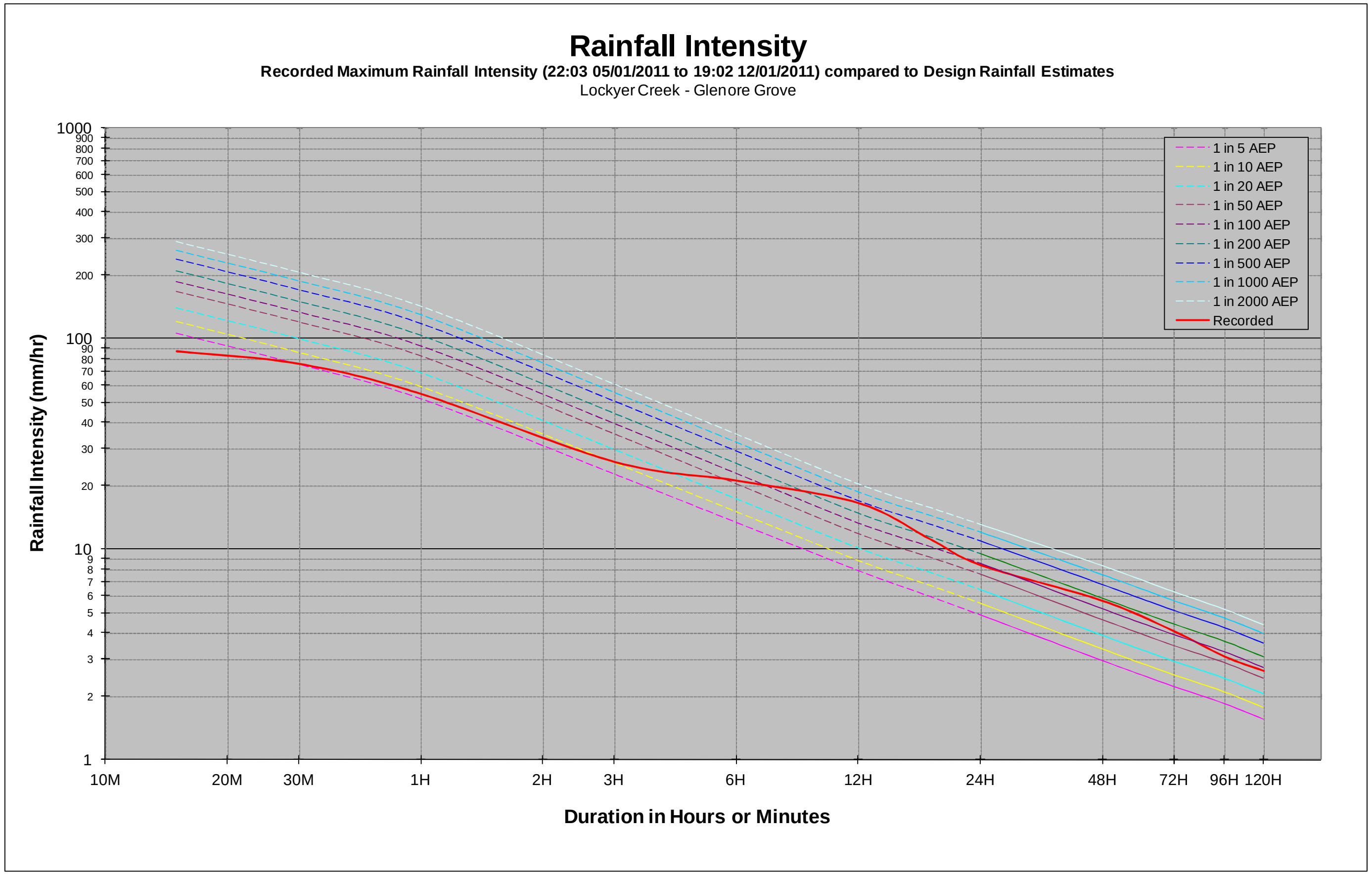
6553 – Cressbrook Creek – Rosentretters

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	58.0	12:43 10/01/2011	< 5
30 M	47.2	12:43 10/01/2011	< 5
1 H	43.4	12:43 10/01/2011	< 5
3 H	20.9	14:13 10/01/2011	< 5
6 H	11.8	20:13 09/01/2011	< 5
12 H	8.9	21:43 09/01/2011	5 - 10
18 H	6.4	04:43 10/01/2011	< 5
24 H	6.8	13:13 10/01/2011	10 - 20
48 H	5.0	09:43 11/01/2011	20 - 50
72 H	3.7	19:13 11/01/2011	20 - 50
96 H	2.9	06:28 11/01/2011	20 - 50
120 H	2.6	19:28 11/01/2011	20 - 50



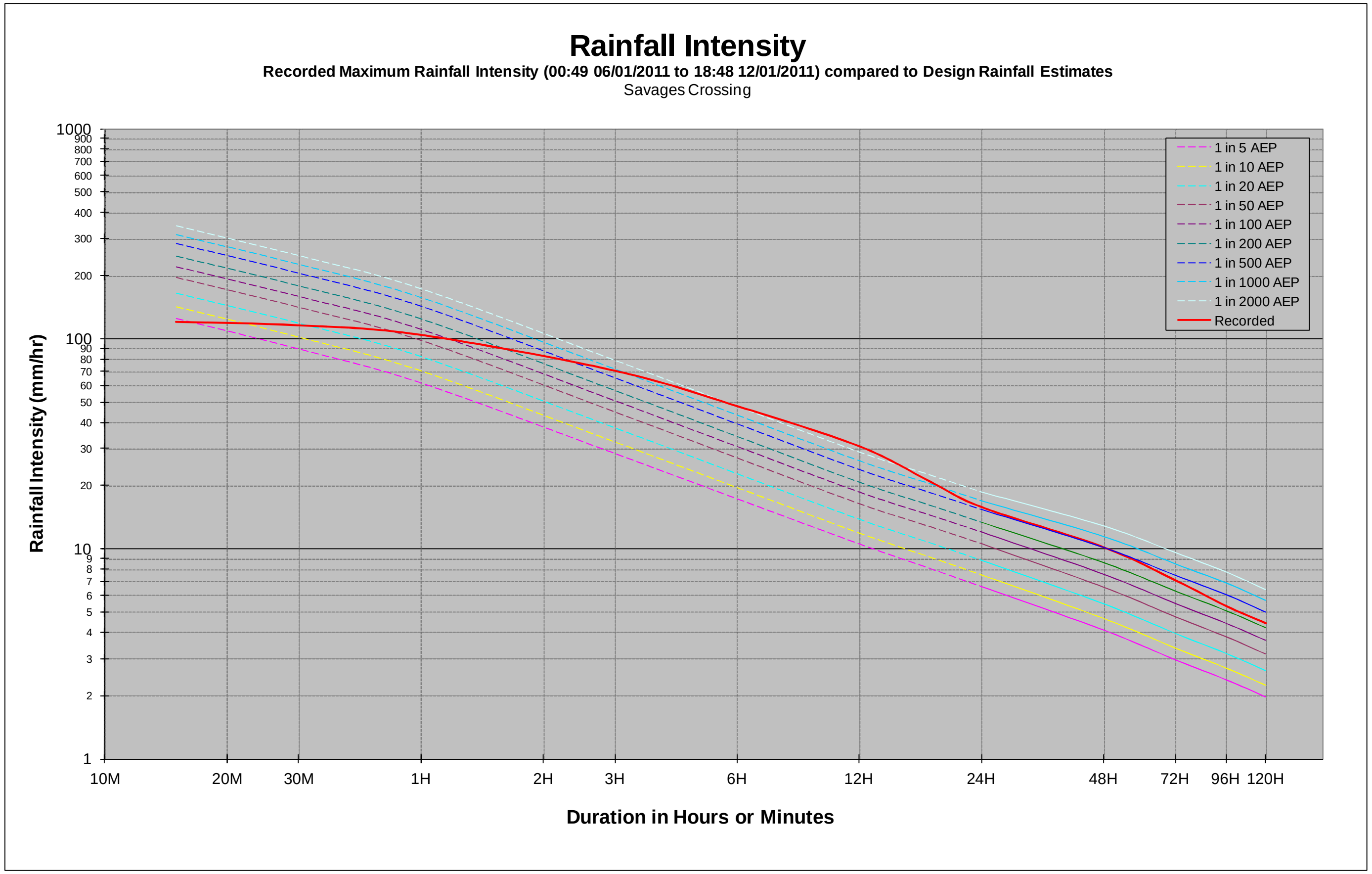
6556 – Lockyer Creek – Glenore Grove

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	87.2	06:18 11/01/2011	< 5
30 M	76.0	06:18 11/01/2011	5 - 10
1 H	54.7	06:48 11/01/2011	5 - 10
3 H	26.0	13:48 11/01/2011	10 - 20
6 H	21.2	15:18 11/01/2011	50 - 100
12 H	16.6	15:18 11/01/2011	200 - 500
18 H	11.2	19:33 11/01/2011	100 - 200
24 H	8.4	19:48 11/01/2011	50 - 100
48 H	5.7	15:18 11/01/2011	100 - 200
72 H	4.1	19:48 11/01/2011	100 - 200
96 H	3.1	19:48 11/01/2011	50 - 100
120 H	2.6	19:48 11/01/2011	50 - 100



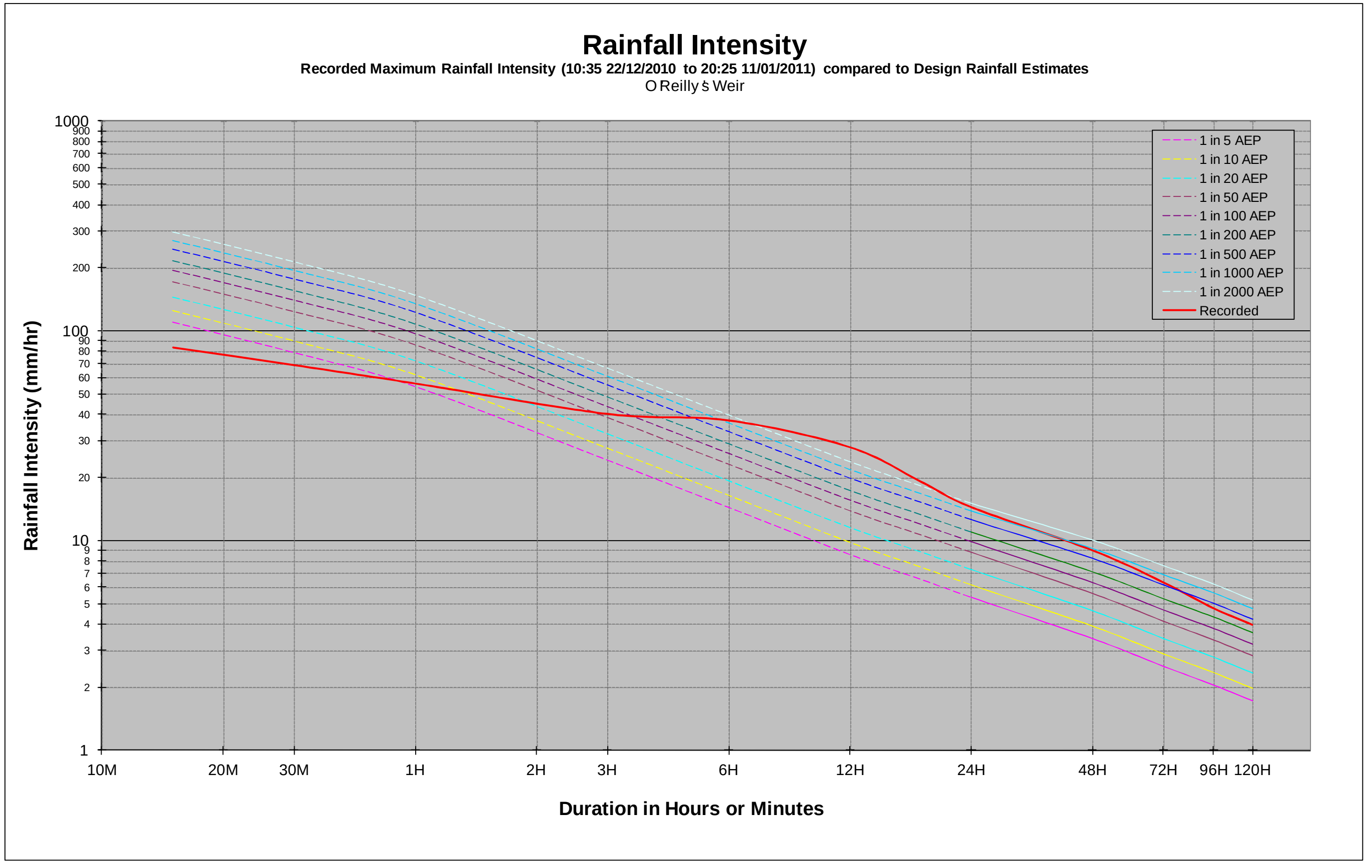
6559 – Savages Crossing

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	120.4	08:34 11/01/2011	< 5
30 M	116.0	08:49 11/01/2011	10 - 20
1 H	104.4	09:04 11/01/2011	50 - 100
3 H	70.5	09:34 11/01/2011	500 -1000
6 H	47.8	12:49 11/01/2011	> 2000
12 H	30.7	14:34 11/01/2011	> 2000
18 H	20.7	14:34 11/01/2011	1000 - 2000
24 H	15.8	14:19 11/01/2011	500 - 1000
48 H	10.1	14:34 11/01/2011	200 - 500
72 H	7.0	02:19 12/01/2011	200 - 500
96 H	5.3	02:19 12/01/2011	200 - 500
120 H	4.4	01:04 12/01/2011	200 - 500



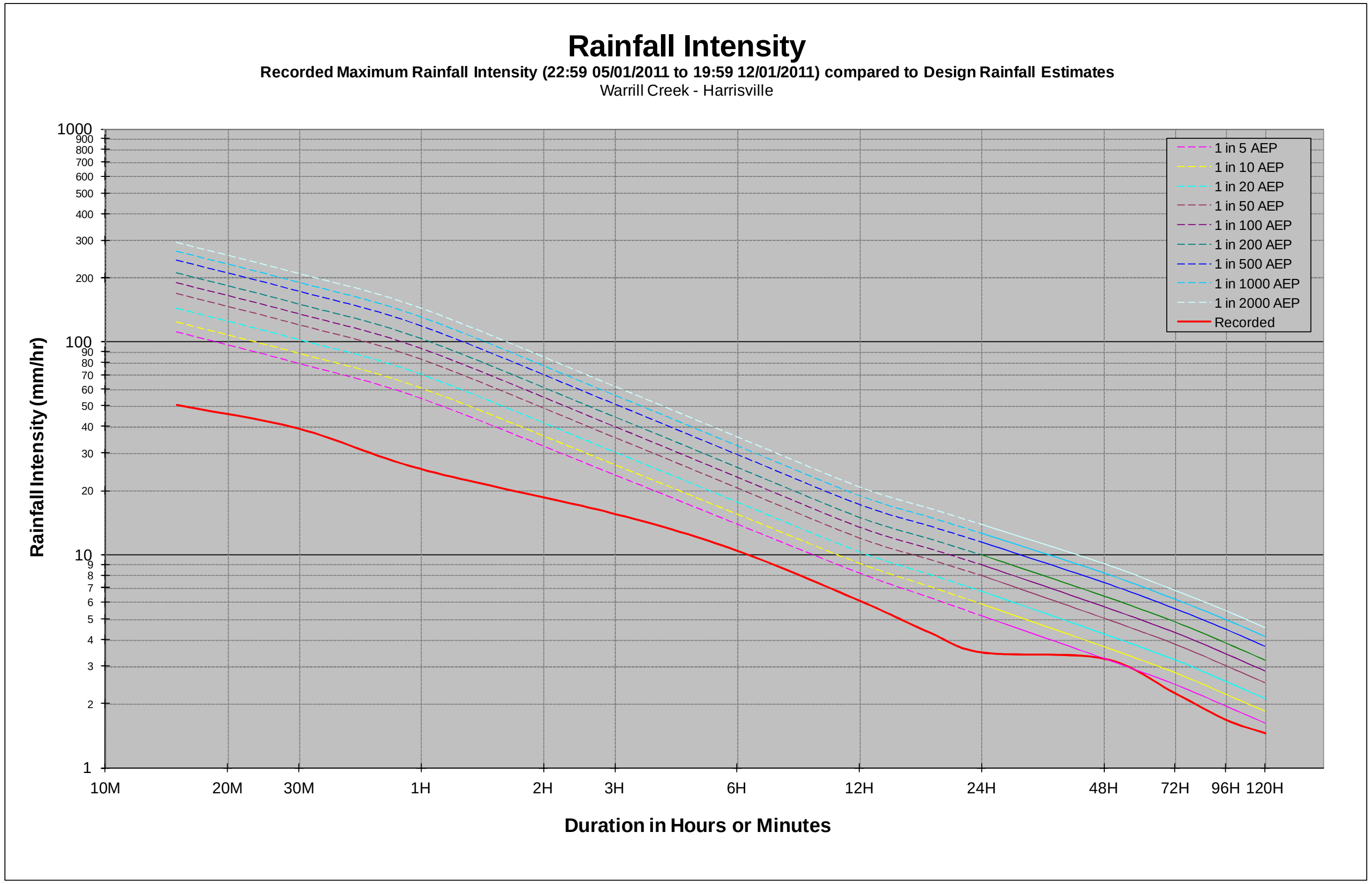
6568 – O'Reillys Weir

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	83.6	13:21 11/01/2011	< 5
30 M	68.8	13:36 11/01/2011	< 5
1 H	56.2	13:36 11/01/2011	5 - 10
3 H	40.2	14:21 11/01/2011	50 - 100
6 H	37.5	14:21 11/01/2011	1000 - 2000
12 H	27.9	16:06 11/01/2011	> 2000
18 H	19.1	20:21 11/01/2011	> 2000
24 H	14.5	20:21 11/01/2011	1000 - 2000
48 H	9.0	14:51 11/01/2011	500 - 1000
72 H	6.3	20:21 11/01/2011	500 - 1000
96 H	4.8	20:21 11/01/2011	200 - 500
120 H	4.0	20:21 11/01/2011	200 - 500



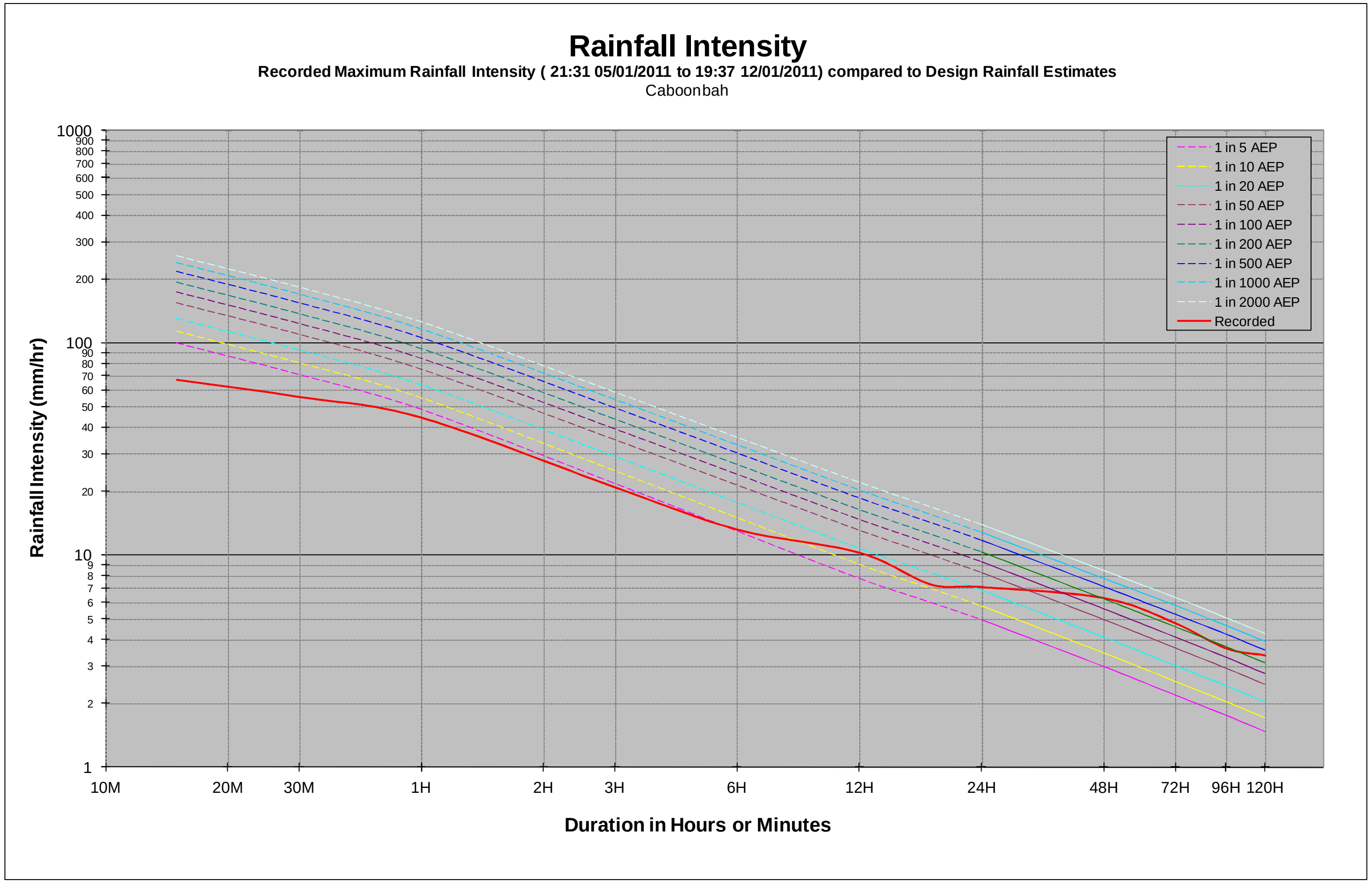
6571 – Warrill Creek – Harrisville

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	50.4	09:45 10/01/2011	< 5
30 M	39.0	09:60 10/01/2011	< 5
1 H	25.2	09:60 10/01/2011	< 5
3 H	15.5	10:45 10/01/2011	< 5
6 H	10.4	12:30 10/01/2011	< 5
12 H	6.1	13:60 10/01/2011	< 5
18 H	4.3	21:45 10/01/2011	< 5
24 H	3.5	02:60 11/01/2011	< 5
48 H	3.3	15:45 11/01/2011	< 5
72 H	2.2	15:45 11/01/2011	< 5
96 H	1.7	15:45 11/01/2011	< 5
120 H	1.5	15:45 11/01/2011	< 5



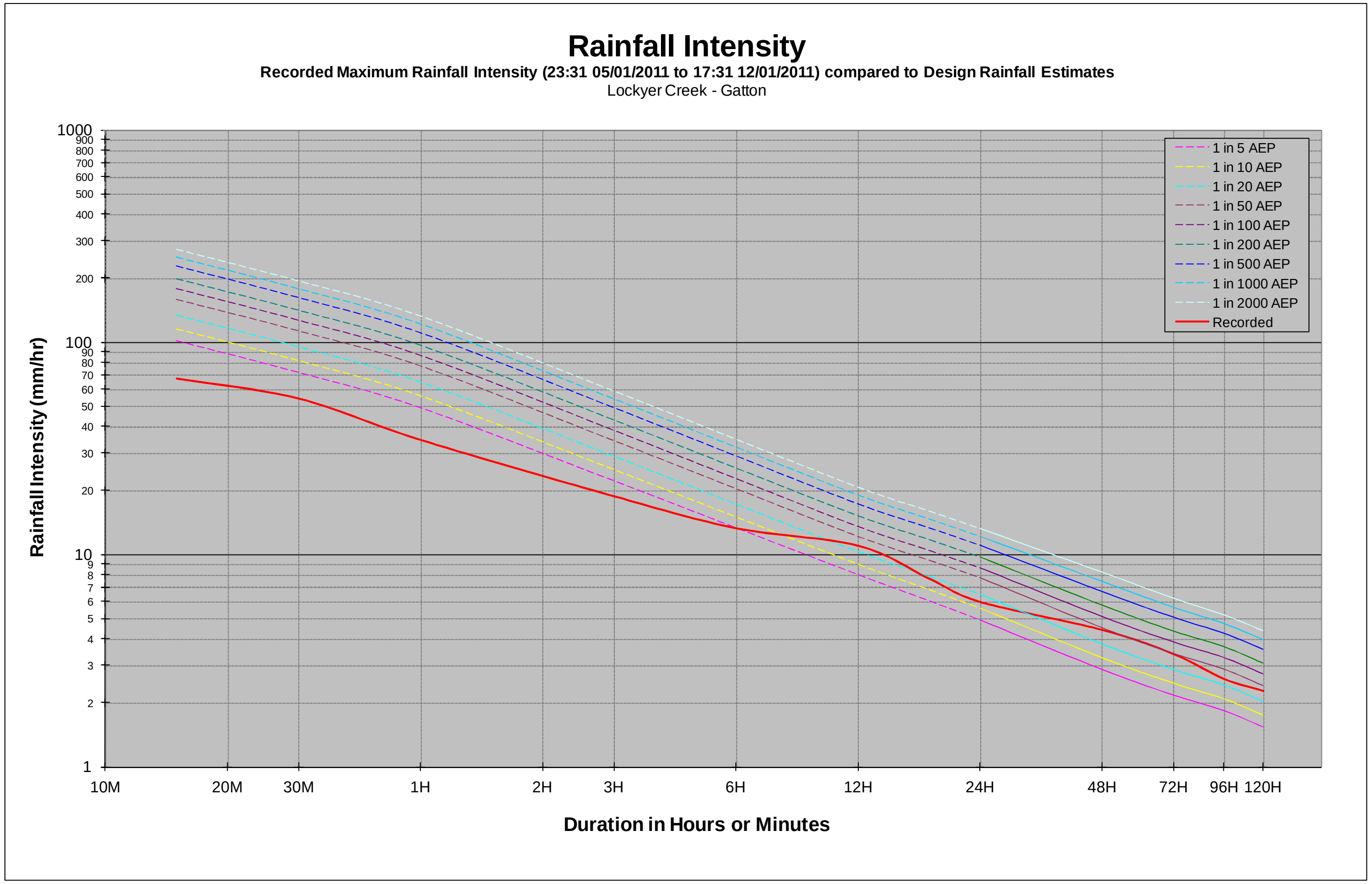
6574 – Caboonbah

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	67.2	11:46 10/01/2011	< 5
30 M	55.8	11:46 10/01/2011	< 5
1 H	44.5	05:31 11/01/2011	< 5
3 H	20.9	07:31 11/01/2011	< 5
6 H	13.2	20:31 09/01/2011	5 - 10
12 H	10.3	16:31 11/01/2011	10 - 20
18 H	7.3	19:46 11/01/2011	10 - 20
24 H	7.1	14:31 10/01/2011	20 - 50
48 H	6.3	14:31 11/01/2011	200 - 500
72 H	4.8	19:46 11/01/2011	200 - 500
96 H	3.6	03:46 12/01/2011	100 - 200
120 H	3.4	19:46 11/01/2011	200 - 500



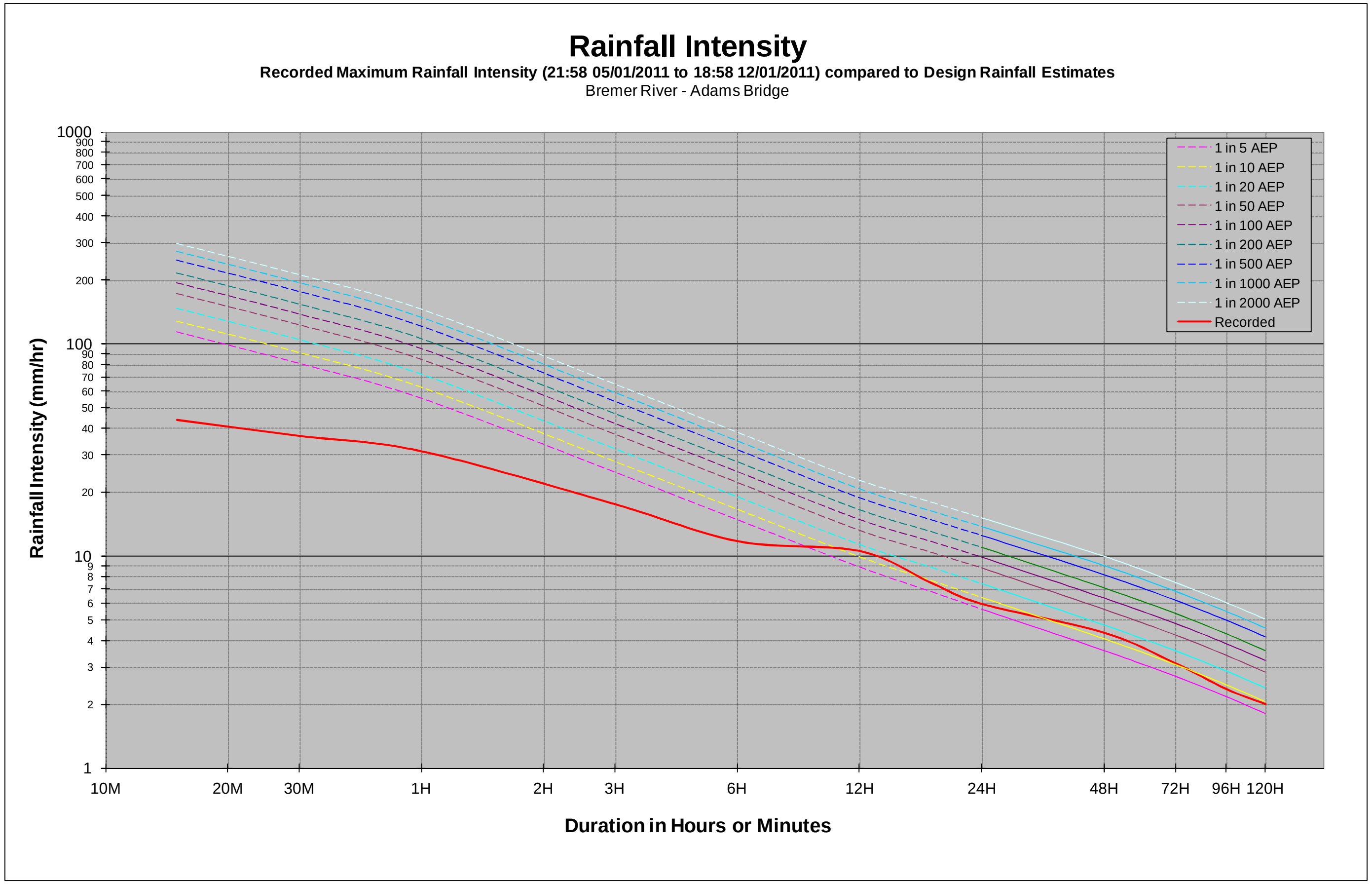
6577 – Lockyer Creek – Gatton

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	67.2	06:02 11/01/2011	< 5
30 M	54.0	06:17 11/01/2011	< 5
1 H	34.5	06:17 11/01/2011	< 5
3 H	18.7	14:32 11/01/2011	< 5
6 H	13.3	16:02 11/01/2011	< 5
12 H	11.0	16:02 11/01/2011	20 - 50
18 H	7.7	18:17 11/01/2011	10 - 20
24 H	6.0	23:47 11/01/2011	10 - 20
48 H	4.4	15:47 11/01/2011	20 - 50
72 H	3.4	23:47 11/01/2011	20 - 50
96 H	2.6	23:47 11/01/2011	20 - 50
120 H	2.3	23:47 11/01/2011	20 - 50



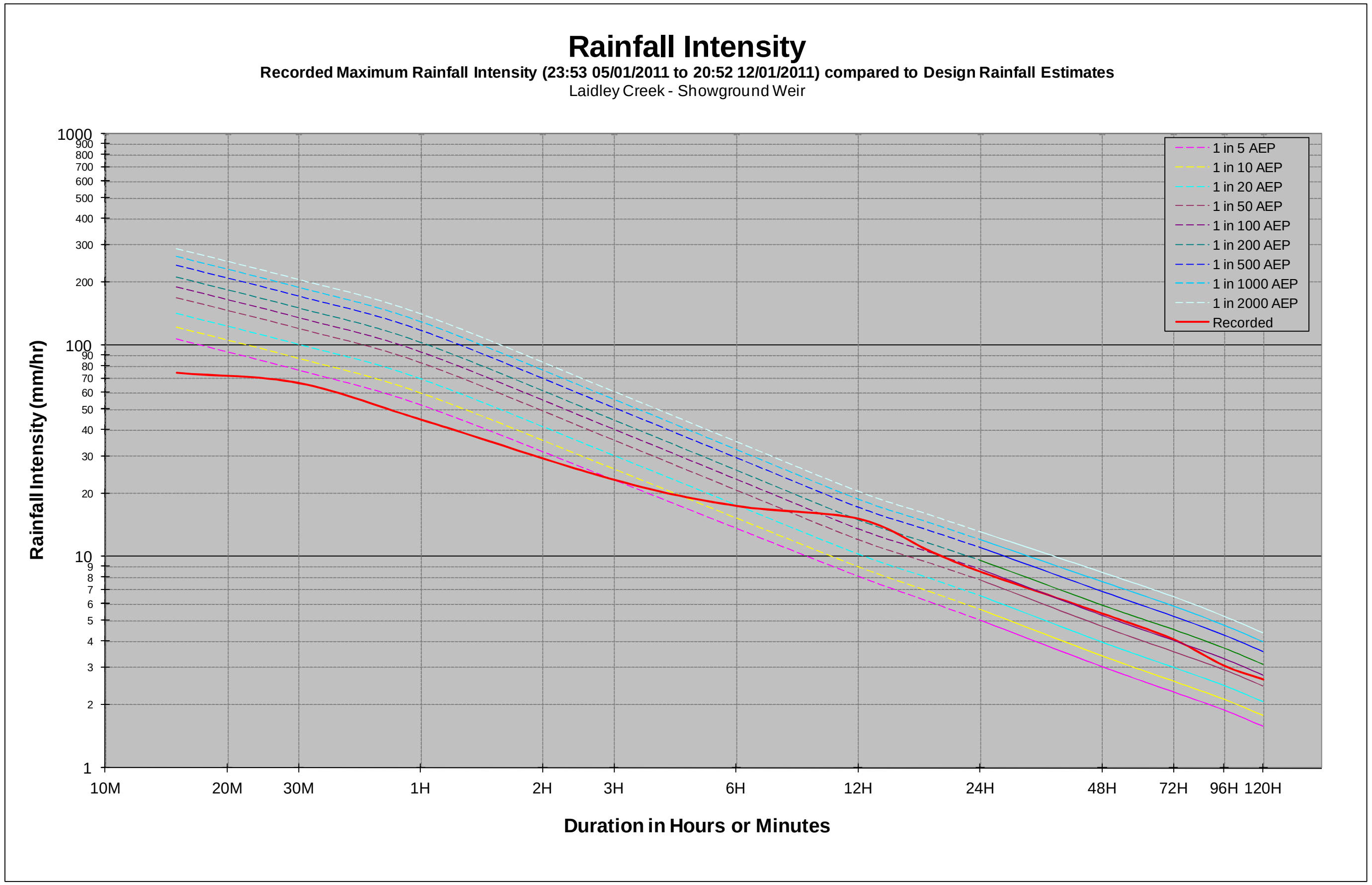
6580 – Bremer River – Adams Bridge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	44.0	15:29 11/01/2011	< 5
30 M	37.0	15:44 11/01/2011	< 5
1 H	31.3	15:59 11/01/2011	< 5
3 H	17.6	15:59 11/01/2011	< 5
6 H	11.8	13:14 11/01/2011	< 5
12 H	10.6	18:14 11/01/2011	10 - 20
18 H	7.5	18:29 11/01/2011	5 - 10
24 H	6.0	18:14 11/01/2011	5 - 10
48 H	4.4	18:14 11/01/2011	10 - 20
72 H	3.1	18:29 11/01/2011	10 - 20
96 H	2.4	10:59 12/01/2011	5 - 10
120 H	2.0	18:29 11/01/2011	5 - 10



6583 – Laidley Creek – Showground Weir

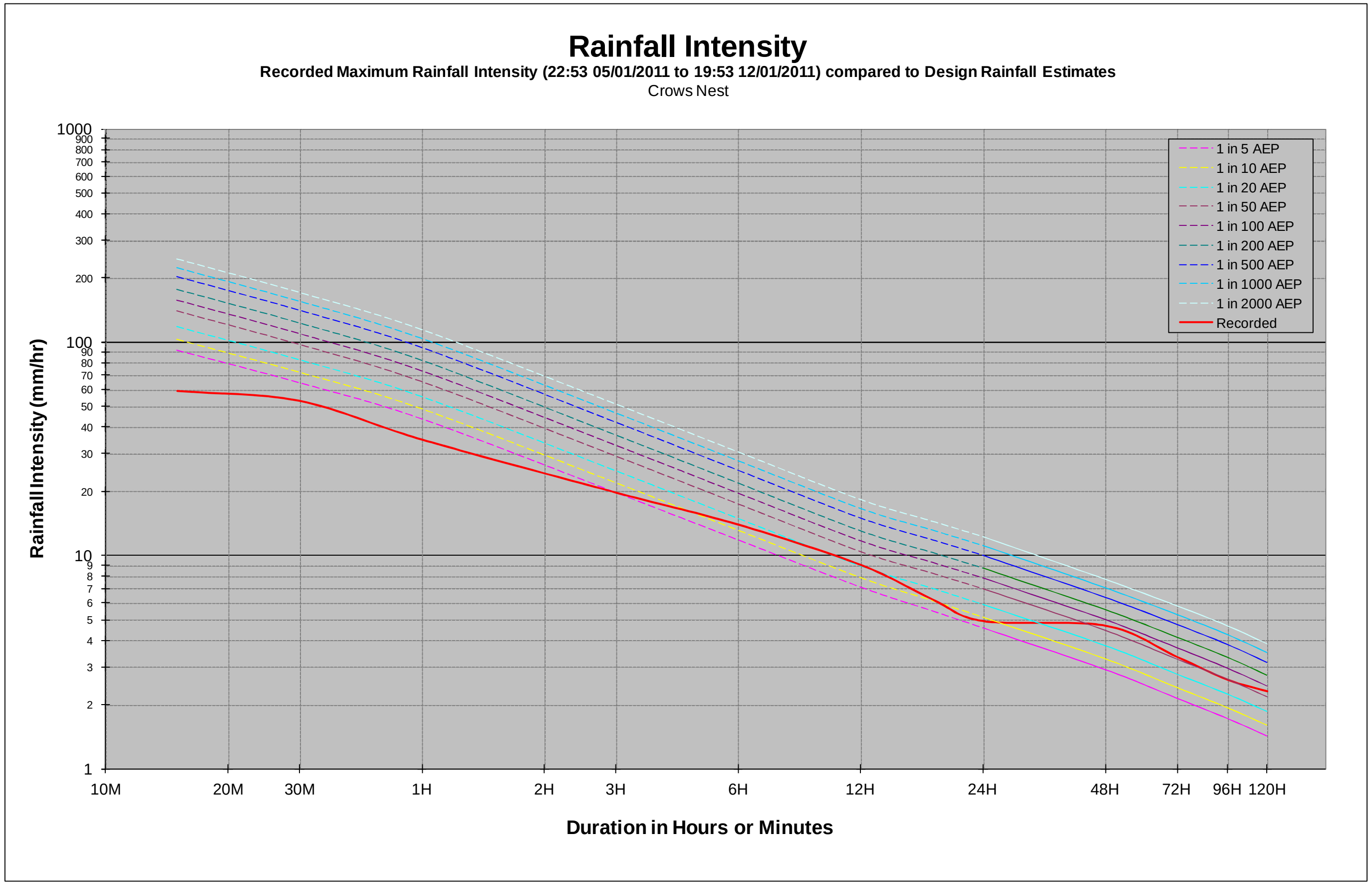
Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	74.0	07:08 11/01/2011	< 5
30 M	66.2	07:08 11/01/2011	< 5
1 H	44.5	07:38 11/01/2011	< 5
3 H	23.1	08:38 11/01/2011	< 5
6 H	17.4	16:38 11/01/2011	10 - 20
12 H	15.1	16:38 11/01/2011	200 - 500
18 H	10.6	20:53 11/01/2011	100 - 200
24 H	8.5	21:08 11/01/2011	50 - 100
48 H	5.4	15:38 11/01/2011	100 - 200
72 H	4.1	03:23 12/01/2011	100 - 200
96 H	3.0	03:23 12/01/2011	50 - 100
120 H	2.6	00:08 12/01/2011	50 - 100



APPENDIX P – RAINFALL INTENSITY FREQUENCY DURATION (continued)

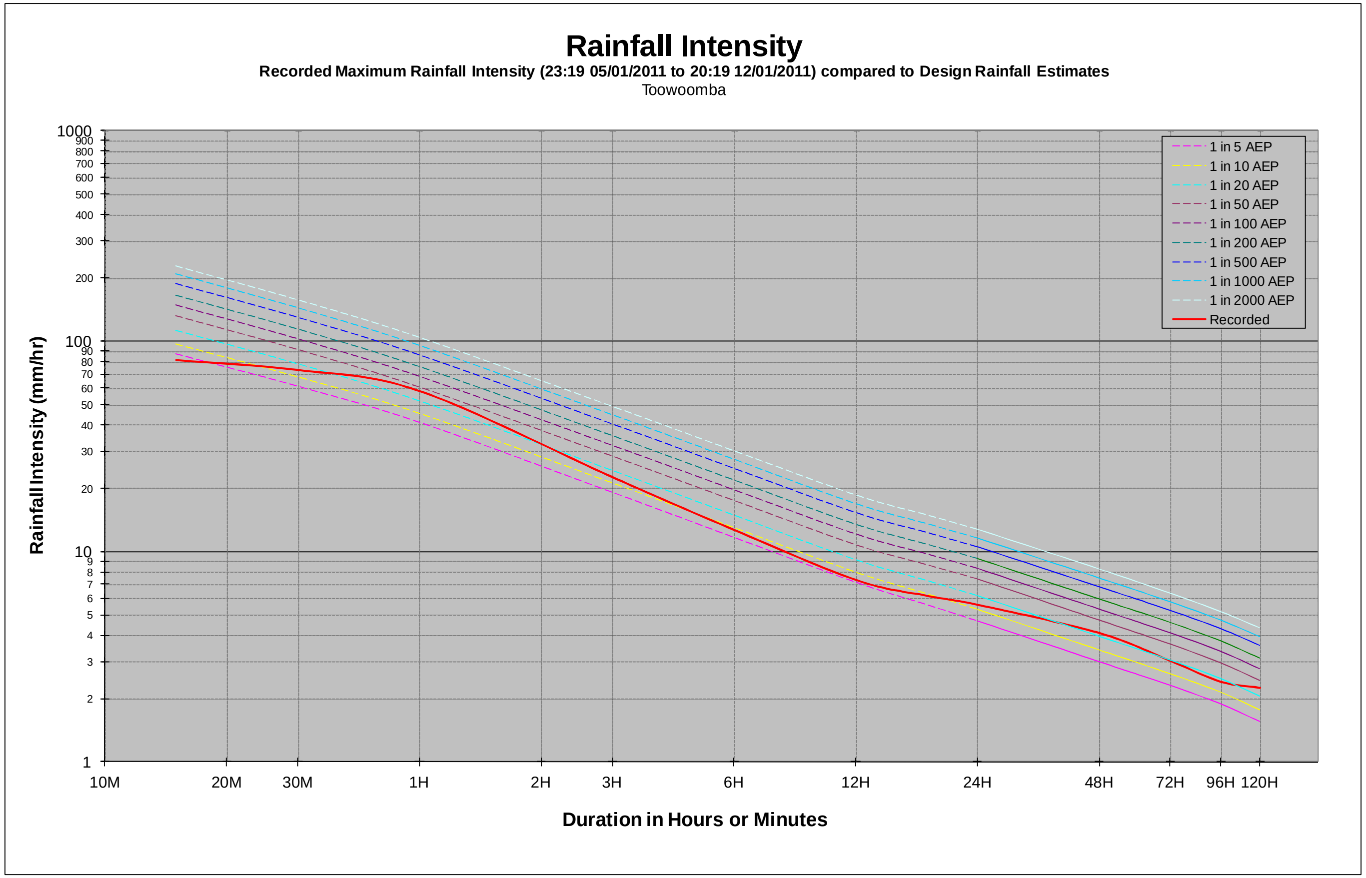
6596 – Crows Nest

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	58.8	16:38 09/01/2011	< 5
30 M	52.8	05:08 11/01/2011	< 5
1 H	34.8	05:23 11/01/2011	< 5
3 H	19.7	17:53 09/01/2011	< 5
6 H	13.9	20:53 09/01/2011	10 - 20
12 H	9.0	23:23 09/01/2011	20 - 50
18 H	6.2	05:08 10/01/2011	10 - 20
24 H	4.9	13:08 10/01/2011	5 - 10
48 H	4.7	10:53 11/01/2011	50 - 100
72 H	3.3	14:23 11/01/2011	50 - 100
96 H	2.6	10:38 11/01/2011	20 - 50
120 H	2.3	06:53 11/01/2011	50 - 100



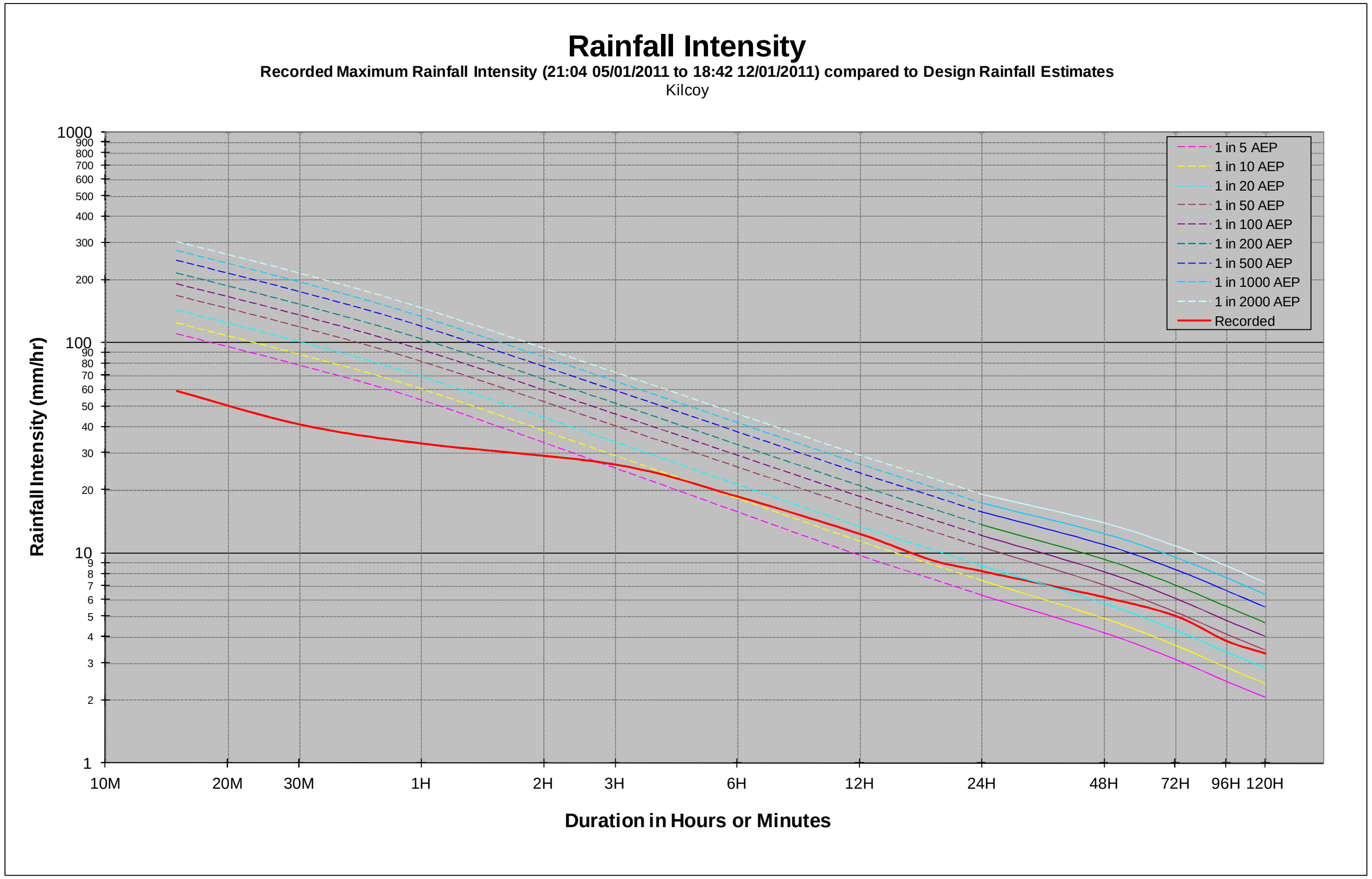
6598 – Toowoomba

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	81.2	14:04 10/01/2011	< 5
30 M	72.8	14:04 10/01/2011	10 - 20
1 H	57.9	14:04 10/01/2011	20 - 50
3 H	22.6	15:49 10/01/2011	10 - 20
6 H	12.7	17:19 10/01/2011	5 - 10
12 H	7.3	17:19 10/01/2011	5 - 10
18 H	6.2	06:19 11/01/2011	5 - 10
24 H	5.6	16:19 10/01/2011	10 - 20
48 H	4.1	11:34 11/01/2011	20 - 50
72 H	3.0	05:34 12/01/2011	10 - 20
96 H	2.4	09:49 11/01/2011	10 - 20
120 H	2.3	06:19 11/01/2011	20 - 50



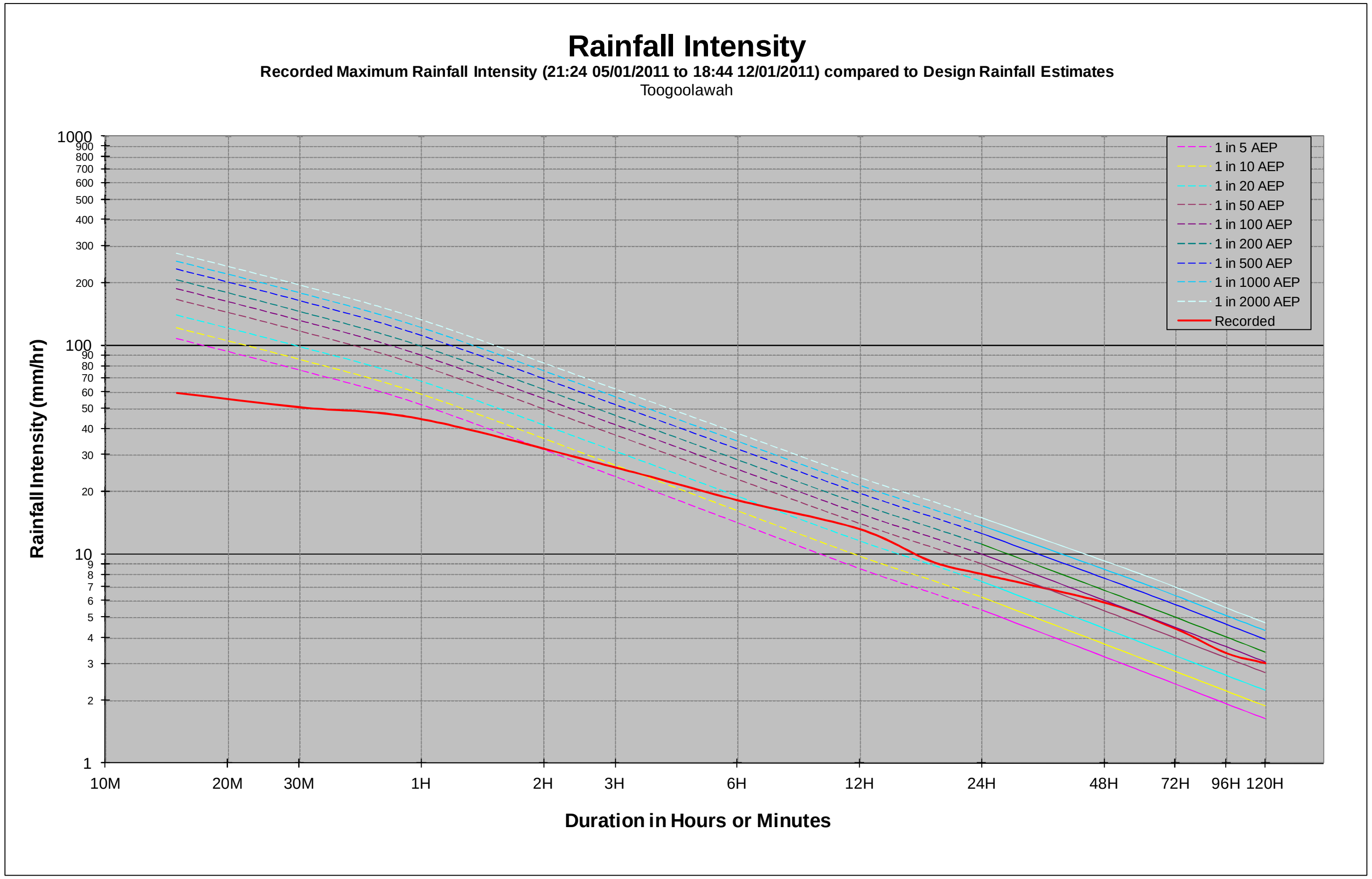
6600 – Kilcoy

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	58.8	11:04 10/01/2011	< 5
30 M	40.8	11:19 10/01/2011	< 5
1 H	33.1	16:04 09/01/2011	< 5
3 H	26.3	17:49 09/01/2011	5 - 10
6 H	18.5	19:49 09/01/2011	10 - 20
12 H	12.3	21:34 09/01/2011	10 - 20
18 H	9.3	22:34 09/01/2011	10 - 20
24 H	8.2	12:04 10/01/2011	10 - 20
48 H	6.2	13:34 11/01/2011	20 - 50
72 H	5.0	19:04 11/01/2011	20 - 50
96 H	3.8	11:34 12/01/2011	20 - 50
120 H	3.3	21:49 11/01/2011	20 - 50



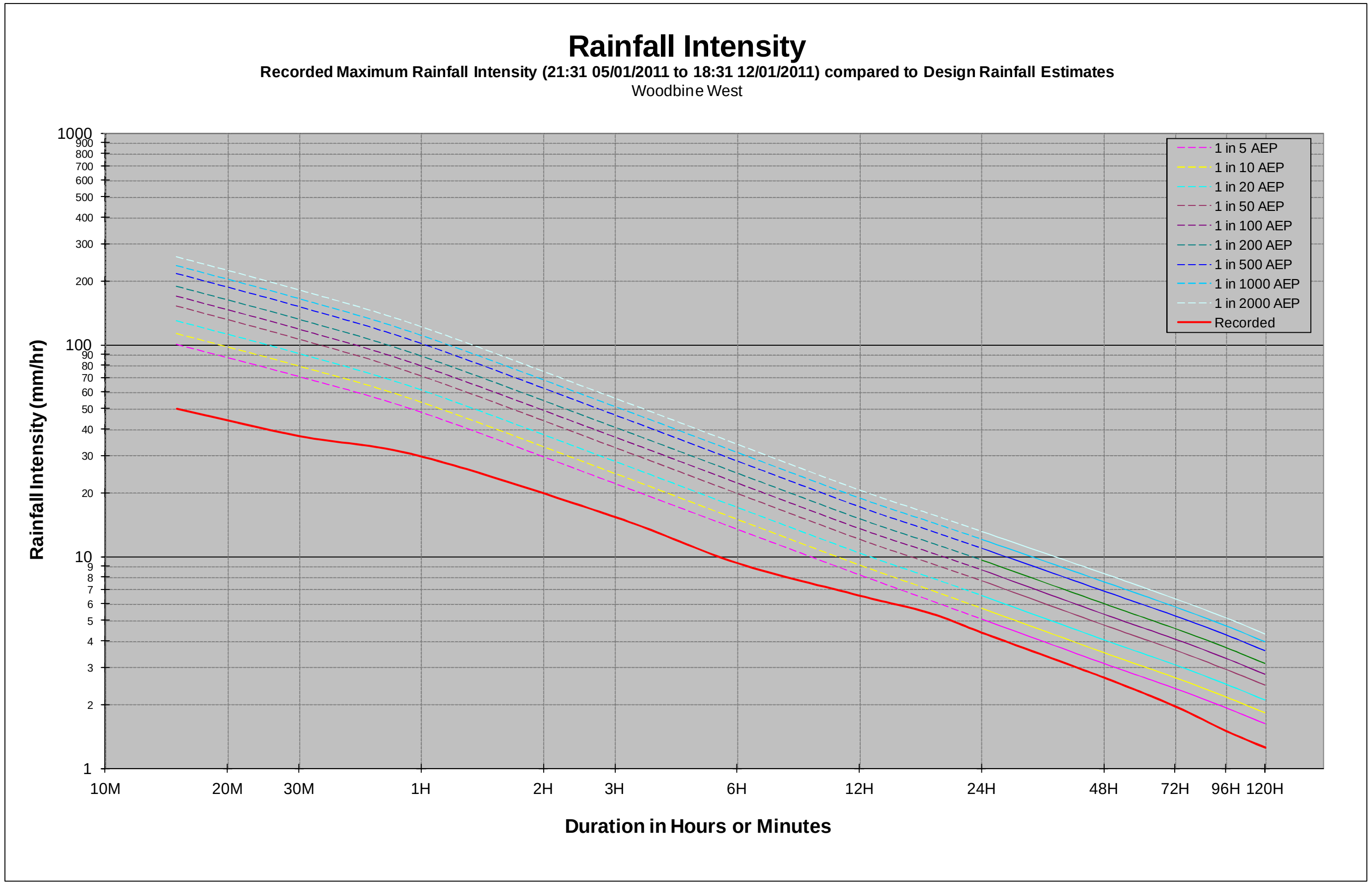
6604 – Toogoolawah

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	59.2	12:24 10/01/2011	< 5
30 M	50.6	12:24 10/01/2011	< 5
1 H	44.4	12:24 10/01/2011	< 5
3 H	26.1	17:54 09/01/2011	5 - 10
6 H	18.2	20:39 09/01/2011	10 - 20
12 H	13.2	22:39 09/01/2011	20 - 50
18 H	9.3	04:39 10/01/2011	20 - 50
24 H	8.1	12:54 10/01/2011	20 - 50
48 H	5.9	05:39 11/01/2011	50 - 100
72 H	4.4	18:54 11/01/2011	50 - 100
96 H	3.4	06:09 11/01/2011	50 - 100
120 H	3.0	19:24 11/01/2011	50 - 100



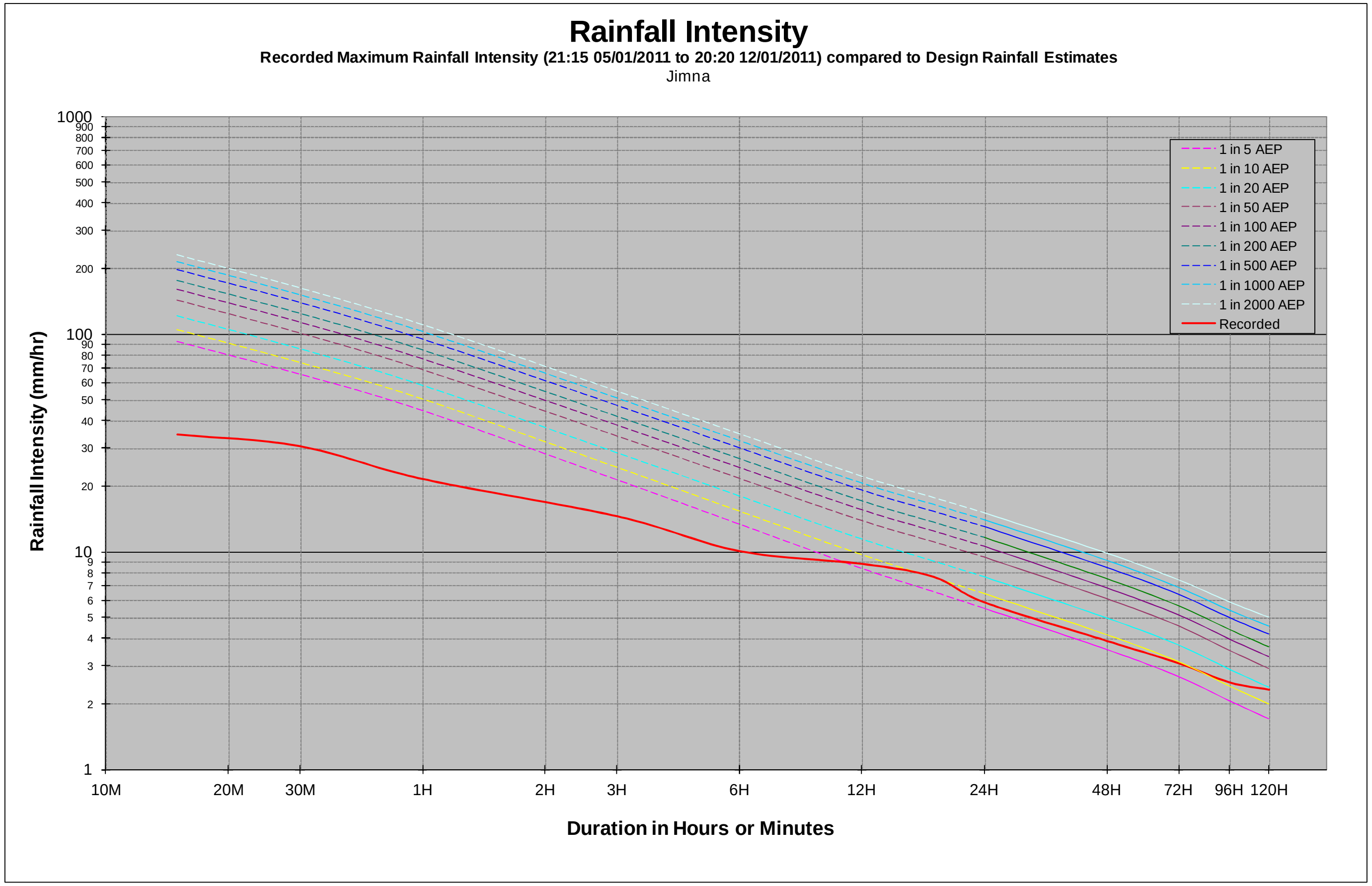
6606 – Woodbine West

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.0	07:17 11/01/2011	< 5
30 M	37.2	07:17 11/01/2011	< 5
1 H	29.8	07:17 11/01/2011	< 5
3 H	15.4	08:02 11/01/2011	< 5
6 H	9.3	12:02 11/01/2011	< 5
12 H	6.6	17:02 11/01/2011	< 5
18 H	5.4	16:17 11/01/2011	< 5
24 H	4.4	13:17 11/01/2011	< 5
48 H	2.7	19:02 11/01/2011	< 5
72 H	2.0	19:17 11/01/2011	< 5
96 H	1.5	19:17 11/01/2011	< 5
120 H	1.3	19:17 11/01/2011	< 5



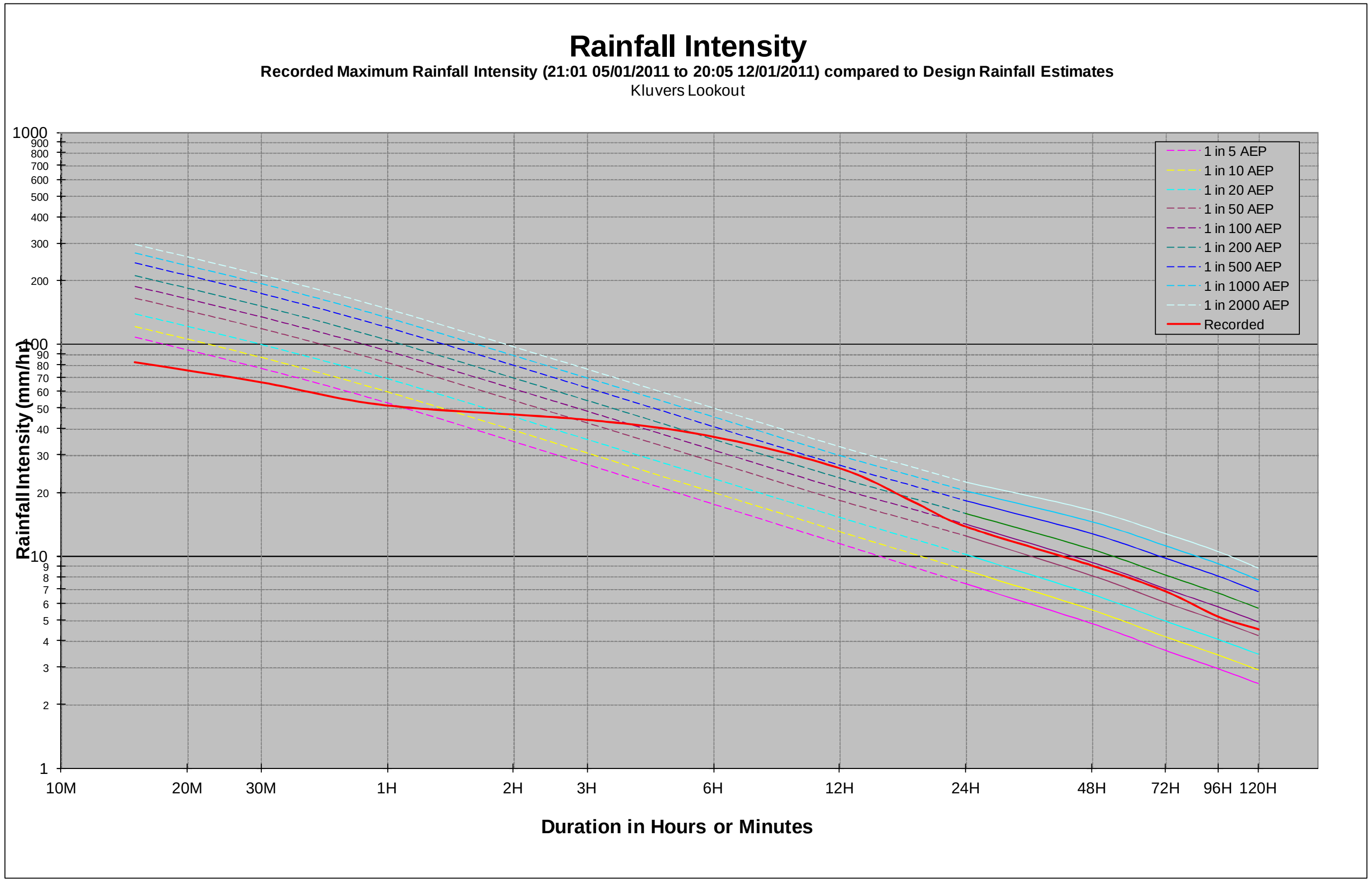
6608 – Jimna

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	34.4	13:31 09/01/2011	< 5
30 M	30.4	13:31 09/01/2011	< 5
1 H	21.5	13:46 09/01/2011	< 5
3 H	14.5	14:01 09/01/2011	< 5
6 H	10.0	18:01 09/01/2011	< 5
12 H	8.8	23:01 09/01/2011	5 - 10
18 H	7.6	23:16 09/01/2011	5 - 10
24 H	5.8	01:16 10/01/2011	5 - 10
48 H	3.9	04:31 11/01/2011	5 - 10
72 H	3.1	16:01 11/01/2011	5 - 10
96 H	2.5	12:31 10/01/2011	10 - 20
120 H	2.3	12:31 11/01/2011	10 - 20



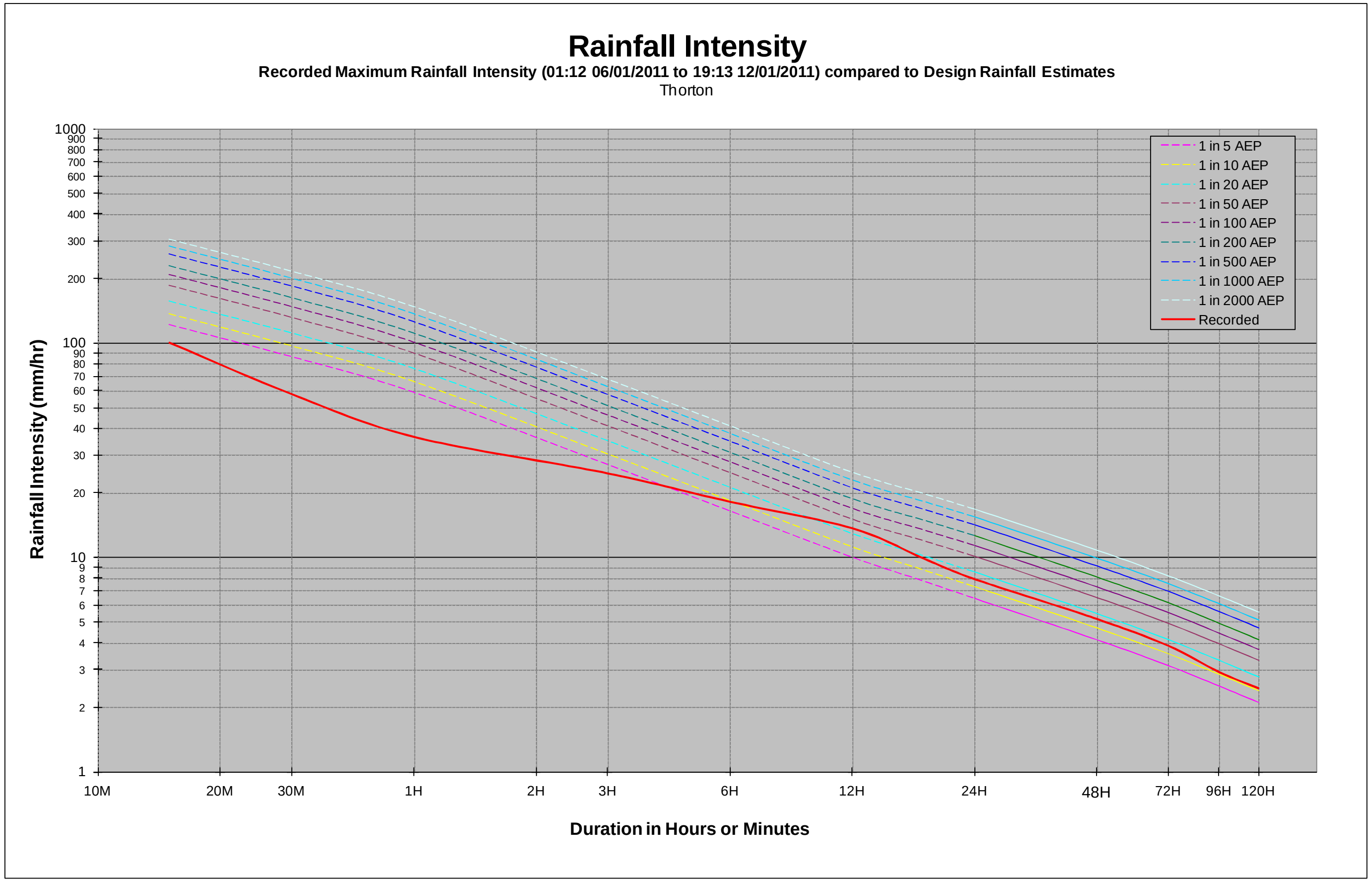
6610 – Kluvers Lookout

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	82.0	07:01 11/01/2011	< 5
30 M	66.0	07:01 11/01/2011	< 5
1 H	51.3	07:01 11/01/2011	< 5
3 H	43.9	11:46 11/01/2011	50 - 100
6 H	36.5	12:01 11/01/2011	200 - 500
12 H	26.0	15:01 11/01/2011	200 - 500
18 H	18.0	20:31 11/01/2011	100 - 200
24 H	13.8	19:16 11/01/2011	50 - 100
48 H	9.0	14:31 11/01/2011	50 - 100
72 H	6.8	20:31 11/01/2011	50 - 100
96 H	5.2	02:46 12/01/2011	50 - 100
120 H	4.5	02:46 12/01/2011	50 - 100



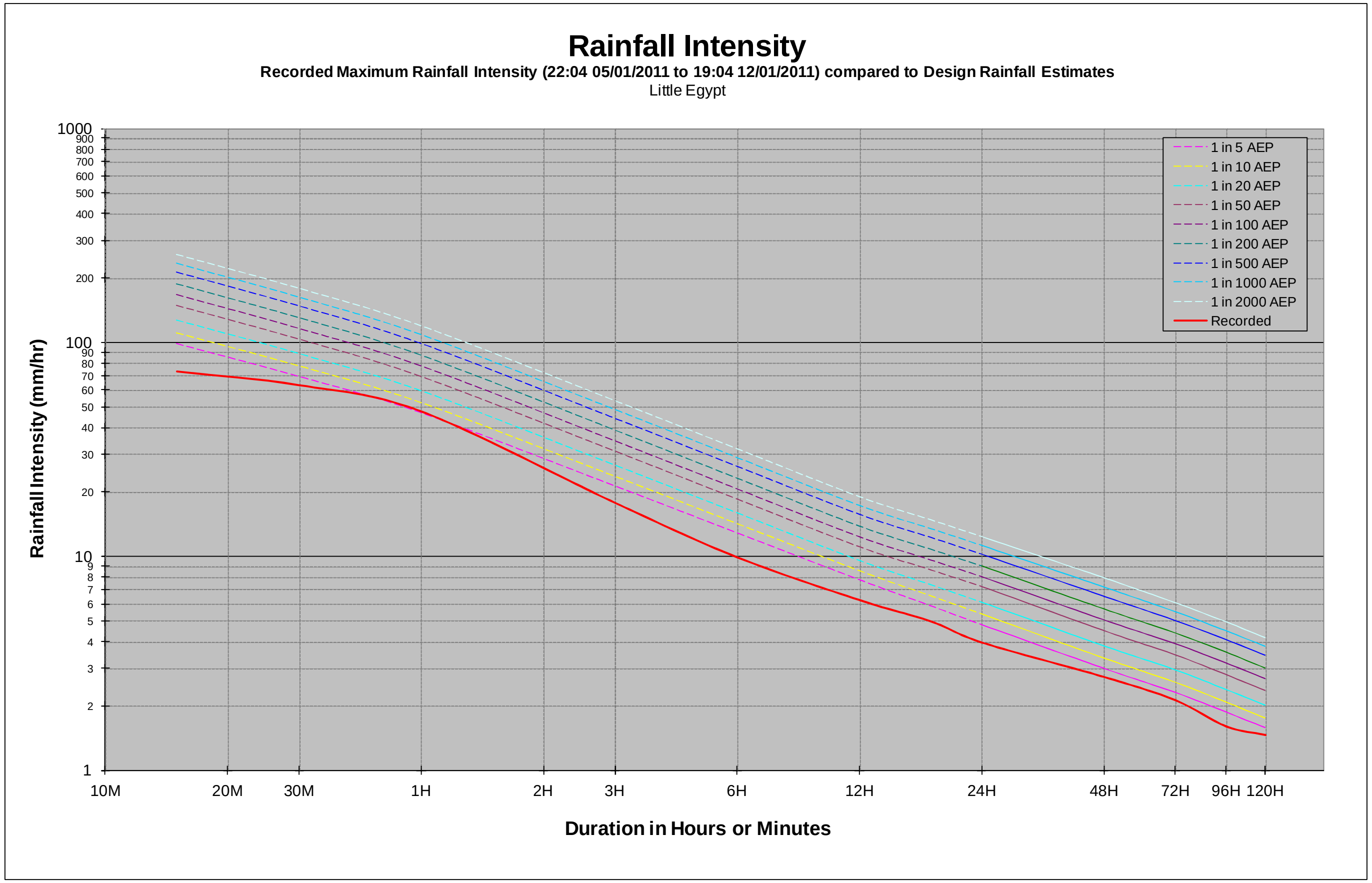
6615 – Thorton

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	100.8	10:43 11/01/2011	< 5
30 M	58.0	07:58 11/01/2011	< 5
1 H	36.6	08:13 11/01/2011	< 5
3 H	24.7	10:43 11/01/2011	< 5
6 H	18.2	10:43 11/01/2011	5 - 10
12 H	13.7	18:13 11/01/2011	20 - 50
18 H	9.9	18:58 11/01/2011	10 - 20
24 H	7.9	19:28 11/01/2011	10 - 20
48 H	5.2	18:58 11/01/2011	10 - 20
72 H	3.9	19:43 11/01/2011	10 - 20
96 H	2.9	19:28 11/01/2011	10 - 20
120 H	2.5	19:28 11/01/2011	10 - 20



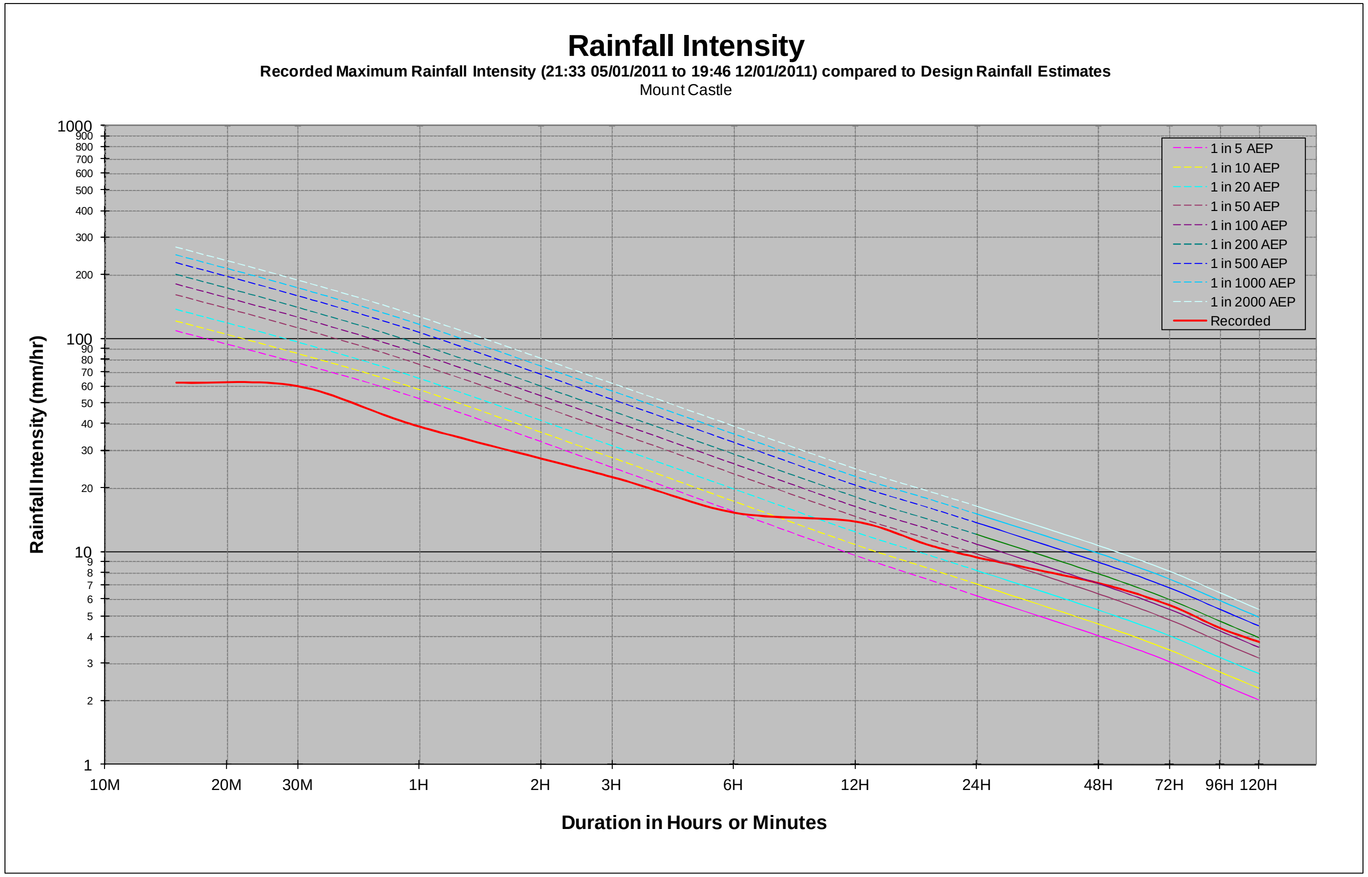
6617 – Little Egypt

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	73.2	06:19 11/01/2011	< 5
30 M	63.2	06:34 11/01/2011	< 5
1 H	47.6	06:34 11/01/2011	5 - 10
3 H	17.8	07:19 11/01/2011	< 5
6 H	9.9	07:19 11/01/2011	< 5
12 H	6.3	16:04 11/01/2011	< 5
18 H	5.0	07:19 11/01/2011	< 5
24 H	4.0	13:19 11/01/2011	< 5
48 H	2.7	16:04 11/01/2011	< 5
72 H	2.1	06:49 12/01/2011	< 5
96 H	1.6	06:49 12/01/2011	< 5
120 H	1.5	07:19 11/01/2011	< 5



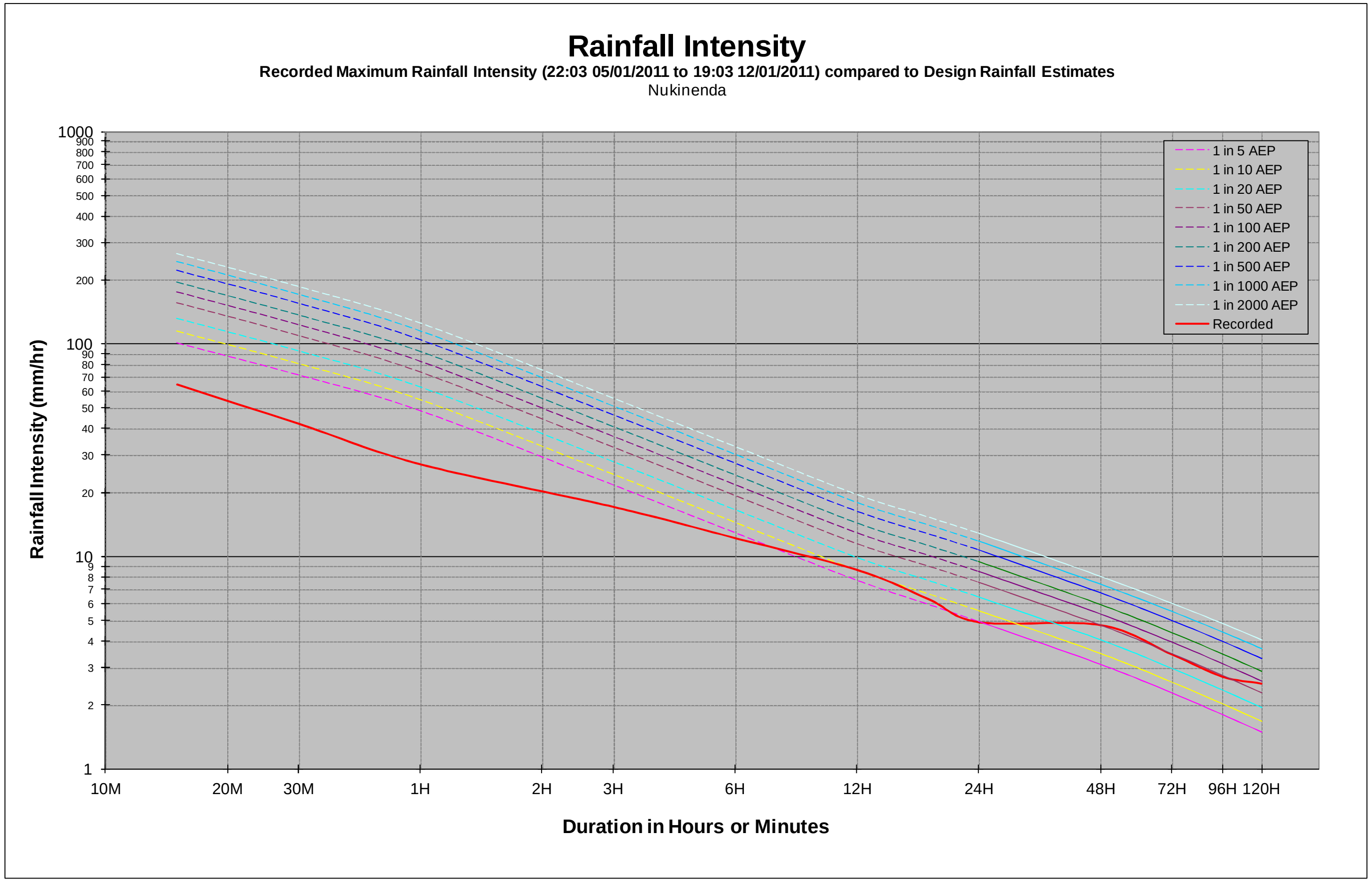
6619 – Mount Castle

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	62.0	08:04 11/01/2011	< 5
30 M	59.6	08:19 11/01/2011	< 5
1 H	38.6	08:19 11/01/2011	< 5
3 H	22.4	10:19 11/01/2011	< 5
6 H	15.3	13:19 11/01/2011	< 5
12 H	13.9	17:19 11/01/2011	20 - 50
18 H	10.9	16:34 11/01/2011	20 - 50
24 H	9.4	19:04 11/01/2011	20 - 50
48 H	7.1	19:49 11/01/2011	100 - 200
72 H	5.6	06:49 12/01/2011	100 - 200
96 H	4.4	19:49 12/01/2011	100 - 200
120 H	3.8	21:49 11/01/2011	100 - 200



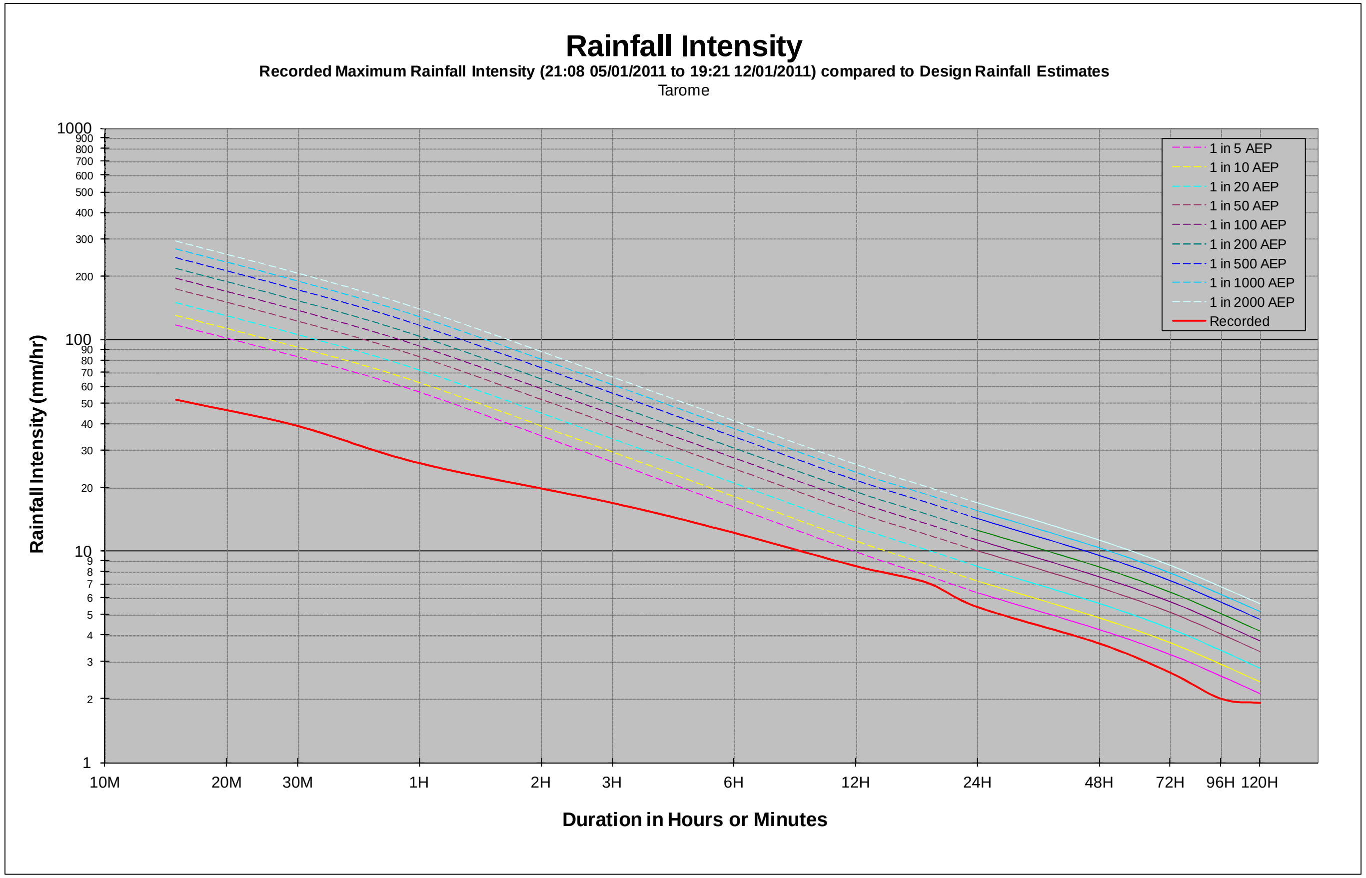
6621 – Nukinenda

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	64.4	04:19 11/01/2011	< 5
30 M	42.0	04:34 11/01/2011	< 5
1 H	27.1	04:49 11/01/2011	< 5
3 H	17.1	18:49 09/01/2011	< 5
6 H	12.2	19:19 09/01/2011	< 5
12 H	8.6	23:19 09/01/2011	5 - 10
18 H	6.3	00:19 10/01/2011	5 - 10
24 H	4.9	00:34 10/01/2011	< 5
48 H	4.7	10:19 11/01/2011	20 - 50
72 H	3.4	19:49 11/01/2011	20 - 50
96 H	2.7	09:49 11/01/2011	20 - 50
120 H	2.5	09:04 11/01/2011	50 - 100



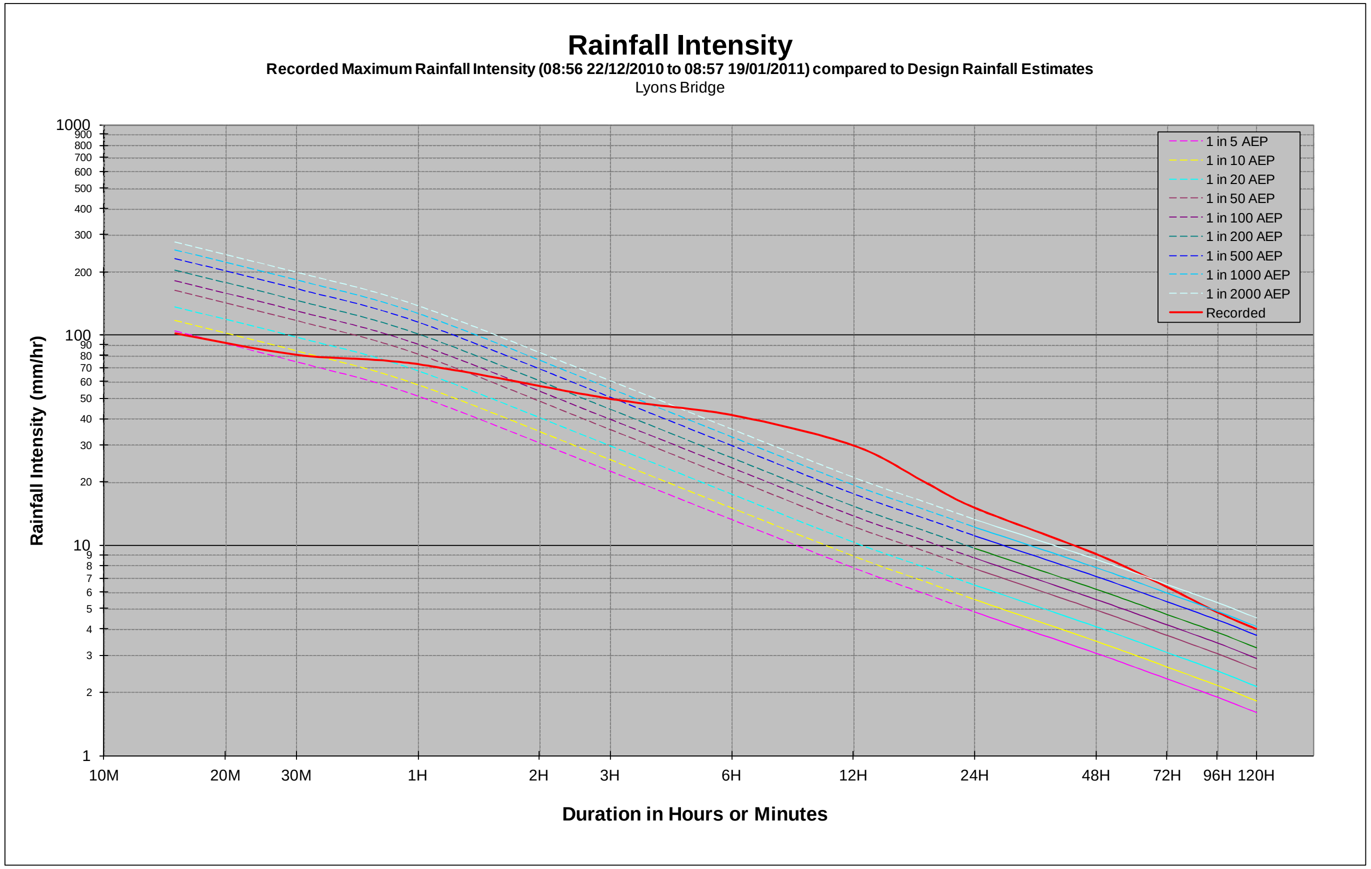
6623 – Tarome

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	51.6	13:38 11/01/2011	< 5
30 M	38.8	13:53 11/01/2011	< 5
1 H	25.9	13:53 11/01/2011	< 5
3 H	16.8	15:38 11/01/2011	< 5
6 H	12.1	14:53 11/01/2011	< 5
12 H	8.5	19:23 11/01/2011	< 5
18 H	7.1	16:23 11/01/2011	< 5
24 H	5.4	19:08 11/01/2011	< 5
48 H	3.6	00:08 12/01/2011	< 5
72 H	2.7	19:38 11/01/2011	< 5
96 H	2.0	00:08 12/01/2011	< 5
120 H	1.9	19:38 11/01/2011	< 5



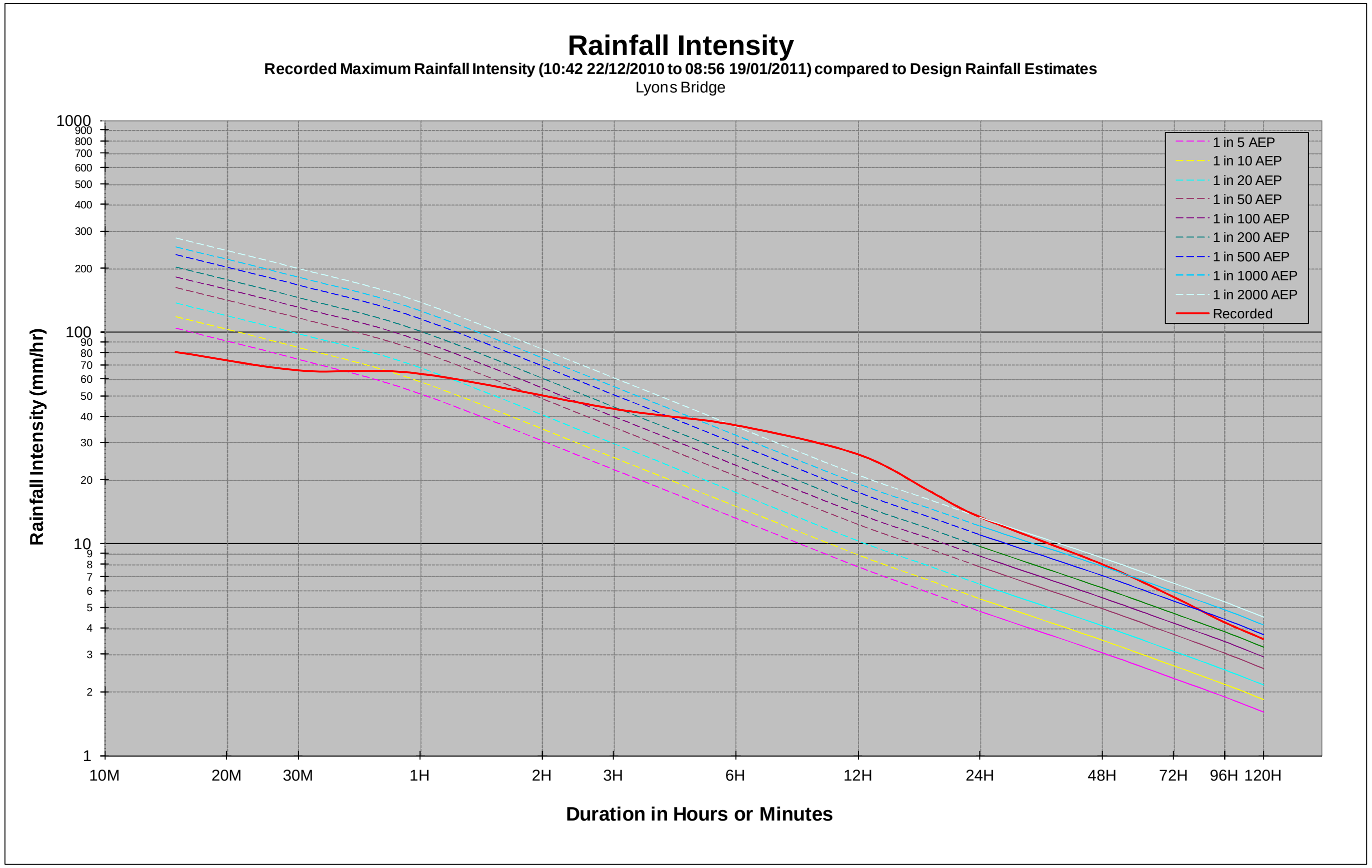
6630 – Lyons Bridge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	101.6	13:42 11/01/2011	< 5
30 M	80.4	13:57 11/01/2011	5 - 10
1 H	72.5	13:42 11/01/2011	20 - 50
3 H	49.6	13:57 11/01/2011	200 - 500
6 H	41.5	14:42 11/01/2011	> 2000
12 H	29.8	14:57 11/01/2011	> 2000
18 H	20.0	20:57 11/01/2011	> 2000
24 H	15.1	02:57 12/01/2011	> 2000
48 H	9.1	14:57 11/01/2011	> 2000
72 H	6.3	03:27 12/01/2011	1000 - 2000
96 H	4.8	03:27 12/01/2011	500 - 1000
120 H	4.0	00:12 12/01/2011	500 - 1000



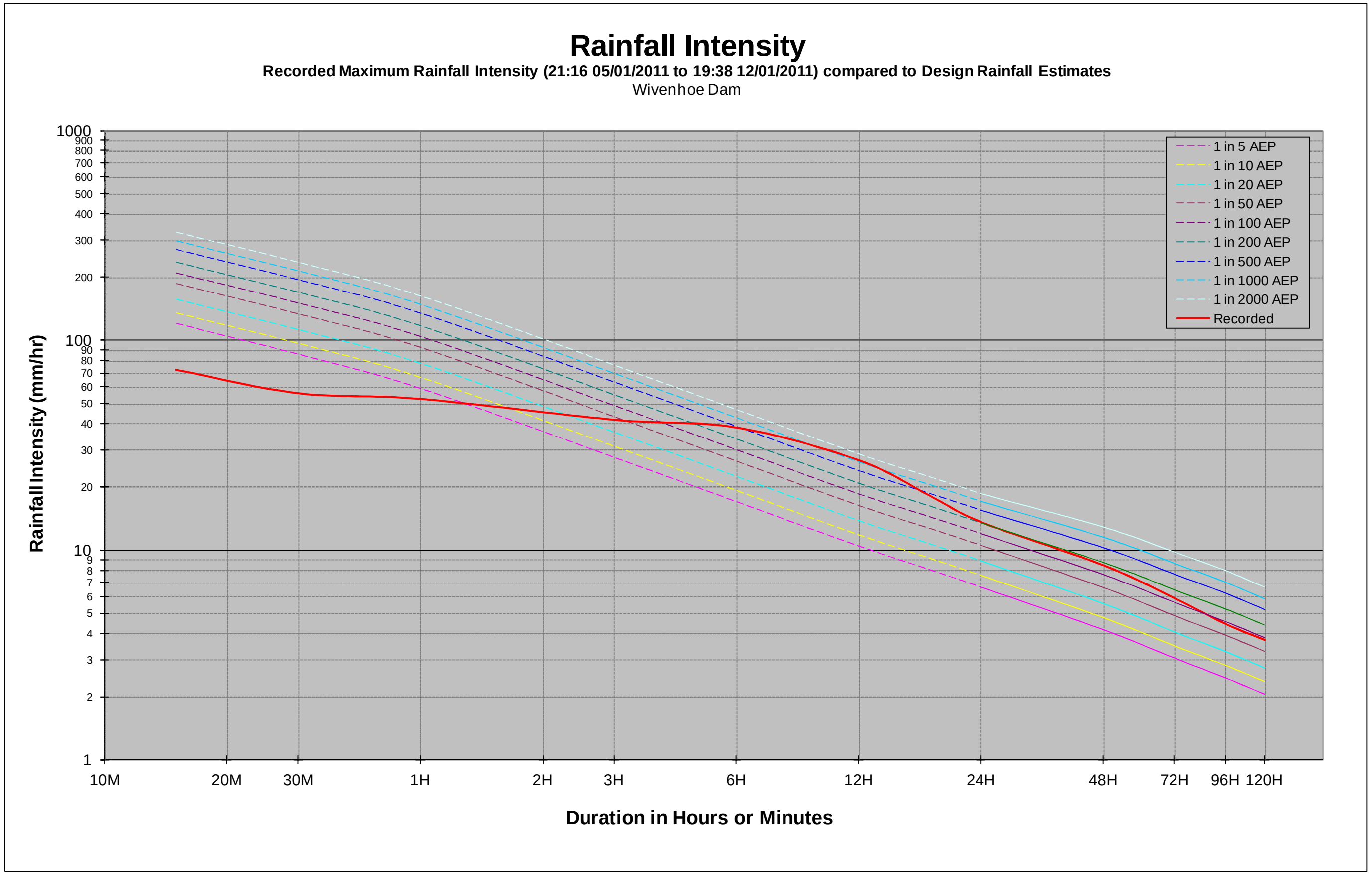
6633 – Lyons Bridge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	80.8	12:57 11/01/2011	< 5
30 M	66.2	13:57 11/01/2011	< 5
1 H	63.8	13:42 11/01/2011	10 - 20
3 H	43.6	13:57 11/01/2011	100 - 200
6 H	36.4	14:42 11/01/2011	> 2000
12 H	26.6	16:12 11/01/2011	> 2000
18 H	17.8	18:27 11/01/2011	> 2000
24 H	13.4	18:27 11/01/2011	> 2000
48 H	8.0	14:57 11/01/2011	1000 - 2000
72 H	5.6	01:27 12/01/2011	500 - 1000
96 H	4.3	01:27 12/01/2011	200 - 500
120 H	3.6	18:27 11/01/2011	200 - 500



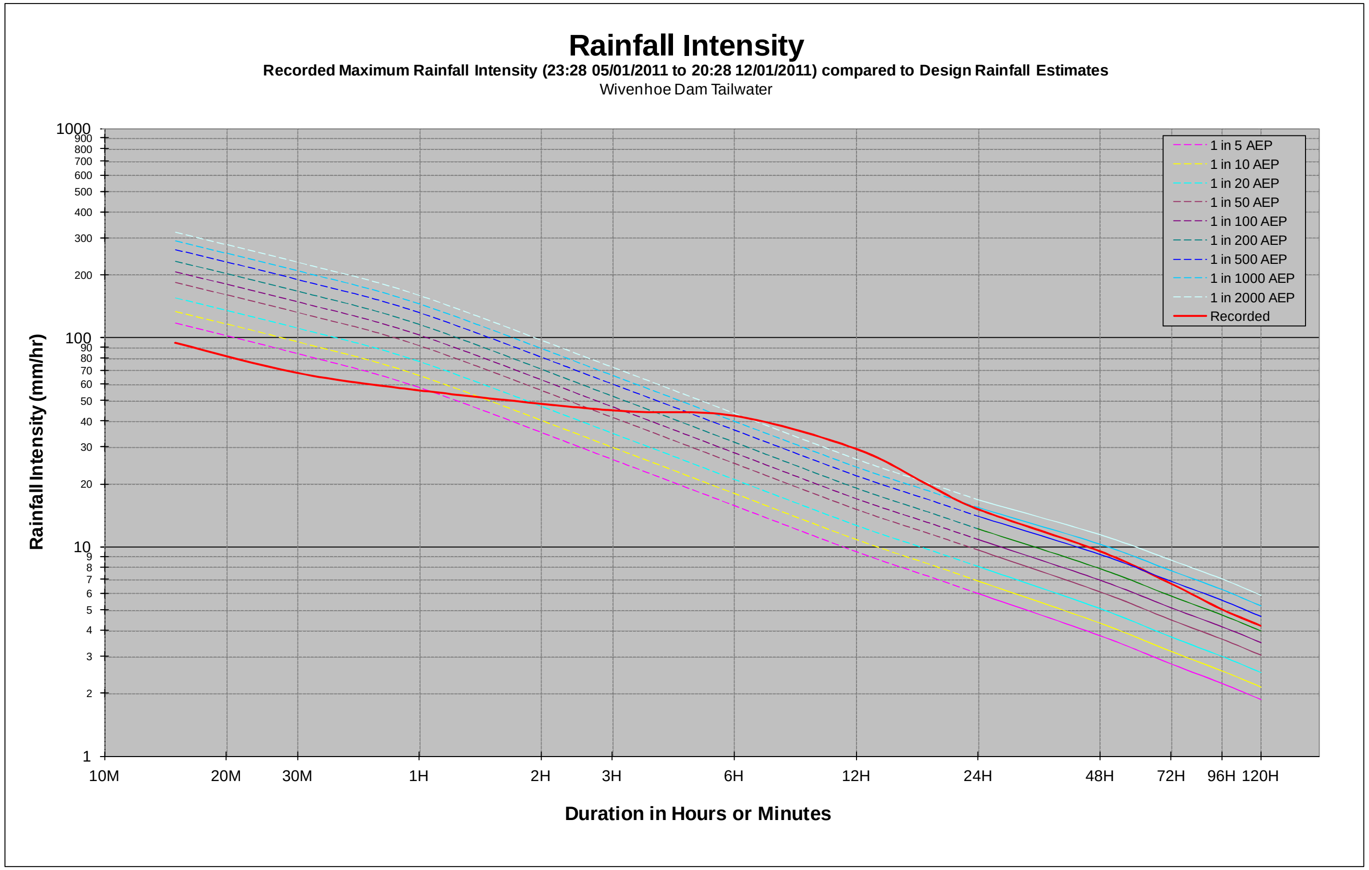
6636 – Wivenhoe Dam

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	72.4	13:17 11/01/2011	< 5
30 M	56.0	13:32 11/01/2011	< 5
1 H	52.6	13:17 11/01/2011	< 5
3 H	41.9	14:17 11/01/2011	20 - 50
6 H	38.5	14:02 11/01/2011	200 - 500
12 H	26.8	16:32 11/01/2011	1000 - 2000
18 H	18.1	19:47 11/01/2011	200 - 500
24 H	13.6	19:47 11/01/2011	200 - 500
48 H	8.5	15:17 11/01/2011	100 - 200
72 H	5.9	23:17 11/01/2011	100 - 200
96 H	4.5	04:32 12/01/2011	50 - 100
120 H	3.7	04:32 12/01/2011	50 - 100



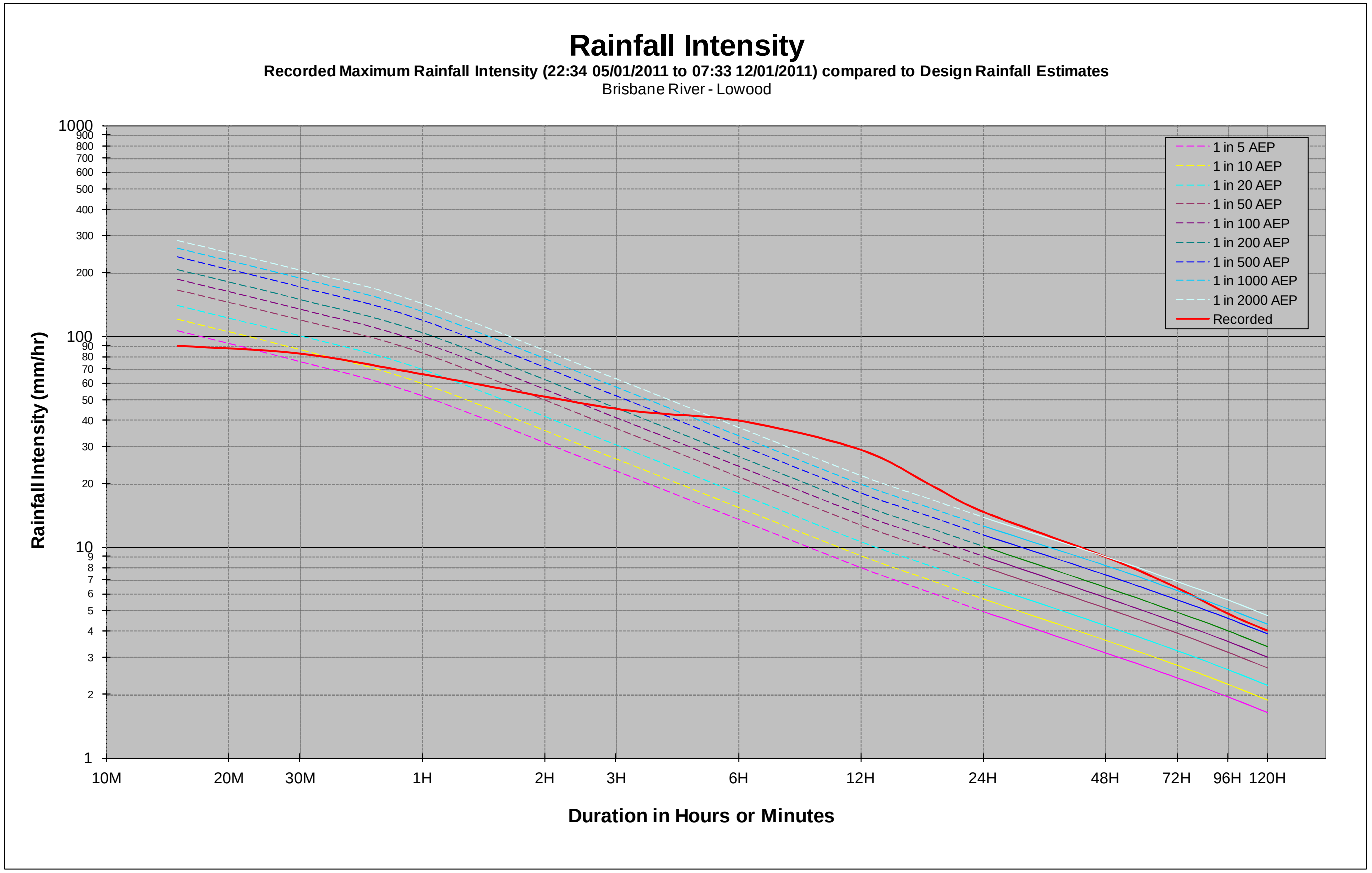
6643 – Wivenhoe Dam Tailwater

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	94.0	09:14 11/01/2011	< 5
30 M	67.6	13:29 11/01/2011	< 5
1 H	55.8	13:29 11/01/2011	< 5
3 H	44.8	13:44 11/01/2011	50 - 100
6 H	42.2	13:59 11/01/2011	1000 - 2000
12 H	29.4	16:29 11/01/2011	> 2000
18 H	19.9	19:29 11/01/2011	1000 - 2000
24 H	15.1	19:14 11/01/2011	500 - 1000
48 H	9.5	14:44 11/01/2011	500 - 1000
72 H	6.7	02:59 12/01/2011	200 - 500
96 H	5.0	04:29 12/01/2011	200 - 500
120 H	4.2	04:29 12/01/2011	200 - 500



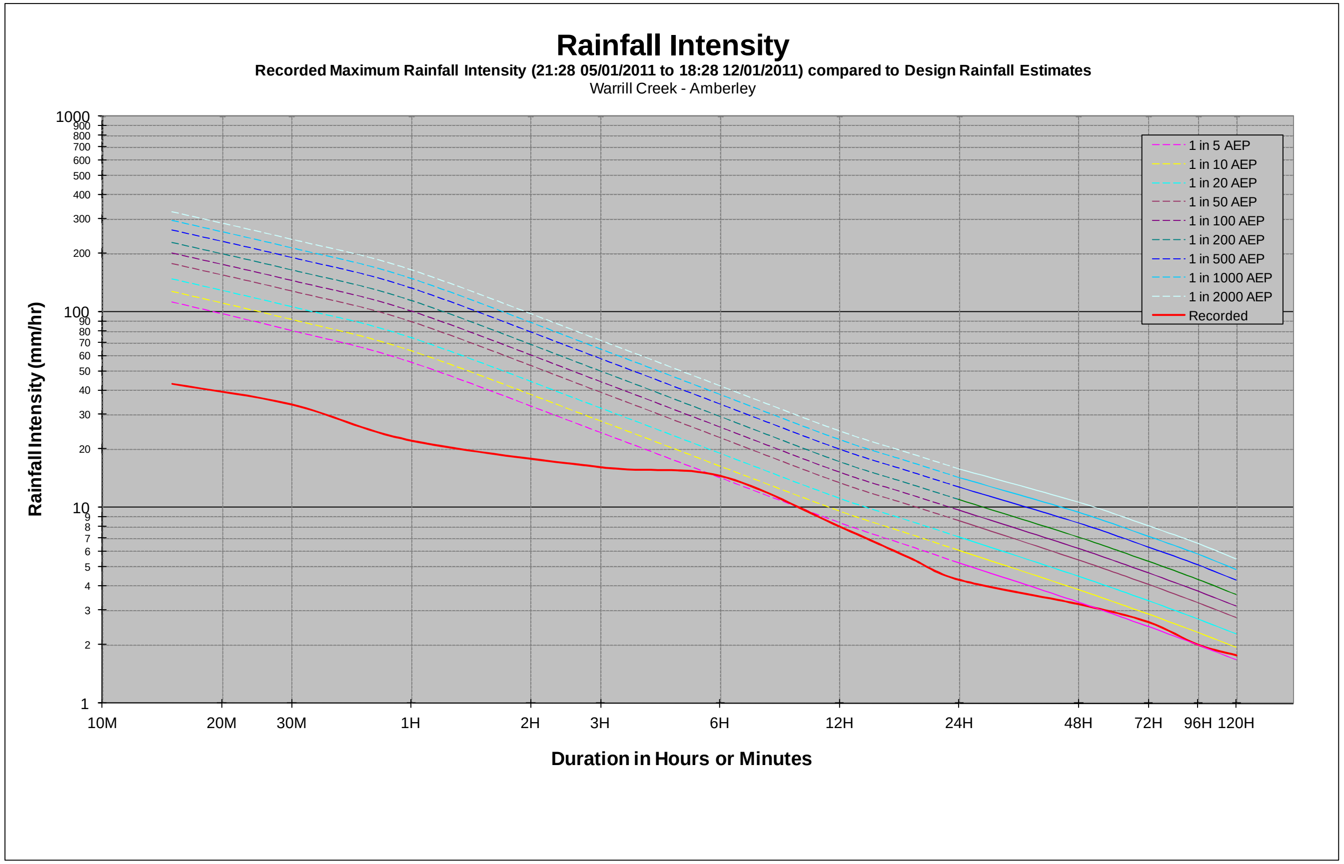
6649 – Brisbane River – Lowood

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	90.4	13:34 11/01/2011	< 5
30 M	83.0	13:34 11/01/2011	5 - 10
1 H	66.3	13:49 11/01/2011	10 - 20
3 H	45.4	09:34 11/01/2011	100 - 200
6 H	40.0	14:04 11/01/2011	> 2000
12 H	29.0	14:49 11/01/2011	> 2000
18 H	19.6	19:34 11/01/2011	> 2000
24 H	14.8	19:19 11/01/2011	> 2000
48 H	9.0	14:49 11/01/2011	> 2000
72 H	6.4	01:19 12/01/2011	1000 - 2000
96 H	4.9	01:19 12/01/2011	500 - 1000
120 H	4.0	01:04 12/01/2011	500 - 1000



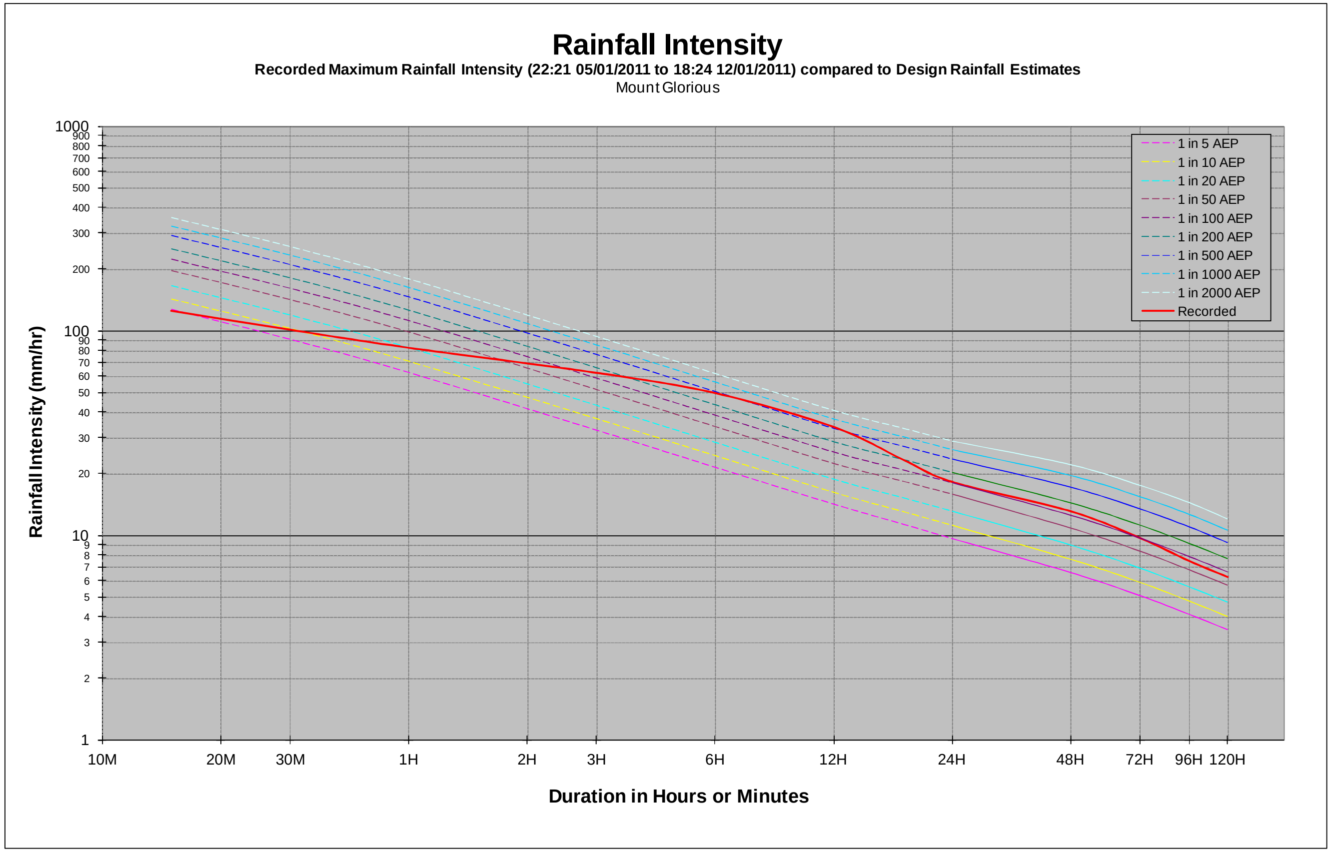
6651 – Warrill Creek – Amberley

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	42.8	11:29 11/01/2011	< 5
30 M	33.6	11:29 11/01/2011	< 5
1 H	22.0	11:44 09/01/2011	< 5
3 H	16.1	11:59 11/01/2011	< 5
6 H	14.5	14:59 11/01/2011	5 - 10
12 H	8.0	17:14 11/01/2011	< 5
18 H	5.6	18:44 11/01/2011	< 5
24 H	4.3	18:44 11/01/2011	< 5
48 H	3.2	16:44 11/01/2011	< 5
72 H	2.6	18:44 11/01/2011	5 - 10
96 H	2.0	18:44 11/01/2011	< 5
120 H	1.8	18:44 11/01/2011	5 - 10



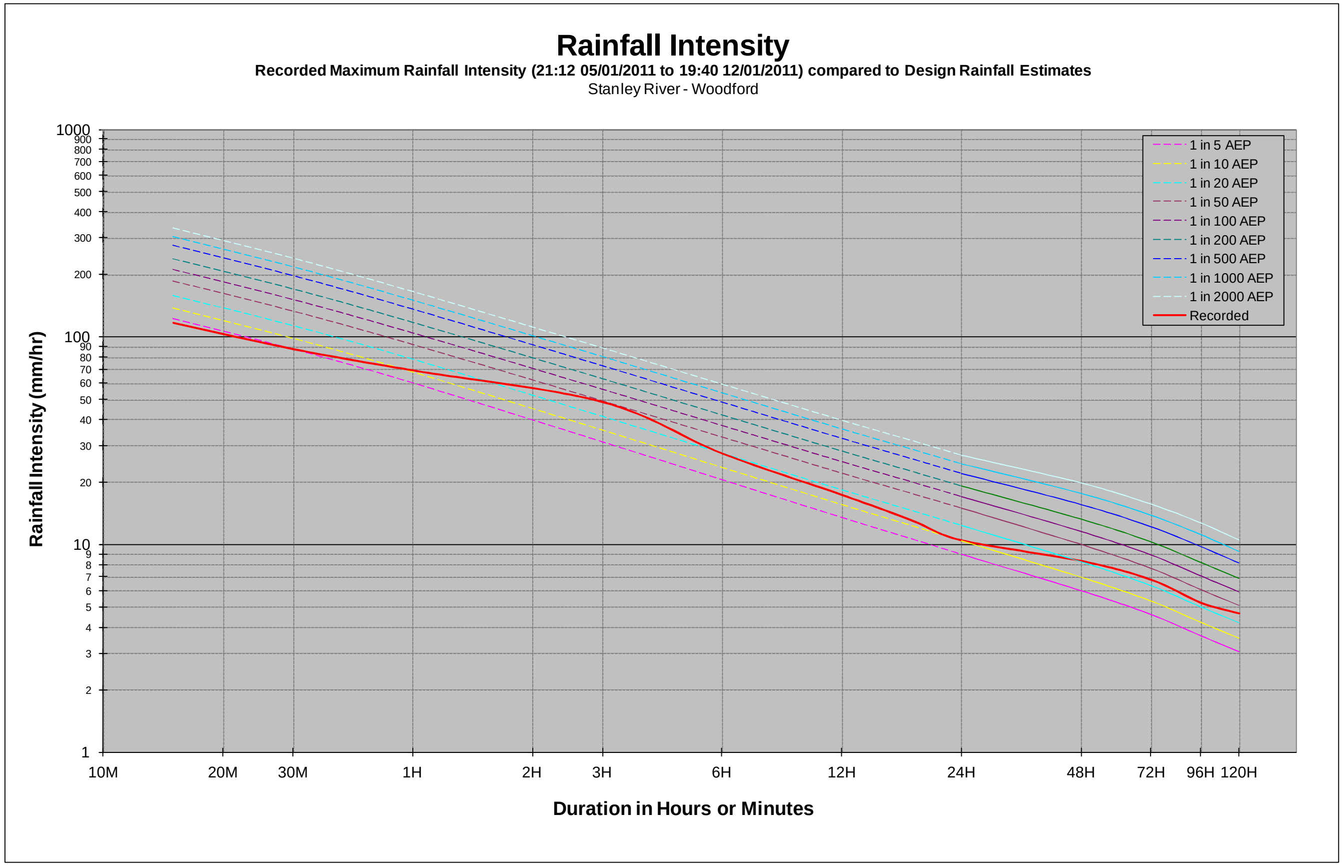
6680 – Mount Glorious

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	125.6	08:52 11/01/2011	< 5
30 M	101.6	08:52 11/01/2011	5 - 10
1 H	82.9	08:52 11/01/2011	20 - 50
3 H	62.5	10:37 11/01/2011	100 - 200
6 H	49.7	12:52 11/01/2011	200 - 500
12 H	33.9	15:37 11/01/2011	500 - 1000
18 H	23.5	19:22 11/01/2011	100 - 200
24 H	18.3	19:07 11/01/2011	100 - 200
48 H	13.1	14:37 11/01/2011	100 - 200
72 H	9.7	05:22 12/01/2011	50 - 100
96 H	7.5	09:07 12/01/2011	50 - 100
120 H	6.3	06:52 12/01/2011	50 - 100



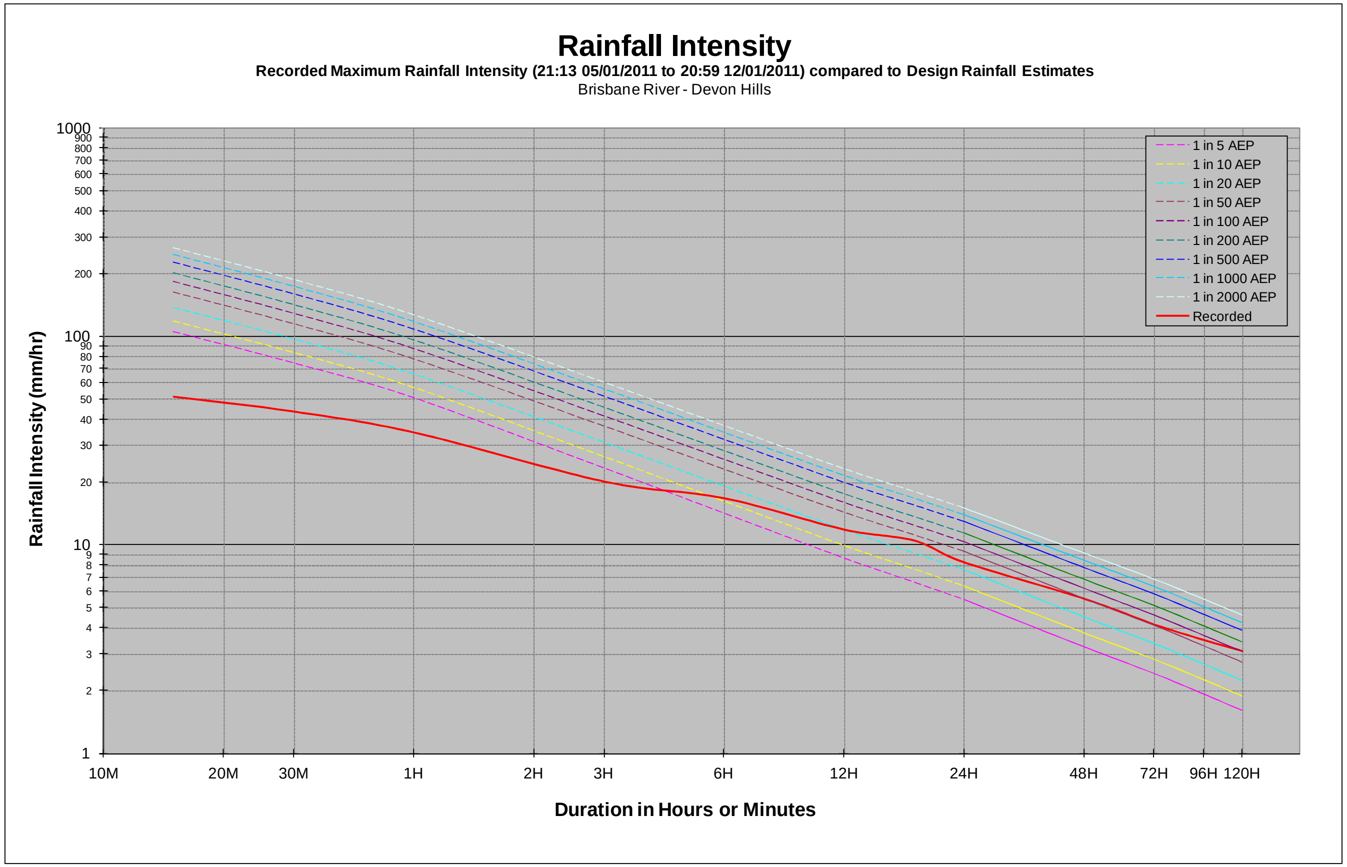
6705 – Stanley River – Woodford

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	116.8	10:58 11/01/2011	< 5
30 M	87.4	11:13 11/01/2011	< 5
1 H	69.0	11:43 11/01/2011	10 - 20
3 H	48.6	13:28 11/01/2011	20 - 50
6 H	27.5	15:13 11/01/2011	10 - 20
12 H	17.4	15:58 11/01/2011	10 - 20
18 H	13.1	18:28 11/01/2011	10 - 20
24 H	10.5	18:28 11/01/2011	10 - 20
48 H	8.4	13:28 11/01/2011	20 - 50
72 H	6.8	18:28 11/01/2011	20 - 50
96 H	5.3	13:43 12/01/2011	20 - 50
120 H	4.7	18:43 11/01/2011	20 - 50



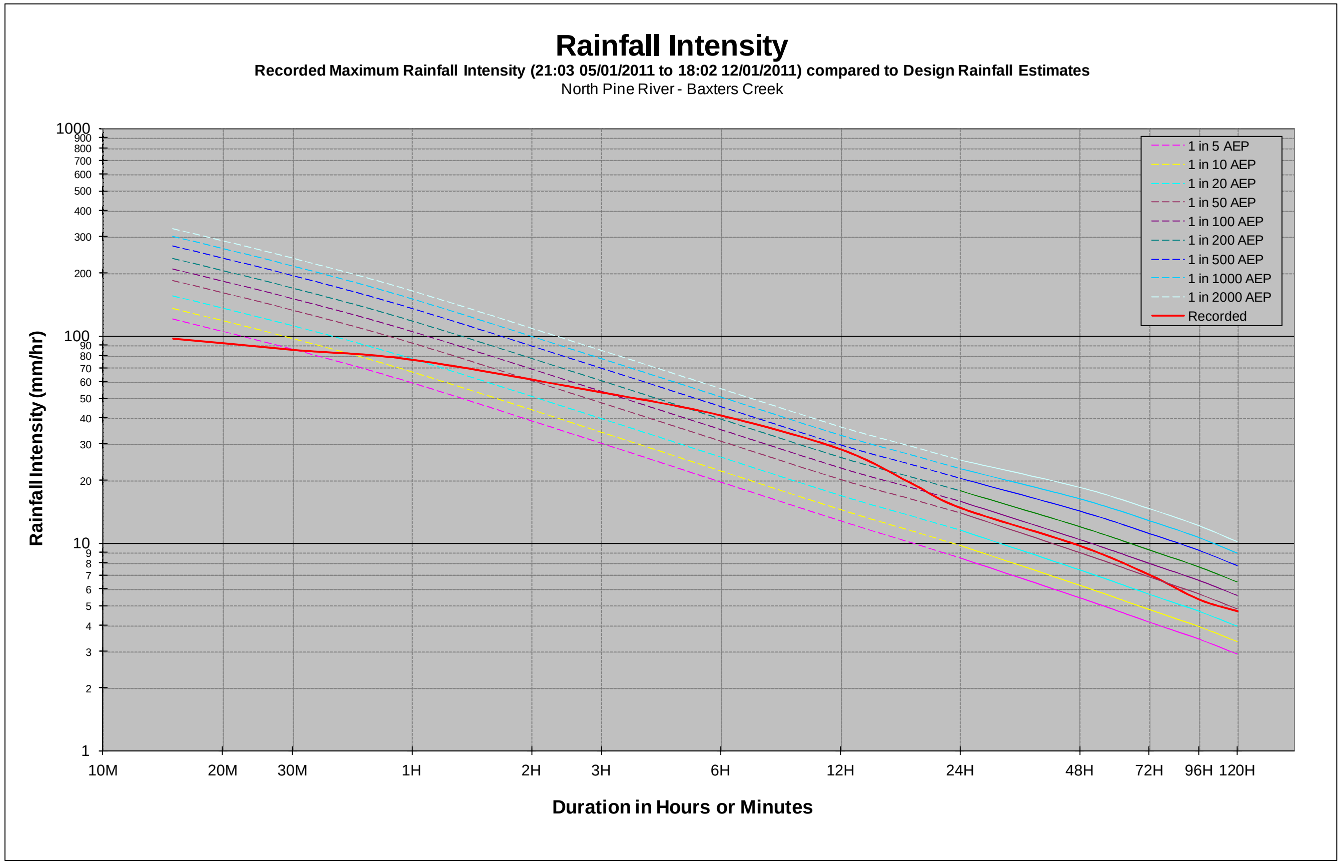
6708 – Brisbane River – Devon Hills

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	51.2	14:28 09/01/2011	< 5
30 M	43.4	14:43 09/01/2011	< 5
1 H	34.5	14:58 09/01/2011	< 5
3 H	20.1	15:13 09/01/2011	< 5
6 H	16.7	18:58 09/01/2011	10 - 20
12 H	11.8	00:13 10/01/2011	20 - 50
18 H	10.5	23:58 09/01/2011	20 - 50
24 H	8.3	02:43 10/01/2011	20 - 50
48 H	5.5	04:58 11/01/2011	20 - 50
72 H	4.2	18:43 11/01/2011	50 - 100
96 H	3.5	04:58 11/01/2011	50 - 100
120 H	3.1	11:43 11/01/2011	100 - 200



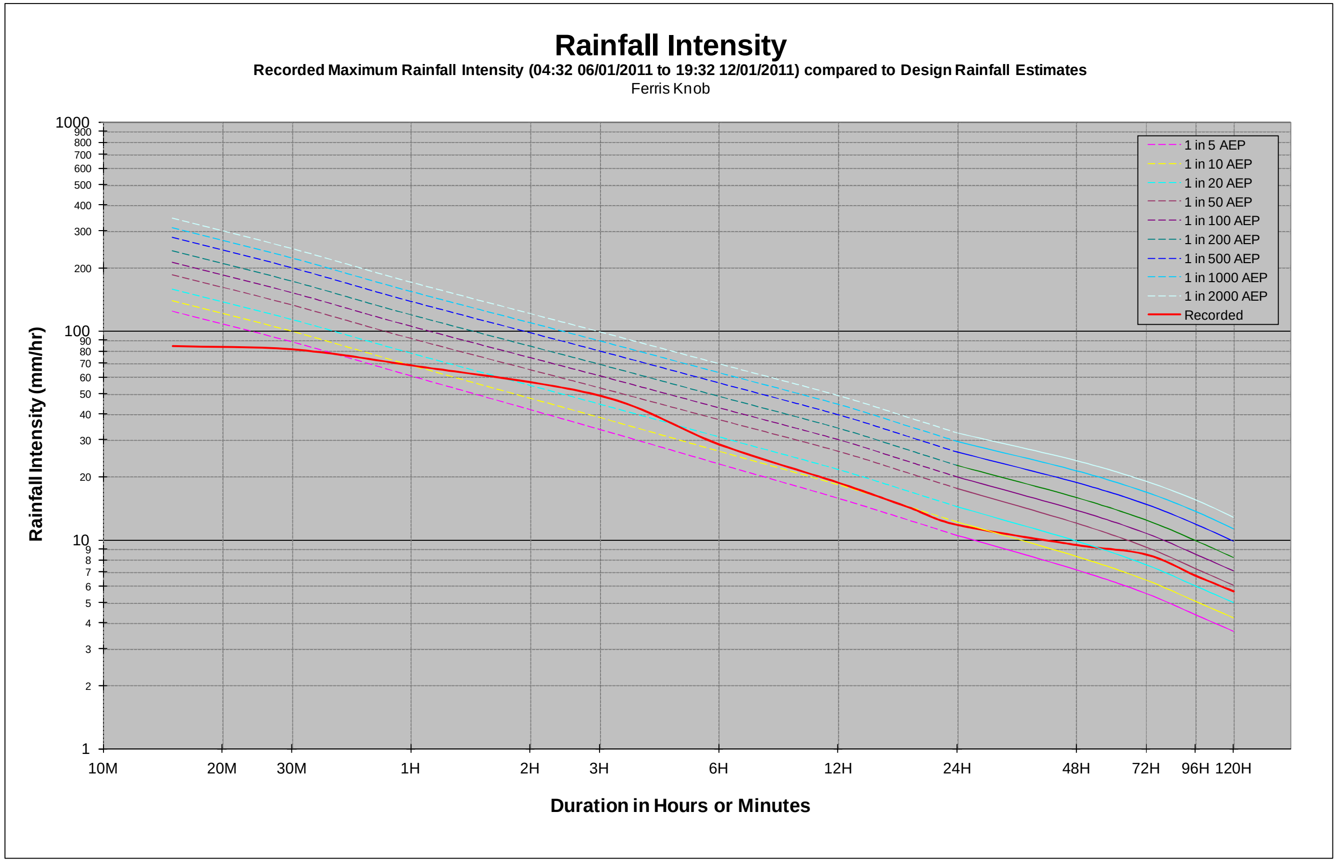
6711 – North Pine River – Baxters Creek

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	96.8	09:48 11/01/2011	< 5
30 M	85.4	09:48 11/01/2011	< 5
1 H	76.5	10:03 11/01/2011	10 - 20
3 H	53.2	11:48 11/01/2011	50 - 100
6 H	41.2	11:18 11/01/2011	200 - 500
12 H	28.3	15:03 11/01/2011	200 - 500
18 H	19.5	18:48 11/01/2011	100 - 200
24 H	14.8	17:48 11/01/2011	50 - 100
48 H	9.7	14:18 11/01/2011	50 - 100
72 H	7.0	15:03 11/01/2011	50 - 100
96 H	5.3	15:18 11/01/2011	20 - 50
120 H	4.7	15:03 11/01/2011	20 - 50



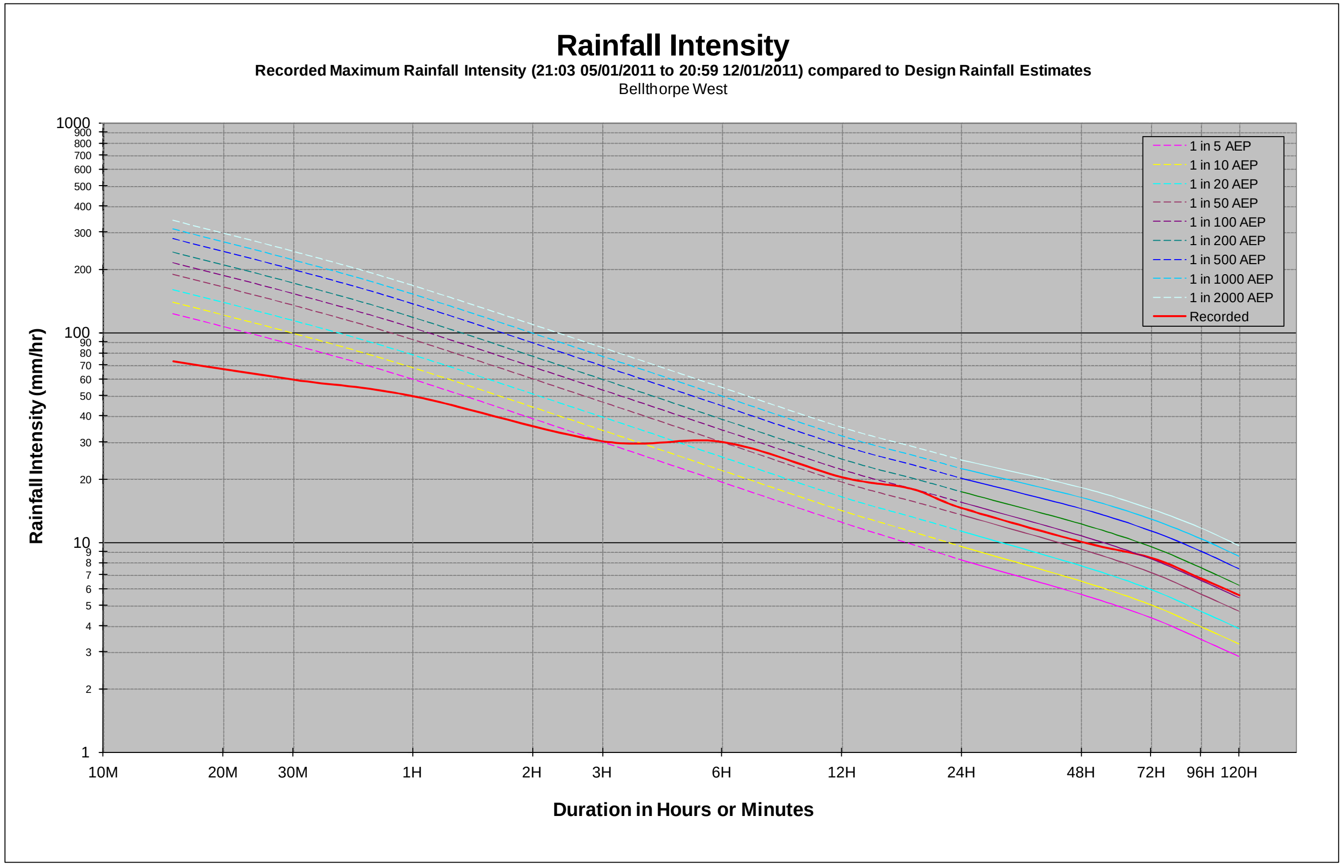
6714 – Ferris Knob

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	84.4	10:48 11/01/2011	< 5
30 M	81.4	11:03 11/01/2011	< 5
1 H	68.3	11:18 11/01/2011	5 - 10
3 H	48.9	13:18 11/01/2011	20 - 50
6 H	28.6	14:33 11/01/2011	10 - 20
12 H	18.8	18:48 11/01/2011	10 - 20
18 H	14.4	18:48 11/01/2011	5 - 10
24 H	11.8	04:18 10/01/2011	5 - 10
48 H	9.5	14:18 11/01/2011	10 - 20
72 H	8.5	02:33 12/01/2011	20 - 50
96 H	6.7	13:33 12/01/2011	20 - 50
120 H	5.7	18:48 11/01/2011	20 - 50



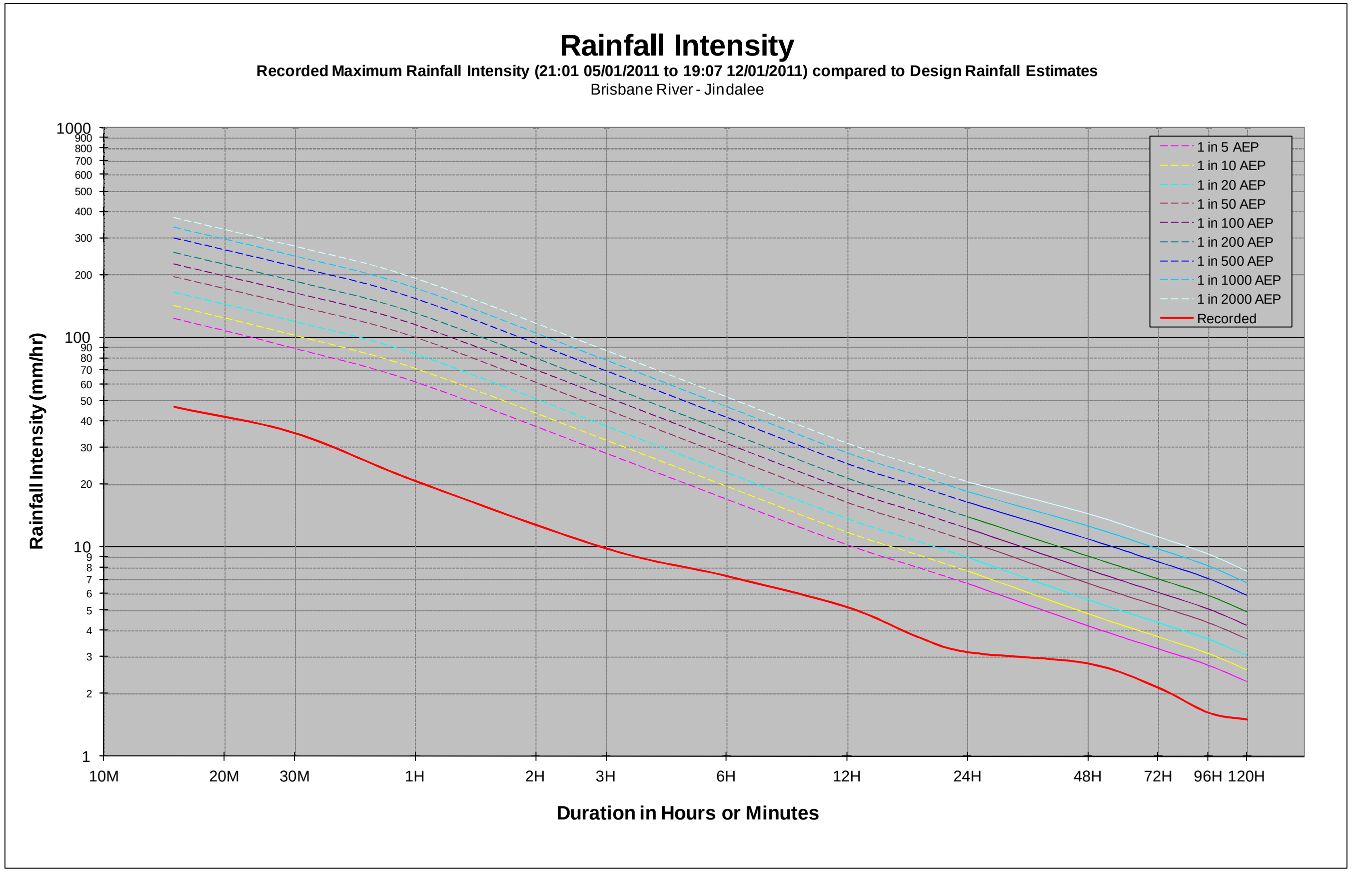
6716 – Bellthorpe West

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	73.2	13:49 09/01/2011	< 5
30 M	59.8	13:49 09/01/2011	< 5
1 H	49.9	14:04 09/01/2011	< 5
3 H	30.4	16:04 09/01/2011	5 - 10
6 H	30.1	19:04 09/01/2011	50 - 100
12 H	20.4	22:19 09/01/2011	50 - 100
18 H	18.0	23:04 09/01/2011	50 - 100
24 H	14.6	04:34 10/01/2011	50 - 100
48 H	10.0	05:04 11/01/2011	50 - 100
72 H	8.4	01:34 12/01/2011	100 - 200
96 H	6.7	13:19 12/01/2011	100 - 200
120 H	5.6	19:49 11/01/2011	100 - 200



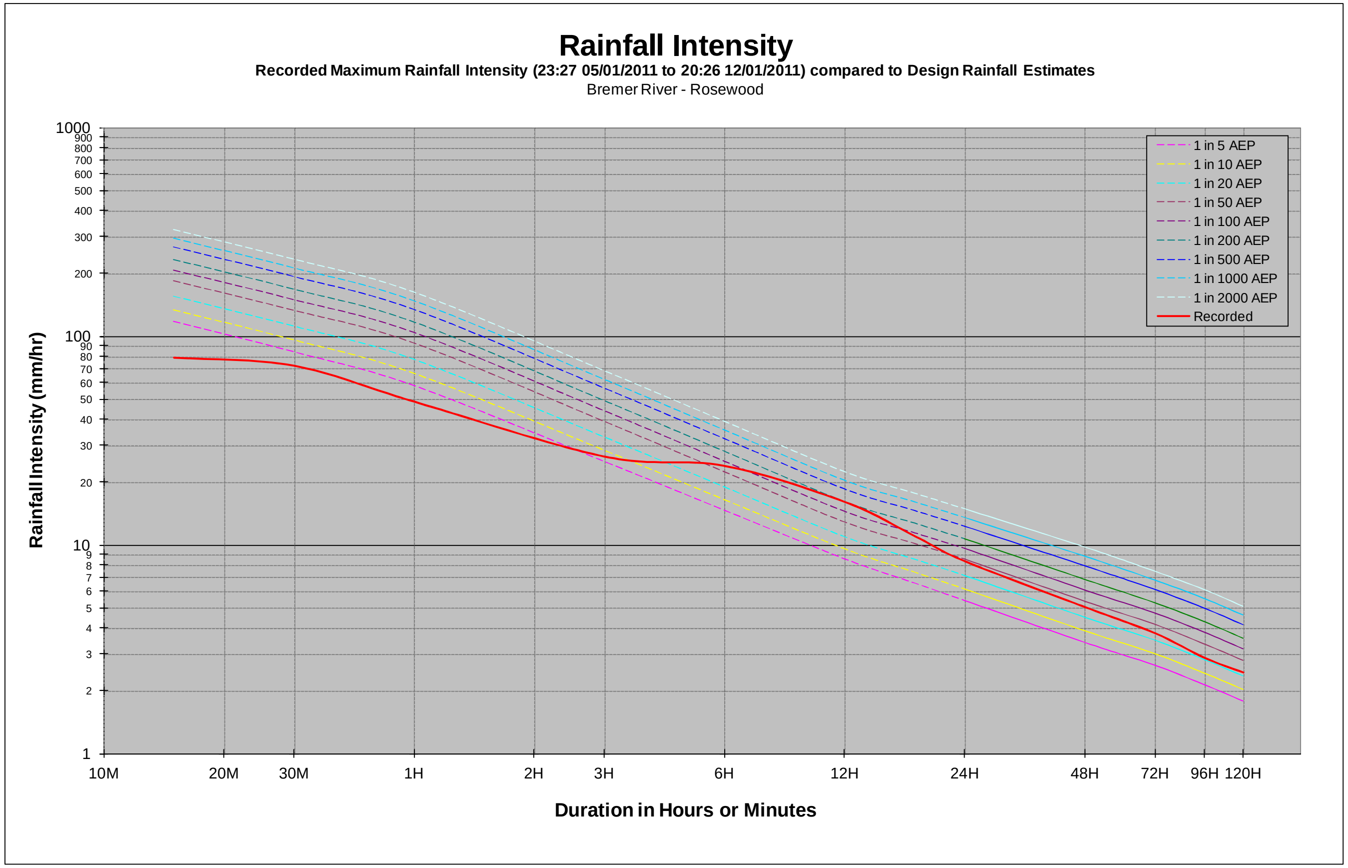
6730 – Brisbane River – Jindalee

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	46.4	10:46 11/01/2011	< 5
30 M	34.8	10:46 11/01/2011	< 5
1 H	20.6	11:16 11/01/2011	< 5
3 H	9.8	13:16 11/01/2011	< 5
6 H	7.3	14:31 11/01/2011	< 5
12 H	5.2	16:16 11/01/2011	< 5
18 H	3.7	19:46 11/01/2011	< 5
24 H	3.2	10:01 10/01/2011	< 5
48 H	2.8	15:01 11/01/2011	< 5
72 H	2.1	19:46 11/01/2011	< 5
96 H	1.6	20:01 11/01/2011	< 5
120 H	1.5	19:46 11/01/2011	< 5



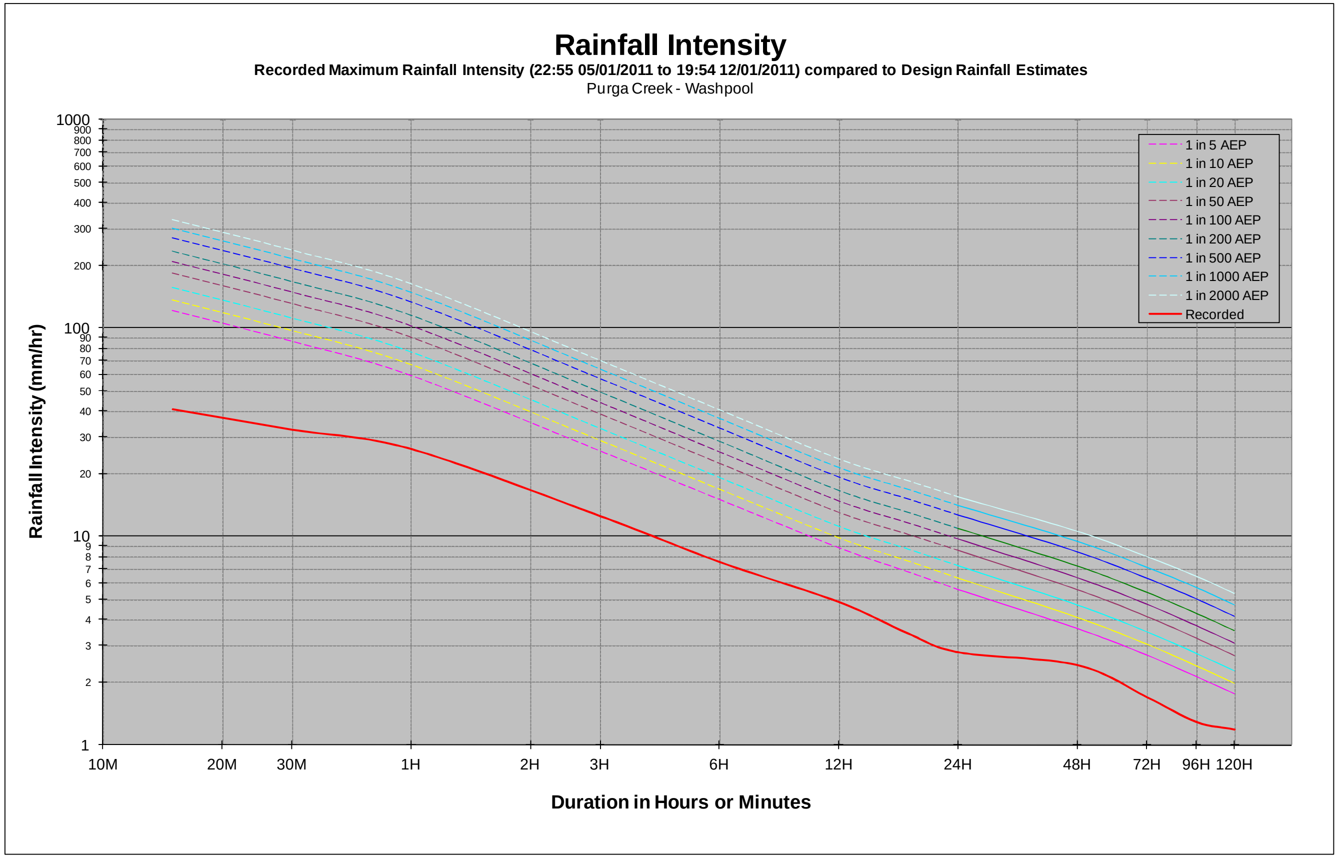
6733 – Bremer River – Rosewood

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	78.8	09:27 11/01/2011	< 5
30 M	72.0	09:42 11/01/2011	< 5
1 H	48.5	09:57 11/01/2011	< 5
3 H	26.5	10:12 11/01/2011	5 - 10
6 H	23.9	14:12 11/01/2011	50 - 100
12 H	16.1	17:57 11/01/2011	100 - 200
18 H	11.0	18:12 11/01/2011	50 - 100
24 H	8.4	18:12 11/01/2011	20 - 50
48 H	5.1	18:12 11/01/2011	20 - 50
72 H	3.8	18:12 11/01/2011	20 - 50
96 H	2.9	18:12 11/01/2011	20 - 50
120 H	2.5	18:12 11/01/2011	20 - 50



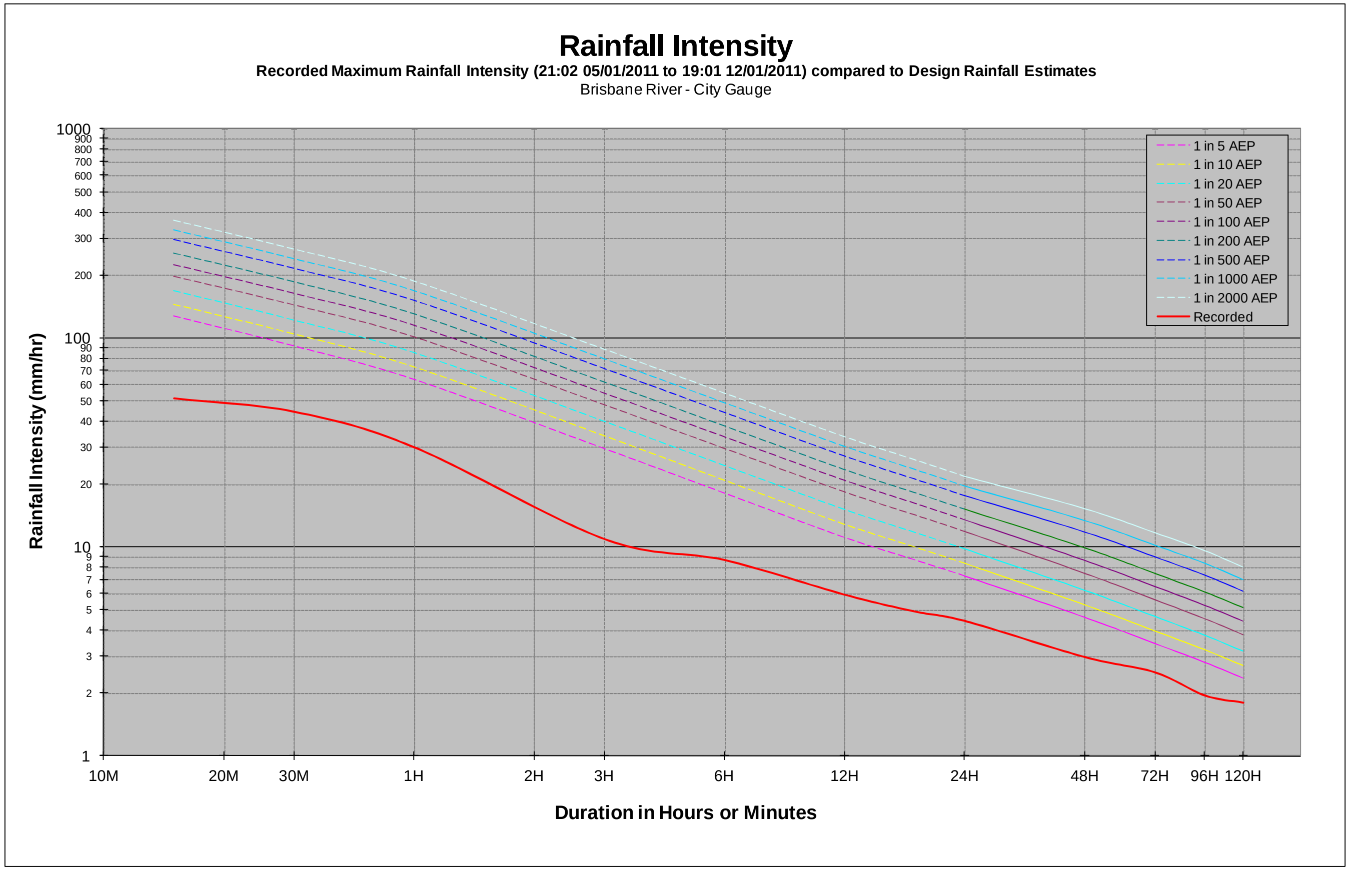
6739 – Purga Creek – Washpool

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	40.8	09:55 10/01/2011	< 5
30 M	32.6	10:10 10/01/2011	< 5
1 H	26.3	10:25 10/01/2011	< 5
3 H	12.5	12:10 10/01/2011	< 5
6 H	7.6	12:10 10/01/2011	< 5
12 H	4.9	15:10 10/01/2011	< 5
18 H	3.4	20:55 10/01/2011	< 5
24 H	2.8	02:25 11/01/2011	< 5
48 H	2.4	17:25 11/01/2011	< 5
72 H	1.7	00:10 12/01/2011	< 5
96 H	1.3	23:55 11/01/2011	< 5
120 H	1.2	17:25 11/01/2011	< 5



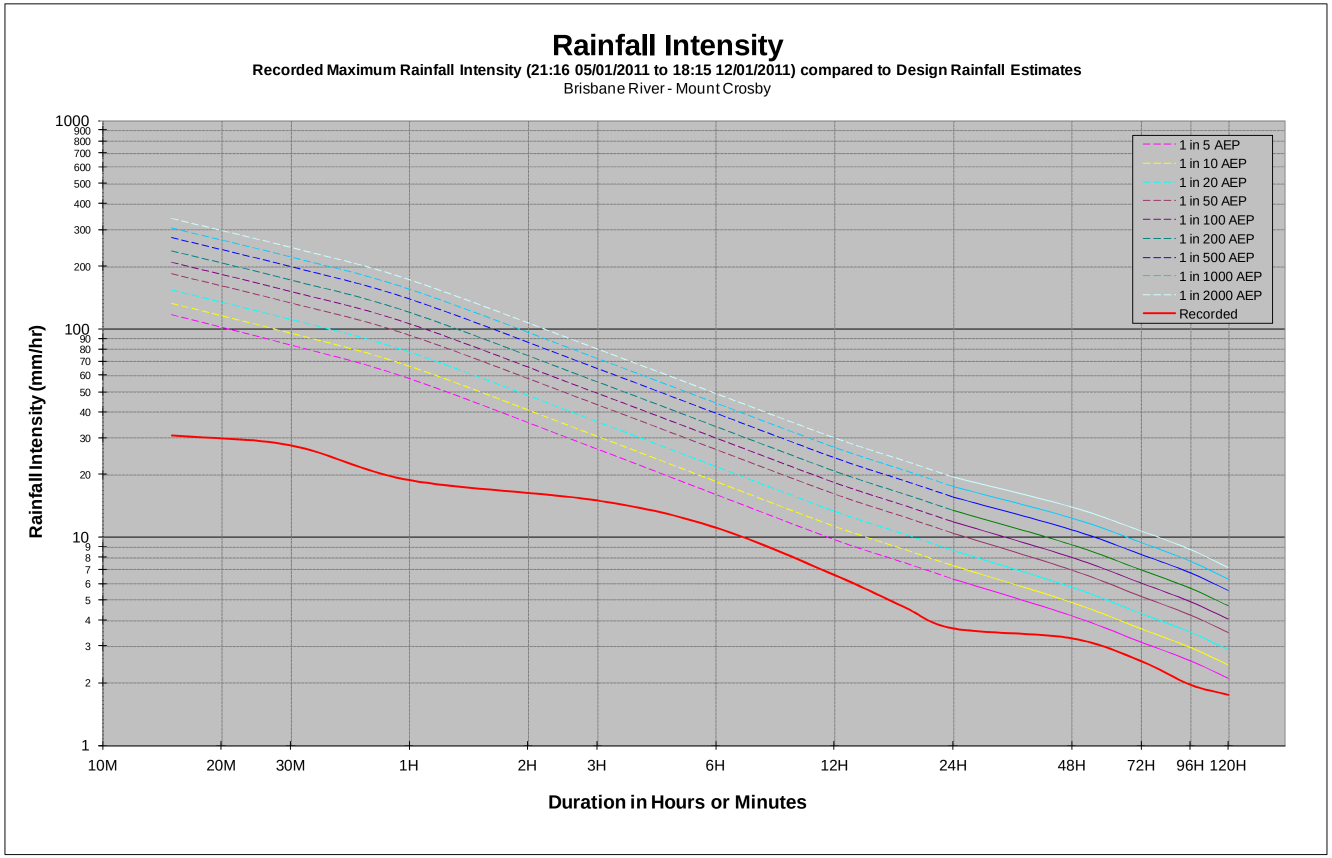
6748 – Brisbane River – City Gauge

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	51.2	15:47 09/01/2011	< 5
30 M	44.2	16:02 09/01/2011	< 5
1 H	29.9	16:02 09/01/2011	< 5
3 H	10.9	17:47 09/01/2011	< 5
6 H	8.6	21:17 09/01/2011	< 5
12 H	5.9	21:17 09/01/2011	< 5
18 H	4.9	01:17 10/01/2011	< 5
24 H	4.4	09:32 10/01/2011	< 5
48 H	3.0	15:17 11/01/2011	< 5
72 H	2.5	18:17 11/01/2011	< 5
96 H	1.9	16:17 11/01/2011	< 5
120 H	1.8	15:32 11/01/2011	< 5



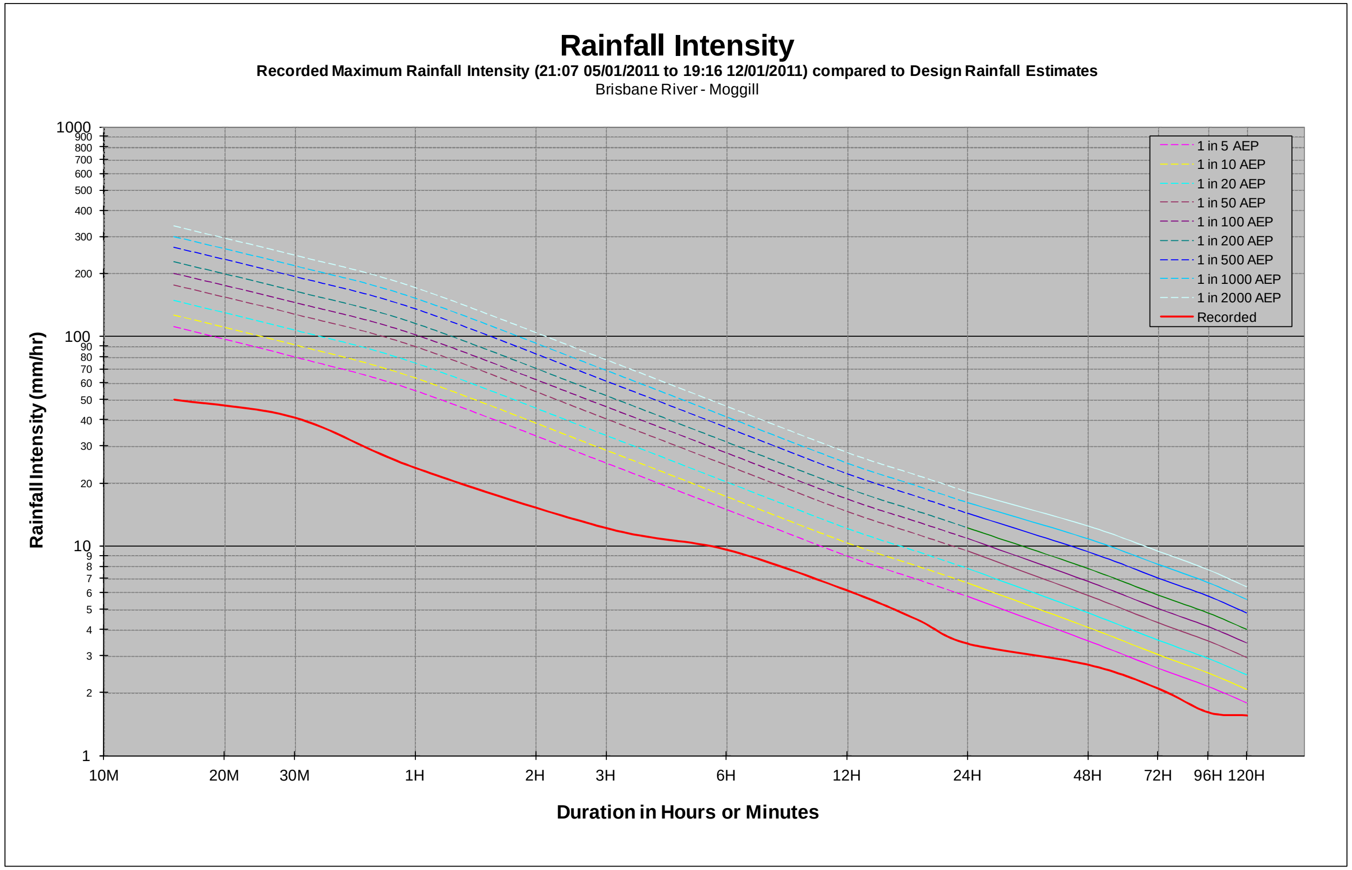
6751 – Brisbane River – Mount Crosby

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	30.8	08:01 10/01/2011	< 5
30 M	27.6	12:31 11/01/2011	< 5
1 H	18.8	12:31 11/01/2011	< 5
3 H	15.0	13:31 11/01/2011	< 5
6 H	11.1	14:46 11/01/2011	< 5
12 H	6.6	16:46 11/01/2011	< 5
18 H	4.6	20:31 11/01/2011	< 5
24 H	3.7	18:46 11/01/2011	< 5
48 H	3.3	15:16 11/01/2011	< 5
72 H	2.5	21:31 11/01/2011	< 5
96 H	2.0	22:31 11/01/2011	< 5
120 H	1.8	20:31 11/01/2011	< 5



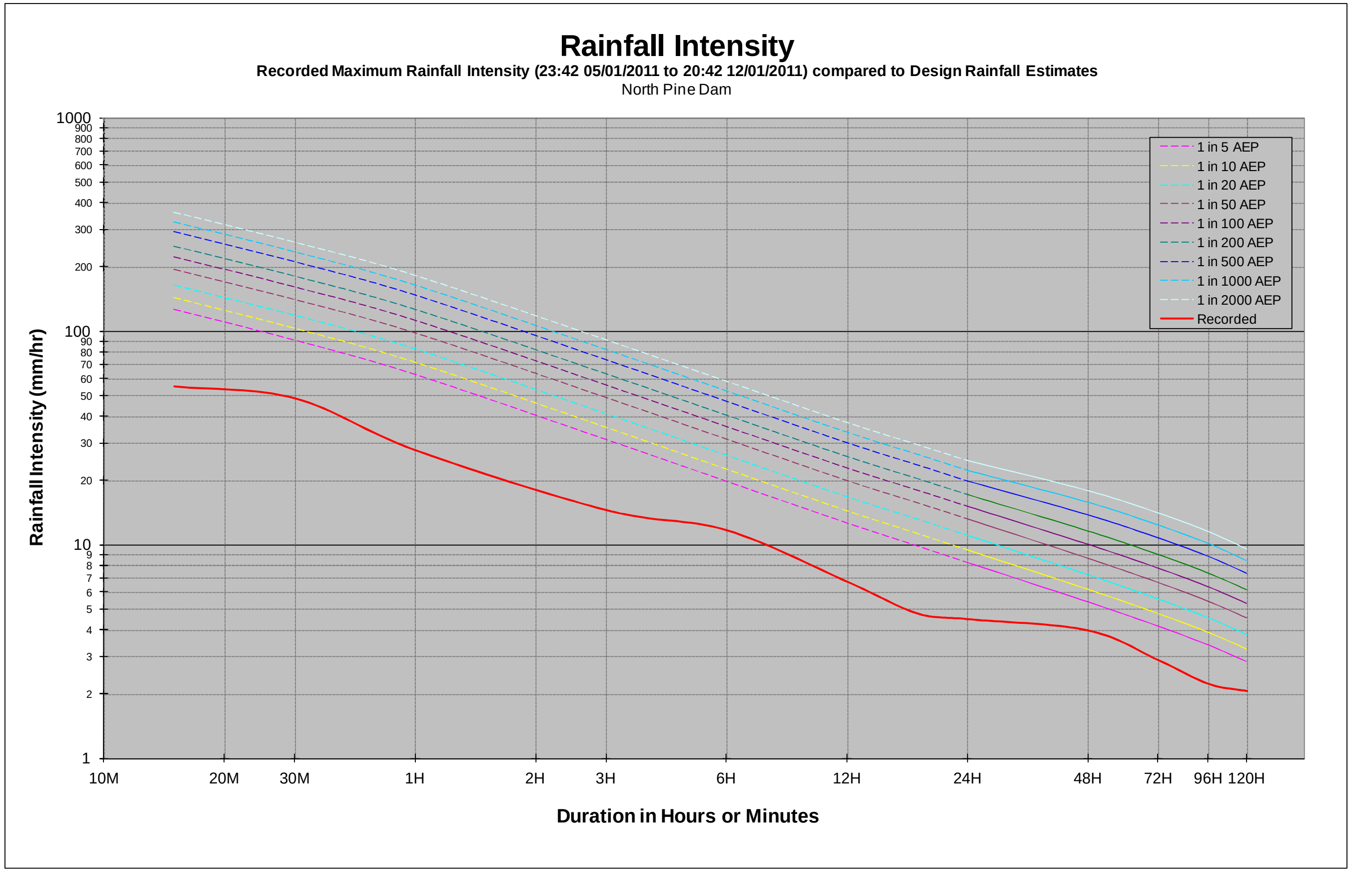
6754 – Brisbane River – Moggill

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.0	09:07 07/01/2011	< 5
30 M	41.0	09:22 07/01/2011	< 5
1 H	23.6	11:22 11/01/2011	< 5
3 H	12.2	13:37 11/01/2011	< 5
6 H	9.6	14:37 11/01/2011	< 5
12 H	6.1	16:52 11/01/2011	< 5
18 H	4.4	15:07 11/01/2011	< 5
24 H	3.4	16:52 11/01/2011	< 5
48 H	2.7	15:07 11/01/2011	< 5
72 H	2.1	16:52 11/01/2011	< 5
96 H	1.6	16:52 11/01/2011	< 5
120 H	1.5	16:52 11/01/2011	< 5



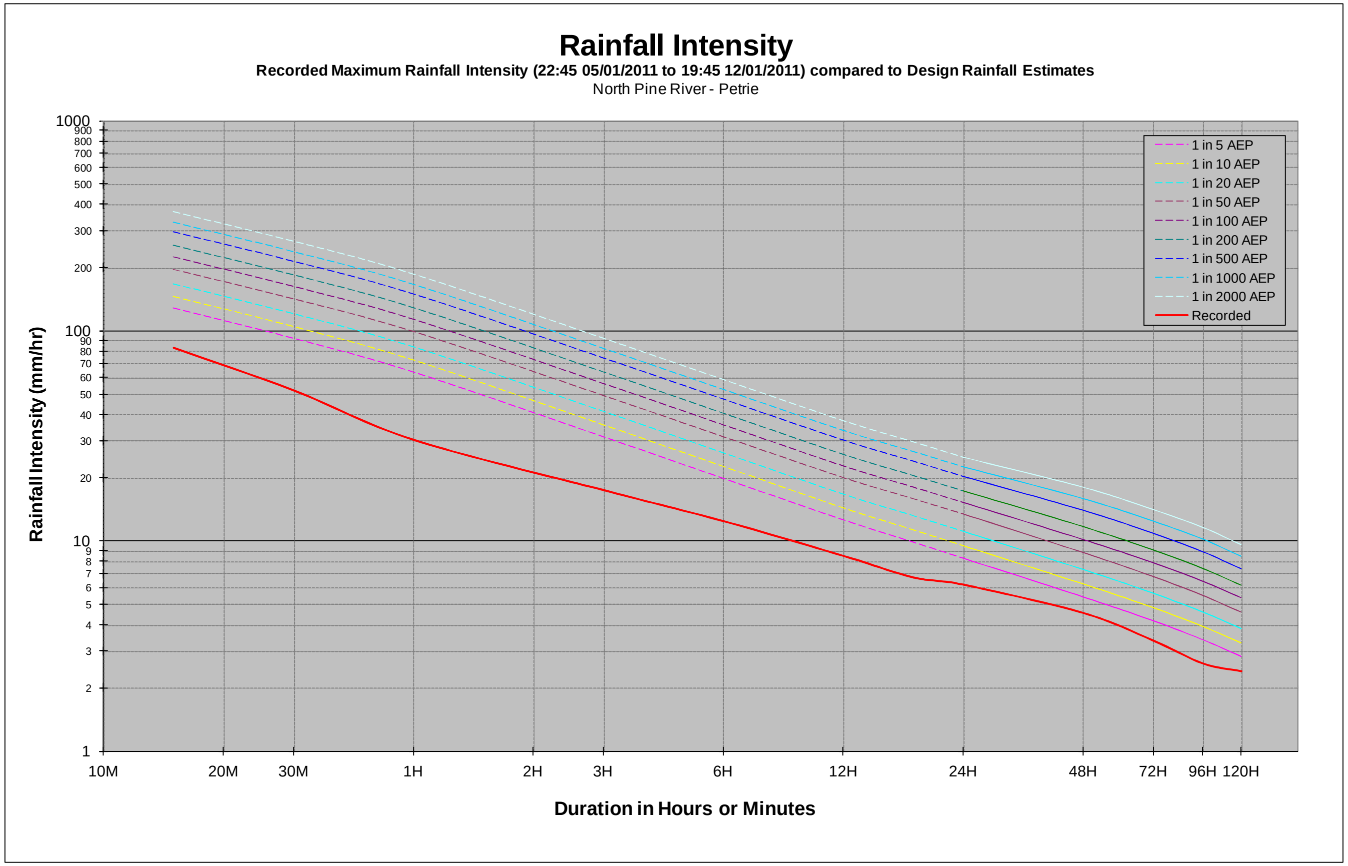
6760 – North Pine Dam

Duration	Recorded intensity mm/hr	End time	AEP 1 in Y
15 M	54.8	10:28 10/01/2011	< 5
30 M	48.2	10:43 10/01/2011	< 5
1 H	27.6	10:43 10/01/2011	< 5
3 H	14.5	12:43 11/01/2011	< 5
6 H	11.7	14:13 11/01/2011	< 5
12 H	6.7	16:13 11/01/2011	< 5
18 H	4.8	18:43 11/01/2011	< 5
24 H	4.5	10:43 10/01/2011	< 5
48 H	4.0	14:13 11/01/2011	< 5
72 H	2.9	02:43 12/01/2011	< 5
96 H	2.2	02:43 12/01/2011	< 5
120 H	2.1	14:58 11/01/2011	< 5



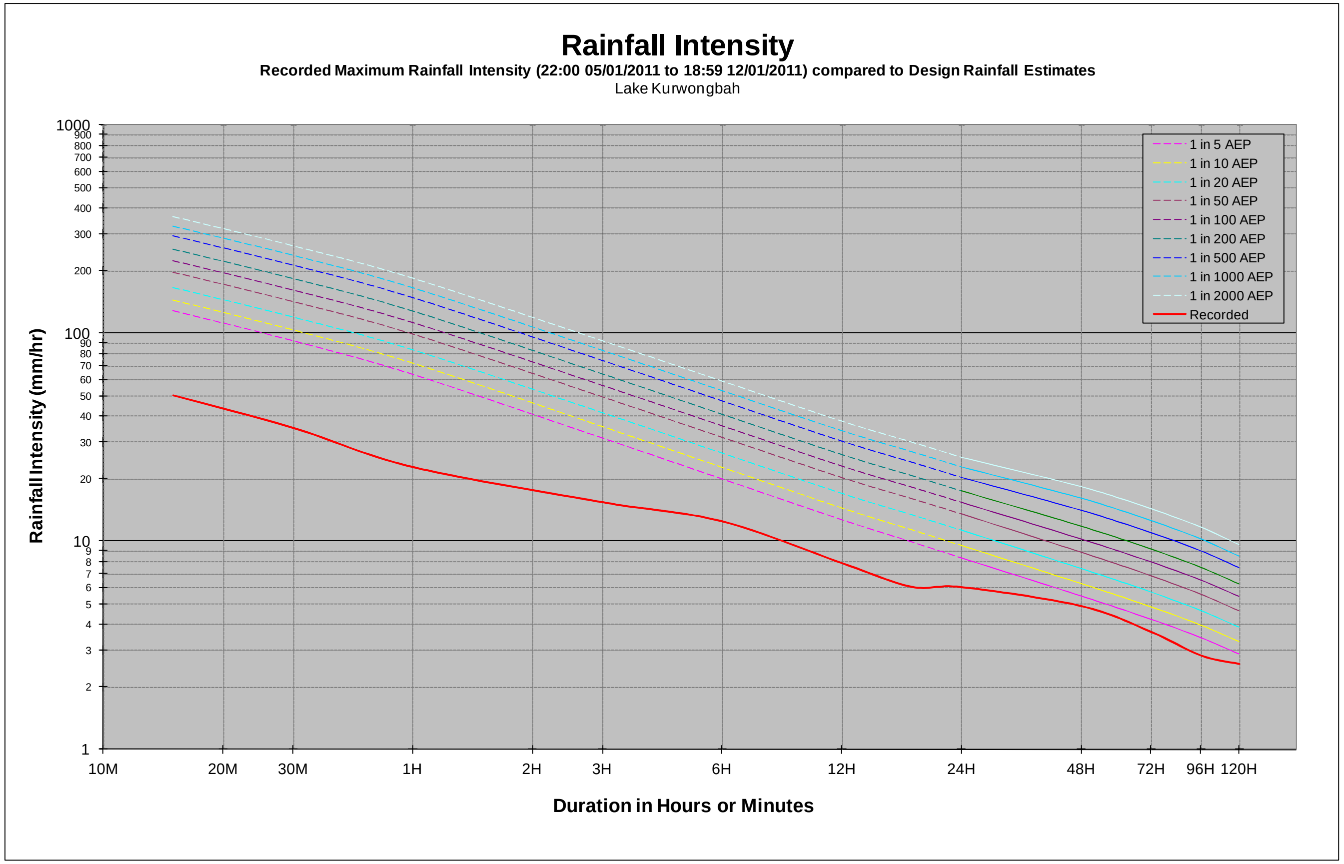
6763 – North Pine River – Petrie

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	82.8	10:16 10/01/2011	< 5
30 M	52.0	10:31 10/01/2011	< 5
1 H	30.3	10:31 10/01/2011	< 5
3 H	17.5	10:16 10/01/2011	< 5
6 H	12.5	10:31 10/01/2011	< 5
12 H	8.5	10:31 10/01/2011	< 5
18 H	6.7	10:31 10/01/2011	< 5
24 H	6.2	10:31 10/01/2011	< 5
48 H	4.6	14:16 11/01/2011	< 5
72 H	3.4	21:46 11/01/2011	< 5
96 H	2.6	21:46 11/01/2011	< 5
120 H	2.4	12:01 11/01/2011	< 5



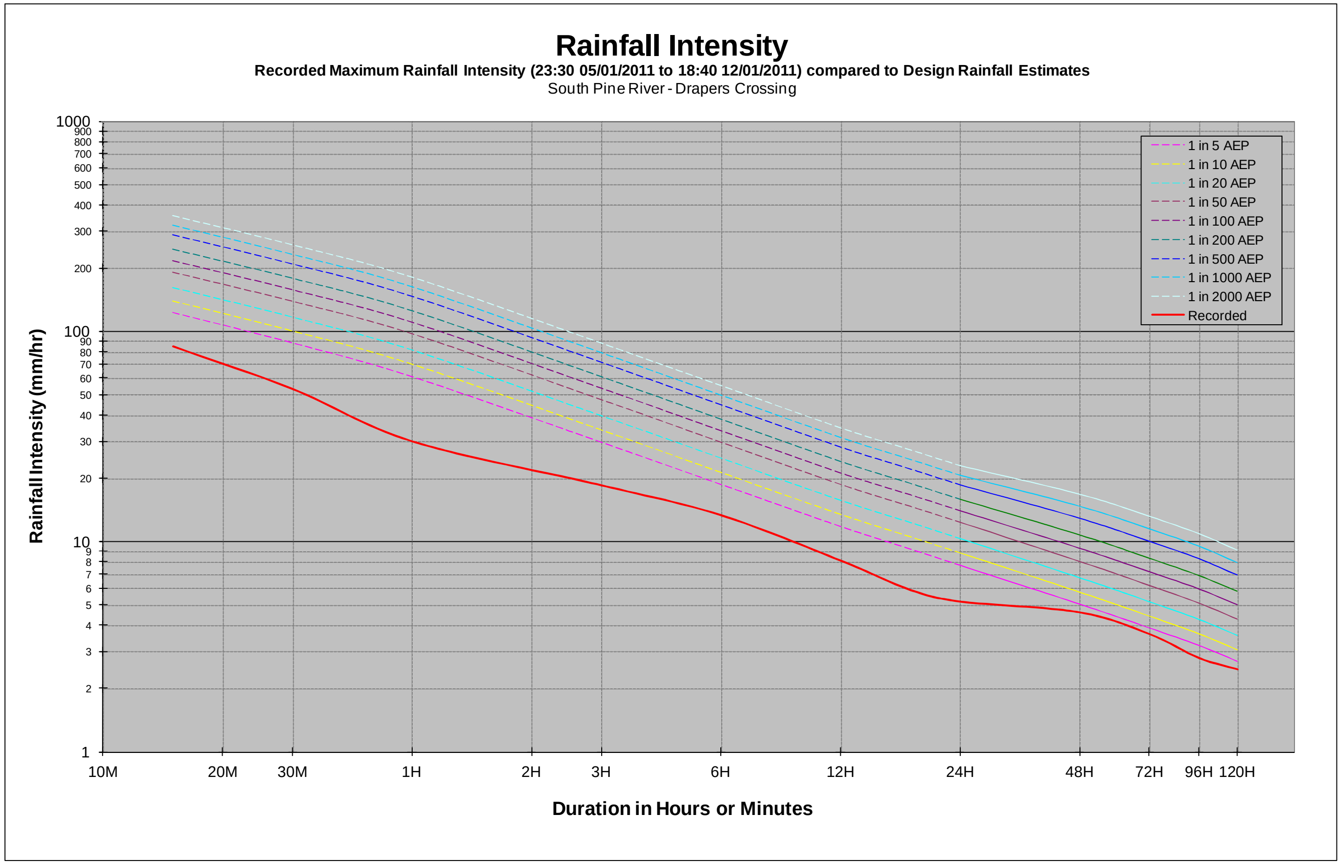
6766 – Lake Kurwongbah

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	50.4	10:00 11/01/2011	< 5
30 M	35.2	10:15 11/01/2011	< 5
1 H	22.8	10:30 11/01/2011	< 5
3 H	15.4	12:30 11/01/2011	< 5
6 H	12.5	14:00 11/01/2011	< 5
12 H	7.9	18:15 11/01/2011	< 5
18 H	6.0	12:30 10/01/2011	< 5
24 H	6.0	12:45 10/01/2011	< 5
48 H	4.9	14:15 11/01/2011	< 5
72 H	3.7	01:15 12/01/2011	< 5
96 H	2.8	01:15 12/01/2011	< 5
120 H	2.6	12:45 11/01/2011	< 5



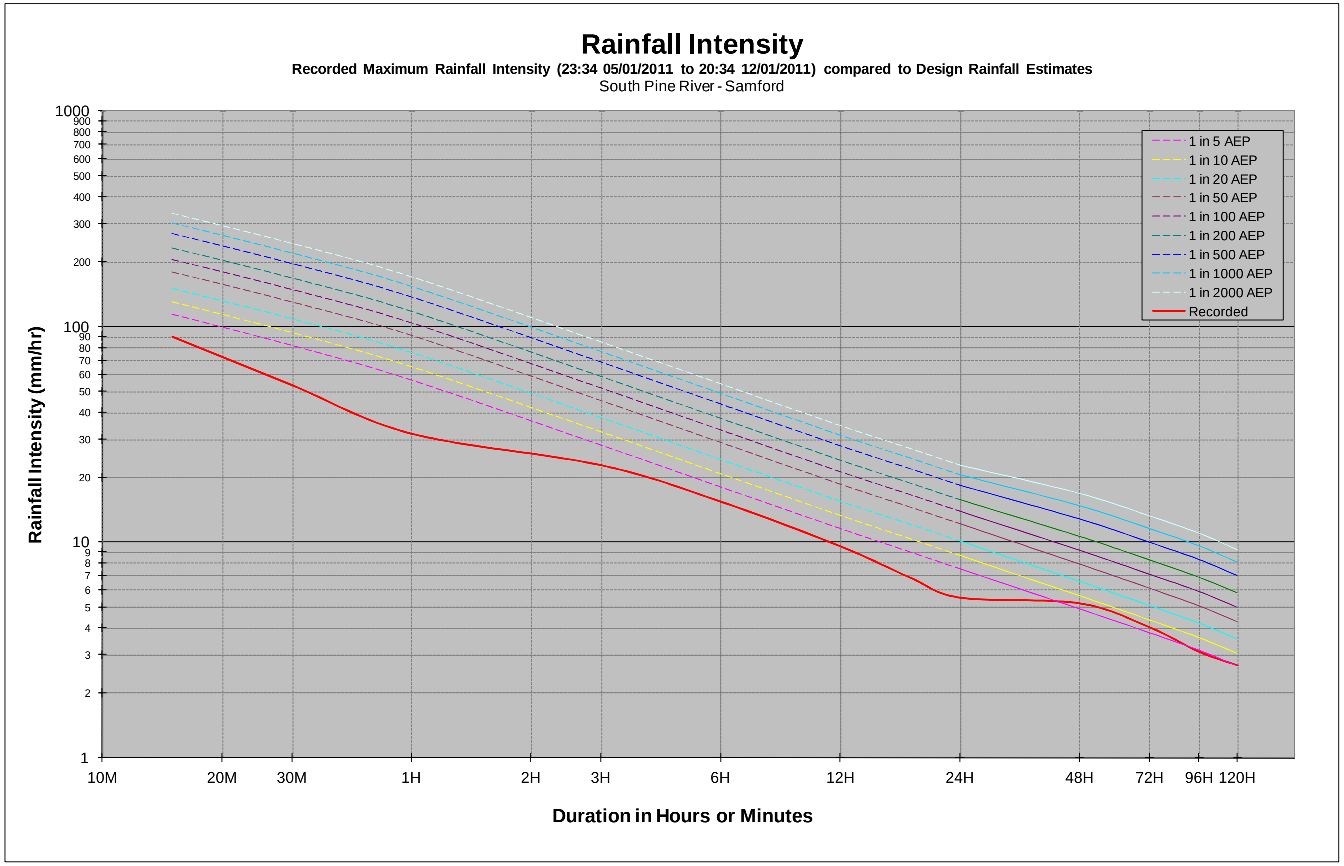
6769 – South Pine River – Drapers Crossing

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	84.4	10:15 11/01/2011	< 5
30 M	53.0	10:30 11/01/2011	< 5
1 H	29.9	10:30 11/01/2011	< 5
3 H	18.5	12:45 11/01/2011	< 5
6 H	13.3	14:15 11/01/2011	< 5
12 H	8.1	15:45 11/01/2011	< 5
18 H	5.9	18:15 11/01/2011	< 5
24 H	5.2	10:15 10/01/2011	< 5
48 H	4.6	14:45 11/01/2011	< 5
72 H	3.6	01:00 12/01/2011	< 5
96 H	2.8	03:45 12/01/2011	< 5
120 H	2.5	03:45 12/01/2011	< 5



6778 – South Pine River – Samford

Duration	Recorded intensity	End time	AEP
	mm/hr		1 in Y
15 M	89.6	10:20 11/01/2011	< 5
30 M	53.4	10:20 11/01/2011	< 5
1 H	31.8	10:50 11/01/2011	< 5
3 H	22.7	12:50 11/01/2011	< 5
6 H	15.4	14:20 11/01/2011	< 5
12 H	9.6	14:35 11/01/2011	< 5
18 H	6.8	18:05 11/01/2011	< 5
24 H	5.5	09:50 10/01/2011	< 5
48 H	5.2	14:35 11/01/2011	5 - 10
72 H	4.0	02:05 12/01/2011	5 - 10
96 H	3.1	02:20 12/01/2011	< 5
120 H	2.7	02:20 12/01/2011	5 - 10



APPENDIX 4

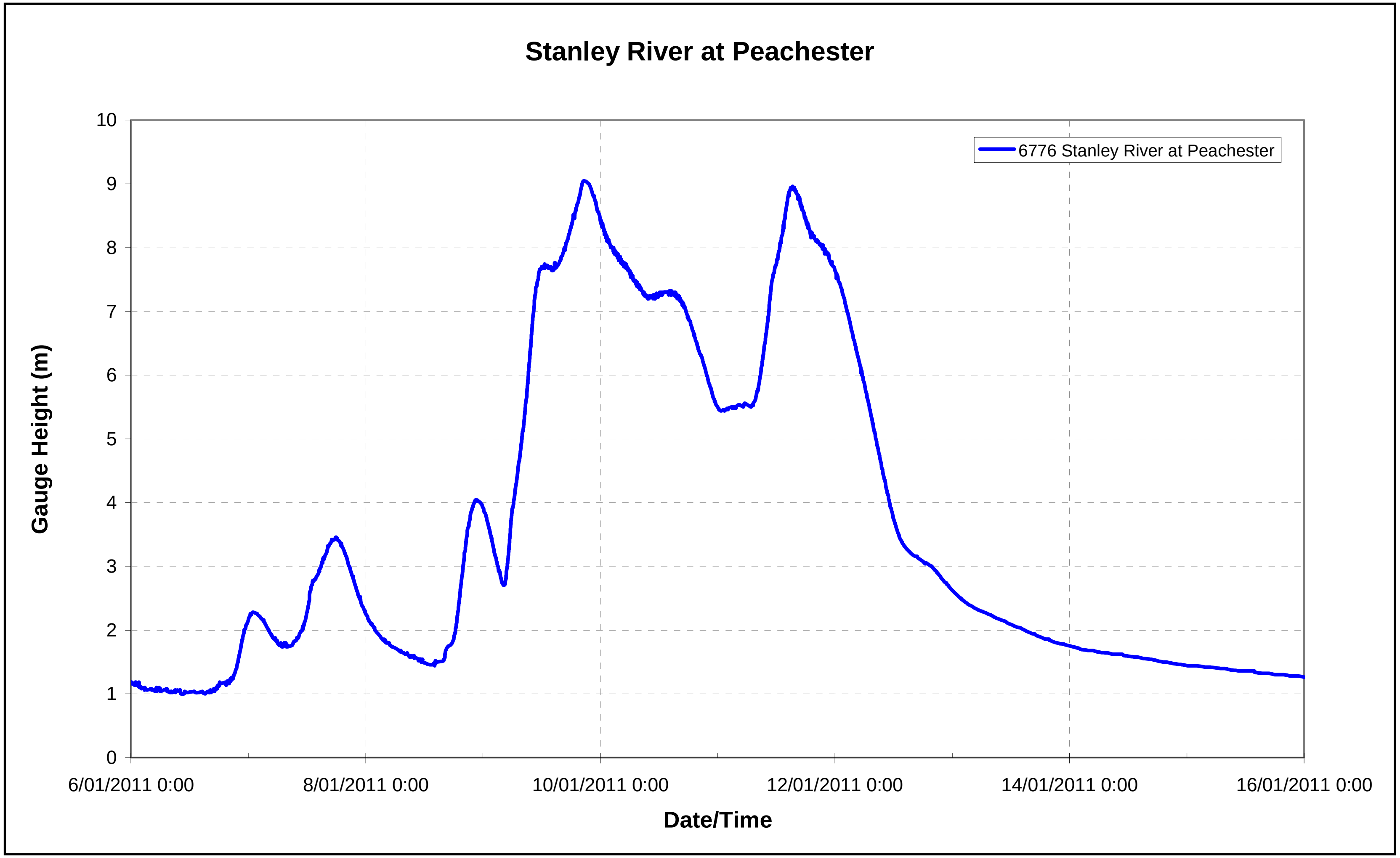
January 2011 Flood Event

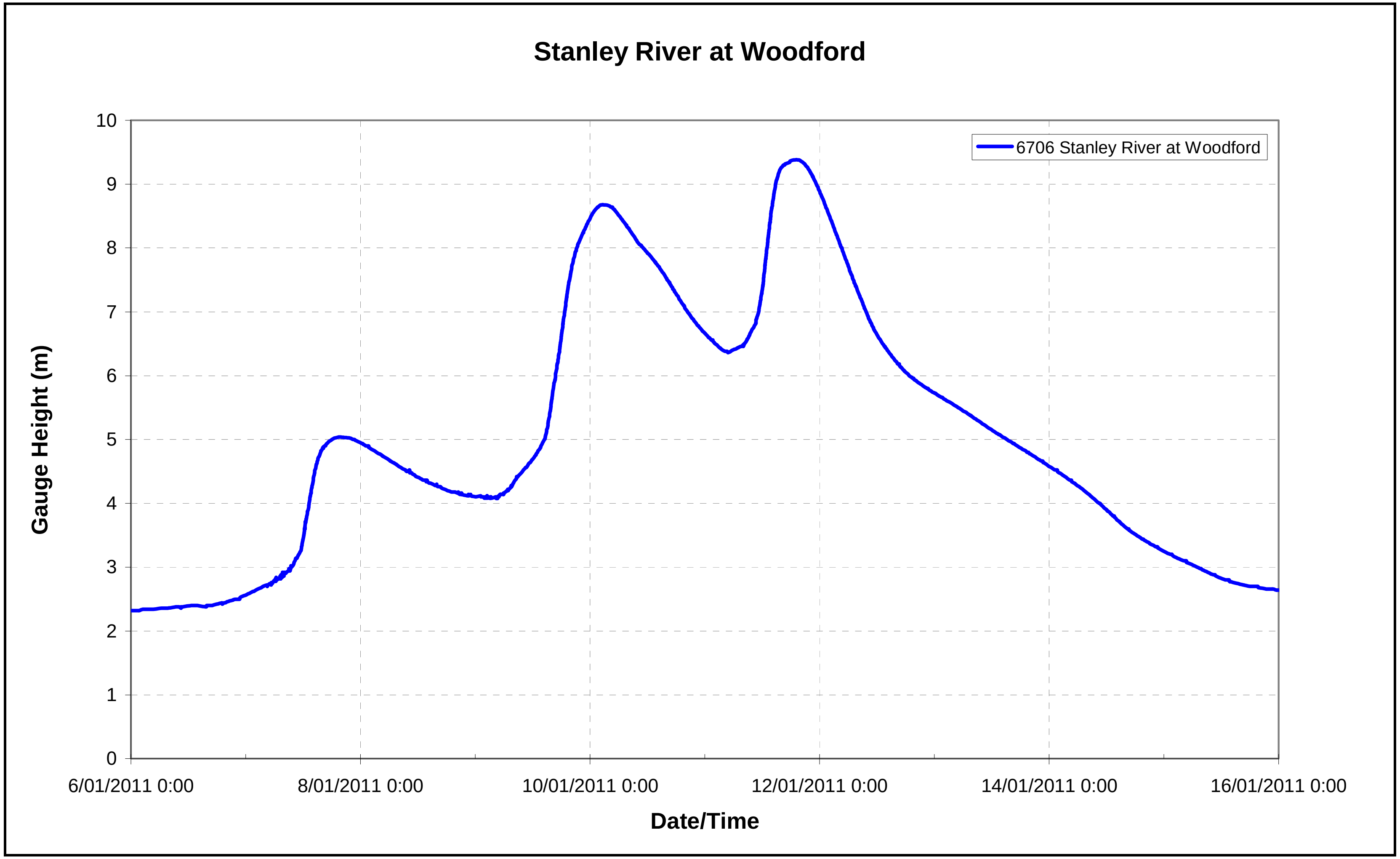
Report on the operation of Somerset Dam and Wivenhoe Dam

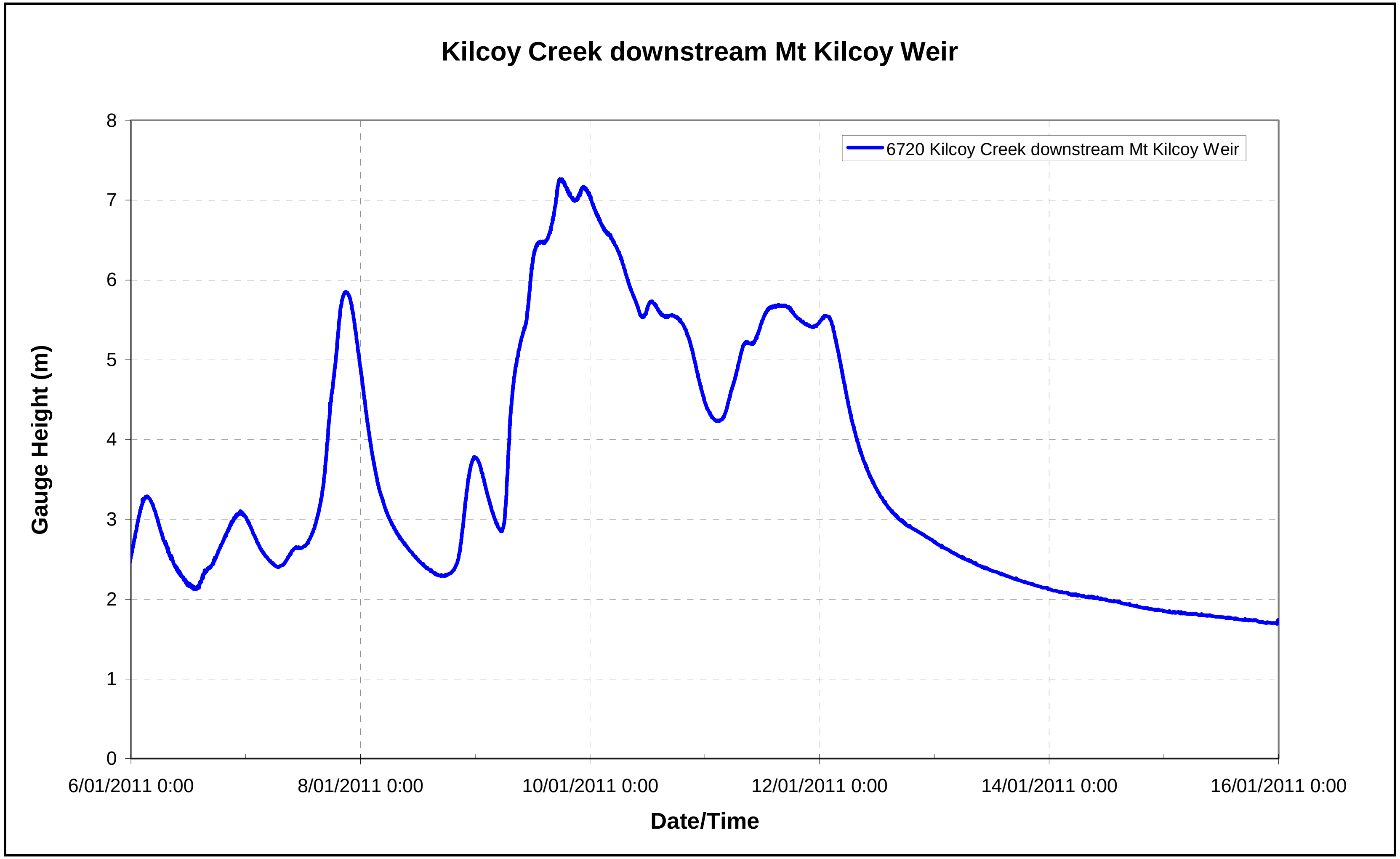
2 March 2011

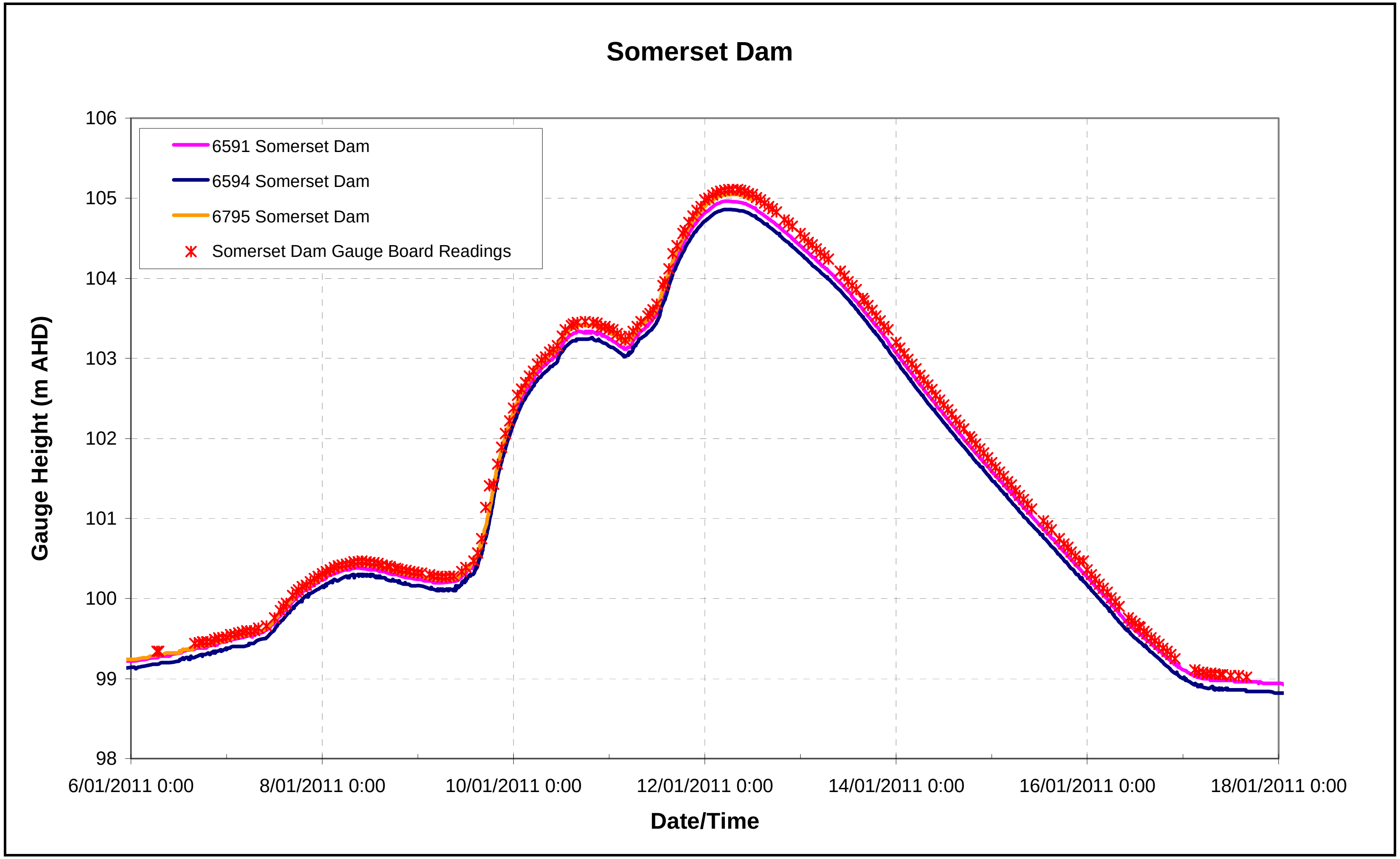
APPENDIX Q – RECORDED HEIGHT HYDROGRAPHS

Stanley River to Somerset Dam


Stanley River at Peachester
6776 Stanley River at Peachester
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

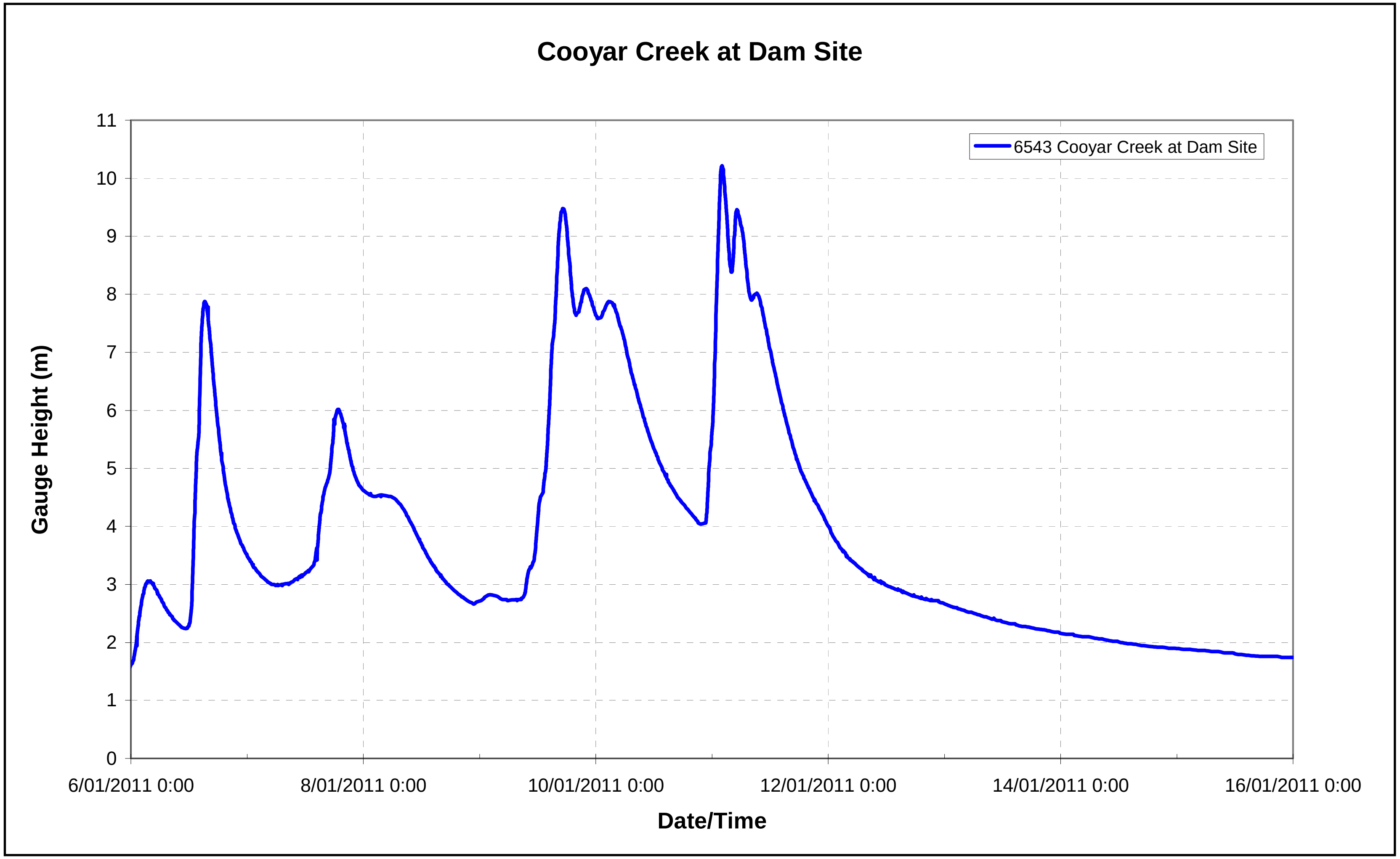

Stanley River at Woodford
6706 Stanley River at Woodford
Gauge Height (m)
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

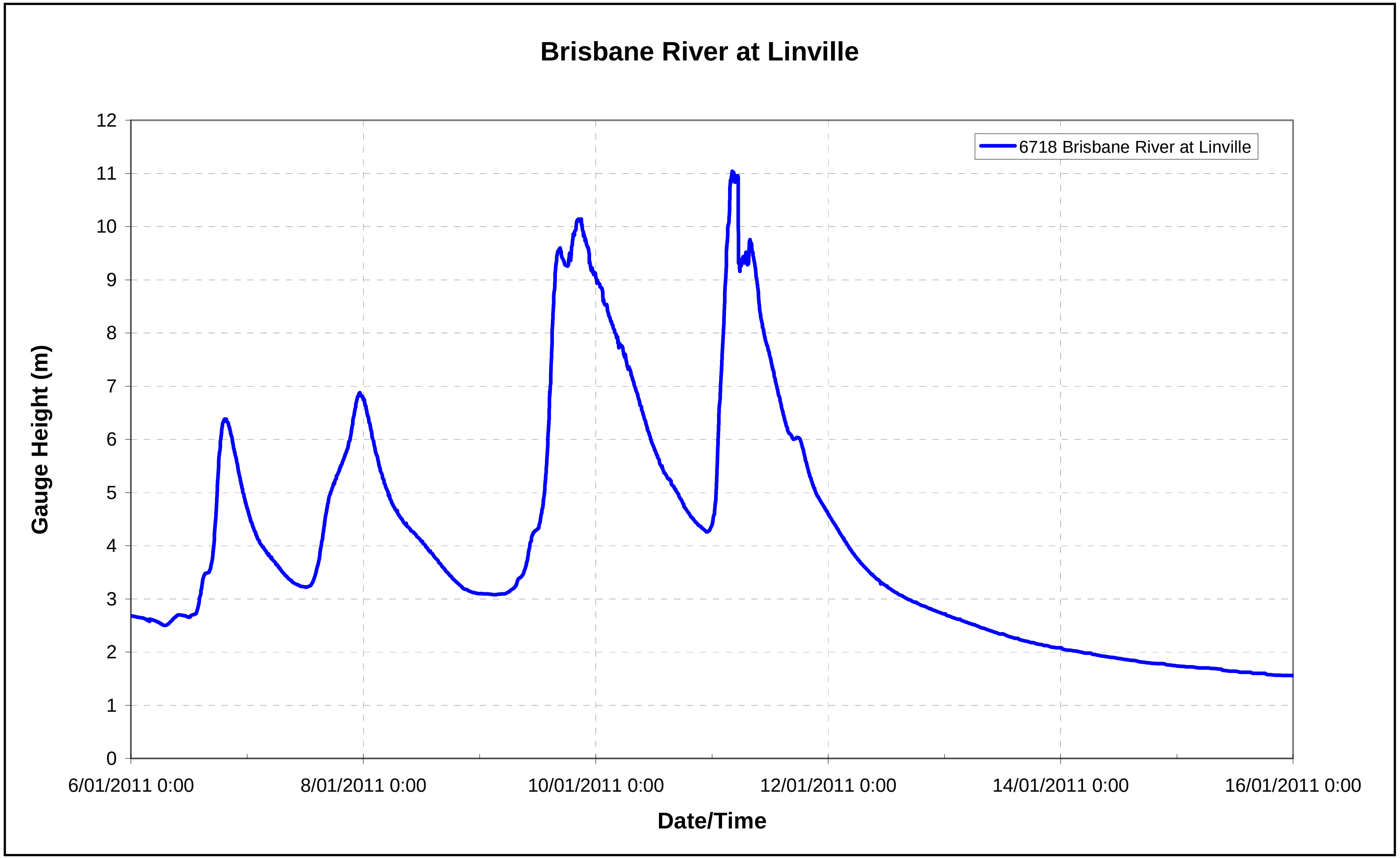

Kilcoy Creek downstream Mt Kilcoy Weir
6720 Kilcoy Creek downstream Mt Kilcoy Weir
Gauge Height (m)
0
1
2
3
4
5
6
7
8
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

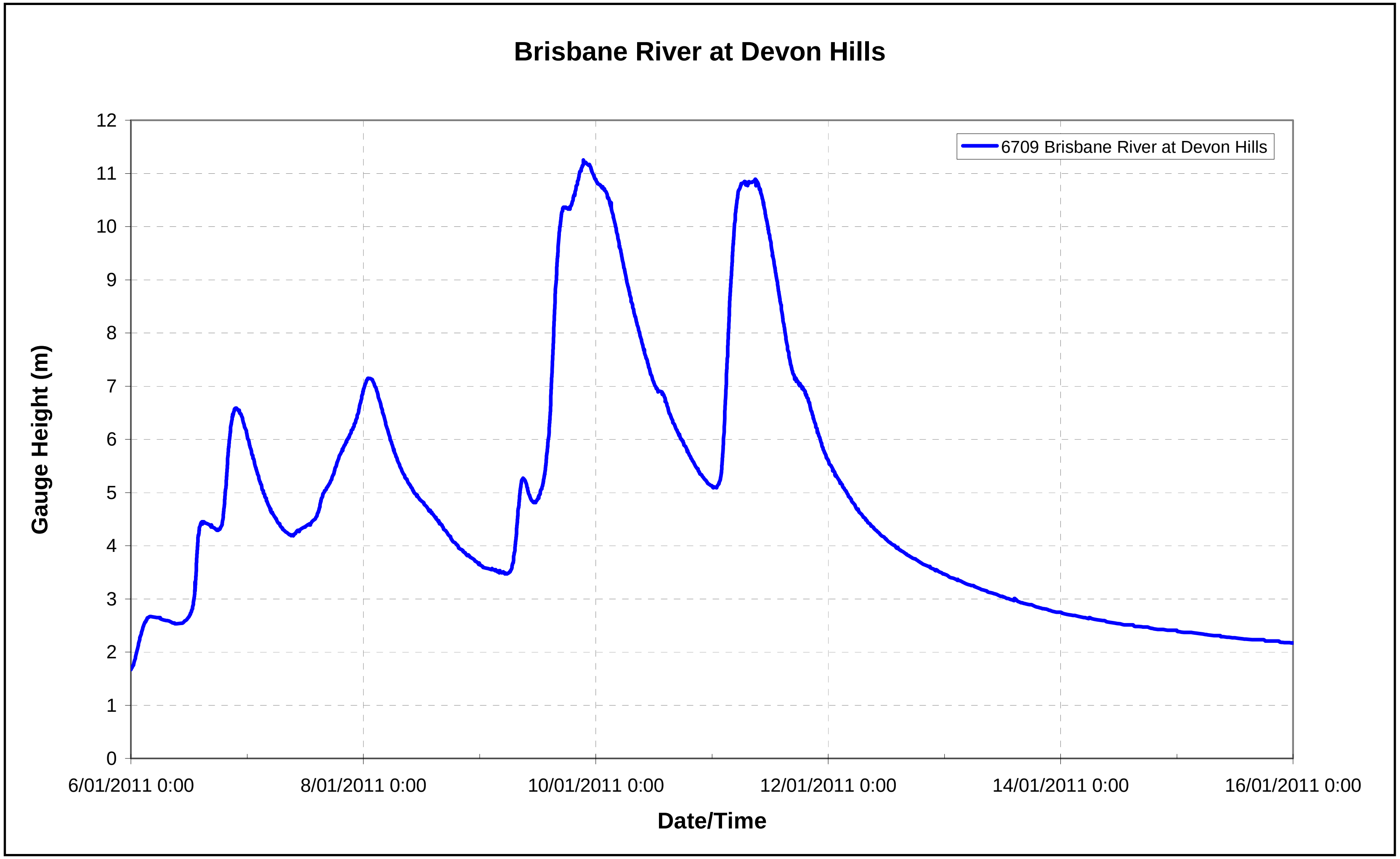

Somerset Dam
106
105
104
103
102
101
100
99
98
Gauge Height (m AHD)
6591 Somerset Dam
6594 Somerset Dam
6795 Somerset Dam
Somerset Dam Gauge Board Readings
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
Date/Time

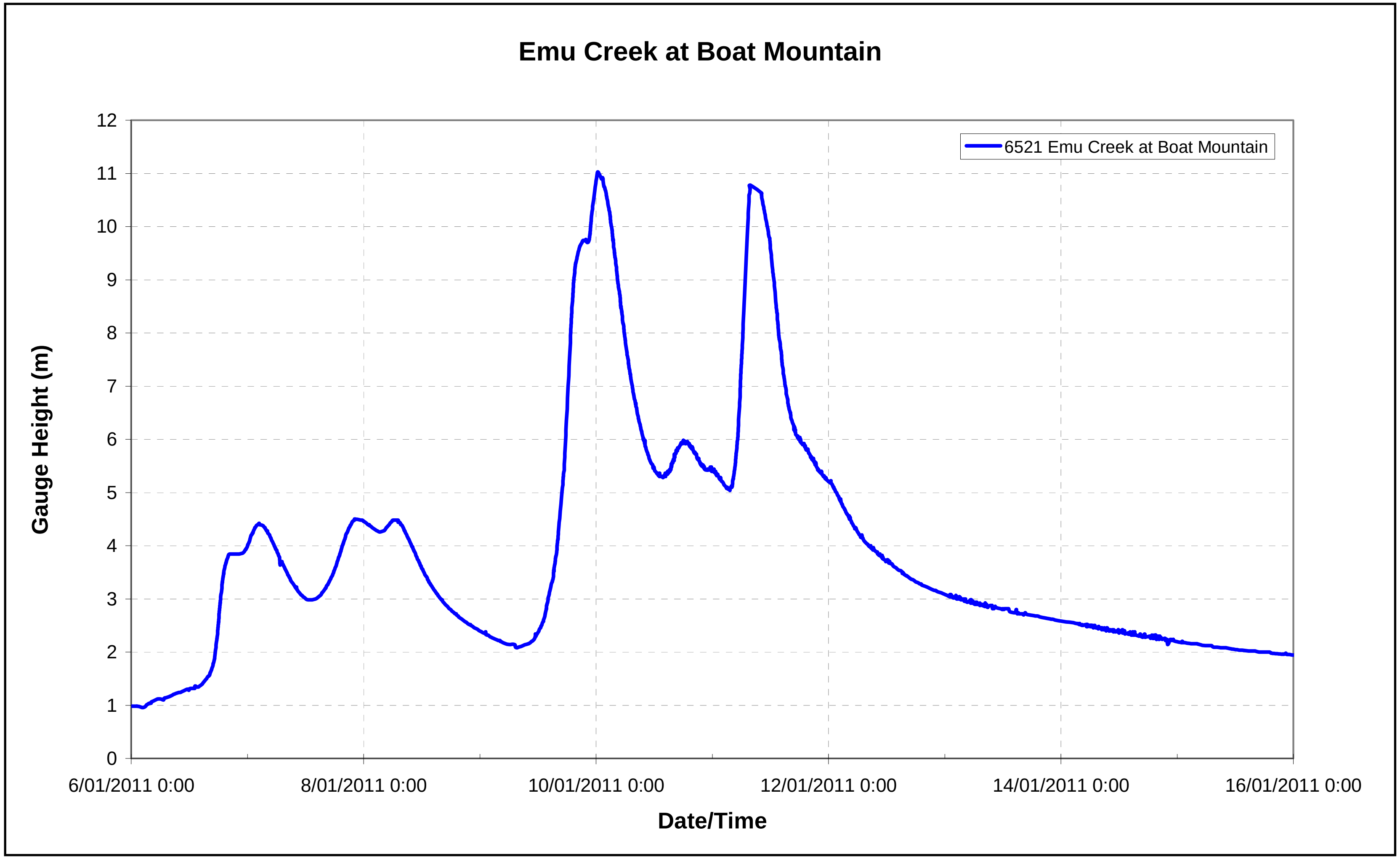
APPENDIX Q – RECORDED HEIGHT HYDROGRAPHS (continued)

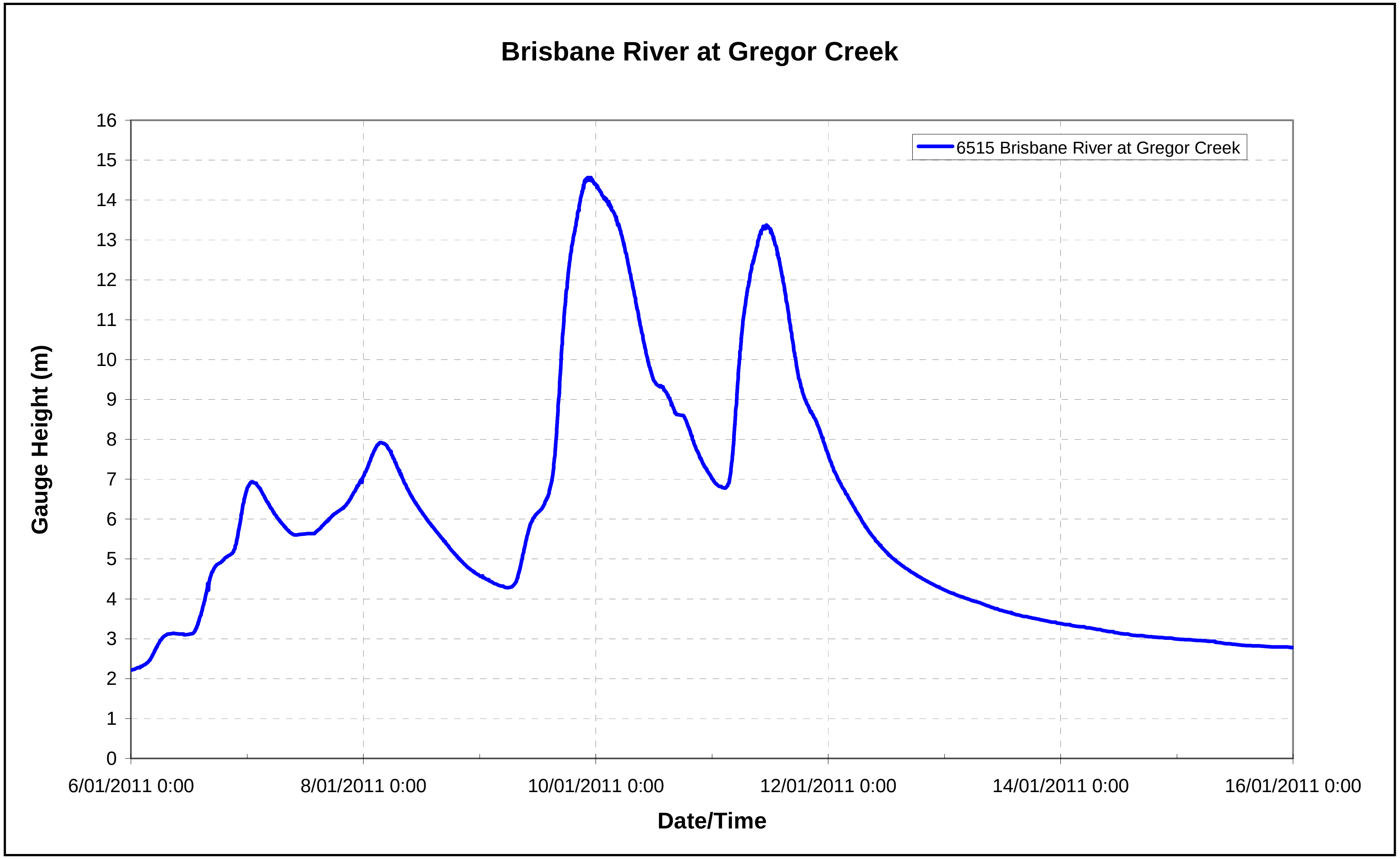
Upper Brisbane River to Wivenhoe Dam

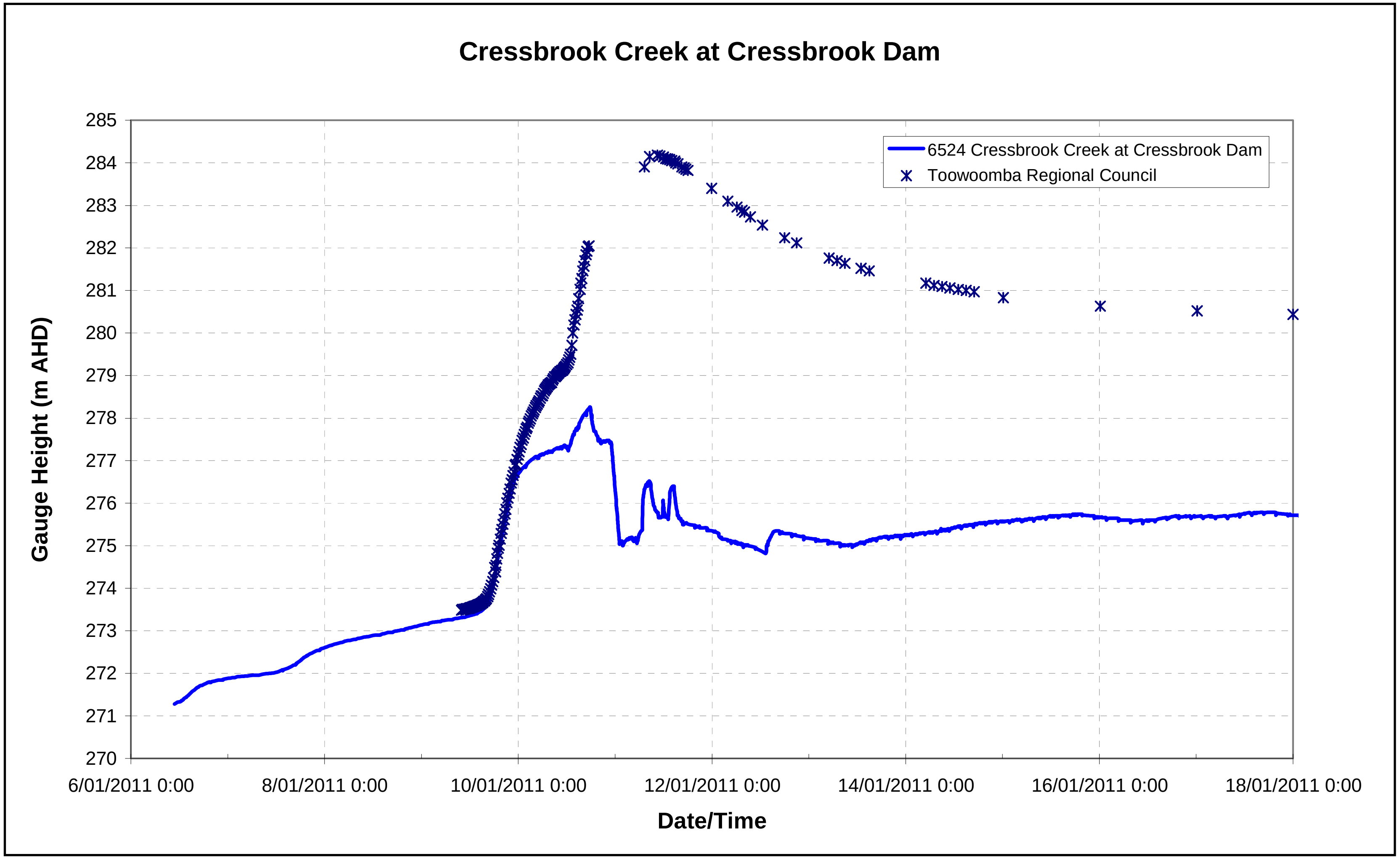

Cooyar Creek at Dam Site
6543 Cooyar Creek at Dam Site
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

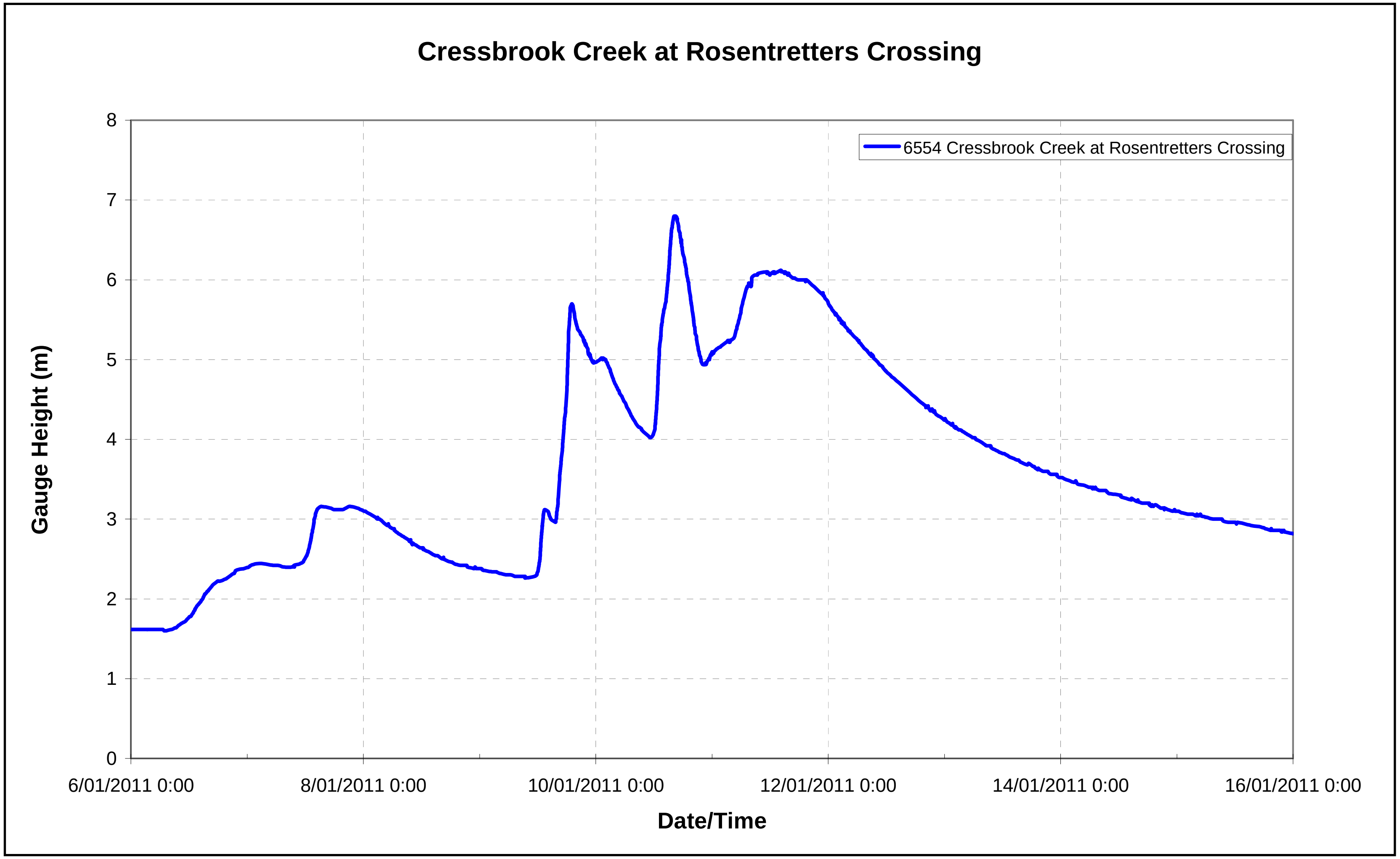

Brisbane River at Linville
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
6718 Brisbane River at Linville
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

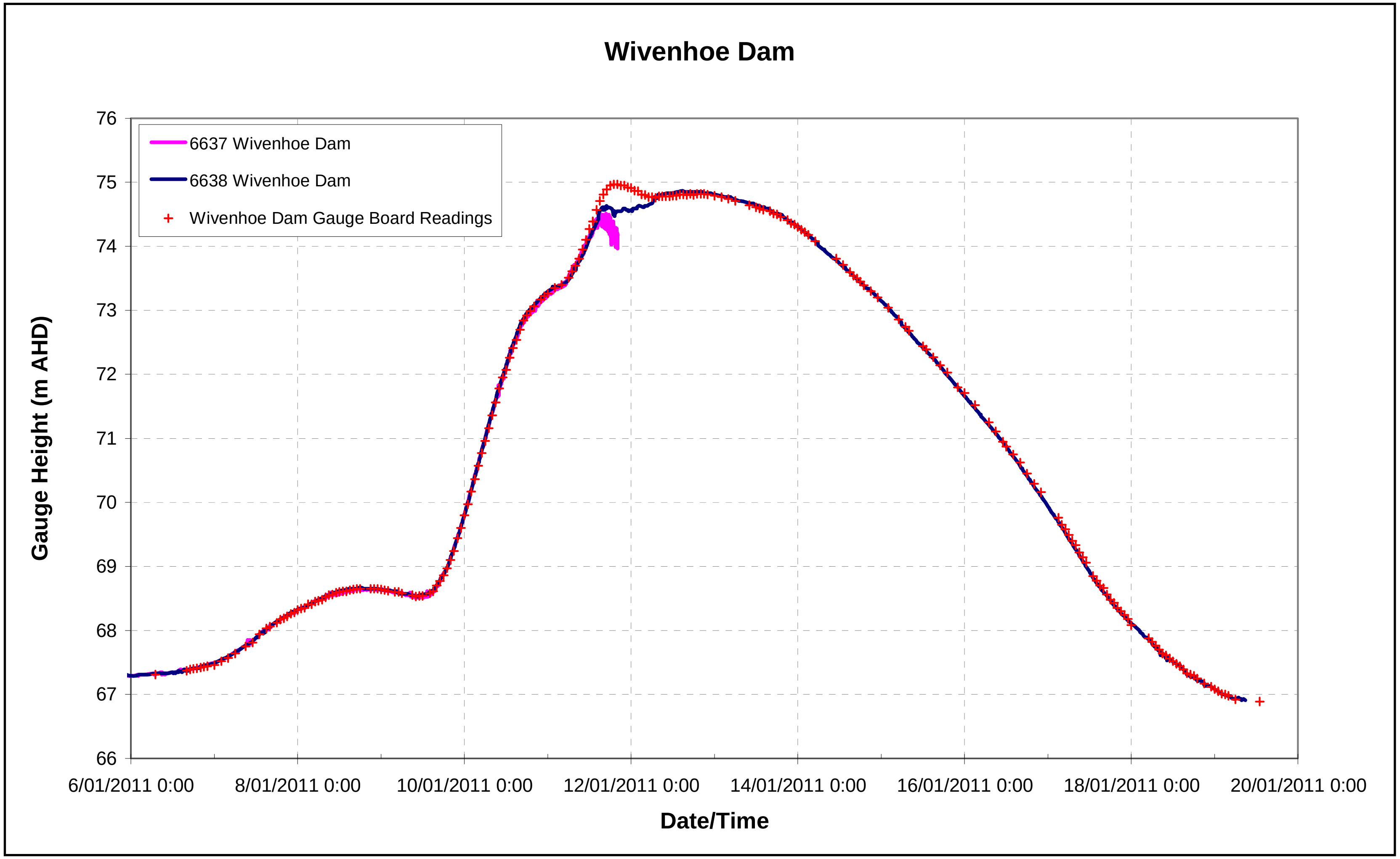

Brisbane River at Devon Hills
6709 Brisbane River at Devon Hills
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time


Emu Creek at Boat Mountain
6521 Emu Creek at Boat Mountain
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

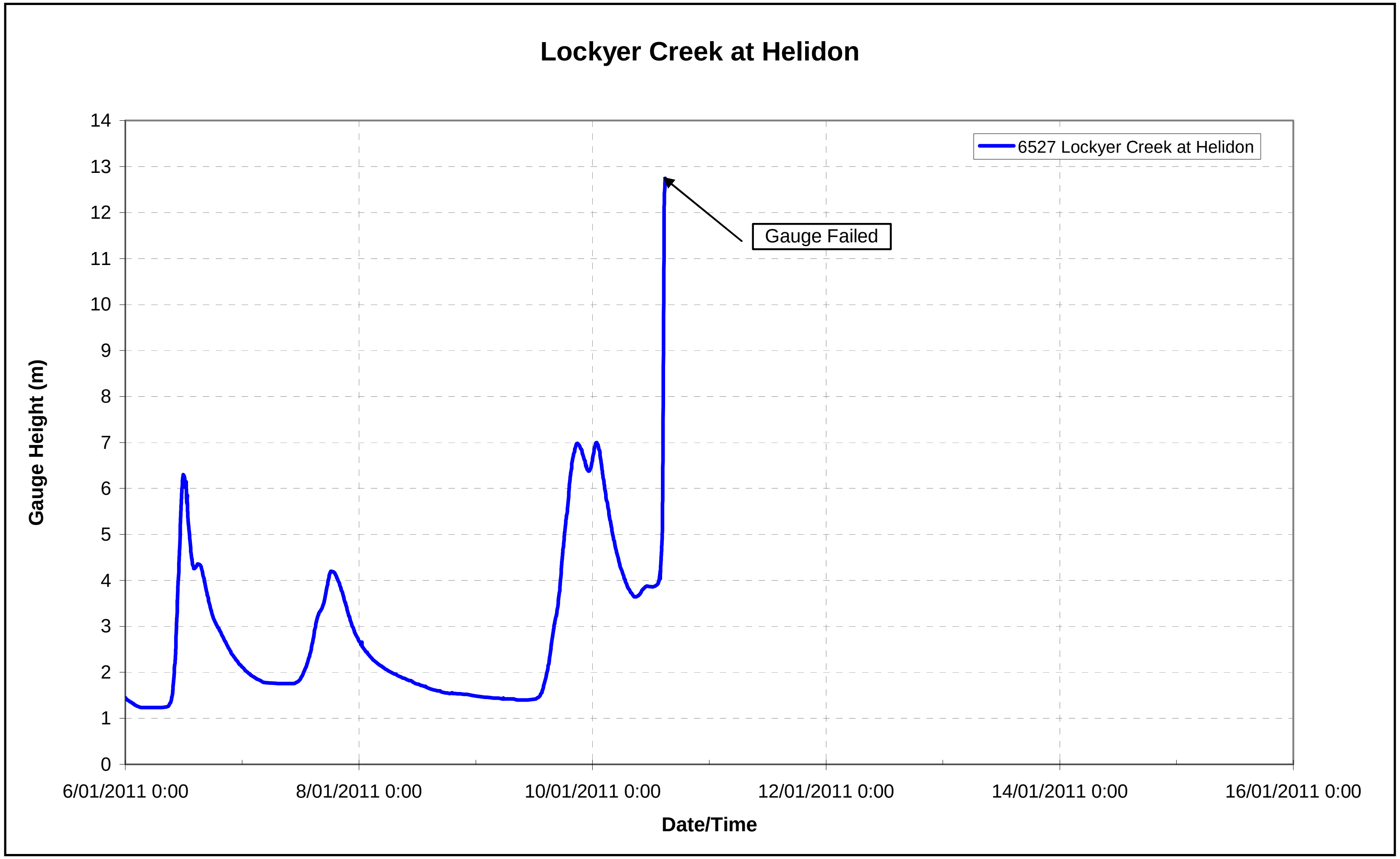

Brisbane River at Gregor Creek
6515 Brisbane River at Gregor Creek
Gauge Height (m)
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

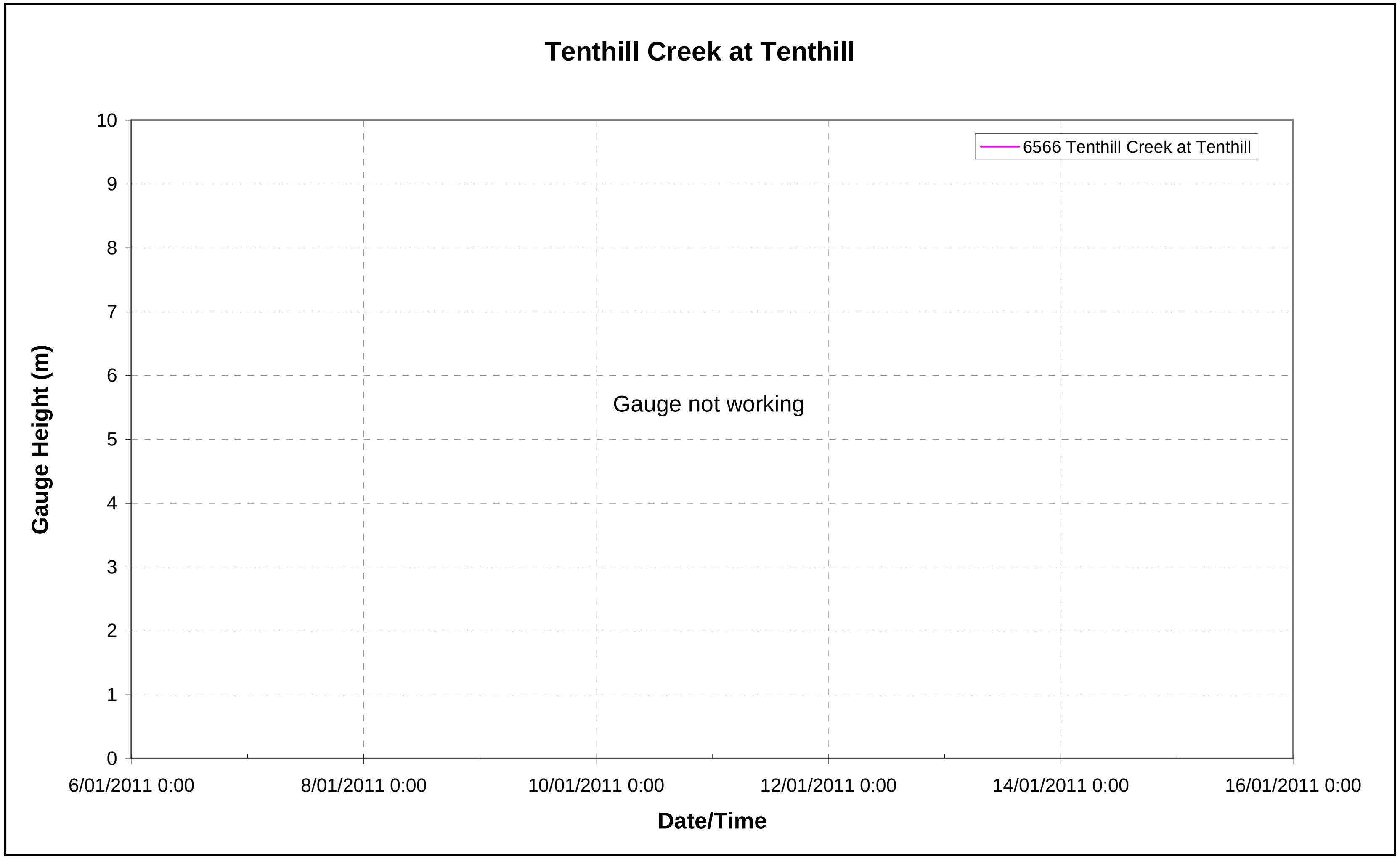

Cressbrook Creek at Cressbrook Dam
6524 Cressbrook Creek at Cressbrook Dam
Toowoomba Regional Council
Gauge Height (m AHD)
285
284
283
282
281
280
279
278
277
276
275
274
273
272
271
270
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
Date/Time

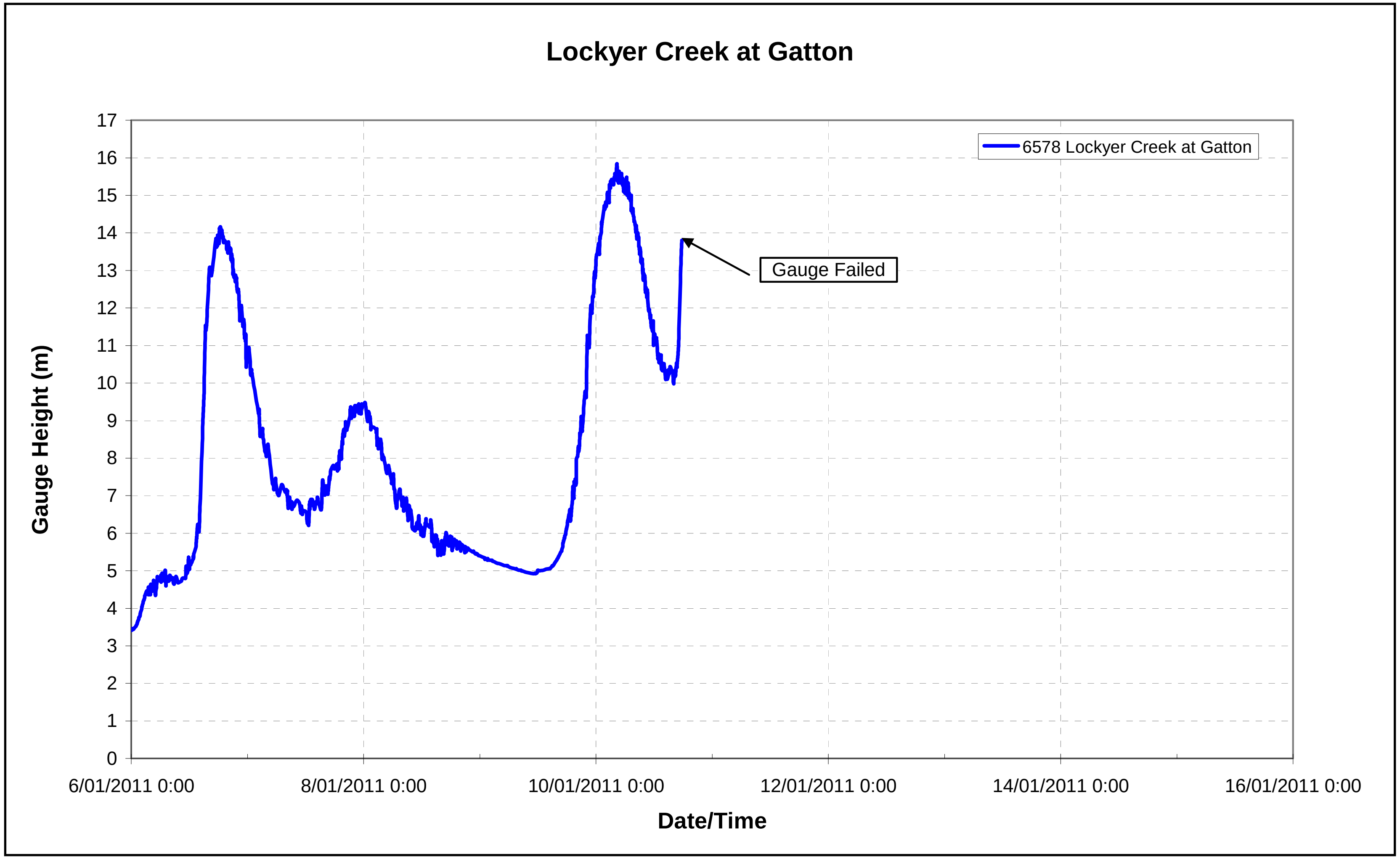

Cressbrook Creek at Rosentretters Crossing
6554 Cressbrook Creek at Rosentretters Crossing
Gauge Height (m)
0
1
2
3
4
5
6
7
8
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

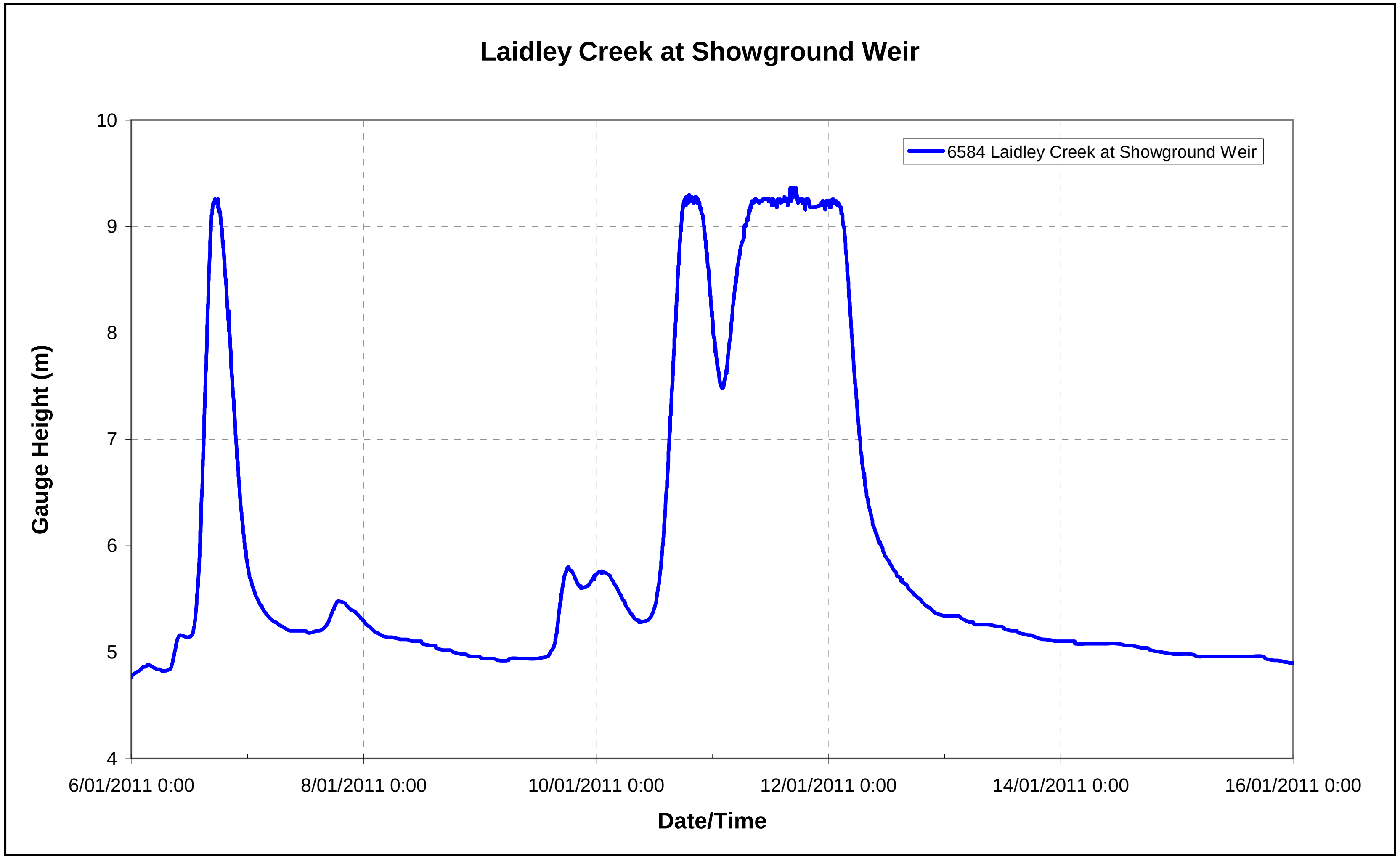

Wivenhoe Dam
6637 Wivenhoe Dam
6638 Wivenhoe Dam
Wivenhoe Dam Gauge Board Readings
Gauge Height (m AHD)
76
75
74
73
72
71
70
69
68
67
66
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

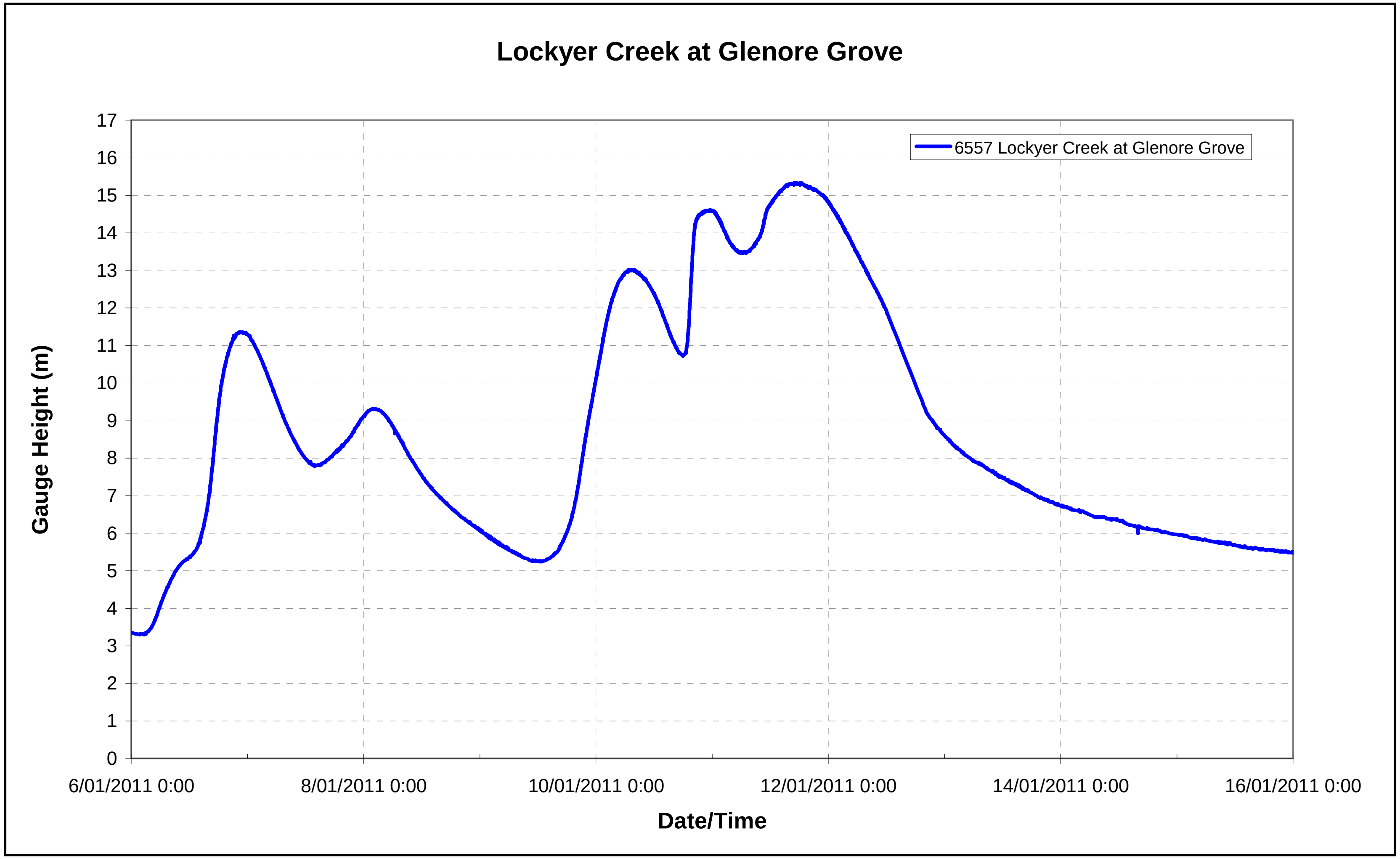
Lockyer Creek to O’Reillys Weir

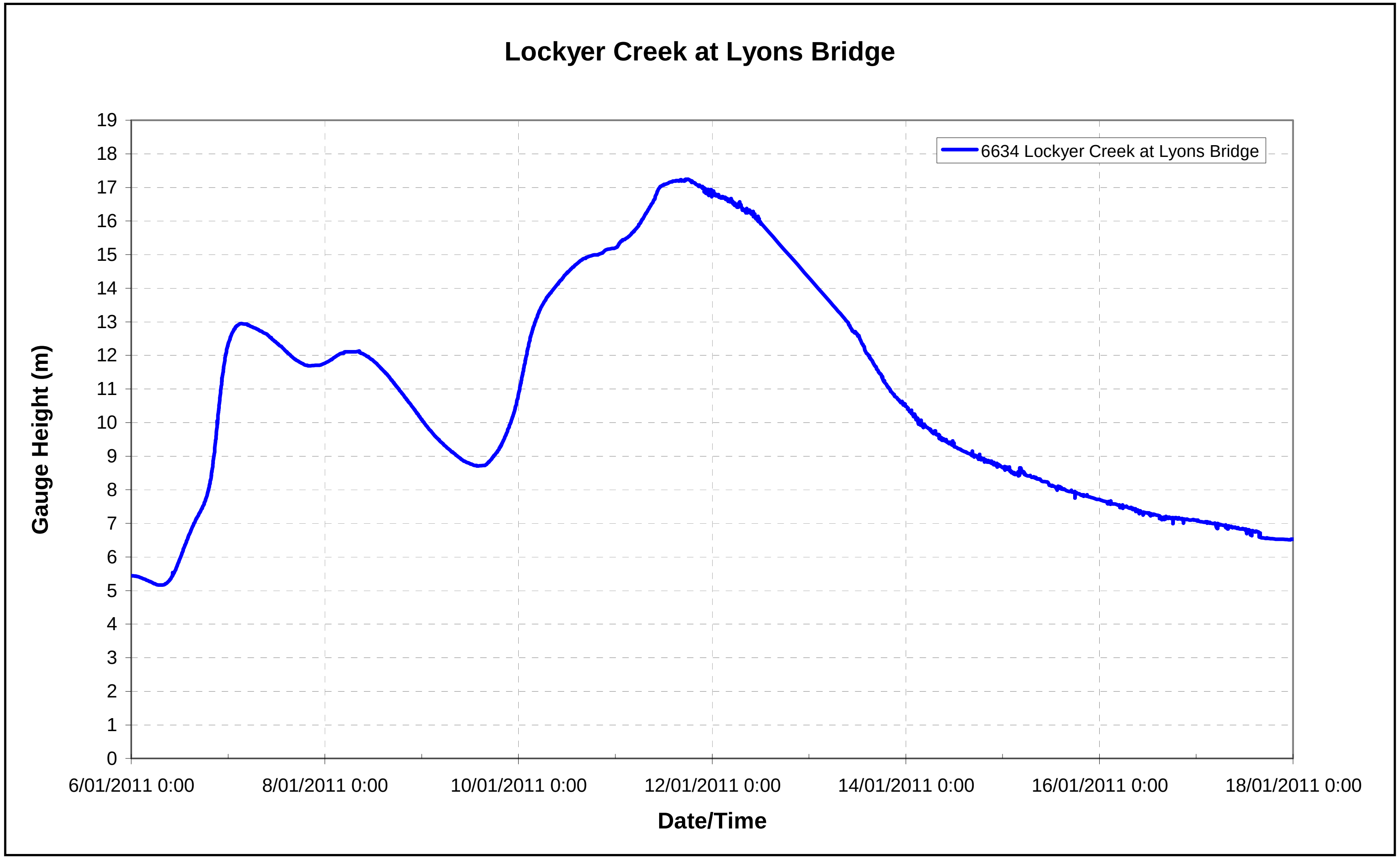

Lockyer Creek at Helidon
6527 Lockyer Creek at Helidon
Gauge Failed
Gauge Height (m)
Date/Time
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00

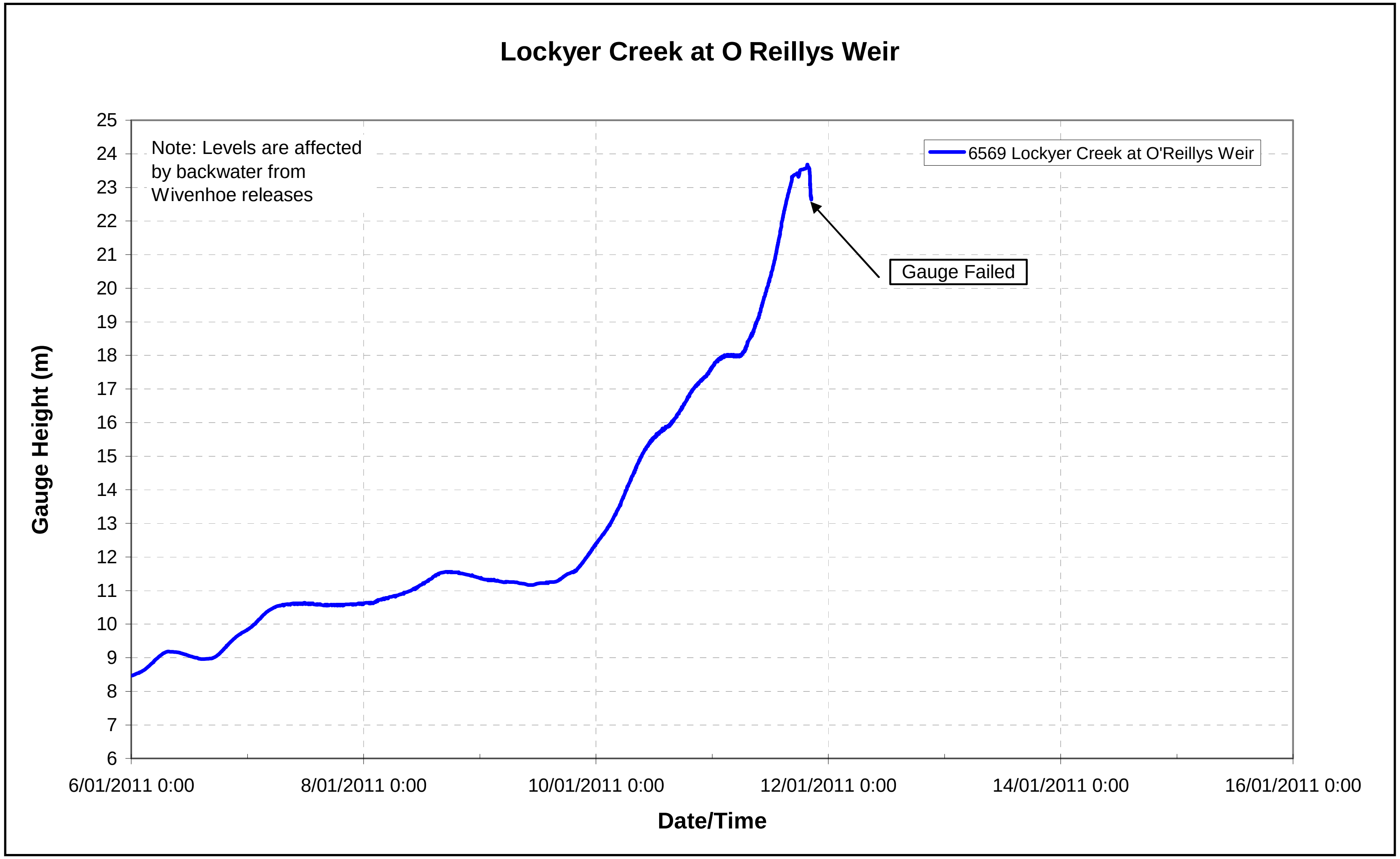

Tenthill Creek at Tenthill
6566 Tenthill Creek at Tenthill
Gauge not working
Gauge Height (m)
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time


Lockyer Creek at Gatton
6578 Lockyer Creek at Gatton
Gauge Failed
Gauge Height (m)
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

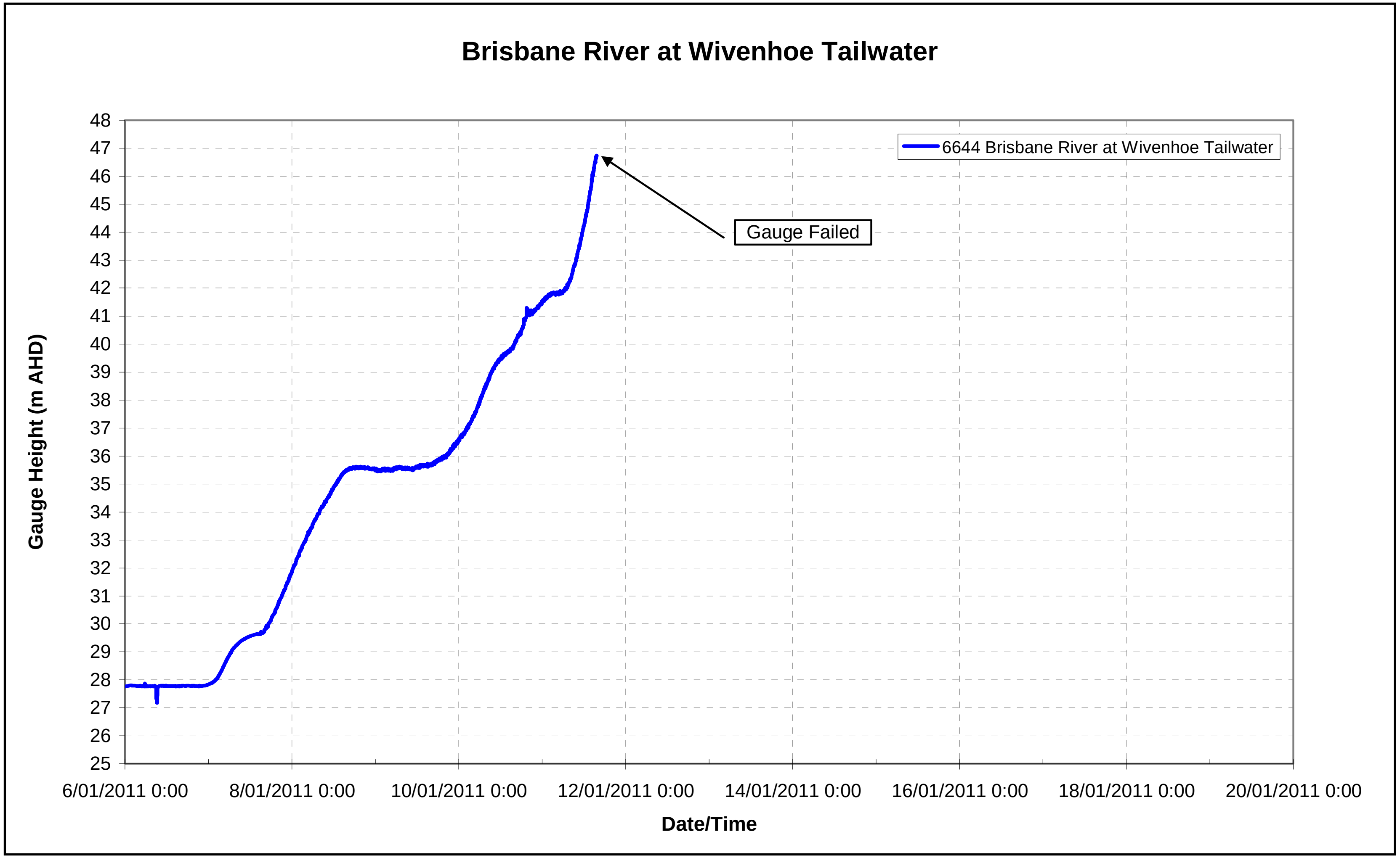

Laidley Creek at Showground Weir
6584 Laidley Creek at Showground Weir
Gauge Height (m)
10
9
8
7
6
5
4
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

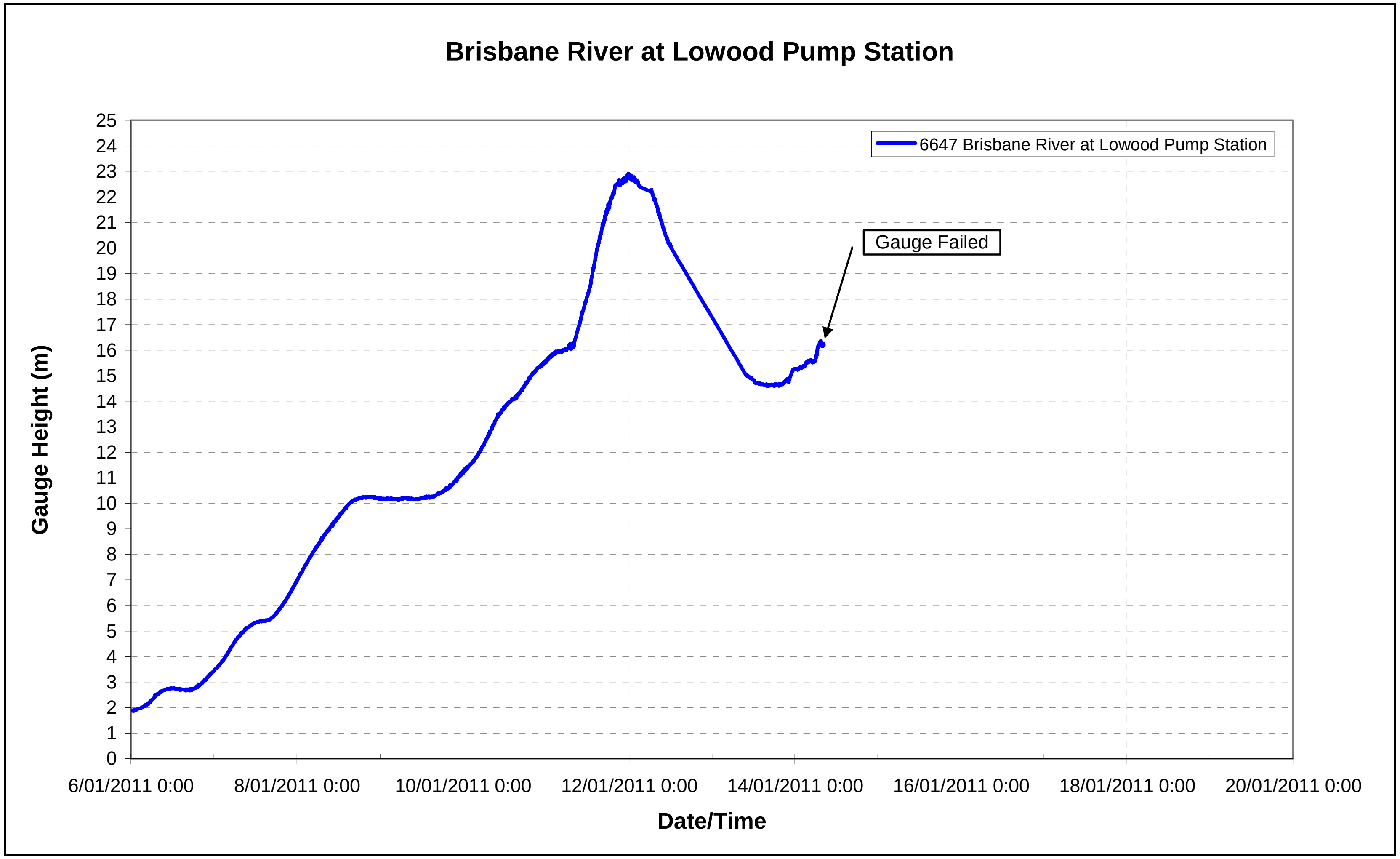

Lockyer Creek at Glenore Grove
6557 Lockyer Creek at Glenore Grove
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

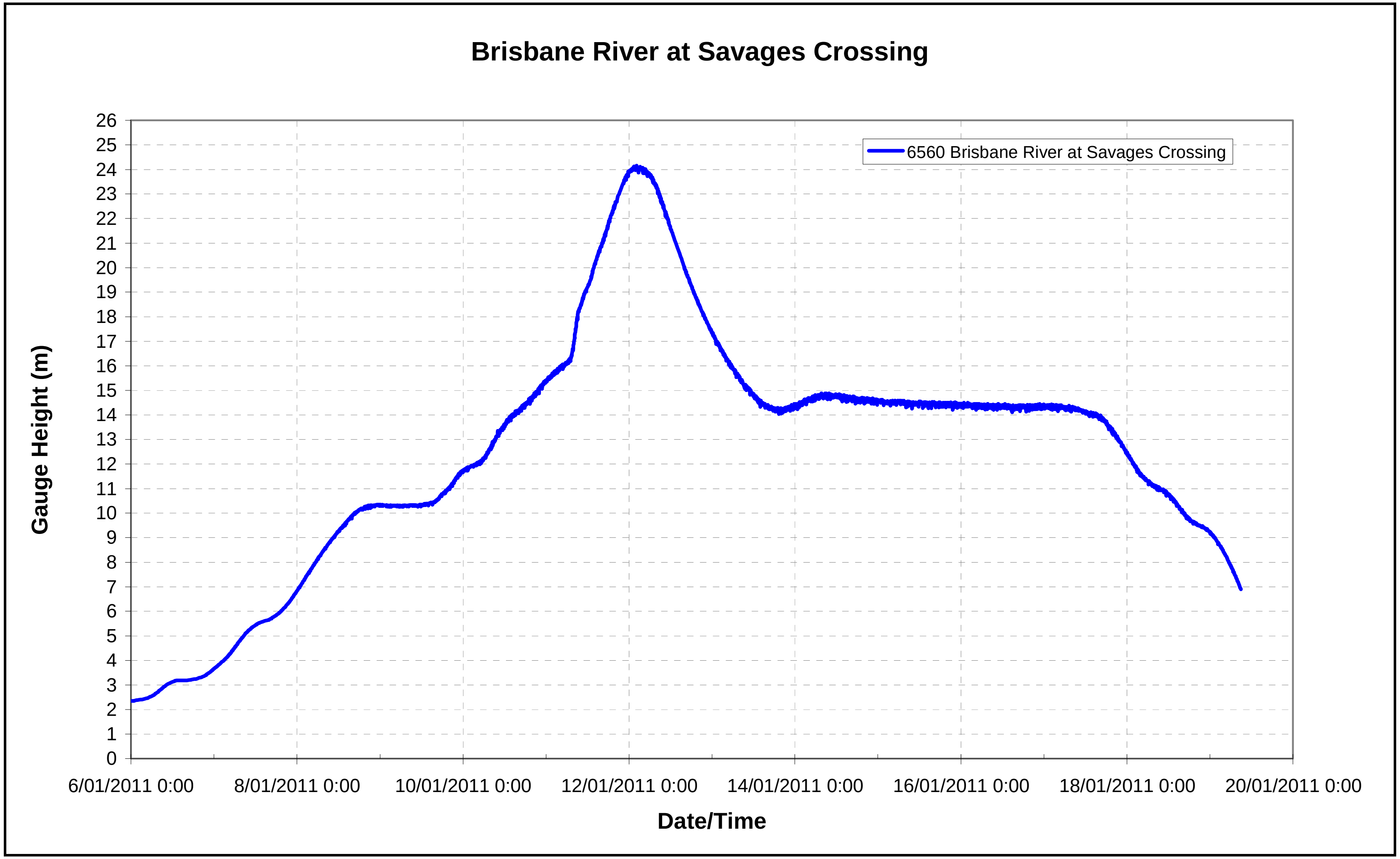

Lockyer Creek at Lyons Bridge
6634 Lockyer Creek at Lyons Bridge
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
Date/Time

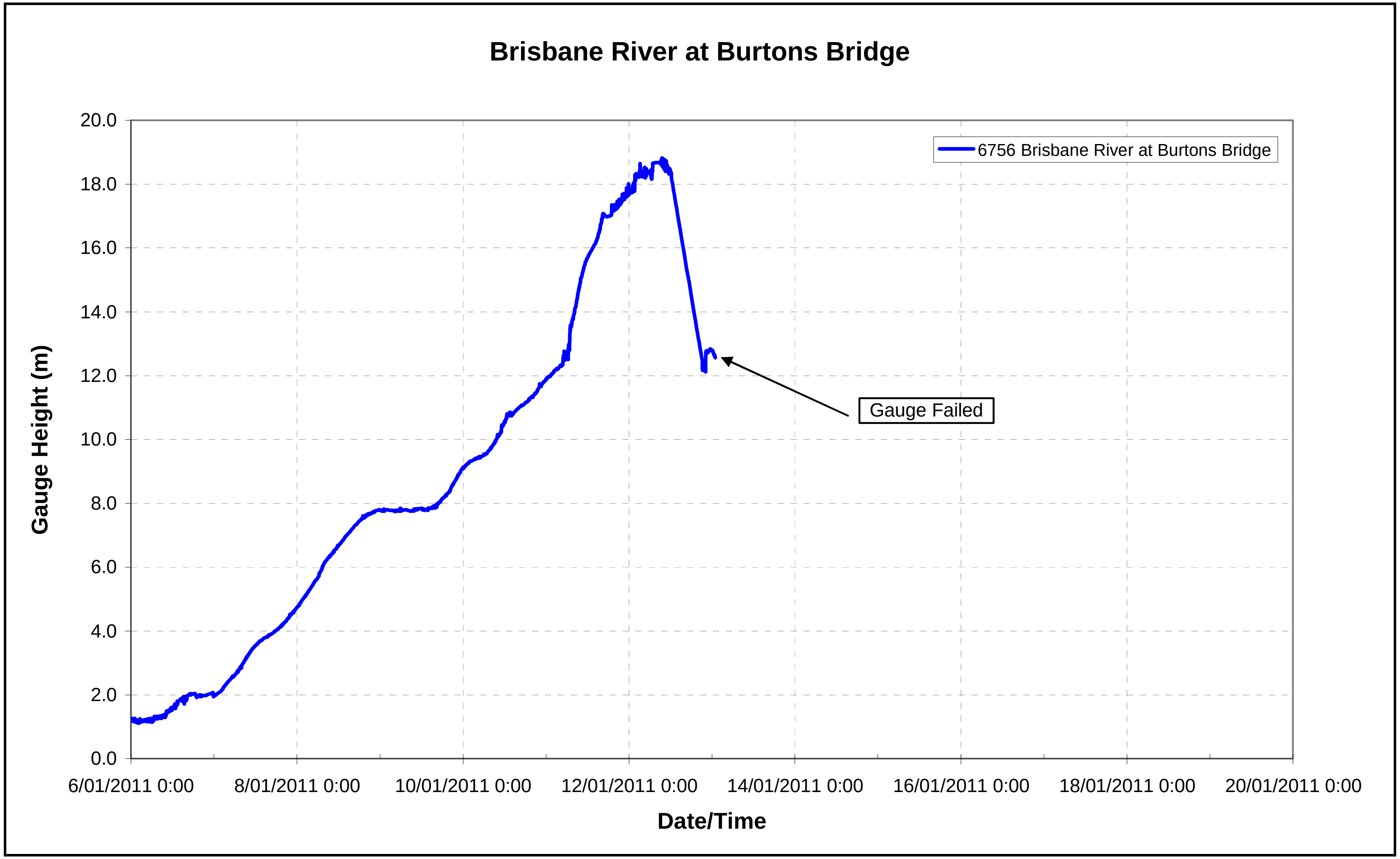

Lockyer Creek at O Reillys Weir
Note: Levels are affected by backwater from Wivenhoe releases
6569 Lockyer Creek at O'Reillys Weir
Gauge Failed
Gauge Height (m)
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

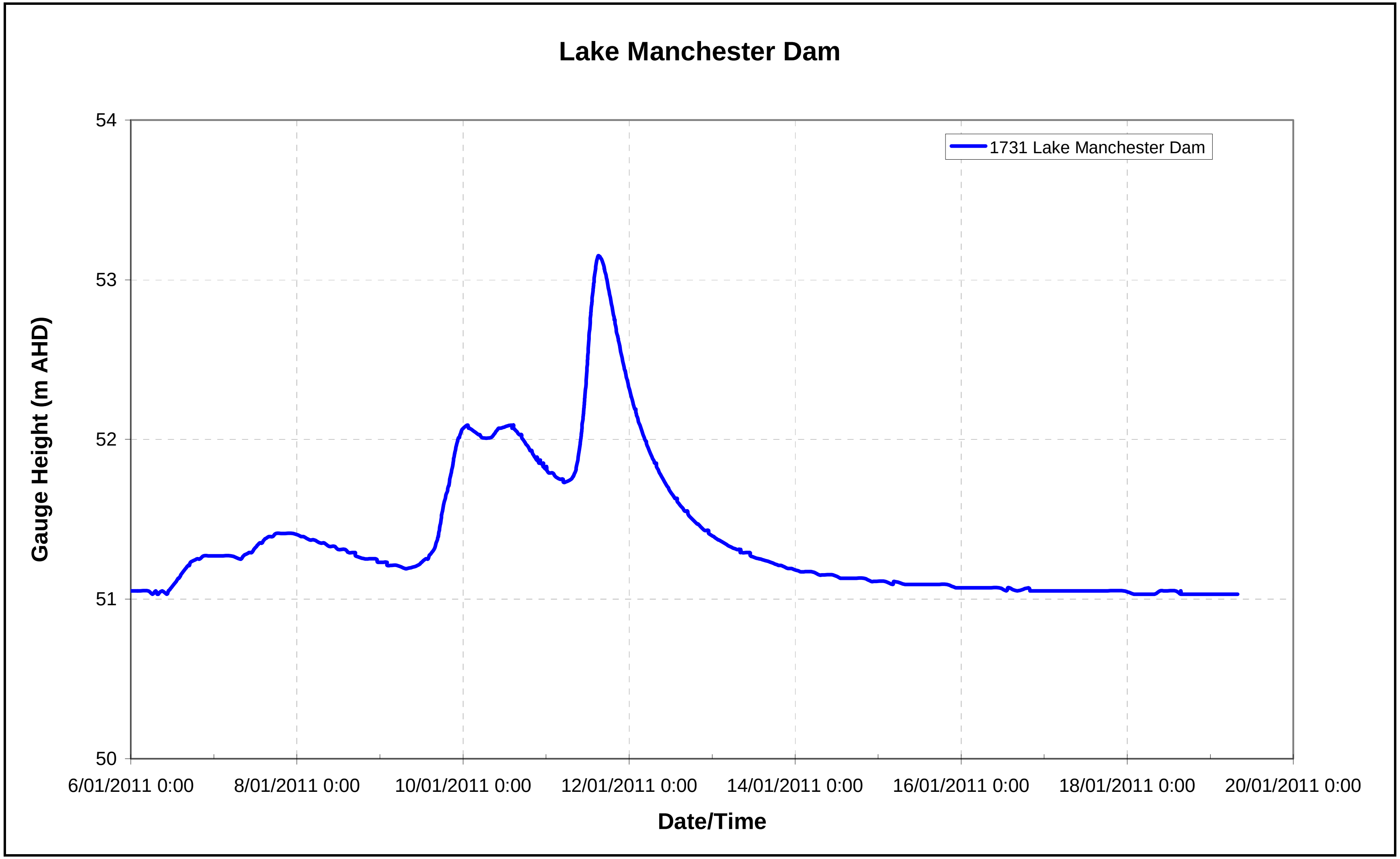
Mid Brisbane River – Wivenhoe to Colleges Crossing

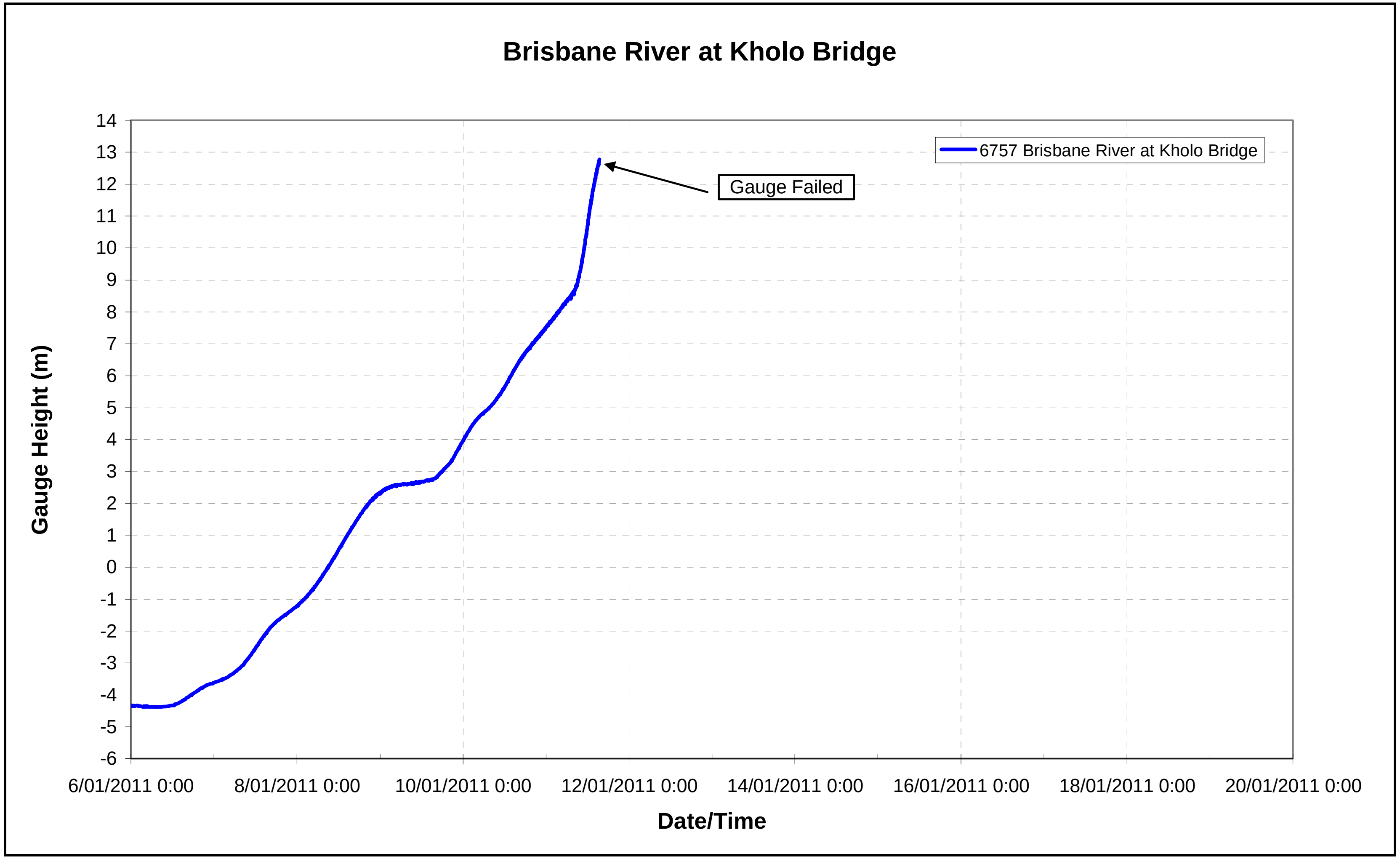

Brisbane River at Wivenhoe Tailwater
6644 Brisbane River at Wivenhoe Tailwater
Gauge Failed
Gauge Height (m AHD)
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
26
25
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

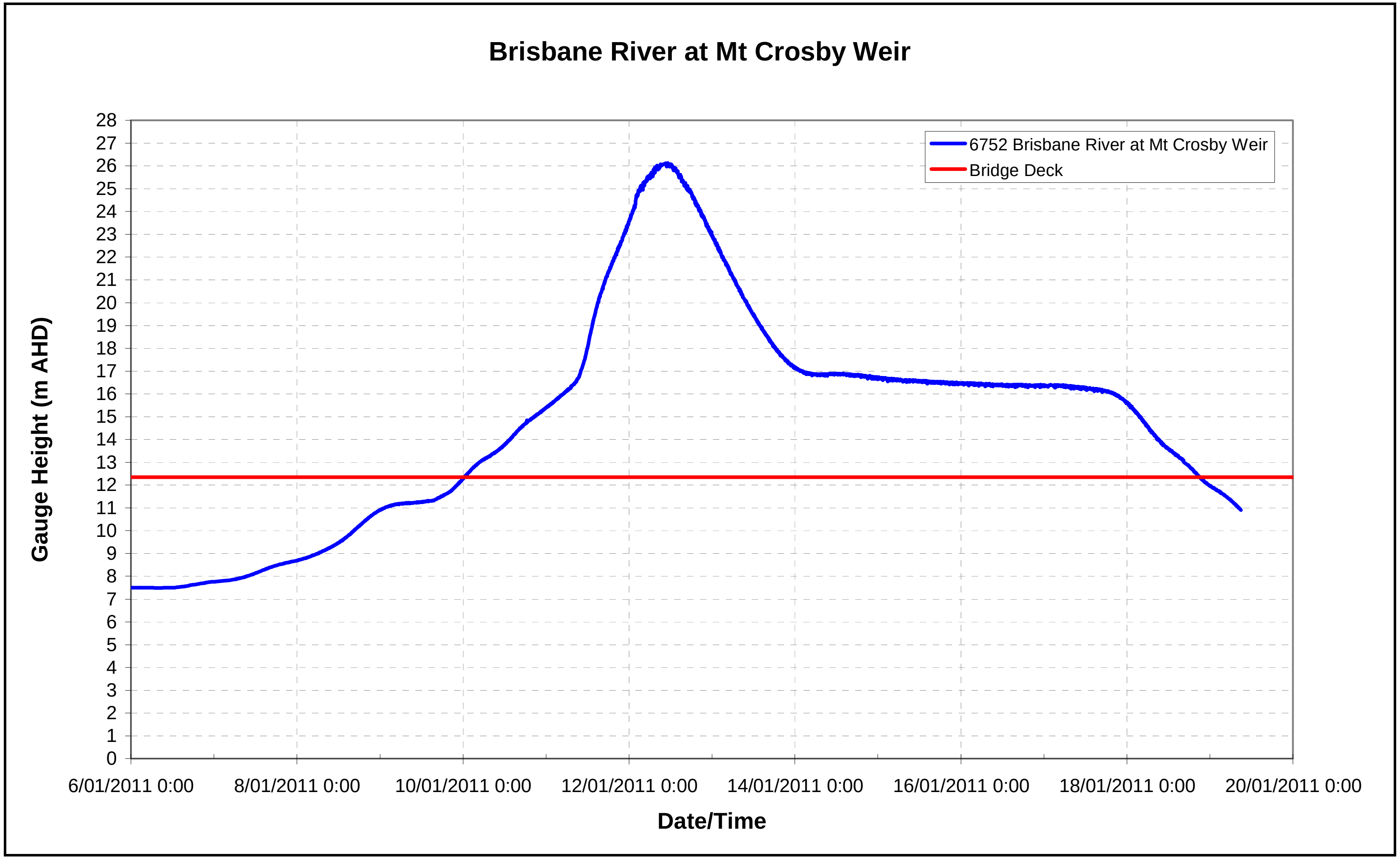

Brisbane River at Lowood Pump Station
Gauge Height (m)
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time
6647 Brisbane River at Lowood Pump Station
Gauge Failed

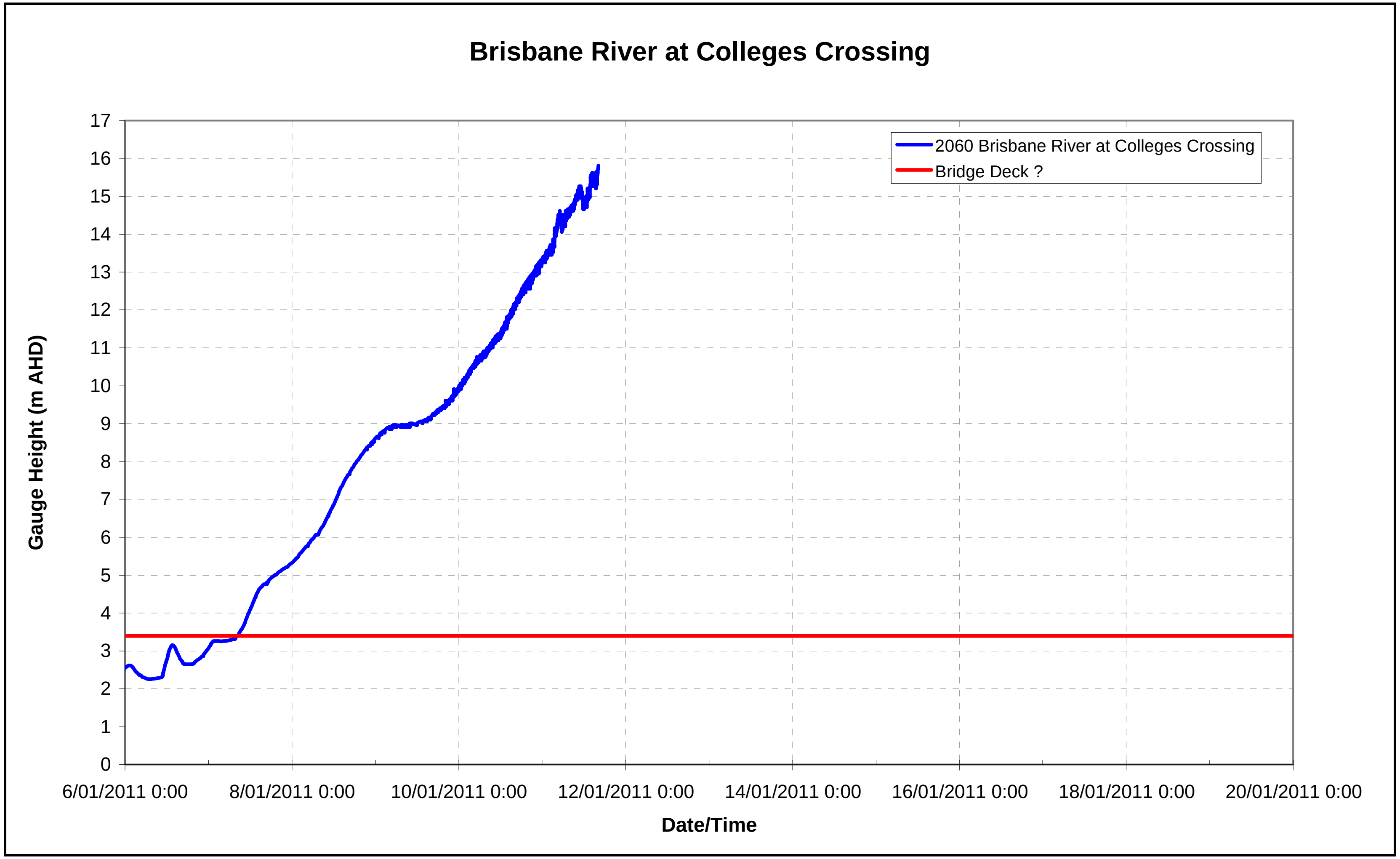

Brisbane River at Savages Crossing
6560 Brisbane River at Savages Crossing
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time


Brisbane River at Burtons Bridge
6756 Brisbane River at Burtons Bridge
Gauge Failed
Gauge Height (m)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

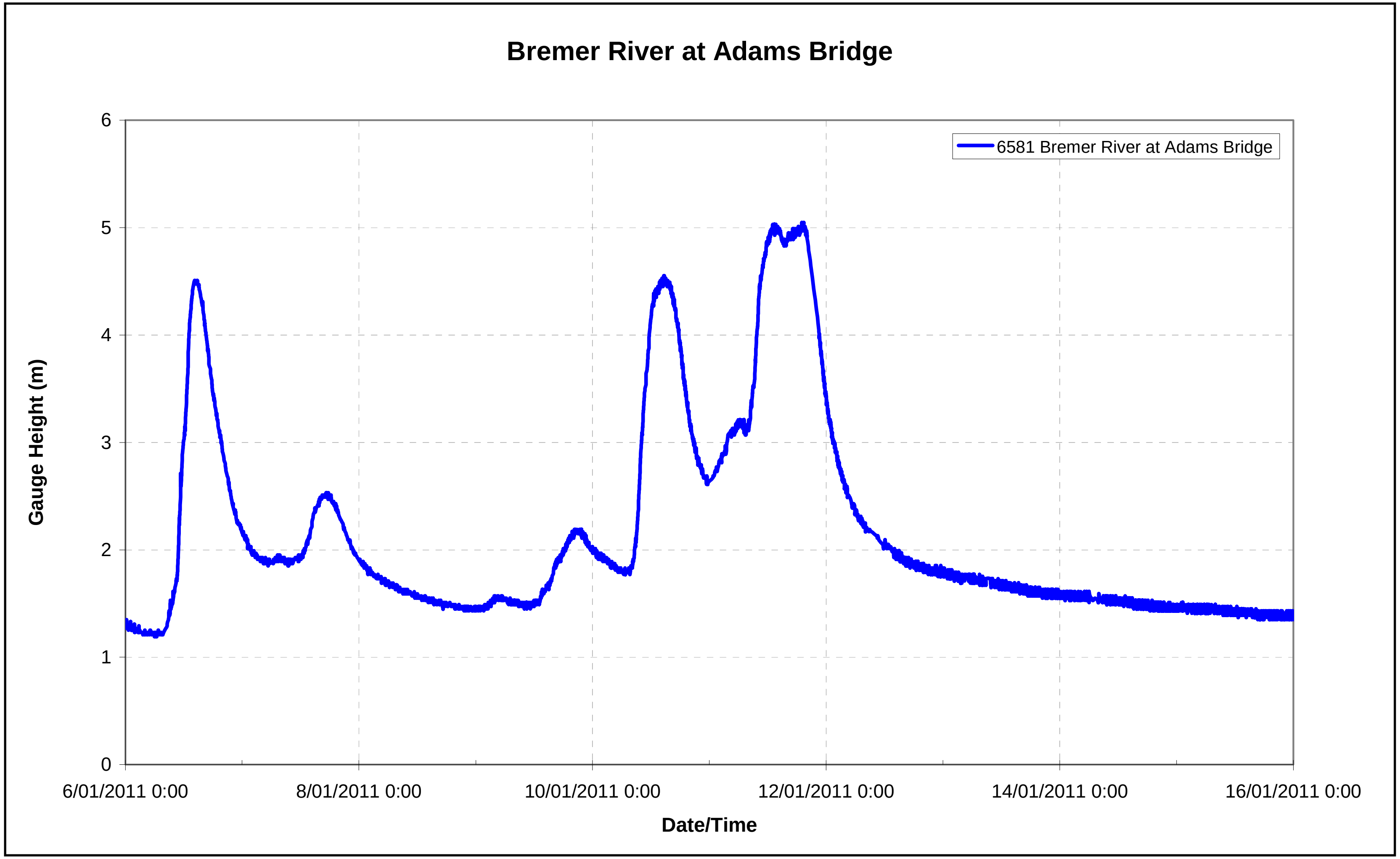

Lake Manchester Dam
1731 Lake Manchester Dam
Gauge Height (m AHD)
54
53
52
51
50
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

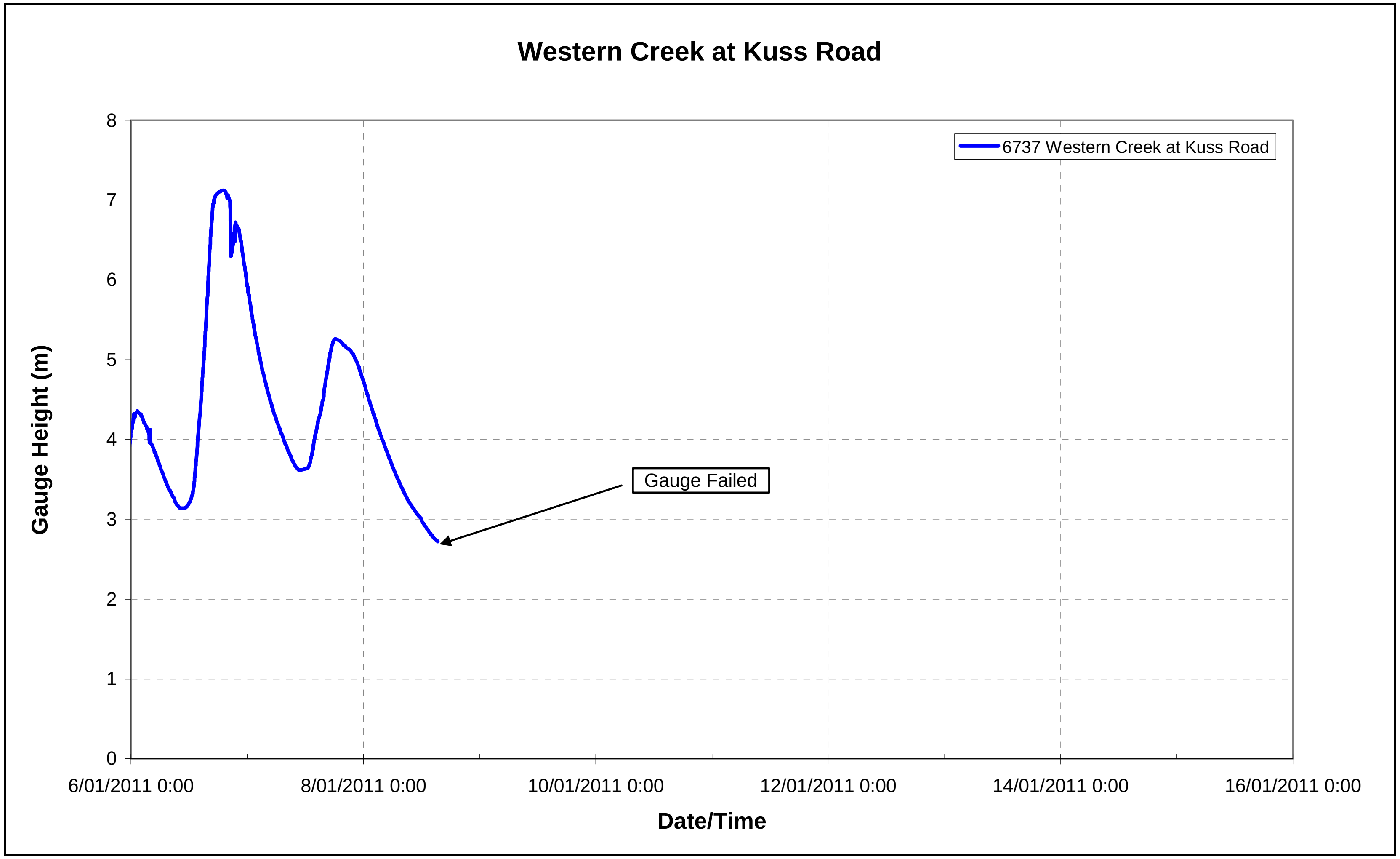

Brisbane River at Kholo Bridge
6757 Brisbane River at Kholo Bridge
Gauge Failed
Gauge Height (m)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

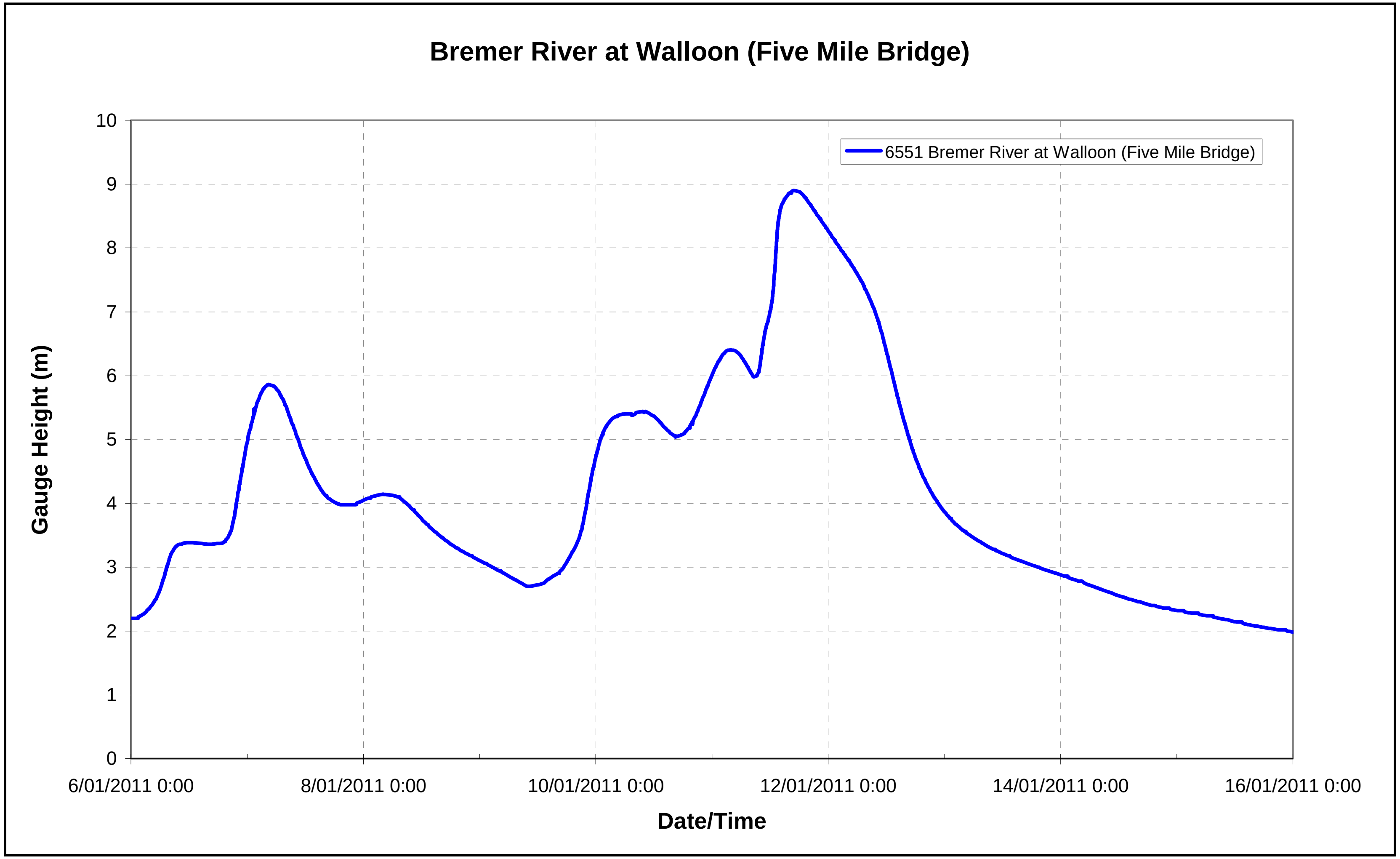

Brisbane River at Mt Crosby Weir
Gauge Height (m AHD)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time
6752 Brisbane River at Mt Crosby Weir
Bridge Deck

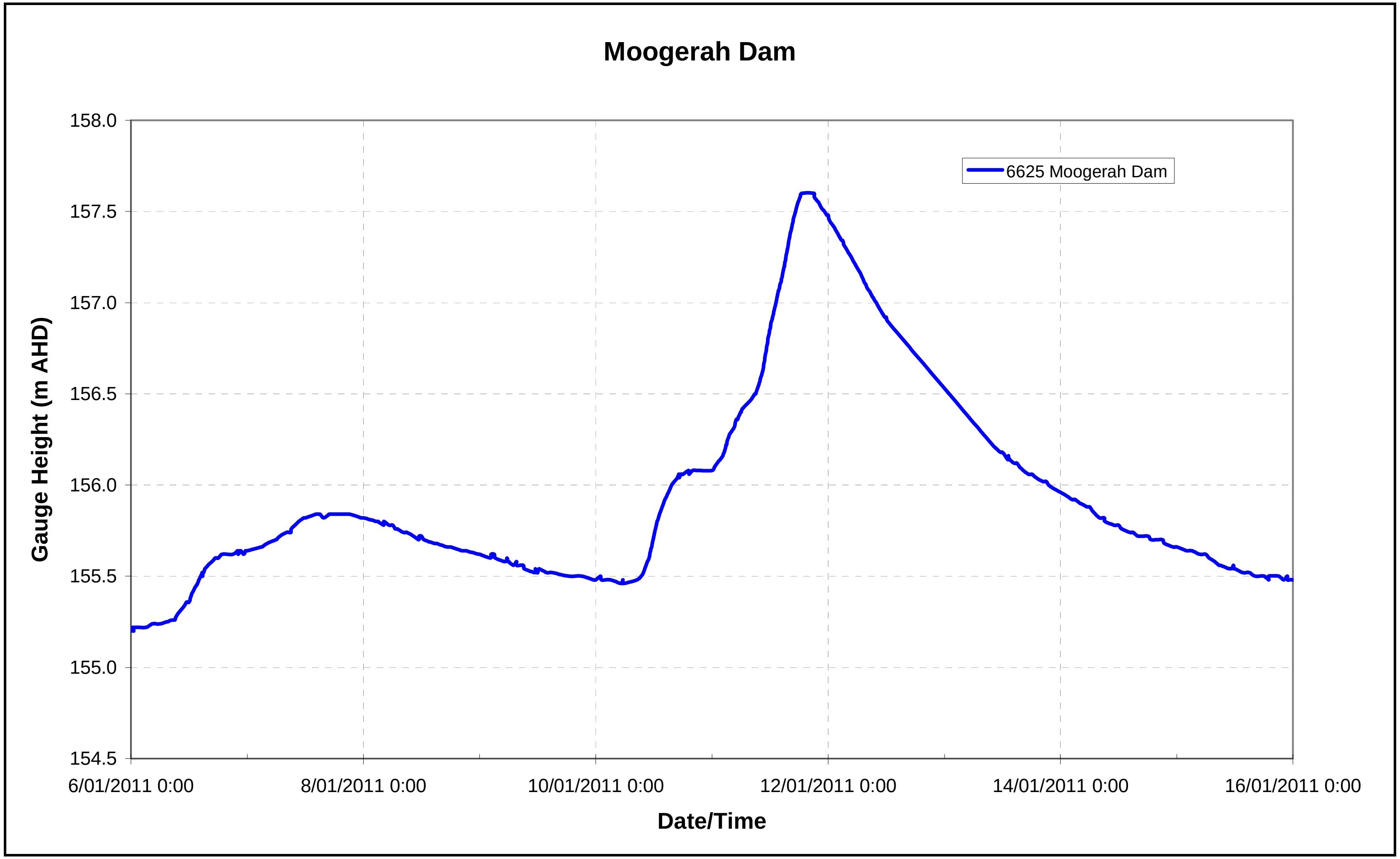

Brisbane River at Colleges Crossing
2060 Brisbane River at Colleges Crossing
Bridge Deck ?
Gauge Height (m AHD)
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

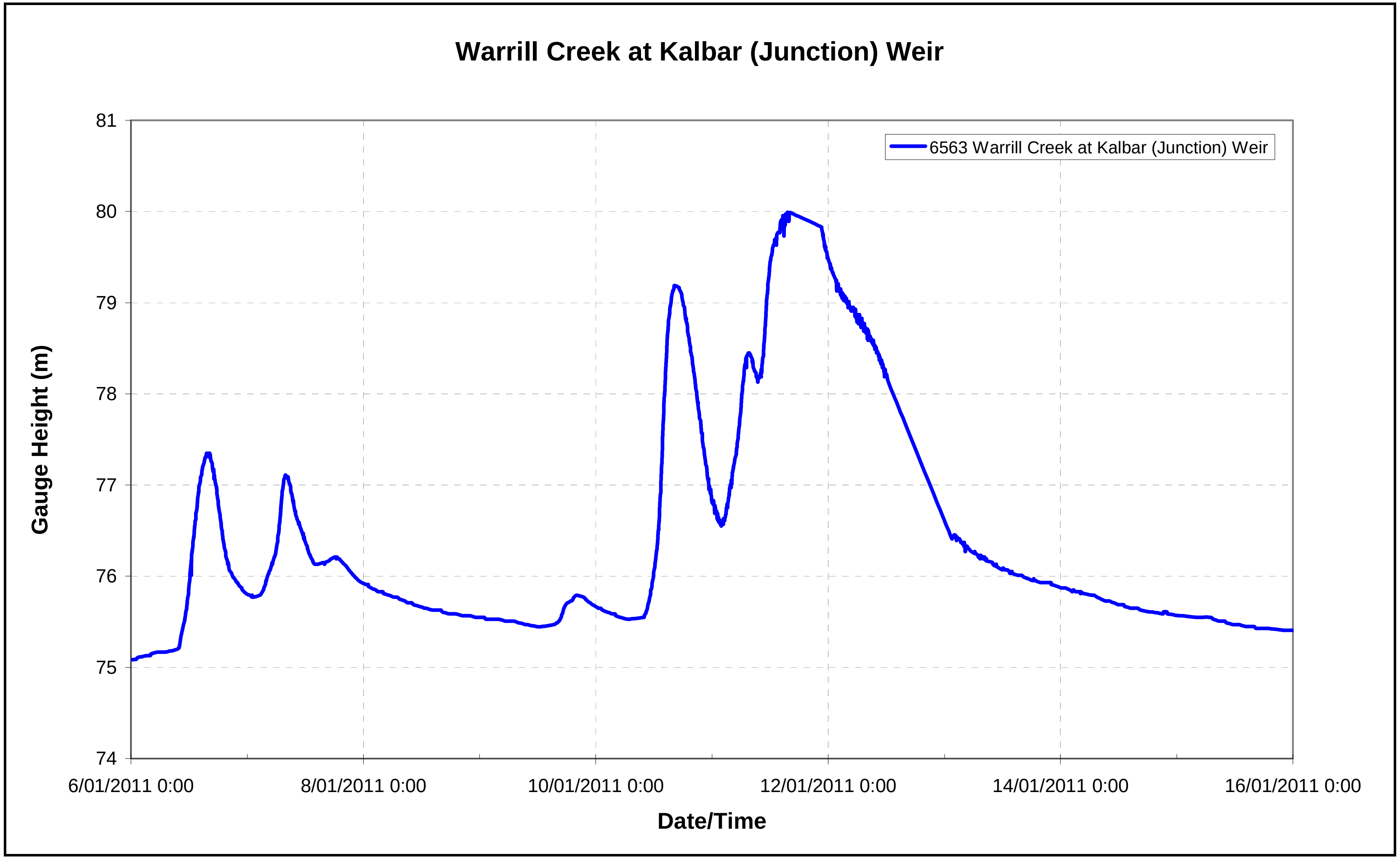
Bremer River to Ipswich

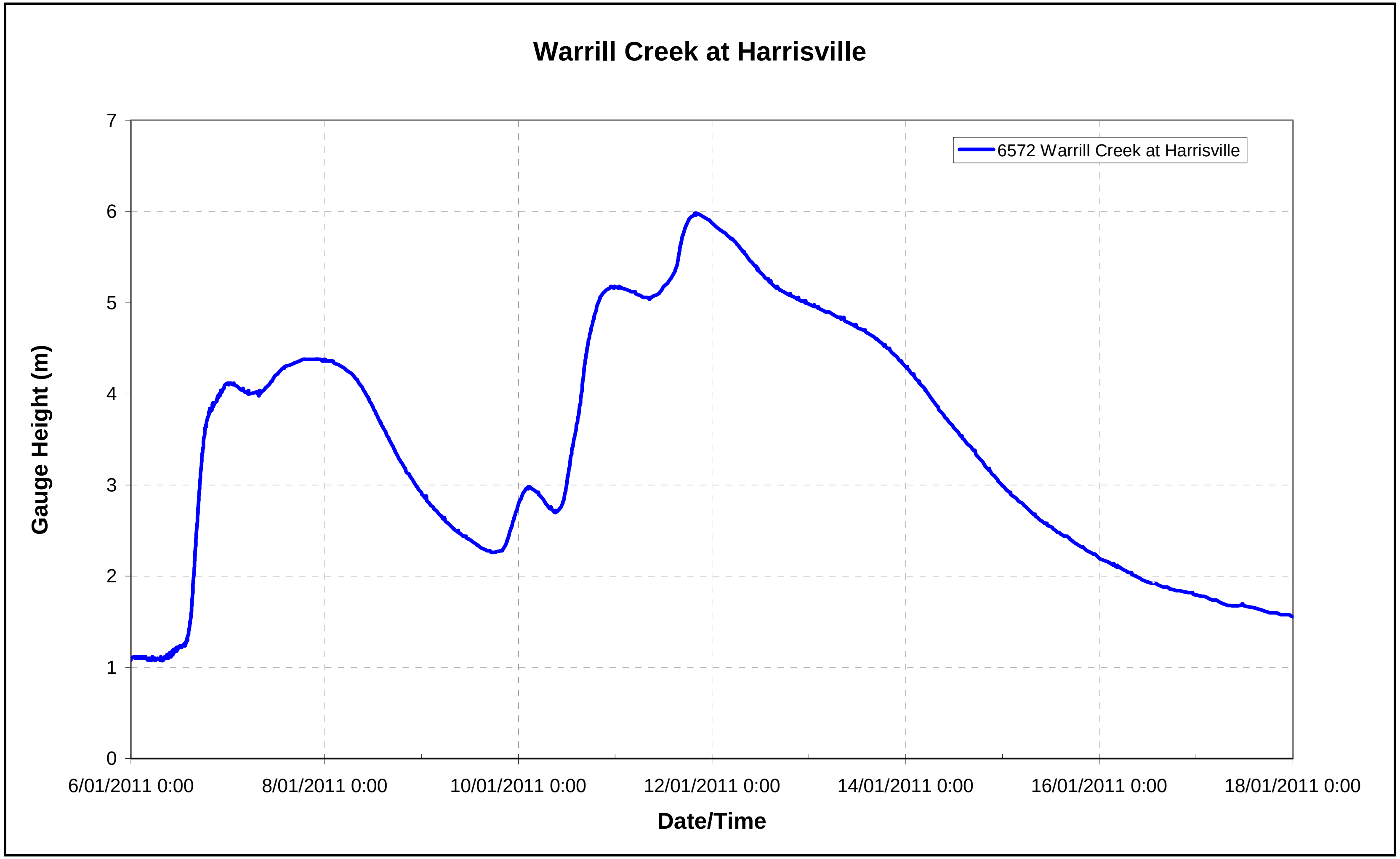

Bremer River at Adams Bridge
6581 Bremer River at Adams Bridge
Gauge Height (m)
0
1
2
3
4
5
6
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

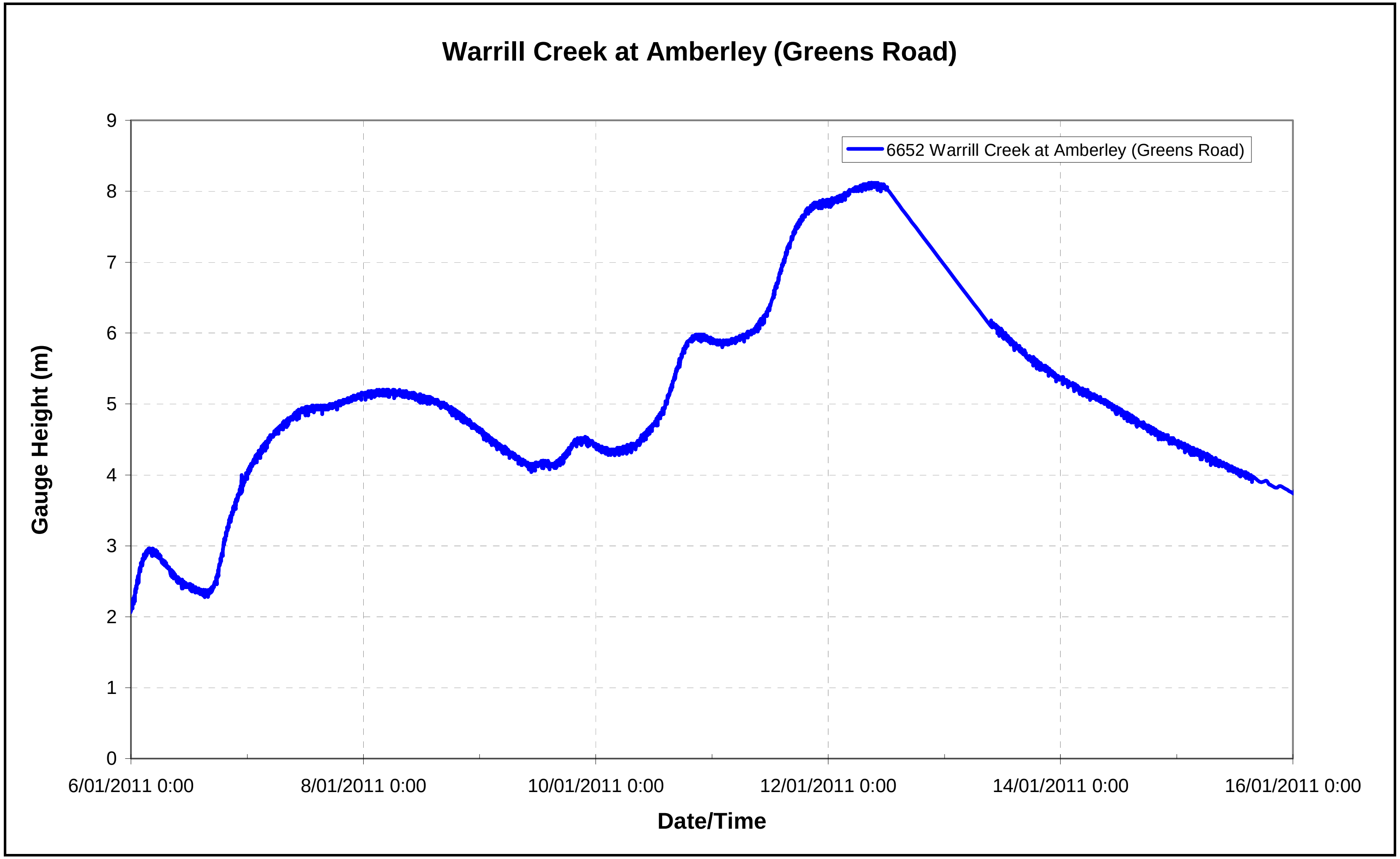

Western Creek at Kuss Road
Gauge Height (m)
0
1
2
3
4
5
6
7
8
6737 Western Creek at Kuss Road
Gauge Failed
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

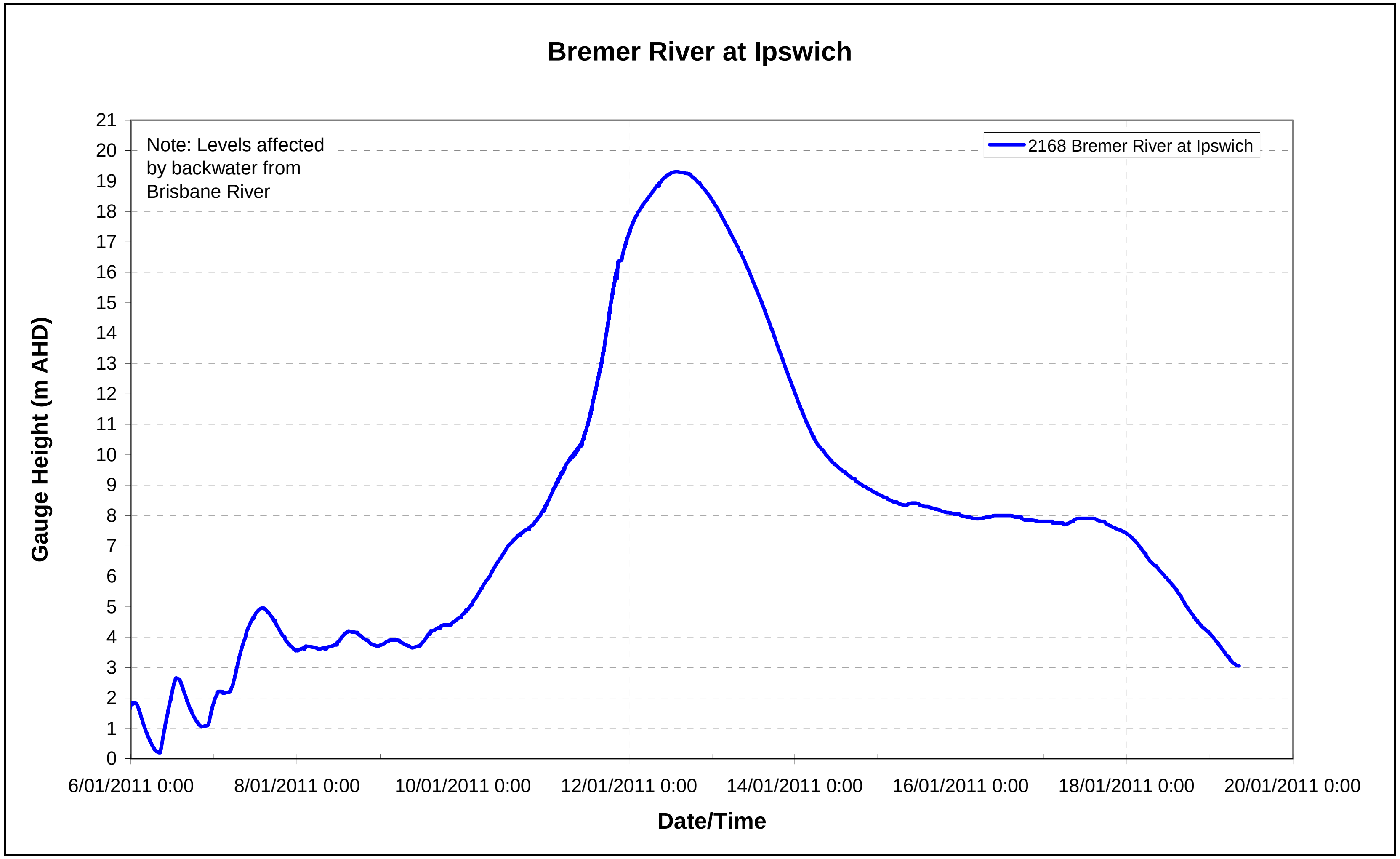

Bremer River at Walloon (Five Mile Bridge)
6551 Bremer River at Walloon (Five Mile Bridge)
Gauge Height (m)
10
9
8
7
6
5
4
3
2
1
0
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time


Moogerah Dam
6625 Moogerah Dam
Gauge Height (m AHD)
158.0
157.5
157.0
156.5
156.0
155.5
155.0
154.5
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

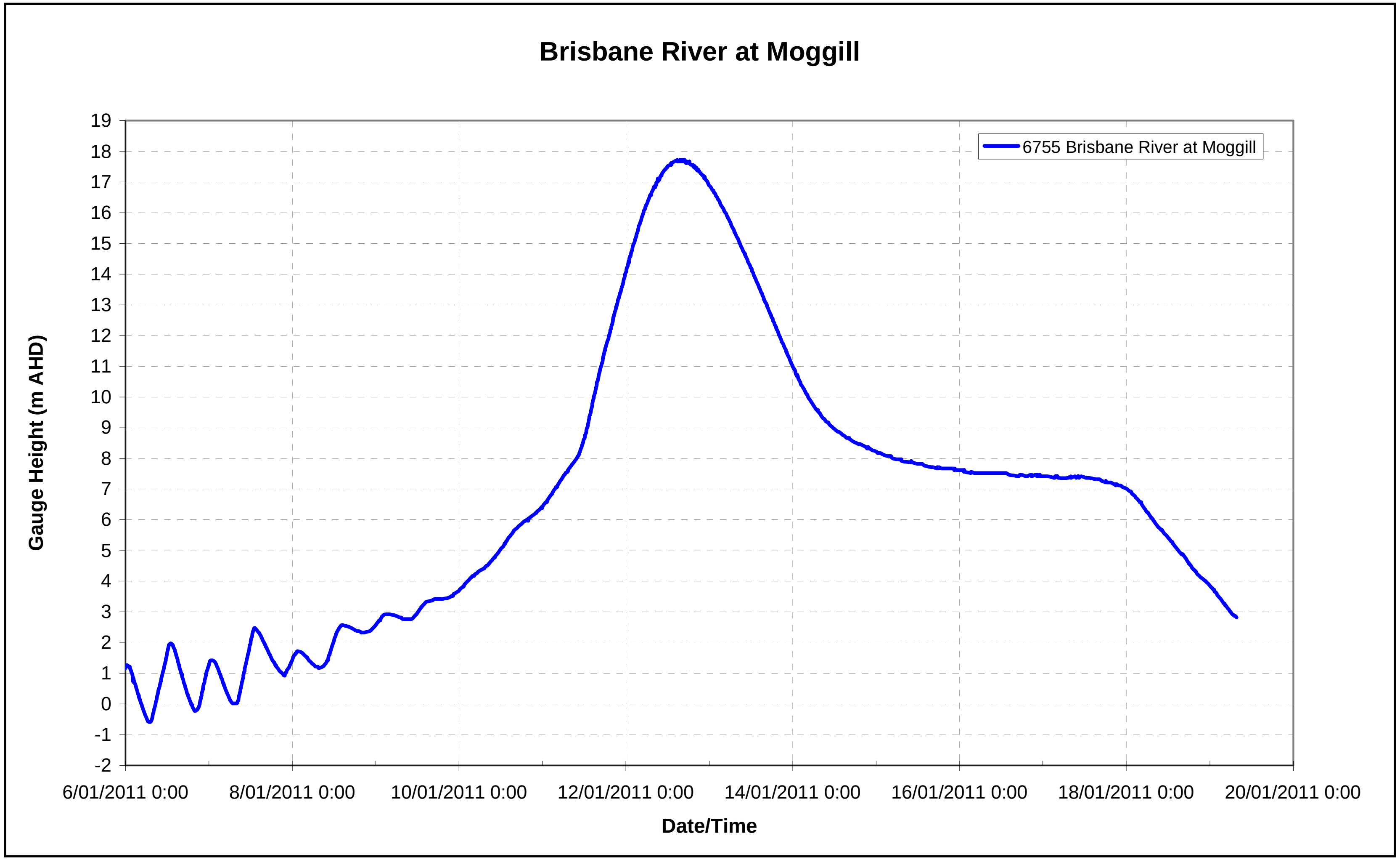

Warrill Creek at Kalbar (Junction) Weir
6563 Warrill Creek at Kalbar (Junction) Weir
Gauge Height (m)
81
80
79
78
77
76
75
74
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

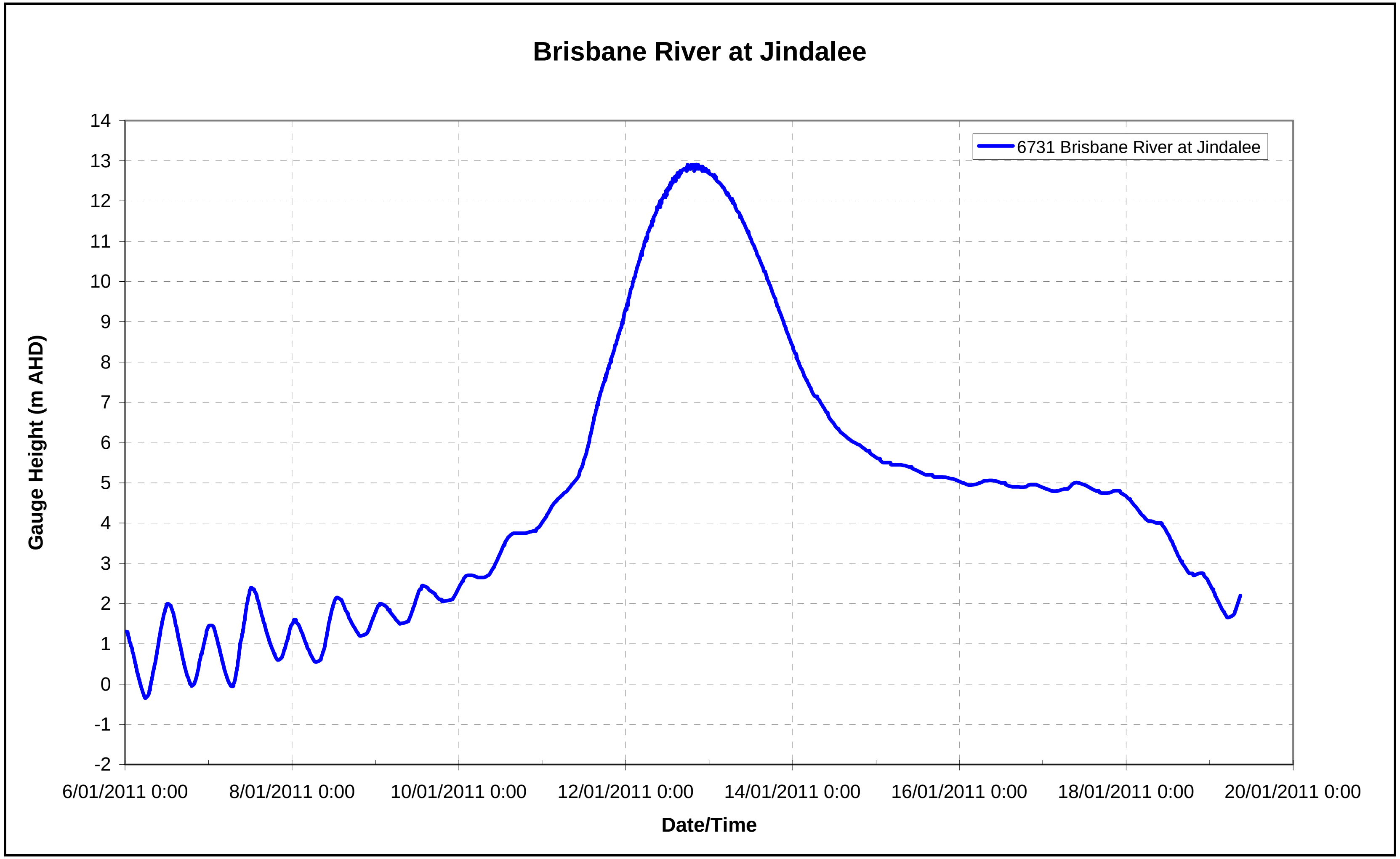

Warrill Creek at Harrisville
6572 Warrill Creek at Harrisville
Gauge Height (m)
0
1
2
3
4
5
6
7
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
Date/Time

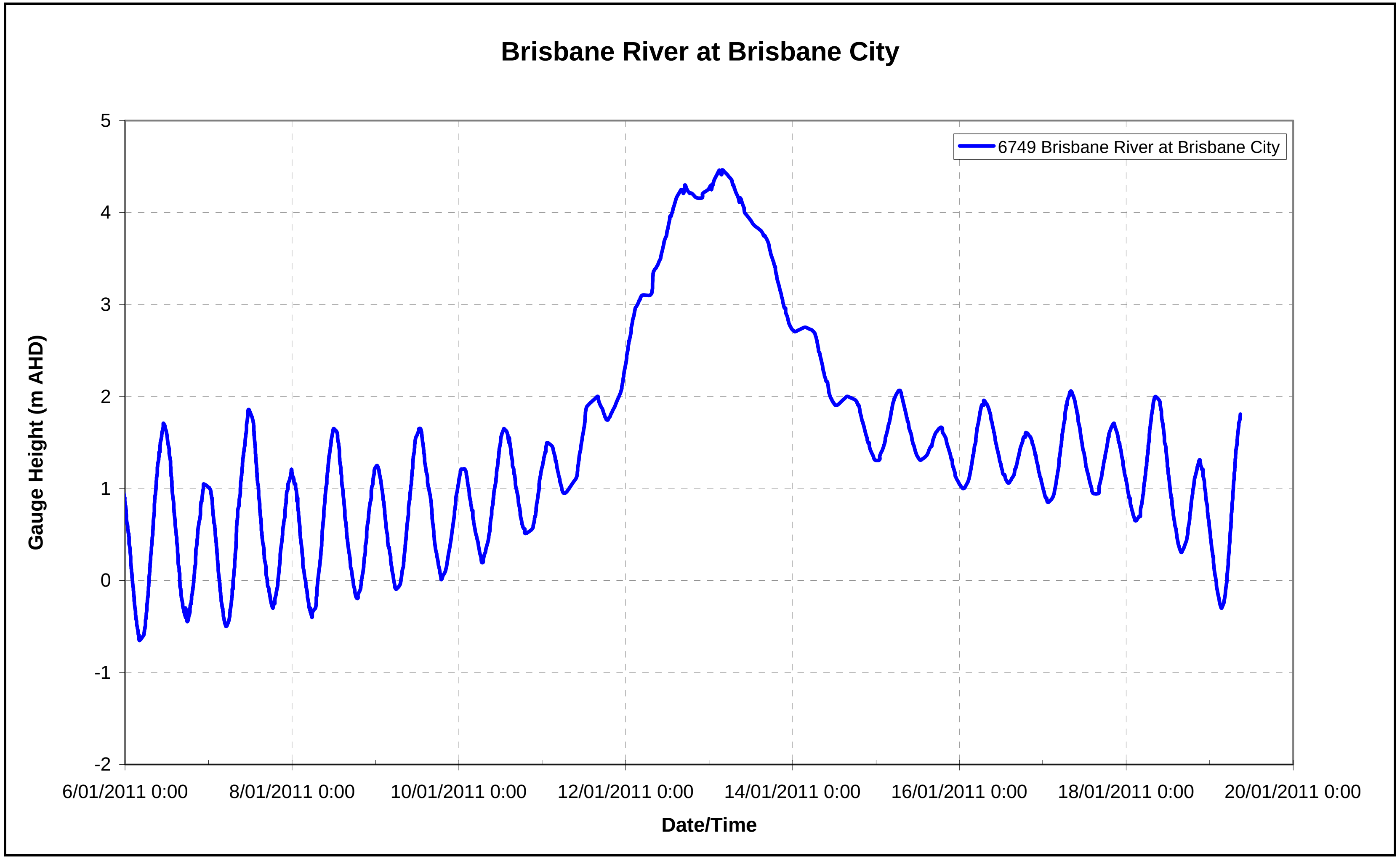

Warrill Creek at Amberley (Greens Road)
6652 Warrill Creek at Amberley (Greens Road)
Gauge Height (m)
0
1
2
3
4
5
6
7
8
9
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
Date/Time

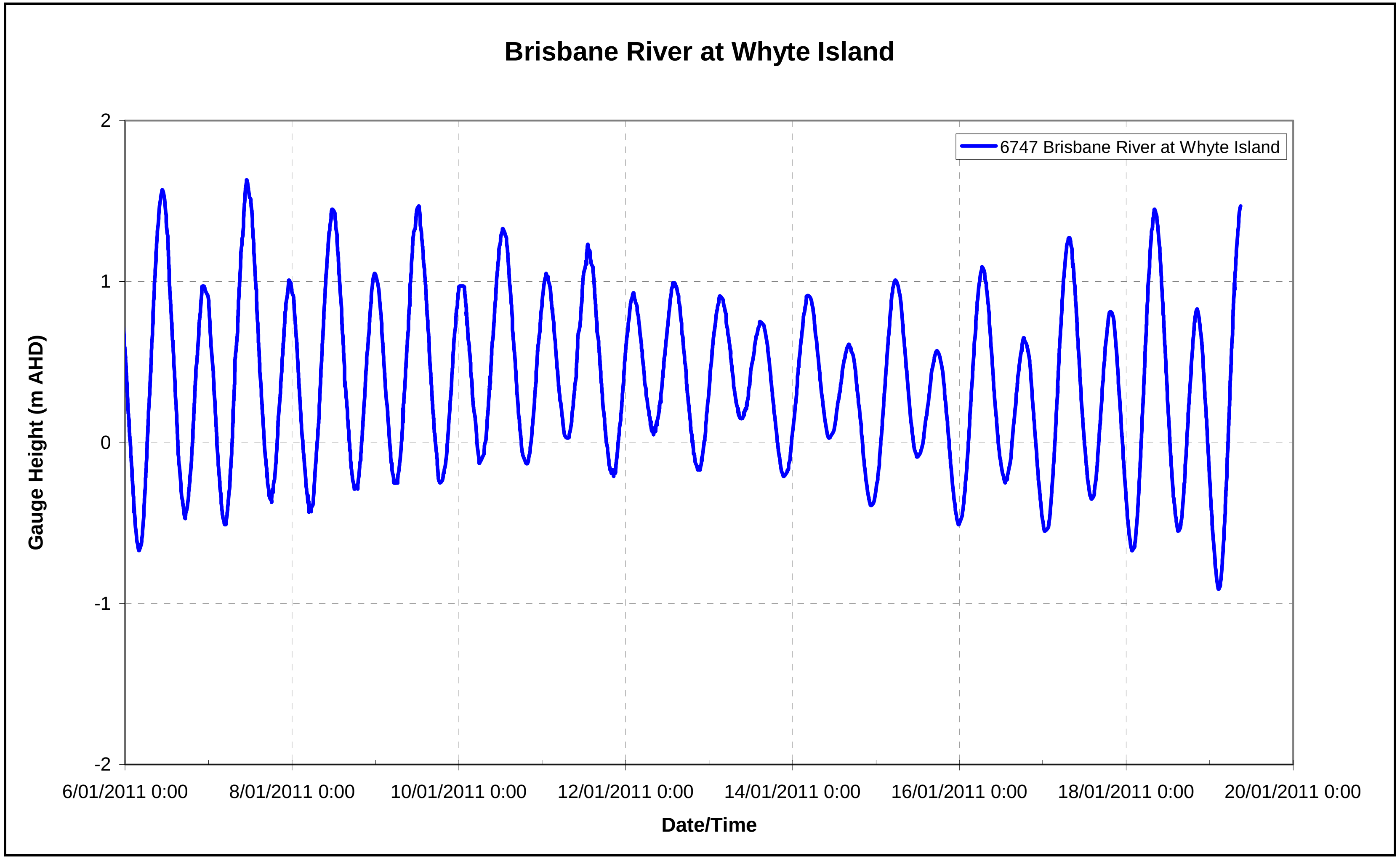

Bremer River at Ipswich
Note: Levels affected by backwater from Brisbane River
2168 Bremer River at Ipswich
Gauge Height (m AHD)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

Lower Brisbane River


Brisbane River at Moggill
6755 Brisbane River at Moggill
Gauge Height (m AHD)
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time


Brisbane River at Jindalee
6731 Brisbane River at Jindalee
Gauge Height (m AHD)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time


Brisbane River at Brisbane City
6749 Brisbane River at Brisbane City
Gauge Height (m AHD)
5
4
3
2
1
0
-1
-2
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time


Brisbane River at Whyte Island
6747 Brisbane River at Whyte Island
Gauge Height (m AHD)
2
1
0
-1
-2
6/01/2011 0:00
8/01/2011 0:00
10/01/2011 0:00
12/01/2011 0:00
14/01/2011 0:00
16/01/2011 0:00
18/01/2011 0:00
20/01/2011 0:00
Date/Time

APPENDIX R – RATINGS

Stream height station ratings

Calibration of the runoff routing model is performed by comparing modelled flows with estimated recorded flows. In turn, these estimated recorded flows are derived from recorded height through the appropriate stream rating curve. Thus rating curves are critical to the modelling process and it is important there is an appreciation of the reliability of the reliability of the height to flow relationship at each site. One method of appreciating this reliability is by comparing the highest gauged (or measured) flow with the highest estimated recorded flow at each gauging station, sometimes termed the 'rating ratio'.

The rating reliability for the gauging stations is shown in the Table below:

ALERT ID	Stream	Location	Rating ratio (%)
6543	Cooyar Creek	Dam Site	18
6718	Brisbane River	Linville	34
6521	Emu Creek	Boat Mountain	15
6515	Brisbane River	Gregors Creek	30
6554	Cressbrook Creek	Rosentretters	12
6527	Lockyer Creek	Helidon	23
6566	Tenthill Creek	Tenthill	21
6584	Laidley Creek	Showground Weir	21
6634	Lockyer Creek	Lyons Bridge	26
6631	Lockyer Creek	Rifle Range Road	40
6560	Brisbane River	Savages Crossing	60
6752	Brisbane River	Mt Crosby Weir	25
6581	Bremer River	Adams Bridge	45
6551	Bremer River	Walloon	?
6563	Warrill Creek	Kalbar	39
6652	Warrill Creek	Amberley	19

RTFM Stream height stations – maximum estimated recorded values

ALERT ID	Stream	Location	Gauge Height (m)	Maximum flow (m^3/s)	Date
6543	Cooyar Creek	Dam Site	9.33	1,156	27/01/1974
6718	Brisbane River	Linville	9.17 11.05	2,698 4,389 (Estimated value from rating table 30)	09/02/1999 11/01/2011
6521	Emu Creek	Boat Mountain	9.61	1,073 (Estimated value from rating table 15)	27/01/1974
6515	Brisbane River	Gregors Creek	14.19 14.49	6,976 7,351	09/02/1999 11/01/2011
6554	Cressbrook Creek	Rosentretters	6.78	346 (Estimated value from rating table 30)	10/01/2011
6527	Lockyer Creek	Helidon	4.74	463	12/06/1967
6566	Tenthill Creek	Tenthill	8.80	1,176 (Estimated value from rating table 50)	27/12/2010
6584	Laidley Creek	Showground Weir	9.19	298	02/02/2001
6634	Lockyer Creek	Lyons Bridge	17.42	2,319	27/01/1974
6631	Lockyer Creek	Rifle Range Road	16.49	1,392	04/05/1996
6560	Brisbane River	Savages Crossing	18.49	5,575	06/02/1931
6752	Brisbane River	Mt Crosby Weir	26.74	6,600	28/01/1974
6581	Bremer River	Adams Bridge	5.29 5.17	385 (Estimated value from rating table 92) 356 (Estimated value from rating table 92)	03/02/1971 26/01/1974
6551	Bremer River	Walloon	11.27	Out of range (max: GH 9.5m)	11/01/2011
6563	Warrill Creek	Kalbar	11.28	497	16/03/1937
6652	Warrill Creek	Amberley	11.08	2,108	27/01/1974

TFM Stream height stations – maximum rated (measured) values

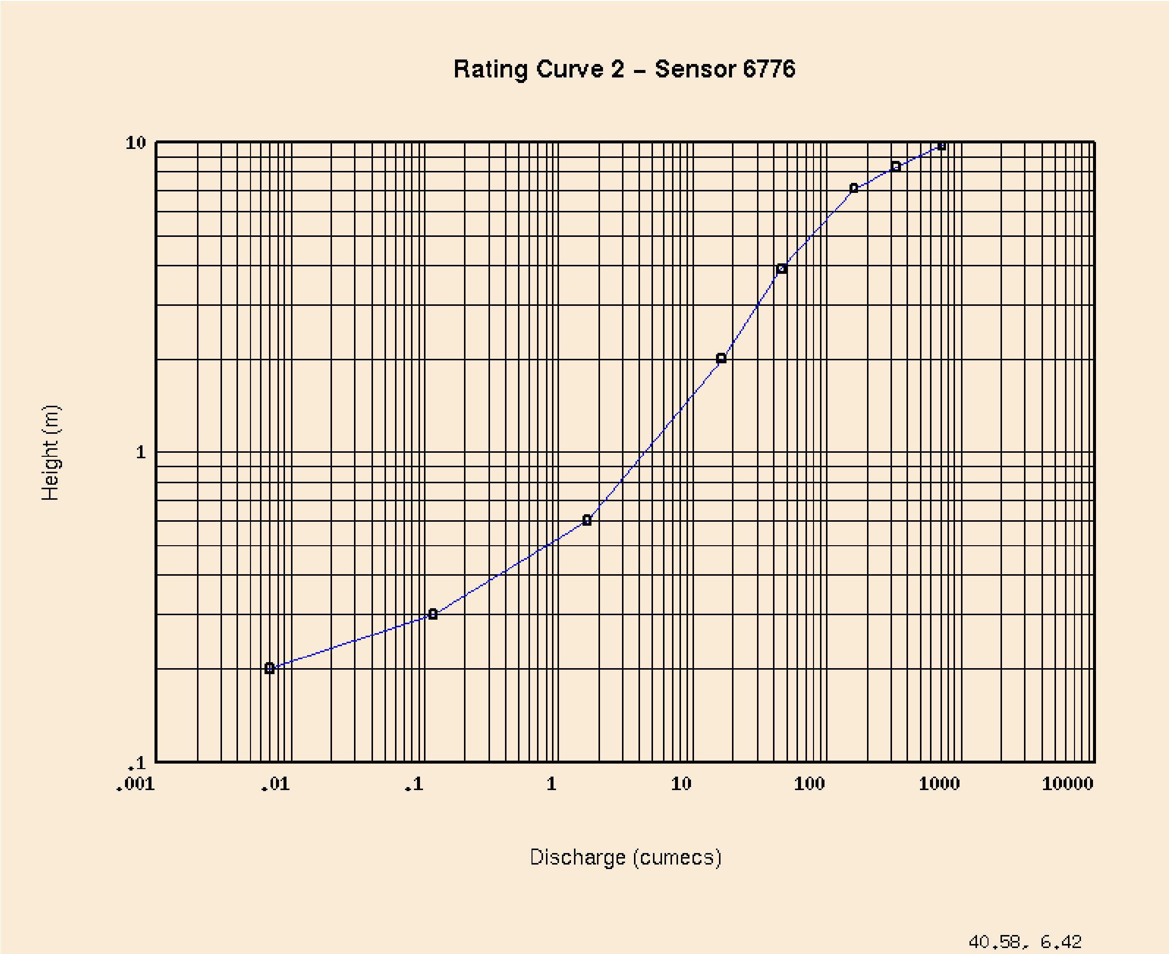
ALERT ID	Stream	Location	Gauge height (m)	Gauged flow (m^3/s)	Date
6543	Cooyar Creek	Dam Site	4.72	208	13/02/1988
6718	Brisbane River	Linville	7.15	1,487	18/02/1971
6521	Emu Creek	Boat Mountain	3.56	161	13/02/1988
6515	Brisbane River	Gregors Creek	7.33 8.76	1,149 2,198	26/04/1989 11/01/2011
6554	Cressbrook Creek	Rosentretters	3.06	43	10/02/1999
6527	Lockyer Creek	Helidon	3.40	108	12/04/1988
6566	Tenthill Creek	Tenthill	4.56	247	06/05/1996
6584	Laidley Creek	Showground Weir	6.00	64	06/07/1988
6634	Lockyer Creek	Lyons Bridge	14.08	595	12/06/1967
6631	Lockyer Creek	Rifle Range Road	14.04	557	06/04/1988
6560	Brisbane River	Savages Crossing	15.95	3,361	14/01/1968
6752	Brisbane River	Mt Crosby Weir	11.73	1,671	14/02/1999
6581	Bremer River	Adams Bridge	4.17	173	11/02/1976
6551	Bremer River	Walloon	7.23	388	05/06/1988
6563	Warrill Creek	Kalbar	8.80	195	10/02/1971
6652	Warrill Creek	Amberley	7.67	409	04/04/1988

Table of ratings

ALERT ID	Watercourse	Station	Updated
6776	Stanley River	Peachester	19/03/3010
6703	**Stanley River**	**Woodford**	01/02/2006
6706			
6543	**Cooyar Creek**	**Dam Site**	01/12/2010
6718	**Brisbane River**	**Linville**	19/03/2010
6709	**Brisbane River**	**Devon Hills**	30/04/1995
6521	**Emu Creek**	**Boat Mountain**	19/03/2010
6515	**Brisbane River**	**Gregors Creek**	19/03/2010
6514			
6524	Cressbrook Creek	Cressbrook Dam	01/01/1984
6554	**Cressbrook Creek**	**Rosentretters Crossing**	19/03/2010
6527	**Lockyer Creek**	**Helidon**	10/11/1987
6566	**Tenthill Creek**	**Tenthill**	01/03/2010
6578	Lockyer Creek	Gatton	30/03/1995
6584	Laidley Creek	Showground Weir	13/10/1989
6557	**Lockyer Creek**	**Glenore Grove**	01/12/2010
6631	**Lockyer Creek**	**Lyons Bridge**	30/03/1995
6634			
6569	Lockyer Creek	O'Reilly's Weir	19/03/2010
6647	**Brisbane River**	**Lowood Pump Station**	30/03/1995
6560	**Brisbane River**	**Savages Crossing**	07/04/2000
6756	Brisbane River	Burtons Bridge	01/01/1995
6757	Brisbane River	Kholo Bridge	na
6752	**Brisbane River**	**Mt Crosby Weir**	01/01/1995
6758			
6581	Bremer River	Adams Bridge	17/03/2010
6737	Weston Creek	Kuss Road	na
6734	Bremer River	Rosewood	na
6551	**Bremer River**	**Walloon**	01/01/1996
6743			
6563	Warrill Creek	Kalbar Weir	30/03/1995
6572	Warrill Creek	Harrisville	na
6652	**Warrill Creek**	**Amberley**	01/12/2010
6654			
2168	Bremer River	Ipswich	na
6755	Brisbane River	Moggill	na
6731	Brisbane River	Jindalee	na
6749	Brisbane River	City Gauge	na

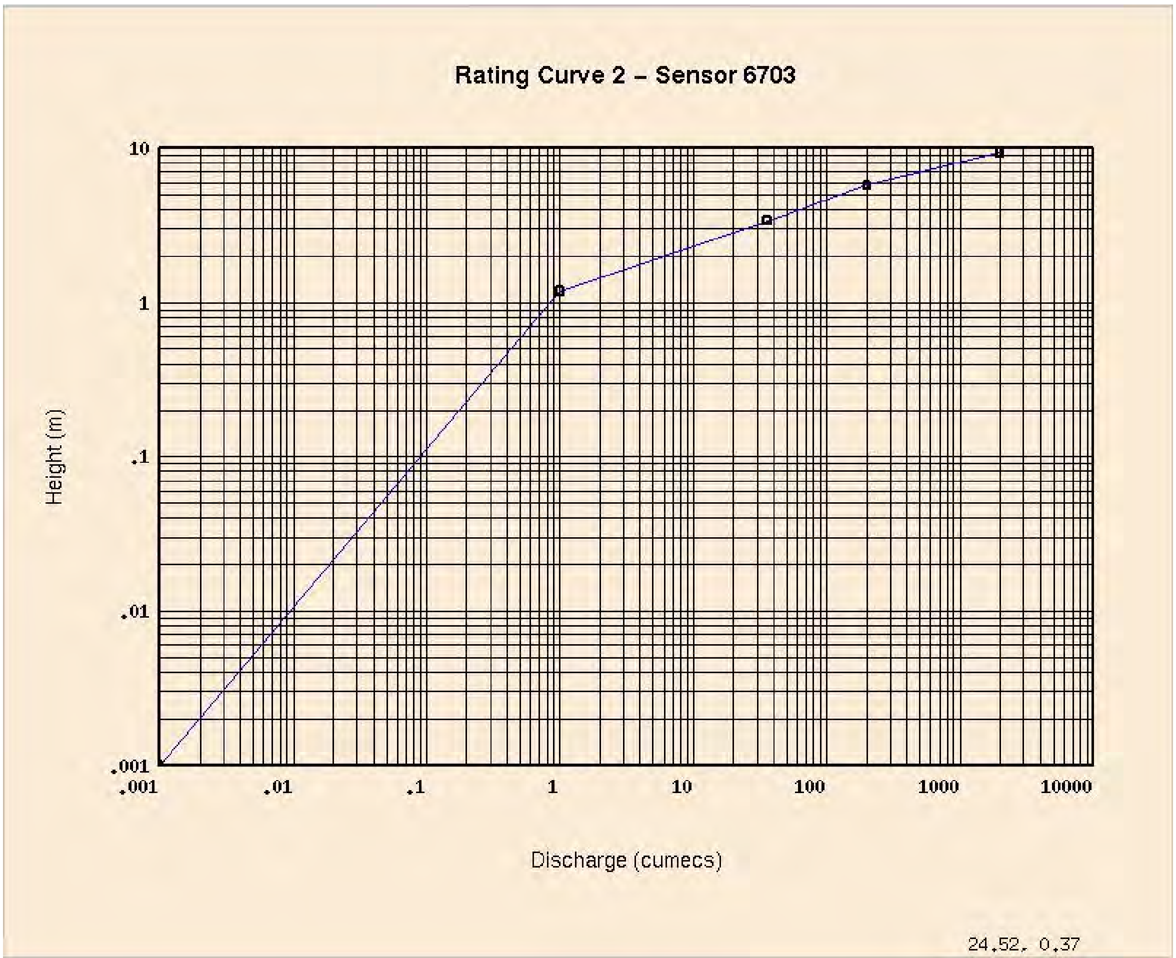
Key locations shown in **bold**

6776 – Stanley River at Peachester



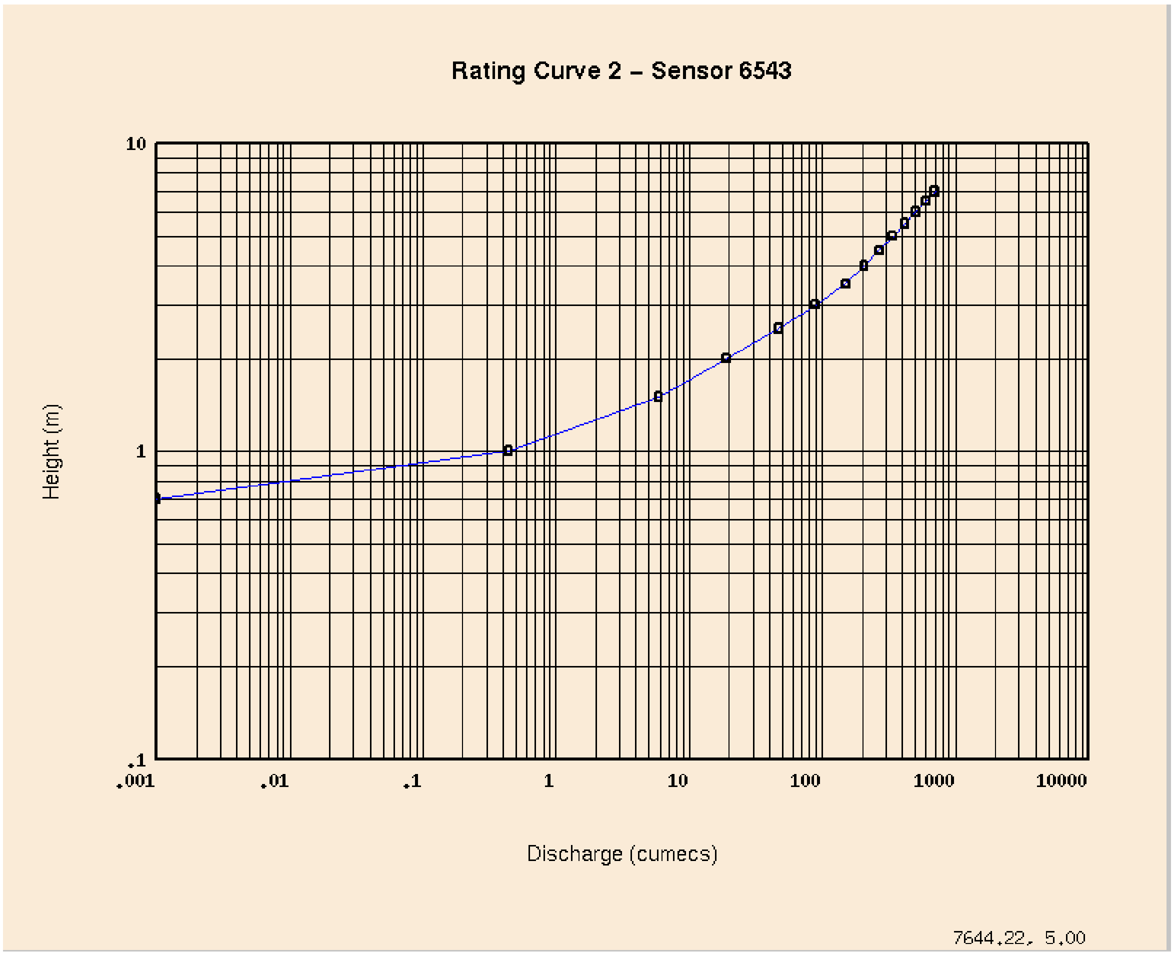
Gauge height	Flow
m	m^3/s
0.2	0.007
0.3	0.116
0.6	1.63
2.0	16.5
3.9	45.8
7.1	161
8.3	328
9.8	722

6703 – Stanley River at Woodford



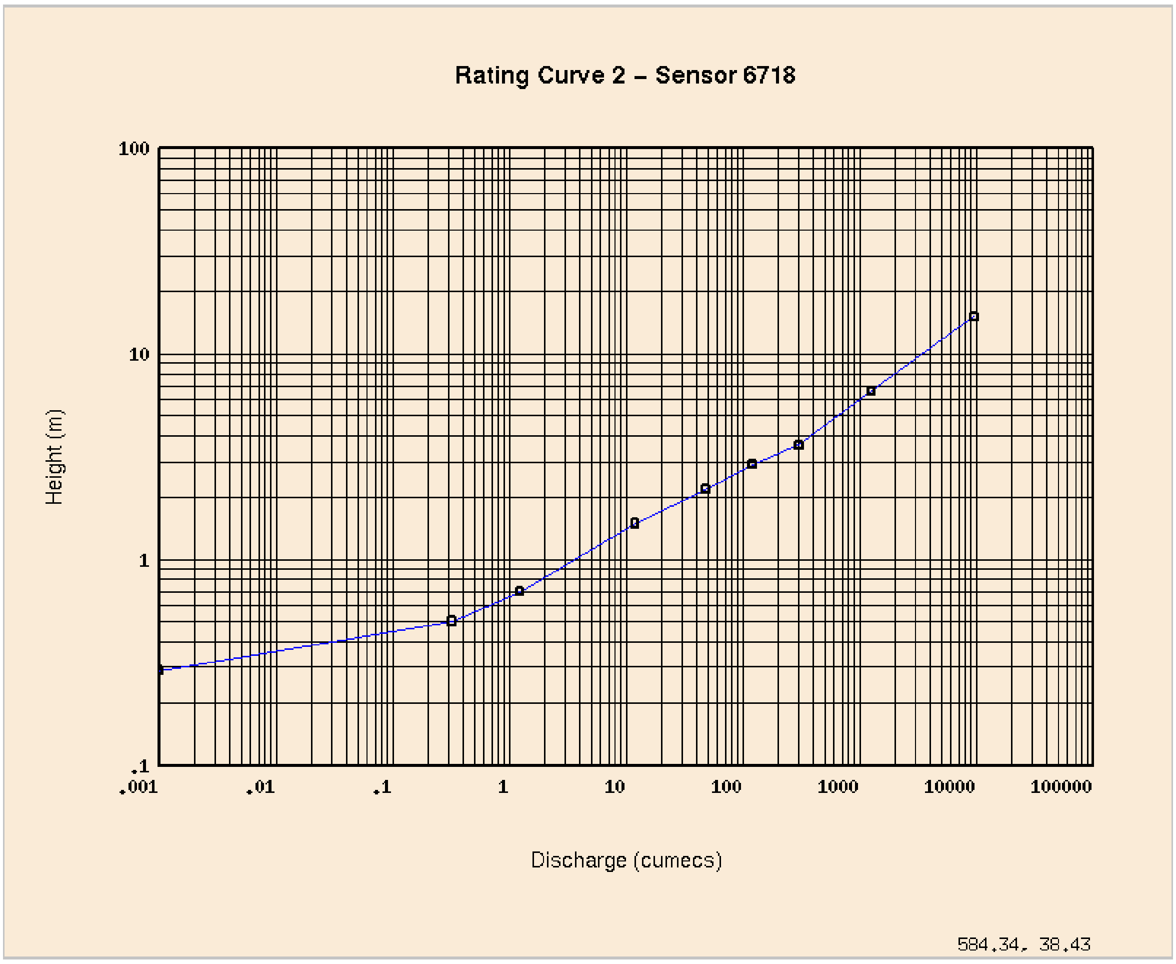
Gauge height	Flow
m	m^3/s
0.001	0.001
1.18	1.0
3.4	36
5.76	202
9.4	2000

6543 – Cooyar Creek at Dam Site



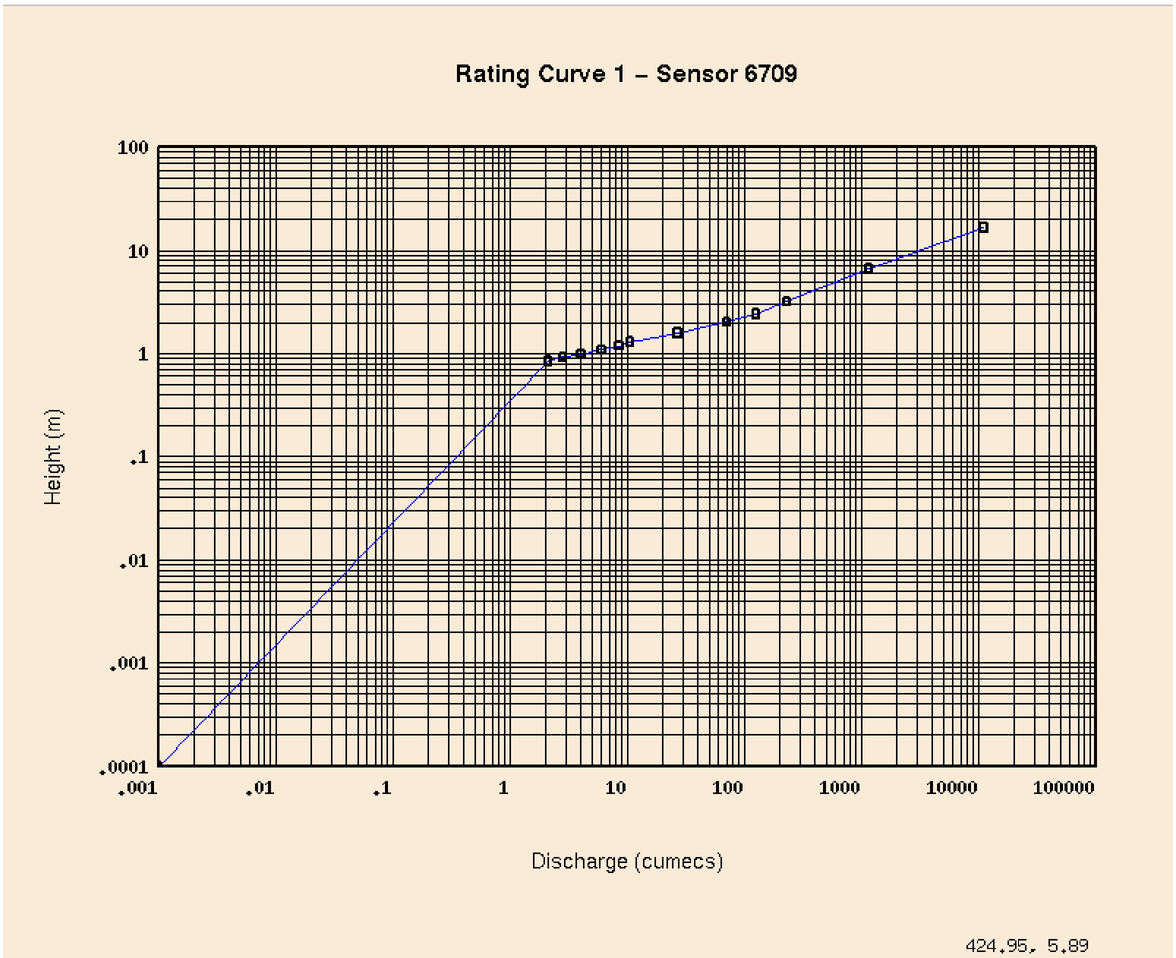
Gauge height	Flow
m	m^3/s
0.7	0.001
1	0.44
1.5	5.92
2	19
2.5	47.1
3	89.3
3.5	150
4	205
4.5	268
5	338
5.5	417
6	503
6.5	598
7	700

6718 – Brisbane River at Linville



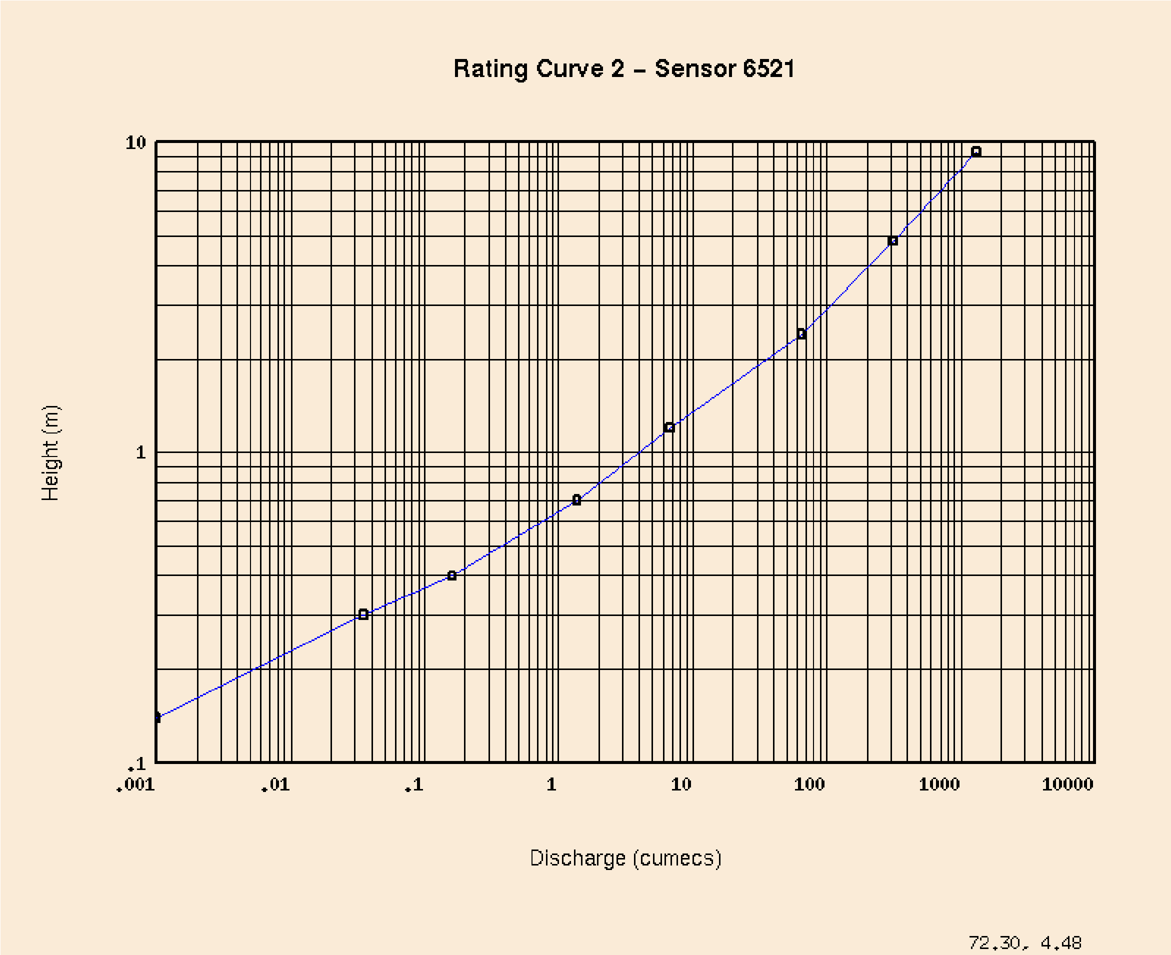
Gauge height	Flow
m	m^3/s
0.29	0.001
0.5	0.322
0.7	1.22
1.5	11.9
2.2	47.7
2.9	120
3.6	300
6.6	1247
15.2	9536

6709 – Brisbane River at Devon Hills



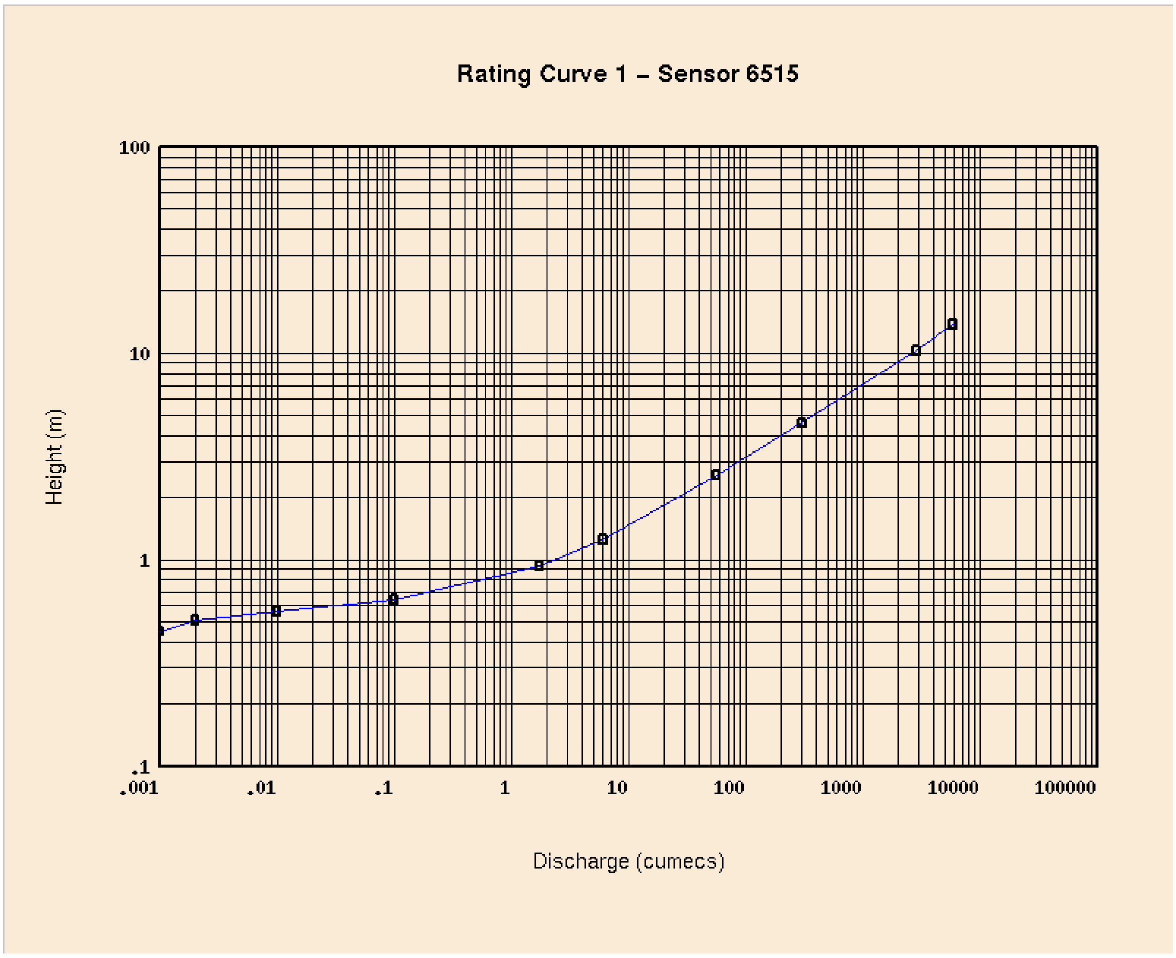
Gauge height	Flow
m	m^3/s
0.0	0.001
0.853	2.1
0.926	2.8
0.979	4.010
1.084	6
1.184	8.5
1.295	10.5
1.589	27
2.032	71
2.4	125
3.189	230
6.663	1150
16.716	11000

6521 – Emu Creek at Boat Mountain



Gauge height	Flow
m	m^3/s
0.14	0.001
0.3	0.035
0.4	0.162
0.7	1.370
1.2	6.760
2.4	65
4.8	313
9.3	1310

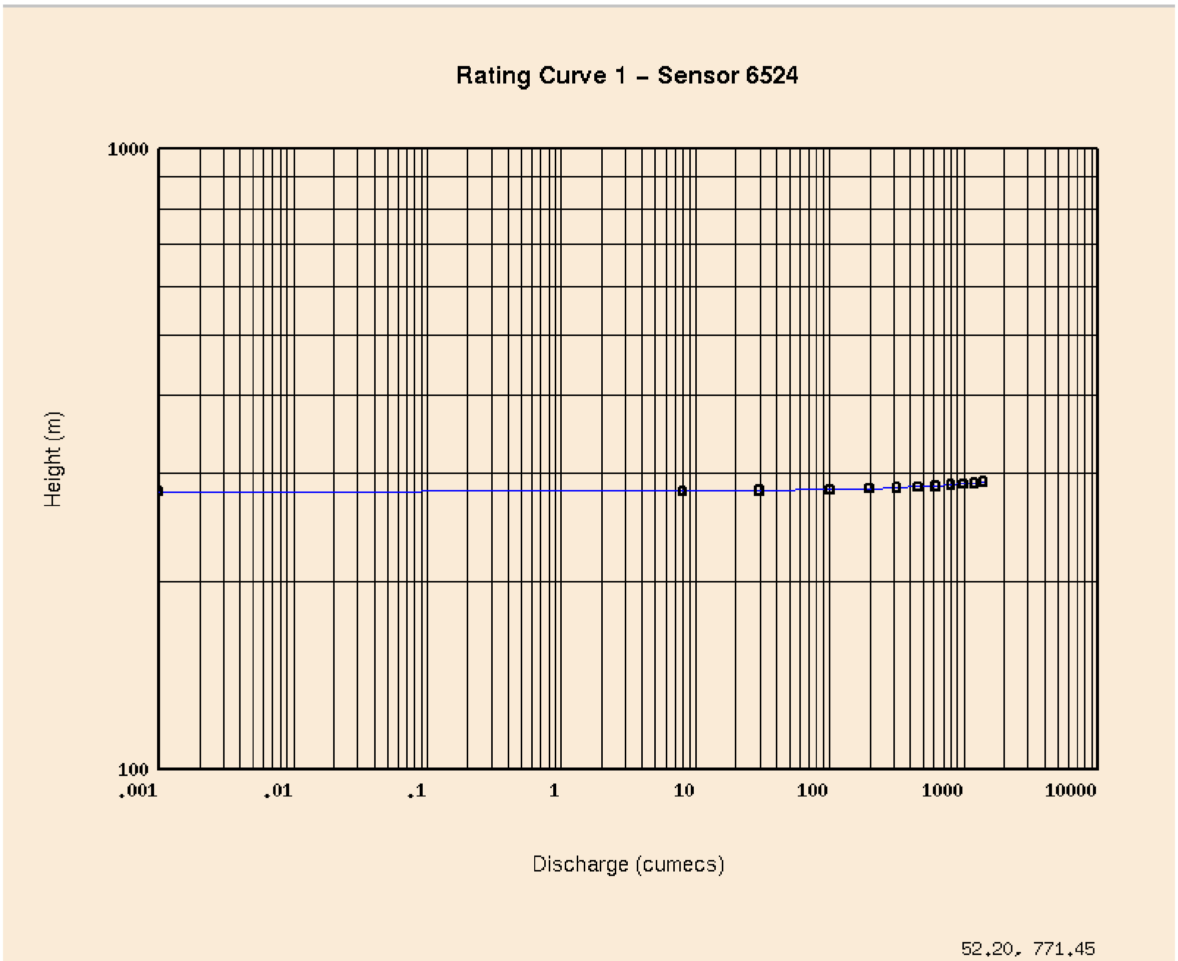
6514, 6515 – Brisbane River at Gregors Creek



Gauge height	Flow
m	m^3/s
0.69	0.001
0.8	0.062
1	0.843
1.4	5.430
2.1	30.5
2.7	80.9
3	111
4	252
5	448
6	706

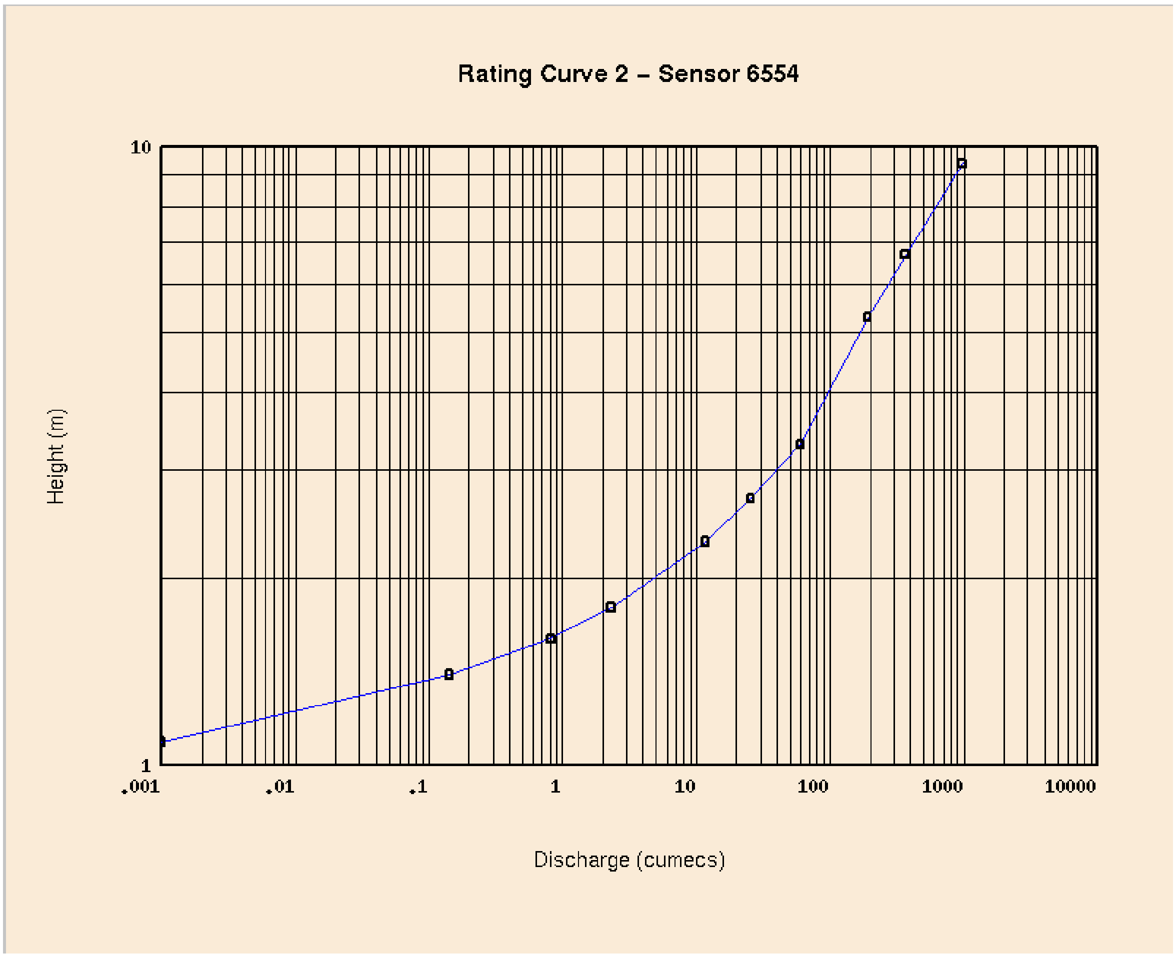
Gauge height	Flow
m	m^3/s
7	1029
8	1451
9	2010
10	2683
11	3478
12	4400
13	5471
14	6687
15	8056
15.5	8800

6524 – Cressbrook Creek at Cressbrook Dam



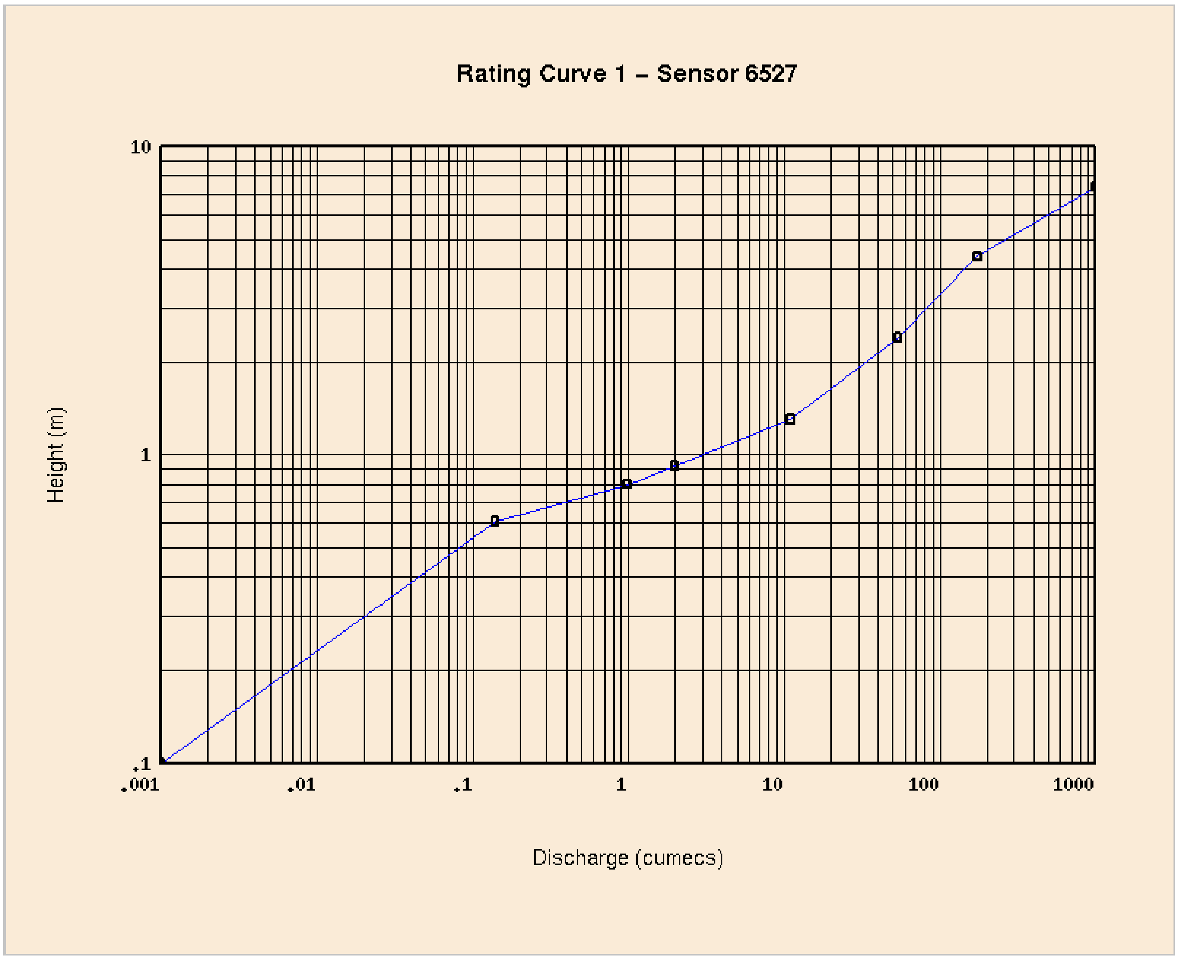
Gauge height	Flow
m	m^3/s
280	0.001
280.5	8
281	30
282	100
283	200
284	317
285	458
286	620
287	800
288	990
289	1200
290	1400

6554 – Cressbrook Creek at Rosentretters



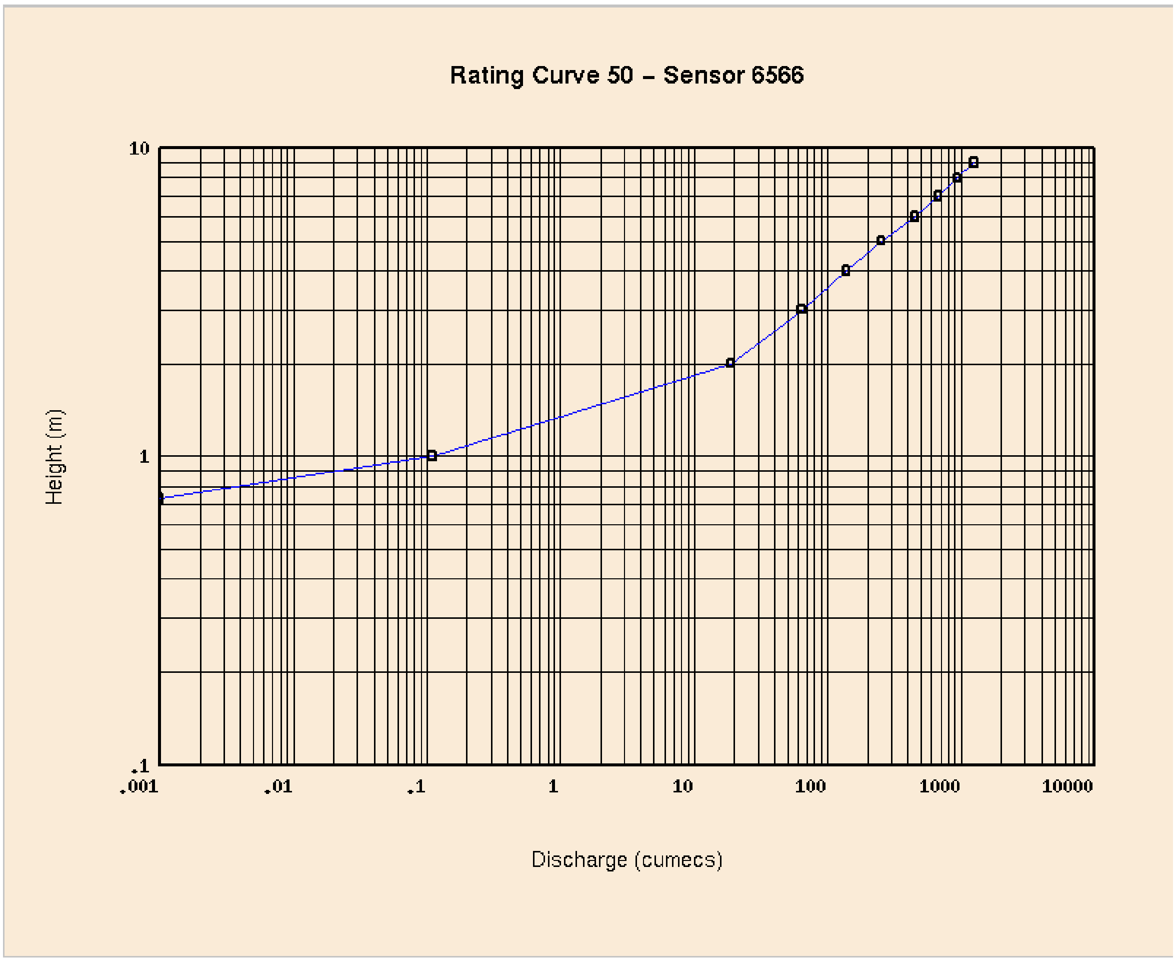
Gauge height	Flow
m	m^3/s
1.09	0.001
1.4	0.142
1.6	0.818
1.8	2.3
2.3	11.6
2.7	25.4
3.3	60
5.3	192
6.7	366
9.4	971

6527 – Lockyer Creek at Helidon



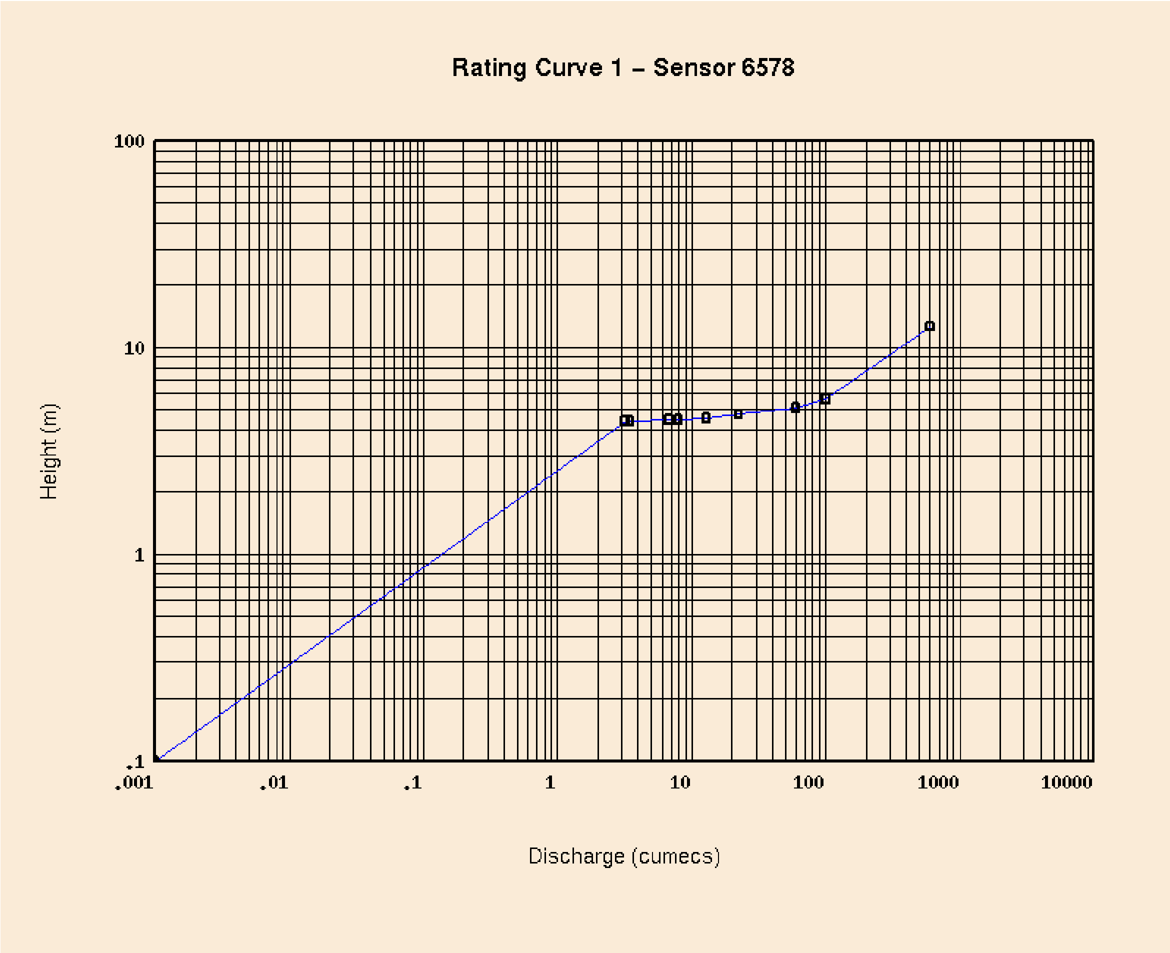
Gauge height	Flow
m	m^3/s
0.1	0.001
0.61	0.14
0.8	0.99
0.92	2
1.3	11
2.4	54
4.4	175
7.4	1000

6566 – Tenthill Creek at Tenthill



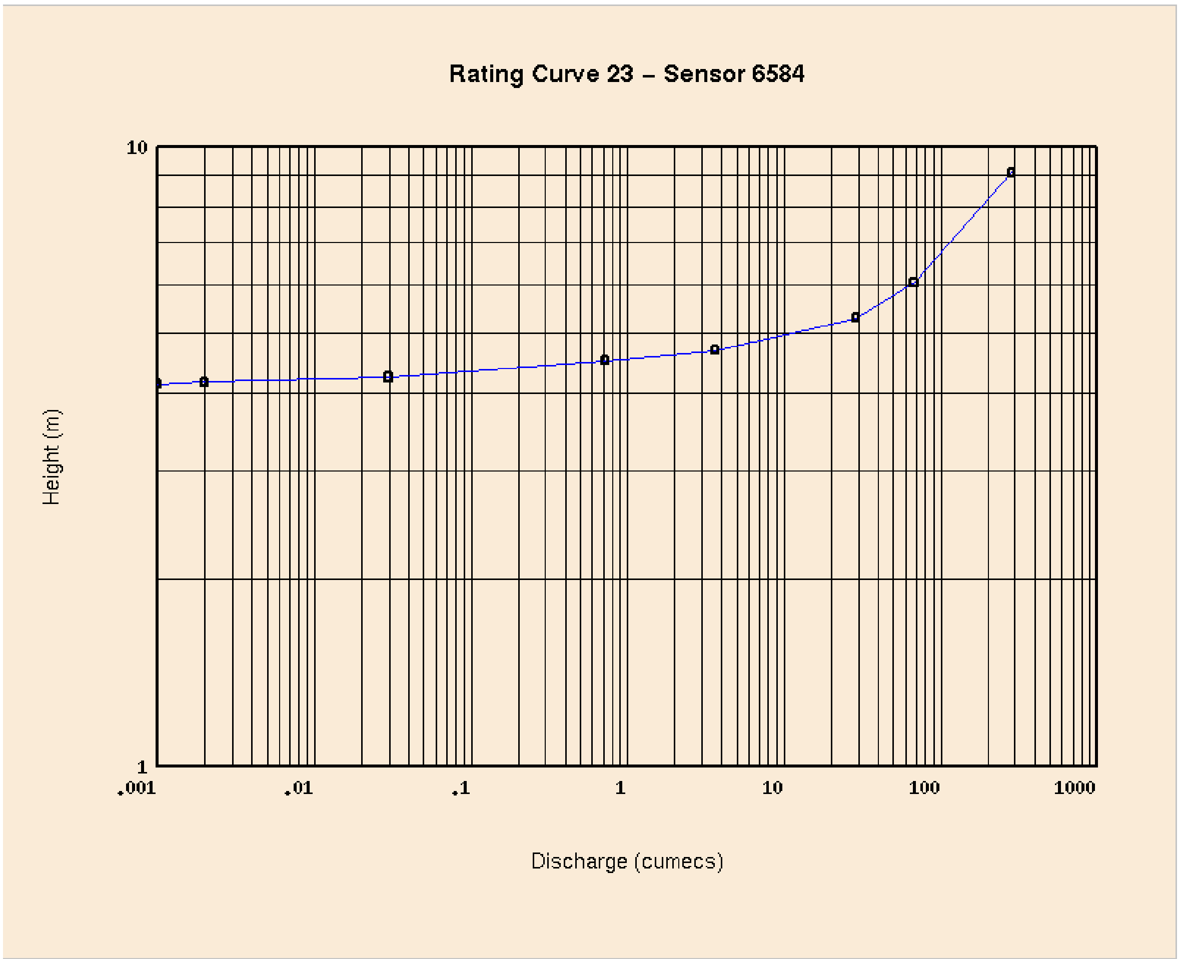
Gauge height	Flow
m	m^3/s
0.73	0.001
1	0.110
2	18.9
3	63.9
4	137
5	252
6	451
7	675
8	934
9	1240

6578 – Lockyer Creek at Gatton



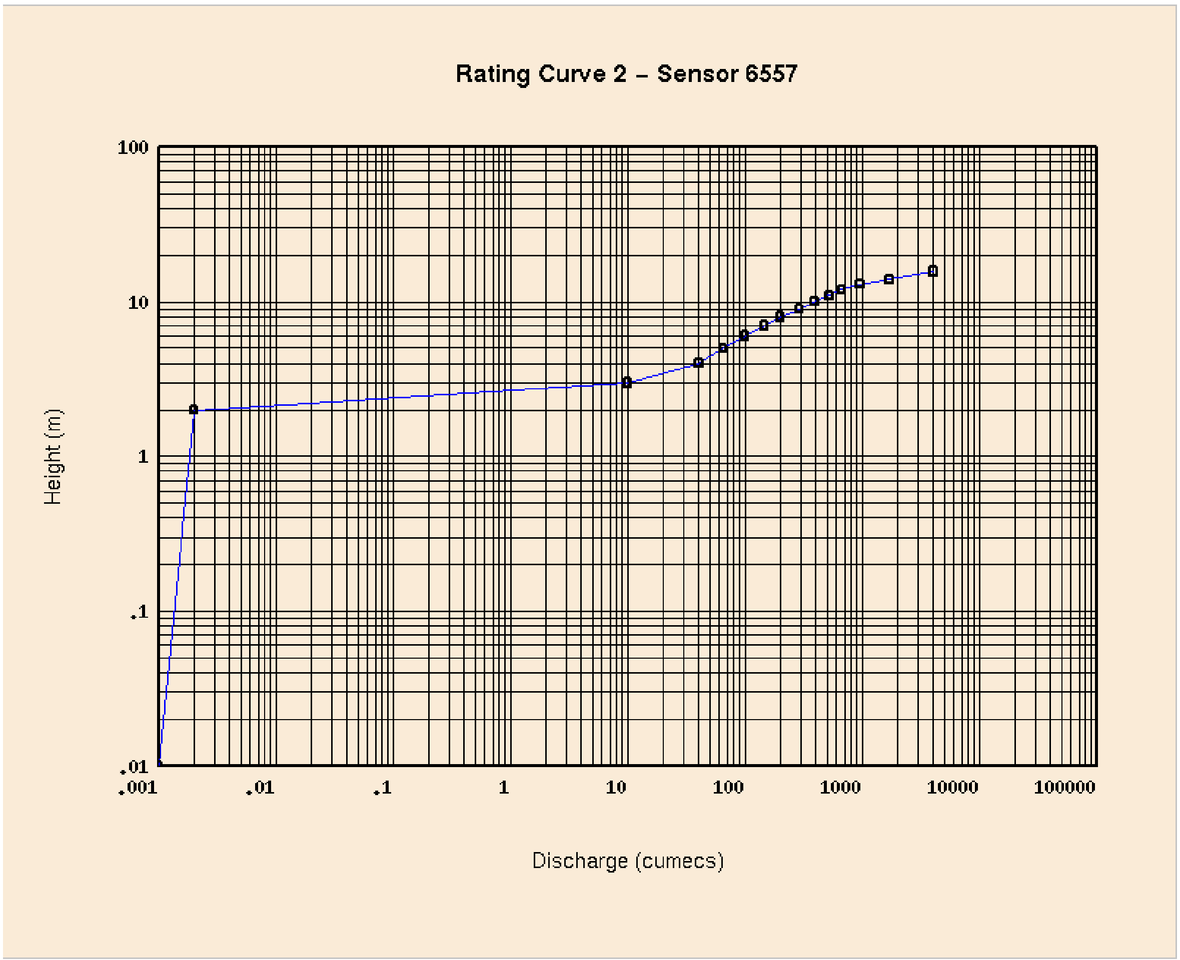
Gauge height	Flow
m	m^3/s
0.1	0.001
4.4	3.2
4.43	3.5
4.47	6.8
4.5	8
4.57	13
4.76	22.5
5.11	60
5.63	100
12.63	600

6584 – Laidley Creek at Showground Weir



Gauge height	Flow
m	m^3/s
4.15	0.001
4.173	0.002
4.25	0.03
4.525	0.72
4.7	3.65
5.3	29
6.05	68
9.1	285

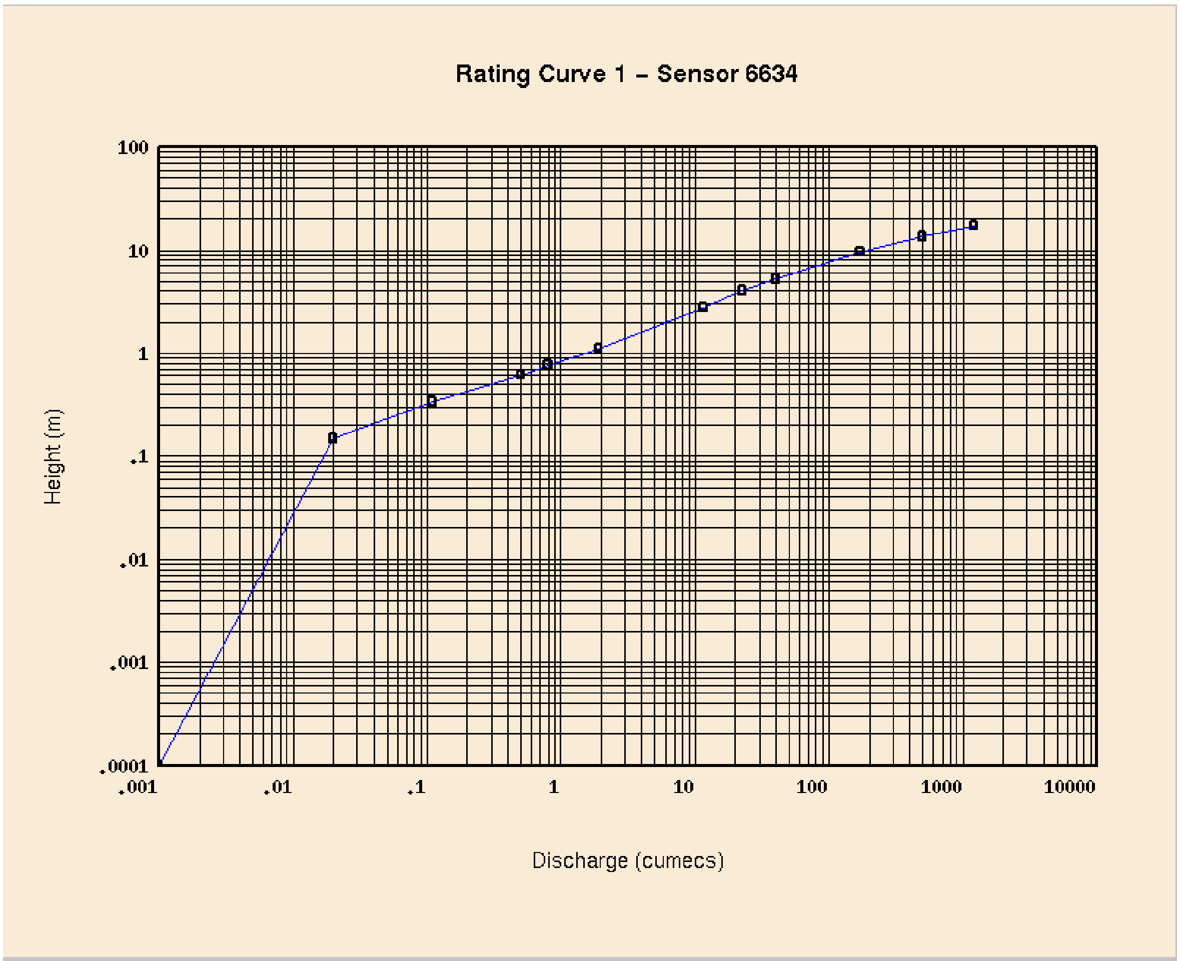
6557 – Lockyer Creek at Glenore Grove



Gauge height	Flow
m	m^3/s
0.01	0.001
2	0.002
3	10
4	40
5	65
6	100
7	145
8	200

Gauge height	Flow
m	m^3/s
9	290
10	390
11	520
12	670
13	950
14	1700
15.7	4000

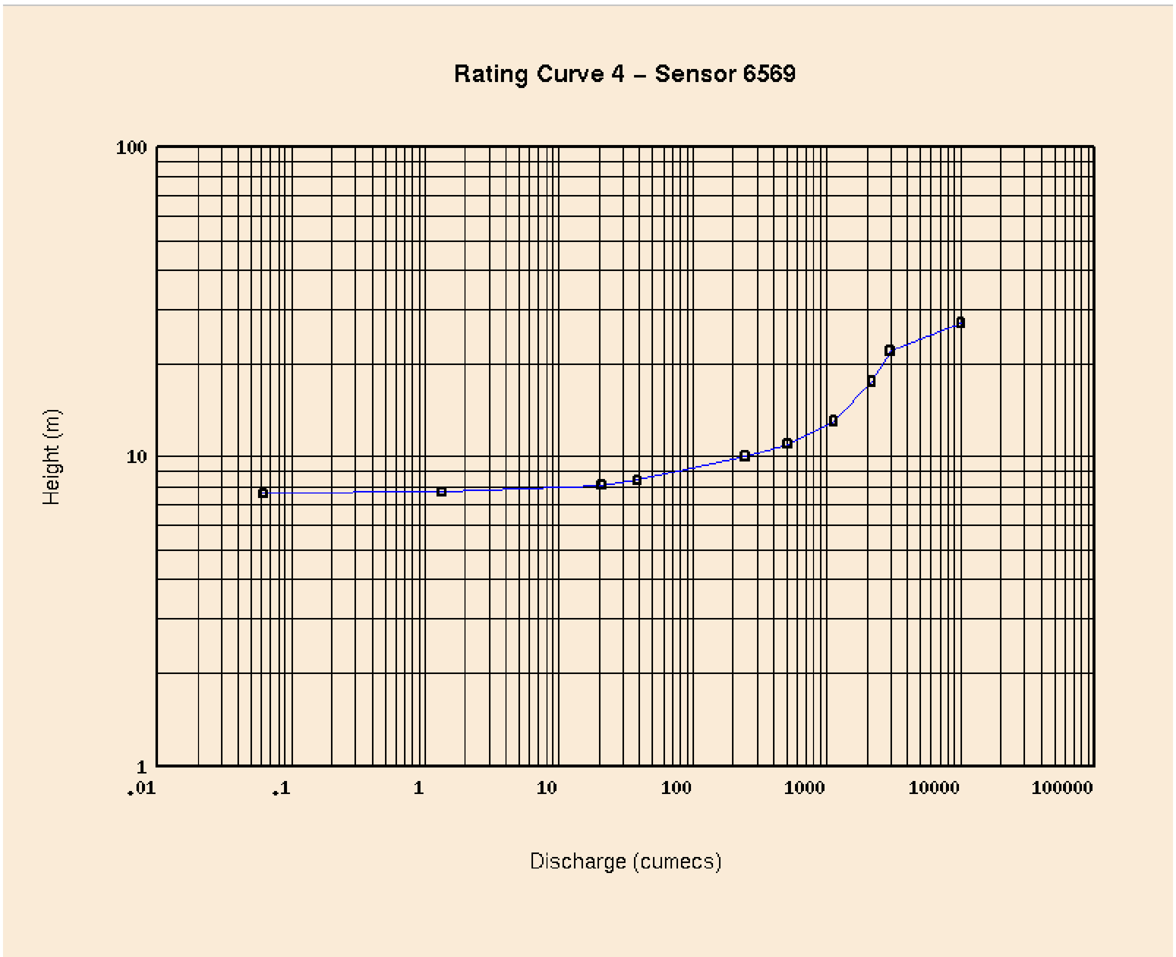
6634 – Lockyer Creek at Lyons Bridge



Gauge height	Flow
m	m^3/s
0	0.001
0.15	0.02
0.337	0.110
0.616	0.5
0.772	0.8
1.114	1.9
2.794	11.5
4.038	22.6
5.282	40
9.636	170
13.680	500
17.403	1200

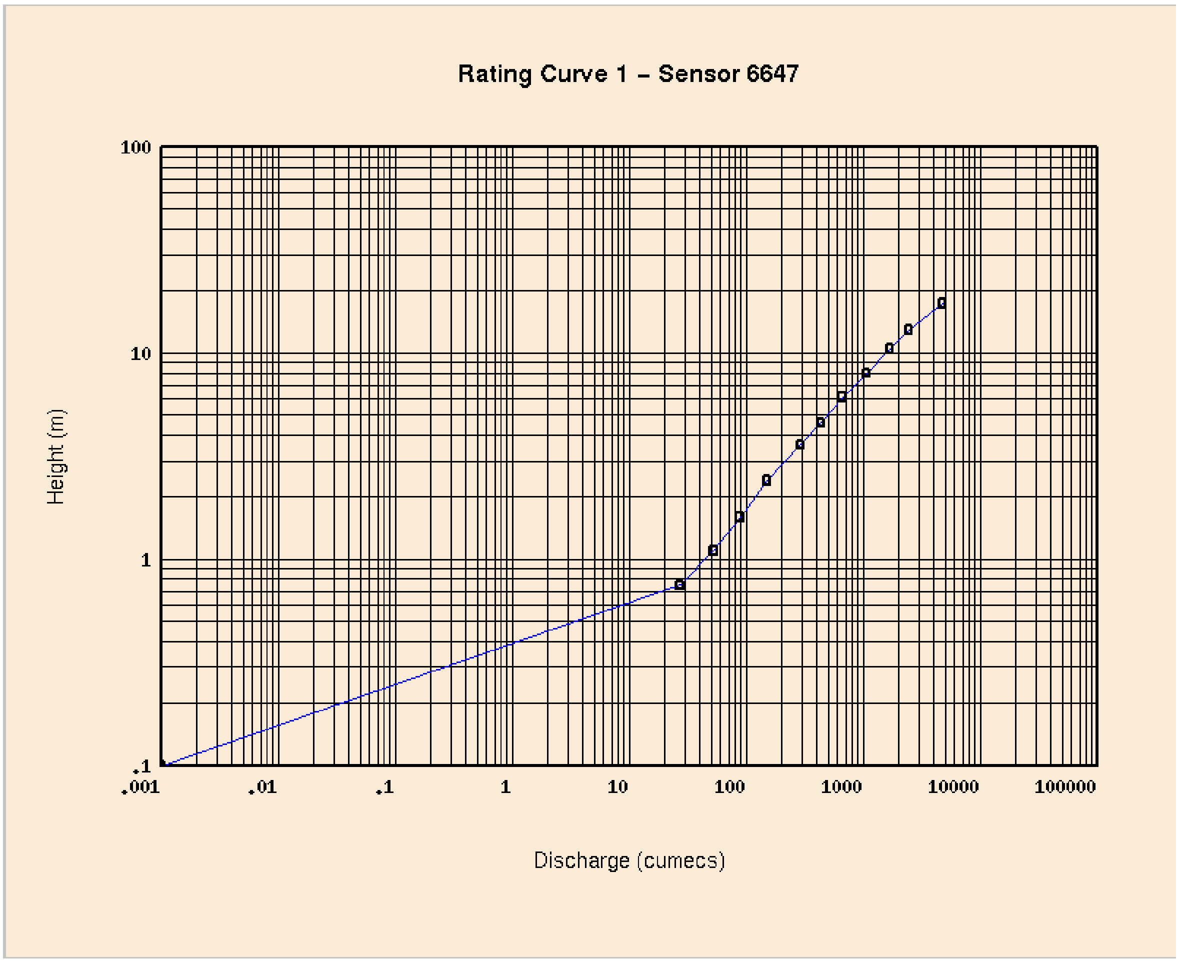
6569 – Lockyer Creek at O'Reillys Weir

Note: This station is affected by backwater during Wivenhoe Dam releases.



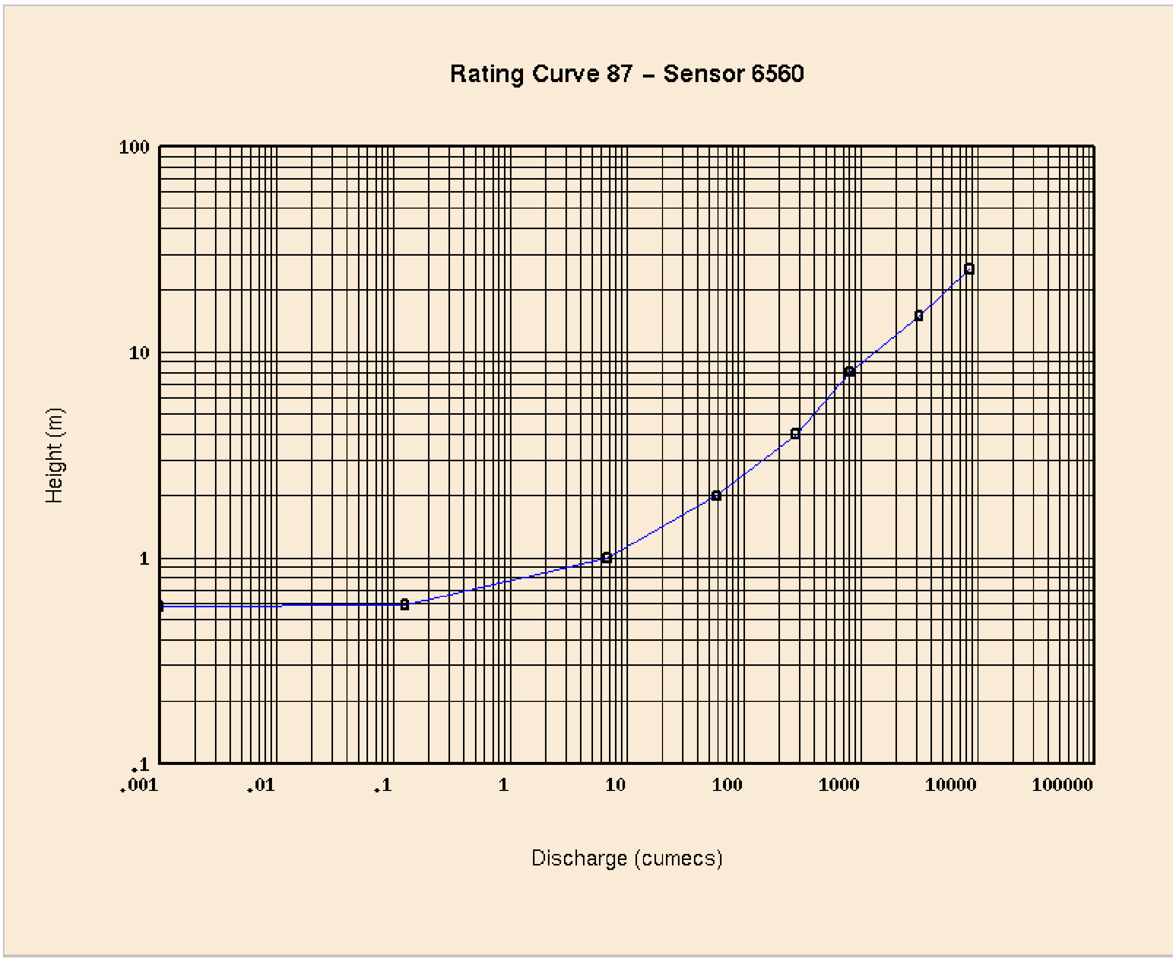
Gauge height	Flow
m	m^3/s
7.6	0.062
7.7	1.34
8.1	20.9
4.4	38.8
10	246
11	512
13	1122
17.5	2177
22	2984
27	10116

6647 – Brisbane River at Lowood Pump Station



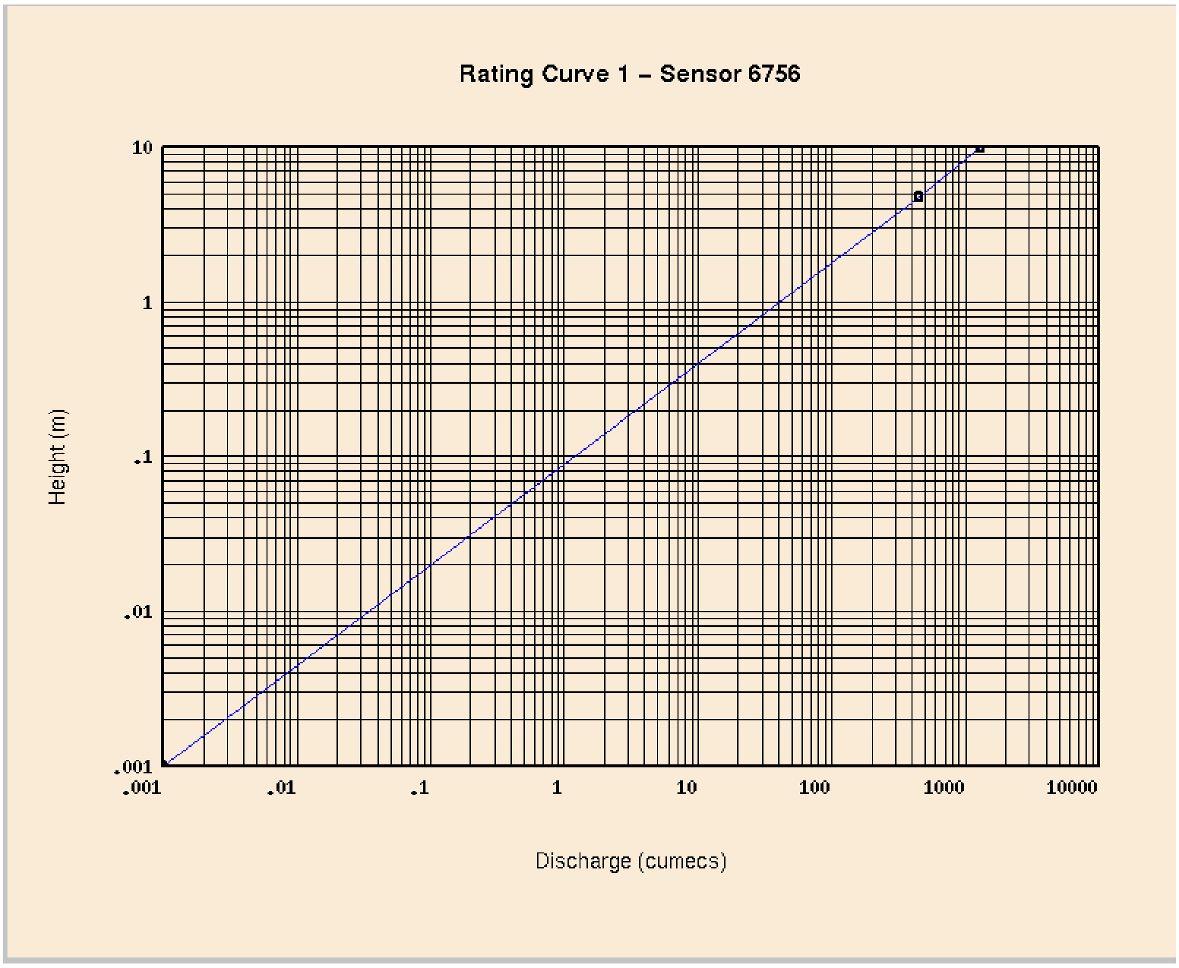
Gauge height	Flow
m	m^3/s
0.1	0.001
0.75	27
1.1	52
1.6	88
2.4	150
3.6	290
4.6	430
6.1	660
8	1050
10.5	1680
13	2420
17.5	4700

6560 – Brisbane River at Savages Crossing



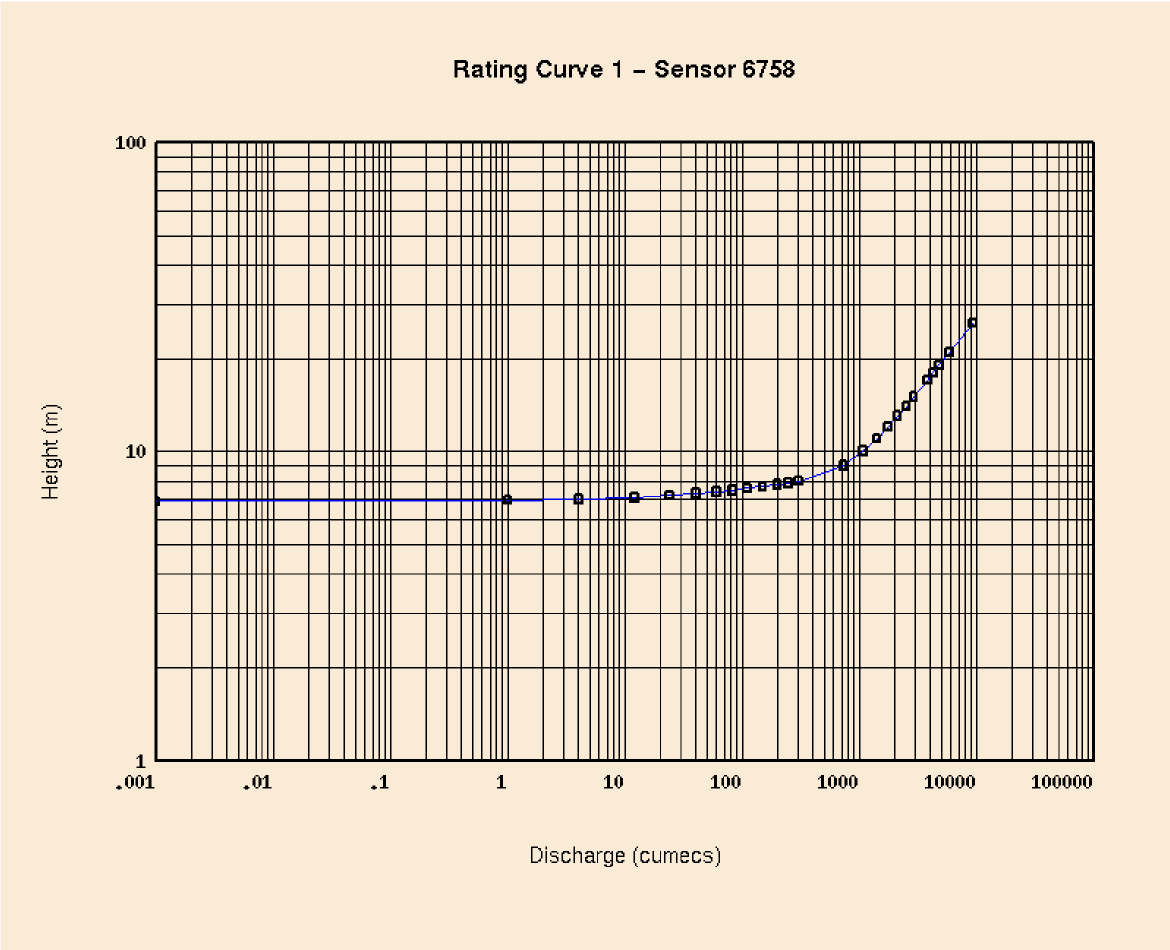
Gauge height	Flow
m	m^3/s
0.58	0.001
0.59	0.125
1	6.73
2	58.3
4	277
8	803
15	3138
25.4	8495

6556 – Brisbane River at Burtons Bridge



Gauge height	Flow
m	m³/s
0.001	0.001
4.78	450
10	1300

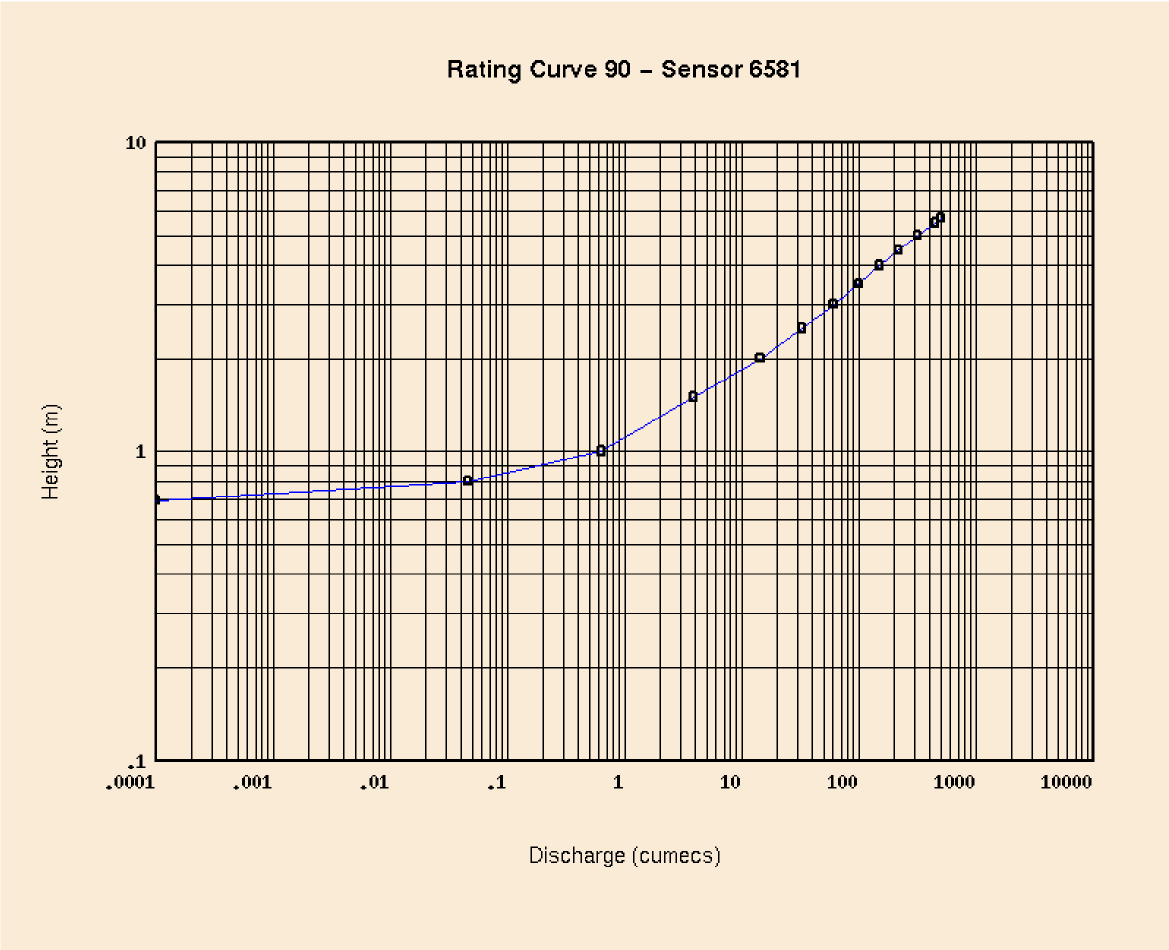
6758 – Brisbane River at Mt Crosby Weir



Gauge height	Flow
m	m^3/s
6.9	0.001
6.95	1
7	1
7.1	12
7.2	24
7.3	40
7.4	60
7.5	82
7.6	110
7.7	150
7.8	200
7.9	248
8	300
9	728
10	1070

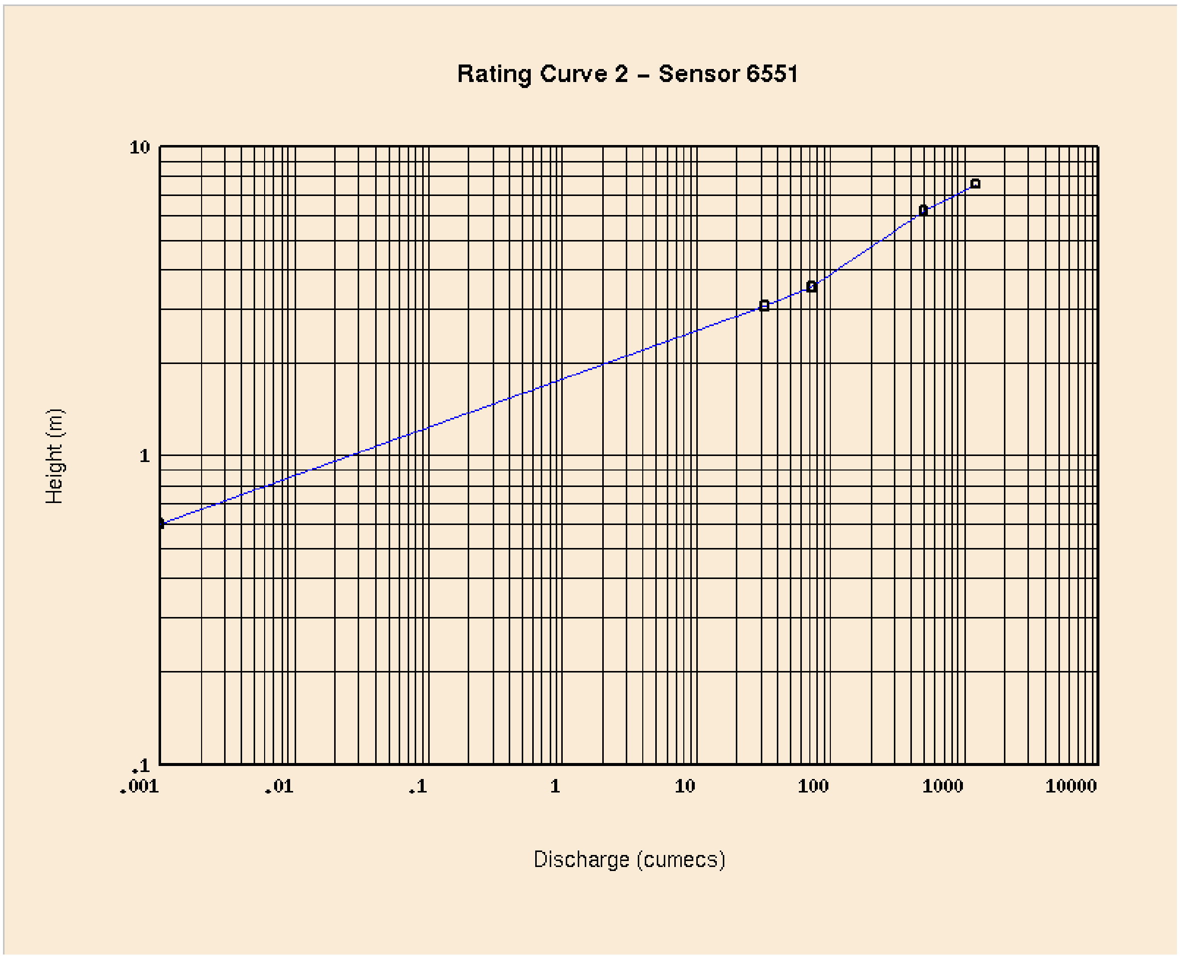
Gauge height	Flow
m	m^3/s
11	1400
12	1735
13	2120
14	2520
15	2900
17	3780
18	4250
19	4750
21	5850
26	9200

6581 – Bremer River at Adams Bridge



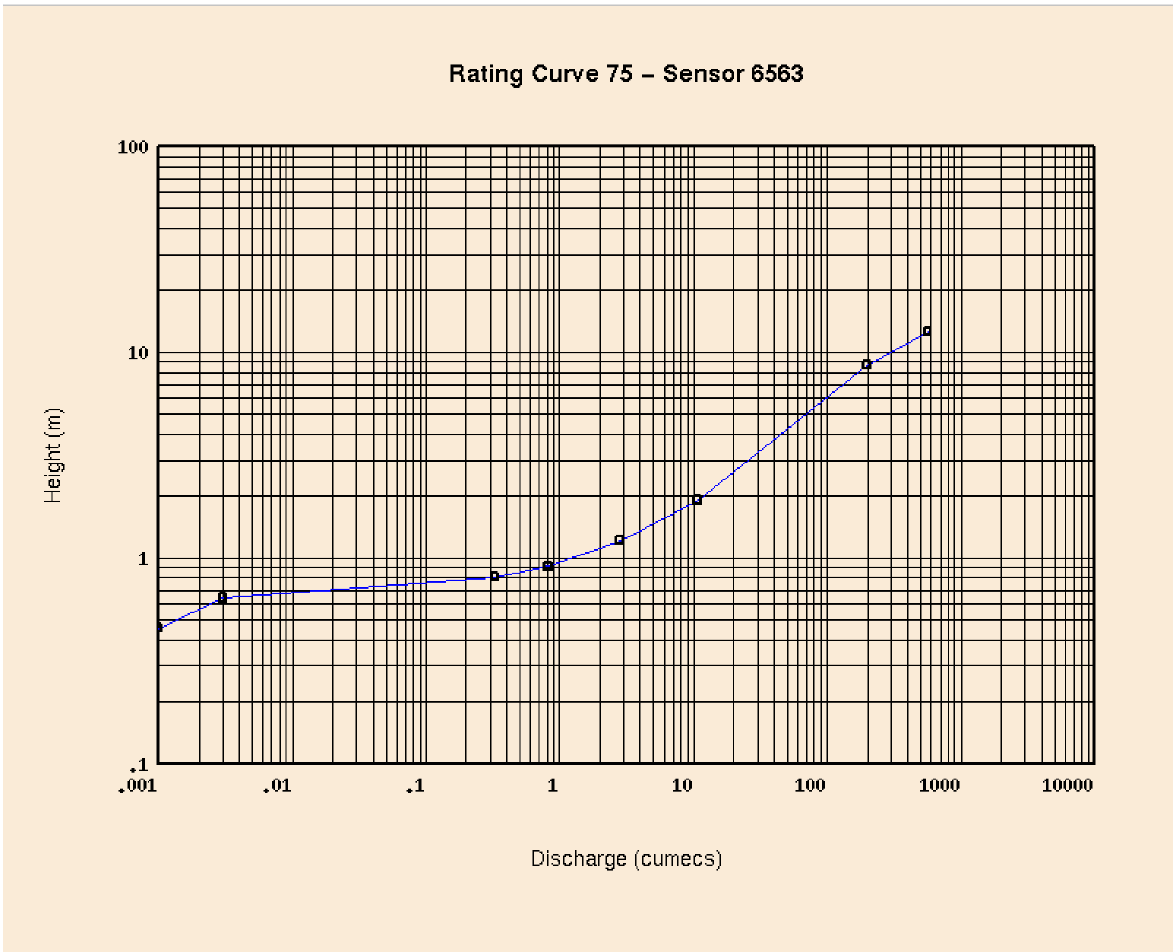
Gauge height	Flow
m	m^3/s
0.695	0
0.8	0.046
1	0.628
1.5	3.86
2	14.3
2.5	32.5
3	60.3
3.5	99
4	150
4.5	317
5	316
5.5	442
5.7	500

6651 – Bremer River at Walloon



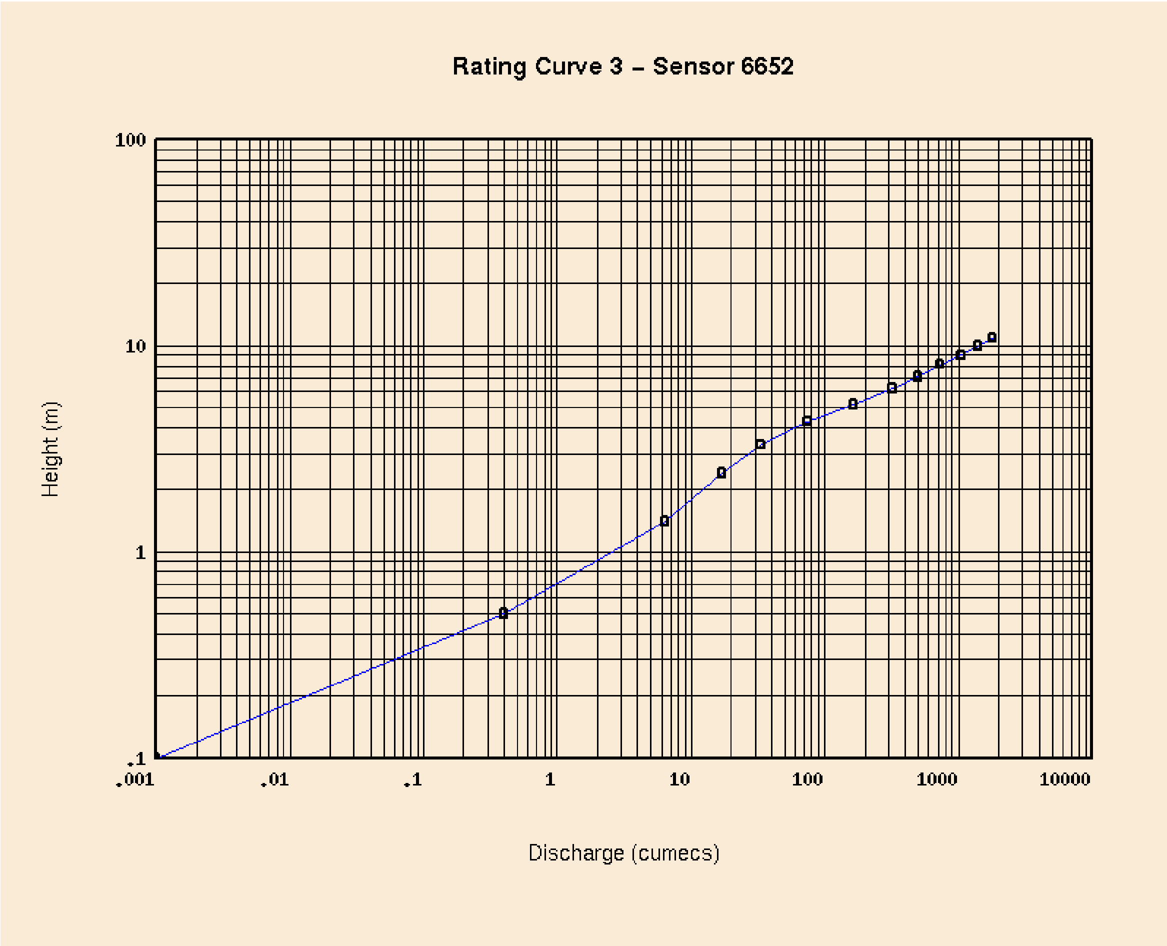
Gauge height	Flow
m	m^3/s
0.6	0.001
3.05	32.4
3.52	72.3
6.19	497
7.58	1210

6563 – Warrill Creek at Kalbar Weir



Gauge height	Flow
m	m^3/s
0.457	0.001
0.64	0.003
0.811	0.326
0.914	0.821
1.219	2.832
1.920	10.76
8.687	198.214
12.649	566.323

6652, 6654 – Warrill Creek at Amberley



Gauge height	Flow
m	m^3/s
0.1	0.001
0.5	0.4
1.4	6.4
2.4	17
3.3	33
4.3	74
5.2	164
6.2	322
7.1	500
8.1	730
9	1050
10	1400
10.9	1800

APPENDIX S – MODEL CALIBRATION RUNS

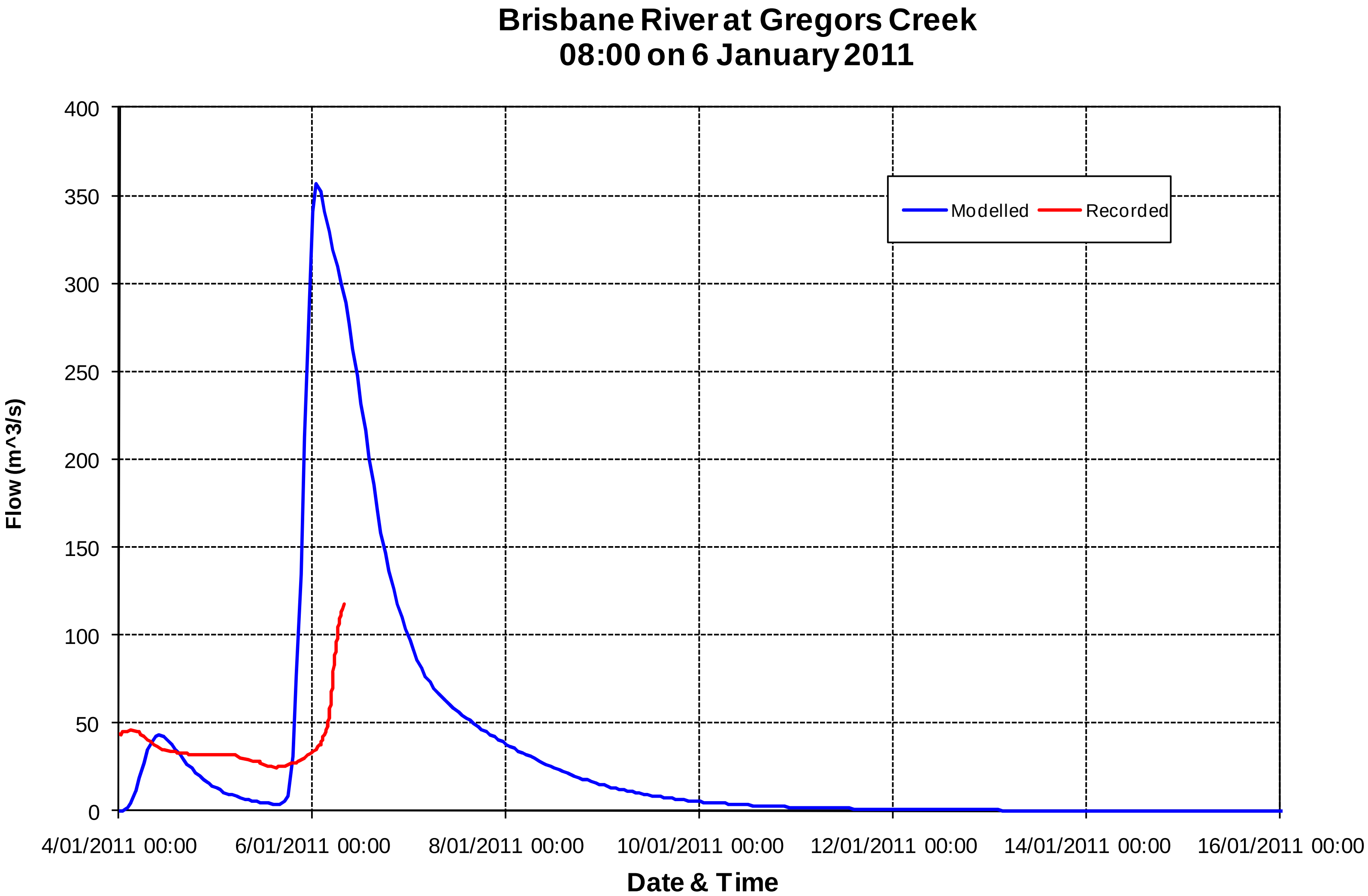
The calibration of the model parameters used are described in detail in the ***Brisbane River and Pine River Flood Study Report Series, (DNR, 1994), Brisbane River Flood Hydrology Report Volume I Report on Runoff Routing Model Calibration, September 1992.***

Run 2

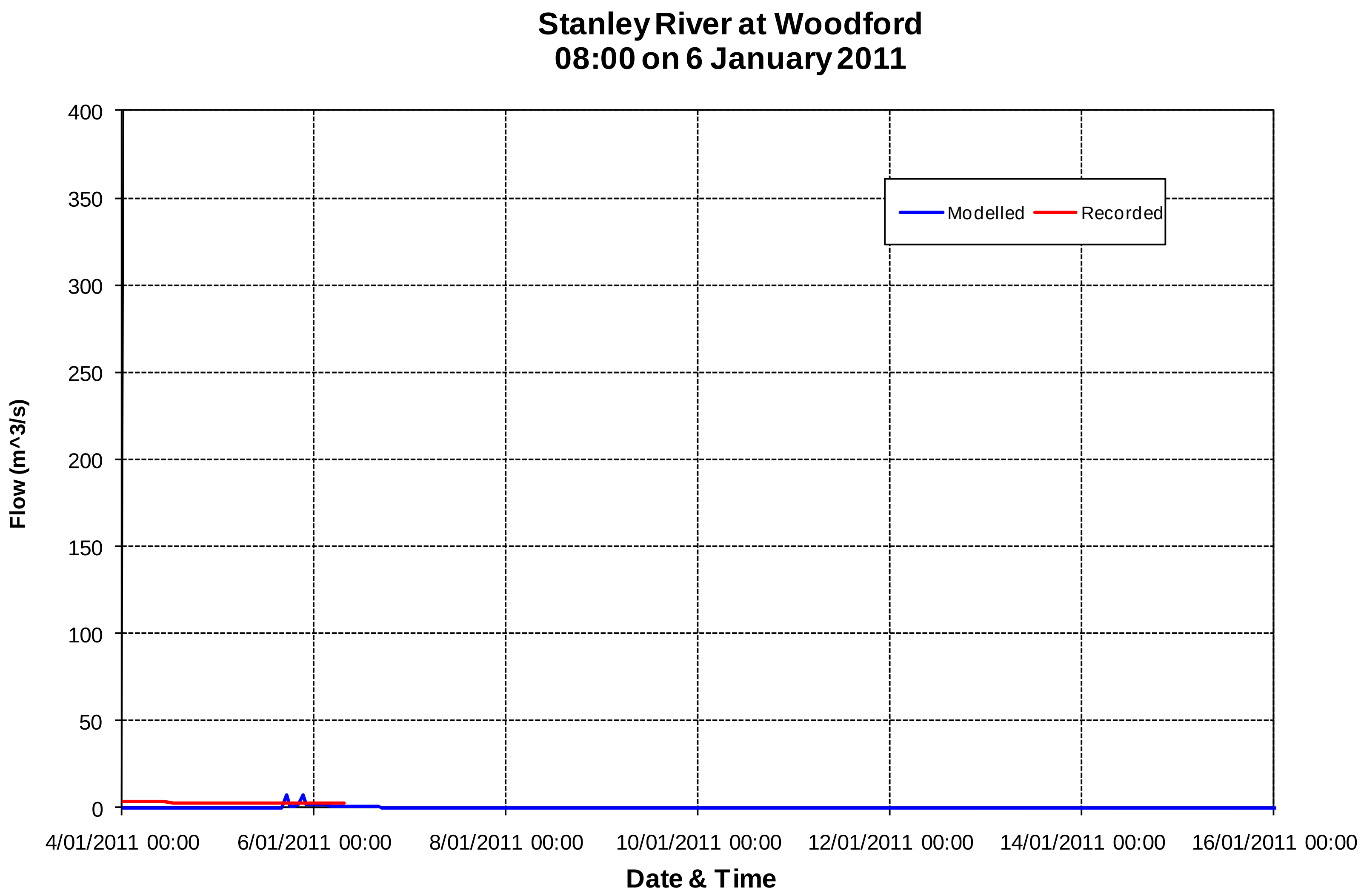
Date: Thursday 6 January 2011

Time: 08:00

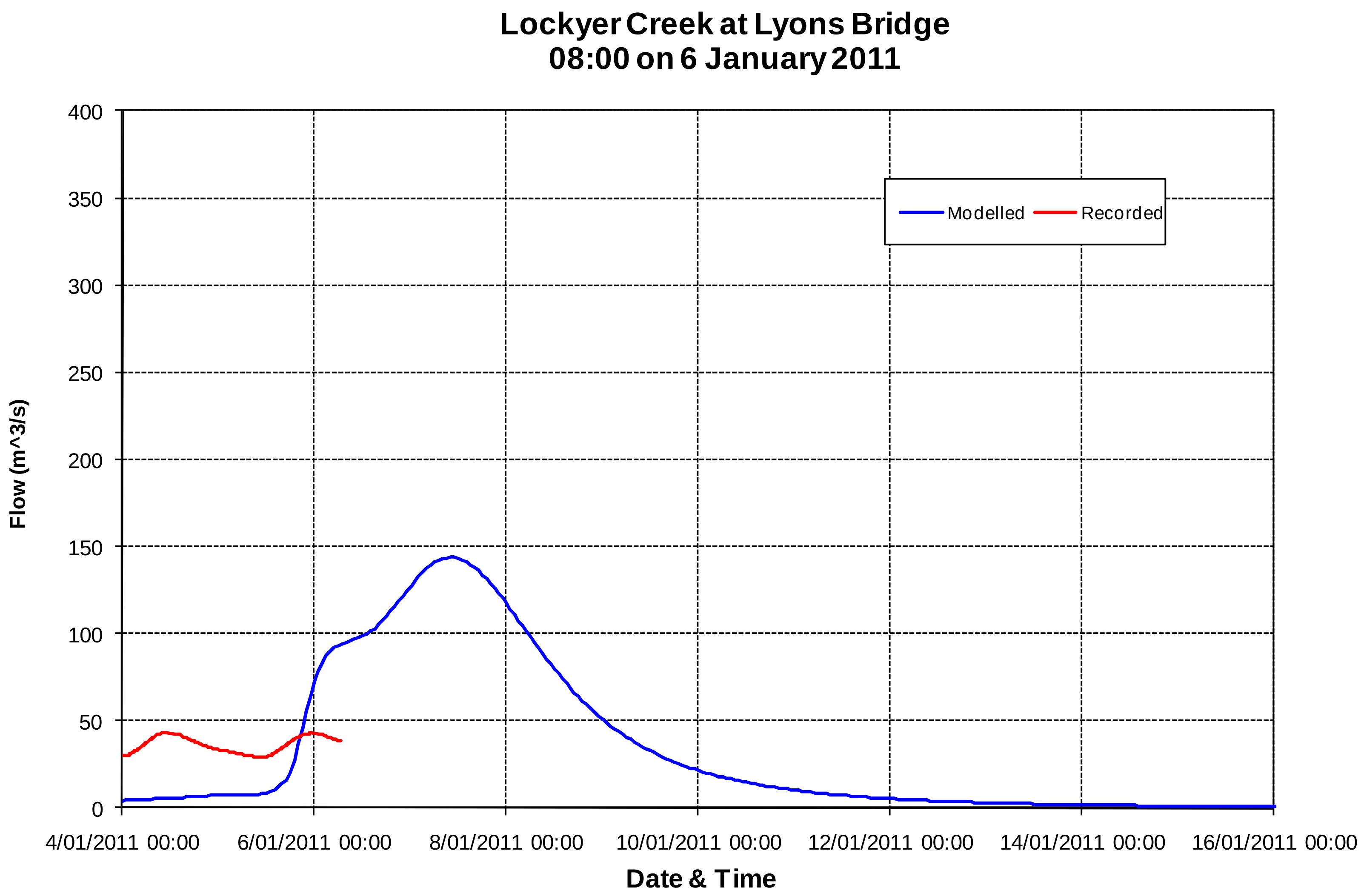
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	117	13,381	357	15,847	240	2,466
Woodford	4	1,998	8	125	3	-1,874
Lyons Bridge	44	12,257	95	4,860	52	-7,397
Walloon	38	480	116	6,426	77	5,946
Amberley	26	6,084	203	5,471	177	-612
Estimate to date and time of run						
Somerset			387	21,292		
Wivenhoe			303	9,015		
Total Event Estimate						
Somerset			387	30,827		
Wivenhoe			303	49,176		



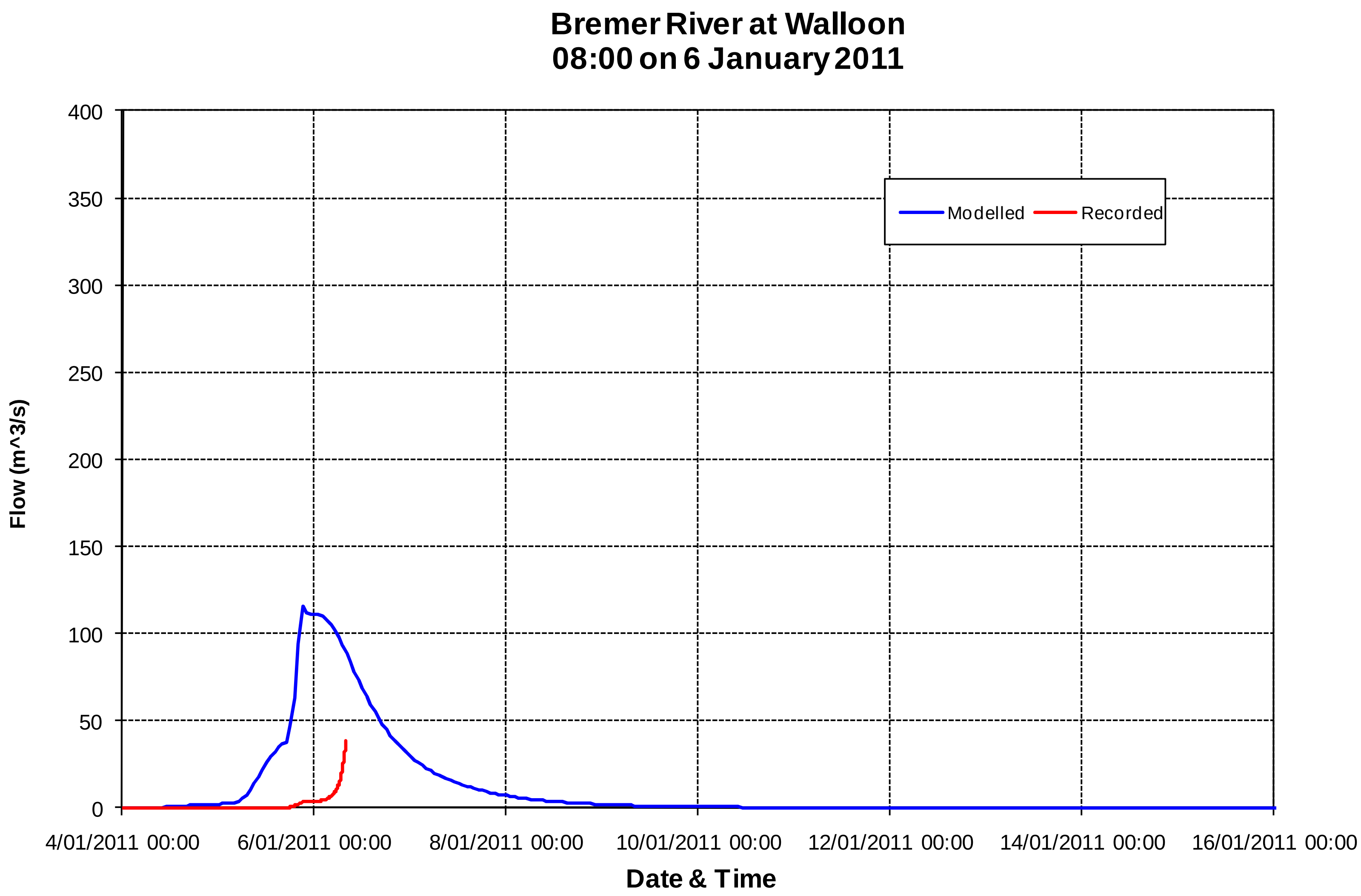
Run 2: Thursday 6 January 2011, 08:00



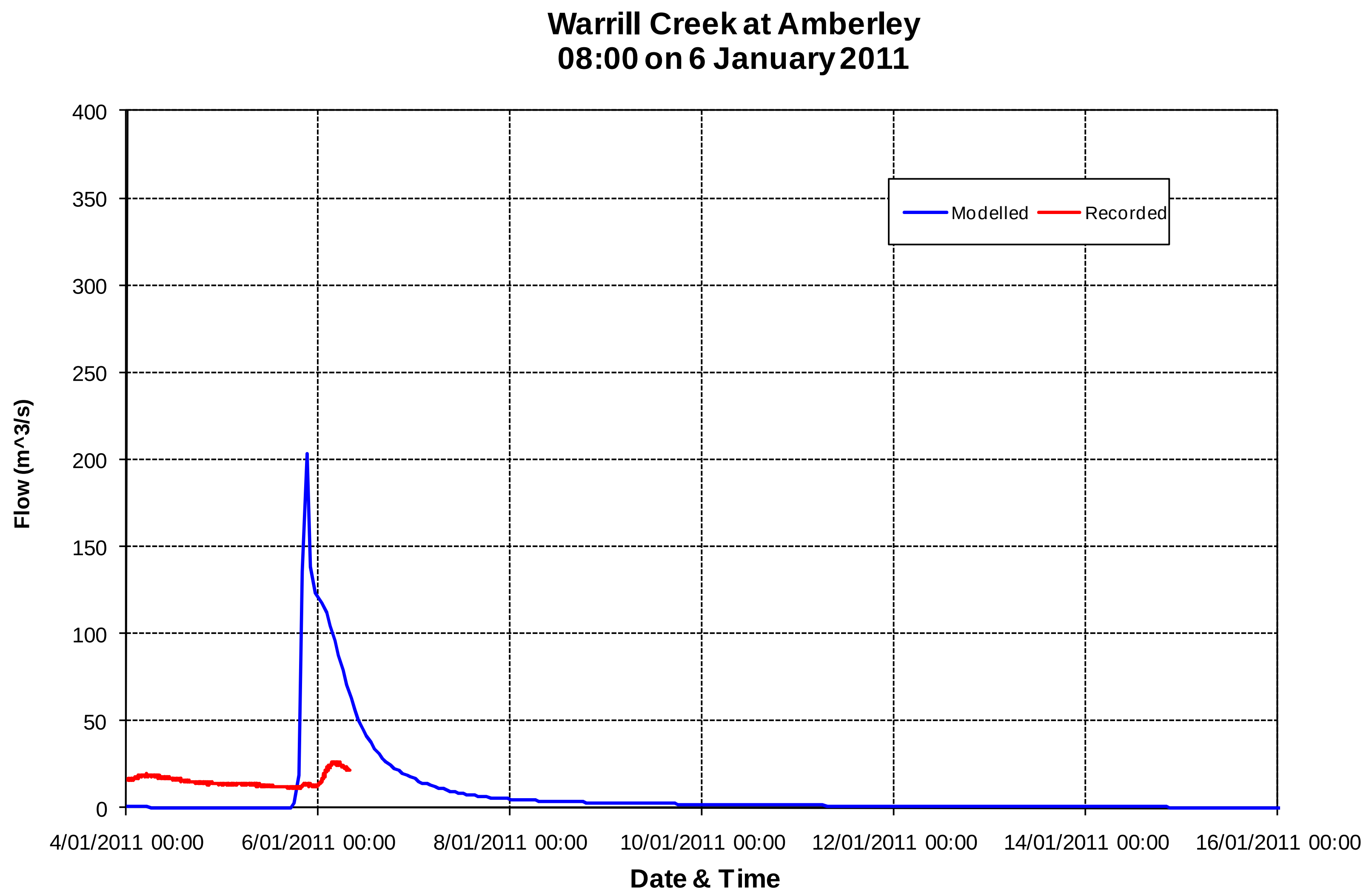
Run 2: Thursday 6 January 2011, 08:00



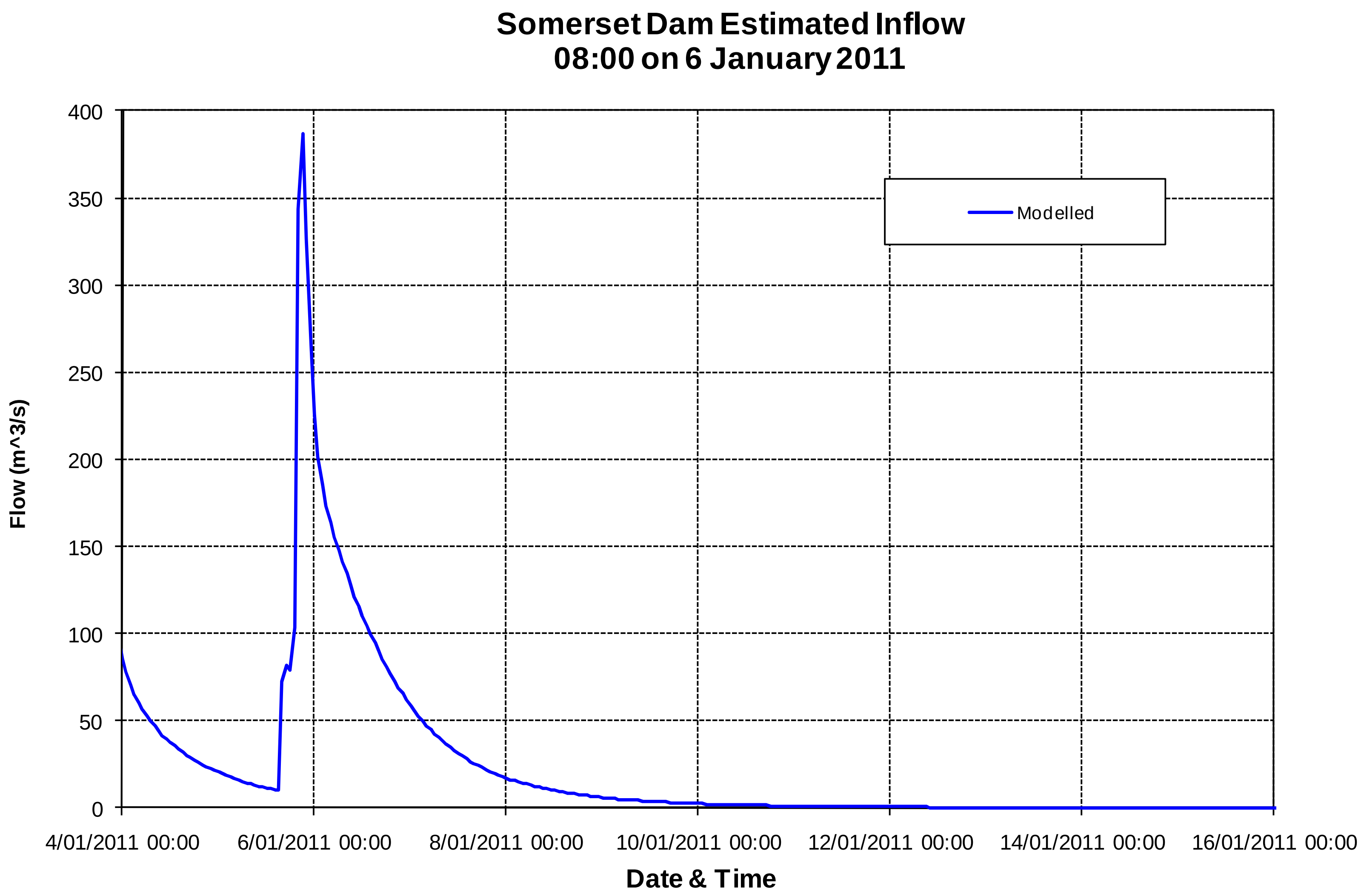
Run 2: Thursday 6 January 2011, 08:00



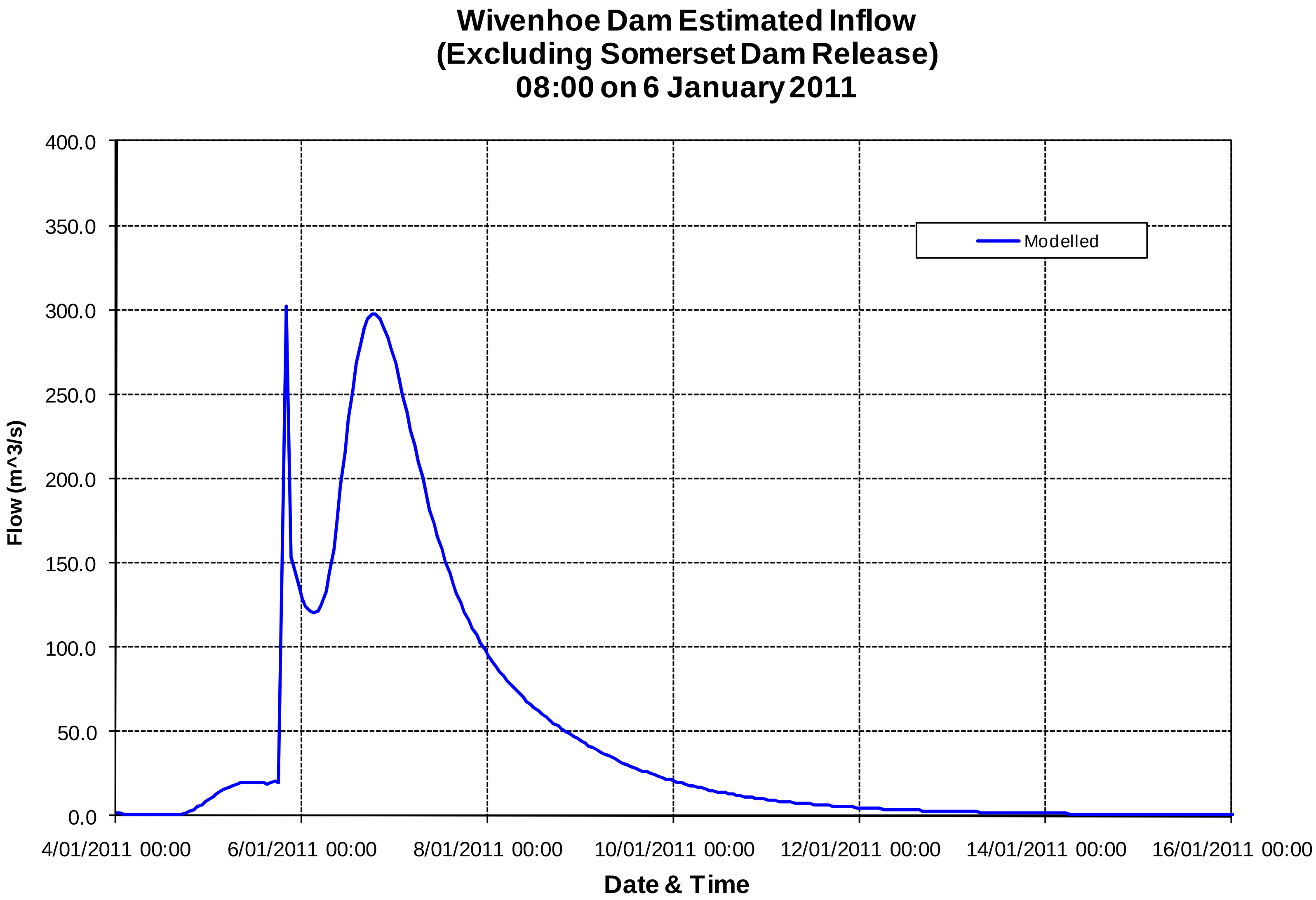
Run 2: Thursday 6 January 2011, 08:00



Run 2: Thursday 6 January 2011, 08:00



Run 2: Thursday 6 January 2011, 08:00



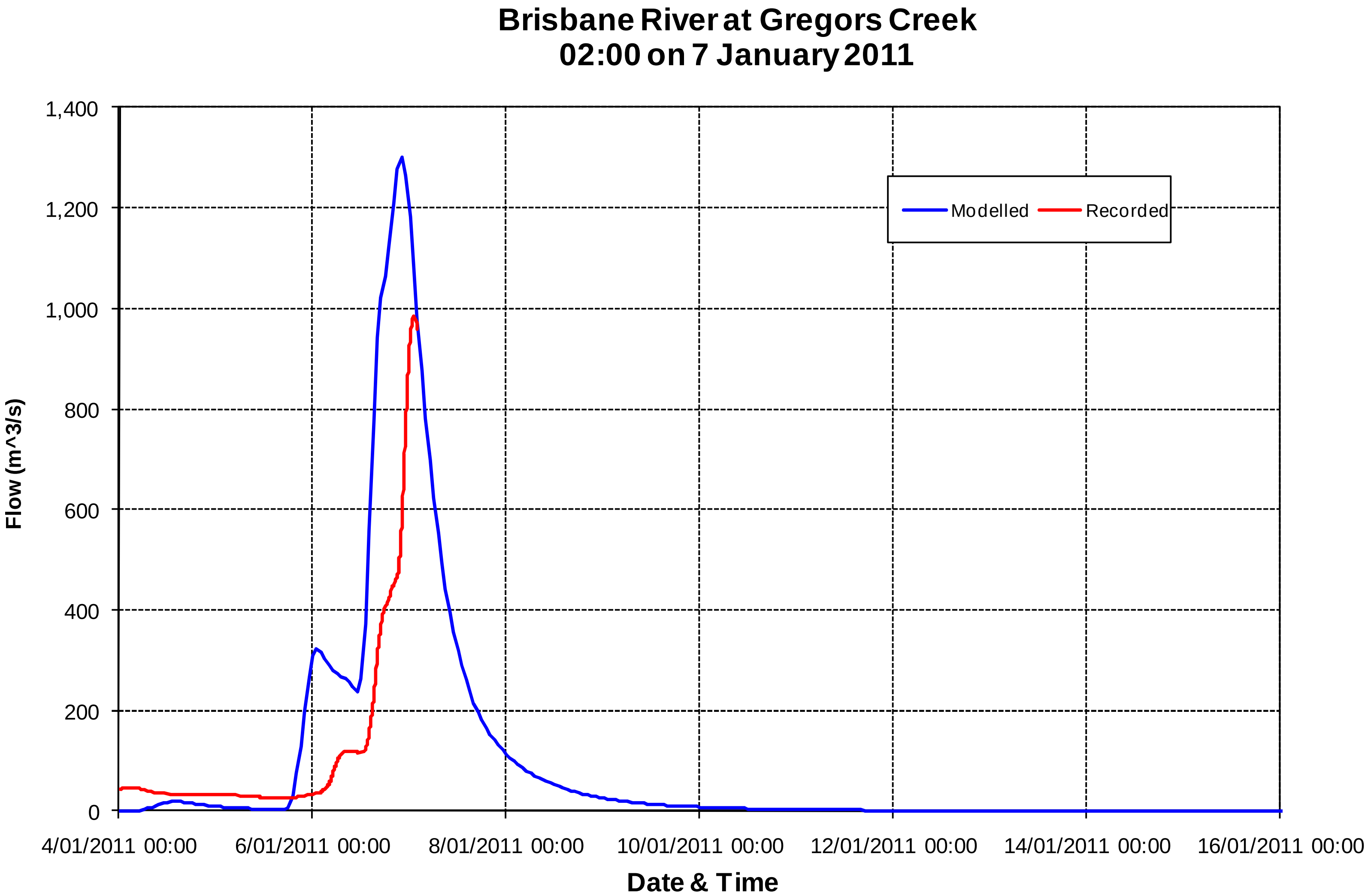
Run 2: Thursday 6 January 2011, 08:00

Run 5

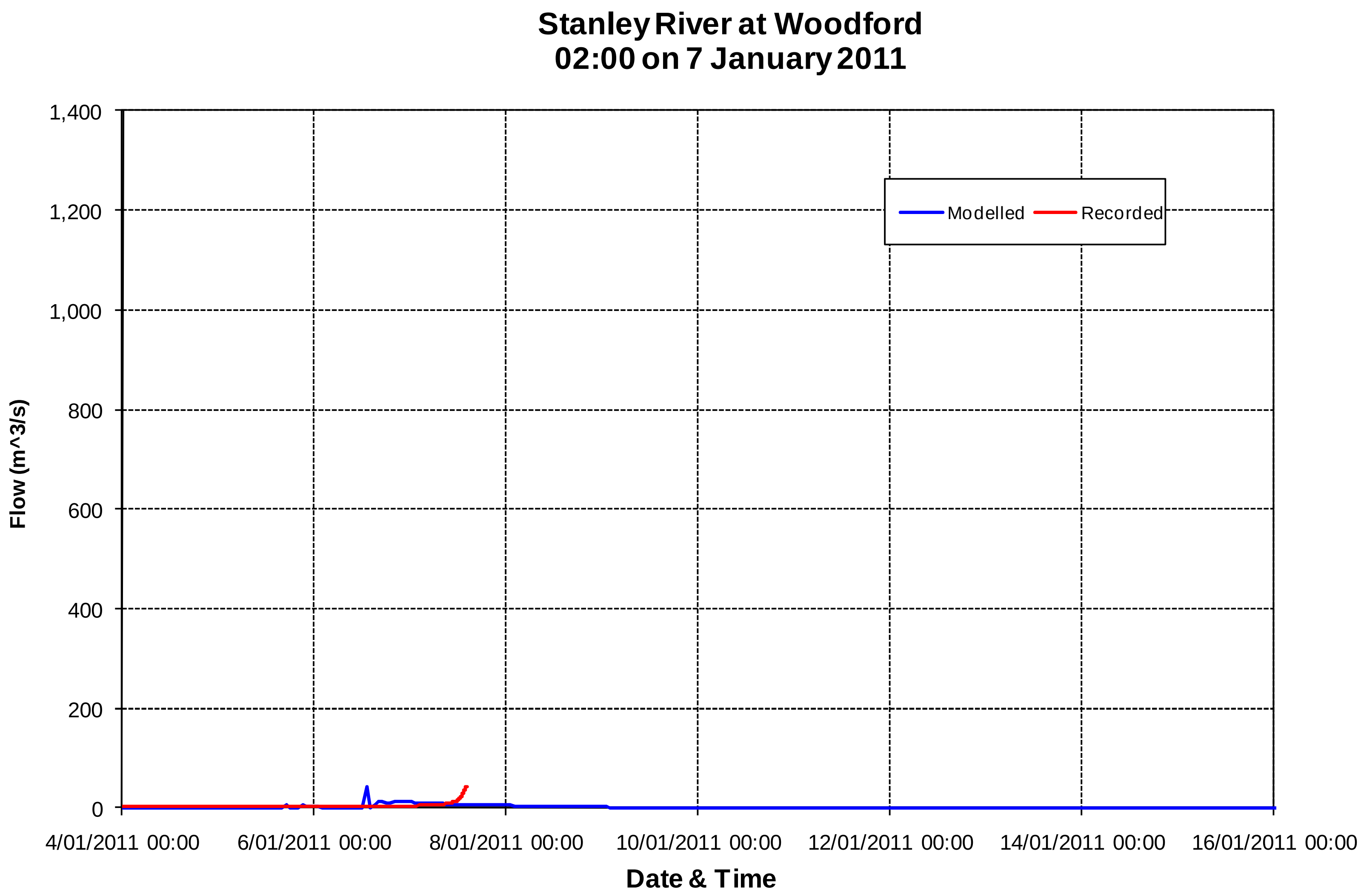
Date: Friday 7 January 2011

Time: 02:00

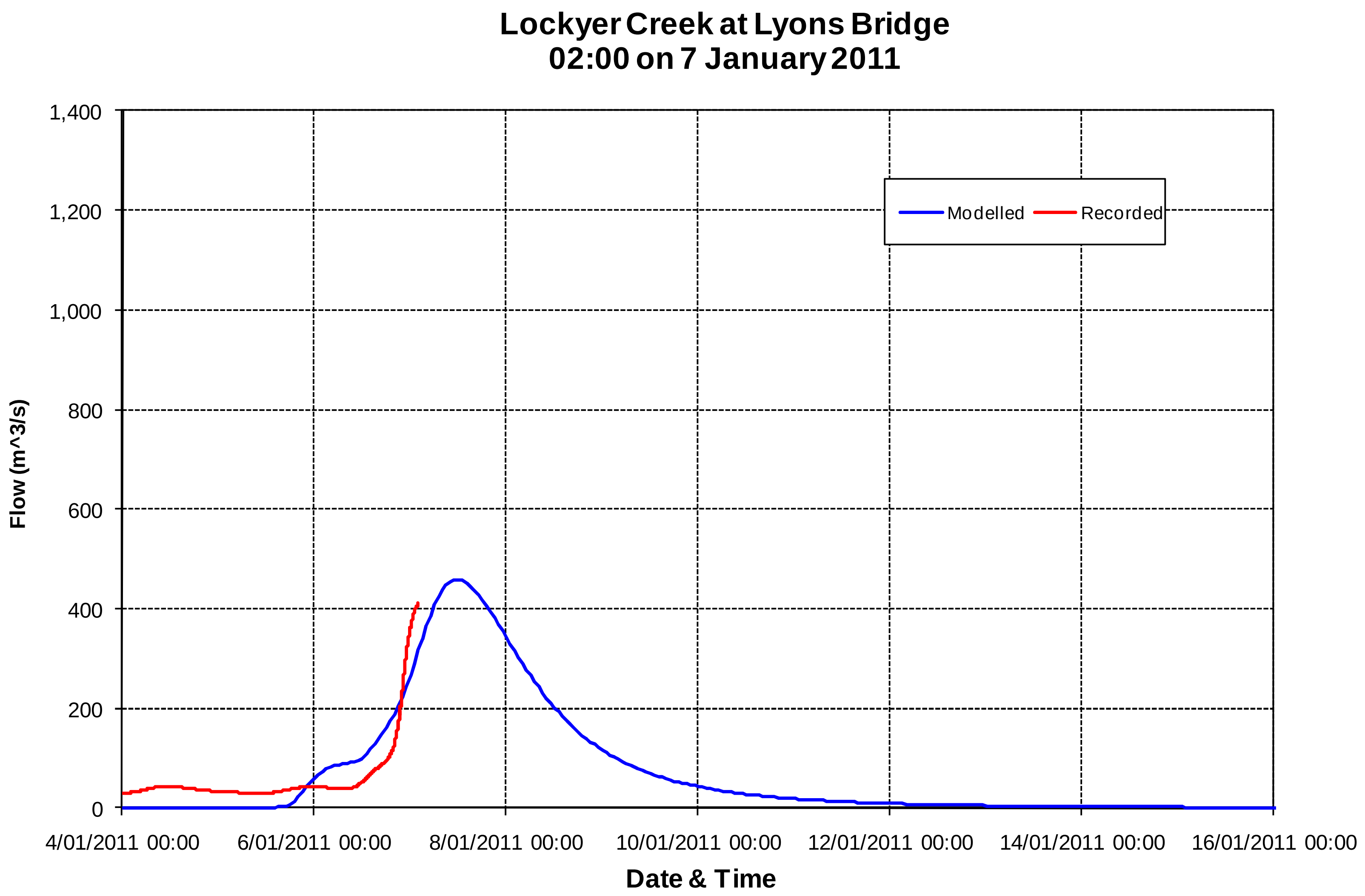
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	40,737	1,302	67,830	316	27,093
Woodford	14	2,227	44	797	30	-1,430
Lyons Bridge	412	22,230	315	14,327	-97	-7,903
Walloon	336	7,429	88	6,291	-248	-1,138
Amberley	73	8,125	124	4,893	51	-3,232
Estimate to date and time of run						
Somerset			387	35,884		
Wivenhoe			861	36,148		
Total Event estimate						
Somerset			387	49,516		
Wivenhoe			1,110	128,992		



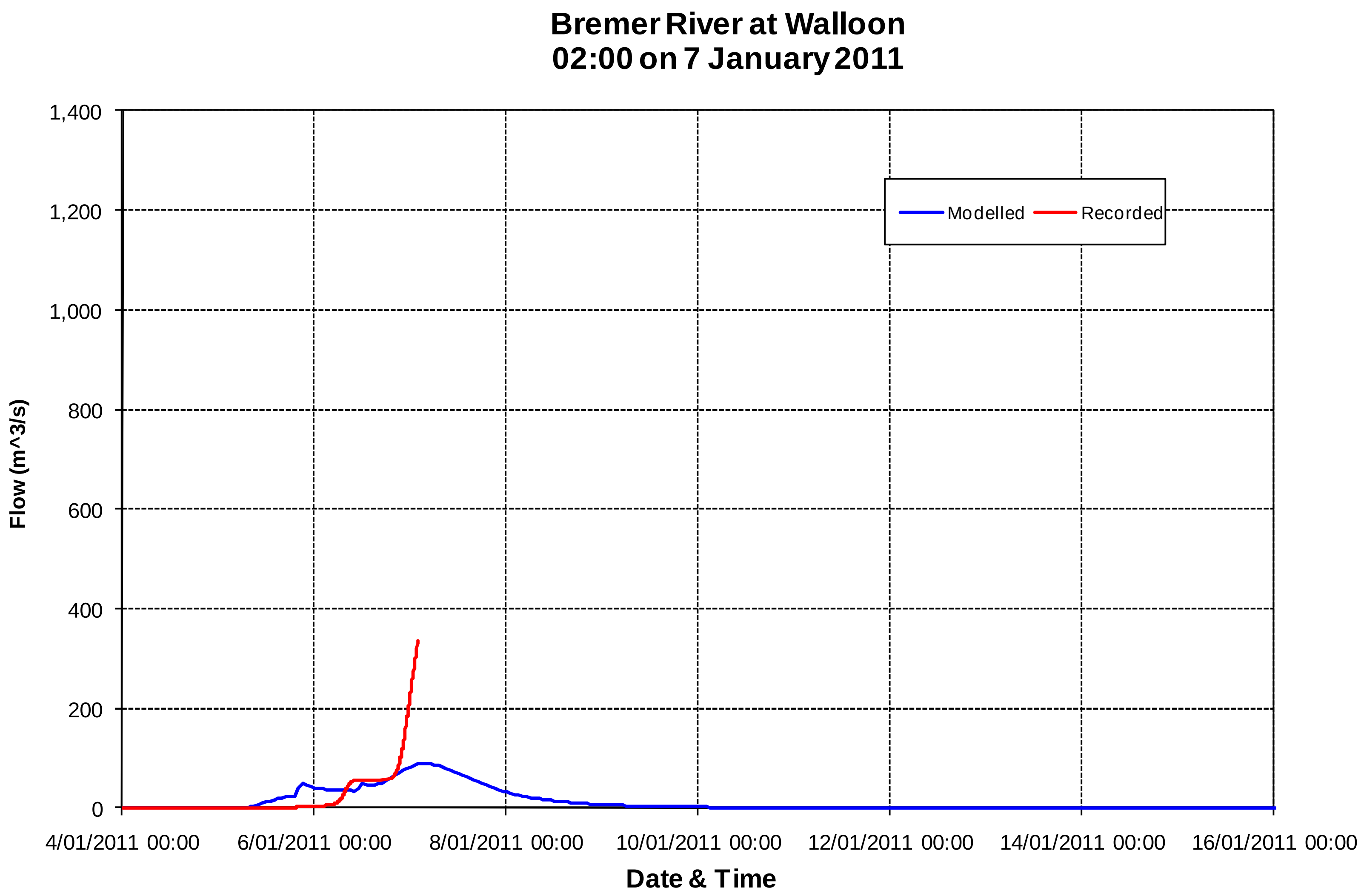
Run 5: Friday 7 January 2011, 02:00



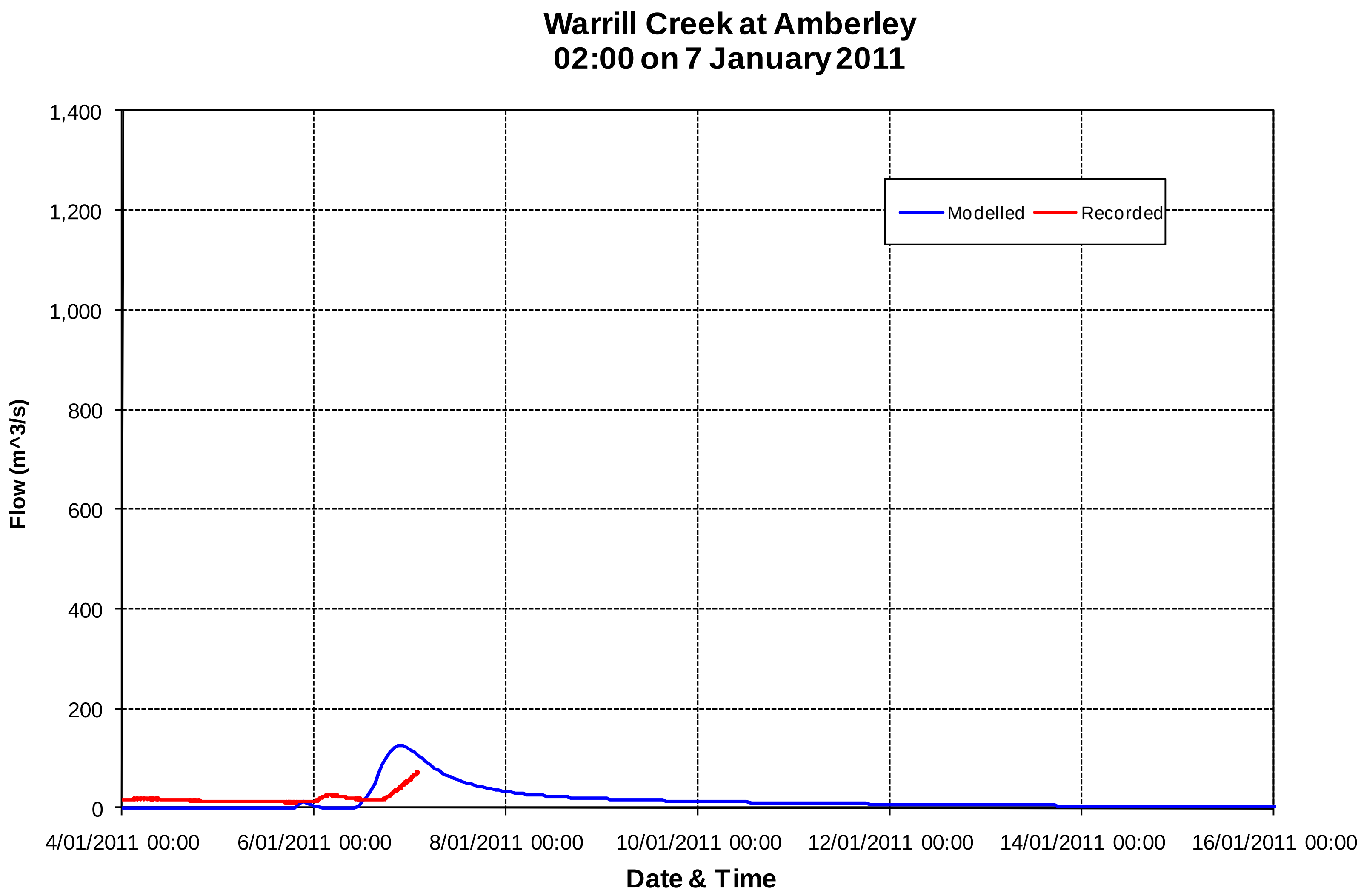
Run 5: Friday 7 January 2011, 02:00



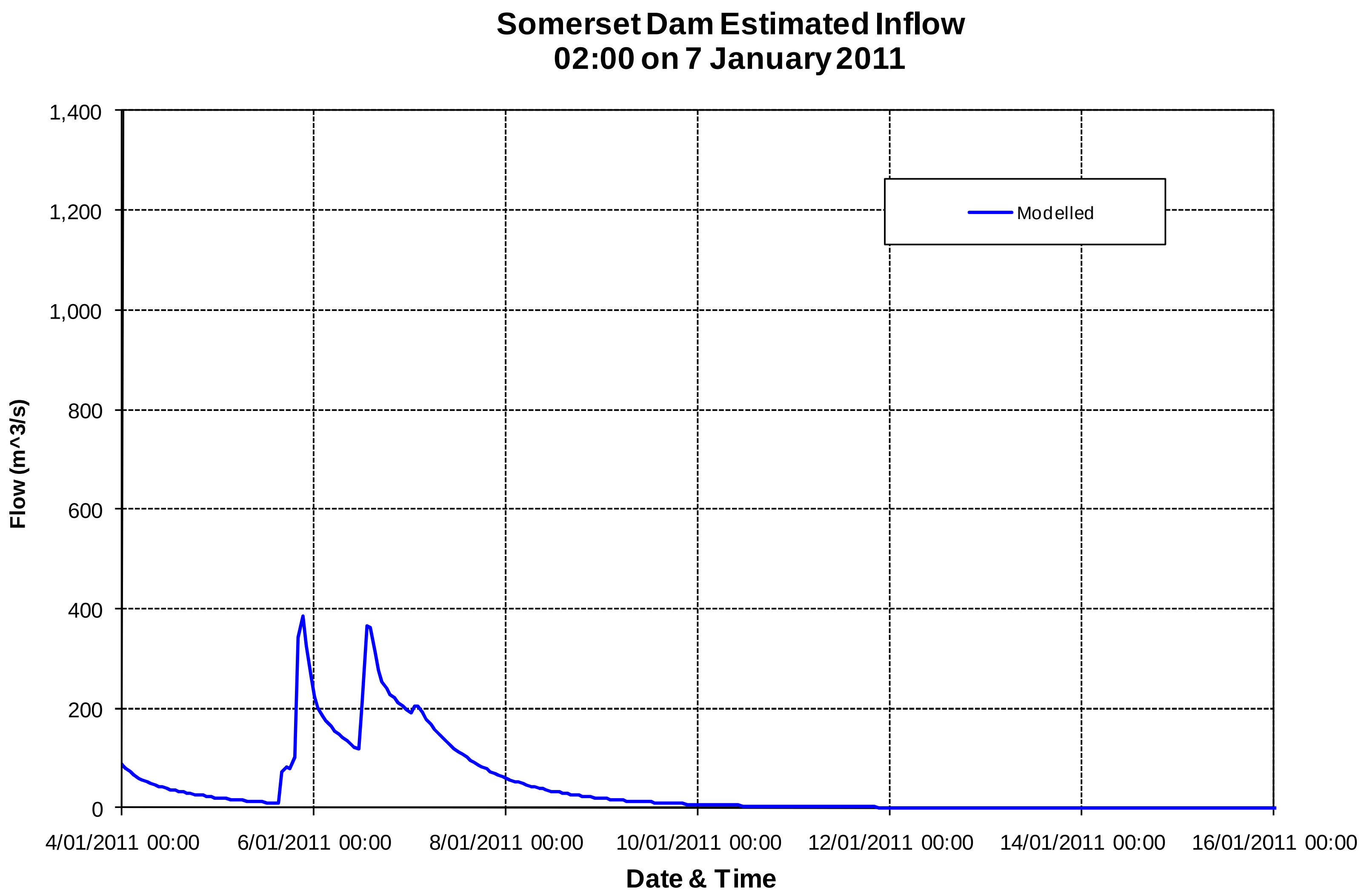
Run 5: Friday 7 January 2011, 02:00



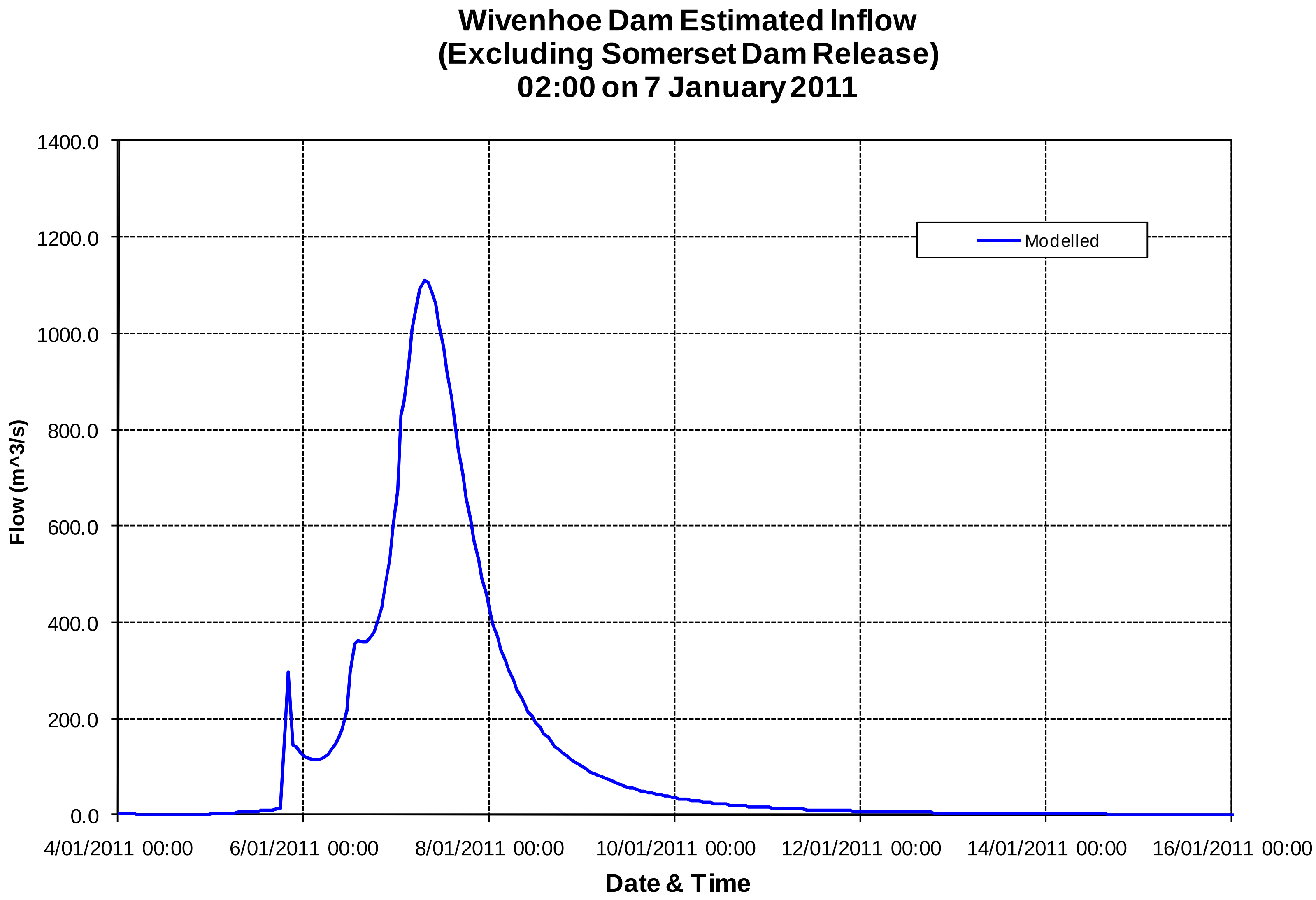
Run 5: Friday 7 January 2011, 02:00



Run 5: Friday 7 January 2011, 02:00



Run 5: Friday 7 January 2011, 02:00



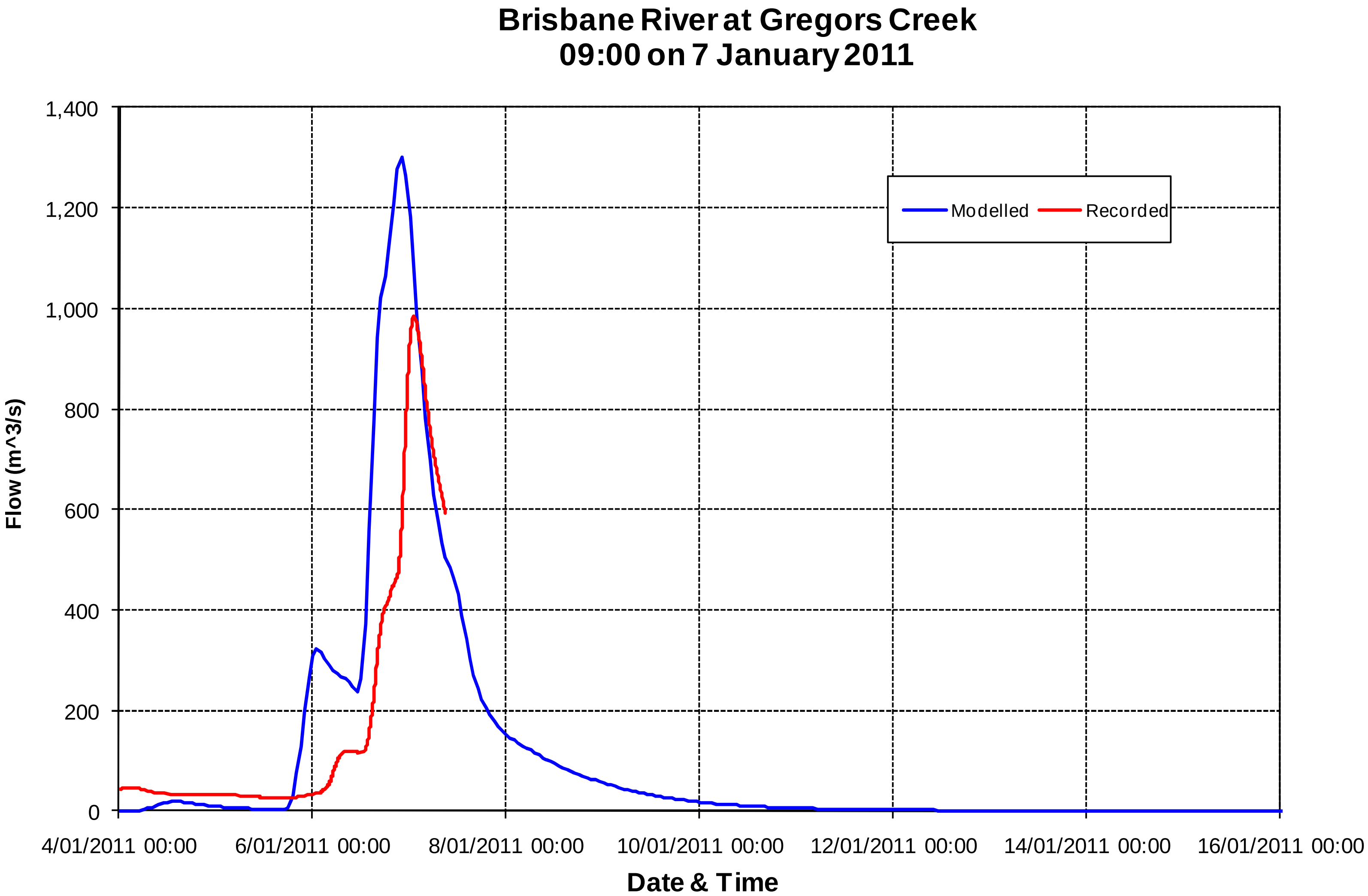
Run 5: Friday 7 January 2011, 02:00

Run 7

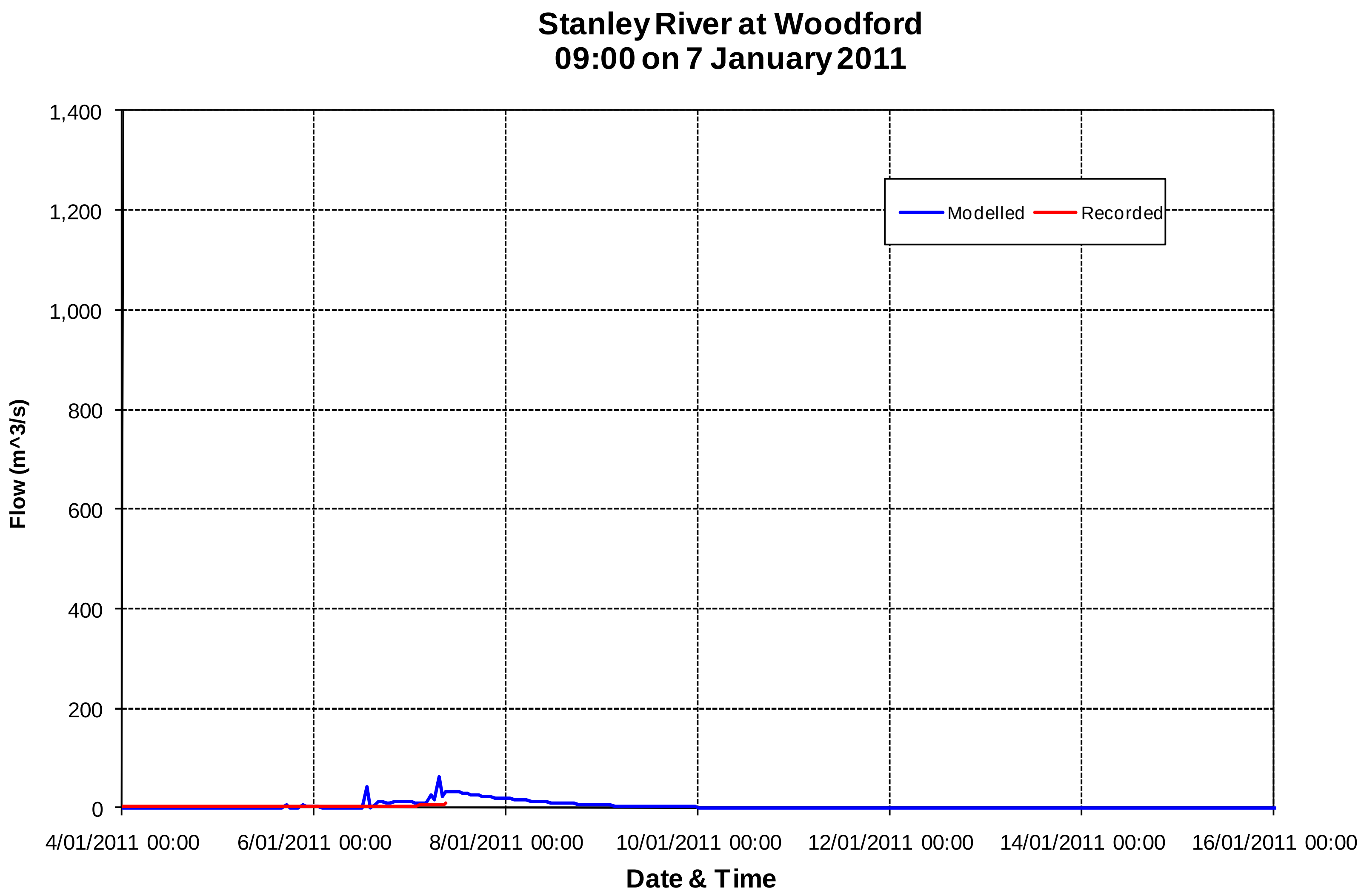
Date: Friday 7 January 2011

Time: 09:00

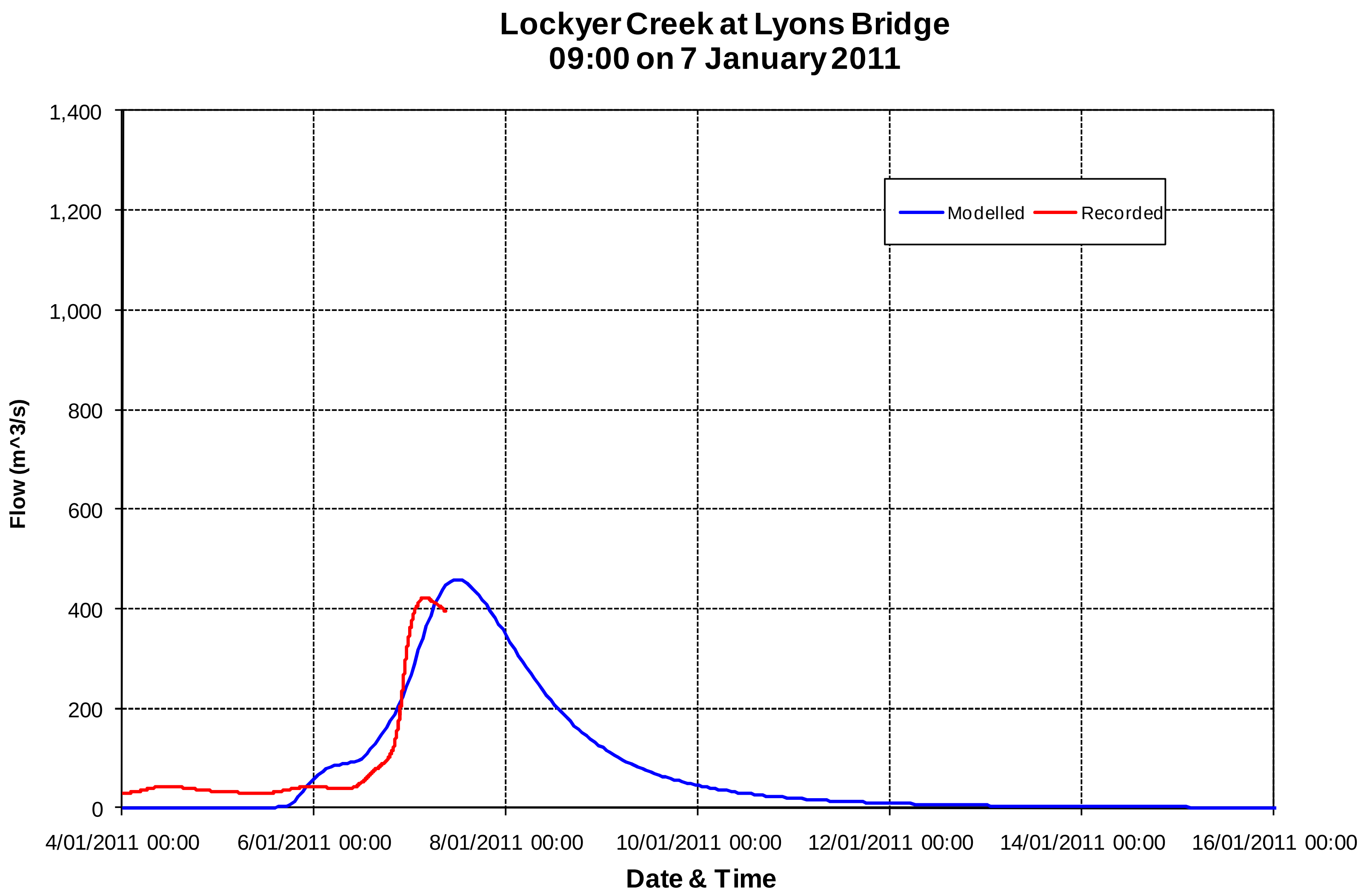
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	59,062	1,302	84,378	316	25,316
Woodford	14	2,394	63	1,446	49	-948
Lyons Bridge	422	32,566	447	24,429	25	-8,137
Walloon	412	16,791	89	8,449	-323	-8,342
Amberley	117	10,629	124	6,938	7	-3,691
Estimate to date and time of run						
Somerset			387	41,850		
Wivenhoe			1,201	63,196		
Total Event estimate						
Somerset			387	62,255		
Wivenhoe			1,201	143,573		



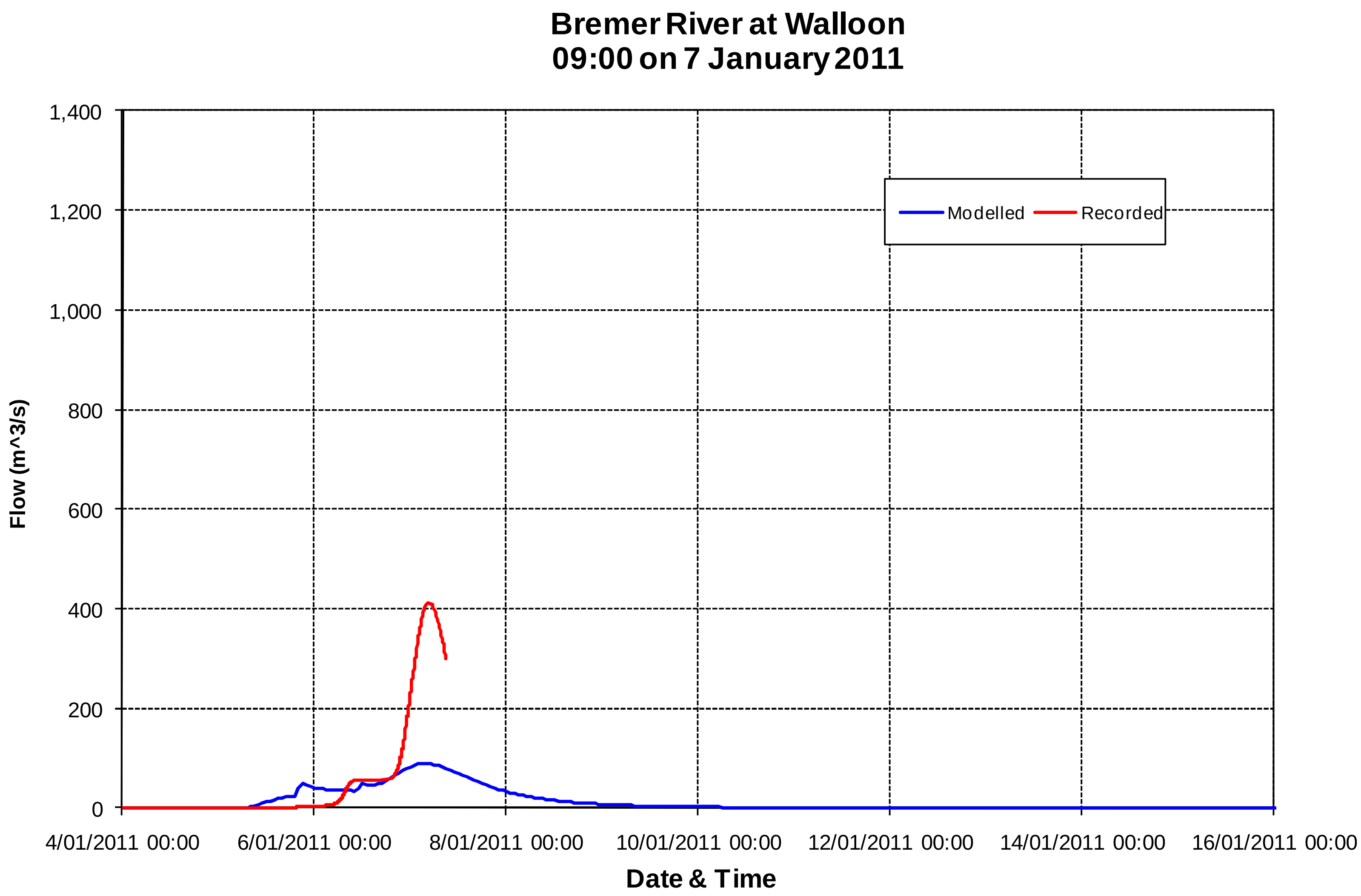
Run 7: Friday 7 January 2011, 09:00



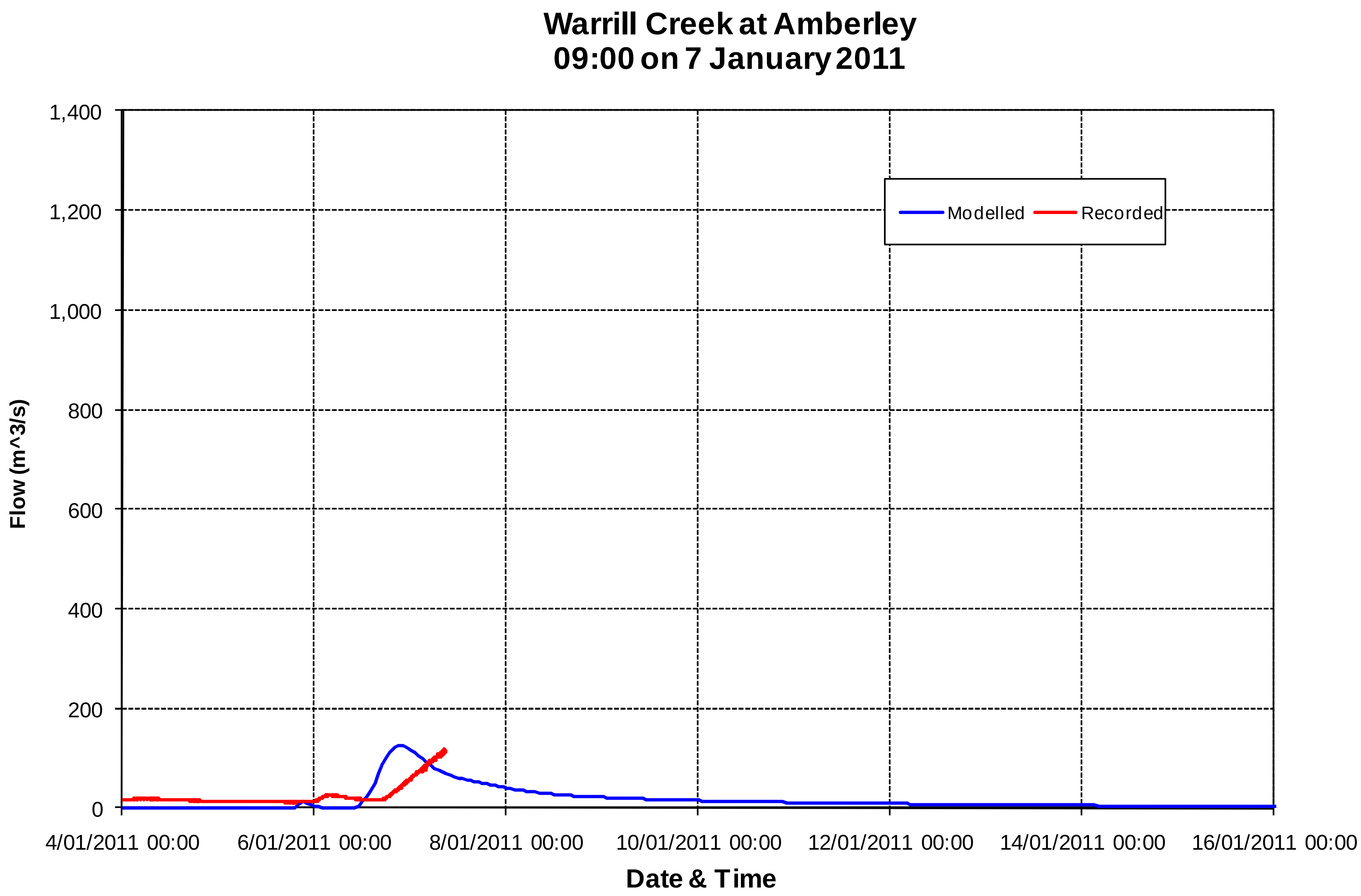
Run 7: Friday 7 January 2011, 09:00



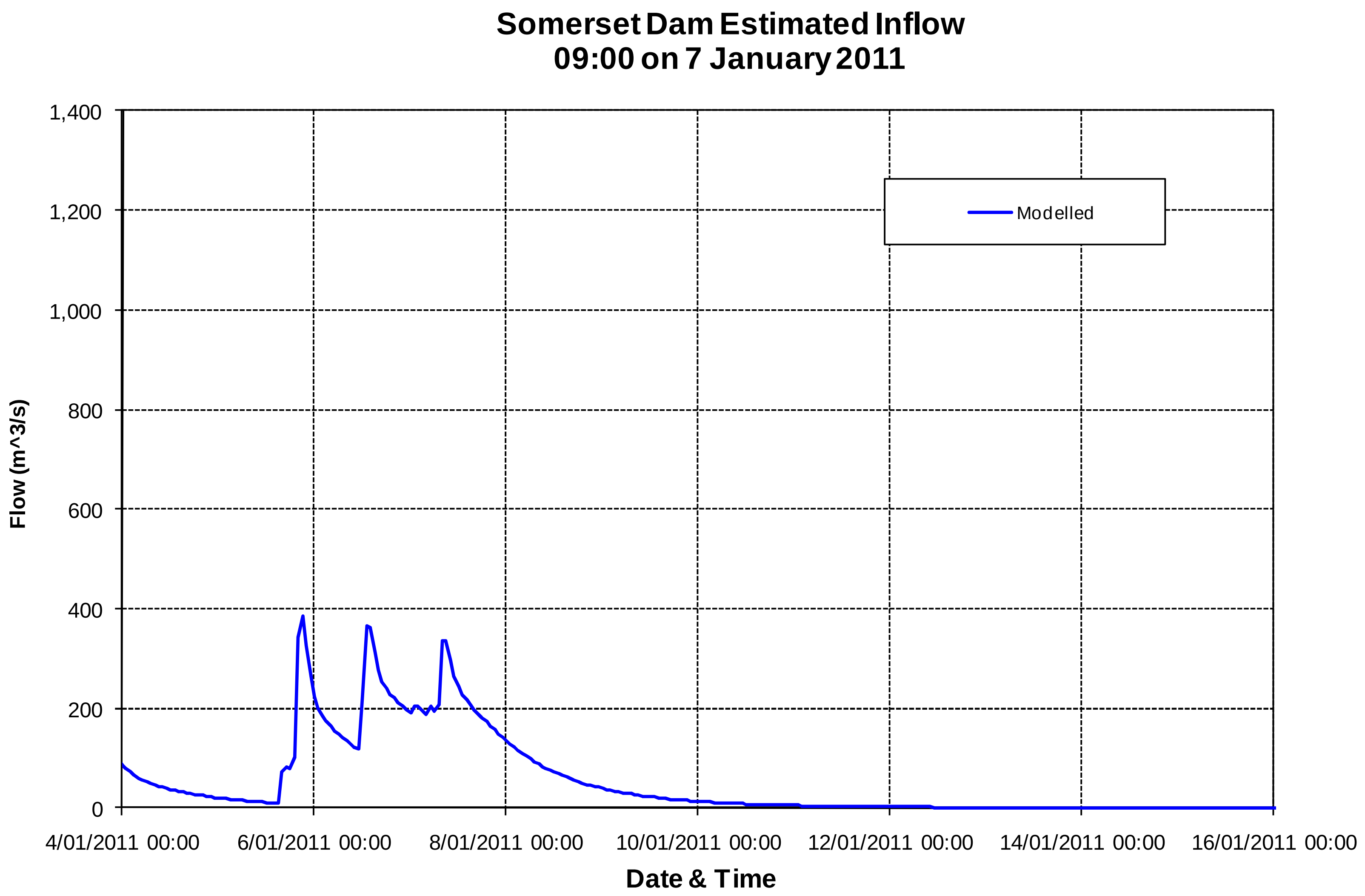
Run 7: Friday 7 January 2011, 09:00



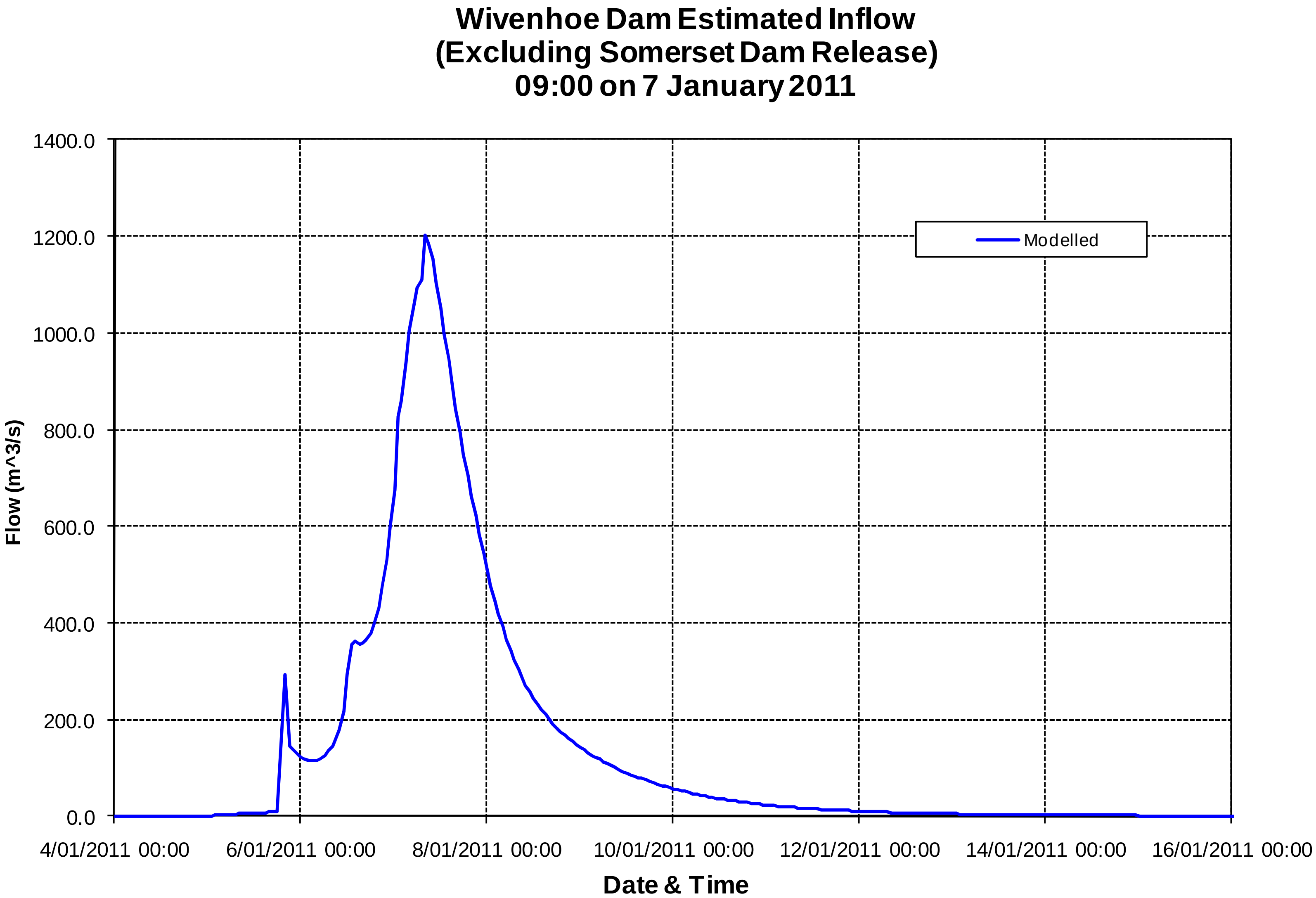
Run 7: Friday 7 January 2011, 09:00



Run 7: Friday 7 January 2011, 09:00



Run 7: Friday 7 January 2011, 09:00



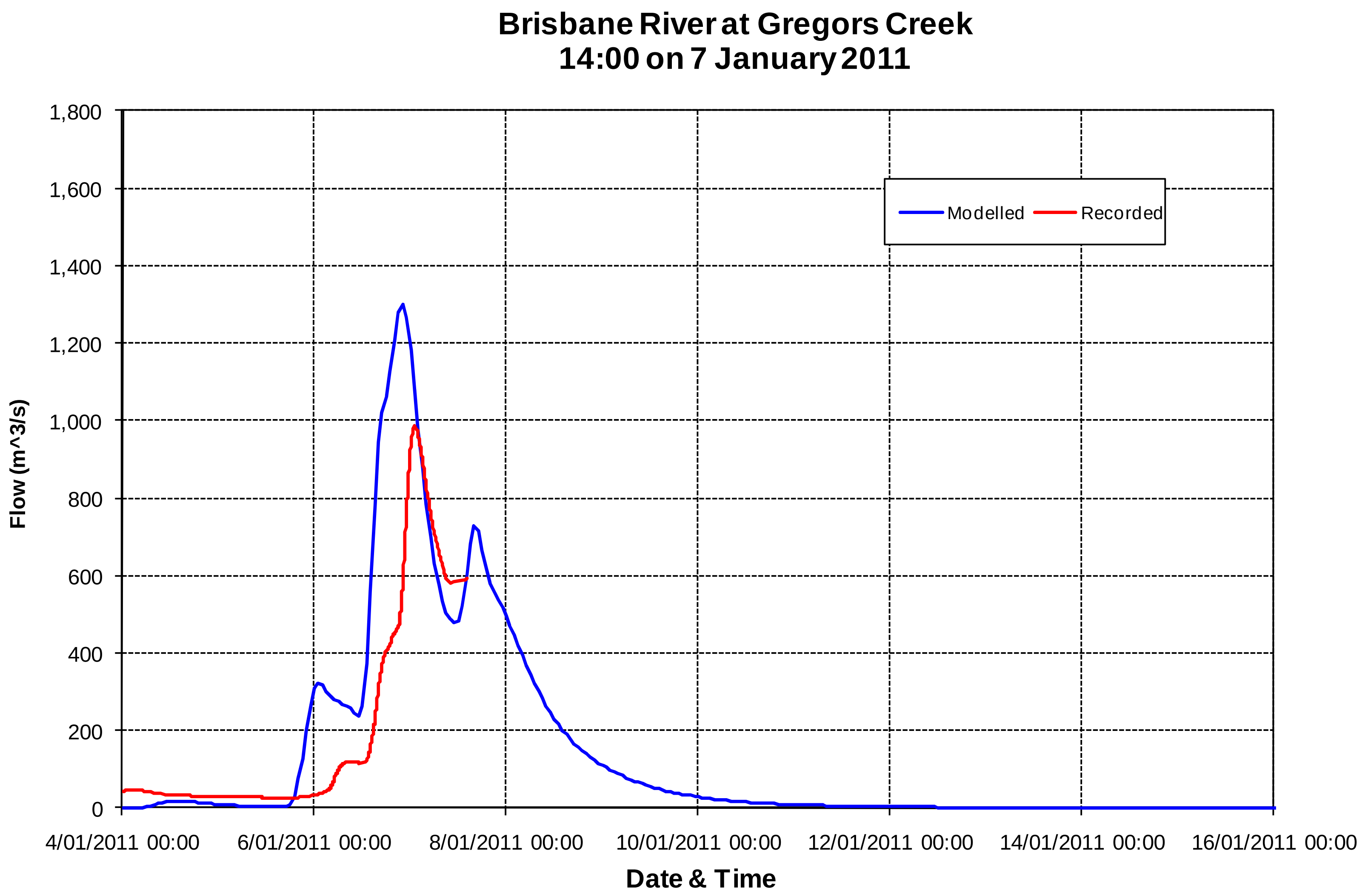
Run 7: Friday 7 January 2011, 09:00

Run 8

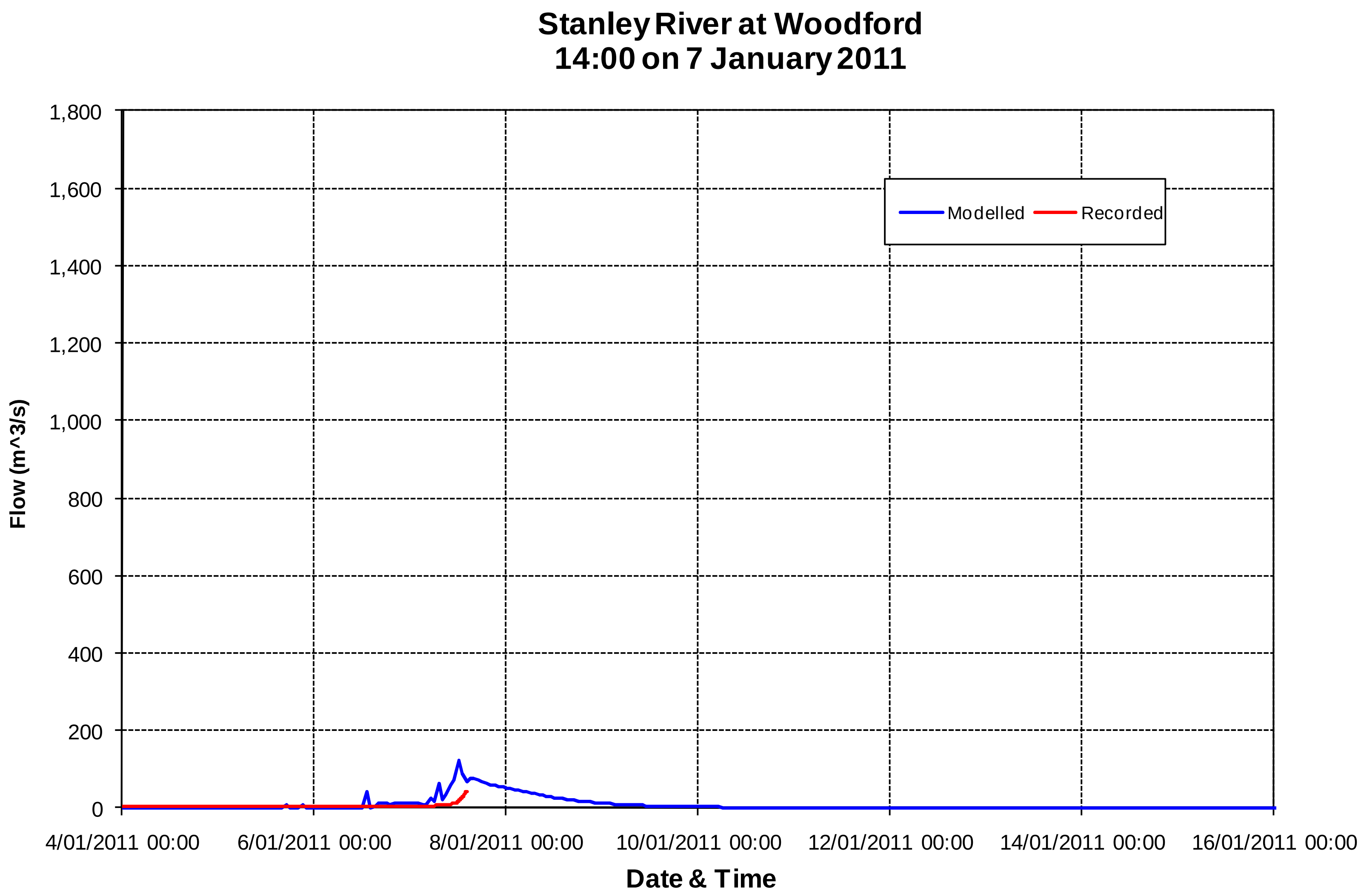
Date: Friday 7 January 2011

Time: 14:00

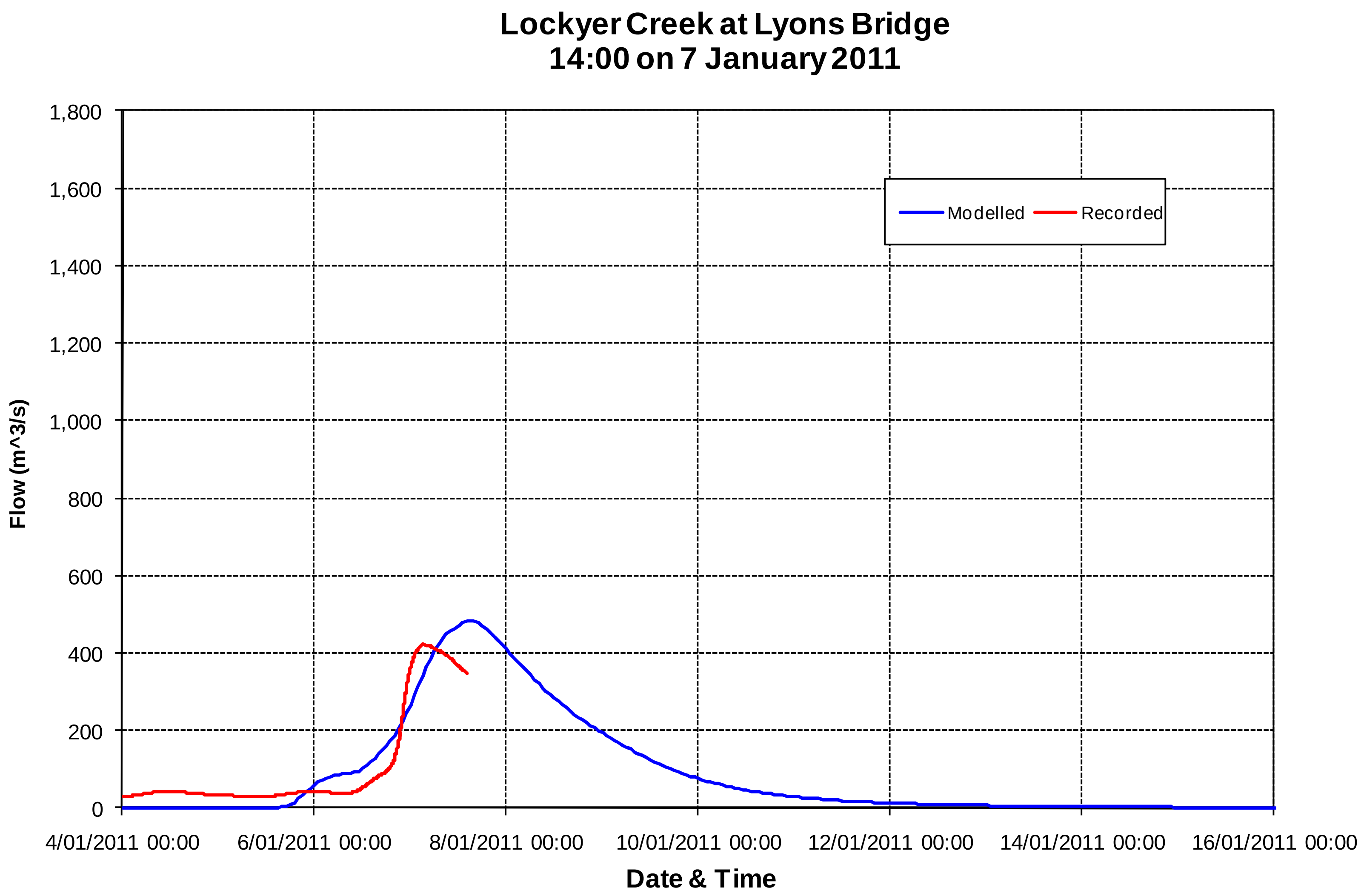
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	986	69,618	1,302	93,636	316	24,018
Woodford	43	2,792	124	2,939	81	148
Lyons Bridge	422	39,179	484	32,904	61	-6,275
Walloon	412	20,384	126	10,418	-286	-9,965
Amberley	137	12,941	130	8,730	-7	-4,212
Estimate to date and time of run						
Somerset			1,034	56,348		
Wivenhoe			1,738	90,137		
Total Event estimate						
Somerset			1,034	95,688		
Wivenhoe			1,738	201,889		



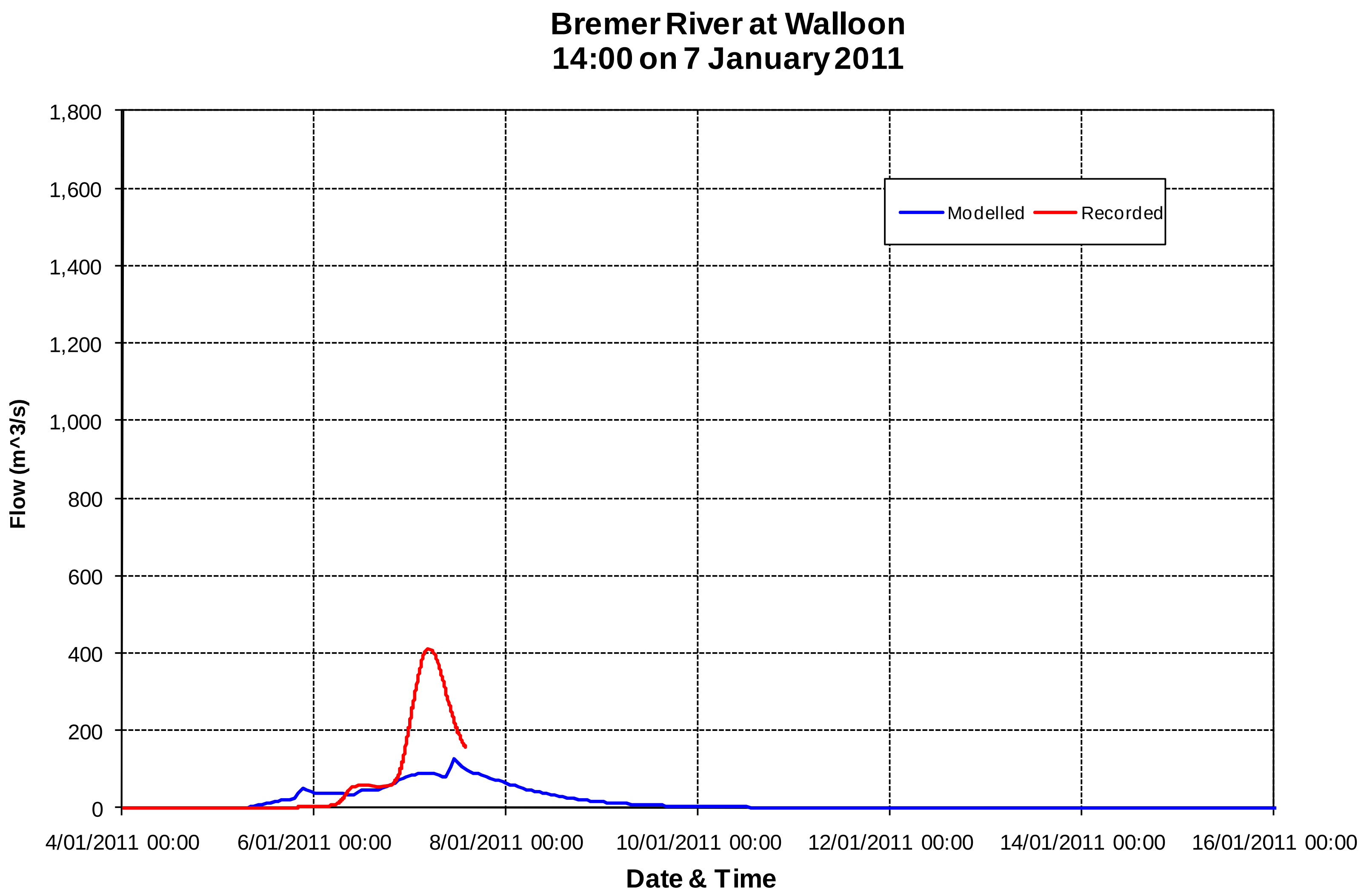
Run 8: Friday 7 January 2011, 14:00



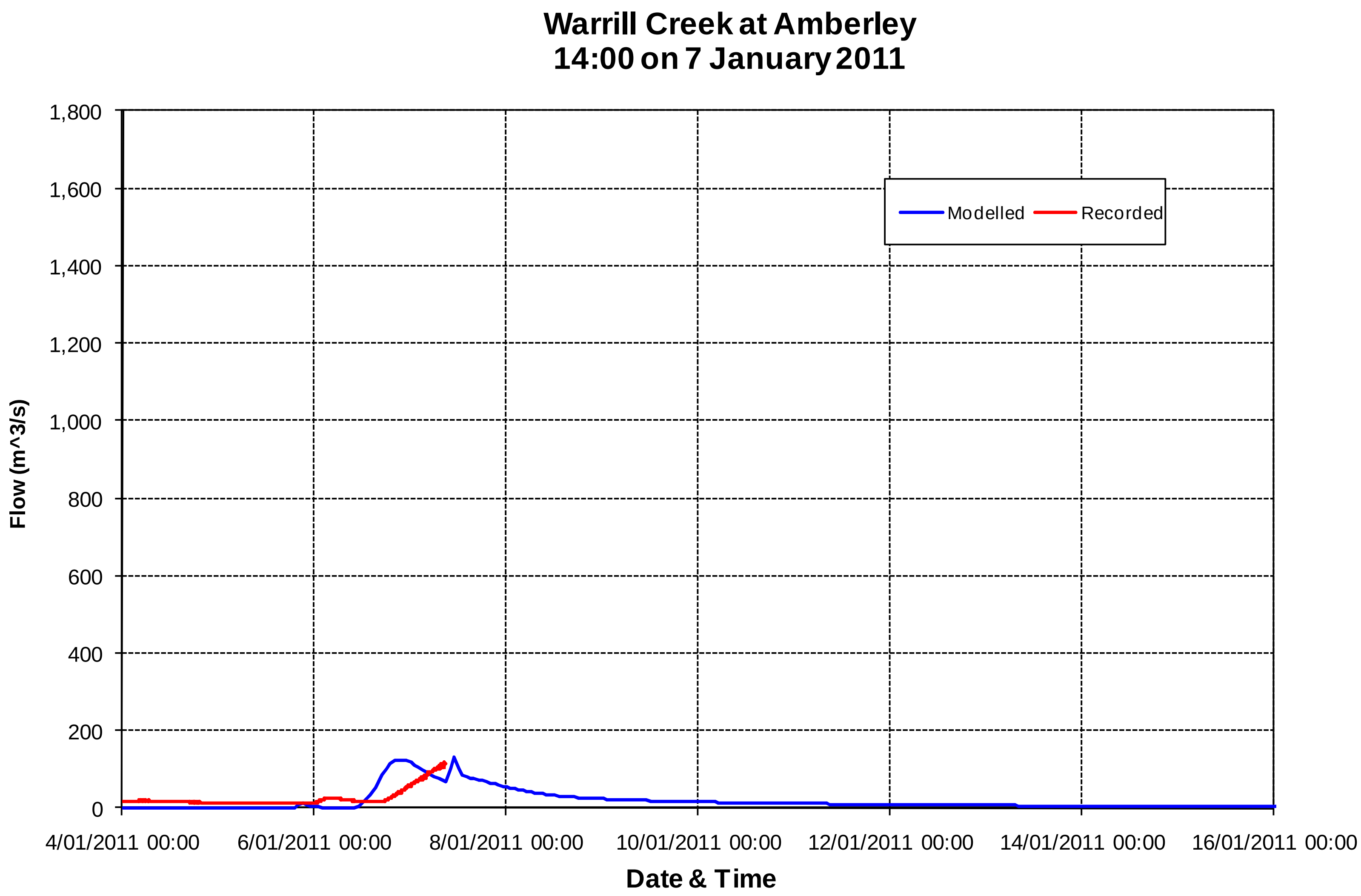
Run 8: Friday 7 January 2011, 14:00



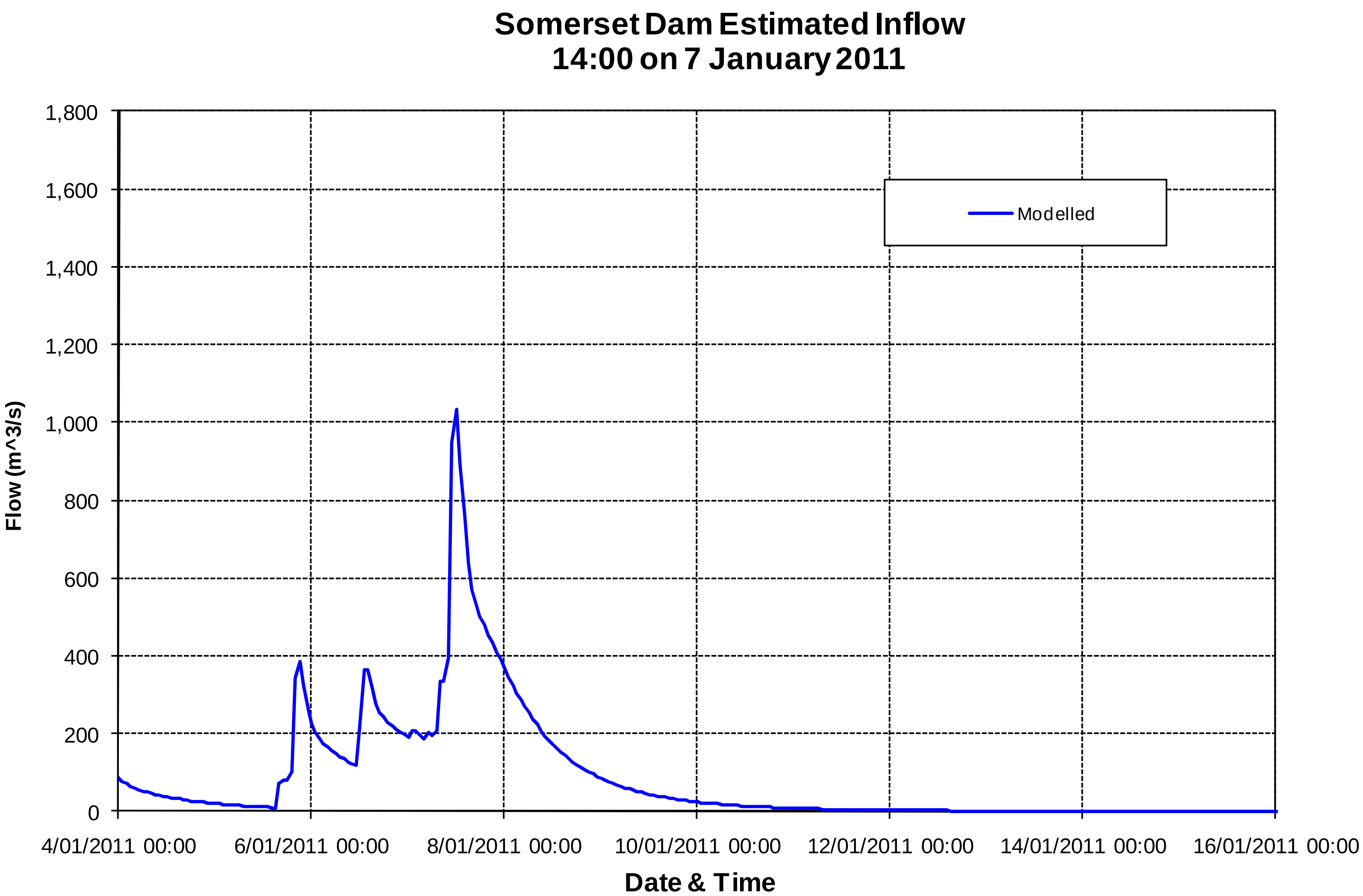
Run 8: Friday 7 January 2011, 14:00



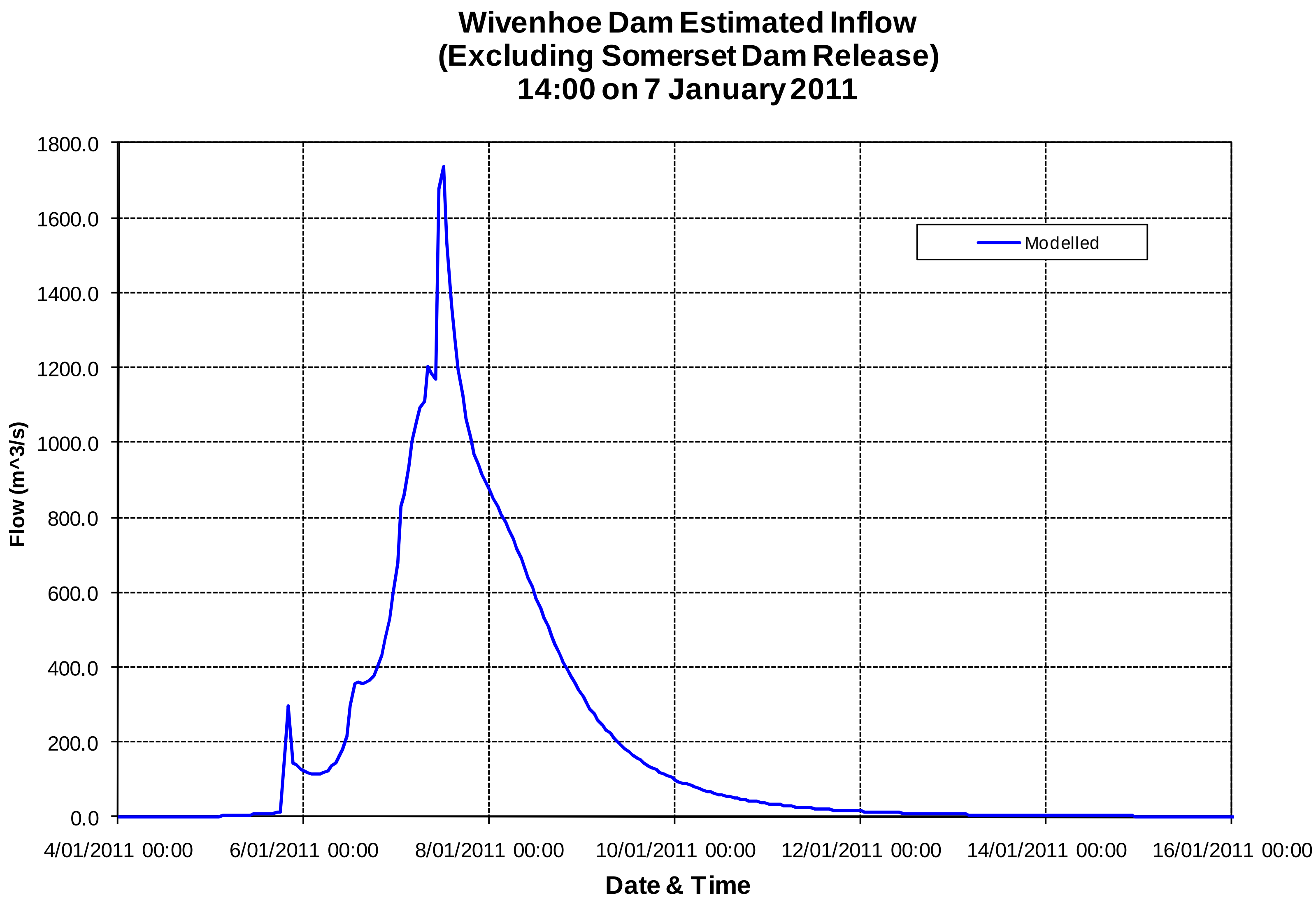
Run 8: Friday 7 January 2011, 14:00



Run 8: Friday 7 January 2011, 14:00



Run 8: Friday 7 January 2011, 14:00



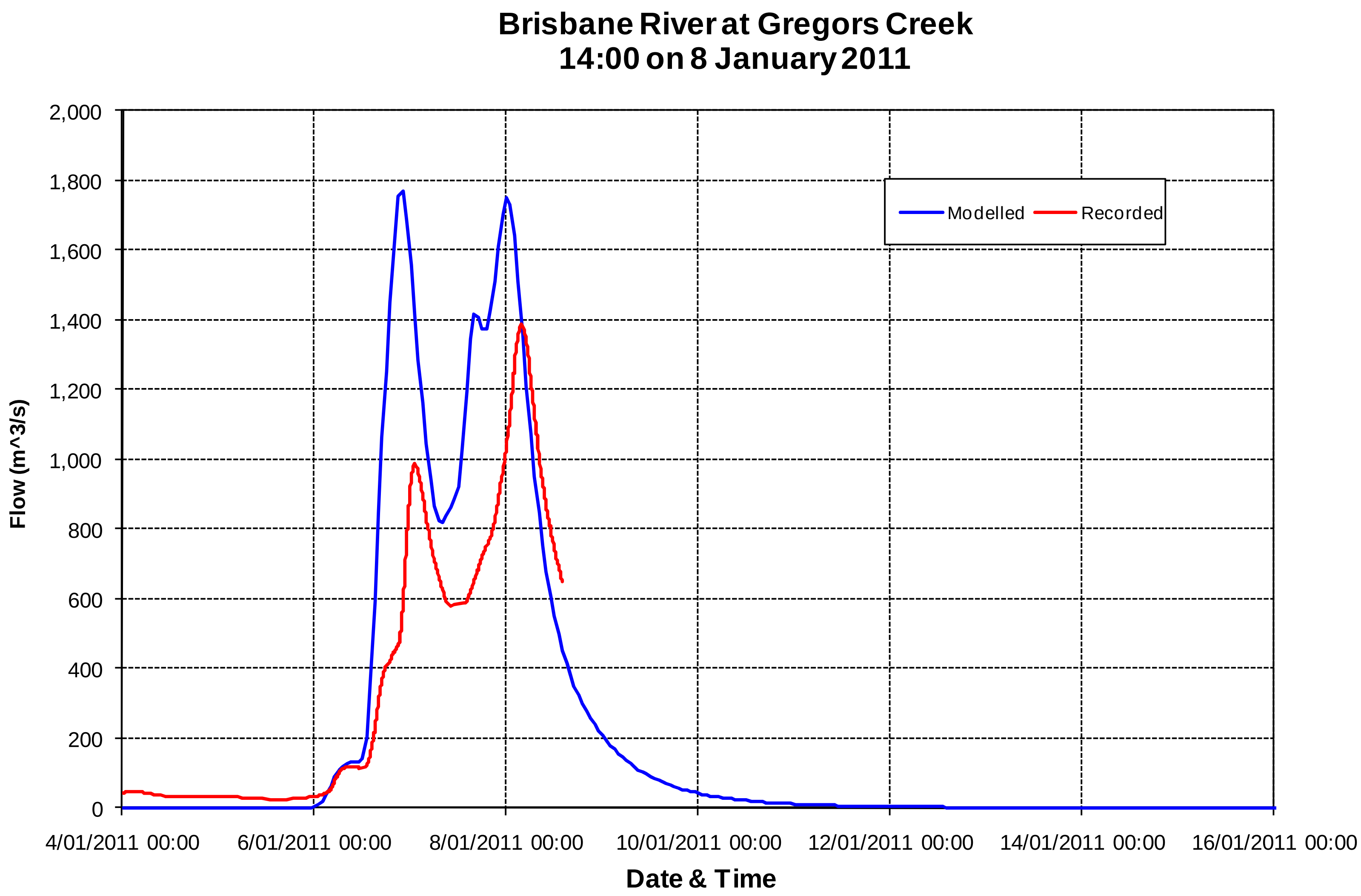
Run 8: Friday 7 January 2011, 14:00

Run 10

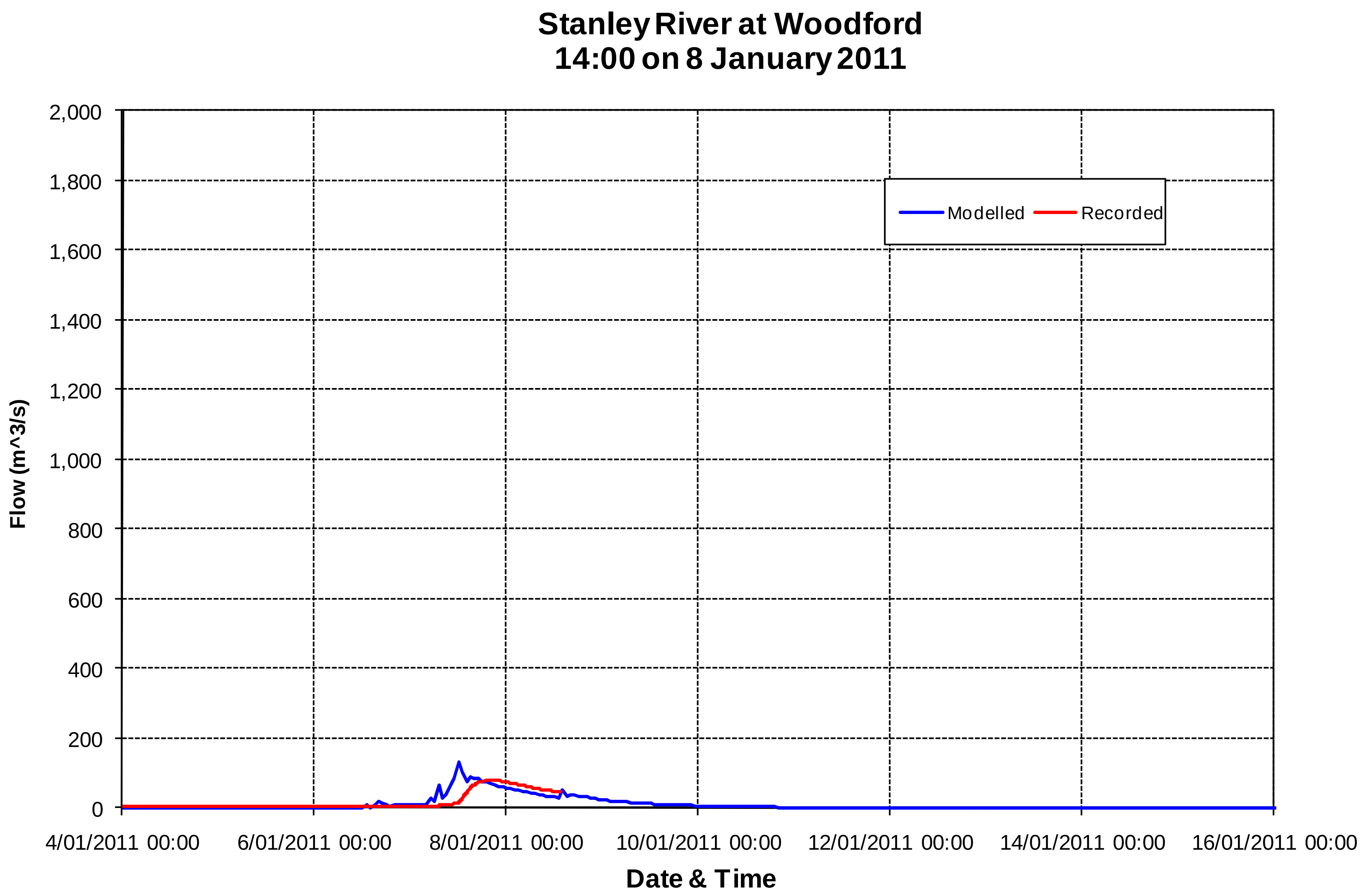
Date: Saturday 8 January 2011

Time: 14:00

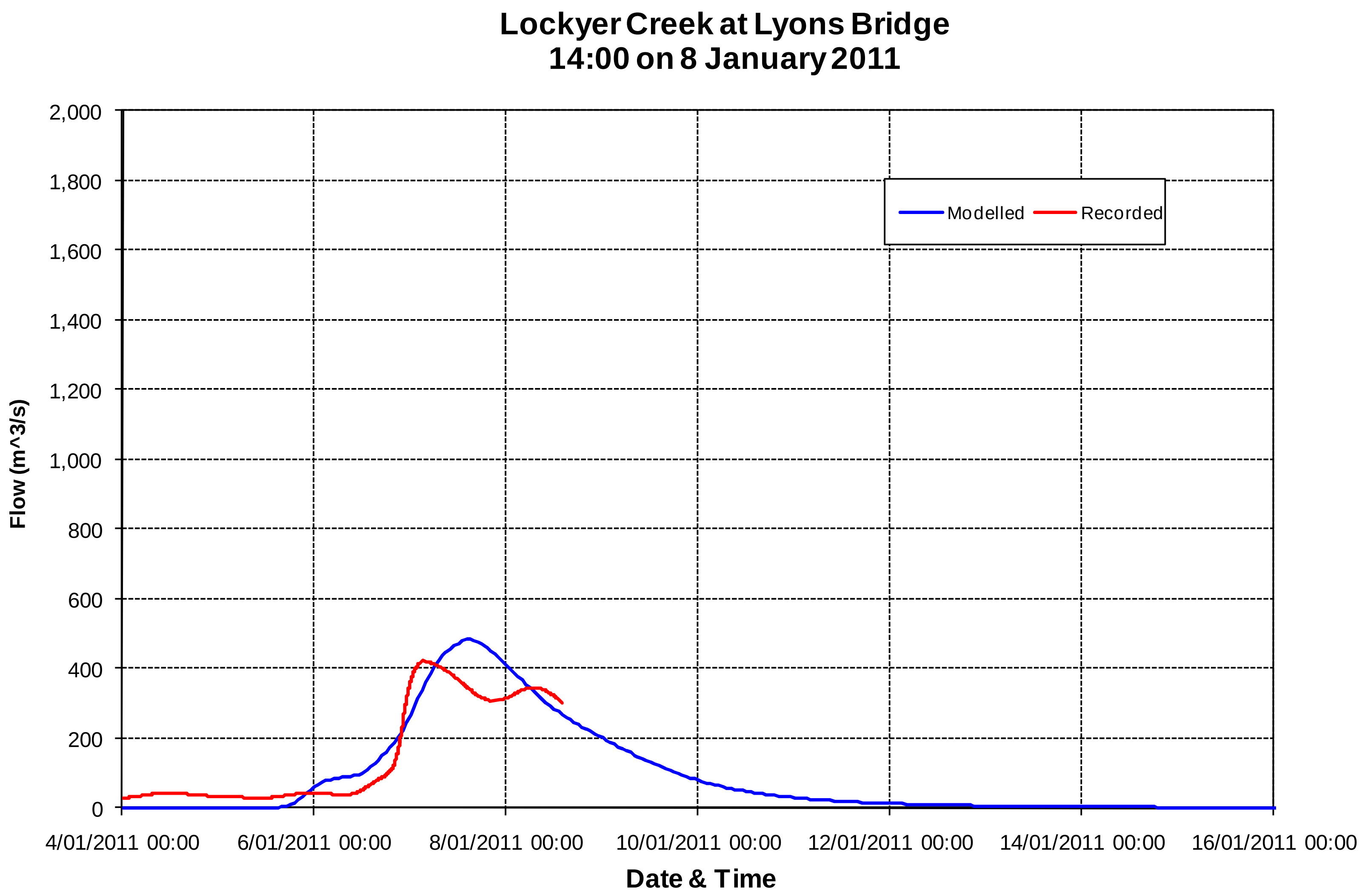
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	150,518	1,767	209,354	381	58,837
Woodford	79	8,356	134	7,628	55	-728
Lyons Bridge	422	67,238	485	65,809	62	-1,429
Walloon	412	30,148	181	24,936	-231	-5,212
Amberley	164	25,976	210	24,026	46	-1,950
Estimate to date and time of run						
Somerset			1,120	84,130		
Wivenhoe			2,010	217,815		
Total Event estimate						
Somerset			1,120	97,880		
Wivenhoe			2,010	289,112		



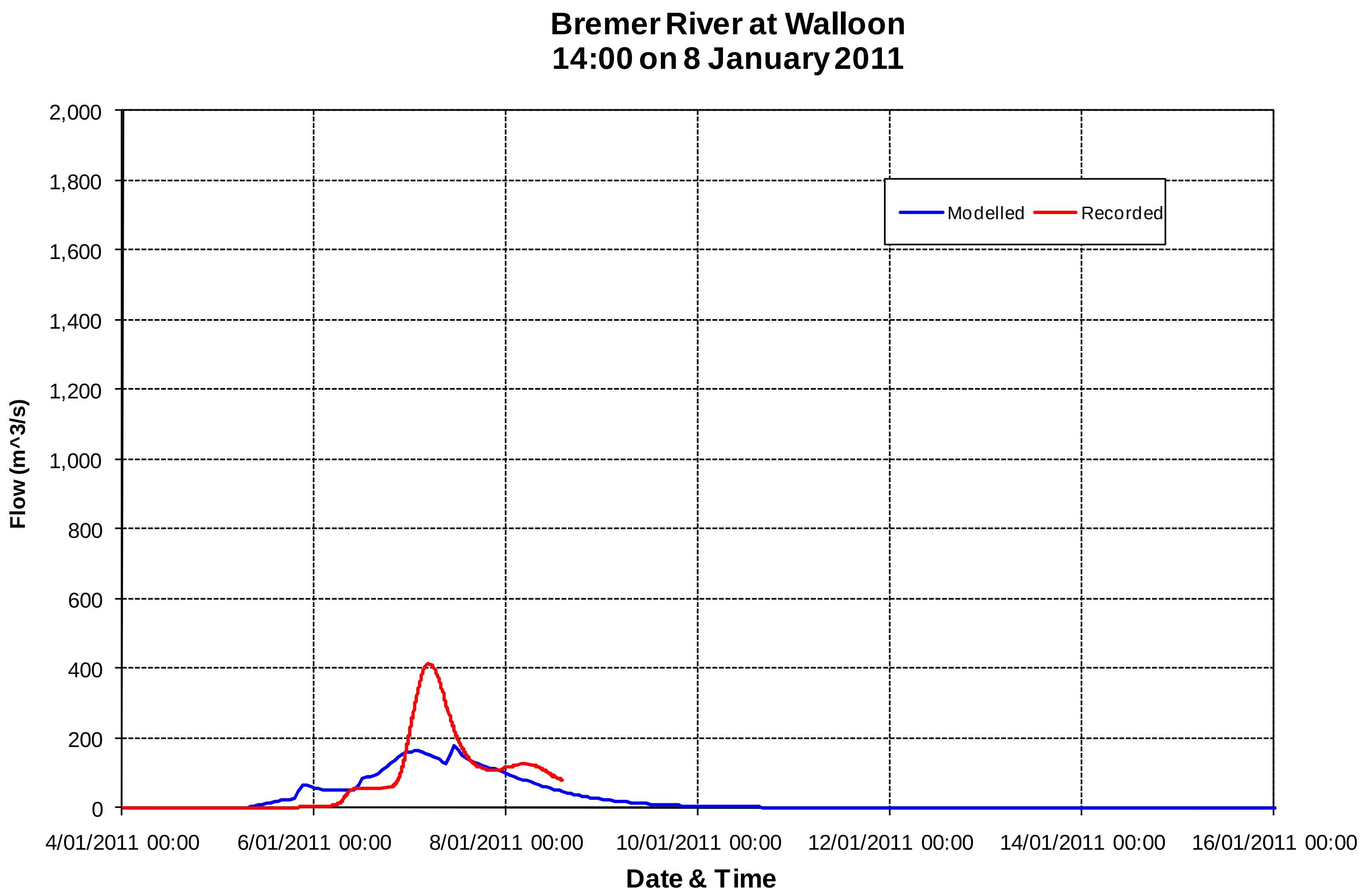
Run 10: Saturday 8 January 2011, 14:00



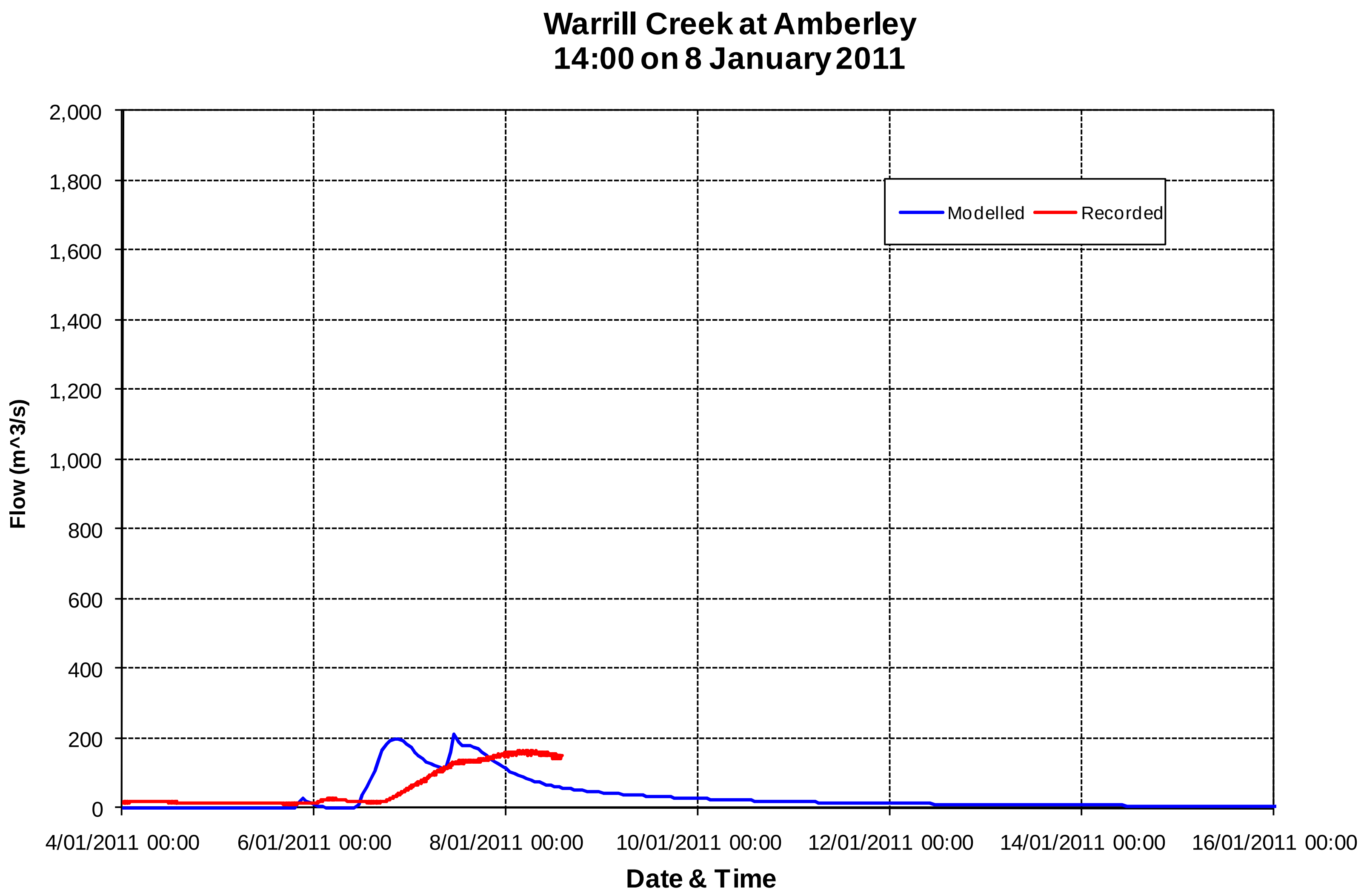
Run 10: Saturday 8 January 2011, 14:00



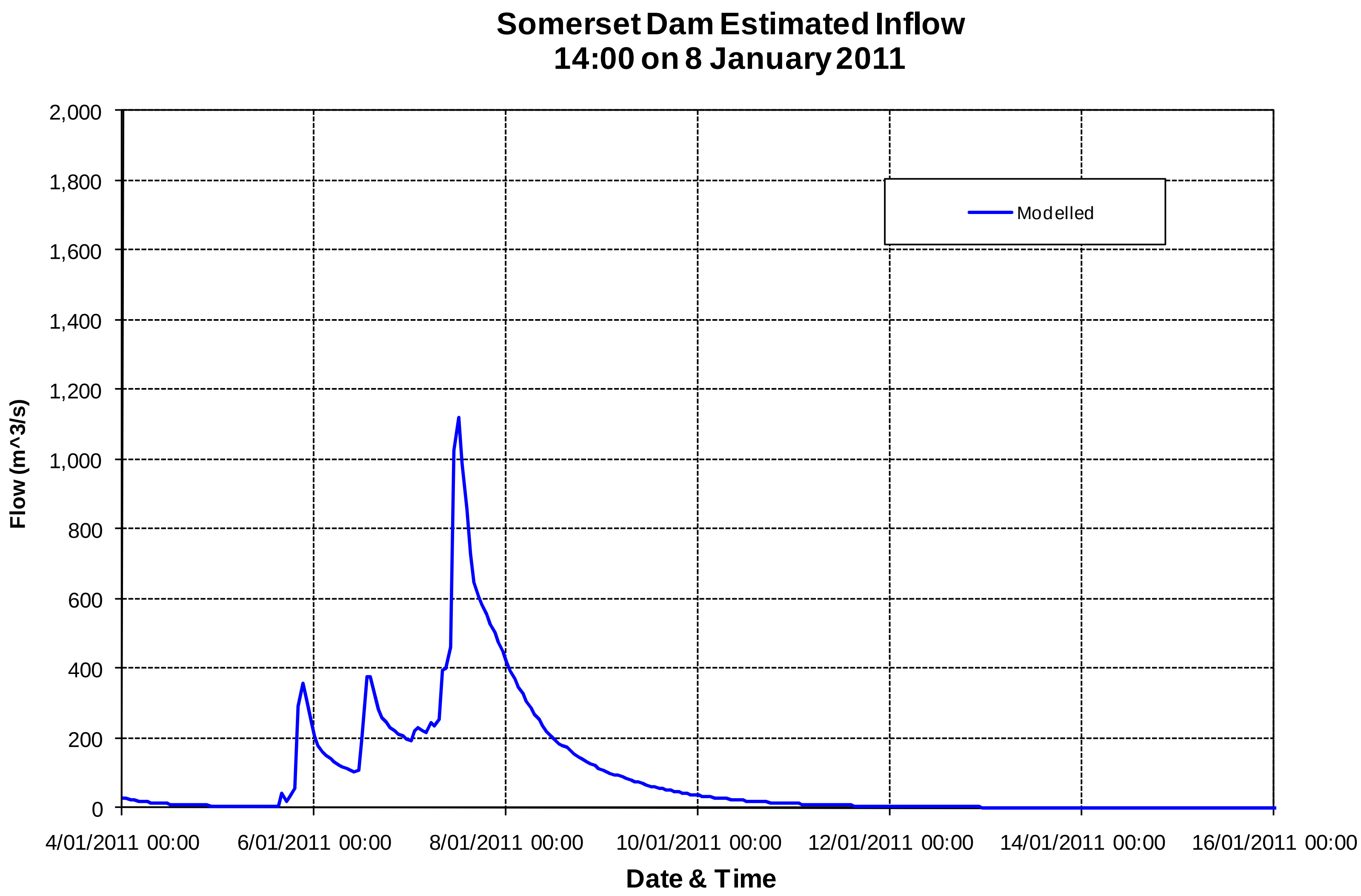
Run 10: Saturday 8 January 2011, 14:00



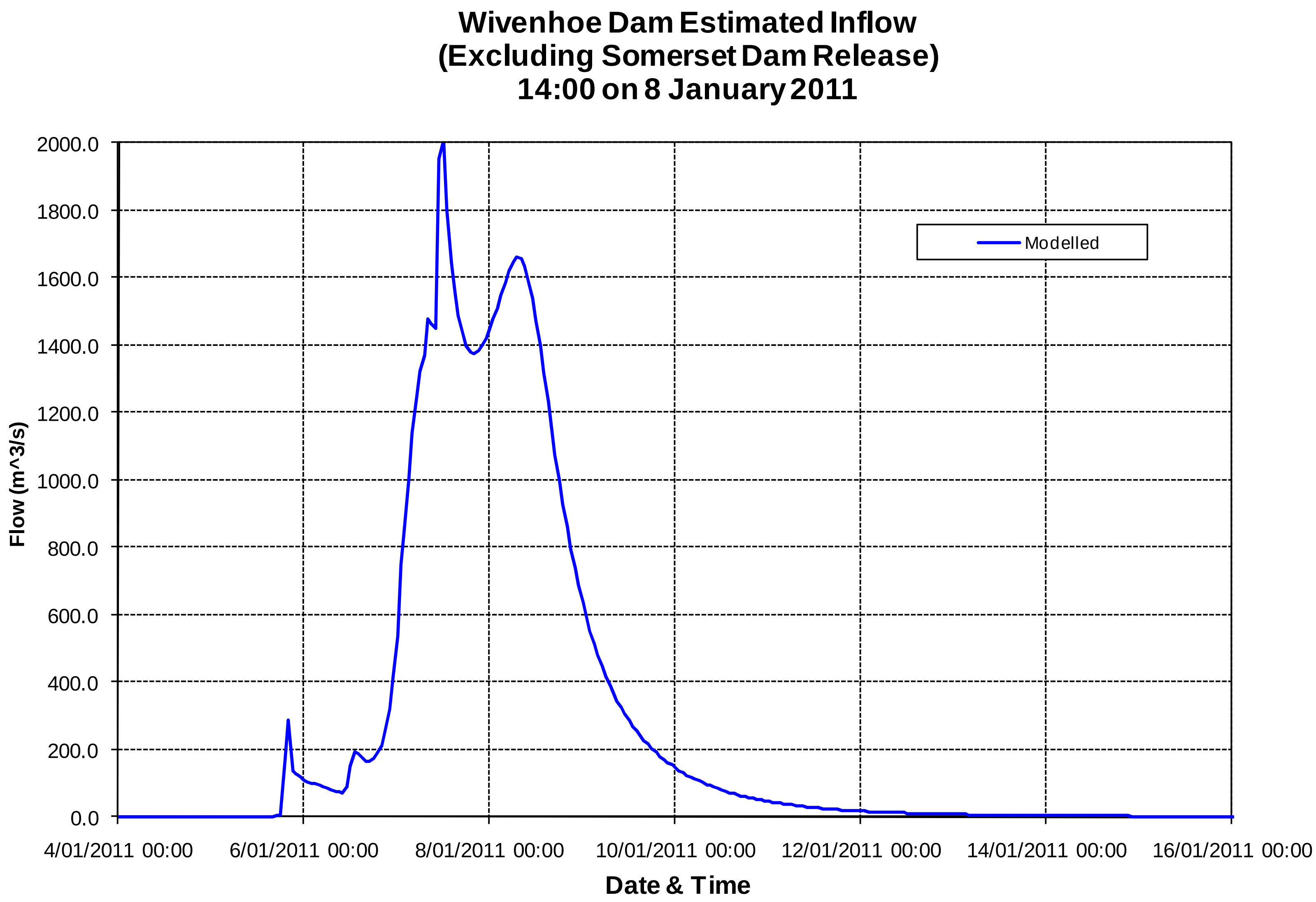
Run 10: Saturday 8 January 2011, 14:00



Run 10: Saturday 8 January 2011, 14:00



Run 10: Saturday 8 January 2011, 14:00



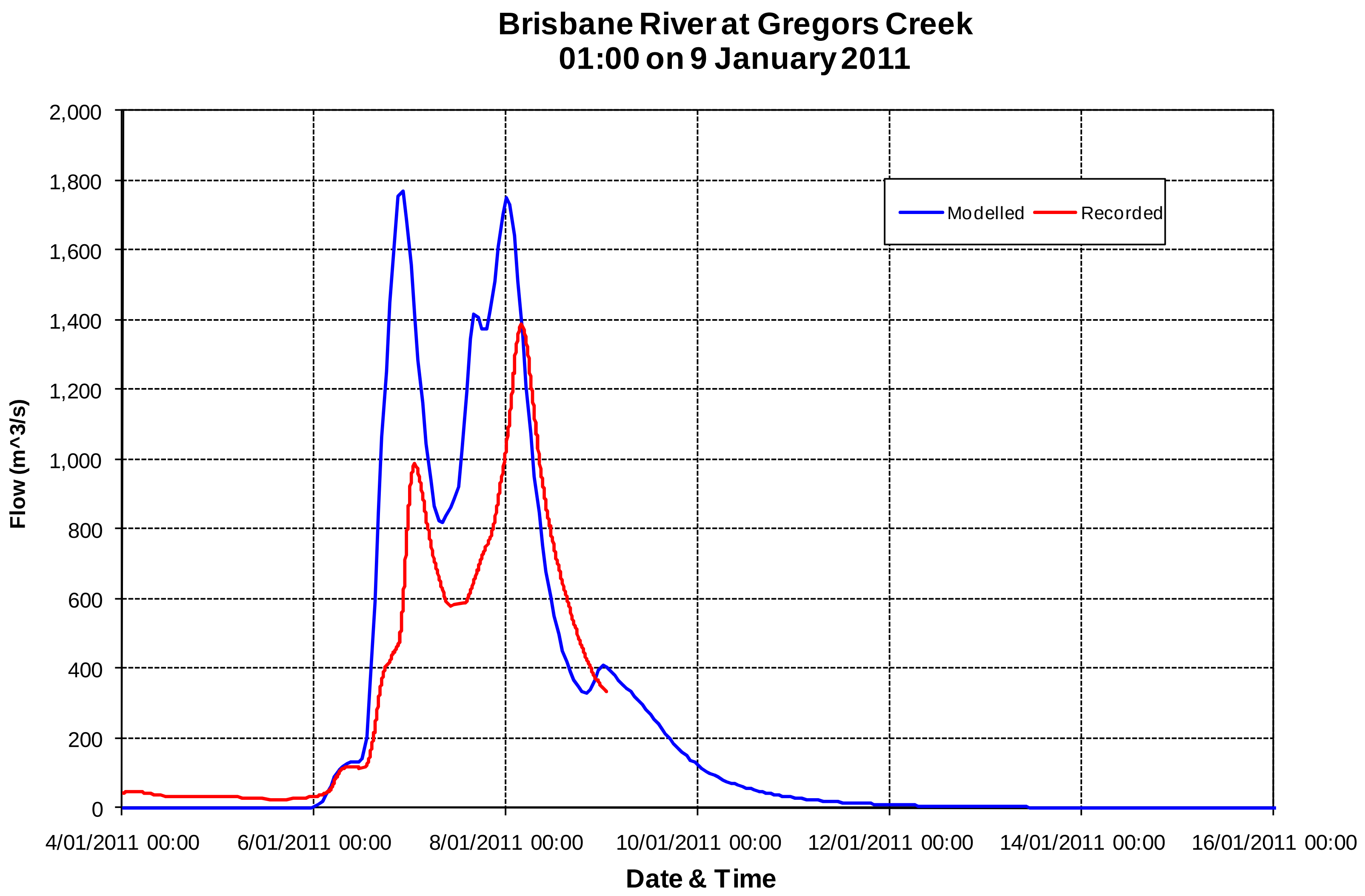
Run 10: Saturday 8 January 2011, 14:00

Run 12

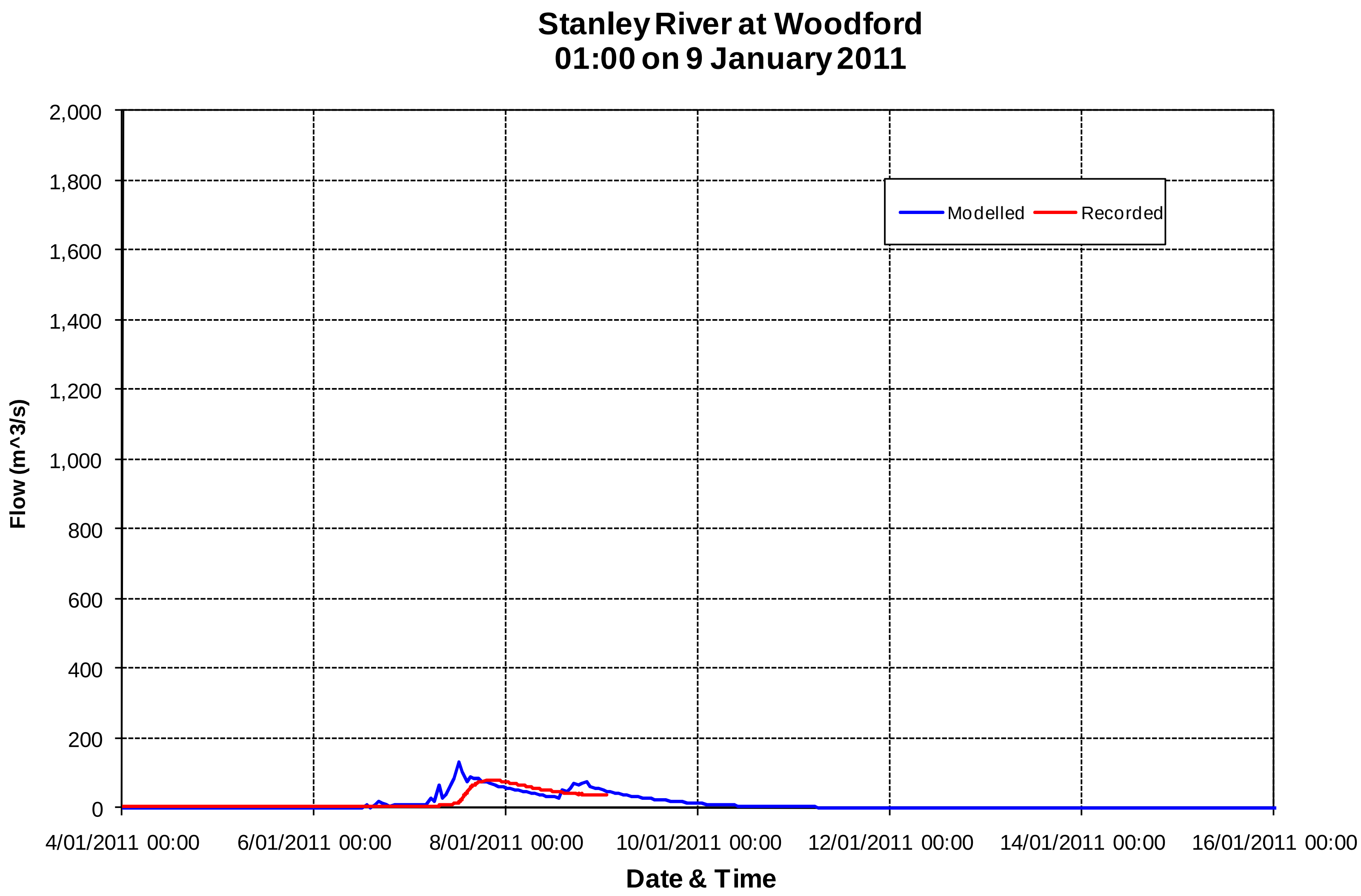
Date: Sunday 9 January 2011

Time: 01:00

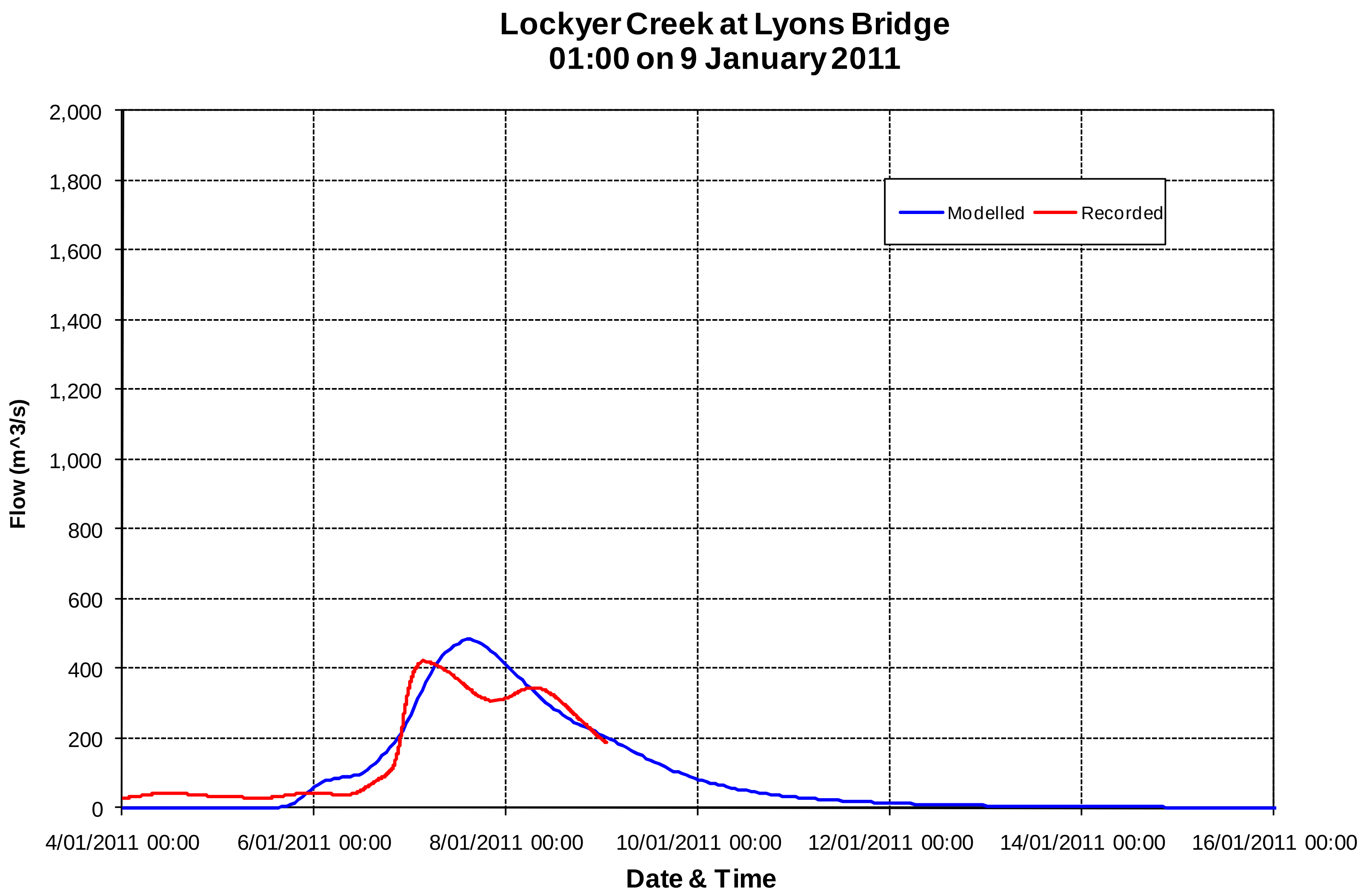
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	168,163	1,767	224,123	381	55,960
Woodford	79	9,905	134	9,993	55	88
Lyons Bridge	422	76,656	485	74,942	62	-1,714
Walloon	412	32,134	251	29,399	-161	-2,734
Amberley	164	30,702	210	26,004	46	-4,697
Estimate to date and time of run						
Somerset			1,120	94,622		
Wivenhoe			2,010	253,094		
Total Event estimate						
Somerset			1,120	113,854		
Wivenhoe			2,010	311,202		



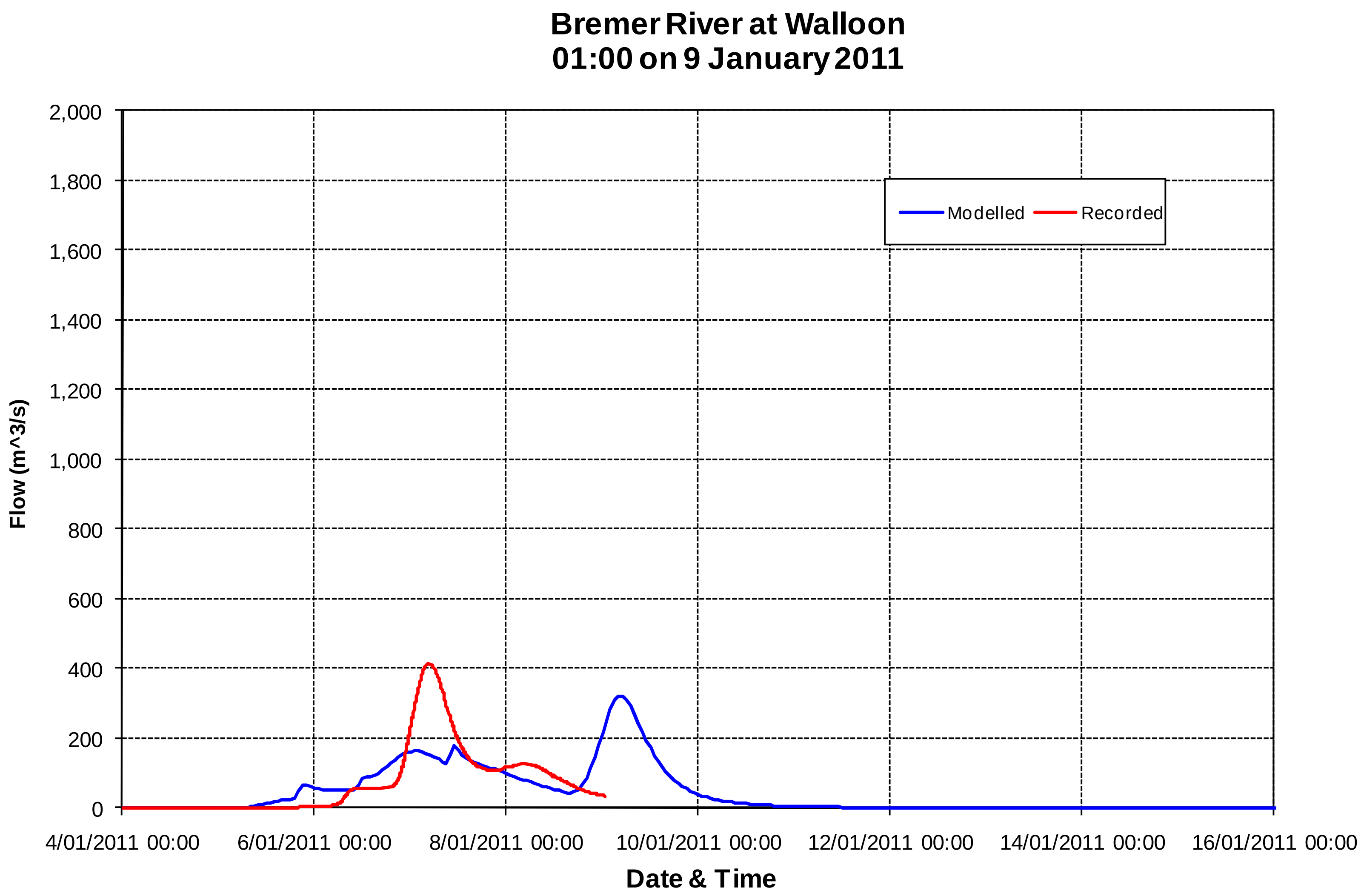
Run 12: Sunday 9 January 2011, 01:00



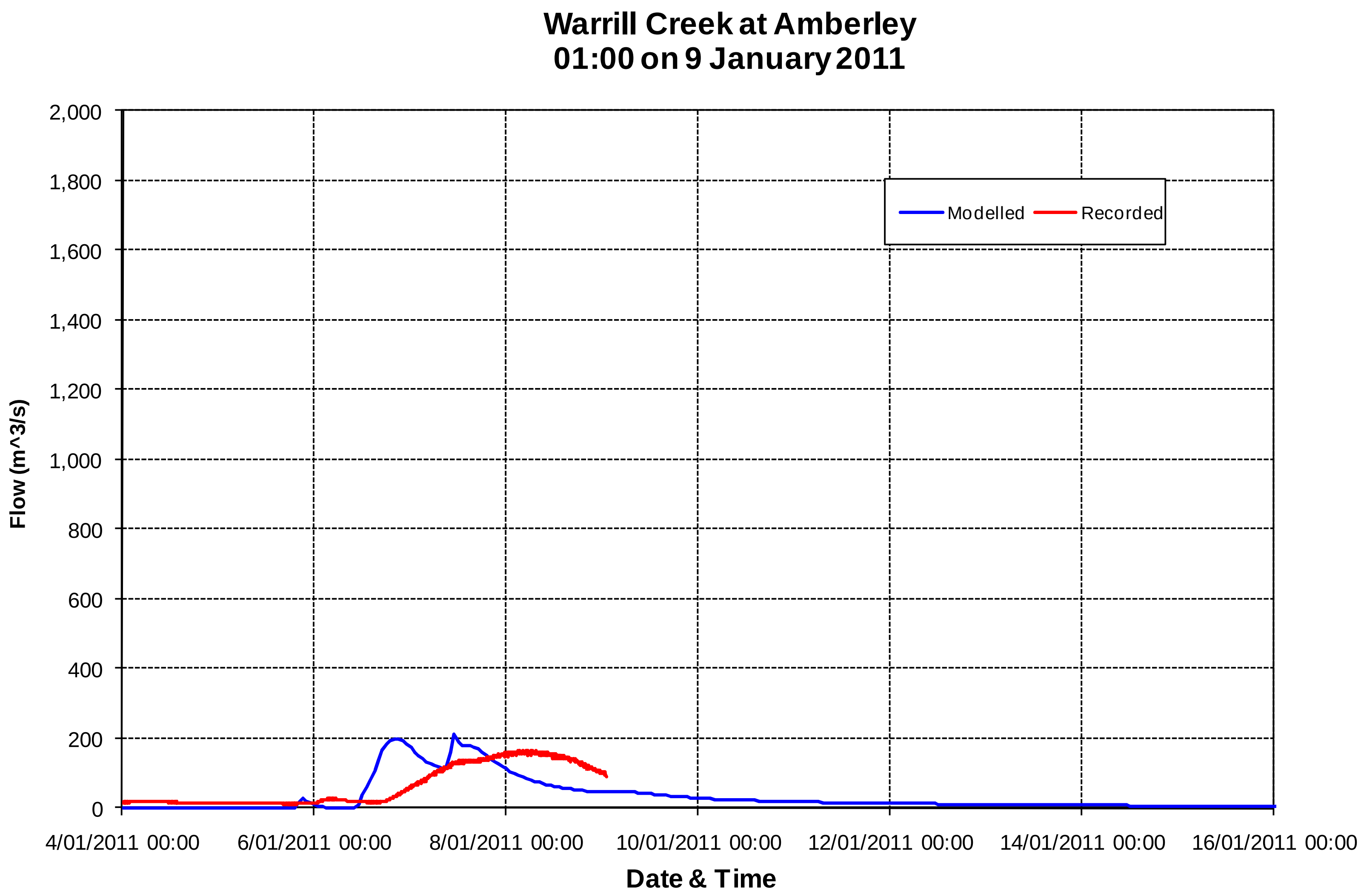
Run 12: Sunday 9 January 2011, 01:00



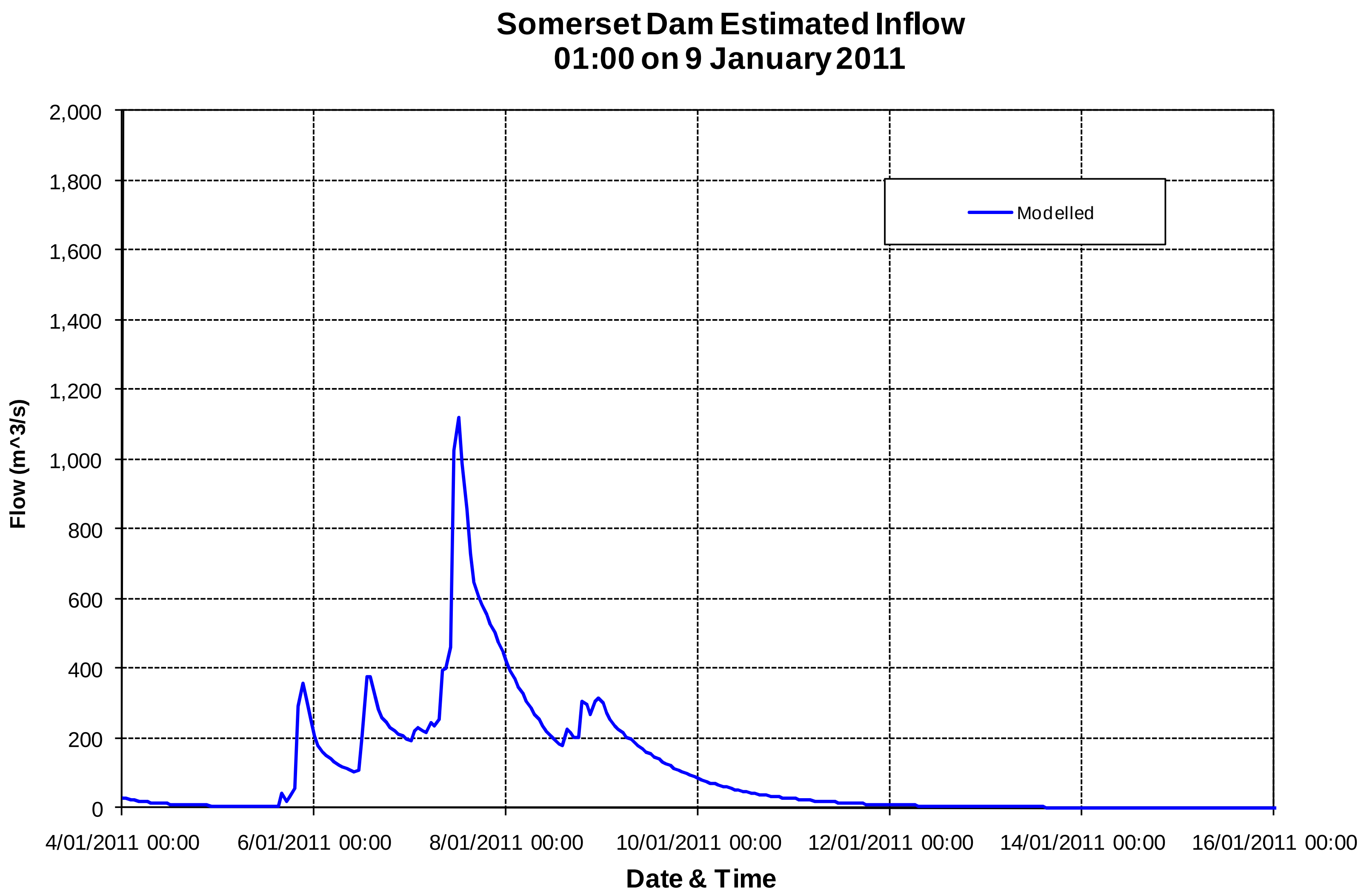
Run 12: Sunday 9 January 2011, 01:00



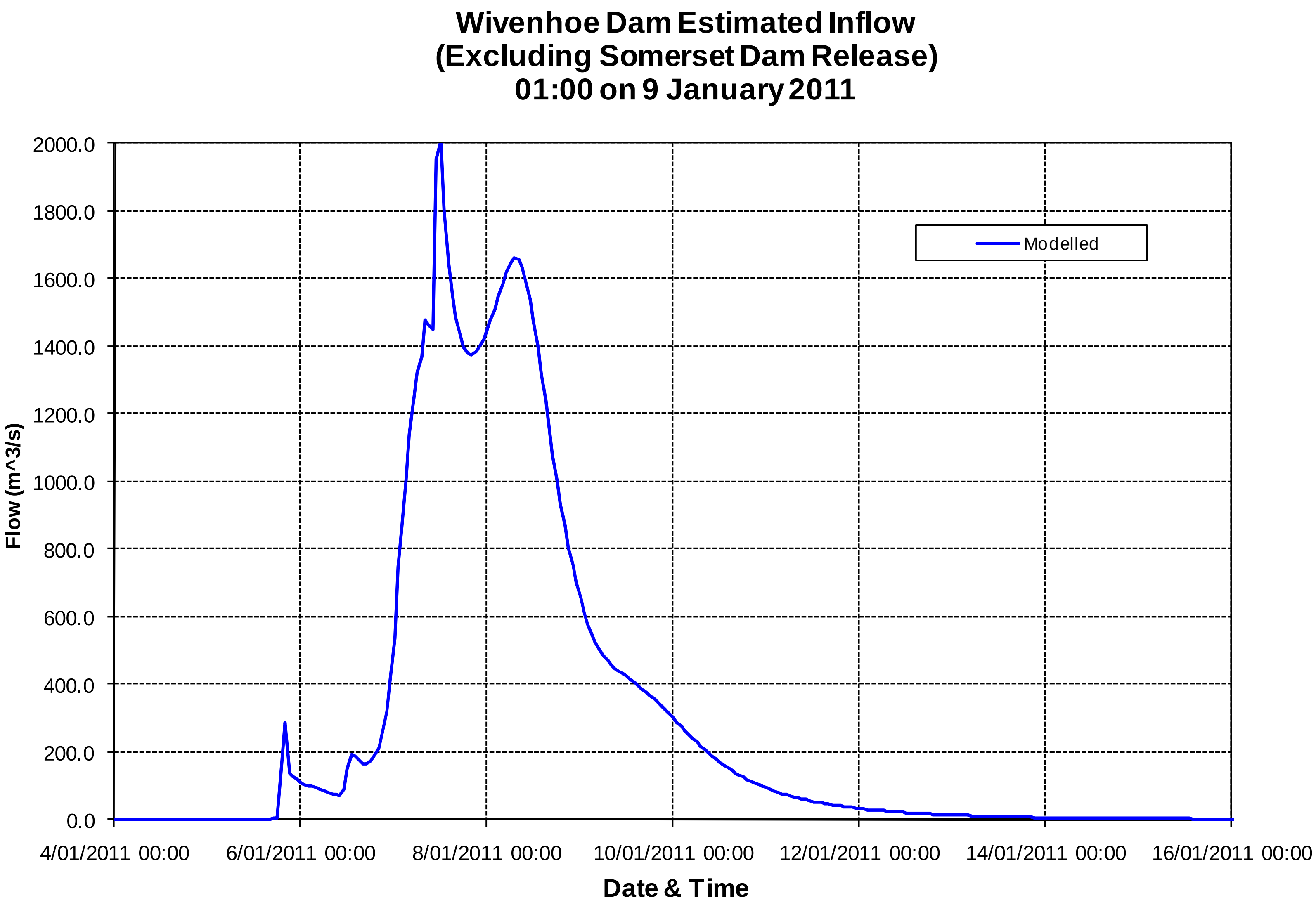
Run 12: Sunday 9 January 2011, 01:00



Run 12: Sunday 9 January 2011, 01:00



Run 12: Sunday 9 January 2011, 01:00



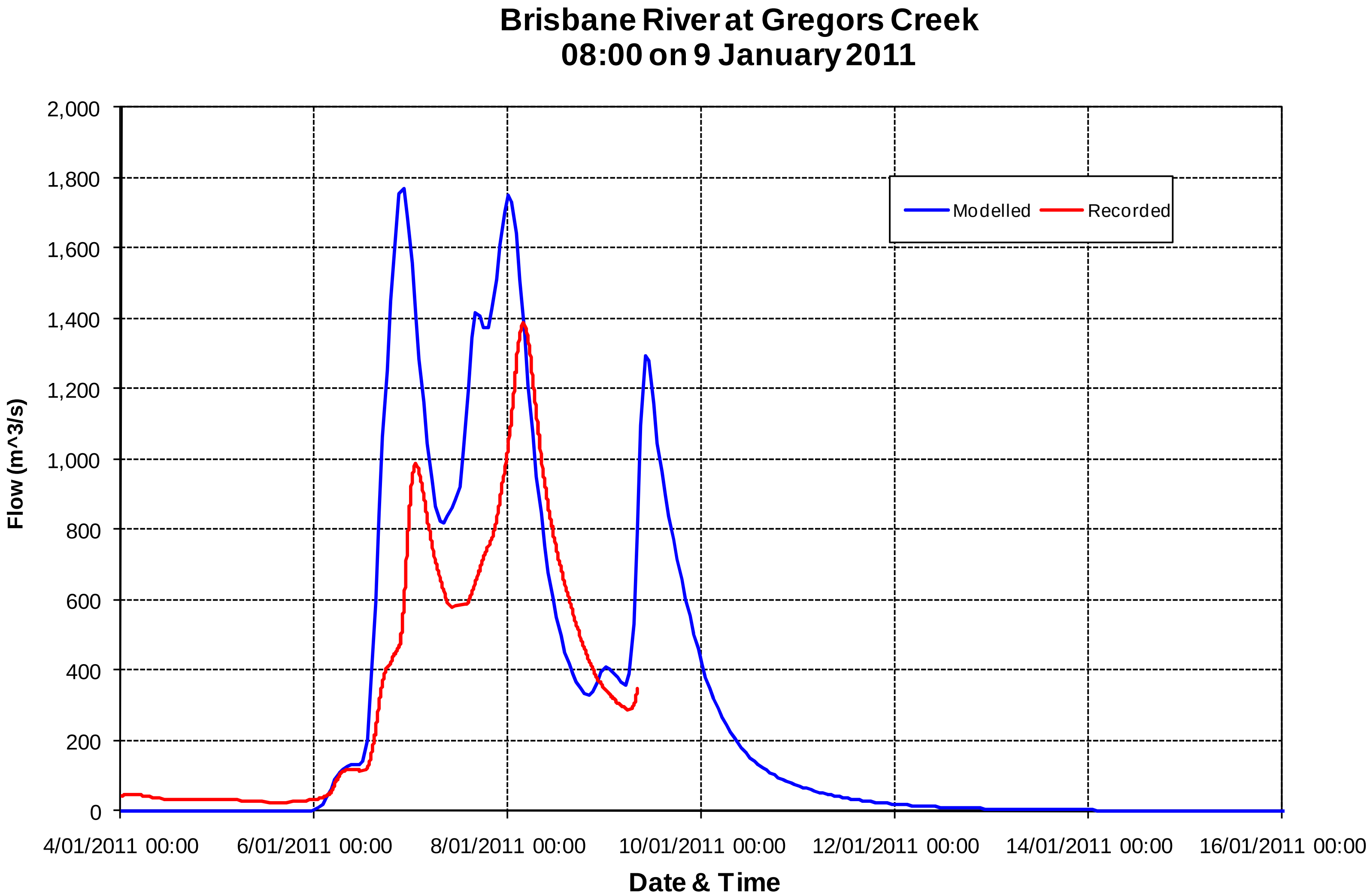
Run 12: Sunday 9 January 2011, 01:00

Run 14

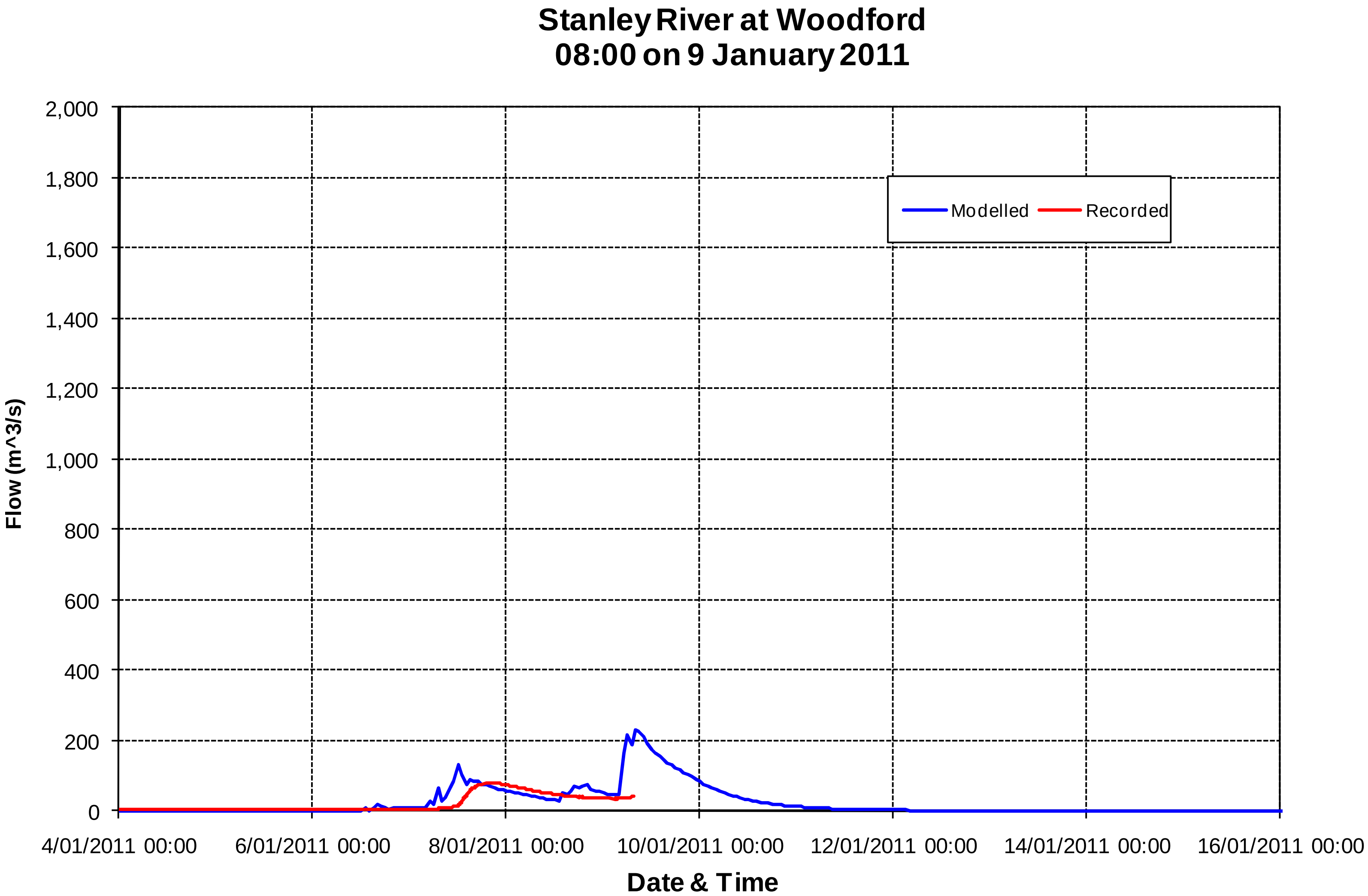
Date: Sunday 9 January 2011

Time: 08:00

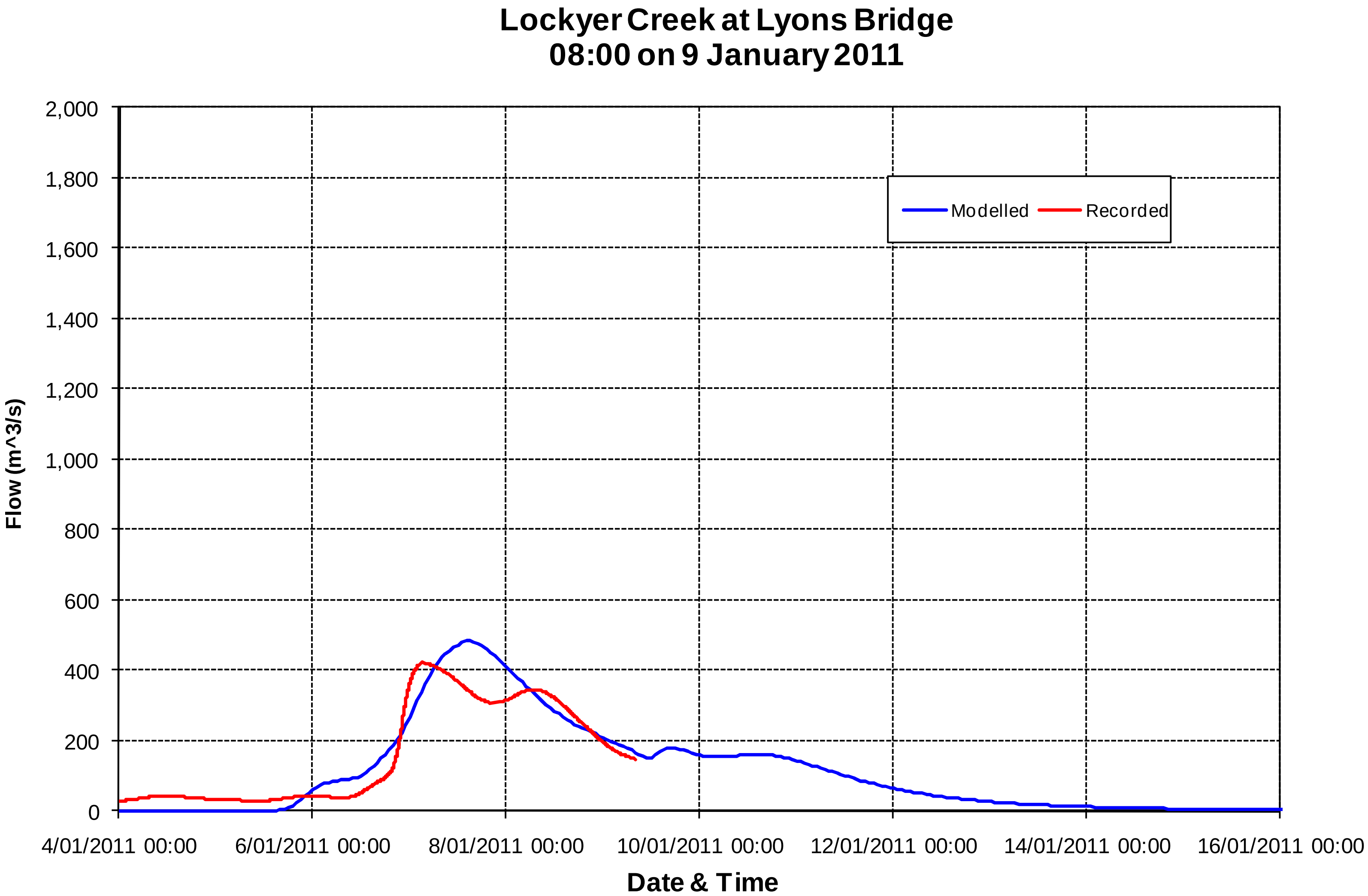
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	175,953	1,767	235,715	381	59,761
Woodford	79	10,863	229	13,359	150	2,496
Lyons Bridge	422	80,713	485	79,538	62	-1,175
Walloon	412	32,737	412	38,411	0	5,674
Amberley	164	32,719	210	27,172	46	-5,547
Estimate to date and time of run						
Somerset			1,120	104,259		
Wivenhoe			2,010	266,100		
Total Event estimate						
Somerset			1,120	157,198		
Wivenhoe			2,010	363,595		



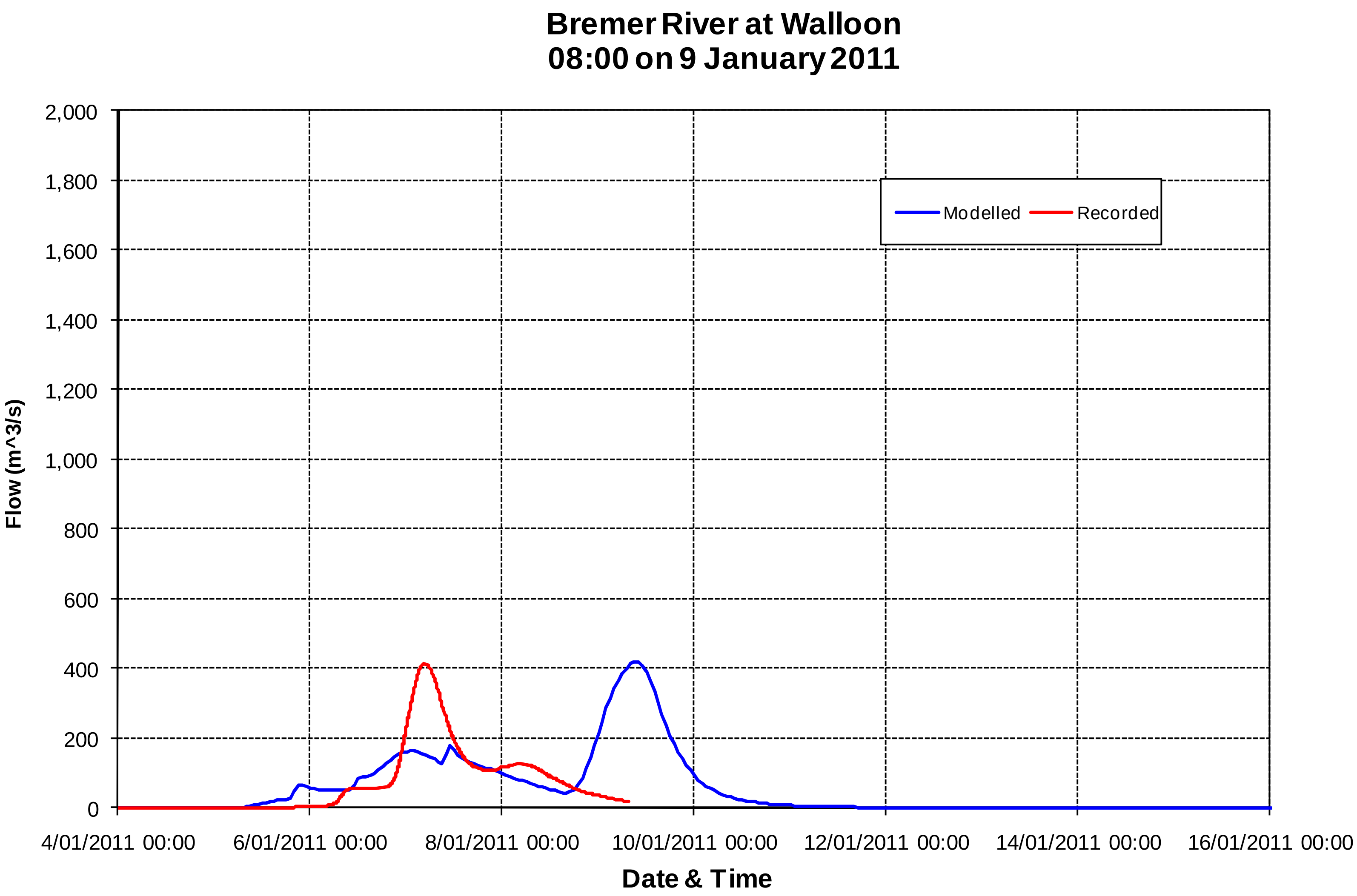
Run 14: Sunday 9 January 2011, 08:00



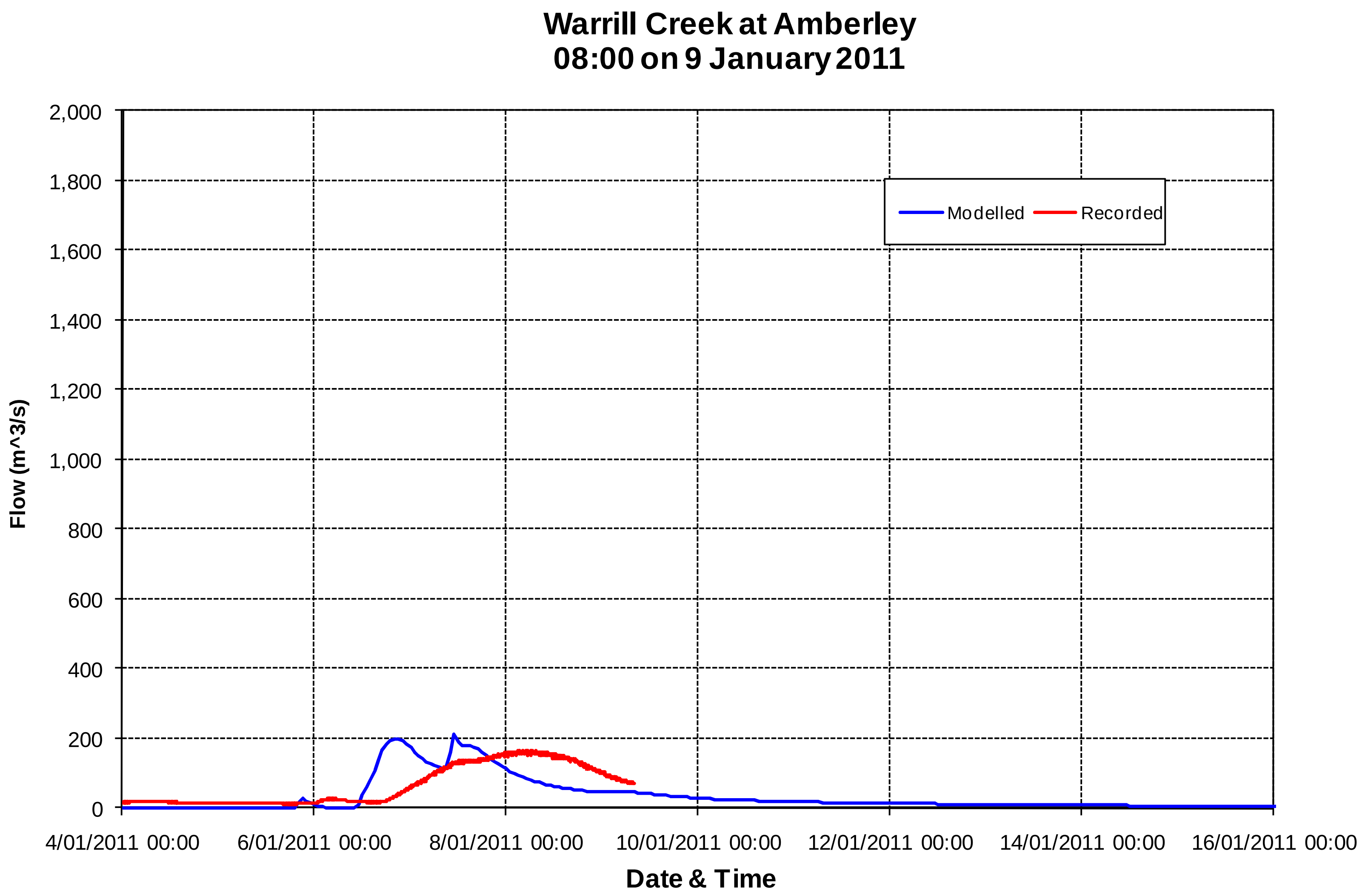
Run 14: Sunday 9 January 2011, 08:00



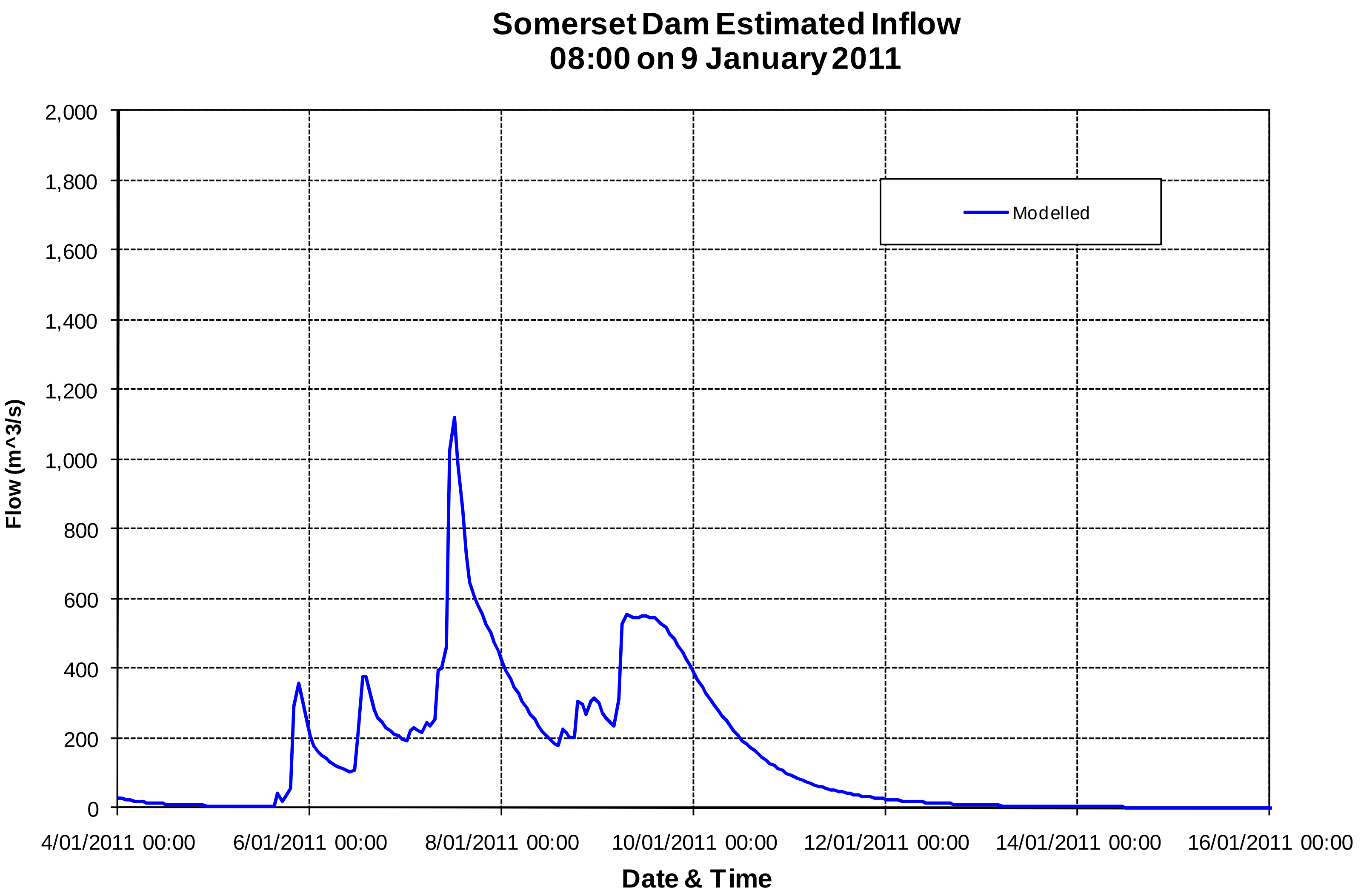
Run 14: Sunday 9 January 2011, 08:00



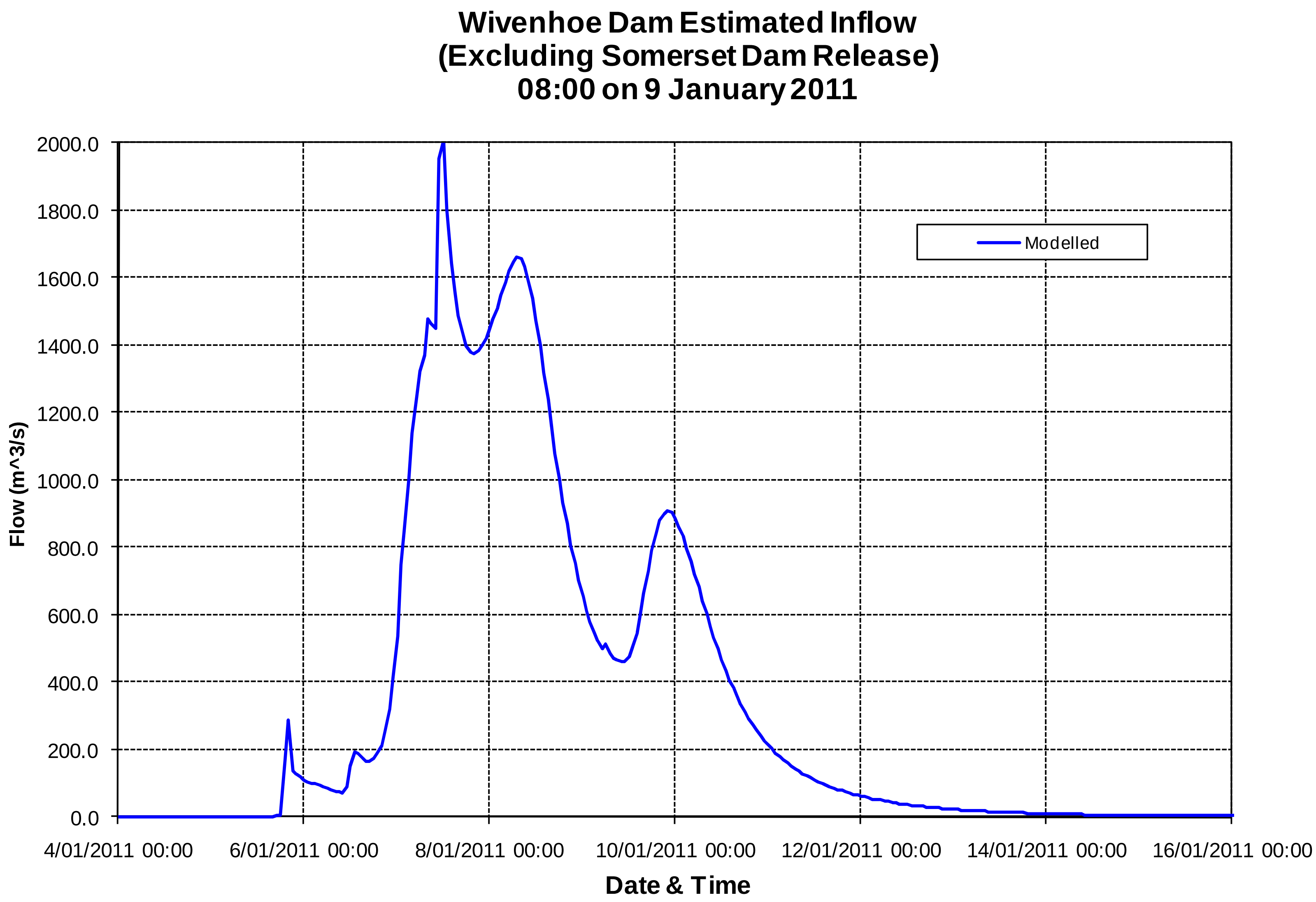
Run 14: Sunday 9 January 2011, 08:00



Run 14: Sunday 9 January 2011, 08:00



Run 14: Sunday 9 January 2011, 08:00



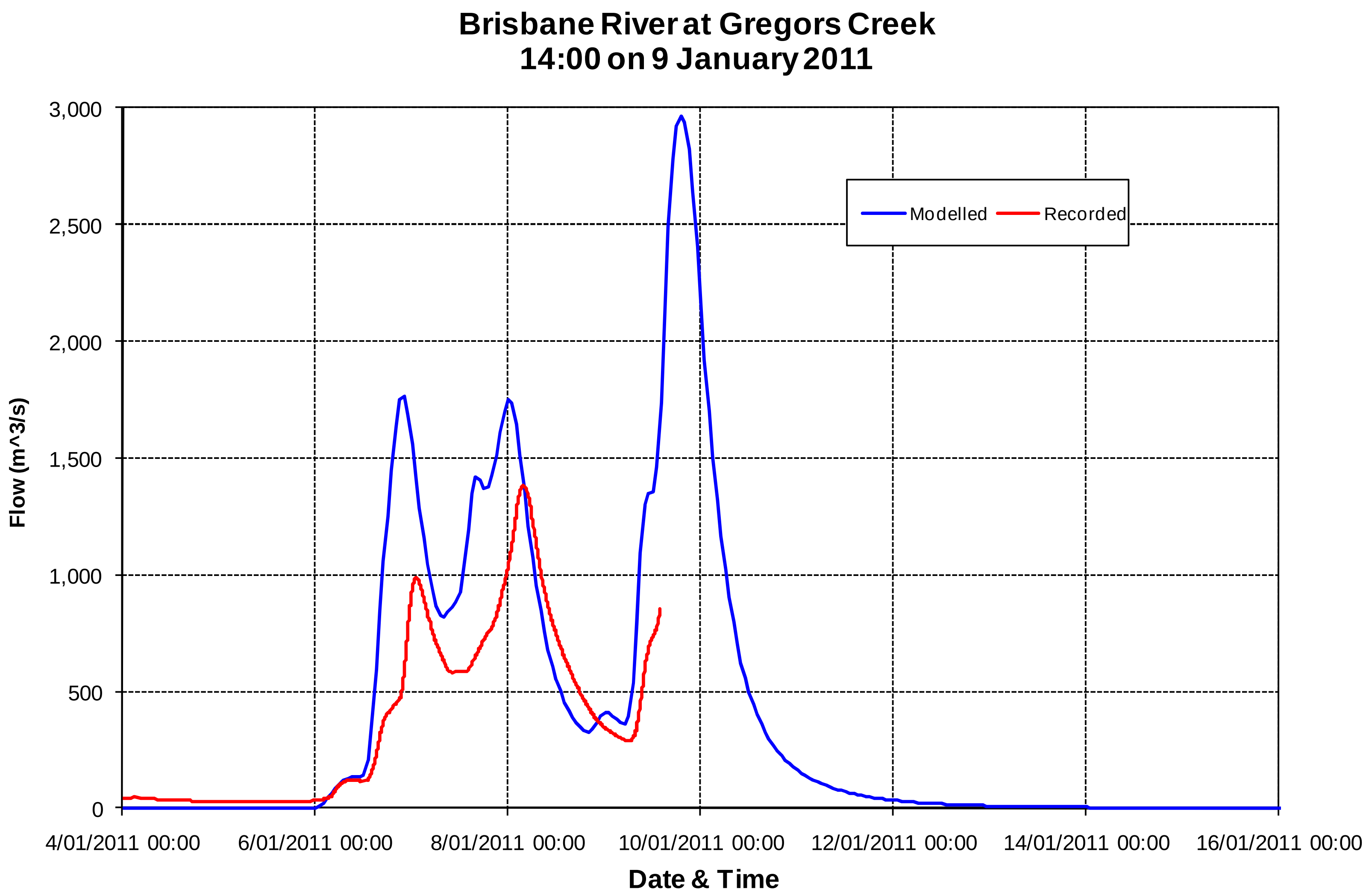
Run 14: Sunday 9 January 2011, 08:00

Run 17

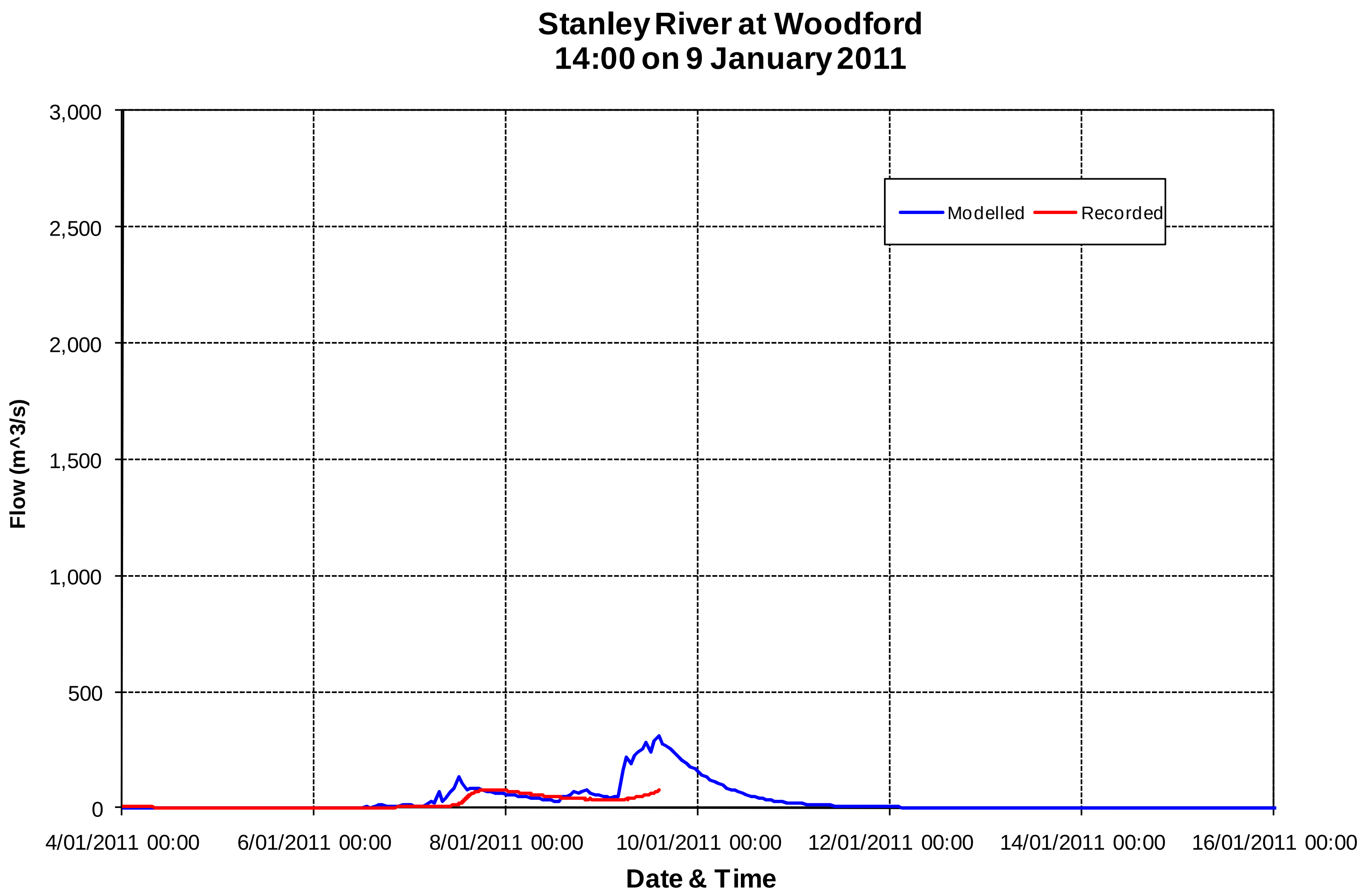
Date: Sunday 9 January 2011

Time: 14:00

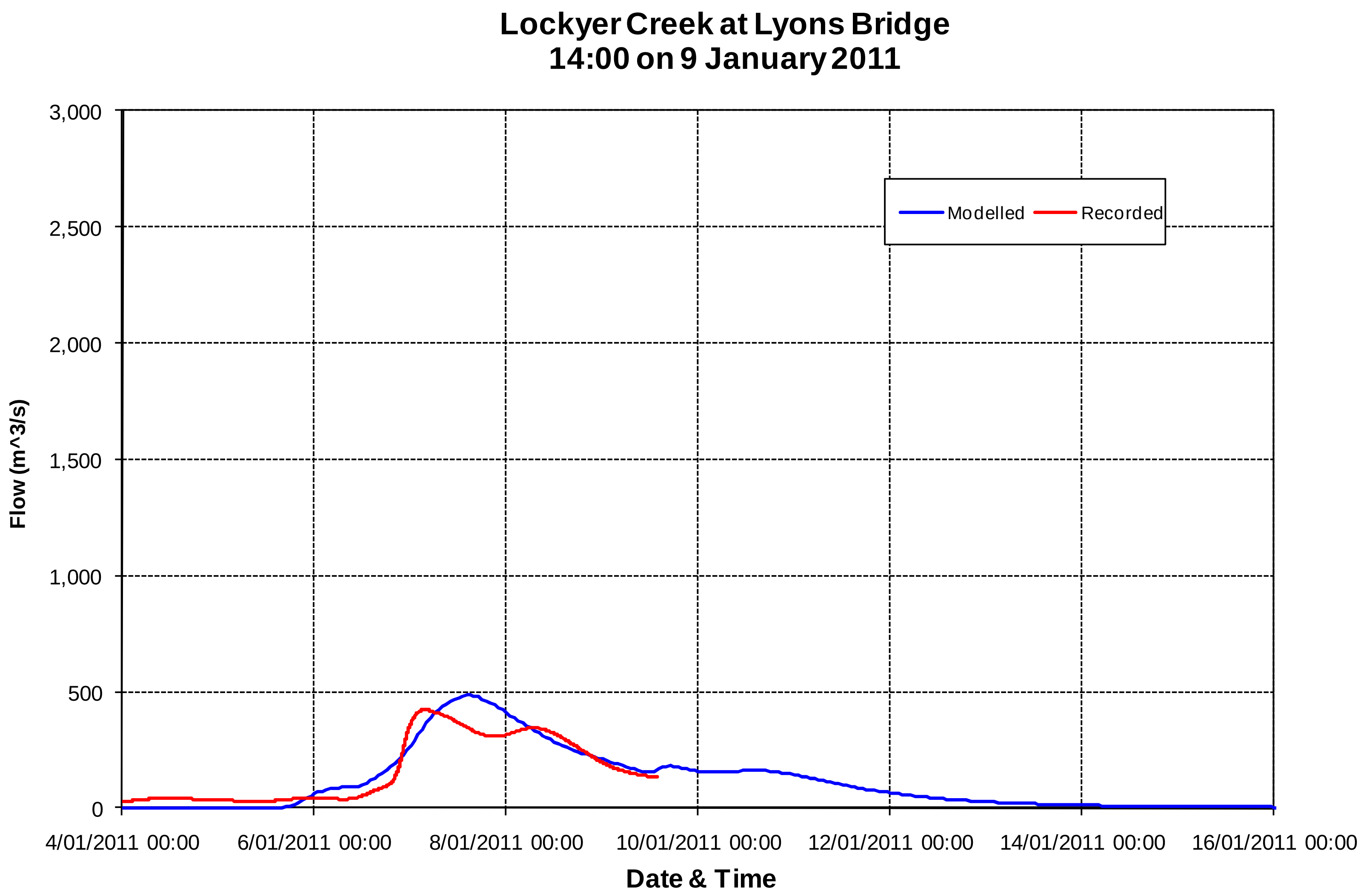
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	1,387	190,752	1,767	265,570	381	74,818
Woodford	79	12,165	313	19,195	233	7,030
Lyons Bridge	422	83,681	485	82,959	62	-722
Walloon	412	33,088	551	48,994	139	15,906
Amberley	164	34,158	210	29,641	46	-4,517
Estimate to date and time of run						
Somerset			1,717	130,273		
Wivenhoe			2,010	282,820		
Total Event estimate						
Somerset			1,717	223,706		
Wivenhoe			2,651	517,010		



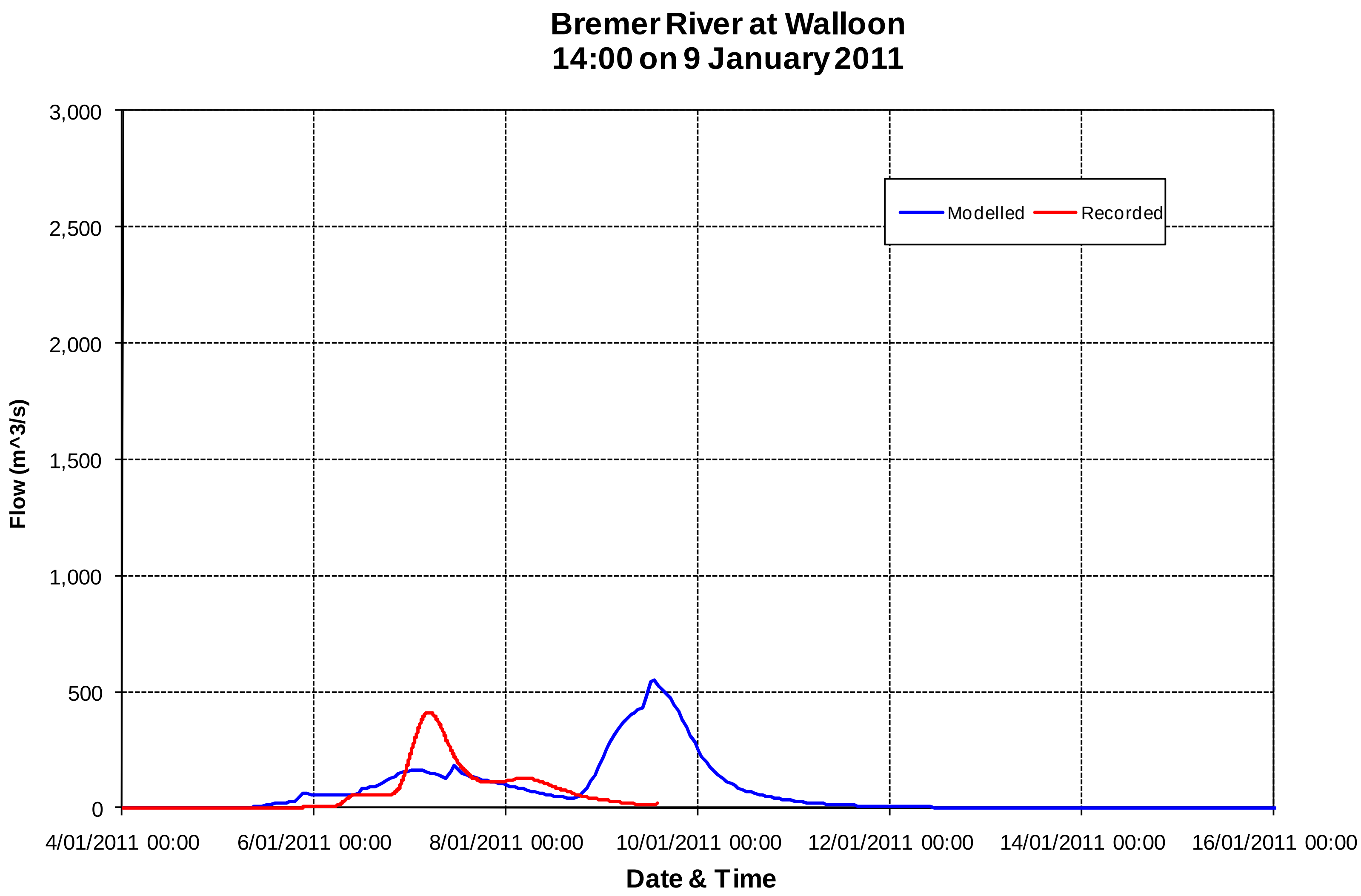
Run 17: Sunday 9 January 2011, 14:00



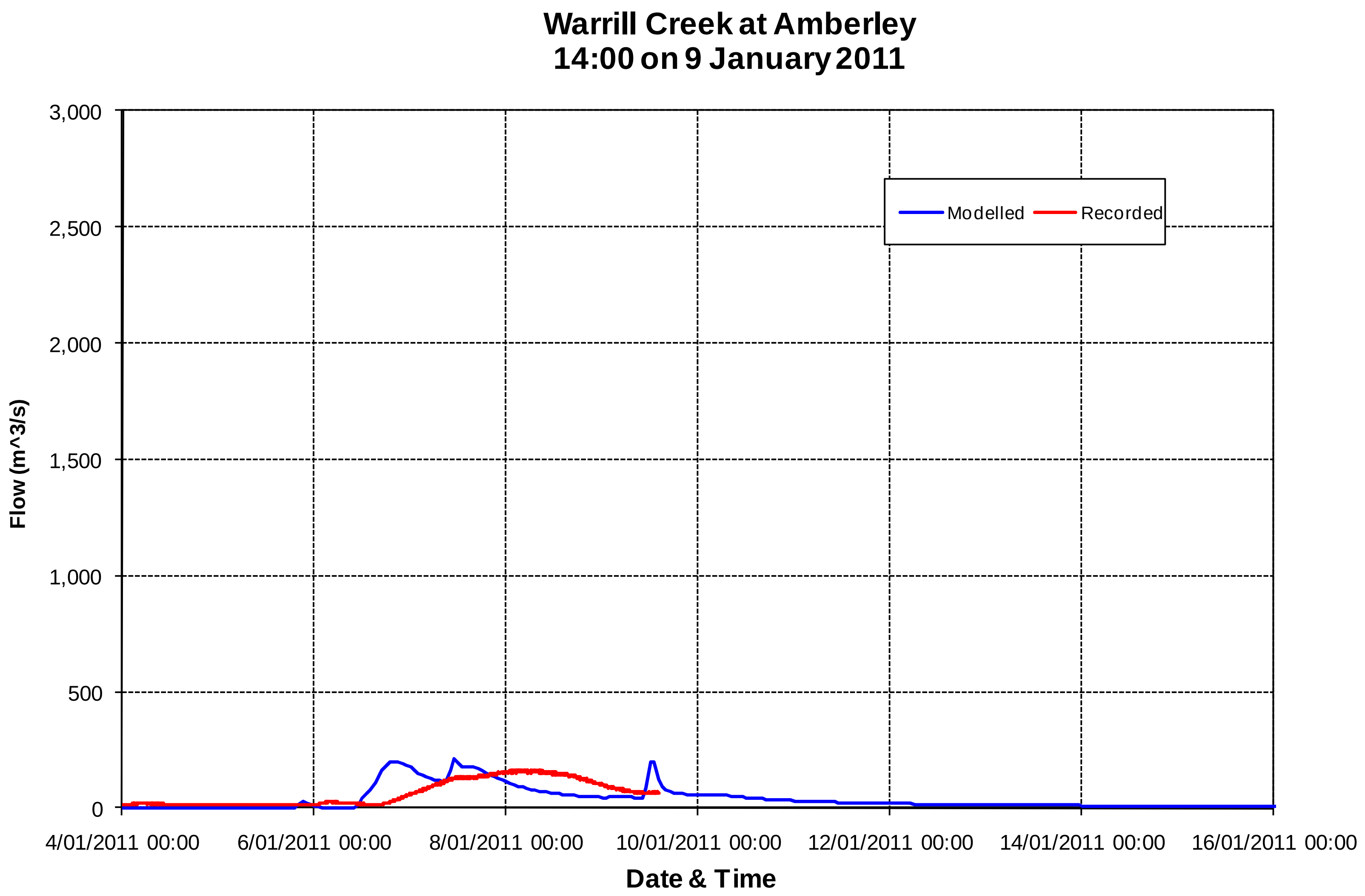
Run 17: Sunday 9 January 2011, 14:00



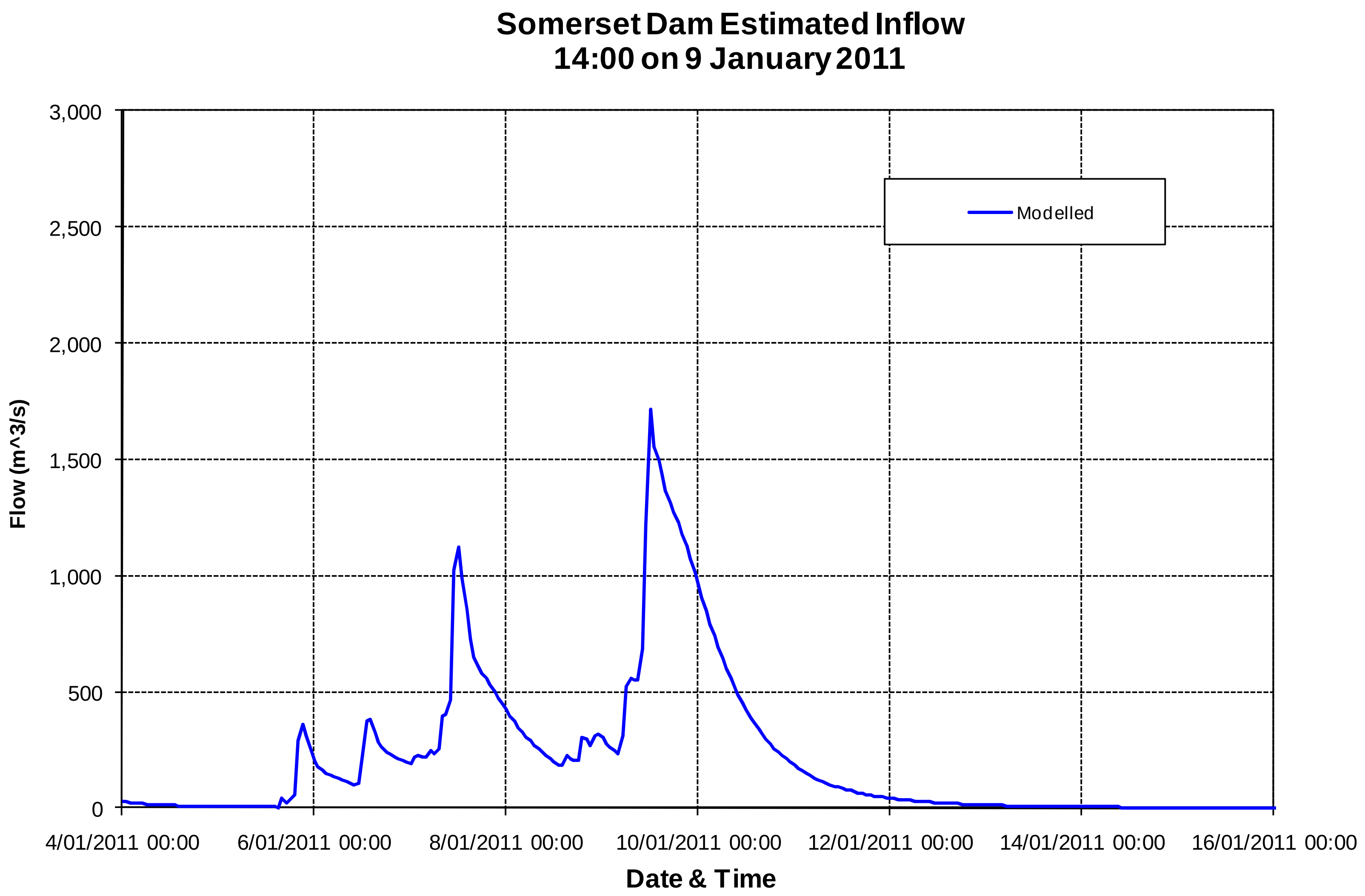
Run 17: Sunday 9 January 2011, 14:00



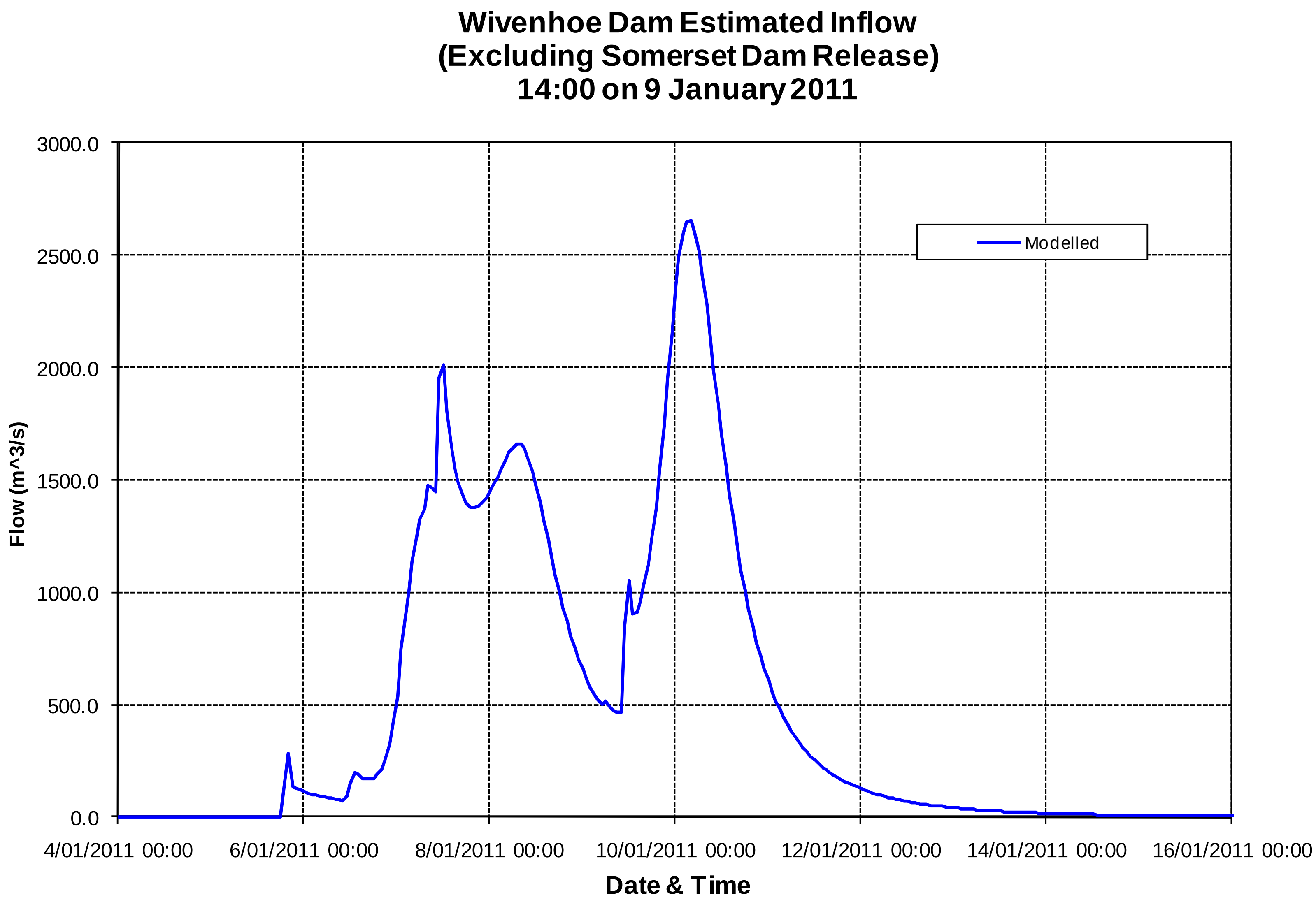
Run 17: Sunday 9 January 2011, 14:00



Run 17: Sunday 9 January 2011, 14:00



Run 17: Sunday 9 January 2011, 14:00



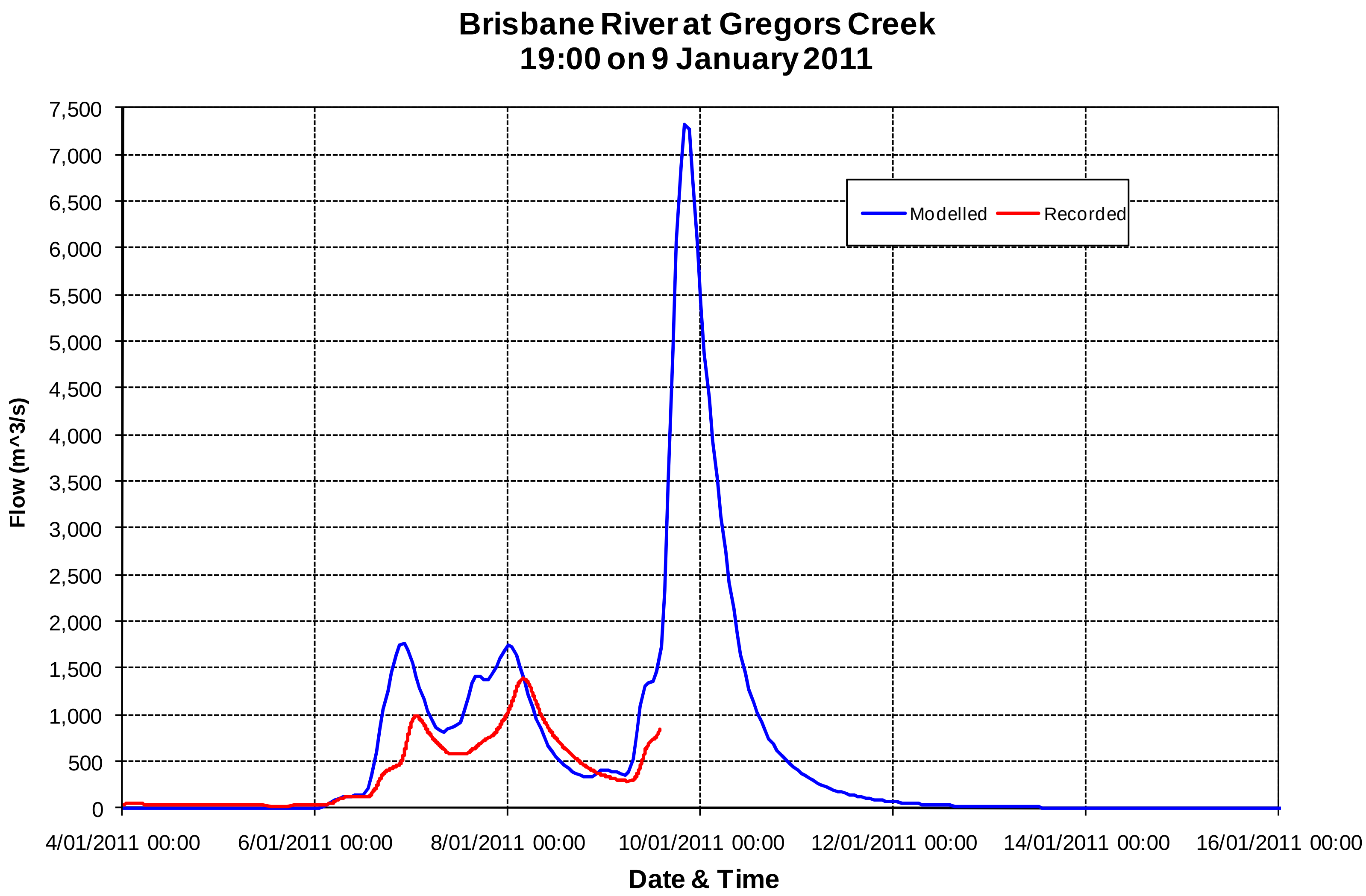
Run 17: Sunday 9 January 2011, 14:00

Run 21

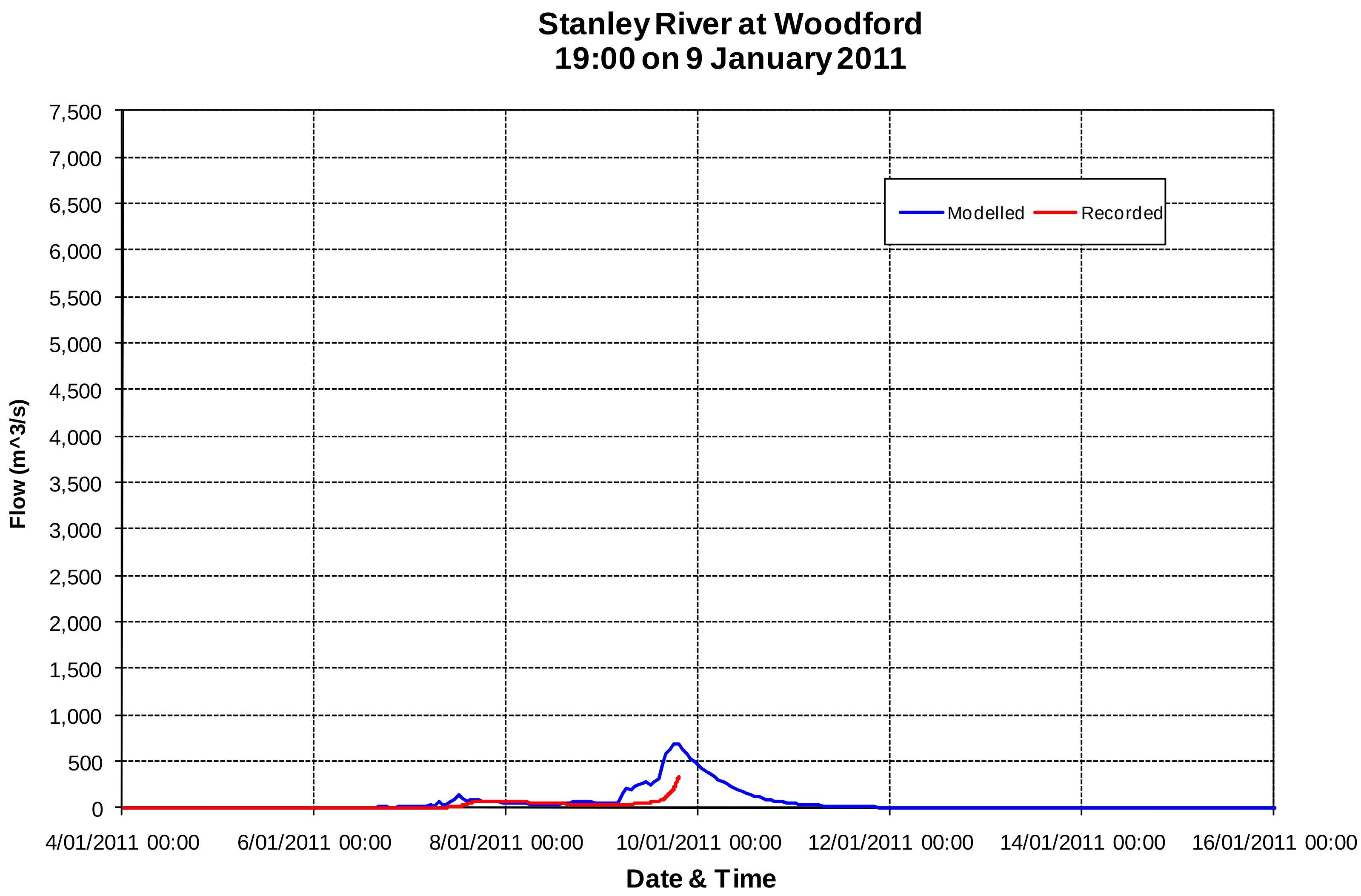
Date: Sunday 9 January 2011

Time: 19:00

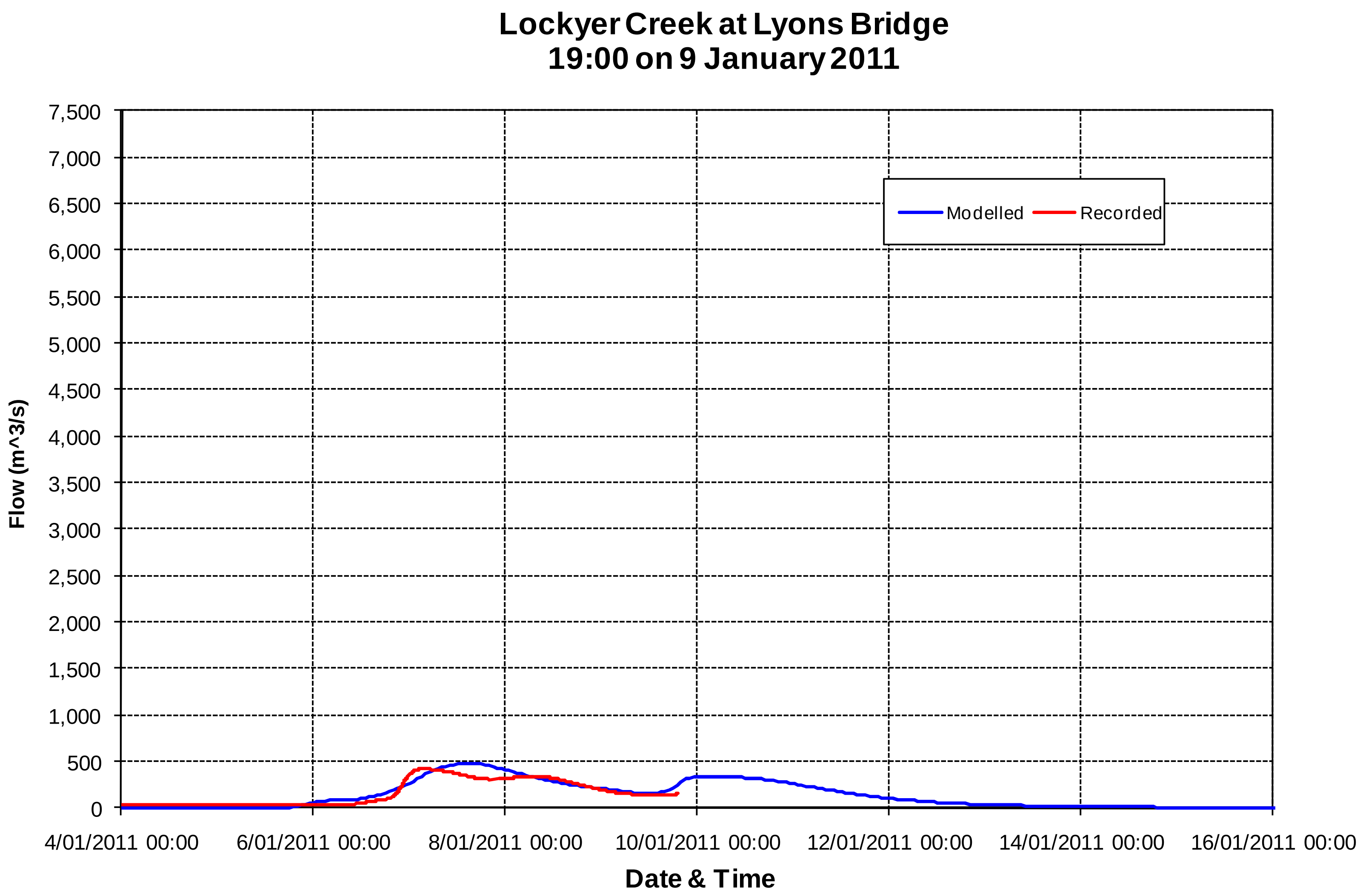
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	5,156	243,878	6,877	350,681	1,720	106,803
Woodford	333	15,543	682	30,089	349	14,547
Lyons Bridge	422	86,218	485	86,639	62	420
Walloon	412	33,624	551	58,159	139	24,535
Amberley	164	35,441	210	31,218	46	-4,223
Estimate to date and time of run						
Somerset			3,856	191,392		
Wivenhoe			2,796	324,314		
Total Event estimate						
Somerset			3,856	360,989		
Wivenhoe			6,610	809,262		



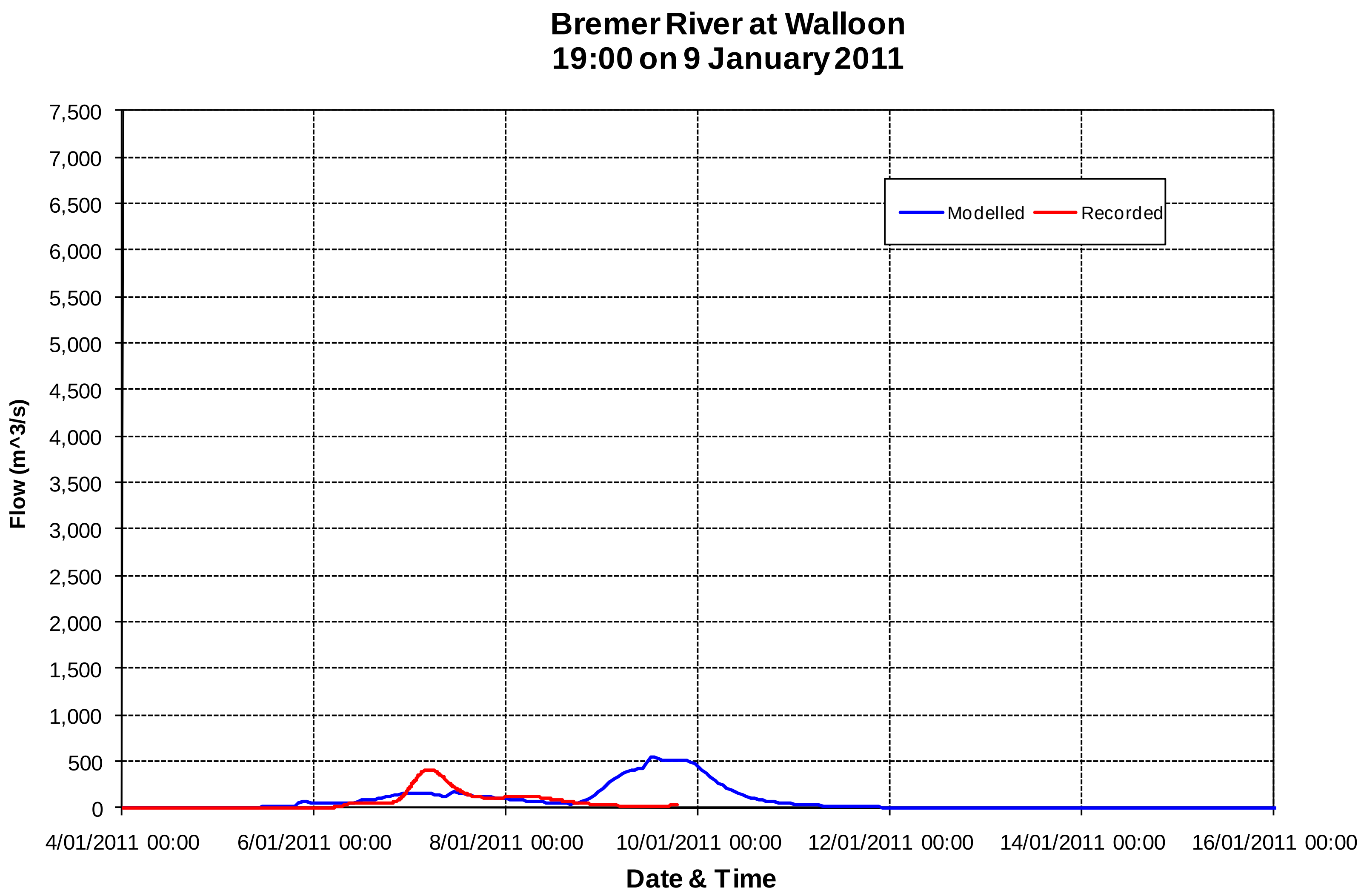
Run 21: Sunday 9 January 2011, 19:00



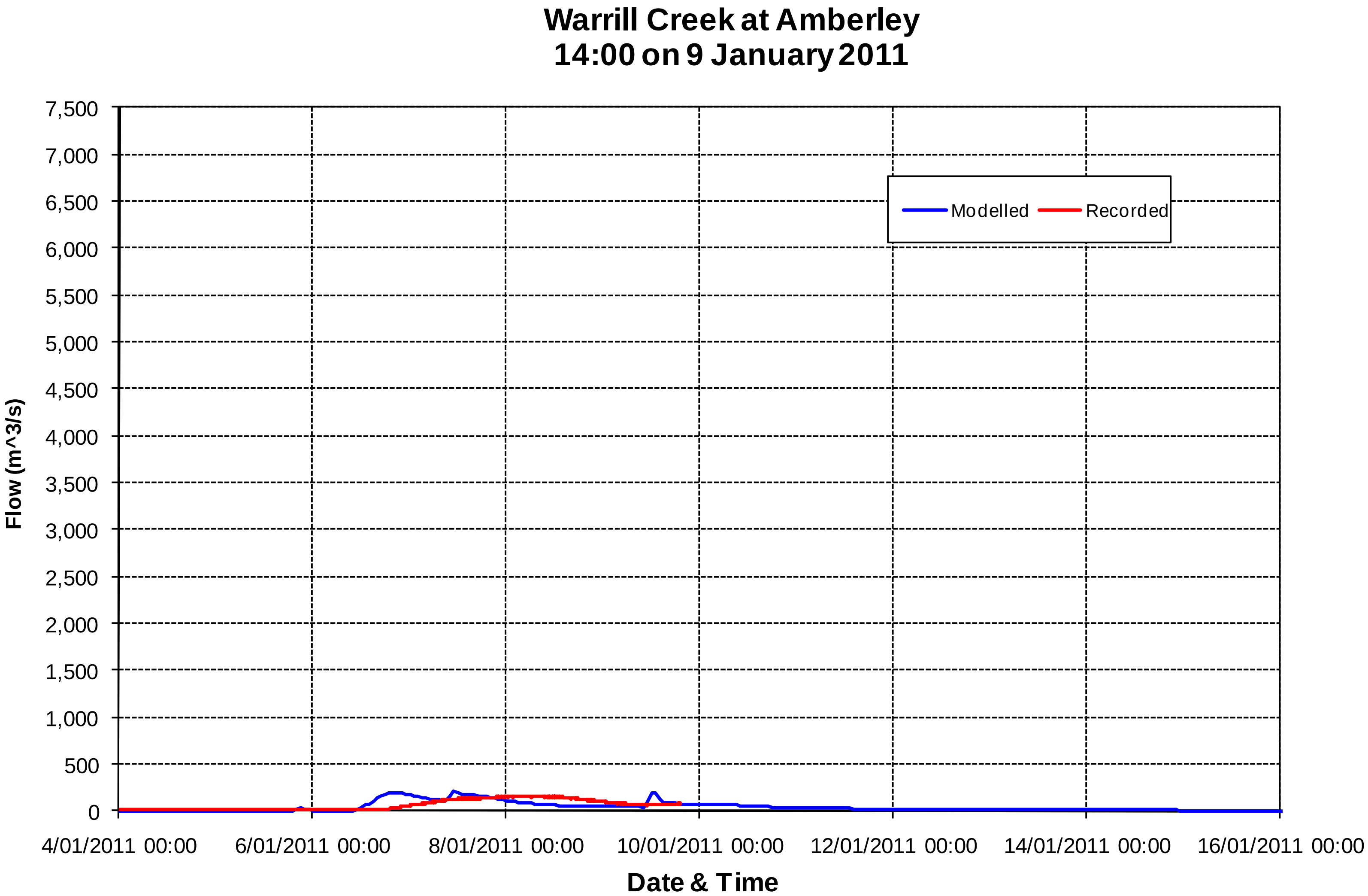
Run 21: Sunday 9 January 2011, 19:00



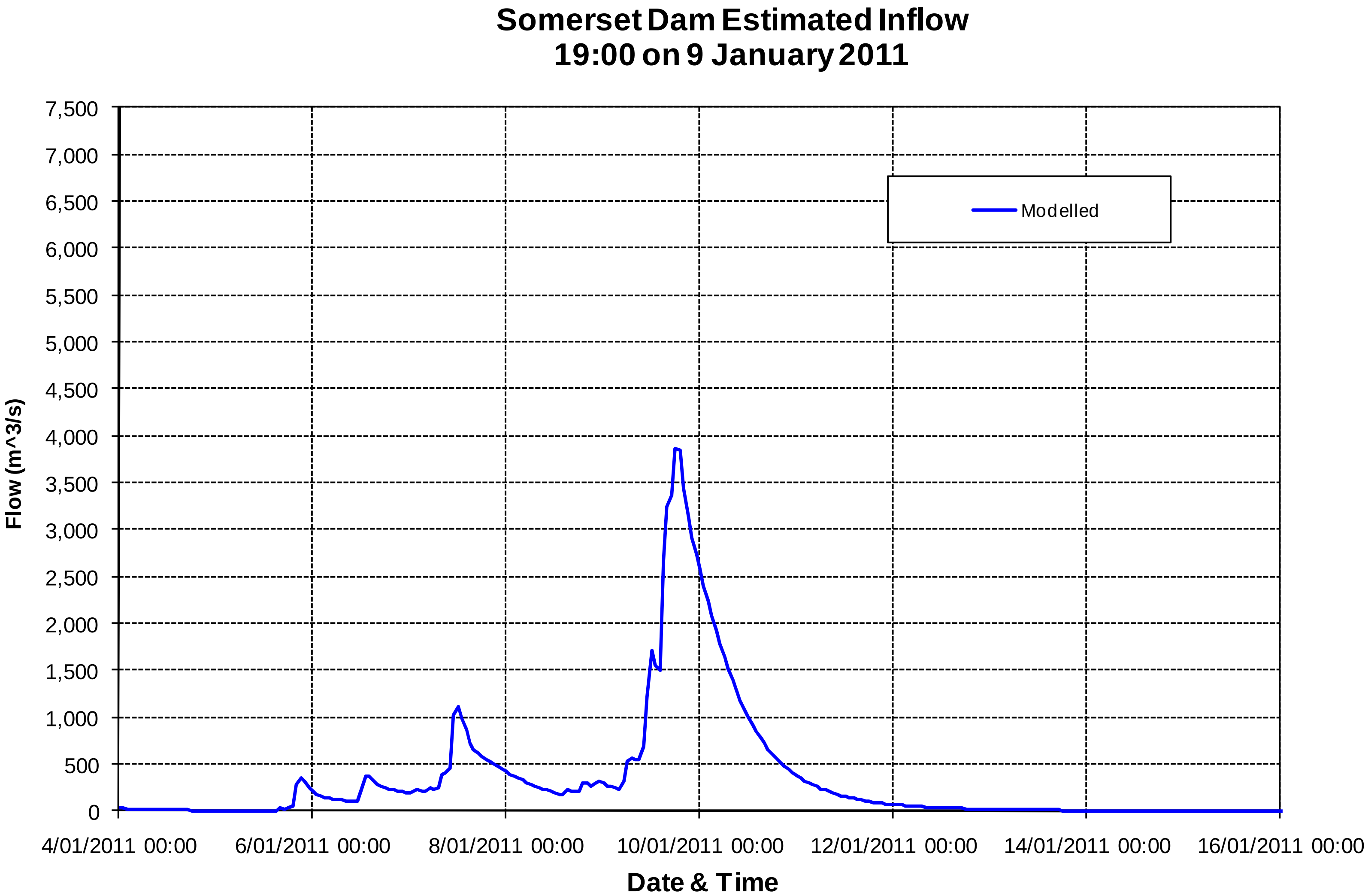
Run 21: Sunday 9 January 2011, 19:00



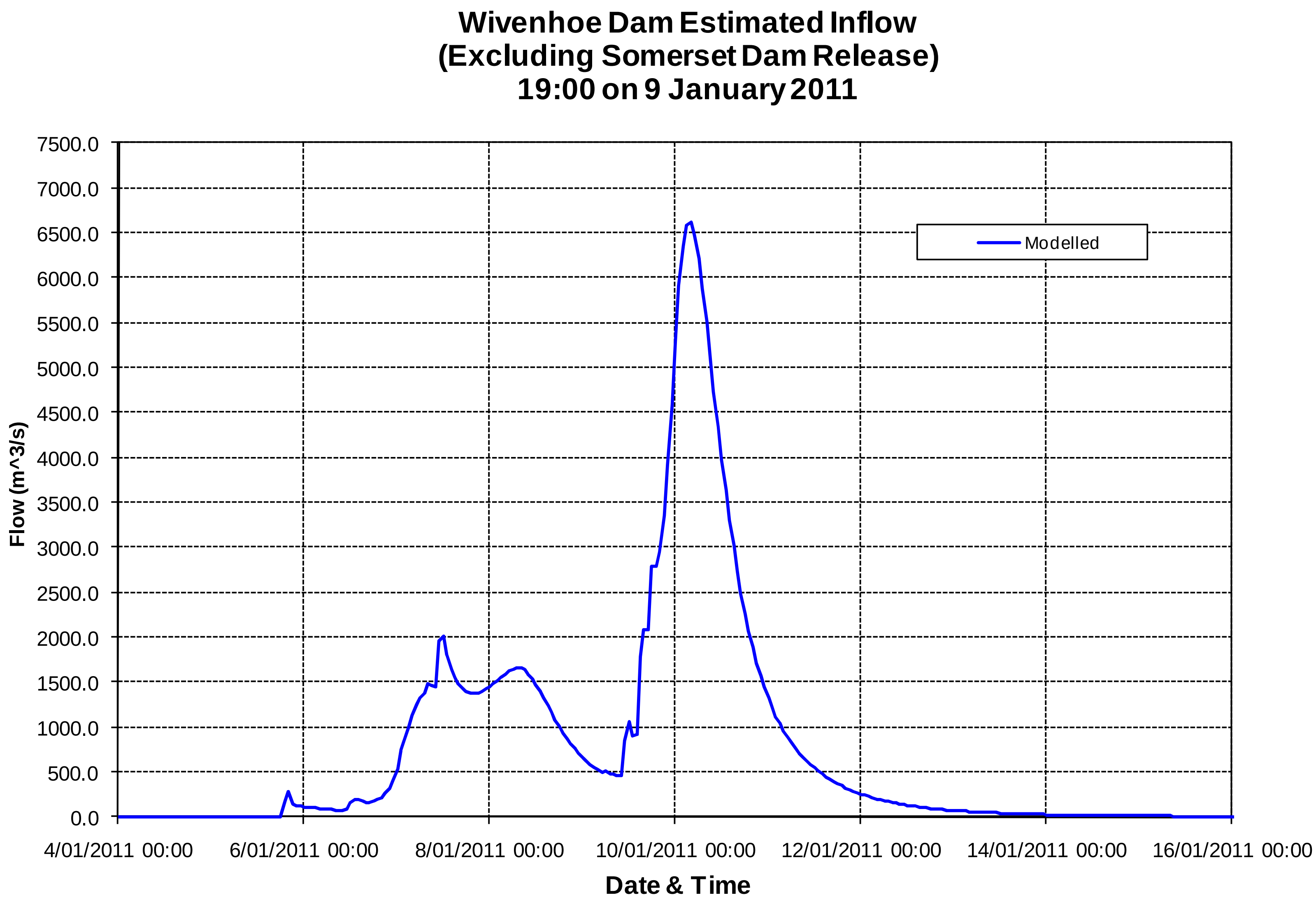
Run 21: Sunday 9 January 2011, 19:00



Run 21: Sunday 9 January 2011, 19:00



Run 21: Sunday 9 January 2011, 19:00



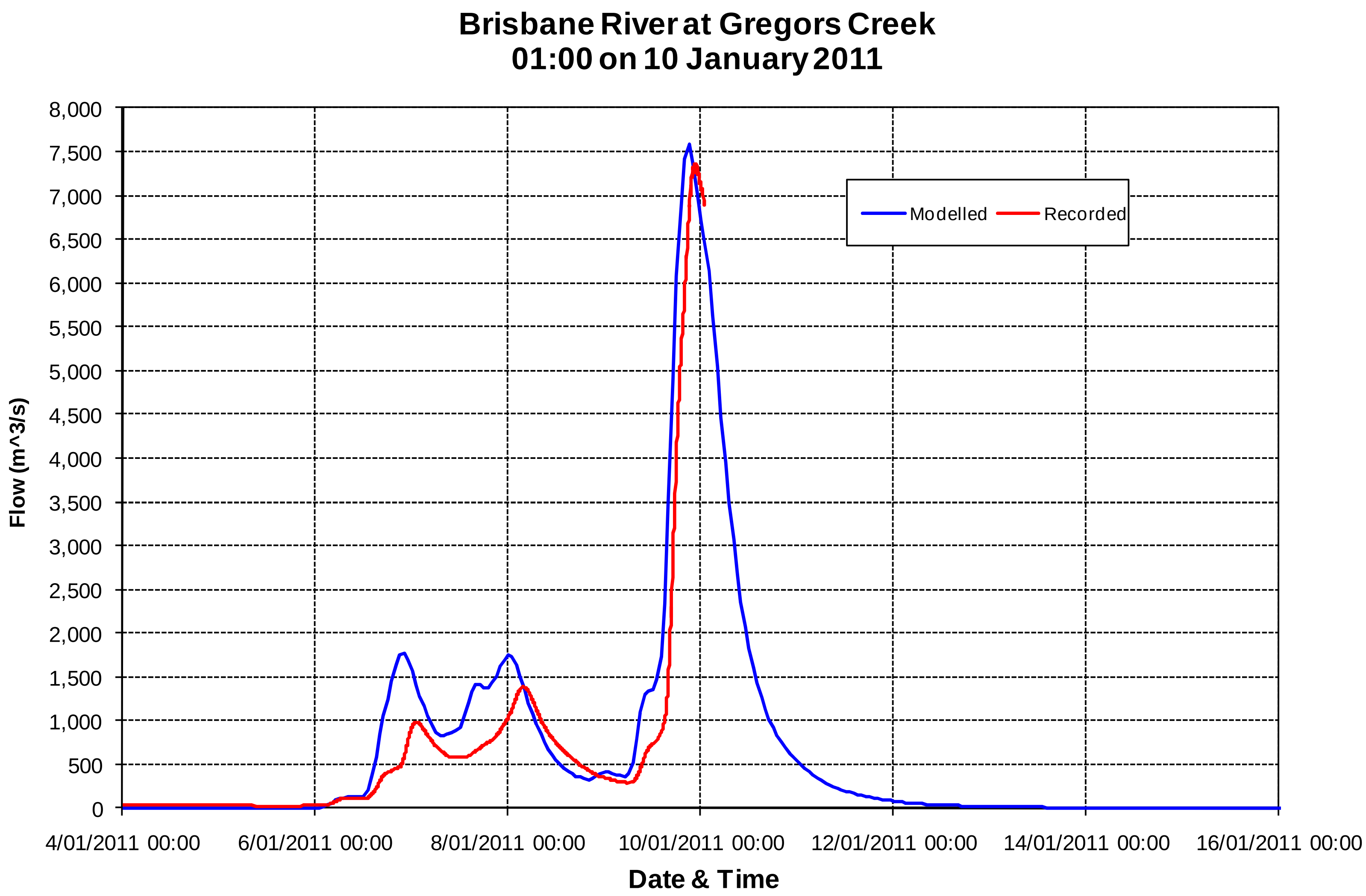
Run 21: Sunday 9 January 2011, 19:00

Run 23

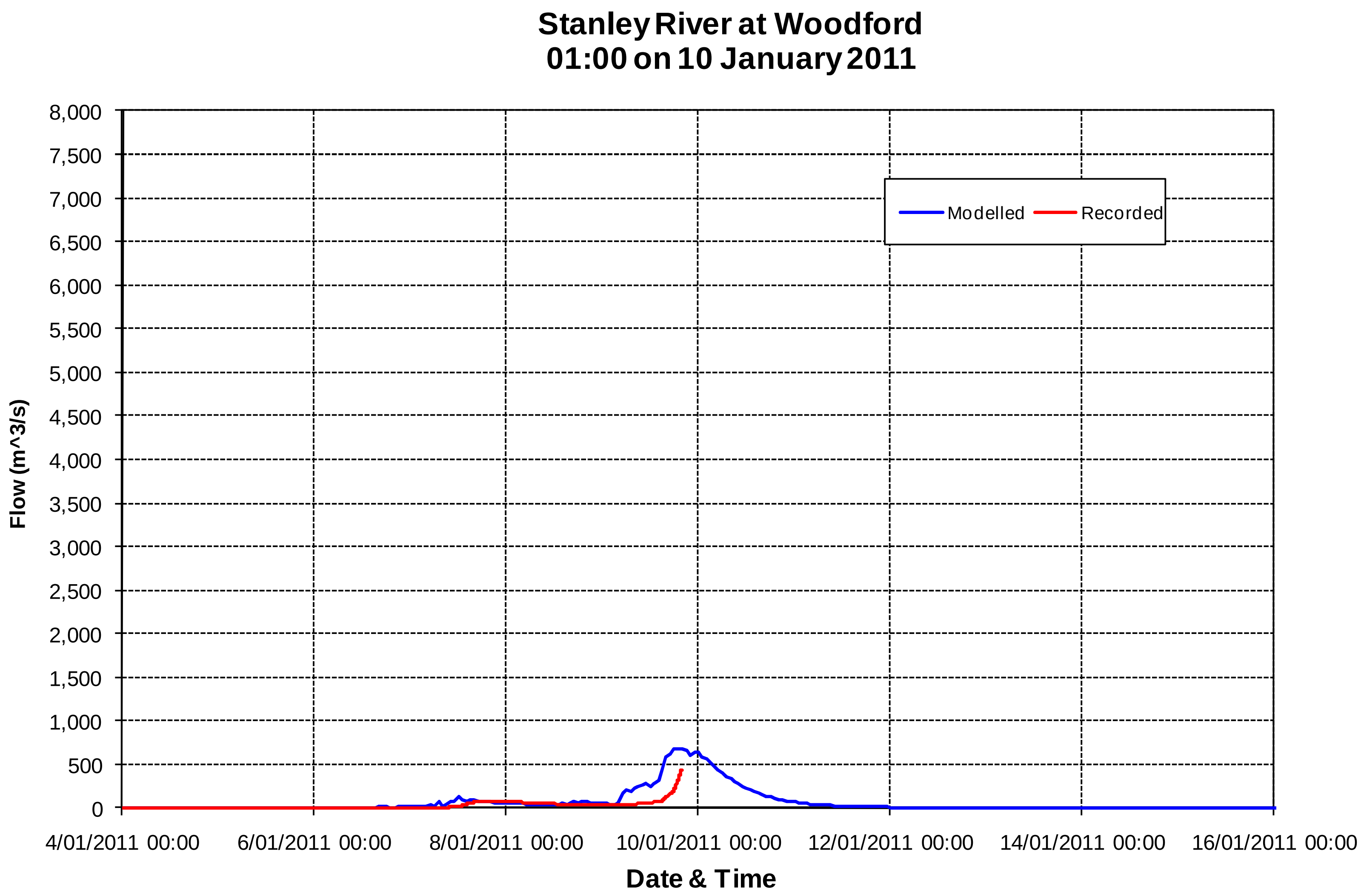
Date: Monday 10 January 2011

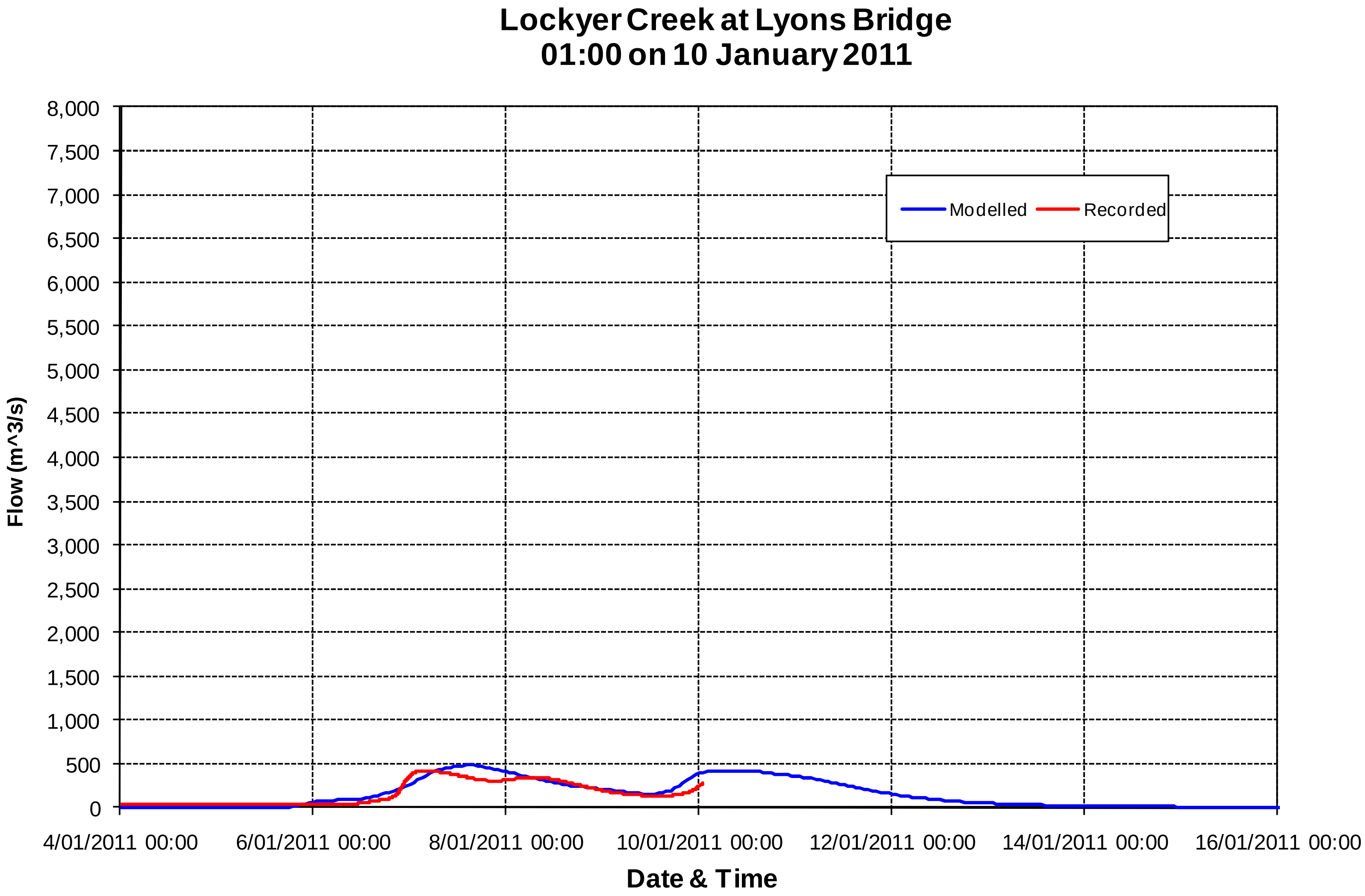
Time: 01:00

Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	392,566	7,594	504,062	243	111,496
Woodford	430	27,101	685	43,826	255	16,725
Lyons Bridge	422	90,773	485	94,213	62	3,440
Walloon	412	36,585	570	70,093	158	33,508
Amberley	164	37,275	210	33,052	46	-4,223
Estimate to date and time of run						
Somerset			3,856	265,286		
Wivenhoe			6,294	424,140		
Total Event estimate						
Somerset			3,856	407,145		
Wivenhoe			7,414	902,406		

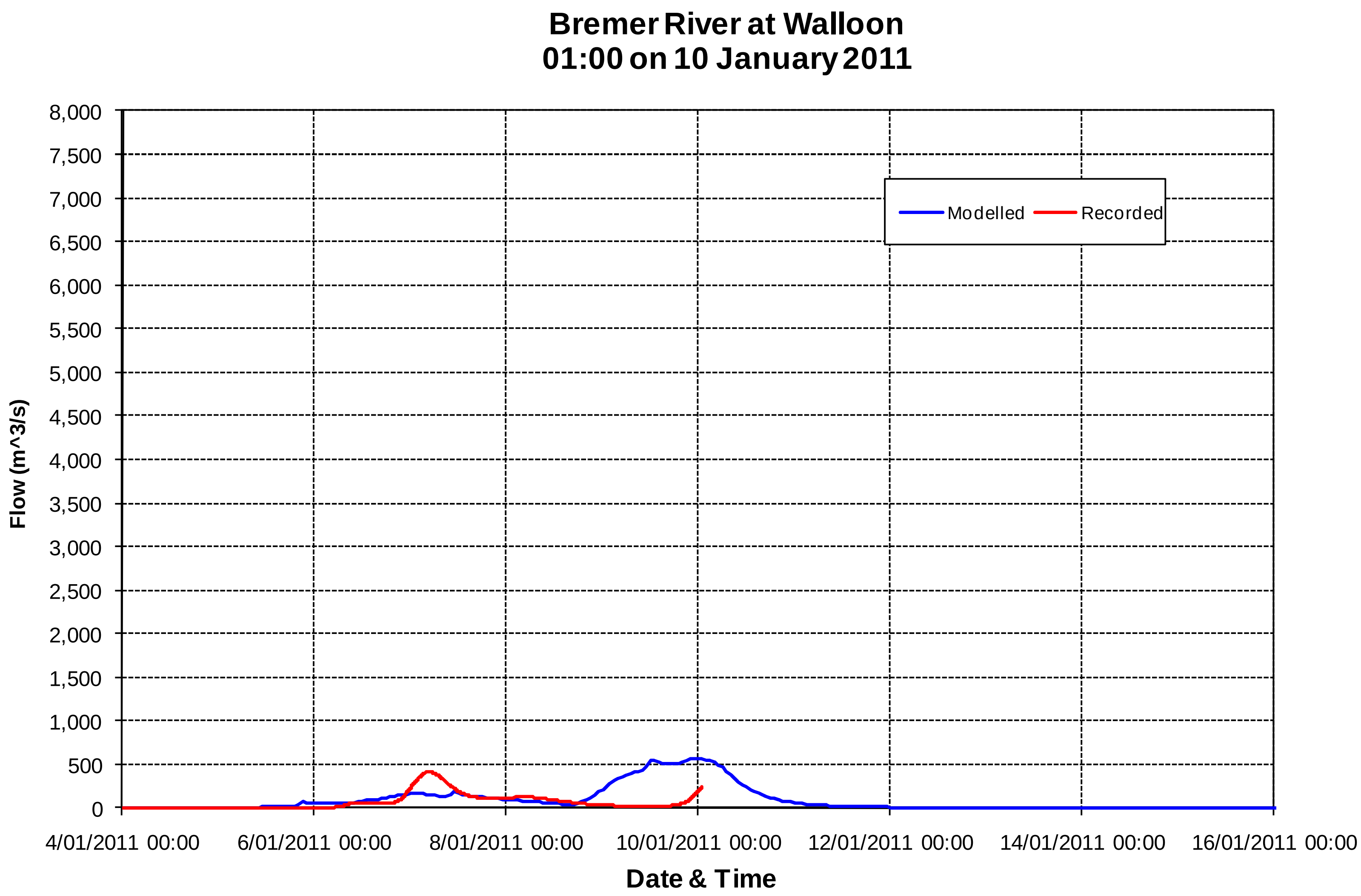


Run 23: Monday 10 January 2011, 01:00

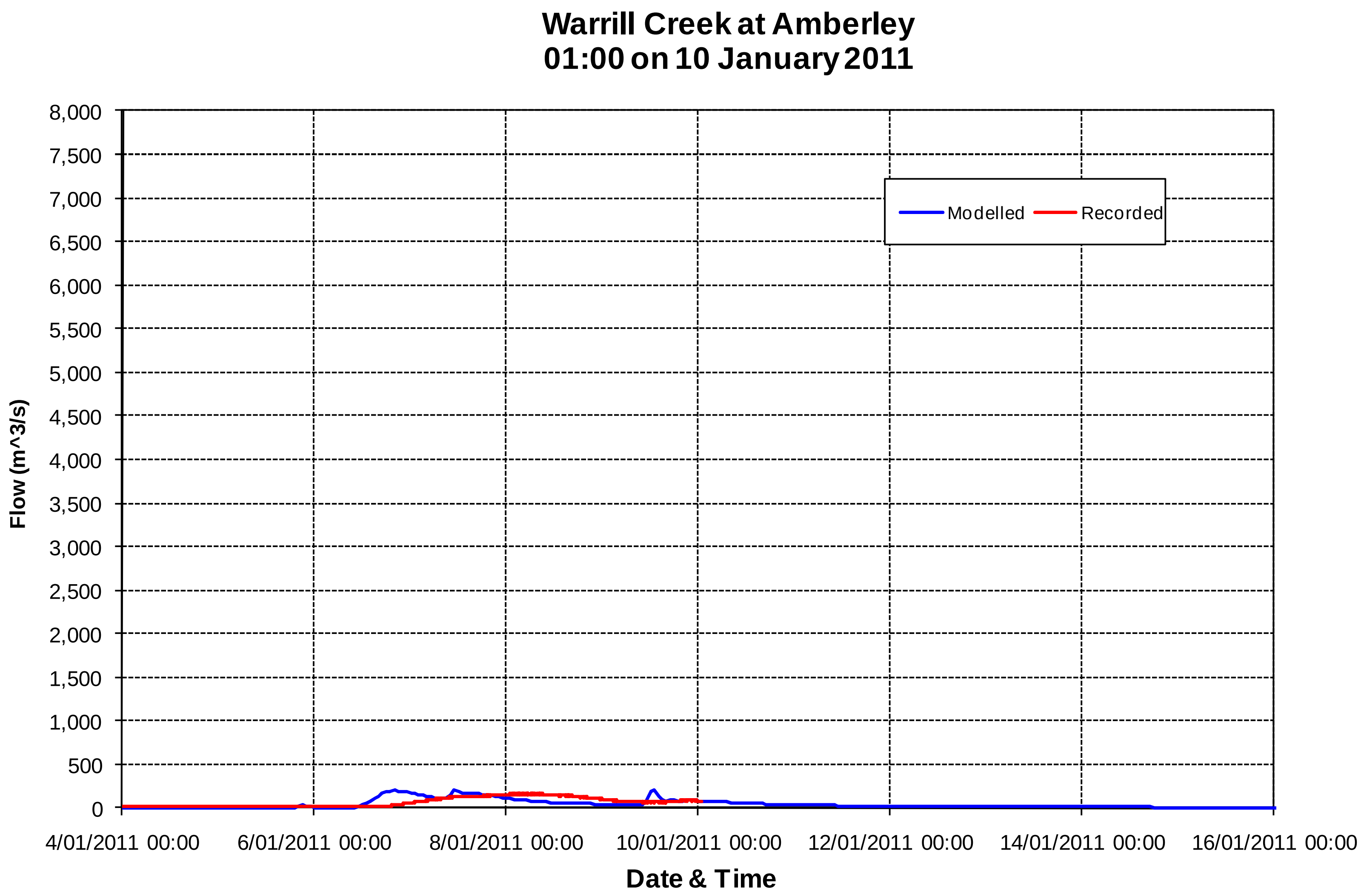

Stanley River at Woodford
01:00 on 10 January 2011
Flow (m^3/s)
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Modelled
Recorded
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time



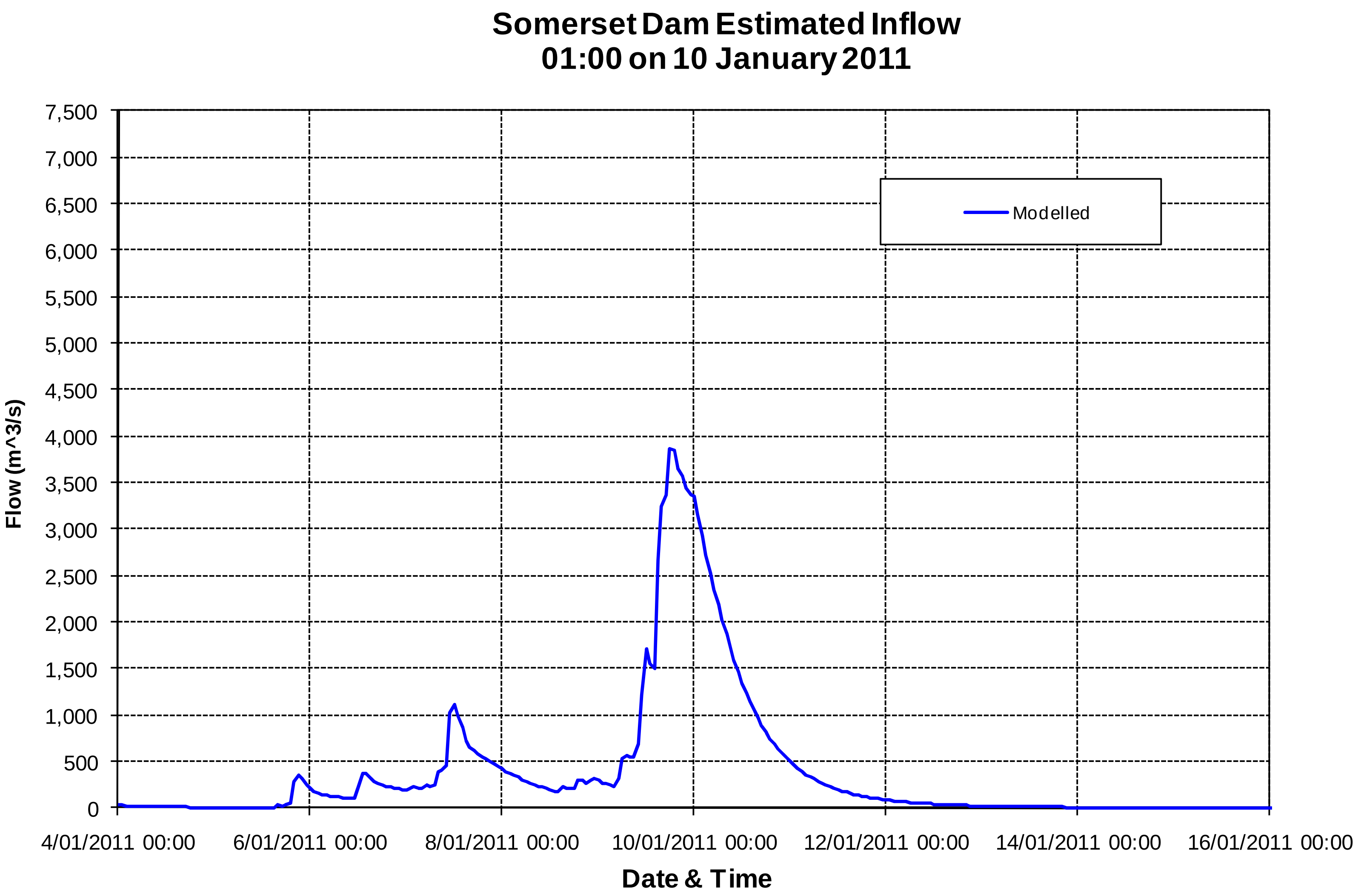
Run 23: Monday 10 January 2011, 01:00



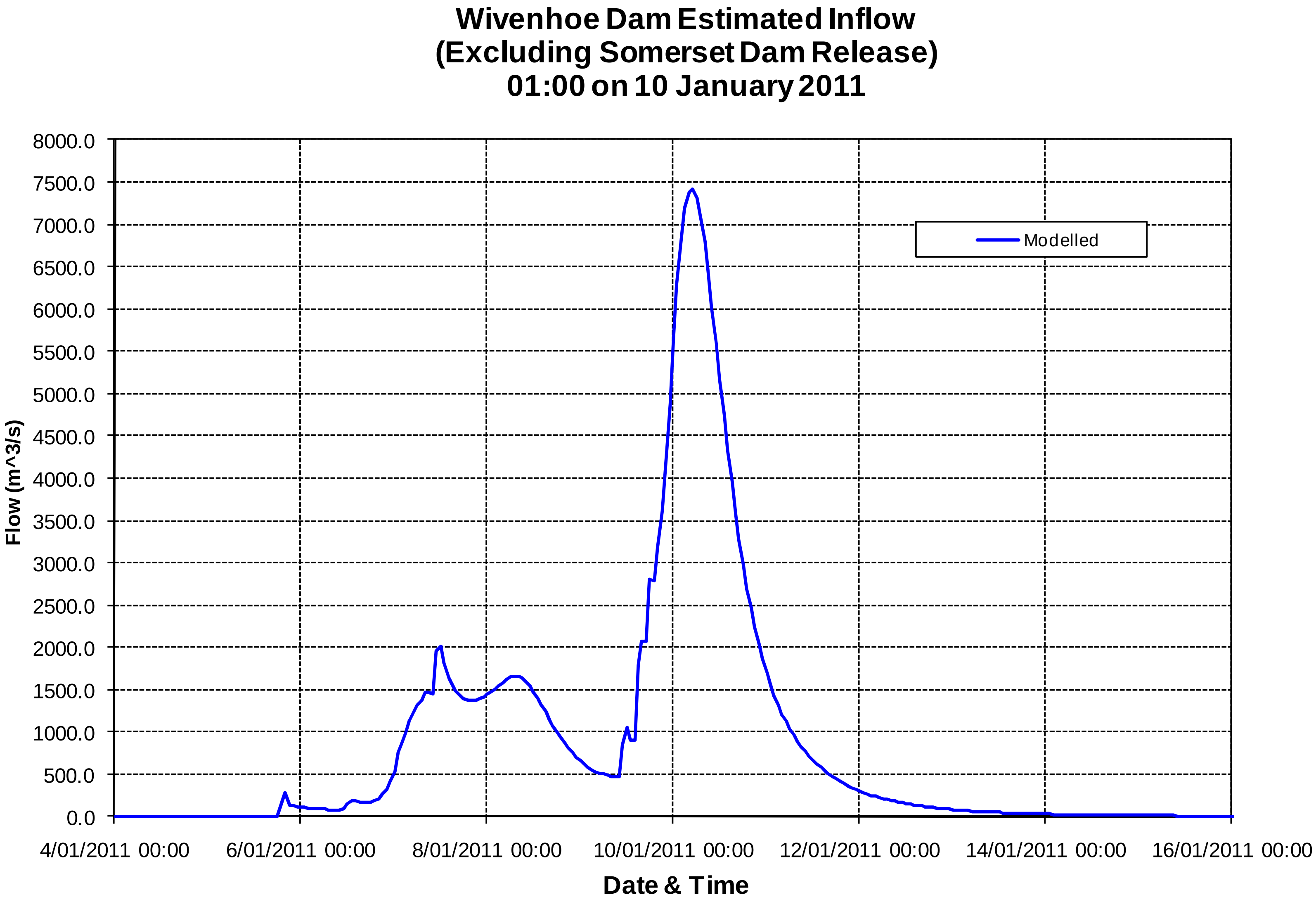
Run 23: Monday 10 January 2011, 01:00



Run 23: Monday 10 January 2011, 01:00



Run 23: Monday 10 January 2011, 01:00



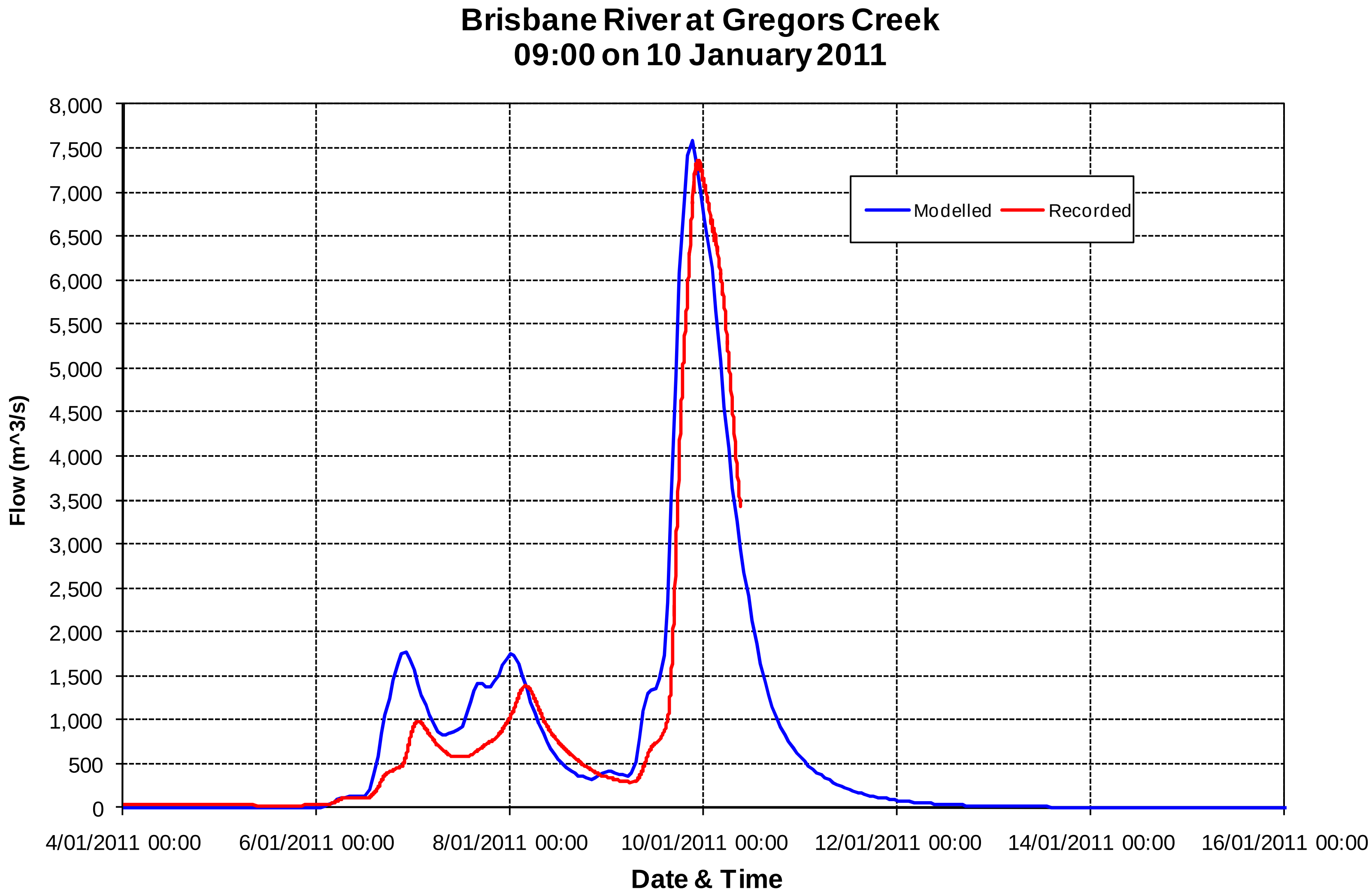
Run 23: Monday 10 January 2011, 01:00

Run 26

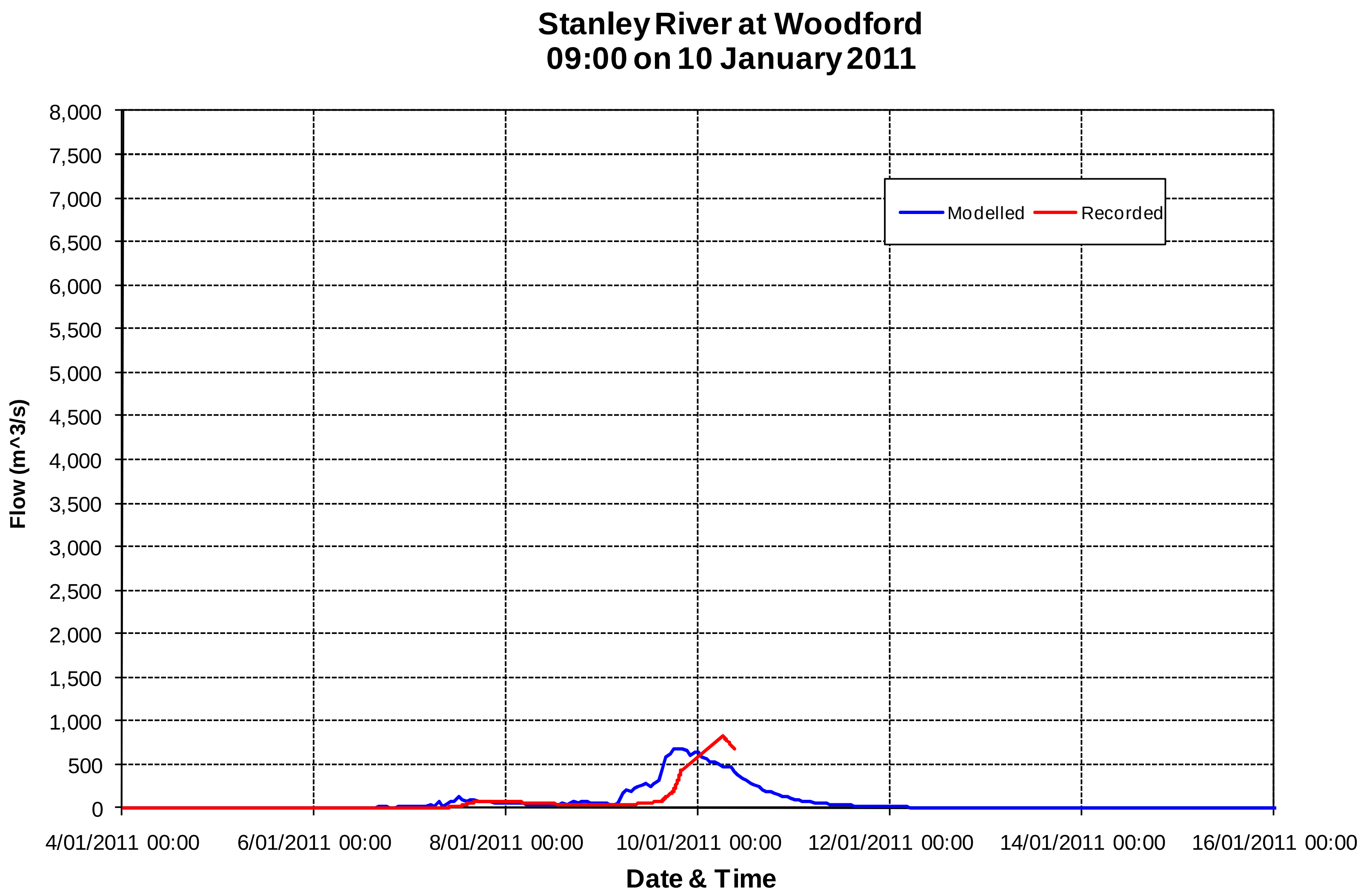
Date: Monday 10 January 2011

Time: 09:00

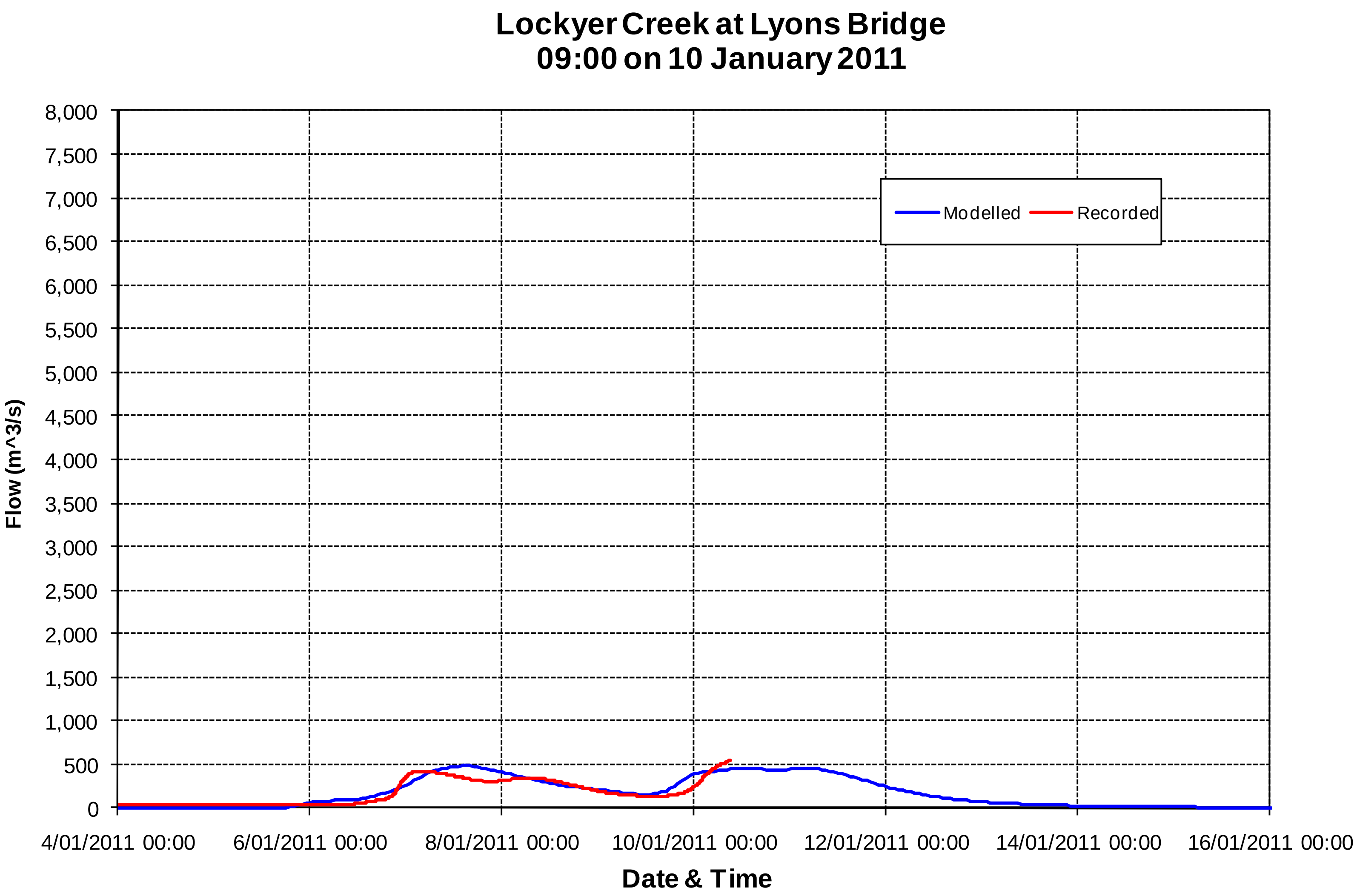
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	543,591	7,594	631,209	243	87,618
Woodford	820	48,307	685	58,068	-135	9,762
Lyons Bridge	548	103,946	485	106,479	-63	2,533
Walloon	412	45,320	635	86,481	223	41,160
Amberley	164	39,540	218	35,975	54	-3,566
Estimate to date and time of run						
Somerset			3,856	339,965		
Wivenhoe			7,540	630,551		
Total Event estimate						
Somerset			3,856	441,517		
Wivenhoe			7,540	925,562		



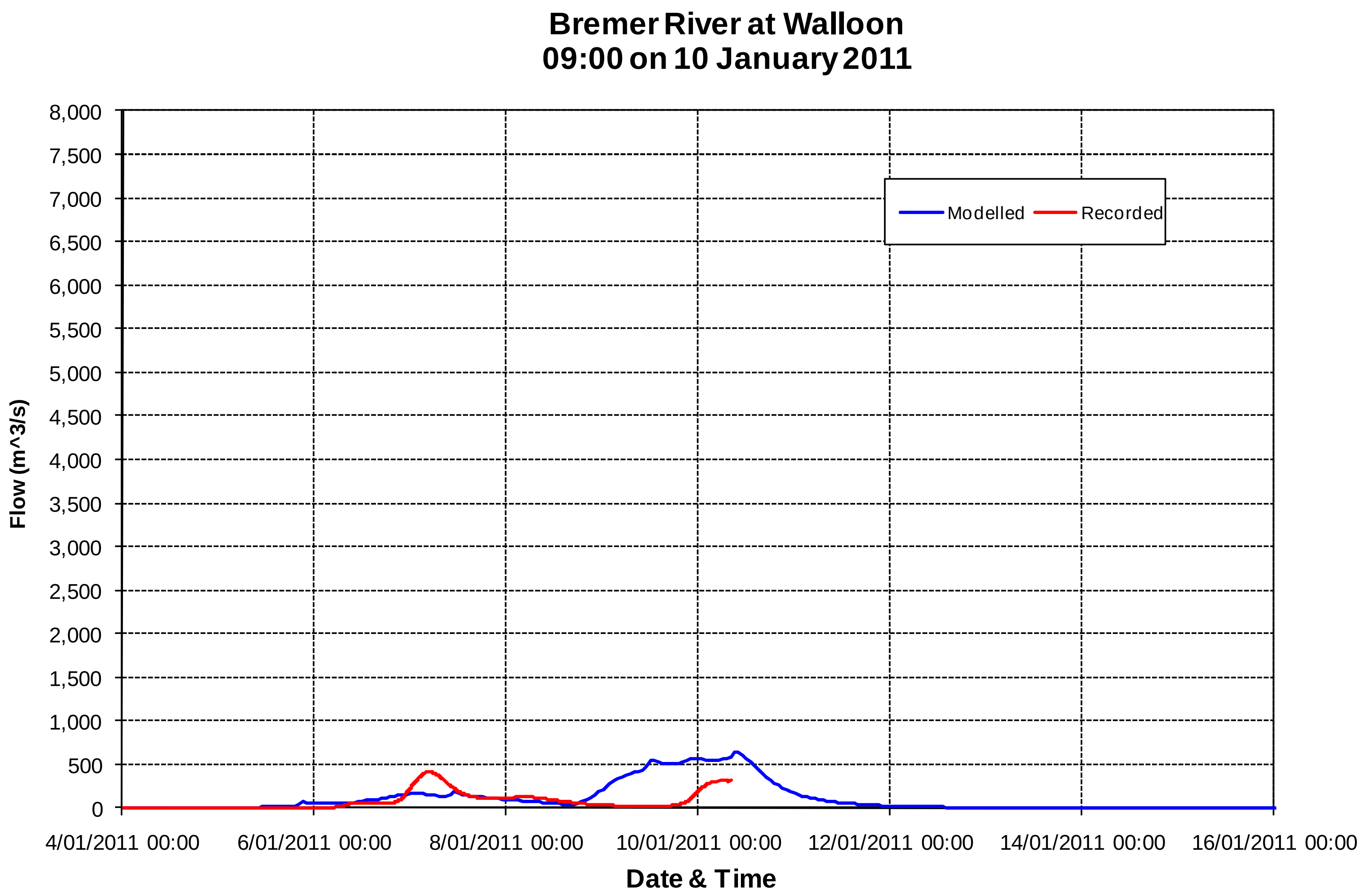
Run 26: Monday 10 January 2011, 09:00



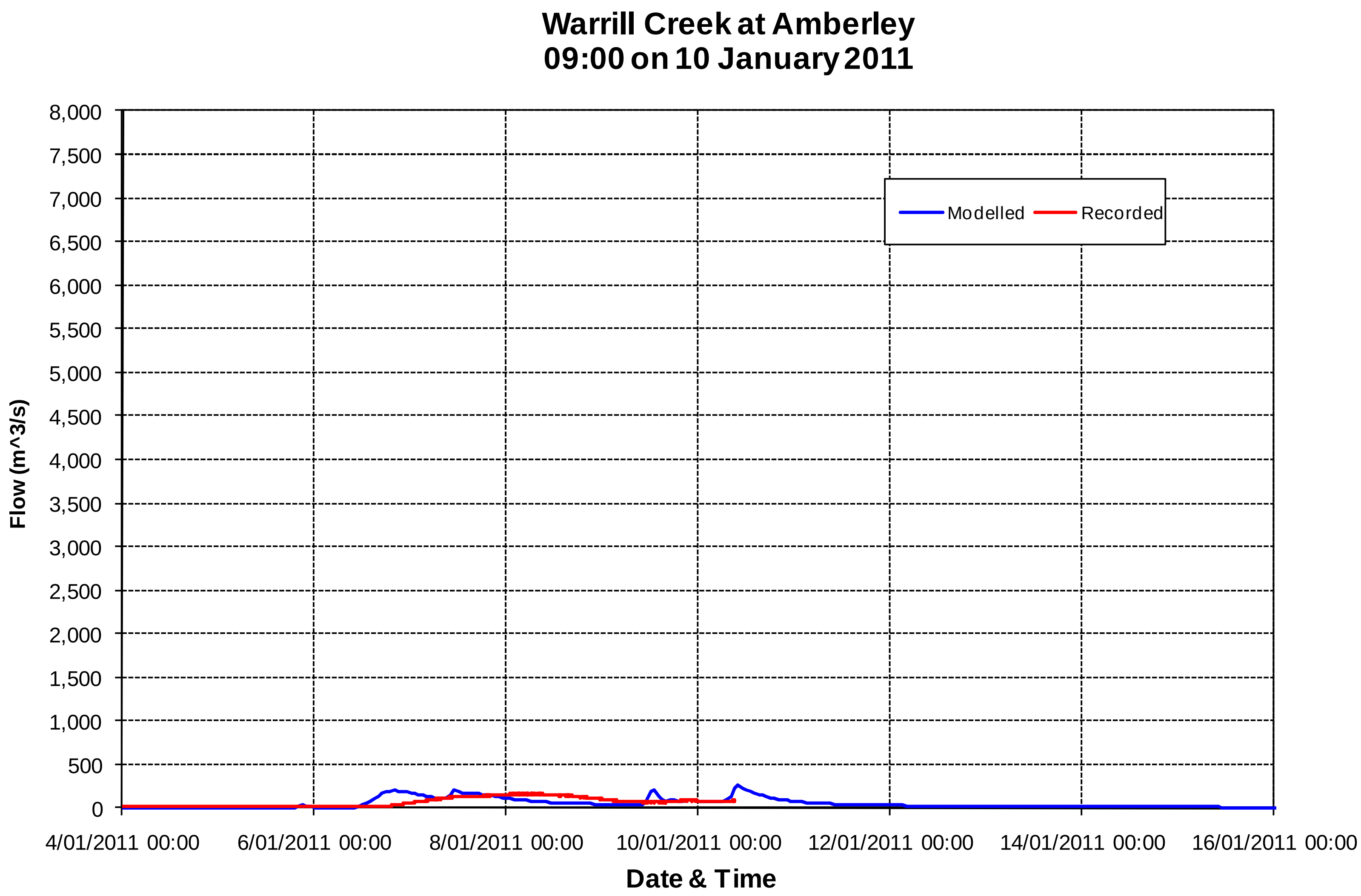
Run 26: Monday 10 January 2011, 09:00



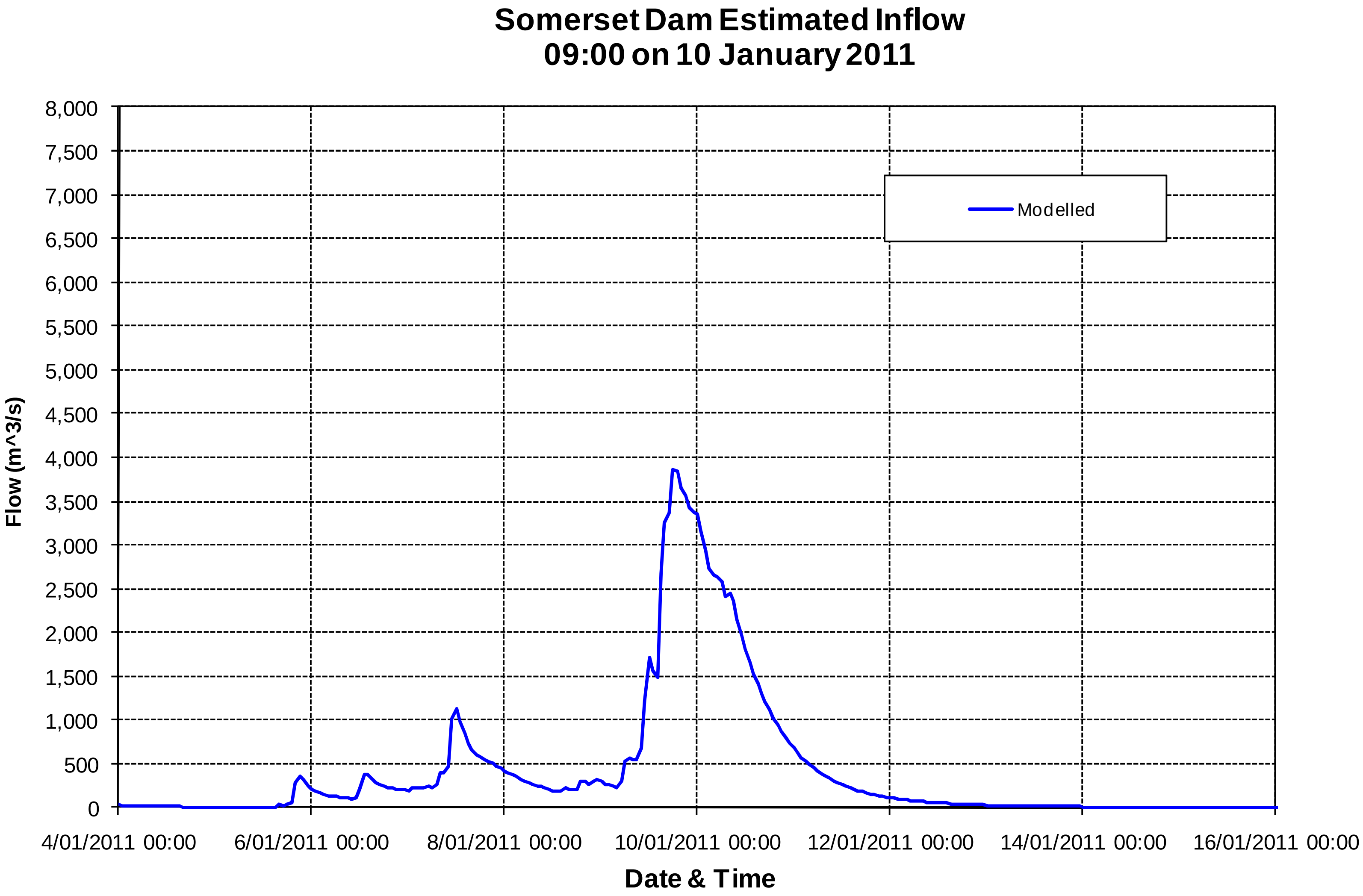
Run 26: Monday 10 January 2011, 09:00



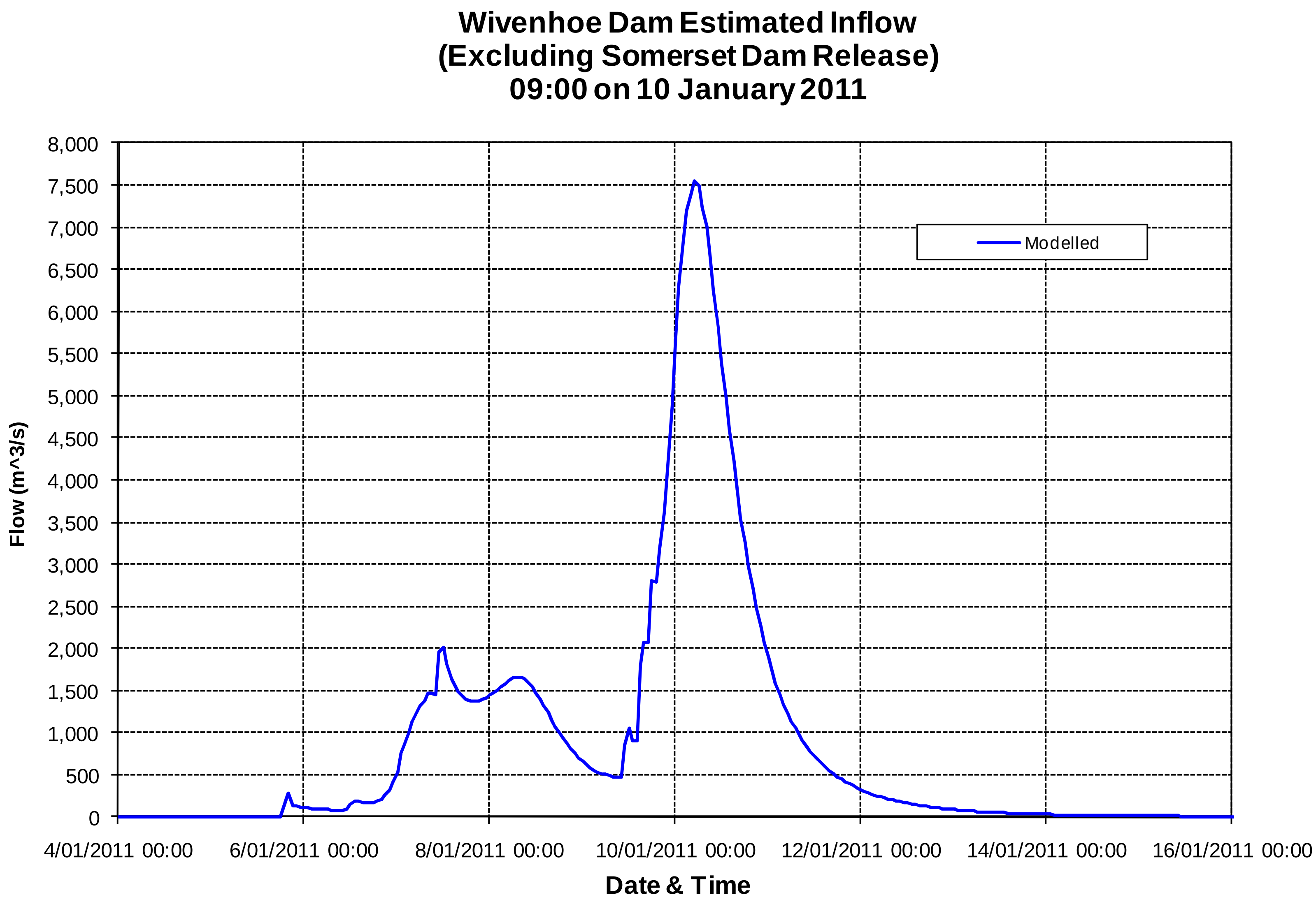
Run 26: Monday 10 January 2011, 09:00



Run 26: Monday 10 January 2011, 09:00



Run 26: Monday 10 January 2011, 09:00



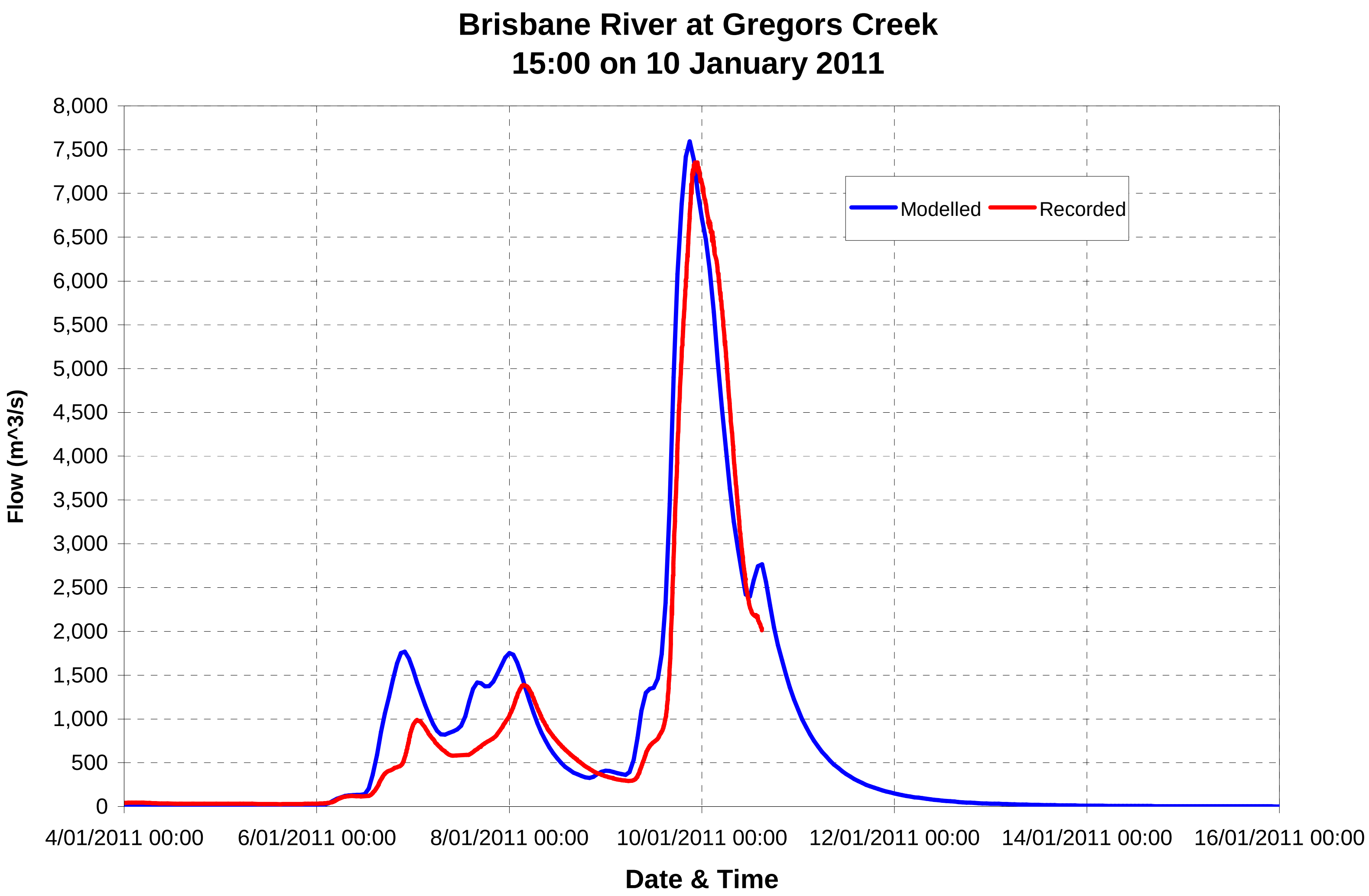
Run 26: Monday 10 January 2011, 09:00

Run 28

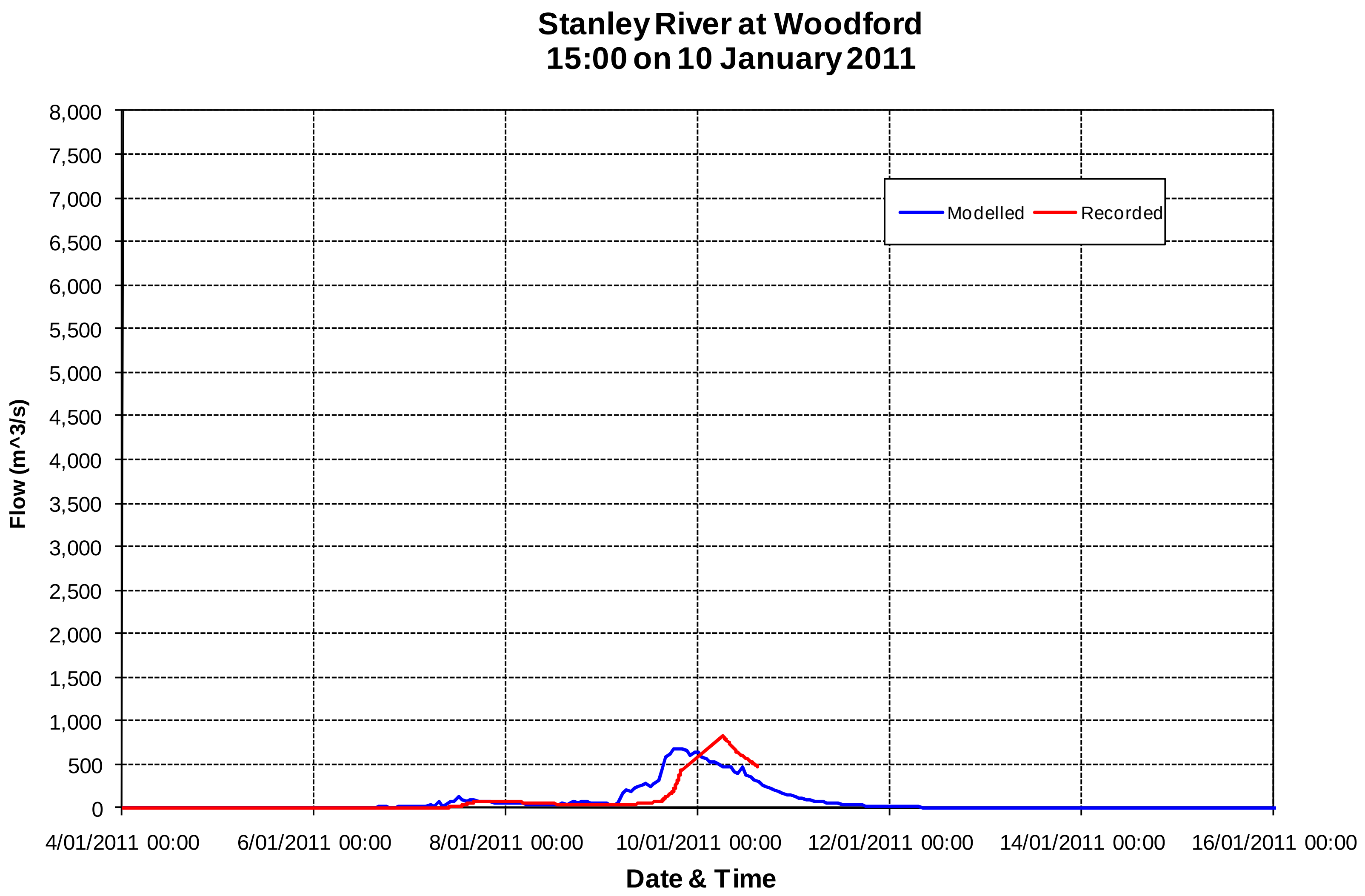
Date: Monday 10 January 2011

Time: 15:00

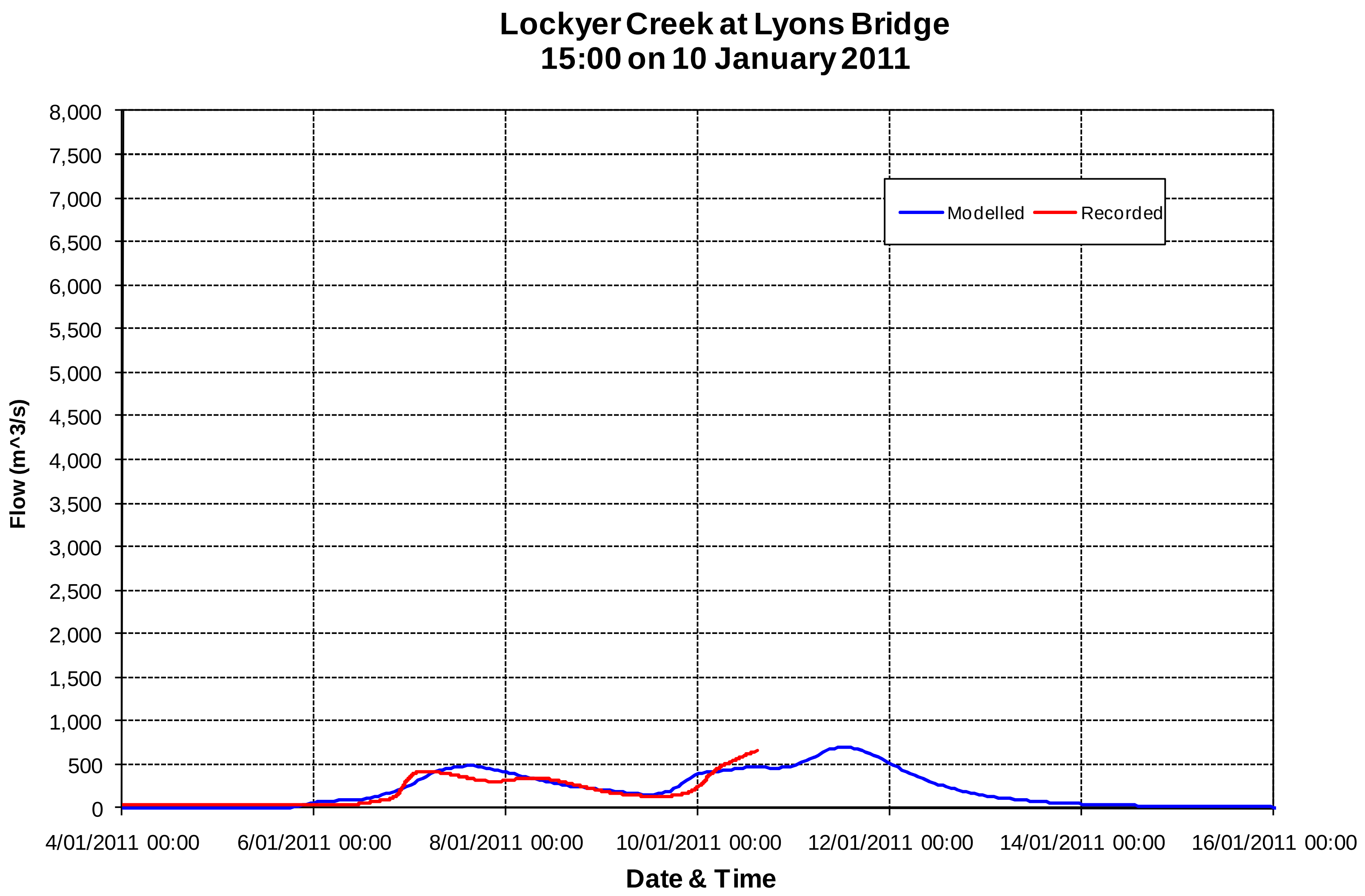
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	594,300	7,594	687,321	243	93,021
Woodford	820	60,211	685	66,084	-135	5,873
Lyons Bridge	661	117,298	485	116,464	-176	-833
Walloon	412	51,673	652	99,571	239	47,897
Amberley	164	42,069	590	47,022	426	4,953
Estimate to date and time of run						
Somerset			3,856	394,884		
Wivenhoe			7,540	630,551		
Total Event estimate						
Somerset			3,856	482,970		
Wivenhoe			7,540	1,044,504		



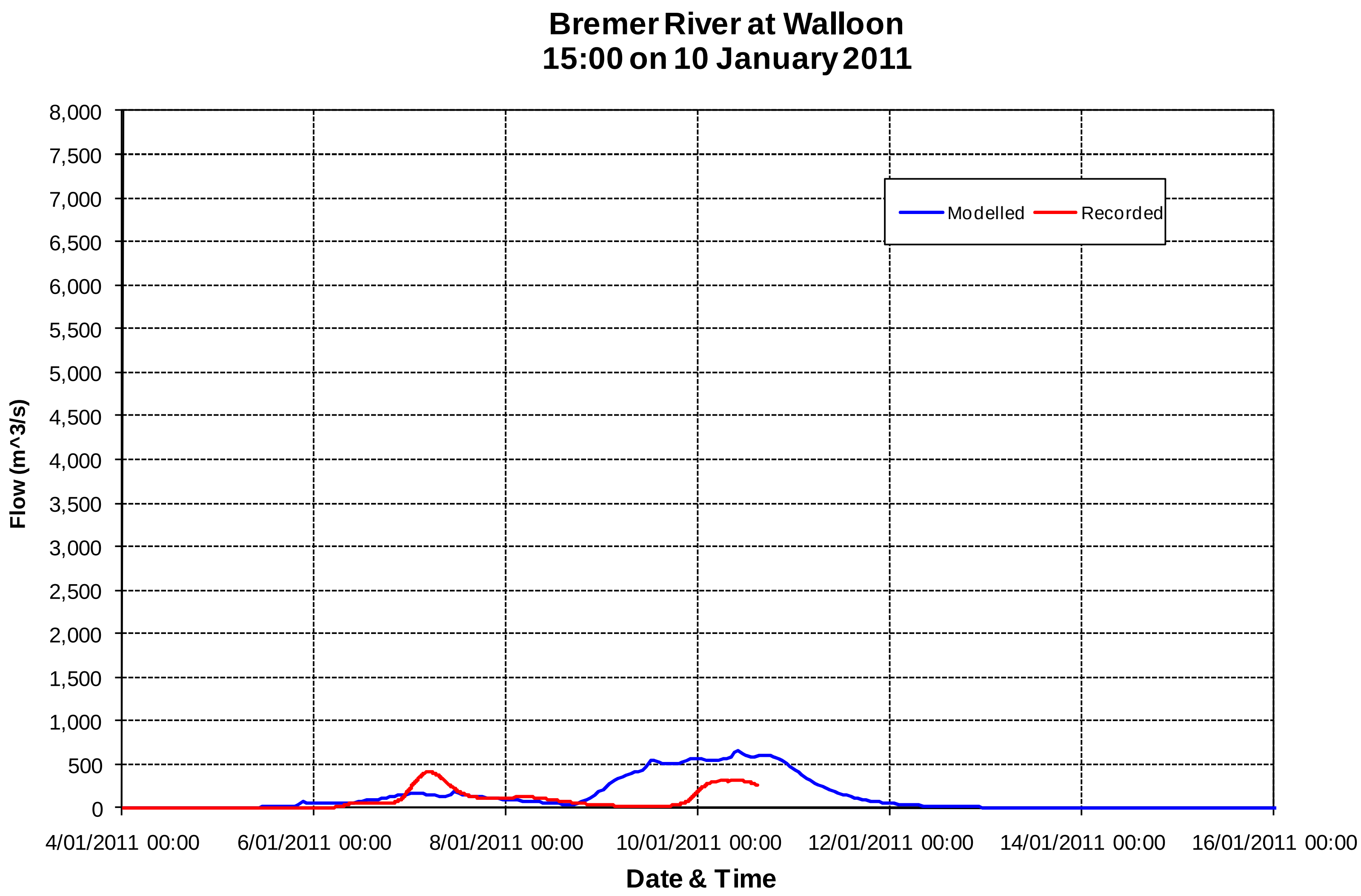
Run 28: Monday 10 January 2011, 15:00



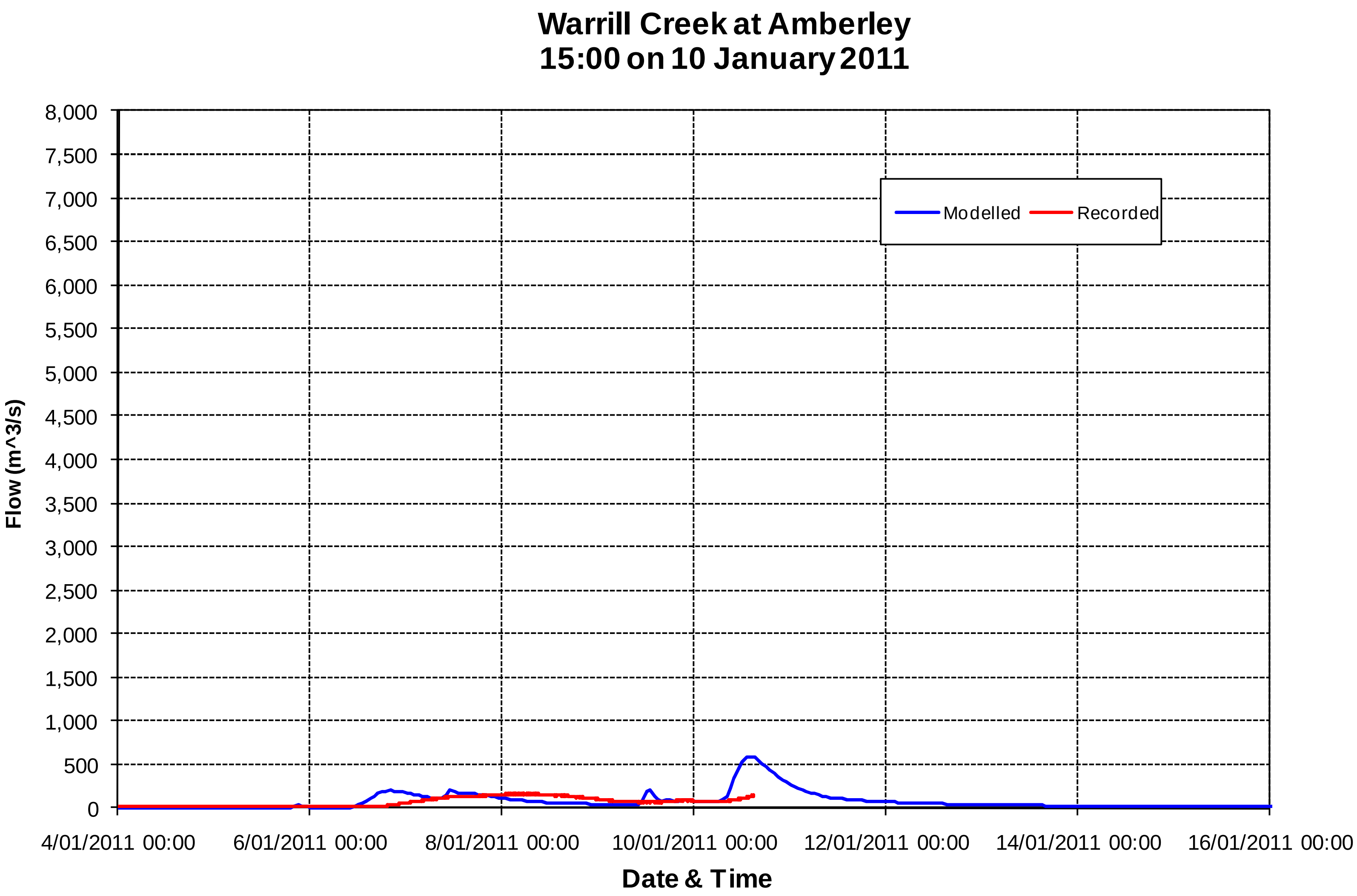
Run 28: Monday 10 January 2011, 15:00



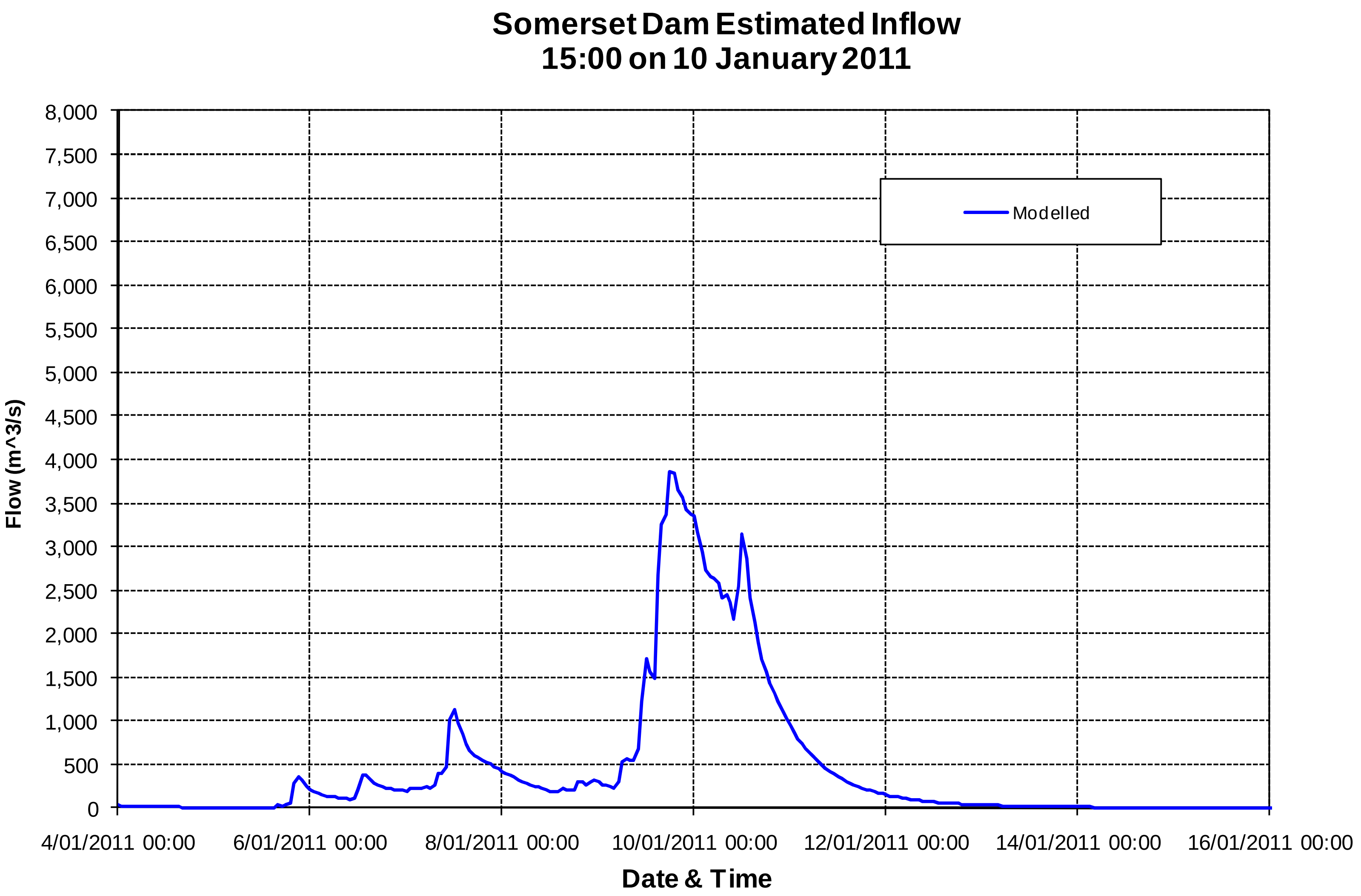
Run 28: Monday 10 January 2011, 15:00



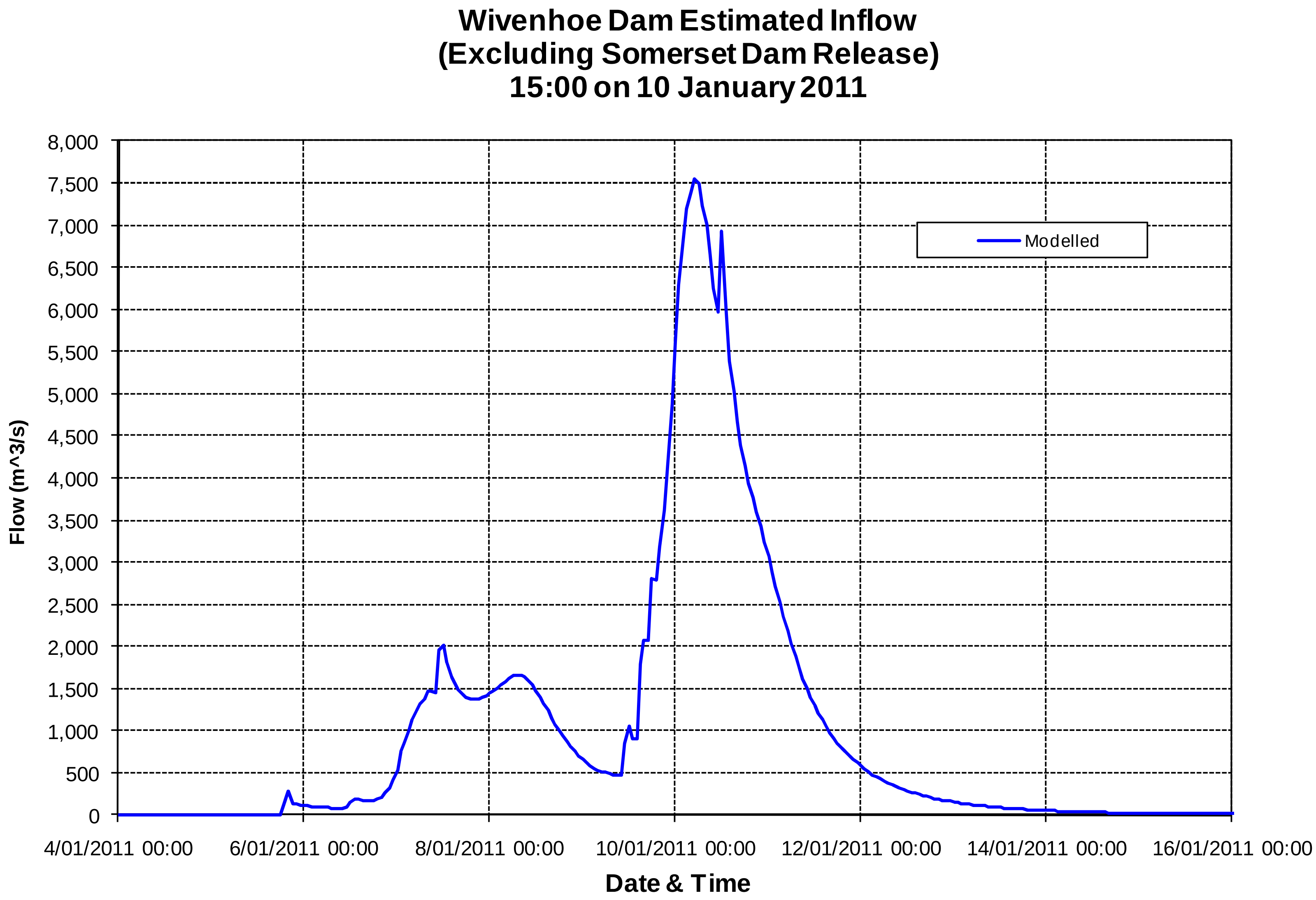
Run 28: Monday 10 January 2011, 15:00



Run 28: Monday 10 January 2011, 15:00



Run 28: Monday 10 January 2011, 15:00



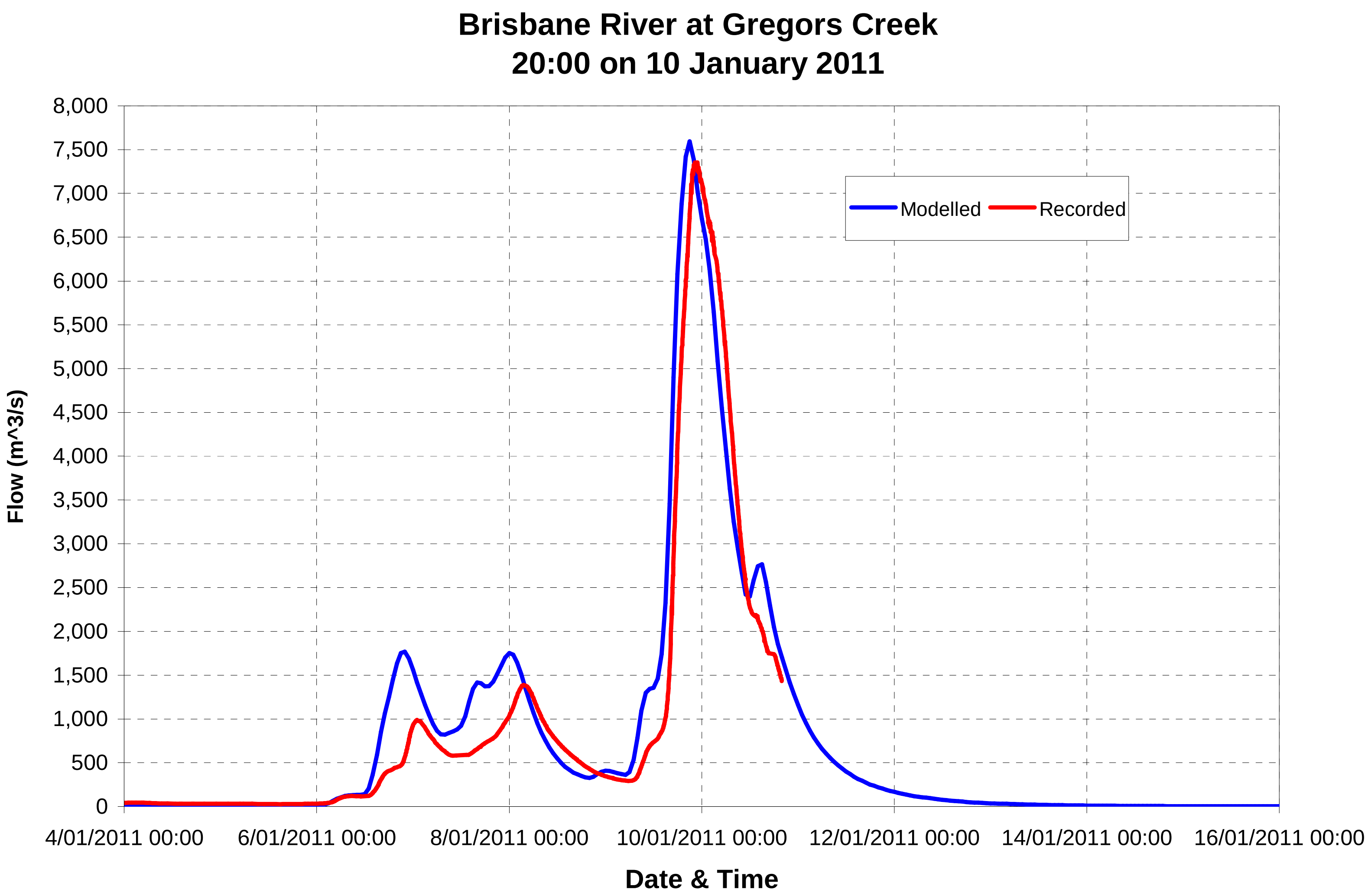
Run 28: Monday 10 January 2011, 15:00

Run 31

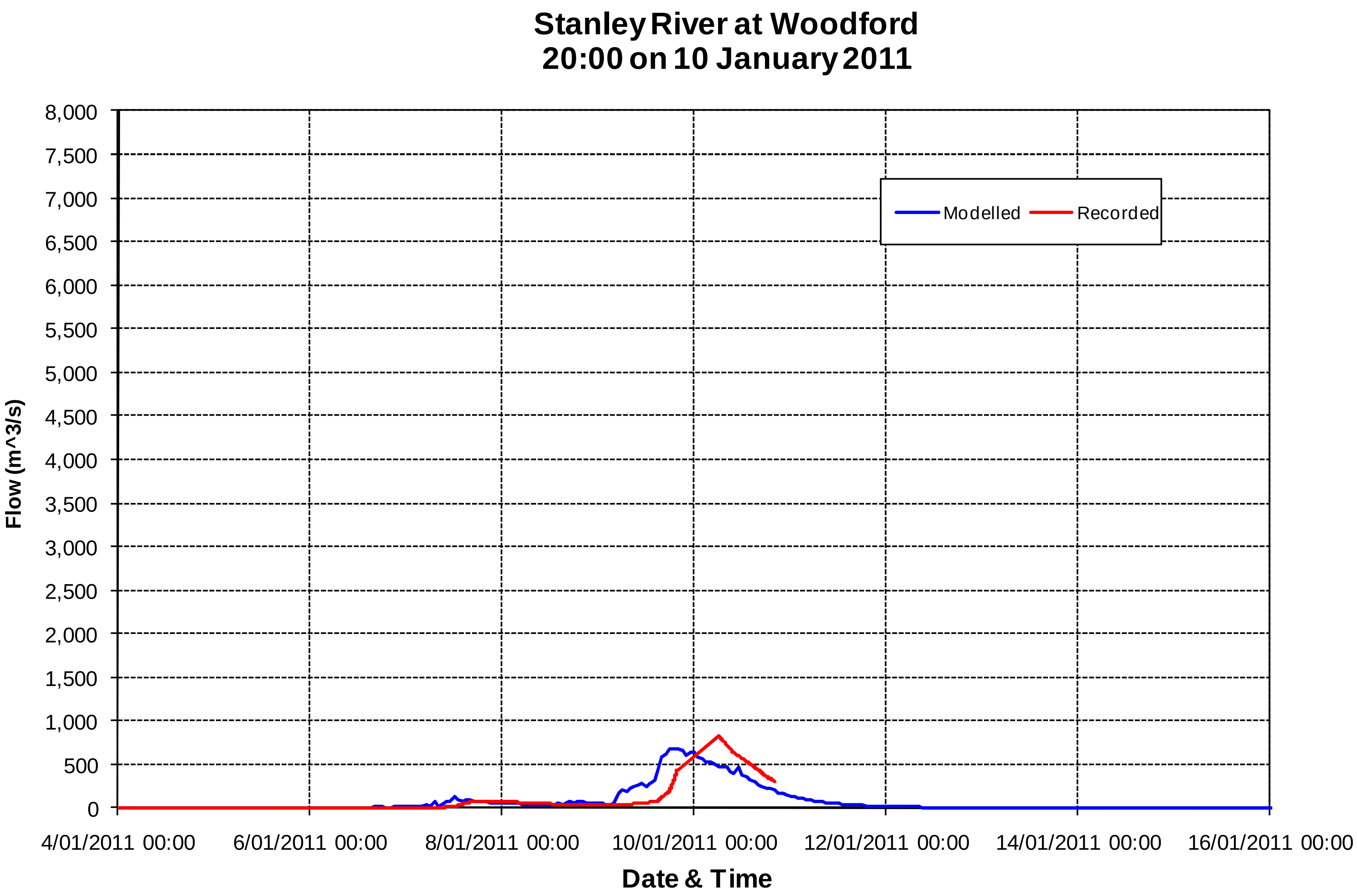
Date: Monday 10 January 2011

Time: 20:00

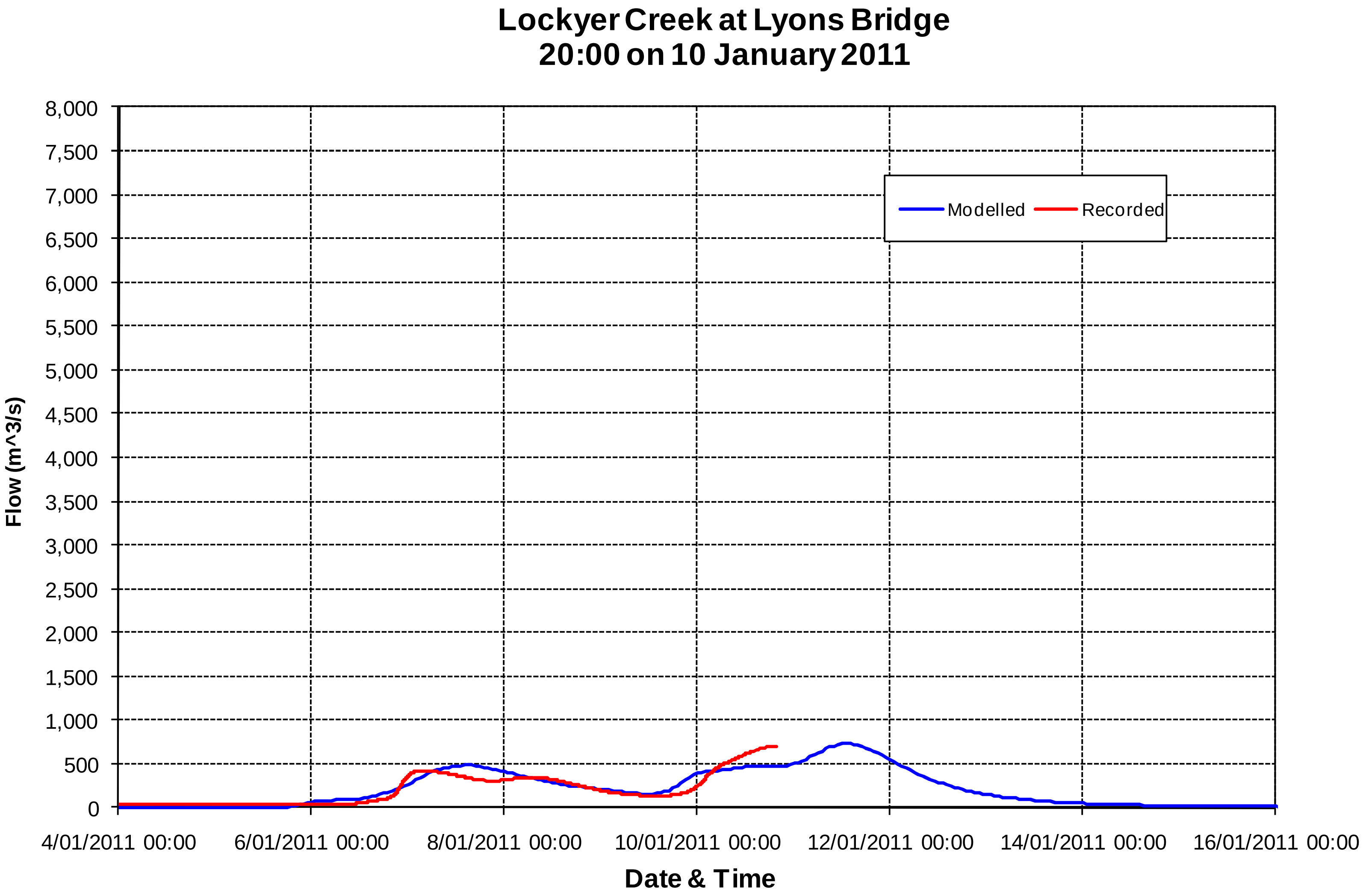
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	624,406	7,594	725,005	243	100,599
Woodford	820	60,211	685	70,357	-135	10,146
Lyons Bridge	701	129,738	485	124,839	-216	-4,898
Walloon	412	56,377	664	110,975	252	54,598
Amberley	277	46,268	590	55,414	313	9,146
Estimate to date and time of run						
Somerset			3,856	424,965		
Wivenhoe			7,540	834,029		
Total Event estimate						
Somerset			3,856	490,939		
Wivenhoe			7,540	1,052,572		



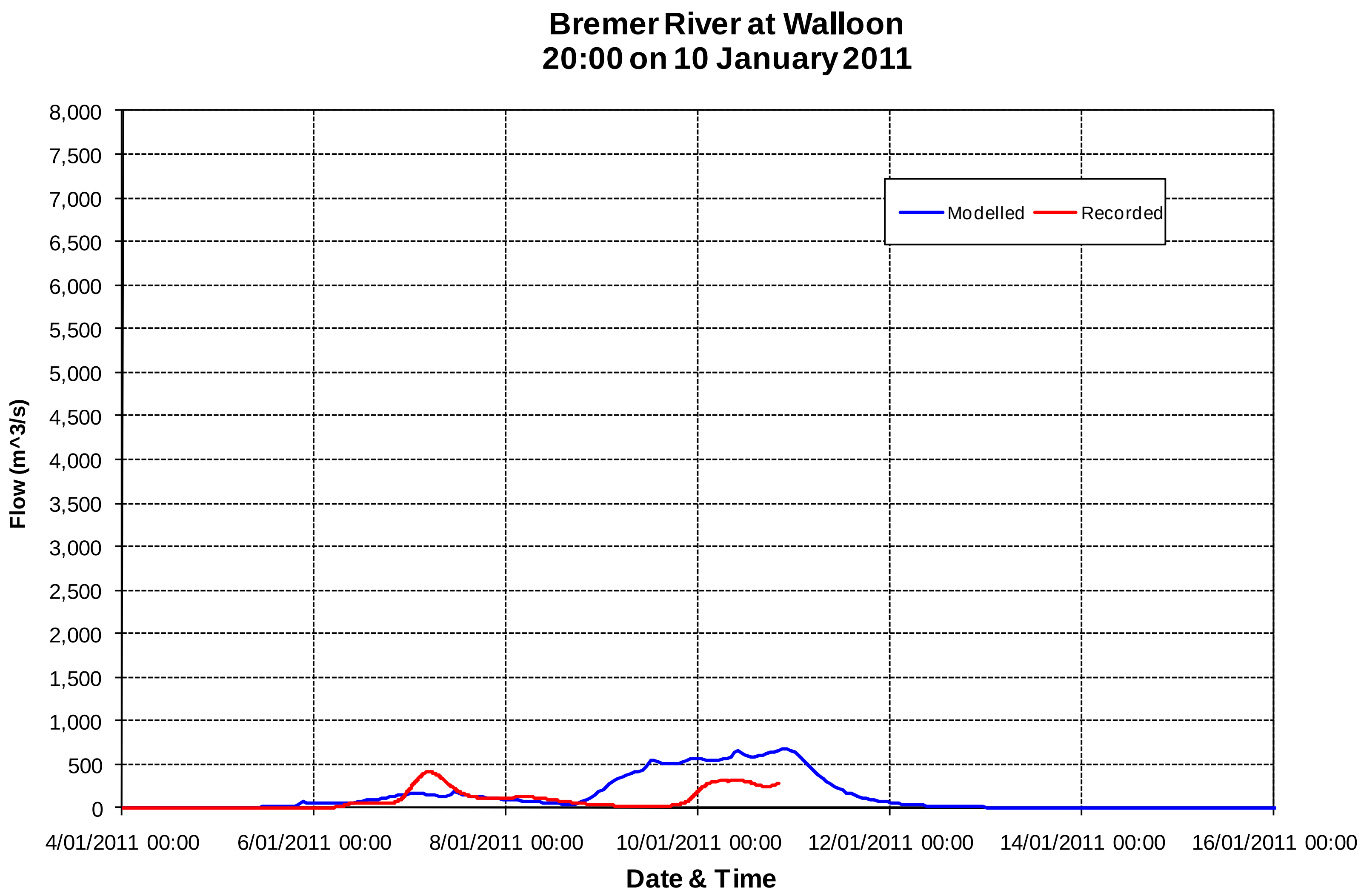
Run 31: Monday 10 January 2011, 20:00



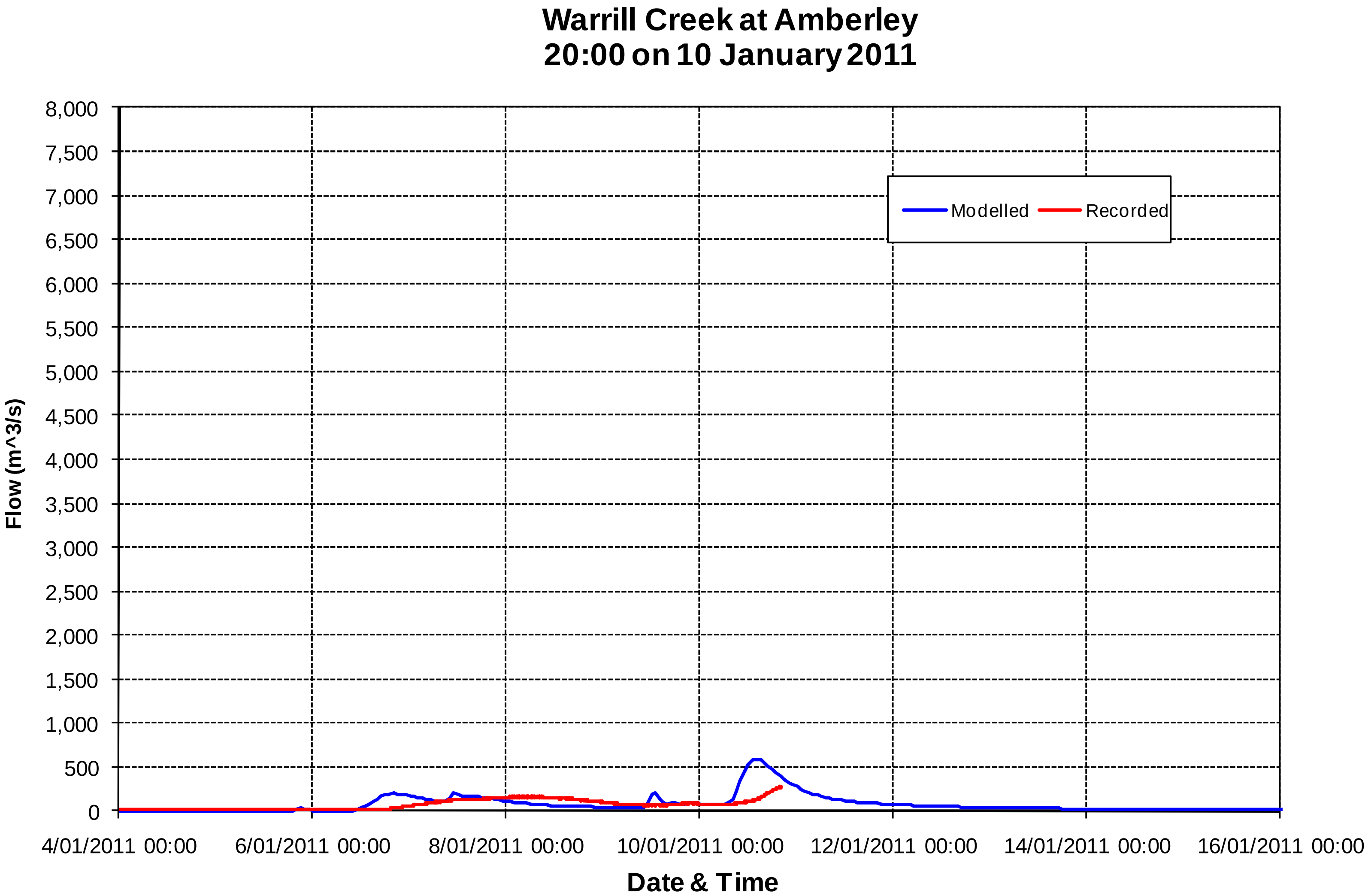
Run 31: Monday 10 January 2011, 20:00



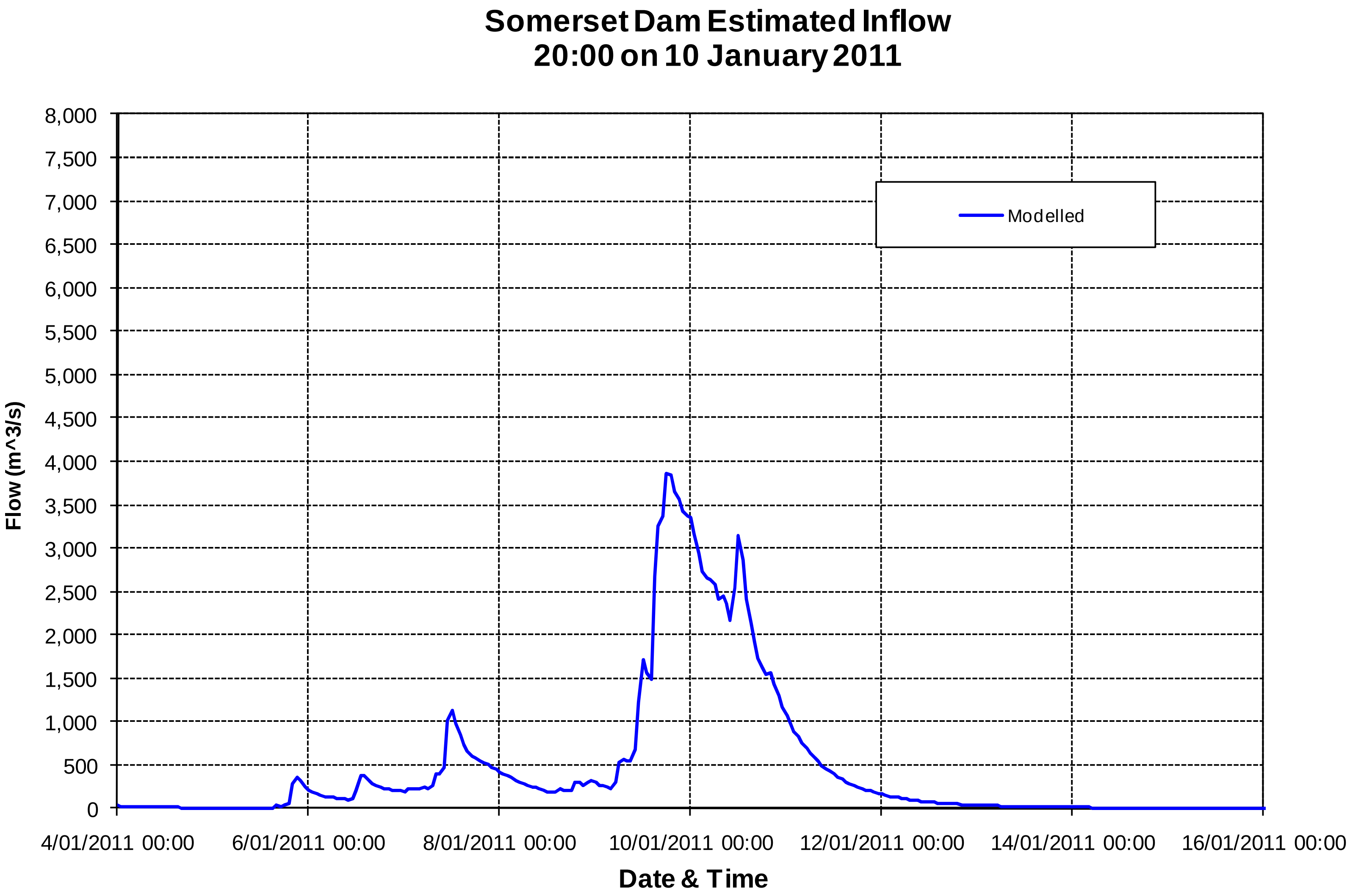
Run 31: Monday 10 January 2011, 20:00



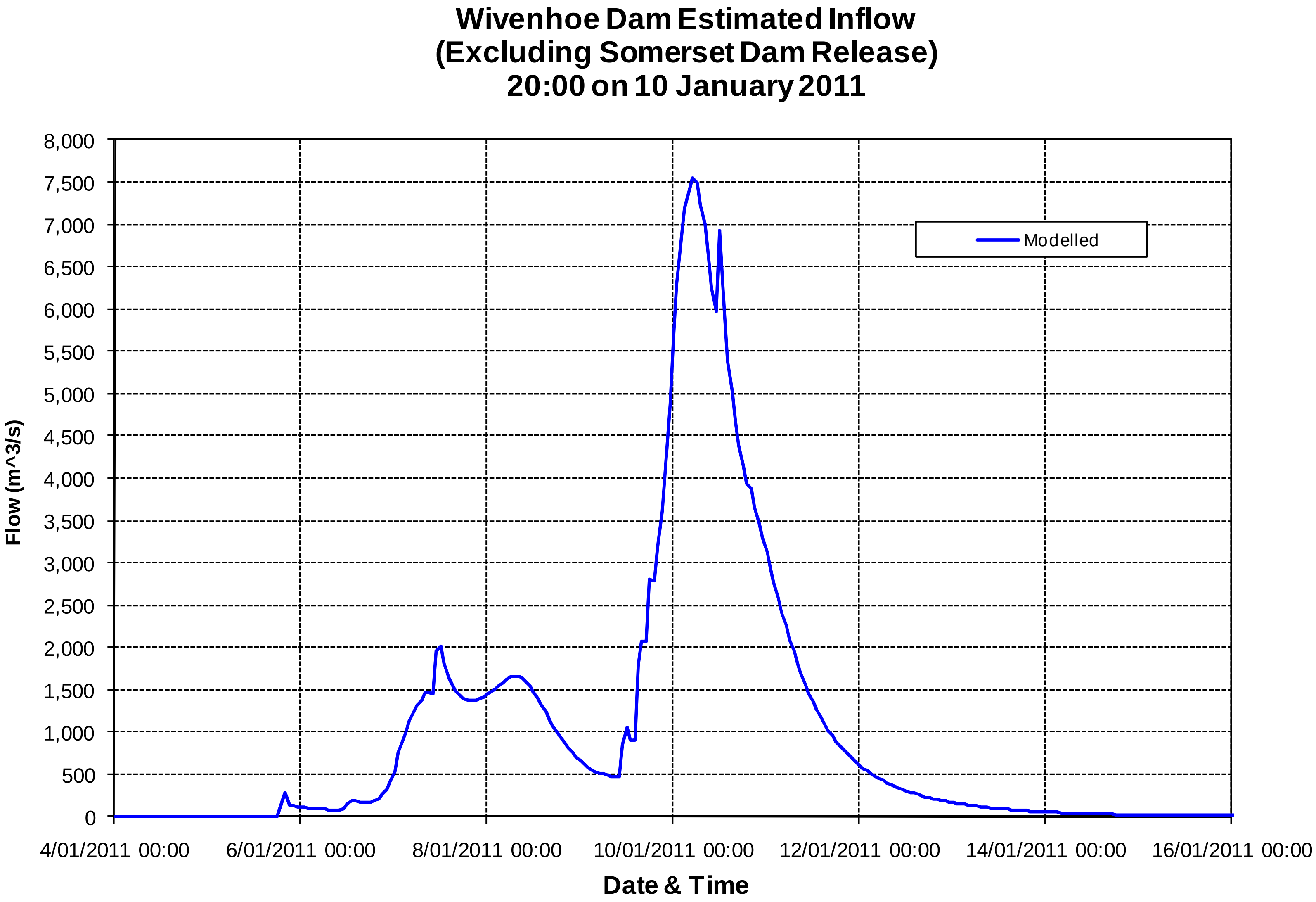
Run 31: Monday 10 January 2011, 20:00



Run 31: Monday 10 January 2011, 20:00



Run 31: Monday 10 January 2011, 20:00



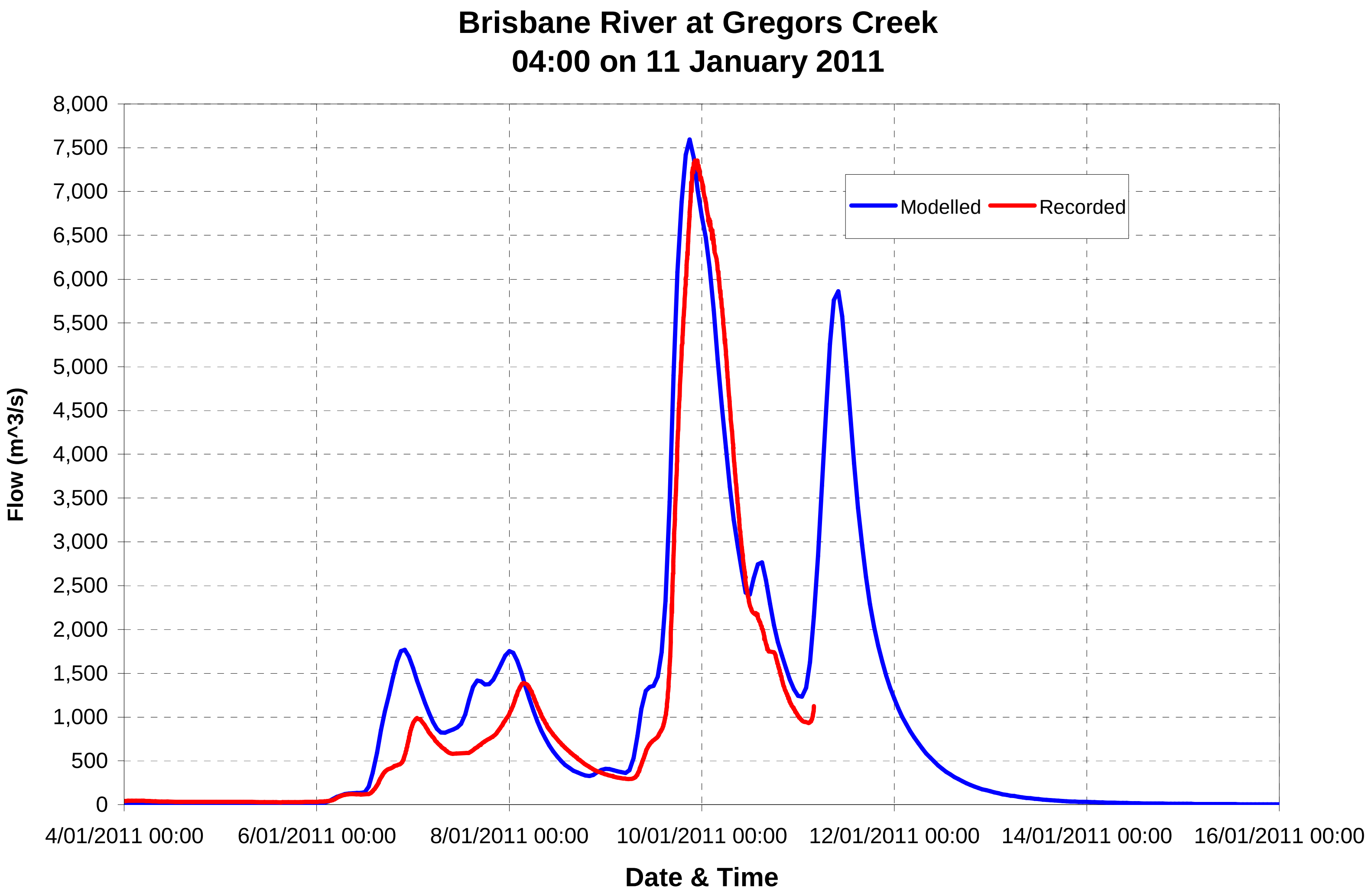
Run 31: Monday 10 January 2011, 20:00

Run 35

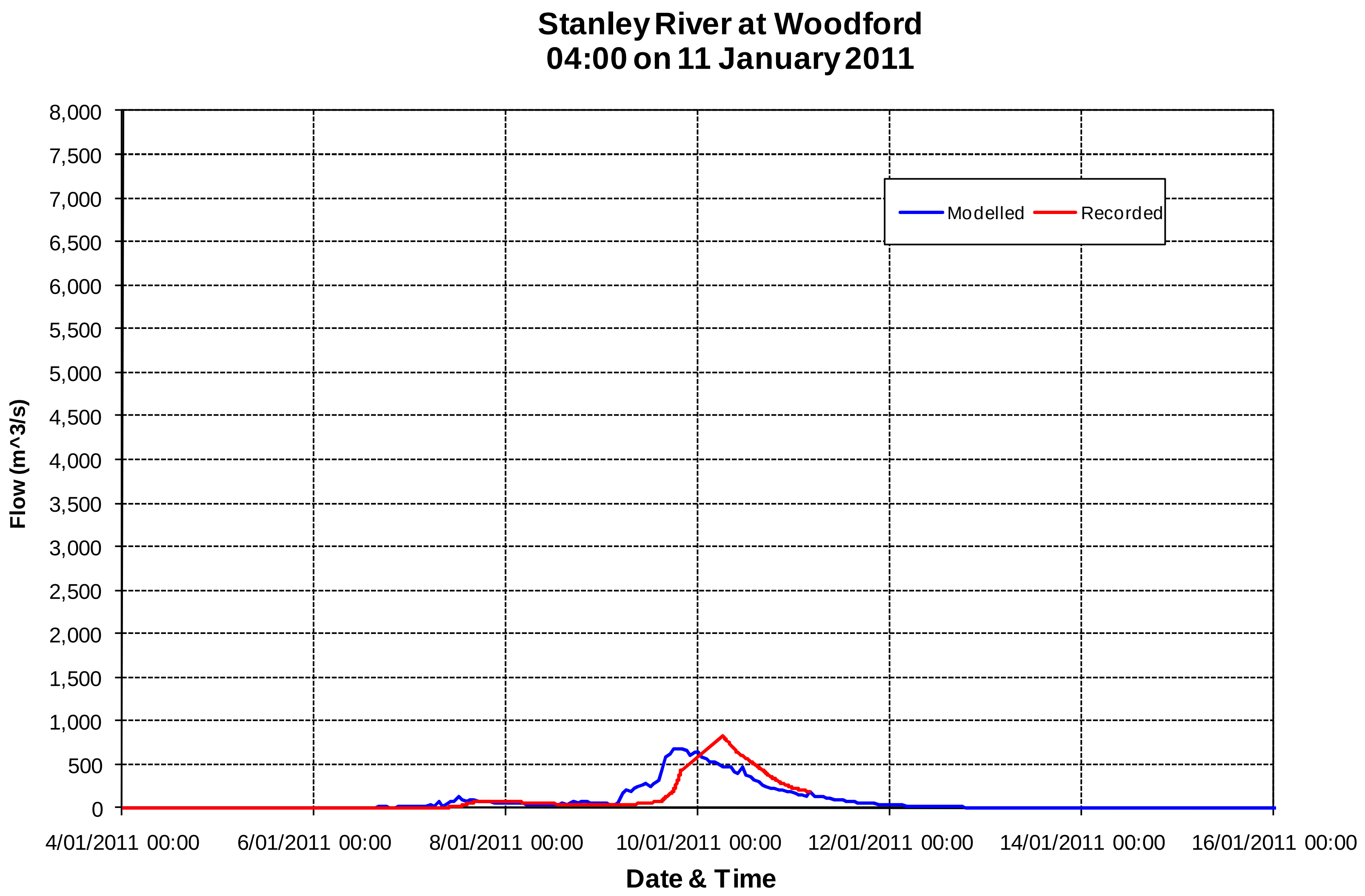
Date: Tuesday 11 January 2011

Time: 04:00

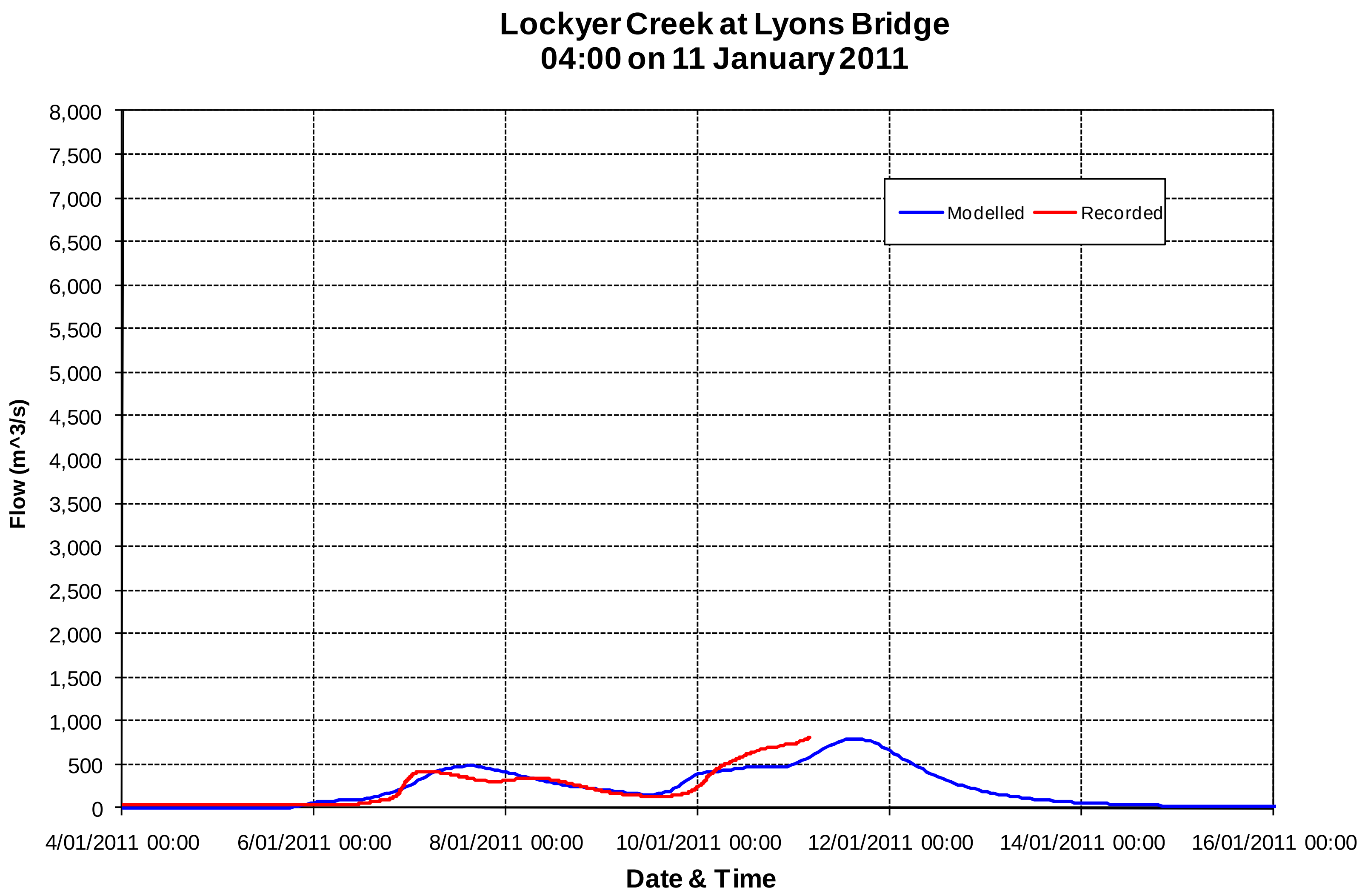
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	655,136	7,594	767,802	243	112,666
Woodford	820	73,389	685	75,235	-135	1,846
Lyons Bridge	808	151,461	591	139,841	-217	-11,620
Walloon	575	69,710	707	131,038	132	61,327
Amberley	280	53,921	590	63,642	310	9,720
Estimate to date and time of run						
Somerset			3,856	458,735		
Wivenhoe			7,540	921,550		
Total Event estimate						
Somerset			3,856	514,735		
Wivenhoe			7,540	1,321,635		



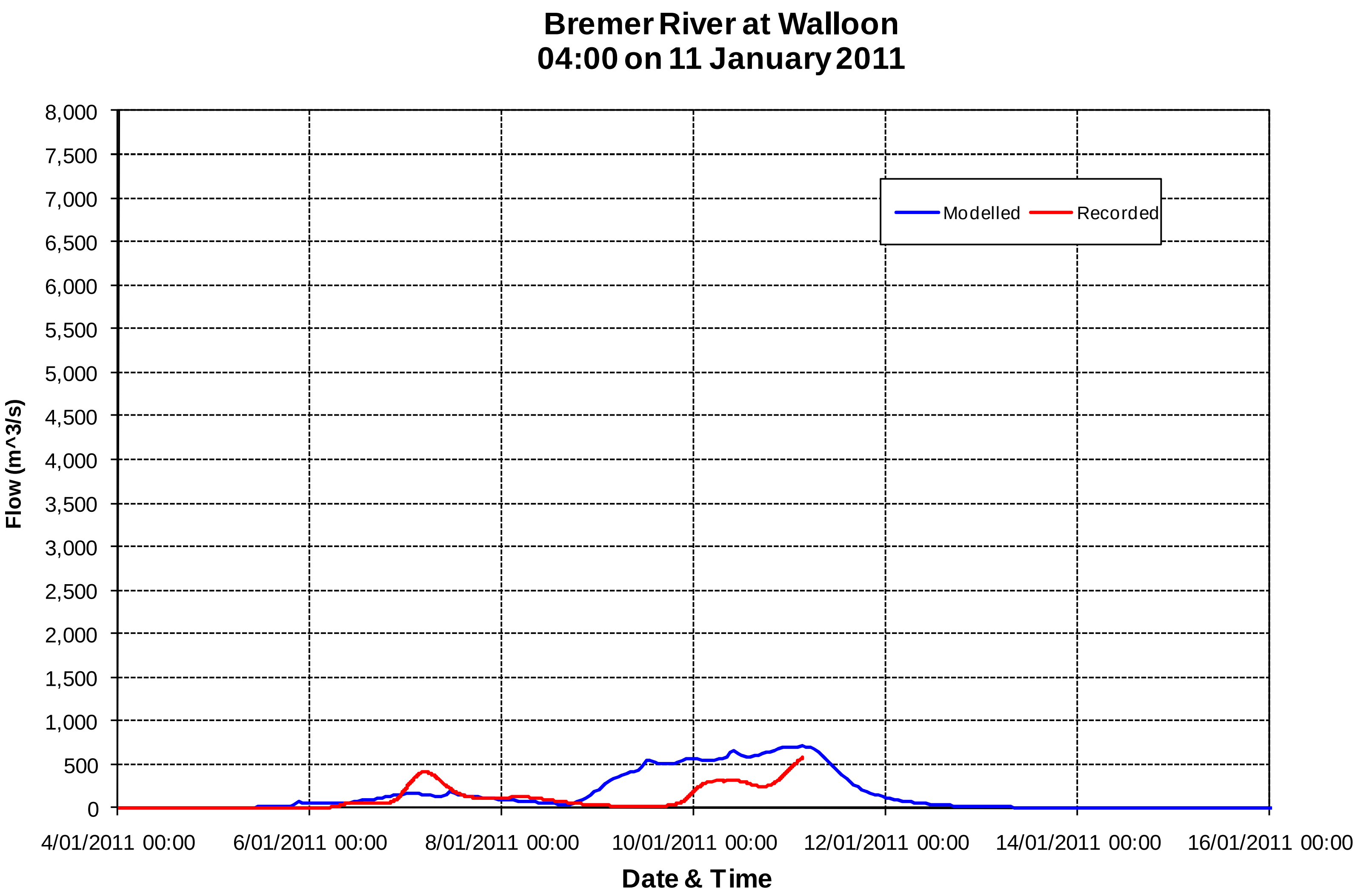
Run 35: Tuesday 11 January 2011, 04:00



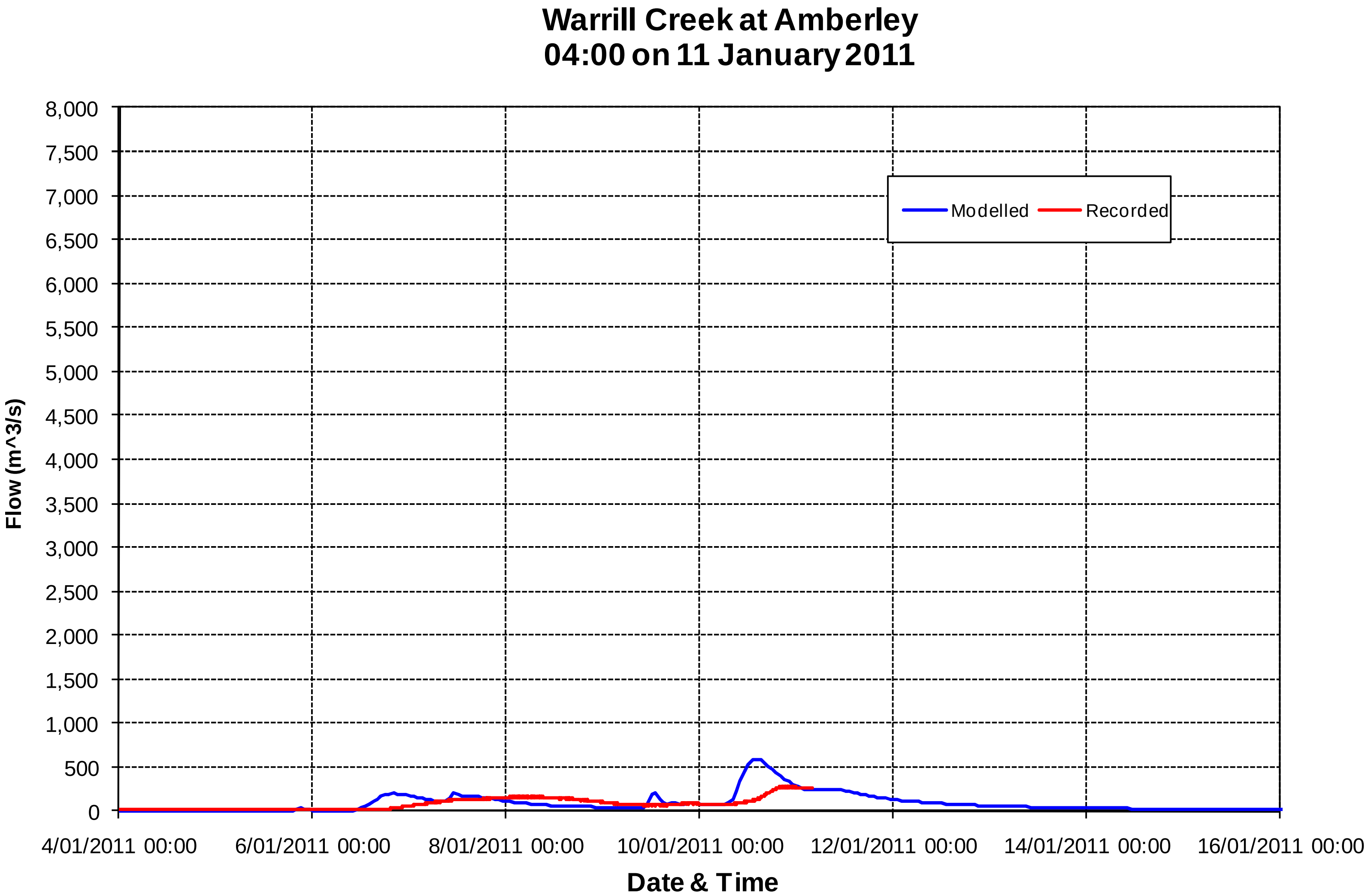
Run 35: Tuesday 11 January 2011, 04:00



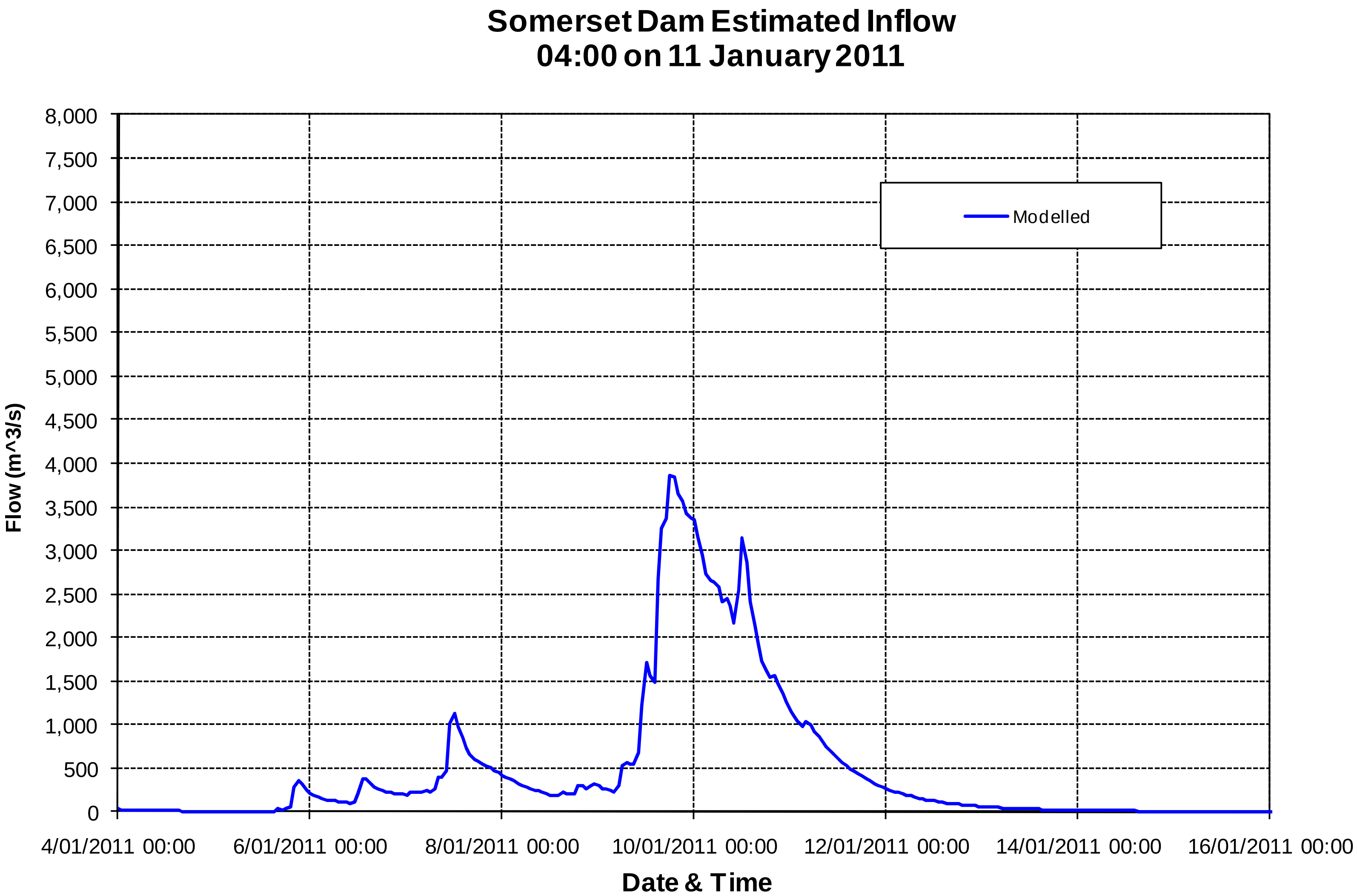
Run 35: Tuesday 11 January 2011, 04:00



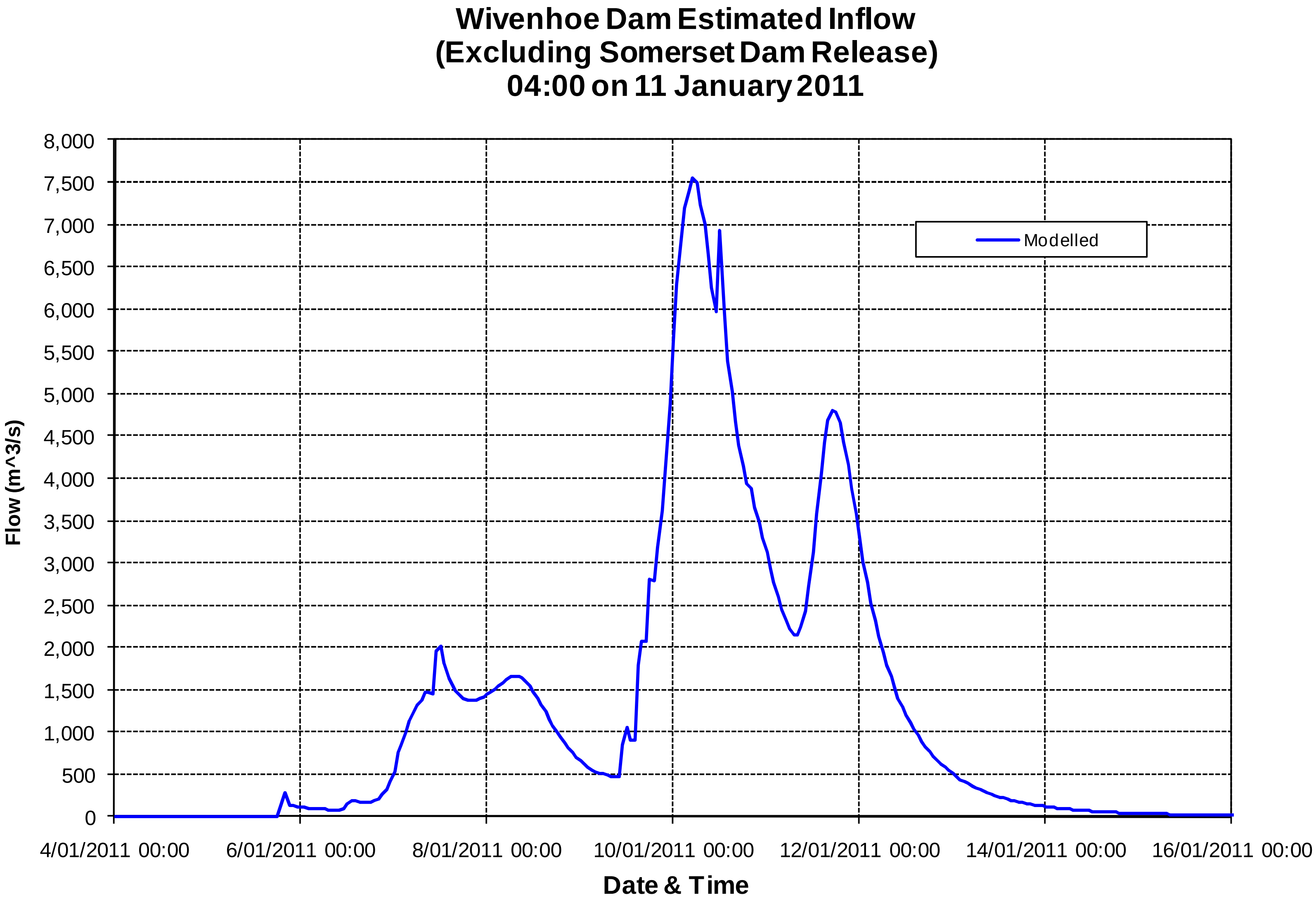
Run 35: Tuesday 11 January 2011, 04:00



Run 35: Tuesday 11 January 2011, 04:00



Run 35: Tuesday 11 January 2011, 04:00



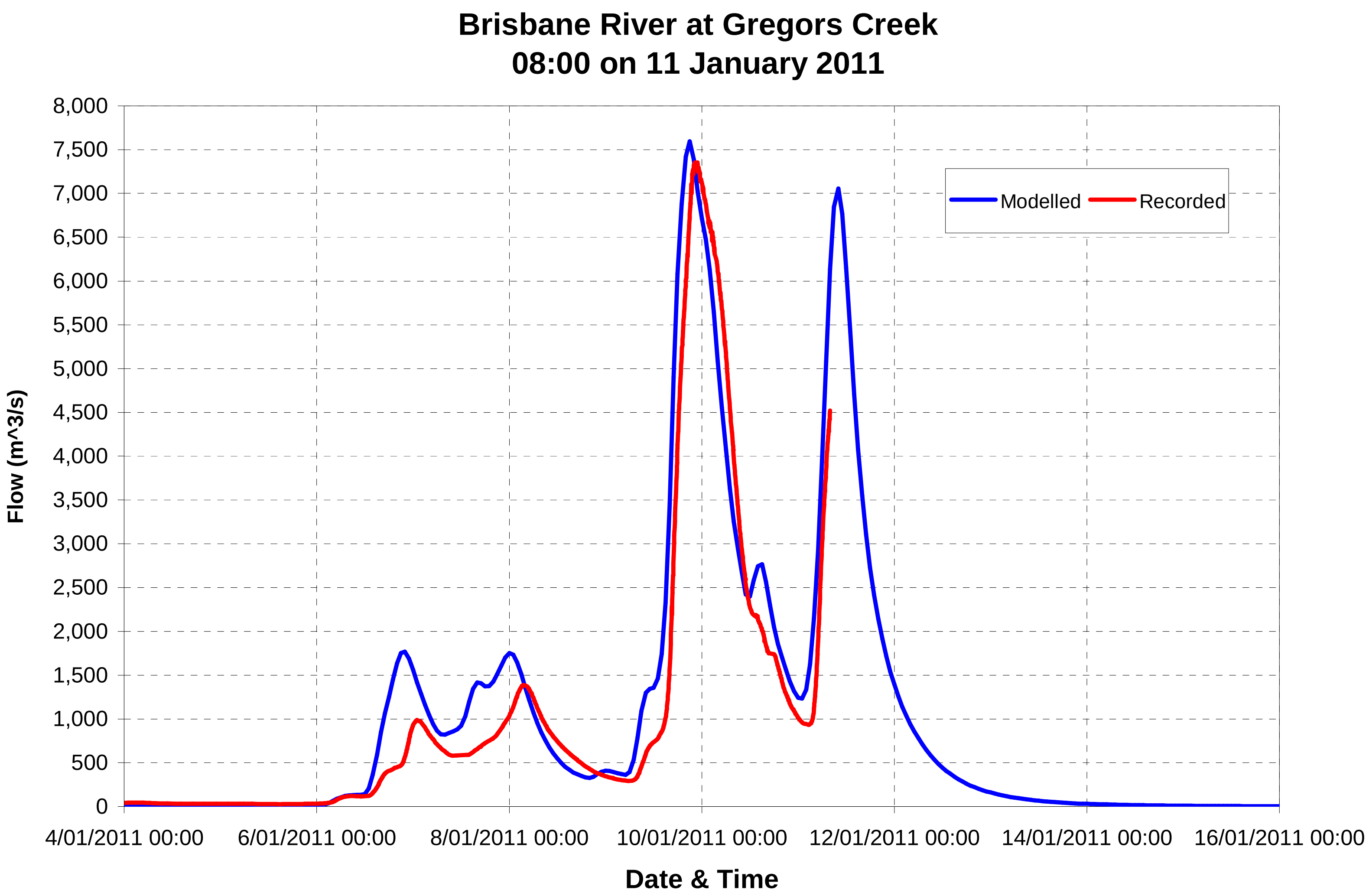
Run 35: Tuesday 11 January 2011, 04:00

Run 37

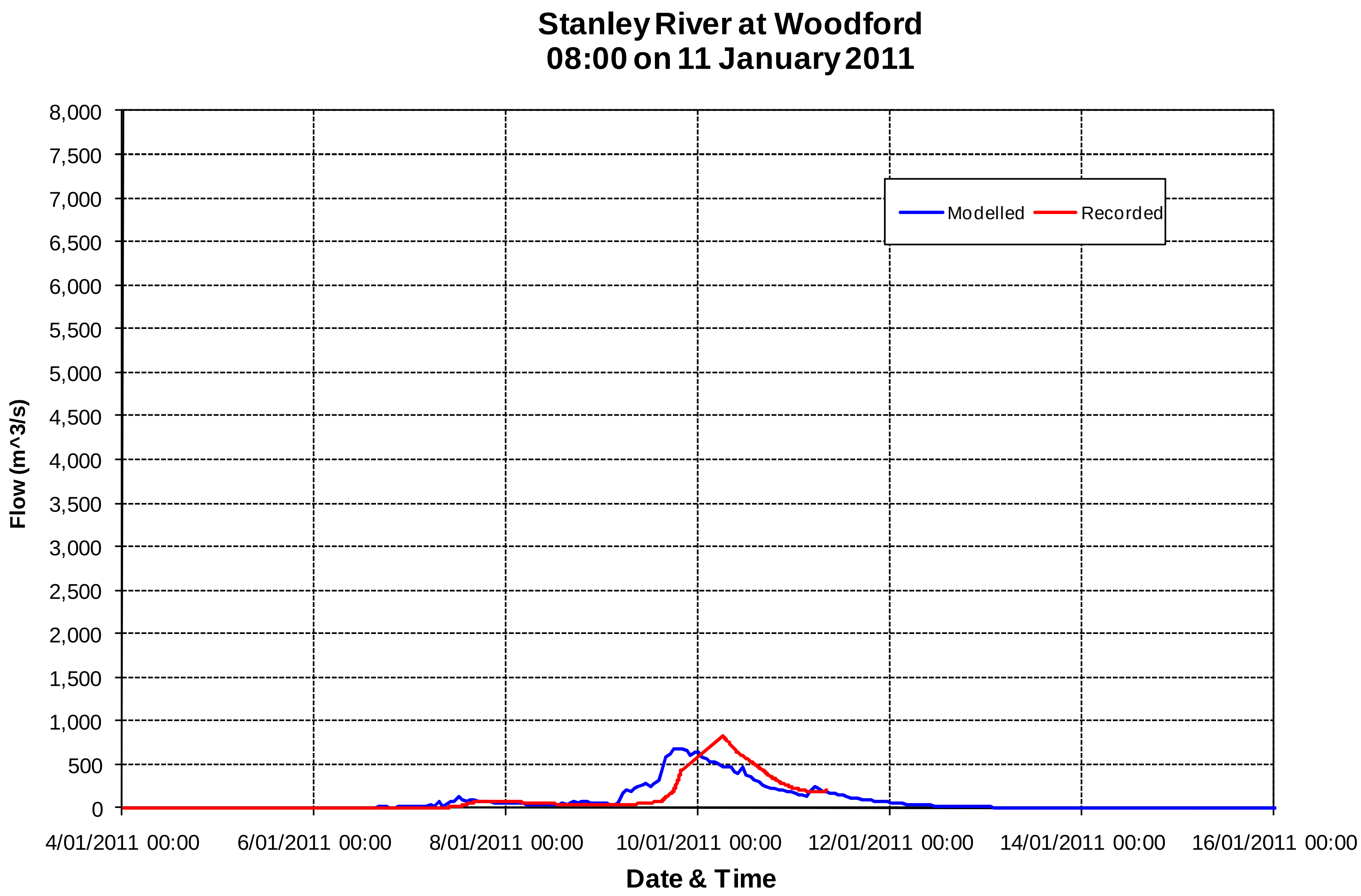
Date: Tuesday 11 January 2011

Time: 08:00

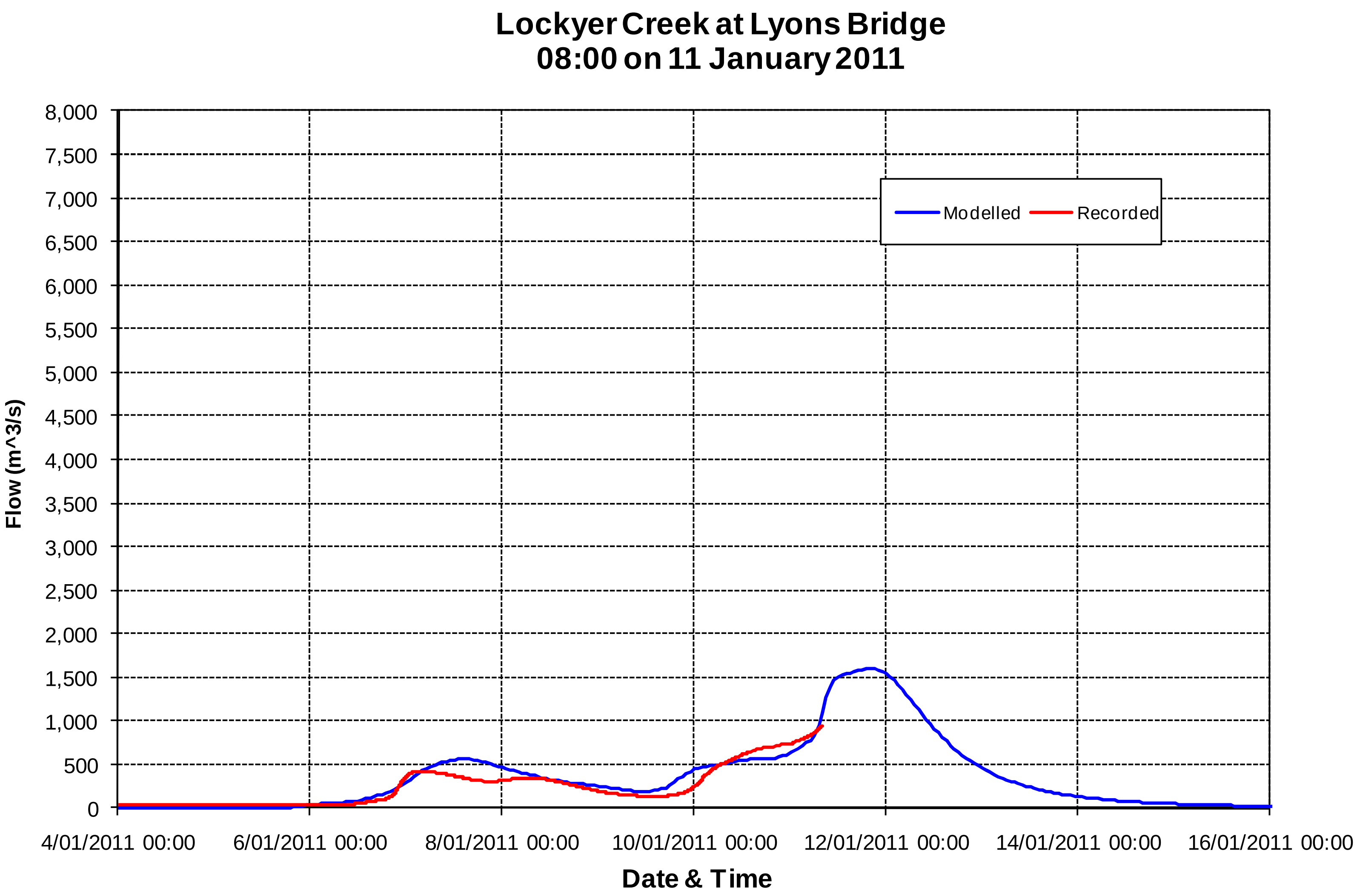
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	702,824	7,594	832,903	243	130,079
Woodford	820	76,158	685	78,289	-135	2,131
Lyons Bridge	944	164,264	1,096	174,591	152	10,327
Walloon	575	77,138	707	140,897	132	63,759
Amberley	288	57,916	590	67,321	303	9,405
Estimate to date and time of run						
Somerset			3,856	494,119		
Wivenhoe			7,540	975,024		
Total Event estimate						
Somerset			3,856	573,708		
Wivenhoe			7,540	1,444,058		



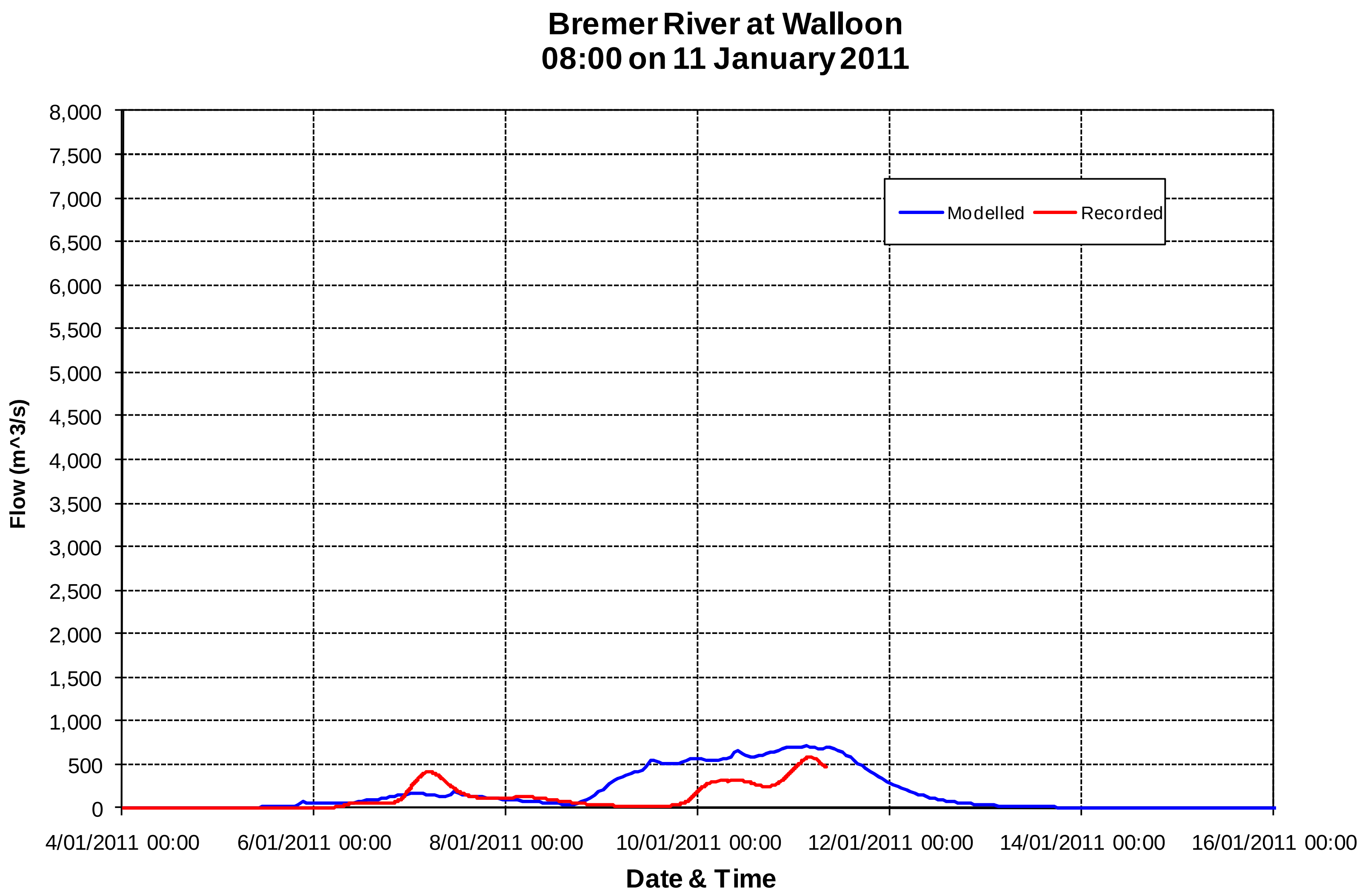
Run 37: Tuesday 11 January 2011, 08:00



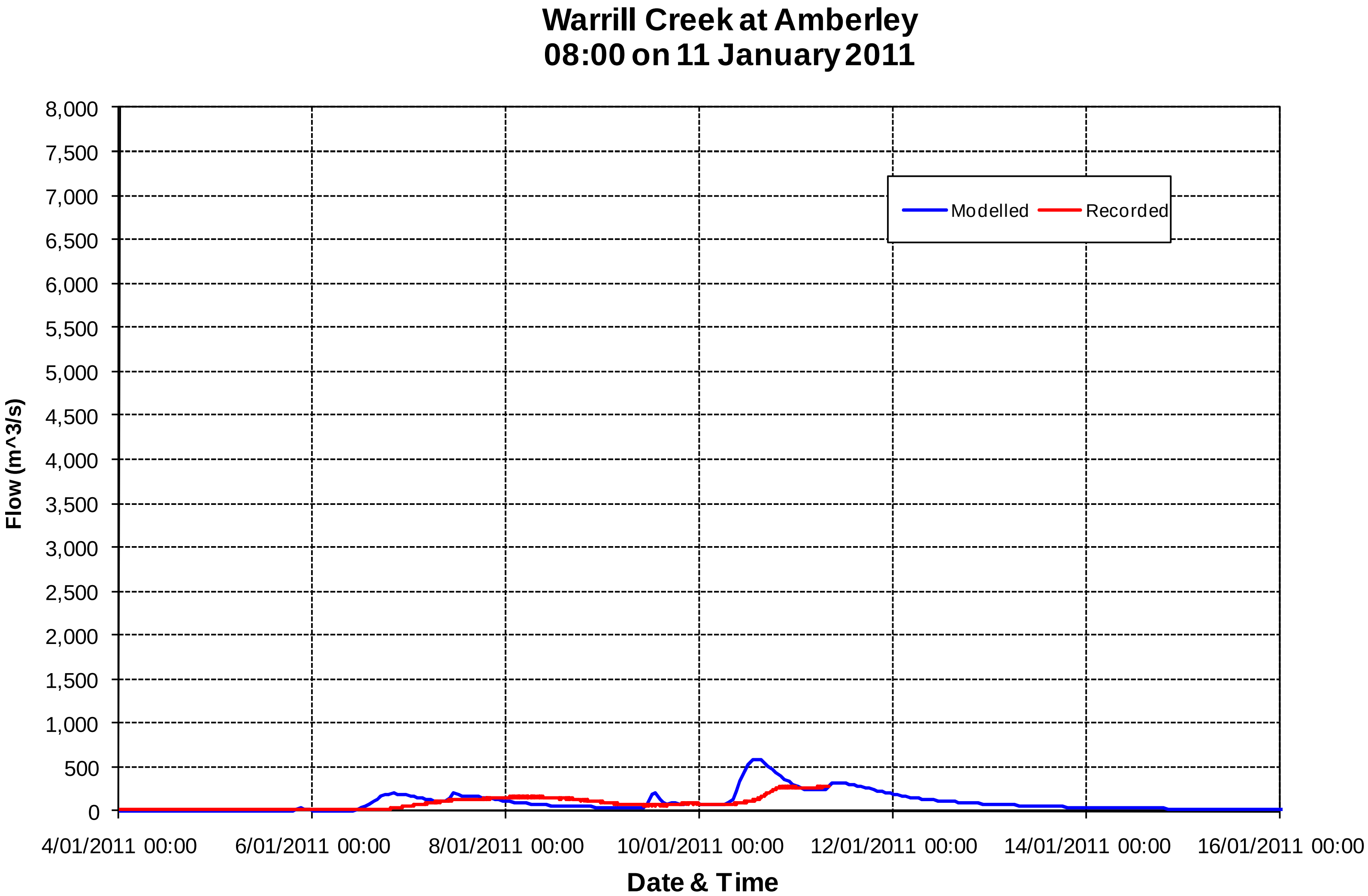
Run 37: Tuesday 11 January 2011, 08:00



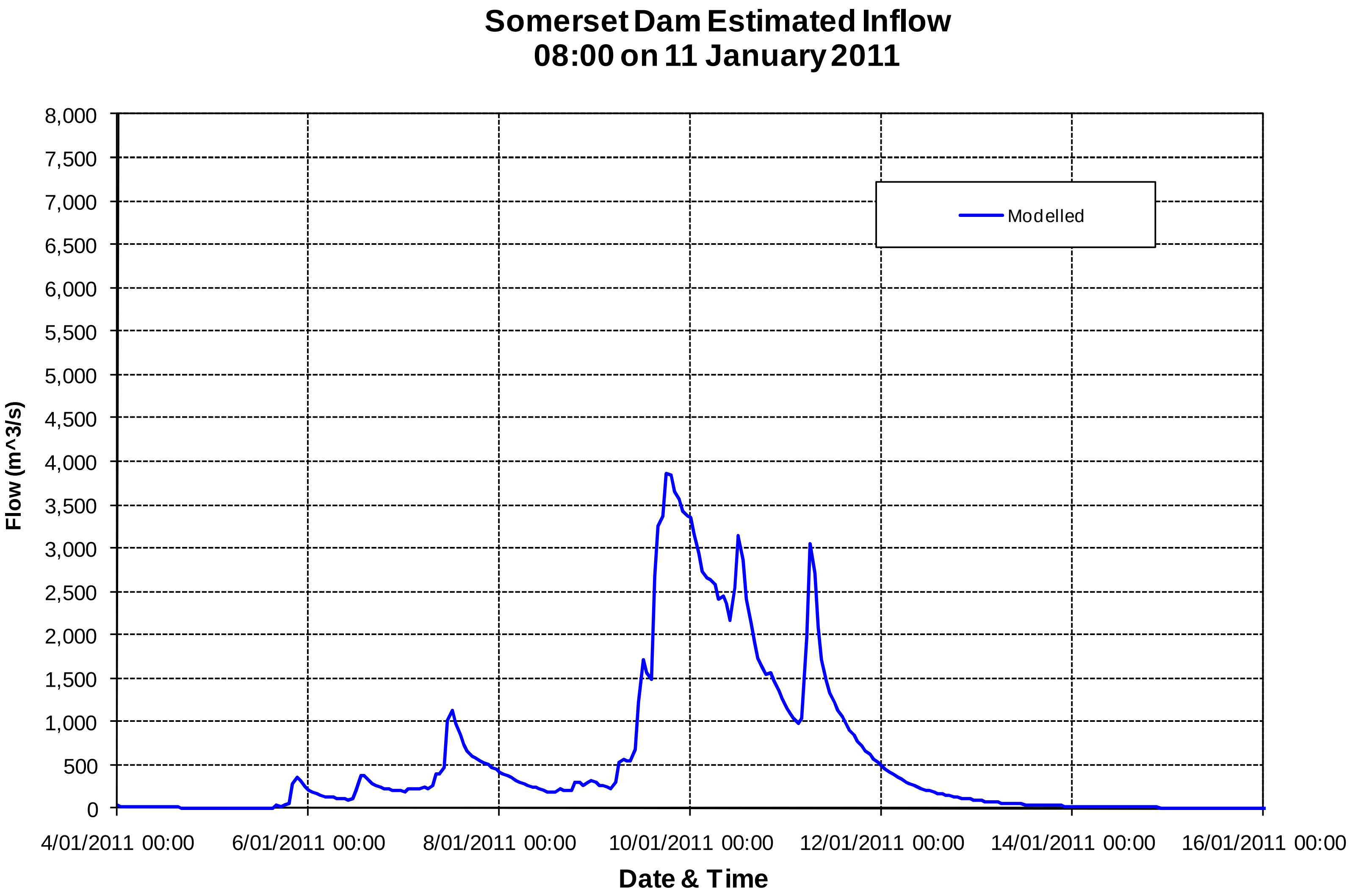
Run 37: Tuesday 11 January 2011, 08:00

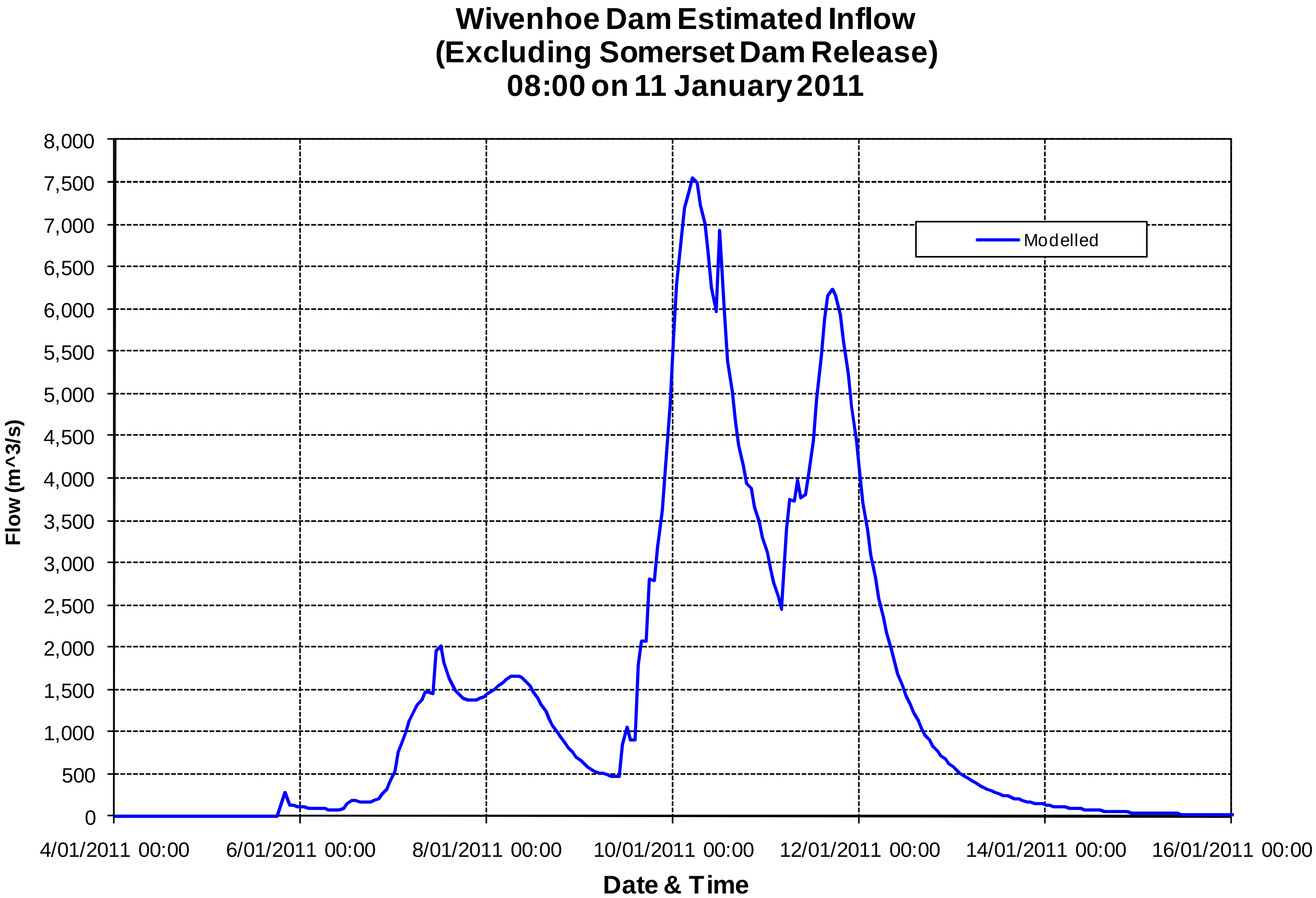


Run 37: Tuesday 11 January 2011, 08:00



Run 37: Tuesday 11 January 2011, 08:00


Somerset Dam Estimated Inflow
08:00 on 11 January 2011
Flow (m^3/s)
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled



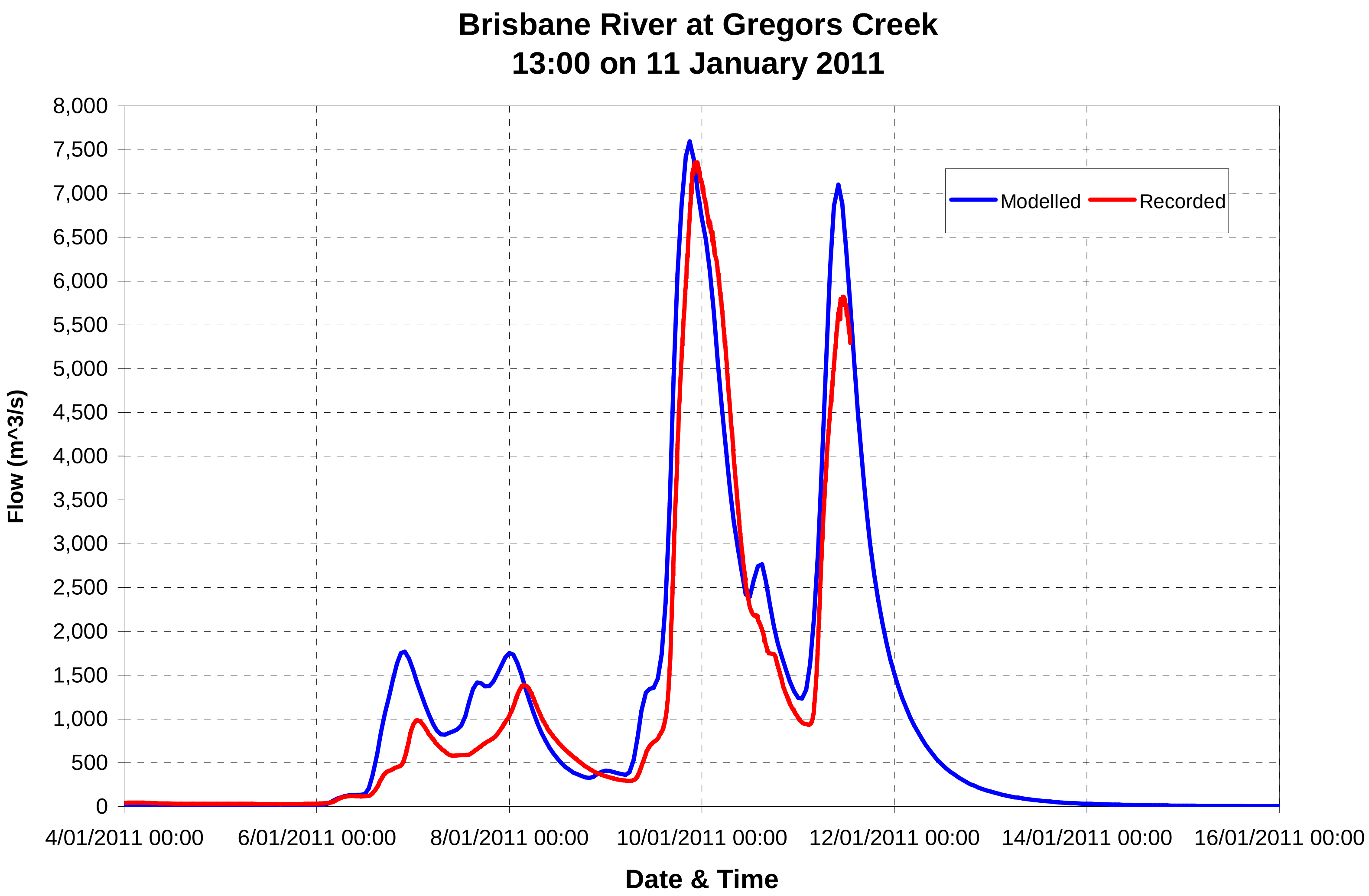
Run 37: Tuesday 11 January 2011, 08:00

Run 39

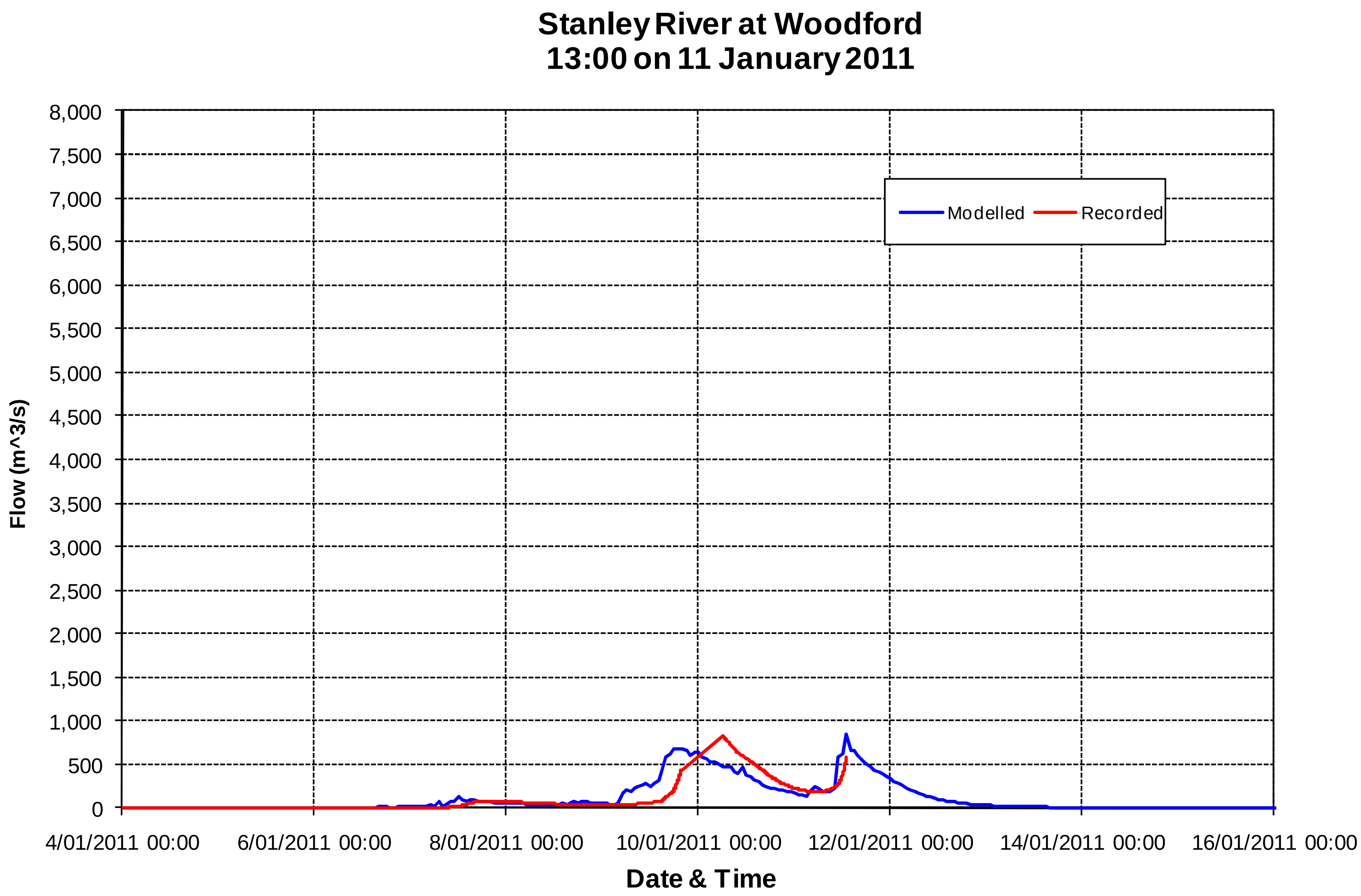
Date: Tuesday 11 January 2011

Time: 13:00

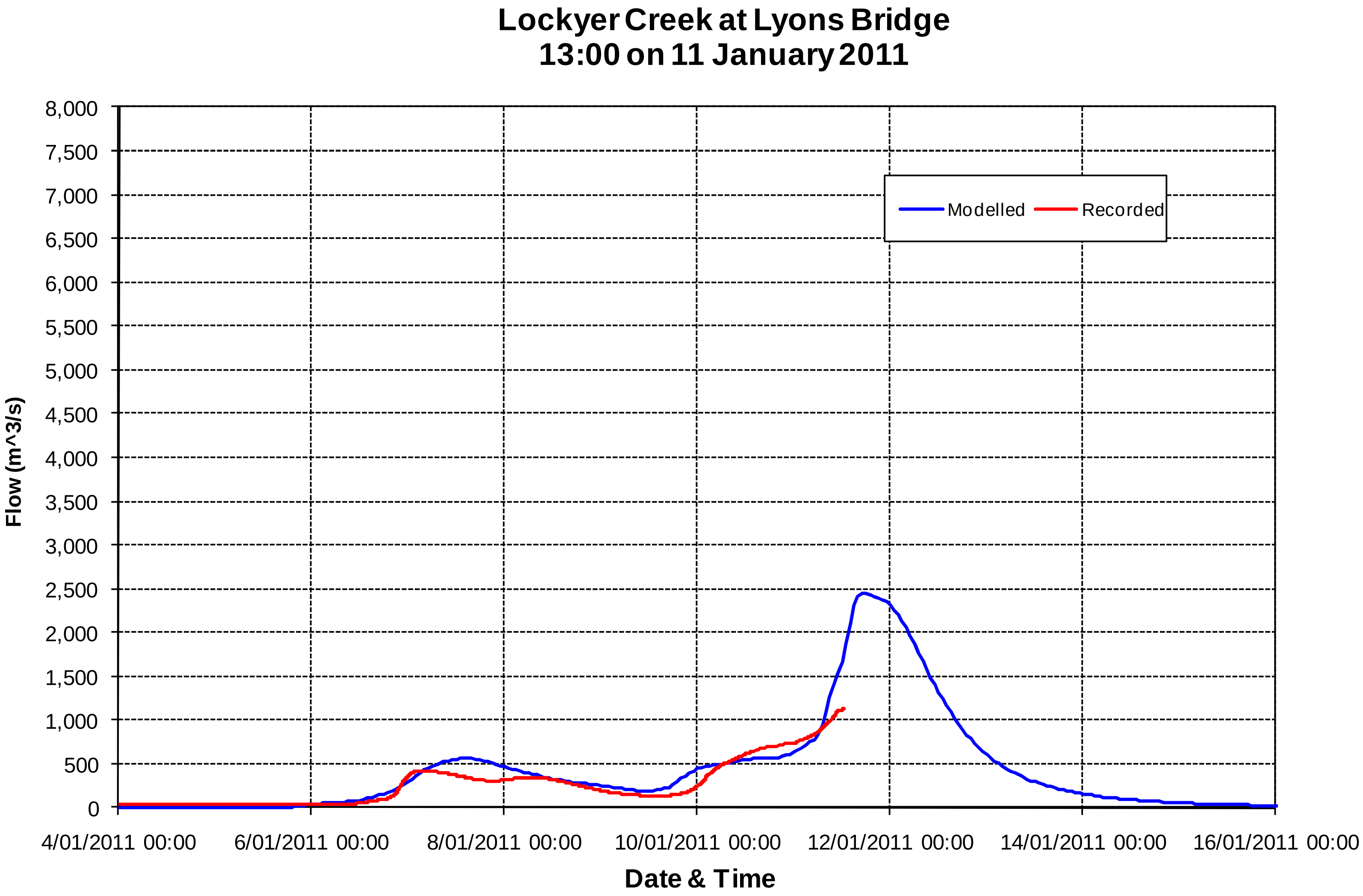
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	801,607	7,594	951,452	243	149,845
Woodford	820	82,317	844	87,121	24	4,805
Lyons Bridge	1,128	183,678	1,861	202,421	733	18,743
Walloon	1,210	90,488	903	66,984	-307	-23,504
Amberley	394	63,991	968	80,639	574	16,648
Estimate to date and time of run						
Somerset			3,856	530,568		
Wivenhoe			7,540	921,551		
Total Event estimate						
Somerset			3,856	685,015		
Wivenhoe			7,540	1,528,771		



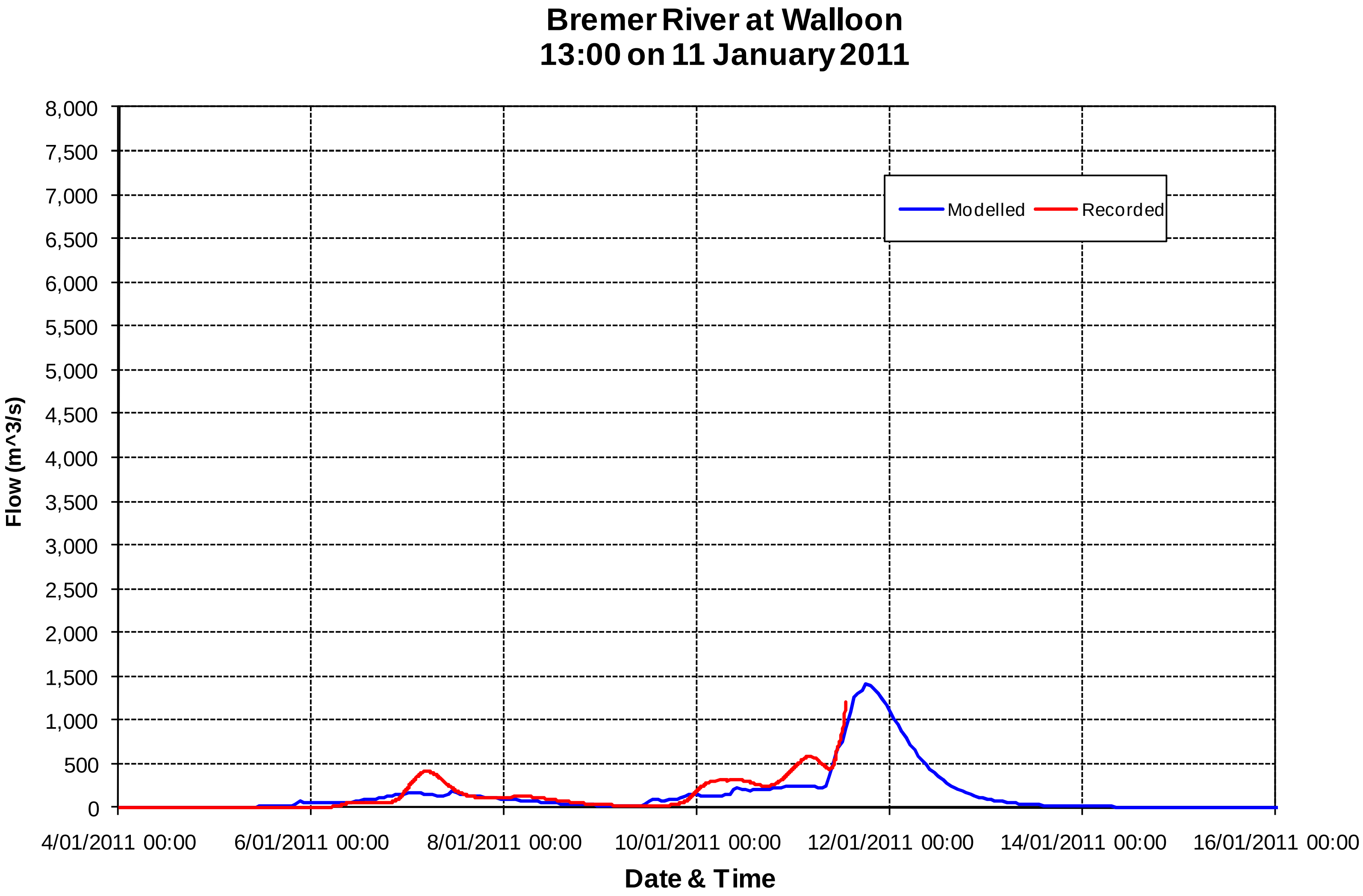
Run 39: Tuesday 11 January 2011, 13:00



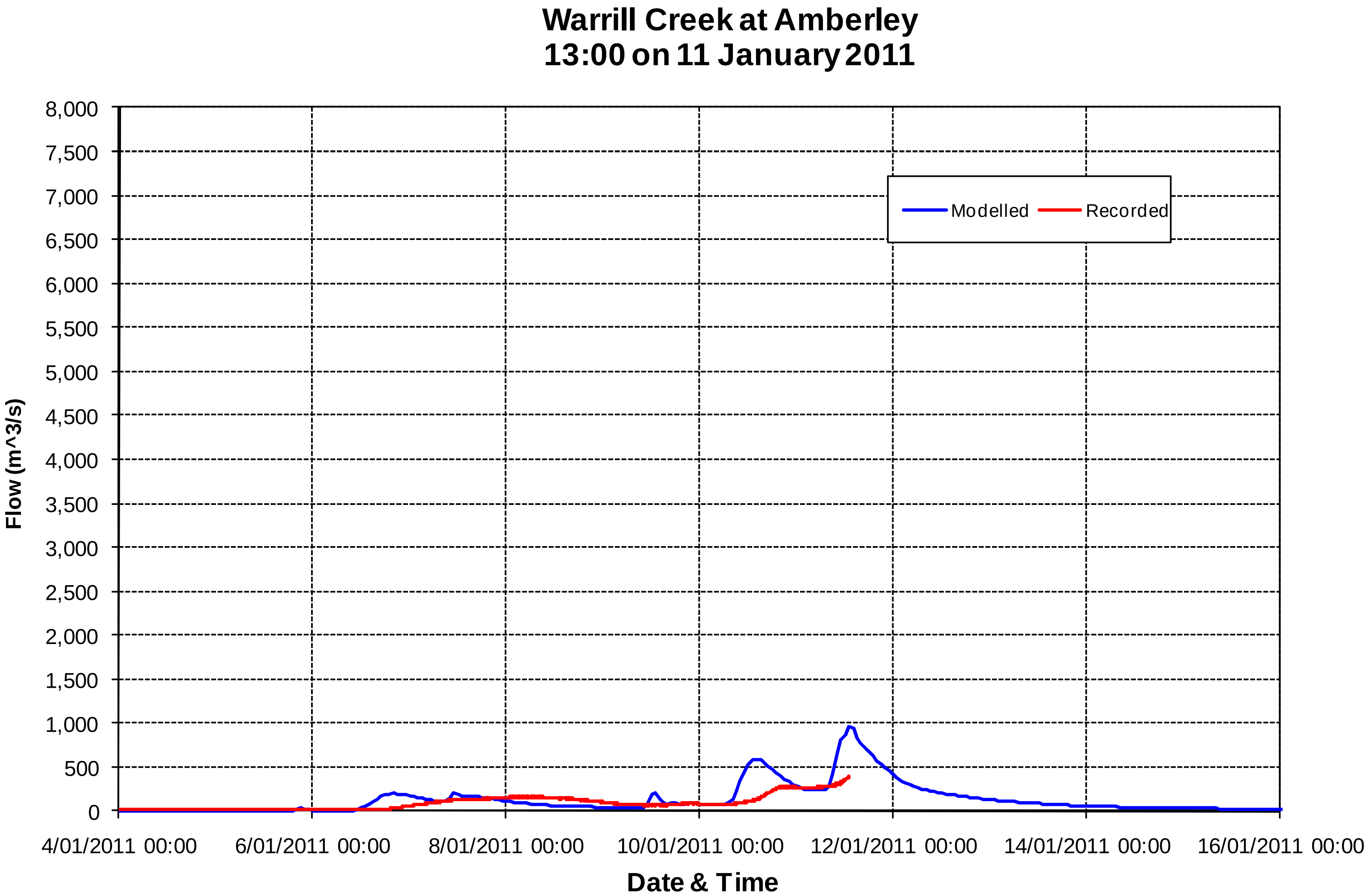
Run 39: Tuesday 11 January 2011, 13:00



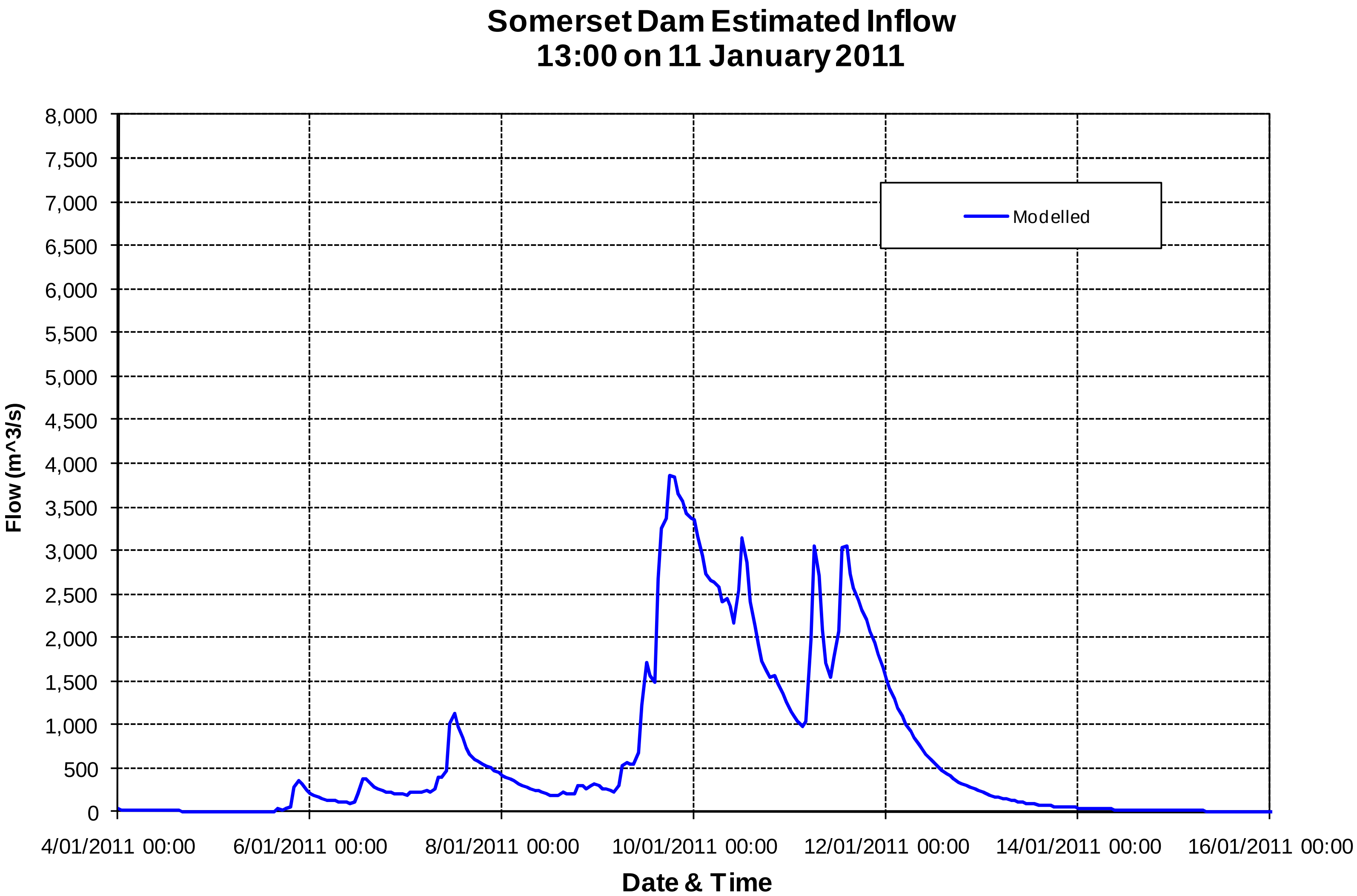
Run 39: Tuesday 11 January 2011, 13:00

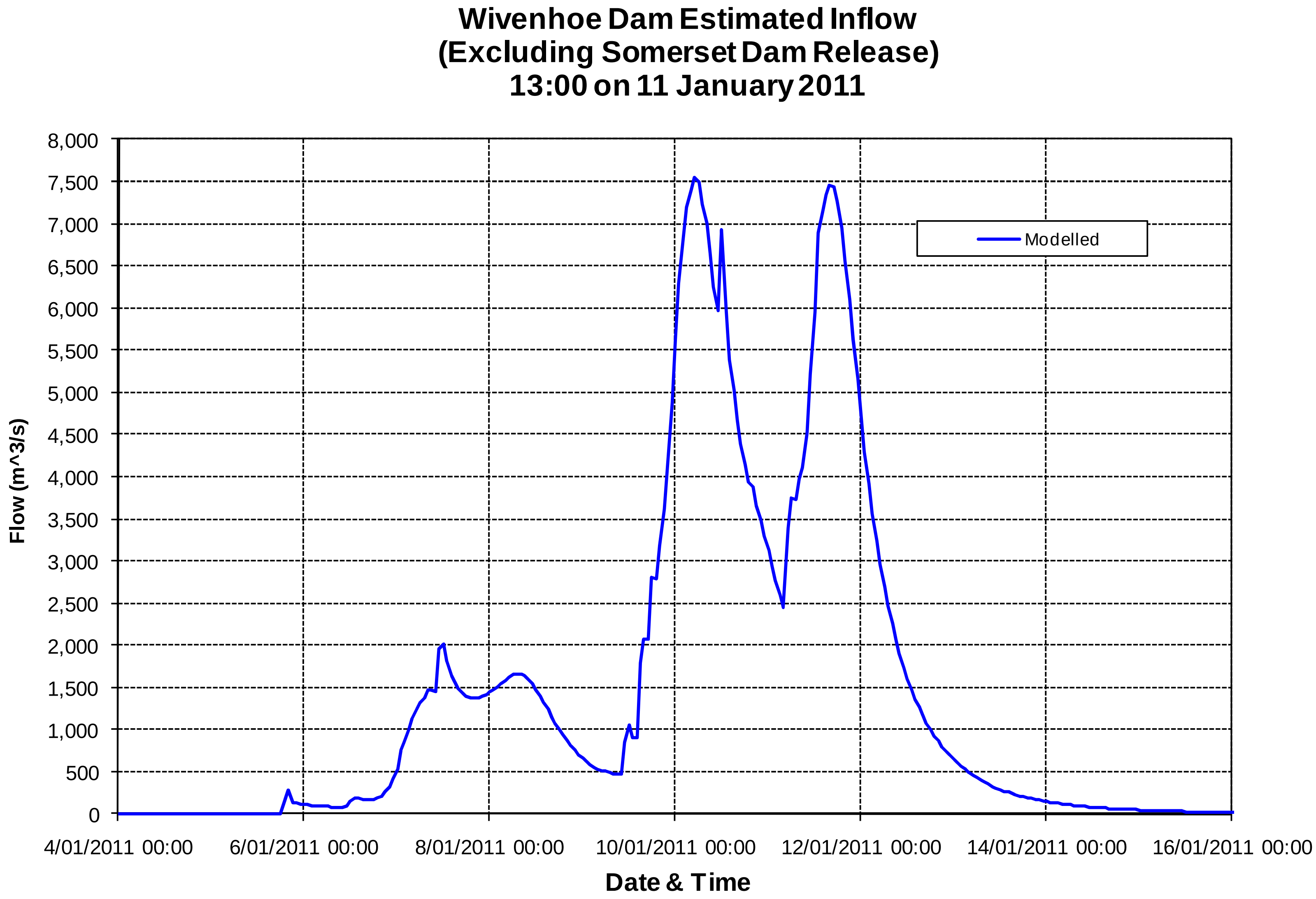


Run 39: Tuesday 11 January 2011, 13:00



Run 39: Tuesday 11 January 2011, 13:00


Somerset Dam Estimated Inflow
13:00 on 11 January 2011
Flow (m^3/s)
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time
Modelled



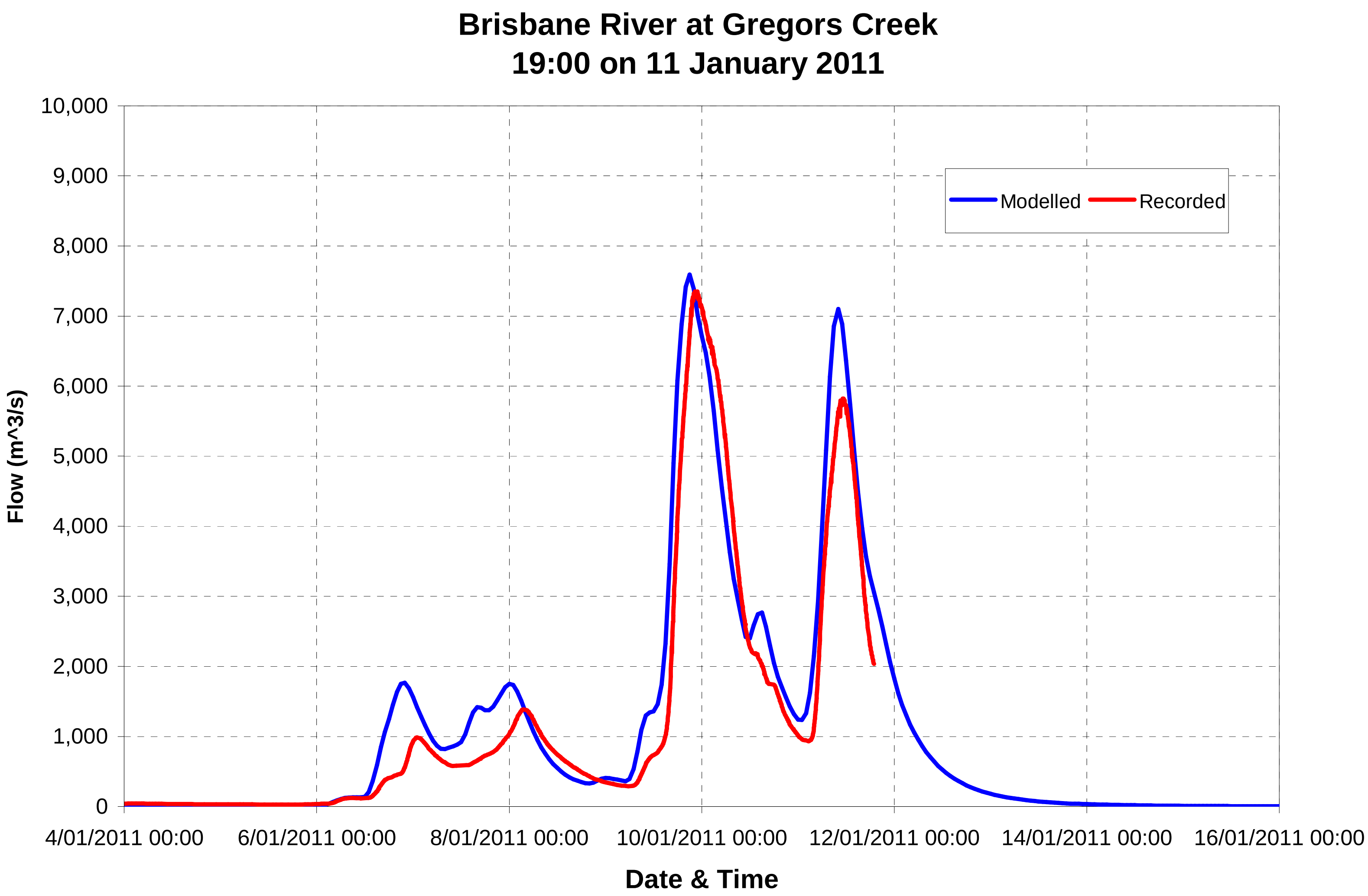
Run 39: Tuesday 11 January 2011, 13:00

Run 41

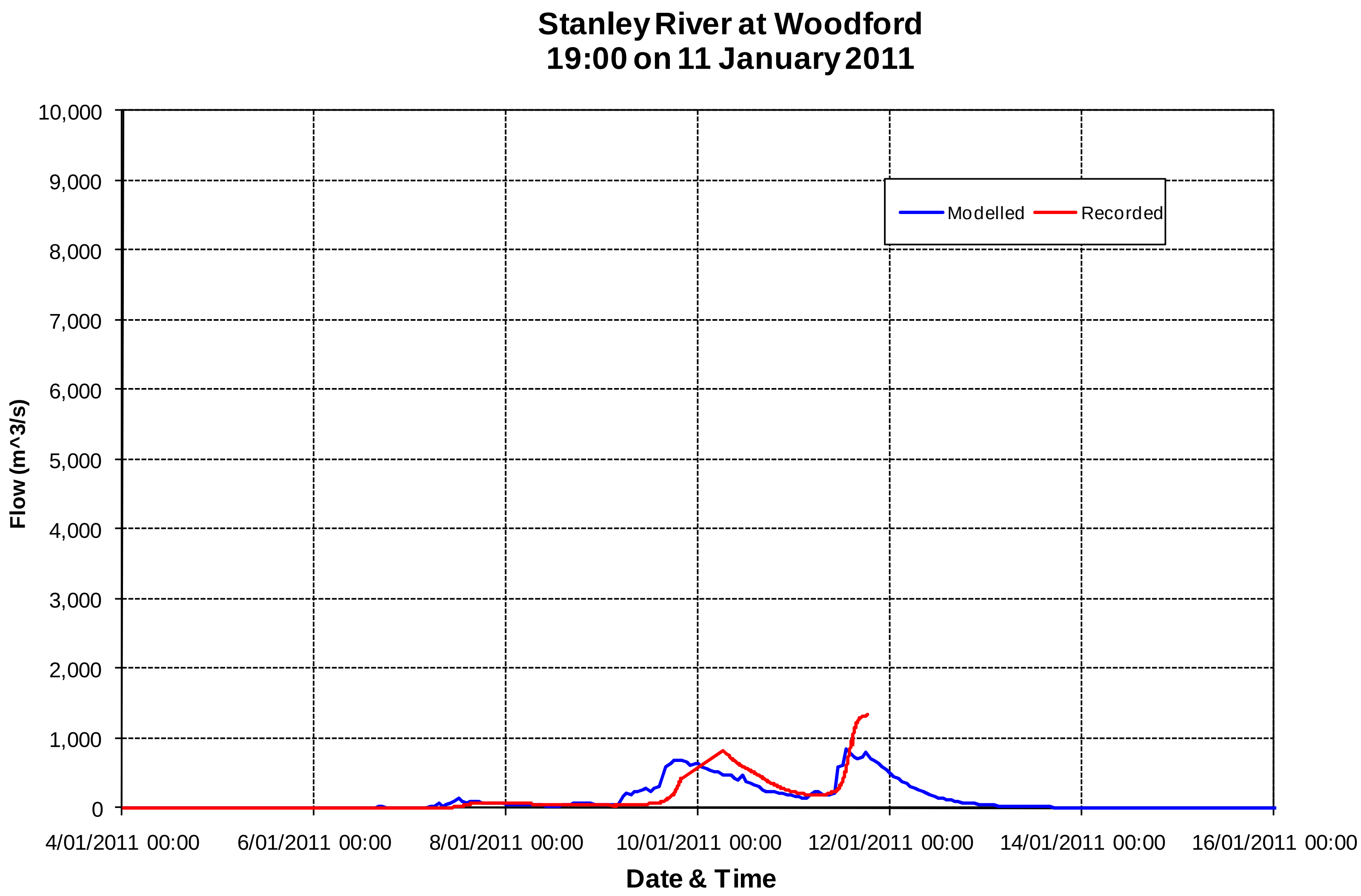
Date: Tuesday 11 January 2011

Time: 19:00

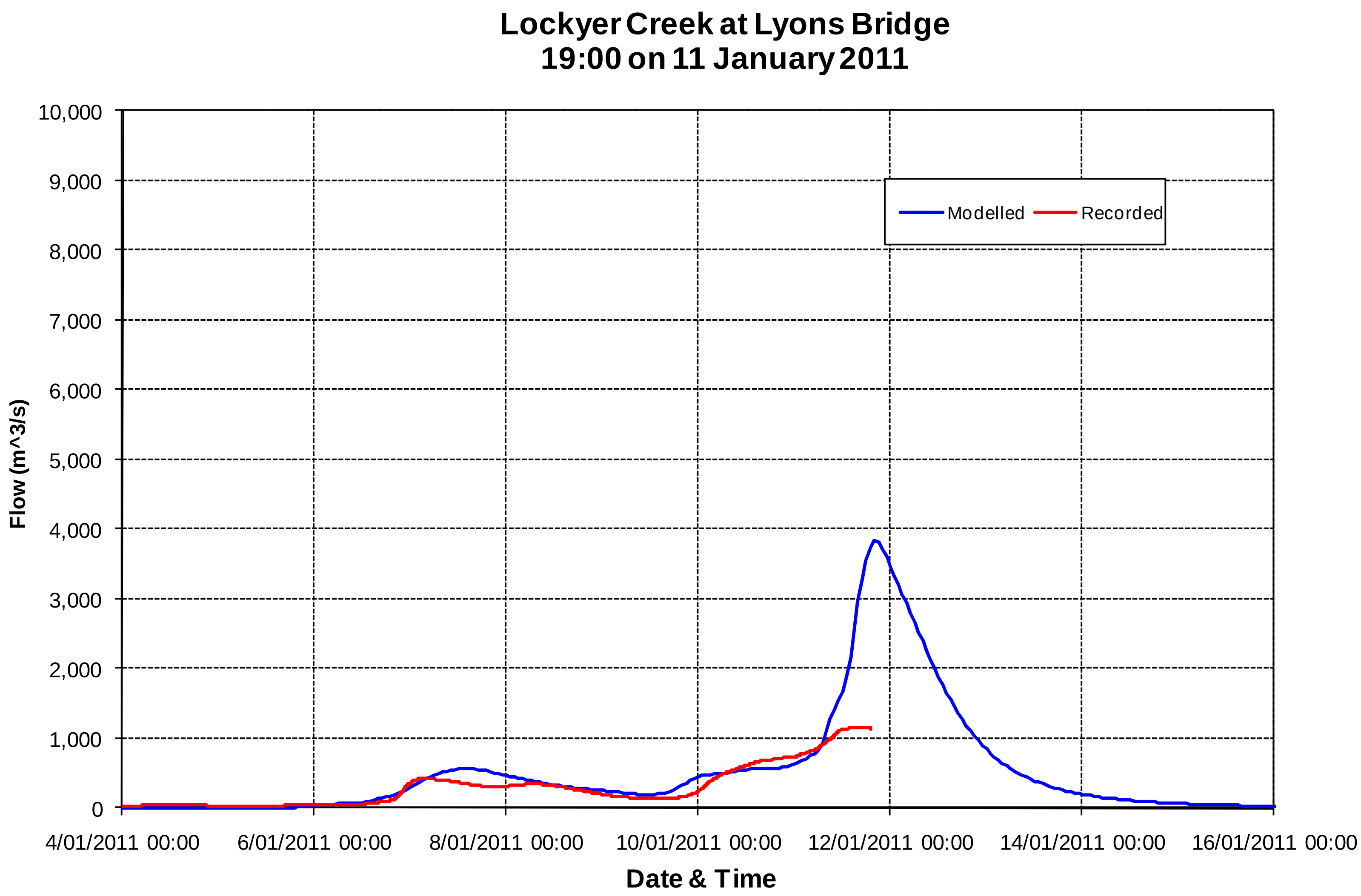
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	871,338	7,594	1,035,877	243	164,538
Woodford	1,341	108,327	844	103,130	-496	-5,198
Lyons Bridge	1,162	208,518	3,733	268,192	2,571	59,675
Walloon	1,210	116,624	1,408	94,997	198	-21,628
Amberley	622	75,667	1,138	104,382	516	28,715
Estimate to date and time of run						
Somerset			3,856	598,170		
Wivenhoe			8,098	1,240,935		
Total Event estimate						
Somerset			3,856	734,067		
Wivenhoe			8,098	1,569,465		



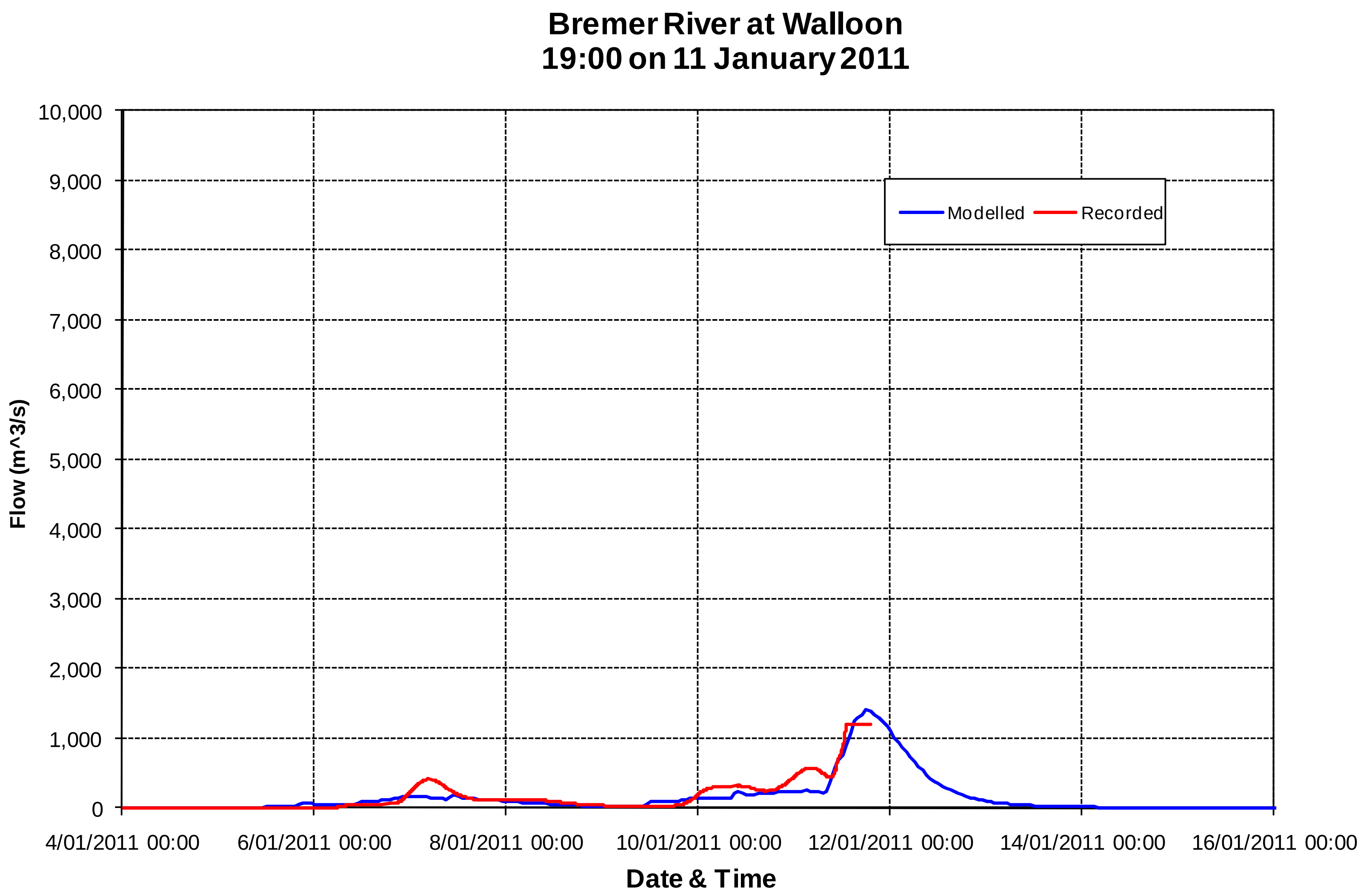
Run 41: Tuesday 11 January 2011, 19:00



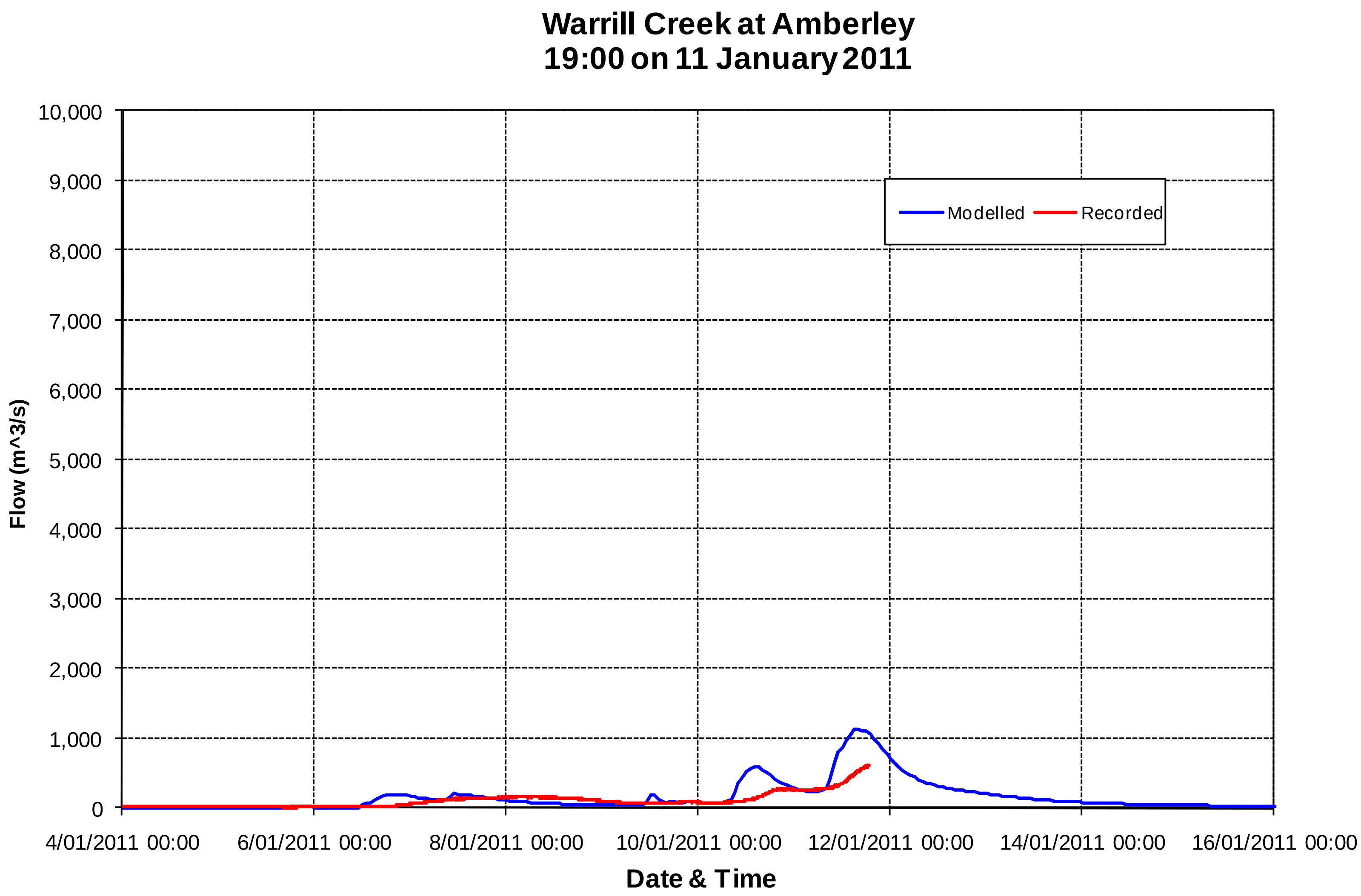
Run 41: Tuesday 11 January 2011, 19:00



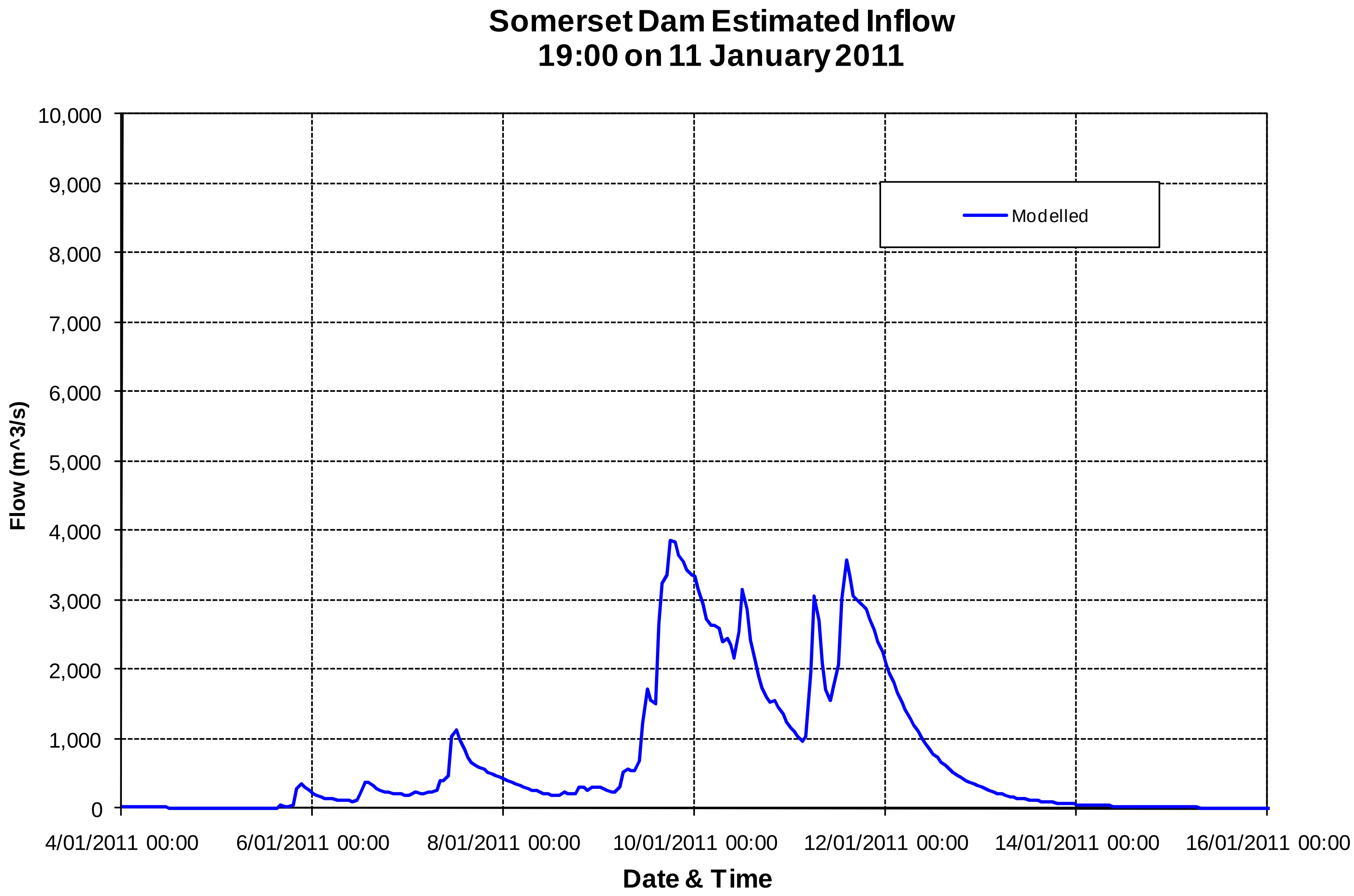
Run 41: Tuesday 11 January 2011, 19:00



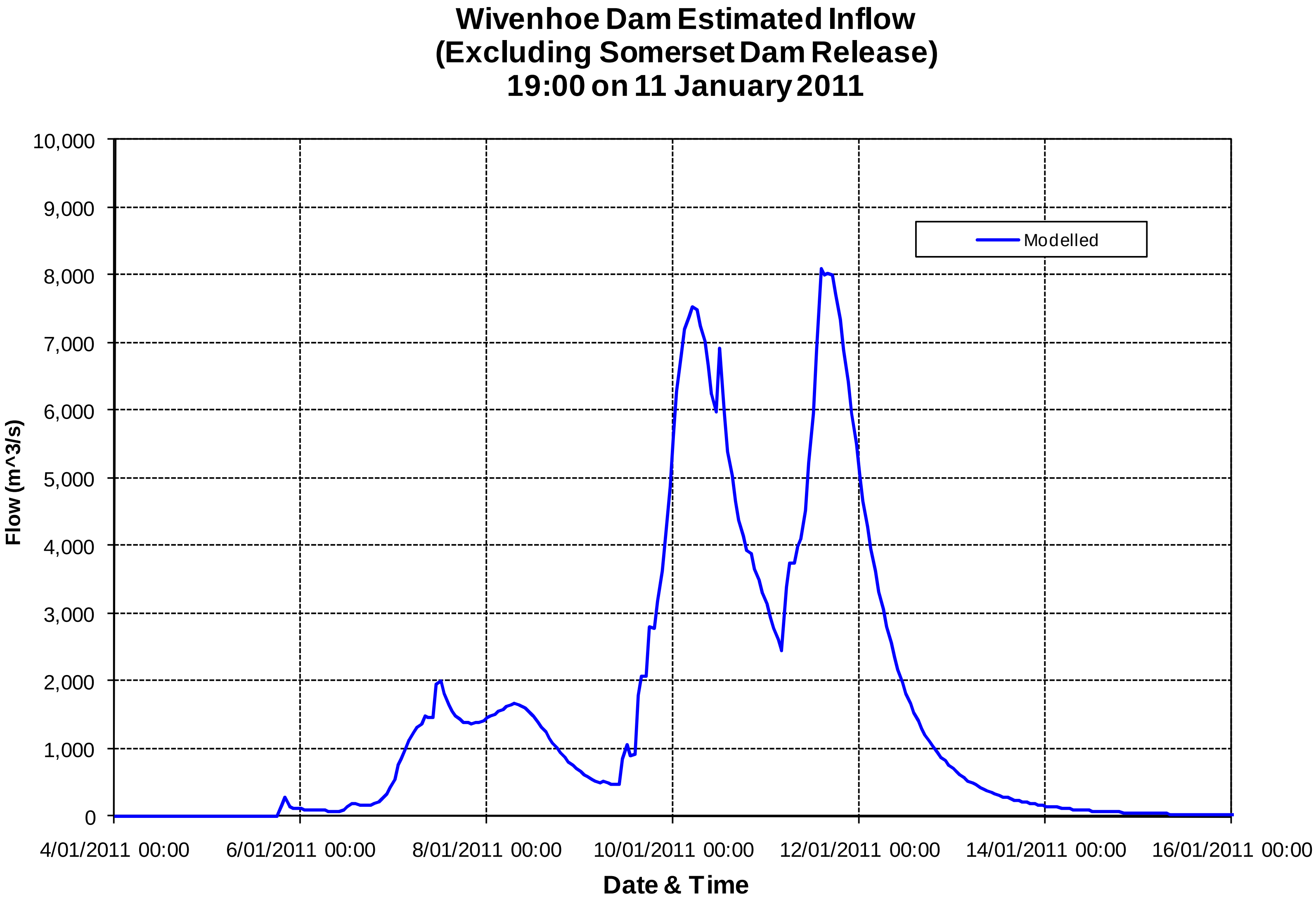
Run 41: Tuesday 11 January 2011, 19:00



Run 41: Tuesday 11 January 2011, 19:00



Run 41: Tuesday 11 January 2011, 19:00



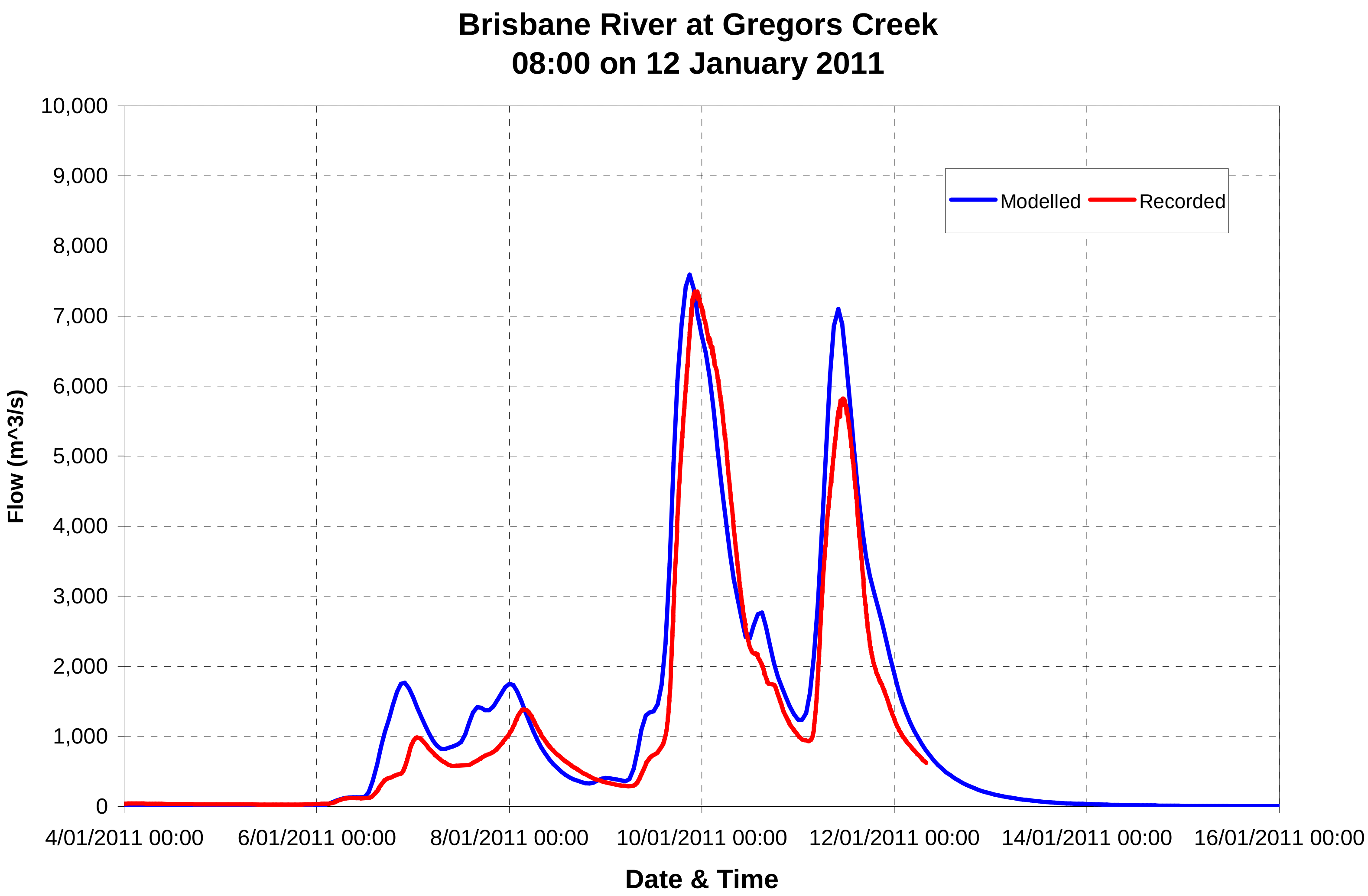
Run 41: Tuesday 11 January 2011, 19:00

Run 43

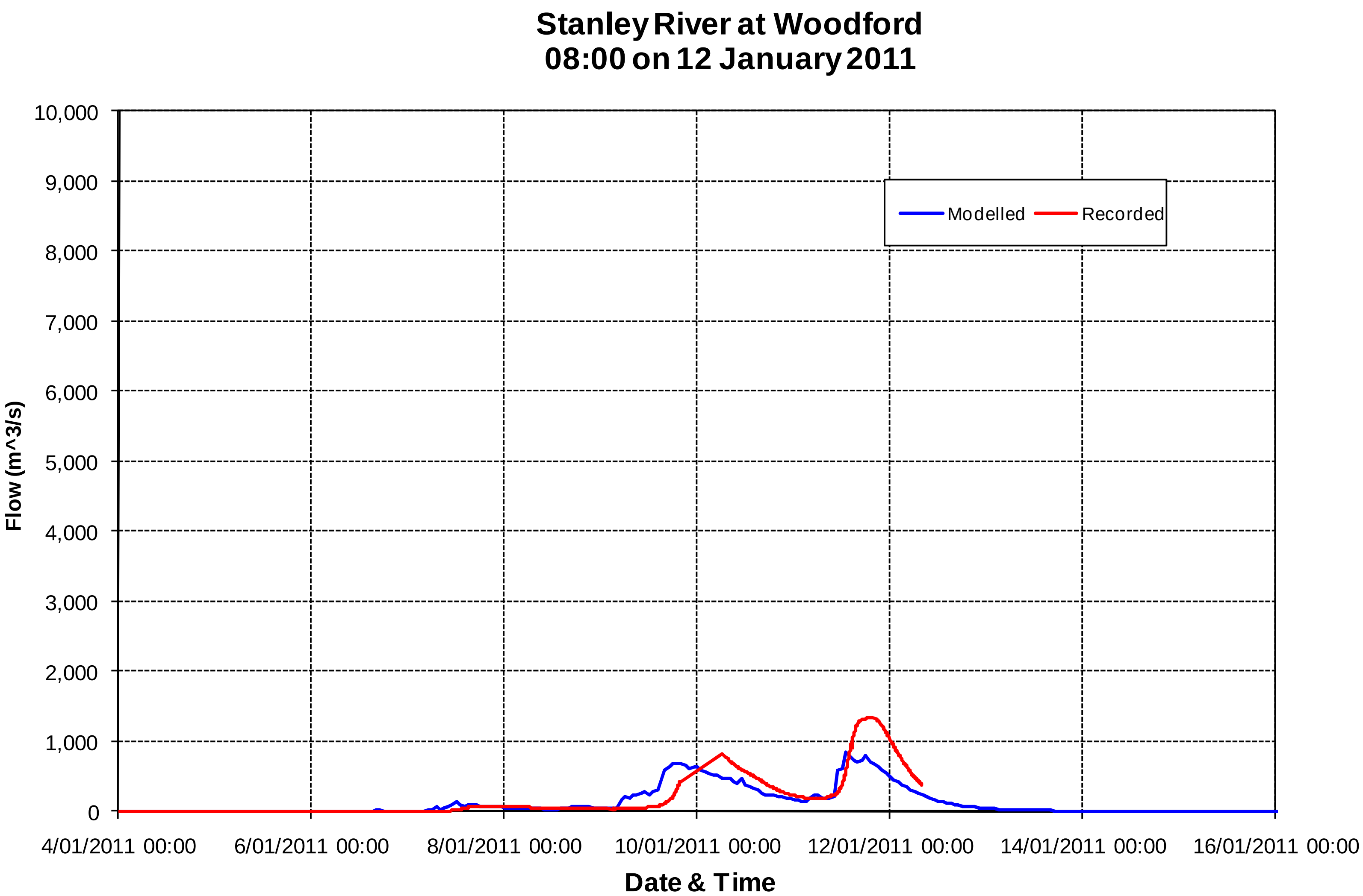
Date: Wednesday 12 January 2011

Time: 08:00

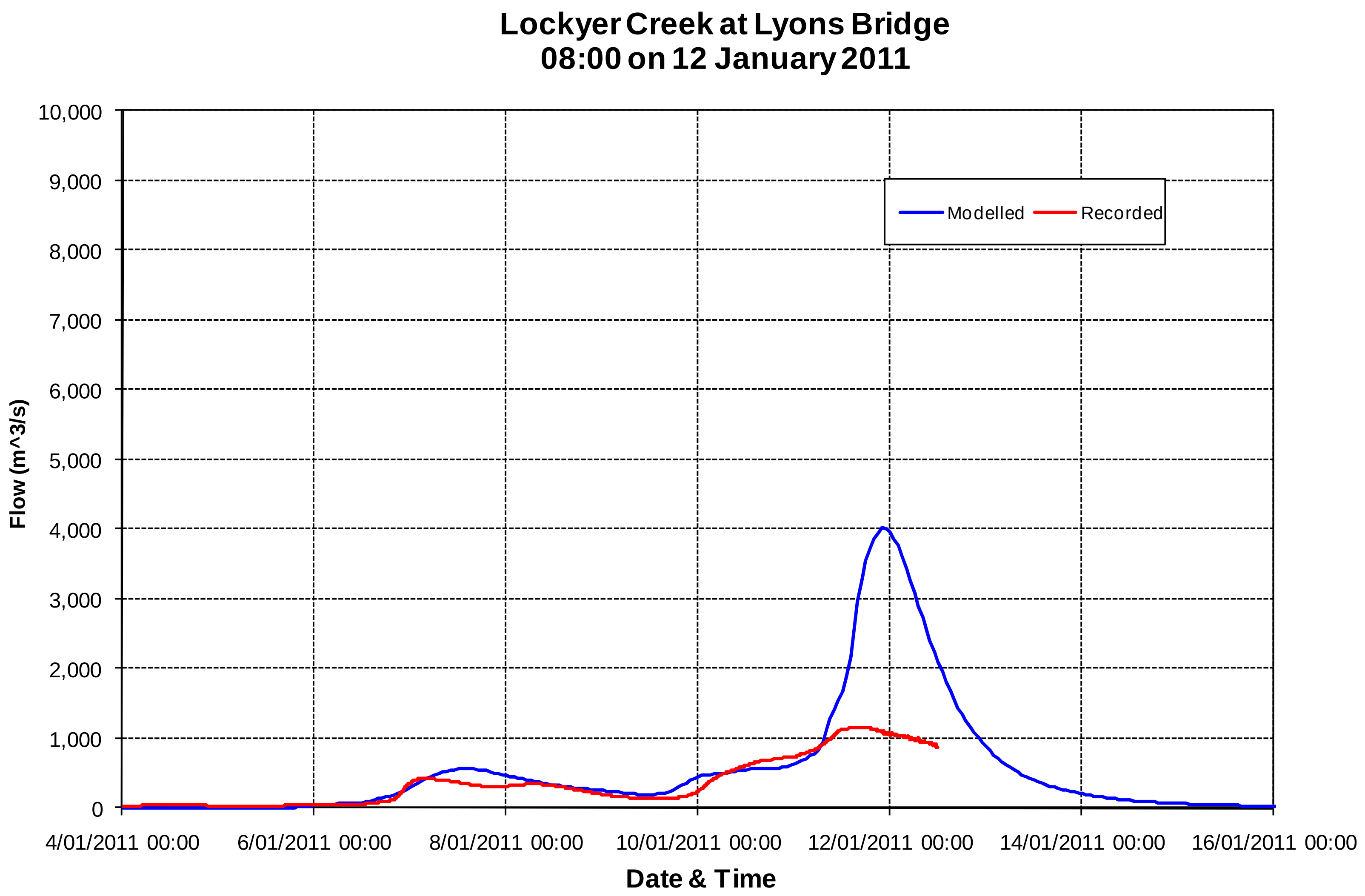
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	923,781	7,594	1,112,372	243	188,591
Woodford	1,341	147,688	844	123,271	-496	-24,417
Lyons Bridge	1,162	257,121	4,013	435,463	2,851	178,342
Walloon	1,210	172,307	1,408	139,207	198	-33,100
Amberley	730	107,495	1,138	133,975	408	26,479
Estimate to date and time of run						
Somerset			3,856	684,814		
Wivenhoe			8,098	1,450,936		
Total Event estimate						
Somerset			3,856	735,314		
Wivenhoe			8,098	1,571,839		



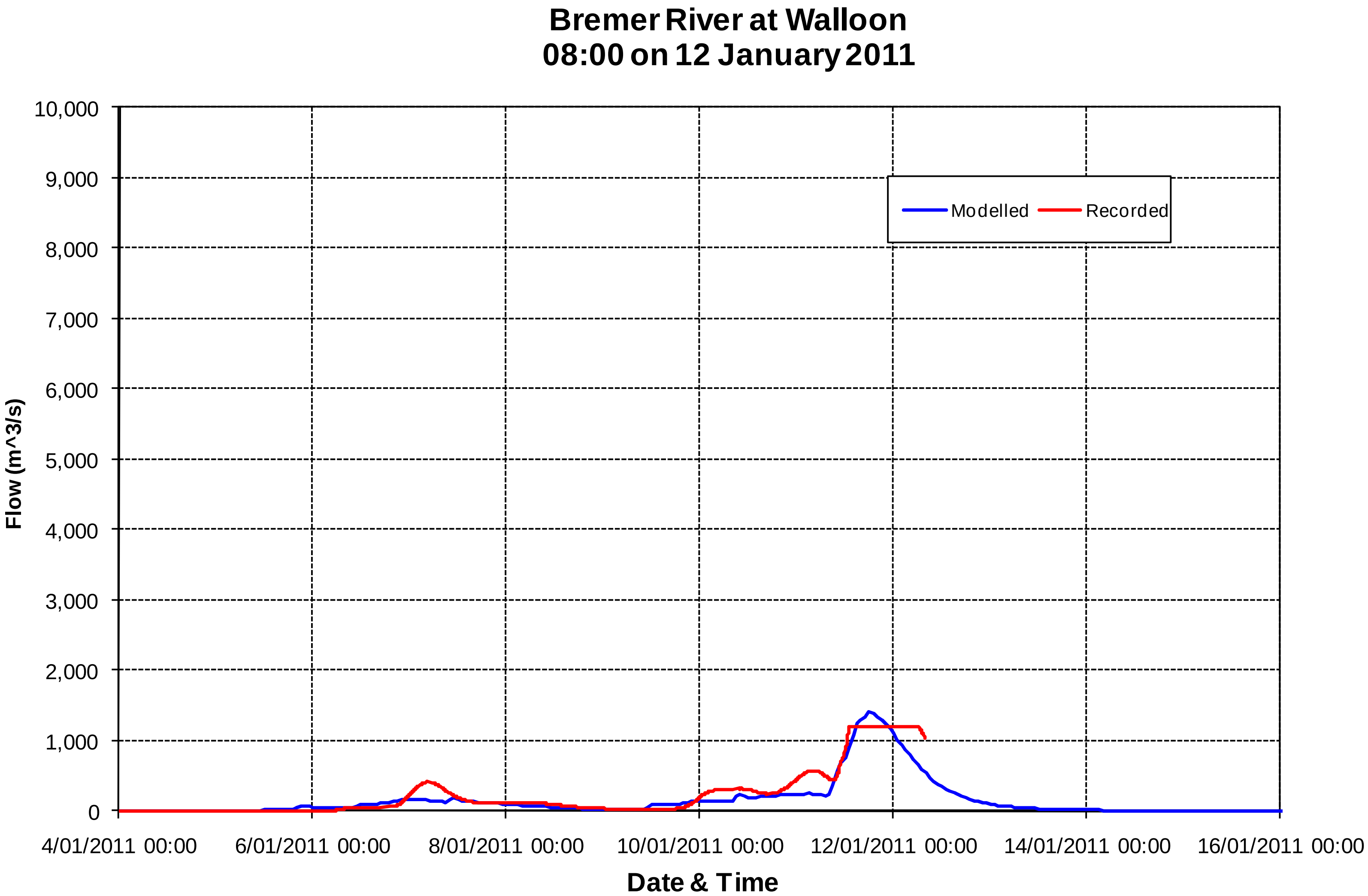
Run 43: Wednesday 12 January 2011, 08:00



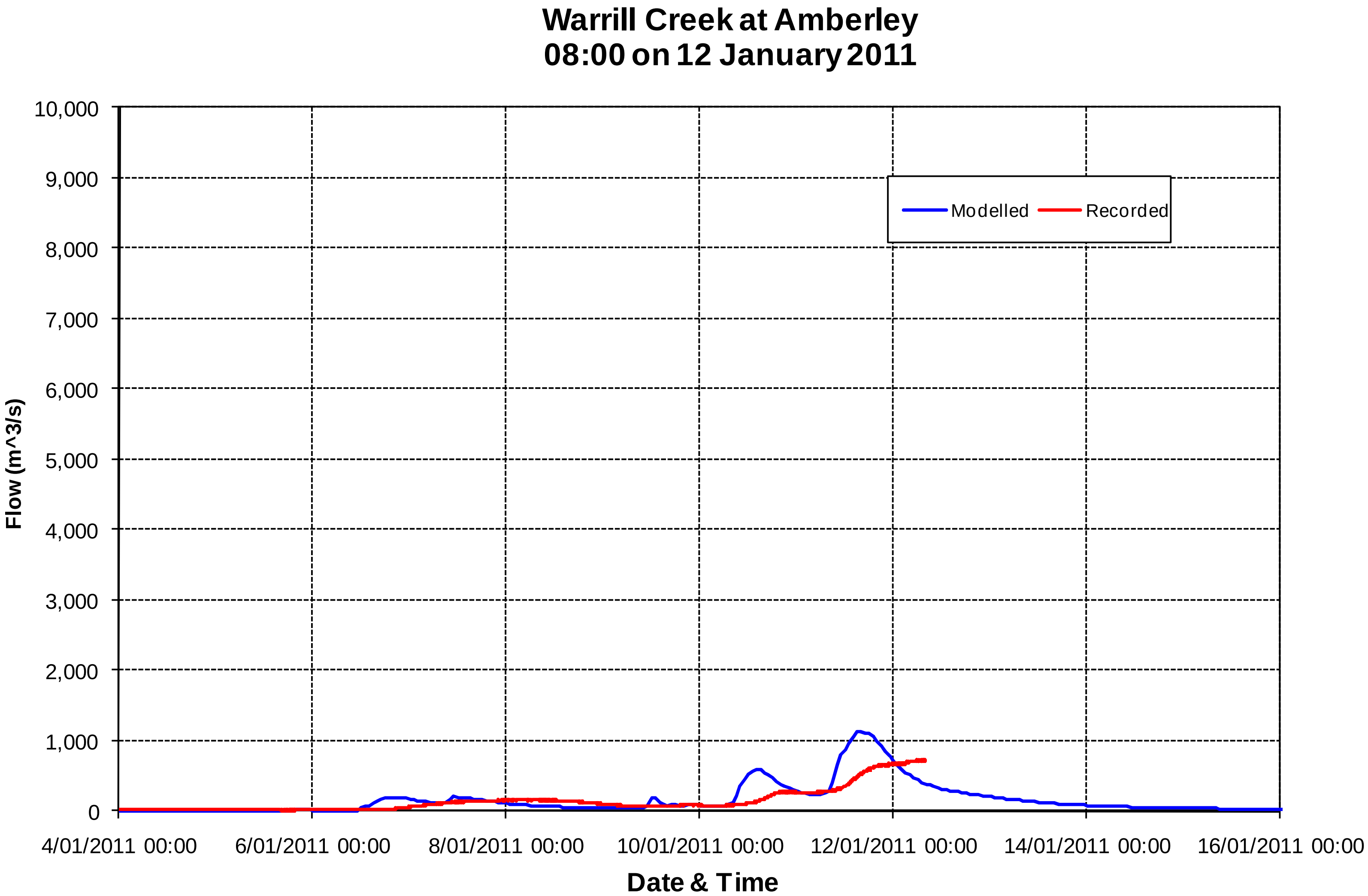
Run 43: Wednesday 12 January 2011, 08:00



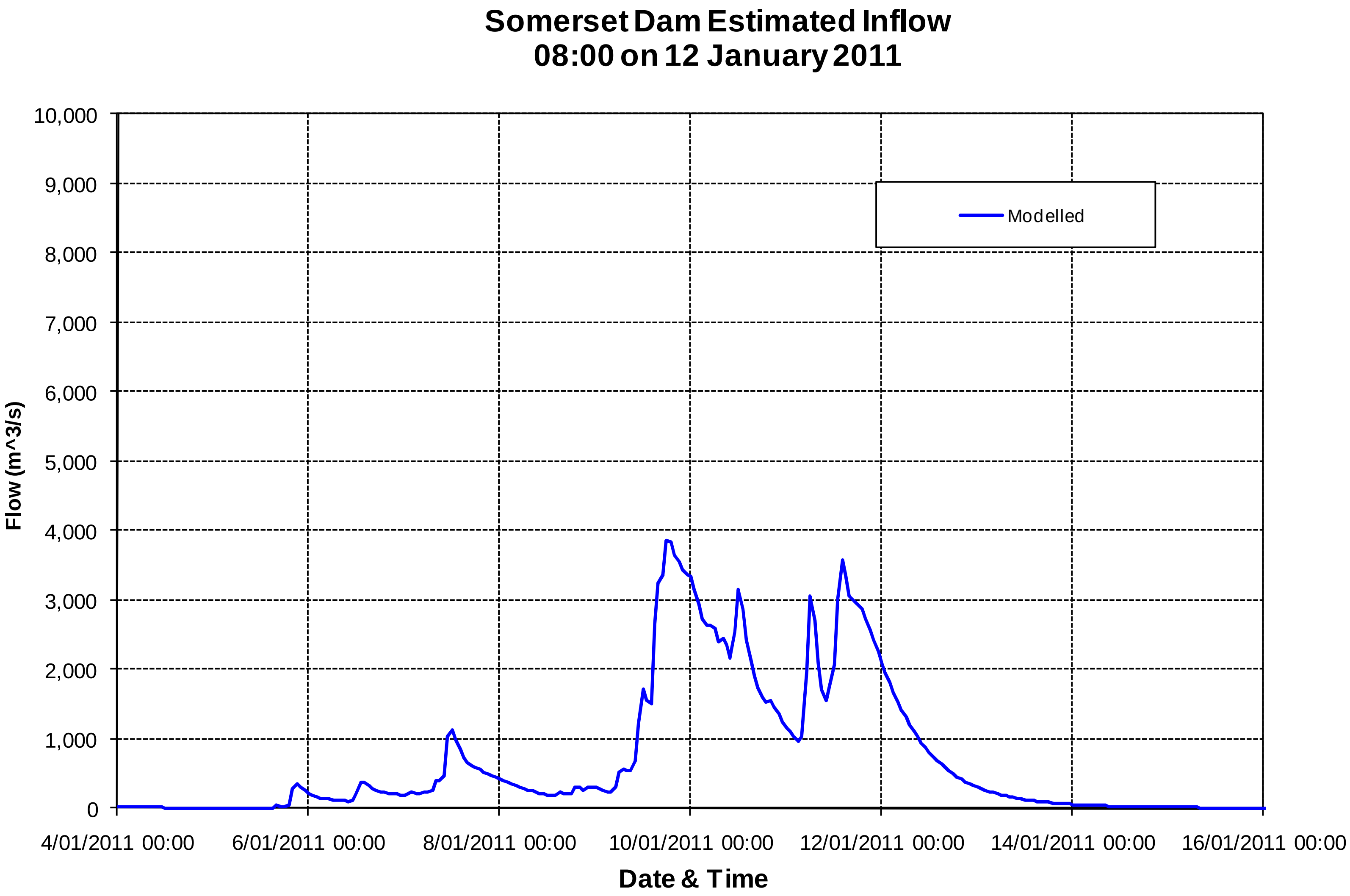
Run 43: Wednesday 12 January 2011, 08:00



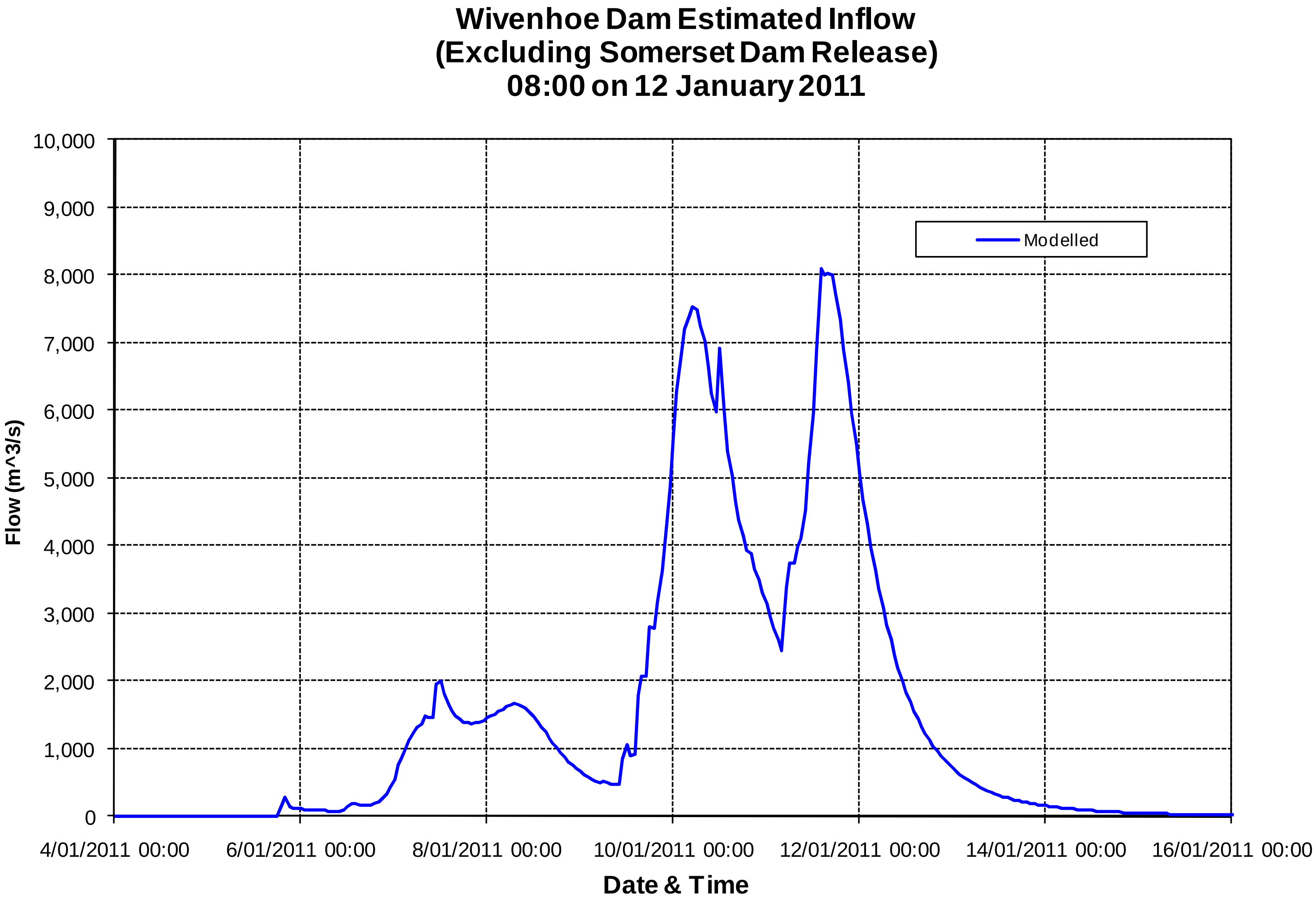
Run 43: Wednesday 12 January 2011, 08:00



Run 43: Wednesday 12 January 2011, 08:00



Run 43: Wednesday 12 January 2011, 08:00

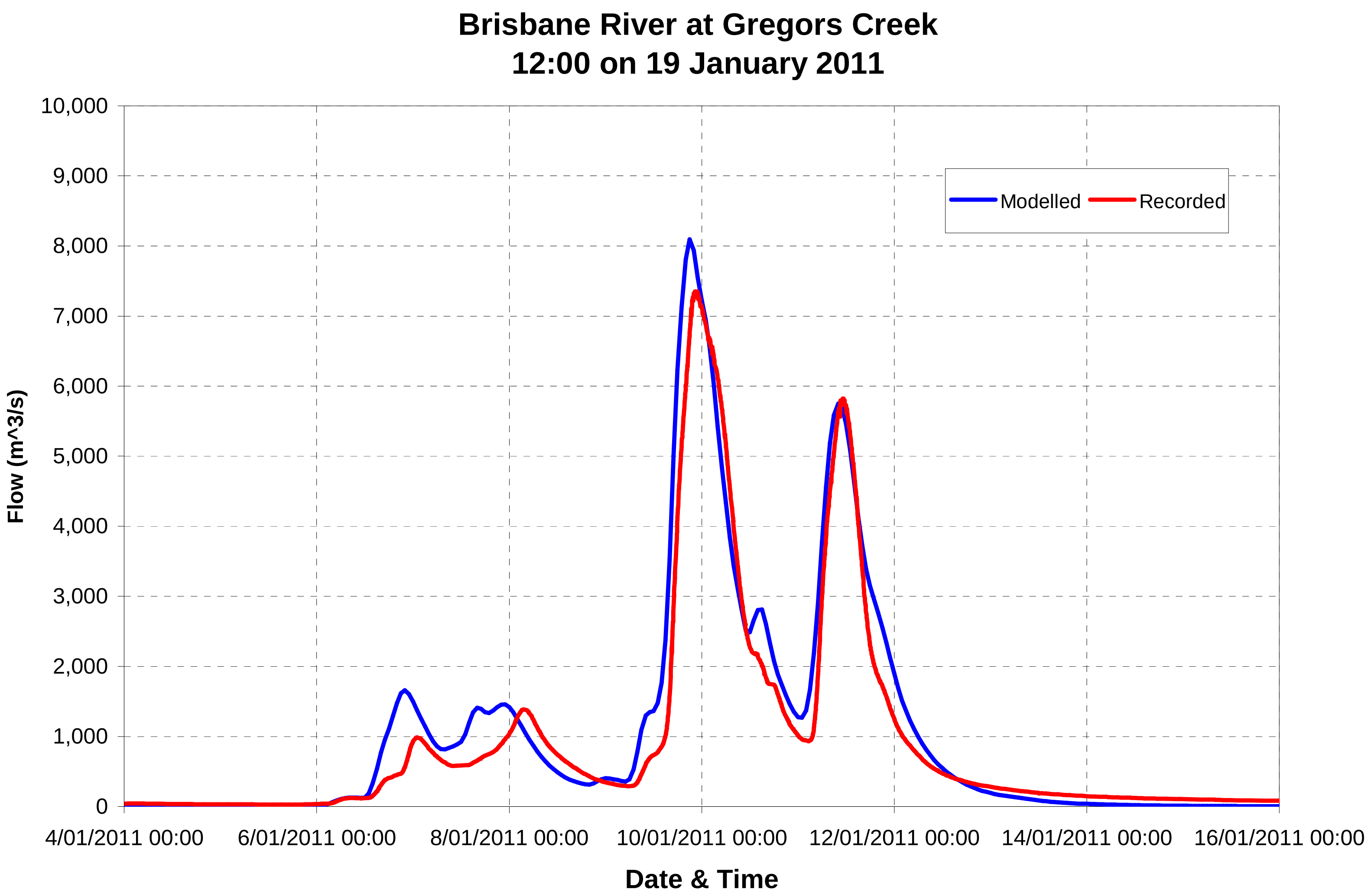

Wivenhoe Dam Estimated Inflow
(Excluding Somerset Dam Release)
08:00 on 12 January 2011
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Flow (m^3/s)
Modelled
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time

Run 45 (final)

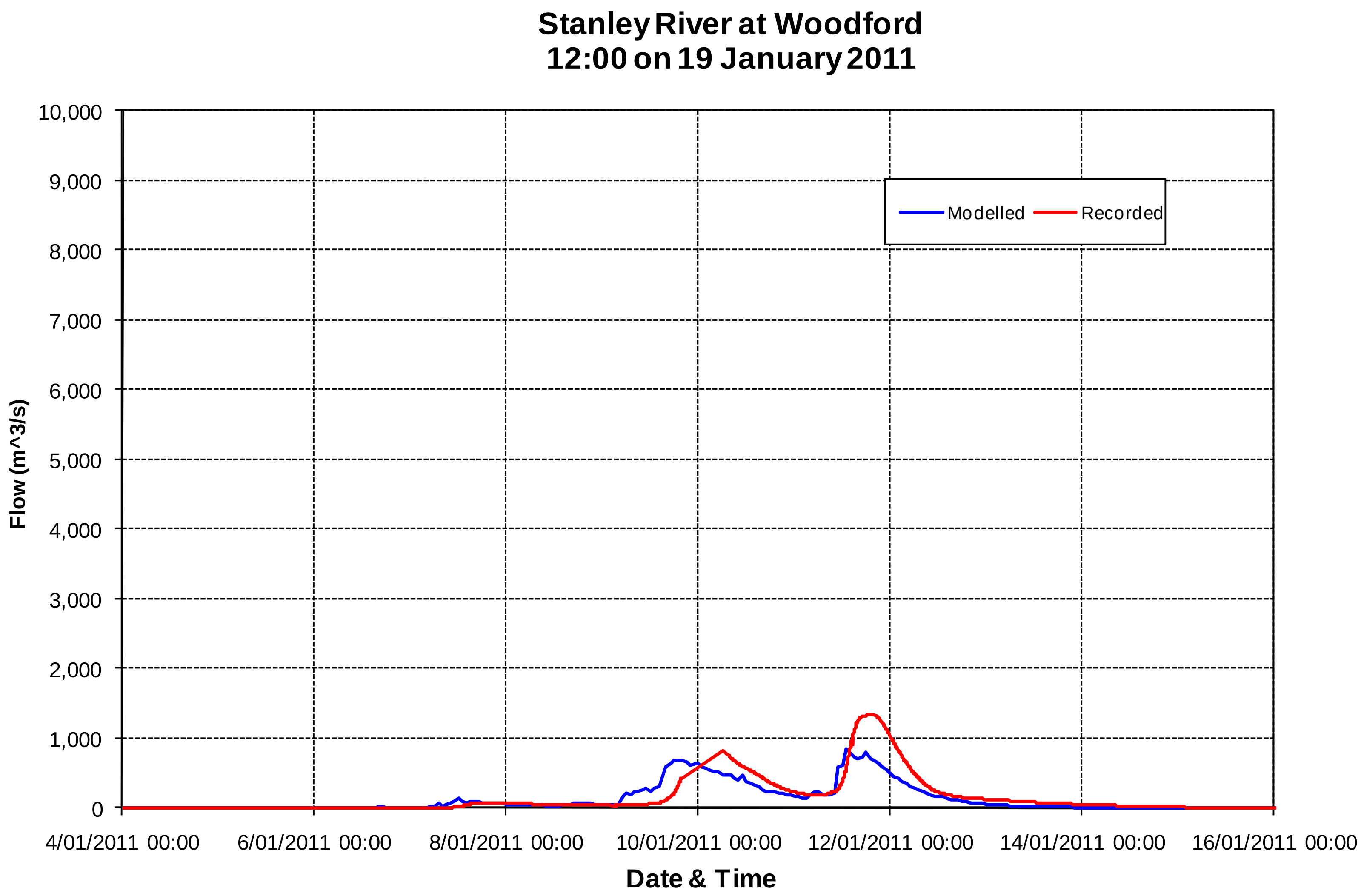
Date: Wednesday 19 January 2011

Time: 12:00

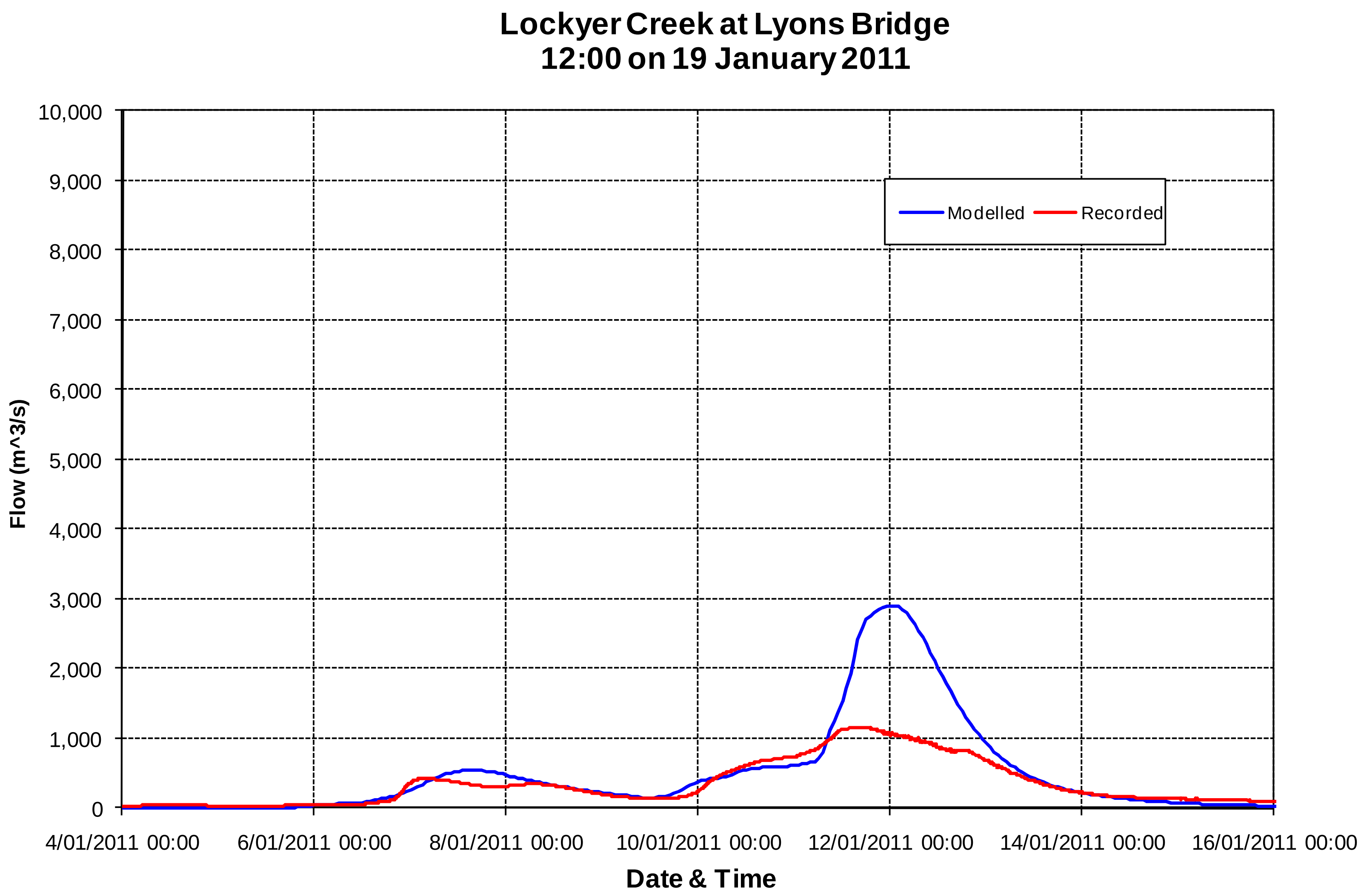
Stream gauge	Recorded		Modelled		Difference	
	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)	Peak flow (m^3/s)	Flood volume (ML)
Gregors Creek	7,351	1,000,750	8,098	1,150,594	746	149,844
Woodford	1,341	169,736	844	132,950	-496	-36,786
Lyons Bridge	1,162	384,482	2,904	518,567	1,742	134,085
Walloon	1,210	198,434	1,408	158,052	198	-40,383
Amberley	736	193,908	1,138	175,781	402	-18,127
Estimate to date and time of run						
Somerset			3,856	740,896		
Wivenhoe			7,965	1,559,363		
Total Event estimate						
Somerset			3,856	742,561		
Wivenhoe			7,965	1,602,001		



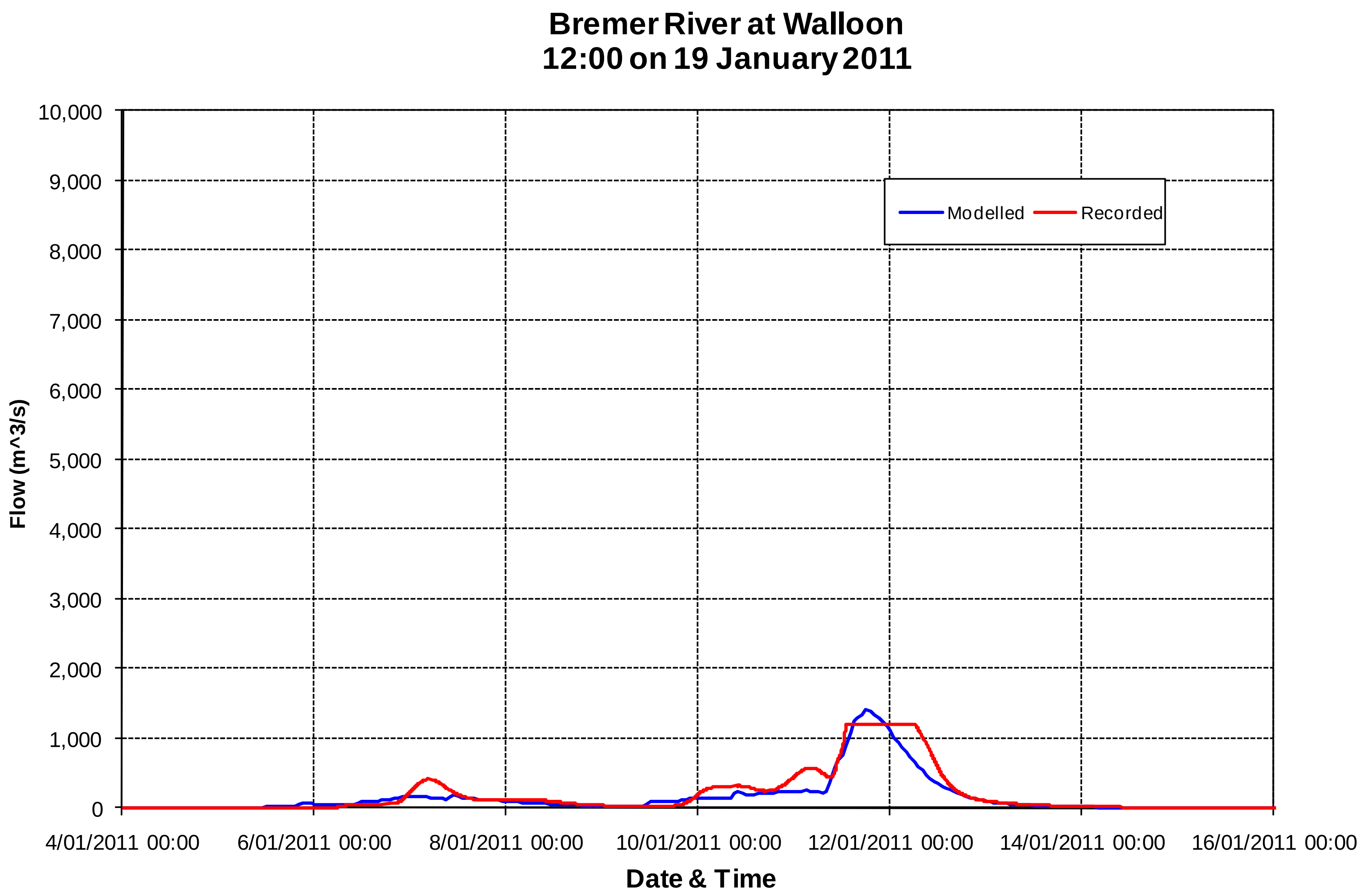
Run 45: Wednesday 19 January 2011, 12:00



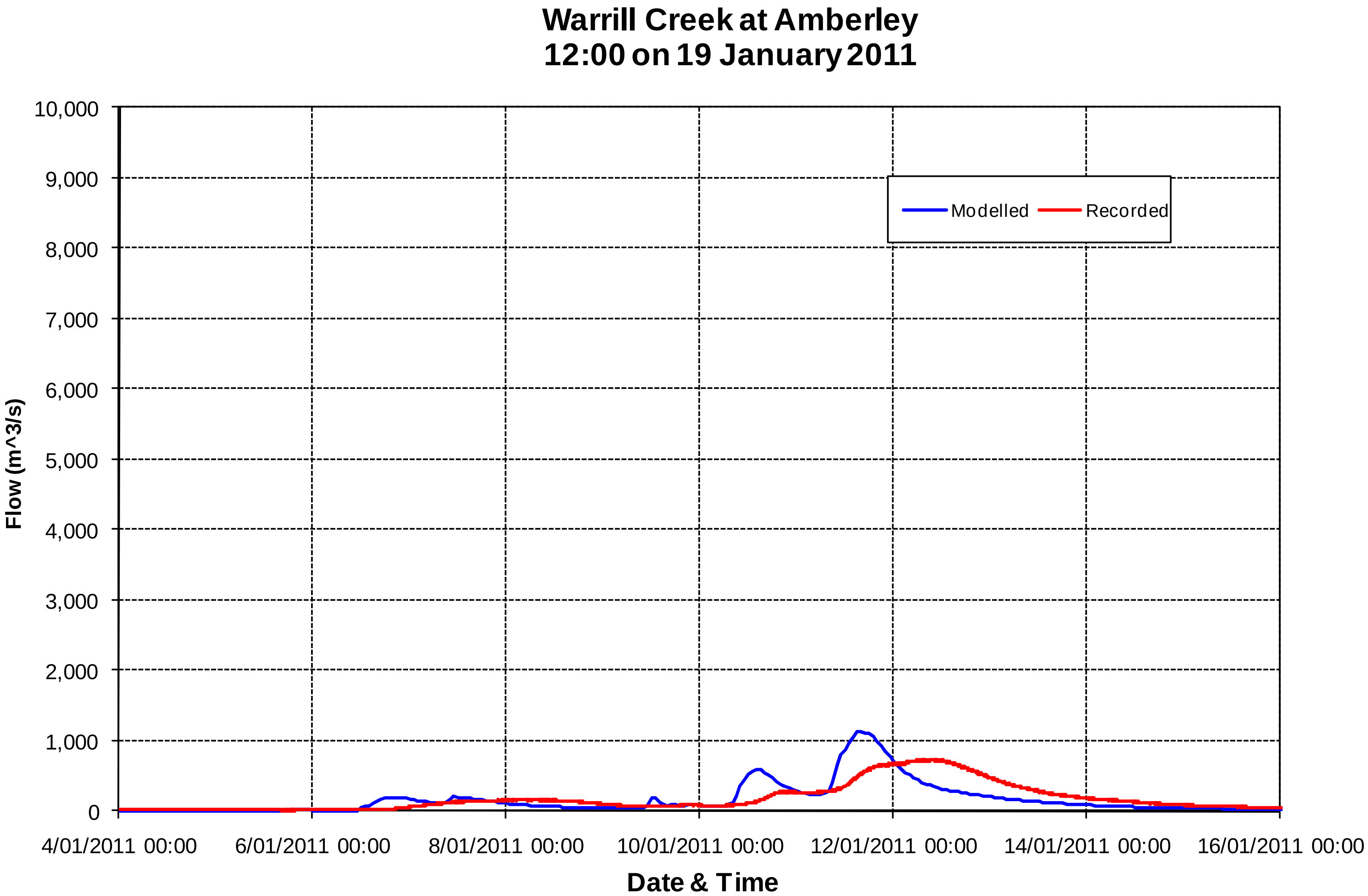
Run 45: Wednesday 19 January 2011, 12:00

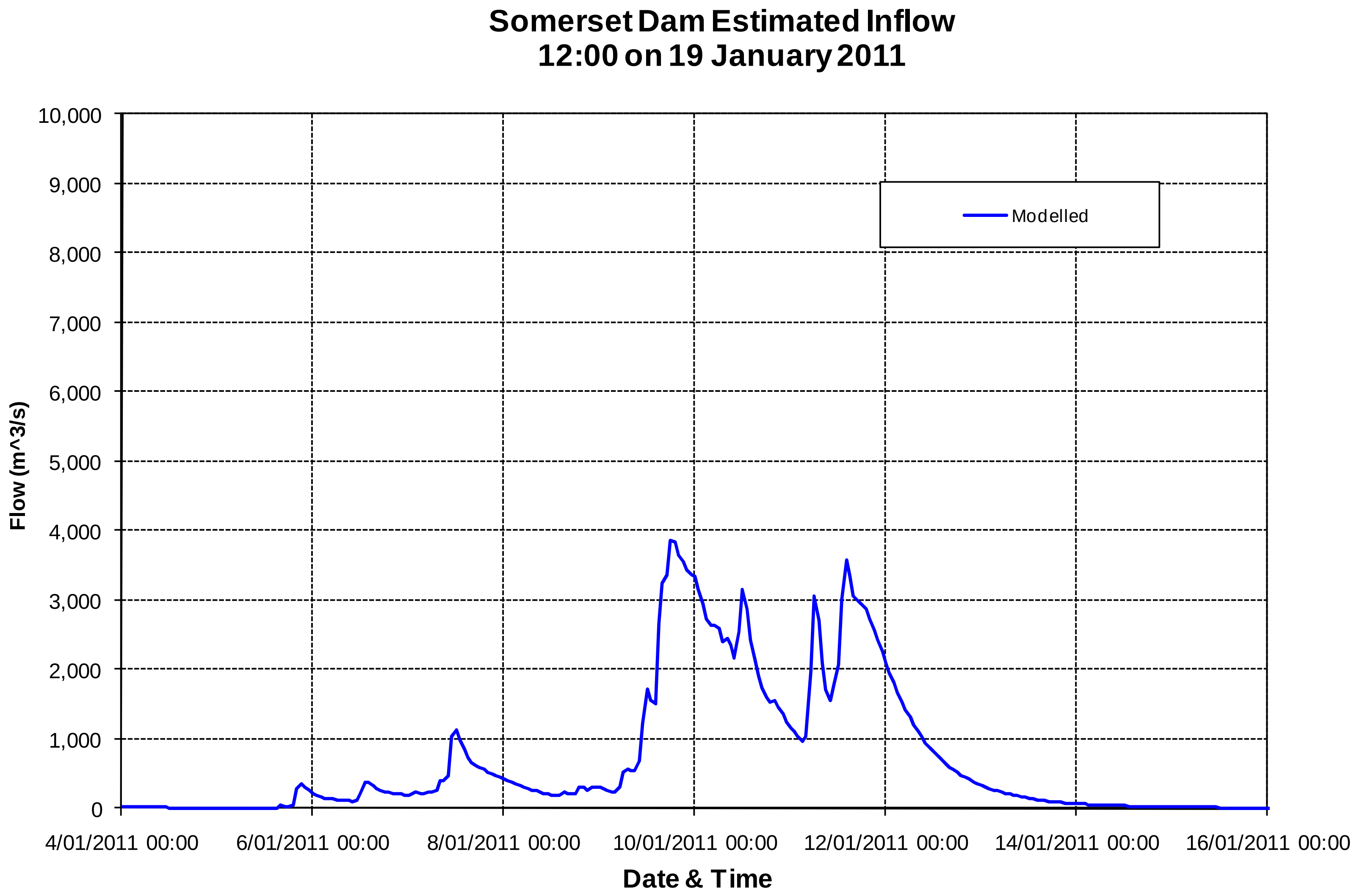


Run 45: Wednesday 19 January 2011, 12:00

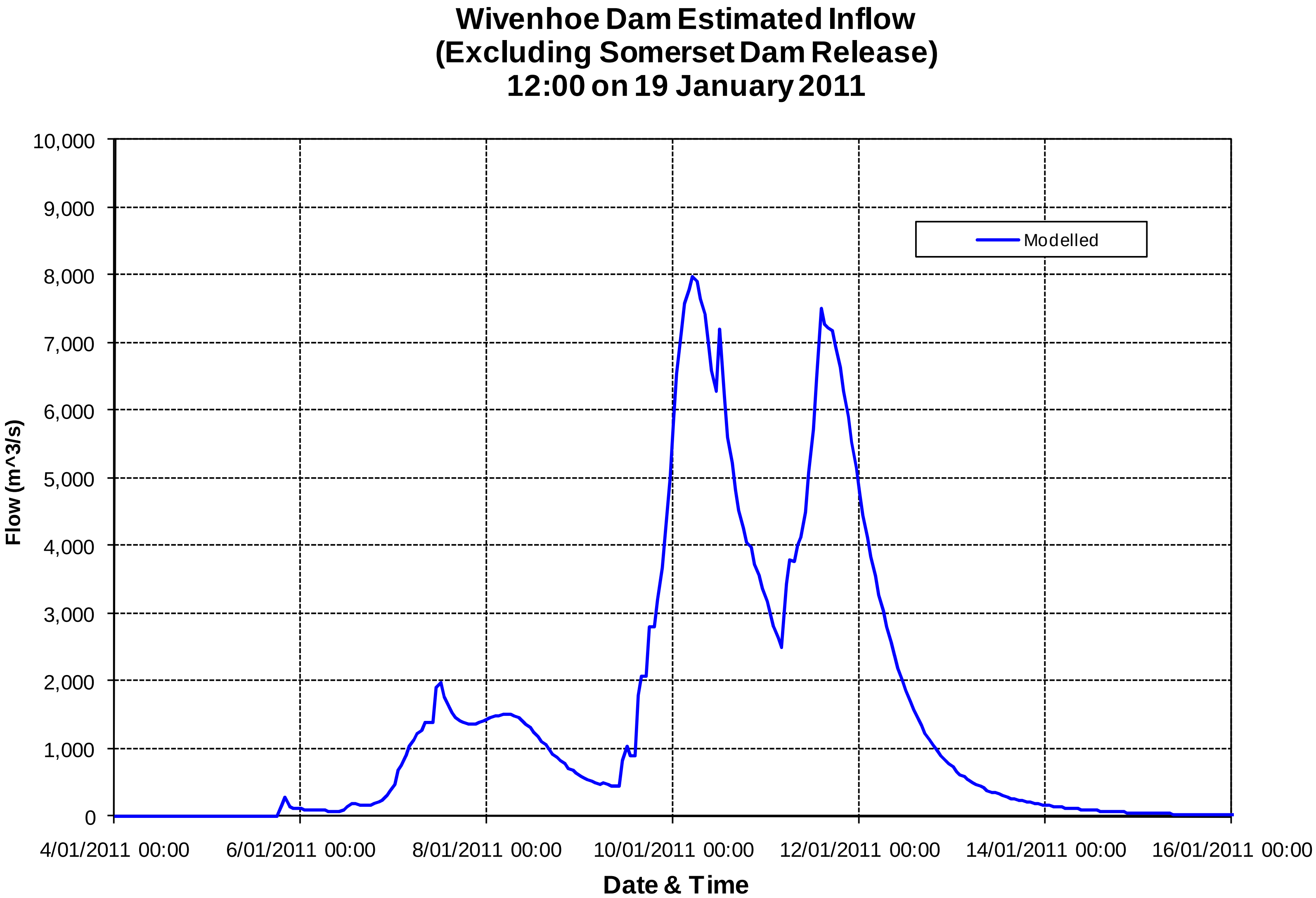


Run 45: Wednesday 19 January 2011, 12:00


Warrill Creek at Amberley
12:00 on 19 January 2011
Modelled
Recorded
Flow (m^3/s)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4/01/2011 00:00
6/01/2011 00:00
8/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date & Time



Run 45: Wednesday 19 January 2011, 12:00

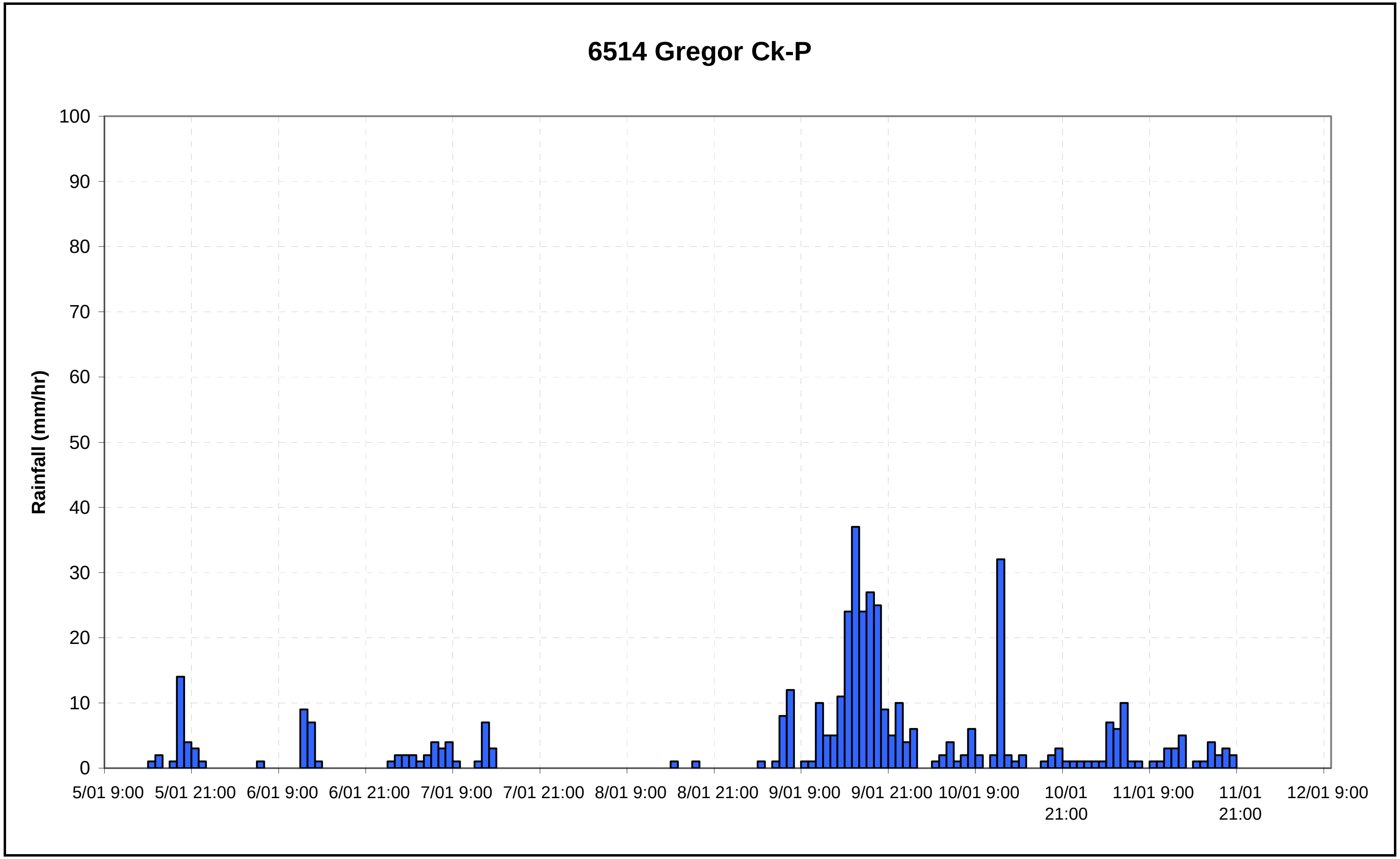


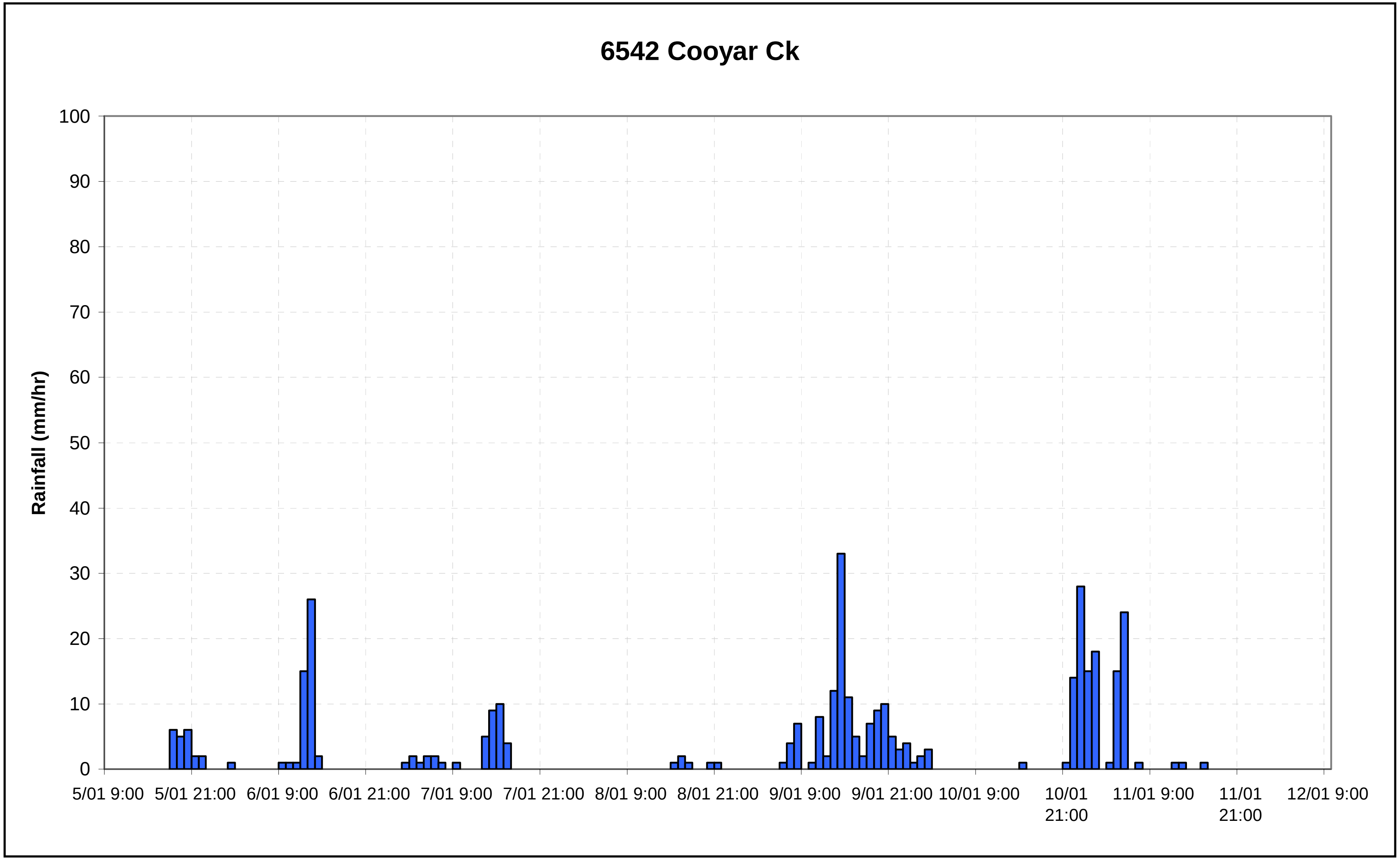
Run 45: Wednesday 19 January 2011, 12:00

APPENDIX T – RAINFALL STATION TEMPORAL PATTERNS

Temporal patterns for selected stations in the table below are located in the sub-catchment of those shown in the map and are plotted below to demonstrate the difference between sub-catchment and station intensities and patterns.

ALERT ID	Station	Latitude	Longitude
6514	Gregors Creek-P	-26.9800	152.4040
6542	Cooyar Creek	-26.7417	152.1367
6556	Glenore Grove	-27.5242	152.4081
6598	Toowoomba	-27.5114	151.9536
6649	Lowood-P	-27.4900	152.5930
6680	Mt Glorious P	-27.3220	152.7470
6716	West Bellthorpe	-26.8230	152.6780


6514 Gregor Ck-P
Rainfall (mm/hr)
100
90
80
70
60
50
40
30
20
10
0
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
9/01 9:00
9/01 21:00
10/01 9:00
10/01 21:00
11/01 9:00
11/01 21:00
12/01 9:00


6542 Cooyar Ck
Rainfall (mm/hr)
100
90
80
70
60
50
40
30
20
10
0
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
9/01 9:00
9/01 21:00
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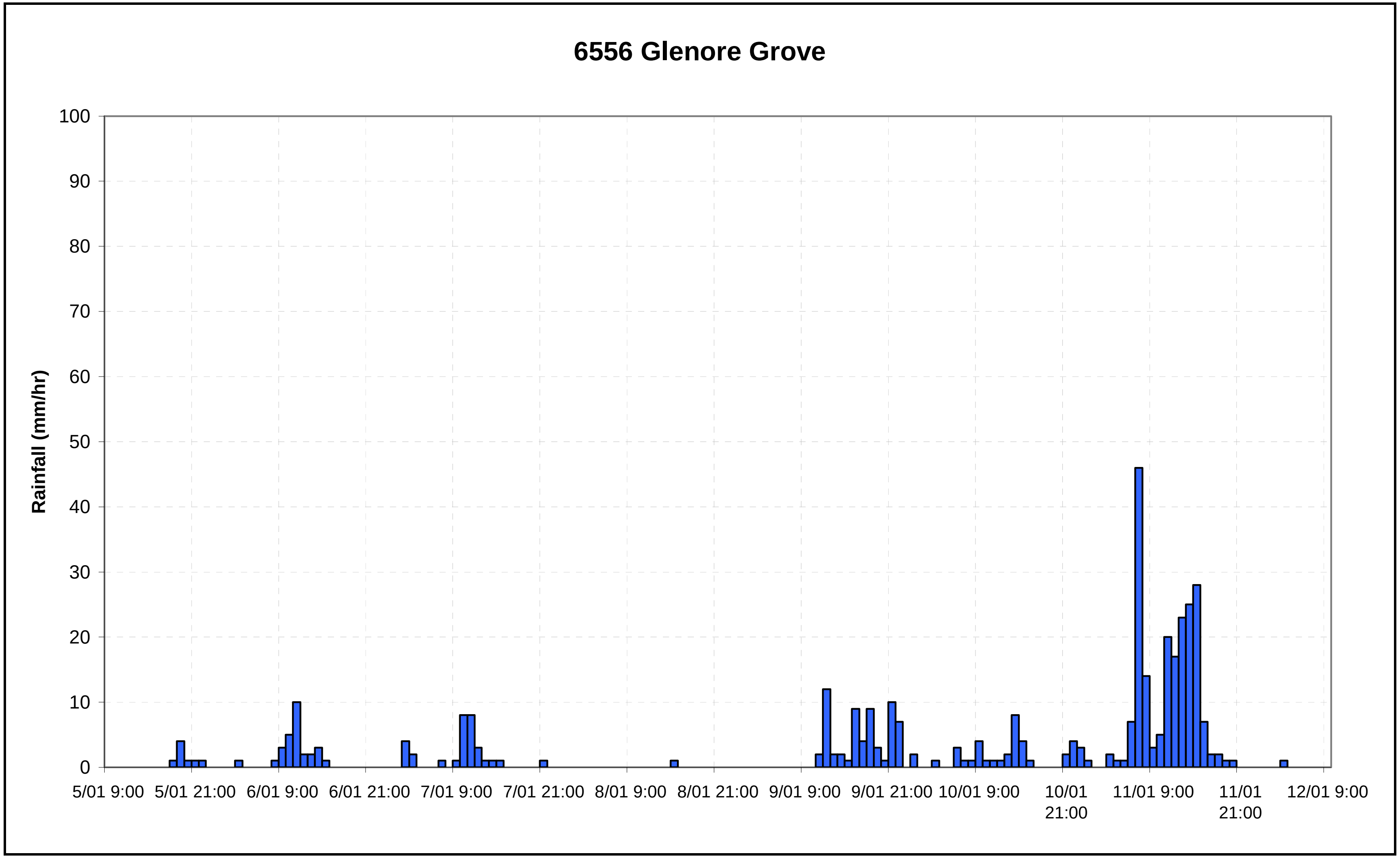
10/01 21:00
11/01 9:00
11/01 21:00
12/01 9:00


6556 Glenore Grove
Rainfall (mm/hr)
0
10
20
30
40
50
60
70
80
90
100
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
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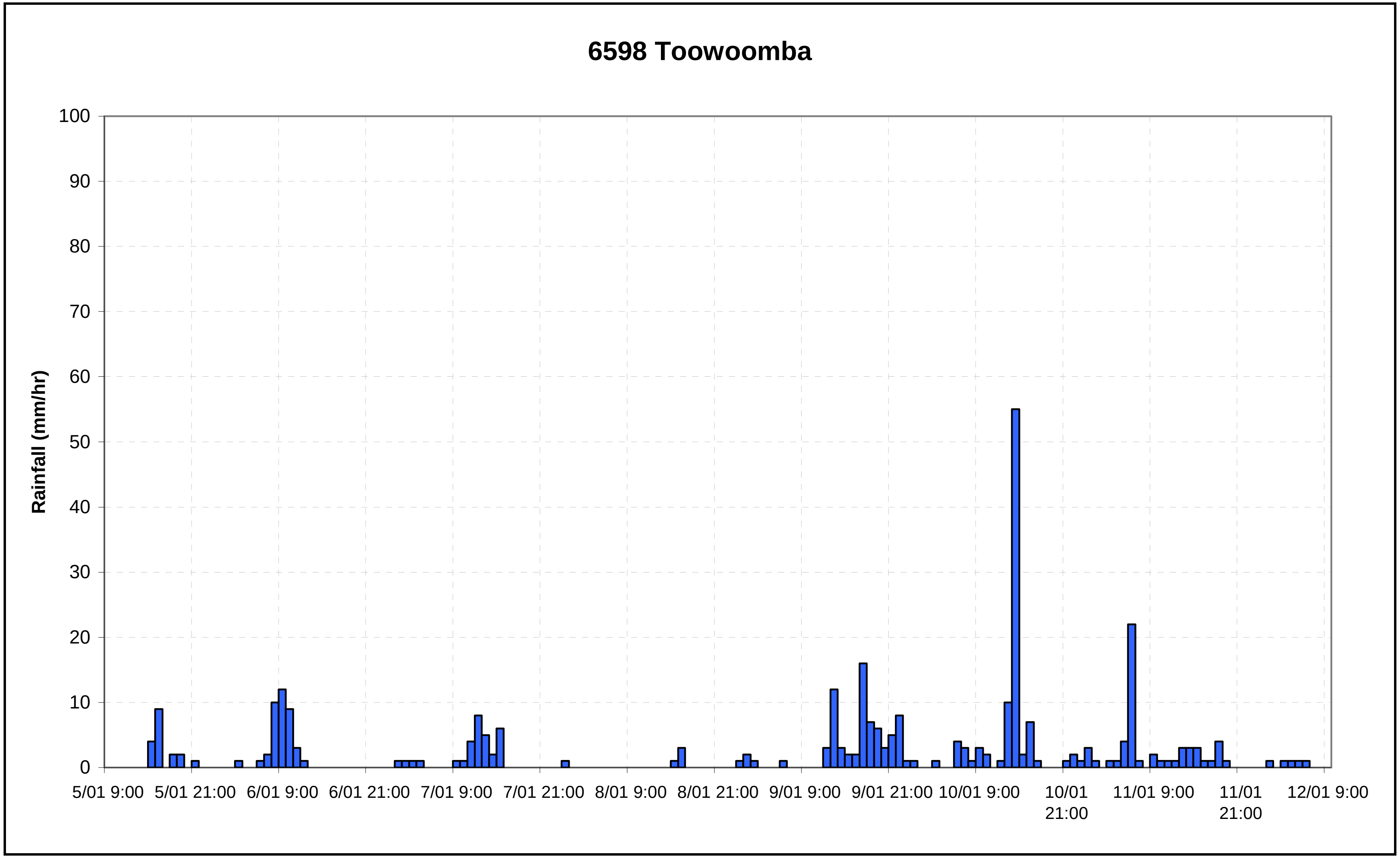
10/01 21:00
11/01 9:00
11/01 21:00
12/01 9:00


6598 Toowoomba
Rainfall (mm/hr)
100
90
80
70
60
50
40
30
20
10
0
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
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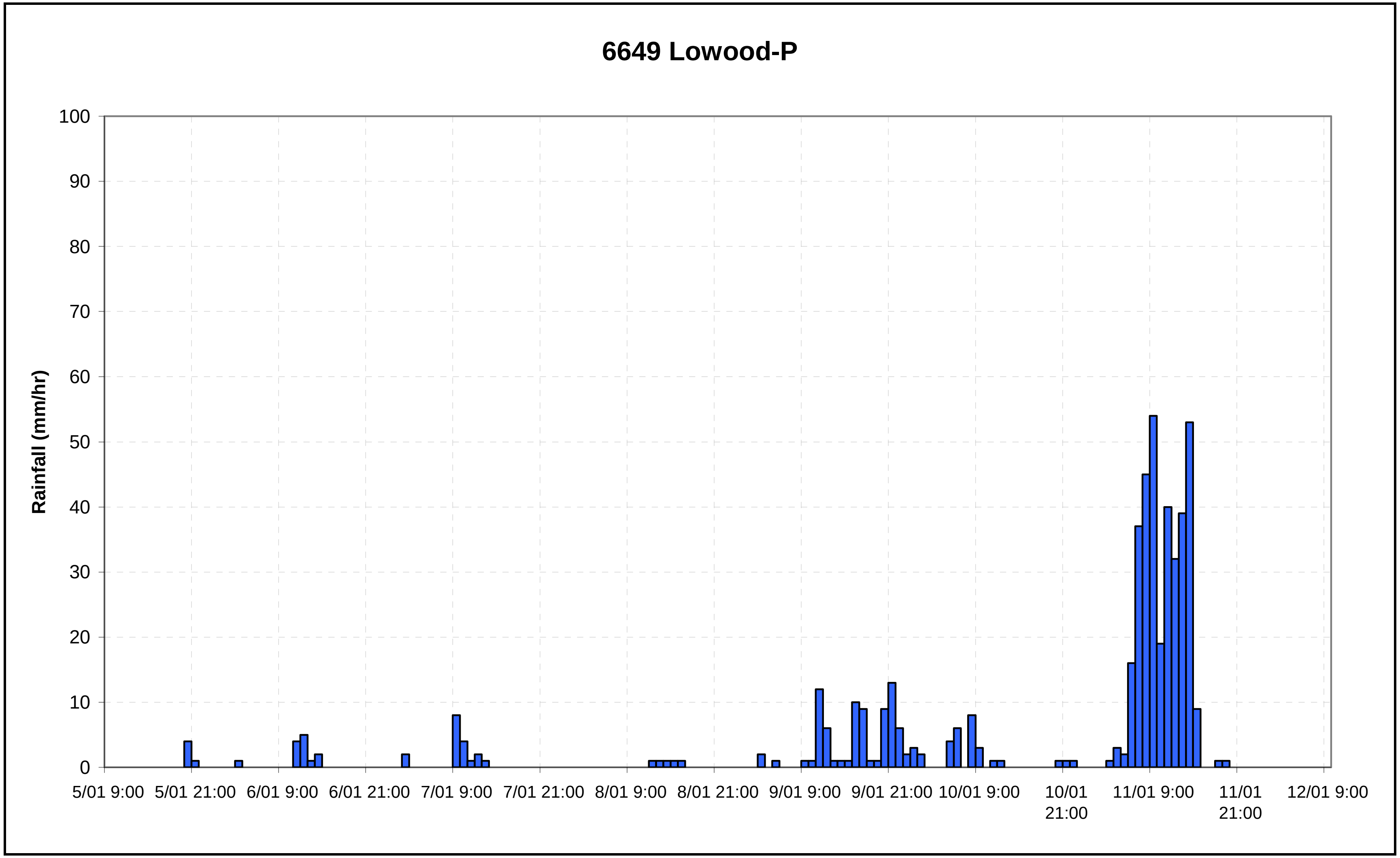
12/01 9:00


6649 Lowood-P
Rainfall (mm/hr)
100
90
80
70
60
50
40
30
20
10
0
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
9/01 9:00
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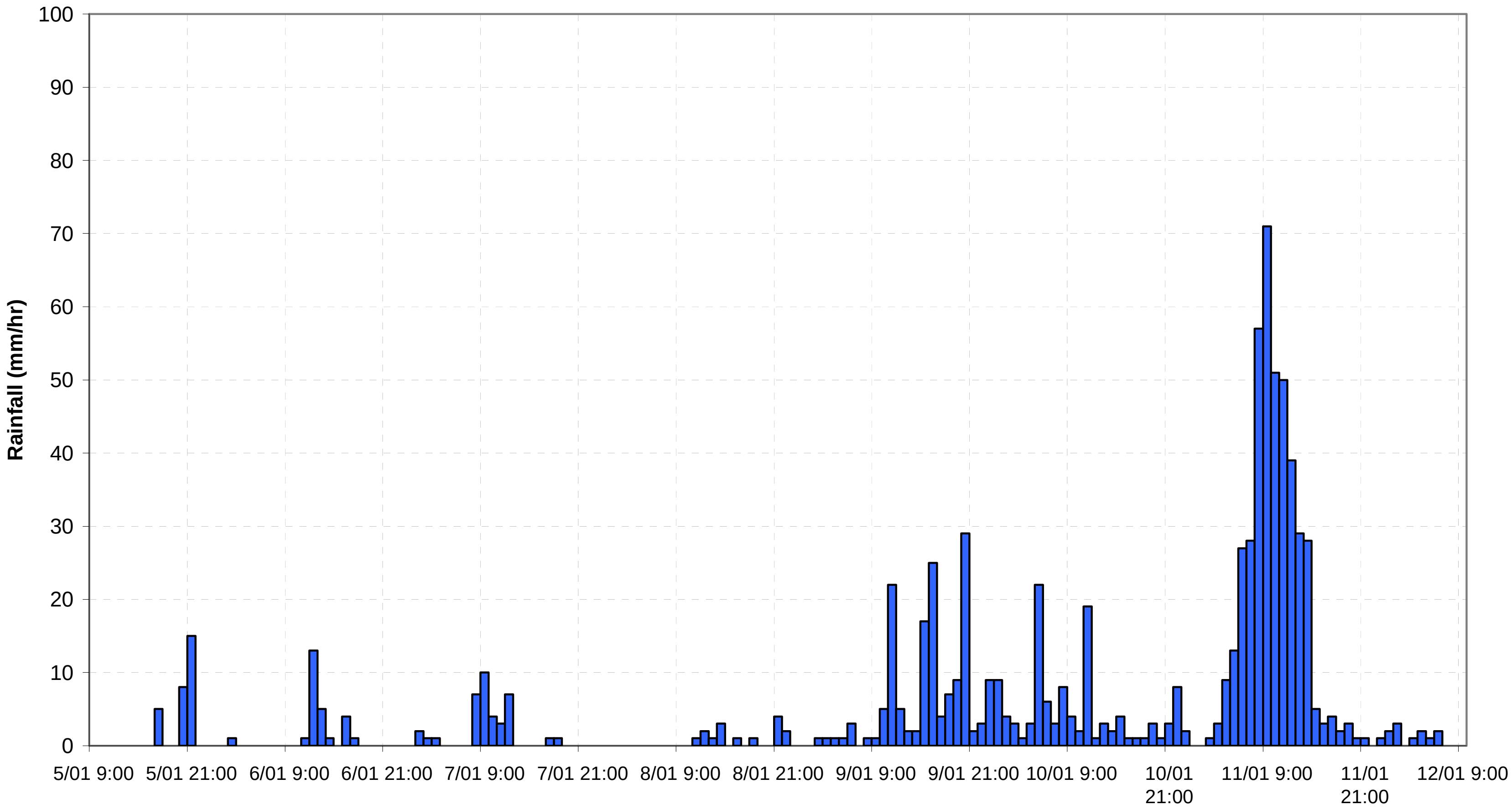
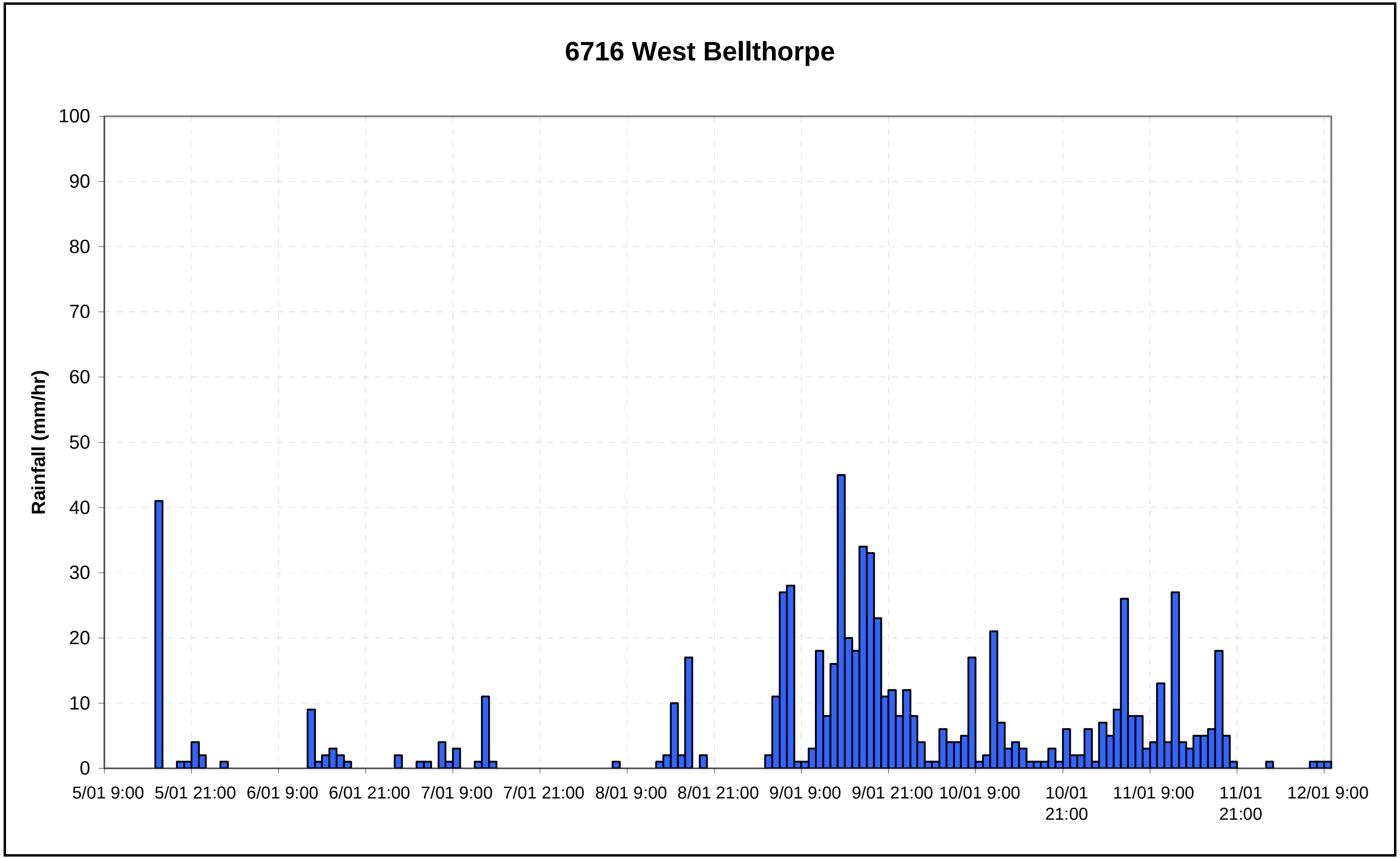
11/01 9:00
11/01 21:00
12/01 9:00

6680 Mt Glorious-P




6716 West Bellthorpe
Rainfall (mm/hr)
100
90
80
70
60
50
40
30
20
10
0
5/01 9:00
5/01 21:00
6/01 9:00
6/01 21:00
7/01 9:00
7/01 21:00
8/01 9:00
8/01 21:00
9/01 9:00
9/01 21:00
10/01 9:00
10/01 21:00
11/01 9:00
11/01 21:00
12/01 9:00

APPENDIX U – WIVENHOE DAM HYDROLOGY REPORTS

The reports listed below support the finding that a flood event similar in magnitude and circumstances to the January 2011 Flood Event would be expected to result in urban damage below Moggill, if both Somerset Dam and Wivenhoe Dam are operated under their current Full Supply Levels.

When reviewing the reports, it is important to understand that the January 2011 Flood Event is defined by its peak flow of 12,000m^3/s and its volume of 2,650,000ML. The Annual Exceedance Probability (AEP) of the Event cannot be generally be reconciled across all of the listed reports for the following reasons:

- The accepted techniques for estimating design rainfall and flood AEP information have been changed five times since 1977. Modelling techniques have also changed and this also impacts on AEP estimations.
- The implied AEP for the January 2011 Flood Event ranges between 1 in 200 and 1 in 2,000.
- The January 2011 Flood Event is represented by two individual floods, with peak inflows from each flood greater than 10,000m^3/s, separated by 30 hours. The probability of two such flood peaks occurring within 36 hours of each other is considered to be appreciably uncommon and would impact on the AEP of the Event.
- An event with a hydrograph similar to the January 2011 Flood Event has not been modelled in any report listed. This is because reports consider idealised storms and historical events, and an event similar in nature to the January 2011 Flood Event has never been recorded.

Co-ordinators General Department (1971), Future Brisbane Water Supply and Flood Mitigation, Report on Proposed Dam on the Brisbane River at Middle Creek or alternatively at Wivenhoe and Flood Mitigation for Brisbane and Ipswich, Queensland Co-ordinator Generals Department, June 1971.

SMEC (1975), Brisbane River Flood Investigations Final Report, Snowy Mountains Engineering Corporation for the Cities Commission, November 1975.

Co-ordinators General Department (1977), A Comprehensive Evaluation of the Proposed Wivenhoe Dam on the Brisbane River, Queensland Co-ordinators General Department, June 1977.`

IWSC (1977), Wivenhoe Dam Assessment of Yields and Flood Magnitudes, Irrigation and Water Supply Commission, Surface Water Branch Hydrology Report 143005.PR, September 1977.

QWRC (1983), Wivenhoe Dam Design Flood Study, Queensland Water Resources Commission, Water Resources Division, Hydrology Report 143005.PR/3, May 1983.

BCC and QWRC (1985), Hydrology Report for Manual of Operational Procedures for Flood Mitigation for Wivenhoe Dam and Somerset Dam. Brisbane City Council and Queensland Water Resources Commission, January 1985.

DNR (1993a), Brisbane River Flood Hydrology Report – Design Flood Estimation. Department of Natural Resources, Report Number 8a, 8b, 8c and 8d, March 1993.

DNR (1993b), Brisbane River Flood Hydrology Report – Downstream Flooding. Report Number 13, August 1993.

DPI, Water Commercial (1995), Wivenhoe Dam Design Report, Queensland Department of Primary Industries, Water Commercial, September 1995.

Gutteridge Haskins and Davey Pty Ltd (1997), Wivenhoe Dam Report on the Safety Review (Draft), April 1997.

Sinclair Knight Merz and Hydro Consulting Hydro Electric Corporation (2000), Preliminary Risk Assessment Wivenhoe, Somerset and North Pine Dams, March 2000.

AGSO – Geoscience Australia in conjunction with the Bureau of Meteorology (2001), Natural Hazards and the risks they pose to South East Queensland.

SKM (2003) Report, Further Investigations of Hydrology and Hydraulics Incorporating Dam Operations and CRC Forge Rainfall Estimated (Draft), August 2003.

Independent Review Panel (2003), Review of Brisbane River Flood Study. Report to Brisbane City Council, Independent Review Panel, September 2003.

Wivenhoe Alliance (2004), Design Discharges and Downstream Impacts of Wivenhoe Dam Upgrade, Wivenhoe Alliance Report Number Q1091, February 2004, Brisbane.

SunWater (2006), Assessment of the Flood Impacts of Raising the Full Supply Level in Wivenhoe Dam. SunWater Report G-70001-04-01, March 2006

SunWater (2007), Assessment of Wivenhoe Dam Flood Impacts, SunWater Report December 2007.

Seqwater (2009), Somerset-Wivenhoe Interaction Study, October 2009.

Statement of Jeffrey David Secker

I, Jeffrey David Secker, Spatial Data Coordinator, City Projects Office, Brisbane City Council, of 505 St Pauls Terrace, Fortitude Valley, in the State of Queensland, state on oath as follows:

1. For the purposes of preparing this Statement I have, in my position as Spatial Data Coordinator, City Projects Office (previously known as City Design branch), of the Brisbane City Council (**Council**), had access to:

   (a) the business records of Council; and

   (b) Council officers,

   to obtain data and information. Unless otherwise stated, the matters set out in this Statement are based on my own knowledge and the information derived from the above sources.

2. The documents from the above sources and attached to this Statement have been collated and/or prepared by me and Council officers within City Projects Office.

Qualifications and Background

3. I am currently completing a Graduate Diploma in Geographical Information Systems. I hold the following qualifications:

   (a) a Bachelor of Applied Science (Hons) majoring in Geology; and

   (b) a Graduate Diploma in Information Technology.

4. I was initially employed by Council in 2006 as a CADD/Spatial Data Officer in City Design, and since 2009 I have been employed by Council as a Spatial Data Coordinator.

Introductory Observations

5. City Projects Office provides expert technical advice for most of Council's flood modelling and flood estimation information. It is important to keep in mind that many of Council's flood modelling and flood estimation output is the result of collegiate co-operation between officers with differing skills and experience. In particular:

[redacted]

Jeffrey David Secker

Witness [redacted]

(a) Flood hydrology and hydraulics expertise is provided by Council's engineers who work in that area;

(b) Surveying expertise necessary for the generation of digital terrain models and the integration of various sources of surveyed data is provided by Council's surveyors. Council's surveyors are also primarily responsible for engineering surveys undertaken in the field (in this case, relevantly, of debris levels for the 2011 Flood Event);

(c) Geographical information systems (**GIS**) expertise is necessary to integrate hydraulic and hydrological data and survey data with geographical data.

6. My area of special expertise is in GIS. However, I have an understanding of the overall processes and the differing roles and expertise of my colleagues.

Joint Flood Task Force Flood Levels

7. I refer to the Joint Flood Task Force Report dated 8 March 2011 (**JFTF Report**), a copy of which is Attachment **"JDS-01"**. I refer in particular to Table 3 on page 20 of the JFTF Report.

8. Table 3 contains a column headed "*Jan 2011 Flood Approx. Level (m AHD)*". As I recall, those levels were provided to the Joint Flood Task Force (**JFTF**) by City Design branch in response to a request to provide those levels. I do not recall the source of that particular request, but I am confident that the levels were provided in response to a specific request.

9. Although I do not recall in detail what occurred, based on my discussion with Council officers, my recollection is that the request was made in about early February 2011 as part of a continuous stream of demands for information directed to City Design branch, not just by the JFTF, but also the Flood Response Review Board and other sections in Council. My recollection is that the information was required in a very short time frame, possibly a few days.

10. As the flood levels provided to the JFTF (**JFTF Levels**) were required to be supplied in a short time frame, the JFTF Levels were taken from Council's existing flood profile at the time which was derived from Council's own Brisbane River Flood Forecast Reporting System (otherwise known as the "Bender").

[redacted]

Jeffrey David Secker

Witness [redacted]

11. The Bender is described in detail in section 3 of the second statement of Mr Kenneth Morris which I understand is Exhibit 404 in the Commission.

12. Consistently with Mr Morris' description of how the Bender works, the JFTF Levels were produced by:

    (a) taking the peak gauge heights recorded during the 2011 Flood Event at each of six points at which BoM flood predictions are made (including Moggill, Jindalee and the Port Office) (see paragraph 3.1-3.2 of Mr Morris' second statement); and

    (b) using the Bender to interpolate points in the flood profile between those gauges.

13. The resultant flood profile has been referred to in Council as the peak at all gauges flood envelope or flood envelope. That flood profile is plotted on JDS-02, as I describe in paragraph 15 below.

14. As Mr Morris explains in his second statement, the Bender works by interpolating river heights between the six BoM gauges using pre-determined river profiles derived from the Mike 11 model for particular flows. It is therefore reliant, amongst other things, on the accuracy of the Mike 11 model. The existing library of Bender profiles used at the time of the 2011 Flood Event were derived from the 2003/2004 SKM Mike 11 model. It is necessarily the case, therefore, that the JFTF Levels were likely to be, at best, a broad estimate of the actual flood profile for the 2011 Flood Event. Bender provides a useful tool for quickly estimating likely inundation depth and extent during flooding events, but is not a substitute for a more detailed analysis of actual events undertaken when time allows.

15. Attachment **"JDS-02"** is a series of flood profiles for the Brisbane River from Karana Downs to Bretts Wharf showing a number of flood profiles derived from various sources. The dark blue line, described as the "JFTF 2011 Bender Profile", shows the flood profile derived from the Bender model as explained in paragraphs 10 to 12 above.

16. While the JFTF Levels provided a reasonable estimate of the 2011 flood profile for the purposes of the JFTF (given the time constraints discussed above), it was expected that more detailed work on the 2011 flood profile based on observed data would produce a different flood profile, as has in fact occurred.

[redacted]

Jeffrey David Secker

Witness [redacted]

Revised flood profiles based on 2011 Flood Event data

17. Since the JFTF Levels were provided, it has been possible to carry out further analyses of the 2011 Flood Event based on actual data collected in respect of that event. In particular, the following data has been used:

    (a) approximately 100 surveyed flood debris marks, (being marks which have been collected and verified by Council's surveyors); and

    (b) approximately 1000 points identifying the actual flood extent derived from the aerial "nearmap.com" images of the 2011 Flood Event within Council's boundaries.

18. Based on that further material, Council was able to develop a flood surface (which digitally represents the flood levels for the 2011 Flood Event) from which other modelling of the 2011 Flood Event could be derived (**2011 Flood Surface**).

19. The flood line derived from the 2011 Flood Surface was provided to the Department of Environment and Resource Management (**DERM**) to assist DERM in developing its flood line for the 2011 Flood Event. Previously, DERM had provided a flood line (known as **DERM V1**) which was prepared soon after the 2011 Flood Event and therefore did not have the benefit of all the available data.

20. In about March 2011, DERM produced a revised and more rigorous flood line for the 2011 Flood Event (**DERM V2**). The DERM V2 flood line was very similar to the flood line derived from Council's 2011 Flood Surface. The DERM V2 flood line has been accepted as the flood extent for the 2011 Flood Event, although I expect it will be revised and refined by DERM as further data and information becomes available.

21. The DERM V2 flood line does not directly provide a flood profile for the River, nor flood levels which can be used to identify flood depth for properties. Council had to undertake this work.

22. Council used the DERM V2 flood line, informed by its 2011 Flood Surface information relating specifically to the Brisbane area, to generate flood cells for the 2011 Flood Event (**2011 Flood Cells**). The 2011 Flood Cells are areas which represent, usually by reference to .1m incremental changes in the flood surface, the level and extent of flooding. Using the 2011 Flood Cells it is possible to produce estimates of flood levels for individual properties in

[redacted]

Jeffrey David Secker

[redacted]

Witness

respect of the 2011 Flood Event. This information provides the basis for the 2011 flood levels entered in the Flood Wise Property Reports and, as I understand it, for the development of the Temporary Local Planning Instrument (**TLPI**).

23. A flood profile for the 2011 Flood Event based on the 2011 Flood Cells is plotted on attachment JDS-02. It is represented by a red line and described in the key as the "2011 Flood Cell Profile".

24. Because the 2011 Flood Cell Profile is based on actual data, it is a more accurate reflection of the actual profile of the 2011 Flood Event than the JFTF 2011 Bender Profile.

SKM Mike 11 2011

25. I have also caused to be included in Attachment JDS-02 the flood profile (**SKM 2011 Profile**) generated from the Mike 11 model, version 2 (**SKM 2011 model**), being (as I understand it) the revised and recalibrated 2003 SKM Mike 11 model which revised version was produced by SKM for the purposes of this Commission. The SKM 2011 Profile is plotted as a light blue line. I am not aware of the extent to which actual data for the 2011 Flood Event (of the kind described in paragraph 17 above) has been incorporated into the SKM 2011 model.

26. I can not comment on whether, and to what extent, the SKM 2011 Profile is more accurate or less accurate than the 2011 Flood Cell Profile where the two profiles diverge. I can say, however, that Council provided the surveyed debris mark data referred to in paragraph 17 above to SKM on 19 May 2011. Attachment "**JDS-03**" is a copy of an email from Council (Ellen Davidge) to SKM (Peter Hill) sent on 19 May 2011 attaching an excel table of the surveyed debris mark data.

Pre-2011 Flood Event profiles

27. For ease of comparison and contrast, I have included in Attachment JDS-02 flood profiles for:

[redacted]
Jeffrey David Secker

Witness [redacted]

(a) the existing Q100 (based as I understand it on the 2003/2004 SKM Mike 11 model) represented by an orange line;

(b) Council's DFL prior to the introduction of the TLPI (being Council's adopted development profile for the Brisbane River) represented by a light green line; and

(c) the profile for the DFL + 500mm, being the minimum habitable floor level for residential properties under (as I understand it) the Subdivision and Development Guidelines, represented by a brown line.

Future work and the 2011 Flood Profile

28. While the 2011 Flood Cell Profile is in my view a good approximation of the actual flood profile for the 2011 Flood Event, I am aware that there is a major flood study of the Brisbane River to be undertaken. One consequence of that study will almost certainly be that a revised and refined flood profile for the 2011 Flood Event will be developed. It is almost certain that that flood profile will differ somewhat from the 2011 Flood Cell Profile and the SKM 2011 Profile.

I make this statement conscientiously believing the same to be true, and by virtue of the provisions of the Oaths Act 1867 (Qld).

Signed and declared by Jeffrey David Secker at
Brisbane
in the State of Queensland
this 13th day of October 2011
Before me:

[redacted]

Signature of [redacted]m the declaration is made

[redacted]

Signature of declarant

[redacted] SOLICITOR.

Full name and qualification of person before whom the declaration is made

"JDS - 01"

Joint Flood Taskforce Report
March 2011

BCC.114.0864

This document has been approved on behalf of the Joint Flood Taskforce by

Name	Professor Colin Apelt		
Position	Joint Food Taskforce Chair		
Signature	Original Signed by Colin Apelt	Date	8 March 2011

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GLOSSARY

Executive Summary

In January 2011, Brisbane experienced the second-highest flood of the last 100 years, after January 1974. There was major flooding through most of the Brisbane River catchment, most severely in the Lockyer and Bremer catchments where numerous flood height records were set. The flooding caused substantial loss of life in the Lockyer Valley and thousands of properties were inundated in metropolitan Brisbane, Ipswich and elsewhere.

Joint Flood Taskforce Brief

As with any such event, questions about flood control levels are raised. Given that the flood control levels are theoretical, it is prudent to review them in light of an actual event to assess the reliability of the present theoretical model. To this end a Joint Flood Taskforce (JFTF) was established to report within 30 days, which it has done, on the following three questions.

- How does the January 2011 flood event compare to the Q100 as presently defined and Brisbane City Council's Defined Flood Event?
- Does Q100, as it is currently described, remain the best estimate of a 1 in 100 year event?
- Accordingly, what standard should be used to enable new development and redevelopment to proceed with confidence and certainty?

Findings of Joint Flood Taskforce

In answering these questions the JFTF has focussed on river flooding only. Creek flooding and the impact of Storm Surge are considered to be outside the scope for this review. The JFTF was limited by the data and modelling available and that could be made available. Further the answers provided stress their interim nature given a number of other reviews that are currently underway. These reviews include "Queensland Floods Commission of Inquiry" and Council's Flood Response Review Board.

How does the January 2011 flood event compare to the Q100 as currently defined and Brisbane City Council's Defined Flood Event (DFE)?

In the flood event experienced, the heaviest rains were inland on the western fringe of the Brisbane River catchment and on the Great Dividing Range. Over the Brisbane River catchment as a whole, based on rainfall captured by the BoM's Enviromon rain gauges, the estimated average 5-day rainfall is 322mm, with the major sub-catchments of Wivenhoe Dam, Bremer River and Lockyer Creek receiving 370mm, 223mm and 268mm respectively.

Given the pattern of rainfall, the Brisbane River received significant flows from the upstream catchments of the Lockyer and Bremer. The flow down the upper Brisbane River (above the Lockyer Creek) and Stanley River were mitigated by Wivenhoe Dam. However Brisbane felt the full force of the flows down the Lockyer and Bremer Rivers. As a result of the rainfall, Brisbane experienced a significant river flood. During this flood event, the rainfall over much of Brisbane was not sufficient to cause any significant creek flooding from local runoff. However, creeks that are tributaries of the Brisbane River were flooded deeply in their lower reaches by water backing up from the River.

Based on examination of the rainfall patterns of a number of previous Brisbane River floods, it is concluded that the Brisbane catchment experienced a significant rainfall event with a rain pattern that was different from that experienced in 1974. Full details of the rainfall magnitudes were not available at the date of this Report. However back calculation from recorded releases from Wivenhoe and the record of water level in the dam suggest significantly more flood producing rainfall occurred than indicated by the presently available rainfall data. The calculated dam inflow hydrographs show two inflow peaks, the first of the magnitude of 1974 and the second 36 hours later of greater magnitude than 1974. The level recorded at Savages Crossing was higher than in 1974. Flood inflow volumes to Wivenhoe as calculated from the known releases from Wivenhoe dam and the recorded water levels in the dam total 2,650 GL, as compared to a total of 1,410 GL for that location in 1974 and 2,744 GL in February 1893.

On balance the JFTF considers that the flood runoff resulting from the major rainfall event of January 2011 was greater than the 1974 event but not as great as the 1893 event.

All of the peak flood levels recorded in January 2011 by the gauges along the Brisbane River were higher than the existing Defined Flood Level, ie. the level previously calculated for the 1974 flood event mitigated by Wivenhoe Dam. Therefore, taking into account this fact together with its assessment of the rainfall event, the JFTF considers that the January 2011 flood event was larger than the Brisbane City Council's Defined Flood Event.

The Q100 as presently defined is, in general, a slightly lesser flood than the Defined Flood Event. Therefore the JFTF considers that the January 2011 flood event was larger than the Q100 as presently defined.

Much more detailed work is required to accurately identify the probability of this event for Brisbane. The information needed and the work required to complete this analysis are summarised in the Recommendations below.

Does Q100, as it is currently described, remain the best estimate of a 1 in 100 year event?

The term, Q100, can be misunderstood. Some people mistakenly believe a 1 in 100 year flood will only occur once every 100 years on average. However, Q100 is a probability-based design flood event, aimed to reflect *typical combinations of flood producing and flood modifying factors* which act together to produce a flood event that has a 1 in 100 chance in any one year (or an average recurrence interval of 100 years) of being equalled or exceeded at a specific location of interest. It is a theoretical flood model used to inform planning and policy.

The January 2011 flood has brought a significant amount of new data and information on the nature of flooding in the Brisbane River and about the factors contributing to very large flood events in this catchment. Significant work is required to review Brisbane's Q100 in the light of this new information. This work could not be completed given the data available to the JFTF report, some of which is still being collected.

In light of the available information about the 2011 flood event, the JFTF considers that it is essential that the current Q100 is reviewed. It is not possible to predict the outcome of such review but it is considered more likely than not that this review will lead to an increase in the magnitude of the Q100 and increases in associated flood levels.

Accordingly, what standard should be used to enable new development and redevelopment to proceed with confidence and certainty?

To answer this question five (5) scenarios have been evaluated. These scenarios are:

- Current Q100 (3.3m at City Gauge)
- Current Defined Flood Level, DFL (3.7m AHD at City Gauge)
- January 2011 Flood Event (4.46m AHD at City Gauge)
- 1974 without Wivenhoe Dam (5.45 m AHD at City Gauge)
- 1893 without Somerset and Wivenhoe Dams (8.35m AHD at City Gauge)

On balance, the JFTF believes that, in the absence of results of a detailed flood study review, a precautionary approach should be adopted. Therefore, it considers that the actual January 2011 flood event, as observed during the event, should be used as the **interim** standard on which Brisbane City Council bases its decisions concerning habitable floor levels for new development and should be a consideration for habitable floor levels for redevelopment of existing properties. Wherever the existing DFL is higher than the January 2011 flood event, the existing higher flood level should prevail.

The JFTF notes that, in regions where the interim standard will be applied, the degree of immunity from flood risk will vary with location. This is because the January 2011 flood event is an actual event and will have variable tidal influences along the tidal reach. Consequently variable probabilities will apply along this reach.

The recommendation of an **interim** development standard refers to land use types that are currently assessed against a DFE in the City Plan. This currently excludes industrial development however this should be considered through the current City Plan review.

Further the DFE and resulting flood regulation lines are considered only part of a flood risk management framework for a community. The approach to flood risk management for Brisbane needs to consider a broader range of initiatives if it is to effectively manage flood risk for the City. Flood risk management requires that the consequences of floods be investigated for a range of flood events up to and including the PMF. For land use planning, flood levels as well as flood flows corresponding to specific probabilities must be considered. This approach must include identification of the benefits of the management of risk, rather than seeing it as all cost.

Recommendations of Joint Flood Taskforce

It is recommended,

That the actual January 2011 flood event, as observed during the event, be used as the **interim** standard, on which Brisbane City Council bases its decisions concerning new development and redevelopment, with the essential condition that, wherever a higher level has been set as the current DFL, the higher level must apply; and that this interim standard apply until conclusion of the Commission of Inquiry and the comprehensive flood study recommended below is completed.

That all data relating to the January 2011 flood event be gathered from all sources and archived so that further analysis can make use of all data available.

That the bathymetry (river bed and banks) of the Brisbane River and its tributaries and the characteristics of the bed material from Wivenhoe dam to the mouth be measured as soon as possible.

That a comprehensive flood study be commissioned to review flood flows and levels within the Brisbane River catchment making full use of the data relating to the January 2011 flood event.

That the effects of morphological (river bed level and cross section) changes due to sediment erosion and deposition during flood events be studied for a range of flood magnitudes to determine their effects on flood levels.

That consideration be given to whether a Monte Carlo approach to the flood risk for the Brisbane Catchment is feasible and, if yes, whether it should be carried out and which influencing factors should be included in the Monte Carlo approach. This may include consideration whether two or more types of rainfall events should be built into the statistical analysis for theoretical floods. (In a Monte Carlo analysis the influencing input factors such as rainfall patterns, storm tracks, catchment conditions, tide and storm surge are sampled, either randomly or in accordance with their joint probabilities, to select a large number of different combinations of inputs for simulation with a catchment modelling system to develop many alternative predictions of flood events. These predictions are then analysed statistically to estimate their exceedance probabilities).

That a complete Flood Risk Management analysis for the area of Brisbane affected by flooding by Brisbane River and its tributaries be carried out. It is essential to move from the Q100 mentality and to adopt a risk management approach inline with National Flood Risk Advisory Group (NFRAG) and other relevant guidelines. The risk management approach would require a detailed assessment of the benefits and costs of a full range of flood mitigation options.

1.0 Purpose and Scope of the Report

1.1 Purpose

On the 11 February 2011 the JFTF was established by the Brisbane City Council. Ipswich City Council were then invited to participate in accordance with the Terms of Reference as given in Appendix A. Ipswich City Council chose to adopt an observer status, providing technical input and were not an approval entity. An outcome of the JFTF required by the TOR was the response to the following questions.

1. How does the January 20011 flood event compare to the Q100 as presently defined and Brisbane City Council's Defined Flood Event (DFE)?
2. Does Q100, as it is currently described, remain the best estimate of a 1 in 100 year event?
3. Accordingly, what standard should be used to enable new development and redevelopment to proceed with confidence and certainty?

A Technical Reference Group and an Industry Reference Group were established at the same time, as detailed in the TOR, to provide input to the work of the core JFTF. The role of the Technical Reference Group was focussed essentially on the first two questions while the role of the Industry Reference Group was critical in the response to the third question.

This report provides the response of the JFTF to the TOR including its answers to the three questions.

1.2 Approach

To provide the context for this work, the flood history of the Brisbane River is summarised including the event of January 2011. An overview the catchment in which Brisbane is situated is provided including major dams with their impacts.

Brisbane's Q100 and DFE control levels for Brisbane are discussed as are their role as development standards. The January 2011 event is then compared to the current Q100 event and the current DFE and the appropriateness of the current Q100 is examined.

Five potential DFEs are examined. These scenarios are:
- Current Q100 (3.3m AHD at City Gauge)
- Current Defined Flood Level, DFL (3.7m AHD at City Gauge)
- January 2011 Flood Event (4.46m AHD at City Gauge)
- 1974 without Wivenhoe Dam (5.45 m AHD at City Gauge)
- 1893 without Somerset and Wivenhoe Dams (8.35m AHD at City Gauge)

The effectiveness and impacts of each option are discussed and a conclusion reached as to their suitability from both a hydrological and planning perspective.

1.3 Limitations

This report only considers river flooding within Brisbane. Flooding in the Bremer River is not examined, neither is creek flooding and nor is the impact of storm surge or climate change.

The State government's "Queensland Floods Commission of Inquiry" will consider and make recommendations relating to any long term planning changes. However, this will not be available for some time. This report aims to provide certainty to Brisbane's community by providing interim guidance on flood levels and controls. The focus of this report is the next 1 to 2 years. As a result, longer term impacts such as changing sea levels and variations in rainfall patterns and other consequences of climate change are not considered.

Given the interim nature of the report, there are limitations on the data that could be collected, flood modelling that could be completed and the economic analysis that could be completed for the analysis of benefit and cost. Therefore recommendations are made for future work to increase the robustness of the recommendations or revise them if necessary.

Finally, the appropriateness of the Wivenhoe Dam operation procedures and potential improvements in these procedures are a consideration for the State's Judicial Commission. This report assumes Dams were operated inline with current legislated operating procedures. Consequently, Wivenhoe Dam operation is not considered.

2.0 Background

2.1 Flood Risk Management

2.1.1 Introduction

Flood risk is the potential for people or property to suffer damage from flooding. Flood risk at a location depends upon the frequency of flooding at different levels and the associated consequences to the community.

The object of flood risk management is to reduce a community's flood risk to acceptable levels, either by reducing exposure to flooding or by reducing the vulnerability of people and property to flooding. This involves trading off the economic, social and environmental costs of flooding against the benefits of allowing a broad range of activities to take place on the floodplain. Such trade-off decisions need to be made in a proper risk management framework, based on firstly assessing the probabilities and consequences of flooding at different levels of severity, and then considering the benefits and costs of a range of flood risk management options. The benefits of flood risk management options can be expressed in terms of the reduction in expected flood damages, environmental, social and economic, while the costs include the cost of implementing the flood risk management measures as well as associated opportunity costs.

In a broader sense, flood risk management also includes flood response and flood recovery actions but in the context of this report the focus is on the *prevention aspects* of flood risk management.

2.1.2 Flood risk management principles and guidelines

In Australia, flood risk management is guided by principles, policies and guidelines established at the national, state and local government levels. At the national level, the National Flood Risk Advisory Group (NFRAG) has been established to follow up on COAG reform commitments, including the development of National Flood Risk Management Guidelines (see AJEM, 2008). The national guidelines developed by NFRAG describe the vision for flood risk management as:

> "Floodplains are managed for the long term benefit of the local and wider community such that hazards to people and damages to property and infrastructure are minimised and environmental values are protected."
> (AJEM, 2008)

The Queensland State Planning Policy 1/03 : Mitigating the Adverse Impacts of Flood, Bushfire and Landslide 1.0 (SPP, 2003) and the associated guideline State Planning Policy 1/03 Guideline: Mitigating the Impacts of Flood, Bushfire and Landslide 1.0, which form the basis for development decisions in relation to floods and other natural hazards, are consistent with the flood risk management framework outlined in 'Floodplain Management in Australia – Best Practice Principles and Guidelines (SCARM, 2000).

2.1.3 Flood risk management options

The range of flood mitigation options available to reduce the exposure of a community to flooding or its vulnerability to flood risk includes the following main groups:

(i) *Land use planning and development controls* (including building regulations) to exclude development from the most hazardous parts of the floodplain and ensure that exposure to flooding and flood damage are minimised for development in fringe areas of the floodplain.

(ii) *Other non-structural measures* such as developing flood warning systems, improving community awareness and readiness by community education on the nature and impacts of flooding.

(iii) *Major structural flood mitigation works* to reduce the frequency of flooding above a given level (e.g. flood control storages) or the extent of flooding (e.g. levees) – these options can be employed to reduce the flood risk to *existing development* in the flood plain

(iv) *Flood proofing measures* to reduce the exposure of property to flood damage (e.g. raising of house floors, flood barriers, use of flood resistant building materials),

This report only concentrates on benefits derived directly or indirectly from the first group, with other potential flood risk management options to be considered as part of a more comprehensive future study. The specific focus of the report is on land use planning and development controls through setting of *defined flood levels for planning and building purposes* in the areas affected by Brisbane River flooding.

2.1.4 Residual flood risk

Flood risk management options are designed to reduce the flood risk for flood events up to a design flood (and the associated defined flood level). There is still a chance of the defined flood level being exceeded by larger floods; this is referred to as '*residual flood risk*'. The larger the average recurrence interval selected for the defined flood event (and thus the higher the defined flood level), the lower the residual flood risk. As an example, if the Q100 is adopted as the defined flood level, then the residual flood risk will consist of the consequences associated with all the floods larger than the Q100 event, weighted by the probability of their occurrence. While floods much larger than the January 2011 event may occur, their low probability of occurrence means that, in the determination of residual flood damages, they will be given a much lower weight than flood events which occur relatively frequently.

2.1.5 Conclusion

Flood Risk Management is a best practice approach and if adopted will provide a framework to mitigate damage from flooding for all properties at risk from flood. No matter what flood DFE is in place it should be considered as only integral part of the Flood Risk Management framework which needs to be complemented with other flood risk controls as outlined in section 2.1.3

2.2 Details of the river flood event of January 2011

In January 2011, Brisbane experienced the second-highest flood of the last 100 years, after January 1974. There was major flooding through most of the Brisbane River catchment, most severely in the Lockyer and Bremer catchments where numerous flood height records were set. The flooding caused substantial loss of life in the Lockyer Valley and thousands of properties were inundated in metropolitan Brisbane, Ipswich and elsewhere.

2.2.1 Rainfall

For the 2011 event, the heaviest rains were inland on the western fringe of the Brisbane River catchment and on the Great Dividing Range. Recorded gauge levels for this event, show Brisbane's peak three-day rainfall was 166 mm, while the peak one-day total was 110 mm.

Over the Brisbane River catchment as a whole, based on rainfall captured by the BoM's Enviromon rain gauges, the estimated average 5-day rainfall is 322mm, with the major sub-catchments of Wivenhoe Dam, Bremer River and Lockyer Creek receiving 370mm, 223mm and 268mm respectively.

However back-calculation from recorded releases from Wivenhoe and the record of water level in the dam suggest significantly more flood producing rainfall occurred. The calculated dam inflow hydrographs show two peaks, the first of the magnitude of 1974 and the second of greater magnitude than 1974, 36 hours later. The peak level recorded at Savages Crossing was higher than in 1974 but not as great as estimated for the 1893 event. Estimated flood volume inflows to Wivenhoe as calculated from the known Wivenhoe dam releases and the recorded water levels in the dam total 2,650 GL as compared to a total of 1,410 GL for that location in 1974 and 2,744 GL in February 1893

It is thought that the coverage of the existing rain gauge network[1] was insufficient to accurately capture the variation in rainfall intensities for this event. This is supported by evidence from radar imaging which suggested significant falls not recorded in rain gauges. For example, there were large falls observed over Wivenhoe Dam that would not be captured by any rain gauge. To obtain a greater understanding of the total rainfall received, work is required to analyse the recorded radar imaging of the event.

Insufficient rainfall data exist for a comprehensive assessment of the 1893 event. However, the available station data indicate that peak rainfalls in the region during the 1893 event were much heavier than those during either the 1974 or 2011 events. Crohamhurst, in the Glasshouse Mountains inland from the Sunshine Coast, received 907.0 mm on 3 February 1893, which remains an Australian daily record, whilst three-day totals included 1715.0 mm at Mooloolah and 1680 mm at Crohamhurst.

On balance the JFTF considers that the flood runoff caused by the rainfall event of January 2011 was greater than the 1974 event but not as great as the 1893 event.

2.2.2 Flood resulting from Rainfall

In 2011 Brisbane experienced a significant river flood. Given the pattern of rainfall, the Brisbane River received significant flows from the upstream catchments of the Lockyer and Bremer. The flow down the upper Brisbane River above Wivenhoe Dam and Stanley River was mitigated by Wivenhoe Dam. However, Brisbane felt the full force of the flows down Locker Creek and Bremer River. As a result of the rainfall, Brisbane experienced a significant river flood.

The flooding caused thousands of properties to be inundated in metropolitan Brisbane. It should be noted that the pattern of rainfall experienced caused little to no creek flooding within Brisbane, though creeks were flooded by backwater from the river.

It is reported that the flood levels recorded at Savages Crossing were higher than in 1974.
DERM reported the peak level recorded at Savages Crossing was 24.167m AHD at 03.40 am on 12 January 2011, somewhat higher than the peak level of 23.767m AHD in the 1974 flood. The corresponding discharge based on the extrapolated rating curve was 6900 cumecs. It has been suggested that the extrapolated rating curve may have underestimated the actual flow rate. Nevertheless the discharge of 6900 cumecs is larger than that for the current DFE.

The peak height at the Brisbane Port Office gauge of 4.46 m was less than that in 1974[2]. The flood level in Brisbane in January 2011 was reduced by the mitigating effect of Wivenhoe Dam.

Measurements of flood levels for January 2011 have been based on marks on buildings where available, rather than on debris marks. Levels vary across the river by substantial

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[1] The existing rain gauge network is made up mostly of gauges owned by BOM and Seqwater.

[2] There are two gauges at/near the Port Office. The "Port Office gauge" is at the end of Edward Street on the true left side of the river. There is also an 'Alert' gauge on the true right side a little downstream from the Thornton Street ferry pier

amounts – up to 0.4m at bends; the water surface is curved generally because of the effects of super-elevation at the outsides and of local reduction at the insides of bends, as well as the tendency for the water to be higher towards the centre of a fast flowing river than near the banks. All the measured flood levels are higher than the Defined Flood Levels and these correspond to the levels calculated for a flood with the characteristics of the 1974 flood after the reducing effects of Wivenhoe Dam.

2.2.3 Outstanding Information Required for Description of 2011 Event

A number of important items required for a complete description of the January 2011 event are not available at the time of writing this report. These include the following:

- BoM is still assembling and checking the rainfall data.
- DERM gauged the flow at Jindalee Bridge with Acoustic Doppler instrumentation – this data is still awaited.
- There is a strong suspicion that the extrapolated part of the DERM rating curve for the gauging station at Savages Crossing is inaccurate causing some underestimates of flows of order 20% or more.
- The bathymetry of the river, from Wivenhoe Dam to the mouth of the river, may have changed substantially and it needs to be measured as soon as possible. There was very extensive erosion of the Lockyer and there is a strong suspicion that much of this was deposited in the Brisbane River. There are suggestions that this may be part of the reason for the apparent "discrepancy" in the differences between the DFLs and 2011 levels upstream from the Tennyson Tennis Centre – further upstream the differences are similar in magnitude but, in some reaches, they decrease before increasing again. However, there are substantial differences in the shapes of the hydrographs for the different flood events and this could be a major contributor.
- The accuracy of the stage/volume relationship for Wivenhoe dam storage needs to be checked.

2.2.4 Comparison of January 2011 with Present DFE

As stated above in 2.2.1, the JFTF considers that the flood runoff caused by the rainfall event of January 2011 was greater than the 1974 event. Further, as noted above in 2.2.2, all the measured flood levels for the January flood event are higher than the levels calculated for a flood with the characteristics of the 1974 flood after mitigation by the effects of Wivenhoe Dam and these latter levels are the presently Defined Flood Levels (DFLs) for areas where the river flooding causes the highest level of flooding.

Consequently, despite the lack of complete data at this time, the JFTF has concluded that the January 2011 flood event, as actually experienced, was larger than a flood similar to that of 1974 after mitigation by Wivenhoe, and therefore larger than the Council's presently defined DFE.

2.3 River Flood history

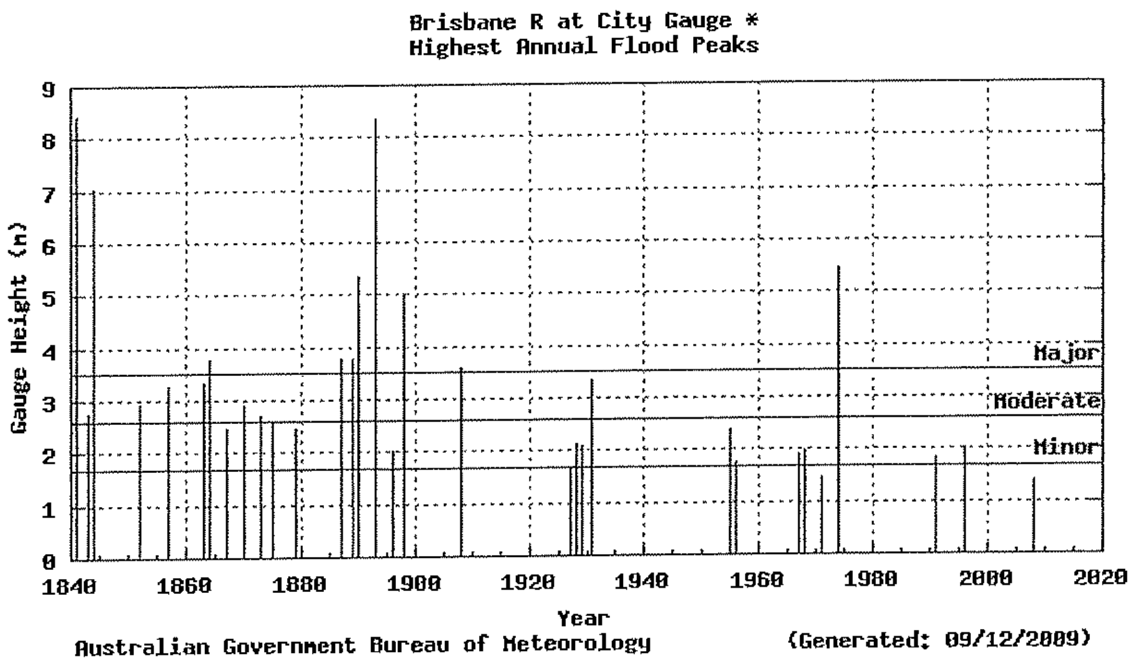
Flood records held by the Bureau of Meteorology and the state extend back as far as the 1840's for Brisbane. These records show Brisbane is a city built on the flood plain of a river with a history of flooding. While flood peaks are referenced to the Brisbane Port Office gauge in Brisbane City, the flood levels reached upstream are significantly higher. The Figure below shows the history of the highest annual flood peaks recorded at the

City Gauge between 1840 and December 2009 (so it does not include the January 2011 flood). In that period, Brisbane experienced 10 Major, 8 Moderate and 12 Minor flood events. The descriptions of Major, Moderate and Minor as used by the Bureau of Meteorology are given in the Glossary. The table below shows flood levels on the Brisbane River for a selected number of river flood events.

Table 1: Selected Flood events

River Height Station (m AHD)	Feb 1893	Feb 1931	Jan 1974	Jan 2011
Gatton	16.33	n/a	14.63	n/a
Mt Crosby	32.00	21.78	26.74	n/a
Ipswich	24.50	15.50	20.70	19.25
Moggill	24.50	15.40	19.93	17.48
Jindalee	17.90	9.60	14.10	12.91
Brisbane City	8.35	3.32	5.45	4.46

The floods of 1841 and 1893 reached over 8 m AHD in Brisbane City. This represents a depth of approximately 6.5 m above the highest tide level. Since 1893 the largest flood in the Brisbane - Bremer systems was in 1974. In Brisbane the 1974 flood rose to a height of 5.45 m at Brisbane Port Office gauge while Ipswich reached a height of 20.7 m. As the Brisbane River flooded it backed up the Bremer River resulting in 4 to 5 days of record heights in Ipswich. Seqwater has been quoted in the media as saying the 1974 flood saw a river flow rate of 9,500 cubic metres of water per second. Note that the Jan 2011 flood (4.46m at City Gauge) is not included in the graph below, which was prepared in 2009 by the Bureau of Meteorology.



2.4 The Brisbane River Catchment

2.4.1 Geographical Characteristics

The Brisbane River is a large catchment of 14,000 km^2. Numerous creek systems feed the Bremer and Brisbane rivers. Rainfall across the catchment varies for any single event with differences of 1,000mm been observed values in the catchment for historic events.

2.4.2 Catchment Characteristics

Runoff is largely controlled by topography (draining system structure, catchment area, grades, etc.), land classification (land use, soil type, vegetation etc.) waterway capacity (conveyance and storage) and antecedent soil moisture content. These characteristics dictate the catchment's response to rainfall. This includes the depth, rate, and duration of runoff.

In the Brisbane catchment, these characteristics have changed significantly since the 1893 events due to progressive settlement and development. This development included two large dams that provide temporary flood storage within the catchment. As a result the catchment's response to rainfall has changed significantly since 1893 and continues to change.

Furthermore, the generation of runoff and hence the development of a flood hydrograph is influenced by the characteristics of an individual storm event. The characteristics include the storm intensity, the spatial and temporal patterns of rainfall, and the movement of the storm over the catchment

2.4.3 Flood Mitigation Dams

Two large dams provide temporary flood storage in the catchment, Wivenhoe and Somerset dams. Both dams are upstream of where the Lockyer Creek and the Bremer River joins the Brisbane River. As such where the rain event is centred within this large catchment and how it moves over it determines their effectiveness as a flood mitigation measure for any event.

Table 2: Major Dams

Dam	Wivenhoe	Somerset
Completed	1985	*1959*
Water supply Storage (GL)	1,150	370
Temporary Flood Storage	1,450	524
Location	Brisbane River Upstream of Lockyer & Bremer	Stanley River upstream of Brisbane River
Catchment (km^2)	7,000 including Somerset Dam	1,330
Reservoir surface area (km^2)	107.5	42.1

While Wivenhoe and Somerset dams are capable of significantly reducing Brisbane River events, they have limited mitigating effect on the Bremer River acting only to reduce the downstream level of the Bremer River as it enters the Brisbane River.

2.4.4 Creeks

As mentioned above, this report does not consider creek flooding. It is the opinion of the review group that given the power of the flow in the Brisbane River during flood any creek flooding will have limited impact on the flood levels seen along the river. The more likely scenario is that the Brisbane River will back up any creek causing greater localised flooding or creek flooding. Given this the increased creek flooding is outside the scope of this report but should be considered as part of a more comprehensive flooding review such as the update of the Lord Mayor's Taskforce on Suburban Flooding.

2.4.5 Tide and Storm Surge

The Brisbane River is tidal for approximately 86km from its mouth to around Colleges Crossing. Mean High Water Spring Tide in the bay is approximately 0.927 m AHD. Highest Astronomical Tide is 1.487 m AHD.

Storm tide risk in the bay is significant. The storm tide level on January 1974 was approximately 1.6m AHD while in May 1996 the storm tide level was around 2.8m AHD. It appears that tide and storm surge can account for approximately +/- 2 m range in the bay. However, the probability of the largest observed storm tide level coinciding with a flood of the magnitude of the January 2011 event is significantly less than 1 in 100.

2.5 Flood control levels in Brisbane

2.5.1 Differences between Design Events and Actual Events

Before any comparative information is presented it is important to understand the difference between actual observed flood events and probability-based design flood event such as Q100.

The flood event experienced in January 2011 is an *actual observed flood event.* It is *one of many possible events* from a large population of flood events that have occurred or could occur in the Brisbane River catchment from a combination of meteorological, hydrological and hydraulic factors. Observations on these factors during actual flood events are the main source of data and information for the derivation of probabilistic design flood events such as the Q100.

The term, Q100, can be misunderstood. Some people believe a 1 in 100 year flood will only occur once every 100 years on average. Rather, Q100 is a probability-based design flood event, aimed to reflect *typical combinations of flood producing and flood modifying factors* which act together to produce a flood event at a specific location of interest that has a 1 in 100 chance of being equalled or exceeded in any one year (1% annual exceedance probability – AEP); it is described as having an average recurrence interval (ARI) of 100 years. It is a theoretical flood model used to inform planning and policy.

Flood event characteristics of interest for flood management considerations are the peak flow, flood event volume and flood duration, and the resulting flood levels at specific locations. Best estimates of Q100, or similar probability-based design floods, together with information on the bounds of uncertainty attached to these estimates, form the basis for the selection of the DFE for a specific location.

As such, any actual flood event will vary in some degree from the theoretical flood model. This is particularly an issue for a large catchment such as the Brisbane-Bremer catchment. In such large catchments there is a greater chance that actual events will have variables that exceed the range used in developing the theoretical flood model.

2.5.2 Q 100 for Brisbane

For Brisbane the Q100 for river flood has a history of calculation and review based on specific events. The current Q100 for Brisbane was last estimated in 2003 as a peak flow of 6,000 cumecs (with uncertainty bounds of ± 1000 cumecs) and a corresponding flood level of 3.3 m AHD at Brisbane's Port Office gauge (with uncertainty bounds of ±. 0.5 m)

2.5.3 Defined Flood Event (DFE) and Defined Flood Level (DFL) for Brisbane

DFL is the level above Australian Height Datum (AHD)[3] that Council requires habitable floors to be built above to provide protection against floods up to the magnitude of the DFE. DFL is based on the flood levels that are estimated in the DFE. It is a planning control to avoid people building habitable floor levels in locations or at heights that carry greater risk of flooding than that protected against by the DFL. The Brisbane City Plan also requires an additional 500mm of "freeboard" to be added to allow for a factor of safety, uncertainties and localised effects. It should be noted that in unusual circumstances Queensland's performance based planning system under the Sustainable Planning Act 2009 can allow alternate solutions other than set floor levels to be considered.

It is desired that the floor levels of commercial and industrial developments meet or exceed the DFL; however an applicant may use a risk management approach if adopting the DFL leads to undesirable outcomes. Although this may be worthy of some reconsideration, it is beyond the scope of the TOR for the Joint Flood Taskforce.

The State Planning Policy 1/03 states the Queensland Government's default position is that the 1% Annual Exceedance Probability (AEP) flood or Q100 is generally suitable as the DFE for a Local Government. However, there is a provision to allow a Local Government to define the DFE as higher than the Q100.

Brisbane City Council has defined the DFE to be higher than the Q100 due to previous experience with river flooding (1974 floods). Brisbane City Council uses a flow of 6,800 cumecs as its DFE with a resulting level of 3.7 m AHD at Brisbane's Port Office gauge as its DFL. This was first set in 1978 and was reconfirmed in 2003.

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[3] AHD - Australian Height Datum - is the national surface level datum corresponding approximately to mean sea level. Levels measured relative to this datum are given as "m AHD

2.5.4 The role DFE and DFL in development

DFE and the resulting DFL are fundamental in setting levels for development. Levels for a development are set from the DFL though they vary with building classification and use (eg. habitable or non-habitable). The DFL reflects the slope of the flood profile and thus increases in level progressively as one moves upstream from the Port Office.

Levels set for development include a 'freeboard' margin which allows for uncertainties in the hydrologic and hydraulic models to determine design flood flows and corresponding flood levels, as well as a range of factors which may raise the flood levels locally. The freeboard margin may vary for different locations and types of development.

3.0 How January 2011 Flood compares to Q 100

As discussed above in 2.4.1, before any comparative information is presented it is important to understand the difference between actual observed flood events and probability-based design flood event such as Q100. The flood event experienced in January 2011 is an *actual observed flood event*. It is *one sample from many possible events* that have occurred or could occur in the Brisbane River catchment from the combination of meteorological, hydrological and hydraulic factors. Observations on these factors during actual flood events are the main source of data and information for the derivation of probabilistic design flood events such as the Q100. Q100 is a theoretical statistical estimate of flood characteristics used to inform planning and policy.

3.1 Runoff

On balance the JFTF considers that the flood runoff resulting from the major rainfall event of January 2011 was greater than the 1974 event but not as great as the 1893 event. One likely contributing factor is the nearly complete saturation of the ground resulting from the long period of rainfall preceding the flood event.

Two large rainfall events, separated by 36 hours were recorded. Further analysis of the rainfall is required to confirm that the January 2011 event was rarer than the Q100 design event. However, this analysis can be undertaken only after the BoM have collated and checked the rainfall data.

3.2 Antecedent catchment conditions

The Q100 calculation assumes 10 mm initial loss and 1 mm/h continuing loss, uniformly distributed over whole catchment. This reflects a relatively saturated state of the catchment at the start of a 72-hour design storm and the resulting flood event. In the months leading up to January 2011, sustained rainfall was experienced across the catchment resulting in a saturated catchment. It is possible that the initial loss and continuing loss were less than those assumed in the Q100 calculation.

In the Q100 calculation the initial reservoir volume was assumed to be 100 percent of its water supply storage with the corresponding level of 67.0m AHD (the "F.S.L.")
The conditions at the beginning of the Jan 2011 flood were similar. The dam level was at 67.0m AHD on 2nd February 2011 and had risen slightly to 67.3m AHD on 6th February.

3.3 Inflows to Wivenhoe Dam

Flood volumes for Q100 for various rainfall durations are given in Table 4-7 of SKM 2003. The 72-hour volume is 2180 GL.

The total flood inflow volume to Wivenhoe dam during the Jan 2011 flood event was estimated to be 2,650 GL. This estimated inflow volume exceeds the available flood storage in the Dam of 1450 GL.

3.4 Flood Routing Effect of Storages

The 2003 review of Q100 estimated that there was a reduction of about 50% in peak flows between pre-dam and post-dam estimates of Q100 in Brisbane. This reduction arose from the attenuation effect of the estimated available flood storage in the dams. A comparison of the magnitude and effectiveness (attenuation capacity) of the available flood storage between the Q100 and the January 2011 event needs to be assessed in future work.

Currently the mitigating effect of the dams in the 2011 flood is not available. The operation of Wivenhoe dam is outside the Terms of Reference of the JFTF and it is expected that it will be one of the matters examined by the State Commission of Enquiry. It is necessary that this mitigating effect is assessed in future work.

3.5 Relative timing of flood contributions from different parts of the Catchment

The twin rainfall events separated by 36 hrs created nearly coincident peaks at the confluence of Lockyer Creek. The timing of peak discharge from the dam was separated by only a relatively small time interval from the arrival of the peak flow from the Lockyer at its junction with the Brisbane River. The design parameters used in design Q100 modelling does not consider coincident peaks.

3.6 Interaction with Tides and Storm Surge

The flood of January 2011 peak was influenced by a high tide of 0.46 m AHD at 3.13am on the 13 January. In the Q100 design model the downstream control used was a level at the mouth of the Brisbane River corresponding to Mean High Water Spring Tide (MWHS), 0.9m AHD ("the tailwater level").

3.7 Resulting Flood Levels Q100 versus January 2011 Flood Levels

Table 3: Level Difference- Q100 Vs January 2011 Flood

Selected Locations	Jan 2011 Flood Approx. Level (m AHD) #	Q100 Design Level (m AHD)	Difference between 2011 and Q100 (m)	DFE Design Level-DFL (m AHD)	Difference between 2011 and DFL (m)
Brett's Wharf	2.48	1.63	0.85	2.05	0.43
Mouth Breakfast Creek	2.80	1.80	1.00	2.05	0.75
Powerhouse	3.20	2.35	0.85	2.80	0.4
New Farm Park	3.41	2.40	1.1	3.10	0.31
Story Bridge	4.35	3.00	1.35	3.66	0.69
City Gauge	4.46	3.30	1.36	3.70	0.76
SouthBank	5.35	3.70	1.65	4.30	1.05
Park Road	6.63	4.31	2.32	5.11	1.52
West End Ferry	7.42	4.92	2.50	5.79	1.64
Fairfield	8.72	5.97	2.75	6.78	1.94
Tennyson Tennis Centre	9.84	7.00	2.84	7.79	2.05
Mouth Oxley Creek	10.0	7.12	2.88	7.99	2.01
Graceville (Low Side)	10.10	7.18	2.92	8.05	2.05
Sherwood Arboretum	11.61	8.44	3.17	9.51	2.10
Seventeen Mile Rocks	12.57	9.24	3.33	10.30	2.27
Centenary Bridge	12.91	9.51	3.40	10.80	2.11
Westlake	13.80	10.30	3.50	11.88	1.92
Goodna Creek	16.79	13.30	3.49	15.20	1.59
Moggill Ferry	17.48	14.00	3.48	15.90	1.58
Karana Downs	22.98	19.31	3.67	21.10	1.88

Jan 2011 level subject to final verification

3.8 Comparison of January 2011 with Present Q100

Despite the lack of complete data at this time the JFTF has concluded that the January 2011 flood event was larger than the Q100 as presently defined.

4.0 Q100 Reviewed

4.1 Basis of current Q100 estimate

4.1.1 Overview

Q100 refers to the peak flow rate at a specific location that has a 1 in 100 chance of being equalled or exceeded in any one year (1% annual exceedance probability – AEP) or an average recurrence interval (ARI) of 100 years. There are many alternative characteristics of flood hydrographs that are important in risk management of flood events and for the selection of the DFE at a specific location. These characteristics include the peak flood flow, the peak flood level, the rate of rise in the flood hydrograph, the flood volume among many others.

From the perspective of land use planning, it is usually the peak flood level that is of interest and hence it is the peak flood level quantiles (the levels that correspond to given annual exceedance probabilities) that are desired from the design flood process. In many flood situations, estimation of the peak flood level quantile is achievable by estimation of the peak flood flow quantile. This occurs as a result of the peak flood level being dominated only by the peak flood flow. However, in many estuarine situations, the peak flood level is the result of interaction between coastal and ocean processes and the flood flow. In these situations, there is a need to consider the joint probability between flood flows and ocean conditions in determining the peak flood level quantile.

For the Brisbane River, peak flood levels in the upstream sections of the catchment would be flow dominated while the peak flood levels in downstream sections of the catchment require consideration of the joint probability between flood flows and ocean conditions.

The estimation of Q100 (and flood characteristics for other probabilistic design floods) is based on the application of a range of hydrological methods and tools, using all the available storm rainfall and flood data that are directly relevant to the area of interest. In the particular case of the Brisbane River design flood estimates, the approach adopted in 2003 used the best elements of two methods: statistical flood frequency analysis and simulation modelling of design flood events, with subsequent reconciliation of the results obtained by the individual methods (SKM, 2003; Independent Review Panel Report, 2003). The steps involved in the estimation process can be briefly described as follows.

Flood frequency analysis (FFA)
This is generally the most direct method for estimating peak flows (or flood volumes), using recorded flood data from many previous flood events of different magnitudes. FFA can be reliably applied where long-term flood records are available and where catchment conditions have remained essentially unchanged over the period of record. In the Brisbane River catchment this applies to flood data from most of the tributaries but for the lower Brisbane River the construction of dams means that pre-dam and post-dam conditions need to be analysed separately. The period of record since the completion of Wivenhoe Dam is quite short and insufficient to allow reliable estimation of Q100 for post-dam conditions. Furthermore, the increased urbanisation downstream of the dam has the potential to modify the flow-probability relationship for the more frequent floods (i.e. the Q2 to Q10 flows).

Rainfall-runoff modelling of design flood events
In this method the processes that convert probability-based design rainfall events to design flood events (hydrographs) of corresponding probability are simulated by means of a rainfall-runoff model of the catchment. This process requires assumptions about typical combinations of flood producing/modifying factors to define design storms and their conversion to flood events of given AEP or ARI (e.g. Q100). Modelling has the advantage that it is quite flexible in allowing different catchment conditions to be

simulated. Specifically, the flood mitigation impacts of dams (i.e. the modification of the inflow hydrograph to an attenuated outflow hydrograph) can be modelled quite accurately. However, in the case of a dam spillway that is controlled by flood gates, this also requires assumptions on how the dam is operated during flood conditions.

It is worth noting that the probability based design rainfalls refer to the most intense portion of a storm event. Hence the parameters used in the design modelling process usually are selected with knowledge of this constraint. Where flood volume is an important aspect of the design flood hydrograph, techniques for inclusion of pre and post peak burst rainfall are available; these techniques have been developed since the publication of the last edition of ARR and therefore are not included in the current document.

Reconciliation of flood estimates from different methods
The approach adopted in the Brisbane River flood studies (SKM, 2003) then combines the strengths of the two estimation methods by using FFA results to verify the model outputs for the pre-dam situation and then applying a modified version of the model (which simulates the effects of the dams) with probability based design storm inputs to derive peak flows and flood hydrographs for the post-dam condition.

4.1.2 Brief summary of flood studies to produce 2003 estimate of Q100

Only a brief summary is given here of the flood studies that were carried out in 2003 to produce the current estimate of Q100; more details are presented in Appendix B. The complete description of the studies and the recommendations drawn from them are given in the SKM (2003) report and the Independent Review Panel Report (2003).

The SKM (2003) study included a broad range of *flood frequency analyses* for a number of sites within the Brisbane River catchment but focussed specifically on the estimation of Q100 at Savages Crossing for the pre-dam conditions. This was based on recorded flood peak data at this site for the period from 1909 to 1958 (prior to completion of Somerset Dam), extension of flood peak data (by DNRM) to cover the period from 1890 to 1909, simulated pre-dam flood peaks for the period from 1959 to 2000 (from modelling studies by DNRM), as well as a regional flood frequency analysis using flood data from Brisbane River tributaries with adequate flood record lengths.
The *rainfall-runoff model* adopted in the SKM (2003) study is the RAFTS runoff routing model, which had earlier been developed by BCC and calibrated in a previous study. The key inputs to the model and assumptions for the estimation of Q100 are listed in Appendix B. Here it is noted that a 72-hour design storm was used, with rainfall distributed over the catchment according to the typical variation of design rainfall intensities and that the design losses assumed were 10 mm initial loss and 1 mm/h continuing loss, uniformly distributed over whole catchment; these losses reflect a relatively saturated state of the catchment at the start of a flood event

For the post-dam situation it was assumed that Wivenhoe dam was at FSL (RL 67.0 m AHD) at the start of the flood event and that the dam was operated according to operational rules incorporated into the WIVOPS simulation program, provided at that time by DNRM.

The Independent Review Panel noted the relatively wide band of uncertainty about the Q100 estimates from both methods. Taking into account all aspects of the study it recommended that the Q100 (peak flood) values shown in Table 4. be adopted.

Table 4: Recommended Pre- and Post-Dam Q100 flow estimates (m3/s) with indication of plausible range of variability (from Independent Review Panel Report, 2003 and SKM, 2003)

Location	Pre-Dams			Post-Dams		
	Q100	Plausible Bound		Q100	Plausible Bound	
		Lower	Upper		Lower	Upper
Savages Crossing	12,000	10,000	14,000	6,000	4,000	8,000
Moggill	12,000	11,000	13,000	6,000	5,000	7,000
Port Office	12,000	11,000	13,000	6,000	5,000	7,000

4.1.3 Summary

The final outcome from the Independent Review Panel Report (2003), drawing on the SKM 2003 flood study, was the conclusion that, for a flood with 1% annual exceedance probability, the best current (i.e. 2003) estimates are a Q100 flow of 6000 m3/s at the Brisbane Port Office and a corresponding flood level of 3.3 m AHD. It is very important to stress the inevitable degree of uncertainty in estimates of this kind. The Panel considered the possible range for Q100 at this location to be 5000 to 7000 m3/s and the associated range of levels to be 2.8 to 3.8 m AHD.

4.2 Critical factors in estimating Q100

4.2.1 Flood frequency analysis

The Q100 estimate for the pre-dam situation from FFA, as discussed in 4.1.2, is affected by a number of sources of uncertainty. The most basic factor relates to the rating curve that is used to convert the observed flood levels at the gauging site to flood flow estimates. As the flow magnitudes of floods for which gaugings have been undertaken are significantly smaller than the largest observed floods, the estimation of peak flows for these larger floods relies on the uncertain extrapolation of rating curves.

The largest floods in the Brisbane River catchment are likely to have resulted from different combinations of flood producing factors than the more frequent events. The statistical methods for fitting flood frequency distributions use data from the whole range of flood magnitudes, and the relatively few observations of large floods may be insufficient to define the shape of the flood frequency curve in the range of large to rare events, resulting in wide uncertainty bounds for the Q100. While some of the analyses have tried to overcome these limitations by extending the record to the floods of the 1890s and by adjusting recorded post-dam floods for the flood mitigating impacts of the dams, these steps introduce additional uncertainty in the basic data used for flood frequency analysis and may thus provide only limited additional information.

Additional flood gauging information collected during the January 2011 flood event may help to redefine rating curves in the extrapolated range and thus reduce the influence of this source of uncertainty on flood estimates. An additional very large observed event has also the potential to reduce uncertainty in the extrapolation of flood frequency curve, but uncertainty in the conversion of post-dam peak flows to pre-dam peak flows still remains.

4.2.2 Rainfall-runoff modelling

The key uncertainty factors in the derivation of Q100 from rainfall-runoff modelling are:

- The spatial pattern of rainfall and the storm movement over the catchment which can be considered typical for producing the flood characteristics of the Q100 in Brisbane under post-dam conditions
- The typical temporal pattern of rainfall associated with a design storm of 100 years ARI
- The typical depth of rainfall that occurs in the period prior to the peak burst of rainfall
- The antecedent conditions (rainfall losses) that would be typical for a Q100 event
- The expected initial level of the storages at the beginning of the design flood event and the spillway operation during the event

The flood data and information collected during the January 2011 event can be expected to provide additional insight into the appropriateness of the assumptions made in the 2003 studies, which could lead to a revision of some of these assumptions. However, only part of this data is available at present.

When it becomes available, the additional information on the above five flood producing/modifying factors available from observations of the January 2011 event should be used to assess the sensitivity of the rainfall-runoff model results to key assumptions, and to consider if some of the assumptions made in the 2003 studies should be revised

In principle, it would also be possible to use the rainfall and flood observations from the January 2011 flood event to check the rainfall-runoff model calibration/validation. This is outside the scope of this interim assessment but should form part of future more detailed studies.

4.2.3 Revision of best estimate of Q100

The analysis of the currently available data from the January 2011 has led to the following observations relevant to a possible revision of assumptions made in the determination of Q100:

- There are additional factors to be considered when defining a 'design storm' and a 'design flood event' that produces design flood levels of corresponding probability in Brisbane.
- The key additional factors include the special characteristics of the temporal rainfall pattern (longer duration, double peak) and spatial distribution of rainfall that tend to be critical for the post-dam flooding situation in Brisbane.
- Both of these factors are highly variable and the Jan 2011 flood indicated a different range of variation than previously assumed.
- The assumed losses in the derivation of the current Q100 event may be higher than what can typically be expected during rare storm events.

- A detailed study of the joint probability of the various flood producing factors (using Monte Carlo simulation) will be necessary to determine the typical combinations of factors that are likely to produce a Q100 event for Brisbane.
- For the determination of flood levels in Brisbane associated with the Q100 event, the joint probability of river flooding, tidal influences and creek flooding will also need to be considered.
- A revised Q100 estimate from a detailed study and the resulting flood levels in Brisbane will still have a significant band of uncertainty associated with them.
- Even without such a detailed study it is clear that any review/revision of Q100 should allow for the special factors experienced during the Jan 2011 flood event which point to an increase in estimated design flood peaks and design flood levels downstream of Wivenhoe Dam compared to the current Q100 event and the DFE.
- In the absence of results of detailed studies a precautionary approach should be adopted in the revision of previous Q100 estimates as an interim measure.

These observations support the following conclusions on the likely direction and magnitude of a revision to the current Q100 for the Brisbane River:

- The flood hydrograph reaching Brisbane during the Jan 2011 event can be interpreted as providing a likely upper bound estimate of the revised Q100 flood estimate for Brisbane and is thus consistent with a precautionary approach.

4.2.4 Flood level considerations

Estimation of a design flood level can be considered to comprise two components; namely estimation of the design flow and, secondly, the conversion of the design flow to a design level at a specific site. Typical approaches for conversion of flows to levels include

- Rating curve;
- Hydrodynamic model.

The use of a rating curve assumes a unique relationship between flow and level. While this approach is applicable for many situations, it is unlikely to be appropriate for the Brisbane River in the tidal region. The 2003 studies recognised this limitation and therefore used the second approach.

The basis of the use of a hydrodynamic model to convert flood flows to flood levels is the numerical solution of the unsteady flow equations for flow over surfaces. There are many factors influencing the local transformation of flow to level with the more important of these being

- Energy gradient – in general, the steeper the energy gradient, the larger the flow rate. Hence, the same flood flow can result in different flood levels due to different energy gradients which may occur during the rising and falling stages of a flood hydrograph or for different types of flood events.
- Floodplain representation – there is a need to represent the floodplain in a digital form either as a cross section or as a DTM. This digital representation is assumed to be representative of the catchment characteristics. If the calibrated model is capable of reproducing historical events, then it is assumed that the

representation is adequate for the purpose. The 2003 studies used a calibrated Mike-11 model.
- Hydrograph volume – the third parameter is the hydrograph volume. There are two components to the hydrograph volume which are the volume arising from the runoff generated by the rainfall prior to the peak burst and the runoff volume generated from the peak burst of rainfall. It is the former volume which can be important in the transformation of flood flows into flood levels as this prior volume can pre-fill the floodplain thereby reducing the energy gradient and hence increasing the flood level for a given flood flow.
- The bathymetry of the river channels – it is likely this has changed in the Brisbane River and in its major tributaries, possibly substantially, since it was last measured.

Of the four components noted above, it is considered that the flood volume is the most important consideration. The flood hydrograph volume for the January 2011 flood event was far greater than that for the Q100 design hydrograph. The design event was based on a flow dominant problem and not one where volume is a major issue. This greater volume will result in filling of the floodplain prior to arrival of the peak flow thereby limiting the available floodplain storage for attenuation of the flood hydrograph. Hence design flood levels calculated for the same peak flow as for the January 2011 flood event are likely to be biased low in the design event in the regions where floodplain storage was assumed to be available.

The peak ocean level during the Jan 2011 event was 0.46 m AHD compared with the level of 0.9 m AHD used for the design event. This means that, in the downstream reaches, the Jan 2011 levels will be lower than in a design event for the same flow rate but with an ocean level of 0.9 m AHD. In downstream reaches influenced by the ocean levels, there is no direct relationship between flow rates and flood levels.

4.2.5 Unknown Information Required for New Estimate of Q100

Before a new estimate for Q100 can be developed it will be necessary for the following information to be obtained.

- BoM is still assembling the rainfall data for Jan 2011
- There is strong suspicion that the extrapolated rating curve for the gauging station at Savages Crossing (owned by DERM) is seriously inaccurate causing underestimates of flows of order 20% or more.
- BoM is finding that large floods often have intense localised rainfall events. These are not adequately recorded by the existing rain gauge network and they may be missed completely.
- BoM suspects that it may be necessary to increase substantially the estimates of peak flows for the 1893 floods, for 1974 and for 2011 because of the previous matter and also because some of the rainfall data is for relatively long periods – up to daily rainfall – and this misses out on high intensity shorter periods within the event.
- There is some belief that the 2011 rainfall event was greater than that in 1974 but this requires clarification when the complete data is available. However there is clear evidence that the runoff volumes were greater than those in 1974 and if

Wivenhoe dam had not been present it is possible that the peak flow and peak levels would have been greater than that in 1974.

4.3 Conclusion

On the basis of the data currently available, the flood levels experienced during the Jan 2011 flood event provide an indication of the levels that may be expected from a revised Q100 event. However, varying tidal influences and creek contributions mean that the probability associated with these levels may be different at different locations.

The January 2011 flood has brought a significant amount of new data and information on the nature of flooding in the Brisbane River and about the factors contributing to very large flood events in this catchment. Significant work is required to review Q100 for the Brisbane River in the light of this new information. This work could not be completed given the data available to the JFTF, some of which is still being collected as detailed in 4.2.5.

In light of the available information it is clear that the current Q100 needs to be reviewed. It is more likely than not that this review will raise the Q100 upwards.

On balance, the JFTF believes that, in the absence of results of a detailed flood study review, a precautionary approach should be adopted. Therefore, it considers that the actual January 2011 flood event, as observed during the event, should be used as the **interim** standard on which Brisbane City Council bases its decisions concerning habitable floor levels for new development and should be a consideration for habitable floor levels for redevelopment of existing properties. Wherever the existing DFL is higher than the January 2011 flood event, the existing higher flood level should prevail.

5.0 Benefits and Cost of New Defined Flood Event

For understanding the consequences of a new DFE, five (5) alternate DFL scenarios have been qualitatively compared. These scenarios are:

- Current Q100 (3.3m at City Gauge)
- Current Defined Flood Level (3.7m AHD at City Gauge)
- January 2011 Flood Event (4.46m AHD at City Gauge)
- 1974 without Wivenhoe Dam (5.45 m AHD at City Gauge)
- 1893 without Somerset and Wivenhoe Dams (8.35m AHD at City Gauge)

Section 6 of this report then draws conclusions on the overall benefits and consequences of changing the Brisbane River flood standard, for each of the scenarios.

5.1 Flood Risk Management Benefits

5.1.1 Nature of Flood Risk Management Benefits

The benefits of different flood risk management strategies are measured by their potential to reduce expected future flood damages and other flood impacts (including risk of injury and loss of life) compared to a base case. In the Brisbane River flooding context considered here, the benefits of various *defined flood event scenarios* are expressed as marginal benefit in comparison with the flood damage costs and flood impacts associated with the *current DFE* (the 'do nothing' option).

The estimation of the expected future flood damages/impacts has to take into account the full range of possible flood events, weighted by their annual exceedance probability. The benefits of a higher DFE (and associated higher defined flood levels) are then measured by the reduction in residual flood damages (the flood damages that are not avoided by the adoption of a specific DFE).

The types of benefits may include:

(i) Reduction in trauma to the community associated with the occurrence of a flood event that exceeds the adopted habitable flood standard and consequential loss of valued possessions. This is a result of development being more resilient to flood damage. This benefit will accrue over the long term as development and redevelopment occurs. It is generally accepted that as the DFE increases in height, the reduction in trauma to the community would reduce, over a period of time.

(ii) Existing development – gradual reduction of flood damage potential as habitable floor levels are raised through redevelopment of existing buildings. It must be noted this is a long term benefit and depends on the rate of redevelopment and refurbishment of existing building stock. Similar to trauma reduction, higher DFE's will lead to a reduction in flood damage potential.

(iii) Future development – reduction in residual flood damage cost in areas subject to the new flood level regulations. This effect provides benefits from the commencement of a new flood standard and continues to accrue as new development comes on line ie. it is a long term benefit

(iv) Reduced cost of flood response and flood recovery measures when an event that exceeds the current DFE occurs. This benefit occurs over the long term through the overall accrual of higher flood protection afforded to people, buildings and infrastructure through development and redevelopment.

These benefits associated with setting defined flood levels for planning and building purposes can be enhanced by other flood risk management measures that raise public awareness of the flood risk, helping the affected community to reduce its exposure to flood risk by preventative measures, flood warning systems, flood mitigation and improved flood resilience. Through the Lord Mayor's Task Force on Suburban Flooding, Council has initiated many such measures since 2005.

5.2 Flood Risk Management Costs

In determining costs of alternate DFE scenarios a descriptive methodology has been used as described below.

5.2.1 Impact Assessment Descriptors

To best determine how these costs can be assessed, three key descriptors have been developed. The criteria are listed below and shown in more detail in Appendix B.

1. Urban Fabric – the impact upon infrastructure and development costs to deliver the desired urban growth patterns for Brisbane ie. the SEQ Regional Plan and CityShape 2026.

2. Social Fabric – the number of people affected, impacts upon their built environment, community facilities, amenity and the amount of change they will be required to manage in their day to day lives. For example, where a property owner's home was not previously included with the DFE, once included there may be consequences for insurance, the value of the dwelling and even community facilities may no longer be able to be located close by.
3. Economic Fabric – relates primarily to the impacts upon businesses such as property development through development costs to achieve flood resilience. Changes in flood standards can also impact upon the decisions about locations of commercial operations that may have higher levels of flood risk e.g. private schools, manufacturing industry with low ability to relocate expensive machinery quickly at a time of flood.

5.2.2 Limitations of Methodology

Given the data available for this investigation, there are known impacts which were not possible to consider. Some of these are listed below, but there may be others:

- Precise knowledge of cost to each property
- Property market response.
- Housing affordability
- Development costs
- Social wellbeing and health

Additionally, habitable floor level information was not available for the various scenarios, so inundation of part or all of a property was used as a proxy in Section 5.3.3.

5.3 Assessment of Individual Criteria

Where data was available it has been used in the following assessment of impacts. Where data was not available, impact has been classified from "low" to "extreme" with reference to the descriptors in Section 5.2.1.

5.3.1 Impact on growth centres & corridors

Significant planning has been undertaken in Brisbane City through Neighbourhood Planning to deliver the CityShape 2026 and support SEQ Regional Plan 2009-2031 growth framework and housing targets. This section aims to give an indication of the potential magnitude of impact of the various DFE scenarios on these planning initiatives.

The growth corridors and centres listed in the table below are those which could be physically affected by some form of inundation from one or more of the various DFE scenarios.

Table 5: Possible consequence of DFL scenarios on growth centres and corridors

DFE Scenario	Current Q100	Current DFE	Jan 2011	5.45m (1974)	8.35m (1893)
Albion	Low	Minor	Medium	High	Extreme
Eastern Corridor	Low	Low	Low	Minor	Medium
City Centre	Low	Low	Minor	Medium	Extreme
South Brisbane Riverside	Low	Low	Medium	High	Extreme
Woolloongabba	Low	Low	Low	Low	Minor
Milton	Low	Low	Medium	High	Extreme
Towong-Taringa	Low	Low	Minor	High	High
South West Rail Corridor	Low	Low	Medium	Medium	High
Overall Impact	Low	Low	Minor	Medium	High

5.3.2 Transport Network

Brisbane and Ipswich are to a large degree established areas with much of the transport network already in place. The consequences of new DFEs are the ability of the transport network to improve its flood immunity without significant impacts on the surrounding area in terms of amenity or functionality with other parts of the network. On this basis the consequence has been assessed subjectively on a number of elements of the transport network.

Table 6: Transport Network Consequences

DFE Scenario	Current Q100	Current DFE	Jan 2011	5.45m (1974)	8.35m (1893)
Local Roads	Minor	Medium	High	High	Extreme
Arterial Roads	Low	Low	Minor	Medium	Medium
Rail Network	Low	Low	Low	Minor	Medium
Overall Impact	Low	Minor	Medium	High	Extreme

5.3.3 Additional number of properties within DFE area

For the purpose of this exercise, properties within the DFE area are defined as those properties situated on land that shows any level of inundation during the peak of these selected flood event scenarios. Where land parcels are held together these are counted as one property. For multi-unit residential development the total number of units on that property has been counted, as they all are affected in some way, if not from direct inundation. For example, a community title development with 150 individual dwelling units may have received flood waters in its basement, though no flooding of habitable areas within any of the individual units may have occurred. In some instances, the flooding impact would have been immaterial, affecting vacant land only.

For residential properties it would have been preferable to compare the number of dwellings that would receive inundation of the habitable floor level, but this information was not available.

Table 7: Numbers of properties within DFE area

DFE Scenario	Current Q100	Current DFE	Jan 2011	5.45m (1974)	8.35m# (1893)	Jan 2011-Current DFE
Commercial	1,171	1,178	2,759	2,907	n/a	1,581
Industrial	783	1,589	2,000	2,482	n/a	411
Community	24	34	46	48	n/a	12
Multi-Unit Residential	6,814	10,756	15,834	18,025	n/a	5,078
Single Dwelling Residential	4,666	7,543	10,228	12,306	n/a	2,685
Total	13,445	21,100	30,867	35,768	n/a	9,767

This measure is not available at this time.

5.3.4 Impact on streetscapes

In determining the impact on residential streetscapes, the additional depth of inundation for each DFE scenario, compared to the current DFE is shown in Table 10. In many areas, such as Fairfield and Rocklea, the existing level of inundation currently causes difficulties with achieving house design under 8.5m. The additional consequence is dealing with the amenity issues of bulk and scale in the local setting of isolated houses over 8.5m. Therefore the assessment of this measure also factors in this consequence.

To assess this impact it is considered a typical two (2) storey houses of timber and tin construction may be between 7.5 and 8.3 m in height (including 0.5m flood freeboard).

Since a large proportion of these types of houses affected during the January 2011 event are located between West End/Milton and Graceville, the average relative difference in level between Park Road and Graceville has been used. The reason for this is the effect of a rise at the City Gauge is magnified upstream. This effect is shown in the comparison of river heights in Table 8.

Table 8: Height difference of DFE scenarios from current DFE and impact on residential design.

DFE Scenario	Q100	Current DFE	Jan 2011	5.45m (1974)	8.35m (1893)
Height Difference to DFL at Park Road	-0.8	0.00	1.52	2.01	5.59
Height Difference to DFL m at Graceville	-0.87	0.00	2.05	2.75	6.73
Average Difference	-0.84	0.00	1.79	2.38	6.16
Relative Impact	Low	Nil	Medium	High	Extreme

The effective interface of a use and the street is a key factor in achieving street activation and amenity. As the height difference between the street and active building uses increases, safety, activation and amenity become harder to successfully achieve. While small differences can be accommodated, greater increases may only be accommodated by graduated design and potentially flood resistant uses.

Many inner city commercial streetscapes are situated between Teneriffe and West End, including the lower city centre and Southbank. As the majority of new development is currently occurring from the City to West End, the difference between the current DFE and the scenario DFEs at the City Gauge and West End Ferry are used as a guide to average consequence as seen in Table 9.

Table 9: Height difference (m) of DFE scenarios from current DFE and impact on streetscape

DFE Scenario	Q100	Current DFE	Jan 2011	5.45m (1974)	8.35m (1893)
Height Difference to DFE Scenario Level m at City Gauge	-0.4	0.00	0.76	1.75	4.76
Height Difference to DFE Scenario Level m at West End Ferry	-0.87	0.00	1.64	2.16	5.90
Average Difference	-0.64	0.00	1.20	1.96	5.33
Relative Impact	Low	Nil	Medium	High	Extreme

5.3.5 Impact on community infrastructure

Community infrastructure such as medical facilities, schools and the like are particularly susceptible to flood risk and many received some level of inundation during the January 2011 event. For comparative purposes, Table 10 shows the number of community facilities that would receive some level of inundation at the various scenarios.

Table 10: Potential impact on community infrastructure – medical & schools

DFE Scenario Event	Q100	Current DFE	Jan2011	5.45m (1974)	8.35m (1893)#
Facilities Affected	24	34	46	49	n/a
Relative impact	Low	Low	Minor	Medium	High

Information not available at this point of time however it is considered the impact is likely to be at least high.

5.3.7 Industry and commercial development

The principal industrial area affected by the January 2011 event is at Rocklea. This is an established area which reuses or rebuilds sites. Much of the area is under the current DFE and consequently risk management solutions are often required to manage the impacts of flooding on individual sites. As the DFE is not applied to development applications for industrial uses, in-depth investigation of the impacts on industry is considered outside the scope of the Terms of Reference. It is hoped however that property and business owners in these areas will choose to manage their own flood risk, possibly using a new DFE as a guide. Table 11 shows the height difference between the current DFE and the various scenarios at Rocklea.

Table 11: DFE comparisons at Rocklea

DFE Scenario	Q100	Current DFE	Jan2 011	1974	1893
Relative Difference in DFL scenarios compared to current DFL at Rocklea (m)	-087	0.0	2.05	2.99	7.05
Relative impact	Low	Nil	High	High	Extreme

Commercial development along the River is concentrated generally between the CBD and Toowong/West End. The impact on these activities will be measured by its ability to adapt to a new DFE over time. This may be through built form/design changes and/or risk and disaster management approaches, such as locating essential building services out of basements and in upper parts of buildings. As the change in DFE increases the process of adaptation becomes more challenging. Therefore, as flood restrictions on built form increase, flexibility in design decreases with potential adverse impact on building utility and costs. There is however a positive benefit over the long term as commercial precincts would become more flood resilient. The difference in level from City Gauge to West End Ferry has been used for comparison. The impact is then applied as per the discussion above, as shown below in Table 13.

Table 12: DFE comparisons in several commercial areas

Flood Scenario	Current Q100	DFE	Jan 2011	5.45m (1974)	8.35m (1893)
Height Difference to DFE Scenario Level m at City Gauge	-0.4	0.00	0.76	1.75	4.76
Height Difference to DFE Scenario Level m at West End Ferry	-0.87	0.00	1.63	2.16	5.9
Average Difference m	-0.64	0.00	1.20	1.96	5.33
Relative Impact	Low	Nil	Medium	High	Extreme

6.0 Discussion of DFE Scenarios

In the limited time available, the assessment of the benefits and costs of the different options could only be undertaken in a qualitative way but it is important that a full flood risk management study should be undertaken as soon as possible.

6.1 Current Q100 of 3.3m AHD at City Gauge

As can be seen from the tables throughout Section 5, the current Q100 is a theoretical flood level that is below the current DFE. Given the research undertaken into the January 2011 flood event and the advice of the expert hydrologists, it is not advisable to reduce the current DFE for the Brisbane River. Due to a lack of available information, the JFTF was unable to redefine the Q100 for the River in the time frame available although this work clearly needs to be done. Adopting the current Q100 as a new DFE would have a negative benefit in terms of improving Brisbane's flood risk management.

6.2 Current DFE of 3.7m AHD at City Gauge

The current DFE is a theoretical event that has been in place for the Brisbane River since 1978. The January 2011 flood was significantly higher than the current DFE (0.76m at the City Gauge), encompassing an estimated 9,767 additional properties.

This height difference is amplified as the distance from the river mouth increases (with some local variations), demonstrated by a height difference of approximately 2.05m at Rocklea and Graceville. Given the recommendations of the expert hydrologists, maintaining the current DFE as an interim development standard would not change the current flood risk and damage profile of the city and is not recommended.

6.3 January 2011 Flood Event Level of 4.46m AHD at City Gauge

As can be seen by looking at the history of Brisbane River annual flood peaks dating back to 1840 (refer to Section 2.3), this event of 4.46m at the City Gauge is very significant. Prior to the January 2011 flood event, only 6 other events have exceeded 4m at the City Gauge since the 1840s. All of these events occurred prior to the construction of Wivenhoe Dam.

The effect of changing an interim DFE to the 2011 flood level has been assessed against the impact on the urban, social and economic fabric as defined in Section 5.2.1. Where possible the effect has been quantified. The overall impact has been assessed as Minor to Medium, with significant benefits for flood risk management accruing over time, as redevelopment and new development occurs.

Due to the limited time available, accurate financial cost implications of this option were not able to be quantified. One notable feature is that if the DFE was to move to such a level, there would be a significant impact on those communities affected by the change. Predominant matters are building heights in the suburbs upstream of West End and difficulty in maintaining streetscape in some local areas with a risk management approach. It does however set the City on a path for achieving a long term outcome of proportions approaching a medium value of flood risk management benefit. It also provides greater protection against a possible trend of more frequent large flood events.

6.4 1974 Flood level of 5.45 m AHD at City Gauge

As a comparison, the pre-Wivenhoe Dam 1974 flood event was assessed. It was used because the level was already modelled making it possible to draw the comparisons to other events undertaken in Section 5.

DFE of this level would have a High consequence on the city's urban, social and economic fabric. It would be difficult for many areas to develop properly with land sterilisation for certain uses locally, a real prospect. It would also have an impact on house raising options with this becoming an unrealistic option in many locations such as Rocklea where the habitable floor level would increase by an estimated 2.99m. In addition to the practicalities of achieving habitable floor levels above this height, detrimental impacts on both residential and commercial streetscapes would result.

At this level, some reconsideration of land uses may be necessary. Notably however the overall impact on growth centres and community facilities is limited, though transport networks will suffer. Long term flood risk and damage profile of the city is likely to be significantly reduced but the costs would outweigh the benefits.

6.5 1893 Flood Level of 8.35m AHD at City Gauge

This level was assessed to provide a feeling for what an extreme event may do. In summary, a DFE of such a magnitude would require a complete reappraisal of how the city is planned, its transport network security and location of community facilities, however long term flood risk and damage profile of the city would likely be highly reduced.

7.0 Conclusion

How does the January 2011 flood event compare to the Q100 as currently defined and Brisbane City Council's Defined Flood Event (DFE)?

In the flood event experienced, the heaviest rains were inland on the western fringe of the Brisbane River catchment and on the Great Dividing Range. Over the Brisbane River catchment as a whole, based on rainfall captured by BoM's Enviromon rain gauges, the estimated average 5-day rainfall is 322mm, with the major sub-catchments of Wivenhoe Dam, Bremer River and Lockyer Creek receiving 370mm, 223mm and 268mm respectively.

Given the pattern of rainfall, the Brisbane River received significant flows from the upstream catchments of the Lockyer and Bremer. The flow down the upper Brisbane River (above the Lockyer Creek) and Stanley River were mitigated by Wivenhoe Dam. However Brisbane felt the full force of the flows down the Lockyer and Bremer Rivers. As a result of the rainfall, Brisbane experienced a significant river flood.

Based on examination of the rainfall patterns of a number of previous Brisbane River floods, it is concluded that the Brisbane catchment experienced a significant rainfall event with a rain pattern that was different from that experienced in 1974. Full details of the rainfall magnitudes were not available at the date of this Report. However back calculations from recorded releases from Wivenhoe and the record of water level in the dam suggest significantly more flood producing rainfall occurred than indicated by the presently available rainfall data. The calculated dam inflow hydrographs show two peaks, the first of the magnitude of 1974 and the second of greater magnitude than 1974, 36 hours later. The level recorded at Savages Crossing was higher than in 1974. Flood inflow volumes to Wivenhoe as calculated from the known releases from Wivenhoe dam and the recorded water levels in the dam total 2,650 GL as compared to a total of 1,410 GL for that location in 1974 and 2,744 GL in February 1893.

On balance the JFTF considers that the flood runoff resulting from the major rainfall event of January 2011 was greater than the 1974 event but not as great as the 1893 event.

All of the peak flood levels recorded in January 2011 by the gauges along the Brisbane River were higher than the existing Defined Flood Levels, ie. levels previously calculated for the 1974 flood event mitigated by Wivenhoe Dam. Therefore, taking into account this fact together with its assessment of the rainfall event, the JFTF considers that the January 2011 flood event was larger than the Brisbane City Council's Defined Flood Event.

The Q100 as presently defined is, in general, a slightly lesser flood than the Defined Flood Event. Therefore the JFTF considers that the January 2011 flood event was larger than the Q100 as presently defined.

Much more detailed work is required to accurately identify the probability of this event for Brisbane.

Does Q100, as it is currently described, remain the best estimate of a 1 in 100 year event?

Q100 is a theoretical flood model used to inform planning and policy. This probability-based design flood event aims to reflect typical combinations of flood producing and flood modifying factors which act together to produce a flood event that has a 1 in 100 chance in any one year of occurring at a specific location of interest.

The January 2011 flood has brought a significant amount of new data and information on the nature of flooding in the Brisbane River and about the factors contributing to very large flood events in this catchment. Significant work is required to review Brisbane's Q100 in the light of this new information. This work could not be completed given the data available to the JFTF report, some of which is still being collected.

In light of the available information about the 2011 flood event, the JFTF considers that it is essential that the current Q100 is reviewed. It is not possible to predict the outcome of such review but it is considered more likely than not that this review will lead to an increase in the magnitude of the Q100 and increases in associated flood levels.

Accordingly, what standard should be used to enable new development and redevelopment to proceed with confidence and certainty?

To answer this question five(5) scenarios have been evaluated. These scenarios are:

- Current Q100 (3.3m at City Gauge)
- Current Defined Flood Level,DFL (3.7m AHD at City Gauge)
- January 2011 Flood Event (4.46m AHD at City Gauge)
- 1974 without Wivenhoe Dam (5.45 m AHD at City Gauge)
- 1893 without Somerset and Wivenhoe Dams (8.35m AHD at City Gauge)

On balance, the JFTF believes that, in the absence of results of a detailed flood study review, a precautionary approach should be adopted. Therefore, it considers that the actual January 2011 flood event, as observed during the event, should be used as the **interim** standard on which Brisbane City Council bases its decisions concerning habitable floor levels for new development and should be a consideration for habitable floor levels for redevelopment of existing properties. Wherever the existing DFL is higher than the January 2011 flood event, the existing higher flood level should prevail.

The JFTF notes that, in regions where the interim standard will be applied, the degree of immunity from flood risk will vary with location. This is because the January 2011 flood event is an actual event and will have variable tidal influences along the tidal reach. Consequently variable probabilities will apply along this reach.

The recommendation of a new development standard refers to land use types that are currently assessed against a DFE in the City Plan. This currently excludes industrial development however this should be considered through the current City Plan review.

Further the DFE and resulting flood regulation lines are considered only part of a flood risk management framework for a community. The approach to flood risk management for Brisbane needs to consider a broader range of initiatives if it is to effectively manage flood risk for the City. Flood risk management requires that the consequences of floods be investigated for a range of flood events up to and including the PMF. For land use planning, flood levels as well as flood flows corresponding to specific probabilities must be considered. This approach must include identification of the benefits of the management of risk, rather than seeing it as all cost.

8.0 Recommendations

It is recommended,

That the actual January 2011 flood event, as observed during the event, be used as the **interim** standard, on which Brisbane City Council bases its decisions concerning new development and redevelopment, with the essential condition that, wherever a higher level has been set as the current DFL, the higher level must apply; and that this interim standard apply until conclusion of the Commission of Inquiry and the comprehensive flood study recommended below is completed.

That all data relating to the January 2011 flood event be gathered from all sources and archived so that further analysis can make use of all data available.

That the bathymetry (river bed and banks) of the Brisbane River and its tributaries and the characteristics of the bed material from Wivenhoe dam to the mouth be measured as soon as possible.

That a comprehensive flood study be commissioned to review flood flows and levels within the Brisbane River catchment making full use of the data relating to the January 2011 flood event.

That the effects of morphological (river bed level and cross section) changes due to sediment erosion and deposition during flood events be studied for a range of flood magnitudes to determine their effects on flood levels.

That consideration be given to whether a Monte Carlo approach to the flood risk for the Brisbane Catchment is feasible and, if yes, whether it should be carried out and which influencing factors should be included in the Monte Carlo approach. This may include consideration whether two or more types of rainfall events should be built into the statistical analysis for theoretical floods. (In a Monte Carlo analysis the influencing input factors such as rainfall patterns, storm tracks, catchment conditions, tide and storm surge are sampled, either randomly or in accordance with their joint probabilities, to select a large number of different combinations of inputs for simulation with a catchment modelling system to develop many alternative predictions of flood events.

These predictions are then analysed statistically to estimate their exceedance probabilities).

That a complete Flood Risk Management analysis for the area of Brisbane affected by flooding by Brisbane River and its tributaries be carried out. It is essential to move from the Q100 mentality and to adopt a risk management approach in line with National Flood Risk Advisory Group (NFRAG) and other relevant guidelines. The risk management approach would require a detailed assessment of the benefits and costs of a full range of flood mitigation options.

Appendix A: Terms of Reference

BRISBANE CITY

Joint Flood Taskforce

TERMS OF REFERENCE (TOR)

Document Change History

Document Control Sheet

Contact for enquiries and proposed changes. If you have any questions regarding this document or if you have a suggestion for improvements, please contact:

Divisional Manager, City Planning and Sustainability	[redacted]
Phone	[redacted]

Version History

Version	Author	Issue Purpose	Date
V 1.0	[redacted]	First Release Draft	1 February 2011
V 2.0		Addition of JTF – Technical Reference Group	2 February 2011
V 3.0	[redacted]	Minor Updates, including changes to membership names, and end-date.	10 February 2011
V4.0		Updates from Cr Cooper's office.	10 February 2011
V5.0		Final updates from Cr Cooper's office.	10 February 2011

Project Owner Approval

The following officers have **approved** this document.

Name ____________________

Position ____________________

Signature ____________________ Date __________

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Document Purpose

The purpose of this document is to clearly define the Terms of Reference (TOR) for a Brisbane City Council/Ipswich City Council Joint Flood Taskforce.

Role of the Joint Flood taskforce

Brisbane City Council, in partnership with Ipswich City Council will form a Joint Flood Taskforce to investigate the January 2011 flooding events. The Taskforce will recommend interim flood immunity standards and development guidelines to manage redevelopment of flood affected properties and new development activity within the Brisbane River floodplain.

Operation of Joint Flood taskforce

The Taskforce will utilise available information to make its recommendations on the questions posed in 3.3 *Outcomes of the Joint Flood Taskforce*

The Taskforce shall provide recommendations to the Lord Mayor's Recovery Task Group by **Thursday 10 March.**

Relationship to State Commission of Inquiry

The Joint Flood Taskforce does not form part of the State's Commission of Inquiry.

The recommendations of the Joint Flood Taskforce are interim and their application may be validated or varied dependant on the outcome of the State's Commission of Inquiry. The recommendations of the Joint Flood Taskforce will be provided to the Commission of Inquiry and Flood Response Review Board.

Relationship to Lord Mayor's Flood Response Review Board and Lord mayor's Recovery Task Group (LMRTG)

The Lord Mayor has established an independent Flood Response Review Board. This Board will review the effectiveness of Council's response and disaster management arrangements, the impact of planning regulations in flood affected areas and the effectiveness of public warnings and advice, as well as the effectiveness of storm water and flood prevention infrastructure, and failure of river-based infrastructure. This Board will report in May 2011 to the Lord Mayor and the LMRTG. The progressive minutes and final recommendations of the Joint Flood Taskforce will be provided to the Lord Mayor's Flood Response Review Board.

The LMRTG, and the Town Planning Recovery Sub-Committee, will oversee the Joint Flood Taskforce and implement its recommendations on an interim basis.

Outcomes of the joint flood taskforce

The primary goal of the Taskforce is to provide expert advice and develop interim recommendations guiding development and redevelopment in Brisbane and Ipswich.

Key questions the Taskforce will need to answer are:

1. How does the January 2011 flood event compare to the Q100 as presently defined and BCC's Defined Flood Event?
2. Does Q100, as it is currently described, remain the best estimate of a 1 in 100 year event?
3. Accordingly, what standard should be used to enable new development and redevelopment to proceed with confidence and certainty?

Membership – Joint Flood Taskforce

The proposed Joint Flood Taskforce shall be comprised of:

- Chair - Emeritus Professor Colin Apelt
- Shane Hackett – Acting Manager Water Resources Branch, Brisbane City Council
- Quinton Underwood – Senior Engineer, Hydraulics, Ipswich City Council
- Erwin Weinmann - Experience: Senior Lecturer in water subjects at Monash University, Former Deputy Director CRC for Catchment Hydrology (Monash Node), and Co-author of Book VI (Estimation of Large and Extreme Floods)
- Professor James Ball - University of Technology Sydney

Membership – Technical Reference Group

In addition to the Joint Flood Taskforce, a Technical Reference Group will be established for the Taskforce to interface with as required.

It is expected the Joint Flood Taskforce would establish smaller expert technical working groups for input into the recommendations (formed from amongst the members of the Technical Reference Group).

Internal

- Kerry Doss – Manager City Planning
- Andrea Kenafake – Manager Development Assessment
- Richard Sivell – Manager Major Development
- Don Carroll – Group Manager Water – City Design
- Ken Morris – Principal Engineer Flood Management – City Design
- Bevan Lynch – Chair Urban Futures Brisbane

External (subject to confirmation)

- Water CRC, Canberra
- BMT
- Bureau of Meteorology
- Department of Infrastructure and Planning
- Department of Environment and Resource Management
- SEQ Water Grid Manager
- SEQ Water

Membership- Industry reference Group

The Taskforce will establish, consult and advise an Industry Reference Group on the proceedings of the taskforce. The Industry Reference Group will have the opportunity to provide comment and advice to the Taskforce on the release of their interim recommendations.

The Industry Reference Group will provide external advice on the needs of industry to respond to the flood in terms of redevelopment and new development standards. The group will also provide industry perspective on the potential impact of the implementation of new standards on practicality, affordability and implantation needs.

The proposed Industry Reference Group will comprise;

- Chair - Bevan Lynch – Urban Futures Brisbane
- BDO Kendalls - [redacted]
- Commonwealth Bank - [redacted]
- MIRVAC - Matthew Wallace
- Pradella [redacted]
- UDIA – [redacted]
- HIA [redacted]
- Property Council of Australia – [redacted]
- Lend Lease - [redacted]
- Insurance Council of Australia - [redacted]
- UDIA - [redacted] (replacement for [redacted]
- PIA – [redacted]
- Master Plumbers - [redacted]
- AIA President - [redacted]

- BDA [redacted]
- UDAL - [redacted]
- Others tbc

Role of the Joint Taskforce members

The Joint Flood taskforce Chairman will be responsible for day to day decision making within the scope of the Terms of Reference and be responsible for decision making where;

- Any significant variation to scope.
- Any change in schedule that will have an impact on delivery
- Any significant issues or risks which they are not able to deal with.

If the designated Chair is not available, then the BCC Manager Water Resources will act as proxy. The acting Chair will be responsible for convening and conducting that meeting. The Acting Chair is responsible for informing the Chair as to the salient points/decisions raised or agreed to at that meeting.

Administration

Agenda

All agenda items for each Taskforce meeting must be forwarded to the Joint Flood Taskforce secretariat by C.O.B. 2 working days prior to the next scheduled meeting.

The agenda, with attached meeting papers will be distributed at least 1 working day prior to the next scheduled meeting. The Chair has the right to refuse to list an item on the formal agenda, but members may raise an item under 'Other Business' if necessary and as time permits.

Minutes & Meeting Papers

The minutes of each Taskforce will be prepared by the Joint Flood Taskforce secretariat. The secretariat will be supported by Brisbane City Council's Water Resourees Branch.

Meeting Agendas will include:

- Minutes and actions from previous meeting
- Update from the last Meeting
- Update on progress of the activities
- Key upcoming events, activities, changes
- Any Other Business
- Action summary and next meeting date

Action items arising from the meeting minutes will be forwarded to the relevant Divisional Manager and Taskforce member within two working days following each meeting.

Frequency of Meetings

Meetings are held weekly or at the determination of the Chair.

Proxies to Meetings

Members of the Taskforce will only have a proxy in exceptional circumstances. Where an extended period of absence is anticipated or known, a proxy shall be nominated with the approval of the Chairman.

The nominated proxy shall have voting rights at the attended meeting. The nominated proxy shall provide relevant comments/feedback to the Taskforce member they are representing of the salient points from the meetings they have attended

Quorum Requirements

The Taskforce members are key advisors to the Chair in their decision making capacity, however all decisions lie with the Chair.

A minimum of 4 Taskforce members is required for the meeting to be recognised as an authorised meeting and for the recommendations or resolutions to be valid.

Review Timetable

TBC

Appendix B: Details of Flood Studies that produced the 2003 Estimate of Q100

B.1 Results of flood frequency analyses

The SKM (2003) study included a broad range of flood frequency analyses for a number of sites within the Brisbane River catchment but focussed specifically on the estimation of Q100 at Savages Crossing for the pre-dam conditions. This was based on recorded flood peak data at this site for the period from 1909 to 1958 (prior to completion of Somerset Dam), extension of flood peak data (by DNRM) to cover the period from 1890 to 1909, simulated pre-dam flood peaks for the period from 1959 to 2000 (from modelling studies by DNRM), as well as a regional flood frequency analysis using flood data from Brisbane River tributaries with adequate flood record lengths.

The Q100 estimate from flood frequency analysis for the pre-dam situation is given in Table B1, together with nominal upper and lower bounds.

Table B1: Summary of Q100 estimates from FFA at Savages Crossing – pre-dam conditions (from Review Panel Report, 2003 and SKM, 2003)

Method	Q100 estimates [m^3/s]		
	Best Estimate	Plausible Range	
		Lower Bound	Upper Bound
Flood Frequency Analysis	12,000	10,000	14,000

B.2 Results of rainfall-runoff modelling

A number of different rainfall-runoff models of the Brisbane River catchment have been developed for a range of purposes. The model adopted by SKM is the RAFTS runoff routing model, which had earlier been developed by BCC and calibrated in a previous study.

The key inputs to the model and assumptions for the estimation of Q100 for the pre-dam situation are:

- Design rainfall depths for an ARI of 100 years and for a range of durations (adopted average rainfall depth over catchment = 308 mm, based on CRC-FORGE design rainfalls for a critical duration of 72-hours, with allowance for an areal reduction factor)
- Rainfall temporal pattern – standard ARR87 temporal pattern for this location, duration and ARI applied over whole catchment (with a sensitivity analysis of temporal patterns based on 4 other patterns)
- Rainfall spatial pattern – based on the spatial variation of CRC-FORGE point design rainfall estimates (with a sensitivity analysis of spatial patterns based on rainfall distributions experience during 7 historical storms); storm assumed to be stationary over the catchment
- Design losses – 10 mm initial loss and 1 mm/h continuing loss, uniformly distributed over whole catchment – these losses reflect a relatively saturated state of the catchment at the start of a flood event

For the post-dam situation two further inputs/assumptions were necessary:

- Initial state of storages – assumed to be at FSL (RL 67.0 m AHD) at the start of the flood event
- Flood operation of dams – Wivenhoe assumed to be operated according to operational rules incorporated into WIVOPS simulation program

The best estimates of Q100 for the pre-dam and post-dam situation at three key locations are given in Table B2, together with nominal upper and lower bounds.

Table B2: RAFTS based Pre- and Post-Dam Q100 flow estimates (m3/s) with indication of plausible range of variability (from Review Panel report, 2003, and SKM, 2003)

Location	Pre-Dams			Post-Dams			Reduction (%)
	RAFTS Q100	Plausible Bound		RAFTS Q100	Plausible Bound		
		Lower	Upper		Lower	Upper	
Savages Crossing	9,600	8,100	10,800	5,400	3,900	6,600	60
Moggill	10,100	9,500	10,800	5,000	4,200	6,000	50
Port Office	10,100	9,500	10,800	5,000	4,200	6,000	50

B.3 Adopted Q100 estimate and uncertainty bounds

The Review Panel noted the relatively wide band of uncertainty about the Q100 estimates from both methods but considered that the pre-dam flood peak estimates at Savages Crossing derived by flood frequency analysis were more reliable than the RAFTS model-based estimates, which involved a range of additional assumptions. The post-dam estimates from RAFTS modelling were thus adjusted accordingly to give the recommended Q100 (peak flood) values shown in Table B3.

Table B3: Recommended Pre- and Post-Dam Q100 flow estimates (m3/s) with indication of plausible range of variability (from Review Panel Report, 2003 and SKM, 2003)

Location	Pre-Dams			Post-Dams		
	Q100	Plausible Bound		Q100	Plausible Bound	
		Lower	Upper		Lower	Upper
Savages Crossing	12,000	10,000	14,000	6,000	4,000	8,000
Moggill	12,000	11,000	13,000	6,000	5,000	7,000
Port Office	12,000	11,000	13,000	6,000	5,000	7,000

Glossary

ARI- Average Recurrence Interval - the expectation (or average over many occurrences) of the interval (years) between flood events with a similar magnitude

AEP – Average Exceedance Probability, the likelihood of occurrence of a flood of given size or larger in any one year, usually expressed as a percentage

AHD - Australian Height Datum - is the national surface level datum corresponding approximately to mean sea level. Levels measured relative to this datum are given as "m AHD".

Bathymetry – Bed levels and cross sectional dimensions of a river channel

COAG – The Council of Australian Governments

CRC-FORGE- Cooperative Research Centre Focussed Rainfall Growth Estimation. The CRC-FORGE method is a regional analytical method for point rainfall estimates of low Average Exceedance Probability (AEP) from data records on average less than 100 years duration. The method is a development of the FORGE method (UK) by the Cooperative Research Centre for Catchment Hydrology

DFE - Defined Flood Event - The flood event from which defined flood levels are developed and ultimately the flood control lines for development

DFL- Defined Flood Level- The flood level resulting from the Defined Flood Event

DMT- Divisional Management Team

Environmon – a network of rain gauges owned by BoM

Flood hydrograph- Expresses peak flow, flood event volume and flood duration in a graph.

Flood quantiles – the values of a flood characteristic (peak flow, flood volume, flood level at a site) that correspond to specified ARIs

Freeboard – a margin above a defined flood level set to provide a factor of safety for uncertainties in flood level estimates and localised flood effects

Mike-11- A computer program for simulation of channel flows using one dimensional equations

Monte Carlo methods (or Monte Carlo experiments) - a class of computational algorithms that rely on repeated random sampling to compute their results. With respect to catchment simulation, the influencing factors are sampled (either randomly or in accordance with their joint probabilities) for simulation with a catchment modelling system to develop alternative predictions. These predictions are then analysed statistically to estimate their exceedance probabilities

Minor, Moderate and Major flooding- as defined by BoM:

- minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.
- moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.
- major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.

NFRAG- National Flood Risk Advisory Group

PMF- Probable Maximum Flood-

Q100- the peak flow rate at a specific location that has a 1 in 100 chance of being equalled or exceeded in any one year (1% annual exceedance probability – AEP; or an average recurrence interval (ARI) of 100 years).

SCARM - the Standing Committee on Agriculture and Resource Management, a committee of the Agriculture and Resource Council of Australia and New Zealand (ARMCANZ)

RAFTS - an acronym for a catchment simulation model - River And Flow Training System

Rating Curve - a rating curve is used to convert a recorded flood level at a gauging station to the equivalent discharge at the gauging station.

WIVOPS- Wivenhoe Dam Operations Systems

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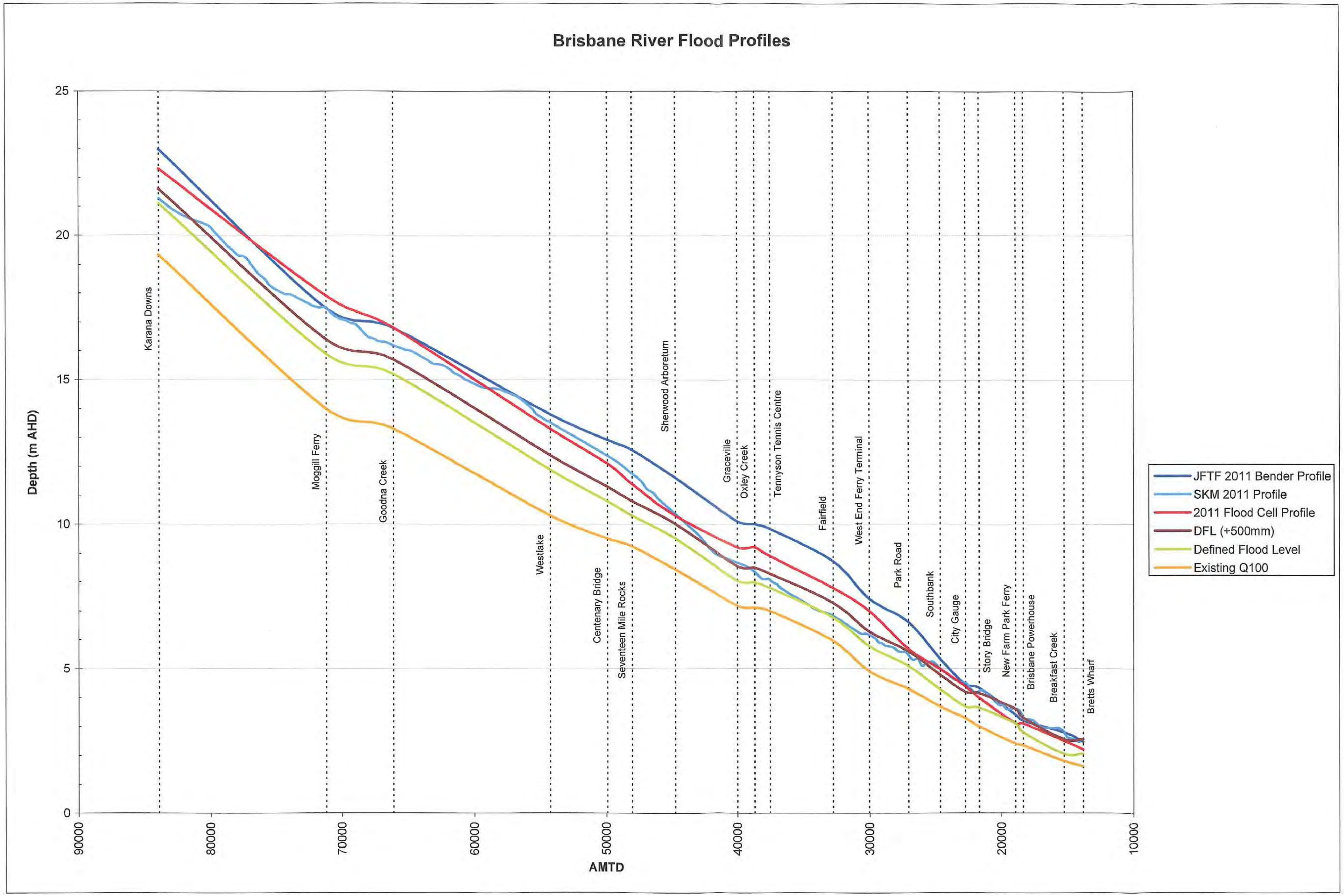
"JDS-02"



Brisbane River Flood Profiles
Depth (m AHD)
25
20
15
10
5
0
90000
80000
70000
60000
50000
40000
30000
20000
10000
AMTD
Karana Downs
Moggill Ferry
Goodna Creek
Westlake
Centenary Bridge
Seventeen Mile Rocks
Sherwood Arboretum
Graceville
Oxley Creek
Tennyson Tennis Centre
Fairfield
West End Ferry Terminal
Park Road
Southbank
City Gauge
Story Bridge
New Farm Park Ferry
Brisbane Powerhouse
Breakfast Creek
Bretts Wharf
JFTF 2011 Bender Profile
SKM 2011 Profile
2011 Flood Cell Profile
DFL (+500mm)
Defined Flood Level
Existing Q100

"JDS -03"

From: [redacted]e [mailto:[redacted]
Sent: Thursday, 19 May 2011 6:13 PM
To: Caswell, Evan; Hill, Peter I (SKM)
Cc: Hackett, Shane; Malone, Terry; [redacted] (SKM)
Subject: RE: Meeting with BCC

Hi Peter,

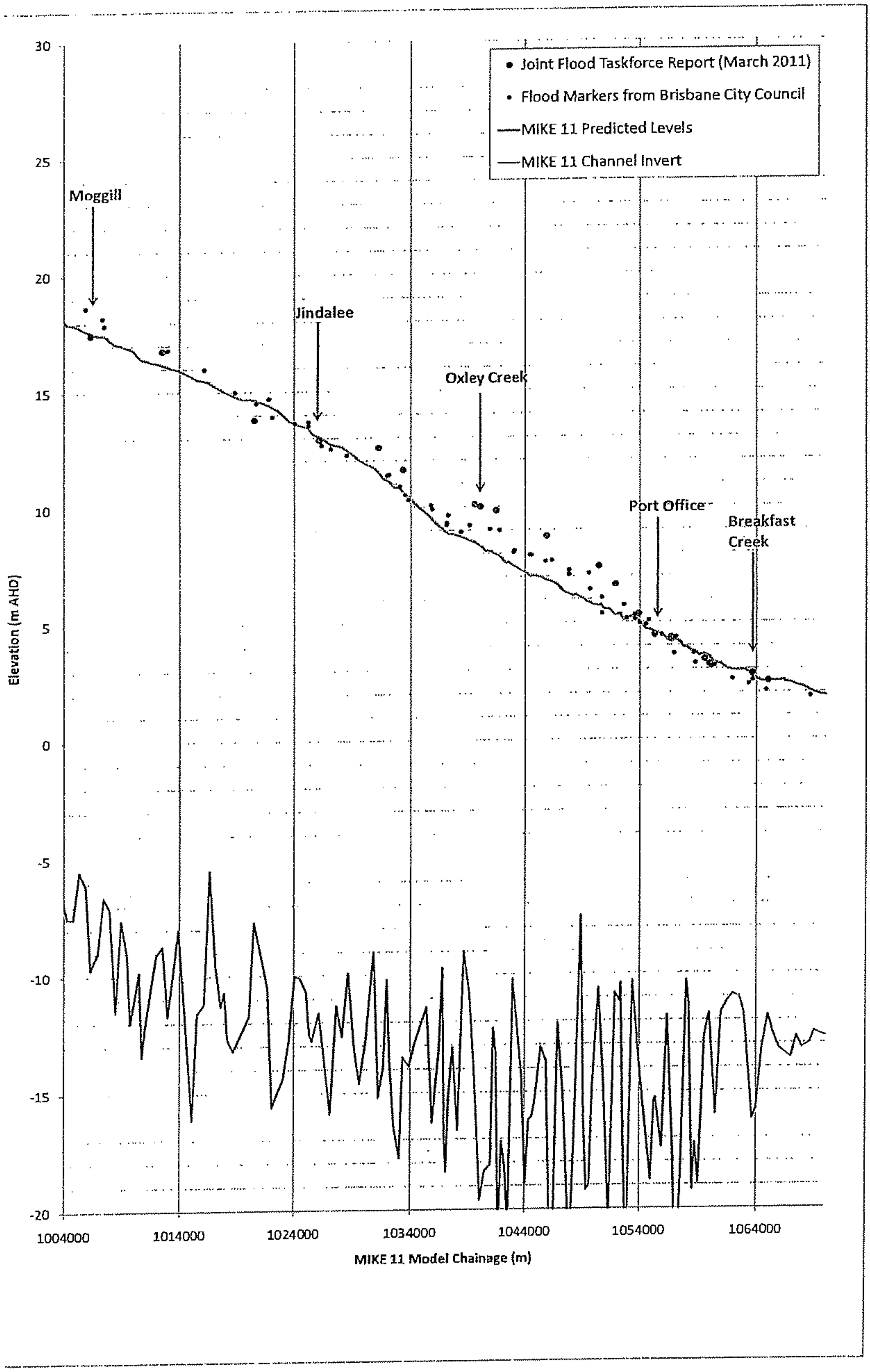
Please see attached an excel table of the surveyed debris mark data. I've also attached a conditions of use document - could you please confirm that SEQWater and SKM agree to the conditions of use.

Please note the flood levels provided have been surveyed from debris marks left by flood waters. Therefore the Brisbane City Council makes no warranty or representation regarding the accuracy of the flood levels derived and disclaims any responsibility or liability in relation to the use of the levels provided.

Many thanks,
[redacted]

[redacted]
Principal Engineer
Planning and Delivery Team
Water Resources
Brisbane City Council

ph:[redacted]
fax



Joint Flood Taskforce Report (March 2011)
Flood Markers from Brisbane City Council
MIKE 11 Predicted Levels
MIKE 11 Channel Invert
Moggill
Jindalee
Oxley Creek
Port Office
Breakfast Creek
Elevation (m AHD)
30
25
20
15
10
5
0
-5
-10
-15
-20
1004000
1014000
1024000
1034000
1044000
1054000
1064000
MIKE 11 Model Chainage (m)

Dedicated to a better Brisbane

Conditions of Use

We understand that Seqwater have engaged SKM to undertake some modelling work and produce a report (**Report**).

In particular Seqwater has requested that Brisbane City Council (**Council**):

1. authorise SKM to use work previously prepared by SKM for Council (**Authorisation**); and

2. provide specific survey data collated by Council following the January 2011 Flood Peak (**Data**).

As discussed, Council is prepared to provide Seqwater with the Authorisation and Data on the following conditions:

1. SKM and Seqwater acknowledge and agree that the Authorisation and Data are provided to Seqwater solely for the use by Seqwater and SKM in preparation of the Report.

2. Council understands that SKM and Seqwater intend to use the Authorisation and Data as part of the Report. Seqwater and SKM acknowledge and agree that the Authorisation and Data provided by Council will not be evaluated or criticised as part of SKM's report but will merely be part of the facts used by SKM to produce their report.

3. Seqwater release Council from any responsibility or liability in relation to the use or release of the Authorisation and Data and indemnify Council in relation to any liability or responsibility arising out of the use of the Authorisation and Data.

Please confirm that Seqwater and SKM agree to the conditions set out above.