



FLOOD OPERATIONS PREPAREDNESS REPORT

**WIVENHOE, SOMERSET AND
NORTH PINE DAM**

October 2010

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1.0 INTRODUCTION

In accordance with the Manuals of Operational Procedures for Flood Mitigation at Wivenhoe, Somerset and North Pine Dams, Seqwater must provide a formal report to the Queensland Dam Safety Regulator by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks associated with the operation of the dams. The report must assess following in terms of hardware, software and personnel:

- Adequacy of the communication and data gathering facilities.
- Reliability of the system over the previous period.
- Reliability of the system under prolonged flood conditions.
- Accuracy of forecasting flood flows and heights.
- Training and state of preparedness of operations personnel.
- The overall state of preparedness of the system.

This report has been prepared to meet these requirements.

2.0 ADEQUACY OF COMMUNICATION AND DATA GATHERING FACILITIES

2.1 ADEQUACY OF COMMUNICATION FACILITIES

The primary facility for gathering rainfall and stream height data is the Flood Operations Centre (FOC). The Centre is currently located on Level 9, 179 Turbot Street, Brisbane.

The following communication facilities exist at the Flood Operations Centre and at each dam site. The facilities are maintained in a state of operational readiness at all times and are tested regularly:

- Landline telephone (minimum of one line at the dams, minimum of three lines in the Flood Operations Centre).
- Mobile telephones (minimum of two phones at each site).
- Satellite telephones (minimum of one phone at each site).
- Facsimile facilities (minimum of one facsimile machine at each site, with each machine connected to a facsimile dedicated data line).
- Internet Connection at each site.
- Radio Base Station facilities at each site to allow voice communications between all sites.

The communication facilities are considered adequate with no recommendations for improved facilities currently considered necessary.

2.2 ADEQUACY OF DATA GATHERING FACILITIES

The primary facility for gathering rainfall and stream height data is the Flood Operations Centre. The Centre is currently located on Level 9, 179 Turbot Street, Brisbane. The Centre is maintained in a fully operational state at all times and contains the following features:-

- It is maintained in a secure state, but provides authorised personnel with 24/7 access;
- It contains all of the computer hardware and software required to gather data and forecast flood flows, with at least one layer of redundancy at all levels.
- It is connected to the building emergency power system and an un-interruptible power supply (UPS).
- It obtains rainfall and stream height data via direct feed radio base station facilities located within the building. Should these facilities fail, data can also be obtain using dedicated data lines connected to direct feed radio base station facilities at both Mineral House and at the Bureau of Meteorology (BoM).

A Back-up Flood Operations Centre facility has also been established on Level 2 of Mineral House. The back-up facility is smaller in flood area than the primary centre, but maintains similar operational characteristics.

Data is also collected at the Seqwater directly and via data feeds from the FOC and BoM.

The communication facilities are considered adequate with no recommendations for improved facilities currently considered necessary.

3.0 SYSTEM RELIABILITY IN 2009/10

3.1 COMMUNICATION FACILITIES

There were no significant failures in communication facilities in 2009/10.

3.2 REAL TIME FLOOD MODEL

The Real Time Flood Model (RTFM) and software was originally developed more than 15 years ago and resides on the Linux Fedora Core Operating System. Both main software components (Flood-Col and Flood-Ops) are running on the Linux PC known as NOAH and the back-up PC located in the Back-up FOC. A number of minor failures occurred in 2009/10 and the age of the software is a concern. Accordingly, although the software is still functioning adequately from an operational perspective, replacement software is currently being developed. Approval for the replacement system will be sought from the Queensland Dam Safety Regulator prior to operational implementation.

A secondary component of the Real Time Flood Model software (WIVOPS) that assists in formulating the gate operations strategy at Wivenhoe Dam is no longer applicable. This has occurred due to the recent changes to the Wivenhoe Flood Mitigation Manual and the inability to modify the program (WIVOPS) to account for these changes. This was due to a number of factors including the age of the program (> 15 years), the absence of program documentation and the complexity of the recent Manual changes. As an interim measure, spreadsheets have been developed to provide the required functionality, however replacement software will be developed. Approval for the replacement system will be sought from the Queensland Dam Safety Regulator prior to operational implementation.

3.3 ALERT NETWORK

The current ALERT data collection network has now been operational since 1995. The overall the performance of the system in 2009/10 has been satisfactory, with the following improvements made during the year:

- Seqwater has 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 initial installation.

- During 2008/09 about 30 stations were upgraded with new generation ALERT (ERRTS) equipment. During 2009/10 a further 55 sites have been upgraded meaning that nearly all the ERRTS equipment in the Seqwater ALERT network has been upgraded.
- During 2008/09 and 2009/10, new rainfall stations have been constructed and installed at the following locations:
 - Lindfield
 - Westvale
 - Hazeldean
 - Monsildale
 - Mt Stanley
 - Mt Binga
 - Blackbutt
 - Redbank Ck
- New rain/river height stations have been constructed and installed at the following locations:
 - Atkinson Dam
 - Bill Gunn Dam
 - Lake Clarendon Dam
 - Moogerah Dam
 - North Pine R at Dayboro WWTP
- New river height stations have installed at the following locations:
 - Kilcoy Ck downstream of Kilcoy Weir
 - Kobble Ck at Mt Samson

Further upgrade and enhancement of the Network will occur in 20010/11 as Seqwater looks to maximise the overall reliability of the system.

4.0 SYSTEM RELIABILITY UNDER PROLONGED FLOOD CONDITIONS

4.1 COMMUNICATION FACILITIES

There are no known additional facilities available that can be purchased to improve the existing communication facilities under prolonged flood conditions.

4.2 ALERT NETWORK

The rainfall and stream height field stations have never been fully tested by an extreme flood event. Certainly, in accordance with all systems of this type around the world, some field failure would occur during an extreme flood event. Seqwater is working to mitigate this risk by improving field redundancy, expanding the field network and accessing stations operated by other agencies. Details of this work are contained in Section 3.3 of this report.

In addition, access to additional 200 non-Seqwater stations in SE Qld is available in the FOC and Seqwater via Enviromon, an application similar to Flood-Col.

4.3 REAL TIME FLOOD MODELS

The deficiencies in the existing Real Time Flood Model software have been recognised and, as previously discussed, replacement software is currently being developed. The existing software and hardware systems are still functioning adequately from an operational perspective, however the age of the software presents a potential failure risk if required to be used for extended periods. Work to manage this risk through the development of improved systems is currently well advanced.

Independent of the RTFM, Seqwater have developed a series of flood models for all of its storages linked to the Enviromon data collection system as a backup to the RTFM software in the FOC.

5.0 ACCURACY OF FORECASTING FLOOD FLOWS AND HEIGHTS

A number of flood events impacting on Wivenhoe, Somerset and North Pine Dams occurred in 2009/10. In accordance with the Manuals of Operational Procedures for Flood Mitigation at Wivenhoe, Somerset and North Pine Dams, Seqwater submitted a formal report on each event to the Queensland Dam Safety Regulator. The reports contained details of the procedures used during the events, and the performance of the Real Time Flood Models during the events.

The Flood Event Reports demonstrated that in terms of accuracy, the Real Time Flood Models are currently forecasting flood flows and heights in a satisfactory manner.

6.0 TRAINING AND STATE OF PREPAREDNESS OF OPERATIONS PERSONNEL

Three groups of operational personnel have been organized for the operation of the dams. These groups and the roles that they perform are as follows:

Organisational Group	Nominated Role
Dam Operators	While on duty at a particular dam, a Dam Operator is responsible for the flood operation of that dam. While these operations will normally be under the direction of the Duty Engineer, provision has been made for the operation of each dam in the event of loss of communication with the Duty Engineer.
Duty Engineer	The engineer responsible for directing flood releases from all three Seqwater dams in accordance with the appropriate Manual of Operational Procedures for Floods.
Data Collectors	The technical staff members of the Flood Response Teams, who staff the Flood Operations Centre, perform data gathering and verification duties on behalf of the Duty Engineer and generally support the Duty Engineer.

6.1 DAM OPERATORS

Formal training of Dam Operators at Wivenhoe, Somerset and North Pine Dams was undertaken between in September 2010 and October 2010. During this training, operators were given theoretical and practical instruction in the following aspects of the operation of each dam:

- The use of the following documents, with particular emphasis on use of the documents during flood operation:
 - Manual of Flood Operations Procedures for Flood Mitigation
 - Emergency Action Plans
 - Seqwater Flood Operations Procedures

- Operation of the water release infrastructure at each dam that is used during flood operations.
- Flood operation communication procedures and reporting requirements.
- Procedures for use during power and/or equipment and/or communications failure during flood operations and events.

Examination of dam operators to verify their competency to operate the dams during flood events was undertaken during the training. All original written examination papers are held on record. Examinations included:

- Practical testing of each individual on the operation of the dam's water release infrastructure.
- Practical testing of each individual on the procedures to be followed during power and/or equipment and/or communication failure during flood operations.
- Classroom review of Flood Operations Procedures including loss of communications procedures.

Following the completion of testing, the following operators were passed as competent to operate Wivenhoe, Somerset and North Pine Dams during flood events.

Wivenhoe Dam

Doug Grigg, Matthew O'Reilly, Darren Varley, Russell Titmarsh, Mark Granzien, Gary Ludlow, Phil Jordan, Louw Van Blerk, Giuseppe Menchise, Graham Keegan, Rob Gorian, Col Gillam, Dave Hesse, Michael Fitzgerald, Murry Bryant, Brent Billington, Jayam Tennakoon.

Somerset Dam

Ag Dagan, Graham Francis, Chris Hine, Ray Ballinger, Darren Cunningham, Adam Weller, Phil Jordan, Scott Coutts, Louw Van Blerk, Giuseppe Menchise, Graham Keegan, Rob Gorian, Col Gillam, Dave Hesse, Michael Fitzgerald, Murry Bryant, Brent Billington, Jayam Tennakoon.

North Pine Dam

Brett Schultz, Mal Lane, Doug Hunt, Geoff Searle, Matt Hegarty, Jason Hine, Louw Van Blerk, Giuseppe Menchise, Rob Gorian, Murray Dunstan.

6.2 DUTY ENGINEERS

Two engineers are currently authorised to fulfil the role of Senior Flood Operations Engineer and they are listed in the Schedule of Authorities as:-

- Robert Ayre (SunWater)
- John Ruffini (DERM)

It is expected that they will both be available throughout the 2010/11 ‘wet season’.

Two engineers are currently authorised to fulfil the role of Flood Operations Engineer and they are listed in the Schedule of Authorities as:-

- Terry Malone (Seqwater)
- John Tibaldi (Seqwater)

It is expected that they will both be available throughout the 2010/11 ‘wet season’.

Flood Operations training of the Duty Engineers was generally “hands on” training during the numerous small floods and rainfall events that occurred during the year. The numerous workshops and meetings that were held in association with the reviews of the Flood Mitigation Manuals also proved a good basis for training and development. This process will continue in 2010/11, particularly with the development of the new Real Time Flood Models.

6.3 DATA COLLECTORS

The following is a list of the current personnel who have been certified to fulfil the role of a Data Collector:

Name	Organisation	Designation
Al NAVRUK	SunWater	Senior Technical Officer
Ken PRICE	SunWater	Senior Technical Officer
Kim HANG	SunWater	Engineer (Hydrology)
Lisa CECCHI	SunWater	Project Officer
Peter MacTAGGART	SunWater	Project Manager
David POKARIER	SunWater	Engineer (Hydrology)
Bill STEPHENS	SunWater	Project Officer
Sean FLEMING	SunWater	Project Manager

In addition to these personnel, four additional Seqwater Data Collectors are currently in training for inclusion in the roster. These trainees will complete training in October 2010 and will be ready for full-time duty during the current wet season.

The trainee Data Collectors are:

Name	Organisation	Designation
John WEST	Seqwater	Data Analyst
Mark TAN	Seqwater	Data Analyst
Louw VAN BLERK	Seqwater	Civil Engineer
Neville ABLITT	Seqwater	Technical Officer

All experienced data collectors are involved in the training of new data collectors. The overall approach to training has been one of maintaining and enhancing their skills through continual use of the model and exposure to the workings of the Flood Operations Centre. A roster system has been operated such that each Data Collector has direct hands on practice using the Flood-COL component of the RTFM every three to four weeks. When they are rostered for 'close call', the Duty Engineer responsible for that period assigns each Data Collector the role of updating and maintaining the RTFM database at least once in the week.

7.0 THE OVERALL STATE OF PREPAREDNESS OF THE SYSTEM

Overall, the system is operating in a satisfactory manner. However, a number of deficiencies have been identified and these can be summarised as follows, along with the remedial actions currently in progress:

- The Real Time Flood Models are more than 15 years old and require modernisation. Seqwater is significantly advanced in a project to modernise this system. The Queensland Dam Safety Regulator and all key stakeholders are involved in this process.
- In some instances the rainfall and stream height field stations contain equipment that is nearing the end of its useful life. While Seqwater has made significant progress in equipment renewal in 2009/10, further work has been programmed in 2010/11.
- Based on the understanding that a percentage of field equipment will fail in any hydrographic system during extreme flood events, further field redundancy would be improve the reliability of the data gathering network. Seqwater is providing this redundancy by obtaining data from networks owned and maintained by other agencies and expanding its existing field network. Seqwater will continue with this work in 2010/11.

In summary, while it is currently operating in a state that is no less reliable in any respect than has been experienced over the last 15 years, the overall system is currently in a state of renewal, with significant improvements in reliability and system useability and performance expected over 2010/11.