Report

Training & Flood Preparedness for Seqwater Dams for Year Beginning 30 September 2008

Date: October 2008
Ref: P-AEXP-1802-AK-01
File: 07-006241

SunWater

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1.0 INTRODUCTION

SunWater commenced the current facility management contract for the flood operation and facility management of the South East Queensland Water Corporation's dams in July 2001. SunWater have now undertaken the contract for the operations of flood operations of Wivenhoe Dam, Somerset Dam and North Pine Dam for 12 years and 3 months. Flood operations at these dams continue to be controlled by the provisions of the following Manuals of Flood Operations:

- Manual of Operational Procedures for Flood Mitigation for Wivenhoe Dam and Somerset Dam, Revision No.6, 20 December 2004
- Manual of Operational Procedures for Flood Releases from North Pine Dam, Revision No.3, 26 July 2002

The Manual for Wivenhoe Dam and Somerset Dam is currently being reviewed to accommodate the completed Stage I works for the construction of an auxiliary spillway at Wivenhoe Dam. The changes to the manual affect the operation of the Wivenhoe Dam and Somerset Dam by taking into consideration the additional design flood levels now allowed in Wivenhoe Dam due to the auxiliary spillway and associated strengthening of the integrity of the wave wall.

Clause 7.2 of both Manuals of Flood Operational Procedures requires the Headworks Operator to submit reports to the South East Queensland Water Corporation (Seqwater) by 30 September each year on the training and the state of preparedness of operations personnel. In addition Clause 7.4 requires the Headworks Operator to review the adequacy of the communication and data gathering facilities.

This report is designed to satisfy both of these requirements. Because of the similarities between the systems adopted for Wivenhoe Dam, Somerset Dam and North Pine Dam a combined report has been prepared.

Under Clause 7.3 of these Manuals, a report is also required to be submitted by 1st May and 1st November each year on the:

- Reliability of the system over the previous period
- Reliability of the system under prolonged flood conditions
- Accuracy of forecasting flood flows and heights
- Overall state of preparedness of the system

This current report provides some data on the reliability of the data collection system since 1st April 2008.

In addition to the above manuals, Seqwater has revised the Emergency Action Plans (EAPs) for Wivenhoe and Somerset Dams and for North Pine Dam. These plans are used for the "*coordination of the necessary actions by the Contractor to provide timely notification to police, counter disaster groups and affected persons in the event of an emergency condition*" at the dams. The current versions of these EAPs were produced in December 2005. Draft EAPs for each of the dams were provided to the Flood Response Team for comment in September 2008 by Seqwater. These documents are expected to be finalised by Seqwater and issued for official use by the end of the 2008 calendar year.

2.0 REPORT ON FLOOD PREPAREDNESS FOR 2008/2009

2.1 STATUS OF STORAGES

At the commencement of the period the storage levels of all of the dams were drawn down to around one third (82, 21 and 32% respectively for Somerset, Wivenhoe and North Pine Dam). During the period inflows occurred on three occasions, early June, late July and early September. This resulted in the combined levels of the dams exceeding 40% combined capacity and the easing of Level 6 restrictions during the period.

No flood operations were required at any of the dams during the period from April 2008 to September 2008 however some significant inflows into Somerset and Wivenhoe dams occurred during June 2008. These inflows were monitored and provided a good check on the systems and procedures being utilised in the Flood Control Centre. This provided some opportunity to review the performance of the ALERT network, especially the stream sensors located in the Upper Brisbane and Stanley River catchments.

The last flood response requiring gate operations occurred in February 2001.

The table below shows the change in storage level during the period:

Storage	April 2008		September 2008	
	Storage Level (m AHD)	Storage Volume (ML)	Storage Level (m AHD)	Storage Volume (ML)
Somerset Dam	97.26	311,990 (82.1%)	98.06	341,900 (90.0%)
Wivenhoe Dam	53.16	246,250 (21.1%)	54.90	315,010 (27.0%)
North Pine Dam	30.09	68,760 (32.1%)	31.02	78,140 (36.5%)
	Total	627,000 (35.6%)	Total	735,050 (41.8%)

2.2 ARRANGEMENT OF FLOOD RESPONSE TEAMS

There have been some changes in personnel that comprise the flood response team however team arrangements remain the same as for the previous twelve months. 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 man the Flood Control Centre, perform data gathering and verification duties on behalf of the Duty Engineer and generally support the Duty Engineer.

As required by the Manuals of Operational Procedures, overall flood operations are under the control of the Senior Flood Operations Engineer. The Senior Flood Operations Engineer organises the other Duty Engineers and the Data Collectors into the Flood Response Teams and ensures that sufficient personnel are available to man the Flood Control Centre 24 hours a day, every day of the year.

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

- Robert Arnold Ayre
- John Lawrence Ruffini

Rob Ayre is the current Senior Flood Operations Engineer. Duty Flood Operations Engineer John Ruffini is also qualified to act as the Senior Flood Operations Engineer. John and Rob will share these responsibilities during the course of the wet season and Seqwater will be advised in advance as to which of these officers is the SFOE at any particular time.

It is expected that they will be both available throughout the 'wet season' with Rob Ayre normally assuming the role and John Ruffini taking on the role when Rob Ayre is unavailable.

Due to the introduction of new institutional arrangements in South East Queensland, SunWater only provides flood management services to Seqwater as Seqwater have taken on the facility management of the dams. This project is managed by Rob Ayre at SunWater. The Principal Engineer, Dam Safety, John Tibaldi at Seqwater, has the responsibility for ensuring that at least two fully trained operators are available for flood operations at each dam 24 hours a day, every day of the year. John is also a nominated Duty Engineer.

All of these personnel have been trained to carry out their assigned roles in the event of a flood requiring the operation of each dam. This training is summarised in the following sections.

2.3 FLOOD CONTROL CENTRE PREPAREDNESS

2.3.1 Flood Control Centre, Level 18 WHK Horwath Building

The SunWater Flood Control Centre (FCC) is located on Level 18 of the WHK Horwath Building, 120 Edward St Brisbane. The FCC is fully operational and ready for flood operations as and when required. The FCC has the following features:

(a) It is lockable with the Duty Engineers and Data Collectors having 24-hour access

(b) It is the location of the Seqwater's computer hardware and software

(c) It is connected to the building emergency power system and an un-interruptible power supply (UPS). This unit is currently being upgraded to have sufficient capacity to run the flood computer system for about 2 hours in the event of failure of the emergency power system.

A Back-up Flood Control Centre facility is established on Level 2 of Mineral House, which mitigates the vulnerability of the Flood Response Team as a whole. The back-up facility houses the backup to the main Linux based Operating System PC, NOAH. It also has duplicate data gathering capability with an independent base station located on the roof.

2.3.2 Proposed Move of Flood Control Centre

SunWater's lease of office space in the WHK Horwath Building expires in February 2009. SunWater has signed a new lease on three floors of a new building currently being constructed at 67 Turbot Street. SunWater proposes to relocate the Flood Control Centre from WHK Horwath Building to the new building when it becomes available, nominally in early 2009. Whilst it is acknowledged that contemplating such a move during the peak of the wet season carries some risk, contingency plans are being developed to ensure the impact of the move on flood readiness is minimised.

The new office location has some benefits as it is located above the known flood level within the Brisbane CBD. The office also has a good line of sight with the repeaters located at Mt Glorious and Constitution Hill.

A separate report on this matter will be issued prior to the planned move.

3.0 REAL TIME FLOOD MODEL PREPAREDNESS

3.1 CONVERSION FROM HP-UX TO LINUX

The RTFM software has now been converted (from HP-UX) to run on the Linux Fedora Core Operating System. Both main software components (Flood-Col and Flood-Ops) are running reliably on the new Linux PCs.

Some software fixes have been implemented on the Flood-Ops module but overall the package appears quite solid. These fixes include rectifying the gate operation module starting level options selection.

3.1.1 Systems Administration

Currently data is backed up from both the Main and Back-up FCC. Both sets of machines get data independently but data is only validated/edited on the WHK Horwath (main) machine. The validated WHK Horwath data is mirrored to the Mineral House machine (in a separate area of the Mineral House machine to its live data).

Periodically, (once a week, or more frequently when required), the Duty Engineer is required to copy validated/edited data over the backup machine's live data. This includes both sensor data and configuration data. This is not done automatically, since it is necessary for the Duty Engineer to ensure that suitably validated data is overwriting the existing data.

The development team needs to provide some scripts to make this possible and easy in the Linux arena. The development team also needs to tidy up the (converted) scripts for backup and recovery. Some aspects of the Linux File System are very different to the HP File System and this requires quite different techniques for file handling. This also means some very different methods are required in the backup/recovery processes.

In addition to day-to-day file backup/recovery, the development team needs to prepare (or redo for Linux) the Disaster Recovery Strategy/Methods. This means there is a need to develop (and test) methods to completely re-build a machine, (i.e. install operating system, install FLOOD software, recover configuration data and latest sensor data, in an efficient manner).

Linux and HP-UX are both flavours of Unix, but underlying structures mean that things happen very differently. HP-UX has reached end of life, but Linux is continuing to develop and there are many new ideas which make things more robust and secure. Most services (eg email, ssh, X-Windows, ftp, web-server) have been re-established, but still require some modification. Security issues also need some close attention; HP-UX was actually quite secure because its use was not very widespread and therefore not so popular with hackers. This is not the case with Linux so the development team needs to monitor developments in this area to ensure the system is quite secure.

3.1.2 Alarm Sub-System

There are a number of messages which the system needs to generate. These messages take two forms:

- Heartbeat-type messages which are delivered to Duty Engineers/Development Staff periodically to signify that hardware/software is operating normally
- Warning/error messages that are delivered (if possible) when hardware (or software) fails or when some other "interesting" event takes place

The main type of "interesting" event is extreme rainfall or significant water-level rises, which come from the captured real-time ERRTS data.

The development team now needs to "convert" the HP methodology and Telstra (HP-UX) Pager Mechanism to run under Linux. Some work has been done on this front, with techniques and machinery for delivering data via SMS and email. However, these processes are running on win32 platforms so an interface to Linux needs to be built. This will require handling the generated group/individual alarms and warnings (i.e. handing them to the win32 system for transmission by email, SMS or any other means desired).

This involves setting hold-off periods, and later receiving 'Acknowledgement', and subsequently 'Suspending Alarms' by the Duty Engineer.

The Enviromon alarm (or Alerting Sub-System) is potentially useful in the future, depending on how much use or adoption of the Enviromon product is integrated into the overall system. At this stage, it is desirable to convert the existing system, since it is straight forward and will handle Systems warnings/alarms as well as Rainfall/Water Level alarms.

3.2 ENVIROMON INTEGRATION INVESTIGATION

It is very desirable to integrate Enviromon into the system.

The primary reasons are:

- Enviromon has now matured and is a quite solid product
- Enviromon is a national standard for capturing and using ERRTS data
- Enviromon has a very superior data filtering system.

However, the integration requires a change of philosophy for both storing and using data (configuration and sensor data). Enviromon has a different method of storing and specifying meta-data (configuration data). Additionally, it does not allow editing of sensor data, only voiding data (marking it as deleted). and it has no means of flagging OOA (Out of Action) sensors, although this can be partially simulated by setting up an OOA group.

It has not yet been determined if the integration or interfacing Enviromon to the FLOOD system can be accomplished in an efficient manner. If Enviromon data is passed onto the FLOOD system (in real time) some of the benefits of the Enviromon Filtering/Validation system will be lost. This is due to the process whereby Enviromon can often validate/edit earlier data on receipt of new data (which would not be available to the FLOOD system). If data is continuously delivered over a period (eg a day's worth) to FLOOD, then it may be likely that editing that has been done by (users of) the FLOOD system will be lost!

It is recommended that the option to try real-time delivery be trialled initially to determine if this approach can be made to work successfully. To achieve this, exported filtered data needs to be passed from Enviromon into the FLOOD system (running on a test machine).

This means developing a new (sensor data) import process into FLOOD-Col (bypassing the FLOOD-Col filtering process). The development team also needs to make configuration changes to the Enviromon System as well as the FLOOD System, or request the Bureau of Meteorology to provide a method to programmatically change Enviromon Configuration Data. It is also desirable that a methodology for sharing configuration data with other ERRTS system users, especially from this neighbourhood, (e.g. BOM, BCC, Ipswich, Somerset Regional Council, Moreton Bay Regional Council) be developed. All of these users are (or are becoming) Enviromon users.

SunWater has set up an Enviromon system for Seqwater to examine and analyse rainfall data. This system will also be provided some (automatic) methods of updating configuration data for this system as well. SunWater strongly recommends that the network go to 3 hour check signals for ERRTS Loggers to get the best results from Enviromon filtering; 3 hours check signals would also enhance filtering on the existing system.

3.3 TIME SERIES DATA ARCHIVE

A permanent archive of Seqwater station data should be established. The FLOOD system was designed as a real time system that would use only a period of operational data, and there is now over ten years of data available and this puts unreasonable loads on the system. If a formal archive is established, then it will make ad hoc requests for data (for other investigations) much easier to extract and provide.

Options are:

1. Purchase an existing Time Series Database System and develop export routines from Flood-Col. (Examples include Wiski and Klisters).

2. Set up a database of relational tables (managed by an SQL engine), mirroring what we currently have in Flood-Col, and modify Flood-Col to use that database. The database could have a real-time and an archive distinction, so that data could remain in the one place and be better managed.

3.4 WEB PAGE DEVELOPMENT

It is desirable that Duty Engineers and Development Staff be able to quickly and efficiently get an understanding of catchment wetness from both in the office and from home (or other remote locations).

The development team has trialled establishing (internal) web pages of catchment data (in the form of graphs, tables and maps) for viewing from both PCs and PDAs. This is an extension of the SMS interrogation software, and it has some similar capabilities. The web page developments to date have been scheduling tasks to generate these pages every hour, but are looking to also do it on demand (refresh button). Currently these pages are only available from inside the Flood Control Centre, but the development team are looking at setting up secure access methods so they can be used from other locations.

The Apache web server (which runs on Linux) is very popular and solid and it is proposed to use the test Linux machine for the development of some web-driven routines to provide suitable maps, graphs, tables for these pages.

The current ALERT data collection network has now been operational since 1995. This network was installed by Seqwater using FutureTech equipment and overall, the performance has been mostly satisfactory, as evidenced by Section 5 of this report. A summary of the overall performance over the period from 2001 shows the following:

Rainfall Stations

	2001	2002	2003	2004	2005	2006	2007	2008
Number of Stations	71	71	72	70	70	70	70	70
Average Availability (%)	84%	92%	91%	89%	85%	81%	91%	78%
Average Duration OAA (Days)	32	27	28	29	62	60	25	60

Stream Height Stations

	2001	2002	2003	2004	2005	2006	2007	2008
Number of Stations	51	51	59	56	56	55	55	55
Average Availability (%)	82%	84%	83%	88%	74%	76%	84%	72%
Average Duration OAA (Days)	51	49	49	31	78	76	67	78

The increase in the average duration of Out of Action (OOA) is the most telling characteristic that the network may be showing its age. These statistics should be tempered somewhat by the acknowledgement that some administration issues over the 2005/06 period have perhaps exaggerated the length of unavailability of the stations. It is recommended that consideration be given to rolling out a new generation of ALERT (ERRTS) sensors as part of the ongoing maintenance of the network over, say, the next two wet seasons. This strategy would include installation of field equipment sensors that are capable of more frequent check signals (3 hourly as mentioned previously) and get equipment which can use IFlows capability.

Parts of the network also need to be strengthened to ensure redundancy such as at Wivenhoe Dam Headwater gauge. At this time, there are only two headwater gauges, one of which is a 5m Druck and therefore the system is somewhat vulnerable if the main gauge fails.

Additional stations have been installed by other agencies such as Moreton Bay Council, Somerset Regional Council and the Bureau of Meteorology. It is recommended that configuration details be obtained for any such sites and these stations be added to the network. Agreements to pass configuration data between agencies would need to be put in place and it should be recognised that response times for station repairs would be in accordance with service level agreements that each party has instigated.

Recent events have highlighted the potential for some catchment blind spots, particularly in the Brisbane and Jimna Ranges. Consideration of additional rainfall stations is recommended, especially with the Jimna site being OAA due to the demolition of the forestry tower.

Previous issues with the configuration of the gate opening sensors are again highlighted in this report. The gate opening sensors are not configured sufficiently well to provide useful data to confirm required gate operations. Checks conducted earlier this year when the gates were exercised, showed poor correlation against actual openings. The calibration of the sensors and the range of coverage may need to be reviewed to ensure the data obtained is useable.

4.0 REPORT ON PERSONNEL TRAINING

All operational personnel required for flood control operations have received significant training in the various activities involved in flood control operations. All continuing members of the flood response teams have undertaken 'refresher' courses and new personnel have been fully trained or have commenced training.

This section summarises the training received by each group referred to in Section 2.

While training is seen as an ongoing function that will be regularly reviewed, it is also envisaged some form of formal training will normally need to be conducted prior to 30 September each year and this was the case for 2008/09.

4.1 DAM OPERATORS

4.1.1 Training of Dam Operators

Formal training of Dam Operators at North Pine, Somerset and Wivenhoe Dams was undertaken between August and September of this year. 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:
  - (a) Standing Operating Procedures
  - (b) Manual of Flood Operations Procedures for Flood Releases
  - (c) Emergency Action Plans
- 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 failure during flood operations

4.1.2 Examination of Dam Operators

Examination of dam operators to verify their competency to operate the dams during flood events was undertaken over four days in August/September of this year. A day was spent on practical aspects at each of North Pine, Somerset and Wivenhoe Dams and one day was spent in SunWater's Ipswich office on theoretical aspects. The dates on which dam operators were trained and tested were:

Somerset Dam	28 August 2008
North Pine Dam	12 August 2008
Wivenhoe Dam	14 August 2008
Wivenhoe Information Centre	4 September 2008

The general format of the each examination period was as follows. The time spent on each component varied between dams depending on the content of the dam's Manual of Flood Operations Procedures and Emergency Action Plan, and the complexity of operation of the dam's water release infrastructure.

- 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 Manual of Flood Operations Procedures and the Emergency Action Plan and hands-on simulation of the operation of each of the dams

4.1.3 Results of Dam Operator Testing

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

DAGAN Anthony	Somerset Dam
DREWS Mick	Ipswich
EGAN Allan	Ipswich
HAMBLETON Wayne	Ipswich
HESSE Dave	Central Lockyer
GEORGE Allan	Wivenhoe Dam
GORIAN Rob	Ipswich
GRIGG Doug	Wivenhoe Dam
HAMBLETON Wayne	Ipswich
KEEGAN Graham	Wivenhoe Dam
KIRCHNER Don	Moogerah Dam
LANE Mal	North Pine Dam
PATTERSON Glenn	Somerset Dam
PETT Steve	Ipswich
ROBERTS Carl	Ipswich
ROCHE Daniel	Ipswich
SCHULTZ Brett	North Pine Dam
TIBALDI John	Ipswich
TITMARSH Grant	Moogerah Dam

A number of other Seqwater staff members attended the operator sessions at each of the dams. These people include:

North Pine Dam – Barton Maher, Col Gillam, Rohan Campbell, Murray Dunstan, Andrew Edbrooke

Wivenhoe Dam – Andrew Edbrooke, Col Gillam

4.2 DUTY ENGINEERS

4.2.1 Nominated Duty Engineers

Four Duty Flood Operation Engineers have been trained as "Operations Engineers" for the operation of Wivenhoe Dam, Somerset Dam and North Pine Dam. These engineers, and the positions they hold within SunWater, Seqwater or the Department of Natural Resources and Water (DNRW) are as follows:

Name & Qualifications	Role	Position within SunWater/NRW
Robert Ayre BE(Civil), CPEng (Reg), RPEQ	Senior Flood Operations Engineer	Engineering Design Manager Asset Solutions SunWater
Terry Malone BE(Civil)	Duty Flood Operations Engineer	Senior Engineer Asset Solutions SunWater
John Ruffini BE(Agric), MSc (Ag Eng), RPEQ	Duty Engineer & Relief SFOE	Principal Engineer Surface Water Assessment Group Resource Sciences and Knowledge Dept of Natural Resources and Water
John Tibaldi BE(Civil) RPEQ	Duty Flood Operations Engineer	Principal Engineer, Dam Safety Seqwater

4.2.2 Training of Duty Engineers

Flood Operations training of the Duty Engineers has become a little more structured with more formal training sessions conducted for both the existing duty engineers and trainee duty engineers. The training is a collective effort with all Duty Engineers contributing to the process.

The current training includes instruction on the use of the RTFM and alternative arrangements for determination of gate operations. Trainee Duty Engineers will be instructed in the use of FLOOD-Col, the data collection module of the RTFM and FLOOD-Ops the data analysis component of the system. It is intended that further training will be undertaken during the course of the wet season and that a number of the candidates will become fully qualified during the course of the next six months.

While training of the Duty Engineers is ongoing, it is considered that as a team they all have sufficient skills to operate the Corporation's dams in accordance with the requirements of the Flood Operations Manuals.

A simulation exercise is planned for the entire SunWater Flood Response Team for late 2008. This will be a major training exercise that involves testing of the Linux version of the RTFM.

4.3 DATA COLLECTORS

4.3.1 Training of 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
Brendan TREBILCO	SunWater	Civil Engineer
Hassan KIBRIA	SunWater	Graduate Engineer
Jon DAVIDSON	SunWater	Electrical Engineer
Ken PRICE	SunWater	Senior Technical Officer
Kim HANG	SunWater	Engineer (Hydrology)
Lisa CECCHI	SunWater	Project Officer
Manu GRAVATT	SunWater	Mechanical Engineer
Neranjala FERNANDO	SunWater	Senior Project Officer
Peter MacTAGGART	SunWater	Project Manager
Roshan SINGH	SunWater	Engineer (Hydrology)
Yong DING	SunWater	Graduate Engineer

In addition to these personnel, sixteen trainee Data Collectors have commenced training for inclusion in the roster. These trainees will complete training during the 2008/09 wet season and will be ready for full-time duty during the current wet season.

The trainee Data Collectors are:

Name	Organisation	Designation
Peyman BOZORGMEHR	SunWater, Asset Solutions	Civil Engineer
Suzanne BUROW	SunWater, Corporate Strategy	Engineer (Hydrology)
Steven CHAU	SunWater, Asset Solutions	Graduate Engineer
Viven CHENG	SunWater, Corporate Strategy	Graduate Engineer
Mitul DESAI	SunWater, Corporate Strategy	Graduate Engineer
Lynden DRUITT	SunWater, Asset Solutions	Senior Technical Officer
Sean FLEMING	SunWater, Asset Solutions	Senior Project Manager
Gakul GURANG	SunWater, Asset Solutions	Graduate Engineer
Dave HARRAGON	SunWater, Asset Solutions	Senior Technical Officer
Amir JOORABCHI	SunWater, Asset Solutions	Graduate Engineer
Bhavin KANTHARIA	SunWater, Water Services	Graduate Engineer
Nataly ORR	SunWater, Water Services	Senior Engineer
Kashyap PAREKH	SunWater, Corporate Strategy	Graduate Engineer
David POKARIER	SunWater, Corporate Strategy	Engineer (Hydrology)
Bill STEPHENS	SunWater, Asset Solutions	Project Manager
Bob THWAITE	SunWater, Asset Solutions	Senior 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 Control 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.

5.0 REPORT ON COMMUNICATION FACILITIES

5.1 COMMUNICATIONS FACILITIES AVAILABLE AT DAMS

Currently there is a combination of standard and mobile telephone services available at Wivenhoe, Somerset Dams and North Pine Dams. The South East Queensland Water Corporation has also supplied a radio base station for the Flood Control Centre and two hand held units for each dam.

Details of standard telephones available at each of the dams are as follows:

WIVENHOE DAM	
Office/Dam Wall	[redacted]
Facsimile Machine	
Autodialler	
SOMERSET DAM	
Office/Dam Wall	[redacted]
Facsimile Machine	
Autodialler	
Office/Dam Wall	[redacted]
Facsimile Machine	
Autodialler	

In addition to the above, the dam operators also have mobile phones. In particular, the phone numbers of the full time operators are as follows:

WIVENHOE DAM		
Phone No. 1	[redacted]	Doug Grigg
Phone No. 2		Alan George
SOMERSET DAM*		
Phone No. 1	[redacted]	Anthony Dagan
Phone No. 2		Glenn Patterson
NORTH PINE DAM		
Phone No. 1	[redacted]	Brett Schultz
Phone No. 2		Malcolm Lane

The FCC also houses the Seqwater's two-way radio equipment which enables communication with the dams and Seqwater offices.

5.2 COMMUNICATIONS FACILITIES AVAILABLE AT FLOOD CONTROL

Currently there are a number of standard telephone services available at the FCC. These services are listed in the following table:

FLOOD CONTROL CENTRE	
Line 1	
Line 2	
Line 3	
Facsimile Machine	
Answering Machine	
ALERT Mobile Data Only	

In addition to these services, all Duty Engineers have mobile phones to enable them to be contacted at all times. These mobile phones are relied on whenever the Duty Engineers are absent from the normal working hours location or are away from their homes.

There is still no direct link between the Flood-COL data collection program and the Duty Engineer's mobile phones. Work is progressing on facilitating this option. Until this program is implemented, there is a risk that the Duty Engineer will not be aware of the conditions that generate alarm conditions such as a reservoir rise.

The contact numbers for the Duty Engineers are listed in the following Table:

DUTY ENGINEER	Work Phone	Home Phone	Mobile Phone
Robert AYRE			
Terry MALONE			
John RUFFINI			
John TIBALDI			

A message is left on the FCC Answering Machine as to the name and contact numbers of the current Duty Engineer.

Each Data Collector carries a mobile phone while on 'close call'. These phones have a range that includes all of South East Queensland.

Data Collector Mobile Phones
Data Collector 1
Data Collector 2
Data Collector 3
Data Collector 4

The FCC also has a dedicated telephone line to the Duty Forecaster at the Bureau of Meteorology. Officers at the Bureau of Meteorology have also indicated that, in the event of their long-term weather models predicting extreme rainfall events, they will invite us to attend their daily briefings.

5.3 CONTACT REGISTER

All contact phone numbers have been updated in accordance with the numbers provided by the Seqwater in April 2008. A check of these numbers in preparation for the coming wet season revealed some changes and these changes are summarised in Appendix A.

6.0 REPORT ON DATA COLLECTION NETWORKS

A range of data is currently available to the Flood Control Centre. This data includes:

6.1 SEQWATER ALERT NETWORK

The Seqwater ALERT system is the most important element of the overall data collection system available to the SunWater Flood Control Room.

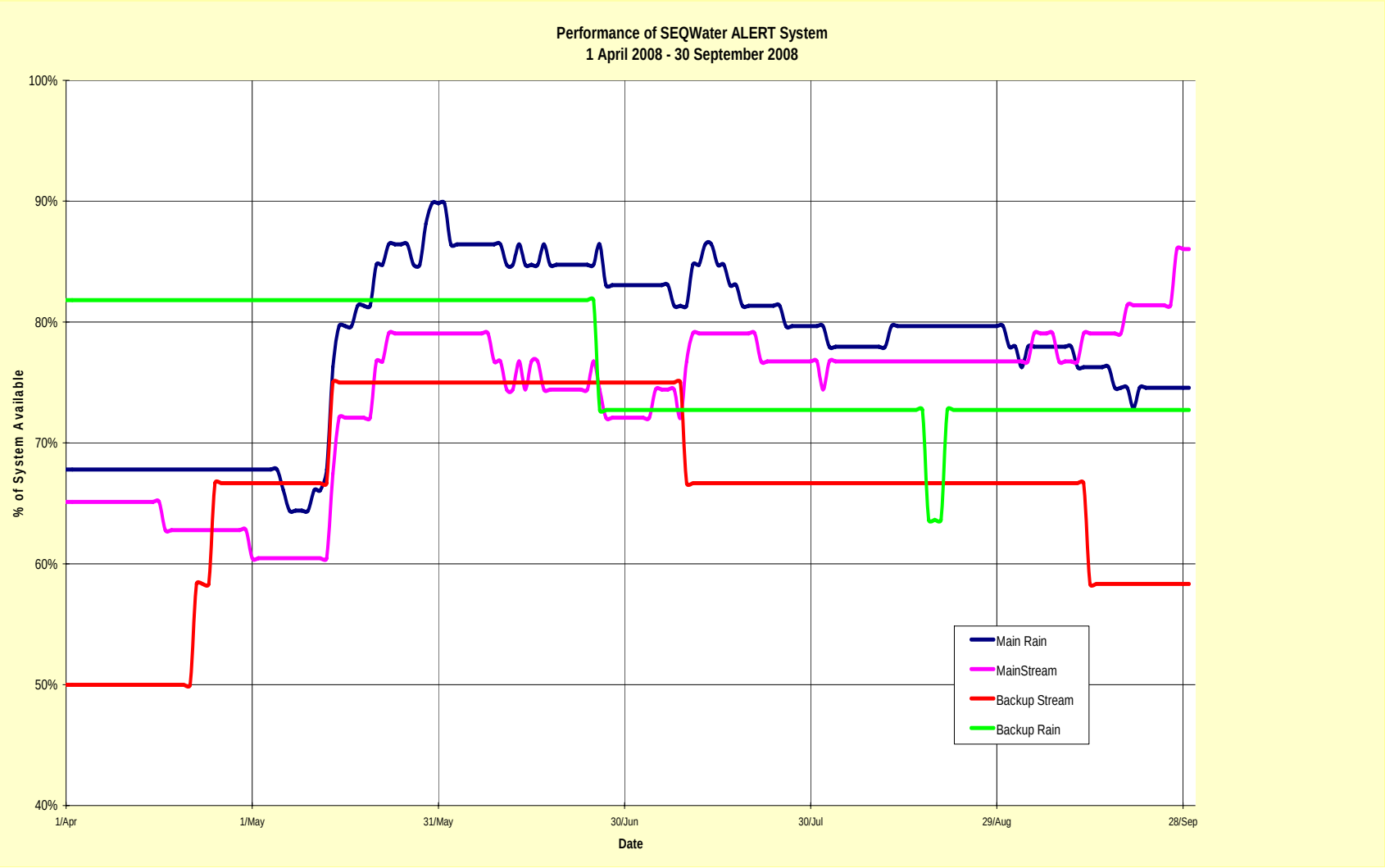
It consists of a network of 70 rainfall and 55 river height sensors spread throughout the Pine River and Brisbane River catchments. Thirty gate-opening sensors were incorporated into the system in March 2004, but calibration data for the sensors is not satisfactory. The report on the performance of these sites shows that further re-configuration of the sensors is required to ensure the gate opening data is appropriate for operational requirements. The availability of the gate sensors is not being monitored as per the remainder of the network due to the poor performance of the sensors.

The ALERT system was supplied and installed by Seqwater and is operated by Seqwater through a third party contract with RoadTek, a business group within the Department of Main Roads. As such, SunWater has no direct responsibility for its performance other than reporting problems to Seqwater as they are identified.

Some summary data has been extracted on the performance of the ALERT sensors and this is presented in the following table. This data is for the period 1 April 2008 to 30 September 2008, a period of 183 days, except for the last column, which repeats the values from the previous report. Figure 5.1 illustrates this information graphically.

	Rainfall			River Height				Overall
	Main Rain	Back-up Rain	Overall Rain	Main River	Back-up River	Overall River	Gates	
Number of Sensors	59	11	70	43	12	55	30	125
Average Availability	78%	77%	78%	74%	66%	72%	0%	75%
Maximum Availability	90%	82%	-	86%	75%	-	0%	-
Minimum Availability	64%	64%	-	60%	50%	-	0%	-
Average OOA [{1}]	54	117	60	74	92	78	183	67
Maximum duration OOA for a single station	183	183	-	183	183	-	183	-

[1]OOA represents Out of Action


Performance of SEQWater ALERT System
1 April 2008 - 30 September 2008
100%
90%
80%
70%
60%
50%
40%
% of System Available
1/Apr
1/May
31/May
30/Jun
30/Jul
29/Aug
28/Sep
Date
Main Rain
MainStream
Backup Stream
Backup Rain

In this period all of the station groups show an average availability around 75%. This result represents a significant drop in performance to the previous six months, which had an average availability of 88%.

Overall performance of the network has diminished since the last period, with the average availability dropping from 88% to 75%, and the average duration of 'Out of Action' (OOA) increasing from 53 days to 67 days. This level of performance is assessed as being below an appropriate level of service. Special attention needs to be paid to the prescribed notification and recording procedures, by both Seqwater and SunWater staff.

The figures could potentially have been even better, but for some ongoing problems. Some of these are outlined below:-

Main Rain Stations

Station	Location	Comment
6615	Thornton	183 days OOA
6619	Mt Castle	148 days OOA
6583	Laidley Ck at Showground Weir	145 days OOA
6565	Tenthill Ck at Tenthill	136 days OOA
6562	Warrill Ck at Kalbar	127 days OOA
6606	Woodbine West	127 days OOA
6733	Bremer R at Rosewood	124 days OOA
6580	Bremer R at Adams Bridge	106 days OOA
6553	Cressbrook Ck at Rosentretters	101 days OOA
6716	Bellthorpe West	93 days OOA

Backup Rain Stations

Station	Location	Comment
6742	Bremer R at Walloon (B)	183 days OOA
6517	Brisbane R at Gregors Ck (B)	142 days OOA
6641	Wivenhoe Dam Tailwater (B)	97 days OOA

Main River Stations

Station	Location	Comment
6650	Brisbane R at Lowood (A)	183 days OOA
6747	Grain Terminal	183 days OOA
6755	Brisbane R at Moggill	183 days OOA
6752	Brisbane R at Mt Crosby (A)	179 days OOA
6761	North Pine Dam (A)	149 days OOA
6554	Cressbrook Ck at Rosentretters	101 days OOA
6551	Bremer R at Walloon (A)	100 days OOA
6764	North Pine R at Petrie	84 days OOA
6757	Brisbane R at Kholo Bridge	75 days OOA
6712	North Pine R at Baxters Ck	73 days OOA

Backup River Stations

Station	Location	Comment
6631	Lockyer Ck at Lyons Bridge (B)	183 days OOA
6654	Warrill Ck at Amberley (B)	183 days OOA
6743	Bremer R at Walloon (B)	183 days OOA

It is recommended that problems with the stations that are still OOA and which are located above the dams be addressed if possible prior to the onset of the wet season. Particular attention should be paid to the key stream sites such as North Pine Dam Headwater, Lyons Bridge, Lowood, Walloon and Mt Crosby Weir.

The performance of two stations – 6638 (Wivenhoe Dam 5 m Druck) and 6762 (North Pine Dam 5 m Druck) cannot be determined on a regular basis as their sensors are out of water currently and have been for the entire period. These stations are set up to provide more precise water level information when the water level is at or just above Full Supply Level. A new radar measuring system has been installed at North Pine Dam and similar installations are being incorporated at Wivenhoe Dam. It is recommended that these new measurement instruments be added to the ALERT telemetry network for redundancy purposes, especially at Wivenhoe Dam.

A number of 'Key' stations were duplicated to improve their reliability. These stations are indicated in the following tables:

Rainfall Stations Having Full Backup			
Location	**A Station**	**B Station**	**No. of Days BOTH Stations unavailable**
Mt Pechey	6511	6513	0
Brisbane River at Gregors Ck	6514	6517	22
Somerset Dam Headwater	6593	6590	0
Stanley River at Woodford	6705	6702	0
Wivenhoe Dam Headwater	6639	6636	0
Wivenhoe Dam Tailwater	6643	6641	0
Mt Mee	6690	6701	0
Lockyer Ck at Lyons Bridge	6633	6630	0
Bremer R at Walloon	6550	6742	63
Warrill Ck at Amberley	6651	6653	0
Brisbane River at Lowood	6649	6646	0

It is highly desirable to reinstate the Brisbane R at Gregors Ck rainfall stations as a matter of priority.

River Height Stations Having Full Backup			
Location	**A Station**	**B Station**	**No. of Days BOTH Stations unavailable**
Brisbane River at Gregors Ck	6515	6518	0
Somerset Dam Headwater	6594	6591 6592	0
Stanley River at Woodford	6706	6703	0
Wivenhoe Dam Headwater	6637	6638	0
Wivenhoe Dam Tailwater	6644	6642	0
North Pine Dam Headwater	6761	6762	0
Lockyer Ck at Lyons Bridge	6634	6631	0
Bremer River at Walloon	6551	6743	100
Warrill Ck at Amberley	6652	6654	0
Brisbane R at Lowood	6650	6647	17
Brisbane R at Mt Crosby Weir	6752	6758	43

The situation at Walloon on Bremer River whereby both river height stations were unavailable for 100 days is a major concern. Fortunately, the seriousness of this situation has been mitigated due to the dry season and lack of any significant runoff, however, the situation needs to be remedied as a matter of urgency.

The occurrence of both A and B stations being out of action at the same time has increased when compared to the previous six months.

There remains concern that the gate opening sensors are not configured sufficiently well to provide useful data to confirm required gate operations. The calibration of the sensors and the range of coverage may need to be reviewed to ensure the data obtained is useable.

Overall the performance of the ALERT network has diminished over the past twelve months. A concerted effort is required to ensure the network achieves the desired level of performance and is fit for the purpose of providing reliable information in real time.

6.2 NRW HYDROMET TELEPHONE TELEMETRY SYSTEM - SIS

A copy of the NRW HYDROMET telephone telemetry software has been installed on the FCC computers. This software allows for polling of NRW hydrographic stations to obtain the available NRW rainfall and river height data in the Brisbane River and Pine River valleys.

A complete download of all relevant rainfall and river height data for the Brisbane River and Pine Rive catchments is carried out periodically using the SIS system and compared to the ALERT sensor data. No major problems were noted during this period.

6.3 MANUAL DATA GATHERING FROM DAM OPERATORS

Every week the Dam Supervisors provide a check on the performance of the headwater gauges. The ALERT sensor data is compared to gauge board readings to ensure that a significant 'drift' in the data has not occurred. It is not possible to check all of the 5m Druck sensors at this time because the water level of all dams is below the lower operating range of these sensors.

6.4 RAPIC WEATHER RADAR

The Flood Control Centre continues to receive the RAPIC weather radar images from a direct link to the BoM. The Mt Stapylton Radar has replaced Marburg as the primary site for South-East Queensland. Some problems have been experienced with the system due to the more detailed data available from the new radar during this period.

6.5 BOM QUANTITATIVE PRECIPITATION FORECASTS

Quantitative Precipitation Forecasts (QPFs) are received twice daily via facsimile from the Bureau of Meteorology. These QPFs are provided for both the Somerset and Wivenhoe catchments and also for the North Pine Dam catchments. They have proved a relatively reliable indicator of the likelihood of rainfall in the catchments up to 24 hours in advance.

6.6 SILO METEOGRAMS

Meteograms provide up to seven-day outlooks on weather variables such as temperature, wind and precipitation. The estimates of the weather variables are derived from latest climatic models and the user can specify the location for which the estimate is required. The estimates can also be obtained at any time, making the service ideal for regular short-term guidance of likely weather conditions. This service is available on subscription.

6.7 SMS – SHORT MESSAGE SERVICE

SMS is available through Optus MobileNet Digital which provides convenient message handling options with the mobile phones issued to the Duty Engineers. Duty Engineers regularly use this facility as a means of remote access to key stations or groups of key stations.

7.0 REFERENCES

DNR State Water Projects, 1999, "*Report to South East Queensland Water Board on Flood Events of February and March 1999 at Somerset Dam, Wivenhoe Dam & North Pine Dam*", 14 September 1999.

SunWater, 2001, "*Investigation into Relocation of Flood Control Centre from Mineral House to 120 Edward Street*", November 2001.

APPENDIX A

REVISED COMMUNICATION LIST

3 REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – WIVENHOE DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]				Seqwater/FCC
	Dam Safety and Source Operations Manager	2	2	Robert DRURY					
	Executive General Manager, Operations	3	3	Phil Aldridge					
	Land and Water Quality Manager	1	1	Peter Schneider					
	Chief Executive Officer	3	3	Peter BORROWS					
	Chairman	4	4	Annabelle CHAPLIN					
	Storage Supervisor	1	1	Doug GRIGG					
	Standby Officer	2	2	Allan GEORGE					
	Seqwater On-call Staff (attended 24 hours)	3	3	Seqwater Controller					
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN					Seqwater/FCC
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF					
	Dam Safety Engineer	3	3	Ron GUPPY					
Flood Control Centre (operated by Sunwater)	Senior Flood Operations Engineer	3	3	Rob AYRE					Seqwater/FCC
	Senior Flood Operations Engineer	4	4	John RUFFINI*					
	Flood Operations Engineer	5	5	Terry MALONE					
	Flood Control Room (Operational)	1	1	General Phones					
	Flood Control Room (Not operational)	2	2		[redacted]	Recorded message identifies on-call engineer.			

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
	Back up FCC (Mineral House)	3	3		[redacted]				

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]				Seqwater/FCC
Somerset Regional Council	Local Disaster Response Coordinator	1	1	Robert BAIN					Seqwater/FCC
Ipswich City Council	Local Disaster Response Coordinator	1	1	Andrew UNDERWOOD					Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Ross DRABBLE					
	Local Disaster Response Coordinator	3	3	Arie Van Den ENDE					
Brisbane City Council	Local Disaster Response Coordinator	1	1	Cathy WILSON					Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer					
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON					Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]				Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2						
Ambulance					000				Seqwater/FCC

Notes:	1.	Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.
	2.	Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.

3 REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – NORTH PINE DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]				Seqwater/FCC
	Dam Safety and Source Operations Manager	2	2	Robert DRURY					
	Executive General Manager, Operations	3	3	Phil Aldridge					
	Land and Water Quality Manager	1	1	Peter Schneider					
	Chief Executive Officer	3	3	Peter BORROWS					
	Chairman	4	4	Annabelle CHAPLIN					
	Storage Supervisor	1	1	Brett SCHULTZ					
	Standby Officer	2	2	Malcolm LANE					
	Seqwater On-call Staff (attended 24 hours)	3	3	Seqwater Controller					
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN					Seqwater/FCC
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF					
	Dam Safety Engineer	3	3	Ron GUPPY					
Flood Control Centre (operated by Sunwater)	Senior Flood Operations Engineer	3	3	Rob AYRE					Seqwater/FCC
	Senior Flood Operations Engineer	4	4	John RUFFINI*					
	Flood Operations Engineer	5	5	Terry MALONE					
	Flood Control Room (Operational)	1	1	General Phones					
	Flood Control Room (Not operational)	2	2		[redacted]	Recorded message identifies on-call engineer.			
	Back up FCC (Mineral House)	3	3						

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]				Seqwater/FCC
Moreton Bay Regional Council	Local Disaster Response Coordinator	1	1	Eleanor DAVIDSON					Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Graeme EMMERSON					
Brisbane City Council	Local Disaster Response Coordinator	1	1	Cathy WILSON					Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer					
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON					Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]				Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2						
Ambulance					000				Seqwater/FCC
Notes:	1. Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.								
	2. Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.								

3 REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – SOMERSET DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]				Seqwater/FCC
	Dam Safety and Source Operations Manager	2	2	Robert DRURY					
	Executive General Manager, Operations	3	3	Phil Aldridge					
	Land and Water Quality Manager	1	1	Peter Schneider					
	Chief Executive Officer	3	3	Peter BORROWS					
	Chairman	4	4	Annabelle CHAPLIN					
	Storage Supervisor	1	1	Anthony DAGAN					
	Standby Officer	2	2	Glenn Patterson					
	Seqwater On-call Staff (attended 24 hours)	3	3	Seqwater Controller					
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN					Seqwater/FCC
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF					
	Dam Safety Engineer	3	3	Ron GUPPY					
Flood Control Centre (operated by Sunwater)	Senior Flood Operations Engineer	3	3	Rob AYRE					Seqwater/FCC
	Senior Flood Operations Engineer	4	4	John RUFFINI*					
	Flood Operations Engineer	5	5	Terry MALONE					
	Flood Control Room (Operational)	1	1	General Phones					
	Flood Control Room (Not operational)	2	2			Recorded message identifies on-call engineer.			
	Back up FCC (Mineral House)	3	3						

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]				Seqwater/FCC
Somerset Regional Council	Local Disaster Response Coordinator	1	1	Robert BAIN					Seqwater/FCC
Ipswich City Council	Local Disaster Response Coordinator	1	1	Andrew UNDERWOOD					Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Ross DRABBLE					
	Local Disaster Response Coordinator	3	3	Arie Van Den ENDE					
Brisbane City Council	Local Disaster Response Coordinator	1	1	Cathy WILSON					Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer					
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON					Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]				Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2						
Ambulance					000				Seqwater/FCC
Notes:	1. Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.								
	2. Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.								


SunWater
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