
Independent Review of the NSW State Emergency Service Operational Response

Northern Rivers Floods March 2017



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Abbreviations

AIIMS	Australasian Inter-Agency Incident Management System
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
BoM	Australian Government Bureau of Meteorology
DSEP	Dam Safety Emergency Plan
EMPLAN	Emergency Management Plan
EOCON	Emergency Operations Controller
FAC	Flood Action Card
FRNSW	Fire and Rescue New South Wales
HAZMAT	Hazardous Material
IC	Incident Controller
IMT	Incident Management Team
LEOCON	Local Emergency Operations Controller
LEOC	Local Emergency Operations Centre
NSW RFS	New South Wales Rural Fire Service
NSW SES	New South Wales State Emergency Service
OEH	Office of Environment and Heritage
OOAA	Out of Area Assistance
PMF	Probable Maximum Flood
REMO	Region Emergency Management Officer
REOC	Region Emergency Operations Centre
REOCON	Region Emergency Operations Controller
RMS	Roads and Maritime Services
RTR	Richmond Tweed Region
SEMC	State Emergency Management Committee
SEOC	State Emergency Operations Centre
SEOCON	State Emergency Operations Controller
SEWS	Standard Emergency Warning Signal

Glossary

Annual Exceedance Probability

The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood level (height) has an AEP of 5%, there is a 5% chance (that is, a one-in-20 chance) of such a level or higher occurring in any one year.

Design Flood (or flood standard)

A flood of specified magnitude that is adopted for planning purpose. Selections should be based on an understanding of flood behaviour and the associated flood risk, and take account of social, economic and environmental considerations. There may be several design floods for an individual area.

EMPLAN (Emergency Management Plan)

The object of an EMPLAN is to ensure the coordinated response by all agencies having responsibilities and functions in emergencies.

Essential Services

Those services, often provided by local government authorities that are considered essential to the life of organised communities. Such services include power, lighting, water, gas, sewerage and sanitation clearance.

Evacuation

The temporary movement (relocation) of people from a dangerous or potentially dangerous place to a safe location, and their eventual return. It is a safety strategy which uses distance to separate people from the danger created by the hazard.

Evacuation Order

Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.

Evacuation Warning

Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to warn a community of the need to prepare for a possible evacuation

Flash Flooding

Flooding which is sudden and often unexpected because it is caused by sudden local or nearby heavy rainfall. It is sometimes defined as flooding which occurs within six hours of the rain that causes it.

Flood

Relatively high-water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences, including Tsunami.

Flood Classifications

Locally defined flood levels used in flood warnings to give an indication of the severity of flooding (minor, moderate or major) expected. These levels are used by the State Emergency Service and the Australian Government Bureau of Meteorology in flood bulletins and flood warnings.

Flood Intelligence

The product of collecting, collating, analysing and interpreting flood related data to produce meaningful information (intelligence) to allow for the timely preparation, planning and warning for and response to a flood.

Flood Liable Land (also referred to as flood prone land)

Land susceptible to flooding by the Probable Maximum Flood (PMF) event. This term also describes the maximum extent of a floodplain which is an area of a river valley, adjacent to the river channel, which is subject to inundation in floods up to this event.

Flood of Record

Maximum observed historical flood.

Floodplain Management Plan

A plan developed in accordance with the principles and guidelines in the New South Wales Floodplain Development Manual. Such a plan usually includes both written and diagrammatic information describing how particular areas of flood prone land can be used and managed to achieve defined objectives.

Flood Plan

A response strategy plan that deals specifically with flooding and is a sub-plan of a Disaster Plan. Flood plans describe agreed roles, responsibilities, functions, strategies and management arrangements for the conduct of flood operations and for preparing for them. A flood plan contains information and arrangements for all floods whereas an IAP is for a specific flood/event.

Flood Rescue

The rescue or retrieval of persons trapped by floodwaters.

Flood Watch

A Flood Watch is a notification of the potential for a flood to occur as a result of a developing weather situation and consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and indicates streams at risk. The Bureau will also attempt to estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood Watches are normally issued 24 to 36 hours in advance of likely flooding. Flood watches are issued on a catchment wide basis.

Flood Warning

A Flood Warning is a gauge specific forecast of actual or imminent flooding. Flood Warnings specify the river valley, the locations expected to be flooded, the likely severity of flooding and when it will occur.

Incident Action Plan (IAP)

An action plan for managing a specific flood event. Information from the Local Flood Plan is used to develop the IAP.

Inundation

Properties and/or communities that are submerged by flooding. Inundation is one of the three primary sources of risk in the context of flooding (the other two are isolation and indirect effects).

Local Overland Flooding

Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam

Major Flooding

Flooding which causes inundation of extensive rural areas, with properties, villages and town's isolated and/or appreciable urban areas flooded.

Minor Flooding

Flooding which 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/or townspeople begin to be affected in a significant manner that necessitates the issuing of a public flood warning by the Australian Government Bureau of Meteorology.

Moderate Flooding

Flooding which inundates low-lying areas, requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

NSW SES Local Controller

A controller of NSW SES Units in a local government area appointed under section 17¹.

NSW SES State Controller

The person who has control of the NSW SES.

NSW SES State Operations Controller

The delegated authority appointed by the NSW SES State Controller, responsible for controlling NSW SES state level operations.

Peak Height

The highest level reached, at a nominated gauging station, during a particular flood event.

Probable Maximum Flood (PMF)

The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years).

¹ NSW State Emergency Service Act 1989, Section 3 definitions.

Riverine Flooding

Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam, Riverine flooding generally excludes watercourses constructed with pipes or artificial channels considered as stormwater channels.

Stream Gauging Station

A place on a river or stream at which the stage height is routinely measured, either daily or continuously, and where the discharge is measured from time to time so as to develop a relationship between stage and discharge or rating curve.

Executive Summary

Severe Tropical Cyclone Debbie formed on the 25th March 2017 in the Coral Sea and made landfall as a severe tropical cyclone near Airlie Beach in central Queensland on the 28 March 2017. On the 29 March, it weakened into a low or rain depression over inland Queensland. The low tracked towards south east Queensland over the following couple of days, with the heaviest rain to the south of the system. In the weeks prior to Severe Tropical Cyclone Debbie, the Northern Rivers Region had experienced rainfall that had caused below minor flooding. In effect, this meant that the ground was already soaked and there was limited ability to absorb the additional rainfall.

This event saw the Richmond Tweed Region receive between 600mm – 700mm in two days (30-31 March) over the Tweed and Wilsons River catchment. Initial analysis indicates that rainfall in the Wilsons River Valley is that some of the 24-hour rainfall totals were very rare and close to the 1 in 100-year design rainfalls at Terania Creek (619 mm) and The Channon (573 mm). The Tweed catchment areas indicate that some of the 24-hour rainfall totals were extremely rare and close to the 1 in 1000-year design rainfalls at Couchy Creek and close to the 1 in 500-year design rainfalls for Palmer Road.

Operational statistics, post event, identified that the Northern Rivers March/April 2017 floods was one of the most significant events to impact the Northern Rivers Region in over 40 years. The result was minor to major flooding in every river catchment area with the third highest flood on record for Lismore and Tweed Heads (1954 and 1974 highest recorded flood levels). Murwillumbah levels surpassed any previously recorded floods.

Overall, the NSW SES received in excess of 3,400 requests for assistance and over 1500 emergency service personnel were deployed to the region during the event. 496 recorded flood rescues were performed, 486 within the Richmond Tweed Region, 211 flood rescues were performed by the Lismore City SES Unit and 190 by the Murwillumbah Unit. The SES personnel should be commended for the flood rescue response.

The Review was to provide an assessment of the NSW SES operational preparedness and response at various levels of operational management

Ex-Severe Tropical Cyclone Debbie was expected to significantly impact the Richmond Tweed Region on Friday 31/3/17 and much of the planning centred on a deployment model occurring on Thursday 30/3/17, allowing for travel on the Thursday and commencement of work on the Friday. However, the dynamically changing nature of the storm system has meant that the system hit with devastating effect on Thursday 30/3/17, taking Emergency Services, Bureau of Meteorology and the community by surprise with the volume of rain experienced within a very short timeframe. There is an identified need for greater pre-emptive modelling between the SES and Bureau of Meteorology and this is addressed in **Recommendation 1**.

The Review identified that through the introduction of an improved and streamlined deployment model for SES staff, including a skills register would ensure swifter deployment to operational areas. The introduction of pre-emptive situational report and pre-deployable Incident Management Teams are all discussed in **Recommendations 3, 5 and 9**.

Recommendations 4, 7, 8 and 11 reinforce the need for all members to utilise the NSW SES systems and processes for recording of information and handover procedures. Policy should also be developed around checking/auditing procedures once documents are submitted. Individuals cannot retain information in their head or on locally based systems that are not accessible. Local Flood Action Cards must be in a standardised format and accessible to Units, Region and State Level Incident Management Teams.

There were 496 flood rescues performed during this event. State Operations identified that there was a need for a triage process to be implemented, in consultation with other emergency services to ensure that a risk based approach is implemented, this is addressed in **Recommendation 10**.

The Bureau of Meteorology is a vital link to both the SES and the Community. The information that they supply is not only used by the SES for their Flood Bulletins, community members also access this information online. It is important to ensure that there are specified times for flood peaks or levee overtopping to allow the community to make informed decisions. It is equally as important that if a flood gauge is not working that this is identified in their Warnings from the time that it is discovered. **Recommendations 12 and 13**.

Flood Bulletins are currently issued by the NSW SES to update members/community about forecast changes and possible or likely impact of a flood. **Recommendations 14, 15, 16, 17 and 18** seek to improve the current manner in which flood bulletins are designed/formatted and the effectiveness of the current operating system in the issuing of the bulletins (Incident Management Toolbox). The accuracy of the information contained in the bulletins should also be reinforced.

The levees overtopped at Lismore and Murwillumbah. The Lismore area would ‘normally’ have three separate Evacuation Orders issued. In this instance only one Evacuation Order covering Lismore CBD, North and South Lismore was issued and a timing for the evacuation of the CBD was not placed on the Evacuation Order. The Order was *directing residents to evacuate immediately*. The decision to evacuate was the right decision, however the Evacuation Order should have included a timing for the Lismore CBD evacuation.

The North and South Lismore flood triggers had already been reached when the order was issued. The very real concern was about the evacuation of a community in darkness, in torrential rain whilst in the middle of an unfolding event where the exact rate of rise of the river system was unknown, should the order not be actioned immediately. Post this event, a new procedure, the ‘State Warning and Order Risk Review Procedure’ has been implemented by the Commissioner (**Recommendation 20**).

An Emergency Operations Centre (EOC) is a centre established under the State Emergency and Rescue Management Act at a State, regional or local level as a centre for communication, and as a centre for coordination of operations and support. The Emergency Operations Centre is always a multi-agency facility that operates in support of the nominated combat agency (**Recommendation 22**). The Lismore EOC was located within the evacuation area and this issue is addressed in **Recommendation 21**.

The Australasian Inter-Service Incident Management System (AIIMS) is a system for the management of all incident, imminent or actual, occurring in the natural or built environment;

or for the many other activities that emergency management agencies, and those that support them, may have to deal with. **Recommendations 23 and 24** are critical steps in ensuring training of Incident Management Teams occurs across the State.

The Lismore City (2013) and Tweed Shire (2014) Flood Emergency Sub Plans are vital for the purposes of preparation, planning, response and recovery. **Recommendations 27, 28, 29 and 30** seek to ensure that the plans are contemporary.

The NSW SES relies heavily on community engagement to ensure that education and preparation for a major flood event remains at the forefront. The manner in which communities are engaged has evolved over the years and it is vital that all communities are actively engaged by the Local Units. **Recommendations 31 and 32** seek to address this issue. The NSW SES has introduced a training course for Community Liaison Officer that should be supported further (**Recommendation 26**).

Media, including social media now plays a vital link during emergency situations between emergency responders and the community. The NSW SES must ensure that their Web based systems and process are able to meet the community need for information and that SES staff all understand the importance of media and the supply of information to the media to keep the community informed. **Recommendations 33 and 34** address these issues.

The issue of fatigue management is addressed in **Recommendation 35**. The Murwillumbah Unit property is unsuitable for their use and alternative short-term arrangements for storage of equipment were found to be unworkable. **Recommendation 2** seeks to rectify this issue. **Recommendation 6** supports the SES practice of mentoring for major events.

Land use planning is a vital tool in floodplain management. Floods will create hazardous conditions within a floodplain when the built environment and people interact. The scale of the impact will depend on how the floodplain has been developed (the nature and scope of the development). It is important that land use planning activities in NSW are consistent with National Guidelines and that the NSW SES becomes a recognised authority for land use planning. Recommendation 36 seeks to remedy this issue.

It is important to acknowledge that the NSW SES has a well-deserved reputation for engagement with the community and their response capabilities. The issues that have been identified in the review, seek to improve upon these planning, preparation and response capabilities to better serve the community of NSW. These capabilities can only be enhanced when the Local Council, Community and NSW SES work together to achieve those outcomes. Preparation and Planning for a major event is everyone's responsibility.

Recommendations

Recommendation 1

That the NSW SES considers the placement of a BoM representative within the State Operations Centre for significant events.

Recommendation 2

That the NSW SES, in concert with the Tweed Shire Council locates suitable premises for the NSW SES Murwillumbah Unit.

Recommendation 3

That the NSW SES review their current systems and procedures for Out of Area Deployments to streamline current practices. This would include a 'skills register' for staff and availability.

Recommendation 4

That the NSW SES review their current documentation as it relates to Incident Action Plans, to ensure that a Policy is introduced to ensure reviewing of Incident Action Plans occurs at State Operations.

Recommendation 5

That the NSW SES considers development of a Pre-emptive situation and appreciation model and issue of daily operational readiness levels to ensure the NSW SES is at the highest level of preparedness necessary to deal with any emergency.

Recommendation 6

That the NSW SES continues to endorse the practice of operational mentoring for large scale events. This should be expanded, where possible, to Region level.

Recommendation 7

That the NSW SES

- Implements a formal handover document that clearly identifies who is the Incident Controller;
- ensures that the Incident Controller is clearly identified to all Incident Management Team members.

Recommendation 8

That the NSW SES ensures that:

- All Regions are fully utilising the Incident Management Toolbox
- Placement of records/templates etc on the central system, not the local system where there is limited access,
- Ensuring that individual flood knowledge is captured and documented centrally and electronically.

Recommendation 9

That the NSW SES consider the implementation of a pre-deployable Incident Management Team capability model across the State.

Recommendation 10

That NSW SES considers the implementation of a triage procedure for flood rescues, in consultation with other Emergency Services for a standardised risk based approach to flood rescue.

Recommendation 11

That the NSW SES

- considers an amendment to their current Flood Action Cards to include an additional column for the date/time and who performed the action (once suitable consultation with Regions/Units occurs)
- ensures that all Local Flood Action Cards are in electronic format and centrally accessible

Recommendation 12

That the Bureau of Meteorology uses a specified time for levee overtopping or flood peak in the release of the Flood Warnings as per the NSW Flood Plan.

Recommendation 13

That the BoM include notification of faulty gauges on all subsequent Flood Warning Notices, rather than simply removing the gauge reading from the Flood Warning Notices.

Recommendation 14

That the NSW SES considers a review of the design of the Flood Bulletins to have levee overtopping information clearly identified at the top of the bulletin.

Recommendation 15

That the NSW SES reinforces with staff the importance of having the issued time on the Flood Bulletin, as opposed to the prepared time.

Recommendation 16

That the NSW SES reinforces with staff the importance of ensuring data on Flood Bulletins is accurate.

Recommendation 17

That the NSW SES reviews the format of the current Flood Bulletins, through the Warnings Working Group.

Recommendation 18

That the NSW SES reviews the effectiveness of their current operating system re the issuing of Bulletins through their Website Warnings Working Party.

Recommendation 19

That the NSW SES ensures that there are sufficient staff trained and proficient in the use of Emergency Alert.

Recommendation 20

That the NSW SES formalises the new process for the issuing of Evacuation Orders into Policy.

Recommendation 21

That NSW SES notifies the SEMC Emergency Operations Centres Working Party of the issues associated with the Lismore City Emergency Operations Centre.

Recommendation 22

That the NSW SES considers reinforcing the need amongst staff to ensure that when an EOC is established, that an appropriate liaison officer is provided.

Recommendation 23

That the NSW SES continues to support the development of staff through AIIMS training.

Recommendation 24

That the NSW SES raises the issue of Multi-Agency Incident Management Teams or co-location of Incident Management Teams and Emergency Operations Centres with the State Emergency Management Committee.

Recommendation 25

That the NSW SES implements a calendar for annual exercising for all Region Incident Management Teams.

Recommendation 26

That the NSW SES continues to support the Community Liaison Officer training course.

Recommendation 27

That the Lismore City Flood Emergency Sub Plan 2013 is revised to include a definition of Incident Controller.

Recommendation 28

That the Lismore City Flood Emergency Sub Plan 2013 annexures and maps are updated as they currently reflect the Lismore City Local Flood Plan 2006.

Recommendation 29

That the Tweed Shire Flood Emergency Sub Plan 2014 is revised to include a definition of Incident Controller.

Recommendation 30

That the Tweed Shire Flood Emergency Sub Plan 2014, Volume 2, annexures and maps are updated as they currently reflect the Tweed Shire Local Flood Plan 2008.

Recommendation 31

That the NSW SES liaise with the appropriate NSW Government Agencies to ensure stronger linkages are forged at a local level between emergency responders, local councils and community development professionals.

Recommendation 32

That the NSW SES supports the additional funding for an additional community engagement staff member for the Richmond Tweed Region.

Recommendation 33

That NSW SES ensures that media ‘blackouts’ do not occur during major events, rather the media is harnessed to ensure the timely delivery of messaging.

Recommendation 34

That the NSW SES Warnings Working Group addresses the issues identified with the NSW SES website and ensure that the Website is tested under operational conditions to ensure it meets the NSW SES systems requirements.

Recommendation 35

That the NSW SES reinforce existing policy on fatigue management ensuring that members understand why it needs to be enforced as it is not only for their safety but for their mental wellbeing. That the NSW SES considers placement of a designated safety officer as part of the Incident Management Team.

Recommendation 36

That the NSW SES becomes a recognised authority for land use planning purposes, having greater involvement in floodplain development with Local Councils and that their input is mandatory before any consent by council is given in flood planning areas.

Terms of Reference

The objective of the review is to provide an assessment of the Service's operational preparedness and response at various levels of operational management.

The scope of the review is focused only on the events and the information provided in relation to the operational response during the period 14:28 on 28 March 2017 and 00:00 on 2 April 2017 in the Lismore and Murwillumbah areas and supporting activities at a Region and State level of operations. It is not intended to be a review of the broader weather event, other emergency service agencies, or other areas impacted by the weather event.

The scope of the review will encompass the following topics:

1. Internal operational preparedness at the Unit, Region and State levels
2. Operational response at each of the levels described- i.e. what actually happened on the ground?
3. An assessment of the timing and content of Bureau of Meteorology products issued through the period 28 March 2017 to 2 April 2017.
4. The warnings and other information provided to the public by the NSW SES during the period 28 March 2017 to 2 April 2017.

In reviewing the issues, the following areas will require close examination to inform a fuller set of recommendations which the Service can consider:

1. Review of the timing and content of the Lismore Local Flood Plan with a view to establishing:
 - a. Potential or planned response as documented
 - b. Actual response by the NSW SES Lismore Unit
 - c. Actual response by the NSW SES Richmond Tweed Region
 - d. Flood warning products, including available plans specific to the hazard.
2. Review of information contained in various internal NSW SES documents including Flood Intelligence Cards
3. Review of the NSW SES Warning products issued in support of Bureau of Meteorology products including but not limited to
 - a. The method and timing of those warnings;
 - b. The methods applied or not applied in provision of those warnings; and
 - c. Consideration as to the suitability of Emergency Alert/SEWS under the specific circumstances that existed.
4. Community Engagement activities undertaken pre-event at both Unit and Region level to gauge community preparedness and resilience
5. The application of AIIMS within the respective areas, whether that system applied, and if so, to what capacity and level of effectiveness.

Background

Emergency Management Arrangements

Well established emergency management arrangements exist within the State and are established under the *State Emergency and Rescue Management Act 1989* (SERM Act). These arrangements cover aspects of prevention of, preparation for response to and recovery from emergencies.

The SERM Act details the planning and management structure in relation to emergency management including the establishment of emergency management Regions and Local areas.

The SERM Act establishes the State Emergency Management Plan (EMPLAN) as an ‘All Agencies, All Hazards’ document which identifies combat agencies to control the response to particular emergencies and details other response and support coordination arrangements.

These arrangements are designed for emergency management operations to be conducted on a decentralised basis at the local level first. The Regional and State levels of the emergency management structure are available to provide support and additional resources as required and to only assume operational control when a higher level of control is essential.

EMPLAN identifies, in relation to each different form of emergency, an agency (known as a combat agency) primarily responsible for controlling the response to a particular hazard. In New South Wales, a combat agency has been nominated for each of the common emergencies. Responsibility for the control of emergencies for which no combat agency has been nominated is vested in the respective Emergency Operations Controller (e.g. earthquakes, landslides).

The NSW SES is the nominated combat agency for flood, storm and tsunami.

Organisational Overview

The NSW SES is divided into 245 Units (subject to change) and 17 Regions which are based on the major river systems. Each Region has a Region Controller who is responsible for the operational management and coordination of emergency flood and storm response, including planning, training and operational support.

Control of operations can be conducted at either the Unit, Region or State level dependent on the level of complexity of the event. Each Region Headquarters is a fully functional Operations Centre supported by volunteers who assist with training, planning and operational functions². Each Unit has a varying capacity to conduct larger scale operations from its Unit Headquarters. The NSW SES Incident Management Policy (2016) states:

*“Incidents occur on a continuum, from the routine everyday incident to the extreme events. They vary in scale, complexity, duration, and the number of agencies and resources involved. **The NSW SES manages incidents at the lowest possible/effective level.** A single Incident Controller of the appropriate skill and experience level must be appointed to take responsibility for managing all activities related to an incident”³.*

² NSW State Emergency Service. <http://www.NSW.SES.nsw.gov.au/>

³ NSW SES Incident Management Policy (2016) pg. 14

In line with the Australasian Inter-Service Incident Management System (AIIMS) principals, the NSW SES uses three classification levels for events, Level 1 being the least complex and small-scale event, to Level 3 being the highest and most complicated. The March 2017 Northern Rivers flood was classified as a Level 3 event. This was recorded on the Incident Action Plans from affected Regions. There were three affected NSW SES Regions:

- Richmond Tweed
- Clarence Nambucca and
- Namoi North West

Region/s & Units impacted

The Review concentrated only on the NSW SES Richmond Tweed Region (RTR), specifically the Lismore City and Murwillumbah Units as per the Terms of Reference. The RTR falls under the NSW SES Director Operations East and consists of the following units:

- Ballina
- Broadwater
- Casino
- Coraki
- Kyogle
- Lismore City
- Mullumbimby
- Murwillumbah
- Tabulam
- Tweed Heads
- Tweed Coast
- Urbenville and
- Woodbine.

State Headquarters (SES SHQ)

The State Headquarters for the NSW SES is currently situated in Regent Street, Wollongong. Within the SHQ there are a number of key departments which report through the chain of Command directly to their respective Director and if necessary to the Deputy Commissioner and/or Commissioner.

The SHQ has a total of approximately 230 paid staff working throughout. The SHQ also houses the State Operations Centre (SOC) for the NSW SES. Additionally, the Operations Center operates on a 24 hour, 7 days per week, 365 days per year and deals with all calls for assistance from the people of NSW. The main function of the SHQ is to provide support to the volunteers and the people of NSW.

The SOC maintains a strategic command and state coordination function to provide NSW communities with emergency management support when faced with disasters (flood, storm and tsunami). This support includes political management, state level media and community engagement.

The SOC provides a central collection, collation and monitoring location for situational awareness and intelligence to assist in preparing communities for natural disasters. The SOC also facilitates incoming and outgoing information to allow for appropriate coordination and planning at all levels of the service.

During high pressure and extended operations, existing functionality within the Operations Centre (level 5) is expanded and a SOC Incident Management Team (IMT) is established. In addition, some areas of the IMT may require supplementation with representation from other key functional Agencies and authorities as identified under the SERM Act 1989 as amended⁴.

In August 2016, the State Operations Centre was integrated into Operations and became known as “State Operations”. The Operations Centre became known as the State Operations Centre and it has the ability to expand or scale up Incident Management Team support as required.

The SOC has the ability to physically expand to another floor within the State Headquarters. This will be overcome shortly with the move to the new facilities.

The SOC removed the concept of being open or closed as this alluded to the fact that the NSW SES needed to open a room to be operational whereas the SOC Team is operational 24/7/365⁵. Under the new structure, the SOC Team is solely responsible for the operational preparedness of the State and the response to any threat/event.

External Agencies

NSW Police Force

Northern Region

The NSW SES Region of Richmond Tweed is within the Northern Region Command for the NSW Police Force. Northern Region Headquarters is located at Newcastle and is divided into 12 Local Area Commands.

The Region Commander (Assistant Commissioner) is the Region Emergency Operations Controller. The Region Emergency Management Officer (REMO) commenced employment on the 13 March 2017. Whilst he was new to this role, he had previously performed in the role of Superintendent/Zone Commander with FRNSW so was familiar with Emergency Management principles.

Richmond Local Area Command

The Richmond Local Area Command is situated at 5 Zadoc Street, Lismore. There are 14 police stations within the Richmond Local Area Command. The Lismore Police Station is operational 24/7.

The Local Area Commander at the Richmond Local Area Command is the Local Emergency Operations Controller.

⁴ Working in the State Operations Centre, Familiarisation Guide 2015 Pg. 3

⁵ SES Email 11 August 2016 to all State Operations Team members

Tweed-Byron Local Area Command

The Tweed-Byron Local Area Command is situated at 52 Recreation Street Tweed Heads. There are 7 police stations within the Local Area Command. The Tweed Heads Police Station is operational 24/7.

The Local Area Commander at the Tweed-Byron Local Area Command is the Local Emergency Operations Controller, however for this event did not operate in this role, but as a Forward Commander for the Richmond LEOCON.

NSW Rural Fire Service

The NSWRFSS has two management areas covering the area in discussion these are:

1. Northern Rivers – (Kyogle, Lismore, Richmond Valley LGA's)
2. Far North Coast – (Tweed, Byron, Ballina LGA's)

Each area has a fully functional Fire Control Centre (FCC) adequately equipped to manage large scale (Level 3) bushfire emergencies.

The location of these FCC's are as follows:

1. Northern Rivers – Neville Bienke Memorial Drive Casino 2470
2. Far North Coast – Lundberg Drive Murwillumbah 2484

Staff resources located at each facility are as follows:

1. Northern Rivers – 6 Staff, 53 Rural Fire Brigades, 1133 Volunteers
2. Far North Coast – 6 Staff, 21 Rural Fire Brigades, 601 Volunteers

Fire & Rescue NSW

Lismore Fire District:

362 Lismore Station (Permanent and Retained)

Permanent: 5 Station Officers and 20 Firefighters, 24 hr roster over 4 Platoons, each Platoon SO and 3 FF's as minimum.

Retained: 1 x Captain, 1 x Dept Capt and 15 Retained Firefighters. Total Actual Establishment at time of event was 16 inclusive.

Appliances: Permanent staff on Class 3. Retained staff on Class 2.

316 Goonellabah Station: (Retained)

Retained Establishment: 1 x Captain, 1 x Deputy Captain and 16 Retained Firefighters. Total Actual Establishment at time of event was 15 inclusive.

Appliances: Class 2, Pump & Intermediate Hazmat Van & vessel.

Tweed Heads Fire District:

468 Tweed Heads Station

Permanent: 5 Station Officers and 20 Firefighters, 24 hr roster over 4 Platoons, each Platoon SO and 3 FF's as minimum. Appliance: Class 3

Retained FF Establishment 1 x Captain, 2 x Dept Capt and 13 Retained Firefighters. Total Actual Establishment at time of event was 16.

Appliances: Class 2 and Intermediate Hazmat Van & vessel.

514 Banora Point Station

Retained FF Establishment 1 x Captain, 1 x Dept Capt and 14 Retained Firefighters. Total Actual Establishment at time of event was 16.

Appliance: Class 2, Call sign 514 Pump

NSW Ambulance

Lismore Ambulance station is located at 212 Keen Street. The station has approximately 23 staff who operate on a 24/7 basis. The station premises are also used for education purposes and is where the Zone Office is located. Murwillumbah Ambulance station is located at 27 Queen Street. The station has approximately 8 staff who operate on a day roster and after hours call out.

The Weather Event

Severe Tropical Cyclone Debbie formed on the 25th March 2017 in the Coral Sea and made landfall as a severe tropical cyclone near Airlie Beach in central Queensland on the 28 March 2017. On the 29 March, it weakened into a low or rain depression over inland Queensland.

The low tracked towards south east Queensland over the following couple of days, with the heaviest rain to the south of the system. In the weeks prior to Severe Tropical Cyclone Debbie, the Northern Rivers Region had experienced rainfall that had caused below minor flooding. In effect, this meant that the ground was already soaked and there was limited ability to absorb the additional rainfall.

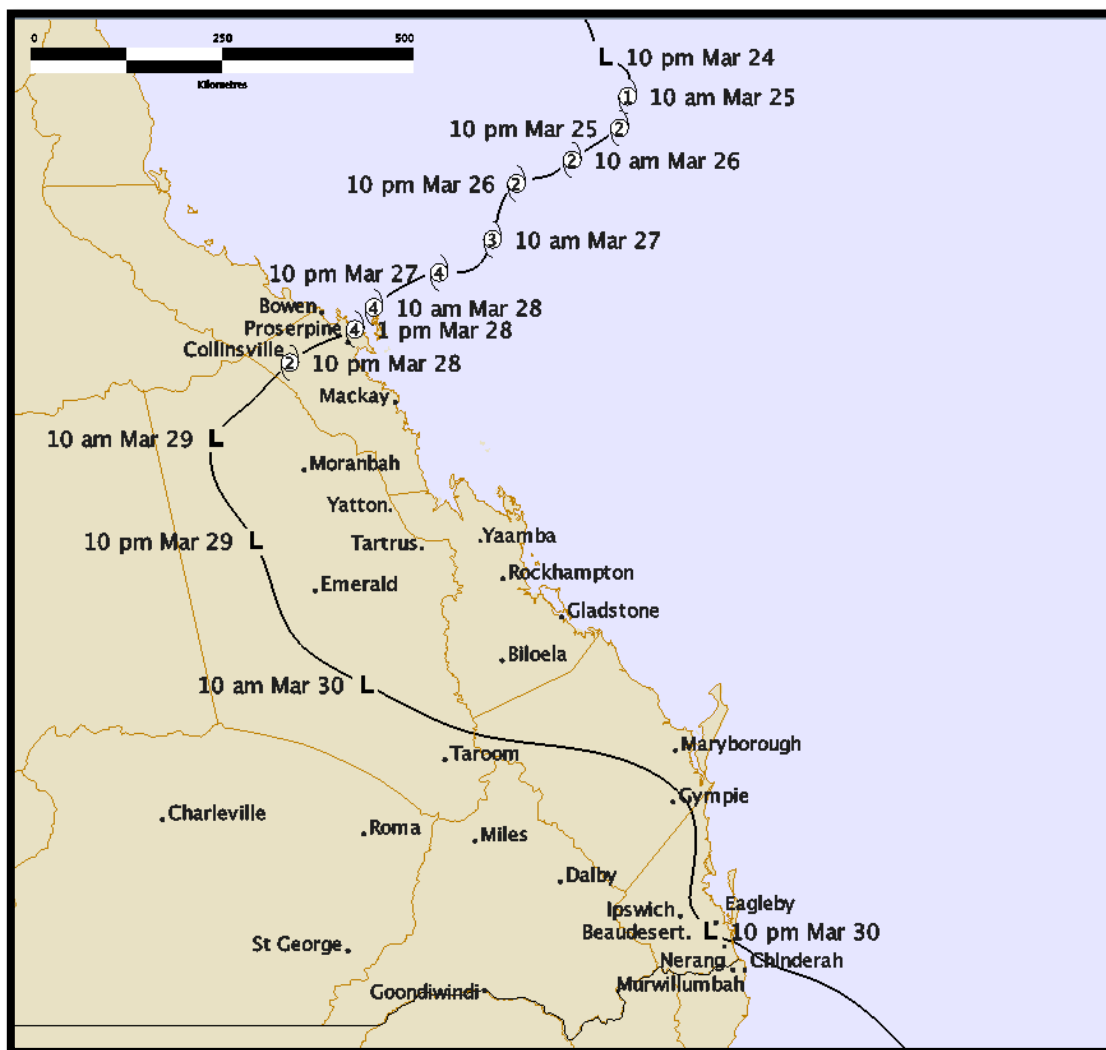


Figure 1: Track of the system as a Tropical Cyclone Debbie and a Tropical Low and from 25 to 30 March 2017 (Bureau of Meteorology)

Local Government Areas affected

Lismore

The City of Lismore is a Local Government area in the Northern Rivers region of New South Wales and covers an area of some 1,290 km² with a population of approximately 44,740 (2015 census). Lismore City is in the Richmond River basin, approximately 700 kilometres north of Sydney. The Richmond River basin consists of two distinct river catchments: the Wilsons River Catchment on the north east of the basin (north of Lismore), and the larger Richmond River catchment on the western and southern sections of the river basin.

The Wilson's River catchment: Lismore is located at the southern end of the catchment at the confluence of Wilsons River and Leicester Creek. The total catchment area at Lismore is approximately 1,400 square kilometres (the Leicester Creek sub-catchment has an area of 900 square kilometres, and the Wilsons sub-catchment an area of 500 square kilometres).

These two tributaries themselves have several contributing arms, each of approximately the same stream length and catchment area. The Wilsons River and Coopers Creek drain the eastern section of the catchment. Leicester Creek, and its tributaries Terania Creek, Goolmangar Creek and Back Creek, drain the central and western sections. This catchment configuration, combined with the steep terrain of the catchment, results in a rapid concentration of rainfall run-off at Lismore; often with coincident peak flows from the upstream catchments.

The Lismore City Flood Emergency Sub Plan 2013 clearly divides the area into three main flood sectors, those being:

- Central Lismore
- North Lismore and
- South Lismore.

There are also clearly identified flood behaviour and consequences of overtopping of the levy at peak heights of 11.3m, 11.8m and 12.4m⁶. The plan also highlights the indicative peak flow travel times.

Lismore Flood Levee

The Central Business District levee was completed in April 2005 at a cost of approximately \$20m. The CBD levee is 1.8km in length from Browns Creek to Gasworks Creek was designed to protect the CBD from a 1 in 10-year flood⁷. There are 31 gates that need to be closed along the levee at varying stages depending on the river level. The first of the gates are closed at approximately 4m and the last ones closed at approximately 8m. Businesses with gates on their premises are contacted early.

There are 5 major pump stations along the levee,

- the one that most are familiar with is probably Browns Creek pump station.

The others are situated

- adjacent to the Transit Centre – tractor
- at the rear of the old RSL in Victoria Street
- Gasworks Creek (off the southern end of Keen Street)

⁶ Lismore City Flood Emergency Sub Plan 2013 pg. 60-62

⁷ Information from Lismore City Council Flood Safe presentation March 2017.

- Hollingworth Creek which keeps the water out of South Lismore.
- There are also three small pumps that are installed in stormwater pits at low points to pick up any water that is trapped behind the levee.



Figure 2: Brown Street Pumping Station

The lowest and first overtopping point is at the spillway opposite the old Police Station in Molesworth Street. However, even though the design height of the levee is 10.95m at the spillway the levee may actually overtop when the official Wilsons River Height gauge at the Rowing Club is around 10.2 – 10.6m (with 10.2m probably being the worst case) and depends on the amount of rain falling in the Leicester and Wilson catchments and the flood gradient⁸.

The gradient varies from flood to flood. The variable level at which the river will overtop is due to the overtopping point being located some 500m or so up river from the official gauge site.

The second overtopping point is at Gasworks Creek south of the CBD which has a design level of 11.3m.

The third overtopping point is in Spinks Park where the levee wall has a design level of 11.6m. Inundation is staged in order to minimise any impact inside the levee.

Tweed Shire

The Tweed River Catchment (Basin No. 201) is located in the Tweed Shire and the most northerly coastal region of NSW. The Tweed Valley consists of flat floodplain land of alluvial sediments, surrounded by higher ground of bedrock. The extensive floodplains form an important cane growing area. The Tweed River has a length of approximately 50 km and a catchment area of about 1303 square kms. The Tweed Valley has suffered frequent and

⁸ Information from Lismore City Council Flood Safe presentation March 2017.

extensive flooding and in major floods, such as occurred in 1954 some 120 to 130 square kilometres were inundated and about 400 houses and farms were isolated by floodwaters.

The basin comprises the catchment areas of the North, Middle and South Arms of the Tweed River – referred to as the Rous, Oxley and Tweed Rivers respectively. Several minor local catchment areas occur between the Tweed River and the Qld/NSW border. The catchment includes the smaller coastal creeks (Cudgen, Cudgera and Mooball creeks) immediately south of the Tweed as far as Billinudgel. The river flows generally in a north-easterly direction and reaches the sea at Point Danger, Tweed Heads. As stated above the Tweed River (Main Arm) is joined by several tributary systems⁹:

- a. Oxley River, which joins at Byangum, about 5 km upstream of Murwillumbah.
- b. Dunbible Creek, which joins upstream of Murwillumbah.
- c. Rous River, which joins at Tumbulgum.
- d. Terranora and Cobaki Broadwaters which join 2 km upstream of the mouth at Tweed Head via Terranora Inlet along with Duroby, Tomewin Catchments and Ukerebagh Passage.

Murwillumbah

Murwillumbah is situated on the Tweed River approximately 8 kilometres east of the junction of the Tweed and Oxley Rivers. The Murwillumbah area extends from Condong in the north to Bray Park in the south west. The Tweed River divides South Murwillumbah from the Murwillumbah township.

The town has a population of 7,696 and some 130 commercial premises. There is a local knowledge and experience with flood within the community. The March 1974 flood (5% AEP), prior to construction of levees, had a peak height of 5.9m (Murwillumbah gauge, 201902) affecting much of the town and flooding the CBD to between 1 and 2.5 metres. About 490 houses are flood prone¹⁰.

Most of the houses in Murwillumbah which are protected by the main town levee have floor levels above the maximum recorded flood height of 6.1m (Murwillumbah gauge, 201902). The South Murwillumbah levee protects about 150 houses and a population of about 400. The town has three levees, which offer some protection to the residents.

The entire township of Murwillumbah will become isolated by a moderate flood event. The Tweed Valley Way will be impassable at several locations including between Tumbulgum and Murwillumbah when flood levels exceed 3.5m -4.0m on the Murwillumbah gauge. The CBD of Murwillumbah is a high flood island with individual property owners becoming trapped in raised houses in a flood event of 1% AEP¹¹.

⁹ Tweed Shire Flood Emergency Sub Plan 2014 Pg. A1

¹⁰ Tweed Shire Flood Emergency Sub Plan 2014 Pg. B7

¹¹ Tweed Shire Flood Emergency Sub Plan 2014 Pg. B7

Murwillumbah Levee system

A system of levees exists to protect Murwillumbah from flooding up to certain heights. These include:

Murwillumbah Levee, with crests heights related to the Murwillumbah gauge (AWRC No. 201902) and which vary along the levee, was originally designed to protect to the 100 YR ARI flood event of 6.5 metres AHD at the gauge, but has been evaluated to protect to the 65-80 YR ARI. The Murwillumbah Levee was implemented to its current height in the early 1990's. There are three public access gates along the Murwillumbah levee which require closure by Tweed Shire council.



Figure 3: Commercial Road Levee wall (Murwillumbah)

South Murwillumbah Levee, with crests heights related to the Murwillumbah gauge (AWRC No. 201902) also vary along the levee, but is designed to protect to approximately the 20% AEP flood level of 5.00 metres at the gauge. Prior to the levee overtopping, water will come across Budd Park and Alma Street into the industrial and then the urban area at approximately 3.2 metres on the gauge. In January 2008, a peak height of 4.87m AHD was reached and the South Murwillumbah levee did not overtop at this height.

East Murwillumbah Levee (raised in 2006 to provide 1% flood protection) with crests heights related to the Murwillumbah gauge (AWRC No. 201902) also vary along the levee, but is designed to protect to approximately the 1% AEP flood, which corresponds with a levee crest height of approximately 6.5 metres AHD on the Murwillumbah gauge.

Tumbulgum and Condong

The village of Tumbulgum is located 10km downstream of Murwillumbah on the eastern bank of the Tweed River. The village is opposite the confluence of the Rous River and has no levee protection and is flood liable.

The village of Tumbulgum consists of 94 houses with a population of 330 and six commercial premises. Residents possess a local knowledge and experience with flood within the community. Ground level flooding in the village occurs about once in 3 years and a 1% AEP flood would necessitate all residents being evacuated¹².

The village of Condong is located 4km downstream of Murwillumbah. The village has 153 houses with a population of 250. Low riverside levees protect the sugar mill from low level flooding and all houses have floor levels above the major flood level. A 1% AEP flood would affect all residential and commercial premises, including the sugar mill.

Due to closure of access and egress routes surrounding the village of Tumbulgum, if a decision is made to evacuate the village of Tumbulgum, the evacuation will be required to be commenced prior to the evacuation of the village of Condong¹³.

¹² Tweed Shire Flood Emergency Sub Plan 2014 Pg. B8

¹³ Tweed Shire Flood Emergency Sub Plan 2014 Pg. B8

Preparedness

Bureau of Meteorology

Arrangements for the emergency management of flooding in New South Wales are set out in the New South Wales State Flood Plan¹⁴ (March 2015) and the Bureau's Flood Warning Service Specification¹⁵.

As agreed by State Agencies both directly and through the NSW State Emergency Management Committee (SEMC), the Bureau of Meteorology's (BoM) main role is to act as the prediction agency for riverine flooding, including the collection and provision of real time rainfall and river level data (from Bureau and 3rd party networks), and to formulate and issue official forecasts and warnings.

The BoM flood warning service centres on two specific flood forecast products - *Flood Watch* and *Flood Warning*.

A *Flood Watch*: Provides advice of potential riverine flooding to emergency services and communities at risk of flooding. *Flood Watches* are issued when the combination of forecast rainfall and catchment or other hydrological conditions indicate that there is the potential for flooding. Flood Watches are issued up to 24-36 hours in advance of likely flooding. The Bureau will also estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood watches are issued on a catchment wide basis.

Flood Warning: A Flood Warning is a gauge specific forecast of actual or imminent riverine flooding. Flood warnings specify the river valley, the locations expected to be flooded, the likely severity of flooding and when it will occur. The Bureau issues advice that riverine flooding is occurring or expected to occur at specific locations on defined criteria which are agreed in the Flood Warning Service Level Specification and in the NSW State Flood Plan.

As outlined in the NSW State Flood Plan (Section 5.3.3 d), the scope of the Bureau's agreed flood warning services in NSW does not include warnings for local overland and/or rapid onset creek flooding. The potential for this type of local creek flooding to occur is captured by the "heavy rainfall" statement when it is included in the Bureau's *Severe Weather Warnings*.

In the preparation for major events, it would greatly assist the NSW SES in their preparation and response to have a representative from the BoM in the NSW SES State Operations Centre for the duration of the event. The intensity of the rainfall could have been highlighted and an appropriate response initiated more rapidly. It is understood that negotiations are currently underway between the NSW SES and BoM to have a BoM officer placed in the SOC during major events and having BoM staff on standby to move forward to the region and/or regions of greatest threat.

Recommendation 1

That the NSW SES considers the placement of a BoM representative within the State Operations Centre for significant events.

¹⁴ NSW State Flood Plan.

¹⁵ Bureau of Meteorology, Service Level Specification for Flood Forecasting and Warning Services in NSW

In preparation for the event, the BoM issued the following Flood Watches (summarised):

Date	Time	Product/Action	Prediction
28/3/17	2.28pm	Flood Watch 1	Tweed Valley – moderate to major flooding Richmond – Wilsons Valley – moderate to major flooding
29/3/17	10.39am	Flood Watch 2	Tweed Valley – moderate to major flooding Richmond – Wilsons Valley – moderate to major flooding
30/3/17	8.29am	Flood Watch 3	Richmond – Wilsons Valley – moderate to major flooding (Tweed Valley did not appear on document)

Table 1: BoM Flood Watches Wilsons River/Tweed River

The following severe weather warnings were also issued by the BoM (summarised):

Date	Time	Product/Action	Prediction
29/3/17	9.57am	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 100mm some areas up to 200mm
29/3/17	4.37pm	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 100mm some areas up to 200mm
29/3/17	10.41pm	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 100mm some areas up to 200mm
30/3/17	4.58am	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 100mm some areas up to 250mm
30/3/17	10.42am	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 200mm some areas up to 350mm

30/3/17	12.44pm	Severe Weather Warning	Heavy rainfall and damaging winds Heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 200mm some areas up to 350mm
30/3/17	4.11pm	Severe Weather Warning	Heavy rainfall and damaging winds Very heavy rainfall which may lead to flash flooding is expected in northern parts of the coast Thursday and Friday. 24 hour totals in excess of 200mm some areas up to 350mm
30/3/17	4.24pm	Severe Weather Warning	Reissue of above
30/3/17	10.09pm	Severe Weather Warning	6-9-hour rainfall totals of about 100mm are expected over parts of the Northern Rivers district, possibly in excess of 150mm
31/3/17	4.12am	Severe Weather Warning	Destructive winds

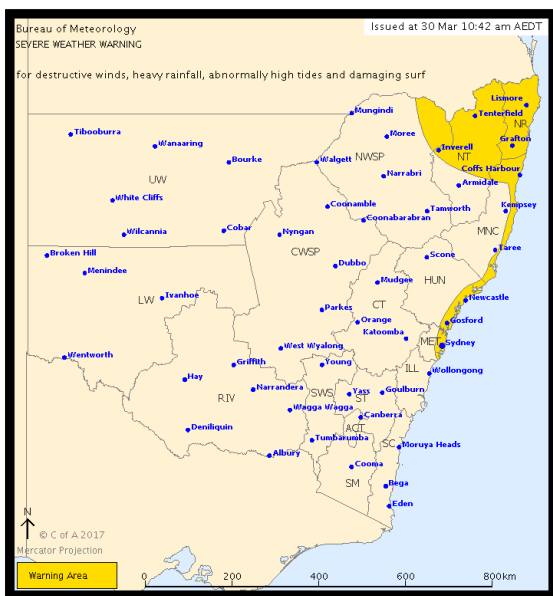


Figure 4: 30/3/17 at 10.42am (BoM)

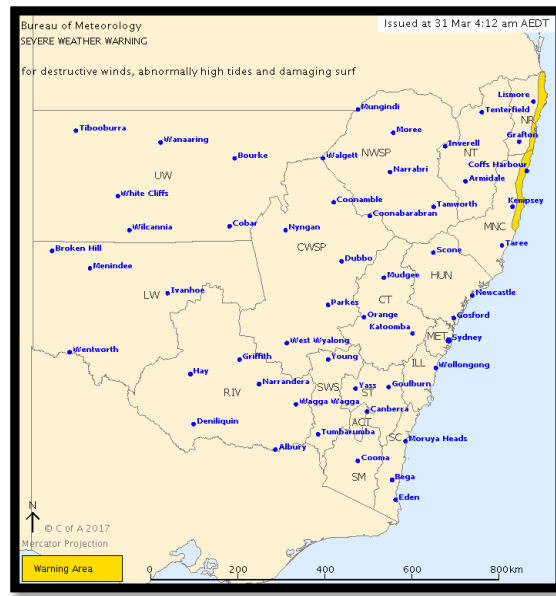


Figure 5: 31/3/17 at 4.12am (BoM)

Unit Preparations

Lismore City SES Unit

The Lismore City SES Unit is located at 61 Brunswick Street, Lismore and consists of a multiple room property with multiple sheds attached. The Local and Unit Controllers were both working from the Lismore City SES property for this event. The Lismore City Flood Emergency Sub Plan¹⁶ states:

NSW SES Lismore City Local Controller.

The NSW SES Lismore City Local Controller is responsible for dealing with floods as detailed in the State Flood Plan, and will:

Preparedness

- a. Maintain a Local Headquarters at 61 Brunswick St, Lismore in accordance with the NSW SES Controllers' Guide and the NSW SES Operations Manual.*
- b. Ensure that NSW SES members are trained to undertake operations in accordance with current policy as laid down in the NSW SES Controllers' Guide and the NSW SES Operations Manual.*
- c. Coordinate the development and operation of a flood warning service for the community.*
- d. Participate in floodplain risk management initiatives organised by the Lismore City Council.*
- e. **Coordinate a public education program.***
- f. Identify and monitor people and/or communities at risk of flooding.*
- g. Ensure that the currency of this plan is maintained.*

The Lismore City Unit consists of an effective strength of approximately 60 volunteers, of which approximately 35-40 were utilised for this event. This number is comparative with volunteer availability across the State. The Unit has 5 boats and 2 'Arc Angles' (boats) and all boats were used during the event.



Figure 6: Lismore City Unit SES

¹⁶ Lismore City Flood Emergency Sub Plan 2013 Pg. 2

In preparation for the event, on the Monday morning (27/3/17) the Local Controller contacted Richmond Tweed Region Headquarters. On Tuesday afternoon, a teleconference was conducted with RTR and discussions took place around the flood intelligence. On Tuesday (28/3/17) contact was also made with Lismore Council to ensure the availability of sandbags. The unit also ensured that all boats were back in service from the last event and fully functional and ready to operate during this event.

The unit has also been preparing Flood Action Cards for the past twelve months. The draft Flood Action Cards indicate certain actions that must be undertaken when the flood reaches different flood levels. The Flood Action Cards are discussed separately below in the report.

Community engagement prior to this event is also covered separately later in this report.

Murwillumbah SES Unit

The Murwillumbah SES Unit is located at 12 Kyogle Rd, Murwillumbah, this is a shared facility with the NSW Rural Fire Service. The property consists of multiple rooms and garages/sheds attached. The A/Unit Controller for this event received official notification of the impending event on Tuesday (28/3/17). On the 28/3/17 the Unit Controller also received an email from the Richmond Tweed Region Controller at 5.41pm informing them that an Acting Local Controller (an ex Region Emergency Management Officer) would be appointed effective immediately for the Tweed and Byron Shires¹⁷.

As the Local Controller was new to the area, they contacted Unit Controllers by email informing them that they were available for advice and assistance if required and they went to the Region HQ as they believed they would be of more benefit there¹⁸.

The Tweed Shire Flood Emergency Sub Plan has the same responsibilities for the Local SES Controller as the Lismore City Plan.

The Murwillumbah Unit consists of approximately 40 active members, of which approximately 35 were utilised at various times (6 staff were directly affected by the floods) for this event. The unit has 2 'V' hull boats and one solid boat.

The Murwillumbah SES Unit is located on Council owned land at 12 Kyogle Road, Murwillumbah and is situated at the base of an abandoned quarry. In 2012, the Unit sustained damage to its shed area because of a landslip during a major storm event. The rear shed bay was demolished and a concrete barrier installed to prevent further damage. Another minor landslip occurred in 2013 and November 2016 but this only required a clean-up of the site.

Tweed Shire Council addressed the lost garaging space by covering the cost of temporary off-site garaging in Cliffords Lane, South Murwillumbah. Whilst this was a less than ideal solution, the location was close to the main town area and the equipment stored there was readily accessible.

The Murwillumbah SES Unit has vacated the shed bays losing a further 6 vehicle/boat/trailer undercover storage areas and only two undercover bays remain in use. Most of the

¹⁷ Email Region Controller to all RTR Unit Controllers 28/3/17 at 5.41pm

¹⁸ Email Peter Mair to Unit Controllers 28/3/17 at 11.58pm

Murwillumbah vehicles, flood rescue boats, trailers, chainsaws, generators and equipment need to be stored off-site. As the existing off-site garaging mentioned above was insufficient to hold this additional equipment, Tweed Shire Council has provided a larger off-site facility in the new Industrial area at Honeyeater Circuit, South Murwillumbah and all off-site equipment has been centralised here.

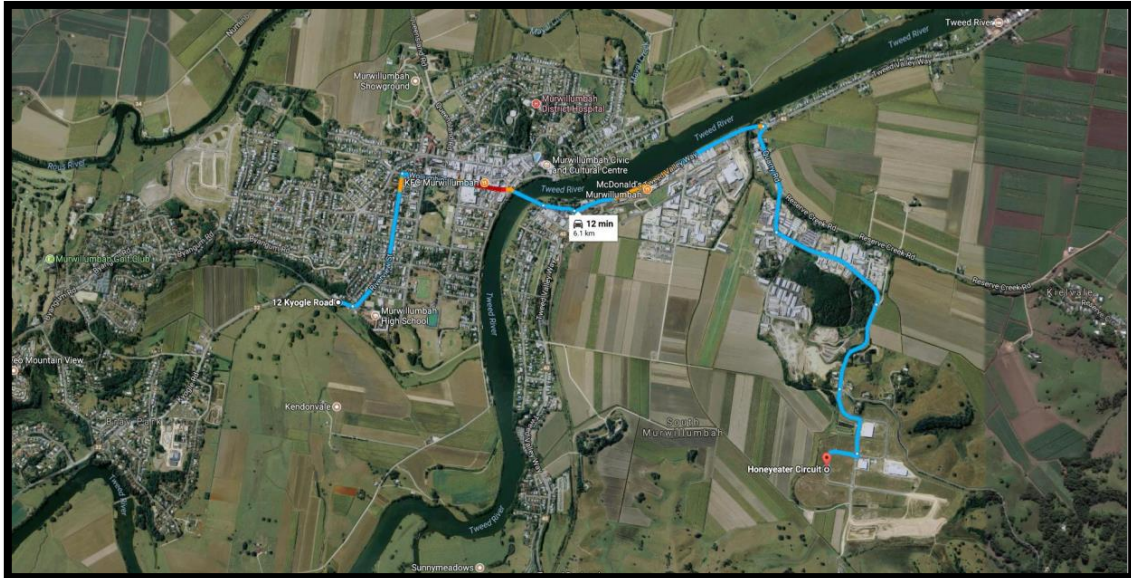


Figure 7: Route from SES Unit to Honeyeater Circuit Murwillumbah

The Unit Controller decided to retain "quick response" assets at the main Murwillumbah HQ for flood rescue, tree jobs and minor storm jobs which will allow one team to respond to these types of jobs. The following are stored at the Murwillumbah SES Unit HQs:

- 2 x vehicles -Medium Storm Mercedes Sprinter and light rescue Toyota Hilux) – (stored outdoors)
- 1 x light flood rescue boat (A07)
- 1 x Ark Angel
- 1 x set of chainsaws (small, medium and pole saw, with PPE and equipment)
- 1 x small generator
- 1 x medium generator
- 1 x small electric water pump

All portable radios, torches and safety equipment were also kept there.

All other equipment and stores are stored at the Honeyeater facility. This includes:

- 2 x vehicles – Holden Rodeo and Toyota Troop Carrier
- 3 x V Hull flood boats – (B13, 344 and 361)
- 1 x light flood rescue boat (3D)
- 1 x RIB (K31)
- 2 x storm trailers
- 1 x double hopper sandbag machine
- 2 x medium generators
- all other chainsaws
- all other stores

Recommendation 2

That the NSW SES, in concert with the Tweed Shire Council locates suitable premises for the NSW SES Murwillumbah Unit.



Figure 8: Murwillumbah Unit SES HQ

Richmond Tweed Region Headquarters Preparations

Richmond Tweed Regional Headquarters is located at 7 Lancaster Drive, Goonellabah. Goonellabah is an eastern suburb of Lismore and is approximately 7kms from the city centre. The Region Controller has been employed in this position since the 11 January 2016.

The Position/Role Description for Region Controller¹⁹ states: *“The Region Controller plans, leads, controls and organises the activities of a Region, and assumes responsibility for emergency management, operations management and the enhancement of community capacity to respond to and recover from disasters, especially floods and storms. The role manages a small staff team to ensure that the Region delivers planning, volunteer management and administrative outcomes in accordance with expectations. The role also establishes and maintains strategic alliances with a range of key internal and external stakeholders”* (Pg. 2).

The Key Accountabilities are listed as:

- *“Provide leadership, management and direction to Units and the Region; advise, mentor and support Unit Controllers with planning, operations, administration, training, finance and human resource management activities”.*
- *“Employ emergency management principles and concepts to enhance the capacity of communities to respond to and recover from disasters, including: representing the NSW SES on local and district committees as required; developing, maintaining and testing*

¹⁹ Position/Role Description Region Controller September 2015

Unit and Region plans; maintaining intelligence systems; controlling region NSW SES storm and flood operations; coordinating operational support with other organisations; and assisting with recovery activities”.

- *“Ensure that community safety is planned, facilitated and coordinated through the dissemination of community education programs detailing actions to be taken before, during and after floods and storms”.*

The Region Team commenced planning for the event on Tuesday (28/3/17) through the issuing of an internal warning order to all RTR Units providing a situation update, direction to commence flood operations planning (including OOAA considerations) and to participate in a RTR teleconference at 0830hrs on the 29/3/17²⁰.

An afterhours RTR Duty Officer was also rostered to commence from Wednesday 29/3/17. The Region Controller stated in an interview on Thursday 22/6/17 that he understood that he was the Incident Controller for this event from the Tuesday through until handing over to a nightshift Incident Controller on Thursday 30/3/17²¹ at 10.15pm.

Out of Area Assistance (OOAA) Request

The Richmond Tweed Region Capability Plan 2013-2018, under “Region Flood Capability” indicates that:

*“The Region Headquarters is capable of managing Level 2 flood operations, initially using Region Resources and supporting service for a period of at least 72 hours
Be capable of sustaining 24-hour operation with 2 shifts for 2 days with no external support*

Build FR L3 capability across 50% of RTR units (i.e. those units with high risk flash flood environments)

The Region is unlikely to have a flooding event e.g. greater than 1:100 that would require a Level 3 flood response”²².

On Tuesday afternoon, 28 March 2017 OOAA requests were received from the Clarence Nambucca and Namoi North West Regions. Verbal discussions took place between RTR and SHQ on Tuesday afternoon and on Wednesday, the 29th March 2017 (8.21am²³) a request was submitted by the RTR Logistics Officer for out of area assistance in the development of their Incident Management Team (including Incident Controllers for dayshift and nightshift) and aviation support.

The current deployment systems and procedures in place are cumbersome and require approximately 48 hours to initiate/complete. It is also currently predicated on a first come first served basis, not on a risk based model. It is recommended that these systems and procedures are reviewed to provide a streamlined process for Out of Area Deployment. This would include a skills register for deployed staff and availability. It is understood that the NSW SES, Operational Improvement Unit is currently developing this capability.

²⁰ Interview CE RTR 22/6/17

²¹ Interview AM RTR 22/6/17

²² Richmond Tweed Region Capability Plan 2013-2018 Pg. 13

²³ NSW SES OOAA Resource Request Form (29/3/17)

Recommendation 3

That the NSW SES review their current systems and procedures for Out of Area Deployments to streamline current practices. This would include a skills register for staff and availability.

Incident Action Plan

An Incident Action Plan (IAP) is defined as “The Plan used to describe the incident objectives, strategies, resources and other information relevant to the control of an incident²⁴” The RTR submitted an Incident Action Plan on Tuesday (28/3/17) that was uploaded to the Incident Management Toolbox to be viewed by State Headquarters.

The roster in the IAP, prepared by the RTR showed the Region Controller as the Deputy Incident Controller commencing Thursday (30/3/17) and the Deputy Region Controller as the Deputy Incident Controller for nightshift on Thursday (30/3/17). The RTR staff were Level 1 Incident Management trained and believed that a Level 3 Controller would be set to the Region through the IAP. No verbal request for Level 3 Controllers is recorded on the SES system. There is currently no policy in respect to reviewing IAP’s.

Recommendation 4

That the NSW SES review their current documentation as it relates to Incident Action Plans, to ensure that a Policy is introduced to ensure reviewing of Incident Action Plans occurs at State Operations.



Figure 9: SES Region Headquarters Richmond Tweed

²⁴ NSW SES Incident Management Policy

State Headquarters

Operations Bulletin 01/1617 – NSW Operational Readiness and Response Bulletin was issued on the 21 July 2016. The Bulletin covered all NSW SES Headquarters (State/Regions and Units) to provide uniformity throughout the service, a clear level of understanding around the requirement and timeliness of actions and the provision of information.

The Bulletin set out that an Operational readiness check had to be undertaken by the 29 July 2016. This Bulletin was followed up on the 30 January 2017 with Operations Bulletin 09/1617 that again reinforced the need for all level, State, Region and Units to ensure operational readiness.

History has shown that Tropical cyclones and East Coast Lows are extremely unpredictable in nature and their effects can be devastating. This event encompassed a vast area of northern NSW and required a significant and coordinated response from the NSW SES. In order to ensure that this is achieved, it is recommended that the NSW SES considers development and deployment of a pre-emptive model (measures) based on forecast conditions.

The aim of the measures is to outline the NSW SES state-wide coordination and preparedness arrangements. The NSW SES State Operations would provide a state-wide status of current incident activity. This would include:

- An oversight of operations;
- Analysis of potential impacts to the community for;
 - All incidents in a NSW SES Region; and
 - All flood and storm incidents regardless of tenure or jurisdiction.

The daily operational readiness levels would be determined for the State, Regions and Units as a guide to ensure the NSW SES is at the highest level of preparedness necessary to deal with any emergency. The readiness levels would be determined in accordance with the predicated forecast weather conditions, current flood/storm activity and other known or forecast influences.

Recommendation 5

That the NSW SES considers development of a pre-emptive situation and appreciation model and issue of daily operational readiness levels to ensure the NSW SES is at the highest level of preparedness necessary to deal with any emergency.

The State Operations Centre (State Operations) increased or scaled up their operations on the Tuesday (28/3/17). The SOC had operational oversight and situational awareness over three Regions (Richmond Tweed, Clarence Nambucca and Namoi North West). The SOC clearly understood that the Incident Controller for the Richmond Tweed Region was the Region Controller until late Thursday evening (30/3/17).

Teleconferences were commenced and records started for the event. The SOC received the three OOA requests (including the Richmond Tweed) and commenced actioning those requests. The difficulties encountered under the current system has been previously documented in this report. The SOC was also involved in arrangements for deployments to Queensland in relation to Severe Tropical Cyclone Debbie out of area assistance requests at this time.

State Operations implemented a mentoring program for this event. This meant that an experienced senior officer was appointed to mentor State Operations staff who were sometimes relatively new into that specific role. This process should be embraced by the NSW SES and be implemented for all major events. The mentoring should also be expanded, where possible, to Region level.

Recommendation 6

That the NSW SES continues to endorse the practice of operational mentoring for large scale events. This should be expanded, where possible, to Region level.

State Operations commenced a flood intelligence cell that was then divided into the different river systems. Their job was to complement the work being done at Region and Unit level, working with the BoM notifications against the local flood plans to implement strategies in respect to the impending flood event.

A decision was also made to deploy an Assistant Commissioner on Thursday (30/3/17) to the RTR Headquarters. This was described as a mentoring role to the Region Controller and also to undertake some of the media duties.

Response to the actual event

On Thursday 30 March 2017, the Richmond Tweed Region experienced the effects of ex-Severe Tropical Cyclone Debbie, accompanied with significant river flooding that resulted in the Lismore CBD and Murwillumbah Levee's overtopping and a large number of dwellings/businesses being inundated.

This event saw the Richmond Tweed Region receive between 600mm – 700mm in two days (30-31 March) over the Tweed and Wilsons catchment. Initial analysis indicates that rainfall in the Wilsons River is that some of the 24-hour rainfall totals Valley were very rare and close to the 1 in 100-year design rainfalls at Terania Creek (619 mm) and The Channon (573 mm). The Tweed catchment area indicates that some of the 24-hour rainfall totals were extremely rare and close to the 1 in 1000-year design rainfalls at Couchy Creek and close to the 1 in 500-year design rainfalls for Palmer Road.

Operational statistics, post event, identified that the Northern Rivers March/April 2017 floods was one of the most significant events to impact the Northern Rivers Region in over 40 years. The result was moderate to major flooding in every river catchment area with the third (3rd) highest flood on record for Lismore and Tweed Heads (1954 and 1974 highest recorded flood levels). Murwillumbah levels surpassed any previously recorded floods.

Overall, the NSW SES received in excess of 3,400 requests for assistance and 1500 emergency service personnel were deployed to the region during the event. 496 recorded flood rescues were performed, 486 within the Richmond Tweed Region, 211 flood rescues were performed by the Lismore City SES Unit and 190 by the Murwillumbah Unit.



Figure 10: Aerial photograph of Lismore Flood (Photo: Rotorwing Helicopter Services)

Bureau of Meteorology

The rainfall recorded by the Bureau of Meteorology, as depicted in Figure 11 below, shows the catchment areas of the Tweed and Wilsons Rivers receiving between 600mm – 700mm during this period.

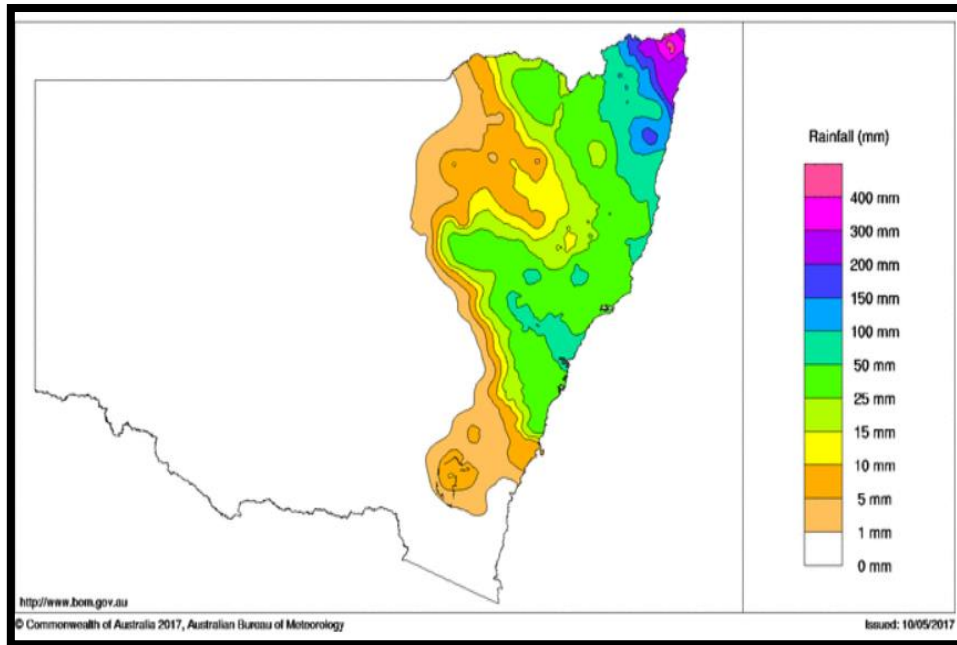


Figure 11: 24-hour rainfall to 9am on the 31 March 2017.

The Bureau of Meteorology has the Tweed River Valley (Couchy Creek) receiving 742mm during this period or close to the 1 in 1000-year design rainfall. The Annual Exceedance Probability has been graphed below against the storm envelope to indicate the severity of the event.

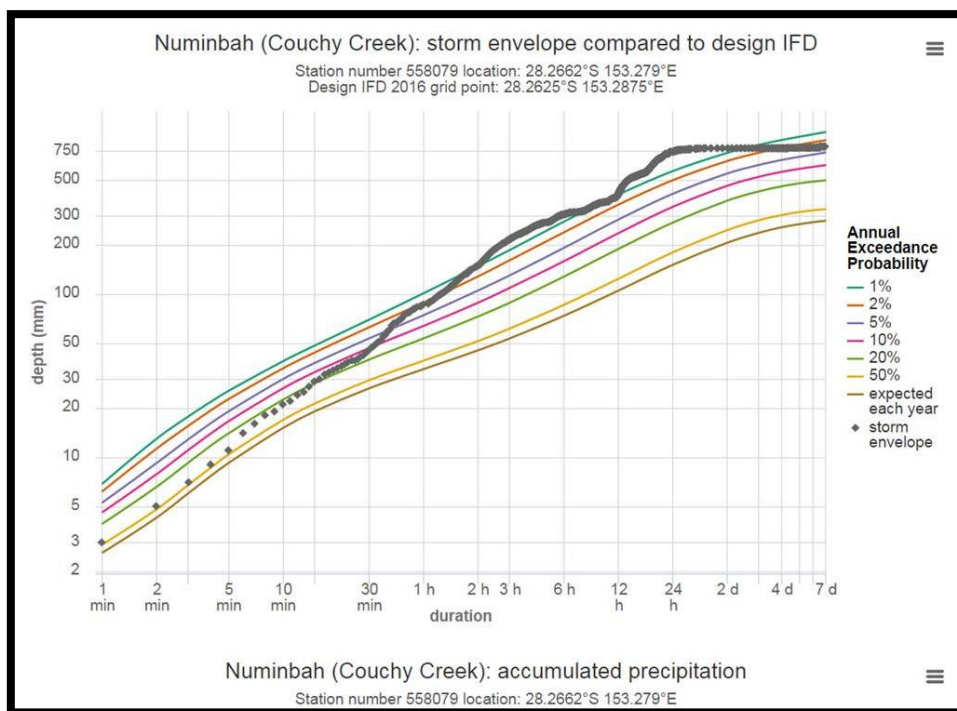


Figure 12: Annual Exceedance Probability Couchy Creek (BoM)

The Bureau of Meteorology has the Wilsons River (Terania Creek) receiving 619mm during this period or close to the 1 in 100-year design rainfall.

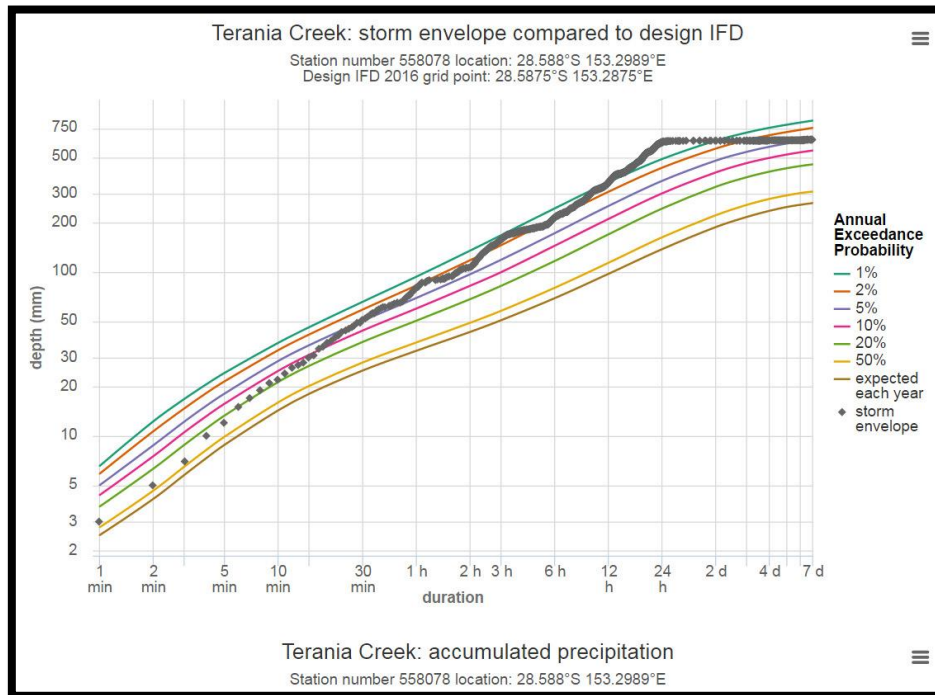


Figure 13: Annual Exceedance Probability Terania Creek (BoM)

Lismore City Unit

The Unit commenced duties on the 30/3/17 with the Unit and Local Controller commencing an Incident Management Team at the Lismore City Unit HQ. The Teams had been prepared and a comprehensive chart indicated the role of each team member. The Local Controller was in constant contact with the Richmond Tweed Region IMT throughout the day as the event unfolded. They had approximately 35-40 active members throughout the event. A number of volunteers were released at various times during the event to see to their families and properties.

The Unit and Local Controllers were of the understanding that on the Thursday, the Richmond Tweed Region Controller was the Incident Controller for this event.

Type	Outstanding Jobs	Completed Jobs	Total Jobs
Storm Job	0	54	54
Total Storm	0	54	54
Support Job	0	10	10
Total Support	0	10	10
Flood Miscellaneous Job	0	235	235
Flood Medical Resupply Job	0	1	1
Total Flood Assistance	0	236	236
Flood Rescue	0	16	16
Total Rescue	0	16	16
Grand Total	0	316	316

Figure 14: Lismore City Unit jobs 30/3/17

Between 7.12 am and 22.32 on Thursday 30th March 2017, 316 Requests for Assistance were entered into Beacon under the Lismore City Unit profile. The majority of jobs were entered as flood miscellaneous and comprised primarily of requests for sandbags and/or sandbagging.

Type	Outstanding Jobs	Completed Jobs	Total Jobs
Storm Job	1	38	39
Total Storm	1	38	39
Support Job	0	3	3
Total Support	0	3	3
Flood Miscellaneous Job	0	84	84
Flood Resupply Job	0	7	7
Flood Medical Resupply Job	0	6	6
Total Flood Assistance	0	97	97
Flood Rescue	0	152	152
Total Rescue	0	152	152
Grand Total	1	290	291

Figure 15: Lismore City Unit jobs 31/3/17

The Lismore City Unit conducted 185 recorded flood rescues, however it is believed that a significantly higher number of flood rescues occurred as teams were responding to evacuation requests at specific locations and returning with a full boat of residents wishing to evacuate. These additional residents were not always captured on the recording systems²⁵. The Unit should be congratulated for the manner in which they performed over this period.

The Unit established a flood desk, out of necessity and over the course of the event this proved to be a valuable tool for managing the flood response (tasking and allocation of resources). There were issues surrounding computer access, connectivity and speeds that in many instances made it impossible to update official records.



Figure 16: North Coast Community Housing (Photo: NCCH blog)

²⁵ Interviews Lismore City Unit & Local Controller

Murwillumbah Unit

The Murwillumbah Unit commenced duties under an AIIMS structure, however they had limited staff. The Unit Controller was absent due to work commitments and the Deputy Unit Controller stepped into the role. Due to the volume of work and rapidly evolving situation, approximately nine staff were placed into the intelligence team over two shifts.

The staff in the Intelligence unit commenced local triage of rescue jobs due to the volume being received. The records that they were using to compare the flood movement is a manually based system and Region did not have access to the same data.

30.03.2017 Type	OutstandingJobs	CompletedJobs	TotalJobs
Storm Job	0	17	17
Total Storm	0	17	17
Support Job	0	5	5
Total Support	0	5	5
Flood Miscellaneous Job	0	67	67
Flood Resupply Job	0	2	2
Flood Medical Resupply Job	0	3	3
Total Flood Assistance	0	72	72
Flood Rescue	0	32	32
Total Rescue	0	32	32
Grand Total	0	126	126

Figure 17: Murwillumbah Unit jobs 30/3/17

Type	OutstandingJobs	CompletedJobs	TotalJobs
Storm Job	0	35	35
Total Storm	0	35	35
Support Job	0	5	5
Total Support	0	5	5
Flood Miscellaneous Job	0	106	106
Flood Fodder Drop Job	0	1	1
Flood Resupply Job	0	10	10
Flood Medical Resupply Job	0	3	3
Total Flood Assistance	0	120	120
Flood Rescue	0	136	136
Total Rescue	0	136	136
Grand Total	0	296	296

Figure 18: Murwillumbah Unit jobs 31/3/17

The Murwillumbah Unit Incident Management Team (IMT) had very little backup, in that volunteers were not able to be replaced, they “snatched a little sleep where they could and then got back to it²⁶” The IMT experienced some difficulties in the Murwillumbah gauge being broken.

²⁶ Interview Murwillumbah Deputy Unit Controller 26/6/17

On the 31/3/17 the Murwillumbah Unit was involved in a flood incident where the SES boat capsized. No staff were injured and the event is subject to a separate review. The example is used to highlight the treacherous conditions that volunteers were operating in. At this time Murwillumbah only had one police officer within the flooded township²⁷. The Unit should be congratulated for the manner in which they performed over this period.

Region Response:

The SES Richmond Tweed Region Headquarters commenced 24 hour operations at 7am on the 30/3/17²⁸. An Incident Management Team (IMT) commenced functioning at this time, however it was not a fully staffed IMT with many individuals performing multiple roles. Over the period of operational response, a significant number of resources from out of area were sent to the Region to assist Local Units due to the high volume of work experienced by these units.

Incident Controller:

The role of an Incident Controller is a vital one and has been previously discussed in this review. It is also important for all those involved in the response to understand who the Incident Controller is. In this event, it is clear that there was significant confusion as to who was the Incident Controller on the afternoon of Thursday 30/3/17. This confusion was contributed to by some of the processes in place.

The Review found that the Region Controller for Richmond Tweed Region was the Incident Controller for this event on Thursday 30/3/17 until relieved by the nightshift Incident Controller at 10.15pm²⁹. Confusion arose due to the following events/processes occurring:

An Assistant Commissioner arrived at the Richmond Tweed Region HQ at approximately 3.30pm (30/3/17). The Assistant Commissioner saw their role as providing guidance, mentoring and undertaking some of the media responsibilities. The Incident Controller believed that if a senior officer attended, they would take over the event.

The Incident Controller (without any direction) stepped back out of the role of Incident Controller and took on the role of Region Commander liaison with emergency services and stakeholders. However, the Region Controller was involved in planning for the evacuation order post this timing and continued to wear the Incident Controller tabard on the 30/3/17.

Out of Area Assistance (Incident Controllers). On Thursday 30/3/17 two out of area Incident Controllers arrived at approximately 4.30pm and 6pm³⁰ (this was post the issuing of the Evacuation Order for Lismore CBD). The original plan had been for them to commence duties on 31/3/17. However, due to staff shortages and tasking/organising difficulties within the IMT, the Assistant Commissioner asked one of the Region Controllers to perform the role of Deputy Incident Controller, effective immediately. This commenced somewhere between 4.30pm-5pm, however some members of the IMT believed that this person was now the Incident Controller as they began directing and organising staff.

²⁷ NSWPF Sitrep 2017-2330

²⁸ Operational Update 1 for Event 210/1617 (30/3/17 at 11.30am)

²⁹ Logbook Nightshift Incident Controller

³⁰ Event Logs and Interviews with IMT staff

The Deputy Incident Controller commenced duties as the nightshift Incident Controller at 10.15pm. No documented handover occurred between Incident Controllers until 10.15pm that evening.

Recommendation 7

That the NSW SES

- Implements a formal handover document that clearly identifies who is the Incident Controller
- ensures that the Incident Controller is clearly identified to all Incident Management Team members.

Incident Management Team

The Incident Controller established an Incident Management Team on Thursday 30/3/17, however believed that due to the management of the three catchment areas into flood planning that they did not have sufficient planning staff.

The Incident Management Team was established under the AIIMS principals and whilst a number of people were undertaking multiple roles, all were wearing tabards. The Incident Controller understood their role to be as a 'clearing house' for units and to provide a link to State Operations. The IMT dayshift 30/3/17 consisted of Local Regional staff and some out of area staff who were in Lismore for another course.

The roles of Incident Controller, Intelligence Officer, Operations Officer and Public Information Officer were all performed by local Regional staff. The nightshift was a skeleton crew due to the limited resources and the Deputy Incident Controller was a local Regional staff member. It should be noted that during the Thursday and Friday many of the staff involved in this event worked extraordinary hours in their efforts to ensure the safety of the community. Fatigue management is discussed later in this report.

Improvements to the process used by the Richmond Tweed Region Incident Management Team were identified as follows:

- Full utilisation of the Incident Management Toolbox
- Placement of records/templates etc on the NSW SES centralised system, not the local system where there is limited access
- Ensuring that individual flood knowledge is captured and documented centrally and electronically
- The planning group consisted of the Incident Controller and Intelligence Officer. Planning Officer needed to be present for these discussions.

Recommendation 8

That the NSW SES ensures that:

- All Regions are fully utilising the Incident Management Toolbox
- Placement of records/templates etc on the central system, not the local system where there is limited access
- Ensuring that individual flood knowledge is captured and documented centrally and electronically.

The Richmond Tweed Region Incident Management Team was short staffed due to the lateness of the Out of Area Assistance request and the processes previously discussed in obtaining staff to fill positions, who had the appropriate skills. Key IMT positions were not filled and SES staff were performing multiple roles, under extreme stress, in a dynamically changing event and was not able to perform to the optimum level.

An improved system and process for the deployment of OOAA staff has been previously discussed. There is also the need to ensure that a pre-deployable IMT is able to be assembled at short notice to supplement Region resources during such an event. This ability does not currently exist within the NSW SES. The pre-deployed IMT needs to complement the Region IMT. There needs to be a blend of local knowledge and strong leadership within the IMT.

Recommendation 9

That the NSW SES consider the implementation of a pre-deployable Incident Management Team capability model across the State.

State Operations

State Operations was operating in the capacity as a strategic coordination centre, in support of the three (3) Regions that were active. They had an Incident Management Team that had been scaled up for Thursday, Friday and Saturday for this event.

State Operations was also involved in the coordination of resources from across the state to ensure that Out of Area requests for assistance were filled where possible and also for the continued functioning of the NSW SES across the State. They were also responsible for the issuing of Emergency Alert information.

Aerial support was organised by State and Region through the Aviation Desk. A number of helicopters were deployed to the Region with down the wire rescue capabilities. Additional aviation support was requested due to mechanical issues with a number of aircraft on the ground, however all were required due to the volume of flood rescues performed.

Community Liaison Officers

Over 105 Community Liaison Officers (CLOs) were deployed to the Far North Coast to work in flood affected towns such as Lismore, Billinudgel, Main Arm, Mullumbimby, Ocean Shores, Fingal Head, Murwillumbah, New Brighton, Tumbulgum, Condong, Tweed Heads and Crabs Creek during the operation.

This emerging but important capability enhanced the service delivery of the Richmond Tweed Region Incident Management Team, and provided valuable information for agency decision making and to inform the NSW Recovery Committee. The CLO's visited approximately 2700 flood affected properties in various locations and provided critical information to the Incident Management Team and Emergency Operations Centre regarding community needs.

Flood Rescues

The nature and severity of this event saw a significant number of flood rescues performed. In total, 496 recorded flood rescues were undertaken for this event. The Richmond Tweed Region units accounted for 486 of the 496 rescues. This Lismore City Unit undertook 211 flood rescues and Murwillumbah 190 flood rescues. All of the NSW SES Units should be commended for the manner in which they operated during this event.

A breakdown of the location of flood rescues that occurred is shown graphically as follows;

The below Lismore City Map shows the evacuation area marked in red along with a breakdown of rescues performed that were life threatening/rescue (red dot) along with requests for assistance. This clearly shows that the majority of rescues performed were within the SES designated evacuation area.

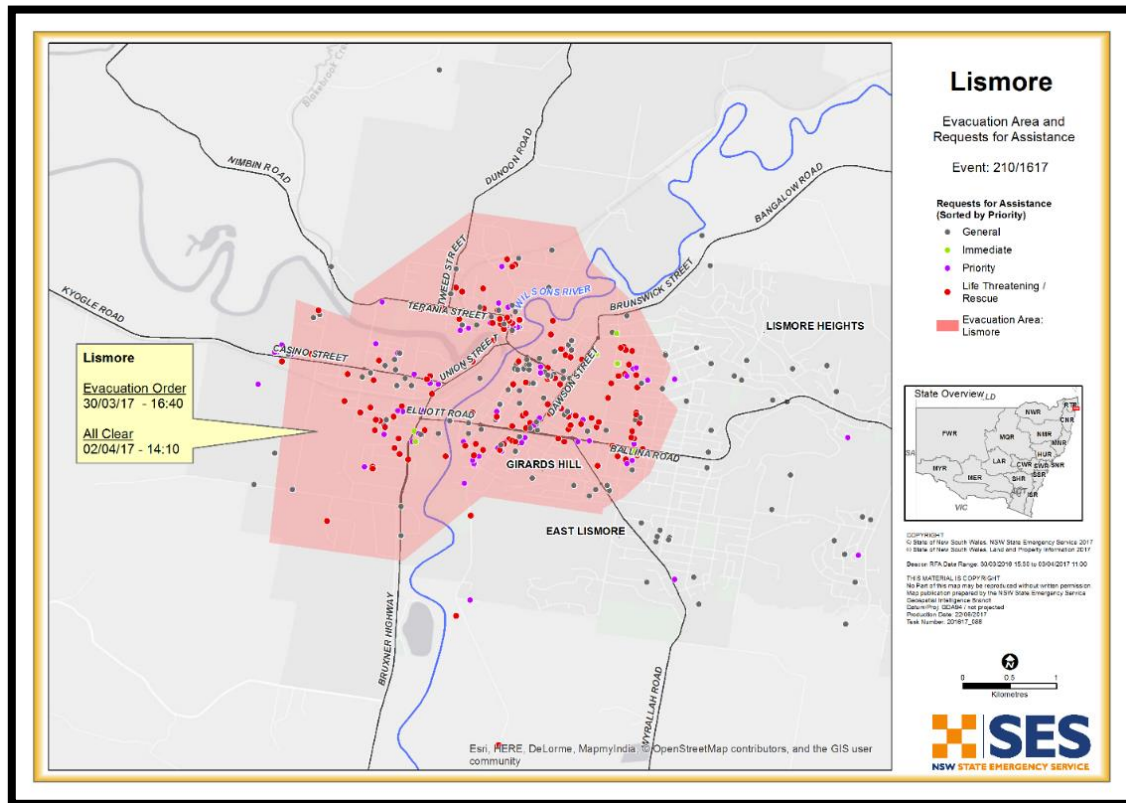


Figure 19: Flood rescues conducted in the Lismore City Area.

The Murwillumbah/Condong & Tumbulgum map shows the different evacuation areas in shades of red, along with a breakdown of the rescues performed that were life threatening/rescue (red dot) along with requests for assistance. This again shows that the majority of assistance was provided with the SES designated evacuation areas.

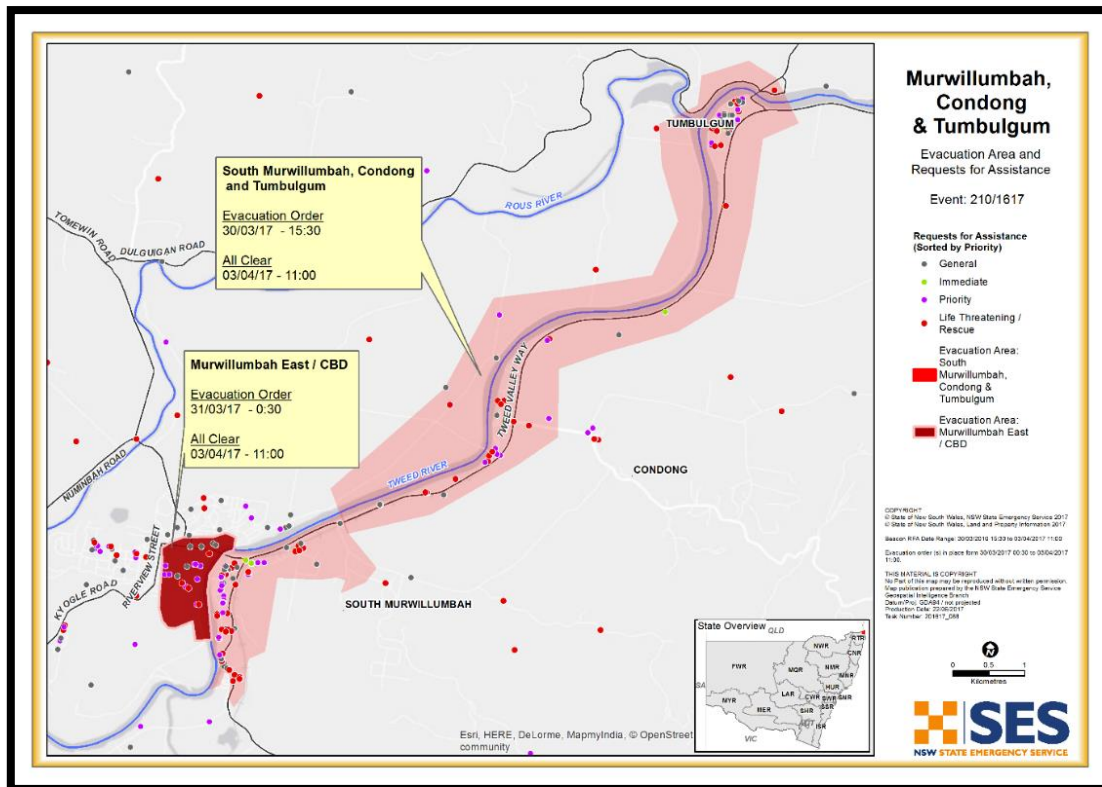


Figure 20: Flood rescues conducted in Murwillumbah, Condong & Tumbulgum

The NSW State Flood Plan defines a flood as: Relatively high-water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences.

Rescue is defined in the State Rescue Policy as *‘the safe removal of persons or domestic animals from actual or threatened danger of physical harm’*.

It was recognised that during the event, a significantly large number of rescue calls were received at the Wollongong SHQ of the SES. These calls were all classified under the definition of ‘flood rescue’ (as per the State Rescue Policy) and forwarded to units/region for immediate action. It should be noted that the definition includes ‘domestic animals’.

Whilst domestic animals are important, State Operations identified that they should be the triage for all flood rescue calls and a priority weighting placed on the rescue of persons -v- domestic animals. Flood rescue teams were also not able to have any downtime to recover as jobs came in batches on member’s pages and mobile phones.

The triaging of jobs needs to distinguish between human and animal life, but also distinguish between someone who is safe but wants to leave or someone who wants to attend hospital to obtain their medications (non-life threatening). This triage process would have greatly assisted the units in their flood rescue responses.

Recommendation 10

That NSW SES considers the implementation of a triage procedure for flood rescues, in consultation with other Emergency Services for a standardised risk based approach to flood rescue.

Flood Action Cards

The purpose of the flood intelligence card is to describe the effects on the community against flood heights reached on this gauge. The information in this card is prepared in conjunction with the Local Flood Plan. Flood Intelligence cards are used by Planners and Intelligence Officers to understand the risk of flooding and provide advice to the Incident Controller to inform operational decision making.

The NSW SES has developed and distributed a centralised and pro formatted template to be used by all SES Units across the State. These are held on the NSW SES Online Intelligence System. They are held centrally so that Regions and State Operations can obtain access to them. The Lismore City Flood Action Cards are not held on the central system and are not in the pro forma version. The Murwillumbah Flood Action Cards are on the online central system in the pro forma version.

Lismore Flood Action Cards:

The Local Controller stated that the Unit had been working on the draft document for approximately 12 months. The Unit also acknowledged that it was not in the correct format and not available online. The Local Controller stated that they contacted the Incident Controller and was informed that they could use the local Flood Action Cards for this event³¹.

The event saw a Planning and Research Officer attempt to get the local Flood Action Card information into the centralised database. Post the issuing of the Flood Watch, State Operations Intelligence Officers attempted to incorporate the off-line intelligence and action cards into the online system. This proved difficult to do. Acknowledgement was also given by State Operations that the Lismore City Unit Flood Action Cards were more detailed for Lismore City than those held centrally.

The Flood Action Cards developed by the Lismore City SES are comprehensive in the information that they contain. The flood heights are clearly identified through the use of colour coding. This colour is consistent throughout the document. The Review obtain a copy of the Flood Action Cards used by the Lismore City Unit and saw that the document contains a section after Actions that has the time and date.

This means that the document can be used during the event to show the time and date the action was completed and who completed that action. The Lismore City Unit used the draft Flood Action Cards during this event in the manner described and found them easy to operate as well as assigning responsibility for actions.

³¹ Interview Lismore City Local Controller

Recommendation 11

That the NSW SES

- considers an amendment to their current Flood Action Cards to include an additional column for the date/time and who performed the action (once suitable consultation with Regions/Units occurs)
- ensures that all Local Flood Action Cards are in electronic format and centrally accessible

Caution must also be used when using Flood Action Cards as they have a specific rate of rise of the water for the timing for the release of evacuation warnings and orders to be considered. The Lismore Unit Flood Action Card uses 0.5m p/hr, this event saw the water rise at a much more rapid rate.

Public Information & Warnings

Bureau of Meteorology

The Bureau of Meteorology has the responsibility to issue Flood Watch and Flood Warnings to assist emergency response agencies in providing the appropriate response to each situation as it develops. It is important to reiterate that the scope of the Bureau's agreed flood warning services in NSW does not include warnings for local overland and/or rapid onset creek flooding.

The NSW Flood Plan states, *“these normally predict flood heights (in metres at a gauge) which will be reached at a location at a specified time in the future. After the issuing of a Preliminary Flood Warning, Flood Warnings are renewed at frequent intervals until the relevant stream drops to below the minor flood level. Flood Warnings are not distributed directly to the media by the Bureau and must be incorporated in Region Flood Bulletins and released by the NSW SES³²”*.

A summary of all Flood Warnings Issued for the Lismore and Murwillumbah is in the attached Annexures 2 & 3. This has been further summarised below to highlight a number of points.

The following Flood Warnings were issued by the Bureau of Meteorology in respect the Lismore area (Summarised):

Date and Time	Product	Prediction
30/3/17 12.39pm	Flood Warning 1	Minor flood level (4.20 m AHD) Thursday afternoon, may reach moderate level (7.2m) early Friday morning
30/3/17 3.38pm	Flood Warning 2	Lismore expected to exceed moderate flood level 7.2m Thursday evening, major flood level 9.70m late Thursday evening & 11m early Friday morning
30/3/17 3.53pm	Flood Warning 3	Same as above except for addition of:

³² NSW Flood Plan Pg. 32

		<i>“with river levels predicted to be higher than the 2001 and 2005 floods”</i>
30/3/17 8.06pm	Flood Warning 4	Wilsons river expected to exceed major flood level 9.70 overnight and 11m early Friday morning
30/3/17 9.44pm	Flood Warning 5	Wilsons river expected to exceed major flood level 9.70 overnight and 11m early Friday morning
31/3/17 1.06am	Flood Warning 6	Wilsons river expected to reach 11.50m Friday morning.

Table 3: BoM Flood Warnings

The above illustrates that whilst the levels for the Wilsons River were given, due to the changing nature of the event the ‘specified time in the future’, as per the NSW State Flood Plan do not appear in the Warnings. They are generic in nature using ‘overnight and/or early Friday morning’.

The BoM Flood Warnings for the Tweed River initially used the ‘Thursday afternoon’ as a specified time, however on BoM Flood Warning 2 changed this to ‘around 11am’ and Warning 3 to ‘around 1pm’. The Warnings then went back to Friday morning.

It would have been preferable if a specific time frame i.e. Between 3am – 6am was used as opposed to overnight or Friday morning.

Recommendation 12

That the Bureau of Meteorology uses a specified time for levee overtopping or flood peak in the release of the Flood Warnings as per the NSW Flood Plan

The attached Annexures 2 & 3 are a summary of the BoM Flood Warnings and it should be noted that the Warnings also included the latest river heights at the following locations:

Wilsons River, Lismore: Rock Valley, The Channon, Ewing Bridge Corndale, Eltham, Woodlawn, Tuncester, Lismore, Wiangaree, Kyogle, Casino, Coraki, Rappville, Bungawalbyn and Woodburn.

Tweed River: Uki, Eungella, Murwillumbah, Chillingham, Boat Harbour, Tumbulgum and Chinderah.

Lismore Flood Warning 2-3 changed in the nature of the presentation of information where there was the inclusion of *‘with river levels predicted to be higher than the 2001 and 2005 floods’*. A number of residents reported that this gave an indication that the flooding was not going to be as bad as the 1974 or 1954 floods. Many residents also took comfort from the fact that this was only predicted to be a 10m flood peak³³. As this prediction changed, so did the warnings.

³³ Telephone interviews residents

The historical flood levels are as follows:

Date	Flood Level
1954	12.15m AHD
1974	12.15m ADH
2001	10.4m ADH
2005	10.3m ADH

Table 4: Historical flood levels

The BoM in issuing each of the Flood Warning had a next warning issued time at the bottom of each document. Lismore Flood Warning 2 (3.38pm) had the next release time as 8pm. Flood Warning 3 was issued at 3.53pm with the additional information about the 2001 and 2005 flood levels. Flood Warning 4 (8.06pm) had the next time of release as 1am. Flood Warning 5 was issued at 9.44pm, with a next warning time of 2am.

Flood Warning 6 was issued at 1.06am. This illustrates the rapidly changing nature of the flood and the willingness of the BoM to issue additional notices/warnings within their stated timeframes where necessary.

Flood Warning 10 identified that “The Murwillumbah forecast gauge was faulty and previous readings were incorrect and overstated”. This was the only time this note appeared on the Warnings and the Murwillumbah gauge reading did not appear on any subsequent Flood Warnings.

Flood Warning 10 was issued at 3.38am on the Friday morning, when many residents were asleep. It would have been best practice to have the faulty gauge warning on all subsequent issued Flood Warnings to highlight that fact, rather than simply removing the gauge readings from the Flood Warning document.

Recommendation 13

That the BoM include notification of faulty gauges on all subsequent Flood Warning Notices, rather than simply removing the gauge reading from the Flood Warning Notices.

NSW SES Flood Bulletins (Lismore)

The NSW SES Flood Bulletins (Lismore) have been integrated into a spreadsheet with the BoM Flood Warnings to clearly show the sequencing of the issuing of the Flood Bulletins. This is in Annexure 2.

The SES Flood Bulletins replicate the information contained in the BoM Flood Warnings, however also include the additional information of, at a specified river height, there is a high probability that specified road closures will occur (listing those road closures) and the Levee/s overtopping. The Levee overtopping information is ‘lost’ within the Bulletin.

The levee overtopping height should be placed at the top of the bulletin so that residents clearly understand that at a specific height, the levee will overtop. This would give residents a greater situational awareness than simply putting in gauge heights. The design of the Flood Bulletins is discussed below.

Recommendation 14

That the NSW SES considers a review of the design of the Flood Bulletins to have levee overtopping information clearly identified at the top of the bulletin.

BoM Flood Warning	Date/Time	SES Flood Bulletin	Date/Time
1	30/3/17 12.39pm	1	30/3/17 12.39pm
2	30/3/17 3.38pm	2	30/3/17 4pm
3	30/3/17 3.53pm	3	30/3/17 4.30pm
4	30/3/17 8.06pm	4	30/3/17 8.15pm
5	30/3/17 9.44pm	5	30/3/17 9.44pm
6	31/3/17 1.06am	6	31/3/17 1.06am
7	31/3/17 4.48am	7	31/3/17 5am
8	31/3/17 8.24am	8	31/3/17 9.30am
9	31/3/17 10.36am	9	31/3/17 12.30pm
10	31/3/17 4.05pm	10	31/3/17 4.30pm
11	31/3/17 9.02pm	11	31/3/17 9.40pm
12	1/4/17 12.59am	12	1/4/17 1am

Table 5: BoM Warning releases and SES Bulletin release times

The SES Flood Bulletins have a clearly identifiable ‘issued’ date and time at the commencement of the Bulletin. However, it was found that there were inconsistencies in the issued times on the document and the time that the SES Flood Bulletins were issued to the public.

The time that appears on the Bulletin was when the document was prepared, ready for authorisation and then subsequent release. In some instances, the Bulletins were issued within minutes, in one instance it took over one hour for the release of the document.

SES Flood Bulletin Number (Lismore)	Time on Document	Time Issued
1	12.39pm	1.51pm
2	4.00pm	4.22pm
3	4.30pm	4.23pm
4	8.15pm	8.27pm
5	9.44pm	10.37pm
6	9.44pm	1.06am

7	5.00am	5.00am
8	9.30pm	9.53pm
9	12.30pm	12.29pm
10	4.30pm	5.10pm
11	9.40pm	9.58pm
12	1.00am	1.23am

Table 6: SES Flood Bulletin timings

Whilst this had no impact on the warnings to the public in this instance, it is recommended that the Flood Bulletins accurately reflect the issued time (that is the time the document is to be released) as opposed to the prepared time that currently appears on the document.

Recommendation 15

That the NSW SES reinforces with staff the importance of having the issued time on the Flood Bulletin, as opposed to the prepared time.

NSW SES Flood Bulletins (Murwillumbah)

The Tweed River have the same issue on their Flood Bulletins re time issued as Lismore. These Bulletins had the South Murwillumbah overtopping height clearly identified at the front of the document along with the consequences if overtopped. Bulletin 4 should have reflected the flood height the same as the BoM Warning 4 however it differed by 0.1m.

This wasn't viewed as a major issue, however Bulletin 8 differed by 0.52m (less than the BoM Flood Warning). This is a significant issue as the public relies on the accuracy of the heights being supplied. The dates on Bulletins 12 and 14 are incorrect. They are shown as Thursday and were issued on Friday. Reviewing processes by the SES should have picked up this issue, however due to the pace of the event was overlooked. Bulletins 9 and 13 were not released to the public.

Recommendation 16

That the NSW SES reinforces with staff the importance of ensuring data on Flood Bulletins is accurate.

Flood Bulletin design

The current NSW SES Flood Bulletin design means that a bulletin may be between two and three pages in length. The bulletin is headed by the following:

“Radio Stations are asked to read this Bulletin verbatim and repeat it periodically”

The bulletin is then broken up into the following:

- Amount of rain fallen
- The Bureau of Meteorology predicts that
- The current river heights are....
- At this predicted height, there is a high probability that: (consequences listed, sometime half a page to almost one page in length)
- Latest River Heights (Gauge heights listed, rising or steady and date and time of observation)
- The NSW SES recommends the following actions (Lists 6-8 action items)

- Listing of webpages (SES. BoM. Roads etc)

The information contained in the Bulletin is important, however many residents identified that the information was too long and didn't contain the information that they needed up front. Residents wanted to know, rainfall, river height and height that the levee would overtop. It was viewed that additional information could be on a webpage.

It is important to supply the public with as much information as possible to allow them to make an informed decision. The NSW SES should review the format of the current Flood Bulletins. It is understood that a Warnings Working Group has been established to review current warnings/bulletins to obtain the best possible product for the community.

Recommendation 17

That the NSW SES reviews the format of the current Flood Bulletins, through the Warnings Working Group.

Incident Management Toolbox

The RTR Incident Management Team members who were responsible for the preparation and distribution of Bulletins raised the issue that the Incident Management Toolbox required a significant amount of time in the preparation work and can take up to one hour to populate.

They found this system 'clunky' and difficult to maintain the pace using this system. They also experienced difficulties when multiple Bulletins/Warnings were being issued together. This saw two Bulletins produced, but due to timeliness issued were never distributed.

There was found to be a variety of methods used though the use of the Incident Management Toolbox and MyPortal. When MyPortal was utilised and State Operations was not placed on the distribution list, they were sometimes unaware that a Bulletin had been issued. This added a significant amount of time to the uploading to the SES webpage.

The training of suitable staff was also identified as an issue during this event. This information should be provided to the NSW SES Website Warnings Working Party for urgent attention in respect to the effectiveness of the current operating systems during major events.

Recommendation 18

That the NSW SES reviews the effectiveness of their current operating system re the issuing of Bulletins through their Website Warnings Working Party.

Emergency Alert

Emergency Alert (EA) is the national telephone warning system used by emergency services to send voice messages to landlines and text messages to mobile phones within a defined area about likely or actual emergencies. EA is only one of the tools that can be used to warn communities of an impending emergency, and is a critical element of emergency response. It can be used across all hazards to alert communities at risk of life threatening emergencies³⁴.

³⁴ NSW SES Emergency Alert Guidelines September 2016 Pg. 3

The EA system is just one way of warning communities. It is an effective warning tool that is available to Incident Controllers and/or the State Duty Operations Controller. In this instance, the EA was also used in conjunction with the following:

- Broadcast media (SES Bulletins)
- Facebook and NSW SES Website
- Door knocking in evacuation areas.

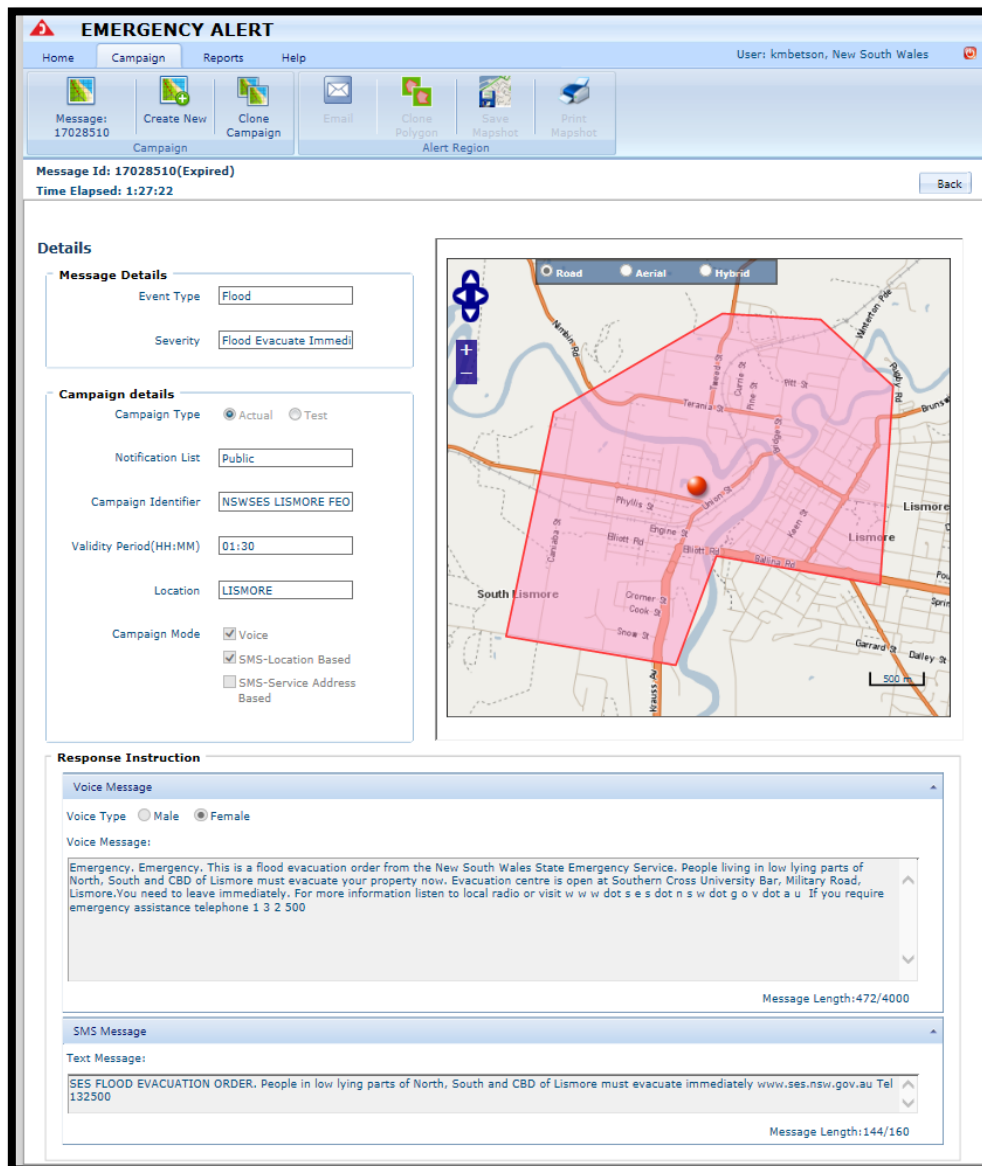


Figure 21: Emergency Alert for Lismore during event

The NSW SES Emergency Alert Guidelines were issued in January 2017. It should be noted that Emergency Alert SMS messages are restricted to 160 characters (including spaces) and do not have the capacity to deliver detailed warning information, Voice messages are restricted to 4000 characters (including spaces).

The Emergency Alerts were uploaded to the system at State Operations and a number of difficulties occurred as follows:

- Lack of trained staff meant that delays sometimes occurred
- The misconception that the EA system only uploaded eight (8) campaigns. It is recommended that for maximum usage eight campaigns are uploaded, anything in excess of this slows the system down. However, they can still be uploaded.
- Issues in the combined Emergency Alert polygon in the NSW SES Emergency Map Centre the proforma CBD area was not big enough and the polygon had to be redrawn (adding additional time). The combined EA also had reference to ‘low lying areas’ that had to be removed.

Recommendation 19

That the NSW SES ensures that there are sufficient staff trained and proficient in the use of Emergency Alert

Evacuation Orders

An Evacuation Order is defined in Flood Plans as “Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to instruct community members to immediately evacuate in response to an imminent threat”. An Evacuation Warning can also be issued prior to the issuing of an Order to notify the community of the possibility of an Evacuation Order being issued.

The Lismore City Flood Plan states the following at section 3.18.3 (pg. 28):

“During floods evacuations will be controlled by the NSW SES. Small-scale evacuations will be controlled by the NSW SES Lismore City Local Incident Controller. Should the scale of evacuation operations be beyond the capabilities of local resources control may be escalated to the NSW SES Richmond-Tweed Region Incident Controller”.

This event was not a small-scale event and a Region Incident Controller had been appointed. As such the control was correctly escalated to the NSW SES Richmond-Tweed Region Incident Controller as per the Flood Plan. The exact same wording is also used in the Tweed Shire Flood Plan (Pg. 33)

Decision to Evacuate

The Lismore City and Tweed Shire Flood Plans have similar wording as follows:

In most cases the decision to evacuate rests with the NSW SES Tweed Shire Local Incident Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the NSW SES Richmond Tweed Region Incident Controller and the Local Emergency Operations Controller.

In events that require large scale evacuations, the decision to evacuate may be escalated to the Region or the State Incident Controller.

The Incident Controller stated that the IMT Planning Group consisted of himself and the Intelligence Officer, a Local volunteer who had an extensive knowledge in respect to flood patterns in the Lismore area³⁵. They did not recall if the Planning Officer who was part of the Out of Area Assistance was involved in those discussions. The Planning Officer, when interviewed stated that they were not involved.

On the afternoon of the 30/3/17 a draft Flood Evacuation Warning from the Lismore City SES Unit was forwarded to RTR for consideration. At approximately 4pm there was discussion as to the release of an Evacuation Warning or going directly to an Evacuation Order due to the behaviour of the flood between the Local Controller, Incident Controller and the Region Intelligence Officer³⁶.

There were also discussions about the three areas (CBD, North & South Lismore) all being placed into the one Evacuation Order. The decision to combine the three areas was based on the fact that South and North Lismore triggers had already been met and the Lismore CBD (with appropriate timeline to the expected levee overtop) was more appropriate.

The very real concern was also raised in discussions about the evacuation of a community in darkness, in torrential rain whilst in the middle of an unfolding event where the exact rate of rise of the river system was unknown. The agreed position was to evacuate all in one order.

The Incident Controller, in an email dated 5/6/17, stated that the Intelligence Officer informed the Planning Officer that there were “3 critical criteria for the release of the Lismore combined Flood Evacuation Order, namely-

1. That there was a 12h timeline for the evacuation of the CBD included in the combined FEO;
2. That there was consultation with the Local Controller; and
3. That there was consultation with X and the RC/IC before release³⁷”.

(The Region Controller was of the view that they were the Incident Controller at the time of preparation of the Evacuation Order³⁸).

Pro forma Evacuation documents

A number of Pro forma Evacuation Orders exist from 2015 in relation to the three areas that were to be combined into the one Evacuation Order. The Pro forma Lismore CBD has the following wording in the document:

“As a result of the flood level predicted by the Bureau of Meteorology for the Wilson River Lismore at [date/time] the NSW State Emergency Service is directing residents within the nominated low lying areas of the Lismore CBD to evacuate within the next [number] hours.

³⁵ Interview Region Controller

³⁶ Interview Region Operations Officer

³⁷ Email Incident Controller 5/6/17

³⁸ Interview Region Controller

Do not delay your evacuation. Roads will be congested or closed. You could become trapped and need rescue. Remaining in flooded areas is dangerous and may place your life at risk”.

The Pro forma Evacuation Orders for North and South Lismore also contain the phrase “evacuate within the next (number) hours”.

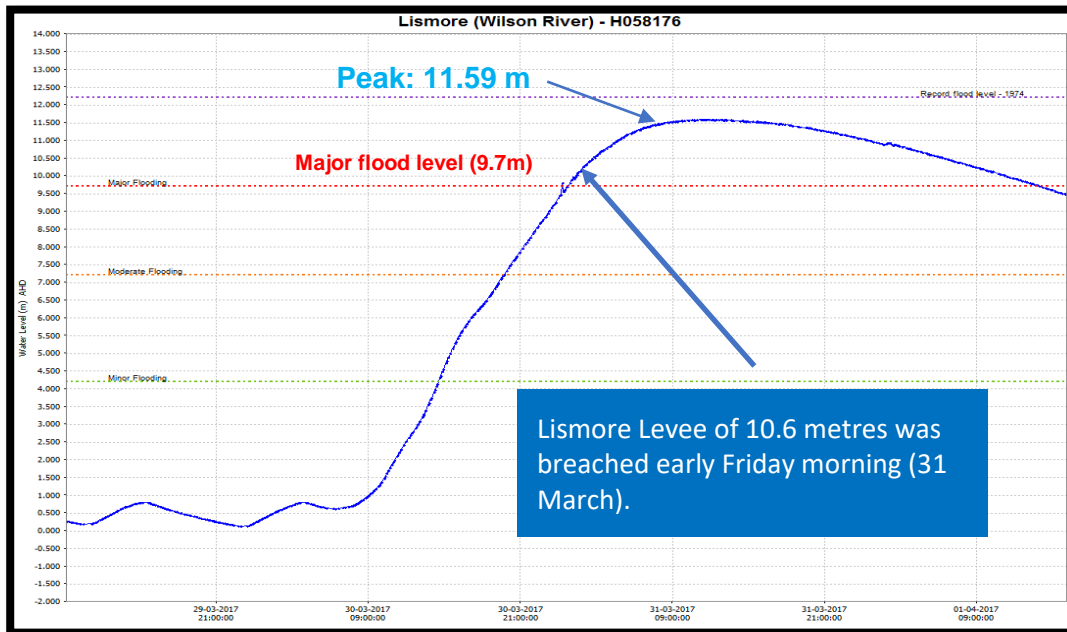


Figure 22: Lismore Peaks and Levee breach (BoM)

Multiple Evacuation Orders were being prepared at this time for the Richmond Tweed Region. The Planning Officer was from out of area and was performing multiple roles within the IMT. The Public Information unit was also understaffed at this time. One of the officers involved had not previously undertaken this role, however another had been involved in multiple Richmond Tweed Region campaigns (not in this role).

The Lismore City Local Controller recalls that when the Evacuation Order was first received at the Unit, they identified that the wording “Low lying areas” was in the document and needed to be removed and that there were no timings on the Order. When the Evacuation Order was issued to the public, the reference to ‘low lying areas’ had been removed, however the document read to evacuate immediately.

The Flood Evacuation Order for Lismore CBD, and North and South Lismore that was released stated the following:

“As a result of a revised prediction by the Bureau of Meteorology for the Wilson River at Lismore of 11 metres early Friday morning, the NSW State Emergency Service is directing residents to evacuate immediately.

Do not delay your evacuation. Roads will be congested or closed. You could become trapped and need rescue. Remaining in flooded areas is dangerous and may place your life at risk³⁹”.

The Planning Officer and the Public Information Officer are both adamant that the Incident Controller viewed and authorised the release of the Flood Evacuation Order. The Incident Controllers name also appears on the document as the authorising officer.

The Commissioner NSW SES has subsequently changed the authorising process for Evacuation Orders post this event through the introduction of the “State Warning and Order Risk Review Procedure”. This procedure applies to the issuance of a flood evacuation warning/order or all clear.

The State Warning and Order Risk Review Team consists of:

- Commissioner;
- Deputy Commissioner;
- Incident Controller;
- State Duty Operations Controller;
- Duty Operations Officer and or Situation Awareness Officer;
- State Operations Centre Public Information Officer;
- Operations Commander (If appointed).
- Local Controller
- Unit Controller/s in the affected area
- Other persons who may be able to provide specialist advice.

Recommendation 20

That the NSW SES formalises the new State Warning and Order Risk Review Procedure into Policy.

Once the Evacuation Order was issued, a number of consequences occurred. Many of the CBD business owners had already left for the day, many obeyed the immediate evacuation order and as such didn't have time to raise or remove stock that was subsequently lost/damaged. A number stayed and removed/raised stock and in one instance had an overtopping party on the premises⁴⁰.

The fact that it was torrential rain and darkness also needs to be factored in to the decision-making process, along with a rapidly changing rate of rise of the river. Many of the CBD owners/residents were angered that the timing did not go into the Evacuation Order. North and South Lismore was an immediate evacuation; however, a time should have been included for

³⁹ Flood Evacuation Order issued 30/3/17 4pm

⁴⁰ Lismore City SES Unit interview

the CBD that still allowed owners/residents sufficient time to evacuate. This timing would have allowed many to have raised/removed some of their stock.

The Region Operations Officer contacted the Lismore City Local Controller to inquire if they required additional resources re doorknocking. They were advised that RFS personnel had already commenced doorknocking in the North and South Lismore area, once completed all resources would be used to doorknock the Lismore CBD area. It was also the Local Controllers intention to have SES/RFS crews drive through the CBD approximately 20 minutes before overtopping with the use of beacons and loud hailers to deliver the final evacuation messaging⁴¹.

Prior to the issuing of the second Flood Evacuation Order at 11.30pm on the 30/3/17 significant discussion took place between the Region Incident Controller and the Local Controller as to the method to be used to notify CBD residents that the levee had overtopped. New procedures were implemented that saw the use of sirens that were situated around the city as the only means of notification, as opposed to SES vehicles driving around. SES staff were also deployed to the Brown's Creek Spillway to monitor the water heights. The second Flood Evacuation Order was released at 22.30 (30/3/17) with the following instructions:

“The levee may commence to overtop into the CBD anytime from midnight tonight. When the levee begins to overtop, a siren will be sounded. This will be:

Siren for One minute, Silence for One Minute, and Siren again for one minute⁴²”

The new State Warning and Order Risk Review Procedure as previously discussed should ensure that Local knowledge is incorporated into the decision-making process for Evacuation Orders.

The Murwillumbah Unit worked in concert with the Region IMT in respect to the Flood Evacuation Orders. A Flood Evacuation Warning was issued on Thursday 30/3/17 at 1.00pm with the warning:

“the NSW SES recommends that residents within the South Murwillumbah, Condong and Tumbulgum area should prepare to evacuate within the next 3 hours⁴³”.

A Flood Evacuation Order was issued for South Murwillumbah, Condong and Tumbulgum at 3.30pm on the 30/3/17 with the Order stating:

“the NSW SES is directing residents within the South Murwillumbah, Condong and Tumbulgum to evacuate immediately where safe transit exists and they are able to do so⁴⁴”

⁴¹ Interview Operations Officer

⁴² Flood Evacuation Order 11.30pm 30/3/17 (Lismore CBD)

⁴³ NSW SES Flood Evacuation Warning Richmond Tweed 30/3/17 1pm

⁴⁴ NSW SES Flood Evacuation Order Richmond Tweed 30/3/17 3.30pm

A Flood Evacuation Order for Murwillumbah was issued at 12.30am on 31/3/17 with the Order stating:

“The Bureau of Meteorology has revised the prediction for the Tweed River to reach 6.2m at Murwillumbah early this morning. The Murwillumbah CBD and East Murwillumbah levee may overtop some sections at this height.

The NSW SES is directing residents within the Murwillumbah CBD and East Murwillumbah to evacuate immediately to higher ground within Murwillumbah⁴⁵”

Refusal to evacuate:

On the 30/3/17 numerous warnings and orders were issued for the Murwillumbah, South Murwillumbah and Northern Rivers areas. These have been previously discussed in this report. As part of the Evacuation Order the SES attended the Greenhills Caravan Park on Tweed Valley Way, South Murwillumbah and conducted door knocking to inform residents. Fire Brigade and Ambulance Officers also attended the Caravan Park to assist in the evacuation duties.

It is reported that a number of residents of the Caravan Park and management were vocal in their disapproval of evacuation orders and insisted on remaining at the park, even though the Caravan park was inundated with water. In the early hours of the morning of the 31/3/17 it is reported that park management contacted Triple Zero requesting assistance due to excessive flooding.

Assistance was not able to be immediately provided due to the treacherous conditions and the Murwillumbah Unit boat capsizing at another incident. The Caravan Park and surrounds were isolated and unable to be accessed for approximately 24 hours⁴⁶.

The Tweed Shire Flood plan clearly identifies the following in respect to residents who refuse to evacuate:

“3.18.20 Refusal to evacuate. Field teams cannot afford to waste time dealing with people who are reluctant or refuse to comply with any Evacuation Order. These cases are to be referred to the NSW Police Force”.

Emergency Management Support

Communication between Emergency Services

On Thursday afternoon (30/3/17) an Emergency Operations Centre (EOC) was established by the Local Emergency Operations Controller (LEOCON) at 5 Zadoc Street, Lismore. This was on the top level of the Lismore Police Station.

The Emergency Operations Centres Policy Document was released by the NSW Government in November 2013. An Emergency Operations Centre (EOC) is a centre established under the State Emergency and Rescue Management Act at a State, Regional or Local level as a centre for communication, and as a centre for coordination of operations and support, during an emergency.

⁴⁵ NSW SES Flood Evacuation Order Murwillumbah 31/3/17 12.30am

⁴⁶ NSWPF Sitrep 2017-23348

An EOC is a facility from which an Emergency Operations Controller can ensure the timely provision of support to affected communities by either:

- a. Planning for an impending event in the pre-impact phase,
- b. monitoring an operation,
- c. **coordinating support to a Combat Agency**, or
- d. controlling an emergency operation (where there is no combat agency or at the combat agency's request or when directed by the Minister).

An Emergency Operations Centre is ALWAYS a multi-agency facility⁴⁷.

The Policy states that if the combat agency IMT (in this instance the Richmond Tweed Region) is controlling response to the emergency over more than one local area, the EOC will coordinate support to the same geographical area. In this instance discussions occurred between the LEOCON's at Richmond and Tweed in consultation with the REOCON (Northern Region) and the decision was made for the Tweed area to become a Forward Command post for the EOC, as opposed to another EOC operating within the same area.

The location of the EOC at 5 Zadoc Street, Lismore has meant that that it was located inside the evacuation area for the Lismore CBD. Once the evacuation order went out, the decision was made to move the EOC out of the evacuation area to the Lismore City Council Chambers located at 43 Oliver Avenue, Goonellabah. This is the alternate site for the EOC and had not been previously exercised. Difficulties were experienced with communications (mobile phones) and laptop connectivity.

The State Emergency Management Committee currently has a working party review into Emergency Operations Centres. This issue should be brought to the attention of the SEMC Working Party (EOC).

Recommendation 21

That NSW SES notifies the SEMC Emergency Operations Centres Working Party of the issues associated with the Lismore City Emergency Operations Centre.

⁴⁷ NSW Government Emergency Operations Centres Policy Document.



Figure 22: Emergency Operations Centre – Lismore Police Station

The NSW SES is the legislated combat agency for floods and is responsible for the control of flood operations as per the State Emergency Management Plan. This includes the coordination of other agencies and organisations for flood management tasks.

The EOC Policy states that the EOC should be staffed by emergency service organisations or functional area liaison officers at the appropriate level, dependent upon the requirements of the situation and as determined by the relevant Emergency Operations Controller⁴⁸. On the afternoon of Thursday 30/3/17 the Emergency Operations Controller requested the Richmond Tweed Region Incident Controller to provide an SES liaison into the EOC.

It was perceived at the time by the Incident Controller that they had no one to spare to perform that role and no liaison was provided into the EOC until Friday afternoon (31/3/17). This meant that at times the SES and Ambulance attended the same jobs. The communication between emergency services would have been greatly enhanced through the provision of a NSW SES liaison officer to the EOC.

Recommendation 22

That the NSW SES reinforces the need to ensure that when an Emergency Operations Centre is established, that an appropriate SES Liaison Officer is provided.

⁴⁸ NSW Government Emergency Operations Centres Policy Document Pg. 8.

Training & Development

Australasian Inter-Service Incident Management System (AIIMS)

The Australasian Inter-Service Incident Management System (AIIMS) is a system for the management of all incident, imminent or actual, occurring in the natural or built environment; or for the many other activities that emergency management agencies, and those that support them, may have to deal with⁴⁹.

AIIMS is founded on five fundamental principles, which guide the application of the system, and against which the activities of incident management are tested. The principles are:

- Flexibility;
- Management by Objectives;
- Functional Management;
- Unity of Command; and
- Span of Control.

Flexibility: In the ‘all hazards-all agencies’ approach the system must be able to be applied across all incidents where the nature, scale, complexities, duration and number of agencies involved can all vary.

Management by Objectives: The Incident Controller, consulting as appropriate with the Incident Management Team and supporting agencies, determines the desired outcomes.⁵⁰

Functional Management: Eight groupings as; Control, Planning, Intelligence, Public Information, Operations, Investigation, Logistics and Finance.

Unity of Command: Each individual should report to only one supervisor. In the context of incident management, it is extended to the idea that there is only one Incident Controller for any incident, directing and coordinating the actions of all forces.

Incident Controller

An Incident Controller is appointed for every incident and is responsible and accountable for all of the functions of incident management⁵¹. This can be a Local, Region or State appointment.

A Richmond Tweed Region Incident Controller was appointed as this was classified as a Level 3 event. The appointment saw the Richmond Tweed Region Controller initially perform the role of Region Incident Controller for Wednesday 29/3/17 and Thursday 30/3/17 (dayshift)⁵². Out of Area Region Controllers then performed this function in the following days. A review of the training records relating to AIIMS Incident Controller qualifications for all staff who performed in the role of Incident Commander revealed the following as at March/April 2017:

⁴⁹ Australasian Fire and Emergency Service Authorities Council. The Australasian Inter-Service Incident Management System

⁵⁰ Australasian Fire and Emergency Service Authorities Council. The Australasian Inter-Service Incident Management System pg. 11

⁵¹ NSW State Flood Plan, pg. xiii

⁵² IAP and RTR IMT Roster

Name	Course/Qualification	Date
RC1	Control a Level 1 Incident	26/6/2016
RC2	Control a Level 1 Incident	25/11/2016
RC3	Nil*	
RC4	Control a Level 1 Incident	22/12/2014
	Control a Level 2 Incident	22/11/2016
	Control a Level 3 Incident	27/01/2017
RC5	Control a Level 1 Incident	11/01/2016
RC6	Control a Level 1 Incident	7/11/2015
	Control a Level 2 Incident	10/1/2016

A review of the training qualifications of Region Controller 3 showed the following courses in respect to Emergency Management Command and Control:

Course		Date
Introduction to Emergency Management	Emergency Management Australia	1998
Senior Emergency Management	Emergency Management Australia	2001
Emergency Risk Management	Emergency Management Australia	2006
Working in an Emergency Operations Centre	Emergency Management Australia	2008
Managing Emergency Operations	Emergency Management Australia	2008
Managing an Evacuation	Emergency Management Australia	2014

A number of Region Controllers/Incident Controllers are currently undergoing an accreditation process up to and including Incident Controller Level 3 through recognition of prior learning under the AIIMS system. This person is very experienced within the NSW SES with 29 years' service, 14 years as a Region Controller.

The NSW SES has increased the amount of training that is currently being provided to staff. The following identifies the courses completed by staff:

Course	Number of staff completed
Introduction to Australasian Inter-Service Incident Management Systems (AIIMS) 4	580
Course in Australasian Inter-Service Incident Management System (AIIMS)	188
Control a Level 1 Incident	391
Control a Level 2 Incident	16
Control a Level 3 Incident	5

Recommendation 23

That the NSW SES continues to support the development of staff through AIIMS training.

Multi-Agency Incident Management Training

The Region Incident Management Team was understaffed in people trained in AIIMS Level 3 positional roles. An Incident Management Team should draw together trained personnel from emergency services involved in the management of the response to the incident. The Richmond Tweed Region IMT was a single agency staffed IMT with an Emergency Operations Centre operating in close proximity.

The Multi-Agency IMT was implemented in Victoria post the 2010 Bushfires and Royal Commission that recommended that ‘personnel involved in managing responses to major, or level 3 incidents, be required to achieve a common standard of competency, and that this be implemented through a multi-agency accreditation process’⁵³.

This would require a significant shift in the management of IMT’s and Emergency Operations Centres, however it is recommended that consideration is given to either colocation of the IMT and EOC for major events or the integration of multi-agency IMT’s (once appropriately trained). This should be raised by the NSW SES with the State Emergency Management Committee.

Recommendation 24

That the NSW SES raises the issue of Multi-Agency Incident Management Teams or co-location of Incident Management Teams and Emergency Operations Centres with the State Emergency Management Committee.

In the development of Incident Management Teams, it is vital that relationships are formed prior to any event. This is done through Exercise Management. Regionally based Incident Management Teams need to participate in Exercise Management, at least annually, to ensure that they are familiar with the systems and processes utilised.

Recommendation 25

That the NSW SES implements a calendar for annual exercising for all Region Incident Management Teams.

Community Liaison Officer Training

Two pilot programs of the Community Liaison Officer Course were held in the Hunter Region on the 16 and 17 June 2017. They involved many of the people deployed to the Far North Coast during the recent operation.

The aim of the Community Liaison Officer course is to provide participants with the skills and knowledge to be able to undertake the role of a Community Liaison Officer within the Incident Management Team.

The purpose of this training is to outline the roles and function of the Community Liaison Unit (CLU) within the Australasian Inter-Service Incident Management System (AIIMS) structure, for the NSW SES. On completion of this participants will be able to achieve an:

- Understanding of the Community Liaison Officer role and the role of the Community Liaison Unit
- Understanding of the mobilisation and demobilisation of the Community Liaison Unit

⁵³ Review of Incident Management Teams: Accreditation and Rostering (July 2017)

- Understanding of the impacts of stress on the individual and communities during incidents
- Understanding of effective communication skills
- Knowledge of the methods of engagement and communication utilised during an incident
- Ability to write a Community Liaison Plan

Recommendation 26

That the NSW SES continues to support the Community Liaison Officer training course.

Flood Planning

Lismore

The Lismore City Flood Emergency Sub Plan was signed off in August 2013 by the NSW SES Lismore Local Controller and the Chair of the Local Emergency Management Committee. The Lismore City Flood Emergency Sub Plan is a sub plan of the Lismore City Local Emergency Management Plan (EMPLAN).

It has been prepared in accordance with the provisions of the State Emergency Service Act 1989 (NSW) and is authorised by the Local Emergency Management Committee in accordance with the provisions of the State Emergency and Rescue Management Act 1989 (NSW)⁵⁴.

The Lismore City Flood Emergency Sub Plan there is no definition or abbreviation for an ‘Incident Controller’. There is one for the Local Emergency Operations Controller. The Local Flood Plan clearly establishes the responsibilities of the Lismore City NSW SES Local Controller⁵⁵ under the categories of Preparedness, Response and Recovery.

Recommendation 27

That the Lismore City Flood Emergency Sub Plan 2013 is revised to include a definition of Incident Controller.

The Local Flood Plan assigns the BoM with the responsibility for the provision of flood watches in a catchment area based on predicted or actual rainfall. Flood Watches will be included in NSW SES Flood Bulletins issued by the NSW SES Richmond-Tweed Region Headquarters⁵⁶.

Flood Plan Maintenance

The Lismore City Flood Emergency Sub Plan 2013 has a number of annexures. Volume 2 – Hazard and Risk in Lismore City (last updated Nov 2006) and Annexure C, D, E, F, G, H, I, J, K, L, and M, along with Maps 1, 2, 3 and 4 are all marked as The Lismore City Local Flood Plan 2006. These documents need to be updated as they are 11 years dated.

Recommendation 28

That the Lismore City Flood Emergency Sub Plan 2013, Volume 2, annexures and maps are updated as they currently reflect the Lismore City Local Flood Plan 2006.

⁵⁴ Lismore City Flood Emergency Sub Plan 2013

⁵⁵ Lismore City Flood Emergency Sub Plan 2013 pg. 2-4

⁵⁶ Lismore City Flood Emergency Sub Plan 2013 pg. 22

Tweed Shire

The Tweed Shire Flood Emergency Sub Plan was signed off in May 2014 by the NSW SES Tweed Shire Local Controller and the Chair of the Local Emergency Management Committee. The Tweed Shire Flood Emergency Sub Plan is a sub plan of the Tweed Shire Local Emergency Management Plan (EMPLAN).

It has been prepared in accordance with the provisions of the State Emergency Service Act 1989 (NSW) and is authorised by the Local Emergency Management Committee in accordance with the provisions of the State Emergency and Rescue Management Act 1989 (NSW)⁵⁷.

The Tweed Shire Flood Emergency Sub Plan there is no definition or abbreviation for an 'Incident Controller'. There is one for the Local Emergency Operations Controller. The Local Flood Plan clearly establishes the responsibilities of the Tweed Shire NSW SES Local Controller⁵⁸ under the categories of Preparedness, Response and Recovery.

Recommendation 29

That the Tweed Shire Flood Emergency Sub Plan 2014 is revised to include a definition of Incident Controller.

Flood Plan Maintenance

The Tweed Shire Flood Emergency Sub Plan 2014, Volume 2 - Hazard and Risk in Lismore City (last updated Nov 2008) and all subsequent annexures and maps are dated November 2008. These documents need to be updated as they are 9 years dated.

Recommendation 30

That the Tweed Shire Flood Emergency Sub Plan 2014, Volume 2, annexures and maps are updated as they currently reflect the Tweed Shire Local Flood Plan 2008.

Community Engagement

Public Education

The NSW Flood Plan states that the NSW SES has the primary responsibility for the collation, assessment and public dissemination of information relating to flooding. The Lismore City and Tweed Rivers Flood Plans have specific responsibilities for the Local Controllers and the Richmond Tweed Region Headquarters as follows:

Specific strategies to be employed include:

- a. Dissemination of flood-related brochures and booklets in flood liable areas.
- b. Talks and displays orientated to community organisations, businesses and schools.
- c. Publicity given to this plan and to flood-orientated NSW SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

⁵⁷ Tweed Shire Flood Emergency Sub Plan 2014

⁵⁸ Tweed Shire Flood Emergency Sub Plan 2014

The Lismore City SES Unit with the Richmond Tweed Region Community Engagement Officer and in some instances the Lismore City Council organised the following events/workshops:

Date	Event
23/1/16	Bunnings BBQ – Raising awareness of flood and storm safety
18/6/16	Aviation Unlimited Air show to raise awareness
2/7/16	Army Open Day to raise awareness
26/7/16	Future Options Day Trinity College
3/8/16	South Lismore Careers Day
13/8/16	Caroona Fete to raise awareness
17/9/16	Lismore Public School Fete
29/9/16	Good Start Early Learning centre flood and storm awareness talk
22/10/16	North Coast National (Lismore Show)
2/11/16	School Group visit to unit
4/11/16	School Group visit to unit
23/11/16	North Lismore Home Emergency Kit and Plan workshop –Richmond River High school (6pm). Reported poorly attended.
6/12/16	CBD Bizsafe Flood information night – Lismore Workers Club This presentation targeted CBD business operators, Council staff presented on the operations of the Levee scheme along with the SES.
8/12/16	Disability Groups Flood Scenario workshop
13/12/16	Jiggi Public School Safety Day
14/3/17	South Lismore FloodSafe information night - South Lismore Bowling Club Targeted at residents and businesses in South Lismore, Council presented on the operations of the South Lismore Levee along with SES.
Oct 2016- Feb 2017	Richmond Region liaised 4 businesses & Lismore Chamber of Commerce re CBD FloodSafe poster

In December 2016 in the lead up to the information nights Council sent out a letter and flyers to all flood prone properties - approximately 3000, with individual levels shown for living area, front gate and centre of road (Annexure 1). These were surveyed in 2006, by registered surveyors, and have been sent out 4 times since then. The database that we use is on the council website, and is publicly available here <https://www.lismore.nsw.gov.au/file.asp?g=RES-OZO-53-47-28> This latest database and mailout included 200 properties in East Lismore that had previously not been on the list.

The Murwillumbah Unit services a significantly smaller population and their community engagement was recorded as follows:

Date	Event
12/11/16	Tumbulgum 150 Anniversary and Tweed Lantern Festival

It was highlighted by the SES and Lismore Council that many of the Community Engagement events were very poorly attended (in some instances only four members of the public). Post the March/April event the following meetings/information sessions have been conducted.

Date	Event
22/6/17	Deaf Awareness Workshop for Emergency Service Personnel
25/6/17	Deaf Awareness Workshop for Community
12/5/17	Post Flood Community Forum – Lismore CBD
13/5/17	Post Flood Community Forum – North Lismore
13/5/17	Post Flood Community Forum – South Lismore
26/6/17	Post Flood Follow up meeting – North Lismore
27/6/17	Post Flood Follow up meeting – South Lismore
April 2017	Presented at Lismore Chamber of Commerce Flood Information Meeting
6/4/17	Presented at Council facilitated community meeting post flood

The NSW SES recognises that they need to change the manner in which they interact or provide information to the community. One section of the Community ‘at risk’ was those suffering from a hearing disability. Upon being brought to the notice of the NSW SES forums were conducted not only for the community, but for SES personnel. The SES should be congratulated on this initiative.

The NSW SES needs to liaise with other NSW Government Agencies to identify best practice for community engagement and to forge linkages with those agencies to ensure that the community education message is being delivered and received in an appropriate format. During the Review, a new initiative by Lismore City Council “Lismore Flood Ready” was identified.

Whilst this is a great strategy by Council, in the list of Partners, the NSW SES is not specifically listed. It could be argued it would come under State Government Agencies, however as the Emergency Service/Combat Agency for Floods, they should be heavily involved in this project. This should be a partnership between the local council, SES and the Community of Lismore.

Recommendation 31

That the NSW SES liaise with the appropriate NSW Government Agencies to ensure stronger linkages are forged at a local level between emergency responders, local councils and community development professionals.

The Richmond Tweed Region Community Engagement Coordinator, in concert with the Units has conducted a number of post flood community forums, using an external facilitator in nine (9) locations. It was apparent in those forums that further engagement is required to work with the communities to build resilience. The Community Engagement Coordinator has gained in principal agreement for funding for an additional community engagement staff member to assist in moving forward. An application for additional recovery funding to also support this position has been put forward to the Commonwealth Government.

Recommendation 32

That the NSW SES supports the additional funding for an additional community engagement staff member for the Richmond Tweed Region.

Community Media during the event

An analysis of the media coverage produced in the 6 days between 28 Mar 2017 and 02 Apr 2017 found 1,058 items. This coverage reached a cumulative audience of 53,721,219.

- Online News provided the largest volume of coverage (140) in a single day (31 Mar 2017)
- TV reached the highest number of people (11,036,000) in a single day (31 Mar 2017)
- TV had the highest advertising space rate (AUD 3,646,758) in a single day (31 Mar 2017)

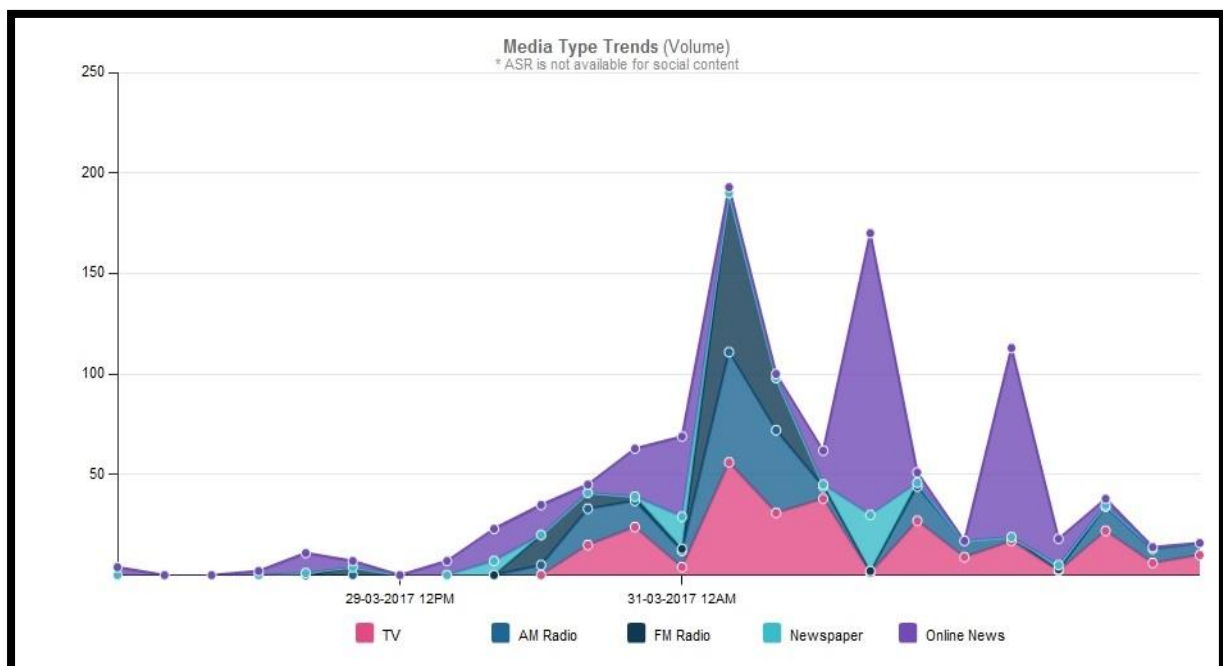


Figure 23: Media type trends

The NSW SES State media section received 184 media calls and did 76 live crosses during this period. The Richmond Tweed Region was inundated with requests for interviews over the course of the event. On Thursday afternoon, 30/3/17 the Incident Controller put a media blackout in place as they believed they were too busy to talk to the media. Unfortunately, this created a media void and did not assist with messaging going out.

The Assistant Commissioner was physically moved to Richmond Tweed Region Headquarters due to the public media in this event. There was also the view amongst local SES staff that when it became apparent that there was criticism in respect to the lack of evacuation time provided for the Lismore CBD, the SES went quiet on the issue. This void meant that the negative sentiment gained momentum instead of the SES being able to provide early explanations as to why the Evacuation Order was made⁵⁹.

Recommendation 33

That NSW SES ensures that media 'blackouts' do not occur during major events, rather the media is harnessed to ensure the timely delivery of messaging.

⁵⁹ Interviews SES RTR staff

The NSW SES website had been launched only a few weeks prior to this event. The event was the first time that the new website had been used for an operational response and it crashed under the volume of traffic using the site⁶⁰. On Thursday 30/3/17 about 10.40pm the warnings map on the www.ses.nsw.gov.au website stopped displaying. This meant that no warnings appeared on the map display.

Analysis identified that this fault was due to the volume of traffic to the google map exceeded the credits of up to 25,000 sessions within a 24-hour period. The developers have now rectified this issue through the purchasing of an additional 50,000 credits. This was implemented about 6am on the 31/3/17.

Additional issues with the new webpage were identified as:

- The process to upload a warning is not automatic and requires additional resources
- There was only one person trained in uploading the new warnings
- There is a limit as to how many warnings can be loaded
- There is no ability to add a warning over multiple SES boundaries
- The map remained visible when there were no current warnings (rectified post event)
- Flood Watches are not publicised on the website. The public would need to check the website and BoM to gain all information.
- Post event the mix of stories and warnings, the warnings are not removed from the story list. This lead to confusion where there were recently back to back events at Lismore and the same area was being shown as 'all clear' that was under flood watch.

The above issues have been raised through the Warnings Working Group and need to be rectified as soon as practicable.

Recommendation 34

That the NSW SES Warnings Working Group addresses the issues identified with the NSW SES website and ensure that the Website is tested under operational conditions to ensure it meets the NSW SES systems requirements

⁶⁰ Information from the Web and Social Media Coordinator.

Other Issues Arising

Fatigue Management

The NSW SES has worked extremely hard at educating their members in the area of fatigue management. However, additional work still needs to occur to ensure that members better understand fatigue management.

Fatigue was present during this event and in many instances, it was unavoidable. However, through employed systems of deployment a number of fatigue issues could have been overcome. A number of staff travelled north to become part of the Incident Management Team that nightshift. A number of local staff members also did extraordinary hours to ensure that the public was kept safe. The fatigue highlighted existing tension and stresses.

The Incident Management Team appointed an AM/PM shift/s however on the Thursday the Local Incident Controller was not relieved until late that evening and the relieving Incident Controller had travelled that day to be at Lismore. There is also an apparent culture within the NSW SES that members don't want to let others down by taking a break, others felt guilty if they did take a break.

The NSW SES should reinforce existing policy on fatigue management ensuring that members understand why it needs to be enforced as it is not only for their safety but for their mental wellbeing.

Recommendation 35

That the NSW SES reinforce existing policy on fatigue management ensuring that members understand why it needs to be enforced as it is not only for their safety but for their mental wellbeing. That the NSW SES considers placement of a designated safety officer as part of the Incident Management Team.

Land Use Planning

It is recommended that the NSW SES has greater involvement in floodplain development with Local Councils and that their input is mandatory before any consent by council is given in flood planning areas.

This would ensure that there is management of the risk to life in rarer events along with more robust evacuation controls. Consideration should be given to examining the role that the NSW RFS in regard to Land Use and Building Consent in bush fire prone areas for development of a similar process by the NSW SES.

Recommendation 36

That the NSW SES becomes a recognised authority for land use planning purposes, having greater involvement in floodplain development with Local Councils and that their input is mandatory before any consent by council is given in flood planning areas.

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- New South Wales State Emergency Service Flood Action Cards (Lismore City Unit) 8/9/2016 Draft

New South Wales State Emergency Service Flood Action Cards (Murwillumbah) Dec 2014.

New South Wales State Emergency Service Flood Bulletins (1-14) Richmond Tweed Region (Wilson River - Lismore)

New South Wales State Emergency Service Flood Bulletins (1-20) Richmond Tweed Region (Tweed River)

New South Wales State Emergency Service Emergency Alert Guidelines V2.2 January 2017

New South Wales State Emergency Service Flood Evacuation Orders Richmond Tweed Region (Lismore CBD, North and South Lismore)

New South Wales State Emergency Service Flood Evacuation Orders Richmond Tweed Region (South Murwillumbah, Condong & Tumbulgum)

New South Wales State Emergency Service Incident Action Plan Event 210-11617 Number 1, 29 March 2017

New South Wales State Emergency Service Incident Management Framework 11 April 2017 Version 1.1

New South Wales State Emergency Service Incident Management Policy (2016) Version 1.0

New South Wales State Emergency Service OAAA Resource Request Form (29/3/17)

New South Wales State Emergency Service Operations Bulletin 01/1617 – NSW Operational Readiness and Response Bulletin

New South Wales State Emergency Service Operations Bulletin 09/1617 – NSW SES Operational Readiness

New South Wales State Emergency Service, Operations Manual Chapter 6-Flood Rescue Guidelines November 2013

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About the Author

David Owens APM MLshipMgmt MEmergMgmt DipCrim
 Managing Director
 Risk-e Business Consultants



David Owens established Risk-e Business Consultants, an Executive Level Management Consultancy, when he retired as Deputy Commissioner of the NSW Police Force after over 30 years of service. The NSW Police Force is Australia's oldest and largest policing organisation and one of the biggest in the English-speaking world. As the Deputy Commissioner, David was responsible for the leadership and management of nearly 13,000 police and 1200 public servants. This consisted of 6 Regions across the State, Major Events and Incident Group (Public Order and Riot Squad) and Traffic Services. He oversaw, with responsibility and accountability a budget of \$1.1 billion.

David has performed in various roles which include Venue Commander for the Sydney 2000 Olympics, Operation Commander, Operation CONTEGO (APEC 2007 Leaders Week) having responsibility for policing & security arrangements. He was also the overall Operation Commander, Operation ANGELUS (World Youth Day 2008) during which His Holiness Pope Benedict XVI conducted services for over 500 000 pilgrims in Sydney.

David was appointed to the legislative role of State Emergency Operations Controller (SEOCN) on 01 December 2007 and performed this position for some four years, making him the longest serving officer in this role. As SEOCN, he was responsible for overall emergency management responses within the New South Wales.

Sample of Operations conducted:

- Sydney 2000 Olympics, Venue Commander, Sailing
- Equine Influenza (2007) with Department of Primary Industries
- Black Saturday Bushfires Victoria (2009) 150 staff deployed
- Emergency Management for World Youth Day and APEC Leaders Week
- Queensland Floods (2011)
- Christchurch New Zealand Earthquake 2011
- Japanese Tsunami (2011) Urban Search & Rescue Deployment
- United Nations Urban Search & Rescue accreditation Turkey (2011)

In addition, he represented the NSW Police Force on the State Emergency Management Committee and State Rescue Board respectively, significantly contributing to planning and policy development.

Post Retirement, David has been a consultant to the NSW and ACT Governments on Investigations, Policy Development and Emergency Management in the areas of mining and transport (Sydney Metro-formally North-West Rail Link). David has also worked with the Office of Liquor, Gaming and Racing (investigations and policy advice); Ambulance NSW (Strategic reviews and leadership development) and in 2015 was the independent Chair for the NSW Government on Loose Fill Asbestos Insulation (a \$280m project), all recommendations accepted by NSW Government. David has also consulted to private industry on a range of issues in the security and emergency management arenas and in 2014 David completed accreditation as an OGC Gateway Review Team Member. In 2015 David was appointed by the State Emergency Management Committee as the facilitator for the Greater Sydney Mass Care Exercise. In June 2016, David was appointed as the NSW State Recovery Coordinator for the East Coast Low and in September 2016 as the Regional Recovery Coordinator for the Central


Western floods. In 2017, David was appointed by the NSW Government to the NSW Energy Security Taskforce.

David holds two (2) Masters, in Emergency Management (2013) and Leadership and Management (2011); Diploma in Criminology (1998); Graduate Certificate in Management (1999) and attended the National Executive Institute Session XXXIV, Federal Bureau of Investigation (FBI), 2009

David has received the following awards: National Medal (1997 & 1st Clasp), NSW Police Medal (1st, 2nd & 3rd Clasp); Three Commissioner's Unit Citations; Commissioner's Olympic Commendation; Two Commissioners Commendations; Australian Police Medal (2007) and the NSW State Government Service Medal.

Annexures

Annexure 1 – Council Letter to Residents December 2016



1 December 2016

Dear Resident,

Re: Important flood information about your property

Please find enclosed our Floodsafe brochure that includes information on flood levels and your property.

The Floodsafe brochure includes a diagram of your property and indicates where flood heights affect your property. Please take the time to read and absorb this information. The flood season is upon us and it's a good idea to be informed about your property and how floods may affect your home.

Below is additional information to keep in mind about flooding in Lismore and your role and responsibility as a person who resides in a flood-prone area.

Be prepared

Part of the responsibility of living within a flood-prone area is to ensure your family, your pets and your belongings are safe and secure during a flood.


Having a Home Emergency Plan in place before a flood occurs helps you ensure you are well-prepared in the event of a flood. NSW SES provides free help for residents to create a Home Emergency Plan and it only takes 5-10 minutes. You can complete the plan online at www.floodsafe.com.au or phone 1800 201 000.

Post-flood waste pick-up

Lismore City Council no longer undertakes roadside waste collection following flood events. The practice is very costly and the system has often been abused in the past, with many residents presenting waste for collection that was not flood damaged.

We will only pick up debris that has been washed onto public land by floodwaters, not flood-damaged household items. We do provide free drop-off for flood-damaged goods at the Lismore Recycling & Recovery Centre after each flood, and we have courtesy trailers that can be borrowed to transport goods.

www.lismore.nsw.gov.au
43 Oliver Avenue, Goonellabah NSW 2480 • PO Box 23A, Lismore NSW 2480 • T: 1300 87 83 87 • E: council@lismore.nsw.gov.au • ABN: 60080932837
Lismore City Council acknowledges the people of the Bundjalung Nation, traditional custodians of the land on which we work.



Residents who live in flood-prone areas should prepare for floods by lifting all items to higher areas once a Flood Warning that affects your property has been announced by the Bureau of Meteorology. For low-risk areas this may simply mean placing items on higher shelves or a verandah, while in high-risk areas it may mean moving items to a friend or relative's house in another area of the city, or into a flood-free storage unit.

Ensuring your belongings are secure is not just for your own wellbeing and safety but also that of others. Having bulky items such as furniture, whitegoods or even gas bottles floating through the city during a flood can be very hazardous.

SMS Flood Alerts and Road Closure Information

For information on road closures during a flood, visit www.myroadinfo.com.au or download the free My Road Info app. The website and smartphone app are updated by field staff during a flood, so you have up-to-date information on closures, delays etc.

Council also sends SMS alert messages during a flood. These SMS alerts use information from the Bureau of Meteorology and/or the Richmond Tweed Region NSW SES to ensure residents are kept informed about how a flood situation is progressing. Please note that NSW SES are the lead agency legislated to issue Evacuation Warnings and Orders for floods, and Council does not issue ANY flood evacuation warnings or orders. This is a function undertaken by the NSW SES and is done in various methods, which can include a combination of media alerts, doorknocking, loud speaker announcements, and in some circumstances an Emergency Alert, which is an automated message managed by the relevant Telco authority that is sent to mobile and landline phones within a designated area under threat.

To register your number for Council SMS flood alerts phone us on 1300 87 83 87 or fill out the Flood Alert SMS Registration form at www.lismore.nsw.gov.au.

For emergency help in floods and storms phone NSW SES on 132 500. In life threatening emergencies phone 000 (triple zero).

For more information on flooding in Lismore, head to our website at www.lismore.nsw.gov.au or phone us on 1300 87 83 87, or visit the NSW SES FloodSafe website at www.floodsafe.com.au or phone the SES on 1800 201 000.

Yours faithfully

Scott Turner
Manager – Assets

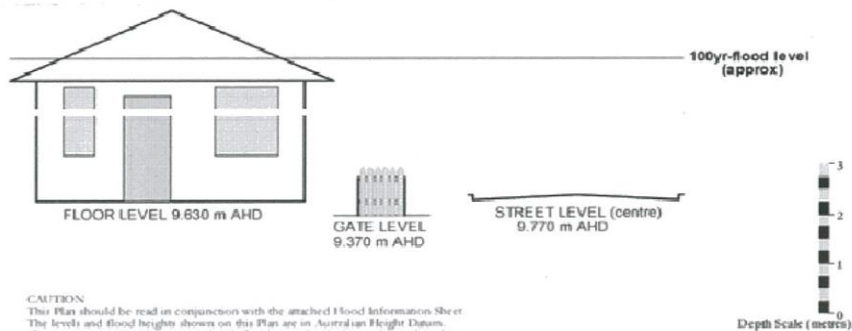




Your property

The plan below provides flood height information specifically for your property. Please keep this in a safe place for future reference.

**IMPORTANT INFORMATION
TO THE RESIDENT
92 KEEN STREET
LISMORE 2480**



CAUTION
This Plan should be read in conjunction with the attached Flood Information Sheet. The levels and flood heights shown on this Plan are in Australian Height Datum. These cannot be directly compared with flood gauge levels due to the surface slope of the flood waters and different measuring techniques used. It should be noted that other parts of your site may be lower than the front gate.

Note: This Property is Protected by the Lismore Levee up to RL 10.65 Subject to Flood Gradient, as observed at the Lismore Rowing Club Gauge

Last roads out to high ground

CBD Lismore:
North: Keen Street then Leycester or High Street
East: Conway Street then Wyrallah Road.

South Lismore:
Casino Street: Ballina Street Bridge then Ballina Road and Wyrallah Road.

North Lismore:
Bridge Street or CBD then north through Keen Street and Leycester Street. Residents furthest away from the river may have access to Dunoon Road through the showground.

Please never drive, ride, walk or play in floodwater.

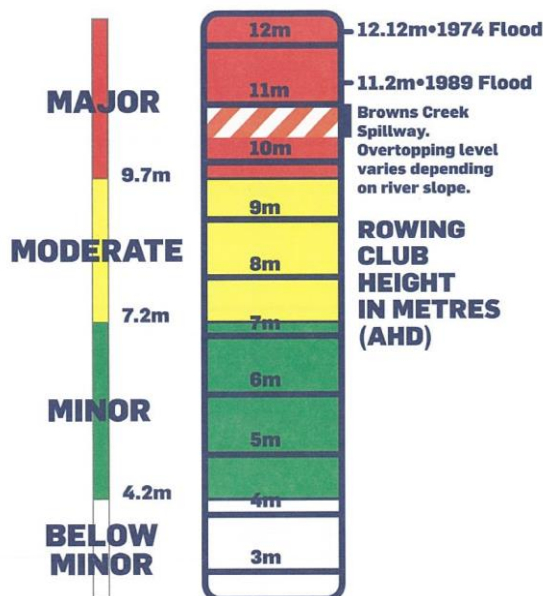
Are you prepared? Do you have a plan for the next flood?

Lismore has a long history of flooding, with more than 100 floods since 1846. The city spans the junction of the Wilsons River and Leycester Creek. Floods split the city into three areas: North, South and Central Lismore.

Your property is situated within one of these flood-prone areas and it is important that you understand the nature of floods in Lismore, the risk factors and how to stay informed so you can make sensible decisions about your family and your property. This brochure contains flood and floor height information specific to your property.

Be prepared

As a resident living in a flood-prone area, you need to plan what you and your family will do in the event of a flood. The NSW SES can help you prepare a Home Emergency Plan or visit www.floodsafe.com.au. It is important to be aware that a major flood is any flood that is predicted to be above 9.7 metres AHD and could potentially overtop the levee as shown below. You can access and monitor the Rowing Club gauge (named 'Wilson's R at Lismore') at www.bom.gov.au.



Three basic measures you can take right now are: **prepare a Home Emergency Plan, keep a list of emergency numbers near the phone and pack a Home Emergency Kit.**

Flood evacuation

Your Home Emergency Plan should consider your evacuation options. In major floods, the safest option is to evacuate early. Make sure your house is secure, collect your pets and pack your Home Emergency Kit with valuables (important documents, photos) as well as any medication and clothing/toiletries for several days.

Turn off electricity (including solar PV arrays and battery banks) and water as you leave, and turn off and secure gas bottles. Arrange to stay with friends and relatives who live in flood-free areas, or at the designated evacuation centre. Tell family or neighbours that you are leaving.

The NSW SES determines the need for evacuation of residents during a flood. Once the decision has been made, the NSW SES will activate official evacuation centres and notify the public of their location.

Home Emergency Kit

At all times, your emergency kit should contain:

- A portable radio with spare batteries.
- A torch with spare batteries.
- A first aid kit.
- Candles and waterproof matches.
- A waterproof bag for valuables.

When flooding is likely, these items should be added:

- Important documents/photos.
- Medications/scripts.
- Special dietary needs or other special requirements.
- Shoes/clothing.

Who to contact during a flood

For emergency help **000**

For people and/or property at risk **132 500**

For road closure information visit www.myroadinfo.com.au or download the free app.

Mobile phone SMS flood messages

You can receive official flood alerts from Council via text message.

Phone **1300 87 83 87** to register or fill out the Flood SMS Registration form at www.lismore.nsw.gov.au.

Stay informed: listen to your local radio

ABC North Coast	94.5FM
Radio 2LM	104.3FM
River FM	92.9FM
ZZZ	100.9FM
NIM FM	102.3FM
Richmond	
Valley Radio	88.9FM

Annexure 2 – Sequence of Warnings & Response: Lismore/Wilsons River

Date	Time	Height at the Lismore Gauge	Product/Action	Prediction
Tuesday 28/3/17	2.28pm	N/A	BoM Flood Watch 1	<ul style="list-style-type: none"> • Flood watch for Northern Rivers & Upper Macintyre Valley • Tweed Valley – moderate to major flooding • Brunswick Valley – moderate to major flooding • Richmond – Wilsons Valley – moderate to major flooding • Clarence Valley – minor to moderate flooding • Upper Macintyre Valley – minor to moderate flooding
Wednesday 29/3/17	10.39am	N/A	BoM Flood Watch 2	<ul style="list-style-type: none"> • Flood watch for Northern Rivers & Upper Macintyre Valley • Tweed Valley – moderate to major flooding • Brunswick Valley – moderate to major flooding • Richmond – Wilsons Valley – moderate to major flooding • Clarence Valley – minor to moderate flooding • Upper Macintyre Valley – minor to moderate flooding • Bellinger Valley – minor flooding
Thursday 30/3/17	8.29am	N/A	BoM Flood Watch 3	<ul style="list-style-type: none"> • Flood watch for the Richmond – Wilsons, Clarence, Coffs Coast, Bellinger, Nambucca and Upper Macintyre Valleys • Richmond – Wilsons Valley – moderate to major flooding • Bellinger/Nambucca & Upper Macintyre – minor to moderate flooding • Coffs Coast – minor flooding • Clarence Valley – moderate flooding
Thursday 30/3/17	12.39pm	2.62m rising	BoM Flood Warning 1	<ul style="list-style-type: none"> • Up to 180mm rain in past 12 hours over Wilsons River Valley

				<ul style="list-style-type: none"> • Further rainfall is forecast next 24-48 hours • Wilson's River moderate flooding predicted at Lismore • Minor flood level (4.20 m AHD) Thursday afternoon, may reach moderate level (7.2m) early Friday morning • Next warning to be issued 3pm 30/3/17
Thursday 30/3/17	12.39pm document Issued 1.51pm	2.62m rising @ 12.14pm	NSW SES Flood Bulletin 1	Predicted: Exceed 4.2m at Lismore gauge Thursday afternoon 7.20m early Friday morning.
Thursday 30/3/17	3.38pm	5.04m rising @ 3.32pm	BoM Flood Warning 2	<ul style="list-style-type: none"> • Up to 270mm rain in past 15 hours over Wilson River Valley • Minor flooding current along Wilson River at Lismore • Forecast Major flooding is predicted Lismore Thursday night • Lismore expected to exceed moderate flood level 7.2m Thursday evening, major flood level 9.70m late Thursday evening and 11m early Friday morning • Next warning 8pm 30/3/17
Thursday 30/3/17	3.53pm	5.18m rising @ 3.44pm	BoM Flood Warning 3	<ul style="list-style-type: none"> • Up to 270mm rain in past 15 hours over Wilson River Valley • <i>with river levels predicted to be higher than the 2001 and 2005 floods</i> • Lismore expected to exceed 7.2m Thursday evening, 9.70m late Thursday evening and 11m early Friday morning • Next warning 8pm 30/3/17
Thursday 30/3/17	4pm document	5.04m @ 3.32pm	NSW SES Flood Bulletin 2	<ul style="list-style-type: none"> • Up to 270mm rain in past 15 hours over Wilson River Valley

	Issued 4.22pm			<ul style="list-style-type: none"> • Lismore expected to exceed 7.2m Thursday evening, 9.70m late Thursday evening and 11m early Friday morning • List of at predicted height, actions to be prepared for at differing heights by SES.
Thursday 30/3/17	4.30pm document Issued 4.23pm	5.18m @ 3.44pm	NSW SES Flood Bulletin 3	<ul style="list-style-type: none"> • Up to 270mm rain in past 15 hours over Wilson River Valley • Major flooding forecast Wilsons River Lismore Thursday night, river predicted to be higher than 2001 and 2005 floods. • Lismore expected to exceed 7.2m Thursday evening, 9.70m late Thursday evening and 11m early Friday morning • List of at predicted height, actions to be prepared for at differing heights by SES.
Thursday 30/3/17	4pm document Issued 4.40pm	N/A	NSW SES Flood Evacuation Order Incident Controller – Andrew McPhee	Flood Evacuation Order for Lismore CBD and North and South Lismore – evacuate immediately Predicted peak 11m Friday morning. The NSW State Emergency Service is directing residents to evacuate immediately.
Thursday 30/3/17	4.58pm	N/A	Emergency Alert for Flood Evacuation Order Lismore No 1	As per report
Thursday 30/3/17	5.08	N/A	Emergency Alert for Flood Evacuation Order Lismore No 2	As per report
Thursday 30/3/17	8.06pm	7.04m @ 7.24pm	BoM Flood Warning 4	Major Flood Warning for the Wilsons River at Lismore and minor to moderate flood warning for the Richmond River. <ul style="list-style-type: none"> • Up to 430mm rain in last 22 hours • Wilsons river expected to exceed major flood level 9.70 overnight and 11m early Friday morning • Wilson River at Lismore 7.04m rising at 7.24pm 30/3/17

				<ul style="list-style-type: none"> • <i>with river levels predicted to be higher than the 2001 and 2005 floods</i> • Next warning issued 1.00am 31/3/17
Thursday 30/3/17	8.15pm document Issued 8.27pm	7.04m rising 7.24pm	NSW SES Flood Bulletin 4	<p>Major flood warning Wilsons River at Lismore</p> <ul style="list-style-type: none"> • People in low lying areas in Lismore CBD, North and South Lismore should evacuate immediately • Evacuation centre established at Southern Cross University • Major flooding forecast Wilsons River Lismore Thursday night, river predicted to be higher than 2001 and 2005 floods • Up to 430mm rain in last 22 hours • Lismore expected to exceed 7.2m Thursday evening, 9.70m late Thursday evening and 11m early Friday morning • List of at predicted height, actions to be prepared for at differing heights by SES.
Thursday 30/3/17	9.44pm	7.83m rising at 8.56pm	BoM Flood Warning 5	<p>Major flood warning Wilsons River at Lismore</p> <ul style="list-style-type: none"> • Major flooding forecast at Lismore from midnight with level predicted to be higher than 2001 and 2005. • Up to 470mm rain in last 23 hours • Wilsons river expected to exceed major flood level 9.70 overnight and 11m Friday morning • Dependent on further rainfall further rises possible • Next warning 2am 31/3/17
Thursday 30/3/17	9.44pm document Issued 10.37pm	7.83m rising at 8.56pm	NSW SES Flood Bulletin 5	<p>Major flood warning Wilsons River at Lismore</p> <ul style="list-style-type: none"> • People in low lying areas in Lismore CBD, North and South Lismore should evacuate immediately • Evacuation centre established at Southern Cross University • Major flooding forecast Wilsons River Lismore Thursday night, river predicted to be higher than 2001 and 2005 floods • Up to 470mm rain in past 23 hours

				<ul style="list-style-type: none"> • BoM has predicted Wilsons River will: exceed 9.70m at Lismore gauge around midnight and 11.50m Friday morning • List of at predicted height, actions to be prepared for at differing heights by SES.
Thursday 30/3/17	23.30 document Issued 23.56	N/A	NSW SES Flood Evacuation Order Incident Controller David Monk	<p>Flood evacuation Order for Lismore CBD and North and South Lismore</p> <ul style="list-style-type: none"> • Revised prediction by the BoM for the Wilsons River of 11.5m on Friday morning. • SES is directing residents and businesses to evacuation immediately. • Levee may commence to overtop into the CBD anytime from midnight tonight. Siren will begin to sound • If you don't evacuate you may become trapped and we may not be able to rescue you.
Friday 31/3/17	1.06am	9.71 rising at 12.48am	BoM Flood Warning 6	<p>Major flood warning for the Wilsons River at Lismore</p> <ul style="list-style-type: none"> • 539mm rain recorded in last 24 hours • Major flooding forecast at Lismore from midnight with level predicted to be higher than 2001 and 2005. • Wilsons river expected to reach 11.50m Friday morning. • Dependent on further rainfall further rises possible • Next warning 5am 31/3/17
Friday 31/3/17 (Recorded Thursday 30/3/17)	9.44pm document Issued 1.06am	Reissue of Bulletin 5	SES Flood Bulletin 6	Reissue of Bulletin 5
Friday 31/3/17	1.23am	N/A	Emergency Alert for Flood Evacuation Order Lismore No 1	
Friday 31/3/17	1.33am	N/A	Emergency Alert for Flood Evacuation Order Lismore No 2	

Friday 31/3/17 @ 4am Lismore CBD Levee Overtops				
Friday 31/3/17	4.48am	11.01m rising at 4.44am	BoM Flood Warning 7	<p>Major flood warning Wilsons River at Lismore</p> <ul style="list-style-type: none"> • Up to 576mm of rain recorded in last 36 hours to 4am • Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. • Further rainfall is possible for next 6 hours which could produce river rises. • Wilsons river likely to peak 11.50m Friday morning • Next warning 8am 31/3/17
Friday 31/3/17	5am	11.01m rising	SES Flood Bulletin 7	<p>Major flood warning issued Wilsons River at Lismore</p> <ul style="list-style-type: none"> • People in low lying areas in CBD, North & South Lismore should evacuate immediately • Up to 576mm of rain in past 36 hours • Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. • List of at predicted height, actions to be prepared for at differing heights by SES.
Friday 31/3/17	8.24am	11.42m rising at 7.24am	BoM Flood Warning 8	<p>Major flood warning for the Wilsons river</p> <ul style="list-style-type: none"> • Up to 580mm of rain recorded in past 39 hours to 7am. Rain has ceased since 4am Friday morning • Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. But smaller than the 1974 flood is predicted for Lismore today • Wilsons river likely to peak 11.50m Friday morning • Next warning 1pm 31/3/17
Friday 31/3/17	9.30am document Issued 9.53am	11.42m rising at 7.24am	SES Flood Bulletin 8	<p>Major flood warning issued Wilsons River at Lismore</p> <ul style="list-style-type: none"> • People in low lying areas in CBD, North & South Lismore should evacuate immediately • Up to 580mm of rain recorded in past 39 hours to 7am. Rain has eased since 4am

				<ul style="list-style-type: none"> Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. But smaller than the 1974 flood is predicted for Lismore today Wilsons river likely to peak 11.50m Friday morning List of at predicted height, actions to be prepared for at differing heights by SES.
Friday 31/3/17	10.36am	11.57m steady at 10.32am	BoM Flood Warning 9	<p>Major flood warning for the Wilsons River at Lismore</p> <ul style="list-style-type: none"> Up to 580mm of rain recorded in past 50 hours to 9am Friday. Rain has ceased since 4am Friday morning Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. But smaller than the 1974 flood is predicted for Lismore today Wilsons River expected peak 11.60m Friday morning Next warning will be issued 4pm 31/3/17
Friday 31/3/17	12.30pm document Issued 12.29pm	11.57m steady at 10.32am	SES Flood Bulletin 9	<p>Major Flood Warning Wilsons River Lismore</p> <ul style="list-style-type: none"> People in low lying areas in Lismore CBD, North & South Lismore should remain outside the flood zone or evacuate immediately. Up to 580mm of rain recorded in past 39 hours to 7am. Rain has eased since 4am Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. But smaller than the 1974 flood is predicted for Lismore today Wilsons river likely to peak 11.60m Friday morning List of at predicted height, actions to be prepared for at differing heights by SES.
Friday 31/3/17	4.05pm	11.54m steady 3.44pm	BoM Flood Warning 10	<p>Major flood warning for the Wilsons River at Lismore</p> <ul style="list-style-type: none"> Up to 628mm of rain recorded in past 48 hours to 3pm Friday. Rain has ceased since 4am Friday morning Major flooding is occurring along the Wilsons River with level predicted to be higher than 2001 and 2005. But

				<p>smaller than the 1974 flood is predicted for Lismore today</p> <ul style="list-style-type: none"> • Wilsons River Peak is close to its peak near 11.57m with major flooding • Next warning will be issued 9pm 31/3/17
Friday 31/3/17	4.26pm	N/A	Emergency Alert for Flood Evacuation Order Lismore No 1	
Friday 31/3/17	4.44pm	N/A	Emergency Alert for Flood Evacuation Order Lismore No 2	
Friday 31/3/17	4.30pm document Issued at 5.10pm	11.57m steady @ 10.32am	SES Flood Bulletin 10	<p>Major Flood Warning Wilsons River Lismore</p> <ul style="list-style-type: none"> • People in low lying areas in Lismore CBD, North & South Lismore should remain outside the flood zone or evacuate immediately • Up to 628mm of rain recorded in past 48 hours to 3pm Friday. Rain has eased since 4am Friday morning • Wilsons river reached its peak 11.57m with major flooding
Friday 31/3/17	9.02pm	11.33m falling @ 8pm	BoM Flood Warning 11	<p>Major Flood Warning Wilsons River Lismore</p> <ul style="list-style-type: none"> • No significant rain has been recorded since early Friday morning • Major flooding is occurring along the Wilsons River peak 11.60 metres around midday Friday, the highest flood peak since the 1974 event.
Friday 31/3/17	9.40pm document Issued at 9.58pm	11.33m falling @ 8pm	SES Flood Bulletin 11	<p>Major Flood Warning Wilsons River Lismore</p> <ul style="list-style-type: none"> • No significant rain has been recorded since early Friday morning • Major flooding is occurring along the Wilsons River peak 11.60 metres around midday Friday, the highest flood peak since the 1974 event. • People in low lying areas in Lismore CBD, North & South Lismore should remain outside the flood zone or evacuate immediately

Saturday 1/4/17	12.59am	11.00m falling 12.24am	BoM Flood Warning 12	Major Flood Warning Wilsons River Lismore <ul style="list-style-type: none"> No significant rain has been recorded since early Friday morning Major flooding is occurring along the Wilsons River peak 11.60 metres around midday Friday, the highest flood peak since the 1974 event.
Saturday 1/4/17	1.00am document Issued at 1.23am	11.00m falling at 12.24am	SES Flood Bulletin 12	Major Flood Warning Wilsons River Lismore <ul style="list-style-type: none"> No significant rain has been recorded since early Friday morning Major flooding is occurring along the Wilsons River peak 11.60 metres around midday Friday, the highest flood peak since the 1974 event. People in low lying areas in Lismore CBD, North & South Lismore should remain outside the flood zone or evacuate immediately

Annexure 3 – Sequence of Warnings & Response: Tweed River

Date	Time	Height at Murwillumbah Gauge	Product/Action	Prediction
Tuesday 28/3/17	2.28pm	N/A	BoM Flood Watch	Tweed Valley – Moderate to major flooding Brunswick Valley - Moderate to major flooding Richmond-Wilsons Valley - Moderate to major flooding
Wednesday 29/3/17	10.39am	N/A	BoM Flood Watch	Tweed Valley – Moderate to major flooding Brunswick Valley - Moderate to major flooding Richmond-Wilsons Valley - Moderate to major flooding
Thursday 30/3/17	7.28am	1.26 rising at 7.19am	BoM Flood Warning 1	Initial minor to moderate flood warning for the Tweed river Up to 132mmrain in past 6 hours Tweed river at Murwillumbah may reach minor flood level(3m) Thursday afternoon, may reach moderate (4m) early Friday morning Next warning 10am
Thursday 30/3/17	8am Document 8.24am issued	1.26 rising at 7.19am	SES Flood Bulletin 1	Initial minor to moderate flood warning for the Tweed river Up to 132mmrain in past 6 hours Tweed river at Murwillumbah may reach minor flood level(3m) Thursday afternoon, may reach moderate (4m) early Friday morning This will cause moderate flooding on the Tweed river around Murwillumbah, Condong, Tumbulgum and Chinderah Consequences at predicted height listed along with latest river heights and recommended actions
Thursday 30/3/17	9.52am	2.25m rising at 9.29am	BoM Flood Warning 2	Minor to Moderate flood warning for the Tweed River Up to 220mm of rain in past 12 hours Moderate flooding is predicted along Tweed at Murwillumbah Tweed at Murwillumbah expected to exceed minor flood level (3m) around 11am . May reach 4.2m early Thursday afternoon with moderate flooding Next warning issued 1pm

Thursday 30/3/17	10am document 10.52am issued	2.25m rising at 9.24am	SES Flood Bulletin 2	Minor to moderate flood warning for the Tweed river Up to 220mm of rain in past 12 hours, with significant river level rises at Murwillumbah and upstream. Tweed at Murwillumbah expected to exceed minor flood level (3m) around 11am . May reach 4.2m early Thursday afternoon with moderate flooding Consequences at Murwillumbah, Tumbulgum and Chinderah at predicted height listed along with latest river heights & recommended actions
Thursday 30/3/17	12.03pm	3.46m steady at 1.39am	BoM Flood Warning 3	Minor to Major flood warning for the Tweed River Up to 270mm in past 24 hours Minor flood is current at Murwillumbah. Major flooding is predicted this afternoon. Tweed River at Murwillumbah is expected to exceed 4.2m around 1pm with moderate flooding, May reach major flood level (4.8m) Thursday afternoon Next warning issue 4pm
Thursday 30/3/17	1.13pm	N/A	NSW SES Flood Evacuation Warning South Murwillumbah, Condong and Tumbulgum	The NSW SES recommends that residents within the South Murwillumbah, Condong and Tumbulgum area should prepare to evacuate within the next 3 hours
Thursday 30/3/17	12.03pm document 1.18pm issued	3.46m steady	SES Flood Bulletin 3 Controller: Andrew McPhee	Minor to Major flood warning for the Tweed River Major flooding along Tweed, with river levels predicted to be similar to the 2001 and 2008 floods Up to 270mm in past 24 hours Tweed River at Murwillumbah is expected to exceed 4.2m around 1pm with moderate flooding, May reach major flood level (4.8m) Thursday afternoon Consequences at Murwillumbah, Tumbulgum and Chinderah at predicted height listed along with latest river heights and recommended actions
Thursday 30/3/17	1.29pm	N/A	EMERGENCY ALERT for FLOOD EVAC WARNING to Murwillumbah South 1 of 2	

Thursday 30/3/17	1.32pm	N/A	EMERGENCY ALERT for FLOOD EVAC WARNING to Tumbulgum and Condong 1 of 2	
Thursday 30/3/17	1.38pm	N/A	EMERGENCY ALERT for FLOOD EVAC WARNING to Tumbulgum and Condong 2 of 2	
Thursday 30/3/17	1.44pm	N/A	EMERGENCY ALERT for FLOOD EVAC WARNING to Murwillumbah South 2 of 2	
Thursday 30/3/17	3.15pm	4.70m rising at 3.07pm	BoM Flood Warning 4	Moderate to Major flood warning for the Tweed River Major flooding along Tweed, with river levels predicted to be similar to the 2001 and 2008 floods 398mm rain in past 24 hours Tweed River at Murwillumbah major flood level (4.8m) late Thursday afternoon, may reach 5.3m late Thursday causing major flooding Next warning issue 6pm
Thursday 30/3/17	3.40pm	N/A	SES FLOOD EVACUATION ORDER for South Murwillumbah, Condong and Tumbulgum	The NSW SES is directing residents within the South Murwillumbah, Condong and Tumbulgum to evacuate immediately where safe transit exists and they are able to do so
Thursday 30/3/17	4pm document 4.17pm issued	4.8m rising	SES Flood Bulletin 4	Moderate to Major flood warning for the Tweed River Major flooding along Tweed, with river levels predicted to be similar to the 2001 and 2008 floods Tweed River at Murwillumbah major flood level (4.8m) late Thursday afternoon, may reach 5.3m late Thursday causing major flooding Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Thursday 30/3/17	4.19pm	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to	

			TUMBULGUM, CONDONG 1 of 2	
Thursday 30/3/17	4.24pm	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to Murwillumbah South 1 of 2	
Thursday 30/3/17	4.54pm	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to TUMBULGUM, CONDONG 2 of 2	
Thursday 30/3/17	4.57pm	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to Murwillumbah South 2 of 2	
Thursday 30/3/17	5.14pm	5.18m rising at 5.12pm	BoM Flood Warning 5	Moderate to Major flood warning for the Tweed River Up to 417mm in past 24 hours Major flooding occurring along Tweed River at Murwillumbah Murwillumbah may reach 5.6m late Thursday evening Next warning issue 9pm
Thursday 30/3/17	5.30pm document 5.38pm issued	5.18m rising	SES Flood Bulletin 5	Moderate to Major flood warning for the Tweed River Up to 417mm in past 24 hours Murwillumbah may reach 5.6m late Thursday evening Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Thursday 30/3/17	9.21pm	5.39m steady at 9.12pm	BoM Flood Warning 6	Moderate to Major flood warning for the Tweed River 480mm rain in past 24 hours Major flooding occurring along Tweed River at Murwillumbah Tweed at Murwillumbah may reach 5.70m Friday morning Next warning issue 1am
Thursday 30/3/17	9.35am document 9.44pm issued	5.39m steady	SES Flood Bulletin 6	Major flood warning Tweed River Rainfall between 350 and 480mm in past 24 hours Further heavy rain for next 9 hours Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions

				Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Thursday 30/3/17	9.37pm	5.42m steady at 9.31pm	BoM Flood Warning 7	Major flood warning Tweed River Rainfall between 350 and 480mm in past 24 hours Significant river rises have occurred Further heavy rain for next 9 hours Tweed at Murwillumbah may reach 5.70m Friday morning Next issue 1am
Thursday 30/3/17	10.25pm 10.30pm	5.48m	SES Flood Bulletin 7 (re-issue)	Major flood warning Tweed River Rainfall between 350 and 480mm in past 24 hours Significant river rises have occurred Further heavy rain for next 9 hours Tweed at Murwillumbah may reach 5.70m Friday morning Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Friday 31/3/17	12.07am	6m rising at 11.58pm	BoM Flood Warning 8	Major flood warning Tweed River Btw 500-650mm rain in past 24 hours In the last 3 hours rainfall intensity has increased over middle parts of catchment. As a consequence, faster than expected river rises have occurred at Murwillumbah Tweed at Murwillumbah may reach 6.2m early Friday morning with major flooding Next issue 3am
Friday 31/3/17	12.25pm (should be am) 00.07am	5.48m rising	SES Flood Bulletin 8	Major flood warning Tweed River Btw 500-650mm rain in past 24 hours In the last 3 hours rainfall intensity has increased over middle parts of catchment. As a consequence, faster than expected river rises have occurred at Murwillumbah Tweed at Murwillumbah may reach 6.2m early Friday morning with major flooding Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions

				Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Friday 31/3/17	0.44am	N/A	SES FLOOD EVACUATION ORDER for Murwillumbah East/CBD	
Friday 31/3/17	1.35am	6.23m rising at 1.26am	BoM Flood Warning 9	Major flood warning Tweed River Btw 500-712mm rain in past 24 hours In the last 3 hours rainfall intensity has increased over middle parts of catchment (120-210mm rain). As a consequence, faster than expected river rises have occurred at Murwillumbah Tweed at Murwillumbah may reach 6.2m early Friday morning with major flooding Next issue 5am
Friday 31/3/17	1.35am		SES Flood Bulletin 9	Not issued
Friday 31/3/17	2.26am	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to Murwillumbah 1 of 2	
Friday 31/3/17	2.32am	N/A	EMERGENCY ALERT for FLOOD EVAC ORDER to Murwillumbah 2 of 2	
Friday 31/3/17	3.38am	Faulty gauge at Murwillumbah	BoM Flood Warning 10	The Murwillumbah forecast gauge was faulty and previous readings were incorrect and overstated. Btw 500-740mm rain in past 24 hours Rainfall rates have started easing in the last hour Current water level at Murwillumbah is estimated at 6m, may peak at 6.2m Friday morning Next issue 5.30am
Friday 31/3/17	3.38am document 4.01am issued	Faulty gauge at Murwillumbah	SES Flood Bulletin 10	The Murwillumbah forecast gauge was faulty and previous readings were incorrect and overstated. Btw 500-740mm rain in past 24 hours Rainfall rates have started easing in the last hour Current water level at Murwillumbah is estimated at 6m, may peak at 6.2m Friday morning

				Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Friday 31/3/17	5.36am	N/A	BoM Flood Warning 11	Major flood warning for the Tweed River Btw 500-740mm rain in past 24 hours In last 3 hours rainfall eased with 10-30mm recorded Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday Next issue 9am
Friday 31/3/17	5.38am document 5.56am issued	N/A	SES Flood Bulletin 11	Major flood warning for Tweed at Murwillumbah and Chinderah Btw 500-740mm rain in past 24 hours In last 3 hours rainfall eased with 10-30mm recorded Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)
Friday 31/3/17	5.50am	N/A	BoM Flood Warning 12 (reissue)	Major flood warning for the Tweed River Btw 500-740mm rain in past 24 hours In last 3 hours rainfall eased with 10-30mm recorded No further significant rainfall is forecast for today Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday
Friday 31/3/17	8.33am	N/A	BoM Flood Warning 13	Major flood warning for the Tweed River Btw 500-740mm rain in past 24 hours Rain has eased since 2am Friday Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday and is falling slowly
Friday 31/3/17	8.43am	N/A	BoM Flood Warning 14 (reissue)	As above
Friday 31/3/17 (shown as Thursday)	9am	N/A	SES Flood Bulletin 12	Major flood warning for the Tweed River Btw 500-740mm rain in past 24 hours In last 3 hours to 5am rainfall eased with 10-30mm recorded

				<p>Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday and is falling slowly</p> <p>Consequences at Murwillumbah and Chinderah at predicted height listed along with latest river heights and recommended actions</p> <p>Clearly states at 4.85m South Murwillumbah levee height. If overtopped (consequences listed)</p>
Friday 31/3/17	9.53am	N/A	SES Bulletin 13	Not issued
Friday 31/3/17 (shown as Thursday)	9am document 9.55am issued	N/A	SES Bulletin 14	Same information as Bulletin 12 (Reissue?)
Friday 31/3/17	10.26am	N/A	BoM Flood Warning 15	<p>Major flood warning for the Tweed</p> <p>Major flooding occurring at Murwillumbah where river level peaked slightly higher than the 1954 flood early Friday morning</p> <p>Btw 500-740mm rain in past 24 hours</p> <p>Tweed at Murwillumbah estimated peak 6.2m around 4.30am Friday and is falling slowly</p>
Friday 31/3/17	12pm document 12.43pm issued	N/A	SES Flood Bulletin 15	<p>Major flood warning for the Tweed</p> <p>Major flooding occurring at Murwillumbah where river level peaked slightly higher than the 1954 flood early Friday morning</p> <p>Communities that may be impacted (listed)</p>
Friday 31/3/17	1.49pm	N/A	BoM Flood Warning 16	No additional information to Warning 15
Friday 31/3/17	2pm document 2.39pm issued	N/A	SES Flood Bulletin 16	No additional information to Bulletin 15
Friday 31/3/17	4.09pm	N/A	EMERGENCY ALERT for FLOOD ADVICE to Murwillumbah 1 of 2	

Friday 31/3/17	4.33pm	N/A	EMERGENCY ALERT for FLOOD ADVICE to Murwillumbah 2 of 2	
Friday 31/3/17	5.45pm	N/A	BoM Flood Warning 17	The main flood peak is approaching Chinderah Moderate flooding still occurring at Murwillumbah
Friday 31/3/17	6.30pm document 7.20pm issued	N/A	SES Flood Bulletin 17	The main flood peak is approaching Chinderah Moderate flooding still occurring at Murwillumbah Communities that may be impacted (listed)