FLOOD INTELLIGENCE: WHAT IT IS, WHY IT MATTERS AND HOW IT IS GENERATED – LESSONS FROM LOCKHART AND URANA SHIRE FLOODS 2010-2012

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Abstract

Flood intelligence seeks to describe flood behaviour and its effects on the community. The NSW State Emergency Service (NSW SES) flood intelligence system includes a flood intelligence database, Local Flood Plans, a reference library and associated spatial data. Reliable intelligence is vital for informed decision-making during flood emergencies to minimise risks to the community. Data collection following flooding is a means both for generating new flood intelligence to improve future emergency response and for informing the floodplain management process.

Between 2010 and 2012, many communities in South Western NSW experienced the highest floods in decades, if not on record. This provided an ideal opportunity to collect flood data. A case study from Lockhart and Urana Shires shows the benefits of this exercise both for an improved flood intelligence leading to an improved flood response and for input into Flood Studies and Floodplain Risk Management Studies and Plans. Strengths and weaknesses of the various sources of flood data including community questionnaires are outlined.

Introduction

Between September 2010 and March 2012, areas in South Western NSW experienced record rainfall, associated with a strong La Niña episode which resulted in extensive and frequent flooding through to May 2012. Many areas experienced major if not record flooding, in some cases significant enough to affect communities behind flood mitigation systems such as levees, triggering evacuations. As a result of the floods over this period, the NSW State Emergency Service (NSW SES) had one of its busiest response periods ever.

Flood intelligence is a key input in the decision-making process during floods. It helps emergency managers to understand the likely behaviour and consequences of flooding on communities. Emergency managers are constrained by the extent and nature of the intelligence available at the time, and despite making decisions in the interests of community safety, the community may strongly disagree with those decisions.

Consequently, the NSW SES invests substantial resources to enhance flood intelligence, especially for communities where recent floods have been the highest for decades. These floods present a significant opportunity to gather post-flood data to improve the NSW SES flood intelligence, which includes updating Flood Intelligence Cards (FICs) and Local Flood Plans (LFPs). In some communities, the data collection

process feeds into post-disaster assessment reporting requirements to inform community recovery. A long-term benefit of the data collection effort is in assisting local government to progress Flood Studies and Floodplain Risk Management Studies and Plans (FRMS&P).

A case study from the 2010 and 2012 floods in Lockhart and Urana Shires demonstrates the benefits of flood intelligence collection both for improved emergency management capability and urban floodplain management. It also shows some of the complexities involved in generating flood intelligence from multiple data sources.

What is Flood Intelligence?

Flood intelligence is 'the product of a process of gathering and assessing flood related data to enable emergency managers to determine the extent of actual or likely effects of flooding on a community' (Pfister and Rutledge, 2002). In essence, flood intelligence describes flood behaviour and its effects on the community to inform decision making in future flood events.

Typical effects described include:
- Inundation (requiring evacuation, property protection and/or rescue);
- Isolation (creating risk to life and the need for resupply and/or rescue); and
- Disruption to community activities (e.g. due to the loss of electricity supply or transport routes) (NSW SES, 2008).

Supporting the NSW SES Flood Intelligence system is a flood intelligence database, Local Flood Plans, a library and associated spatial data.

Flood Intelligence System

The NSW SES flood intelligence system is in the form of a database, the primary products being a Flood Intelligence Card (FIC) and Flood Action Card (FAC). FICs are maintained for over 400 river height gauges across NSW not all of which have official warnings provided by the Bureau. This database is expanding as available information is being collected and new gauges are being populated with intelligence.

The information is normally related back to a relevant river height gauge to enable a predictive capability. The NSW SES relies on the predictions provided by the Australian Government Bureau of Meteorology (Bureau) who as the official flood prediction agency, provide predictions to over 200 river height gauges in NSW, represented as flood warnings (see Annex C of *NSW State Flood Plan* for a comprehensive list).

Local Flood Plans

The NSW SES has over 120 Local Flood Plans for areas that are at risk from flooding. Local Flood Plans are structured to contain information on the flood threat and the potential effects to a community. This information is used to develop strategies for responding to floods.

The Local Flood Plan should consider all floods up to and including the Probable Maximum Flood (PMF) if data is available.

It is important that information and intelligence in the Local Flood Plan is consistent with the Flood Intelligence Database so that operational decisions are based on the most accurate and available data.

An example of how the *NSW Flood Planning Manual* (NSW SES, 2007a) has been applied in a community driven flood planning process, demonstrates how flood intelligence was used to improve emergency response and gain ownership by the Eugowra community of the Cabonne Local Flood Plan following the 2005 floods (see Gissing et al., 2007).

Library

The NSW SES maintains a reference library of planning and information resources including coastal zone management plans, dam break studies, dam safety emergency plans, flood studies and FRMS&Ps. The NSW SES in partnership with the Office of Environment and Heritage are currently undertaking a project to develop the NSW Flood Database that will incorporate existing historical and modelled flood extents from flood studies and FRMS&Ps, representing the extents spatially in a Geographic Information System (GIS). This will complement the NSW SES's library.

Geographic Information System

The NSW SES uses a GIS to provide a visual representation of flood information to support planning and operations.

The GIS stores and displays spatial data such as stream gauges, flood extents, evacuation areas, roads and key infrastructure.

GIS can be used in the planning process to assist with classifying communities according to the Emergency Response Planning classification (DECC, 2007 through using historical and design flood extents to identify evacuation routes and where evacuation routes could be cut in a flood. GIS can also be used to analyse the population at risk within these areas (see e.g. Cinque et al., 2003).

Flood Intelligence – Why it matters?

Improving emergency management decision making

The NSW SES flood intelligence system is reliant on good quality data, as with any predictive system, the system is only as good as the data that inputs into it. Similarly operational decision making should be supported by reliable and validated intelligence.

A robust flood intelligence system incorporates the latest information obtained from historical records, recent flood studies, local anecdotal information and other relevant information. However, for some communities, local anecdotal information from previous floods is all that exists. Nonetheless, this information is valuable where no other information is available.

Flood intelligence provides an emergency manager with an understanding of how a certain flood height at a river height gauge will impact on a community. Combined with time-framed predictions issued by the Bureau, emergency response can be managed in a proactive, informed manner.

Improving the floodplain management process

The process of collecting data and generating flood intelligence is important not only for the NSW SES, but for other stakeholders including local government Councils who

seek surveyed flood marks and other related information to update Flood Studies and FRMS&Ps (Figure 1). This will enable future planning decisions to consider the impact of flooding, based on the best available modelling, calibrated with recent data.

This is one of the main additional benefits from these reviews. As Figure 1 shows, the post-flood data collection process benefits the NSW SES not only through direct flood intelligence generation, but subsequently by incorporating the information from revised Flood Studies and FRMS&Ps.

Post Disaster Assessment

The post flood data collection and analysis projects assist in collecting the required data to inform the NSW government's post disaster report. The improved flood intelligence, flood warning and public information resulting from the projects are key measures that contribute to community capacity building in community recovery after a flood.
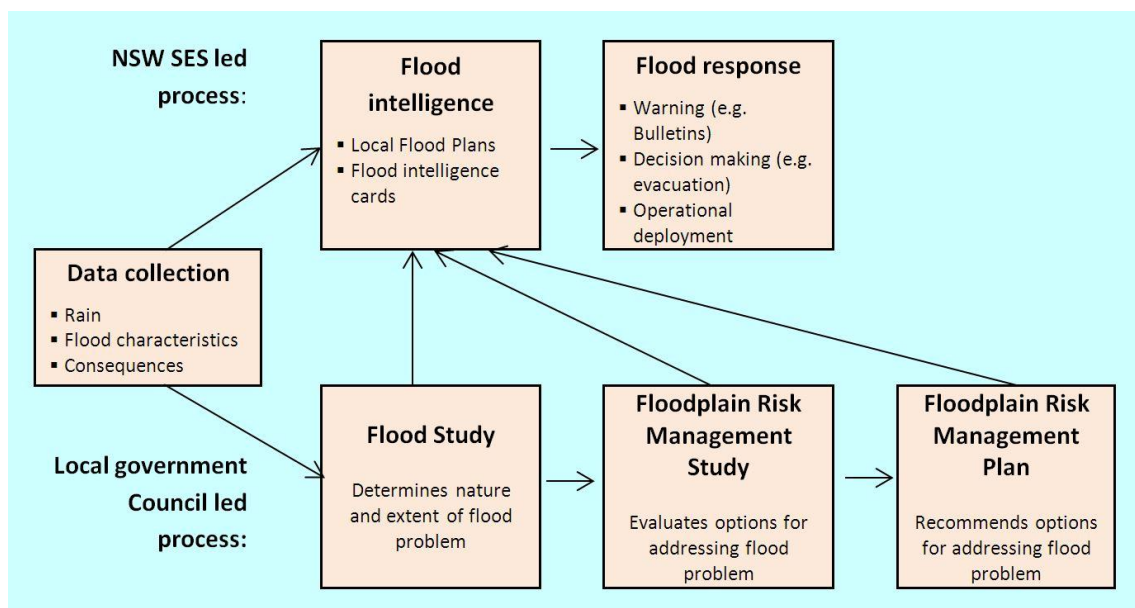

Figure 1 – Post flood intelligence review and floodplain risk management process (also see Appendix N, DIPNR, 2005)

Generating Flood intelligence

As described in the *NSW Flood Intelligence Manual* (NSW SES, 2007b), the flood intelligence process consists of five phases: the collection, processing, interpretation, dissemination and storage of flood related information. Information from recent floods and historical and/or modelled floods is collected, collated and assessed for accuracy and reliability. This information is interpreted to produce flood intelligence and then disseminated to planners and incident controllers at all levels to be used in any future flood emergency response. A flood intelligence system allows for the storage of this information so that it can be retrieved easily.

Collection

The first phase – collection of information – can occur before, during or after a flood. Information is obtained from a wide variety of sources including: anecdotal evidence (including post flood community questionnaires and surveys); flood studies and FRMS&Ps; levee audits; historical records; design studies (for bridges, dams, levees or

roads); operational information such as NSW SES's Request for Assistance (RFA) records; insurance company claim records; media including local newspapers, journals and television stations; flood gauge reader networks; census data; and reconnaissance of known problematic areas during an event (NSW SES, 2007b).

The information generated and applied to each river height gauge needs to be validated in order to be used as flood intelligence. This process involves a two-step process which includes processing and interpreting information.

To capture information that could become flood intelligence the NSW SES uses a variety of methods which includes volunteers and residents collecting information and/or flood specialists undertaking a formal intelligence review.

The NSW SES flood intelligence system also relies on information from Flood Studies and associated FRMS&Ps, but there are some difficulties in using the information from these studies and plans. It is sometimes the case that it is hard to link the modelled data to an appropriate river height gauge. However, what these studies can provide is a robust source of flood information based on scientifically well-practiced and accepted principles and methods which can aid in understanding what the potential impacts are to a community beyond the historical experiences of the community.

Historical information is particularly valuable where there has been limited or no design flood modelling. It also is useful to validate and calibrate models, although there are limitations on the historical information such as potential changes to the floodplain since the historical flood (Yeo et al., 2010).

Processing and Interpretation

The processing and interpretation phases are arguably the most important stages in the flood intelligence process, although these stages are largely reliant on having good quality information from the collection phase.

The processing phase involves evaluation of the data including assessing its credibility, reliability, relevance and accuracy. Once the data is deemed to be credible, reliable, relevant and accurate (or at least identified to the contrary), the next phase involves interpreting the data to draw conclusions, thereby determining the significance of what the information means.

Dissemination and Storage

The final two phases – dissemination and storage – are vital for using flood intelligence in any future floods and for informing future decision making.

Flood intelligence informs the development of Local Flood Plans and a range of briefing and public information products. The NSW SES implements a document control and quality assurance process for storing intelligence.

The floods of 2010-12: A chance to gather new and audit existing flood intelligence

Between 2010 and 2012, the NSW SES experienced an extremely busy operational period, when the majority of the State was included in an official Bureau Flood Watch or Flood Warning.

Many catchments in coastal NSW experienced major flooding; however the flooding that caused the most significant impact was experienced in the West and South West of NSW. Some of these areas had not seen flooding for 20 years or more and then experienced two major floods within 18 months, some experiencing the highest floods since official records have been kept. Table 1 summarises the magnitude of the October 2010 and March 2012 floods for the main flood-affected LGAs in the NSW SES Murray and Murrumbidgee Regions.

Floods of the magnitude as listed in Table 1, create the perfect opportunity to gather and update flood intelligence. This will contribute to the post disaster assessment and enhance the community's and NSW SES's capability to respond to future floods. In the areas impacted by flooding across the state, the NSW SES initiated 16 major flood data and intelligence review projects covering 35 local government areas.

Table 1 – Summary of significant flooding in NSW SES Murray and Murrumbidgee Regions, 2010-2012

LGA	October 2010 Flood	March 2012 Flood
Tumbarumba	Record flooding of Mannus and Jingellic Creeks. Significant Upper Murray River flood.	Record flooding of Upper Murray River at Jingellic (highest since gauge commenced in 1891).
Greater Hume	Record flooding at Holbrook. Highest Billabong Creek flood since 1931. Severe flooding at Henty.	Significant Billabong Creek flood.
Urana	Some flooding at Boree Creek and Urana. Significant Billabong Creek flood.	Record flooding at Boree Creek and Urana (higher than 1930s). Significant Billabong Creek flood. Significant Colombo Creek flood.
Tumut	Record flooding at Adelong and Gilmore. Moderate flooding at Tumut.	Record flooding of Brindabella and Goobarragandra Rivers. Major flooding at Tumut (highest post Blowering Dam, 1968).
Gundagai	Minor flooding at Gundagai.	Major flooding at Gundagai (highest since 1974).
Wagga Wagga	Record flooding at Tarcutta, Ladysmith and Uranquinty. Minor flooding at Wagga Wagga.	Major flooding at Wagga Wagga (highest since 1974).
Lockhart	Near-record flooding at Lockhart and The Rock (higher than 1931, 1934).	Record flooding at Lockhart and The Rock (higher than 2010).
Coolamon	Not significant.	Record flooding at Ganmain. Highest flood at Beckom since 1984. Highest Bygoo Creek flood at Ardlethan since 1956.
Narrandera	Moderate flooding at Narrandera.	Major flooding at Narrandera (highest since 1974).
Griffith	Not significant.	Severe flooding in Main Drain 'J' catchment (largest since 1989). Severe flooding of lower Mirrool Creek and Yenda (similar to 1931).

Local government Councils have also taken the opportunity to progress their Floodplain Risk Management planning, with more than 19 Councils in South West and Western NSW seeking funding under the State Flood Management Program since the 2010-12 flooding.

The following case study focusses on an area in South Western NSW that intersects the NSW SES Murrumbidgee and Murray Regions (Figure 2). The towns in this area were affected by both the 2010 and 2012 floods. This case study is derived from two intelligence review projects conducted following the October 2010 and March 2012 floods (Bewsher Consulting, 2012; Yeo, 2013).

Case Study: Lockhart and Urana Shires

Lockhart and Urana Shires are located in the Riverina district of NSW, southwest of Wagga Wagga (Figure 2). Watercourses in the eastern area of Lockhart Shire drain via Bullenbong Creek towards the Murrumbidgee River, whilst watercourses in the western area of Lockhart Shire and in Urana Shire drain towards Billabong Creek and the Edward and Murray Rivers. Lockhart Shire experienced major overland flows and creek flooding in March 2012, with record flooding at Lockhart (about 67 houses and 31 businesses/public sector buildings flooded over floor) and at The Rock (63 houses and 17 businesses). These towns also sustained damage from large floods in October 2010. Urana Shire experienced major flooding in March 2012, with record flooding at Urana (29 houses, 12 businesses) and at Boree Creek (24 houses, 10 businesses).

Why flood intelligence matters

Improved emergency management capability in Lockhart and Urana Shires

Prior to these floods, the understanding of the behaviour and consequences of flooding in these communities was limited. There are just a few depth indicators, none of which are automated. None of the indicators had accompanying Flood Intelligence Cards (FICs). The description of the flood threat in the relevant Local Flood Plans was sparse. Lockhart Local Flood Plan stated that "several residences and the caravan park on the western edge are liable to be flooded by Brookong Creek". For The Rock, the Lockhart Local Flood Plan stated that "Burkes Creek and two unnamed tributaries can flood a number of residences on the village's north and north-western edges". The Urana Local Flood Plan focussed on flooding from Billabong Creek with little appreciation of the more significant threat to Urana from the Urangeline Creek system. The village of Boree Creek received no mention at all.

None of the watercourses in Lockhart and Urana Shires are formally incorporated into the Bureau's flood warning network. With a reliance on informal warning, and with the limited flood intelligence, it is perhaps not surprising that the response to the flood emergencies were not as good as they could have been. At Lockhart, this was evidenced in the October 2010 flood by some elderly and wheelchair-bound residents having to be rescued after their houses had begun to flood. At The Rock, whilst advice received from upstream at Mangoplah provided some warning ahead of the October 2010 flood, it was difficult to interpret the likely effects at The Rock, so some houses that were subsequently inundated were 'door-knocked' but others were not. At Urana, a temporary earth embankment that had been of some benefit in protecting the town from flooding in February 2011 was overrun by the much larger March 2012 flood. The decision to issue an Evacuation Order for the town can at least in part be attributed to the lack of intelligence and uncertainty about the consequences of inundation.
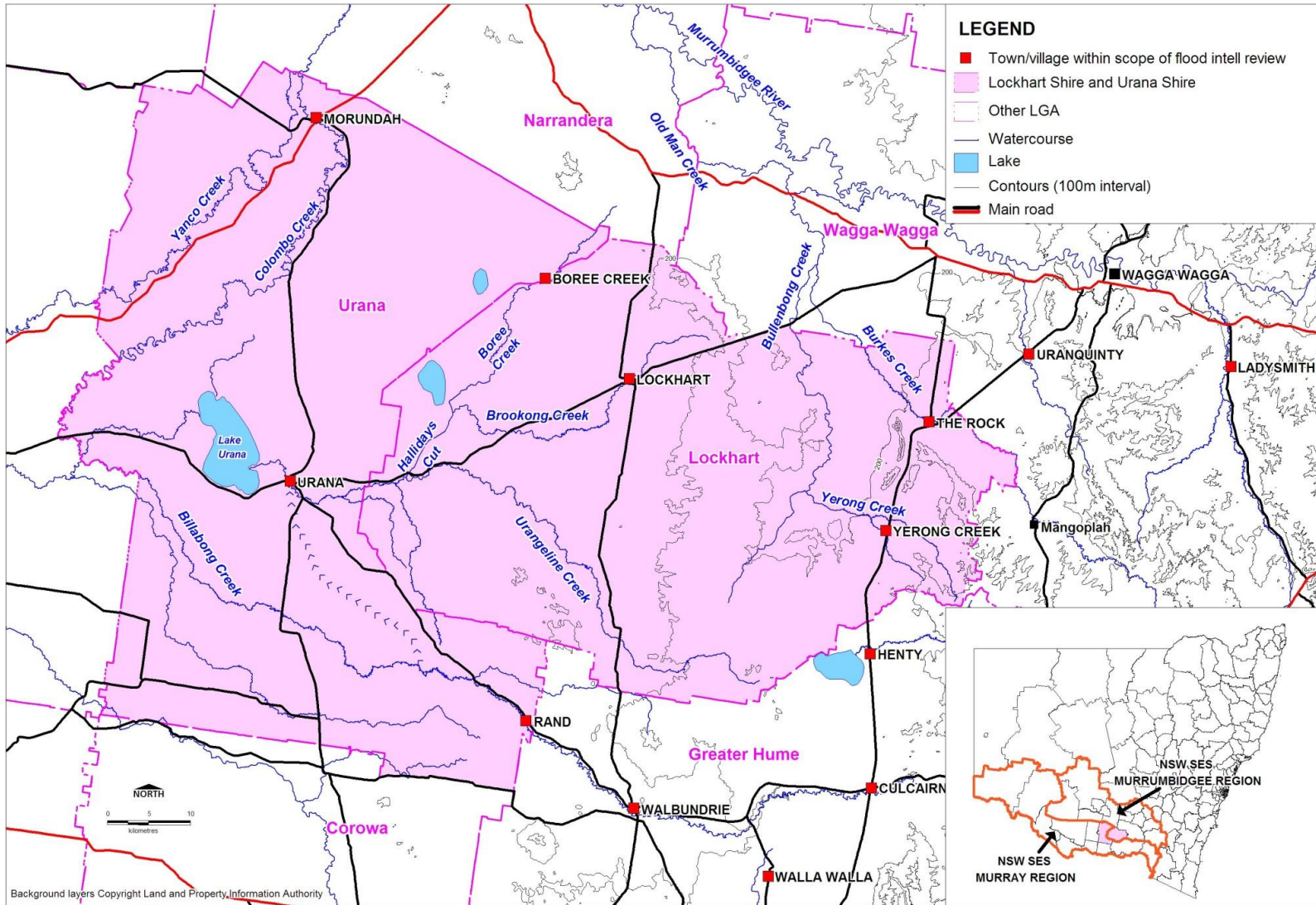
Figure 2 – Lockhart and Urana Shires

Following the flood intelligence reviews, new text has been drafted for the Lockhart and Urana Local Flood Plans using the NSW SES Local Flood Plan template. This includes a much more detailed description of landforms and river systems in the Local Government Areas (LGAs). Flood-producing weather systems have been reviewed suggesting that inland troughs have been responsible for the most severe floods in these LGAs. The characteristics of flooding are much better understood including flood peak travel times (e.g. five to six hours from Mangoplah to The Rock) and typical critical times for flooding across each LGA (e.g. the arrival of Billabong Creek floodwaters at Urana some four to six days after the Urangeline Creek floodwaters). Flood histories and the effects of flooding on each community are much more fully documented.

New flood intelligence cards have been drafted, including for some locations still awaiting the installation of manual gauges.

Flood extents for these historical events have been prepared in a spatial format, ready for importation into the NSW SES's GIS.

Flood intelligence reports also contain restricted property-specific information, which is useful for informing emergency response.

In some areas, tools useful for preparing flood warning have been constructed for gauges that do not receive official Bureau flood warnings, such as relationships between gauges on Billabong Creek.

A measure of the value of good flood intelligence for emergency management capability is the much improved operation at The Rock in the March 2012 flood. This response included:

- Early warning of the rising flood from several farmers up the Burkes Creek catchment, as a result the establishment of an informal warning network after 2010;
- Early door-knocking of residences to prepare for evacuation;
- Assisting the community to protect their houses;
- Early evacuation to Wagga Wagga; and
- The tasking of an NSW SES member for flood reconnaissance.

In part this improved response must be attributed simply to the experience of a large flood just 18 months previously, but it is also a reflection of enhanced flood intelligence and improved decision making.

Improved floodplain management in Lockhart and Urana Shires

A secondary benefit from the flood intelligence reviews is the inputs provided to the floodplain risk management process. These inputs include much processed data for the Flood Study reviews underway at Lockhart and at The Rock (and required at Urana and Boree Creek). A rainfall pluviograph was obtained from a resident at Lockhart, which is valuable for defining the temporal pattern given the absence of official pluviographs in the catchments. A time series of photographs at the Green Street causeway depth indicators in Lockhart was used to derive a stage hydrograph for Brookong Creek. Flood peak levels were collected and surveyed in all four communities. The descriptions of flood behaviour at key locations across the floodplain in each town provide a good 'head start' for calibrating and verifying the hydrologic and hydraulic flood models.

The flood intelligence reports contain restricted property-specific information, which is a useful input to flood damage assessments that form part of FRMS&Ps. The reports

also document preliminary flood risk management ideas that emerged from the studies and require evaluation in FRMS&Ps. At Boree Creek, the mapped extent of flooding in the March 2012 event vastly exceeds the Flood Planning Area included in the *Urana Local Environmental Plan 2011*. Here, there may be grounds for amending the flood planning map in the existing LEP using the historical flood extent, so that flood risk is considered in planning decisions pending commencement of a Flood Study.

How flood intelligence was generated in Lockhart and Urana Shires

A variety of sources were used to generate flood intelligence for Lockhart and Urana Shires following the floods of October 2010 and March 2012. Some of these are outlined below:

Digitised newspapers at the National Library of Australia's website provide a readily accessible means for discovering historical floods which provide some context for the recent events. From this it was learned that the January 1934 flood exceeded the June 1931 flood at Lockhart, which was confirmed by information from Lockhart's Museum. Also, the railway at Boree Creek was implicated in flooding of the village on several occasions in the 1930s – although the inundation of the village in March 2012 reached record depths, it was no by means a 'one-off'. Limitations of this source are that at this stage few titles are available after the 1950s and that the most relevant local paper may not be available.

Rapid Impact Assessments (RIA) were conducted by emergency management personnel in Lockhart and The Rock after the March 2012 flood. This is a very useful source for compiling a property register of flood effects since it provides close to 100% coverage of flooded areas. Disadvantages include: 1) poor reception by communities that have sustained losses (unless the RIA is rolled into a Department of Community Services needs assessment); 2) compromised quality of data since observers may be untrained; and 3) limited ability to incorporate key flood intelligence questions such as *the time* at which a house floor was inundated.

Community questionnaires can provide detailed and extensive information about flood behaviour and effects, which may otherwise not be captured. The experience gained from flood intelligence investigations around NSW has led to the development of a standardised flood data questionnaire that gathers information for each address about rainfall, flood behaviour (depth, velocity, rate-of-rise, duration, direction, etc.), flood impacts (buildings, yards, roads, isolation) and flood responses (property protection, evacuation, alternative accommodation).

In the case of Lockhart and Urana Shires, the standard questionnaire was varied to include a question about flood history tailored to these communities. 75 questionnaires were returned for each of Lockhart and The Rock following the October 2010 flood, which provided an excellent basis for understanding the flood. It is unlikely that the Lockhart pluviograph would have been known about without the issuance of questionnaires. On the other hand, few questionnaires were received from Urana following the March 2012 flood, where the community was largely unwilling to participate. It needs to be acknowledged that preparing, distributing and, in particular, processing questionnaires is costly and has a relatively slow turnaround.

Local government Councils are often repositories of a great deal of flood data. Lockhart and Urana Shires provided information about the impacts of the floods especially on roads and other infrastructure. Council staff also assisted by clarifying addresses and facilitating community consultation. Having a local government Council that from the outset of a study commits to partner with NSW SES, is of enormous help in the process of collecting data.

Identifying local 'champions' is an efficient means for gathering good information about communities, whether this person is a member of Council, NSW SES, Rural Fire Service (RFS), or just an enthusiastic resident. Local champions can provide their own insights and secure information from their contacts, as well as be available to field questions on the telephone.

Flood imagery, both aerial and ground-based, whether obtained from official or unofficial sources or from media or social media, is very useful for accurately mapping flood extents. Video imagery of floods is useful for estimating flow velocities. Challenges for using flood imagery include doubts about the time of the digital photo (camera clocks may be erroneous or neglectful of daylight-savings time; or the time attribute may be lost if the image is taken from a secondary source), and uncertainty about the location of the photo, which can take considerable time to confirm. Nevertheless, the benefits of using flood photos are demonstrated in the derivation of a stage hydrograph for Lockhart, and a flood extent for Urana, which would otherwise have been difficult if not impossible.

Flood peak survey is clearly useful for Flood Studies but is also required to relate flood levels to local gauges and to populate flood intelligence cards. NSW SES personnel marked flood peak levels in The Rock, Urana and Boree Creek soon after the flooding of March 2012. Residents also indicated on the questionnaires whether they had an accurate flood mark suitable for survey. These sources were the basis for preparing flood survey briefs issued to surveyors.

There is no single formula for success, and sometimes there is a need to try different methods or a combination of methods (including mode of distribution of questionnaires) depending on the particular community being investigated.

Future challenges for flood intelligence generation and use – lessons from Lockhart and Urana Shires

The ability to populate flood intelligence cards using historical flood events depends in large part on the *gathering of data during a flood*, particularly on the hydrograph's rising limb. This requires an appropriate person to monitor and record heights on a manual gauge (at least hourly) and another person to record consequences (including using a GPS camera, with accurate date/time), so that flood heights can readily be related to consequences at the same time. But sparing one or two members of what may be only a small NSW SES unit for the purpose of documenting flood intelligence may be difficult given the priorities of assisting the community to evacuate and/or protect property. Nevertheless, every effort should be made to adequately resource and train for the important task of gathering flood intelligence during events.

Another challenge is for the *maintenance* of flood intelligence products. Local Flood Plans and flood intelligence cards need to be regarded as 'living' documents. As Flood Studies and FRMS&Ps are completed, revisions will be required including documentation of the effects of the PMF (which among other things will inform the Emergency Response Planning classification of each community). The implementation of flood mitigation measures or removal of highly susceptible houses will also trigger amendments.

A third challenge is to *build ownership and understanding* of the flood risks by the Local NSW SES units and other emergency services involved in managing flood emergencies (e.g. Fire and Rescue NSW at Lockhart and the RFS at Boree Creek). Having good information about flooding may do little to improve flood responses unless

that information is known and valued by frontline emergency services personnel and the knowledge is sustained over periods were no major flooding is experienced.

Lessons for future flood intelligence collection

Ensuring flood intelligence is available for all communities at risk of flooding in NSW is important, but is nonetheless a mammoth task. In seeking to achieve this with the limited in-house available resources, the NSW SES has trialled the use of external flood specialists. Apart from achieving the firm objectives of the intelligence reviews, which includes providing a quality assured data collection process, engaging external specialist has had a number of benefits that were not originally forecast such as:

- Enabling communities to be more open and frank in their responses during the collection of data phase;
- Reducing the exposure of NSW SES volunteers to disgruntled communities, yet still enabling the collection of data to continue;
- Reducing the workload for tired volunteers who may have been working non-stop since the flooding started;
- The development of innovative approaches in collecting, processing and interpreting information; and
- The development of innovative methods for displaying and/or storing flood intelligence

The future of the NSW SES Intelligence System

The NSW SES is proposing to expand the currently existing flood intelligence system into a fully integrated hazard intelligence system, incorporating intelligence on flood, tsunami and storm based on forecast as opposed to real-time information.

Other jurisdictions have in some shape and form embraced currently available technology to make it easier for emergency managers to make decisions based on real time data (e.g. Brisbane and Gold Coast City Council's application of Decision Support Systems; see Mirfenderesk (2009) and Victoria's FloodZoom) and these existing systems may have components that the NSW SES will further explore and consider during the research and development phase.

Most importantly, as described in this paper, a predictive system is limited by the intelligence that is input into it and this work of collecting information to enhance flood intelligence needs to continue. This will improve the community and government's understanding of communities at risk to the applicable hazard and will lead to improved emergency management arrangements to ensure that communities are protected and damage to properties minimised from that hazard.

Conclusion

Flood intelligence seeks to describe flood behaviour and its effects on the community. Reliable intelligence is vital for informed decision-making to minimise risks to the community. Without reliable intelligence, emergency management decisions may be based on scant information, and may lead to questionable decisions and community discontent.

Ensuring the community and local emergency service personnel understand the flood risk through involving them in the planning review process, including the review of flood

intelligence, will build ownership within the community and a better emergency response when the next flood arrives.

The recent experience in Lockhart and Urana Shires shows why flood intelligence is important for the NSW SES and local government Councils and has also shown the benefits of involving the community and local government in the process of generating flood intelligence. This should aid in improving both flood emergency responses and the management of flood risks associated with living and working on floodplains.

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Biographies

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