

Community response to flood warnings: the case of an evacuation from Grafton, March 2001

Neil Pfister explores why the flood warnings issued during the Grafton Floods in March 2001 were ignored by ninety per cent of the community

In March 2001, a large slow moving East Coast low-pressure system passed over the North Coast area of New South Wales, bringing extensive torrential rain that caused serious flooding on several river systems. On Saturday March 10, the Commonwealth Bureau of Meteorology issued a flood warning that predicted that the Clarence River would rise to 8.1 metres or more at Grafton. As the city's levees were thought to give protection to a gauge height of 8.23 metres, there was a very real danger that they would be overtopped. In such an event, most of the urban area would be inundated, with only two relatively small areas of high ground in South Grafton (comprising less than a third of the total population) remaining above the floodwaters. A decision was made to evacuate the 12,000 residents that live in the flood-prone areas of Grafton. The evacuation, however, did not proceed optimally and it was estimated after the operation that fewer than ten per cent of Grafton's population left the city during the nine hours that the evacuation was in effect.

The flood peaked at 7.75 metres, a level considerably lower than that predicted. This was fortunate, as the level of protection afforded by the levees was lower than expected. Water came within 0.2 metres of the top of the levee. The levees were not overtopped and evacuation turned out to be unnecessary (but not unwarranted given the

uncertainty inherent in flood prediction and the dire consequences of a levee-overtopping flood). Nonetheless, the low level of community response raises a number of important questions about the effectiveness of the warning process and the evacuation operation. Did the community hear the warnings? Did the warnings communicate effectively? What were the primary motivations for evacuation or non-evacuation? Why did so few people leave?

In the follow up to the flood, the evacuation was scrutinized in several ways. Operational issues were addressed using the debriefing process. Debriefs generally deal with what went right and what went wrong during operations. They can investigate issues such as decisions made 'on the day' by emergency managers, the control of resources, inter-agency communications, and the extent to which the design and delivery of warning messages conform with current conceptions of best practice. Debriefs are important means of exploring 'areas for improvement' and they allow emergency managers to incorporate lessons learnt into plans for future operations. Operational debriefs, however, do not usually capture the public perspective. They rarely are able to plumb the perceptions, experiences and behaviours of the community members that emergency operations are aiming to protect. Public meetings, such as those held in the Clarence River



Stranded livestock affected by Grafton flood.

communities after the March flood can go some way in this regard. Public meetings, however, do not provide the opportunity to systematically explore these issues, nor to obtain a representative sample of the communities' points of view. Consequently, the research

Operational debriefs are important but they do not usually explore the communities' points of view.

reported here aimed to explore the public experience of the evacuation in a more structured and insightful manner.

A considerable body of research regarding evacuation warnings already exists. For example, Handmer (2000) canvasses many of the reasons for the failure of

Table 1: Reasons for Failure of Flood Warnings

SHARED MEANING MAY EXIST BUT IS OF LIMITED VALUE:

- Some people are not risk averse (or less adverse or differently adverse than the warners would like) – hence warnings are understood but ignored or even taken as a challenge.
- **Other priorities may interfere with immediate response to warning messages – eg. people may be unlikely to respond until the whereabouts of all household members is established.**
- Other signals, such as the actions of neighbours or weather, may contradict the official warning – people may seek confirmation before acting.
- **Some people have an aversion to following authority and may ignore official advice – in any case, people are disinclined to follow orders preferring to make their own decisions based on the information in front of them.**
- Some people cannot respond and for these warnings are of no value – for example they may lack the physical or mental capacity to respond, or they may be absent.
- **Some of those at risk may not be worried about flooding until they suffer a loss. Then the question may become the source and ease of compensation – and warnings are interpreted in this context.**

SHARED MEANING DIFFICULT TO ACHIEVE:

- Typically the population at risk will be anything but homogeneous. This diversity may mean that there are different priorities, languages and levels of understanding. Shared meaning may be achieved with some groups and not others.
- **Related to population [heterogeneity] is the problem of designing messages to have individual relevance and meaning.**
- Some groups are largely excluded from most networks and they may not receive any warnings even where the system appears near perfect.
- **Informal personal networks may reinforce, undermine or deflect official communications.**

Source: Handmer (2000)

warnings. Table 1 summarises these reasons, which Handmer has classified according to whether a shared meaning between the authority issuing the warning and the public has been achieved. Shared meaning may be difficult to achieve because sections of the population do not receive the evacuation message or because language barriers exist. Where shared meaning is achieved, people may still not evacuate because they are not risk averse, because they have little faith in the warnings, or because they have some impediment to evacuation, such as lack of mobility.

The behavioural and situational factors listed by Handmer however, are not exhaustive; additional reasons are also known to come into play. The principle that levee protection can create an unjustified sense of invulnerability in a community is well established (Keys

and Campbell, 1991; O'Brien and Payne, 1997). Moreover, communities often believe that a flood will not exceed the previous flood of record, as Heatherwick (1990) found in relation to the Charleville flood of the April 1990.

McKay (1992) has raised another point that may have impeded the evacuation of Grafton. He argues that there is a general expectation that river height forecasts will have a high degree of accuracy. This may have been problematic, given that the Bureau of Meteorology had predicted a river gauge height that was less than the purported levee protection height, albeit by a small margin.

As an ancillary issue, the impact of false alarms on future evacuations is a widespread source of speculation and concern in the emergency management community. Dow and Cutter's (1997) research on

hurricane-related evacuations in the United States however, found that previous 'unnecessary evacuations' played only a small role in decisions made. The current research project provided an opportunity to explore this issue in the context of flood-induced evacuations in Australia.

The lessons learnt from previous research on evacuation have informed the preparation of best practice guidelines for flood warnings, including those intended to induce evacuation (Emergency Management Australia, 1999). The existence of previous research on evacuation, and the translation of the findings of that research into guides for practice, however, does not diminish the value of detailed, local, post-event studies. Research such as the project reported here is needed to check the importance of community perception of warning messages in a real and highly significant event. It can also serve to

check the veracity of current notions of best practice, and to reinforce the importance of best practice guidelines in the minds of emergency management practitioners where appropriate.

The aim of the research project, then, was to estimate the extent of the evacuation from Grafton, to investigate the reasons why people chose to evacuate or to not evacuate, and to explore the impact of an evacuation warning that proved to be 'unnecessary', in the sense that the expected flooding of the town did not eventuate. The research project investigated the following hypotheses:

- That many people were unaware that an evacuation warning had been issued.
- That members of the public sought confirmation of the flood threat from other people.
- That doubts about the authority of the person and organisation issuing the evacuation warning influenced behaviour.
- That people were aware that the river height prediction was less than the levee height, and that they had an unrealistic degree of faith in that prediction.
- That fears about home security contributed to the decision to stay in Grafton.
- That family responsibilities influenced the decision to evacuate.
- That pet owners did not evacuate because they did not want to abandon their pets.
- That people were confused by the content of the evacuation message, and unsure about what to do.
- That living behind a levee creates community complacency, and that experience with previous floods that did not overtop the levee contributed to a 'myth of invulnerability'.
- That the public's experience with an 'unnecessary' evacuation during this flood will militate against compliance with any future evacuation warnings.



Cars attempting to cross highway during Grafton flood.

Research Methods

The research fieldwork had two components: a telephone survey and face-to-face interviews. The fieldwork was conducted between two and three weeks after the peak of the flood.

During the telephone survey, Grafton residents who were present during the flood were asked a standard series of questions that relate to the hypotheses. The questions were a combination of open-ended and constrained response types.

The survey sample was drawn from two sources. The largest group of respondents was randomly selected from the telephone directory covering the New South Wales North Coast. Only telephone subscribers with an address in Grafton or South Grafton were selected. It was expected that the majority of the respondents from this random sample would not have evacuated, so a second targeted sample was drawn from a register of people who had evacuated. This ensured that the experiences of those who had chosen to evacuate were sufficiently represented.

Telephone surveys were conducted on several days of the week, and over a range of times during the day, in an effort to achieve as random a sample as possible. For the same reason calls that were not answered, or that were engaged, were recalled.

It is notoriously difficult to get dependable results from telephone surveys, other than on matters of fact. Issues that are not open to interpretation, such as the mode in which evacuation messages were received and the means of evacuation, are relatively straightforward, and the respondents' answers to these questions can be taken to be generally reliable. Issues that require interpretation, however, such as the motivation for behaviour, are much more difficult to investigate. For a number of reasons survey respondents can be unable or unwilling to provide accurate or insightful answers. This being the case, the survey results have to be interpreted with some caution.

Face-to-face interviews were also conducted as they can usefully



Backwater flooding – Grafton March, 2001.

complement the telephone surveys. They can usually provide more detailed and more insightful answers.¹ Initial responses can be explored further, and often, in a more extended interview, people become more relaxed and willing to give fuller and more candid accounts of their experiences and the motivations for their behaviours. Because of the less rigid structure, face-to-face interviews are also more likely to elicit responses that are not constrained by the researcher's preconceptions. The interviewees were selected as opportunities presented themselves.

Results and Discussion

Two hundred and five questionnaires were completed in the phone survey. Of these, one hundred and ninety one were from the random (telephone directory) sample, and fourteen from the targeted (evacuee register) sample.

One hundred and seventy of the one hundred and ninety one

random sample respondents (90%) live in flood-prone areas.

Twelve people participated in face-to-face interviews. The interviews were between ten minutes and ninety minutes in length.

The number of evacuees and their destinations

The random sample survey confirmed that few people evacuated from Grafton. Only twenty-nine respondents left their homes. Furthermore, seven of the people who did leave their homes moved to the homes of friends and relatives that were still within the area to be evacuated. At best only twenty-two respondents from the random sample evacuated to a safe area. This is thirteen per cent of the respondents who live in flood-prone areas, which extrapolates to approximately 1,600 residents of Grafton and the flood-labile parts of South Grafton. A further six hundred hospital patients and residents of nursing and aged homes

were evacuated. The destinations of the respondents who left their homes are shown in Table 2.

A further forty-seven respondents from the random sample (29% of those who had stayed at home) could, to some extent, be considered to be 'ready to evacuate'. These people made comments indicating that:

- they would go if they had been door-knocked;
- they were waiting for the final order to evacuate;
- they had packed and were ready to go;
- they were waiting until the last minute; and
- they had actually started to evacuate when the evacuation had been terminated.

This finding has both positive and negative ramifications. On the one hand, it shows that a large number of people were 'receptive' to the idea of evacuation. They may not have needed much more of a push to get them moving. On the other hand, the fact that they were delaying action until the last possible moment is perturbing. A 'last minute rush' to leave Grafton would be potentially disastrous, especially if evacuation was only possible via the two-lane bridge across the Clarence River. Furthermore, evacuation is likely to only be possible for a short period after levee overtopping (Water Studies Pty Ltd, 1992).

Awareness of the evacuation warning

Ninety-seven per cent of the people from the random sample reported that they were aware that an evacuation warning had been issued. While this very high level of awareness is encouraging, the three per cent that were unaware would

¹ There are several of reasons why survey respondents may be unable or unwilling to provide accurate or insightful answers during surveys. Social scientists use the term 'demand effects' to refer to the unconscious tendency of some survey respondents to provide 'socially acceptable' answers; that is, the answers that they believe that the questioner would like to hear. For example, a respondent may tend to tell a researcher from the SES that they thought the SES did a great job, because that is what the researcher wants to hear. In addition, many psychologists would argue that people are often not always conscious of their motivations for behaviour.

Table 2: Summary of Grafton evacuation
(random sample, flood-prone areas)

Destination	No. of respondents	% of sample
Remained at home	139	82%
Moved within Grafton	8	5%
Evacuated to high area near Grafton (South Grafton hill, Junction Hill, Waterview Heights)	18	11%
Evacuated to place outside Grafton area	3	2%
Evacuated, but destination unknown	2	1%
Total	170	

Table 3: Modes in which respondents heard evacuation warning
(combined random and targeted samples)

	Radio	Other People	Doorknock	Police Loud Hailer	Other Modes
All respondents	132 63%	64 31%	51 25%	6 3%	11 5%
Non-evacuees	100 62%	51 31%	37 23%	4 2%	11 7%
Evacuees	27 73%	10 27%	13 35%	2 5%	0 0%
Moved within Grafton	5 83%	3 50%	1 17%	0 0%	0 0%

equate to approximately 360 people in the flood-prone area. Nevertheless, it could be argued that many of the people who were unaware of the evacuation would have become aware if the evacuation operation had continued.

The modes through which the survey respondents heard the evacuation warnings are summarised in Table 3. Most people heard the evacuation warning on the radio, almost a third of respondents reported hearing of the evacuation warning from friends, neighbours and relatives, approximately a quarter of the respondents were doorknocked, and a few heard the evacuation warning via police car loud-hailer. Several people who heard the loud hailer warning, however, reported that the police car was moving so fast that the message was incomprehensible.

Although only a minority of respondents spontaneously reported that they were told of the evacuation warning by friends, neighbours and relatives, most people discussed the evacuation with other people. The 'other modes' category in Table 3 includes being informed by employer, by publican, and by landlord.

The proportion of evacuees that were doorknocked (35%) was significantly higher than the proportion of non-evacuees doorknocked (25%). This may be due to the concentration of the doorknocking teams' efforts in the lower-lying areas of Grafton, where residents may have a better awareness of the flood threat and a greater readiness to evacuate. The difference also indicates the value of face-to-face warnings in motivating action and reinforces the worth of this tried and true method.

Perceptions of the flood threat

A third of the evacuees indicated that they were generally risk averse. They described themselves as cautious people or used phrases such as 'you're better safe than sorry'. This conforms with the expectation that personal risk aversion is a critical factor in the decision to evacuate. Only a minority of evacuees (37%) had a firm belief that Grafton would be flooded. The fact that the majority of evacuees were not convinced that Grafton would be flooded is encouraging: it means that people, to some extent, accept that there is a degree of uncertainty in the prediction of flood behaviour but

that they are still willing to behave in a precautionary manner.

Three quarters of the survey respondents who did not evacuate believed that they were not under threat. This is by far the greatest impediment to the evacuation of Grafton. Much of the housing stock in Grafton pre-dates the construction of the levees and elevated houses are commonplace. Many of the residents of these houses are inclined to stay in the upper floor areas during flooding. Other survey respondents believed that they lived in 'the higher parts of Grafton' that would not be inundated if the levee was overtopped or breached (12% of those who stayed). Some of these people in the supposedly 'high and dry' areas gave responses that indicated that they do actually live outside the areas that would be inundated (the two hills of South Grafton), but many live in the low-lying areas which would definitely be inundated if overtopping occurred for more than a very short period.

Living behind a levee

Very few survey respondents expressed the firm belief that the levee would not, or could not, be overtopped. Conversely, many



Flood devastation of rural property.

people surveyed and interviewed admitted the possibility of levee overtopping. On this issue then, the behaviour of the people of Grafton seems to be somewhat at odds with their survey and interview responses. They express no great faith in the levee, but they behave as if the levee is likely to protect them. In the case of Grafton, living

This seems to have been one of the greatest obstacles to the evacuation. On the day in that sense and to a certain extent, the battle was lost before it was fought. Whatever emergency managers did on the day, they would still be up against a huge level of inertia in the population that would be very difficult to overcome.

The residents of Grafton, having experienced few direct effects of flooding since the construction of the levees, are likely to have developed a relatively low consciousness of the flood threat, and are therefore less ready to act.

behind a levee does not result in the residents having a conscious or expressed belief in the 'myth of invulnerability'. The contribution of the levee to the poor response to the evacuation warning is likely to be subtler, and to have built up over a long period of time. The residents of Grafton, having experienced few direct effects of flooding since the construction of the levees, are likely to have developed a relatively low consciousness of the flood threat, and are therefore less ready to act. In most cases, the residents do not seem to have ever considered the possibility of one day having to evacuate.

Confirming the flood threat

As expected, the results of the research indicate that people take steps to confirm the flood threat. All of the people interviewed reported that they spoke with neighbours, friends and relatives about the flood and the evacuation warning. A few of them also sought confirmation about the flood threat and about courses of action recommended by the SES and the Police Service.

Many phone survey respondents and interviewees reported that they had spoken with older, longer-term

residents of Grafton. These older residents frequently said that they had experienced large floods in Grafton (the implication being that they were the largest) and that the water 'never gets up to here'. This is of some concern given the relatively short span of any individual's experience. Floods larger than those that have occurred during the lifetime of Grafton's residents are inevitable but there is little consciousness of the potential for what has not been personally experienced.

A few people reported that they were persuaded to stay by other people, but a larger number of people were persuaded to go by others.

Some aspects of life in Grafton during the term of the evacuation warning were out of the ordinary – drivers queued at service stations to fill their cars with fuel, shoppers exhausted the supermarkets' stocks of bread and milk, business owners scrambled to lift and relocate stock and equipment. Evacuation warnings on the radio were heralded by the standard Emergency Warning Signal and emergency services vehicles cruised the streets with flashing lights. Other aspects of life however, continued much as they normally do. In particular, the pubs and clubs of Grafton were well patronised. One of the interviewees reported that the sight of the disco at the Royal Hotel going 'full-tilt' gave the impression that it was just another ordinary Saturday night in Grafton, and that evacuation was not really warranted. This is noteworthy, given the location of the Crown Hotel adjacent to the Prince Street gauge, where many people went to get direct confirmation of the flood threat.

Authority to issue an evacuation warning

Seventy per cent of the people surveyed knew that the SES had the authority to issue an evacuation warning. This percentage was the

same for both those who stayed in Grafton, and for those who evacuated. The perceived authority of the organisation issuing the warning therefore was not a major influence on the decision to evacuate.

Despite the fact that most people knew that the SES had the authority to issue an evacuation warning it did not necessarily imply that they had faith in the decision to evacuate. Indeed, the poor response to the evacuation warning is perhaps *prima facie* evidence that they do not have faith in the State Emergency Service's judgement on the need to evacuate.

Awareness of river height predictions

Most people were aware of the river height predictions during the flood. Eighty four per cent of the random sample reported that they were aware of the predictions. Most people were listening to their radios and, as indicated above, there was a lot of discussion about the flood, so river height predictions would have been passed by 'word of mouth'. Several people also reported that they had logged on to the Bureau of Meteorology web site to get the latest river height predictions.

All of the interviewees indicated that they were aware of the safe gauge height of the levee. It is difficult to determine, however, whether they were aware of the levee height before the flood, or have only become aware of the height since the event. Very few people said that they would not evacuate because the predicted river height was less than the levee height. The responses of the people surveyed and discussions with people interviewed indicated that Grafton residents generally seem to understand that the river height predictions cannot be absolutely precise. This is especially encouraging as the protection afforded by the levee turned out to be less than

expected. As mentioned in the introduction, the water came within 0.2 metres of the levee top, so the gauge height that the levee protects to is in the order of 7.95 metres rather than 8.23 metres.

Evacuation and home security

Surprisingly few survey respondents expressed concerns about the security of their homes once they had evacuated. Only fifteen respondents mentioned home security (8% of respondents), despite the fact that this issue had been raised in the local press in the week before the survey.

One of the interviewees, however, said that many people, with whom she had spoken after the flood, had talked about the prospect of looting. The same interviewee said that she had heard on the radio that the police would provide security for residences, but because of the small number of police in Grafton, she did not believe that the area would be secured. She thought that the police would be busy with evacuation work. Interestingly, she had not considered the possibility of looting before the radio brought the issue to her attention. The mention of police therefore 'sowed the seed of doubt' about the security of her home and reinforced her decision to stay.

As an aside, there were no reports of looting during the evacuation, but this may have been because only a minority of residents left town.

Evacuation and pet owners

Only a few people said that they would not evacuate because of the need to care for their pets. This is counter to expectations. The small number might be explained by two factors. First, most people who evacuated did so by car, to a place of their choice, so they presumably could take their pets with them.



Helicopter resupply operation.

Furthermore, a number of people who evacuated by State Rail train took their pets with them. In general terms therefore, people may not have felt constrained in their evacuation decision by pet ownership. Second, as noted above, people mostly did not evacuate because they did not consider themselves to be at risk. Having already fully attributed their decision to stay on basis of the perceived lack of risk, the respondents may not have allocated any attribution to their concern for pets. For this reason, the idea that people are often reluctant to evacuate because of the need to care for pets cannot be discounted. Furthermore, there is evidence that pet owners who do evacuate without their pets often return to the evacuated area to rescue their pets, thereby increasing their exposure to the hazard (Heath et al., 2000). Clearly evacuation planning must continue to address this issue.

Clarity of the evacuation message and the effectiveness of the evacuation procedure

As stated in the introduction, operational aspects of the evacuation are beyond the scope of this research. The decision of the emergency services to call the



Preparing sandbags during Grafton floods

evacuation, the effectiveness of the strategy pursued and tactical aspects such as the mechanics of the door-knocking operation, for example, are not addressed here. The public's perceptions of the evacuation warnings and the operational effectiveness of the emergency services may, however, inform the post-operational review process.

In the evacuation warnings, the evacuation was characterised as 'voluntary' rather than 'compulsory', even though the emergency services in New South Wales have the legislative authority to issue a mandatory evacuation order (Kanarev, 2001). Grafton residents generally comprehended the voluntary nature of the evacuation, with only a small minority of the evacuees believing that they were compelled to leave because of a compulsory order.

Also on the subject of the evacuation warnings, only three survey respondents commented that the evacuation messages were

confusing. One of the respondents said that he didn't understand the term 'self evacuation'. Another two respondents said that the evacuation message was very general and not clear on specific details of who needed to evacuate. Similarly, one of the interviewees did not know whether she lived in the first priority area in the evacuation warning, and another was critical of the 'broad brush' nature of the areas notified for evacuation. These remarks indicate a need for the SES to check the wording, and the concepts behind the wording, of the warnings.

Responses from the surveys and interviews indicate that there was a high degree of variability in the way that the door knocking was conducted. Some residents were door-knocked forcefully. They were told for example, that they should get out, that they would not be warned again, that they needed to get out as soon as possible. Other residents reported that the door-

knockers delivered a 'half-hearted' message. They were told that they should consider leaving as a precaution – that they might be asked to go later that day, or they were asked whether they wanted to go. It is not known whether the forcefulness of the door knocking corresponds with the phasing of the evacuation, with more forceful messages being delivered in areas that were first priority, and 'softer' doorknocking occurring in later priority areas.

The survey and interview responses also indicate that the coverage of the doorknocking was not optimised. Some streets were doorknocked on only one side, adding to the confusion amongst the residents. Other areas were doorknocked up to three times. In one case this was in an area that the interviewee considered to be one of the highest points in Grafton, and so the credibility of the SES was adversely impacted. These points reinforce the need for meticulous planning of doorknocking operations and thorough briefing of doorknocking teams.

The 'cry wolf' factor

Counter to expectations, few people reported that the experience with an unnecessary evacuation would have an impact on any future decision to evacuate. Only two of the thirty-seven evacuees who were surveyed indicated that the 'false alarm' would influence any future decision to evacuate. On the other hand, twenty-nine of the one hundred and sixty survey respondents who did not evacuate (18%) reported that the experience would have an effect on future evacuation decisions; that is, they would consider leaving next time because of the close call. This attitude was also expressed by one of the interviewees who said that she surprised herself with her reluctance to leave and that she would definitely evacuate in a future flood.

The interruption of service utilities

Several survey respondents and interviewees indicated that they were concerned with the possible loss of services if the levee had been overtopped. Some of these people did not become aware of this prospect until after the floods, and others did not fully comprehend the implications, until after the flood, of living without electricity, telephone, water and sewerage. This point raises two issues. First, there is an opportunity to further emphasise the consequences of the loss of services in future evacuation messages as a supplement to (not as a replacement of) messages that emphasise potential loss of life. The emphasis of inconvenience would be a stimulus to evacuate for those people who do not believe that they are physically at risk, and so do not respond to evacuation messages that emphasise loss of life. Second, the large number of people who have become aware of the serious inconvenience of the loss of services after the event, even without experiencing that inconvenience, reinforces the belief that a large proportion of the population would quickly tire of the inconvenience. These people they may have a propensity to place themselves at risk by moving about by foot in flood waters and they would increase the workload of emergency service workers as they would require evacuation by boat if the Grafton urban area became inundated.

Conclusions

Community education

The key to a successful evacuation is the readiness of the public to respond to an evacuation warning. The residents of Grafton simply were not ready to evacuate. They had very little in the way a realistic appreciation of the flood threat. For



Floodwaters encroach on the town of Ulmarra downstream of Grafton. (NB: traffic jam on Pacific Highway).

the most part, they had no acceptance of the possible need to evacuate. They had no understanding of the evacuation strategy.

Community education provides an opportunity to start the work required to successfully evacuate, outside of flood time. As many emergency managers would appreciate, however, community risk education is a difficult challenge. It is especially difficult to mount an arousing and convincing campaign in relation to a rare event such as a levee-overtopping flood that has only a one per cent chance of occurring in any one year. Nevertheless, when (not if) the big flood comes, there is a significant risk of loss of life for those people who do not evacuate. Consequently, the residents of Grafton must be given the opportunity to become aware about the local flood problem so that they have a realistic appreciation of the situation that

they face. They should be convinced about the possible need to evacuate in future floods, so that they have at least considered the option and do not dismiss it out of hand. They need to be advised of the folly of staying to remain in their homes. They should be informed about the evacuation

The residents of Grafton had a lucky escape. The levees protected them – this time.

strategy for Grafton. They need to be convinced about the need to act early, so that congestion of evacuation routes is minimised. They need to know that floods greater than those experienced by older, longer-term residents can and will occur.



Flooded canefields on the lower Clarence.
Photo courtesy of the Grafton Daily Examiner.

Community education would also increase public awareness of, and confidence in, the State Emergency Service's planning and operational ability. The enhanced public profile of the SES would help ensure that people would have greater faith in any future decision to evacuate.

While it is a difficult job, emergency managers have an obligation to do all that they can to ensure that communities are ready to react to emergencies.

Evacuation warnings

As a preface to this section, it should be noted that this research does not address the process of making a decision to evacuate in a general sense, nor does it assess the merits of the decision to evacuate in this specific case. Once the decision to evacuate has been made, however, emergency managers must

maximise the effectiveness of the evacuation.

It is self evident that, if evacuations are required, the evacuation warnings are the primary means available for emergency managers to influence public behaviour. While community education can lay much of the groundwork for evacuation, the evacuation messages are the most potent intervention 'on the day'. Their optimisation is crucial.

An evacuation warning that is not presented as a compulsory order will not compel evacuation. A voluntary evacuation warning implies uncertainty on the part of the emergency management agency and so promotes inaction on the part of residents. Furthermore, it pushes the onus for decision making onto those who are not in the best position to make that decision. Emergency managers are in the best position to appreciate the threat presented by a flood, and they must shoulder the responsibility to make a decision and act wholeheartedly on that decision.

Because a large number of people indicated that they had made some preparations to evacuate but were delaying their action, evacuation orders should emphasise that the decision to evacuate should be made early and that people should leave as soon as possible. Early action will minimise any 'last minute' congestion of evacuation routes.

Given that Grafton residents have expressed concern about the loss of services during a flood, evacuation orders should emphasise both the potential for interruption of essential services and the potential for loss of life.

Given that there is some indirect evidence that the existence of levees has contributed to a reluctance to evacuate, warning messages should actively engage

the issue. They should state that the levees are not designed to keep out very serious floods. They could mention both levee heights and flood height predictions (with due care to emphasise the uncertainty inherent in the predictions). Educational efforts outside of flood time also need to stress the point that levees can be overtopped, noting examples, such as Nyngan, where extreme floods have overtopped levees.

Emergency operations

It is imperative that flood operations serve to reinforce the authority of the emergency agencies. If people doubt the ability and effectiveness of emergency managers, they will not have faith in the call to evacuate. Messages to the public have to be credible and consistent. Headquarters staff must come across as competent. Door-knocking and other field operations have to be well planned and efficiently executed.

If a critical mass of people comprehended the seriousness of the flood threat and decided to evacuate next time the levees are threatened, then a cumulative, 'snow-ball effect' is likely to result. If so, the number of people choosing to evacuate would increase markedly.

The March 2001 flood brought widespread damage and loss to many communities on the Clarence River floodplain. The residents of Grafton however, had a lucky escape. The levees protected them – this time. Indeed, in many ways the experience of a severe flood has been advantageous. It has served as a 'wake up call' for the residents of Grafton; it has alerted them to the possibility of flooding in the city, and it may help to overcome the inertia that is the greatest obstacle to evacuation, although a conscious effort will be needed if this is to be achieved. The experience can also



Flooded canefields on the lower Clarence.
Photo courtesy of the Grafton Daily Examiner.

bring benefits to emergency management agencies. It can serve to illuminate shortcomings in planning, in procedures and in operational readiness. Emergency managers are duty-bound to examine the experience closely and to draw from it as many lessons as possible. The incorporation of these lessons into augmented plans and improved procedures is already under way within the NSW State Emergency Service.

References

Dow, K. and Cutter, S. 1997, *Repeat Response to Hurricane Evacuation Orders*, Quick Response Report #101, Natural Hazards Center, University of Colorado [http://www.colorado.edu/hazards/qr/qr101.html]

Emergency Management Australia 1999, Flood Warning, Australian Emergency Manuals Series, Part III – Emergency Management Practice, vol. 3, Guidelines, Guide 5 (2nd ed), Emergency Management Australia, Canberra.

Handmer, J. 2000 Are Flood Warnings Futile? Risk communication in emergencies, *The Australasian Journal of Disaster and Trauma Studies*, vol. 2000, no. 2, [http://www.massey.ac.nz/%7Etrauma/issues/2000-2/handmer.htm].

Heath, S., Voeks, S. and Glickman, L. 2000, 'A Study of Pet Rescue in Two Disasters', *International Journal of Mass Emergencies and Disasters*, vol. 18, no.3, November, pp.361–381.

Heatherwick, G. 1990, 'The Nature and Purpose of Flood Warnings', *The Macedon Digest*, vol. 5, no. 2&3, December, pp.7–11.

Kanarev, N. 2001, 'Assessing the legal liabilities of emergencies', *The Australian Journal of Emergency Management*, vol. 16, no. 1, Autumn, pp.18–22.

Keys, C. and Campbell, B. 1991, 'Preparing Communities for Flooding: some recent lessons and some ways forward', *The Macedon Digest*, vol. 6, no. 3, September, pp.1–5.

Legates, D. and Biddle, M. 1999, *Warning Response and Risk Behavior in The Oak Grove – Birmingham, Alabama, Tornado of 08 April 1998*, Quick Response Report #116, Natural Hazards Center, University of Colorado, [http://www.colorado.edu/hazards/qr/qr116/qr116.html].

McKay, G. 1992, 'Flood Forecasting by the Bureau of Meteorology: limitations and expectations', *The Macedon Digest*, vol. 7, no. 4, pp.22–24.

O'Brien, P. and Payne, J. 1997, *Public Response to the 1997 Northern California Floods*, Quick Response Report #97, Natural Hazards Center, University of Colorado, [http://www.colorado.edu/hazards/qr/qr97/qr97.html].

Water Studies Pty Ltd. 1992, *Grafton Flooding Caused by Levee Overtopping*, vol., *Flood Behaviour and Contingency Planning*, September, Clarence River County Council, Grafton, NSW.

Neil Pfister is Planning and Research Officer, New South Wales State Emergency Service.